Measurement report R39 Tests for OVR
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Content

Test equipment

GPS17, VBOX VIDEO
Using a small display, it can be verified that the odometer is correctly visible

Figure 1: VIDEO VBOX and camera filming the odometer

Alternative test procedures

During the test campaign alternative test procedures have been considered. Based upon the equipment used for these tests.

Test procedure A:
Step 1: odometer jumps to the next integer [km].
Step 2: accelerate within 1 km to a constant speed between 50 and 100 km/h.
Step 3: when the odometer jumps to the next integer (x→y) a distance of 10 km is travelled (y+10 km).
Step 4: After reading y+10 km the vehicle can be brought to a stand still.
Step 5: Using the video footage and VBOX Testsuite, the data can be evaluated. Video is stopped when jumping from (x→y and y+10 km). Between the 10 km jumps at speeds between 50 and 100 km/h the distances are evaluated.

Test procedure B:
As A, but with variable speed between y and y+10 km.

Test procedure C:
(no video camera needed, from stand still, speed at choice of test engineer (<100 km/h))
Step 1: odometer to jump to next integer [km].
Step 2: drive towards the next integer and at the time of the jump from x→y (while driving) stop immediately.
Step 3: start measurement, setpoint 0.
Step 4: Start driving and drive at any speed up to 100 km/h.
Step 5: keep an eye on the odometer and drive slowly before the odometer jumps to y+10 km. At the time of jumping to y+10 km manually activate a trigger, which will create a marker in the measurement data (or choose another way to stop the measurement of the distance). Then stop the vehicle.
Step 6: the real distance travelled can be evaluated up to the y+10 km marker (or when measured without the marker, read directly from the display). This way there is no need to have video footage of the test.

At test procedures A and B video footage is needed while at a test speed between 50 – 100 km/h the exact moment of the jump cannot be determined precisely, not even when using a manual trigger. This is due to an inconsistent human reaction time; in this time frame, x meters is travelled. This is why, at the time of the jump in method C, it was decided to drive slowly.

At test procedures A and B it is important for the video time stamp, to run synchronously with the GPS equipment measuring the distance (with our GPS17 this is automatically the case). If a camera is used that is not connected to the GPS equipment, it would be better to use a camera that records both the odometer display and the GPS unit display. GPS17 is not provided with an external display.

See recommendations for other possible measurement procedures.

Test results per vehicle

Test vehicle # 1: SEAT Toledo

Test procedure A.
Driven at a constant GPS speed of 72 km/h between y and y+10 km.
Odometer jumps at UTC 7:54:21 from x to y
Odometer jumps at UTC 8:02:54 to y+10 km
Travelled distance is 10221.7 m (see table below)

