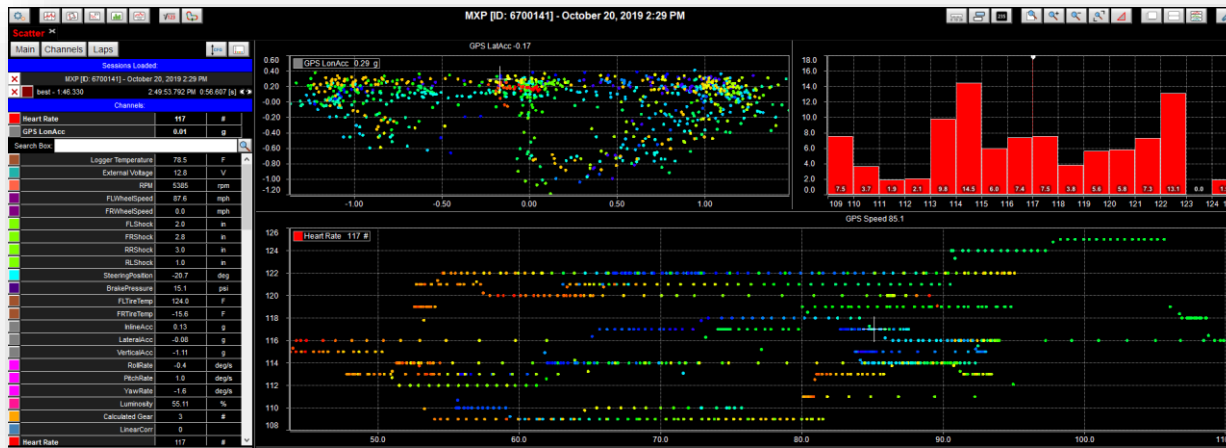




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Are Race Car Drivers Athletes?

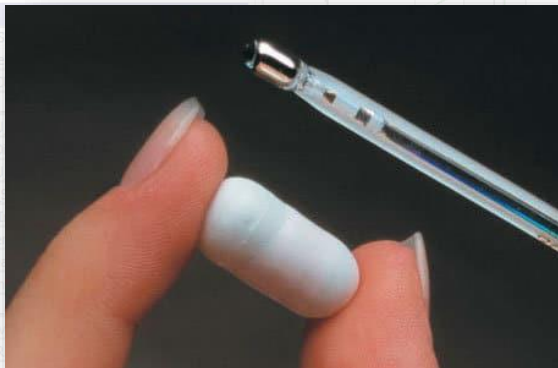
Definition of 'Athlete' From Meriam Webster Dictionary:

1: A person who is trained or skilled in exercises, sports, or games requiring physical strength, agility, or stamina

YES!

Drivers experience significant physical strain for long periods of time, under extreme conditions (high G forces and temperatures) and must perform highly skilled, fine motor functions at a high speed

Hardware at the Top Levels



Measures and Laps

Measures Laps User Profiles

Per Lap Color Sort Channels

Tests Loaded:

MATHS_Andrew_MuleHT8_VIR_VA_Warm-up

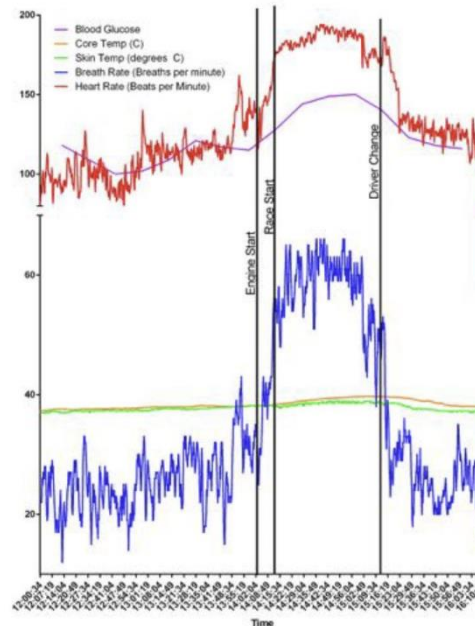
4 02.11.308

Measures:

GPS_Speed [mph]	123.4
RearDiffCk [%]	0.07
ECU_Rpm [rpm]	7062
ECU_Pedal_Pos [%]	99.500
ECU_Water_T [°F]	198
Oil_Temp [°F]	223.0
ECU_Lambda [A/F]	0.85
ECU_Spark_Adv [deg]	23.50
ECU_Intake_Air_T [°F]	89.6
External Voltage [V]	13.0
GearRatio [ratio]	1.00
LambdaFiltered [I]	0.851
Spark_AdvFiltered [deg]	23.50
OverRev [secs]	0.00
OverRevFiltered [secs]	0.00
ECU_SpeedCheckFilt [diff]	2.2
AFR [ratio]	12.51
AFR_Filt [ratio]	12.51
AvgRearWheelSpeed [mph]	121.52
RPS_Diff [%]	100.50
ECU_SpeedCheck [diff]	2.2
GPS_LatAcc [g]	-0.09
GPS_LonAcc [g]	0.02
GPS_Slope [deg]	0.22
InlineAcc [g]	-0.02
LateralAcc [g]	-0.17
VerticalAcc [g]	-1.43
PitchRate [deg/s]	-0.6
RollRate [deg/s]	0.8
YawRate [deg/s]	-0.2
GPS_PosAccuracy [ft]	0.940
GPS_Neat [ft]	15
GPS_Gyro [deg/s]	-0.9
GPS_Heading [deg]	-23.8
GPS_Altitude [m]	142.96
GPS_SpdAccuracy [ft]	0.157
GPS_Heading_Smooth [deg]	171.1

Research Data Output

Representative Race Data



From Physical Responses to Driving a Racecar - Dr. David Ferguson PhD, RCEP

What Hardware Do We Need?

