TEST REPORT

Title 47-Telecommunication

Chapter I - Federal Communications Commission
Subchapter A - General
Part 15 - Radio Frequency Devices
Subpart B - Unintentional Radiators

Report Reference No. .....:	342304TRFFCC
Tested by (name, function and signature).....:	Bazzi Luca (project handler)
Approved by (name, function and signature).....:	P. Barbieri (verifier)
Date of issue.....:	2018-02-07
Testing Laboratory .....:	**Nemko Spa**
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy
Testing location	Nemko Spa
Address.....:	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy
Registration number:	682159
Applicant's name .....:	Displax S.A.
Address.....:	Rua Soldado Manuel Pinheiro Magalhaes nbr 68 Braga 4710-167 - Portugal
Test specification:	
Standard .....:	FCC CFR 47 Part 15 Subpart B
	§15.107 – Conducted limits ☒
	§15.109 – Radiated emission limits ☒
Test procedure.....:	Nemko WM L0077, WM L0177 and WM L1002
Test Report Form No. .....:	FCCTRF
TRF Originator .....:	Nemko Spa
Master TRF.....:	2014-03

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Test item description ..... :	Touch Screen
Trade Mark .....:	Displax
Manufacturer.....:	Displax S.A.
Address of manufacturer .....:	Rua Soldado Manuel Pinheiro Magalhaes nbr 68 Braga 4710-167 - Portugal
Model .....:	Skin Fit
Ratings.....:	5 Vdc (by USB)

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The test report merely corresponds to the tested sample.
The phase of sampling / collection of equipment under test is carried out by the customer.

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Test Report No. : 342304TRFFCC	2018-02-09 Date of issue

Short description of the EuT	Copy of marking plate
EUT is a touch screen composed of a multi-touch foil controlled by appropriate module powered via USB cable, coming from the PC. FCC ID: 2AOJT-SKINFIT	DISPLAX

Number of tested samples:	1
Serial number:	042010000146
Internal operating frequency:	Clock: <1.6 GHz
Class:	B
Device type:	Rack Mounting
Accessories and detachable parts included:	The E.U.T. is composed by two unit
Other options included:	None
Testing	
Date of receipt of test sample:	2017/11/16
Testing commenced on:	2018/01/18
Testing concluded on:	2018/02/09
Possible test case verdicts:	
test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)

Symbols used in this test report

☒ The crossed square indicates that the listed condition or equipment is applicable for this report.

☐ The empty square indicates that the listed condition or equipment is not applicable for this report.

The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.

Verdict according to the standards listed at page 5:	**Pass**

PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
342304TRFFCC	First release	2018/02/09
REMARKS		

PRODUCT VARIANTS		
Variant model	**Difference against the main model**	**Additional test performed**
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REMARKS		

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1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

FCC CFR 47 Part 15 Subpart B
Code of Federal Regulations – Title 47 – Part 15 Radio Frequency Devices – Subpart B Unintentional radiation

The main standard above contains references to other standards, which are listed below.

ANSI C63.4 (2014)
'Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz''

2 SUMMARY OF TEST RESULTS

FCC Part 15 Subpart B requirements			
Part	Test description	Frequency range	Verdict
§15.107	Conducted emission	150 kHz to 30 MHz	P
§15.109	Radiated emission	30 MHz to 8000 MHz	P
GENERAL REMARKS			

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage:	☐	230V/50 Hz / 1ϕ	☐	115V/60Hz / 1ϕ
	☐	400V/50 Hz 3PE	☐	400V/50 Hz 3NPE
	☒	5 VDC (by USB cable from PC)	☐	24 VDC

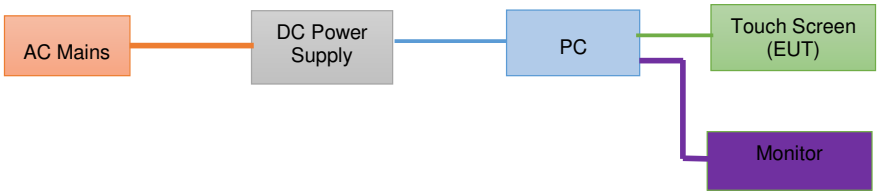
3.2 EuT operation modes

Mode	Description
1	ON mode with data connectivity active, PC sending and receiving data to/from the touch controller

