

Test Report

Customer:

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RF test report

150866-AU01+W02

Amendment to RF-Report 150253-AU01+W02



Industry
Canada

Industrie
Canada

Hottinger Baldwin Messtechnik GmbH

Torque meter

T40FH

S10, S11



The test result refers exclusively
to the tested model.
This test report may not be copied or
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of the accreditation agency and/or
EMV **TESTHAUS** GmbH
Revision: 1.0



EMV **TESTHAUS** GmbH

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Accreditation:



FCC facility registration number: 221458
Test Firm Type "2.948 listed": Valid until 2017-04-22
Test Firm Type "accredited": Valid until 2017-06-09
MRA US-EU, FCC designation number: DE0010
BnetzA-CAB-02/21-02/04 Valid until 2018-11-27

Industry Canada test site numbers with registration expiry date:
3472A-1, expiring 2018-11-09
3472A-2, expiring 2018-11-12

Test Laboratory:

EMV **TESTHAUS** GmbH
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Germany

The technical accuracy is guaranteed through the quality management of the
EMV **TESTHAUS** GmbH



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T40FH
S10, S11

150866-AU01+W02

Page 2 of 49

Table of contents

1	Test regulations	6
1.1	Summary of test results	7
2	Equipment under Test (EUT)	8
2.1	Photo documentation	9
2.2	Short description of the EUT	9
2.3	Operation mode	9
2.4	Configuration	10
2.5	Used cables	10
3	AC power line conducted emissions	11
3.1	Test location	11
3.2	Test instruments	11
3.3	Limits	11
3.4	Test procedure	12
3.5	Test setup	12
3.6	Test results - T40FH S10	13
3.7	Test results - T40FH S11	17
4	Radiated emission measurement (<1 GHz)	21
4.1	Test Location	21
4.2	Test instruments	21
4.3	Limits	22
4.4	Test procedure	23
4.5	Test setup	24
4.6	Test deviation	24
4.7	Test results - T40FH S10	25
4.8	Test results - T40FH S11	30
5	Radiated emission measurement (>1 GHz)	36
6	Bandwidths	37
6.1	Test Location	37
6.2	Test instruments	37
6.3	Limits	37
6.4	Test setup	37
6.5	Test deviation	37
6.6	Test results - T40FH S10	38
6.7	Test results - T40FH S11	42



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 Revision: 1.0

Hottinger Baldwin Messtechnik GmbH
 Torque meter
 T40FH
 S10, S11

150866-AU01+W02

Page 3 of 49

7	Equipment calibration status.....	46
8	Measurement uncertainty	47
9	Summary.....	48
10	Revision History.....	49



EMV **TESTHAUS** GmbH
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 Revision: 1.0

Hottinger Baldwin Messtechnik GmbH
 Torque meter
 T40FH
 S10, S11

150866-AU01+W02

Page 4 of 49

List of pictures

Picture 1: Outline of conducted emission test setup	12
Picture 2: T40FH S10 - Graphic - Conducted emission on mains, phase 1 (w/o termination) ...	13
Picture 3: T40FH S10 - Table - Conducted emission on mains, phase 1 (w/o termination)	14
Picture 4: T40FH S10 - Graphic - Conducted emission on mains, neutral (w/o termination)	15
Picture 5: T40FH S10 - Table - Conducted emission on mains, neutral (w/o termination)	16
Picture 6: T40FH S11 - Graphic - Conducted emission on mains, phase 1 (w/o termination) ...	17
Picture 7: T40FH S11 - Table - Conducted emission on mains, phase 1 (w/o termination)	18
Picture 8: T40FH S11 - Graphic - Conducted emission on mains, neutral (w/o termination)	19
Picture 9: T40FH S11 - Table - Conducted emission on mains, neutral (w/o termination)	20
Picture 10: Test setup for radiated emission measurement (< 30 MHz)	24
Picture 11: Test setup for radiated emission measurement (< 1 GHz)	24
Picture 12: T40FH S10 - Radiated emission 9 kHz – 30 MHz @ 3m distance	26
Picture 13: T40FH S10 - Restricted Band - PK @ 3m distance	27
Picture 14: T40FH S10 - Restricted Band - QP @ 3m distance	27
Picture 15: T40FH S10 - Radiated emission 30 MHz - 1000MHz @ 3m distance	29
Picture 16: T40FH S11 - Radiated emission 9 kHz – 30 MHz @ 3m distance	31
Picture 17: T40FH S11 - Restricted Band - PK @ 3m distance	33
Picture 18: T40FH S11 - Restricted Band - QP @ 3m distance	33
Picture 19: T40FH S11 - Radiated emission 30 MHz - 1000MHz @ 3m distance	35
Picture 20: T40FH S10 - Occupied bandwidth (99 %) - 523.0 kHz	39
Picture 21: T40FH S10 - -6 dB emission bandwidth - 523.0 kHz	40
Picture 22: T40FH S10 - -20 dB emission bandwidth - 523.0 kHz	41
Picture 23: T40FH S11 - Occupied bandwidth (99 %) - 523.0 kHz	43
Picture 24: T40FH S11 - -6 dB emission bandwidth - 523.0 kHz	44
Picture 25: T40FH S11 - -20 dB emission bandwidth - 523.0 kHz	45

List of tables

Table 1: Equipment calibration status	46
Table 2: Measurement uncertainty	47



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Revision: 1.0

Hottinger Baldwin Messtechnik GmbH
Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 5 of 49

1 Test regulations

47 CFR Part 2: 10-2014	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)
47 CFR Part 15: 10-2014	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)
ANSI C63.10: June 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ICES-003 Issue 5, August 2012, updated November 2014	Spectrum Management and Telecommunications Interference-Causing Equipment Standard Information Technology Equipment (ITE) – Limits and methods of measurement
RSS-Gen Issue 4, November 2014	Spectrum Management and Telecommunications Radio Standards Specification General Requirements for Compliance of Radio Apparatus
RSS-102 Issue 5, March 2015	Spectrum Management and Telecommunications Radio Standards Specification Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
RSS-210 Issue 8, December 2010 with Amendment 1, February 2015, updated May 2015	Spectrum Management and Telecommunications Radio Standards Specification Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment



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Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 6 of 49

1.1 Summary of test results

Standard	Test result
47 CFR Part 15, sections 15.207 and 15.209	Passed
RSS-210 Issue 8 clause 2 (with appropriate references to RSS-Gen Issue 4)	Passed

Note:

This report amends test report no. 150253-AU01+W02 due to changes in wireless power transfer (WPT). According to manufacturer there is no change on the wireless data transfer part. Therefore all tests relating to carrier frequency and modulation used for wireless data transfer were omitted. However, radiated field strength of wireless data transfer was measured (see clause 4 starting on page 21).



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Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 7 of 49

2 Equipment under Test (EUT)

Product type: Torque meter
Model Name: T40FH S10
T40FH S11
Manufacturer: Hottinger Baldwin Messtechnik GmbH
Serial number: T40FH S10: test sample
T40FH S11: test sample
FCC ID: 2ADAT-T40S10TOS11
IC certification number: 12438A-T40S10TOS11
Application frequency band: Not applicable (general requirements apply)
Frequency range: 523.00 kHz -> wireless power transfer
1.22 MHz -> wireless data transfer
Operating frequency: 523.00 kHz -> wireless power transfer
1.22 MHz -> wireless data transfer
Number of RF-channels: 2
Modulation: ASK -> wireless power transfer
PSK -> wireless data transfer
Antenna types: loop antenna
☐ detachable ☒ not detachable
Power supply: External power source
nominal: 24.0 VDC
Temperature range: -20°C to +85°C

Remark:

The tests were performed with 120V AC / 60Hz at mains input of DC power supply.



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Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 8 of 49

2.1 Photo documentation

For photos of the EUT see annex B.
For photos taken during testing see annex A.

2.2 Short description of the EUT

The EUT is a torque meter with wireless measurement data transfer and wireless power supply. The measurement data transfer goes from rotor to stator. The wireless power supply goes the other way round. In the field EUT is part of an engine test bench.

2.3 Operation mode

The EUT is configured to start wireless power supply, measurement and data transfer as soon as supplied by external power.

The position in which the EUT was tested is documented in annex A.



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Revision: 1.0

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Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 9 of 49

2.4 Configuration

The following peripheral devices and interface cables were connected during the tests:

Device	Model:	Serial or inventory number
Torque meter	T40FH S10	test sample
Torque meter	T40FH S11	test sample
DC power supply	TRIO-PS/1AC/24DC/5 120 VAC / 60 Hz -> 24 VDC	2866310
Data cable termination box	hbm test device (for radiated measurements)	n/a
AC power source	CHROMA 61602	616020002099

2.5 Used cables

Numbers:	Description: (type / lengths / remarks)	Serial No
1	7-pin shielded cable with 2 screw connectors, 3 m (for radiated measurements)	n/a
1	7-pin shielded cable with 1 screw connector and DC plug, 3 m (for AC power line conducted emissions)	n/a



3 AC power line conducted emissions

according to 47 CFR Part 15, section 15.207, and
RSS-210, section 2.1 with RSS-Gen, section 8.8

3.1 Test location

Description	Manufacturer	Inventory No.
Shielded room	Siemens - Matsushita	E00107

3.2 Test instruments

	Description	Manufacturer	Inventory No.
☒	ESCS 30	Rohde & Schwarz	E00003
☐	ESU 26	Rohde & Schwarz	W00002
☐	ESCI	Rohde & Schwarz	E00001
☐	ESH3-Z2	Rohde & Schwarz	E00028
☒	ESH2-Z5	Rohde & Schwarz	E00004
☐	ESH2-Z5	Rohde & Schwarz	E00005

3.3 Limits

Frequency [MHz]	Quasi-peak [dB μ V]	Avarage [dB μ V]
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5.0	56	46
5 – 30	60	50



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Revision: 1.0

Hottinger Baldwin Messtechnik GmbH
Torque meter
T40FH
S10, S11

150866-AU01+W02

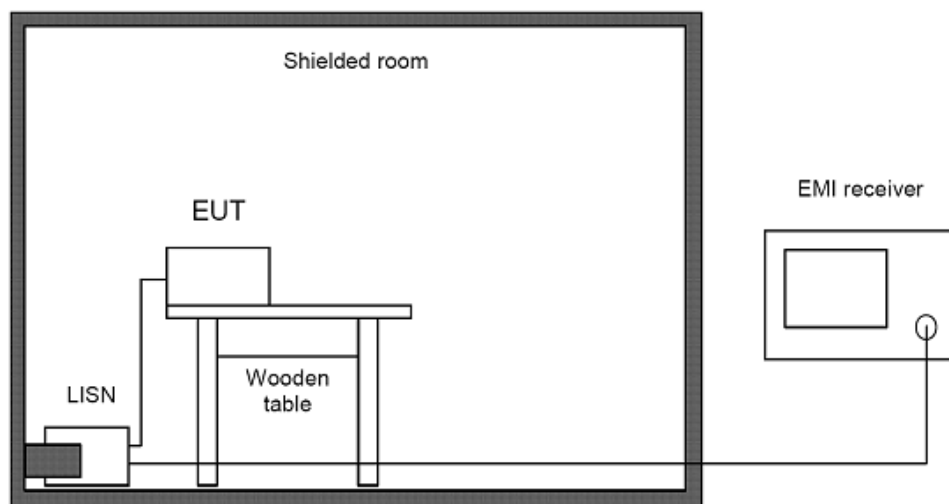
Page 11 of 49

3.4 Test procedure

1. The tests of conducted emission were carried out in a shielded room using a line impedance stabilization network (LISN) 50 μ H/50 Ohms and an EMI test receiver.
2. The EMI test receiver was connected to the LISN and set to a measurement bandwidth of 9 kHz in the frequency range from 0.15 MHz to 30 MHz.
3. The EUT was placed on a wooden table and connected to the LISN.
4. To accelerate the measurement the detector of the EMI test receiver was set to peak and the whole frequency range from 0.15 MHz to 30 MHz was scanned.
5. After that all peaks values with less margin than 10 dB to quasi-peak limit or exceeding the limit were marked and re-measured with quasi-peak detector.
6. If after that all values are under the average limit no addition measurement is necessary. In case there are still values between quasi-peak and average limit then these values were re-measured with average detector.
7. These measurements were done on all power lines.

