REPORT ON THE CERTIFICATION TESTING OF A AXELL WIRELESS DUAL BAND REPEATER MBF-D-8-19 WITH RESPECT TO THE FCC RULES CFR 47, PARTS 22H & 24E PRIVATE LAND MOBILE REPEATER.

TEST REPORT NO: TTR-001973WUS1

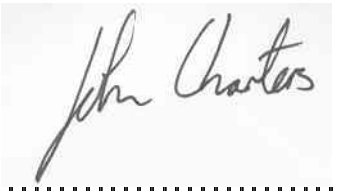
COPY NO: 1

ISSUE NO: 1

FCC ID: NEOA215SERIES

REPORT ON THE CERTIFICATION TESTING OF A
AXELL WIRELESS
DUAL BAND REPEATER
MBF-D-8-19
WITH RESPECT TO
THE FCC RULES CFR 47, PARTS 22H & 24E
PRIVATE LAND MOBILE REPEATER.

TEST DATE: 15th – 29th November 2010



APPROVED BY: ..... J CHARTERS
RADIO PRODUCT MANAGER

DATE: 17th February 2011

Distribution:

Copy Nos:
1. Axell Wireless
2. TCB: TRaC EMC & Safety
3. TRaC Telecoms & Radio

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www.tracglobal.com

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Notes:

1. Component failure during test — YES [ ] NO [X]
2. If Yes, details of failure:
3. The facilities used for the testing of the product contain in this report are FCC Listed.

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	NEOA215SERIES
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC RULES CFR 47, Part 90 Subpart I
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	MBF-D-8-19
EQUIPMENT TYPE:	Private Land Mobile Repeater
MAXIMUM GAIN:	800MHz Band Uplink 31.86 dB 1900MHz Band Uplink 30.61 dB 800MHz Band Downlink 35.71 dB 1900MHz Band Downlink 34.93 dB
MAXIMUM INPUT:	800MHz Band Uplink -63.42 dBm 1900MHz Band Uplink +0.78 dBm 800MHz Band Downlink +0.26 dBm 1900MHz Band Downlink +1.56 dBm
MAXIMUM OUTPUT CONDUCTED:	800MHz Band Uplink -31.56 dBm 1900MHz Band Uplink -32.47 dBm 800MHz Band Downlink +35.97 dBm 1900MHz Band Downlink +36.49 dBm
MAXIMUM NUMBER OF CHANNELS:	Not Applicable
CHANNEL BANDWIDTH:	Not Applicable, Wideband
POWER SOURCE(s):	+110Vac
TEST DATE(s):	15th – 29th November 2009
APPLICANT:	Axell Wireless
ADDRESS:	Aerial House Asheridge Road Chesham Buckinghamshire HP5 1TU

APPROVED BY: ..... J CHARTERS
RADIO
PRODUCT
MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	MBF-D-8-19
EQUIPMENT TYPE:	Private Land Mobile Repeater
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Parts 22H & 24E
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S CONTACT PERSON(s):	Mr J Divall
E-mail address:	Jon.divall@axellwireless.com
APPLICANT:	Axell Wireless
ADDRESS:	Aerial House Asheridge Road Chesham Buckinghamshire HP5 1TU United Kingdom
TEL:	+44 (0)1494 777000
FAX:	+44 (0)1494 778456
MANUFACTURER:	Axell Wireless
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRaC Telecoms & Radio, Skelmersdale
UKAS ACCREDITATION No:	0971
TEST DATE(s):	15th – 29th November 2010
TEST REPORT No:	TTR-001973WUS1

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	APPLICABILITY	RESULT
RF Power Output	22.913 24.232	Yes	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	N/A	N/A
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	N/A	N/A
Modulation Limiting	TIA EIA-603.3.2.6	N/A	N/A
Occupied Bandwidth	22.359 24.238	Yes	Complies
Spurious Emissions at Antenna Terminals	22.359 & 22.917 24.238	Yes	Complies
Field Strength of Spurious Emissions	22.359 & 22.917 24.238	Yes	Complies
Frequency Stability	22.359 & 22.917 24.238	N/A(note 1)	N/A
Transient behaviour	N/A	N/A(note 2)	N/A

Notes:
1 The EUT does not contain modulation circuitry; therefore the test was not performed.
2 The EUT is not a keyed carrier system; therefore the test was not performed.

2. Product class: Uplink Class A [ ] Class B [X]
   Downlink Class A [ ] Class B [X]
3. Product Use: Private Land Mobile Repeater
4. Emission Designator: F3E, F9W, GXW, G7W, DXW, F1D
5. Temperatures: Ambient (Tnom) 20^{o}C
6. Supply Voltages: Vnom +110Vac

   Note: Vnom voltages are as stated above unless otherwise shown on the test report page
7. Equipment Category: Single channel [X]
   Two channel [ ]
   Multi-channel [ ]
8. Channel Bandwidth: Narrowband [ ]
   Wideband [ ]
9. Test Location TRaC Telecoms & Radio
   Skelmersdale [X]
   Hull [ ]
10. Modifications made during test program No modifications were performed.

System description:

The MBF-D-8-19 is bi directional repeater covering two bands in the uplink direction and two bands in the downlink direction. The uplink bands are wideband and cover the frequency ranges 824 MHz – 849MHz and 1850MHz – 1910MHz. The downlink bands are wideband and cover the frequency ranges 869 MHz – 894MHz and 1930MHz – 1990MHz

COMPLIANCE TESTS

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – UPLINK

Ambient temperature	=	20^{o}C	Radio Laboratory
Relative humidity	=	58%	
Supply voltage	=	+110Vac	
Channel number	=	See test results	

800 MHz Band

Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Level at Spectrum Analyser dBm	Output Cable & Attenuator loss dB	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
824.000	-61.00	0.53	-31.66	0.45	30.32	-31.21	20.35
836.500	-62.90	0.52	-32.01	0.45	31.86	-31.56	21.92
849.000	-61.10	0.47	-32.44	0.45	29.58	-31.99	19.69

Notes: 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

1900 MHz Band

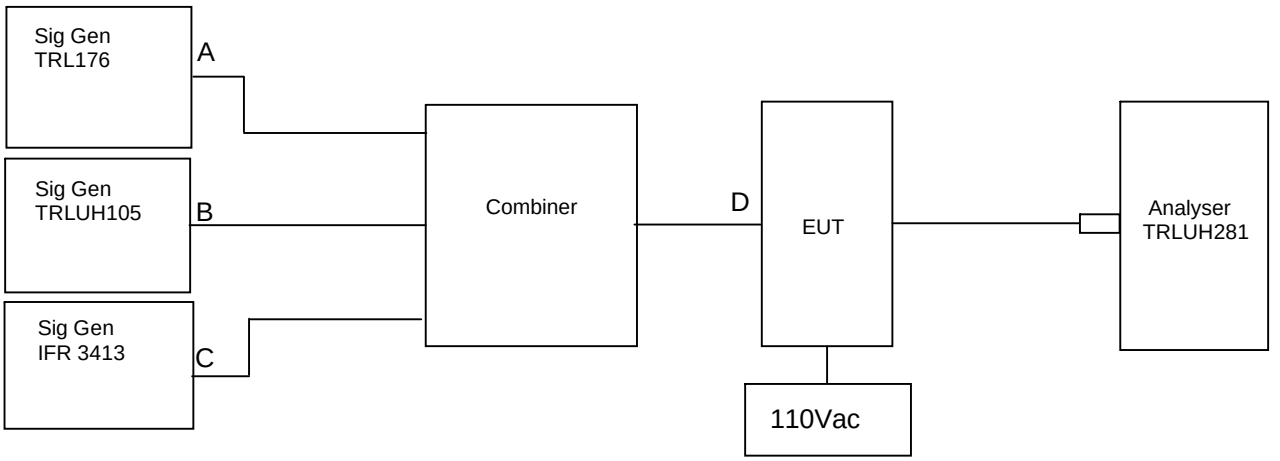
Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Level at Spectrum Analyser dBm	Output Cable & Attenuator loss dB	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
1850.000	-62.00	0.72	-33.23	0.7	30.21	-32.51	20.26
1880.000	-62.30	0.78	-33.25	0.8	30.61	-32.47	20.64
1910.000	-60.60	0.81	-32.58	0.8	29.64	-31.77	19.67

Notes: 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
ATTENUATOR	AXELL	N/A	N/A	N/A	**X**
ATTENUATOR	SPINNER	745357	D37224	UH225	**X**
CABLE	TRaC	N/A	N/A	UH273	**X**
CABLE	TRaC	N/A	N/A	UH274	**X**

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK

Ambient temperature = 24°C Radio Laboratory
Relative humidity = 56%
Supply voltage = +110Vac



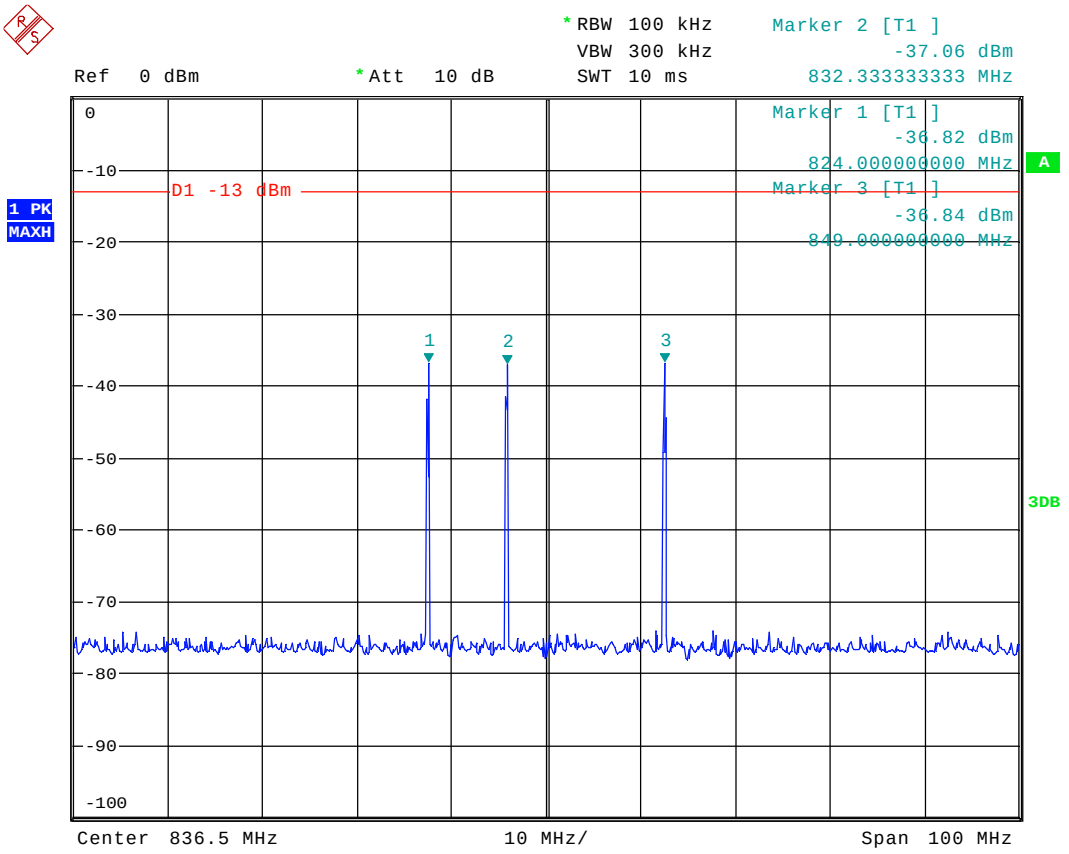
The intermodulation and spurious products were measured with the amplifier operating at maximum gain. A three tone test was conducted using the equipment as above. The input power level was adjusted so the level at point D was 10dB above the maximum input.

Uplink Band	RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
800 MHz	824.0	832.5	849.0	No Significant Emissions Within 20 dB of Limit	-13
1900 MHz	1850.0	1870.0	1910.0	No Significant Emissions Within 20 dB of Limit	-13
Cross Band	824.0	1850.0	1910.0	No Significant Emissions Within 20 dB of Limit	-13

Test equipment used for intermodulation test

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
SIGNAL GENERATOR	MARCONI	2023	112224/040	UH105	**X**
COMBINER	AXELL	N/A	N/A	N/A	**X**
ATTENUATOR	AXELL	N/A	N/A	N/A	**X**
ATTENUATOR	SPINNER	745357	D37224	UH225	**X**
CABLE	TRaC	N/A	N/A	UH253	**X**
CABLE	TRaC	N/A	N/A	UH254	**X**
CABLE	TRaC	N/A	N/A	UH269	**X**
CABLE	TRaC	N/A	N/A	UH273	**X**
CABLE	TRaC	N/A	N/A	UH274	**X**

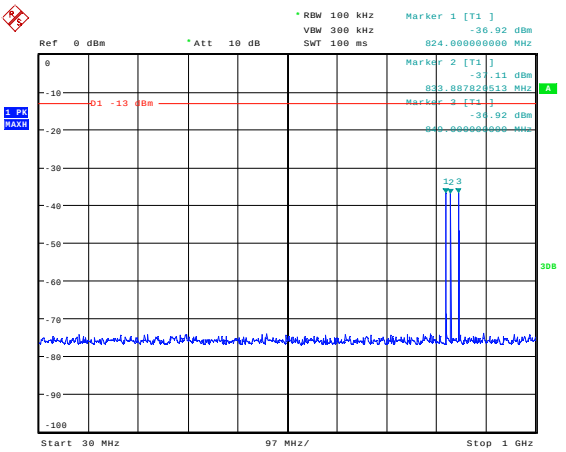
Intermodulation Inband – 800MHz Band



Date: 19.NOV.2010 10:25:33

The above plot shows that no products fall within 20 dB of the spurious limit.

Intermodulation Wideband – 800MHz Band



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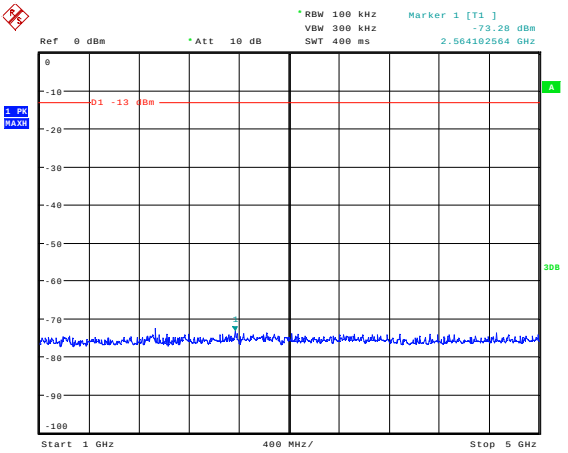

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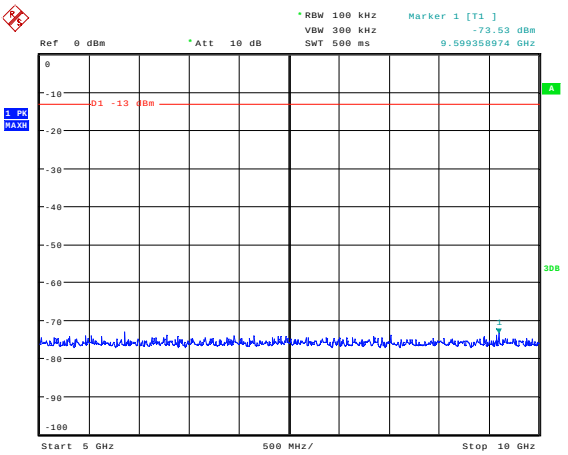
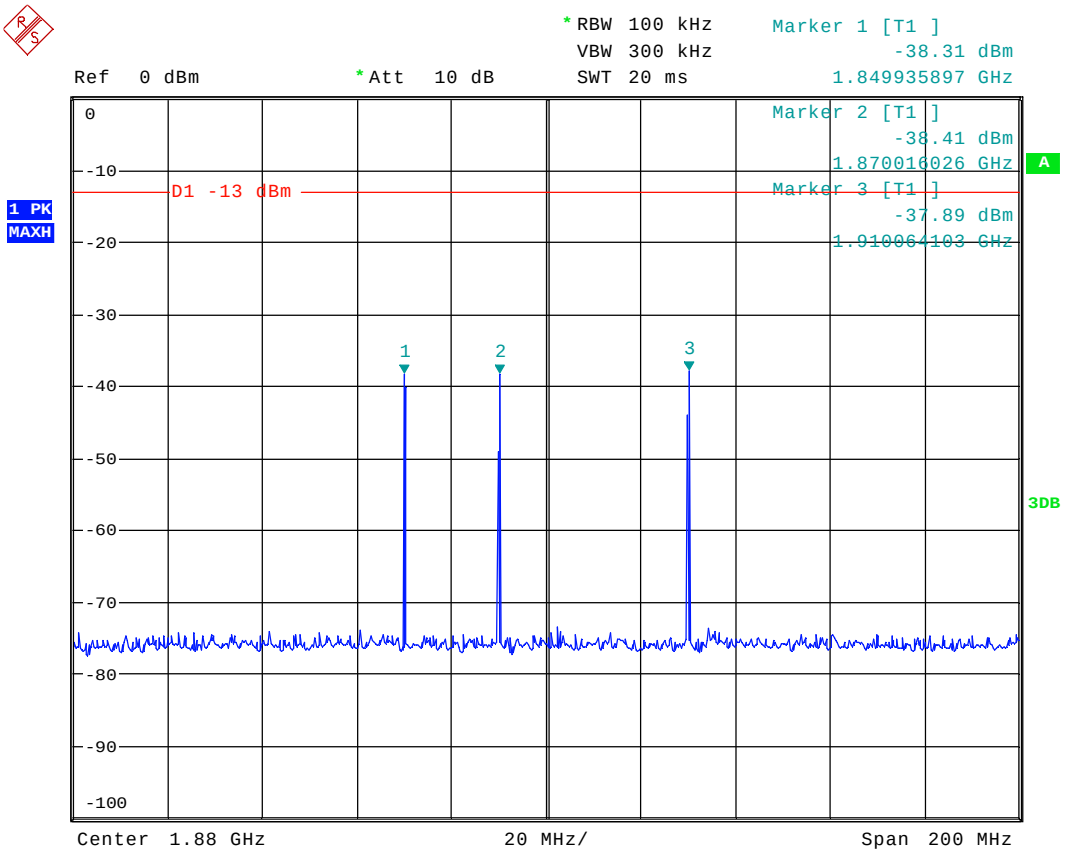


Date: 19.NOV.2010 10:28:06

The above plot shows that there are no products outside the bands.

Intermodulation Inband – 1900MHz Band



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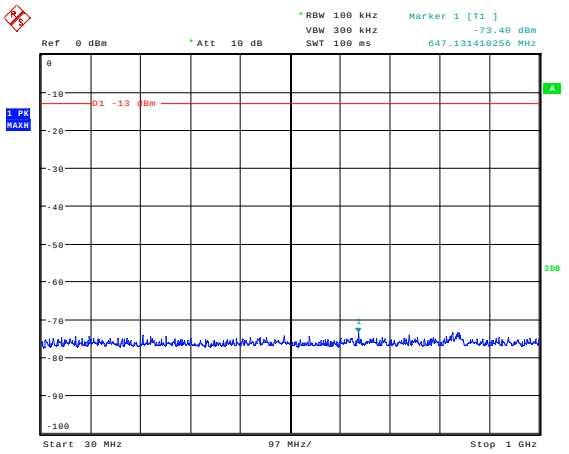
The above plot shows that no products fall within 20 dB of the spurious limit.

Intermodulation Wideband – 1900MHz Band



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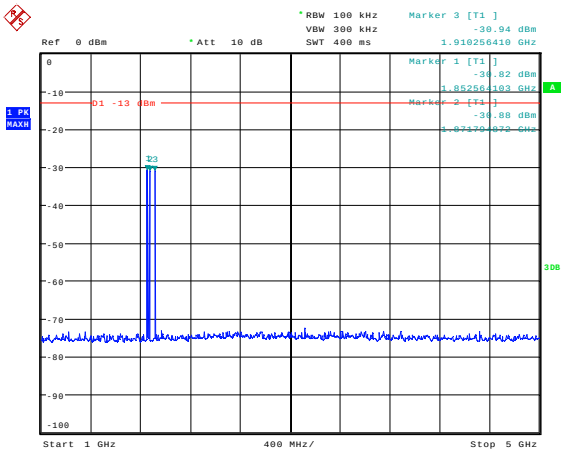

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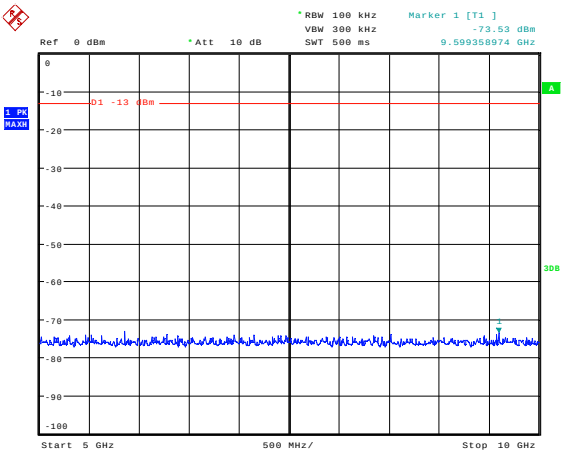
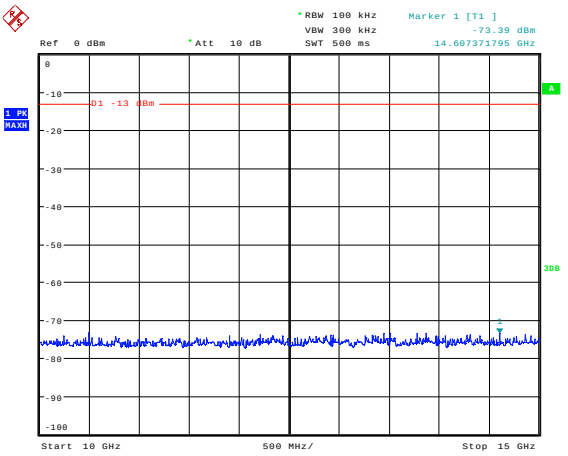


Date: 19.NOV.2010 10:28:06

The above plot shows that there are no products outside the bands.

Intermodulation Wideband – 1900MHz Band



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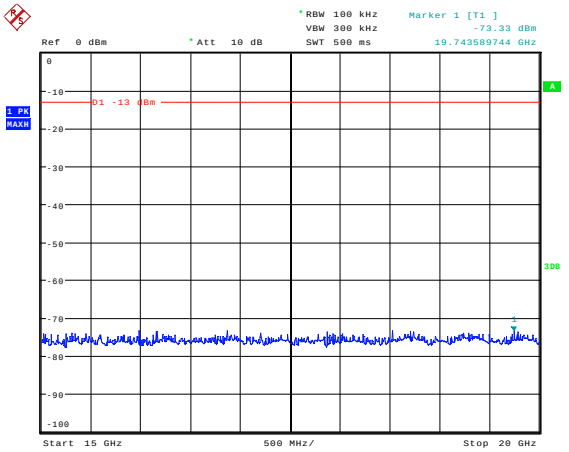
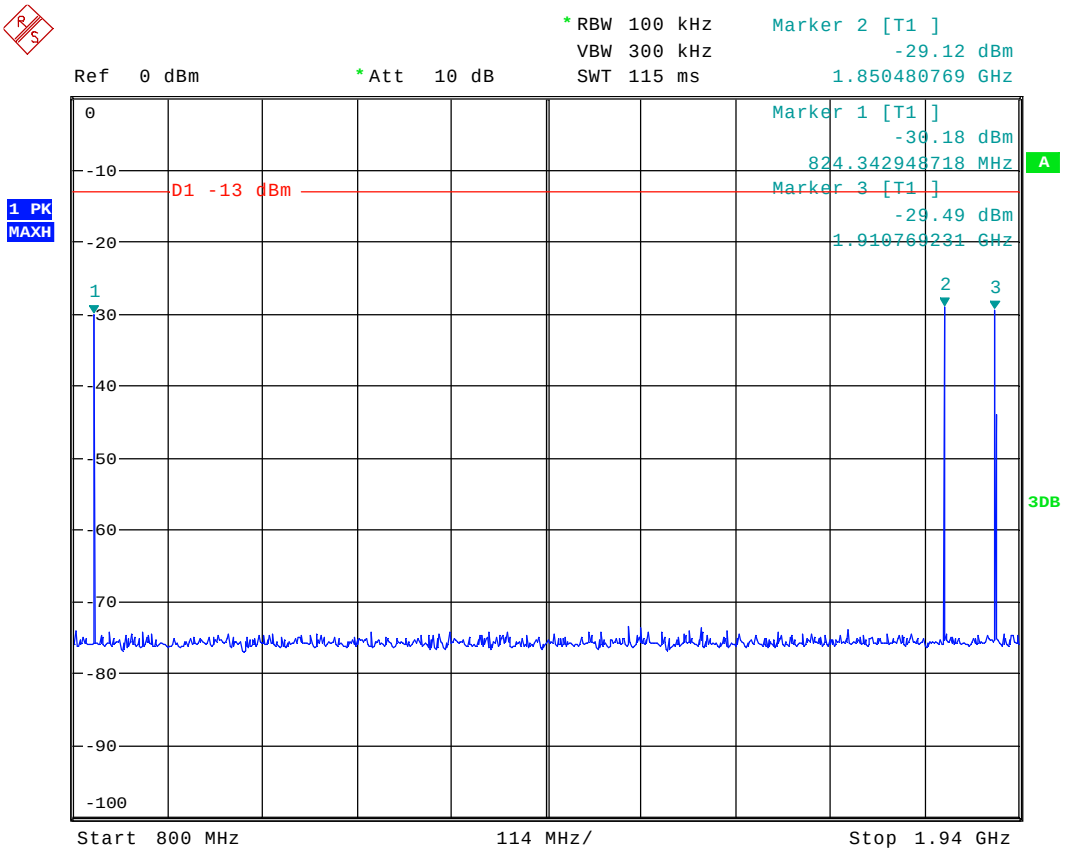


Date: 19.NOV.2010 10:39:31

The above plot shows that there are no products outside the bands.

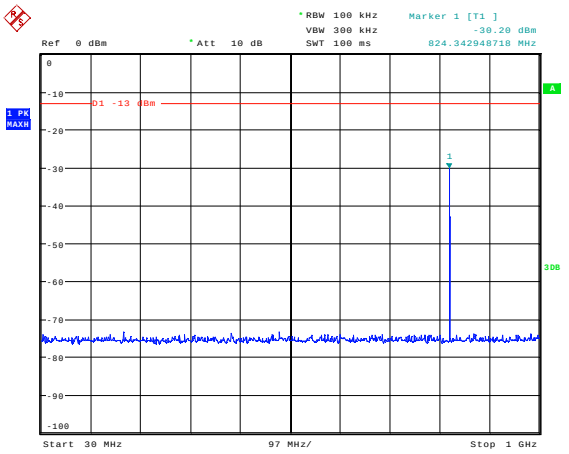
Intermodulation Inband – Cross Band



Date: 11.JAN.2011 15:05:14

The above plot shows that no products fall within 20 dB of the spurious limit.

Intermodulation Wideband – Cross Band



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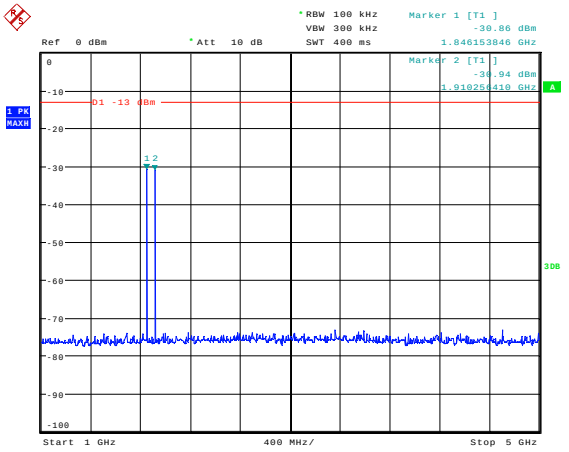

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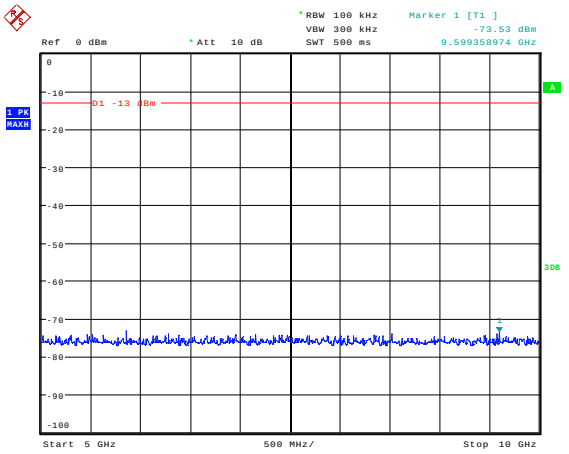
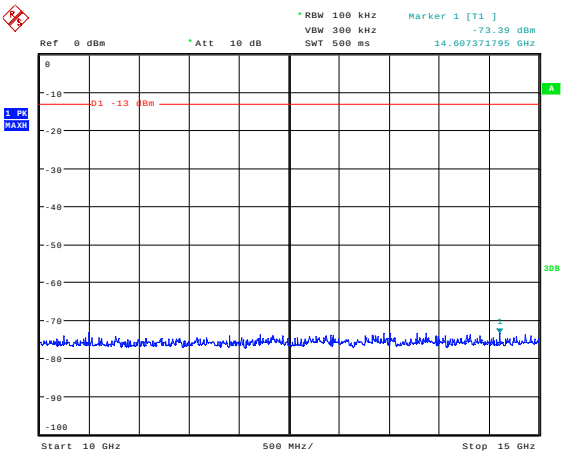


Date: 19.NOV.2010 10:28:06

The above plot shows that there are no products outside the bands.

Intermodulation Wideband – Cross Band



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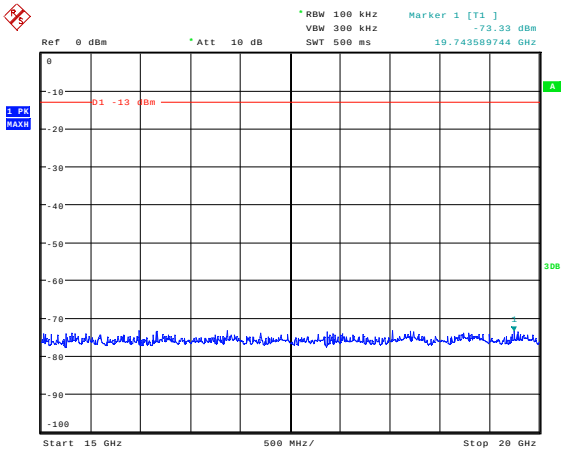


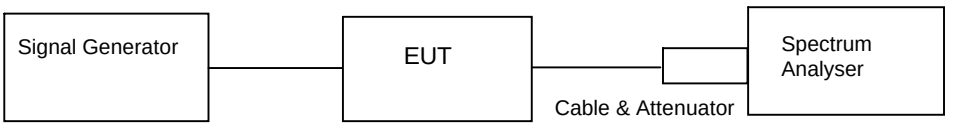
Date: 19.NOV.2010 10:39:31

The above plot shows that there are no products outside the bands.

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– UPLINK

Ambient temperature = 24°C Radio Laboratory
Relative humidity = 56%
Supply voltage = +110Vac
Channel number = See test results



This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input. The following modulation schemes were produced, a 2500Hz FM tone with 2.5 and 5 kHz deviation, 20MHz wide LTE, GSM, EDGE, CDMA and W-CDMA.

The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

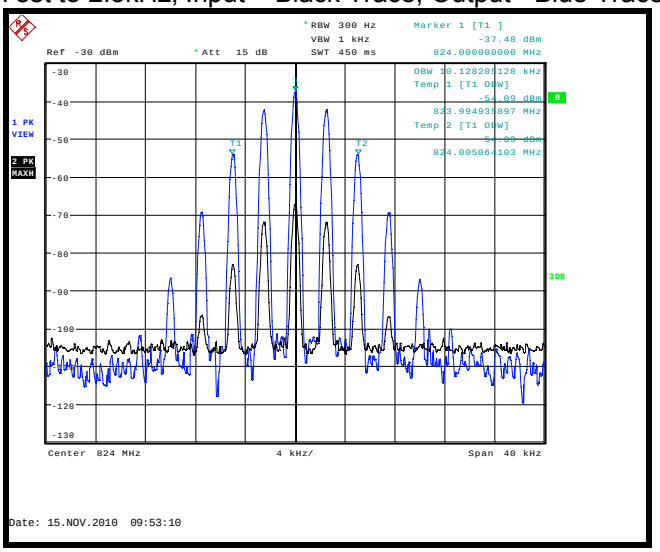
Note: The cables and attenuators had the following losses.

1. Cable and attenuator between EUT and spectrum analyser 40.7dB
2. Cable between signal generator and EUT 0.4dB

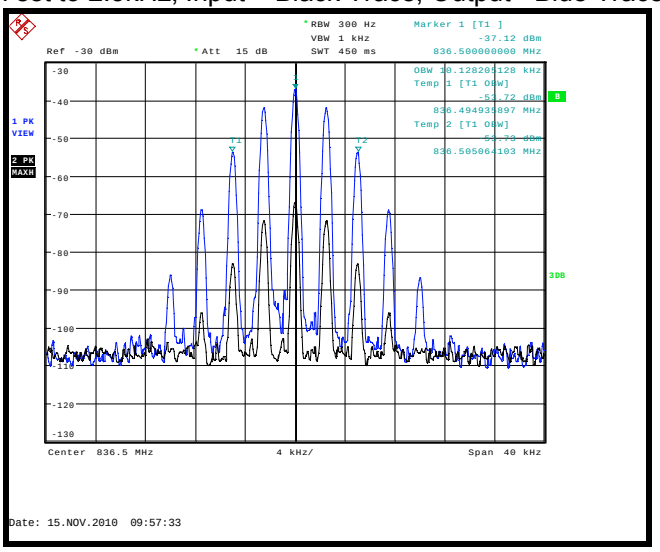
Frequency Of Operational	Modulation Type						
	2.5 kHz FM	5 kHz FM	LTE	GSM	EDGE	CDMA	W-CDMA
824.000	10.128 kHz	15.256 kHz	17.839 MHz	243.589 kHz	238.782 kHz	1.272 MHz	4.134 MHz
836.500	10.128 kHz	15.256 kHz	17.875 MHz	241.987 kHz	237.179 kHz	1.275 MHz	4.173 MHz
849.000	10.128 kHz	15.256 kHz	17.839 MHz	241.987 kHz	238.782 kHz	1.277 MHz	4.144 MHz
1850.000	10.128 kHz	15.256 kHz	17.875 MHz	241.987 kHz	238.782 kHz	1.272 MHz	4.134 MHz
1880.000	10.128 kHz	15.256 kHz	17.910 MHz	241.987 kHz	235.576 kHz	1.275 MHz	4.173 MHz
1910.000	10.128 kHz	15.256 kHz	17.875 MHz	243.589 kHz	233.974 kHz	1.272 MHz	4.163 MHz

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
ATTENUATOR	BIRD	8308-200	N/A	103	**X**
ATTENUATOR	BIRD	830-100-N	N/A	222	**X**
CABLE	TRaC	N/A	N/A	UH273	**X**
CABLE	TRaC	N/A	N/A	UH274	**X**

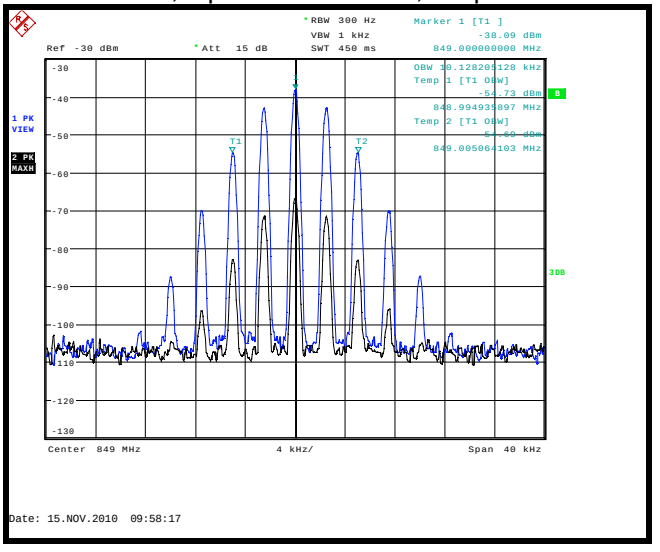
824.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace



836.5MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

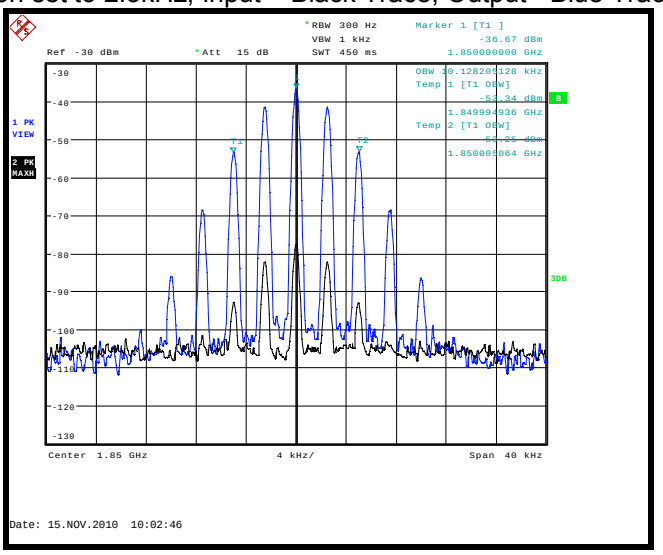


849.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

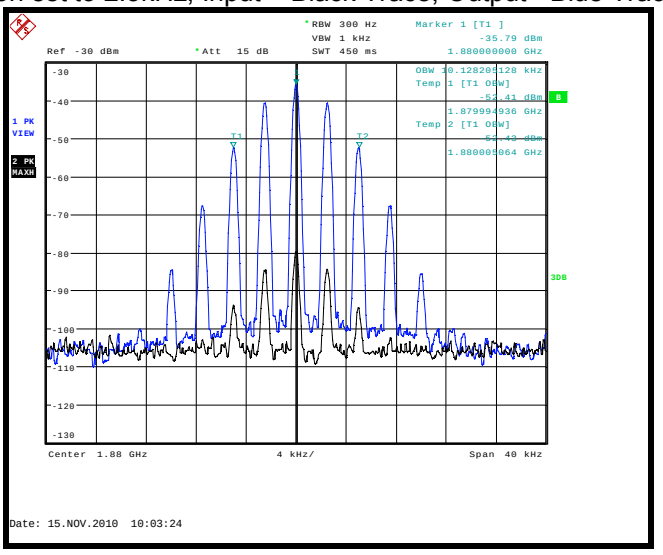


The above plots show no significant distortion visible when compared to the input signal.

