

Produkte
Products

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Auftraggeber: <i>Client:</i>		Fujitsu Kyushu Network Technologies Limited Fujitsu Kyushu R&D Center Bldg., 2-2-1 Momochihama, Sawara-ku, Fukuoka-shi, Fukuoka 814-8588, Japan			
Gegenstand der Prüfung: <i>Test Item:</i>		Communication Module			
Bezeichnung: <i>Identification:</i>	YAA75-0402	Serien-Nr.: <i>Serial No.:</i>	48, 74, 92, 97, 98		
Wareneingangs-Nr.: <i>Receipt No.:</i>	PT0214023805	Eingangsdatum: <i>Date of Receipt:</i>	2012-04-11		
Zustand des Prüfgegenstandes bei Anlieferung: Good <i>Condition of Test Item at Delivery:</i>					
Prüfört: <i>Testing Location:</i>		TÜV Rheinland Japan Ltd. – Global Technology Assessment Center 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan			
Prüfgrundlage: <i>Test Specification:</i>		FCC 47 CFR Part 15, Subpart C, Section 15.247 (October 1, 2011) ANSI C63.4-2003 KDB Publication No. 558074 D01: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 (v01) RSS-210 (Issue 8): 2010 RSS-Gen (Issue 3): 2010 ANSI C63.4-2003			
Prüfergebnis: <i>Test Result:</i>		Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). <i>The test item passed the test specification(s).</i>			
Prüflaboratorium: <i>Testing Laboratory:</i>		TÜV Rheinland Japan Ltd. – Global Technology Assessment Center 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan			
geprüft/ tested by:		kontrolliert/ reviewed by:			
					
2012-08-27	Y. Mashima / Inspector	2012-08-27	T. Sauter / Reviewer		
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other Aspects: This test report covers the testing of the intentional radiator aspects of the Communication Module YAA75-0402 used in conjunction with the following hosts: FM1S, FM2S, FM12S and FM25S. The tests were performed with the models FM1S, FM2S and FM25S. Model FM25S was used as representative sample for the model FM12S. Refer to section 3.2 of this report for more details.					
Abkürzungen:		Abbreviations:			
P(ass) = entspricht Prüfgrundlage		P(ass) = passed			
F(ail) = entspricht nicht Prüfgrundlage		F(ail) = failed			
N/A = nicht anwendbar		N/A = not applicable			
N/T = nicht getestet		N/T = not tested			
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>					

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TEST SUMMARY

5.1.1 SUPPLY VOLTAGE REQUIREMENTS

RESULT: PASS

5.1.2 ANTENNA REQUIREMENTS

RESULT: PASS

5.1.3 RESTRICTED BANDS OF OPERATION

RESULT: PASS

5.2.1 CONDUCTED OUTPUT POWER

RESULT: PASS

5.2.2 6dB BANDWIDTH

RESULT: PASS

5.2.3 99% BANDWIDTH

5.2.4 CONDUCTED SPURIOUS EMISSIONS

RESULT: PASS

5.2.5 PEAK POWER SPECTRAL DENSITY

RESULT: PASS

5.3.1 RADIATED SPURIOUS EMISSIONS OF TRANSMITTER

RESULT: PASS

5.4.1 AC POWER LINE CONDUCTED EMISSION OF TRANSMITTER

RESULT: PASS

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1. General Remarks

1.1 Complementary Materials

There is no attachment to this test report.

2. Test Sites

2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center
4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

The used test equipment is in accordance with CISPR 16 for measurement of radio interference.

The Federal Communications Commission has reviewed the technical characteristics of the radiated and conducted emission facilities and has found these test sites to be in compliance with the requirements of section 2.948 of the FCC rules. The description of the test facility is listed under FCC registration number 299054.

The Industry Canada has reviewed the technical characteristics of the radiated and conducted emission facilities and has found these test sites to be in compliance with Canadian requirements. The description of the test facility is listed under OATS filing number 3466B-1.

The test facility is accredited by VLAC (member of ILAC) under number VLAC-017 according to ISO/IEC 17025:2005.



TÜV Rheinland Japan Ltd. is accredited by the Federal Communications Commission as a Conformity Assessment Body under Designation Number JP0017 and Test Firm Registration Number 386498.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
For Antenna Port Conducted Emission					
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2013-01
For AC Power Line Conducted Emission					
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2013-01
LISN	Rohde & Schwarz	ENV216	100276	RF-0016	2012-06
LISN	Rohde & Schwarz	ENV216	101371	RF-0459	2012-12
For Radiated Emission					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2013-02
Receiver	Rohde & Schwarz	ESU 40	100029	RF-0021	2013-01
RF Selector (10m Chamber)	Toyo Corporation	NS4900	0703-182	RF-0029	2013-05
Loop Antenna with Amplifier, 9kHz-30MHz	Rohde & Schwarz	HFH2-Z2	100139	RF-0048	2013-02
Trilog Antenna No. 2, 30-1000MHz	Schwarzbeck	VULB9168	9168-475	RF-0462	2013-01
Biconical Antenna, 30-300MHz	EMCO	3110B	9603-2379	RF-0207	2013-02
10dB Attenuator	Hewlett Packard	8491A 10dB	58354	RF-0314	2012-11
Low Noise Pre-Amplifier, 9kHz-1GHz	TSJ	MLA-10K01-B01-35	1370750	RF-0253	2012-11
Horn Antenna, 1-8GHz	Schwarzbeck	BBHA9120B	419	RF-0050	2012-05
Microwave Pre-Amplifier, 1-8GHz	Toyo Corporation	TPA0108-40	0634	RF-0052	2012-11
Band Reject Filter, 1-8GHz	Nitsuki	NF-49BT	027	RF-0131	2012-11
Horn Antenna with Pre-Amplifier, 8-18GHz	Toyo Corporation	HAP06-18W	00000025	RF-0065	2012-06
High Pass Filter, 8-18GHz	Micro-Tronics	HPM50107	006	RF-0334	2013-05
Horn Antenna with Pre-Amplifier, 18-26.5GHz	Toyo Corporation	HAP18-26N	00000010	RF-0070	2012-06
Constant Voltage Constant Frequency Stabilizers					
CVCF (Shielded Room)	NF Corporation	ESU2000S	9075612	RF-0210	N/A
CVCF Booster (Shielded Room)	NF Corporation	ESU2000B	9074403	RF-0211	N/A
CVCF (10m Chamber)	NF Corporation	ESU2000S	9067307	RF-0212	N/A
CVCF Booster (10m Chamber)	NF Corporation	ESU2000B	9074408	RF-0213	N/A

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Conformance of the used measurement and test equipment with the requirements of ISO/IEC 17025:2005 has been confirmed before testing.

2.3 Measurement Uncertainty

Table 2: Emission Measurement Uncertainty

Measurement Type	Frequency	Uncertainty
AC Power Line Conducted Emission	150kHz - 30MHz	±3.0dB
Antenna Port Conducted Emission	20Hz - 40GHz	±1.5dB
Radiated Emission	150kHz - 30MHz	±4.7dB
	30MHz - 1GHz	±4.7dB
	> 1GHz	±4.7dB

3. General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is a wireless communication module to be installed into a wattmeter for home use. It is used to transmit power consumption information via IEEE 802.11b signals to a remote access point.

3.2 System Details

Radio standard: IEEE 802.11b
Specified output power: 20dBm
Antenna gain: Antenna 1: max. 4.2dBi, Antenna 2: max. 2.6dBi
Antenna type: Printed-circuit antenna
Antenna mounting type: Internal
Frequency range: 2412 - 2462MHz
Number of channels: 11
Channel spacing: 5MHz
Data rate: 1Mbps
Modulation type: DSSS coupled with BPSK
FCC classification: DTS
IC classification: Spread Spectrum/Digital Device (2400-2483.5 MHz)
Emission designator: G1D

Rated voltage: AC 120/240V
Rated frequency: 50/60Hz
Rated power: Max. 8.49W
Protection class: II

Test voltage: Refer to each test item.
Test frequency: 60Hz

The EUT is intended to be used with the following hosts:

Host Model Name	Rated Input Voltage	S/N of Tested Sample
FM1S	AC 120V	92
FM2S	AC 240V	74
FM12S with 120V setting	AC 120V	Not tested (See Note)
FM12S with 240V setting	AC 240V	Not tested (See Note)
FM25S with 120V setting	AC 120V	97
FM25S with 240V setting	AC 240V	98

Note:

The models FM12S and FM25S are identical, except for the location of the N (neutral) terminal. This difference is deemed not to affect the EMC and radio properties of the equipment and therefore the model FM25S was used as representative sample for the model FM12S.

An additional sample Communication Module (S/N: 48) with temporary 50Ω antenna connectors was used for antenna conducted measurements. It was installed inside the different types of hosts mentioned here above for testing purpose.

The two antennas do not transmit simultaneously.

3.3 Clock Frequencies

The highest frequency generated or used by the equipment is 41.94304MHz for the digital interface.

3.4 Noise Suppressing Parts

Refer to schematics.

4. Test Set-up and Operation Modes

4.1 Test Methodology

The test methodology used is based on the requirements of 47 CFR Part 15, Sections 15.31, 15.33, 15.35, 15.205, 15.207, 15.209 and KDB Publication No. 558074 D01.

The test methods, which have been used, are based on ANSI C63.4-2003 and RSS-Gen (Issue 3).

For details, see under each test item.

4.2 Operation Modes

Testing was performed at the lowest operating frequency (2412MHz), at the operating frequency in the middle of the specified frequency band (2437MHz) and at the highest operating frequency (2462MHz).

The basic operation modes used for testing are:

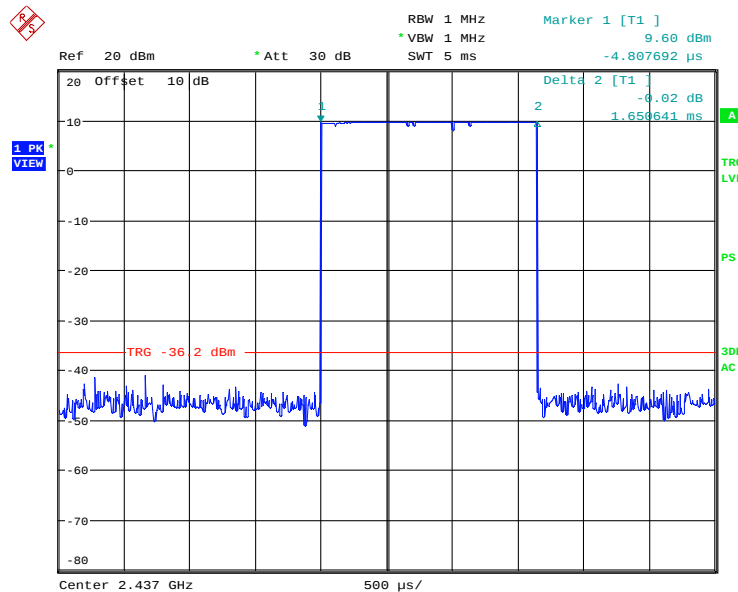
- A. EUT transmits (TX mode), with full power, at lowest channel (2412MHz), a continuous modulated signal streaming.
- B. EUT transmits (TX mode), with full power, at middle channel (2437MHz), a continuous modulated signal streaming.
- C. EUT transmits (TX mode), with full power, at highest channel (2462MHz), a continuous modulated signal streaming.

Note:

The duty cycle was approximately 1.65% for testing purpose (maximum duty cycle achievable by the transmitter using special test software). The pulse duration is 1.65ms (see figure here below) and there are approximately 100 pulses per 10 seconds.

The maximum duty cycle in normal operation condition (transfer of data) is 0.017%.

Figure 1: Pulse Duration for Testing



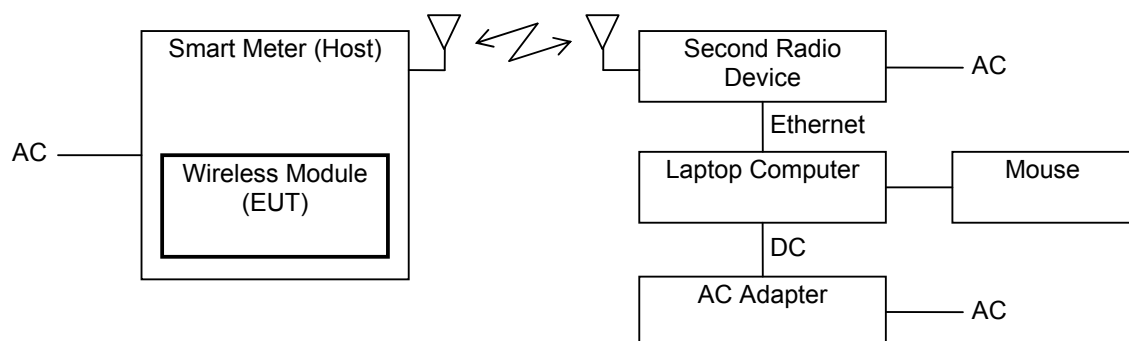
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4.3 Physical Configuration for Testing

The EUT was installed inside a host for testing purpose. The test system was configured in a typical fashion (as a customer would normally use it).

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4:2003.

Figure 2: Block Diagram



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Table 3: Interfaces present on the EUT

No.	Interface	Cable Length for Testing, Shielding	Interface Classification
1.	AC Input (on Host)	2m for radiated tests, 1m for other tests, un-shielded	AC input power port

For more details, refer to section: Photographs of the Test Set-Up.

4.4 Test Software

Software used for testing: Tera Term Professional by TeraTerm Project.

This software was running on the laptop computer. It was used to enable on the EUT the test operation modes listed in section 4.2 as appropriate.

4.5 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- Product: Laptop computer
Manufacturer: Fujitsu
Model: FMV-R8250
Rated Voltage: DC 16V
Input Current: 3.75 A
Protection Class: III
Serial Number: R8900339
- Product: AC Adapter for Laptop Computer
Manufacturer: Fujitsu Limited
Model: PXW1637N
Rated Voltage: AC 100-240V
Input Current: 1.3A
Frequency: 50/60Hz
Protection Class: II
Serial Number: 08704718B
- Product: Mouse
Manufacturer: Fujitsu Limited
Model: Unspecified
Rated Voltage: DC 5V (via USB)
Protection Class: III
Serial Number: Unspecified

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4. Product: Communication Module (used as Second Radio Device)
Manufacturer: Fujitsu Limited
Model: YAA75-0402
Rated Voltage: AC 120/240V
Input Power: Max. 8.49W
Frequency: 50/60Hz
Serial Number: 84

4.6 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

5. Test Results RADIO

5.1 Technical Requirements

5.1.1 Supply Voltage Requirements

RESULT: **PASS**

Requirements:

FCC 15.31(e)

For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

Verdict:

The EUT has an internal voltage regulator to supply the RF circuit. Hence it complies with the supply voltage requirements.

5.1.2 Antenna Requirements

RESULT: **PASS**

Requirements:

FCC 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Verdict:

The EUT has internal printed-circuit antennas which are not user accessible. Hence it complies with the antenna requirements.

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5.1.3 Restricted Bands of Operation

RESULT:

PASS

Requirements:

FCC 15.205 and RSS-Gen 7.2.2

Only spurious emissions are permitted in any of the restricted frequency bands, unless otherwise specified.

Verdict:

The EUT operation frequency range is 2412-2462MHz. Therefore only spurious emissions may be found in the restricted bands of operation and the EUT complies with the restricted frequency band requirement.

5.2 Conducted Measurements at Antenna Port

5.2.1 Conducted Output Power

RESULT:

PASS

Date of testing: 2012-04-18

Ambient temperature: 24°C

Relative humidity: 43%

Atmospheric pressure: 1015hPa

Tested host: FM1S (AC 120V input voltage)
FM2S (AC 240V input voltage)
FM25S (AC 120V and 240V input voltages)

Requirements:

FCC 15.247(b)(3) and RSS-210 A8.4(4)

For systems using digital modulation in the 2400-2483.5MHz band, the maximum peak output power is 1W (30dBm).

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.8 and KDB Publication No. 558074 D01.

The maximum peak output power was measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth was set to 1MHz and the video bandwidth to 3MHz. The measured power levels were integrated over the 6dB bandwidth of the carrier.

The measurement was performed for all the hosts and input voltages mentioned here above in order to identify the configuration producing the highest output power. The results given here below show that the worst case output power is found for the host FM1S (AC 120V input voltage), and that there is no significant power variations between the hosts. Therefore, all the other antenna port conducted measurements for the evaluation of the radio properties of the EUT have been performed using the host FM1S.

