



REPORT

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Page
1 (2)



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Radio measurements on RUS 01 B5 850 MHz cellular equipment with FCC ID: TA8AKRC11864-2 and IC: 287AB-AS118642 (9 appendices)

Test object

RUS 01 B5, KRC 118 64/2, revision R1B


Summary


Standard	Compliant	Appendix
FCC CFR 47 / IC RSS-132 Issue 2		
2.1046 / RSS-132 4.4 RF power output	Yes	2
2.1049 / RSS-Gen 4.6.1 Occupied bandwidth	Yes	3
2.1051 / RSS-132 4.5 Band edge	Yes	4
2.1051 / RSS-132 4.5 Spurious emission at antenna terminals	Yes	5
2.1053 / RSS-132 4.5 Field strength of spurious radiation	Yes	6
2.1055 / RSS-132 4.3 Frequency stability	Yes	7
FCC CRF 47 / Industry Canada RSS-132 Issue 2		
15.111 / RSS-132 4.6 Receiver spurious emissions	Yes	8

Note 1: Above RSS-132 items are given as cross-reference only. Measurements were performed according to ANSI procedures referenced by FCC and covered by SP's accreditation.

Note 2: Reduced output power must be used on the channels adjacent to the frequency band edges in order to comply with band edge requirements, see appendix 4 for details.

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REPORT

Date Reference Page
2010-12-20 FX018755-F22 2 (2)

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Table of contents

Description of the test object	Appendix 1
Operation mode during measurements	Appendix 1
Test setups	Appendix 1
Purpose of test	Appendix 1
RF power output	Appendix 2
Occupied bandwidth	Appendix 3
Band edge	Appendix 4
Spurious emission at antenna terminals	Appendix 5
Field strength of spurious radiation	Appendix 6
Frequency stability	Appendix 7
Receiver spurious emissions	Appendix 8
External photos of the test object	Appendix 9



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 1

Description – Test object

Equipment: RUS 01 B5 radio equipment 850 MHz single and multi carrier operating in GSM mode.

Antenna ports: RF A: TX/RX port
RF B: RX port

Frequency range: TX: 869.2 – 893.8 MHz
RX: 824.2 – 848.8 MHz

Modulations: GMSK and 8-PSK

Nominal output power: Single carrier: 1x 47.8 dBm (1x 60W)
(Maximum) Multi carrier: 2x 44.8 dBm (2x 30W) / Carrier
4x 41.8 dBm (4x 15W) / Carrier

Nominal power voltage: -48 VDC

Tested channels

Channel	ARFCN	Frequency (MHz)	
		Downlink	Uplink
B	128	869.2	824.2
B+1	129	869.4	824.4
B+5	133	870.2	825.2
B+10	138	871.2	826.2
B+15	143	872.2	827.2
M	190	881.6	836.6
T-15	236	890.8	845.8
T-10	241	891.8	846.8
T-5	246	892.8	847.8
T-1	250	893.6	848.6
T	251	893.8	848.8

Used RF configurations

Unless noted otherwise, following configurations were used:

Single Carrier (One carrier configuration):

Cell	1	1	1
Channel	B	M	T

Multi Carrier 1x2 (Two carrier configuration):

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

Multi Carrier 1x4 (Four carrier configuration):

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

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 1

Operation mode during measurements

Unless otherwise stated, all measurements were performed with the test object transmitting pseudorandom data in all timeslots and settings for maximum transmitter output power applicable for each configuration. Both modulations GMSK and 8-PSK were tested. Occupied bandwidth and frequency error were only measured with single carrier configuration.

Conducted measurements

The test object was mounted into an RBS 6201 cabinet and powered by the cabinets internal -48 VDC. All RF conducted TX measurements were performed at antenna port RF A, with antenna port RF B terminated into 50 ohm. All RX measurements were performed at antenna port RF B, with the test object transmitting at maximum output power at antenna port RF A.

Radiated measurements

The test object was tested stand-alone. It was powered with -48 VDC. All measurements were performed with the test object configured for maximum transmitter output power at port RF A. The port RF A was via a RF attenuator terminated into 50 ohm outside the shielded chamber. Antenna port RF B was unterminated. The modulation 8-PSK was found to be representative for worst case setting for the radiated measurements. This configuration represented worst case for radiated spurious emission measurements.

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-132.

References

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

ANSI 63.4-2003
ANSI/TIA/EIA-603-C-2004
J-STD007A Vol 1
ANSI/TIA/EIA 136-280-D-2002
CFR 47 part 2, October 1st, 2009
CFR 47 part 22, October 1st, 2009
RSS-Gen Issue 3
RSS-132 Issue 2

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 1

Measurement equipment

Measurement equipment	Calibration Due	SP number
Semi anechoic chamber, Edison	2011-07	504 114
Rohde & Schwarz FSIQ 40	2011-07	503 738
Rohde & Schwarz FSQ 40	2011-07	504 143
Rohde & Schwarz ESI 26	2011-08	503 885
EMI measurement computer	-	-
Software: R&S EMC32, ver. 6.30.10	-	503 745
R&S EMI test receiver ESIB 26	2011-08	503 885
High pass filter	2011-07	502 758
High pass filter	2011-07	503 739
High pass filter	2011-07	503 740
High pass filter	2011-07	504 199
RF attenuator	2011-07	504 159
RF attenuator	2011-08	900 233
Boonton RF Peak power meter/analyzer	2011-10	503 144
Boonton Power sensor 56518-S/4	2012-10	503 145
Antenna Schaffner CBL 6143	2013-04	504 079
Horn antenna EMCO 3115	2011-02	501 548
Std gain antenna FLANN 16240-25	-	503 939
Std gain antenna FLANN 18240-25	-	503 900
Low Noise Amplifier, Miteq	2011-07	503 285
µComp Nordic, Low Noise Amplifier	2011-07	504 160
Climate chamber 2	2010-11	501 031
Multimeter Fluke 87	2011-03	502 190
Testo 625 temperature and humidity meter	2011-04	504 117
Testo 635 temperature and humidity meter	2011-03	504 203

Uncertainties

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

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 2010-10-26.

Test engineers

Tomas Lennhager, Jonas Bremholt and Reinhold Reul, SP

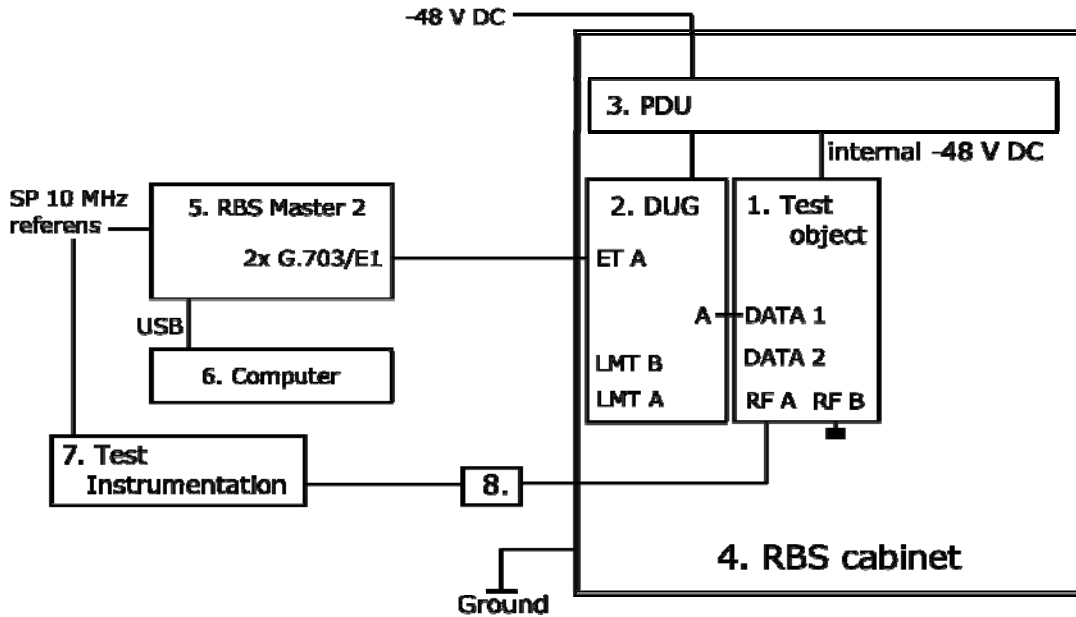
Test participants

Christer Hjorth, Ericsson AB (partially)

FCC ID: TA8AKRC11864-2
 IC: 287AB-AS118642

Appendix 1

Test set-up conducted measurements TX



Test object

1. RUS 01 B5, KRC 118 64/2, revision R1B, SN C823824655 and C823824694 (this unit was only used for spurious emission measurements above 15 GHz)
 FCC ID: TA8AKRC11864-2 and IC: 287AB-AS118642
 with software CXP 1040007/04, revision R29E

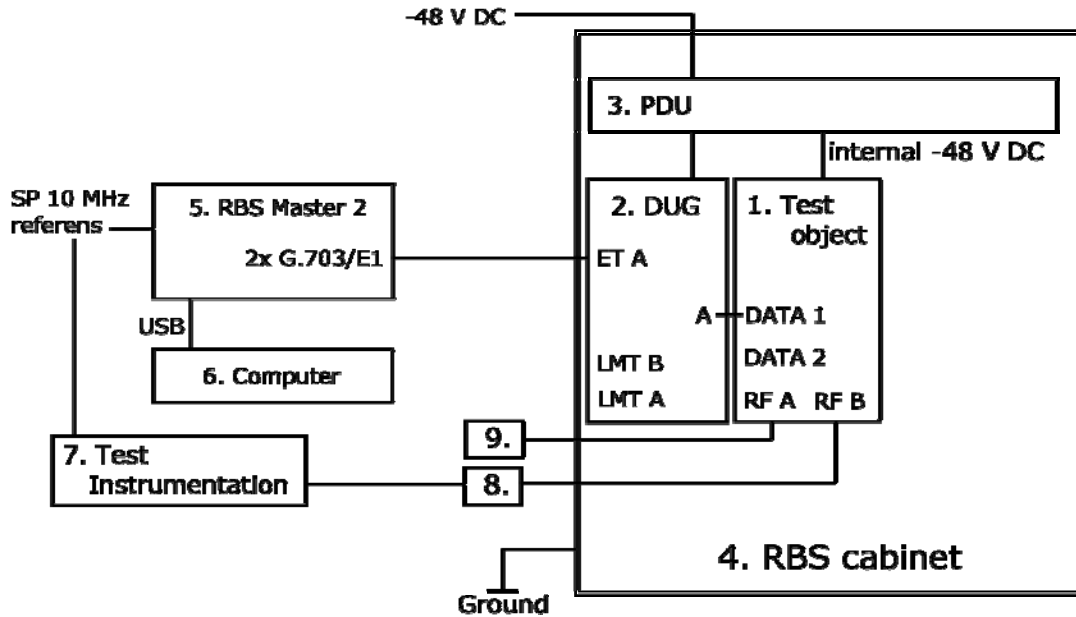
Functional test equipment

2. DUG 20 01, product KDU 137 569/1, revision R1E, C823533972
3. PDU 02 01, product BMG 980 336/4, revision R2A, SN BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792, see below for hardware details
5. RBS Master 2, product LPY 107 1007/1, revision R1F/A, SN 0000000179
6. Computer, Compaq nc6000, BAMS – 1000092619
 running software RBS 2000 E1 RBSM4 Master2, version R7D05
7. SP test instrument according measurement equipment list
8. Attenuator and filter according measurement equipment list

FCC ID: TA8AKRC11864-2
 IC: 287AB-AS118642

Appendix 1

Test set-up conducted measurements RX



Test object

1. RUS 01 B5, KRC 118 64/2, revision R1B, SN C823824655 and C823824694 (this unit was only used for measurements above 1 GHz)
 FCC ID: TA8AKRC11864-2 and IC: 287AB-AS118642
 with software CXP 1040007/04, revision R29E

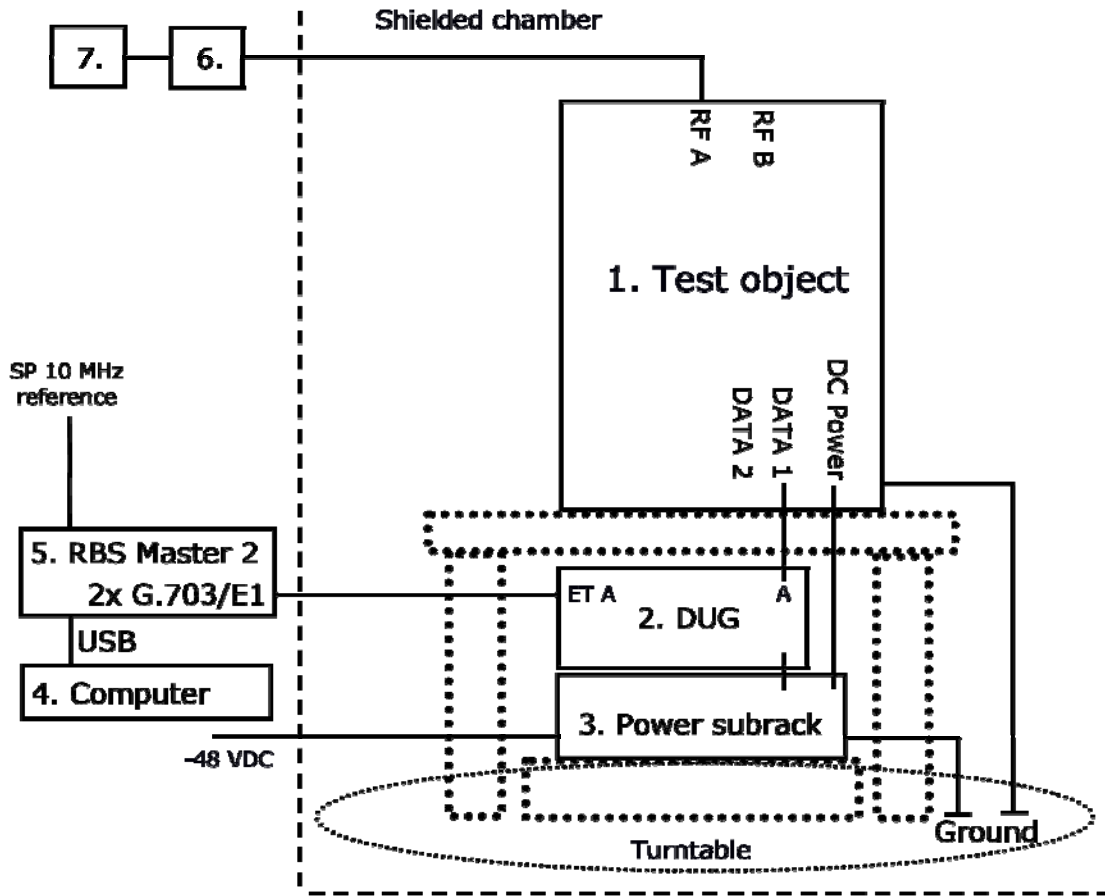
Functional test equipment

2. DUG 20 01, product KDU 137 569/1, revision R1E, C823533972
3. PDU 02 01, product BMG 980 336/4, revision R2A, SN BJ31528316
4. RBS 6201 cabinet, BAMS 1000778792, see below for hardware details
5. RBS Master 2, product LPY 107 1007/1, revision R1F/A, SN 0000000179
6. Computer, Compaq nc6000, BAMS – 1000092619
 running software RBS 2000 E1 RBSM4 Master2, version R7D05
7. SP test instrument according measurement equipment list
8. Attenuator and filter according measurement equipment list
9. Attenuator and 50 ohm termination

FCC ID: TA8AKRC11864-2
 IC: 287AB-AS118642

Appendix 1

Test set-up radiated measurements



Test object

1. RUS 01 B5, product KRC 118 64/2, revision R1B, SN C823824655 and C823824694 (above 15 GHz).
 FCC ID: TA8AKRC11864-2 and IC: 287AB-AS118642
 with software CXP 1040007/04, revision R29E

Functional test equipment

2. DUG 20 01, product KDU 137 569/1, revision R1E, C823533972
3. Power subrack, see below for hardware details
4. Computer, Compaq nc6000, BAMS – 1000092619
 running software RBS 2000 E1 RBSM4 Master2, version R7D05
5. RBS Master 2, product LPY 107 1007/1, revision R1F/A, SN 0000000179
6. Attenuator, Weinschel model 57-40-34 s/n: ML394
7. Terminator, Weinschel model M1426 s/n: BL3559

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 1

Test object interfaces	Type of port:
Power configuration: -48 VDC	DC Power
Ground via RBS frame during conducted measurements, Ground via ground strap during radiated stand-alone measurements	Ground
Antenna port RF A, combined TX/RX, female 7/16 connector	Antenna
Antenna port RF B, RX only, female 7/16 connector	Antenna
Cross connect RX A, not supported, omitted in set-up drawings above	-
Cross connect RX B, not supported, omitted in set-up drawings above	-
RXA CO-site, not supported, omitted in set-up drawings above	-
Data 1, connected to DUG port A	Signal
Data 2, not supported	-

Hardware of power subrack used during stand-alone radiated tests

Position	Product name	Product number	R-state	Serial number
	Power subrack	SXK 109 8115/1	R2A	
1	PDU 01 01	BMG 980 336/2	R4F	BJ31532384
2	PDU 01 01	BMG 980 336/2	R4F	BJ31532382
3	SHU 01 01	BGK 901 18/1	R3C	BJ31446269
4	DUMMY	SXK 109 8257/1	R1D	-
5	DUMMY	SXK 109 8257/1	R1D	-
6	PFU 01 01	KFE 101 1162/1	R1B	BR80910495
7	DUMMY	SXK 109 8257/1	R1D	-
8	DUMMY	SXK 109 8257/1	R1D	-
9	PCF 02 01	KFE 101 1157/1	R1C	BW95301450

Hardware of RBS 6201 cabinet used during conducted measurements

Position	Product name	Product number	R-state	Serial number
	SUP RBS 6201	1/BFM 901 290/2	-	
	PCF 02 03	KFE 101 1157/4	R1C	BW96600253
	SHU 02 01	BGK 901 18/2	R1B	BJ31524373
	SCU 02 01	BGM 136 1006/2	R2A	C823109881
	PDU 02 01	BMG 980 336/4	R2A	BJ31528316
	FRU Subrack	SXK 109 8604/1	R1A	
1	DUG	KDU 137 569/1	R1E	C823533972
	Dummy 31	SXK 109 8971/1	R1B	-
2	Dummy	SXA 134 2193/1	-	-
3	Dummy	SXA 134 2193/1	-	-
4	Dummy	SXA 134 2193/1		
5	RUS 01 B5	KRC 118 64/2	R1B	C823824655
5 ¹⁾	RUS 01 B5	KRC 118 64/2	R1B	C823824694
6	Dummy	SXA 134 2193/1	-	-
7	Dummy	SXA 134 2193/1	-	-
	PFU 01 01	KFE 101 1162/1	R1B	BR80947325

¹⁾ This unit was only used during spurious emission measurements above 15 GHz and RX conducted emission measurements above 1 GHz.



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 2

RF power output measurements according to 47 CFR 2.1046/ RSS-132 4.4

Date	Temperature	Humidity
2010-11-23	22 °C ± 3 °C	17 % ± 5 %
2010-11-24	23 °C ± 3 °C	17 % ± 5 %
2010-11-25	23 °C ± 3 °C	14 % ± 5 %

Test set-up and procedure

The output was connected to a peak power analyzer with the CDF mode activated.

Measurement equipment	SP number
Boonton RF Peak power meter/analyzer	503 144
Boonton Power sensor 56518-S/4	503 145
RF attenuator	504 159
Multimeter Fluke 87	502 190
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 0.7 dB

Results

Single carrier: Rated output power level at port RF A (maximum): 47.8 dBm

Transmitter power (dBm/ dB) RMS / PAR			
Channel	B	M	T
GMSK	47.4 / 0.7	47.5 / 0.8	47.0 / 0.7
8-PSK	47.0 / 4.0	47.2 / 3.9	46.7 / 3.9

Multi carrier 1x2: Rated output power level at port RF A (maximum): 44.8 dBm / carrier

Transmitter power (dBm/ dB) RMS / PAR			
Channel	B	M	T
GMSK	44.3 / 0.7	44.4 / 0.7	44.0 / 0.6
8-PSK	44.0 / 4.0	44.1 / 4.0	43.7 / 4.0

Multi carrier 1x4: Rated output power level at port RF A (maximum): 41.8 dBm / carrier

Transmitter power (dBm/ dB) RMS / PAR			
Channel	B	M	T
GMSK	41.4 / 0.5	41.5 / 0.5	41.2 / 0.5
8-PSK	39.3 / 3.7	39.4 / 3.7	39.3 / 3.7



REPORT

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 2

Limit

According to CFR 47/ RSS there are no conducted limits at the antenna connector.

CFR § 22.913/ SRSP-503 5.1: The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts (57 dBm).

RSS-132: The transmitter output power shall not exceed the limits given in SRSP-503

Complies?	Yes
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FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 3

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

Date	Temperature	Humidity
2010-11-23	22 °C ± 3 °C	17 % ± 5 %
2010-11-24	23 °C ± 3 °C	17 % ± 5 %

Test set-up and procedure

The measurements were made as defined in §2.1049. 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.

Measurement equipment	SP number
Rohde & Schwarz FSQ	504 143
RF attenuator	504 159
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 3.1

Modulation: GMSK

	Channel	OBW
Diagram 1	B	245 kHz
Diagram 2	M	245 kHz
Diagram 3	T	245 kHz

Modulation: 8-PSK

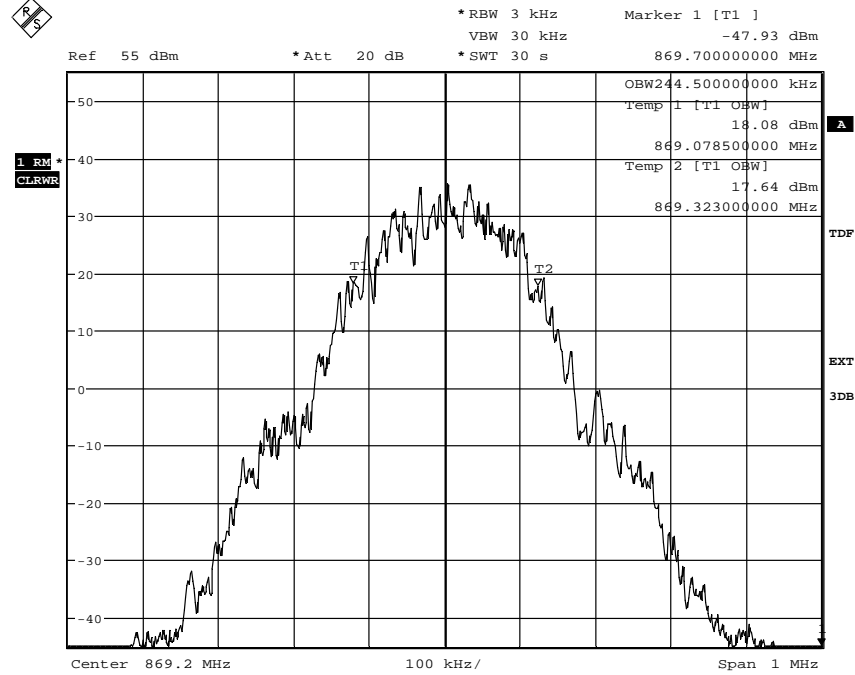
	Channel	OBW
Diagram 4	B	239 kHz
Diagram 5	M	239 kHz
Diagram 6	T	239 kHz



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

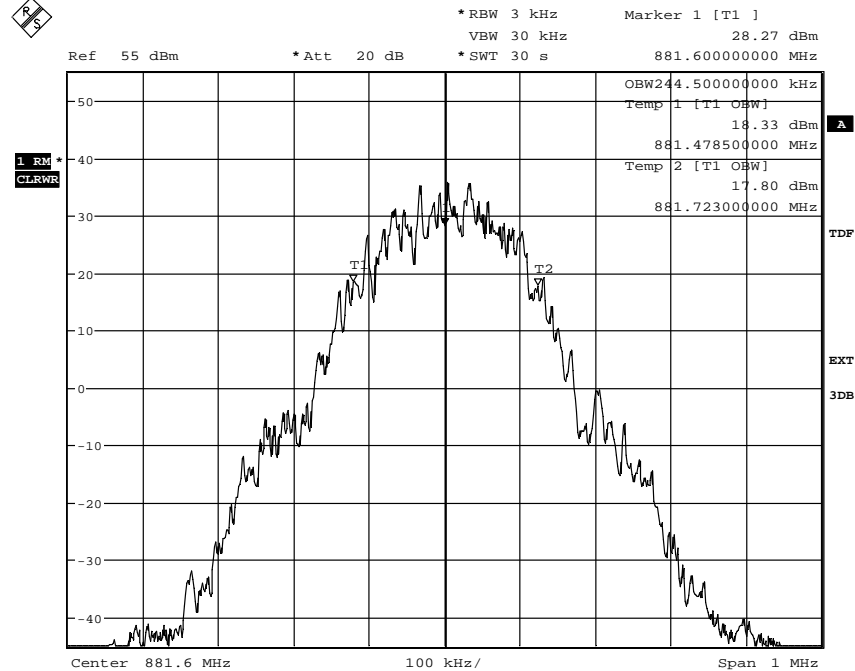
Appendix 3.1

Diagram 1



Date: 23.NOV.2010 13:20:49

Diagram 2



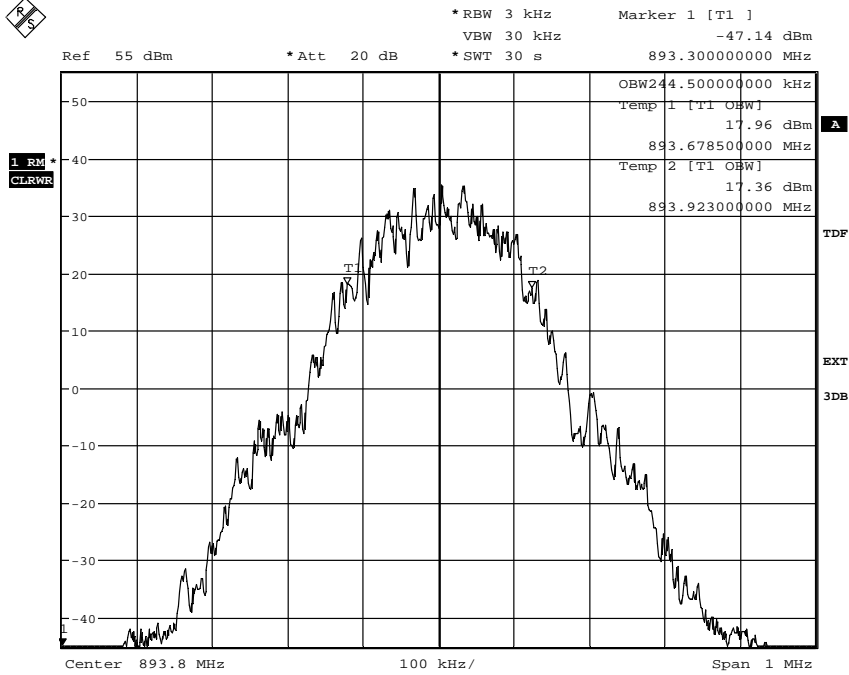
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FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

