EMC TEST REPORT

No. 1910014STO-004, Ed. 1

Electromagnetic disturbances

EQUIPMENT UNDER TEST

Equipment:	Gateway
Type/Model:	TENA SmartCare (BLE version) Tork EasyCube (802.15.4 version)
Manufacturer:	Essity AB
Tested by request of:	Essity AB

SUMMARY

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the requirements according to the following standards:

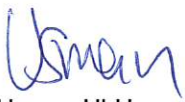
FCC 47 CFR Part 15: Radio frequency device, Subpart B: Unintentional radiators. Class B equipment.

ICES-003 Issue 6: Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement, Class B.

For details, see clause 2 – 4.

Date of issue: January 15, 2020

Tested by:



Usman Ul-Haq

Approved by:

Stefan Andersson

Revision History

Edition	Date	Description	Changes
1	January 15, 2020	First release	

CONTENTS

1. CLIENT INFORMATION

The EUT has been tested by request of

Company	Essity Hygiene and Health AB Mölndals bro 2, Mölndal SE-405 03 Göteborg Essity Hygiene and Health AB
Name of contact	Magnus Nordin

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment:	Gateway
Type/Model:	TENA SmartCare (BLE version) Tork EasyCube (802.15.4 version)
Brand name:	Essity Hygiene and Health AB
Serial number:	GW-REV-05-01
Manufacturer:	Essity Hygiene and Health AB
Rating	100 – 230 V, 50 – 60 Hz
Class	I
Highest clock frequency	2480 MHz (including radio transmit freq.)

Photo of EUT or/and rating plate

2.2 Additional information about the EUT

The EUT is a gateway for LTE,GSM,BLE and 802.15.4. The EUT was tested in a tabletop configuration.

The EUT was equipped with the following cables:

Port:	Type:	Length: [m]	Specifications:
AC Mains	AC Power	1 m	

2.1 Peripheral equipment

Peripheral equipment is equipment needed for correct operation of the EUT, but not included as part of the testing and evaluation of the EUT.

Equipment	Type / Model	Manufacturer	Serial no.
Transmitter		Essity	

2.2 Opinions and interpretations

The two versions (BLE and 802.15.4) have the exact same hardware and only software is changed.

3. TEST SPECIFICATIONS

3.1 Standards

Requirements:
FCC 47 CFR Part 15: Radio frequency device, Subpart B: Unintentional radiators.

ICES-003 Issue 6: Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement (2016).

Test methods:
ANSI C63.4: 2014: American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a FCC accredited conformity assessment body with designation number SE0002
Intertek Semko AB is an Industry Canada listed test facility with IC assigned code 2042G
Intertek Semko AB is an ISED recognized wireless testing laboratory with CAB identifier SE003

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORA HALLEN	Semi-anechoic 10 m and 3 m	2042G-2

3.4 Mode of operation during the test

The EUT was tested with 120 V, 60 Hz.
The EUT was tested normal mode of operation for conducted emission and receive mode for radiated emission. A transmitter was used to make sure the EUT was actively receiving data.

The EUT shall comply with the emission limits according to the standards as listed below

Conducted emission requirements:
The EUT shall meet the limits for the standards.
Reference: 47 CFR §15.107
ICES-003, section 6.1

Limits for conducted emission according to FCC and ICES-003

Class A

Frequency range [MHz]	Limits [dBµV]	
	Quasi-Peak	Average
0.15 – 0.50	79	66
0.50 – 30.0	73	60

Class B

Frequency range [MHz]	Limits [dBµV]	
	Quasi-Peak	Average
0.15 – 0.50	66 – 56	56 – 46
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Radiated Emission requirements:
The EUT shall meet the limits for the standards.
Reference: 47 CFR §15.109
ICES-003, section 6.2

Limits for radiated emission according to FCC and ICES-003

Class A

Frequency range [MHz]	Field strength at 10 m (dBµV/m)	Field strength at 3 m (dBµV/m)	Detector
30 – 88	39.1	49.6	Quasi Peak
88 – 216	43.5	54.0	Quasi Peak
216 – 960	46.4	56.9	Quasi Peak
960 – 1000	49.5	60.0	Quasi Peak
Above 1000	49.5 / 69.5	60.0 / 80.0	Average / Peak

