



Inter**Lab**[®]

Final Report on

INARI8-3GAN-1 Tablet PC

FCC ID: 2ABVH-INARI81 & 2ABVH-IN020101

IC: 11875A-INARI81

Report Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

Date: April 11, 2014

Test Laboratory:

7Layers AG
Borsigstr. 11
40880 Ratingen
Germany



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.

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1 Administrative Data

1.1 Project Data

Project Responsible: Patrick Lomax
Date Of Test Report: 2014/04/11
Date of first test: 2014/03/17
Date of last test: 2014/03/24

1.2 Applicant Data

Company Name: Aava Mobile
Street: Nahkatehtaankatu 2
Oulu
City: 90130
Country: Finland
Contact Person: Kari Räisänen
Phone: +3588373800
Fax: +49 (0) 2102 749 380
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1.3 Test Laboratory Data

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

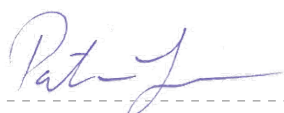
7 layers DE

Company Name : 7 layers AG
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.de

Laboratory Details

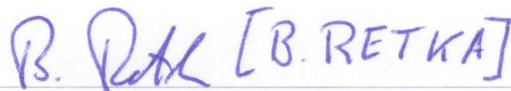
Lab ID	Identification	Responsible	Accreditation Info
Lab 1	Conducted Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAkKS-Registration no. D-PL-12140-01-01
Lab 2	Radiated Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAkKS-Registration no. D-PL-12140-01-01

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]

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: INARI8 Tablet PC

Type / Model / Family: INARI8-3GAN Tablet PC
FCC ID: 2ABVH-INARI81
IC: 11875A-INARI81

Product Category: Mobile Computer

Manufacturer:
Company Name: Please see applicant data

Contact Person: -

Parameter List:

Parameter name	Value
Parameter for Scope FCC_v2:	
AC Power Supply	120V/60Hz AC input to charger
Antenna Gain - Bluetooth Antenna	1.9 (dBi)
highest channel (BT)	2480 (MHz)
lowest channel (BT)	2402 (MHz)
mid channel (BT)	2441 (MHz)

Ancillary Equipment: AC/DC adapter (EU)

Product Category: Computer Accessory

Ancillary Equipment: IN0201-1 Tablet Dock

Type / Model / Family: FCC.ID: 2ABVH-IN020101
IC:11875A-IN020101

Product Category: Computer Accessory

Manufacturer:
Company Name: Please see applicant data

Contact Person: -

Ancillary Equipment: Micro-USB cable

Product Category: Computer Accessory



2.2 Detailed Description of OUT Samples

Sample : AD01

<i>OUT Identifier</i>	INARI8 Tablet PC
<i>Sample Description</i>	RSE #2
<i>Serial No.</i>	IN14060123
<i>HW Status</i>	AB-W, Build: EV2.5
<i>SW Status</i>	Windows 8.1
<i>Date of Receipt</i>	2014/02/24

Parameter List:

<i>Parameter Description</i>	<i>Value</i>
Parameter for Scope FCC_v2	
Antenna Gain	1.9 (dBi)
Channel_BW	1 (MHz)

Sample : ae01

<i>OUT Identifier</i>	INARI8 Tablet PC
<i>Sample Description</i>	RSE #1
<i>Serial No.</i>	IN14060110
<i>HW Status</i>	Pre-Production Sample
<i>SW Status</i>	Windows 8.1
<i>Date of Receipt</i>	2014/02/24

Parameter List:

<i>Parameter Description</i>	<i>Value</i>
Parameter for Scope FCC_v2	
Antenna Gain	1.9 (dBi)
Channel_BW	1 (MHz)

Sample : cdc01

<i>OUT Identifier</i>	AC/DC adapter (EU)
<i>Sample Description</i>	AC adapter
<i>Serial No.</i>	053W3370003
<i>Date of Receipt</i>	2014/02/24



Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

Sample : Dock1

<i>OUT Identifier</i>	IN0201-1 Tablet Dock
<i>Sample Description</i>	Docking station for Tablet
<i>Serial No.</i>	0001
<i>HW Status</i>	Pre-Production Sample

Sample : sb1

<i>OUT Identifier</i>	Micro-USB cable
<i>Sample Description</i>	USB cable
<i>Date of Receipt</i>	2014/02/24