3.3 EuT configuration modes

The EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

Mode	Description
1	5 Vdc powered by USB cable from PC kit (Intel NUC)



3.4 Input/Output Ports

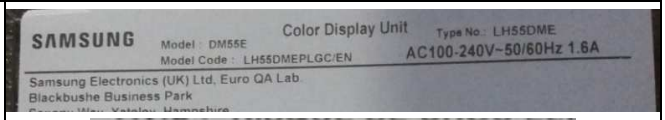
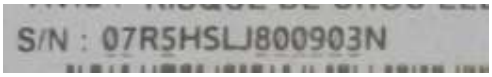
Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
0	Enclosure	N/E	—	—	—
1	Mains	DC	☐	☐	Imposed by USB
2	USB	I/O	☐	☐	Signal & power

*Note:

AC = AC Power Port DC = DC Power Port N/E = Non-Electrical

I/O = Signal/Control Input or Output Port TP = Telecommunication Ports

3.5 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
AE	PC kit	Intel	NUC7i5BNK	FCC Authorized (DoC)
AE	Monitor	Samsung	DM55E	  FCC Authorized (Verified)

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) - Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized by Nemko Spa testing engineer(s).

4.2 Environmental conditions

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Ambient temperature: 18÷33 °C

Relative Humidity: 30÷60 %

Atmospheric pressure: 980÷1060 hPa

4.3 Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model	Serial N°
Thermohygrometer data loggers	Testo	175-H2	38203337/307
Barometer	MSR	MSR145B	330080

4.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements" and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

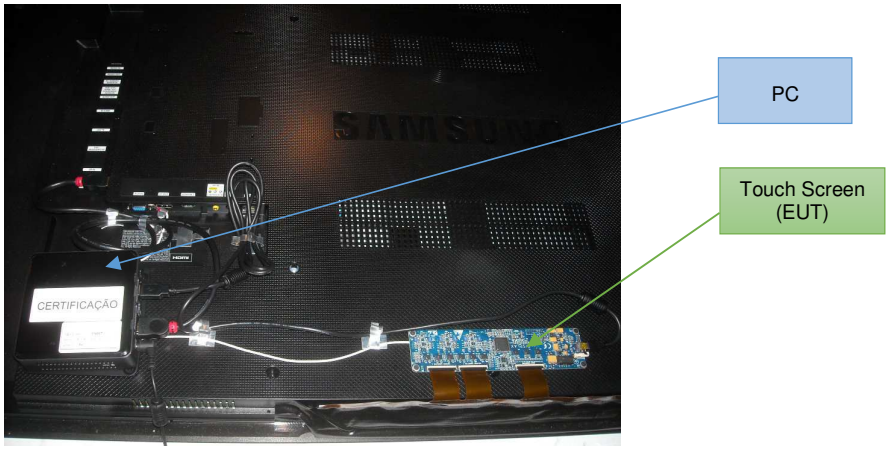
Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 3m, 10m Chamber	Antenna distance 1m, 3m, 10m (30÷200) MHz	5.0 dB	(1)
	Antenna distance 1m, 3m, 10m (0.2÷6) GHz	5.2 dB	(1)
	Antenna distance 1m, 3m (6÷18) GHz	5.8 dB	(1)
	Antenna distance 1m, 3m (18÷40) GHz	7.2 dB	(1)
Conducted Disturbance	9 kHz ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	9 kHz ÷ 30 MHz with current probe	2.9 dB	(1)

NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %;

5 TEST CONDITIONS AND RESULTS

5.1 Clause 15.107 – Conducted limits

5.1.1 Photo documentation of the test set-up



5.1.2 Test method

Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Conducted voltage measurements on mains lines were made at the output of the LISN.