The values for 3 m measuring distance are calculated by adding 10.5 dB to the 10 m limit.
(i.e. an extrapolation factor of 20 dB/decade according to §15.33(f)(1))

Class B

Frequency range [MHz]	Field strength at 3 m (dBµV/m)	Field strength at 10 m (dBµV/m)	Detector
30 – 88	40.0	29.5	Quasi Peak
88 – 216	43.5	33.0	Quasi Peak
216 – 960	46.0	35.5	Quasi Peak
960 – 1000	54.0	43.5	Quasi Peak
Above 1000	54.0 / 74.0	43.5 / 63.5	Average / Peak

The values for 10 m measuring distance are calculated by subtracting 10.5 dB from the 3 m limit.
(i.e. an extrapolation factor of 20 dB/decade according to §15.31(f)(1))

4. TEST SUMMARY

The results in this report apply only to sample tested:
Result: Pass – Fail – N/A= Not applicable

Standard	Description	Result
	Emission	
FCC Part 15 subpart B **ICES-003**	**Conducted continuous emission in the frequency range 0.150 – 30 MHz, AC Power input port** The EUT complies with the Class B limits. The margin to the limit was at least >10 dB See clause 5.4.	**PASS**
FCC Part 15 subpart B **ICES-003**	**Radiated emission of electromagnetic fields in the frequency range 30 – 1000 MHz** The EUT complies with the Class B limits. The margin to the limit was at least >10 dB See clause 6.5.	**PASS**
FCC Part 15 subpart B **ICES-003**	**Radiated emission of electromagnetic fields in the frequency range 1.0 – 13.0 GHz** The EUT complies with the Class B limits. The margin to the limit was at least > 10 dB See clause 6.6	**PASS**

5. CONDUCTED CONTINUOUS DISTURBANCES in the frequency-range 0.15 – 30 MHz

5.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
July 3, 2019	21 [°C]	30 [%]

5.2 Test setup and test procedure

The test method is in accordance with ANSI C63.4.

The EUT was connected to the power via Artificial Mains Networks AMN.
The EUT was placed on an insulating support 0.8 m above the floor, 0.4 m from the vertical reference ground plane (RGP) and 0.8 m from the AMN.
Overview sweeps were performed for each lead.
During the tests the EUT was operated according to the mode of operation mentioned in clause 3.4.