$$\text{Accuracy: } \frac{10000 - 10221{,}7}{10221{,}7} * 100 = -2{,}2\ \%$$

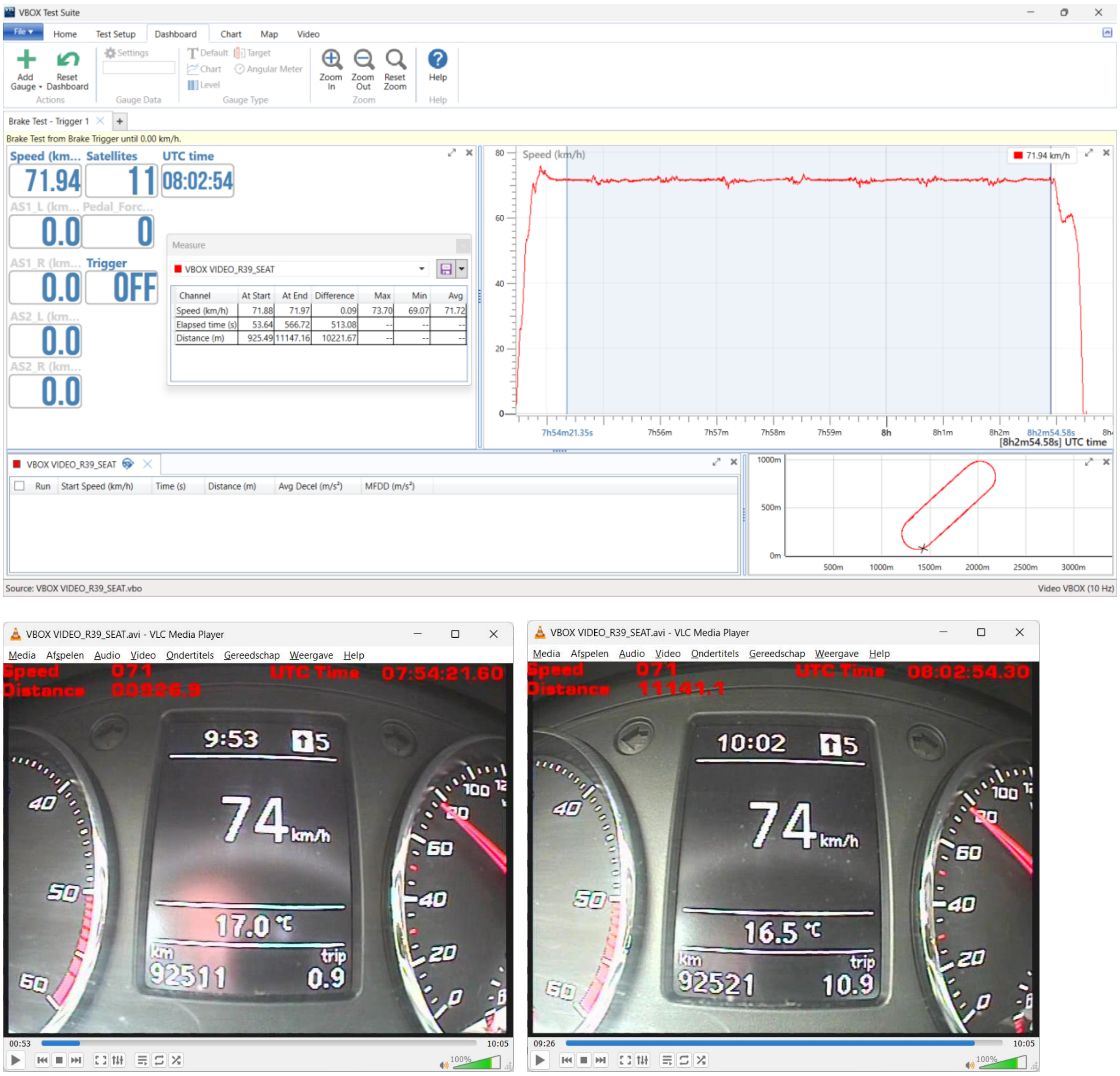


Figure 2: VBOX VIDEO_R39_SEAT

N.B. the shown "distance" at the video in the end was not used for determination of the travelled distance. For this purpose, VBOX Testsuite has been used. There was a discrepancy; see under findings and recommendations.

Test vehicle #2: DAF CF (test 1)

Measurement procedure A.
Driven at a constant GPS speed of 65 km/h between y and y+10 km.
Odometer jumps at UTC 9:26:07 from x to y
Odometer jumps at UTC 9:35:42 to y+10 km
Travelled distance is 10358.7 m (see table below)