5.1.3 Limits for AC mains port

Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50µH/50ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56*	59 to 46*
0.50 to 5	56	46
5 to 30	60	50

*The limits decrease linearly with the logarithm of the frequency

For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.50	79	66
0.50 to 30	73	60

5.1.4 Test result

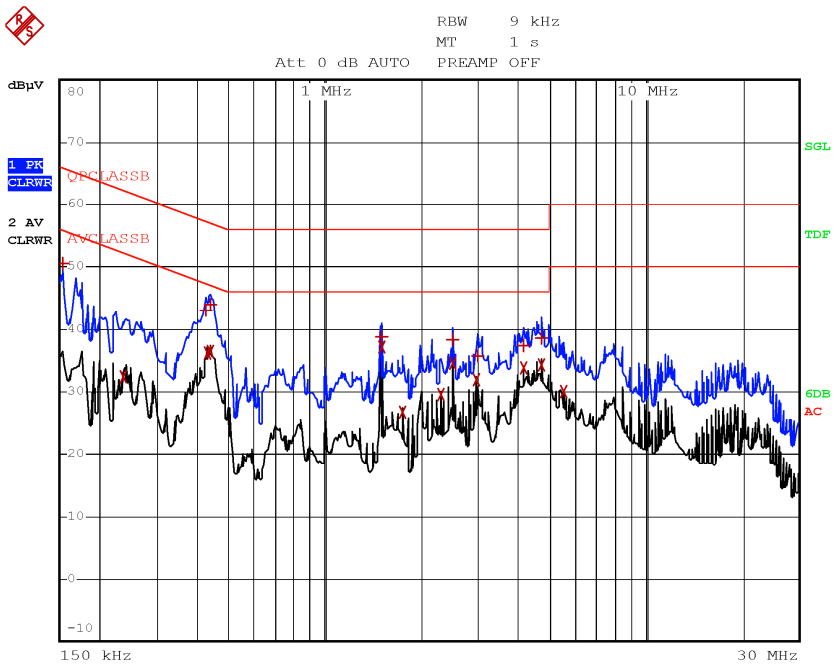
Verdict:	☒ P ☐ F ☐ N
Frequency range:	0.15MHz - 30MHz
Kind of test site:	Shielded room
Remarks:	

5.1.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°	Cal. Date	Due Date
EMI receiver 9 kHz ÷ 3 GHz	R&S	ESCI	100888	2017-09	2018-09
LISN 9 kHz ÷ 30 MHz	R&S	ESH2-Z5	872 460/041	2017-09	2018-09
Shielded room	Siemens	Conducted emission test room	1862	Not subject to calibration	Not subject to calibration

5.1.6 Test protocol

Test point: Phase line Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: -



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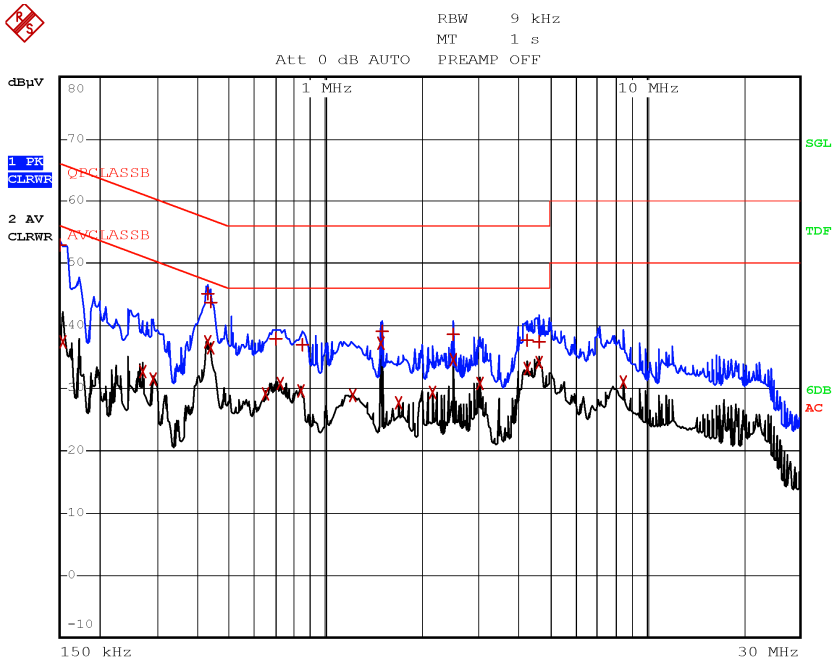
Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
1.5020	37.2	46.0	-8.8	Av
0.4380	36.5	47.1	-10.6	Av
0.4300	36.3	47.3	-11.0	Av
2.5020	34.6	46.0	-11.4	Av
4.7260	34.3	46.0	-11.7	Av
4.1860	33.8	46.0	-12.2	Av
0.4380	44.1	57.1	-13.0	QP
2.9700	31.9	46.0	-14.1	Av
0.4220	43.1	57.4	-14.3	QP
0.1540	50.7	65.8	-15.1	QP
2.2940	29.7	46.0	-16.3	Av
1.5020	38.9	56.0	-17.1	QP
4.7260	38.7	56.0	-17.3	QP
2.4980	38.3	56.0	-17.7	QP
4.1860	37.4	56.0	-18.6	QP
1.7540	26.8	46.0	-19.2	Av
0.2380	32.5	52.2	-19.7	Av
5.5340	30.2	50.0	-19.8	Av
3.0020	35.9	56.0	-20.1	QP