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Table 4: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 1

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	19.15	1.37	20.52	112.81	30.00	1000	9.48
2437	20.60	1.37	21.97	157.52	30.00	1000	8.03
2462	20.31	1.35	21.66	146.58	30.00	1000	8.34

Table 5: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 2

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	18.99	1.37	20.36	108.73	30.00	1000	9.64
2437	19.43	1.37	20.80	120.32	30.00	1000	9.20
2462	18.90	1.35	20.25	105.94	30.00	1000	9.75

Table 6: Conducted Output Power, Host FM2S, AC 240V Input Voltage, Antenna 1

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	19.11	1.37	20.48	111.78	30.00	1000	9.52
2437	19.38	1.37	20.75	118.94	30.00	1000	9.25
2462	18.91	1.35	20.26	106.19	30.00	1000	9.74

Table 7: Conducted Output Power, Host FM2S, AC 240V Input Voltage, Antenna 2

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	19.68	1.37	21.05	127.45	30.00	1000	8.95
2437	19.10	1.37	20.47	111.52	30.00	1000	9.53
2462	18.63	1.35	19.98	99.56	30.00	1000	10.02

Table 8: Conducted Output Power, Host FM25S, AC 120V Input Voltage, Antenna 1

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	19.00	1.37	20.37	108.98	30.00	1000	9.63
2437	19.38	1.37	20.75	118.94	30.00	1000	9.25
2462	18.37	1.35	19.72	93.77	30.00	1000	10.28

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Table 9: Conducted Output Power, Host FM25S, AC 120V Input Voltage, Antenna 2

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	19.33	1.37	20.70	117.58	30.00	1000	9.30
2437	18.84	1.37	20.21	105.04	30.00	1000	9.79
2462	18.19	1.35	19.54	89.97	30.00	1000	10.46

Table 10: Conducted Output Power, Host FM25S, AC 240V Input Voltage, Antenna 1

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	18.69	1.37	20.06	101.47	30.00	1000	9.94
2437	20.31	1.37	21.68	147.35	30.00	1000	8.32
2462	20.22	1.35	21.57	143.57	30.00	1000	8.43

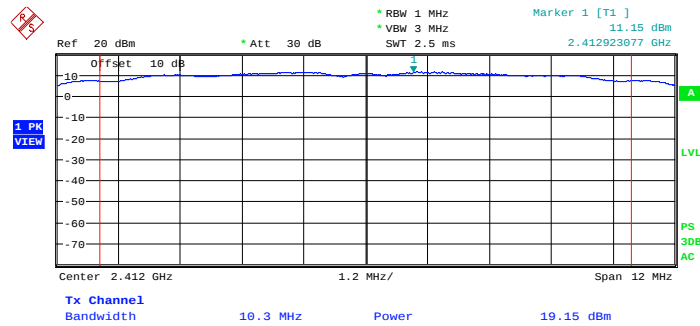
Table 11: Conducted Output Power, Host FM25S, AC 240V Input Voltage, Antenna 2

Operating Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Output Power [dBm]	Output Power [mW]	Limit [dBm]	Limit [mW]	Margin [dB]
2412	18.77	1.37	20.14	103.36	30.00	1000	9.86
2437	19.24	1.37	20.61	115.17	30.00	1000	9.39
2462	18.98	1.35	20.33	107.91	30.00	1000	9.67

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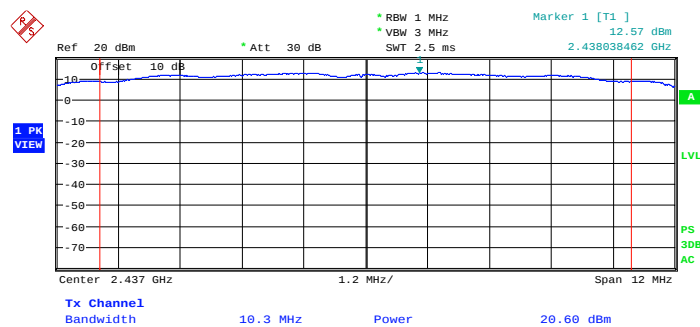
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Figure 3: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 1, Mode A (2412MHz)



COP, Mode A
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Figure 4: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 1, Mode B (2437MHz)

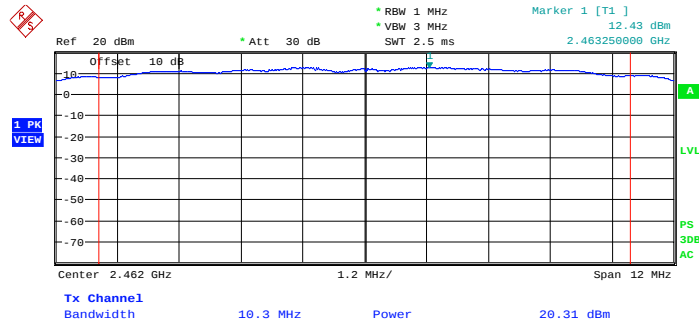


COP, Mode B
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Test Report No.:

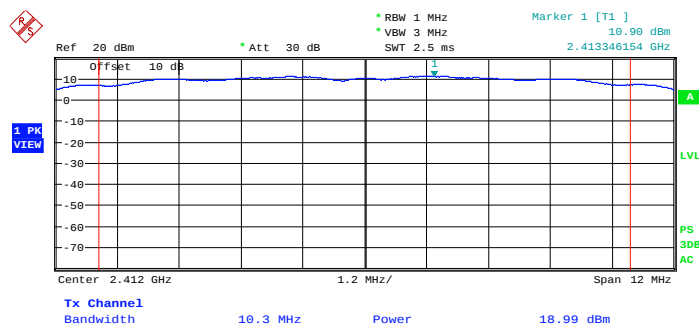
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Figure 5: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 1, Mode C (2462MHz)



COP, Mode C
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Figure 6: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 2, Mode A (2412MHz)

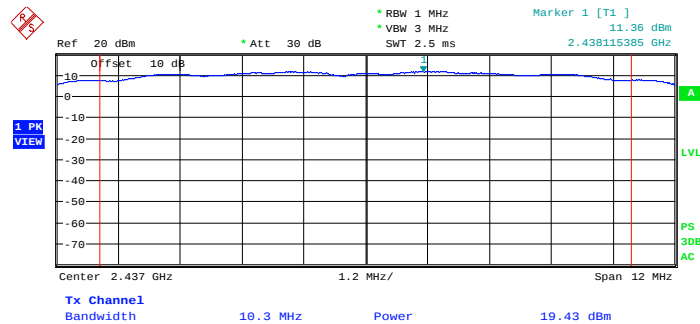


COP, Mode A
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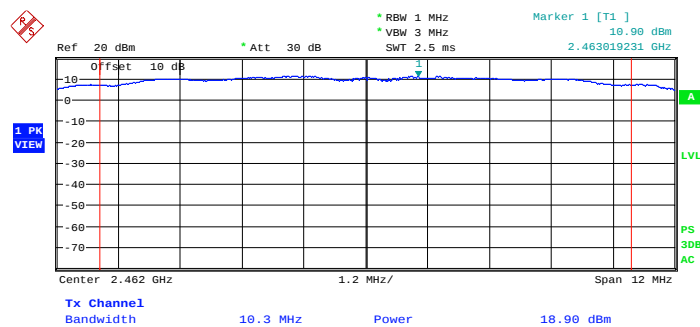
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Figure 7: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 2, Mode B (2437MHz)



COP, Mode B
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Figure 8: Conducted Output Power, Host FM1S, AC 120V Input Voltage, Antenna 2, Mode C (2462MHz)



COP, Mode C
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5.2.2 6dB Bandwidth

RESULT:

PASS

Date of testing: 2012-04-18

Ambient temperature: 24°C

Relative humidity: 43%

Atmospheric pressure: 1015hPa

Tested host: FM1S (AC 120V input voltage)

Requirements:

FCC 15.247(a)(2) and RSS-210 A8.2(a)

For systems using digital modulation in the 2400-2483.5MHz band, the 6dB bandwidth shall be at least 500kHz.

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.6.2 and KDB Publication No. 558074 D01.

The 6dB bandwidth was measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth was set to 100kHz and the video bandwidth to 300kHz. Markers placed at the lowest and highest intersections of the trace with a 6dBc line were used to calculate the emission bandwidth.

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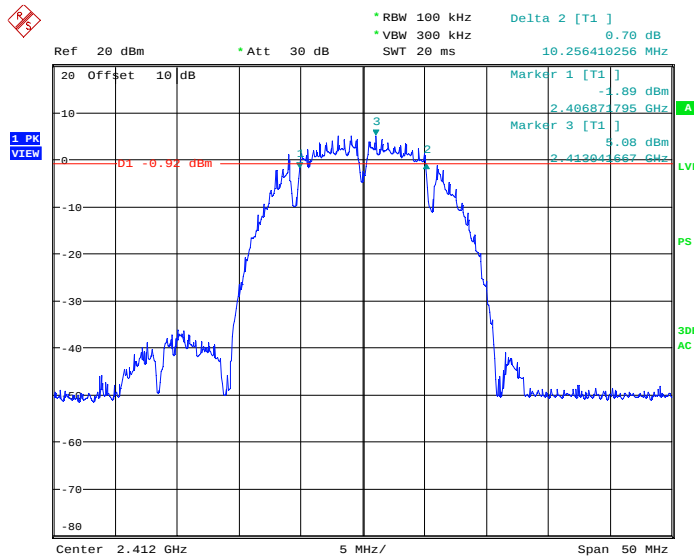
Table 12: 6dB Bandwidth, Antenna 1

Operating Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
2412	10.26	0.50
2437	10.18	0.50
2462	10.10	0.50

Table 13: 6dB Bandwidth, Antenna 2

Operating Frequency [MHz]	6dB Bandwidth [MHz]	Limit [MHz]
2412	10.26	0.50
2437	10.26	0.50
2462	10.26	0.50

Figure 9: 6dB Bandwidth, Antenna 1, Mode A (2412MHz)

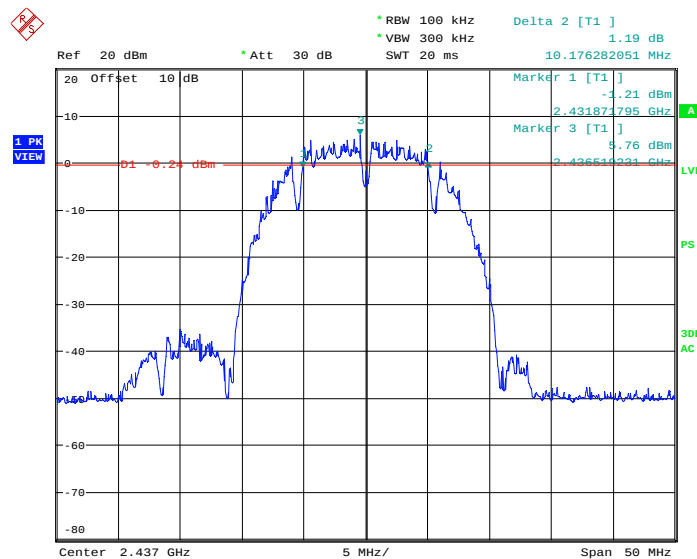


6dB bandwidth, mode A
Date: 18.APR.2012 13:08:49

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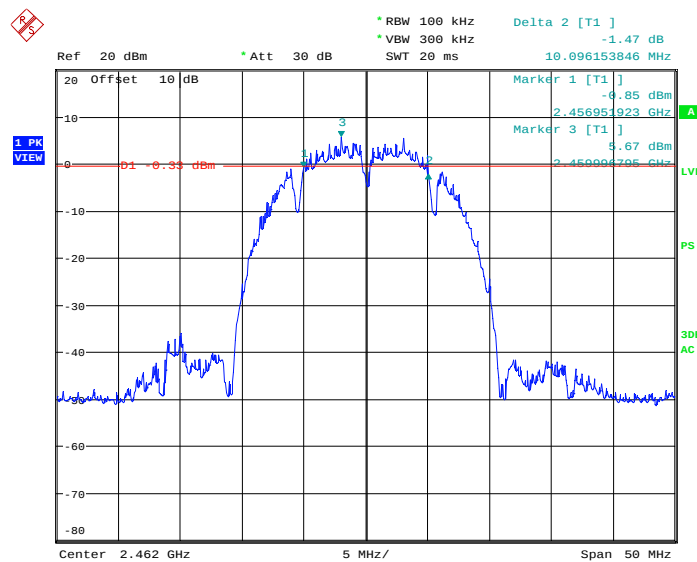
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Figure 10: 6dB Bandwidth, Antenna 1, Mode B (2437MHz)



6dB bandwidth, mode B
Date: 18.APR.2012 12:32:11

Figure 11: 6dB Bandwidth, Antenna 1, Mode C (2462MHz)

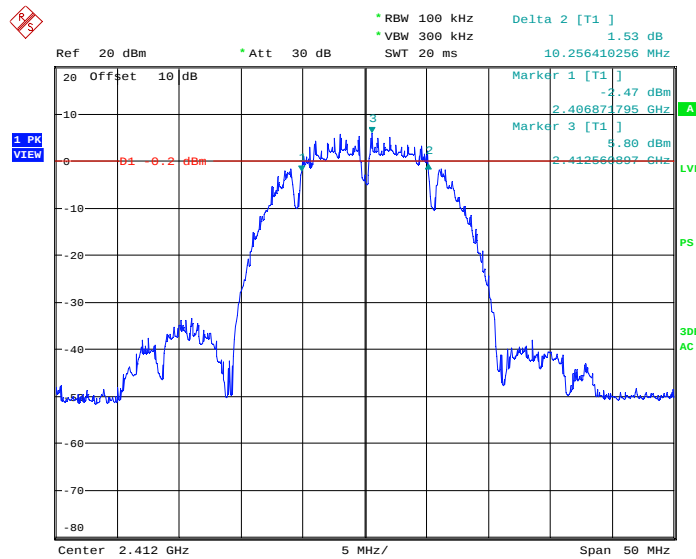


6dB bandwidth, mode C
Date: 18.APR.2012 14:07:44

Prüfbericht - Nr.: 12701723 001
Test Report No.:

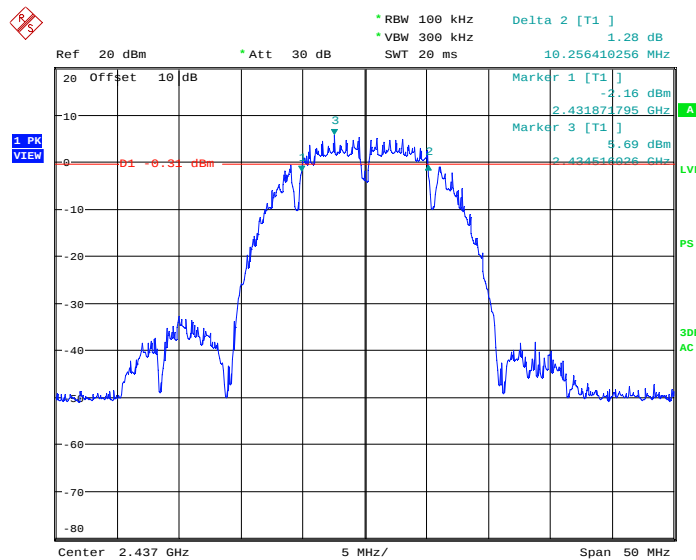
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Figure 12: 6dB Bandwidth, Antenna 2, Mode A (2412MHz)



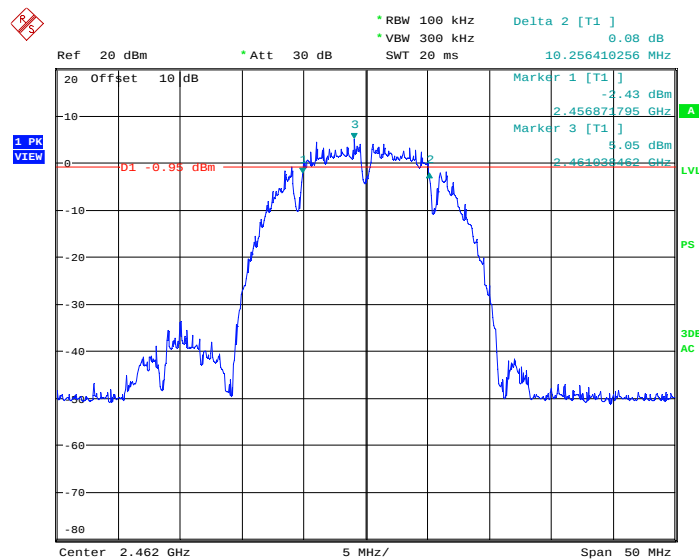
6dB bandwidth, mode A
Date: 18.APR.2012 13:02:23

Figure 13: 6dB Bandwidth, Antenna 2, Mode B (2437MHz)



6dB bandwidth, mode B
Date: 18.APR.2012 12:35:30

Figure 14: 6dB Bandwidth, Antenna 2, Mode C (2462MHz)



6dB bandwidth, mode C
Date: 18.APR.2012 14:14:37

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5.2.3 99% Bandwidth

Date of testing: 2012-06-04

Ambient temperature: 23°C

Relative humidity: 63%

Atmospheric pressure: 1010hPa

Tested host: FM1S (AC 120V input voltage)

Requirements:

RSS-Gen 4.6.1

The 99% bandwidth shall be reported according to RSS-Gen 4.6.1.

Test procedure:

RSS-Gen 4.6.1.

The 99% bandwidth was measured at the antenna port with a spectrum analyzer using a sample detector. The resolution bandwidth was set to 1MHz (1% of the span) and the video bandwidth to 3MHz. The 99% bandwidth was measured by using the OBW function of the analyzer with a 99% coverage setting.

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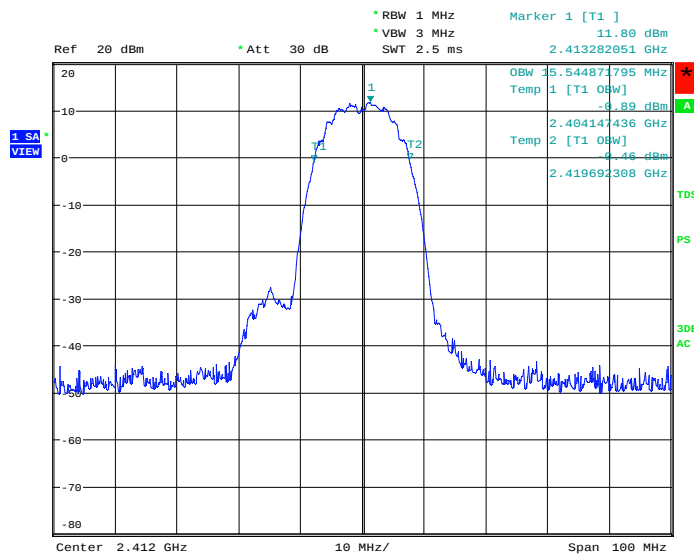
Table 14: 99% Bandwidth, Antenna 1

Operating Frequency [MHz]	99% Bandwidth [MHz]
2412	15.545
2437	15.385
2462	15.545

Table 15: 99% Bandwidth, Antenna 2

Operating Frequency [MHz]	99% Bandwidth [MHz]
2412	15.545
2437	15.545
2462	15.545

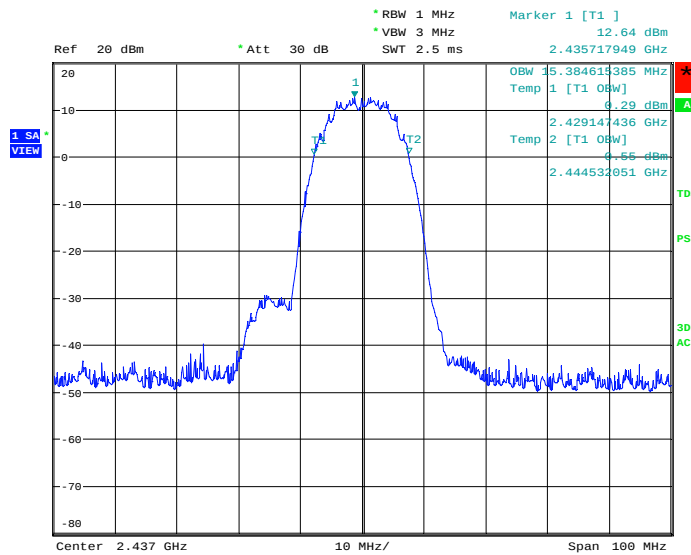
Figure 15: 99% Bandwidth, Antenna 1, Mode A (2412MHz)



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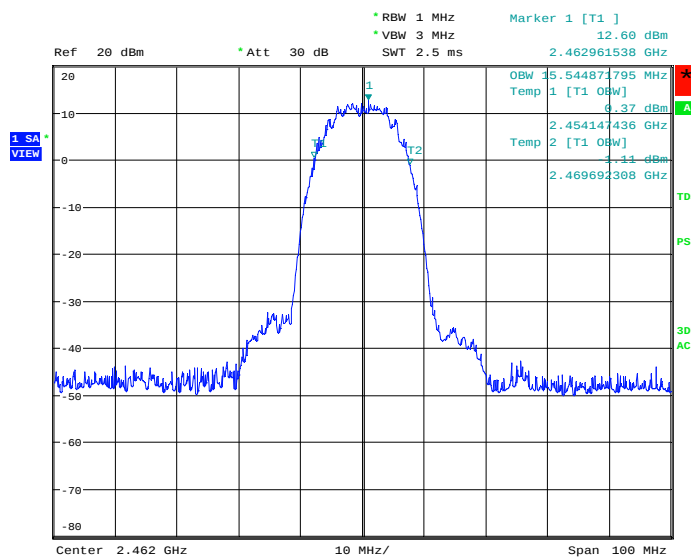
Figure 16: 99% Bandwidth, Antenna 1, Mode B (2437MHz)



99% bandwidth, mode B

Date: 4.JUN.2012 17:14:30

Figure 17: 99% Bandwidth, Antenna 1, Mode C (2462MHz)



