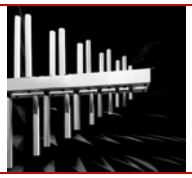
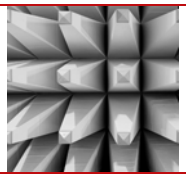




CETECOM™
CETECOM ICT Services
consulting - testing - certification

TEST REPORT

Test Report No.: 1-3296-01-02/11

DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-01

Testing Laboratory

CETECOM ICT Services GmbH
Untertürkheimer Straße 6 – 10
66117 Saarbrücken/Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom.com
e-mail: ict@cetecom.com

Accredited Test Laboratory:
The test laboratory is accredited according to:
DIN EN ISO/IEC 17025
DAkkS registration number: D-PL-12076-01-01

The area of testing is recognized by the FCC and IC.
Anechoic chamber registration no.: 90462 (FCC)
Anechoic chamber registration no.: 3462C-1 (IC)
Certification ID: DE 0001 (FCC)
Accreditation ID: DE 0002 (IC)

Applicant

Sagemcom
250, route de l Empereur
92848 Rueil-Malmaison cedex/FRANCE
Phone: +33 15 76 10
Contact: Bruno Pellet
e-mail: bruno.pellet@sagemcom.com

Manufacturer

Same as Applicant

Test Standard/s

47CFR15	2009-10	Subpart B - Unintentional Radiators
ICES-003, Issue 4	2004-02	Interference-Causing Equipment Standard Digital Apparatus

Test Item

Kind of test item:	**WiMax System**
Model name:	**SE681**
FCC ID:	TVU-SE681
S/N serial number:	A5B00101007530
HW hardware status:	unknown
SW software status:	unknown
Power Supply:	AC 115 V / 60 Hz

This test report is electronically signed and valid without handwritten signature. The public keys can be requested at the test laboratory to verify the electronic signatures.

Test performed:

cn=Joerg Langer, o=CETECOM ICT,
ou=LAN-100216,
email=joerg.langer@ict.cetecom.de, c=DE
2011.07.15 13:25:37 +02'00'

Jörg Langer

Test Report authorised:

DN: cn=Uli Kraus, o=CETECOM ICT, ou=KRA-100118,
email=uli.kraus@ict.cetecom.de, c=DE
Datum: 2011.07.15 13:58:44 +02'00'

Uli Kraus

DIN EN ISO/IEC 17025 CETECOM Accredited EMC Laboratory CETECOM ICT Services GmbH Untertürkheimer Str. 6-10 DE-66117 Saarbrücken DGA-PL-176-/94-D1

1 Table of contents

2 General information

2.1 Notes

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM ICT Services GmbH.

2.2 Application details

Date of receipt of order:	2011-04-11
Date of receipt of test item:	2011-07-12
Start of test:	2011-07-12
End of test:	2011-07-13
Person(s) present during the test:	---

3 Test standard/s:

Test Standard	Version	Test Standard Description
47CFR15	2009-10	Subpart B - Unintentional Radiators
ICES-003, Issue 4	2004-022	Interference-Causing Equipment Standard Digital Aparatus

4 Test Environment

Temperature:	20°C – 25°C
Relative humidity content:	30 % - 50 %
Air pressure:	1020 hPa
Power supply:	230 V / 50 Hz

5 Test Laboratories sub-contracted

---

6 Information about Test Conditions

6.1 Test Item

Kind of test item :	**WiMax System**		
Type identification :	**SE681**		
Equipment classification:	Equipment for fixed use		
Environment classification:	Residential, commercial and light industry		
Supply voltage :	AC 115 V/ 60 Hz		
Ports : **(maximum cable lengths declared by manufacturer)**	**Description**	**Direction**	**Length**
	AC power port	Input	> 3m
	Ethernet port	In / output	> 3m
Is mounting position / usual operating position defined?			tabletop
Additional information:			
The device contains radio parts (FCC ID: TVU-SX682) which are not part of this test			

6.2 EUT: Type, S/N etc. and Short Descriptions Used in this Test Report

short descrip-tion*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	WiMax System	SE681	A5B00101007530	unknown	unknown
EUT B	Switching power supply	S018BU0700180	A002	unknown	unknown

*) EUT short description is used to simplify the identification of the EUT in this test report.

6.3 Auxiliary Equipment (AE): Type, S/N etc. and Short Descriptions

AE descrip -tion*)	Auxiliary equipment	Type	S/N serial number	HW hardware status	SW software status
AE A	Notebook	Sony Personal Computer PCG-382	28206051 5002204	C3LPH13M	Microsoft Windows Vista Home Premium
AE B	Ethernet switch	Pro Curve switch 408	CN643RAoSD	- / -	- / -
AE C	Ethernet switch	POE FS108P	1DL16B330081E	- / -	- / -

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

6.1 set-up(s)

EUT set-up no.*)	Combination of EUT and AE	Remarks
Set. 1	EUT A+ EUT B + AE A + AE C	Test setup of conducted emission on mains
Set. 2	EUT A+ EUT B + AE A + AE B	Test setup of radiated emission

6.2 EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional information
op. 1	Data transfer	Data transfer 100 MBit/s and antenna port terminated with load

*) EUT operating mode no. is used to simplify the test report.

7 Summary of Test Results

☒ No deviations from the technical specifications were ascertained
☐ There were deviations from the technical specifications ascertained

7.1 Emission

7.1.1 Enclosure

EMI Phenomenon	Frequency range	Basic standard	Result
Radiated Interference Field Strength	30 - 1000 MHz	FCC Part 15 Class B	passed
Radiated Interference Field Strength	> 1 GHz	FCC Part 15 Class B	passed

7.1.2 AC Mains Power Input/Output Ports

EMI Phenomenon	Frequency range	Basic standard	Result
Conducted interference voltage	0,15– 30 MHz	FCC Part 15 Class B	passed

Remarks:

NA1	Not tested because not required by used standard
NA2	Test not applicable because port does not exists
NA3	Test not applicable because port only for services
NA4	Test not applicable because port lengths not longer than 3m
NA5	Not tested because not required by customer
NA6	Not tested because used frequency < 108 MHz

7.2 Measurement and Test Set-up

Note: The test configuration is in accordance with the requirements given in the standards in point 3

7.3 Measurement uncertainty

The uncertainty of the measurement equipment fulfils CISPR 16 and the related European and national standards.

The semi anechoic chamber fulfils the requirements of CISPR 16-1 (ANSI C63.4) for a test volume of 3m ∅.

Measurement uncertainty calculations are on file and available from the test laboratory upon request.

8 Detailed test results - Emission

8.1 Conducted Emission

8.1.1 Instrumentation for Test (see equipment list)

G 1	G 2	F 21									

8.1.2 Test Plan

EUT set-up	Set.1		
Operating mode	**Port / Line**	**Limit**	**Result**
Op.1	AC power line	FCC part 15 B Class B	passed

Remark :	Powered by external power supply (115V / 60Hz)

8.1.3 Conducted Limits (Power-Line)

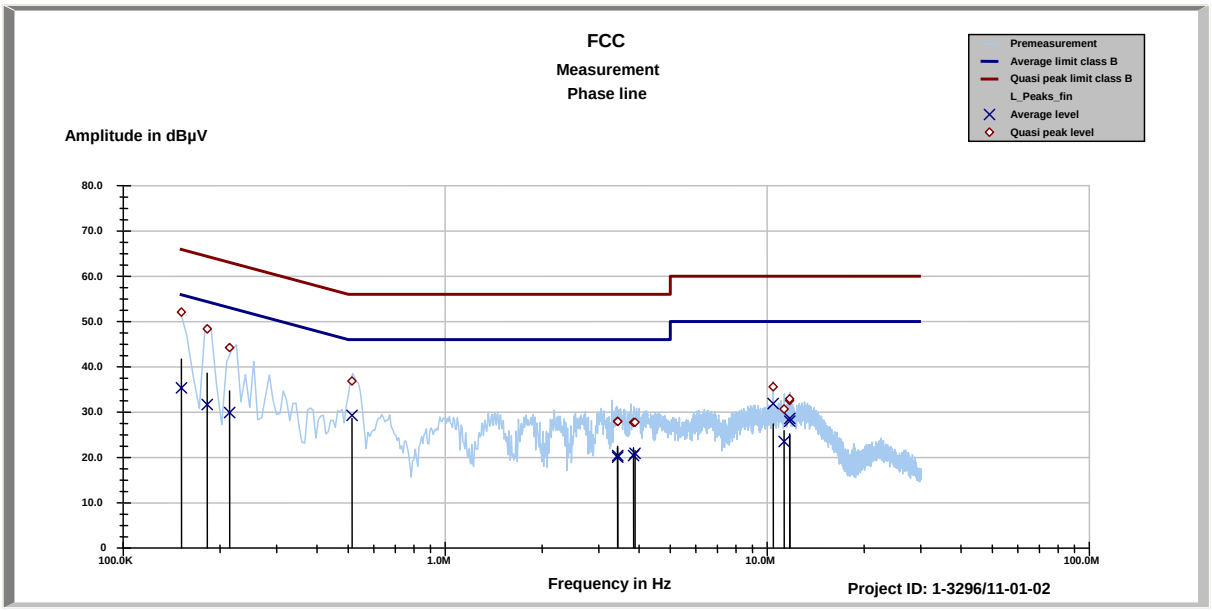
	FCC part 15 B Class B		**FCC part 15 B Class A**	
Frequency- range	Quasi-Peak (dBµV)	Average (dBµV)	Quasi-Peak (dBµV)	Average (dBµV)
0,15 MHz – 0,5 MHz	66-56	56-46	79	66
0,5 MHz -5 MHz	56	46	73	60
5 MHz -30 MHz	60	50	73	60

