



AiM Webinar
“Braking Analysis with GPS Based Data and Math Channels”
4.30.20
Edited Q&A

1 **Q:**Emiliano: Is there a possibility that the dashes may be able to display corner vMin speeds soon?

A1:Thanks for asking. I'll be forwarding the request along to our firmware dept (firmware@aim-sportline.com)

A2:Yes, there is Jeff.

2 **Q:**Can someone provide a formula for corner radius math as discussed a few sessions ago and how to load it into an MXL.?

A:The formula is only available for Race Studio 2 Analysis. Email us at support@aimsports.com and we can send you a few documents to better assist.

3 **Q:**Could the brake pressure variation be due to bumps causing change in pressure between foot and pedal?

A:It absolutely could be, but I would say that you would have less chance of that on the majority of racetracks unless you're on the rumble strips.

4 **Q:**If I already have a brake pressure sensor, isn't it simpler to just look at that?

A:It is, however some users do not have those analog or ECU channels. This is a great way for all AiM data users with GPS to analyze their braking.

5 **Q:**Is Inverse Long. G the same as GPS Long?

A:[Answered live]

6 **Q:**I have a brake position sensor with “mechanical” brakes on a kart. Is there any way to calculate the approximate “dead zone” by use GPS acc data?

A:Yes, using both brake position and GPS_LonAcc together will give you more clarity in trying to find that "dead zone".

7 **Q:**How would this look on a downhill like into Turn 4 at Sears Point?

A:[Answered live]

8 **Q:**Why not use absolute value or Long. G?

A:[Answered live]

9 **Q:**Does “looping” in the friction circle most likely indicate loss of grip/sliding?

A1:Not always. Sometimes it is from the input of the driver. I.E. lining up the car before entrance to a turn but generally a smooth transition between braking and cornering G forces is optimum.

A2:[Answered live]

10 **Q:**How do I get the math channels I create to show on across all tests? I made a channel, but notice it only shows up when I open the test I created it on.

A:You need to make sure they are made on the "General" tab rather than the tab for that specific test. This concept is deeply discussed in this video: https://youtu.be/raPWKW8T_QA

11 **Q:**How does the friction circle make viewing the G's clearer than the trace? Is there a certain shape you are looking for?

A:[Answered live]

12 **Q:**As an engineer, how do you know that the added lines are the limit curve without getting the tire test data?

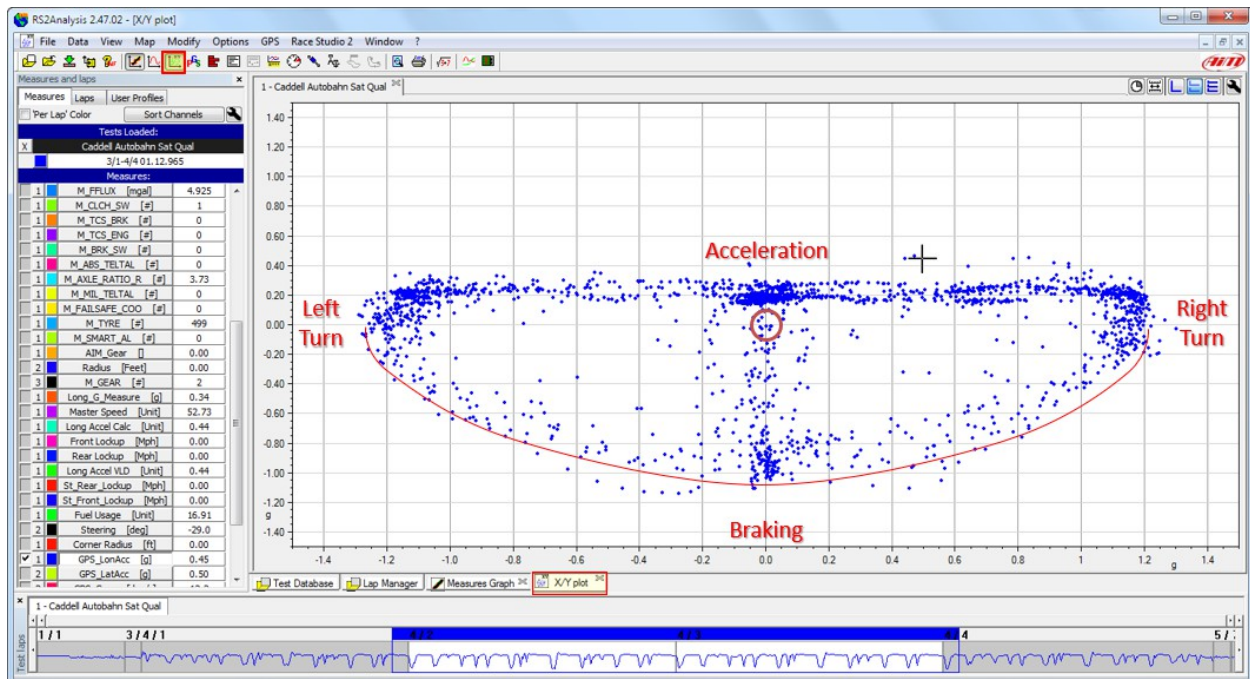
A:You can imagine/draw an ellipse using max inline braking and max lat. acc. when inline G is zero.

