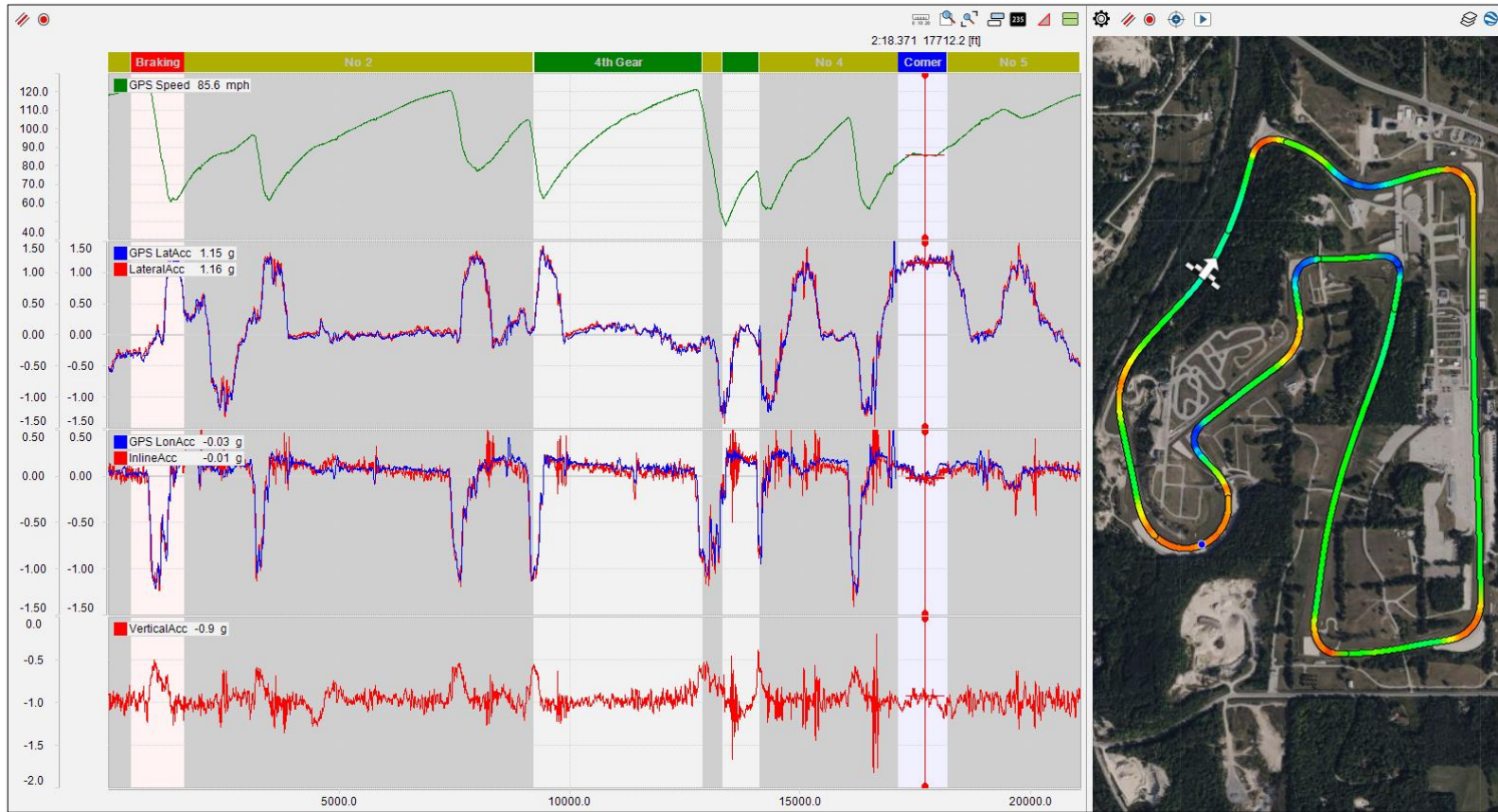


Accelerometers

in Racing Data Analysis



Host:

Roger Caddell

AiM Sports - National Training Manager

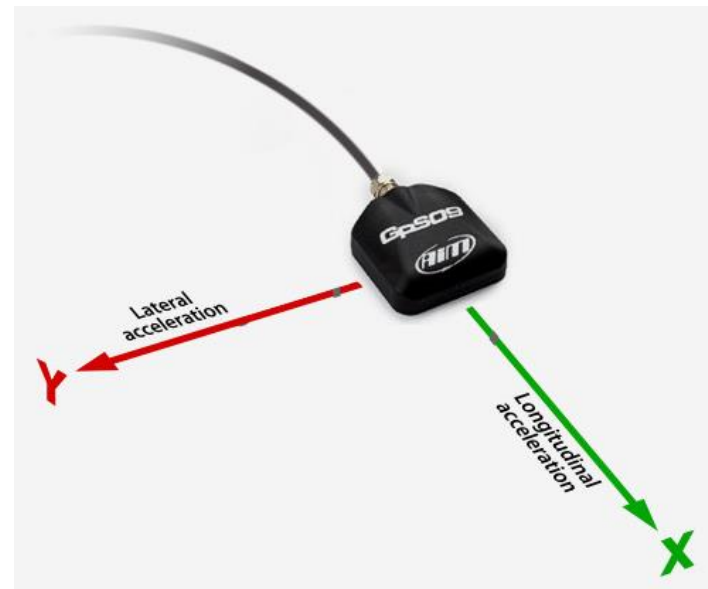
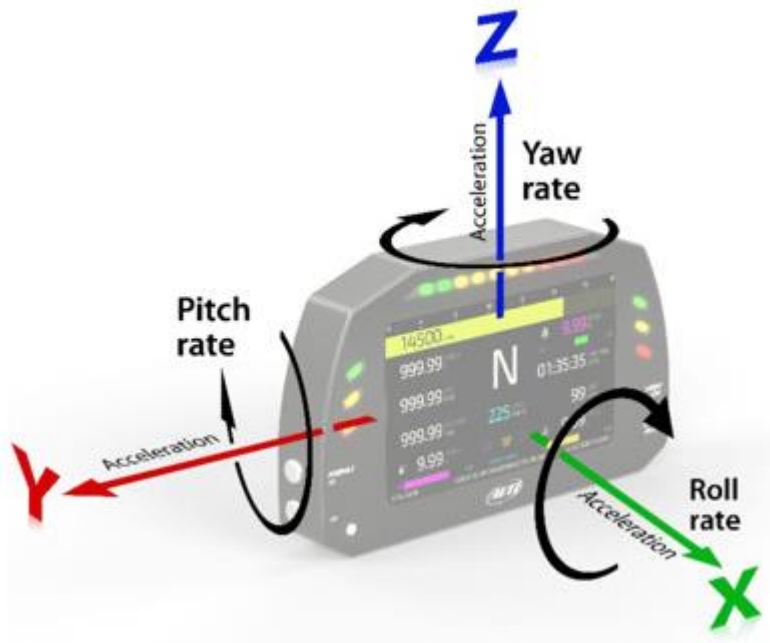


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Different Accelerometer Sources