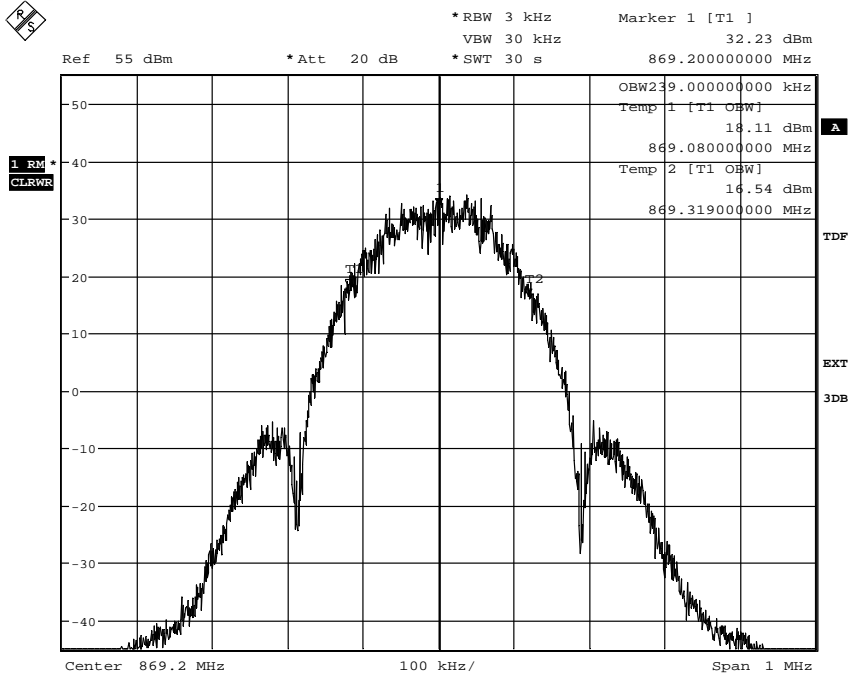
Appendix 3.1

Diagram 3



Date: 23.NOV.2010 14:48:39

Diagram 4



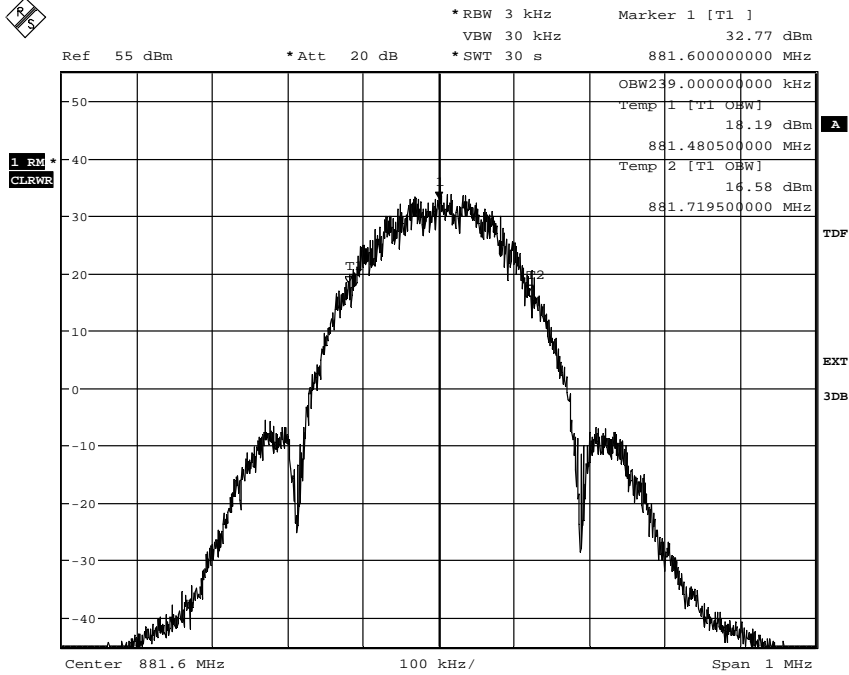
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FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

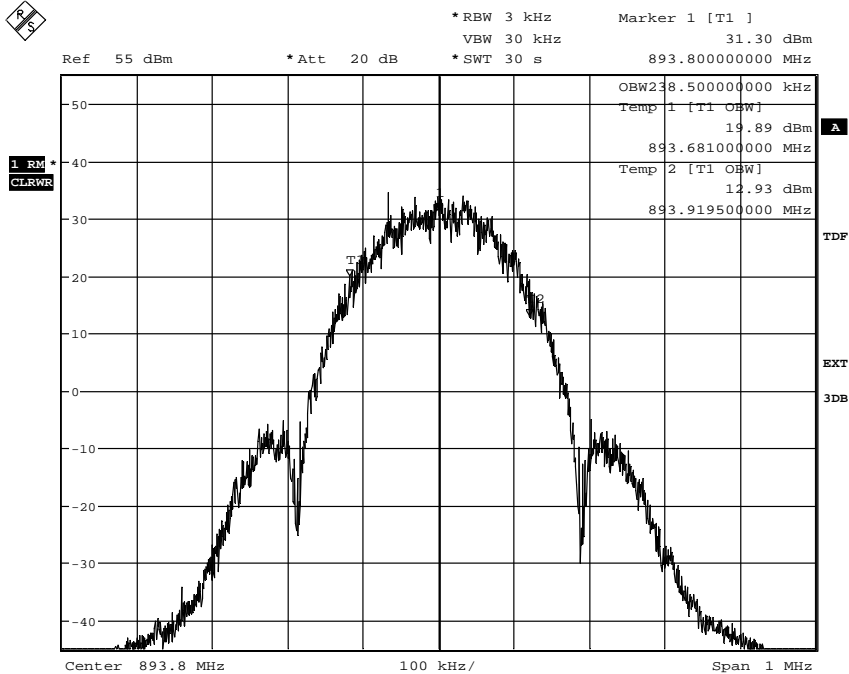
Appendix 3.1

Diagram 5



Date: 23.NOV.2010 15:15:36

Diagram 6



Date: 24.NOV.2010 10:51:08



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 4

Band edge measurements according to 47 CFR 2.1051 / RSS-132 4.5

Date	Temperature	Humidity
2010-11-23	22 °C ± 3 °C	17 % ± 5 %
2010-11-24	23 °C ± 3 °C	17 % ± 5 %

Test set-up and procedure

The measurements were made as defined in §22.917. 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 3 kHz (1% of OBW) was used up to 1 MHz away from the band edges and 100 kHz was used from 1 MHz to 11 MHz away from the band edges.

Measurement equipment	SP number
Rohde & Schwarz FSIQ	503 738
RF attenuator	504 159
Testo 635 temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 4.1

Modulation GMSK

	Power setting	Measured RMS power
Diagram 1: B	P36	35.4 dBm
Diagram 2: B+1	P48 (Maximum)	47.4 dBm
Diagram 3: T-1	P48 (Maximum)	47.1 dBm
Diagram 4: T	P34	33.2 dBm

Modulation 8-PSK

	Power setting	Measured RMS power
Diagram 5: B	P36	34.9 dBm
Diagram 6: B+1	P48 Maximum	47.1 dBm
Diagram 7 T-1	P48 Maximum	46.8 dBm
Diagram 8 T	P36	34.8 dBm

Remark

Above tables show the maximum reduced output power setting and corresponding measured RMS value for GMSK and 8-PSK modulation that meet band edge requirements for channels 128 and 251. Additional measurements were performed at maximum nominal TX output power with the carrier frequency moved one channel into the TX band.

Limits

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least 43 + 10 log P dB.

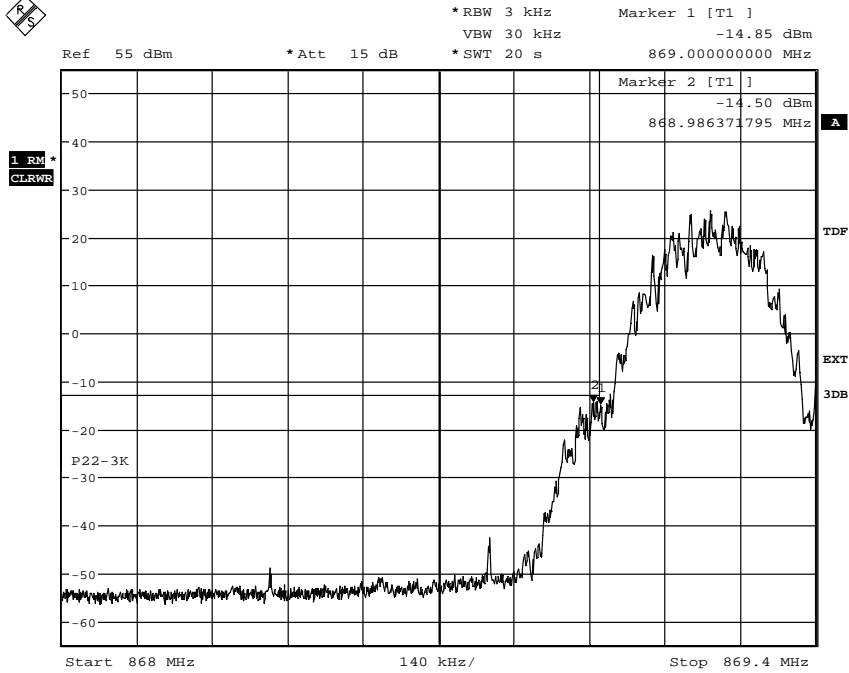
Complies?	Yes
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FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

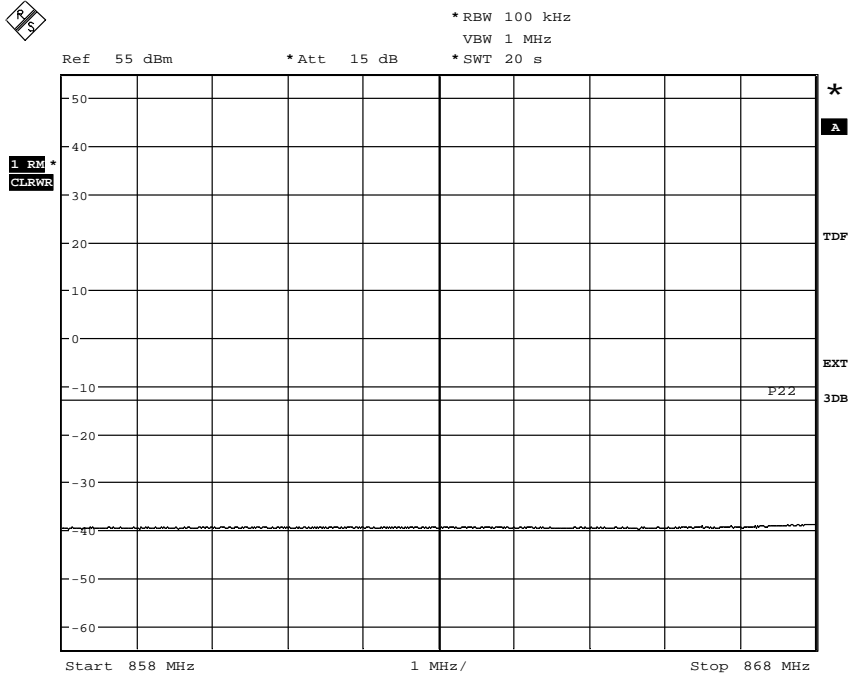
Appendix 4.1

Diagram 1-1



Date: 23.NOV.2010 13:33:19

Diagram 1-2



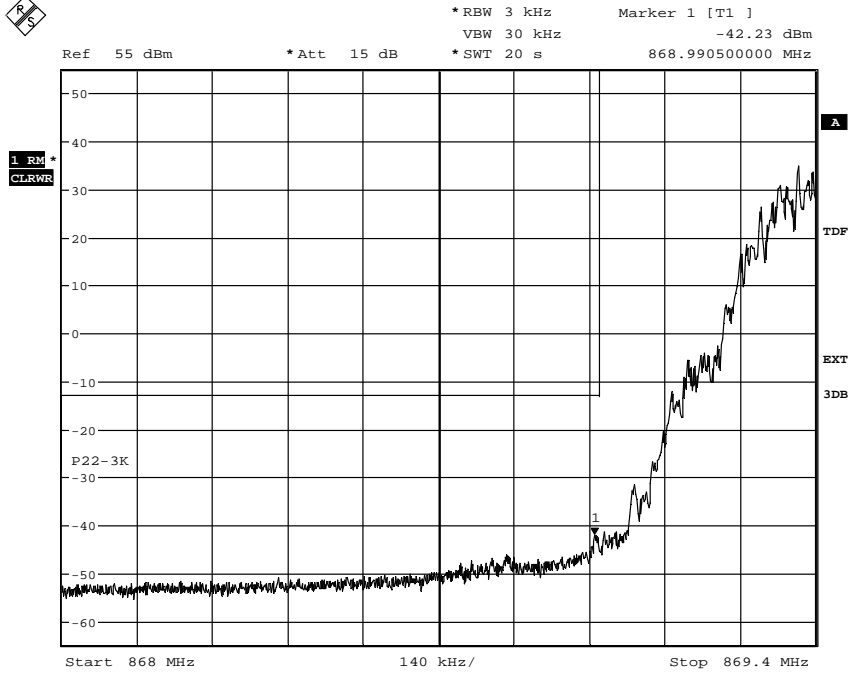
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IC: 287AB-AS118642

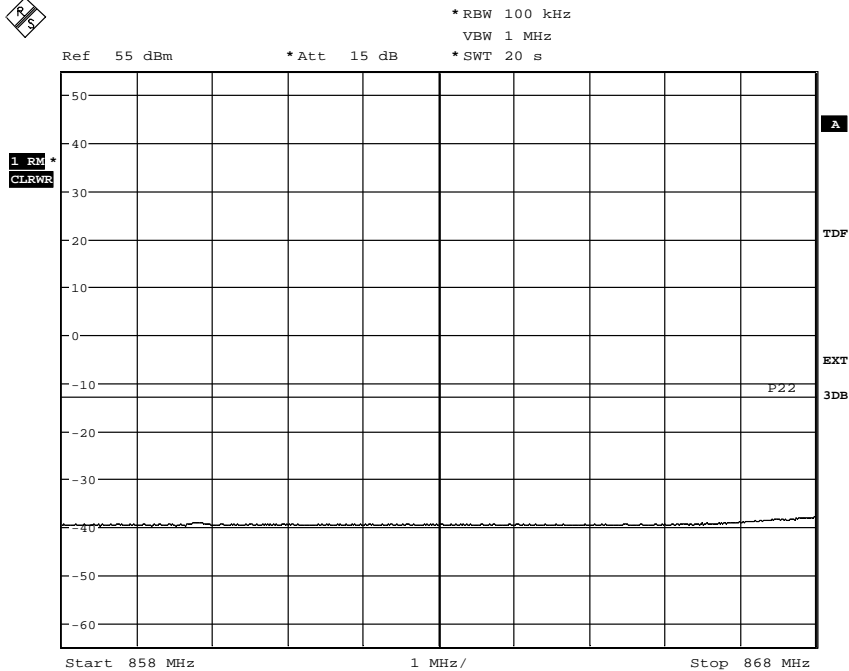
Appendix 4.1

Diagram 2-1



Date: 23.NOV.2010 14:43:19

Diagram 2-2



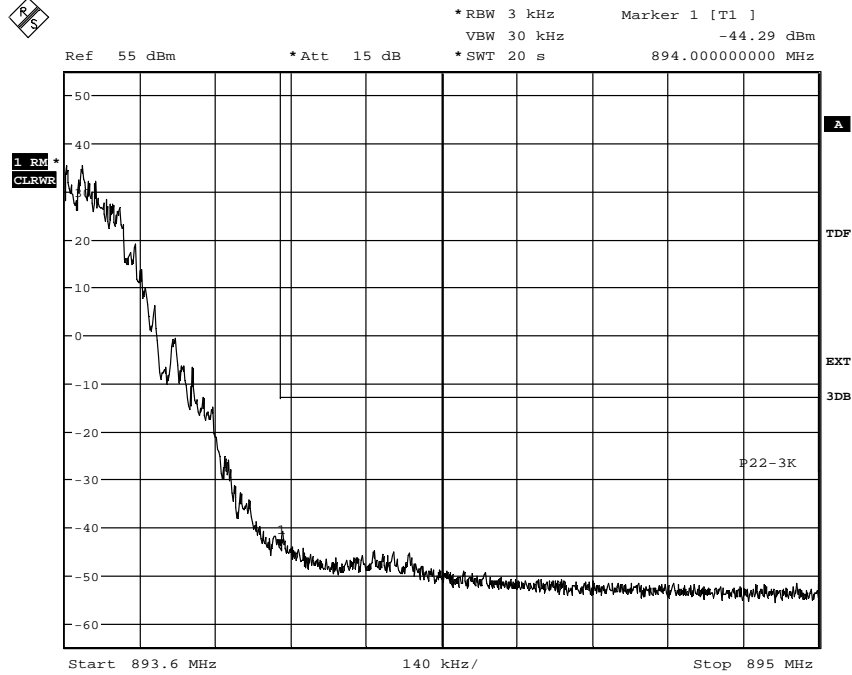
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IC: 287AB-AS118642

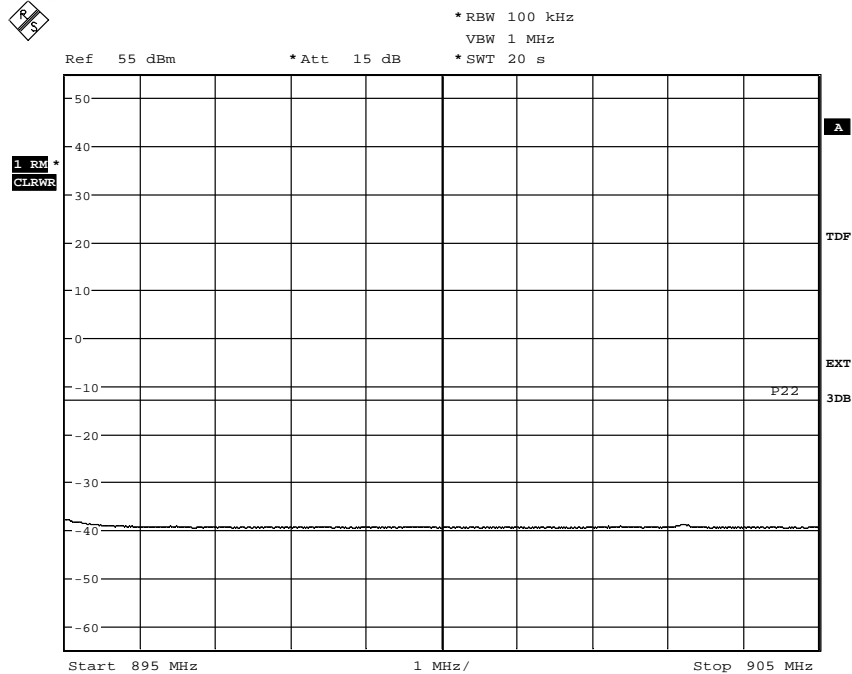
Appendix 4.1

Diagram 3-1



Date: 24.NOV.2010 12:32:35

Diagram 3-2



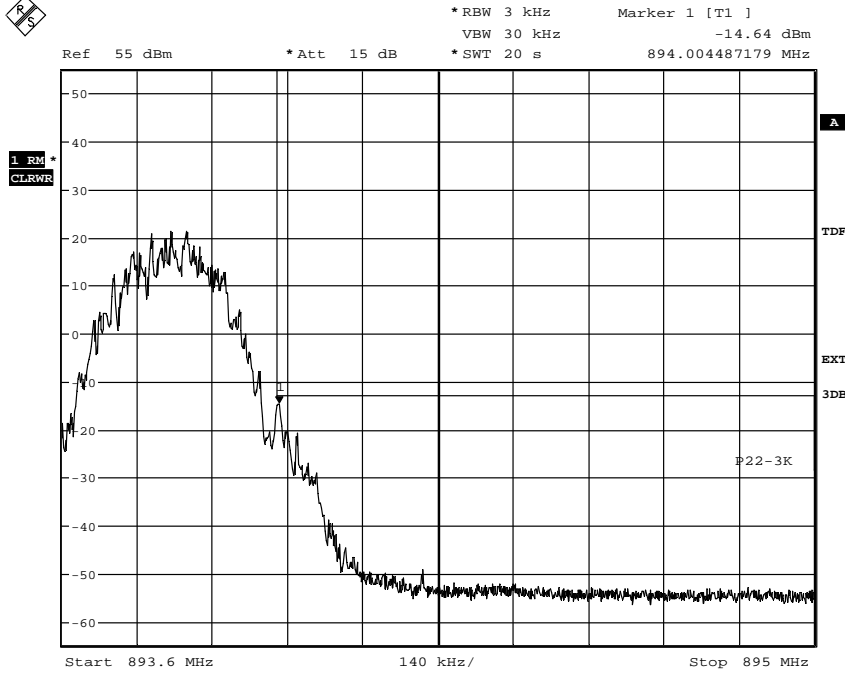
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IC: 287AB-AS118642

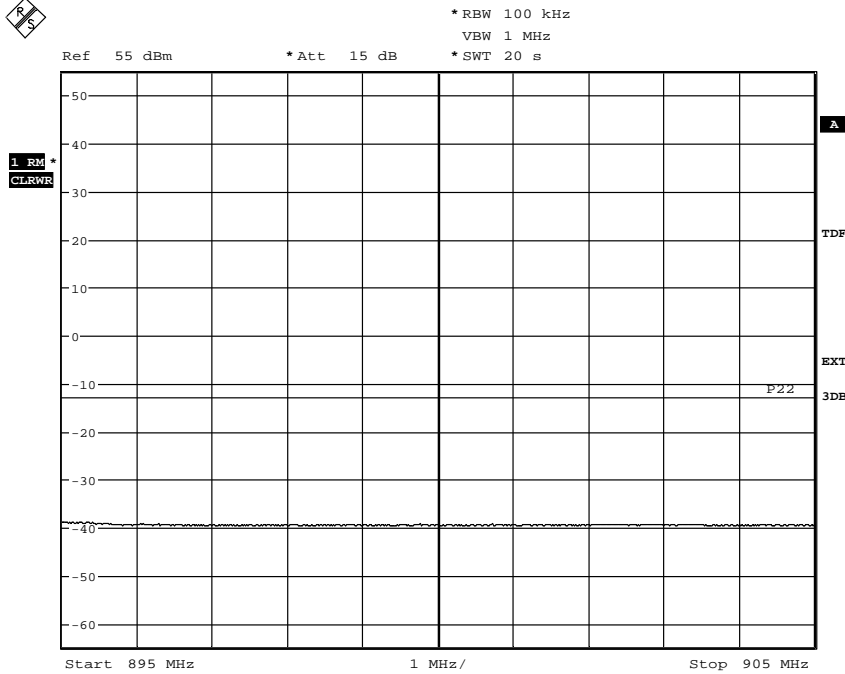
Appendix 4.1

Diagram 4-1



Date: 24.NOV.2010 15:50:07

Diagram 4-2



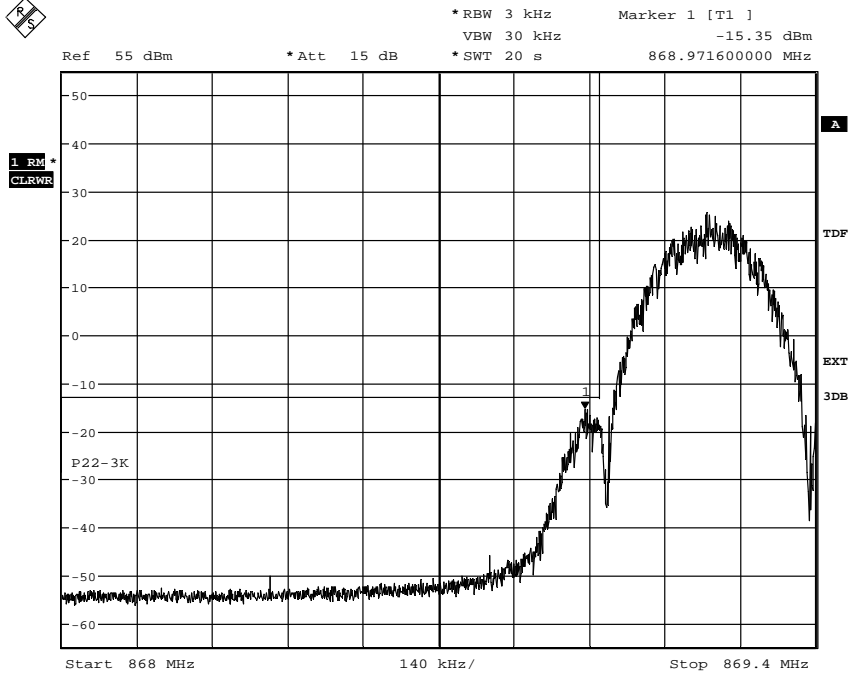
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IC: 287AB-AS118642

