



**REPORT ON THE CERTIFICATION TESTING OF A
AXELL WIRELESS
4078SD DIGITAL REPEATER
MW-DCSB-40D95-700/800-24-AC-R – IP95
WITH RESPECT TO
THE FCC RULES CFR 47, PART 90 Subpart I
PRIVATE LAND MOBILE REPEATER.**

TEST REPORT NO: 9F2528WUS1
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FCC ID: NEODCSB40D9578AC

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4078SD DIGITAL REPEATER
MW-DCSB-40D95-700/800-24-AC-R – IP95
WITH RESPECT TO
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PRIVATE LAND MOBILE REPEATER.**

TEST DATE: 16th – 28th October 2009

TESTED BY: _____ D WINSTANLEY

APPROVED BY: _____ J CHARTERS
RADIO PRODUCT
MANAGER

DATE: 12th November 2009

Distribution:

- Copy Nos:
1. Axell Wireless
 2. TCB: TRaC EMC & Safety
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THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE

The results herein relate only to the sample tested. Full results are contained in the relevant works order file.

UP HOLLAND

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CONTENTS

	PAGE		
CERTIFICATE OF CONFORMITY & COMPLIANCE	4		
APPLICANT'S SUMMARY	5		
EQUIPMENT TEST CONDITIONS	6		
TESTS REQUIRED	6		
TEST RESULTS	7 - 59		
		ANNEX	
PHOTOGRAPHS	A		
PHOTOGRAPH No. 1: Test setup			
PHOTOGRAPH No. 2: Overview			
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST	B		
EQUIPMENT CALIBRATION	C		
MEASUREMENT UNCERTAINTY	D		
Notes:			
1. Component failure during test	YES		<input type="checkbox"/>
	NO		<input checked="" type="checkbox"/>
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: NEODCSB40D9578AC

PURPOSE OF TEST: Certification

TEST SPECIFICATION: FCC RULES CFR 47, Part 90 Subpart I

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: W-DCSB-40D95-700/800-24-AC-R – IP95

EQUIPMENT TYPE: Private Land Mobile Repeater

MAXIMUM GAIN: Uplink = 94.29 dB (Software set to 92)
700MHz Downlink = 88.64 dB (Software set to 85)
800MHz Downlink = 95.47 dB (Software set to 92)

MAXIMUM INPUT: Uplink = -66.40 dBm
700MHz Downlink = -51.50 dBm
800MHz Downlink = -58.90 dBm

MAXIMUM OUTPUT CONDUCTED: Uplink = 27.89 dBm
700MHz Downlink = 37.14 dBm
800MHz Downlink = 36.57 dBm

MAXIMUM NUMBER OF CHANNELS: 24 software defined channels per system

CHANNEL SPACING: 25 kHz

POWER SOURCE(s): +110Vac

TEST DATE(s): 16th – 28th October 2009

APPLICANT: Axell Wireless

ADDRESS: Aerial House
Asheridge Road
Chesham
Buckinghamshire
HP5 1TU

TESTED BY: _____ D WINSTANLEY

APPROVED BY: _____ J CHARTERS
RADIO
PRODUCT
MANAGER

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): W-DCSB-40D95-700/800-24-AC-R – IP95

EQUIPMENT TYPE: Private Land Mobile Repeater

PURPOSE OF TEST: Certification

TEST SPECIFICATION(s): FCC RULES CFR 47, Part 90 Subpart I

TEST RESULT: COMPLIANT Yes
No

APPLICANT'S CATEGORY: MANUFACTURER
IMPORTER
DISTRIBUTOR
TEST HOUSE
AGENT

APPLICANT'S CONTACT PERSON(s): Mr Peter Bradfield

E-mail address: Peterb@axellwireless.co.uk

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, Up Holland

UKAS ACCREDITATION No: 0971

TEST DATE(s): 16th – 28th October 2009

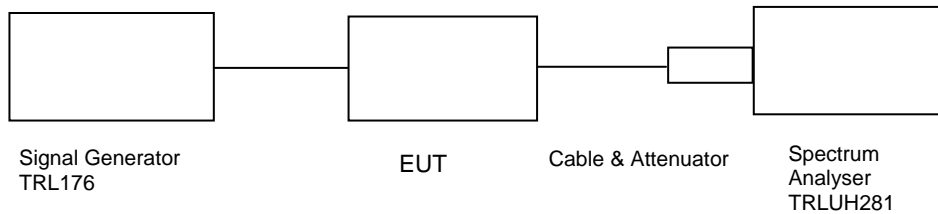
TEST REPORT No: 9F2528WUS1

COMPLIANCE TESTS

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – UPLINK

Ambient temperature = 24°C
 Relative humidity = 58%
 Supply voltage = +110Vac
 Channel number = See test results

Radio Laboratory



Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
793.0	-62.4	0.4	40.7	-14.69	88.87	26.01	78.01
808.5	-66.0	0.4	40.7	-12.81	94.29	27.89	84.26
824.0	-60.0	0.4	40.7	-15.03	86.07	25.67	76.07

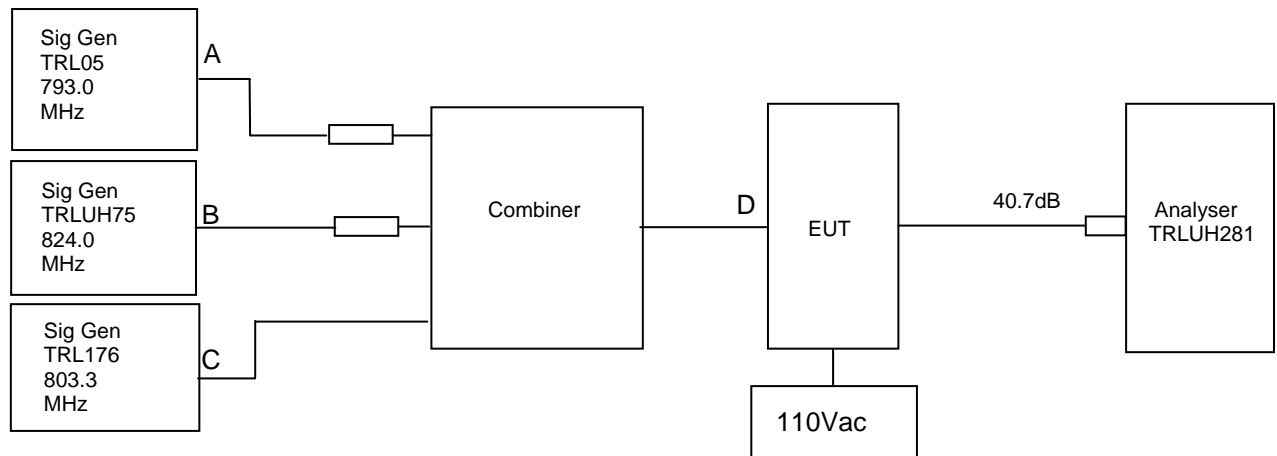
Notes: 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	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
 Relative humidity = 56%
 Supply voltage = +110Vac

Radio Laboratory



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. The cable and attenuator loss between the EUT and the spectrum analyser was 40.7dB.

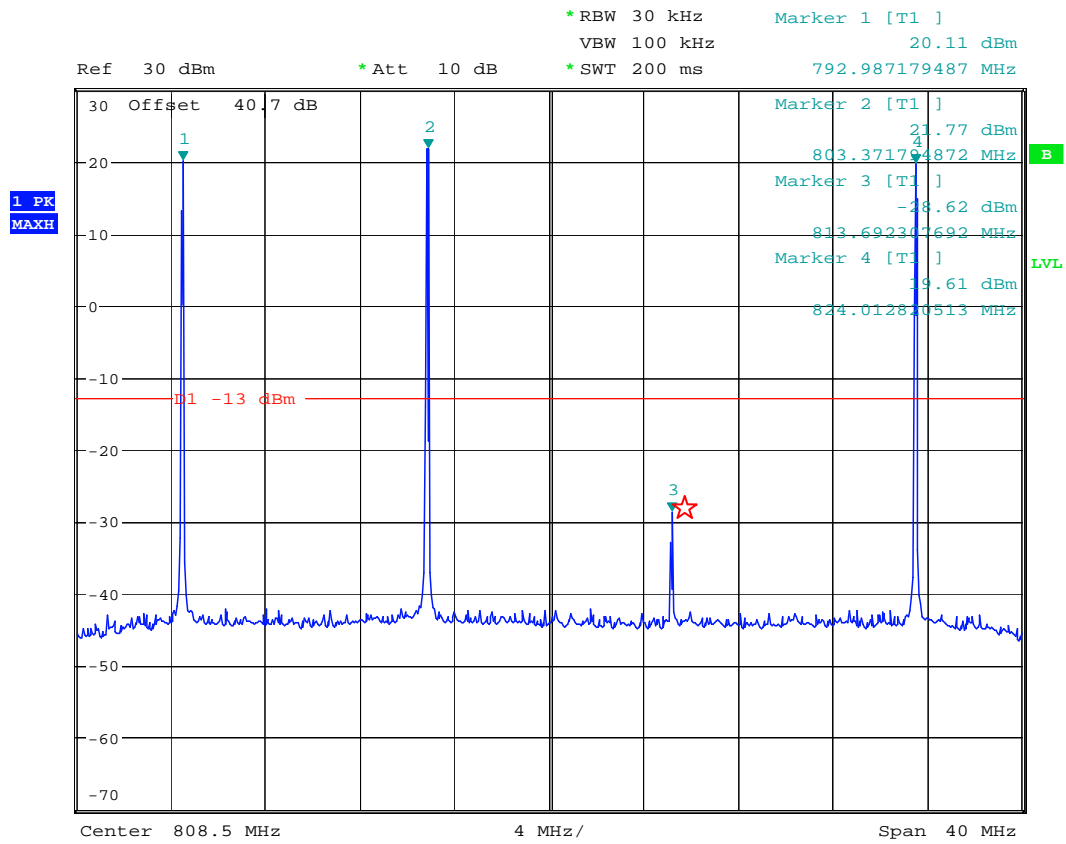
RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
793.0	803.3	824.0	813.69 MHz @ -28.26 dBm	-13

Sweep data is shown on the next page:

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	MARCONI	2022D	119215/058	UH75	X
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	X
COMBINER	AXELL	05003005	N/A	N/A	X
CIRCULATORS	AXELL	N/A	646063 & 646073	N/A	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	X
CABLE	TRaC	N/A	N/A	UH273	X
CABLE	TRaC	N/A	N/A	UH274	X

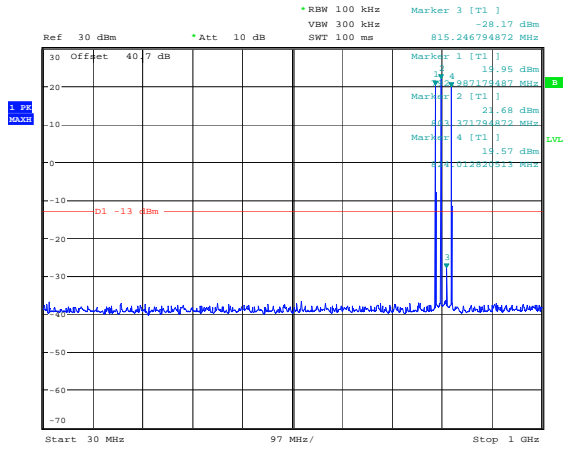
Intermodulation Inband



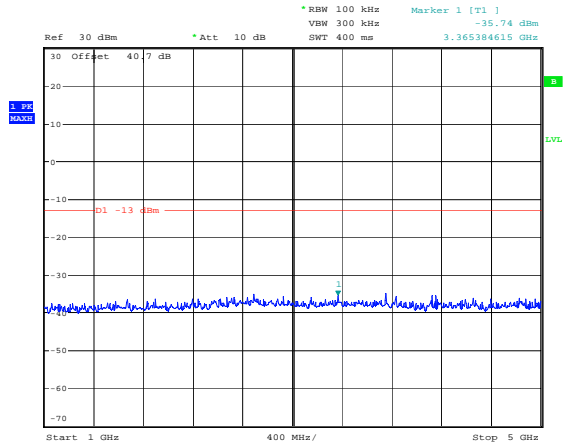
Date: 26.OCT.2009 10:48:20

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

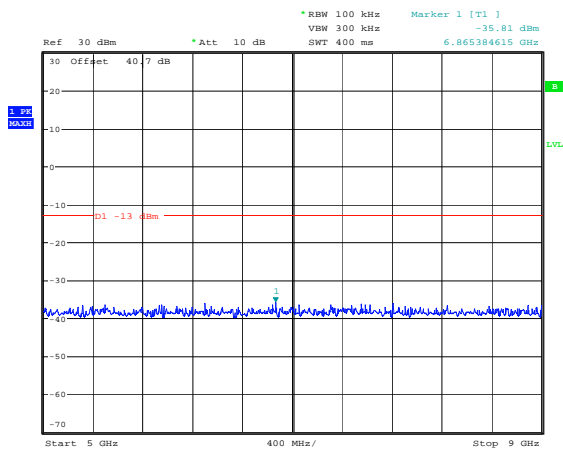
Intermodulation Wideband



Date: 26.OCT.2009 10:48:50



Date: 26.OCT.2009 10:49:05



Date: 26.OCT.2009 10:49:21

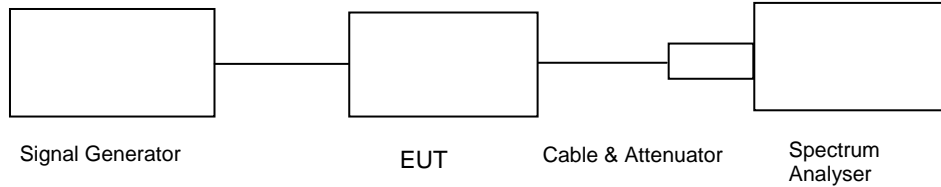
The above plot shows that there are no products outside the bands.

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– UPLINK

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

Radio Laboratory



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, C4FM and TDMA Type.

The plots show the signal measured at the signal generator (Black trace) and the signal measured at the output of the EUT (Blue Trace).

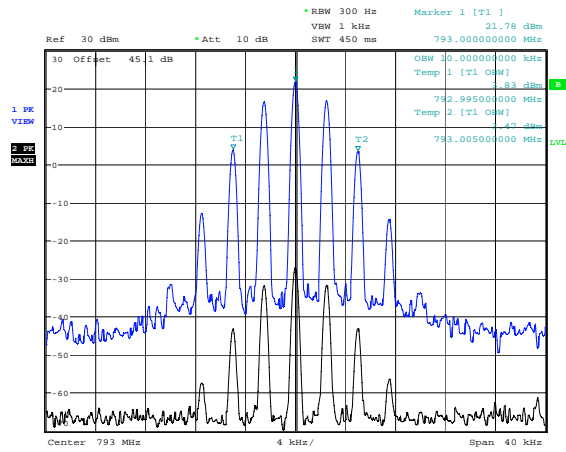
Note: The cables and attenuators had the following losses.

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

Frequency Of Operational Channel	Modulation Type			
	2.5 kHz FM	5 kHz FM	C4FM	TDMA
793.0	10.00 kHz	14.94 kHz	8.22 kHz	22.43 kHz
808.5	9.94 kHz	14.87 kHz	8.22 kHz	22.30 kHz
824.0	9.94 kHz	14.94 kHz	8.20 kHz	22.35 kHz

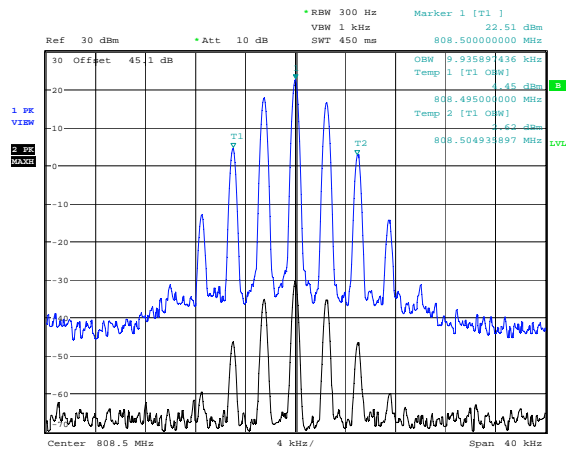
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	X
SIGNAL GENERATOR	AGILENT	4438C	MY45091850	REF844	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	X
CABLE	TRaC	N/A	N/A	UH273	X
CABLE	TRaC	N/A	N/A	UH274	X

793.0 FM deviation set to 2.5kHz



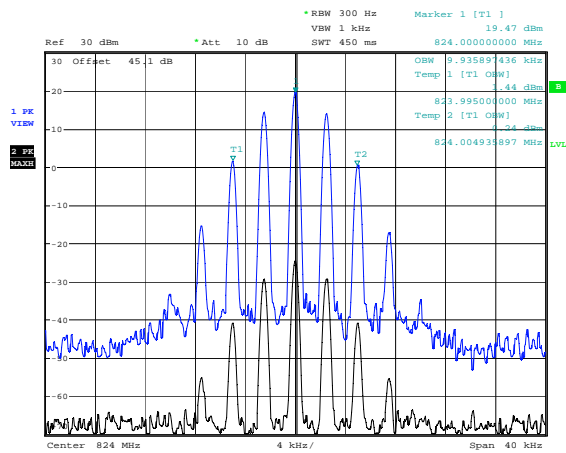
Date: 26.OCT.2009 09:21:04

808.5 FM deviation set to 2.5kHz



Date: 26.OCT.2009 09:25:05

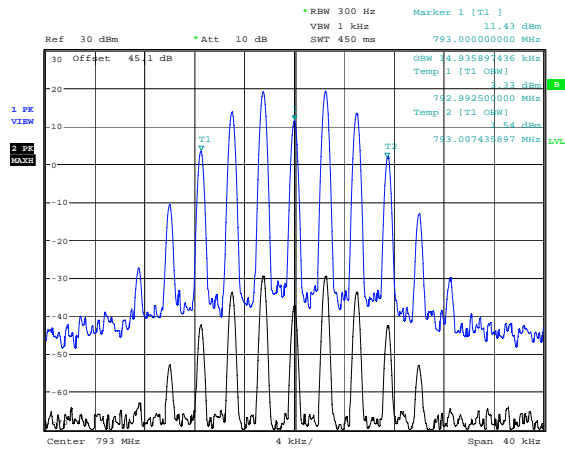
824.0 FM deviation set to 2.5kHz



Date: 26.OCT.2009 09:27:44

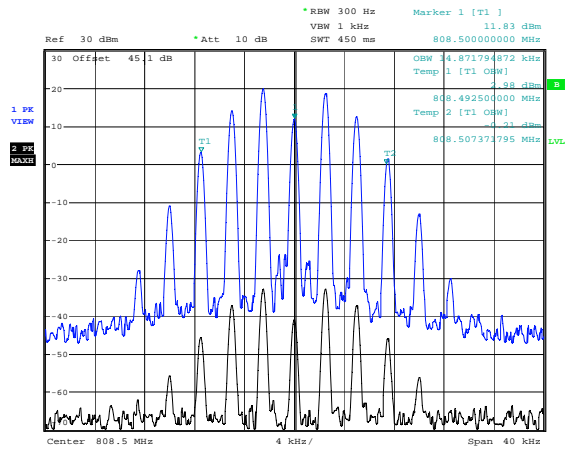
The above plots show no significant distortion visible when compared to the input signal.

