InterLab®

Final Report on

Cinterion EHS6T LAN
FCC ID: QIPEHS6T IC: 7830A-EHS6T
HW: Rev. 02
SW: Rev. 03.001

Report Reference:	MDE_GEMALTO_1602_FCCa_rev1 acc. Title 47 CFR chapter I part 15 subpart B, Class B
Date:	June 17, 2016

Test Laboratory:
7layers GmbH
Borsigstraße 11
40880 Ratingen
Germany

DAkkS
Deutsche
Akkreditierungsstelle
D-PL-12140-01-01

Note:
The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

1 Administrative Data

1.1 Project Data

Project Responsible:	Andreas Tübel
Date Of Test Report:	2016/06/13
Date of first test:	2016/04/15
Date of last test:	2016/06/07

1.2 Applicant Data

Company Name:	Gemalto M2M GmbH
Street:	Siemensdamm 50
City:	13629 Berlin
Country:	Germany
Contact Person:	Mr. Thorsten Liebig
Phone:	+49 30 31102 8241
E-Mail:	thorsten.liebig@gemalto.com

1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

7 layers DE

Company Name :	7layers GmbH
Street :	Borsigstrasse 11
City :	40880 Ratingen
Country :	Germany
Contact Person :	Mr. Michael Albert
Phone :	+49 2102 749 201
Fax :	+49 2102 749 444
E Mail :	Michael.Albert@7Layers.com

Laboratory Details

Lab ID	*Identification*	*Responsible*	*Accreditation Info*
Lab 1	Conducted Emissions	Mr. Andreas Petz Mr. Wolfgang Richter	DAkkS-Registration no. D-PL-12140-01-01
Lab 2	Radiated Emissions	Mr. Marco Kullik Mr. Jens Dörwald	DAkkS-Registration no. D-PL-12140-01-01

1.4 Signature of the Testing Responsible

Patrick Lomax
responsible for tests performed in: Lab 1, Lab 2

1.5 Signature of the Accreditation Responsible

B. Retka [B. RETKA]

Accreditation scope responsible person
responsible for Lab 1, Lab 2

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: Cinterion EHS6 Terminal LAN

Type / Model / Family:	Cinterion EHS6T LAN FCC ID: QIPEHS6T IC: 7830A-EHS6T HW: Rev. 02 SW: Rev. 03.001
Product Category:	Fixed Wireless Access Terminal
Manufacturer:	
Company Name:	RAFI GmbH & Co. KG
Street:	Ravensburger Str. 128-134
City:	88276 Berg
Country:	Germany
Contact Person:	Mrs. Natalie Gugenheimer

2.2 Detailed Description of OUT Samples

Sample : bc02

OUT Identifier	Cinterion EHS6 Terminal LAN
Sample Description	Sample #01 for LAN
Serial No.	357042060483667
HW Status	Rev. 02
SW Status	Rev. 03.001
Low Voltage	8 V
High Voltage	57 V
Nominal Voltage	12 V

2.3 OUT Features

Features for OUT: Cinterion EHS6 Terminal LAN

Designation	*Description*	*Allowed Values*	*Supported Value(s)*
Features for scope: FCC_v2			
AC	The OUT is powered by or connected to AC Mains		
Eant	removable antenna supplied and type tested with the radio equipment, designed as an indispensable part of the equipment		
EDGE850	EUT supports EDGE in the band 824 MHz - 849 MHz		
EDGE1900	EUT supports EDGE in the band 1850 MHz - 1910 MHz		
FDD2	EUT supports UMTS FDD2 in the band 1850 MHz - 1910 MHz		
FDD5	EUT supports UMTS FDD5 in the band 824 MHz - 849 MHz		
GSM850	EUT supports GSM850 band 824MHz - 849MHz		
HSUPA-FDD2	EUT supports UMTS FDD2 HSUPA in the band 1850 MHz - 1910 MHz		
HSUPA-FDD5	EUT supports UMTS FDD5 HSUPA in the band 824 MHz - 849 MHz		
PantC	permanent fixed antenna connector, which may be built-in, designed as an indispensable part of the equipment		
PCS1900	EUT supports PCS1900 band 1850MHz - 1910MHz		

2.4 Auxiliary Equipment

AE No.	*Type Designation*	*Serial No.*	*HW Status*	*SW Status*	*Description*
AE AE09					Standard Cables, Serial and LAN
AE AE04	Cherry RS6000	G 0000273 2P28			Keyboard
AE AE02	Fujitsu Siemens 0335C2065	A30638114250			AC Adapter Laptop
AE AE01	Fujitsu Siemens Amilo Pro V3205	YK2H014267			Laptop
AE AE08	FW7555O/12				AC/DC adapter for Terminal
AE AE03	LG Flatron L1740BQ	509WANF1W607			TFT Display
AE AE05	Logitech MBB48	LZC90505478			Mouse
AE AE07	SMARTEQ MiniMag				Exernal cellular antenna
AE AE10	ZyXEL Communication Corporation	S150H05004858			Power on Ethernet adapter

2.5 Operating Mode(s)

Ref.-No.	*Description*
G0850D	GSM data link in 850 band (TCH190) at max. power; active data transfer on LAN and RS232; AC Mains: 120 V / 60 Hz
G1900D	GSM data link in 1900 band (TCH661) at max. power; active data transfer on LAN and RS232; AC Mains: 120 V / 60 Hz
G1900I	GSM idle mode in 1900 band; active data transfer on LAN and RS232; AC Mains: 120 V / 60 Hz
UFDD2	UMTS link in Utra FDD band II (TCH9400) at max. power; active data transfer on LAN and RS232; AC Mains: 120 V / 60 Hz