Measures and Laps

Measures Laps User Profiles

Per Lap Color Sort Channels

Tests Loaded:

MATHS_Andrew_MuleHT8_VIR_VA_Warm-up

4 02.11.308

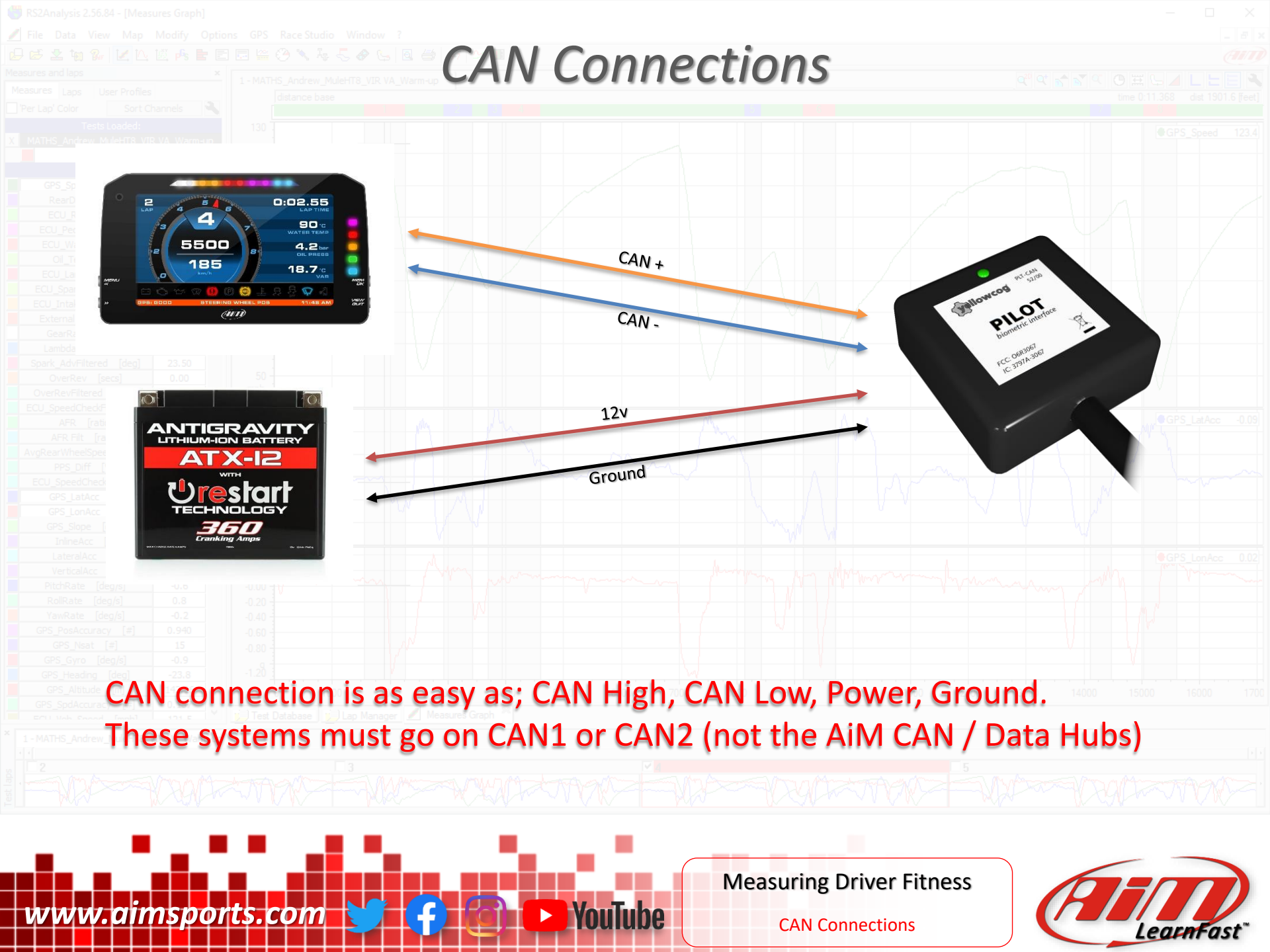
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InlineAcc [g]	
LateralAcc [g]	
VerticalAcc [g]	
PitchRate [deg/s]	
RollRate [deg/s]	
YawRate [deg/s]	
GPS_PosAccuracy [m]	
GPS_Heard [deg]	
GPS_Altitude [m]	
GPS_SpdAccuracy [m/s]	

