



Report No.: 60.870.11.014.01F
Date: 2011-08-26

TEST REPORT

Applicant: SIGMA Elektro GmbH..
Dr. Julius Leber Str.15
Neustadt 67433 Germany

Description of Samples: Model name: R1 Transmitter
Brand name: SIGMA
Model no.: STS-F-4
FCCID: M5LHR4STS
IC: 7580A-HR4STS

Date Samples Received: 2011-07-12

Date Tested: 2011-07-12 to 2011-08-02

Investigation Requested: FCC Part 15, Section 15.209
RSS-210 Issue 8,
RSS-Gen Issue 3

Conclusions: The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

The submitted product COMPLIED with the requirements of RSS-210, and RSS-Gen. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Remarks: ----

Checked by:

Nicolas Cheng
Project Manager
Wireless & Telecom department

Approved by:-

Jeff Pong
Operating Manager
Wireless & Telecom department



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6.0 List of Measurement Equipments

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Appendix A

Photos of Test Setup

Appendix B

External EUT Photos

Appendix C

Internal EUT Photos



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1.0 General Details

1.1 Test Laboratory

Neutron Engineering Inc.
No.3, Jinshagang 1st Road, ShiXia, Dalang Town, Dong
Guan, China.
Registration Number: 319330
File Number: IC4428B-1

1.2 Applicant Details
Applicant

SIGMA ELEKTRO GmbH.
Dr. Julius Leter Str. 15 Neustadt 67433 Germany.



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1.3 Equipment Under Test [EUT]

Description of EUT

Model Name:	R1 Transmitter
Brand Name:	SIGMA
Model Number:	STS-F-4
FCCID:	M5LHR4STS
IC:	7580A-HR4STS
Rating:	DC 3.0V (CR 2 battery)
Antenna Type:	Integral
Operated Frequency:	112kHz
No. of Channel:	1
Accessories and Auxiliary Equipment:	None
EUT Exercising Software:	None

General Operation of EUT

The Equipment Under Test (EUT) is a transmitter of Heart Rate Meter operated at 112kHz.

1.4 Equipment Modification

No modification was made to the tested unit by TÜV SÜD Hong Kong Ltd.

1.5 Related Submittal(s) Grants

This is a single application of certification for this transmitter.



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2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with

CFR 47, Part 15: 2009 and ANSI C63.4: 2003.
RSS-GEN Issue 3, RSS-210 Issue 8 and RSS-102 Issue 4.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary			
Test Condition	Test Requirement	Test Result	
		Pass	N/A
Field Strength of Fundamental and Harmonics	Part 15.209 (a) RSS-210 Issue 8 Section 2.2, 2.5	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Spurious Radiated Emission	Part 15.209 (a), Part 15.205 RSS-210 Issue 8 Section 2.2, 2.5	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Bandwidth Measurement	Part 15.215 (c) RSS-Gen Issue 3, Section 4.6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conducted Emission	Part 15.207 RSS-Gen Issue 3, Section 7.2.4	<input type="checkbox"/>	<input checked="" type="checkbox"/>
SAR Evaluation	RSS-102 Issue 4 Section 2.5.1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
RF Exposure Evaluation	RSS-102 Issue 4 Section 2.5.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Note: N/A - Not Applicable



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3.0 Test Methodology

3.1 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

3.2 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

$$\text{FS} = \text{R} + \text{System Factor}$$
$$\text{System Factor} = \text{AF} + \text{CF} + \text{FA} - \text{PA}$$

Where FS = Net Field Strength in dBuV/m at 3 meters.

R = Reading of Spectrum Analyzer / Test Receiver in dBuV.

AF = Antenna Factor in dB.

CF = Cable Attenuation Factor in dB.

FA = Filter Attenuation Factor in dB.

PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

3.3 Conducted Emissions

The EUT was placed on a non-metallic table 0.8m above the horizontal metal reference plane and 0.4m from a vertical ground plane which is connected to the horizontal metal ground plane. Meanwhile, the AC main of EUT was connected to the distance of 0.8m line impedance stabilization network (LISN) during measurement.

Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

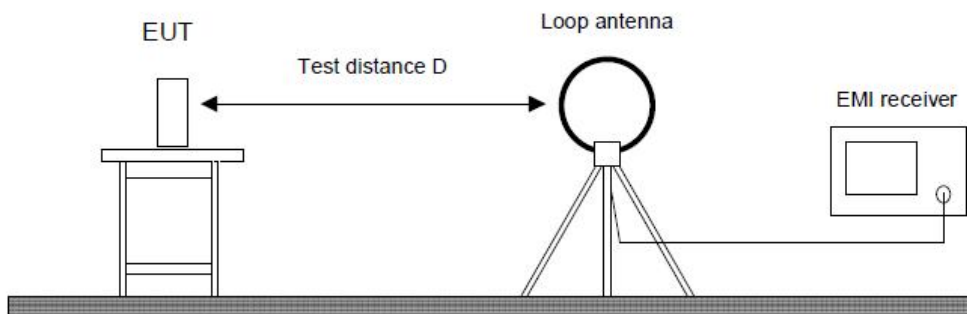
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4.0 Test Results

4.1 Field Strength of Fundamental and Harmonics

Test Requirement:	FCC part 15 section 15.209 (a) RSS-210 Issue 8 Section 2.2, 2.5 RSS-Gen Issue 3 Section 4.8
Test Method:	ANSI C63.4:2003
Test Date:	2011-07-27
Mode of Operation:	Transmitting mode.
Detector Function:	Average and Peak
Measurement BW:	200 Hz (RBW)

Test Setup:





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Results: PASS

Field Strength of Fundamental and Harmonics					
Value	Emissions Frequency	Field Strength (at 3m)	Limit Line (at 3m)	Delta to Limit	Remarks
	kHz	dB μ V/m	dB μ V/m	dB μ V/m	
PK	111.10	67.12	106.69	-39.57	Fund.
AV	111.10	67.12	106.69	-39.57	Fund.

Remark : - (*) Radiated emissions which fall in the restricted bands as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2.

- Calculated measurement uncertainty: ± 5.0 dB

Limit for Radiated Emission [Part 15 Section 15.209, RSS-Gen Section 7.2.5]:

Frequency (MHz)	Field Strength [μ V/m]	Measurement Distance (Meter)
0.009 – 0.490	2400/F (kHz)	300
0.049 – 1.705	24000/F (kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Note :

- Emission Level (dB μ V/m) = 20 log Emission Level (μ V/m)
- Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
- Limit line = specific limit (dB μ V) + distance extrapolation factor.

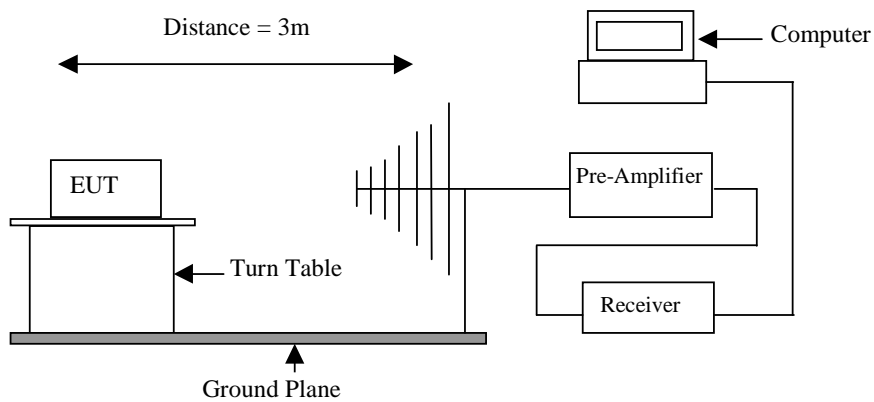
Radiated emissions, which fall in the restricted bands, as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2, must also comply with the radiated emission limits as above.

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4.2 Spurious Radiated Emission

Test Requirement:	FCC part 15 section 15.209 (a) RSS-210 Issue 8 Section 2.2, 2.5 RSS-Gen Issue 3 Section 4.8
Test Method:	ANSI C63.4:2003
Test Date:	2011-07-27
Mode of Operation:	Transmitting Mode
Detector Function:	Quasi-peak, Average and Peak
Measurement BW:	200 Hz (Below 150 kHz) 9 kHz (150kHz to 30 MHz) 120 kHz (30MHz to 1000 MHz) 1 MHz (Above 1000 MHz)

Test Setup:





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Results: PASS

Spurious Radiated Emissions (Below 30MHz)				
Value	Emissions Frequency	Field Strength (at 3m)	Limit Line (at 3m)	Delta to Limit
	MHz	dBμV/m	dBμV/m	dBμV/m
QP	0.87	44.89	68.85	-23.96
QP	2.03	35.58	69.54	-33.96
QP	5.25	33.28	69.54	-36.26
QP	12.54	33.18	69.54	-36.36
QP	14.54	32.55	69.54	-36.99
QP	18.03	33.52	69.54	-36.02