8.1.4 Calibration Information

Device	**Serial number**	**ICT Number**	**Calibration valid until**	**Calibration interval**
HP 8542 EMI Receiver with RF Filter Unit	3617A00170	300000568	01 / 2012	12 month
VISN ESH 3-Z5	892475/017	300002209	01 / 2012	24 month

Remarks: All emission components and the shielded room were checked weekly
Cable loss: 0.6 to 2.4 dB (150kHz to 30 MHz)

8.1.5 Test Results of Main

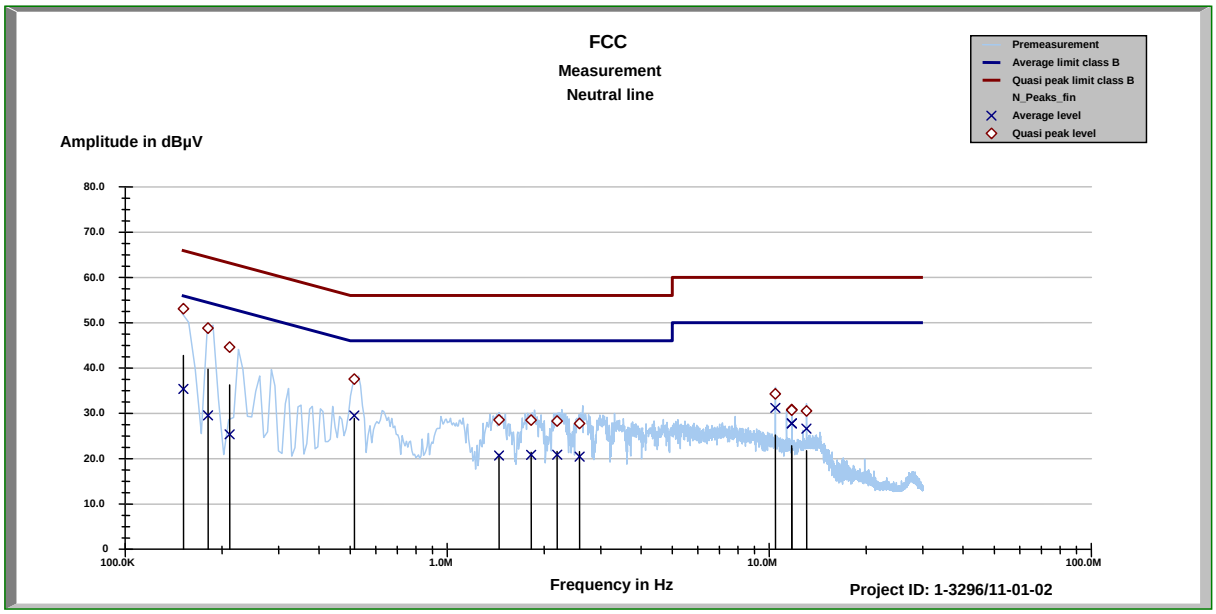


FCC
Phase line tbl
Project ID: 1-3296/11-01-02

05:54:47 PM, Tuesday, July 12, 2011

Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15168	52.07	13.84	35.35	20.60
0.18244	48.35	16.02	31.68	23.39
0.21409	44.26	18.78	29.90	24.27
0.5137	36.87	19.13	29.28	16.72
3.4301	27.97	28.03	20.05	25.95
3.4334	27.93	28.07	20.42	25.58
3.8447	27.72	28.28	20.43	25.57
3.8838	27.76	28.24	20.88	25.12
10.4312	35.60	24.40	31.87	18.13
11.2751	30.67	29.33	23.52	26.48
11.734	32.59	27.41	28.01	21.99
11.7373	32.93	27.07	28.60	21.40

Project ID - 1-3296/11-01-02
EUT - Sagemcom SE681 + S018BU0700180
Serial Number - S308A5B00101007530 + A007
Operating mode - Data traffic 100MBit/, Wi-max terminated (50 Ohm)



FCC
Neutral line tbl
Project ID: 1-3296/11-01-02

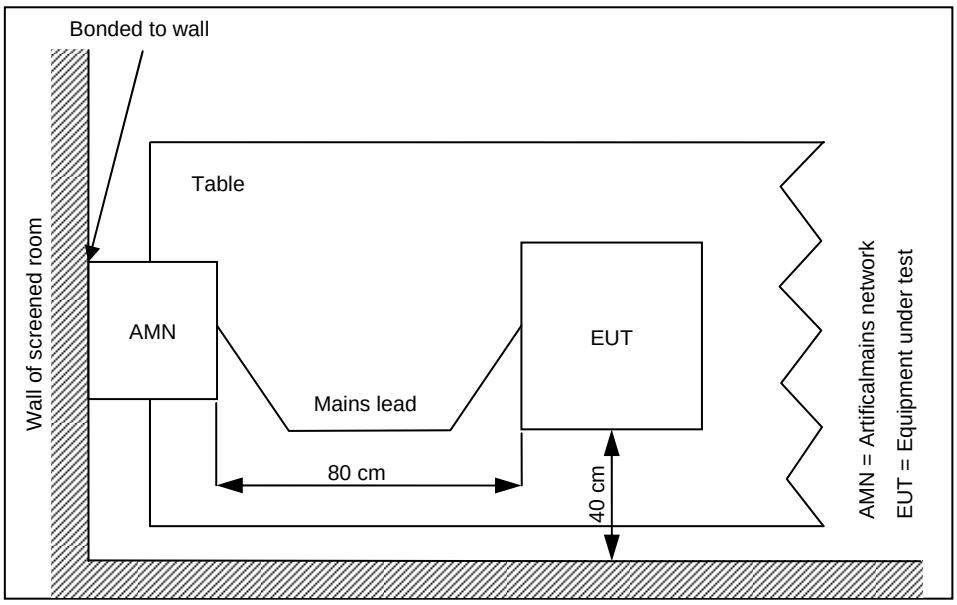
05:54:47 PM, Tuesday, July 12, 2011

Frequency	Quasi peak level	Margin quasi peak	Average level	Margin average
MHz	dBµV	dBµV	dBµV	dBµV
0.15173	53.07	12.83	35.38	20.57
0.18095	48.79	15.65	29.53	25.59
0.21112	44.58	18.58	25.35	28.90
0.51481	37.54	18.46	29.51	16.49
1.4481	28.55	27.45	20.66	25.34
1.8222	28.49	27.51	20.83	25.17
2.1954	28.28	27.72	20.85	25.15
2.5772	27.74	28.26	20.45	25.55
10.4399	34.30	25.70	31.20	18.80
11.7428	30.83	29.17	27.79	22.21
11.7429	30.70	29.30	27.74	22.26
13.048	30.54	29.46	26.62	23.38

Project ID - 1-3296/11-01-02
EUT – Sagem.com SE681 + S018BU0700180
Serial Number - S308A5B00101007530 + A007
Operating mode - Data traffic 100MBit/, Wi-max terminated (50 Ohm)

8.1.6 Test Set-up

According to EMC basic standard **ANSI 63.4**



8.2 Electromagnetic Radiated Emissions (Distance 10 m)

8.2.1 Instrumentation for Test (see equipment list)

F 1	F 2	F 4b	F 5	F 6	F 7	F 8	F 21				

8.2.2 Test Plan

EUT set-up	Set.2		
Operating mode	**Application**	**Limit**	**Result**
Op.1	Enclosure	FCC part 15 B Class B	passed

Remarks:	Powered by external power supply (115V / 60Hz)

8.2.3 Radiated Limits

Frequency- range	**FCC part 15 B Class B**	**FCC part 15 B Class A**
30 MHz – 88 MHz	30 dBµV/m	39,1 dBµV/m
88 MHz – 216 MHz	33,5 dBµV/m	43,5 dBµV/m
216 MHz – 960 MHz	36 dBµV/m	46,4 dBµV/m
960 MHz – 40000 MHz	44 dBµV/m	49,5 dBµV/m
	* This values are recalculated from the class B limits at 3 m antenna distance in §15.109 (g 2) of the FCC rules	.