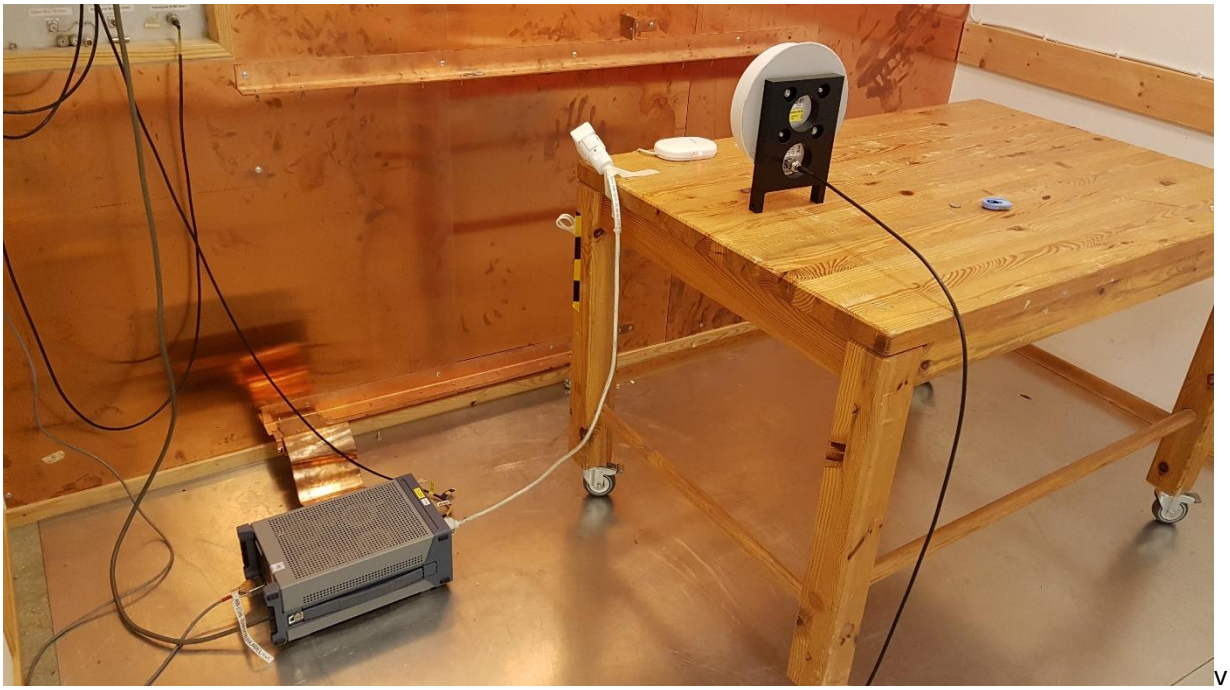


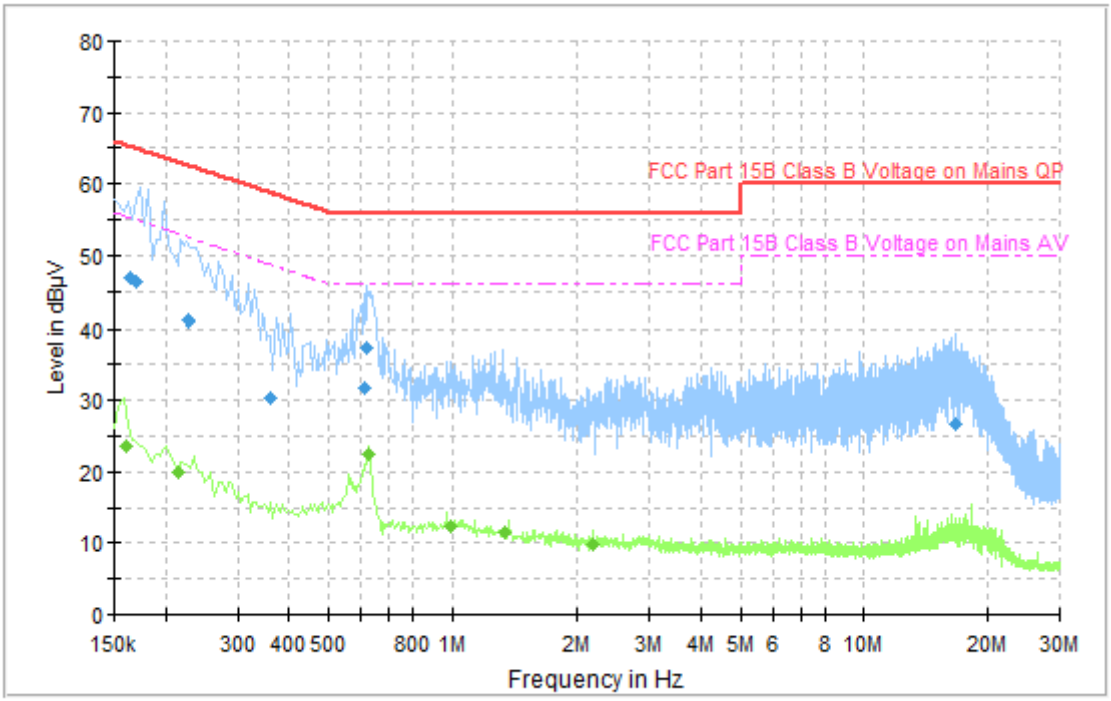
Photo of the test setup for conducted emission

5.3 Measurement uncertainty

Continuous conducted disturbances with AMN
in the frequency range 150 kHz to 30 MHz ± 3.3 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011.
The measurement uncertainty is given with a confidence of 95 %.

5.4 Test results, AC Power input port, Class B



Diagram, Peak and Average overview sweep

Measurement results, Quasi-peak, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0,163	45,64	65,31	L1	19,67
0,241	38,58	62,06	N	23,48
0,325	31,53	59,58	N	28,05
0,447	27,74	56,93	N	29,19
0,611	37,62	56	N	18,38
0,908	21,91	56	L1	34,09

Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV]	Limit [dBµV]	Line L/N	Margin [dB]
0,175	22,63	54,72	N	32,09
0,377	14,37	48,35	N	33,98
0,614	23,07	46	N	22,93
1,045	12,66	46	N	33,34
1,416	11,01	46	N	34,99
2,999	10,72	46	N	35,28