According to ANSI C63.4, section 13.3.1 testing of intentional radiators with detachable antennas shall be done with a dummy load otherwise the tests should be done with connected antenna and if adjustable fully extended.

3.5 Test setup

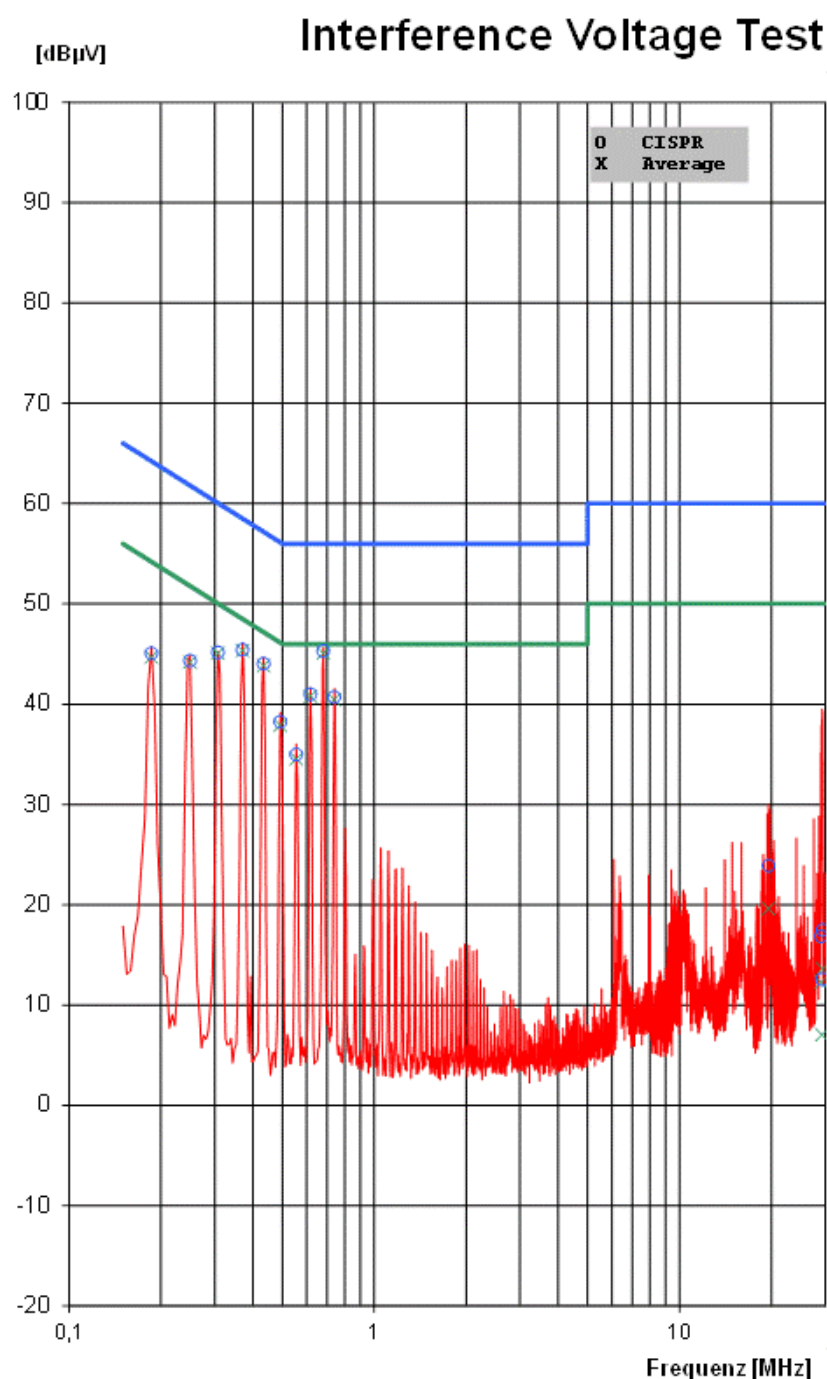


Picture 1: Outline of conducted emission test setup

Comments: All peripheral devices were additionally decoupled by means of a line stabilization network.

3.6 Test results - T40FH S10

Temperature:	22°C	Humidity:	35%
Tested by:	Martin Müller	Test date:	2015-11-30



REGULATIONS:
47 CFR, Sec 15.207. Cl B
PEAK / CISPR / AV

TEST EQUIPMENT:
R&S ESCS30 (E00003)
R&S ESH2-Z5 (E00004)

ORDER NO.:
150866-AU01+W02

EUT:
Hottinger Baldwin Messtechnik
GmbH
Torquemeter
T40FH S10
test sample

OPERATION MODE:
WPT active

Mains 120V AC /60Hz
Phase

TEST FACILITY:
EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:
2015-11-30 11:25:48
22°C 35% 98kPa

TEST ENGINEER:
Martin Müller

StoSp_11.E10

Picture 2: T40FH S10 - Graphic - Conducted emission on mains, phase 1 (w/o termination)



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Germany
Revision: 1.0

Hottinger Baldwin Messtechnik GmbH
Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 13 of 49

Interference Voltage Test

Freq. [MHz]	U_CISPR [dBµV]	Limit [dBµV]	delta_U [dB]	U_AV [dBµV]	Limit [dBµV]	delta_U [dB]	Corr. [dB]	Remark
0,19	45,1	64,2	19,1	44,7	54,2	9,5	0,0	
0,25	44,3	61,8	17,5	44,2	51,8	7,6	0,0	
0,31	45,2	60,0	14,9	45,1	50,0	5,0	0,0	
0,37	45,4	58,5	13,1	45,3	48,5	3,2	0,0	
0,43	44,0	57,2	13,2	43,8	47,2	3,4	0,0	
0,49	38,2	56,1	17,9	37,9	46,1	8,3	0,0	
0,56	35,0	56,0	21,0	34,5	46,0	11,5	0,0	
0,62	41,0	56,0	15,0	40,8	46,0	5,2	0,0	
0,68	45,3	56,0	10,7	45,1	46,0	1,0	0,0	
0,74	40,7	56,0	15,3	40,4	46,0	5,6	0,0	
19,60	23,9	60,0	36,1	19,6	50,0	30,4	0,0	
29,15	16,8	60,0	43,2	12,2	50,0	37,8	0,0	
29,33	12,5	60,0	47,5	7,0	50,0	43,0	0,0	
29,46	17,5	60,0	42,6	13,6	50,0	36,4	0,0	

Picture 3: T40FH S10 - Table - Conducted emission on mains, phase 1 (w/o termination)

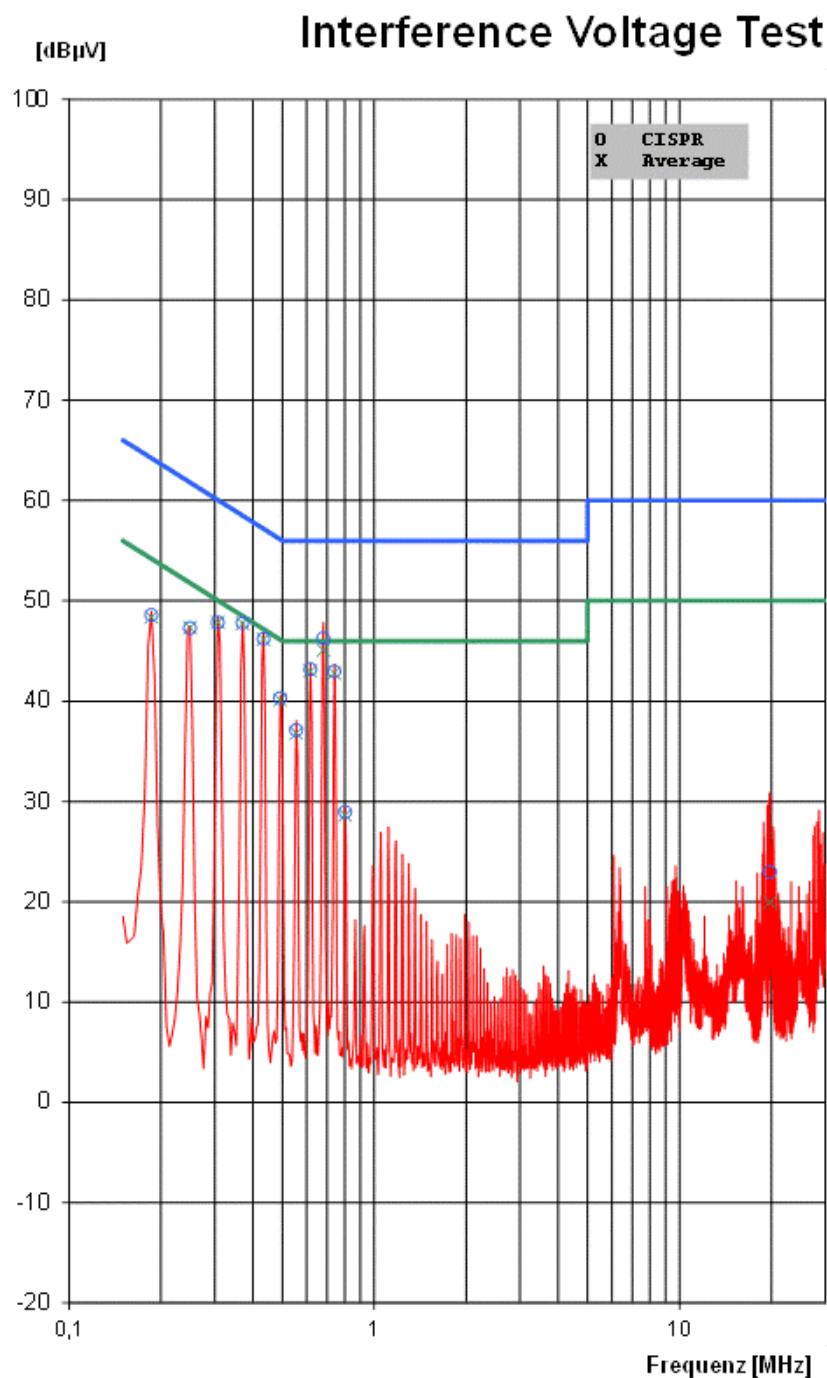


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Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 14 of 49



REGULATIONS:
47 CFR, Sec 15.207, Cl B
PEAK / CISPR / AV

TEST EQUIPMENT:
R&S ESCS30 (E00003)
R&S ESH2-Z5 (E00004)

ORDER NO.:
150866-AU01+W02

EUT:
Hottinger Baldwin Messtechnik
GmbH
Torquemeter
T40FH S10
test sample

OPERATION MODE:
WPT active

Mains 120V AC /60Hz
Neutral

TEST FACILITY:
EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:
2015-11-30 11:26:29
22°C 35% 98kPa

TEST ENGINEER:
Martin Müller

StoSp_N.E10

Picture 4: T40FH S10 - Graphic - Conducted emission on mains, neutral (w/o termination)