2.3 OUT Features

Features for OUT: INARI8 Tablet PC

<i>Designation</i>	<i>Description</i>	<i>Allowed Values</i>	<i>Supported Value(s)</i>
Features for scope: FCC_v2			
AC	The OUT is powered by or connected to AC Mains		
BT	EUT supports Bluetooth data rate of 1 Mbps with GFSK modulation in the band 2400 MHz - 2483.5 MHz		
BTLE	Support of Bluetooth Low Energy		
EDGE850	EUT supports EDGE in the band 824 MHz - 849 MHz		
EDGE1900	EUT supports EDGE in the band 1850 MHz - 1910 MHz		
EDR2	EUT supports Bluetooth using data rate of 2 Mbps with PI/4 DQPSK modulation in the band 2400 MHz - 2483.5 MHz		
EDR3	EUT supports Bluetooth using data rate of 3 Mbps with 8DPSK modulation in the band 2400 MHz - 2483.5 MHz		
FDD2	EUT supports UMTS FDD2 in the band 1850 MHz - 1910 MHz		
FDD4	EUT supports UMTS FDD4 in the band 1710 MHz - 1755 MHz		
FDD5	EUT supports UMTS FDD5 in the band 824 MHz - 849 MHz		
GSM850	EUT supports GSM850 band 824MHz - 849MHz		
HSDPA-FDD2	EUT supports UMTS FDD2 HSDPA in the band 1850 MHz - 1910 MHz		
HSDPA-FDD4	EUT supports UMTS FDD4 HSDPA in the band 1710 MHz - 1755 MHz		
HSDPA-FDD5	EUT supports UMTS FDD5 HSDPA in the band 824 MHz - 849 MHz		
HSUPA-FDD2	EUT supports UMTS FDD2 HSUPA in the band 1850 MHz - 1910 MHz		
HSUPA-FDD4	EUT supports UMTS FDD4 HSUPA in the band 1710 MHz - 1755 MHz		
HSUPA-FDD5	EUT supports UMTS FDD5 HSUPA in the band 824 MHz - 849 MHz		
Iant	Integral Antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment		
PCS1900	EUT supports PCS1900 band 1850MHz - 1910MHz		
SRD	EUT is a short range device		
TantC	temporary antenna connector, which may be only built-in for testing, designed as an example part of the equipment		
Wa1	EUT supports WLAN in mode a in the band 5150 MHz - 5250 MHz		
Wa2	EUT supports WLAN in mode a in the band 5250 MHz - 5350 MHz		
Wa3	EUT supports WLAN in mode a in the band 5470 MHz - 5725 MHz		
Wa4	EUT supports WLAN in mode a in the band 5725 MHz - 5825 MHz		
Wa5	EUT supports WLAN in mode a in the band 5725 MHz - 5850 MHz		
Wa6	EUT supports WLAN in mode a in the band 5745 MHz - 5805 MHz		

Features for OUT: INARI8 Tablet PC

<i>Designation</i>	<i>Description</i>	<i>Allowed Values</i>	<i>Supported Value(s)</i>
Wa7	EUT supports WLAN in mode a in the band 5180 MHz - 5240 MHz		
Wa8	EUT supports WLAN in mode a in the band 5260 MHz - 5320 MHz		
Wa9	EUT supports WLAN in mode a in the band 5500 MHz - 5600 MHz		
Wa10	EUT supports WLAN in mode a in the band 5650 MHz - 5700 MHz		
Wb	EUT supports WLAN in mode b in the band 2400 MHz - 2483.5 MHz		
Wg	EUT supports WLAN in mode g in the band 2400 MHz - 2483.5 MHz		
WLAN	EUT supports WLAN channels 2412 MHz - 2462 MHz.		