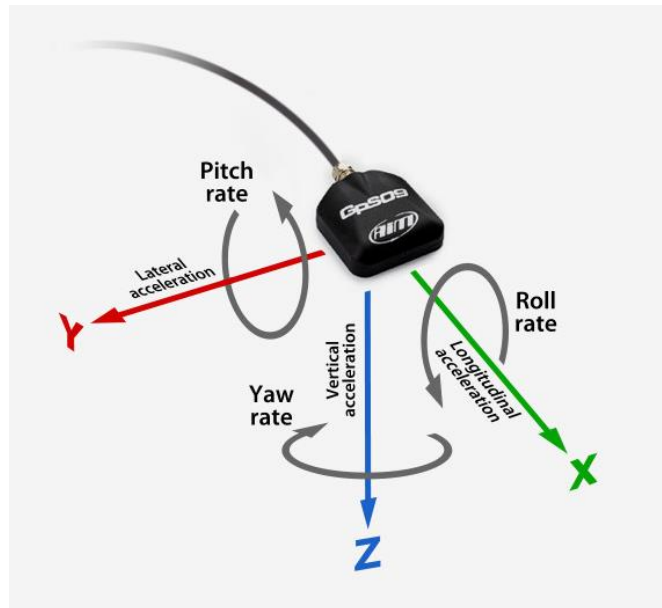


GPS Lat/Lon Accelerometers



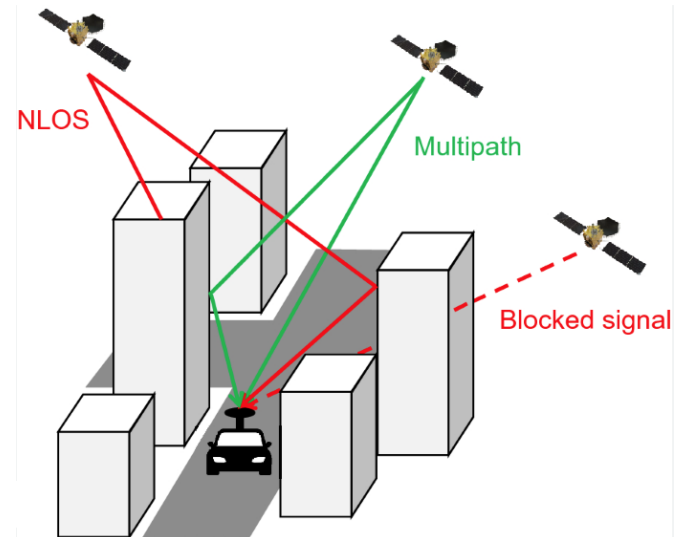
Strengths –

- The technology continues to improve
- Price is now lower, included with every AiM system
- With AiM, plug & play



Weaknesses –

- Relative low power signal, easily blocked
- Electronic technology can have issues
- Antenna must have clear view of the sky
- Non Line of Sight and/or Multipath (mostly an urban location issue)



Sensor Based Accelerometers

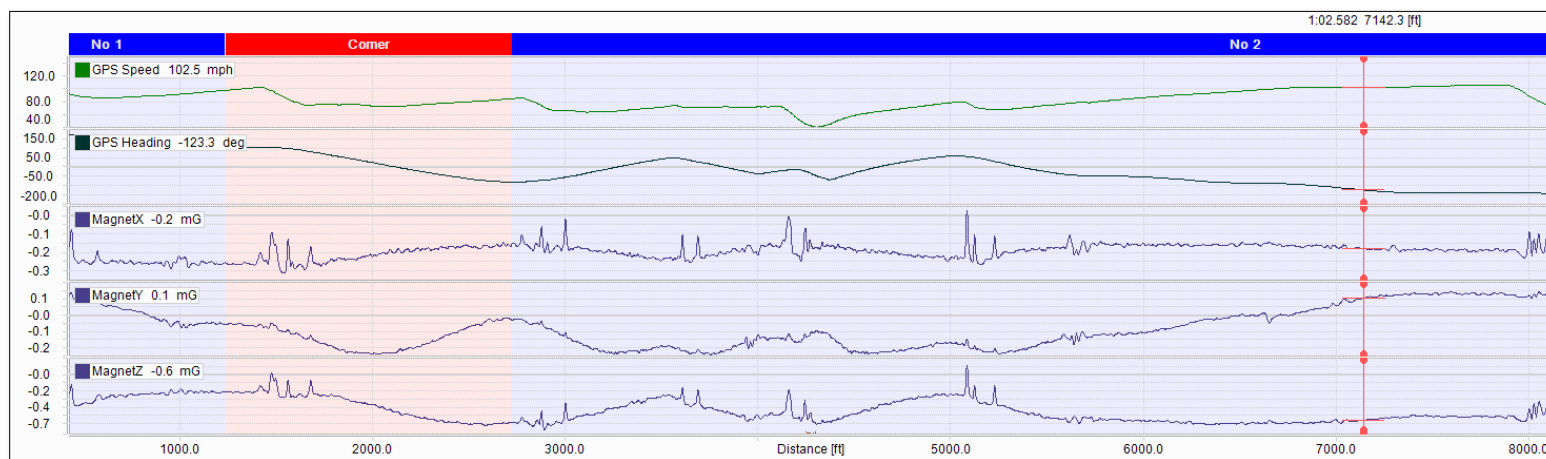
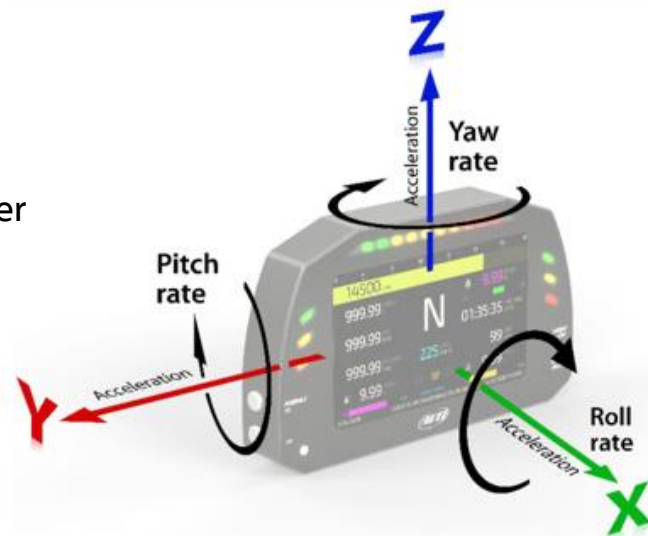


Strengths –

- Available internally with many AiM data loggers
- User definable (orientation, sample rates, etc.)
- Also gives Gyro (Pitch, Roll, Yaw)
- On some, a Magnetometer (when used with accelerometer and gyro, enhances altitude and direction data)

Weaknesses –

- Must be calibrated and possibly orientated
- Track slope/banking can skew results
- Mounting can produce 'noisy' data



Accelerometers in Race Data

Sensor Based Accelerometers

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AiM Accelerometer Sensor Setup



Tools: [X] [Gears] [V2] [V3] [Wireless] [Bluetooth] [USB] [Wi-Fi] [AiM Data Guy] [Signal] [Bluetooth] [AiM Logo]

All Configurations **AiM Webinar MXS v2**

Buttons: Save Save As Close Transmit

Tabs: Channels ECU Stream CAN2 Stream CAN Expansions Math Channels Status Variables Parameters Shift Lights and Alarms Commands Icons Manager Display SmartyCam Stream CAN Output