All other measured disturbances have a margin of more than 20 dB to the limits.
Result [dBµV] = Analyser reading [dBµV] + cable loss [dB] + LISN insertion loss [dB]

5.5 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 - V10.50.00	--	--	--
Receiver	Rohde & Schwarz	ESCI	12741	06-2019	1 year
AMN	Rohde & Schwarz	ESH3-Z5	32798	06-2019	1 year
Cable	Suhner	RG 223/U	9800	01-2019	1 year
Cable	Suhner	RG 223/U	9786	10-2018	1 year
Multimeter	Fluke	287	33690	08-2018	1 year
Thermo-&hygro-meter			244	08-2018	1 year
Radio communication tester	Rohde Schwarz	CMW500	32597	01-2017	2 year

6. RADIATED RF EMISSION IN THE FREQUENCY-RANGE 30 MHZ – 13 GHZ

6.1 Operating environment

Date of test:	Temperature:	Relative Humidity:
July 3, 2019	21 [°C]	19 [%]
July 4,2019	30 [°C]	40 [%]

6.2 Test setup and test procedure

The test method is in accordance with ANSI C63.4.
The EUT was set up according to the standard

The EUT was placed on an insulating support 0.8 m above the turntable which is part of the reference ground plane.
Overview sweeps were performed with the measurement receiver in max-hold mode and the peak detector activated in the frequency-range 30 – 1000 MHz
Above 1 GHz additionally the average detector was activated.
During height scan above 1 GHz the EUT was kept in antennas cone of radiation.

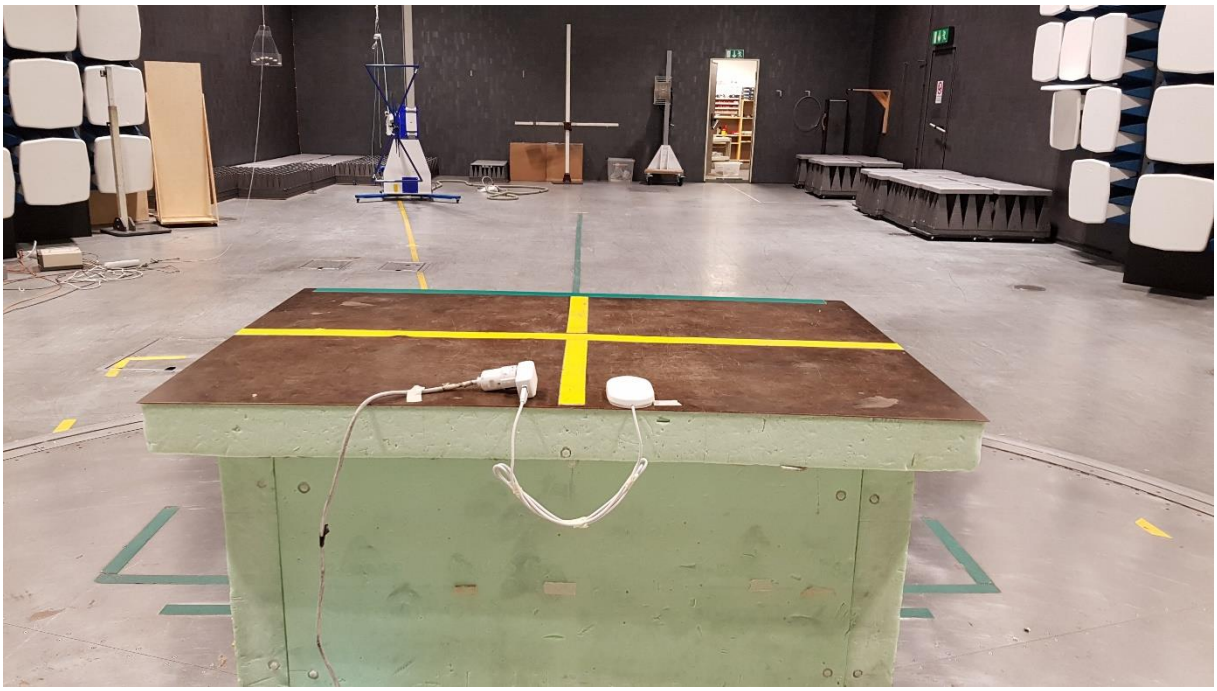


Photo of the test setup for radiated emission

6.3 Test conditions

Test setup:	**30 – 1000 MHz**		
Test receiver set-up:			
Preview test:	Peak,	RBW 120 kHz	VBW 1 MHz
Final test:	Quasi-Peak,	RBW 120 kHz	
Measuring distance:	10 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Bilog		