8.2.4 Calibration Information

Device	**Serial number**	**ICT Number**	**Calibration valid until**	**Calibration interval**
ESCI 3 Receiver	100083/003	300003312	03/2012	12 month
Trilog Antenna	9163-295	300003787	04/2012	24 month
Remarks: System check of all relevant devices and the chamber (weekly) Cable loss: 0.5 to 4.2 dB (30 MHz to 2 GHz); the cable and connectors loss is re-measured every 3 month				

8.2.5 Test Results

CETECOM ICT Services GmbH

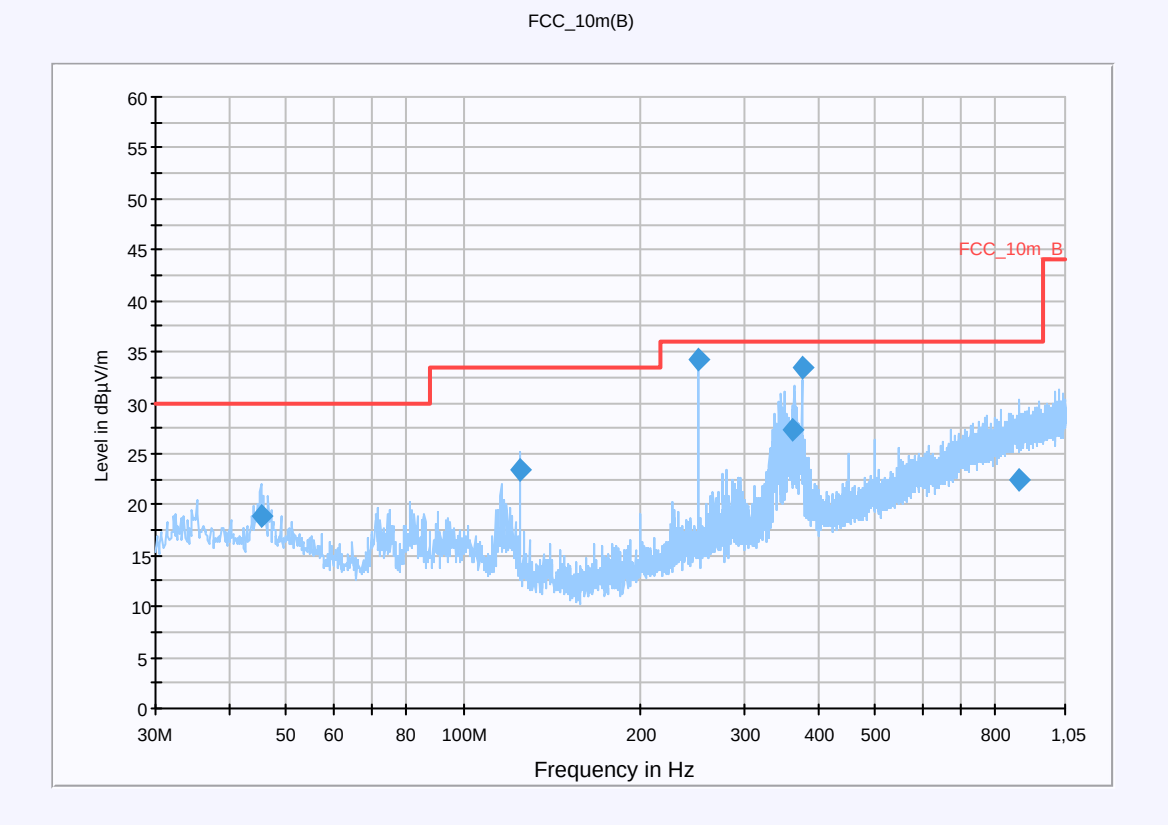
Common Information

EUT:	Sagemcom SE681 + S018BU0700180
Serial Number:	A5B00101007530 + A007
Test Description:	FCC part 15b @ 10m < 1GHz,
Operating Conditions:	Data traffic 100MBit/s, Wi-max 50R terminated
Operator Name:	Langer
Comment:	115VAC/60Hz

Scan Setup: STAN_Fin [EMI radiated]

Hardware Setup:	Electric Field (NOS)
Level Unit:	dBµV/m

Subrange	Detectors	IF Bandwidth	Meas. Time	Receiver
30 MHz - 2 GHz	QuasiPeak	120 kHz	15 s	Receiver



Final Result 1

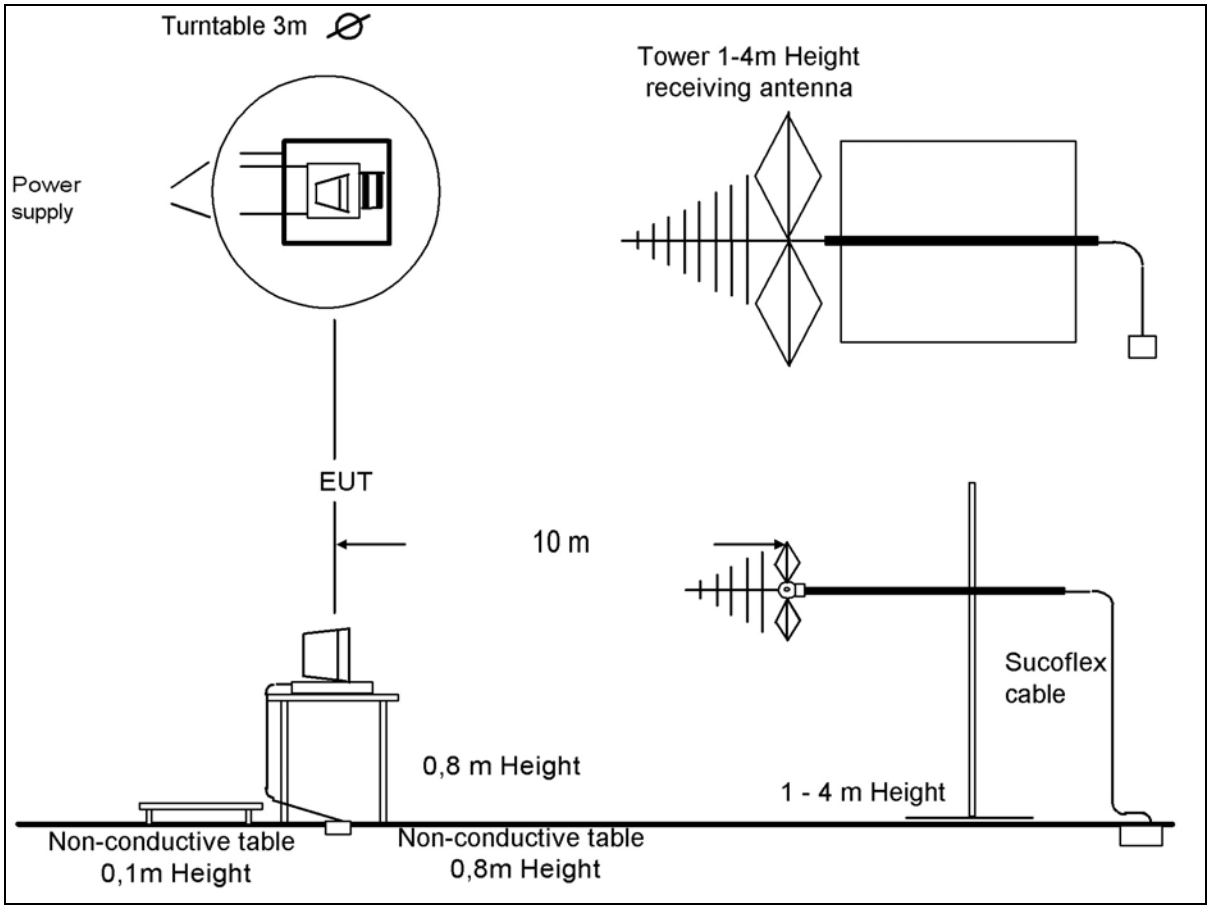
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
45.267600	18.9	15000.000	120.000	106.0	V	129.0	13.3	11.1	30.0	
124.992750	23.5	15000.000	120.000	147.0	V	177.0	9.8	10.0	33.5	
250.003350	34.3	15000.000	120.000	198.0	V	38.0	13.3	1.7	36.0	
363.121950	27.4	15000.000	120.000	98.0	V	186.0	16.3	8.6	36.0	
375.015450	33.5	15000.000	120.000	384.0	V	-2.0	16.5	2.5	36.0	
879.770550	22.4	15000.000	120.000	198.0	H	101.0	24.9	13.6	36.0	