793.0 FM deviation set to 5kHz



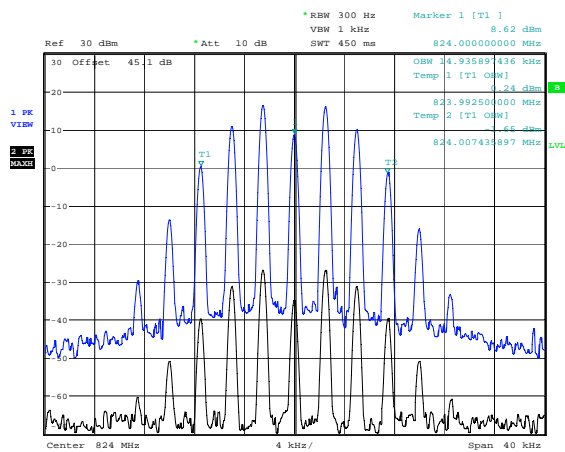
Date: 26.OCT.2009 09:22:07

808.5 FM deviation set to 5kHz



Date: 26.OCT.2009 09:24:33

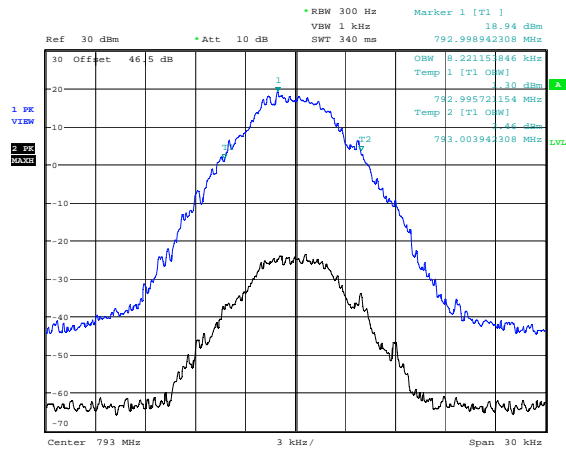
824.0 FM deviation set to 5kHz



Date: 26.OCT.2009 09:28:11

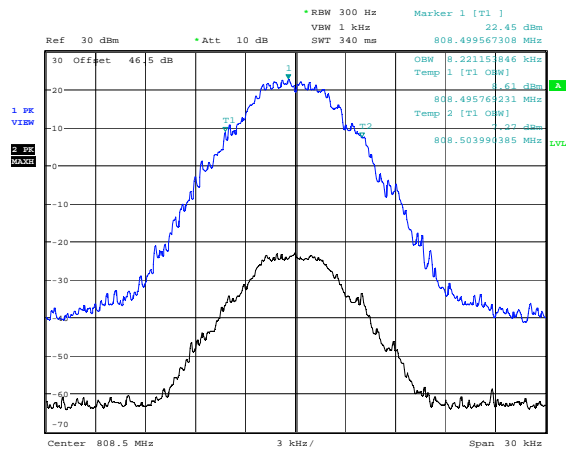
The above plots show no significant distortion visible when compared to the input signal.

793.0 C4FM Modulation



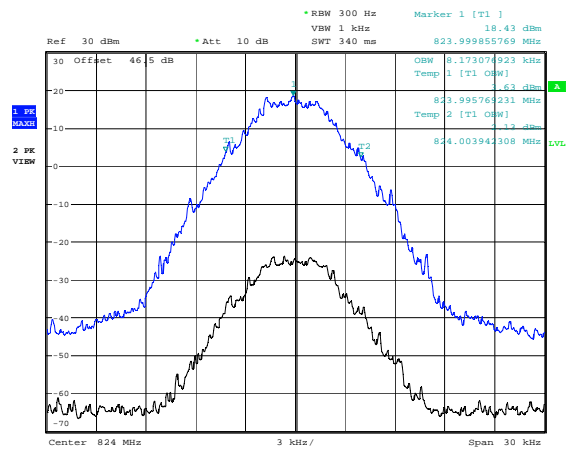
Date: 28.OCT.2009 09:10:47

808.5 C4FM Modulation



Date: 28.OCT.2009 09:06:07

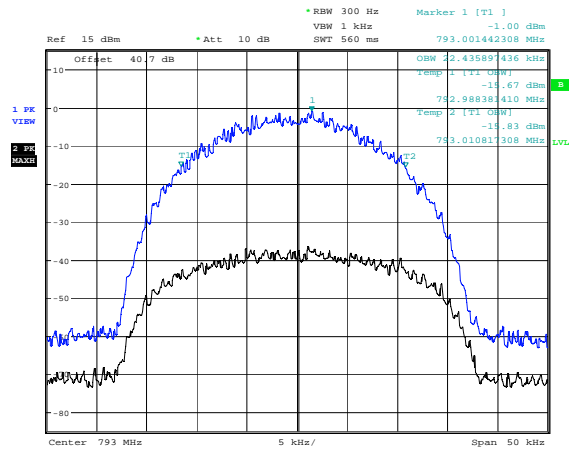
824.0 C4FM Modulation



Date: 28.OCT.2009 08:59:44

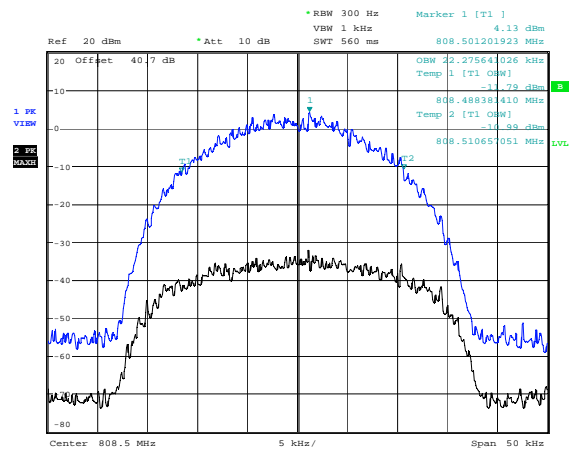
The above plots show no significant distortion visible when compared to the input signal.

793.0 TDMA Modulation



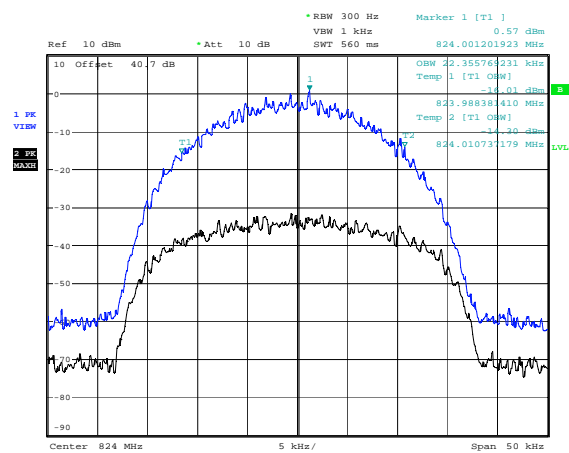
Date: 26.OCT.2009 12:31:03

808.5 TDMA Modulation



Date: 26.OCT.2009 12:35:05

824.0 TDMA Modulation



Date: 26.OCT.2009 12:38:05

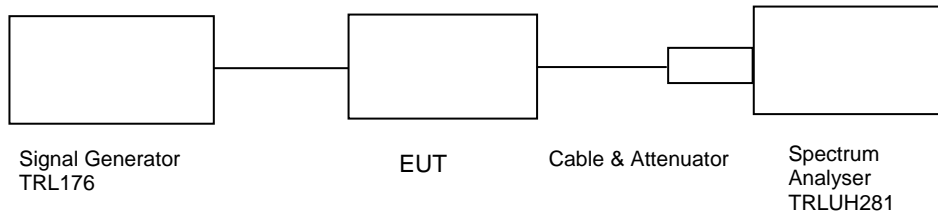
The above plots show no significant distortion visible when compared to the input signal.

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – UPLINK

Ambient temperature = 23°C
 Relative humidity = 56%
 Supply voltage = +110Vac

Radio Laboratory



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 than 250% of the authorised bandwidth

At least $43 + 10 \log P_{dB}$

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

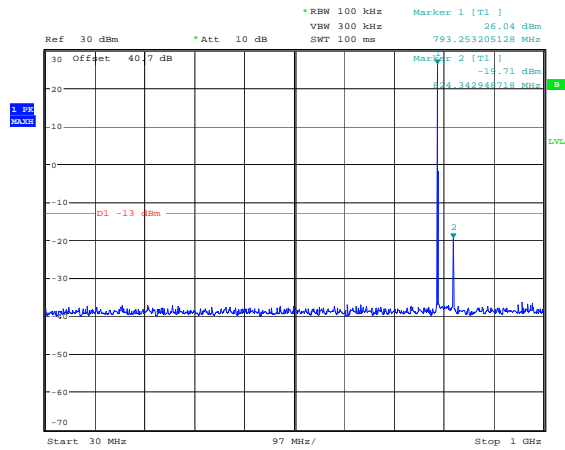
RESULTS

FREQUENCY RANGE	EUT FREQ (MHz)	EMISSION FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTEN & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
30 MHz - 9 GHz	793.0	824.017	-60.15	40.7	-19.45	-13
	824.0	793.016	-60.75	40.7	-20.05	-13

The test equipment used for the Transmitter Conducted Emissions:

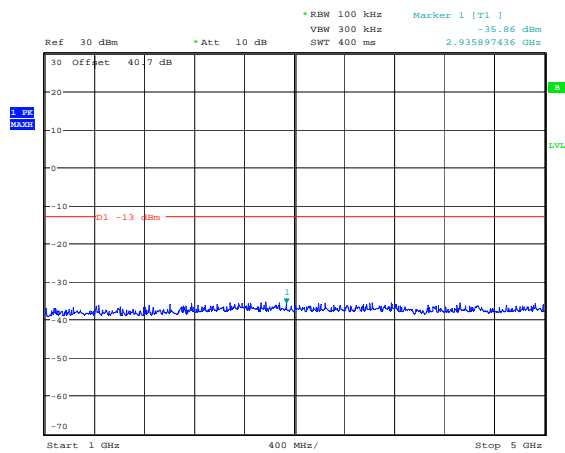
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	X
CABLE	TRaC	N/A	N/A	UH273	X
CABLE	TRaC	N/A	N/A	UH274	X

Conducted emissions 793.0 MHz 30MHz – 1GHz



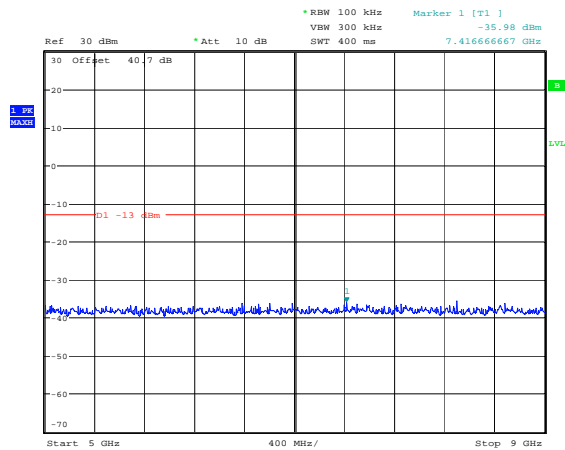
Date: 21.OCT.2009 16:05:47

Conducted emissions 793.0 MHz 1 – 5GHz



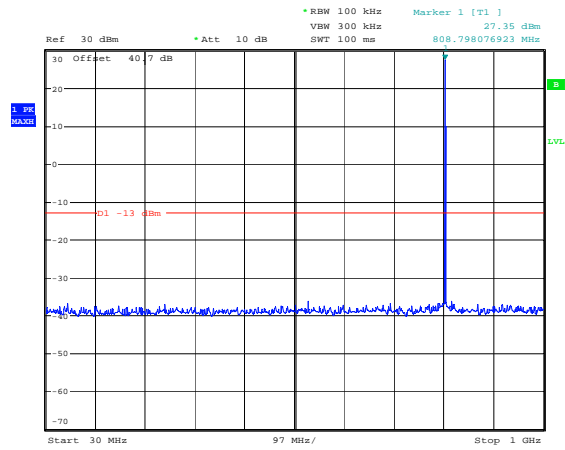
Date: 21.OCT.2009 16:06:55

Conducted emissions 793.0 MHz 5 – 9GHz



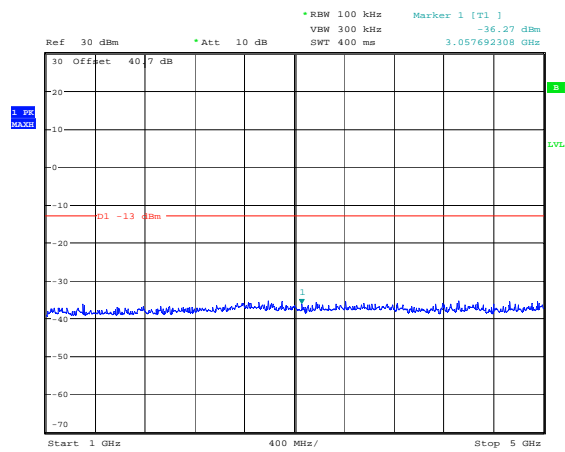
Date: 21.OCT.2009 16:07:12

Conducted emissions 808.5 MHz 30MHz – 1GHz



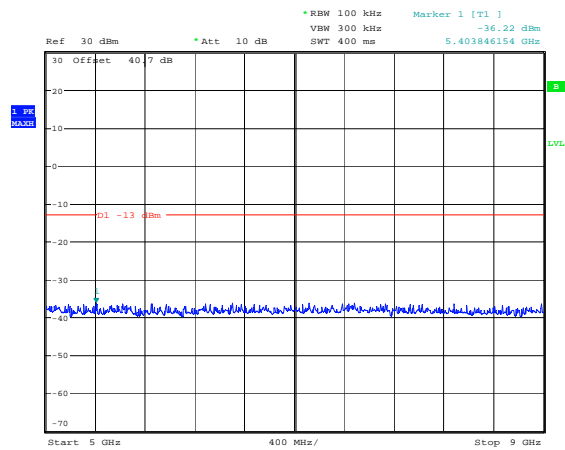
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Conducted emissions 808.5 MHz 1 – 5GHz



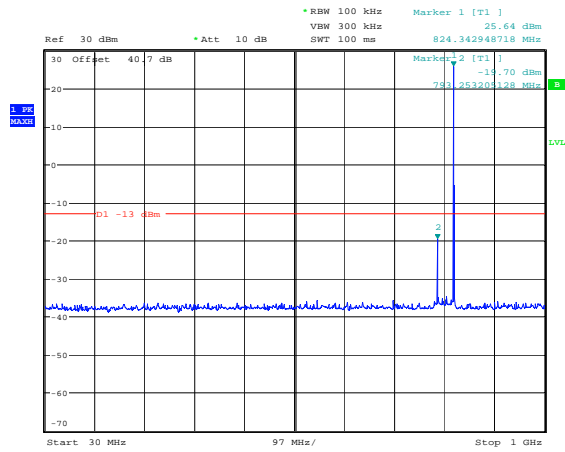
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Conducted emissions 808.5 MHz 5 – 9GHz



