- English -

DTS Tool Manual

Revision History

Revision	Description	Release Date	Author
0	Initial Release	2021-01-21	TS

Content

1 Notes and symbols used in this Manual

These paragraphs contain tips and practical advice for working with the System

In the paragraphs highlighted with this symbol, you will find additional information and it is very important that you follow the instructions given.

Documentation reference
A user manual reference number is provided so the user can seek further assistance

“`Software Parameter`”	Monospaced text in quotation marks designates a software parameter, pages, tabs or tables in the 2D Software
“`#Channel`”	Monospaced text in quotation marks with a leading hash mark designates a channel in the 2D Software
- cross-reference -	Italic, dotted underlined text designates a cross-reference to a different Chapter of the manual

2 Introduction

The Dynamic Test System software tool (DTS Tool) allows for a fast, table-oriented overview of the recorded measurements. You can use it on “DTS”-measurements or also on “normal” track data to analyze the vehicle or driver/rider performance.

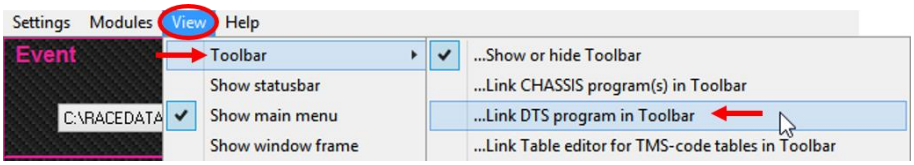
Depending on the set-up, you´ll get a report window with the information and you can additionally generate Excel files customized to your needs.

This manual will help you to set up the DTS Tool and define your own test conditions and reports.

3 Starting the DTS Tool

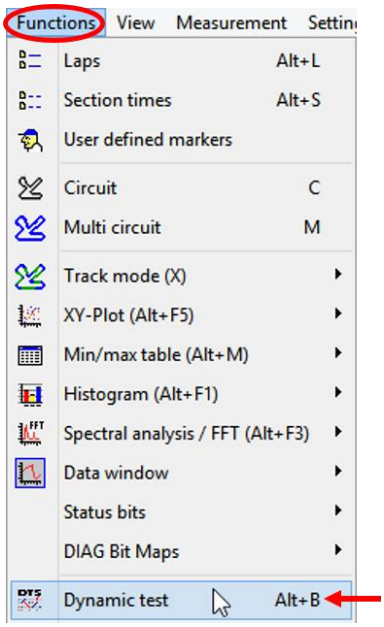
There are two different ways to start the DTS Tool: directly from the WinARace Toolbar or while analyzing the data from Analyzer.

If you want to directly start the DTS Tool from WinARace, it needs to be linked to the Toolbar. To get the DTS button linked in it, please select from the main menu "`View`" ⇒ "`Toolbar`" ⇒ "…`Link DTS program in Toolbar`".



Then simply click the DTS button to start the program:

If you want to start the DTS Tool while analyzing data, use the "`Functions`" menu in the Analyzer ⇒ "`Dynamic Test`" or the shortcut <**Alt**> + <**B**>:



Mandatory Restart

If you´ve changed the measurement, please restart the DTS Tool

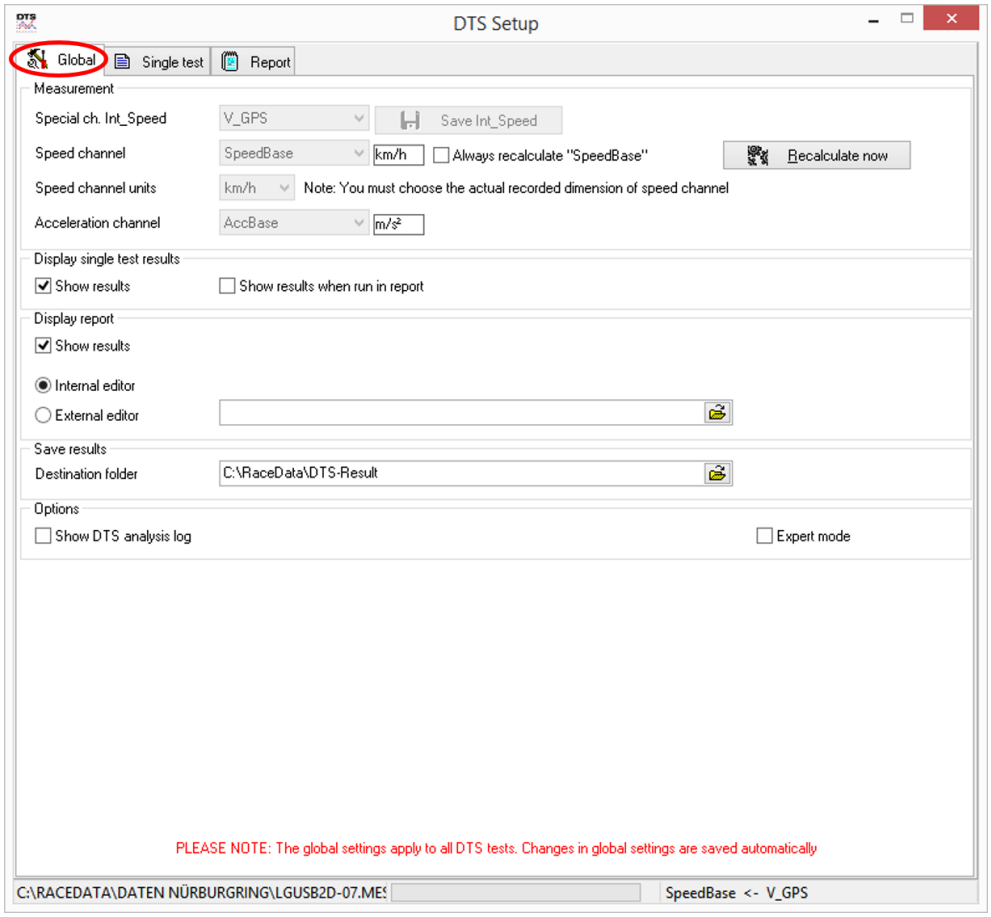
4 Software Configuration

The DTS Tool is divided in three tabs:

- "Global"
- "Single test"
- "Report"

4.1 Global

In tab "Global" you modify the settings which are used in all DTS tests.



4.1.1 Measurement

At the top you can check if the software uses the correct speed channel[1]. In this example it is "V_GPS". If that is not the correct speed channel you want to use, please change the special channel "Int_Speed".

