Schooling

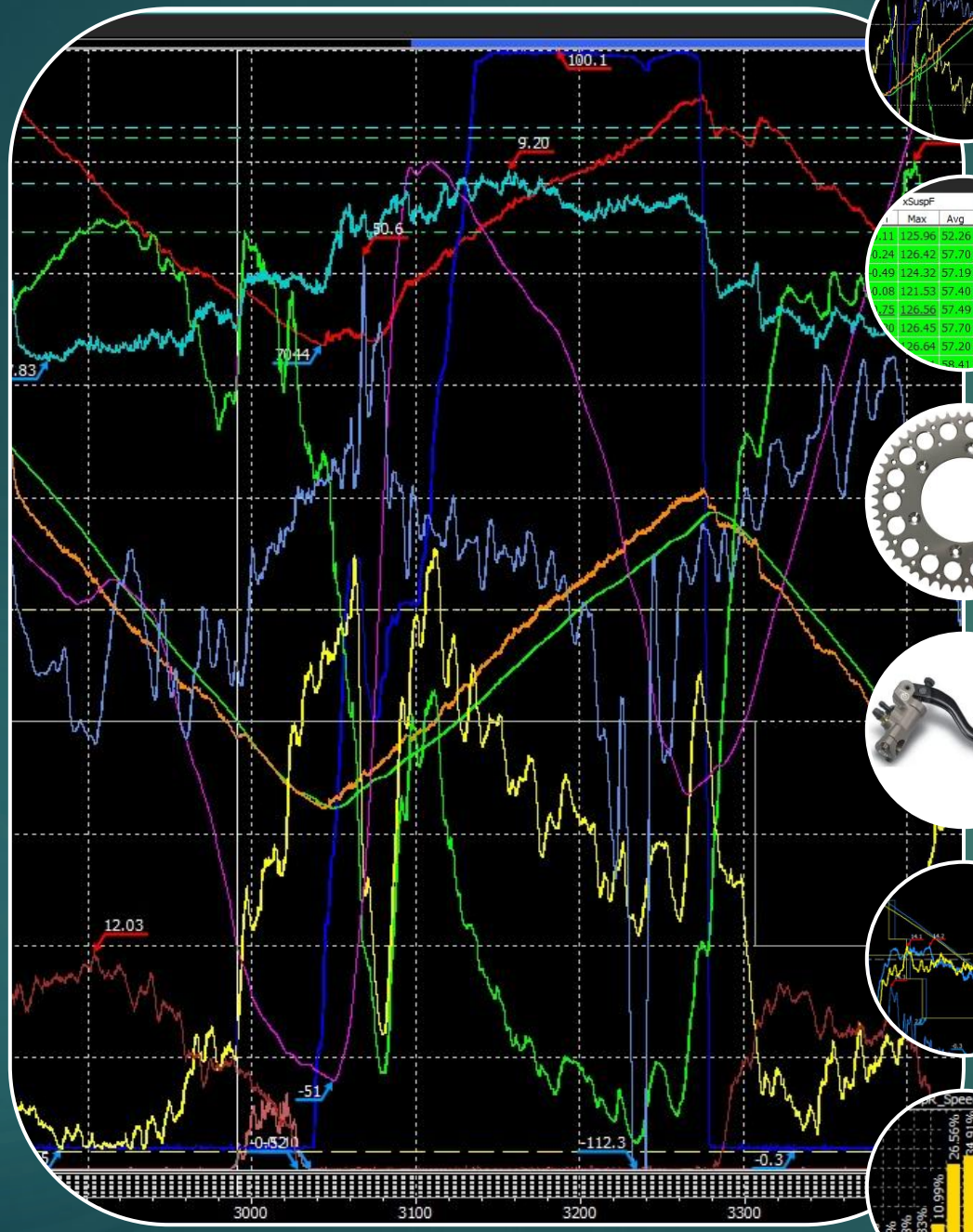
Data Analysis

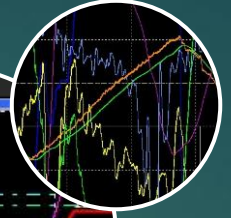
NICOLAS REYNIER

GP-PRECISION@OUTLOOK.COM

WWW.GP-PRECISION.COM

- MotoGP
- Moto2
- EWC
- MotoE



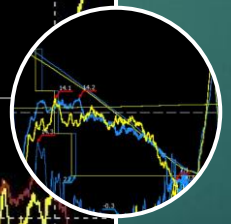


Main window with main logged channels

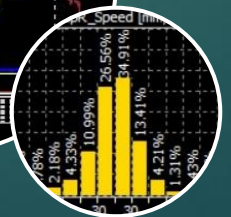
Min Max

Gearing, gear changes, top speed

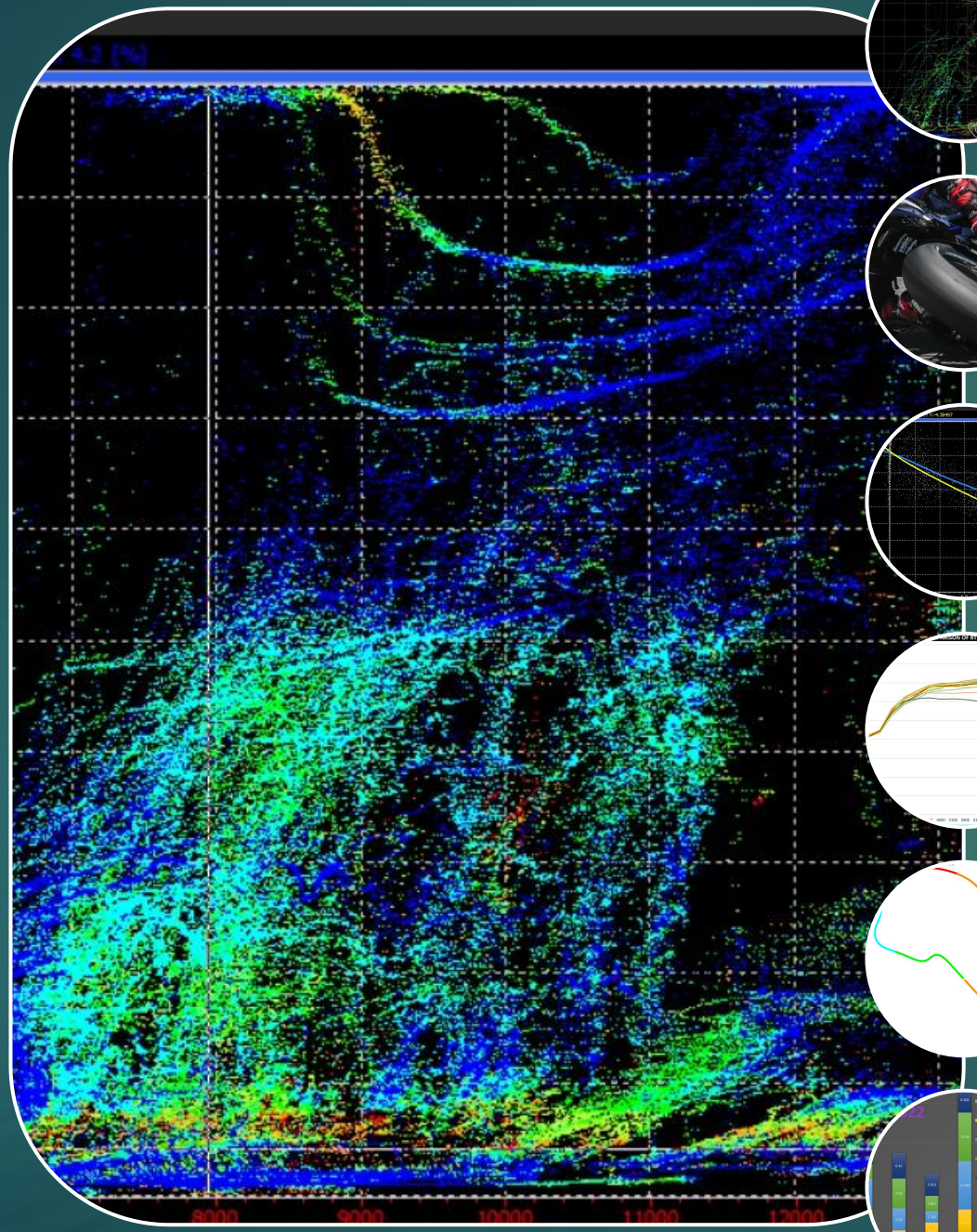
Rider's input

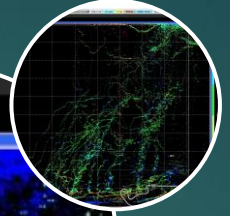


Compare runs



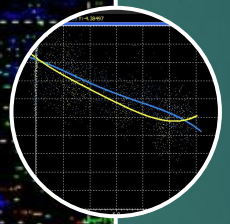
Suspensions



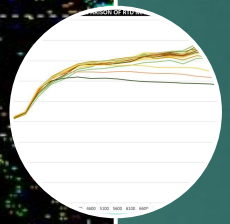


Fuel

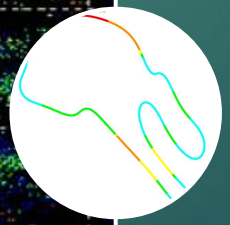
Spinning and Sliding



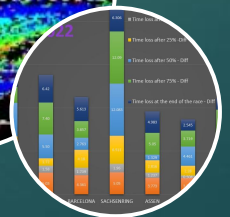
Deceleration and EB



Torque maps simulations



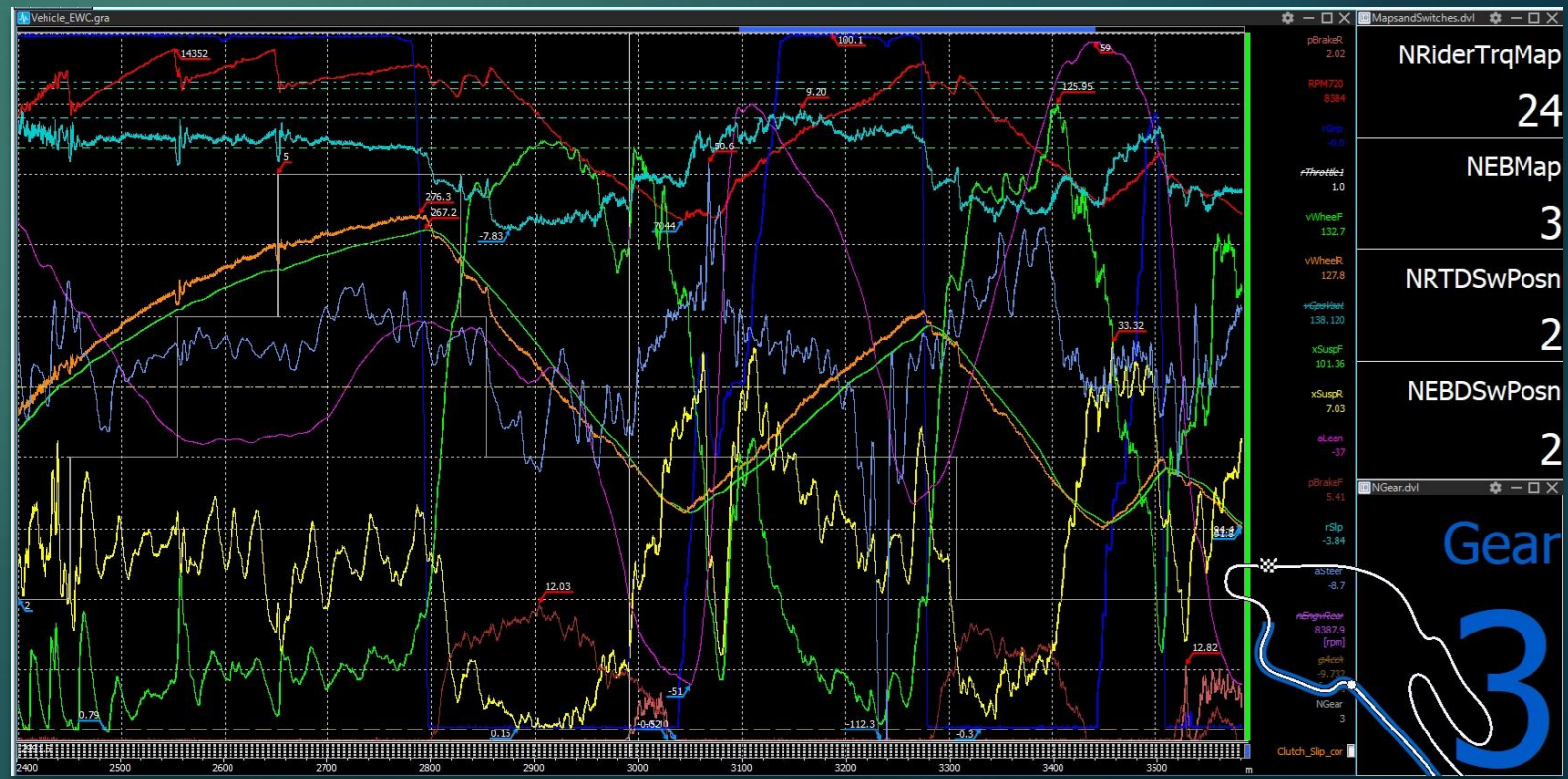
Track maps



Post Race Analysis

Main window

- Tool : Wintax, 2D, RaceStudio, Dodata
- Overview of main logged channel : powerful visual
- Colours, careful with tyre profile, example of logged and math channels
- Scroll to spot easily bottoming, rear under braking, , wheelies, spinning, front closing, chatter, rider's input, rpm, engine brake
- Possibility to look at details



Suspensions_EWC.rep (Run Laps) - [Lap Filter Enabled]

DataSet	Lap Time	rThrottle1	pBrakeF	pBrakeR	xSuspF			SuspF_Speed		xSuspR			SuspR_Speed		vWheelFront		vWheelRear		rSlip		aL
Slot	Info	Avg	Max	Max	Min	Max	Avg	Min	Max	Min	Max	Avg	Min	Max	Min	Max	Min	Max	Max	Avg	Min
1	2:22.796	27.1	12.033	93.250	-0.11	125.96	52.26	-557	676	-0.14	32.16	16.06	-243	215	0.0	261.8	0.0	271.7	161.40	0.60	-56