Spurious Radiated Emissions (Above 30MHz)							
Value	Emissions Frequency	E-Field Polarity	Reading	System Factor	Field Strength at 3m	Limit	Delta to Limit
	MHz		dBμV/m	dB	dBμV/m	dBμV/m	dBμV/m
QP	30.42	V	19.29	6.77	26.06	40.00	-13.94
QP	33.09	V	17.70	6.77	24.47	40.00	-15.53
QP	42.90	V	16.31	8.20	24.51	40.00	-15.49
QP	63.09	V	15.03	6.32	21.35	40.00	-18.65
QP	97.46	V	14.49	8.23	22.72	43.50	-20.78
QP	919.29	V	16.33	21.26	37.59	46.00	-8.41
QP	30.42	H	19.18	6.77	25.95	40.00	-14.05
QP	33.09	H	21.38	6.77	28.15	40.00	-11.85
QP	34.76	H	20.07	6.77	26.84	40.00	-13.16
QP	42.90	H	15.05	8.20	23.25	40.00	-16.75
QP	53.69	H	15.17	7.82	22.99	40.00	-17.01
QP	93.44	H	14.37	7.76	22.13	43.50	-21.37

- Note:
- No further spurious emissions found between 150 kHz and lowest internal used / generated frequency.
 - Result data graph is shown at the following pages for reference.

- Remark :
- (*) Radiated emissions which fall in the restricted bands as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2.
 - Calculated measurement uncertainty: ± 5.0 dB.



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Limit for Radiated Emission [Part 15 Section 15.209, RSS-Gen Section 7.2.5]:

Frequency (MHz)	Field Strength [$\mu\text{V}/\text{m}$]	Measurement Distance (Meter)
0.009 – 0.490	2400/F (kHz)	300
0.049 – 1.705	24000/F (kHz)	30
1.705 – 30	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Note :

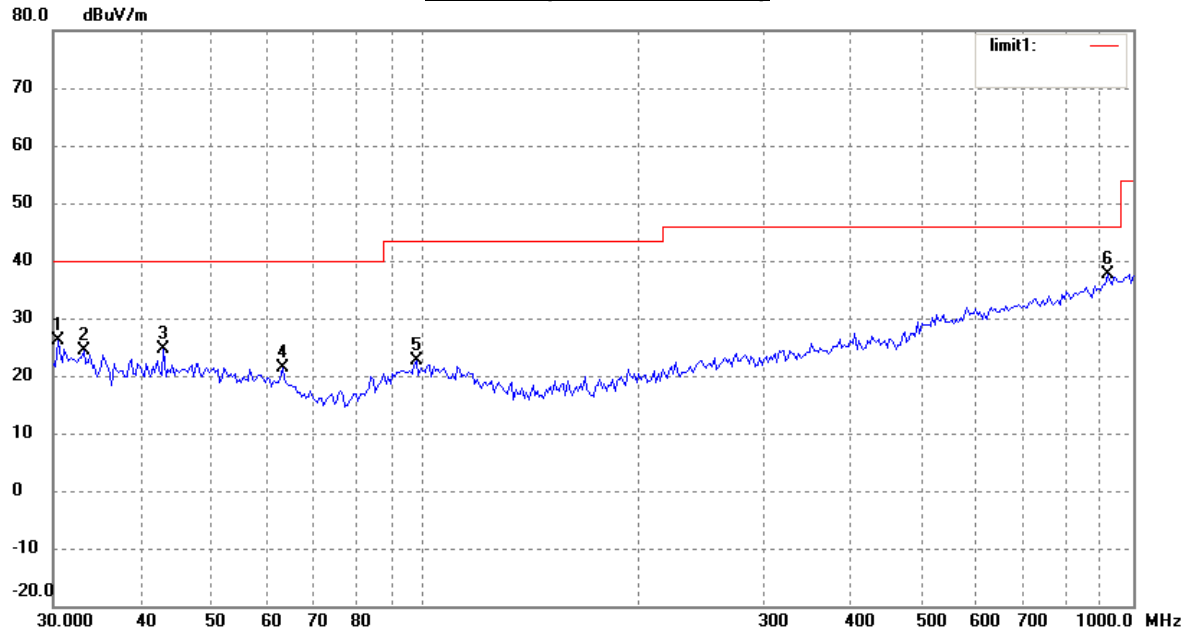
- Emission Level ($\text{dB}\mu\text{V}/\text{m}$) = $20 \log$ Emission Level ($\mu\text{V}/\text{m}$)
- Distance extrapolation factor = $40 \log$ (specific distance / test distance) (dB)
- Limit line = specific limit ($\text{dB}\mu\text{V}$) + distance extrapolation factor.