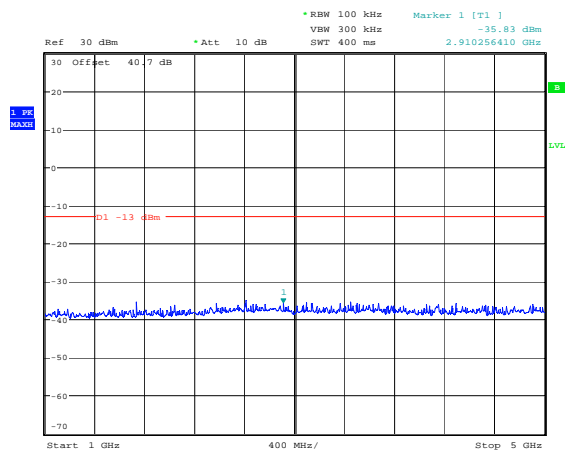
Date: 21.OCT.2009 16:04:12

Conducted emissions 824.0 MHz 30MHz – 1GHz



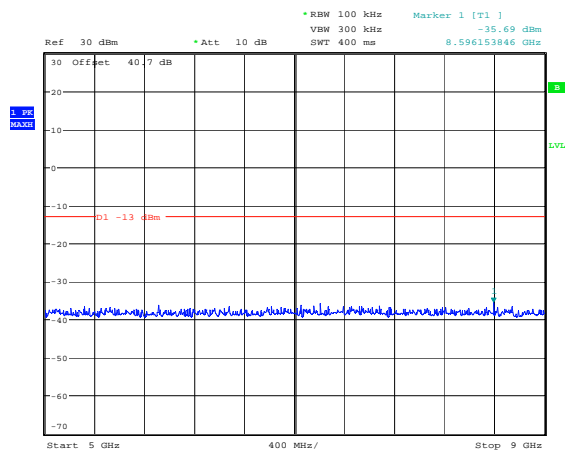
Date: 21.OCT.2009 15:59:12

Conducted emissions 824.0 MHz 1 – 5GHz



Date: 21.OCT.2009 15:59:33

Conducted emissions 824.0 MHz 5 – 9GHz

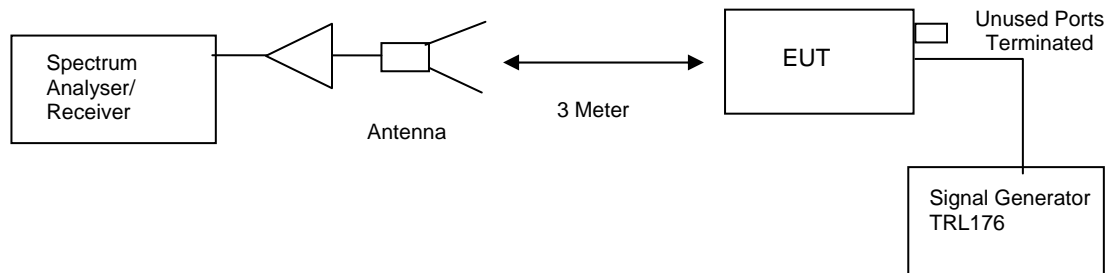


Date: 21.OCT.2009 15:59:54

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– UPLINK

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 $43 + 10 \log P_{dB}$

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

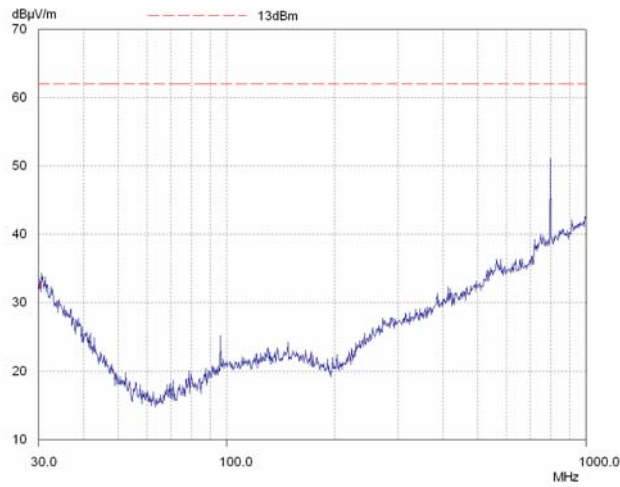
RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 9 GHz	No Significant Emissions Within 20 dB of Limit						-13

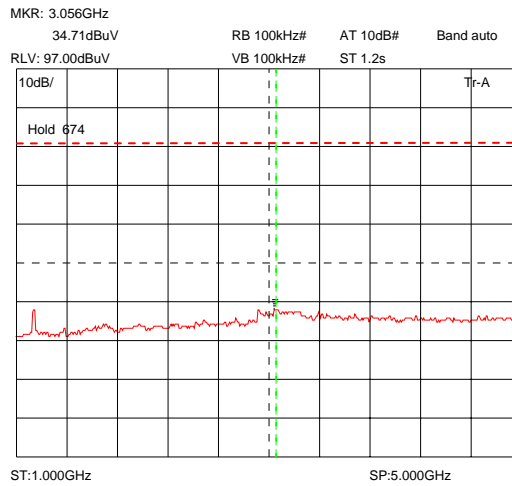
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
HORN	EMCO	3115	9010-3580	138	X
PRE AMPLIFIER	HP	8449B	3008A016	572	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ANTENNA	YORK	CBL611/A	1618	UH191	X
PRE AMPLIFIER	WATRKINS JOHNSON	6201-69	2740	UH372	X
RECEIVER	RHODE & SCHWARZ	ESVS10	825890/006	UH04	X

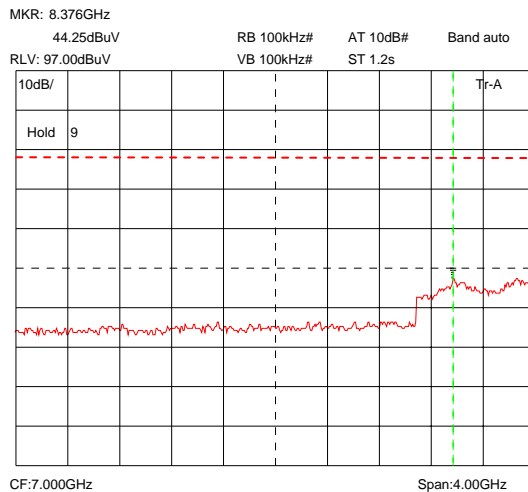
Radiated emissions 793.0 30MHz – 1GHz



Radiated emissions 793.0 1 – 5GHz

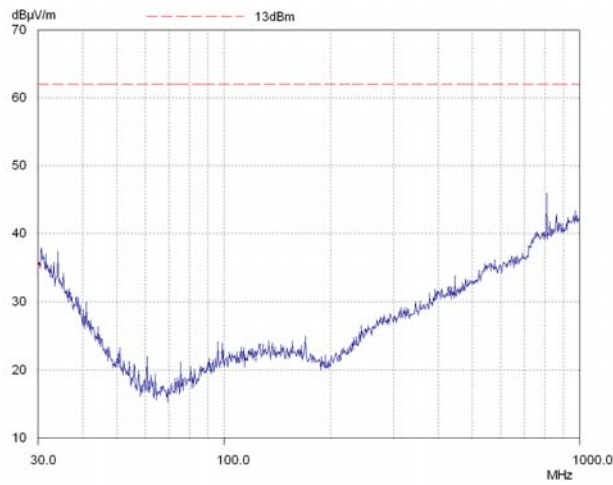


Radiated emissions 793.0 5 – 9GHz

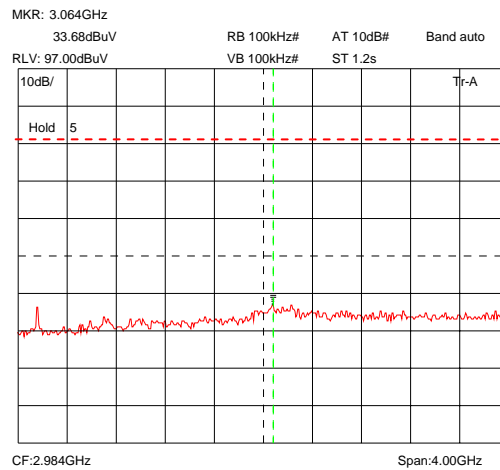


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

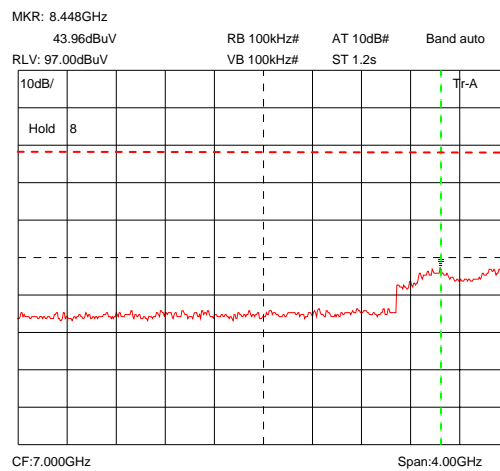
Radiated emissions 808.5 30MHz – 1GHz



Radiated emissions 808.5 1 – 5GHz

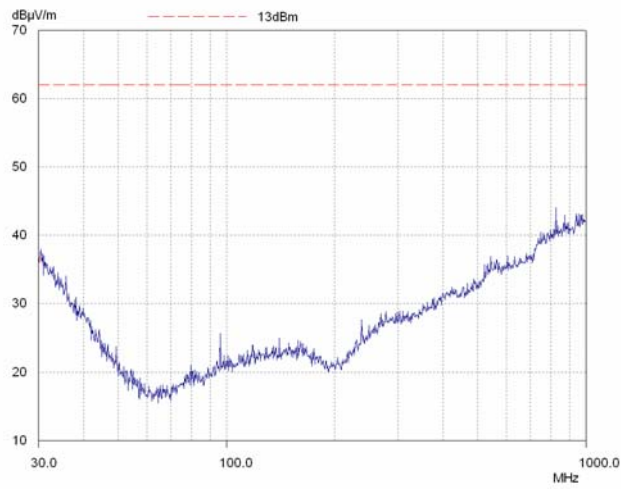


Radiated emissions 808.5 5 – 9GHz

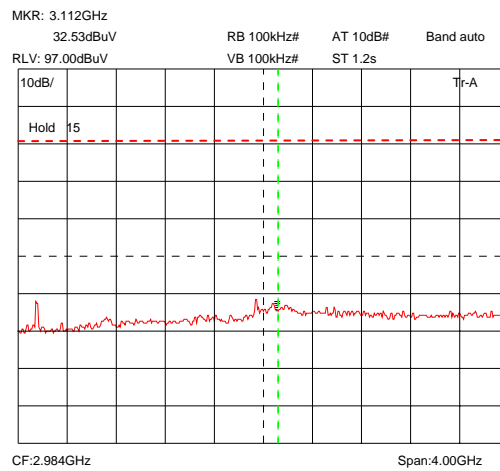


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

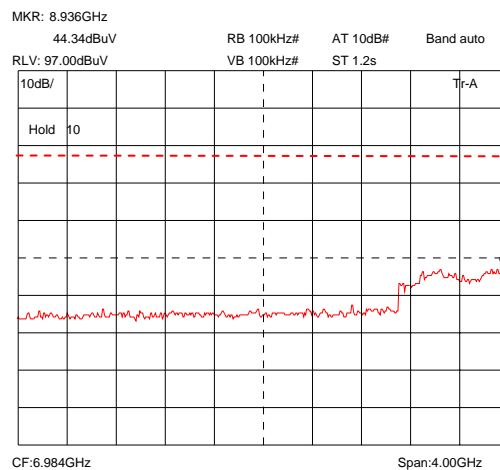
Radiated emissions 824.0 30MHz – 1GHz



Radiated emissions 824.0 1 – 5GHz

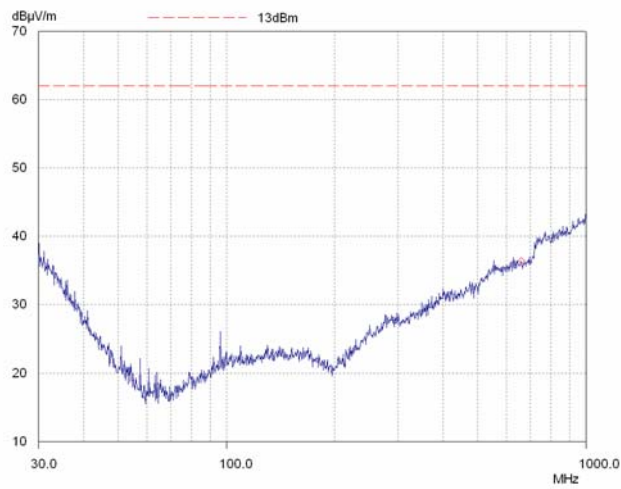


Radiated emissions 808.5 5 – 9GHz

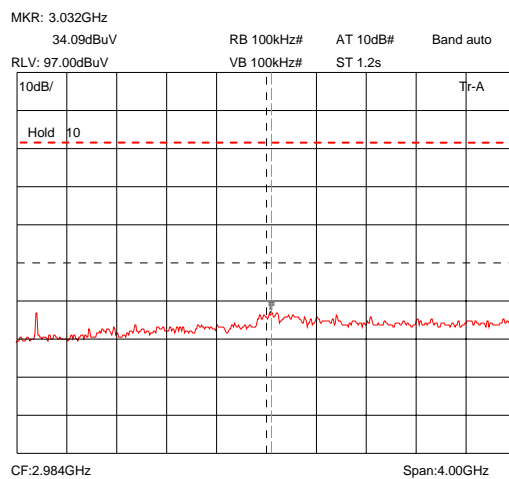


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

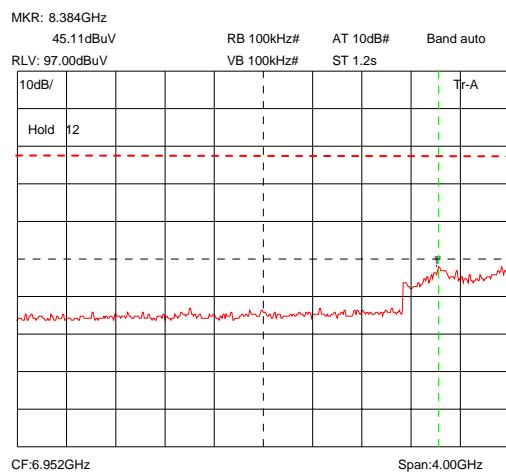
Radiated emissions no input signal 30MHz – 1GHz



Radiated emissions no input signal 1 – 5GHz



Radiated emissions no input signal 5 – 9GHz

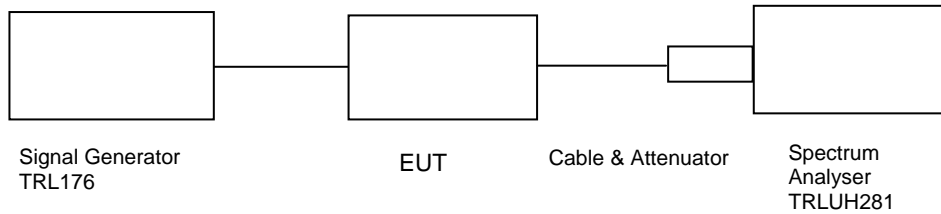


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – DOWNLINK – 700 MHz

Ambient temperature = 21°C
 Relative humidity = 68%
 Supply voltage = +110Vac
 Channel number = See test results

Radio Laboratory



Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
763.0	-49.5	0.4	40.7	-4.83	85.77	35.87	75.77
769.0	-51.1	0.4	40.7	-3.56	88.64	37.14	78.64
775.0	-48.0	0.4	40.7	-4.20	84.90	36.50	74.79

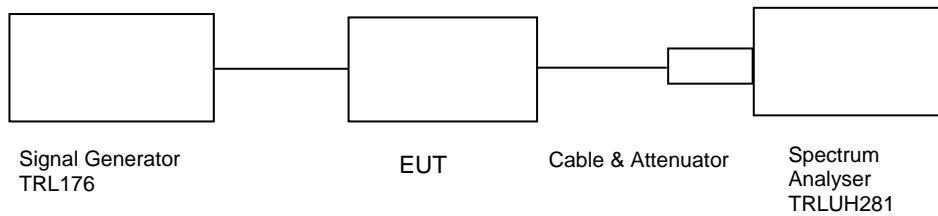
Notes: 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	X
CABLE	TRaC	N/A	N/A	UH273	X
CABLE	TRaC	N/A	N/A	UH274	X

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – DOWNLINK – 800 MHz

Ambient temperature = 24°C
 Relative humidity = 58%
 Supply voltage = +110Vac
 Channel number = See test results

Radio Laboratory



Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
851.0	-57.5	0.4	40.7	-4.46	94.14	36.24	84.14
860.0	-58.5	0.4	40.7	-4.16	95.47	36.57	85.48
869.0	-57.8	0.4	40.7	-5.55	93.95	35.15	83.44

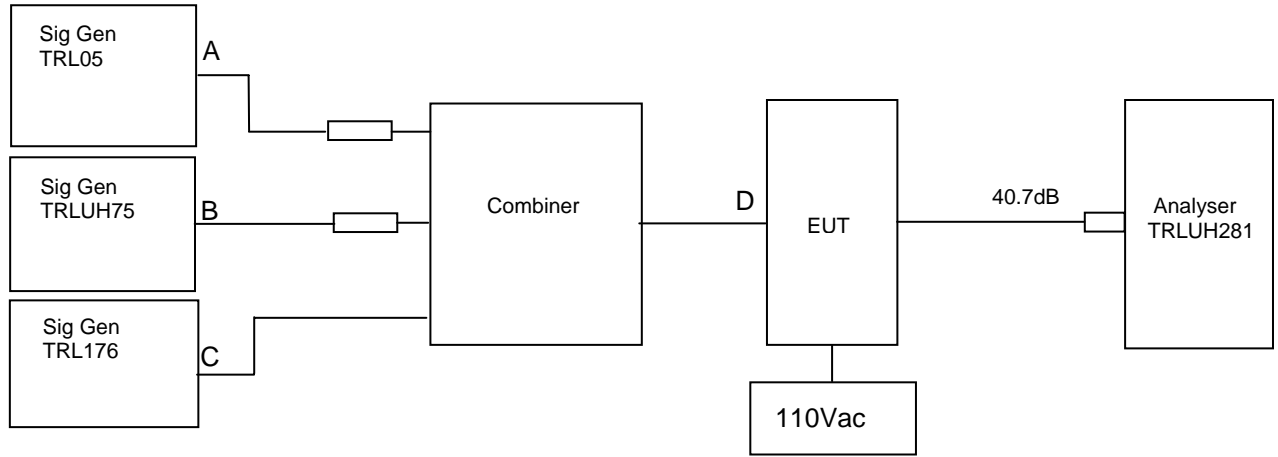
Notes: 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	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– DOWNLINK

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

Radio Laboratory



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. The cable and attenuator loss between the EUT and the spectrum analyser was 40.7dB.