1	1:40.977	33.4	13.078	12.785	-0.24	126.42	57.70	-457	1285	0.04	34.91	17.71	-297	269	73.2	276.3	72.1	291.6	12.57	1.61	-57
1	1:42.110	32.5	13.490	23.107	-0.49	124.32	57.19	-392	1116	0.07	33.54	17.66	-289	211	68.5	276.4	67.4	292.6	15.31	1.51	-58
1	1:42.075	30.8	12.182	11.450	-0.08	121.53	57.40	-431	871	0.18	34.27	17.85	-230	215	71.9	275.2	70.6	288.1	13.65	1.72	-58
1	1:38.194	36.6	13.614	23.257	-0.75	126.56	57.49	-457	1112	0.10	38.99	17.85	-295	327	70.2	276.1	68.4	292.5	14.76	1.87	-58
1	1:38.708	35.4	12.978	12.374	-0.80	126.45	57.70	-449	889	0.09	38.73	17.79	-261	263	68.6	279.5	67.1	296.5	14.12	1.91	-58
1	1:39.046	35.5	13.976	15.359	-0.86	126.64	57.20	-392	1068	0.13	33.99	17.58	-286	259	60.9	279.8	59.5	296.7	14.46	1.95	-59
1	1:47.504	31.2	13.526	15.843	-0.39	126.21	58.41	-575	806	0.11	34.65	16.88	-286	346	0.0	276.3	0.0	294.1	30.39	0.52	-58

MidCorner.rep (Run Laps) - [Lap Filter Enabled]

DataSet	Lap Time	Neutral_xSuspF	Neutral_xSuspR	Neutral_Lean_LH	Neutral_Lean_RH	Neutral1_Trail	Neutral1_Rake	Neutral1_SwingarmAngle	Neutral1_FwheelForce	Neutral1_
Slot	Info	Avg	Avg	Avg	Avg	Avg	Avg	Avg	Avg	
1	2:22.796	88.4	23.6	-48.9	51.4	95.8	22.8	-7.9	1909.9	
1	1:40.977	88.2	25.3	-49.0	50.7	97.1	23.0	-7.9	1850.3	
1	1:42.110	89.8	25.4	-47.9	51.1	96.3	22.9	-7.7	1928.2	
1	1:42.075	88.3	25.8	-50.3	52.6	96.9	23.0	-7.7	1910.1	
1	1:38.194	88.1	25.1	-51.5	53.4	96.5	22.9	-7.6	1949.3	
1	1:38.708	88.8	25.6	-51.5	53.7	96.7	22.9	-7.6	1941.1	
1	1:39.046	89.0	24.9	-51.0	52.5	96.7	22.9	-7.9	1881.8	