8.2.6 Hardware Set-up

Subrange 1

Frequency Range:	30 MHz - 2 GHz
Receiver:	Receiver [ESCI 3] @ GPIB0 (ADR 20), SN 100083/003, FW 4.42
Signal Path:	without Notch FW 1.0
Antenna:	VULB 9163 SN 9163-295, FW --- Correction Table (vertical): VULP6113 Correction Table (horizontal): VULP6113 Correction Table: Cable_EN_1GHz (1005)
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.12
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12
	EMC 32 Version 8.10.00

8.2.7 Test Set-up



8.2.8 Electromagnetic Radiated Emissions (Distance 5 m)

8.2.8.1 Instrumentation for Test (see equipment list)

F 1	F 6	F 29	F 30	F 33							

8.2.8.2 Test Plan

EUT set-up	Set.2		
Operating mode	**Application**	**Limit**	**Result**
Op.1	Enclosure	FCC part 15 B Class B	passed

Remarks:	The measured values are recalculated from 5m to 3m distance Powered by external power supply (115V / 60Hz)

8.2.8.3 Radiated Limits

Frequency- range	47CFR15: (FCC part 15 B) Class B	47CFR15: (FCC part 15 B) Class A *
30 MHz – 88 MHz	40 dBµV/m	49,1 dBµV/m
88 MHz – 216 MHz	43,5 dBµV/m	53,5 dBµV/m
216 MHz – 960 MHz	46 dBµV/m	56,4 dBµV/m
960 MHz – 18000 MHz	54 dBµV/m	59,5 dBµV/m
		* This values are recalculated from the class A limits at 10 m antenna distance in §15.109 (g 2) of the FCC rules.

8.2.8.4 Calibration Information

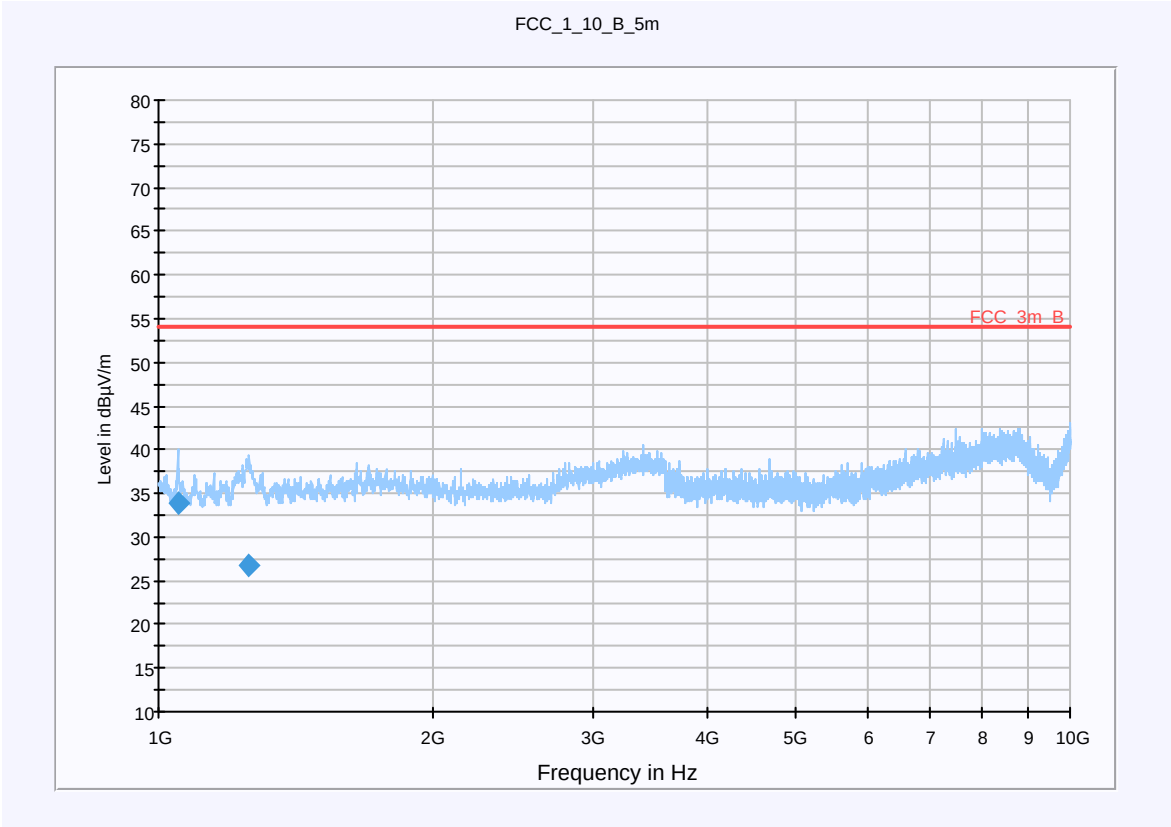
Device	Serial number	ICT Number	Calibration valid until	Calibration interval
FSU 26	200809	300003874	01/2012	12 month
Horn Antenna	9120B188	300003896	04/2012	24 month
Remarks: System check of all relevant devices and the chamber (weekly) Cable loss: 0.5 to 4.2 dB (30 MHz to 2 GHz); the cable and connectors loss is re-measured every 3 month				

8.2.8.5 Test Results

CETECOM ICT Services GmbH

Common Information

EUT:	Sagemcom SE681 + S018BU0700180
Serial Number:	A5B00101007530 + A007
Test Description:	FCC part 15b @ 5m > 1GHz,
Operating Conditions:	Data traffic 100MBit/, Wi-max 50R terminated
Operator Name:	Langer
Comment:	115VAC/60Hz



Final Result 1

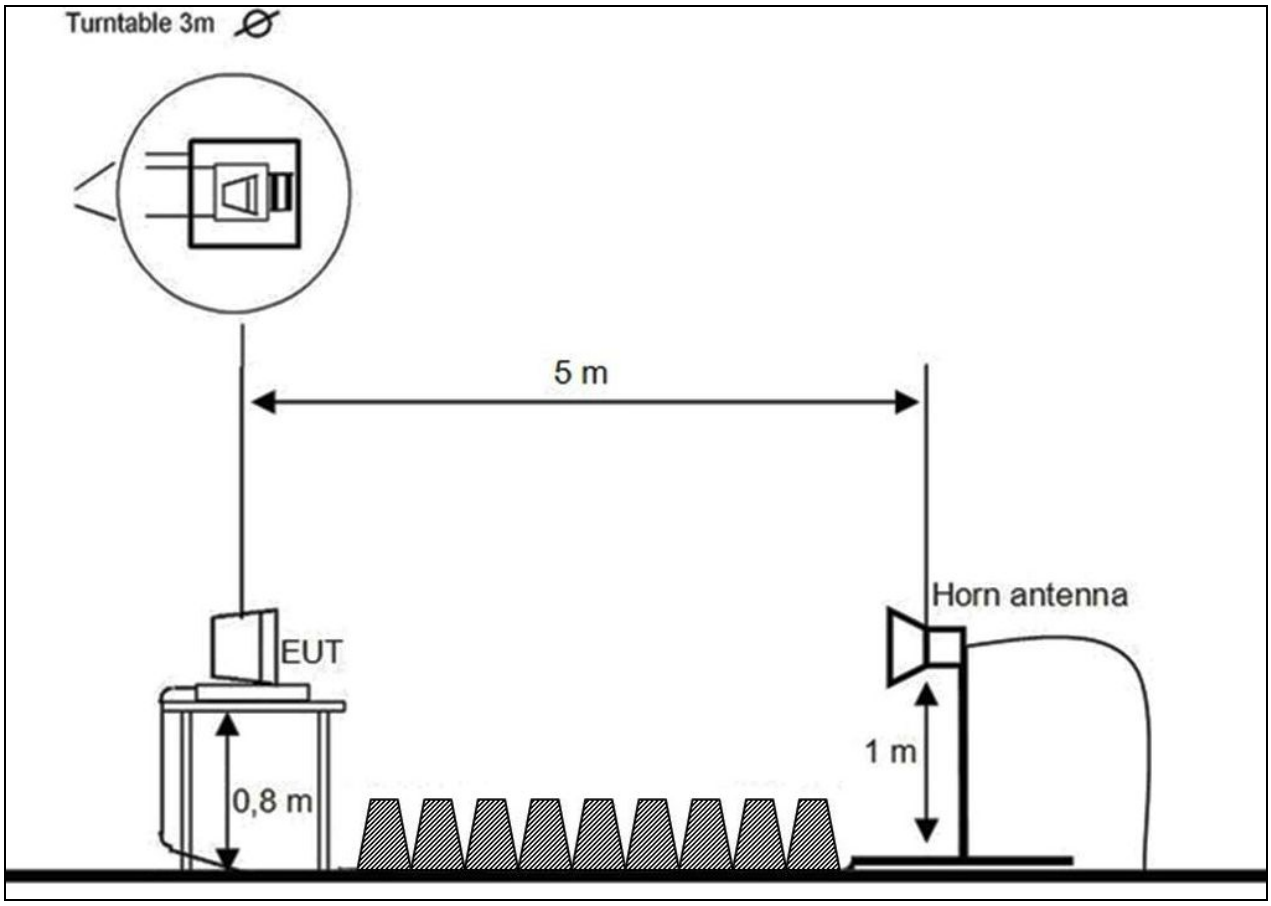
Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)	Comment
1049.981766	34.0	100.000	1000.000	100.0	H	228.0	-5.2	20.0	54.0	
1256.335008	26.7	100.000	1000.000	100.0	V	261.0	-2.6	27.3	54.0	