Test point: Neutral line Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: -



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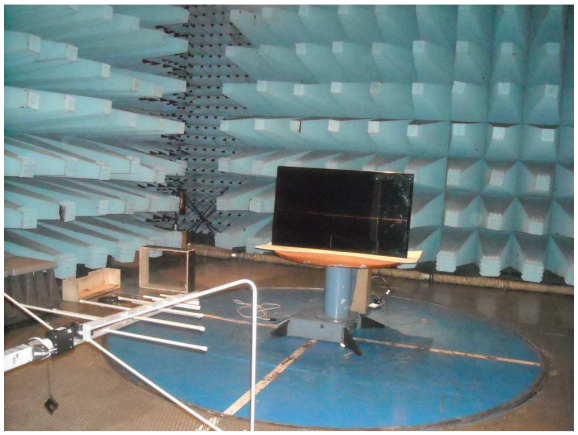
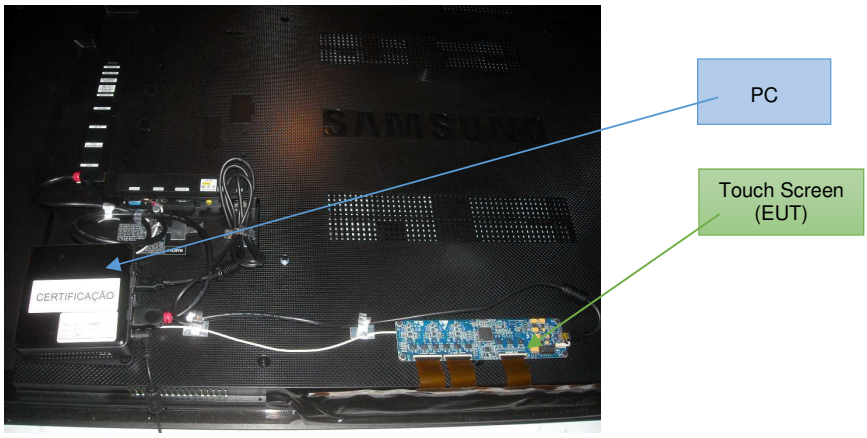
Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.1500	53.1	66.0	-12.9	QP
0.1540	37.5	55.8	-18.3	Av
0.2700	32.7	51.1	-18.4	Av
0.2900	31.6	50.6	-19.0	Av
0.4300	45.1	57.2	-12.1	QP
0.4300	37.4	47.3	-9.9	Av
0.4380	43.8	57.1	-13.3	QP
0.4380	36.4	47.1	-10.7	Av
0.6500	29.2	46.0	-16.8	Av
0.6980	37.9	56.0	-18.1	QP
0.7260	30.9	46.0	-15.1	Av
0.8380	29.6	46.0	-16.4	Av
0.8500	37.0	56.0	-19.0	QP
1.2180	28.8	46.0	-17.2	Av
1.4980	37.1	46.0	-8.9	Av
1.5020	39.1	56.0	-16.9	QP
1.6860	27.8	46.0	-18.2	Av
2.1580	29.5	46.0	-16.5	Av
2.4980	38.5	56.0	-17.5	QP
2.5020	34.6	46.0	-11.4	Av
3.0380	30.8	46.0	-15.2	Av
4.2540	37.7	56.0	-18.3	QP
4.2540	33.3	46.0	-12.7	Av
4.6540	37.3	56.0	-18.7	QP
4.6580	34.2	46.0	-11.8	Av
8.5020	31.1	50.0	-18.9	Av