Engine_EWC.rep (Run Laps) - [Lap Filter Enabled]

DataSet	NLap	Lap Time	RPM720		TEng			TAir	TOil		pOil	pFuel	rGrip	rThrottle1	vWheelFront		Vbatt_Corr		NGear	
Slot	Avg	Info	Min	Max	Min	Max	Avg	Avg	Max	Avg	Avg	Avg	Avg	Avg	Min	Max	Min	Max	Min	Max
1	0	2:22.796	162	14562	36.5	78.3	54.2	22.7	67.5	45.9	5.621	4.563	43.3	27.1	0.0	261.8	10.168	13.530	1	5
1	1	1:40.977	5872	14568	65.0	74.7	68.7	19.3	86.0	78.1	5.297	4.552	42.5	33.4	73.2	276.3	13.207	13.892	2	6
1	2	1:42.110	5475	14381	66.3	75.2	69.4	19.2	94.3	89.8	4.821	4.554	41.3	32.5	68.5	276.4	13.455	13.816	2	6
1	3	1:42.075	5611	14149	67.0	73.0	69.5	20.1	97.7	95.5	4.651	4.557	39.6	30.8	71.9	275.2	13.410	13.873	2	6
1	4	1:38.194	5651	14352	66.8	74.4	69.4	19.3	99.6	97.5	4.617	4.541	45.5	36.6	70.2	276.1	13.349	13.833	2	6
1	5	1:38.708	5554	14630	66.9	74.0	69.7	19.6	101.2	99.9	4.518	4.544	44.4	35.4	68.6	279.5	13.447	13.863	2	6
1	6	1:39.046	4839	14514	66.8	74.0	69.6	19.4	101.9	100.7	4.460	4.542	44.7	35.5	60.9	279.8	13.435	13.821	2	6
1	7	1:47.504	0	14472	66.6	72.8	69.5	19.0	102.7	100.9	3.967	4.540	39.7	31.2	0.0	276.3	12.965	14.095	0	6

Min Max Tables :

Excellent summary, quick to read during sessions

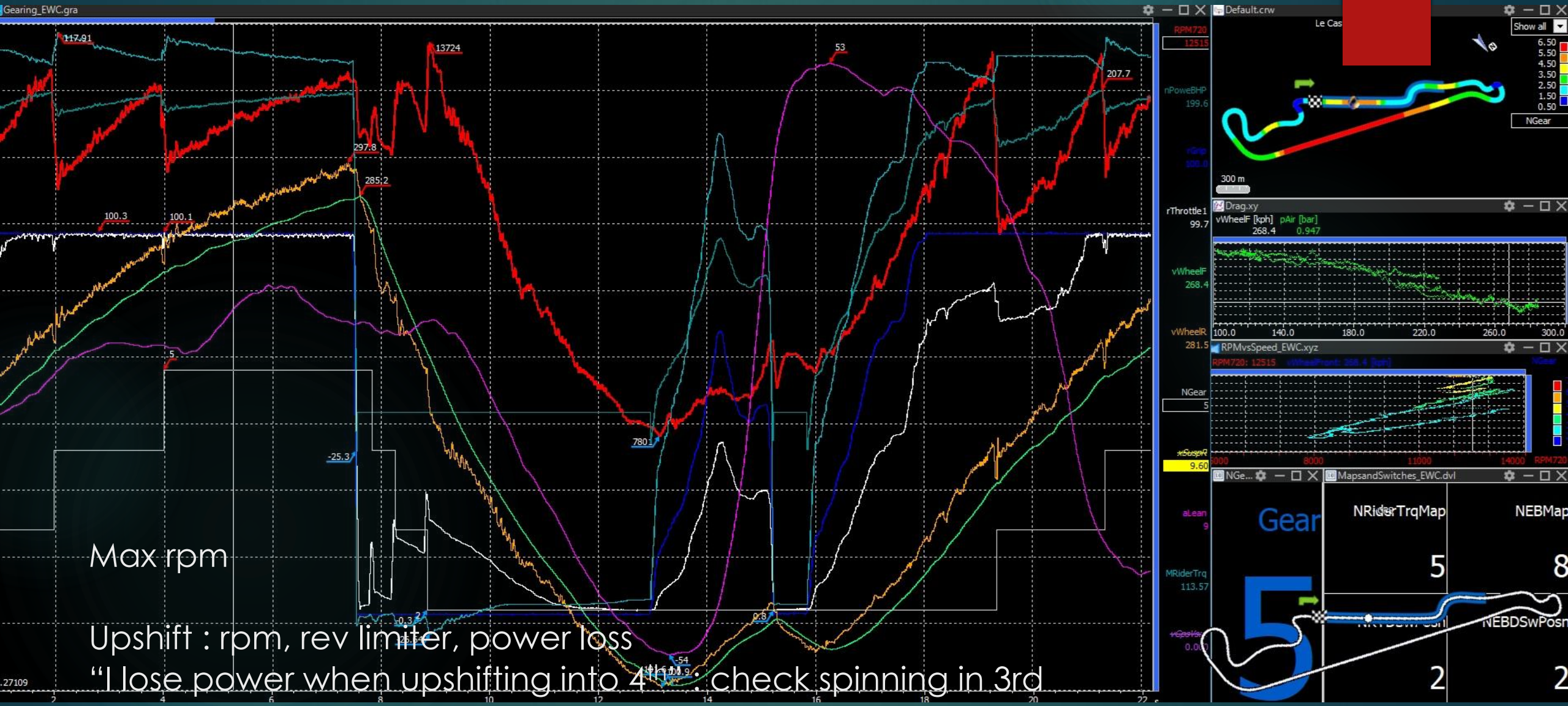
Suspensions :

- Are we bottoming ? Check reality
- Averages are a good indicator
- " I can't stop the bike,. The forks are bottoming uder hard braking."
- Mid corner values

