



AiM Webinar
“Friction Circle and Other X/Y Plots”
Edited Q&A
4.28.20

- 1 **Q:**
I use a Solo2. What measure is the best one to show the effect of braking?

A:
You would be able to see acceleration and deceleration with the GPS_LonAcc measure.

- 2 **Q:**
Are friction circles applicable to motorcycles?

A:
If you use GPS based acceleration channels (GPS_LatAcc and GPS_LonAcc), yes Friction Circles can provide valuable data for motorcycles.

- 3 **Q:**
Where does the accelerometer data come from?

A:
The current generation of hardware has an on-board IMU that has a 3 axis accelerometer and 3 axis gyro and plus accelerometer data based on the GPS data.

- 4 **Q:**
Is there a way to lock the aspect ratio of the GG plot?

A:
No, there is not. You can store window sizes by using the user profile settings.

- 5 **Q:**
Can you flip the scale so negative is on top?

A:
You can reverse the channel in order to get what you’re looking for.

- 6 **Q:**
Can you put driver 1 on the left and driver 2 on the right synced to track location?

A:
When using the ‘Multiple Views’ function you can have multiple tabs in the same function. Here is a video explaining Multiple Views: <https://youtu.be/IuDvchVz1TI>

- 7 **Q:**
Is there a way for me to specify equidistant X and Y plot intervals (outside of using the mouse to resize the window and eyeball it?)
A:
Right click on the channel name in the measures and laps window to set scale of any channel.
- 8 **Q:**
How is the friction circle created?
A:
You should place lateral accel as X axis, longitudinal accel as Y axis.
- 9 **Q:**
To me it visually it makes more sense to have braking going up but this way you have displayed is the conventional way to do it?
A:
It is my preference and many that I know, but it is a personal choice. No wrong answer. The meaning of this analysis is not influenced by how you place axes.
- 10 **Q:**
If you're viewing the measures graphs and X/Y plots simultaneously, can you isolate which channels are reported on the X/Y chart?
A:
[Answered live]
When using the 'Multiple Views' function you can isolate channels in multiple tabs. Here is a video explaining Multiple Views: <https://youtu.be/IuDvchVz1TI>
- 11 **Q:**
Does the lean angle of a motorcycle affect the lateral forces?
A:
If you use GPS based channels the Lat G number is accurate to forces applied in the lateral direction. However, the onboard accelerometer will be affected by lean angle.
- 12 **Q:**
Is there a way to put heavier/bolder lines along the 0/0 axis on the plot?
A:
Unfortunately not.
- 13 **Q:**
How do you turn the vertical axis on?
A:
Right click on the plot, then choose 'settings'.

- 14 **Q:**
What advantage or in what type of analysis do you use the gyro and internal accelerometer channels?
A:
I use the onboard IMU to look more closely at data. GPS points me to the right area to investigate and if I need a closer look I use the onboard accelerometer and gyros to get actual sensor data as opposed to calculated GPS data.
- 15 **Q:**
What is the best position to install the accelerometer?
A:
This is a valid question but there are so many variables that it is best answered on a case-by-case basis. You can call us at 800.718.9090 or email support@aimsports.com with questions.
- 16 **Q:**
I have three data channels on my X/Y plot. One is a diagonal line lower left to upper right. How do I fix this?
A:
Ensure you choose only longitudinal acceleration as the Y axis. Go to the wrench icon and set the X and Y axis to lateral and longitudinal G, then disable those channels from view in the measures and laps window.
- 17 **Q:**
Can I do this with a simple Solo?
A:
Yes. Using your Accel and Gyro channels. The same channels being shown in this device.
- 18 **Q:**
Is there a way to determine the “total G force” a tire can handle? I.E. at what load the tire will begin to lose grip and slide?
A:
The max load normally comes from manufacturer’s data, and your setup and driving style affects it.
- 19 **Q:**
So each dot represents a moment in time. Can that be related to a certain track position>
A:
Yes. You can see the GPS position with the GPS map open
- 20 **Q:**
If the display is only one lap, why are there so many data points? Is it sampling rate?
A:
[Answered live]

- 21 **Q:**
Can you play the data back in real time?
- A:**
Play back, yes. Real time, no.
- 22 **Q:**
For the setup how can you have two different data for the Y plot (long acc for the X/Y and the speed plot)?
- A:**
The data in the XYplot is speed based on the LatG forces X axis and the Long G forces Y axis.
When using the 'Multiple Views' function you can have multiple tabs in the same function that will allow different channels to be shown. Here is a video explaining Multiple Views: <https://youtu.be/luDvchVz1TI>
- 23 **Q:**
How do you know you are at the limit? Is it the max sum of X & Y?
- A1:**
[Answered live]
- A2:**
Use the G sum math channel to evaluate total combined forces.
 $A^2 + B^2 = C^2$ or $gsum = \text{squareroot of } latacc^2 + Longacc^2$
- Here is a video on the g sum channel for you to look over:
<https://youtu.be/WPnYF8aGwF8>
- 24 **Q:**
Are "loops" or "curly Qs" inefficiency in transitions? In other words, are those easily identifiable places for driver improvements.
- A:**
[Answered live]
- 25 **Q:**
Will the new version of RS3 analysis allow us to use video instead of the GPS map?
- A1:**
Yes, you will be able to view the video as well.
- A2:**
We actually showed the software with video integration in a previous episode. About 55 minutes in, here is a direct link: <https://youtu.be/iDyj-3dof1o?t=3304>