2.6 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used.
The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

Setup No.	*List of OUT samples*		*List of auxiliary equipment*	
	Sample No.	*Sample Description*	*AE No.*	*AE Description*
S01_BC02_ACDC	**(computer peripheral setup, supplied by auxiliary AC/DC adapter)**			
	Sample: bc02	Sample #01 for LAN	AE AE09	Standard Cables, Serial and LAN
			AE AE04	Keyboard
			AE AE02	AC Adapter Laptop
			AE AE01	Laptop
			AE AE08	AC/DC adapter for Terminal
			AE AE03	TFT Display
			AE AE05	Mouse
			AE AE07	Exernal cellular antenna
S02_BC02_PoE	**(computer peripheral setup, supplied by auxiliary PoE adapter)**			
	Sample: bc02	Sample #01 for LAN	AE AE09	Standard Cables, Serial and LAN
			AE AE04	Keyboard
			AE AE02	AC Adapter Laptop
			AE AE01	Laptop
			AE AE03	TFT Display
			AE AE05	Mouse
			AE AE07	Exernal cellular antenna
			AE AE10	Power on Ethernet adapter

3 Results

3.1 General

Documentation of tested devices:	Available at the test laboratory.
Interpretation of the test results:	The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard. In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation. In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.
Note:	1. Cinterion® EHS6T-LAN contains a Cinterion® EHS6 (FCC ID: QIPEHS6; IC: 7830A-EHS6T) module and implements a LAN interface and also a RS-232 interface with a D-sub 9-pole female socket as well as a 6-pole Western jack as plug-in power supply connector. 2. The environmental conditions are recorded and available in the InterLab system for each performed test.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

Designation	*Description*
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Part 15, Subpart B - Unintentional Radiators

3.3 List of Test Specification

Test Specification:	**FCC part 2 and 15**
Version	ANSI C63.4-2014
Title:	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES

3.4 Summary

Test Case Identifier / Name *Test (condition)*	*Result*	*Date of Test*	*Lab Ref.*	*Setup*
15b.1 Conducted Emissions (AC Power Line) §15.107				
15b.1; Mode = generating a high power consumption	Passed	2016/04/15	Lab 1	S02_BC02_PoE
	operating mode: G1900D tested at auxiliary PoE (power over ethernet) injector which supplies the EUT			
	Passed	2016/04/15	Lab 1	S01_BC02_ACDC
	operating mode: UFDD2 tested at AC/DC adapter of laptop			
	Passed	2016/04/15	Lab 1	S01_BC02_ACDC
	operating mode: G0850D tested at AC/DC adapter of EUT			
15b.2 Spurious Radiated Emissions §15.109				
15b.2; Mode = generating a high power consumption	Passed	2016/06/07	Lab 2	S01_BC02_ACDC
	operating mode: G1900I radiated test 1-10 GHz in fully-anechoic room			
	Passed	2016/04/15	Lab 2	S01_BC02_ACDC
	operating mode: G1900D radiated test 30 MHz - 1 GHz in semi-anechoic chamber			

3.5 Detailed Results

3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107

Test1: 15b.1; Mode = generating a high power consumption

Result:	Passed tested at AC/DC adapter of EUT
Setup No.:	S01_BC02_ACDC
Date of Test:	2016/04/15 11:50
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15

Used Test Parameter:

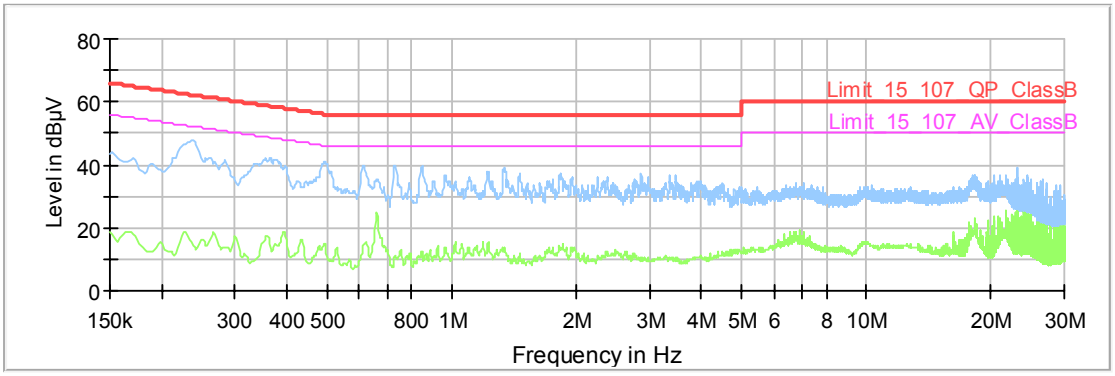
Name	*Value*
Mode	generating a high power consumption

Detailed Results:

Test Report

Common Information

Test Description:	Conducted Emissions 150k-30MHz
Test Standard	FCC 15b
Operating Conditions:	(DE1034013bc02), setup_01, DC-Adapter, GSM850 traffic mode
Operator Name:	URO
Comment:	120 V / 60 Hz, computer peripheral setup, LAN+RS232 traffic



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
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EMI Auto Test Template: FCC15b_15-107_VOLTAGE_ClassB