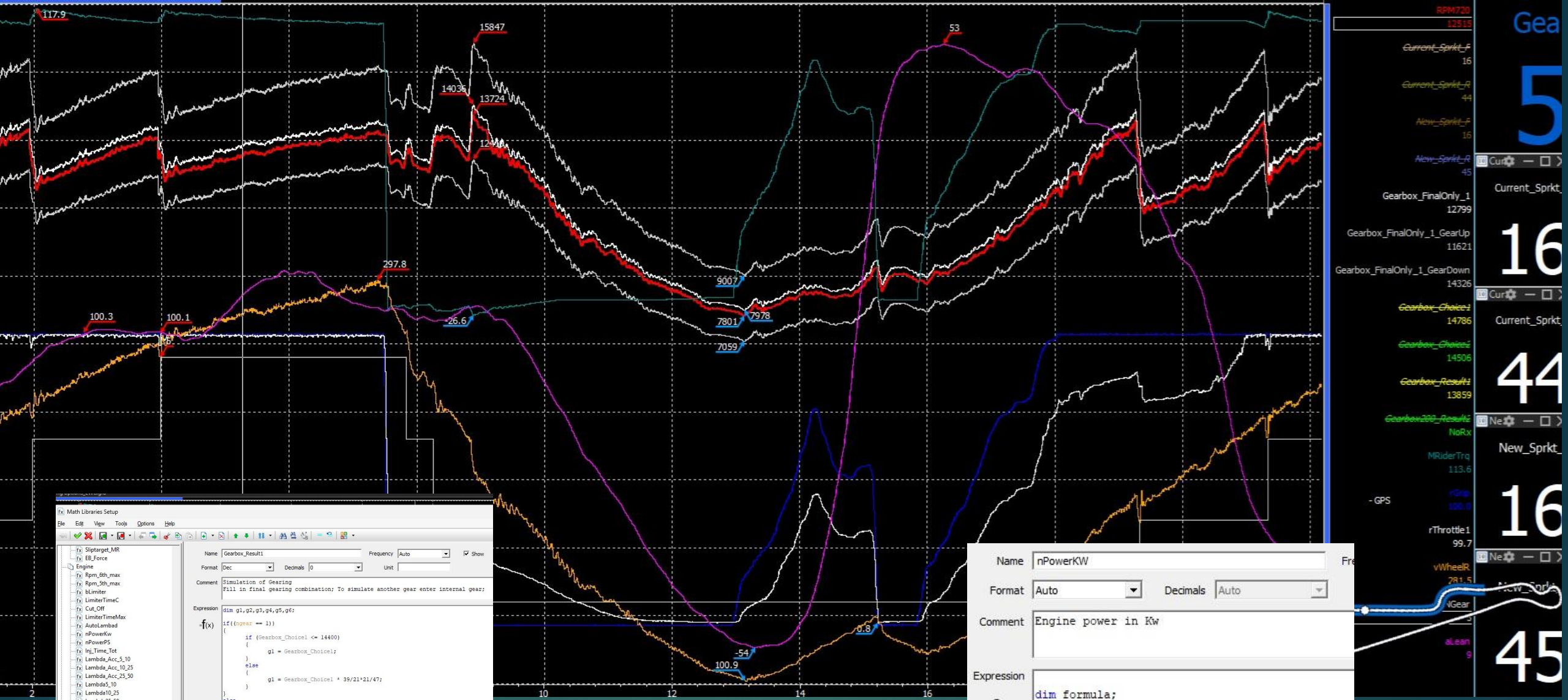
Tyre pressures and temperatures

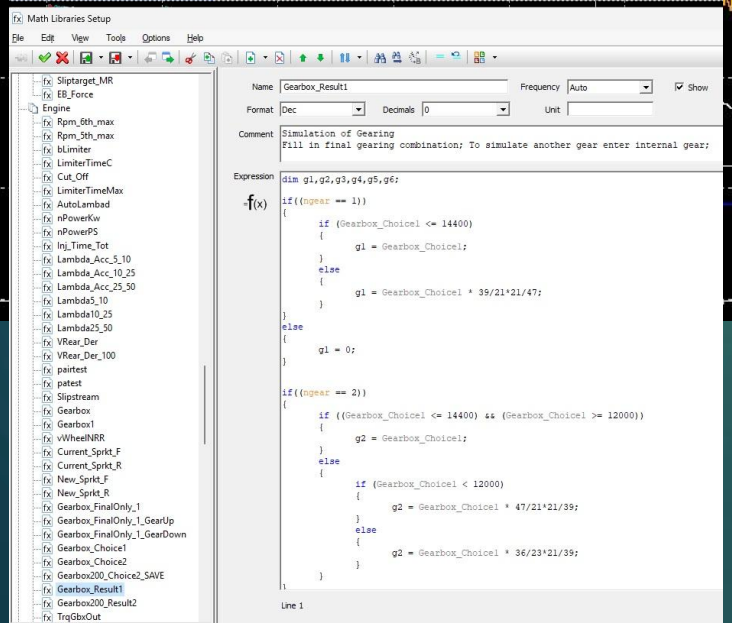
Engine maximum rpm, overheating, alarms

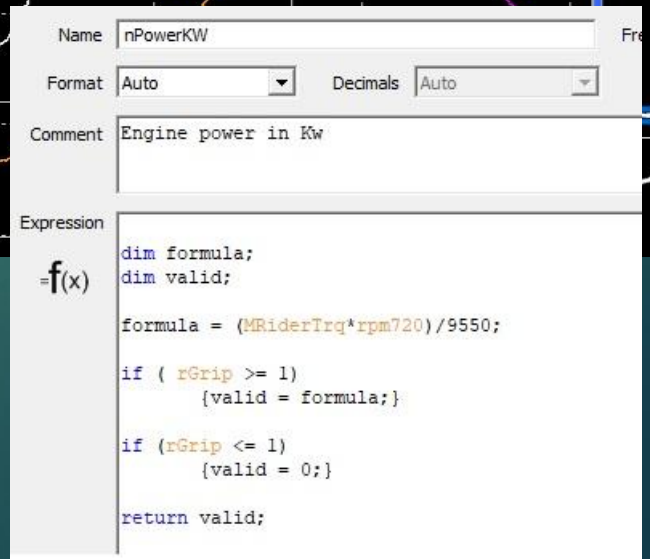
Gearing



Downshift and engine brake







Gearbox Simulation

Power Calculation

Rider's input

Use of all the brakes

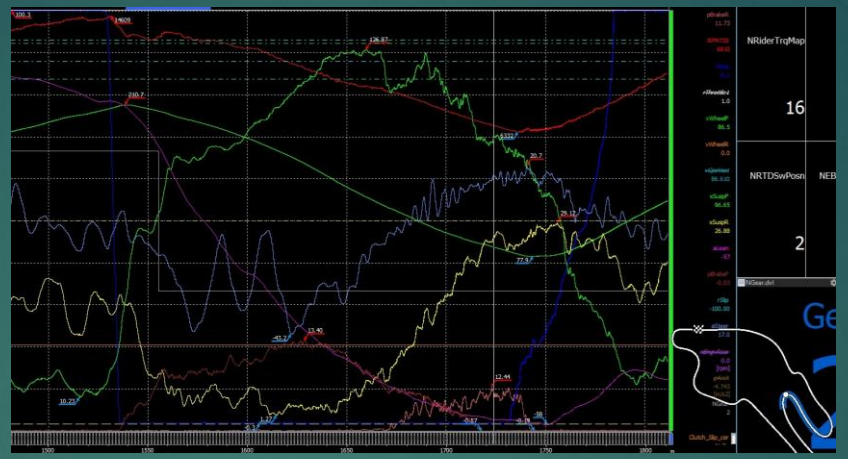
The rear brake for stopping, for stability and for turning

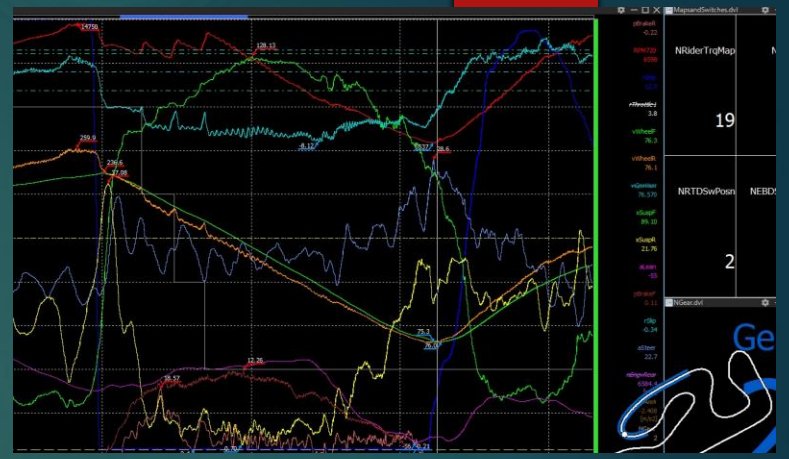
The rear brake for diagnostic

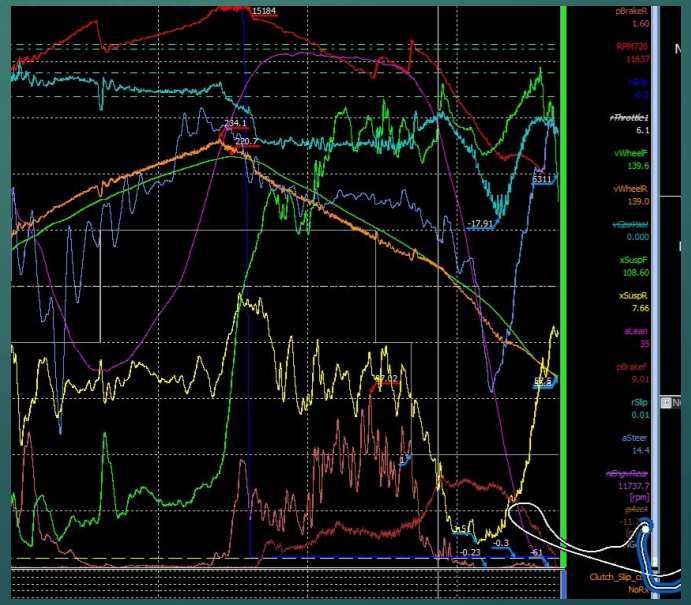
"I brake harder than anyone, but the bike doesn't stop"

