

Analyzer program: BMW-specific features

Introduction

The following data channels can be used and viewed in Anna-Liza:

Speed [km/h]	Vehicle speed
V_Front [km/h]	Front-wheel speed
V_Rear [km/h]	Rear-wheel speed
RPM [1/min]	Engine speed
Bank_dtc [°]	Bank angle from bank-angle sensor
Grip_pos [%]	Driver input at throttle twistgrip
Throttle [%]	Throttle-valve position
T_eng [°C]	Engine coolant temperature
Gear [#]	Current gear
Brake_f	Front brake actuated
Brake_r	Rear brake actuated
Brake_pres_f[%]	Braking pressure, front wheel cylinder
Brake_pres_r[%]	Braking pressure, rear wheel cylinder
Slip [%]	Slip between front and rear wheels
Re_dtc_spn	Relative DTC torque reduction from traction control
Re_dtc_tot	Relative DTC torque reduction from traction control, precontrol and other limiting functions
ABS_Status	Channel computed from Brake_f, Brake_r, ABS_stat and ABS_act
ABS_stat	1 = ABS activated, 0= ABS deactivated
ABS_act	ABS intervention
V_Sat [km/h]	Vehicle speed from GPS signal
V_GPS [km/h]	Corrected vehicle speed from GPS signal
Banking_GPS [°]	Bank angle from GPS signal
A_Lon_GPS [m/s²]	Longitudinal acceleration from GPS signal
A_Lat_GPS [m/s²]	Lateral acceleration from GPS signal
GPS_Yaw [°/s]	Rate of yaw from GPS signal
GPSValid	GPS signal present 0= no GPS signal present 1= GPS signal present
ValidSat	Number of GPS satellites available
Course [°]	Vehicle heading from GPS signal
Altitude [m]	Altitude above sea level
Longitude [°]	Geographical GPS coordinate of longitude
Latitude [°]	Geographical GPS coordinate of latitude
HHMM	Time in hours and minutes relative to Greenwich Mean Time
SSHH	Seconds and hundredths of second
Time_diff [sec]	Time difference between measurements per lap

Bear in mind that individual channels such as ABS for example are available only in combination with the Race ABS optional extra. The value of a channel that is not available is always 0.

As part of the BMW HP Race Datalogger software, the following predefined settings and templates will be available in Anna-Liza:

Templates:	Various predefined views
Track mode:	Various track plots
XY diagrams:	Two channels plotted as XY value pairs
Min/max tables:	Minimum and maximum tables for the measured values of a measurement
Histogram:	Statistical analysis of the vehicle data

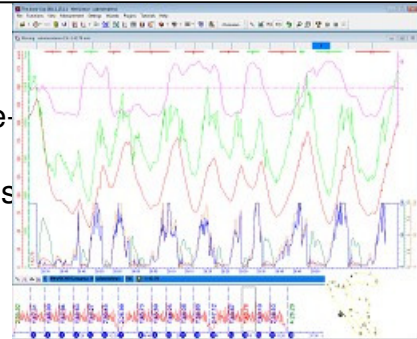
Outline of the templates and settings

Templates

The following predefined templates can be used for analysis of the measured data.

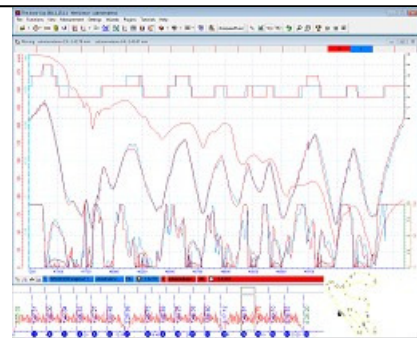
OverView

- Analysis and evaluation of lap information
- Contains information on rpm, speed, throttle-valve position, braking and bank angle
- Analysis of riding style and cornering speeds
- The position of the vehicle is shown in the Track window



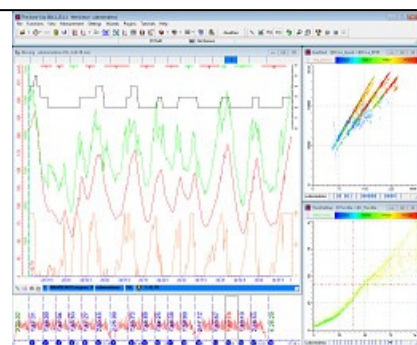
Compare2Runs

- Comparison between two laps
- Riding-style analysis of two riders
- Time-difference comparison between two laps
- Speed, throttle-valve angle, braking and gear information