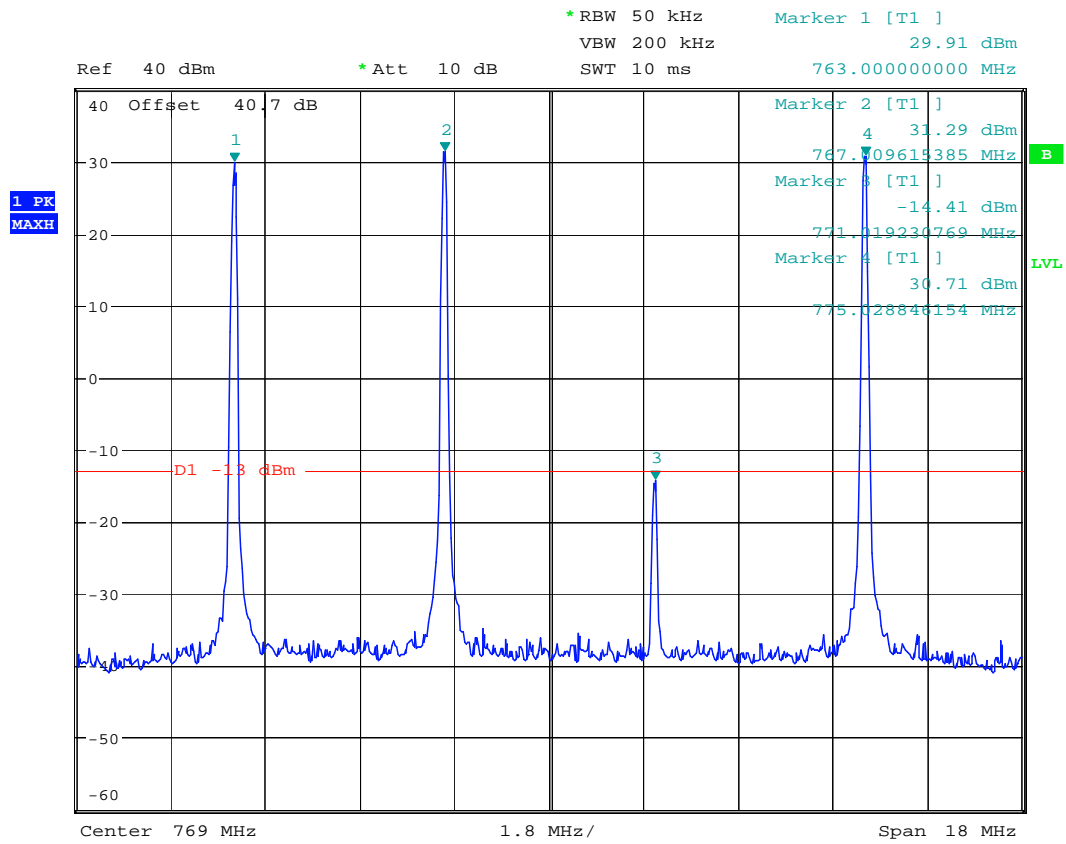
Downlink Band	RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
700	763.0	767.0	775.0	-14.41dBm @ 771.0 MHz	-13
800	851.0	857.0	869.0	-13.59 dBm @ 862.98 MHz	-13
Cross Band	763.0	851.0	869.0	No Significant Emissions Within 20 dB of the limit	-13

Sweep data is shown on the next page:

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	MARCONI	2022D	119215/058	UH75	X
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	X
COMBINER	AXELL	05003005	N/A	N/A	X
CIRCULATORS	AXELL	N/A	646063 & 646073	N/A	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	X
CABLE	TRaC	N/A	N/A	UH273	X
CABLE	TRaC	N/A	N/A	UH274	X

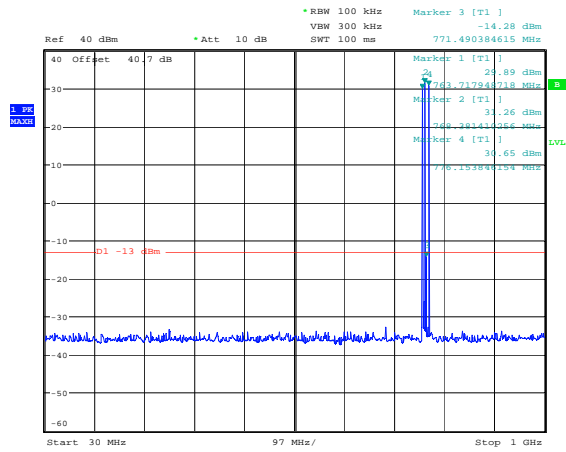
Intermodulation Inband – 700 MHz Downlink Band



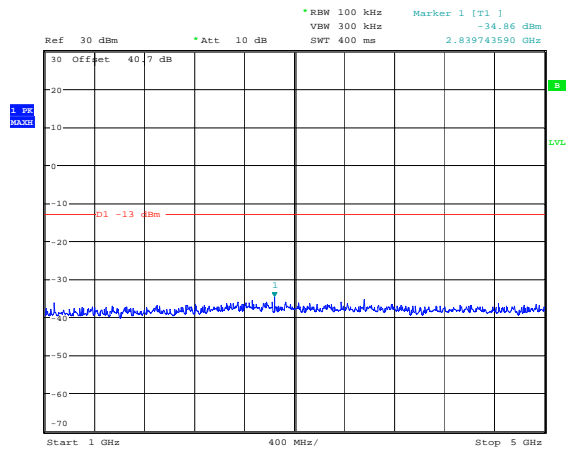
Date: 26.OCT.2009 11:22:56

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

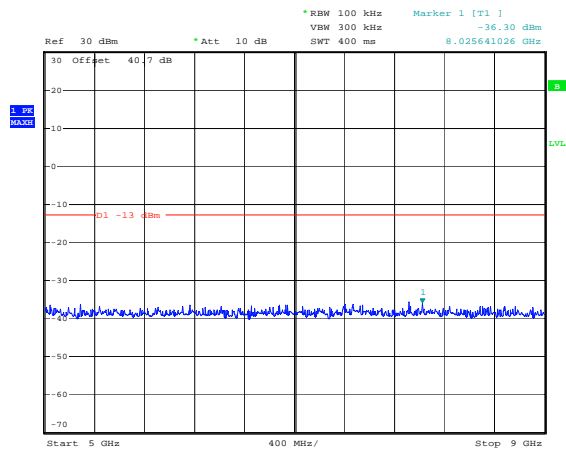
Intermodulation Wideband – 700 MHz Downlink Band



Date: 26.OCT.2009 11:24:57



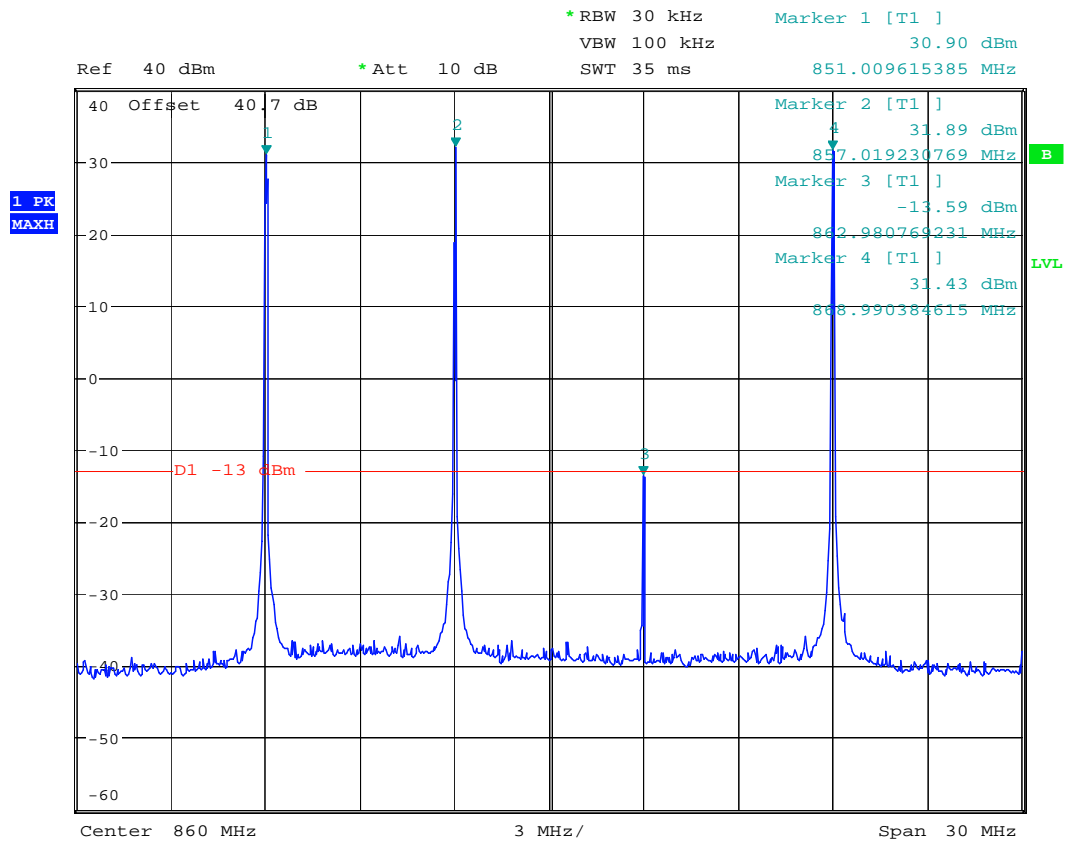
Date: 26.OCT.2009 11:25:16



Date: 26.OCT.2009 11:25:24

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

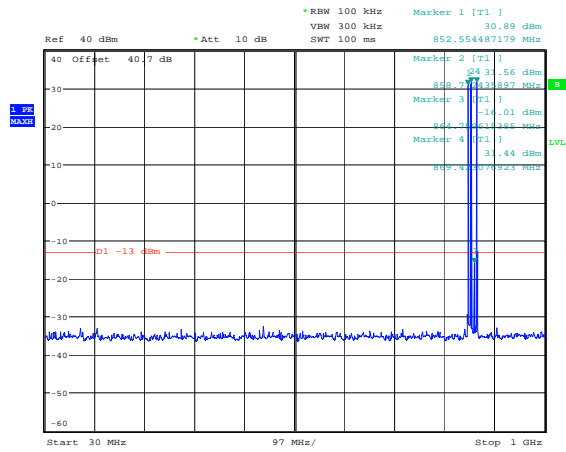
Intermodulation Inband – 800 MHz Downlink Band



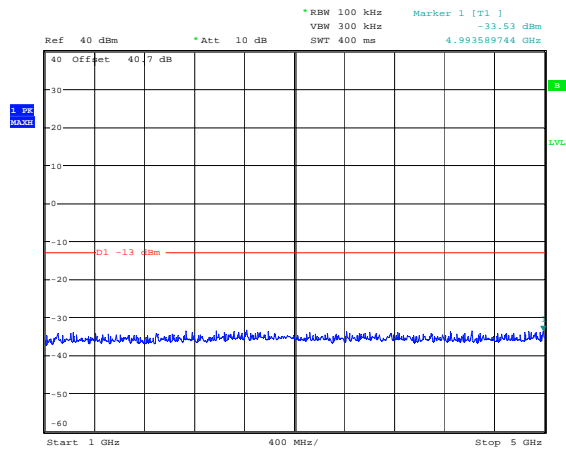
Date: 26.OCT.2009 11:08:39

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

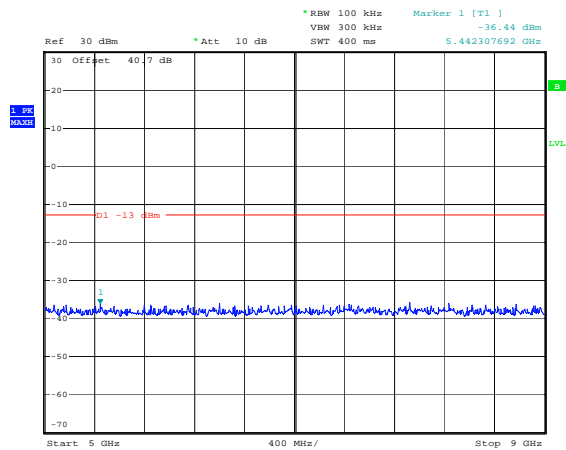
Intermodulation Wideband – 800 MHz Downlink Band