- 26 **Q:**
Is there a way to see elevation changes on the plots you're displaying?
A:
Yes. We just had a seminar on understanding slope. See it here:
<https://youtu.be/kF7d1gLinGQ>
- 27 **Q:**
How do I zoom in?
A:
You can use the zoom icons in time/distance plots or the mouse wheel.
- 28 **Q:**
Is it possible to see steering wheel angle and brake pressure?
A:
[Answered live]
- 29 **Q:**
Any way to change the color of the 0 longitudinal and the 0 latitudinal grid line to help enhance the visual?
A:
Unfortunately not.
- 30 **Q:**
Matt, does your car have a fairly soft suspension where it takes several tenths of a second for the car to take a set?
A:
[Answered live]
- 31 **Q:**
I seem to have two separate graphs. The one on top looks much like the friction circle but has no X axis numbers. The graph on the bottom has a straight line going from bottom left to upper right. It has X axis numbers based on GPS Lat Acc. What am I doing wrong?
A:
You need to set the channels for the axis in the X/Y plot settings. Use the wrench icon on the top right section of the X/Y plot window. Then only select the GPS speed channel in your measures and laps window.
- 32 **Q:**
Can you please give the formula for the Gsum Math Channel?
A:
 $\text{sqrt}((\text{GPS_LonAcc}^2) + (\text{GPS_LatAcc}^2))$

- 33 **Q:**
Can you just click a specific dot in the X/Y plot and have the cursor jump to the equivalent spot in all the other measures graphs?
A:
No unfortunately not. Clicking in most all other functions will move the curser in all other functions jump to that location but that feature does not work in the X/Y plots.
- 34 **Q:**
Are there ever examples of where a “loop” is good? Or, as a starter, can we just focus on the loops as an indication of not taking full advantage?
A:
As a general rule you should be able to ‘stay’ on the edge of G-G plot.
- 35 **Q:**
Is there a good way to see coasting in the G-G graph.
A1:
In coasting moments you’ll see a decrease in acceleration, so I’d look for lines going to the center of the plot and to light negative longitudinal acceleration.
A2:
[Answered live]
- 36 **Q:**
Can the interior dots be good? The ones not on the limit .
A1:
The center is where you have no acceleration, for instance at the end of a straight.
A2:
Whether a dot is in a "good" place or not is also going to be pretty depended on the car, setup, track, weather conditions, etc.
- 37 **Q:**
Could you use SmartyCam wheel position?
A:
Yes, video can always help correlate your data analysis. The SmartyCam file cannot currently be utilized in analysis, however.
- 38 **Q:**
Have you had any luck with a speed/steering calculation?
A:
[Answered live]

- 39 **Q:**
Could this be used to see if a driver is over driving or under driving the car?
A:
[Answered live]
- 40 **Q:**
So with more steering angle at the same G's indicates understeer or push and less steering angle at the same G's indicates oversteer or loose?
A:
[Answered live]
- 41 **Q:**
Do you guys have recommendation on installing the steering sensor on a kart?
A:
Contact our support at 800.718.9090 or support@aimsports.com. We have a common installation diagram / recommendation.
- 42 **Q:**
What is the vertical axis for on the tire pressure graphs being shown?
A:
[Answered live]
- 43 **Q:**
For the info we have seen today, the only sensor we need is the steering? Is that an AiM sensor or another brand? Do we need other sensors? Will this work with a Solo DL?
A:
With Solo DL you can get steering only from Car's ECU. Some of the video is only using GPS or internal accelerometer channels. Some are collected by external sensors, such as the steering example earlier.
- 44 **Q:**
So the tire pressure with the widest distribution of points is the optimum because it shows the largest lateral G?
A:
[Answered live]
- 45 **Q:**
Are those AiM tire pressure sensors providing that data? I don't think OEM is accurate and/or fast enough
A:
[Answered live]

- 46 **Q:**
How do know if there in increase in grip?
A:
There will be higher lateral grip and higher G force measures.
- 47 **Q:**
Will there ever be a chance in the future to create your own CAN protocols for Mychron5? Currently it's not possible to have pressure sensors like what Matt is showing without being able to create your own protocols for other sensors.
A1:
Not with the Mychron5. These features are available in the more powerful, automotive units.
A2:
We have an IR tire temperature module that can be tied into the MyChron5 that can correlate to this data.
- 48 **Q:**
Is there a document that describes turning on the multiple data plot feature?
A:
[Answered live]
Here is a video explaining Multiple Views: <https://youtu.be/luDvchVz1TI>
- 49 **Q:**
Has anyone asked: Matt, why did you grow your hair out??!!??
A:
[Answered live]
- 50 **Q:**
Do you use tire temp vs. tire pressure for optimal grip?
A:
[Answered live]
- 51 **Q:**
My display does not show the dots as fine as your presentation. How do I control that?
A:
You can click the settings at the top right and select the size of your dots.