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Torque meter
T40FH
S10, S11

150866-AU01+W02

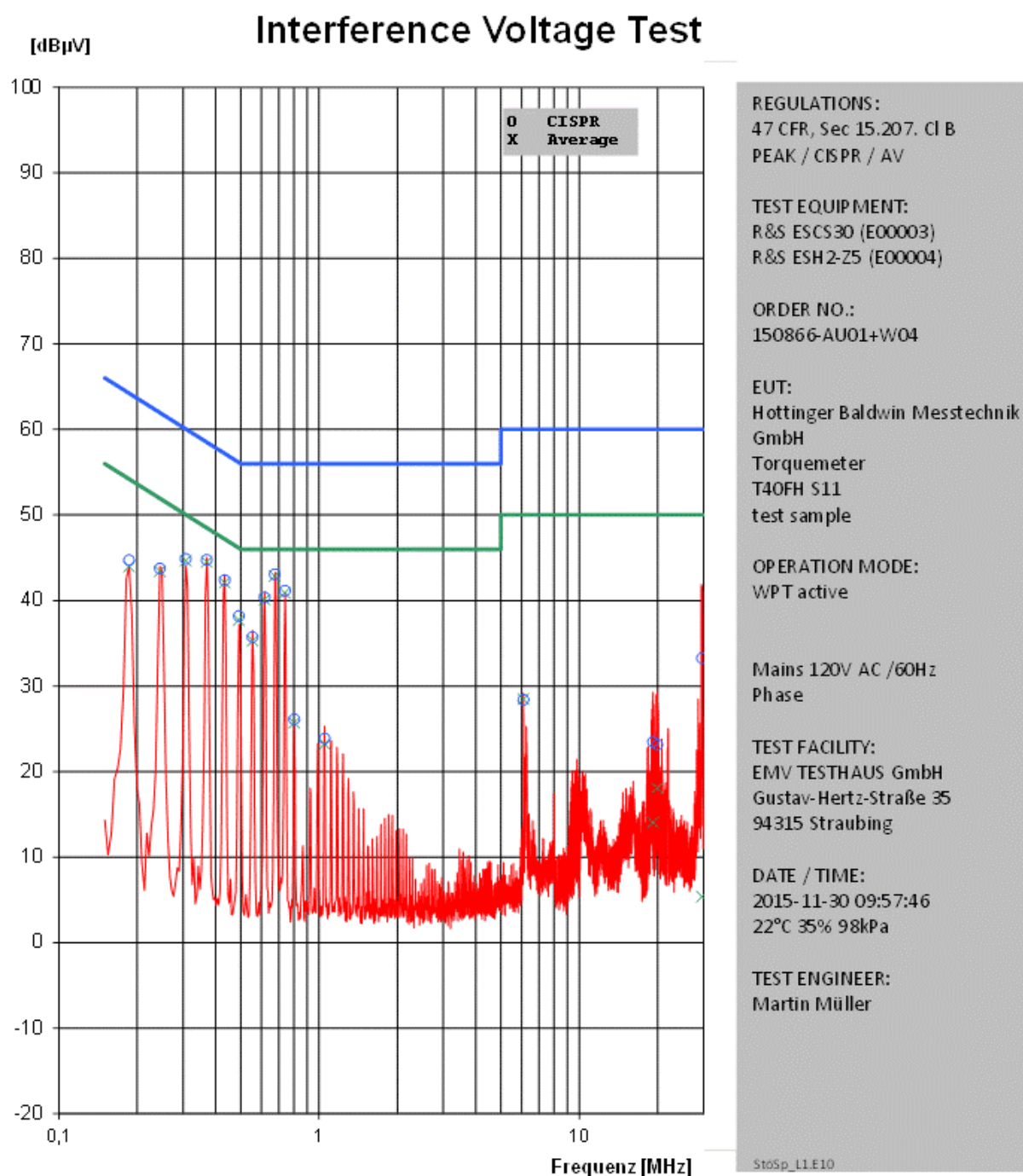
Page 15 of 49

Interference Voltage Test

Freq.	U_CISPR	Limit	delta_U	U_AV	Limit	delta_U	Corr.	Remark
[MHz]	[dBµV]	[dBµV]	[dB]	[dBµV]	[dBµV]	[dB]	[dB]	StöSe N.F.10
0,19	48,6	64,2	15,6	48,4	54,2	5,8	0,0	
0,25	47,3	61,8	14,5	47,3	51,8	4,5	0,0	
0,31	47,9	60,0	12,2	47,8	50,0	2,2	0,0	
0,37	47,8	58,5	10,7	47,7	48,5	0,8	0,0	
0,43	46,2	57,2	11,0	46,2	47,2	1,0	0,0	
0,49	40,3	56,1	15,8	40,1	46,1	6,0	0,0	
0,56	37,1	56,0	18,9	36,8	46,0	9,2	0,0	
0,62	43,2	56,0	12,8	43,0	46,0	3,0	0,0	
0,68	46,3	56,0	9,7	45,1	46,0	0,9	0,0	
0,74	43,0	56,0	13,1	42,8	46,0	3,2	0,0	
0,80	28,9	56,0	27,1	28,6	46,0	17,4	0,0	
19,77	23,0	60,0	37,0	19,9	50,0	30,1	0,0	

3.7 Test results - T40FH S11

Temperature:	22°C	Humidity:	35%
Tested by:	Martin Müller	Test date:	2015-11-30



Picture 6: T40FH S11 - Graphic - Conducted emission on mains, phase 1 (w/o termination)



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Torque meter
T40FH
S10, S11

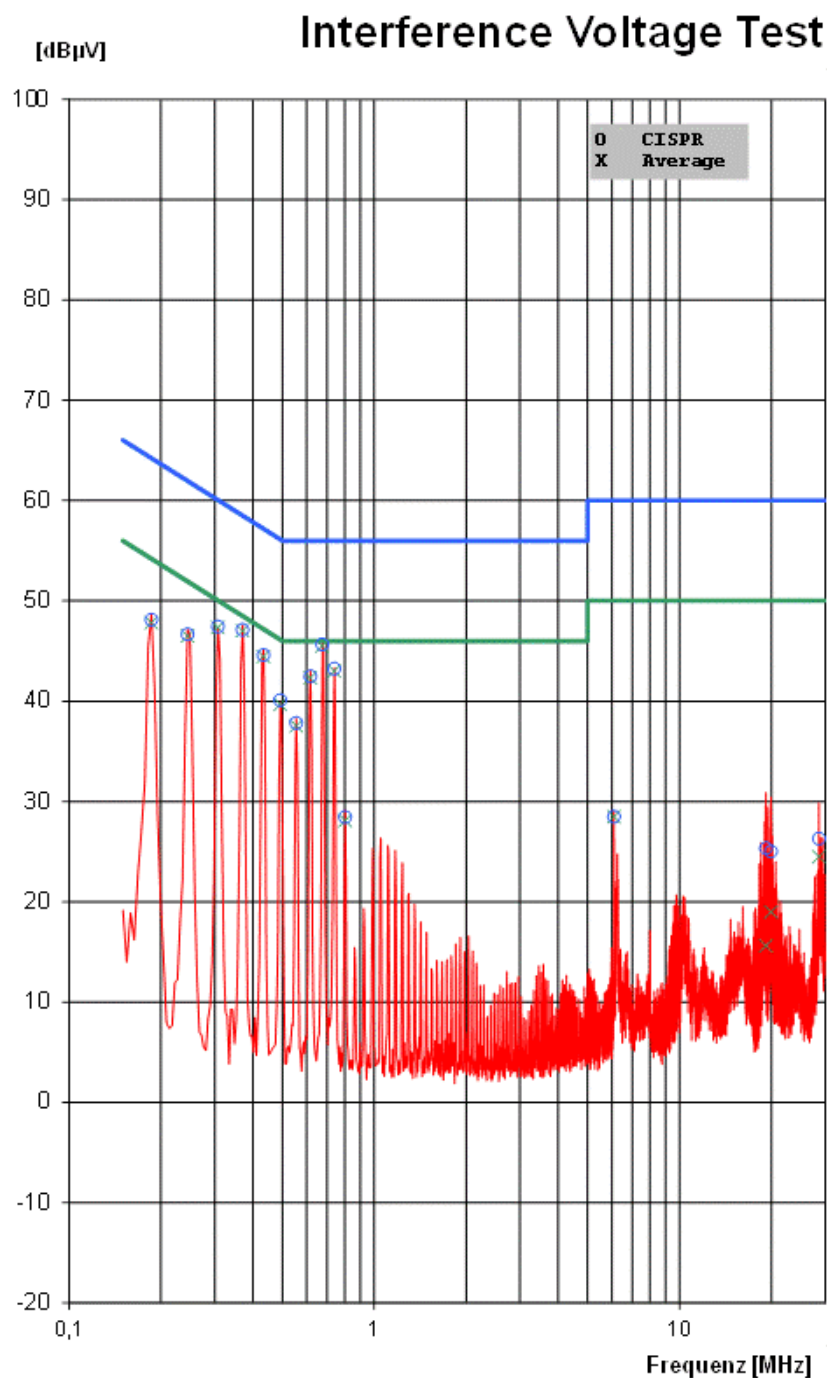
150866-AU01+W02

Page 17 of 49

Interference Voltage Test

Freq. [MHz]	U_CISPR [dBµV]	Limit [dBµV]	delta_U [dB]	U_AV [dBµV]	Limit [dBµV]	delta_U [dB]	Corr. [dB]	Remark
0,19	44,7	64,2	19,5	44,0	54,2	10,3	0,0	StöSe 11 E10
0,24	43,7	61,9	18,2	43,4	51,9	8,5	0,0	
0,31	44,8	60,0	15,2	44,7	50,0	5,4	0,0	
0,37	44,7	58,5	13,8	44,5	48,5	4,0	0,0	
0,43	42,4	57,2	14,8	42,1	47,2	5,1	0,0	
0,49	38,2	56,1	18,0	37,7	46,1	8,4	0,0	
0,56	35,7	56,0	20,3	35,3	46,0	10,7	0,0	
0,62	40,3	56,0	15,7	40,1	46,0	5,9	0,0	
0,68	43,1	56,0	13,0	42,9	46,0	3,2	0,0	
0,74	41,1	56,0	14,9	40,9	46,0	5,1	0,0	
0,80	26,1	56,0	29,9	25,7	46,0	20,3	0,0	
1,05	23,8	56,0	32,2	23,2	46,0	22,8	0,0	
6,10	28,4	60,0	31,6	28,5	50,0	21,5	0,0	
19,18	23,5	60,0	36,5	14,0	50,0	36,0	0,0	
19,93	23,1	60,0	36,9	18,1	50,0	32,0	0,0	
29,67	33,3	60,0	26,7	5,4	50,0	44,6	0,0	

Picture 7: T40FH S11 - Table - Conducted emission on mains, phase 1 (w/o termination)



REGULATIONS:
 47 CFR, Sec 15.207, Cl B
 PEAK / CISPR / AV

TEST EQUIPMENT:
 R&S ESCS30 (E00003)
 R&S ESH2-Z5 (E00004)

ORDER NO.:
 150866-AU01+W04

EUT:
 Hottinger Baldwin Messtechnik
 GmbH
 Torquemeter
 T40FH S11
 test sample

OPERATION MODE:
 WPT active

Mains 120V AC /60Hz
 Neutral

TEST FACILITY:
 EMV TESTHAUS GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing

DATE / TIME:
 2015-11-30 09:59:26
 22°C 35% 98kPa

TEST ENGINEER:
 Martin Müller

StoSp_N.E10

Picture 8: T40FH S11 - Graphic - Conducted emission on mains, neutral (w/o termination)



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 Torque meter
 T40FH
 S10, S11

150866-AU01+W02

Page 19 of 49

Interference Voltage Test

Freq. [MHz]	U_CISPR [dBµV]	Limit [dBµV]	delta_U [dB]	U_AV [dBµV]	Limit [dBµV]	delta_U [dB]	Corr. [dB]	Remark
0,19	48,1	64,2	16,1	47,8	54,2	6,4	0,0	StöSe N.F.10
0,24	46,7	61,9	15,3	46,5	51,9	5,5	0,0	
0,31	47,4	60,0	12,6	47,4	50,0	2,7	0,0	
0,37	47,1	58,5	11,4	47,0	48,5	1,5	0,0	
0,43	44,6	57,2	12,6	44,5	47,2	2,7	0,0	
0,49	40,1	56,1	16,1	39,7	46,1	6,5	0,0	
0,56	37,8	56,0	18,2	37,5	46,0	8,5	0,0	
0,62	42,5	56,0	13,6	42,3	46,0	3,7	0,0	
0,68	45,6	56,0	10,4	45,5	46,0	0,5	0,0	
0,74	43,2	56,0	12,8	43,0	46,0	3,0	0,0	
0,80	28,4	56,0	27,6	28,1	46,0	17,9	0,0	
6,10	28,5	60,0	31,5	28,5	50,0	21,5	0,0	
19,18	25,3	60,0	34,7	15,6	50,0	34,4	0,0	
19,93	25,0	60,0	35,0	19,0	50,0	31,0	0,0	
28,66	26,3	60,0	33,7	24,5	50,0	25,5	0,0	

Picture 9: T40FH S11 - Table - Conducted emission on mains, neutral (w/o termination)

4 Radiated emission measurement (<1 GHz)

according to 47 CFR Part 15, section 15.205(a), 15.209(a),
RSS-210, section 2.5 with RSS-Gen, sections 8.10 and 8.9

4.1 Test Location

- ☒ Scan with peak detector in 3 m CDC.
- ☒ Final CISPR measurement with quasi peak detector on 3 m open area test site.