8.2.8.6 Hardware Set-up

Subrange 1

Frequency Range:	1 GHz - 10 GHz
Receiver:	ESU [ESU 26] @ GPIB0 (ADR 17), SN 100037/026, FW 4.43
Signal Path:	1_6_EN FW 1.0 Correction Table: 3_5m Correction Table: LNA_EN (matix)
Antenna:	BBHA 9120 B Correction Table (vertical): BBHA9120 Correction Table (horizontal): BBHA9120 Correction Table: Cable_Horn_EN (1103)
Antenna Tower:	Generic Tripod [Generic Tripod] @ GPIB0 (ADR 19), SN ?
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), FW REV 3.12

8.2.8.7 Test Set-up



9 Test equipment and ancillaries used for tests

To simplify the identification of the test equipment and/or ancillaries which were used, the reporting of the relevant test cases only refer to the test item number as specified in the table below.

No.	Instrument/Ancillary	Manufacturer	Type	Serial-No.	Internal identification
	Radiated emission in chamber F				
F-1	Control Computer	F+W		FW0502032	300003303
F-2	Trilog-Antenna	Schwarzbeck	VULB 9163	9163-295	---
F-3a	Amplifier	Veritech Microwave Inc.	0518C-138	- / -	- / -
F-4b	Switch	HP	3488A	- / -	300000368
F-5	EMI Test receiver	R&S	ESCI	100083	300003312
F-6	Turntable Interface-Box	EMCO / ETS-LINDGREN	Model 105637	44583	300003747
F-7	Tower/Turntable Controller	EMCO / ETS-LINDGREN	Model 2090	64672	300003746
F-8	Tower	EMCO / ETS-LINDGREN	Model 2175	64762	300003745
F-9	Ultra Notch-Filter Rejected band Ch. 62	WRCD		9	
	Radiated immunity in chamber F				
F-10	Control Computer	F+W		FW0502032	300003303
F-11	Signal Generator	R&S	SML 03	102519	300003407
F-12	RF-Amplifier	ar	100W1000 M1	12951	300000529
F-13	Directional Coupler	ar	DC 3010	12708	300001428
F-14	Stacked Logper Antenna	Schwarzbeck	STLP9128 E	9128 E 013	300003408
F-15	RF-Amplifier	ar	60S1G3	313649	300003410
F-15b	RF-Amplifier 0.8 – 4 GHz	BONN	BLMA 0840-2000/100D	076820B	300003783
F-16	Directional Coupler	ar	DC7144A	312786	300003411
F-17	Horn Antenna	ar	AT 4002	19739	300000633
F-18	Power Meter	R&S	NRV	860327/024	F033
F-19	Power sensor	R&S	URV5-Z2	839080/005	300002844.02
F-20	Power sensor	R&S	URV5-Z2	830755/057	F032
	Harmonics and flicker in front of chamber F				
F-21	Flicker and Harmonics Test System	Spitzenberger & Spies	PHE4500/B I PHE4500/B II	B5983 B5984	300000210
F-28	Power Supply	Hewlett Packard	6032 A	2920 A 04466	300000580
	Radiated emission in chamber F > 1GHz				
F-29	Horn antenna	Schwarzbeck	BBHA 9120 B	9120B188	300003896
F-30	Amplifier	ProNova	0518C-138	005	F 024
F-31	Amplifier	Miteq	42-00502650-28-5A	1103782	300003379
F-32	Horn antenna	Emco	3115	9709-5289	300000213
F-33	Spectrum Analyzer	R&S	ESU26	100037	300003555
F-34	Loop antenna	EMCO	6502	8905-2342	300000256

No.	Instrument/Ancillary	Manufacturer	Type	Serial-No.	Internal identification
	Conducted emission in chamber G				
G-1	EMI Receiver	Hewlett Packard	8542 E	3617A00170	300000568
G-2	V-ISN	Rohde & Schwarz	ESH 3-Z5	892475/017	300002209
G-2a	V-ISN	Rohde & Schwarz	ESH 2-Z5	892602/024	300000587
G-3	2-Wire ISN	Schaffner	ISN T200	19075	300003422
G-4	4-Wire ISN	Schaffner	ISN T400	22325	300003423
G-5	Shielded wire ISN	Schaffner	ISN ST08	22583	300003433
G-6	Unshielded 8 wire ISN	Teseq	ISN T800	26113	300003833
G-7	Unshielded 8 wire ISN	Teseq	ISN T8-Cat. 6	26374	300003851
G-8	RF Current probe	FCC	F-33-4	46	300003257
G-9	V-ISN	Schaffner	ISN PLC-150	21579	300003318
G-10	V-ISN	Schaffner	ISN PLC-25-30	21584	300003319
G 10a	PLC Filter	TESEQ	Filter PLC	23436	300003598
G 10b	Coupling unit 75 Ohm	Fiedler	AC	----	300003272.04
	Conducted immunity in chamber G				
G-11	Signal generator	R&S	SMG	8610647025	300000204.01
G-12	RF-Amplifier	BONN	BSA 0125-75	066502-01	300003545
G-13	Power Meter	R&S	URV 5	837723/025	300002844.01
G-14	Power Sensor	R&S	URV 5-Z2	832874/021	300002239
G-15	Directional coupler	emv	DC 2000	9401-1677	300000592
G-16	Attenuator 6dB	Alan	50HP6-100 N	1210480348	300003148
G-17	EM-Injection Clamp	FCC	203i	232	300000626
G-18	CDN	FCC	FCC-801-M3-16	237	300000627
G-19	CDN	FCC	FCC-801-T2	78	300000629
G-20	CDN	FCC	FCC-801-AF 2	62	300000630
G-21	CDN	FCC	FCC-801-AF 4	61	300000631
G-22	CDN	FCC	FCC-801-M1	2027	300002761
G-23	CDN	Lüthi	CDN 801-M2/M3	9350105	300000534
G-24	Transformator for 50Hz Loop Antenna	EM-Test	MC2630	0200-10	300002659.01
G-25	50Hz Loop Antenna	EM-Test	MS 100	none	300002659
	Surge, Burst, Dips and Interruptions in chamber G				
G-26	Hybrid-Generator	EM-Test	UCS 500M6	0399-07	300002599
G-27	Motor Variac	EM-Test	MV 2616	0600-01	300002658
G-28	Capacitive Coupling Clamp	MWB	KKS 100	---	300000589
G-29	Coupling Decoupling Network	EMC-Partner	CDN-UTP	00014	300003226
	ESD in chamber G				
G-30	ESD generator	Schaffner	NSG 435	308	300002249
	Emission on bench in chamber G				
G-31	Absorbing Clamp	R&S	MDS-21	832 231/006	300000527

10 Observations

No observations, exceeding those reported with the single test cases, have been made.