Radiated emissions, which fall in the restricted bands, as defined in Part 15 Section 15.205(a) and RSS-Gen Section 7.2.2, must also comply with the radiated emission limits as above.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

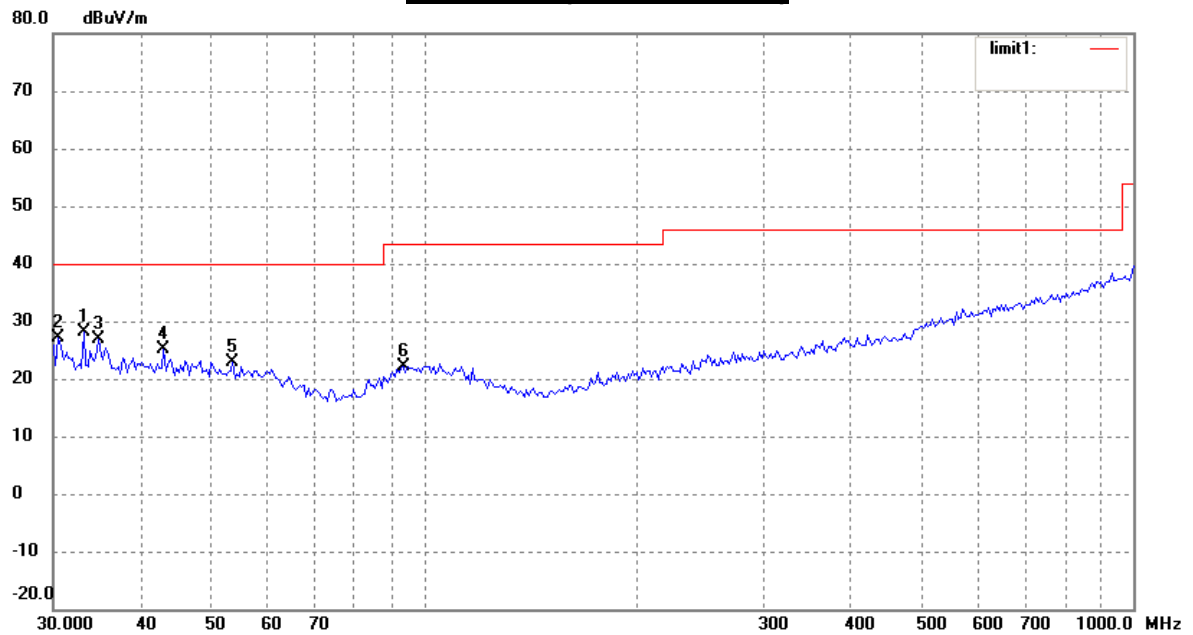
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Vertical (30 to 1000MHz)



Remark: Only background noise was measured above 1GHz.

Horizontal (30 to 1000MHz)



Remark: Only background noise was measured above 1GHz.



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4.3 Bandwidth Measurement

Test Requirement:	FCC part 15 section 15.215 (c) RSS-Gen Issue 3 Section 4.6
Test Method:	ANSI C63.4:2003
Test Date:	2011-08-02
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

Results: PASS

20 dB BW	99% OBW	Test Result
339.835 Hz	287.230 Hz	Complies

Remarks: Result data graph is shown at the following pages for reference.