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site (OATS)	EMV TESTHAUS GmbH	E00354

4.2 Test instruments

	Description	Manufacturer	Inventory No.
☒	ESCS 30 (FF)	Rohde & Schwarz	E00551
☐	ESU 26	Rohde & Schwarz	W00002
☒	ESCI (CDC)	Rohde & Schwarz	E00001
☒	VULB 9163 (FF)	Schwarzbeck	E00013
☒	VULB 9160 (CDC)	Schwarzbeck	E00011
☒	HFH2-Z2	Rohde & Schwarz	E00060
☒	RF-R 400-1	Langer EMV-Technik	E00270
☒	Feedline OATS	Huber & Suhner	200024



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T40FH
S10, S11

150866-AU01+W02

Page 21 of 49

4.3 Limits

The field strength of any emissions including spurious emissions falling into restricted bands as specified in 15.205(a) shall not exceed the general radiated emission limits as specified in 15.209.

Frequency [MHz]	Field strength Fs [μ V/m]	Field strength [dB μ V/m]	Measurement distance d [m]
0.009 – 0.490	266.6 – 4.9	48.5 – 13.8	300
0.490 – 1.705	48.98 – 14.08	33.8 – 22.97	30
1.705 – 30.0	30	29.54	30
30 – 88	100	40	3
88 – 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3



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T40FH
S10, S11

150866-AU01+W02

Page 22 of 49

4.4 Test procedure

1. EUT was configured according to ANSI C63.4. It was placed on the top of the turntable 0.8 meter above ground. The receiving antenna was placed 3 meters from the turntable. The test setup was placed inside a compact diagnostic chamber.
2. EUT and all peripherals were powered on.
3. The broadband antenna was set to vertical polarization.
4. The EMI receiver performed a scan from 30 MHz to 1000 MHz with peak detector peak and measurement bandwidth set to 120 kHz.
5. The turn table was rotated to 6 different positions ($360^\circ / 6$) and the antenna polarization was changed to horizontal.
6. Test procedure at step 4 and 5 was repeated.
7. The test setup was then placed in an OATS at 3 m distance and all peak values over or with less margin to the limit than 6dB were marked and re-measured with a quasi-peak detector.
8. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
9. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization. The highest value was recorded.
10. For emissions below 30 MHz measurements were done using a loop antenna. Prescans were performed with peak detector and final measurements with quasi-peak except for the frequency bands 9 to 90 kHz and 110 to 490 kHz where average detector applies. Antenna height was not changed during this test. Appropriate CISPR bandwidths of 200 Hz for frequencies up to 150 kHz and 9 or 10 kHz for frequencies above were used.



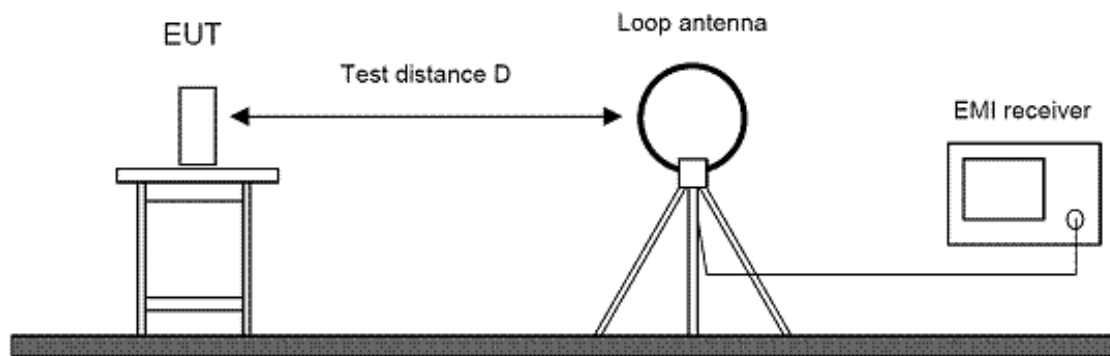
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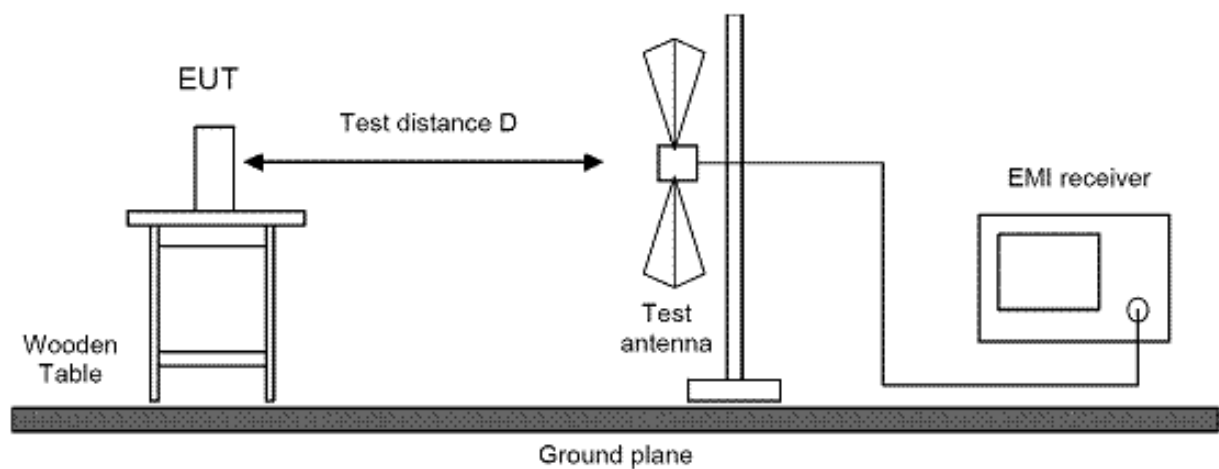
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Page 23 of 49

4.5 Test setup



Picture 10: Test setup for radiated emission measurement (< 30 MHz)



Picture 11: Test setup for radiated emission measurement (< 1 GHz)

4.6 Test deviation

There is no deviation from the standards referred to.

4.7 Test results - T40FH S10

Temperature:	18°C	Humidity:	47%
Tested by:	Martin Müller	Test date:	2015-12-02

Radiated Emission Measurement 9 kHz - 30 MHz

Test procedure

The EUT was placed in a full anechoic chamber and the spurious emission testing was performed in accordance with ANSI C63.10, and 47 CFR Part 15, Subpart C. The measurement distance was 3 m.

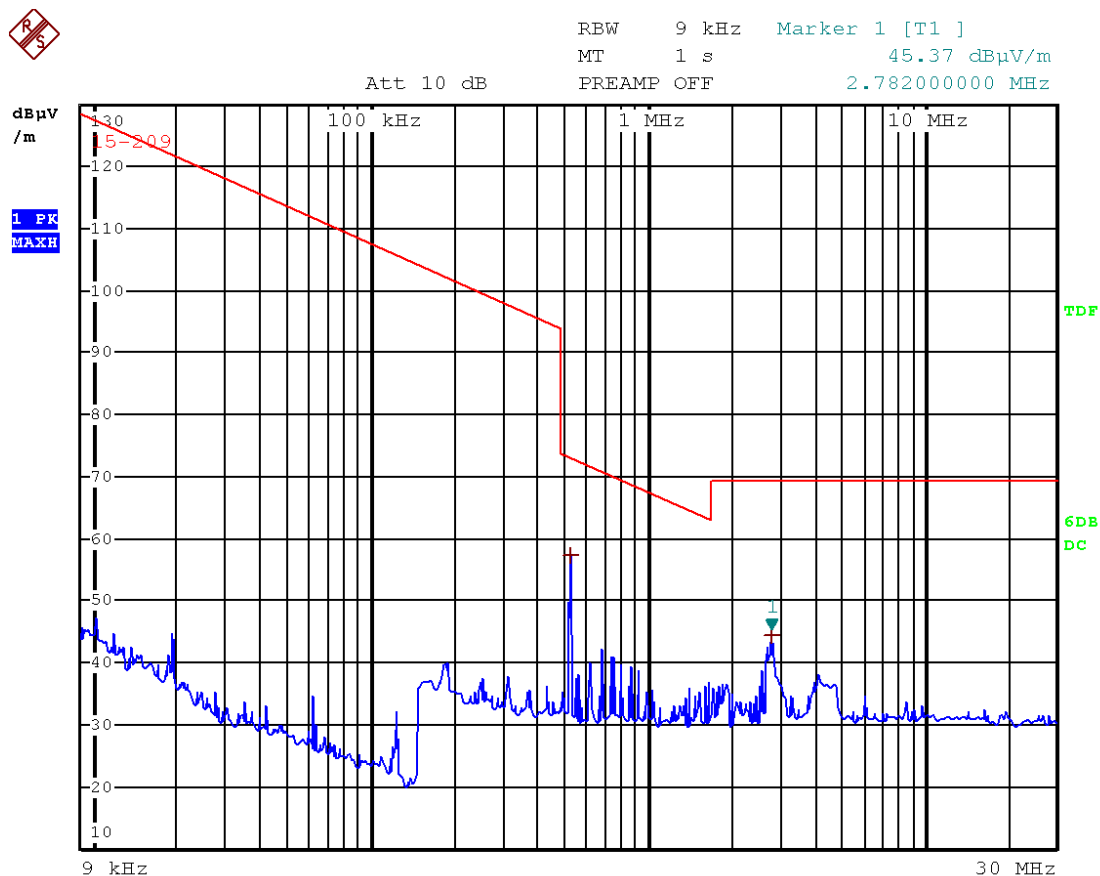


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T40FH
S10, S11

150866-AU01+W02

Page 25 of 49



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15-209			
Trace2:	---			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBμV/m	DELTA LIMIT dB	
1 Quasi Peak	522 kHz	57.49	-15.76	
1 Quasi Peak	2.782 MHz	44.55	-24.94	

Picture 12: T40FH S10 - Radiated emission 9 kHz – 30 MHz @ 3m distance

Frequency (kHz)	Measured value (dBμV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin	Result
¹⁾ 522	57.49	QP	40	17.49	33.25	11.24	PASS
2782	44.55	QP	40	4.55	30.00	25.45	PASS

¹⁾ Note:

Measured value = 57.49 dBμV/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value = 57.49 dBμV/m @ 3 m - 40 dB = **17.49 dBμV/m @ 30 m**