Annex A: Photographs of the test set-up

Photo 1: setup of radiated emission

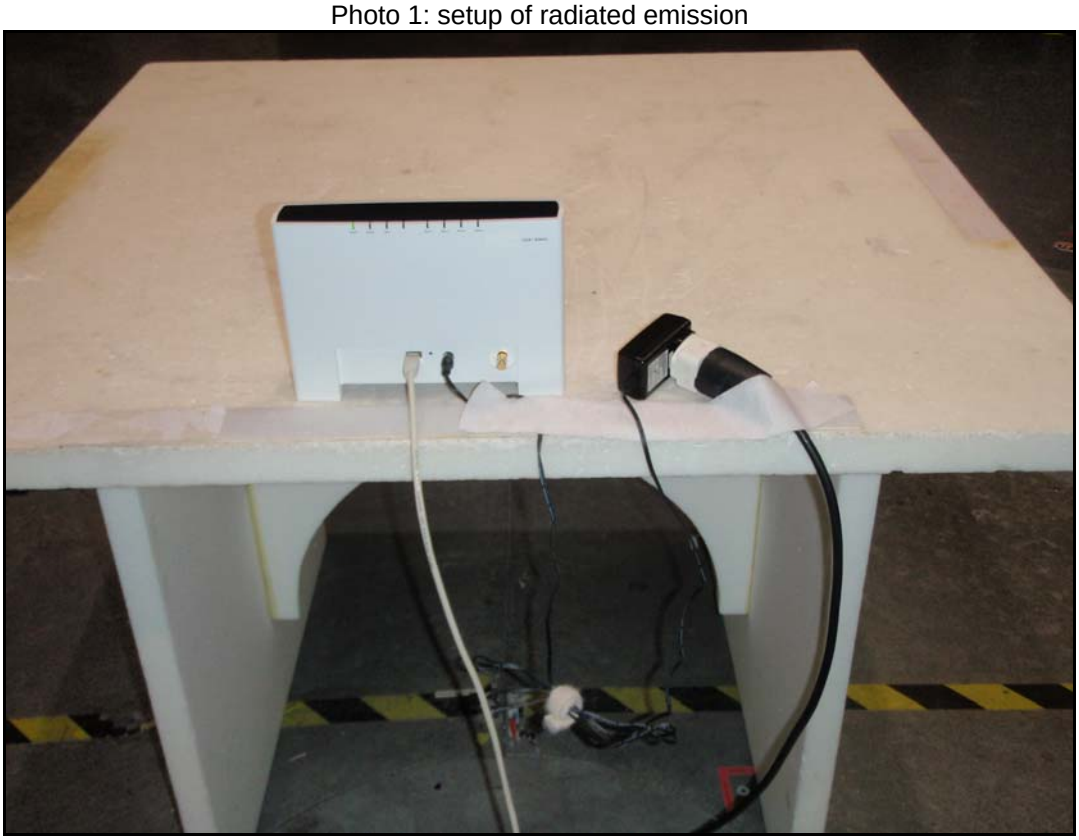


Photo 2: setup of radiated emission

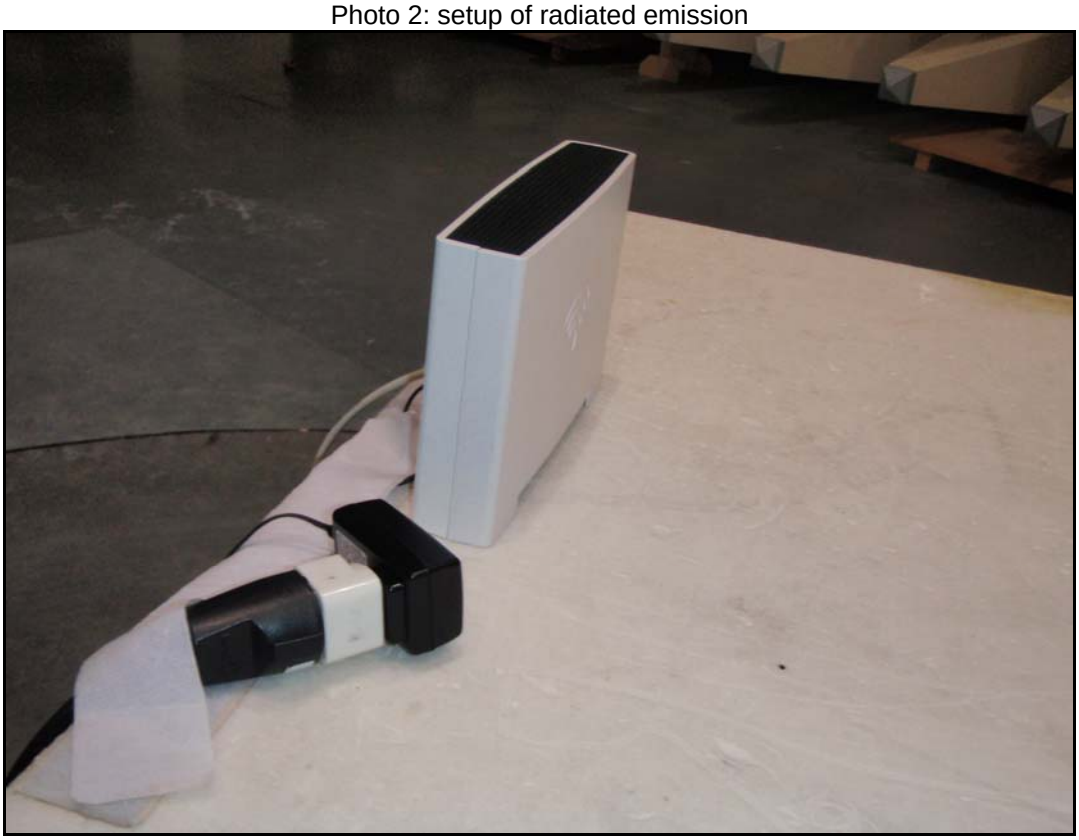


Photo 3: setup of radiated emission < 1 GHz

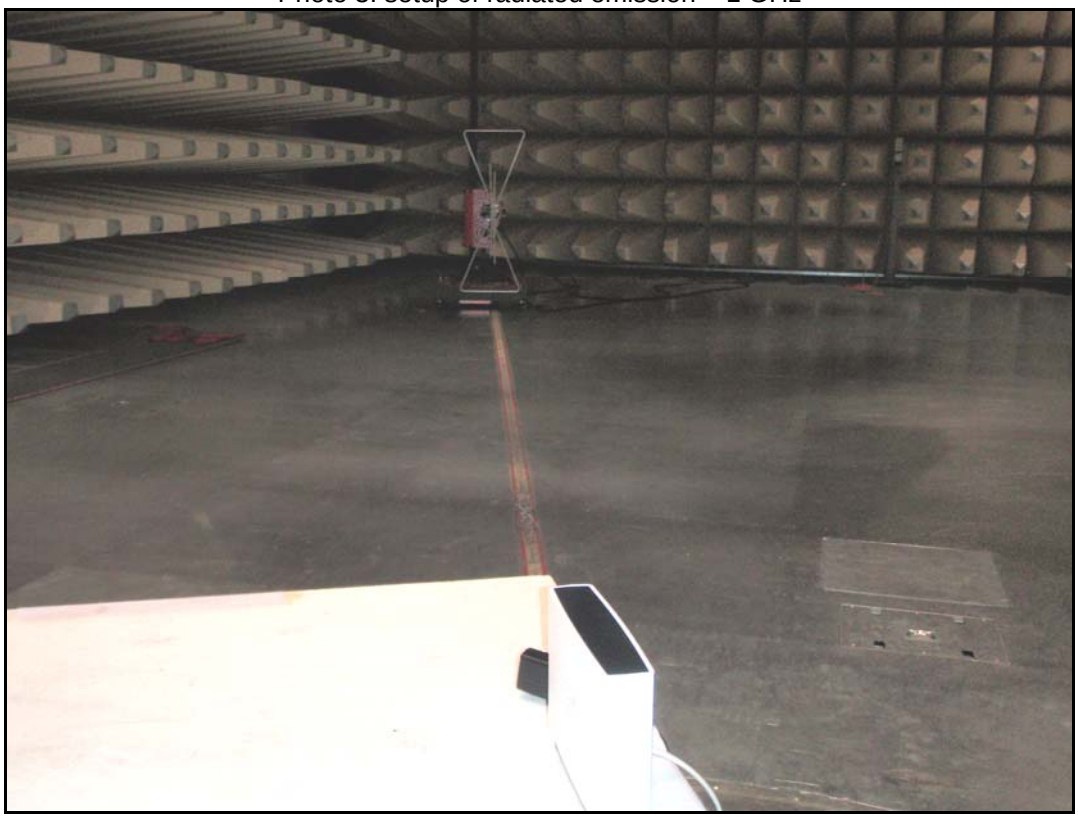


Photo 4: setup of radiated emission > 1 GHz

Photo 5: setup of conducted emission on mains

Photo 6: setup of conducted emission on mains