1 - MATHS_Andrew_Mule

2

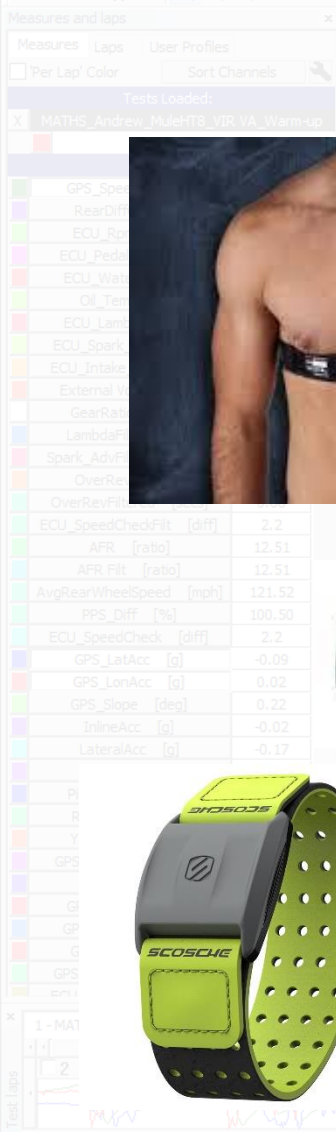




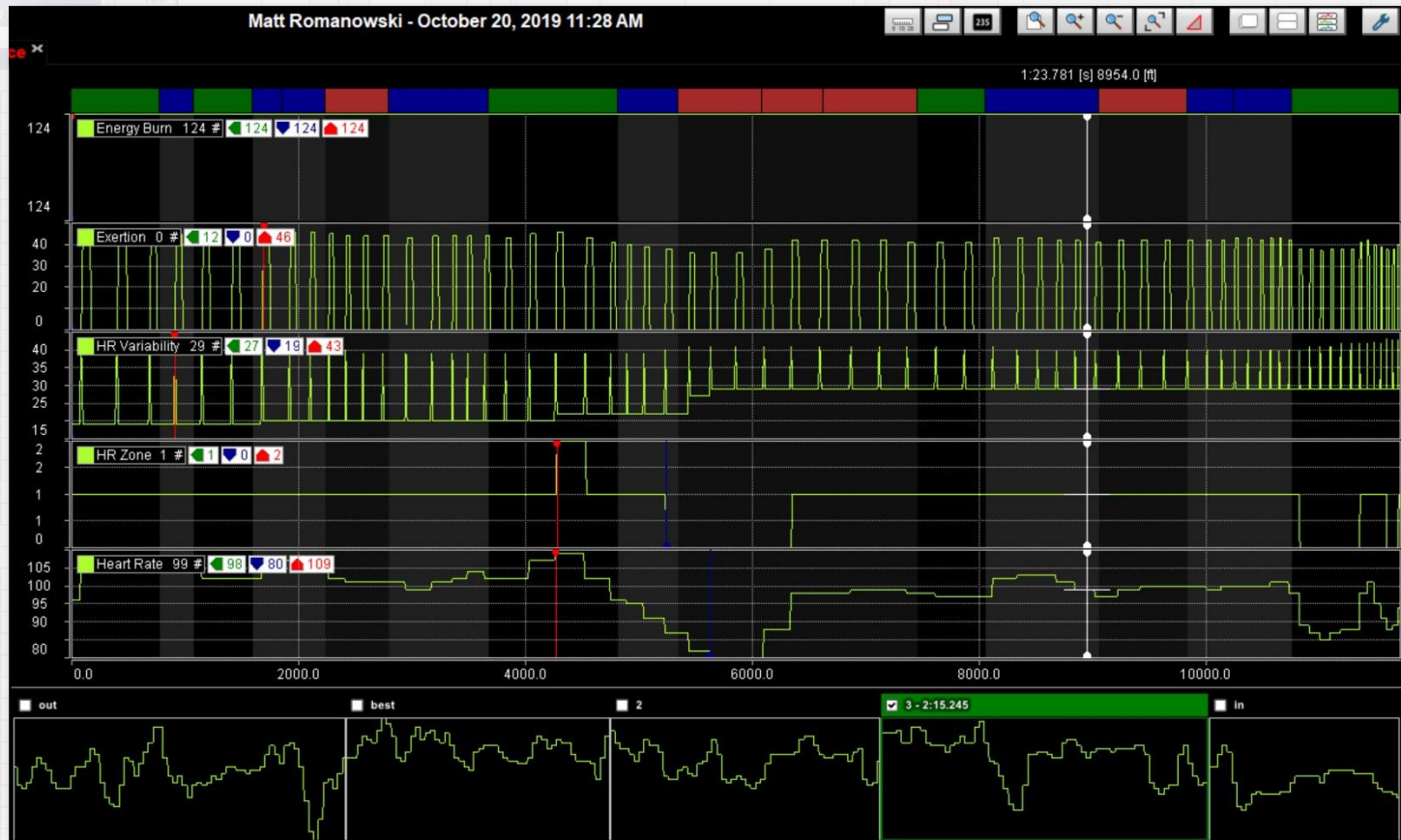
CAN Connections



CAN connection is as easy as; CAN High, CAN Low, Power, Ground.
These systems must go on CAN1 or CAN2 (not the AiM CAN / Data Hubs)



What Are We Looking At?



It's easy to get Heart Rate, HR Variability, Energy Burn (Calories), HR Zone, Calculated Core Temperature, and an estimate of overall exertion (in percent)

What Are We Looking At?

Heart Rate (HR)

- How fast your heart is beating (beats per minute – like RPM)

Heart Rate Variance (HRV)

- A normalized time measurement between heart beats

Energy Burn

- How many calories you are burning per hour

Heart Rate Zone

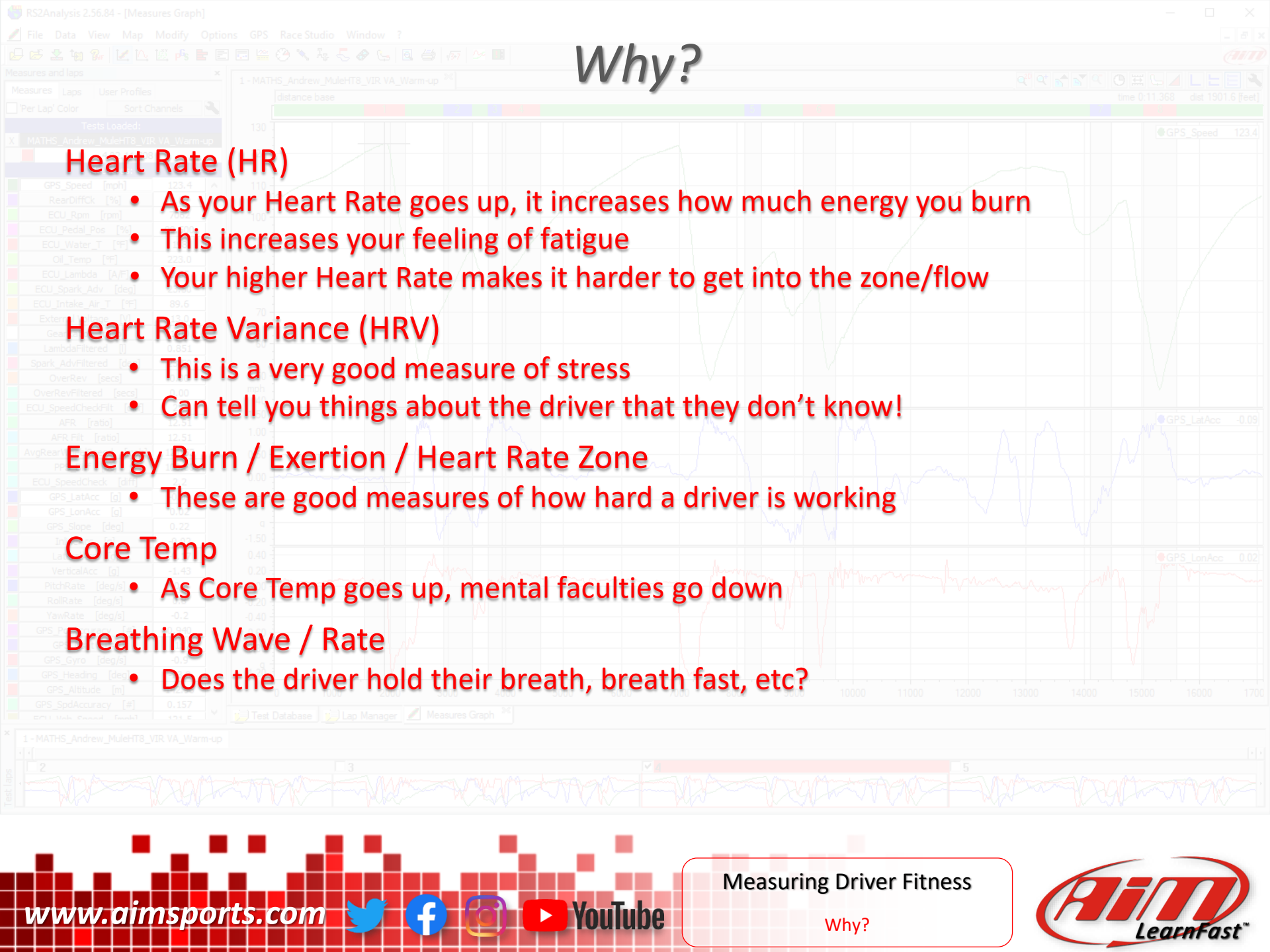
- Heart Rates are put into 5 Heart Rate Zones to categorize how hard your heart is beating

Exertion

- A calculated measure of what percent of total work you are doing

Core Temp

- A calculated estimate of your internal body temperature



Why?