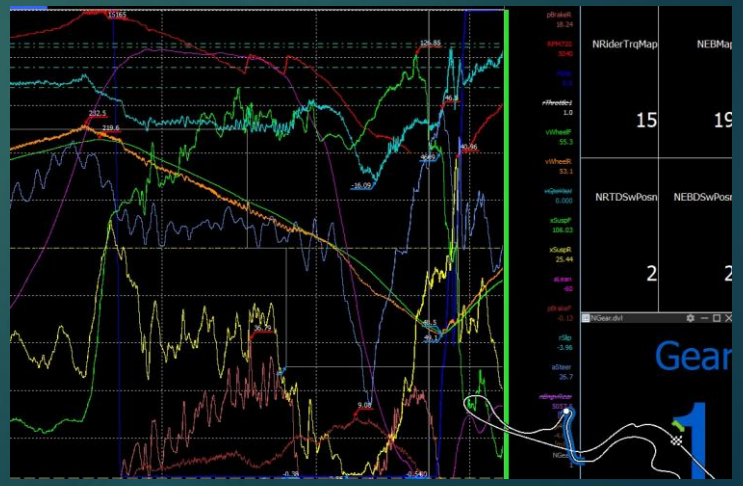
1-adjust the bike but…

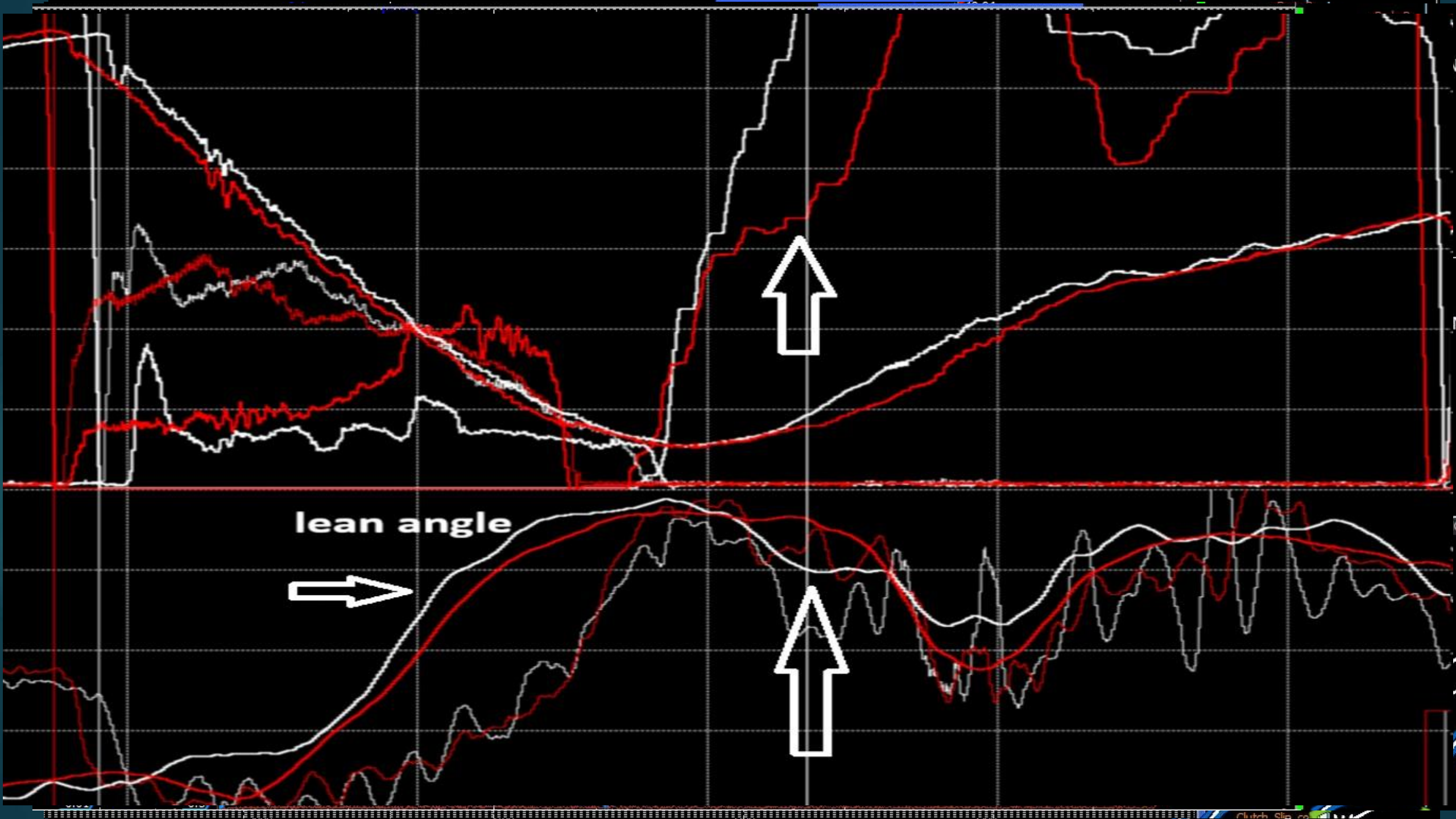
2-adjust the riding. No but.





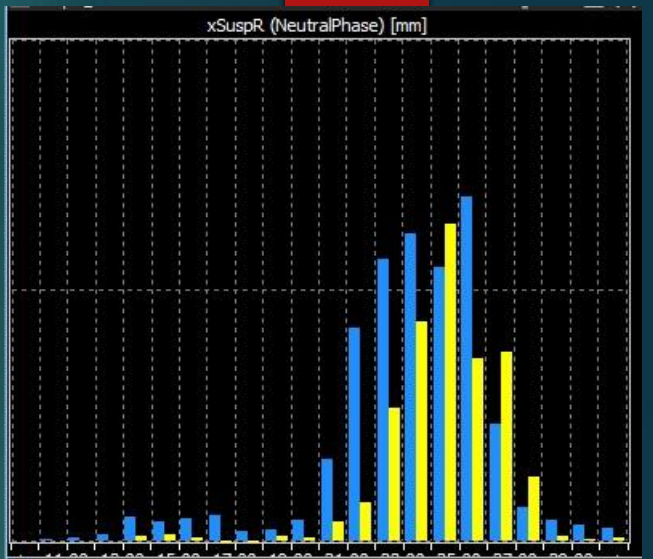


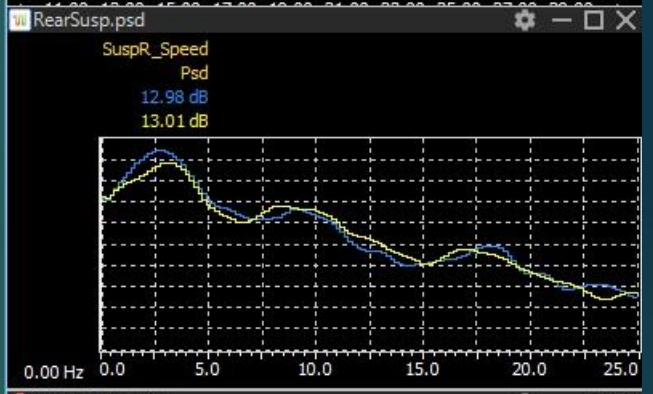



lean angle

Comparing runs

How to synchronize
Abscissa is Time or Distance ?
Create a TimeDiff
Tyre profile identical ?
Careful when compare rear stroke : check corner speed





Suspensions

Max and Avg from Overview and MinMax

Check where the Max really is : do we actually hav margin? C1 in Paul Ricard vs C1 in Portimao