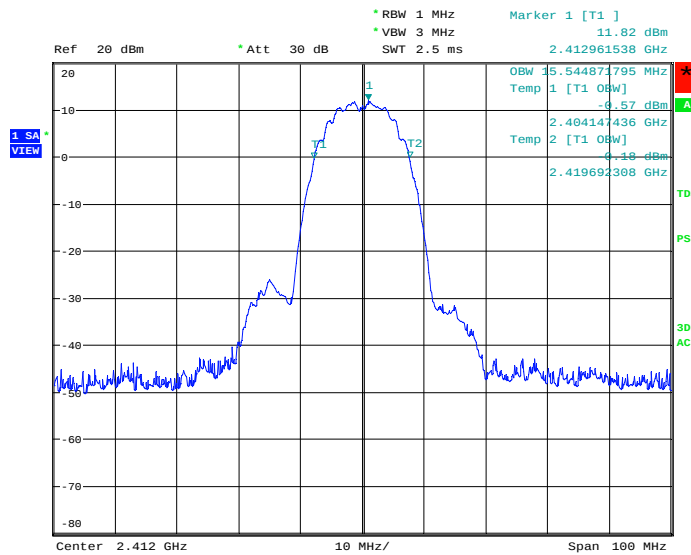
99% bandwidth, mode C

Date: 4.JUN.2012 17:28:39

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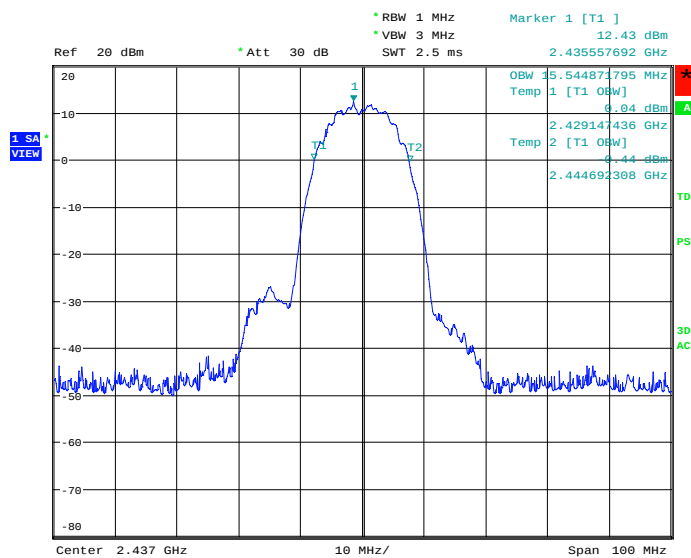
Figure 18: 99% Bandwidth, Antenna 2, Mode A (2412MHz)



99% bandwidth, mode A

Date: 4.JUN.2012 16:07:34

Figure 19: 99% Bandwidth, Antenna 2, Mode B (2437MHz)



99% bandwidth, mode B

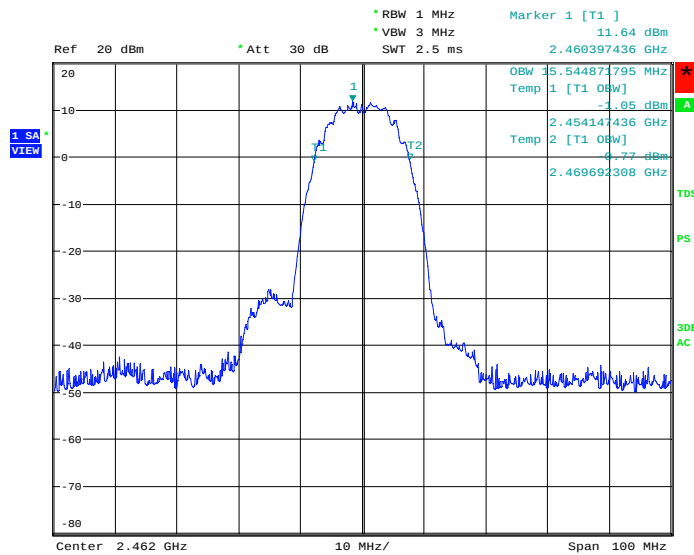
Date: 4.JUN.2012 17:12:10

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Figure 20: 99% Bandwidth, Antenna 2, Mode C (2462MHz)



99% bandwidth, mode C

Date: 4.JUN.2012 17:30:54

5.2.4 Conducted Spurious Emissions

RESULT:

PASS

Date of testing: 2012-04-25, 2012-04-26

Ambient temperature: 25, 25°C

Relative humidity: 50, 53%

Atmospheric pressure: 1011, 1007hPa

Tested host: FM1S (AC 120V input voltage)

Requirements:

FCC 15.247(d) and RSS-210 A8.5

In any 100kHz bandwidth outside the frequency band in which the intentional radiator is operating, the RF power shall be at least 20dB below that of the maximum in-band 100kHz emission.

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.9 and KDB Publication No. 558074 D01.

The conducted spurious emissions were measured at the antenna port with a spectrum analyzer using a peak detector. The resolution bandwidth was set to 100kHz and the video bandwidth to 300kHz. Measurements were performed from 30MHz to 25GHz (10th harmonics).

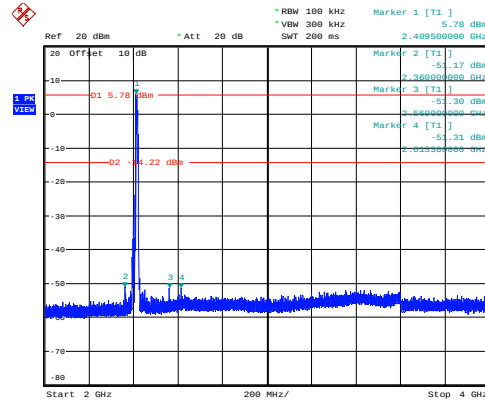
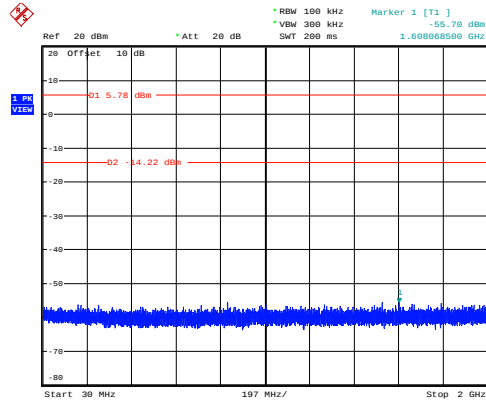
The readings of the measurements take into account the loss generated by all the involved cables.

Produkte
Products

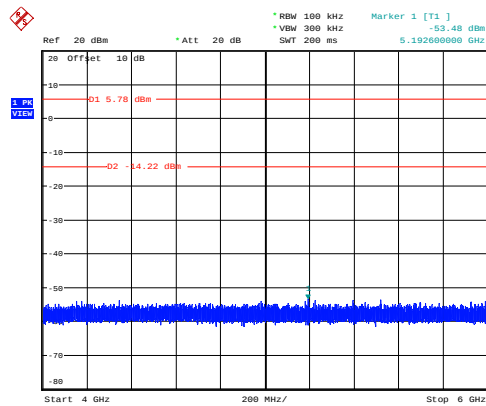
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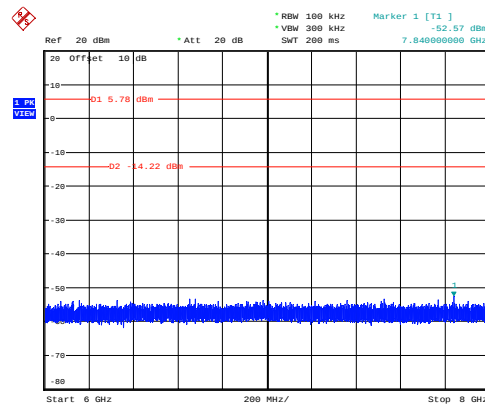
Figure 21: Conducted Spurious Emissions, 30MHz - 12GHz, Antenna 1, Mode A (2412MHz)



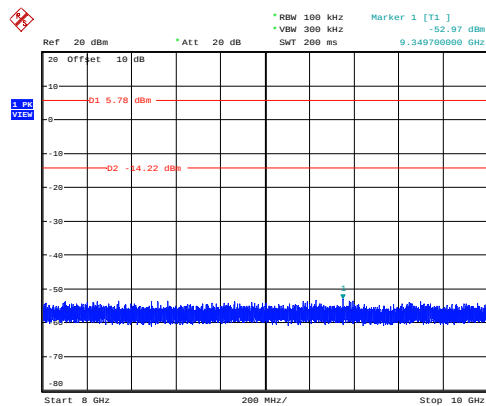
Spurious Emissions, mode A
Date: 26.APR.2012 16:55:41



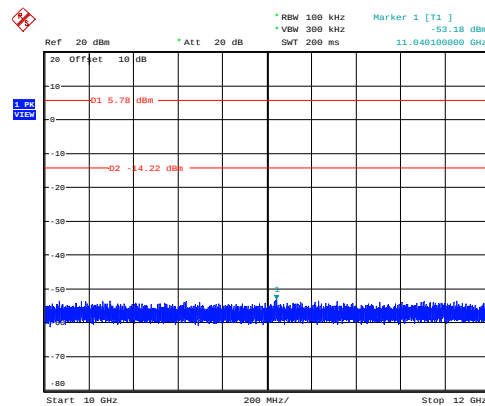
Spurious Emissions, mode A
Date: 26.APR.2012 16:54:57



Spurious Emissions, mode A
Date: 26.APR.2012 16:56:17



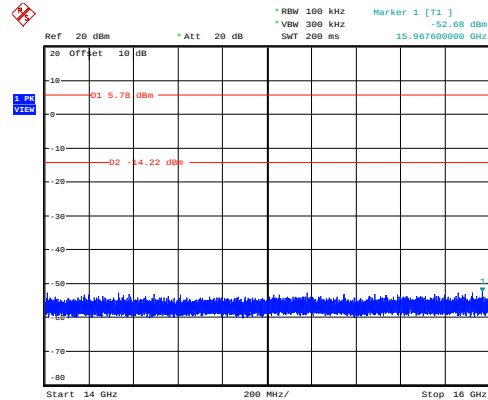
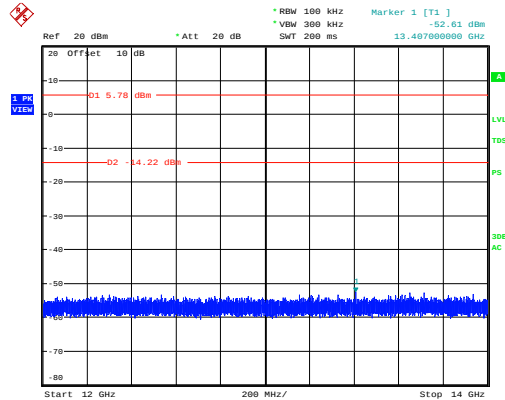
Spurious Emissions, mode A
Date: 26.APR.2012 16:56:53



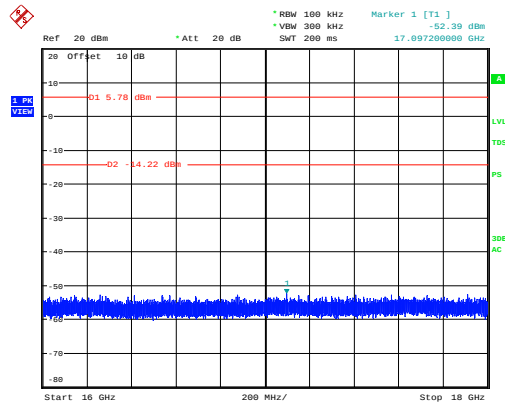
Spurious Emissions, mode A
Date: 26.APR.2012 16:57:30

Spurious Emissions, mode A
Date: 26.APR.2012 16:58:06

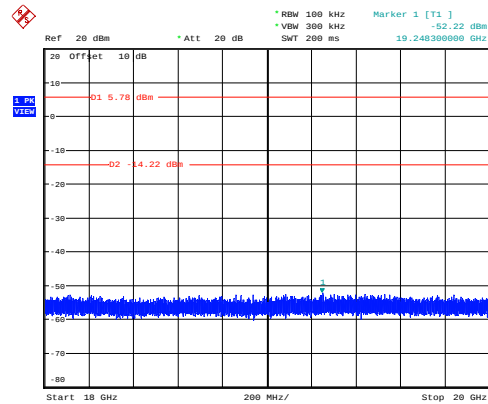
Figure 22: Conducted Spurious Emissions, 12 - 24GHz, Antenna 1, Mode A (2412MHz)



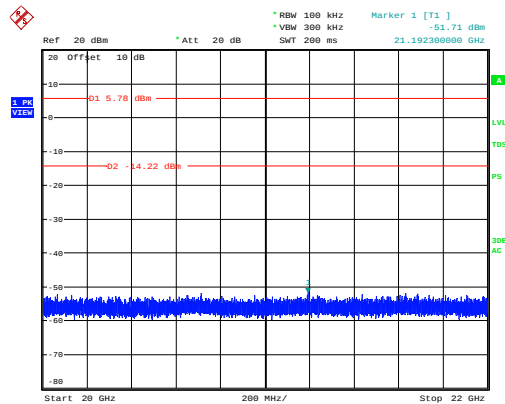
Spurious Emissions, mode A
Date: 26.APR.2012 16:58:42



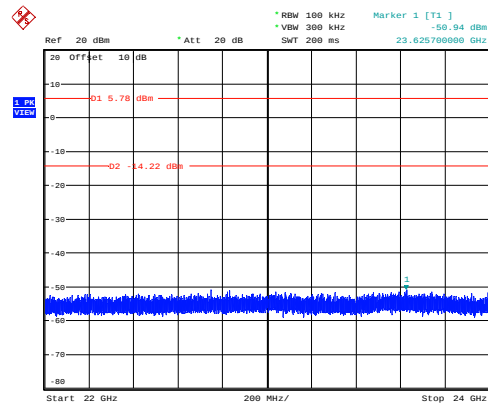
Spurious Emissions, mode A
Date: 26.APR.2012 16:59:19



Spurious Emissions, mode A
Date: 26.APR.2012 16:59:56



Spurious Emissions, mode A
Date: 26.APR.2012 17:00:33



Spurious Emissions, mode A
Date: 26.APR.2012 17:01:10

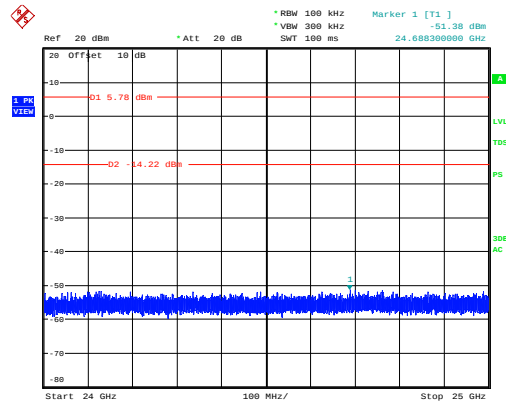
Spurious Emissions, mode A
Date: 26.APR.2012 17:01:48

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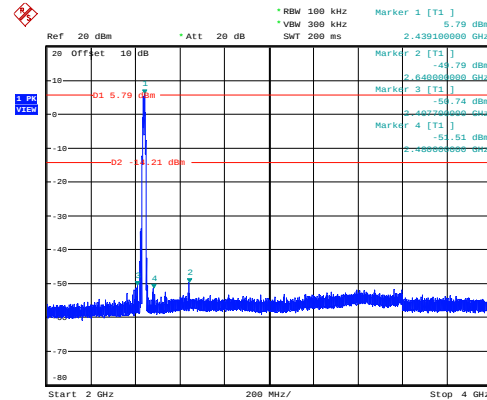
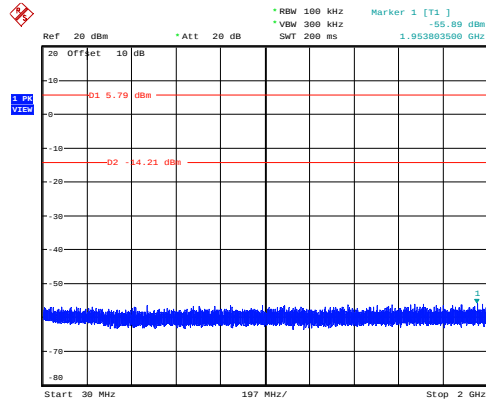
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Figure 23: Conducted Spurious Emissions, 24 - 25GHz, Antenna 1, Mode A (2412MHz)

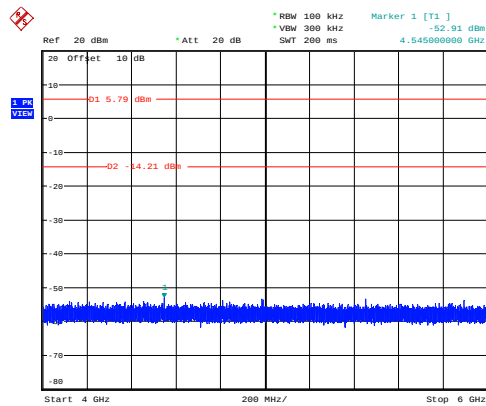


Spurious Emissions, mode A
Date: 26.APR.2012 17:02:26

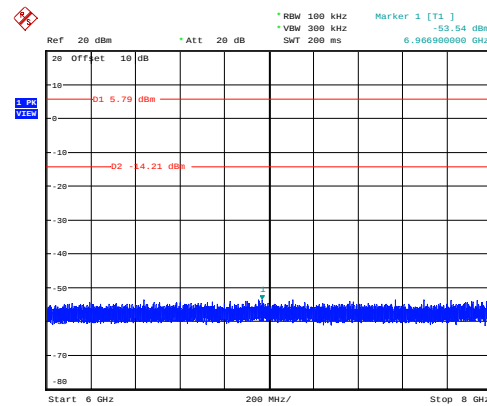
Figure 24: Conducted Spurious Emissions, 30MHz - 12GHz, Antenna 1, Mode B (2437MHz)



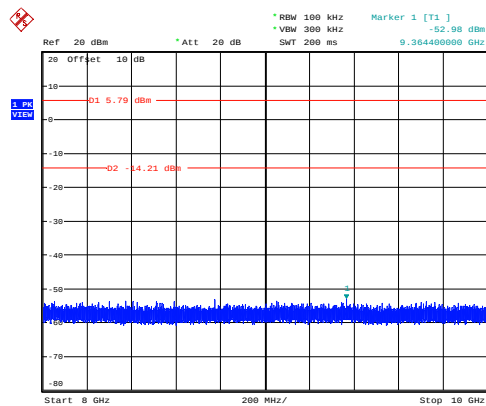
Spurious Emissions, mode B
Date: 26.APR.2012 15:51:17



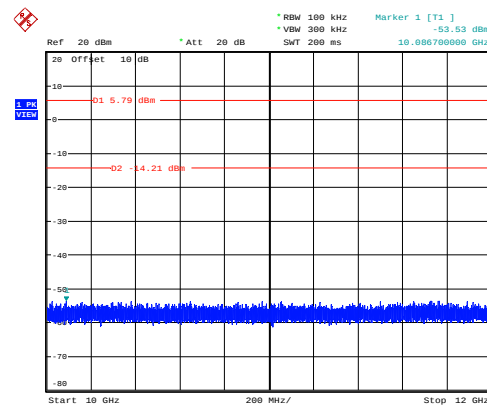
Spurious Emissions, mode B
Date: 26.APR.2012 15:48:39



