RaceStudio 3 Manual

AiM Tech Srl

Last updated : April, 2025

1

1 RaceStudio 3 in Few Words **3**

2 Registration, Feedback and Support **5**
2.1 Registering for AiM RaceStudio 3 . . . 5
2.2 Feedback and Support . . . 6

3 Configuration of Devices **7**
3.1 All Configurations . . . 7
3.2 Configurations of Specific AiM Devices . . . 7
3.3 Configurations in Manual Collections . . . 8
3.4 List of Configurations . . . 8
3.5 All Configurable Devices . . . 8

4 RaceStudio 3 Analysis **9**
4.1 Why two 'Analysis' Icons? . . . 9
4.2 Introduction to RaceStudio 3 Analysis . . . 9
4.3 RaceStudio 3 Analysis Database . . . 10
4.3.1 Populate RS3A Database . . . 10
4.3.2 Sessions database window . . . 12
4.3.3 Sessions database filtering column . . . 12
4.3.4 Sessions Main List . . . 14
4.3.5 Preview for Selected Sessions . . . 18
4.3.6 RS3A Database Position . . . 27
4.4 Data Analysis Window . . . 28
4.4.1 RS3A Top Toolbar . . . 29
4.4.2 Getting Useful Information . . . 30
4.4.3 Detailing How To... . . . 41
4.4.4 Fine Tuning the Analysis . . . 95
4.4.5 The Analysis Base . . . 99
4.4.6 Data of Laps and Sessions . . . 99
4.5 Analysis Profiles . . . 99
4.5.1 Profiles Manager . . . 100
4.5.2 Colors and Accessories Settings . . . 101
4.5.3 Layout Settings . . . 103
4.5.4 Analysis Window Behaviour . . . 103
4.6 Math Channels . . . 104
4.6.1 How to Use a Math Channel . . . 104
4.6.2 Sample Math Channels by AiM . . . 107
4.6.3 How to Create/Edit a Math Channel . . . 109
4.6.4 LookUp Tables . . . 117
4.6.5 DLLs . . . 118
4.7 Synchronizing your Data . . . 118
4.8 Track Maps in Analysis . . . 119
4.9 Split Divisions . . . 120

4.10 Create a New Track Map . . . 120
4.11 Data Tech Reports . . . 121
4.11.1 Report Map . . . 121
4.11.2 Report Tabs . . . 122
4.11.3 Report Statistics . . . 122
4.11.4 List of Available Reports . . . 122
4.11.5 Report Settings . . . 123
4.11.6 Managing, creating and editing a data report . . . 126
4.11.7 Unmatched Channels . . . 127
4.11.8 Filtering data for laps and splits report . . . 127
4.11.9 Management of scales for statistics with same units . . . 128
4.11.10 Choosing the statistics to be used . . . 129
4.11.11 Report Sessions Naming . . . 130
4.11.12 Preliminary Work . . . 130
4.11.13 Exporting data reports to printable files . . . 130
4.12 Analysis Examples . . . 131

5 Tracks for Analysis and Devices **133**
5.1 All Tracks . . . 134
5.2 Tracks of Specific Nations . . . 134
5.3 Tracks in Smart Collections . . . 134
5.4 Tracks in Manual Collections . . . 134
5.5 List of Tracks . . . 134
5.5.1 Web based maps . . . 135
5.5.2 Time Zone and DayLight Saving Time (DST) . . . 135
5.5.3 Track Preview for the Track under Mouse Pointer . . . 135
5.5.4 Weather Forecast . . . 137
5.5.5 Track Creation Process . . . 137

6 Custom Sensors **139**
6.1 All Custom Sensors . . . 140
6.2 Custom Sensors of Specific Physical Quantities . . . 140
6.3 Custom Sensors in Manual Collections . . . 140
6.4 List of Custom Sensors . . . 140

7 Custom Protocols **141**
7.1 All Custom Protocols . . . 141
7.2 Custom Protocols of Specific Manufacturers . . . 141
7.3 Custom Protocols in Manual Collections . . . 142
7.4 List of Custom Protocols . . . 142

8 Devices **143**

9 Wi-Fi Networks **145**
9.1 Possible Issues using Windows 11 - 24H2 . . . 145

10 Web Updates **147**
10.1 Updates for Firmware and Software . . . 147
10.1.1 Download Software and Firmware Updates . . . 148
10.1.2 Export and Import Updates . . . 148
10.1.3 Install a New RaceStudio 3 Version . . . 148
10.1.4 Update Your Device . . . 148
10.2 Updates for Display Resources of Configurations . . . 148
10.2.1 Download Graphical Resources . . . 148
10.2.2 Export and Import Graphical Resources . . . 148

11 Preferences **149**

12 AiM World **151**

13 Simulator Manager **153**

14 AiM Video Documentation **155**
14.1 Roger Caddell's Webinars on AiM World . . . 155
14.1.1 2024 Roger's Webinars . . . 155
14.1.2 2023 Roger's Webinars . . . 157
14.2 James Colborn's Webinars on AiM Software . . . 159
14.2.1 2024 James' Webinars . . . 159
14.2.2 2023 James' Webinars . . . 159

15 Frequently Asked Queries **161**
15.1 Technical Specifications for RaceStudio 3 Installation . . . 161
15.1.1 Operating System . . . 161
15.1.2 MacOS - Linux . . . 161
15.1.3 Antivirus Software . . . 161
15.1.4 PC Hardware . . . 161
15.2 Tile Providers . . . 162
15.3 How to Translate RaceStudio 3 for Localization . . . 177
15.3.1 Caveats . . . 178
15.4 How to Enable and Share RaceStudio 3 Logs . . . 178

16 Access AiM Data Files with a DLL **179**
16.1 Visual Studio 2022 . . . 179
16.2 MatLab (TM) . . . 180
16.3 Release History . . . 180
16.3.1 December 20th, 2024 . . . 180
16.3.2 October 12th, 2023 . . . 180
16.3.3 September 8th, 2023 . . . 180
16.3.4 September 6th, 2023 . . . 180
16.3.5 September 5th, 2023 . . . 180

This is the quick documentation for AiM RaceStudio 3.

Note: The information included here are  "under construction", coded by developers and aimed at supplying a quick help or a quick reference for RaceStudio 3 windows.

Official AiM Documentation Web Page.

The online version of this manual can be found as html page or as pdf file.

Thank you

The AiM Software Team.

software@aim-sportline.com

Having this manual being developed in "months" times, please keep in mind that some screen captures could have been done with previous releases of RaceStudio 3.

Chapter 1

RaceStudio 3 in Few Words

RaceStudio 3 is the AiM software toolset to manage all AiM devices, to download data and videos from them, and to properly analyze downloaded data in order to improve the overall performances of your vehicle and of you as a racer.

Reading the full explanation of such a complete piece of software is hard and for sure time consuming, but we divided this manual so to have any chapter not needing all the previous ones. This means that you can point exactly where you need to, saving time and being quicker in getting the information you need.

So, how do we proceed? Well, next chapers will be addressing every button of the top RaceStudio 3 toolbar.

Please keep in mind that in the following pages the RaceStudio 3 piece of software can be referenced as RS3.

Chapter 2

Registration, Feedback and Support

2.1 Registering for AiM RaceStudio 3

Starting from July 2020, in RaceStudio 3 you have the option to become a registered user. Look for the "Log in" icon in top right toolbar.

- Knowing who's pleased to use our software allows us a more direct feedback and a warmer cooperation;
- Weather information is available for the place and time of every session (up to 1 year back), and is available as forecast in the tracks database page;
- Access to AiM Cloud services, i.e. saving data and profiles on the cloud, a small amount of space is freely available and additional space is available for purchase.

Clicking the above icon will trigger a menu. To register, choose "Register on AiM Website". Click here to open the Official AiM registration webpage. Fill all the fields and click "Register". Open your mail client and look for an email from info@aim-sportline.com. Click the "Activate your Account" button. If you don't confirm clicking on the button, RaceStudio 3 will not be able to perform the login.

Go back to RaceStudio 3, and, after clicking the above icon, select the menu "Login with your credentials". You'll be prompted the login window.

Fill the Mail and the Password fields with user name and password chosen during the registration and click the "Log In" button. RaceStudio 3 "Log in" icon will now be drawn as a racing helmet.

You will not need to enter user name and password every time as RaceStudio 3 safely stores them. New menu items will be available from now on.

- Send Feedback to AiM
- Manage My Account on AiM Website
- Change Logged in User
- Log Out
- Log Out and Forget me

The "Send Feedback" menu will give you the possibility to send feedback and suggestions to AiM software team.

The "Manage your account on AiM website" menu will redirect your internet browser on AiM user account webpage, in which you'll be able to manage your account.

The "Change Logged in User" menu will open the login dialog box, so for you to be able to manage a second possible RaceStudio 3 user.

The "Log Out" menu will let you go back having RaceStudio 3 behave as an unregistered user.

The "Log Out and Forget Me" menu will do the same, ensuring that RaceStudio 3 deletes every trace of your account and password.

In case you forgot your password.

Click here to open the Official AiM "forgot password" webpage.

2.2 Feedback and Support

You have several possibilities to get in contact with the development team in Italy or the support team.

The first one is via email. Please use one of the mail addresses "software@aim-sportline.com" or "support@aim-sportline.com". In case you're submitting an issue, we kindly ask for data or everything else that's needed to make us able to reproduce the issues you tell us about.

In case you're a registered user you can go for two other ways.

The second way you have is to click the user icon in the top toolbar of RaceStudio 3 main window, and select the "Send Feedback" menu. We advise you to write here opinion or suggestions. All of them are being read by the development team.

The third way is, while editing a configuration or a custom sensor, or viewing some data in analysis database, is to click on the "AiM Support" or the "To AiM" icon. This way the selected configuration or the selected session will be uploaded to the team.

Chapter 3

Configuration of Devices

The vast majority of AiM devices need a configuration to program the way they work. Such configurations are managed by this part of the software.

The devices configurations manager is a database, the window of which is vertically divided in two parts: left and right.

The right part is a configurations list, in which, by default, all configurations are shown. For each configuration you're prompted the most important information, and there are buttons for the main operations you can do on configurations.

The left part is the 'filtering' part, in which you can drive a subset of configurations to be shown instead of the complete list. From top to bottom in the column, you find: all configurations, devices, manual collections, connected devices. This last 'connected devices' item will be described in the part dedicated to devices.

3.1 All Configurations

Select this item in the left column and the list of configurations will include all, at present, the configurations available in the software database.

At the very first use of RaceStudio 3, selecting this item the right part of the page will show an empty list. Click 'New' button to create a new configuration or 'Import' button to add a configuration from a drive or again click 'Receive' button to load in RaceStudio 3 database the configuration of any connected AiM device.

3.2 Configurations of Specific AiM Devices

Creating or importing configurations for different AiM devices the list on the left will populate showing a row for each device.

Selecting any device item in the devices list on the left, the configurations list on the right will show only the configurations available in the database for that device.

3.3 Configurations in Manual Collections

Configurations can be grouped as wished creating "Manual collections". This can be done clicking on the cogged wheel icon right of "Manual collections" item. Name the collection as you wish in the window you're prompted anc click OK. The new collection folder appears under the "Manual collections" item. After dragging and dropping the configurations in the folder, they will be shown in the list of configurations when clicking the collection folder.

3.4 List of Configurations

The top right toolbar allows the user to perform different operations, i.e.:

- **New/Clone/Delete** adds or removes a configuration; 'new' button adds a configuration from scratch, while 'clone' makes a copy of an existing one.
- **Import/Export** 'import' adds a configuration to the software database copying it from an external drive, 'export" copies a configruation from the software database to an external drive.
- **Receive/Transmit** adds a configuration to the software database copying it from the connected device, or transfers a configuration from the PC to the connected device.
- **AiM Support** sends a configuration to AiM support service, allowing the user to add a message.

3.5 All Configurable Devices

Each device features its own peculiarities. Please look for the specific user manuals clicking the following link.

Official AiM Products Web Page.

Chapter 4

RaceStudio 3 Analysis

RaceStudio 3 Analysis, here referenced, from now on, as RS3A, is the analysis tool included in RaceStudio 3 software. To launch it, click RS3A icon on the top left toolbar, highlighted here below.

Click to download the RS3A official pdf manual.

4.1 Why two 'Analysis' Icons?

RaceStudio 2 Analysis is the analysis tool included in RaceStudio 2 software. It has been around forever, and many users are still loving it. The reason for which we're still referencing RaceStudio 2 Analysis is that we want to allow our customers taking their time to get in love with RaceStudio 3 Analysis. To launch RaceStudio 2 Analysis, click its dedicated icon on the top left toolbar, highlighted here below.

4.2 Introduction to RaceStudio 3 Analysis

Within RS3A, automatic and perfect time data-video integration is available. In addition to this more data are available in a quicker way; this because the new ".xrk" format contains more information than the old ".drk" one and because RS3 software can better exploit ".xrk" format potentials. The new RS3A is quicker in finding the information and each view has been properly designed and developed to be more intuitive and user friendly.

What does RS3A offers me if I log in?

As we explain in the *Registration, Feedback and Support*, RS3 has a new "log in" feature that provides dedicated services and cloud sharing. New available services are, for example, weather conditions (for the last year only) and forecast while cloud sharing include data and profiles. They can be shared among your PCs or among your friends, coaches etc.

What about my previous data?

RaceStudio 2 Analysis is still available and will be for a while. With the new RS3A software, previous data can be imported and analysed. You can import entire folders as well as single files browsing your PC.

What do I see first?

The first page that you see when running RS3A is Database page, with data and videos of the sessions in the central column, grouping criteria and collections on the left and the session preview on the right.

What are RS3A session collections?

RS3A allows you to group your sessions in different ways called collections as shown in the software home page. Recent session collection collects the most recent sessions you interacted with. This means that if you recently worked on an old session that was particularly important you do not need to look for it again: you find it in the recent sessions folder. Smart collections group sessions following a rule that you can decide like, for example, all sessions performed by a racer or on a track or belonging to a championship. With Manual collections, sessions are grouped as you wish, without the need to fix any specific criteria. Just drag and drop the sessions in the collection.

What is the preview feature?

The new RS3A software features a preview window on the right that shows dedicated information without needing to open the session for analysis. The information shown change according to the session mode selected through the toolbar placed just above the preview column.

What about the Analysis window?

The analysis shows, in the same window: channels tables, web-based map of the circuit, channels graphs of RPM and Speed (you can change this view through the profiles) and video of the race if available. All views can be changed and their setting saved as a "Profile" that you can apply to any session you open. Pressing the space bar you can hide/unhide different panels of the view.

Can I sync the graphs of my movies?

Yes. You can place the movie in the centre of the page with the desired graphs cursors automatically synchronized with the movies.

4.3 RaceStudio 3 Analysis Database

All imported data are copied into a database, to allow a quicker availability of bigger quantities of data. The xrk files saved by AiM devices contain more information, if compared to drk files. The technology embedded in our database let us take all the benefits of these information.

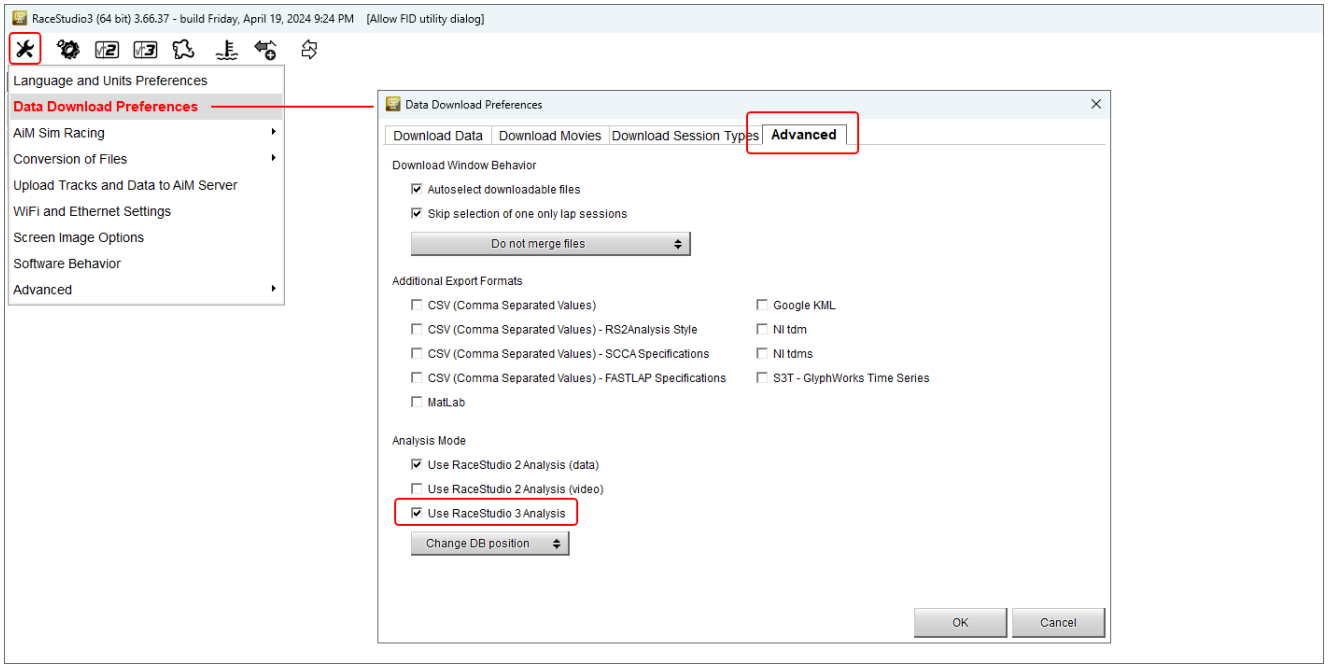
4.3.1 Populate RS3A Database

The RS3A database gets populated in two ways.

- Automatically while downloading;
- Manually adding sessions.

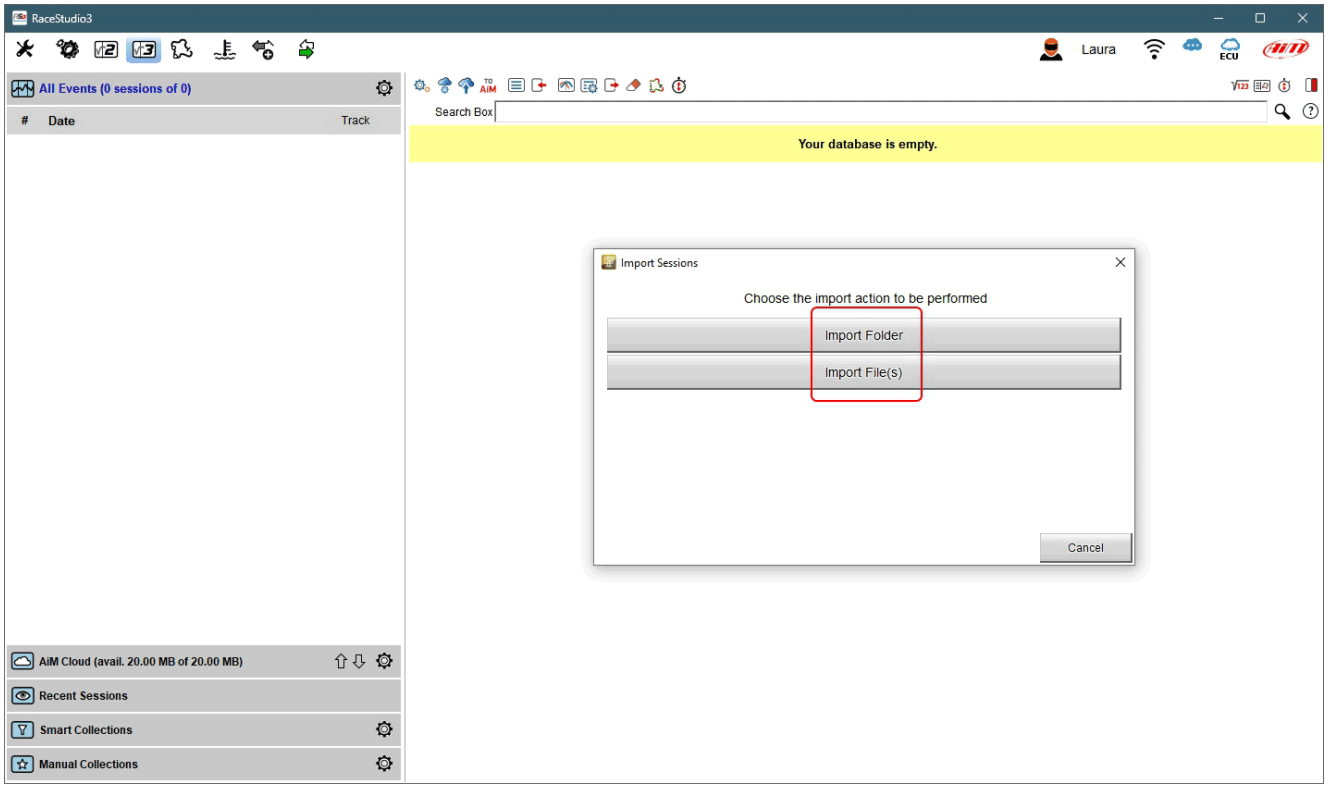
Automatically while downloading

Since the public beta release of July 9th 2020, RaceStudio 3 enables by default the flag that adds all downloaded sessions into the analysis database. In case it doesn't happen on your PC please ensure you flag "Use RaceStudio 3 Analysis" checkbox in the last tab on the right of "Data Download Preferences" panel you can reach through the setting icon on the top left toolbar as shown below.



RS3A is typically run after data download and this means that the software database populates automatically but previous data can also be imported from an external drive.

In this case at the very first time the software database is empty and this dialog window is prompted.



It is possible to import single files or entire folders of data. Pressing one of the buttons highlighted browse windows is prompted: select the file/folder to import and press OK. A window with a progress bar appears. In case the files are already in the database or if there is any issue the software warns you.

Manually adding sessions

Import menu is available clicking the cogged wheel icon top of the left column in the main database page.

Selecting the menu you'll be prompted "Import" dialog window.

Selecting "Import Folder" you will be importing all data into a specific folder and all its subfolders.

Selecting "Import File(s)" you'll be in control of which files will be added.

In both cases, upon confirmation, a new dialog will be shown, witnessing the import progression.

During the import process the database engine will automatically recognize which data and video files are linkable and will purpose them as linked. For this to be happening automatically you need a recent firmware in the SmartyCam (capable of a data stream embedded in video) and your SmartyCam must have been connected to the device while logging.

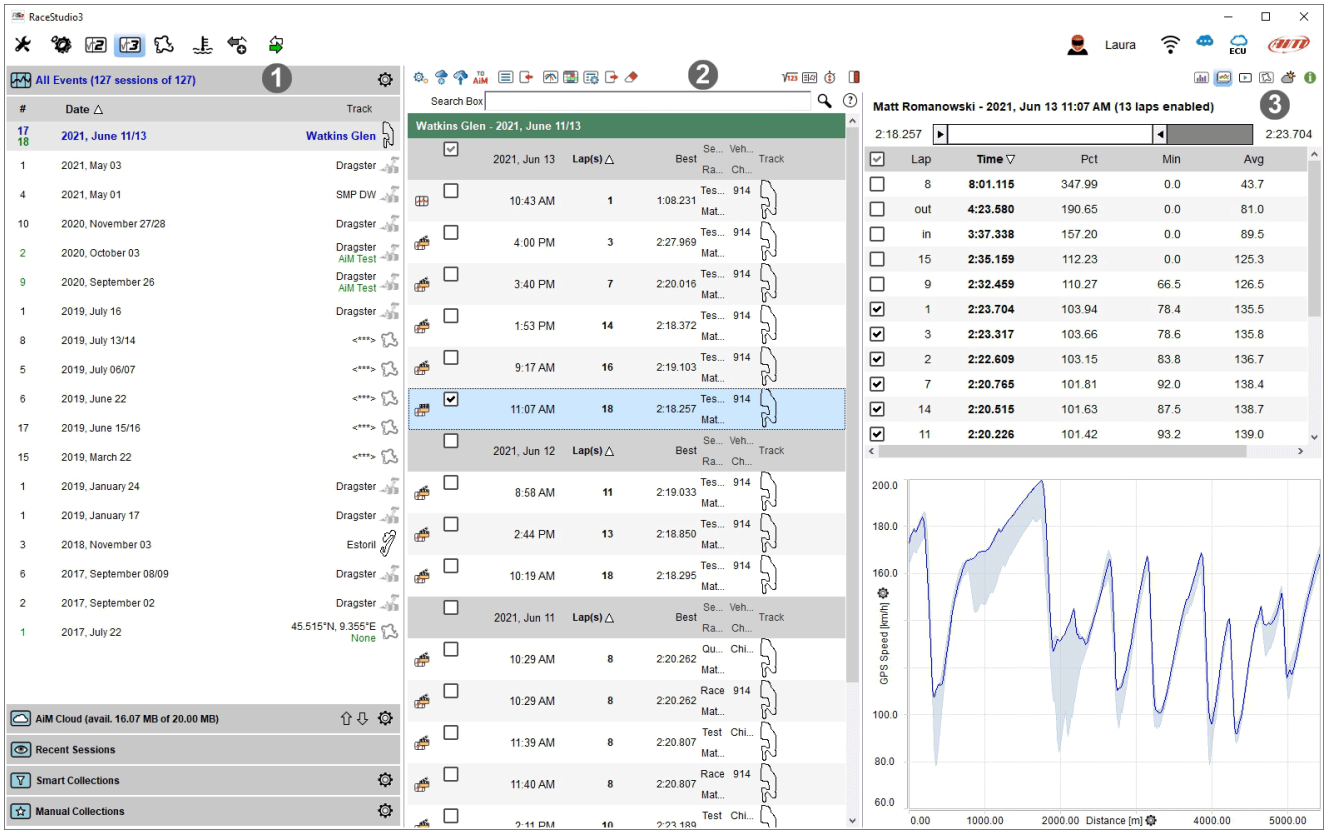
4.3.2 Sessions database window

RS3A home page is divided in three parts:

Sessions database filtering column on the left: all available sessions with grouping criteria and collections where the desired one can be selected (1)

Sessions Main List central: data and video of the selected session (2)

Preview of the Selected Session right: the selected session data preview (3)



4.3.3 Sessions database filtering column

Being the RS3A database page divided in three, we're introducing here the leftmost one. Even if the database has different view modes, this part is always to be meant as a left aligned column.

The selection column works like an accordion, with some items:

- All Events;
- AiM Cloud;
- Recent Sessions;
- Smart Collections;
- Manual Collections.

All Sessions

Once the database has been populated all sessions are shown by default in "All Events" item; sessions are grouped into events (by week) on the same track/race; this means that it features a row for each week on a specific track and for each championship. In case you're having data of racers from different categories they'll be separated in different rows.

Clicking the cogged wheel you're prompted a dialog window in which you can choose if you want the RS3A to permanently (until you change this setting again) filter session per: race mode, racer, track, vehicle, ...

AiM Cloud

- shows all sessions uploaded on AiM cloud
- allows to enter cloud settings and shows the related icons
- shows your current AiM Cloud Plan and allows you to enter AiM Cloud plan settings

Recent sessions

This database remembers the last 30 sessions you have interacted with; the very first time it is empty. This part of the accordion is aimed at prompting you the last 30 sessions you interacted with.

- The last 30 recorded, to find the most recent.
- The last 30 analyzed... where is that thing that I "just" saw?
- The last 30 imported, to find for example an old session that a friend just shared with you.

Smart collection

Sessions that populate the collection follow specific, custom, criteria.

As shown by the tooltip that appears clicking on the question mark you can fill in a text to be used as search string and the sessions corresponding to that string are automatically included in the new smart collection; default collection name is day and time but it can be named as wished.

You can, clicking on its cogged wheel, create a smart collection, that lets you retrieve all the sessions that follow a certain rule, for example all the sessions whose vehicle-racer-track-championship fields contain a given string.

Once this part of the accordion is shown, you'll see a search edit box in it. Inserting a search string in this edit box, the database will automatically prompt you all the sessions that match the entered text. This way you can quickly test some search strings before creating a collection.

Manual Collection

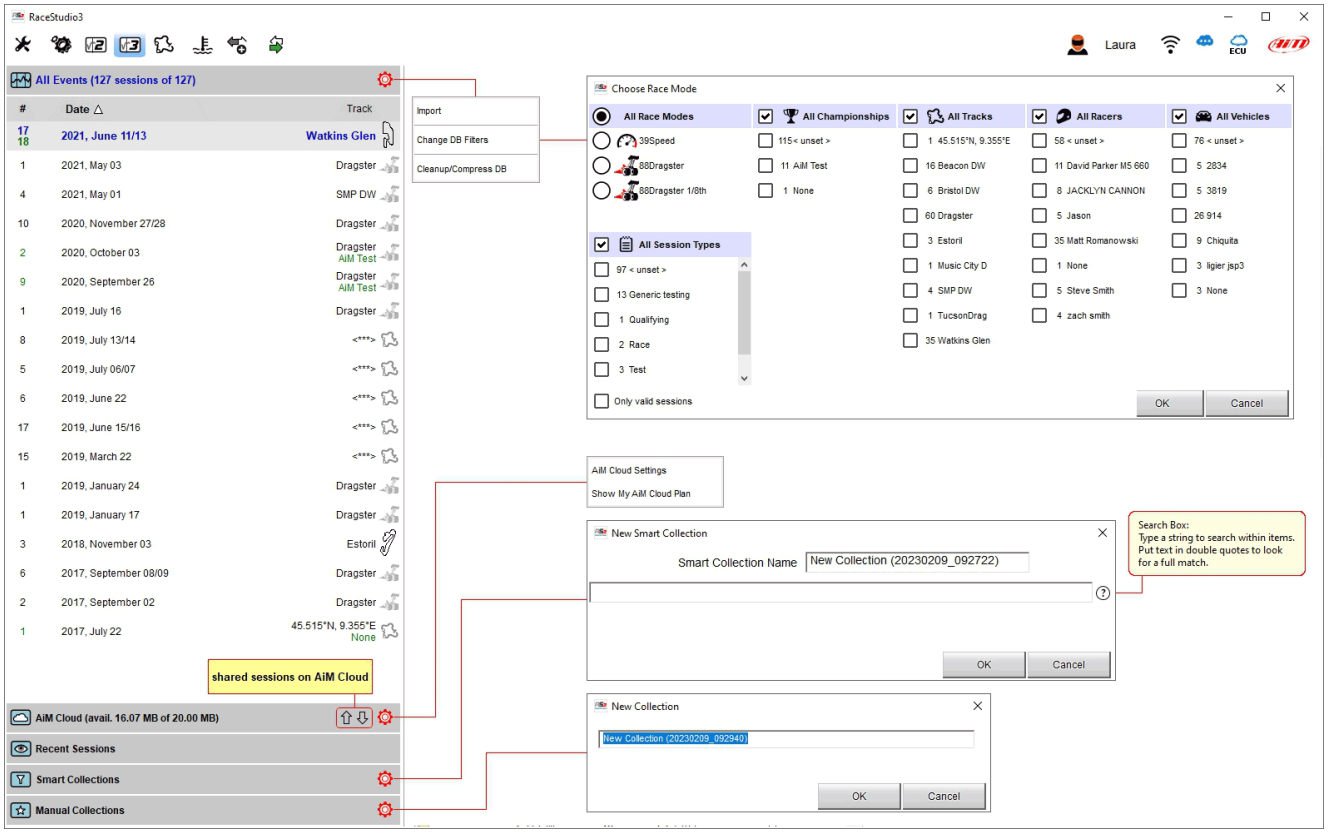
Sessions need to be added to the collection by the user.

You can, clicking on its cogged wheel, create a collection of your own. You can add sessions into this collection in order to retrieve them later.

This feature can for example be useful to save all sessions in which you notice something you want to show to someone else; for example all the sessions in which you overtake someone or all the sessions in which you notice a different temperature range.

To add sessions to the collection you need to drag the session from the database and drop it over the collection on the left.

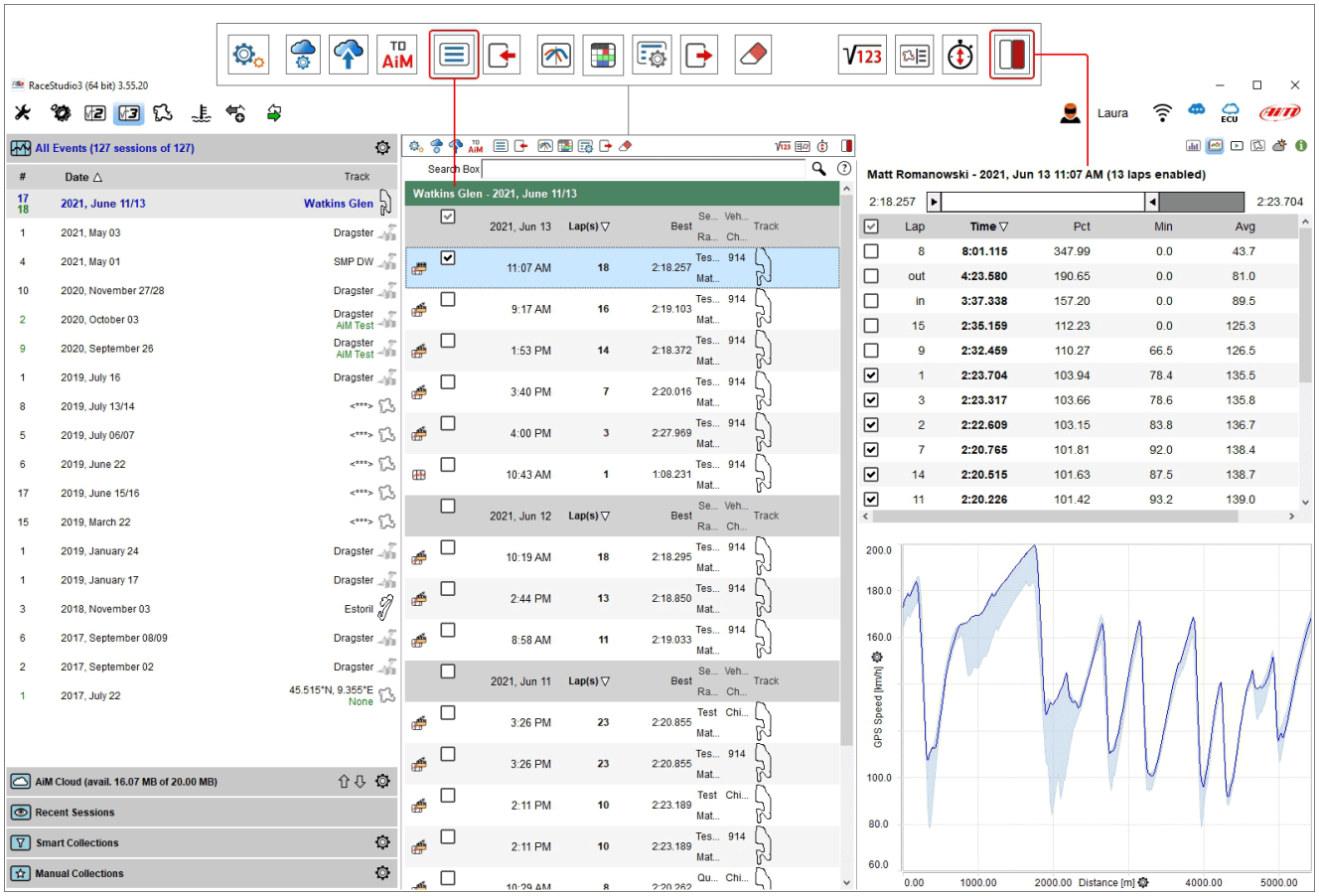
- click the setting icon on the right
- a dialog window is prompted: name it and the collection appears below the Manual Collection label
- click "All sessions" to show all available session and drag and drop the sessions you want to include in it.



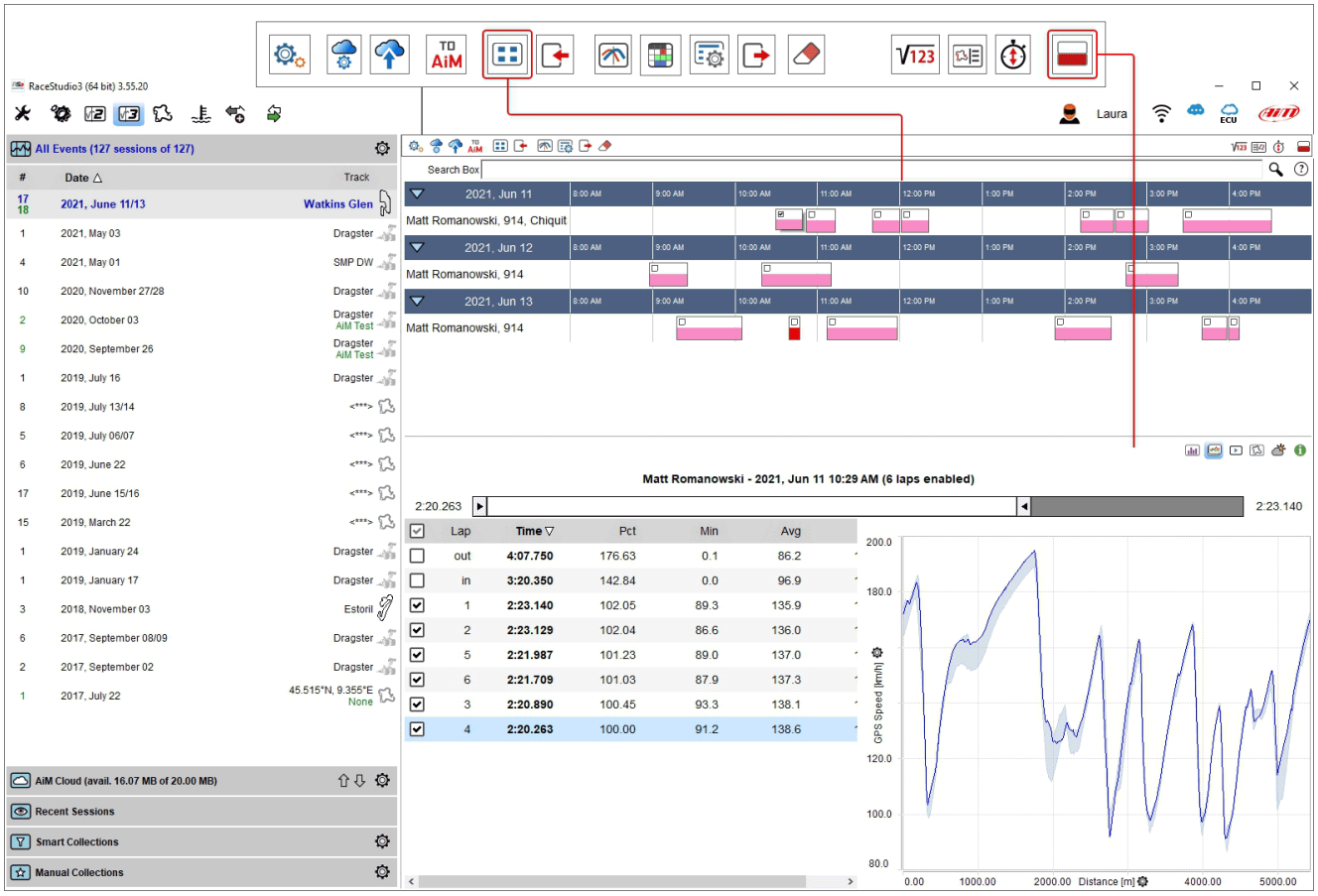
4.3.4 Sessions Main List

When you select an event or any row in the filtering column on the left, the **central** column shows all the sessions that refer to the left row. The session view can be list or agenda and the different preview window can be shown right, bottom or hidden. By default all sessions are grouped by date; click on any column header to change the order criteria.

The following image show: list/right view.



The following image show: agenda/bottom view.



Top of "Selected session" column is a toolbar, shown here below and deeply explained in the following page.

From left to right the buttons indicate:

 **Choose what to see: allows you to choose what sessions to show; available options are:**

- Show movies only when linked to data; appears only if the selected session contains video
- Show all sessions

 **Show Profiles**: recalls a profile manager panel (see *Analysis Profiles*)

 **Send a request to AiM support**: it activates a dialog window where to insert an object and a message addressed to AiM support team that makes easier and quicker for AiM service to investigate the problem; **Please note**: selected session(s) will be attached to the message; if no session is selected the panel is not prompted

Change DB line up: switch the view from list  to agenda  and vice-versa; by default "group by day" checkbox is enabled.

 **Import new session(s) into database**: windows explorer window is prompted: browse it to find the session(s) to import

 **Open selected session(s) for analysis**

 **Open selected session(s) for report** (see *Data Tech Reports*)

 **Change properties for the selected session(s)**: in the panel prompted you can fill the desired information and a comment too

 **Export selected session(s)**: windows explorer window is prompted: browse it to choose where to export the selected session(s)

 **Erase the selected session**

 **AiM Cloud settings**:

 **Upload Files** to your **AiM cloud** drive

 **Math channels**: opens math channels dialog window (see *Math Channels*)

 **Open Track Map and Sector Selector**: the track map with sectors is prompted; you can manage them

 **Open Predictive Reference Laps Manager**: reference laps of all tracks stored in the PC are prompted and you can manage them

Preview Windows placement:

 preview windows can be placed below the sessions list

 on the right of it

or hidden.

The selected session is shown in the central column and RS3A automatically recognizes which data it includes matching each session to the dedicated icon.

Here below all icons are explained.

 Session including only data

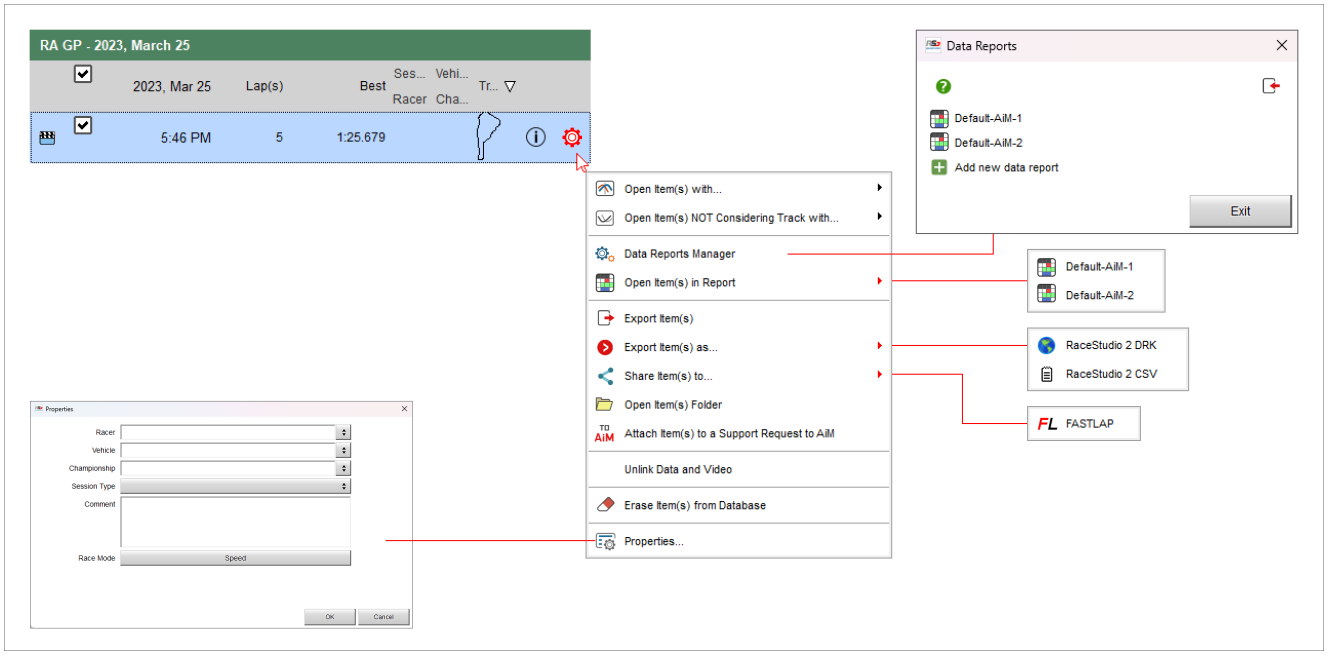
 Session including only video

 Session including data and video

 Session coming from a Sim racing

As shown here below, mousing over a session a setting icon is prompted that allows to:

- Open a session
- Open a session **NOT** considering Track (this can be very useful to compare similar sections of different tracks)
- Manage data reports (see *Data Tech Reports*)
- Open items in reports (see *Data Tech Reports*)
- Export items
- Export item(s) as RaceStudio 2 .drk format or as Race Studio 2 .csv format
- Open Item(s) Folder
- Attach the session to a support request to AiM team
- Unlink Data and Video
- Erase Item(s) from the PC database
- Modify session properties



Data preview of the selected session is shown right of the page. It changes according to the key pressed on the keyboard placed top right of the view straight above the data and highlighted in red here below.

The toolbar buttons show different preview and if the session has no video in it the corresponding button is hidden.

 shows laps summary preview

 shows laps report preview

 shows video preview

 shows map preview

 shows weather info preview

 shows advanced info preview

4.3.4.1 Analysis Search Bar

The sessions list feature also a search bar to refine the list of shown sessions against:

- racer contains
- vehicle contains
- championship contains
- track contains
- comments contain
- logger name
- logger identification number

You can enter multiple words in the search bar, selecting if you want either of the above criteria matching ANY of these words or ALL these words.

4.3.5 Preview for Selected Sessions

Preview feature, allows users to check some sessions information without opening the session for analysis. The preview window prompts different dedicated information, for each session mode: on track racing, oval racing, performances, dragsters...

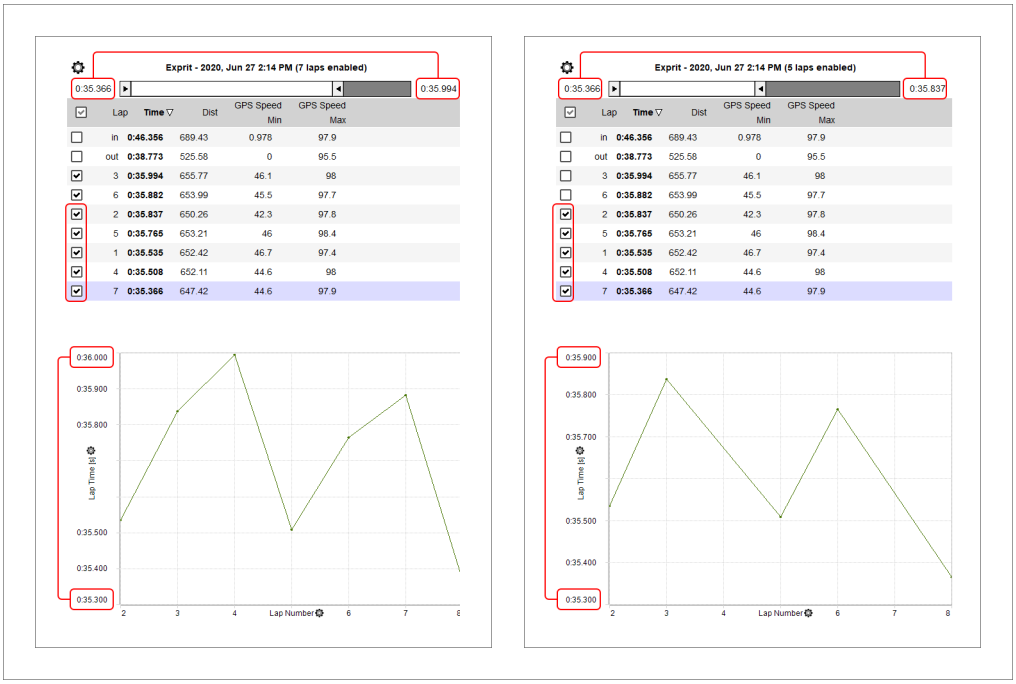
4.3.5.1 Laps summary preview

Laps summary preview shows by default all the laps except for the first and the last one (left image below) and the related max/min lap time values are indicated side of the top sliding bar and in the bottom graph.

Sliding the top bar only laps in a fixed lap time range are shown (right image below). This range is shown in the bottom graph too. It is possible to add/remove channels to the central table using the setting icon top left of the sliding bar.

The bottom graph shows, by default, Lap time on the ordinate axis and lap number on the X axis.

The graph can be zoomed in/out through the mouse wheel.

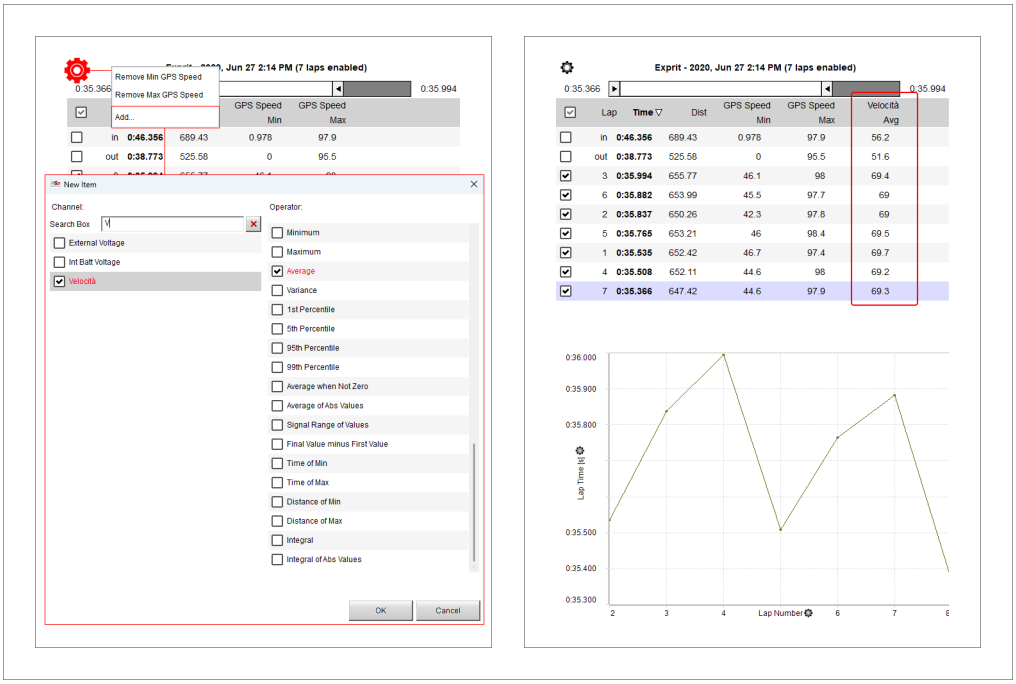


This views allows to add/remove a channel in the table top of the graph and to change the channel plotted on "Y" axis

As shown here below on the left, to **add a channel**:

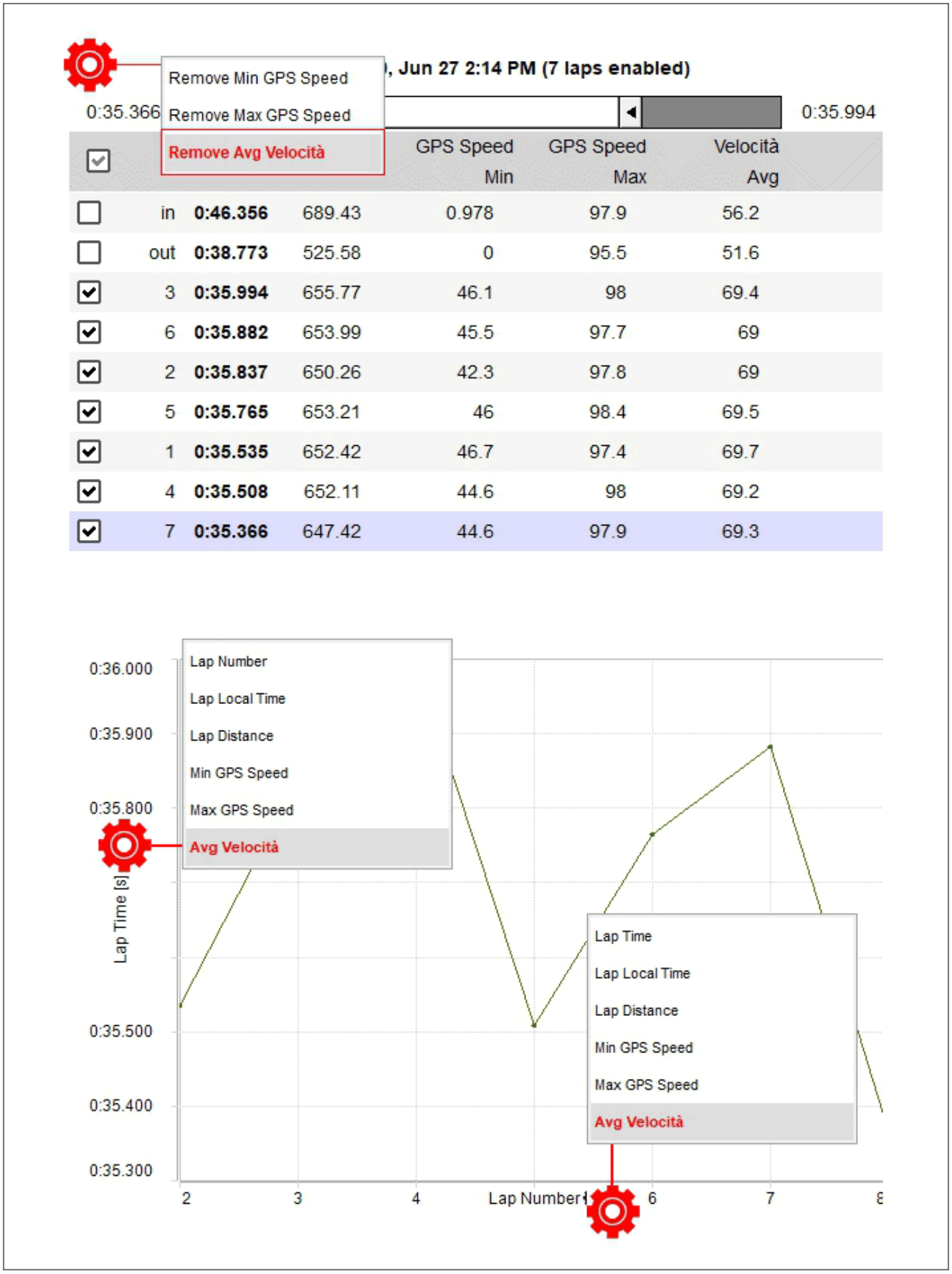
- Click the setting icon and select "Add"
- Select the desired channel in the list or search for it filling in "Search Box"
- Click "OK"

The channel appears in a new column as shown here below on the right.



When the desired channel has been added the software allows you to perform the following actions:

- **remove the added channel** clicking the top left setting icon and selecting the channel to remove
- **change the channels plotted on the graph** clicking the setting icon on the axis and selecting the channel to plot


Remove Min GPS Speed
Remove Max GPS Speed
Remove Avg Velocità
, Jun 27 2:14 PM (7 laps enabled)
0:35.366
0:35.994
GPS Speed Min
GPS Speed Max
Velocità Avg
in 0:46.356 689.43 0.978 97.9 56.2
out 0:38.773 525.58 0 95.5 51.6
3 0:35.994 655.77 46.1 98 69.4
6 0:35.882 653.99 45.5 97.7 69
2 0:35.837 650.26 42.3 97.8 69
5 0:35.765 653.21 46 98.4 69.5
1 0:35.535 652.42 46.7 97.4 69.7
4 0:35.508 652.11 44.6 98 69.2
7 0:35.366 647.42 44.6 97.9 69.3
Lap Number
Lap Local Time
Lap Distance
Min GPS Speed
Max GPS Speed
Avg Velocità
0:36.000
0:35.900
0:35.800
0:35.500
0:35.400
0:35.300
Lap Time [s]
2
3
4
Lap Number
6
7
Lap Time
Lap Local Time
Lap Distance
Min GPS Speed
Max GPS Speed
Avg Velocità

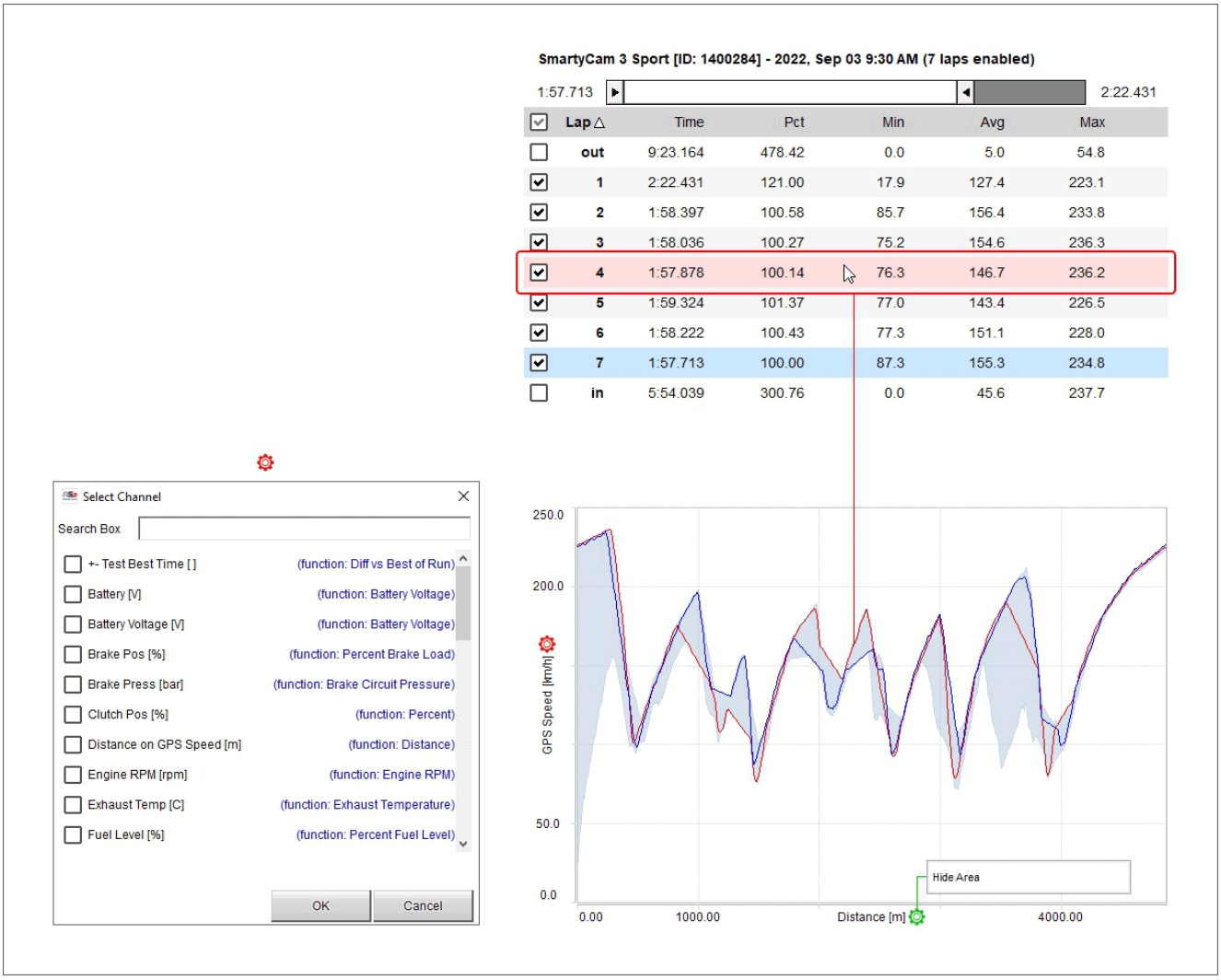
4.3.5.2 Laps report preview

Laps report is the view shown by default when you enable a session in the central column. By default it shows the laps ordered by lap time and sliding the top bar you can select only laps in a fixed lap time range as well as show them in the graph. Mousing over the laps list the line of the lap you are mousing over becomes red in the graph.

The graph shows, by default, GPS Speed on the Y axis and Distance on the X axis. To change the channel plotted on the Y axis click the related setting icon (red below) and select the channel to plot in the dialog window that is prompted (left in the image below).

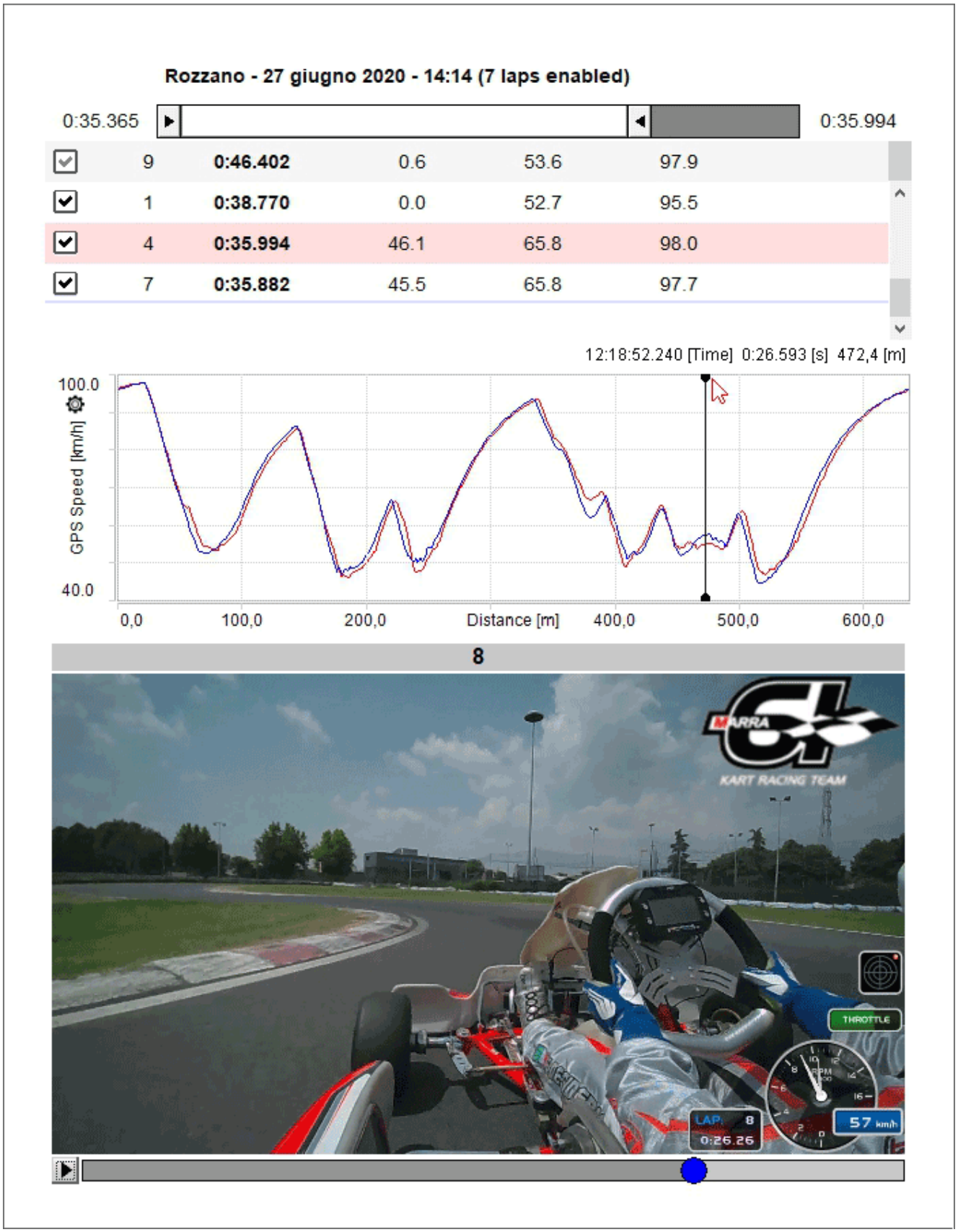
The graph has a sort of grey/light blue shadow that highlights the range set with the top sliding bar. To hide this background click the setting icon on the X axis (green below) and then click "Hide Area".

The graph can be zoomed in/out using ctrl+the mouse wheel.



4.3.5.3 Video Preview

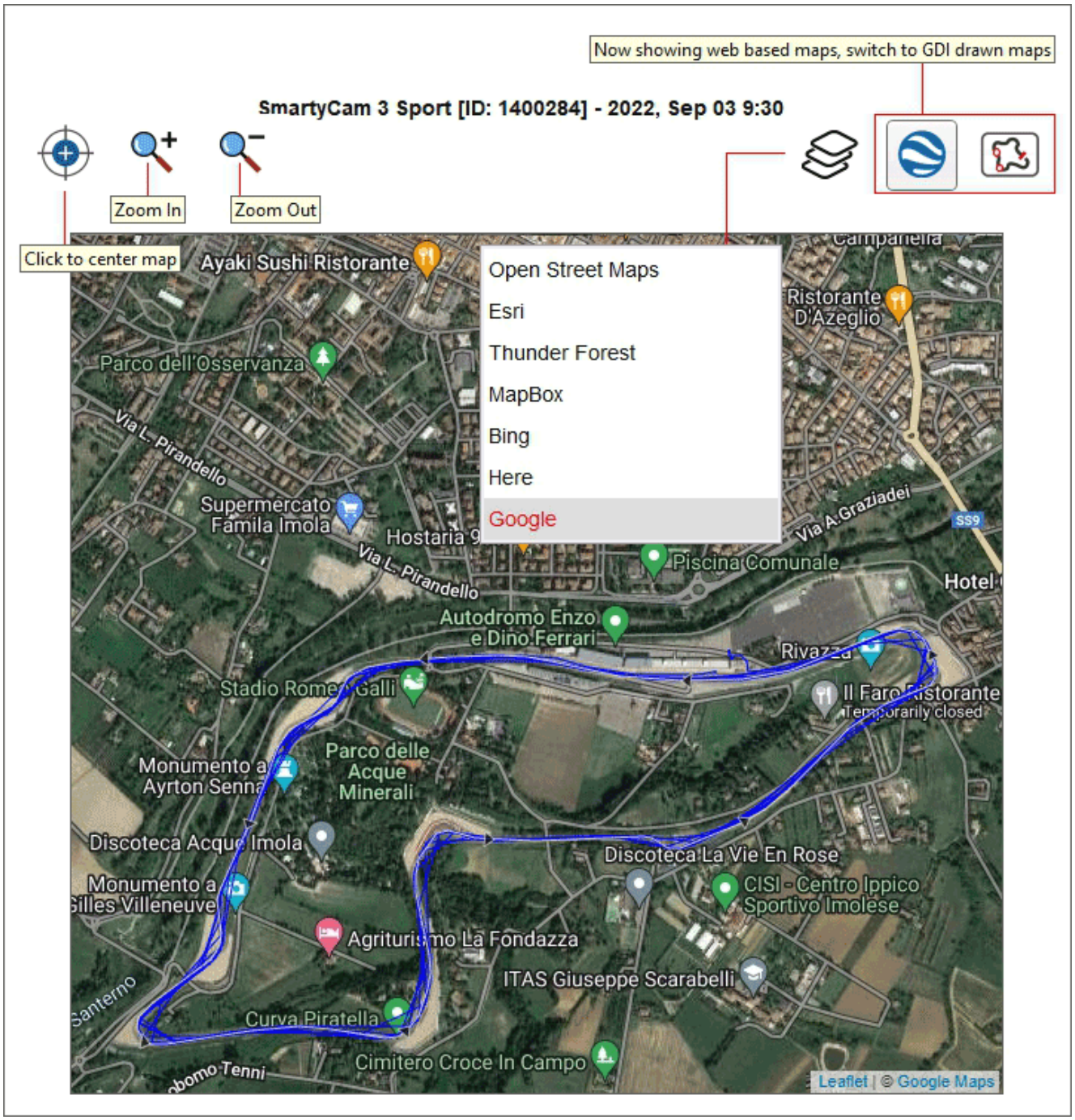
Video preview works mostly like the previous two. Pressing "Play" button bottom left of the preview, the video plays and the cursor on the central graph moves simultaneously. Clicking on a point in the graph the video goes to that point.