If you enable the function "Always recalculate "SpeedBase"", the channels "SpeedBase" and "AccBase" will always be calculated by the software. If this function is disabled, you can also use the button **<Recalculate now>** to start the calculation.

[1] If your measurement contains the channel „DTS_Speed", this channel will be used.

4.1.2 Display single test results

In here you can select if you want the software to show you the results of the single test in a separate window. The first box is for the results, when executed as a single test, the second box is for the results of the single tests executed in a report.

4.1.3 Display report

In here you can select if you want to see the results of a report in a separate window. In addition, you can select if you want to use the editor of the 2D Software or if you want to use an external editor, for example Notepad.

The editor is used just to show the results. You can´t change them in there.

4.1.4 Save results

Please select a folder where to store the test results. The default folder is `C:\RaceData\DTS-Result.`

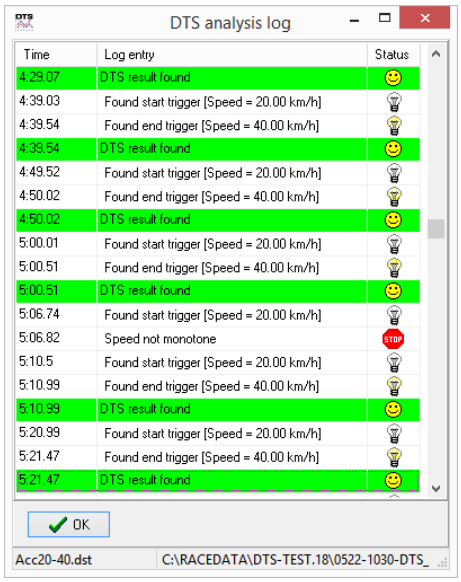
4.1.5 Options

If you enable the option **"`Show DTS analysis log`"** you will get a detailed report on the beginning and ending of a test or why it was stopped without a result.

This might be helpful if you don´t get the results you´re expecting.

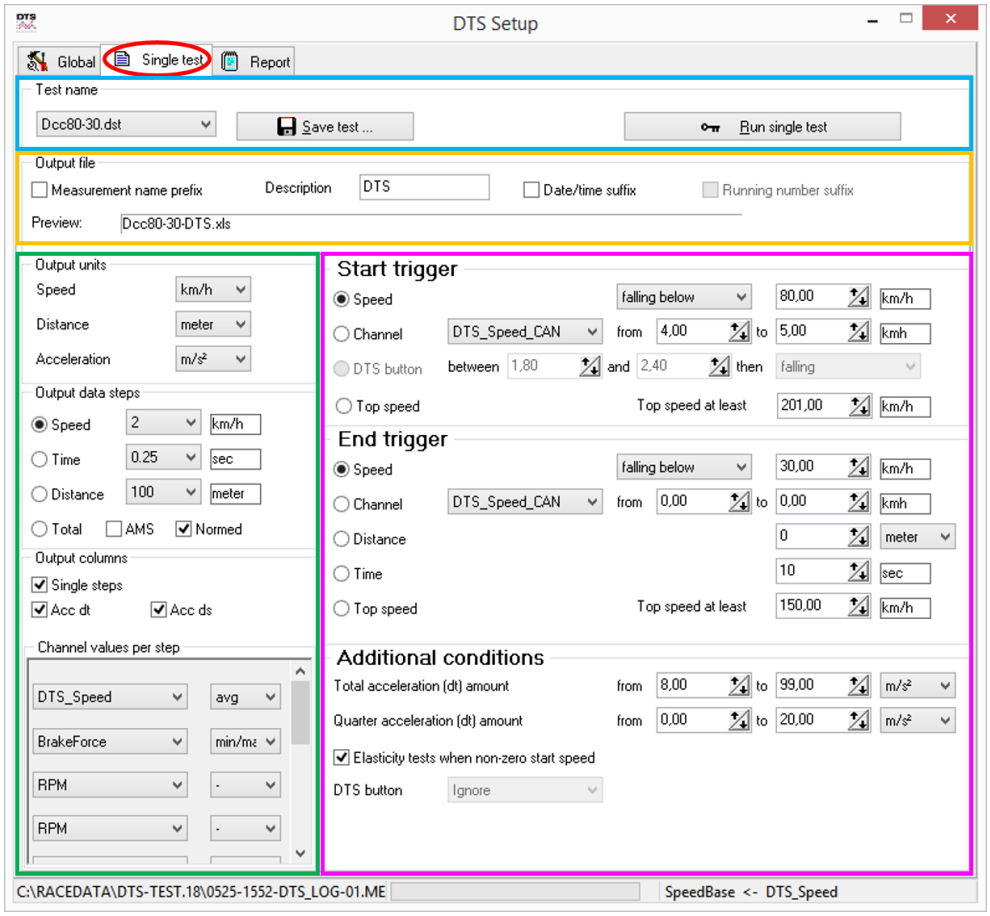
This will interrupt the process, as you´ll only get the results after clicking **<OK>**.

If you enable the **"`Expert mode`"** you are able to change the source channel for the special channel **"`Int_Speed`"** within this DTS Tool.



4.2 Single Test

In tab "`Single test`" you can set-up the start, the end and additional conditions (data steps, units, etc.). of a test. You also define here the name of the result file, save the test settings and start the testing.



4.2.1 Blue area

In this area you can select an already defined test profile from the drop-down list, save the current test profile settings or run the selected single test.

4.2.2 Orange area

In here you define the name of the Excel file, which contains the test results. "`Measurement name prefix`" will automatically put the measurements name in first position, the tests name is used next. The text entered in the field "`Description`" will be put in the next position and if you enable "`Date/time suffix`", a date and time stamp (`yyyymmdd-hhmmss`) will be put at the end. The preview shows the filename. The results will be saved in the destination folder you have selected in the global settings. See chapter *- 4.1.4 - Save results -*.

4.2.3 Pink area

This is the area in which you define your tests. The selection is organized in rows. Define the start and end trigger to set the start and end condition for the test. They can be set individually to meet your requirements.

"`Start Trigger`" - You can select whether you want to trigger the start of the test with based on the speed, a value of any channel in the system or you can trigger on the top speed, where the DTS Tool is searching for maximum speed achieved in the test.

"`End Trigger`" - Here you have the same options as on the start trigger and additionally, you can stop the test based on the covered distance and elapsed time

In **"`Additional conditions`"** you define the acceleration or deceleration rate which defines the test as valid. The total acceleration can be considered as an average of the acceleration during the test. The quarter acceleration range can be roughly evaluated by dividing the time of the test into four segments on which the acceleration is evaluated.