5.2 Clause 15.109 – Radiated emissions limit

5.2.1 Photo documentation of the test set-up





5.2.2 Test method

Measurements were made on a semi anechoic chamber. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 or 10 meters with the receive antenna located at a fixed height (from 1 to 4 meter) in both horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

5.2.3 Limits for enclosure

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of emission (MHz)	Field strength (µV/m)	Field strength (dBµV/m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0

The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of emission (MHz)	Field strength (µV/m)	Field strength (dBµV/m)
30–88	90	39.0
88–216	150	43.5
216–960	210	46.4
Above 960	300	49.5

5.2.4 Test result

Verdict:	☒ P ☐ F ☐ N
Frequency range:	30MHz - 8000MHz (clock <1.6 GHz)
Kind of test site:	Semi anechoic chamber
Measurement distance:	3 m

Remarks: for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

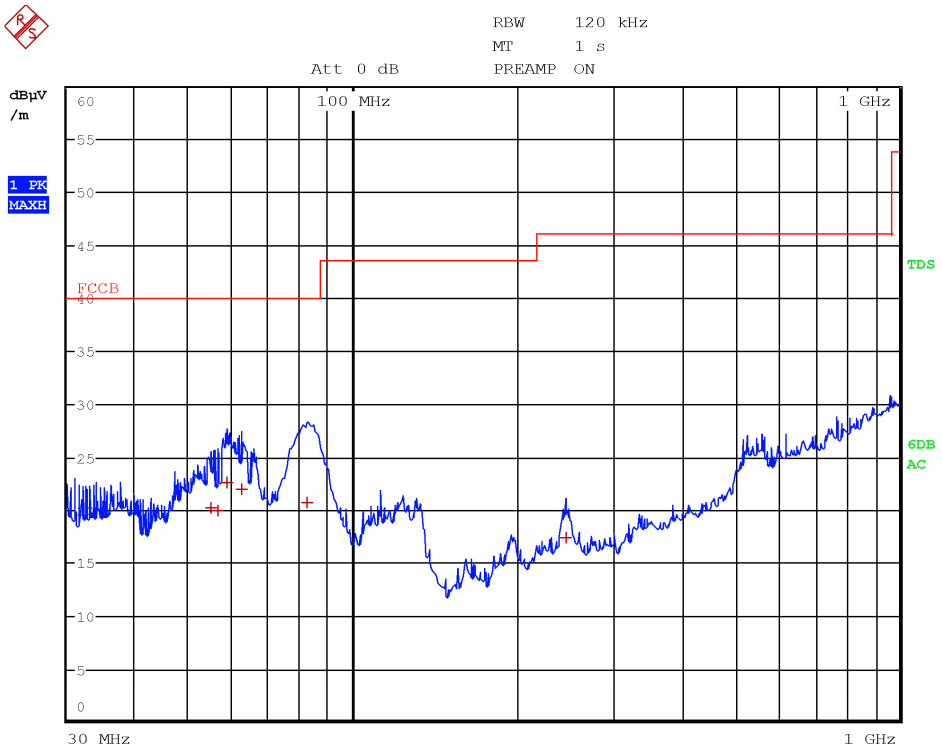
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

5.2.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°	Cal Date	Cal Date
Trilog Broadband Antenna 25 ÷ 8000 MHz	Schwarzbeck	VULB 9162	9162-025	2015-07	2018-07
Bilog antenna 1 ÷ 18 GHz	Schwarzbeck	STLP 9148-123	123	2015-06	2018-06
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	2017-12	2018-12
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202	2018-01	2019-01
Turn-table	R&S	HCT	835 803/03	Not subject to calibration	Not subject to calibration
Antenna mast	R&S	HCM	836 529/05	Not subject to calibration	Not subject to calibration
Controller	R&S	HCC	836 620/7	Not subject to calibration	Not subject to calibration
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2016-10	2018-10
Shielded room	Siemens	10m control room	1947	Not subject to calibration	Not subject to calibration