Rozzano - 27 giugno 2020 - 14:14 (7 laps enabled)
0:35.365
0:35.994
9 0:46.402 0.6 53.6 97.9
1 0:38.770 0.0 52.7 95.5
4 0:35.994 46.1 65.8 98.0
7 0:35.882 45.5 65.8 97.7
12:18:52.240 [Time] 0:26.593 [s] 472,4 [m]
100.0
GPS Speed [km/h]
40.0
0,0
100,0
200,0
Distance [m]
400,0
500,0
600,0
8
MARRA
KART RACING TEAM
THROTTLE
RPM
LAP 8
0:26.26
57 km/h

4.3.5.4 Map Preview

Map preview shows the track map and you can:

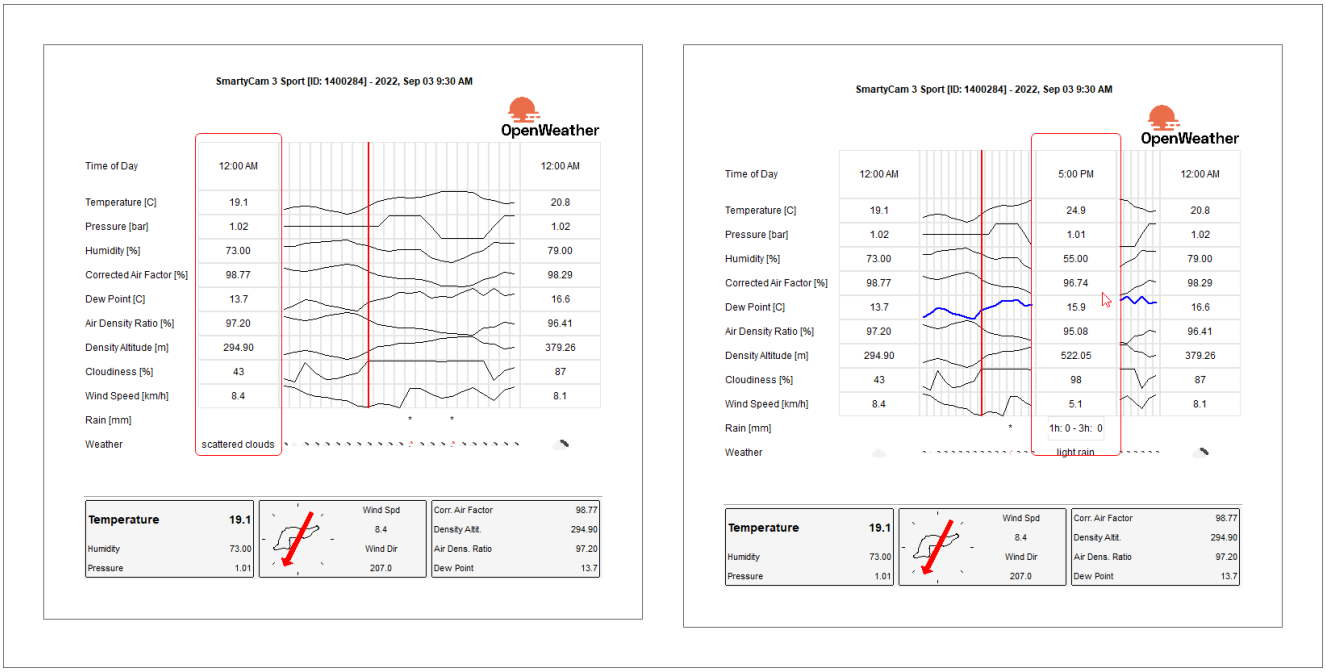
- center the map in the window
- zoom in/out the map using the related buttons or with the mouse wheel
- change the map tile provider choosing among the options shown here below (in the example Google Maps is being used)
- switch among web based maps and GDI drawn map; the top right button in the image below changes according to the view



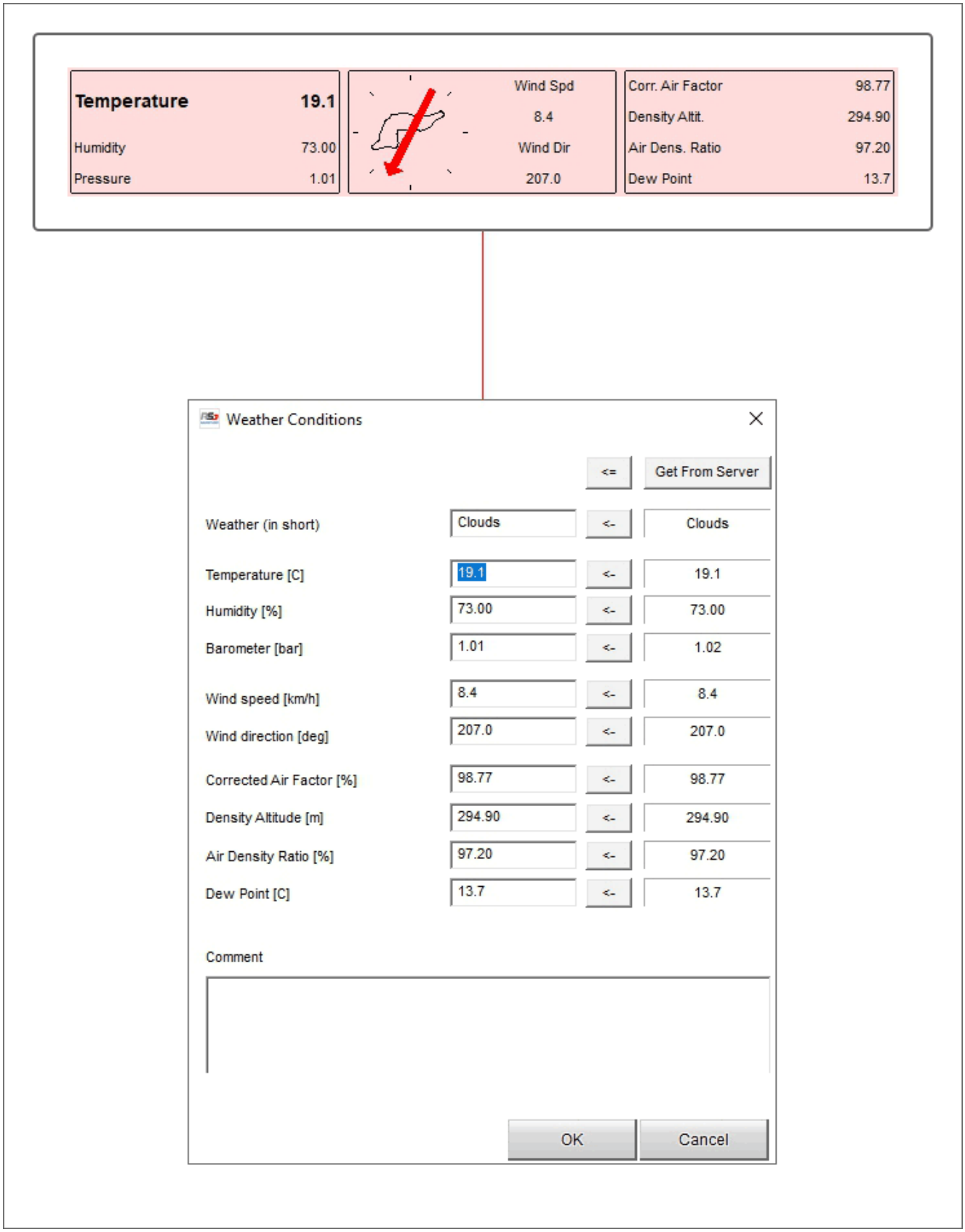
4.3.5.5 Weather Preview

The weather preview shows all information about the weather conditions in the date of the race, from midnight to midnight. Mousing over the graph the weather conditions during the day are shown.

Please note: these information are available for 12 months from the day they are recorded only.



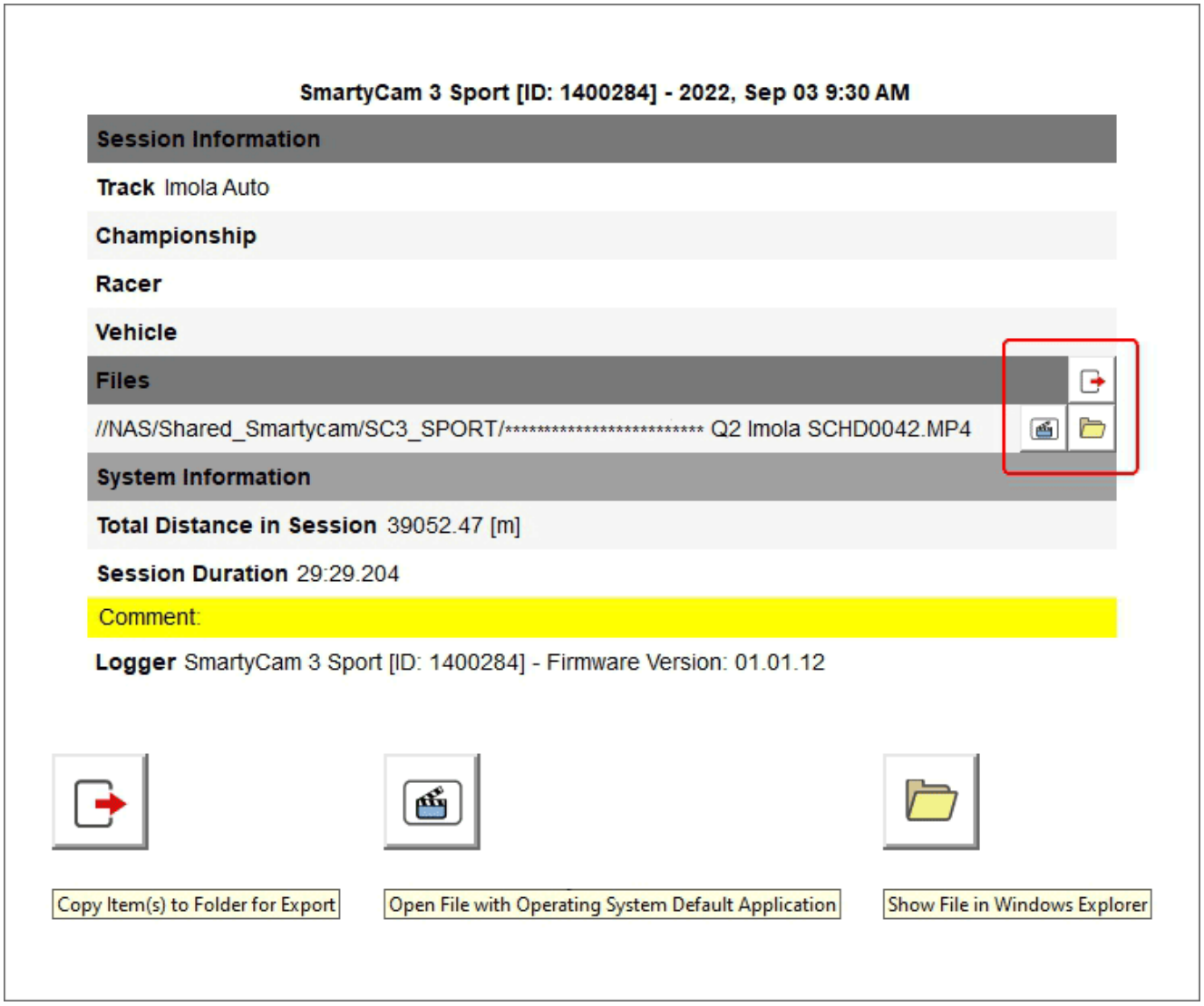
Weather information come from AiM server that connects to the nearest OpenWeather station according to your GPS coordinates. Double clicking on the panels bottom of the preview a weather conditions panel is prompted. If you have more accurate information here you can fill them in. In a second moment you can replace them (one or all) with the information coming from AiM server: use “<-“ to replace the single piece of information and “<=” to replace all information.


Temperature 19.1
Humidity 73.00
Pressure 1.01
Wind Spd
8.4
Wind Dir
207.0
Corr. Air Factor 98.77
Density Altit. 294.90
Air Dens. Ratio 97.20
Dew Point 13.7
Weather Conditions
<=
Get From Server
Weather (in short)
Clouds
<-
Clouds
Temperature [C]
19.1
<-
19.1
Humidity [%]
73.00
<-
73.00
Barometer [bar]
1.01
<-
1.02
Wind speed [km/h]
8.4
<-
8.4
Wind direction [deg]
207.0
<-
207.0
Corrected Air Factor [%]
98.77
<-
98.77
Density Altitude [m]
294.90
<-
294.90
Air Density Ratio [%]
97.20
<-
97.20
Dew Point [C]
13.7
<-
13.7
Comment
OK
Cancel

4.3.5.6 Advanced Info preview

Advanced info preview shows all the information about the session according to the logger in use.

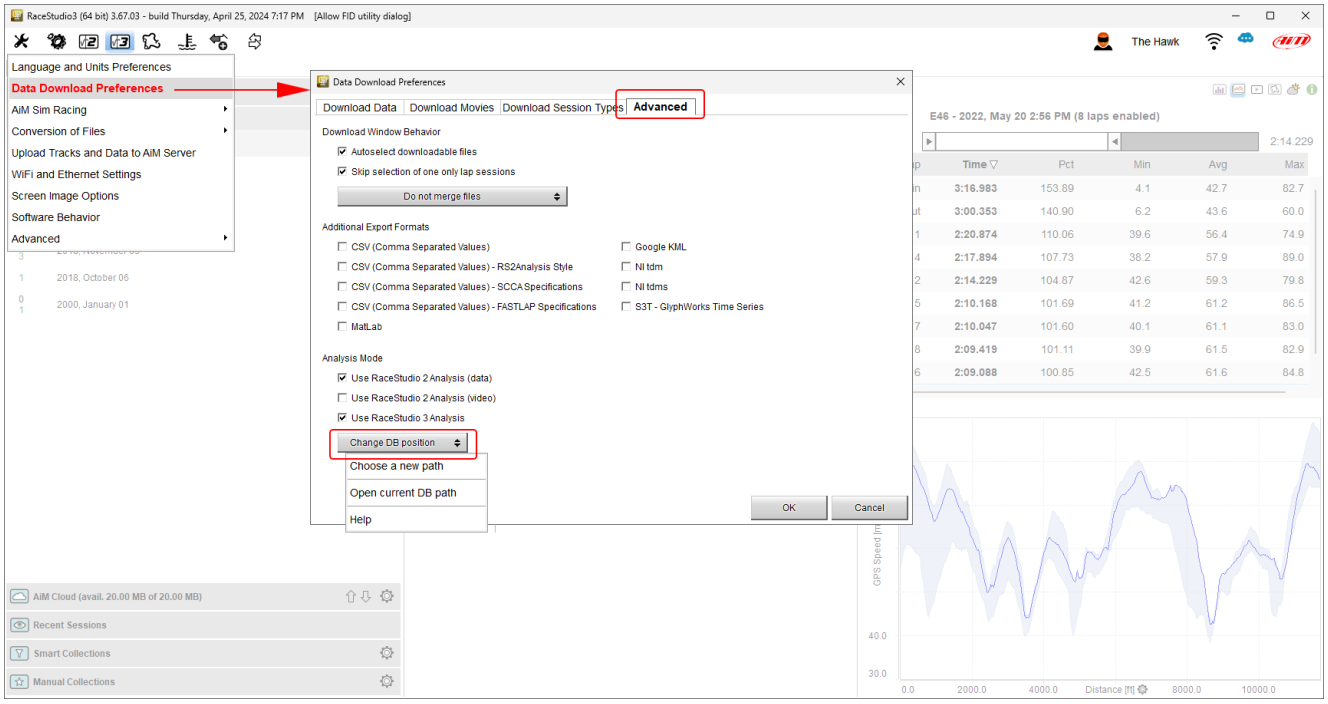
You can also see the files containing the data in their folder clicking "Show file in Windows Explorer". If a SmartyCam HD is connected to the logger two explorer windows will open: one for the racing data, the other for the video .MOV file except files are saved in the same folder and in this case they appear both selected.



4.3.6 RS3A Database Position

By default, RS3A database is created in a specific folder in RaceStudio 3 user folders. You can decide to move it using a folder of your choice. In "Advanced" tab of Data Download preferences panel you'll find a "Change DB position" button that allows you to:

- choose a new path for the database
- open current Database path
- be redirected to an online help page.



Once a new path is chosen, RaceStudio 3 will, in case the folder is empty, create a new database allowing you to start from scratch, to copy there your current database or to use a database already available in the folder.

For any change in database position to be applied it is necessary to restart RaceStudio 3.

You can choose to place your database also in a removable drive or in a network drive. Depending on connection and drive speed it could become a little slow. If at RaceStudio 3 startup either the removable drive or the network drive are not available, RaceStudio 3 warns you and switches to the default database position.

In case you have two PCs on the same network, you could think to place the database in a folder shared among both PCs. AiM firmly discourages this practice. This because the database does not support more than one simultaneous write access.

4.4 Data Analysis Window

The first thing you see when you open data for analysis is AiM default profile. As a brief introduction, let's say that a profile is made of a set of visualization properties you want data to be displayed with and a set of windows showing your data.

What exactly is a profile is described in the dedicated chapter (see *Analysis Profiles*). You'll learn, reading this manual, how to customize shown data according to your needs; this is called "creating your profile". You'll also learn how to manage more than a single profile, to save time while doing several types of analysis.

In the upper part of the analysis window, you'll find a toolbar and some tabs. Most of the buttons of the toolbar show a tab. Each tab is a "layout". Properly, a profile is made of layouts. You can decide which layouts must be shown.

Each tab contains windows, each window being a "panel". Properly, a layout is made of panels. Each panel features its own settings window, in which you can customize what the panel shows.

Hovering the mouse for fraction of a second between the panels you'll see a splitter line. Dragging and dropping it you can resize the panels.

This profile-layouts-panels is aimed at a better use of the space on the screen.

4.4.1 RS3A Top Toolbar

The main analysis top toolbar divides in two (left and right). The left part mostly affers which layout windows are shown, the right part mostly affers shown data.

Here below is the **top left toolbar**.

Here follows explanation of all icons functions.

 Allows changing the settings of *Analysis Profiles* (some of these settings might add other icons here)

 Shows *Time-Distance Layout*

 Shows *Data-Movies Layout* (if available)

 Shows *Track Split Report Layout*

 Shows *Scatter Layout*

 Shows *Histogram Layout*

 Shows *Split Times Report Layout*

 Shows *Channels Report Layout*

 Shows the *Log Sheets Layout*

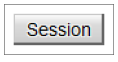
 Shows the *Track Map Layout*

 Shows *Suspension Analysis Layout* (if available)

 Shows *Frequency Analysis Layout*

 Allows to **add or show a Custom layout**

Top right keyboard is shown here below.

 Sessions selection (see *Data of Laps and Sessions*)

 Laps selection (see *Data of Laps and Sessions*)

 Introduces you to all *Math Channels* functionalities

 Introduces you to all *Track Maps in Analysis* functionalities

 Manages **predictive reference laps**

Open these **Help** pages

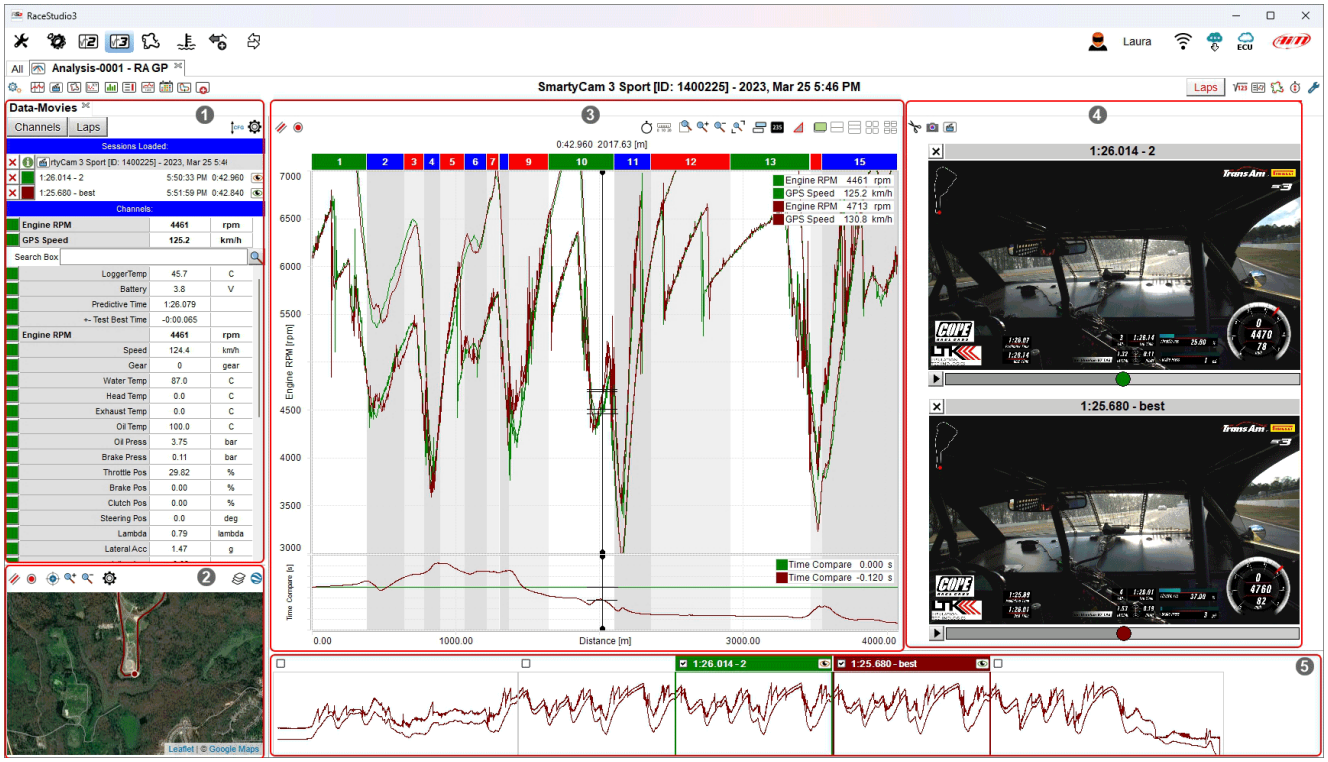
4.4.2 Getting Useful Information

A profile is made of layouts. You can show, using the top toolbar icons, one of the available layouts.

- *Data-Movies Layout*
- *Time-Distance Layout*
- *Split Times Report Layout*
- *Channels Report Layout*
- *Track Split Report Layout*
- *Scatter Layout*
- *Histogram Layout*
- *Track Map Layout*
- *Log Sheets Layout*
- *Frequency Analysis Layout*
- *Suspension Analysis Layout*
- *Custom Layouts*

We'll see in the next paragraphs a description for every layout and the information you can get from it.

4.4.2.1 Data-Movies Layout



This layout comes by default with a *Channels and Laps List Panel* (**1**), a *Track Map Panel* (**2**), a *Time-Distance Panel* (**3**), a *Movies Panel* (**4**) and a *StoryBoard Panel* (**5**).

Please follow the above links to learn how every panel works.

The very first time you open this layout you'll find the best lap already shown, and the data cursor placed in the middle of the lap.

In the **channels list** you'll see the list of the shown channels, on top, a search bar in which to look for other channels (useful in case the session you're analyzing features many channels), the list of all channels, and a bottom

list in which you can add comments to the session. Clicking on the "Laps" button just above the channels list, you'll be switching to the list of all session laps.

Clicking on the channels in the complete list you can show/hide them. In the laps list you can do the same. While shown channels will affect what's shown in this layout only, shown laps will be for all layouts.

Shown laps and shown channels feature a colored square, clicking on which you can select its color. This color choice will affect all layouts.

Laps can be shown/hidden doubleclicking the laps themselves in the **story board**. Some laps in the story board feature a greyed background (normally the "in" and "out" laps), it means that such laps are not considered as valid by the algorithm computing the best lap. The story board allows also to drag shown laps moving them to other laps.

The **track map** shows the (GPS) driven line of the shown laps. Clicking on the driven line trace you can move the cursor. The cursor is in common with all other panels in this and all other layouts. The track map can be zoomed separately by data zoom.

The **time-distance plot** shows the graphical representation of the values of the shown channels/laps. Also here, clicking on the plot you can move the cursor. To add a channel to the plot, click on it in the list of all channels. Using the mouse wheel on this panel you'll be able to zoom data in and out, the zoom level being in common with all other panels of this and all other layouts.

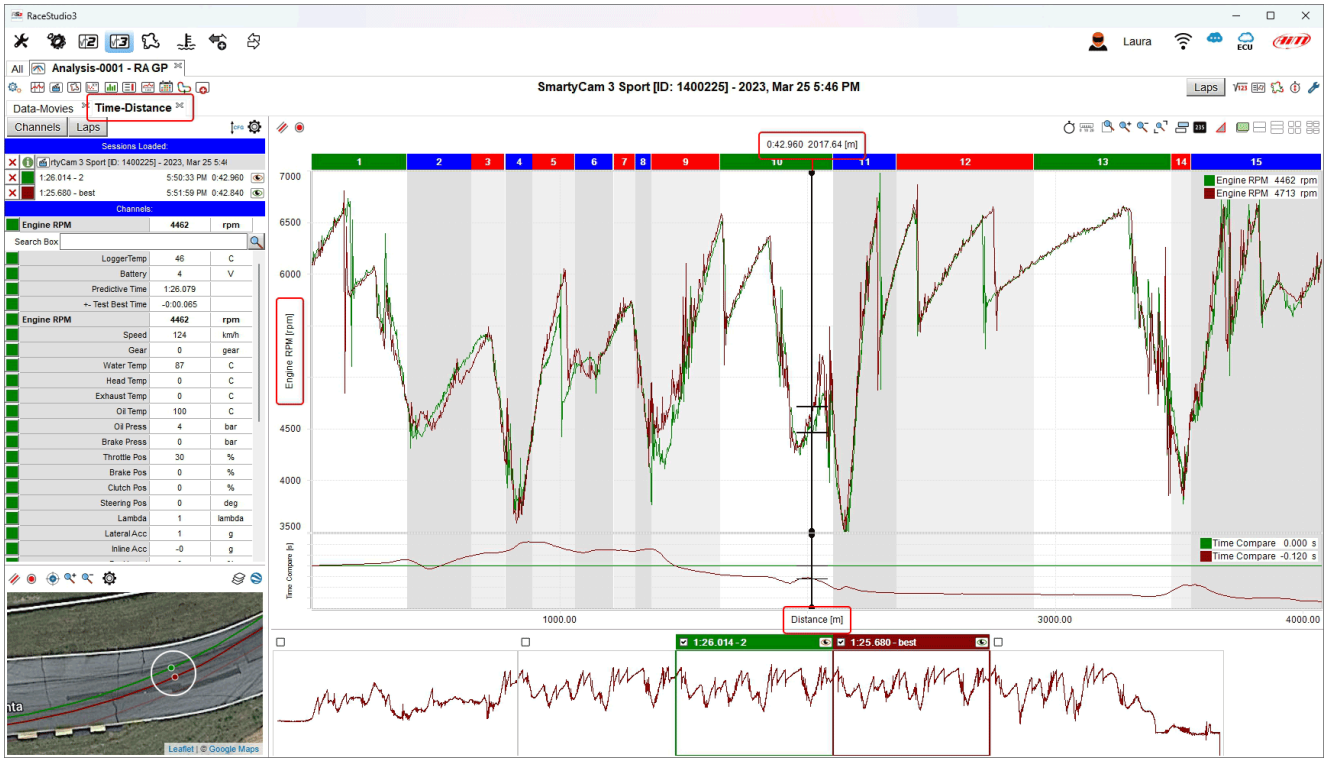
The cursor movement will trigger the **movie** panel to show the correct frame that refers to the specific cursor point. You can move forward and backward the cursor in the movie panel, and you'll see it move in all other panels of this and all other layouts.

In all the panels the right click (or context menu) will guide you into the main command and setting options.

By default, pressing the space bar you can toggle the shown status of channels list and track map.

For more information on how data and videos are synchronized, please see *Synchronizing your Data*.

4.4.2.2 Time-Distance Layout



This layout comes by default with a *Channels and Laps List Panel* (**1**), a *Track Map Panel* (**2**), a *Time-Distance Panel* (**3**) and a *StoryBoard Panel* (**4**).

Please follow the above links to learn how every panel works.

The very first time you open this layout you'll find the best lap already shown, and the data cursor placed in the middle of the lap.

In the **channels list** you'll see the list of the shown channels, on top, a search bar in which to look for other channels (useful in case the session you're analyzing features many channels), the list of all channels, and a bottom list in which you can add comments to the session. Clicking on the "Laps" button just above the channels list, you'll be switching to the list of all session laps.

Clicking on the channels in the complete list you can show/hide them. In the laps list you can do the same. While shown channels will affect what's shown in this layout only, shown laps will be for all layouts.

Shown laps and shown channels feature a colored square, clicking on which you can select its color. This color choice will affect all layouts.

Laps can be shown/hidden doubleclicking the laps themselves in the **story board**. Some laps in the story board feature a greyed background (normally the "in" and "out" laps), it means that such laps are not considered as valid by the algorithm computing the best lap. The story board allows also to drag shown laps moving them to other laps.

The **track map** shows the (GPS) driven line of the shown laps. Clicking on the driven line trace you can move the cursor. The cursor is in common with all other panels in this and all other layouts. The track map can be zoomed separately by data zoom.

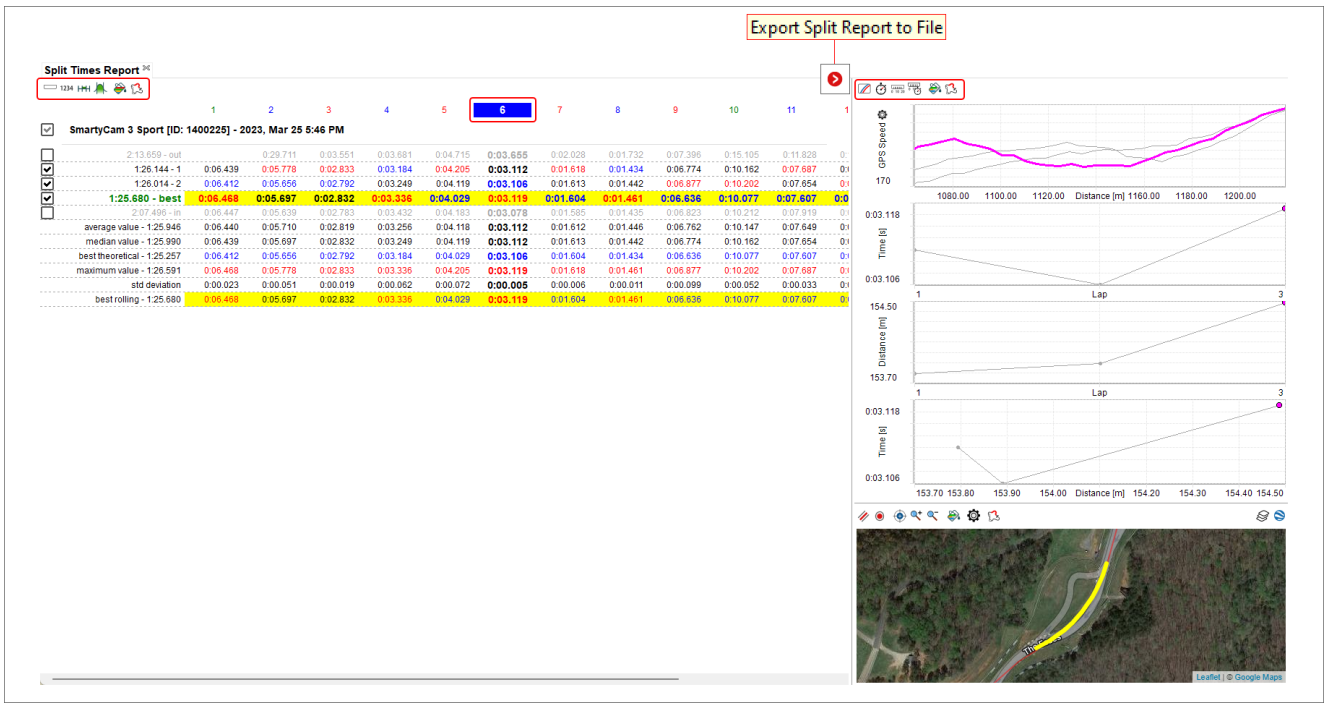
The **time-distance plot** shows the graphical representation of the values of the shown channels/laps. Also here, clicking on the plot you can move the cursor. To add a channel to the plot, click on it in the list of all channels. Using the mouse wheel on this panel you'll be able to zoom data in and out, the zoom level being in common with all other panels of this and all other layouts.

In all the panels the right click (or context menu) will guide you into the main command and setting options.

By default, pressing the space bar you can toggle the shown status of channels list and track map.

For more information on how data are synchronized, please see *Synchronizing your Data*.

4.4.2.3 Split Times Report Layout



This layout comes by default with a *Split Report Panel* (**1**), a *Split Details Panel* (**2**) and a *Track Map Panel for Selected Split* (**3**).

Please follow the above links to learn how every panel works.

The **split report** divides every lap in N segments, offering you the measurement of the time spent in every segment, lap after lap.

It automatically computes which is your best theoretical time, made out of all the best segment times of every segment.

It automatically computes which is your best rolling time, i.e. a lap time you indeed made on track but not necessarily from start/finish line to start/finish line.

In the split report rows, each lap can be enabled/disabled checking/unchecking the corresponding checkbox. By default, "in" and "out" laps are not enabled.

One of the segments can be the selected one. Click on the cell with the segment number at the top of the table to do it. The whole column will be having a bold font making it evident.

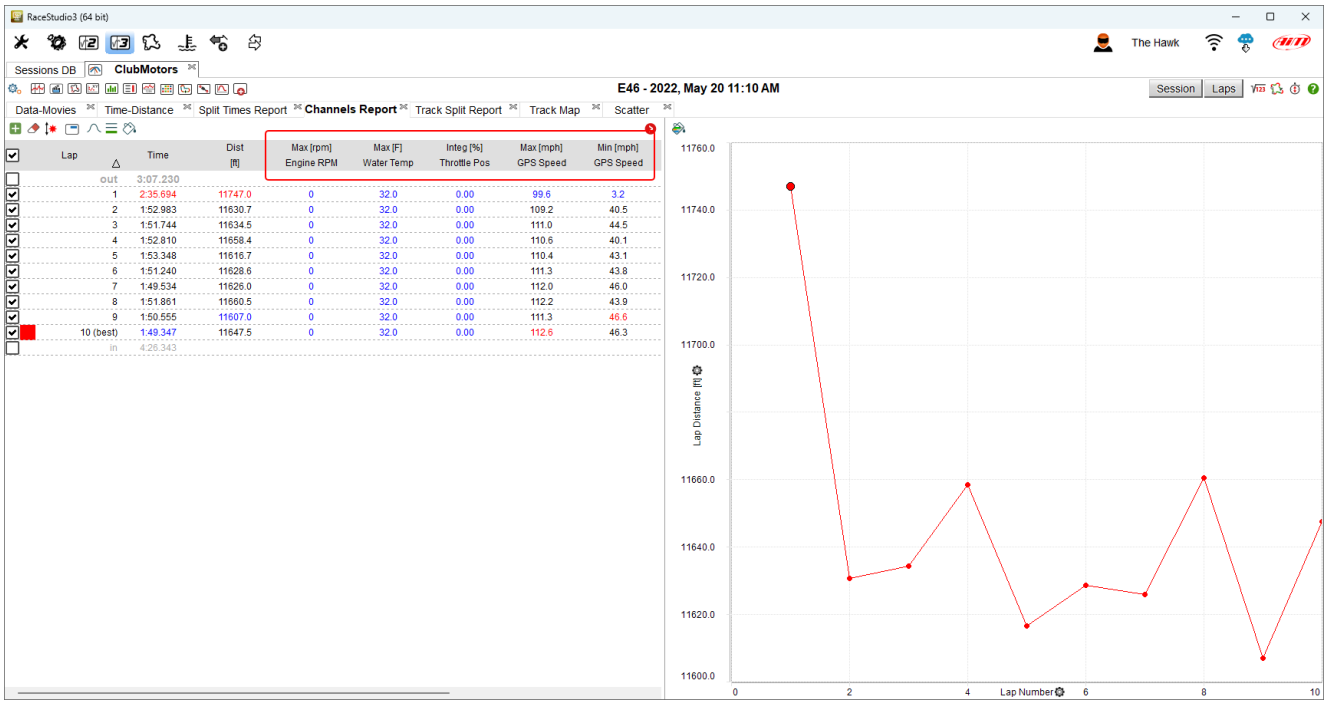
Data of the table can be exported into a local file, for example comma separated values files.

The **split details** panel will generate some graphs on the selected segment.

On top, by default, the speed trace of all laps within the segment. This normally allows an immediate understanding of slow segments, as they're generally associated with low speeds. Bottom of it, the scatter plot of segment times vs the segment driven distances, that could allow the identification of a faster driven line. Bottom of it, the scatter plots of segment times and segment distances vs the lap number, useful to identify trends of a vehicle changing behaviour.

The **track map for selected split** will, as well, show GPS traces for the segments of the enabled laps. This can be helpful as a different representation of similar data.

4.4.2.4 Channels Report Layout



It comes by default with a *Channels Report Panel* (**1**) and a *Channels Report Graph Panel* (**2**).

Please follow the above links to learn how every panel works.

This layout offers you some statistics computed on session channels, lap by lap and, if you enable it, also segment by segment.

Shown values can be minimum, maximum, averages... of a channel, in a lap or a segment.

The **channels report table** offers you the numerical value, while the **channels report graph** offers you a plot of the values.

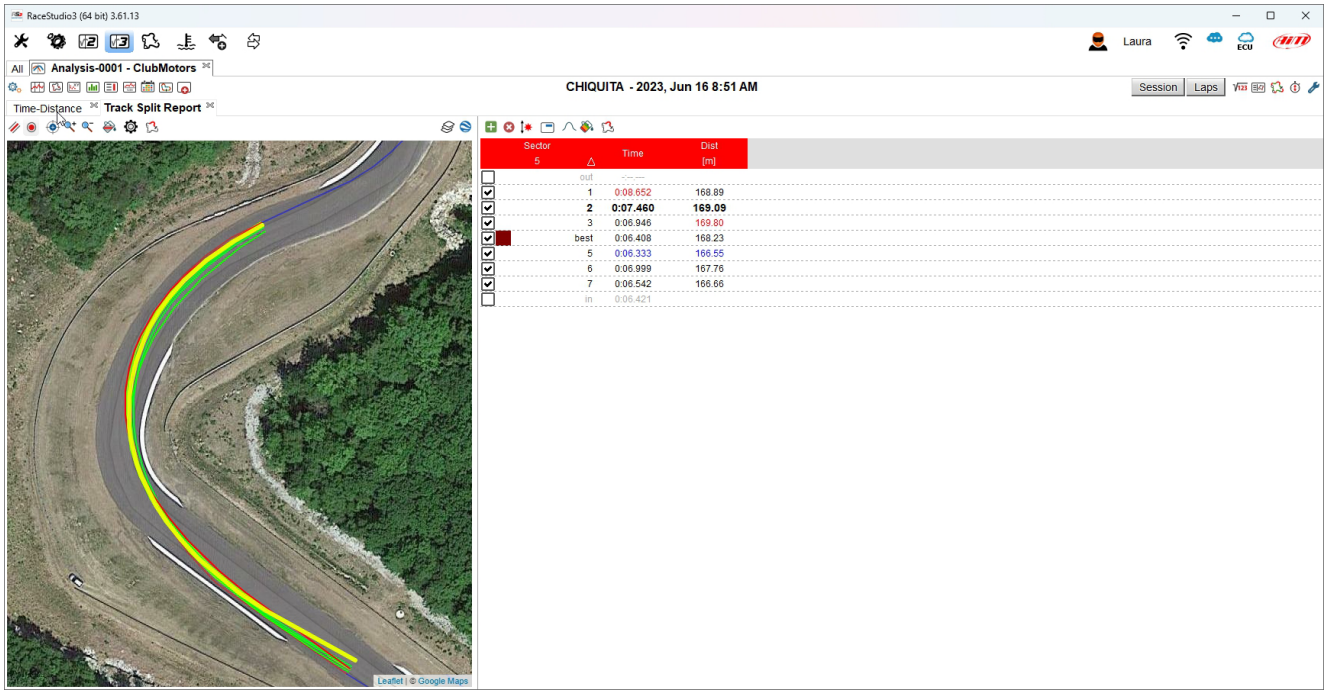
The graph, by default, is a scatter plot of the values versus the lap number. Clicking on the cogged wheel icon along the axes you can change what's in the plot. Another way to change what's in the vertical axis of the plot is to click a column in the table. To change the horizontal axis, ust ctr+click a column in the table.

While passing the mouse over the table, the row that's currently under the mouse pointer is drawn as bold, and the graph reflects the hot tracking making its related point a little bigger.

This layout offers a magic wand shaped icon that suggests you three possible table populations basing upon the channels available in your sessions:

- Vehicle health: mainly through temperatures, pressures and battery level
- Racer performances: mainly through average throttle opening, average steering angle value, average brake pressure (the racer inputs)
- Vehicle performance: mainly through longitudinal and lateral acceleration variations and max speed

4.4.2.5 Track Split Report Layout



It comes by default with a *Track Map Panel for Selected Split* (**1**) and a *Channels Report Panel for Selected Split* (**2**).

Please follow the above links to learn how every panel works.

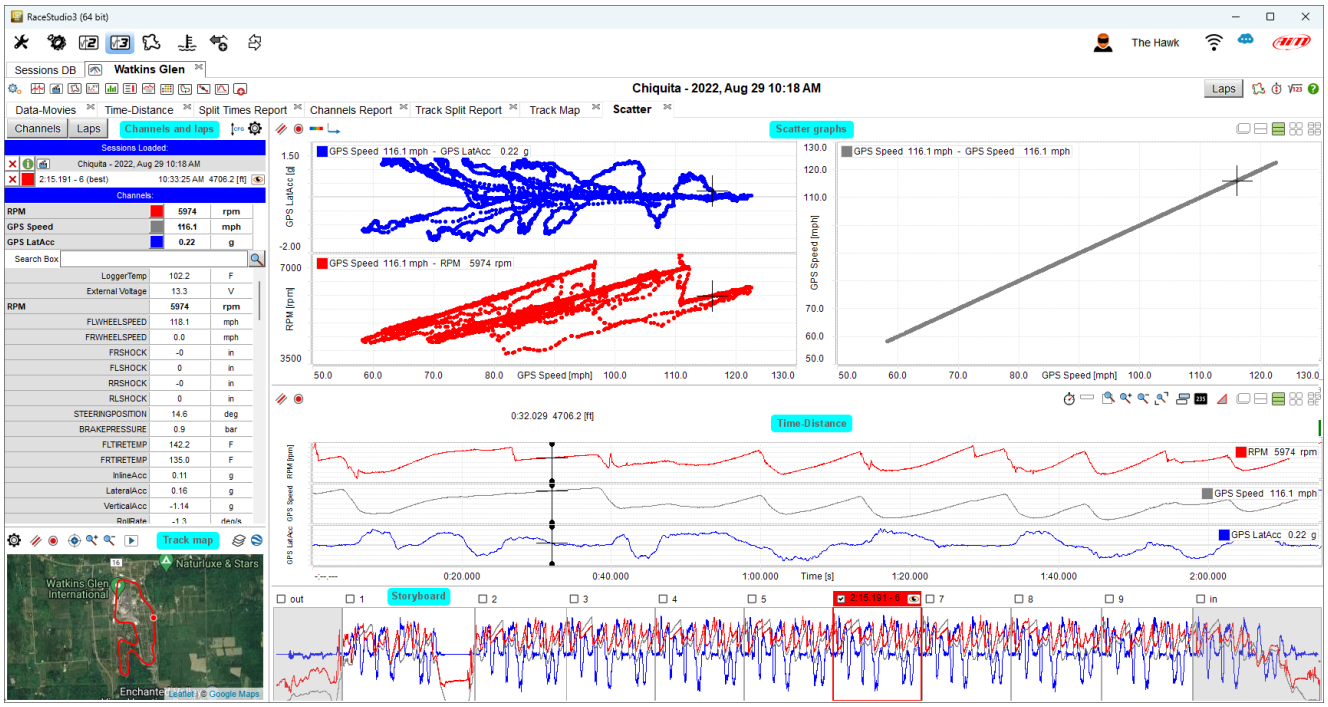
This layout allows for a detailed analysis on what is happening within a segment. The **track map** shows the GPS driven lines, while the **report table** shows numeric values.

While passing the mouse over the table, the row that's currently under the mouse pointer is drawn as bold, and the track map reflects the hot tracking making its related trace a little bigger.

Hitting the space bar you can toggle the visibility of the table.

Each lap can be enabled/disabled checking/unchecking the corresponding checkbox in the table.

4.4.2.6 Scatter Layout



This layout comes by default with a *Channels and Laps List Panel* (**1**), a *Track Map Panel* (**2**), a *Scatter Panel* (**3**), a *Time-Distance Panel* (**4**) and a *StoryBoard Panel* (**5**).

Please follow the above links to learn how every panel works.

The aim of this layout is to create a channel plot not versus time/distance but versus another channel. A typical example is the G-G diagram (the vehicle fraction circle), in which you show longitudinal (inline) acceleration of the vehicle as vertical axis and lateral acceleration of the vehicle as horizontal axis.

In the **channels list** you'll see the list of the shown channels, on top, a search bar in which to look for other channels (useful in case the session you're analyzing features many channels), the list of all channels, and a bottom list in which you can add comments to the session. Clicking on the "Laps" button just above the channels list, you'll be switching to the list of all session laps.

Clicking on the channels in the complete list you can show/hide them. In the laps list you can do the same. While shown channels will affect what's shown in this layout only, shown laps will be for all layouts.

Shown laps and shown channels feature a colored square, clicking on which you can select its color. This color choice will affect all layouts.

Laps can be shown/hidden doubleclicking the laps themselves in the **story board**. Some laps in the story board feature a greyed background (normally the "in" and "out" laps), it means that such laps are not considered as valid by the algorithm computing the best lap. The story board allows also to drag shown laps moving them to other laps.

The **track map** shows the (GPS) driven line of the shown laps. Clicking on the driven line trace you can move the cursor. The cursor is in common with all other panels in this and all other layouts. The track map can be zoomed separately by data zoom.

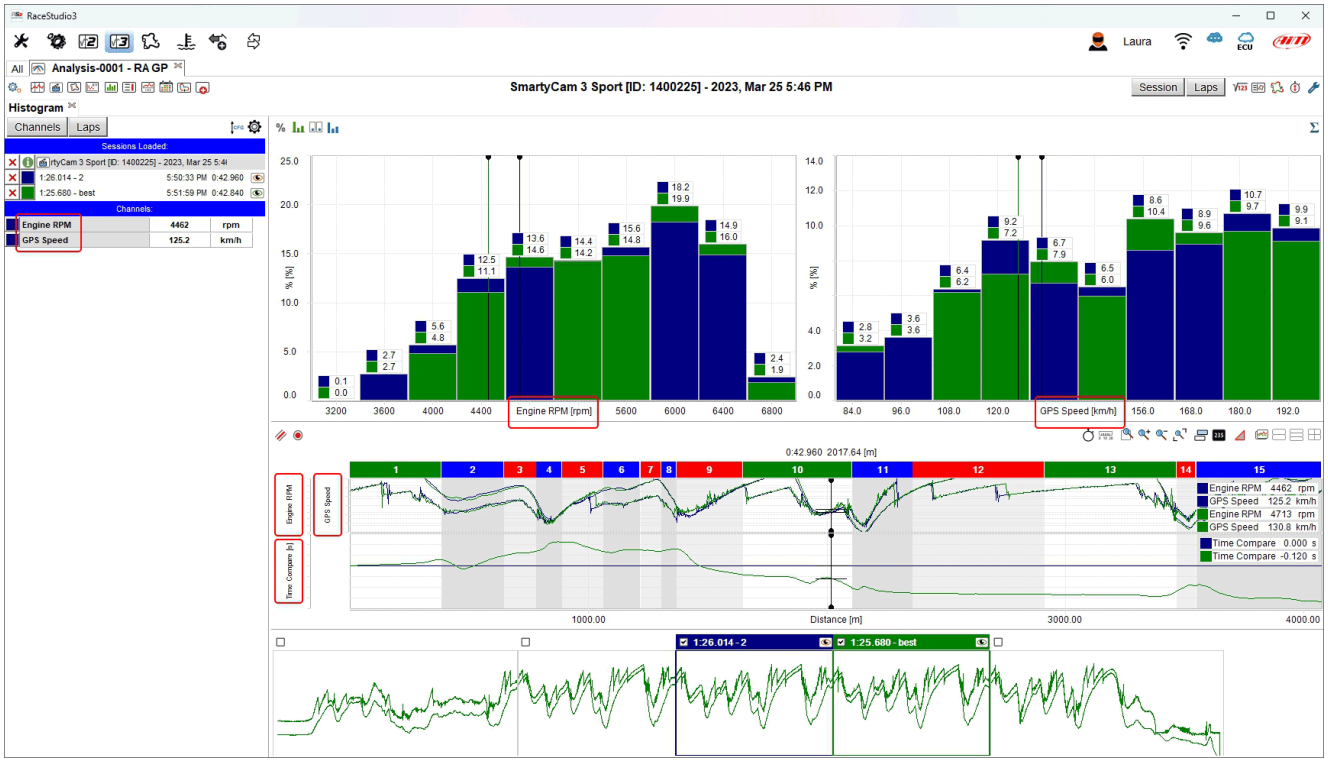
The **time-distance plot** shows the graphical representation of the values of the shown channels/laps. Also here, clicking on the plot you can move the cursor. To add a channel to the plot, click on it in the list of all channels. Using the mouse wheel on this panel you'll be able to zoom data in and out, the zoom level being in common with all other panels of this and all other layouts.

In all the panels the right click (or context menu) will guide you into the main command and setting options.

By default, pressing the space bar you can toggle the shown status of channels list and track map.

Clicking on the **scatter plot** the cursor in time/distance or in time compare graph goes to the closest corresponding point.

4.4.2.7 Histogram Layout



This layout comes by default with a *Channels and Laps List Panel* (**1**), a *Track Map Panel* (**2**), a *Histogram Panel* (**3**), a *Time-Distance Panel* (**4**) and a *StoryBoard Panel* (**5**).

Please follow the above links to learn how every panel works.

In the **channels list** you'll see the list of the shown channels, on top, a search bar in which to look for other channels (useful in case the session you're analyzing features many channels), the list of all channels, and a bottom list in which you can add comments to the session. Clicking on the "Laps" button just above the channels list, you'll be switching to the list of all session laps.

Clicking on the channels in the complete list you can show/hide them. In the laps list you can do the same. While shown channels will affect what's shown in this layout only, shown laps will be for all layouts.

Shown laps and shown channels feature a colored square, clicking on which you can select its color. This color choice will affect all layouts.

Laps can be shown/hidden doubleclicking the laps themselves in the **story board**. Some laps in the story board feature a greyed background (normally the "in" and "out" laps), it means that such laps are not considered as valid by the algorithm computing the best lap. The story board allows also to drag shown laps moving them to other laps.

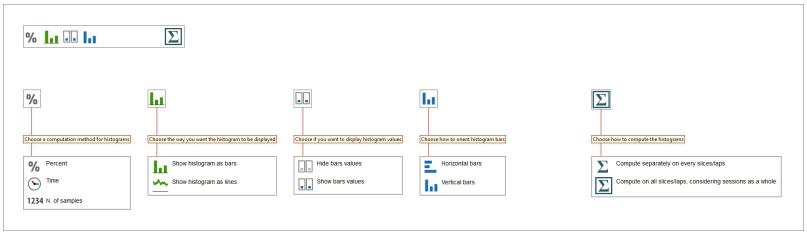
The **track map** shows the (GPS) driven line of the shown laps. Clicking on the driven line trace you can move the cursor. The cursor is in common with all other panels in this and all other layouts. The track map can be zoomed separately by data zoom.

The **time-distance plot** shows the graphical representation of the values of the shown channels/laps. Also here, clicking on the plot you can move the cursor. To add a channel to the plot, click on it in the list of all channels. Using the mouse wheel on this panel you'll be able to zoom data in and out, the zoom level being in common with all other panels of this and all other layouts.

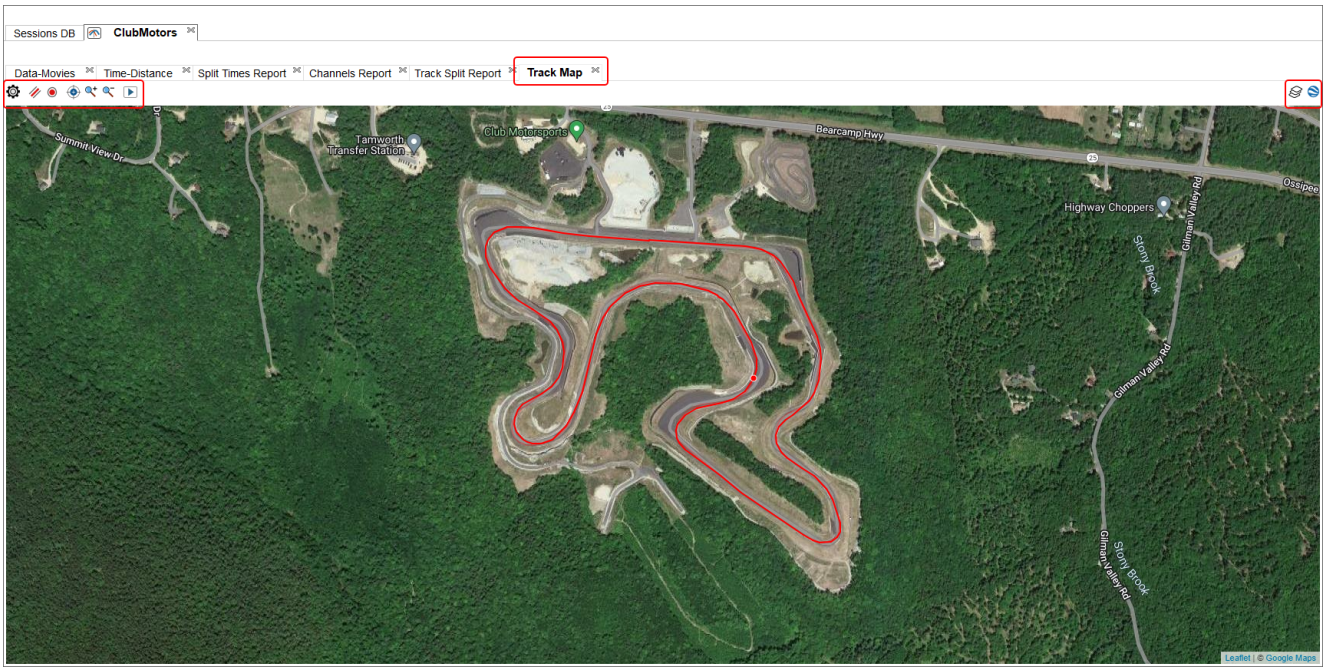
The main part (dimensions wise) of the layout shows the histogram panel. By default, hitting the space bar, only this part will result in being shown, hitting the space bar again, the hidden parts will be promptly back.

Pressing the icon shown here above you enter "Histogram" layout. Each channel has its own histogram and each lap is identified by a different colour; below the histograms is a graph of the channel on a distance base and time compare if enabled. Bottom of the graphs is the storyboard.

Using the icons on the toolbar top of the graph you can modify the graph layout and its computation. The graph can be shown in percentage, in time or as number of samples. Its layout can be in bars (horizontal or vertical) or lines, showing or hiding the values. If more laps/slices are shown they can be computed separately or as a whole.



4.4.2.8 Track Map Layout



This panel comes by default with, simply, a *Track Map Panel*.

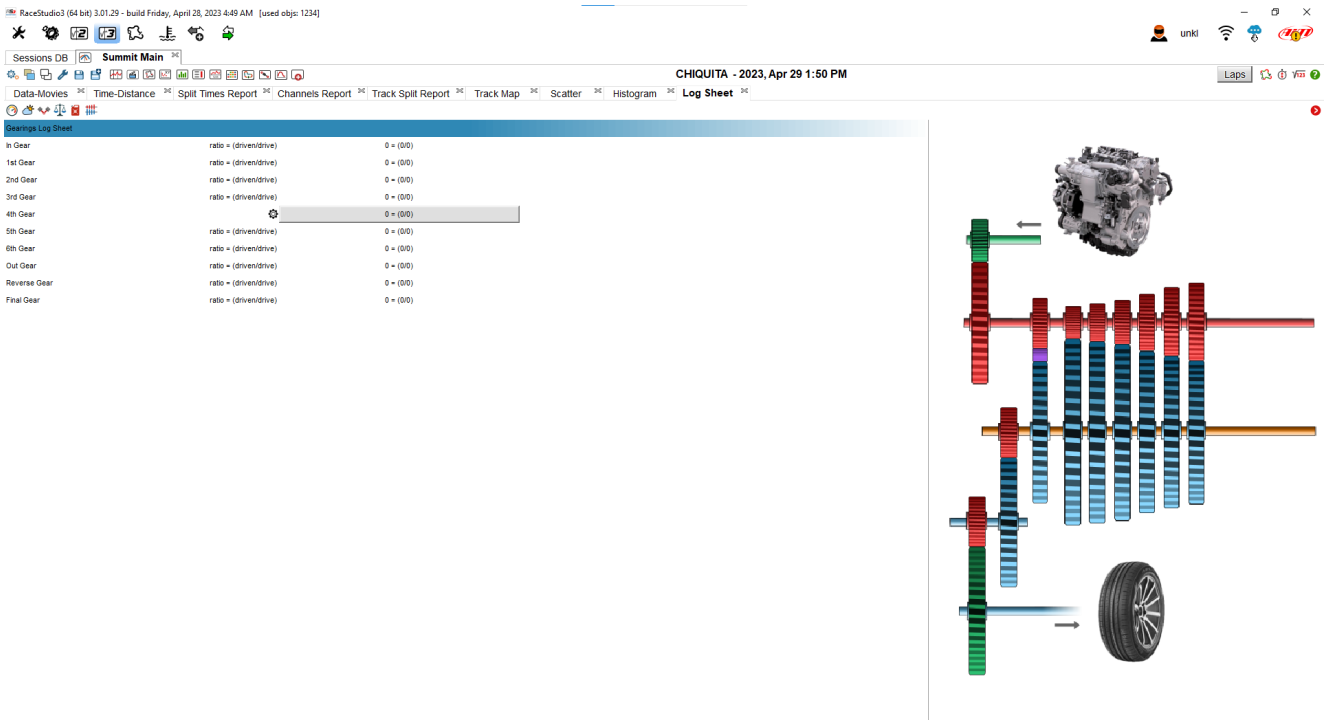
Please follow the above link to learn how the panel works.

This layout shows, with a screen wide view of the map, all the GPS driven traces of shown laps. As well as all other views of RaceStudio 3 in which GPS traces are shown, you can select if to draw against web based tiles or draw using OS GDI.

You can zoom in and out the map view without affecting the data zoom, this can be helpful to look into corners or straights. If you show and compare more than one lap, you will see the vehicle position as a point on the GPS traces.

You can perform a time based animation of the points over the traces.

4.4.2.9 Log Sheets Layout



This layout comes by default with, simply, a *LogSheets Panel*.

Please follow the above link to learn how the panel works.

Log sheet view allows to fill in and set different information concerning the run/session, the weather and the vehicle as shown below.

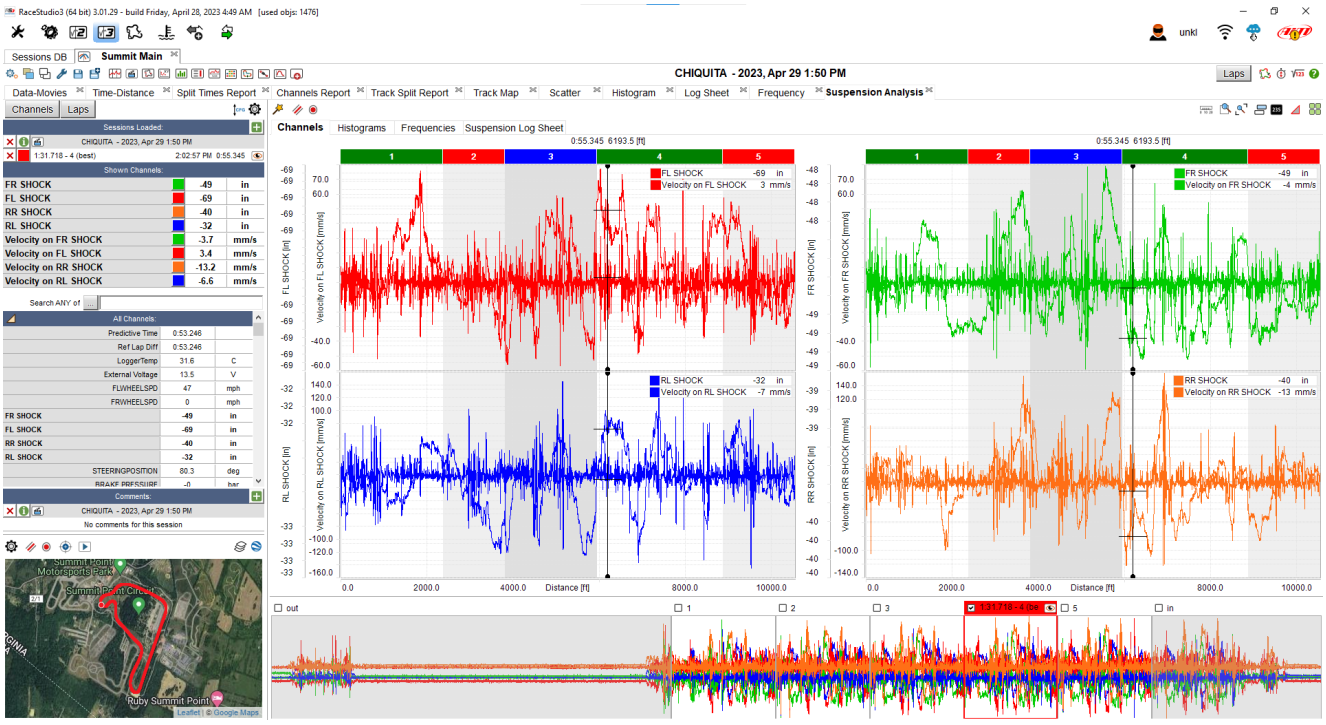
Such information can be recalled and used, for example, in math channels.

4.4.2.10 Frequency Analysis Layout

This layout comes by default with a *Channels and Laps List Panel* (**1**), a *Frequency Analysis Panel* (**2**) and a *StoryBoard Panel* (**3**).

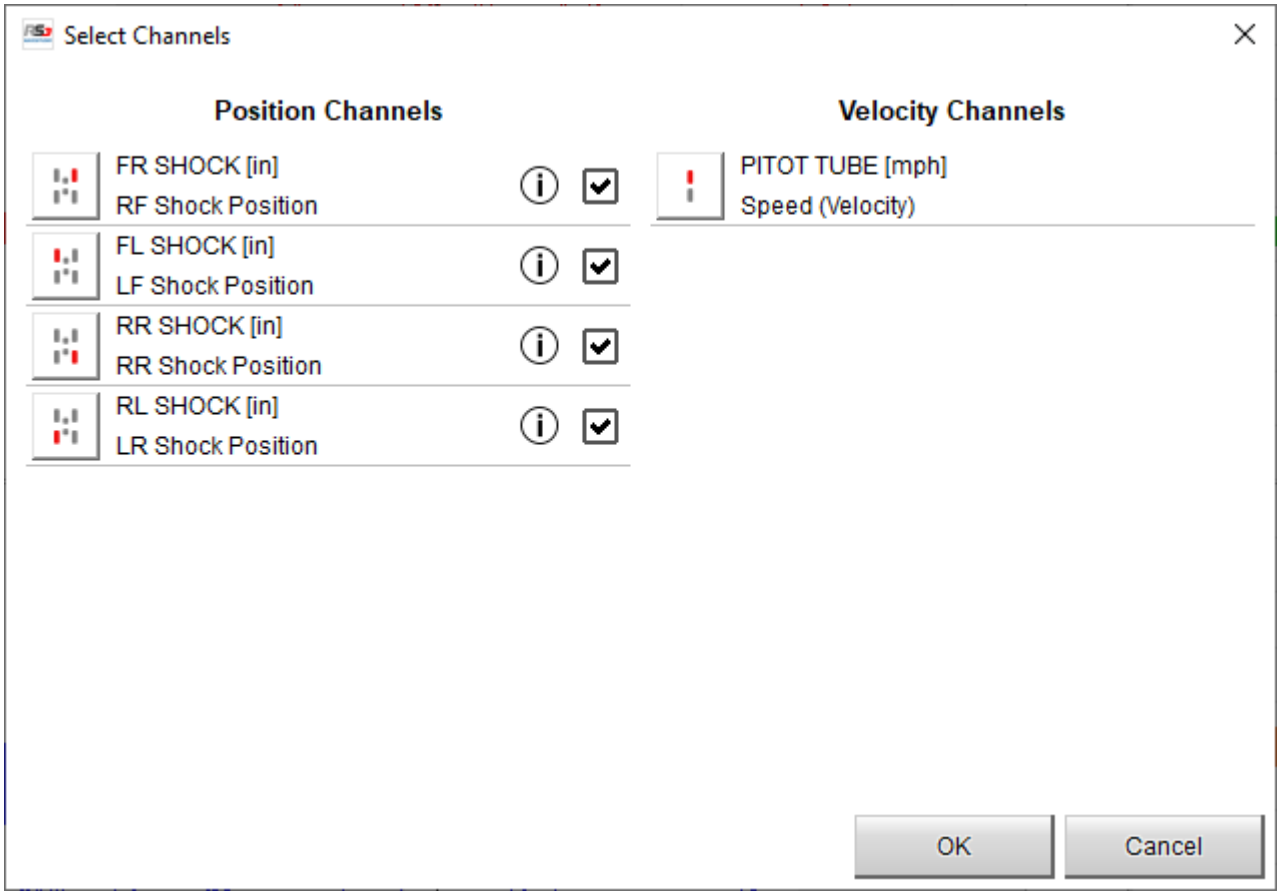
Please follow the above links to learn how every panel works.