ID	☐	Name	Function	Sensor	Unit	Freq	Parameters
RPM	☒	RPM	Engine RPM	RPM Sensor	rpm	20 Hz	max: 16000 ; factor: /1 ;
Spd1	☒	FR Speed	Wheel Speed - Front Right	Speed Sensor	mph 0.1	50 Hz	wheel: 65.25 ; pulses: 4 ;
Spd2	☐	Speed2	Speed	Speed Sensor	mph 0.1	20 Hz	wheel: 40 ; pulses: 1 ;
Spd3	☐	Speed3					wheel: 40 ; pulses: 1 ;
Spd4	☐	Speed4					wheel: 40 ; pulses: 1 ;
Ch01	☒	Oil Pressure					
Ch02	☒	Channel02					
Ch03	☒	Channel03					
Ch04	☒	Channel04					
Ch05	☒	Channel05					
Ch06	☒	Channel06					
Ch07	☒	Channel07					
Ch08	☒	Channel08					
Acc1	☐	InlineAcc					
Acc2	☒	LateralAcc					
Acc3	☐	VerticalAcc					
Gyr1	☐	RollRate					
Gyr2	☐	PitchRate					
Gyr3	☐	YawRate					
PAccu	☒	GPS PosAccuracy	AiM GPS Position Accuracy	GPS	ft 0.01	auto (accor...	
Spd	☒	GPS Speed	GPS Speed	GPS	mph 0.1	auto (accor...	
Alt	☒	Altitude	GPS Altitude	GPS	ft 0.01	auto (accor...	
OdD	☒	Odometer	Odometer Total	Odometer	mi 0.1	1 Hz	
Luma	☒	Luminosity	Brightness	Luminosity	% 0.01	1 Hz	

Channel Settings

Name: LateralAcc

Function: Lateral Acceleration

Sensor: Internal Accelerometer

Sampling Frequency: 50 Hz

Unit of Measure: g

Display Precision: 2 decimal places

Buttons: Save Cancel



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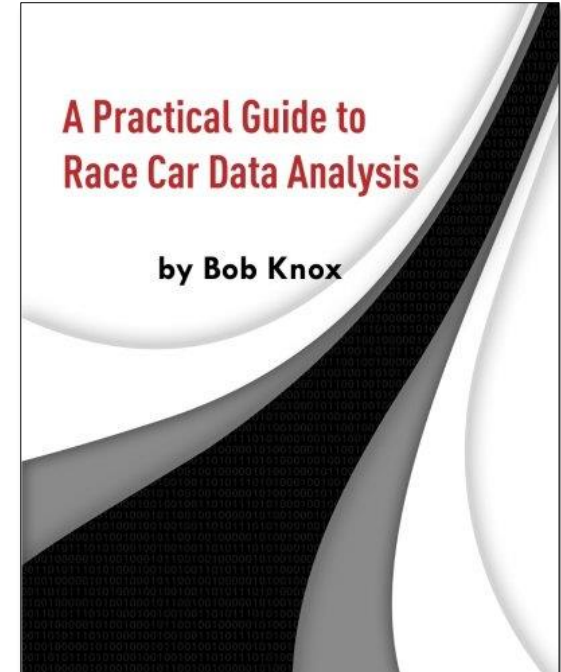
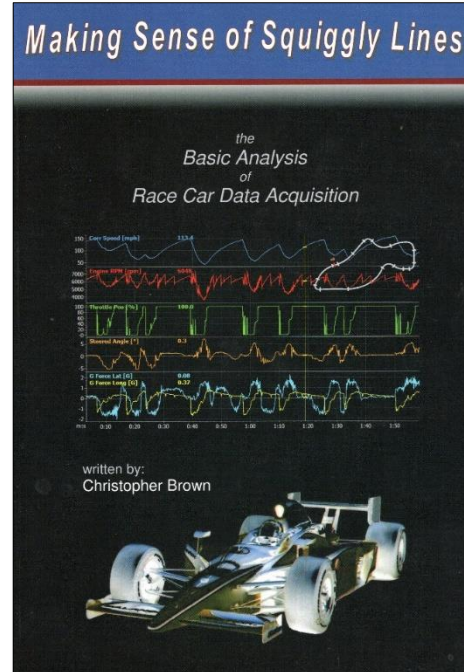
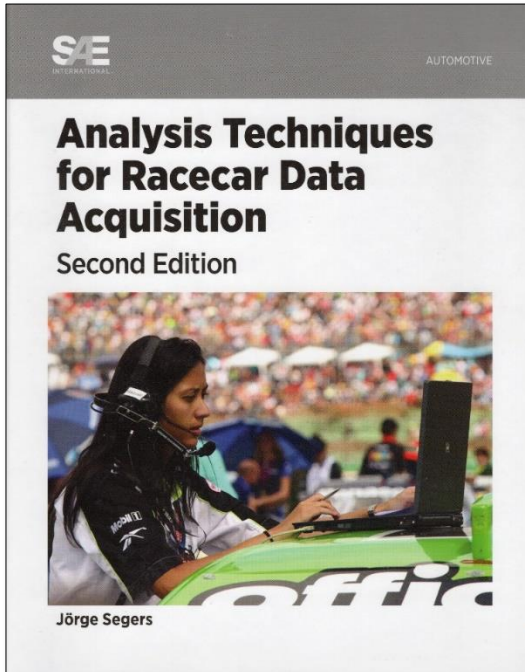
Accelerometers in Race Data

AiM Accelerometer Sensor Setup

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Information Sources

Great Data Books



- **Analysis Techniques for Racecar Data Acquisition (Second Edition) – Jörg Segers**
- **Making Sense of Squiggly Lines – Christopher Brown**
- **A Practical Guide to Race Car Data Analysis – Bob Knox**