13 Q:Is there any way to see the actual limit of the tires on the friction circle?

A:The maximum value will be the tires limit, once they slip you will have less G forces as you are sliding.

14 Q:Do you have an example of using most of the friction circle and how those graphs look?

A:We're not showing one for this example but generally the farther you are from the center of the GG plot, the better you're using the grip your tires can give. Below is a slide from one of our data analysis seminars. It gives a good example:



X/Y Graph or G/G Diagram You can plot 2 channels against another. Here we have plotted GPS_LatAcc vs. GPS_LonAcc to determine if the driver is using maximum grip while transitioning from Long G's to Lat g's, commonly known as a GG Diagram. This driver is good at running the car near the performance envelope. Here we have also labeled the directions of force and the "zero" point.

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How to Use Data Acquisition

Driver Performance

G/G Diagram – Good Example

15 Q:Can you put two diff measures on single graph on RS2 analysis?

A:Yes, any number of measures. You can do this by selecting the mixed graph option found in the top right of the measures graph. The icon looks like 2 blue L's.

16 **Q:**Can you post the math channel in the chat for Brake Aggression?

A: GPS_Brake_Speed: IF(LT(GPS_LonAcc,-0.15),deriv(GPS_LonAcc),0)

All of the math channels are also included in the actual sample data from this webinar and also included in the slides in the presentation.

17 **Q:**Should the slope of brake aggression always be the same (corner, equipment all same), but end at a different "value" depending on the conditions?

A:[Answered live]

18 **Q:**Very high brake aggression isn't always better, correct?

A:Correct. Things like tires, grip, weather, even camber should be taken into consideration. Too much Brake aggression can lock up the tires and/or create handling issues.

19 **Q:**Is there an easy way to change from meters to feet for the distance delta?

A:It depends on preference settings, if you use km/h for speed the distance is meters, if you use mph then it's in feet.

20 **Q:**So would an "ideal" GSUM graph for a corner look like a horizontal line at the peak value, representing a seamless transition from braking to lateral grip and back to acceleration?

A:Yes.

21 **Q:**Jeremy mentions being able to understand if you can benefit from braking later by looking at the transition from braking to turning. Conversely, is there a method to understand if you're over driving the entry of the corner?

A:[Answered live]

22 **Q:**Can you address figuring out if the inconsistency in braking is car related, a chassis setup issue or a track surface issue?

A:[Answered live]

23 **Q:**How does one create specific measures graphs? I.e. I see Jeremy has one labeled “Brake Analysis and Friction Circle”.

A:You must switch to ‘multiple views’. Here is a link to a video explaining this function:
Multiple Views Function in Race Studio 2 Analysis: <https://youtu.be/IuDvchVz1TI>

24 **Q:**Aren't both drivers braking early and starting the turning late?

A:[Answered live]

25 **Q:**Just to confirm, as GSum and Inv. Lon. G diverge, that indicates the turn in point?

A:Yes.

26 **Q:**A loop in a friction circle is an indication of oversteer?

A:It could be oversteer or understeer. If you lose grip in the front or rear of the car you will have less lateral G and less braking G so you will create a loop once traction is restored.

27 **Q:**When using the Delta button, it shows the time between the selected points; is it also showing the distance between the two selected points?

A:Yes.

28 **Q:**Are there any sensors that will give vertical load on the tire? Does it matter?

A:Weight transfer is a linear function of the height of center of gravity and long. acceleration.

29 **Q:**It would be interesting to see some comparisons with kart data since the reactions from driver to tires happen much quicker. I’m curious to know if the data is capable of being as smooth as what we see with this data.

A:This information comes from GPS. The smoothness should be approximately the same, as the sample rate of the GPS is the same between our automotive hardware and the Mychron5. A difference some find in analyzing karting braking and turning data is in many cases a kart starts turn in before braking because of their high grip levels.

30 **Q:**If your displaying two laps, does time delta display both laps?

A:Yes

31 **Q:**Is the brake speed something that the AiM software provides?

A:[Answered live]

32 **Q:**What would logical or effective braking be like on a gravel rally?

A:This is a tricky one to get into. On a track we see the same corner with about the same surface grip (at least per session) over and over, so finding patterns and figuring out the places that need improvement, braking points, etc. is much easier. In a rally, you could still apply the same principles, however, you'll rarely see the same corner twice and a rally driver is constantly making adjustment to steering, brakes, throttle in search of grip.

33 **Q:**What does AiM stand for?

A:Applicazioni Industriali Microprocessori. Long story short, it tells where the company started more than 40 years ago.

34 **Q:**Where are math channels configured?

A1:Modify > Math Channels, at the top of RS2 analysis.

A2:Here's a link to our video on math channels:

Using Math Channels in Race Studio 2 Analysis: https://youtu.be/raPWKW8T_QA

35 **Q:**Does AiM work on a Mac as well as PC?

A:For now it is a Windows based software.