Heart Rate (HR)

- As your Heart Rate goes up, it increases how much energy you burn
- This increases your feeling of fatigue
- Your higher Heart Rate makes it harder to get into the zone/flow

Heart Rate Variance (HRV)

- This is a very good measure of stress
- Can tell you things about the driver that they don't know!

Energy Burn / Exertion / Heart Rate Zone

- These are good measures of how hard a driver is working

Core Temp

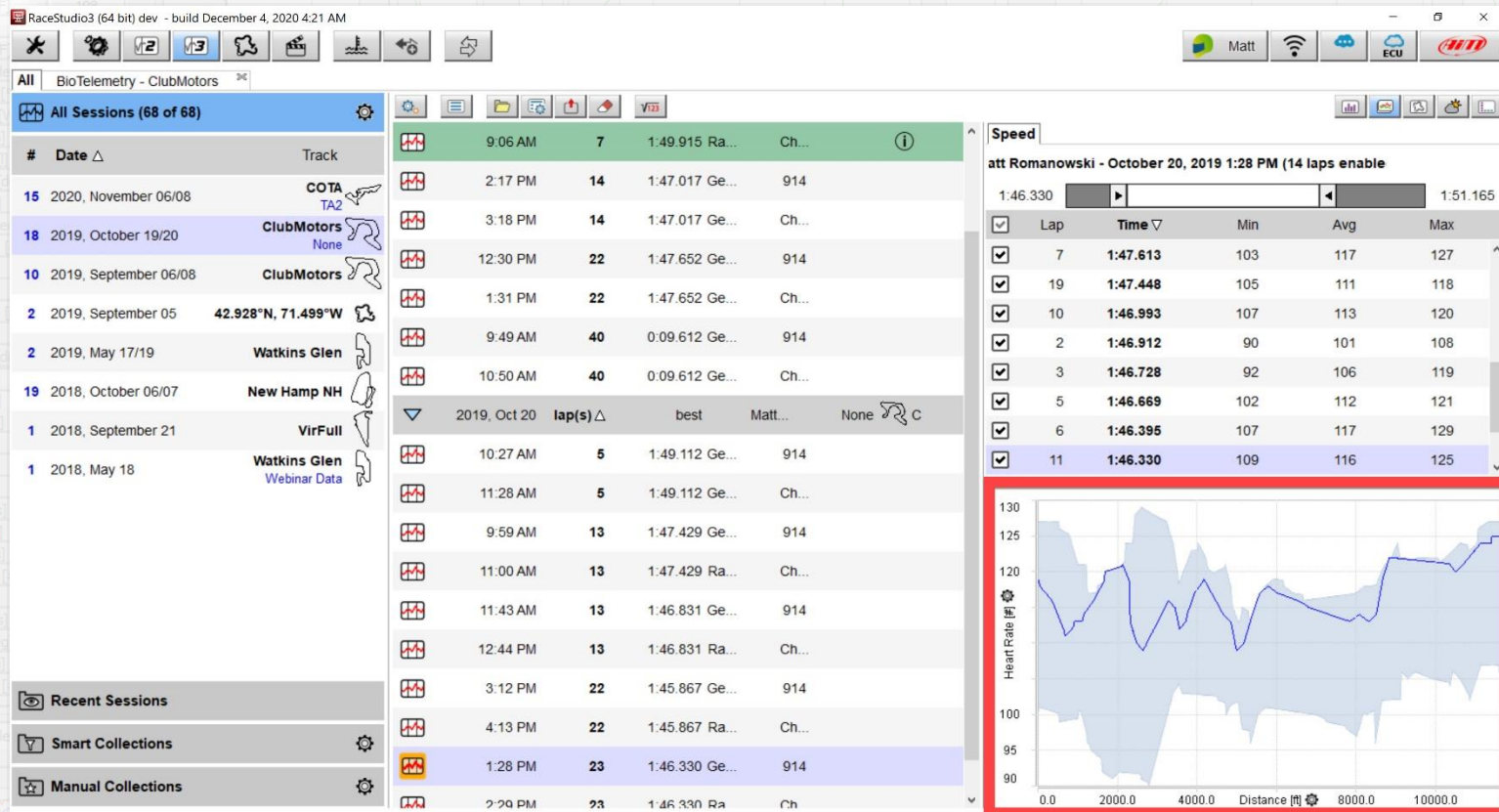
- As Core Temp goes up, mental faculties go down

Breathing Wave / Rate

- Does the driver hold their breath, breath fast, etc?