4.4.2.11 Suspension Analysis Layout



This layout comes by default with a *Channels and Laps List Panel* (**1**), a *Track Map Panel* (**2**), a *Suspension Analisys Panel* (**3**) and a *StoryBoard Panel* (**4**).

Please follow the above links to learn how every panel works.



The **suspension analysis** panel puts together a time/distance plot of the suspension related channels (shock positions and/or velocities), a histogram of the same channels, the frequency analysis plot of the same channels and a logsheet with the main settings related to suspension analysis.

This entire layout is not visible (as well as the icon in the main analysis toolbar) in case the session you open is not featuring any shock position or shock velocity channel. In case your session only features position channels, the first time you open this layout you're prompted a dialog window in which you can enable the automatic addition of velocity math channels.

4.4.2.12 Custom Layouts

Here it is possible to Add/show/hide and delete custom layout. They work exactly like explained in *Add/removing a panel to/from the software view*.

4.4.3 Detailing How To...

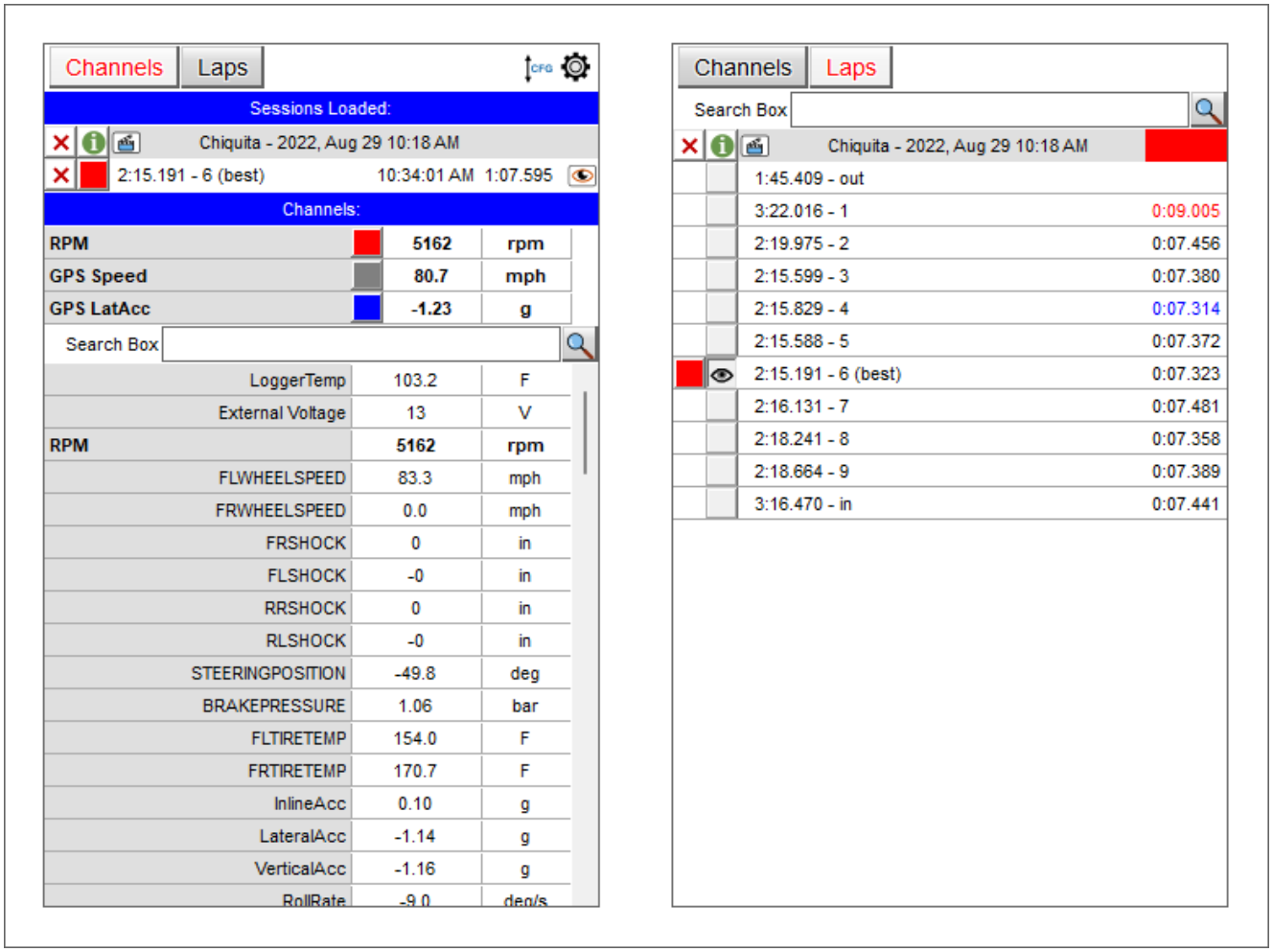
A layout is made of panels. While modifying a layout, you can choose between available panels. Available panels (alphabetically sorted, more or less) are:

- *Channels and Laps List Panel*
- *Channels Report Panel*
- *Channels Report Graph Panel*
- *Channels Report Panel for Selected Split*
- *Frequency Analysis Panel*
- *Histogram Panel*
- *LogSheets Panel*
- *Movies Panel*
- *Scatter Panel*
- *Split Details Panel*
- *Split Report Panel*
- *StoryBoard Panel*
- *Suspension Analisys Panel*
- *Time-Distance Panel*
- *Track Map Panel*
- *Track Map Panel for Selected Split*

We'll see in the next paragraphs a description for every panel and its possibilities.

4.4.3.1 Channels and Laps List Panel

Channels and laps table shows channels and laps data according to the button pressed on the top left keyboard as shown here below.



Channels view

Top right of the panel are **two buttons** that allow to change the order of the channels (left icon) and set them recalling the related dialog window (right icon).

Channels can be **variously ordered**. Clicking the left button it changes its appearance according to the option you choose. Available options are:

Channels are sorted by configuration (the firmware)

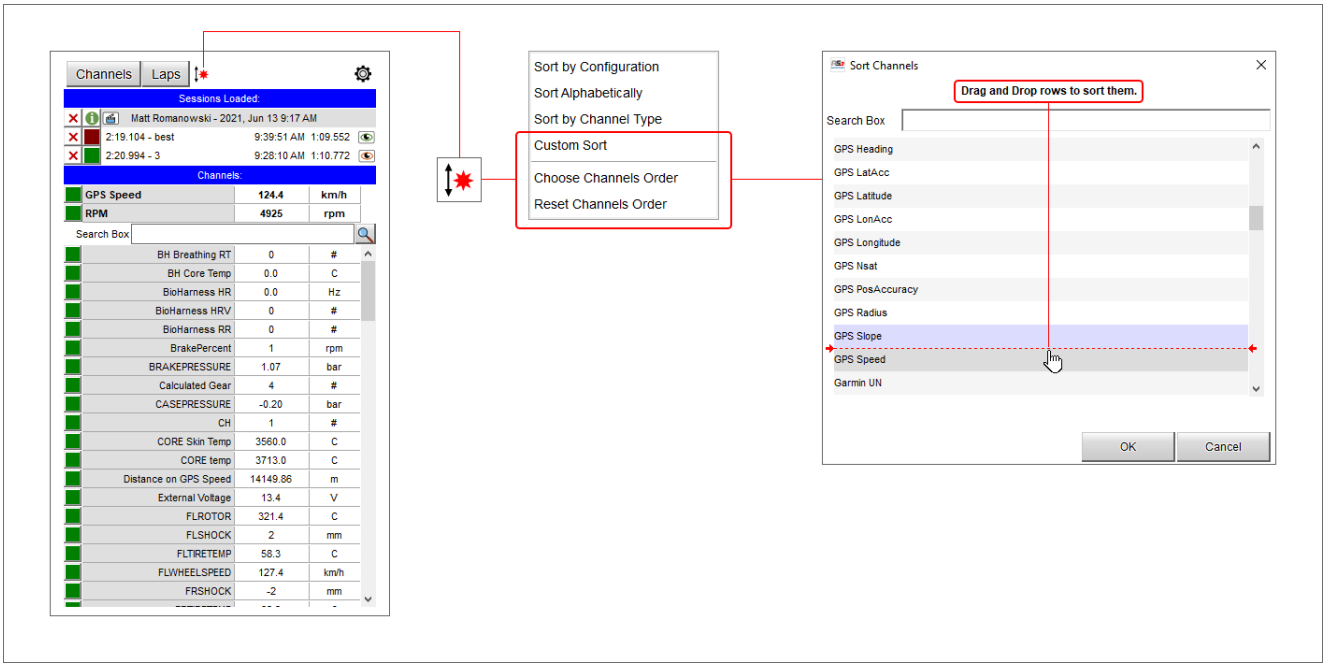
Channels are sorted alphabetically

Channels are sorted by channel type

Channels are custom sorted. Selecting this icon two additional options are prompted in the menu:

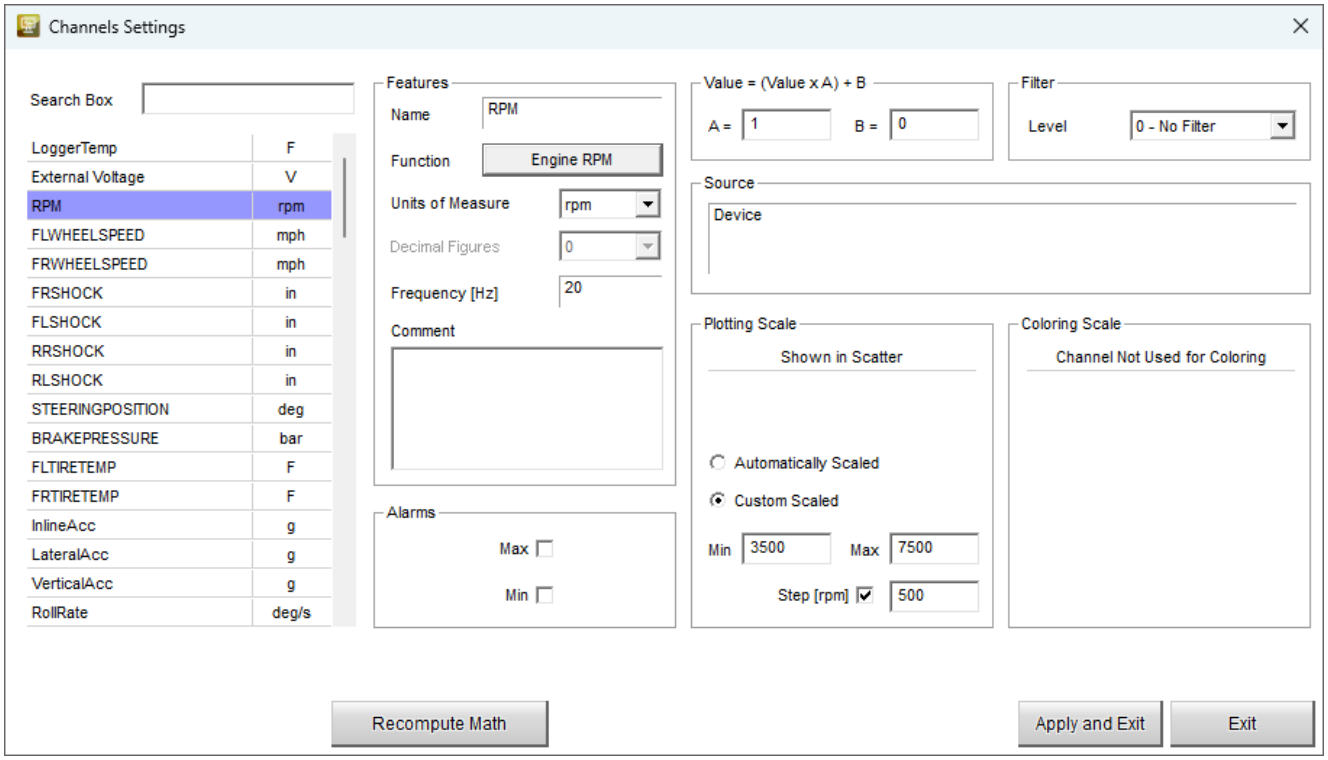
- choose channel order and
- reset channels order

As shown here below you can drag and drop the voices to custom sort them in the panel or reset the channels order through the related option.

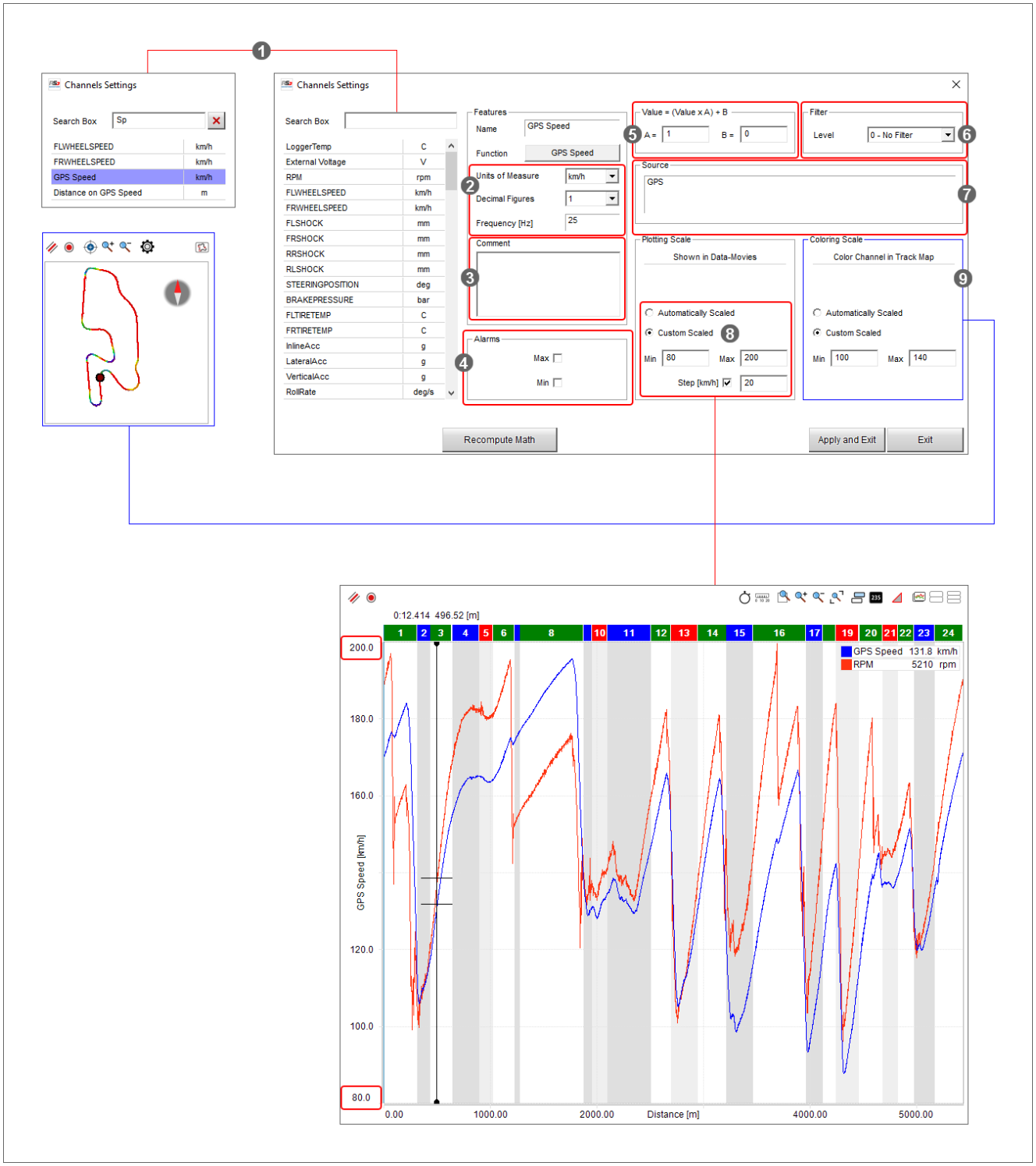


Channels can be **variously set**.

 Pressing the icons shown here on the left you recall setting dialog window shown below that allows to set each channel.



With reference to the image below, the setting dialog window allows to perform a lot of operations:



- look for a channel typing it in "Search" box: the system makes an automatic selection (**1**)
- change the unit of measure, the number of decimal figures and the sampling frequency (**2**)
- insert a comment about the data (**3**)
- to set an alarm for max and min values of the channel (**4**)
- correct a channel that has been wrongly set and cannot be reset in "Value" box (**5**)
- can filter the noises using different levels of filter (**6**)
- specify the source of your channel (GPS in the image above) (**7**)
- use an automatic or custom plotting scale; in the second case a range of values is needed (**8**)
- colour the channel in the track map using max and min values as reference with "Colour per lap/slice" setting (**9**).

On top of Channels view, under the label "**Sessions Loaded**" you see the sessions currently open.

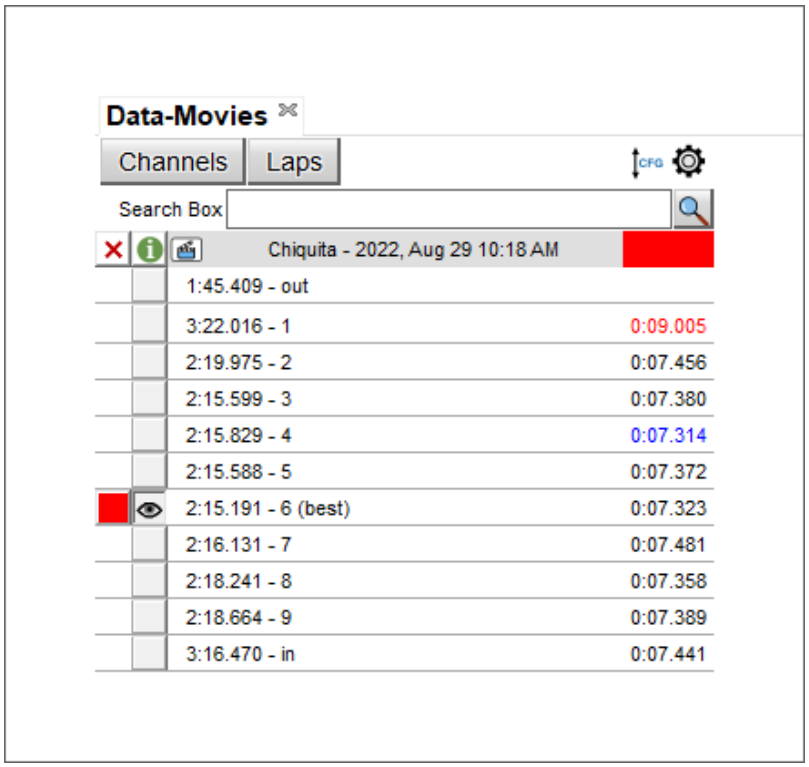
Under the label "Channels" are the channels plotted in the central graph (by default RPM if available and speed), a search box (indicated by the magnifying lens) and bottom of it all the available channels.

Mousing over any of the channel plotted in the graph a setting icon and a red cross (if the channel is shown in the graph) appear in the corresponding box. The red cross is to delete the channel from the central graph while the setting icon allows to set it and recalls the related dialog window with the channel you are setting already selected.

Mousing over any of the channels not plotted in the central graph the setting icon only appears.

Laps table

Laps table shows all laps of the session with the best one indicated by default.



Right clicking on a lap time a menu is prompted you can:

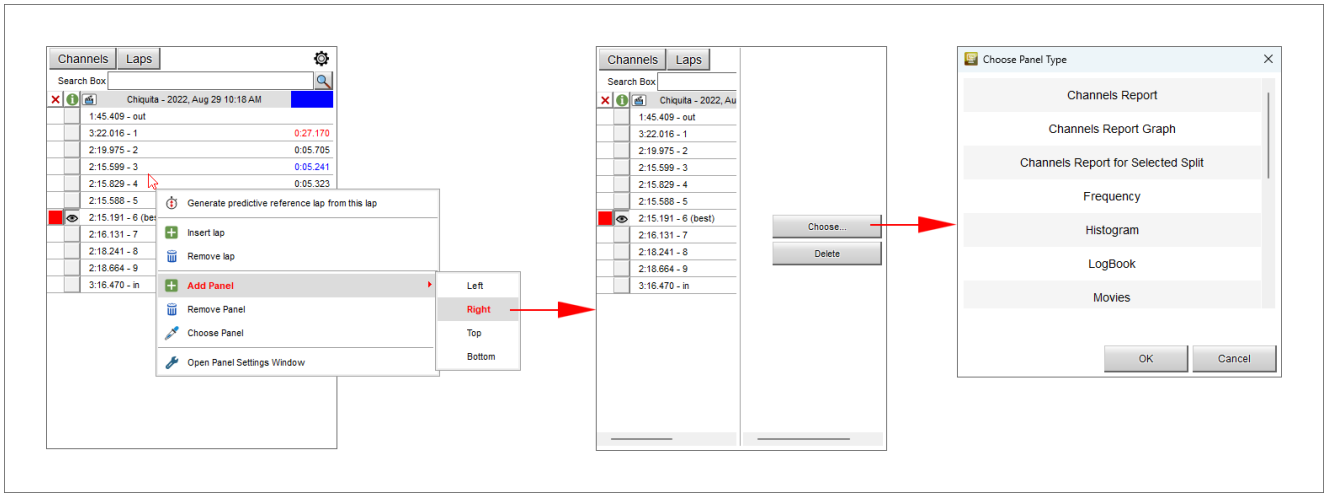
 generate a predictive reference lap from the selected lap

 add a lap in cases not foreseen by AiM start/finish lines; the selected lap is divided

 remove the selected lap

 add a panel to the current view;

As shown here below the software allows the user to choose where to place the additional panel (left, right, top or bottom) and a menu is prompted where to select the panel to add.



 remove the selected panel

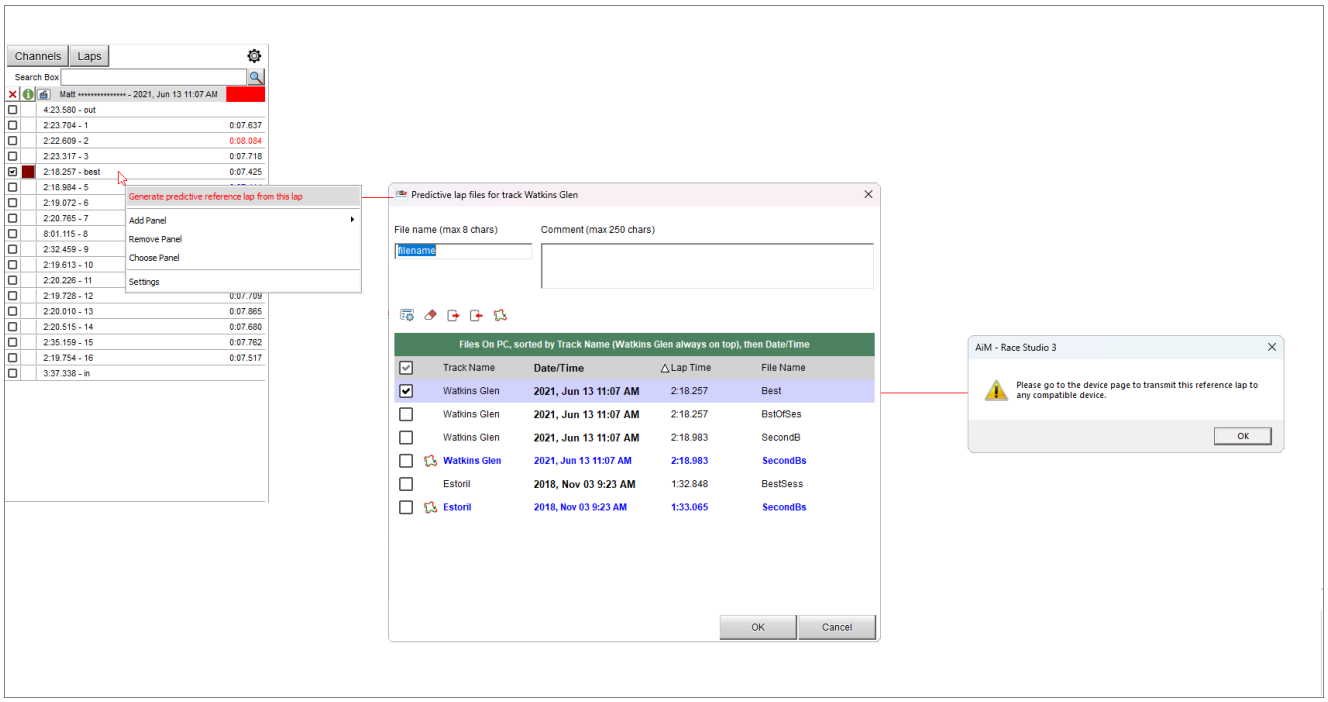
 change the current panel content selecting it in a menu that is prompted

 enter Setting options of this panel

Generating a predictive reference lap from a recorded lap

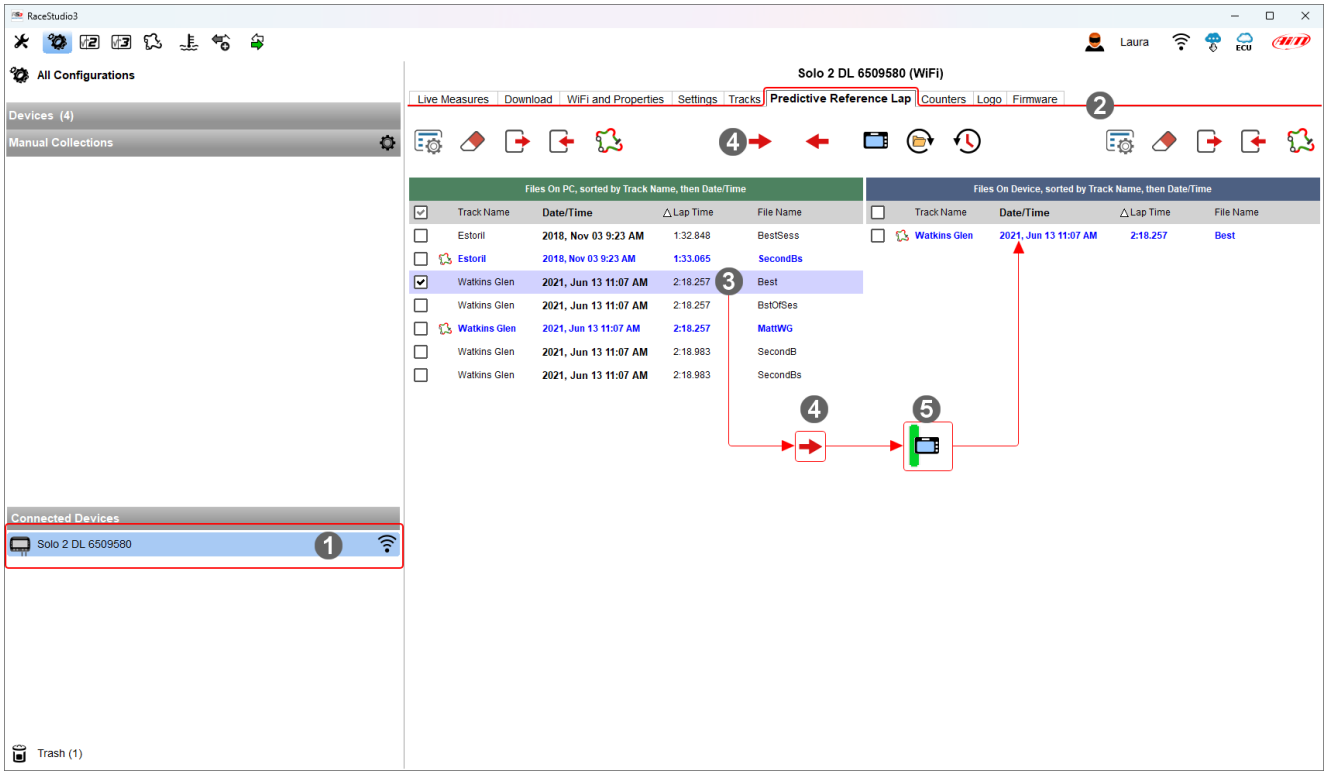
To create a predictive reference lap from a recorded lap follow these steps:

- right click on the lap and select "Generate predictive reference lap from this lap"
- a dedicated panel is prompted where all available reference laps are shown
- to add your lap enable it (is the first of the list)
- fill in "file name" and a comment if needed and press "OK"
- a new panel is prompted saying "Please go to the device page to transmit this reference lap to any compatible device"": press "OK"



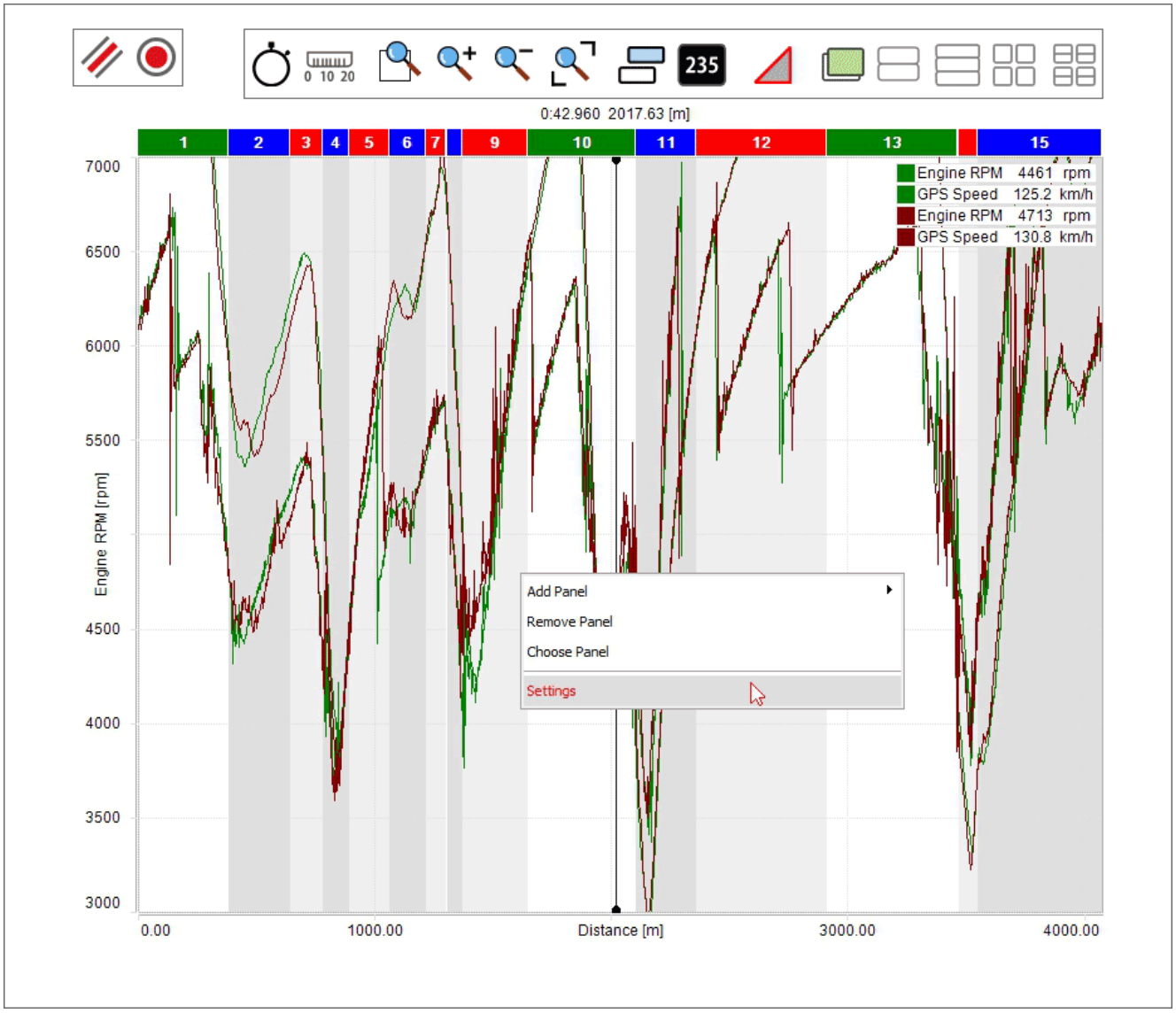
With reference to the image below, once the predictive reference lap generated connect your AiM device to RaceStudio 3 if it is not and:

- click on it bottom left on the software configuration page (**1**)
- enter "Predictive Reference Lap" tab (**2**)
- top of the tab are three keyboards: one on the left another central and the last one on the right
- select the lap to be used as reference (**3**)
- press the first left icon on the central keyboard (**4**)
- the software copies the lap to your device (**5**) and you can fix it as reference for those devices that support this functionality

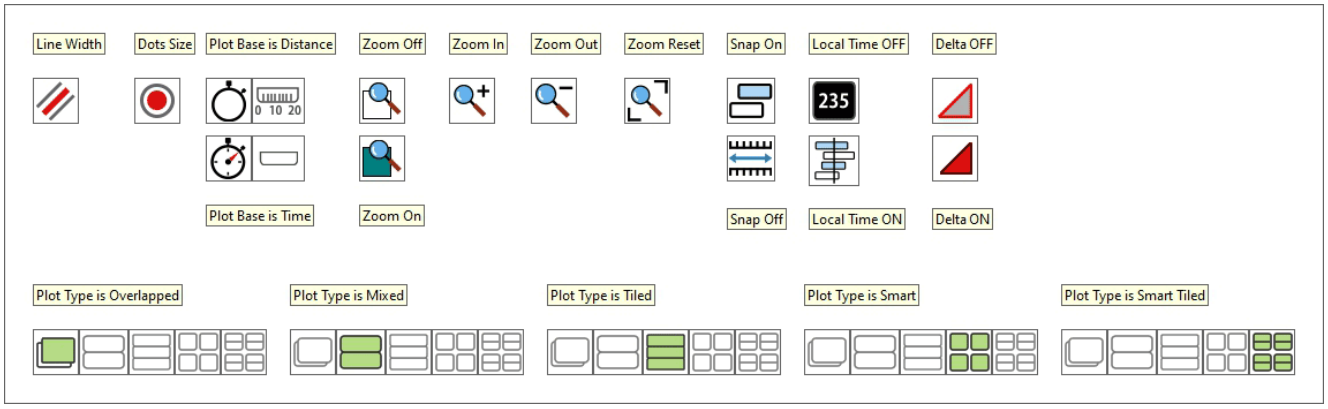


4.4.3.2 Time-Distance Panel

Central in the page of the software is a graph whose appearance changes according to the icon you select in the keyboard above it as well as to the setting fixed in "setting panel".



The image here below shows the keyboard above the graph; buttons placed one above the other are switching buttons.



Here follows a short explanation of the different options activated by the buttons.

Line Width: available line widths are: 1 (default), 2, 3, 5, 7, 9

Dots Size: available dot sizes are: 1 (default), 2, 3, 5, 7, 9

Plot:

- by distance: you have run distance on the X axis and RPM value on the ordinate axis
- by time: you have run time on the X axis and RPM on the ordinate axis

Zoom:

- Custom zoom ON: dragging and dropping the graph cursor you define the time period/run distance to zoom
- The other icons allows to zoom in/out the graph and reset the zoom

Snap:

- ON: the graph can show only part of the graph included in a complete laps
- OFF: the graph can show also part of the graph belonging to different but following laps

Local Time On/Off (useful to show different pilots in the same race):

- ON: shows "Time" on the X axis, the selected time period in the storyboard and can be modified using the mouse wheel
- OFF: shows distance on the X axis, the selected time period in the storyboard and can be modified using the mouse wheel

Delta ON: dragging and dropping the graph cursor the calculated time period/run distance is shown top left of the graph

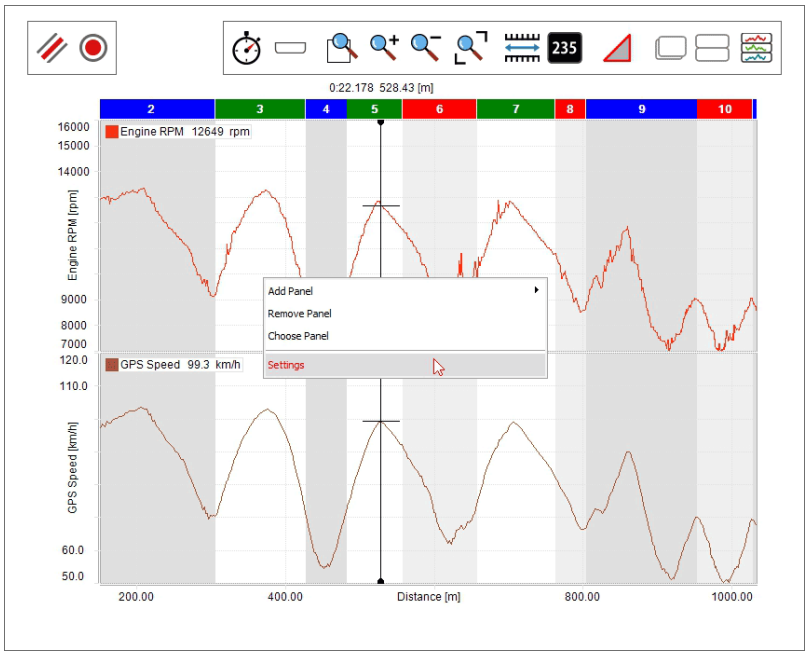
Plot type can be:

- **Overlapped**: all shown channels are shown in the same graph
- **Mixed: you can decide which channel to show in which graph; a numbered box appears left of each sho**
  clicking it you can decide in which graph to show that channel; max allowed number of graphs is 6
- **Tiled**: each channel has its own graph
- **Smart: this plotting fits particularly channels bound to vehicle corners like dumpers, brakes, wheel spe**
  First of all you need to ensure that the channels are configured as bound to the vehicle corner
- **Smart Tiled**: analysing two groups of channels bound to vehicle corners it is possible to show them in the graph not only smart but also tiled.

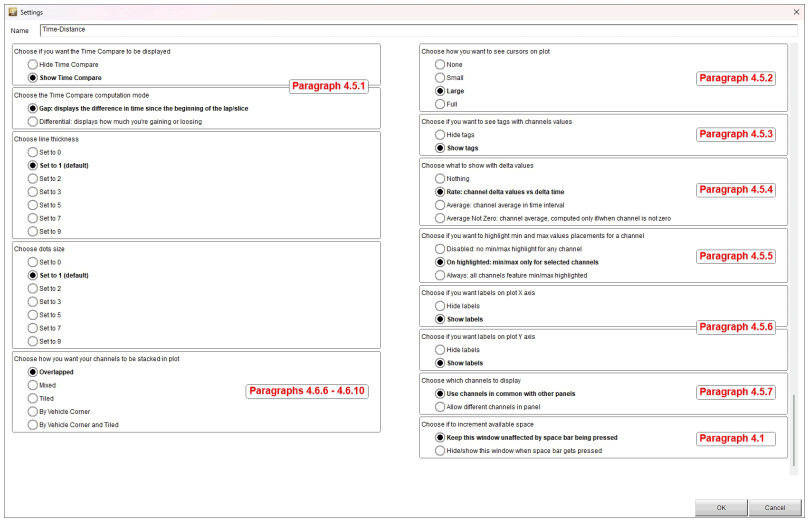
Graph settings

The graph layout can be customized using the proper setting dialog window. To do so:

- place the mouse on the graph
- right click on it
- select "Settings"

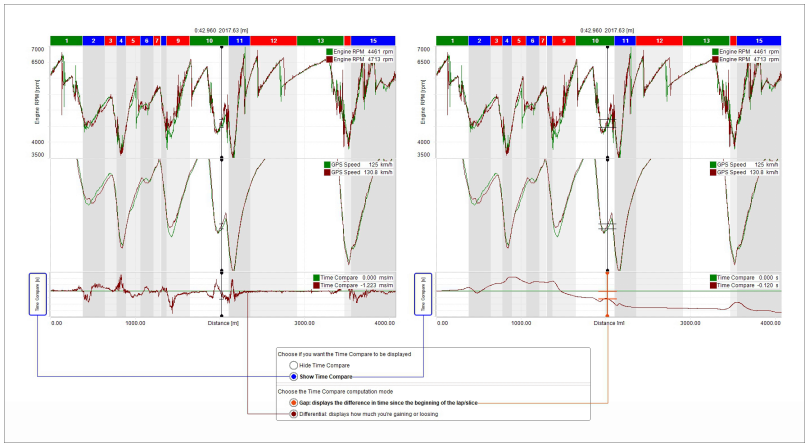


As for all graphs you can decide line width and dots size. The other features are explained in the paragraph here below indicated.



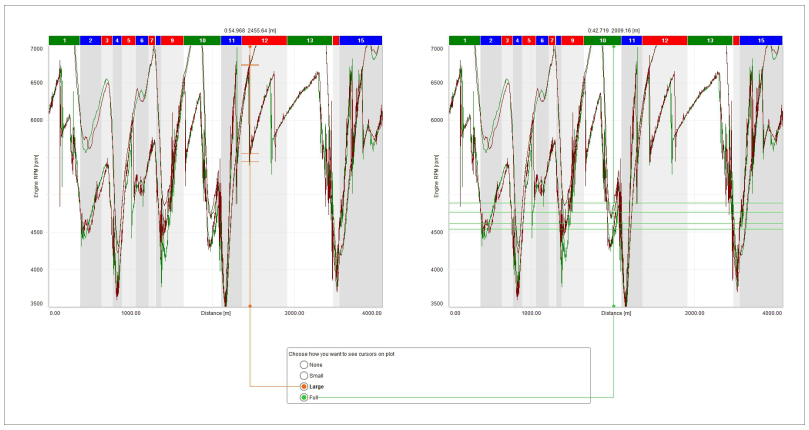
Time compare setting

As shown here below Time compare can be hidden or shown and shown as "Differential" or as "Gap".



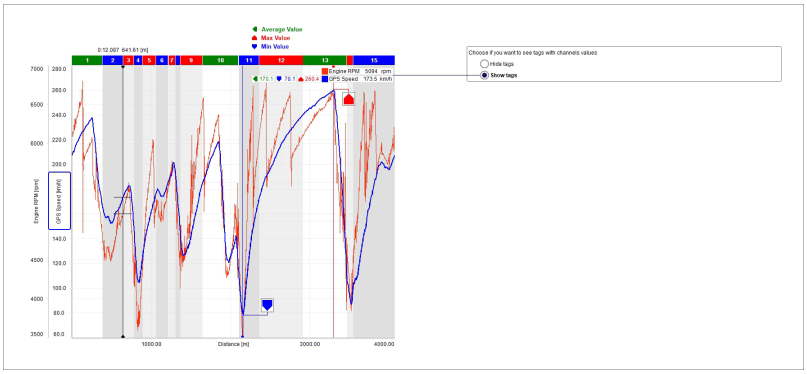
Cursor settings

As shown here below the cursor can be hidden (none) or shown as small or as large and be "full" to say crossing the graph.



Tags settings

As shown here below the values of the channels plotted in the graph can be shown in dedicated boxes called "**Channels tags**" enabling the corresponding checkbox; clicking the channel tag the line of the channel whose tags has been pressed becomes thicker and max, min and average values of the channels are shown.



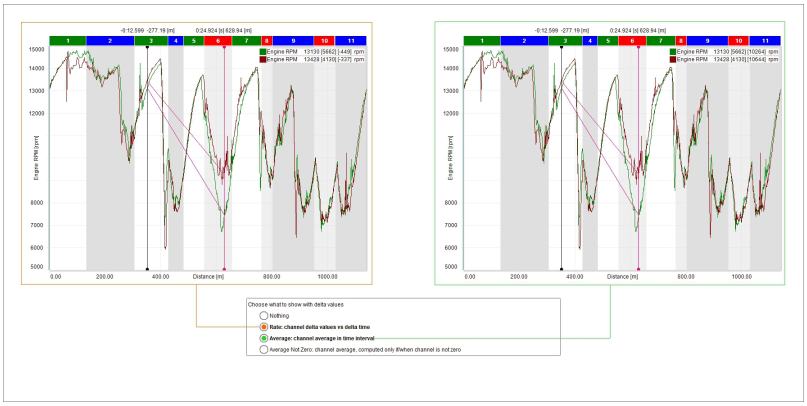
Setting graphs in delta mode and managing it

Enabling “Delta” mode you can analyse the delta of a channel in two points. Available options are:

- Nothing
- Rate: channel delta values vs delta time
- Average: channel average in time interval
- Average not zero: channel average, computed only if/when channel is not zero

To show the delta:

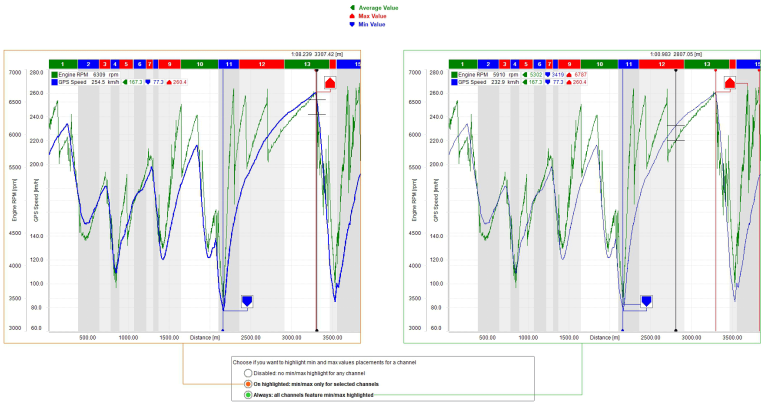
- click "Delta" icon: shown here above
- hook the graph cursor and drag it as you wish
- release the cursor: the delta is shown.



Highlighting Max/Min values placements for a channel

It is possible to show max min values of the shown channels on the graph. Available options are:

- Disabled (no max/min values are highlighted on the graph)
- On highlighted: clicking on the tags the channel graph become thicker and max/min and average values are shown (left image below)
- Always: max/min and average values of all channels shown in the graph are shown (right image below)

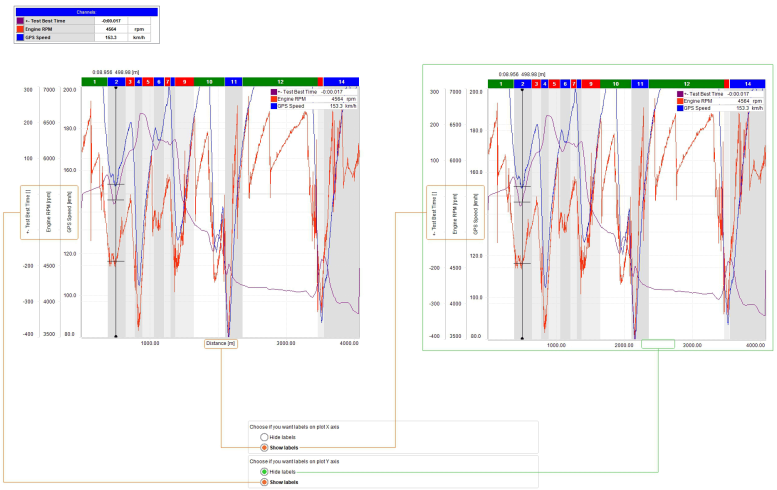


Min/Max values tags are three boxes that shows min/max and average value of the channel; the point where the min/max value has been sampled can be indicated; available options are:

- always: they are always shown
- on highlighted: they appear only selecting the channel tag
- disabled: they are never shown

Managing labels on plot "X" and "Y" axis

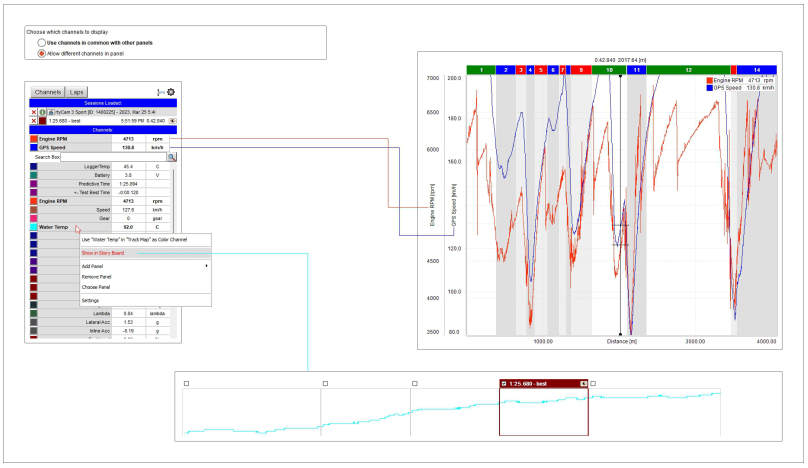
The central graph can show or hide labels on the axes. You can also decide to show them on one axis only as shown here below.



Choose which channels to display

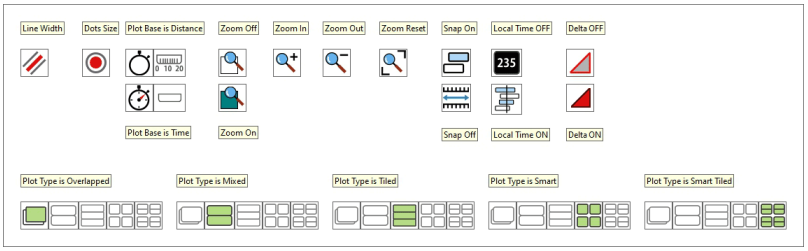
The channels shown in the central graph and in the storyboard can be changed enabling the related checkbox in "Setting" dialog window. To show, for example, Engine RPM and GPS speed in the central graph and water temperature in the storyboard follow these instructions:

- place the mouse on the storyboard
- right click and select "Settings" options
- enable "Allow different channels in panel" checkbox
- press "OK"
- go in channels table and right click on "Water temperature" channel
- select the option "Show in storyboard"
- As shown here below central graph shows RPM and GPS Speed while the storyboard bottom shows Water temperature graph



The time/distance keyboard working mode

As said before the central graph can be managed also using the keyboard placed above it and shown here below.

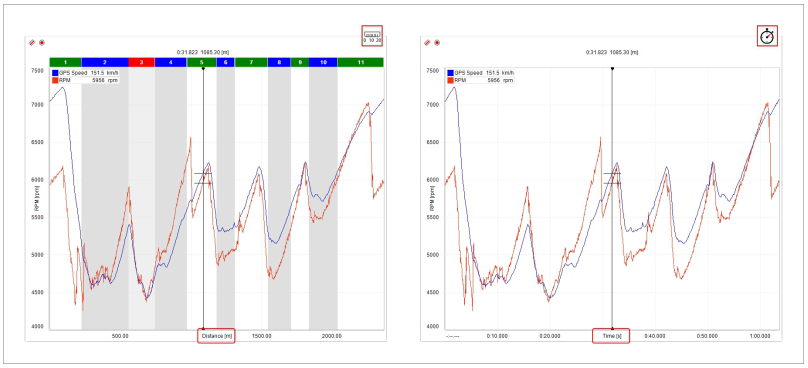


Plotting the graph by Time-Distance

As shown here below, the main difference among the graphs is the channel plotted on the X axis:

- Distance plotting is shown here below on the left
- Time plotting is shown here below on the right.

In distance plotting the splits are shown on the graph and it can be zoomed at a split level double clicking on the desired split. To come back to standard zoom double click on the split band or press the proper button. The graph can also be zoomed in/out with the mouse wheel.

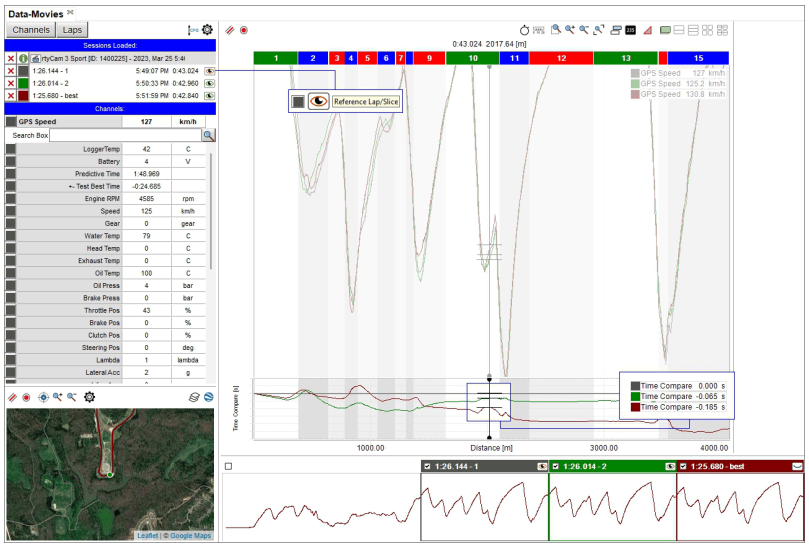


If more laps are open for analysis each one is indicated by an icon according to its status. In the image below the icons are shown centrally:

- Reference lap (top icon): is the one used in time compare graph (see image in the following page)
- Lap loaded with video and map (central icon)
- Lap loaded but without video nor track map (bottom icon); this happens if more laps (reference slices) than these set in custom settings are open

"Time Compare" graph appears bottom of the graph view if enabled in the setting dialog window

- Using a lap as reference lap( ) it shows in a graph the time differences among the reference lap and the other loaded laps.



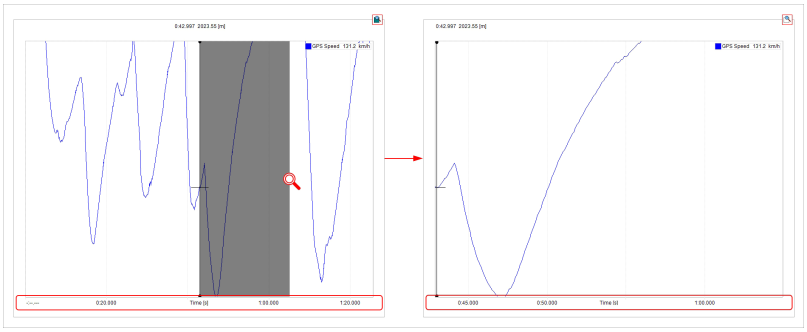
Graph zooming

With the zoom buttons you can:

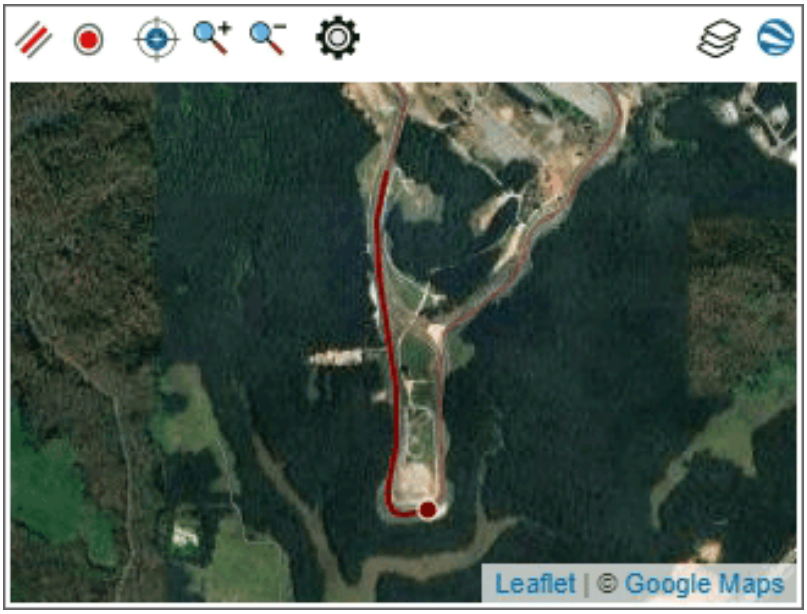
- Activate/deactivate the custom zoom
- zoom in/out and reset the graph zoom

If you want to **zoom in a specific part of the graph**:

- click on the first left zoom icon and it activates (left image below)
- hook the cursor
- a magnifying lens appears: drag the cursor as desired and the selected part is highlighted in dark grey (left image below)
- release the cursor and the graph is zoomed in (image here below on the right)



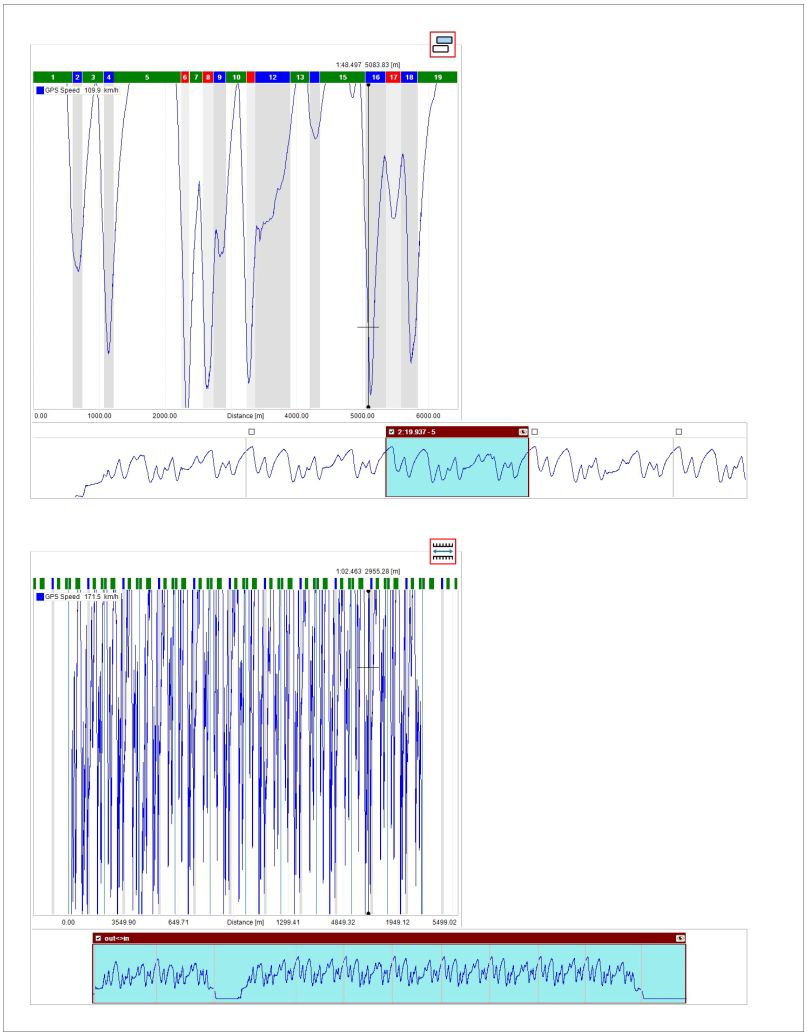
Once the graph is zoomed in the part of the track you have zoomed in is shown in the related box bottom left of the software page.



Graph Snap ON/OFF mode

Assuming you are plotting the graph by distance, as shown here below:

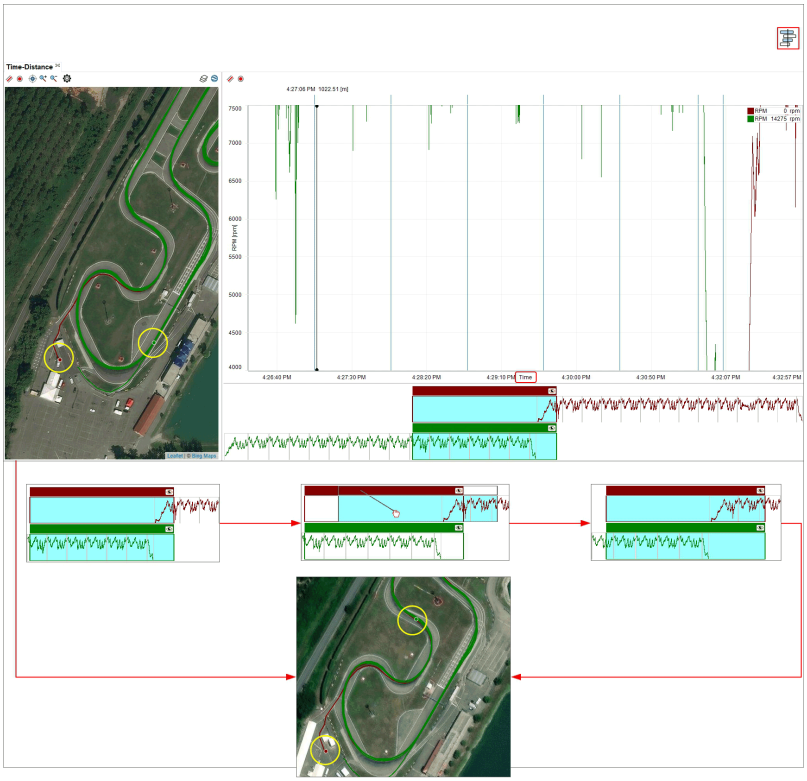
- with **Snap on** (top image) zooming out the graph it shows a lap in the central graph and in the storyboard
- with **Snap OFF** (bottom image) zooming out the graph you see in the central graph and in the storyboard the entire session.



Local Time ON/OFF (local time versus normal time)

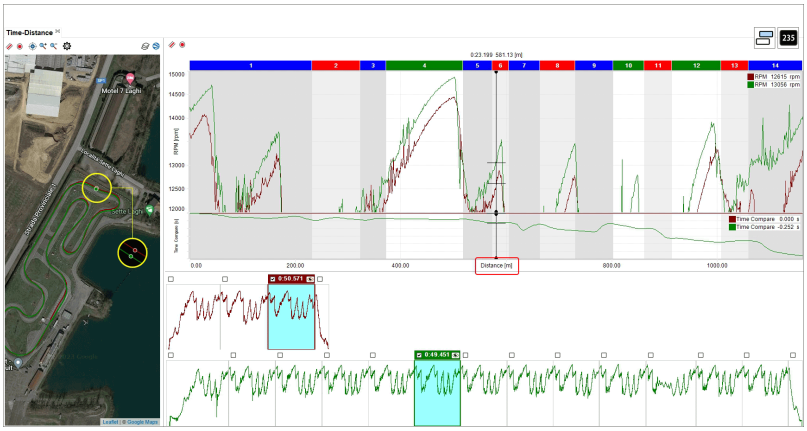
"**Local time on**" mode is very useful to compare different drivers on the same track:

- you can only have Time on the X axis
- the track box shows the position of the drivers on the track
- the boxes in the storyboard and the central graph show the part of the track that is being analysed
- the graph can be zoomed in/out with the mouse wheel and
- **dragging and dropping the selection in the storyboard you can see the same slice of a lap in the followi**
  too as shown bottom of the image below. The storyboard can always be dragged and dropped.

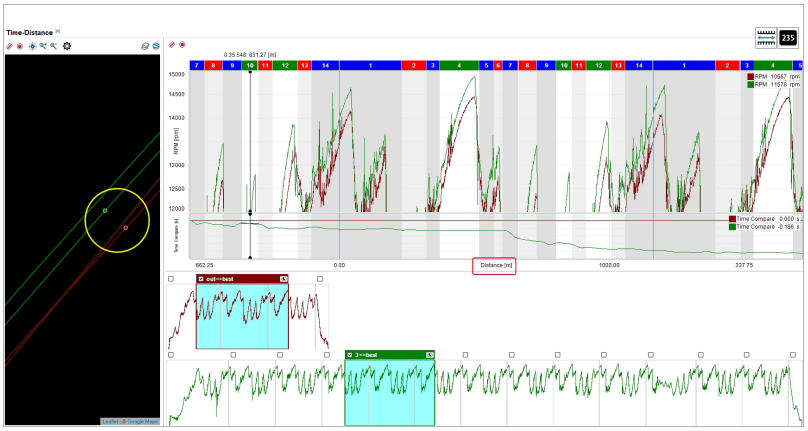


In "**Local timing off**" mode the X axis can show "Time" or "distance", the graph can be in snap on/off mode and the storyboard selects a fixed range of time; the graph can be zoomed in/out with the mouse wheel. dragging and dropping the selection in the storyboard the slice of race shown in the graph is moved as explained before.