With **"`Elasticity tests when non-zero start speed`"** you are able to relax the condition that the speed must be zero.

4.2.4 Green area

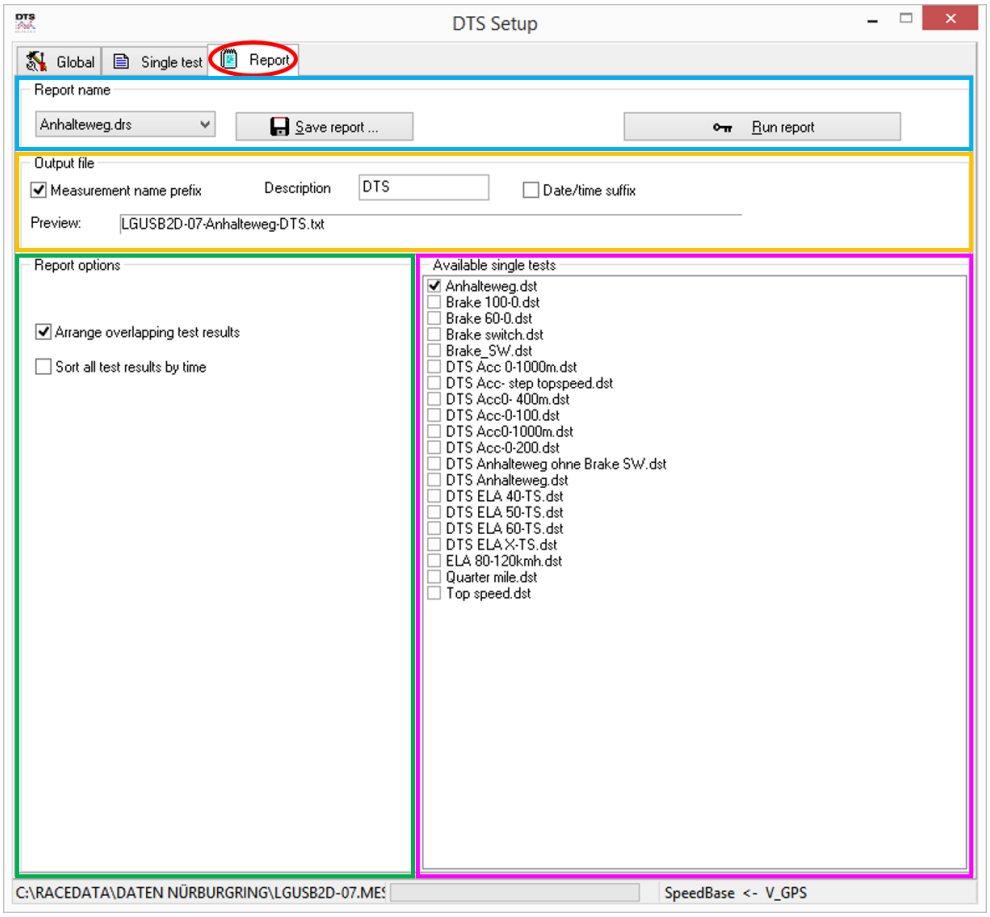
In this area you can define the data which is listed in your result table / Excel sheet.

In **"`Output units`"** you define the units, which will be used in the output. In **"`Output data steps`"** you can decide on if you want to have one result per test event or if you want to split it into different steps, depending on speed / time / distance, for which you can also select a step width.

If you select **"`Single steps`"** in **"`Output columns`"**, it will generate accumulated distance and time values as well as incremental. If it is not selected, you will only get incremental values. You can also add the columns **"`ACC dt`"** (acceleration or deceleration values from delta time) and / or **"`ACC ds`"** (acceleration deceleration values from delta distance). Additionally, you can also add up to 12 channels of your measurement to this output. Simply select the channel from the drop-down list and select from min, max, avg or min / max / avg, to define the channels values.

4.3 Report

In tab "`Report`" you put together different single tests to execute them together. To be able to do this, you must have created single tests which fulfil your requirements.



4.3.1 Blue area

In this area you can select an already defined report profile from the drop-down list, save the current report profile settings or run the selected report.

4.3.2 Orange area

In here you define the name of the created Excel file, which contains the test results of all tests combined. "`Measurement name prefix`" will automatically put the measurements name in first position, the reports name is used next. The text entered in the field "`Description`" will be put in the next position and if you enable "`Date/time suffix`", a date and time stamp (`yyyymmdd-hhmmss`) will be put at the end. The preview shows you the name. The results will be saved in the destination folder you have selected in the global settings. See chapter *- 4.1.4 - Save results -*.

4.3.3 Pink area

This is the area in which you define your report. All currently defined single tests are listed. Select the appropriate tests for your application.

4.3.4 Green area

In this area you can decide on how your result table/Excel sheet is organized.

5 Automation / Scripting

5.1 CalcTool Integration

To automate the process of data analysis, you can call the DTS Tool with the CalcTool or from with a .CAL file.

The CalcTool command to call an additional program is "`Execute`". There you tell CalcTool which program to call, followed by parameters to tell the called program what to do. Typically, there are up to three parameters added with the DTS Tool:

- Which measurement
- Which report/single test
- Close/exit the program afterwards

5.1.1 Examples:

Running a Report:

```
Execute('DTS.exe',<MesDir>,'Report=Brake.drs','/Close')
```

- `'DTS.exe'` ⇒ program to call
- `<MesDir>` ⇒ placeholder for the currently selected measurement
- `'Report=Brake.drs'` ⇒ the **report** saved as "`Brake.drs`"
- `'/Close'` ⇒ command to exit the program afterwards

Running a single Test:

```
Execute('DTS.exe',<MesDir>,'Test=Dcc80-30.dst','/Close')
```

- `'DTS.exe'` ⇒ program to call
- `<MesDir>` ⇒ placeholder for the currently selected measurement
- `'Test=Dcc80-30.dst'` ⇒ the single **test** saved as "`Dcc80-30.dst`"
- `'/Close'` ⇒ command to exit the program afterwards

Automation

You should program your reports and single tests inside the DTS Tool to run without further user input, otherwise the automation will be interrupted. Please refer to chapter *- 4.1.5 - Options –* for more information.

5.2 Spec Sheet Integration

You can also integrate the DTS Tool into your Spec Sheets. Together with the AutoCalc function of the Analyzer you can directly execute single tests or reports automatically after the download.