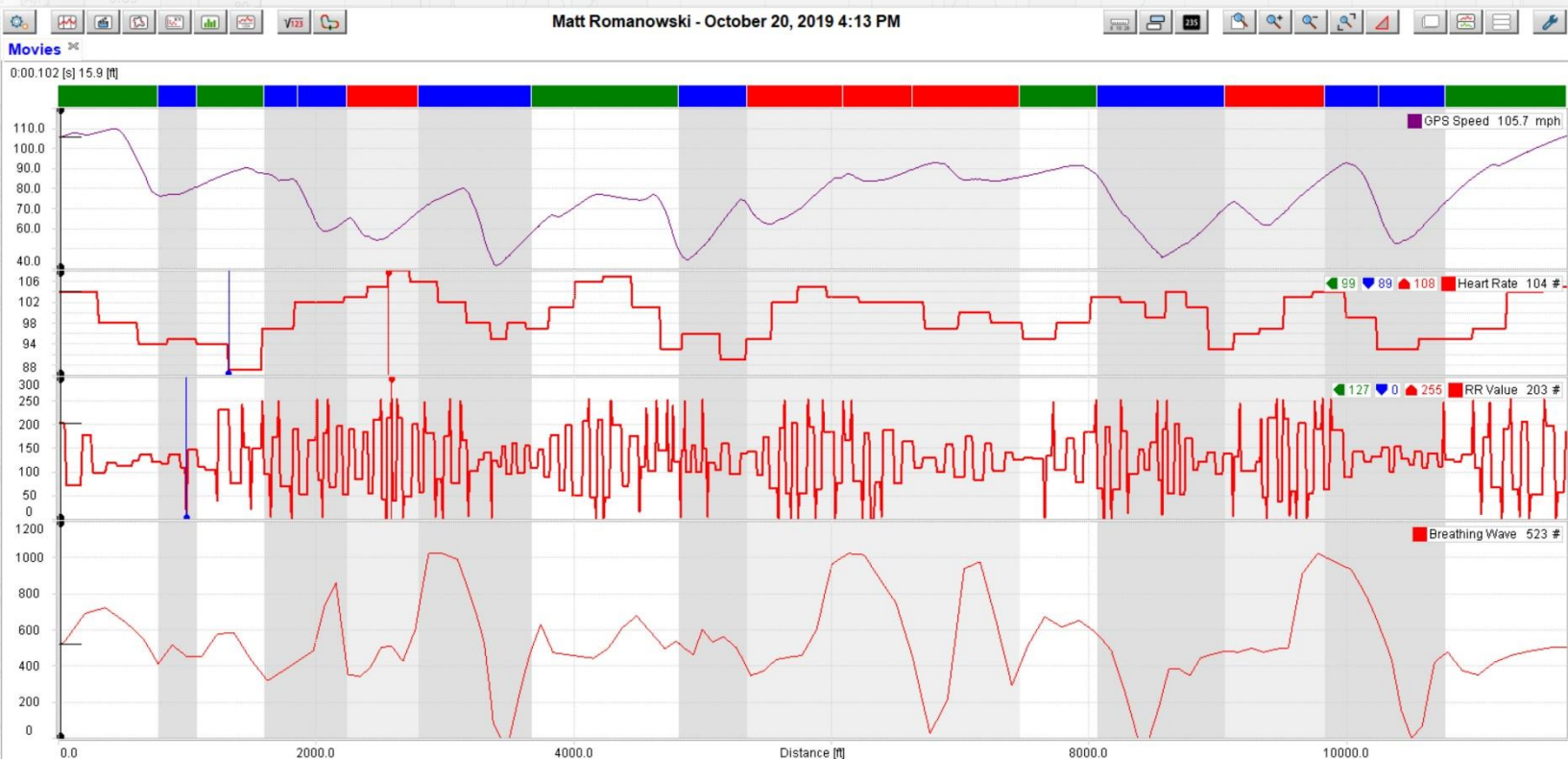
RS3 Tip – Use The Preview Function!

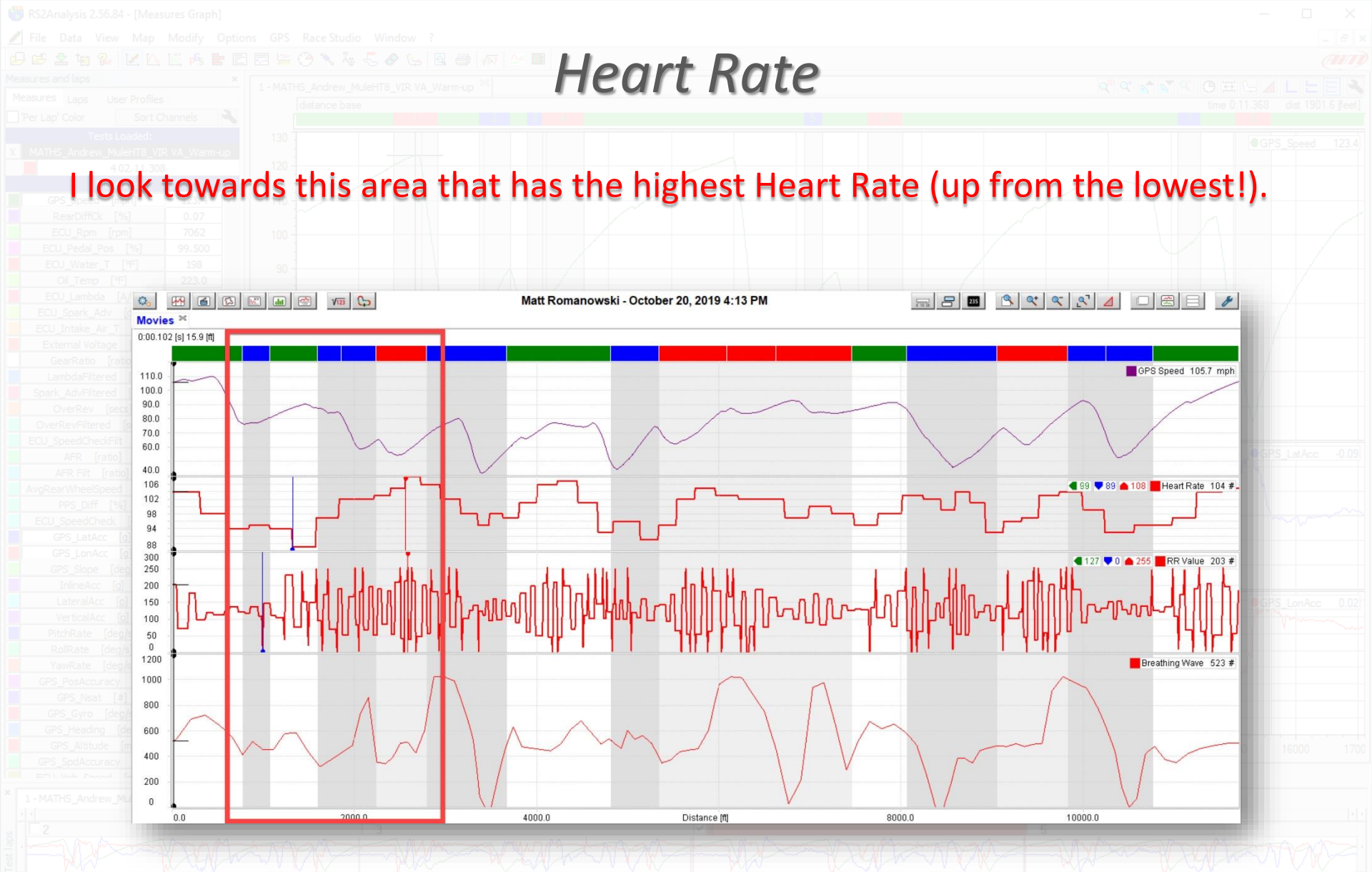
When looking at data from several/many sessions, the 'Preview Function' can be changed to show any measure you want along with a range of the data!