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Accelerometers in Race Data

Information Sources

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High Bank Road Race



Accelerometers in Race Data

High Bank Road Race

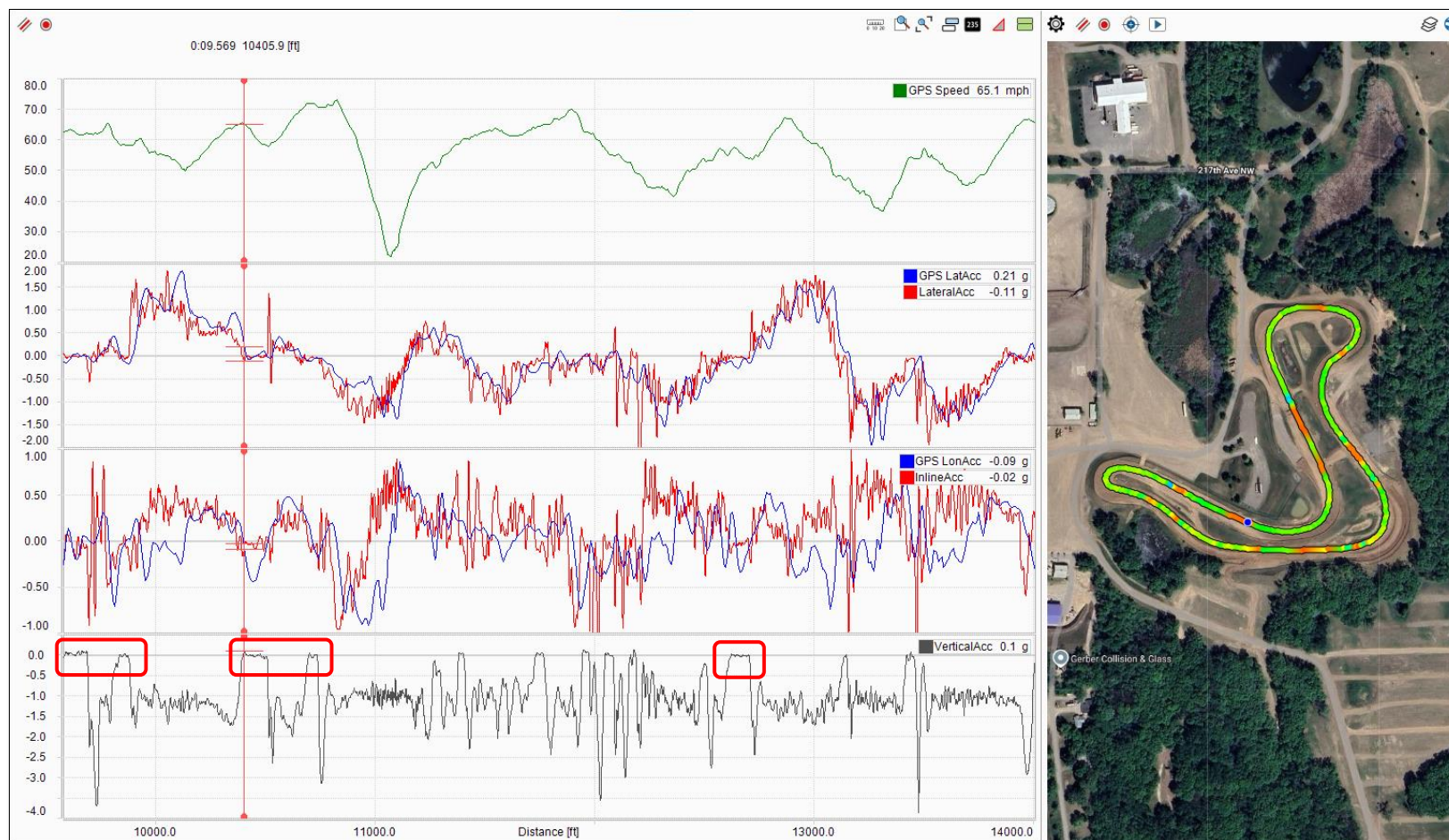


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Off Road UTV



Accelerometers in Race Data

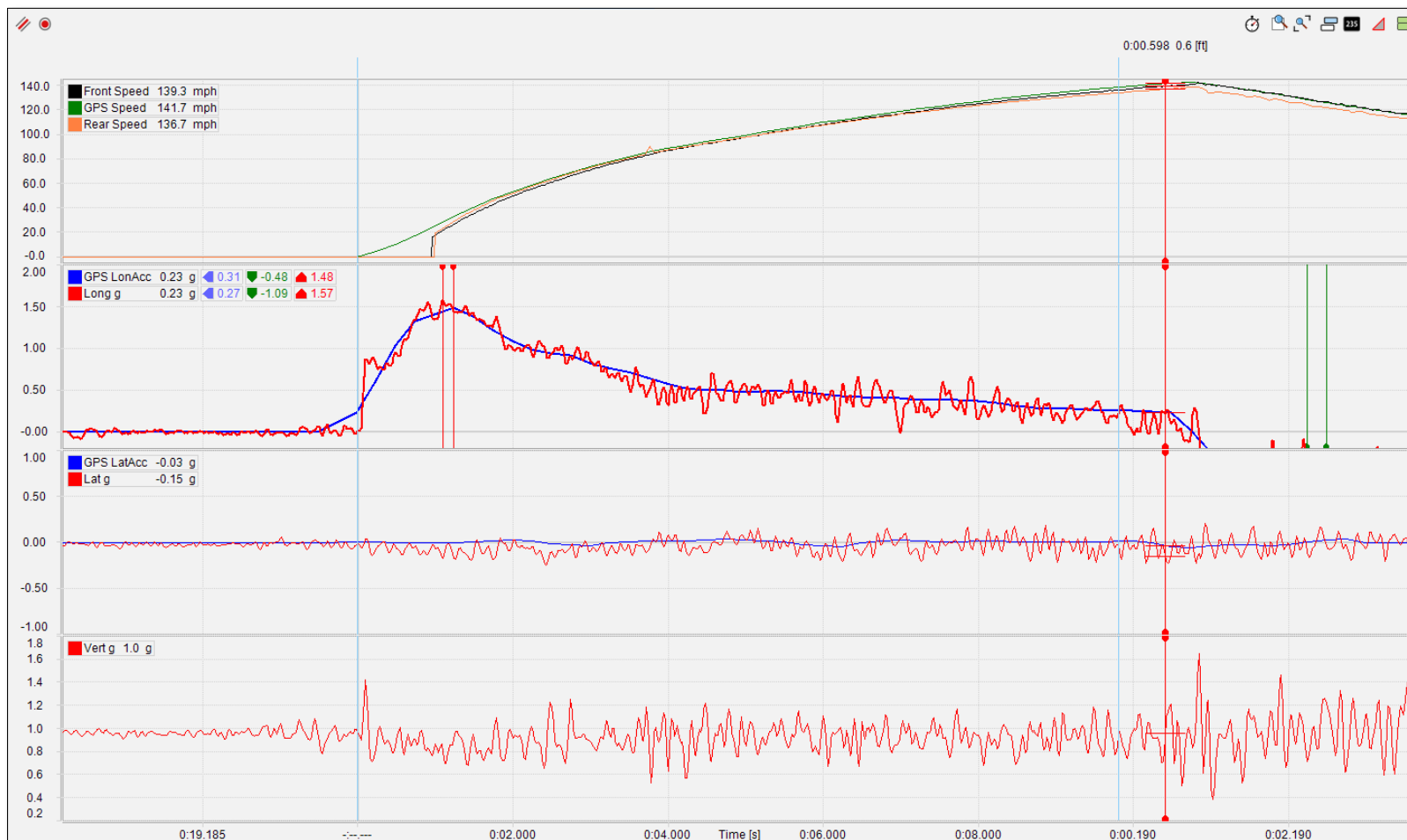
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Drag Racing



