

Contact person
Jörgen Wassholm
Electronics
+46 10 516 57 06
jorgen.wassholm@sp.se

Ericsson AB
Mia Jernhake
PDU HW
164 80 Stockholm

Radio measurements on AIR 21 B2A/B4P 1900 MHz radio equipment with FCC ID:TA8AKRC118023-1 and IC:287AB-AS1180231 (8 appendices)

Test object

AIR 21 B2A/B4P, KRC 118 023/1 Rev R1C

Summary

Standard	Compliant	Appendix
FCC CFR 47 / IC RSS-133		
2.1046 / RSS-133 6.4 RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1 Occupied bandwidth	Yes	3
2.1051 / RSS-133 6.5 Band edge	Yes	4
2.1051 / RSS-133 6.5 Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-133 6.5 Field strength of spurious radiation	Yes	6
2.1055 / RSS-133 6.3 Frequency stability	Yes	7

Note: Above RSS-133 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

SP Technical Research Institute of Sweden Electronics - EMC

Performed by



Jörgen Wassholm

Examined by



Christer Karlsson

SP Technical Research Institute of Sweden

Postal address

SP
Box 857
SE-501 15 Borås
SWEDEN

Office location

Västeråsen
Brinellgatan 4
SE-504 62 Borås
SWEDEN

Phone / Fax / E-mail

+46 10 516 50 00
+46 33 13 55 02
info@sp.se

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IC:287AB-AS1180231

Appendix 1

Description – Test object

Equipment: Radio equipment AIR 21 B2A/B4P running in WCDMA mode supporting single and multi carrier.

Antenna ports: 2 TX ports configured for TX diversity

Frequency bands: TX: 1930 – 1990 MHz
RX: 1850 – 1910 MHz

Modulations: QPSK, 16QAM and 64QAM

Nominal output power per antenna port: Single carrier: 1x 44.8 dBm (1x 30W)
Multi carrier: 2x 41.8 dBm (2x 15W)
3x 40.0 dBm (3x 10W)
4x 38.8 dBm (4x 7.5W)

Channel bandwidth: 4.2 to 5 MHz (configurable in steps of 100/200 kHz)

Channel spacing: 4.4 to 5 MHz (configurable in steps of 100/200 kHz)

Nominal power voltage: -48 VDC

Tested channels

Channel	Downlink		Uplink	
	Frequency*	UARFCN	Frequency*	UARFCN
B	1932.4	9662	1852.4	9262
B+5	1937.4	9687	1857.4	9287
B+10	1942.4	9712	1862.4	9312
B+15	1947.4	9737	1867.4	9337
M	1960.0	9800	1880.0	9400
T-15	1972.6	9863	1892.6	9463
T-10	1977.6	9888	1897.6	9488
T-5	1982.6	9913	1902.6	9513
T	1987.6	9938	1907.6	9538

* Frequency in MHz

Operation mode during measurements

Measurements were performed with the test object transmitting the Test model 1 which are defined in 3GPP TS 25.141. Test model 1 (TM1) uses the QPSK modulation only. Test model 5 (TM5) includes the 16QAM modulation and Test model 6 (TM6) includes the 64QAM modulation.

The settings below were found to be representative for all traffic scenarios when several settings with the different modulations, channel bandwidths and the number of carriers were tested to find the worst case setting. These settings were used for all measurements if not otherwise noted.

Single carrier

TM1: 64 DPCH:s at 30 ksps (SF=128)

Multi carrier

TM1: 32 DPCH:s at 30 ksps (SF=128) in each carrier (Two carriers activated)

Channel bandwidth 5 MHz

Conducted measurements

The EUT was a pole mounted unit supplied with -48 VDC by an external power supply. All RF conducted measurements were performed with the test object configured for maximum transmit power. Complete measurements were made on RF A with additional measurements on RF B to verify that the ports are identical.

Radiated measurements

The test object was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmit power. The configurations below represents worst case for radiated spurious emission measurements.

The RF output power port was via a RF attenuator connected to functional test equipment for supervision.

The AIR unit was allocated to the following UARFCN:

Single Carrier: (One carrier configuration)

Cell	1	1	1
Channel	B	M	T

Multi Carrier: (Two carrier configuration)

Cell	1	2
Channel	B	B+10
Channel	T-10	T

Multi Carrier: (Four carrier configuration)

Cell	1	2	3	4
Channel	B	B+5	B+10	B+15
Channel	T	T-5	T-10	T-15

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-133 and RSS-Gen.

References

Measurements were done according to relevant parts of the following standards:

ANSI 63.4-2009

ANSI/TIA/EIA-603-C-2004

CFR 47 part 2, October 1st, 2010

CFR 47 part 24, October 1st, 2010

3GPP TS 25.141, version 8.9.0

RSS-Gen Issue 3

RSS-133 Issue 5

Measurement equipment

Measurement equipment	Calibration Due	SP number
Test site Tesla	2014-01	503 881
R&S FSIQ 40	2012-07	503 738
R&S FSQ 40	2012-07	504 143
R&S ESI 26	2012-07	503 292
Control computer with R&S software EMC32 version 8.52.0	-	503 479
High pass filter	2012-07	504 199
High pass filter	2013-01	901 373
High pass filter	2012-07	503 739
High pass filter	2012-07	503 740
RF attenuator	2012-07	504 159
RF attenuator	2012-07	900 233
Boonton RF Peak power meter/analyzer	2012-11	503 144
Boonton Power sensor 56518-S/4	2012-11	503 145
Chase Bilog Antenna CBL 6111A	2013-10	503 182
EMCO Horn Antenna 3115	2014-01	502 175
Std.gain horn FLANN model 20240-20	-	503 674
µComp Nordic, Low Noise Amplifier	2013-03	901 545
MITEQ Low Noise Amplifier	2012-07	503 285
Temperature cabinet	-	503 360
Testo 635 Temperature and humidity meter	2013-05	504 203

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "SP-QD 10885". The uncertainties are calculated with a coverage factor $k=2$ (95% level of confidence).

Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test object

The test object was delivered 2012-04-05.

Manufacturer's representative

Christer Gustavsson, Ericsson AB



REPORT

Date
2012-06-18

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FX200707-F24W

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Appendix 1

Test engineers

Andreas Johnson Tomas Isbring, Hyder Khalaf, Kexin Chen, Jörgen Wassholm, and Martin Theorin, SP

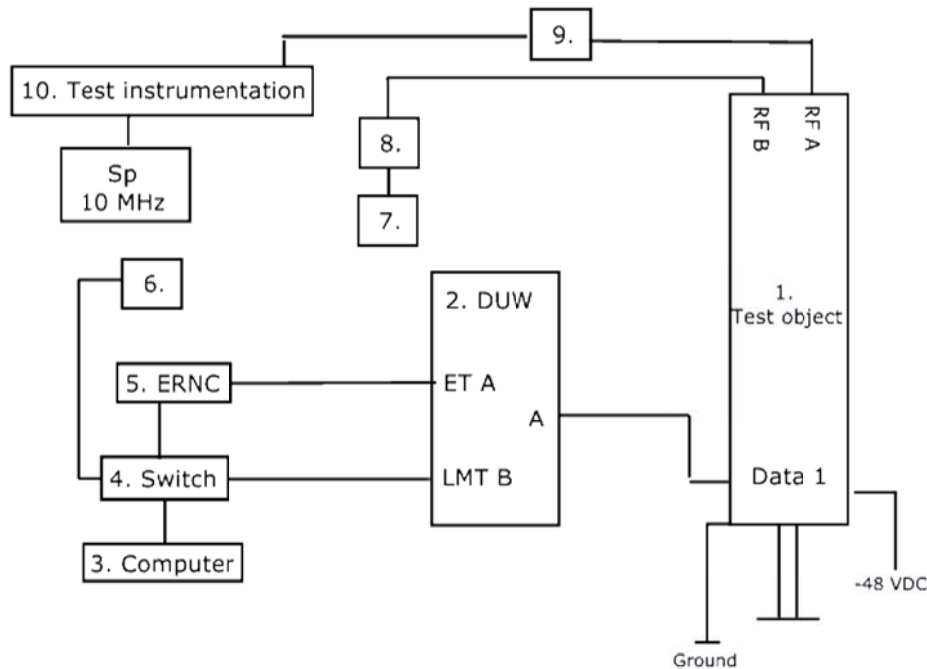
Test participant

Mikael Jansson, Ericsson AB (Partly present)

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Appendix 1

Test set-up conducted measurements TX



Test object

1. AIR 21 B2A/B4P, KRC 118 023/1, rev. R1C, s/n: CQ30000598
with software (PIS): CXP 901 3268/6 rev. R44FX
(FCC ID:TA8AKRC118023-1 / IC:287AB-AS1180231)

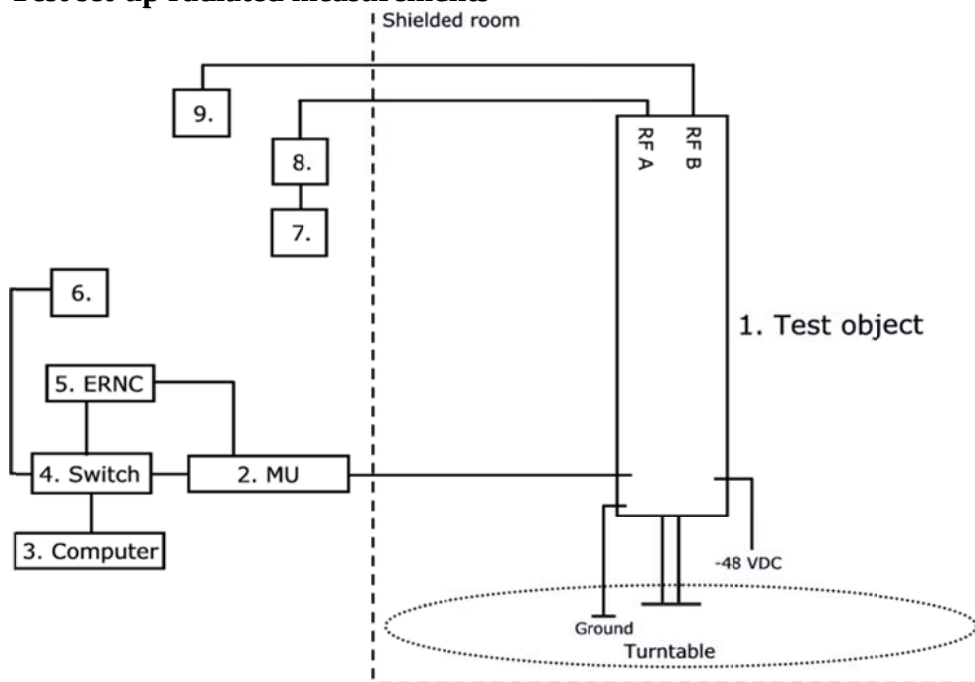
Functional test equipment

2. DU 1: DUW 30 01, KDU 127 161/3, Rev R4E, S/N: C825385045 and
DU 2: DUW 30 01, KDU 127 161/3, Rev R4E, S/N: C825542090
3. Computer HP Elitebook 8540w, BAMS – 1001052061
4. Fast Ethernet switch, Netgear FS276T
5. ERNC-SIM 130, BAMS – 1000660991
6. Rubidium Frequency Standard Symmetricom 8040, BAMS – 1000714189
7. Terminator
8. Attenuator
9. SP test instrument according measurement equipment list
10. SP test instrument according measurement equipment list

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Appendix 1

Test set-up radiated measurements



Test object

1. AIR 21 B2A/B4P, KRC 118 023/1, rev. R1C, s/n: CQ30000598
with software (PIS): CXP 901 3268/6 rev. R44FX
(FCC ID:TA8AKRC118023-1 / IC:287AB-AS1180231)

Functional test equipment

2. DU 1: DUW 30 01, KDU 127 161/3, Rev R4E, S/N: C825385045 and
DU 2: DUW 30 01, KDU 127 161/3, Rev R4E, S/N: C825542090
SUP 1: SUP 6601, 1/BFL 901 009/1, Rev R3B, S/N: BR81526560
SUP 2: SUP 6601, 1/BFL 901 009/1, Rev R3B, S/N: BR81526559
3. Computer HP Elitebook 8540w, BAMS – 1001052061
4. Fast Ethernet switch, Netgear FS276T
5. ERNC-SIM 130, BAMS – 1000660991
6. Rubidium Frequency Standard Symmetricom 8040, BAMS – 1000714189
7. R&S FSIQ 40
8. Attenuator
9. Terminator

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Appendix 1

Interfaces:

Type of port:

Power: -48 VDC	DC Power
Antenna port (A), 7/16 connector, N/A in this configuration	Antenna
Antenna port (B), 7/16 connector, N/A in this configuration	Antenna
Opto 1, Optical Interface Link, single mode opto fibre	Telecom
Opto 2, N/A in this configuration	Telecom
Ground wire	Ground

RBS software

Software	Revision
CXP 901 8350/1	R4D01

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Appendix 2

RF power output measurements according to CFR 47 §24.232 / IC RSS-133 6.4

Date	Temperature	Humidity
2012-06-04	24 °C ± 3 °C	27 % ± 5 %
2012-06-07	21 °C ± 3 °C	34 % ± 5 %

Test set-up and procedure

The test object was connected to a signal analyzer measuring peak and RMS output power in CDF mode. A resolution bandwidth of 50 MHz was used.

Measurement equipment	SP number
R&S FSQ 40	504 143
RF attenuator	504 159
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 1.1 dB
Results

Single carrier: Rated output power level at RF A connector 1 x 44.8 dBm

UARFCN	Result RSM (dBm)	10log(N) ¹⁾ (dBm)	Result RMS (dBm/ MHz) ²⁾
B	44.7	47.7	41.5
M	44.7	47.7	41.5
T	44.7	47.7	41.5

Multi carrier 1x2: Rated output power level at RF A connector 2 x 41.8 dBm

UARFCN	Result RMS 2 carrier combined power (dBm)	10log(N) ¹⁾ (dBm)	Result RMS (dBm/ MHz) ²⁾
B+(B+10)	44.7	47.7	38.5
M+(M+10)	44.8	47.8	38.6
T+(T-10)	44.7	47.7	38.5

Multi carrier 1x4: Rated output power level at RF A connector 4 x 38.8 dBm

UARFCN	Result RMS 4 carrier combined power (dBm)	10log(N) ¹⁾ (dBm)	Result RMS (dBm/ MHz) ²⁾
B+(B+5)+(B+10)+(B+15)	44.7	47.7	35.5
(M-5)+M+(M+5)+(M+10)	44.8	47.8	35.6
T+(T-5)+(T+10)+(T+15)	44.8	47.8	35.6

Single carrier: Rated output power level at RF B connector

UARFCN	Result RMS (dBm)	10log(N) ¹⁾ (dBm)	Result RMS (dBm/ MHz) ²⁾
B	44.8	47.8	41.6

¹⁾: 2 outputs summed power according to FCC KDB662911 Multiple transmitter output v01r01

²⁾: Power density (dBm/MHz) for a 5 MHz BW= Output power -10log(OBW/1MHz)

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Appendix 2

Single carrier:

Diagram 1: B

Diagram 2: M

Diagram 3: T

Multi carrier:

Diagram 4: $B+(B+10)$

Diagram 5: $M+(M+10)$

Diagram 6: $T+(T-10)$

Diagram 7: $B+(B+5)+(B+10)+(B+15)$

Diagram 8: $(M-5)+M+(M+5)+(M+10)$

Diagram 9: $T+(T-5)+(T-10)+(T-15)$

Single carrier RF B

Diagram 10 M

Limits

§24.232 Federal Register / Vol. 73, No. 86

The maximum output power may not exceed 1640 W/MHz (EIRP).

The Peak to Average Ratio (PAR) may not exceed 13 dB.

RSS-133: The average equivalent isotropically radiated power (e.i.r.p.) for transmitters shall not exceed the limits given in SRSP-510. Moreover, base station transmitters operating in the band 1930-1995 MHz shall not have output power exceeding 100 watts.

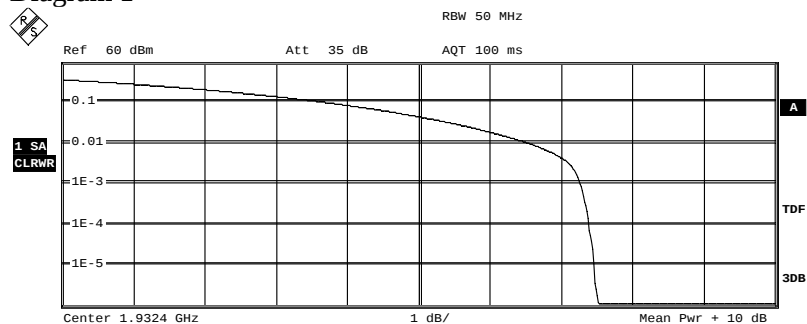
In addition, when the transmitter power is measured in terms of average value, the peak-to-average ratio of the power shall not exceed 13 dB.

Complies?	Yes
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Appendix 2

Diagram 1



Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

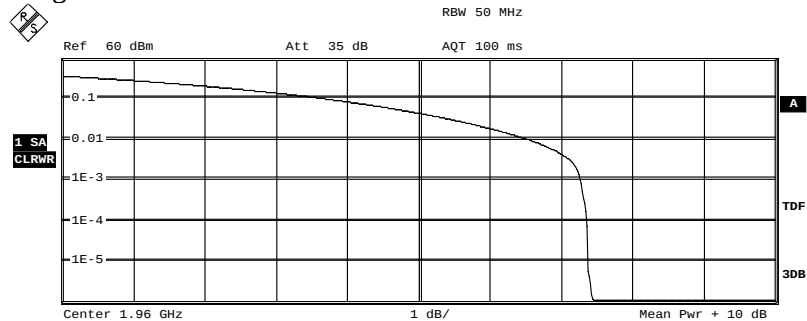
EXT

Trace 1
Mean 44.65 dBm
Peak 52.18 dBm
Crest 7.53 dB

10 % 3.73 dB
1 % 6.54 dB
.1 % 7.28 dB
.01 % 7.40 dB

Date: 4. JUN. 2012 15:01:10

Diagram 2



Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

EXT

Trace 1
Mean 44.65 dBm
Peak 52.09 dBm
Crest 7.44 dB

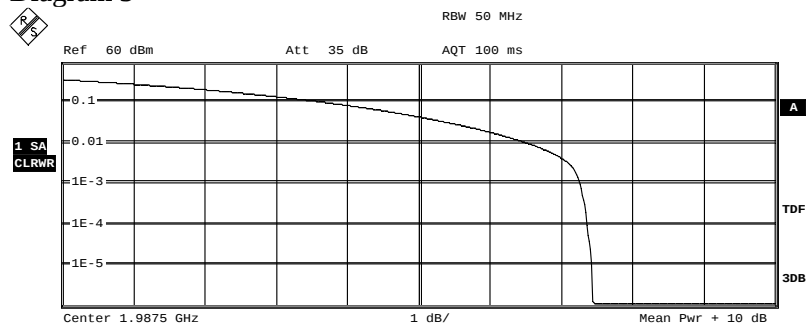
10 % 3.73 dB
1 % 6.54 dB
.1 % 7.28 dB
.01 % 7.37 dB

Date: 4. JUN. 2012 13:47:35

FCC ID:TA8AKRC118023-1
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Appendix 2

Diagram 3



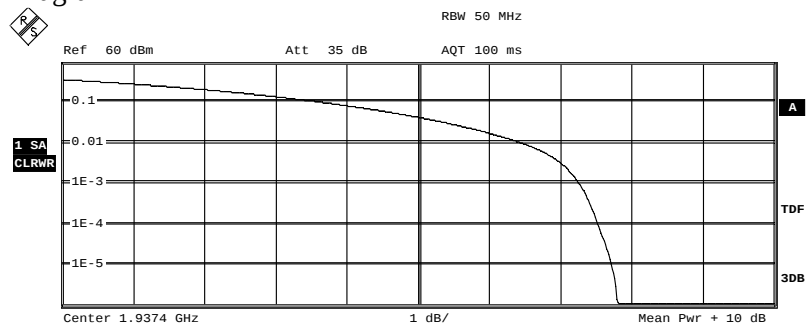
Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