SpecView Manual

- If you are not familiar with 2D spec sheets and/or the 2D SpecView tool, please refer to the SpecView Manual which you can download from our homepage. 2d-datarecording.com/en/downloads/manuals/

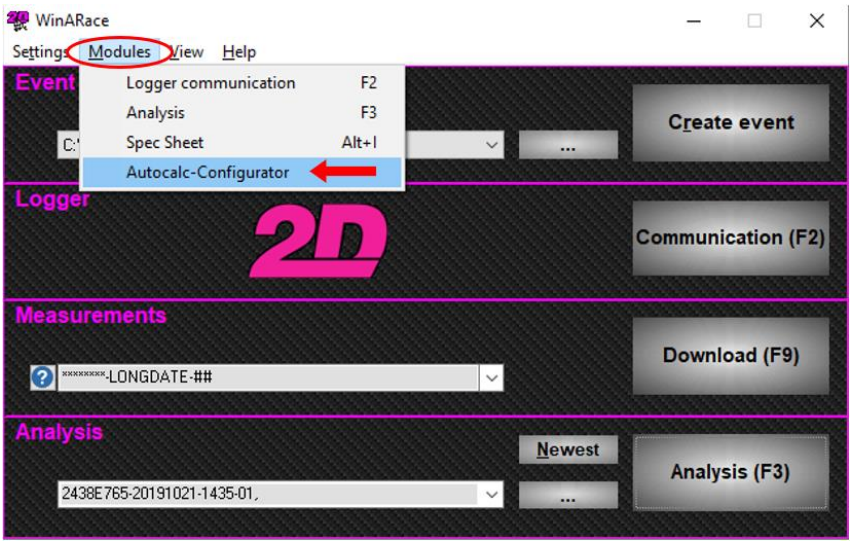
5.2.1 Prerequisites

The following prerequisites have to be fulfilled to run the automation:

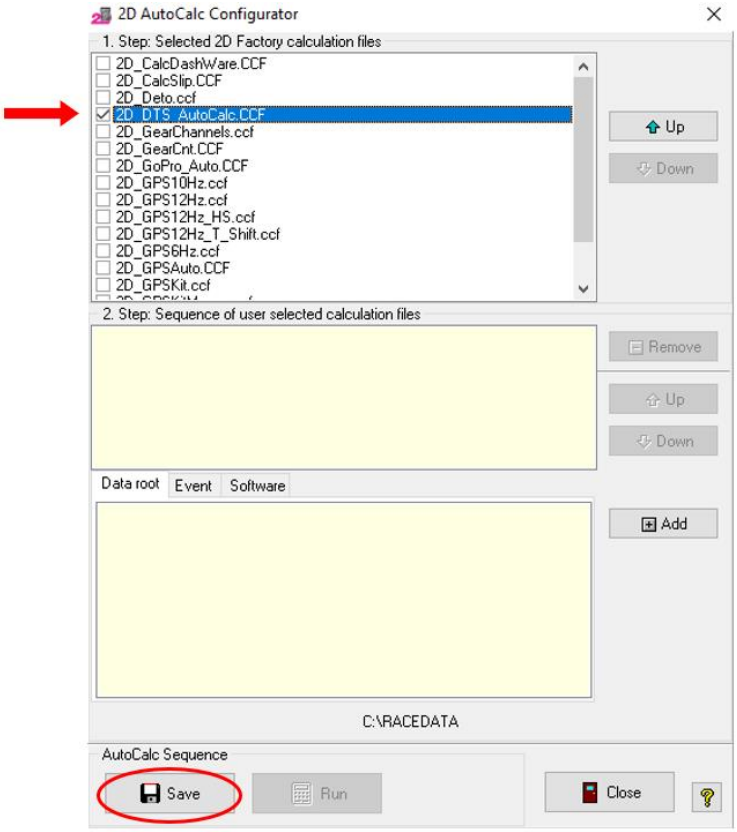
- The DTS AutoCalc file has to be activated in WinARace
- The .HED file has to be properly configured, named and placed in the parent folder of the event.

5.2.2 AutoCalc Configuration

To enable the DTS AutoCalc, open the "`AutoCalc-Configurator`" in the "`Modules Menu`" in WinARace.



In the AutoCalc Configurator, activate the checkbox next to "`2D_DTS_AutoCalc.CCF`"



Confirm your changes with <**Save**>.

2D_DTS_AutoCalc.CCF source

The source of the 2D_DTS_AutoCalc.CCF file is shipped with the DTS Demo Data:

→ `2D_DTS_AutoCalc.CAL`

5.2.3 .HED File

The .HED file needs to be named according to the logger name with a leading P_.

- P_[Loggername.HED]

If you logger is named for example "`DTS-Logger`" the .HED files needs to be named `P_DTS-LOGGER.HED`

In the .HED file you can specify which test data should be generated:

Example:

```
[DTS_Tool]
DCC=YES
DCC_RUN='Report=xxx.DRS'
ACC=YES
ACC_RUN='Report=xxx.DRS'
```

- **[DTS_Tool]** ⇒ Group Name, do not change!
- DCC= ⇒ [yes / no] generate brake test data
- DCC_RUN= ⇒ 'Report=xxx.DRS' run a **report**
  ⇒ 'Test=yyy.DST' run a single **test**

- ACC= ⇒ [yes / no] generate acceleration tests
- ACC_RUN= ⇒ 'Report=xxx.DRS' run a **report**
  ⇒ 'Test=yyy.DST' run a single **test**

5.3 Writing SpecSheet Values to reports

The DTS Tool can be configured to write SpecSheet Values to the generated Excel and Text Report files.

By Default, all Values from the SpecSheet Group "`[DTS_Info]`", will be written into the result files.

If you want to specify a different Group, you can define it by editing the "`DTS_Global_Settings.ini`":

Change the Parameter "`SpecGroupToBeginReport=`" In the Group "`[Options]`" to the SpecSheet Group you want to be written in the result files.

If Spec Sheet Group is configured, the DTS Tool will automatically use the "[Comment]" group from the SpecSheet if it is available.

5.4 Example SpecSheet

Example .HED file

An example .HED file (P_DTS.HED) for the DTS Automation is Shipped with the 2D Software.

5.5 DTS Tool Setting file

The Global Settings of the DTS are stored in "`DTS_Global_Settings.ini`" in the settings directory of the current user.

If you have installed the DTS Demo Data you can find it here:

- `C:\Users\Public\Documents\Race20xx\Users\User204=DTS\Settings\`

5.6 Filling SpecSheet Values after Download

You can configure WinARace to prompt you to fill Values in the SpecSheet directly after the Download.

This feature is controlled via the "`WinIt.ini`" file, which is located at `C:\ProgramData\Race20xx`.