$$\text{Accuracy: } \frac{10000 - 10358{,}7}{10358{,}7} * 100 = -3{,}5\ \%$$

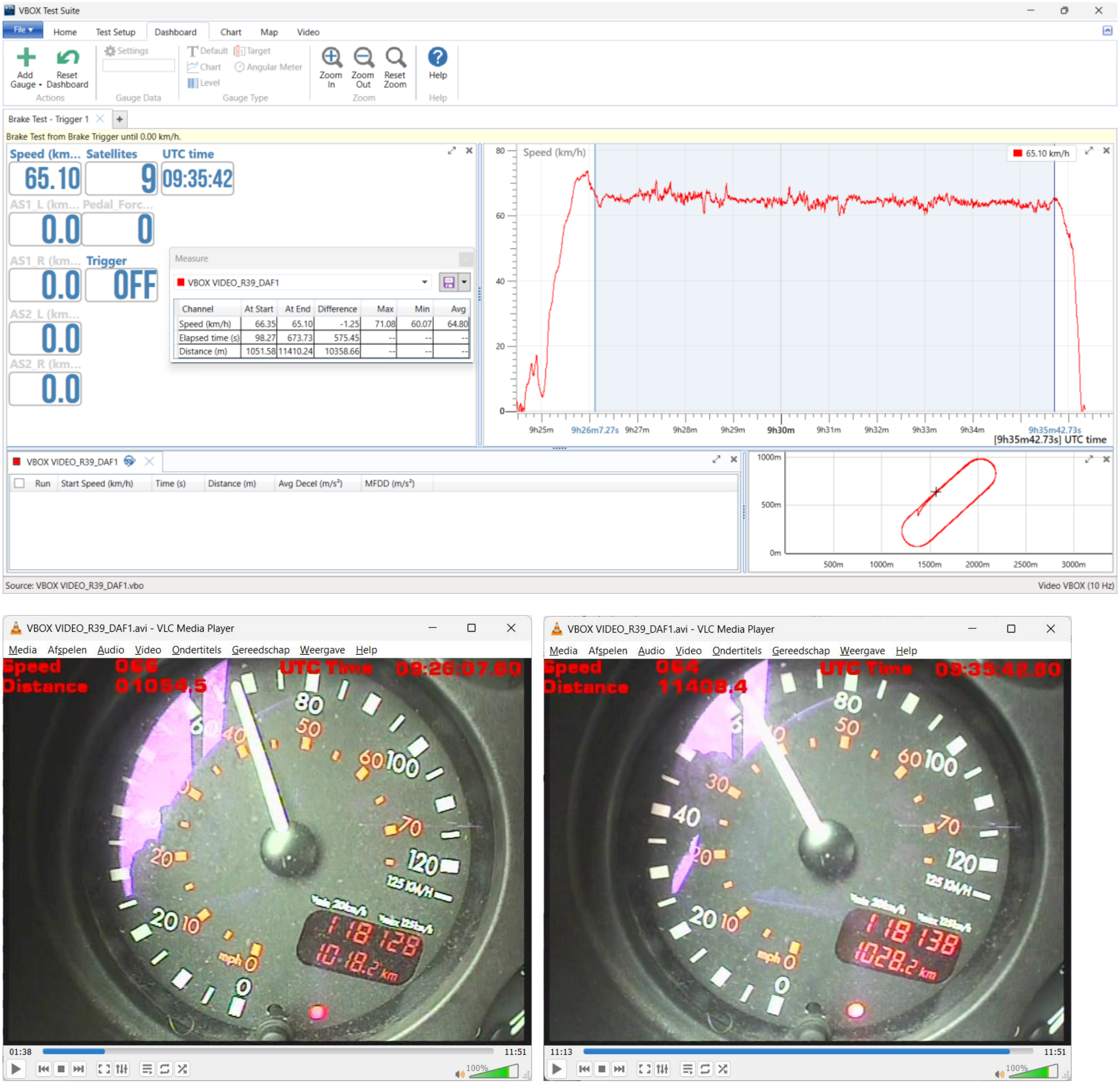
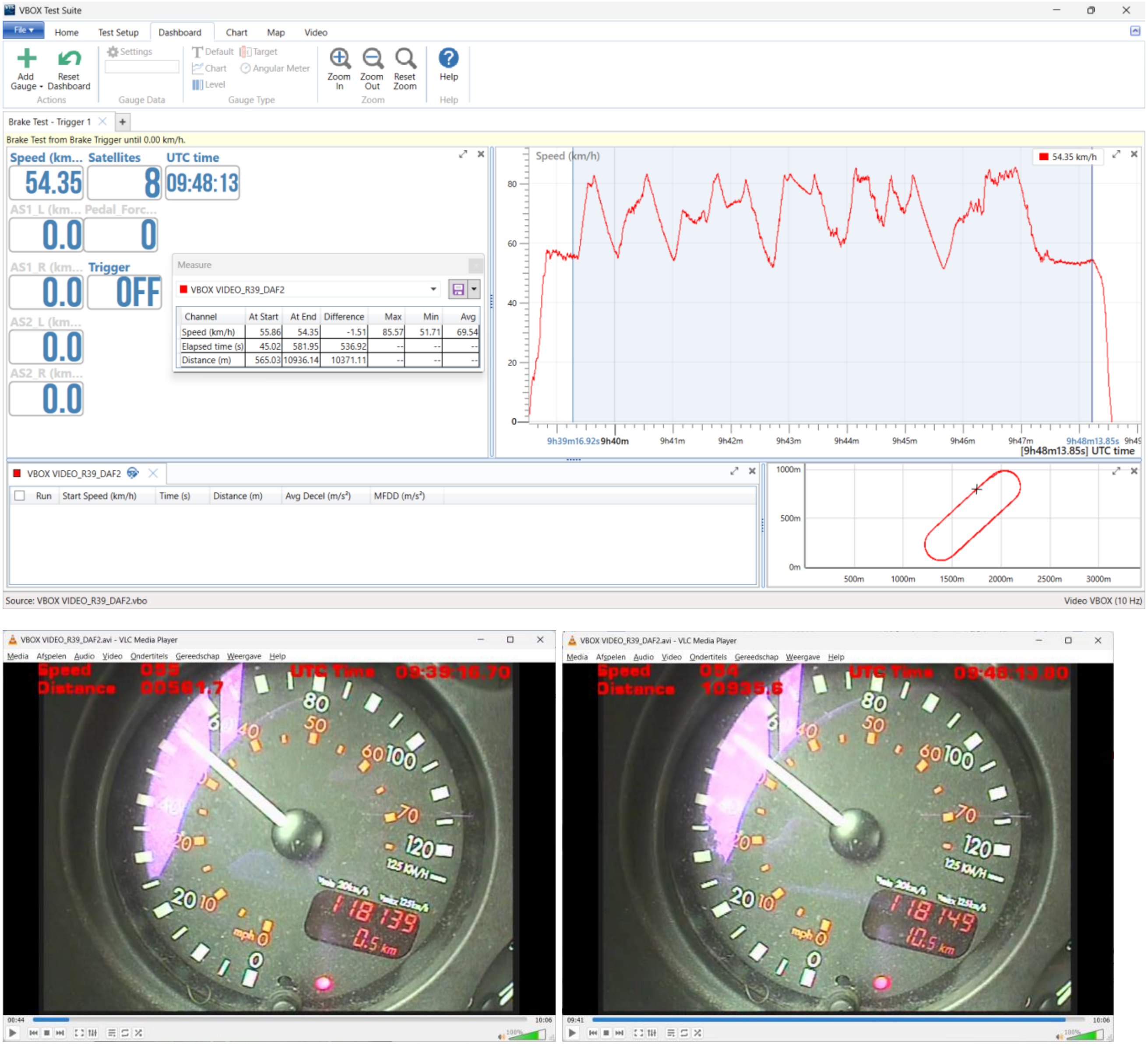