Accelerometers in Race Data

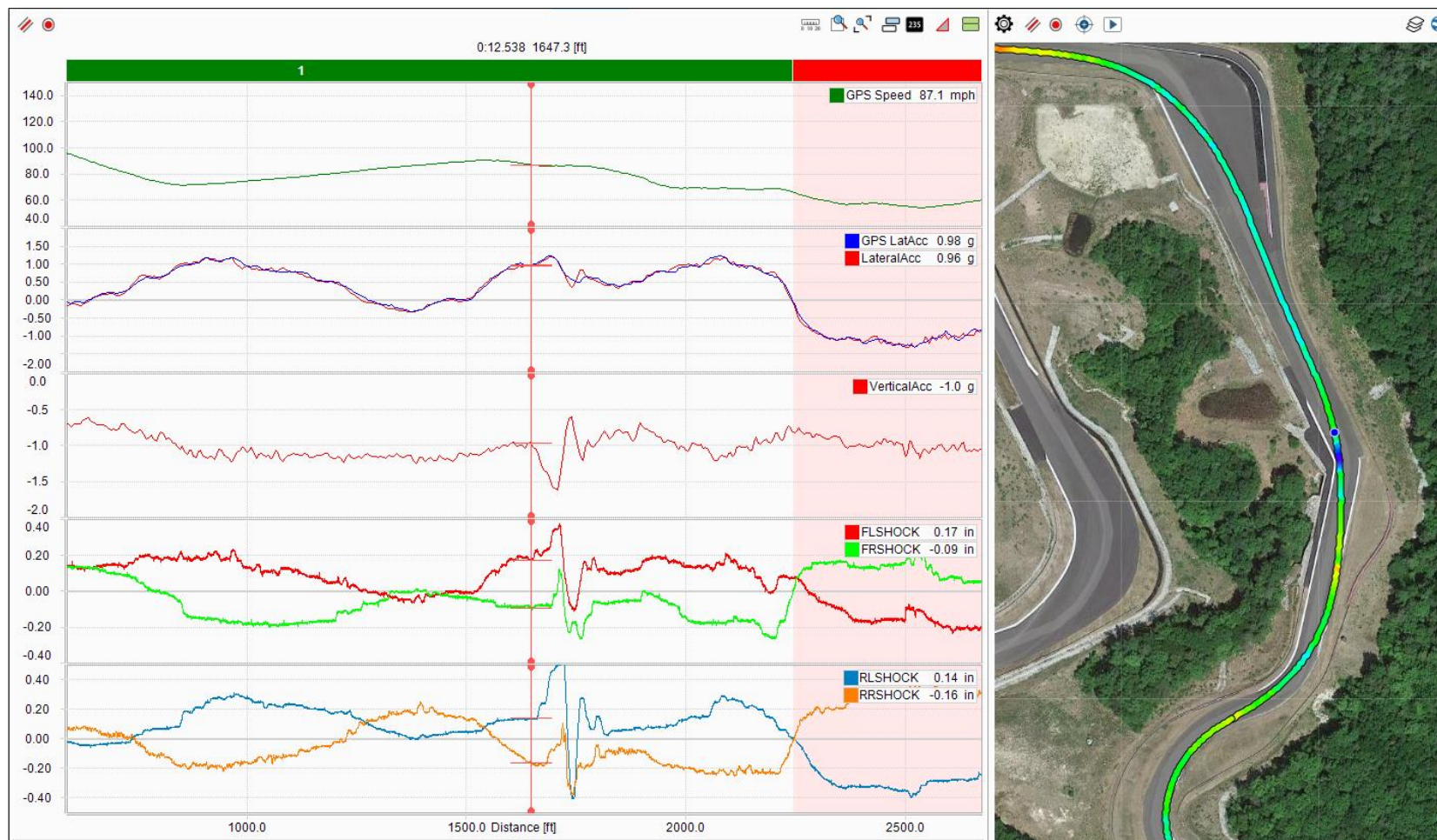
Drag Racing

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Vertical Acceleration



Accelerometers in Race Data

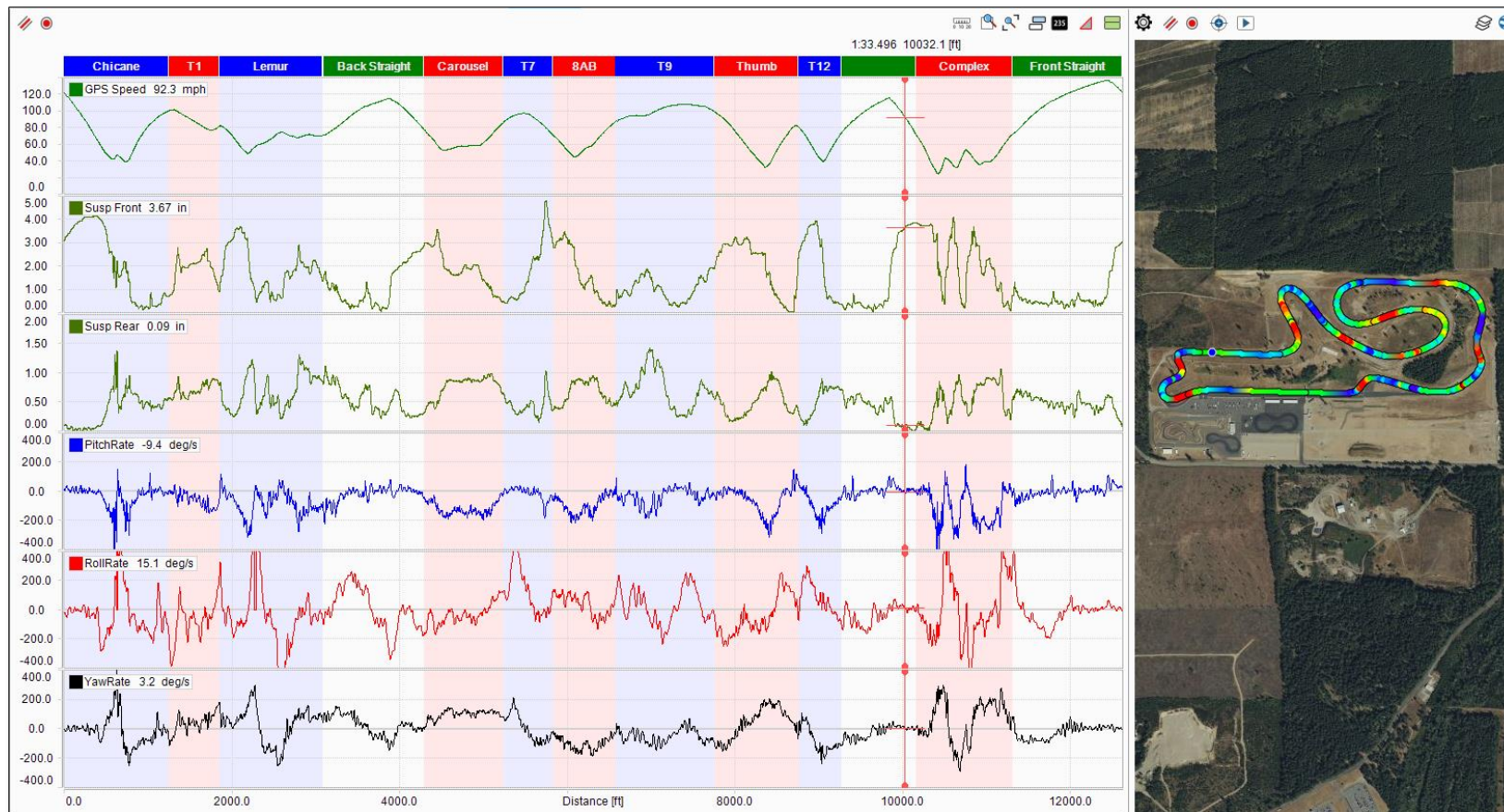
Vertical Acceleration

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Road Race Motorcycle



Accelerometers in Race Data

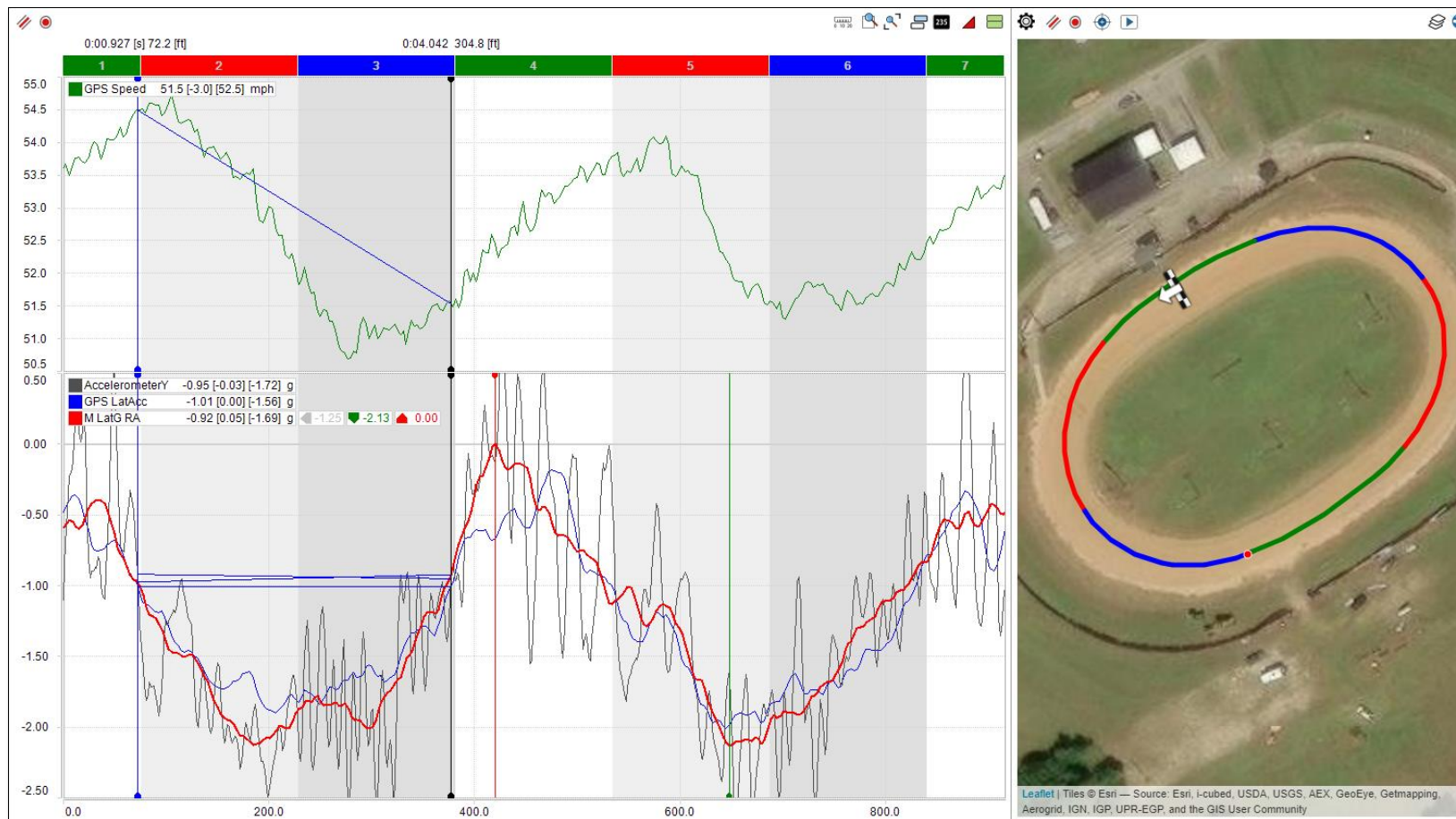
Road Race Motorcycle

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Oval Dirt Kart



Accelerometers in Race Data

Oval Dirt Kart

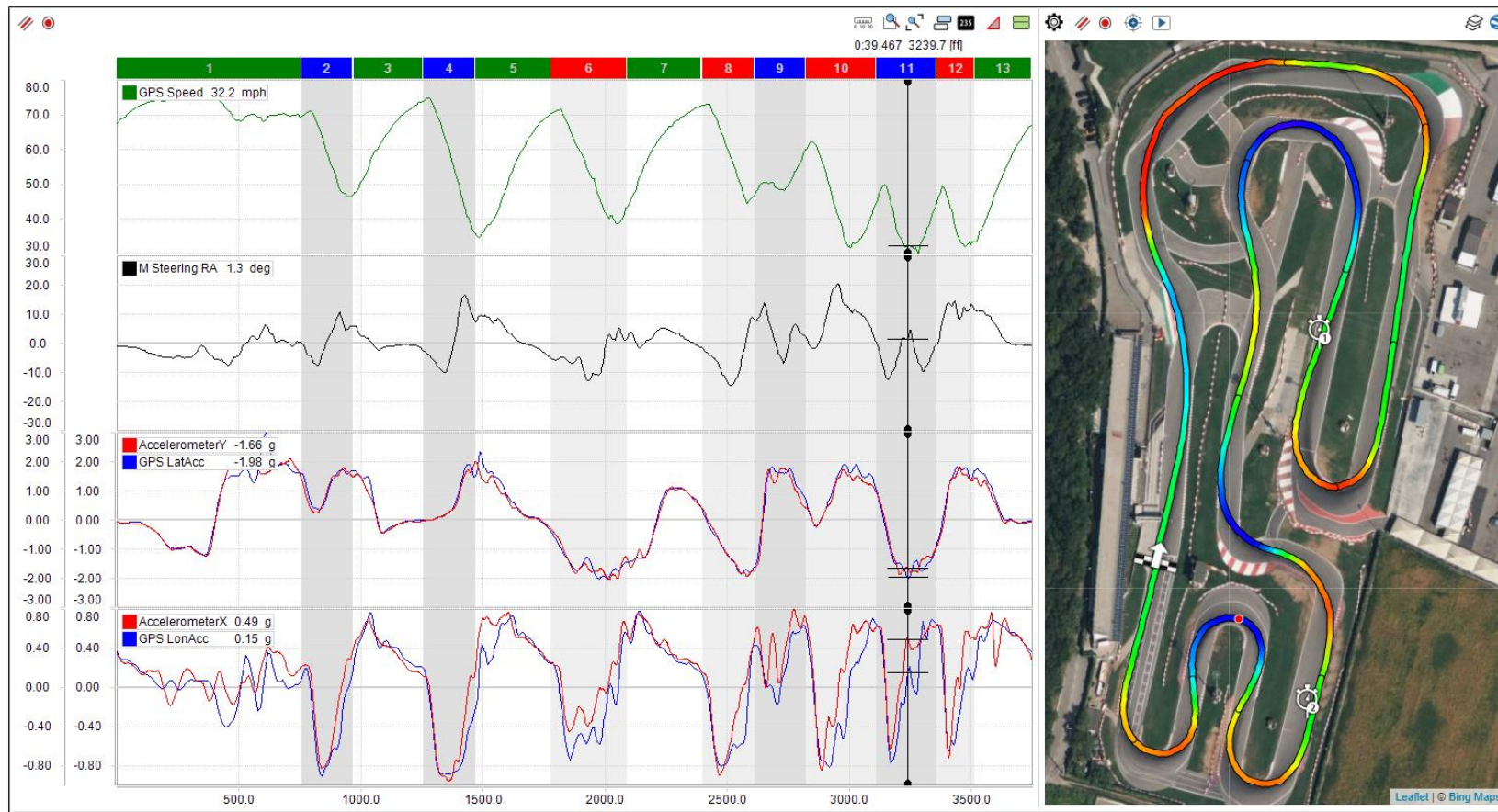
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Sprint Kart



Accelerometers in Race Data

Sprint Kart



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Filtering Accelerometer Data



Raw Accelerometer Data – I searched and found a data file with a 'noisy' Vertical Accelerometer channel.

You may get the data you want from this unfiltered channel and that is great and sometimes appropriate or maybe you would like to apply a filter, it is your call!



Accelerometers in Race Data

Filtering Accelerometer Data

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Filtering Accelerometer Data



Here I have created a math channel using the Rolling Average function with the setting of 9. The Math Channel is: **ROLL_AVG("VerticalAcc"[g],9)**

I also lightened the color of the raw channel and placed the new filtered channel right on top and changed the color to a bolded black.