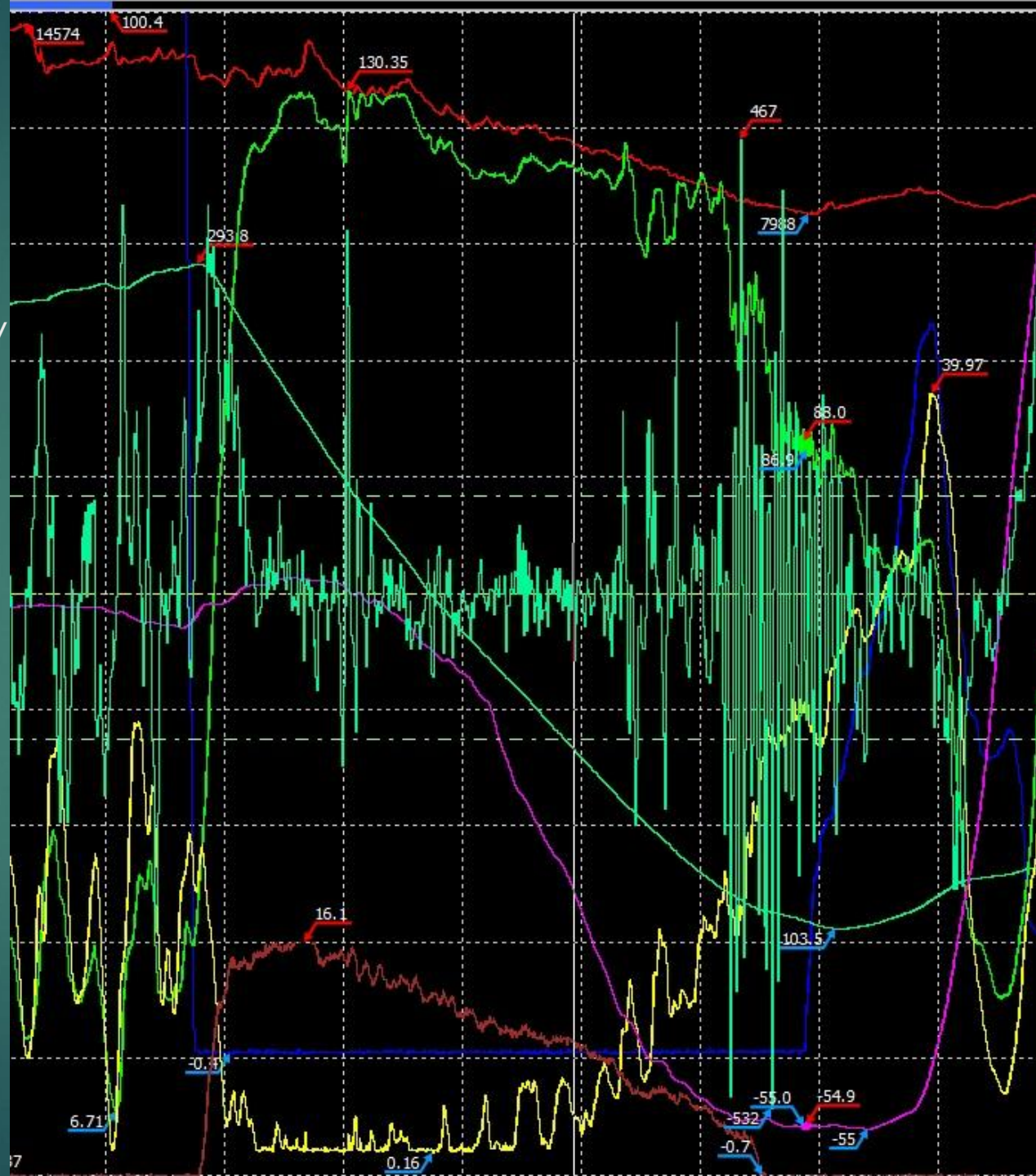
Braking downhill vs uphill

Suspension Speed : when rolling off the gas, taking the brakes, careful Max for wheelies, helps detecting chatter

Histograms or other visuals

Chatter : what is it, FFT, frequencies, rider's fault, what to try

Adjust speeds with hydraulics but keep in mind spring effect. Hydraulics = absorbed energy.



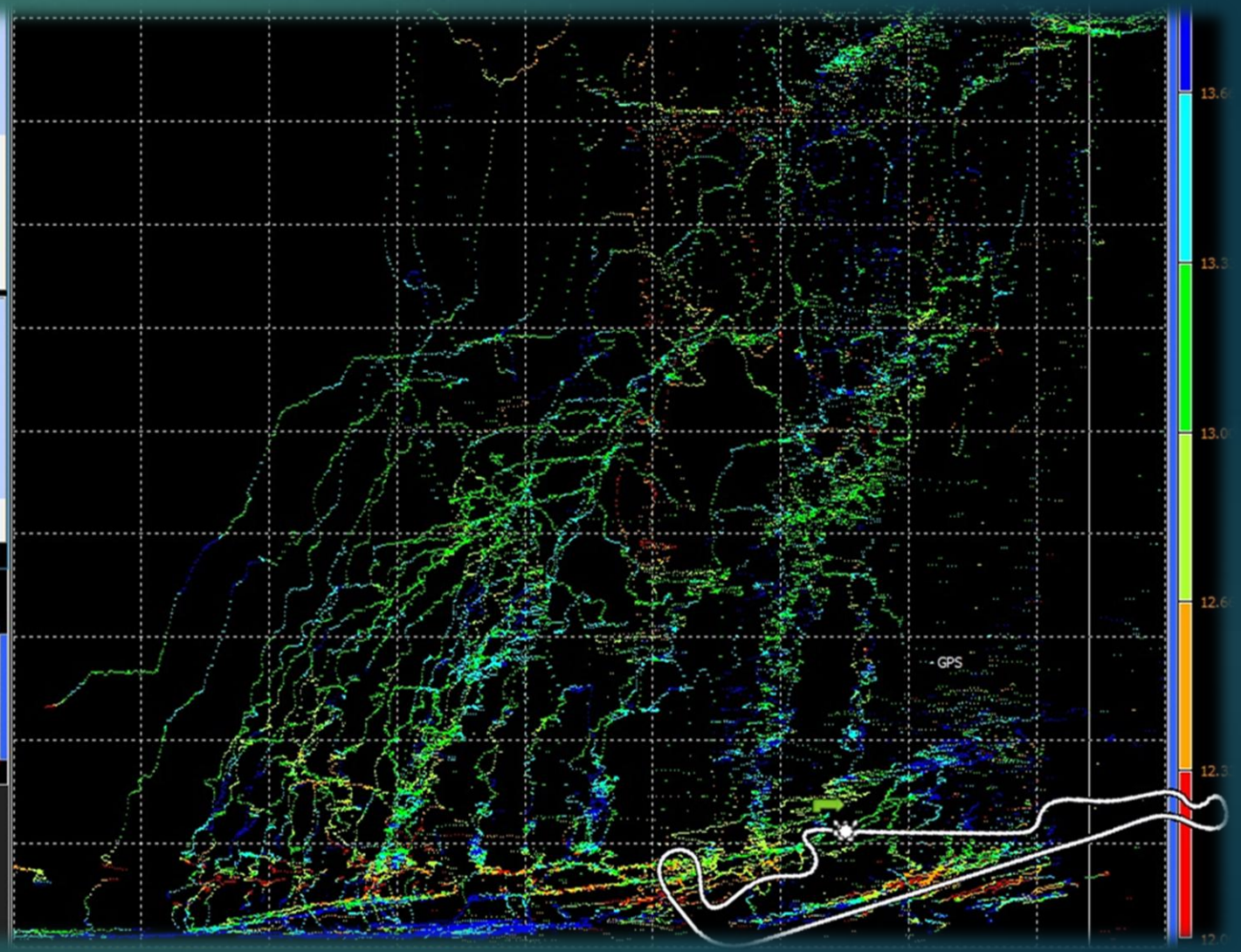
Fuel

Stoichiometric coefficient vs reality

Transient vs full throttle

Check and install alarms for related organs

Bring correction map closer to real map in case of fail mode



Spinning and Sliding

Name	Spin			Frequency	Auto
Format	Dec	Decimals	1	Unit	%
Comment	Spinning between Rear and Front wheels				
Expression	(vWheelR-vGpsVsat)/(vGpsVsat)*100				

Check calc in straights, never at 0%

Overview : powerful visual

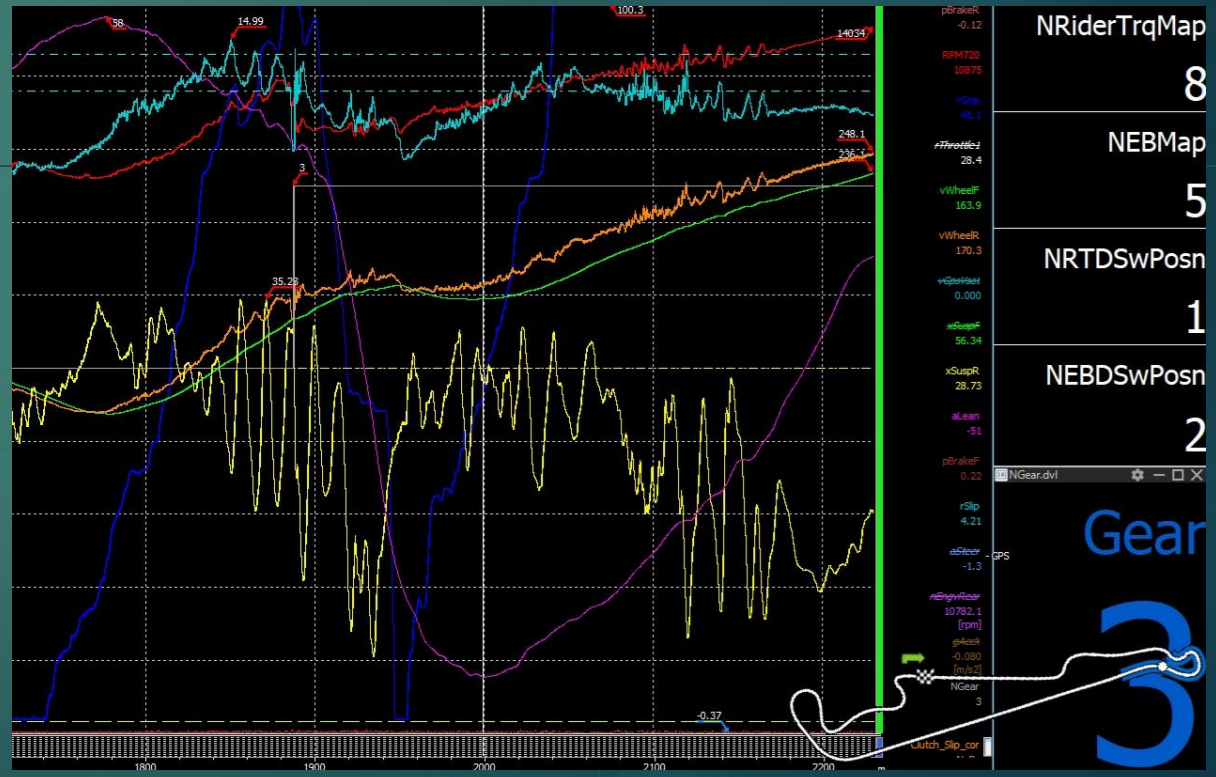
- Le Castellet C6
- Effect on rear wheel speed, suspension, lean angle
- Check rider's input (throttle, lean angle)