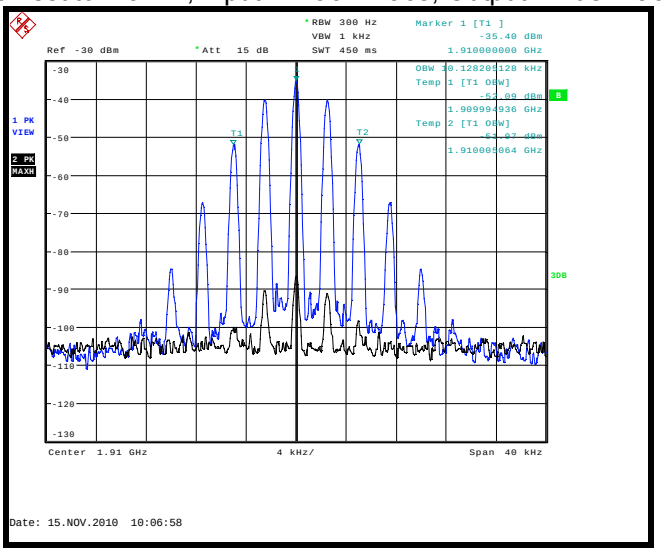
1850.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace



1880.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

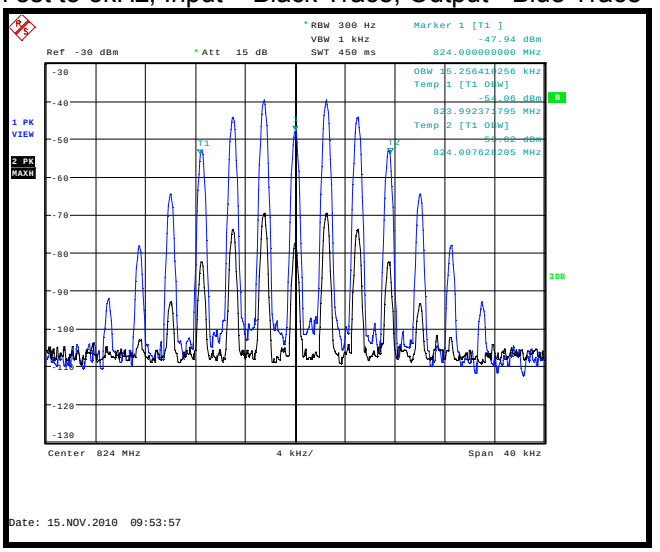


1910.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

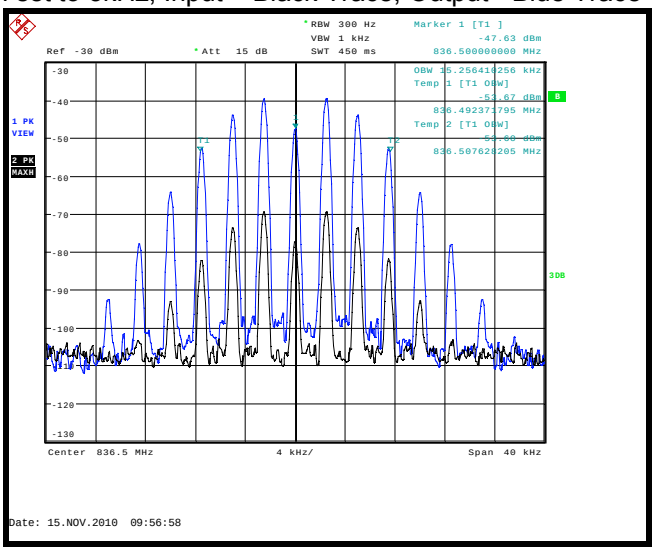


The above plots show no significant distortion visible when compared to the input signal.

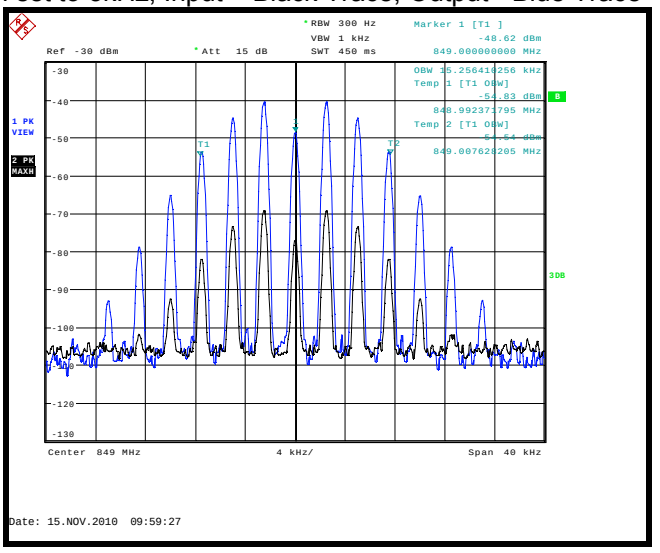
824.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace



836.5MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

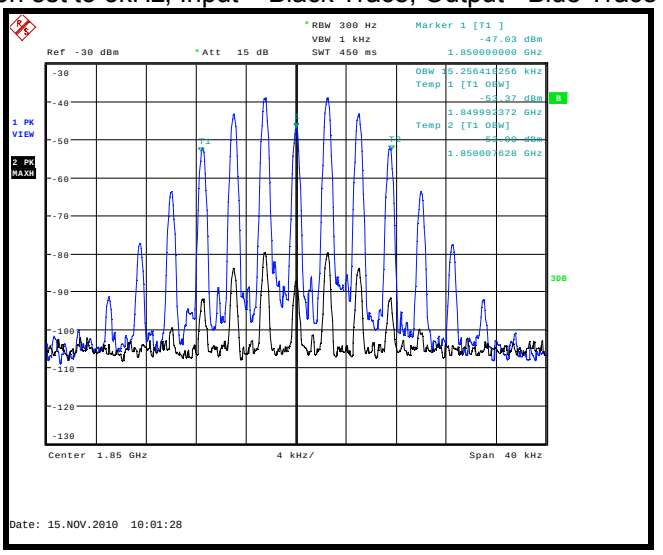


849.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

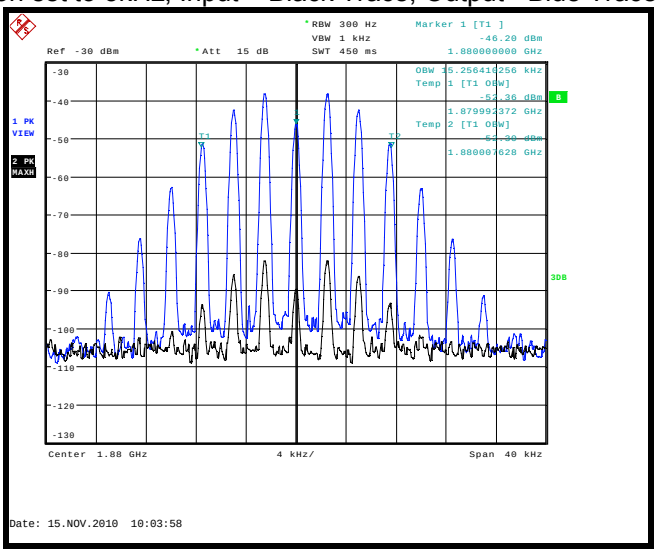


The above plots show no significant distortion visible when compared to the input signal.

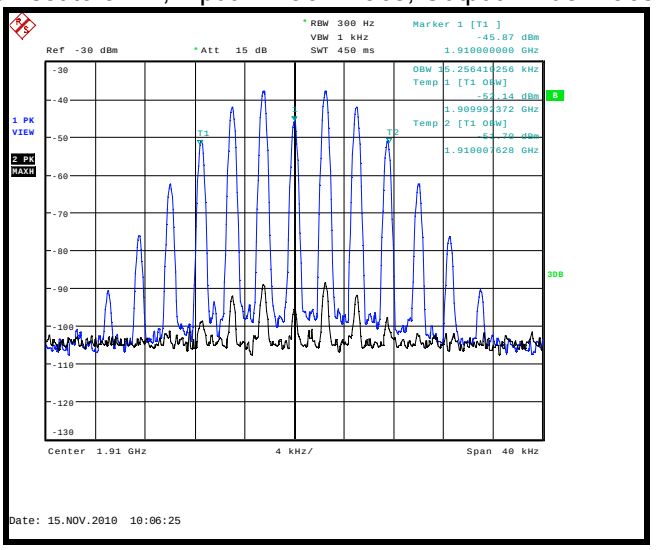
1850.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace



1880.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

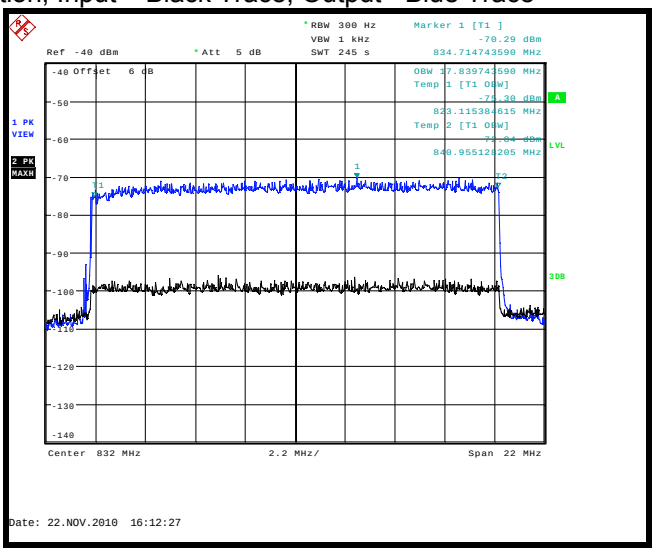


1910.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

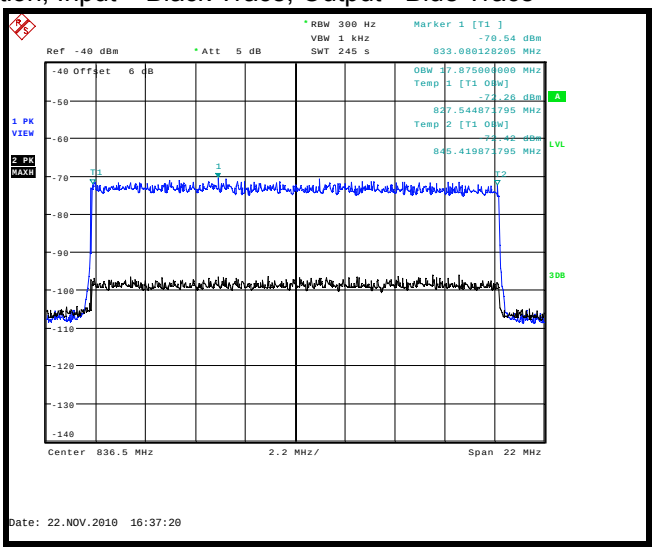


The above plots show no significant distortion visible when compared to the input signal.

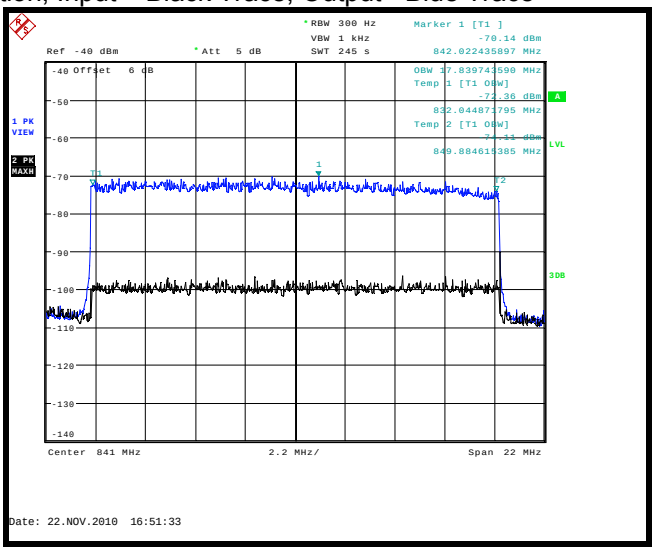
824.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace



836.5MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

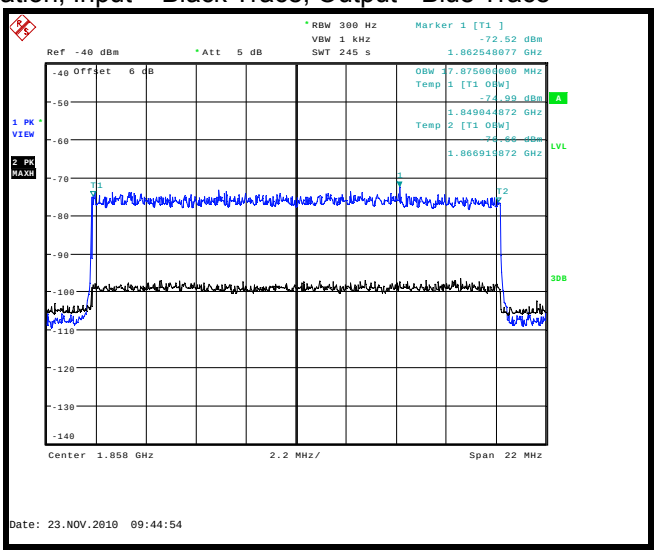


849.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

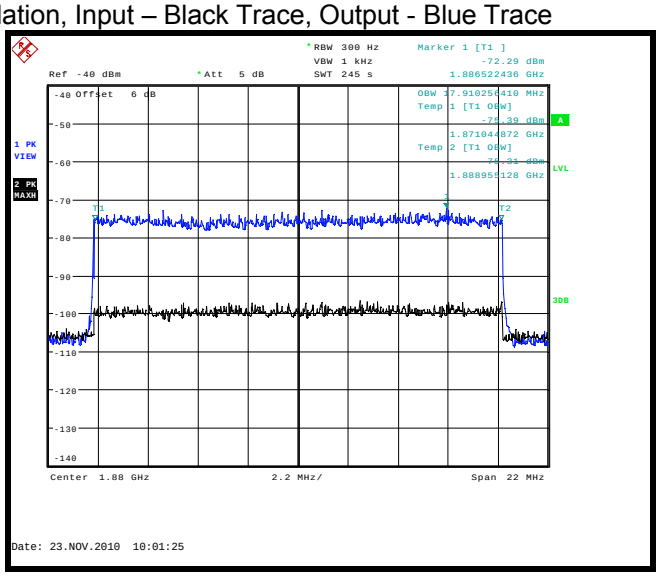


The above plots show no significant distortion visible when compared to the input signal.

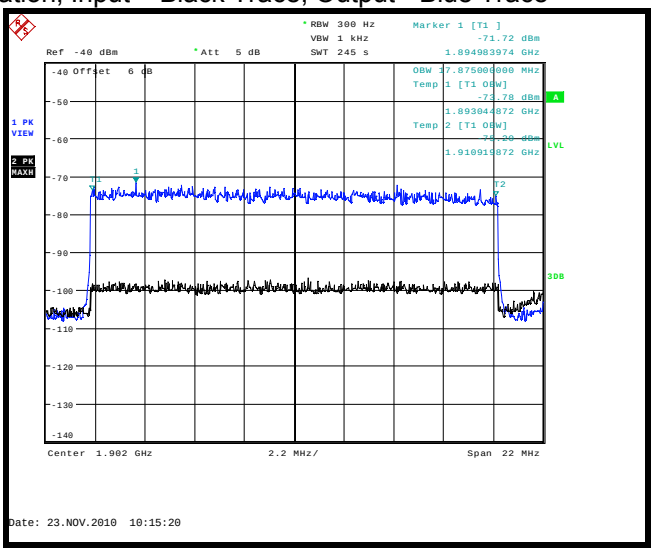
1850.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace



1880.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

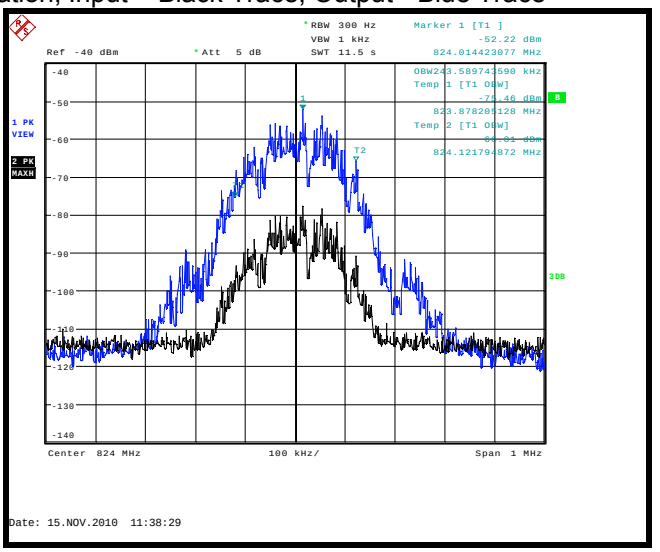


1910.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

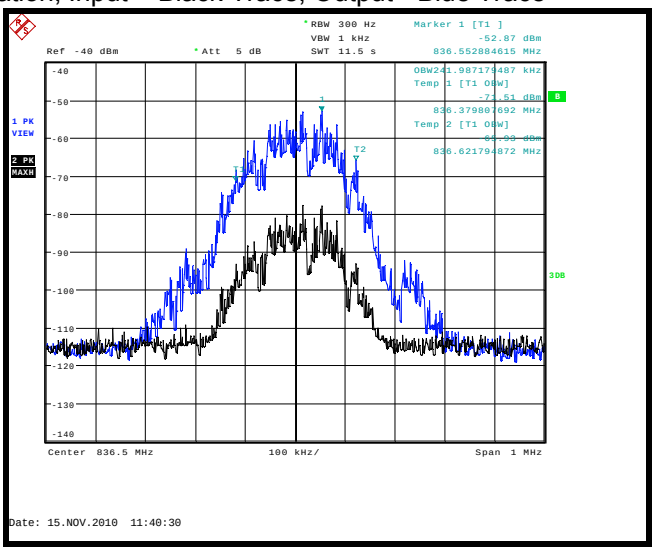


The above plots show no significant distortion visible when compared to the input signal.

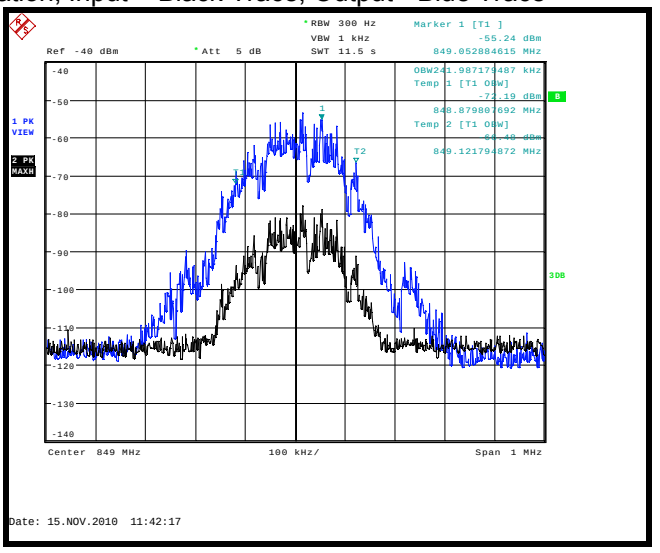
824.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace



836.5MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

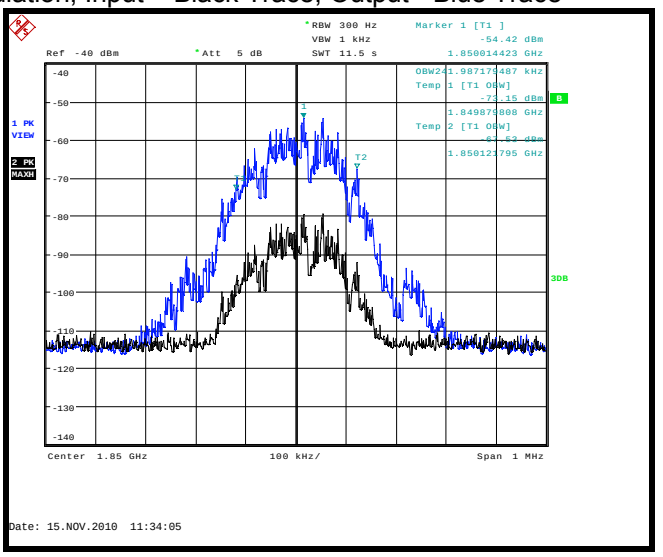


849.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

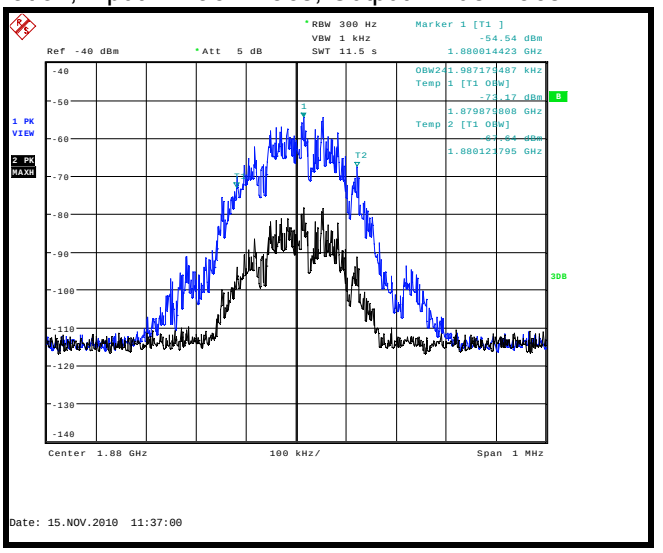


The above plots show no significant distortion visible when compared to the input signal.

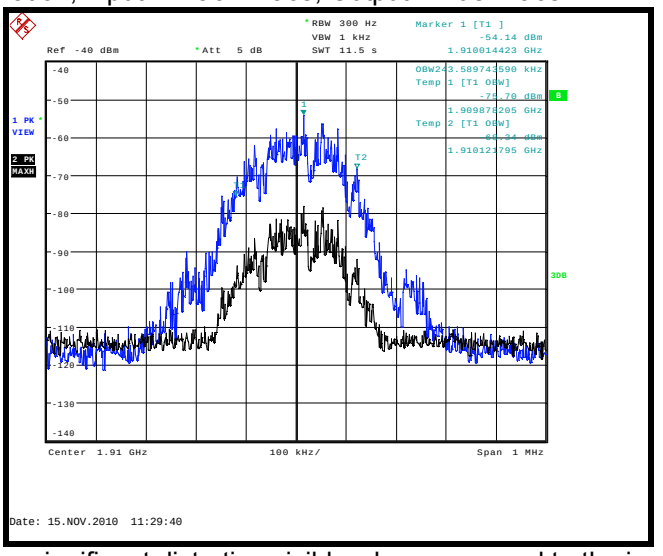
1850.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace



1880.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

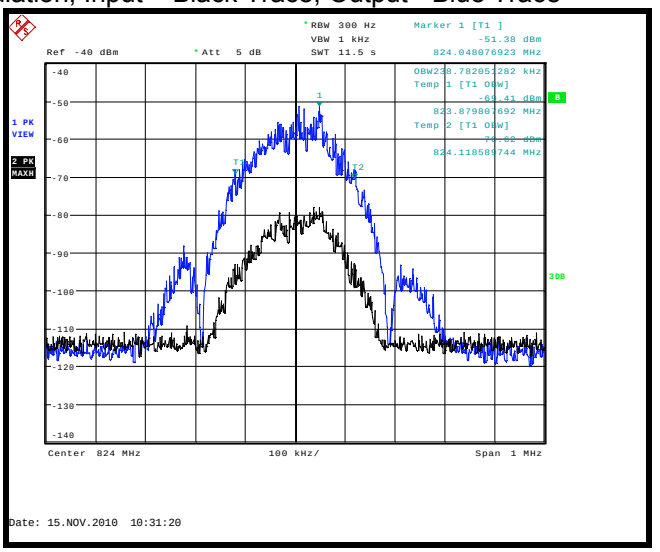


1910.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

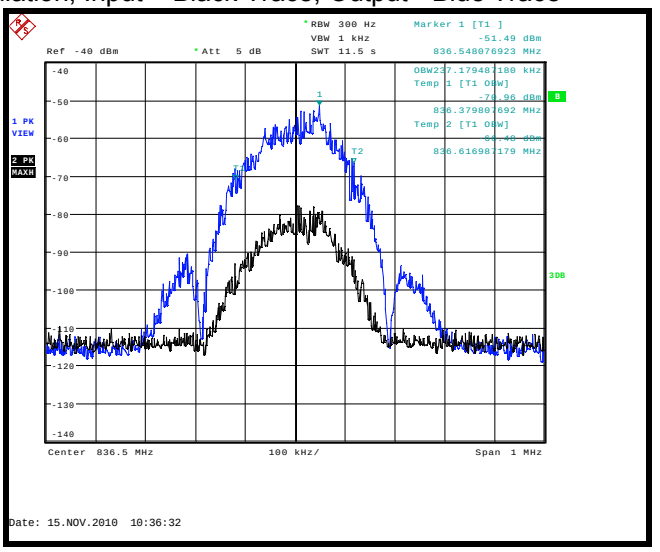


The above plots show no significant distortion visible when compared to the input signal.

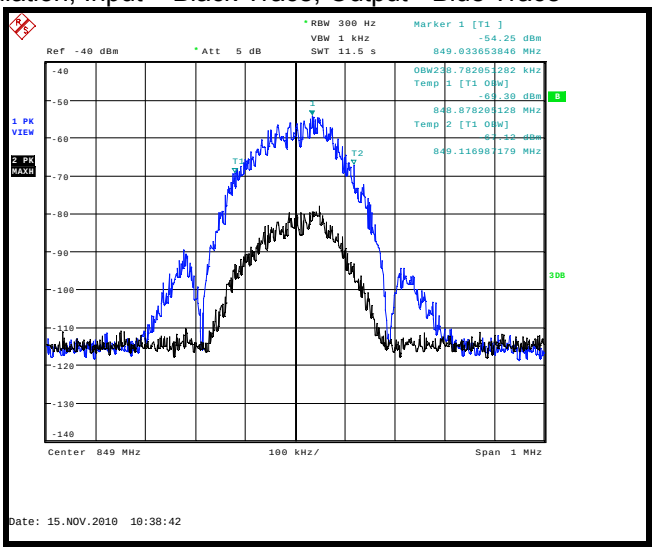
824.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace



836.5MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

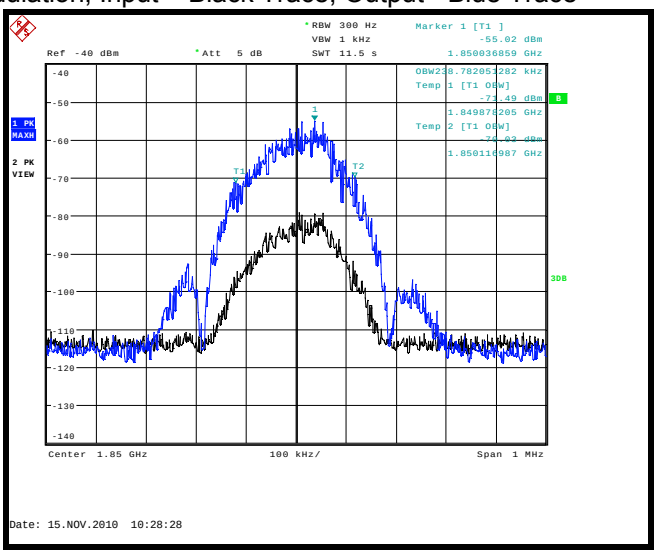


849.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

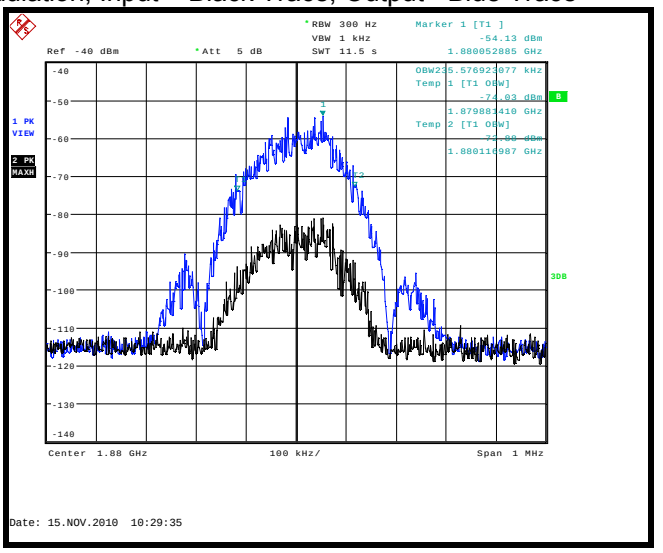


The above plots show no significant distortion visible when compared to the input signal.

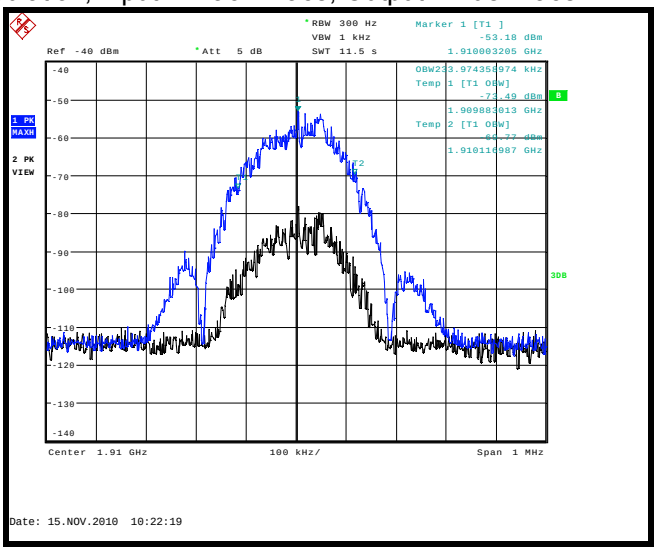
1850.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace



1880.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

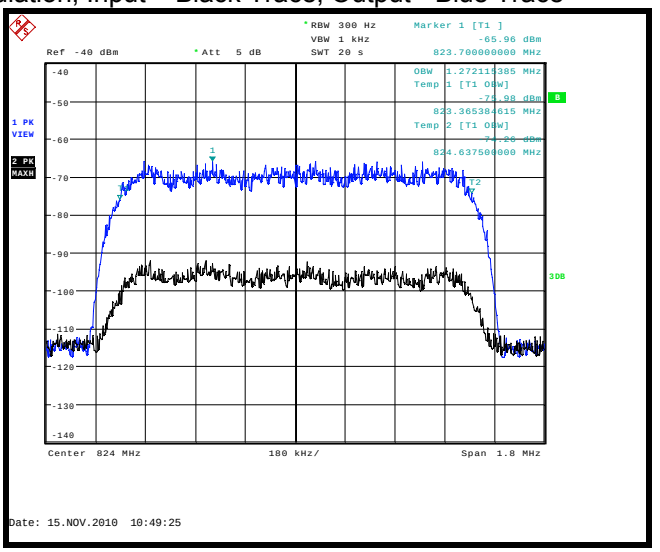


1910.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

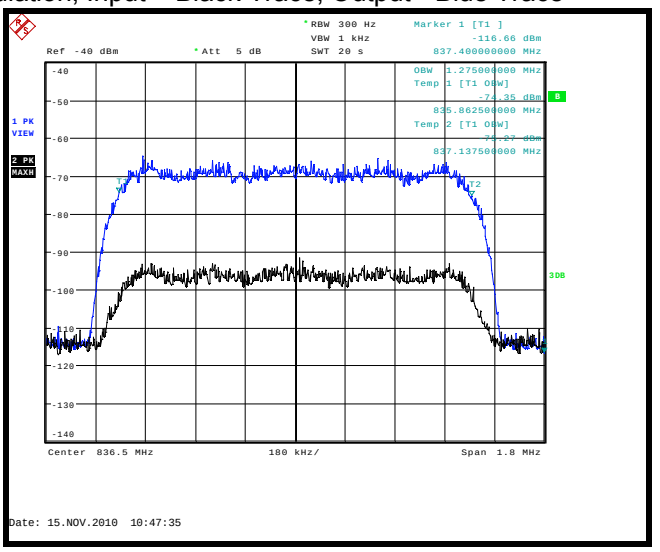


The above plots show no significant distortion visible when compared to the input signal.

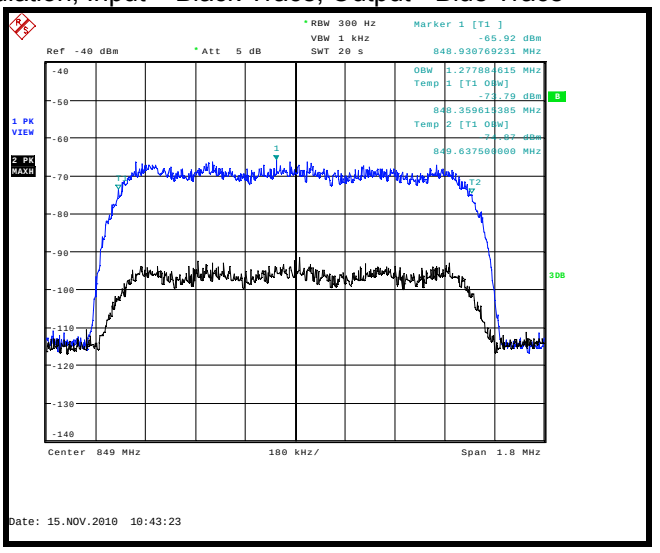
824.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace



836.5MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

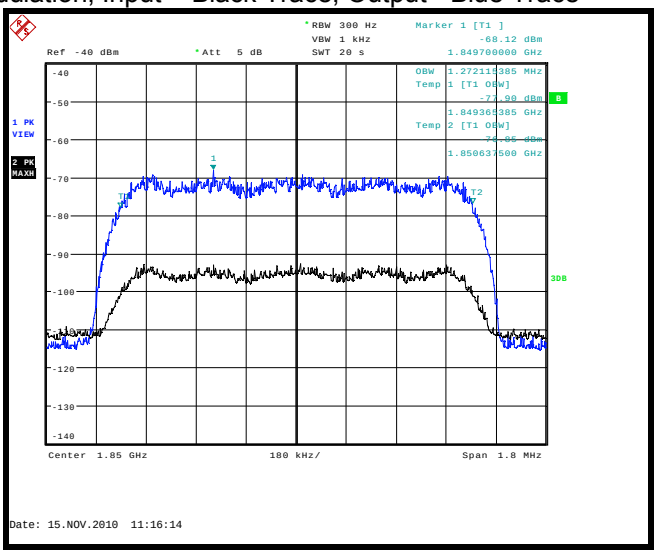


849.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

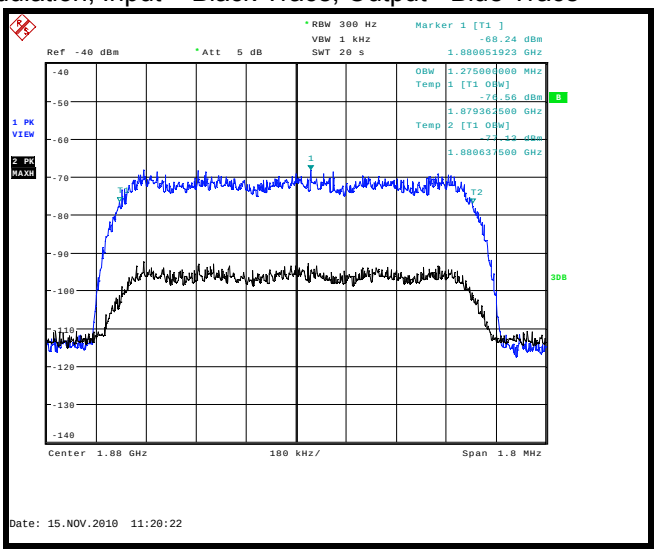


The above plots show no significant distortion visible when compared to the input signal.

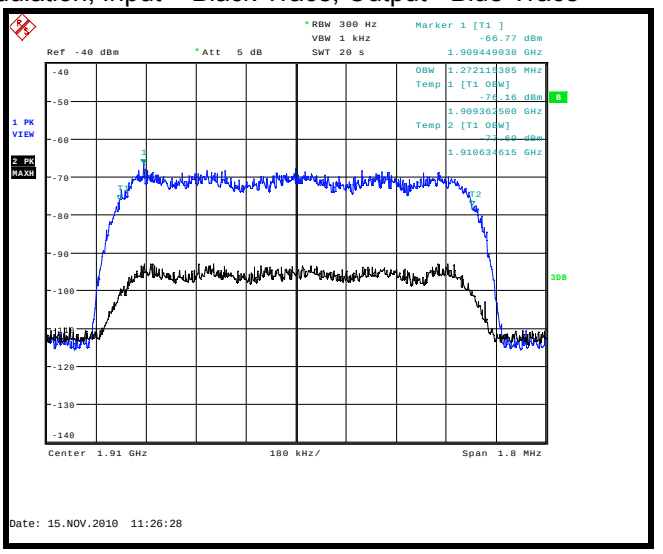
1850.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace



1880.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

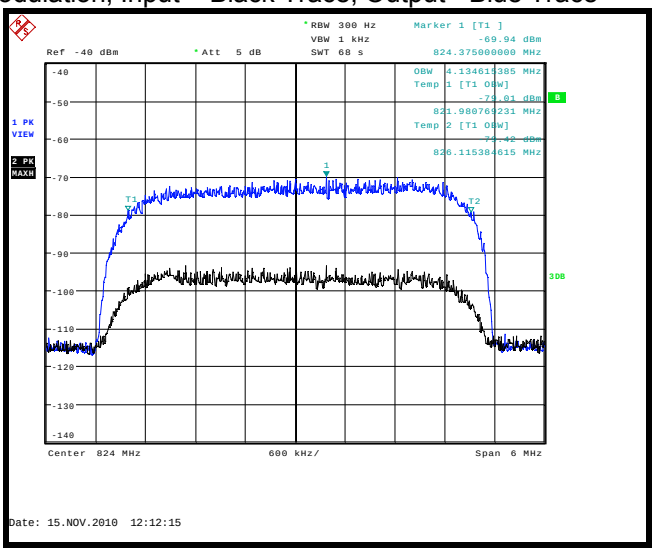


1910.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

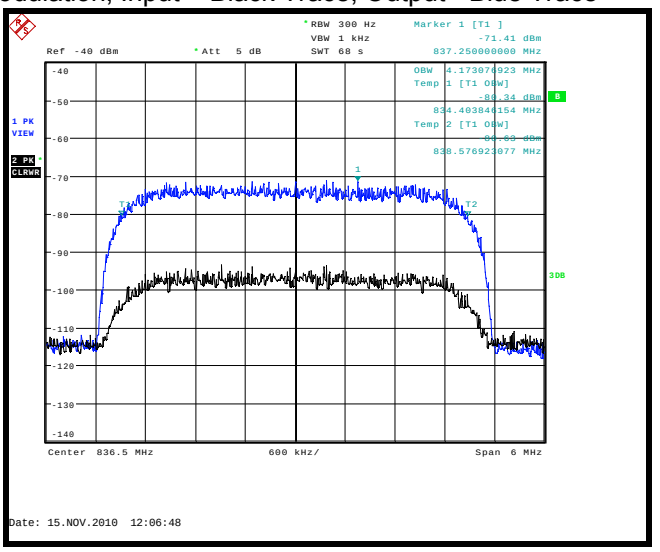


The above plots show no significant distortion visible when compared to the input signal.