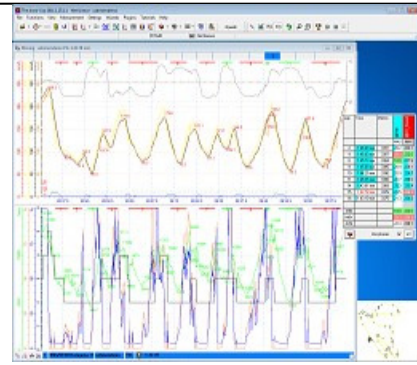
Gearbox

- Gear selection analysis of a measurement
- Analysis of shift rpm and shifting pattern
- Engine rpm, speed, throttle-valve position and gear
- XY plot of gear vs. speed
- XY plot of throttle-valve mapping



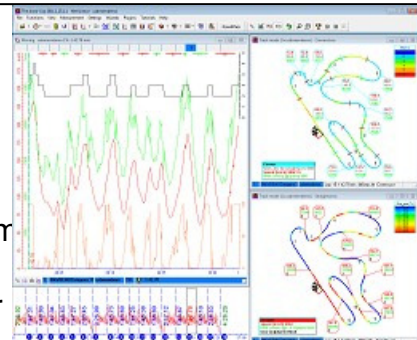
Speed

- Detailed analysis of vehicle speeds
- Split-screen view
- The top window contains four speed channels and the bank angles
- The bottom window shows engine rpm, throttle-valve position and gear
- Tabular view of wheel slip and speed



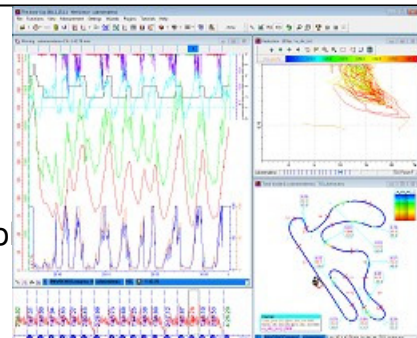
SpeedMap

- Track mode window for quick analysis of riding style and speed of a lap
- Plots of engine rpm, speed, throttle-valve position and gear
- Track mode 1 shows **cornering speed**, rpm, bank angle and gear
- Track mode 2 shows **top speed**, rpm, gear and throttle-valve position