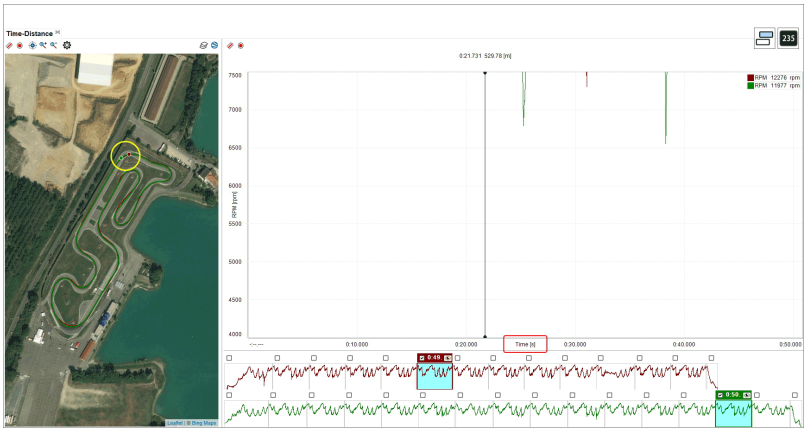
Local timing off and plot mode Snap on



Local timing off and plot mode Snap off



Local timing off and time on the X axis

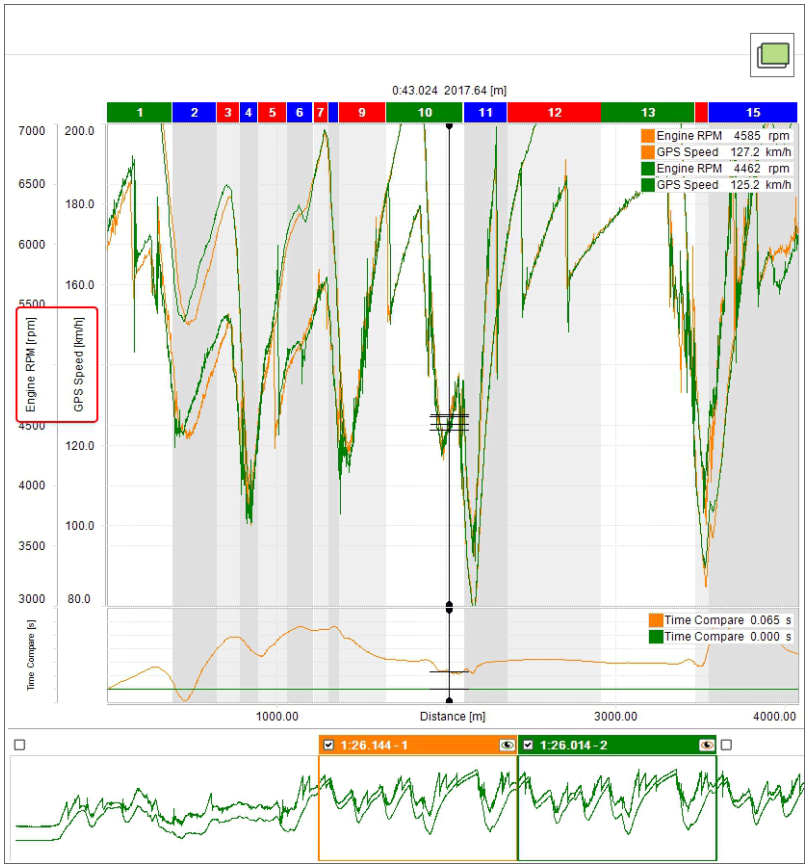


Graph in delta Mode

Graphs plotting overlapped

When the graph plotting is overlapped all channels are shown in the same graph and values of different channels belonging to the same lap are identified by the same colour as shown below:

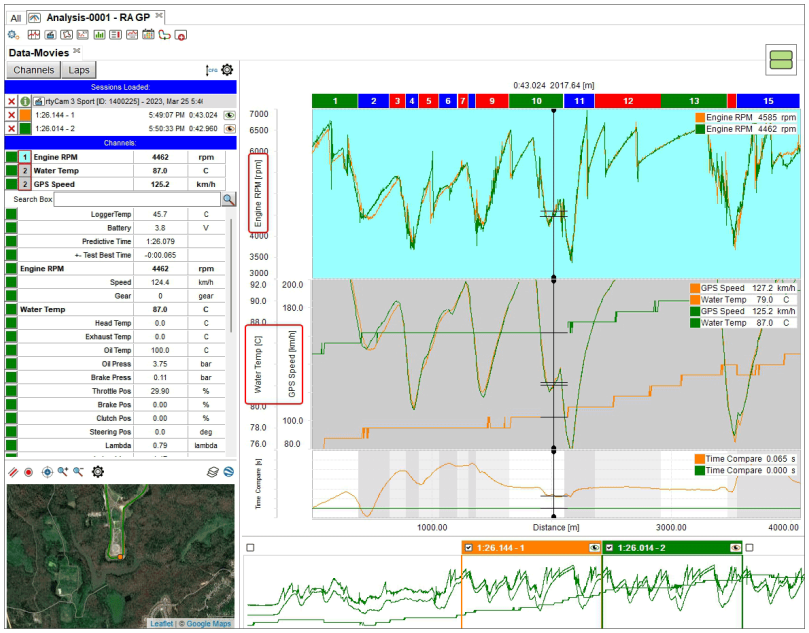
- a lap is plotted green and the other orange
- the channels you are analysing are both indicated on the ordinate axis
- the graph plot base is distance and "Time Compare" graph is enabled and shown bottom of the main graph.



Graphs plotting mixed

When the graph plotting is mixed you can decide where to plot each channel and the values of different channels belonging to the same session are identified by the same colour. In the example below:

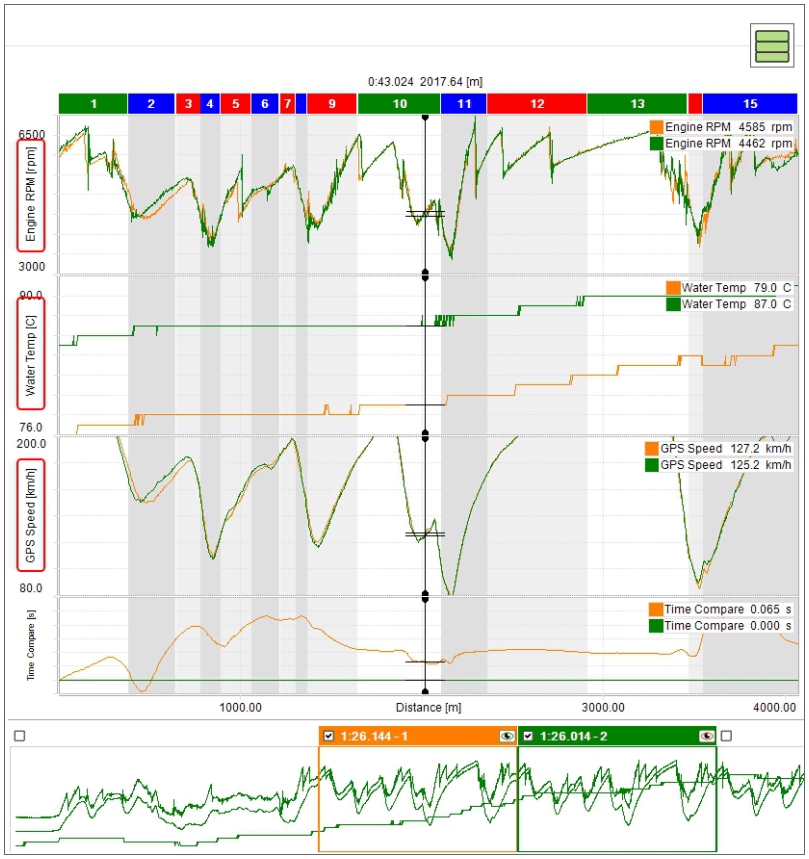
- a session is plotted green and the other orange
- Engine RPM channel is plotted in graph "1" (Top)
- Water Temperature and GPS Speed are plotted in graph "2" (central)
- You can change the graph where a channel is plotted clicking on the box left of the channel in channels table
- max allowed number of graphs is six
- the channels you are analysing are both indicated on the ordinate axis
- the graph plot base is distance and “Time Compare” graph is enabled and shown bottom of the other graphs.



Graph plotting tiled

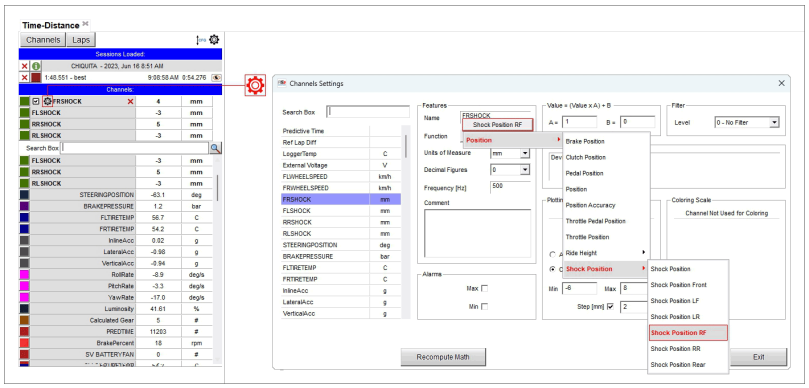
When the graph plotting is tiled each channel is plotted in a graph and the channels belonging to the same session are identified by the same colour. In the example below:

- a session is plotted green and the other orange
- plotted channels are Engine RPM, Water temperature and GPS Speed
- the channels are indicated on the ordinate axis

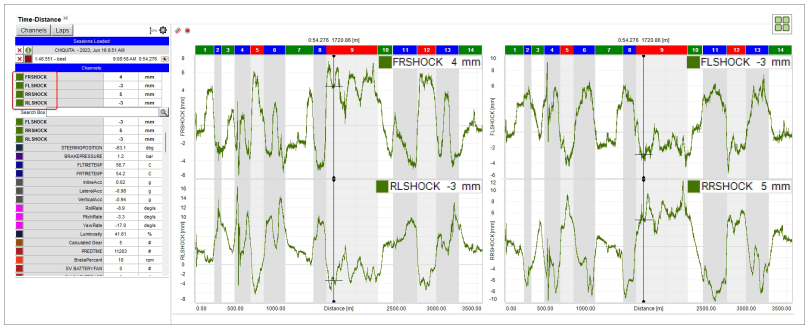


Graph plotting smart

This plotting fits particularly channels bound to vehicle corners like dumpers, brakes, wheel speed and so on. First of all you need to ensure that the channels are configured as bound to the vehicle corner like shown here below.



Once the procedure performed for all channels bound to vehicle corners you can show them smart, to say showing a graph for each channel as shown here below.



Graph plotting smart tiled

If analysing two groups of channels bound to vehicle corners it is possible to show them in the graph not only smart but also tiled as shown here below.

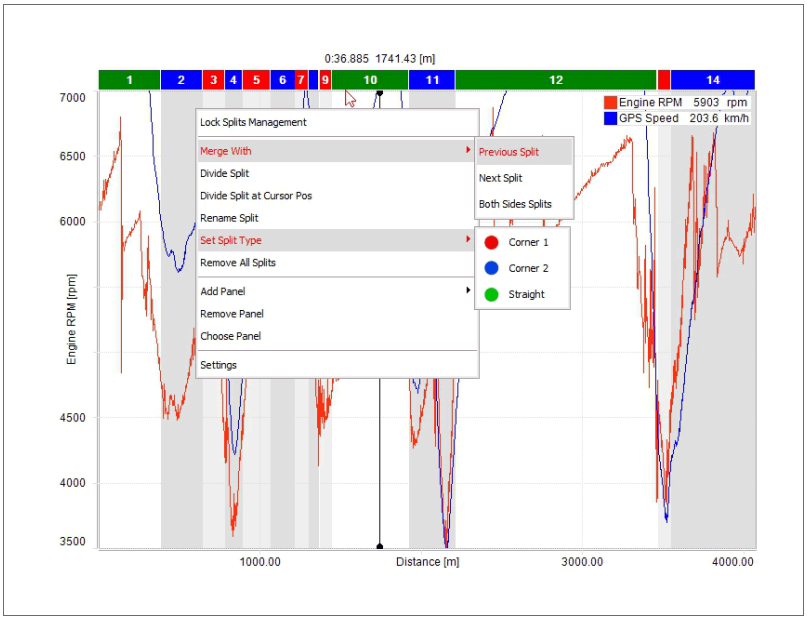
Managing track splits

In time/distance view all splits are identified by a coloured bar top of the graph. By default splits are locked; right clicking on the bar you can unlock them; in a few seconds they will be re-locked.

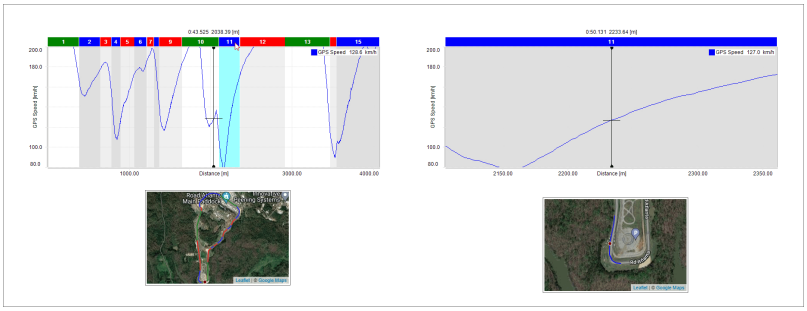
Please note that all changes made in this panel are saved and shown anywhere the track is recalled. To see the changes in the track map, bottom left of the view you need to set it as "Switch to colour per split".

Right clicking on the split bar it is possible to:

- **Merge more splits**. Each split can be merged with previous split, with next split, with both sides split
- **Divide splits**
- **Rename Split**
- **Set split type as**: corner 1, corner 2, straight
- **Duplicate split sequence**
- **Add/Remove/Choose** a panel



Double clicking on a split of the split bar the graph resizes at that split level and so does the track map bottom left of the software view; clicking again on the split bar the graph and the track map are resized back.

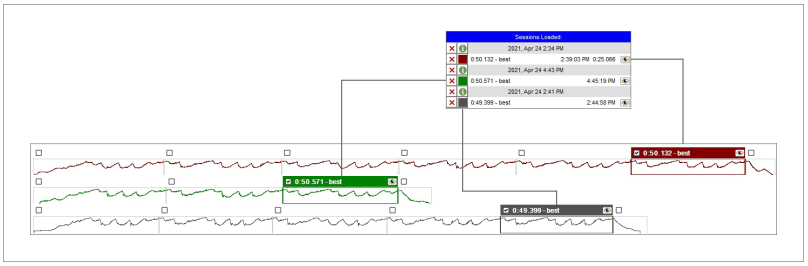


4.4.3.3 StoryBoard Panel

Bottom of the software view is the storyboard. By default it shows the graphs of all laps with best lap of the session indicated and – if more sessions are open – it shows so many rows as many sessions are open. Selecting a lap its lap time appears on the lap bar.

Using the setting dialog window (right click on the storyboard or press the setting icon on the top right keyboard) you can:

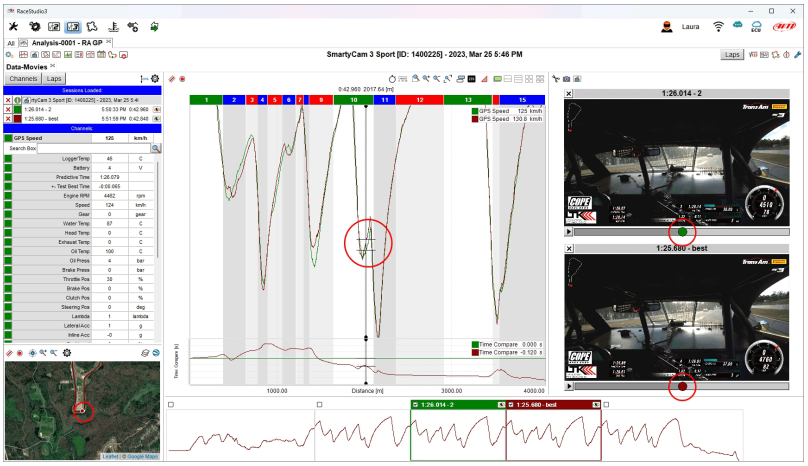
- show different channels in the storyboard.
- hide/unhide the storyboard pressing and re-pressing the space bar.



4.4.3.4 Movies Panel

Right of the software view are the videos included in the sessions. Enabling the corresponding checkbox in "Settings" dialog window videos can be hidden/unhidden when the space bar get pressed.

The session each video refers to is identified by the colour of play button in the video; it recalls the colour of the sessions in channels table top left of the software view. The position of the driver on the track is shown in the map and in the central graph.

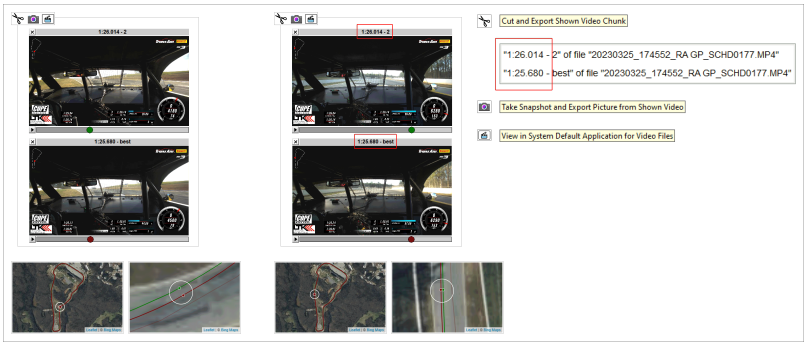


Pressing “play” button on one video:

- all video starts
- the cursor in the central graph moves following the movie
- the track map shows the driver moving on the track

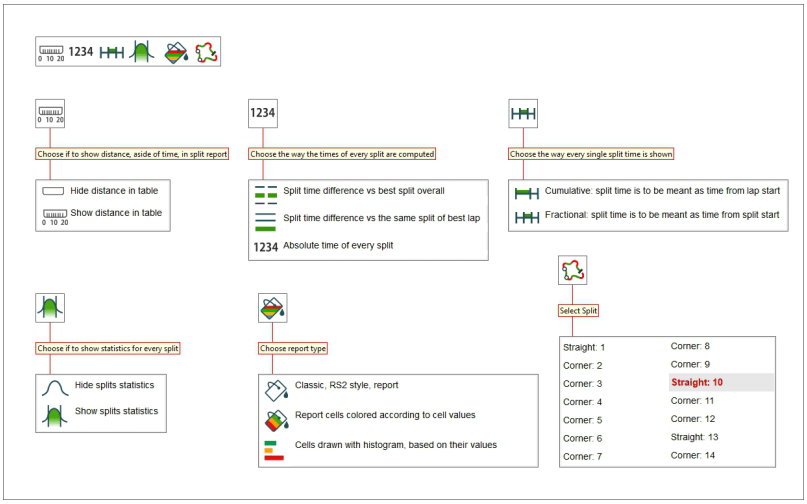
Through the keyboard top of the videos, it is possible to:

- cut and export the video chunk from the starting point to the current moment
- take a snapshot and export the picture of the current videos in a default folder (browse the PC to change the destination folder)
- view the video in the system default application for video files.

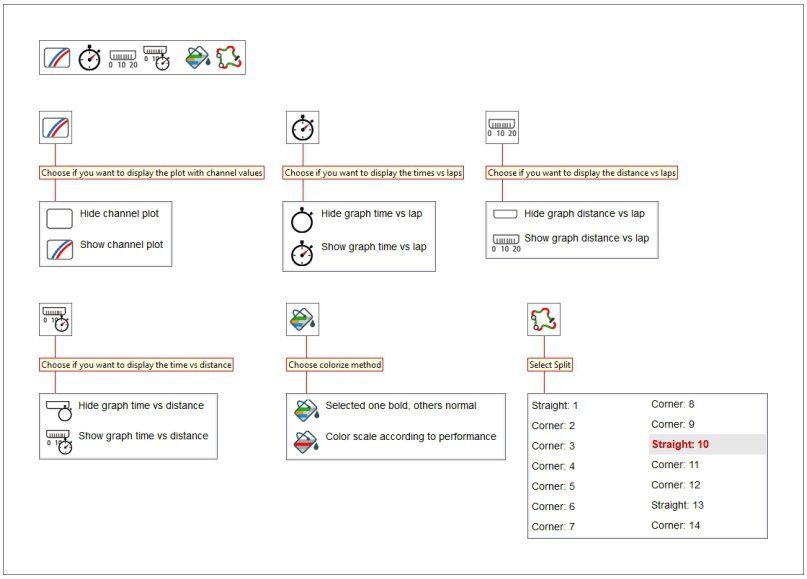


4.4.3.5 Split Report Panel

The top toolbar change and switch among different functions that show the data in various ways allowing different data analysis that will be explained in the following paragraphs. The image below shows left keyboard legenda. It manages the table left of the software view.

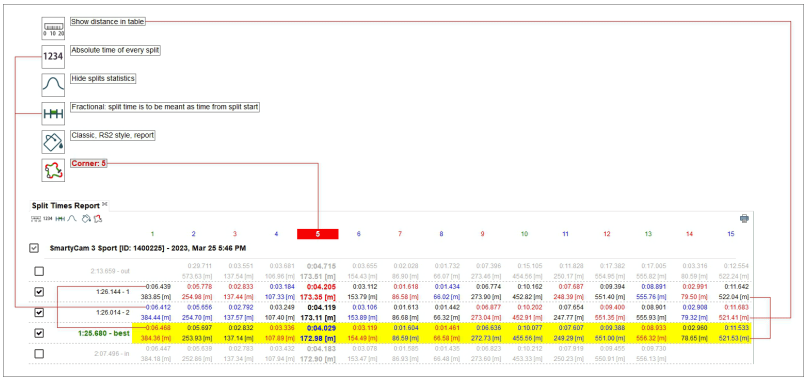


The image below shows right keyboard legenda that manages the available graphs shown below it.

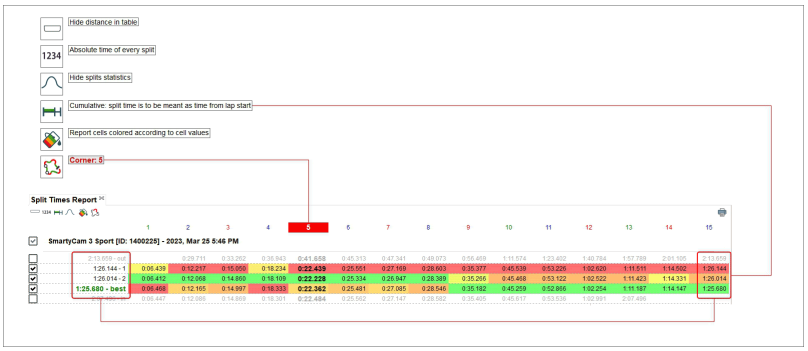


Considering the table left of the software view here follow different possible layouts.

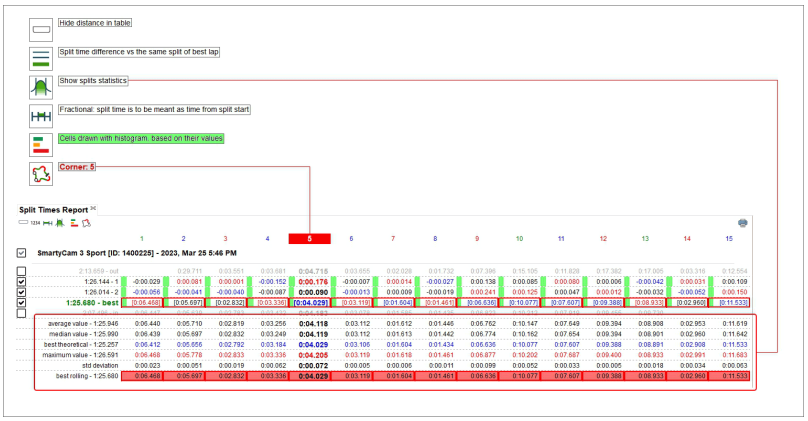
Show distance in table, absolute time of every split, fractional split time, classic RS2 style report.



Hide distance in table, absolute time of every split, cumulative split time, reports cells coloured according to cell values (from green for better values to red for worst values).



Hide distance in table, split time difference vs the same split of best lap, show split statistics, fractional split time, cells draws with histogram based on their values.



Pressing Statistics button a lot of information can be shown/hidden bottom of the laps figures, to say:

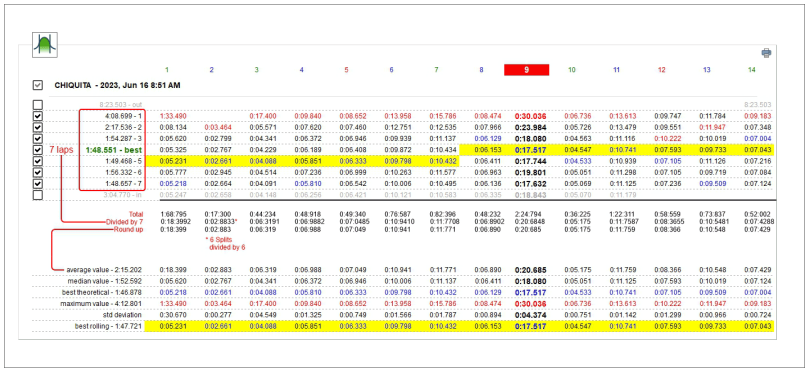
- Average value: it shows the average(**1**) time value of each split
- Median value: it shows the median (**2**) time value of each split
- Best theoretical: this lap time is the addition of all best split times no matter what lap they belong to
- Maximum value: it is the higher time obtained for each split; these values are written in red in the dedicated statistics row
- **Standard deviation (in the split): this value allows to understand how constant the racer is; a low stand**
  are no strange behaviours in the vehicle
- Best rolling: is the best lap time really made also if the splits belong to different laps assumed that they are successive.

(**1**) Average value is obtained summing up all items and dividing the result by the number of items

(**2**) Median value is the value that, ordered the items of a list, is central in the list. If the number of items is odd the median value is one while if the number of items is even the median value is obtained summing up the two central items of the list and dividing the result by two.

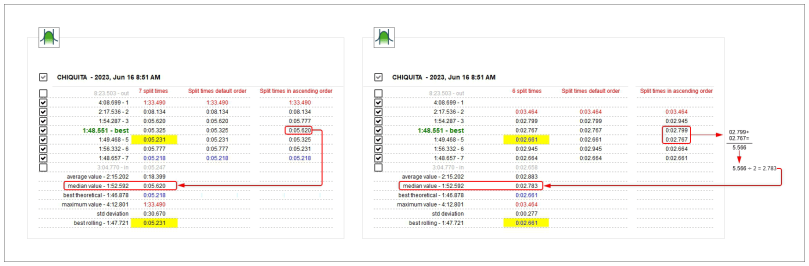
Statistics: average value

As shown below average value is obtained summing up all split times and dividing the result by the number of items. In this case 7 laps are considered except for split 2 where the time of lap 1 is missing and so that sum is to be divided by 6.



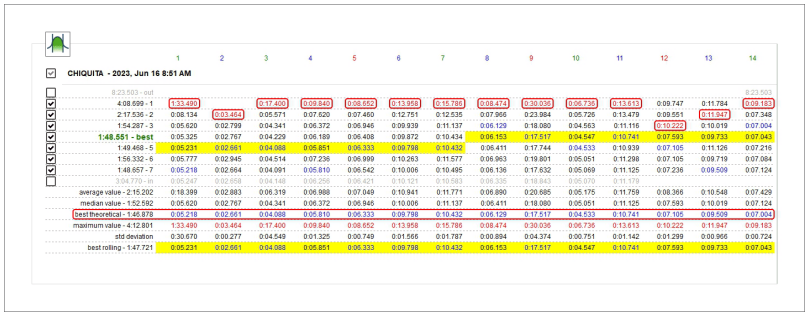
Statistics: median value

Once the items listed in an increasing order the median value is the one central in the list. If the number of items is odd the median value is one (left image) while if the number of items is even the median value is the average value of the two central items of the list (right image).



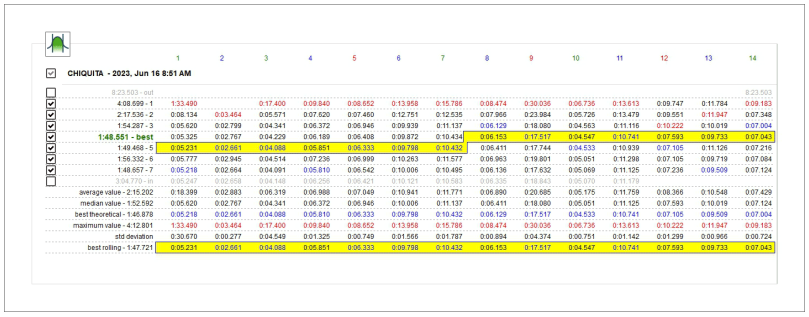
Statistics: best theoretical time

Best theoretical lap time is obtained summing all best split times of all considered laps. This is why is called theoretical. In the image below all best split times are highlighted and they are summed in the bottom best theoretical row in the statistics.



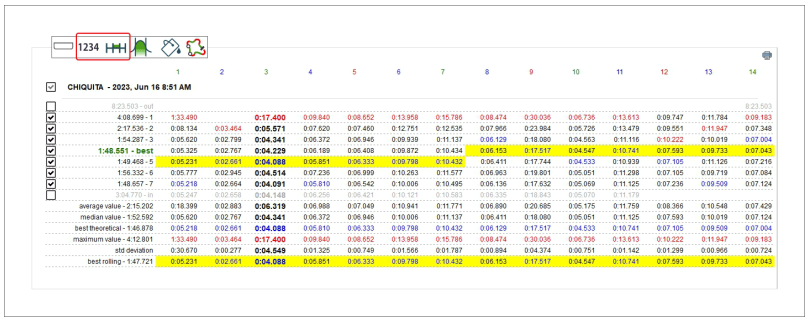
Statistics: best rolling time

Best rolling: is the best lap time really made also if the splits belong to different laps assumed that they are successive.



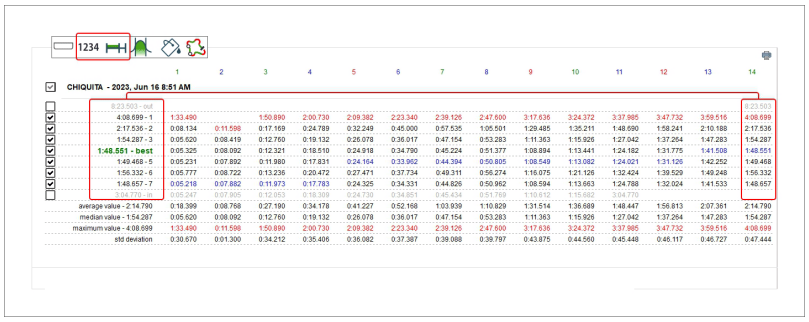
Absolute fractional mode

It shows all split times with lap time on the left of the row.



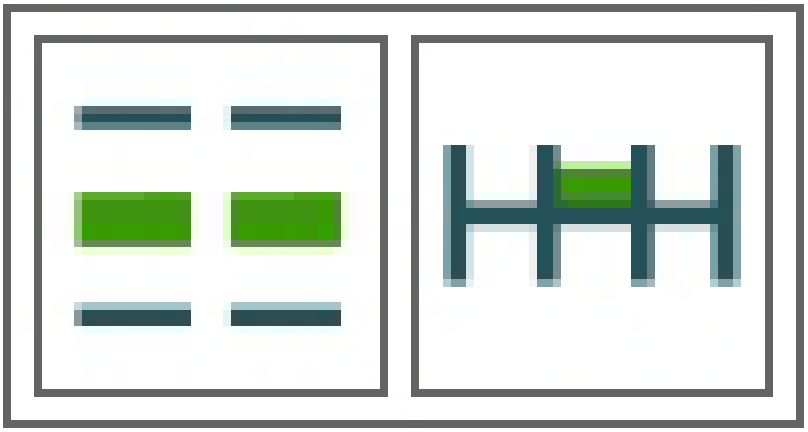
Absolute cumulative mode

Each split time is added to the previous split time; the last split time is the lap time.



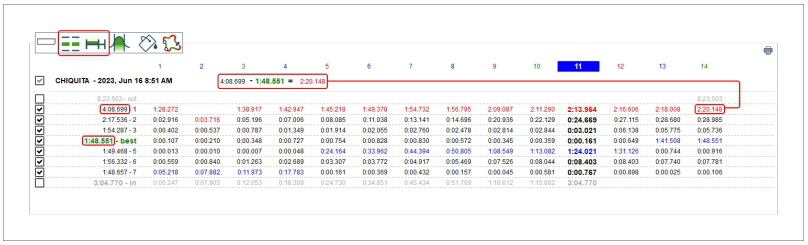
Split time difference vs best split overall fractional mode

Shows for each split the difference between the current split time and the best time recorded for this split in the session. As shown here below the split time of the current split is in red; adding it to the best time of this split you recorded in the session you have the split time of the current split.



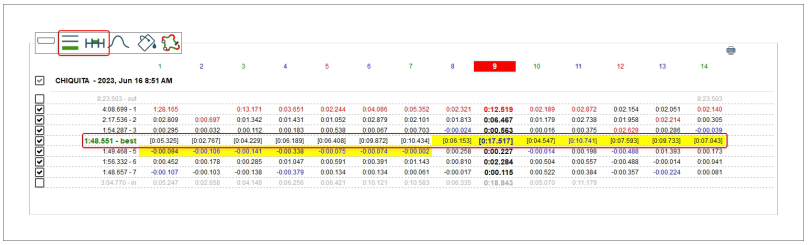
Refer to best split cumulative mode

The difference between the current split time and the time reached at the current split in the best lap. Split times are added and the last split of the current lap shows the difference between the current lap time and the best lap time.



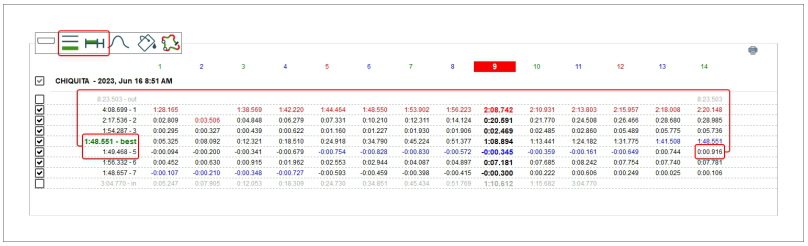
Refer to best lap fractional mode

It shows the difference between the current split time and the time of the same split in best lap. Best lap time splits are shown in a square parenthesis on the related row (highlighted in the image below).



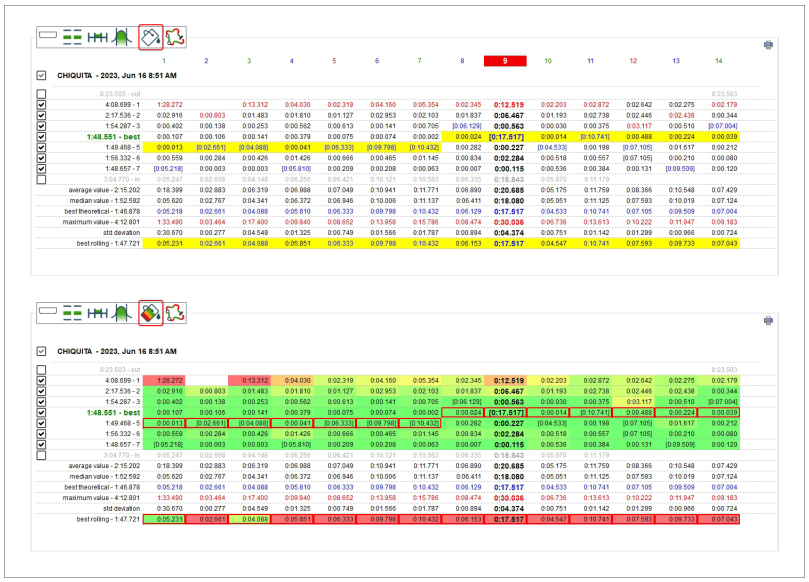
Refer to best lap cumulative mode

The difference between the current split time and the split time of the same split in best lap time is added to the difference between the following split time and the split time of that split in best lap time. The last split time is the difference between the current lap time and best lap time.



Classic/Colorize layout

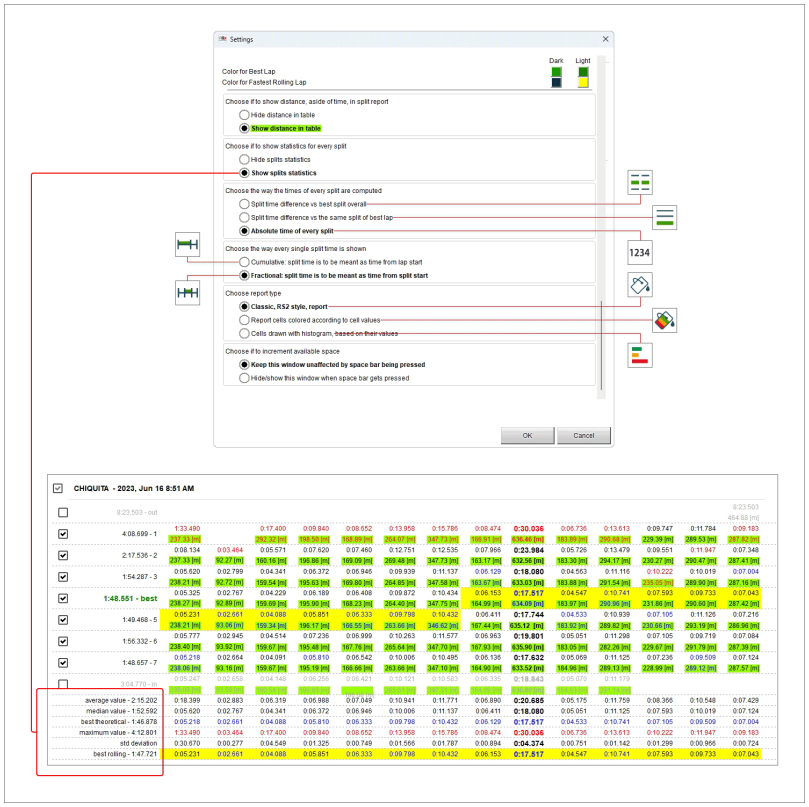
Default layout is **Classic**: white background with best rolling lap highlighted in yellow (top image below). If you **Colorize** it the cells will have coloured background that go from green for good values to red for bad values and best rolling is highlighted with red squares (bottom image below).



Settings dialog window

Right clicking on the central table "Setting"" dialog window is prompted. It allows to perform the same operations performed through the top left keyboard as well as to hide the table when the Space Bar is pressed enabling the related checkbox.

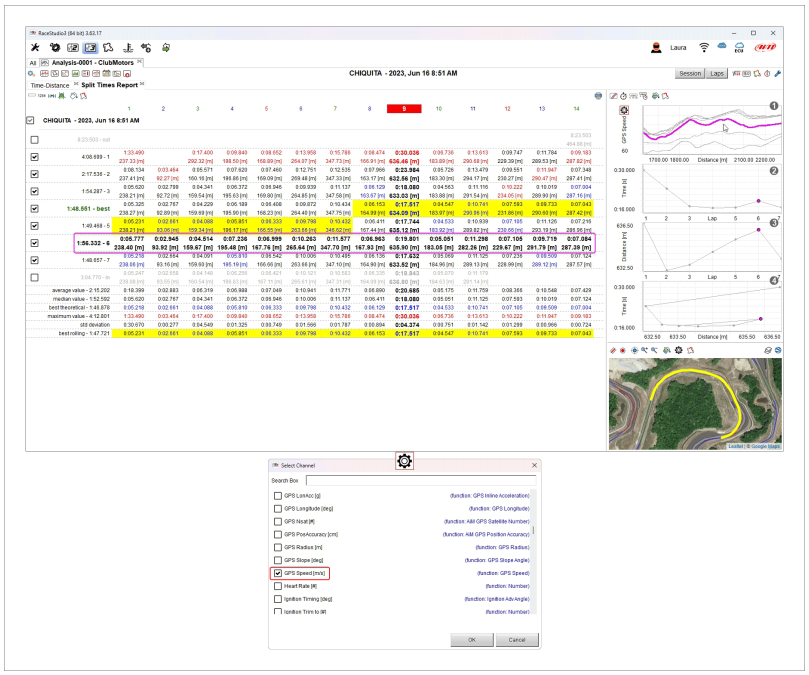
Enabling the devoted checkbox in the first box (highlighted with green background in the image below) the length of each split is shown below each split time (cells highlighted with green background).



4.4.3.6 Split Details Panel

Selecting any split column the split graphs appear right of the central table. They are:

- Custom channel (GPS Speed in the example below)/distance (**1**)
- Time vs Lap (**2**)
- Distance vs Lap (**3**)
- Time vs Distance (**4**)

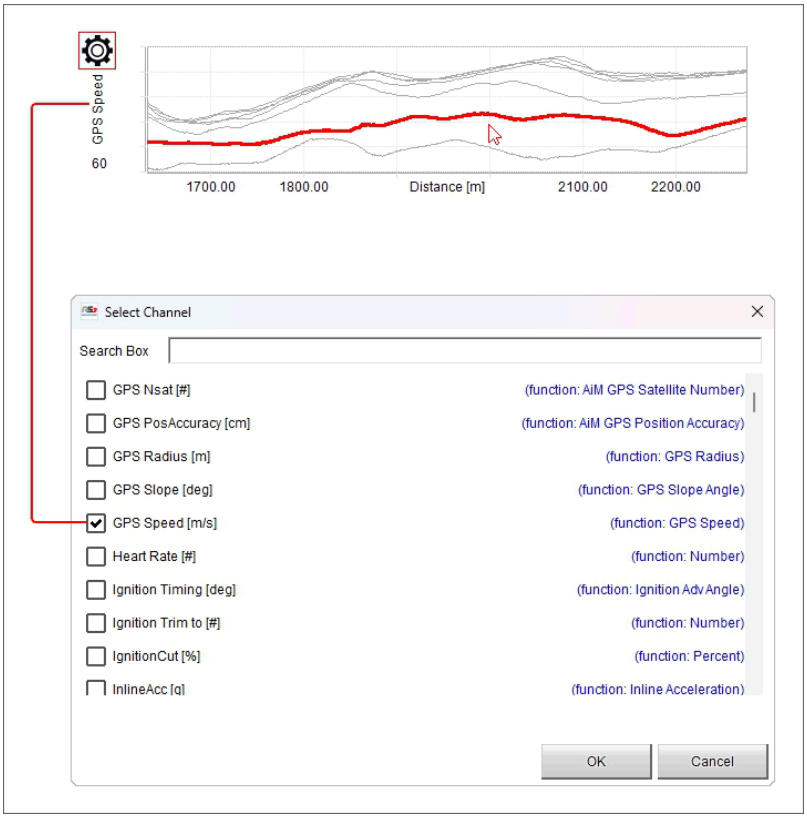


Each graph can be shown/hidden using the keyboard top left of the graphs.

Channel graph

The first graph on top is a custom graph because you can choose the channel you want on “Y” axis. To do so:

- click the setting icon
- "Select Channel" dialog window is prompted: scroll it or search for the channel you want to set on the ordinate axis and press "OK"; default channel is GPS Speed
- mousing over the graph the split you are mousing over becomes bold in the central table and vice-versa

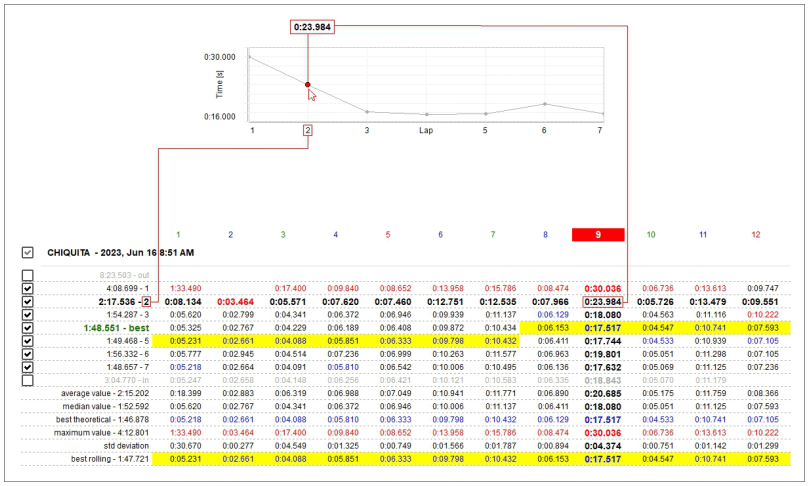


Time/Lap (number) graph

The second graph from top is Time/Lap number. It shows:

- Lap number on X axis
- split time of the split in each lap on ordinate axis

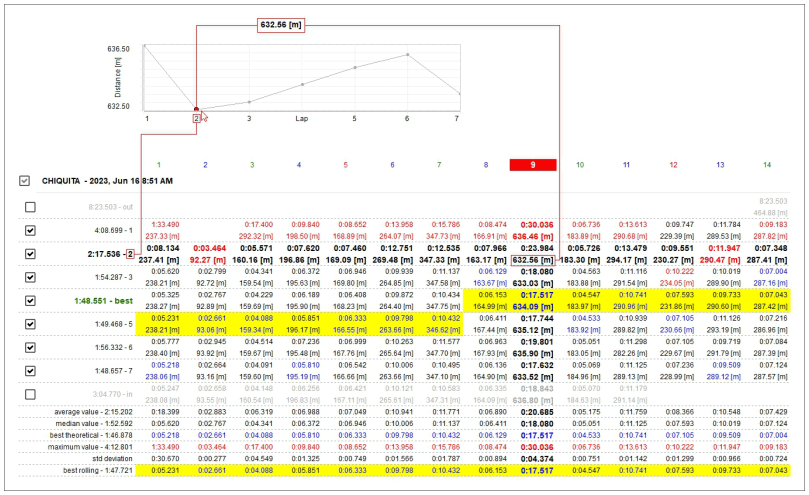
Mousing over the selected split it becomes bold in the central table and vice versa; in the example below split time of the 9th split in the second lap is shown.



Distance/Lap number graph

The third graph from top is Distance/Lap number. It shows:

- Lap number on X axis
- Run distance of the split in each lap on ordinate axis
- **As shown here below, mousing over the graph the selected split it becomes bold in the central table an**
  it is suggested to keep "Distance" row activated

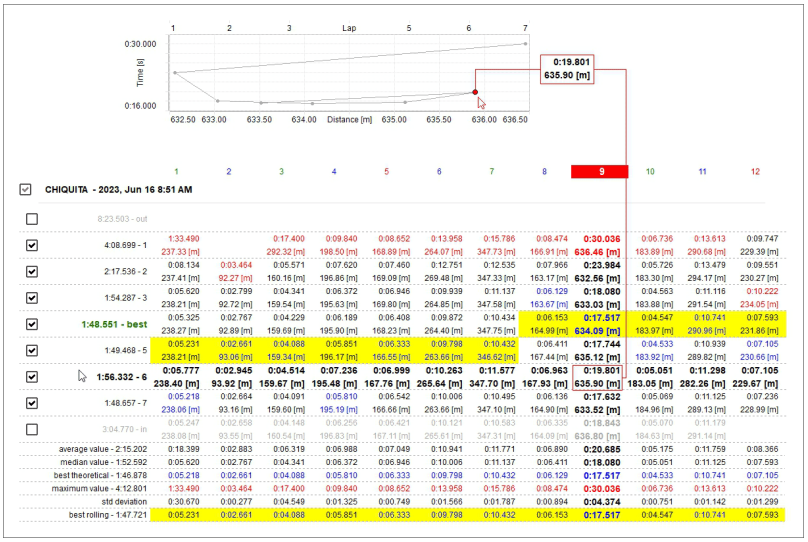


Time-Distance graph

The bottom graph is Time-Distance and is a scatter graph. It shows:

- Run distance on X axis
- Split time in each lap on ordinate axis
- As shown here below, mousing over the graph the selected split becomes bold in the central table and vice versa

This graph, linking the run distance with the split time is particularly useful to analyse the racer guide in cornering.



4.4.3.7 Channels Report Panel

Using the top left toolbar (shown here below) you can perform different actions, explained in the following paragraphs.

 Pressing this icon a panel that allows you to **select a channel to add to the left part of the view** is prompted.

 Pressing this a menu panel that allows you to **select the channel to remove from the left part of the view** is prompted.

 Pressing this icon a panel is prompted: it allows you to **sort the columns of the left part of the view** dragging and droppping them in the panel.

 Once one or more channels have been added, pressing this icon you can **show the values of this channel together with another one in the same point**. To **remove** this view simply click the icon again and de-select the channel.

 Bottom of channels split report table it is possible to **show or hide the related statistics** as shown here below.

 The table in the left part of the view can be organized in different ways: you can see data referred to all laps on top and data referred to the single splits below (**show splits** - left icon beklow and left part of the image below) or data referred to all laps only (**hide splits** - right icon and right part of the image below)

 Split times report can be shown in different ways; to say **classic** (left icon and left part of the image below), **coloured** (central icon and central part of the image below) or **histogram** (right icon and right part of the image below)

Add/remove items in the left part of "Channels Report" view

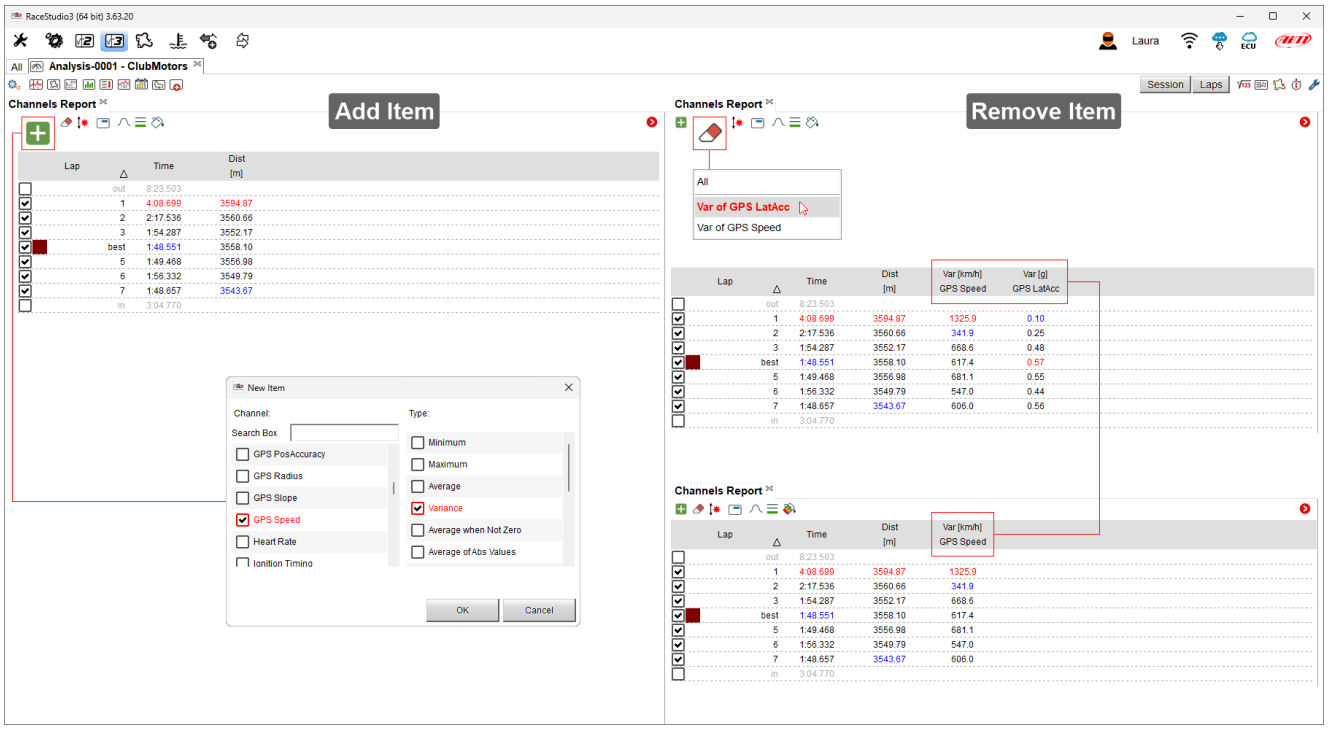
 Through these buttons it is possible to add/remove items (column) to/from the table placed left of "Channels report" view except for the first three columns from the left.

To "**Add**" an item:

- press the related icon (+)
- scroll the panel that is prompted or search for the channel
- select the item do add and its type (Max/Min/Average value, Variance, Average when not zero etc..)
- press "OK" and the item is added. Repeat this operation for all the items to add

To "**Remove**" an item:

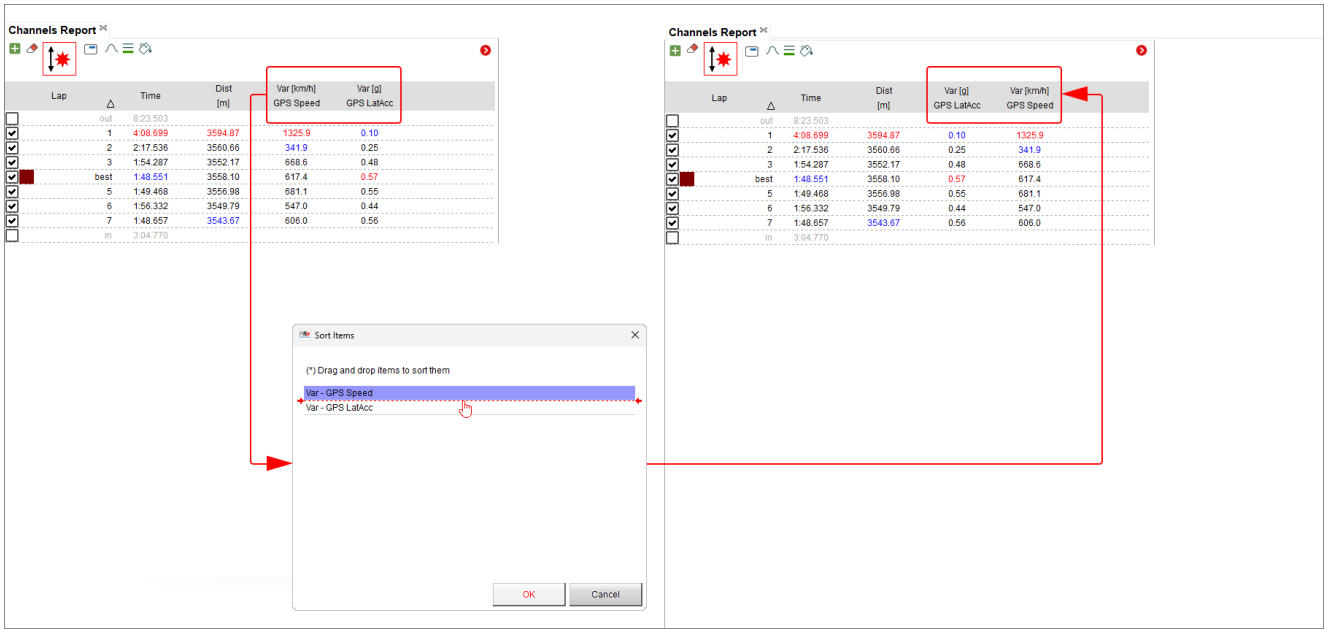
- press the related icon (the rubber)
- a menu showing the items previously added Is prompted
- select the one to remove
- it will be removed.



Sort items

 Once added all the desired item it is possible to displace the related columns as preferred.

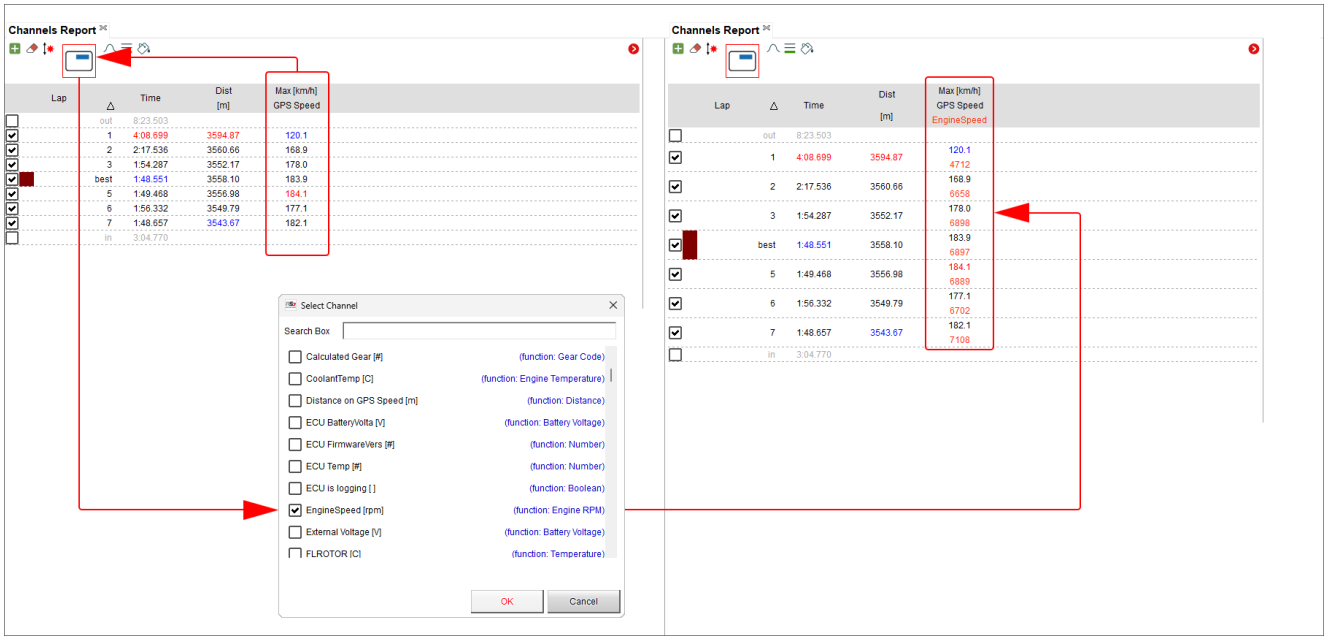
- press the icon above
- drag and drop the items as you wish
- press "OK"
- the columns are displaced



Managing Channels Report Side Items

Once one or more channels have been added, pressing this icon you can see the values of different channels in the same point assuming that both channels are shown as Max/Min Values. In the example below Max GPS Speed and RPM are shown. To do so:

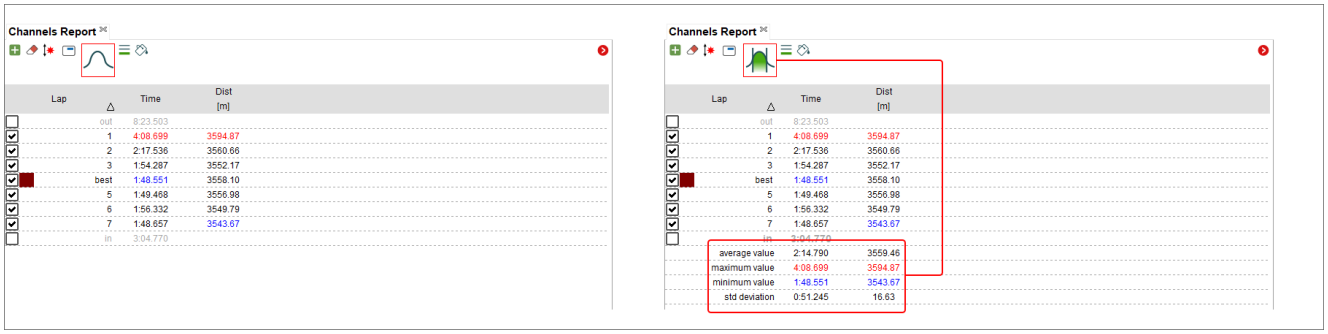
- add the first channel
- click "Side Items Icon" shown above
- select the second channel
- both channels are shown one below the other



Show/Hide statistics

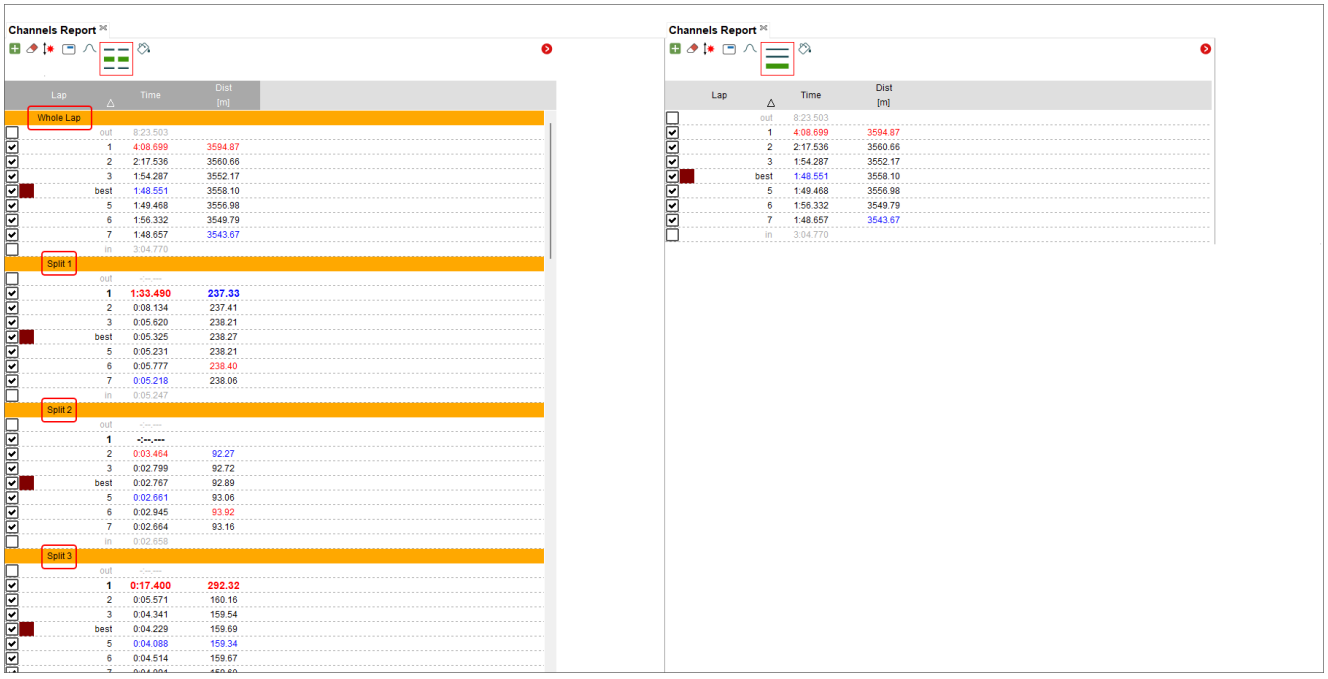
 As for Time-Distance and Track split report Channels report too allows to show the statistics using the related buttons. They show:

- max, min and average values of the channels reported
- standard deviation; this is a measure of the amount of variation or dispersion of a set of values; a low standard deviation indicates that the values tend to be close to the mean (also called the expected value) of the set while a high standard deviation indicates that the values are spread out over a wider range.



Show/Hide splits in report

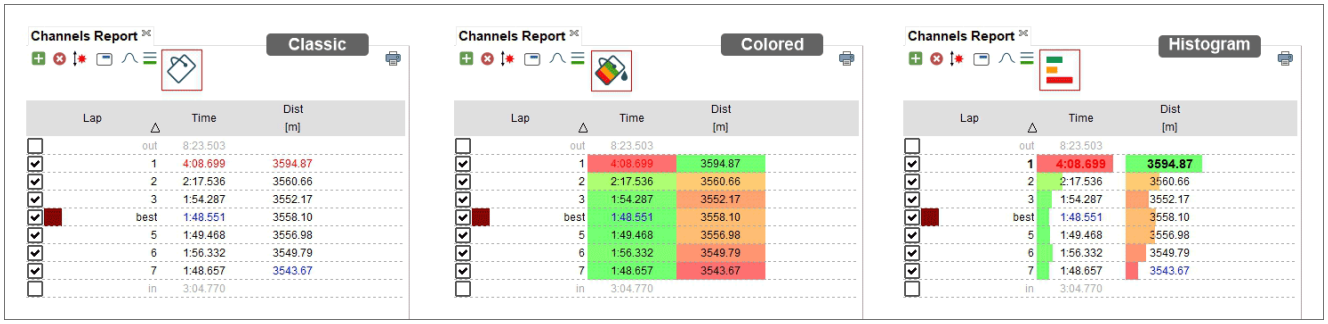
 With reference to the image below, data can be shown with (left table) or without (right) splits. When showing the laps with splits data concerning the whole laps are on the coloured bar and all splits follows.