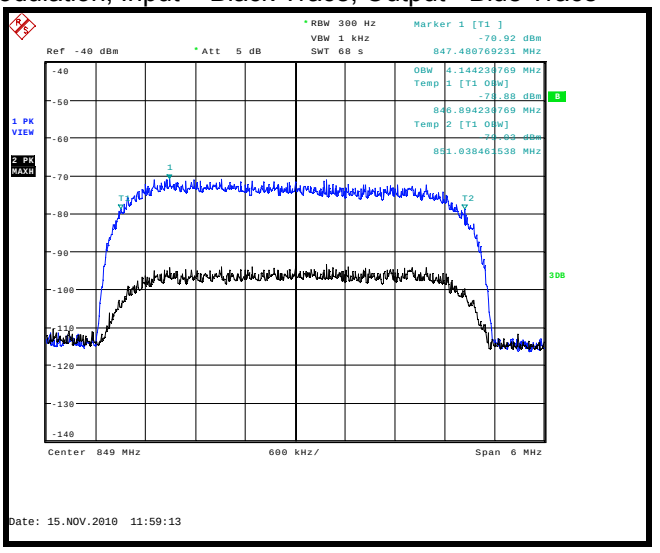
824.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace



836.5MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace

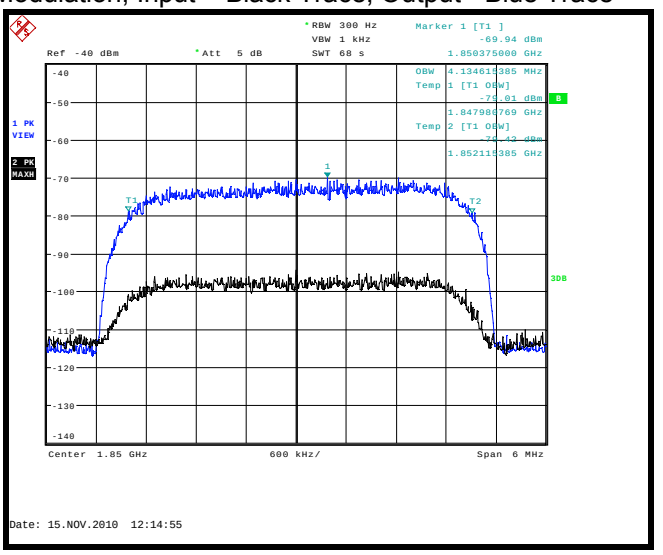


849.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace

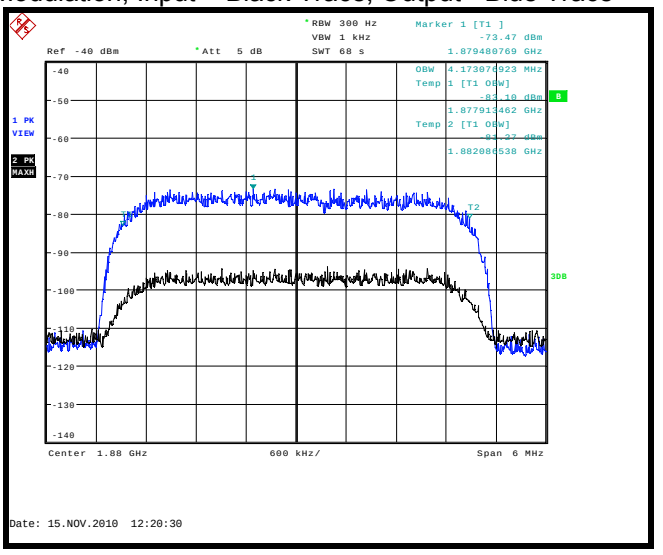


The above plots show no significant distortion visible when compared to the input signal.

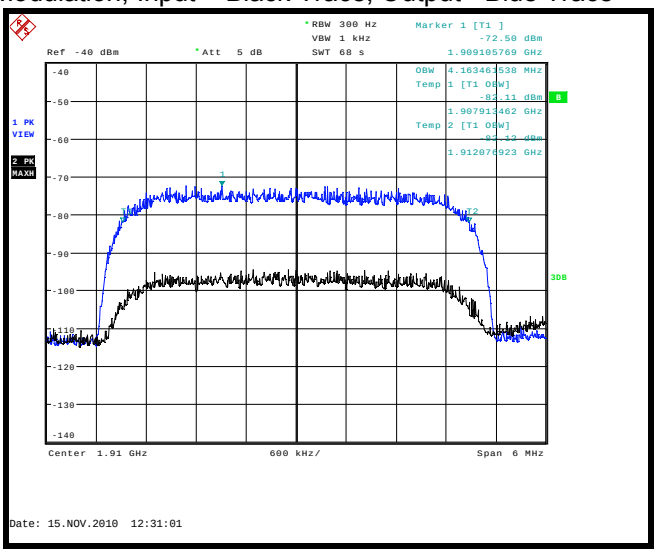
1850.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace



1880.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace



1910.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace

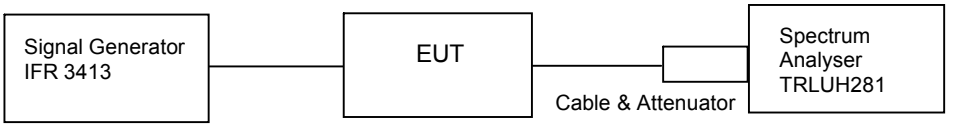


The above plots show no significant distortion visible when compared to the input signal.

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – UPLINK

Ambient temperature = 20°C Radio Laboratory
Relative humidity = 45%
Supply voltage = +110Vac



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating at maximum power and on three test frequencies.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least 43 + 10 log PdB

$(10\log P_{watts}) – (43+10\log (P_{watts} * 1000)) =$ LIMIT =-13 dBm

RESULTS

800 MHz Band

FREQUENCY RANGE	EUT FREQ (MHz)	EMISSION FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTEN & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
100KHz - 20GHz	No Significant Emissions Within 20 dB of the limit					-13

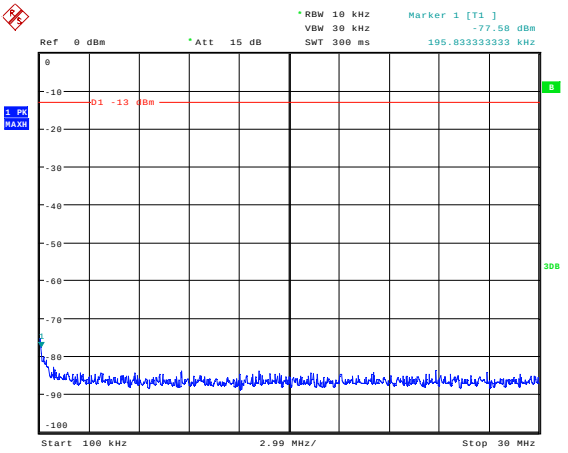
1900 MHz Band

FREQUENCY RANGE	EUT FREQ (MHz)	EMISSION FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTEN & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
100KHz - 20GHz	No Significant Emissions Within 20 dB of the limit					-13

The test equipment used for the Transmitter Conducted Emissions:

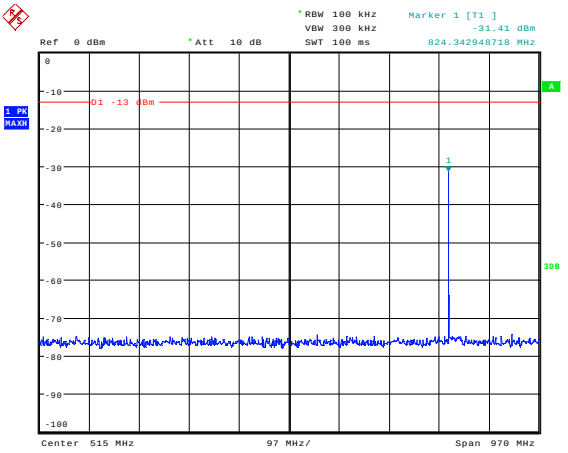
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	AEROFLEX	3413	341001/261	N/A	**X**
ATTENUATOR	BIRD	8308-200	N/A	103	**X**
ATTENUATOR	BIRD	830-100-N	N/A	222	**X**
CABLE	TRaC	N/A	N/A	UH273	**X**
CABLE	TRaC	N/A	N/A	UH274	**X**

Conducted emissions 824.0MHz 100kHz – 30MHz



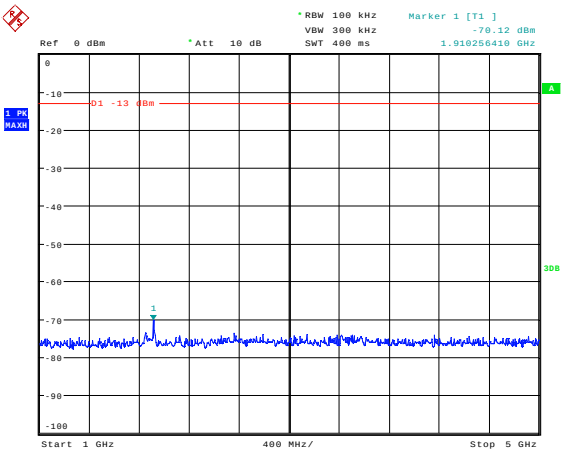
Date: 12.NOV.2010 15:15:20

Conducted emissions 824.0MHz 30MHz – 1GHz



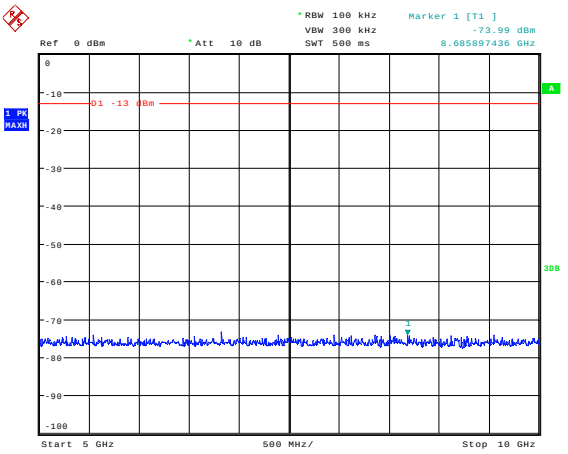
Date: 12.NOV.2010 15:15:30

Conducted emissions 824.0MHz 1 – 5GHz



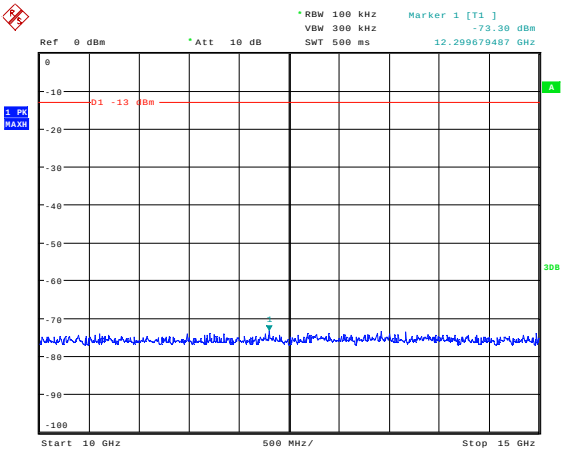
Date: 12.NOV.2010 15:15:44

Conducted emissions 824.0MHz 5 – 10GHz



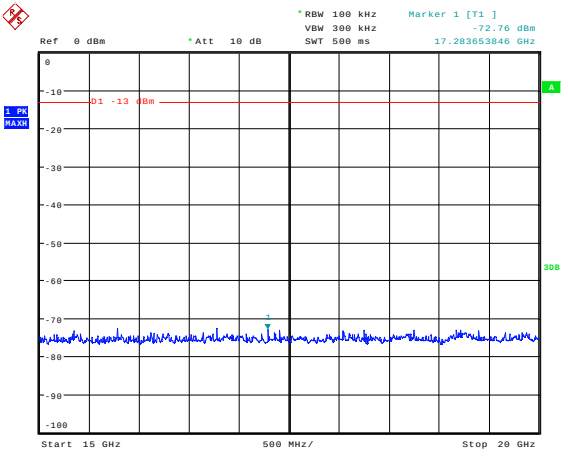
Date: 12.NOV.2010 15:16:01

Conducted emissions 824.0MHz 10 – 15GHz



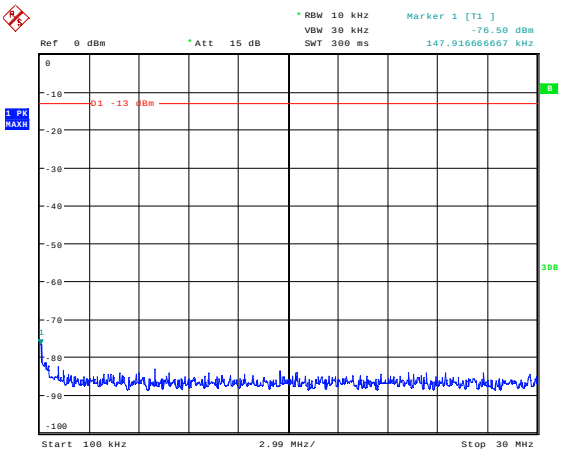
Date: 12.NOV.2010 15:16:18

Conducted emissions 824.0MHz 15 – 20GHz



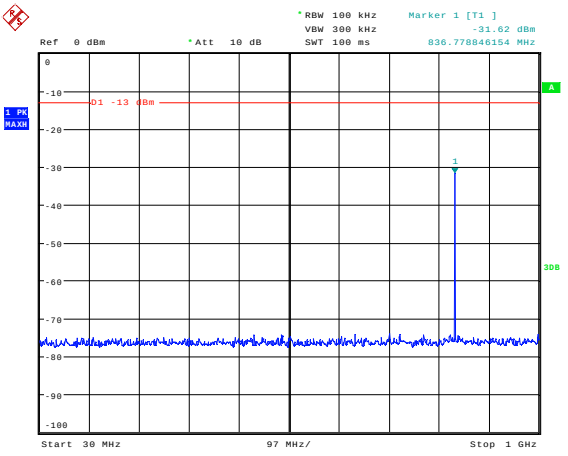
Date: 12.NOV.2010 15:16:38

Conducted emissions 836.5MHz 100kHz – 30MHz



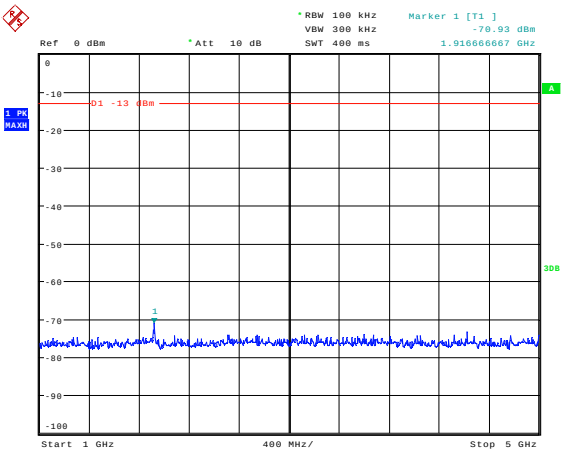
Date: 12.NOV.2010 15:18:56

Conducted emissions 836.5MHz 30MHz – 1GHz



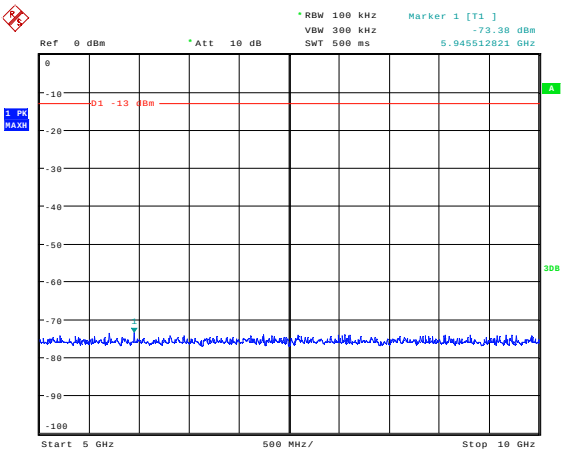
Date: 12.NOV.2010 15:18:42

Conducted emissions 836.5MHz 1 – 5GHz



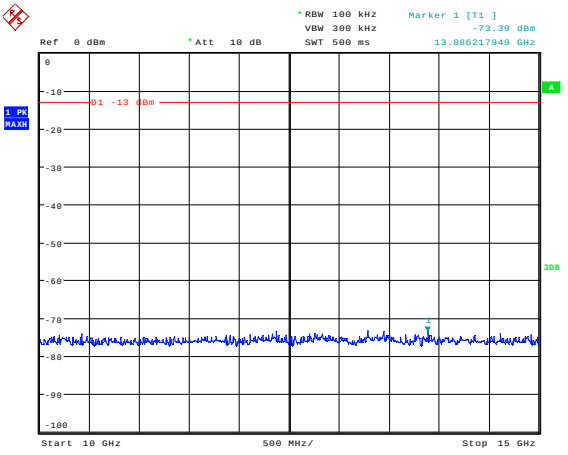
Date: 12.NOV.2010 15:18:28

Conducted emissions 836.5MHz 5 – 10GHz



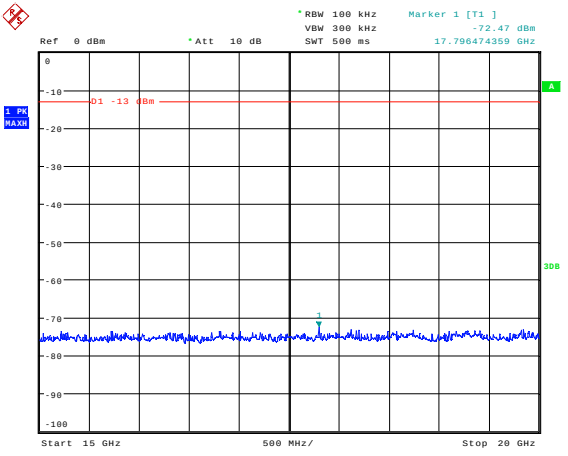
Date: 12.NOV.2010 15:18:17

Conducted emissions 836.5MHz 10 – 15GHz



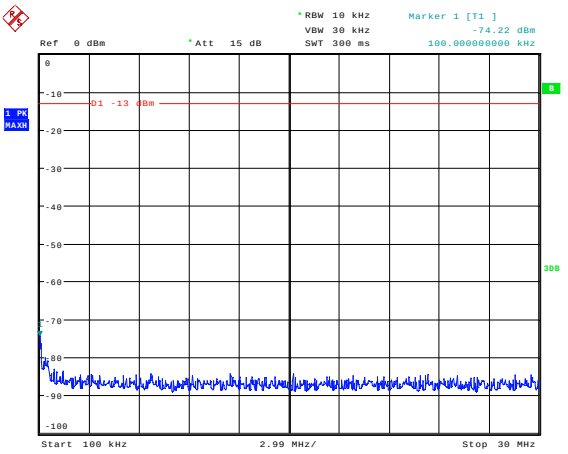
Date: 12.NOV.2010 15:17:51

Conducted emissions 836.5MHz 15 – 20GHz



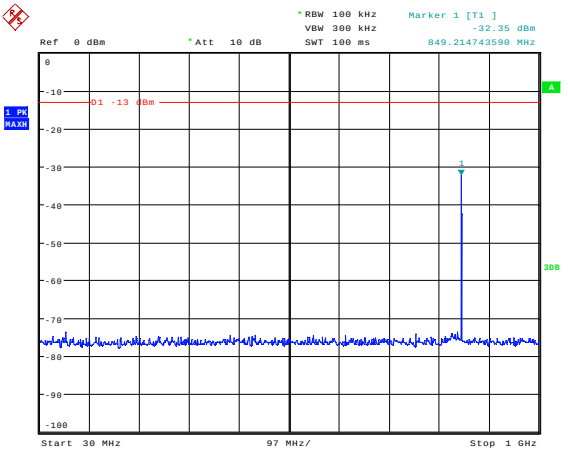
Date: 12.NOV.2010 15:17:34

Conducted emissions 849.0MHz 100kHz – 30MHz



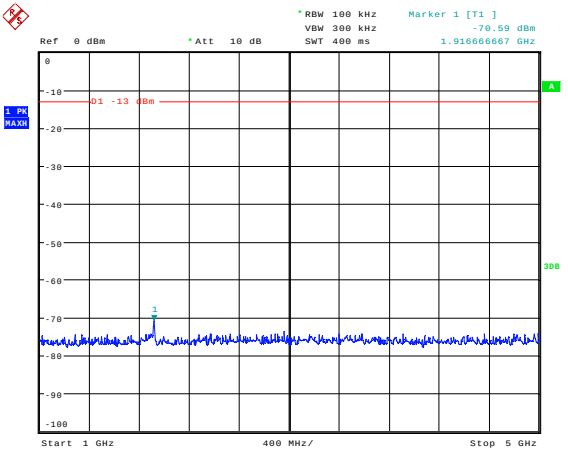
Date: 12.NOV.2010 15:19:25

Conducted emissions 849.0MHz 30MHz – 1GHz



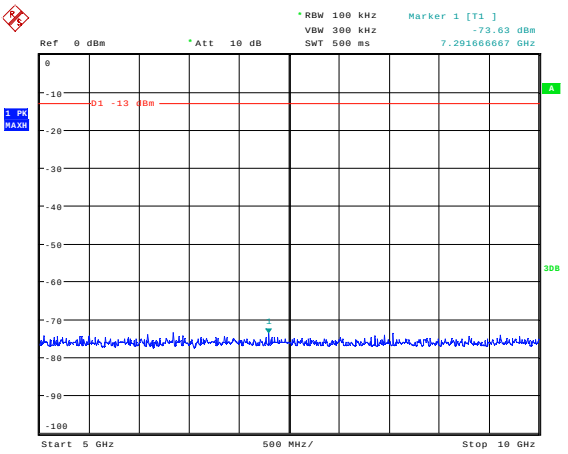
Date: 12.NOV.2010 15:19:38

Conducted emissions 849.0MHz 1 – 5GHz



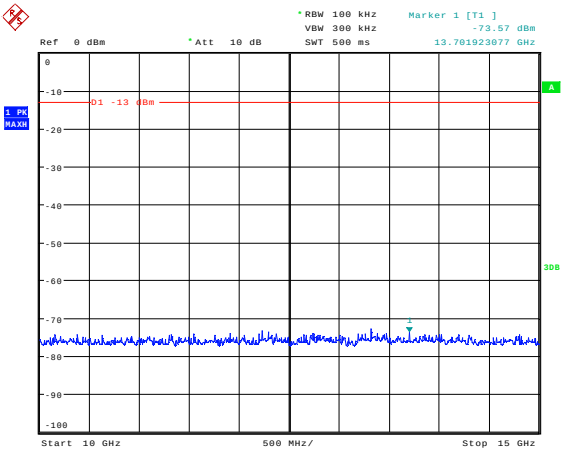
Date: 12.NOV.2010 15:19:53

Conducted emissions 849.0MHz 5 – 10GHz



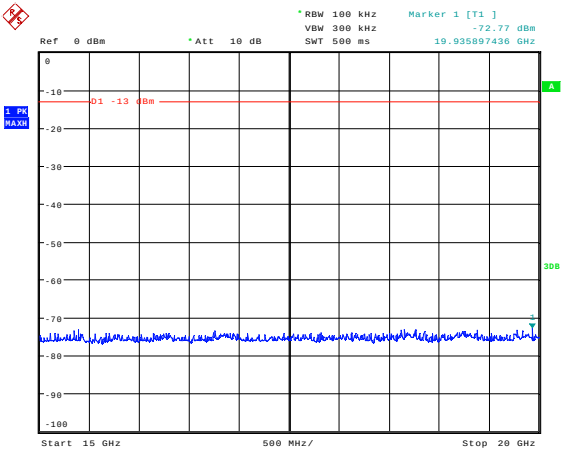
Date: 12.NOV.2010 15:20:08

Conducted emissions 849.0MHz 10 – 15GHz



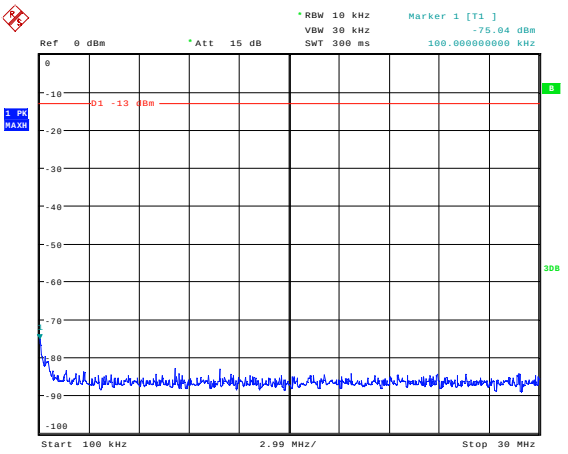
Date: 12.NOV.2010 15:20:46

Conducted emissions 849.0MHz 15 – 20GHz



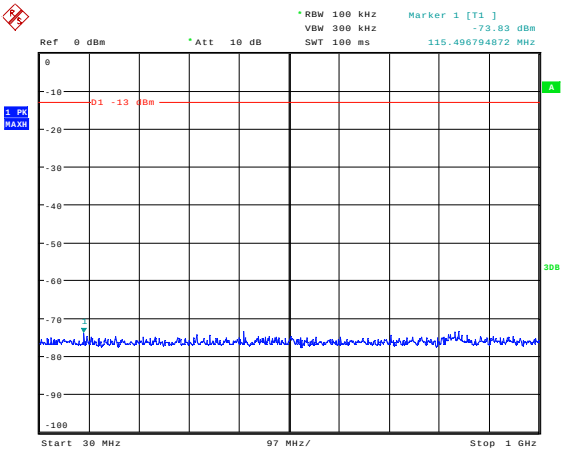
Date: 12.NOV.2010 15:21:12

Conducted emissions 1850.0MHz 100kHz – 30MHz



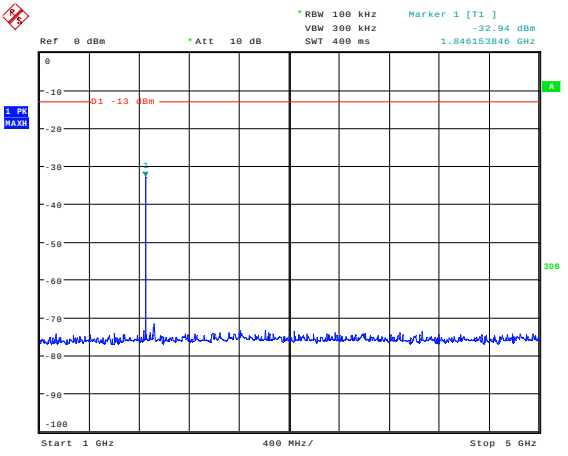
Date: 12.NOV.2010 15:23:36

Conducted emissions 1850.0MHz 30MHz – 1GHz



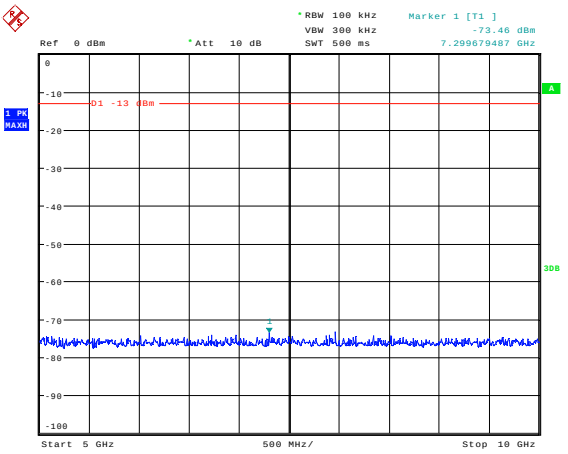
Date: 12.NOV.2010 15:23:22

Conducted emissions 1850.0MHz 1 – 5GHz



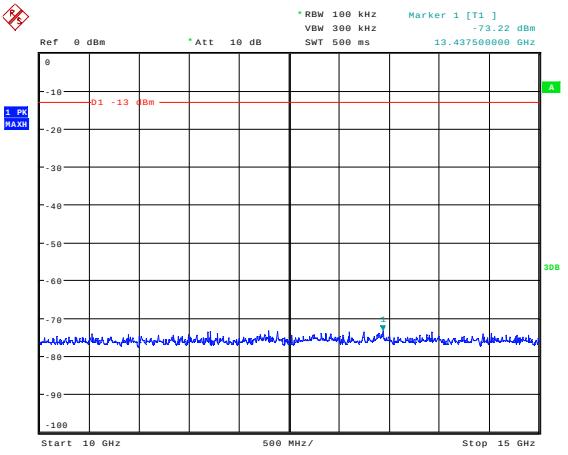
Date: 12.NOV.2010 15:23:06

Conducted emissions 1850.0MHz 5 – 10GHz



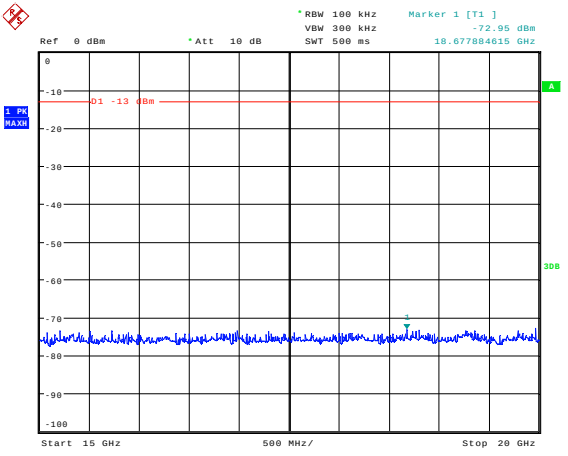
Date: 12.NOV.2010 15:22:43

Conducted emissions 1850.0MHz 10 – 15GHz



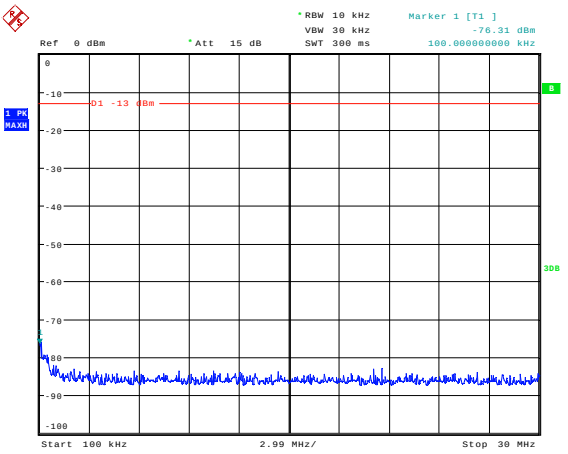
Date: 12.NOV.2010 15:22:27

Conducted emissions 1850.0MHz 15 – 20GHz



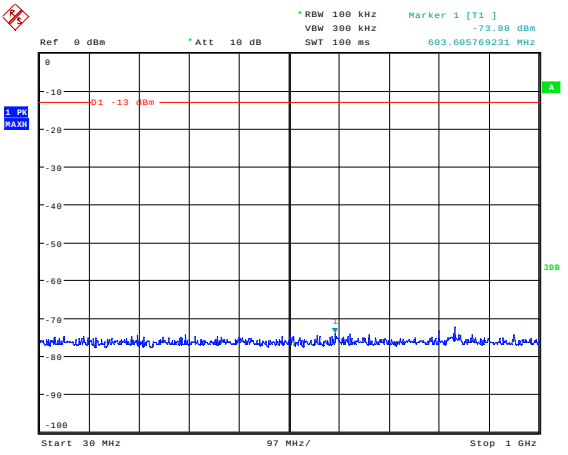
Date: 12.NOV.2010 15:22:10

Conducted emissions 1880.0MHz 100kHz – 30MHz



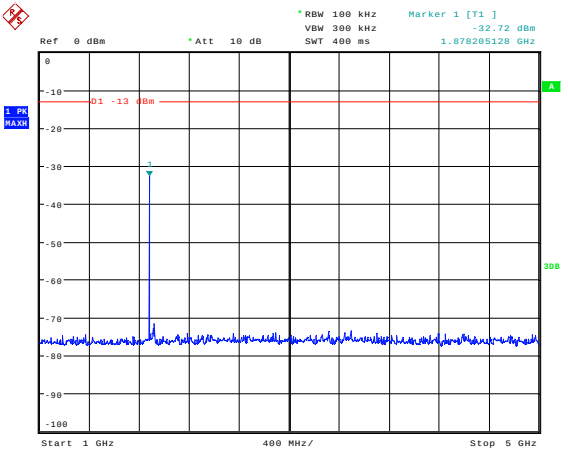
Date: 12.NOV.2010 15:24:13

Conducted emissions 1880.0MHz 30MHz – 1GHz



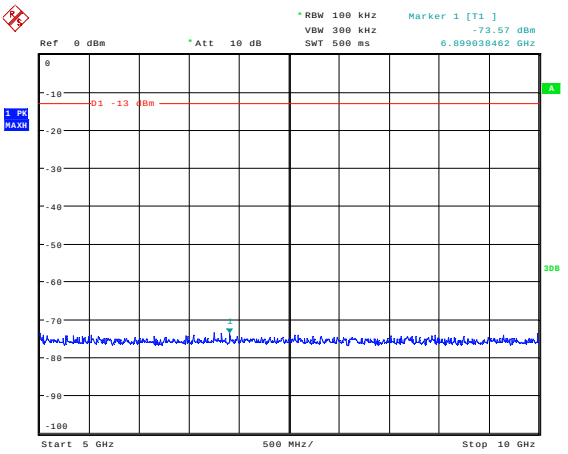
Date: 12.NOV.2010 15:24:40

Conducted emissions 1880.0MHz 1 – 5GHz



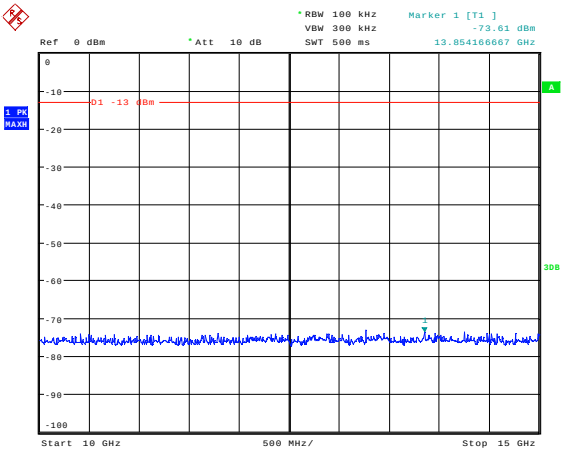
Date: 12.NOV.2010 15:24:54

Conducted emissions 1880.0MHz 5 – 10GHz



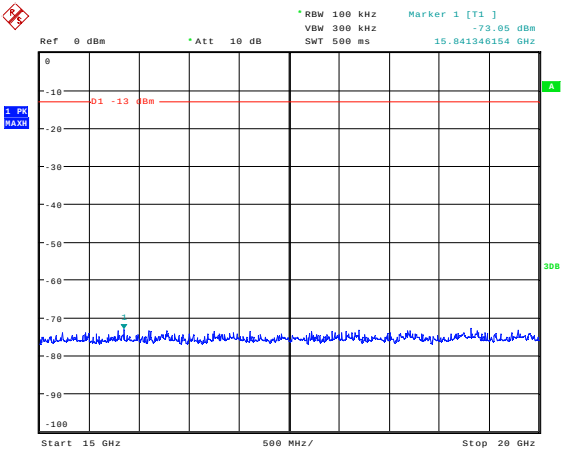
Date: 12.NOV.2010 15:25:23

Conducted emissions 1880.0MHz 10 – 15GHz



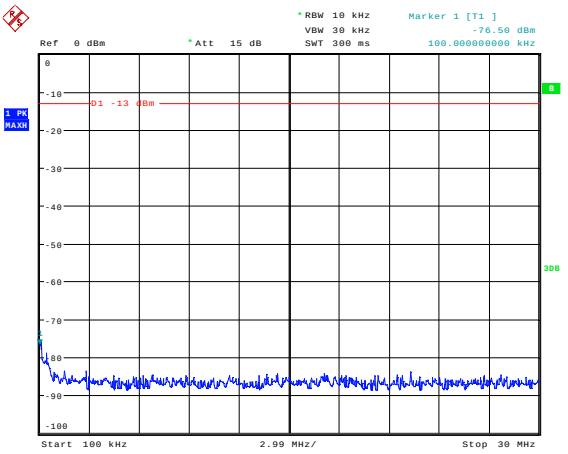
Date: 12.NOV.2010 15:25:40

Conducted emissions 1880.0MHz 15 – 20GHz



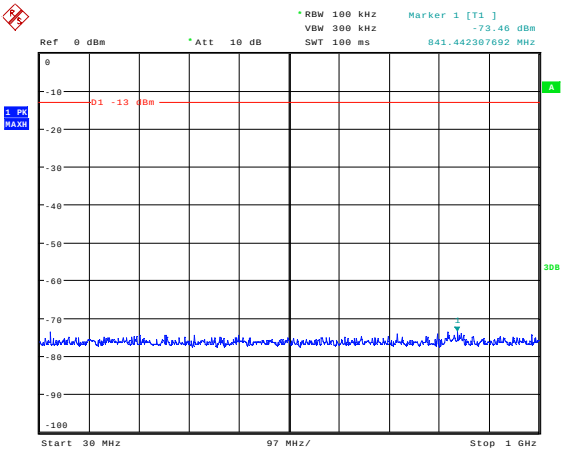
Date: 12.NOV.2010 15:26:05

Conducted emissions 1910.0MHz 100kHz – 30MHz



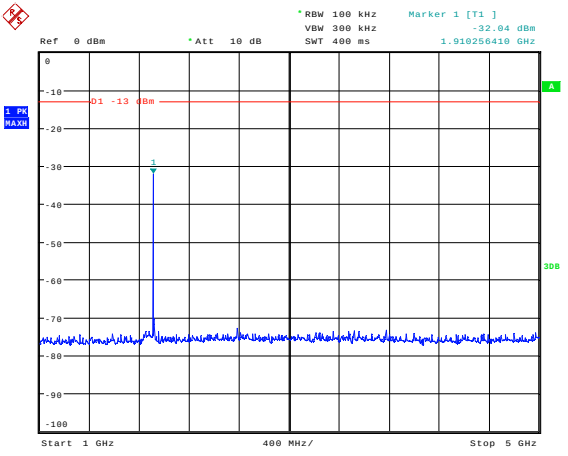
Date: 12.NOV.2010 15:28:00

Conducted emissions 1910.0MHz 30MHz – 1GHz



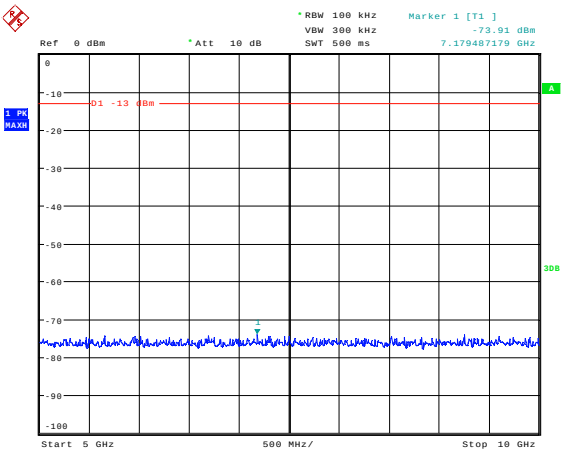
Date: 12.NOV.2010 15:27:49

Conducted emissions 1910.0MHz 1 – 5GHz



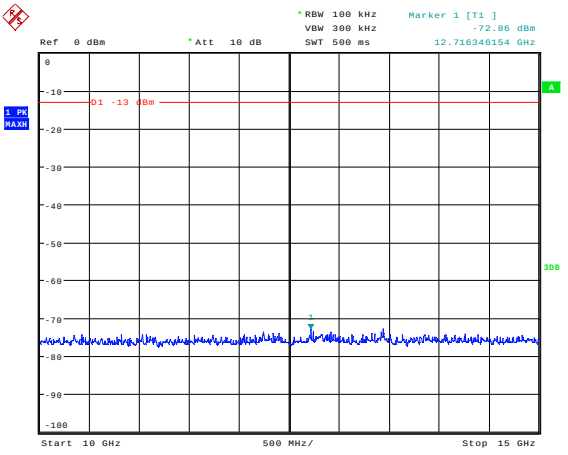
Date: 12.NOV.2010 15:26:47

Conducted emissions 1910.0MHz 5 – 10GHz



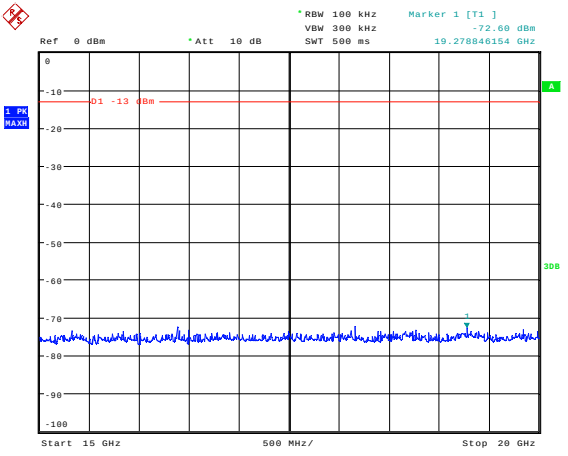
Date: 12.NOV.2010 15:27:02

Conducted emissions 1910.0MHz 10 – 15GHz



Date: 12.NOV.2010 15:27:16

Conducted emissions 1910.0MHz 15 – 20GHz

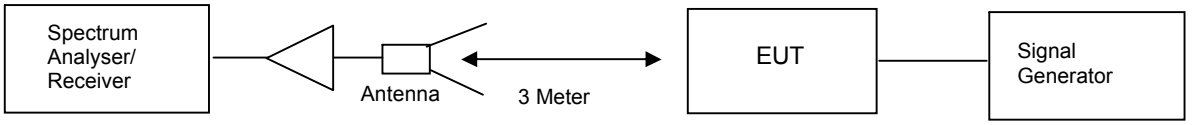


Date: 12.NOV.2010 15:27:35

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– UPLINK

Ambient temperature = 15°C
Relative humidity = 45%
Conditions = OATS
Supply voltage = +110Vac
Supply Frequency = N/A



