REPORT ON THE CERTIFICATION TESTING OF A AXELL WIRELESS VISIO REPEATER 60- 232301 WITH RESPECT TO THE FCC RULES CFR 47, PART 90 PRIVATE LAND MOBILE REPEATER.

TEST REPORT NO: 9F2749WUS1

COPY NO: 1

ISSUE NO: 1

FCC ID: NEO60-2323SERIES

REPORT ON THE CERTIFICATION TESTING OF A
AXELL WIRELESS
VISIO REPEATER 60- 232301
WITH RESPECT TO
THE FCC RULES CFR 47, PART 90
PRIVATE LAND MOBILE REPEATER.

TEST DATE: 23rd - 28th October 2009

TESTED BY: S HODGKINSON — Digitally signed by S HODGKINSON DN: CN = S HODGKINSON, C = GB, O = TRL COMPLIANCE LTD Reason: I am the author of this document Date: 2009.12.18 10:44:18 Z — S HODGKINSON

APPROVED BY: Digitally signed by John Charters DN: CN = John Charters, C = GB, O = TRaC Telecoms & Radio Reason: I am approving this document Date: 2009.12.22 10:46:37 Z — J CHARTERS PRODUCT MANAGER

DATE: 18th December 2009

Distribution:

Copy Nos: 1. Axell Wireless

2. TRaC Telecoms and Radio

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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:	NEO60-2323SERIES
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC RULES CFR 47, Part 90
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	Visio Repeater 60- 232301
EQUIPMENT TYPE:	Private Land Mobile Repeater
MAXIMUM GAIN:	Uplink = 15.23dB Downlink = 25.07 dB
MAXIMUM INPUT:	Uplink = -46.6dBm Downlink = +12.62dBm
MAXIMUM OUTPUT CONDUCTED:	Uplink = -31.93dBm Downlink = +37.26dBm
CHANNEL BANDWIDTH:	N/A Wideband amplifier
FREQUENCY GENERATION:	N/A
MODULATION TYPE:	F3E
POWER SOURCE(s):	+110Vac
TEST DATE(s):	23rd – 28th October 2009
ORDER No(s):	61175
APPLICANT:	Axell Wireless
ADDRESS:	Aerial House Asheridge Road Chesham Buckinghamshire HP5 1TU

TESTED BY: S HODGKINSON — Digitally signed by S HODGKINSON DN: CN = S HODGKINSON, C = GB, O = TRL COMPLIANCE LTD Reason: I am the author of this document Date: 2009.12.18 10:44:31 Z — S HODGKINSON

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APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT):	Visio Repeater 60- 232301
EQUIPMENT TYPE:	Private Land Mobile Repeater
PURPOSE OF TEST:	Certification
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 90
TEST RESULT:	COMPLIANT Yes [X] No [ ]
APPLICANT'S CATEGORY:	MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]
APPLICANT'S ORDER No(s):	61175
APPLICANT'S CONTACT PERSON(s):	Mr Peter Bradfield
E-mail address:	peter.bradfield@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 and Radio
TEST DATE(s):	23rd – 28th October 2009
TEST REPORT No:	9F2749WUS1

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.

TEST/EXAMINATION	RULE PART	APPLICABILITY	RESULT
RF Power Output	90.205	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	90.210	Yes	Complies
Spurious Emissions at Antenna Terminals	90.210	Yes	Complies
Field Strength of Spurious Emissions	90.210	Yes	Complies
Frequency Stability	90.213	N/A(note 1)	N/A
Transient behaviour	90.214	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 [X] Class B [ ]
   Downlink Class A [X] Class B [ ]
3. Product Use: Private Land Mobile Repeater
4. Emission Designator: F3E
5. Temperatures: Ambient (Tnom) 21°C
6. Supply Voltages: Vnom +110Vac

   Note: Vnom voltages are as stated above unless otherwise shown on the test report page

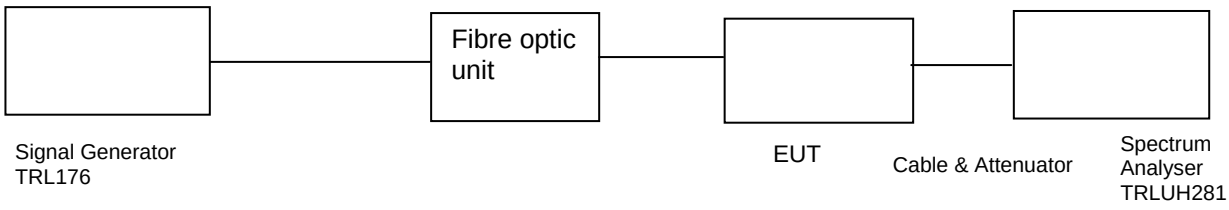
7. Equipment Category: Single channel [ ]
   Two channel [ ]
   Multi-channel [X]
8. Channel spacing: Wideband Uplink
   Narrowband Downlink
9. Test Location TRaC Telecoms and Radio
   Up Holland [X]
10. Modifications made during test program No modifications were performed.