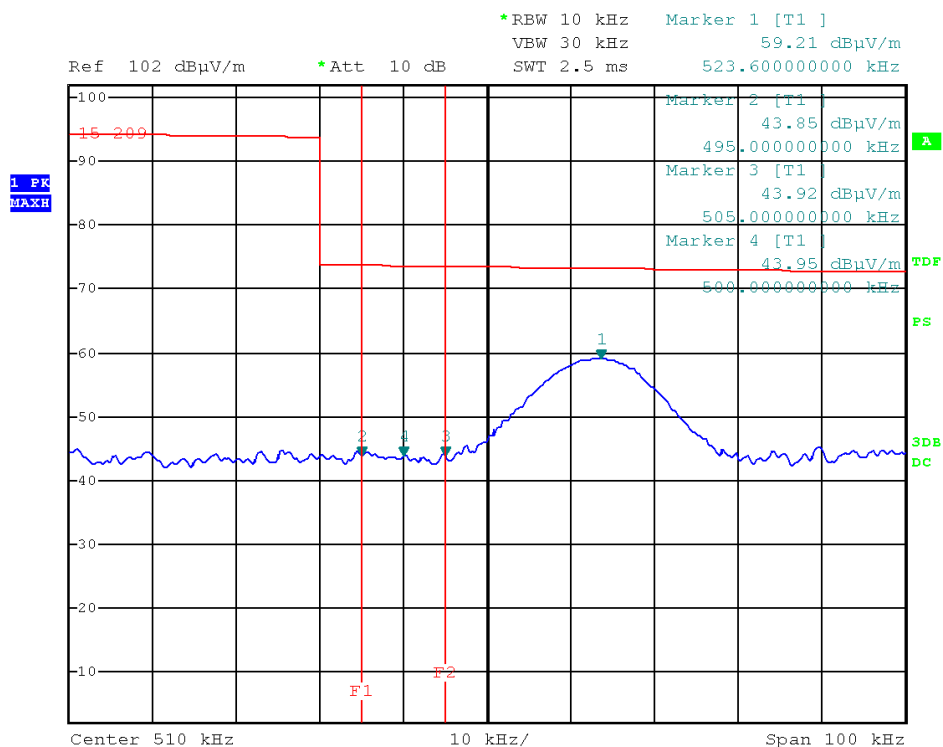
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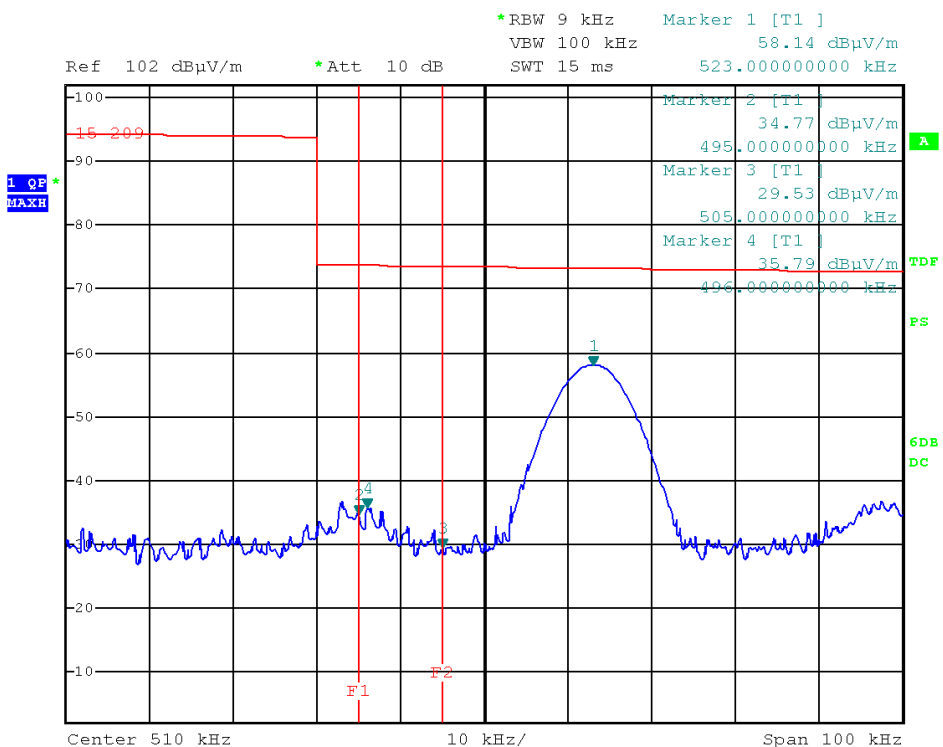
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Page 26 of 49

Restricted Band (495 kHz - 505 kHz)



Picture 13: T40FH S10 - Restricted Band - PK @ 3m distance



Picture 14: T40FH S10 - Restricted Band - QP @ 3m distance

Frequency (kHz)	Measured value (dBµV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
495.00	43.85	PK	40	3.85	33.71(QP)	29.86	PASS
495.00	34.77	QP	40	-5.23	33.71	38.94	PASS
496.00	35.79	QP	40	-4.21	33.69	37.90	PASS
500.00	43.95	PK	40	3.95	33.62(QP)	29.67	PASS
505.00	43.92	PK	40	3.92	33.54(QP)	29.62	PASS
505.00	29.53	QP	40	-10.47	33.54	44.01	PASS
¹⁾ 523.00	58.14	QP	40	18.14	33.23	15.09	PASS
523.60	59.21	PK	40	19.21	33.22(QP)	14.01	PASS

¹⁾ Note:

Measured value = 58.14 dBµV/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value = 58.14 dBµV/m @ 3 m - 40 dB = **18.14 dBµV/m @ 30 m**

Additional note:

Emissions in restricted band are spurious emissions not caused by carrier or modulation.



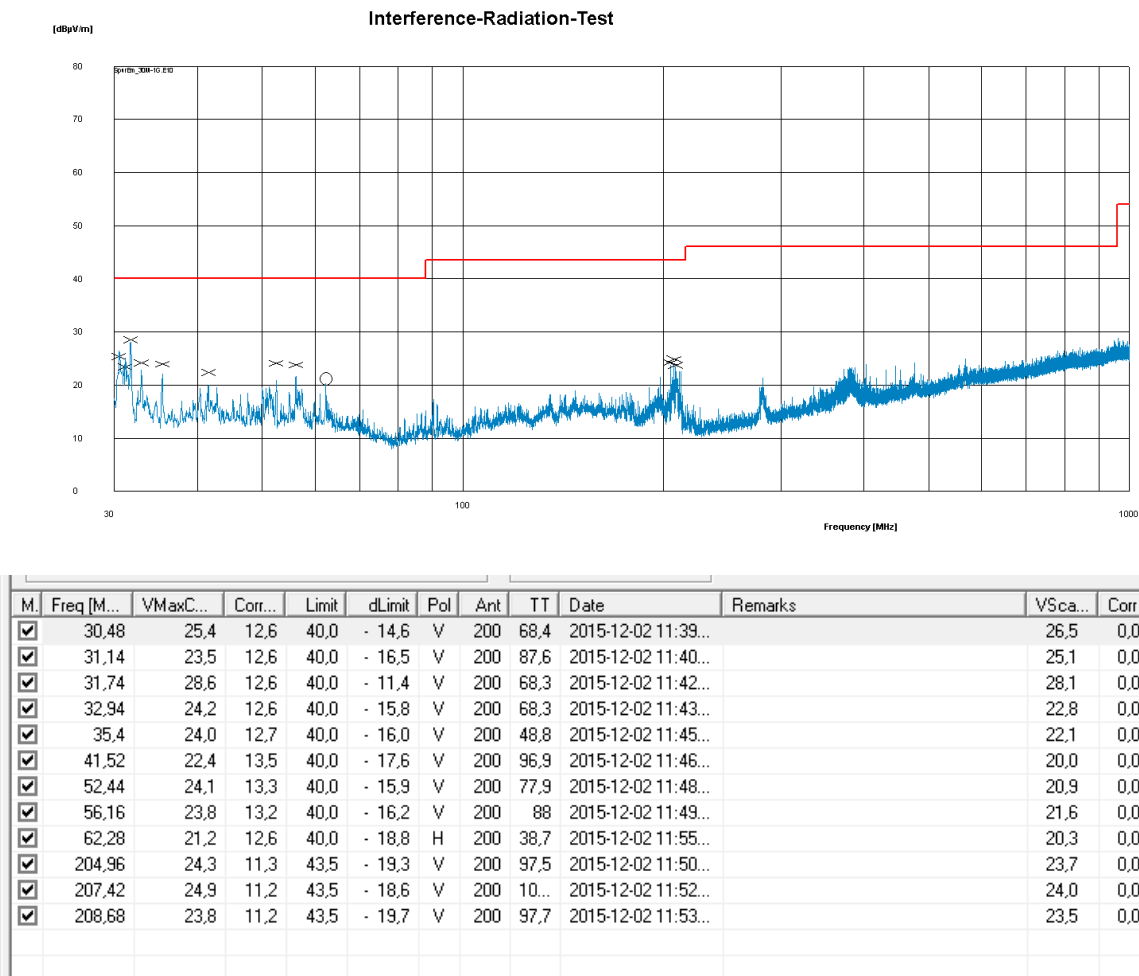
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S10, S11

150866-AU01+W02

Page 28 of 49

Radiated Emission Measurement 30 MHz - 1000 MHz



Picture 15: T40FH S10 - Radiated emission 30 MHz - 1000MHz @ 3m distance

4.8 Test results - T40FH S11

Temperature:	18°C	Humidity:	47%
Tested by:	Martin Müller	Test date:	2015-12-02

Radiated Emission Measurement 9 kHz - 30 MHz

Test procedure

The EUT was placed in a full anechoic chamber and the spurious emission testing was performed in accordance with ANSI C63.10, and 47 CFR Part 15, Subpart C. The measurement distance was 3 m.

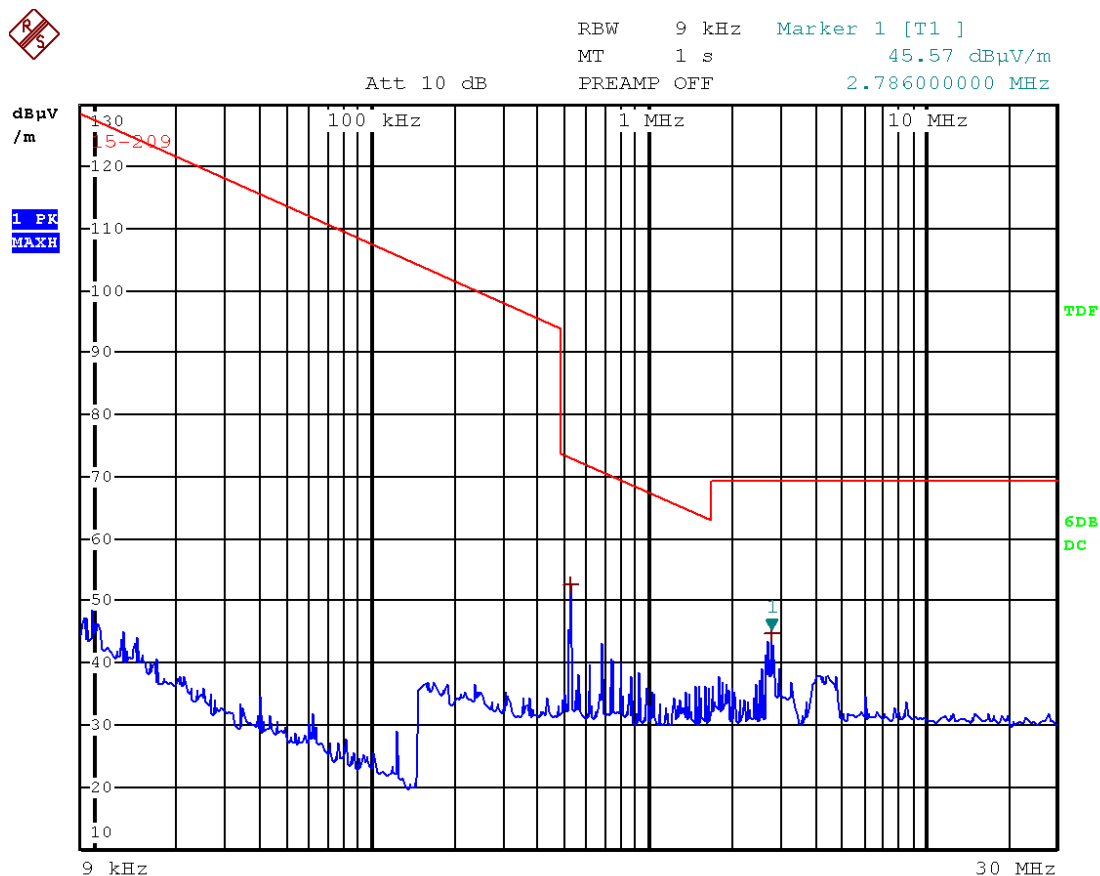


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T40FH
S10, S11

150866-AU01+W02

Page 30 of 49



EDIT PEAK LIST (Final Measurement Results)				
Trace1:	15-209			
Trace2:	---			
Trace3:	---			
TRACE	FREQUENCY	LEVEL dBµV/m	DELTA	LIMIT dB
1 Quasi Peak	522 kHz	52.74	-20.51	
1 Quasi Peak	2.786 MHz	44.77	-24.72	