Date: 26.OCT.2009 11:10:13



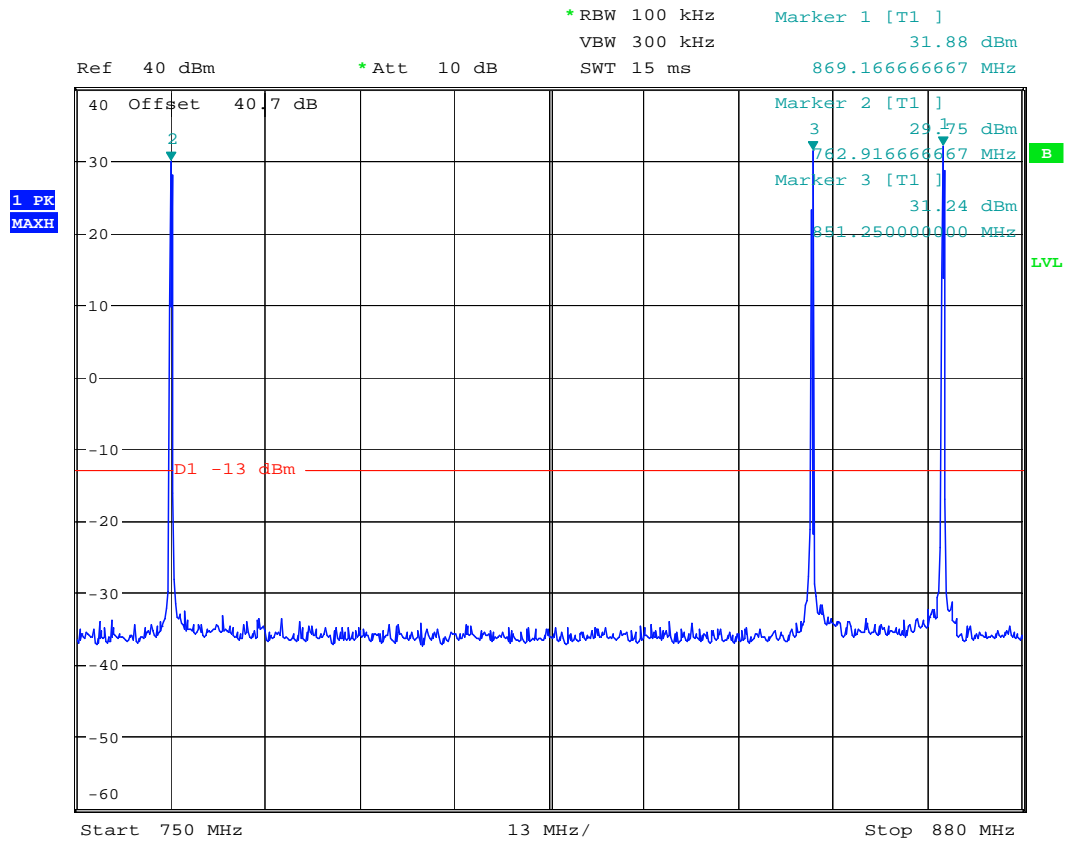
Date: 26.OCT.2009 11:10:26



Date: 26.OCT.2009 11:10:49

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

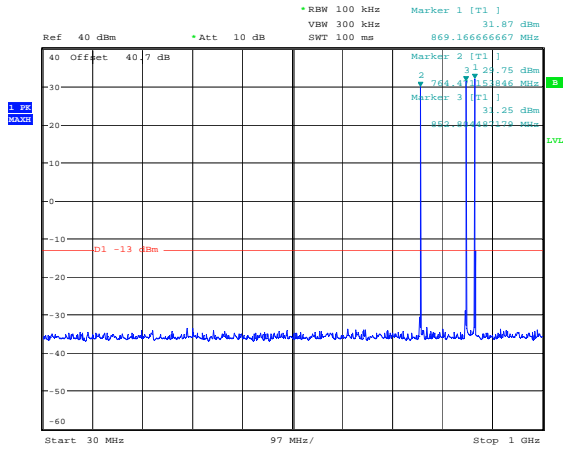
Intermodulation Inband – Cross Band



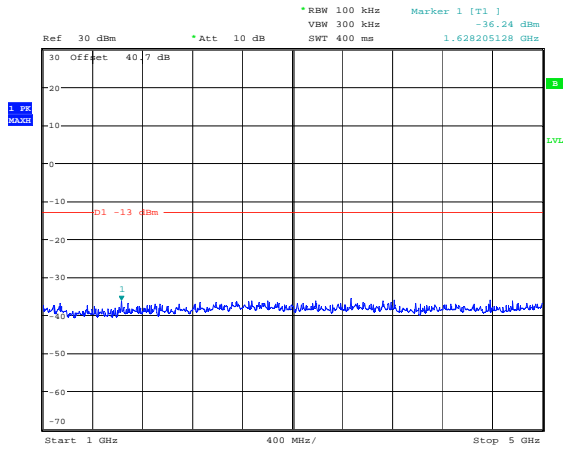
Date: 26.OCT.2009 11:30:54

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

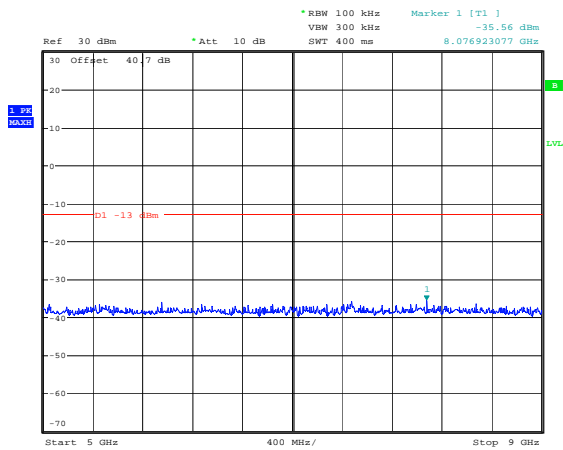
Intermodulation Wideband – Cross Band



Date: 26.OCT.2009 11:31:20



Date: 26.OCT.2009 11:39:11



Date: 26.OCT.2009 11:38:48

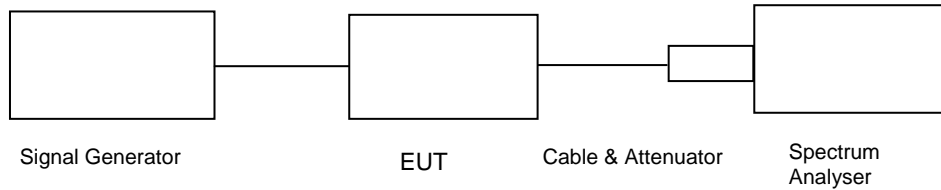
The above plot shows that there are no products outside the bands

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– DOWNLINK

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

Radio Laboratory



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, C4FM and TDMA Type.

The plots show the signal measured at the signal generator (Black trace) and the signal measured at the output of the EUT (Blue Trace).

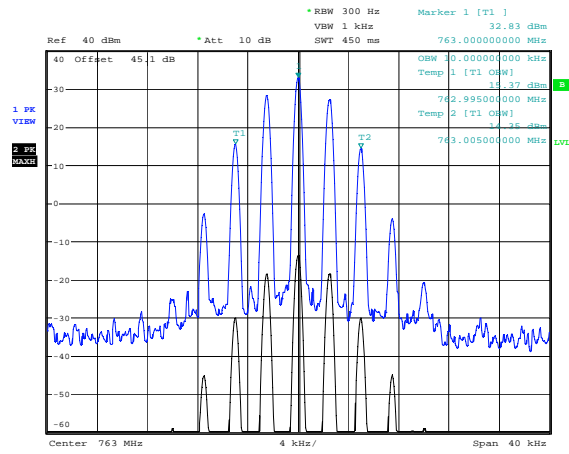
Note: The cables and attenuators had the following losses.

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

Frequency Of Operational Channel	Modulation Type			
	2.5 kHz FM	5 kHz FM	C4FM	TDMA
763.0	10.00 kHz	15.00 kHz	8.27 kHz	22.35 kHz
769.0	10.00 kHz	15.00 kHz	8.27 kHz	22.20 kHz
775.0	10.13 kHz	15.00 kHz	8.32 kHz	22.60 kHz
851.0	10.13 kHz	15.13 kHz	8.27 kHz	22.75 kHz
860.0	10.25 kHz	15.25 kHz	8.32 kHz	22.20 kHz
869.0	10.25 kHz	15.25 kHz	8.32 kHz	22.43 kHz

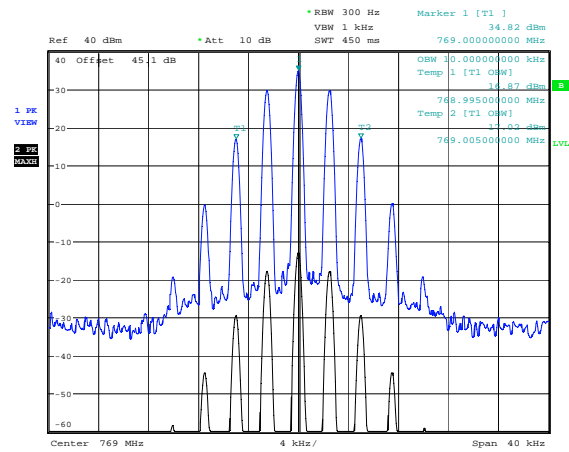
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
SIGNAL GENERATOR	IFR	3413	341001/261	N/A	X
SIGNAL GENERATOR	AGILENT	4438C	MY45091850	REF844	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	X
CABLE	TRaC	N/A	N/A	UH273	X
CABLE	TRaC	N/A	N/A	UH274	X

763.0 FM deviation set to 2.5kHz



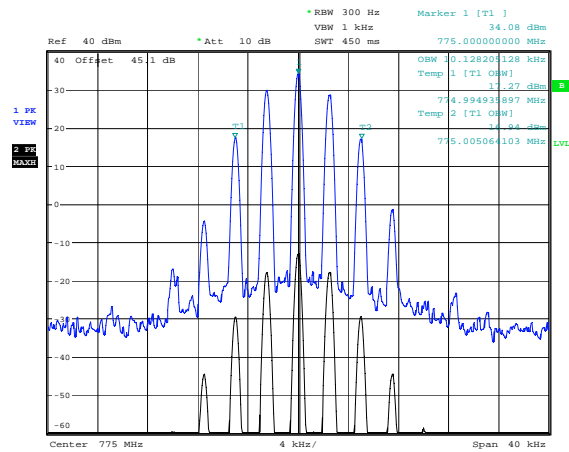
Date: 26.OCT.2009 09:15:20

769.0 FM deviation set to 2.5kHz



Date: 26.OCT.2009 09:10:18

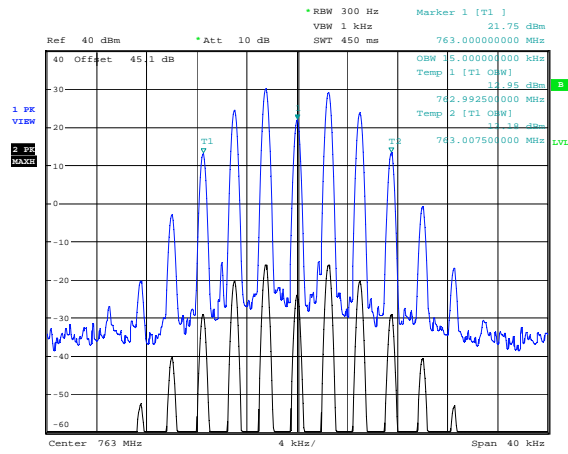
775.0 FM deviation set to 2.5kHz



Date: 26.OCT.2009 09:09:00

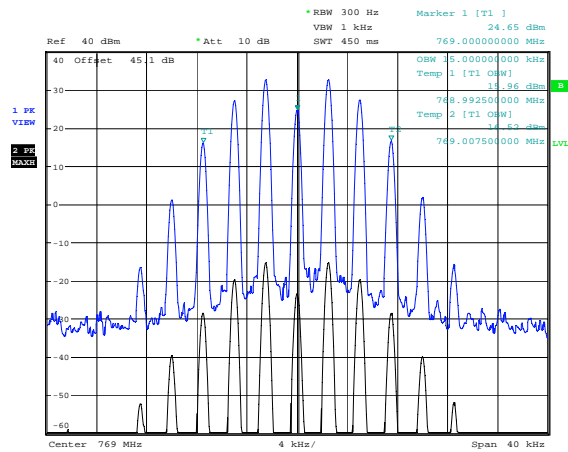
The above plots show no significant distortion visible when compared to the input signal.

763.0 FM deviation set to 5kHz



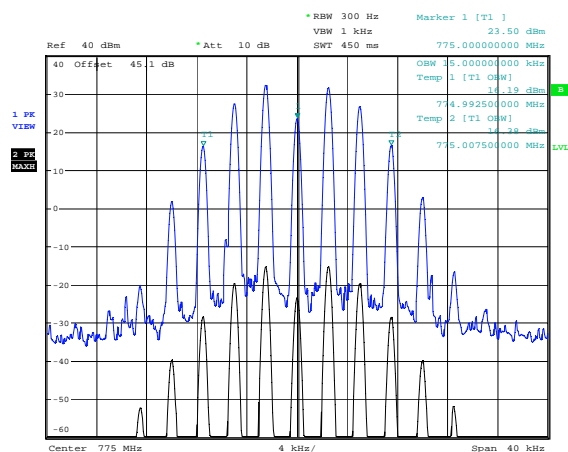
Date: 26.OCT.2009 09:14:58

769.0 FM deviation set to 5kHz



Date: 26.OCT.2009 09:10:59

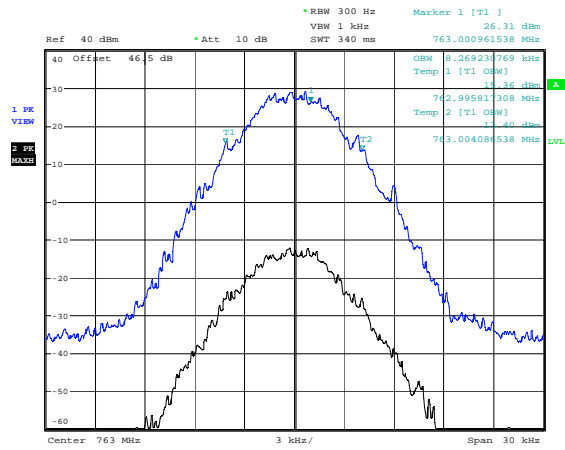
775.0 FM deviation set to 5kHz



Date: 26.OCT.2009 09:08:24

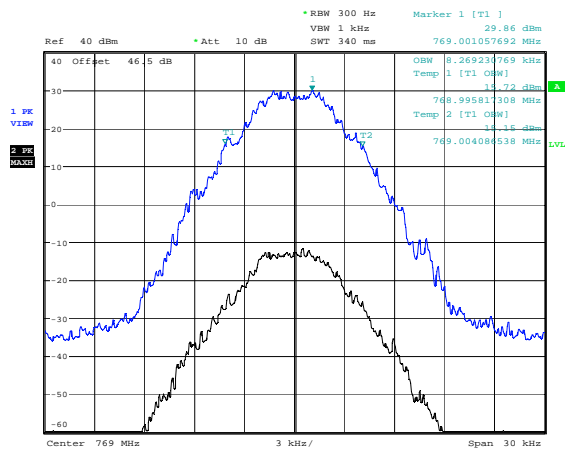
The above plots show no significant distortion visible when compared to the input signal.

763.0 C4FM Modulation



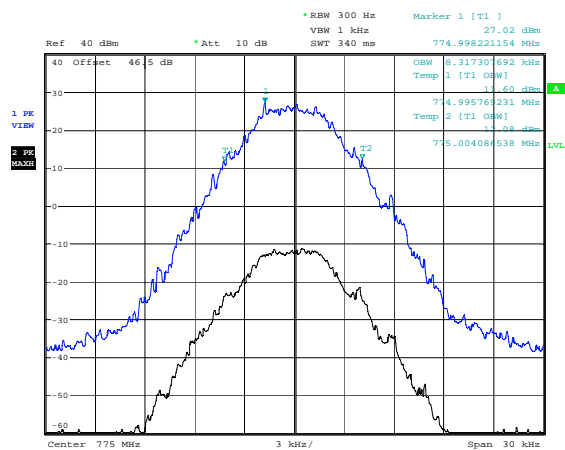
Date: 28.OCT.2009 09:17:16

769.0 C4FM Modulation



Date: 28.OCT.2009 09:20:43

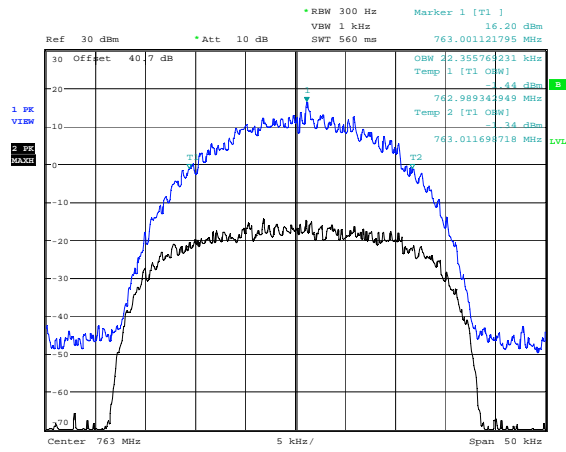
775.0 C4FM Modulation



Date: 28.OCT.2009 09:29:20

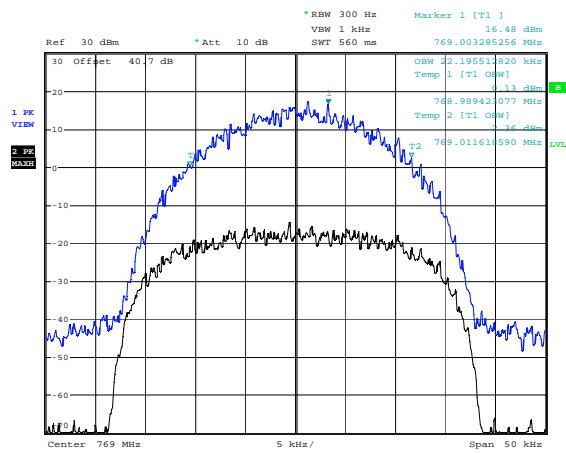
The above plots show no significant distortion visible when compared to the input signal.

763.0 TDMA Modulation



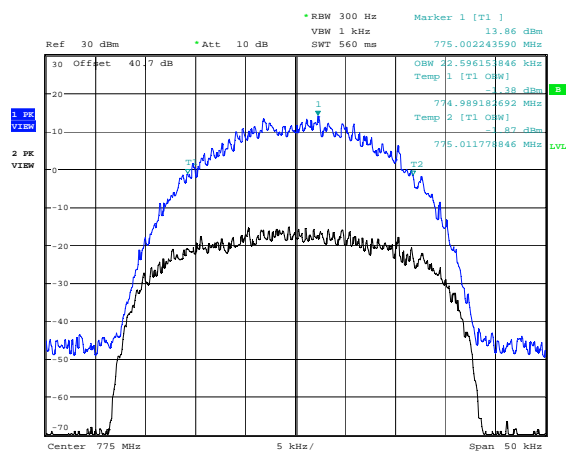
Date: 26.OCT.2009 12:26:36

769.0 TDMA Modulation



Date: 26.OCT.2009 12:25:14

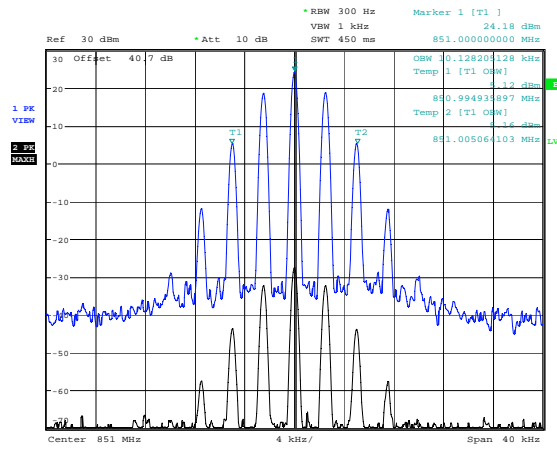
775.0 TDMA Modulation



Date: 26.OCT.2009 12:23:48

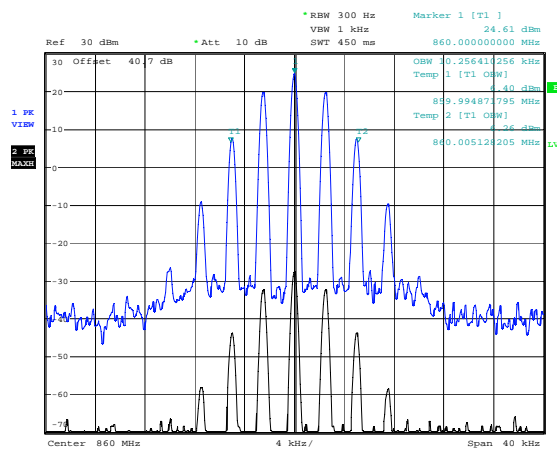
The above plots show no significant distortion visible when compared to the input signal.