Test setup:	**1 – 13 GHz**		
Test receiver set-up:			
Preview test:	Peak,	RBW 1 MHz	VBW 3 MHz
Final test:	Average,	RBW 1 MHz	
	Peak,	RBW 1 MHz	
Measuring distance:	3 m		
Measuring angle:	0 – 359°		
Antenna			
Height above ground plane:	1 – 4 m		
Polarisation:	Vertical and Horizontal		
Type:	Horn		
Antenna tilt:	Activated		

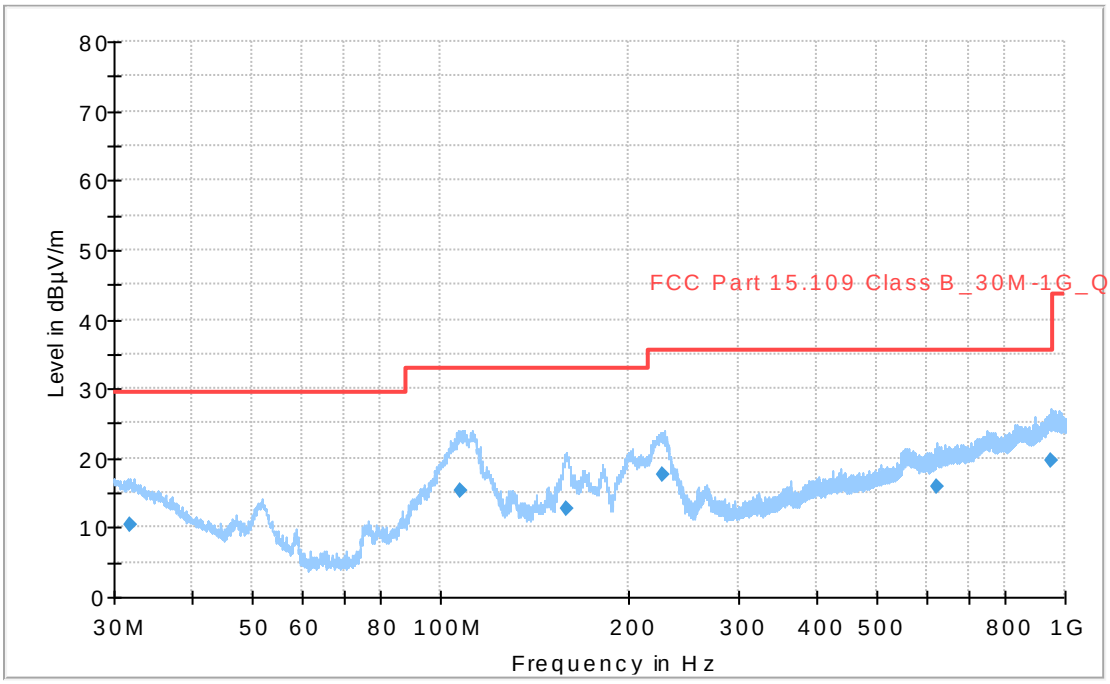
6.4 Measurement uncertainty

Measurement uncertainty for radiated disturbance

Uncertainty for the frequency range 30 to 1000 MHz at 10 m	± 5.0 dB
Uncertainty for the frequency range 1.0 to 18 GHz at 3 m	± 4.5 dB

Measurement uncertainty is calculated in accordance with CISPR 16-4-2:2011.
The measurement uncertainty is given with a confidence of 95 %.

6.5 Test results, 30 – 1000 MHz, Class B



Diagram, Peak overview sweep, 30 – 1000 MHz at 10 m distance.