Looking At A Full Lap

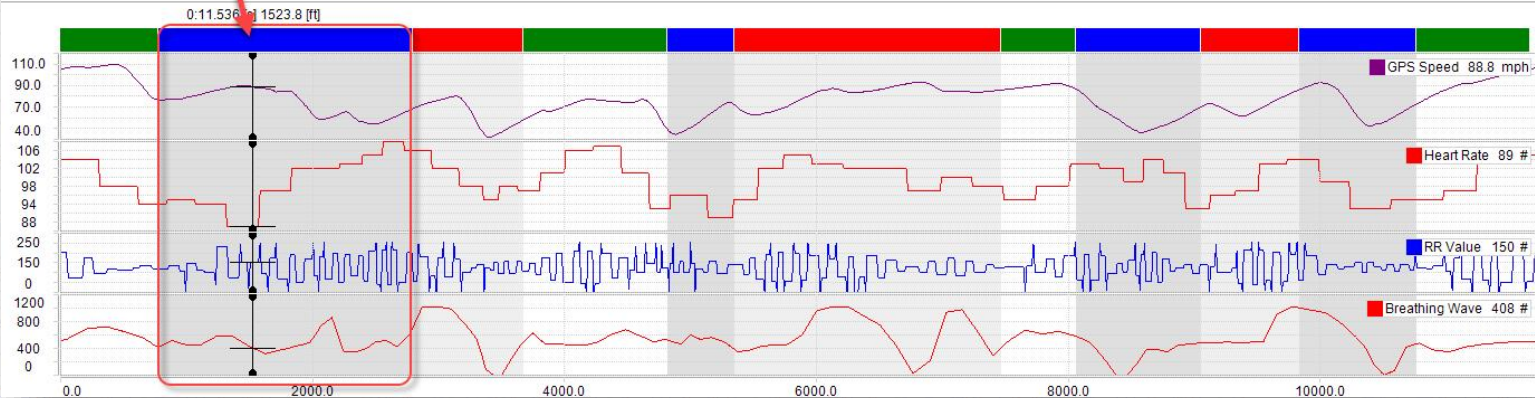
From this view in RS3A, we can see a lot of valuable information. We can see where I'm exerting the most effort, based on my Heart Rate. Also, where I am most stressed based on my HRV and how/where I'm breathing!





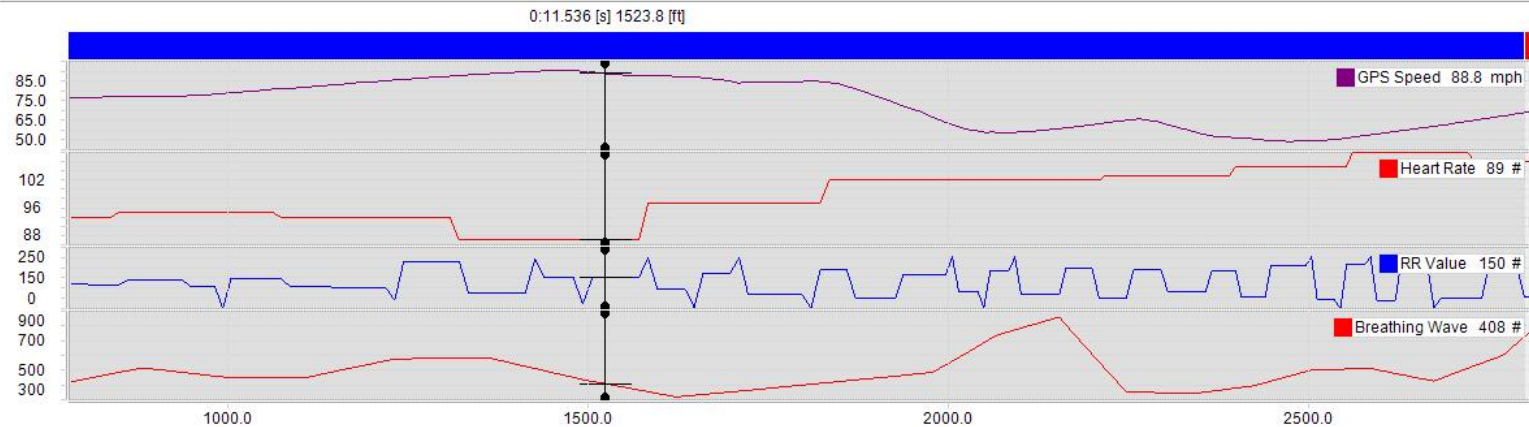
RS3A Tip – Quick Segment Zoom!

After setting the track segments, you can double click on any single track segment to zoom into that area. Here we are showing the Video for even more clarity.



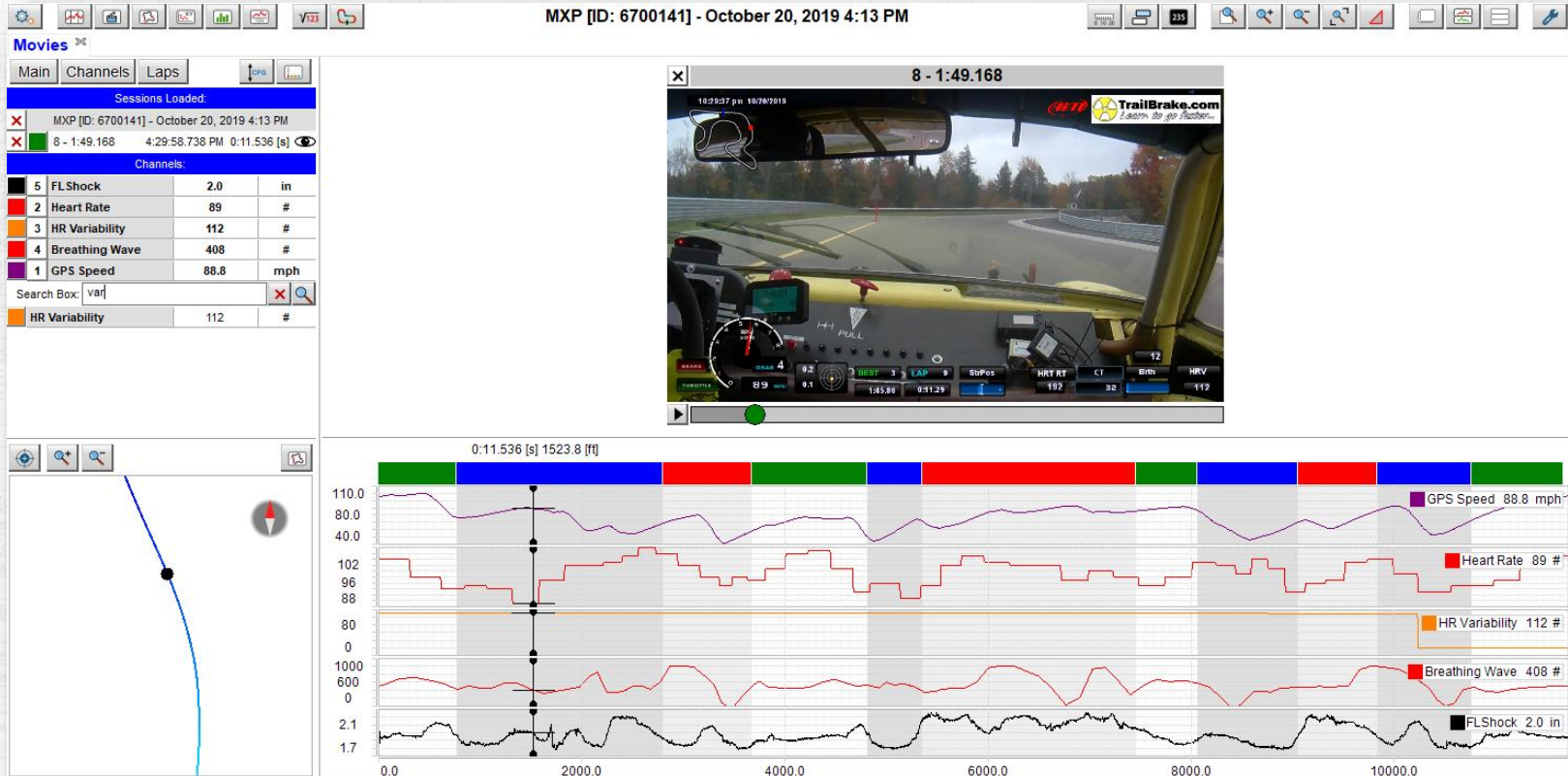
RS3A Tip – Quick Segment Zoom!