851.0 FM deviation set to 2.5kHz



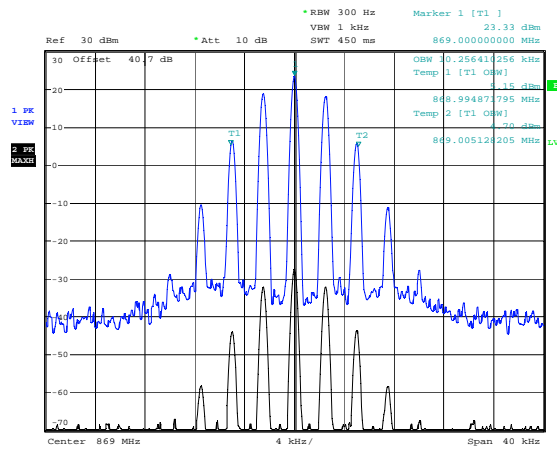
Date: 23.OCT.2009 14:12:48

860.0 FM deviation set to 2.5kHz



Date: 23.OCT.2009 14:08:56

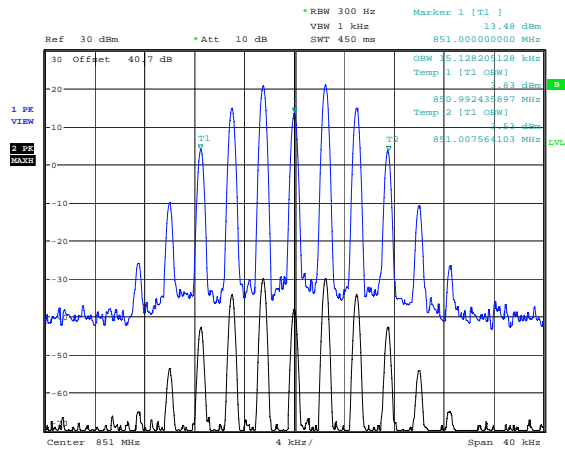
869.0 FM deviation set to 2.5kHz



Date: 23.OCT.2009 14:10:15

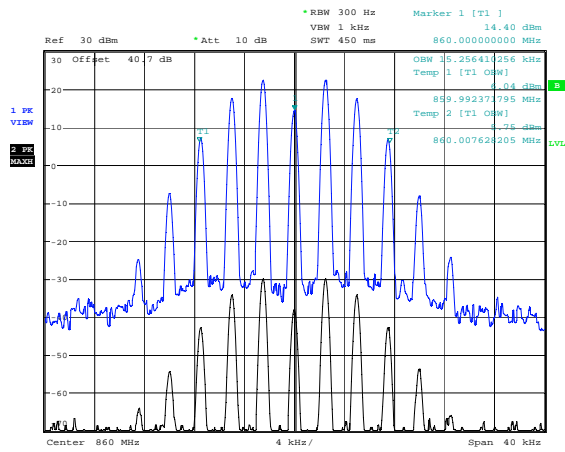
The above plots show no significant distortion visible when compared to the input signal.

851.0 FM deviation set to 5kHz



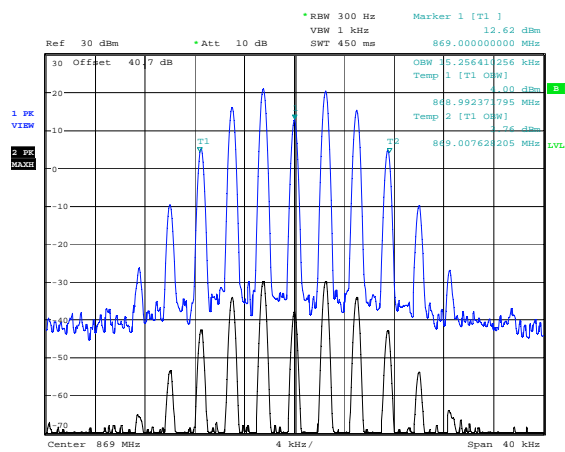
Date: 23.OCT.2009 14:12:04

860.0 FM deviation set to 5kHz



Date: 23.OCT.2009 14:08:32

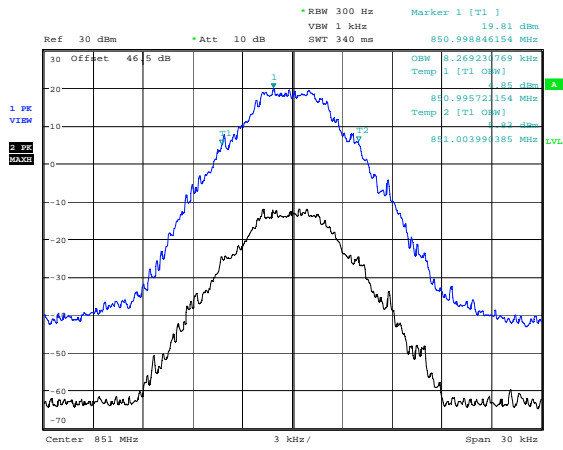
869.0 FM deviation set to 5kHz



Date: 23.OCT.2009 14:10:43

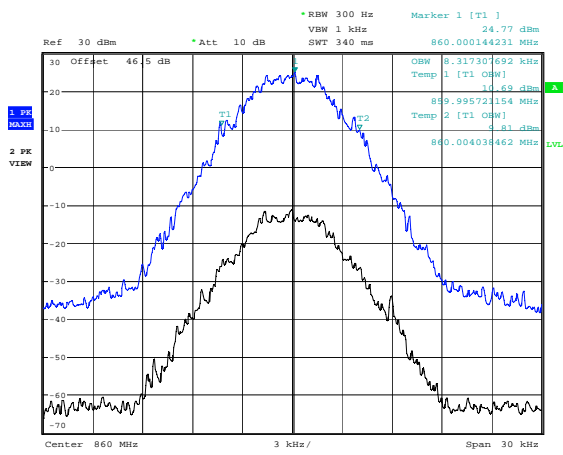
The above plots show no significant distortion visible when compared to the input signal.

851.0 C4FM Modulation



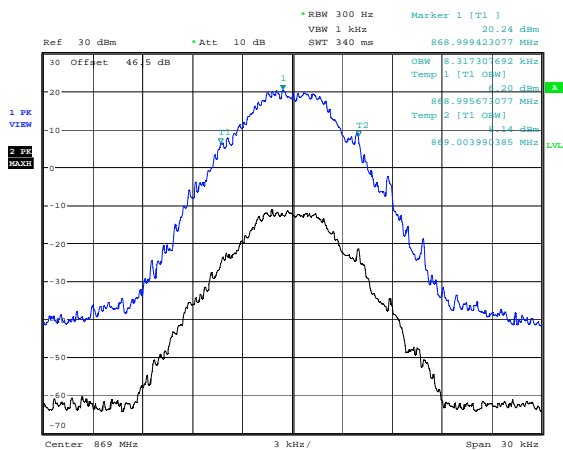
Date: 28.OCT.2009 09:48:12

860.0 C4FM Modulation



Date: 28.OCT.2009 09:40:51

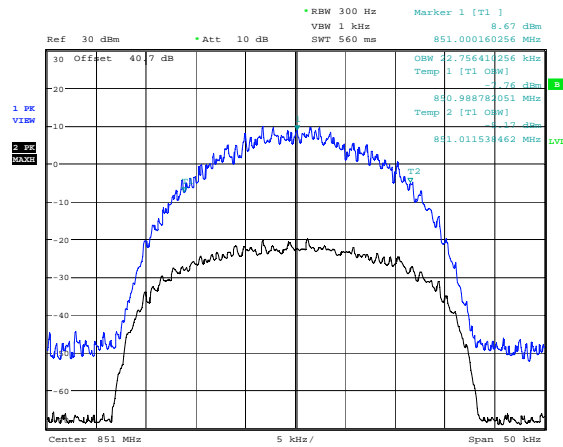
869.0 C4FM Modulation



Date: 28.OCT.2009 09:35:45

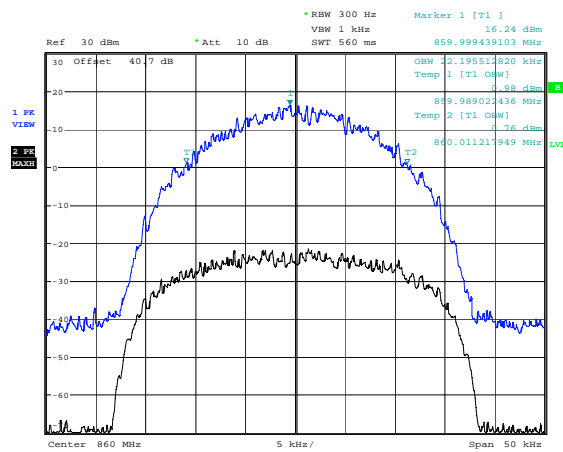
The above plots show no significant distortion visible when compared to the input signal.

851.0 TDMA Modulation



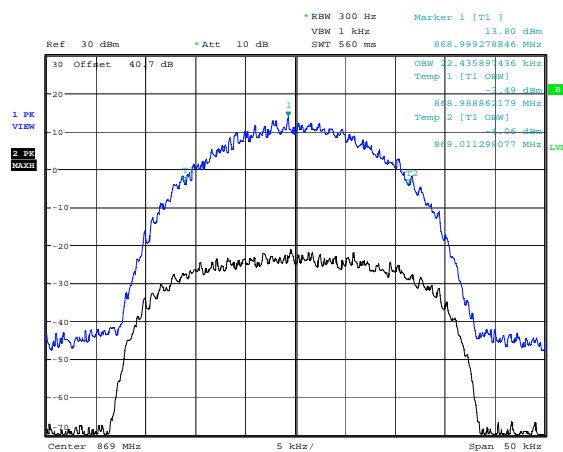
Date: 26.OCT.2009 12:06:26

860.0 TDMA Modulation



Date: 26.OCT.2009 12:07:58

869.0 TDMA Modulation



Date: 26.OCT.2009 12:09:40

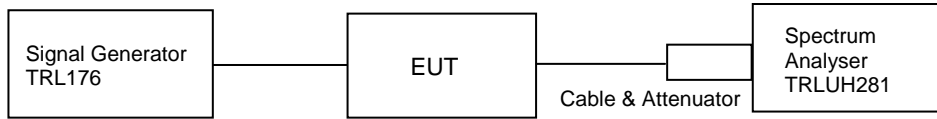
The above plots show no significant distortion visible when compared to the input signal.

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

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

RESULTS

700MHz Downlink

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
30MHz – 9 GHz	No Significant Emissions Within 20 dB of the Limit				-13

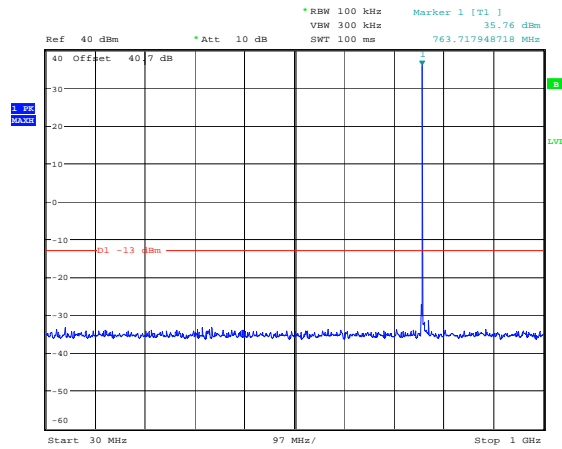
800MHz Downlink

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
30MHz – 9 GHz	No Significant Emissions Within 20 dB of the Limit				-13

The test equipment used for the Transmitter Conducted Emissions:

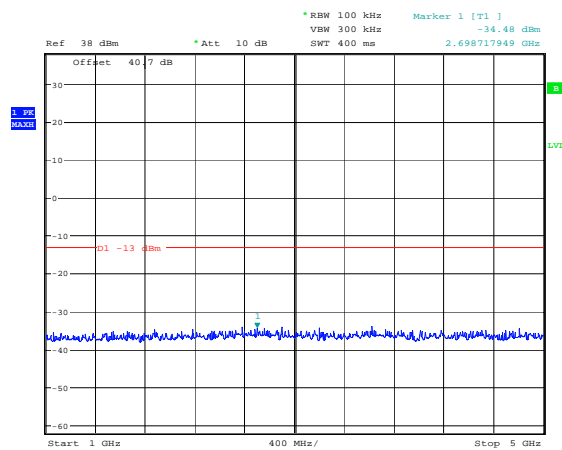
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU46	200034	UH281	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ATTENUATOR	SPINNER	745357	57224	U225	X
ATTENUATOR	AXELL	20 dB 100W	N/A	N/A	X
CABLE	TRaC	N/A	N/A	UH253	X
CABLE	TRaC	N/A	N/A	UH273	X
CABLE	TRaC	N/A	N/A	UH274	X