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating maximum power on three test frequencies with a 50 ohm load on the output. The unit was also tested with the signal generator replaced by another 50ohm load.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least 43 + 10 log PdB

$(10\log P_{watts}) – (43+10\log (P_{watts} * 1000)) = LIMIT = -13$ dBm

RESULTS

800 MHz Band

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 18 GHz	No Significant Emissions Within 20 dB of Limit						-13

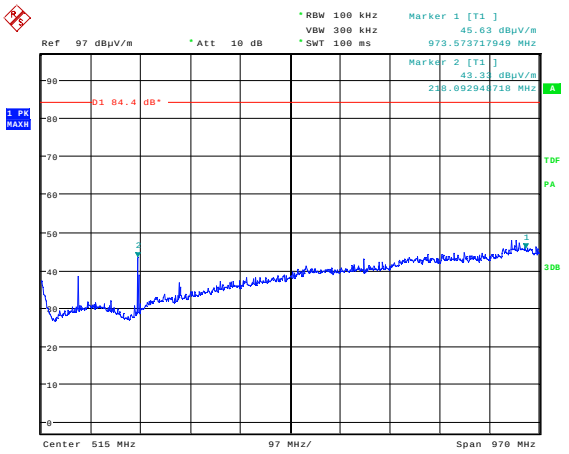
1800 MHz Band

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 18 GHz	No Significant Emissions Within 20 dB of Limit						-13

The test equipment used for the Transmitter Spurious Emissions:

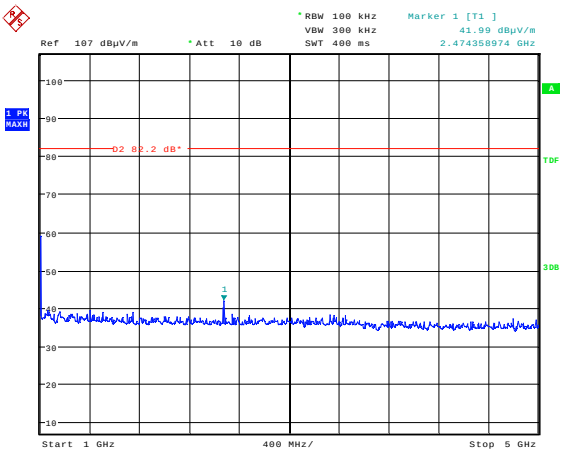
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
HORN	EMCO	3115	9010-3580	138	**X**
HORN	FLANN	20240-20	322	300	**X**
PRE AMPLIFIER	HP	8449B	3008A016	572	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
ANTENNA	YORK	CBL611/A	1618	UH191	**X**

Radiated emissions 824.0 30MHz – 1GHz



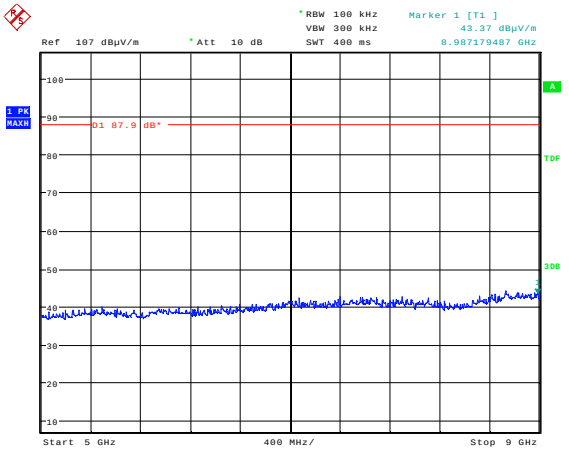
Date: 29.NOV.2010 11:15:44

Radiated emissions 824.0 1 – 5GHz



Date: 25.NOV.2010 11:09:54

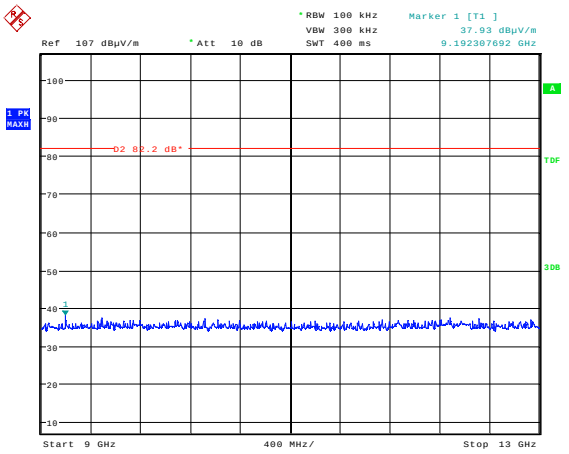
Radiated emissions 824.0 5 – 9GHz



Date: 24.NOV.2010 13:51:23

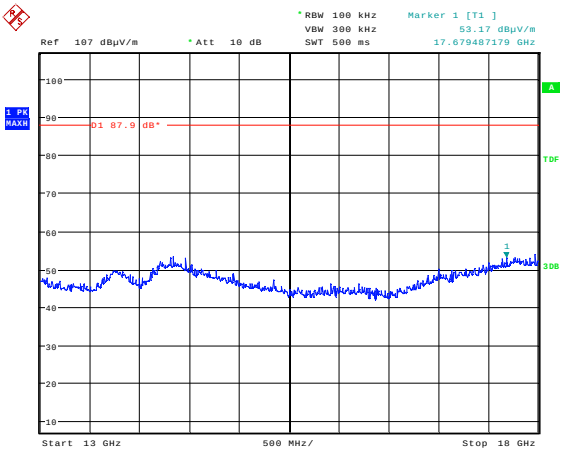
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 824.0 9 – 13GHz



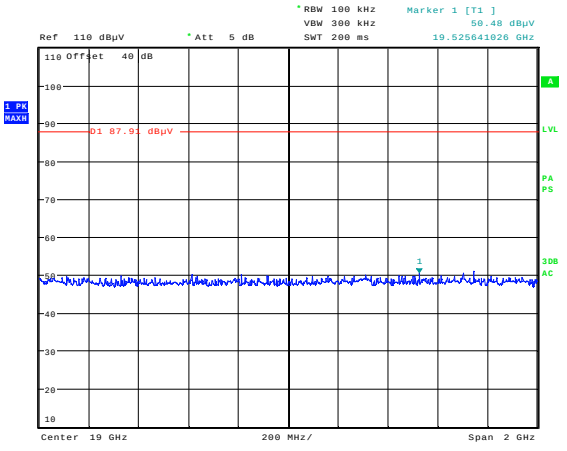
Date: 25.NOV.2010 11:35:34

Radiated emissions 824.0 13 – 18GHz



Date: 24.NOV.2010 14:19:31

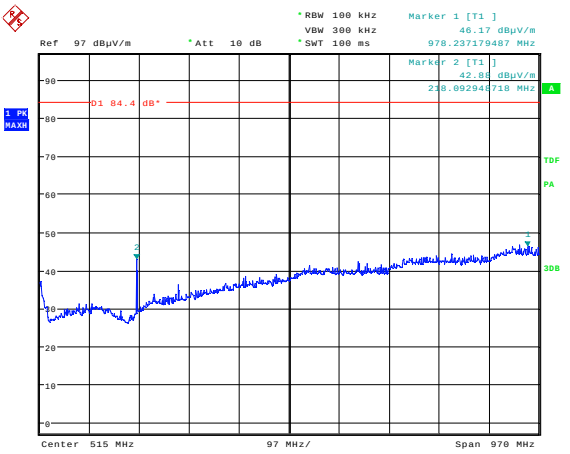
Radiated emissions 824.0 18 – 20GHz



Date: 23.NOV.2010 17:14:51

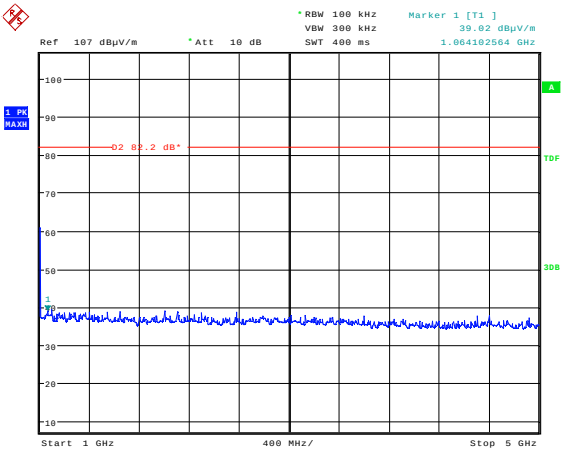
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 836.5 30MHz – 1GHz



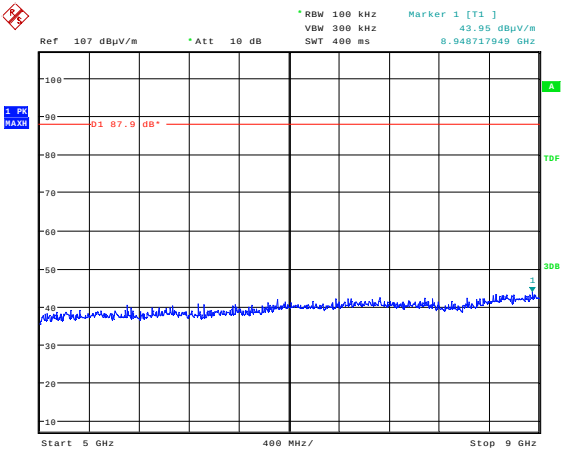
Date: 29.NOV.2010 11:16:30

Radiated emissions 836.5 1 – 5GHz



Date: 25.NOV.2010 11:08:51

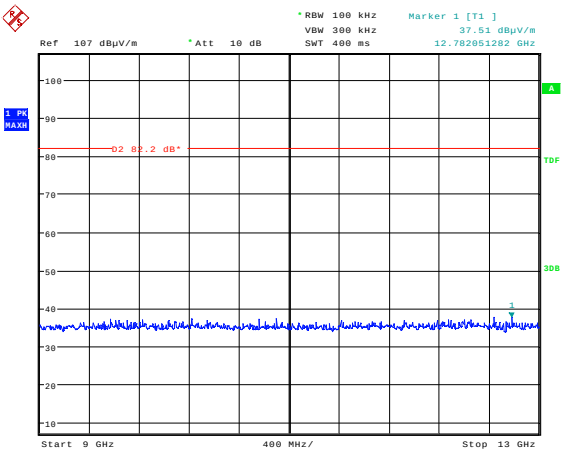
Radiated emissions 836.5 5 – 9GHz



Date: 24.NOV.2010 13:48:22

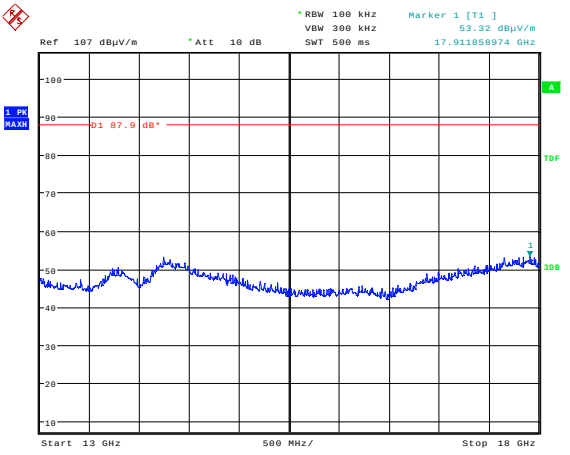
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 836.5 9 – 13GHz



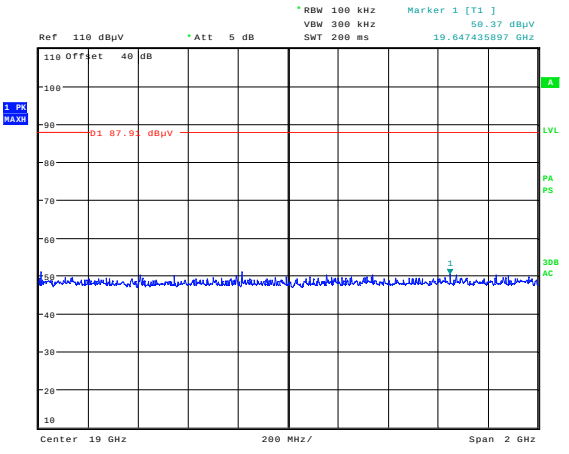
Date: 25.NOV.2010 11:36:10

Radiated emissions 836.5 13 – 18GHz



Date: 24.NOV.2010 14:19:57

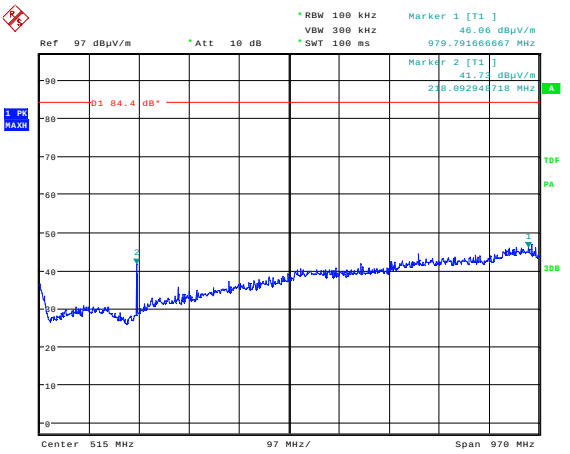
Radiated emissions 836.5 18 – 20GHz



Date: 23.NOV.2010 17:14:07

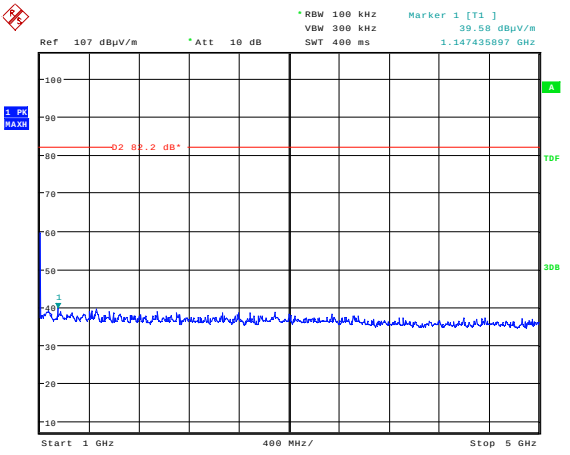
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 849.0 30MHz – 1GHz



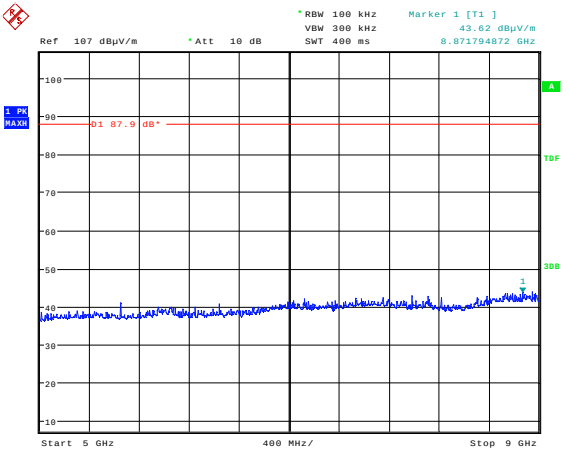
Date: 29.NOV.2010 11:17:03

Radiated emissions 849.0 1 – 5GHz



Date: 25.NOV.2010 11:07:52

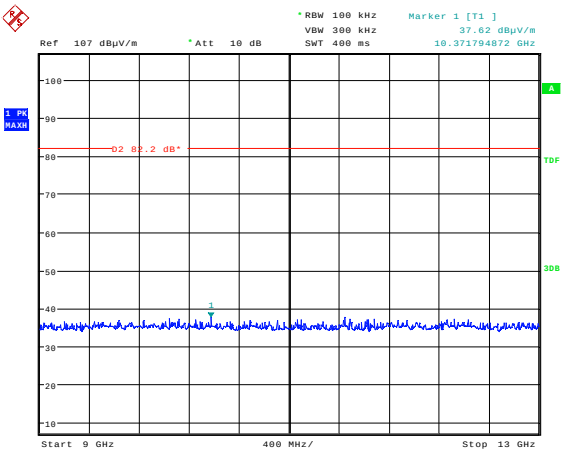
Radiated emissions 849.0 5 – 9GHz



Date: 24.NOV.2010 13:50:21

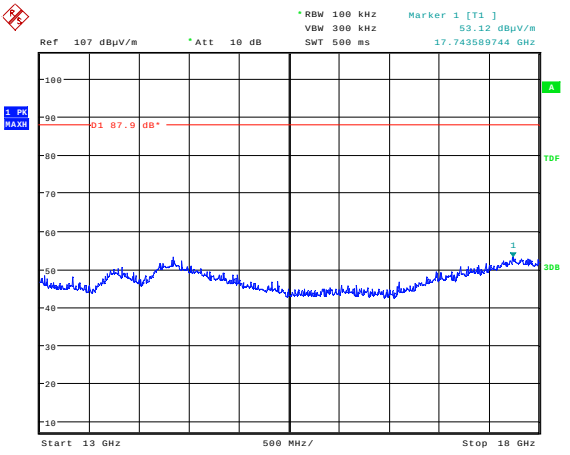
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 849.0 9 – 13GHz



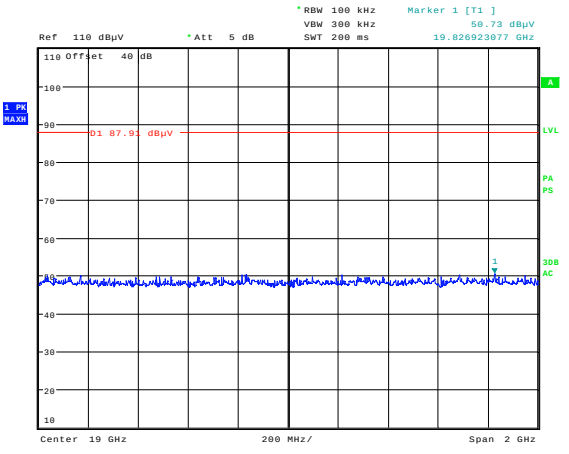
Date: 25.NOV.2010 11:36:46

Radiated emissions 849.0 13 – 18GHz



Date: 24.NOV.2010 14:20:23

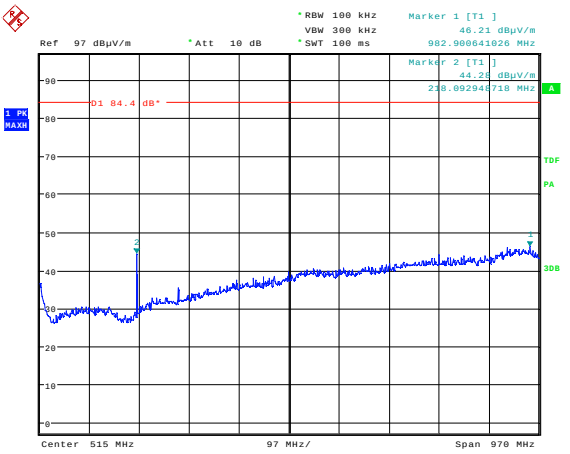
Radiated emissions 849.0 18 – 20GHz



Date: 23.NOV.2010 17:13:19

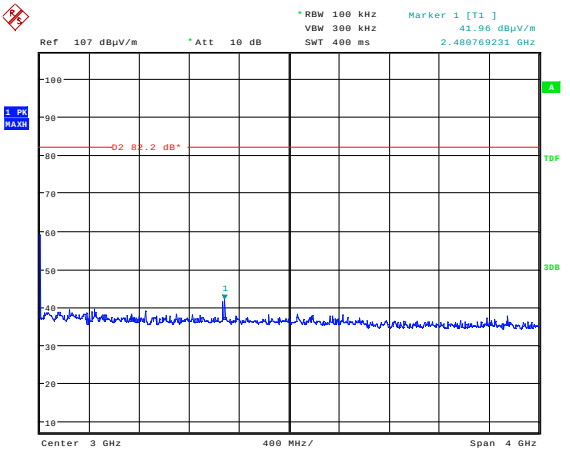
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1850.0 30MHz – 1GHz



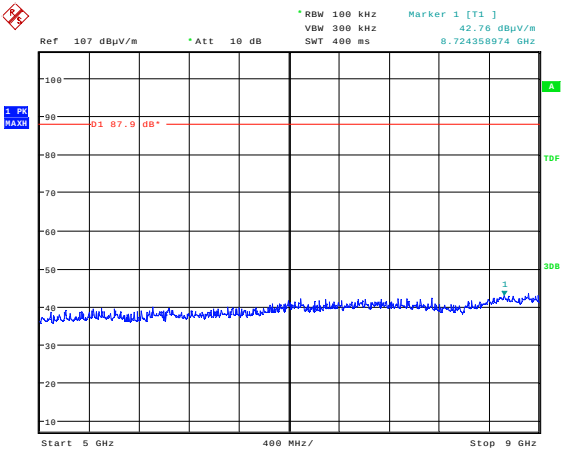
Date: 29.NOV.2010 11:18:19

Radiated emissions 1850.0 1 – 5GHz



Date: 25.NOV.2010 11:12:53

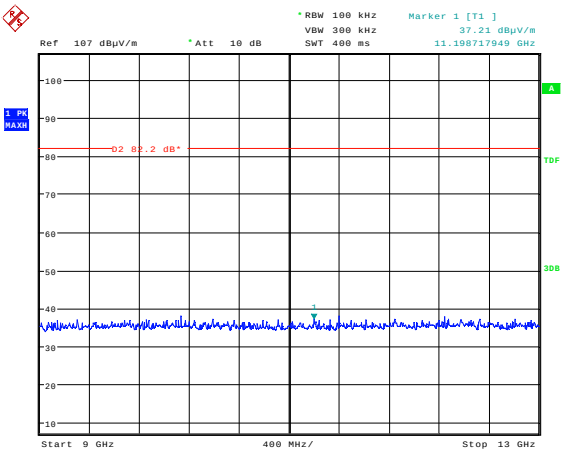
Radiated emissions 1850.0 5 – 9GHz



Date: 24.NOV.2010 13:52:44

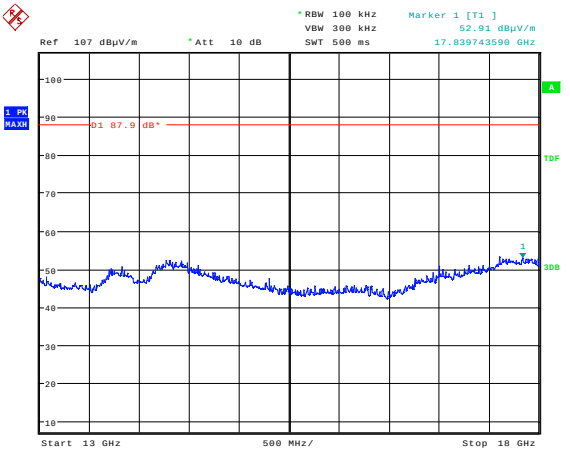
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1850.0 9 – 13GHz



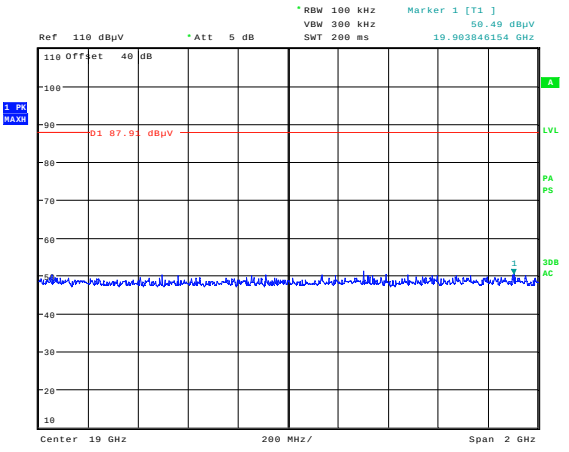
Date: 25.NOV.2010 11:33:34

Radiated emissions 1850.0 13 – 18GHz



Date: 24.NOV.2010 14:13:15

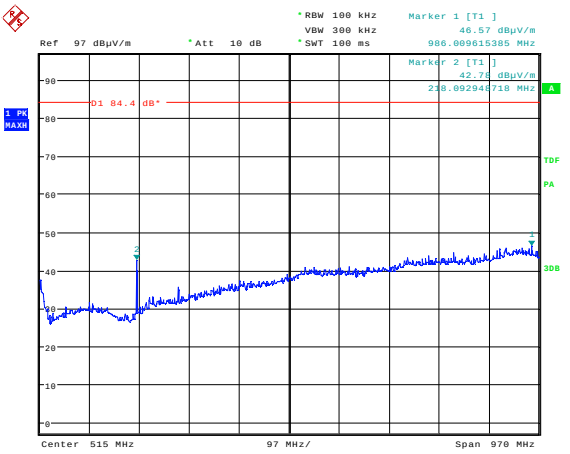
Radiated emissions 1850.0 18 – 20GHz



Date: 23.NOV.2010 17:16:52

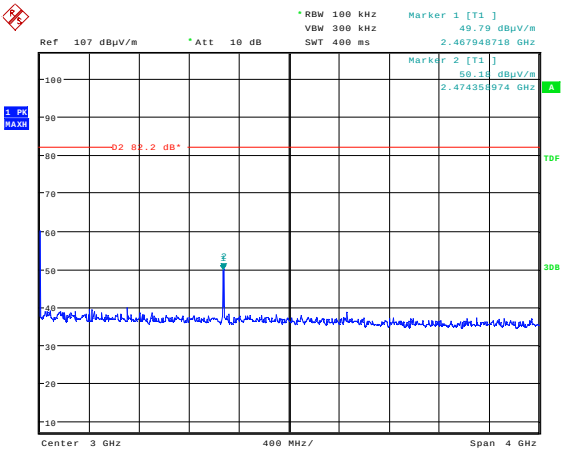
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1880.0 30MHz – 1GHz



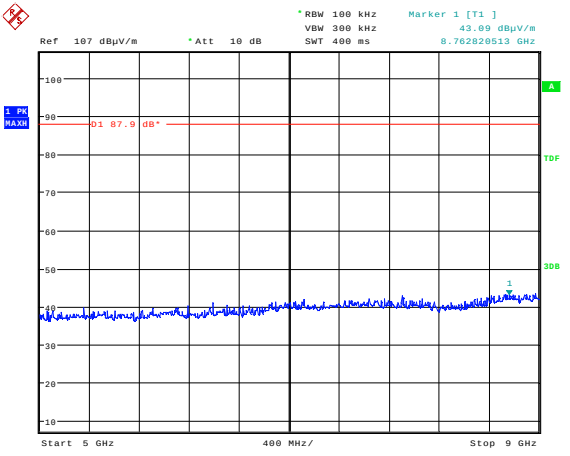
Date: 29.NOV.2010 11:19:01

Radiated emissions 1880.0 1 – 5GHz



Date: 25.NOV.2010 11:14:16

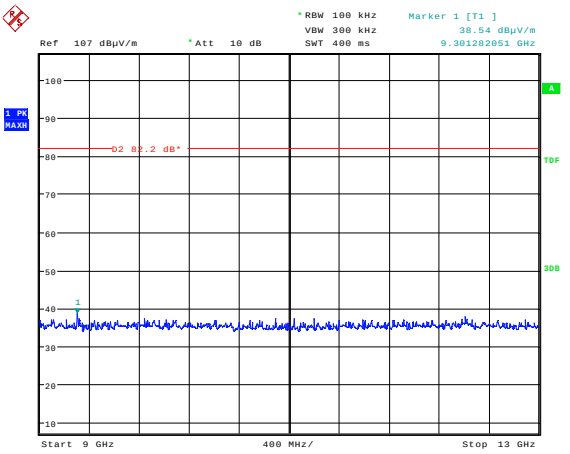
Radiated emissions 1880.0 5 – 9GHz



Date: 24.NOV.2010 13:53:14

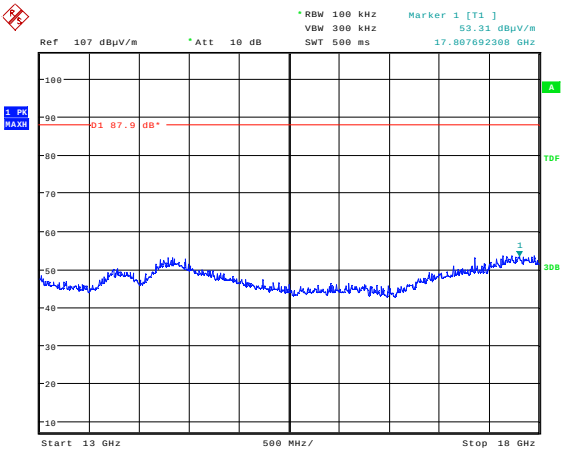
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1880.0 9 – 13GHz



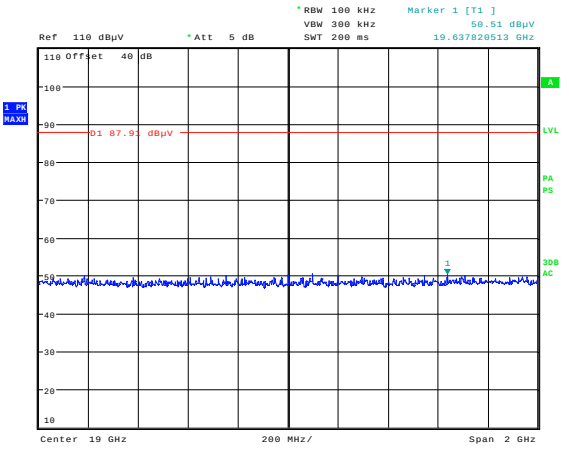
Date: 25.NOV.2010 11:25:20

Radiated emissions 1880.0 13 – 18GHz



Date: 24.NOV.2010 14:04:53

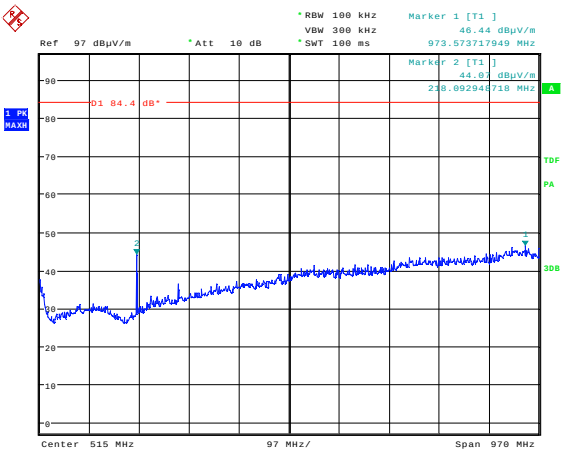
Radiated emissions 1880.0 18 – 20GHz



Date: 23.NOV.2010 17:17:52

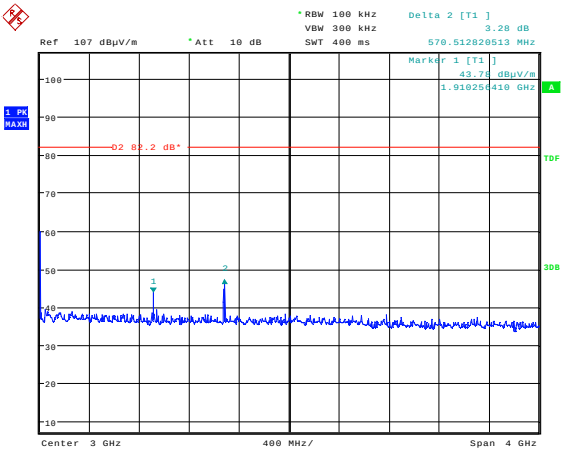
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1910.0 30MHz – 1GHz



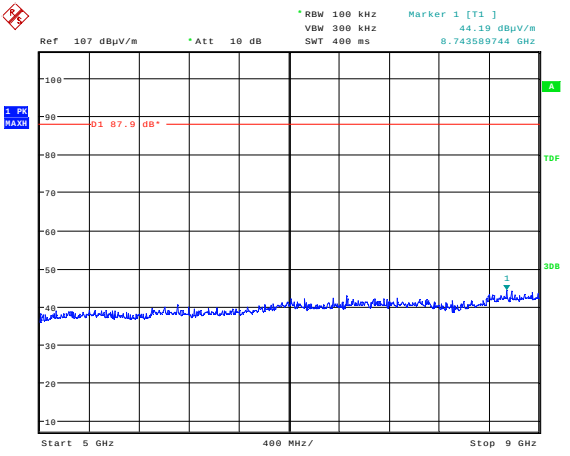
Date: 29.NOV.2010 11:19:34

Radiated emissions 1910.0 1 – 5GHz



Date: 25.NOV.2010 11:15:18

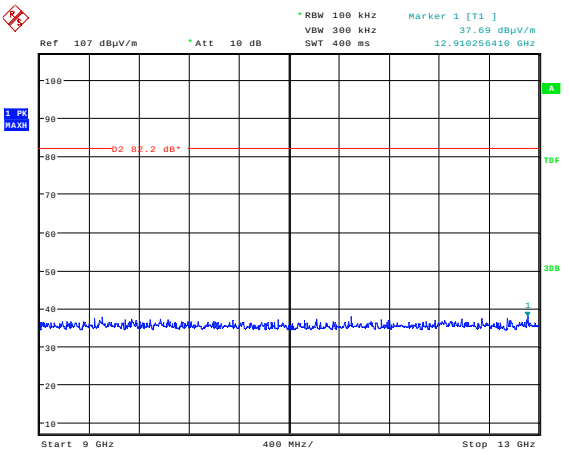
Radiated emissions 1910.0 5 – 9GHz



Date: 24.NOV.2010 13:53:48

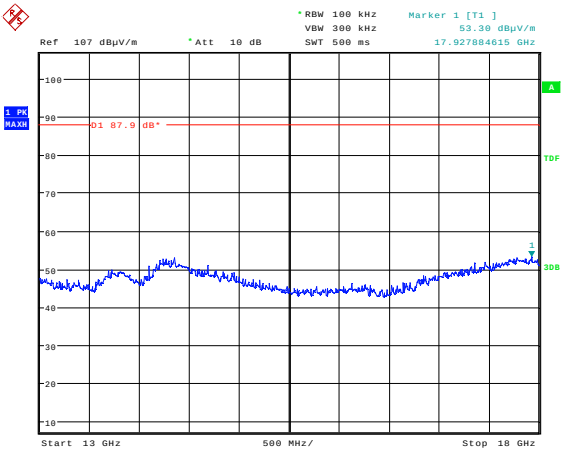
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1910.0 9 – 13GHz



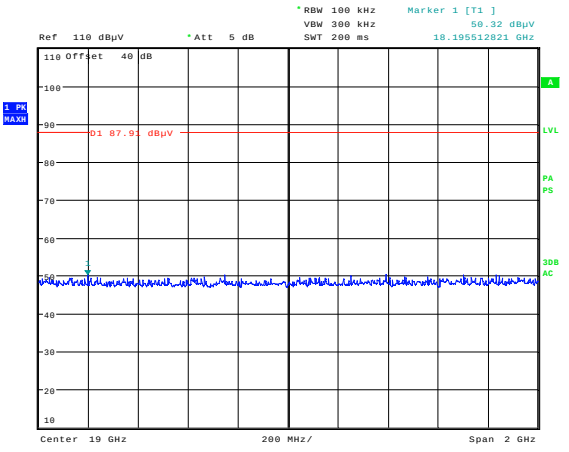
Date: 25.NOV.2010 11:32:00

Radiated emissions 1910.0 13 – 18GHz



Date: 24.NOV.2010 14:12:14

Radiated emissions 1910.0 18 – 20GHz

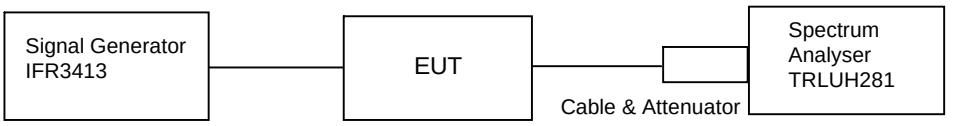


Date: 23.NOV.2010 17:18:33

The above test results show that there were no emissions within 20dBs of the –13dBm limit.