WinARace Short Cut

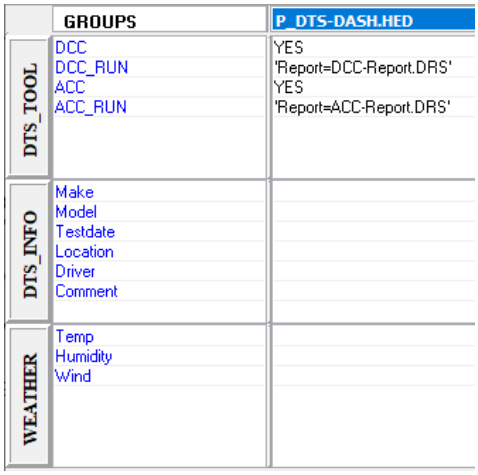
To access the configuration file folder of the 2D Software simply press `<CTRL>+<ALT>+<D>` and WinARace will automatically open the correct folder

It will be activated when:

- In the WinIt.ini the group "`[Special]`" the Parameter "`FillSpecGroupAtDownload=1`" is existent.
- The WinIt.ini the group "`[SpecGroupsToEnterAfterDL]`" is configured with the SpecSheet Groups that should be filled.
- The SpecSheet Groups defined in "`[SpecGroupsToEnterAfterDL]`" are in the used SpecSheet.

If all these criteria are met a Pop-up prompting to fill the Values will appear after the Download.

For example, if you want to fill the SpecSheet Group "`DTS_Info`" and "`Weather`" after the Download, the configuration should look like this:

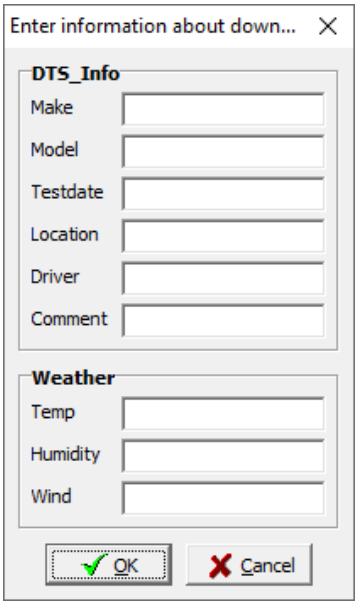


SpecSheet

```
[Special]
...
FillSpecGroupAtDownload=1

[SpecGroupsToEnterAfterDL]
1=DTS_Info
2=Weather
```

WinIt.ini



Pop-Up

SpecSheet Naming

If no suitable SpecSheet for the Logger is found by WinIt the function will not be activated.

6 DTS Demo Data

Demo Data Download

To get the DTS Demo Data please refer to 2d-datarecording.com/en/downloads/

To get a quick and easy start, we have compiled a set of demos and examples to explore the possibilities of the DTS Tool and the Analyzer.

With the DTS Demo Data you can run single tests or complete reports, visualize the status of the DTS Dash, review the selected settings in a test, run additional test and reports on the data and also automate the test and test report generation with scripts and .HED files.

The DTS Demo Data contains an 2D Event (“`RaceData\DemoData\DTS`”) which contains following Items:

- An Example DTS Measurement “`DTS-DASH-01.MES`”
- .HED File for Automation “`P_DTS.HED`” to be used with your system
- The source file of the “`2D_DTS_AutoCalc.CCF`” → “`2D_DTS_AutoCalc.CAL`” for your understanding and to modify them to your needs
- `DTS_BitChannels.CAL`
- `DTS_ClearBitChannels.CAL`

Additionally, it contains a User “`DTS`” for the Analyzer Software with a template “`DTS-Overview`” and also a sample set of tests and reports.

6.1 DTS_BitChannels.CAL

This file generates Status and Modus Bit Channels from the DTS Measurement for a more convenient way to view them in the Analyzer. Those channels show the Mode and Status of the DTS Dash during the tests. For example, you can see which test was selected and whether it was deemed valid.