Picture 16: T40FH S11 - Radiated emission 9 kHz – 30 MHz @ 3m distance

Frequency (kHz)	Measured value (dBµV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
¹⁾ 522	52.74	QP	40	12.74	33.25	20.51	PASS
2786	44.77	QP	40	4.77	30.00	25.23	PASS

¹⁾ Note:

Measured value = 52.74 dBµV/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value = 52.74 dBµV/m @ 3 m - 40 dB = **12.74 dBµV/m @ 30 m**



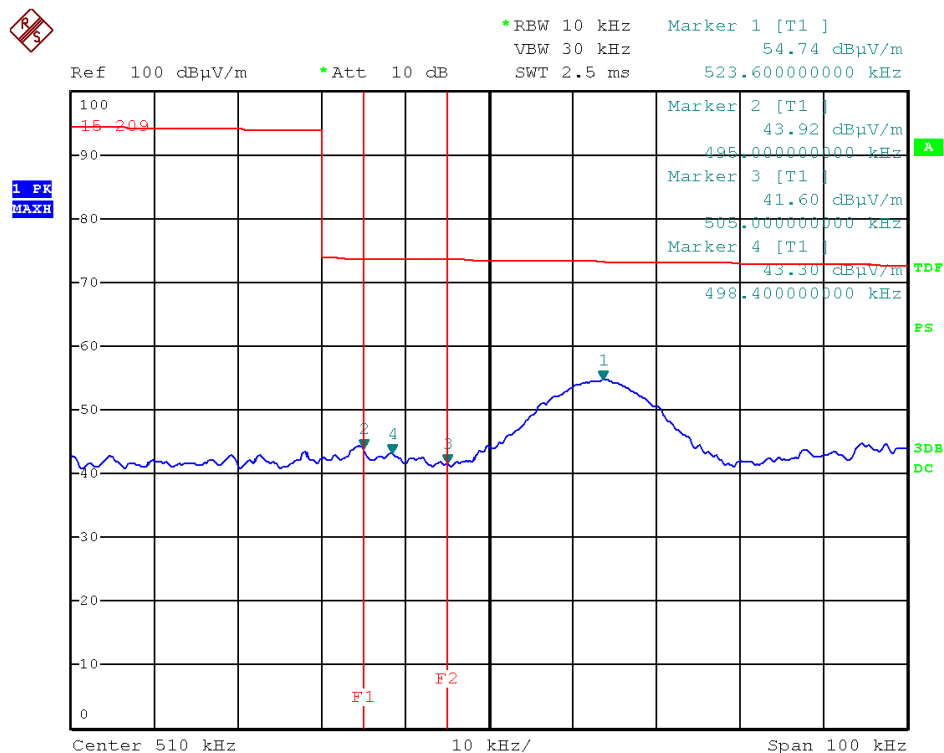
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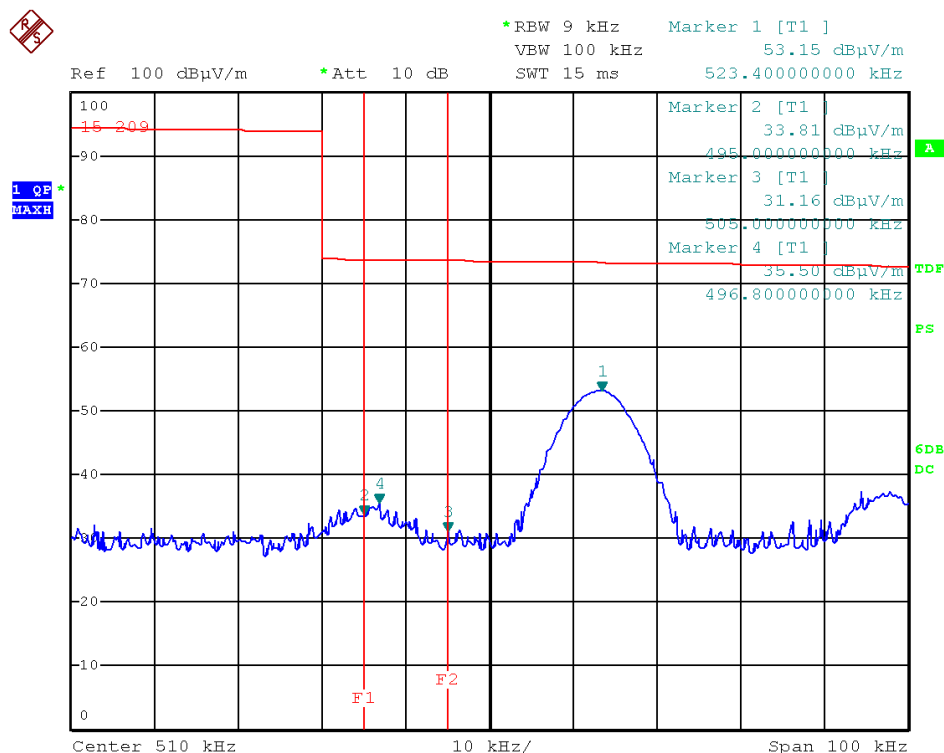
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Page 32 of 49

Restricted Band (495 kHz - 505 kHz)



Picture 17: T40FH S11 - Restricted Band - PK @ 3m distance



Picture 18: T40FH S11 - Restricted Band - QP @ 3m distance

Frequency (kHz)	Measured value (dBµV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
495.00	43.92	PK	40	3.92	33.71(QP)	29.79	PASS
495.00	33.81	QP	40	-6.19	33.71	39.90	PASS
496.80	35.50	QP	40	-4.50	33.68	38.18	PASS
498.40	43.30	PK	40	3.30	33.65(QP)	30.35	PASS
505.00	41.60	PK	40	1.60	33.54(QP)	31.94	PASS
505.00	31.16	QP	40	-8.84	33.54	42.38	PASS
¹⁾ 523.40	53.15	QP	40	13.15	33.23	20.08	PASS
523.60	54.74	PK	40	14.74	33.22(QP)	18.48	PASS

¹⁾ Note:

Measured value = 53.15 dBµV/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value = 53.15 dBµV/m @ 3 m - 40 dB = **13.15 dBµV/m @ 30 m**

Additional note:

Emissions in restricted band are spurious emissions not caused by carrier or modulation.



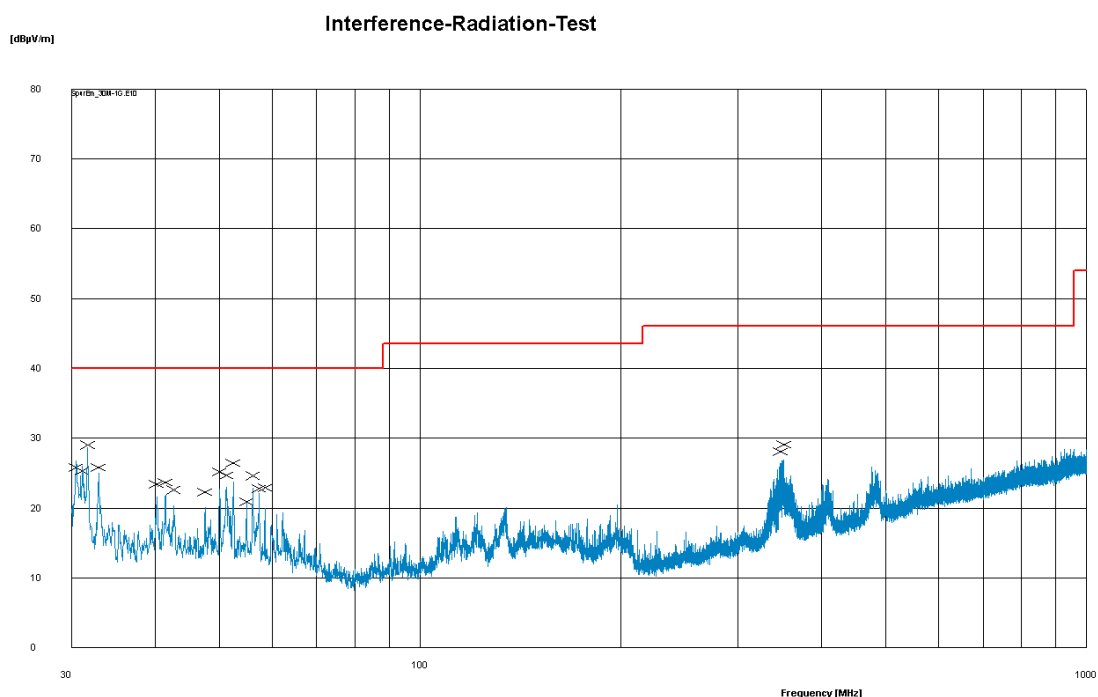
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T40FH
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150866-AU01+W02

Page 34 of 49

Radiated Emission Measurement 30 MHz - 1000 MHz



M.	Freq [M...]	VMaxC...	Corr...	Limit	dLimit	Pol	Ant	TT	Date	Remarks	VScal...	Corr ...
☒	30.48	25,8	12,6	40,0	- 14,2	V	200	74,4	2015-12-02 08:24...		26,8	0,0
☒	31.14	25,3	12,6	40,0	- 14,7	V	200	87,6	2015-12-02 08:26...		26,0	0,0
☒	31.74	29,0	12,6	40,0	- 11,0	V	200	68,5	2015-12-02 08:27...		28,6	0,0
☒	32.94	25,8	12,6	40,0	- 14,2	V	200	77,6	2015-12-02 08:28...		25,0	0,0
☒	40.26	23,4	13,6	40,0	- 16,6	V	200	68,5	2015-12-02 08:30...		21,6	0,0
☒	41.52	23,6	13,5	40,0	- 16,4	V	200	87,5	2015-12-02 08:31...		21,8	0,0
☒	42.72	22,6	13,4	40,0	- 17,4	V	200	68,5	2015-12-02 08:33...		20,3	0,0
☒	47.58	22,2	13,3	40,0	- 17,8	V	200	88,1	2015-12-02 08:34...		20,1	0,0
☒	50.04	25,2	13,3	40,0	- 14,8	V	200	68,8	2015-12-02 08:36...		22,8	0,0
☒	51.24	24,7	13,3	40,0	- 15,3	V	200	87,8	2015-12-02 08:37...		23,0	0,0
☒	52.44	26,4	13,3	40,0	- 13,6	V	200	68,5	2015-12-02 08:38...		23,7	0,0
☒	54.96	20,9	13,2	40,0	- 19,1	V	200	87,5	2015-12-02 08:40...		20,8	0,0
☒	56.16	24,6	13,2	40,0	- 15,4	V	200	68,5	2015-12-02 08:41...		22,9	0,0
☒	57.36	22,8	13,2	40,0	- 17,2	V	200	87,5	2015-12-02 08:43...		22,0	0,0
☒	58.56	22,9	13,1	40,0	- 17,1	V	200	68,7	2015-12-02 08:44...		20,0	0,0
☒	347.7	28,0	15,3	46,0	- 18,0	V	200	87,3	2015-12-02 08:46...		26,3	0,0
☒	351.9	29,0	15,4	46,0	- 17,0	V	200	78,3	2015-12-02 08:47...		26,9	0,0

Picture 19: T40FH S11 - Radiated emission 30 MHz - 1000MHz @ 3m distance

5 Radiated emission measurement (>1 GHz)

according to 47 CFR Part 15, section 15.209(a),
RSS-210, section 2.5 with RSS-Gen, section 8.9

Remark:

This measurement needs not to be applied because

- the intentional radiator operates below 10 GHz and tenth harmonic of the highest fundamental frequency is lower than 1 GHz (see 47 CFR Part 15, section 15.33(a)(1), and RSS-Gen, section 6.13), and
- the digital part of the device does not generate or use internal frequencies higher than 108 MHz (see 47 CFR Part 15 section 15.33(b)(1), and RSS-Gen, section 2.3.3 with ICES-003, section 6.2).



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T40FH
S10, S11

150866-AU01+W02

Page 36 of 49

6 Bandwidths

according to CFR 47 Part 2, section 2.202(a), and RSS-Gen, section 6.6

6.1 Test Location

See clause 4.1 on page 21.

6.2 Test instruments

See clause 4.2 on page 21.