2.4 Auxiliary Equipment

<i>AE No.</i>	<i>Type Designation</i>	<i>Serial No.</i>	<i>HW Status</i>	<i>SW Status</i>	<i>Description</i>
AE 09	E119932-U with 2 fixed mounted				HDMI Cable
AE 02	Fujitsu ADP-80NB A	07Y17323A	120V/60Hz AC		AC Adapter
AE 01	Fujitsu Siemens Lifebook Eseries	DSCK013817		Windows 7 Pro	Laptop RE
AE 03	Logitech M-BT58	HC60915A2XC			Mouse
AE 04	Logitech Ultrax Media Keyboard	ST635J01624			Keyboard
AE 11	Netgear WNDR3300	1TS1847F01363			WLAN access point
AE 05	NXP NFC passive tag				NFC Tag
AE 10	R&M freenet Real 10 S/FTP Cat. 6				LAN Cable ca. 3.2m
AE 08	Samsung AD-3014A		120V/60Hz AC		ACDC Power adapter
AE 07	Samsung S22B350H	0166H4MC40232 8Y			Monitor
AE 06	USB Memory Stick SONY 16 GB				USB Memory Stick

2.5 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

PC_E01 (Computer peripheral setup)

Sample: Dock1	Docking station for Tablet	AE 09	HDMI Cable
Sample: ae01	RSE #1	AE 02	AC Adapter
		AE 01	Laptop RE
		AE 03	Mouse
		AE 04	Keyboard
		AE 11	WLAN access point
		AE 05	NFC Tag
		AE 10	LAN Cable ca. 3.2m
		AE 08	ACDC Power adapter
		AE 07	Monitor
		AE 06	USB Memory Stick

S01_AD01 (AC Charger setup)

Sample: cdc01	AC adapter	AE 06	USB Memory Stick
Sample: sb1	USB cable		
Sample: AD01	RSE #2		

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. This report contains the abbreviated information content pertaining to services rendered. Supporting documentation not included herein is maintained and available at the laboratory.

2. All tests are performed under environmental conditions within the requirements of the specifications. Environmental conditions are available at the laboratory.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

<i>Designation</i>	<i>Description</i>
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Part 15, Subpart B - Unintentional Radiators

3.3 List of Test Specification

<i>Test Specification:</i>	FCC part 2 and 15
<i>Version</i>	10-1-12 Edition
<i>Title:</i>	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES



Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

3.4 Summary

<i>Test Case Identifier / Name</i> <i>Test (condition)</i>	<i>Result</i>	<i>Date of Test</i>	<i>Lab</i> <i>Ref.</i>	<i>Setup</i>
15b.1 Conducted Emissions (AC Power Line) §15.107				
15b.1; Mode = generating a high power consumption	Passed	2014/03/24	Lab 1	S01_AD01
	Passed	2014/03/24	Lab 1	PC_E01
15b.2 Spurious Radiated Emissions §15.109				
15b.2; Mode = generating a high power consumption	Passed	2014/03/18	Lab 2	S01_AD01
	Passed	2014/03/17	Lab 2	PC_E01



Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

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

<i>Result:</i>	Passed
<i>Setup No.:</i>	PC_E01
<i>Date of Test:</i>	2014/03/24 10:53
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