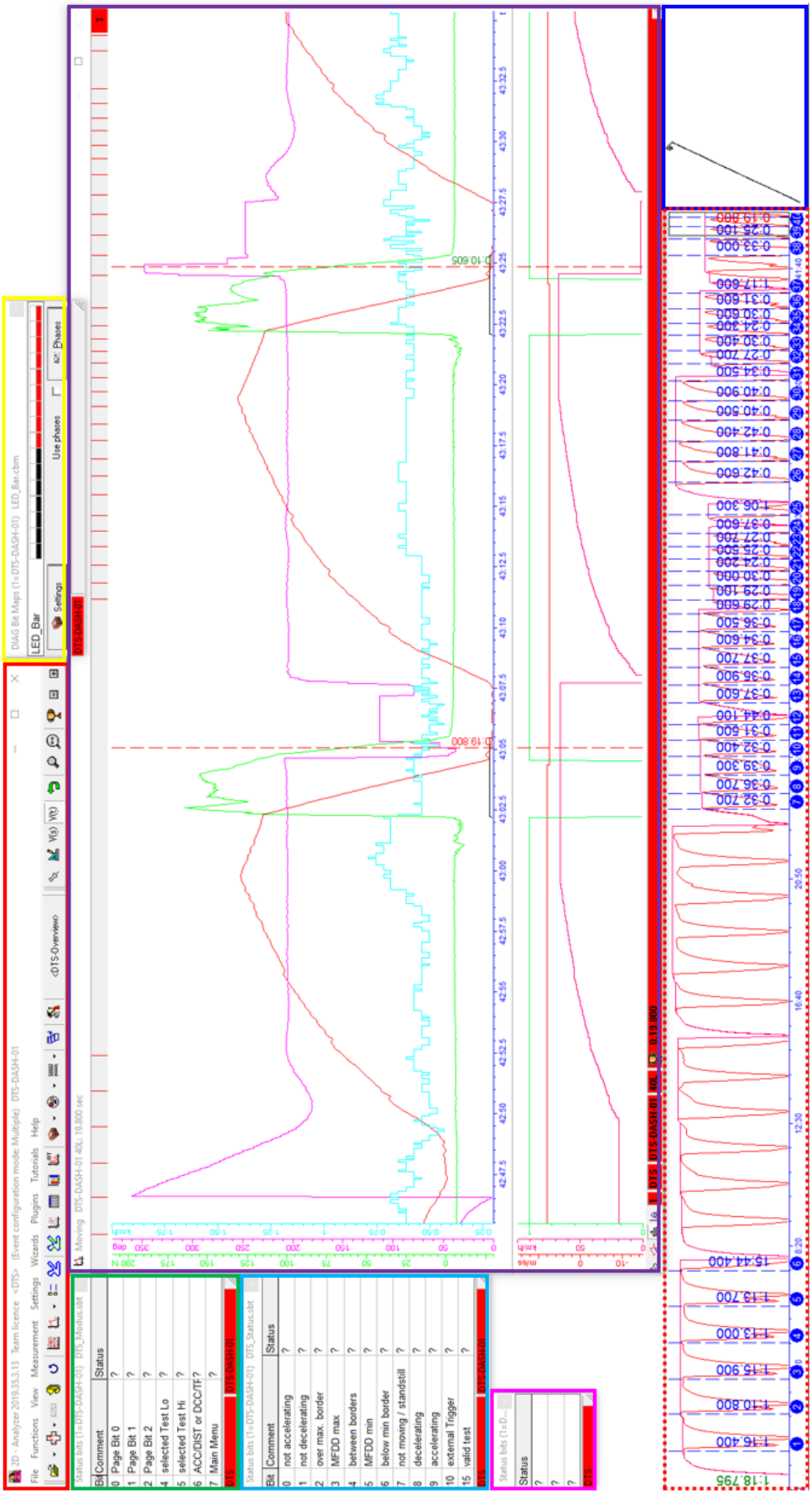
6.2 DTS_ClearBitChannels.CAL

This file removes the Bit Channels generated with “`DTS_BitChannels.CAL`” from the measurement to reduce the data size for your convenience.

DTS Bit Channels

➢ For a detailed description of the DTS Bit Channels, please refer to the DTS Manual → Advanced Setup → #DTS_Status and #DTS_Modus

6.3 Analyzer Template



The DTS-Overview template consists of the following items:

- Analyzer Menu Bar (**red**)
- Moving Window (**purple**)
- DTS Status Bits Channel Indicator (**green**)
- DTS Modus Bits Channel Indicator (**aqua**)
- DTS Dash Status LEDs Indicator (**pink**)
- DTS Dash LED Bar Indicator (**yellow**)
- Measurement Overview (**dotted red**)
- GPS Track Map (**blue**)

6.3.1 DTS Dash LED Bar Indicator

The DTS Dash LED Bar Indicator mimics the LED Bar of the DTS Dash when you scroll through the data in `<Measure>` mode.

6.3.2 DTS Dash Status LEDs Indicator

The DTS Dash Status LED Bar Indicator mimics the Status LEDs of the DTS Dash when you scroll through the data in `<Measure>` mode.

6.3.3 DTS Status Bits Channel Indicator

The DTS Dash Status Bits Indicator visualizes the DTS Status Channel of the DTS Dash when you scroll through the data in `<Measure>` mode.

Status bits (1=DTS-DASH-01) DTS_Status.sbt

Bit	Comment	Status
0	not accelerating	not accelerating
1	not decelerating	not decelerating
2	over max. border	0
3	MFDD max	0
4	between borders	0
5	MFDD min	0
6	below min border	0
7	not moving / standstill	standstill
8	decelerating	0
9	accelerating	0
10	external Trigger	0
15	valid test	Test Valid

DTS Manual

- For a detailed description of the DTS Status Bits Channel, please refer to the DTS Manual → Advanced Setup → #DTS_Status

6.3.4 DTS Modus Bits Channel Indicator

The DTS Dash Status Bits Indicator visualizes the DTS Status Channel of the DTS Dash when you scroll through the data in `<Measure>` mode.

Status bits (1=DTS-DASH-01) DTS_Modus.sbt

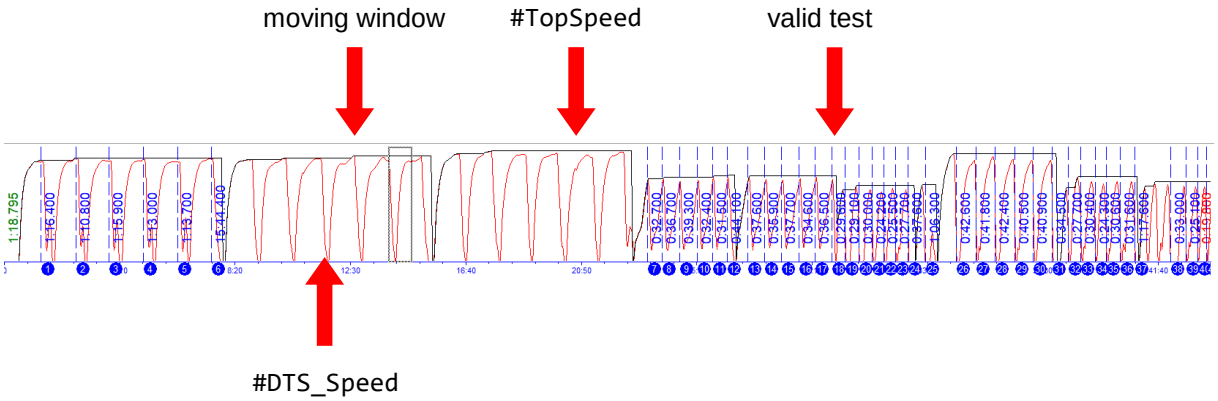
Bit	Comment	Status
0	Page Bit 0	Brake
1	Page Bit 1	0
2	Page Bit 2	0
4	selected Test Lo	1
5	selected Test Hi	0
6	ACC/DIST or DCC/TF	1
7	Main Menu	0

DTS Manual

- For a detailed description of the DTS Modus Bits Channel, please refer to the DTS Manual → Advanced Setup → #DTS_Modus

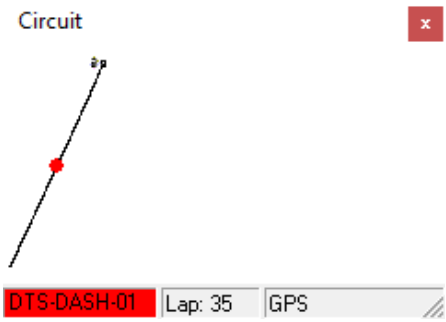
6.3.5 Measurement Overview

This window provides an overview over the complete measurement. The displayed channels are: "`#DTS_Speed`" (red) and "`#TopSpeed`" (black). The vertical blue dotted lines indicate a valid test and the gray rectangle indicates the part of the measurement which is shown in the moving window



6.3.6 GPS Track Map

The GPS Track Map display a simplified track map of the Measurement and indicates the position of the vehicle on it with a red dot when you scroll through the data in `<Measure>` mode.