Spurious Emissions, mode B
Date: 26.APR.2012 15:52:05



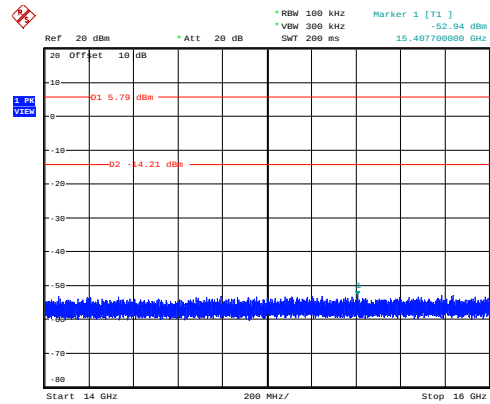
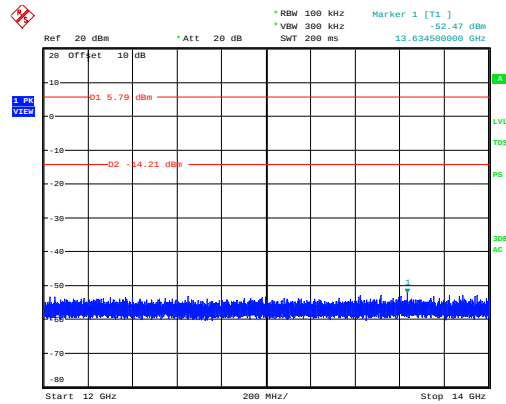
Spurious Emissions, mode B
Date: 26.APR.2012 15:52:45



Spurious Emissions, mode B
Date: 26.APR.2012 15:53:22

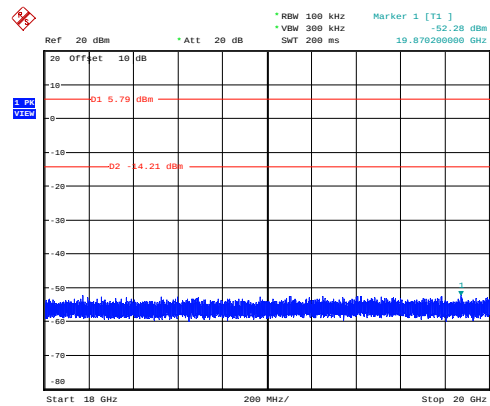
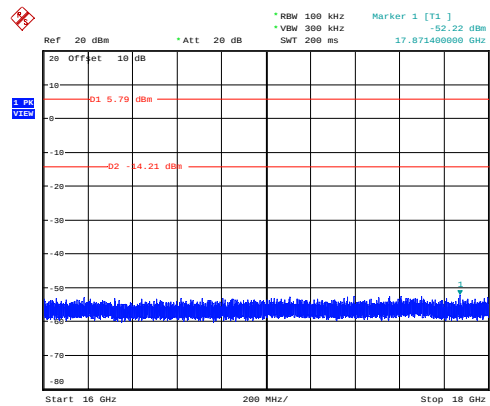
Spurious Emissions, mode B
Date: 26.APR.2012 15:53:58

Figure 25: Conducted Spurious Emissions, 12 - 24GHz, Antenna 1, Mode B (2437MHz)



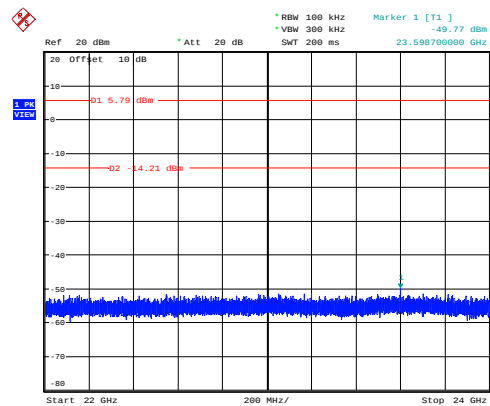
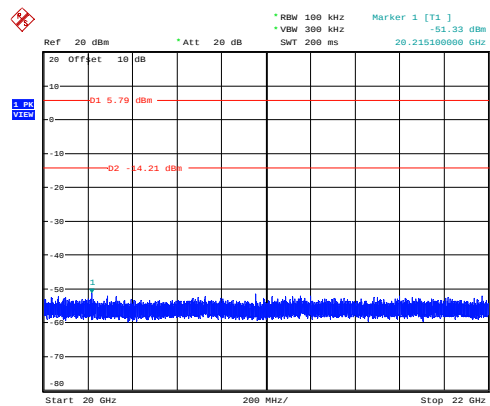
Spurious Emissions, mode B
Date: 26.APR.2012 15:54:36

Spurious Emissions, mode B
Date: 26.APR.2012 15:55:14



Spurious Emissions, mode B
Date: 26.APR.2012 15:55:47

Spurious Emissions, mode B
Date: 26.APR.2012 15:56:17



Spurious Emissions, mode B
Date: 26.APR.2012 15:58:29

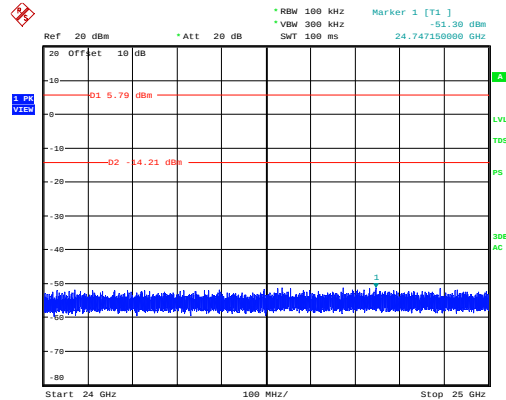
Spurious Emissions, mode B
Date: 26.APR.2012 15:59:10

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Figure 26: Conducted Spurious Emissions, 24 - 25GHz, Antenna 1, Mode B (2437MHz)

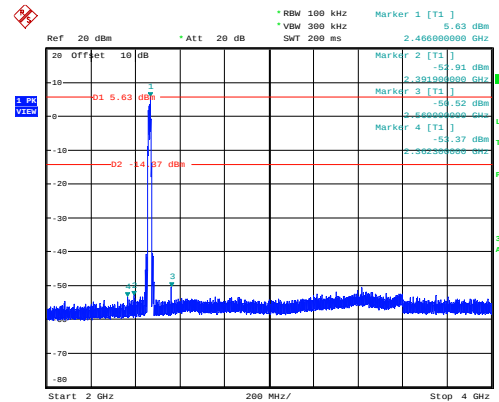
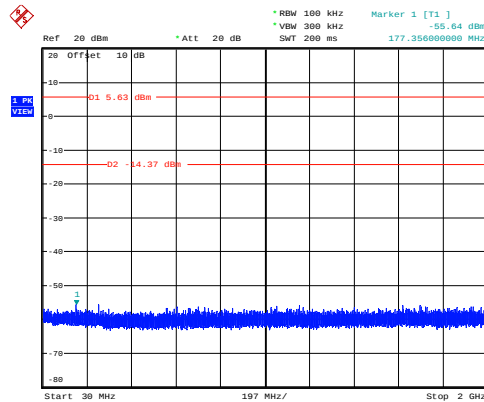


Spurious Emissions, mode B
Date: 26.APR.2012 15:59:48

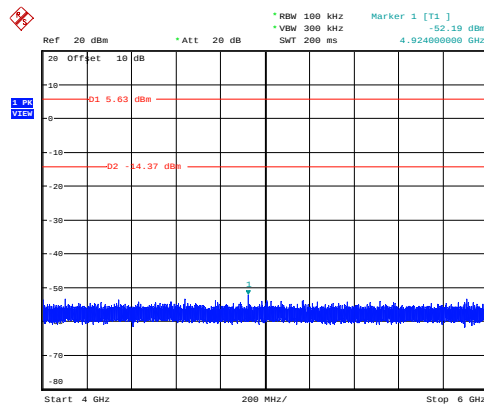
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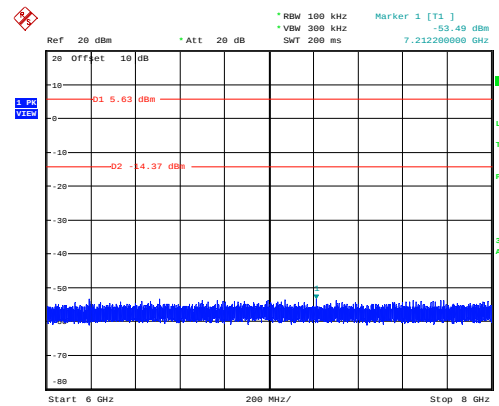
Figure 27: Conducted Spurious Emissions, 30MHz - 12GHz, Antenna 1, Mode C (2462MHz)



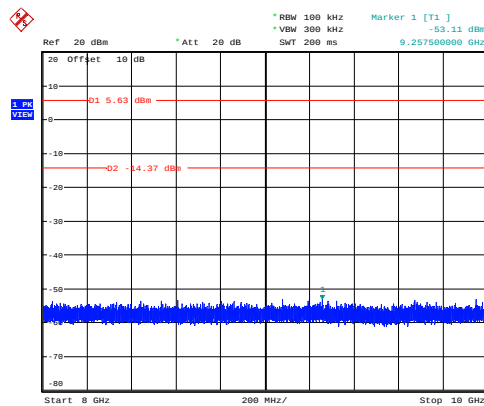
Spurious Emissions, mode C
Date: 25.APR.2012 22:36:48



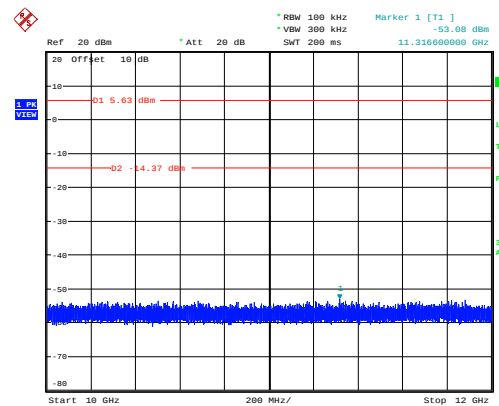
Spurious Emissions, mode C
Date: 25.APR.2012 22:10:15



Spurious Emissions, mode C
Date: 25.APR.2012 22:37:32



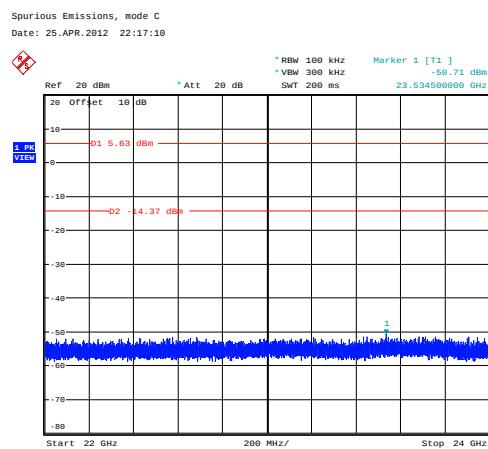
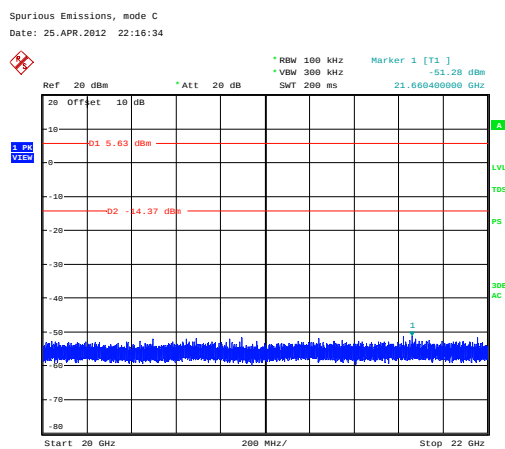
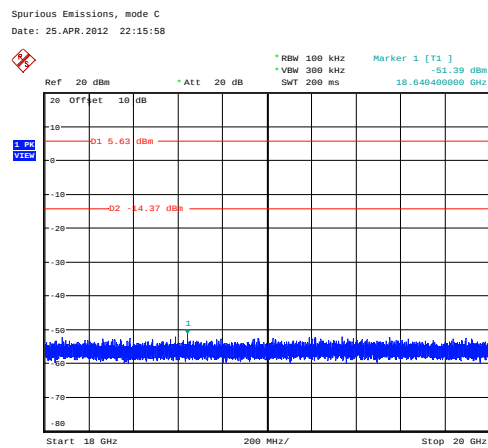
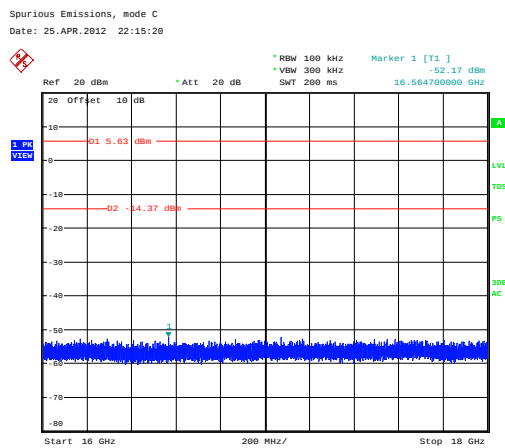
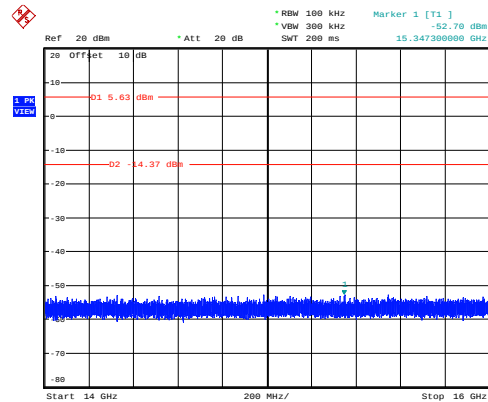
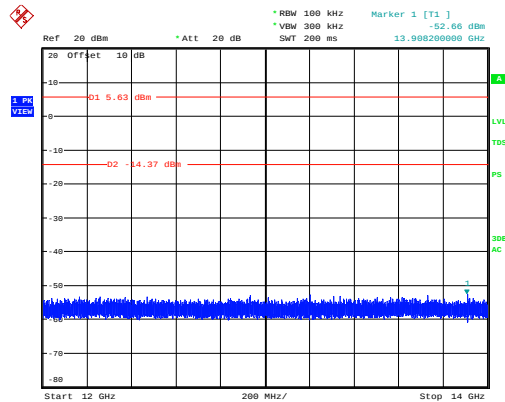
Spurious Emissions, mode C
Date: 25.APR.2012 22:13:25



Spurious Emissions, mode C
Date: 25.APR.2012 22:14:05

Spurious Emissions, mode C
Date: 25.APR.2012 22:14:43

Figure 28: Conducted Spurious Emissions, 12 - 24GHz, Antenna 1, Mode C (2462MHz)

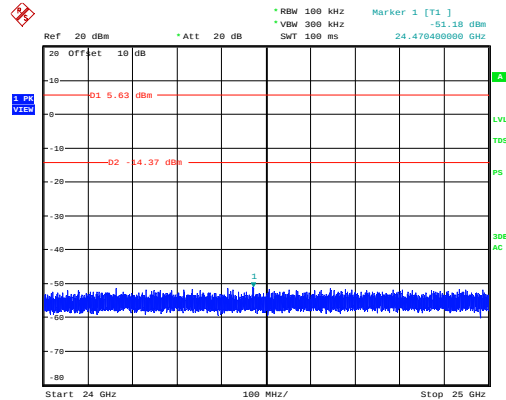


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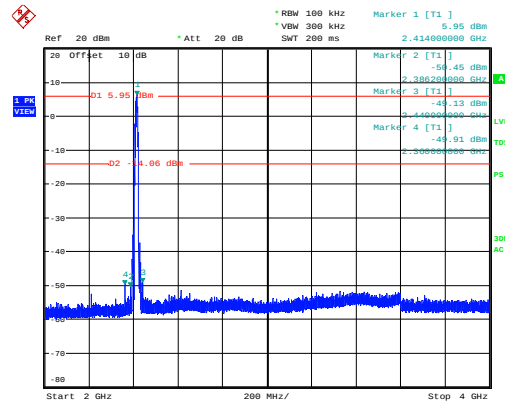
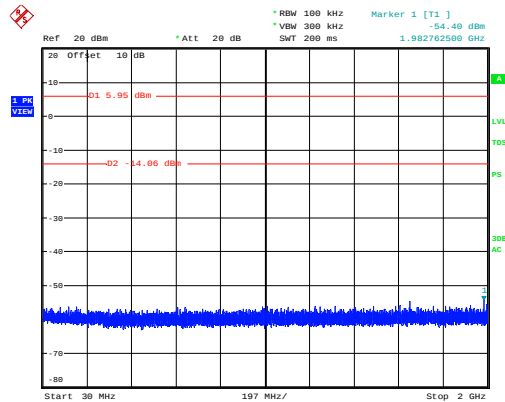
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Figure 29: Conducted Spurious Emissions, 24 - 25GHz, Antenna 1, Mode C (2462MHz)

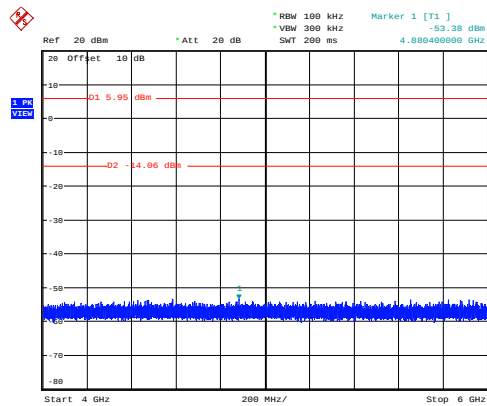


Spurious Emissions, mode C
Date: 25.APR.2012 22:19:03

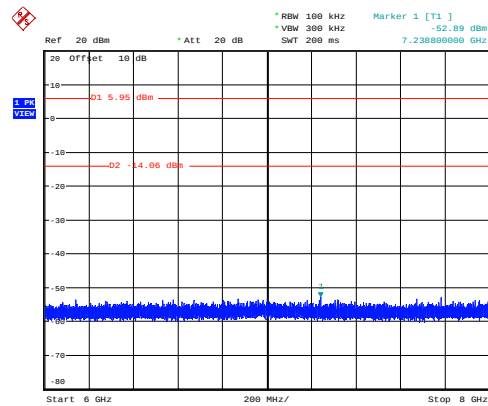
Figure 30: Conducted Spurious Emissions, 30MHz - 12GHz, Antenna 2, Mode A (2412MHz)



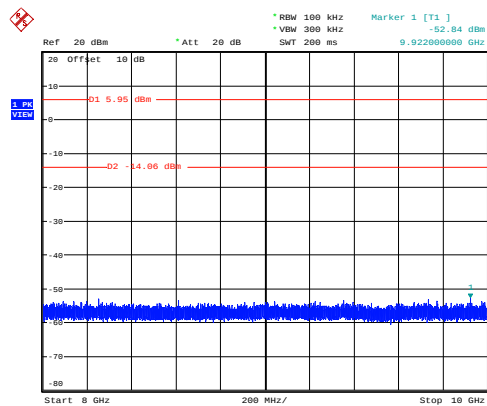
Spurious Emissions, mode A
Date: 25.APR.2012 20:49:55