Hardware Setup:	EMI_Conducted_EN_FCC_ESH3-Z5
Measurement Type:	2 Line LISN
Frequency Range:	150 kHz - 30 MHz
Graphics Level Range:	0 dBµV - 80 dBµV
Preview Measurements:	
Scan Test Template:	FCC_Part107_Pre_ESH3-Z5
Final Measurements:	
Template for Single Meas.:	FCC_Part107_Final_ESH3-Z5

Test2: 15b.1; Mode = generating a high power consumption

Result:	Passed tested at AC/DC adapter of laptop
Setup No.:	S01_BC02_ACDC
Date of Test:	2016/04/15 12:09
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15

Used Test Parameter:

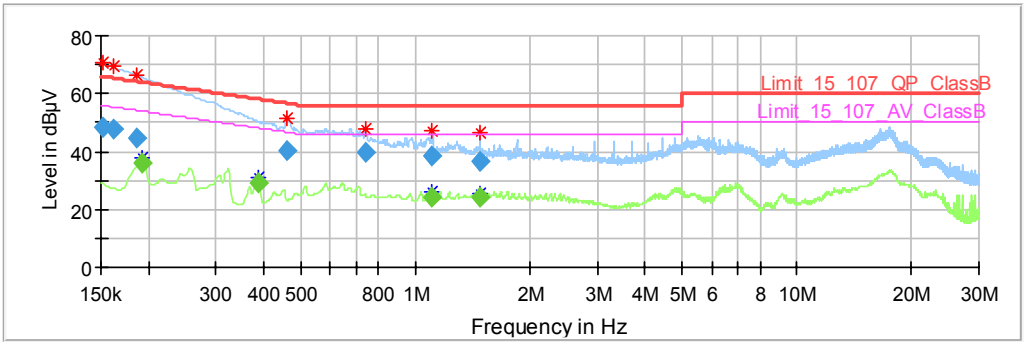
Name	*Value*
Mode	generating a high power consumption

Detailed Results:

Test Report

Common Information

Test Description:	Conducted Emissions 150k-30MHz
Test Standard	FCC 15b
Operating Conditions:	(DE1034013bc02), setup_02, Laptop-Adapter, FDD2 traffic mode
Operator Name:	URO
Comment:	120 V / 60 Hz, computer peripheral setup, LAN+RS232 traffic



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.152250	48.48	---	65.88	17.39	1000.0	9.000	L1	FL	10.1
0.161250	47.54	---	65.40	17.86	1000.0	9.000	L1	FL	10.1
0.186000	44.40	---	64.21	19.82	1000.0	9.000	L1	FL	10.1
0.192750	---	36.17	53.92	17.75	1000.0	9.000	N	FL	10.1
0.388500	---	28.92	48.10	19.17	1000.0	9.000	N	FL	10.1
0.462750	40.57	---	56.64	16.08	1000.0	9.000	L1	FL	10.1
0.737250	39.45	---	56.00	16.55	1000.0	9.000	L1	GND	10.1
1.101750	---	23.97	46.00	22.03	1000.0	9.000	N	FL	10.1
1.108500	38.26	---	56.00	17.74	1000.0	9.000	L1	GND	10.1
1.475250	36.69	---	56.00	19.31	1000.0	9.000	L1	GND	10.1
1.477500	---	24.28	46.00	21.72	1000.0	9.000	L1	GND	10.1

EMI Auto Test Template: FCC15b_15-107_VOLTAGE_ClassB

Hardware Setup:	EMI_Conducted_EN_FCC_ESH3-Z5
Measurement Type:	2 Line LISN
Frequency Range:	150 kHz - 30 MHz
Graphics Level Range:	0 dBµV - 80 dBµV
Preview Measurements:	
Scan Test Template:	FCC_Part107_Pre_ESH3-Z5
Final Measurements:	
Template for Single Meas.:	FCC_Part107_Final_ESH3-Z5

Test1: 15b.1; Mode = generating a high power consumption

Result:	Passed tested at auxiliary PoE (power over ethernet) injector which supplies the EUT
Setup No.:	S02_BC02_PoE
Date of Test:	2016/04/15 12:39
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15

Used Test Parameter:

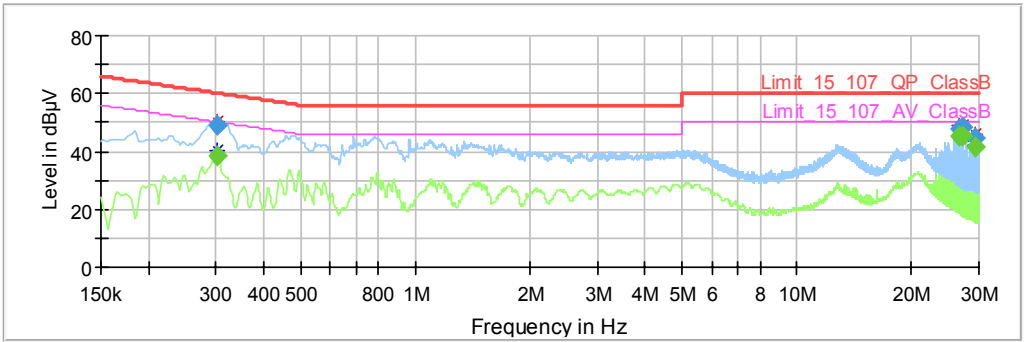
Name	*Value*
Mode	generating a high power consumption

Detailed Results:

Test Report

Common Information

Test Description:	Conducted Emissions 150k-30MHz
Test Standard	FCC 15b
Operating Conditions:	(DE1034013bc02), setup_03, LAN-Adapter_AE10, GSM1900 traffic
Operator Name:	URO
Comment:	120 V / 60 Hz, computer peripheral setup, LAN+RS232 traffic



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.303000	---	38.37	50.16	11.79	1000.0	9.000	L1	GND	10.1
0.303000	48.68	---	60.16	11.48	1000.0	9.000	L1	FL	10.1
26.607750	---	45.10	50.00	4.90	1000.0	9.000	N	GND	11.2
26.607750	48.00	---	60.00	12.00	1000.0	9.000	N	GND	11.2
27.159000	48.20	---	60.00	11.80	1000.0	9.000	N	GND	11.2
27.159000	---	45.27	50.00	4.73	1000.0	9.000	N	GND	11.2
29.235750	---	41.75	50.00	8.25	1000.0	9.000	N	GND	11.3
29.235750	44.87	---	60.00	15.13	1000.0	9.000	N	GND	11.3

EMI Auto Test Template: FCC15b_15-107_VOLTAGE_ClassB

Hardware Setup:	EMI_Conducted_EN_FCC_ESH3-Z5
Measurement Type:	2 Line LISN
Frequency Range:	150 kHz - 30 MHz
Graphics Level Range:	0 dBµV - 80 dBµV
Preview Measurements:	
Scan Test Template:	FCC_Part107_Pre_ESH3-Z5
Final Measurements:	
Template for Single Meas.:	FCC_Part107_Final_ESH3-Z5

3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test1: 15b.2; Mode = generating a high power consumption

Result:	Passed radiated test 30 MHz - 1 GHz in semi-anechoic chamber
Setup No.:	S01_BC02_ACDC
Date of Test:	2016/04/15 18:27
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15

Used Test Parameter:

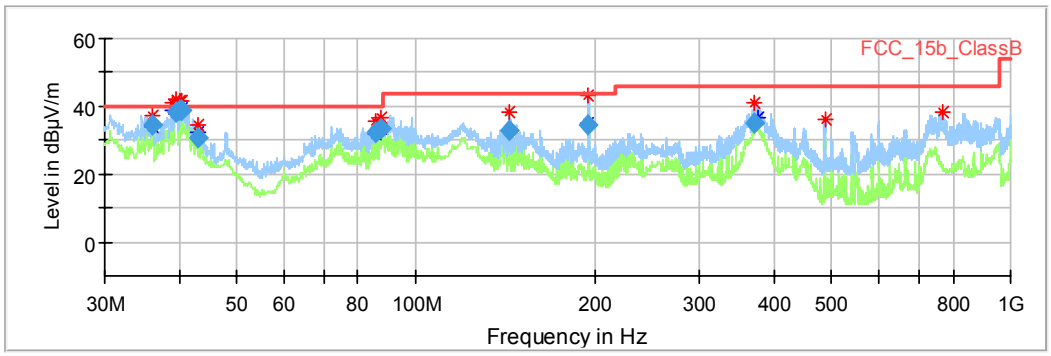
Name	*Value*
Mode	generating a high power consumption

Detailed Results:

Test Report

Common Information

Test Description:	Radiated Emissions 30 MHz - 1 GHz
Test Standard	FCC 15b
Operating Conditions:	(DE1034013bc02), setup_01, DC-Adapter, GSM1900 traffic
Operator Name:	URO
Comment:	120 V / 60 Hz, computer peripheral setup, LAN+RS232 traffic



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Comment
36.150000	34.53	40.00	5.47	1000.0	120.000	106.0	V	-90.0	17:15:35 - 15/04/2016
39.480000	38.55	40.00	1.45	1000.0	120.000	106.0	V	-95.0	17:21:30 - 15/04/2016
40.110000	38.67	40.00	1.33	1000.0	120.000	100.0	V	-45.0	17:24:22 - 15/04/2016
40.350000	39.00	40.00	1.00	1000.0	120.000	102.0	V	-52.0	17:27:18 - 15/04/2016
42.960000	30.67	40.00	9.33	1000.0	120.000	107.0	V	115.0	17:30:24 - 15/04/2016
85.530000	32.44	40.00	7.56	1000.0	120.000	146.0	V	-195.	17:33:38 - 15/04/2016
87.630000	33.53	40.00	6.47	1000.0	120.000	121.0	V	-186.	17:36:30 - 15/04/2016
144.030000	32.75	43.50	10.75	1000.0	120.000	350.0	H	-99.0	17:40:58 - 15/04/2016
194.760000	34.39	43.50	9.11	1000.0	120.000	113.0	V	0.0	17:45:01 - 15/04/2016
371.760000	35.16	46.00	10.84	1000.0	120.000	109.0	H	-195.	17:48:13 - 15/04/2016