Managing report type

 Channels report table can be shown in different ways as shown here below. The visualization can be:

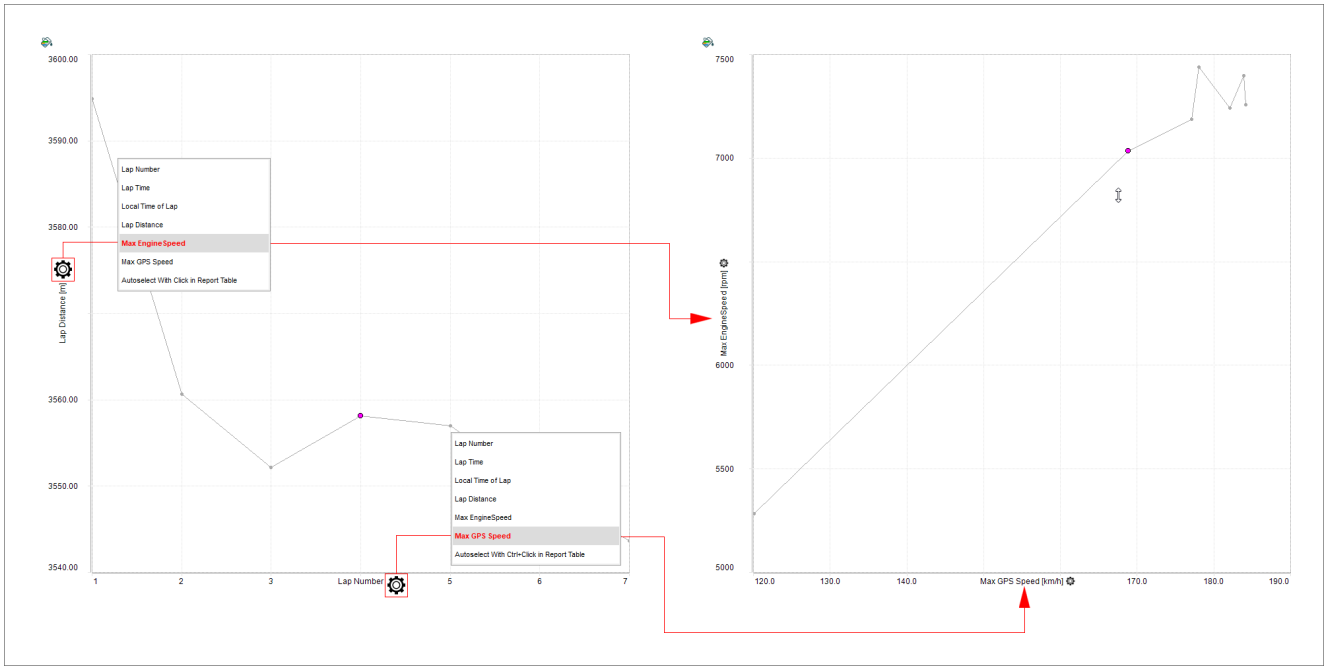
- Classic
- Coloured according to cell values: each cell is coloured according to its value from green to red where green stays for good performance and red for bad performance
- Histogram: allows to see at a glance the difference between the laps/splits



4.4.3.8 Channels Report Graph Panel

Right of "Channels Report" layout is a "Custom"" graph whose channels on the “X”axis and on the “Y" axis can be changed according to the user preferences. To change the channel on the axes:

- click the setting icon of the axis to change
- a selection menu is prompted
- select the channel to be shown
- click out of the panel

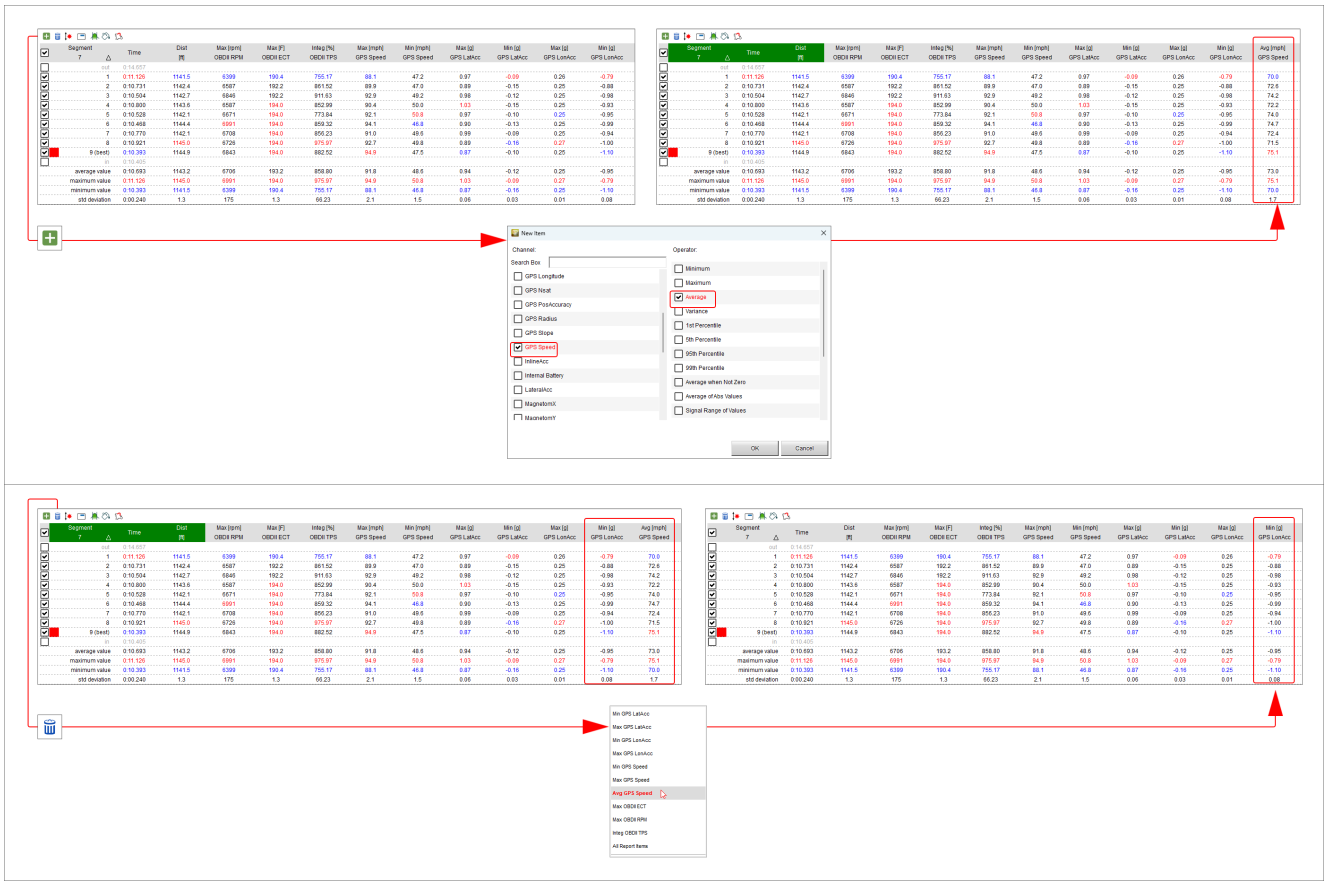


4.4.3.9 Channels Report Panel for Selected Split

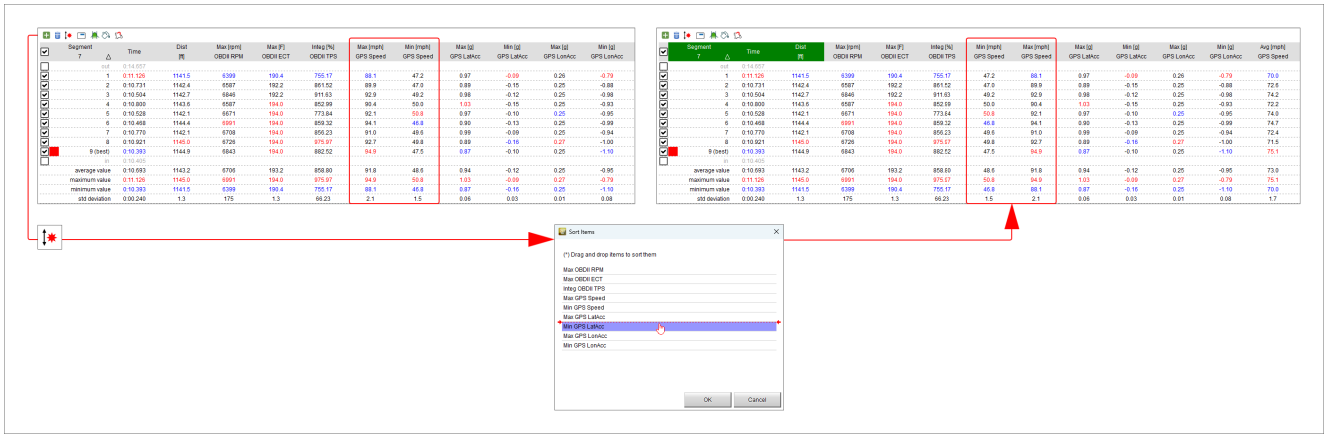
The toolbar shown here below allows you to add/remove, sort channels as well as manage side items, show/hide statistics, devcide the report type and select the segment to show in the left part of the view.

Adding/Removing/Sorting items

 These icons allow you to add/remove columns/channels to/from channel report right of the software view. For each channel it is possible to decide the type of value (Max, min, average, variance etc...) to show. Once the channel(s) added you can remove it through the related icon shown here above and selecting the channel to remove in the panel that is prompted. The images below shows how to add a column on top and how to remove it bottom.



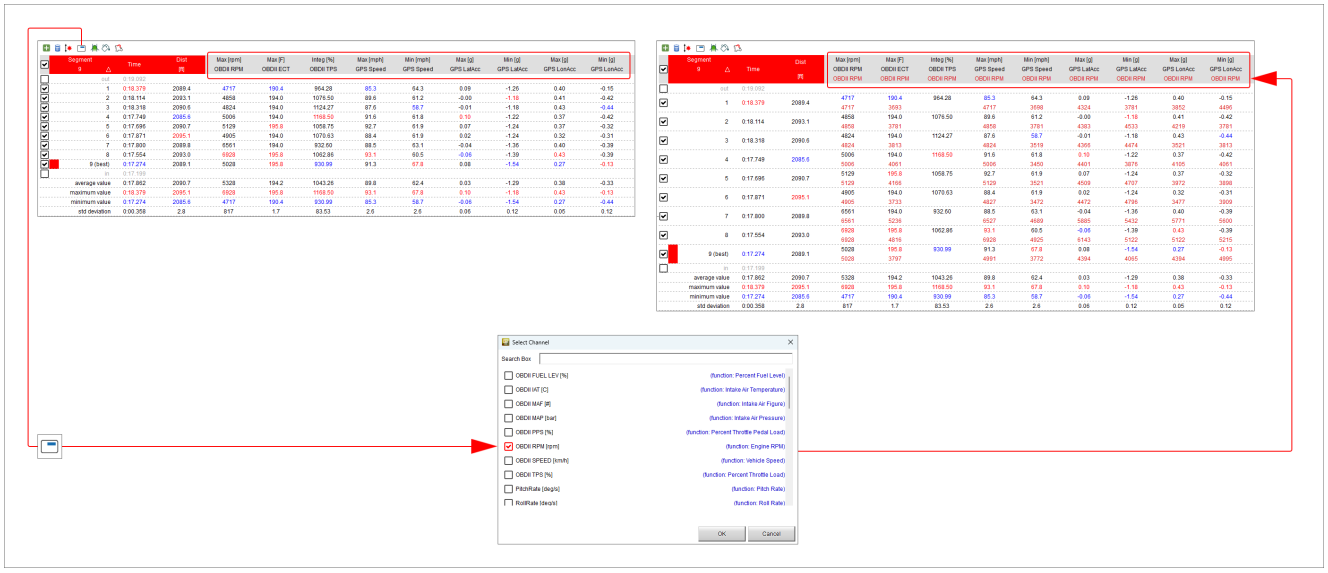
 This icon allows you to sort the channels dragging and dropping them in the "Sort Items" panel as shown here below. In the example below Min GPS Speed and Max GPS Speed have been displaced.



Managing Track Split Report Side Items

Once one or more channels have been added, clicking the icon shown here on the left it is possible to show the values of a channel together with another one in the same point. Here below OBD RPM value is shown below the other channels (in red).

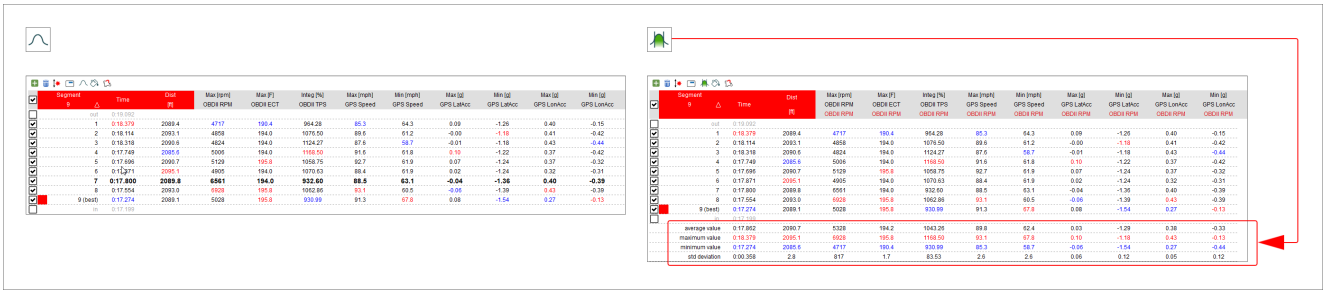
To remove this view simply click the icon again and de-select the channel.



Showing/Hiding statistics

Bottom of channels split report table it is possible to show (left icon) or hide (right icon) the related statistics; they show:

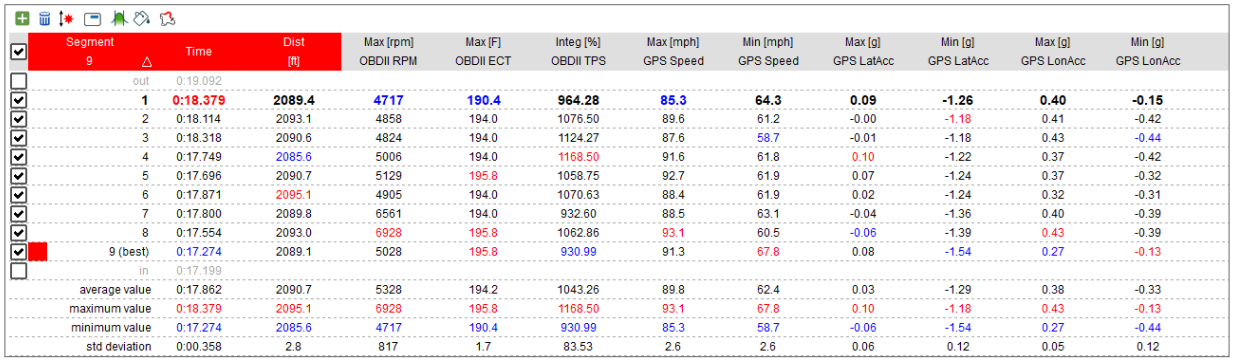
- max, min and average values of the channels reported
- standard deviation; this is a measure of the amount of variation or dispersion of a set of values; a low standard deviation indicates that the values tend to be close to the mean (also called expected value) of the set while a high standard deviation indicates that the values are spread out over a wider range.



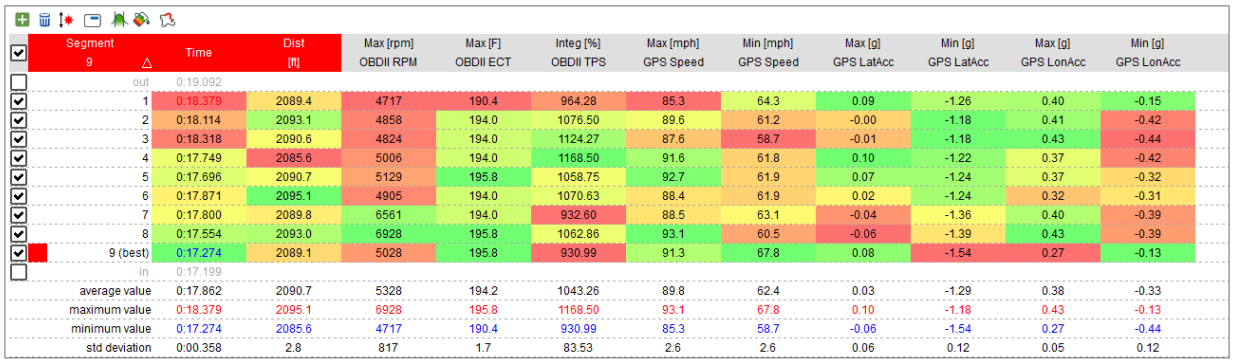
Choosing the report type

Selecting the icons here on the left it is possible to decide how to visualize split channels report table. Available options are:

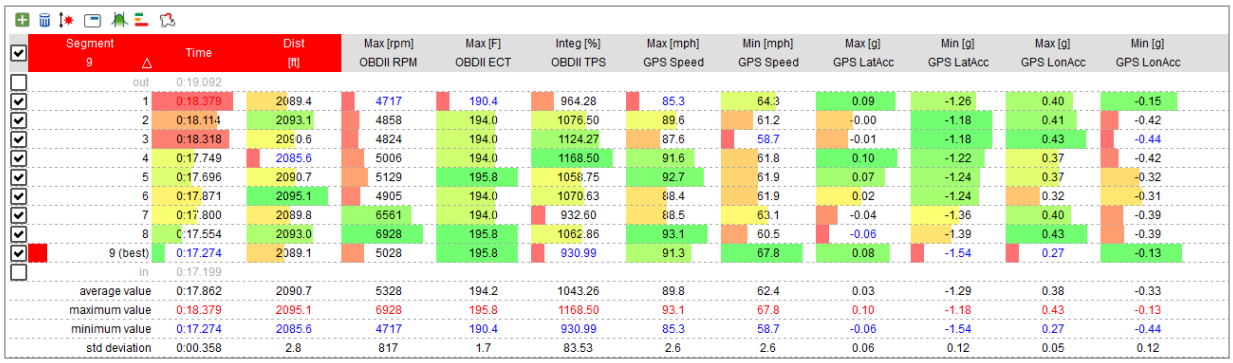
- classic (left icon): it simply shows the split channel values
- report cells coloured according to cell values (central icon): each cell is coloured according to its value from green to red where green stays for good performance and red for bad performance
- cells drawn with histogram (right icon): each cells have a background that plots as histogram the values it contains.



Segment 9	Time	Dist [ft]	Max [rpm] OBDII RPM	Max [F] OBDII ECT	Integ [%] OBDII TPS	Max [mph] GPS Speed	Min [mph] GPS Speed	Max [g] GPS LatAcc	Min [g] GPS LatAcc	Max [g] GPS LonAcc	Min [g] GPS LonAcc
out	0:19.092										
1	**0:18.379**	**2089.4**	**4717**	**190.4**	**964.28**	**85.3**	**64.3**	**0.09**	**-1.26**	**0.40**	**-0.15**
2	0:18.114	2093.1	4858	194.0	1076.50	89.6	61.2	-0.00	-1.18	0.41	-0.42
3	0:18.318	2090.6	4824	194.0	1124.27	87.6	58.7	-0.01	-1.18	0.43	-0.44
4	0:17.749	2085.6	5006	194.0	1168.50	91.6	61.8	0.10	-1.22	0.37	-0.42
5	0:17.696	2090.7	5129	195.8	1058.75	92.7	61.9	0.07	-1.24	0.37	-0.32
6	0:17.871	2095.1	4905	194.0	1070.63	88.4	61.9	0.02	-1.24	0.32	-0.31
7	0:17.800	2089.8	6561	194.0	932.60	88.5	63.1	-0.04	-1.36	0.40	-0.39
8	0:17.554	2093.0	6928	195.8	1062.86	93.1	60.5	-0.06	-1.39	0.43	-0.39
9 (best)	0:17.274	2089.1	5028	195.8	930.99	91.3	67.8	0.08	-1.54	0.27	-0.13
in	0:17.199										
average value	0:17.862	2090.7	5328	194.2	1043.26	89.8	62.4	0.03	-1.29	0.38	-0.33
maximum value	0:18.379	2095.1	6928	195.8	1168.50	93.1	67.8	0.10	-1.18	0.43	-0.13
minimum value	0:17.274	2085.6	4717	190.4	930.99	85.3	58.7	-0.06	-1.54	0.27	-0.44
std deviation	0:00.358	2.8	817	1.7	83.53	2.6	2.6	0.06	0.12	0.05	0.12



Segment 9	Time	Dist [ft]	Max [rpm] OBDII RPM	Max [F] OBDII ECT	Integ [%] OBDII TPS	Max [mph] GPS Speed	Min [mph] GPS Speed	Max [g] GPS LatAcc	Min [g] GPS LatAcc	Max [g] GPS LonAcc	Min [g] GPS LonAcc
out	0:19.092										
1	0:18.379	2089.4	4717	190.4	964.28	85.3	64.3	0.09	-1.26	0.40	-0.15
2	0:18.114	2093.1	4858	194.0	1076.50	89.6	61.2	-0.00	-1.18	0.41	-0.42
3	0:18.318	2090.6	4824	194.0	1124.27	87.6	58.7	-0.01	-1.18	0.43	-0.44
4	0:17.749	2085.6	5006	194.0	1168.50	91.6	61.8	0.10	-1.22	0.37	-0.42
5	0:17.696	2090.7	5129	195.8	1058.75	92.7	61.9	0.07	-1.24	0.37	-0.32
6	0:17.871	2095.1	4905	194.0	1070.63	88.4	61.9	0.02	-1.24	0.32	-0.31
7	0:17.800	2089.8	6561	194.0	932.60	88.5	63.1	-0.04	-1.36	0.40	-0.39
8	0:17.554	2093.0	6928	195.8	1062.86	93.1	60.5	-0.06	-1.39	0.43	-0.39
9 (best)	0:17.274	2089.1	5028	195.8	930.99	91.3	67.8	0.08	-1.54	0.27	-0.13
in	0:17.199										
average value	0:17.862	2090.7	5328	194.2	1043.26	89.8	62.4	0.03	-1.29	0.38	-0.33
maximum value	0:18.379	2095.1	6928	195.8	1168.50	93.1	67.8	0.10	-1.18	0.43	-0.13
minimum value	0:17.274	2085.6	4717	190.4	930.99	85.3	58.7	-0.06	-1.54	0.27	-0.44
std deviation	0:00.358	2.8	817	1.7	83.53	2.6	2.6	0.06	0.12	0.05	0.12



Segment 9	Time	Dist [ft]	Max [rpm] OBDII RPM	Max [F] OBDII ECT	Integ [%] OBDII TPS	Max [mph] GPS Speed	Min [mph] GPS Speed	Max [g] GPS LatAcc	Min [g] GPS LatAcc	Max [g] GPS LonAcc	Min [g] GPS LonAcc
out	0:19.092										
1	0:18.379	2089.4	4717	190.4	964.28	85.3	64.3	0.09	-1.26	0.40	-0.15
2	0:18.114	2093.1	4858	194.0	1076.50	89.6	61.2	-0.00	-1.18	0.41	-0.42
3	0:18.318	2090.6	4824	194.0	1124.27	87.6	58.7	-0.01	-1.18	0.43	-0.44
4	0:17.749	2085.6	5006	194.0	1168.50	91.6	61.8	0.10	-1.22	0.37	-0.42
5	0:17.696	2090.7	5129	195.8	1058.75	92.7	61.9	0.07	-1.24	0.37	-0.32
6	0:17.871	2095.1	4905	194.0	1070.63	88.4	61.9	0.02	-1.24	0.32	-0.31
7	0:17.800	2089.8	6561	194.0	932.60	88.5	63.1	-0.04	-1.36	0.40	-0.39
8	0:17.554	2093.0	6928	195.8	1062.86	93.1	60.5	-0.06	-1.39	0.43	-0.39
9 (best)	0:17.274	2089.1	5028	195.8	930.99	91.3	67.8	0.08	-1.54	0.27	-0.13
in	0:17.199										
average value	0:17.862	2090.7	5328	194.2	1043.26	89.8	62.4	0.03	-1.29	0.38	-0.33
maximum value	0:18.379	2095.1	6928	195.8	1168.50	93.1	67.8	0.10	-1.18	0.43	-0.13
minimum value	0:17.274	2085.6	4717	190.4	930.99	85.3	58.7	-0.06	-1.54	0.27	-0.44
std deviation	0:00.358	2.8	817	1.7	83.53	2.6	2.6	0.06	0.12	0.05	0.12

4.4.3.10 Track Map Panel

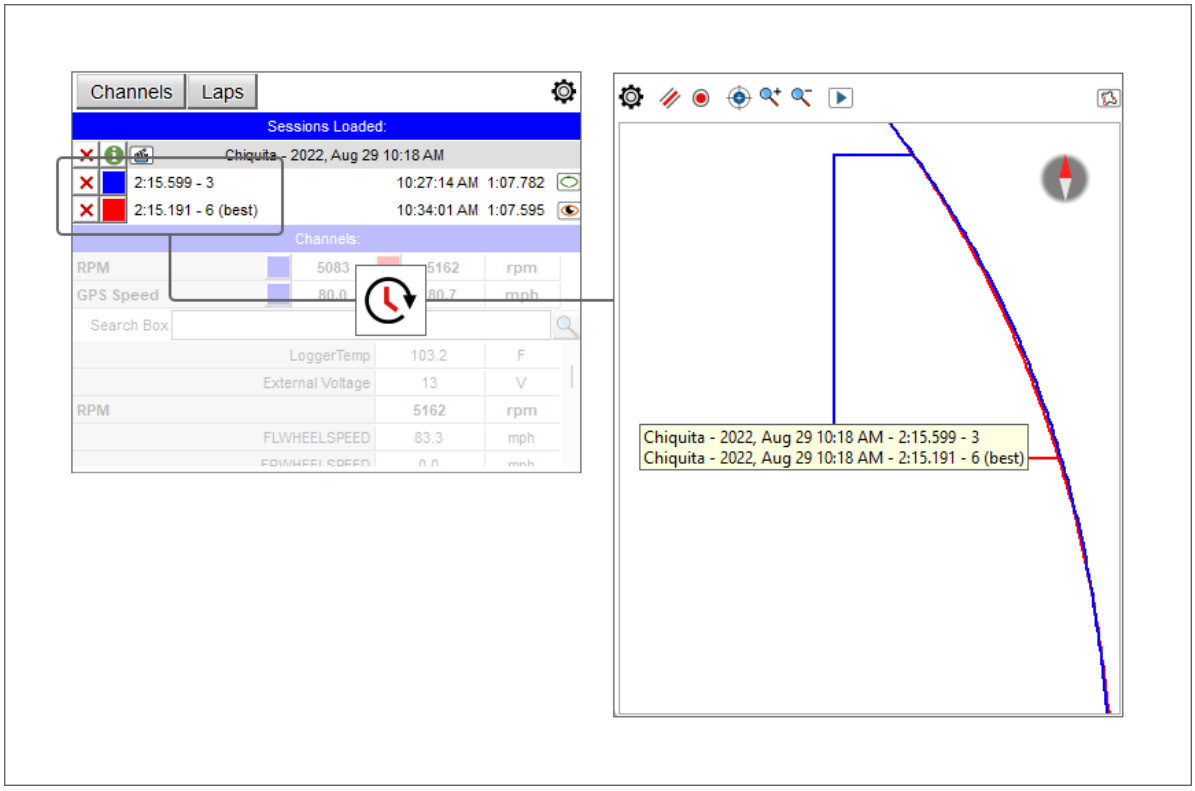
Track Map view features two top toolbars used to set the tab.

The **Top Left Toolbar** is shown here below.

Using the different icons you can:

 Set the map in different ways; clicking the icon here on the left a menu is prompted; through it you can perform different actions.

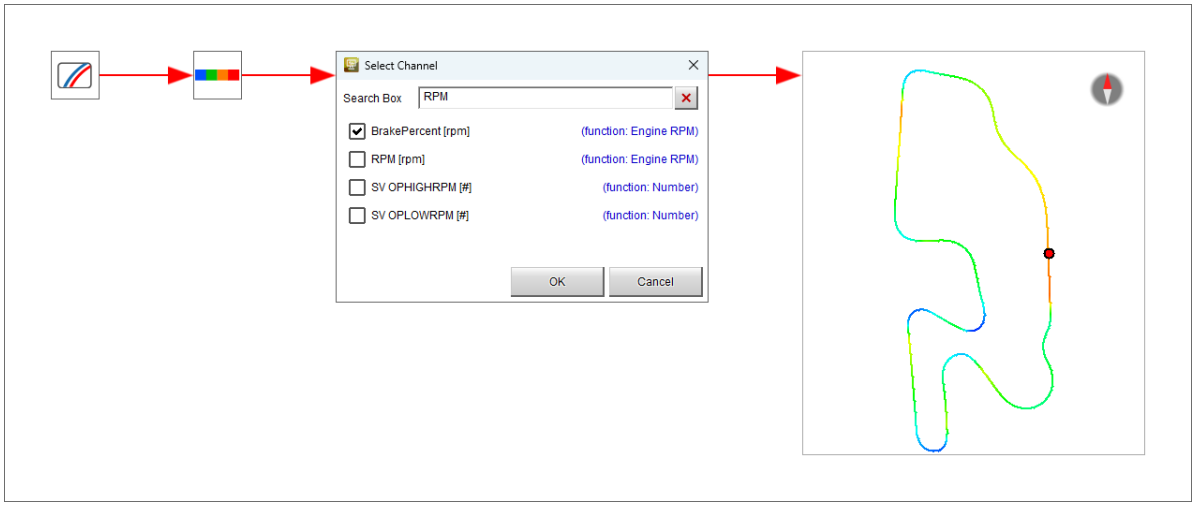
 First of all you can decide how to colourize the map; this icon allows you to colourize the map per lap/slice



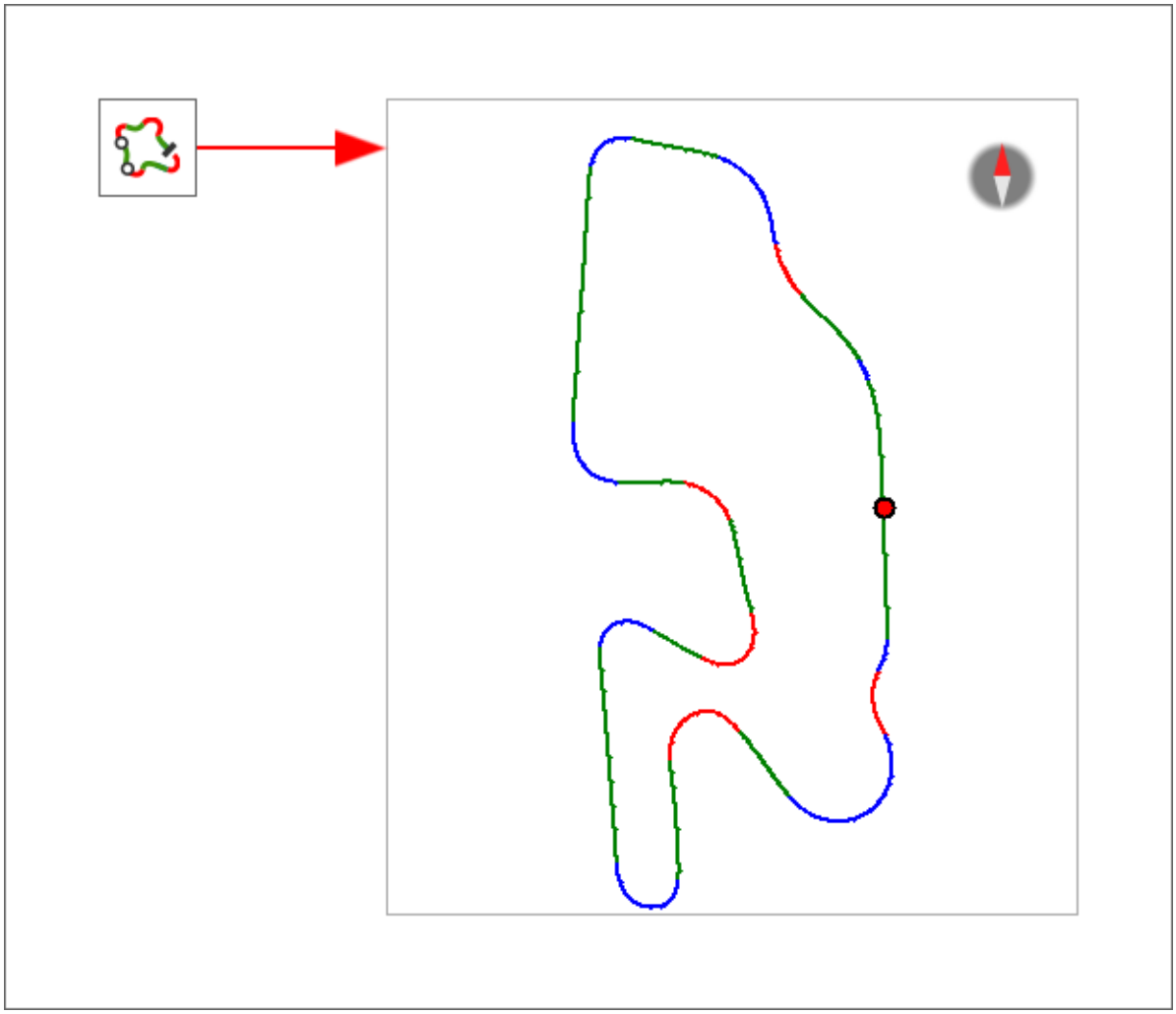
 this icon allows you to colourize the channels according to their values.

With this setting a new icon  appears in setting menu that allows you to search for the channel to colourize.

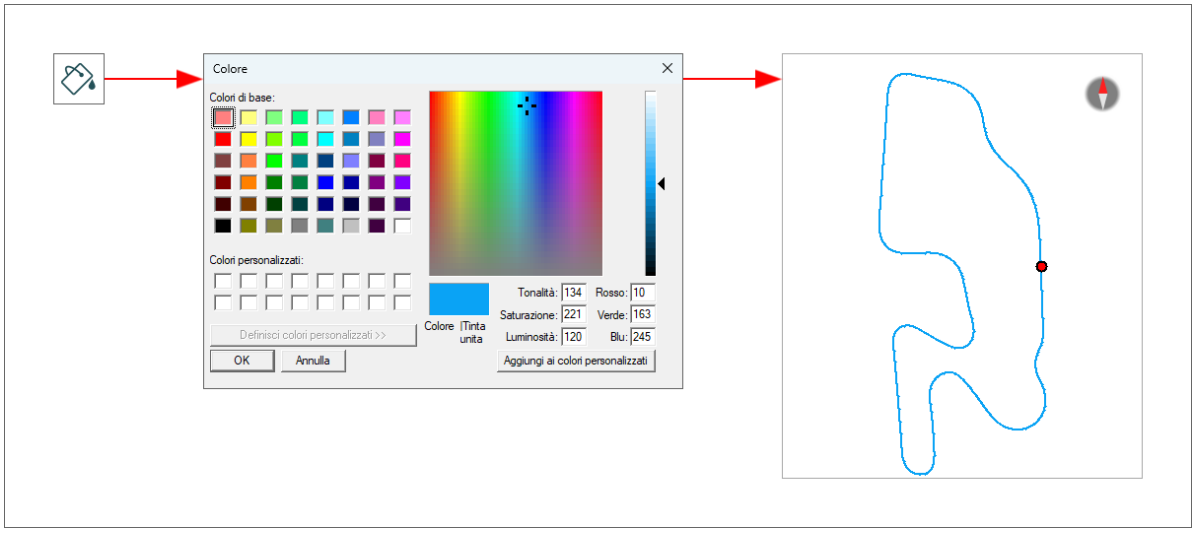
The image below shows the steps to follow.



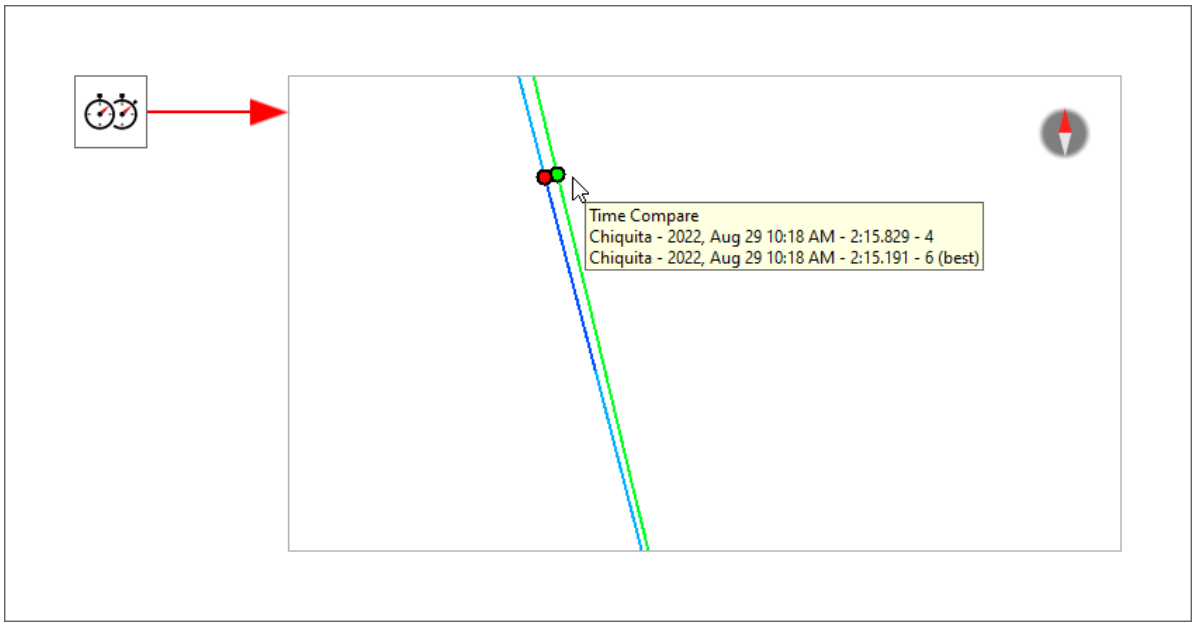
 show the track splits in different colours



 show the track map as monochrome; clicking this icon a colour choice panel is prompted



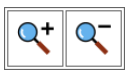
 reproduces time compare graph on the map as shown here below



Moreover, through the setting menu  it is possible to show/hide both AiM start/finish lines and track line on the map.

 Decide line width and dots size of the map (default value is 2 for both)

 centre the map in the view

 zoom in/out the map

 See the vehicle moving on the track pressing "play" button.

The **Top Right Toolbar** is shown here below.

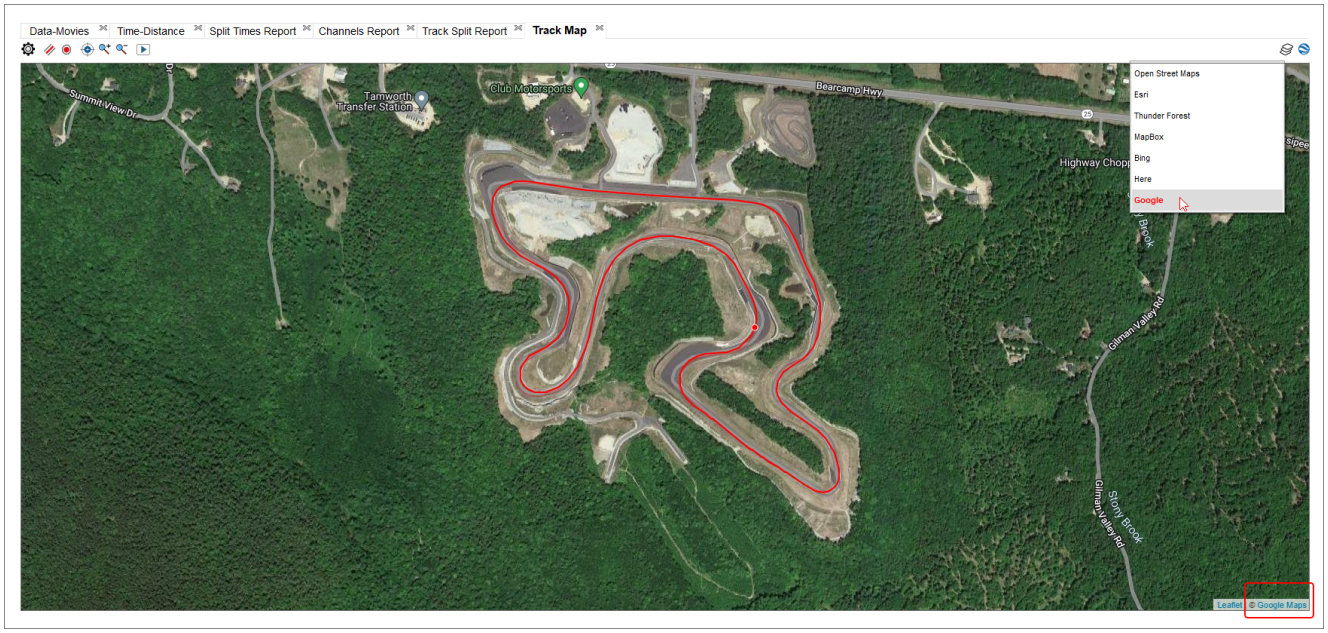
Its appearance changes according to the button that is pressed.

By default it shows the two buttons from the left. Pressing the central button the toolbar will only show the last button on the right.

They are used for:

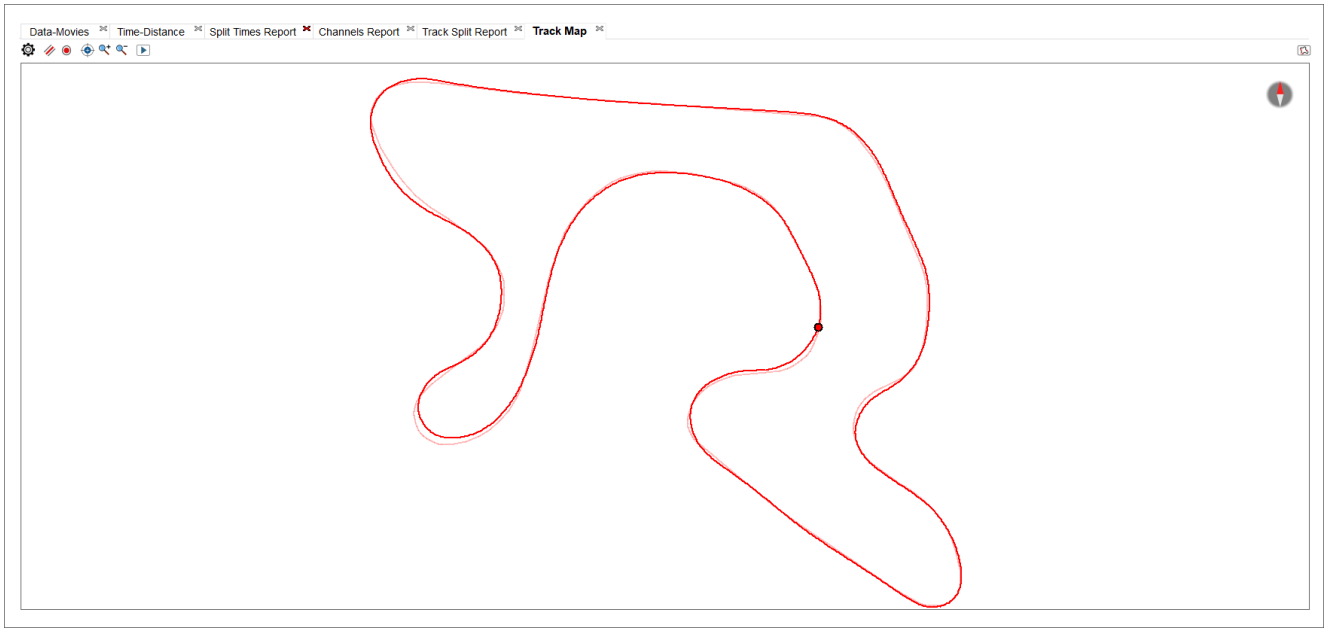
 choosing the source to use for the map.

The one selected is shown bottom right of the view as highlited in red in the image below.



 showing the map as Web based and switching it to GDI Drawn; the top right toolbar changes its appearance including the button shown here below only

 showing the map as GDI Drawn (see below). This map allows the user to use some specific settings managed by the setting icon of the top left toolbar.



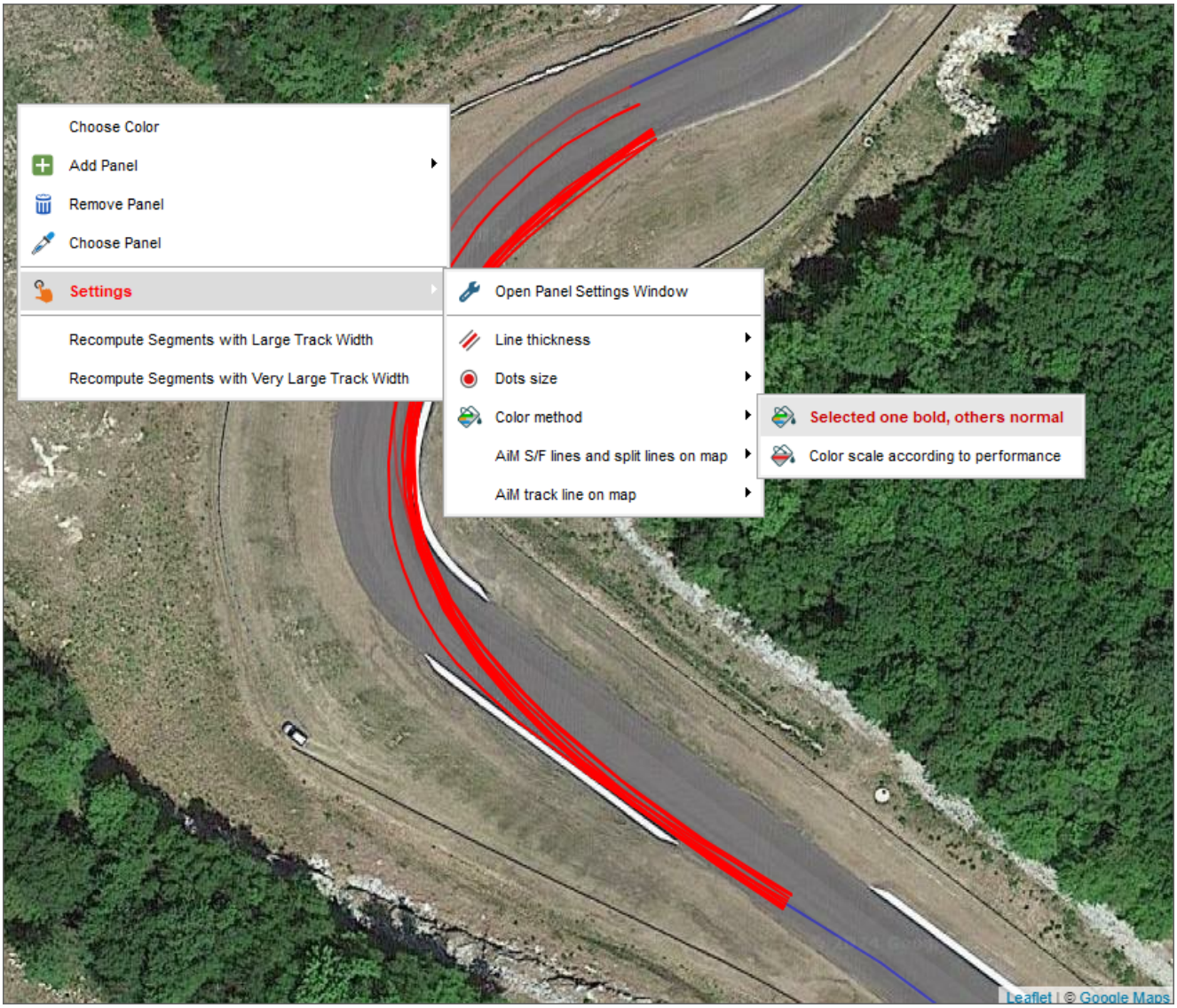
4.4.3.11 Track Map Panel for Selected Split

Through the **map toolbar** shown here above - in addition to the usual functions (line width, dots size, centre map, zooming in/out) - it is possible to:

 choose colorize method: splits are coloured according to their performance: from green for good performance to red for bad one

 Select a split to analyse (the one current split is highlighted in bold red in the menu)

Moreover right clicking on the map the menu panel shown here below is prompted:

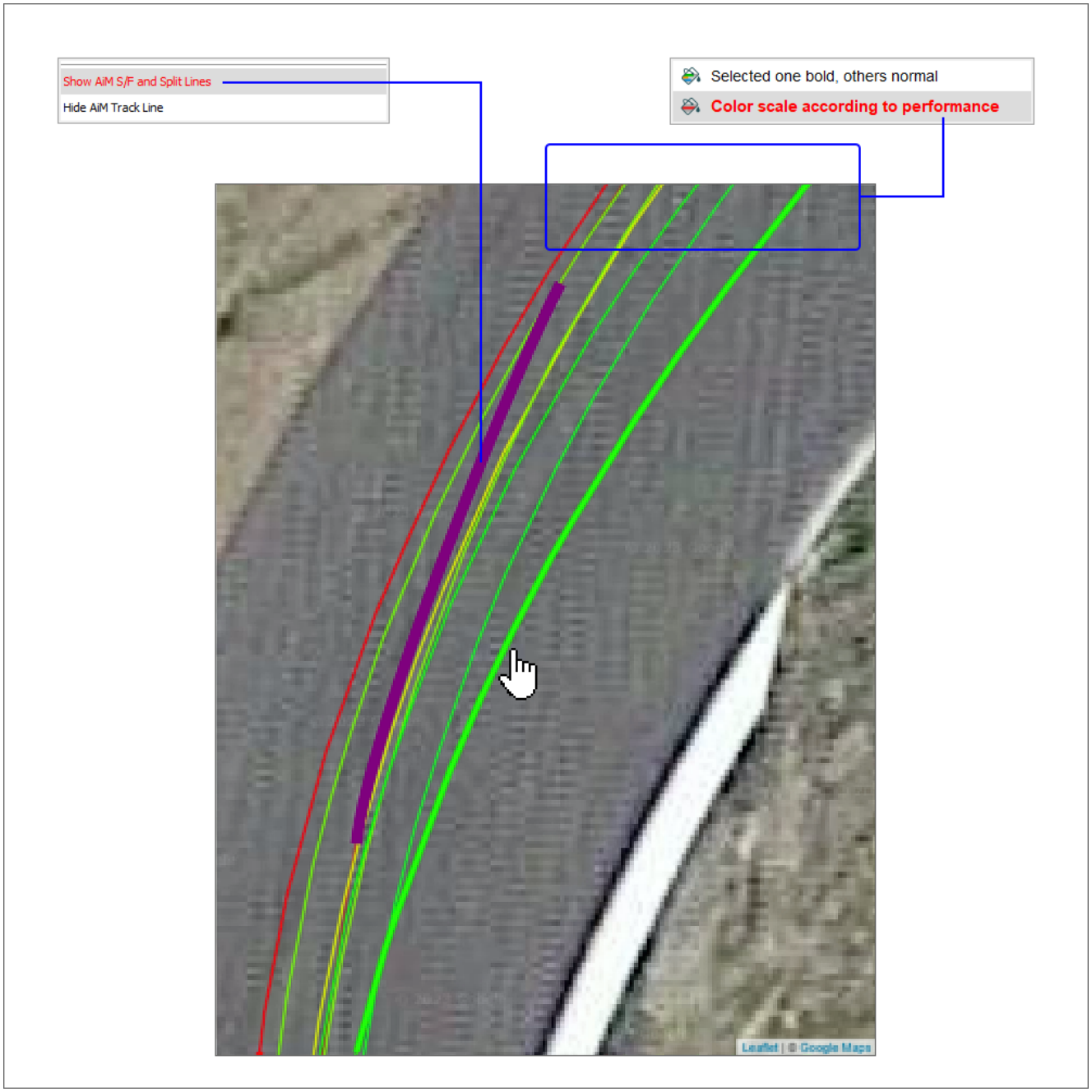


Here you can:

 use colorize method. With the left icon here above you can show the selected segment bold and the others normal while using the right icon above segments are shown according to their performance from green for good perfoemance to red for bad one;

Moreover you can show/hide on the map AiM S/F and split lines as well as track lines.

In the image below AiM Start/Finish and split lines are shown and the laps are colorized according to the performance, from green for good performance to red for bad performance.



4.4.3.12 Scatter Panel

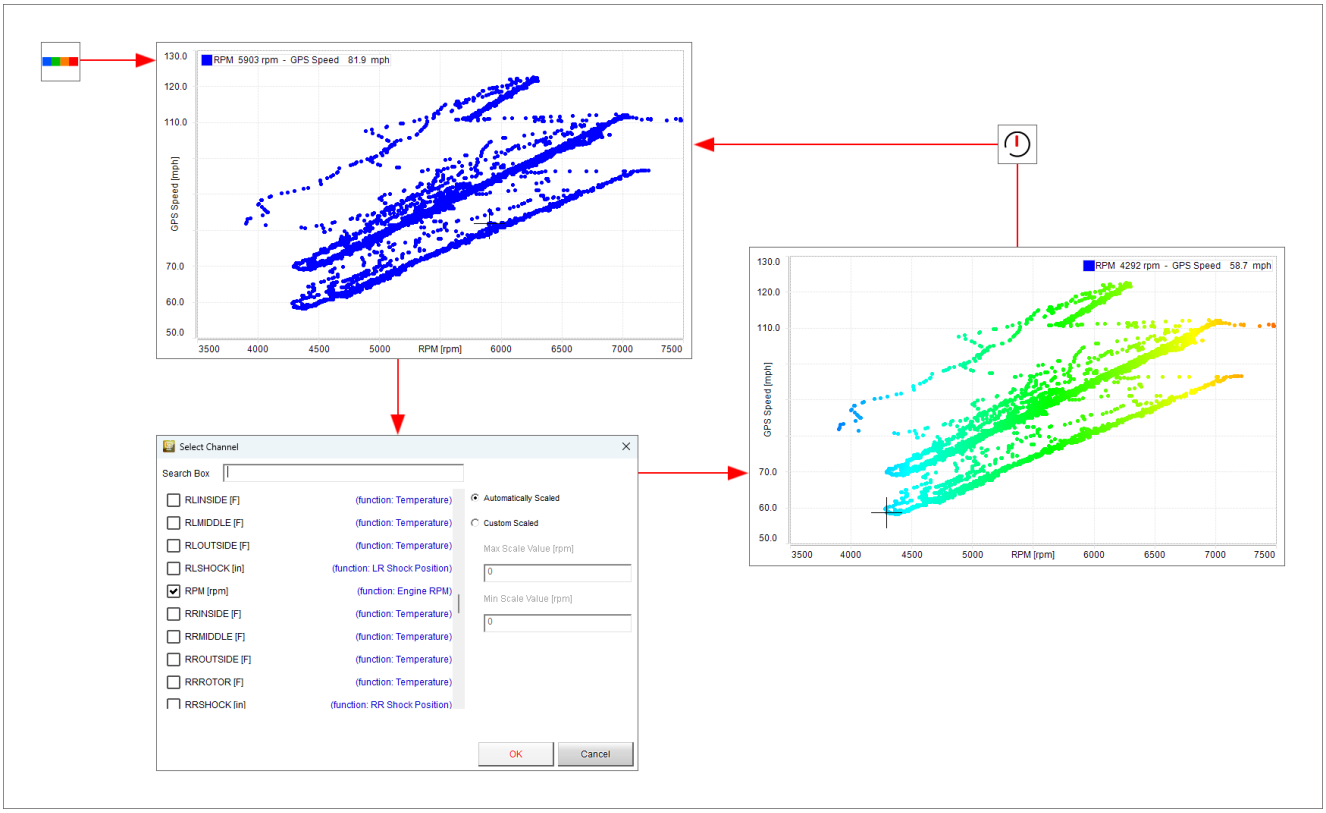
Scatter graph features a toolbar shown above top left of the panel. It allows toperform different actions:

 decide graph lines and dots size

 choose the channel to colourize according to its value (left icon) or reset it (right icon).

To select the channel to colourize according to its value click the proper icon, select the channel in the panel that is prompted and click "OK". The graph shows the channel colourized according to its value. Clicking reset icon

the graph comes back to its default appearance

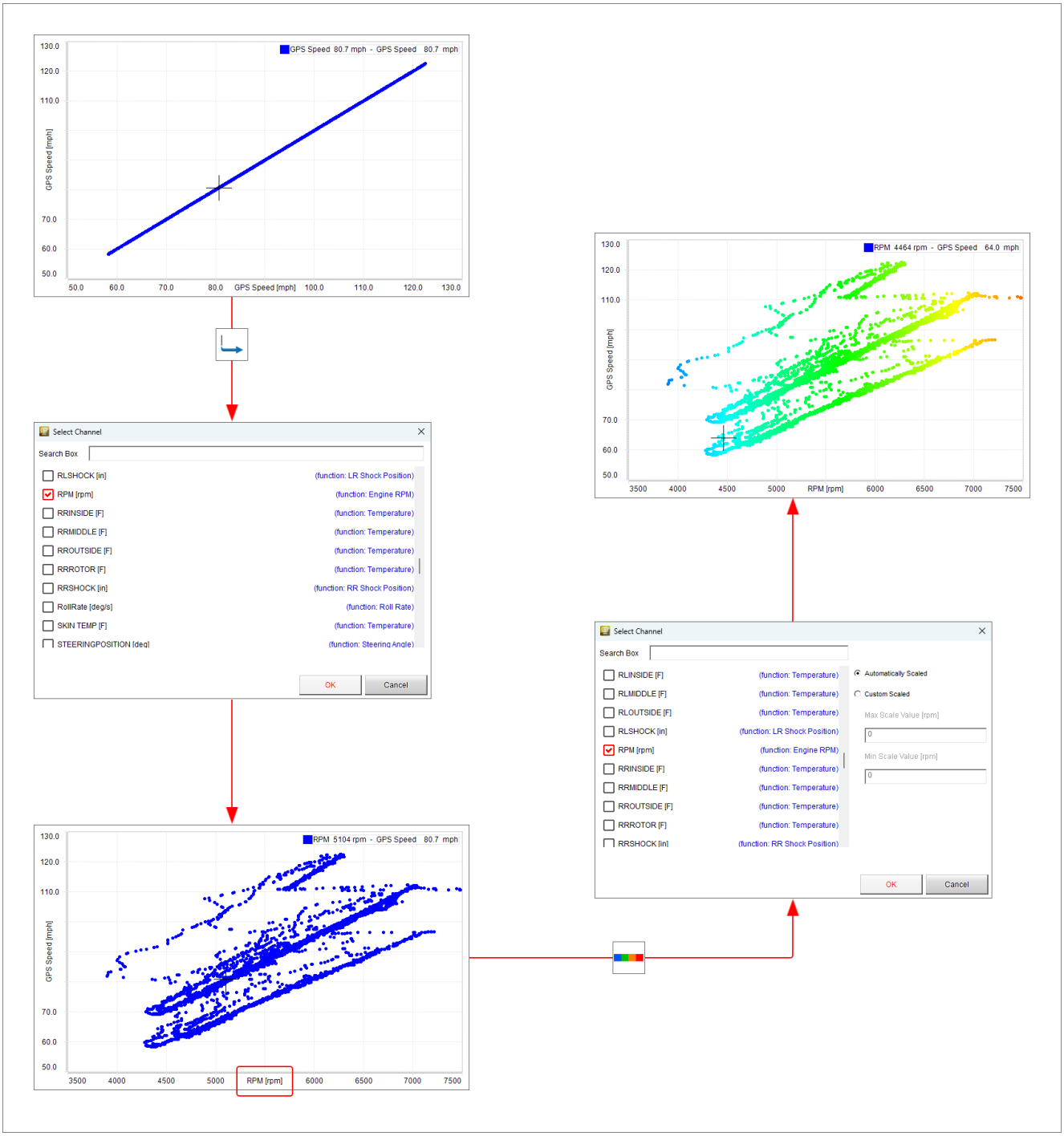


 choose the channel to show on "X" axle

Scatter layout allows to view a channel graph in function of another channel too. To show this graph follow these steps:

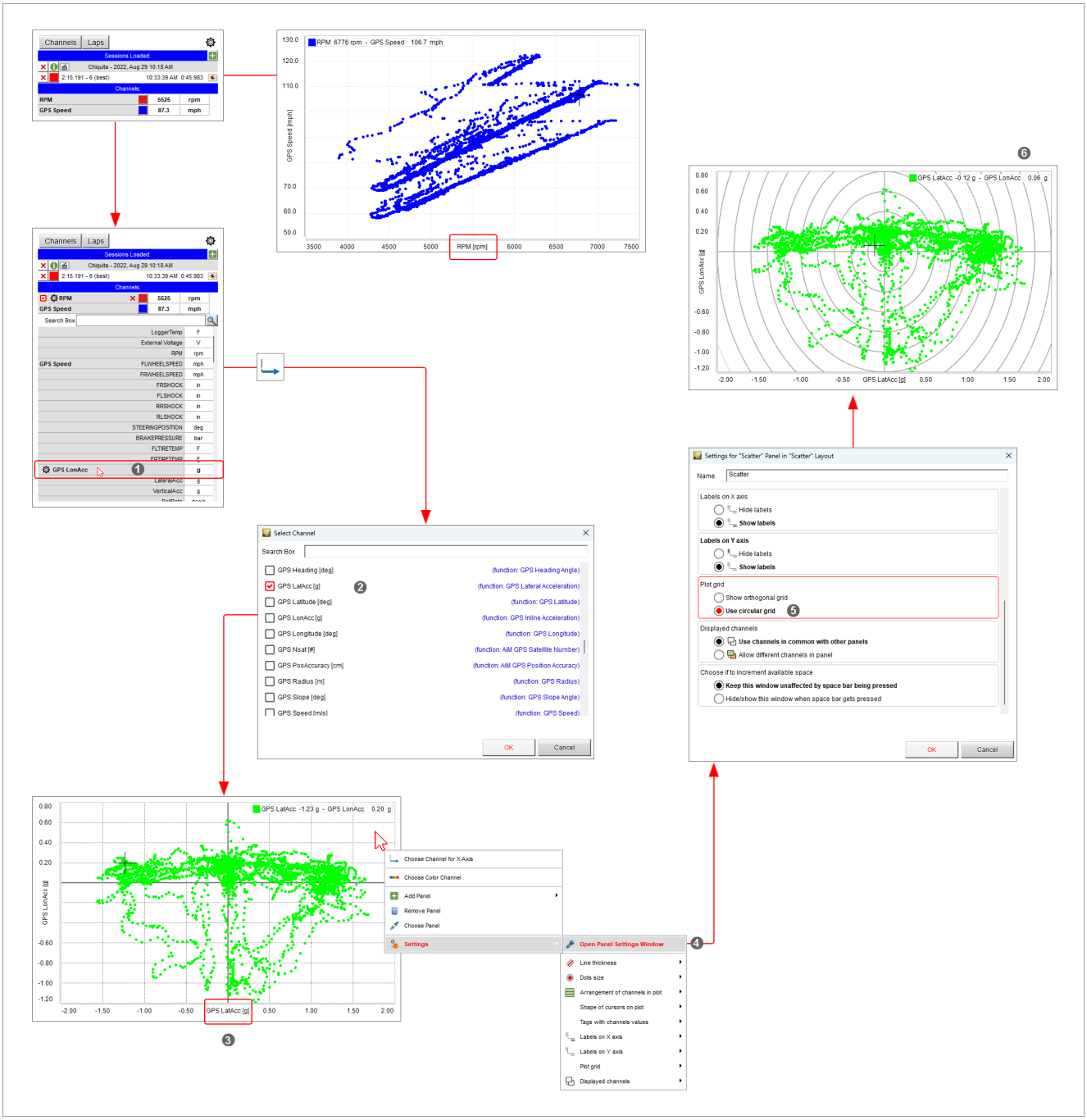
- from default setting clik "Choose X Channel" icon 
- a choice panel is prompted: look for the channel you want to place on X axle (RPM in the example below) and press OK
- the channel is placed on X axle
- click "Colourize" icon 
- a choice panel is prompted: look for the channel you want use to colourize the graph (RPM in the example below) and press OK
- the graph is colourized

In the example below the graph has been colourized using GPS and Engine RPM channels. When RPM value is higher the graph is red; on the contrary where RPM value is lower the graph is green.



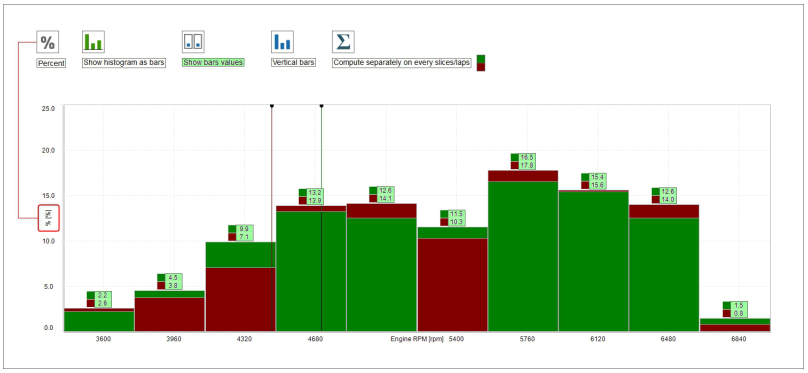
Another feature provided by scattery layout is **circular plotting grid** that can be very useful when analyzing accelerations. To show it:

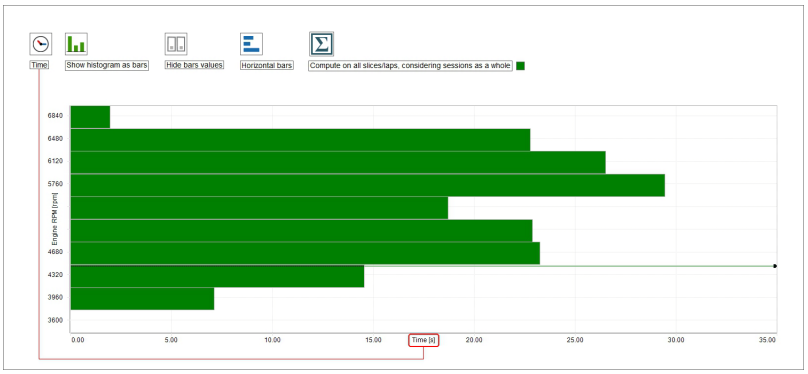
- from default channel list search for an acceleration channel (GPS LonAcc in the example below) (**1**)
- from default setting clik "Choose X Channel" icon 
- a choice panel is prompted: scroll up to lateral acceleration channel, select it and press OK (**2**)
- the channel is placed on X axle (**3**)
- right click on the graph, select "Settings" option and "Open Panel Settings Window" (**4**)
- scroll the panel up to "Plot grid" option, select "Use circular grid" and press "OK" (**5**)
- the circular grid is shown as in the image below (**6**)



4.4.3.13 Histogram Panel

The following images show the main options.





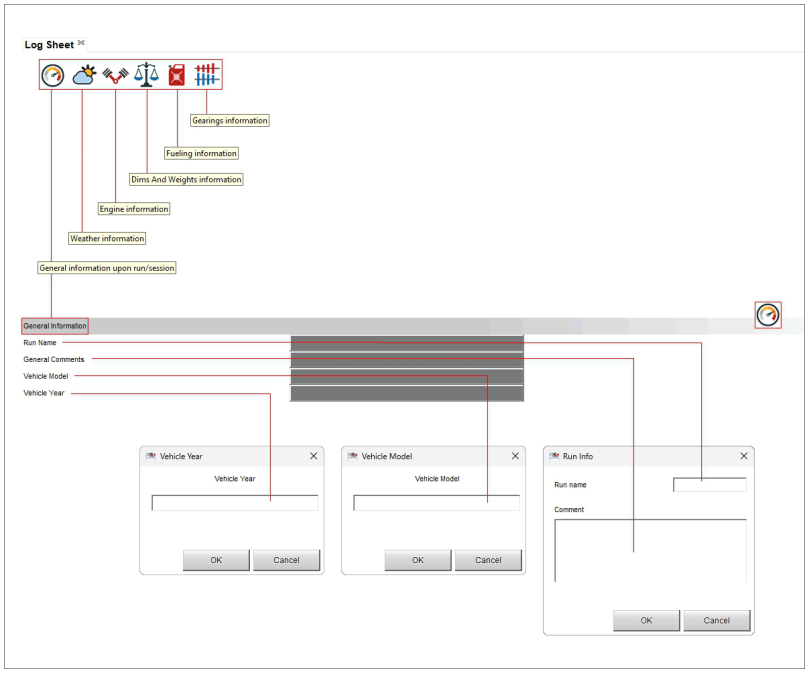
4.4.3.14 Frequency Analysis Panel

4.4.3.15 LogSheets Panel

Log sheet general information

By default the view opens on "**General Information**" where it is possible to fill in information concerning the run and the vehicle through the related panels.

- mousing over the view a grey box appears in correspondence of each row
- click on it and the related panel appears
- fill it in
- press "OK"

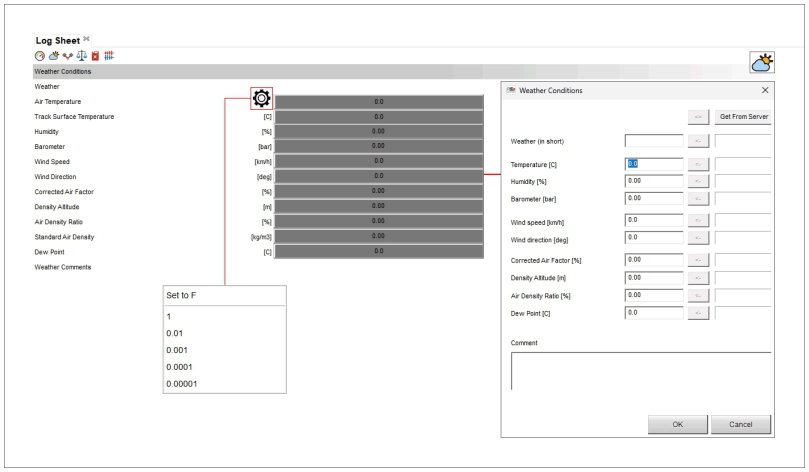


Log sheet weather

Weather information come from AiM server that connects to the nearest weather station according to your GPS coordinates. Mousing over the view a grey box and a setting icon appear in correspondence of each row.