6.3 Limits

The bandwidths are recorded only. There are no limits specified in CFR 47 Part 15, section 15.209, and RSS-210, Annex 2.6

6.4 Test setup

See clause 4.5 on page 24.

6.5 Test deviation

There is no deviation from the standards referred to.



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T40FH
S10, S11

150866-AU01+W02

Page 37 of 49

6.6 Test results - T40FH S10

Temperature:	22°C	Humidity:	35%
Tested by:	Martin Müller	Test date:	2015-11-30

Occupied bandwidth (99 %)

Test procedure

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth. For this purpose the appropriate measurement function of the spectrum analyzer is used.

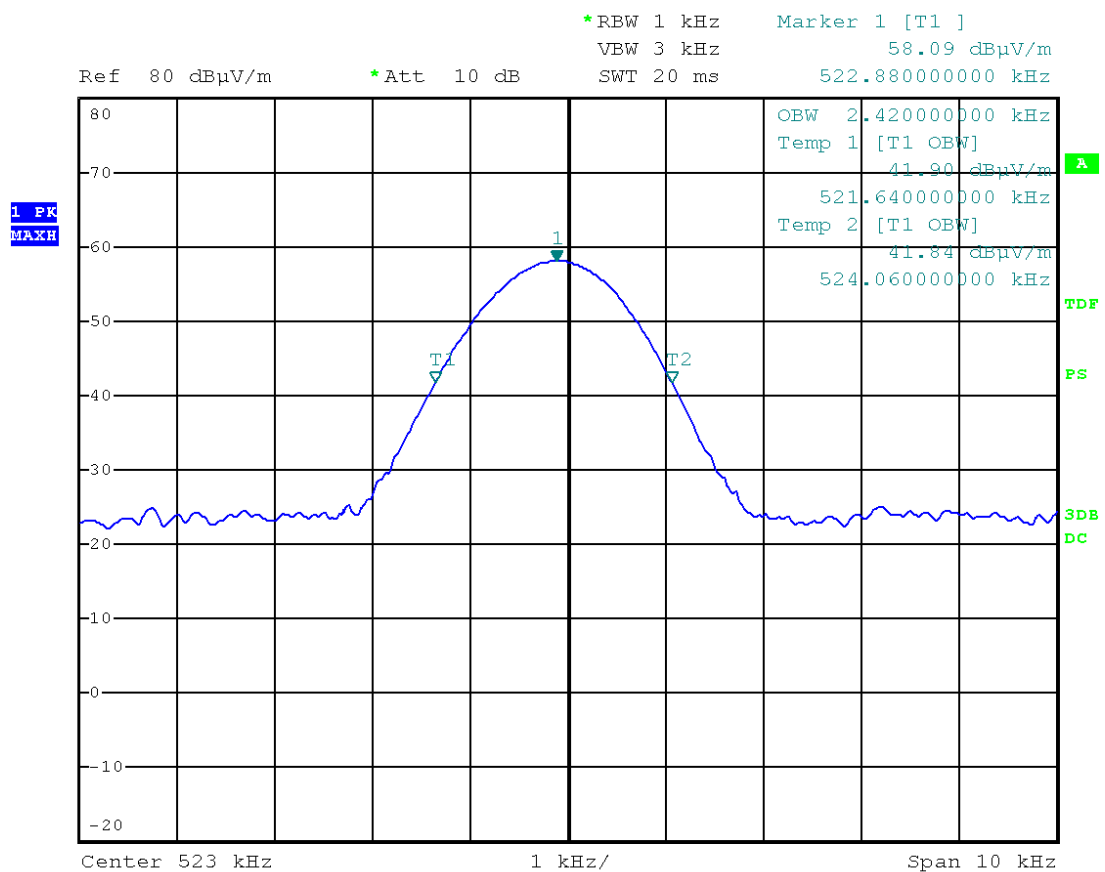


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T40FH
S10, S11

150866-AU01+W02

Page 38 of 49



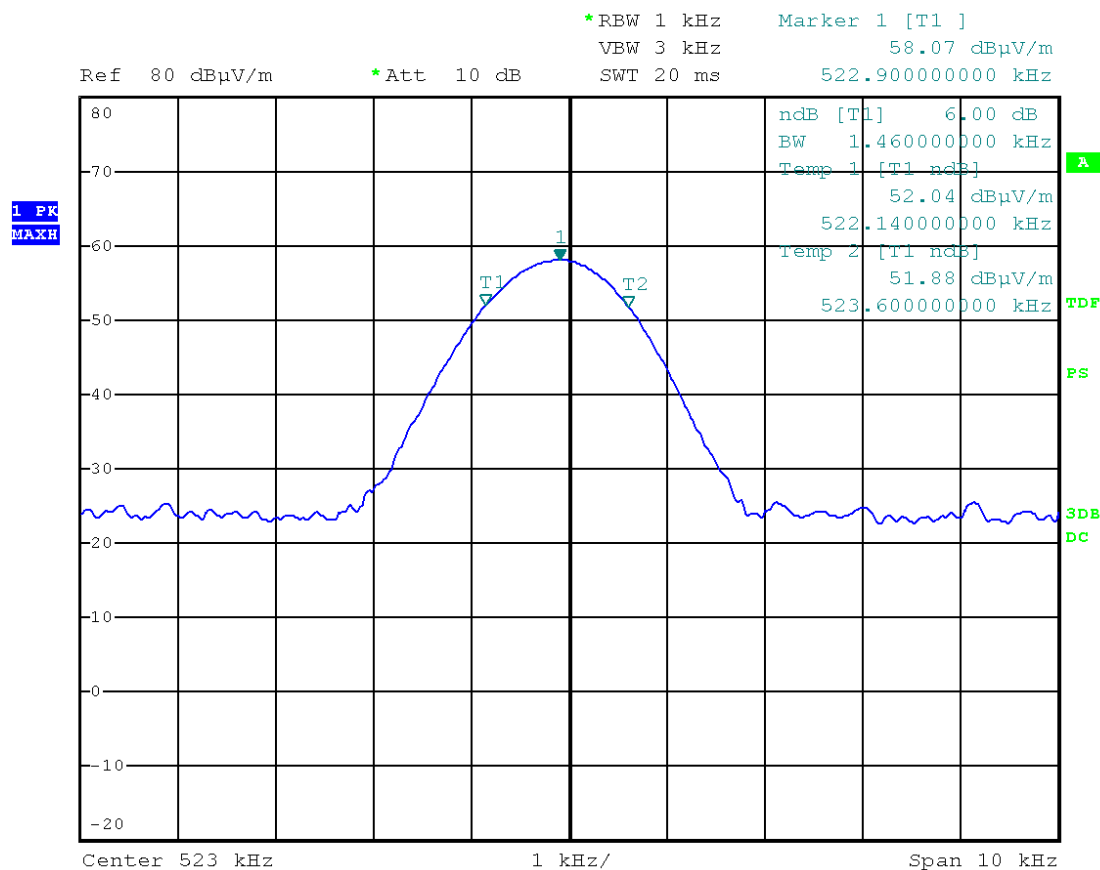
Picture 20: T40FH S10 - Occupied bandwidth (99 %) - 523.0 kHz

Measured occupied bandwidth (99 %) - 523.0 kHz: 2.4200 kHz

-6 dB emission bandwidth

Test procedure

Where indicated, the -6 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 6 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth



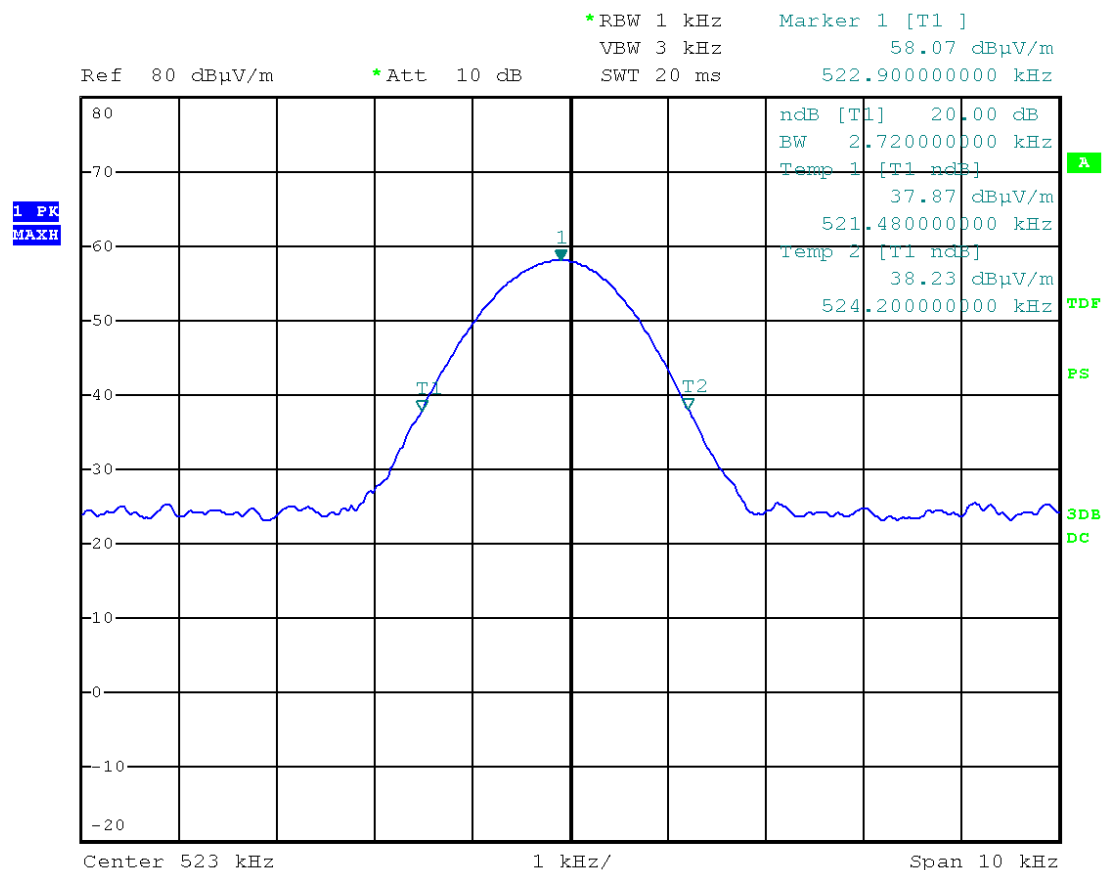
Picture 21: T40FH S10 - -6 dB emission bandwidth - 523.0 kHz

Measured -6 dB emission bandwidth - 523.0 kHz: 1.4600 kHz

-20 dB emission bandwidth

Test procedure

Where indicated, the -20 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 20 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.



Picture 22: T40FH S10 - -20 dB emission bandwidth - 523.0 kHz

Measured -20 dB emission bandwidth - 523.0 kHz: 2.7200 kHz

6.7 Test results - T40FH S11

Temperature:	22°C	Humidity:	35%
Tested by:	Martin Müller	Test date:	2015-30-11

Occupied bandwidth (99 %)

Test procedure

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured. The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth. For this purpose the appropriate measurement function of the spectrum analyzer is used.