What to do : gearing, spring, hydraulics, geometry

The rider's comment may guide you

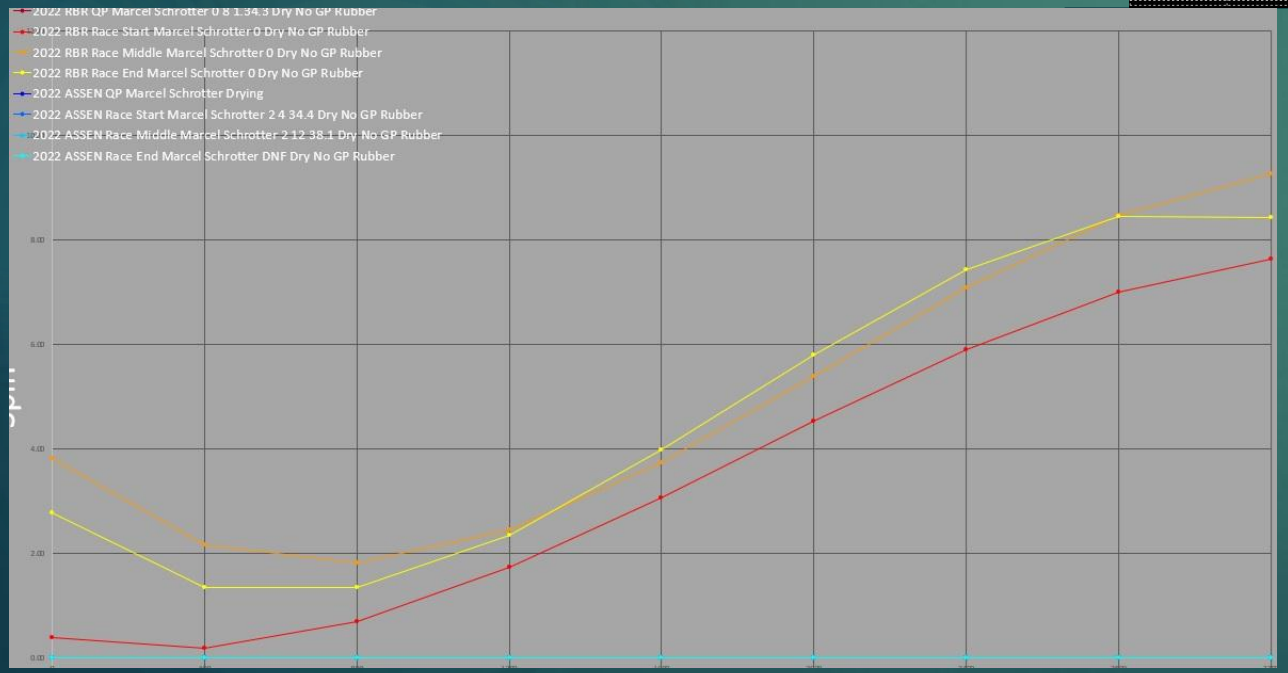
- Is it sudden ?
- Does the bike recover ?
- What do you have to do to help?
- Initial grip vs Power grip

Trap : overreacting to bad track conditions or tyre



Extra visual tools

Tool : Grip vs Acc database with tyre profile correction



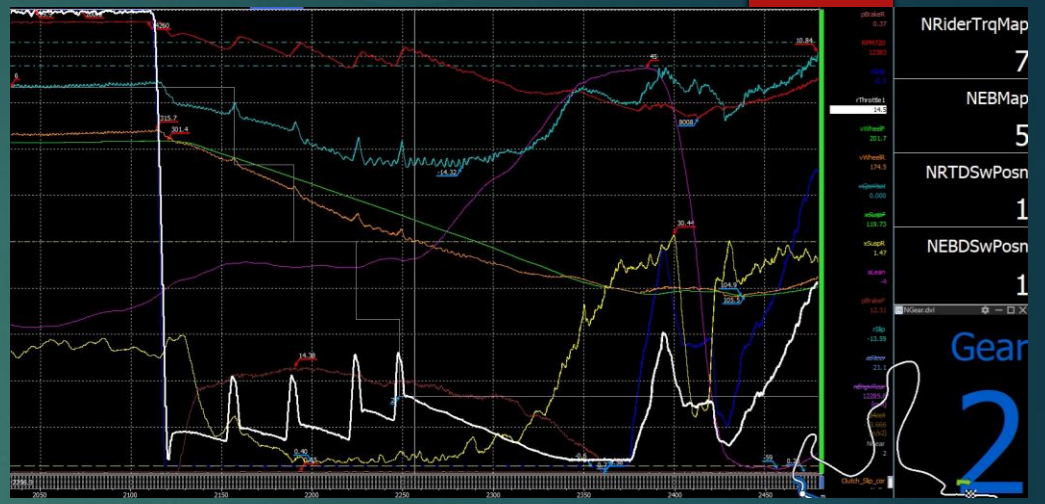
Deceleration and EB

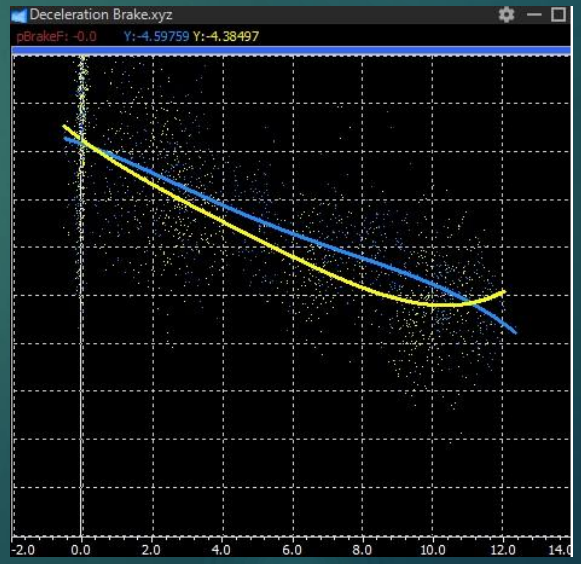
Rider : roll of the gas, braking pressure shape, use two or three brakes

Steering damper shows sliding

Deceleration vs Front Brake Pressure

- careful if rear brake
- allows to compare settings
- allows to see when the riders struggles to stop





EB : overview of RWS : sliding, pushing ?