Trace 1
Mean 44.70 dBm
Peak 52.21 dBm
Crest 7.51 dB

10 % 3.73 dB
1 % 6.54 dB
.1 % 7.28 dB
.01 % 7.37 dB

Date: 4. JUN. 2012 19:14:13

Diagram 4



Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

Trace 1
Mean 44.67 dBm
Peak 52.54 dBm
Crest 7.86 dB

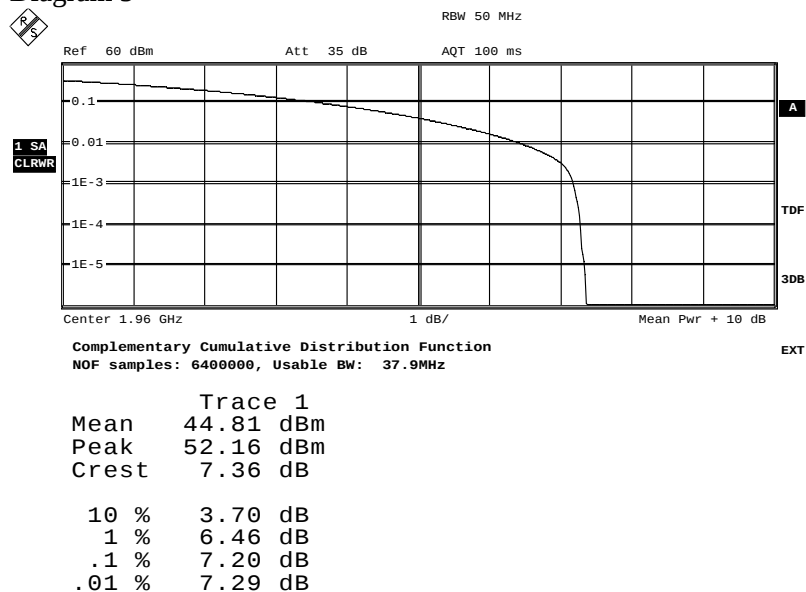
10 % 3.72 dB
1 % 6.46 dB
.1 % 7.26 dB
.01 % 7.53 dB

Date: 7. JUN. 2012 12:36:44

FCC ID:TA8AKRC118023-1
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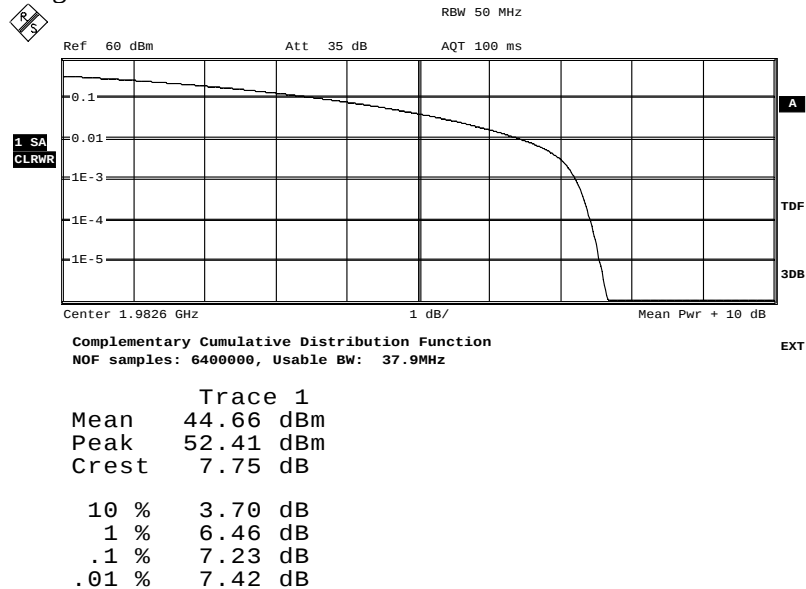
Appendix 2

Diagram 5



Date: 7. JUN. 2012 12:27:26

Diagram 6

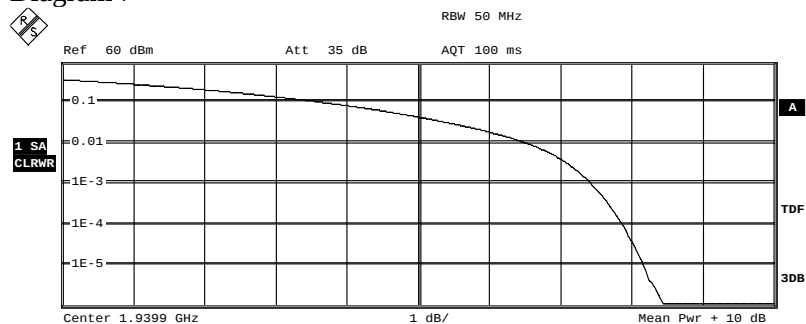


Date: 7. JUN. 2012 13:02:33

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 2

Diagram 7



Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

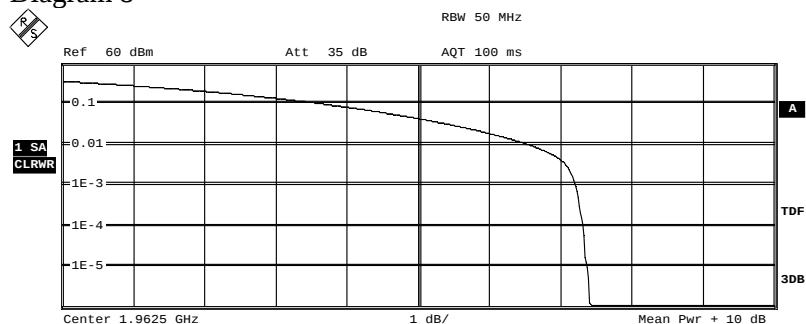
EXT

Trace 1
Mean 44.73 dBm
Peak 53.25 dBm
Crest 8.52 dB

10 % 3.72 dB
1 % 6.54 dB
.1 % 7.44 dB
.01 % 7.87 dB

Date: 7. JUN. 2012 15:44:23

Diagram 8



Complementary Cumulative Distribution Function
NOF samples: 6400000, Usable BW: 37.9MHz

EXT

Trace 1
Mean 44.76 dBm
Peak 52.24 dBm
Crest 7.48 dB

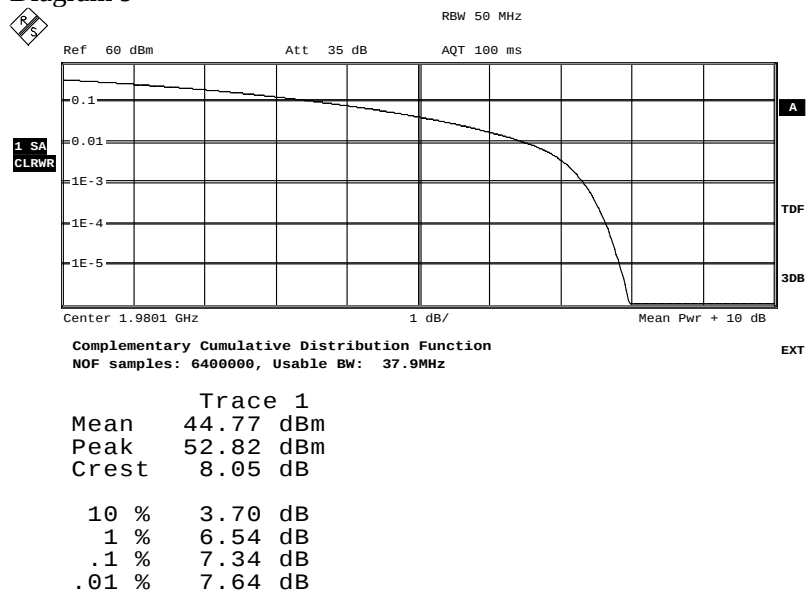
10 % 3.72 dB
1 % 6.55 dB
.1 % 7.21 dB
.01 % 7.32 dB

Date: 7. JUN. 2012 15:35:58

FCC ID:TA8AKRC118023-1
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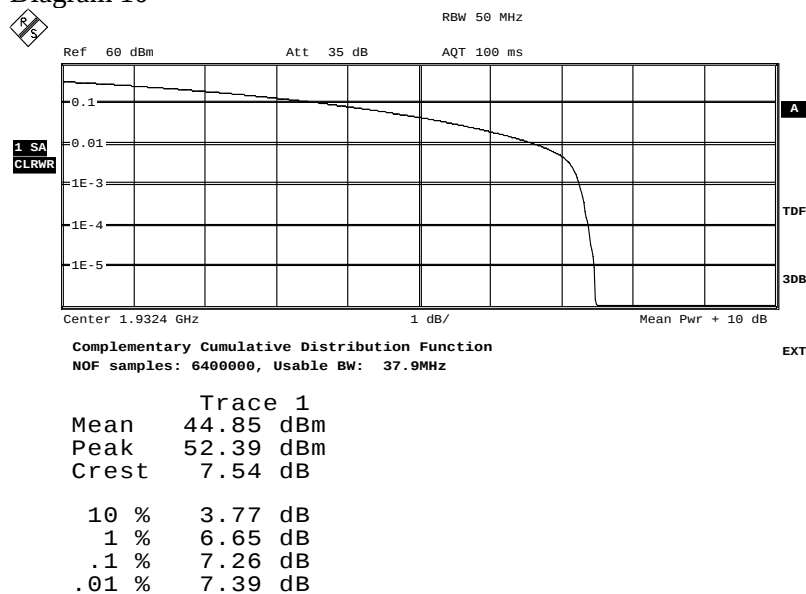
Appendix 2

Diagram 9



Date: 7. JUN. 2012 16:09:22

Diagram 10



Date: 8. JUN. 2012 13:31:33

Occupied bandwidth measurements according to 47 CFR 2.1049 / RSS-Gen 4.6.1

Date 2012-06-04 to 2012-06-08	Temperature 21-24 °C ± 3 °C	Humidity 27-34 % ± 5 %
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Test set-up and procedure

The measurements were made per definition in §2.1049. The output was connected to a signal analyzer with the RMS detector activated. The signal analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40	504 143
RF attenuator	504 159
Testo 615 temperature and humidity meter	503 498

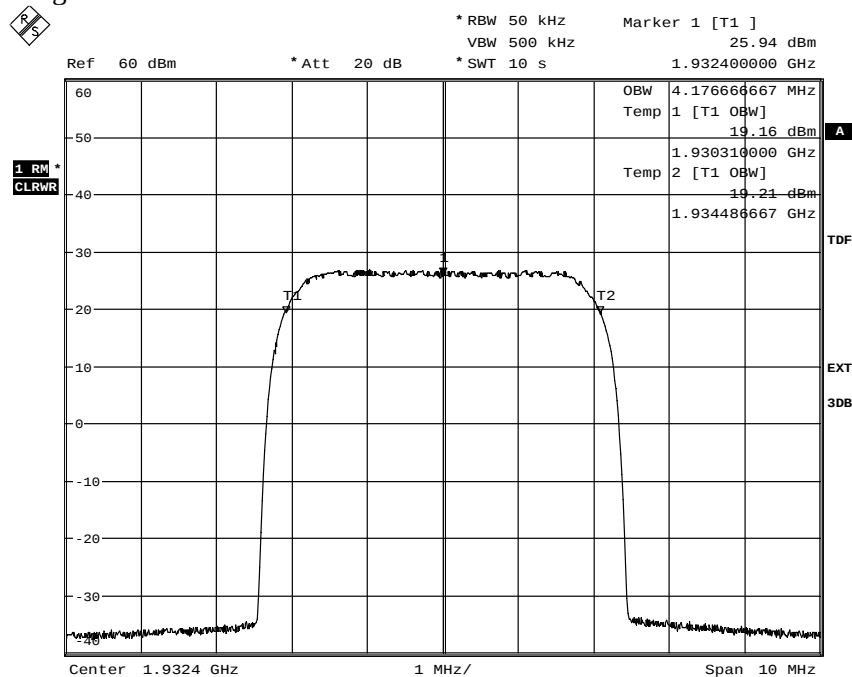
Measurement uncertainty: 3.7 dB

Diagram	BW configuration	Tested frequency	Occupied BW (99%) [MHz]
1	5.0 MHz	B	4.18
2	5.0 MHz	M	4.18
3	5.0 MHz	T	4.18
4	4.2 MHz	B	3.85
5	4.2 MHz	M	3.85
6	4.2 MHz	T	3.85
7	5.0 MHz	M, RF B	4.18

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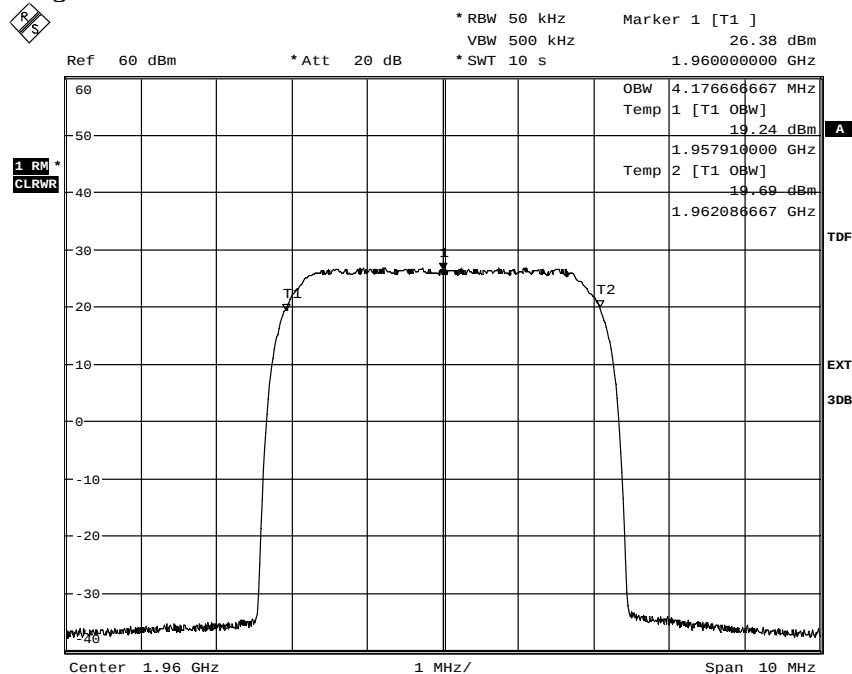
Appendix 3

Diagram 1



Date: 4.JUN.2012 15:06:16

Diagram 2

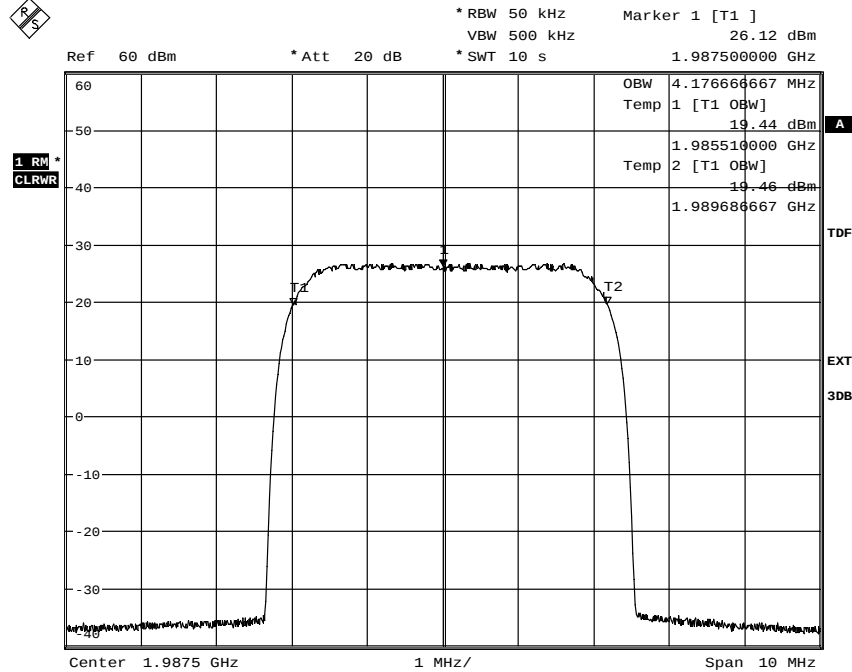


Date: 4.JUN.2012 13:55:04

FCC ID:TA8AKRC118023-1
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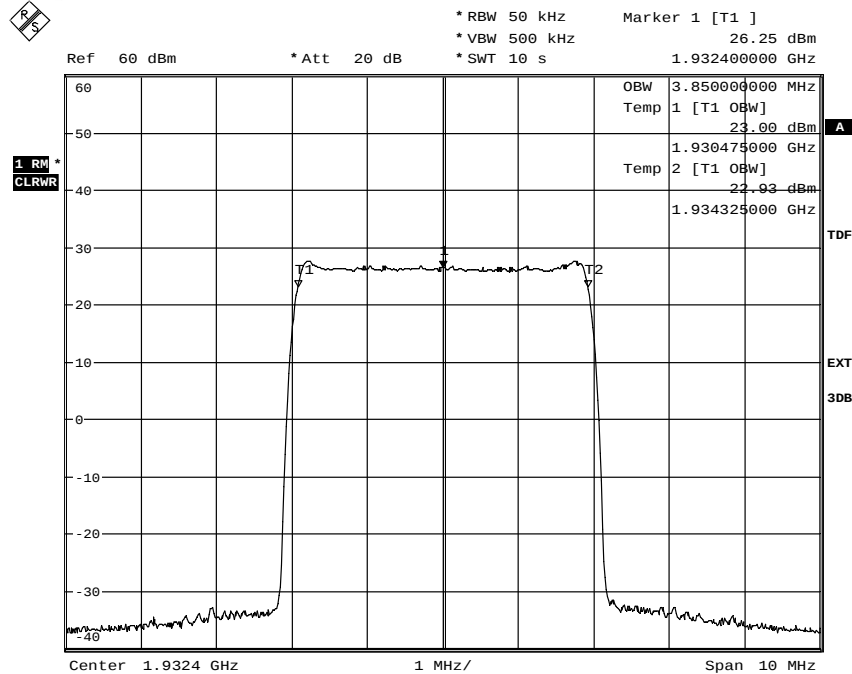
Appendix 3

Diagram 3



Date: 4.JUN.2012 19:15:53

Diagram 4

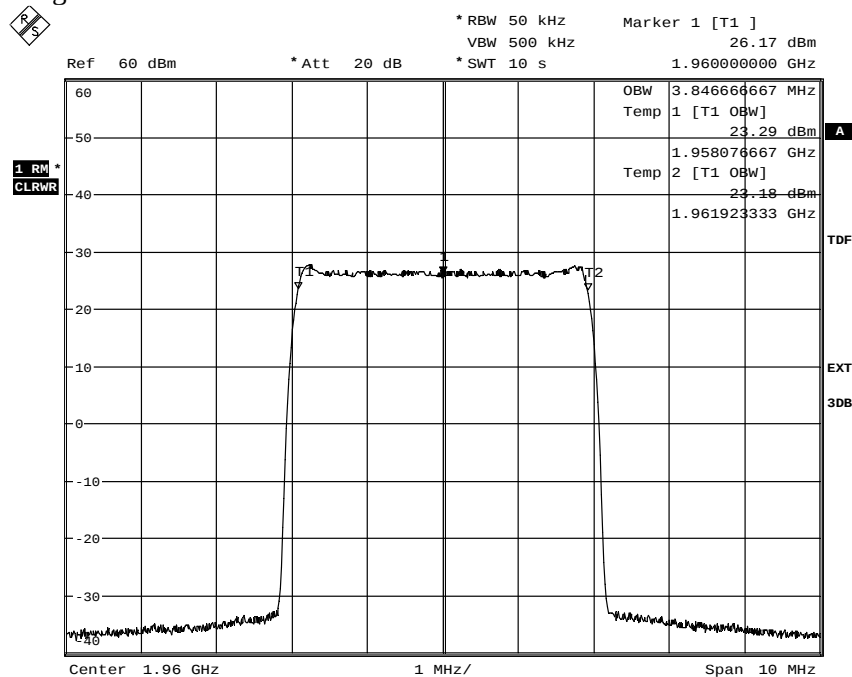


Date: 5.JUN.2012 08:06:43

FCC ID:TA8AKRC118023-1
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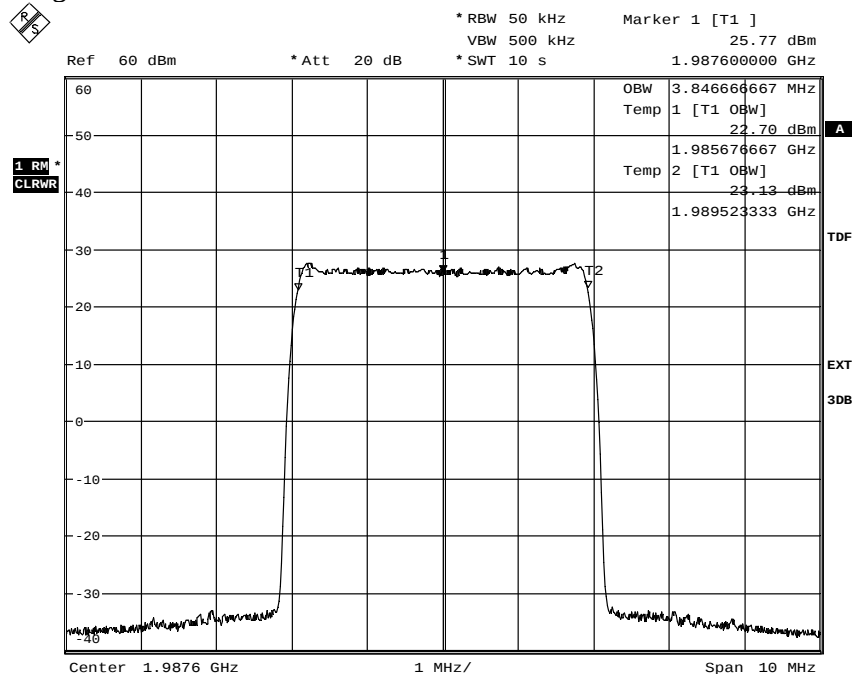
Appendix 3