EMI Auto Test Template: FCC_15b_ClassB_30M-1G

Hardware Setup:	EN_FCC_FieldStrength_30M-1G_withoutDistanceCorrection_SAC
Measurement Type:	Open-Area-Test-Site
Frequency Range:	30 MHz - 1 GHz
Graphics Level Range:	-10 dBµV/m - 60 dBµV/m
Preview Measurements:	
Scan Test Template:	FCC_15b_3m_PRE
Adjustment:	
Template for Single Meas.:	FCC_15b_3m_ADJUSTMENT
Final Measurements:	
Template for Single Meas.:	FCC_15b_3m_FINAL

test result 30 MHz - 1 GHz in semi-anechoic chamber

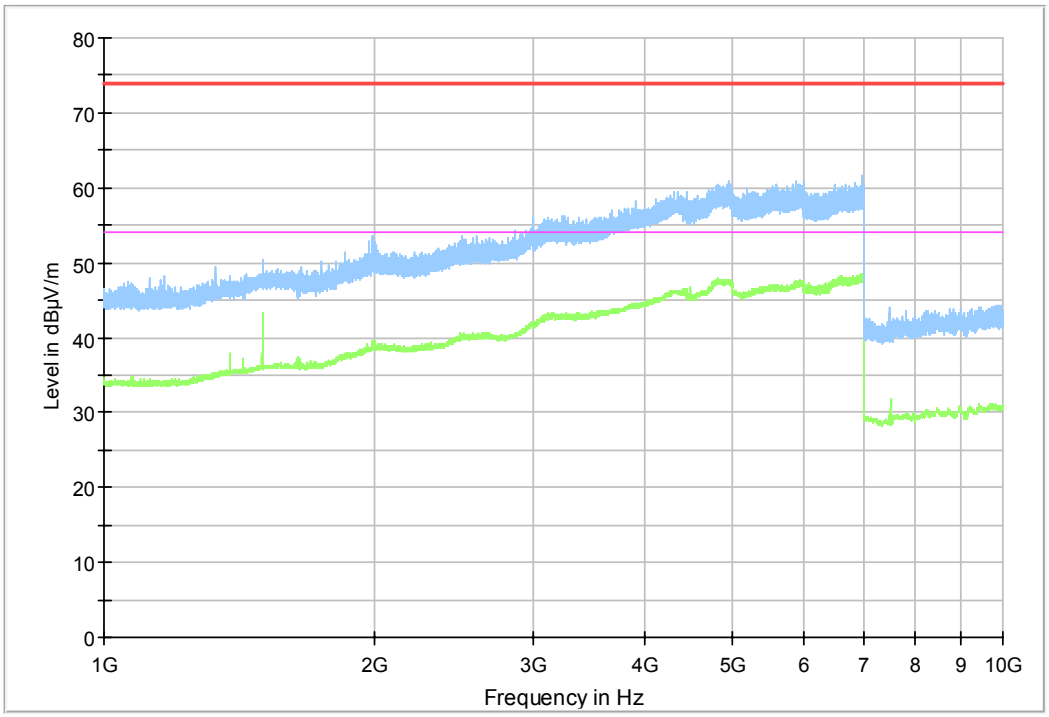
Test1: 15b.2; Mode = generating a high power consumption

Result:	Passed radiated test 1-10 GHz in fully-anechoic room
Setup No.:	S01_BC02_ACDC
Date of Test:	2016/06/07 21:45
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15

Used Test Parameter:

Name	*Value*
Mode	generating a high power consumption

Detailed Results:



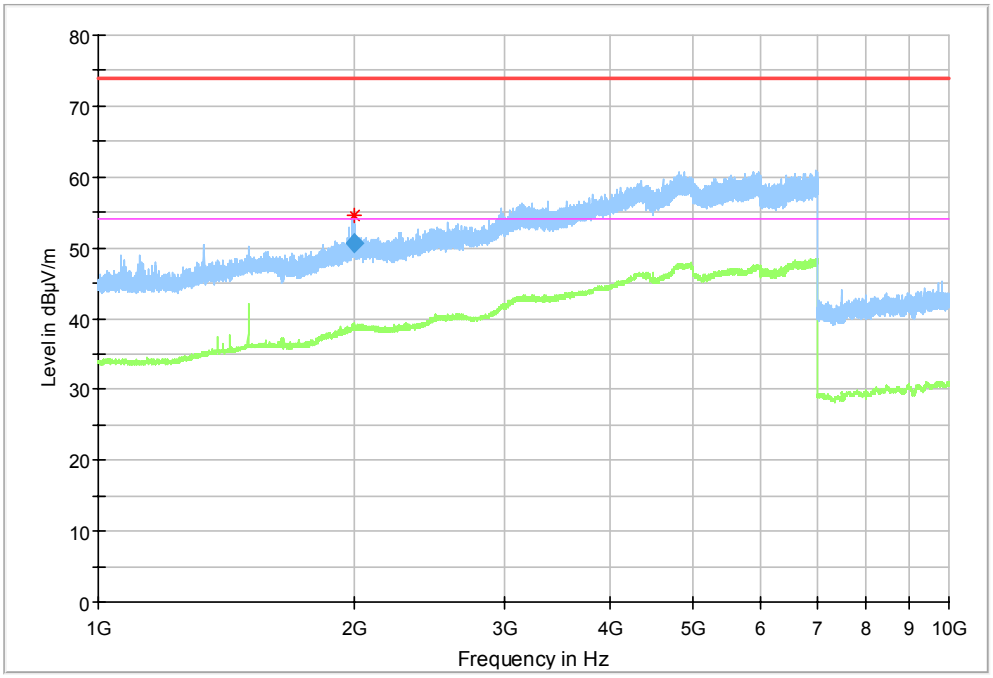
Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
---	---	---	---	---	---	---	---		---	---

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
---	---	---	---	---	---	---	---		---	---

Note: EUT horizontal



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2000.04	54.51	---	74.00	19.49	---	---	150.0	V	-186.0	11.1