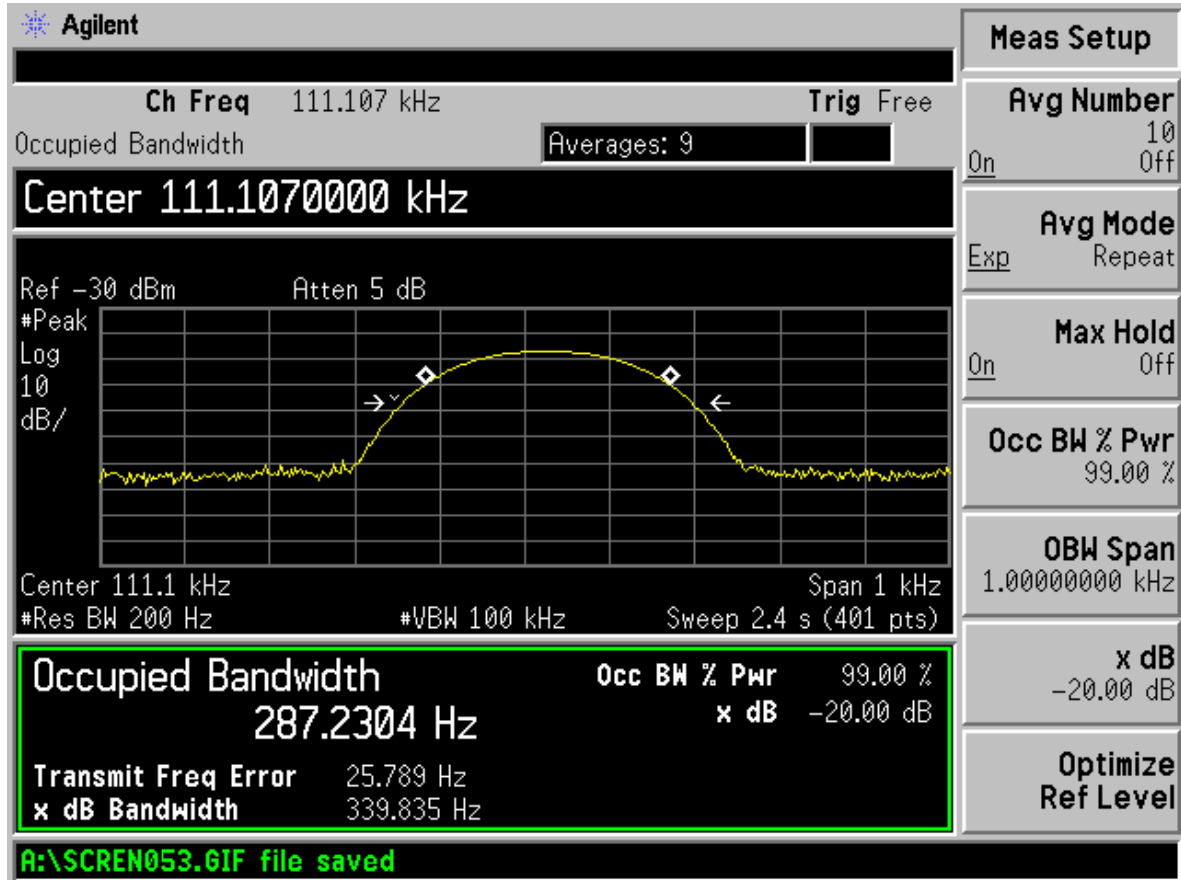
Limit for Bandwidth

The 20dB / 99% bandwidth of the emission shall be within the frequency band designated in the rule section under which the equipment is operated.



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20 dB & 99% bandwidth





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4.4 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement: FCC part 15 Section 15.207 Class B
RSS-Gen Issue 3 Section 7.2.4
Test Method: ANSI C63.4:2003
Test Date: ---
Mode of Operation: ---
Detector Function: ---
Measurement BW: ---

Result : N/A

Note : This testing is not applicable for the battery operated EUT.

Limits for Conducted Emission [FCC Part 15.207 and RSS-Gen table 2]:

Frequency Range [MHz]	Quasi-Peak Limit [dB μ V]	Average Limit [dB μ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.



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5.0 Radio Frequency Exposure Compliance of Radiocommunication Apparatus

RSS-102 Issue 4

5.1 Exemption from Routine Evaluation limits - SAR Evaluation

Test Requirement: RSS-102 Issue 4 section 2.5.1

Results: PASS

Refer to clause 4.1 of this test report, it shows that the output power of the fundamental frequency is less than 250mW, hence it deems to fulfill the requirement of RSS-102 section 2.5.1 without further testing.



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6.0 List of Measurement Equipment

Radiated Emission and Bandwidth Measurement

Description	Manufacturer	Model no.	Serial no.	CAL due
Test Receiver	R & S	ESI26	836079/035	19 Dec 2011
Spectrum Analyzer	R & S	FSP30	838786/013	19 Dec 2011
Active Loop Antenna	R & S	HFH2-Z2	830749/020	26 May 2012
Antenna	Schwarbeck	VULB9106	9160-3232	08 Jun 2012
Antenna	Schwarbeck	BBHA9170	9170319	16 Aug 2011
Amplifier	Agilent	8447D	2944A11203	26 May 2012
Amplifier	Agilent	8449B	3008A02274	26 May 2012
Test Cable	Huber+Suhner	C-45	N/A	04 May 2012

Remarks:

CM Corrective Maintenance
N/A Not Applicable or Not Available