System description:
Visio Repeater 60- 232301 consists of an uplink and downlink wideband amplifier. The uplink is a wide band amplifier and operates over the frequency band 806.0MHz – 824.0MHz.
The downlink is a wide band amplifier and operates over the frequency band 851.0MHz – 869.0MHz

COMPLIANCE TESTS

SYSTEM GAIN/OUTPUT POWER – CONDUCTED – PART 2.1046 – UPLINK

Ambient temperature = 21°C Radio Laboratory
Relative humidity = 50%
Supply voltage = +110Vac
Channel number = See test results



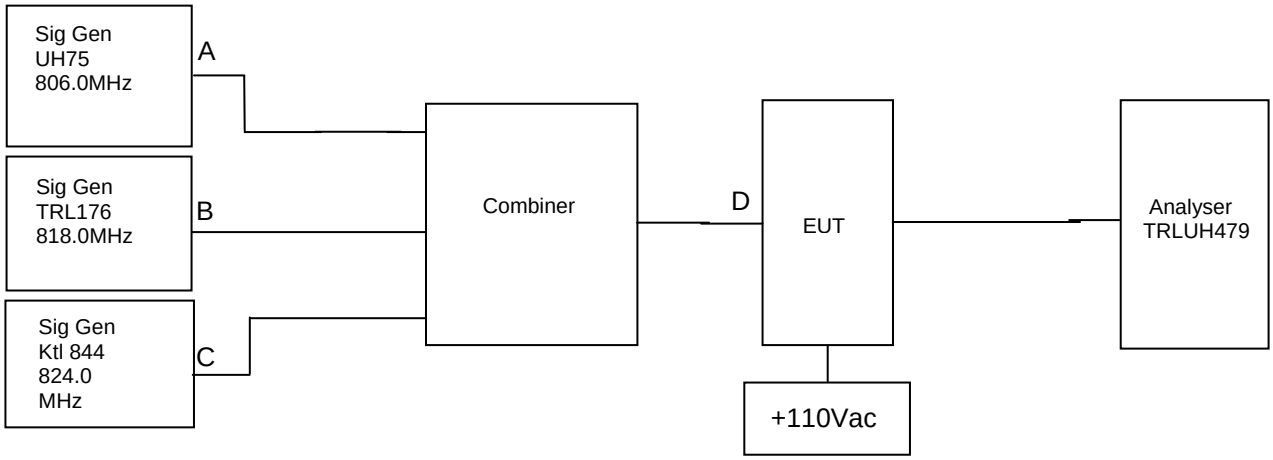
Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
806.0	-49.6	0.88	0.32	-35.73	14.75	-35.41	4.75
815.0	-46.6	0.88	0.32	-32.25	15.23	-31.93	5.24
824.0	-49.3	0.84	0.30	-35.32	14.82	-35.02	4.80

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	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8308-200-N	N/A	103	
ATTENUATOR	BIRD	8304-100-N	N/A	222	
CABLE	TRL	N/A	N/A	UH272	**X**
CABLE	TRL	N/A	N/A	UH378	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK

Ambient temperature = 20°C Radio Laboratory
Relative humidity = 516%
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 at the +1dB compression point on the three carriers, the signal generators were then increased by +10dB.The cable and attenuator loss between the EUT and the spectrum analyser was 0.32dB.