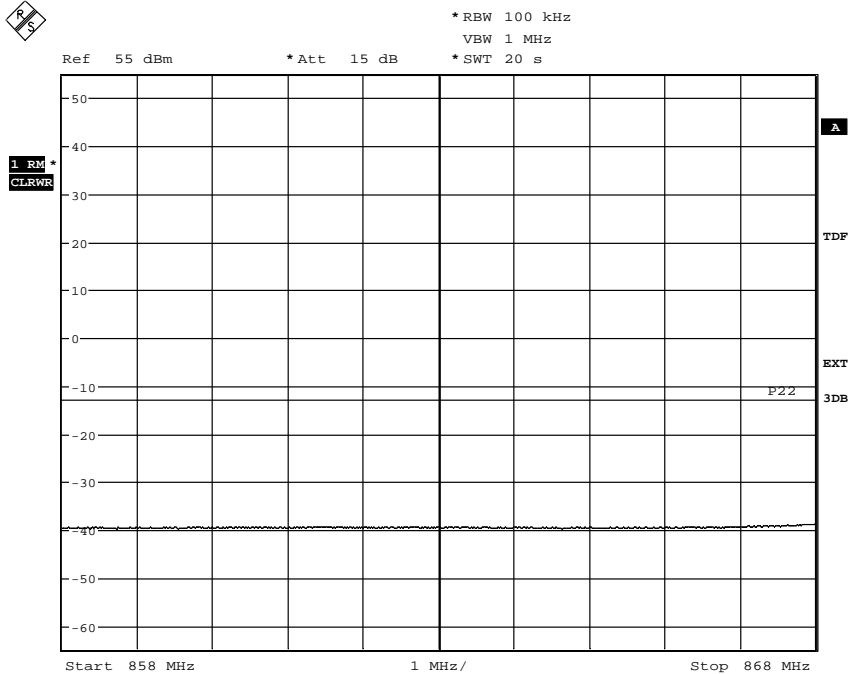
Appendix 4.1

Diagram 5-1



Date: 23.NOV.2010 15:33:42

Diagram 5-2



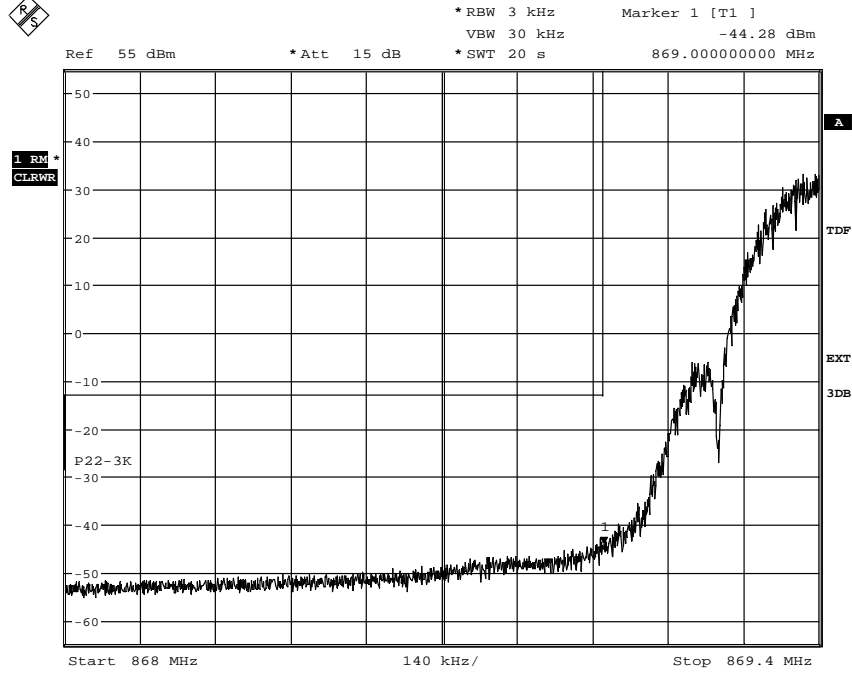
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IC: 287AB-AS118642

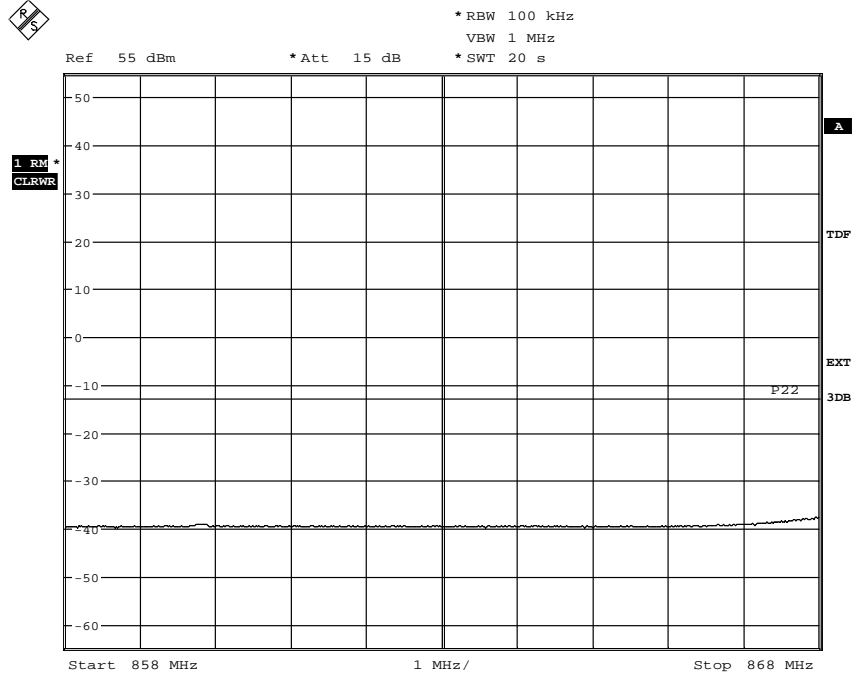
Appendix 4.1

Diagram 6-1



Date: 23.NOV.2010 16:04:14

Diagram 6-2



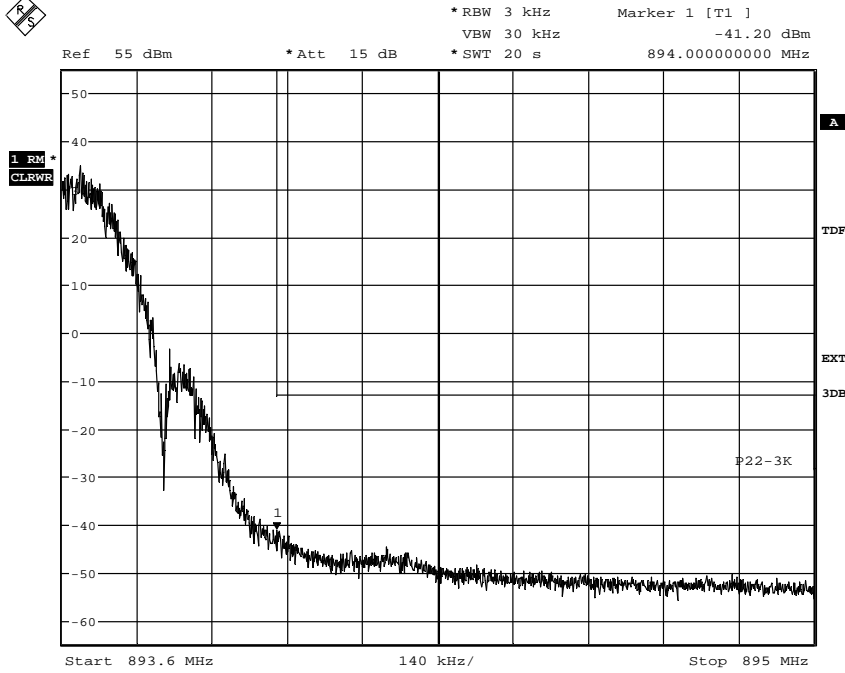
Date: 23.NOV.2010 16:13:49



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

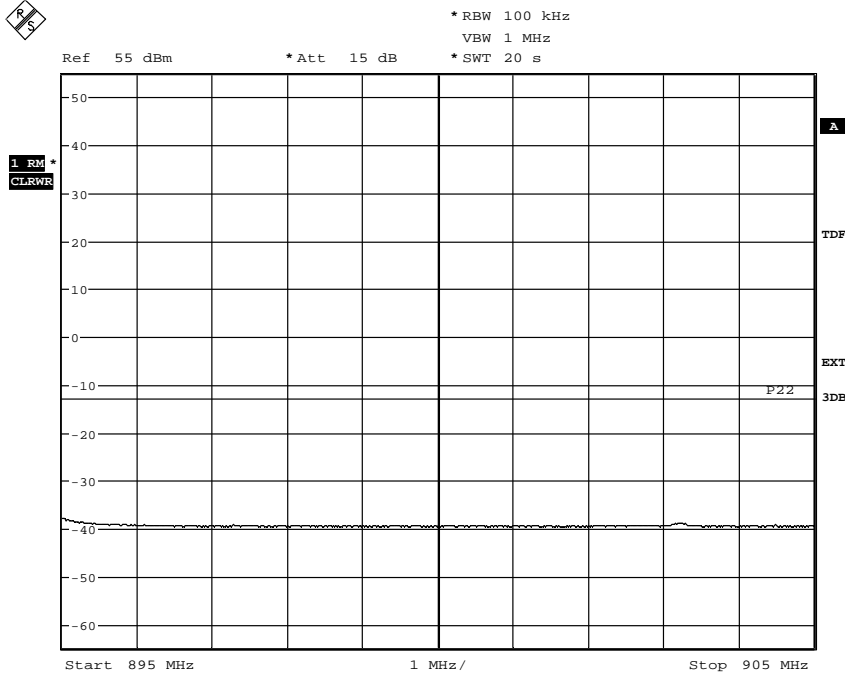
Appendix 4.1

Diagram 7-1



Date: 24.NOV.2010 12:54:41

Diagram 7-2



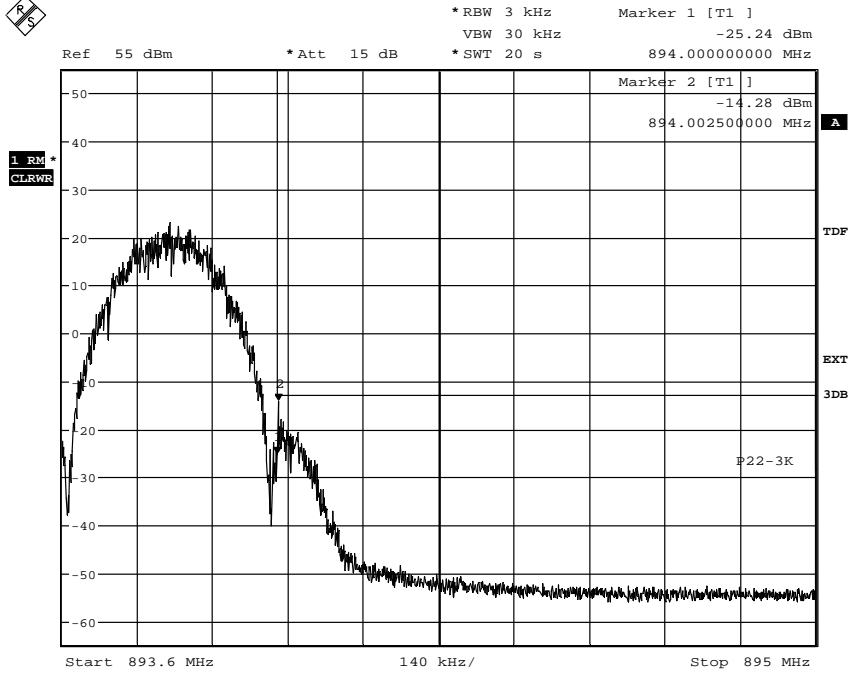
Date: 24.NOV.2010 12:56:41



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

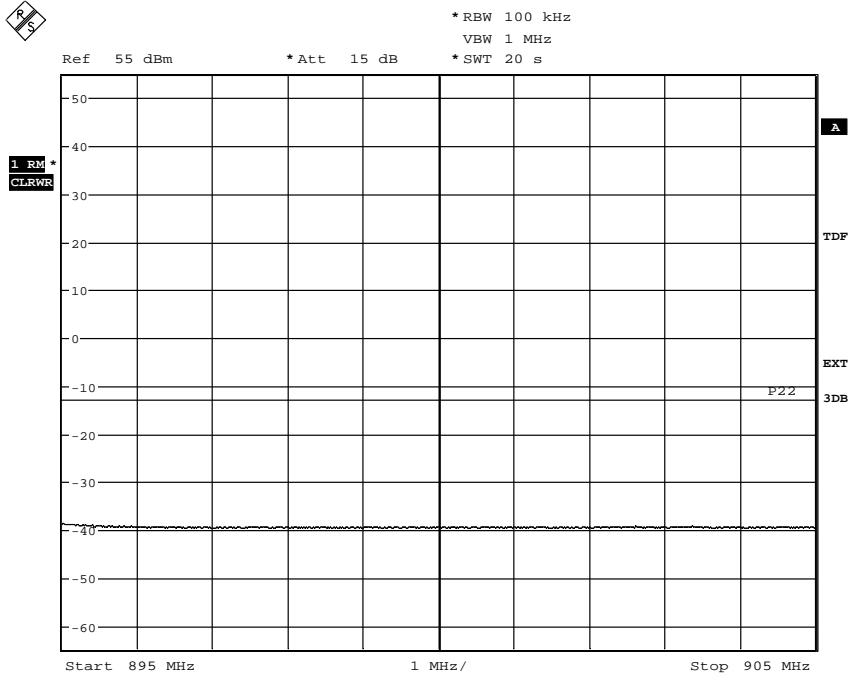
Appendix 4.1

Diagram 8-1



Date: 24.NOV.2010 11:11:00

Diagram 8-2



Date: 24.NOV.2010 11:19:30



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5

**Conducted spurious emission measurements according to 47 CFR 2.1051/
RSS-132 4.5**

Date	Temperature	Humidity
2010-11-23	22 °C ± 3 °C	17 % ± 5 %
2010-11-24	23 °C ± 3 °C	17 % ± 5 %
2010-12-15	23 °C ± 3 °C	16 % ± 5 %

Test set-up and procedure

The measurements were made per definition in §22.917. The output was connected to a spectrum analyzer. First a pre-measurement with activated peak detector was performed. An emission close to or above the limit is measured with activated RMS detector and the RMS measurement result is noted. The spectrum analyzer was connected to an external 10 MHz reference standard during the measurements.

Measurement equipment	SP number
Rohde & Schwarz FSQ	504 143
RF attenuator	504 159
RF attenuator	900 233
High pass filter	504 199
High pass filter	503 739
High pass filter	503 740
Testo 635, Temperature and humidity meter	504 203

Measurement uncertainty: 3.7 dB

Results

The results are shown in appendix 5.1

Single carrier

Channel	GMSK	8-PSK
B:	Diagram 1	Diagram 4
M:	Diagram 2	Diagram 5
T:	Diagram 3	Diagram 6

Multi carrier 1x2 (2 carriers):

Channels	GMSK	8-PSK
B+(B+10):	Diagram 7	Diagram 9
T+(T-10):	Diagram 8	Diagram 10

Multi carrier 1x4 (4 carriers):

Channels	GMSK	8-PSK
B+(B+5)+(B+10)+(B+15):	Diagram 11	Diagram 13
T+(T-5)+(T-10)+(T-15):	Diagram 12	Diagram 14



REPORT

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5

Remarks

The emission at 9 kHz on some 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 measurements in the frequency range 859 to 904 MHz were not intended to show compliance at the band edges. The purpose was to verify compliance for intermodulation products in multicarrier configurations. Band edge compliance was addressed in appendix 4.

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.

The 2.4576 GHz frequency was identified as not used in the RF chain and is not affected by the power setting of the carrier frequency, the transmitter was activated for 40 W output power during the measurements in the frequency range 15 to 25 GHz. In the frequency range 9 kHz to 15 GHz the transmitter was activated for maximum output power.

Limits

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P \text{ dB}$.