5.2.6 Test protocol

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: 30-1000 MHz



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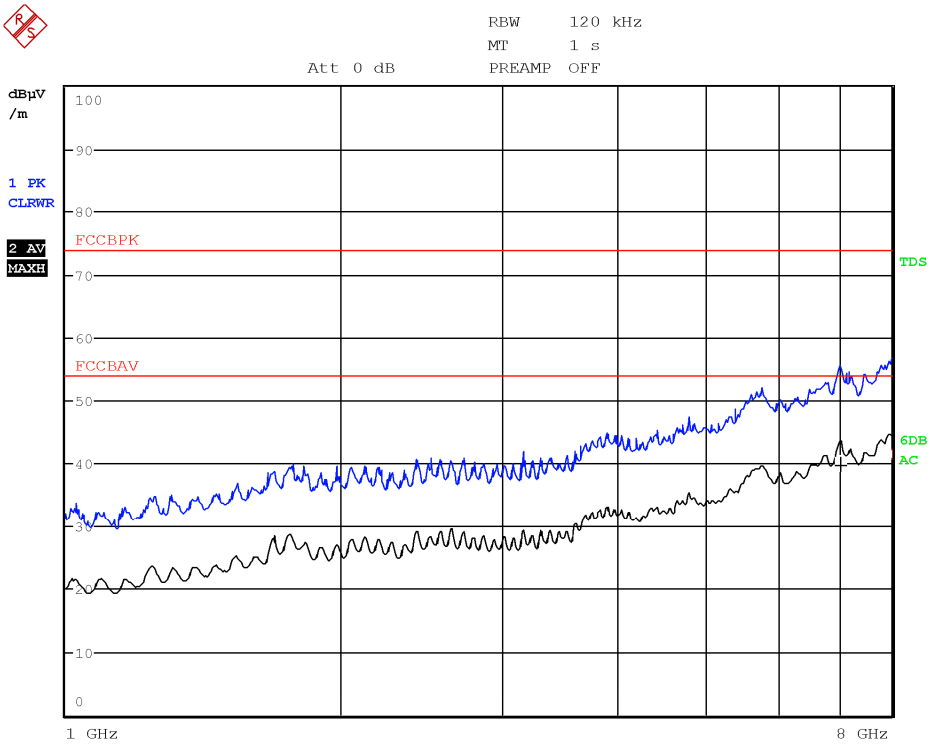
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
55.0000	20.3	40.0	-19.7	QP
56.5200	20.0	40.0	-20.0	QP
59.0000	22.7	40.0	-17.3	QP
62.4800	22.1	40.0	-17.9	QP
82.2400	20.7	40.0	-19.3	QP
244.7600	17.4	46.0	-28.6	QP

Antenna polarization: Horizontal Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: 1-8 GHz



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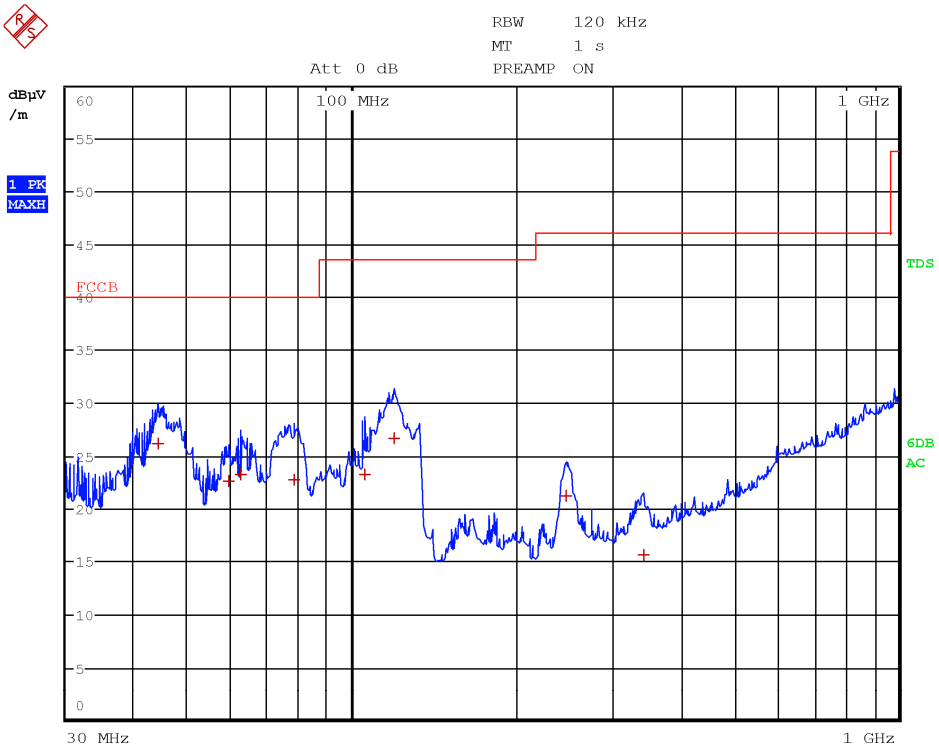
Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: 30-1000 MHz