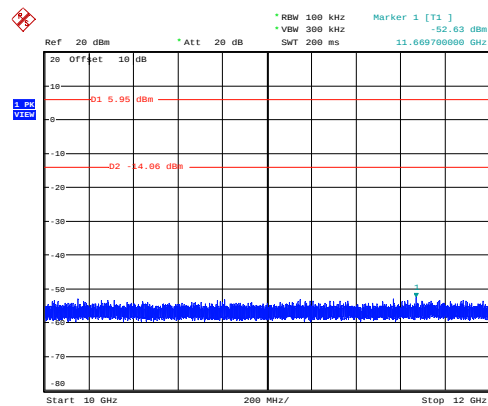
Spurious Emissions, mode A
Date: 25.APR.2012 20:28:39



Spurious Emissions, mode A
Date: 25.APR.2012 20:51:21



Spurious Emissions, mode A
Date: 25.APR.2012 20:52:45



Spurious Emissions, mode A
Date: 25.APR.2012 20:54:06

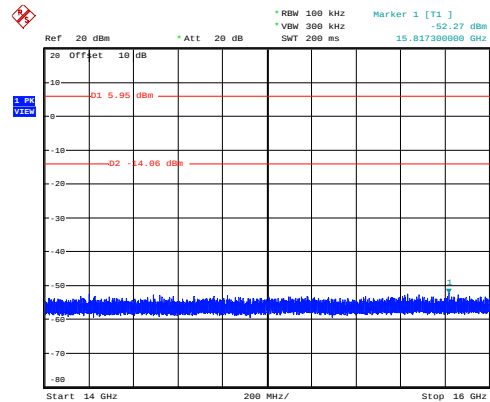
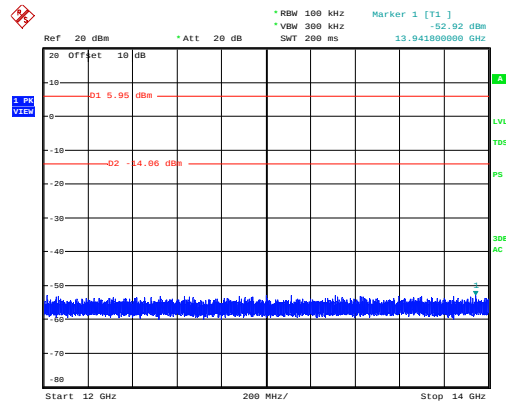
Spurious Emissions, mode A
Date: 25.APR.2012 20:55:58

Produkte
Products

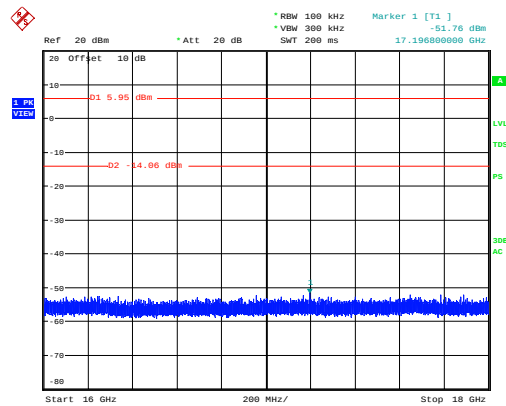
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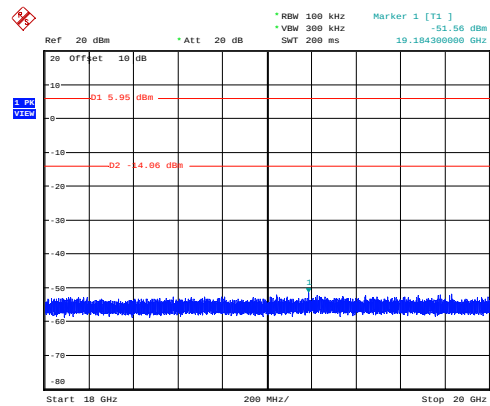
Figure 31: Conducted Spurious Emissions, 12 - 24GHz, Antenna 2, Mode A (2412MHz)



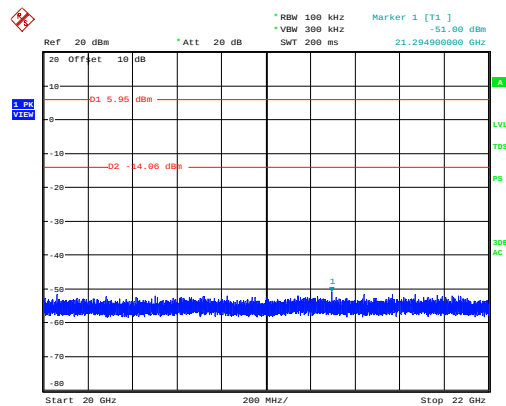
Spurious Emissions, mode A
Date: 25.APR.2012 20:57:12



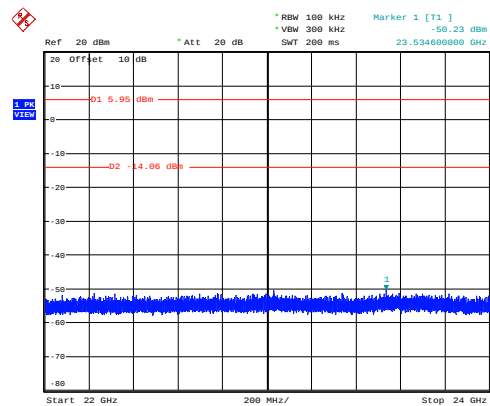
Spurious Emissions, mode A
Date: 25.APR.2012 20:42:05



Spurious Emissions, mode A
Date: 25.APR.2012 20:43:30



Spurious Emissions, mode A
Date: 25.APR.2012 20:44:46



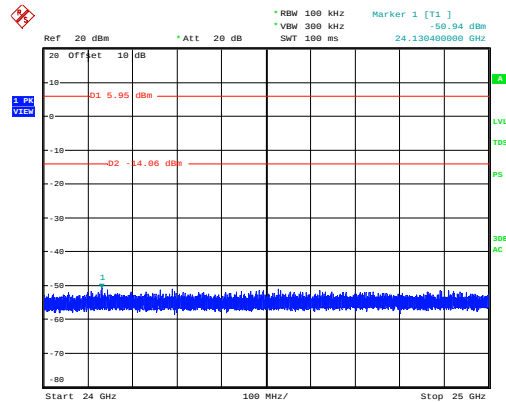
Spurious Emissions, mode A
Date: 25.APR.2012 20:46:06

Spurious Emissions, mode A
Date: 25.APR.2012 20:47:17

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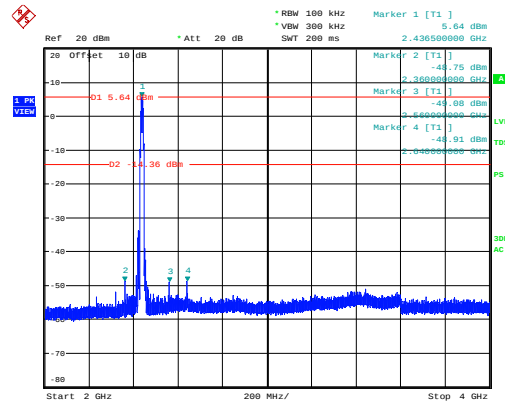
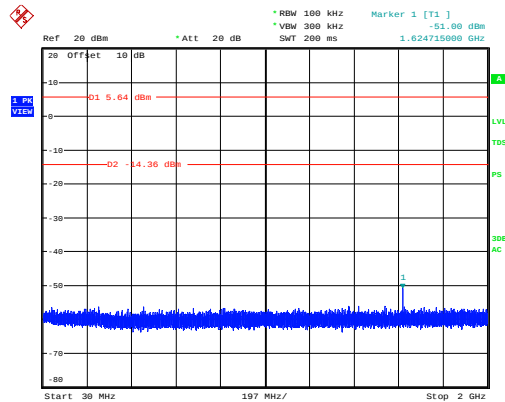
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Figure 32: Conducted Spurious Emissions, 24 - 25GHz, Antenna 2, Mode A (2412MHz)

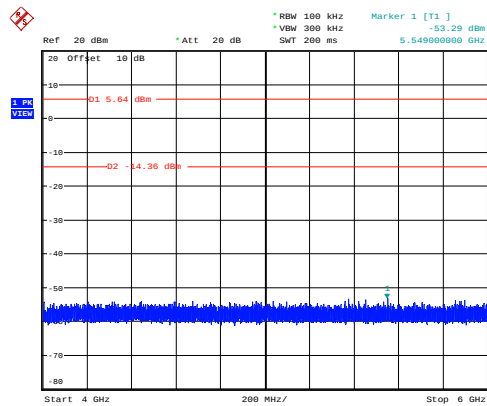


Spurious Emissions, mode A
Date: 25.APR.2012 20:48:27

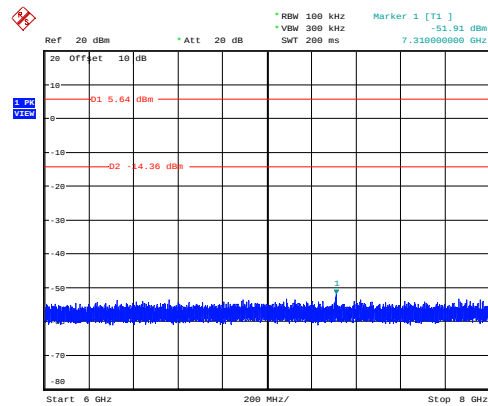
Figure 33: Conducted Spurious Emissions, 30MHz - 12GHz, Antenna 2, Mode B (2437MHz)



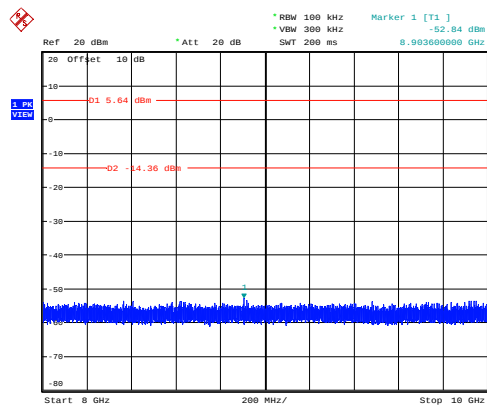
Spurious Emissions, mode B
Date: 25.APR.2012 23:26:03



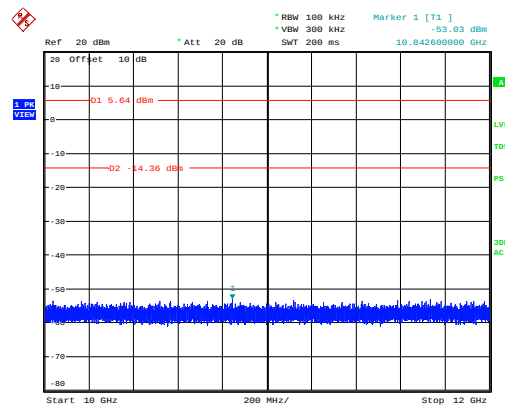
Spurious Emissions, mode B
Date: 25.APR.2012 23:23:55



Spurious Emissions, mode B
Date: 25.APR.2012 23:26:50



Spurious Emissions, mode B
Date: 25.APR.2012 23:27:46



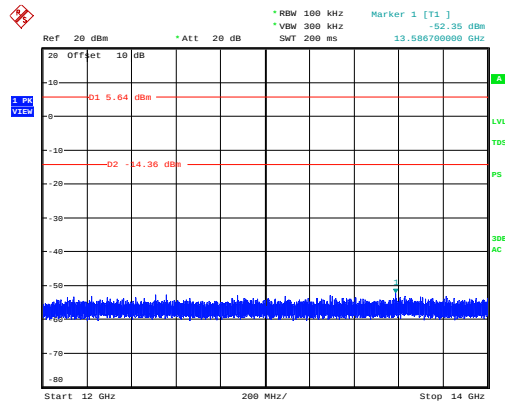
Spurious Emissions, mode B
Date: 25.APR.2012 23:28:23

Spurious Emissions, mode B
Date: 25.APR.2012 23:28:58

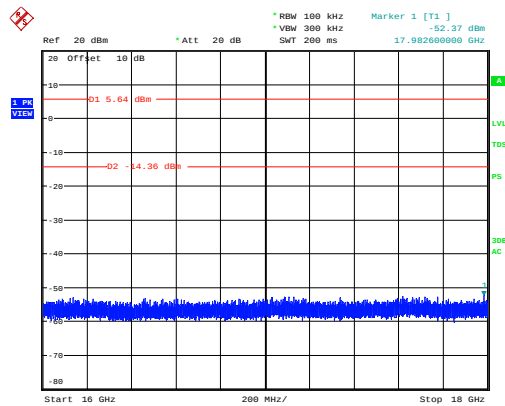
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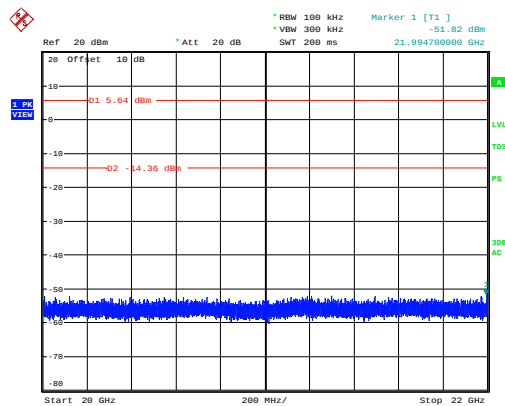
Figure 34: Conducted Spurious Emissions, 12 - 24GHz, Antenna 2, Mode B (2437MHz)



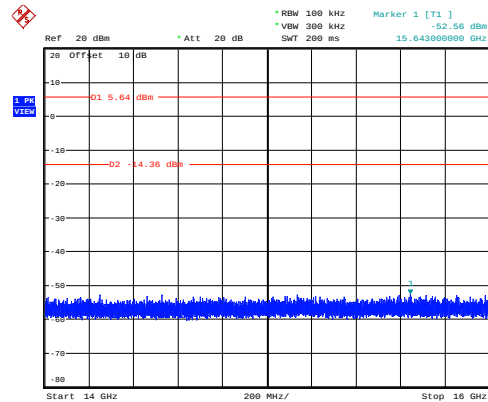
Spurious Emissions, mode B
Date: 25.APR.2012 23:29:39



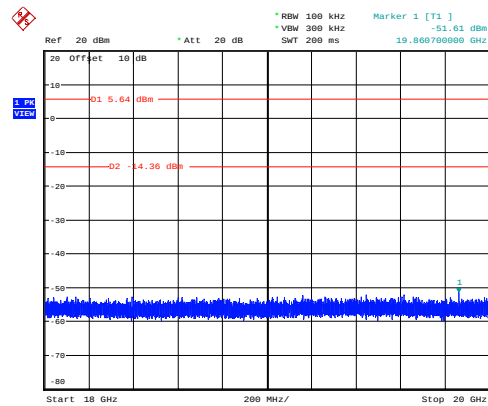
Spurious Emissions, mode B
Date: 25.APR.2012 23:31:05



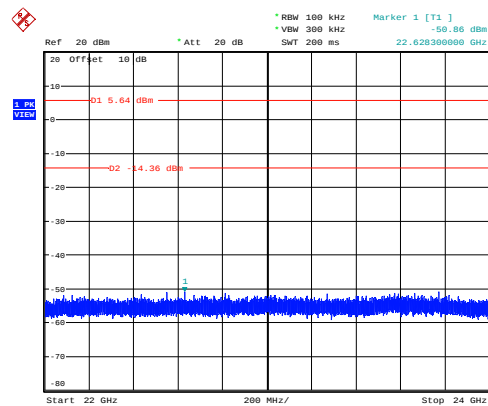
Spurious Emissions, mode B
Date: 25.APR.2012 23:32:18



Spurious Emissions, mode B
Date: 25.APR.2012 23:30:25

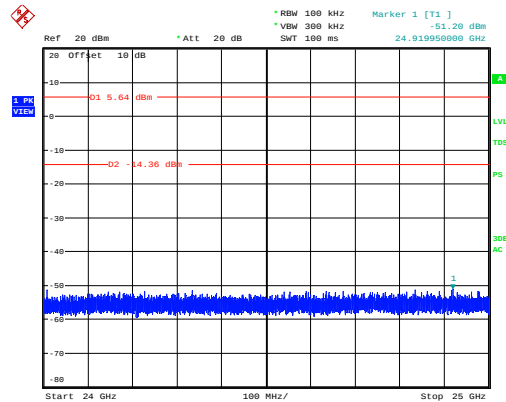


Spurious Emissions, mode B
Date: 25.APR.2012 23:31:42



Spurious Emissions, mode B
Date: 25.APR.2012 23:33:09

Figure 35: Conducted Spurious Emissions, 24 - 25GHz, Antenna 2, Mode B (2437MHz)

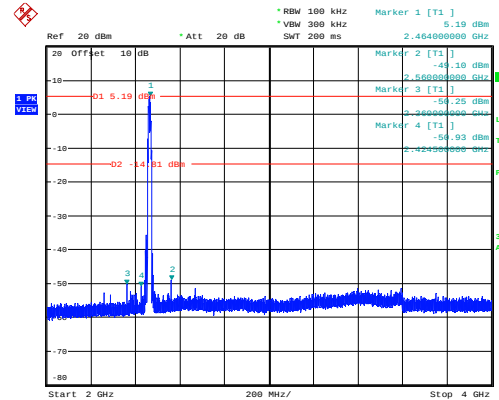
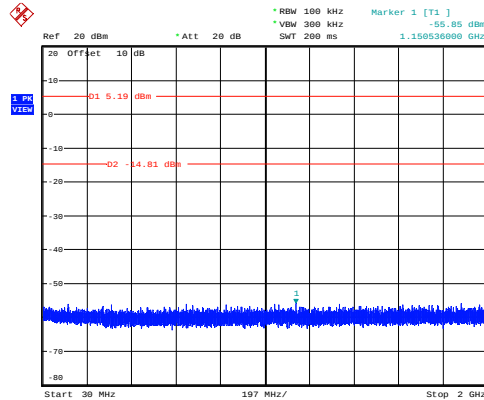


Spurious Emissions, mode B
Date: 25.APR.2012 23:33:45

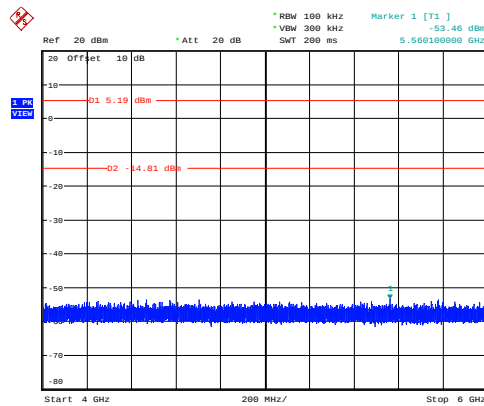
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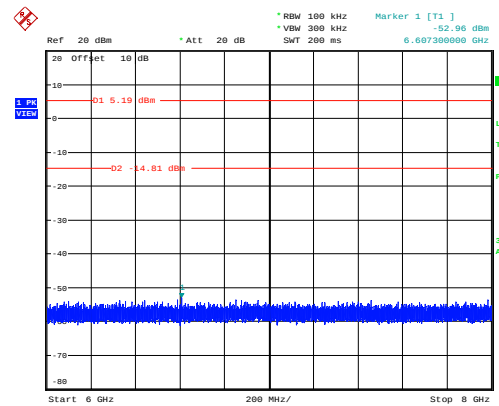
Figure 36: Conducted Spurious Emissions, 30MHz - 12GHz, Antenna 2, Mode C (2462MHz)