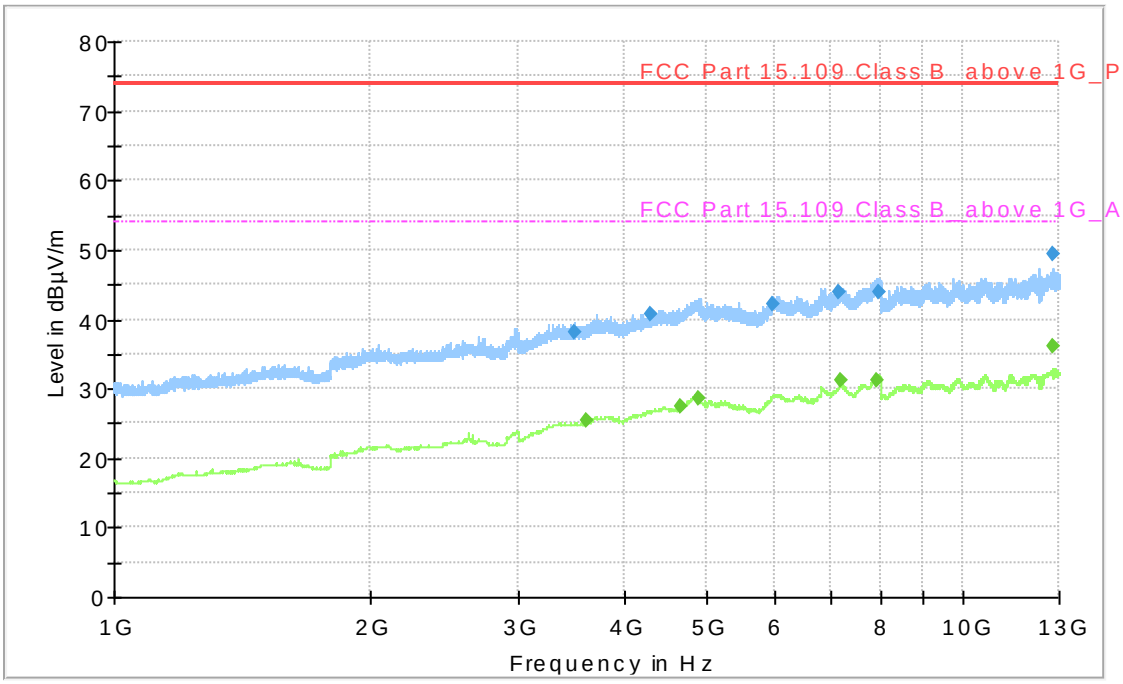
Measurement results, Quasi Peak, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
31.740	10.26	29.54	V	19.28
107.940	15.42	33.06	V	17.64
159.150	12.58	33.06	V	20.48
227.280	17.58	35.56	V	17.99
625.020	15.78	35.56	V	19.78
953.070	19.60	35.56	H	15.96

All other measured disturbances have a margin of more than 20 dB to the limits.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.6 Test results, 1 – 13 GHz, Class B



Diagram, Peak and average overview sweep, 1 – 13 GHz at 3 m distance.

Measurement results, Peak, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
3498.8	38.09	74.00	V	35.91
4291.3	40.68	74.00	V	33.32
5975.0	42.11	74.00	H	31.89
7151.5	43.85	74.00	H	30.15
7983.0	43.77	74.00	V	30.23
12779.3	49.31	74.00	H	24.69

Measurement results, Average, Class B

Frequency [MHz]	Result [dBµV/m]	Limit [dBµV/m]	Polarization H/V	Margin [dB]
3599.5	25.45	54.00	V	28.55
4649.3	27.33	54.00	V	26.67
4895.0	28.59	54.00	V	25.41
7196.5	31.27	54.00	V	22.73
7946.5	31.33	54.00	V	22.67
12785.0	36.22	54.00	V	17.78

All other measured disturbances have a margin of more than 20 dB to the limits.

Result [dBµV/m] = Analyser reading [dBµV] + Antenna factor [1/m] - Amplifier gain [dB] + Cable loss [dB]

6.7 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Last Cal. date	Cal. interval
Measurement software	Rohde & Schwarz	EMC32 V10.50.00	--	--	--
Test Receiver	Rohde & Schwarz	ESW 44	33890	06-2019	1 year
Measurement cable	Rosenberger	LA5-S003-10000	39163	04-2019	1 year
Measurement calbe	Huber+Suhne	Sucoflex 106	39122	03-2019	1 year
Horn antenna	Rohde & Schwarz	HF907	31245	12-2016	3 years
Pre amplifier	Sangus	00101400-23-10P -6-S ; AFS44-12002400-32-10P -44	7292	03-2019	1 year
Biconical antenna	Chase	CBL6110A	971	09-2017	3 year
Hygro- & thermometer	Vaisala	HMI 41	7503	08-2018	1 year