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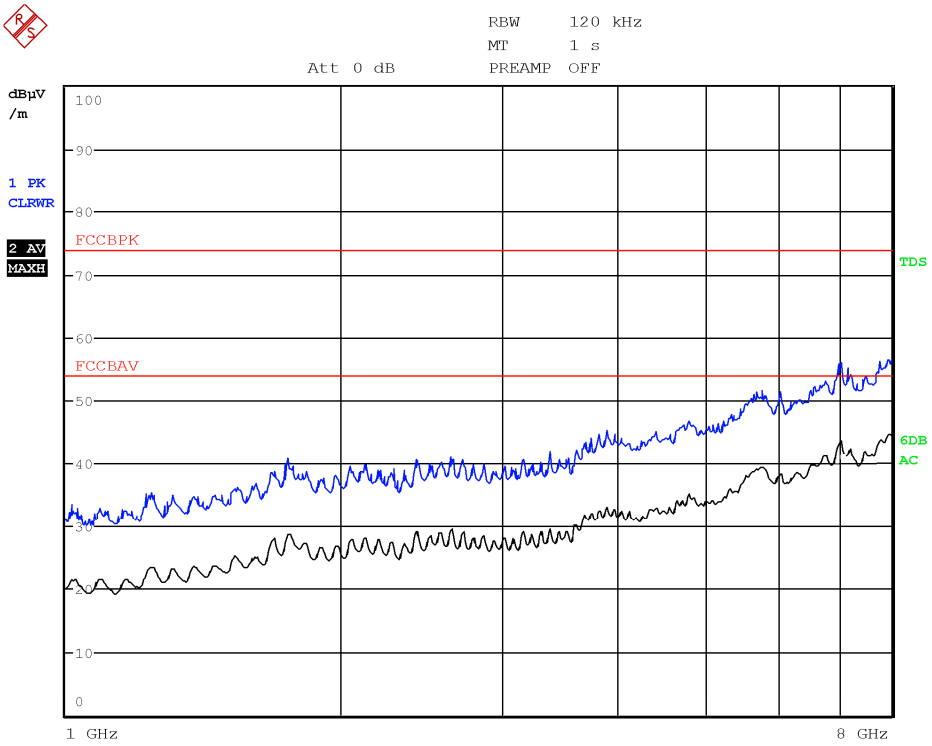
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
44.2800	26.2	40.0	-13.8	QP
59.4800	22.6	40.0	-17.4	QP
62.5200	23.3	40.0	-16.7	QP
78.2400	22.8	40.0	-17.2	QP
105.5200	23.3	43.5	-20.2	QP
119.5600	26.7	43.5	-16.8	QP
246.7600	21.3	46.0	-24.7	QP
341.8000	15.6	46.0	-30.4	QP

Antenna polarization: Vertical Verdict: Pass
Operation mode: 1
Configuration mode: 1
Remarks: 1-8 GHz