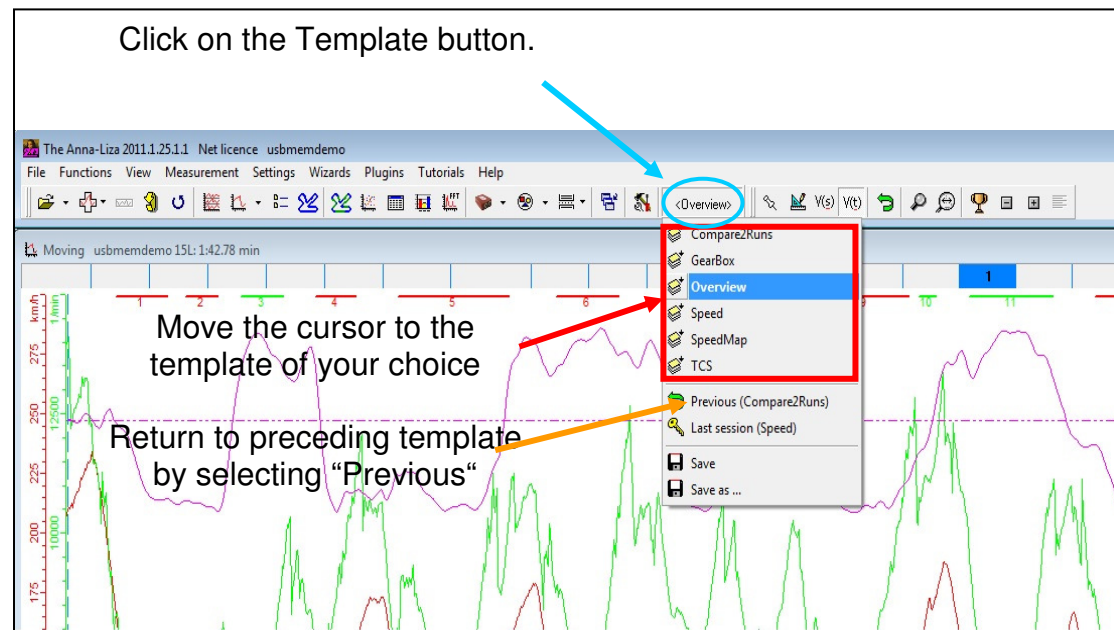
TCS

- Detailed analysis of traction control
- Analysis of where traction control cuts in
- Engine rpm, speed, throttle valves
- XY plot for a clear impression of DTC control intervention
- Track mode shows where DTC intervenes



Switch templates

To switch between templates, proceed as follows.

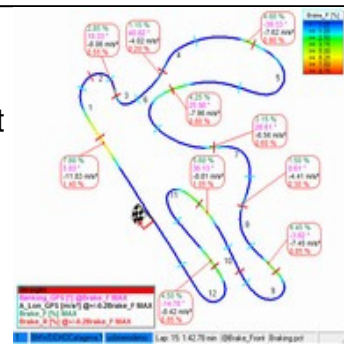


Track mode

The following predefined track modes are available:

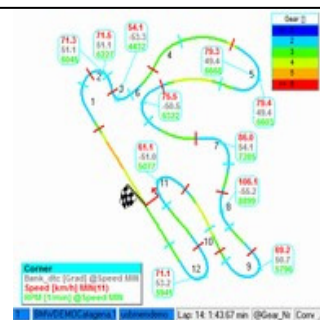
Braking

- Overview of brake usage
- Front-brake and rear-brake maxima at significant points on the track
- Bank angle and retardation at maximum braking force
- Colour-highlighted map of the track to show retardation achieved



Corners

- Quick overview of the cornering speeds on a lap
- Minimum cornering speeds
- Bank angles and rpm at significant points on the track
- Colour-highlighted map of the track to show selected gear
-



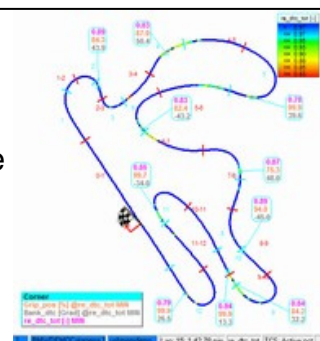
Straights

- Quick overview of the top speeds achieved on a lap
- Engine rpm and gear at the points of highest speed
- Colour-highlighted map of the track to show rider input on the basis of throttle twistgrip position