6.3.7 Moving Window

This moving window is the main part of the DTS-Overview. It is split up into 2 sections, in the upper part the "physical" channels are displayed:

- "`#BrakeForce`" (green) ⇒ Brake force in [N]
- "`#DTS_BrakeSwitch`" (black) ⇒ Status Channel: Brake Switch condition reached [0 or 1]
- "`#Course`" (pink) ⇒ Heading of the vehicle in degrees to north [°]
- "`#DTS_Speed`" (red) ⇒ Vehicle speed [km/h]
- "`#SpAccu`" (aqua) ⇒ Accuracy of the vehicle speed in [± km/h]

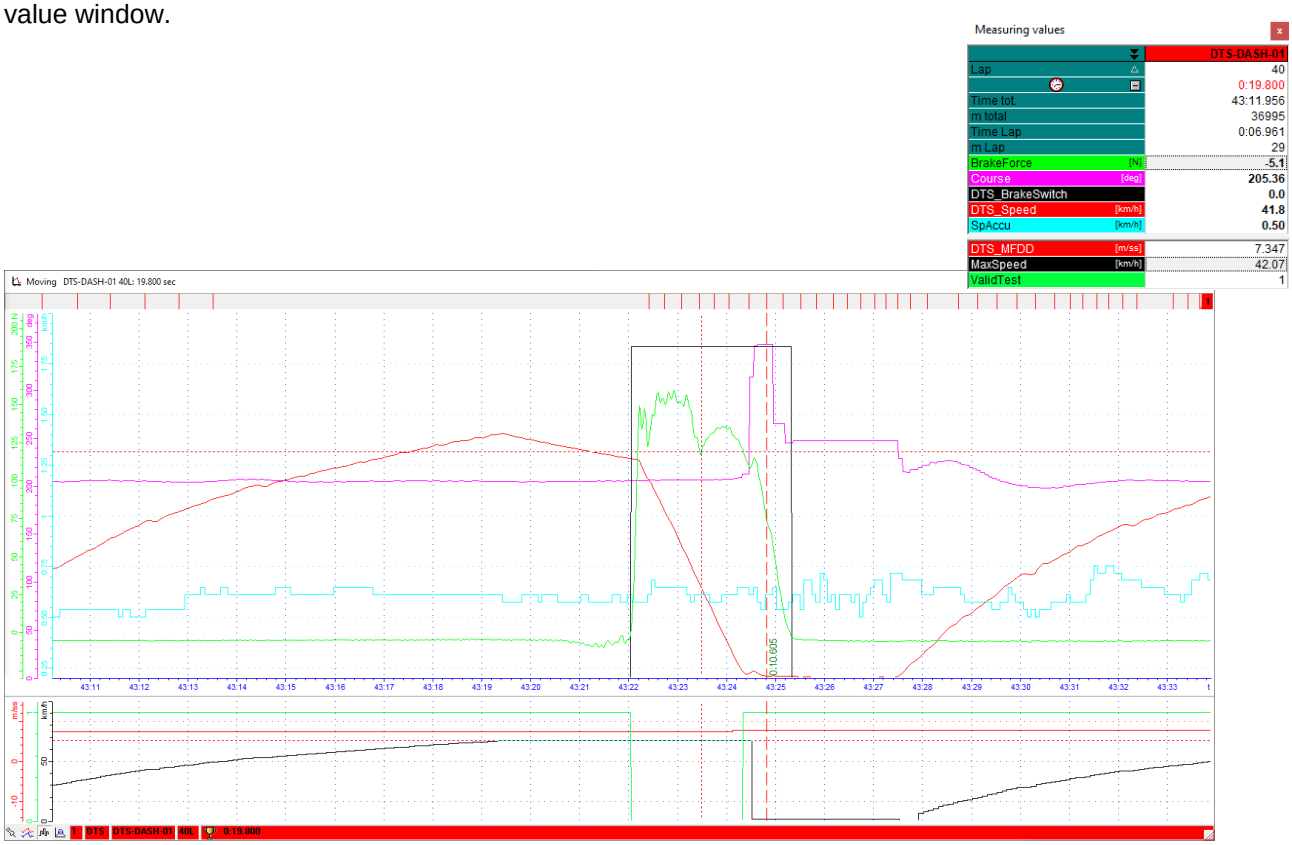
In the lower part are the calculated channels displayed:

- "`#MaxSpeed`" (black) ⇒ Max. vehicle speed since start of the measurement [km/h]
- "`#DTS_MFDD`" (red) ⇒ mean fully developed deceleration [m/s²]
- "`#ValidTest`" (green) ⇒ Status Channel: Valid Test condition reached [0 or 1]

DTS Manual

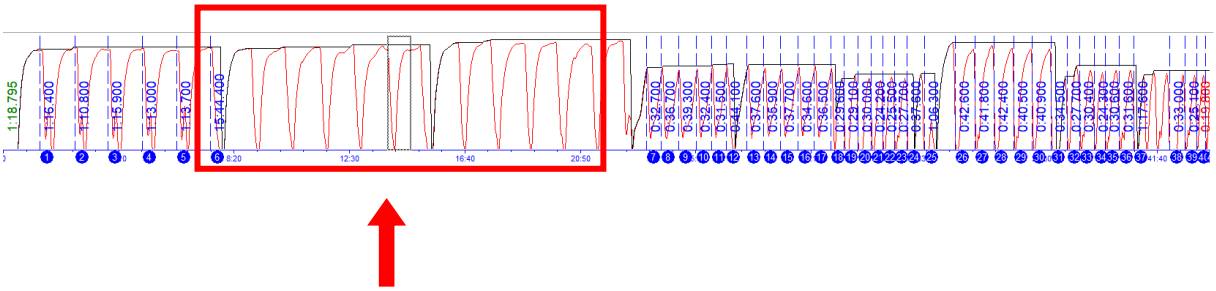
➢ For a detailed description of the Channels, please refer to the DTS Manual

When you scroll through the data in `<Measure>` mode, all Channel Value will be displayed in the measuring value window.



6.4 DTS Tool

The demo data does have some “missing” valid tests because a different mode was select, when performing them.



With the DTS Tool you can generate those tests after you have completed the measurement. For example, you can perform an acceleration test from 0 to 80 km/h and also a brake test from 60 to 0 km/h with a reduced minimum MFDD.

Along with the demo data a set of example single tests and reports is shipped to show the possibilities of the DTS Tool. You can view and customize all tests and reports to your needs and also use them on other measurements.