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – DOWNLINK

Ambient temperature = 23°C Radio Laboratory
Relative humidity = 37%
Supply voltage = +110Vac
Channel number = See test results



800 MHz Band

Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Level at Spectrum Analyser dBm	Output Cable & Attenuator loss dB	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
869.0	1.20	0.53	-5.06	40.56	34.83	35.50	25.20
881.5	1.00	0.74	-4.71	40.68	35.71	35.97	25.90
894.0	1.50	0.78	-4.69	40.68	35.27	35.99	25.26

Notes: 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

1900 MHz Band

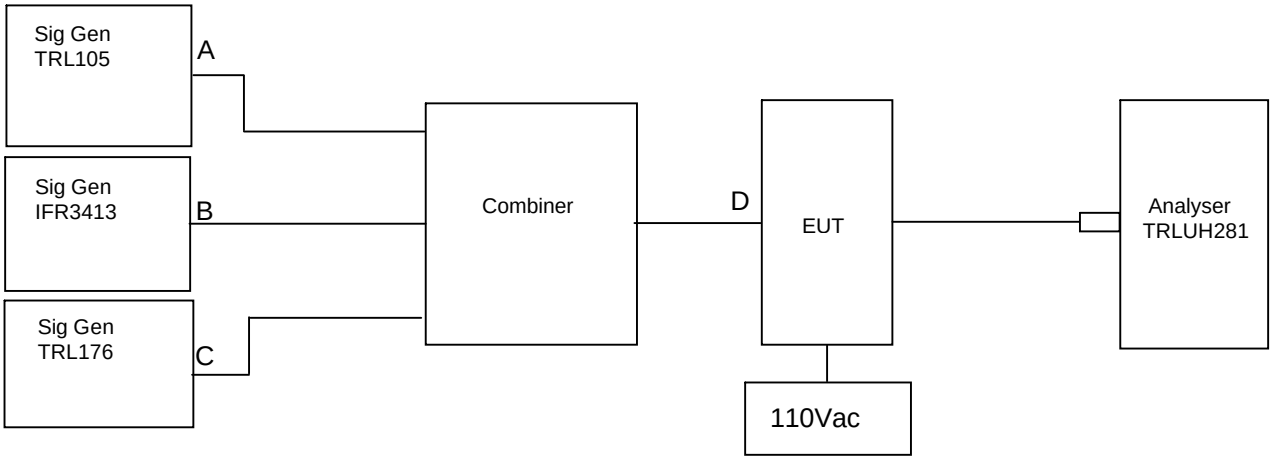
Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Level at Spectrum Analyser dBm	Output Cable & Attenuator loss dB	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
1930.0	5.10	0.53	-4.51	40.56	31.48	36.05	21.51
1960.0	2.30	0.74	-4.19	40.68	34.93	36.49	24.97
1990.0	4.00	0.78	-4.55	40.68	32.91	36.13	22.95

Notes: 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
ATTENUATOR	SPINNER	745357	D37224	UH225	**X**
ATTENUATOR	AXELL	20dB	N/A	N/A	**X**
CABLE	TRaC	N/A	N/A	UH253	**X**
CABLE	TRaC	N/A	N/A	UH254	**X**
CABLE	TRaC	N/A	N/A	UH271	**X**

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– DOWNLINK

Ambient temperature = 23°C Radio Laboratory
Relative humidity = 37%
Supply voltage = +110Vac



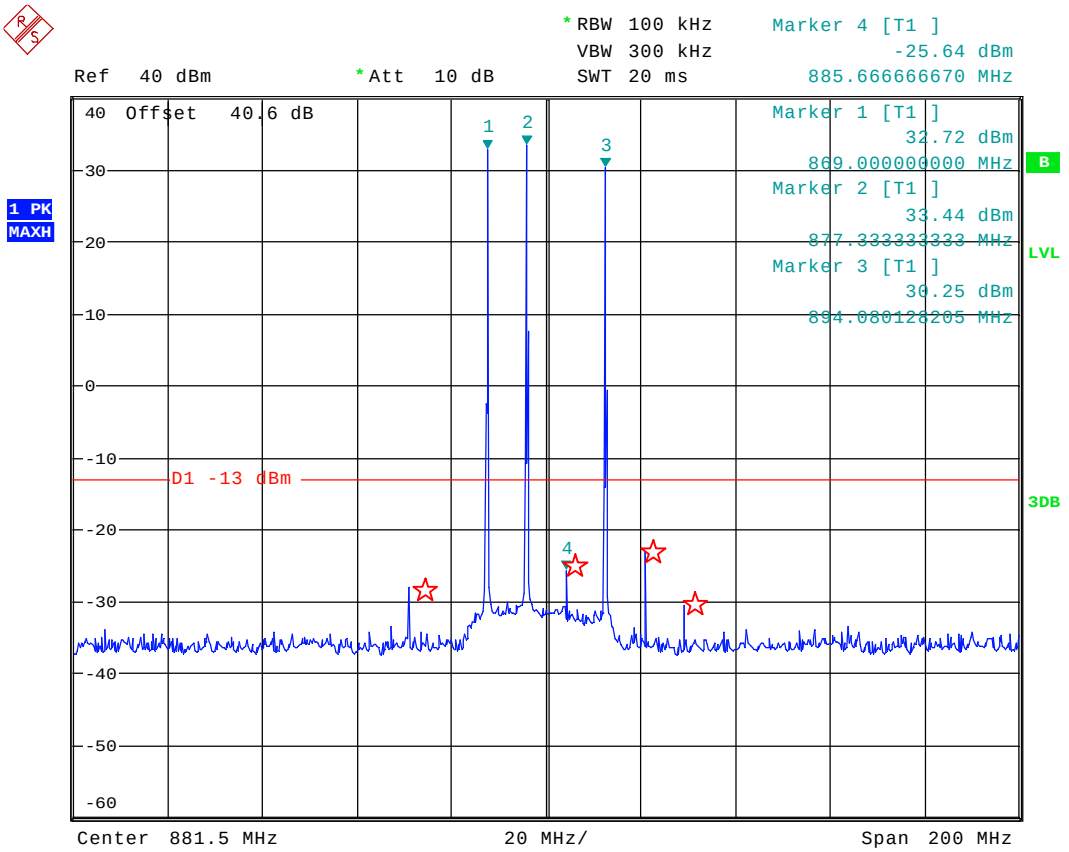
The intermodulation and spurious products were measured with the amplifier operating at maximum gain. A three tone test was conducted using the equipment as above. The input power level was adjusted so the level at point D was 10dB above the maximum input.

Downlink Band	RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
800	869.0	877.3	894.0	-14.45 dBm @1939.019 MHz	-13
1900	1930.0	1950.0	1990.0	-18.06dBm @ 885.014 MHz	-13
Cross Band	881.5	1930.0	1999.0	-17.81dBm @ 1940.846 MHz	-13

Test equipment used for intermodulation test

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
SIGNAL GENERATOR	MARCONI	2023	112224/040	UH105	**X**
COMBINER	AXELL	N/A	N/A	N/A	**X**
ATTENUATOR	AXELL	N/A	N/A	N/A	**X**
ATTENUATOR	SPINNER	745357	D37224	UH225	**X**
CABLE	TRaC	N/A	N/A	UH253	**X**
CABLE	TRaC	N/A	N/A	UH254	**X**
CABLE	TRaC	N/A	N/A	UH269	**X**
CABLE	TRaC	N/A	N/A	UH273	**X**
CABLE	TRaC	N/A	N/A	UH274	**X**

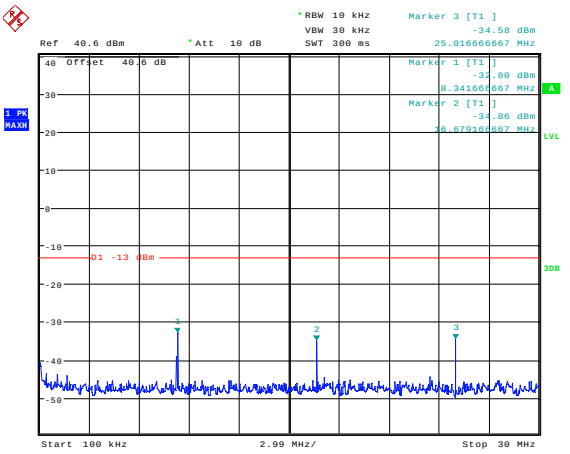
Intermodulation Inband – 800 MHz Downlink Band



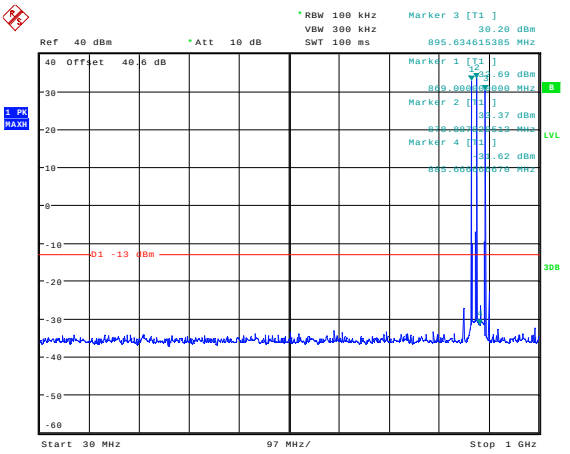
Date: 19.NOV.2010 11:13:09

The above plot shows that all products (designated by ☆) are below the spurious limit.

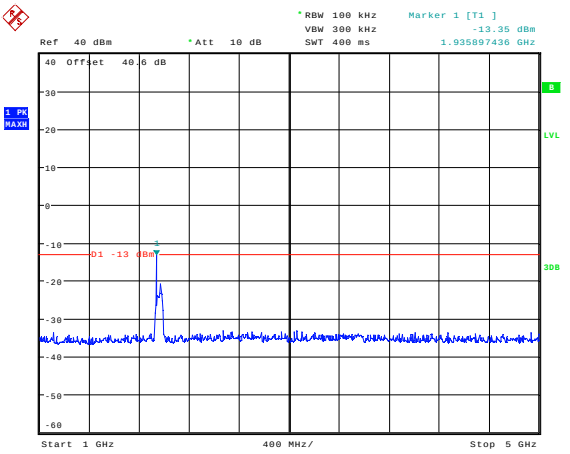
Intermodulation Wideband – 800 MHz Downlink Band



Date: 19.NOV.2010 11:14:04



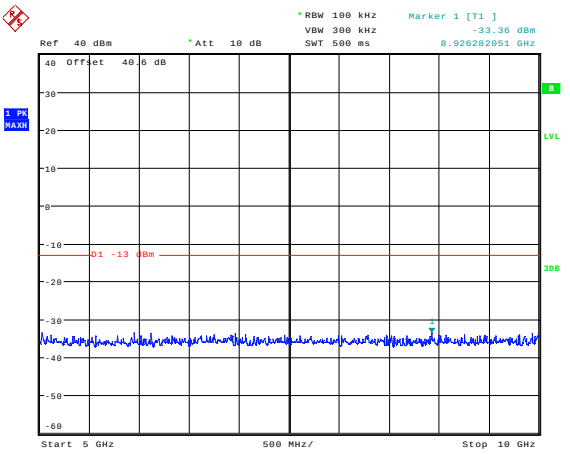
Date: 19.NOV.2010 11:13:25



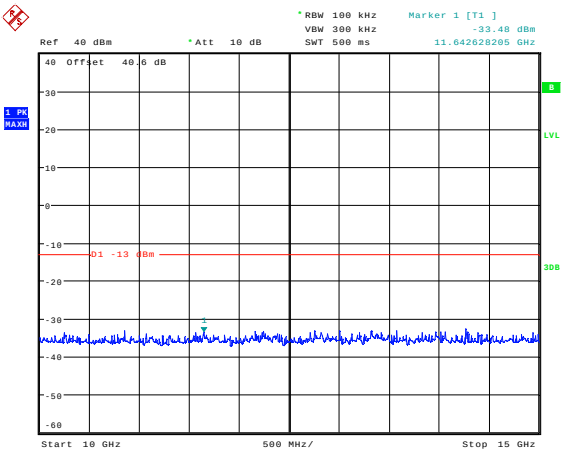
Date: 19.NOV.2010 11:14:30

The above plot shows that products outside the bands are below the limit

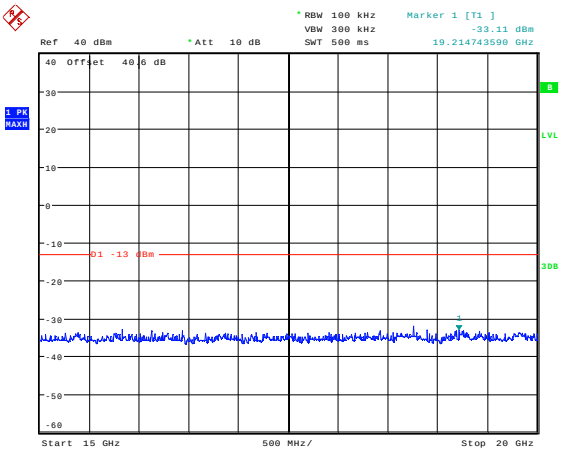
Intermodulation Wideband – 800 MHz Downlink Band



Date: 19.NOV.2010 11:14:44



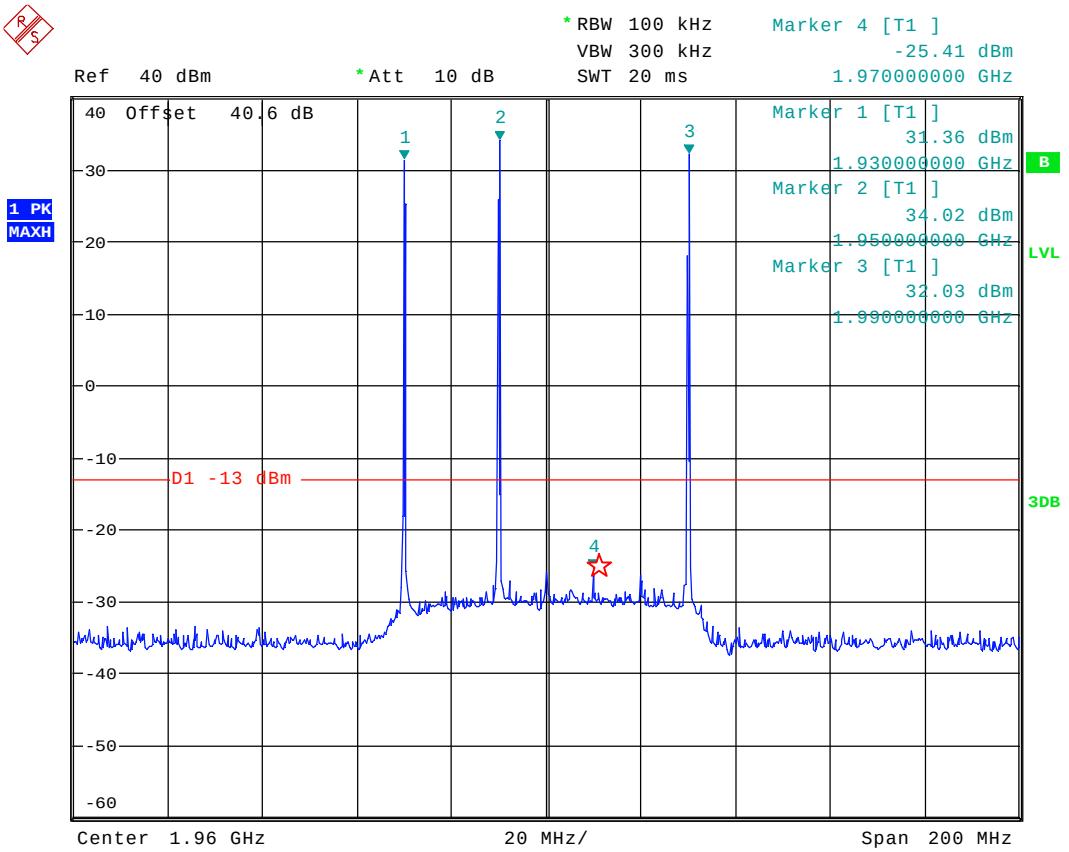
Date: 19.NOV.2010 11:14:57



Date: 19.NOV.2010 11:15:10

The above plot shows that products outside the bands are below the limit

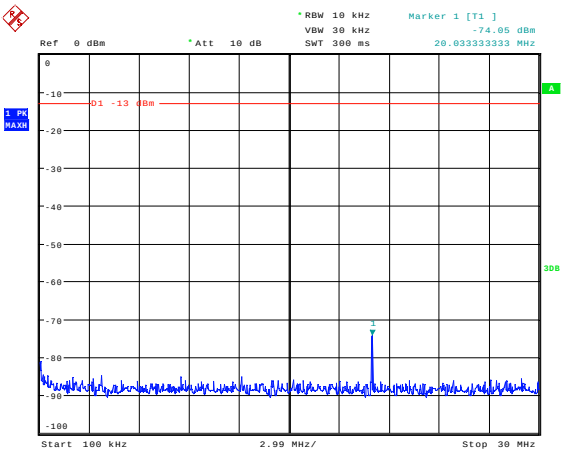
Intermodulation Inband – 1900 MHz Downlink Band



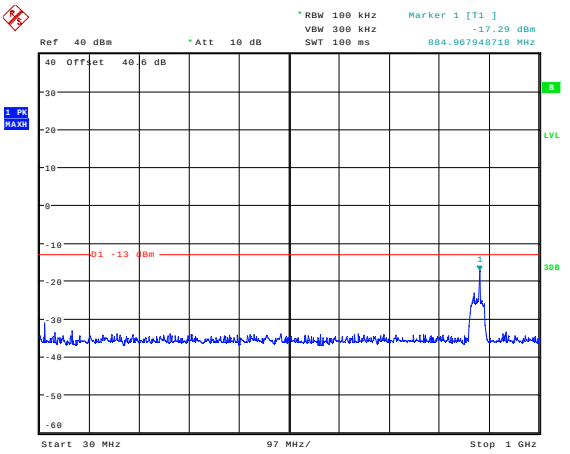
Date: 19.NOV.2010 10:50:55

The above plot shows that all products (designated by☆) are below the spurious limit.

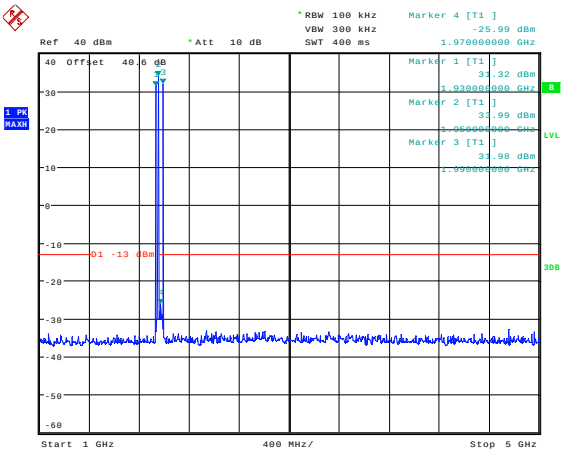
Intermodulation Wideband – 1900 MHz Downlink Band



Date: 19.NOV.2010 10:52:05



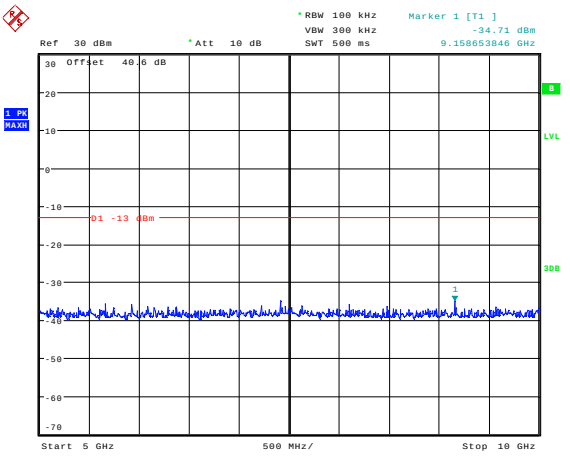
Date: 19.NOV.2010 10:51:27



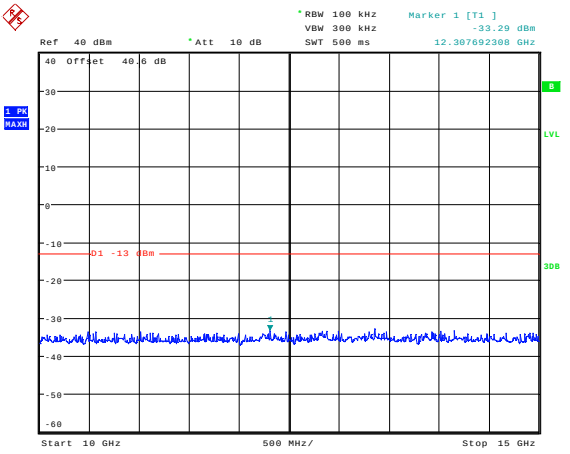
Date: 19.NOV.2010 10:51:09

The above plot shows that products outside the bands are below the limit

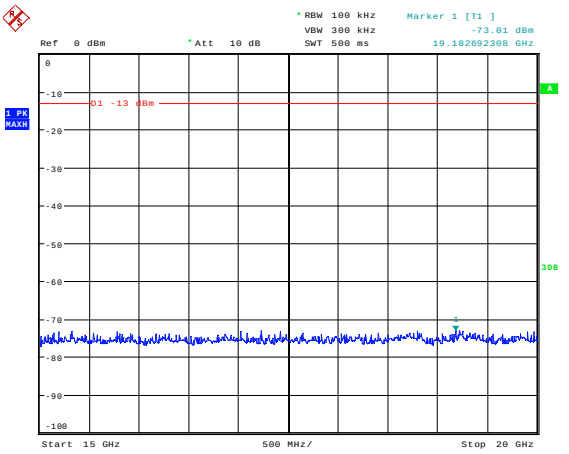
Intermodulation Wideband – 1900 MHz Downlink Band



Date: 19.NOV.2010 10:52:26



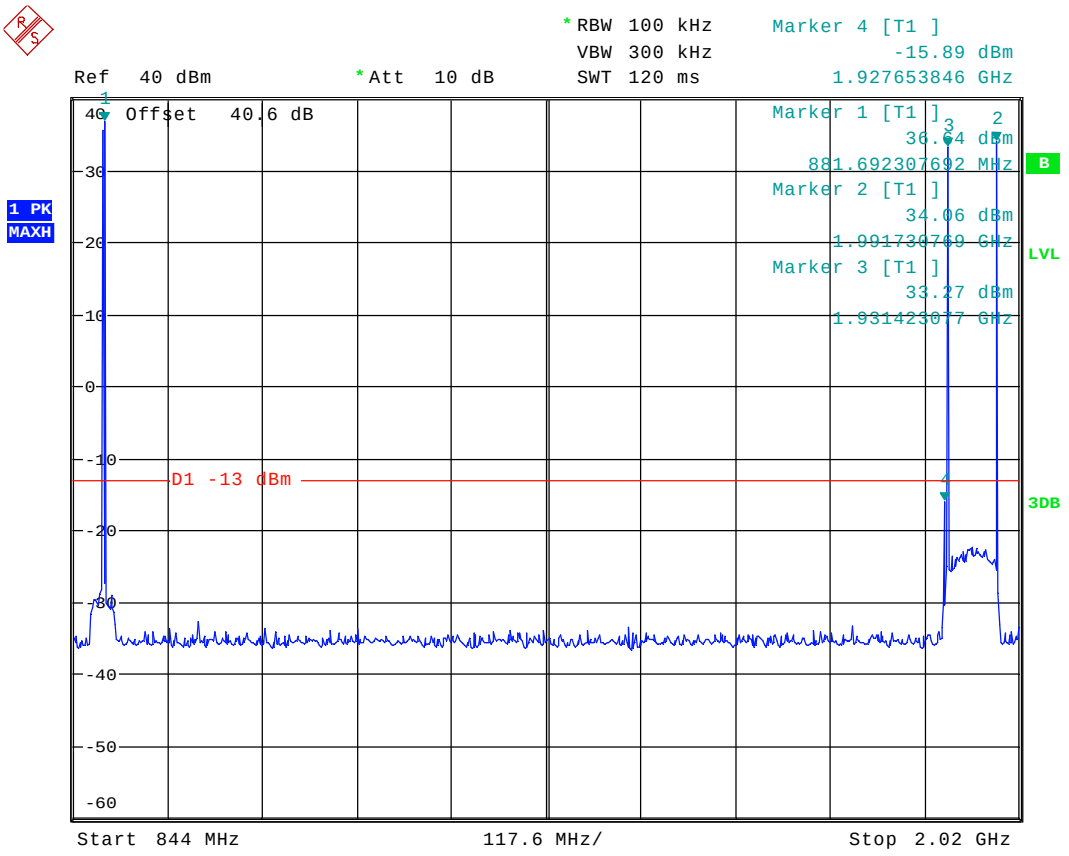
Date: 19.NOV.2010 10:52:42



Date: 19.NOV.2010 10:51:42

The above plot shows that products outside the bands are below the limit

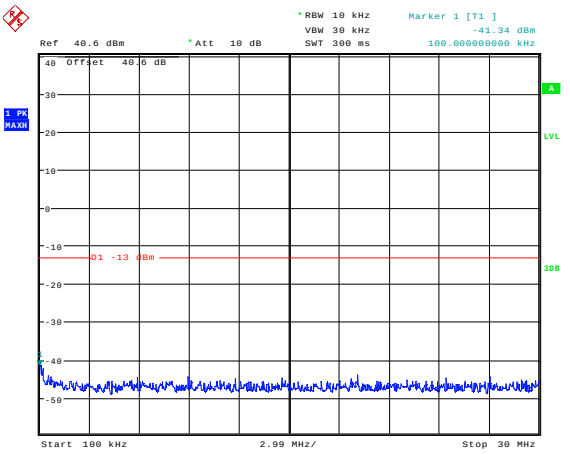
Intermodulation Inband – Cross Band



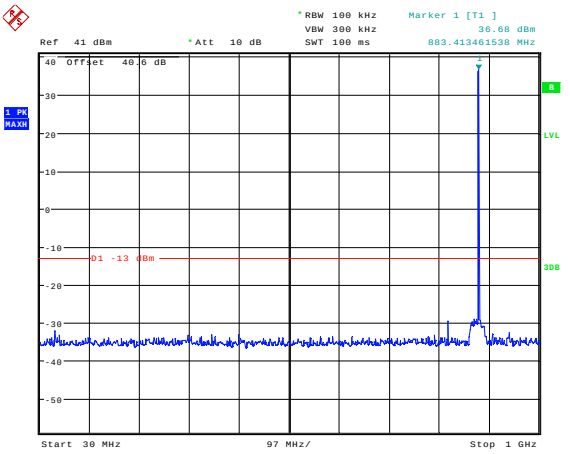
Date: 19.NOV.2010 11:51:12

The above plot shows that all products (designated by ☆) are below the spurious limit.

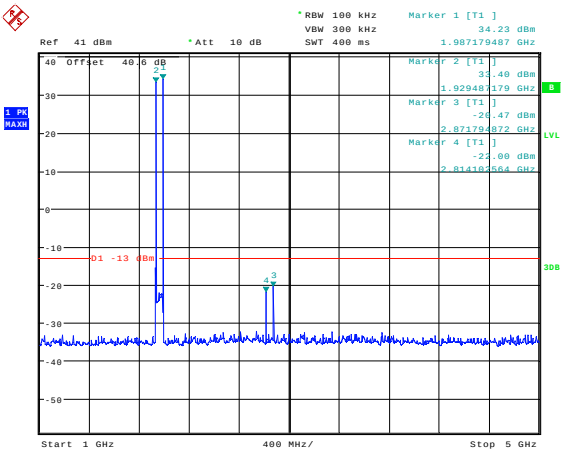
Intermodulation Wideband – Cross Band



Date: 19.NOV.2010 11:52:28



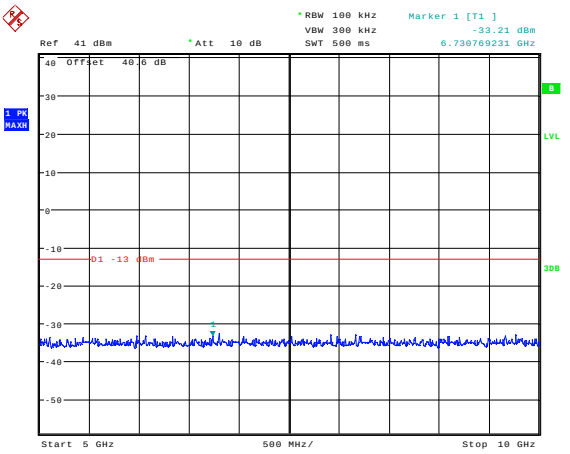
Date: 19.NOV.2010 11:52:07



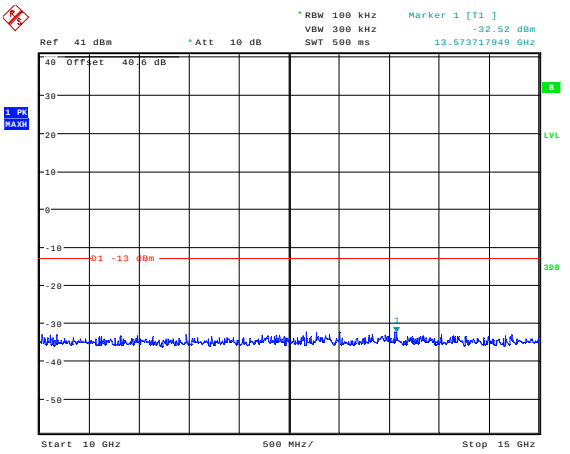
Date: 19.NOV.2010 11:52:54

The above plot shows that products outside the bands are below the limit

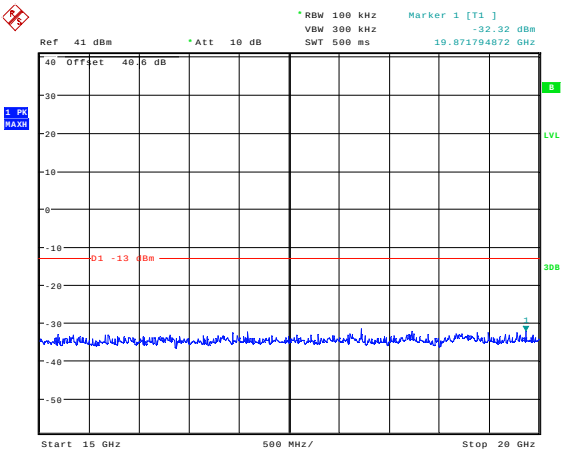
Intermodulation Wideband – Cross Band



Date: 19.NOV.2010 11:53:09



Date: 19.NOV.2010 11:53:22



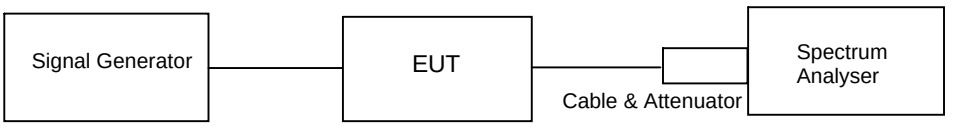
Date: 19.NOV.2010 11:53:36

The above plot shows that products outside the bands are below the limit

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– DOWNLINK

Ambient temperature = 24°C Radio Laboratory
Relative humidity = 56%
Supply voltage = +110Vac
Channel number = See test results



This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input. The following modulation schemes were produced, a 2500Hz FM tone with 2.5 and 5 kHz deviation, 20MHz wide LTE, GSM, EDGE, CDMA and W-CDMA.

The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

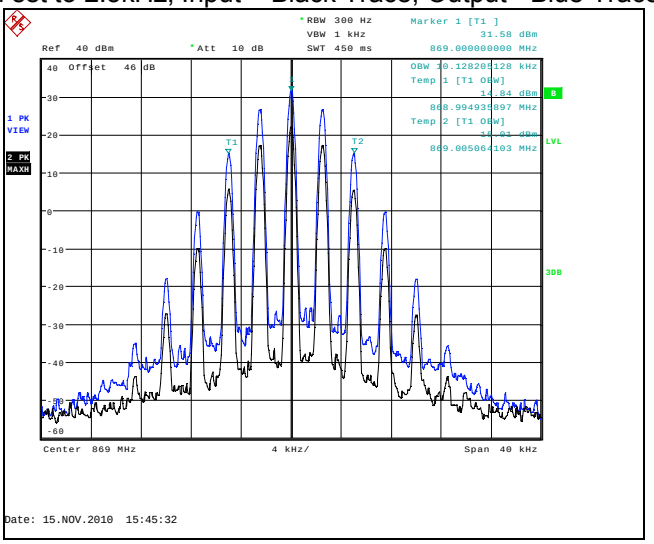
Note: The cables and attenuators had the following losses.

1. Cable and attenuator between EUT and spectrum analyser 40.7dB
2. Cable between signal generator and EUT 0.4dB

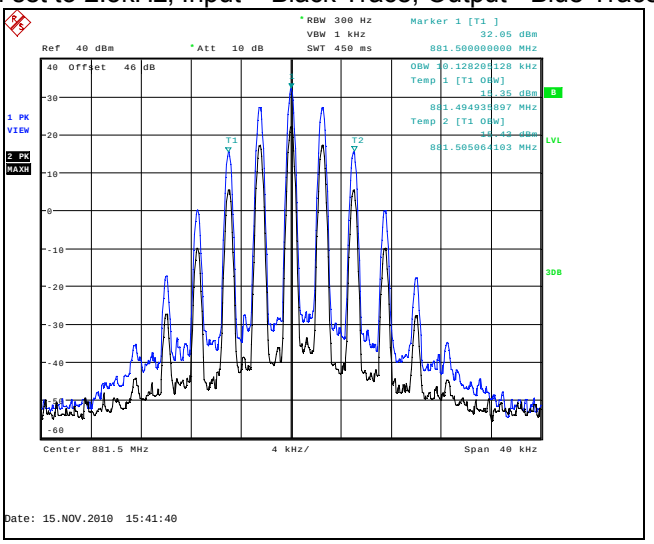
Frequency Of Operational	Modulation Type						
	2.5 kHz FM	5 kHz FM	LTE	GSM	EDGE	CDMA	W-CDMA
869.000	10.128 kHz	15.256 kHz	8.919 MHz	241.987 kHz	237.179 kHz	1.275 MHz	4.163 MHz
881.500	10.128 kHz	15.256 kHz	8.937 MHz	241.987 kHz	238.782 kHz	1.272 MHz	4.163 MHz
894.000	10.128 kHz	15.256 kHz	8.919 MHz	241.987 kHz	238.782 kHz	1.275 MHz	4.168 MHz
1850.000	10.128 kHz	15.256 kHz	17.875 MHz	241.987 kHz	237.179 kHz	1.272 MHz	4.173 MHz
1880.000	10.128 kHz	15.256 kHz	17.875 MHz	241.987 kHz	232.371 kHz	1.280 MHz	4.173 MHz
1910.000	10.128 kHz	15.256 kHz	17.875 MHz	243.589 kHz	235.576 kHz	1.275 MHz	4.144 MHz

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
ATTENUATOR	BIRD	8308-200	N/A	103	**X**
ATTENUATOR	BIRD	830-100-N	N/A	222	**X**
CABLE	TRaC	N/A	N/A	UH273	**X**
CABLE	TRaC	N/A	N/A	UH274	**X**

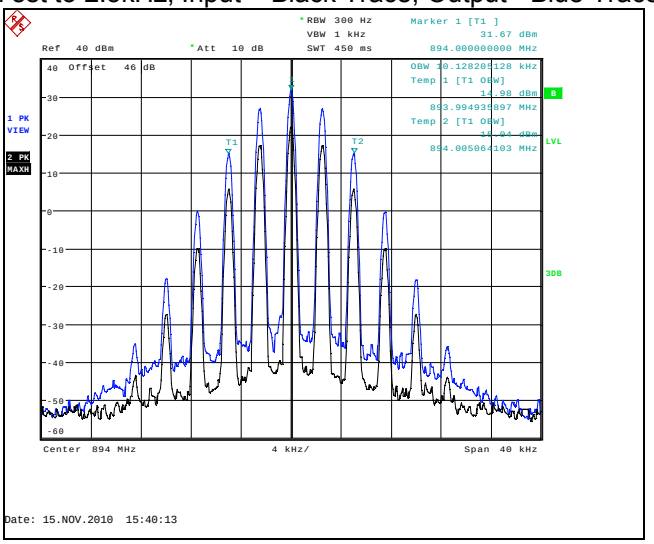
869.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace



881.5MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

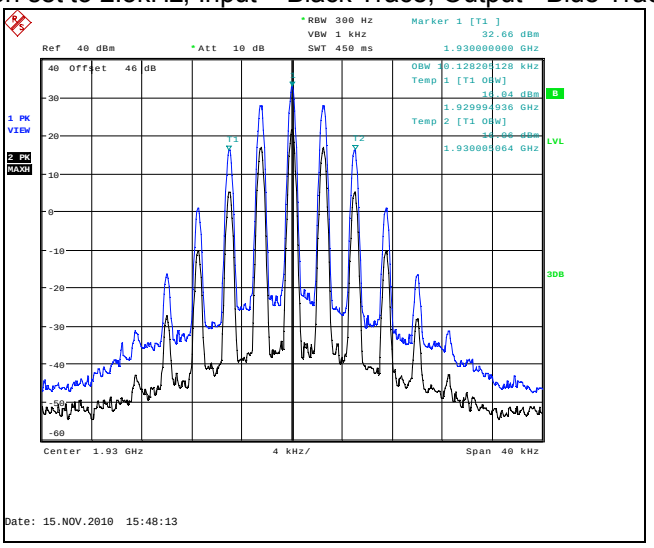


894.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

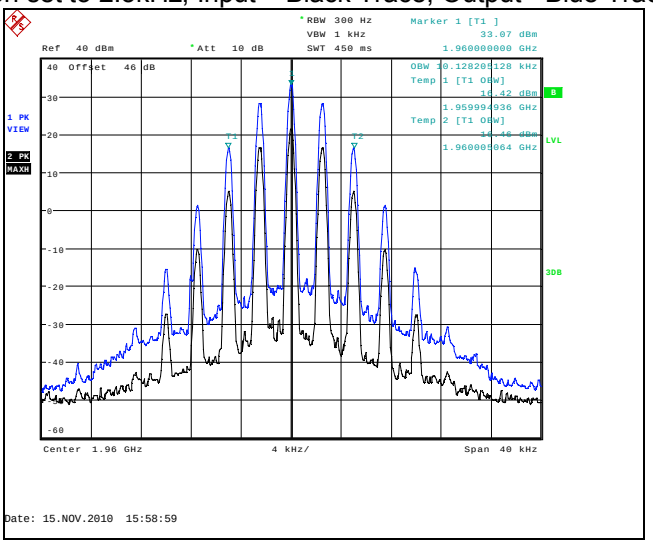


The above plots show no significant distortion visible when compared to the input signal.

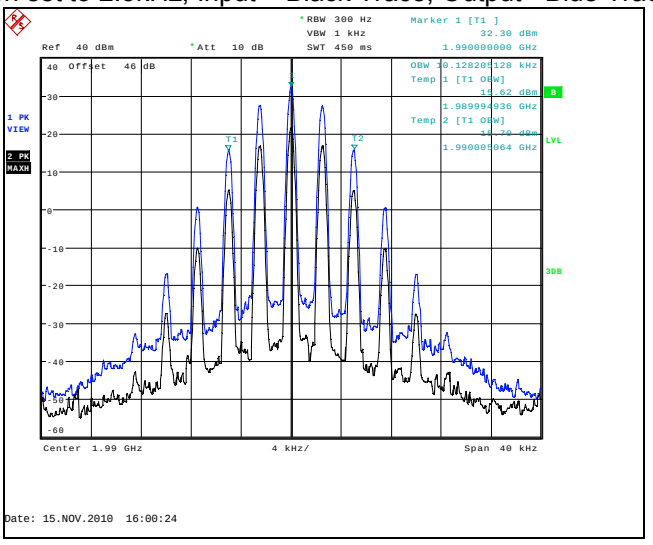
1930.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace



1960.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

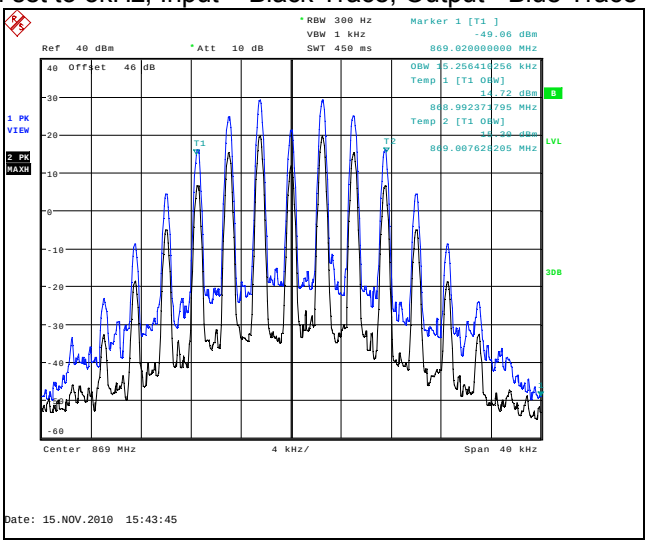


1990.0MHz FM deviation set to 2.5kHz, Input – Black Trace, Output - Blue Trace

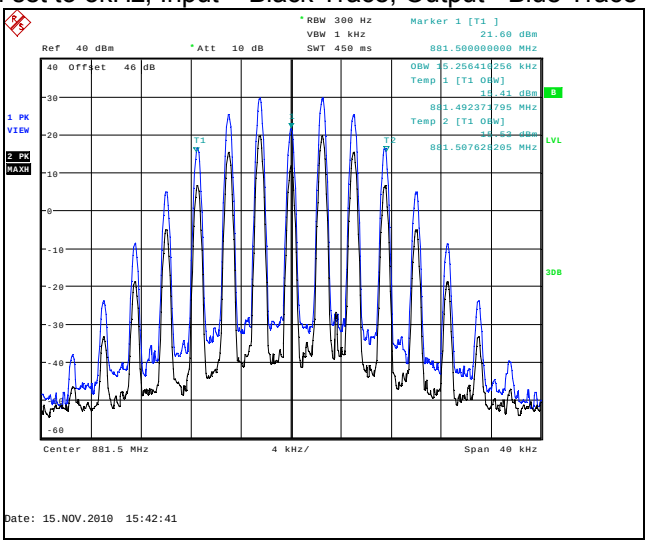


The above plots show no significant distortion visible when compared to the input signal.