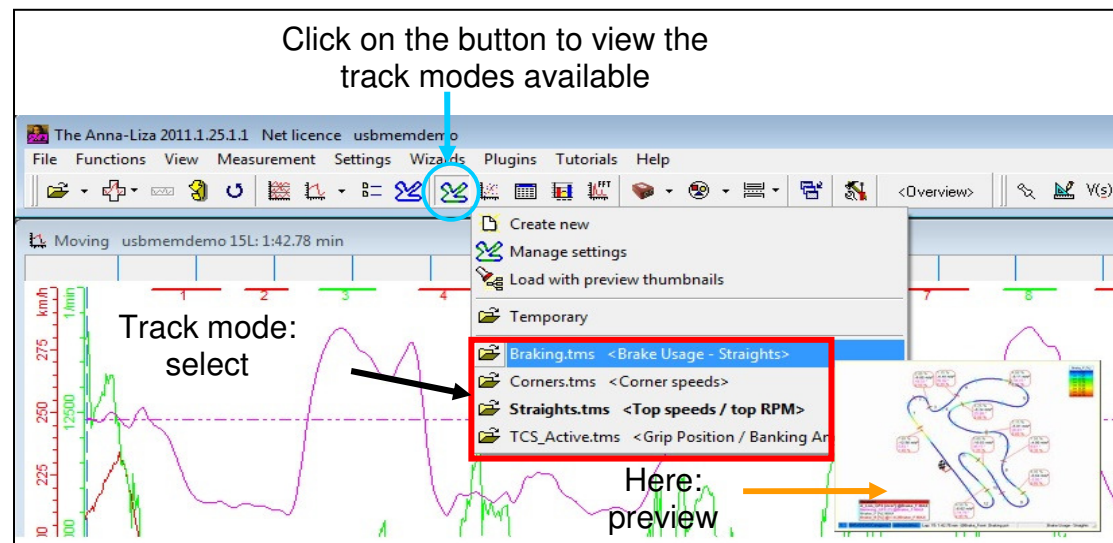


TCS_Active

- Quick overview of intervention by the traction control system on a lap
- Where on the track traction control reduces engine torque to avoid slip or wheelies.
- Rider's input and bank angle
- Colour-highlighted map of the track to show DTC control intervention



Selecting a track mode

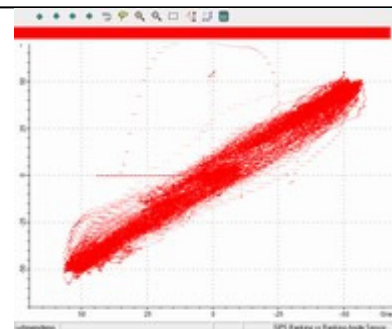


XY diagrams

The following predefined XY plots are available.

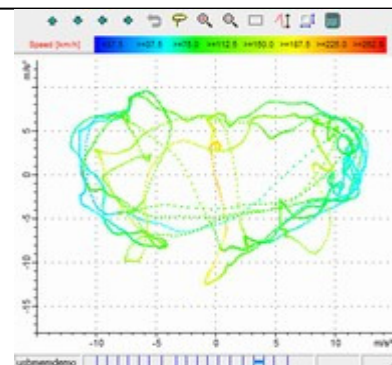
Bank Comparison

- GPS bank angle vs. bank angles registered by sensor
- Deviation between GPS bank angle and internal on-board sensor
- Information for all laps



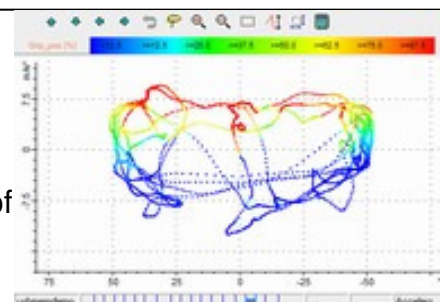
Acc Camm by GPS Current Lap

- Lateral acceleration vs. longitudinal acceleration
- Colour-coded speed channel
- Lap-based view
- Shape and size of the plot are indicative of the rider's skill



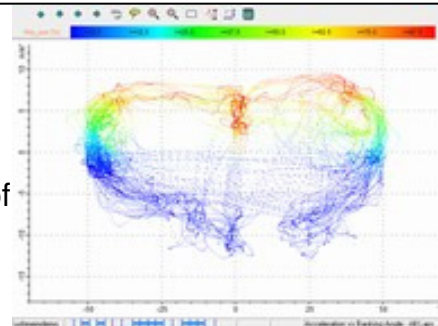
Camm by GPS Current Lap

- Bank angle vs. longitudinal acceleration
- Colour-coded throttle-twistgrip position
- Lap-based view
- Shape and size of the plot are indicative of the rider's skill
-



Camm by GPS All Laps

- Bank angle vs. longitudinal acceleration
- Colour-coded throttle-twistgrip position
- View for all laps
- Shape and size of the plot are indicative of the rider's skill
- A heart-shaped contour indicates a professional