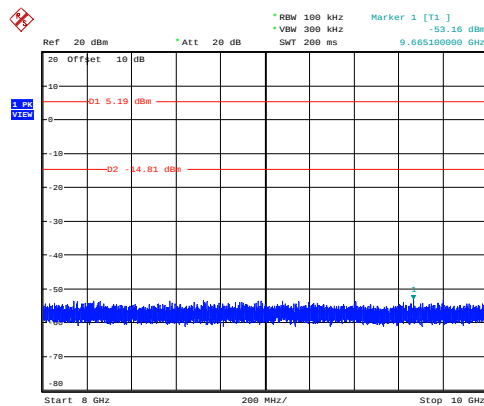
Spurious Emissions, mode C
Date: 26.APR.2012 16:19:19



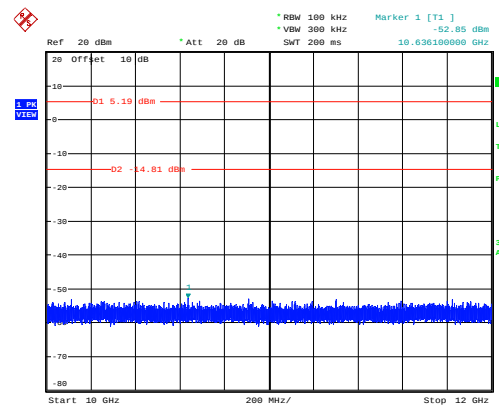
Spurious Emissions, mode C
Date: 26.APR.2012 16:17:12



Spurious Emissions, mode C
Date: 26.APR.2012 16:20:01



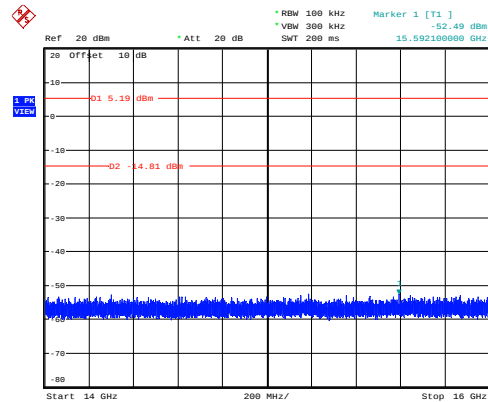
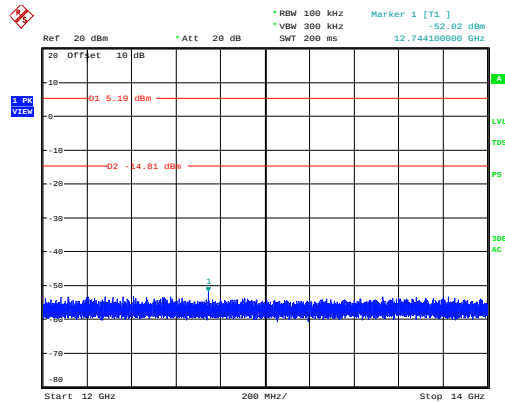
Spurious Emissions, mode C
Date: 26.APR.2012 16:20:38



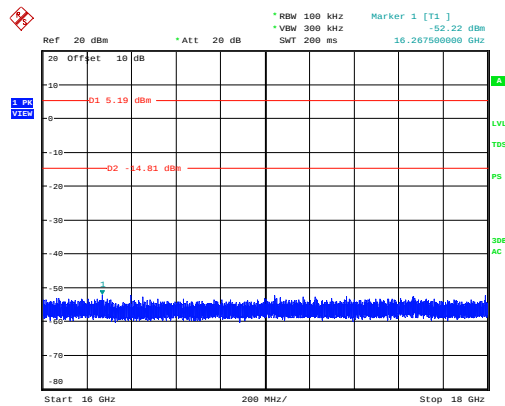
Spurious Emissions, mode C
Date: 26.APR.2012 16:21:14

Spurious Emissions, mode C
Date: 26.APR.2012 16:21:51

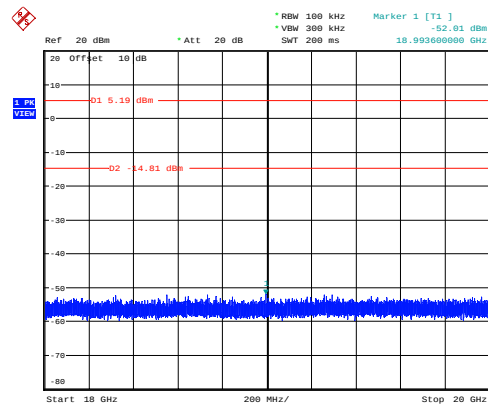
Figure 37: Conducted Spurious Emissions, 12 - 24GHz, Antenna 2, Mode C (2462MHz)



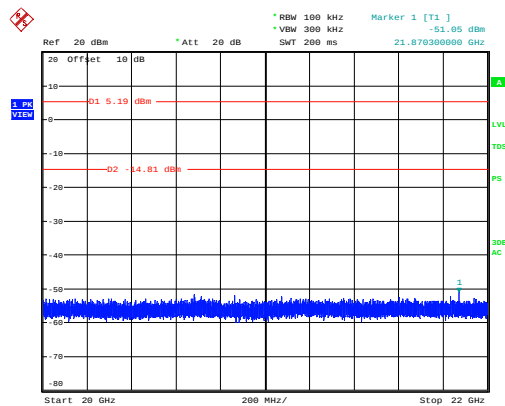
Spurious Emissions, mode C
Date: 26.APR.2012 16:22:27



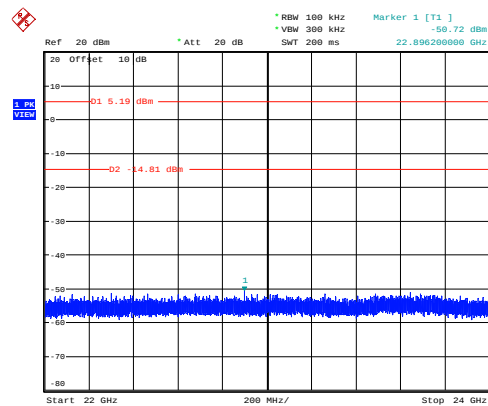
Spurious Emissions, mode C
Date: 26.APR.2012 16:23:03



Spurious Emissions, mode C
Date: 26.APR.2012 16:23:39



Spurious Emissions, mode C
Date: 26.APR.2012 16:24:15



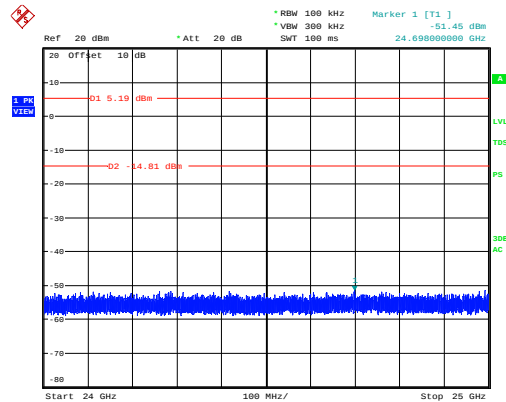
Spurious Emissions, mode C
Date: 26.APR.2012 16:24:51

Spurious Emissions, mode C
Date: 26.APR.2012 16:25:27

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Figure 38: Conducted Spurious Emissions, 24 - 25GHz, Antenna 2, Mode C (2462MHz)



Spurious Emissions, mode C
Date: 26.APR.2012 16:26:05

5.2.5 Peak Power Spectral Density

RESULT:

PASS

Date of testing: 2012-04-24, 2012-04-25

Ambient temperature: 26, 25°C

Relative humidity: 43, 50%

Atmospheric pressure: 1007, 1011hPa

Tested host: FM1S (AC 120V input voltage)

Requirements:

FCC 15.247(e) and RSS-210 A8.2(b)

For digitally modulated systems, the power spectral density (PSD) conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

Test procedure:

ANSI C63.4-2003 and KDB Publication No. 558074 D01.

The peak power spectral density was measured at the antenna port with a spectrum analyzer using a peak detector with a resolution bandwidth of 100kHz and a video bandwidth of 300kHz. The observed highest power level in a 100kHz band was scaled to an equivalent value in a 3kHz band by adjusting the measured power by a bandwidth correction factor.

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Table 16: Peak Power Spectral Density, Antenna 1

Operating Frequency [MHz]	Max PSD Frequency [MHz]	Max PSD in 100kHz Band (Reading) [dBm]	Correction Factor [dB]	Max PSD in 3kHz Band [dBm]	Limit [dBm]	Margin [dB]
2412	2409.00	5.51	-13.83	-23.52	8.00	31.52
2437	2435.99	6.91	-13.83	-22.12	8.00	30.12
2462	2461.49	5.52	-13.85	-23.53	8.00	31.53

Notes: Max PSD in 3kHz band = Max PSD in 100kHz band + Correction factor

Correction factor = [Cable loss] + [100kHz to 3kHz bandwidth conversion factor] = [cable loss] + [10 x log(3kHz / 100kHz)] = [Cable loss] – 15.2dB

Table 17: Peak Power Spectral Density, Antenna 2

Operating Frequency [MHz]	Max PSD Frequency [MHz]	Max PSD in 100kHz Band (Reading) [dBm]	Correction Factor [dB]	Max PSD in 3kHz Band [dBm]	Limit [dBm]	Margin [dB]
2412	2414.00	5.69	-13.83	-23.34	8.00	31.34
2437	2437.49	6.47	-13.83	-22.56	8.00	30.56
2462	2459.01	5.49	-13.85	-23.56	8.00	31.56

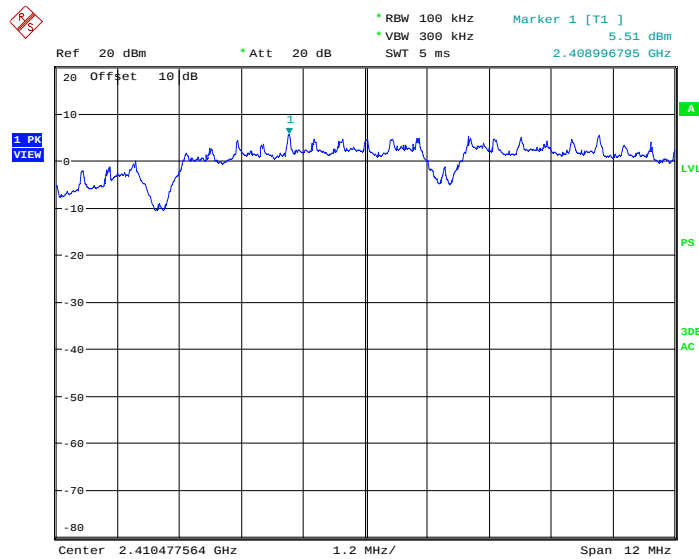
Notes: Max PSD in 3kHz band = Max PSD in 100kHz band + Correction factor

Correction factor = [Cable loss] + [100kHz to 3kHz bandwidth conversion factor] = [cable loss] + [10 x log(3kHz / 100kHz)] = [Cable loss] – 15.2dB

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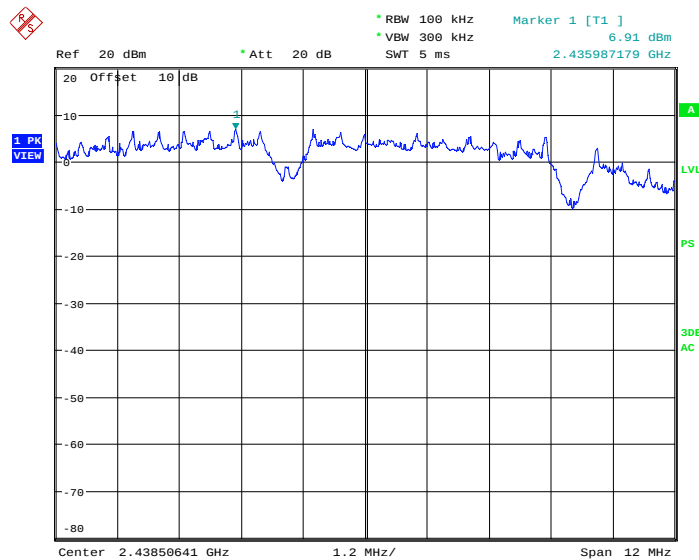
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Figure 39: Power Spectral Density, Antenna 1, Mode A (2412MHz)



Peak power spectral density, mode A
Date: 24.APR.2012 21:42:21

Figure 40: Power Spectral Density, Antenna 1, Mode B (2437MHz)

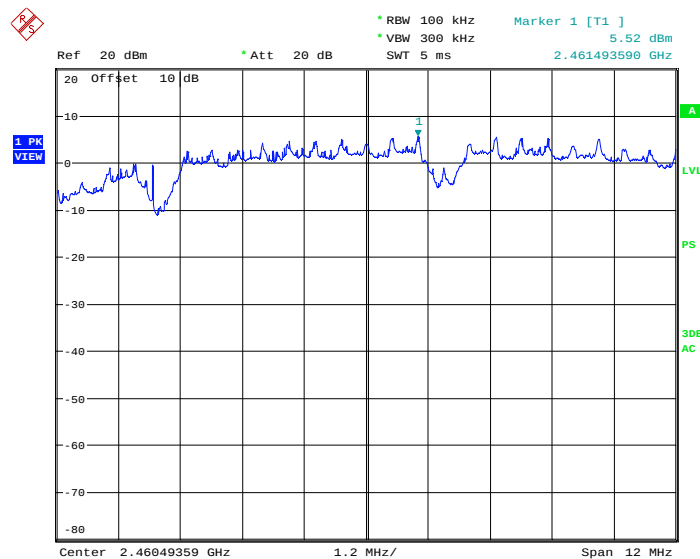


Peak power spectral density, mode B
Date: 24.APR.2012 19:18:33

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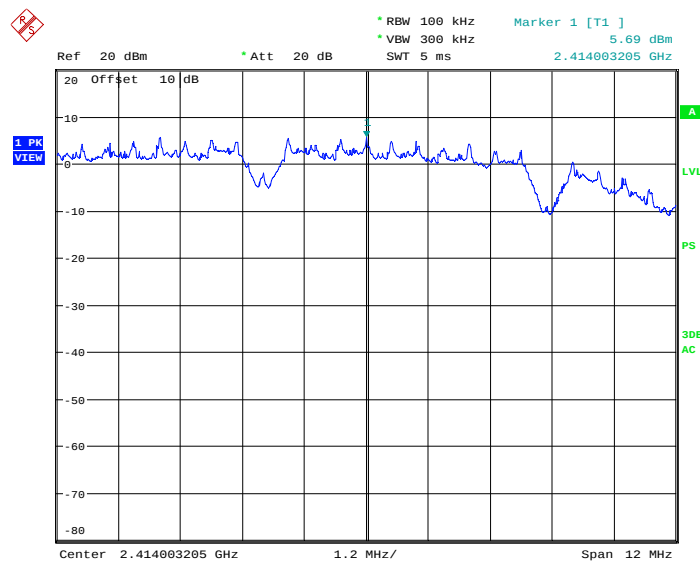
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Figure 41: Power Spectral Density, Antenna 1, Mode C (2462MHz)



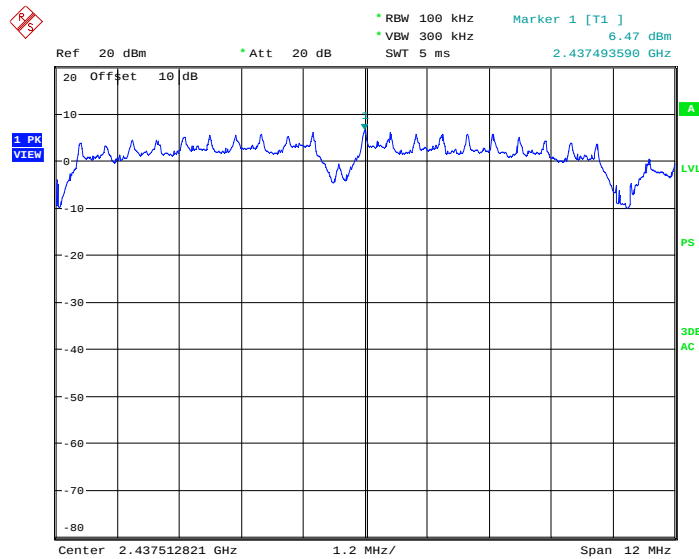
Peak power spectral density, mode C
Date: 25.APR.2012 21:39:59

Figure 42: Power Spectral Density, Antenna 2, Mode A (2412MHz)



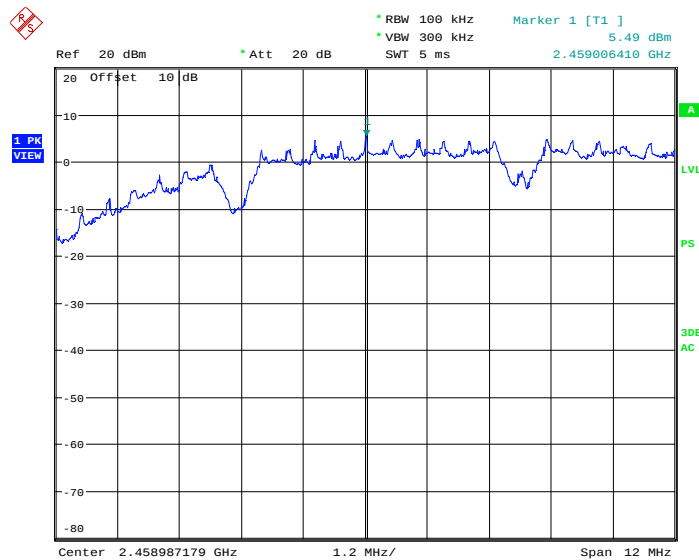
Peak power spectral density, mode A
Date: 24.APR.2012 21:50:57

Figure 43: Power Spectral Density, Antenna 2, Mode B (2437MHz)



Peak power spectral density, mode B
Date: 24.APR.2012 20:33:15

Figure 44: Power Spectral Density, Antenna 2, Mode C (2462MHz)



Peak power spectral density, mode C
Date: 25.APR.2012 21:31:43

5.3 Radiated Measurements

5.3.1 Radiated Spurious Emissions of Transmitter

RESULT:

PASS

Date of testing:	2012-04-11 till 2012-06-05
Ambient temperature:	20 to 23°C
Relative humidity:	40 to 62%
Atmospheric pressure:	1000 to 1024hPa
Frequency range:	9kHz - 25GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber
Tested host:	FM1S (AC 120V input voltage) FM2S (AC 240V input voltage) FM25S (AC 120V and 240V input voltages)

Requirements:

FCC 15.205, FCC 15.209, FCC 15.247(d), RSS-Gen 7.2.2 and 7.2.5 and RSS-210 2.1, 2.2, 2.5 and A8.5

Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen 7.2.2 (table 3), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen 7.2.5 (tables 5 and 6).