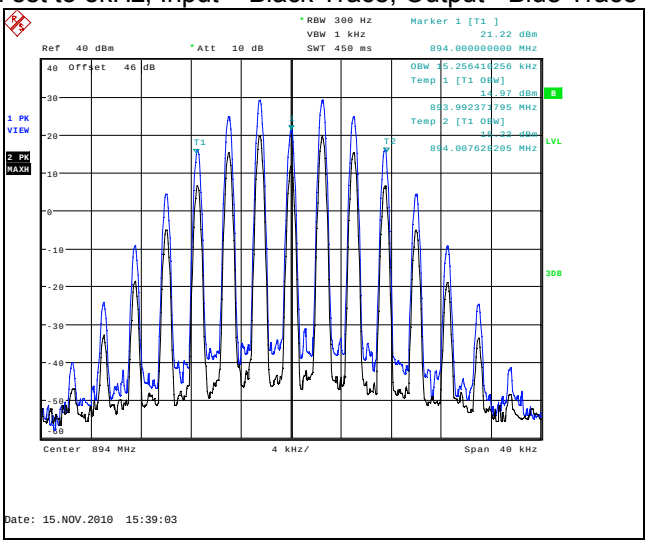
869.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace



881.5MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

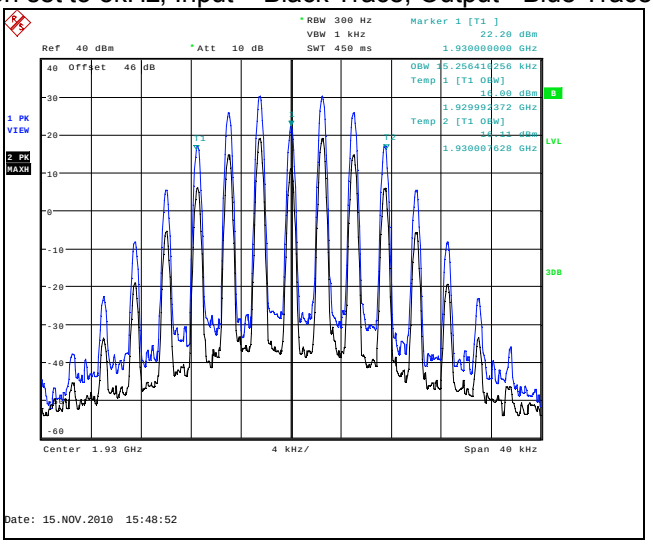


894.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

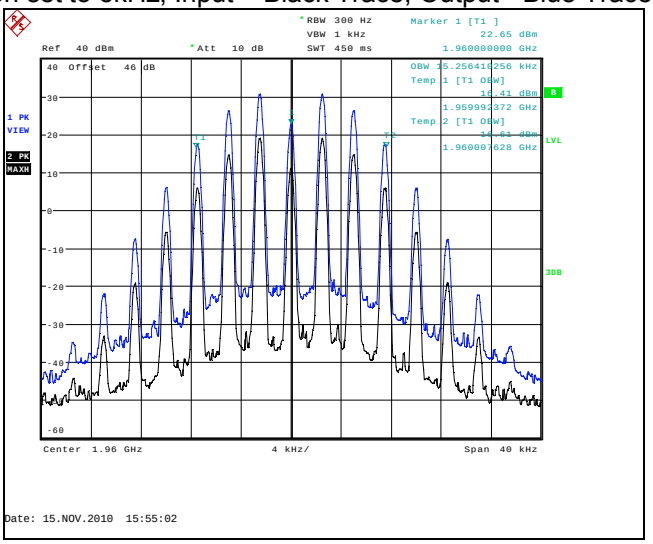


The above plots show no significant distortion visible when compared to the input signal.

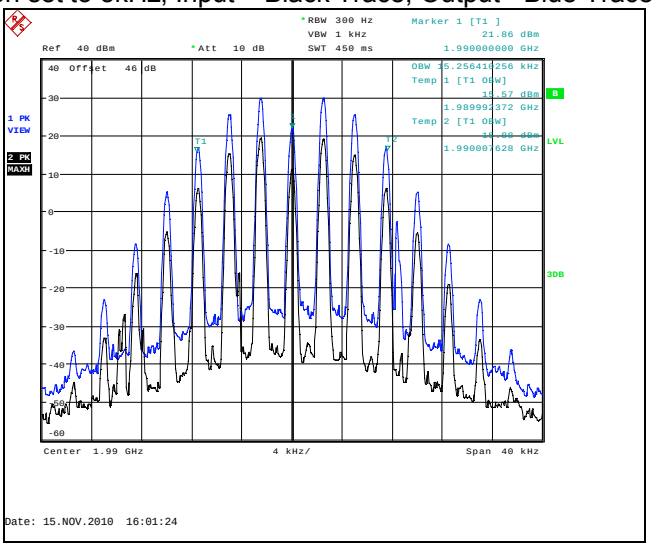
1930.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace



1960.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

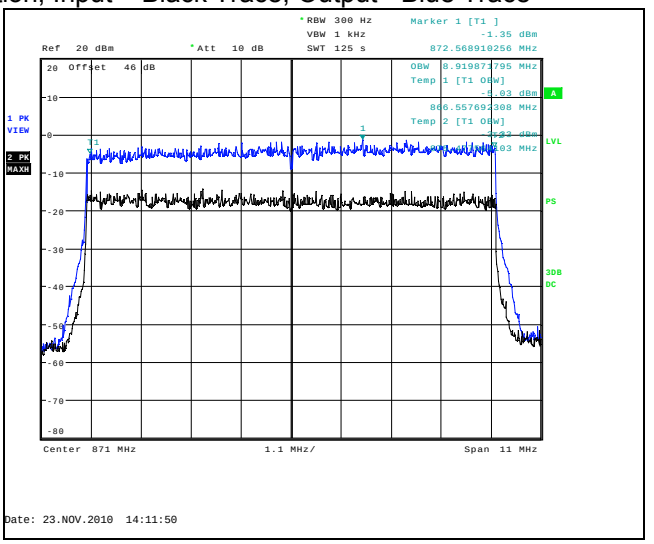


1990.0MHz FM deviation set to 5kHz, Input – Black Trace, Output - Blue Trace

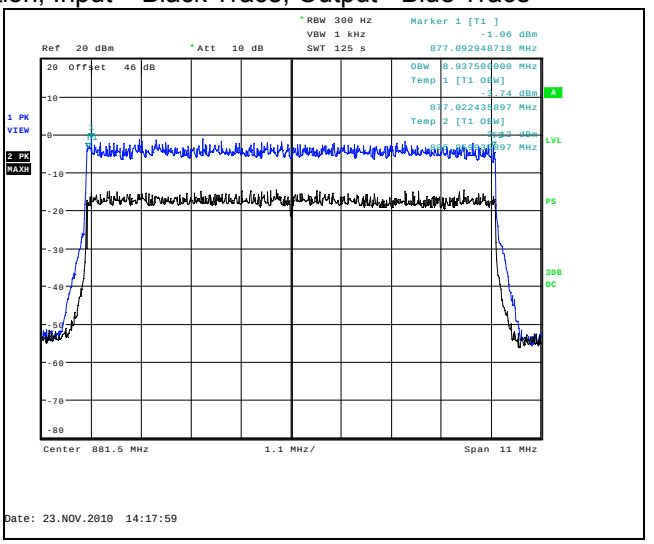


The above plots show no significant distortion visible when compared to the input signal.

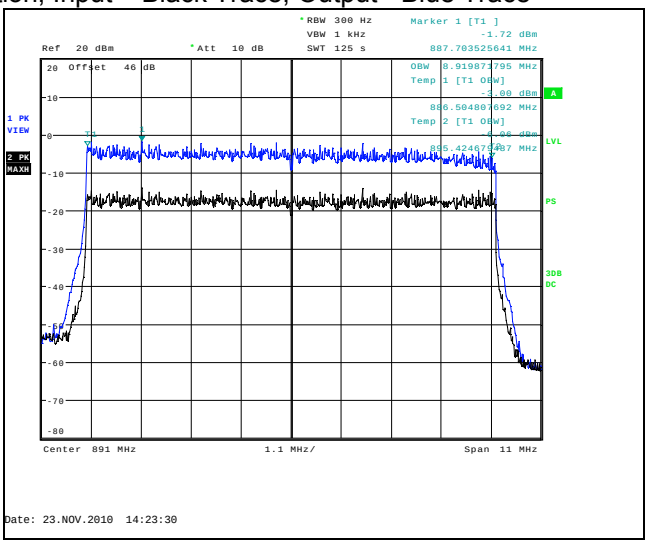
869.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace



881.5MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

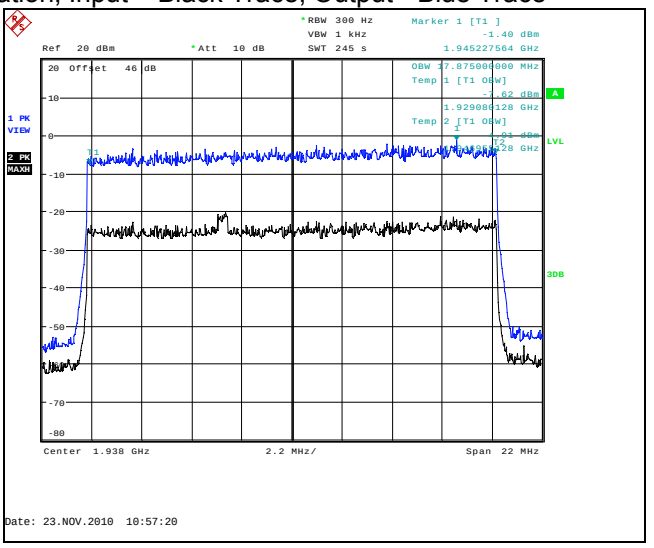


894.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

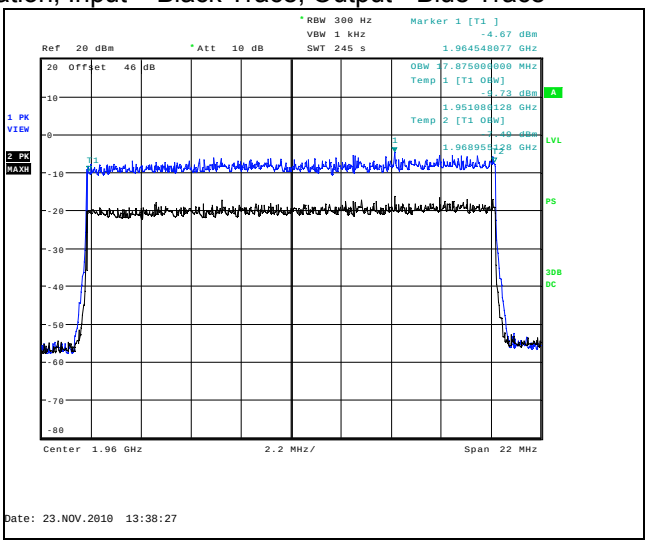


The above plots show no significant distortion visible when compared to the input signal.

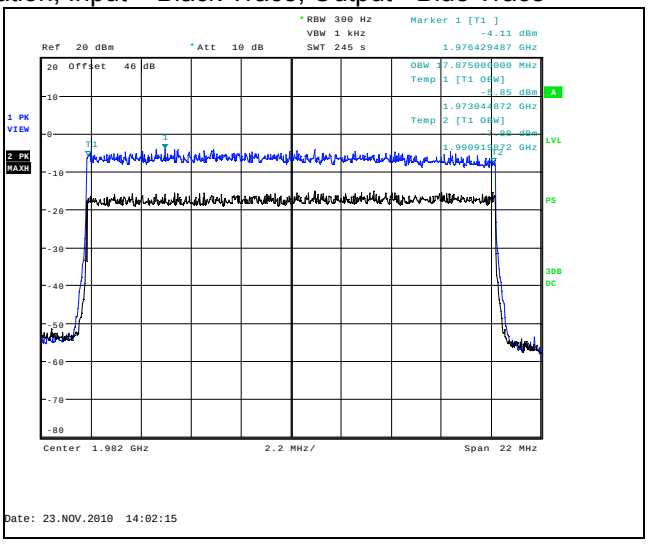
1930.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace



1960.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

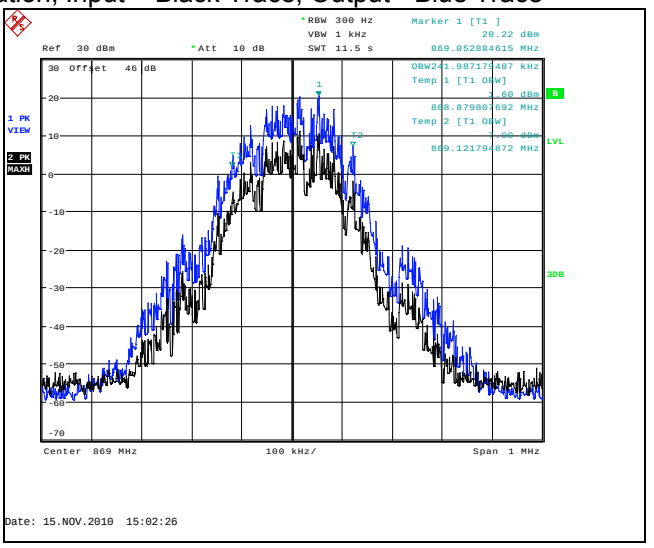


1990.0MHz LTE Modulation, Input – Black Trace, Output - Blue Trace

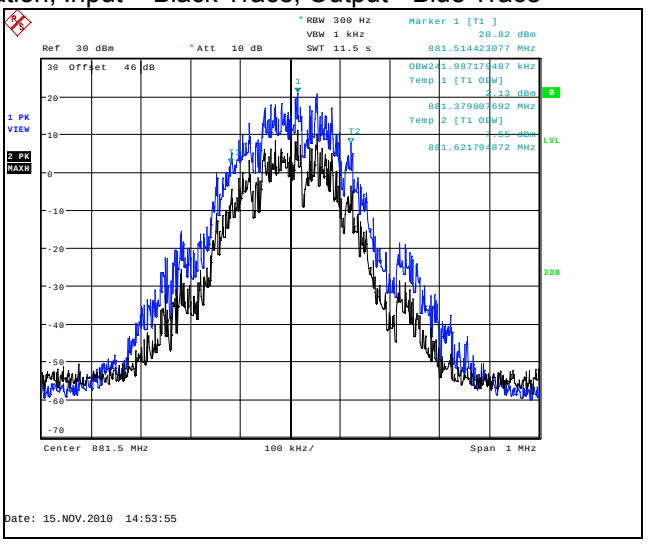


The above plots show no significant distortion visible when compared to the input signal.

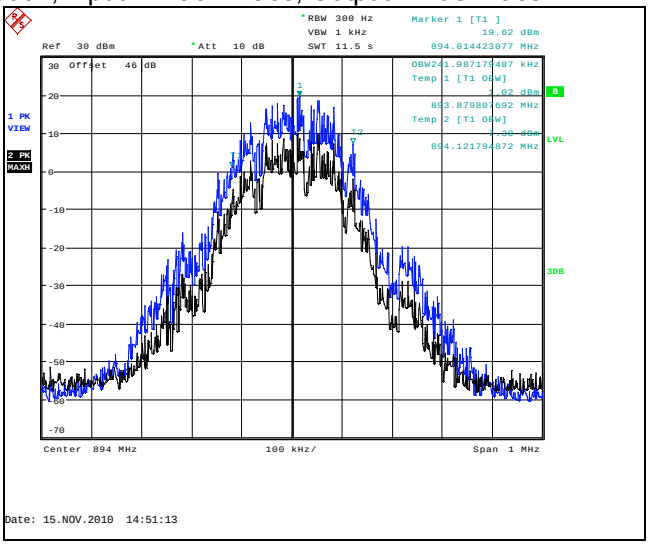
869.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace



881.5MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

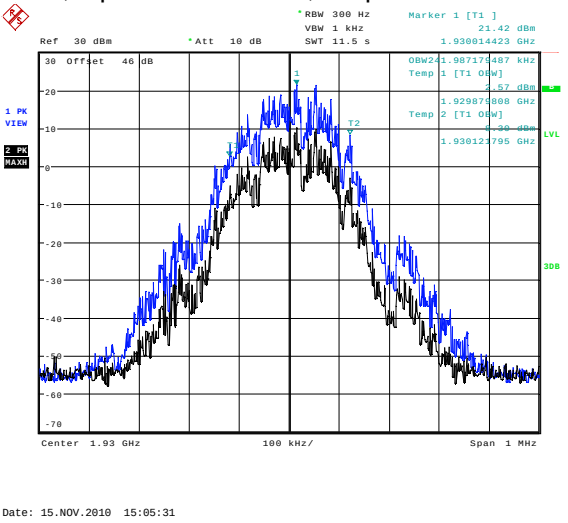


894.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

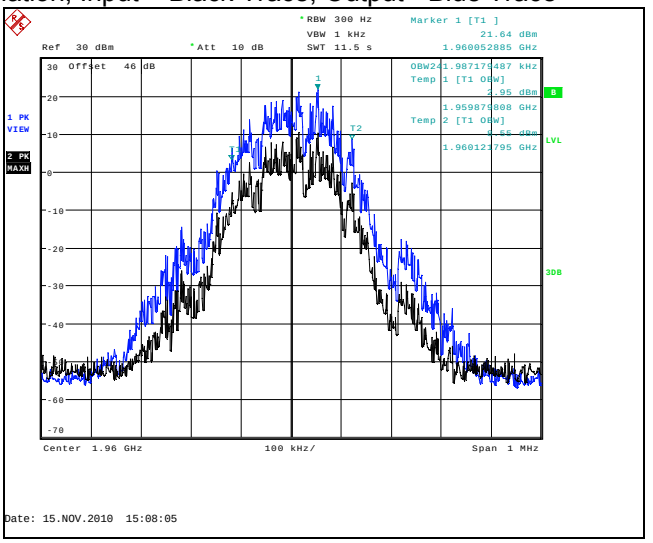


The above plots show no significant distortion visible when compared to the input signal.

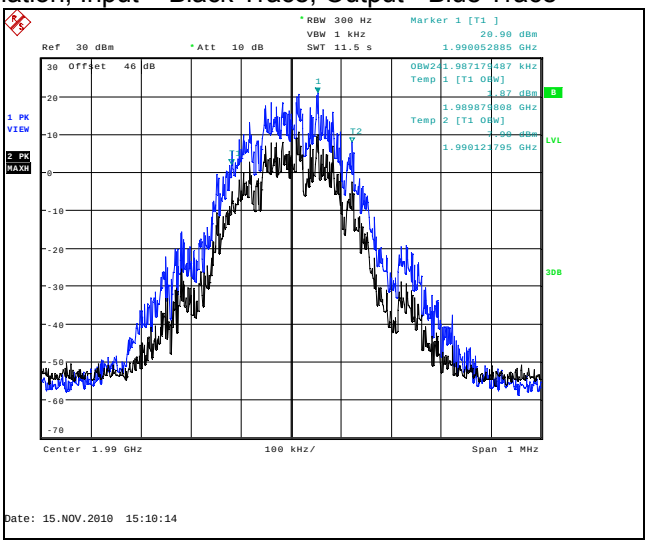
1930.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace



1960.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

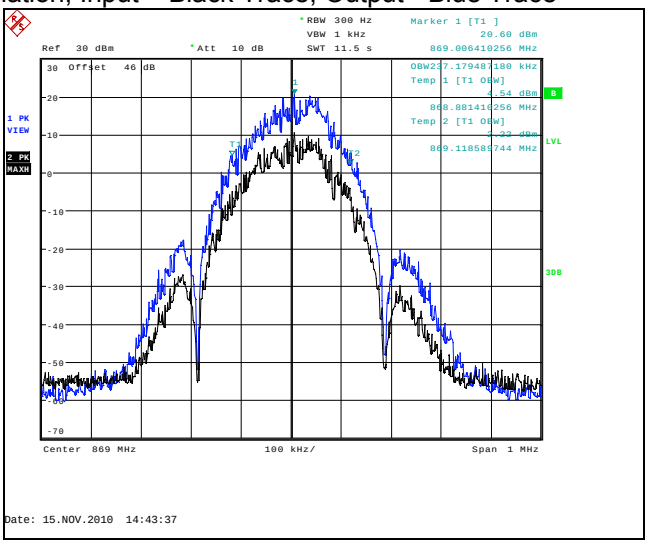


1990.0MHz GSM Modulation, Input – Black Trace, Output - Blue Trace

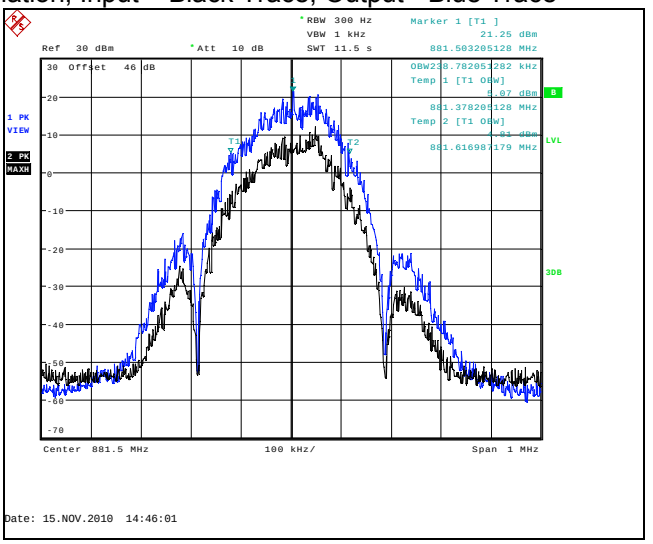


The above plots show no significant distortion visible when compared to the input signal.

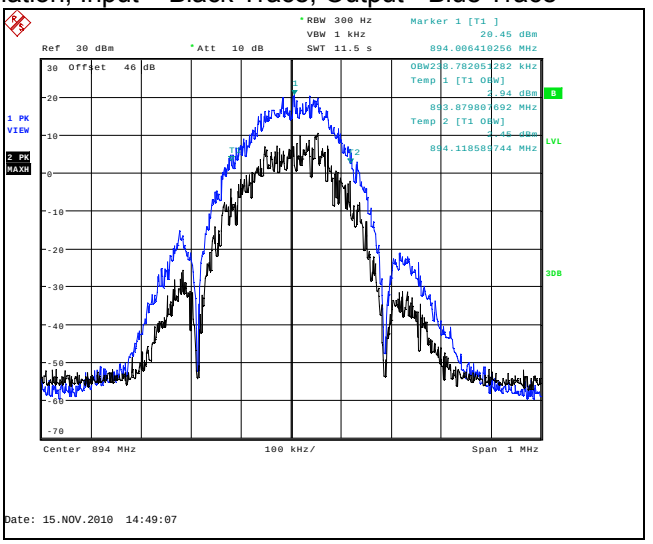
869.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace



881.5MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

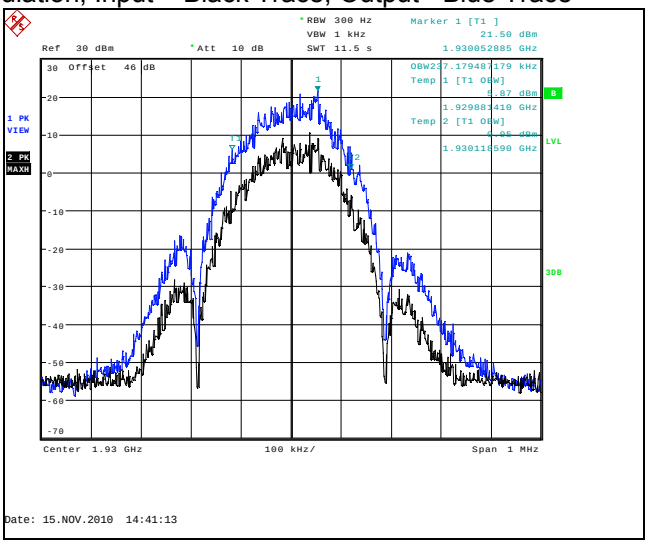


894.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

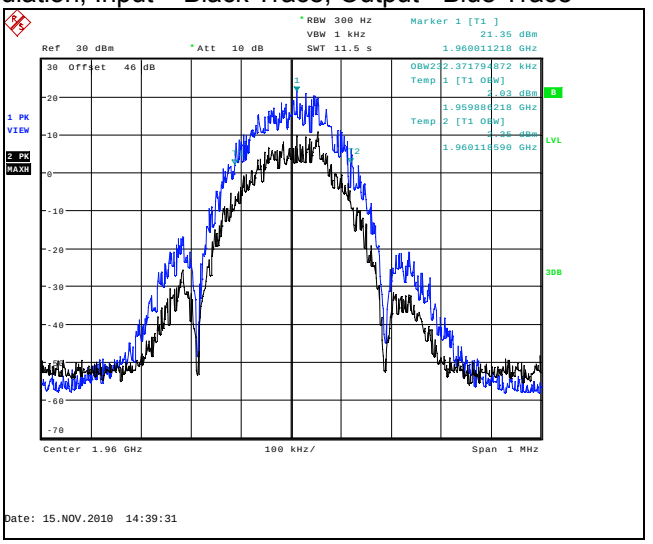


The above plots show no significant distortion visible when compared to the input signal.

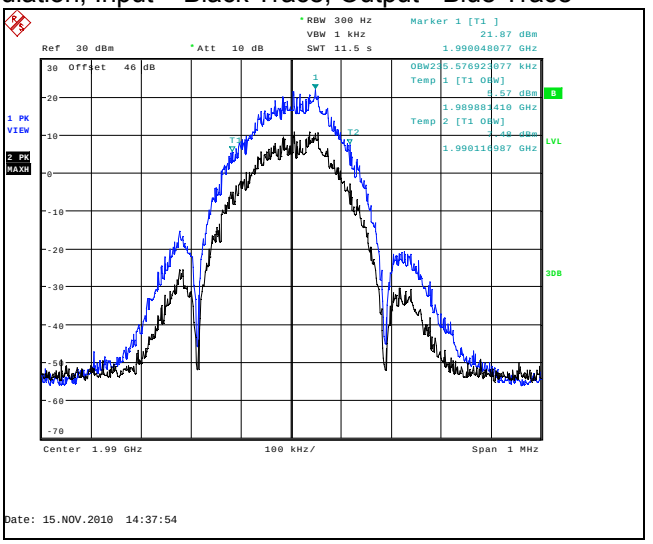
1930.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace



1960.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

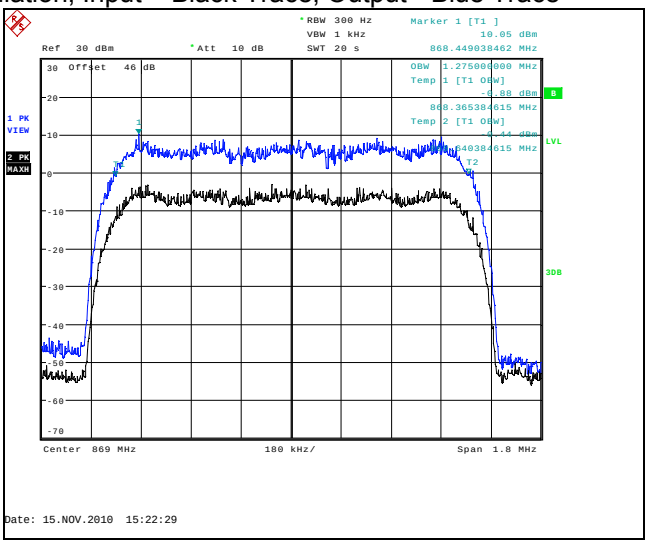


1990.0MHz EDGE Modulation, Input – Black Trace, Output - Blue Trace

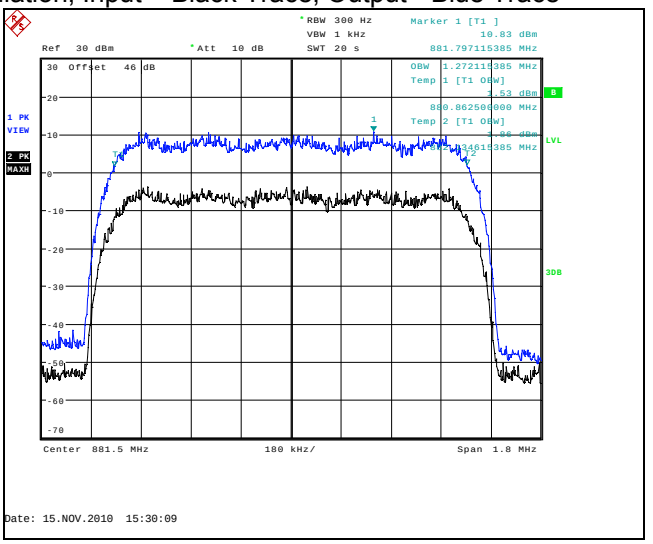


The above plots show no significant distortion visible when compared to the input signal.

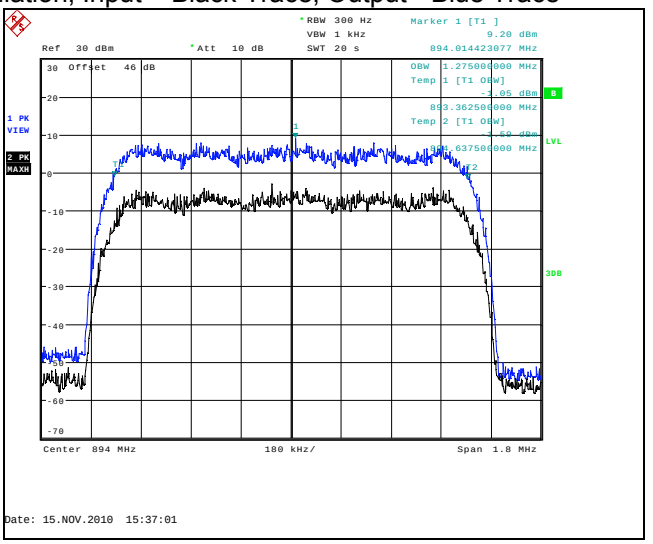
869.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace



881.5MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

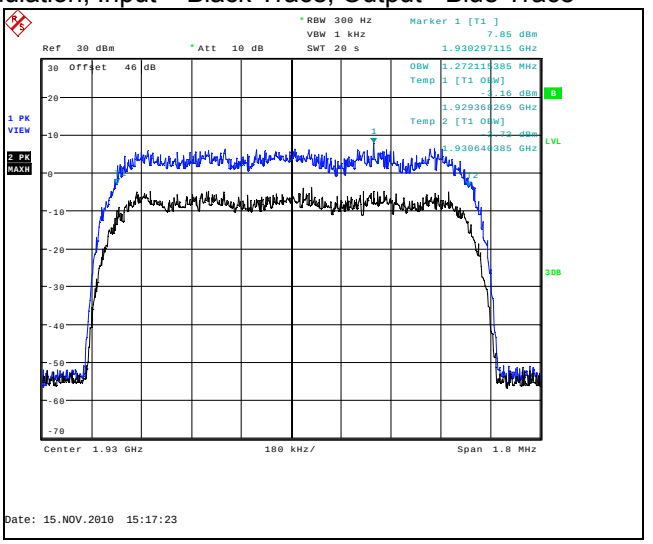


894.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

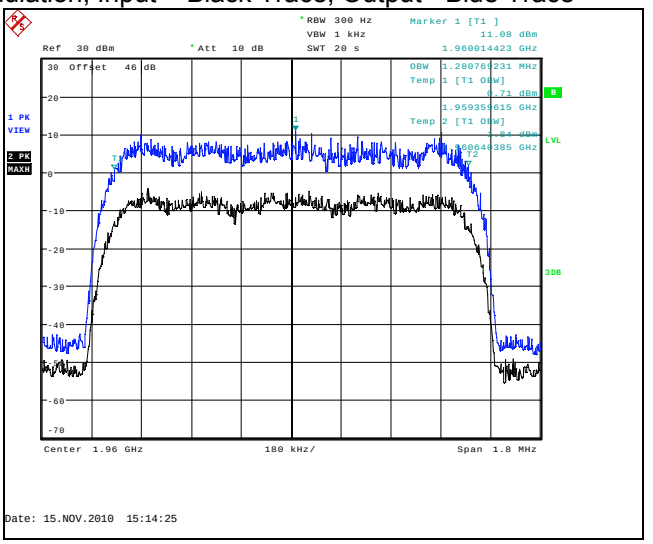


The above plots show no significant distortion visible when compared to the input signal.

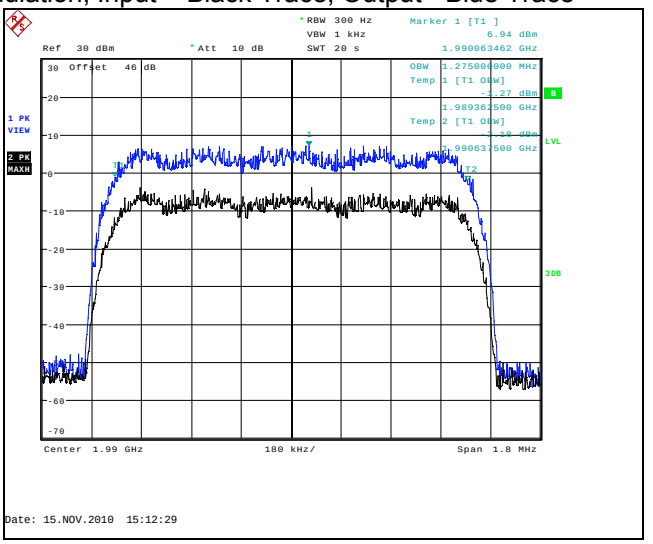
1930.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace



1960.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

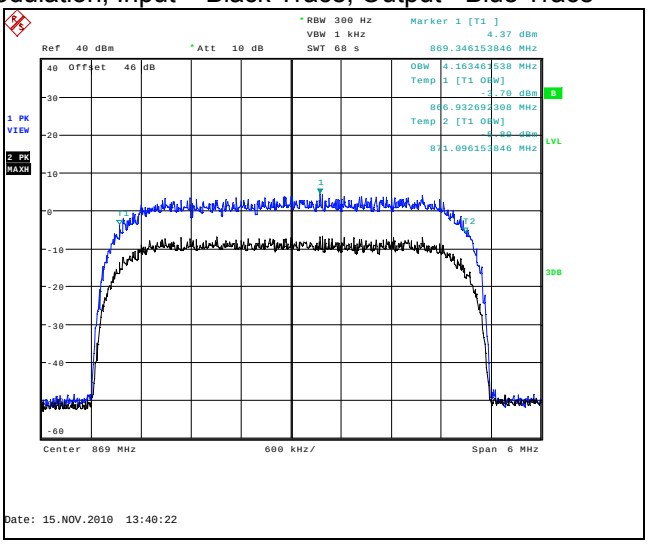


1990.0MHz CDMA Modulation, Input – Black Trace, Output - Blue Trace

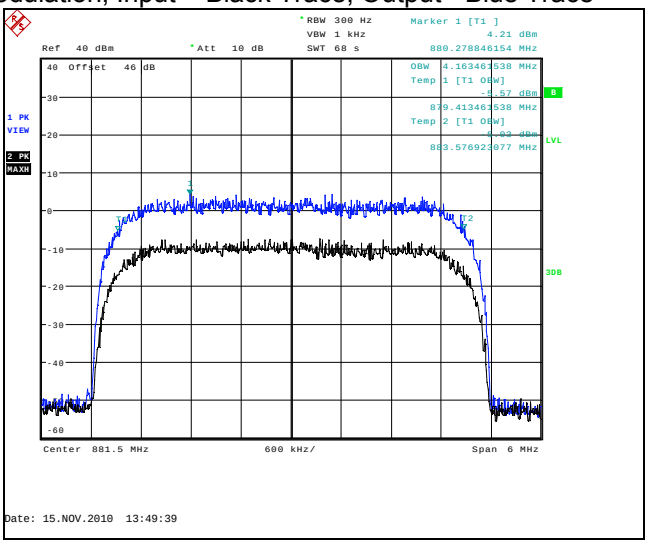


The above plots show no significant distortion visible when compared to the input signal.

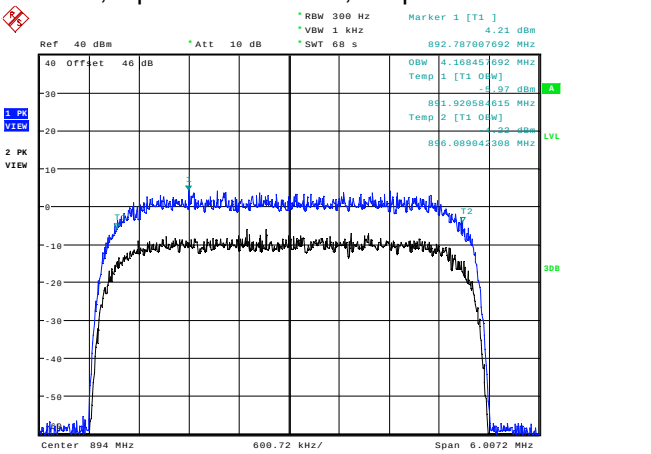
869.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace



881.5MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace

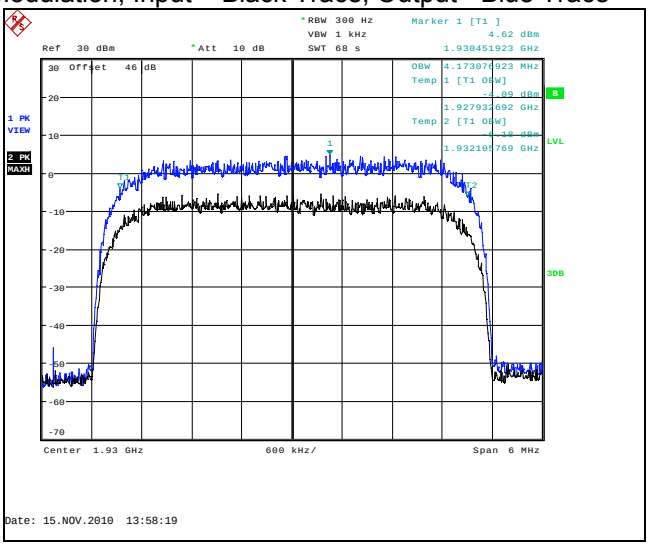


894.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace

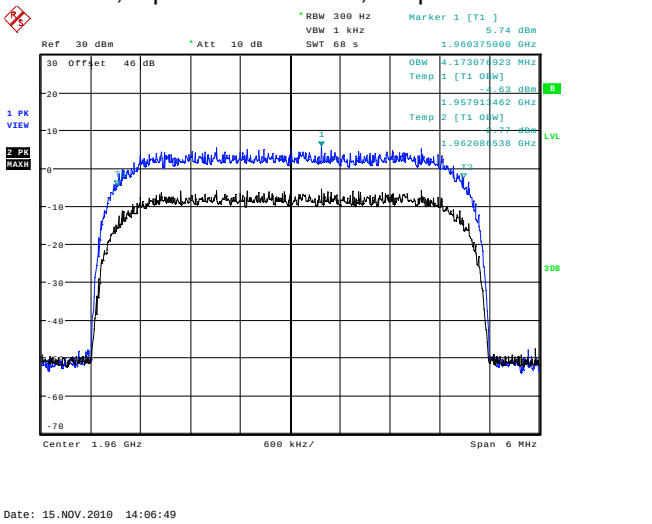


The above plots show no significant distortion visible when compared to the input signal.