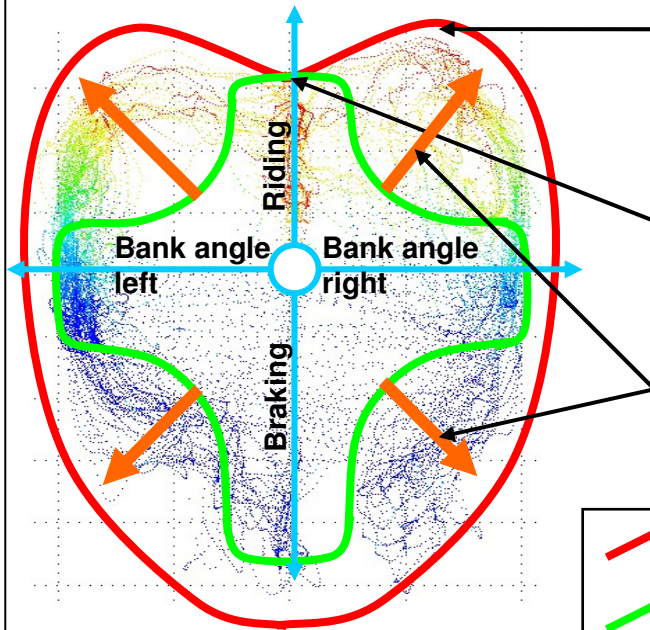
Bank angle assists acceleration

- Reduced tyre circumference improves ratio
- Lowering the centre of gravity counters tendency to wheelie

Acceleration limited by wheelie

- Centre of gravity is highest here

Time gained by expansion of the contour

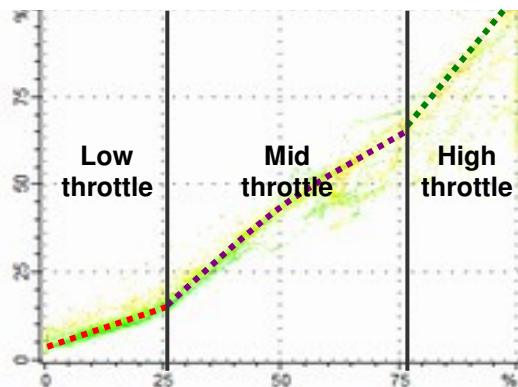
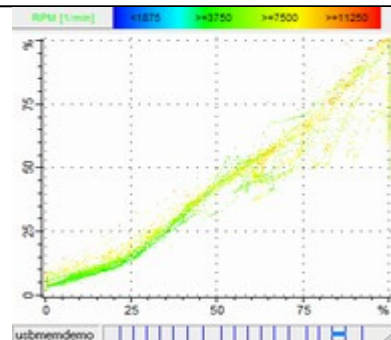


— = professional rider

— = amateur rider

ThrottleMap

- Driver input at throttle twistgrip vs. throttle-valve position
- Colour-coded engine rpm
- Lap-based view
- Comparison of driver's input vs. electronically controlled throttle valve



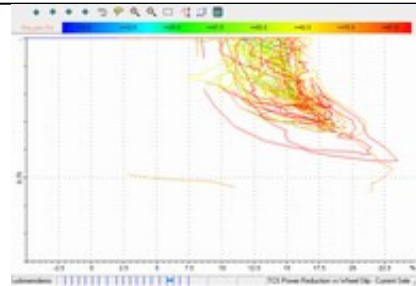
Low: DTC overrides driver input to stabilise the vehicle.

Mid: DTC allows more leeway

High: DTC intervention minimised so that the throttle valve can respond as rapidly as possible to rider input and the motorcycle can achieve maximum performance

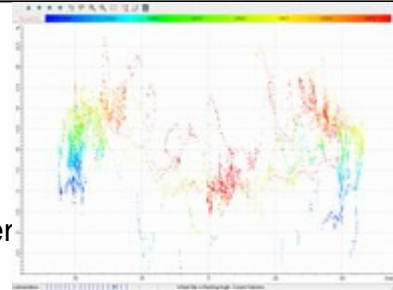
Reduction

- DTC torque reduction vs. wheel slip
- Colour-coded throttle-twistgrip position
- Dynamic view of the data in the selected window section
- Analysis of DTC control strategy



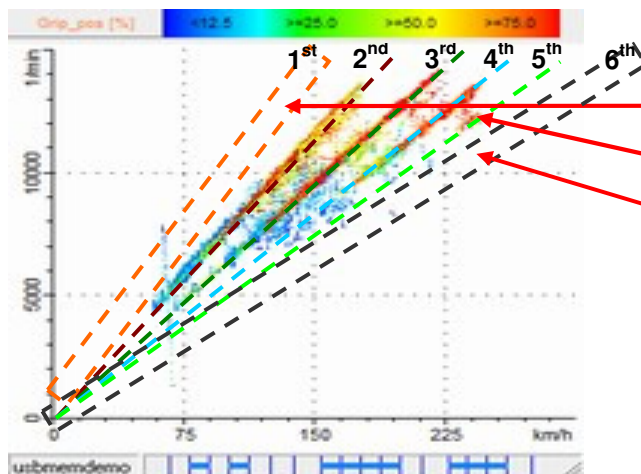
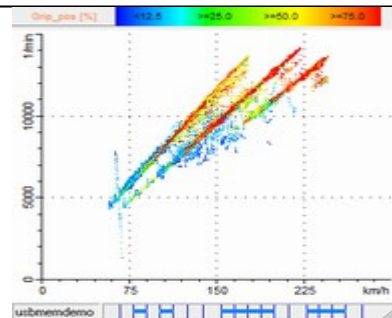
Slip