Radiated emissions which fall outside the operation frequency band and outside restricted bands shall either meet the limit specified in FCC 15.209(a) and RSS-Gen 7.2.5 or be attenuated at least 20dB below the power level in the 100kHz bandwidth within the band that contains the highest level of the desired power (the less severe limit applies).

Test procedure:

ANSI C63.4-2003, RSS-Gen 4.9 and 7.2 and KDB Publication No. 558074 D01.

The EUT was placed on a nonconductive turntable 0.8m above the ground plane. The second radio device was placed in a pit below the turntable. Before final measurements of radiated emissions were performed, the EUT was scanned to determine its emission spectrum profile. The physical arrangement of the test system, the associated cabling and the EUT orientation (X, Y, Z) were varied in order to ensure that maximum emission amplitudes were attained.

The spectrum was examined from 9kHz to the 10th harmonic of the highest fundamental transmitter frequency (25GHz). Final radiated emission measurements were made at 3m distance.

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At each frequency where a spurious emission was found, the EUT was rotated 360° and the antenna was raised and lowered from 1 to 4m in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations.

For emissions between 30MHz and 1GHz, measurements were performed with a test receiver operating in the CISPR quasi-peak detection mode. The receiver's 6dB bandwidth was set to 120kHz. For emissions above 1GHz, measurements were performed with a spectrum analyzer using the following settings: for peak field strength: RBW & VBW = 1MHz; for average field strength: RBW = 1MHz & VBW = 10Hz.

Prechecks were performed in modes A, B, C for all the hosts and input voltages mentioned here above. It was found that the worst case results are obtained with the hosts FM1S (AC 120V input voltage) for the frequency range 30-1000MHz and at band edge and with the host FM25S (AC 240V input voltage) for the rest of the frequency range 1-8GHz (in mode B). Final measurements were performed these configurations only.

The highest emission amplitudes relative to the appropriate limit were recorded in this report. Emissions other than those mentioned are small or not detectable.

No spurious emission was found in the range 9kHz - 30MHz and above 8GHz.

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Table 18: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Host FM1S, AC 120V Input Voltage, Mode A (2412MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
32.051	Z / H	45.2	-16.8	28.4	40.0	11.6	101	359
32.052	Z / V	45.2	-17.5	27.7	40.0	12.3	103	359
53.503	Z / H	45.1	-15.6	29.5	40.0	10.5	362	73
53.580	Z / V	44.4	-16.1	28.3	40.0	11.7	104	190
124.997	Z / V	52.1	-17.1	35.0	43.5	8.5	105	125
174.994	Z / V	49.3	-15.7	33.6	43.5	9.9	119	221
257.631	Z / V	43.4	-15.6	27.8	46.0	18.2	272	13
268.904	Z / H	49.5	-14.8	34.7	46.0	11.3	117	26
275.987	Z / H	53.8	-9.2	44.6	46.0	1.4 (*)	131	49
275.995	Z / V	47.7	-7.3	40.4	46.0	5.6	193	338

Note: Level QP = Reading QP + Factor

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Table 19: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Host FM1S, AC 120V Input Voltage, Mode B (2437MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
32.051	Y / H	46.1	-16.8	29.3	40.0	10.7	100	359
32.053	Y / V	46.3	-17.5	28.8	40.0	11.2	100	359
53.507	Y / H	45.1	-15.6	29.5	40.0	10.5	400	45
53.509	Y / V	45.2	-16.1	29.1	40.0	10.9	179	359
124.998	Y / V	50.5	-17.1	33.4	43.5	10.1	102	132
174.996	Y / H	49.1	-15.4	33.7	43.5	9.8	299	141
276.002	Y / V	53.4	-14.7	38.7	46.0	7.3	177	308
276.012	Y / H	54.1	-9.2	44.9	46.0	1.1 (*)	127	268
306.668	Y / H	46.0	-13.3	32.7	46.0	13.3	100	226
460.003	Y / H	41.6	-9.5	32.1	46.0	13.9	192	211

Note: Level QP = Reading QP + Factor

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

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Table 20: Radiated Emissions, Quasi Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Host FM1S, AC 120V Input Voltage, Mode C (2462MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading QP [dBμV]	Factor [dB(1/m)]	Level QP [dBμV/m]	Limit [dBμV/m]	Margin QP [dB]	Height [cm]	Angle [°]
32.052	Y / H	45.1	-16.8	28.3	40.0	11.7	101	359
32.053	Y / V	45.9	-17.5	28.4	40.0	11.6	100	359
53.507	Y / V	45.4	-16.1	29.3	40.0	10.7	103	18
53.570	Y / H	44.3	-15.6	28.7	40.0	11.3	137	212
124.996	Y / V	49.9	-17.1	32.8	43.5	10.7	104	115
174.996	Y / V	48.3	-15.7	32.6	43.5	10.9	389	291
174.999	Y / H	45.2	-15.4	29.8	43.5	13.7	294	261
257.847	Y / H	40.9	-15.3	25.6	46.0	20.4	101	232
275.998	Y / V	54.9	-14.7	40.2	46.0	5.8	203	233
276.009	Y / H	52.5	-9.2	43.3	46.0	2.7 (*)	113	289
296.400	Y / H	49.4	-13.6	35.8	46.0	10.2	101	28

Note: Level QP = Reading QP + Factor

(*) The measured result is below the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a high probability that the tested product complies with the specification limit.

Table 21: Radiated Emissions, Average Data, 1 - 8GHz, Horizontal and Vertical Antenna Orientations, Host FM25S, AC 240V Input Voltage, Mode B (2437MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading AV [dBμV]	Factor [dB(1/m)]	Level AV [dBμV/m]	Limit [dBμV/m]	Margin AV [dB]	Height [cm]	Angle [°]
2544.416	Z / H	40.8	-13.1	27.7	54.0	26.3	122	317
4873.284	Z / H	37.9	-9.0	28.9	54.0	25.1	100	129

Note: Level AV = Reading AV + Factor

Table 22: Radiated Emissions, Peak Data, 1 - 8GHz, Horizontal and Vertical Antenna Orientations, Host FM25S, AC 240V Input Voltage, Mode B (2437MHz)

Freq. [MHz]	EUT / Antenna Orientation	Reading PK [dBμV]	Factor [dB(1/m)]	Level PK [dBμV/m]	Limit [dBμV/m]	Margin PK [dB]	Height [cm]	Angle [°]
2544.416	Z / H	63.2	-13.1	50.1	74.0	23.9	122	317
4873.284	Z / H	55.8	-9.0	46.8	74.0	27.2	100	129

Note: Level PK = Reading PK + Factor

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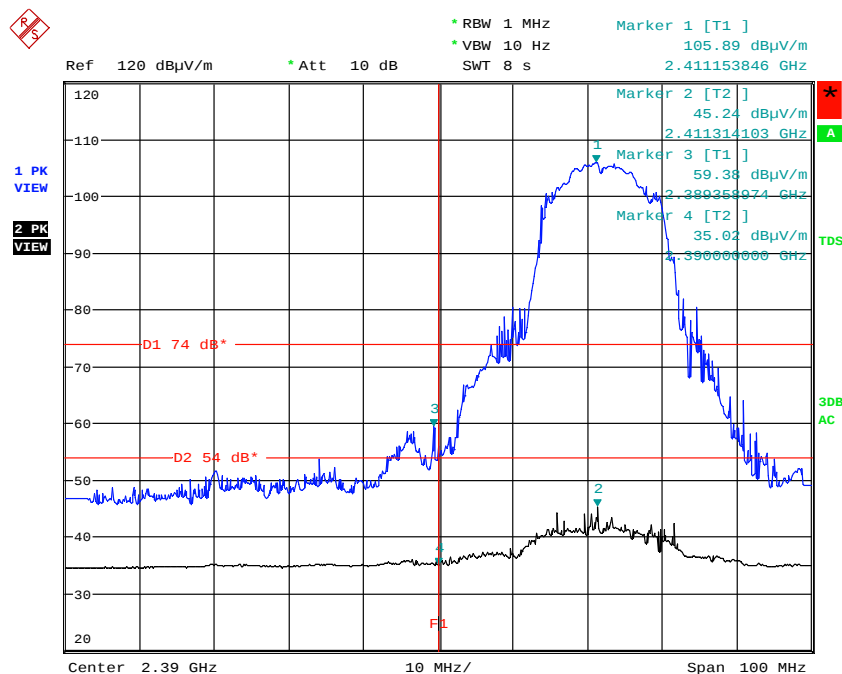
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Table 23: Radiated Emissions at Band Edge, Average and Peak Data, Horizontal and Vertical Antenna Orientations, Host FM1S, AC 120V Input Voltage, Modes A (2412MHz) and C (2462MHz)

Operating Frequency [MHz]	EUT / Antenna Orientation	Level AV [dBμV/m]	Level PK [dBμV/m]	Limit AV [dBμV/m]	Limit PK [dBμV/m]	Margin AV [dB]	Margin PK [dB]
2412	X / H	35.02	59.38	54.00	74.00	18.98	14.62
2462	X / H	34.74	50.56	54.00	74.00	19.26	23.44

Notes: All correction factors (antenna, cable, pre-amplifier) are included in the measurement values.
Average limit in dBμV/m is calculated as follows: Average limit = 20 x log(500μV/m).
Peak limit in dBμV/m is calculated as follows: Peak limit = Average limit + 20dB.

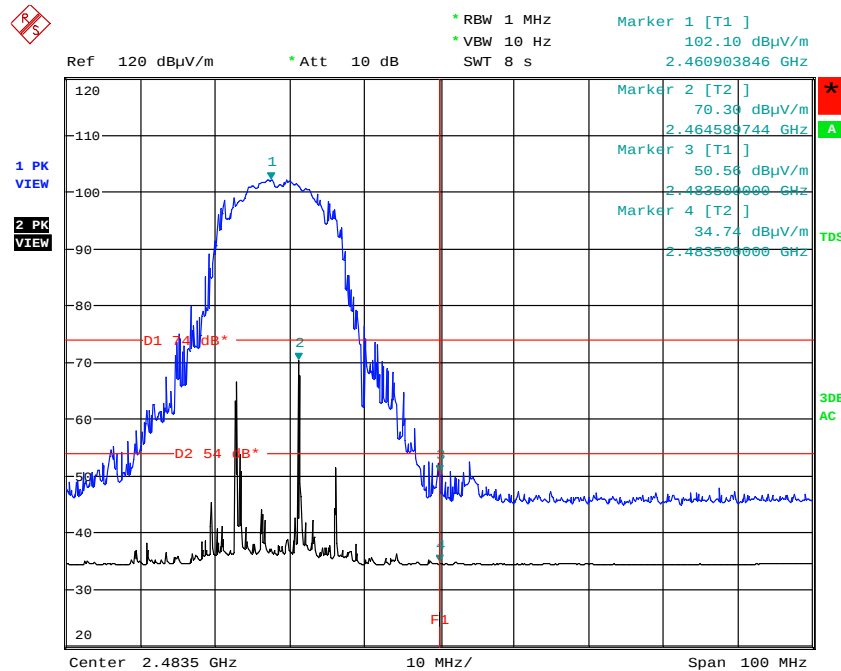
Figure 45: Radiated Emissions at Band Edge, Spectral Diagram, Host FM1S, AC 120V Input Voltage, Mode A (2412MHz)



Band Edge (Lo), Hor, Mode A, Position X
Direct/Fundamental
Date: 21.APR.2012 17:56:28

Note: The upper trace shows the peak value and the lower trace shows the average value.

Figure 46: Radiated Emissions at Band Edge, Spectral Diagram, Host FM1S, AC 120V Input Voltage, Mode C (2462MHz)



Band Edge (Hi), Hor, Mode C, Position X
Direct/Fundamental
Date: 21.APR.2012 18:16:09

Note: The upper trace shows the peak value and the lower trace shows the average value.

5.4 AC Power Line Conducted Measurements

5.4.1 AC Power Line Conducted Emission of Transmitter

RESULT:

PASS

Date of testing: 2012-04-17

Ambient temperature: 25°C

Relative humidity: 45%

Atmospheric pressure: 1011hPa

Frequency range: 0.15 - 30MHz

Kind of test site: Shielded Room

Tested host: FM1S (AC 120V input voltage)
FM2S (AC 240V input voltage)
FM25S (AC 120V and 240V input voltages)

Requirements:

FCC 15.207 and RSS-Gen 7.2.4

The AC power line conducted emission on any frequency within the band 150kHz to 30MHz shall not exceed the limits specified in FCC 15.207 and RSS-Gen 7.2.4 (table 4).

Test procedure:

ANSI C63.4-2003 and RSS-Gen 7.2

The EUT was placed on a wooden table raised 80cm above the reference ground plane. A vertical conducting plane of the screened room was located 40cm to the rear of the EUT. The EUT was connected to a Line Impedance Stabilization Network (LISN).

The physical arrangement of the test system and associated cabling was varied to determine the effect on the EUT's emissions in amplitude and frequency in order to ensure that maximum emission amplitudes were attained.

The measurements were performed with a test receiver operating in the CISPR quasi-peak and average detection modes. The receiver's 6dB bandwidth was set to 9kHz.

Prechecks were performed in modes A, B, C for all the hosts and input voltages mentioned here above. It was found that the worst case results are obtained for the hosts FM1S (AC 120V input voltage) and FM25S (AC 120V input voltage) and final measurements were performed for these two configurations only.

Disturbances other than those mentioned are small or not detectable.

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Table 24: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Host FM1S, AC 120V Input Voltage, Mode A (2412MHz)

Freq. [MHz]	Phase	Reading QP [dBµV]	Reading AV [dBµV]	Factor [dB]	Level QP [dBµV]	Level AV [dBµV]	Limit QP [dBµV]	Limit AV [dBµV]	Margin QP [dB]	Margin AV [dB]
0.15828	N	44.4	33.6	9.6	54.0	43.2	65.6	55.6	11.6	12.4
0.15828	L1	44.7	33.9	9.6	54.3	43.5	65.6	55.6	11.3	12.1
0.16120	L1	44.7	34.9	9.6	54.3	44.5	65.4	55.4	11.1	10.9
0.21012	N	42.1	33.1	9.7	51.8	42.8	63.2	53.2	11.4	10.4
0.21319	L1	42.6	35.3	9.7	52.3	45.0	63.1	53.1	10.8	8.1
0.26610	N	41.8	34.5	9.7	51.5	44.2	61.2	51.2	9.7	7.0
0.26800	L1	41.6	33.4	9.7	51.3	43.1	61.2	51.2	9.9	8.1
0.30836	L1	37.9	29.8	9.7	47.6	39.5	60.0	50.0	12.4	10.5
0.31341	N	37.2	30.1	9.7	46.9	39.8	59.9	49.9	13.0	10.1
0.46805	L1	29.4	22.8	9.7	39.1	32.5	56.5	46.5	17.4	14.0
0.60291	N	33.3	23.5	9.7	43.0	33.2	56.0	46.0	13.0	12.8
0.60441	N	33.0	23.4	9.7	42.7	33.1	56.0	46.0	13.3	12.9
0.60929	L1	32.2	24.9	9.7	41.9	34.6	56.0	46.0	14.1	11.4
0.63712	N	36.3	30.8	9.7	46.0	40.5	56.0	46.0	10.0	5.5
0.64171	L1	35.1	28.2	9.7	44.8	37.9	56.0	46.0	11.2	8.1
0.69599	N	37.6	30.9	9.7	47.3	40.6	56.0	46.0	8.7	5.4
0.72879	L1	38.3	30.0	9.7	48.0	39.7	56.0	46.0	8.0	6.3
1.07005	N	30.7	21.9	9.7	40.4	31.6	56.0	46.0	15.6	14.4
1.49596	L1	29.2	22.3	9.7	38.9	32.0	56.0	46.0	17.1	14.0
1.59041	N	28.3	20.0	9.7	38.0	29.7	56.0	46.0	18.0	16.3

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

Table 25: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Host FM1S, AC 120V Input Voltage, Mode B (2437MHz)

Freq. [MHz]	Phase	Reading QP [dBµV]	Reading AV [dBµV]	Factor [dB]	Level QP [dBµV]	Level AV [dBµV]	Limit QP [dBµV]	Limit AV [dBµV]	Margin QP [dB]	Margin AV [dB]
0.15674	L1	44.0	33.1	9.6	53.6	42.7	65.6	55.6	12.0	12.9
0.16049	N	44.6	34.2	9.6	54.2	43.8	65.4	55.4	11.2	11.6
0.20162	N	39.6	28.7	9.7	49.3	38.4	63.5	53.5	14.2	15.1
0.21496	L1	42.4	35.0	9.7	52.1	44.7	63.0	53.0	10.9	8.3
0.26717	N	41.6	33.7	9.7	51.3	43.4	61.2	51.2	9.9	7.8
0.26805	L1	41.5	33.3	9.7	51.2	43.0	61.2	51.2	10.0	8.2
0.30569	N	36.1	27.4	9.7	45.8	37.1	60.1	50.1	14.3	13.0
0.30921	L1	37.9	30.2	9.7	47.6	39.9	60.0	50.0	12.4	10.1
0.60362	L1	33.5	23.7	9.7	43.2	33.4	56.0	46.0	12.8	12.6
0.63474	N	36.1	31.0	9.7	45.8	40.7	56.0	46.0	10.2	5.3
0.64323	L1	35.7	30.0	9.7	45.4	39.7	56.0	46.0	10.6	6.3
0.69820	N	37.8	31.1	9.7	47.5	40.8	56.0	46.0	8.5	5.2
0.72487	L1	36.4	28.3	9.7	46.1	38.0	56.0	46.0	9.9	8.0
1.05791	L1	31.0	22.3	9.7	40.7	32.0	56.0	46.0	15.3	14.0
1.06461	N	30.7	21.7	9.7	40.4	31.4	56.0	46.0	15.6	14.6
1.52475	L1	29.1	22.3	9.7	38.8	32.0	56.0	46.0	17.2	14.0
1.98548	L1	28.6	22.3	9.7	38.3	32.0	56.0	46.0	17.7	14.0
2.80059	L1	28.1	21.9	9.8	37.9	31.7	56.0	46.0	18.1	14.3

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

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Table 26: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Host FM1S, AC 120V Input Voltage, Mode C (2462MHz)