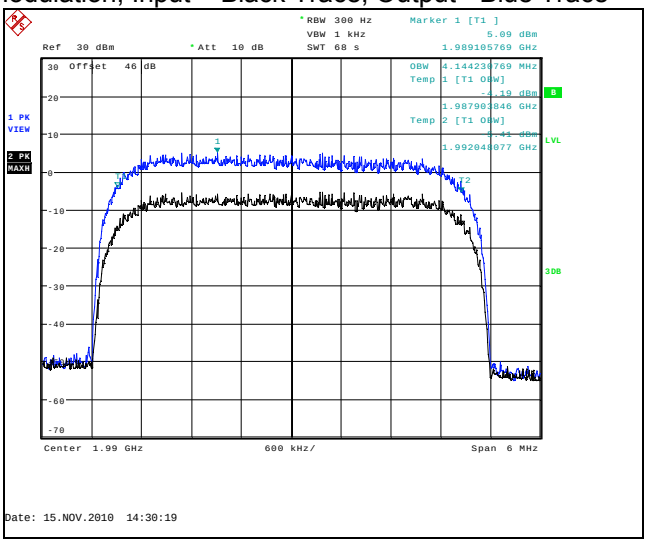
1930.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace



1960.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace



1990.0MHz W-CDMA Modulation, Input – Black Trace, Output - Blue Trace



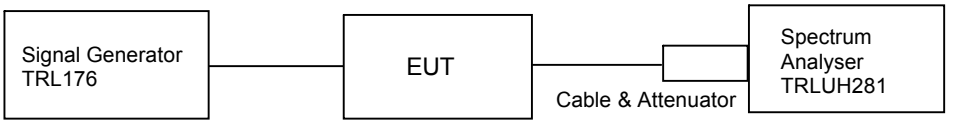
The above plots show no significant distortion visible when compared to the input signal.

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – DOWNLINK

Ambient temperature = 24°C
Relative humidity = 56%
Supply voltage = +110Vac

Radio Laboratory
Test Signal = F3E



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating at maximum power and on three test frequencies.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least 43 + 10 log PdB

$(10\log P_{watts}) – (43+10\log (P_{watts} * 1000)) =$ LIMIT =-13 dBm

RESULTS

800MHz Downlink

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
100kHz – 20 GHz	No Significant Emissions Within 20 dB of the Limit				-13

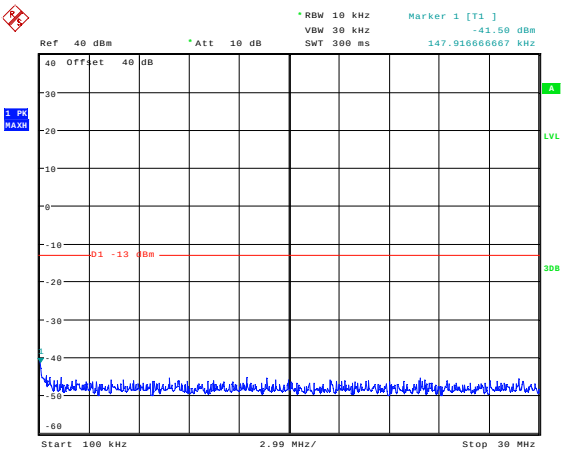
1900MHz Downlink

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
100kHz – 20 GHz	No Significant Emissions Within 20 dB of the Limit				-13

The test equipment used for the Transmitter Conducted Emissions:

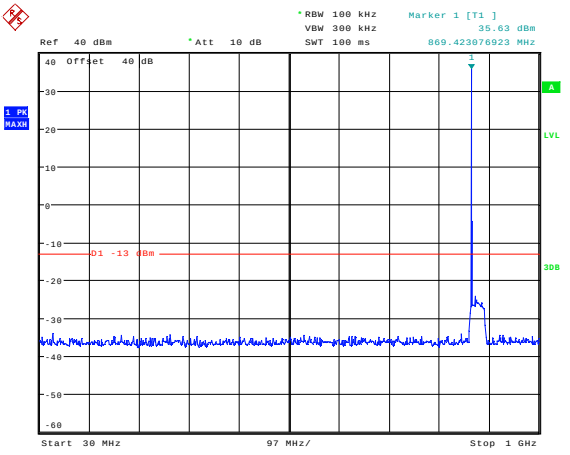
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
ATTENUATOR	BIRD	8308-200	N/A	103	**X**
ATTENUATOR	BIRD	830-100-N	N/A	222	**X**
CABLE	TRaC	N/A	N/A	UH273	**X**
CABLE	TRaC	N/A	N/A	UH274	**X**

Conducted emissions 869.0MHz 100kHz – 30MHz



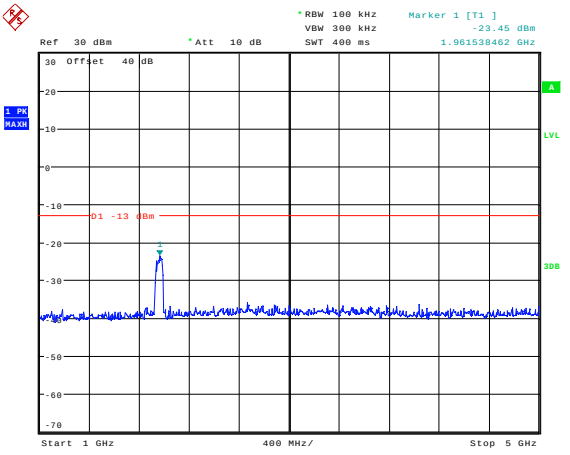
Date: 16.NOV.2010 14:24:22

Conducted emissions 869.0MHz 30MHz – 1GHz



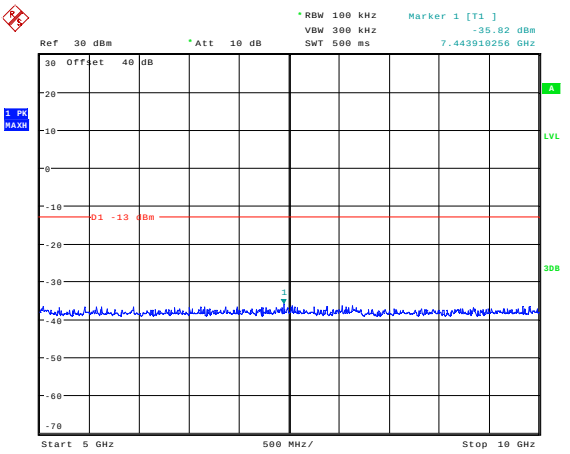
Date: 12.NOV.2010 14:59:36

Conducted emissions 869.0MHz 1 – 5GHz



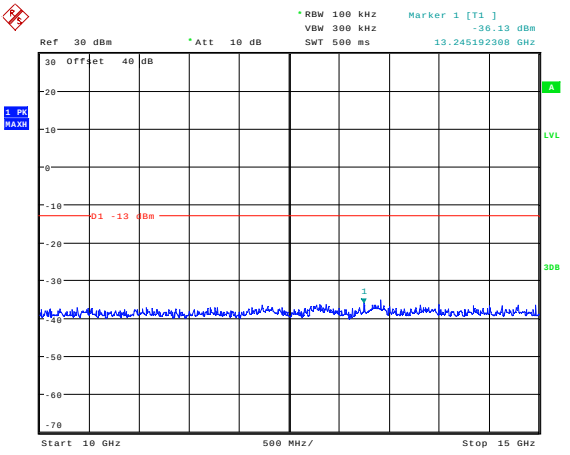
Date: 12.NOV.2010 14:59:04

Conducted emissions 869.0MHz 5 – 10GHz



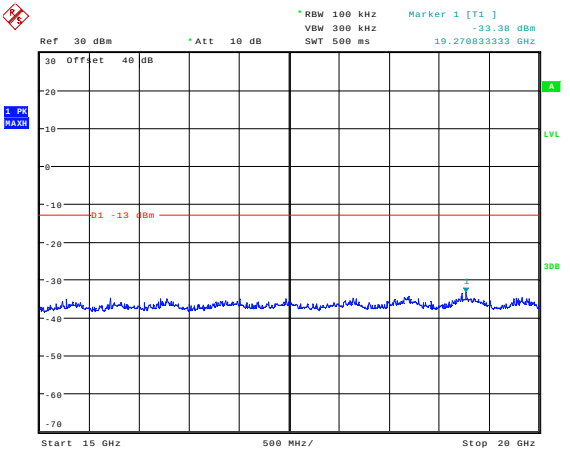
Date: 12.NOV.2010 14:58:48

Conducted emissions 869.0MHz 10 – 15GHz



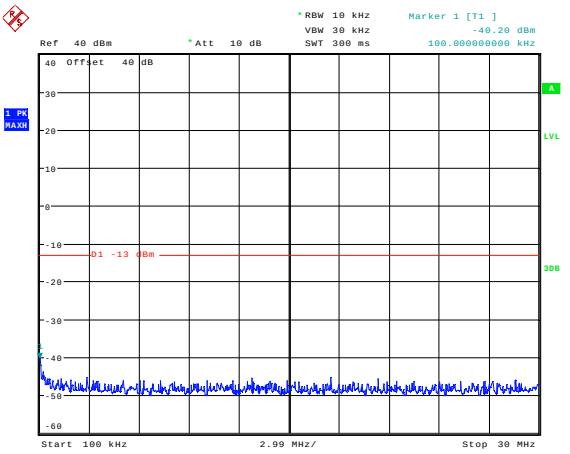
Date: 12.NOV.2010 14:57:40

Conducted emissions 869.0MHz 15 – 20GHz



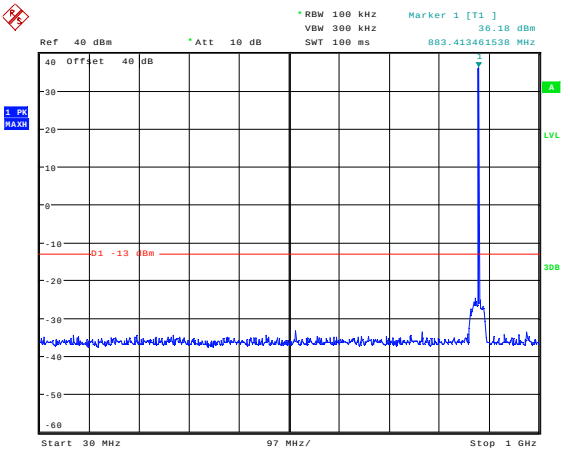
Date: 12.NOV.2010 14:54:34

Conducted emissions 881.5MHz 100kHz – 30MHz



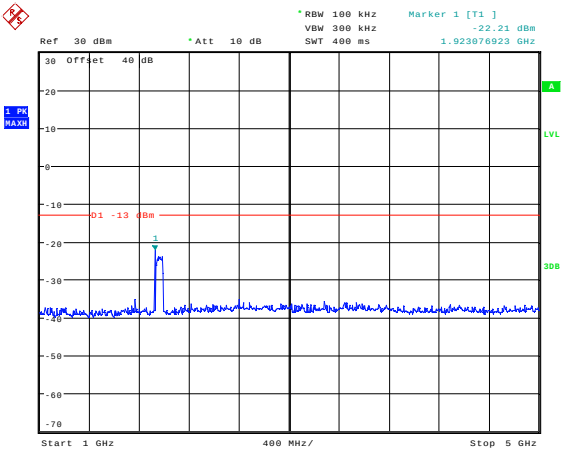
Date: 16.NOV.2010 14:35:25

Conducted emissions 881.5MHz 30MHz – 1GHz



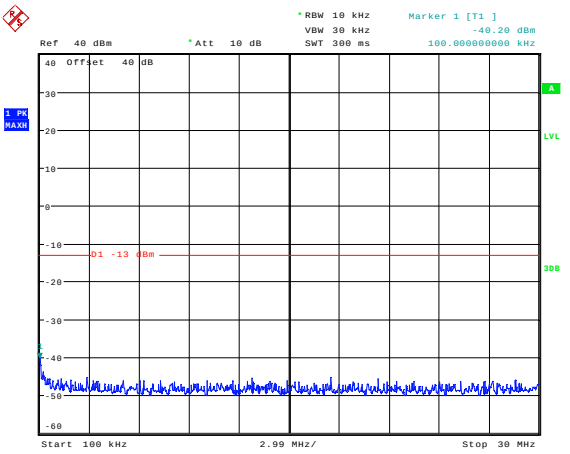
Date: 12.NOV.2010 15:00:53

Conducted emissions 881.5MHz 1 – 5GHz



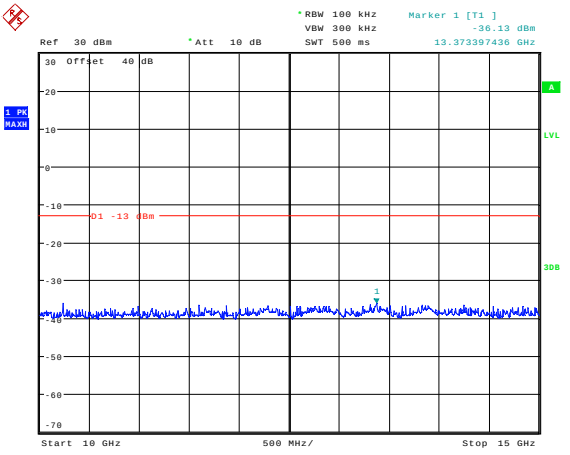
Date: 12.NOV.2010 15:02:00

Conducted emissions 881.5MHz 5 – 10GHz



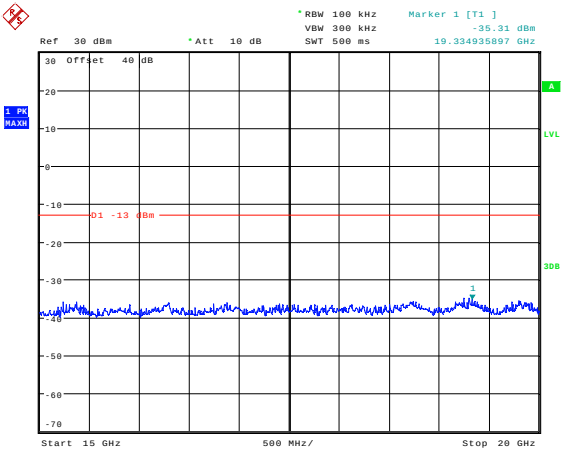
Date: 16.NOV.2010 14:35:25

Conducted emissions 881.5MHz 10 – 15GHz



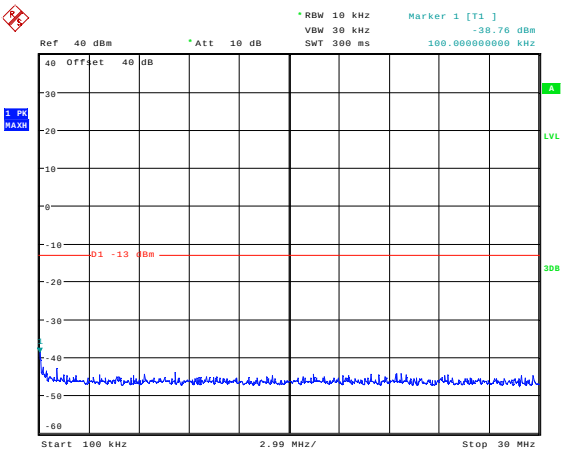
Date: 12.NOV.2010 15:04:25

Conducted emissions 881.5MHz 15 – 20GHz



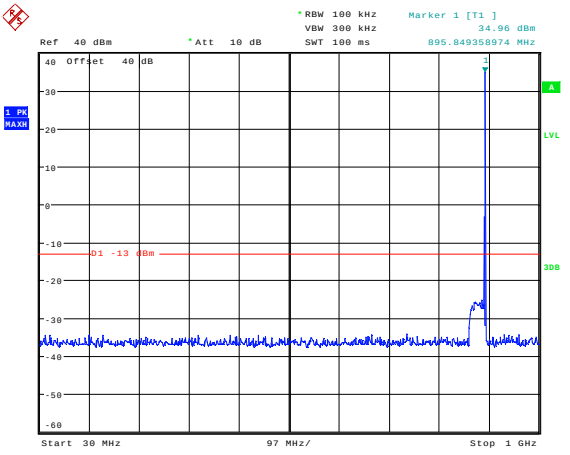
Date: 12.NOV.2010 15:04:45

Conducted emissions 894.0MHz 100kHz – 30MHz



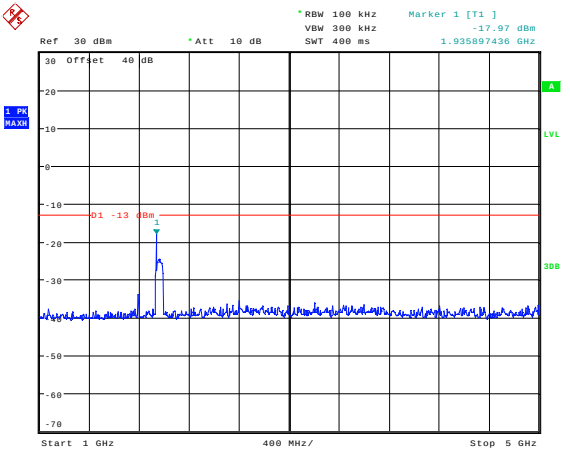
Date: 16.NOV.2010 14:20:18

Conducted emissions 894.0MHz 30MHz – 1GHz



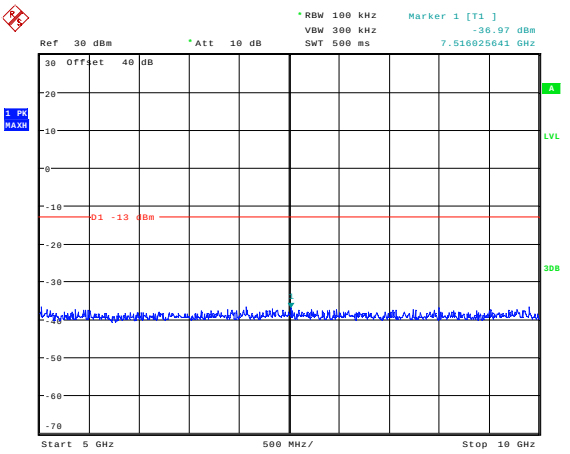
Date: 12.NOV.2010 15:12:51

Conducted emissions 894.0MHz 1 – 5GHz



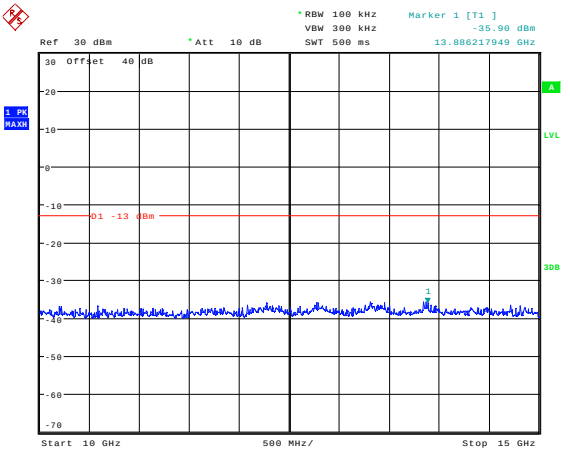
Date: 12.NOV.2010 15:11:21

Conducted emissions 894.0MHz 5 – 10GHz



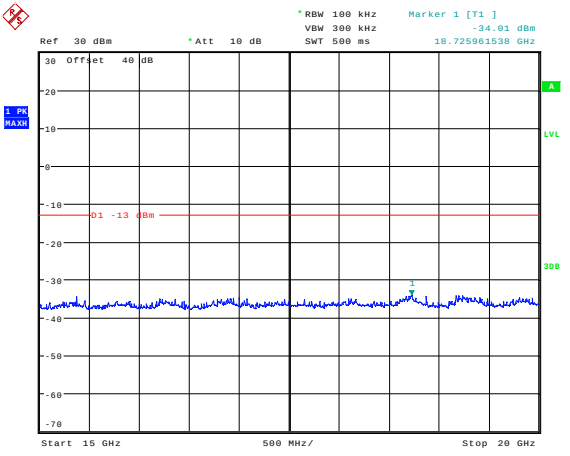
Date: 12.NOV.2010 15:11:05

Conducted emissions 894.0MHz 10 – 15GHz



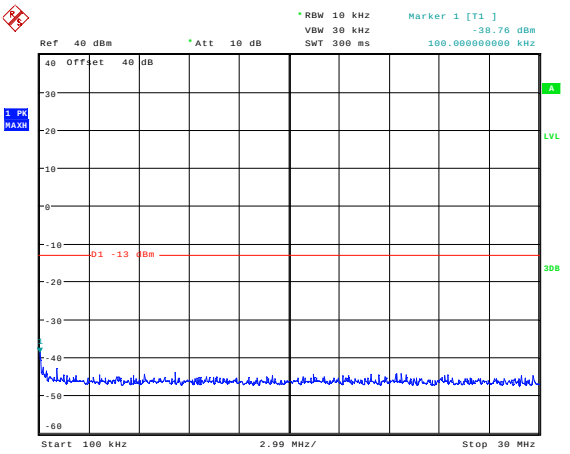
Date: 12.NOV.2010 15:10:50

Conducted emissions 894.0MHz 15 – 20GHz



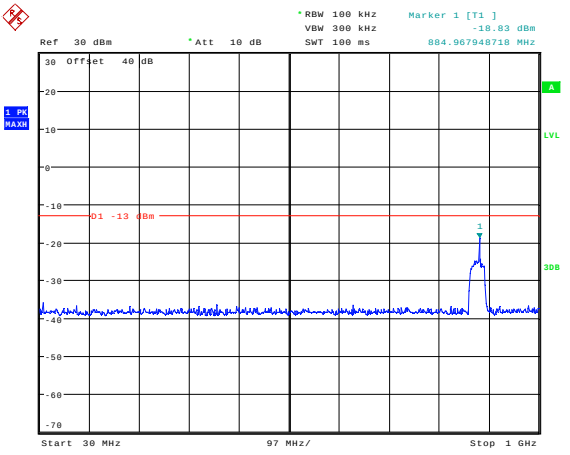
Date: 12.NOV.2010 15:10:32

Conducted emissions 1930.0MHz 100kHz – 30MHz



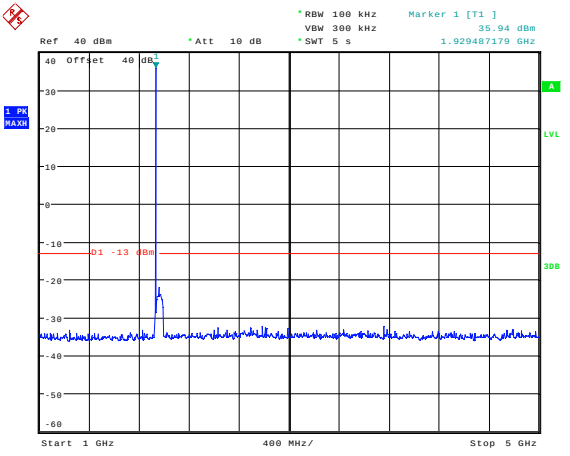
Date: 16.NOV.2010 14:20:18

Conducted emissions 1930.0MHz 30MHz – 1GHz



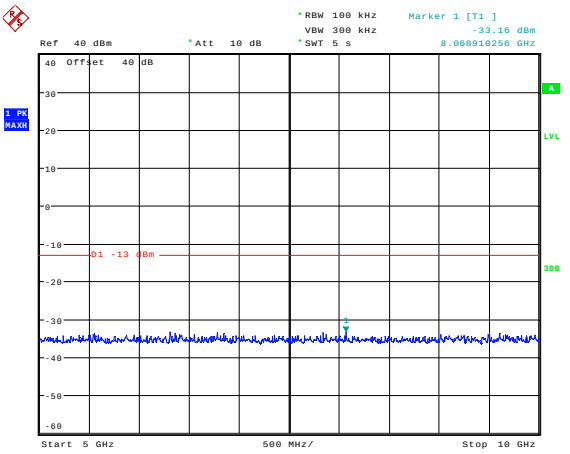
Date: 12.NOV.2010 14:25:47

Conducted emissions 1930.0MHz 1 – 5GHz



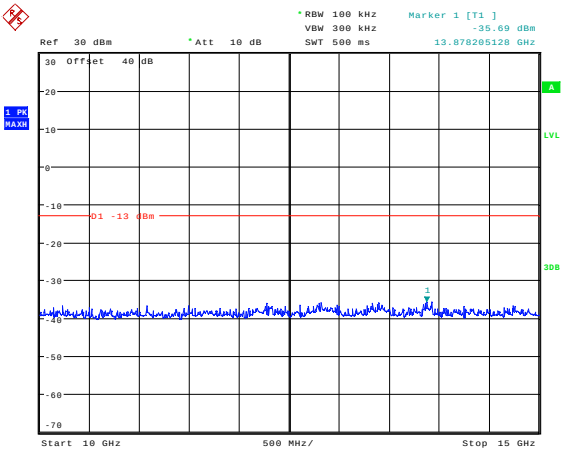
Date: 12.NOV.2010 14:42:47

Conducted emissions 1930.0MHz 5 – 10GHz



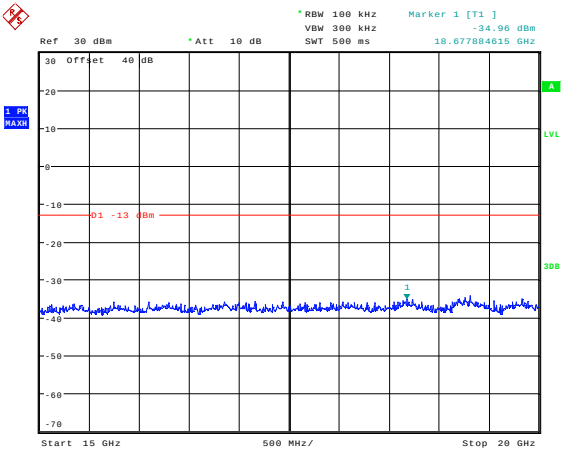
Date: 12.NOV.2010 14:44:04

Conducted emissions 1930.0MHz 10 – 15GHz



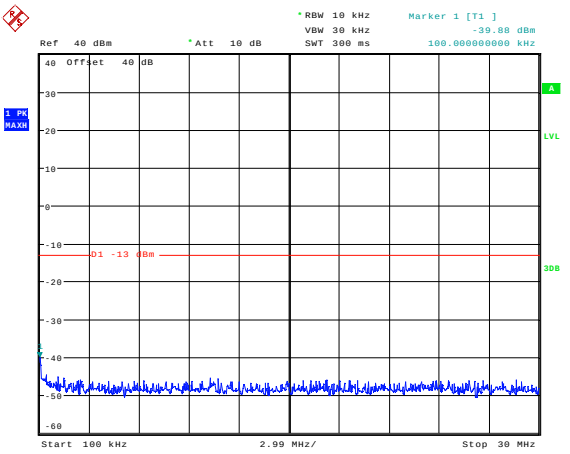
Date: 12.NOV.2010 14:44:28

Conducted emissions 1930.0MHz 15 – 20GHz



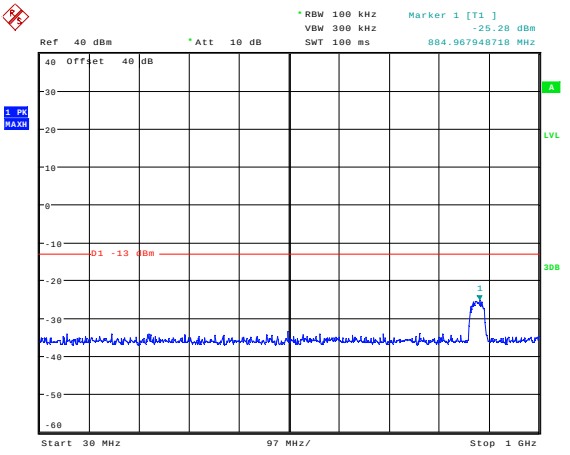
Date: 12.NOV.2010 14:45:10

Conducted emissions 1960.0MHz 100kHz – 30MHz



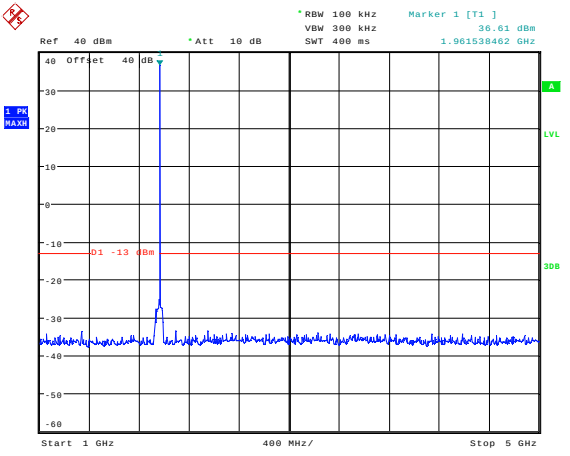
Date: 16.NOV.2010 14:17:08

Conducted emissions 1960.0MHz 30MHz – 1GHz



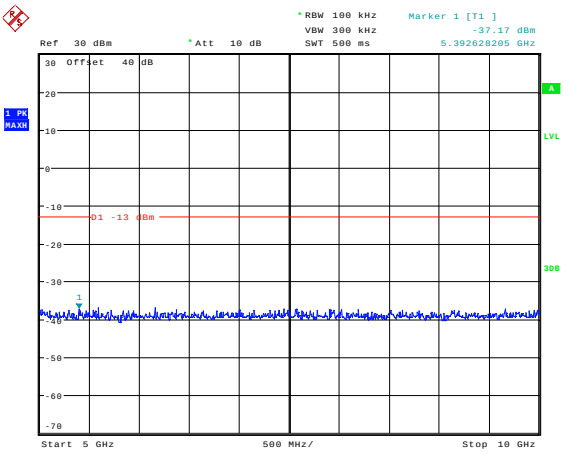
Date: 12.NOV.2010 14:49:43

Conducted emissions 1960.0MHz 1 – 5GHz



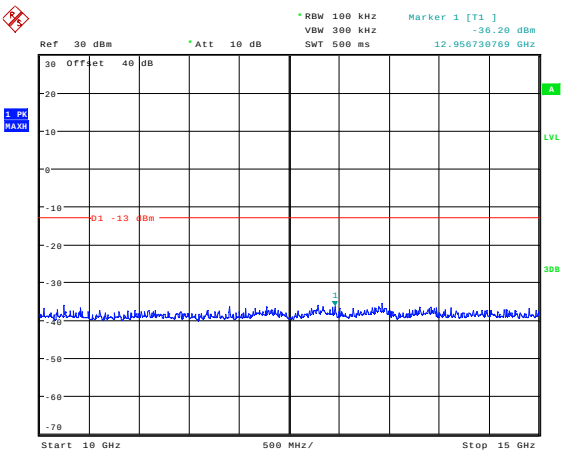
Date: 12.NOV.2010 14:49:10

Conducted emissions 1960.0MHz 5 – 10GHz



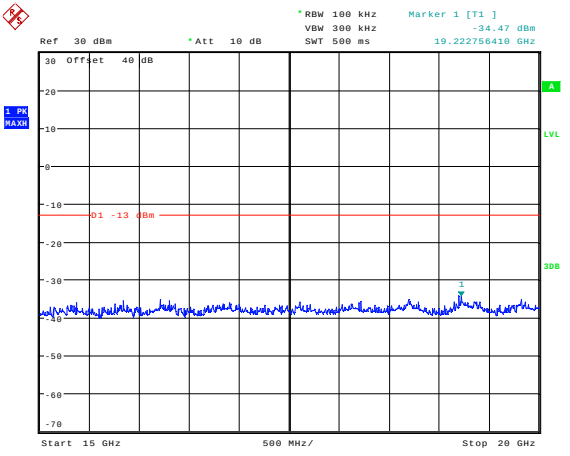
Date: 12.NOV.2010 14:48:55

Conducted emissions 1960.0MHz 10 – 15GHz



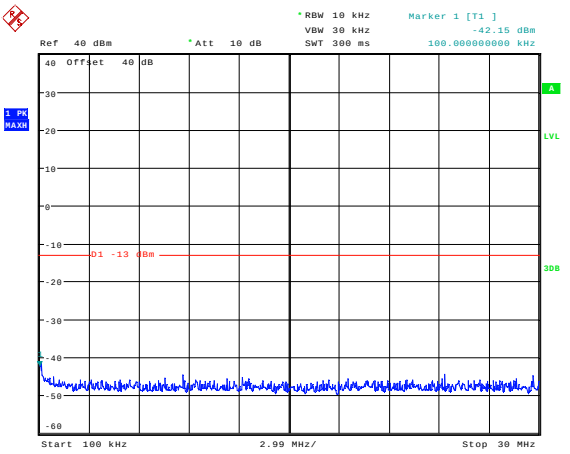
Date: 12.NOV.2010 14:48:41

Conducted emissions 1960.0MHz 15 – 20GHz



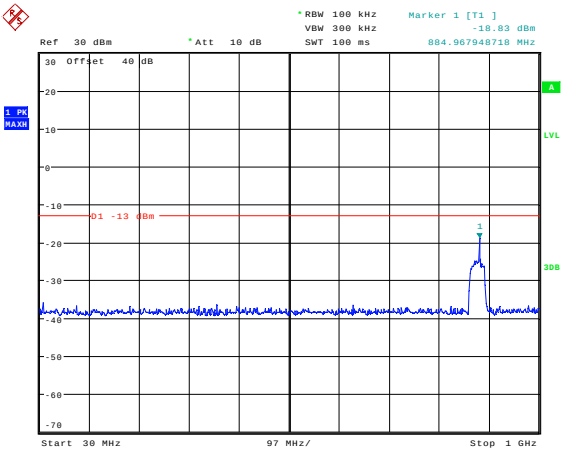
Date: 12.NOV.2010 14:47:56

Conducted emissions 1990.0MHz 100kHz – 30MHz



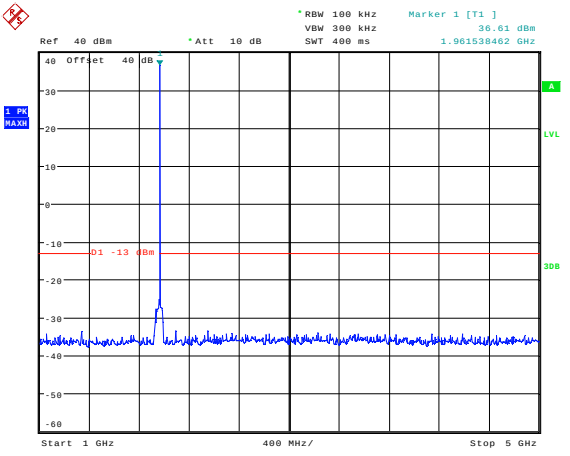
Date: 16.NOV.2010 13:57:45

Conducted emissions 1990.0MHz 30MHz – 1GHz



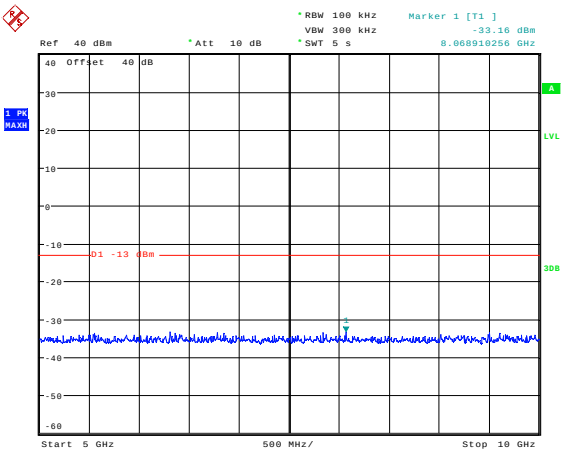
Date: 12.NOV.2010 14:25:47

Conducted emissions 1990.0MHz 1 – 5GHz



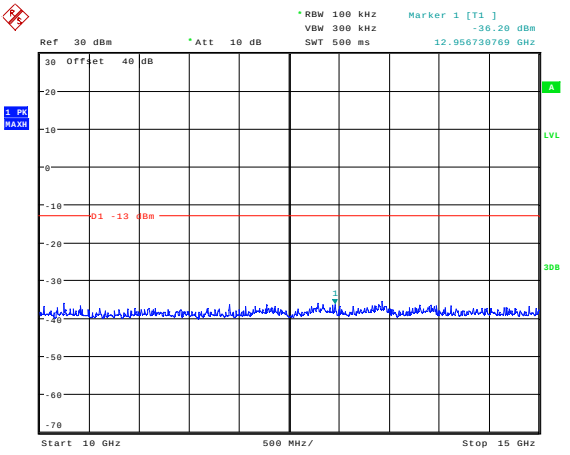
Date: 12.NOV.2010 14:49:10

Conducted emissions 1990.0MHz 5 – 10GHz



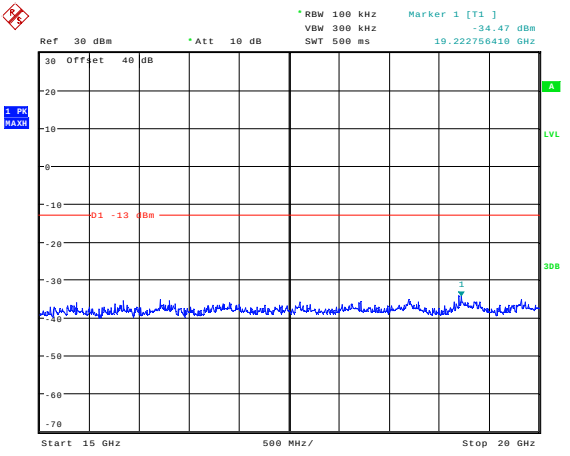
Date: 12.NOV.2010 14:44:04

Conducted emissions 1990.0MHz 10 – 15GHz



Date: 12.NOV.2010 14:48:41

Conducted emissions 1990.0MHz 15 – 20GHz

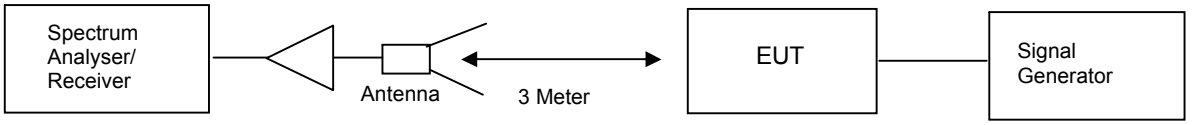


Date: 12.NOV.2010 14:47:56

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– DOWNLINK

Ambient temperature = 17°C
Relative humidity = 48%
Conditions = OATS
Supply voltage = +110Vac
Supply Frequency = N/A