- Wheel slip vs. bank angle
- Colour-coded throttle-twistgrip position
- Dynamic view of the data in the selected window section
- Wheel slip at each bank angle for current rider input



GearBox1

- Engine rpm vs. speed
- Colour-coded throttle-twistgrip position
- All gears engaged during a measurement
- Max. engine rpm per gear
- Min./max. speeds



Analysis

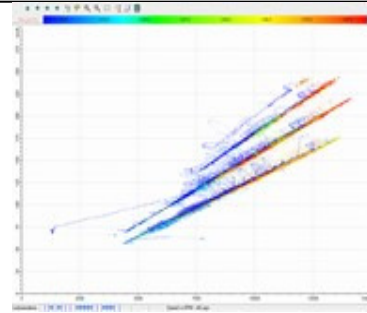
- 1st gear was not used
- 5th gear was used only briefly
- 6th gear was never used

Conclusions

- Rear sprocket is too small for this track size
- Increasing sprocket size would make for better acceleration and allow full benefit to be extracted from 5th and 6th gears

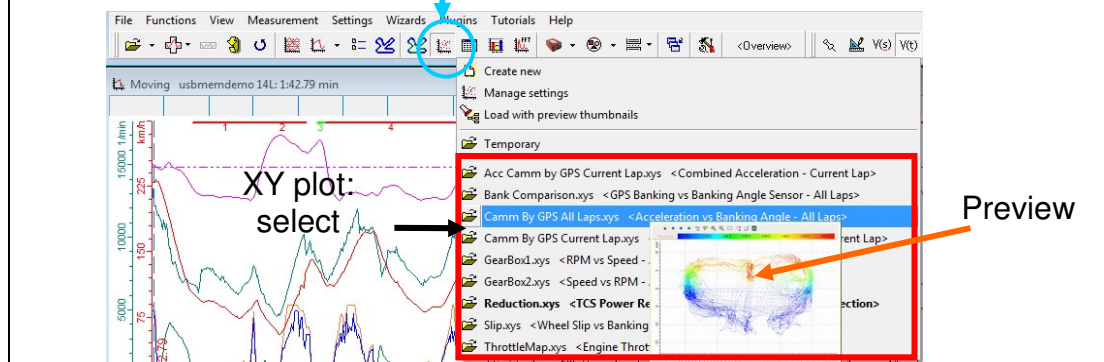
GearBox2

- Speed vs. engine rpm
- Colour-coded throttle-twistgrip position
- All gears engaged during a measurement
- Max. engine rpm per gear
- Min./max. speeds



Selecting an XY plot

Click on the button for XY plots



Min/max tables

The following predefined min/max tables are available.

Bike

- Quick overview of rider and vehicle performance
- Overview of all lap times
- Overview of all min./max. speeds
- Rider input, throttle twistgrip maximum & average
- Max. bank angle (GPS & sensor)