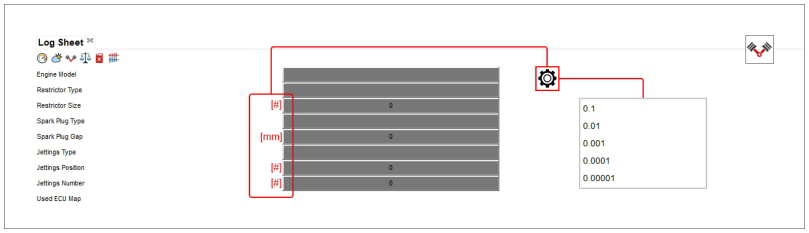
Clicking on the **setting icon** you can set specific condition of each parameter.

Double clicking on the **grey boxes** a weather conditions panel is prompted. If you have more accurate information here you can fill them in. In a second moment you can replace them (one or all) with the information coming from AiM server. Use "<-" to replace the single information and "<=" to replace all information.



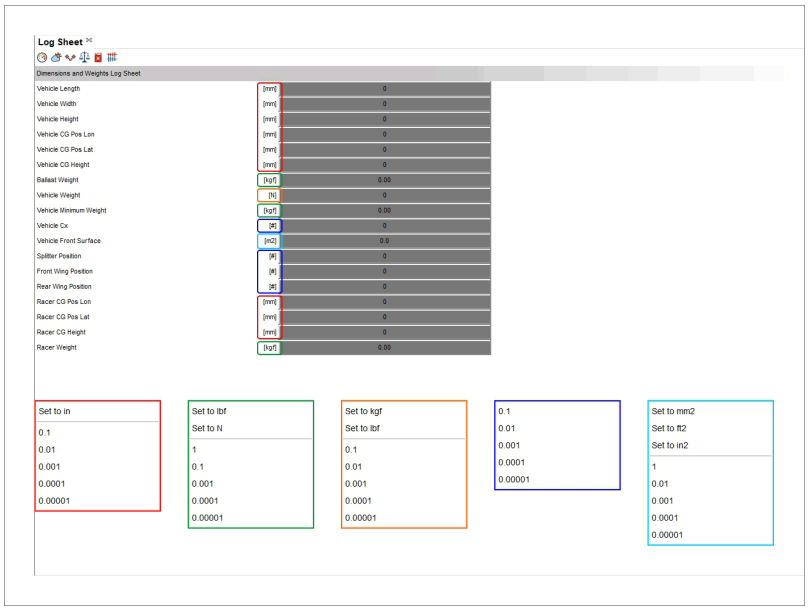
Log Sheet Engine Information

In this view it is possible to fill in all information concerning the engine installed on the vehicle. Mousing over the lines where a Measure is to be filled in a setting icon is shown and clicking it a menu is prompted: here you can choose the number of decimal places.



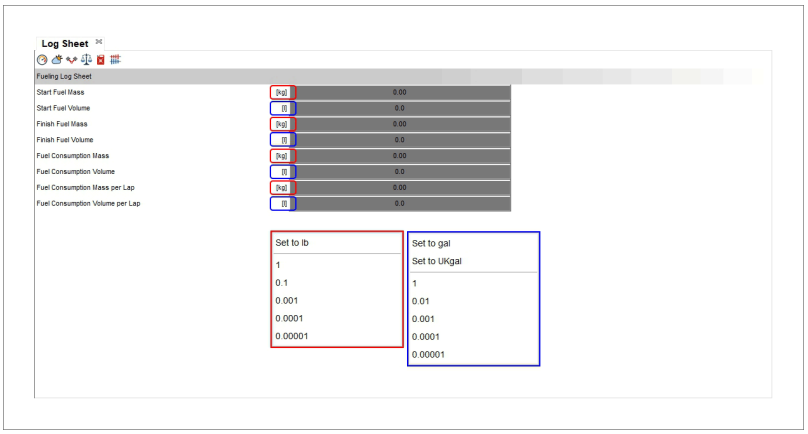
Log Sheet Dims (dimensions) and Weights information

Here you can fill in information concerning the vehicle dimensions and weights; mousing over the lines where a measure is to be filled in a setting icon is shown and clicking it a menu is prompted. Once set the parameter and the number of decimal places, clicking on the grey boxes right of the measure unit a panel is prompted where the measures can be filled in.



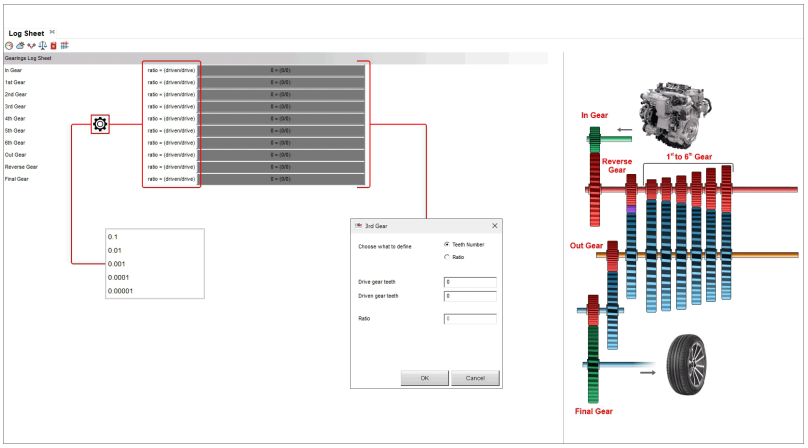
Log Sheet fuel Information

Here you can fill in information concerning the vehicle fuel information; mousing over the lines where a measure is to be filled in a setting icon is shown and clicking it a menu is prompted. Clicking on the grey boxes right of the measure unit a panel is prompted where the measures can be filled in and/or converted.



Log Sheet gearings information

Here you can fill in all the information concerning the gear management. Mousing over the rows in the left the image on the right highlights the item you are mousing over making the all view very user friendly.



4.4.3.16 Suspension Analisys Panel

4.4.4 Fine Tuning the Analysis

4.4.4.1 Add/removing a panel to/from the software view

Say we open a layout with the only movie panel in it, and we want to add a time/distance panel below the movie panel. In this case we need to right click on the movie panel, and select “Add”, then “Bottom”.

A new placeholder panel window will appear. Click the “Choose” button to pick the panel of the desired type.

Choose the type in the prompted window.

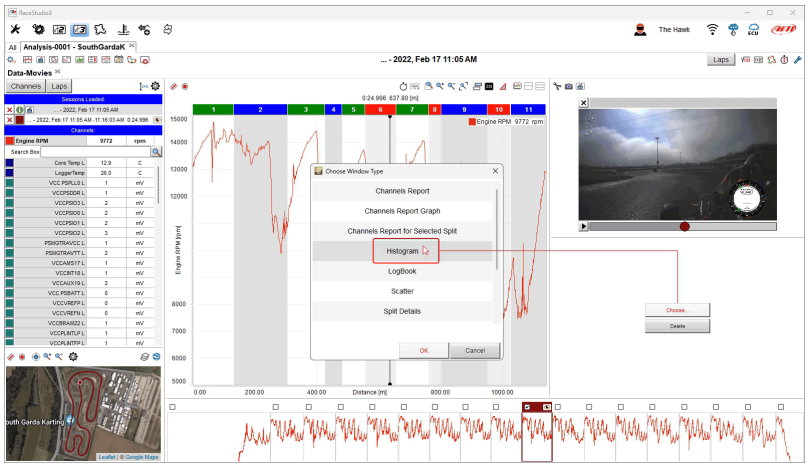
The desired panel widow will substitute the placeholder.

Remember to save the profile.

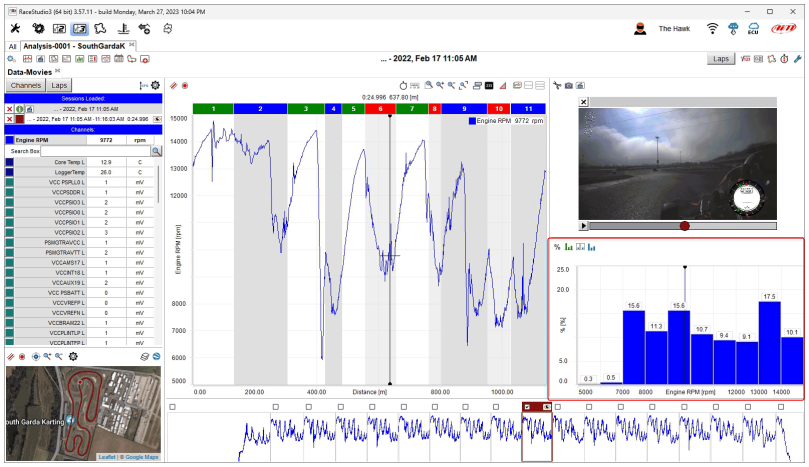
To **add** a panel: - right click on the view

- select “Add Panel” option
- select the desired position (bottom in the example)

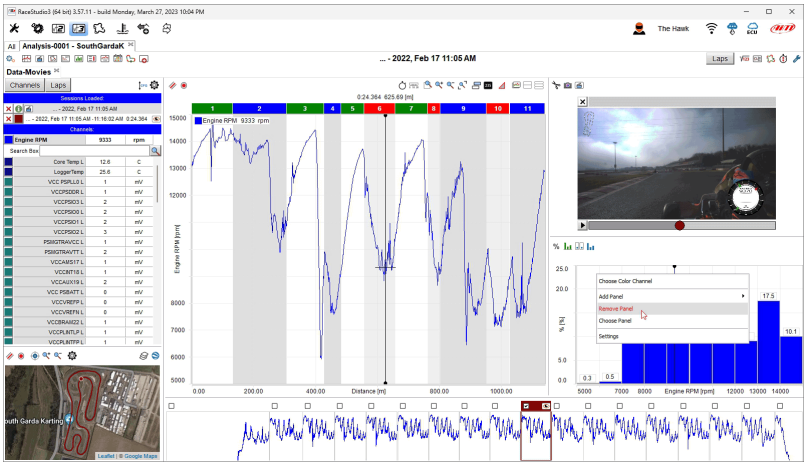
Choose the window to add in “Chose window type” dialog window (histogram in the example below).



Press "OK" (image above) and the window is added (image below).



To **remove** a window place the mouse on the window to remove right click on it and select "Remove Window" option.

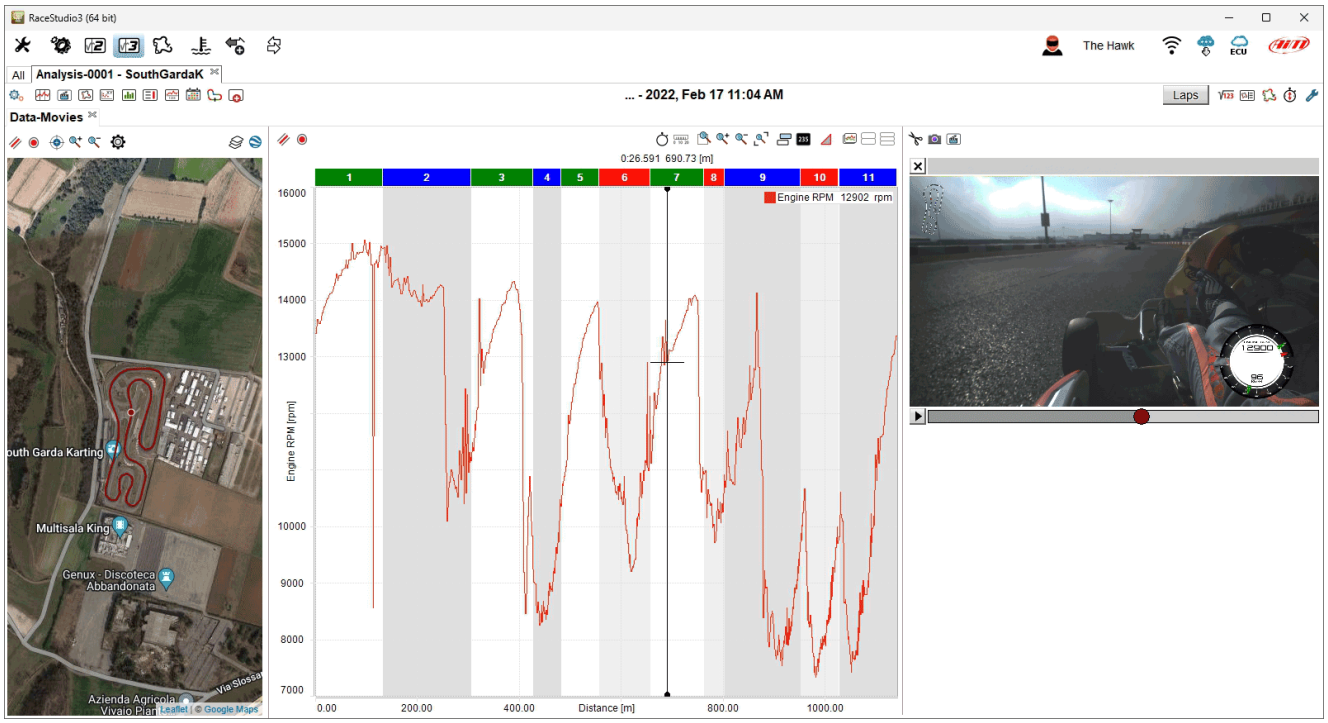


The window is removed

4.4.4.2 Showing/Hiding a Panel Using the Space Bar

Any panel can be shown/hidden pressing the space bar. To enable this function: - right click on the panel - select "Settings" option - enable the checkbox "Hide/show when Space Bar gets pressed" on the dialog window that appears - press "OK"

Once the setting fixed, the panel is shown/hidden when the space bar is pressed; in the image below we fixed this setting on "Channel table" panel that is in effect hidden.



4.4.5 The Analysis Base

Analysis can be performed in time mode or in distance mode, as it has always been in RaceStudioAnalysis 1 and 2. The RaceStudioAnalysis 3 introduces a new mode called Global Timing. This new mode is best used when analyzing data sessions coming from the same event.

4.4.6 Data of Laps and Sessions

The "Session" button allows to temporarily disable one of the sessions open for analysis, without closing it. This can, for example, result to be useful when analyzing data from many vehicles. The same button menu allows you to enable disabled session back in. An icon allows an immediate perception of the enabled/disabled sessions.

The "Laps" button allows to select the laps to open for analysis.

You have the option show all laps of all sessions, to be precise you'll be selecting all valid laps, i.e. excluding IN and OUT laps. This can be useful while looking for trends in a specific channel.

All other options are to show one, three or five laps. They can be:

- the best laps, i.e. the laps with the lowest lap times, handy while looking for lap performances
- the laps with the best segment, i.e. the laps in which you ran the lowest segment time, useful while looking for segment performances
- the first laps, handy while looking at things that happen at the beginning of the session, for example water in the cooling system that warms up
- the last laps, handy while looking at things that happen at the end of the session, for example, again, water in the cooling system that is expected to stabilize.

4.5 Analysis Profiles

A profile is a set of windows showing your data.

Properly, a profile is made of layouts. There are some default analysis layouts (see *Getting Useful Information*), available for a prompt use. You can create your *Custom Layouts*. You can identify layouts with tabs in the main analysis window.

Properly, a layout is made of panels. You can identify panels with windows inside any tab.

Layouts and panels can be modified. For example, layouts can be arranged over multiple monitors (drag and drop tabs into another monitor to allow this).

The icon  in the main analysis toolbar allows the user to change analysis profile main settings. Pressing this icon a menu is prompted where you have some options.

In the *Profiles Manager* dialog window you can manage profiles: see the complete list of your profiles, save/delete/reset profiles, import/export, to/from local path or AiM Cloud.

In the *Colors and Accessories Settings* dialog window you can change the main settings of the profile currently in use.

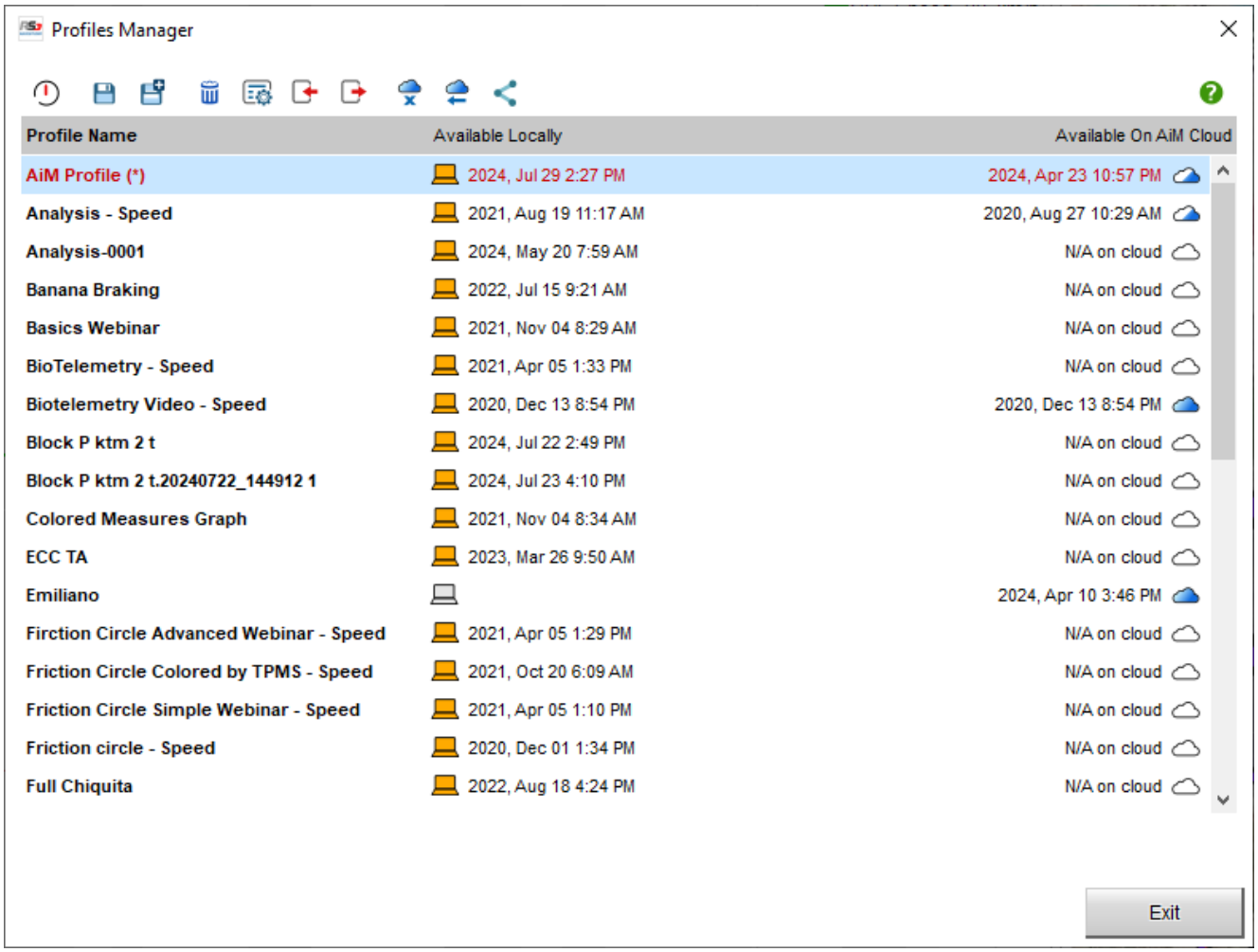
In the *Layout Settings* dialog window you can modify the settings for all the panels of the currently shown layout.

The **Save Profile** and **Save Profile As** menus trigger the saving of the currently loaded profile, while **Reset to AiM Default Profile** sets the currently loaded profile as brand new.

In the *Analysis Window Behaviour* dialog window you can set all the parameters that are not saved with the profile, i.e. what you set here is in common among all profiles.

4.5.1 Profiles Manager

Profiles can be loaded, cleared, exported and shared one by one. There's a default "AiM Profile" with all default windows that RaceStudio 3 creates for you, if you want to, basing upon data channels available in the loaded sessions.

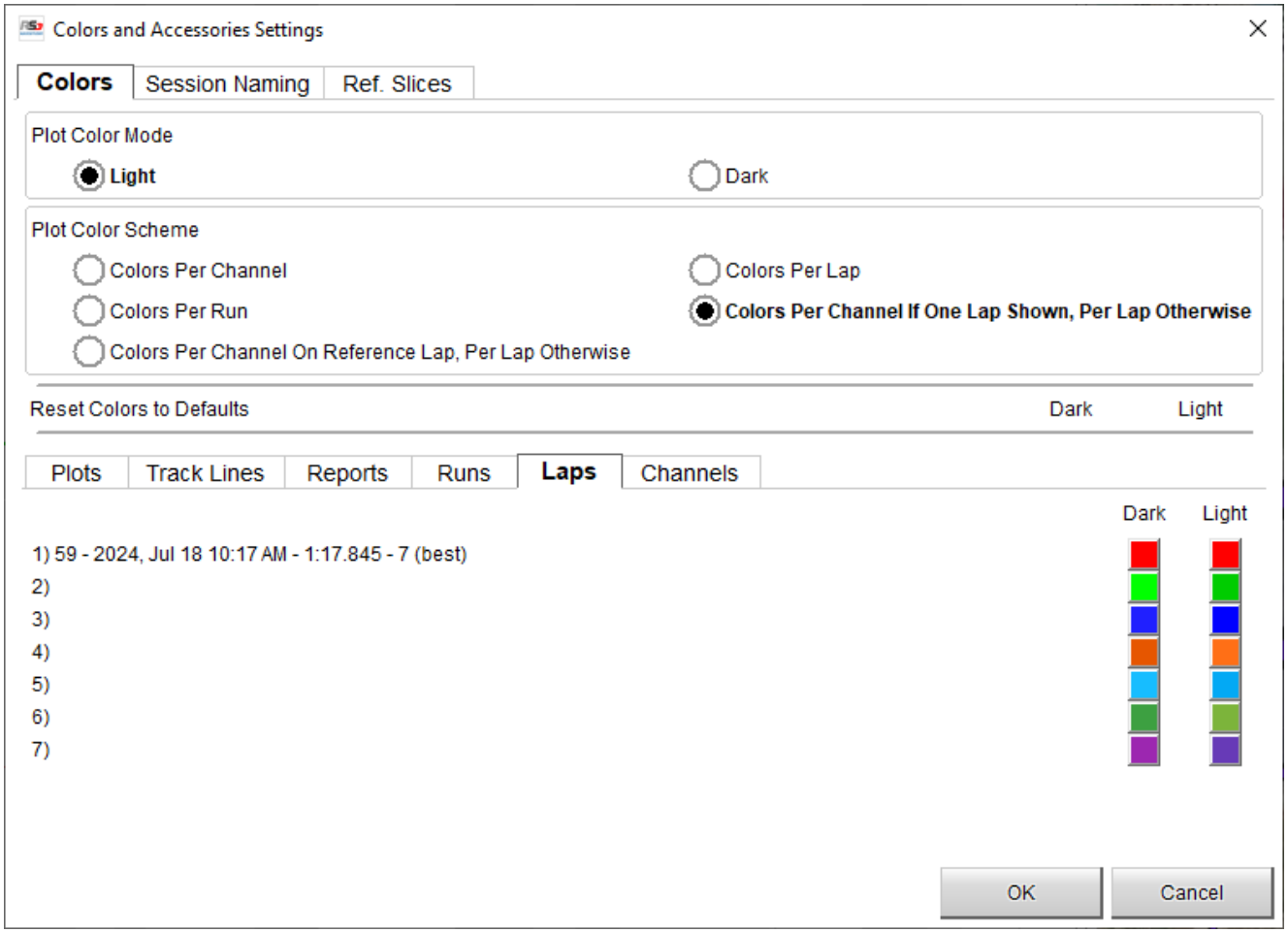


Any of the above operations can be performed on one only profile at a time.

As you can see in the above picture, the window features a table of three columns. Leftmost, the profile name. Proceeding rightwise, the other two columns tell you about the availability of the profile either on the local machine or on the AiM Cloud. What's saved on the AiM Cloud can be accessed on every machine of yours. The table features the **last saving date** both locally and on the AiM Cloud, please pay attention to this while copying a profile in either direction.

4.5.2 Colors and Accessories Settings

This dialog window allows you to customize the general settings that rule the behaviour of all layouts and panels.



4.5.2.1 Colors

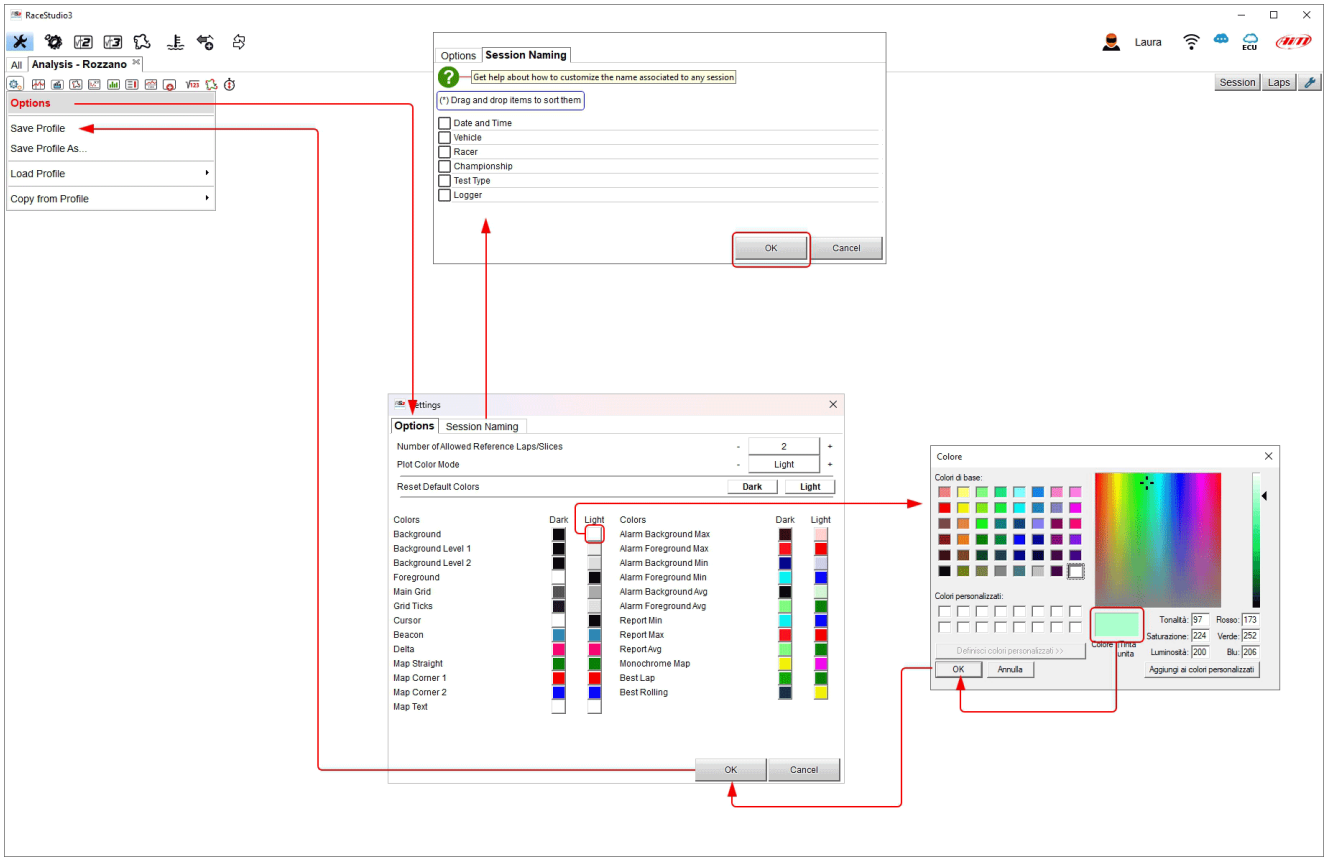
The "Plot Color Mode" lets you choose among two different working modes, mainly bound to the colors of the background.

The "Plot Color Scheme" refers to how you want channel data to be colorized.

The "Reset" line allows you to go back to AiM default colr settings.

The colors tab allows you to select the desired color for all the items in the layouts. To change the colour of a single item in a colour plot mode, click on the related box.

- a colour palette appears
- select the desired colour or move the pointer in the nuanced palette
- the result appears bottom of the nuanced palette
- press “OK” on both “colours”



4.5.2.2 Analysis Sessions Naming

You can customize the way RaceStudio 3 associates a name to every session.

Flag a field to use it, unflag it not to.

Drag and drop the fields so to sort them, top fields will be used first.

Please be careful to the fact that improperly choosing fields you could be getting duplicated names, that is the same name for two sessions. For example: if you choose the only racer name as session naming fiels, and you then select two sessions from the same racer, the two sessions will share the same name.

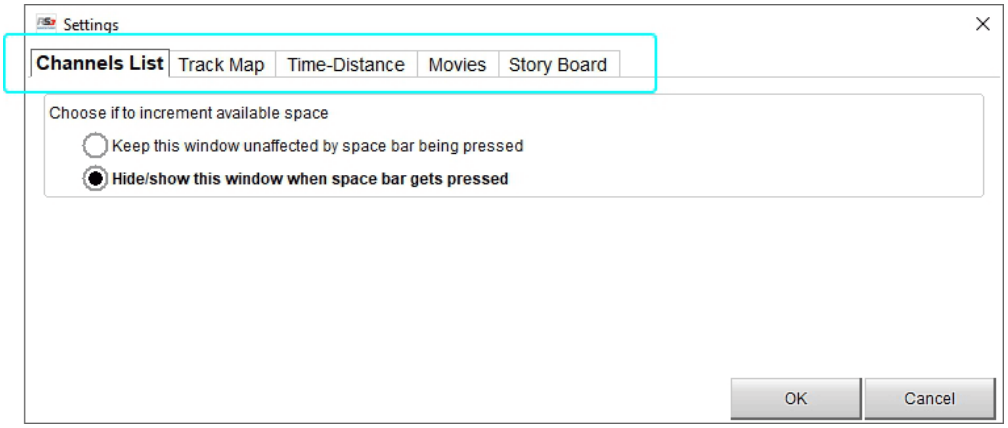
You can access the session naming window through the leftmost options button in the main analysis toolbar, together with main profile settings. Session naming panel allows the user to name a session sorting its characteristics in a preferred order dragging and dropping them;

4.5.2.3 Reference Slices

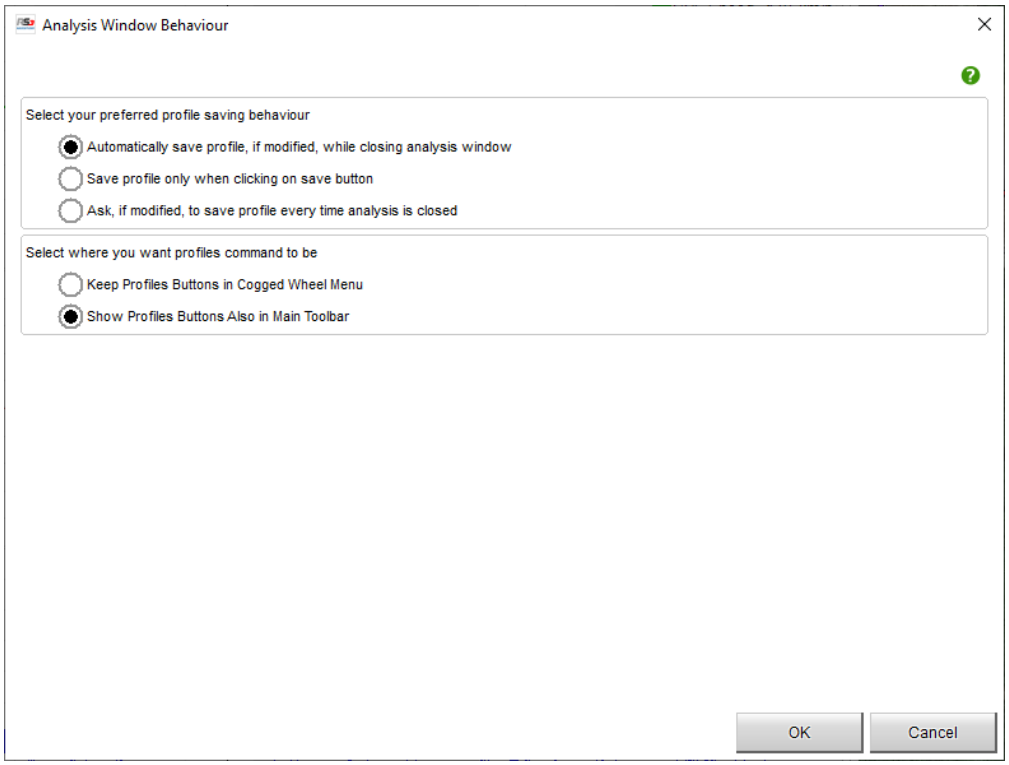
You can, in the analysis window, show a number of laps. All their data will be shown, but only a limited number of laps will feature the complete visualization of, for example, channel tags, associated videos, ... Well, that exact limited number can be set here.

4.5.3 Layout Settings

Using the icon shown here above you can decide plot settings of all the panels included in a layout. Each panel features its setting tab.



4.5.4 Analysis Window Behaviour



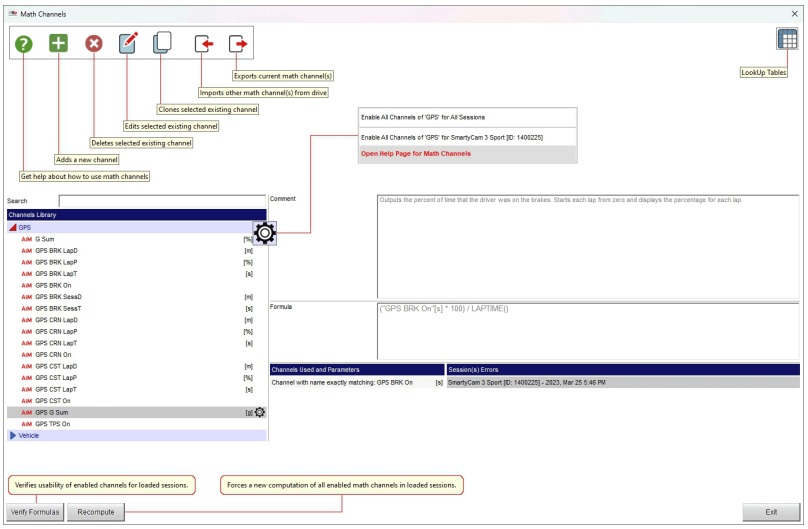
This dialog window features settings that affect the analysis window and that do not depend upon profiles. They go across all profiles.

You can define a "saving behaviour", i.e. a possible automatic strategy for the saving of the profile, in few words: always auto save, never auto save, ask me if to save.

You can define if you want main profiles commands always available in the main analysis toolbar.

4.6 Math Channels

Clicking the icon above Math channels panel setting is prompted. Here below all buttons are explained.



Selecting "Open help page for math channels" the software re-directs you to an online help page that is being completed. This function is better explained here *Math Channels*.

4.6.1 How to Use a Math Channel

The first window that's prompted when clicking on math channels icon is the one that shows you the list of all math channels in your library and that let you apply any number of math channels to your sessions.

Such a math channels library is populated of both channels created by AiM (default channels) and channels created by yourself.

4.6.1.1 Channels List

Please identify such a list in the left part of math channels usage window. All your available math channels are listed here. Channels collect into groups, channels in each group are listed alphabetically sorted. Channels list can be filtered through a search box right above it. The search text filters on channel name, units of measure and comment.

Each list item shows up to two icons on the left, the name of the channel, channel units of measure and a cogged wheel icon on the right.

Icons on the left let you identify which are default channels from AiM, and which are the channels you enabled. The cogged wheel, when clicked, prompts a context menu in which you can enable the channel for either all sessions, or all sessions coming from a specific logger.

Enabling a channel means that from now on the channel will be added either to all the sessions you open or to the sessions coming from a specific logger.

Left of the view channels are grouped by type in the channels library; using the search box it is possible to search for a channel in the library. The search box filters by channel name, measure unit, comment and description.

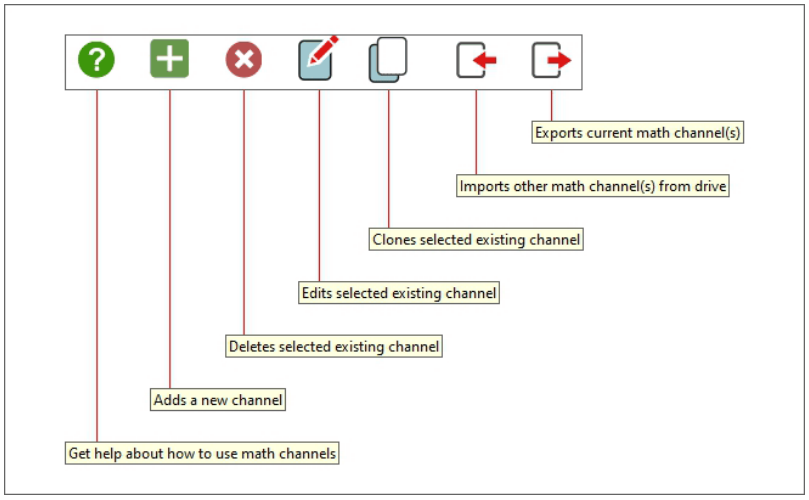
Please note: switching from one measurement system to another or importing a channel created with different measure units RSA3 computes and shows the channel using the measure units You decided.

Clicking on the **setting icon** right of each channel it is possible to enable that channel for all sessions or for a single device as well as to be re-directed to the paragraph dedicated to that specific channel in the online help page.

In the central part of the dialog window are shown the channels applied to the current session.

For every channel you select in the channels library, the boxes right of the view show a comment (on top), the computation formula (central) and two lists(bottom right): the first showing used parameters and the second with notes or warnings while applying the channel to loaded sessions. All needed channels are listed using an unit of measure.

Using the buttons at the top of the math channels usage window, you can:



- Open this help page.
- Add a new channel. You'll be starting a channel from scratch.
- Delete a channel. You can delete an existing channel.
- Edit a channel. You can modify an existing channel.
- Clone a channel. You'll be creating a channel from an existing one.
- Import a previously exported channels list. You can also import math channels from RS2Analysis.
- Export a list of channels. You'll be choosing which channel or group of channels you want to export, as well as exporting all of them.

Last item on the right of the toolbar, the button to show the LookUp Tables Manager.

4.6.1.2 Channels Description

For every channel you select in the channels list, the remaining part (right) of the math channels usage window shows a comment (on top), the computation formula (right below) and (bottom right) two lists: the first with all the channels such a channel relies upon, the second with notes or warnings while applying the channel to loaded sessions.

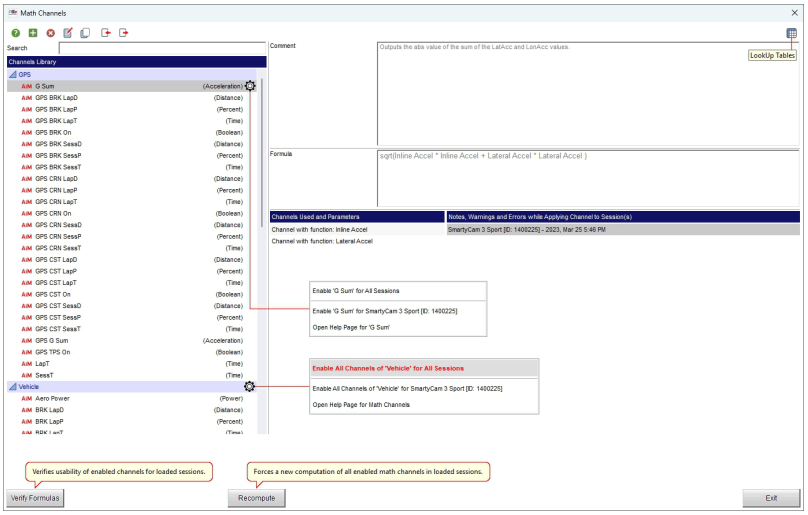
We need to notice that all needed channels are listed using a unit of measure. It's important to notice that this unit is the one the computation formula generates with. In other words, suppose you imported a math channel written from a friend of yours, with its written formula that computes a speed in km/h, and state this speed has km/h units. When you will use such a math channel and display it on a graph, RS3A will use your speeds settings and will display the math channel according to the units YOU defined, automatically converting from the computed units to your units.

4.6.1.3 Verifying Formulas

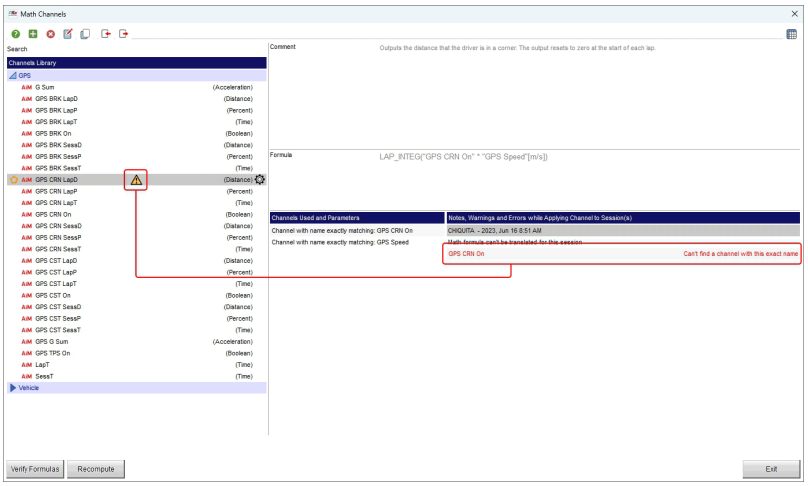
Please identify the *Verify Formulas* button at the bottom of the math channel usage window. Clicking this button will trigger a verification of the channels that are enabled in the list against the sessions that were selected before opening the math channels usage window, warning you in case any of the channels can't be applied.

4.6.1.4 Recompute Applied Channels

Please identify the *Recompute* button at the bottom of the math channel usage window. Clicking this button will trigger the complete recomputation of all the enabled chnnels for every session that was selected before opening the math channels usage window.



If any channel is for any reason not correct a waring is shown in the channels library as shown here below.



4.6.1.5 Side Notes

There's no need to sort the channels as RaceStudio 3 creates a computation cycle that iterates the computations and solves cross references between channels.

RaceStudio 3 cannot solve loops within channels, i.e., channel "A" that uses channel "B" that uses channel "C" that uses channel "A".

4.6.2 Sample Math Channels by AiM

Following here a list of all the math channels that are available by default. All these are perfectly functional channels, that can be used exactly as they are or can be considered as a starting point for customer defined math channels.

We basically show the same computations for two different cases, that we divide in separate groups.

4.6.2.1 GPS Math Channels Group

All the math channels of this group are computed over the channels that are generated by default by any AiM device that has GPS. For example, all of them are available in case you have a Solo2.

Triggers

These channels are "conditions" that assess a state.

- GPS BRK On - A way to assess when the vehicle is under braking.
- GPS TPS On - A way to assess when the vehicle is accelerating.
- GPS CRN On - A way to assess when the vehicle is in a corner.
- GPS CST On - A way to assess when the vehicle is coasting.

Performance

- GPS G Sum - Total acceleration applied to vehicle.

Statistics

All the channels that help analyzing racer performance or that help comparing two racers looking for better behaviour. Laps statistics are primarily aimed at those who race on tracks, for which a comparison or a trend between laps is meaningful. Session statistics are instead better for thos who race point to point.

- GPS BRK LapT (Brake Lap Time) - Total amount of lap time spent braking.
- GPS BRK LapD (Brake Lap Distance) - Total distance spent braking, in a lap.
- GPS BRK LapP (Brake Lap Percentage) - Percentage of lap spent braking.
- GPS CRN LapT (Corner Lap Time) - Total amount of lap time spent cornering.
- GPS CRN LapD (Corner Lap Distance) - Total distance spent cornering, in a lap.
- GPS CRN LapP (Corner Lap Percentage) - Percentage of lap spent cornering.
- GPS CST LapT (Coast Lap Time) - Total amount of lap time spent coasting.
- GPS CST LapD (Coast Lap Distance) - Total distance spent coasting, in a lap.
- GPS CST LapP (Coast Lap Percentage) - Percentage of lap spent coasting.
- GPS BRK SessT (Brake Session Time) - Total amount of session time spent braking.
- GPS BRK SessD (Brake Session Distance) - Total distance spent braking, in session.
- GPS BRK SessP (Brake Session Percentage) - Percentage of lap spent braking.
- GPS CRN SessT (Brake Session Time) - Total amount of session time spent cornering.
- GPS CRN SessD (Brake Session Distance) - Total distance spent cornering, in session.
- GPS CRN SessP (Brake Session Percentage) - Percentage of lap spent cornering.
- GPS CST SessT (Brake Session Time) - Total amount of session time spent coasting.
- GPS CST SessD (Brake Session Distance) - Total distance spent coasting, in session.
- GPS CST SessP (Brake Session Percentage) - Percentage of lap spent coasting.

4.6.2.2 Vehicle Math Channels Group

Channels of this group, if compared to the GPS Group ones, may need some more sensors in your vehicle. For example throttle position sensor, brake pressure sensors, ...

Triggers

These channels are "conditions" that assess a state.

- TPS On - Measures if any throttle is applied.
- TPS Part On - Measures if throttle is patrially applied.
- TPS Full On - Measures if throttle is fully applied.
- BRK On - A way to assess when the vehicle is under braking.
- CRN On - A way to assess when the vehicle is in a corner.
- CST On - A way to assess when the vehicle is coasting.

Performance

- G Sum - Total acceleration applied to vehicle.

Statistics

All the channels that help analyzing racer performance or that help comparing two racers looking for better behaviour. Laps statistics are primarily aimed at those who race on tracks, for which a comparison or a trend between laps is meaningful. Session statistics are instead better for thos who race point to point.

- TPS Full LapT (TPS Full Lap Time) - Total amount of lap time spent at full throttle.
- TPS Full LapD (TPS Full Lap Distance) - Total distance spent at full throttle, in a lap.
- TPS Full LapP (TPS Full Lap Percentage) - Percentage of lap spent at full throttle.
- TPS Part LapT (TPS Part Lap Time) - Total amount of lap time spent at partial throttle.
- TPS Part LapD (TPS Part Lap Distance) - Total distance spent at partial throttle, in a lap.
- TPS Part LapP (TPS Part Lap Percentage) - Percentage of lap spent at partial throttle.
- BRK LapT (Brake Lap Time) - Total amount of lap time spent braking.
- BRK LapD (Brake Lap Distance) - Total distance spent braking, in a lap.
- BRK LapP (Brake Lap Percentage) - Percentage of lap spent braking.
- CRN LapT (Corner Lap Time) - Total amount of lap time spent cornering.
- CRN LapD (Corner Lap Distance) - Total distance spent cornering, in a lap.
- CRN LapP (Corner Lap Percentage) - Percentage of lap spent cornering.
- CST LapT (Coast Lap Time) - Total amount of lap time spent coasting.
- CST LapD (Coast Lap Distance) - Total distance spent coasting, in a lap.
- CST LapP (Coast Lap Percentage) - Percentage of lap spent coasting.
- TPS Full SessT (TPS Full Session Time) - Total amount of session time spent at full throttle.
- TPS Full SessD (TPS Full Session Distance) - Total distance spent at full throttle, in a session.
- TPS Full SessP (TPS Full Session Percentage) - Percentage of session spent at full throttle.
- TPS Part SessT (TPS Part Session Time) - Total amount of session time spent at partial throttle.
- TPS Part SessD (TPS Part Session Distance) - Total distance spent at partial throttle, in a session.
- TPS Part SessP (TPS Part Session Percentage) - Percentage of session spent at partial throttle.
- BRK SessT (Brake Session Time) - Total amount of session time spent braking.
- BRK SessD (Brake Session Distance) - Total distance spent braking, in session.
- BRK SessP (Brake Session Percentage) - Percentage of lap spent braking.
- CRN SessT (Brake Session Time) - Total amount of session time spent cornering.
- CRN SessD (Brake Session Distance) - Total distance spent cornering, in session.
- CRN SessP (Brake Session Percentage) - Percentage of lap spent cornering.
- CST SessT (Brake Session Time) - Total amount of session time spent coasting.
- CST SessD (Brake Session Distance) - Total distance spent coasting, in session.
- CST SessP (Brake Session Percentage) - Percentage of lap spent coasting.

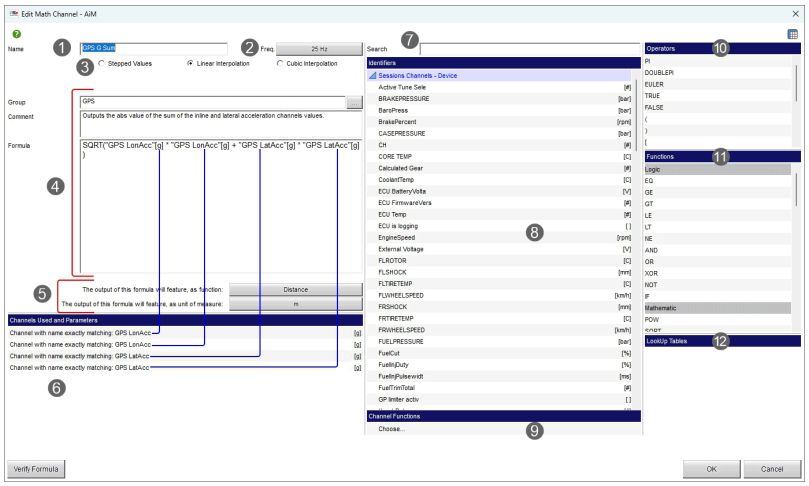
General Purpose

- Max Speed - Computes the maximum of two channels, looking for the exact names of the channels.
- Linear Acc - Computes the linear acceleration of the vehicle out of the speed values.
- Gear - This channel demonstrates the use of the GEAR math function, that assesses the engaded gear out of RPM and Speed channels.

- Damper Velocity - Example for computing the velocity of damper movement out of a suspension potentiometer.

4.6.3 How to Create/Edit a Math Channel

The math channel create/edit window is where you craft a math channel that will be usable in the main math channels window.



In the left part of channel creation window you have to set:

- Name. A unique name to be used whe the channel is applied.
- Frequency. How "often" you want the formula to be evaulated.
- Interpolation Method. Three radiobuttons that let you choose how the used channels will be resampled.
- Group. This text field is used to collect channels in the main list of available channels.
- Comment. This will be shown in the channel description in the main list.
- Formula. The math expression that will be computed.
- Function. Here you tell the RaceStudio 3 engine what you're using this channel for. It will be of help when computing units of measure within other channels.
- Unit of measure. You need to tell the math engine which is the output of your formula (that can be different from the values you'll see in analysis).

We'll be describing the syntax for building your math expressions in few rows.

In the right part of the window you can find all the shortcuts that are useful when building the formula: identifiers, operators, logbook items (they were called contants in RS2A), functions and channels functions.

Identifiers are basically all the channel names for the runs in use, and the log sheets fields.

Channel functions, operators and functions never change (please read further for the list of avaibale functions).

Logsheet items (constants per sessions) are defined in a dedicated part of the software and they will be run dependent. To make a quick example, you can define a logbook item named "ballast" and enter its value separately per every run. The math channel engine will get the value you enter in every run.

4.6.3.1 Math syntax

Our first advice is to look at the sample channels to get a little bit of practice on how to build your formulas.

"Speed" - means you want the formula to take the values of a channel named "Speed". Double quotes are always needed, so the pointed channel name can also feature spaces.

"Speed"[mph] - same as before, but here you want the math engine to convert it to mph.

CHF(Water Temperature) - means you want the formula to take the values of a water temperature channel, whichever this name could be.

CHF(Water Temperature)[C] - same as before, but here you want the math engine to convert it to C.

$Humidity$ - means that you want to take humidity from the weather service and use it for your computations.

4.6.3.2 Available Logical Functions

All these functions (except IF) output 0 or 1. AND, OR, NOT, XOR and IF need conditions. Theorically, a condition is 1 (for true) or 0 (for false). In practice, all values different from 0 are interpreted as 1 (true).

EQ - EQ(Equal, to)

Outputs 1 if the channel value matches a specific value, 0 otherwise. Example EQ(Gear, 2) would be telling you when/where your vehicle uses the 2nd gear. This condition, in the formula field, can also be written as "Gear == 2".

GE - GE(GreaterOrEqual, to)

Outputs 1 if the channel value is greater than, or equal to, a specific value, 0 otherwise. Example "EQ(WaterT[F], 180)" would be telling you when/where your water temperature is greater than, or equal to, 180 F. This condition can also be written with ">=" operator, i.e. "WaterT[F] >= 180".

GT - GT(Greater, than)

Outputs 1 if the channel value is greater than, a specific value, 0 otherwise. It can also be written using the ">" operator.

LE - LE(LowerOrEqual, to)

Outputs 1 if the channel value is lower than, or equal to, a specific value, 0 otherwise. It can also be written using the "<=" operator.

LT - LT(Lower, than)

Outputs 1 if the channel value is lower than, a specific value, 0 otherwise. It can also be written using the "<" operator.

NE - NE(Different, from)

Outputs 1 if the channel value is different from a specific value, 0 otherwise. It can also be written using the "!=" operator.

AND - (Condition1) AND (Condition2)

Outputs 1 if both conditions are different from 0, 0 otherwise.

OR - (Condition1) OR (Condition2)

Outputs 1 if any condition is different from 0, 0 otherwise.

XOR - (Condition1) XOR (Condition2)

Exclusive OR, outputs 1 if either one of the two conditions is different from zero and the other condition is equal to zero , 0 otherwise.

NOT - NOT(Condition)

Inverts a condition, so it outputs 1 if the condition is zero, 0 otherwise.

IF - IF(condition, ifTrue, ifFalse)

Given a condition, when this is different from zero, the channel equals what passed as second parameter, otherwise the channel equals what passed as third parameter. Example IF("GPS LonAcc"[g] $<$ 0, -"GPS LonAcc", 0) would give you the absolute value of the inline acceleration when this is lower than 0, otherwise it would output 0.

4.6.3.3 Available Mathematical Functions

POW - POW(ChanOrVal, Exponent)

Power. You can compute the value of "ChanOrVal" (raised) to the (power of) the "Exponent".

SQRT - SQRT(ChanOrValGreaterOrEqualToZero)

Square root. You can compute the

LN - LN(ChanOrValGreaterThanZero)

Logarithm (Euler base).

LOG - LOG(ChanOrValGreaterThanZero)

Logarithm (base 10).

ABS - ABS(ChanOrVal)

Absolute value. The result is the input value if positive, the input value made positive when negative.

EXP - EXP(ChanOrVal)

Exponential.

CEIL - CEIL(ChanOrVal)

Returns the closest bigger integer. Examples: 3.1 returns as 4.0, 3.8 returns as 4.0, -3.1 returns as -3.0, -3.8 returns as -3.0.

FLOOR - FLOOR(ChanOrVal)

Returns the closest smaller integer. Examples: 3.1 returns as 3.0, 3.8 returns as 3.0, -3.1 returns as -4.0, -3.8 returns as -4.0.

DERIV - DERIV(ChanOrVal)

Derivative.

INTEG - INTEG(ChanOrVal)

Integral.

LAP_INTEG - LAP_INTEG(ChanOrVal)

Integral, with its value resetting at start/finish line crossing.

CR_INTEG - CR_INTEG(Chan, Condition)

Conditional Reset Integral, with its value resetting when given condition is different from 0.

CR_LAP_INTEG - CR_LAP_INTEG(Chan, Condition)

Conditional Reset Integral, with its value resetting when given condition is different from 0 and at start/finish line crossing.

AVG - AVG(ChanOrVal, ChanOrVal)

Outputs the average of the values passed as input. Pay attention to the fact that you can pass more than two parameters. Example AVG("SpeedFL", "SpeedFR", "SpeedRL", "SpeedRR") would compute the average value of all the four corners speeds.

LAP_AVG - LAP_AVG(ChanOrVal, ChanOrVal)

Outputs the average of the values passed as input, within every single lap. Pay attention to the fact that you can pass more than two parameters. Example LAP_AVG("SpeedFL", "SpeedFR", "SpeedRL", "SpeedRR") would compute the average value of all the four corners speeds.

MAX - MAX(ChanOrVal, ChanOrVal)

Outputs the maximum of the values passed as input. Pay attention to the fact that you can pass more than two parameters. Example MAX("SpeedFL", "SpeedFR", "SpeedRL", "SpeedRR") would compute the maximum value of all the four corners' speeds.

LAP_MAX - LAP_MAX(ChanOrVal, ChanOrVal)

Outputs the maximum of the values passed as input, within every single lap. Pay attention to the fact that you can pass more than two parameters. Example MAX("SpeedFL", "SpeedFR", "SpeedRL", "SpeedRR") would compute the maximum value of all the four corners' speeds.

MIN - MIN(ChanOrVal, ChanOrVal)

Outputs the minimum of the values passed as input. Pay attention to the fact that you can pass more than two parameters, as well as AVG and MAX.

LAP_MIN - LAP_MIN(ChanOrVal, ChanOrVal)

Outputs the minimum of the values passed as input, within every single lap. Pay attention to the fact that you can pass more than two parameters, as well as AVG and MAX.

4.6.3.4 Available Trimming Functions

These function are meant to be used to trim (or limit) the value of a input channel to specific threshold values. HIGH_PASS features a lower limit, LOW_PASS features an upper limit, while BAND_PASS features both.

HIGH_PASS - HIGH_PASS(ChanOrVal, LowThreshold)

LOW_PASS - LOW_PASS(ChanOrVal, HighThreshold)

BAND_PASS - BAND_PASS(ChanOrVal, LowThreshold, HighThreshold)

4.6.3.5 Available Filtering Functions

FIR - FIR(Chan, Number_From_1_To_3)

Finite Impulse Response (FIR) are a class of filters, basically every output sample is the result of the weighted sum of N samples before. There's a wide literature upon FIR filters, we implemented a rather strong low pass filter, tailoring the needs of our data acquisition. The strength can be decided passing 1 to 3 as a second parameter (1 is mild, 3 is strong).

ROLL_AVG - ROLL_AVG(Chan, Number_From_3_To_10)

Rolling average (sometimes, in literature, named moving average). Every output sample is the average value of the closest 3 to 10 (second parameter) samples passed as input. It is a mild filter, useful to compute a channel value upon its trend over the considered interval. All samples in the average feature the same weight.

EMA - EMA(Chan, alpha)

Exponential moving average. The first parameter needs to be a channel, while the second is any number from 0 to 1. Output(t) = alpha*Chan(t)+(1-alpha)*Chan(t-1)

MEDIAN_FILT - MEDIAN_FILT(Chan, Number_From_3_To_10)

Rolling average (sometimes, in literature, named moving average). Every output sample is the average value of the closest 3 to 10 (second parameter) samples passed as input. It is a mild filter, useful to compute a channel value upon its trend over the considered interval. All samples in the average feature the same weight.

4.6.3.6 Available Timing Functions

LAPTIME - LAPTIME()

Outputs, in seconds, the rolling time within the lap.

SESSIONTIME - SESSIONTIME()

Outputs, in seconds, the rolling time within the session.

TIME_SHIFT - TIME_SHIFT(Channel, ShiftMilliSeconds)

The output of this function is the channel itself, just shifted in time, shift time being passed as second parameter.

4.6.3.7 Available Specific Purpose Functions

SLIP - SLIP(RPM, Speed)

The output is basically the ratio between speed and rpm, just normalized to appear as percentage. Theorically these two values are strictly bound by the drive line, so, highlighting a deviation from linearity shows where slippage occurs.

BIKE_ANGLE - BIKE_ANGLE(Speed, Gyro)

The output is an estimation of bike lean angle. "Estimation" means that it's not the true exact value, but that it can be a very good and quick tool for a quick comparison between different setups.

BIKE_ACCLAT - BIKE_ACCLAT(Speed, Gyro)

This channel has been kept for compatibility purpose with RS2A, having been computed as "GPS LatAcc" within GPS channels.

BIKE_CORNRAD - BIKE_CORNRAD(Speed, Gyro)

This channel has been kept as is for compatibility purpose with RS2A, having been inserted by default within GPS channels as "GPS Radius".

GEAR - GEAR(RPM, Speed, minGearN, maxGearN)

Useful when no gearbox sensor is available on the vehicle. The output of this channel is the gear used, given as input the values of rpm, speed and first/last gear used. Normally first gear is 1, but there are cases in which the 1st gear is used just for a stand start and never inserted any more... in these cases passing 2 as first gear can help the algorithm to better perform in identifying used gear. Same for last gear... if your gearbox features 7 gears but the track configuration makes 6th and 7th gears useless, you need to input 5 as last gear.

UWA - UWA(Angle)

Unwrapped angle. An example is worth a thousand words. Three channels taken from an oval session: speed, heading angle (decreases as the track is counterclockwise, jumping from -180 to 180 while crossing the southwise direction), unwrapped angle (keeps decreasing lap after lap).

4.6.3.8 Available Advanced Logics Functions

COND_VALID_AT_LEAST - COND_VALID_AT_LEAST(ConditionChannel, TrueOrFalse, AtLeast, InLen)

This function outputs 1 if the given condition is true (you can also choose false) for at least a given number of samples in a given samples number, say 2 samples in 5 total samples.

BISTABLE - BISTABLE(StartTrueOrFalse, RaiseConditionChannel, FallConditionChannel)

This function makes, upon a starting value, a positive step every time the rase condition channel is non zero, and a negative step every time the fall condition channel is non zero.

EDGE_COUNTER - EDGE_COUNTER(ConditionChannel, RisingOrFallingOrBoth)

This function simply counts (and accumilates) how many times you have an edge in the given channel. The edge can be: raising, falling or both. You can use it for example to compute how many gear shift you do: EDGE_COUNTER("Gear", Both).

LAP_EDGE_COUNTER - LAP_EDGE_COUNTER(ConditionChannel, RisingOrFallingOrBoth)

This function behaves exactly like the EDGE_COUNTER function, except that it resets the count at every lap (passage on start/finish line).

4.6.3.9 Available Trigonometry Functions

The purpose of the following lines is not to explain trigonometry, but to detail that you can pass as argument a numeric value or a channel. SIN, COS, TAN need radians as input, so you need to take care of converting angles from degrees to radians. ASIN, ACOS, ATAN, ATAN2 output radians, so you need to pay attention to angle conversion. Please notice that the difference between ATAN and ATAN2 is that ATAN resolves angles between -90 deg to 90 deg, while ATAN2 resolves from -180 to 180.

Trigonometric ratios are the ratios between edges of a right triangle.

COS - COS(ChanOrValRadians)

Cosine (denoted cos), defined as the ratio of the adjacent leg (the side of the triangle joining the angle to the right angle) to the hypotenuse.

ACOS - ACOS(ChanOrValBetweenMinusOneAndPlusOne)

Inverse of the previous function.

SIN - SIN(ChanOrValRadians)

Sine (denoted sin), defined as the ratio of the side opposite the angle to the hypotenuse.

ASIN - ASIN(ChanOrValBetweenMinusOneAndPlusOne)

Inverse of the previous function.

TAN - TAN(ChanOrValRadians)

Tangent (denoted tan), defined as the ratio of the opposite leg to the adjacent leg.

ATAN - ATAN(ChanOrValBetweenMinusOneAndPlusOne)

Inverse of the previous (TAN) function, working from -90 to 90 deg.

ATAN2 - ATAN2(ChanOrVal_X, ChanOrVal_Y)

Inverse of the previous (TAN) function, working from -180 to 180 deg.

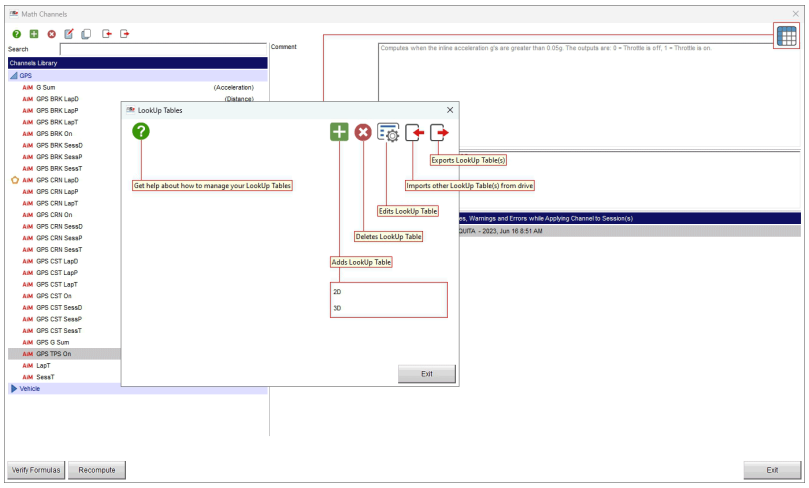
4.6.3.10 Available Custom Purpose Functions

FMI_LIMITER - FMI_LIMITER(RPM, Limit, NOfPoints, Threshold)

F.M.I. asked for this specific function to be added, as it is used in some Moto3 classes.

4.6.4 LookUp Tables

We are introducing here a special functionality of the analysis that is very close to what custom sensors do for the configuration. You can define a "curve" of your own according to which, given the value of one or two channels, you define which value to have as output.



4.6.4.1 2D LookUp Tables

You can imagine the curve, in this case, as a line on a plot, with x as input and y as output.

4.6.4.2 3D LookUp Tables

You can imagine the curve, in this case, as a surface in space, with x and y as inputs and z as output.

4.6.4.3 How To Use LookUp Tables with LogSheets

Define the needed LookUp Tables, in this example there will be two of them, named "A" and "B".

The lookup tables can be simple, what's important is to ensure that all the lookup tables you plan to use share the same functions (for input and output).

Create a math channel that uses a LUT function in its formula but, instead of having a formula like **LUT(A, "RPM")**, that would be perfectly valid, features a formula like **LUT($Engine Model$, "RPM")**.

The first formula will use the lookup table names "A", passing it a channel with name "RPM".