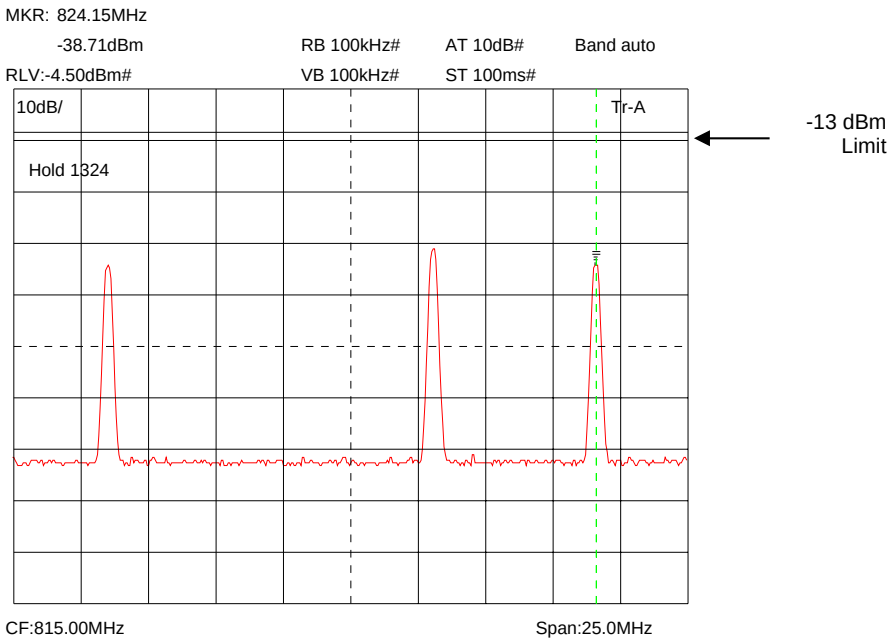
RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
806.0	818.0	824.0	No emissions within 20dB of the limit	-13

Sweep data is shown on the next page:

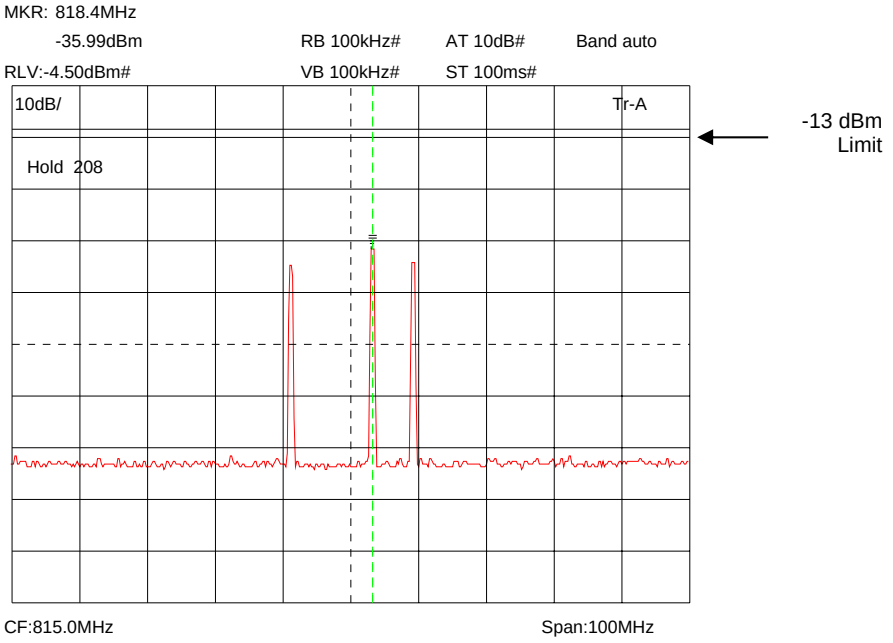
Test equipment used for intermodulation test

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	
SIGNAL GENERATOR	MARCONI	2022D	119215/058	UH75	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	TRL176	**X**
SIGNAL GENERATOR	AGILENT	4438C	MY45091850	105	**X**
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	
COMBINER	ELCOM	RC-4-50	N/A	170	**X**

Intermodulation Inband



Intermodulation Wideband



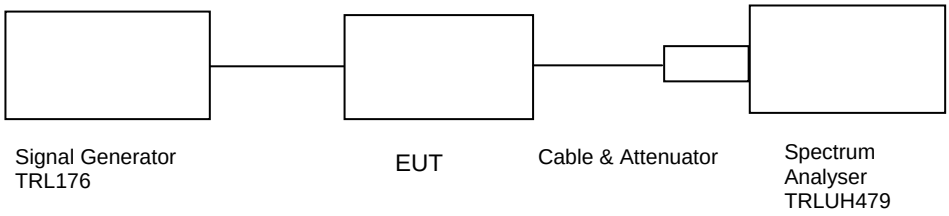
No Significant emissions within 20dB of the limit

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

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– UPLINK

Ambient temperature	=	21°C	Radio Laboratory
Relative humidity	=	50%	
Supply voltage	=	+110Vac	
Channel number	=	See test results	