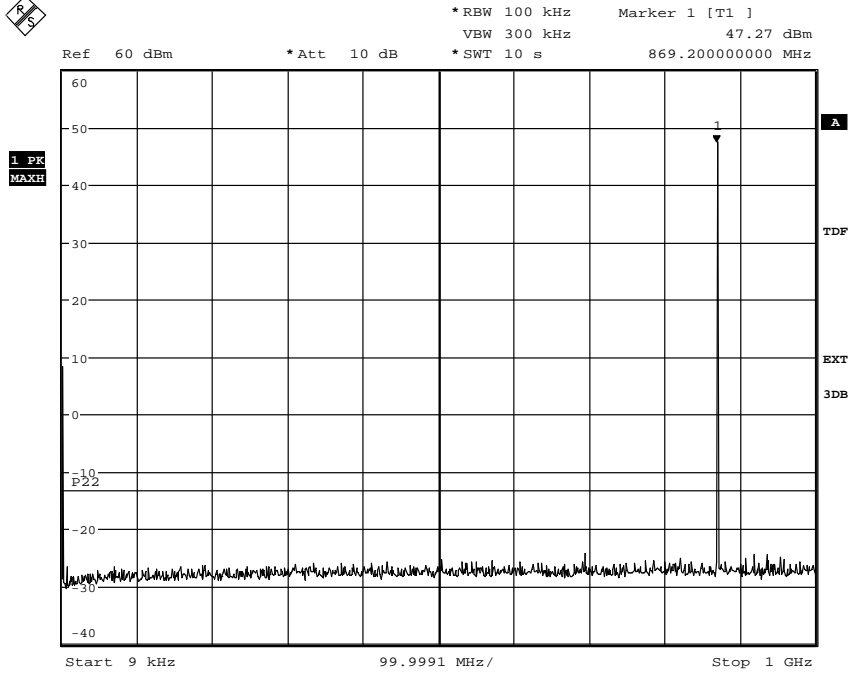
Complies?	Yes
-----------	-----



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

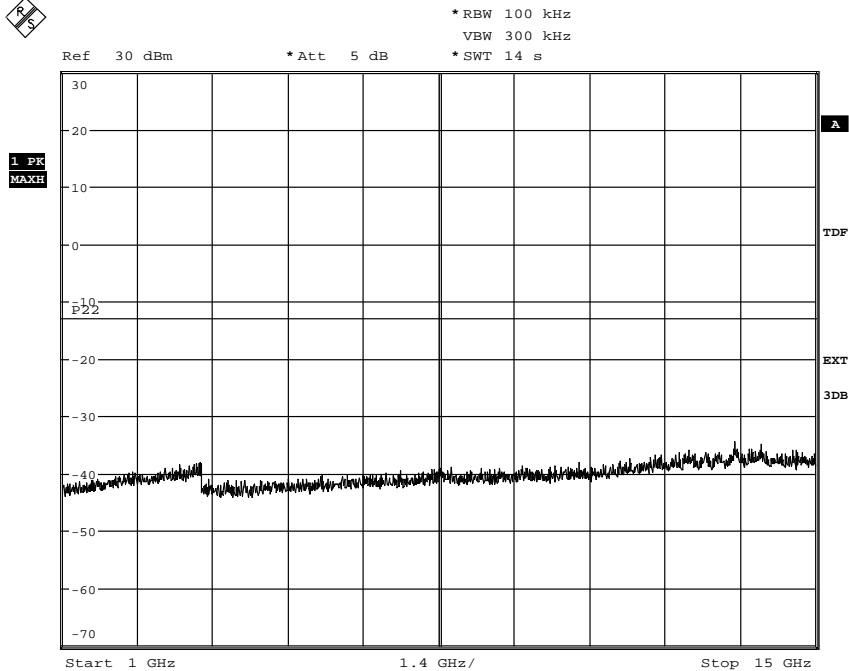
Appendix 5.1

Diagram 1-1



Date: 23.NOV.2010 14:15:37

Diagram 1-2



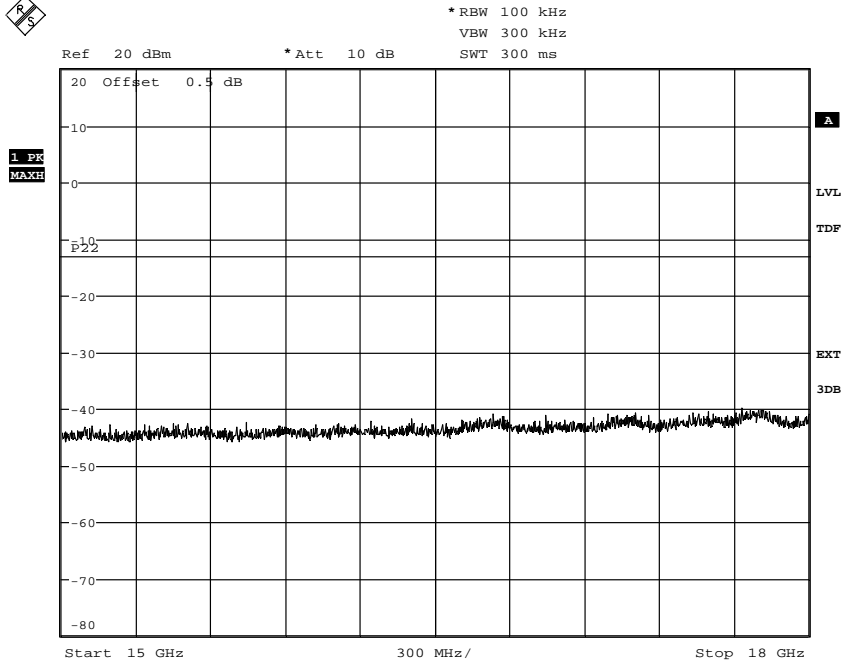
Date: 23.NOV.2010 13:55:00



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

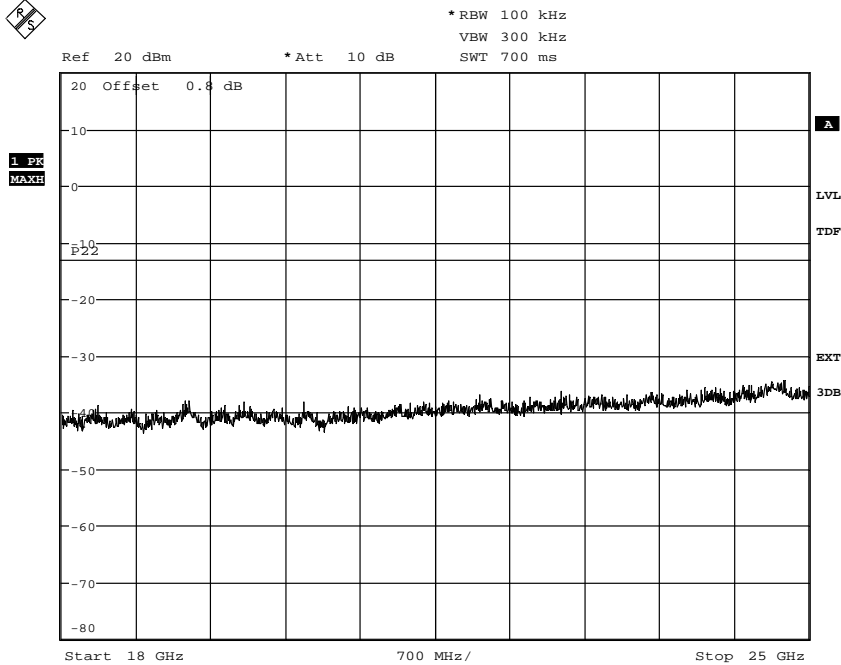
Appendix 5.1

Diagram 1-3



Date: 15.DEC.2010 10:05:07

Diagram 1-4



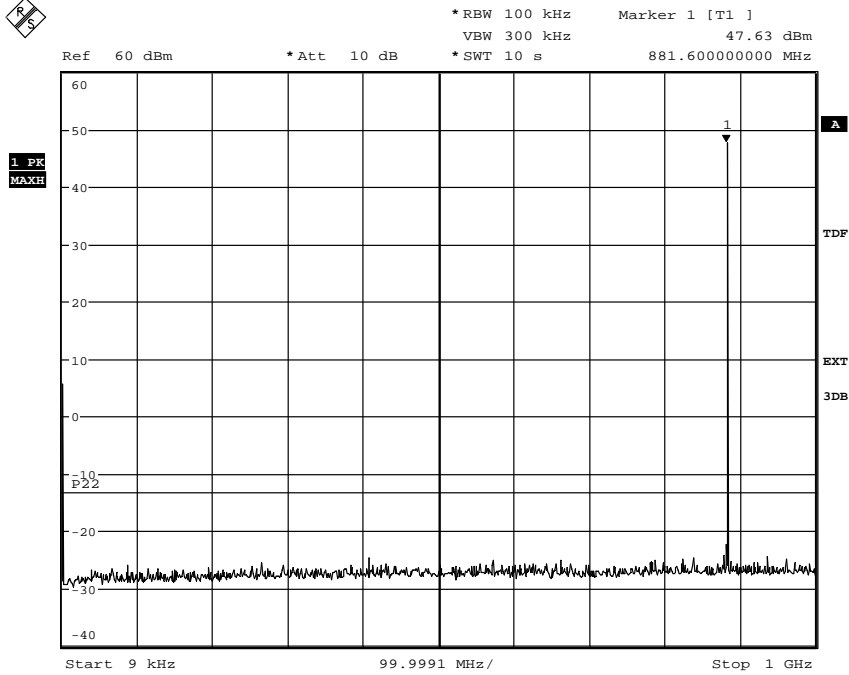
Date: 15.DEC.2010 10:52:01



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

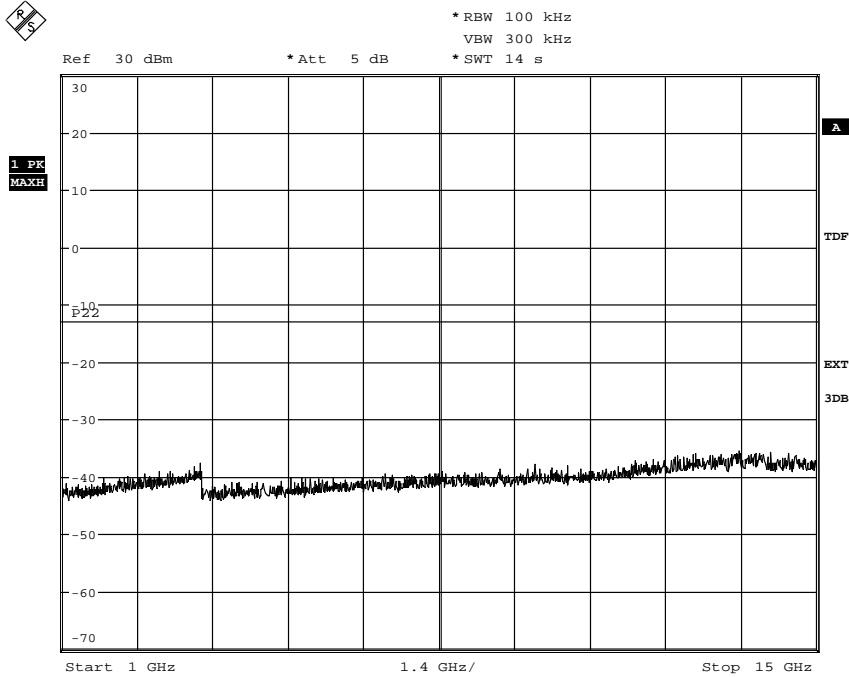
Appendix 5.1

Diagram 2-1



Date: 23.NOV.2010 14:31:59

Diagram 2-2



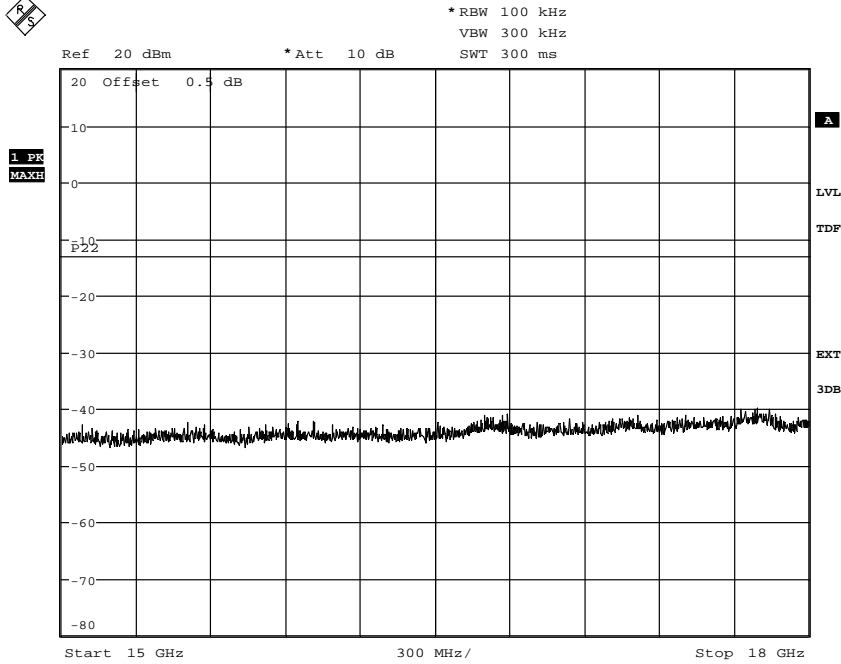
Date: 23.NOV.2010 14:35:05



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

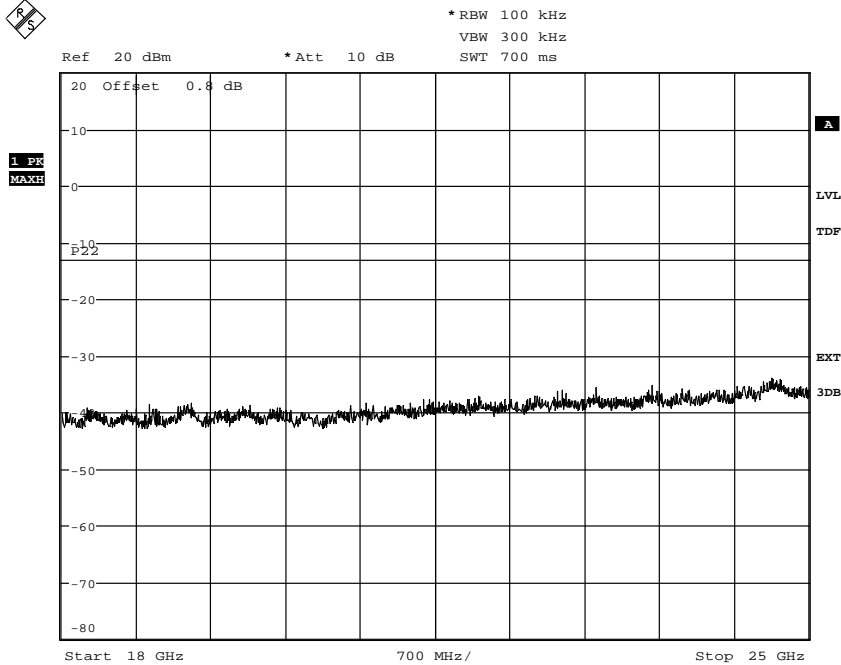
Appendix 5.1

Diagram 2-3



Date: 15.DEC.2010 09:56:36

Diagram 2-4



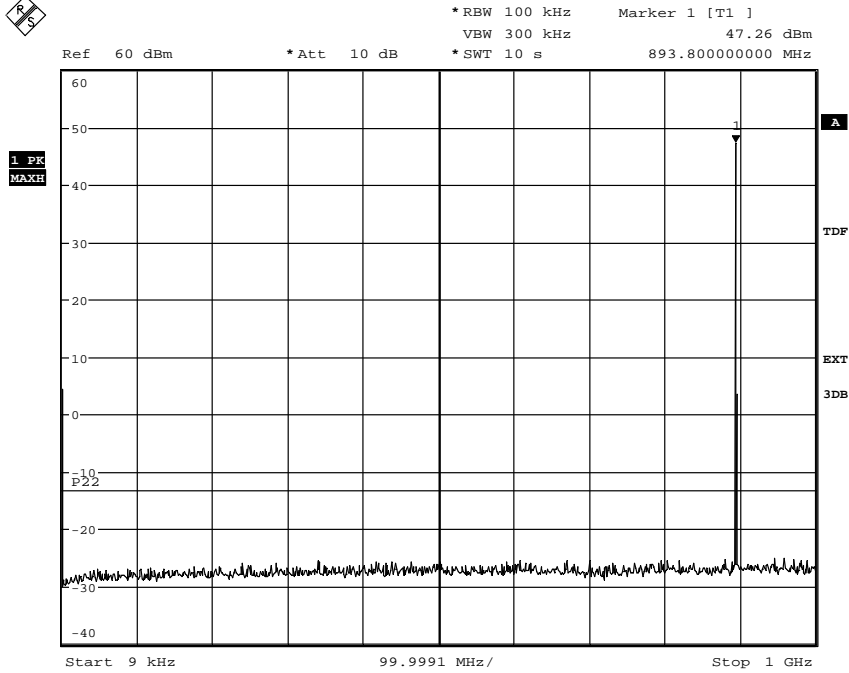
Date: 15.DEC.2010 10:54:48



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

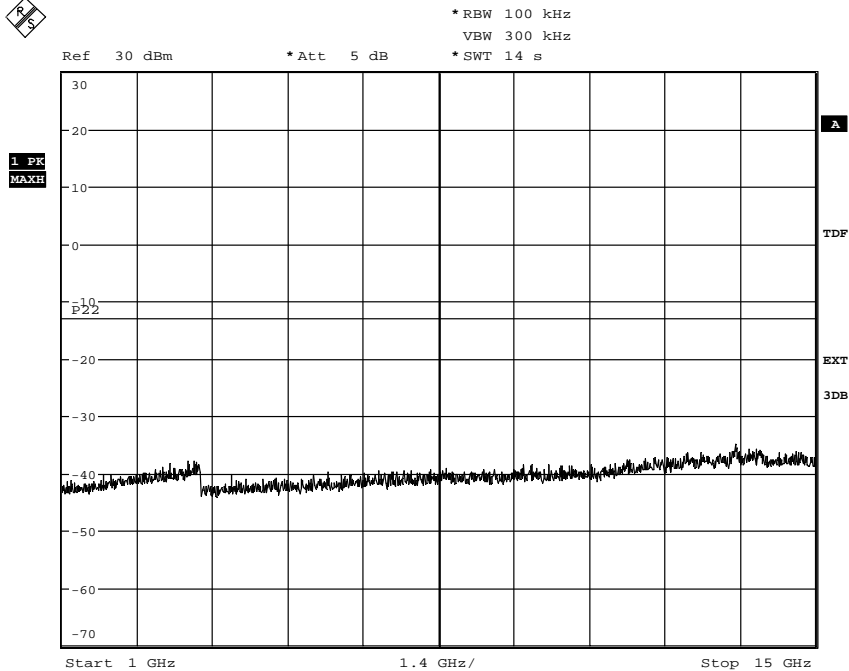
Appendix 5.1

Diagram 3-1



Date: 23.NOV.2010 14:52:05

Diagram 3-2



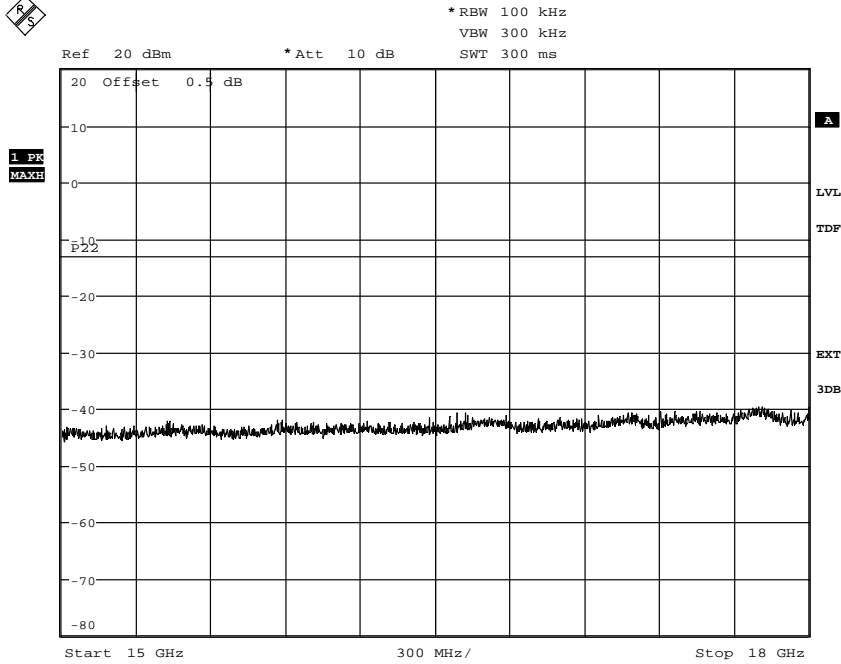
Date: 23.NOV.2010 14:53:49



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IC: 287AB-AS118642

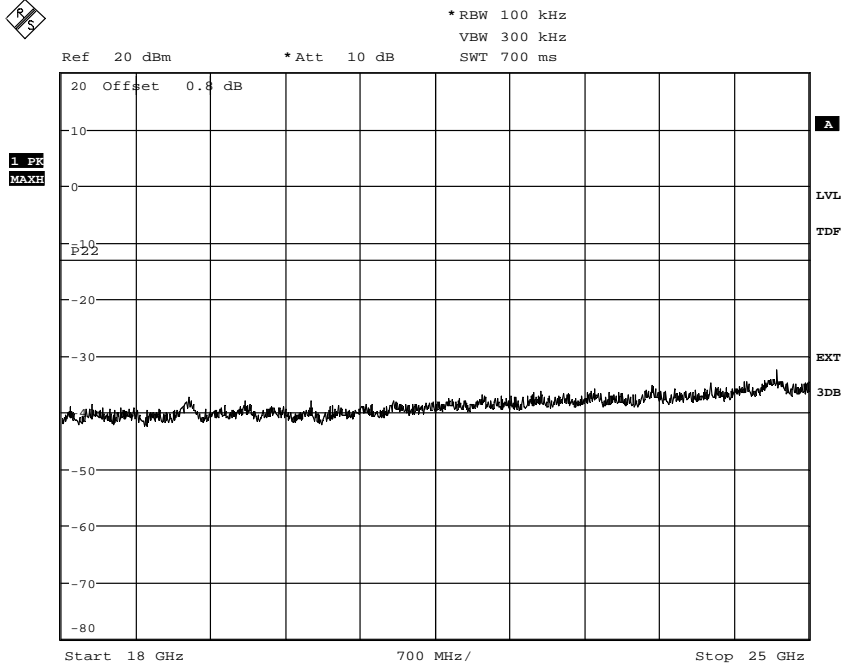
Appendix 5.1

Diagram 3-3



Date: 15.DEC.2010 10:00:59

Diagram 3-4



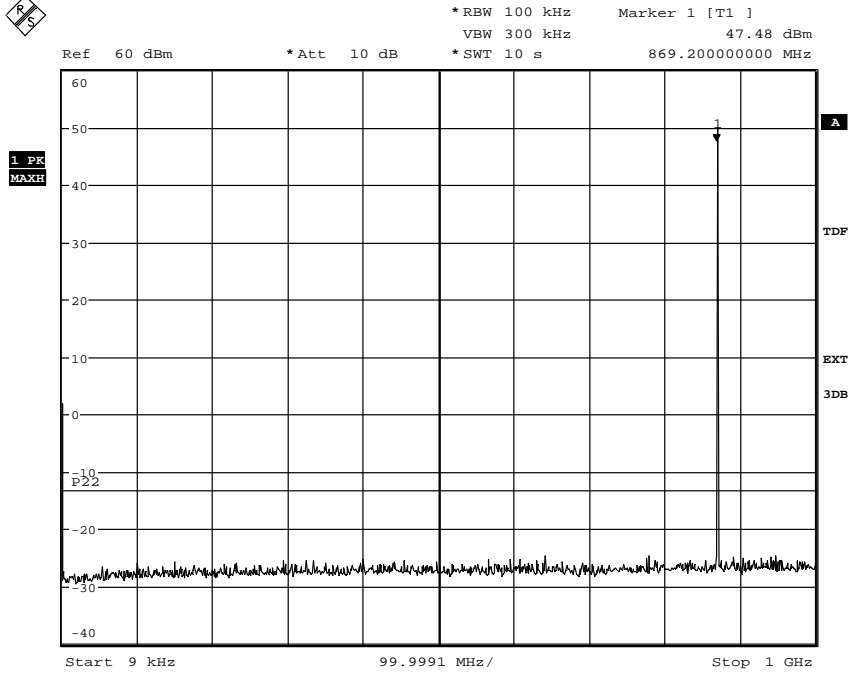
Date: 15.DEC.2010 10:58:36



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IC: 287AB-AS118642

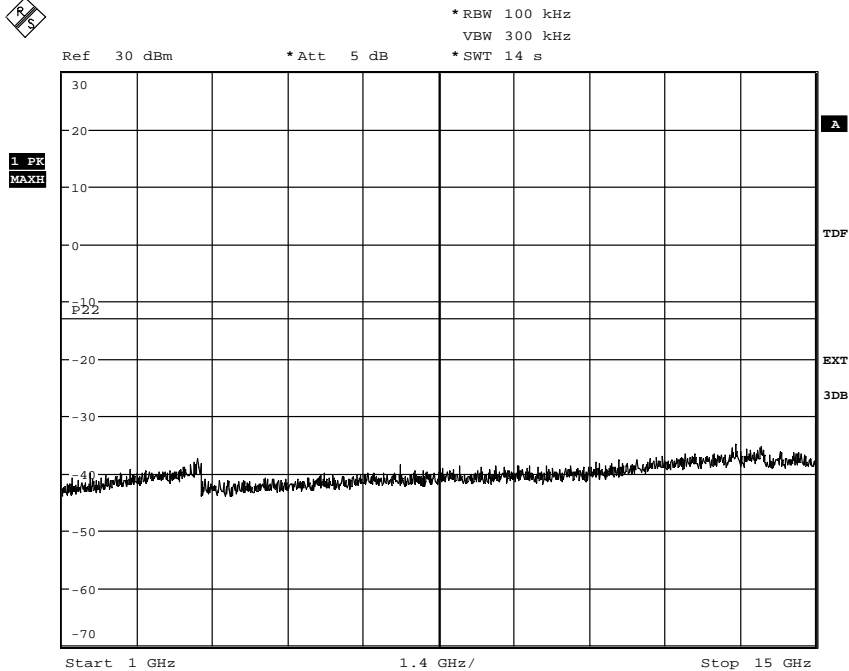
Appendix 5.1

Diagram 4-1



Date: 23.NOV.2010 15:51:17

Diagram 4-2



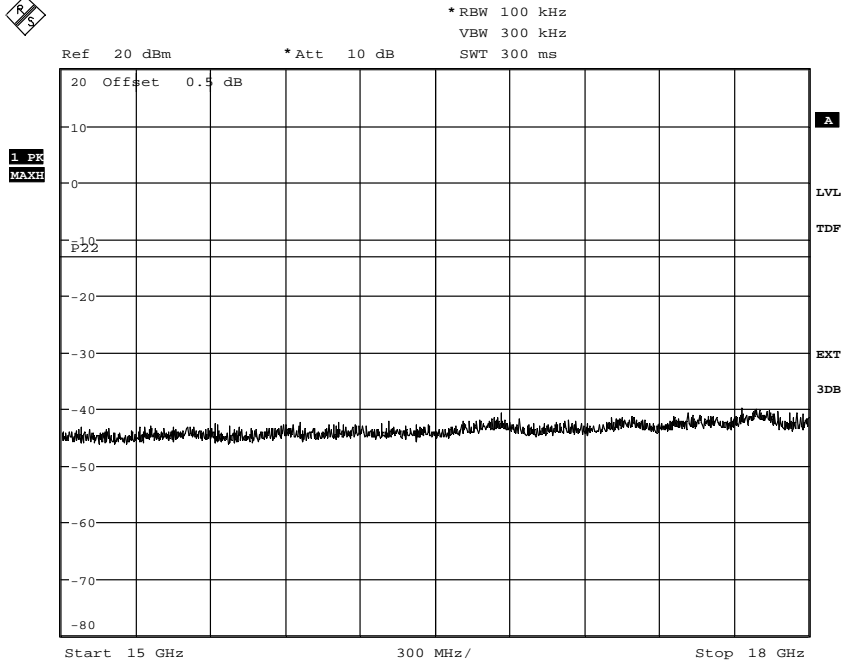
Date: 23.NOV.2010 15:53:46



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

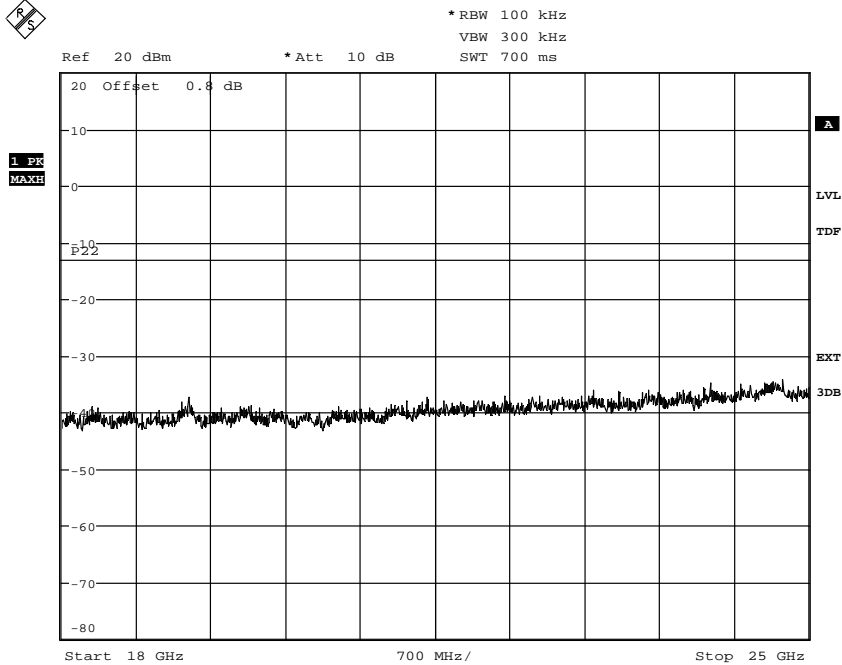
Appendix 5.1

Diagram 4-3



Date: 15.DEC.2010 10:10:42

Diagram 4-4



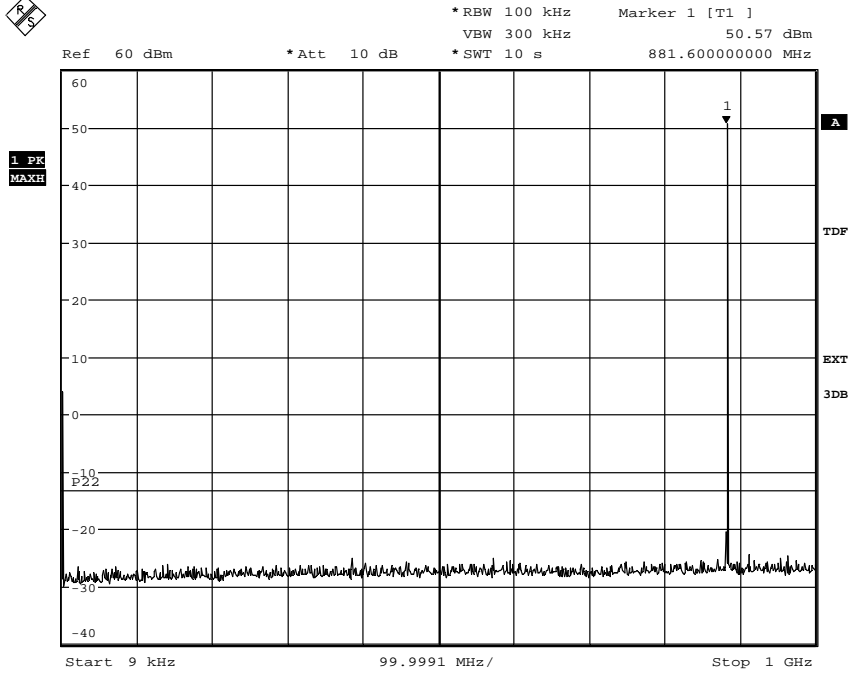
Date: 15.DEC.2010 10:48:42



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IC: 287AB-AS118642

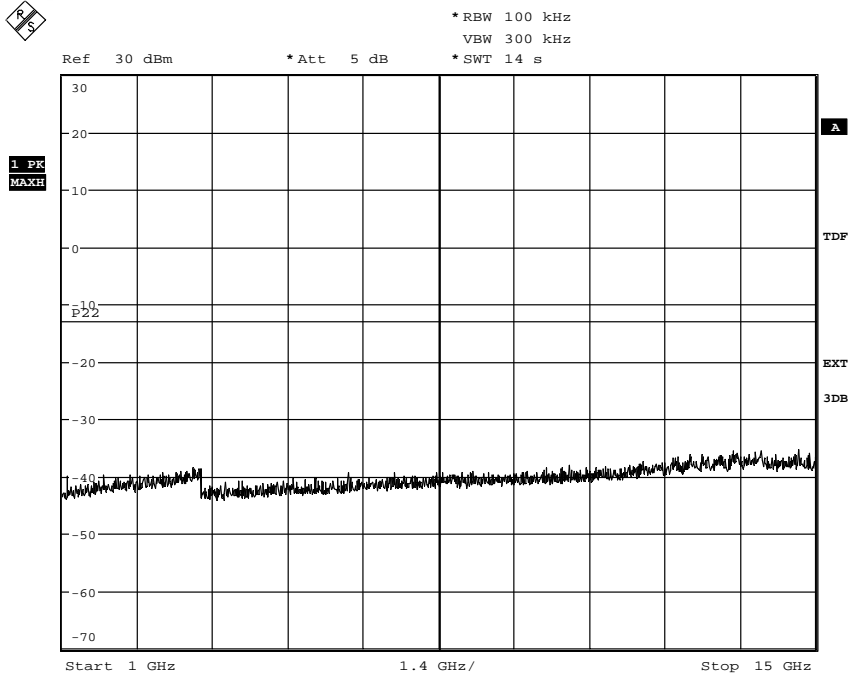
Appendix 5.1

Diagram 5-1



Date: 23.NOV.2010 15:19:10

Diagram 5-2



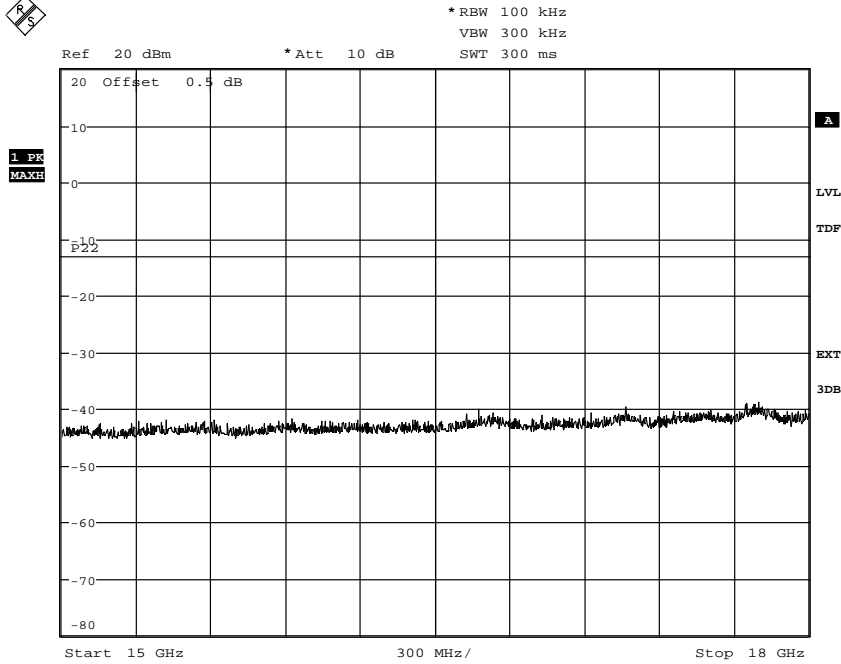
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IC: 287AB-AS118642