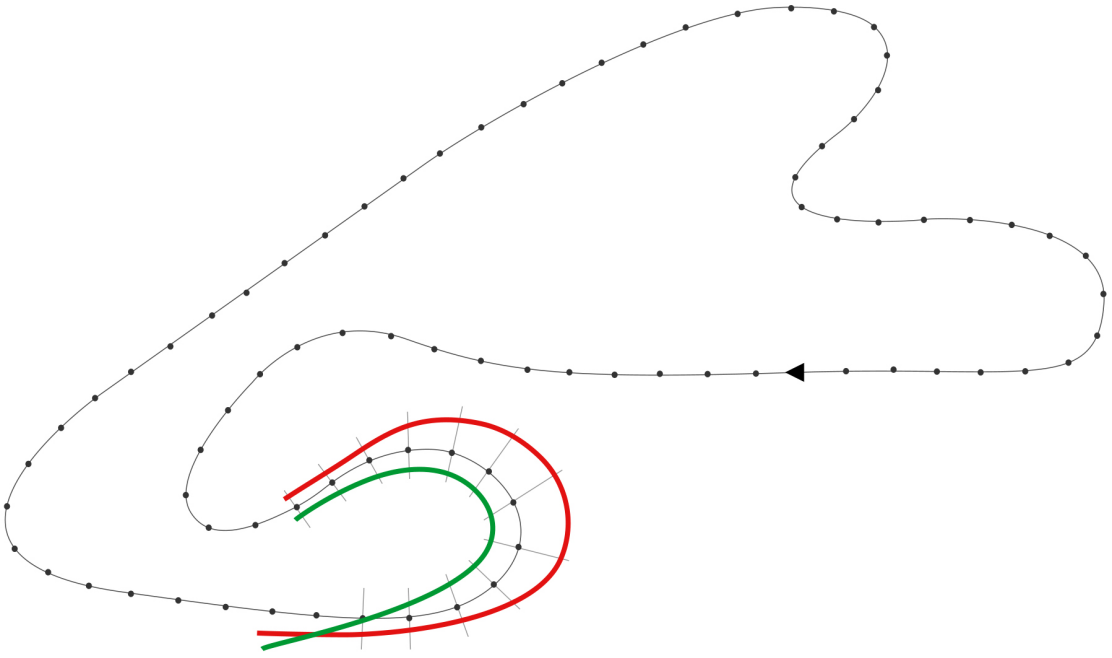
The second formula will pass the "RPM" channel exactly the same way, but it will use what's written into the log sheet item named "Engine Model" as a name for the lookup table to be used.

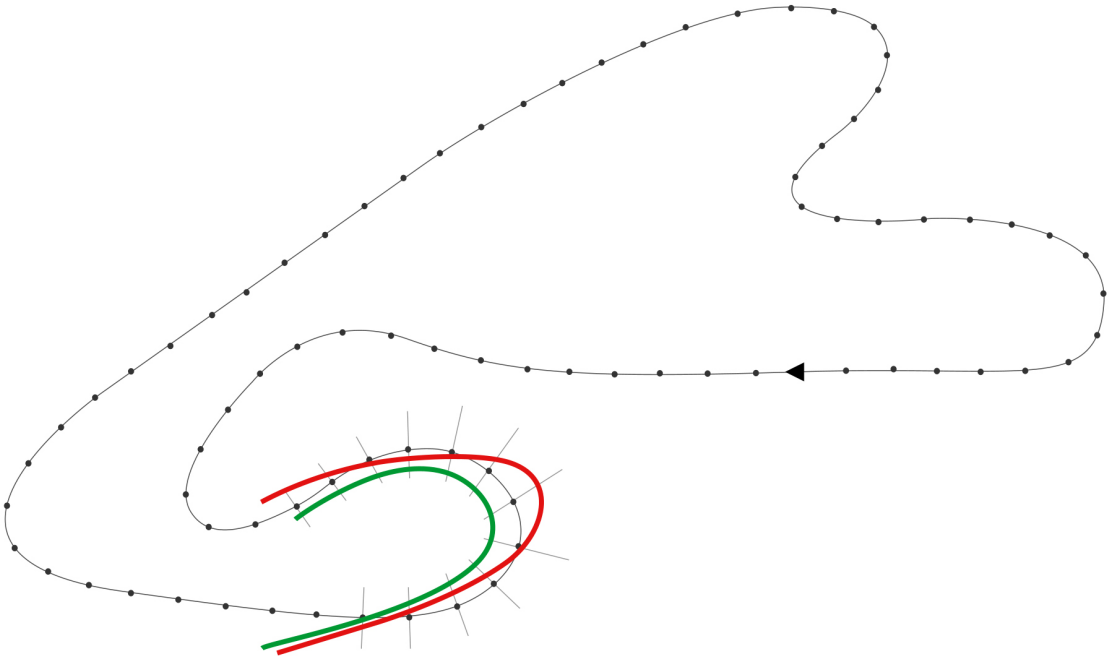
Log sheet items are saved separately for every session, so you can, defining a math channel that is valid for all the sessions, make it behave differently for every session.

4.6.5 DLLs

4.7 Synchronizing your Data

The increasing performances of GPS in the last years and the improvements in our data model allowed us a new feature we called **Smart Synch**. These two images can witness what we're saying here.





Showing linked data and video will be as simple as selecting a lap and moving a cursor in the time/distance plot, in the map or in the video window.

4.8 Track Maps in Analysis

The "Track Maps" button () prompts you some opportunities.

Choose **Track Map and Segments Selector** to open a dialog window that allow you to manually set the track map that's associated to the currently analyzed session. AiM offers you a full feature track database that already includes the very most of the race tracks of the world, so it's very likely that you can find the track matching your driven lines here.

Choose **Create New Track Map** to create a new user track map selecting coordinates from a lap driven in the currently analyzed session. Use this option in case you can't identify any AiM created track map that fits your recorded driven lines.

The menu **Get Help for Track Maps in Analysis** brings you to this help page.

All the other menus give you the possibility of dividing in segments the currently used track map. Please keep in mind that the division in segments affects:

- segments shown in *Time-Distance Panel*
- segments shown in *Track Map Panel*
- segment times in *Split Report Panel*
- channels data for segments in *Channels Report Panel*

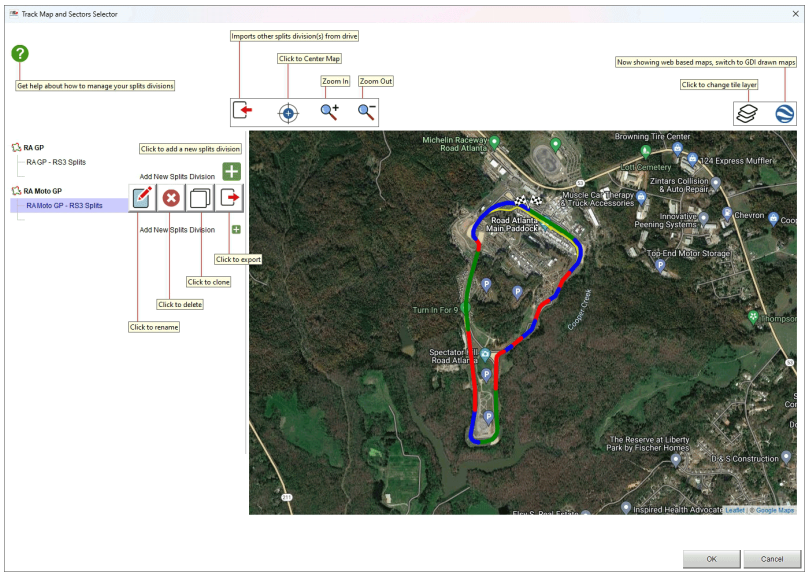
Choose **Set Division to Segments per Corners/Straights** to divide segments according to AiM defaults, hence separating straight lines, left and right corners. This can be handy for separating data according to vehicle behaviour.

Choose **Set Division to to N Segments**, with N from 2 to 5 to divide the track in N segments. This can be handy while coaching, to help the learning process using shorter parts of the track.

Choose **Set Division to Track Splits Segments** to use the exact position of track official splits (when available) for creating segments. This can be handy while comparing your segment times with the ones that will be measured by the officials.

4.9 Split Divisions

Pressing this icon above Track map and sector selector panel is prompted. Here you can manage this division as shown below.



As for any track map you can import the split division from the device, centre and zoom it in/out using the top left keyboard as well as decide the map tile provider and switch among web mapping and GDI drawn map using the top right keyboard.

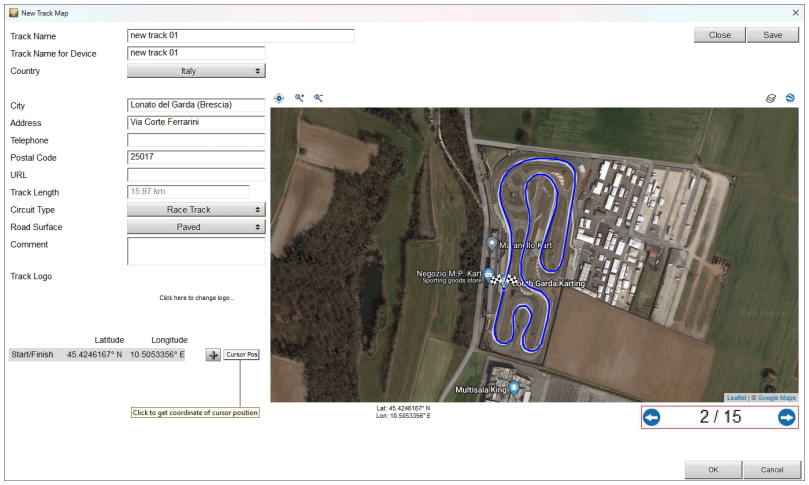
Split division can be renamed, deleted, cloned and exported using the icons that appears mousing over the splits.

Please note: clicking the question mark top left of the software panel you are re-directed to an online software help page.

4.10 Create a New Track Map

Clicking the above showed icon it is possible to create a new track map from available data. Bottom right of the panel all available track laps are shown: scrolling them it is possible to select the one to use to create a track map.

Pressing the bottom left "+" button you can add new splits.



4.11 Data Tech Reports

Say you work in a team with multiple vehicles and/or racers. Take a group of sessions you want to quantitatively compare. For example, all vehicles from a race qualifying or all weekend for a given driver. This report will give you a way to.

Available comparison ranges are: sessions, laps, corner sectors, straight sectors. Apart from sessions, you can compute statistics upon the fastest N laps for every session, or the laps with the fastest N sectors for every session.

Available statistics are: minimum, maximum, average, range, delta, absolute value of average, average when not zero, integral, integral of absolute value.

Statistics can be applied to any channel, any number of channels. A very significative report can be obtained using performance channels like GPS Speed and GPS Accelerations.

For the whole session or the whole lap, performance items can be: session or lap time and any statistics on channels of your choice.

For corners sectors, performance items can be: sector time, any statistics on channels of your choice and, for the braking phase, average deceleration and braking distance as well as deceleration report items like times for speed and the times for distance. The comparison is performed on the fastest N sectors (whatever lap the sectors were made in) or on the fastest N laps of every sector.

For straight sectors, performance items can be: sector time, any statistics on channels of your choice. Also available for straight sensors are the acceleration report items like times for speed and the times for distance. The comparison is performed on the fastest N sectors (whatever lap the sectors were made in) or on the fastest N laps of every sector.

4.11.1 Report Map

The map window, in the left part of the data report window, shows the track map selected for the sessions in the data report itself. It also draws the sectors for corners and straights, highlighting the selected one (if any).

Clicking on a sector, you ease the data report into showing the correct statistics for the sector.

The map can be shown on a GDI background as well as on a web tiled cartography. Look for the map toolbar, right above the map itself. The rightmost icon in the toolbar will allow such a change. The leftmost buttons will instead allow you into zooming, but this operation is more easily available through the mousewheel and through mouse drag.

4.11.2 Report Tabs

The tab window, in the right part of the data report window, shows all the statistics for the data report.

Data report statistics are divided, tab by tab, per session, per lap, per corner sector or per straight sector. The first tab will be weather conditions one, then, according to what you enable, the sessions tab, the laps tab, then all corners tabs and the straights tabs.

Identify and select tabs at the top of the data report window. Click on them to show proper statistics.

Selecting a tab that refers to corner or to a straight, the matching sector will be highlighted on the map.

4.11.3 Report Statistics

All the statistics information will be displayed in the window in the right part of the data report window. Statistics are available accordingly to what you choose in the settings.

For both the whole session and the whole lap, performance items can be: session or lap time and any statistics on channels of your choice.

For corners sectors, performance items can be: sector time, any statistics on channels of your choice and, for the braking phase, average deceleration and braking distance as well as deceleration report items like times for speed and the times for distance. The comparison is performed on the fastest N sectors (whatever lap the sectors were made in) or on the fastest N laps of every sector.

For straight sectors, performance items can be: sector time, any statistics on channels of your choice. Also available for straight sensors are the acceleration report items like times for speed and the times for distance. The comparison is performed on the fastest N sectors (whatever lap the sectors were made in) or on the fastest N laps of every sector.

Basing on session recording time and date, and on session coordinates, a weather conditions window will be added.

Information items can be represented as box plots or normal distribution.

4.11.3.1 Box Plots

Box Plots are a visual picture that compares sets of data for central tendency (location) and variation (process spread). The line segmenting the box represents the median data value. Left and right of the box represent the first and third quartile, respectively. The quartiles represent the 25th and 75th percentile of the data spread. Whiskers extend to highest and lowest samples, given that those samples do not exceed the median value plus/minus 1.5 times the interquartile range. Samples that exceed the whiskers are plotted as outliers, like the following picture.

4.11.3.2 Normal Distribution

The gaussian bell of the probability density function is built on sampled data, the three vertical lines being average value, plus/minus the standard deviation.

4.11.4 List of Available Reports

Please identify, at the top of the list window, the main toolbar.

Apart from the leftmost button that lead you to this documentation page, you'll see a button for importing a previously exported data report (that anyone could be sharing with you).

Other buttons will appear directly over the list items, to delete or export the items itselves. In this case, the action triggered by the buttons is made on the clicked data report list item.

As special bottom list item, you'll find the new report creation button.

Two AiM default reports will be built by RaceStudio 3 and constantly refreshed at every RaceStudio 3 restart. This to guarantee you always have a reference point to start from. Don't please customize them otherwise your modifications will be lost: save them with a different name to keep your settings.

4.11.4.1 Create a New Data Report

This button will prompt you another window, in which you'll be choosing which elements will appear in the data report you're creating.

4.11.4.2 Delete a Data Report

This button will, upon confirmation window, delete the selected data report.

4.11.4.3 Edit a Data Report

This button will prompt you another window, in which you'll be choosing which elements will appear in the data report you're editing.

4.11.4.4 Import a Data Report

This button will prompt you the Windows (TM) file selection window. Data reports in selected files will be imported for use in RaceStudio 3.

4.11.4.5 Export a Data Report

The selected report will be exported by default to "<user documents>/AiM-RS3-Exports/DataReports" folder. Upon finish, a Windows (TM) Explorer window will be opened on this folder.

4.11.4.6 Hints

How to duplicate a report? Just edit it, insert a new name and click OK.

4.11.5 Report Settings

The report settings window is basically made of the list of all the available data report items.

List items are divided in the usual sections: sessions, laps, corners, straights.

Within sections, every list item will be possibly having: *enable* flags, *delete* buttons, *edit* buttons.

Upon a click on any of these buttons, you will be prompted a window showing you all possible settings for the specific item. A doubleclick on the list item will default to being a click on the edit button.

At the bottom of every section, a *add new* item button will be available.

All the items will have an item name and a comment string, that will be shown in the data report.

Some of the items can be enabled directly flagging their checkbox in the list. For these, in the item settings window only the name and the comment strings are available.

Others must be specifically added, these latter being mainly analysis channels report items. For these kind of items you must be choosing a channel (picking names from loaded sessions ones) and you must be picking an operator among those available in analysis channels report function.

In common, there's the elapsed time to complete the session, lap or sector.

Corners sectors feature specific items for braking analysis and deceleration report. This kind of analysis is available only if you have GPS data. The braking phase will be identified from the highest speed point to the lowest speed point in the sector.

Straight sectors feature two specific items for acceleration report: the times to speed and the times to distance.

In RaceStudio 3 Analysis home view is "Reports" function; it allows to make a quantitative analysis of different performances (vehicle or pilot) and can be applied to different vehicles of a team or to the same vehicle for an entire week end. Using this report you can compare selected channels values for the entire laps or for different track part (corners and straights). Most useful reports are these referred to GPS Speed and GPS Acceleration.

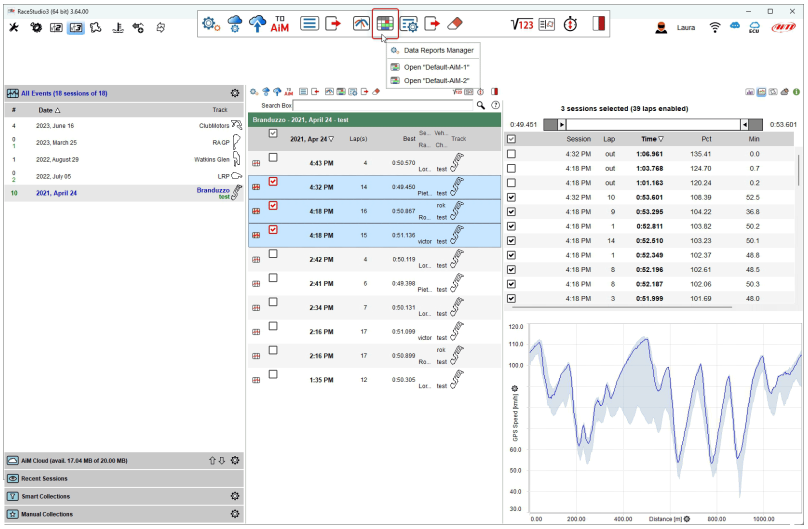
Available statistics are: min/max/average values, range, delta, absolute value of average, average when not zero, integral and integral of absolute value. You can also decide to see the values for entire laps only as well as for desired track sectors.

The comparison can be made for all laps or for a selected number of best laps, for laps with best splits or considering a fixed percentage around best lap.

By default RaceStudio 3 Analysis software provides two samples of reports named "Default AiM-1" and "default AiM-2".

To enter Reports Manager:

- Select the sessions you want to see the report of
- Click the above reported icon in the software main page
- Select the report you prefer or choose "Data Reports Manager" to add a new one.

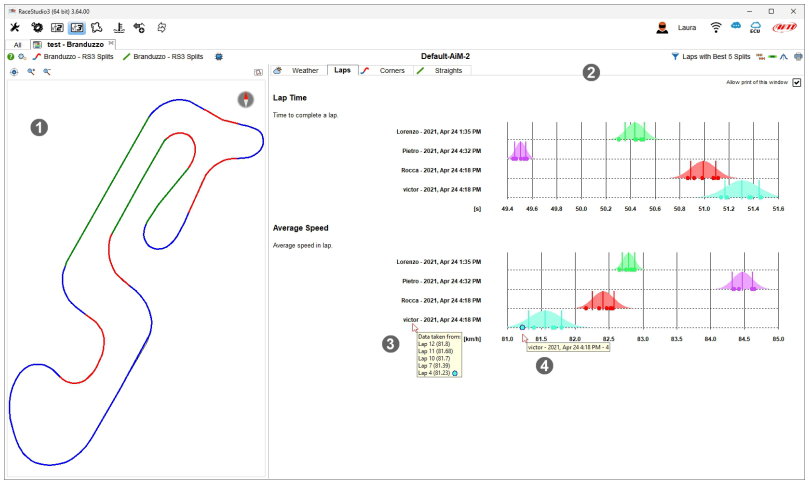


The software enters Reports page view. In the example below we selected "Default-AiM-2" example.

The view below shows:

- track map CDI mode on the left (**1**)
- report on the right (**2**)
- mousing over the report view a tooltip showing which data are taken is prompted (**3**)
- mousing over the graph right of the report a tooltip for each point of the graph is prompted (**4**).

Each part of the view can be customized as we will explain in the following pages.



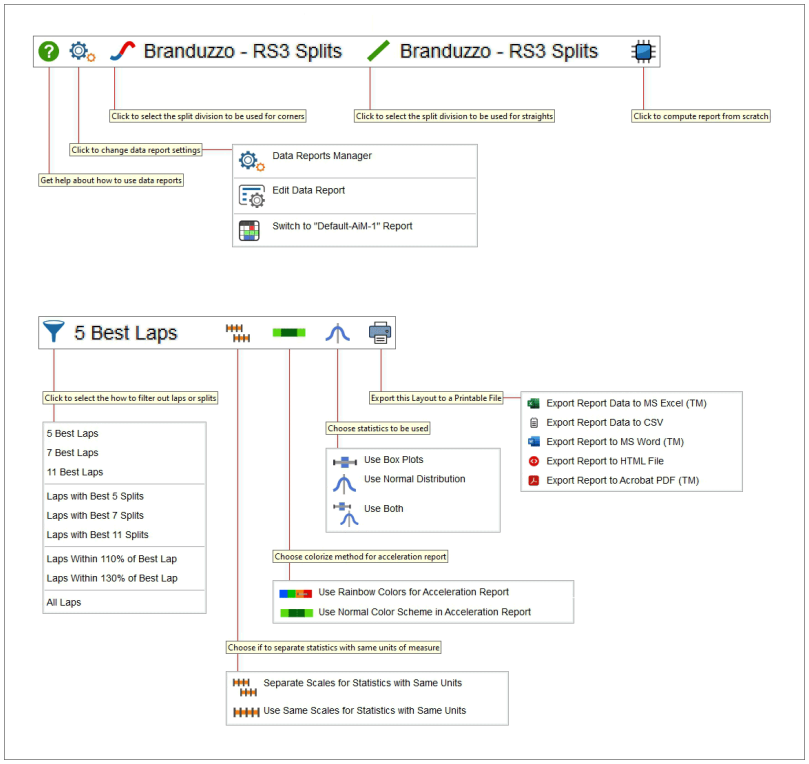
Top left and top right of Report view are two toolbars.

We start from **the left toolbar** (top one in the image).

- through the **question mark** you are redirected to an online help page
- the **setting icon** allows you to manage the reports, creating a new one included, edit the current report or switch among different reports
- **corners** and **straight** split division used for the report are these you previously created or default ones
- through the **scratch** icon you can reset the report computation.

Right toolbar (**bottom** one in the image):

- through the **funnel icon** you can select the laps or the range of laps to be used for the report
- **right of it is the icons that allows you to decide whether keeping the same scales for similar statistics a**
  for acceleration report
- graph can use normal **distribution**, box plot or both and data can be exported in different format through the **printer icon**.



4.11.6 Managing, creating and editing a data report

RaceStudio 3 software provides two Reports sample named "Default-AiM-1" and "Default-AiM-2" and allows you to import others from a drive as well as create new ones.

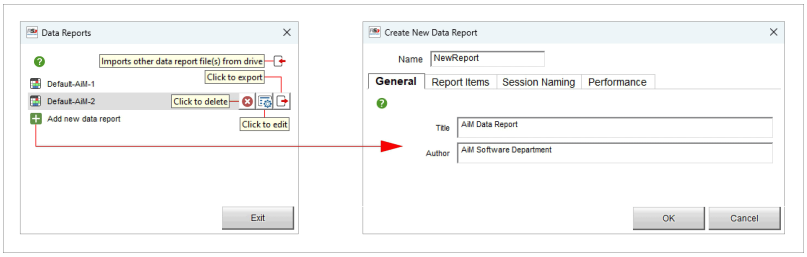
To **choose a default report model**:

- press the above reported icon
- select "Data Report Manager" item
- select the desired model in the panel that is prompted

Please note: mousing over the available reports some icons allowing you to edit, export and delete them are prompted; moreover using the top right icon on "Data Reports" panel you can import data reports from a drive

To **add a new report**:

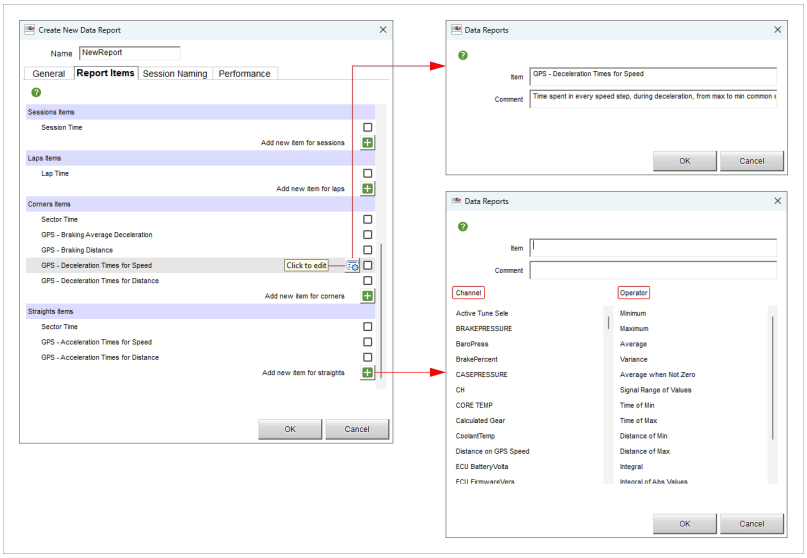
- press the above reported icon
- select "Data Report Manager" item
- **select "+" icon in the panel that is prompted and a new panel is shown: fill in "Title" and "Author" ar**
  in the following pages.



"**Report Items**" tab includes Sessions, Laps, Corners and Straight Items. They can be enabled with the related checkboxes or added pressing "+" icon.

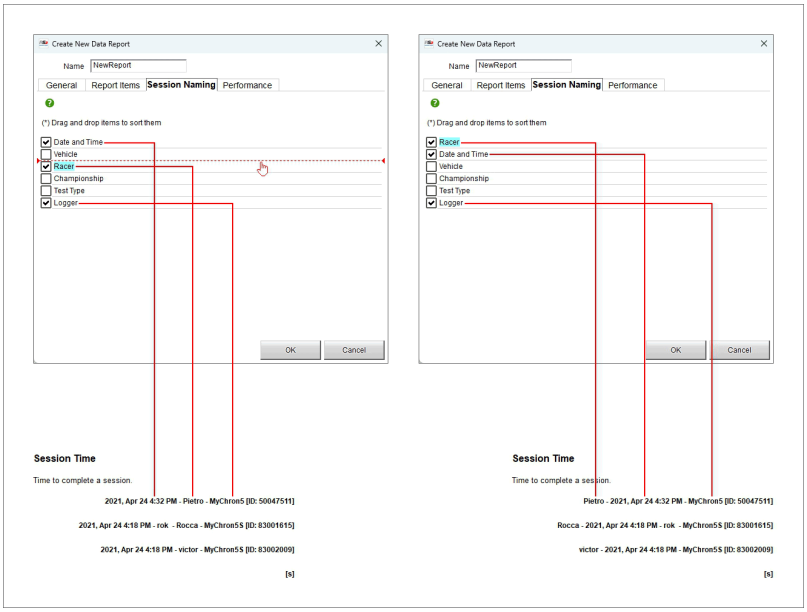
Adding a new channel the corresponding setting panel is prompted:

- fill in Item name and comment
- select the channel on the left and the operator on the right of the panel as highlighted below
- press "OK"



"**Session naming**" tab

Each session can be named using pre-defined fields you can enable/disable and displace in the dedicated tab. After having enabled the voice you want to use drag and drop it in the desired position and the session name will be changed as shown here below.



4.11.7 Unmatched Channels

When you create and save a report, you go picking channels from a given session or a set of sessions.

When you open a previously created session and you're using a different sessions set, it might happen that RaceStudio 3 is not able to identify, in the used sessions set, the correct channels.

In the unmatched channels window there's a left list with all the unmatched channels. Selecting a row in this left list the right list gets populated with all the possibile sessions channels that best match the chosen channel on the left.

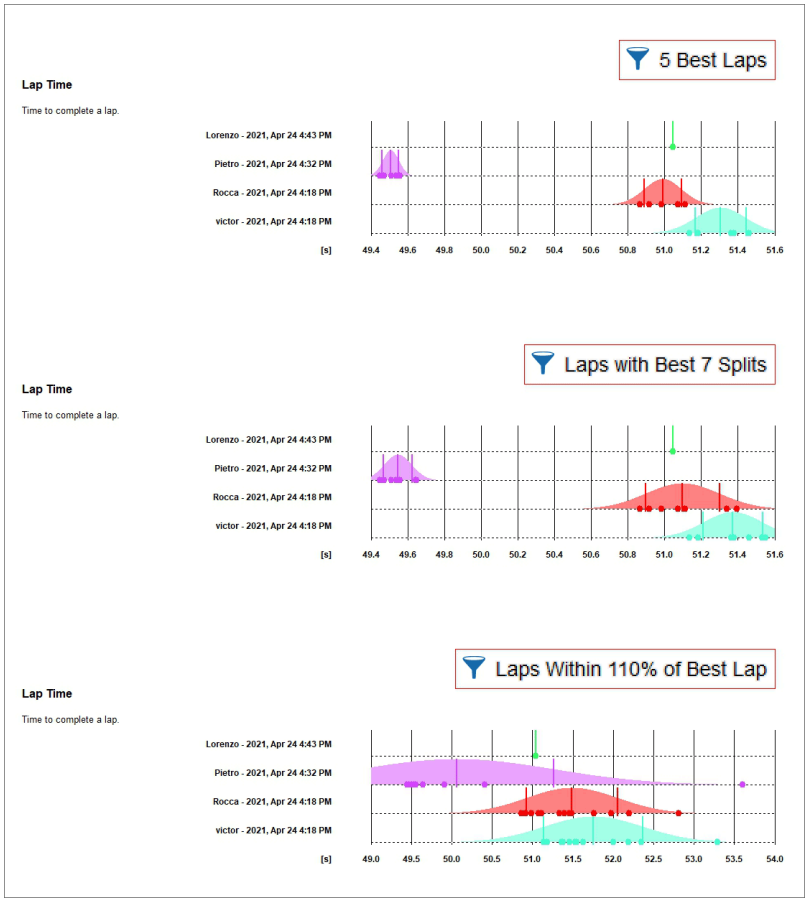
You just need to go through all the channels in the left list and pick a channel on the right. This way the report can be correctly populated. Otherwise there could be some report statistics that are not populated.

You can access the unmatched channels window only if there are any unmatched channels in the data report, through a dedicated icon in the data report main toolbar.

4.11.8 Filtering data for laps and splits report

As shown here below, using the above reported icon it is possible filter data to be used for the report. Available options are:

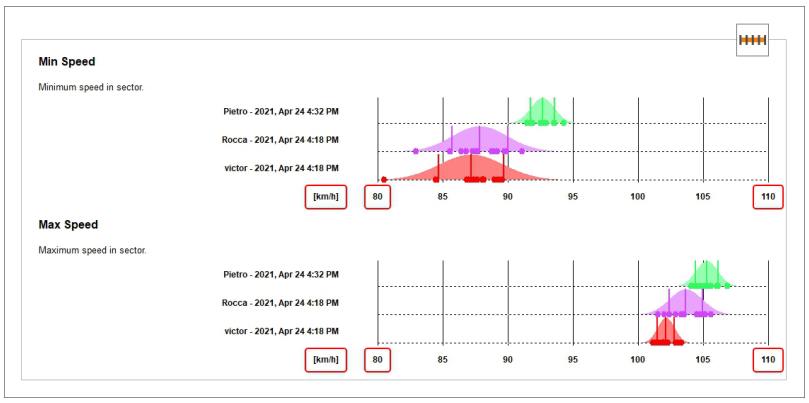
- 5, 7 and 11 best laps
- Laps with best 5, 7 and 11 splits
- Laps within 110% or 130% of best laps
- All laps

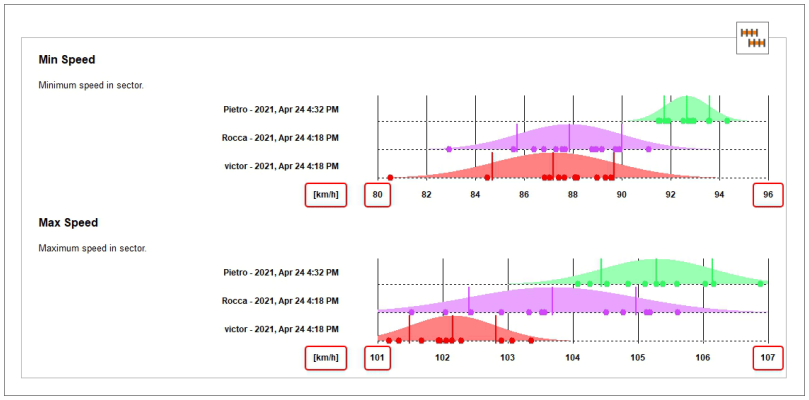


4.11.9 Management of scales for statistics with same units

Using the above reported icons the graphs can have on the x axis:

- the same scales for statistics with the same units (top in the image below) or
- different scales for statistics with the same units (bottom in the image below)

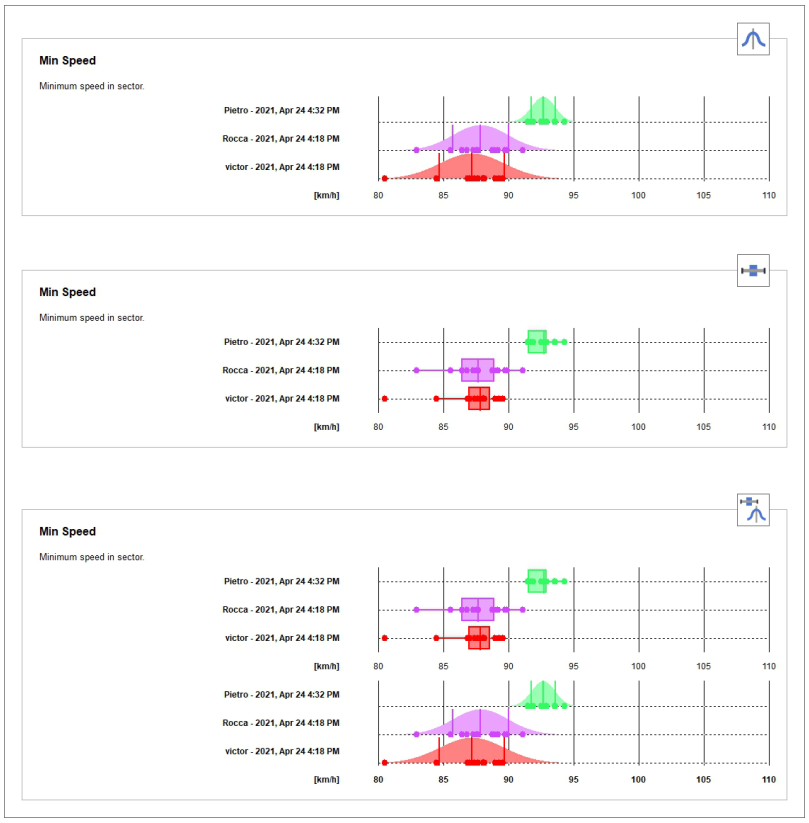




4.11.10 Choosing the statistics to be used

Using the above reported icons (from left to right normal graph, box plot, both) it is possible to represent data with different graphs:

- **normal graph (top): using sampled data a gaussian bell of the probability density function is built; the** average value, plus/minus the standard deviation
- **box plot (central): are a visual picture that compares sets of data for central tendency (location) and v** the line segmenting the box represents the median data value; left and right of the box are first and third quartile, respectively; quartiles represent 25th and 75th percentile of the data spread while whiskers extend to highest and lowest samples, given that those samples do not exceed the median value plus/minus 1.5 times the interquartile range; samples exceeding the whiskers are plotted as outliers
- **Both (bottom)**



4.11.11 Report Sessions Naming

You can customize the way RaceStudio 3 associates a name to every session.

Flag a field to use it, unflag it not to.

Drag and drop the fields so to sort them, top fields will be used first.

Please be careful to the fact that improperly choosing fields you could be getting duplicated names, that is the same name for two sessions. For example: if you choose the only racer name as session naming fiels, and you then select two sessions from the same racer, the two sessions will share the same name.

You can access the session naming window through the leftmost options button in the main data report toolbar, together with main report settings.

4.11.12 Preliminary Work

Using RaceStudio 3 Analysis, you need to build two "splits divisions", as RaceStudio 3 Analysis calls them, one for corners, one for straights. Each of these will be useful to generate a part of the report.

When you select a name for the splits division, remember that inserting the words "Corners" and "Straights" in the splits division name will make the report select them automatically. Also, in case you need several reports for several classes, using the "Championship" field as class name in the download window, and using the class name in the splits division name will make the report select the correct splits divisions automatically. For example, if you have a class name like "XS" and you create two splits divisions named "XS - Straight" and "XS - Corners" will help the report selecting them automatically. Normally one (only) division is needed for many if not all classes, so name them at your will, following the example in the screenshots right above here. The ideal way of tuning the splits divisions is to select the best 5 (or N) laps of all the needed sessions and to show the within the Time-Distance plot.

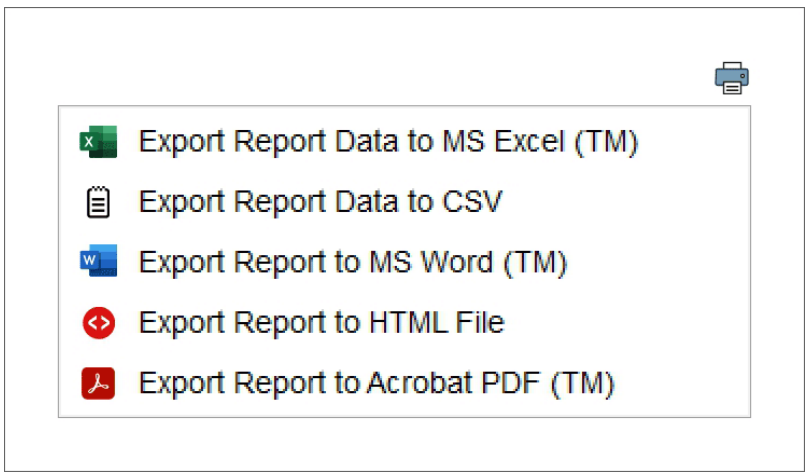
For corners, the parts that will be used of the division are the "not green". Tune them so to start before the maximum speeds and to finish after the minimum speeds, for all laps.

For straights, the parts that will be used of the division that will be considered are the green ones. Tune them so to start before the minimum speeds and to finish after the maximum speeds, for all laps.

4.11.13 Exporting data reports to printable files

All reports can be exported in different formats, to say:

- Microsoft Excel[™]_ (exports report data)
- CSV (exports report data)
- Microsoft Word[™]_ (exports a printable file)
- HTML (exports a printable file)
- Adobe Acrobat[™]_ PDF (exports a printable file)



Choosing the export command you will be prompted several export possibilities. Basically Excel(TM) and CSV ones will export the data, while all others, like Word(TM) or PDF, will export a printable report. The export will work through two external applications that needs to be downloaded separately. Such a download operation will be managed and guided by RaceStudio 3. The first application is needed to export in Word(TM) or HTML format. It is a simple executable merely copied into RaceStudio 3 install folder. The second application is needed to create PDF files. It will need to be installed on the PC. RaceStudio 3 will, upon user confirmation, download the installer and launch it, but users will need to go through the installer completion by themselves.

4.12 Analysis Examples

Chapter 5

Tracks for Analysis and Devices

Any of us may know that a 'track' is a racing location anywhere in the world. In the AiM world a track is a model built upon a race track, where 'model' means that we take some information on the track and we use such information to make computations while racing.

Computations for the firmware side could be, for example, measuring lap times upon crossing a start/finish line stored in the track file.

Computations for the RaceStudio 3 Analysis side could be, other than the obvious lap times, synchronizing different laps and allow a time comparison among different laps/racers/trajectories.

The model is a description of important information of the track itself. Let's make a list of all the information available.

- Start/finish lines position
- Possible splits position
- Driven line
- Time zone and daylight saving time

These last two pieces of information need a dedicated explanation, please read the *Time Zone and DayLight Saving Time (DST)* paragraph.

Note:  AiM Tech Tips short video, held by Bryc Talley, named "Managing Tracks". Click here to open the August 5th, 2024 video.

The tracks manager is a database, the window of which is vertically divided in three parts: left, center and right.

The left part is the 'filtering' part, in which you can drive a subset of tracks to be shown instead of the complete list. From top to bottom in the column, you find: all tracks, nations, smart collections, manual collections, connected devices. This last 'connected devices' item will be described in the part dedicated to devices.

The center part is a tracks list, in which, by default, all tracks are shown. For each track you're prompted the most important information, and there are buttons for the main operations you can do on tracks.

The right part is a detail window for the track your mouse cursor is currently over. This part of the window shows a detailed track shape and allows for weather forecasts.

5.1 All Tracks

Select this item in the left column and the list of tracks will include all the tracks you ever managed.

At the very first use of RaceStudio 3, all available tracks will be automatically downloaded from AiM server. You just need to wait for the automatic procedure to complete.

5.2 Tracks of Specific Nations

Select any nation item in the nations list and the list of tracks will include all the tracks for that nation.

5.3 Tracks in Smart Collections

You can create collections of tracks you want *RaceStudio 3* to group for any given reason. The way to do this is add a smart collection in this part of RaceStudio 3. Once you create a collection, selecting it in the left list will have RaceStudio 3 show in the tracks list all the tracks that match the selection criteria.

5.4 Tracks in Manual Collections

You can create collections of tracks you want to *manually* group for any given reason. The way to do this is add a manual collection in this part of RaceStudio 3. Once you create a collection, selecting it in the left list will have RaceStudio 3 show in the tracks list all the tracks you put in the collection itself.

5.5 List of Tracks

Let's now go through all the buttons over the list of tracks in order to see all the operations that you can do.

- **New/Delete** to add or remove a track, take care that 'new' will add a track from scratch, you can also get a copy of an AiM track opening it and saving any modification on it.
- **Import/Export** to add a track copying ir from an external drive, or to export a track copying it into an external drive.
- **Receive/Transmit** to add a track copying it from the device, or to transfer a track to the device.

The tracks list feature also a search bar to refine the list of shown tracks against:

- track long name contains
- track short name contains
- track city begins with

You can enter multiple words in the search bar, selecting if you want either of the above criteria matching ANY of these words or ALL these words.

5.5.1 Web based maps

Web based maps allow you to show driven line data on a nicer base, the former track base always being available in case no internet connection is available. You can also try different tile providers.

5.5.2 Time Zone and DayLight Saving Time (DST)

The time zone of a track never changes, or is supposed to change very rarely. The DST Information is, when a track file is saved, made available for the next 10 years.

These information are used by AiM devices to automatically set device date and time after synchronizing with the GPS clock. This way your device will always set the correct local time into any logged file.

In case you turn your AiM device ON and you're not nearby a track, the device will use the time zone and DST information from the closest track it has loaded.

It is extremely important to update the track database of RaceStudio 3 and to update all of the tracks on your AiM devices.

You can send all/many tracks in the RaceStudio 3 database to your AiM device, this does not make it slower in identifying the currently used track.

In the case of a facility having multiple track configurations (Buttonwillow CA as an example) you can manually select the track configuration on your AiM device.

5.5.3 Track Preview for the Track under Mouse Pointer

A number of important information on the track shown in a preview window. Of primary importance: time zone and local time at the track, website and phone number.

Virginia International Raceway

Track Name on Device: VIR Full Alt

1245 Pine Tree Road - 24520 - Alton

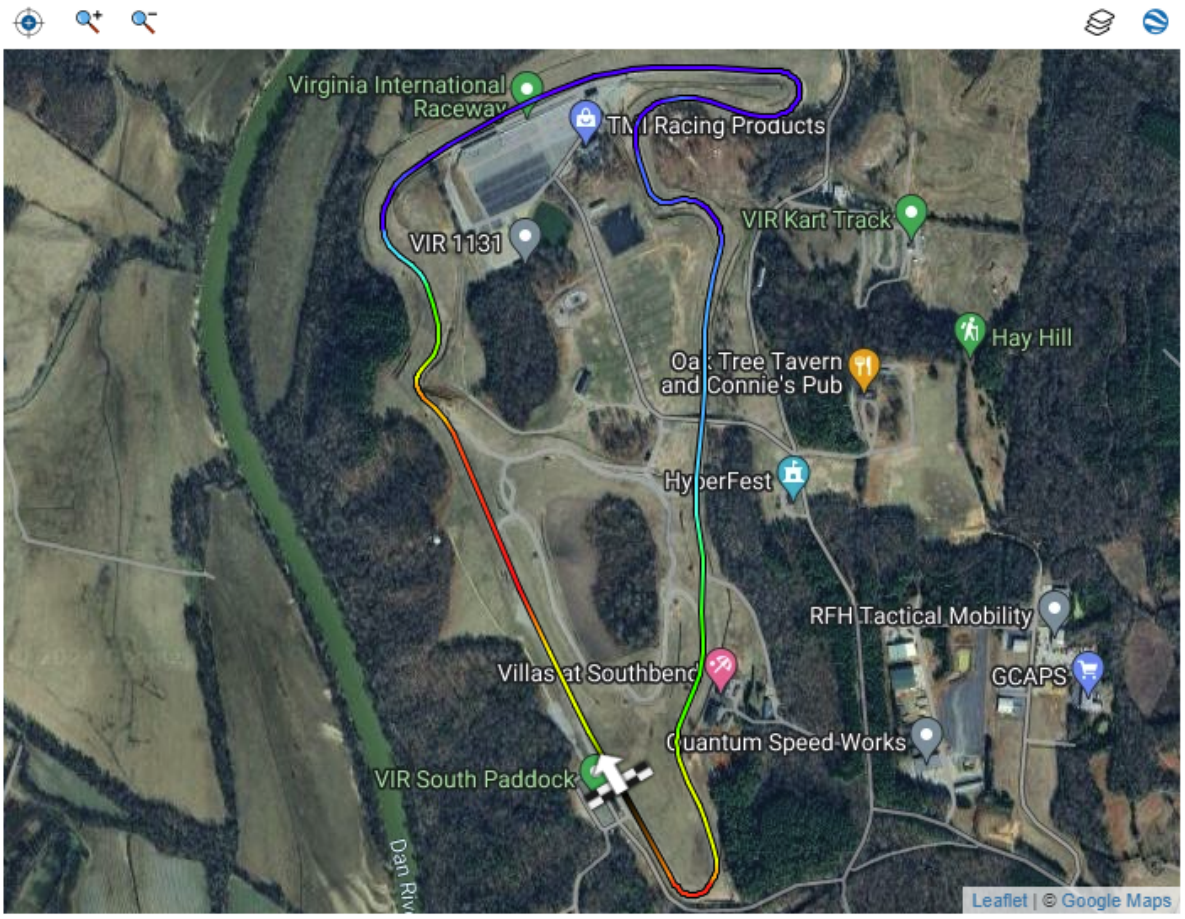
Virginia, United States

+1 434 822 7700

https://virnow.com

Time Zone: (UTC-05:00) Eastern Time (US _Canada) (EDT)

Local: 2024, Jul 29 9:02 AM (DST currently ON)

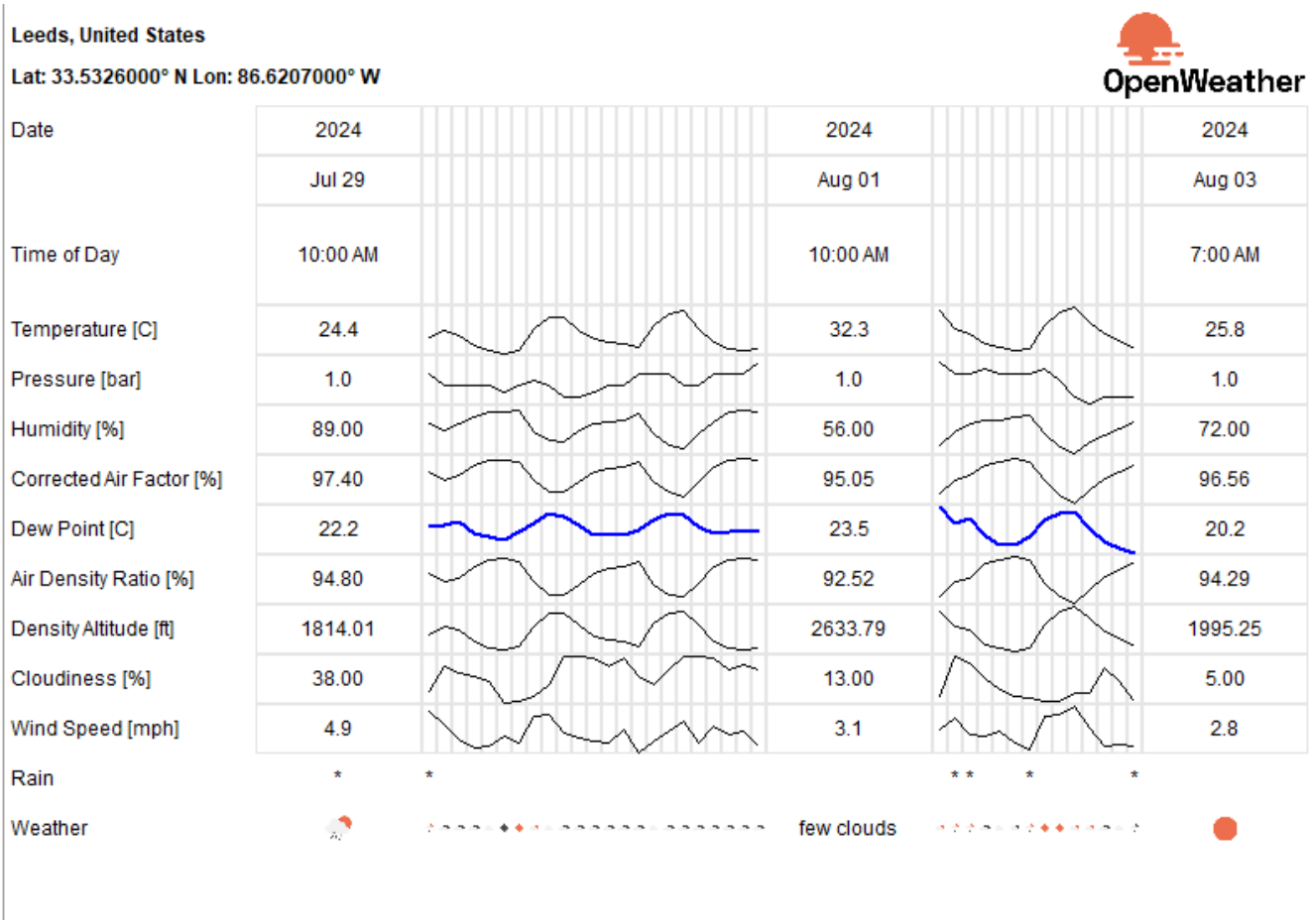


	Latitude	Longitude
Start/Finish	36.5539990° N	79.2066680° W

Nice to have, as shown in the above picture: a color line, with colors indexed on GPS altitude.

5.5.4 Weather Forecast

Up to three days from when you see them, all main parameters from weather forecasts. In the leftmost colum you'll see the forecast start time, in the rightmost one the finish time, in the middle a graphical representation with a values column shown under the mouse pointer.



To use this feature you need to log RaceStudio 3 in to your AiM account, see the *Registration, Feedback and Support* paragraphs of this manual.

5.5.5 Track Creation Process

To create a new track, the minimal information you need to have is the position of start/finish lines. You can improve your track with the driven line, taking it from any logged session.

Chapter 6

Custom Sensors

While managing configurations, you've surely seen that every channel needs information about which sensor is used to log data. The 'sensor' is a description of how a physical quantity is transduced into an electrical quantity (either a resistance or a voltage), being such an electrical quantity the information the AiM device can manage and log.

AiM supplies a rather complete set of sensors, but you, as a user, can decide that AiM supplied sensors don't match your needs, and you can define yours: the 'custom sensors'.

Note: AiM Tech Tips short video, held by Bryc Talley, named "Custom Fuel Level Sensors". Click here to open the August 26th, 2024 video.

The custom sensors manager is a database, the window of which is vertically divided in two parts: left and right.

The right part is a custom sensors list, in which, by default, all custom sensors are shown. For each custom sensor you're prompted the most important information, and there are buttons for the main operations you can do on custom sensors.

The left part is the 'filtering' part, in which you can drive a subset of custom sensors to be shown instead of the complete list. From top to bottom in the column, you find: all custom sensors, sensor types, manual collections.

6.1 All Custom Sensors

Select this item in the left column and the list of custom sensors will include all the custom sensors you ever managed.

At the very first use of RaceStudio 3, selecting this item will always generate an empty right list. Click on the 'New' button to create a new custom sensor or on the 'Import' button to add a custom sensor from a drive.

6.2 Custom Sensors of Specific Physical Quantities

Say you create, or you import, custom sensors for two/three different physical quantities, this left list will be populated with a row for every physical quantity.

Select any physical quantity item in the physical quantities list and the list of custom sensors will include all the custom sensors you ever managed for that physical quantity.

6.3 Custom Sensors in Manual Collections

You can create collections of custom sensors you want to group for any given reason. The way to do this is add a manual collection in this part of RaceStudio 3. Once you create a collection, selecting it in the left list will have RaceStudio 3 show in the custom sensors list all the custom sensors you put in the collection itself.

6.4 List of Custom Sensors

Let's now go through all the buttons over the list of custom sensor in order to see all the operations that you can do.

- **New/Delete** to add or remove a custom sensor.
- **Import/Export** to add a custom sensor copying ir from an external drive, or to export a custom sensor copying it into an external drive.
- **AiM Support** to send a custom sensor to AiM support service, requesting for explanations.

Chapter 7

Custom Protocols

While managing configurations, you've surely seen that the devices can log data coming from ECU streams, given the protocol the ECU streams with. The 'protocol' is a description of how all ECU channels are encoded into the stream.

AiM supplies a rather complete set of protocols, but you, as a user, can decide that AiM supplied protocols don't match your needs, and you can define yours: the 'custom protocols'.

The custom protocols manager is a database, the window of which is vertically divided in two parts: left and right.

The right part is a custom protocols list, in which, by default, all custom protocols are shown. For each custom protocol you're prompted the most important information, and there are buttons for the main operations you can do on custom protocols.

The left part is the 'filtering' part, in which you can drive a subset of custom protocols to be shown instead of the complete list. From top to bottom in the column, you find: all custom protocols, manufacturers, manual collections.

7.1 All Custom Protocols

Select this item in the left column and the list of custom protocols will include all the custom protocols you ever managed.

At the very first use of RaceStudio 3, selecting this item will always generate an empty right list. Click on the 'New' button to create a new custom protocol or on the 'Import' button to add a custom protocol from a drive.

7.2 Custom Protocols of Specific Manufacturers

Say you create, or you import, custom protocols for two/three different manufacturers, this left list will be populated with a row for every manufacturer.

Select any manufacturer item in the manufacturers list and the list of custom protocols will include all the custom protocols you ever managed for that manufacturer.

7.3 Custom Protocols in Manual Collections

You can create collections of custom protocols you want to group for any given reason. The way to do this is add a manual collection in this part of RaceStudio 3. Once you create a collection, selecting it in the left list will have RaceStudio 3 show in the custom protocols list all the custom protocols you put in the collection itself.

7.4 List of Custom Protocols

Let's now go through all the buttons over the list of custom protocol in order to see all the operations that you can do.

- **New/Delete** to add or remove a custom protocol.
- **Import/Export** to add a custom protocol copying ir from an external drive, or to export a custom protocol copying it into an external drive.
- **Authorizations** to manage all possibile passwords that protect your intellectual property.

Chapter 8

Devices

In this part of RaceStudio 3 you will see and manage all the AiM devices the PC is connected to.

Note: AiM Tech Tips short video, held by Bryc Talley, named "Downloading Data". Click here to open the August 9th, 2024 video.

** Under Construction **

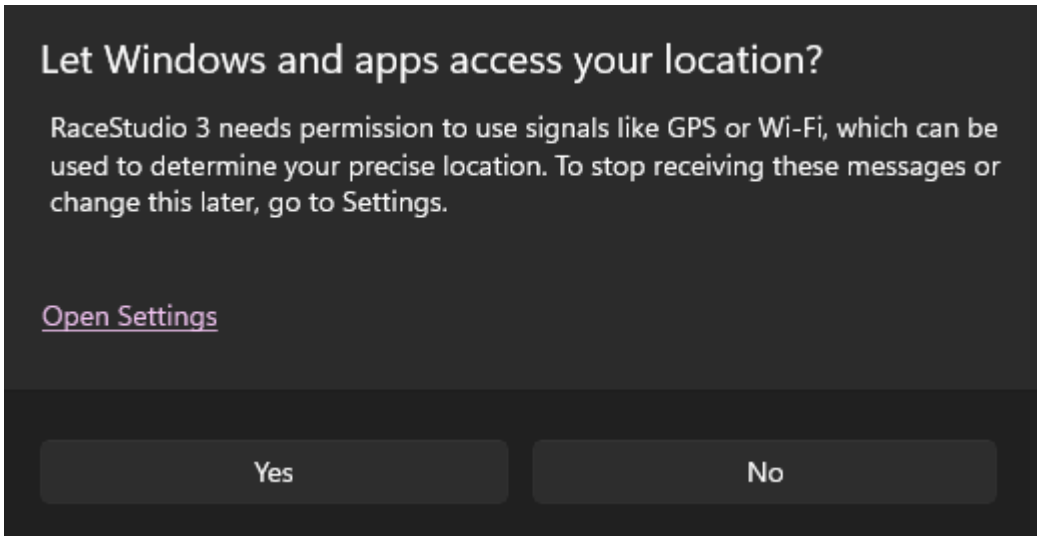
Chapter 9

Wi-Fi Networks

In the following lines we will be describing how to use this toolbar button to connect your PC to AiM devices.

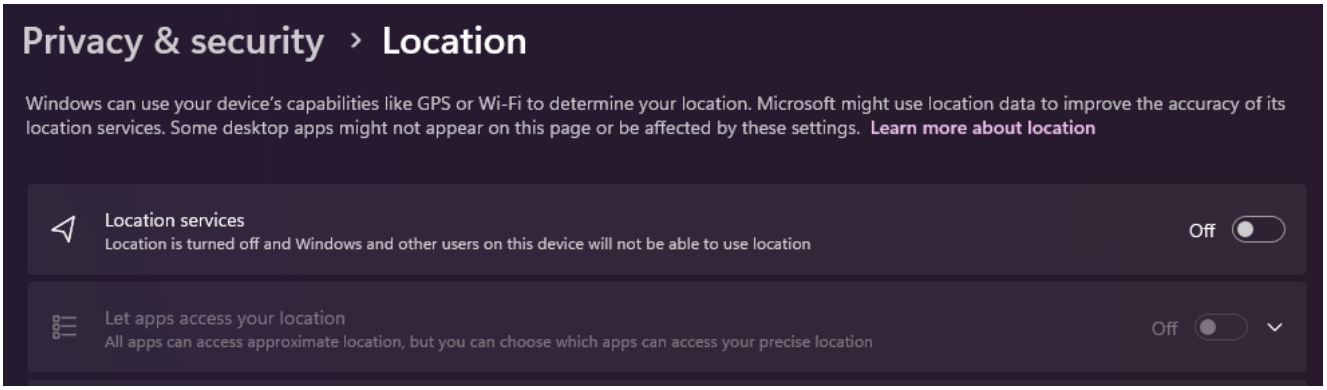
9.1 Possible Issues using Windows 11 - 24H2

After the update to Windows 11 (24H2), you'll find that the operating system added new privacy controls.

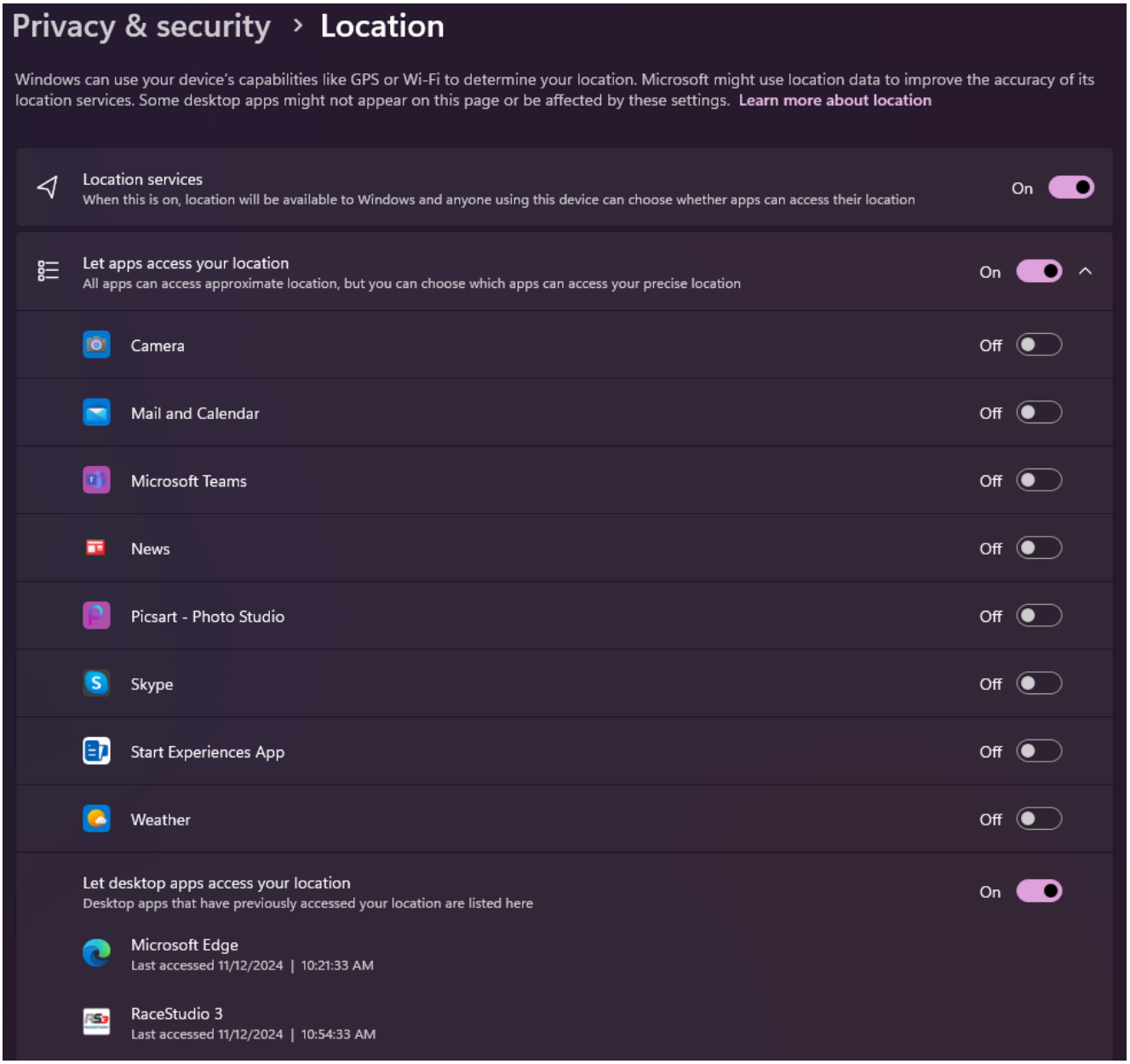


As a consequence of this, taking from Microsoft web pages: "access to APIs that provide the necessary Basic Service Set Identifiers (BSSIDs) will be restricted to only those apps that the user has configured as being allowed to access the user's precise location. That consent to use the Location service is configured in Windows Settings > Privacy & security > Location."

Entering system settings, you'll need t enable three options, the third of which is nested into the second one.



Please enable the settings that are enabled into the following picture.



Chapter 10

Web Updates

There are a lot of components, of the firmware and of the software, that can be updated. The update process is managed in this part of the software.

Updates need to be copied from the AiM server to the local PC drive. Updates for firmware need to be tranmitted to the AiM devices.

Note: AiM Tech Tips short video, held by Bryc Talley, named "RaceStudio3 Download and Update". Click here to open the August 15th, 2024 video.

Note: AiM Tech Tips short video, held by Bryc Talley, named "Updating MyChron5". Click here to open the August 14th, 2024 video.

At the top left corner of the page, look for two separate tabs: Firmware and Display. They refer to the two main things that can be updated.

10.1 Updates for Firmware and Software

This window is vertically divided in two parts: left and right.

The left part features the list of connected devices.

The right part is the list of all latest software and firmware versions available on AiM server, for all the AiM devices.

Let's see all the buttons in the top toolbar: download updates, install sw, export/import, update device.

10.1.1 Download Software and Firmware Updates

After selecting the devices you want the firmware of, the download button starts the download process.

The first time you enter the Web Updates page, all the rows of the list will be enabled b default. Every time AiM publishes a new version, this list will enable the newly available ones.

Take care that the download process is separate from the update process, that needs to be manually triggered.

10.1.2 Export and Import Updates

Through this operation you can copy an update to or from an external drive.

10.1.3 Install a New RaceStudio 3 Version

The 'Install SW' button launches the most recent RaceStudio 3 installer downloaded on the PC.

10.1.4 Update Your Device

The 'Update Device' button copies all the files of the most recent firmware to the user chosen connected device.

10.2 Updates for Display Resources of Configurations

The graphical resources for AiM devices are the feature that weigh the most among all the stuff that AiM distribute online. All these graphical resources used to be into the installer, this implied that all AiM users, at every update, used to download all the graphical resources of all the devices, even if they didn't use them. Add that the very most of AiM users use a MyChron or a Solo, that don't feature any graphical resource, and it's immediate that most of the users used to download a lot of stuff with a high likelyhood of being unused. hence the decision of having the graphical resources to be downloaded separately.

Let's see all the buttons in the top toolbar: download resources, export/import, download all.

10.2.1 Download Graphical Resources

You can select wether to download all graphical resources of all devices, or the resources of only the ones you want to download the resources of, right after having selected them into the list.

10.2.2 Export and Import Graphical Resources

Through this operation you can copy a graphical resources file to or from an external drive.

Chapter 11

Preferences

In the following lines we will be describing all the configurability of the RaceStudio 3 software itself.

Chapter 12

AiM World

This icon in the toolbar will open a menu that allows you into all AiM world possibilities.

Open AiM website, that triggers your default browser to navigate to AiM main web page.

Stay up to date with AiM Webinars, that triggers your default browser to navigate to AiM webinars page.

Look for an AiM Distributor, that triggers your default browser to navigate to dedicated pages for every continent on Earth.

- Europe.
- America.
- Asia.
- Oceania.
- Africa.

See AiM on FaceBook, that triggers your default browser to navigate to AiM FaceBook page.

See AiM on Instagram, that triggers your default browser to navigate to AiM Instagram page.

See AiM on YouTube, that triggers your default browser to navigate to AiM YouTube page.

See AiM on LinkedIn, that triggers your default browser to navigate to AiM LinkedIn page.

Show ECU Protocols Updates History, that triggers your default browser to navigate to AiM protocols updates pdf.

Chapter 13

Simulator Manager

This is a dedicated piece of software that will allow you to receive a stream of data from a simulator and to stream it along to a connected AiM device.

** Under Construction **

Chapter 14

AiM Video Documentation

14.1 Roger Caddell's Webinars on AiM World

Our USA datadriven teacher Roger Caddell periodically conducts informative webinars and/or lectures on the AiM world.