700 MHz Downlink Conducted emissions 763.0 30 MHz – 1GHz



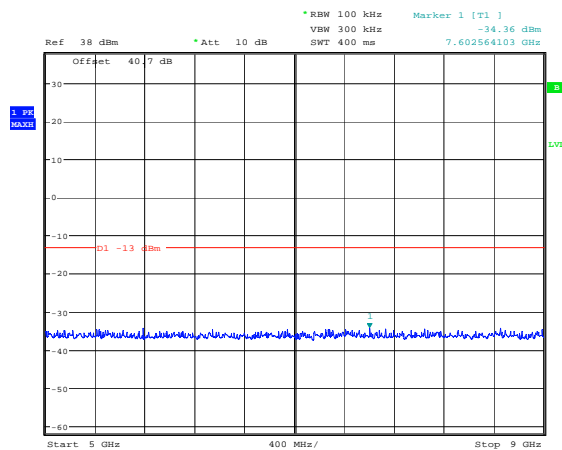
Date: 21.OCT.2009 16:14:56

700 MHz Downlink Conducted emissions 763.0 1 – 5GHz



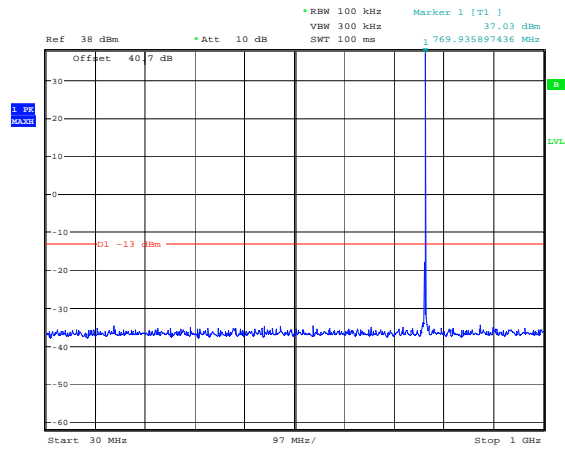
Date: 21.OCT.2009 16:15:46

700 MHz Downlink Conducted emissions 763.0 5 – 9GHz



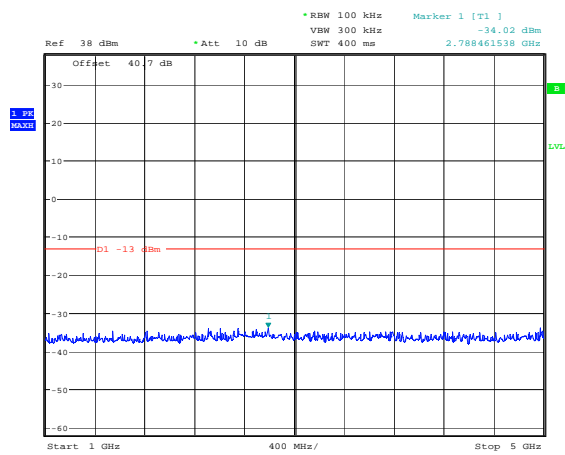
Date: 21.OCT.2009 16:16:11

700 MHz Downlink Conducted emissions 769.0 30 MHz – 1GHz



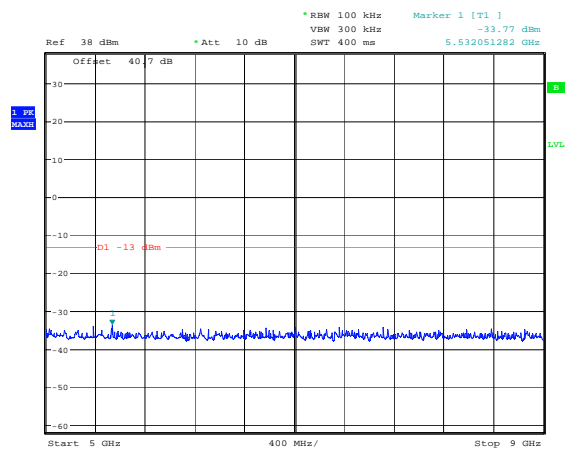
Date: 21.OCT.2009 16:17:11

700 MHz Downlink Conducted emissions 769.0 1 – 5GHz



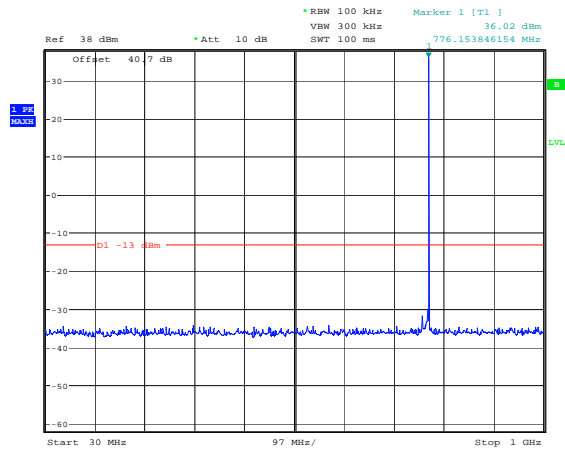
Date: 21.OCT.2009 16:17:24

700 MHz Downlink Conducted emissions 769.0 5 – 9GHz



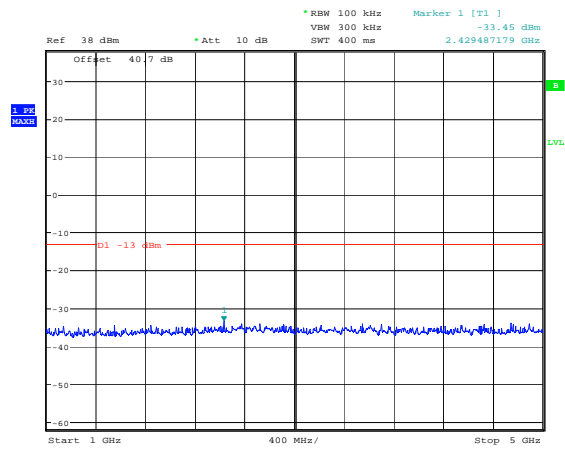
Date: 21.OCT.2009 16:17:37

700 MHz Downlink Conducted emissions 775.0 30 MHz – 1GHz



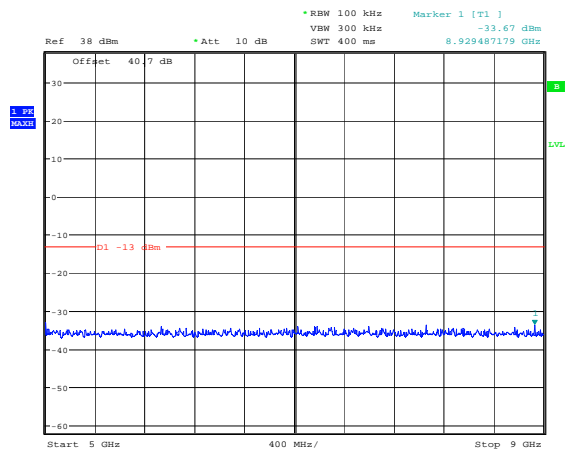
Date: 21.OCT.2009 16:18:54

700 MHz Downlink Conducted emissions 775.0 1 – 5GHz



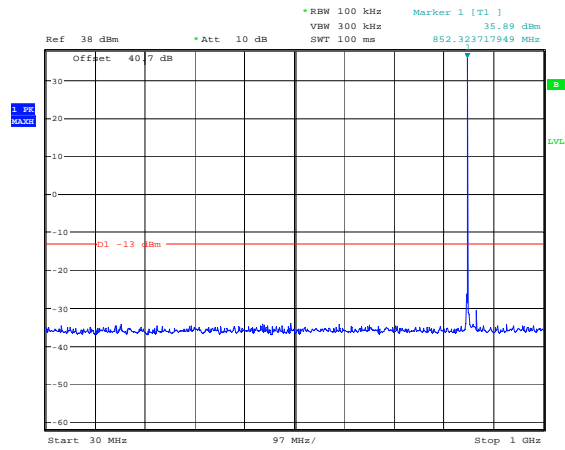
Date: 21.OCT.2009 16:19:23

700 MHz Downlink Conducted emissions 775.0 5 – 9GHz



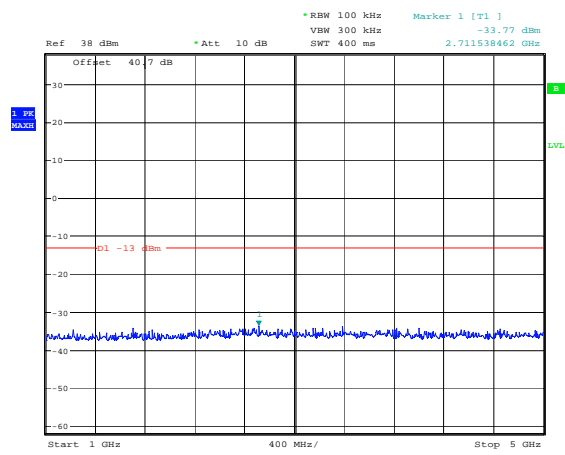
Date: 21.OCT.2009 16:20:03

800 MHz Downlink Conducted emissions 851.0 30 MHz – 1GHz



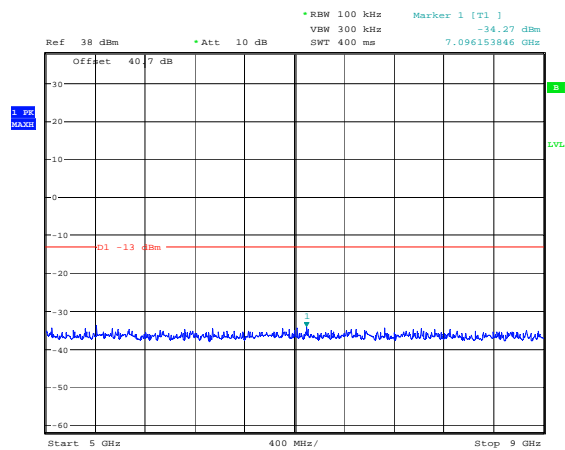
Date: 21.OCT.2009 16:21:54

800 MHz Downlink Conducted emissions 851.0 1 – 5GHz



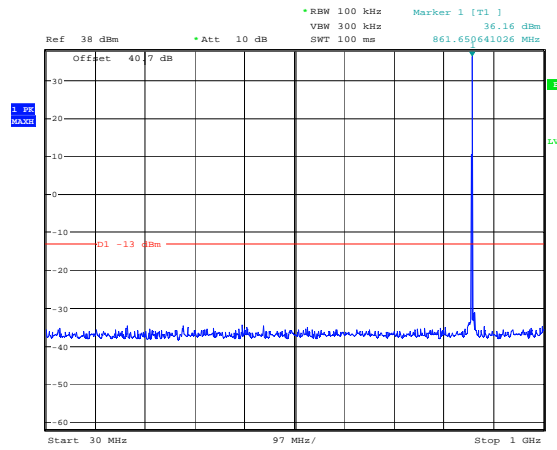
Date: 21.OCT.2009 16:22:21

800 MHz Downlink Conducted emissions 851.0 5 – 9GHz



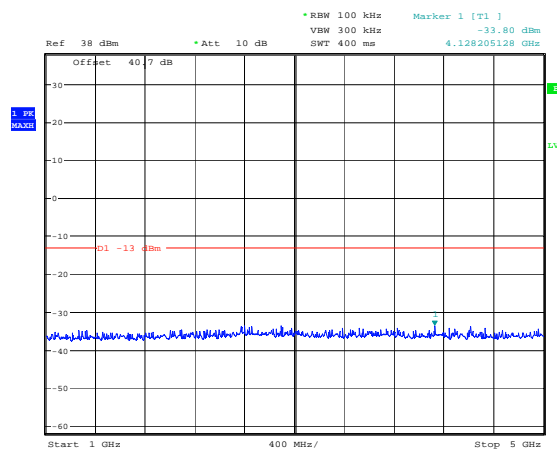
Date: 21.OCT.2009 16:22:34

800 MHz Downlink Conducted emissions 860.0 30 MHz – 1GHz



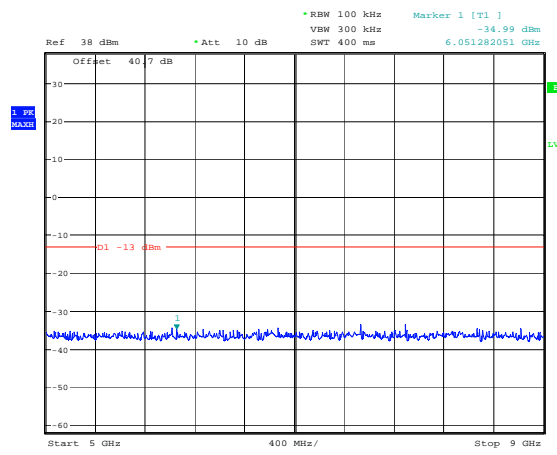
Date: 21.OCT.2009 16:23:18

800 MHz Downlink Conducted emissions 860.0 1 – 5GHz



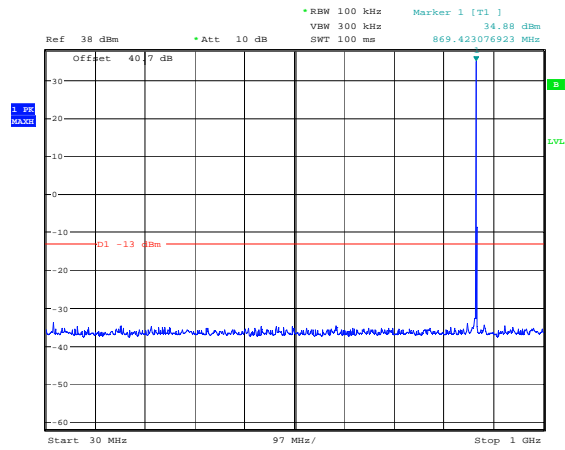
Date: 21.OCT.2009 16:23:37

800 MHz Downlink Conducted emissions 860.0 5 – 9GHz



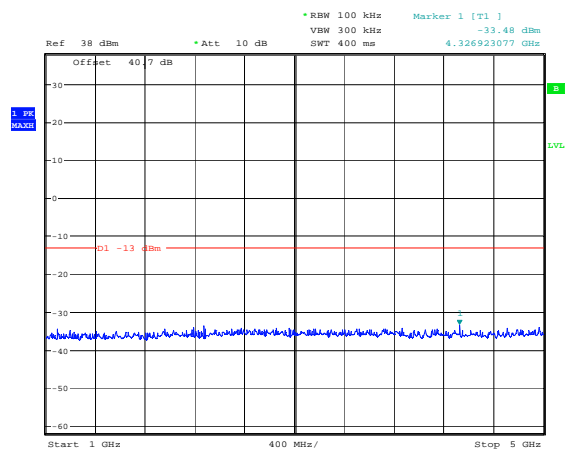
Date: 21.OCT.2009 16:23:51

800 MHz Downlink Conducted emissions 869.0 30 MHz – 1GHz



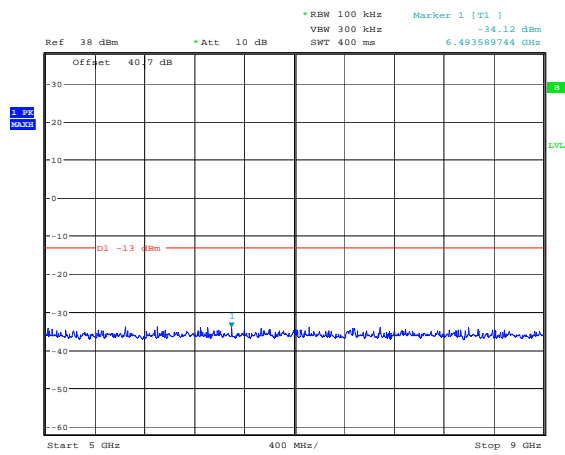
Date: 21.OCT.2009 16:24:44

800 MHz Downlink Conducted emissions 869.0 1 – 5GHz



Date: 21.OCT.2009 16:25:16

800 MHz Downlink Conducted emissions 869.0 5 – 9GHz

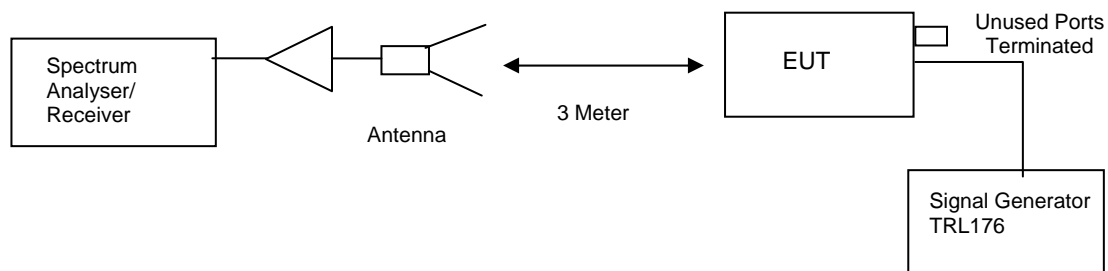


Date: 21.OCT.2009 16:25:49

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 $43 + 10 \log P_{dB}$

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

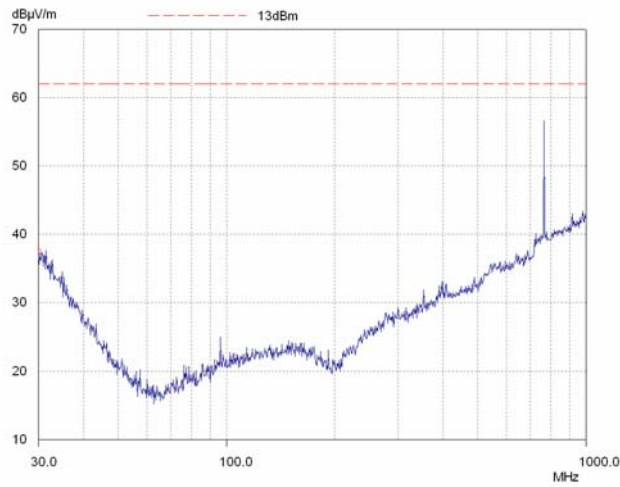
RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 9 GHz	No Significant Emissions Within 20 dB of Limit						-13

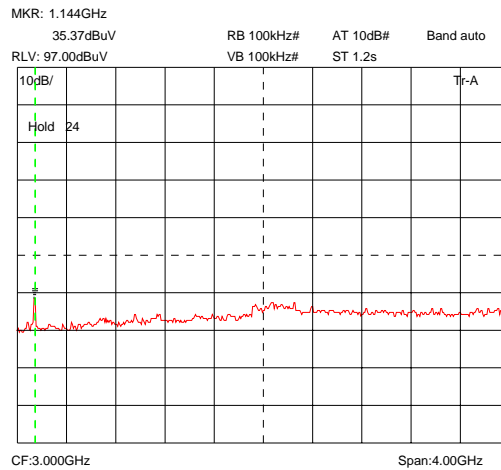
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	REF No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
HORN	EMCO	3115	9010-3580	138	X
PRE AMPLIFIER	HP	8449B	3008A016	572	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
ANTENNA	YORK	CBL611/A	1618	UH191	X
PRE AMPLIFIER	WATRKINS JOHNSON	6201-69	2740	UH372	X
RECEIVER	RHODE & SCHWARZ	ESVS10	825890/006	UH04	X