Accelerometers in Race Data

Filtering Accelerometer Data

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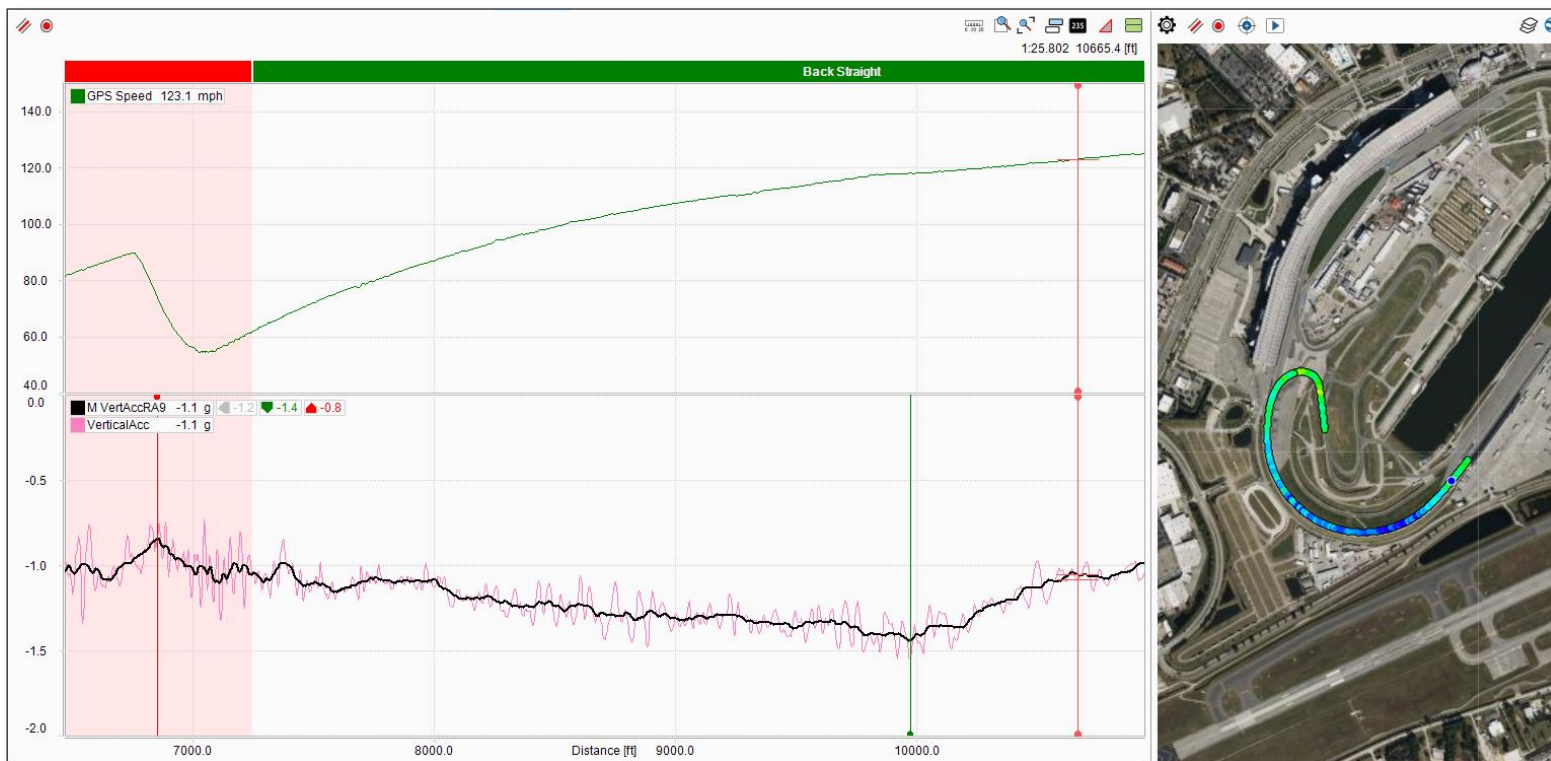
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Filtering Accelerometer Data



Here I have created a math channel using the Rolling Average function with the setting of 9. The Math Channel is: **ROLL_AVG("VerticalAcc"[g],9)**

Here I have simply zoomed in to give a closer look at what the channel traces look like.



Accelerometers in Race Data

Filtering Accelerometer Data

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Filtering Accelerometer Data



Here I want to show the average channel value over time. I have used the Delta function and focusing on over 30 seconds of data when the car exited the infield section, went through the corner banking, and then down the back straight. (Gold segment)

You can see that the average of both the raw and filtered channel is -1.2g



Accelerometers in Race Data

Filtering Accelerometer Data

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Accelerometers
in Racing Data Analysis

Host:
Roger Caddell
AIM Sports - National Training Manager

aimsports.com Tuesday October 8th, 2024 LearnFast™

GPS vs. Wheel Speeds
in Racing Data Analysis

Host:
Roger Caddell
AIM Sports - National Training Manager

aimsports.com Tuesday September 24th, 2024 LearnFast™

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March 31st, 2020

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 - **I Have Downloaded my Data, Now What - Part 2*
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 - Data Views
 - Sensor Calibration
 - Measure Units
 - Conditional Alarms
 - Sort Channels
 - Gear Position
 - Test Properties
 - Firmware Update
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Additional Materials