You can register clicking here. Upon registration you'll receive two remind emails, one 24 hours before the start, another one 1 hour before.

All webinars are available at AiM Sports YouTube channel.

14.1.1 2024 Roger's Webinars

14.1.1.1 Scatter Plots and Log Sheets

Webinar held by Roger Caddell with Matt Romanowski.

Click here to open the September 10th, 2024 video.

14.1.1.2 Using Data to Optimize

Webinar held by Roger Caddell with Chloé Lerin.

Click here to open the August 27th, 2024 video.

14.1.1.3 Detailed Cornering Analysis

Webinar held by Roger Caddell with Ray Phillips.

Click here to open the August 13th, 2024 video.

14.1.1.4 RaceStudio3 Updates

Webinar held by Roger Caddell with Emiliano Bina.

Click here to open the July 30th, 2024 video.

14.1.1.5 A conversation on conquering Pike's Peak

Webinar held by Roger Caddell with Tom Tang.

Click here to open the July 9th, 2024 video.

14.1.1.6 AiM Sports Open Products - For Use with AiM and Non-AiM Systems

Webinar held by Roger Caddell with Bryc Talley and Robbie Yeoman.

Click here to open the June 25th, 2024 video.

14.1.1.7 A conversation on Mazda Series

Webinar held by Roger Caddell with Joshua Smith, Mazda Motorsports Manager, and Justin Cornelison, Spec MX-5 Series Manager.

Click here to open the June 11th, 2024 video.

14.1.1.8 A conversation on 2024 Pikes Peak Racing

Webinar held by Roger Caddell with Tom Tang.

Click here to open the May 28th, 2024 video.

14.1.1.9 1990 Daytona 500 Winner

Webinar held by Roger Caddell with Derrike Cope.

Click here to open the May 14th, 2024 video.

14.1.1.10 SW4: The Power of an AiM Dash at your Fingertips

Webinar held by Roger Caddell with James Colborn.

Click here to open the April 30th, 2024 video.

14.1.1.11 Finding Speed with Data, Universal Goal for All Racers

Webinar held by Roger Caddell with David Smith.

Click here to open the April 9th, 2024 video.

14.1.1.12 Introducing the K8 CAN-Bus Keypad

Webinar held by Roger Caddell with Robbie Yeoman.

Click here to open the March 26th, 2024 video.

14.1.1.13 The Power of SIM Racing Data Analysis

Webinar held by Roger Caddell with Matt Romanowski.

Click here to open the March 12th, 2024 video.

14.1.1.14 AiM Sports and Flagtronics

Webinar held by Roger Caddell with Cameron Buseth.

Click here to open the February 27th, 2024 video.

14.1.1.15 A Conversation with IMSA President

Webinar held by Roger Caddell with John Doonan.

Click here to open the February 13th, 2024 video.

14.1.1.16 Race Studio 3 User Profiles

Webinar held by Roger Caddell with some AiM friends.

Click here to open the January 30th, 2024 video.

14.1.2 2023 Roger's Webinars

14.1.2.1 RaceStudio 3 Updates featuring Suspension Analysis

Webinar held by Roger Caddell with Emiliano Bina.

Click here to open the November 28th, 2023 video.

14.1.2.2 Analog CAN Converter (ACC), Compact Yet Powerful

Webinar held by Roger Caddell with Chloé Lerin.

Click here to open the October 31th, 2023 video.

14.1.2.3 All Systems Go! Properly Preparing for a Big Event

Webinar held by Roger Caddell with Matt Romanowski.

Click here to open the September 26th, 2023 video.

14.1.2.4 Simplify Your Data Analysis

Webinar held by Roger Caddell with Emiliano Bina.

Click here to open the August 29th, 2023 video.

14.1.2.5 How Data is Helpful in a Life of Motorsports

Webinar held by Roger Caddell with Nick Tucker.

Click here to open the July 25th, 2023 video.

14.1.2.6 RaceStudio 3 Data Analysis - Introducing Data Reports

Webinar held by Roger Caddell with Emiliano Bina.

Click here to open the June 27th, 2023 video.

14.1.2.7 RaceStudio 3 Data Analysis - User Interface Top Tips

Webinar held by Roger Caddell.

Click here to open the May 30th, 2023 video.

14.1.2.8 SmartyCam 3 Information and Camera Lineup

Webinar held by Roger Caddell with Robbie Yeoman and Bryc Talley.

Click here to open the April 25th, 2023 video.

14.1.2.9 RaceStudio 3 Data Analysis - Math Channels, Lookup Tables and Log Sheets

Webinar held by Roger Caddell with Emiliano Bina.

Click here to open the March 28th, 2023 video.

14.1.2.10 RaceStudio 3 Data Analysis - Corner Analysis by the Numbers

Webinar held by Roger Caddell with Thijs Veenstra and Matt Romanowski.

Click here to open the February 28th, 2023 video.

14.1.2.11 RaceStudio 3 Data Analysis - Braking and Corner Entry Analysis

Webinar held by Roger Caddell with Ray Phillips.

Click here to open the January 31th, 2023 video.

14.2 James Colborn's Webinars on AiM Software

"James Colborn, a race mad Englishman who loves a bit of data analysis!"

14.2.1 2024 James' Webinars

14.2.1.1 Viewer Requests - Ep.1 - Histogram & Math Channels

Webinar held by James Colborn.

Click here to open the April 7th, 2024 video.

14.2.2 2023 James' Webinars

14.2.2.1 Race Studio Analysis 3 - Export & Import Data Files

Webinar held by James Colborn.

Click here to open the December 16th, 2023 video.

14.2.2.2 Can you compare SIM data with real life data?

Webinar held by James Colborn.

Click here to open the September 17th, 2023 video.

Chapter 15

Frequently Asked Queries

15.1 Technical Specifications for RaceStudio 3 Installation

15.1.1 Operating System

RaceStudio 3 can be installed on Windows 7, Windows 8/8.1 and **Windows 10** or **Windows 11**. We recommend one of the two most recent OSs.

32 bit Windows versions and ARM Windows versions are not supported, as well as any other OSs.

15.1.2 MacOS - Linux

A RaceStudio 3 installation can be performed using a virtualized Windows into another OS. As a virtualizer, for example, you can use: VMWare, Parallels, VirtualBox. There are others, anyway.

32 bit OSs cannot virtualize a 64 bit Windows, so, again, RaceStudio 3 will not install.

ARM OSs normally don't feature a correct support for drivers, so there are very high chances that RaceStudio 3 won't communicate.

15.1.3 Antivirus Software

In case of any malfunctions, please ensure that you add the RaceStudio 3 both executable and installation path within the folder list the antivirus software makes exception for.

Please remember that all AiM drivers are signed and certified by Microsoft, and all AiM installers are digitally signed by third party authorities. With a simple right click on the file, choose "Properties" from the context menu, and go to the "Digital Signatures" tab.

15.1.4 PC Hardware

As a general advice, or rule of thumb, we can say that the greater/bigger/faster the better. We purpose here what we recommend as minimum.

15.1.4.1 Processor

Data analysis requires computations, and computations require processor speed. It's difficult to find a way in a world in which commercial names for processors constantly change and most of all commercial names seldomly relate clearly to their performance. Just for example, taking Intel as reference, while the processor range is i3xxxx/i5xxxx/i7xxxx/i9xxxx we recommend the i7xxxx and we wouldn't go under the i5xxxx. Please remember that what we represent with *xxxx* can hide other information affering performance. A quick look on a search engine would ease you into finding the alternatives, for example for AMD, for the Intel processors we quote here.

15.1.4.2 Memory (RAM)

16 GB is what we recommend if you want or plan to use the videos from AiM SmartyCams, and to show web mappings track maps. In any case we wouldn't go under 8 GB.

15.1.4.3 Hard Drive

Solid State Drives (SSD) should be preferred over Hard Disks, as they generally are faster and more reliable. 1 TB capacity is what we recommend as minimum. Other than capacity, when comparing between different drives, take a look at the data transfer speed.

15.1.4.4 Display Resolution

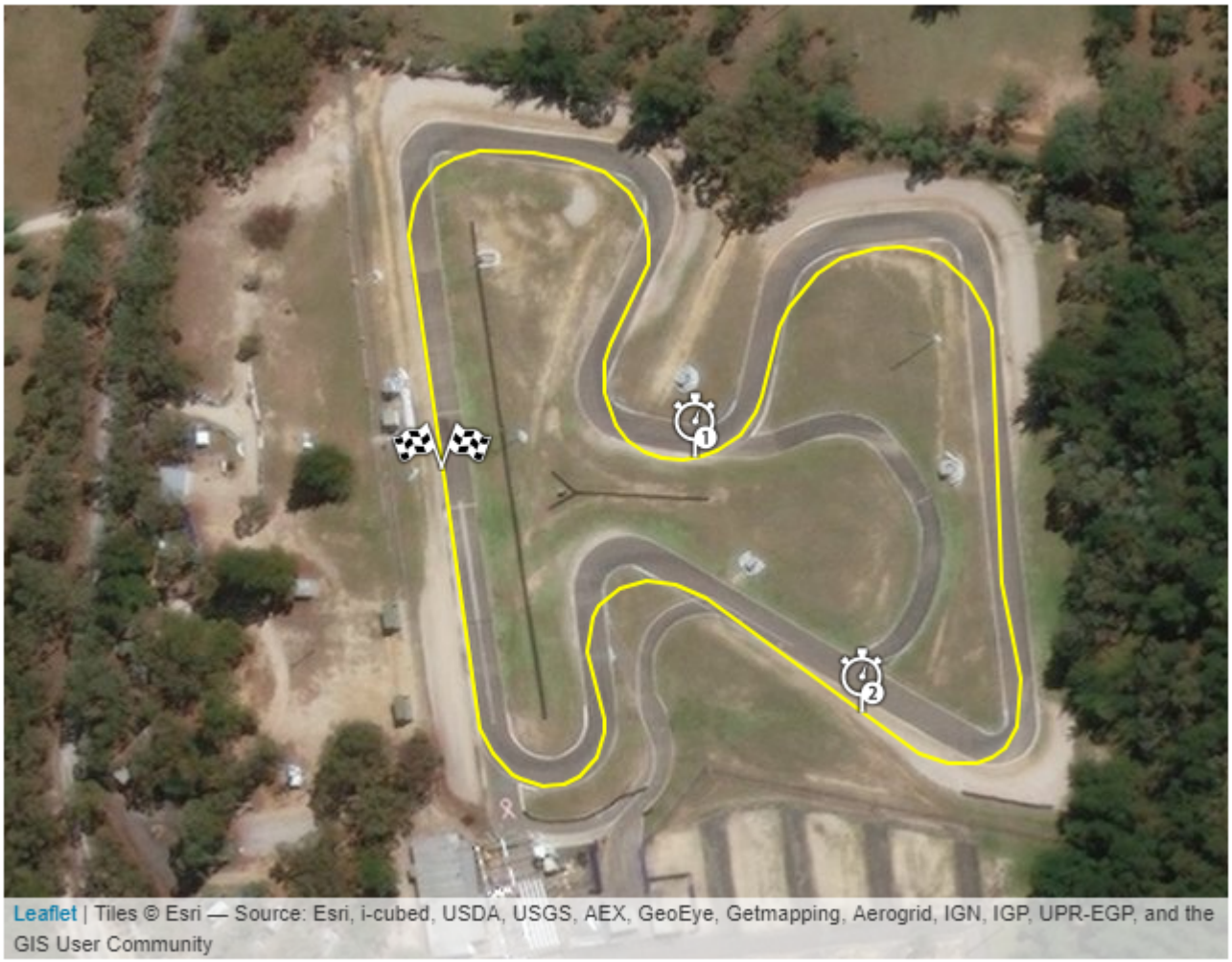
1920 x 1080 (Full HD) pixel is what we recommend if you want or plan to use the videos from AiM SmartyCams. In any case we wouldn't go under 1024 x 768 (HD).

15.2 Tile Providers

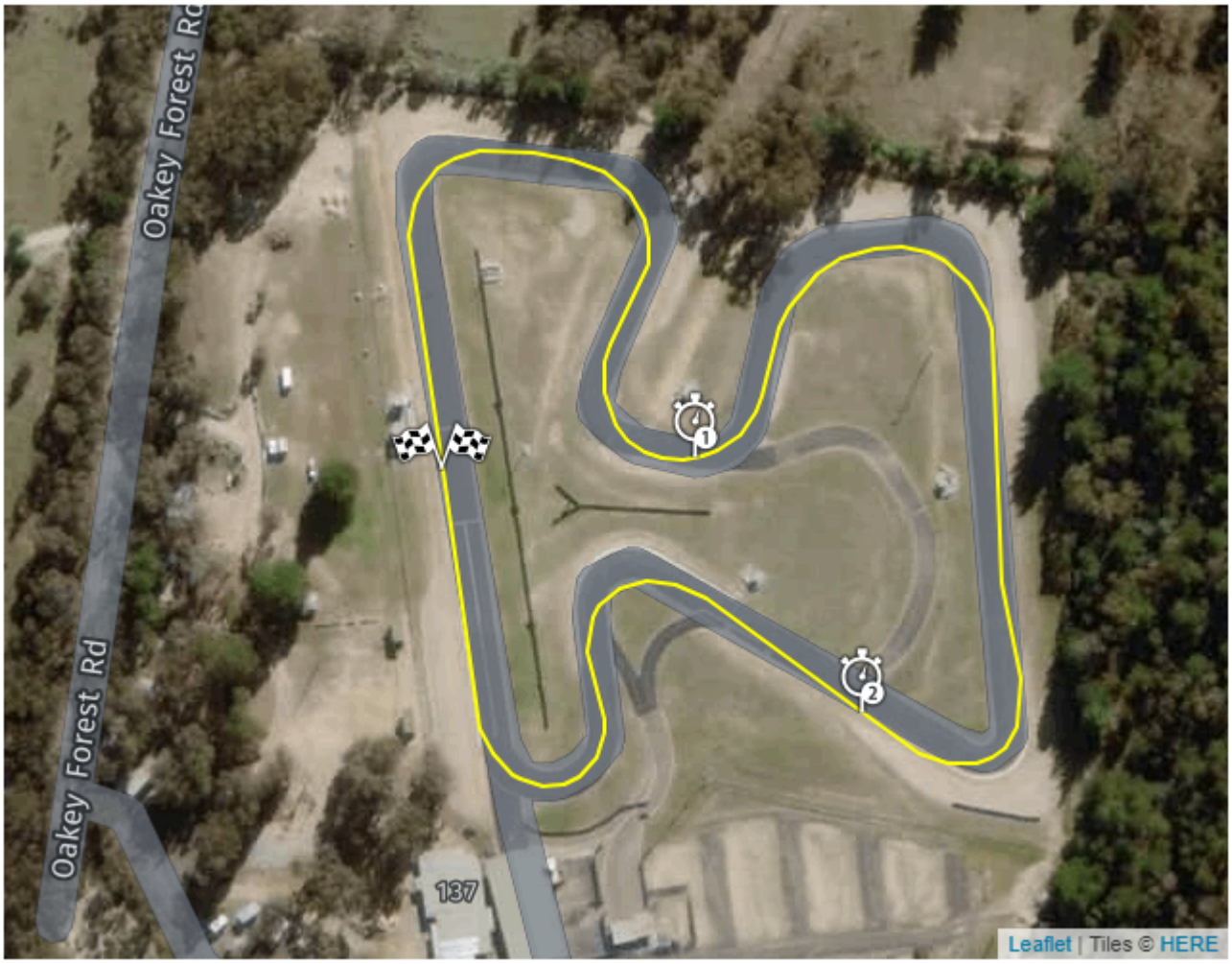
We sometimes get complaints about GPS data apparently not matching the maps implemented in web services tile providers.

Those services have become, years after years, better and better, their developers successfully fronted numbers of representation issues, mostly bound to the fact that the tiles are pictures taken from satellites of flying crafts. Such pictures are also processed to fit a Earth model that's all but a perfect sphere. This implies that some issues can still arise. Take the two following examples to understand the "problem".

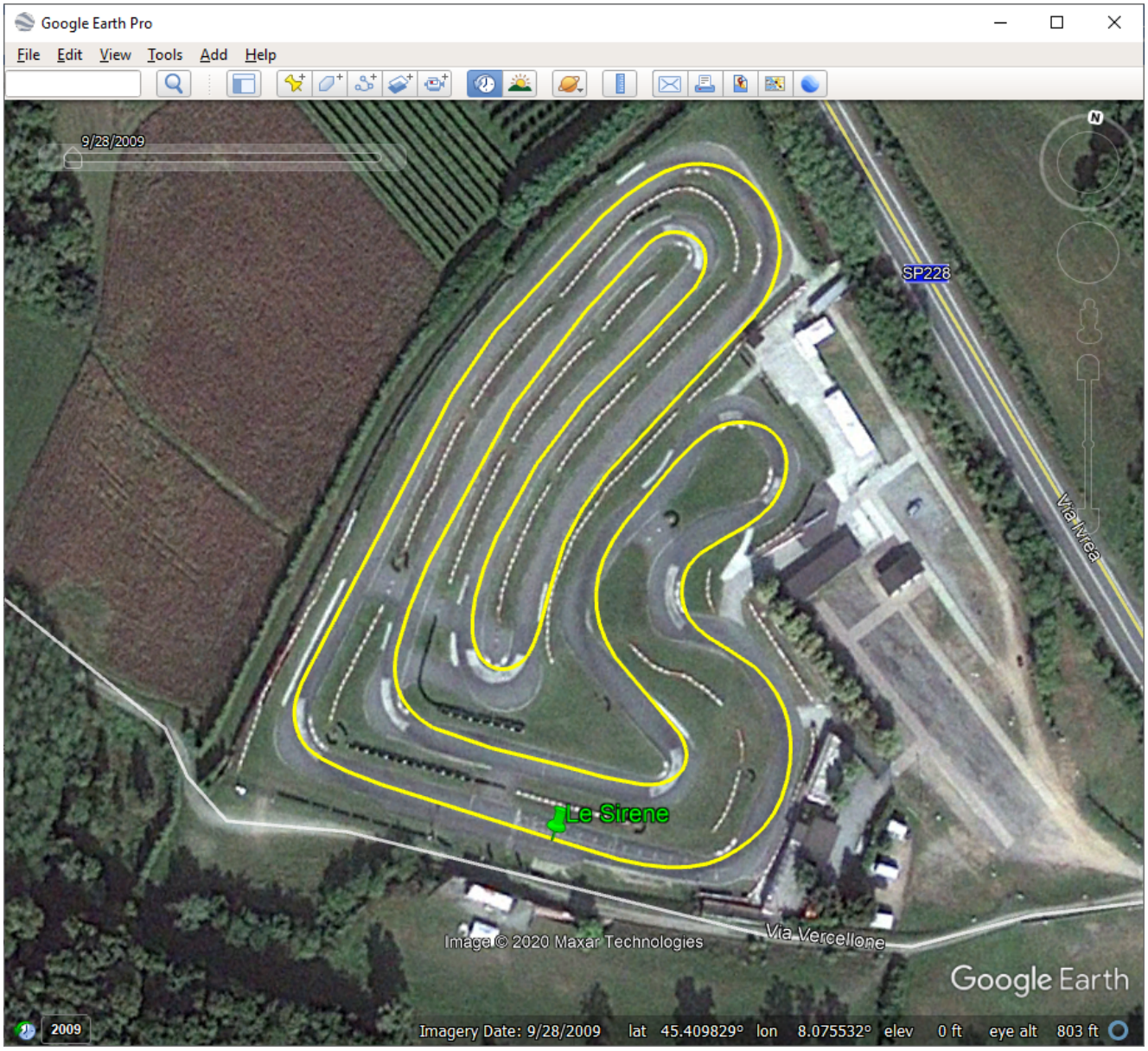
Same data, different tile provider. We see that different tiles match differently the same plotted data.

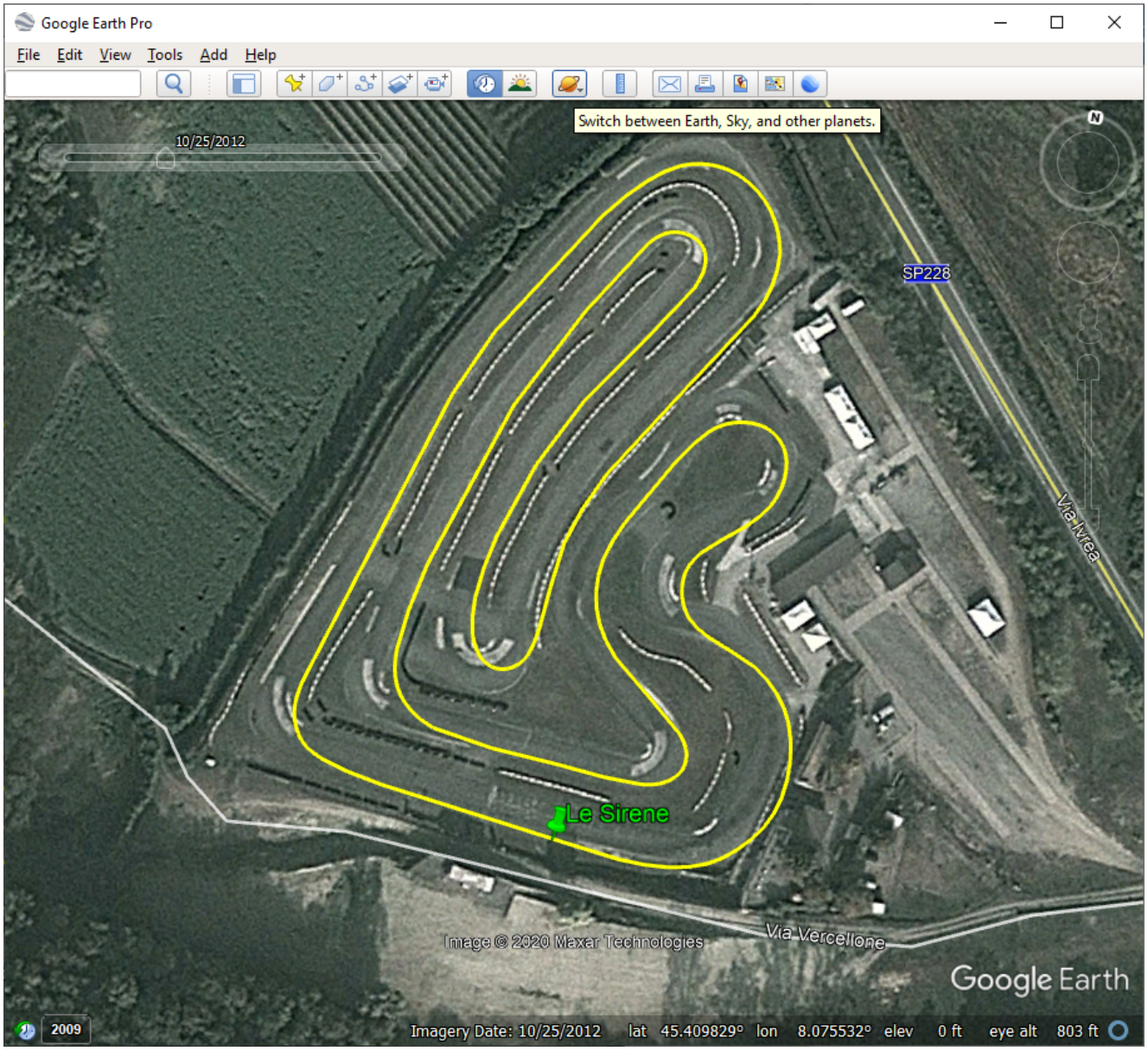

Leaflet | Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community

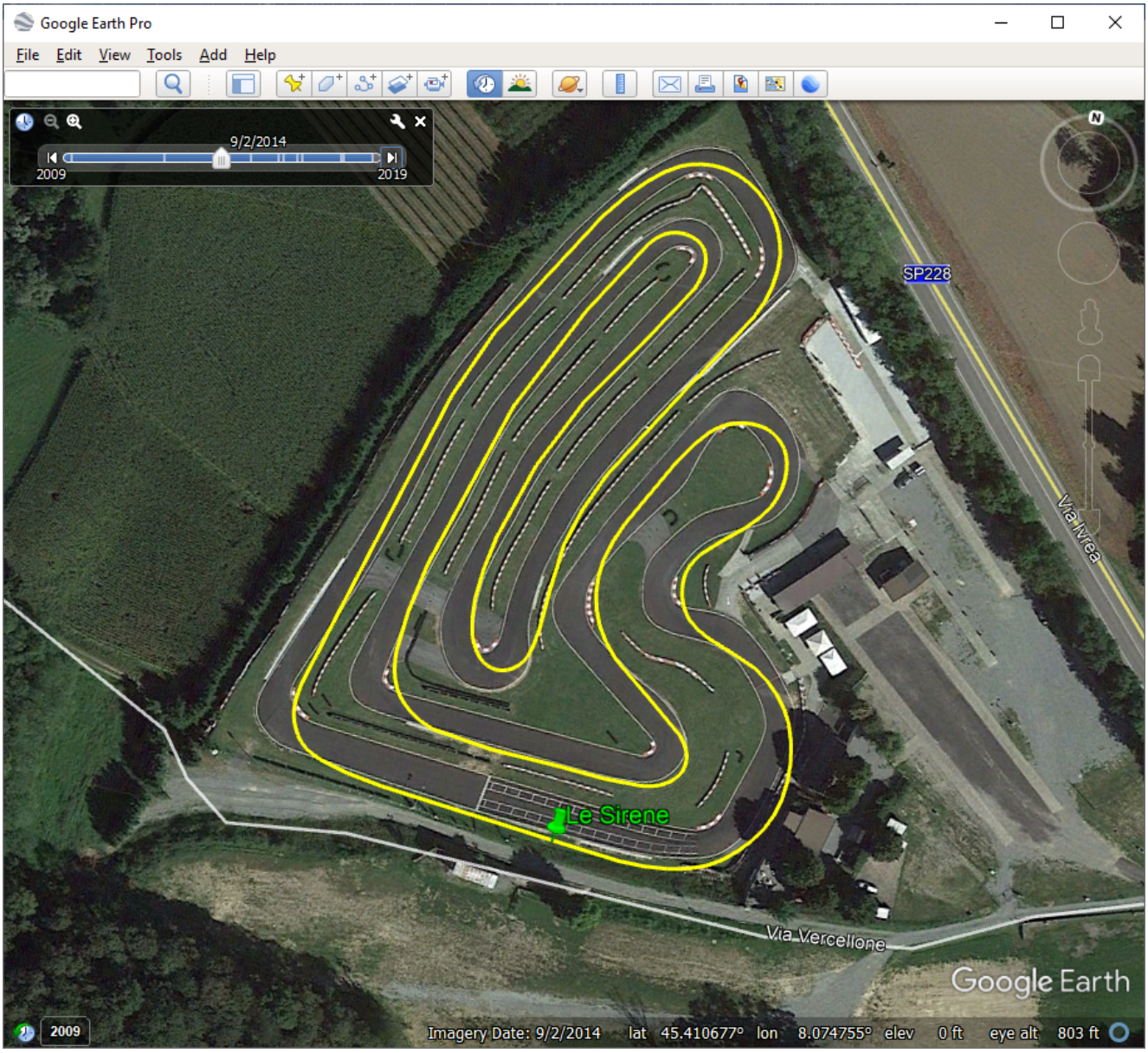

122
Metromix
137
Leaflet | © Google Maps

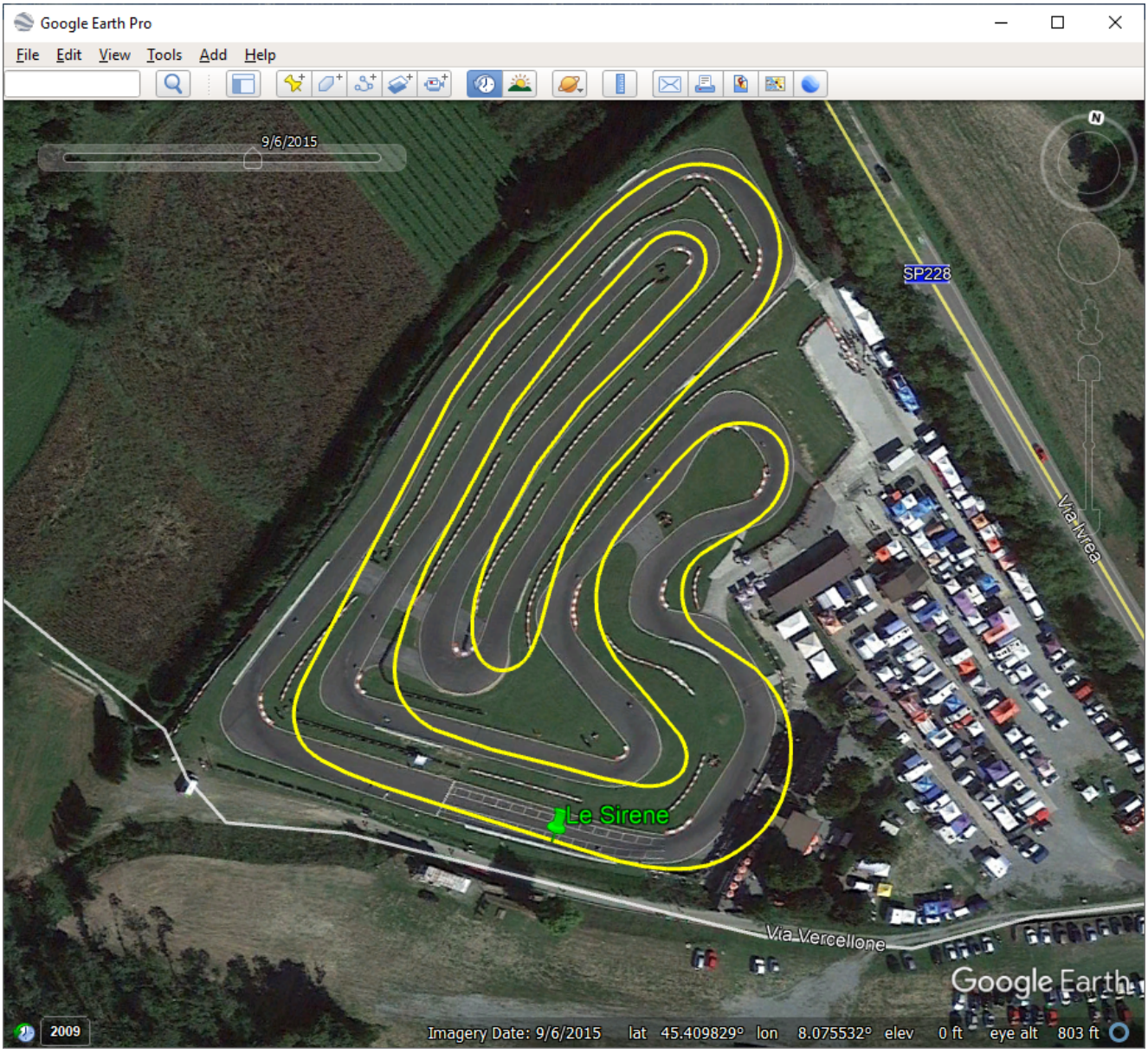

Oakey Forest Rd
Oakey Forest Rd
137
Leaflet | Tiles © HERE

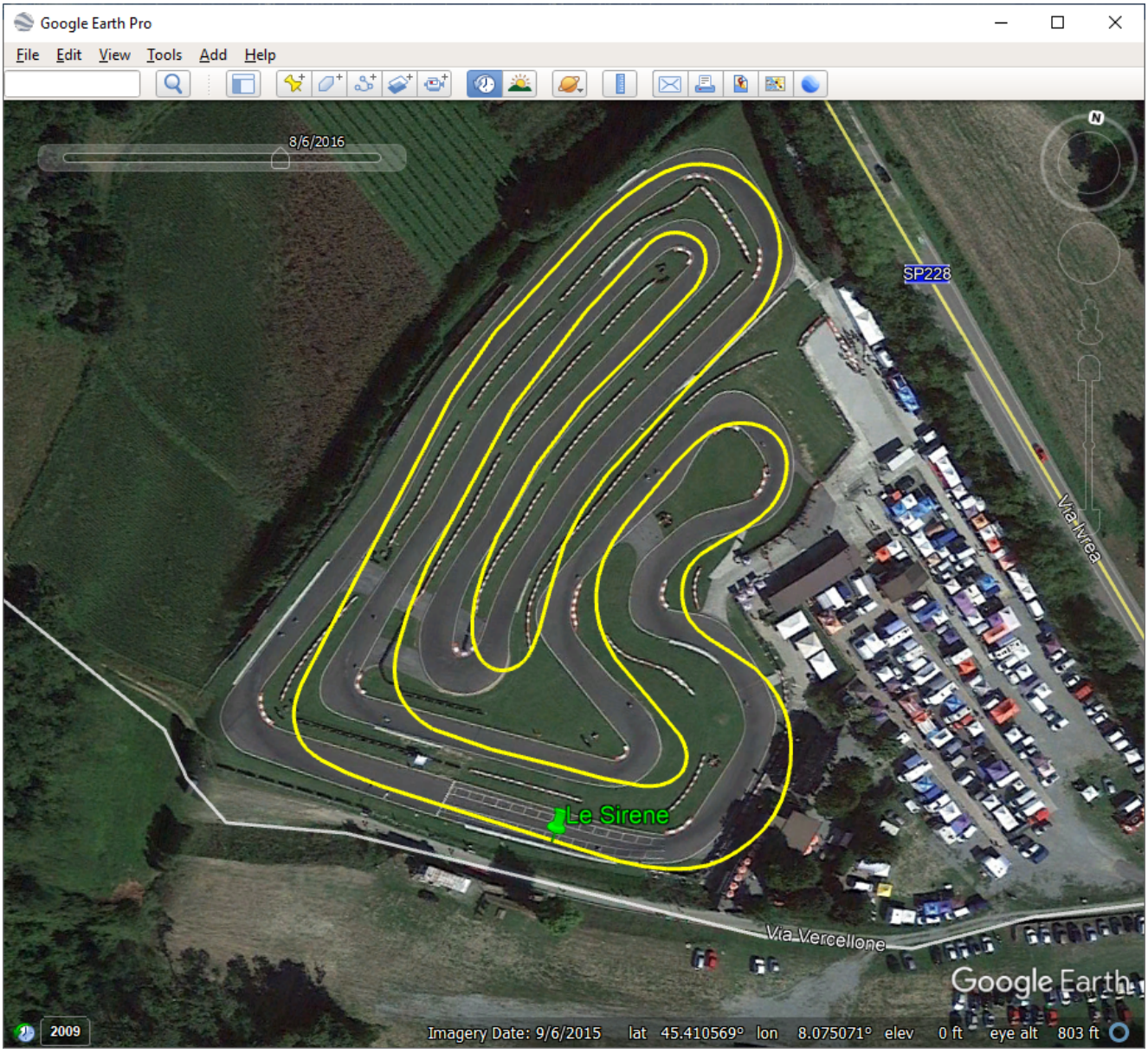
Same data, same tile provider, different time. We can see here that tile providers evolve (improving) in time.

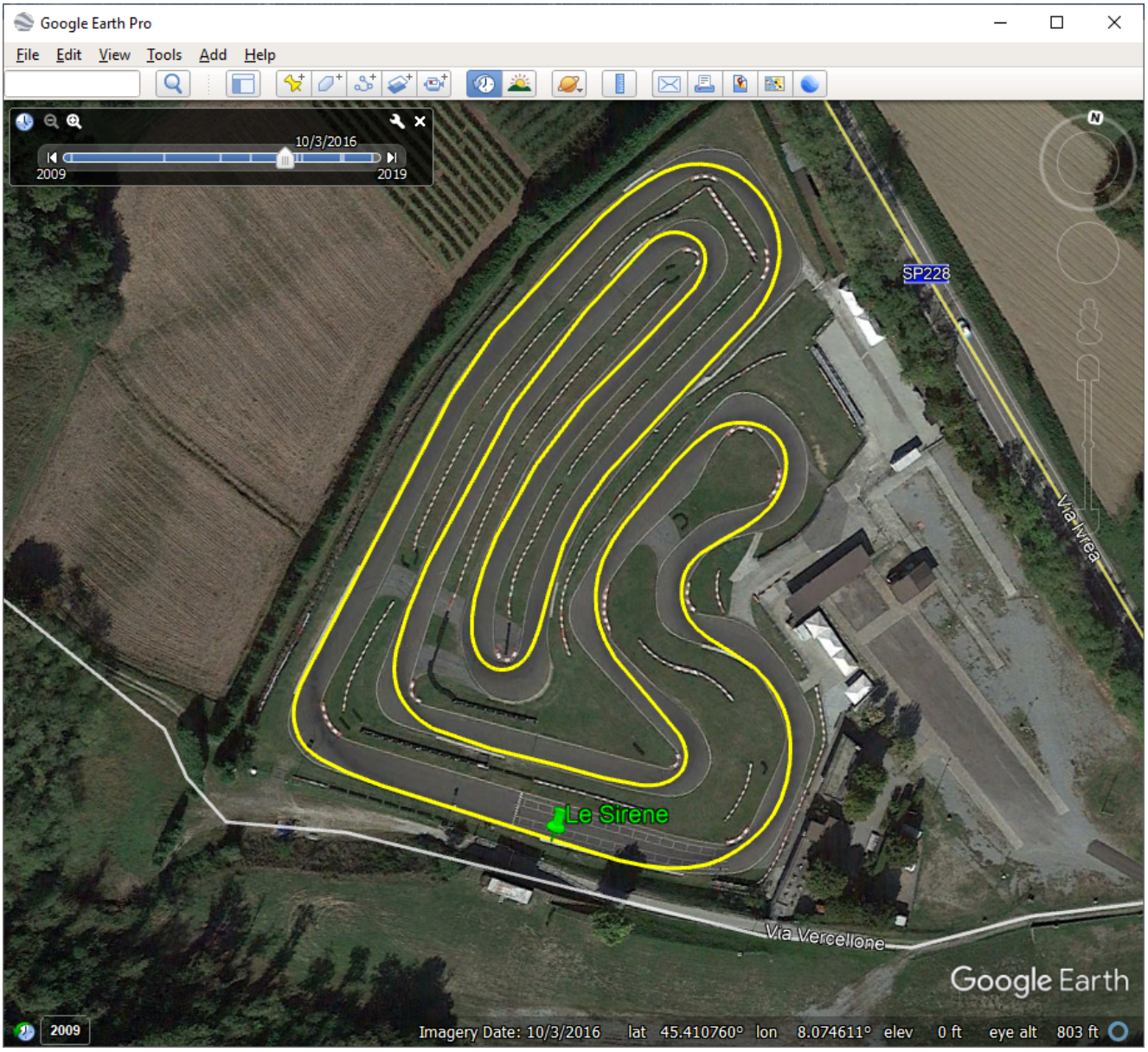

Google Earth Pro
File Edit View Tools Add Help
9/28/2009
SP228
Via Ivrea
Le Sirene
Image © 2020 Maxar Technologies
Via Vercellone
Google Earth
2009
Imagery Date: 9/28/2009 lat 45.409829° lon 8.075532° elev 0 ft eye alt 803 ft

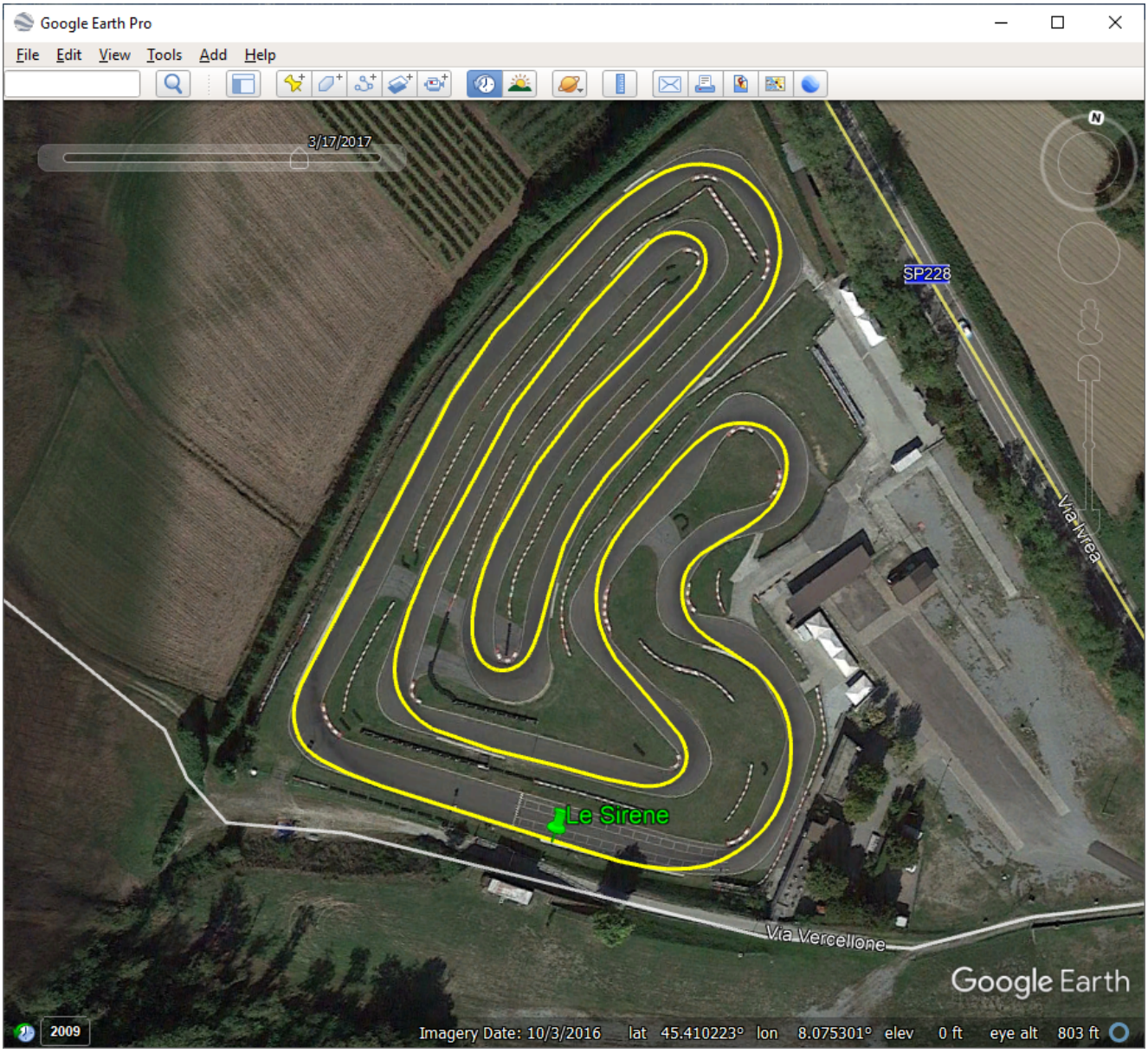

Google Earth Pro
File Edit View Tools Add Help
Switch between Earth, Sky, and other planets.
10/25/2012
SP228
Via Ivrea
Le Sirene
Image © 2020 Maxar Technologies
Via Vercellone
Google Earth
2009
Imagery Date: 10/25/2012 lat 45.409829° lon 8.075532° elev 0 ft eye alt 803 ft

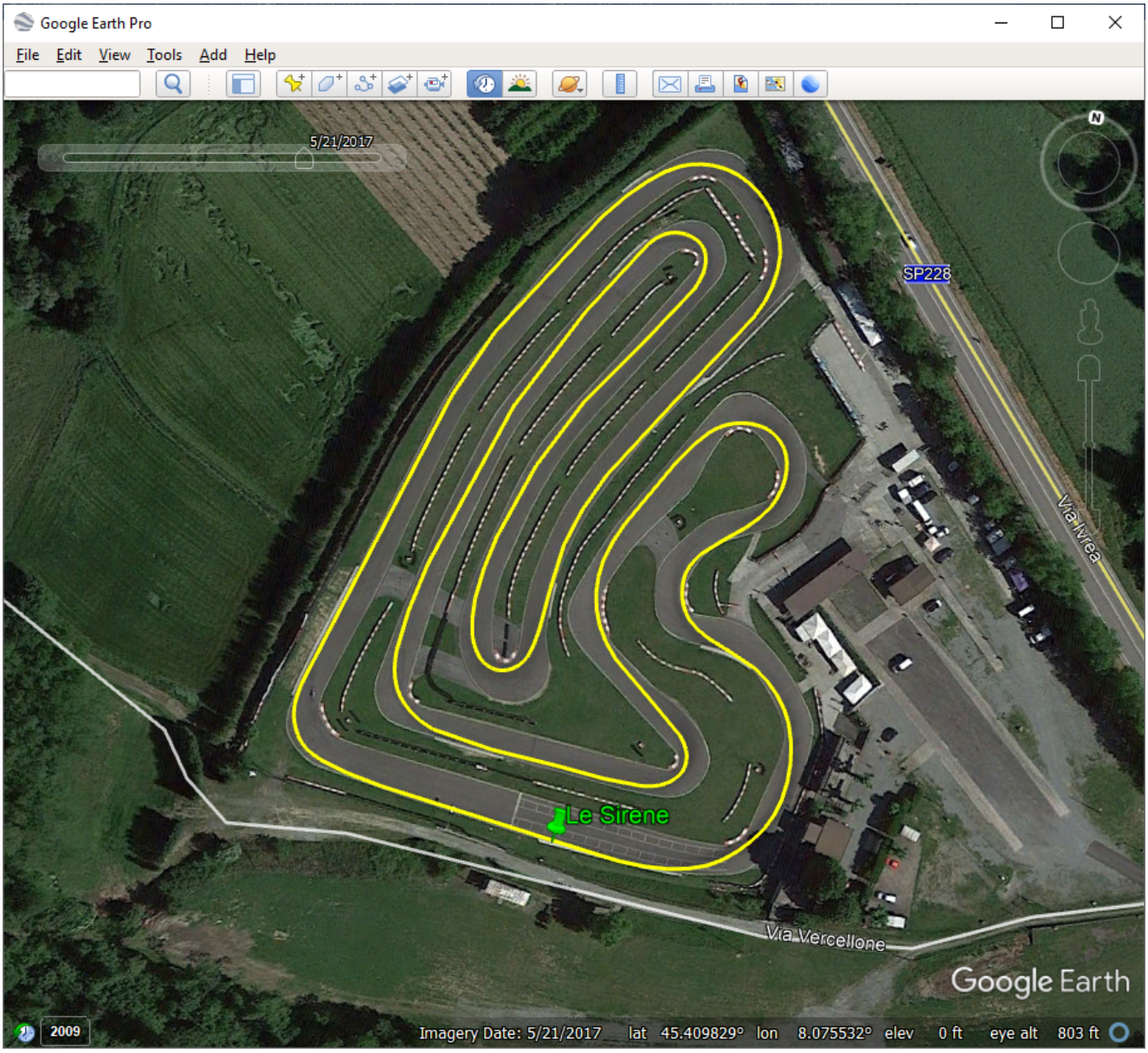

Google Earth Pro
File Edit View Tools Add Help
9/2/2014
2009
2019
SP228
Via Ivrea
Le Sirene
Via Vercellone
Google Earth
2009
Imagery Date: 9/2/2014 lat 45.410677° lon 8.074755° elev 0 ft eye alt 803 ft

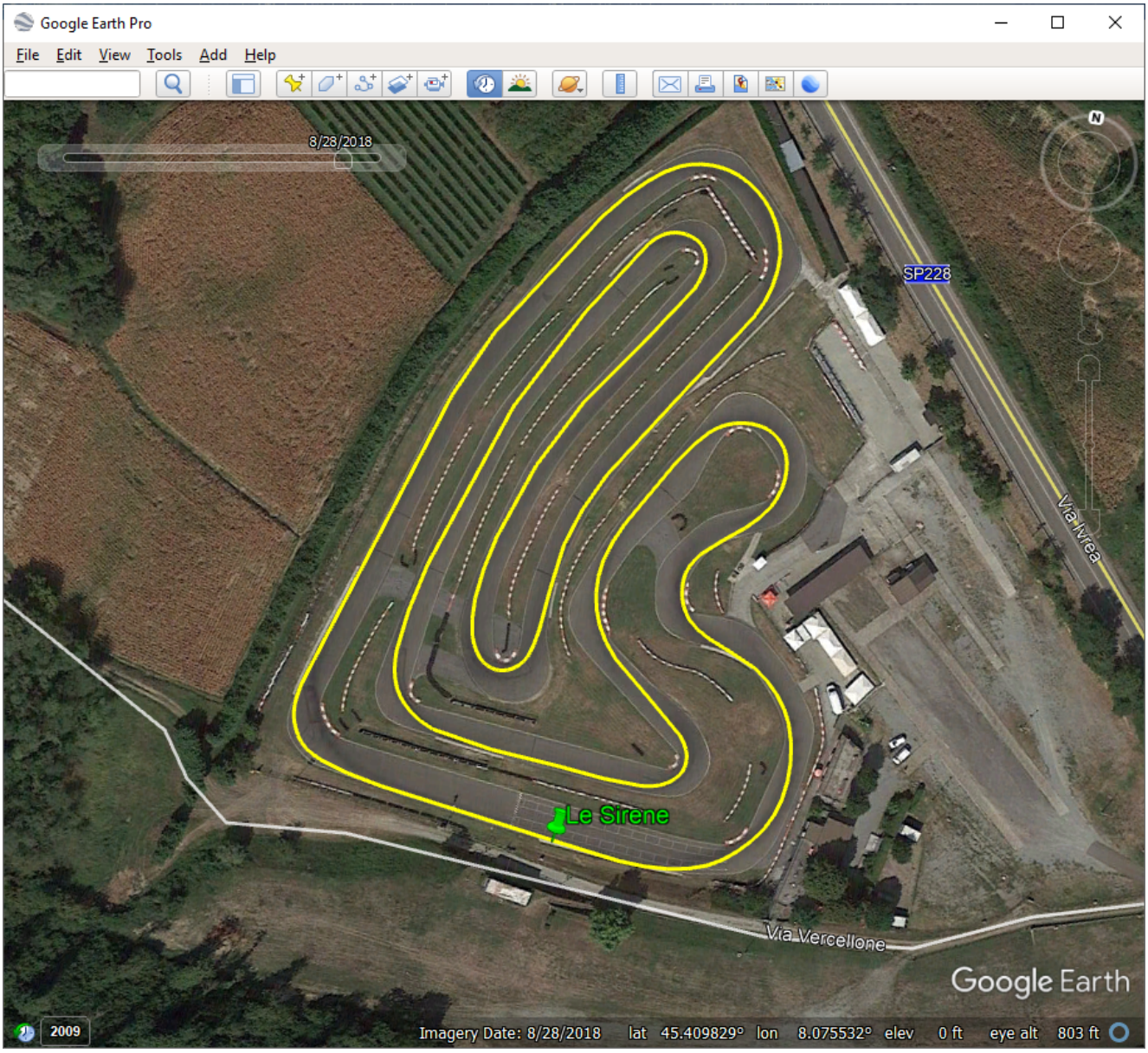

Google Earth Pro
File Edit View Tools Add Help
9/6/2015
SP228
Via Ivrea
Le Sirene
Via Vercellone
Google Earth
2009
Imagery Date: 9/6/2015 lat 45.409829° lon 8.075532° elev 0 ft eye alt 803 ft

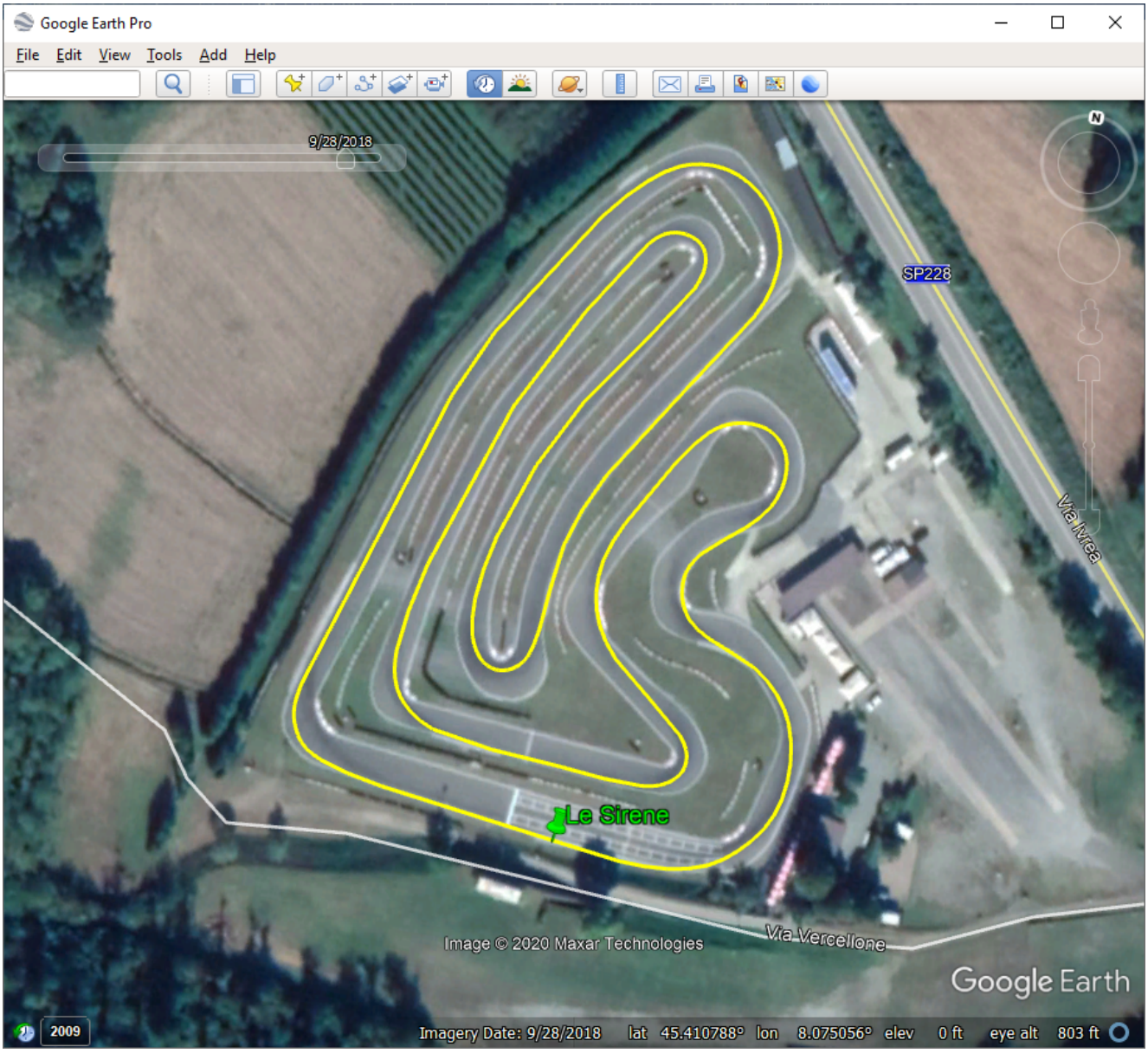

Google Earth Pro
File Edit View Tools Add Help
8/6/2016
SP228
Via Ivrea
Le Sirene
Via Vercellone
Google Earth
2009
Imagery Date: 9/6/2015 lat 45.410569° lon 8.075071° elev 0 ft eye alt 803 ft

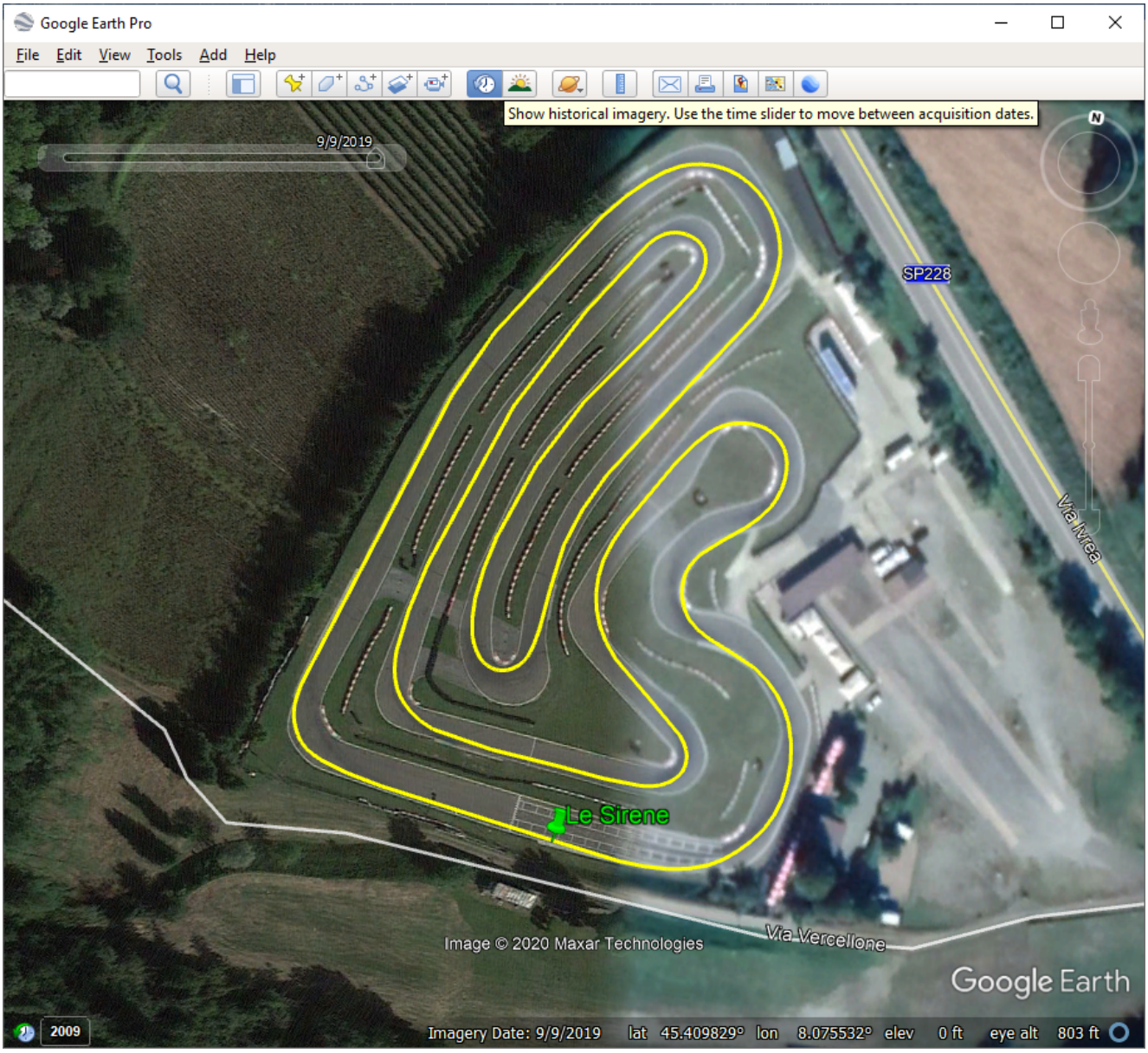

Google Earth Pro
File Edit View Tools Add Help
10/3/2016
2009
2019
SP228
Via Ivrea
Le Sirene
Via Vercellone
Google Earth
2009
Imagery Date: 10/3/2016 lat 45.410760° lon 8.074611° elev 0 ft eye alt 803 ft


Google Earth Pro
File Edit View Tools Add Help
3/17/2017
SP228
Via Ivrea
Le Sirene
Via Vercellone
Google Earth
2009
Imagery Date: 10/3/2016 lat 45.410223° lon 8.075301° elev 0 ft eye alt 803 ft


Google Earth Pro
File Edit View Tools Add Help
5/21/2017
SP228
Via Ivrea
Le Sirene
Via Vercellone
Google Earth
2009
Imagery Date: 5/21/2017 lat 45.409829° lon 8.075532° elev 0 ft eye alt 803 ft


Google Earth Pro
File Edit View Tools Add Help
8/28/2018
SP228
Via Ivrea
Le Sirene
Via Vercellone
Google Earth
2009
Imagery Date: 8/28/2018 lat 45.409829° lon 8.075532° elev 0 ft eye alt 803 ft


Google Earth Pro
File Edit View Tools Add Help
9/28/2018
SP228
Via Ivrea
Le Sirene
Via Vercellone
Image © 2020 Maxar Technologies
Google Earth
2009
Imagery Date: 9/28/2018 lat 45.410788° lon 8.075056° elev 0 ft eye alt 803 ft



15.3 How to Translate RaceStudio 3 for Localization

RaceStudio 3 software can be translated in a simple and effective way. If you want to create your translation please read on and follow these instructions.

Look for a "language" folder into RaceStudio 3 install folder, you'll find some .png and some .xml files.

The .png files are the icons that are shown in the language choice window.

The .xml files are text files that contain the translations.

To add the translation into your language, please create your own files, example: "French.png" and "French.xml". As a first attempt, you can start copying and renaming two existing files (say, for example, Italian).

Your RaceStudio 3 will feature a new language: French, with an Italian flag icon.

Double click the following zip file icon, that links to a zip file containing some predefined icons from AiM. In case your one is missing please contact us (software@aim-sportline.com).

Substitute the one you just created, restart RaceStudio 3, and you'll get the correct icon promptly shown.

Now you're ready to translate. Open the xml files with any text editor and change the rightmost part of any row.

For example, this:

```
<string name="Track">Track</string>
```

will become this:

```
<string name="Track">Pista</string>
```

Please notice that what's included between the $<...>$ chars is xml formatting, and must not be modified, otherwise RaceStudio 3 will not be able to recognize the line or, possibly worse, the entire file. In this *bad* case, no worries: RaceStudio 3 will open up using the English language as default.

15.3.1 Caveats

While translating, you'll find some special chars like %s, %d, %f or %%. They're place holders for software inserted strings, integer numbers, floating point numbers, characters. They need to stay as they are in the translated string, and, in case there are more than one in the string, they need to keep the original order (otherwise RaceStudio 3 will crash).

Examples (English vs Italian).

```
<string name="Forbidden Character '%s'">Carattere Proibito '%s'</string>
<string name="With %d %s, the output value could be truncated">Con %d %s, il valore in uscita potrebbe␣
↪venire troncato</string>
```

As long as you create translations you can see the results just restarting RaceStudio 3.

Once you complete the translation or you just reach a safe point, just send the .xml file to software@aim-sportline.com.

Please notice that all the .xml files are cleared up and substitutes across any RaceStudio 3 software update, so keep regular updates of your translations. You can also consider, as a backup strategy, to send the translation to software@aim-sportline.com. Once we receive the files with translations, we validate them and we include them into the installer.

15.4 How to Enable and Share RaceStudio 3 Logs

In case you're experiencing any issue with RaceStudio 3 and you want to log its behaviour allowing developers to better understand what happens, you can enable and share a number of software logs. To do this, please follow the following procedure.

- Identify the logs folder into RaceStudio 3 install path (usually, C:\AIM_SPORT\RaceStudio3\logs).
- **In this folder, look for the file log-options.txt.**
  - If you can't find it, just start RaceStudio 3 once, it will be creating such file with all default options.
- **Edit the file with any text editor (Microsoft Notepad will perfectly fit this need) and change all the '0'**
  - If, for any reason, you think you messed up with this file, delete it and start RaceStudio 3 once, it will be creating such file with all default options.
- Run RaceStudio 3 and reproduce any function or issue you want to, then close RaceStudio 3.
- Zip the entire log folder (again, usually, C:\AIM_SPORT\RaceStudio3\logs).
- Send the zipped folder to 'software@aim-sportline.com', explaining the issue you're having.

Chapter 16

Access AiM Data Files with a DLL

for a downloadable (and nicer) **pdf copy of this page**.

We've had requests in the recent past to open xrz/xrk files in order to access the data recorded by our devices using external software. It works (beta version) also with drk files. Most of the requests received till now were for MatLab(TM) or custom developed software.

We developed a DLL (32 and 64 bit) that lets users accomplish this task in a very easy way. You can download two complete examples to understand how to use the DLL.

16.1 Visual Studio 2022

Click here to download **the example project**.

Unzip the file content on your hard disk, then identify the "TestMatLabXRK.sln" file and open it with Visual Studio 2022. Compile it and run it, you should see a simple dialog window that lets you test all DLL functions.

All DLL functions are documented directly in the "MatLabXRK.h" file supplied. Few quick example hints are given in the following lines.

"DLL Version" has to be used to verify the DLL build time and date, that are prompted to you as soon as you click.

"Lap Times" are, as well as all other timing information, given in seconds.

"Vehicle", "Racer", "Championship" and "Venue Type" refer to data set by users into AiM loggers before the on track session, "Track" is automatically identified by the AiM loggers among all the tracks previously sent to them using RaceStudio 3, "Date & Time" refers to start acquisition and is managed by the loggers themselves.

Channels data values are available on a session timing base, or a lap timing base.

Logged channels are "according to device configuration".

GPS raw channels are: "ECEF position_Y", "ECEF position_Z", "ECEF velocity_X", "ECEF velocity_Y", "ECEF velocity_Z", "N Satellites".

GPS channels are computed by the DLL upon GPS raw channels: "GPS_Speed", "GPS_Nsat", "GPS_LatAcc", "GPS_LonAcc", "GPS_Slope", "GPS_Heading", "GPS_Gyro", "GPS_Altitude", "GPS_PosAccuracy", "GPS_SpdAccuracy", "GPS_FreqAccuracy", "GPS_East", "GPS_North".

16.2 MatLab (TM)

Click here to download **the example project**.

This example has been developed by:

Michael Metzner metzner software engineering https://www.metzner-se.com

Unzip the file content on your hard disk, then load/run the "XrkAccessExample.m" file to see an example of how the dll works.

When calling the example script without any filename you'll be asked to select a XRK/XRZ file. Two sample files are supplied.

After loading the file you'll have to select a lap, in a list that's prompted to you.

After lap selection you'll be prompted a list in which you have to select a data channel and the corresponding data are plotted.

Afterwards you'll be asked to select a GPS channel and the corresponding data are plotted.

Finally you'll be prompted to select a GPS raw data channel and the corresponding data are plotted.

16.3 Release History

16.3.1 December 20th, 2024

- Added test function to library.
- Fixed a crash that could occurr managing GPS data.

16.3.2 October 12th, 2023

- Added data recovery for GPS channels "Latitude" and "Longitude".
- Fixed bug recovering data for GPS raw channels "N_Satellites" and "ITOW".

16.3.3 September 8th, 2023

- Added function to initialize sampling time intervals for GPS computations.

16.3.4 September 6th, 2023

- Fixed GPS channels sample rate at 10 Hz instead of 100 Hz.
- Added function to get session duration.

16.3.5 September 5th, 2023

- Improved error messages upon a bad opening of an xrk file.
- Switch to usage of default temp directory to improve reliability of the dll when hooked up into MatLab (TM).