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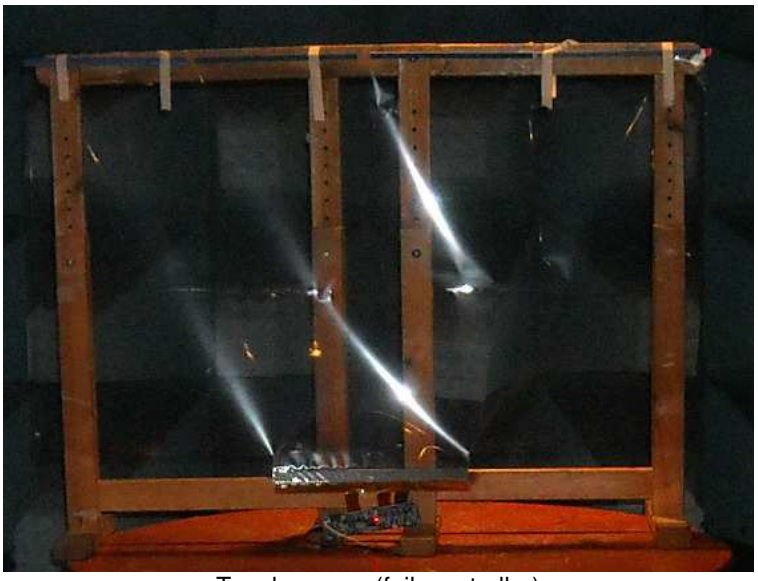
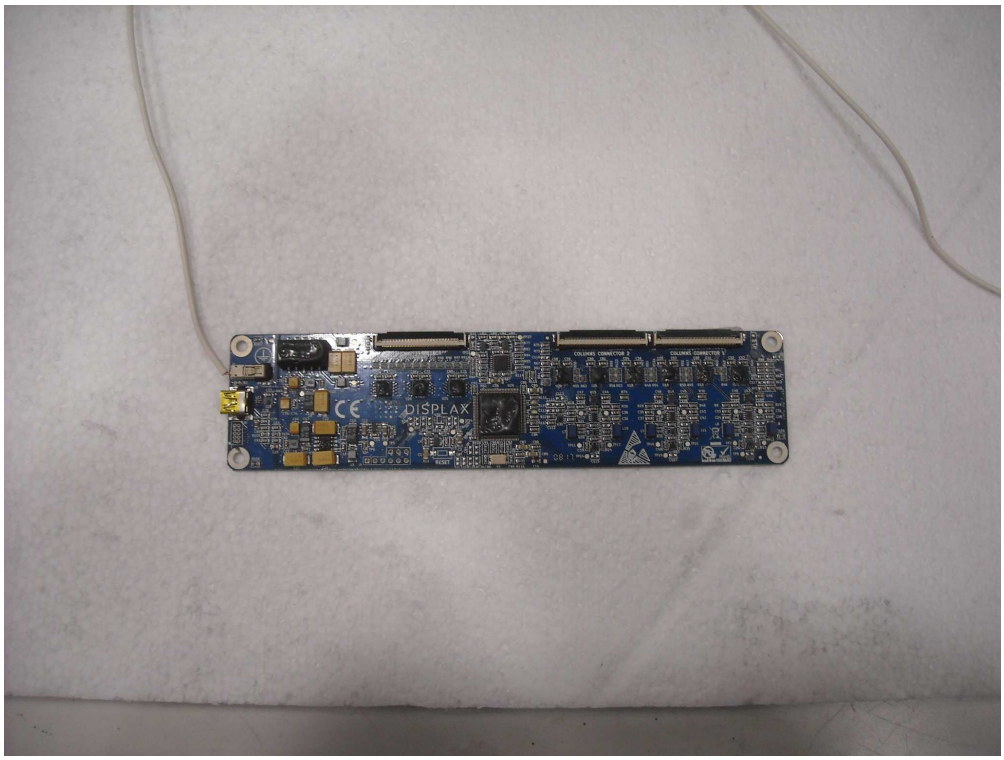
6 EUT PHOTOS



Touch screen (foil+controller)



Touch screen controller

Touch screen controller unit (rear)

Touch screen foil (connector)

PC, connecting to monitor and touch screen
The monitor was used to establish a data contact to/from the touch controller through the PC

End of report