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
2000.04	50.53	---	74.00	23.47	1000.0	1000.000	150.0	V	-186.0	11.1

Note: EUT vertical

4 Test Equipment Details

4.1 List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	**Lab 2**
Manufacturer:	Frankonia
Description:	Anechoic Chamber for radiated testing
Type:	10.58x6.38x6.00 m³

Calibration Details	*Last Execution*	*Next Exec.*
NSA (FCC)	2014/01/09	2017/01/09

Single Devices for Anechoic Chamber

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m³	none	Frankonia
	Calibration Details	*Last Execution*	*Next Exec.*
	FCC listing 96716 3m Part15/18	2014/01/09	2017/01/08
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	CE-SYS
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita

Test Equipment Auxiliary Equipment for Conducted emissions

Lab ID:	**Lab 1**
Manufacturer:	Rohde & Schwarz GmbH & Co.KG
Description:	EMI Conducted Auxiliary Equipment

Single Devices for Auxiliary Equipment for Conducted emissions

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber&Suhner	
Impedance Stabilization Network	ISN T800	36159	Teseq GmbH	
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ENY41	100002	Rohde & Schwarz GmbH & Co. KG	
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ST08	36292	Teseq GmbH	
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN T8-Cat6	32187	Teseq GmbH	
One-Line V-Network	ESH 3-Z6	100489	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	standard calibration		2014/06/18	2017/11/30
One-Line V-Network	ESH 3-Z6	100570	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2013/11/25	2016/11/24
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DAkkS Calibration		2015/03/30	2017/03/31
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DAkks Calibration		2015/03/30	2017/03/31

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID:	**Lab 2**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Antenna mast	AM 4.0	AM4.0/180/11920 513	Maturo GmbH	
Biconical Broadband Antenna	SBA 9119	9119-005	Schwarzbeck Mess-Elektronik OHG	
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck Mess-Elektronik OHG	
Broadband Amplifier 1 GHz - 4 GHz	AFS4-01000400-1Q-10P-4	-	Miteq	
Broadband Amplifier 18 GHz - 26 GHz	JS4-18002600-32-5P	849785	Miteq	
Broadband Amplifier 30 MHz - 18 GHz	JS4-00101800-35-5P	896037	Miteq	
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch	
Cable "ESI to Horn Antenna"	SucoFlex	W18.02-2+W38.02-2	HUBER+SUHNER	
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2015/06/23	2018/06/22
Double-ridged horn	HF 907	102444	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2015/05/11	2018/05/10
Double-ridged horn-duplicated 2015-07-15 10:47:55	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	
High Pass Filter	5HC3500/18000-1.2-KK	200035008	Trilithic	
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright	
Horn Antenna Schwarzbeck 15-26.5 GHz BBHA 9170	BBHA 9170	BBHA9170262	Schwarzbeck Mess-Elektronik OHG	
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG	
Log.-per. Antenna (upgraded)	HL 562 Ultralog new biconicals	830547/003	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2015/06/30	2018/06/29
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD Calibration		2014/11/27	2017/11/27

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Standard Gain / Pyramidal Horn Antenna 26.5 GHz	3160-09	00083069	EMCO Elektronik GmbH
Standard Gain / Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	Maturo GmbH

Test Equipment Auxiliary Test Equipment

Lab ID:	**Lab 2**
Manufacturer:	see single devices
Description:	Single Devices for various Test Equipment
Type:	various
Serial Number:	none

Single Devices for Auxiliary Test Equipment

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates	
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates	
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.	
	Calibration Details		*Last Execution*	*Next Exec.*
	DAkkS Calibration		2016/02/04	2018/02/28
Digital Multimeter 13 (Clamp Meter)	Fluke 325	31270091WS	FLUKE	
	Calibration Details		*Last Execution*	*Next Exec.*
	DAkkS-Calibration		2016/02/04	2019/02/28
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis	
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis	
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH	
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright	
Signal Analyzer	FSV30	103005	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2016/02/25	2018/02/24
Spectrum Analyser	FSU26	200418	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2015/10/20	2016/10/19
Spectrum Analyzer	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2015/06/23	2018/06/22
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG	

Test Equipment Digital Signalling Devices

Lab ID:	**Lab 1, Lab 2**
Description:	Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
CMW500	CMW500	107500	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2015/07/13	2017/07/14
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2014/12/02	2017/12/01
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG	
	HW/SW Status		*Date of Start*	*Date of End*
	Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22 Firmware: µP1 8v50 02.05.06 ---		2007/07/16	
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DKD calibration		2014/12/03	2017/12/02
	HW/SW Status		*Date of Start*	*Date of End*
	HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 ---		2007/01/02	
	SW: K62, K69		2008/11/03	
Vector Signal Generator	SMU200A	100912	Rohde & Schwarz GmbH & Co. KG	

Test Equipment Emission measurement devices

Lab ID:	**Lab 1, Lab 2**
Description:	Equipment for emission measurements
Serial Number:	see single devices

Single Devices for Emission measurement devices

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
EMI Receiver / Spectrum Analyzer	ESR 7	101424	Rohde & Schwarz	
	Calibration Details		*Last Execution*	*Next Exec.*
	Initial Factory Calibration		2014/11/13	2016/11/12
Personal Computer	Dell	30304832059	Dell	
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2015/05/11	2016/05/10
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2015/05/11	2016/05/10
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2014/06/24	2017/06/23
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	DAkkS Calibration (DK)		2015/12/09	2017/12/08
	HW/SW Status		*Date of Start*	*Date of End*
	Firmware-Update 4.34.4 from 3.45 during calibration		2009/12/03	
Spectrum Analyzer	FSW 43	103779	Rohde & Schwarz	
	Calibration Details		*Last Execution*	*Next Exec.*
	Initial Factory Calibration		2014/11/17	2016/11/16