Lap	Time	Speed	RPM	Throttle	Bank Angle	...
1	1:42.79	150.0	8000	100	15	...
2	1:43.12	148.5	7950	95	14	...
3	1:42.55	151.2	8100	105	16	...
4	1:43.01	149.8	7980	98	15	...
5	1:42.88	150.5	8050	102	15.5	...
6	1:43.25	147.9	7900	92	14.5	...
7	1:42.95	150.1	8020	100	15.2	...
8	1:43.18	148.2	7920	96	14.8	...
9	1:42.72	151.5	8120	108	16.2	...
10	1:43.05	149.5	7960	97	15.1	...
11	1:42.85	150.8	8080	104	15.8	...
12	1:43.15	148.8	7940	94	14.6	...
13	1:42.98	150.3	8040	101	15.4	...
14	1:43.22	147.5	7880	91	14.4	...
15	1:42.78	151.8	8150	110	16.5	...
16	1:43.08	149.2	7910	93	14.7	...
17	1:42.82	150.6	8060	103	15.6	...
18	1:43.12	148.4	7930	95	14.9	...
19	1:42.92	150.9	8090	106	15.9	...
20	1:43.18	148.6	7950	96	14.8	...
21	1:42.75	152.0	8200	112	16.8	...
22	1:43.02	149.0	7970	98	15.0	...
23	1:42.80	151.0	8100	107	16.0	...
24	1:43.15	148.0	7900	90	14.0	...
25	1:42.70	152.5	8250	115	17.0	...
26	1:43.00	149.5	7990	99	15.5	...
27	1:42.75	152.0	8200	112	16.8	...
28	1:43.05	149.0	7970	98	15.0	...
29	1:42.75	152.0	8200	112	16.8	...
30	1:43.05	149.0	7970	98	15.0	...
31	1:42.75	152.0	8200	112	16.8	...
32	1:43.05	149.0	7970	98	15.0	...
33	1:42.75	152.0	8200	112	16.8	...
34	1:43.05	149.0	7970	98	15.0	...
35	1:42.75	152.0	8200	112	16.8	...
36	1:43.05	149.0	7970	98	15.0	...
37	1:42.75	152.0	8200	112	16.8	...
38	1:43.05	149.0	7970	98	15.0	...
39	1:42.75	152.0	8200	112	16.8	...
40	1:43.05	149.0	7970	98	15.0	...
41	1:42.75	152.0	8200	112	16.8	...
42	1:43.05	149.0	7970	98	15.0	...
43	1:42.75	152.0	8200	112	16.8	...
44	1:43.05	149.0	7970	98	15.0	...
45	1:42.75	152.0	8200	112	16.8	...
46	1:43.05	149.0	7970	98	15.0	...
47	1:42.75	152.0	8200	112	16.8	...
48	1:43.05	149.0	7970	98	15.0	...
49	1:42.75	152.0	8200	112	16.8	...
50	1:43.05	149.0	7970	98	15.0	...

Tip

- If you click on a value in the table, say speed for example, the point at which this speed was reached is shown automatically in the Overview window. This makes it all the easier to evaluate the min/max values.

Engine

- Quick overview of top speed, gear and engine rpm
- Speed maximum & average
- Rear-wheel speed, maximum & average
- Engine rpm, min., max. & average
- Rider throttle - max. & average



Control

- Quick overview of ABS and DTC interventions
- ABS status – min. & max.
- Wheel slip - max. & average
- Wheel slip with DTC intervention - min.
- Absolute torque reduction - min.



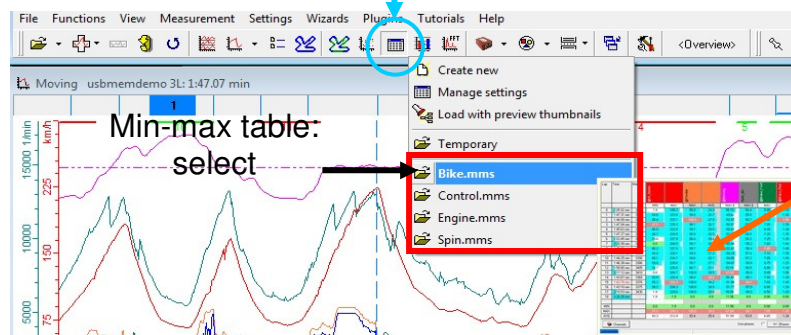
Spin

- Quick overview of wheel slip
- Lap times of all valid laps
- Wheel slip - max.
- Speed - max.