Figure 3: VBOX VIDEO_R39_DAF1

Test vehicle #2: DAF CF (test 2)

Measurement procedure B
Driven at a variable speed between 50 and 80 km/h between y and y+10 km.
Odometer jumps at UTC 09:39:16 from x to y
Odometer jumps at UTC 09:48:13 to y+10 km
Travelled distance is 10371,1 m (see table below)

$$\text{Accuracy: } \frac{10000 - 10371{,}1}{10371{,}1} \ast 100 = -3{,}6\ \%$$



Figur 4: VBOX VIDEO_R39_DAF2

Test vehicle #2: DAF CF (test 3)

Measurement procedure C
Odometer jumps at UTC 09:56:03 from x to y
Odometer jumps at UTC 10:06:29 to y+10 km
Travelled distance is 10374,5 m (see table below)

$$\text{Accuracy: } \frac{10000 - 10374{,}5}{10374{,}5} \cdot 100 = -3{,}6\ \%$$

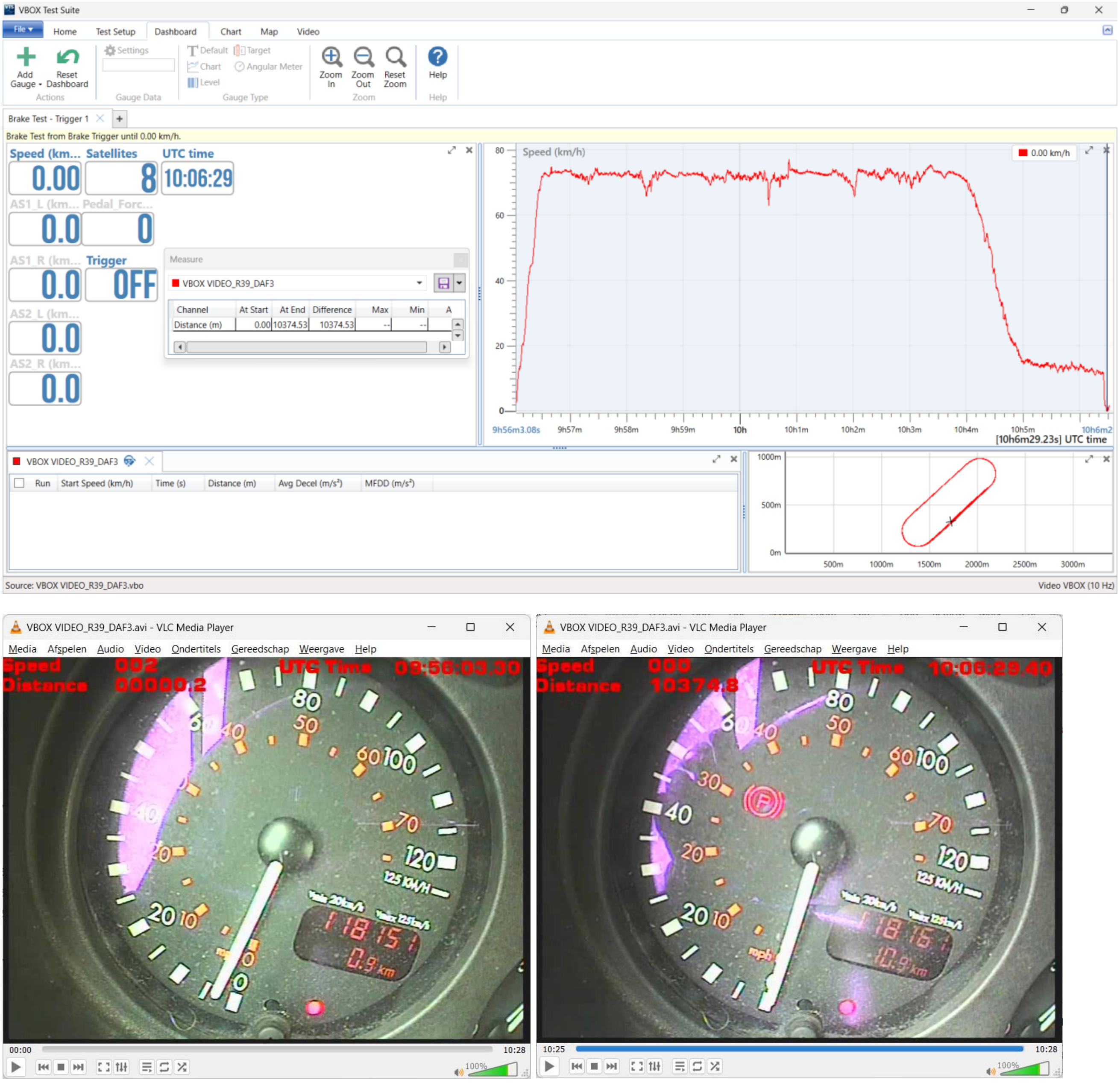


Figure 5: VBOX VIDEO_R39_DAF3

N.B. video footage has been added but is actually not needed for measurement procedure C.

Test vehicle #3: SUZUKI motorcycle

Measurement procedure A
Driven at a constant GPS speed between 65 km/h tussen y en y+10 km.
Odometer jumps at UTC 13:12:35 from x to y
Odometer jumps at UTC 13:21:41 to y+10 km
Travelled distance is 10006,6 m (see table below)