The files are located here:

→ `C:\Users\Public\Documents\Race20xx\Users\User204=DTS\Settings\`

The tests and reports have the following naming scheme:

`TEST_(Step-)Mode_Start-End.DST`

- `TEST` ⇒ ACC = Acceleration Test / DCC = Brake Test
- `Step-` ⇒ Step- = The data will be shown in increments
- `Mode` ⇒ Dist = distance based / Speed = speed based / Trigger = triggered test
- `Start` ⇒ Start condition of the test
- `End` ⇒ End condition of the test

For example, a speed-based acceleration test from 0 to 80 km/h will be named: “`ACC_Speed_0-80.DST`” and a distance-based acceleration test with an incremented (stepped) output from stand-still 0 to 1000m will be named: “`ACC_Step-Dist_0-1000m.DST`”.

When you run the acceleration test with the DTS Tool you will see that you will get more valid acceleration test than originally marked as valid during measurement:

	A	B	C	D	E	F	G	H	I	J
1		Speed [km/h]	Time total [s]	Dist. total [m]	Acc dt tot [m/s²]	Acc ds tot [m/s²]	Course avg	SpAccu min	SpAccu max	SpAccu avg
2	1	0.00 - 80.00	18,75	306,59	1,18	0,81	26,58	0,5	0,61	0,55
3	2	0.00 - 80.00	16,36	256,57	1,36	0,96	206,36	0,54	0,65	0,57
4	3	0.00 - 80.01	18,38	294,87	1,21	0,84	26,48	0,5	0,61	0,53
5	4	0.00 - 80.01	15,9	245,66	1,4	1,01	205,7	0,43	0,68	0,55
6	5	0.00 - 80.00	16,52	257,31	1,35	0,96	27,56	0,5	0,58	0,54
7	6	0.00 - 80.00	16,5	257,31	1,35	0,96	205,74	0,43	0,68	0,55
8	7	0.00 - 80.00	17,83	281,88	1,25	0,88	48,11	0,47	0,61	0,53
9	8	0.00 - 80.00	15,76	246,57	1,41	1	203,93	0,47	0,65	0,53
10	9	0.00 - 80.00	22,04	367,78	1,01	0,67	44,18	0,5	0,65	0,56
11	10	0.00 - 80.00	15,67	238,59	1,42	1,03	202,44	0,47	0,83	0,56
12	11	0.00 - 80.00	22,34	377,35	0,99	0,65	44,96	0,5	0,65	0,56
13	12	0.00 - 80.00	14,45	218,85	1,54	1,13	203,63	0,47	0,76	0,57
14	13	0.00 - 80.00	17,18	264,47	1,29	0,93	50,54	0,47	0,65	0,58
15	14	0.00 - 80.01	13,59	203,86	1,64	1,21	202,99	0,47	0,94	0,57
16	15	0.00 - 80.00	17,37	268,22	1,28	0,92	49,51	0,47	0,65	0,58
17	16	0.00 - 80.00	13,34	196,31	1,67	1,26	202,56	0,47	0,76	0,57
18	17	0.00 - 80.00	16,92	258,51	1,31	0,96	51,41	0,47	0,65	0,56
19	18	0.00 - 80.01	14,49	218,99	1,53	1,13	202,81	0,43	0,72	0,59
20	19	0.00 - 80.01	16,9	252,43	1,32	0,98	201,06	0,43	0,79	0,59
21	20	0.00 - 80.03	18,55	261,92	1,2	0,94	62,54	0,43	0,9	0,61
22	21	0.00 - 80.01	20,89	292,51	1,06	0,84	67,62	0,5	0,83	0,62
23	22	0.00 - 80.00	21,17	302,6	1,05	0,82	62,48	0,47	0,9	0,57
24										

When you adjust the deceleration / MFDD values in the example test you will also see results from tests with less aggressive braking:

	A	B	C	D	E	F	G	H	I	J	K
1		Speed [km/h]	Time total [s]	Dist. total [m]	Acc dt tot [m/s²]	Acc ds tot [m/s²]	MFDD [m/s²]	Course avg	SpAccu min	SpAccu max	SpAccu avg
2	1	60.00 - 0.00	8,52	57,21	-1,96	-2,43	-2,2	119,99	0,43	0,72	0,58
3	2	60.00 - 0.00	8,7	55,87	-1,92	-2,49	-2,24	127,29	0,47	0,68	0,58
4	3	60.00 - 0.00	9,1	64,92	-1,83	-2,14	-1,89	112,36	0,47	0,72	0,59
5	4	60.00 - 0.00	8,03	51,59	-2,08	-2,69	-2,48	135,45	0,5	0,79	0,61
6	5	60.00 - 0.00	8,21	54,07	-2,03	-2,57	-2,32	128,72	0,4	0,86	0,59
7	6	60.00 - 0.00	8,61	55,7	-1,94	-2,49	-2,49	135,03	0,43	0,76	0,6
8	7	60.00 - 0.00	7,63	53,79	-2,18	-2,58	-2,48	160,93	0,47	0,68	0,58
9	8	60.00 - 0.00	3,45	30,97	-4,83	-4,48	-4,68	206,94	0,58	0,65	0,59
10	9	60.00 - -0.10	4,5	54,93	-3,71	-2,53	-7,43	25,55	0,54	0,61	0,58
11	10	60.00 - -0.10	4,12	49,96	-4,05	-2,78	-7,82	25,6	0,58	0,79	0,64
12	11	60.00 - -0.05	4,11	50,04	-4,06	-2,78	-8,16	25,51	0,5	0,65	0,56
13	12	60.00 - -0.09	4,85	62,03	-3,44	-2,24	-8,36	206,24	0,43	0,58	0,54
14	13	60.00 - 0.00	4,61	56,84	-3,62	-2,44	-7,74	207,05	0,68	0,86	0,75
15	14	60.00 - 0.00	4,48	54,17	-3,72	-2,56	-7,75	25,45	0,54	0,76	0,64
16	15	60.00 - 0.00	2,38	20,17	-7	-6,89	-7,06	23,78	0,5	0,58	0,55
17	16	60.00 - 0.00	2,02	16,72	-8,23	-8,31	-8,37	206,36	0,61	0,72	0,66
18	17	60.00 - -0.07	1,98	16,41	-8,43	-8,46	-8,42	25,37	0,54	0,65	0,61
19	18	60.00 - -0.04	2,04	16,93	-8,16	-8,2	-8,1	205,54	0,61	0,68	0,67
20	19	60.00 - 0.00	2,02	16,76	-8,23	-8,29	-8,42	24,62	0,54	0,94	0,64

Please refer to chapter *- 4 - Software Configuration –* how to setup and run test with the DTS Tool.