Diagram 5



Date: 5.JUN.2012 08:47:30

Diagram 6

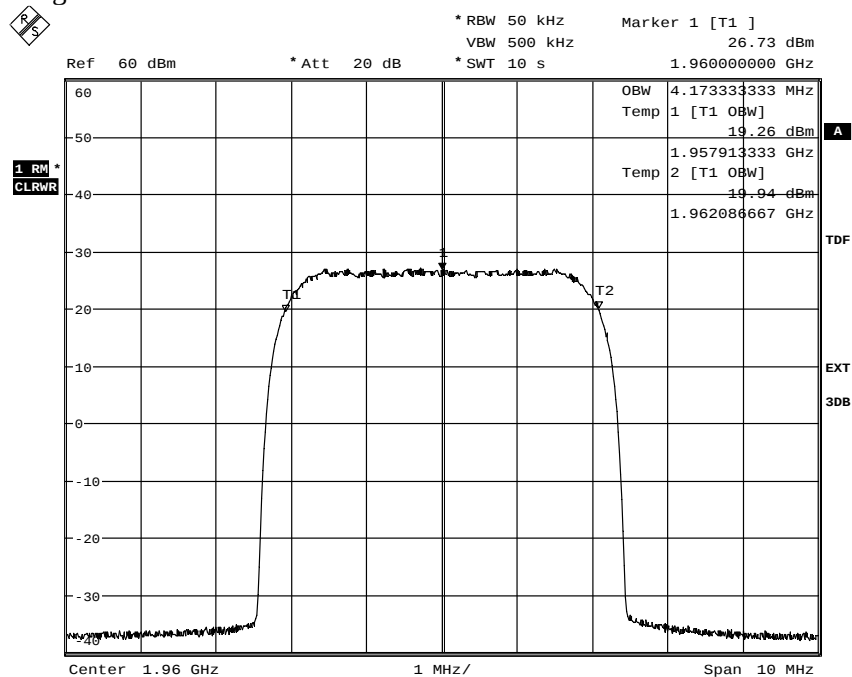


Date: 5.JUN.2012 09:14:04

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 3

Diagram 7



Date: 8.JUN.2012 08:48:20

Band edge measurements according to CFR 47 §24.238 / IC RSS-133 6.5

Date 2012-06-04 to 2012-06-08	Temperature 21-24 °C ± 3 °C	Humidity 27-34 % ± 5 %
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Test set-up and procedure

The measurements were made per definition in §24.238. The output was connected to a spectrum analyzer with the RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. A resolution bandwidth of 30 kHz was used up to 1 MHz away from the band edges. 30 kHz is <1% of the Emission BW (4.37 MHz between the 26 dB points for 5 MHz nominal BW setting). To compensate for the reduced resolution bandwidth, and 10 log (N) according to FCC KDB662911, the limit was adjusted with 4.6 dB to -17.6 dBm. A resolution bandwidth of 200 kHz was used 1 MHz to 6 MHz away from the band edges, to compensate for the reduced resolution bandwidth and 10 log (N) according to FCC KDB662911, the limit was adjusted by 7 dB to -23 dBm.

Measurement equipment	SP number
R&S FSQ	504 143
RF attenuator	504 159
Testo 635, temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier:

Diagram 1 a-c: B

Diagram 2 a-c: T

Multi carrier:

Diagram 3 a-c: B+(B+5)

Diagram 4 a-c: T+(T-5)

Diagram 5 a-c: B+(B+5+5+5)

Diagram 6 a-c: T+(T-5-5-5)

Single carrier: RF B

Diagram 7 a-c: B

Diagram 8 a-c: T



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Appendix 4

Limits

CFR 47 §24.238 and RSS-133 6.5

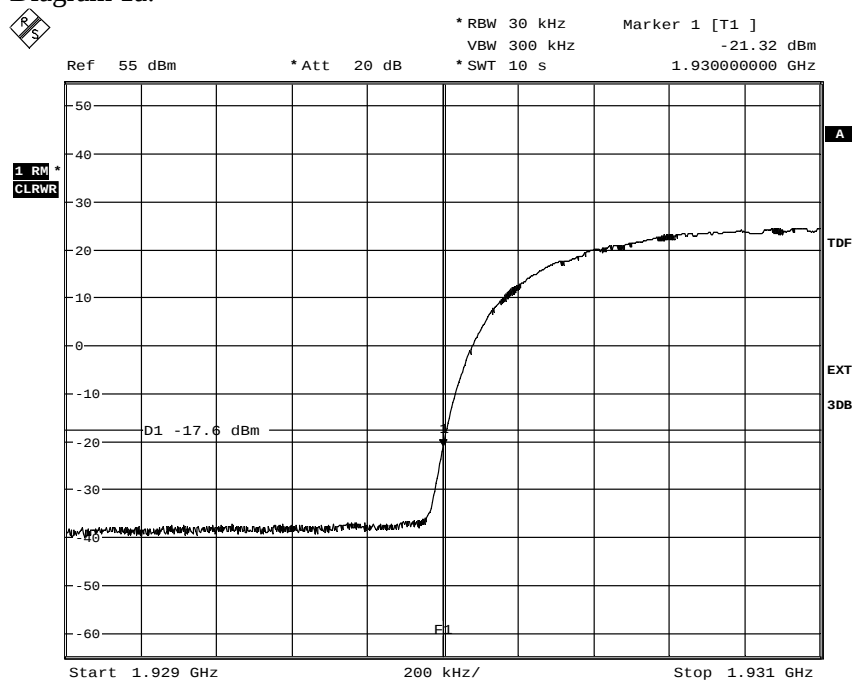
Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm.

Complies?	Yes
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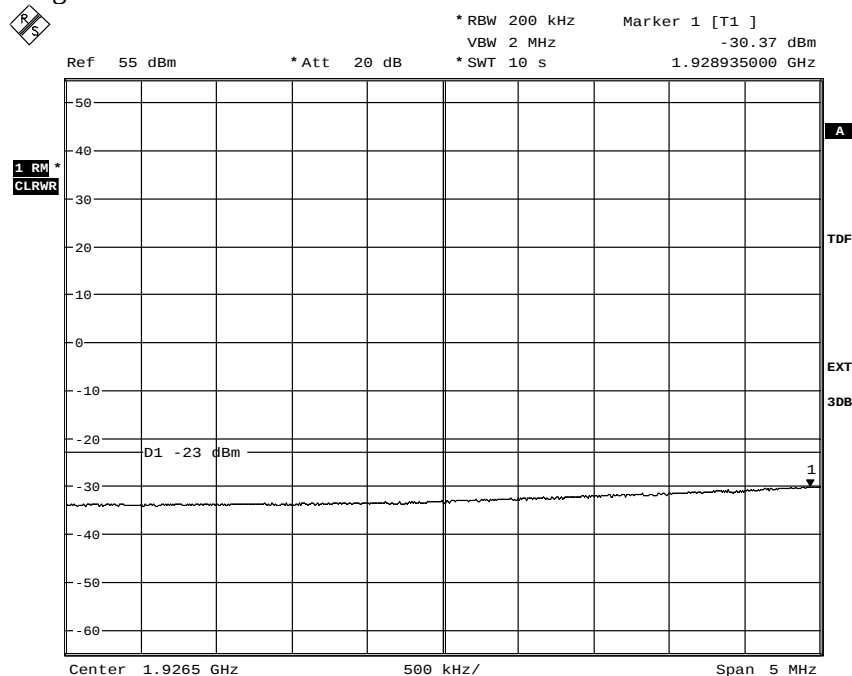
Appendix 4

Diagram 1a:



Date: 4.JUN.2012 15:41:55

Diagram 1b:

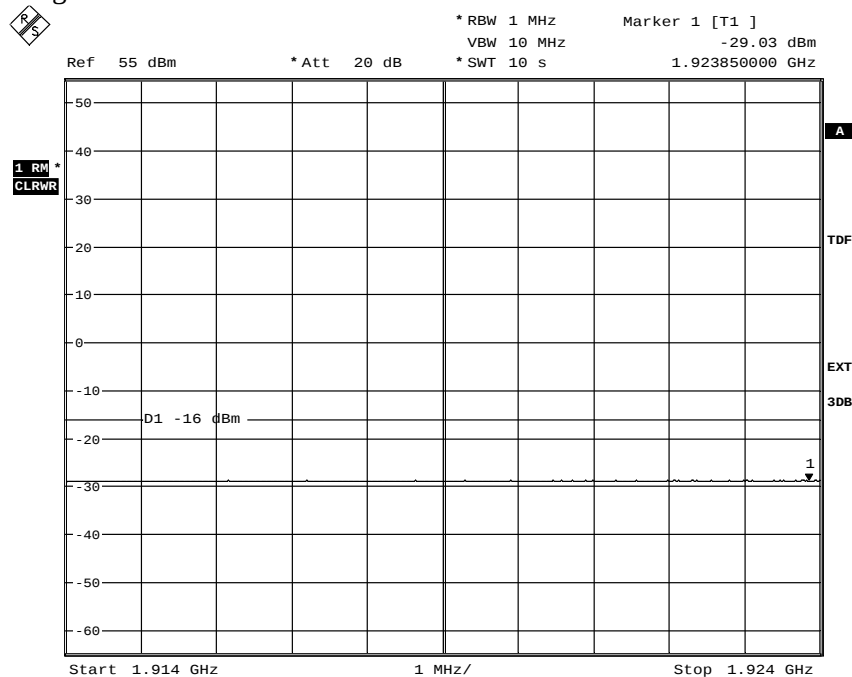


Date: 4.JUN.2012 15:16:13

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IC:287AB-AS1180231

Appendix 4

Diagram 1c

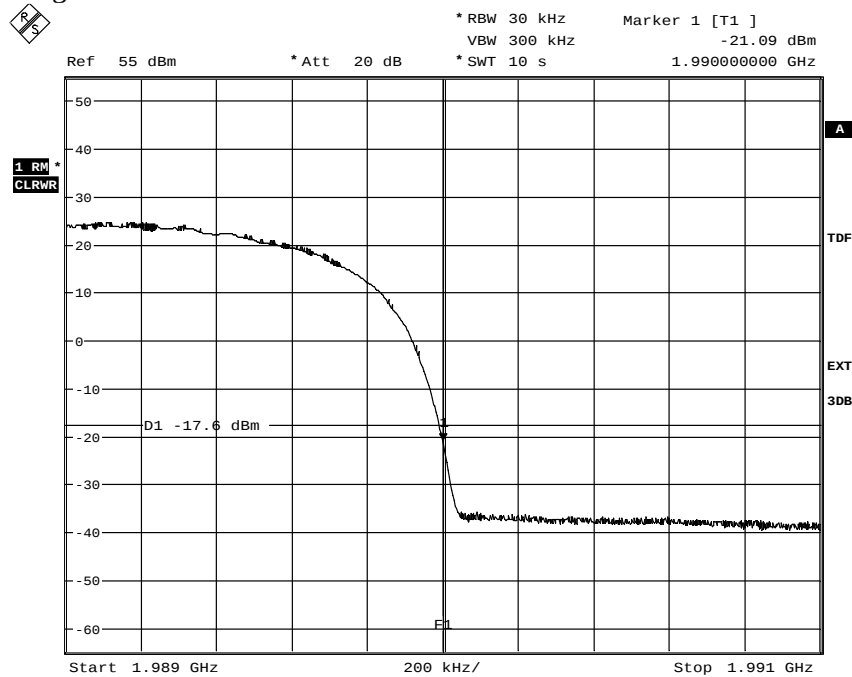


Date: 4.JUN.2012 15:20:38

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

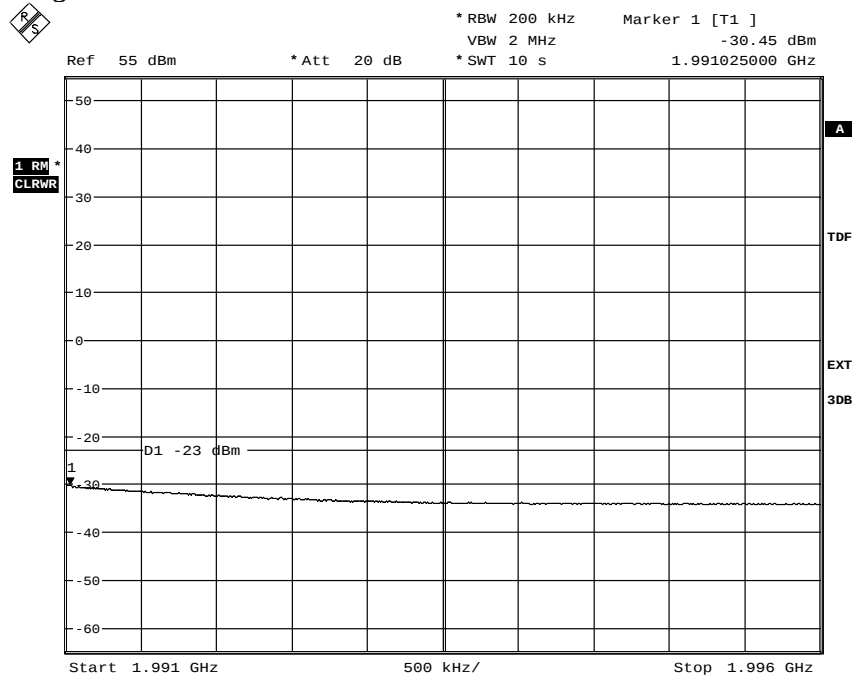
Appendix 4

Diagram 2a:



Date: 4.JUN.2012 19:22:31

Diagram 2b:

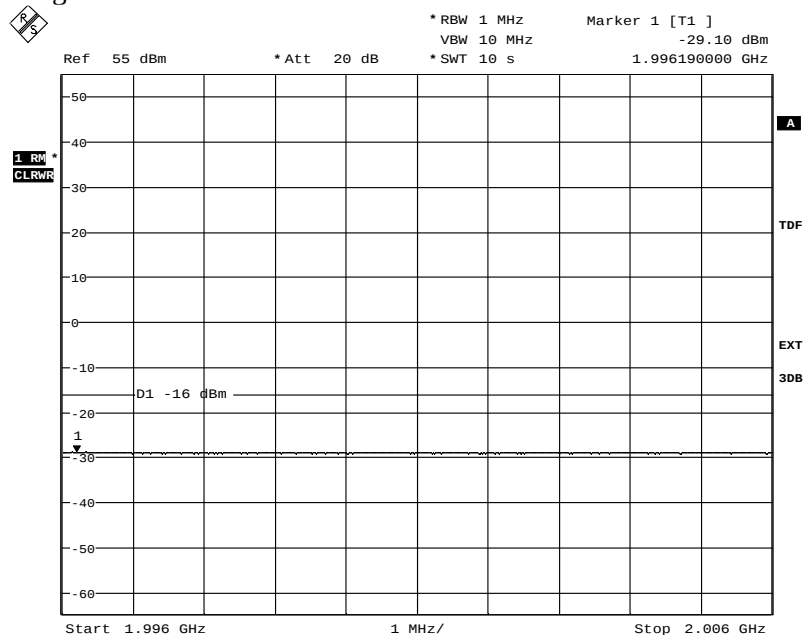


Date: 4.JUN.2012 19:24:41

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 4

Diagram 2c:

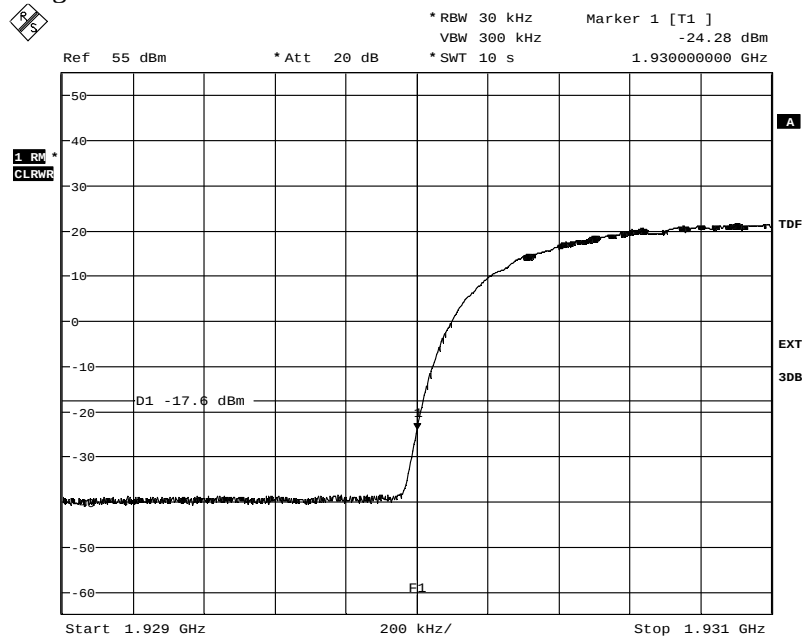


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IC:287AB-AS1180231

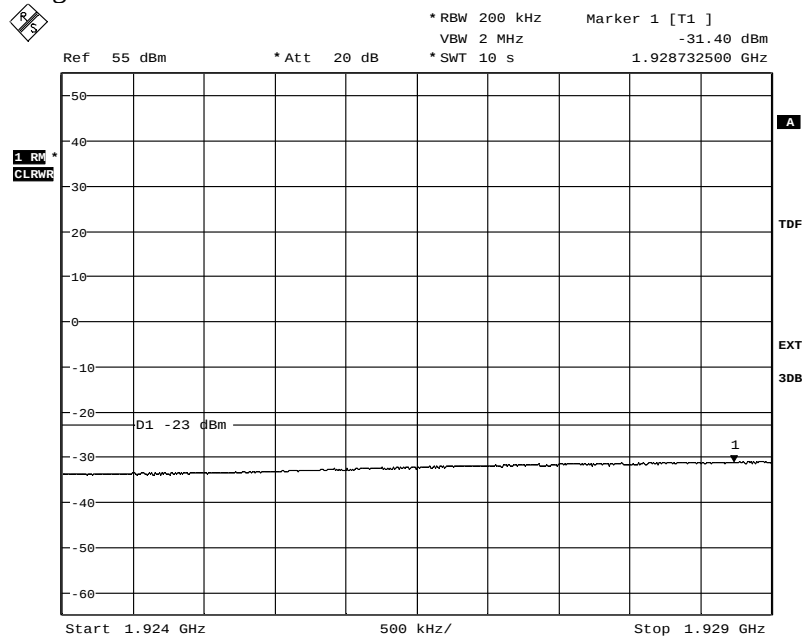
Appendix 4

Diagram 3a:



Date: 7.JUN.2012 14:14:24

Diagram 3b:

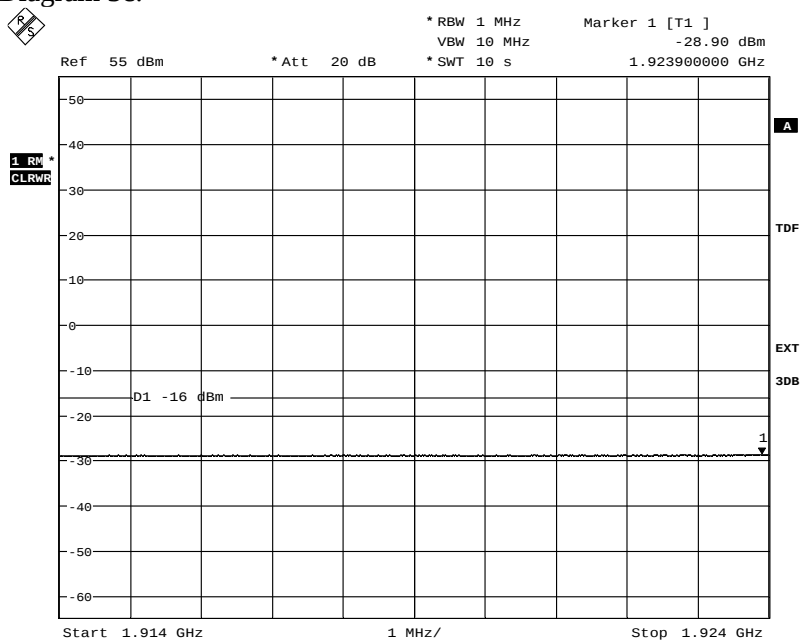


Date: 7.JUN.2012 14:15:25

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 4

Diagram 3c:

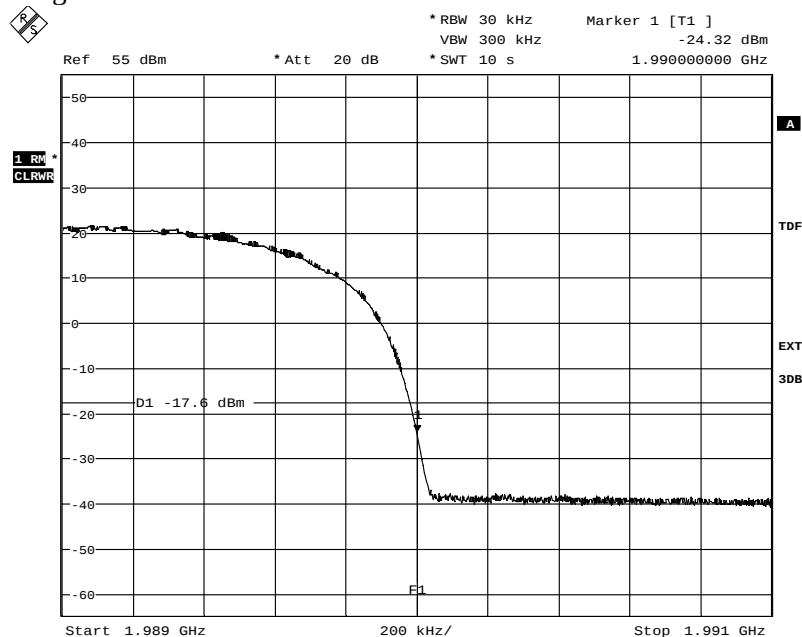


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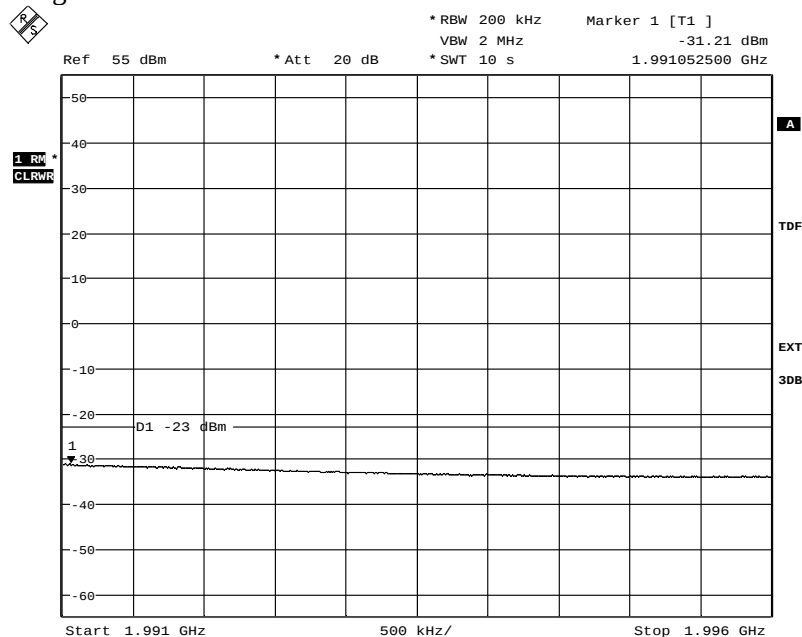
Appendix 4

Diagram 4a:



Date: 7.JUN.2012 13:57:27

Diagram 4b:

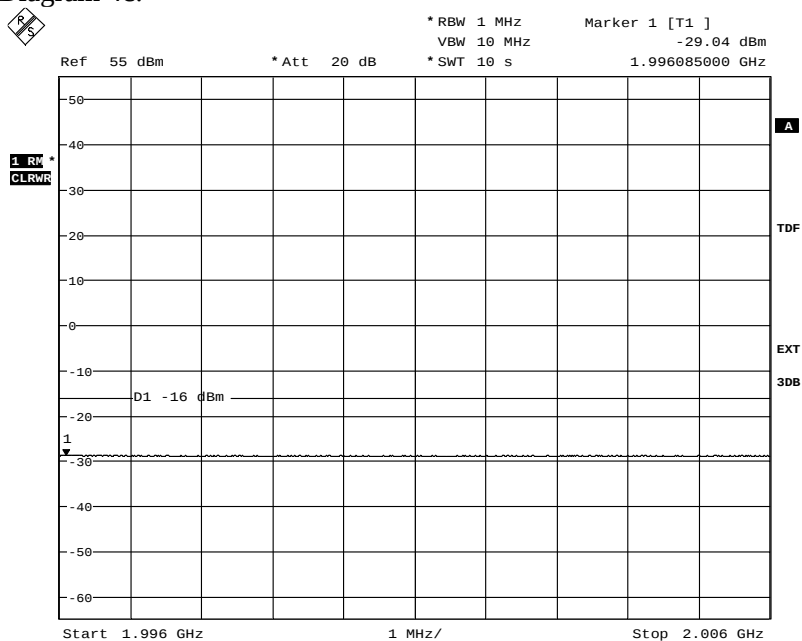


Date: 7.JUN.2012 13:59:25

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 4

Diagram 4c:

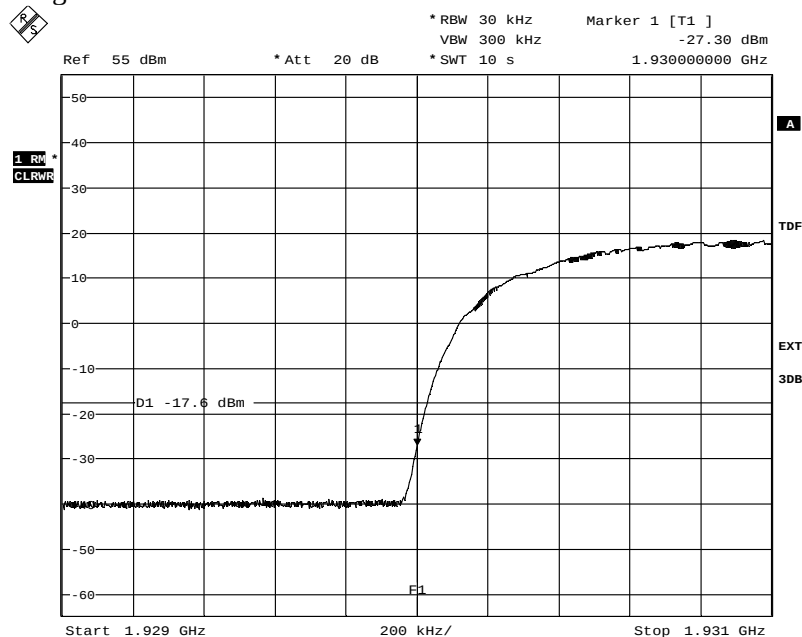


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IC:287AB-AS1180231

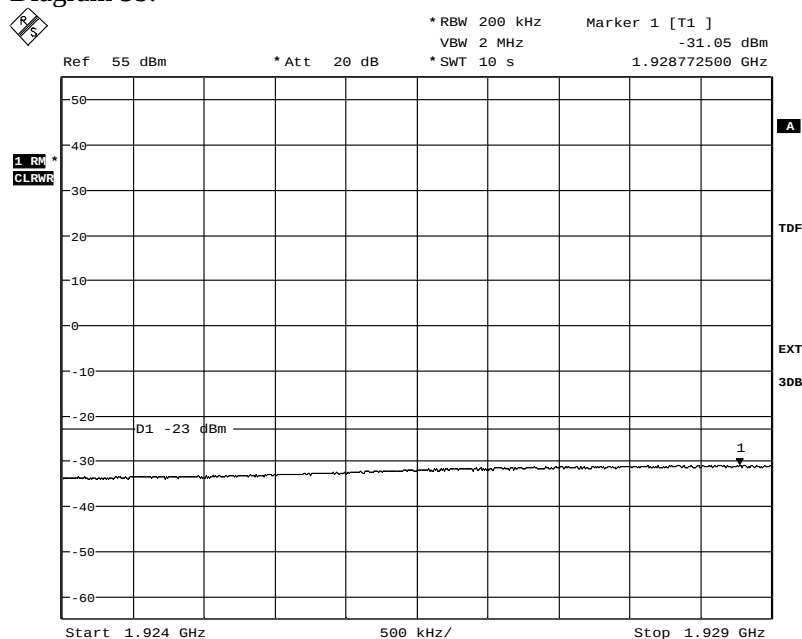
Appendix 4

Diagram 5a:



Date: 7.JUN.2012 15:47:58

Diagram 5b:

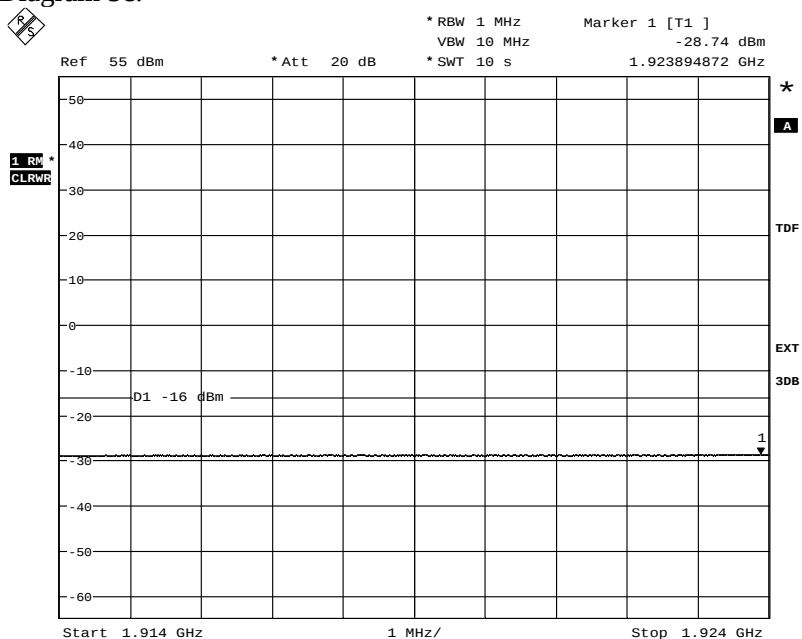


Date: 7.JUN.2012 15:49:14

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 4

Diagram 5c:

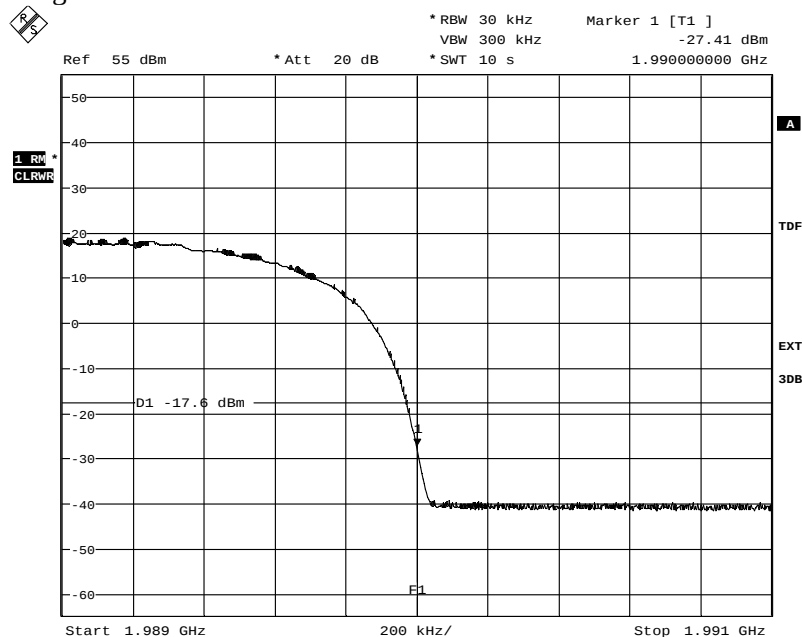


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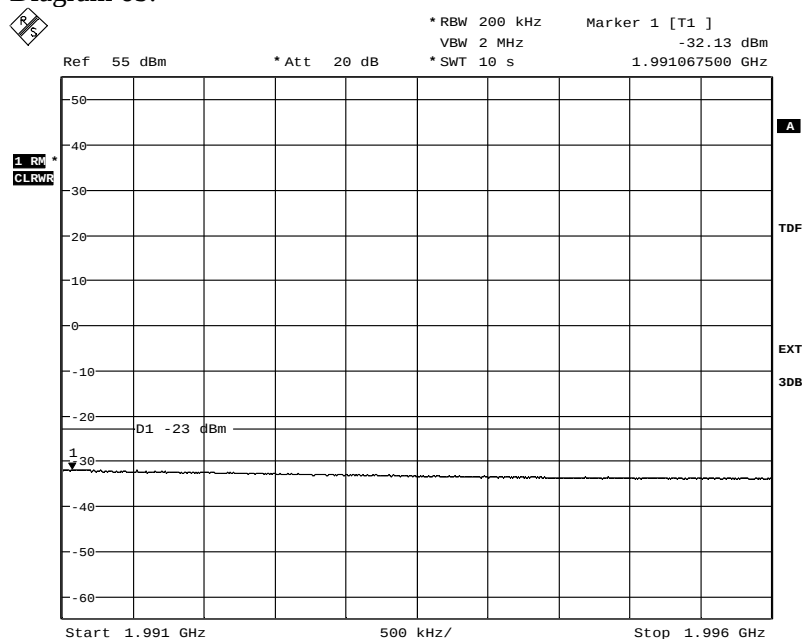
Appendix 4

Diagram 6a:



Date: 7.JUN.2012 16:14:23

Diagram 6b:

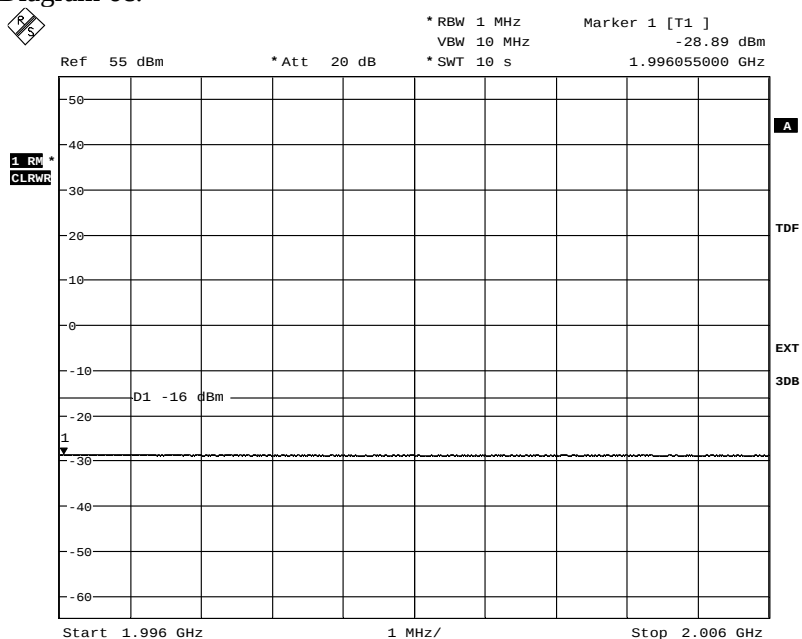


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FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 4

Diagram 6c:

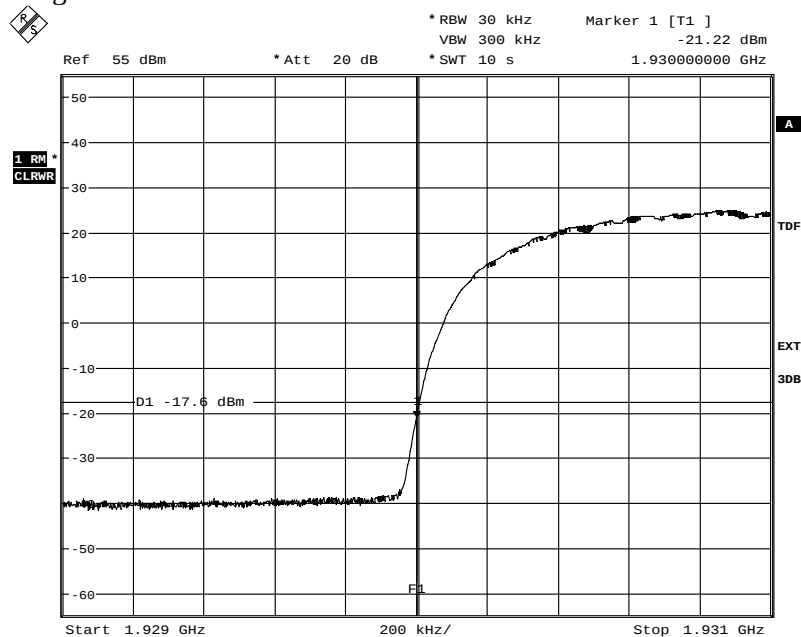


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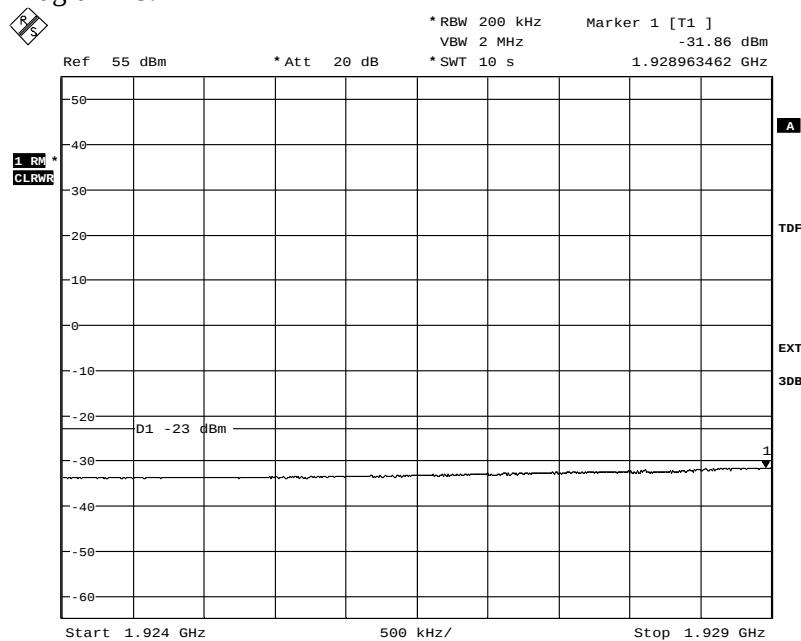
Appendix 4

Diagram 7a:



Date: 8.JUN.2012 13:35:20

Diagram 7b:

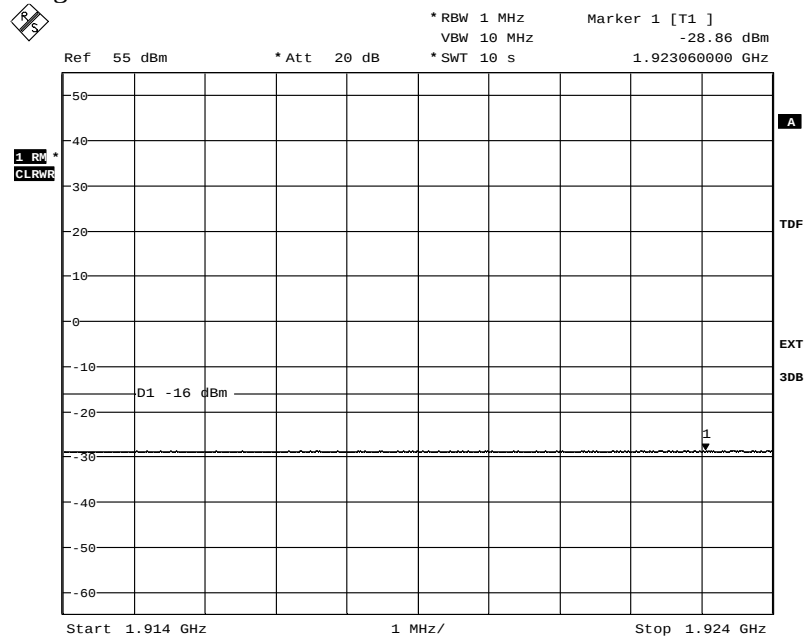


Date: 8.JUN.2012 13:36:40

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 4

Diagram 7c:

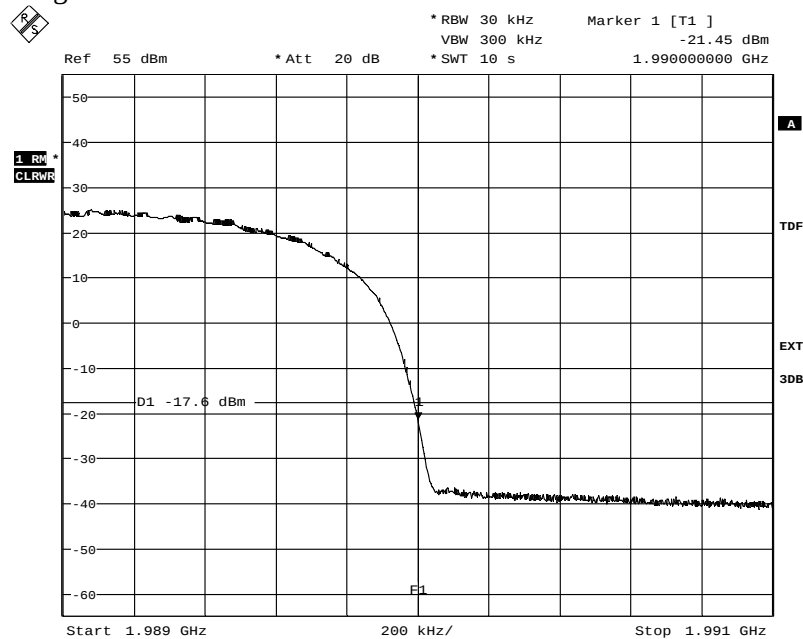


Date: 8.JUN.2012 13:38:02

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

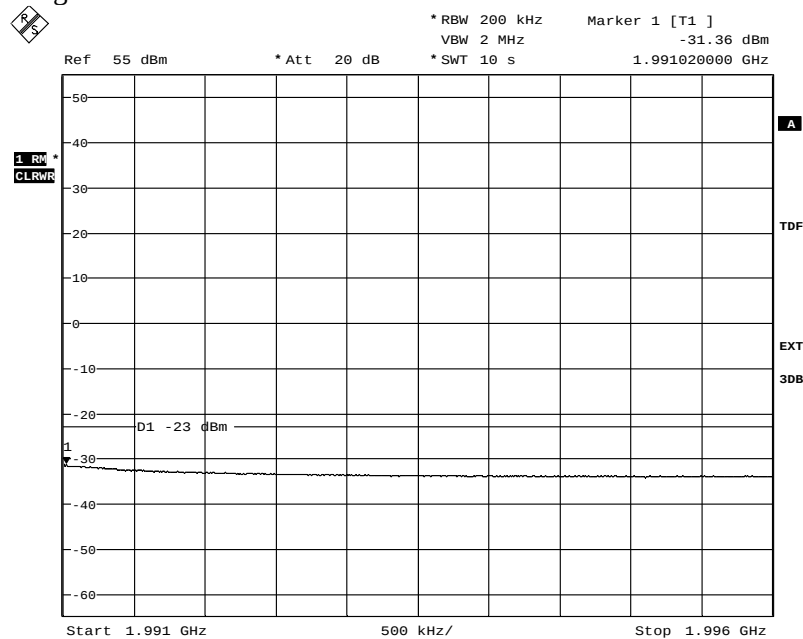
Appendix 4

Diagram 8a:



Date: 8 JUN.2012 13:50:17

Diagram 8b:

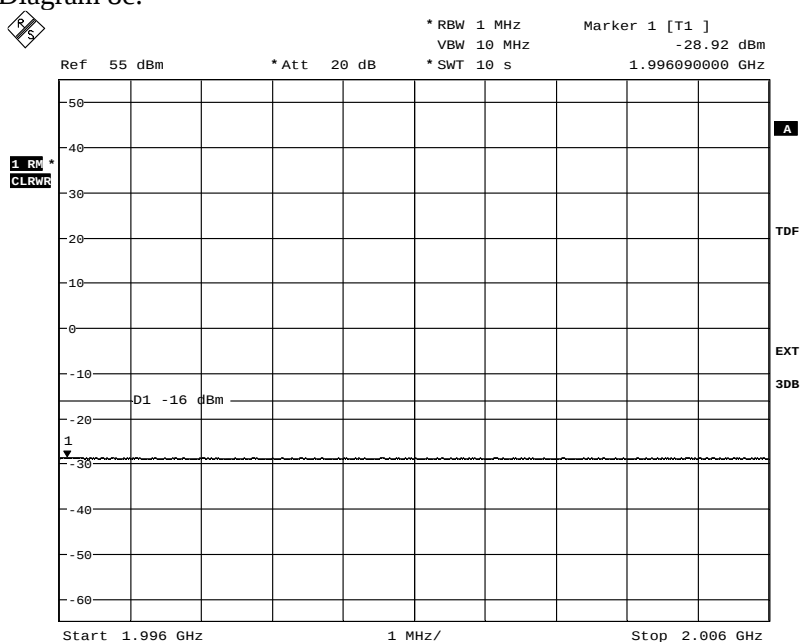


Date: 8 JUN.2012 13:52:10

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 4

Diagram 8c:



Date: 8.JUN.2012 13:53:27

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 5

Conducted spurious emission measurements according to CFR 47 §24.238 / IC RSS-133 6.5

Date 2012-06-04 to 2012-06-08	Temperature 21-24 °C ± 3 °C	Humidity 27-34 % ± 5 %
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Test set-up and procedure

The measurements were made per definition in §24.238. The output was connected to a spectrum analyzer with a RBW setting of 1 MHz and RMS detector activated. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements. The limit was adjusted with 3 dB to -16 dBm to compensate for TX diversity according to FCC KDB662911 [10 log (N)].

Measurement equipment	SP number
R&S FSQ	504 143
RF attenuator	504 159
High pass filter	503 739
RF attenuator	900 229
High pass filter	503 740
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

Single carrier:

Diagram 1: B

Diagram 2: M

Diagram 3: T

Multi carrier:

Diagram 4: B+(B+10)

Diagram 5: T+(T-10)

Diagram 6: B+(B+5+5+5)

Diagram 7: T+(T-5-5-5)

Single carrier RF B

Diagram 8: M

Remark

The emission at 9 kHz on the plots was not generated by the test object. A complementary measurement with a smaller RBW showed that it was related to the LO feed-through.

The highest internal frequency as declared by the client was 2.4576 GHz, thus the choice of the upper frequency boundary was set to $10 \times 2.5 \text{ GHz} = 25 \text{ GHz}$ for emission measurements.



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2012-06-18

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Appendix 5

Limits

§24.238 and RSS-133 6.5

Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm per 1 MHz RBW.

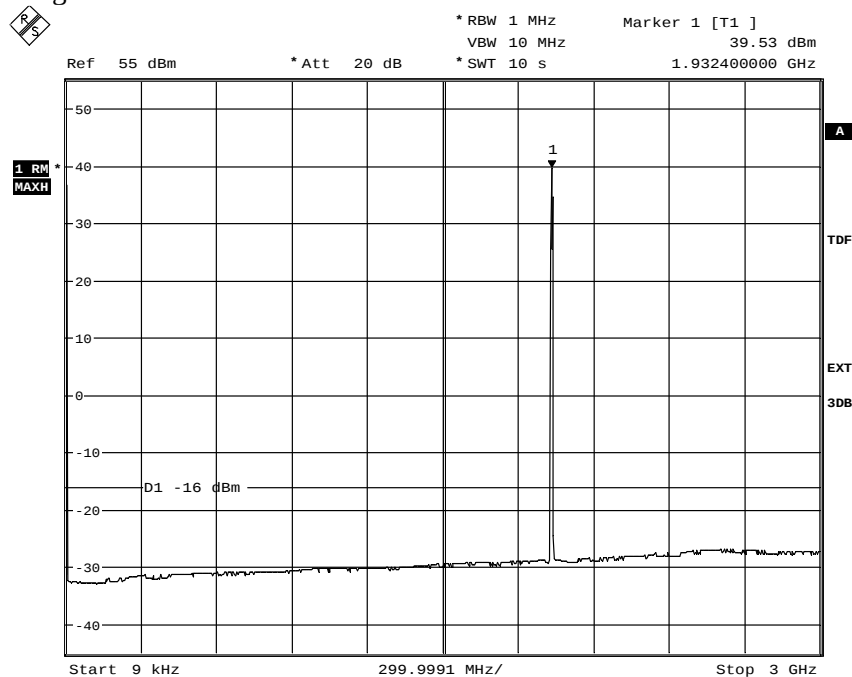
Remark. To compensate for TX diversity the limit was adjusted to -16 dBm per 1 MHz RBW.

Complies?	Yes
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FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 5

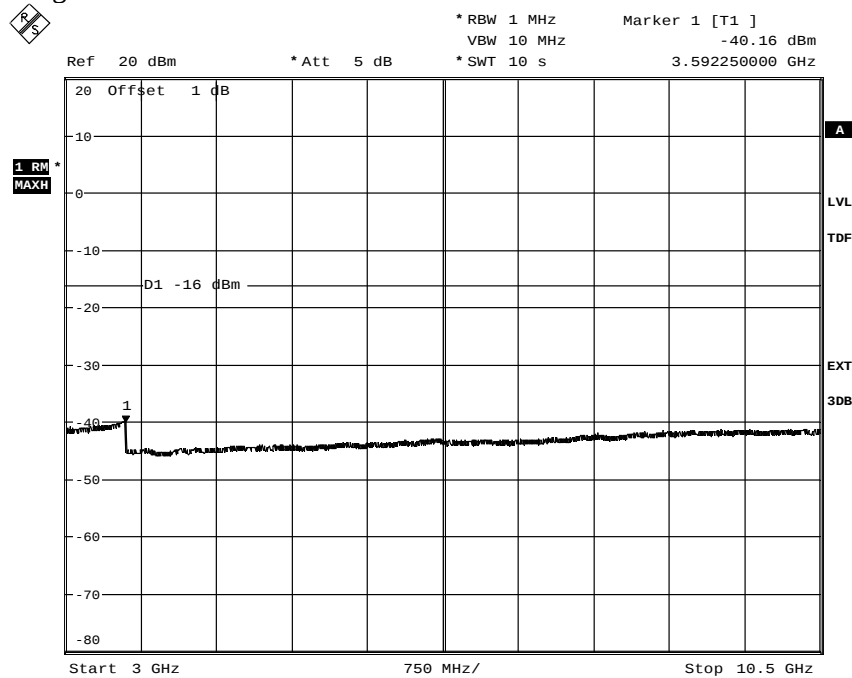
Diagram 1a



Date: 4.JUN.2012 15:22:39

The emissions around the carrier are within the operating frequency band

Diagram 1b

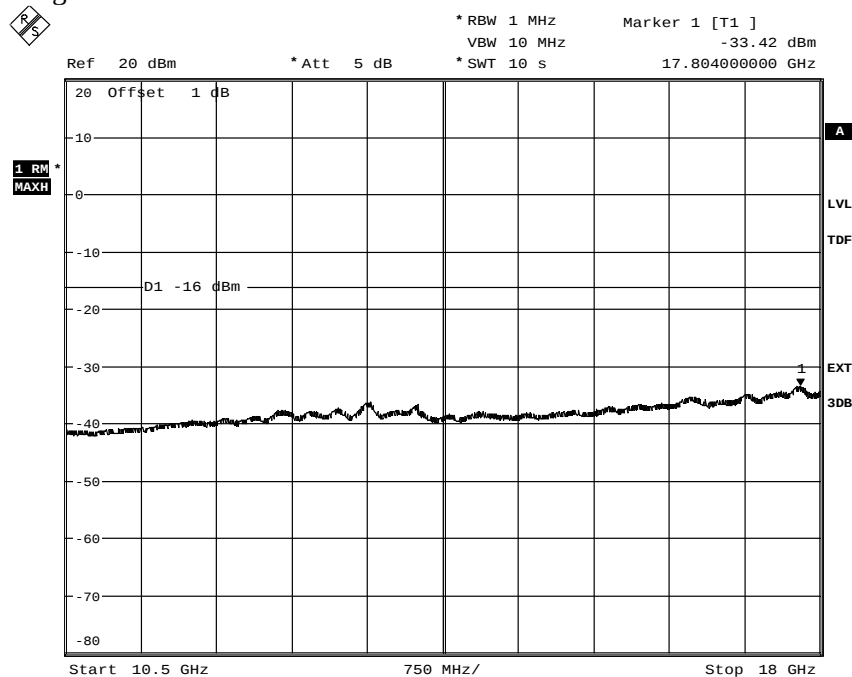


Date: 4.JUN.2012 15:24:53

FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

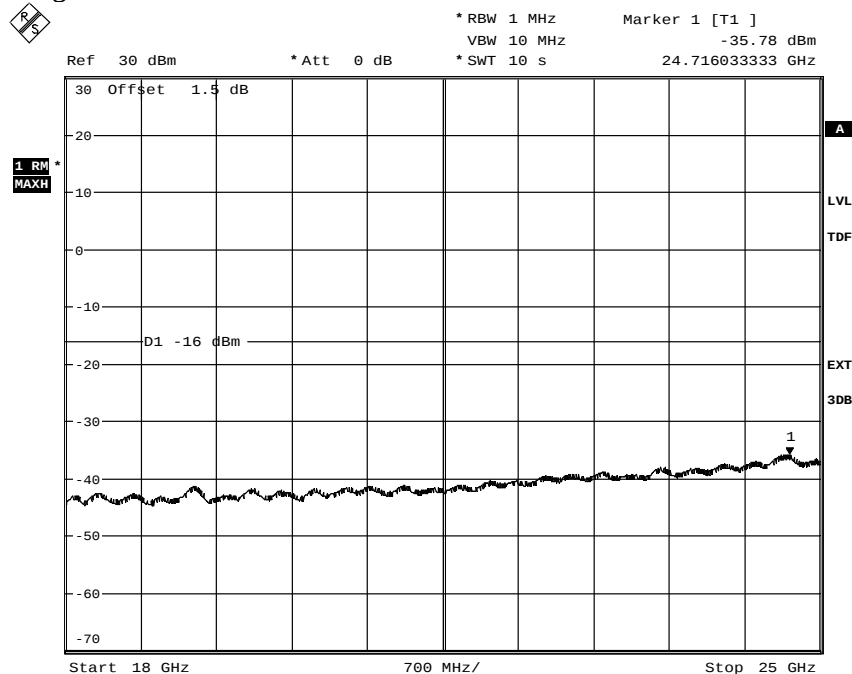
Appendix 5

Diagram 1c



Date: 4.JUN.2012 15:25:58

Diagram 1d

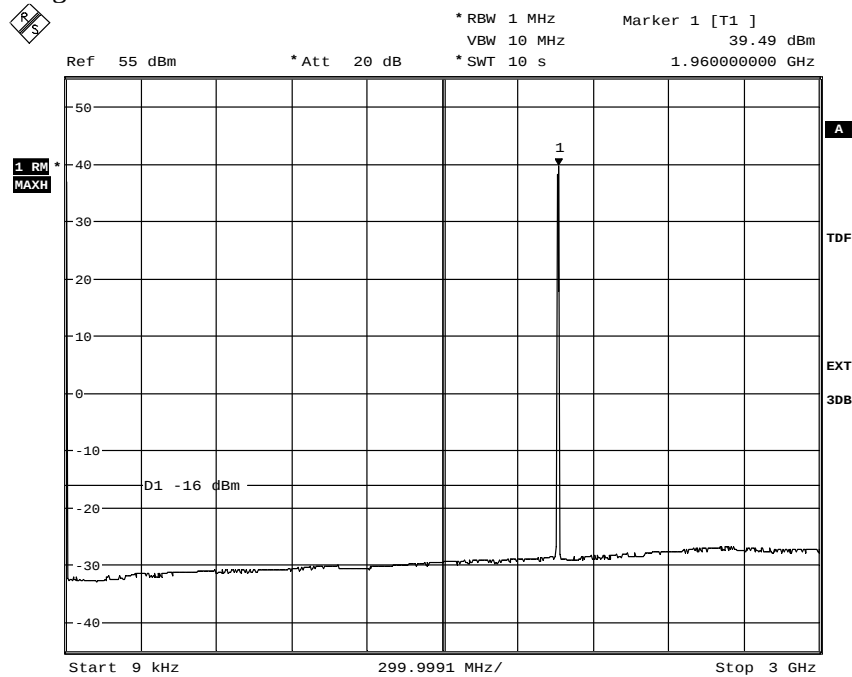


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IC:287AB-AS1180231

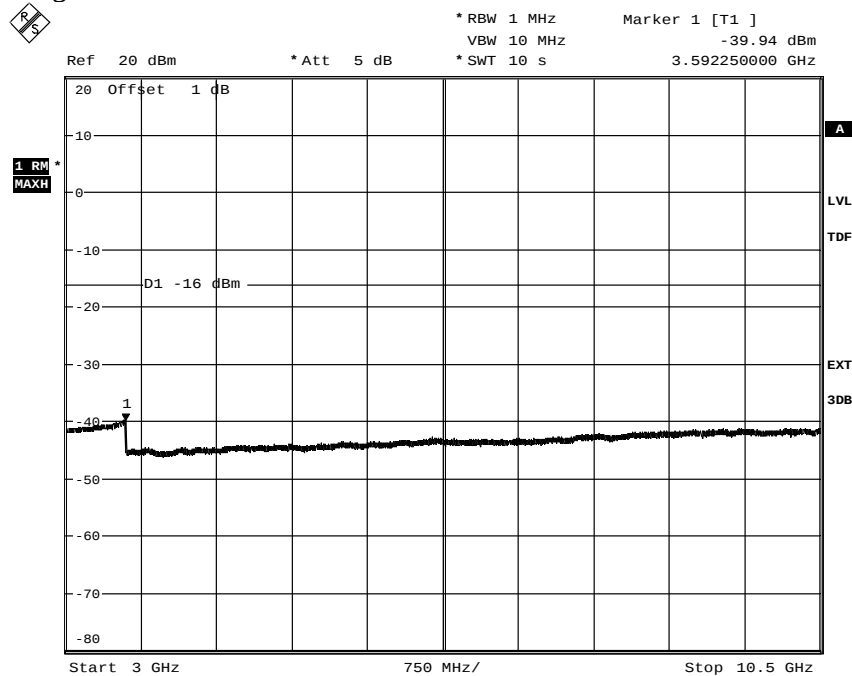
Appendix 5

Diagram 2a



Date: 14.JUN.2012 16:29:04

Diagram 2b

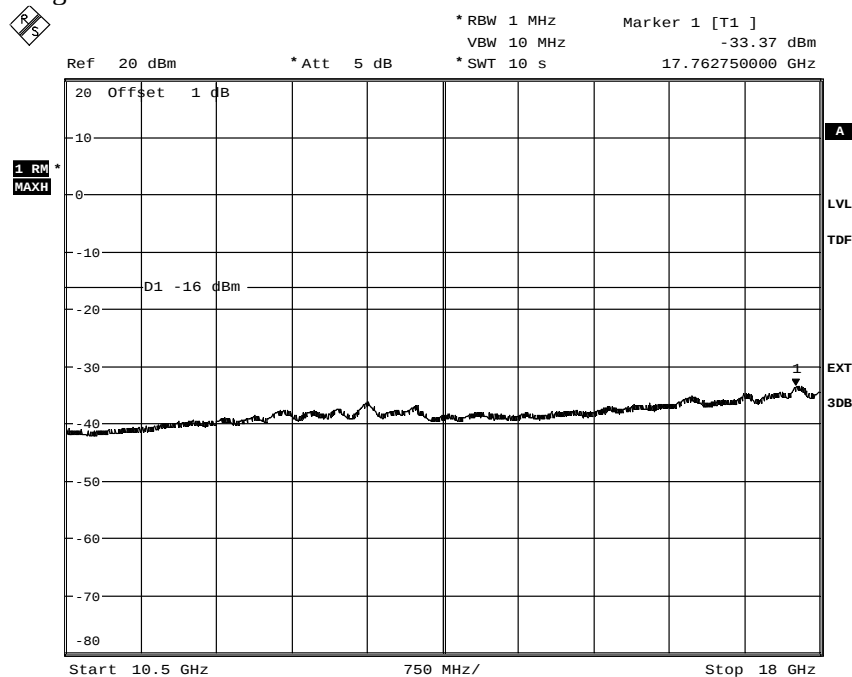


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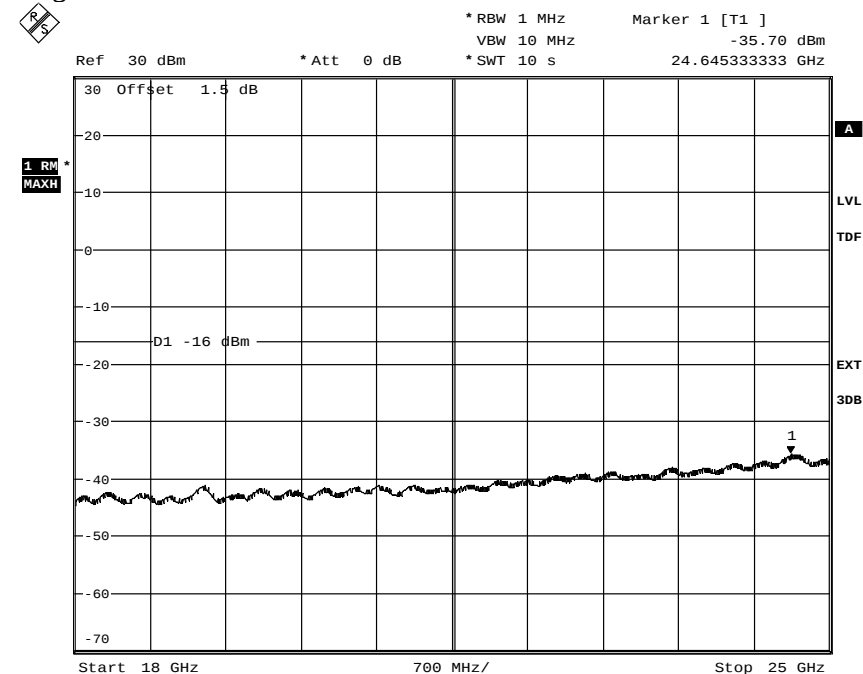
Appendix 5