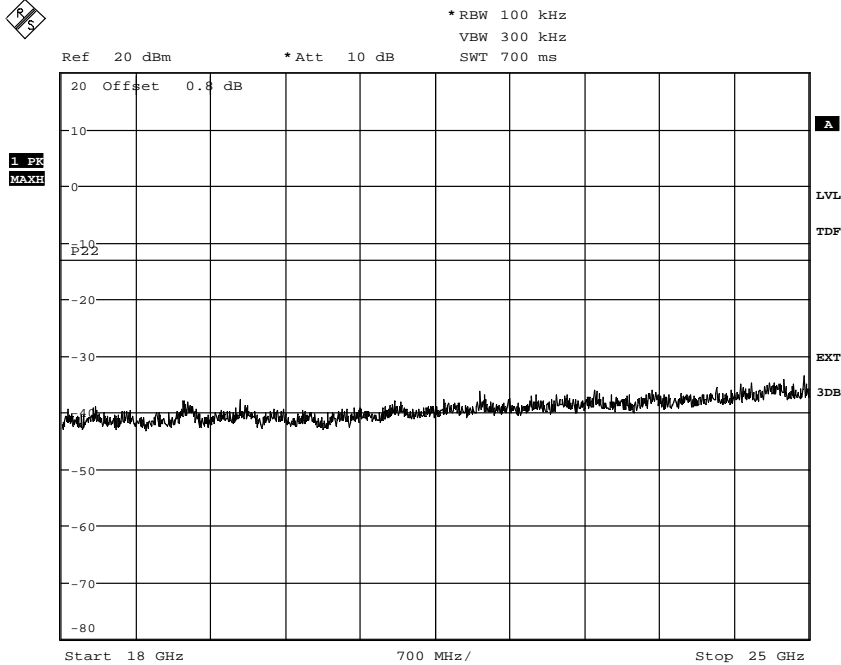
Appendix 5.1

Diagram 5-3



Date: 15.DEC.2010 10:29:17

Diagram 5-4



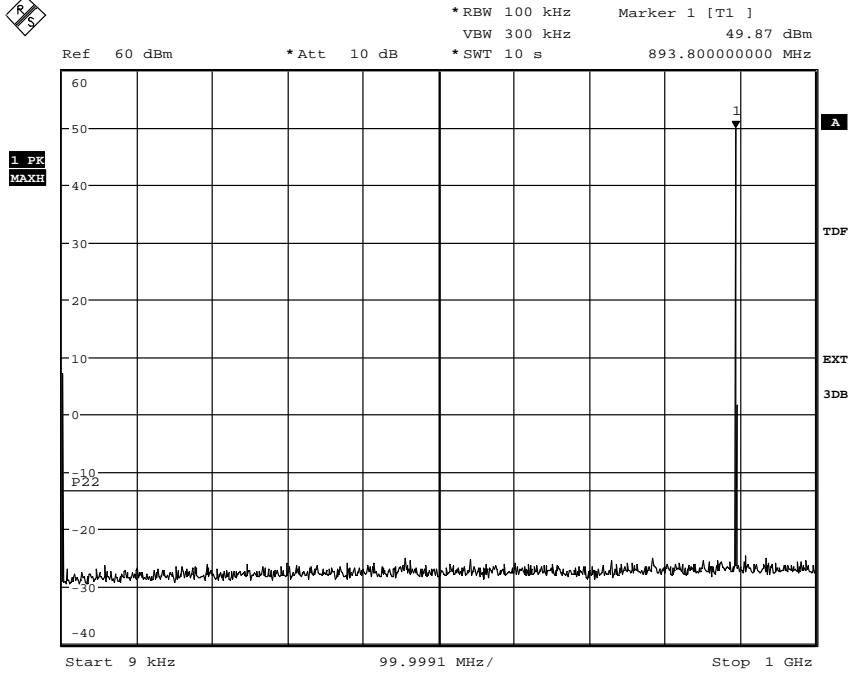
Date: 15.DEC.2010 10:41:25



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IC: 287AB-AS118642

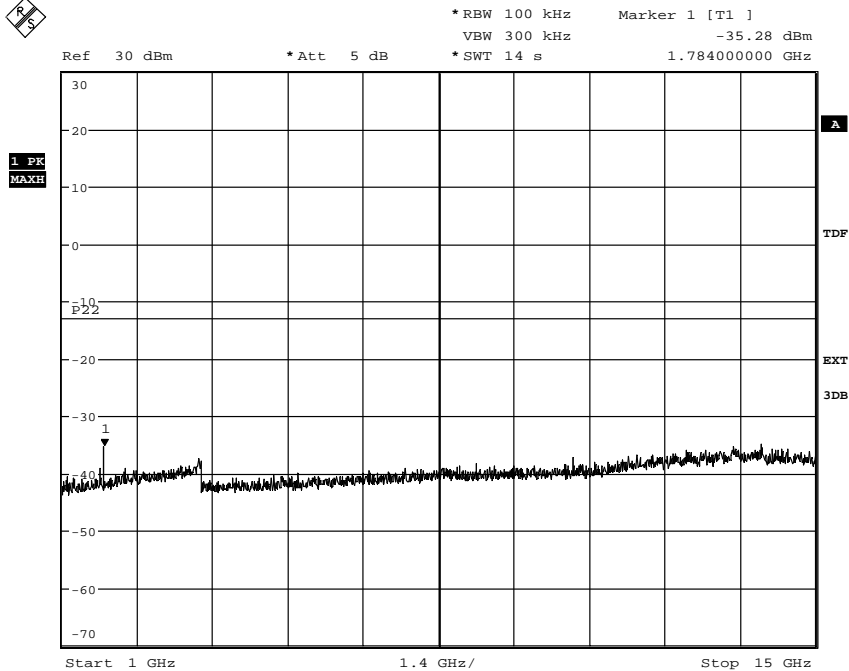
Appendix 5.1

Diagram 6-1



Date: 24.NOV.2010 11:30:41

Diagram 6-2



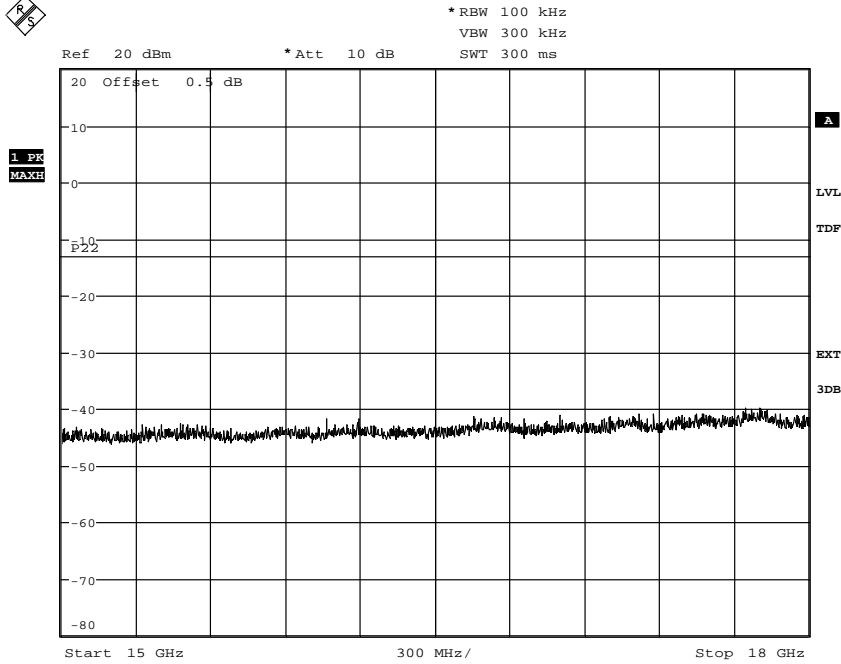
Date: 24.NOV.2010 11:34:16



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IC: 287AB-AS118642

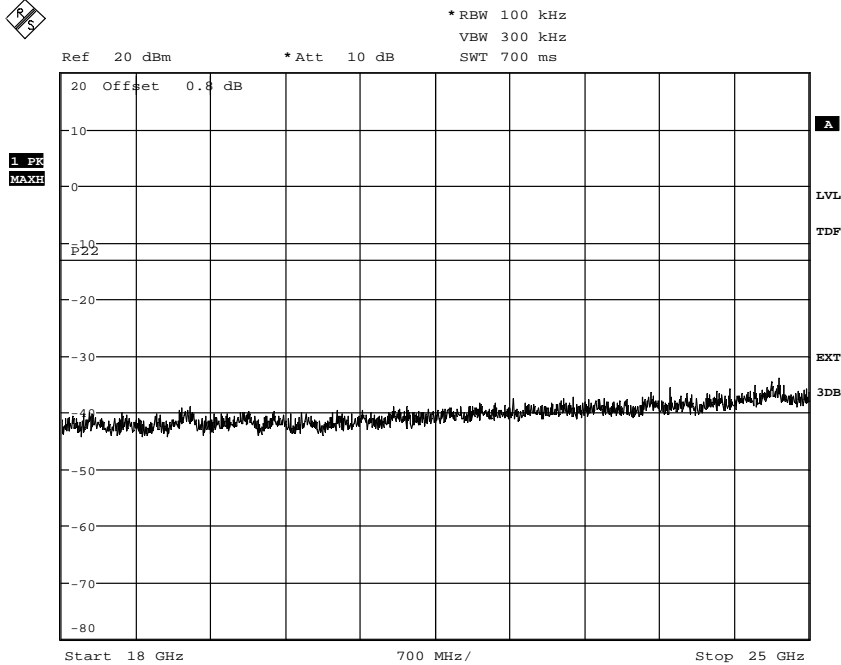
Appendix 5.1

Diagram 6-3



Date: 15.DEC.2010 10:32:39

Diagram 6-4



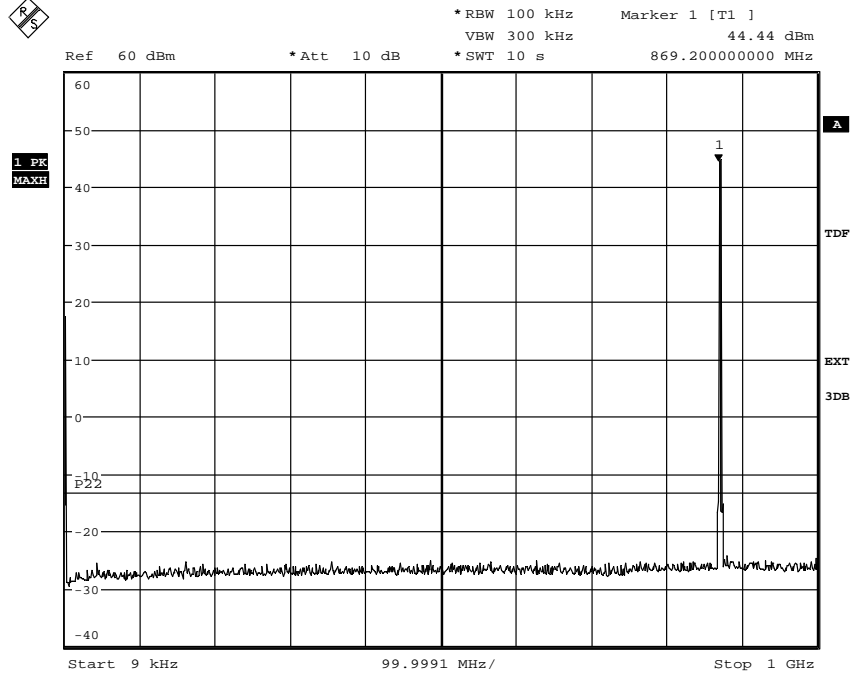
Date: 15.DEC.2010 10:36:51



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IC: 287AB-AS118642

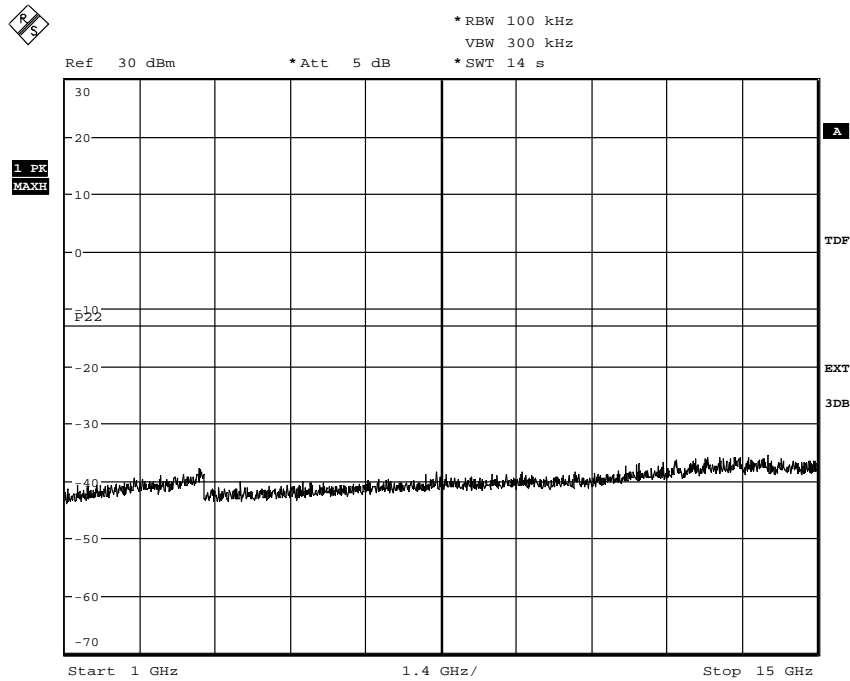
Appendix 5.1

Diagram 7-1



Date: 25.NOV.2010 13:28:04

Diagram 7-2



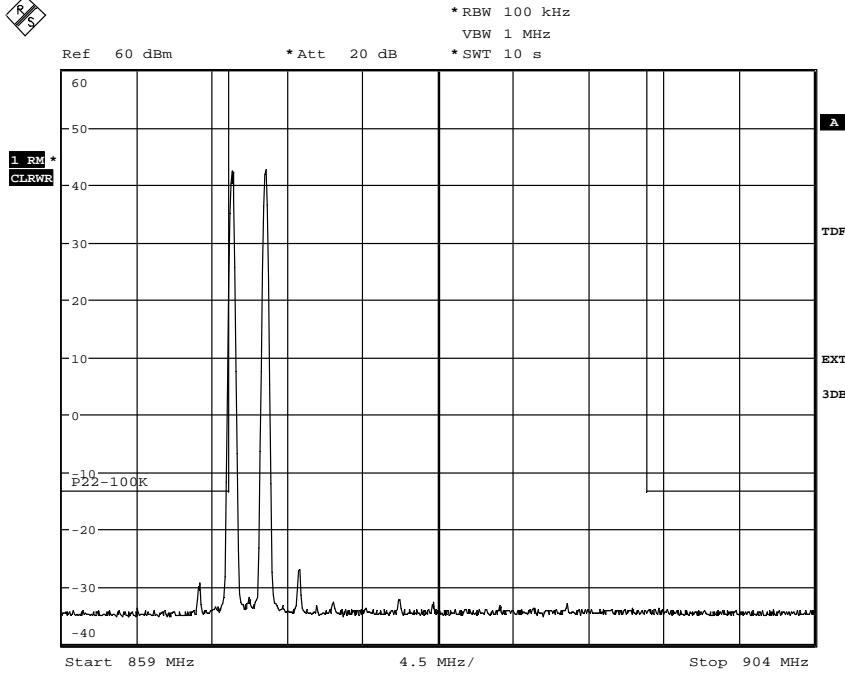
Date: 25.NOV.2010 13:32:34



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IC: 287AB-AS118642

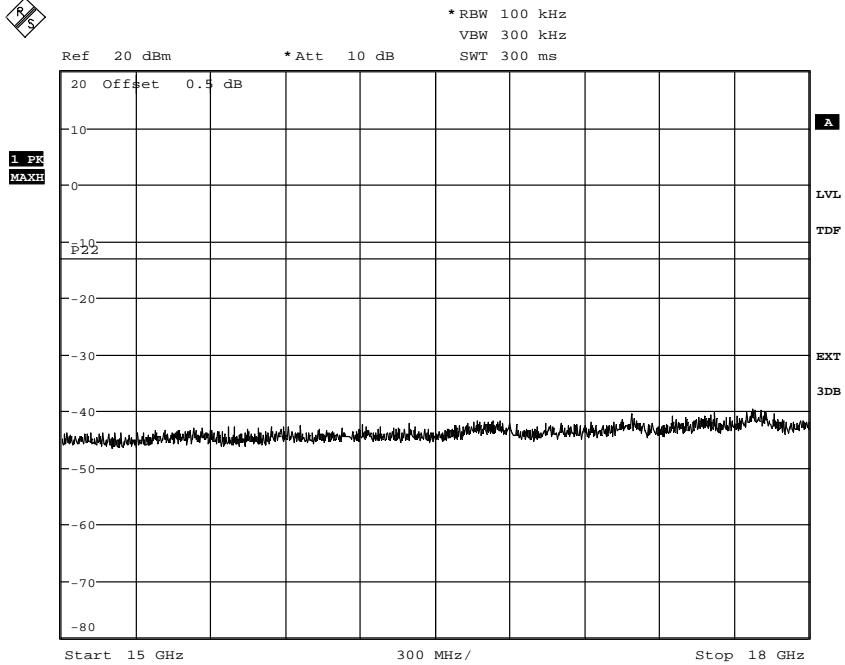
Appendix 5.1

Diagram 7-3



Date: 25.NOV.2010 13:30:03

Diagram7 -4



Date: 15.DEC.2010 14:33:11

Diagram 7-5



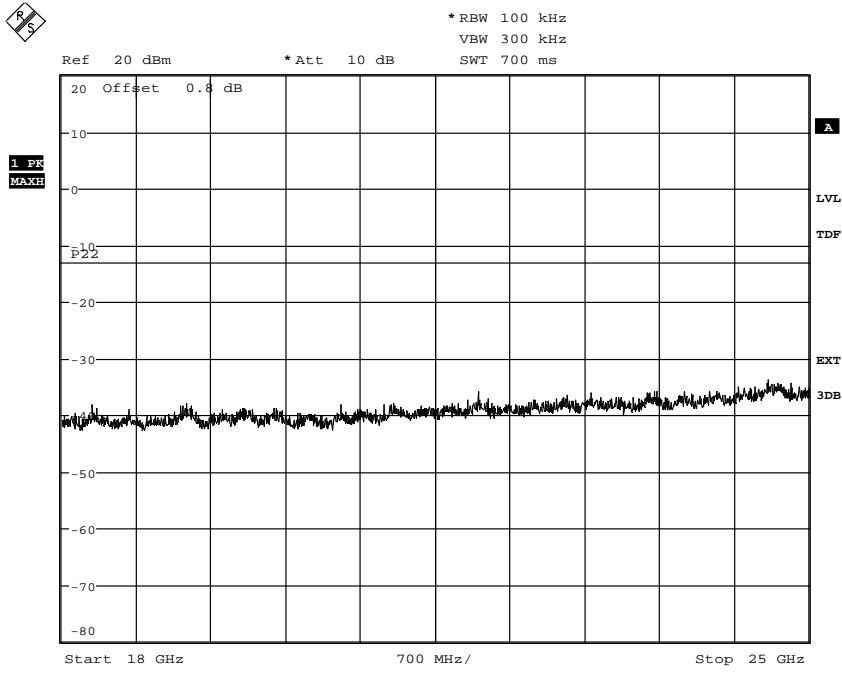
REPORT

Date 2010-12-20 Reference FX018755-F22

Page 15 (36)