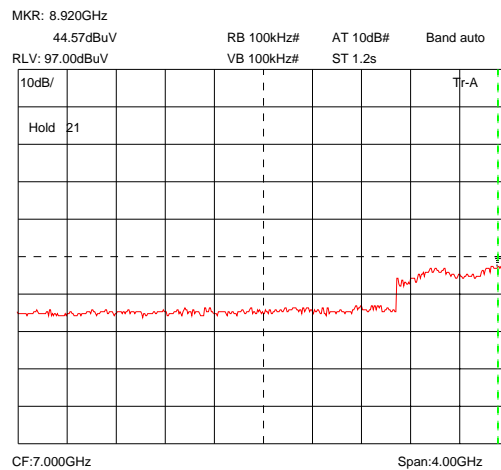
Radiated emissions 763.0 30MHz – 1GHz



Radiated emissions 763.0 1 – 5GHz

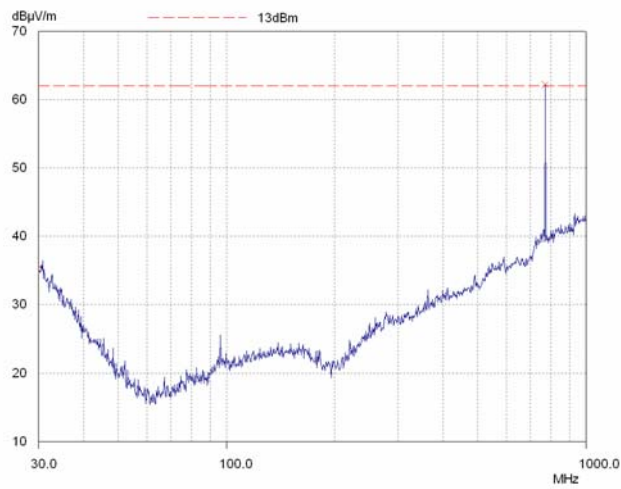


Radiated emissions 763.0 5 – 9GHz

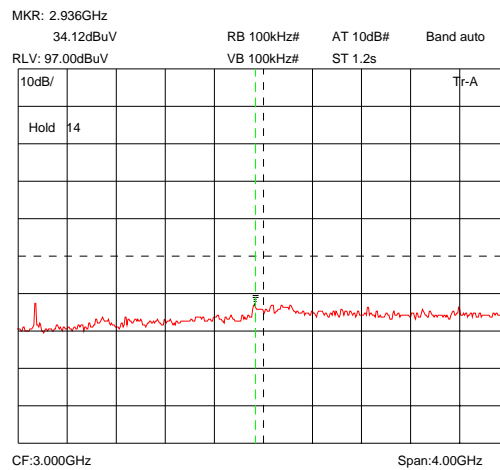


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

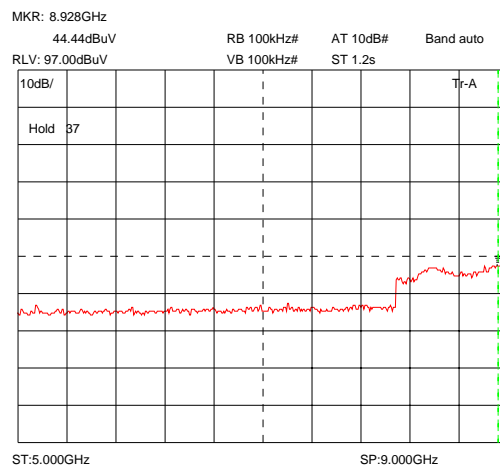
Radiated emissions 769.0 30MHz – 1GHz



Radiated emissions 769.0 1 – 5GHz

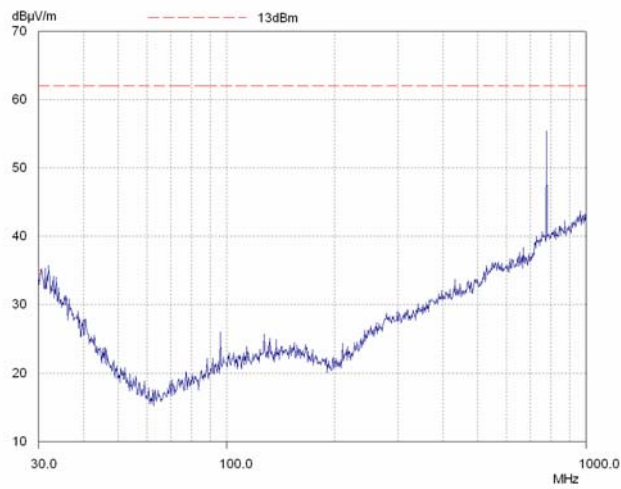


Radiated emissions 769.0 5 – 9GHz

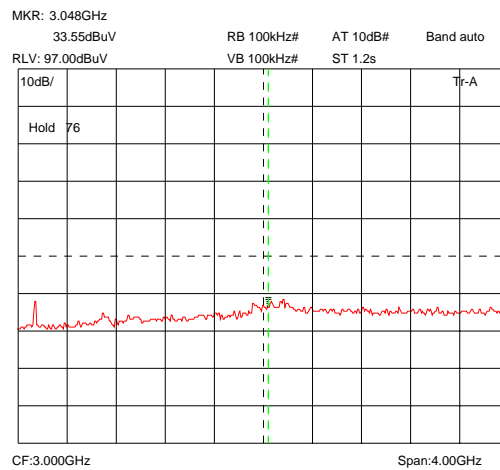


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

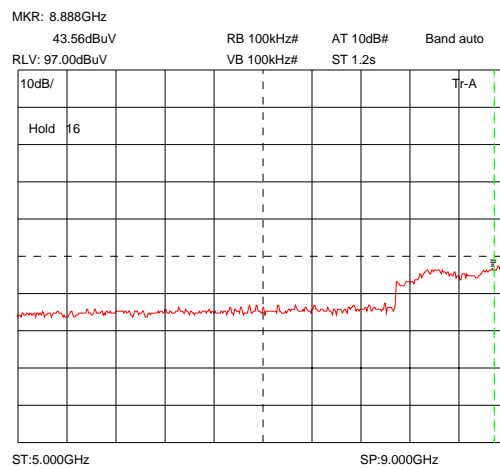
Radiated emissions 775.0 30MHz – 1GHz



Radiated emissions 775.0 1 – 5GHz

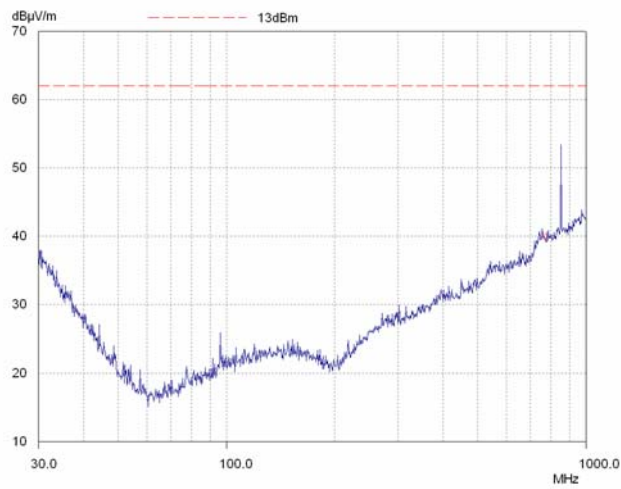


Radiated emissions 775.0 5 – 9GHz

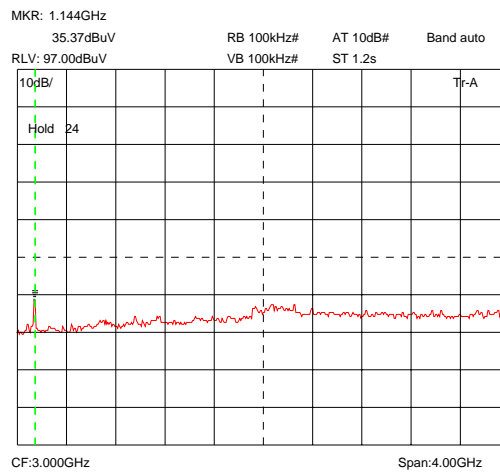


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

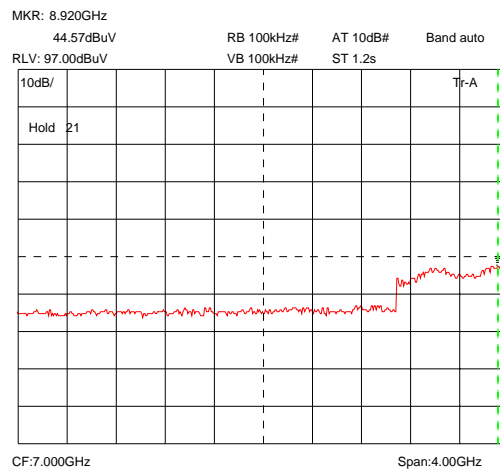
Radiated emissions 851.0 30MHz – 1GHz



Radiated emissions 851.0 1 – 5GHz

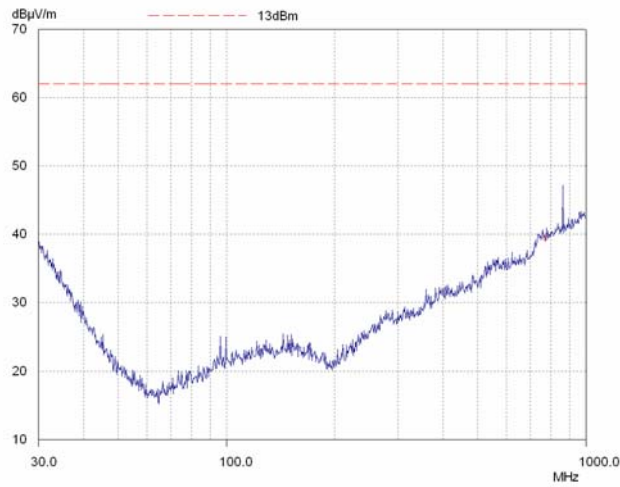


Radiated emissions 851.0 5 – 9GHz

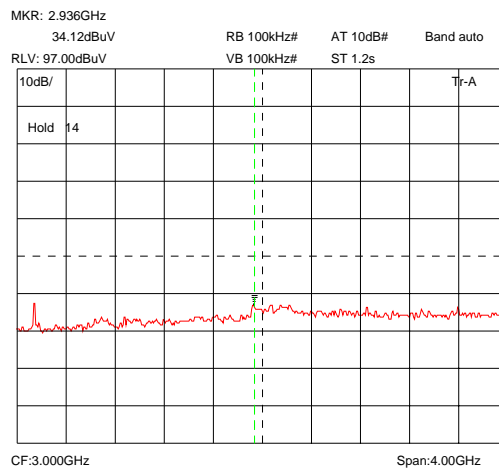


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

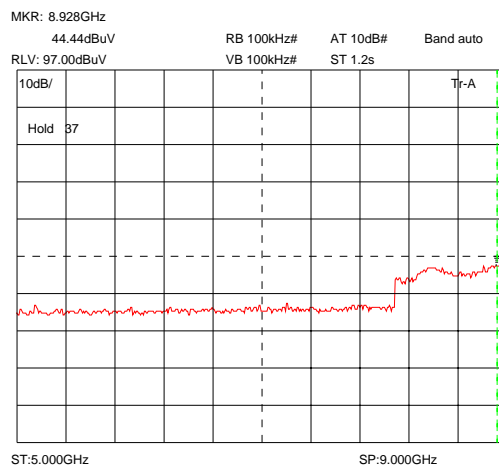
Radiated emissions 860.0 30MHz – 1GHz



Radiated emissions 860.0 1 – 5GHz

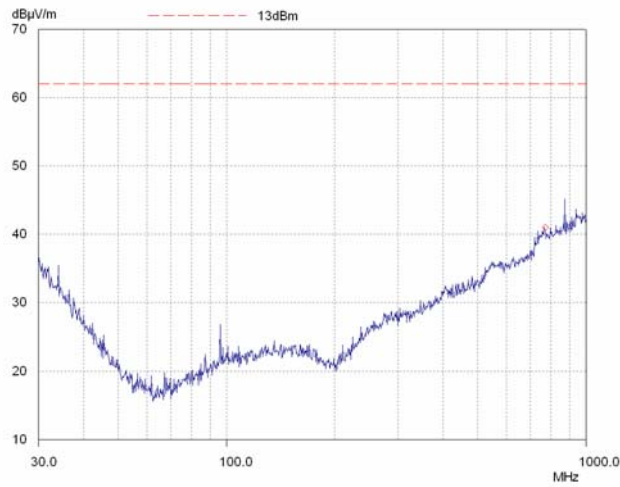


Radiated emissions 860.0 5 – 9GHz

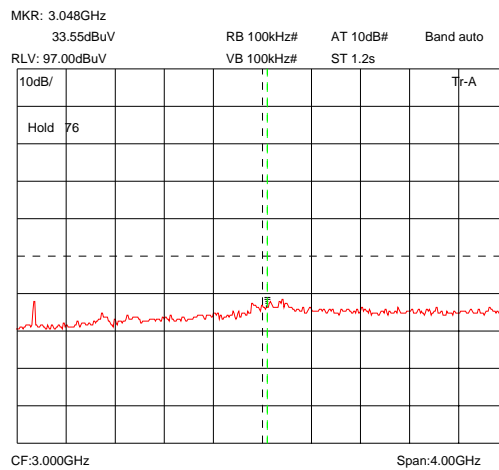


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

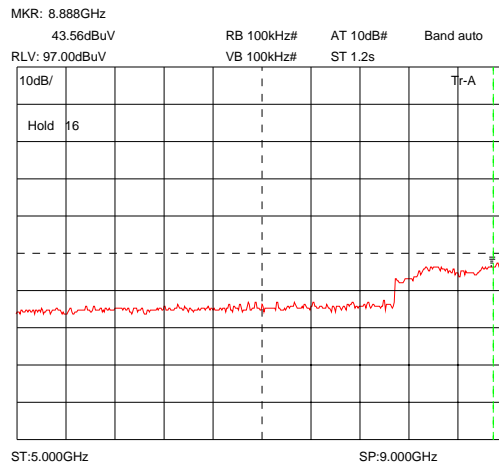
Radiated emissions 869.0 30MHz – 1GHz



Radiated emissions 869.0 1 – 5GHz

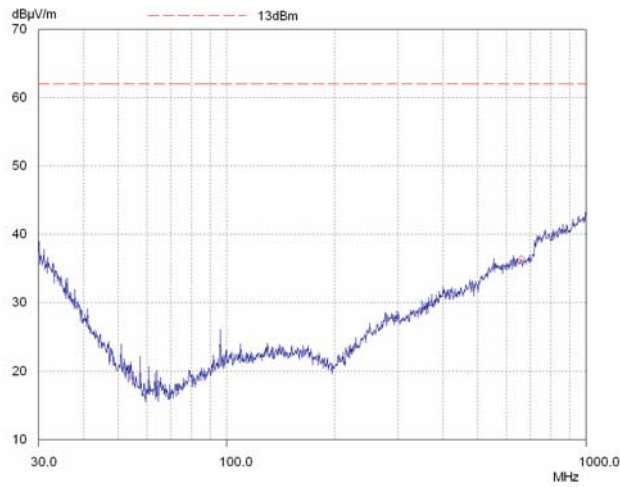


Radiated emissions 869.0 5 – 9GHz

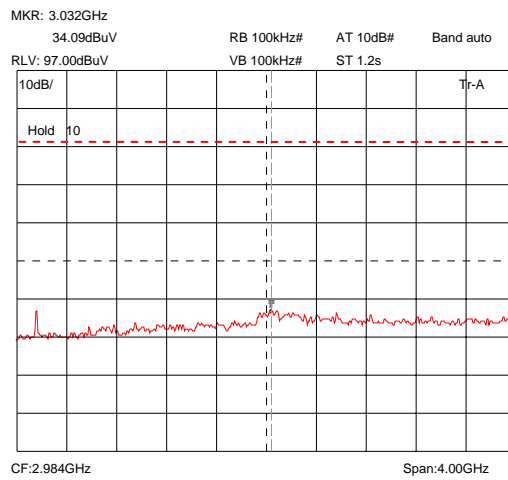


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

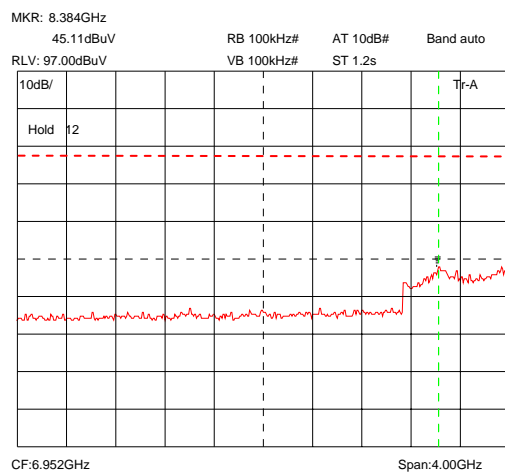
Radiated emissions no input signal 30MHz – 1GHz



Radiated emissions no input signal 1 – 5GHz



Radiated emissions no input signal 5 – 9GHz



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
UH04	Receiver	R&S	19/11/2008	12	19/11/2009
UH06/07	IC OATS Submission	TRL	02/07/2009	24	02/07/2011
UH06/07	NSA Calibration	TRL	19/06/2009	12	19/06/2010
UH028	Log Periodic Ant	Schwarbeck	14/08/2009	24	14/08/2011
UH029	Bicone Antenna	Schwarbeck	13/08/2009	24	13/08/2011
UH075	Signal Generator	Marconi	20/01/2009	12	20/01/2010
UH162	ERP Cable Cal	TRL	01/03/2009	12	01/03/2010
UH191	Bilog	York	01/10/2008	24	01/10/2010
UH225	Attenuator	Spinner		Calibrate In Use	
UH253	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH254	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH269	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH270	1m Cable N type	TRL	15/07/2009	12	15/07/2010
UH271	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH272	1.5m Cable N type	TRL	15/07/2009	12	15/07/2010
UH273	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH274	2m Cable N type	TRL	15/07/2009	12	15/07/2010
UH281	Spectrum Analyser	R&S	28/10/2008	12	28/10/2009
UH288	1m Cable N type	N/A	15/07/2009	12	15/07/2010
UH291	K-Type Cable	Succoflex	15/07/2009	12	15/07/2010
UH293	K-Type Cable	Megaphase	15/07/2009	12	15/07/2010
UH372	Pre Amplifier	Watkins Johnson	27/11/2008	12	27/11/2009
L005	CMTA	R&S	29/10/2008	12	29/10/2009
L138	1-18GHz Horn	EMCO	10/09/2009	24	10/09/2011
L139	1-18GHz Horn	EMCO	17/08/2009	24	17/08/2011
L176	Signal Generator	Marconi	23/06/2009	12	23/06/2010
L193	Bicone Antenna	Chase	06/05/2008	24	06/05/2010
L203	Log Periodic Ant	Chase	06/05/2008	24	06/05/2010
L479	Analyser	Anritsu	02/10/2009	12	02/10/2010
L572	Pre Amp	Agilent	15/07/2009	12	15/07/2010
REF844	Signal Generator	Agilent	05/03/2008	24	05/03/2010
N/A	Signal Generator	IFR	07/11/2008	24	07/11/2010
N/A	Attenuator	Axell		Calibrate In Use	
N/A	Combiners	Axell		Calibrate In Use	
N/A	Circulators	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 - TRLUH120) = **2.18dB**

Uncertainty in test result (Equipment – TRL05) = **1.08dB**

Uncertainty in test result (Equipment – TRL479) = **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 - TRLUH120) = **119ppm**

Uncertainty in test result (Equipment – TRL05) = **0.113ppm**

Uncertainty in test result (Equipment – TRL479) = **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 TRL479) Up to 8.1GHz = **3.31dB**

Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result (Equipment TRLUH120) 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%**