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating maximum power on three test frequencies with a 50 ohm load on the output. The unit was also tested with the signal generator replaced by another 50ohm load.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least 43 + 10 log PdB

$(10\log P_{watts}) – (43+10\log (P_{watts} * 1000)) = LIMIT = -13$ dBm

RESULTS

800 MHz Band

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 20 GHz	No Significant Emissions Within 20 dB of Limit						-13

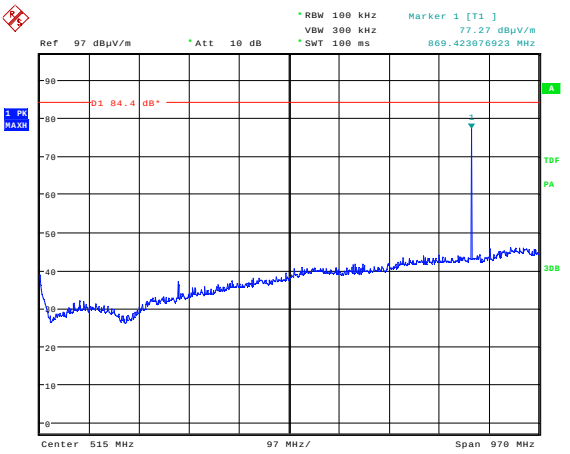
1900 MHz Band

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 20 GHz	No Significant Emissions Within 20 dB of Limit						-13

The test equipment used for the Transmitter Spurious Emissions:

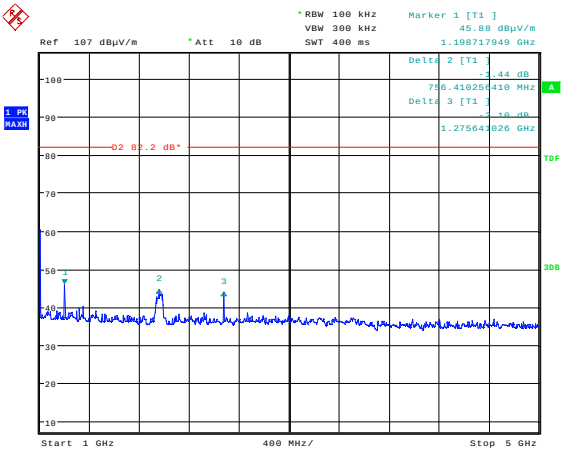
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	**X**
HORN	EMCO	3115	9010-3580	138	**X**
HORN	FLANN	20240-20	322	300	**X**
PRE AMPLIFIER	HP	8449B	3008A016	572	**X**
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	**X**
ANTENNA	YORK	CBL611/A	1618	UH191	**X**

Radiated emissions 869.0 30MHz – 1GHz



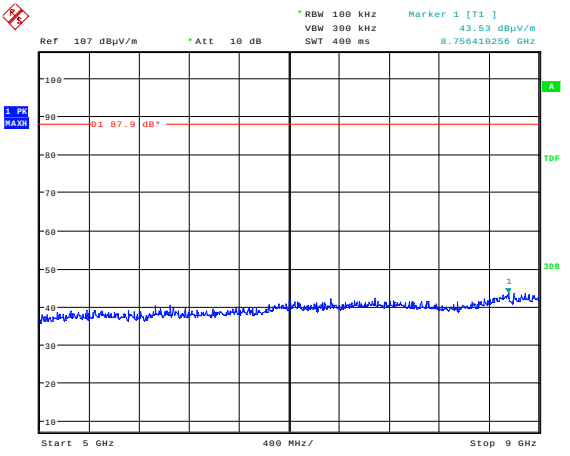
Date: 29.NOV.2010 11:55:27

Radiated emissions 869.0 1 – 5GHz



Date: 25.NOV.2010 14:02:03

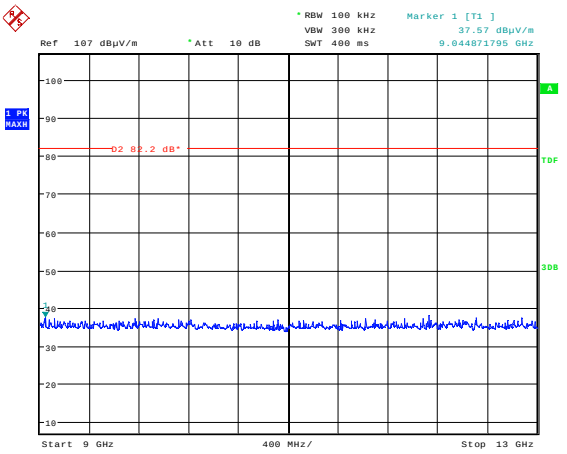
Radiated emissions 869.0 5 – 9GHz



Date: 24.NOV.2010 13:43:53

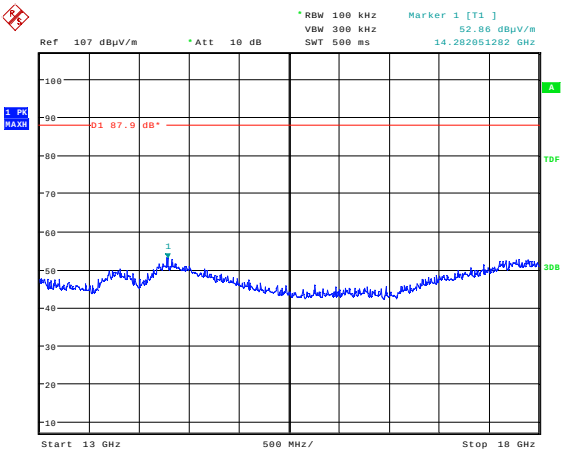
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 869.0 9 – 13GHz



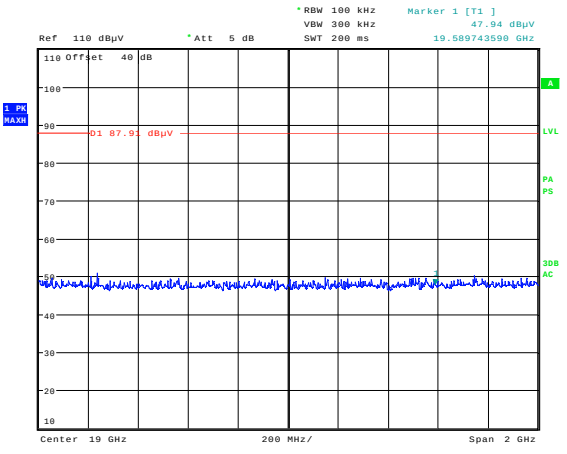
Date: 25.NOV.2010 12:10:57

Radiated emissions 869.0 13 – 18GHz



Date: 24.NOV.2010 13:15:16

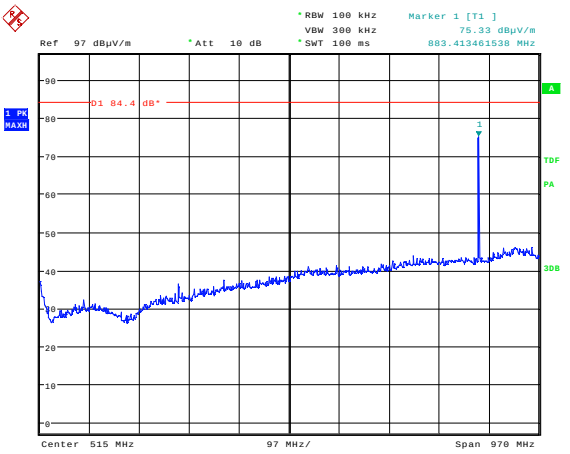
Radiated emissions 869.0 18 – 20GHz



Date: 23.NOV.2010 17:31:20

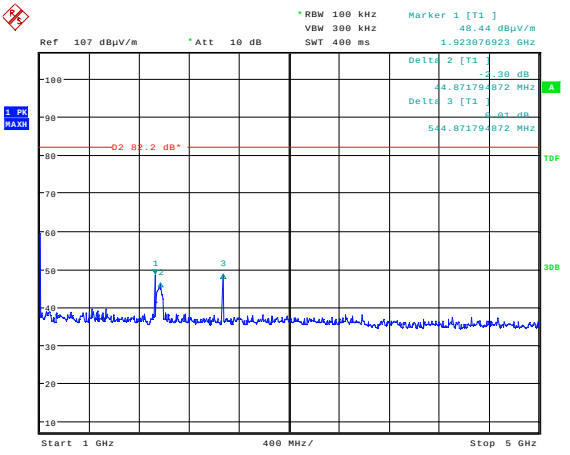
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 881.5 30MHz – 1GHz



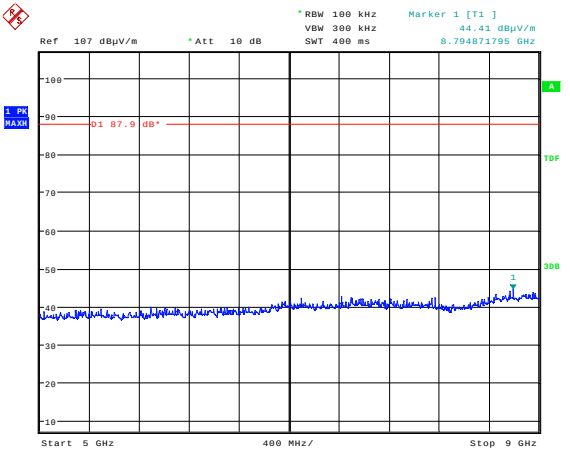
Date: 29.NOV.2010 11:56:04

Radiated emissions 881.5 1 – 5GHz



Date: 25.NOV.2010 13:53:36

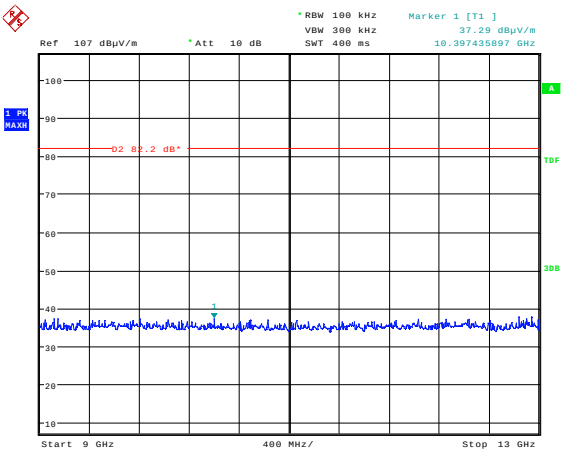
Radiated emissions 881.5 5 – 9GHz



Date: 24.NOV.2010 13:43:26

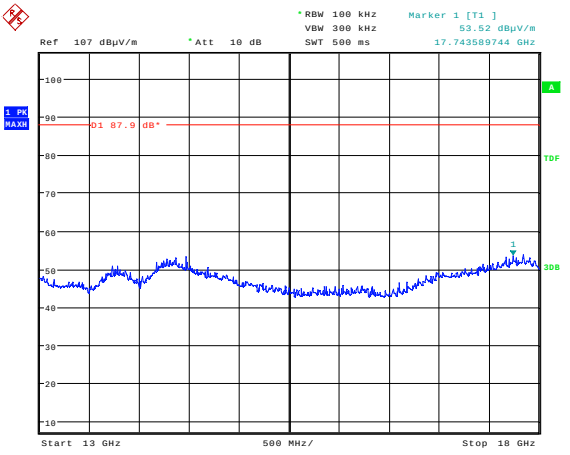
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 881.5 9 – 13GHz



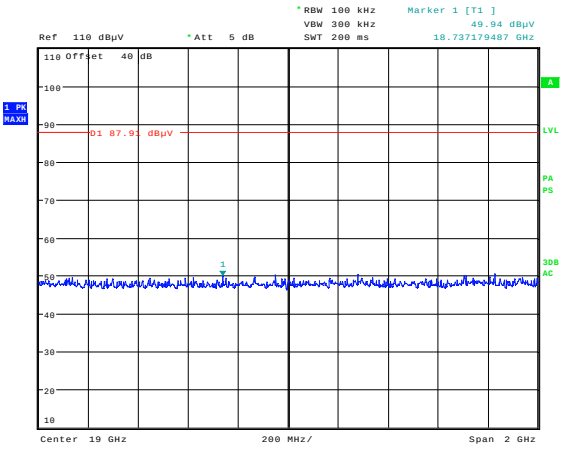
Date: 25.NOV.2010 12:05:12

Radiated emissions 881.5 13 – 18GHz



Date: 24.NOV.2010 13:14:49

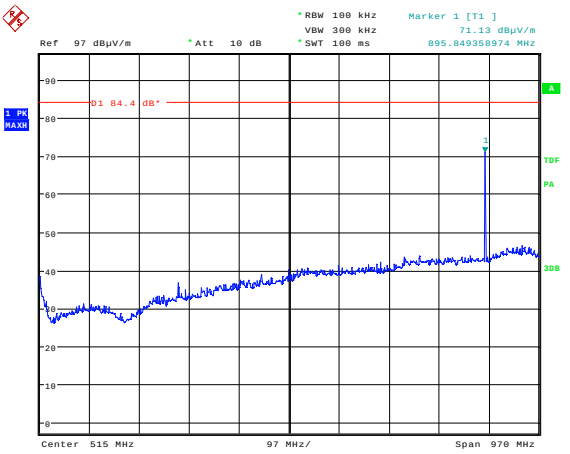
Radiated emissions 881.5 18 – 20GHz



Date: 23.NOV.2010 17:31:54

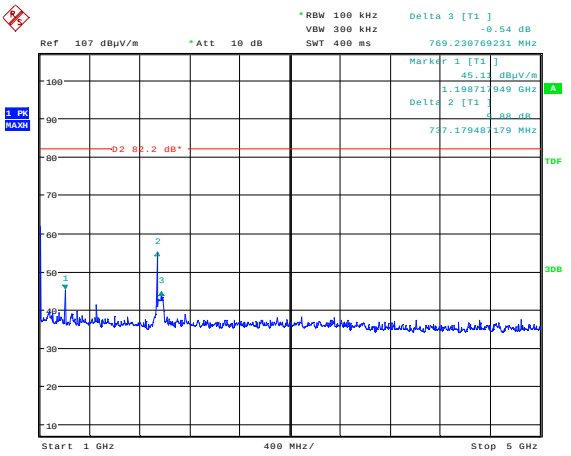
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 894.0 30MHz – 1GHz



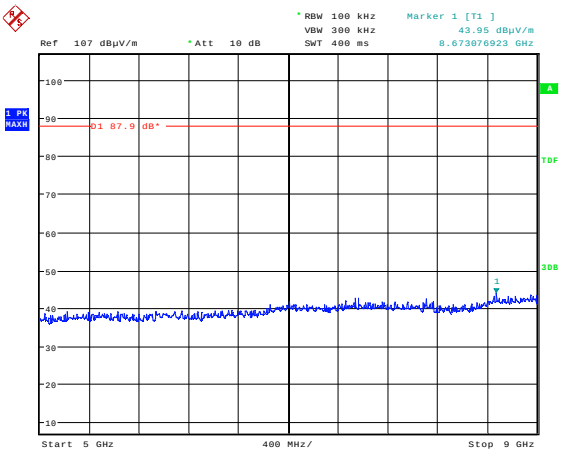
Date: 29.NOV.2010 11:56:43

Radiated emissions 894.0 1 – 5GHz



Date: 25.NOV.2010 13:59:55

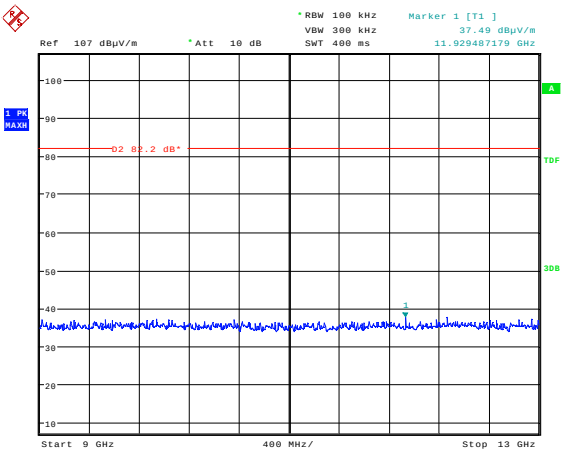
Radiated emissions 894.0 5 – 9GHz



Date: 24.NOV.2010 13:41:38

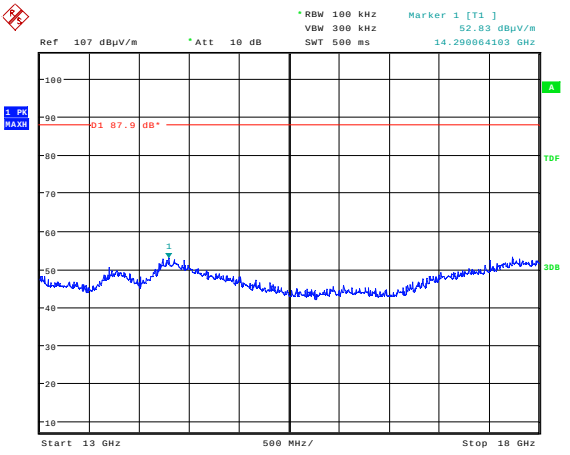
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 894.0 9 – 13GHz



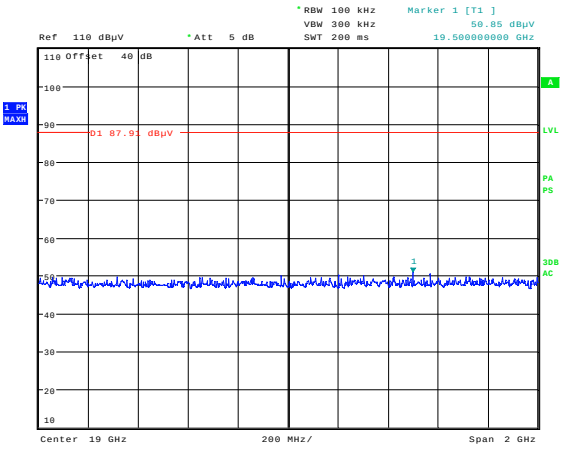
Date: 25.NOV.2010 12:05:48

Radiated emissions 894.0 13 – 18GHz



Date: 24.NOV.2010 13:14:14

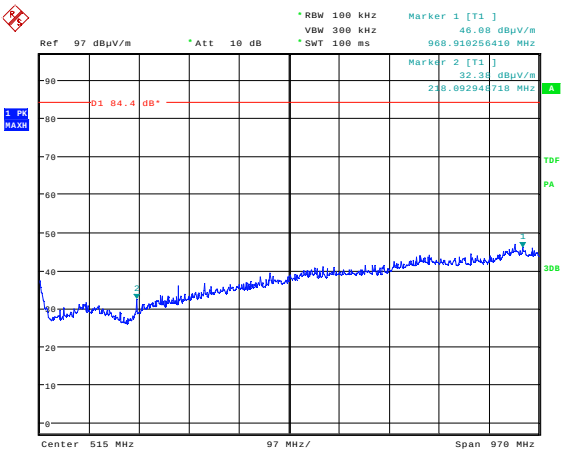
Radiated emissions 894.0 18 – 20GHz



Date: 23.NOV.2010 17:32:27

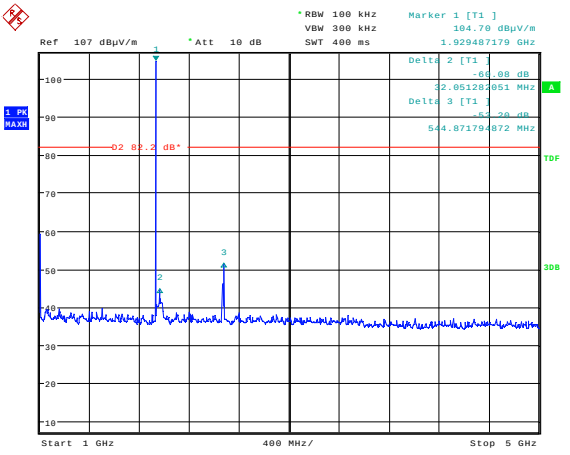
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1930.0 30MHz – 1GHz



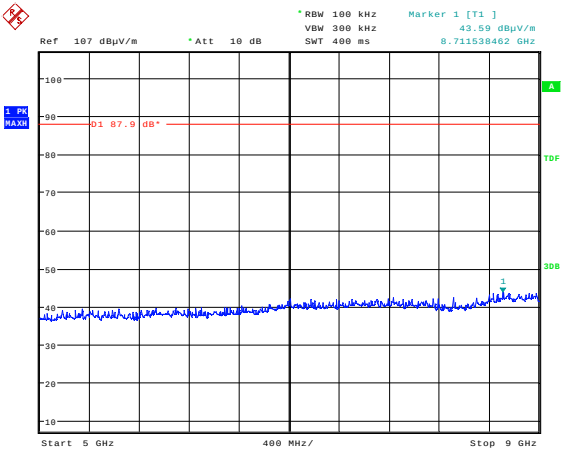
Date: 29.NOV.2010 11:49:59

Radiated emissions 1930.0 1 – 5GHz



Date: 25.NOV.2010 13:45:19

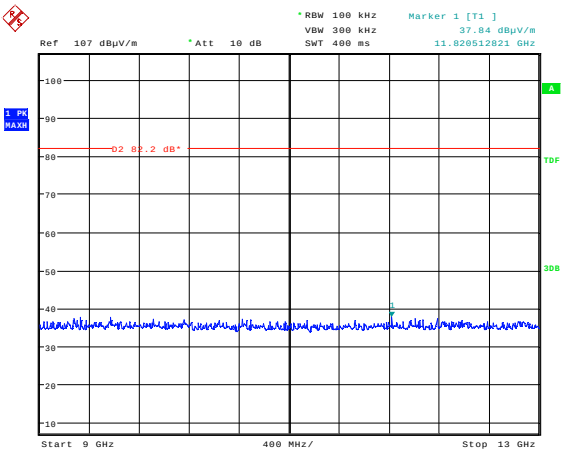
Radiated emissions 1930.0 5 – 9GHz



Date: 24.NOV.2010 13:38:25

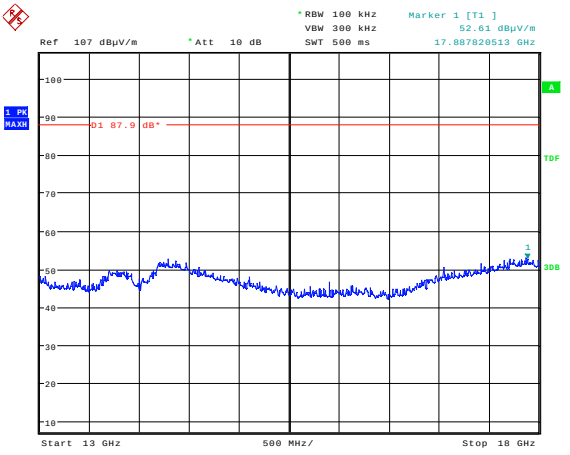
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1930.0 9 – 13GHz



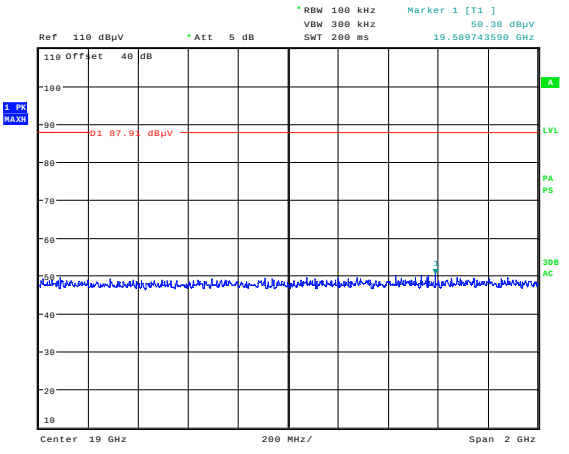
Date: 25.NOV.2010 12:12:24

Radiated emissions 1930.0 13 – 18GHz



Date: 24.NOV.2010 13:21:47

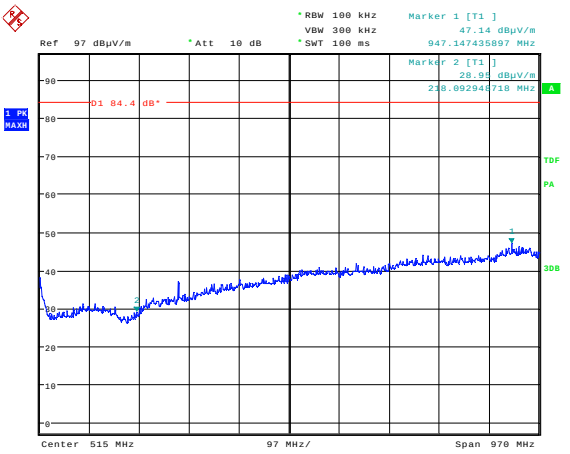
Radiated emissions 1930.0 18 – 20GHz



Date: 23.NOV.2010 17:29:10

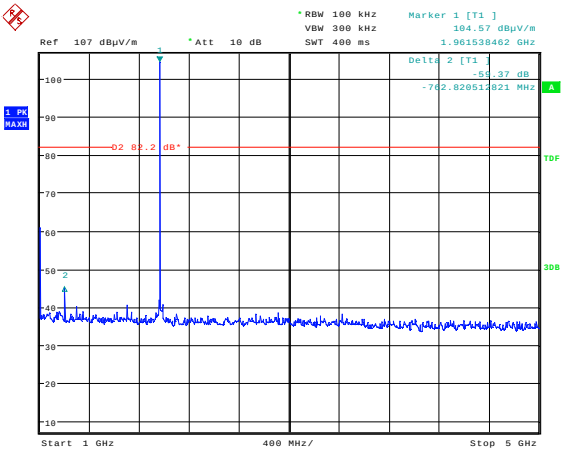
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1960.0 30MHz – 1GHz



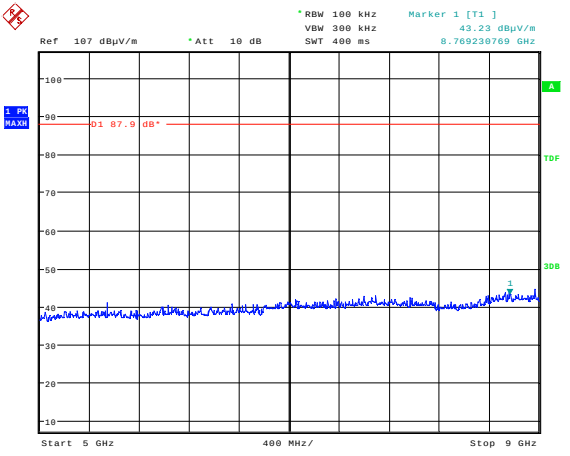
Date: 29.NOV.2010 11:53:34

Radiated emissions 1960.0 1 – 5GHz



Date: 25.NOV.2010 13:39:29

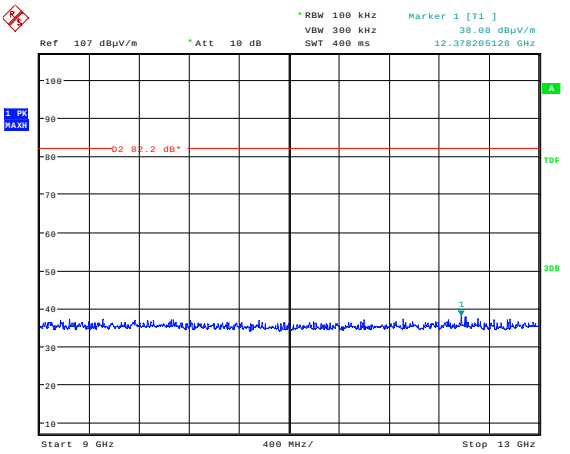
Radiated emissions 1960.0 5 – 9GHz



Date: 24.NOV.2010 13:33:50

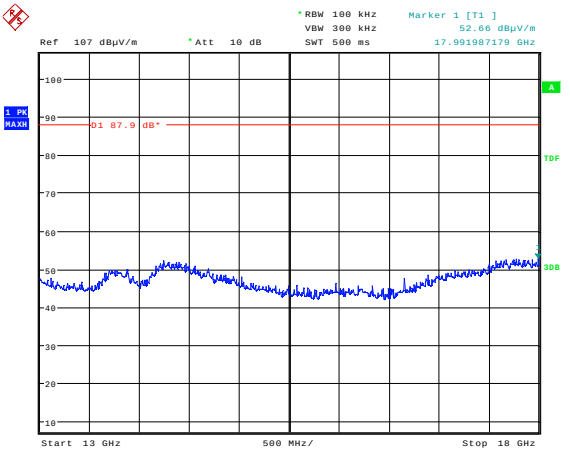
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1960.0 9 – 13GHz



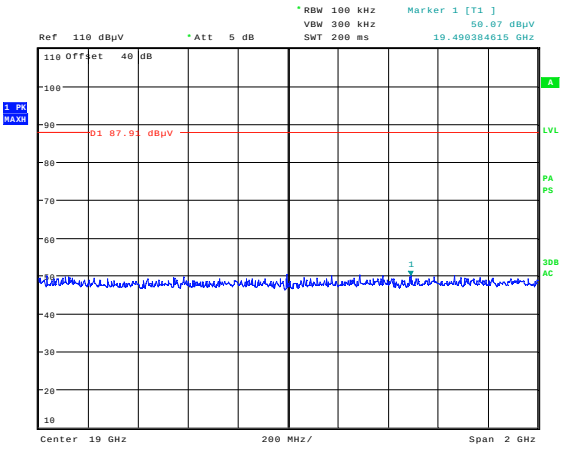
Date: 25.NOV.2010 12:13:06

Radiated emissions 1960.0 13 – 18GHz



Date: 24.NOV.2010 13:22:18

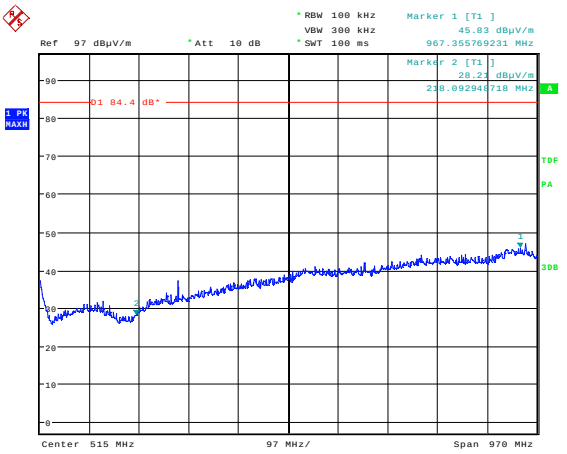
Radiated emissions 1960.0 18 – 20GHz



Date: 23.NOV.2010 17:28:43

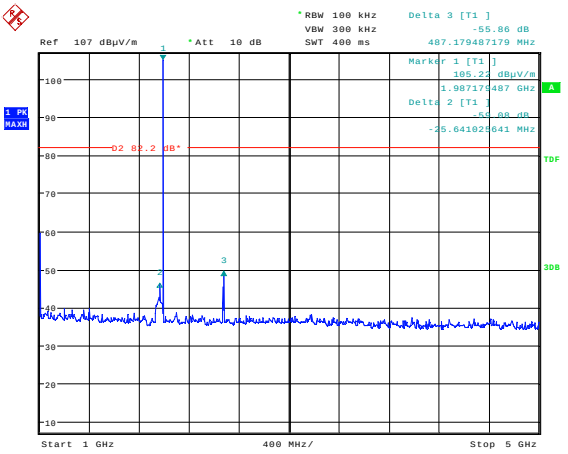
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1990.0 30MHz – 1GHz



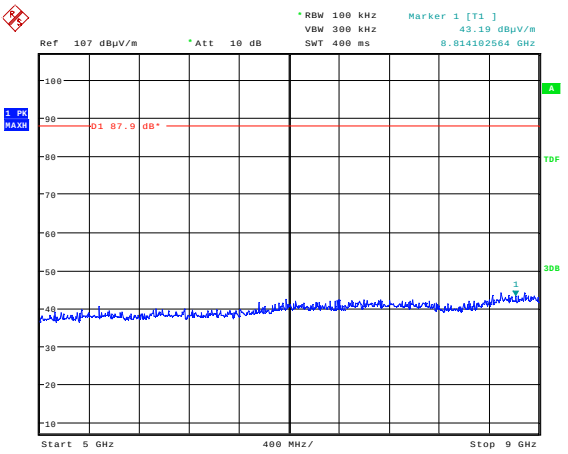
Date: 29.NOV.2010 11:52:50

Radiated emissions 1990.0 1 – 5GHz



Date: 25.NOV.2010 13:42:15

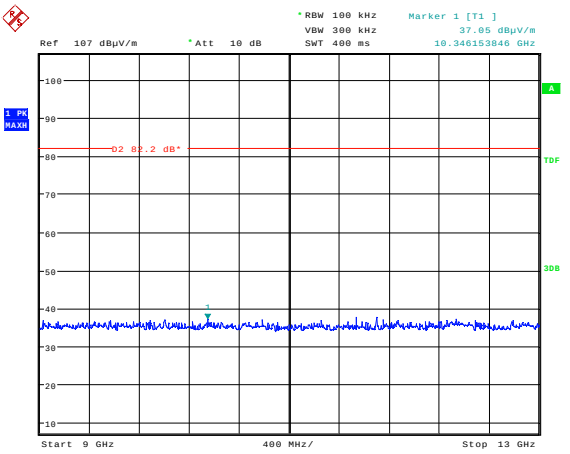
Radiated emissions 1990.0 5 – 9GHz



Date: 24.NOV.2010 13:37:03

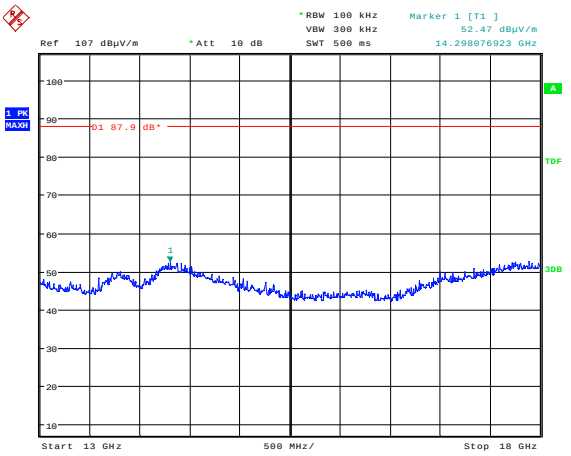
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 1990.0 9 – 13GHz



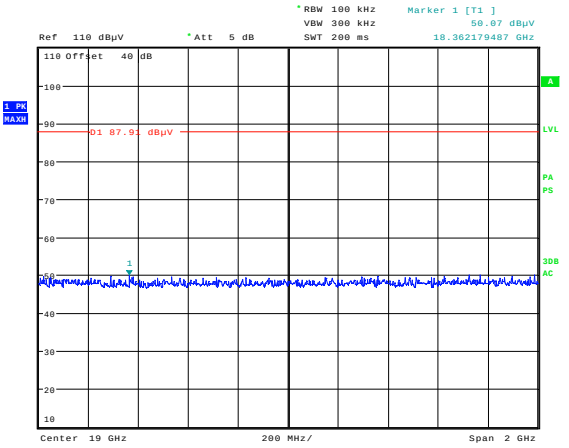
Date: 25.NOV.2010 12:13:43

Radiated emissions 1990.0 13 – 18GHz



Date: 24.NOV.2010 13:22:42

Radiated emissions 1990.0 18 – 20GHz



Date: 23.NOV.2010 17:28:07

The above test results show that there were no emissions within 20dBs of the –13dBm limit.

ANNEX A

PHOTOGRAPHS

PHOTOGRAPH No. 1 **TEST SETUP**

PHOTOGRAPH No. 2 **OVERVIEW**

ANNEX B

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	TCB	-	APPLICATION	[X]
		-	FEE	[X]
b.	AGENT'S LETTER OF AUTHORISATION	-		[X]
c.	MODEL(s) vs IDENTITY	-		[ ]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[ ]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[ ]
		-	DRAWINGS	[ ]
f.	TECHNICAL DESCRIPTION	-		[X]
g.	BLOCK DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
h.	CIRCUIT DIAGRAMS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[X]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

ANNEX C

EQUIPMENT CALIBRATION

Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH105	Signal Generator	Marconi	08/07/2010	12	08/07/2011
UH191	Bilog	York	01/10/2008	24	01/10/2010
UH225	Attenuator	Spinner	Calibrate In Use		
UH253	1m Cable N type	TRaC	Calibrate In Use		
UH254	1m Cable N type	TRaC	Calibrate In Use		
UH269	1m Cable N type	TRaC	Calibrate In Use		
UH270	1m Cable N type	TRaC	Calibrate In Use		
UH271	1.5m Cable N type	TRaC	Calibrate In Use		
UH272	1.5m Cable N type	TRaC	Calibrate In Use		
UH273	2m Cable N type	TRaC	Calibrate In Use		
UH274	2m Cable N type	TRaC	Calibrate In Use		
UH281	Spectrum Analyser	R&S	29/01/2010	12	29/01/2011
UH291	K-Type Cable	Succoflex	Calibrate In Use		
UH293	K-Type Cable	Megaphase	Calibrate In Use		
UH372	Pre Amplifier	Watkins Johnson	14/04/2010	12	14/04/2011
L138	1-18GHz Horn	EMCO	10/09/2009	24	10/09/2011
L176	Signal Generator	Marconi	08/07/2010	12	08/07/2011
L572	Pre Amp	Agilent	15/07/2009	12	15/07/2010
N/A	Signal Generator	IFR	25/10/2010	24	25/10/2012
N/A	Attenuator	Axell	Calibrate In Use		

ANNEX D

MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRACUH120) = **2.18dB**
Uncertainty in test result (Equipment – TRAC05) = **1.08dB**
Uncertainty in test result (Equipment – TRAC479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRACUH120) = **119ppm**
Uncertainty in test result (Equipment – TRAC05) = **0.113ppm**
Uncertainty in test result (Equipment – TRAC479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**, Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRAC479) Up to 8.1GHz = **3.31dB**
Uncertainty in test result (Equipment TRAC479) 8.1GHz – 15.3GHz = **4.43dB**
Uncertainty in test result (Equipment TRAC479) 15.3GHz – 21GHz = **5.34dB**
Uncertainty in test result (Equipment TRACUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%,** Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

[12] Spectrum Mask Measurements

Uncertainty in test result = **2.59% (frequency)**
Uncertainty in test result = **1.32dB (amplitude)**

[13] Adjacent Sub Band Selectivity

Uncertainty in test result = **1.24dB**

[14] Receiver Blocking – Listen Mode, Radiated

Uncertainty in test result = **3.42dB**

[15] Receiver Blocking – Talk Mode, Radiated

Uncertainty in test result = **3.36dB**

[16] Receiver Blocking – Talk Mode, Conducted

Uncertainty in test result = **1.24dB**

[17] Receiver Threshold

Uncertainty in test result = **3.23dB**

[18] Transmission Time Measurement

Uncertainty in test result = **7.98%**