Diagram 2c



Date: 4.JUN.2012 14:27:45

Diagram 2d

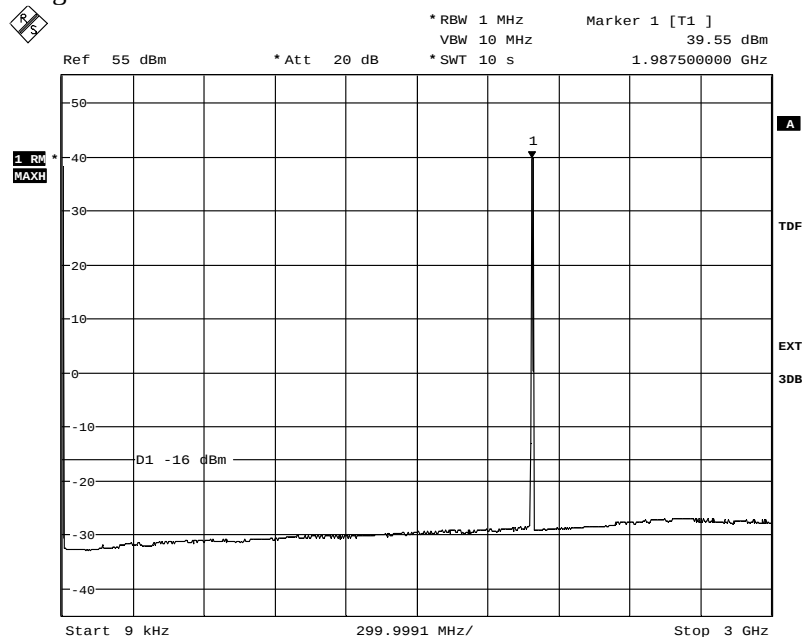


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FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 5

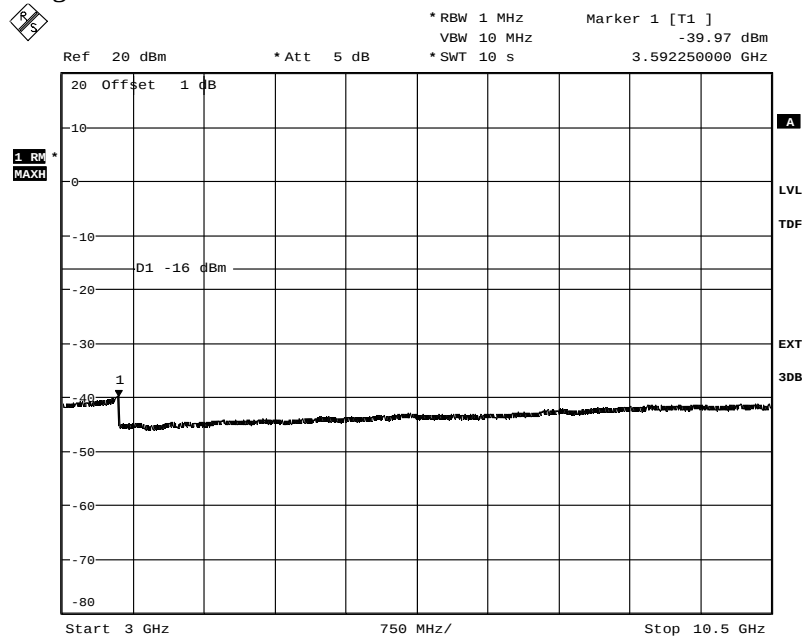
Diagram 3a



Date: 4.JUN.2012 19:28:17

The emissions around the carrier are within the operating frequency band

Diagram 3b

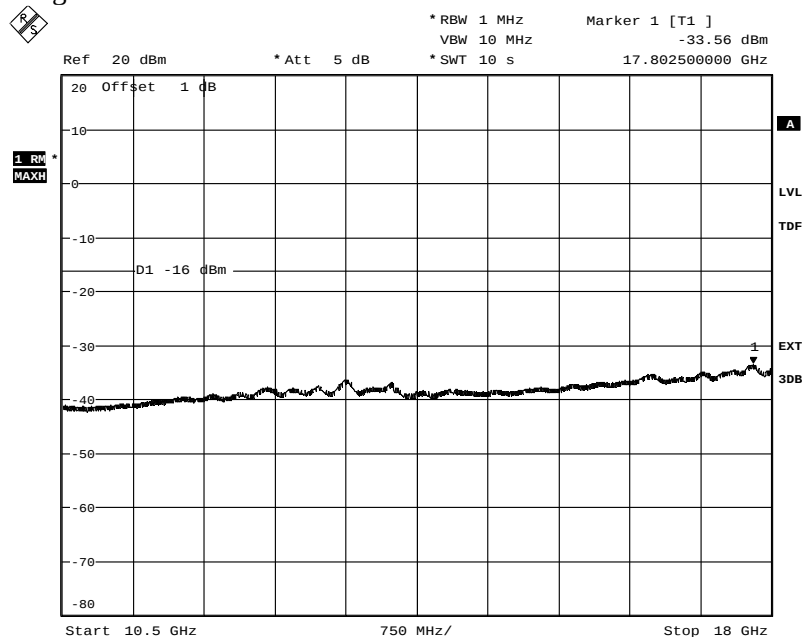


Date: 4.JUN.2012 19:29:53

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IC:287AB-AS1180231

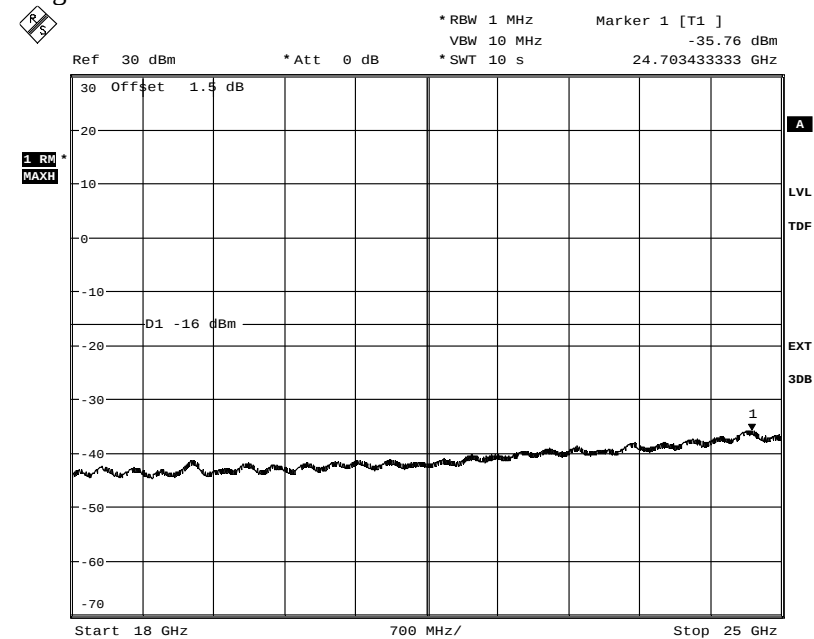
Appendix 5

Diagram 3c



Date: 4.JUN.2012 19:31:25

Diagram 3d

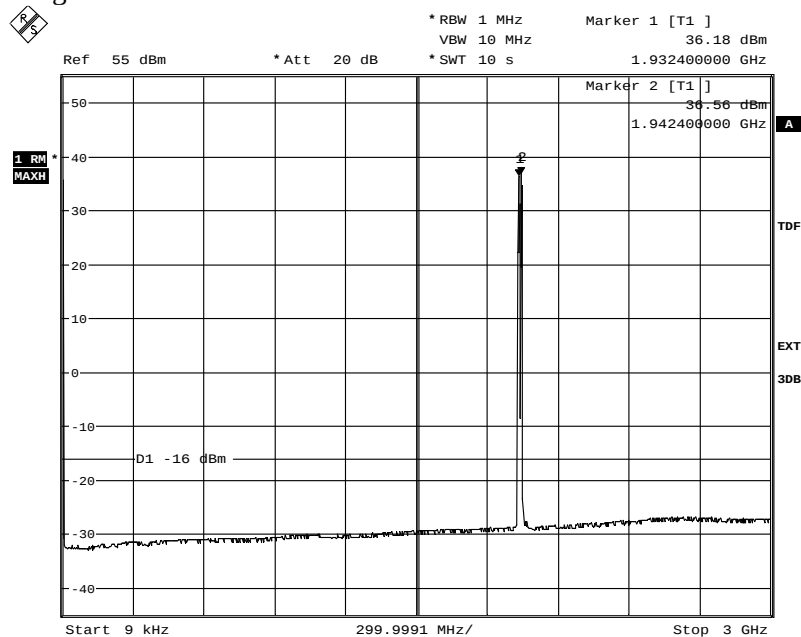


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FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 5

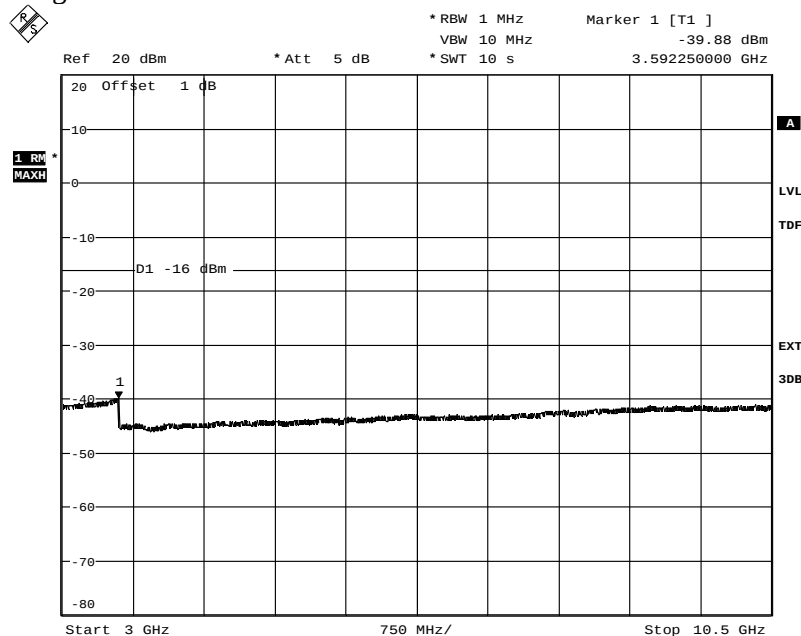
Diagram 4a



Date: 7.JUN.2012 12:40:25

The emissions around the carriers are within the operating frequency band

Diagram 4b

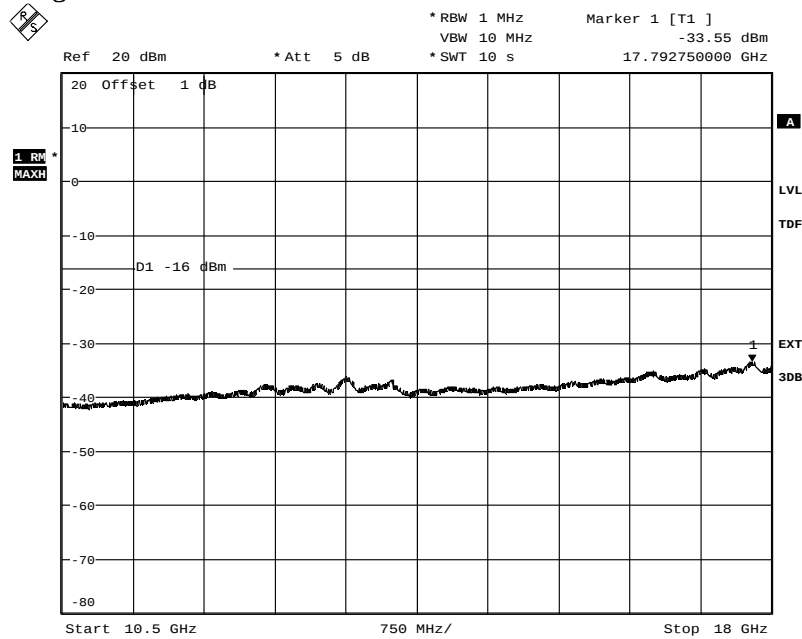


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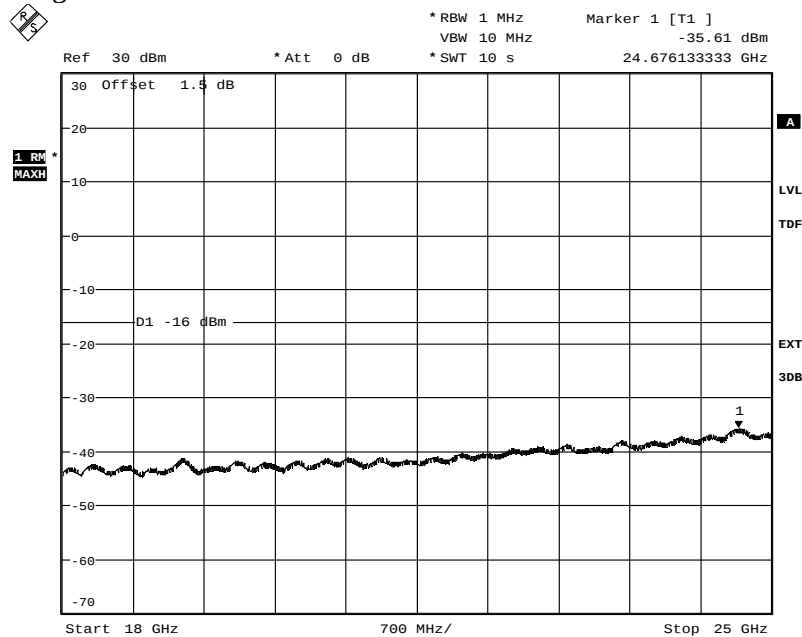
Appendix 5