Test Equipment Harmonic & Flicker measurement system and AC Source

Lab ID:	**Lab 1**
Manufacturer:	Spitzenberger & Spieß GmbH & Co. KG
Description:	EN61000-3-2&3 test system,source for magnetic field EN61000-4-8
Type:	PHE 1200/B Spitzenberger&Spies
Serial Number:	B6280

Single Devices for Harmonic & Flicker measurement system and AC Source

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Amplifier with integrated variable Oscillator	EP 1200/B, NA/B1	B6278	Spitzenberger & Spieß GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2015/07/23	2018/07/30
Flickermeter / Harmonic Analyzer	B10	M70579	Spitzenberger & Spieß GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2015/07/23	2018/07/30
Line impedance simulation system	1-pase 16A	B6279	Spitzenberger & Spieß GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2015/07/22	2018/07/30

Test Equipment Multimeter 03

Lab ID:	**Lab 2**
Description:	Fluke 177
Serial Number:	86670383

Single Devices for Multimeter 03

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.	
	Calibration Details		*Last Execution*	*Next Exec.*
	DAkkS Calibration		2016/02/04	2018/02/28

Test Equipment Shielded Room 02

Lab ID:	**Lab 1**
Manufacturer:	Frankonia
Description:	Shielded Room for conducted testing
Type:	12 qm
Serial Number:	none

Test Equipment T/A Logger 13

Lab ID:	**Lab 1, Lab 2**
Description:	Lufft Opus10 TPR
Type:	Opus10 TPR
Serial Number:	13936

Single Devices for T/A Logger 13

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ThermoAirpressure Datalogger 13 (Environ)	Opus10 TPR (8253.00)	13936	Lufft Mess- und Regeltechnik GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Customized calibration		2015/02/27	2017/02/26

Test Equipment T/H Logger 02

Lab ID:	**Lab 1**
Description:	Lufft Opus10
Serial Number:	7489

Single Devices for T/H Logger 02

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ThermoHygro Datalogger 02 (Environ)	Opus10 THI (8152.00)	7489	Lufft Mess- und Regeltechnik GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Customized calibration		2015/02/27	2017/02/26

Test Equipment T/H Logger 12

Lab ID:	**Lab 2**
Description:	Lufft Opus10
Serial Number:	12482

Single Devices for T/H Logger 12

Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
ThermoHygro Datalogger 12 (Environ)	Opus10 THI (8152.00)	12482	Lufft Mess- und Regeltechnik GmbH	
	Calibration Details		*Last Execution*	*Next Exec.*
	Customized calibration		2015/03/10	2017/03/09

5 Annex

5.1 Additional Information for Report

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15 Subpart B

The test was performed according to: ANSI C 63.4

Test Description
The test set-up was made in accordance to the general provisions of ANSI C 63.4.
The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration.
The EUT was connected to a 50 µH || 50 Ohm Line Impedance Stabilization Network (LISN), which meets the requirements of ANSI C63.4, Annex B,
in the frequency range of the measurements. The LISN's unused connections were terminated with 50 Ohm loads.
AC Power supply voltage for EUT: 120 V / 60 Hz (if not stated within the measurement plot and/or test result).

The measurement procedure consists of two steps. It is implemented into the EMI test software EMC32 from R&S.

Step 1: Preliminary scan
Intention of this step is, to determine the conducted EMI-profile of the EUT.
EMI receiver settings:
- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 2.5 kHz
- IF–Bandwidth: 9 kHz
- Measuring time / Frequency step: 100 ms (FFT-based)
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement
Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.
EMI receiver settings:
- Detector: Quasi-Peak & (CISPR) Average
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:
1) Neutral lead - reference ground (PE grounded)
2) Phase lead - reference ground (PE grounded)
3) Neutral lead - reference ground (PE floating)
4) Phase lead - reference ground (PE floating)

The highest value is reported.

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.107, Class B Limit

Frequency Range (MHz)	QP Limit (dBµV)	AV Limit (dBµV)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50

FCC Part 15, Subpart B, §15.107, Class A Limit

Frequency Range (MHz)	QP Limit (dBµV)	AV Limit (dBµV)
0.15 - 0.5	79	66
0.5 – 30	73	60

Used conversion factor: Limit (dBµV) = 20 log (Limit (µV)/1µV).

NOTES:
A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.
The chosen operating mode is selected as representative mode to generate "worst-case" conditions, i.e. high power consumption.

Spurious radiated emissions

Standard FCC Part 15, Subpart B

The test was performed according to: ANSI C 63.4

Test Description
Measurement below 1 GHz:
The test set-up was made in accordance to the general provisions of ANSI C 63.4.
The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.
The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software EMC32 from R&S.
The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.
AC Power supply voltage for EUT: 120 V 60 Hz (if not stated within the measurement plot and/or test result).