Lap	Time	Meters	Wheel Slip	Speed
			MAX	MAX
2	1:46.00 min	3391	20.2	223.1
4	1:45.63 min	3387	23.3	222.6
8	1:45.73 min	3384	18.0	227.9
9	1:45.69 min	3395	20.9	228.1
10	1:44.25 min	3390	20.9	234.7
11	1:45.38 min	3386	22.7	230.6
14	1:43.67 min	3388	28.8	233.4
15	1:42.78 min	3376	32.5	237.4
16	1:43.10 min	3375	21.3	234.3
MIN			18.0	222.6
MAX			29.3	236.3
AVG			22.4	230.1

Selecting a min-max table

Click on the button for min-max tables



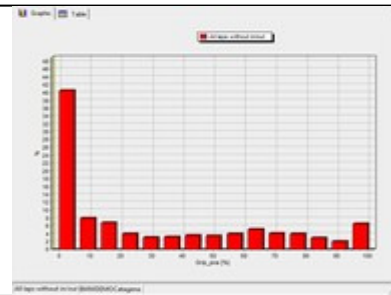
Preview

Histogram

The following predefined histograms are available.

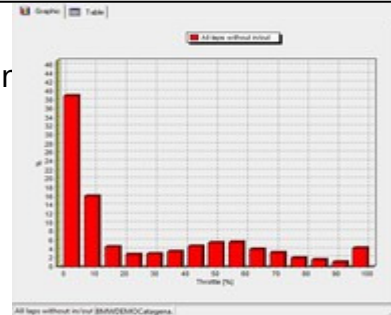
GripPos

- Quick overview of throttle twistgrip position use
- Statistical overview of throttle twistgrip position
- Throttle twistgrip position percentages per lap



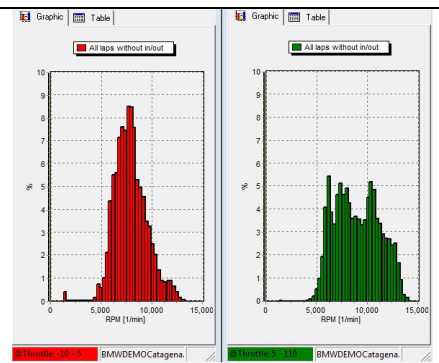
Throttle

- Statistical overview of throttle twistgrip position
- Percentages for each position
- Lap times of all valid **laps**
- Comparison with GripPos histogram



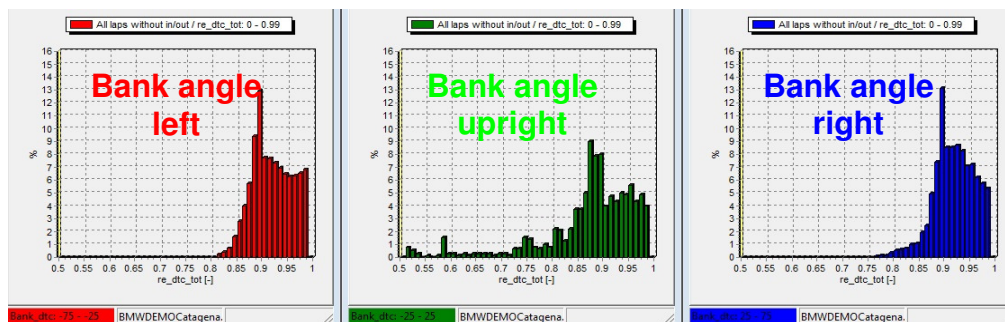
RPM

- Statistical overview of the engine speeds achieved
- Percentages for each engine rpm
- Lap times of all valid **laps**



TCS

- Statistical overview of DTC interventions
- Lap times of all valid **laps**
- Relationship to bank angle – **left, upright, right**
- Lower values indicate TCS is working harder.



Selecting a histogram:

Click on the button to select a histogram

Histogram: select

Preview

The screenshot shows a software interface with a menu bar (File, Functions, View, Measurement, Settings, Wizards, Plugins, Tutorials, Help) and a toolbar. A blue circle highlights a histogram icon in the toolbar. Below the toolbar, a list of histograms is displayed under the heading 'Temporary'. The list includes: GripPos.sts <Rider Throttle Usage>, RPM.sts <Engine RPM - C, TCS.sts <TCS Reduction -, and Throttle.sts <Engine Thr. A red box highlights this list. An arrow points from the text 'Histogram: select' to the list. To the right, a preview of a histogram is shown, with an orange arrow pointing from the text 'Preview' to it. The main window displays a line graph with multiple colored lines (red, green, blue, purple) and a y-axis ranging from 00 to 15000. The x-axis is labeled 'Moving' and 'usbmemo demo 14L: 1:42.79 min'.