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



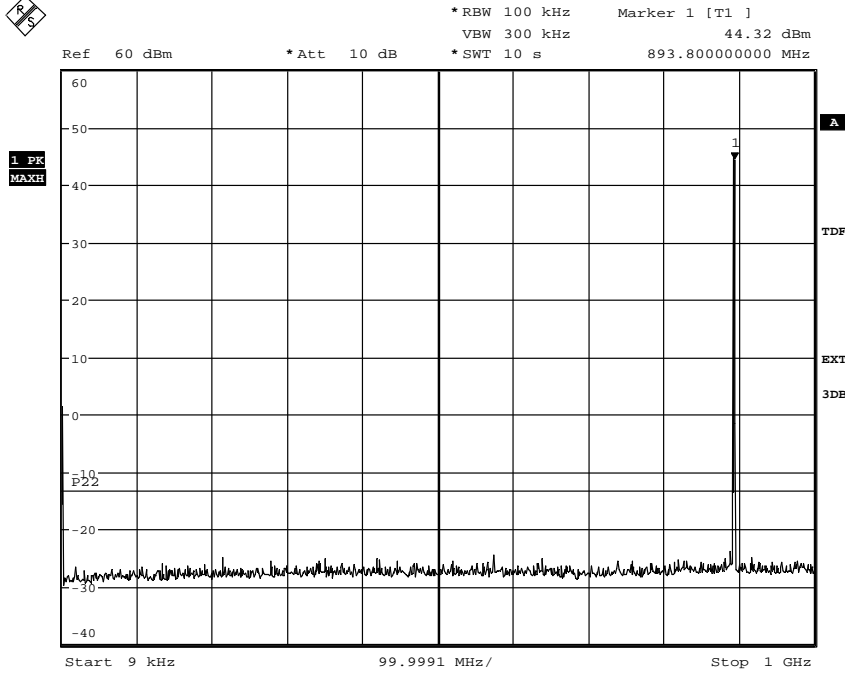
Date: 15.DEC.2010 14:38:15



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IC: 287AB-AS118642

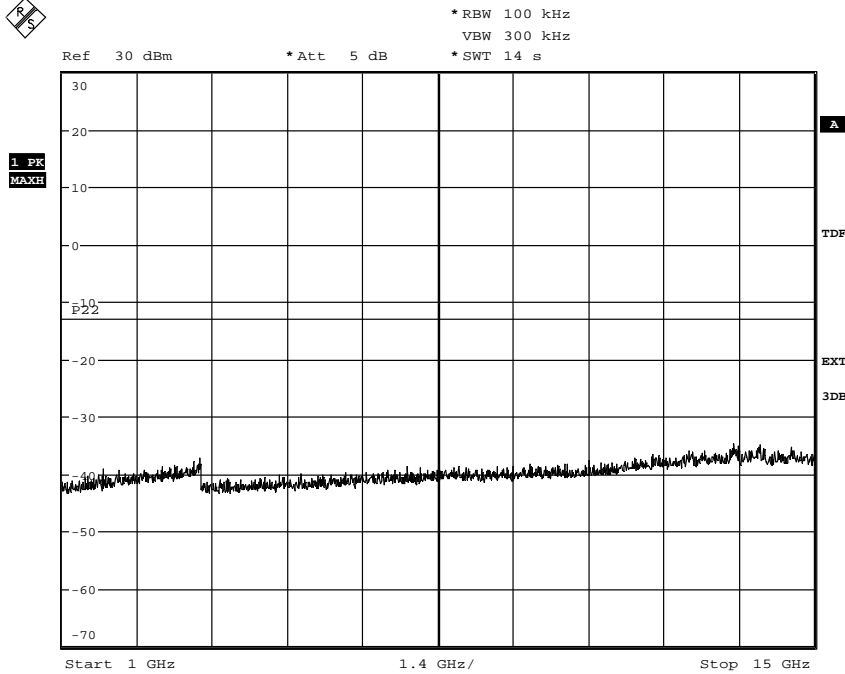
Appendix 5.1

Diagram 8-1



Date: 25.NOV.2010 13:47:53

Diagram 8-2



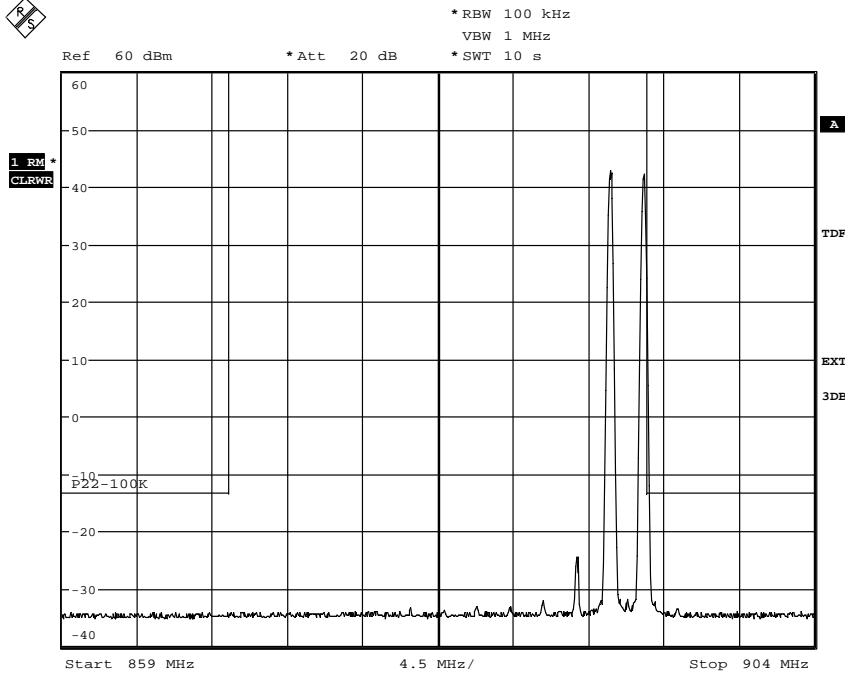
Date: 25.NOV.2010 13:44:09



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IC: 287AB-AS118642

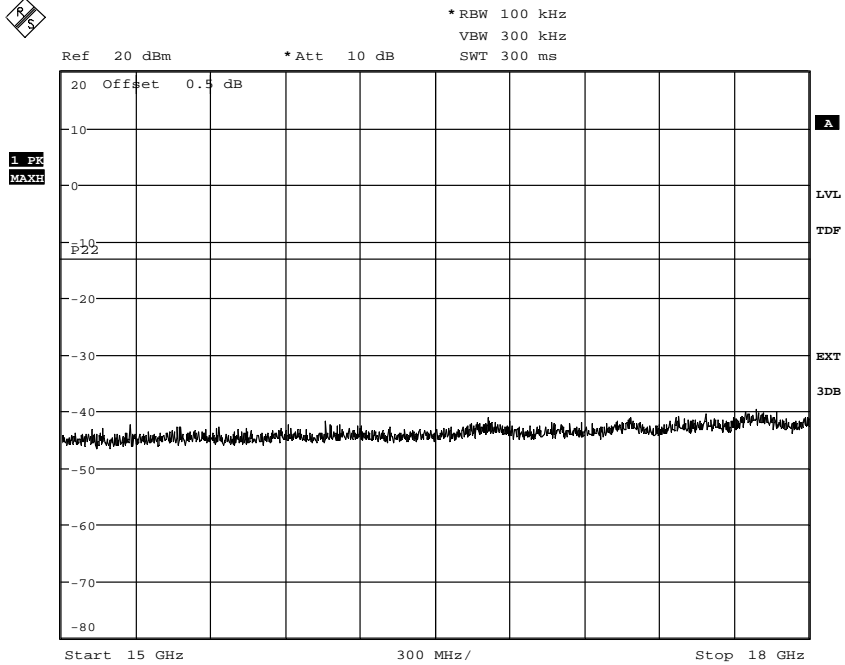
Appendix 5.1

Diagram 8-3



Date: 25.NOV.2010 13:46:22

Diagram 8-4



Date: 15.DEC.2010 14:42:52

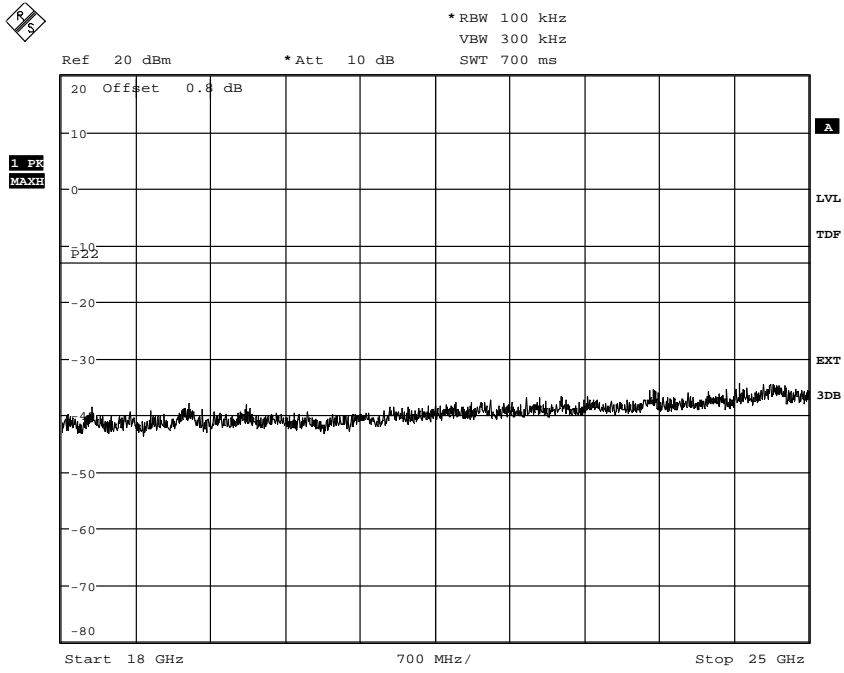
Diagram 8-5



REPORT

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



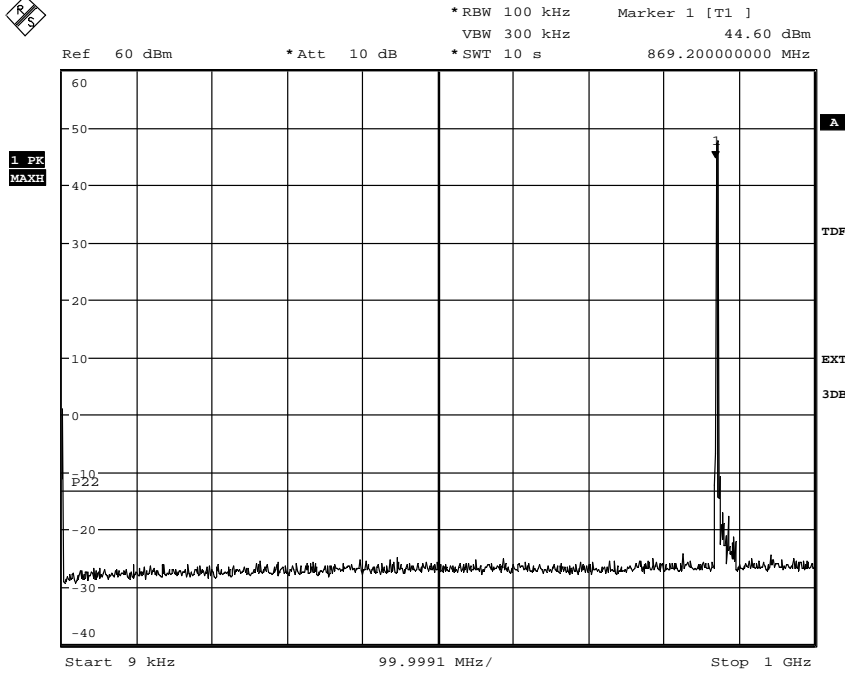
Date: 15.DEC.2010 14:40:28



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IC: 287AB-AS118642

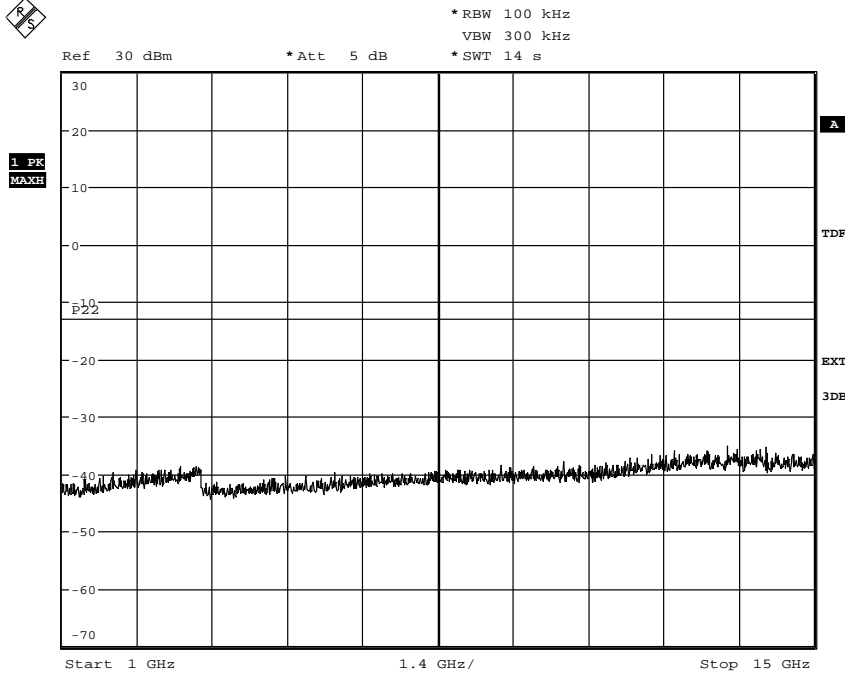
Appendix 5.1

Diagram 9-1



Date: 25.NOV.2010 14:22:04

Diagram 9-2



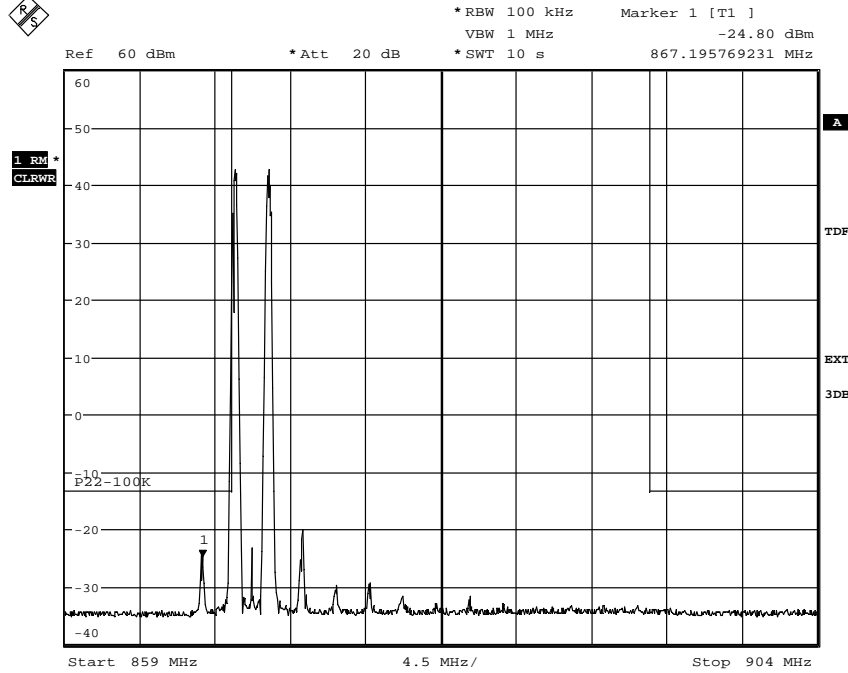
Date: 25.NOV.2010 14:12:39



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

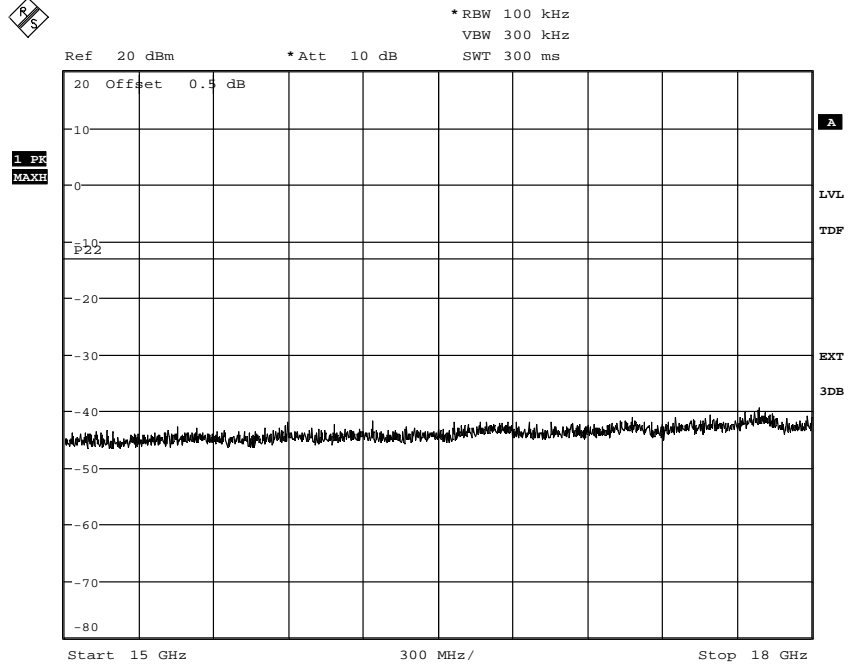
Appendix 5.1

Diagram 9-3



Date: 25.NOV.2010 14:14:50

Diagram 9-4



Date: 15.DEC.2010 14:58:14

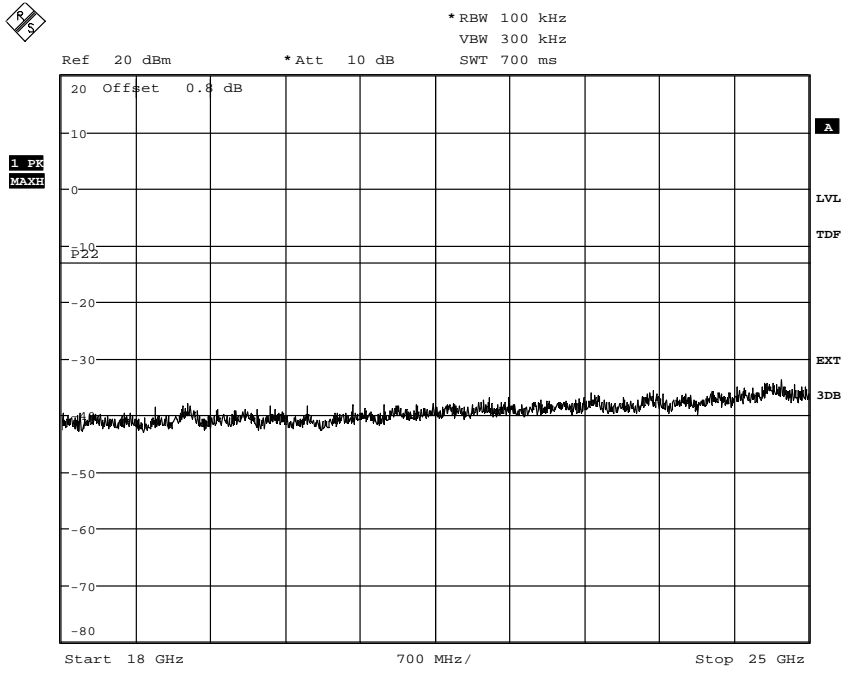
Diagram 9-5



REPORT

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



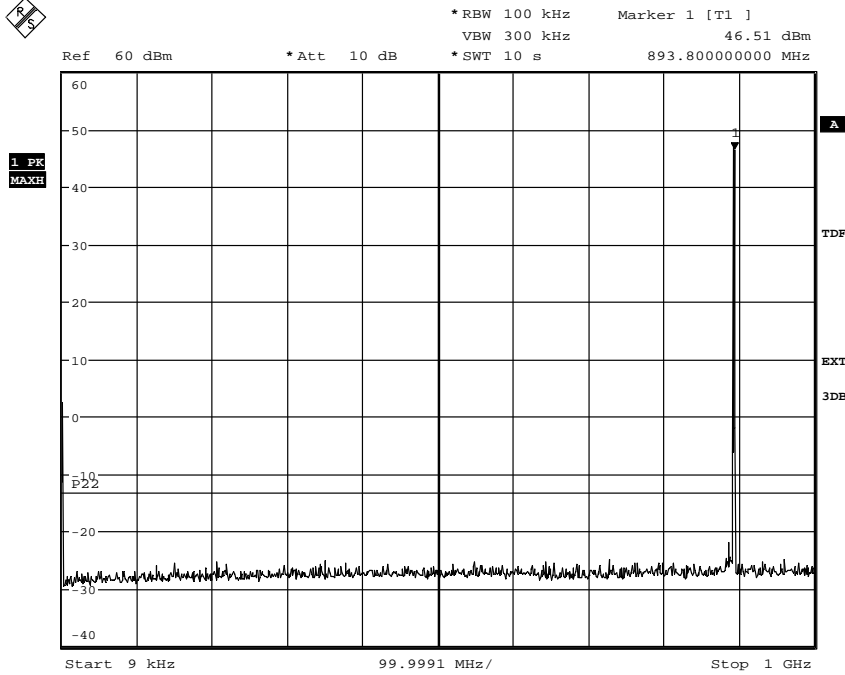
Date: 15.DEC.2010 14:55:24



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IC: 287AB-AS118642

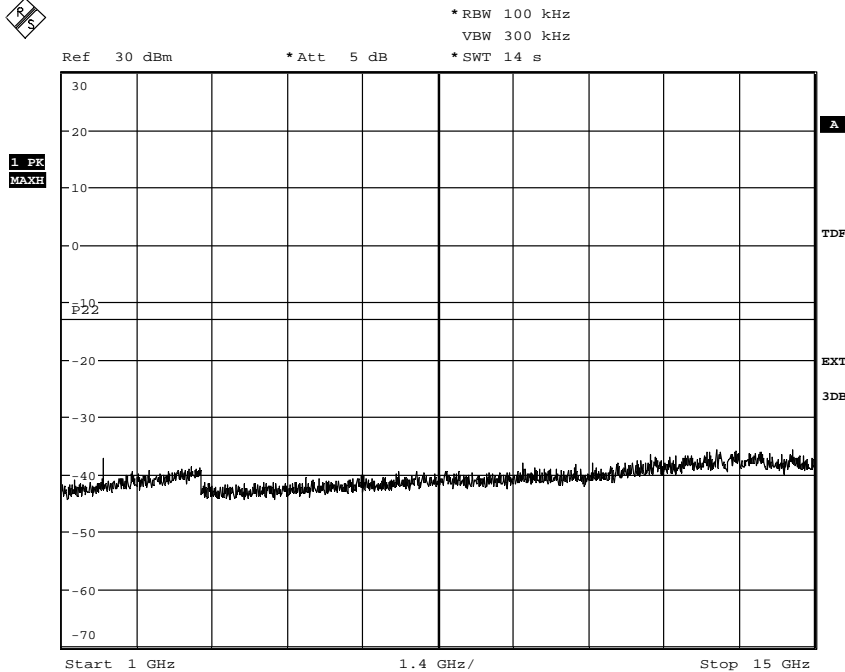
Appendix 5.1

Diagram 10-1



Date: 25.NOV.2010 13:51:40

Diagram 10-2



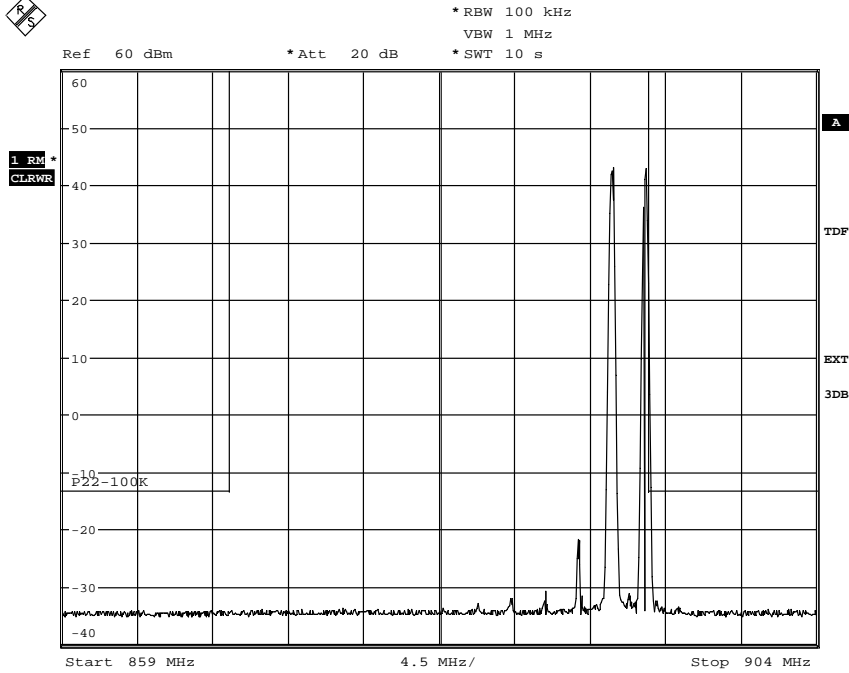
Date: 25.NOV.2010 14:00:28



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

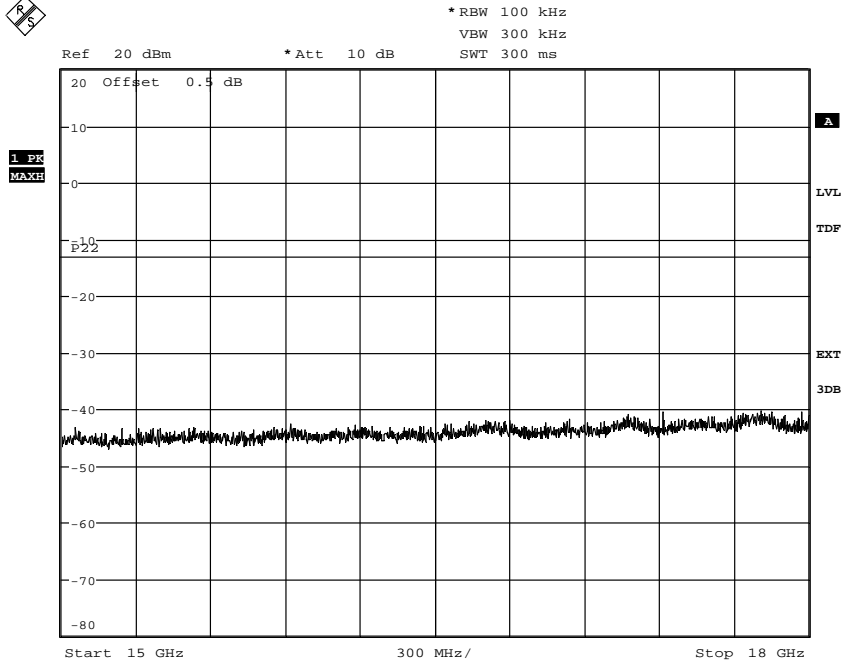
Appendix 5.1

Diagram 10-3



Date: 25.NOV.2010 13:53:17

Diagram 10-4



Date: 15.DEC.2010 14:46:49

Diagram 10-5



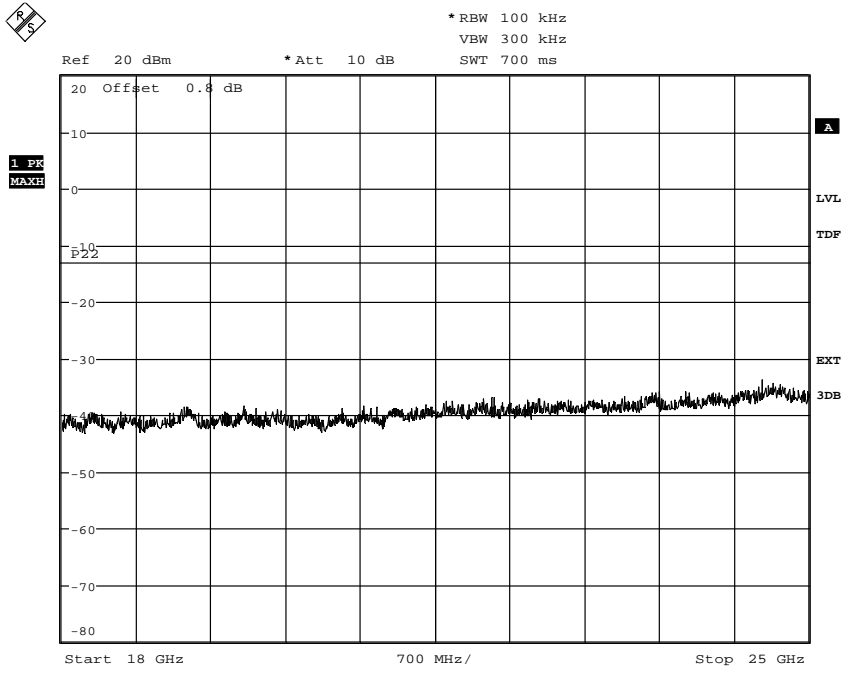
REPORT

Date 2010-12-20 Reference FX018755-F22

Page 24 (36)