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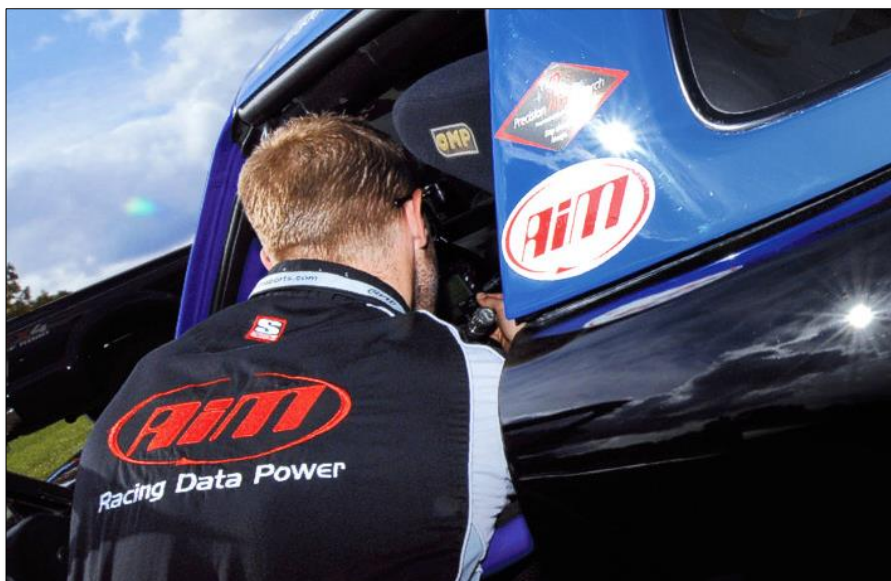
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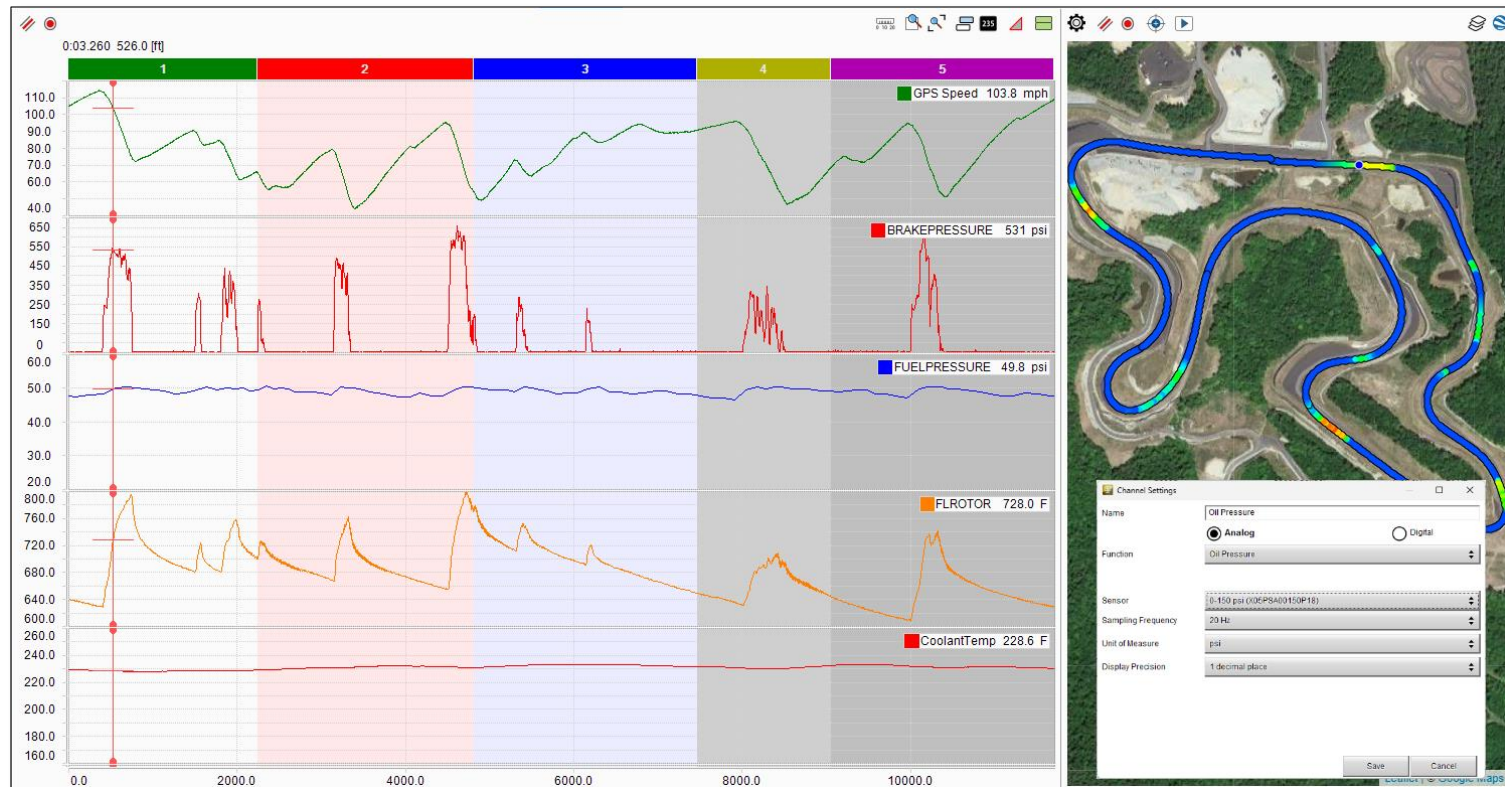
#5-19
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If You Have Questions

Next AiM Sports Webinar

Tuesday, October 29th, 2024 – 10am Pac / 1pm East



Pressure & Temp Sensors



Roger Caddell

AiM Sports - National Training Manager

Next Webinar

2nd Tues & Last Tues of Each Month

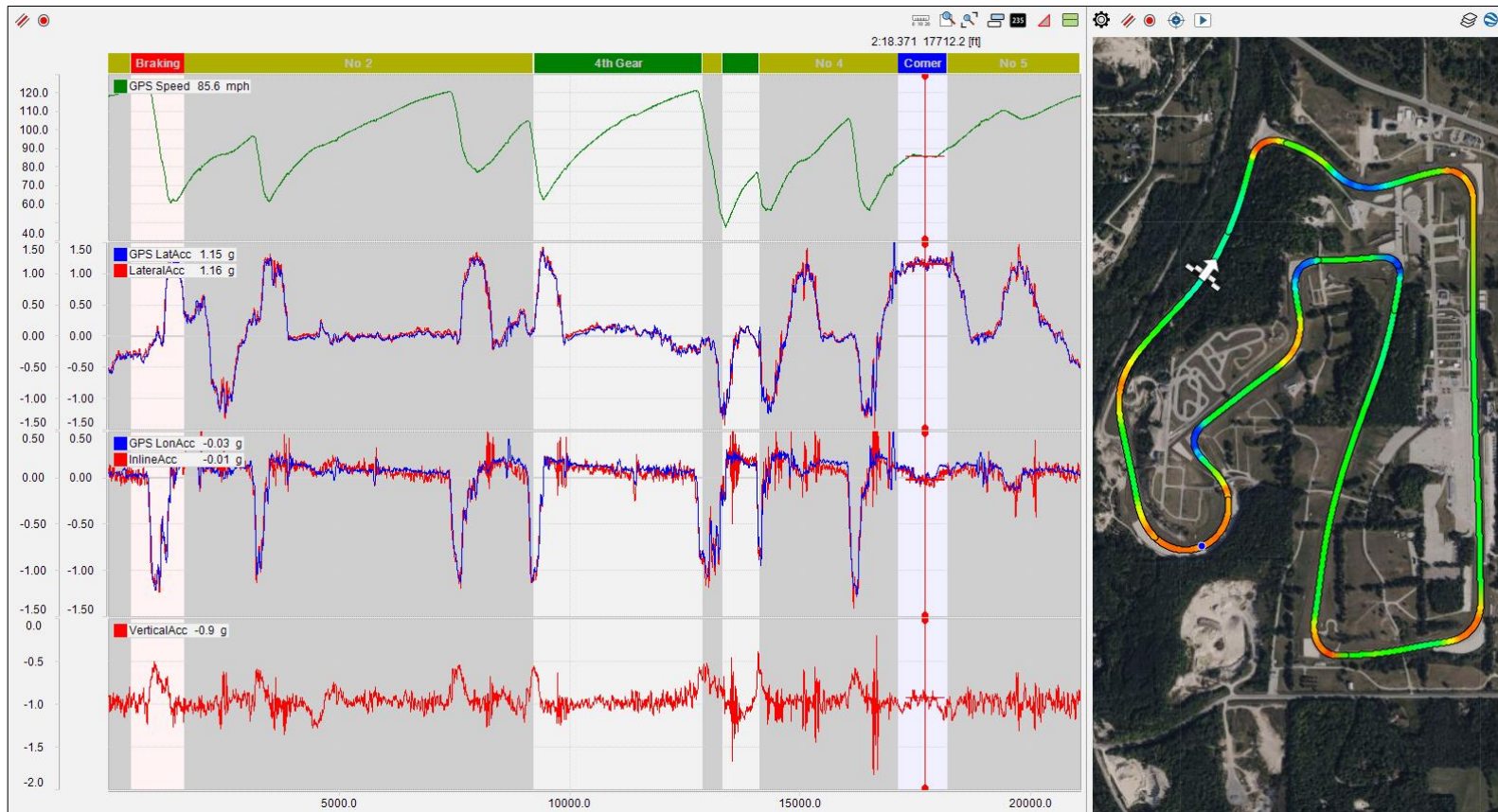


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Contact Information



Host:

Roger Caddell

AiM Sports - National Training Manager
roger@aimsports.com



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