$$\text{Accuracy: } \frac{10000 - 10006{,}6}{10006{,}6} *100 = -0{,}1\ \%$$

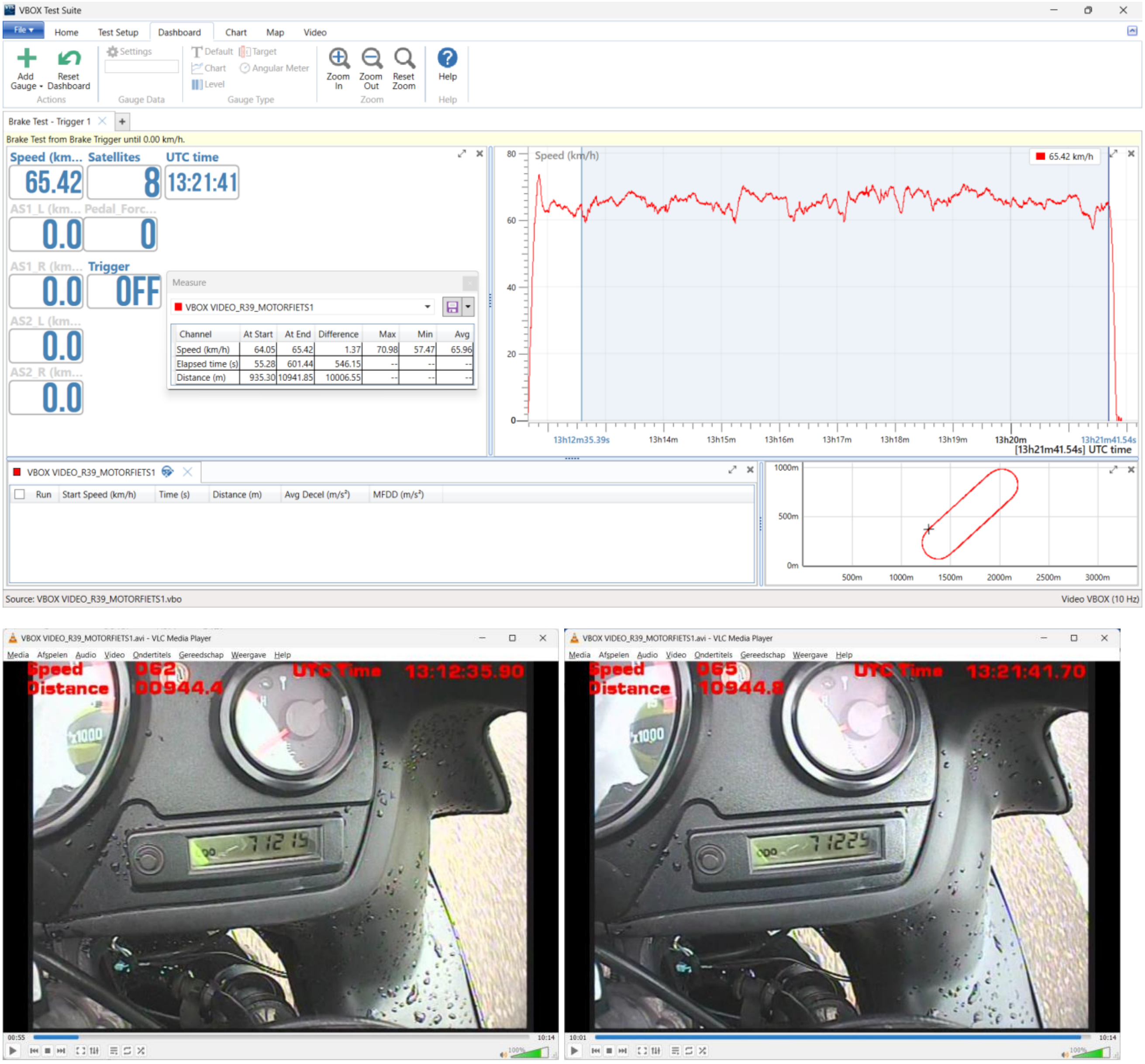


Figure 6: VBOX VIDEO_R39_MOTORFIETS1

Findings

- The 3 different measurement procedures used for the DAF only marginally effected the test results.
- Speed between 50 and 100 km/h is not strictly needed. To travel 10 km, you would like to reach a certain speed (depending on the test track, etc.)
- Due to the current wording of par. 1.7 it is not possible not to use video footage and to evaluate afterwards. (the procedure is understood such, that when jumping from x to y consequently to y+10 km you have to drive at a speed between 50 and 100 km/h.)
- Measuring from stand still to (almost) stand still (see measurement procedure C) is possible as well. Less test equipment is needed
- Be aware of the amount of sunlight at the dashpanel/odometer display; this could result in a badly visible odometer at the camera view
- When the camera needs to view both the odometer display and the measurement display, this can be challenging due to a need for solid mounting of the equipment
- When using a camera, to stop the camera view shall be possible at the same sampling rate as the of the GPS equipment. This way, the evaluation of the video footage and GPS data can be done at the exact same time stamp. With the testing performed, the video could not be uploaded to VBOX Testsuite, resulting in a slightly less exact determination of the distance travelled. (this explains a slight difference in the travelled distance between VBOX Testsuite and “distance” at the video footage.
- When a suitable procedure is determined (in agreement with the Technical Service and Type Approval Authority), the measurements can be taken quick and easy. Without using a camera and evaluation afterwards, it is the easiest way.

Recommendations

- In case par. 1.7 was wrongly interpreted by us (see remark) then it could be useful to reword par. 1.7 slightly so it is less sensitive to different interpretations.
- When using a video camera, state the minimum required FPS. (24 FPS is common and works well).
- See also document GRSG-127-12r1e_OPM GDK for further remarks.

Possible continuation of the test programme with different equipment:

- Testing using VBOX VIDEO while having the possibility to upload video to VBOX Testsuite (see findings above)
- Testing using a separate camera and external GPS display. Filming odometer and measurement display simultaneously. In the end, only the video footage needs tob e evaluated (Test procedure D)
- Test without camera and external GPS display from stand still to almost stand still while jumping at y+10 km. Create a possibility to stop recording the distance travelled at any time. (Test procedure E)
- Possible requests can be discussed with OVR. Several colleagues at the RDW Proving Ground gathered experience with these methods.