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



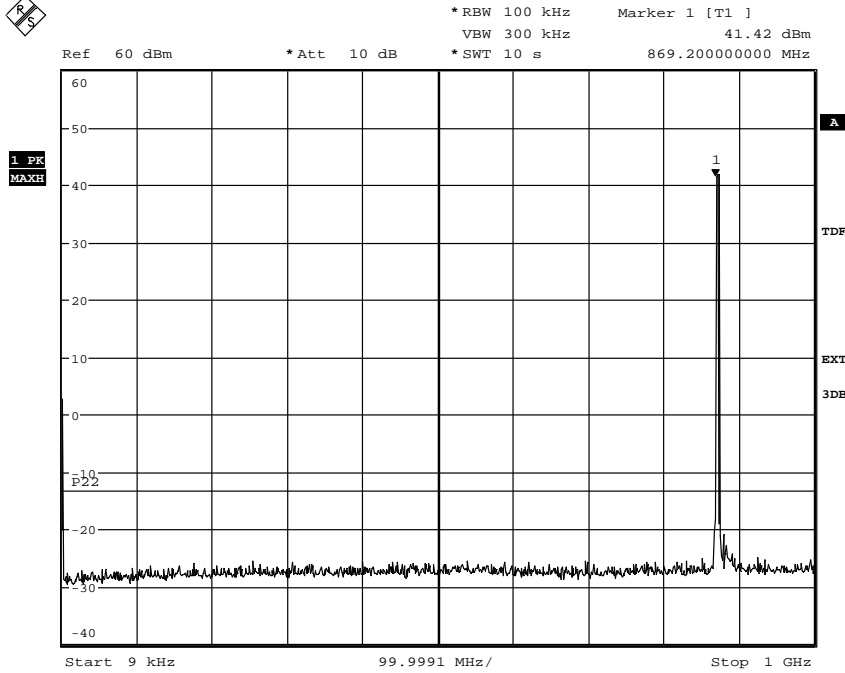
Date: 15.DEC.2010 14:51:17



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IC: 287AB-AS118642

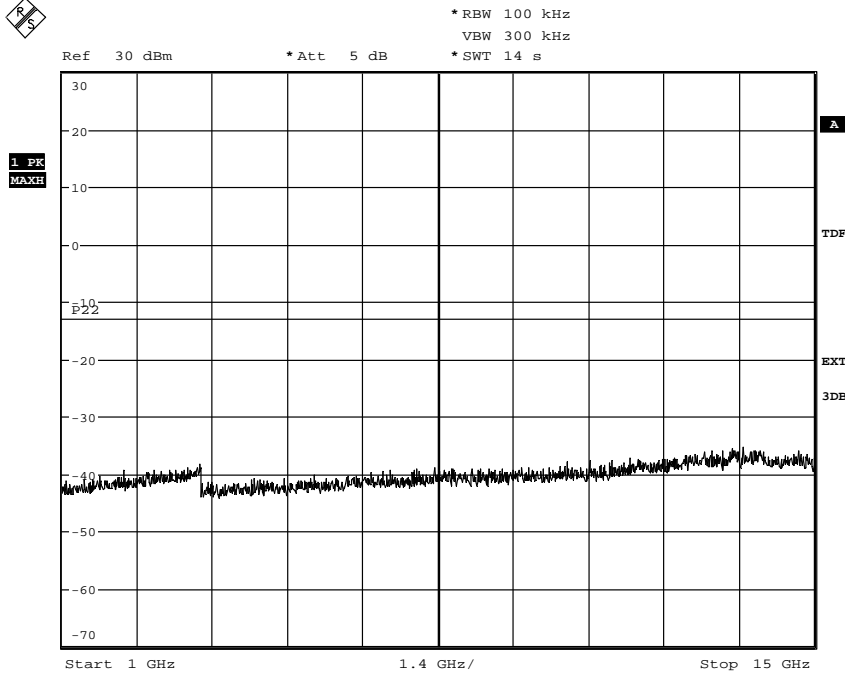
Appendix 5.1

Diagram 11-1



Date: 24.NOV.2010 15:16:38

Diagram 11-2



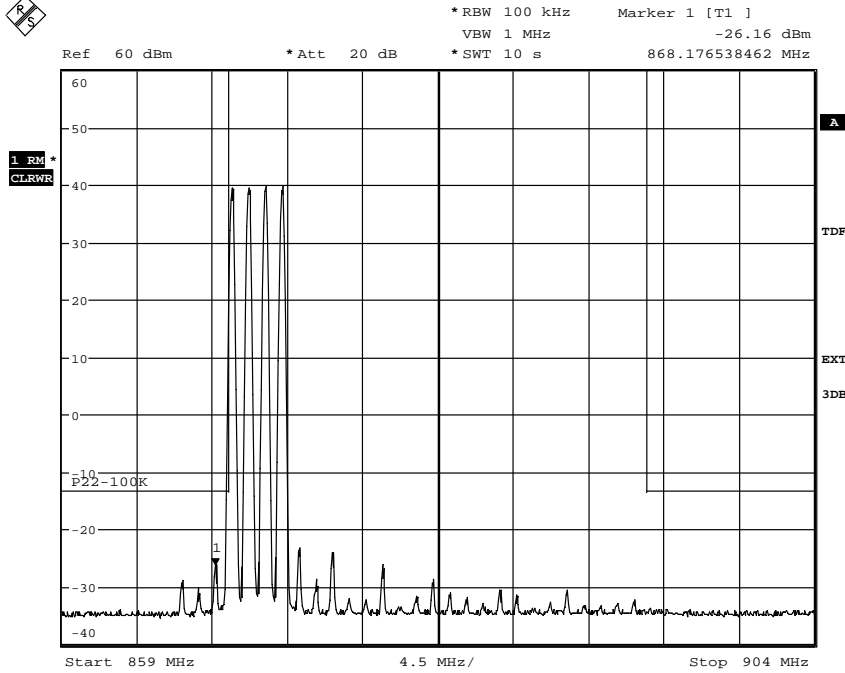
Date: 24.NOV.2010 15:18:16



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

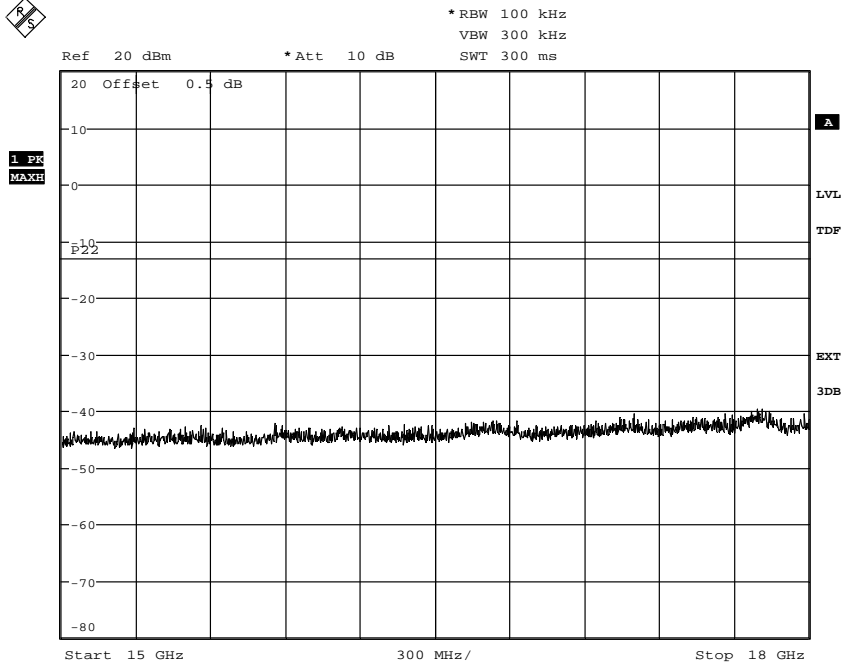
Appendix 5.1

Diagram 11-3



Date: 24.NOV.2010 15:15:17

Diagram 11-4



Date: 15.DEC.2010 14:10:29

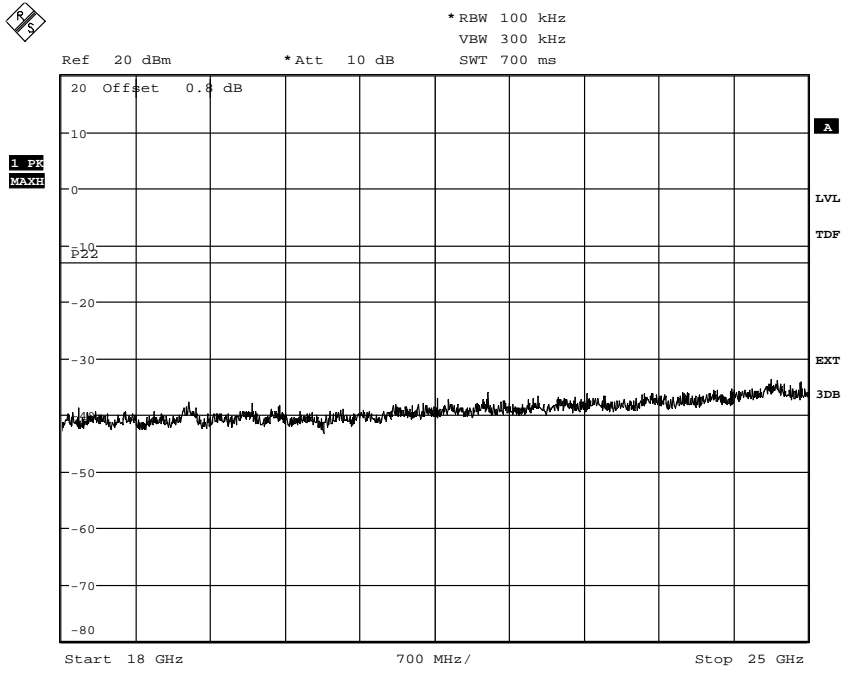
Diagram 11-5



REPORT

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



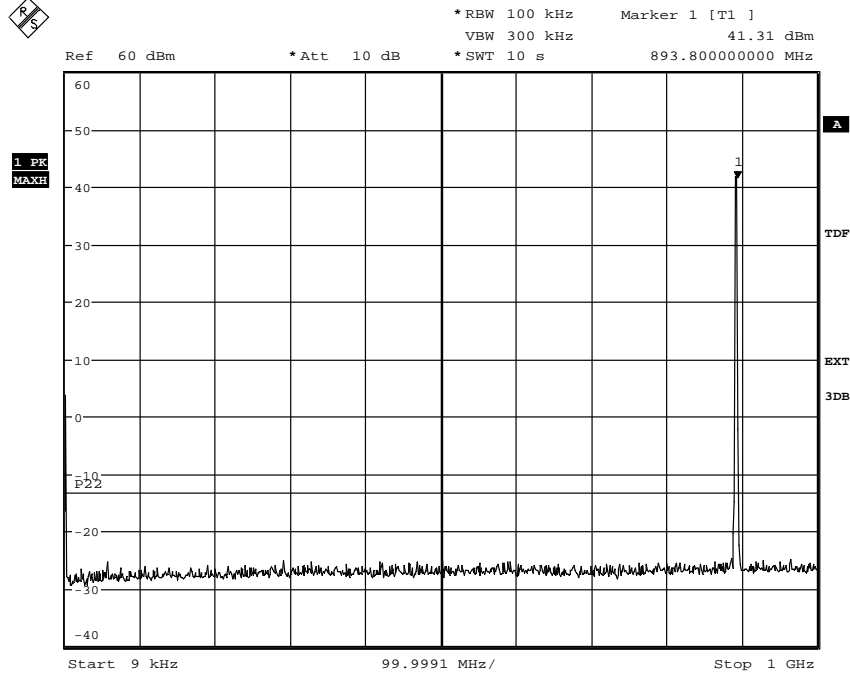
Date: 15.DEC.2010 13:05:13



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IC: 287AB-AS118642

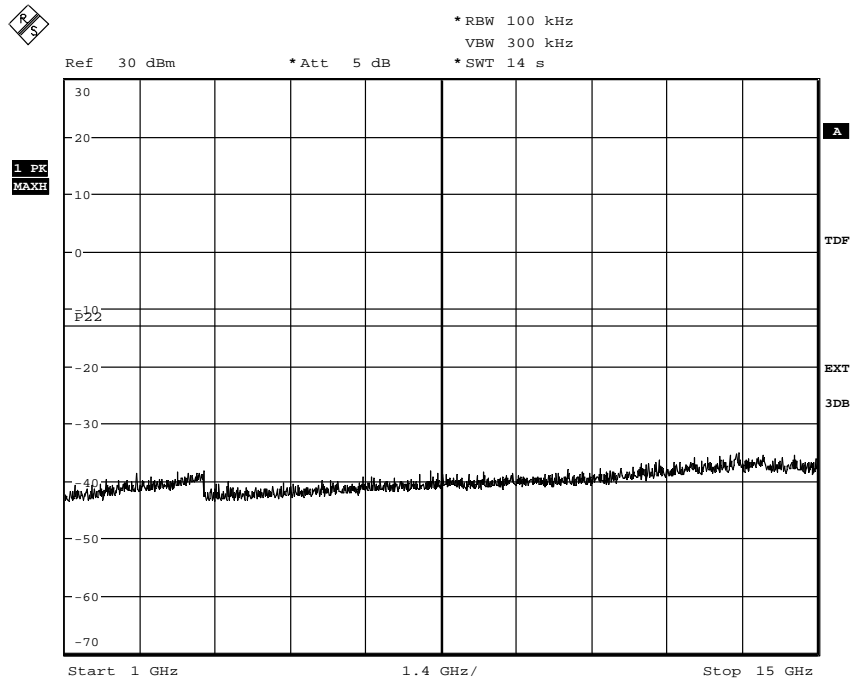
Appendix 5.1

Diagram 12-1



Date: 24.NOV.2010 14:45:50

Diagram 12-2



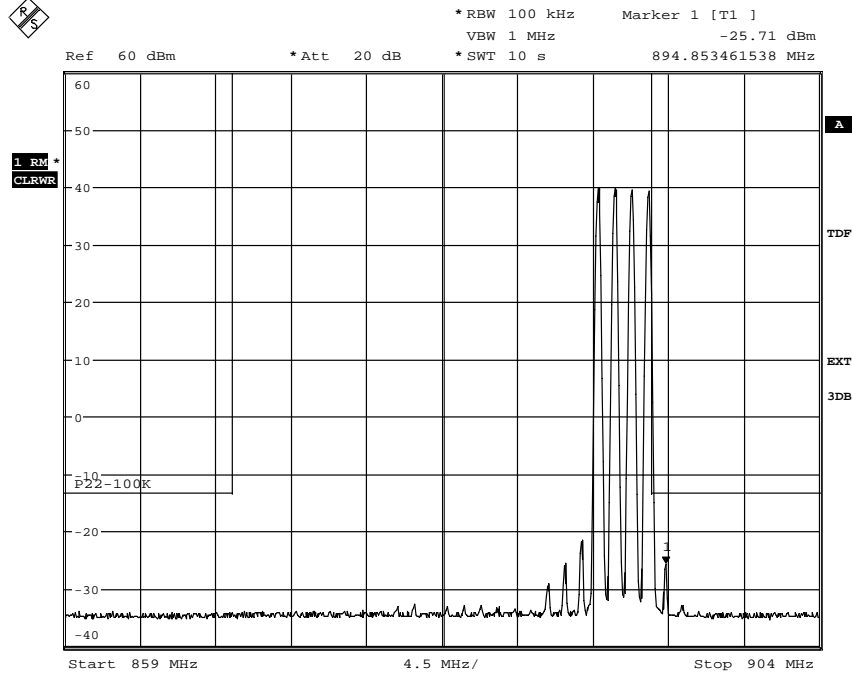
Date: 24.NOV.2010 14:49:09



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IC: 287AB-AS118642

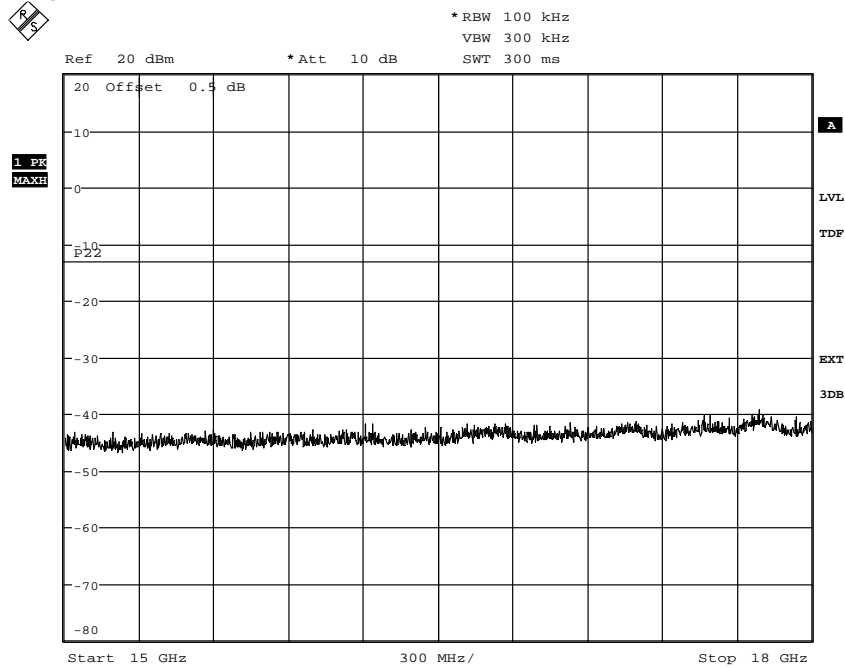
Appendix 5.1

Diagram 12-3



Date: 24.NOV.2010 14:43:20

Diagram 12-4



Date: 15.DEC.2010 14:06:56

Diagram 12-5



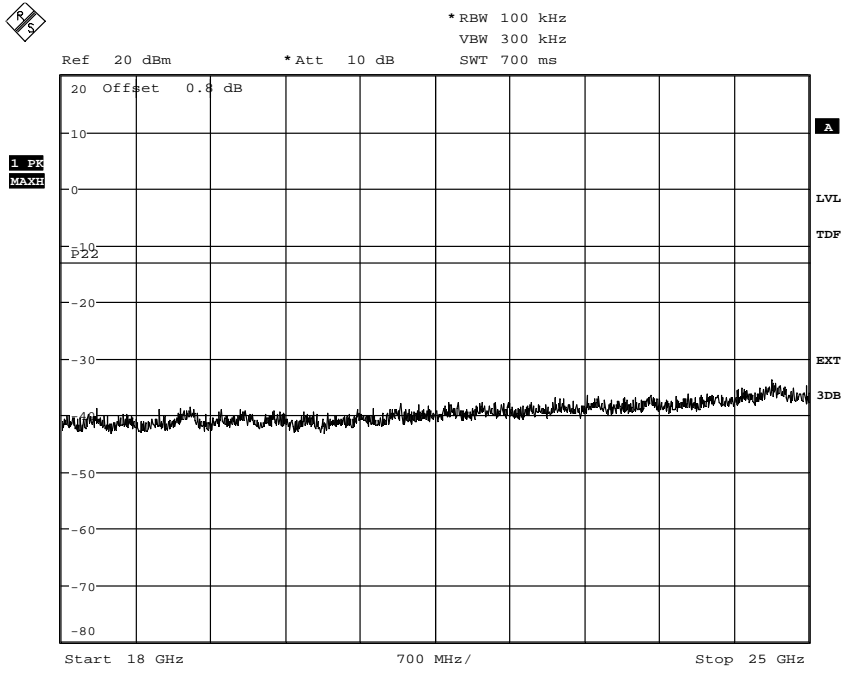
REPORT

Date 2010-12-20 Reference FX018755-F22

Page 30 (36)

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



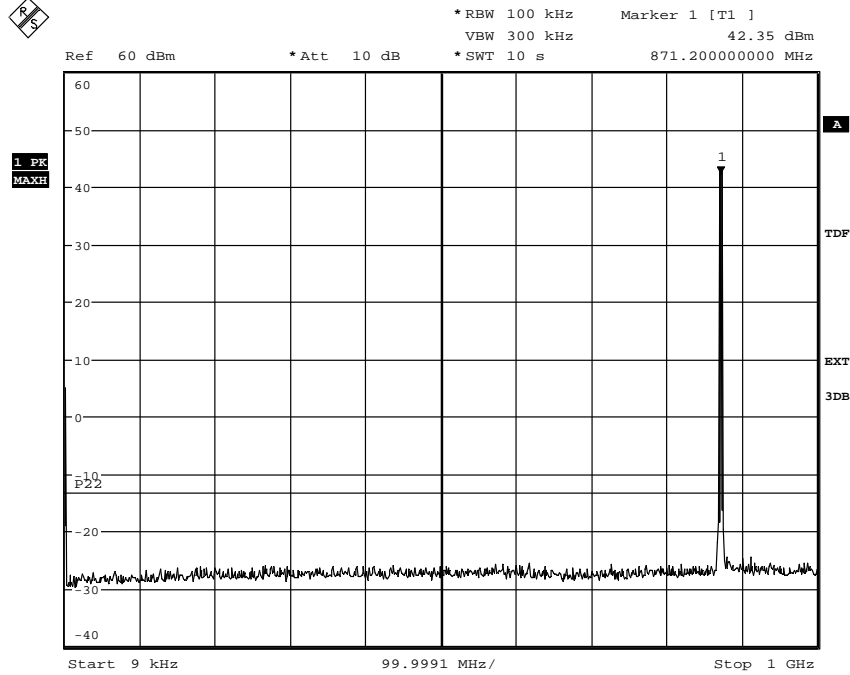
Date: 15.DEC.2010 13:09:55



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

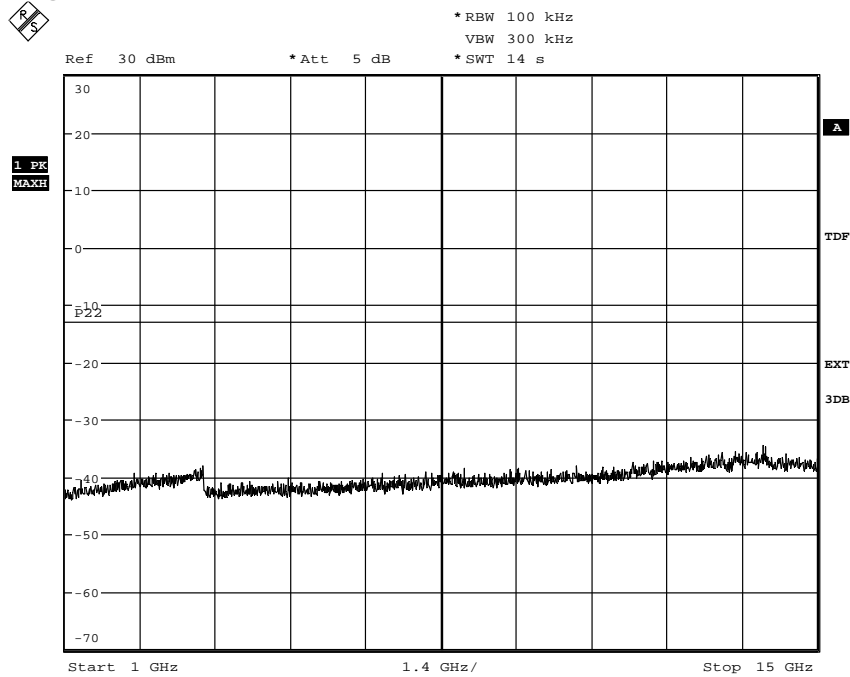
Appendix 5.1

Diagram 13-1



Date: 24.NOV.2010 15:29:34

Diagram 13-2



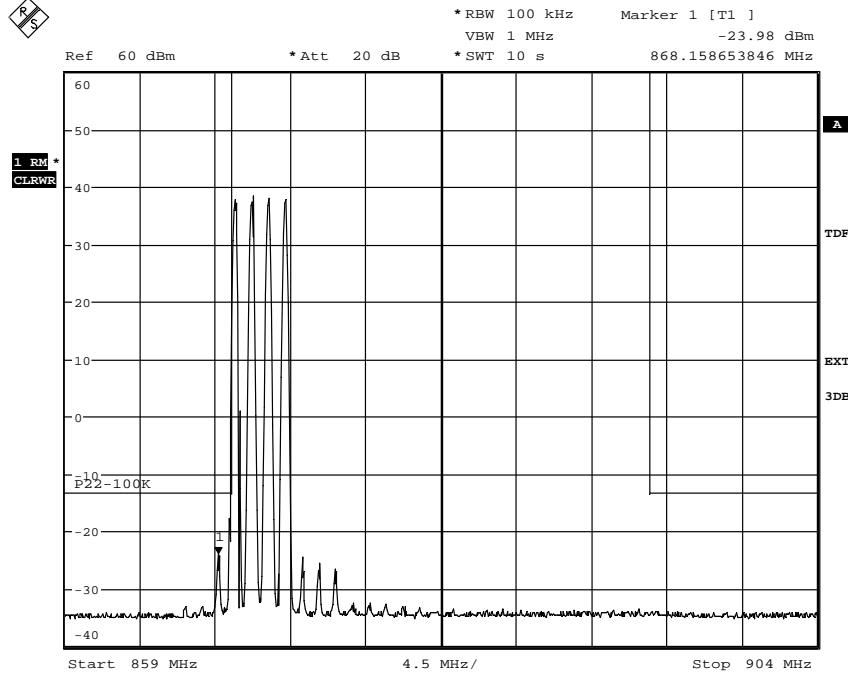
Date: 24.NOV.2010 15:26:01



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

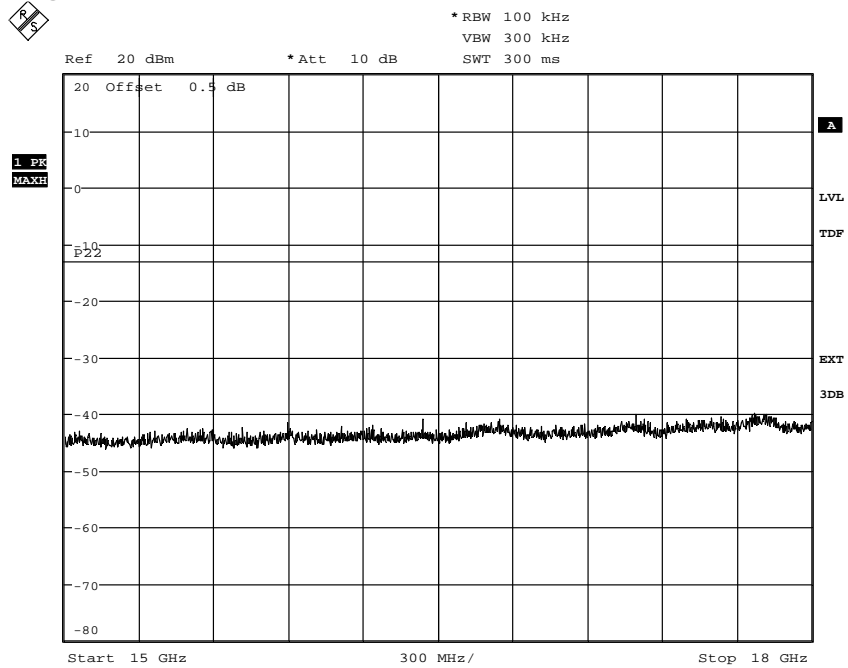
Appendix 5.1

Diagram 13-3



Date: 24.NOV.2010 15:35:13

Diagram 13-4



Date: 15.DEC.2010 13:46:28

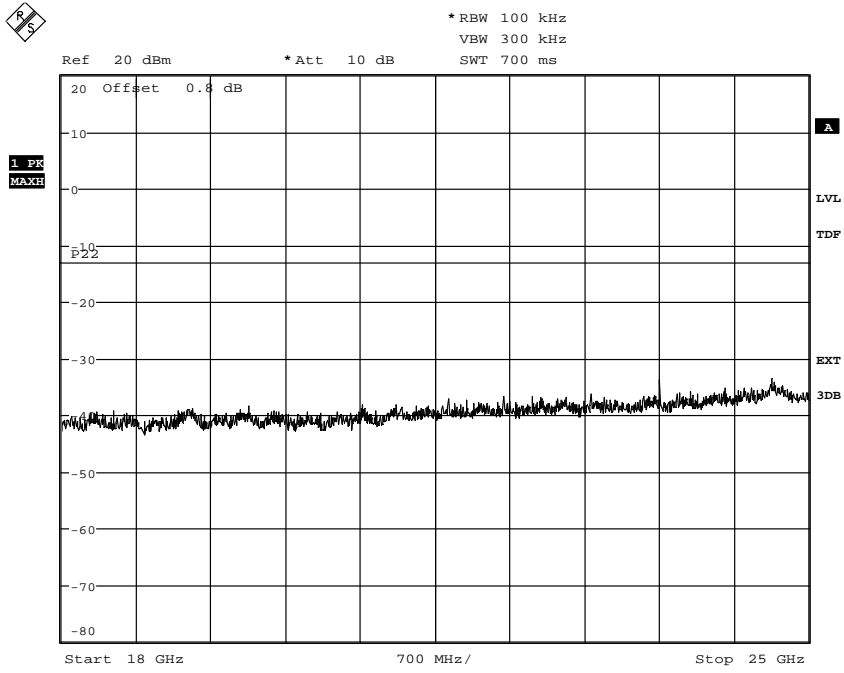
Diagram 13-5



REPORT

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



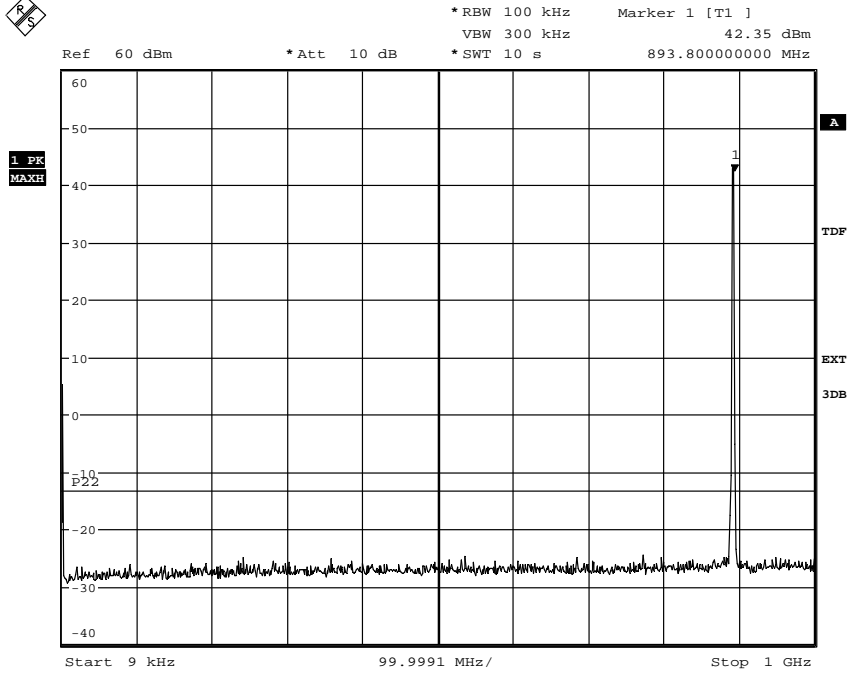
Date: 15.DEC.2010 13:36:56



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1

Diagram 14-1



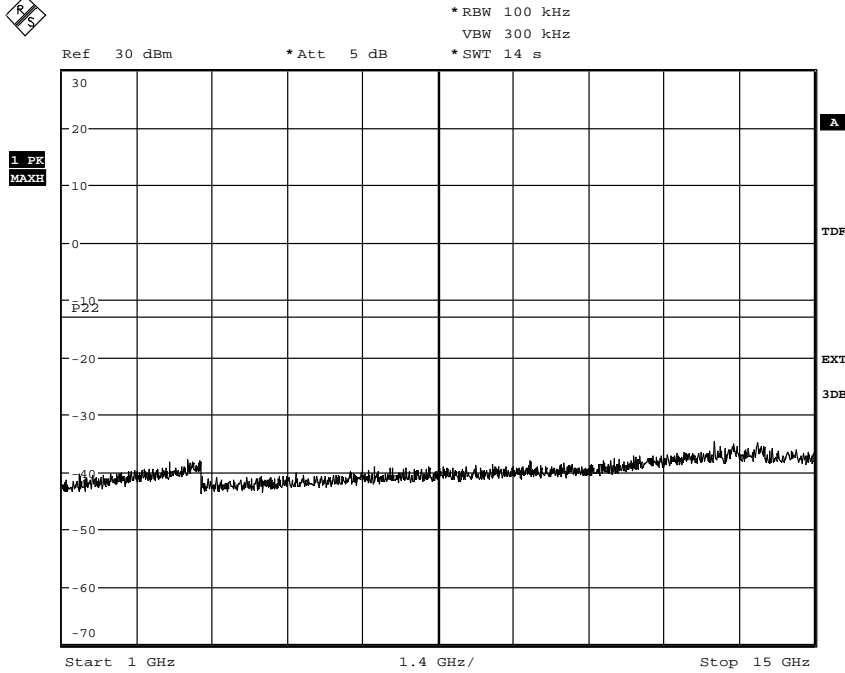
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FCC ID: TA8AKRC11864-2
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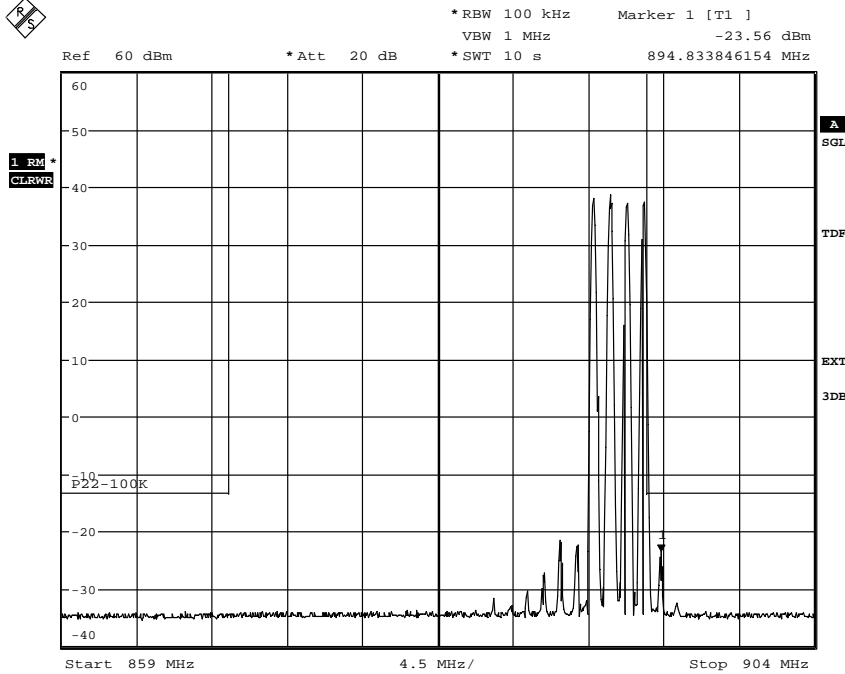
Appendix 5.1

Diagram 14-2



Date: 24.NOV.2010 14:35:57

Diagram 14-3



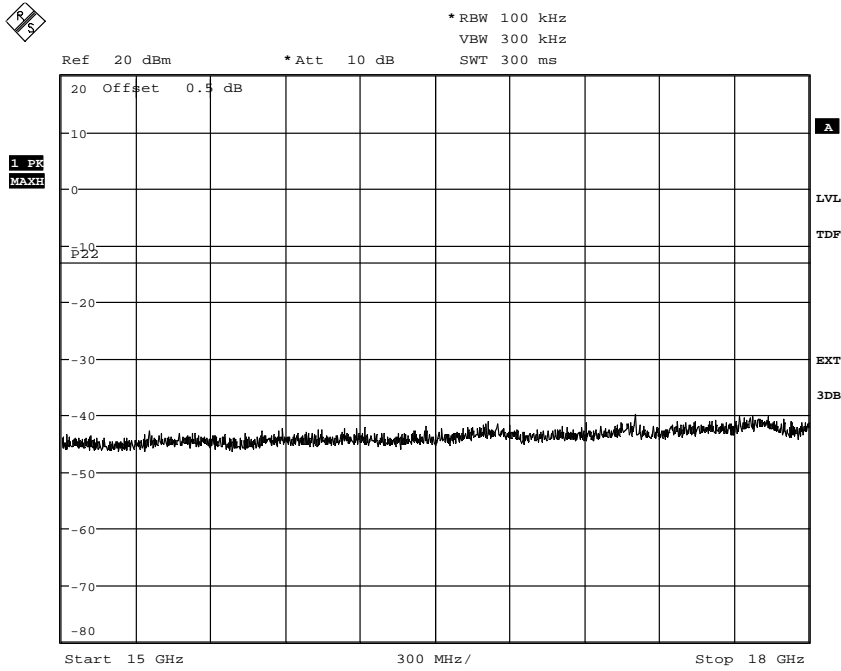
Date: 24.NOV.2010 14:22:22

Diagram 14-4



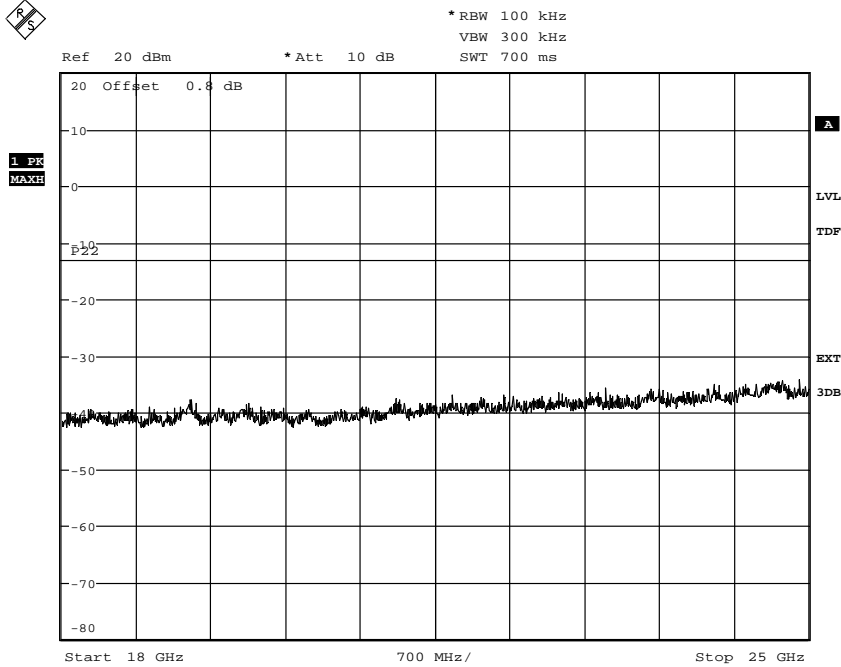
FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 5.1



Date: 15.DEC.2010 14:02:27

Diagram 14-5



Date: 15.DEC.2010 13:17:37



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 6

**Field strength of spurious radiation measurements according to 47 CFR 2.1053/
RSS-132 4.5**

Date	Temperature	Humidity
2010-11-05	23 °C ± 3 °C	32 % ± 5 %
2010-11-12	22 °C ± 3 °C	29 % ± 5 %
2010-12-16	20 °C ± 3 °C	12 % ± 5 %

Procedure

The test site is listed at FCC, Columbia with registration number: 93866. The test site also complies with RSS-Gen, Industry Canada file no.: 3482A-2.