To quickly return to a view of the full lap, double click again on the segment to zoom back out. This is a newly added function and will save a lot of time.



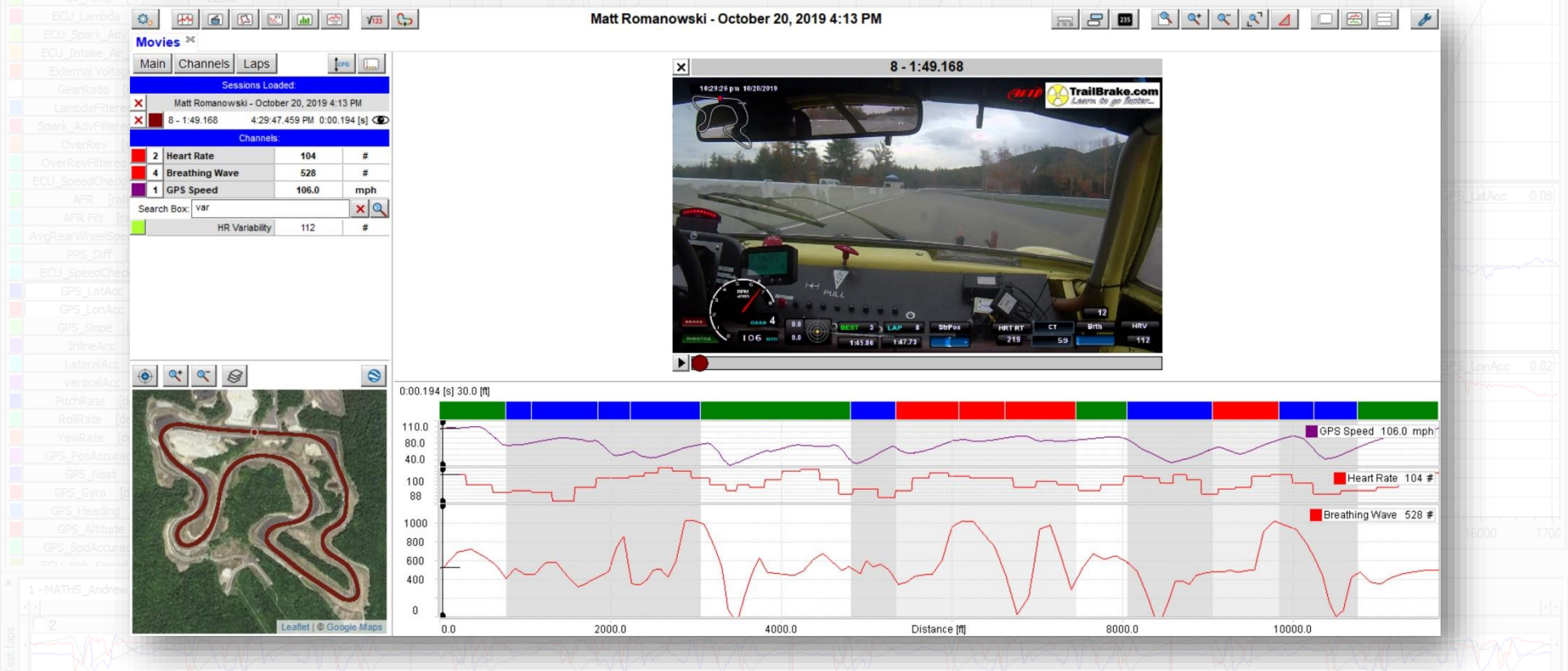
Now We Add the 'Why'

Right where the Heart Rate values start to change there is a large bump (shown in the FL Shock trace) that is also in a fast corner!





You can also see from the 'Breathing Wave' channel if someone is holding their breath, breathing fast, etc.



Holding My Breath!

Focusing on these 3 areas, we can see that my breathing elevates and holds before every significant brake zone. I am taking in a deep breath and holding it!



RS2Analysis 2.56.84 - [Measures Laps]

File Data View Map Modify Options GPS RaceStudio Window ?