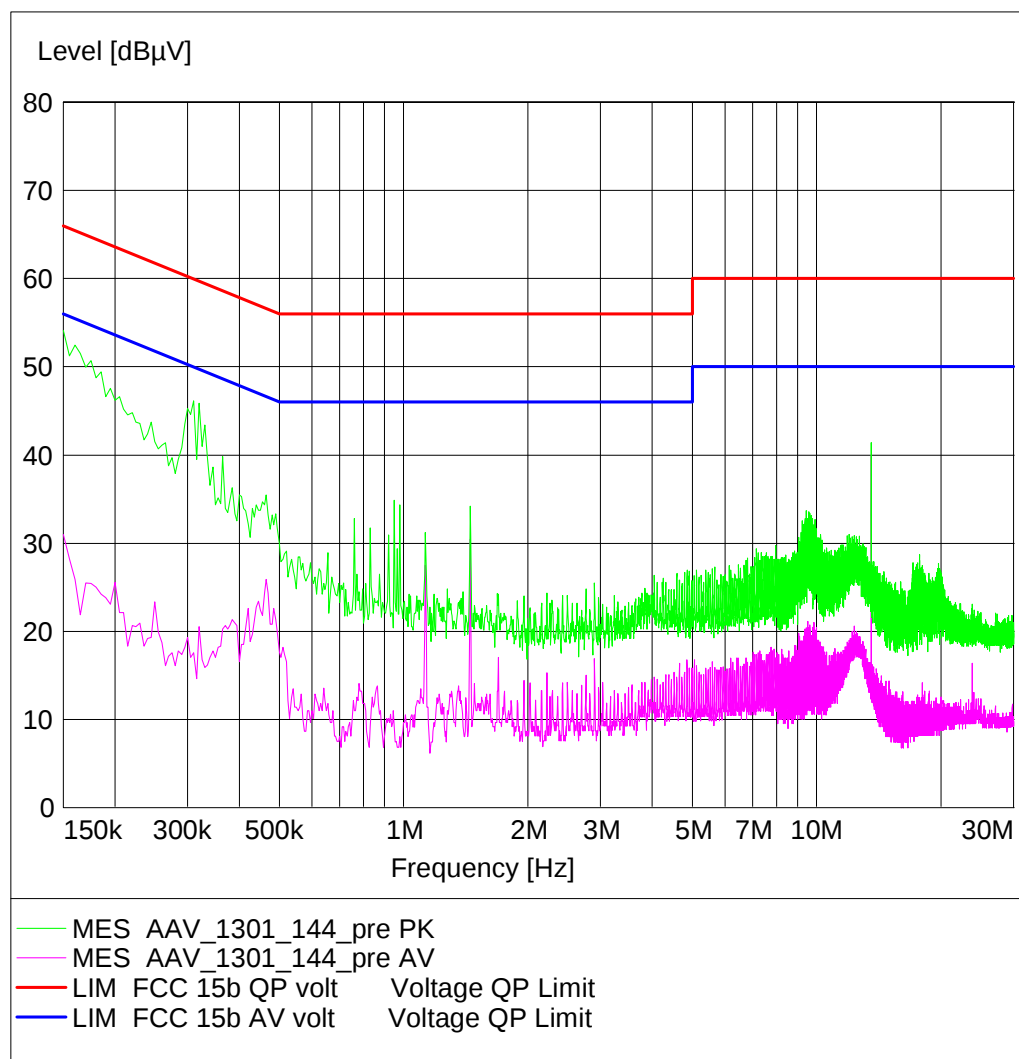
Detailed Results:

AC MAINS CONDUCTED

EUT: (DE1004000ae01+DE1004000dock1)
Manufacturer: AAVAM
Operating Condition: GSM1900 traffic mode / WLANTX / NFC-on / Video / pinging
Test Site: 7 layers Ratingen
Operator: URO
Test Specification: ANSI C63.4; FCC 15.107 / 15.207
Comment: computer peripheral setup, 120V / 60 Hz
Start of Test: 24.03.2014 / 19:13:10

SCAN TABLE: "FCC Voltage"

Short Description:			FCC Voltage			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak Average	20.0 ms	9 kHz	ESH3-Z5





Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

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

<i>Result:</i>	Passed
<i>Setup No.:</i>	S01_AD01
<i>Date of Test:</i>	2014/03/24 11:04
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

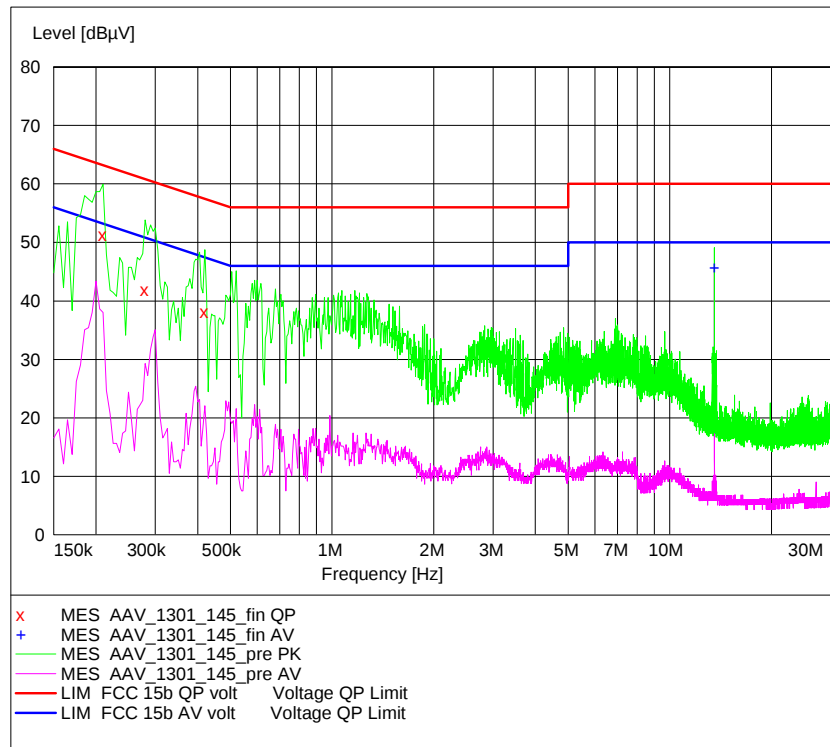
Detailed Results:

AC MAINS CONDUCTED

EUT: (DE1004000ad02+DE1004000acdc03)
Manufacturer: AAVAM
Operating Condition: GSM1900 traffic mode / WLANTX / NFC-on / Video playing from usb
Test Site: 7 layers Ratingen
Operator: URO
Test Specification: ANSI C63.4; FCC 15.107 / 15.207 120V/60HZ AC
Comment: tested with US charger
Start of Test: 24.03.2014 / 19:29:43

SCAN TABLE: "FCC Voltage"

Short Description:	FCC Voltage	Meas.	IF	Transducer
Start Stop Step	Detector	Time	Bandw.	
Frequency Frequency Width				
150.0 kHz 30.0 MHz 5.0 kHz	MaxPeak	20.0 ms	9 kHz	ESH3-Z5
	Average			



MEASUREMENT RESULT: "AAV_1301_145_fin QP"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.210000	51.30	10.1	63	11.9	L1	FLO
0.280000	42.00	10.1	61	18.8	N	FLO
0.420000	38.20	10.1	57	19.2	N	FLO

MEASUREMENT RESULT: "AAV_1301_145_fin AV"

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
13.560000	45.70	10.7	50	4.3	L1	FLO



Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

3.5.2 15b.2 Spurious Radiated Emissions §15.109

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

<i>Result:</i>	Passed
<i>Setup No.:</i>	PC_E01
<i>Date of Test:</i>	2014/03/17 11:03
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

Detailed Results:

EMI RADIATED TEST

EUT: (DE1004000ae01+DE1004000ums1+DE1004000hs1+DE1004000acdc07+DE1004000mse1+DE1004000keyb1+DE1004000dock1+DE1004000lan1+DE1004000hdm1)

Manufacturer: AAVAM

Operating Condition: GSM 1900 traffic + NFC TX, 120 V/ 60 Hz, video playing, network traffic, Headset connected