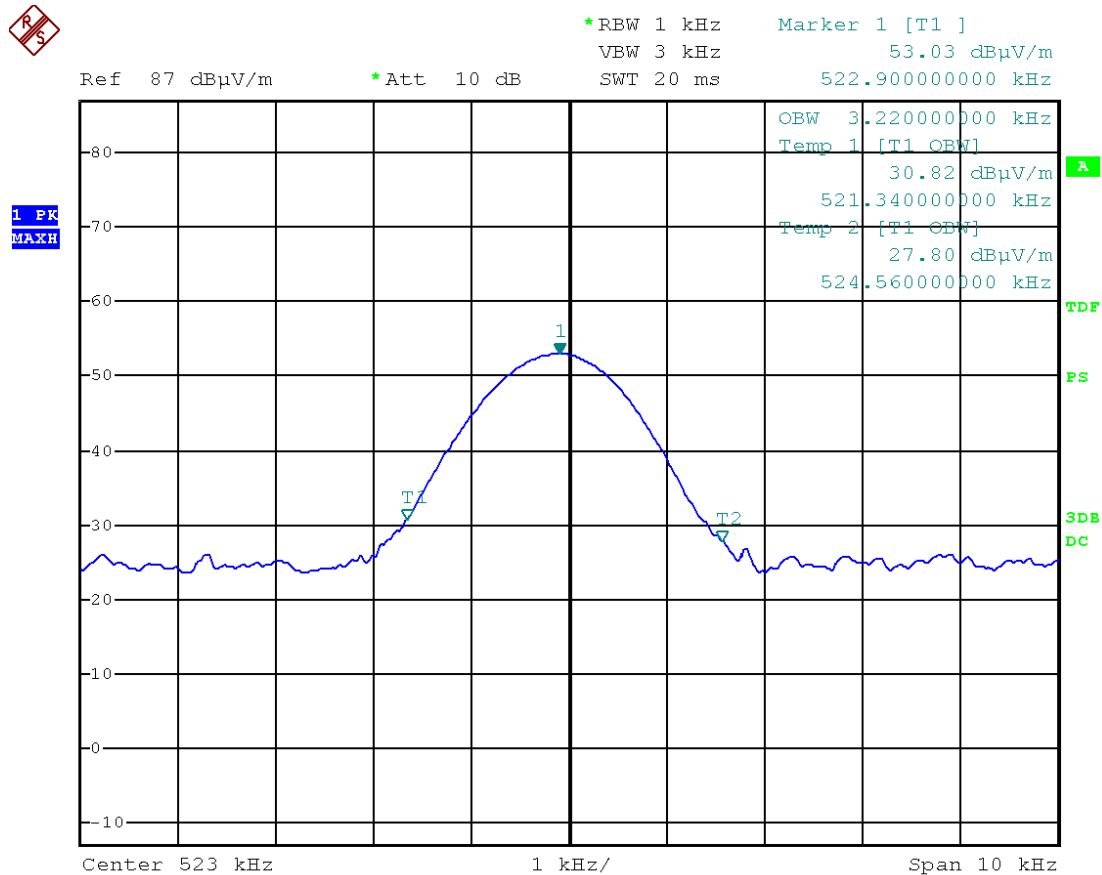


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T40FH
S10, S11

150866-AU01+W02

Page 42 of 49



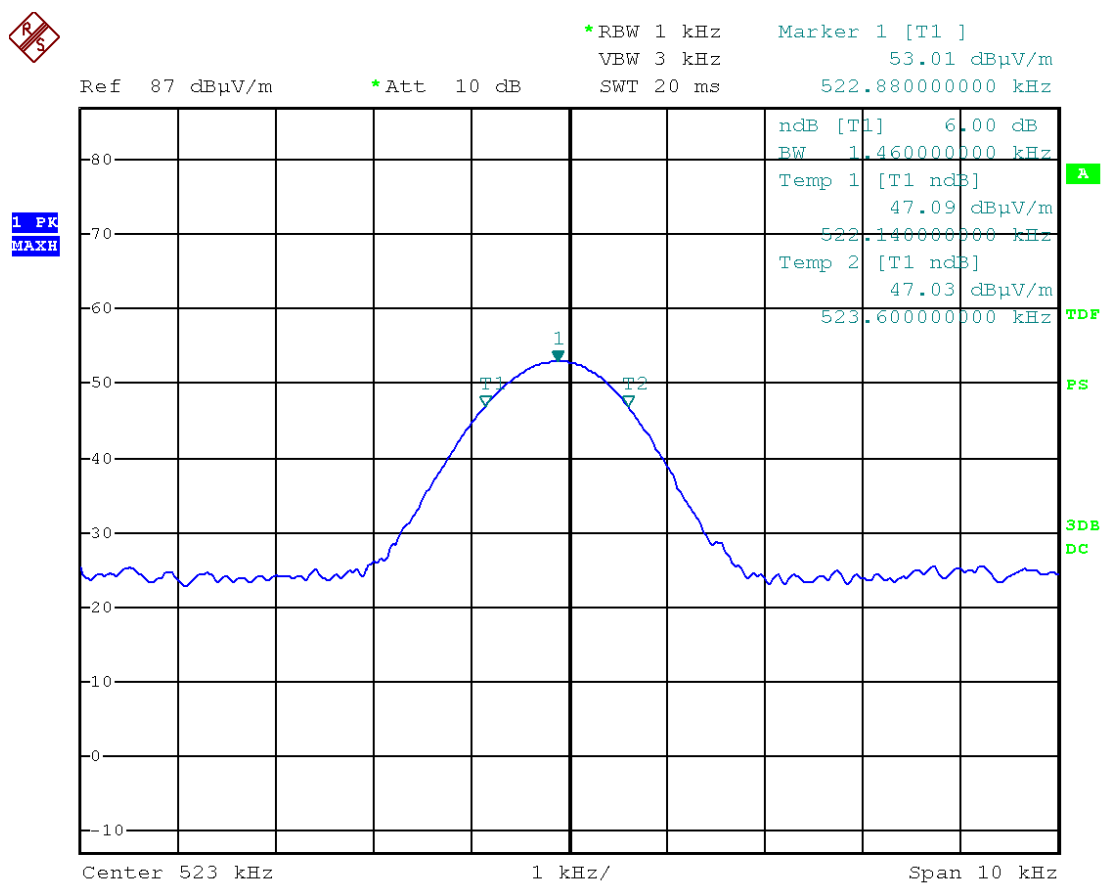
Picture 23: T40FH S11 - Occupied bandwidth (99 %) - 523.0 kHz

Measured occupied bandwidth (99 %) - 523.0 kHz: 3.2200 kHz

-6 dB emission bandwidth

Test procedure

Where indicated, the -6 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 6 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth



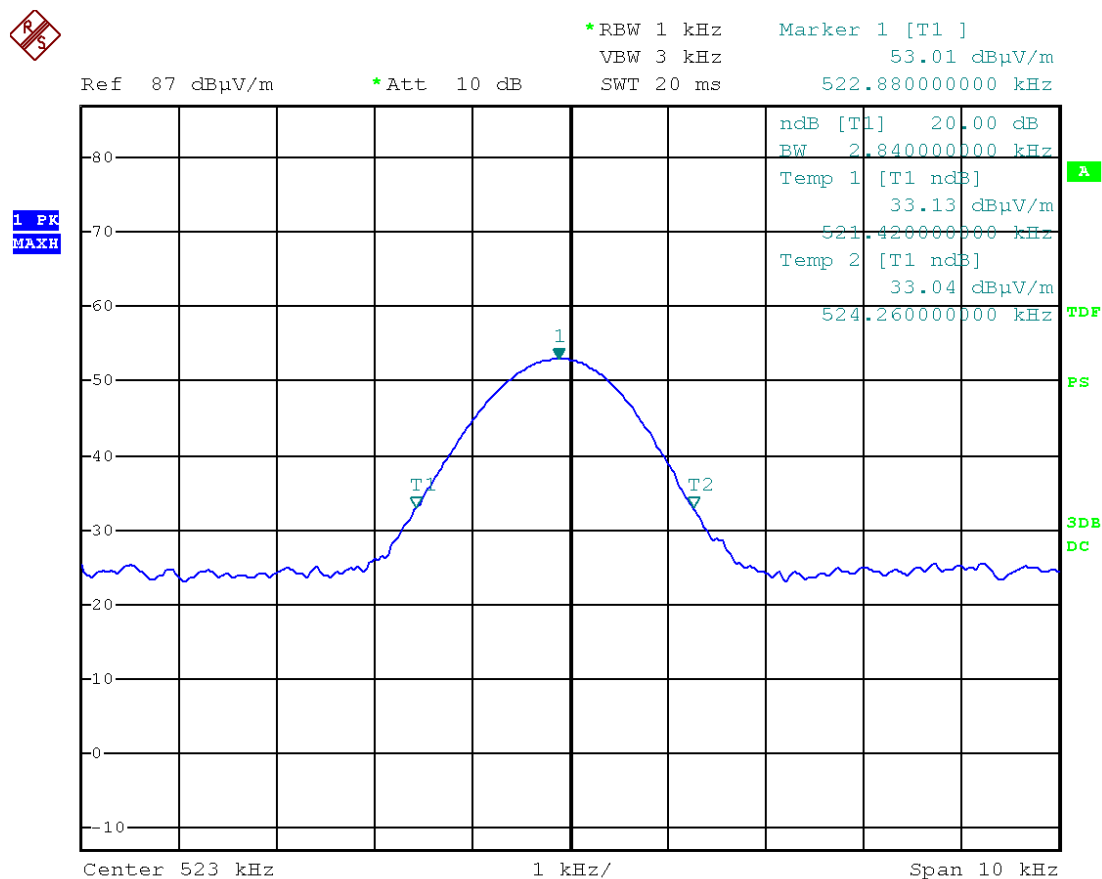
Picture 24: T40FH S11 - -6 dB emission bandwidth - 523.0 kHz

Measured -6 dB emission bandwidth - 523.0 kHz: 1.4600 kHz

-20 dB emission bandwidth

Test procedure

Where indicated, the -20 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 20 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.



Picture 25: T40FH S11 - -20 dB emission bandwidth - 523.0 kHz

Measured -20 dB emission bandwidth - 523.0 kHz: 2.8400 kHz

7 Equipment calibration status

Description	Modell number	Serial number	Inventory number	Last calibration	Next calibration
Test receiver	ESU 26	100026	W00002	2014-02	2016-02
Test receiver	ESCI 3	100013	E00001	2013-12	2015-12
Test receiver	ESCI 3	100328	E00552	2014-07	2016-07
Test receiver	ESCS 30	825442/0002	E00003	2014-02	2016-02
Test receiver	ESCS 30	845552/0008	E00551	2014-01	2016-01
LISN	ESH2-Z5	881362/037	E00004	2015-06	2017-06
Broadband antenna	VULB 9163	9163-114	E00013	2015-09	2017-09
Loop antenna	HFH2-Z2	871398/0050	E00004	2014-07	2016-07
Magnetic field probe	RF-R 400-1	02-1165	E00270	N/A (see note 1)	
Shielded room	P92007	B83117C1109T211	E00107	N/A	
Compact Diagnostic Chamber (CDC)	VK041.0174	D62128-A502-A69-2-0006	E00026	N/A	
Open area test site (OATS)	---	---	E00354	2015-10	2016-10
Climatic chamber 340 I	VC ³ 4034	58566123250010	C00015	2014-09	2016-09

Table 1: Equipment calibration status

Note 1: Used for relative measurements only.

Note 2: Expiry date of measurement facility registration by

- FCC (registration number 221458): 2017-04
- Industry Canada (test site numbers 3472A-1 and 3472A-2): 2018-11



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Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 46 of 49

8 Measurement uncertainty

Description	Max. deviation	k=
Conducted emission AMN (9kHz to 30 MHz)	± 3.8 dB	2
Radiated emission open field (3 m) (30 MHz to 300 MHz) (300MHz to 1 GHz)	± 5.4 dB ± 5.9 dB	2
Radiated emission absorber chamber (> 1000 MHz)	± 4.5 dB	2

Table 2: Measurement uncertainty

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k. For a confidence level of 95 % the coverage factor k is 2.



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Hottinger Baldwin Messtechnik GmbH
Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 47 of 49

9 Summary

The EMC Regulations according to the marked specifications are

☒ **KEPT**

The EUT does fulfill the general approval requirements mentioned.

☐ **NOT KEPT**

The EUT does not fulfill the general approval requirements mentioned.

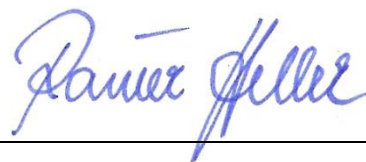
Place, Date: Straubing, December 7th, 2015



Martin Müller

Test engineer

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Hottinger Baldwin Messtechnik GmbH
Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 48 of 49

10 Revision History

Date	Description	Person	Revision
2015-12-07	First edition	M. Müller	- - -

Template used: A_1.0_FCC 15.225_EN_PB.dotx



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Torque meter
T40FH
S10, S11

150866-AU01+W02

Page 49 of 49