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)
Intention of this step is, to determine the radiated EMI-profile of the EUT.
Settings for step 1:
- Antenna distance: 3 m
- Detector: Peak-Maxhold / Quasipeak (FFT-based)
- Frequency range: 30 – 1000 MHz
- Frequency steps: 30 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 ms
- Turntable angle range: –180° to +90°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarization: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2:
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.
For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will slowly vary by ± 45° around this value. During this action, the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position, the antenna height will also slowly vary by ± 100 cm around the antenna height determined. During this action, the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
Settings for step 2:
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz

- Measuring time: 100 ms
- Turntable angle range: ± 45° around the determined value
- Height variation range: ± 100 cm around the determined value
- Polarizations: max. value determined in step 1

After this step the EMI test system has determined the following values for each frequency (of step 1):
- Frequency
- Azimuth value (of turntable)
- Antenna height

Step 3: Final measurement (with QP detector)
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

3. Measurement above 1 GHz
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
Step 1:
All steps were performed with one height of the receiving antenna only.
The EUT is turned during the preliminary measurement across the elevation axis, with a step size of 90 °.
The turn table step size (azimuth angle) for the preliminary measurement is 45 °.
Step 2:
Due to the fact, that in this frequency range the test is performed in a fully anechoic room, the height scan of the receiving antenna instep 2 is omitted. Instead of this, a maximum search with a step size ± 45° for the elevation axis is performed.
The turn table azimuth will slowly vary by ± 22.5°.
The elevation angle will slowly vary by ± 45°
EMI receiver settings (for all steps):
- Detector: Peak, Average
- IF Bandwidth = 1 MHz

Step 3:
Spectrum analyser settings for step 3:
- Detector: Peak / (CISPR) Average
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 1 MHz
- Measuring time: 1 s

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

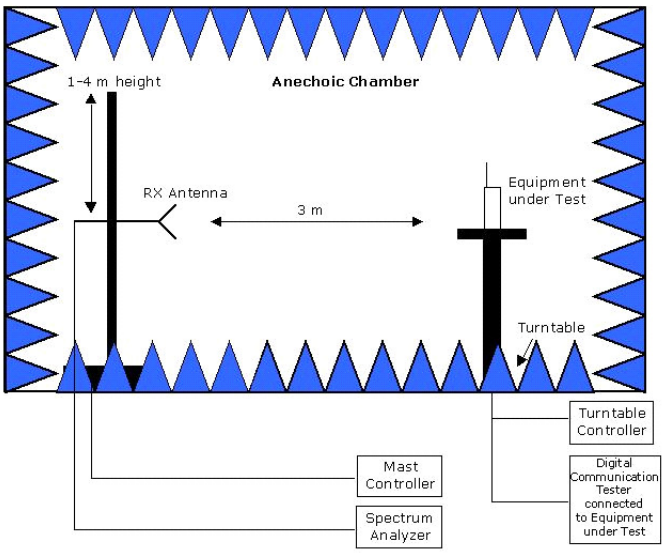
Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

Frequency Range (MHz)	Class A Limit (dBµV/m) / @ 3 m!
30 - 88	49.5
88 - 216	54.0
216 - 960	56.9
above 960	60.0

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....
Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

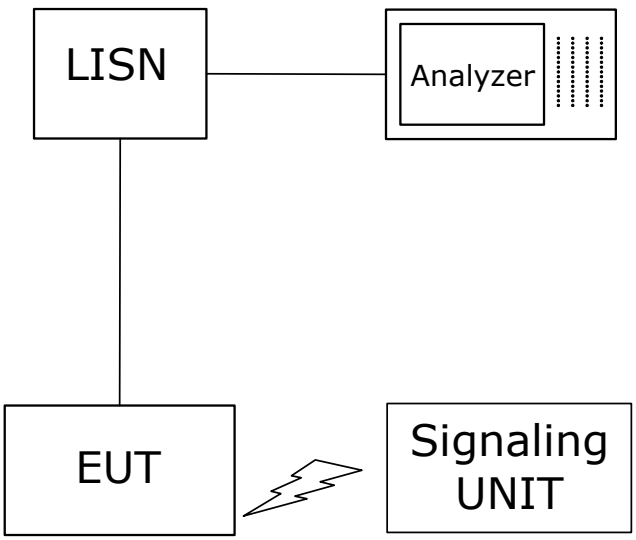
NOTE: A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.



Setup in the shielded room for conducted measurements at AC mains port

Correlation of measurement requirements from FCC and IC

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§15.107	ICES-001 Issue 4 or ICES-003 Issue 6
Radiated Spurious Emissions	§15.109	ICES-001 Issue 4 or ICES-003 Issue 6

Remarks:

1. FCC Part 15 subpart B, ICES 003 and CISPR 22 contain different definitions of Class A and Class B limits, i.e. which class is applicable to which kind of EUT.
   ICES 003 and CISPR 22 distinguish between the location where the EUT is intended to operate whilst FCC refers to the method of commercial distribution (distributive trades).
2. The correct assignment of the appropriate class to the concrete EUT is not scope of this test report!
3. A radio apparatus that is specifically subject to an Industry Canada Radio Standard Specification (RSS) and which contains an ITE is not subject to ICES-003 provided the ITE is used only to enable operation of the radio apparatus and the ITE does not control additional functions or capabilities.
4. ISM (Industrial, Scientific or Medical) radio frequency generators, though they may contain ITE, are excluded from the definition of ITE and are not subject to ICES-003. They are instead subject to the Interference-Causing Equipment Standard ICES-001, which specifically addresses ISM radio frequency generators.
5. The kind of EUT (ITE, ISM, Radio) determines which IC Standard is applicable.

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