Test Site: 7 layers, Ratingen

Operator: URO

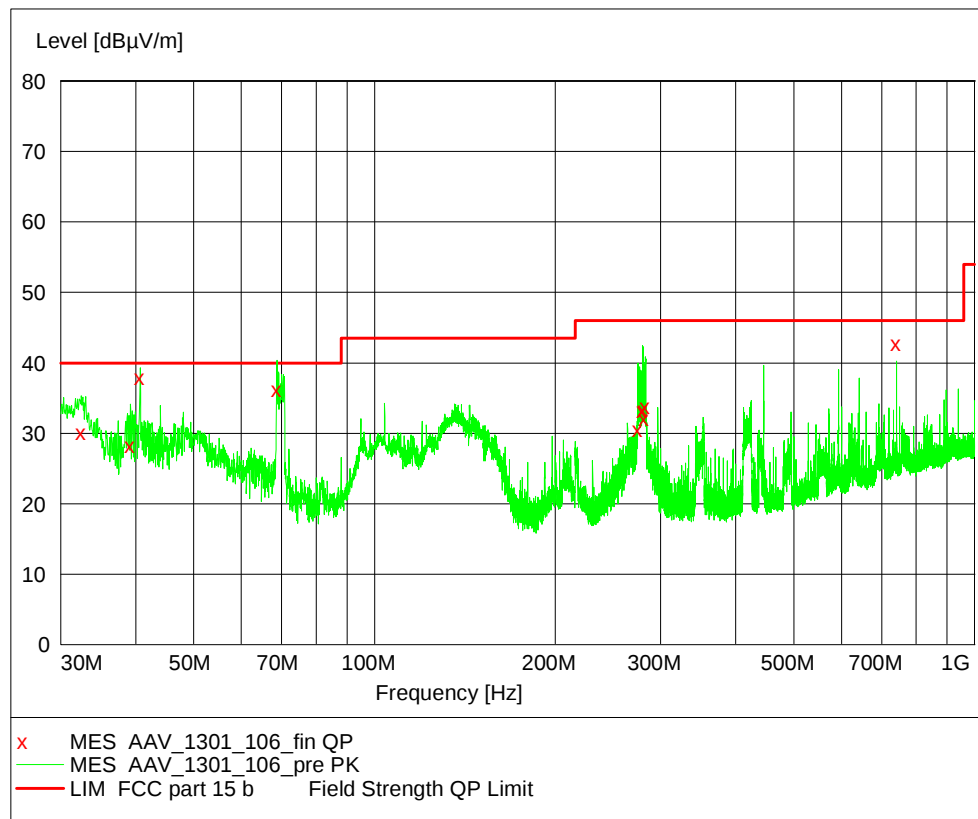
Test Specification: FCC part 15 b

Comment: Horizontal EUT position, comp. peri., video playback, ping, zwei

Start of Test: 17.03.2014 / 18:18:57

SCAN TABLE: "FCC part 15 b"

Short Description:		FCC part 15 b					
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
Frequency	Frequency	Width					
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	1.0 ms	120 kHz	HL562	



MEASUREMENT RESULT: "AAV_1301_106_fin QP"

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
32.460000	30.20	19.2	40.0	9.8	101.0	158.00	VERTICAL
39.180000	28.20	15.4	40.0	11.8	100.0	292.00	VERTICAL
40.680000	37.90	14.6	40.0	2.1	100.0	292.00	VERTICAL
68.760000	36.20	7.5	40.0	3.8	112.0	93.00	VERTICAL
274.920000	30.60	12.2	46.0	15.4	108.0	292.00	HORIZONTAL
279.840000	33.20	12.3	46.0	12.8	109.0	0.00	HORIZONTAL
280.680000	33.40	12.4	46.0	12.6	100.0	0.00	HORIZONTAL
281.520000	32.10	12.4	46.0	13.9	100.0	359.00	HORIZONTAL
283.020000	33.80	12.4	46.0	12.2	100.0	6.00	HORIZONTAL
741.720000	42.80	22.5	46.0	3.2	113.0	202.00	VERTICAL



Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

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

<i>Result:</i>	Passed
<i>Setup No.:</i>	S01_AD01
<i>Date of Test:</i>	2014/03/18 11:12
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

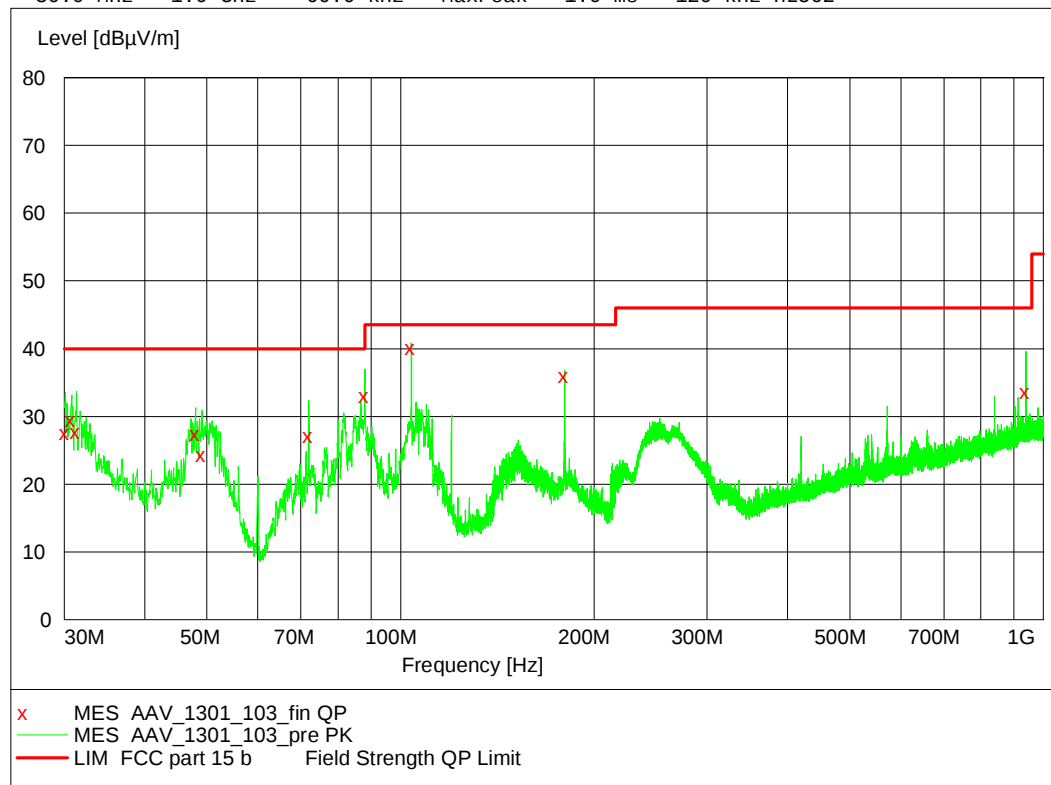
Detailed Results:

EMI RADIATED TEST

EUT: (DE1004000ad02+DE1004000ums1+DE1004000acdc03+DE1004000usb1+DE1004000hs1)
Manufacturer: AAVAM
Operating Condition: GSM 1900 traffic+ NFC 1375 bytes, 120 V/60 Hz video playing from USB,
BT/WLAN in Idle mode
Test Site: 7 layers, Ratingen
Operator: Mit
Test Specification: FCC part 15 b rad
Comment: Horizontal EUT position, video playback
Start of Test: 17.03.2014 / 12:05:11

SCAN TABLE: "FCC part 15 b"

Short Description: FCC part 15 b
Start Stop Step Detector Meas. IF Transducer
Frequency Frequency Width Time Bandw.
30.0 MHz 1.0 GHz 60.0 kHz MaxPeak 1.0 ms 120 kHz HL562



MEASUREMENT RESULT: "AAV_1301_103_fin QP"

17.03.2014 12:56

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarisation
30.120000	27.60	20.4	40.0	12.4	117.0	247.00	VERTICAL
30.780000	29.50	20.2	40.0	10.5	101.0	0.00	VERTICAL
31.320000	27.70	19.9	40.0	12.3	101.0	247.00	VERTICAL
48.000000	27.40	10.1	40.0	12.6	101.0	247.00	VERTICAL
49.080000	24.40	9.4	40.0	15.6	101.0	293.00	VERTICAL
72.000000	27.20	8.4	40.0	12.8	118.0	112.00	VERTICAL
87.960000	33.10	9.9	40.0	6.9	125.0	22.00	VERTICAL
103.980000	40.10	10.8	43.5	3.4	100.0	157.00	VERTICAL
180.000000	36.00	8.6	43.5	7.5	125.0	22.00	VERTICAL
939.960000	33.60	24.5	46.0	12.4	107.0	67.00	HORIZONTAL

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 m ³		
	<i>Calibration Details</i>	<i>Last Execution</i>	<i>Next Exec.</i>
	NSA (FCC)	2014/01/09	2017/01/09

Single Devices for Anechoic Chamber

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³	none	Frankonia
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	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		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2014/02/06	2016/02/28
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ENY41	100002	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration			2013/03/01	2015/03/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ST08	36292	Teseq GmbH		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration			2014/01/10	2016/01/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN T8-Cat6	32187	Teseq GmbH		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2014/01/08	2016/01/31
One-Line V-Network	ESH 3-Z6	100489	Rohde & Schwarz GmbH & Co. KG		
One-Line V-Network	ESH 3-Z6	100570	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2013/11/25	2016/11/24
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standart Calibration			2013/03/01	2015/02/28
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2013/03/01	2015/02/28

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
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard Calibration			2009/06/04 2014/06/03
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard Calibration			2012/01/18 2015/01/17
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq
Broadband Amplifier 30MHz-18GHz	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"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard Calibration			2012/05/18 2015/05/17
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard Calibration			2012/06/26 2015/06/25
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright
Horn Antenna Schwarzbeck 15-26 GHz BBHA 9170	BBHA 9170		
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard Calibration			2012/12/18 2015/12/17
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard calibration			2011/10/27 2014/10/26

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	Type	Serial Number	Manufacturer
Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH
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.
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Customized calibration	2013/12/04 2015/12/03
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
Spectrum Analyser	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Standard	2012/06/13 2015/06/12
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