Freq. [MHz]	Phase	Reading QP [dBμV]	Reading AV [dBμV]	Factor [dB]	Level QP [dBμV]	Level AV [dBμV]	Limit QP [dBμV]	Limit AV [dBμV]	Margin QP [dB]	Margin AV [dB]
0.15807	L1	45.7	35.5	9.6	55.3	45.1	65.6	55.6	10.3	10.5
0.16156	N	46.0	35.6	9.6	55.6	45.2	65.4	55.4	9.8	10.2
0.18065	N	40.7	30.9	9.6	50.3	40.5	64.5	54.5	14.2	14.0
0.20692	L1	41.0	31.6	9.7	50.7	41.3	63.3	53.3	12.6	12.0
0.21168	N	42.5	34.7	9.7	52.2	44.4	63.1	53.1	10.9	8.7
0.23015	L1	37.7	27.9	9.7	47.4	37.6	62.4	52.4	15.0	14.8
0.26446	N	41.6	35.0	9.7	51.3	44.7	61.3	51.3	10.0	6.6
0.26526	L1	41.8	35.0	9.7	51.5	44.7	61.3	51.3	9.8	6.6
0.30283	N	35.9	26.5	9.7	45.6	36.2	60.2	50.2	14.6	14.0
0.34774	L1	33.1	24.9	9.7	42.8	34.6	59.0	49.0	16.2	14.4
0.37127	N	32.2	25.0	9.7	41.9	34.7	58.5	48.5	16.6	13.8
0.37559	N	31.8	23.9	9.7	41.5	33.6	58.4	48.4	16.9	14.8
0.38660	L1	31.4	24.0	9.7	41.1	33.7	58.1	48.1	17.0	14.4
0.46853	L1	29.9	23.4	9.7	39.6	33.1	56.5	46.5	16.9	13.4
0.53450	L1	29.2	23.1	9.7	38.9	32.8	56.0	46.0	17.1	13.2
0.63744	N	35.8	31.5	9.7	45.5	41.2	56.0	46.0	10.5	4.8
0.65667	L1	33.7	28.0	9.7	43.4	37.7	56.0	46.0	12.6	8.3
0.72871	N	36.1	29.3	9.7	45.8	39.0	56.0	46.0	10.2	7.0
0.73107	L1	37.3	29.6	9.7	47.0	39.3	56.0	46.0	9.0	6.7
0.77762	L1	26.0	19.2	9.7	35.7	28.9	56.0	46.0	20.3	17.1
0.97238	L1	27.2	20.0	9.7	36.9	29.7	56.0	46.0	19.1	16.3
1.07433	N	31.4	22.3	9.7	41.1	32.0	56.0	46.0	14.9	14.0
1.54765	L1	29.3	22.0	9.7	39.0	31.7	56.0	46.0	17.0	14.3
1.56368	N	30.1	22.1	9.7	39.8	31.8	56.0	46.0	16.2	14.2
3.65753	N	27.1	20.1	9.8	36.9	29.9	56.0	46.0	19.1	16.1
5.38019	L1	26.3	19.9	9.9	36.2	29.8	60.0	50.0	23.8	20.2
5.73494	N	26.9	18.5	9.9	36.8	28.4	60.0	50.0	23.2	21.6
24.9994	L1	28.1	24.3	10.3	38.4	34.6	60.0	50.0	21.6	15.4
25.0001	N	27.4	23.6	10.4	37.8	34.0	60.0	50.0	22.2	16.0

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

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Table 27: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Host FM25S, AC 120V Input Voltage, Mode A (2412MHz)

Freq. [MHz]	Phase	Reading QP [dBμV]	Reading AV [dBμV]	Factor [dB]	Level QP [dBμV]	Level AV [dBμV]	Limit QP [dBμV]	Limit AV [dBμV]	Margin QP [dB]	Margin AV [dB]
0.15435	N	47.6	35.6	9.6	57.2	45.2	65.8	55.8	8.6	10.6
0.15790	L1	47.7	36.6	9.6	57.3	46.2	65.6	55.6	8.3	9.4
0.19698	N	40.6	29.6	9.6	50.2	39.2	63.7	53.7	13.5	14.5
0.20467	N	42.7	34.0	9.7	52.4	43.7	63.4	53.4	11.0	9.7
0.20710	L1	43.1	35.1	9.7	52.8	44.8	63.3	53.3	10.5	8.5
0.25449	N	43.2	34.9	9.7	52.9	44.6	61.6	51.6	8.7	7.0
0.25577	L1	42.9	35.4	9.7	52.6	45.1	61.6	51.6	9.0	6.5
0.30324	L1	38.6	31.1	9.7	48.3	40.8	60.2	50.2	11.9	9.4
0.30492	N	38.5	31.7	9.7	48.2	41.4	60.1	50.1	11.9	8.7
0.31907	N	34.3	25.5	9.7	44.0	35.2	59.7	49.7	15.7	14.5
0.34290	N	32.0	24.3	9.7	41.7	34.0	59.1	49.1	17.4	15.1
0.35155	L1	32.4	25.1	9.7	42.1	34.8	58.9	48.9	16.8	14.1
0.38361	L1	30.1	22.6	9.7	39.8	32.3	58.2	48.2	18.4	15.9
0.55435	N	33.2	28.4	9.7	42.9	38.1	56.0	46.0	13.1	7.9
0.58927	L1	27.1	19.3	9.7	36.8	29.0	56.0	46.0	19.2	17.0
0.64299	L1	30.7	24.4	9.7	40.4	34.1	56.0	46.0	15.6	11.9
0.65722	N	32.3	24.9	9.7	42.0	34.6	56.0	46.0	14.0	11.4
0.73931	L1	38.4	29.9	9.7	48.1	39.6	56.0	46.0	7.9	6.4
0.76373	N	38.7	30.4	9.7	48.4	40.1	56.0	46.0	7.6	5.9
0.85082	L1	26.3	19.3	9.7	36.0	29.0	56.0	46.0	20.0	17.0
1.51153	N	28.0	21.1	9.7	37.7	30.8	56.0	46.0	18.3	15.2
1.51994	L1	27.0	19.9	9.7	36.7	29.6	56.0	46.0	19.3	16.4
2.01641	N	27.3	20.6	9.8	37.1	30.4	56.0	46.0	18.9	15.6
2.04256	L1	26.1	18.9	9.8	35.9	28.7	56.0	46.0	20.1	17.3
5.39839	N	27.9	16.3	9.9	37.8	26.2	60.0	50.0	22.2	23.8
5.48191	L1	28.1	16.6	9.9	38.0	26.5	60.0	50.0	22.0	23.5
24.9996	L1	27.5	22.9	10.3	37.8	33.2	60.0	50.0	22.2	16.8
24.9999	N	27.6	23.0	10.4	38.0	33.4	60.0	50.0	22.0	16.6

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

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Table 28: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Host FM25S, AC 120V Input Voltage, Mode B (2437MHz)

Freq. [MHz]	Phase	Reading QP [dBμV]	Reading AV [dBμV]	Factor [dB]	Level QP [dBμV]	Level AV [dBμV]	Limit QP [dBμV]	Limit AV [dBμV]	Margin QP [dB]	Margin AV [dB]
0.15384	L1	49.6	36.8	9.6	59.2	46.4	65.8	55.8	6.6	9.4
0.15661	N	47.6	36.0	9.6	57.2	45.6	65.6	55.6	8.4	10.0
0.21040	N	42.6	35.4	9.7	52.3	45.1	63.2	53.2	10.9	8.1
0.21290	L1	42.7	34.8	9.7	52.4	44.5	63.1	53.1	10.7	8.6
0.25566	N	42.8	35.2	9.7	52.5	44.9	61.6	51.6	9.1	6.7
0.25723	L1	42.4	35.7	9.7	52.1	45.4	61.5	51.5	9.4	6.1
0.30383	N	38.4	31.5	9.7	48.1	41.2	60.1	50.1	12.0	8.9
0.31028	L1	37.3	29.7	9.7	47.0	39.4	60.0	50.0	13.0	10.6
0.35605	N	33.4	25.9	9.7	43.1	35.6	58.8	48.8	15.7	13.2
0.38650	L1	29.7	22.2	9.7	39.4	31.9	58.1	48.1	18.7	16.2
0.50962	N	30.2	24.2	9.7	39.9	33.9	56.0	46.0	16.1	12.1
0.55311	N	33.2	28.1	9.7	42.9	37.8	56.0	46.0	13.1	8.2
0.55833	L1	30.6	25.0	9.7	40.3	34.7	56.0	46.0	15.7	11.3
0.64842	N	31.4	25.1	9.7	41.1	34.8	56.0	46.0	14.9	11.2
0.65447	L1	28.8	22.4	9.7	38.5	32.1	56.0	46.0	17.5	13.9
0.73797	N	39.1	30.9	9.7	48.8	40.6	56.0	46.0	7.2	5.4
0.73897	L1	38.3	29.8	9.7	48.0	39.5	56.0	46.0	8.0	6.5
0.83995	N	28.2	21.2	9.7	37.9	30.9	56.0	46.0	18.1	15.1
1.06435	N	28.6	20.6	9.7	38.3	30.3	56.0	46.0	17.7	15.7
1.15622	L1	24.3	17.0	9.7	34.0	26.7	56.0	46.0	22.0	19.3
1.51369	N	28.2	21.3	9.7	37.9	31.0	56.0	46.0	18.1	15.0
1.51843	L1	27.3	19.9	9.7	37.0	29.6	56.0	46.0	19.0	16.4
1.98816	L1	26.1	19.0	9.7	35.8	28.7	56.0	46.0	20.2	17.3
2.00998	N	27.1	20.4	9.8	36.9	30.2	56.0	46.0	19.1	15.8
5.03821	N	26.5	17.3	9.9	36.4	27.2	60.0	50.0	23.6	22.8
5.44641	L1	27.7	15.9	9.9	37.6	25.8	60.0	50.0	22.4	24.2
5.56631	N	27.2	16.3	9.9	37.1	26.2	60.0	50.0	22.9	23.8
24.9996	N	27.6	22.9	10.4	38.0	33.3	60.0	50.0	22.0	16.7
25.0000	L1	27.4	22.7	10.3	37.7	33.0	60.0	50.0	22.3	17.0

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

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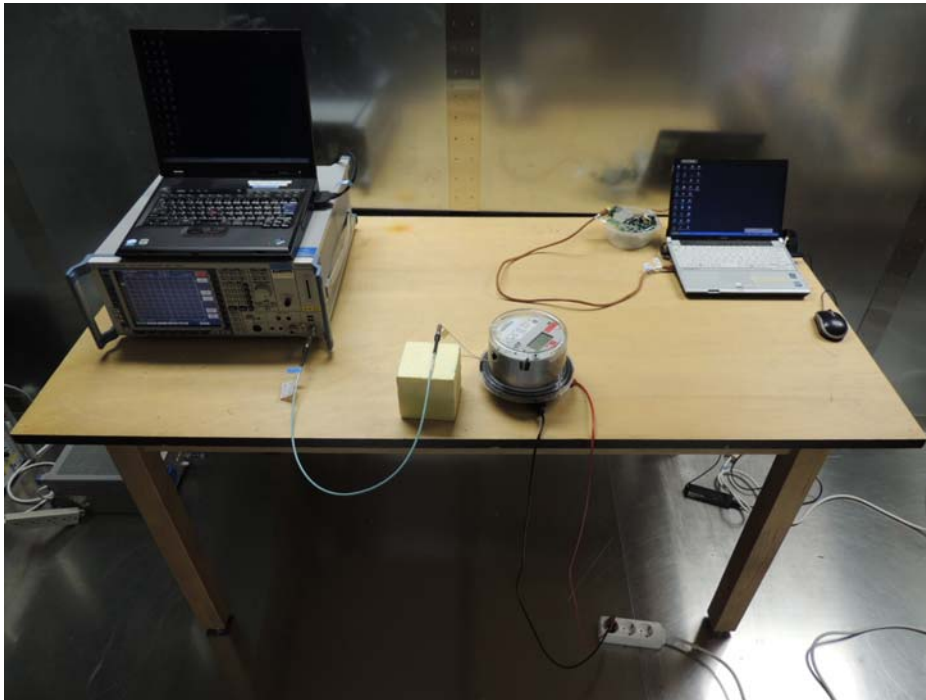
Table 29: AC Power Line Conducted Emission, Quasi Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Host FM25S, AC 120V Input Voltage, Mode C (2462MHz)

Freq. [MHz]	Phase	Reading QP [dBμV]	Reading AV [dBμV]	Factor [dB]	Level QP [dBμV]	Level AV [dBμV]	Limit QP [dBμV]	Limit AV [dBμV]	Margin QP [dB]	Margin AV [dB]
0.15280	L1	48.0	35.7	9.6	57.6	45.3	65.8	55.8	8.2	10.5
0.15458	N	48.0	36.0	9.6	57.6	45.6	65.8	55.8	8.2	10.2
0.18956	L1	41.4	30.0	9.6	51.0	39.6	64.1	54.1	13.1	14.5
0.20660	N	43.1	34.9	9.7	52.8	44.6	63.3	53.3	10.5	8.7
0.21305	L1	42.7	34.4	9.7	52.4	44.1	63.1	53.1	10.7	9.0
0.25493	N	43.1	35.2	9.7	52.8	44.9	61.6	51.6	8.8	6.7
0.25689	L1	42.6	35.7	9.7	52.3	45.4	61.5	51.5	9.2	6.1
0.30375	L1	38.5	31.2	9.7	48.2	40.9	60.1	50.1	11.9	9.2
0.30419	N	38.6	31.7	9.7	48.3	41.4	60.1	50.1	11.8	8.7
0.39587	L1	29.8	22.3	9.7	39.5	32.0	57.9	47.9	18.4	15.9
0.51432	L1	28.5	22.1	9.7	38.2	31.8	56.0	46.0	17.8	14.2
0.55518	N	33.3	28.4	9.7	43.0	38.1	56.0	46.0	13.0	7.9
0.55662	L1	30.5	25.2	9.7	40.2	34.9	56.0	46.0	15.8	11.1
0.64240	L1	31.0	24.4	9.7	40.7	34.1	56.0	46.0	15.3	11.9
0.64566	N	31.5	25.0	9.7	41.2	34.7	56.0	46.0	14.8	11.3
0.76252	N	39.1	30.8	9.7	48.8	40.5	56.0	46.0	7.2	5.5
0.76261	L1	38.5	30.0	9.7	48.2	39.7	56.0	46.0	7.8	6.3
0.86849	L1	26.9	20.4	9.7	36.6	30.1	56.0	46.0	19.4	15.9
1.08120	L1	27.5	19.3	9.7	37.2	29.0	56.0	46.0	18.8	17.0
1.10559	N	28.6	20.8	9.7	38.3	30.5	56.0	46.0	17.7	15.5
1.51932	N	28.6	21.5	9.7	38.3	31.2	56.0	46.0	17.7	14.8
2.02014	N	27.4	20.6	9.8	37.2	30.4	56.0	46.0	18.8	15.6
2.85016	L1	24.8	17.7	9.8	34.6	27.5	56.0	46.0	21.4	18.5
5.48694	L1	28.3	16.5	9.9	38.2	26.4	60.0	50.0	21.8	23.6
5.53025	N	28.4	16.9	9.9	38.3	26.8	60.0	50.0	21.7	23.2
24.9998	N	27.9	23.2	10.4	38.3	33.6	60.0	50.0	21.7	16.4
24.9998	L1	27.8	23.1	10.3	38.1	33.4	60.0	50.0	21.9	16.6

Note: Level QP = Reading QP + Factor, Level AV = Reading AV + Factor

6. Photographs of the Test Setup

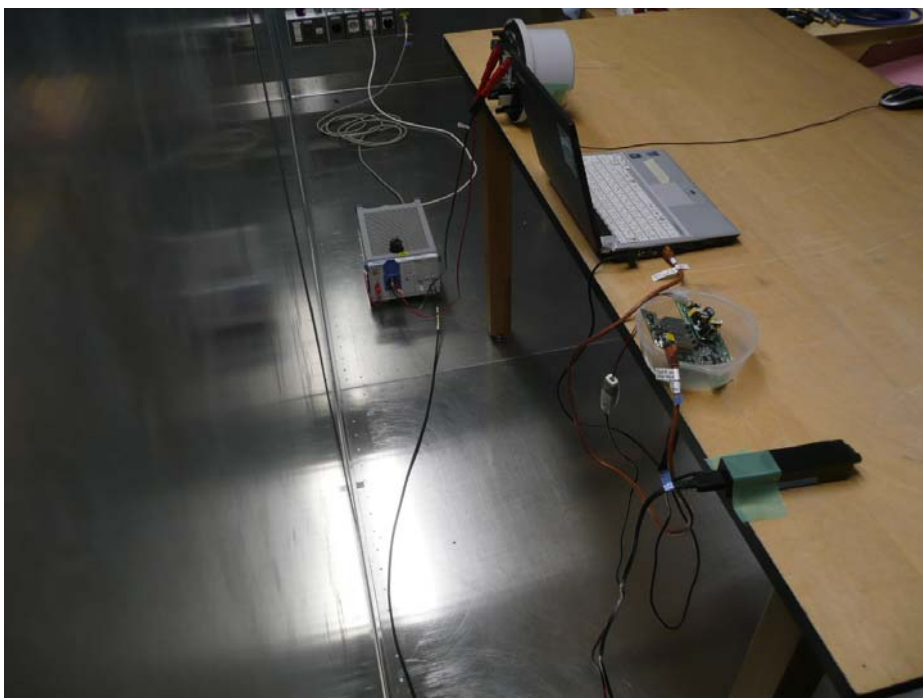
Photograph 1: Set-up for Conducted Emissions at Antenna Port



Photograph 2: Set-up for AC Power Line Conducted Emission of Transmitter, Front View



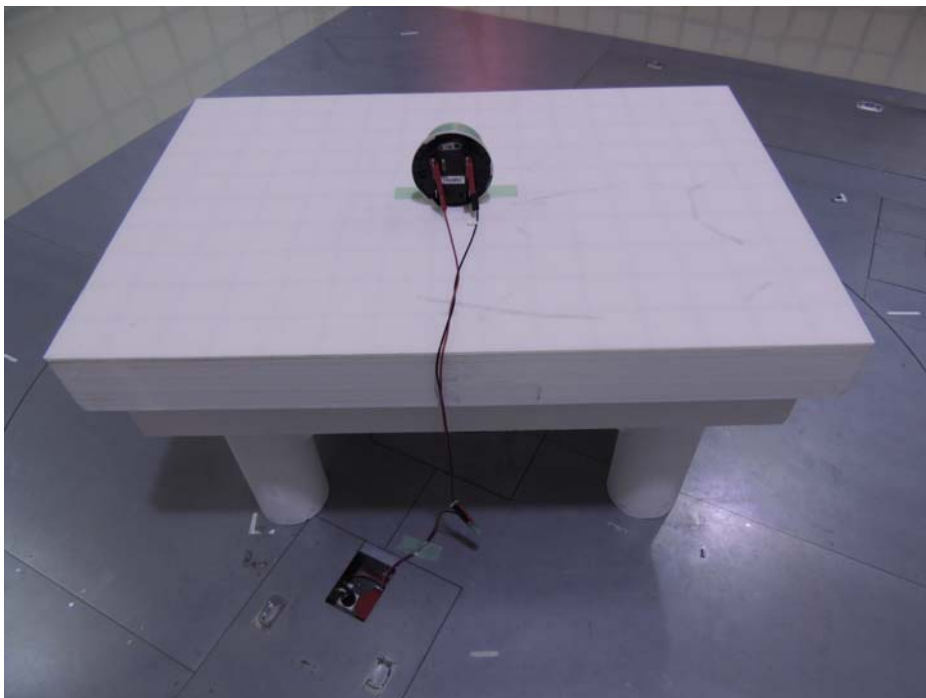
Photograph 3: Set-up for AC Power Line Conducted Emission of Transmitter, Rear View



Photograph 4: Set-up for Radiated Emission of Transmitter, Front View



Photograph 5: Set-up for Radiated Emission of Transmitter, Rear View



Photograph 6: Set-up for Radiated Emission, EUT Configuration X-Axis



Photograph 7: Set-up for Radiated Emission, EUT Configuration Y-Axis



Note: EUT is rotated 90 degrees around the horizontal axis compared to orientation X.

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