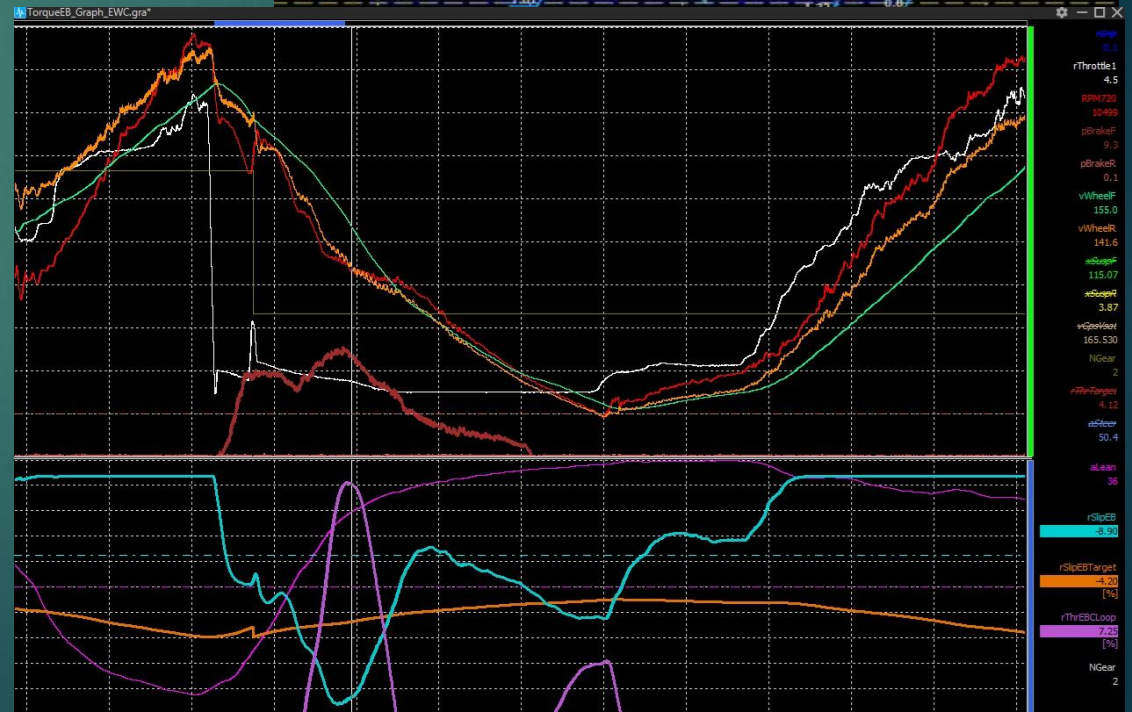
Mapping by Negative Torque much better than by Throttle

Conflict between Clutch, Bypass and EB maps. FFT?

Negative Torque, Closed Loop, saturated maps

Tool : EB Map maker,

create EB maps channels with lookup tables



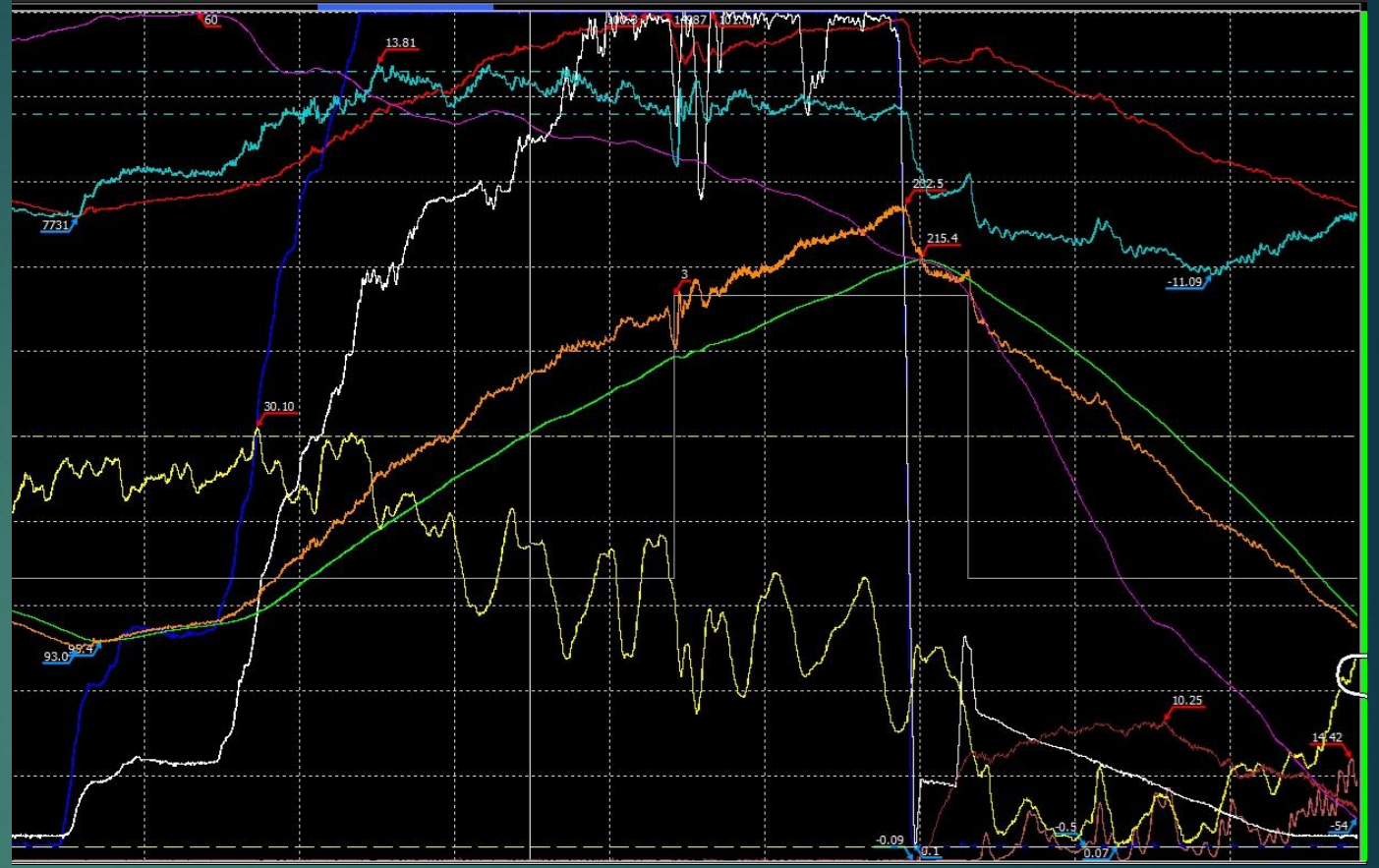
TRD Maps

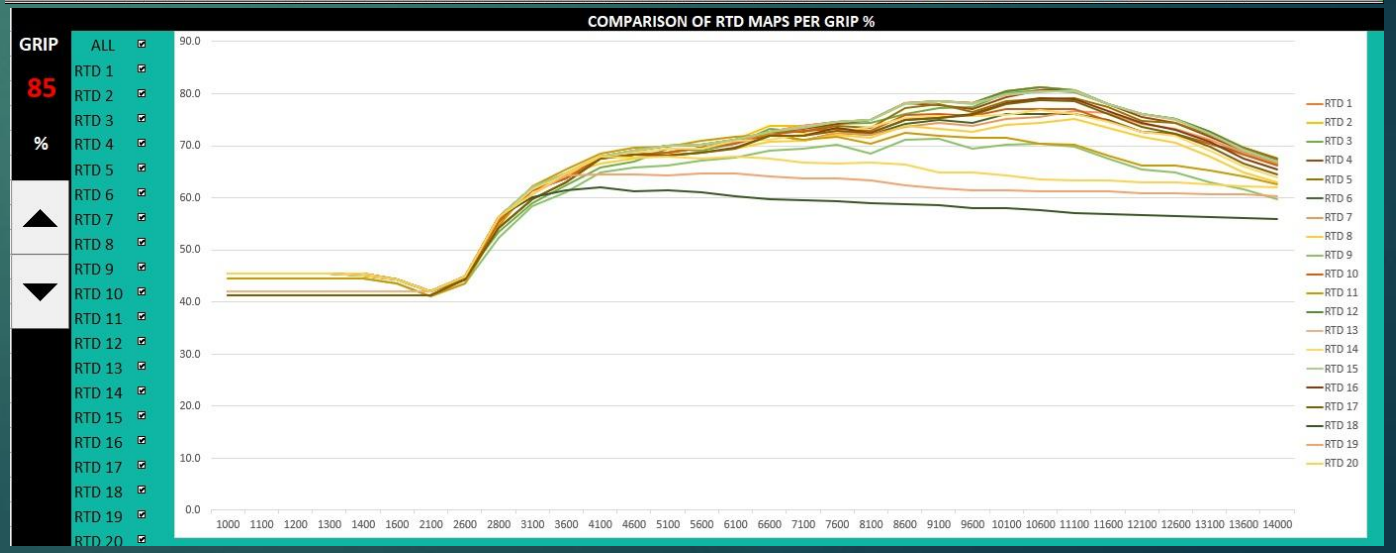
Usually 2 or 3 usual ones

Tool : TRD Maps Comparison

Create maps channels with lookup tables

Check the spinning but talking with the rider is critical





Track Maps

Pleasant visuals to discover tracks (Susp stroke, braking, throttle)

Essential gear map to provide to the rider before the event

Post Race Analysis

Championship documentation : Best Lap compared to others, sector times, careful with top speed

Data : Compare bad lap to best lap and with another rider

Tool : Time Loss during the Race, very instructive

Tool : Start database