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

Single Device Name	Type	Serial Number	Manufacturer	
Bluetooth Signalling Unit CBT	CBT	100589	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		Last Execution	Next Exec.
	Standard calibration		2011/11/24	2014/11/23
CMW500	CMW500	107500	Rohde & Schwarz GmbH & Co.KG	
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		Last Execution	Next Exec.
	Standard calibration		2011/11/28	2014/11/27
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.
	Standard calibration		2011/12/07	2014/12/06
	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
Personal Computer	Dell	30304832059	Dell
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Standard calibration	2013/05/03 2014/05/02
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Standard calibration	2013/04/30 2014/04/29
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		standard calibration	2011/05/12 2014/05/11
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Standard Calibration	2014/01/07 2016/01/31
		<i>HW/SW Status</i>	<i>Date of Start Date of End</i>
		Firmware-Update 4.34.4 from 3.45 during calibration	2009/12/03

Test Equipment Shielded Room 02

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



Reference: MDE_AAVAM_1301_FCCc
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

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, 2009

Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.
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 powered from 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN) which meets the requirements of ANSI C63.4-2009, Annex B, in the frequency range of the measurements. The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 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: 5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- 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
- 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 (dB μ V)	AV Limit (dB μ V)
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, 2009

Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.
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 ES-K1 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.

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:

- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180° to +180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: 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:

A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

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: –180° to +180°

- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

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

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

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 be slowly varied by +/- 22.5° 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 is also slowly varied by +/- 25 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.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: -22.5° to +22.5° around the determined value
- Height variation range: -0.25 m to +0.25 m around the determined value

Step 4: 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 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.

Detector: Peak, Average (simultaneously)

RBW = VBW = 1 MHz; above 7 GHz 100 kHz

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)

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) / @ 3m !
30 - 88	49.5
88 - 216	54.0
216 - 960	56.9
above 960	60.0

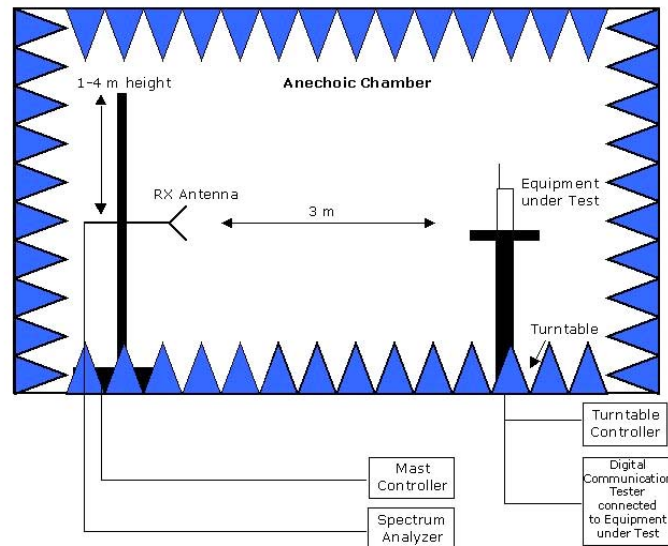
§15.35(b)

..., 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: $\text{Limit (dB}\mu\text{V/m)} = 20 \log (\text{Limit } (\mu\text{V/m})/1\mu\text{V/m})$

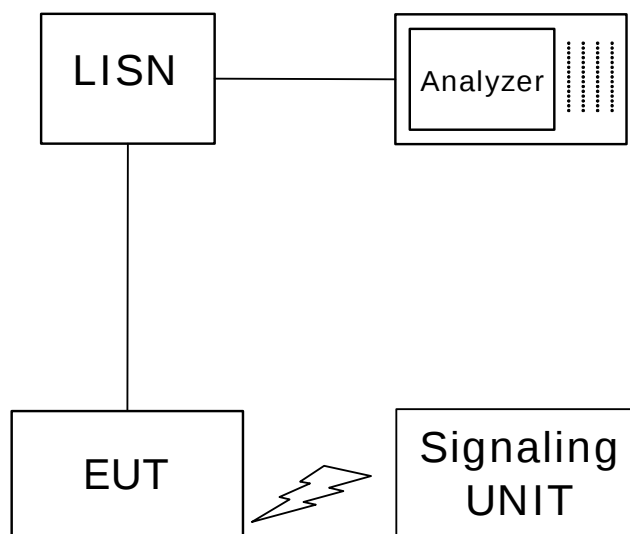
NOTE: A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

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 5 or RSS- Gen Issue 3
Radiated Spurious Emissions	§15.109	ICES-001 Issue 4 or ICES-003 Issue 5 or RSS- Gen Issue 3

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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