Annex B: Photographs of the EUT

Photo 7: EUT front view

Photo 8: EUT front rear view

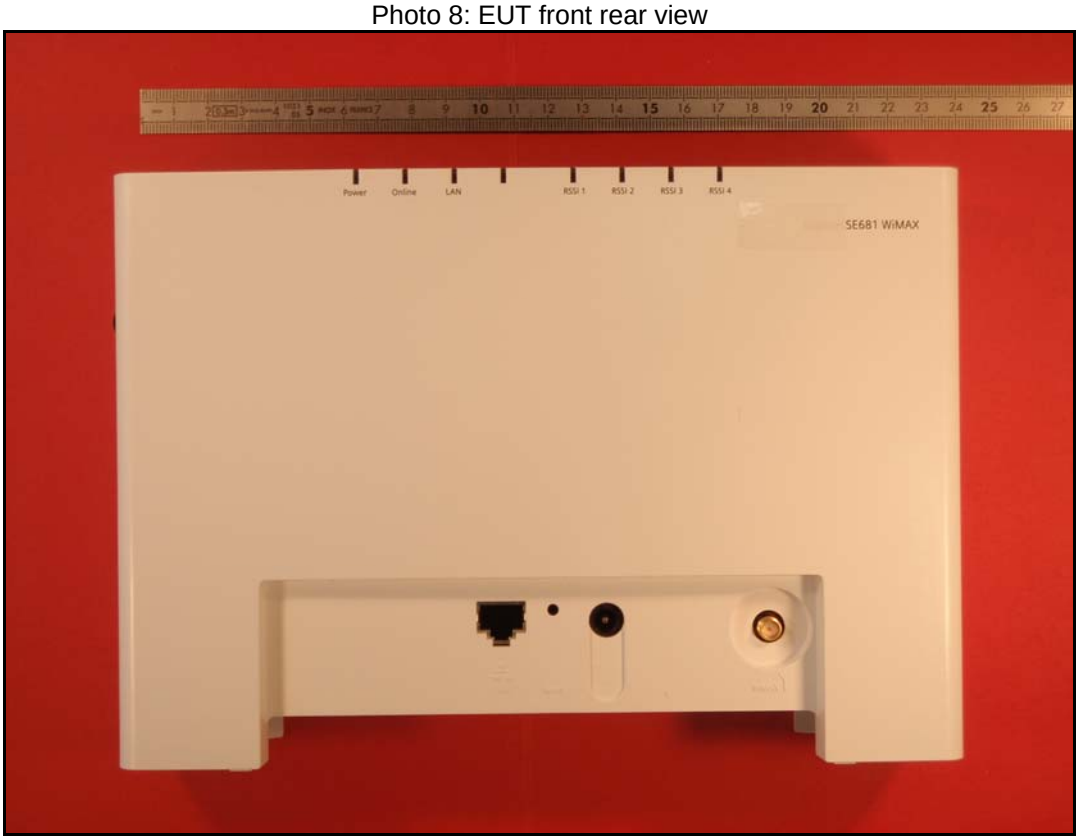


Photo 9: EUT top view

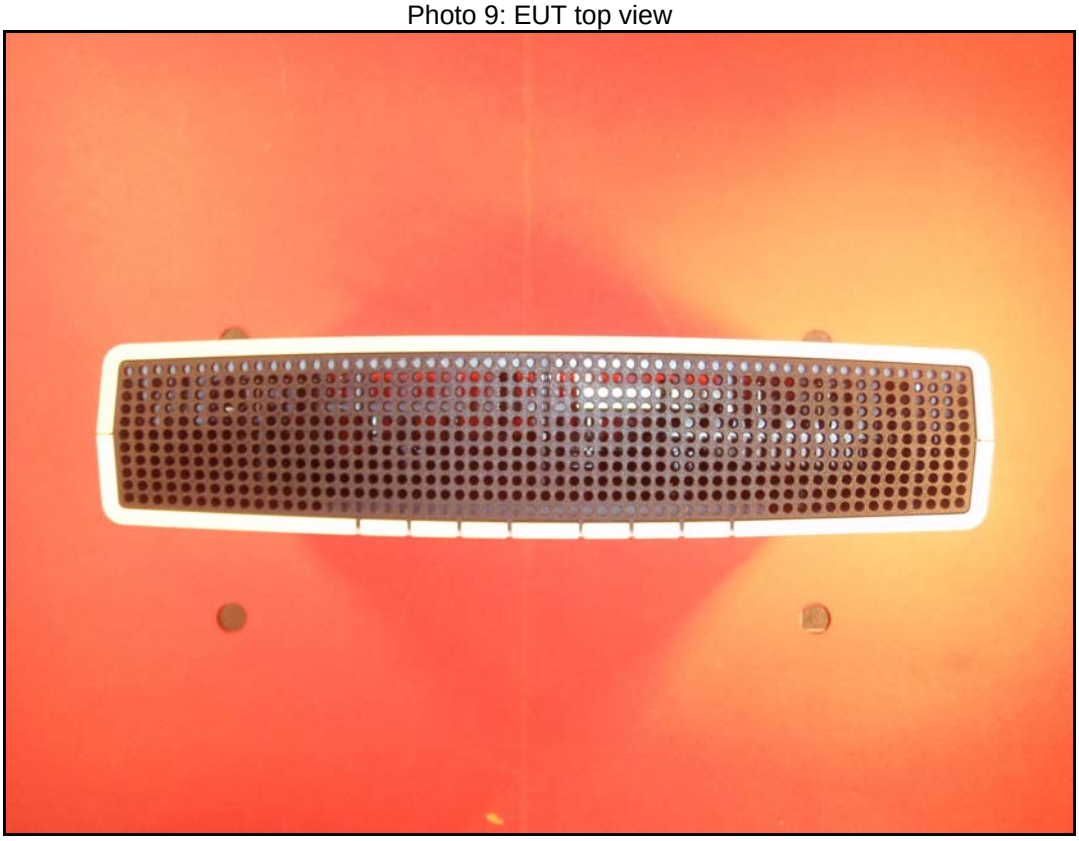


Photo 10: EUT bottom view

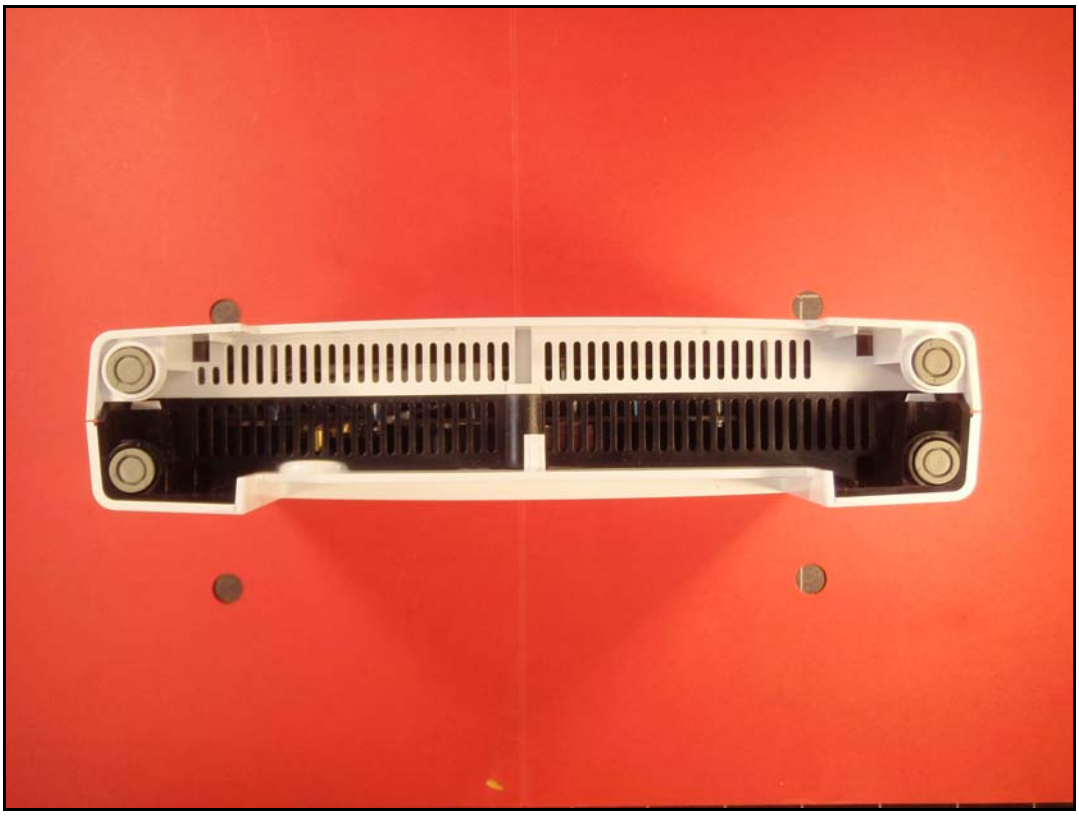


Photo 11: inside view of PCB

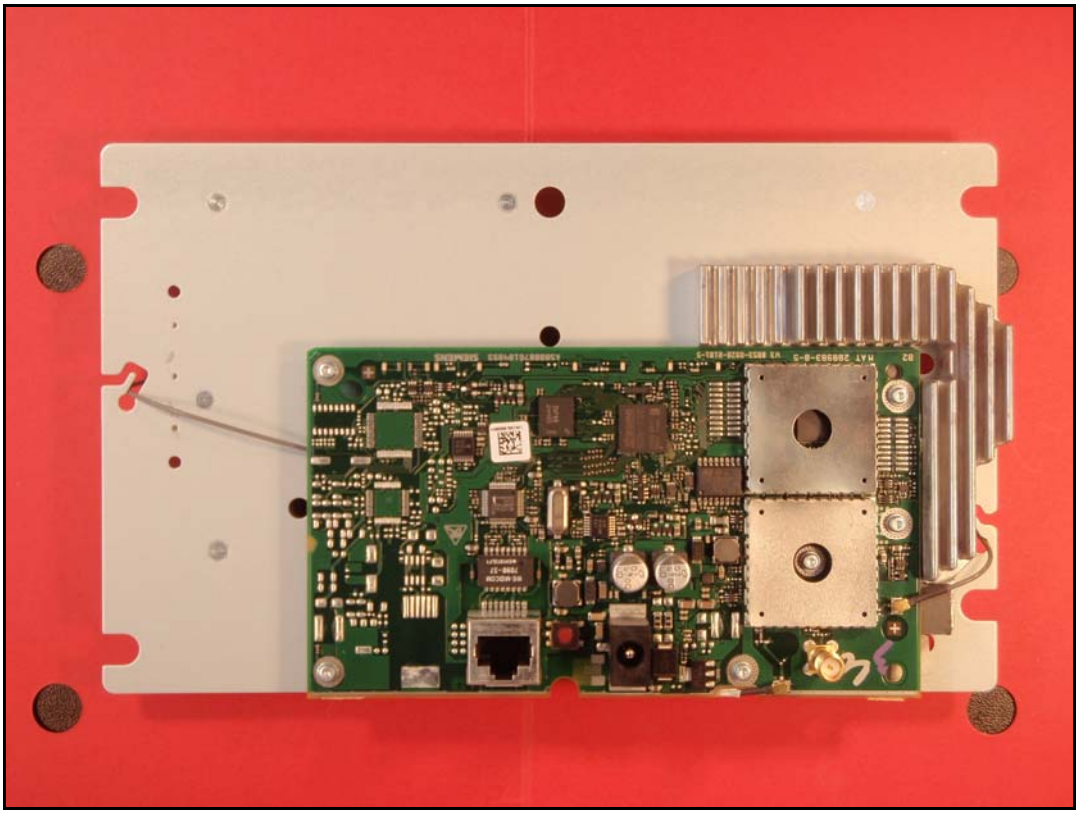


Photo 12: inside view of PCB

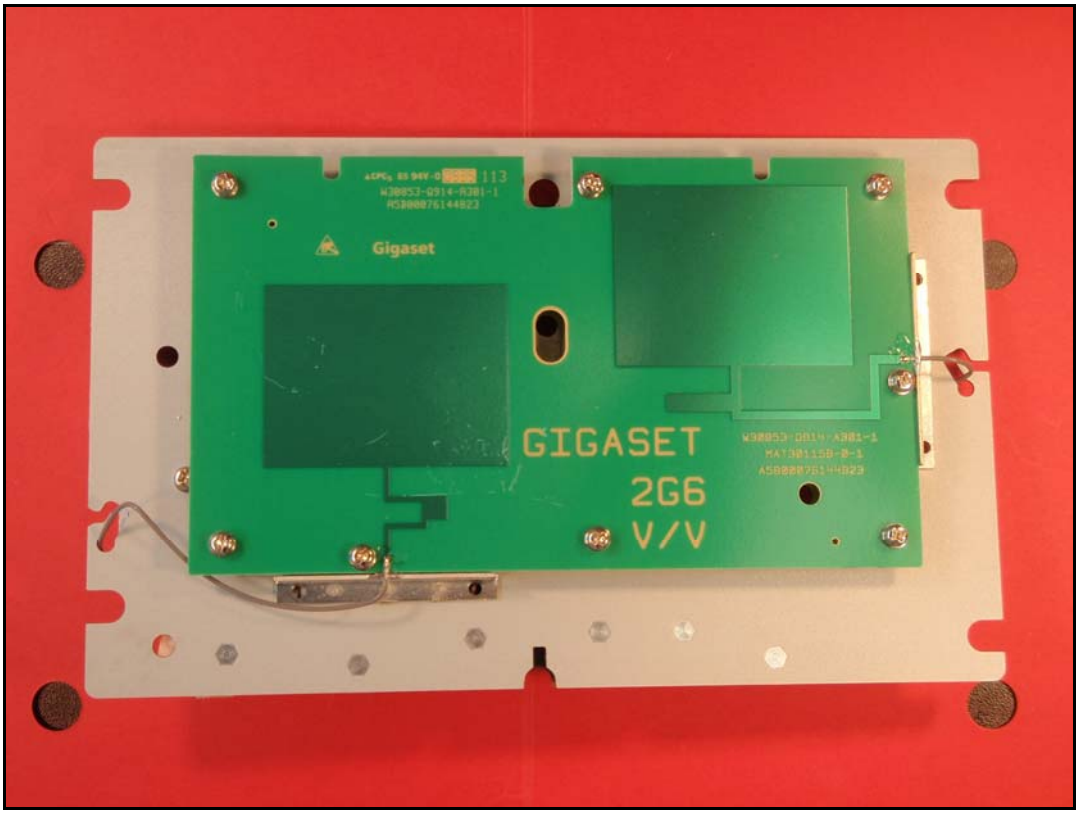