The antenna port “RF A” was connected to functional test equipment outside the test chamber for signal monitoring. Antenna port “RF B” was unterminated.

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 to 15 GHz and 1 m in the frequency range 15 to 25 GHz.

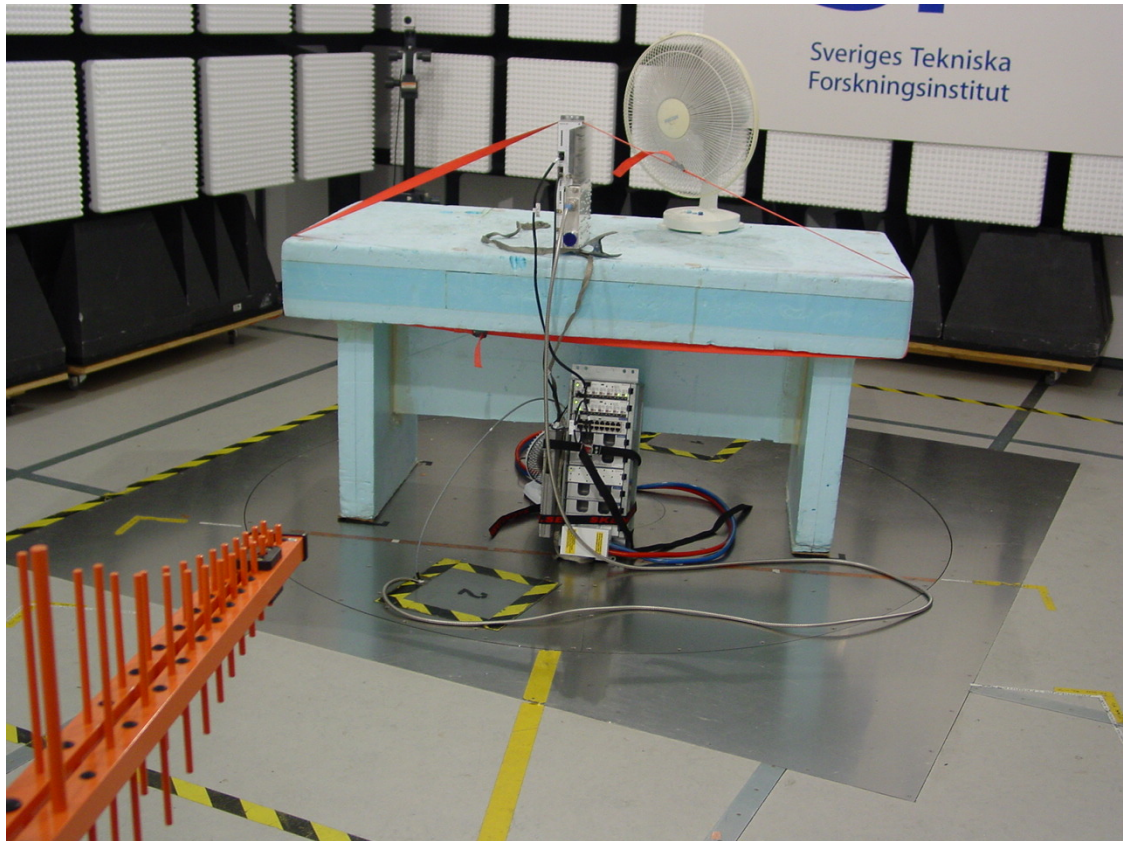
1. A pre-measurement was first performed.
2. In the frequency range 30 MHz-25 GHz the measurement was performed in power with a RBW of 100 kHz. A propagation loss in free space was calculated. The used formula was,
$$\gamma = 20 \log \left(\frac{4\pi D}{\lambda} \right),$$
 γ is the propagation loss and D is the antenna distance.
3. The measurement procedure was as the following.
4. 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.
5. Spurious radiation on frequencies closer than 20 dB to the limit 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 measured with the RMS detector were measured with the substitution method according to the standard.

FCC ID: TA8AKRC11864-2
 IC: 287AB-AS118642

Appendix 6

Test set-up

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



Measurement equipment

Measurement equipment	SP number
Semi anechoic chamber, Edison	504 114
EMI measurement computer	-
Software: R&S EMC32, ver. 6.30.10	503 745
R&S EMI test receiver ESIB 26	503 885
Antenna Schaffner CBL 6143	504 079
EMCO Horn Antenna 3115	501 548
Std gain, FLANN 16240-25	503 939
Std gain, FLANN 18240-25	503 900
Low Noise Amplifier, Miteq	503 285
Low Noise Amplifier, µComp Nordic	504 160
HP-filter, Wainwright	504 199
Temperature and humidity meter, Testo 625	504 117



REPORT

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 6

Results

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 4.7 dB		

Limits

The power of any emission outside the frequency band shall be attenuated below the transmitter power (P) by at least $43 + 10 \log P$ dB.

Complies?	Yes
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FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 7

Frequency stability according to 47 CFR 2.1055 / RSS-132 4.3

Date 2010-10-28 to 2010-11-02	Temperature (test equipment) 22-23°C ± 3 °C	Humidity (test equipment) 30-43 % ± 5 %
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Test set-up and procedure

The measurements were made per J-STD-007A Vol 1 (GMSK) and TIA/EIA-136-280-B (8-PSK).

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 FSIQ 40	503 758
RF attenuator	504 159
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)	GMSK	8-PSK
-48.0	+20	+4	+6
-55.2	+20	+4	-5
-40.8	+20	-4	-6
-48.0	+30	-5	-6
-48.0	+40	-4	+6
-48.0	+50	-5	-7
-48.0	+10	-6	+5
-48.0	0	+3	-5
-48.0	-10	+3	-5
-48.0	-20	+3	+7
-48.0	-30	-4	+5
Maximum freq. error (Hz)		6	7
Measurement uncertainty		< ± 1 x 10 ⁻⁷	

§ 22.335 The maximum frequency error shall not be greater than 1.5 ppm (1322.4 Hz).

Complies?	Yes
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FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 8

**Receiver spurious emissions measurements according to 47 CFR 15.111/
IC RSS-132, section 4.6.**

Date	Temperature	Humidity
2010-11-25	23°C ± 3 °C	14 % ± 5 %
2010-12-14	23°C ± 3 °C	12 % ± 5 %

Test set-up and procedure

The measurements were performed according to ANSI C63.4.

Measurements were performed on the receiver antenna terminal (RF B). The measurement is first performed with peak detector. Emission on frequencies close to or above the limit is re-measured with quasi-peak detector (average detector above 1000 MHz).

Measurement equipment	SP number
Rohde & Schwarz FSQ 40	504 143
Testo 635 temperature and humidity meter	504 203

Result

The results are shown in appendix 8.1:

	Channel
Diagram 1	B
Diagram 2	M
Diagram 3	T

Note: During the measurement on the RX port RF B the combined TX/RX port RF A was terminated into 50 ohm, the TX was active in single carrier mode transmitting GMSK modulation at maximum output power setting.

Remark

The highest internal frequency as declared by the client was 2.4576 GHz, thus the choice of the upper frequency boundary was set to 5x2.5 GHz = 12.5 GHz for emission measurements.

Limit

The power of any spurious output signals appearing at the antenna terminals must not exceed -57 dBm (2 nanowatt).

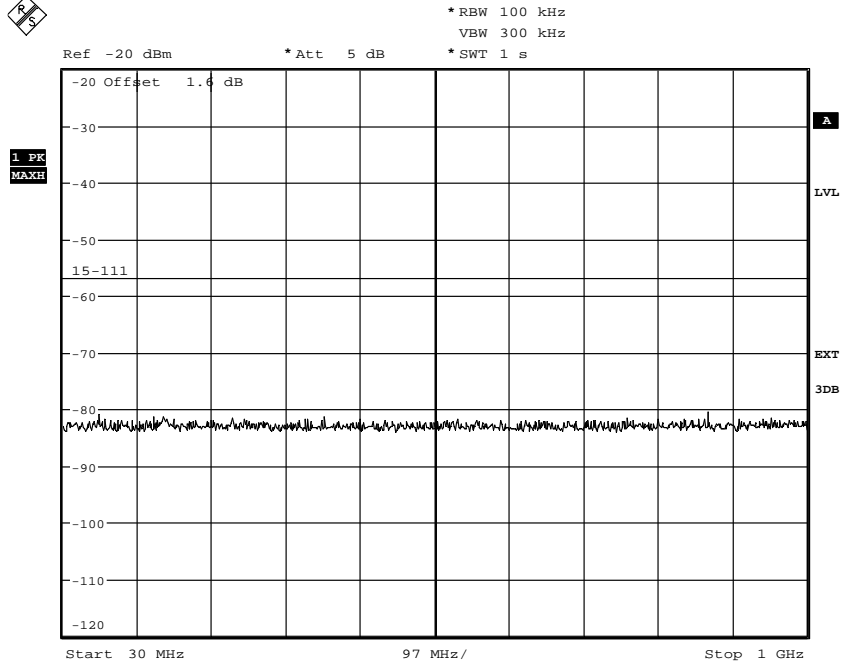
Emission below limit?	Yes
-----------------------	-----



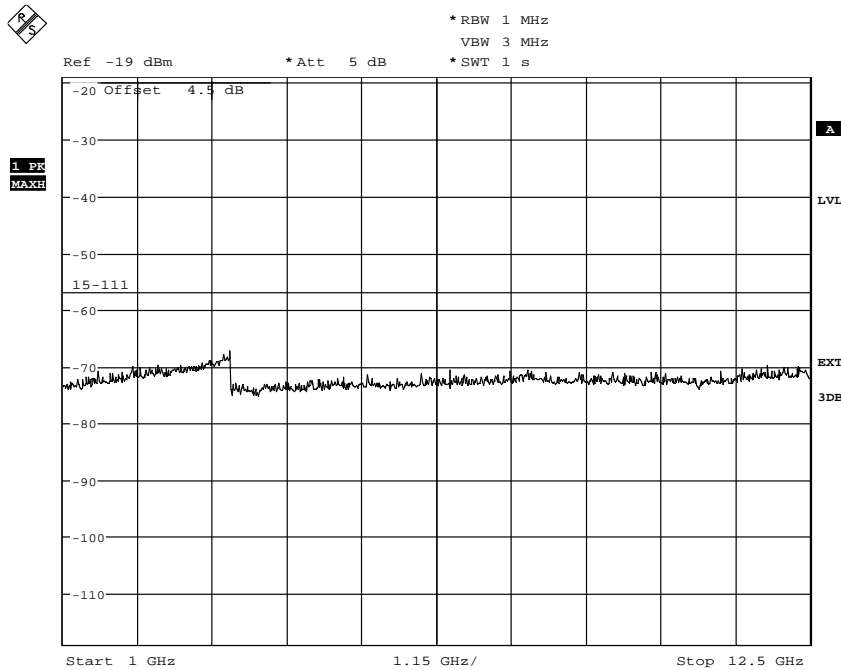
FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 8.1

Diagram 1



Date: 25.NOV.2010 10:56:17



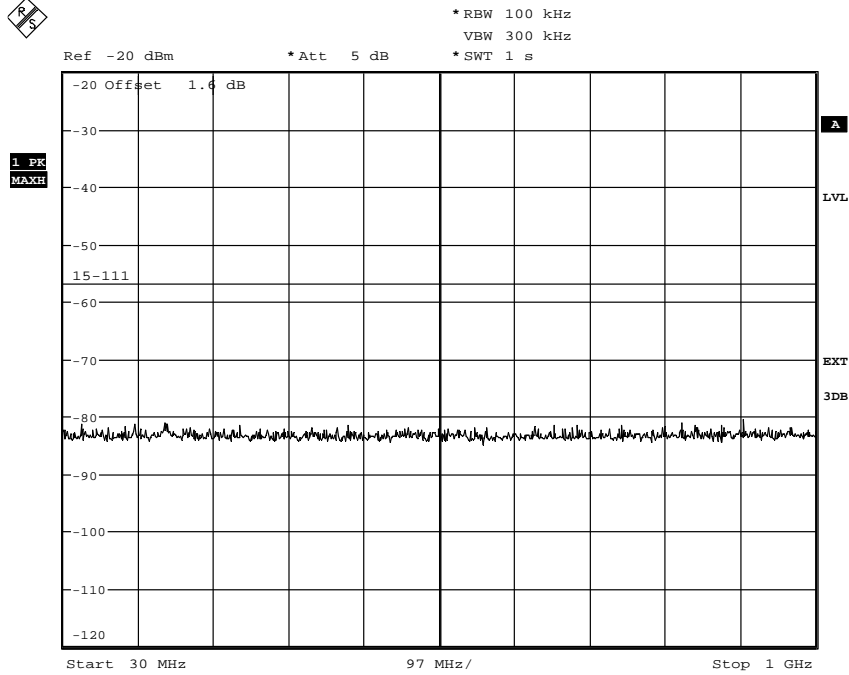
Date: 14.DEC.2010 16:02:54



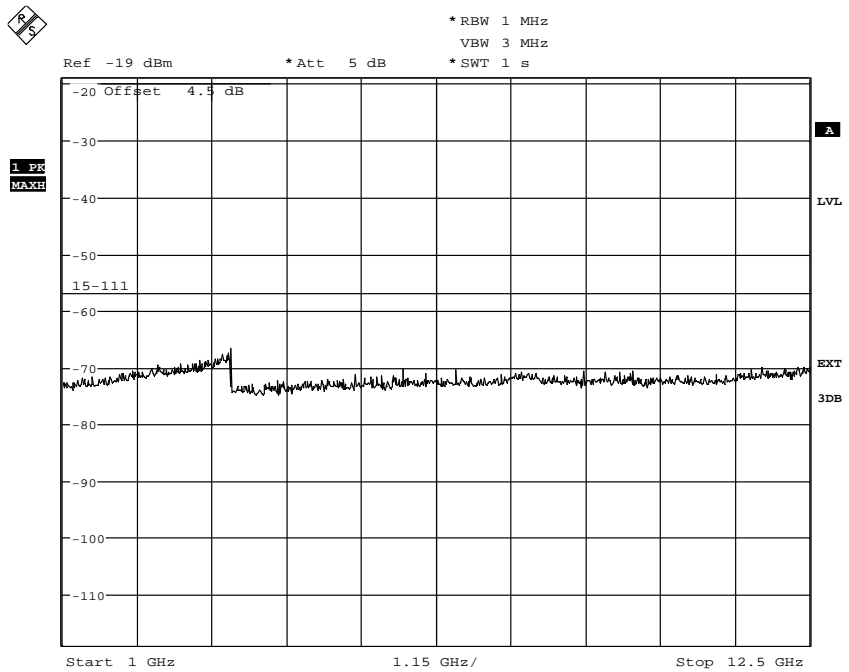
FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 8.1

Diagram 2



Date: 25.NOV.2010 11:08:53



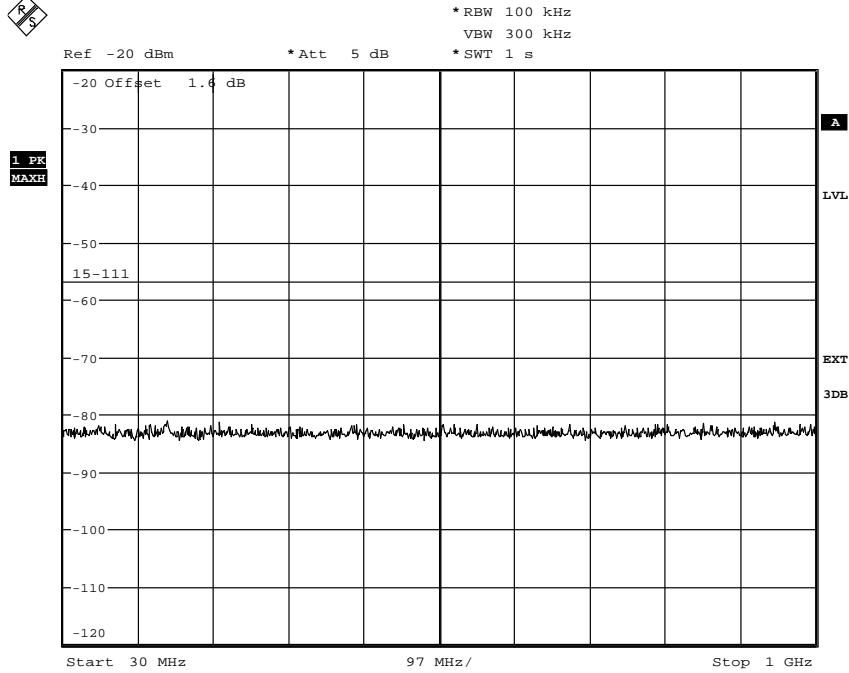
Date: 14.DEC.2010 16:00:17



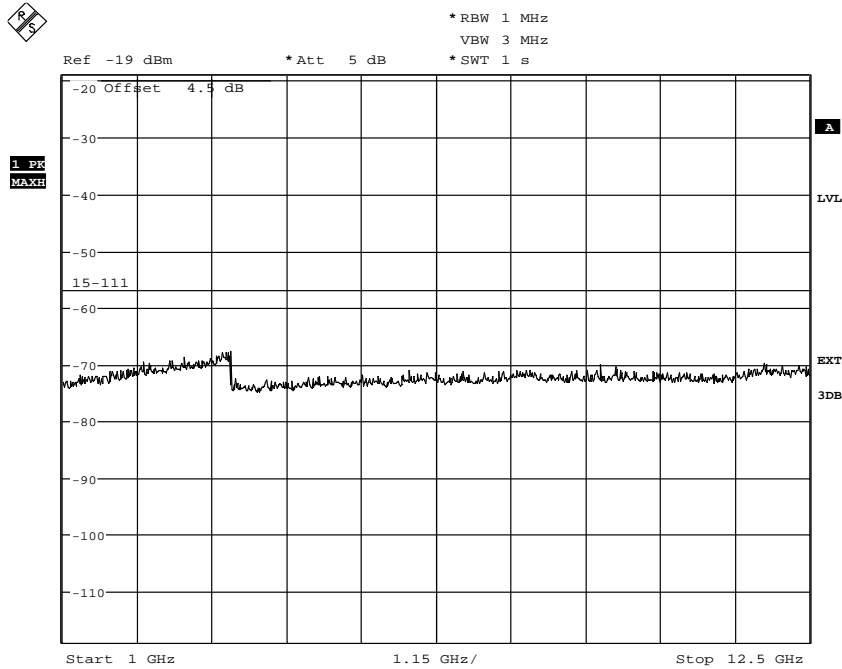
FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 8.1

Diagram 3



Date: 25.NOV.2010 11:18:29



Date: 14.DEC.2010 16:06:10

FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

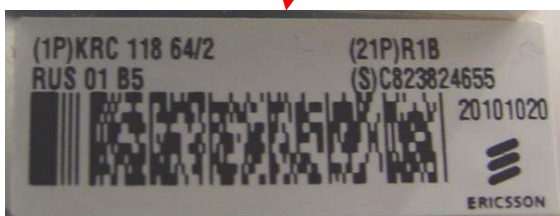
Appendix 9

External photos of the test object

Front side



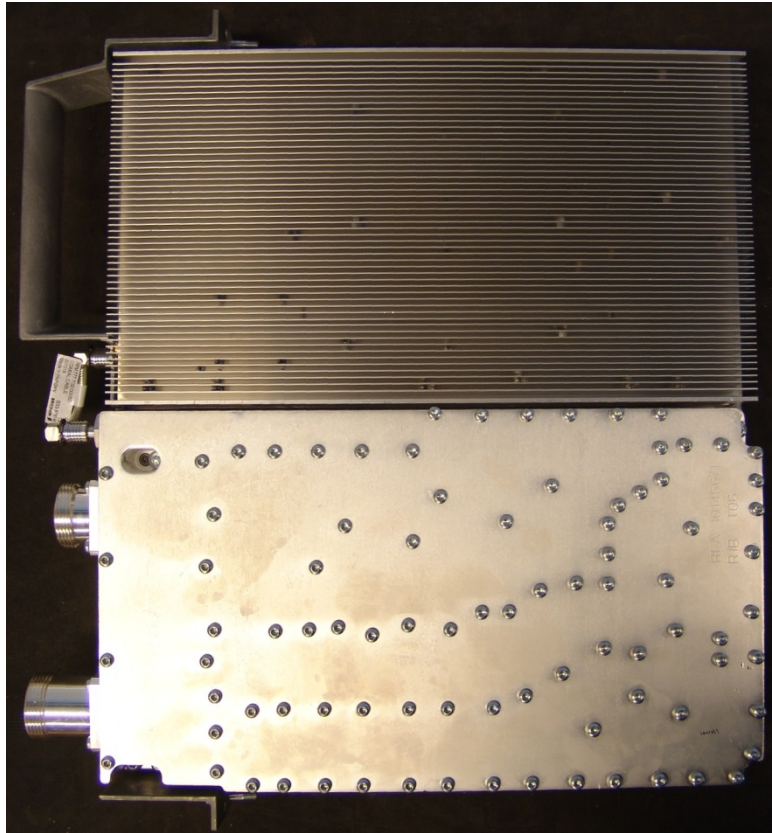
Rear side



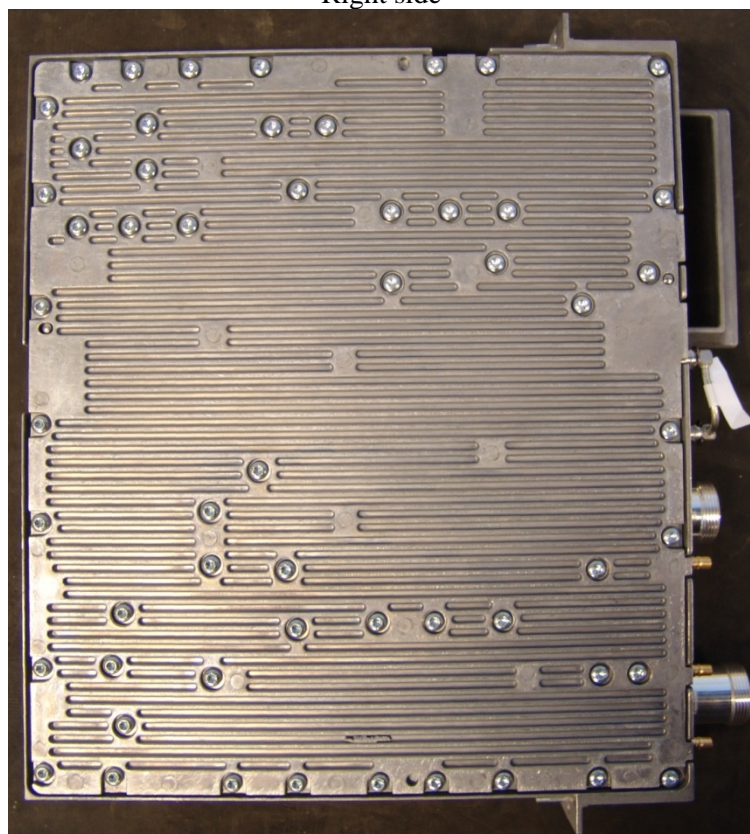
FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 9

Left side



Right side



FCC ID: TA8AKRC11864-2
IC: 287AB-AS118642

Appendix 9

Bottom side



Top side