Measures and laps

Measures Laps User Profiles

Per Lap Color Sort Channels

Tests Loaded

1 - MATHS_Andrew_MuleH3_VIR_VA_Warm-up

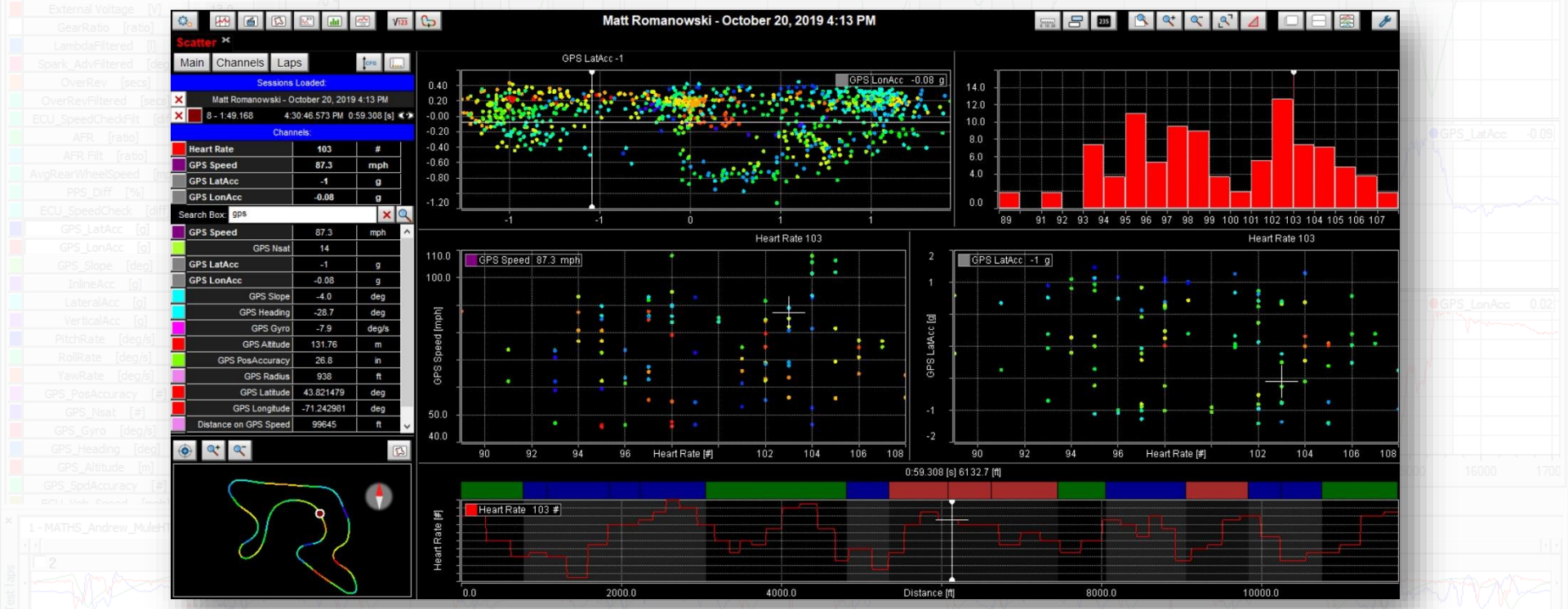
distance base

time 0:11:36.8 dist 1301.6 feet

GPS_Speed 123.4

Look For More

Use the power of Race Studio 3 Analysis to look for more! The Friction Circle colored by Heart Rate, Heart Rate vs Speed, Heart Rate vs Long G, Heart Rate vs Lat G, etc. Understand what changes your Heart Rate and Heart Rate Variance to learn more about yourself, your car setup, the track, and more.

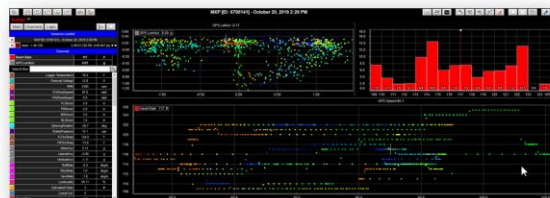


https://www2.onu.edu/~e-potkanowicz/e-potkanowicz/My_Work.html

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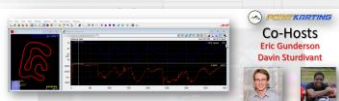
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Using Technology To Go Faster

December 10th, 2020

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In Race Studio 3

March 31st, 2020

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- Pre-Calculated Gear Position Function
- Configuring WiFi Communication
- Customizing AiM Device Logos
- Race Studio 3 Basic Configuration - Part 1
- Race Studio 3 Basic Configuration - Part 2
- **I Have Downloaded my Data, Now What - Part 1*
- **I Have Downloaded my Data, Now What - Part 2*
- GPS Lap Insert
- Data Views
- Measure Units
- Sort Channels
- Test Properties
- Per Lap Color
- Export Tests
- Channel Reports
- Setting Time
- Track Mapping
- Selection Criteria
- Sensor Calibration
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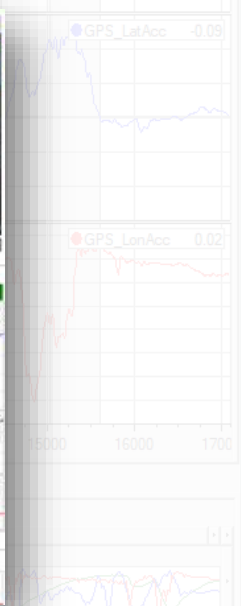


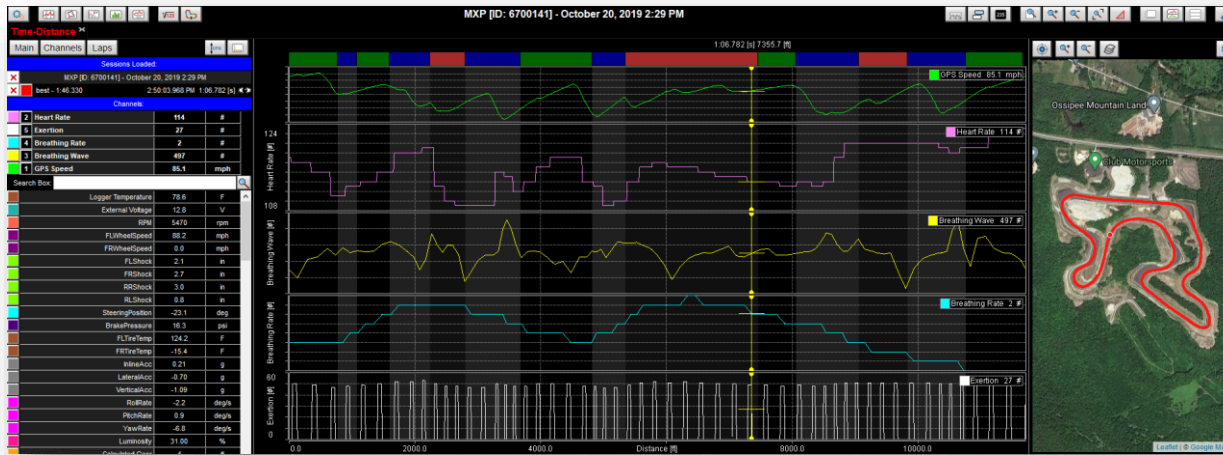
Co-Host

Emiliano Bina

AiM Sportline - Software

Software Release - Update #6





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roger@aimsports.com

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matt@TrailBrake.net
 @TrailBrakeMatt

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