Diagram 4c



Date: 7. JUN. 2012 12:45:09

Diagram 4d

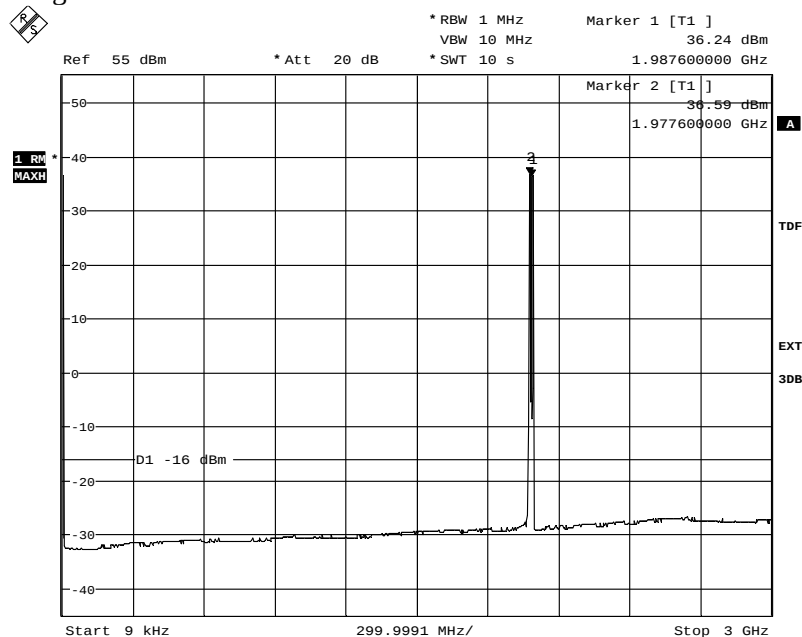


Date: 7. JUN. 2012 12:50:14

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IC:287AB-AS1180231

Appendix 5

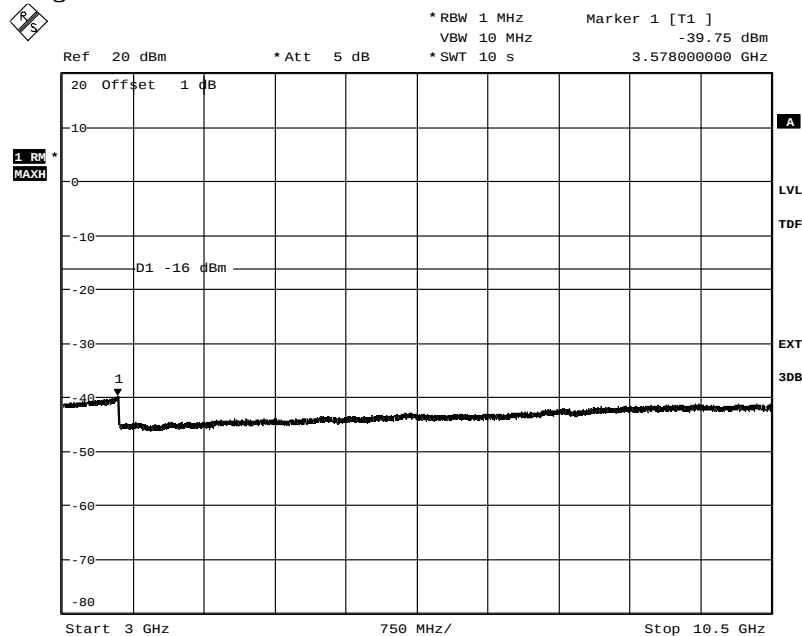
Diagram 5a



Date: 7.JUN.2012 13:05:01

The emissions around the carriers are within the operating frequency band

Diagram 5b

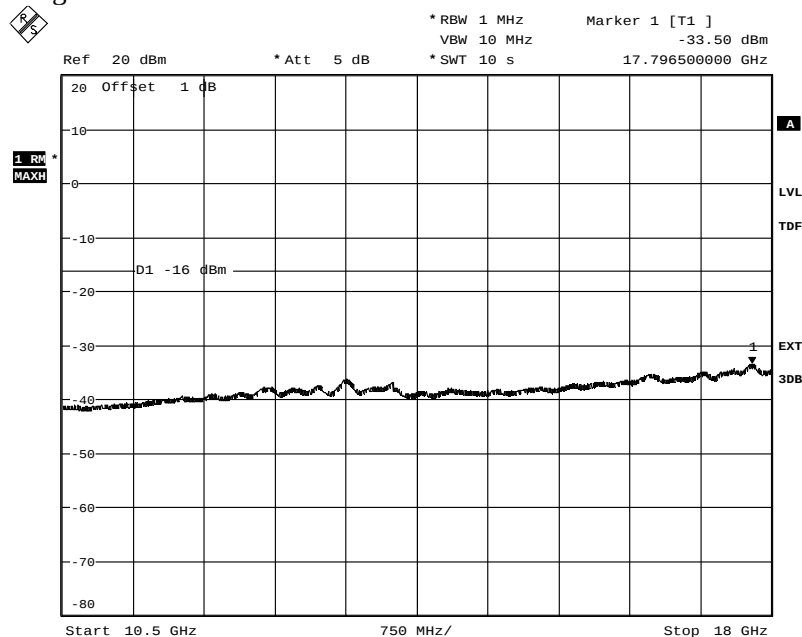


Date: 7.JUN.2012 13:06:28

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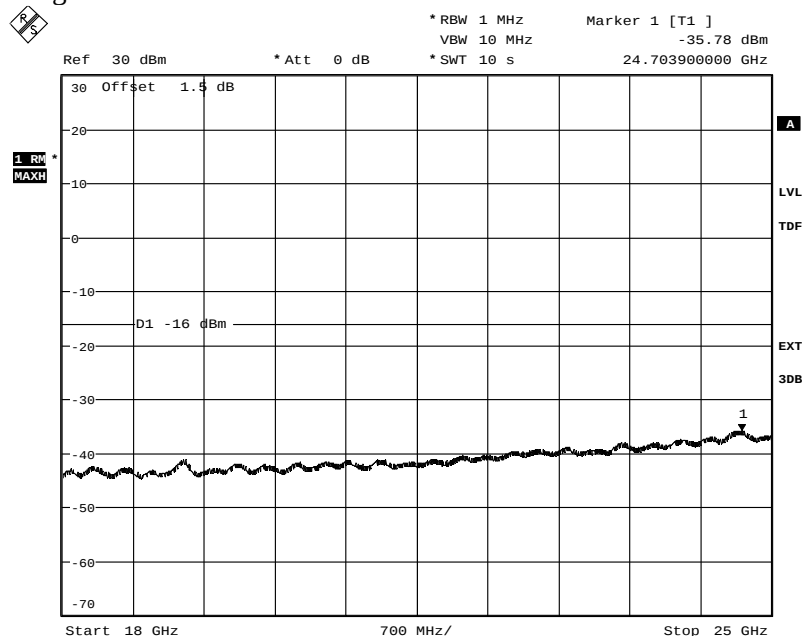
Appendix 5

Diagram 5c



Date: 7. JUN. 2012 13:07:32

Diagram 5d

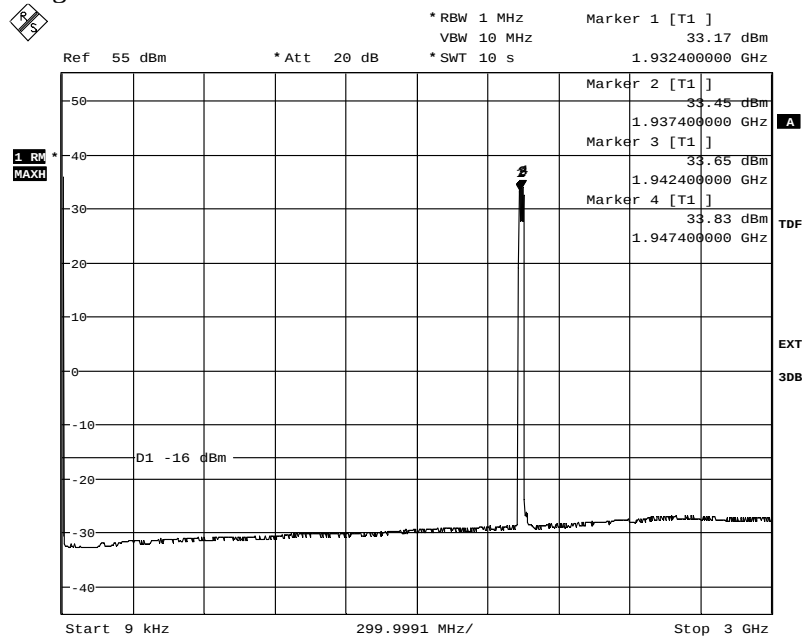


Date: 7. JUN. 2012 13:10:21

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Appendix 5

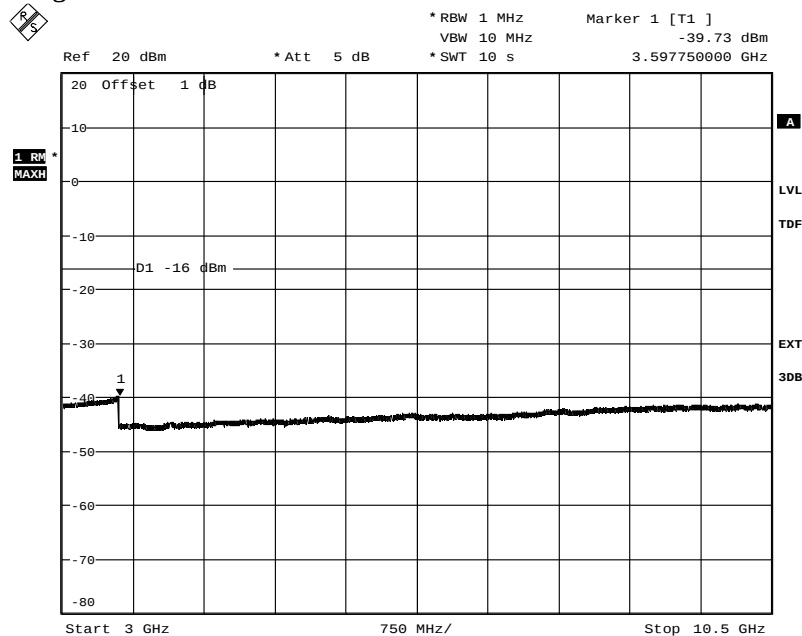
Diagram 6a



Date: 7.JUN.2012 15:51:51

The emissions around the carriers are within the operating frequency band

Diagram 6b

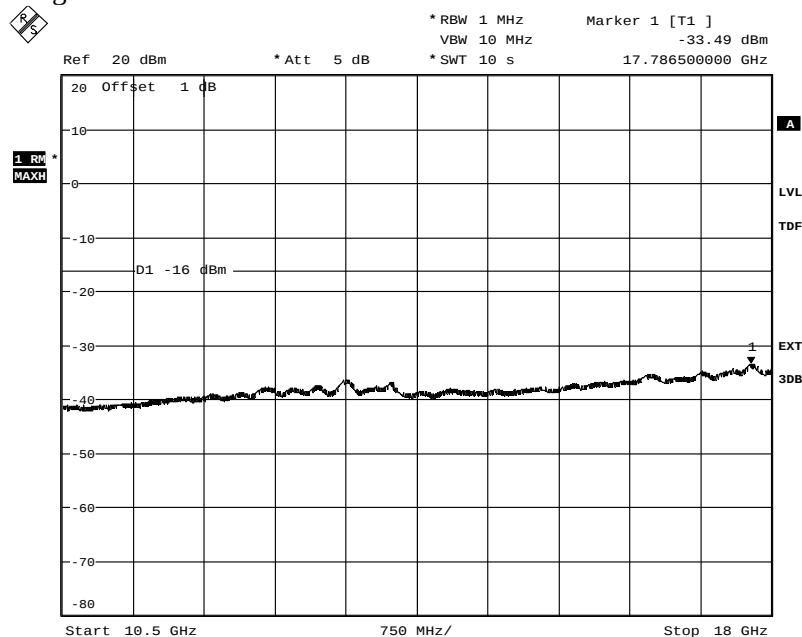


Date: 7.JUN.2012 15:53:29

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IC:287AB-AS1180231

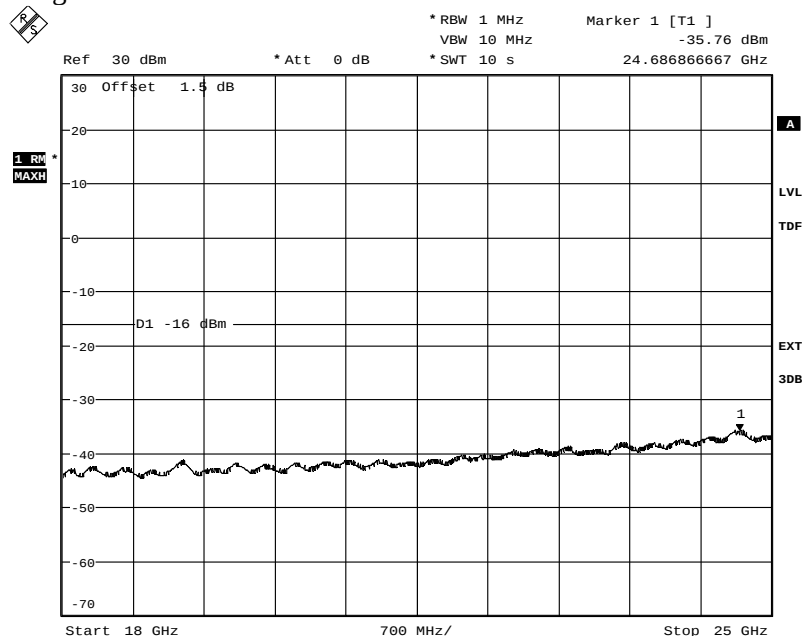
Appendix 5

Diagram 6c



Date: 7.JUN.2012 15:54:29

Diagram 6d

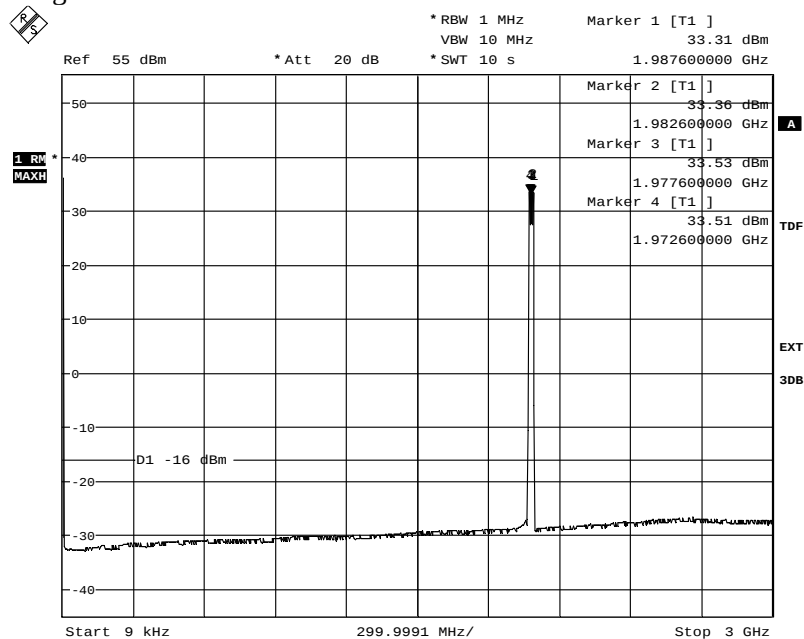


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IC:287AB-AS1180231

Appendix 5

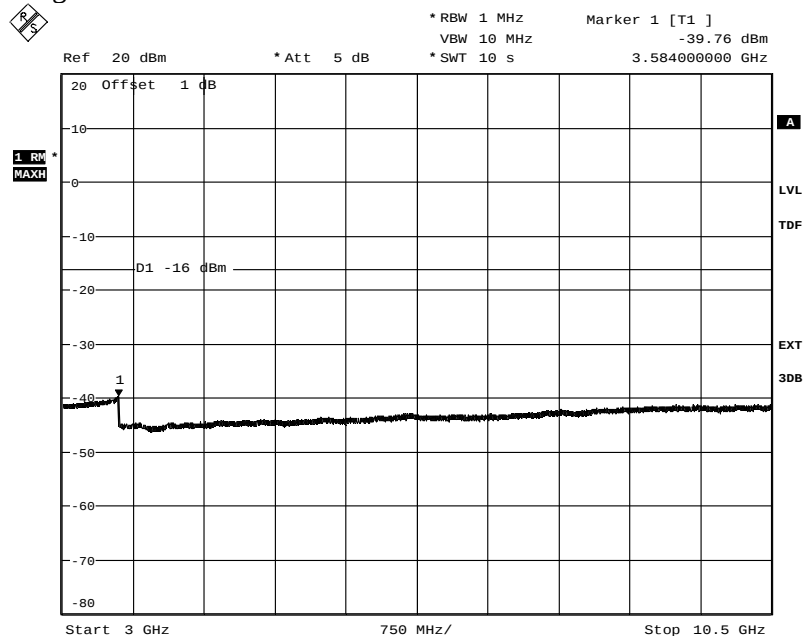
Diagram 7a



Date: 7.JUN.2012 16:21:10

The emissions around the carriers are within the operating frequency band

Diagram 7b

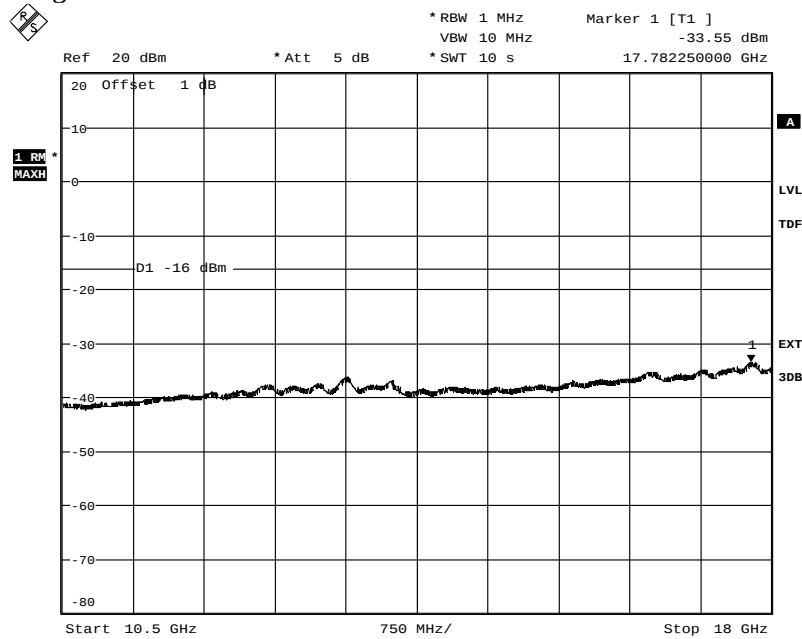


Date: 7.JUN.2012 16:24:13

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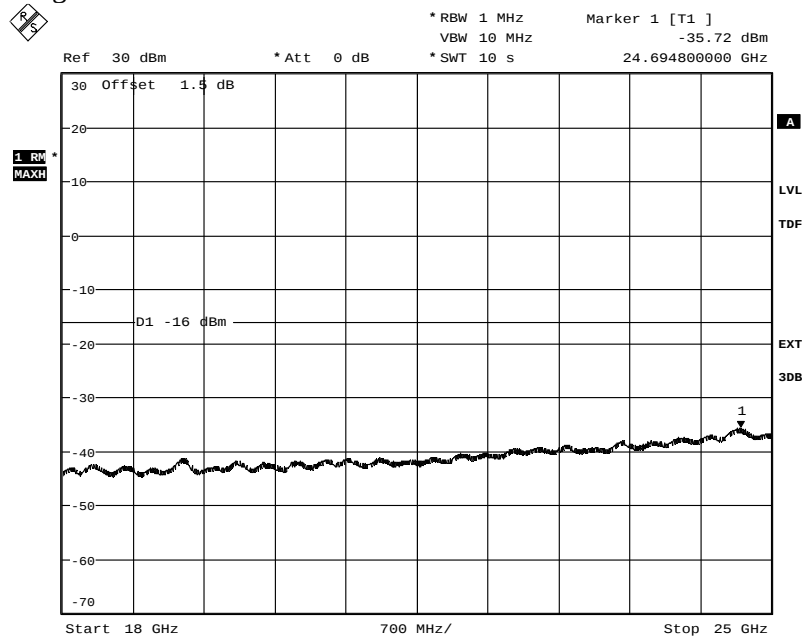
Appendix 5

Diagram 7c



Date: 7.JUN.2012 16:25:17

Diagram 7d

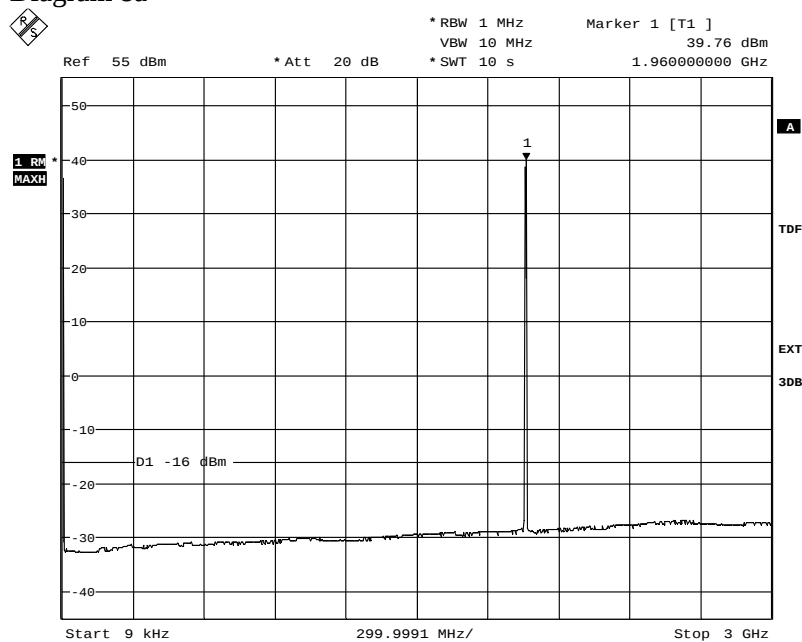


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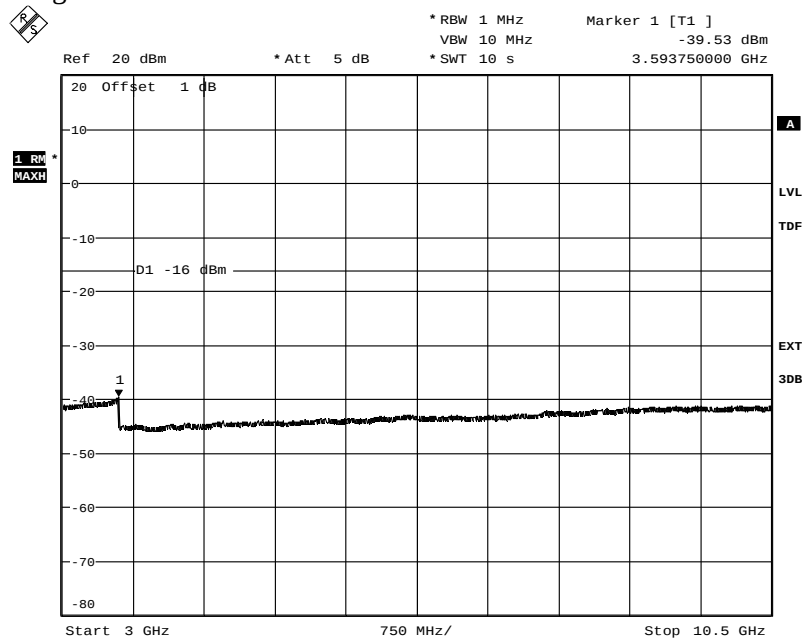
Appendix 5