Photo 13: switching power supply of EUT

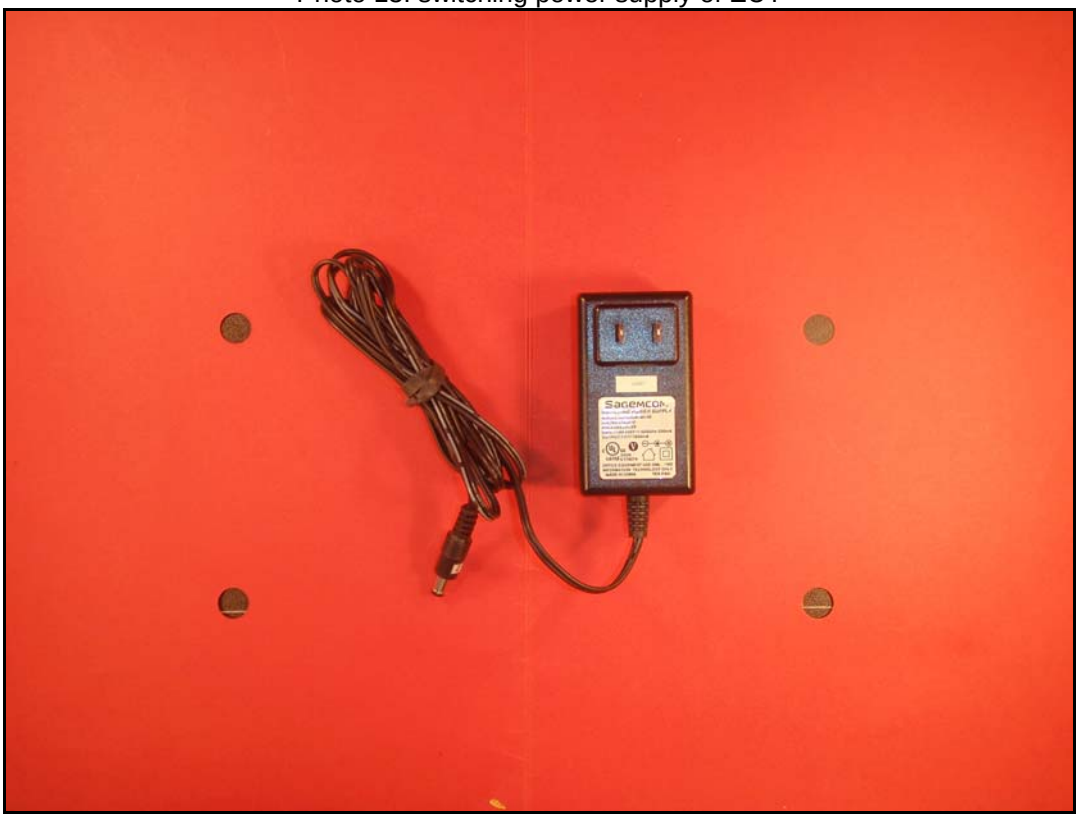


Photo 14: detail view of label

Annex C: Document history

Version	Applied changes	Date of release
	Initial release	2011-07-14

Annex D: Further information

Glossary

DUT	-	Device under Test
EMC	-	Electromagnetic Compatibility
EUT	-	Equipment under Test
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	not applicable
S/N	-	Serial Number
SW	-	Software