Diagram 8a



Date: 8.JUN.2012 13:12:16

Diagram 8b

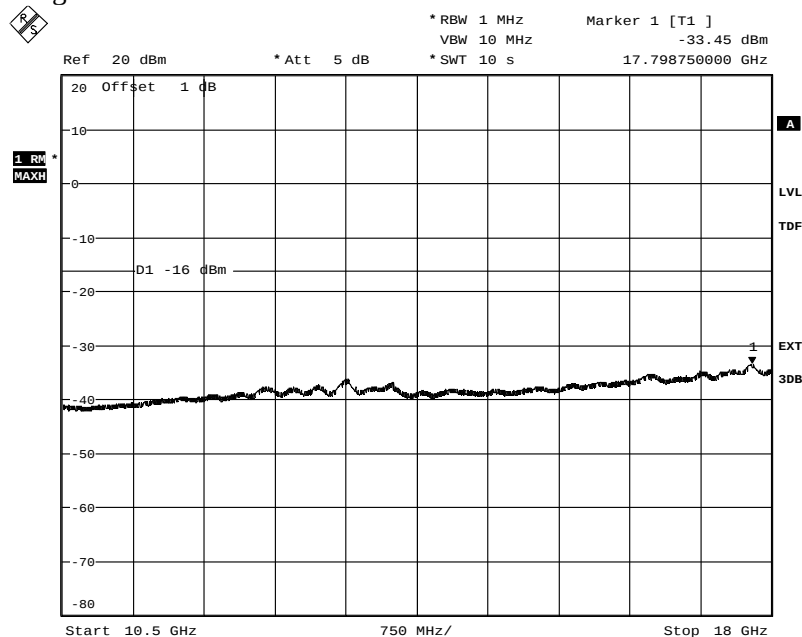


Date: 8.JUN.2012 13:14:14

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IC:287AB-AS1180231

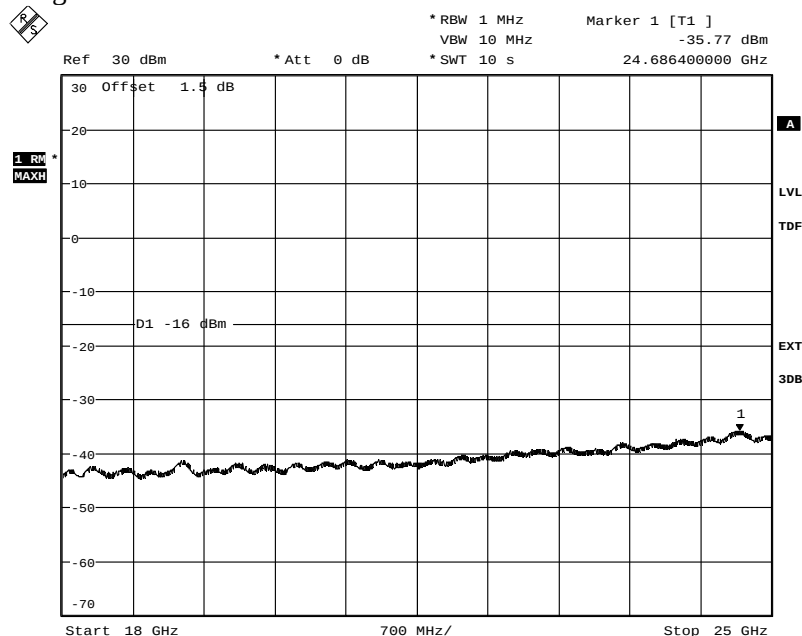
Appendix 5

Diagram 8c



Date: 8.JUN.2012 13:15:30

Diagram 8d



Date: 8.JUN.2012 13:17:53

Field strength of spurious radiation measurements according to CFR 47 §24.238 / IC RSS-133 6.5

Date	Temperature	Humidity
2012-04-05 to 2012-04-13	23-24°C ± 3°C	52-64 % ± 5 %
2012-05-25	23°C ± 3°C	33 % ± 5 %

Test set-up and procedure

The test sites are listed at FCC, Columbia with registration number: 93866. The test site complies with RSS-Gen, Industry Canada file no. 3482A-1.

The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 18 GHz and 1m in the frequency range 18 - 25 GHz.

In the frequency range 30 MHz - 25 GHz the measurement was performed in power with a RBW of 1 MHz. A propagation loss in free space was calculated. The used formula was

$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right), \gamma \text{ is the propagation loss and } D \text{ is the antenna distance.}$$

The measurement procedure was as the following:

1. The pre-measurement was first performed with peak detector. The EUT was measured in eight directions and with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. Spurious radiation on frequencies closer than 20 dB to the limit in the pre-measurement is scanned 0-360 degrees and the antenna is scanned 1- 4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported. Frequencies closer than 10 dB to the limit when measured with the RMS detector were measured with the substitution method according to the standard.

The test set-up during the spurious radiation measurements is shown in the picture below:



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Appendix 6

Measurement equipment

Measurement equipment	SP number
Test site Tesla	503 881
R&S ESU 26	901 553
Control computer	-
R&S FSIQ 40	503 738
Software: R&S EMC32, ver. 8.52.0	503 745
Chase Bilog antenna CBL 6111A	503 182
µComp Nordic, Low Noise Amplifier	901 545
Miteq, Low Noise Amplifier	503 285
EMCO Horn Antenna 3115	502 175
Standard gain antenna 20240-20	503 674
High pass filter, Wainright	504 200
High pass filter, RLC Electronics	503 739
Testo 625, temperature and humidity meter	504 188

Results, representing worst case

Diagram 1:a-d 0.03-25 GHz TM1 BW 5.0 MHz (T)

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-25 000	All emission > 20 dB below limit	All emission > 20 dB below limit

Measurement uncertainty:

3.2 dB up to 18 GHz, 3.6 dB above 18 GHz

Limits

§24.238 and RSS-133 6.5

Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log (P)$ dB, resulting in a limit of -13 dBm per 1 MHz RBW.

Complies?	Yes
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FCC ID:TA8AKRC118023-1
IC:287AB-AS1180231

Appendix 6

Diagram 1a:

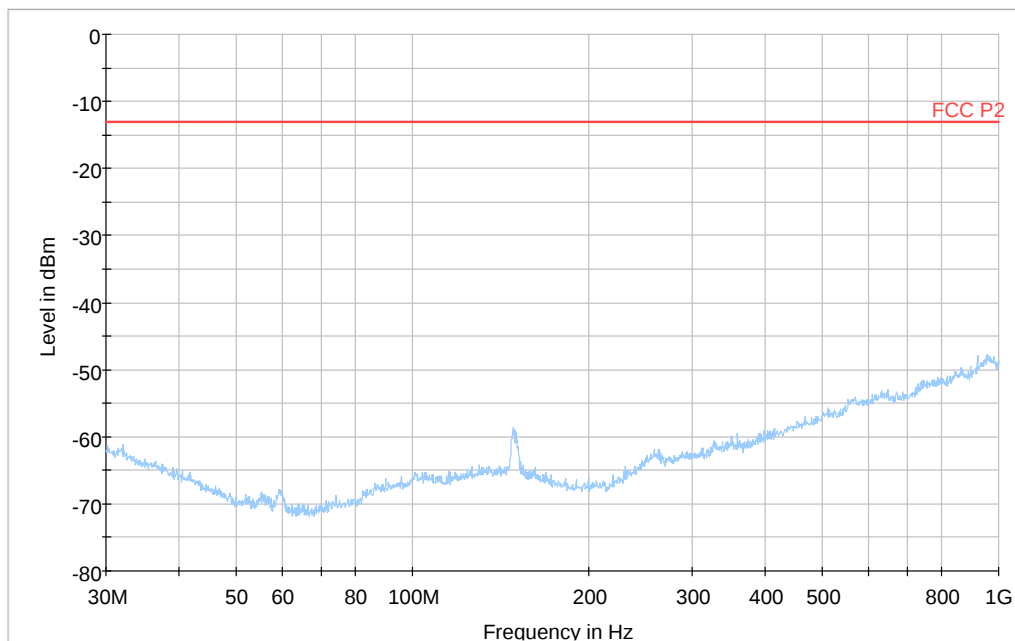
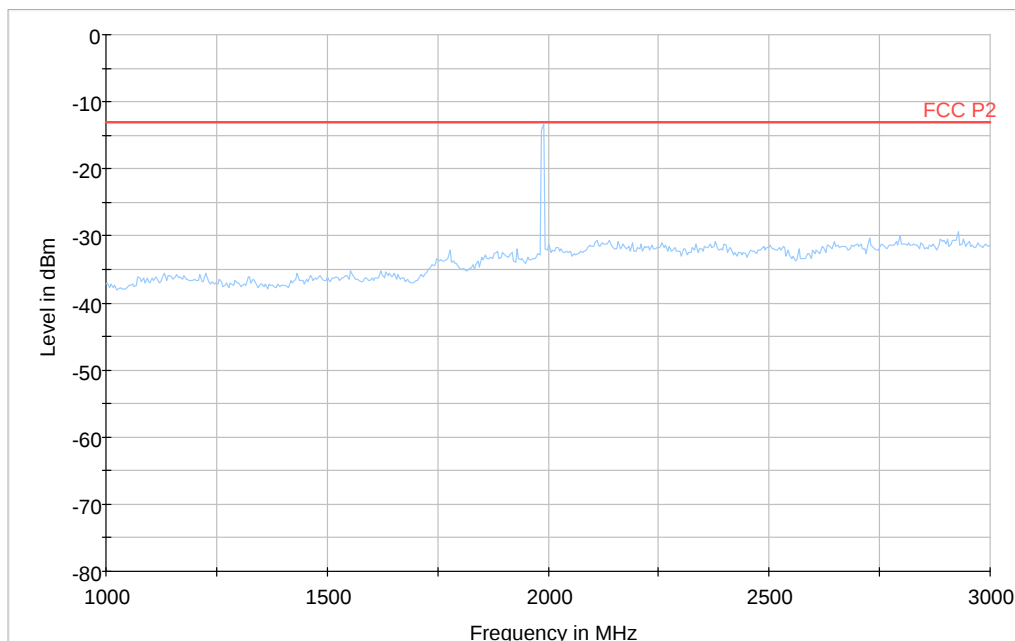


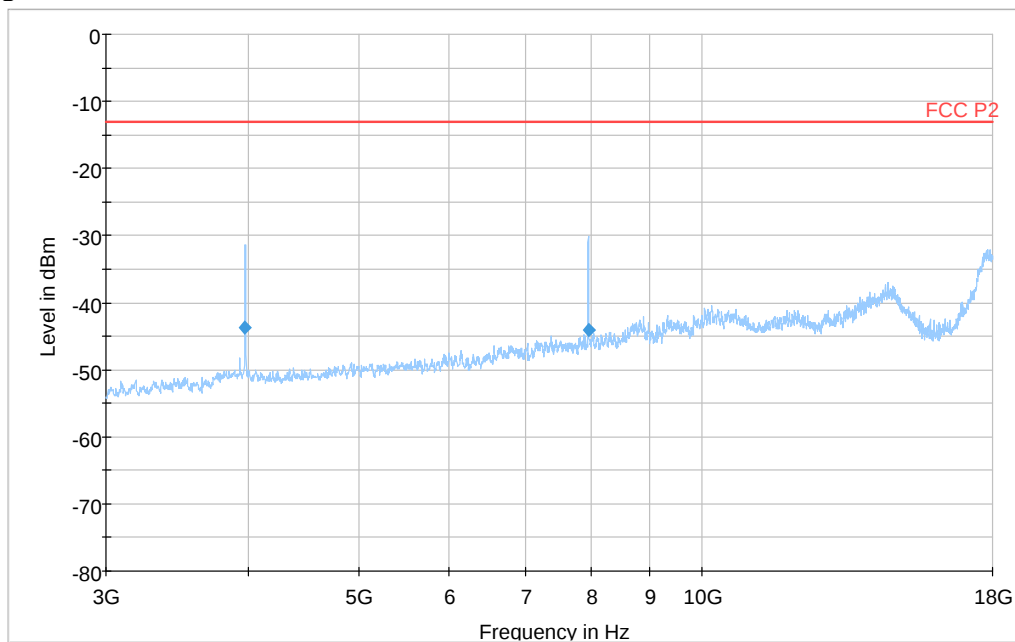
Diagram 1b:



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Appendix 6

Diagram 1c:



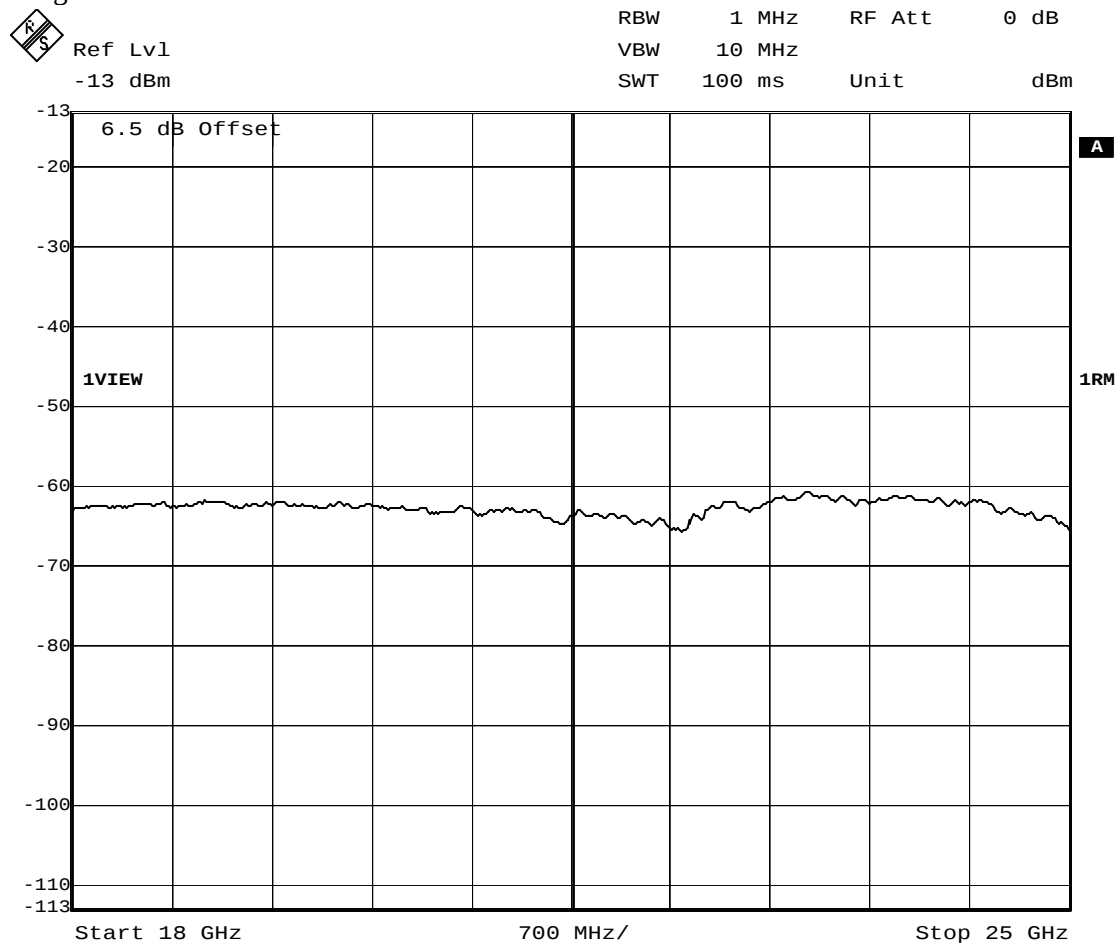
Final RMS Result

Frequency (MHz)	RMS (dBm)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBm)
3974.226	-43.7	5000.0	1000.000	218.0	H	212.0	-103.4	30.7	-13.0
7951.382	-44.0	5000.0	1000.000	147.0	H	241.0	-95.4	31.0	-13.0

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Appendix 6

Diagram 1d:



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Appendix 7

Frequency stability measurements according to CFR 47 §24.235 / IC RSS 133 6.3

Date 2012-06-08 to 2012-06-13	Temperature (test equipment) 22-23 °C ± 3 °C	Humidity (test equipment) 36-47 % ± 5 %
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Test set-up and procedure

The measurement was made per 3GPP TS 25.141. The output was connected to a spectrum analyzer. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
Rohde & Schwarz signal analyzer FSQ40, EAB equipment	-
RF attenuator	503 870
Testo 635, Temperature and humidity meter	504 203
Climate chamber 2	501 031

Results

Nominal Voltage -48 V DC

Maximum output power at mid channel (M)

Test conditions		Frequency error (Hz)
Supply voltage DC (V)	T (°C)	
-48.0	+20	-8
-55.2	+20	-8
-40.8	+20	-8
-48.0	+30	-10
-48.0	+40	-7
-48.0	+50	-10
-48.0	+10	-7
-48.0	0	-5
-48.0	-10	+6
-48.0	-20	-7
-48.0	-30	-7
Maximum freq. error (Hz)		10
Measurement uncertainty		$< \pm 1 \times 10^{-7}$

Limits (according to 3GPP TS 25.141)

The frequency error shall be within ± 0.05 PPM ± 12 Hz (109.9 Hz).

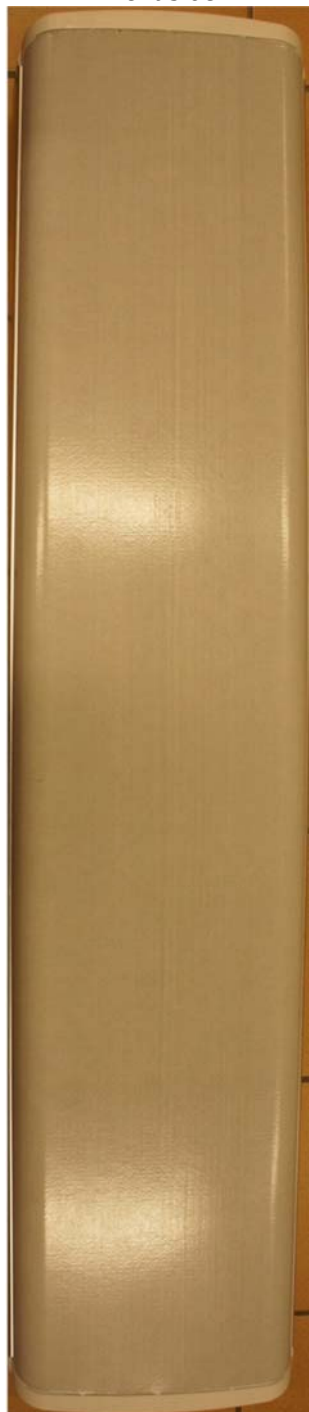
Complies?	Yes
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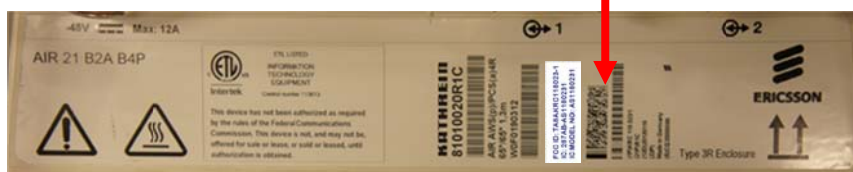
Appendix 8

External photos

Front side



Rear side



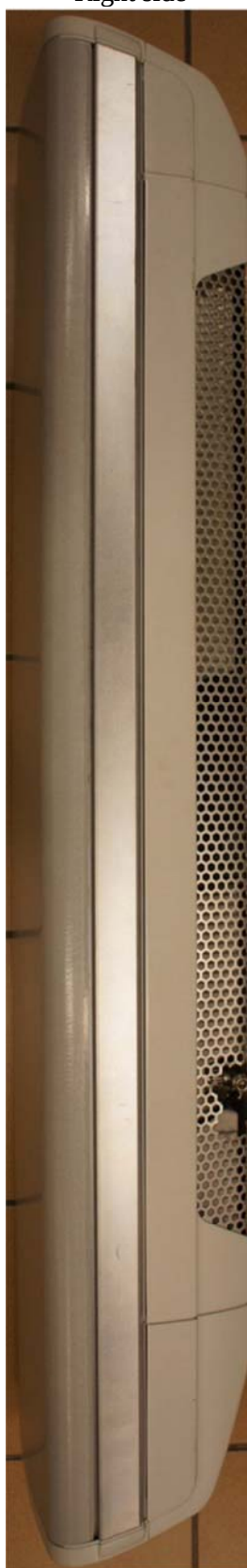
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Appendix 8

Left side



Right side



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Appendix 8

Top side



Bottom side