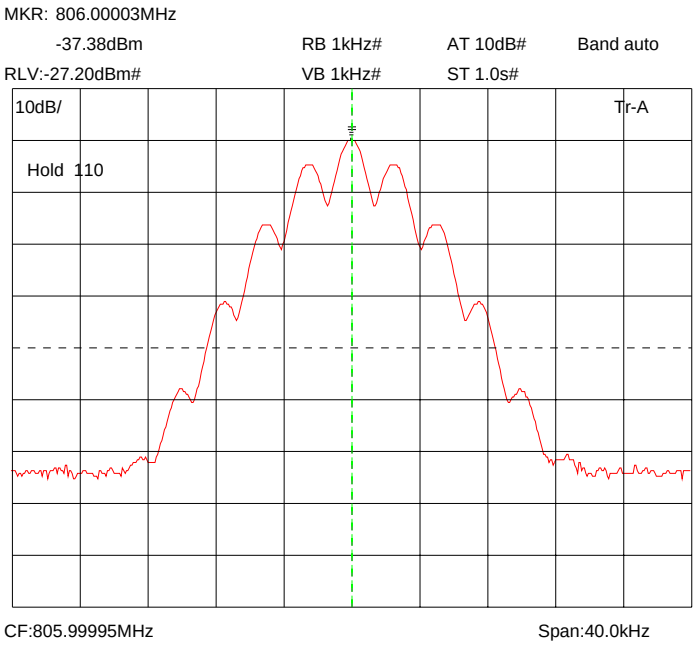
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-46dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

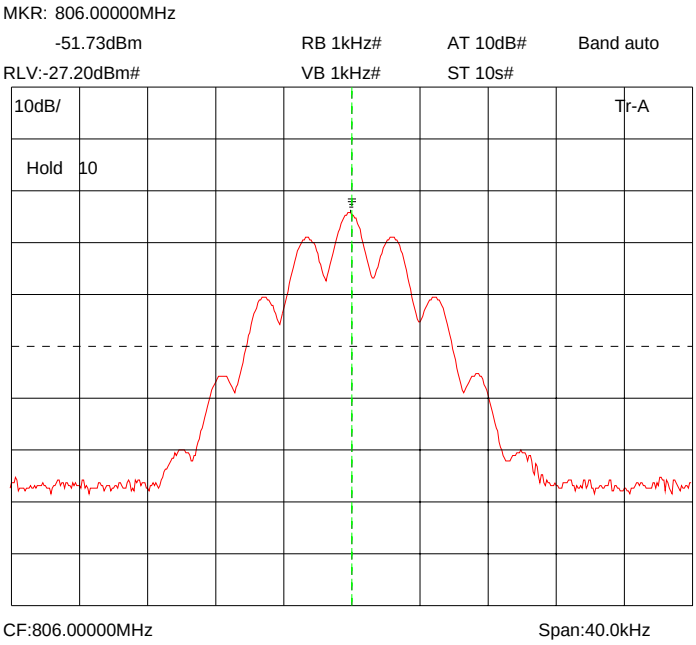
1. Cable and attenuator between EUT and spectrum analyser 0dB
2. Cable between signal generator and EUT 0.32dB

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8308-200-N	N/A	103	
CABLE	TRL	N/A	N/A	UH272	**X**
CABLE	TRL	N/A	N/A	UH2378	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**

806.0 MHz Signal Generator, and EUT deviation set to 2.5kHz FM

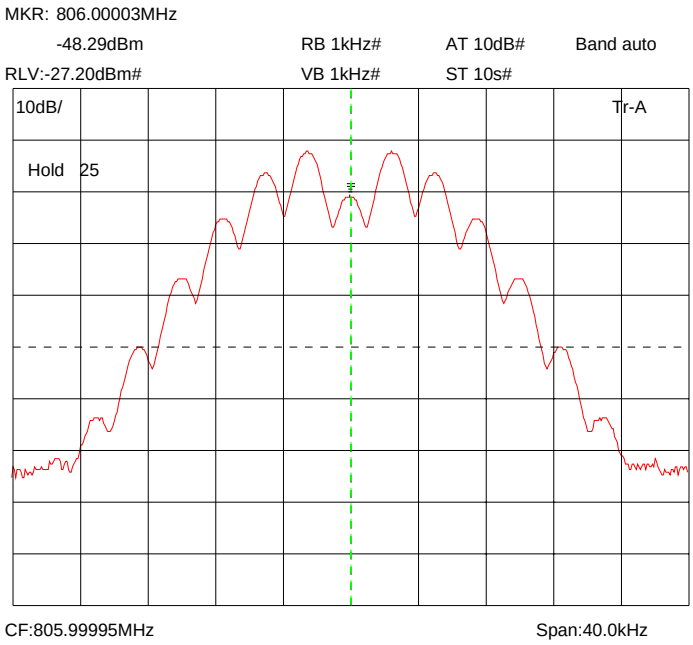


806.0 MHz Signal Generator, deviation set to 2.5kHz FM

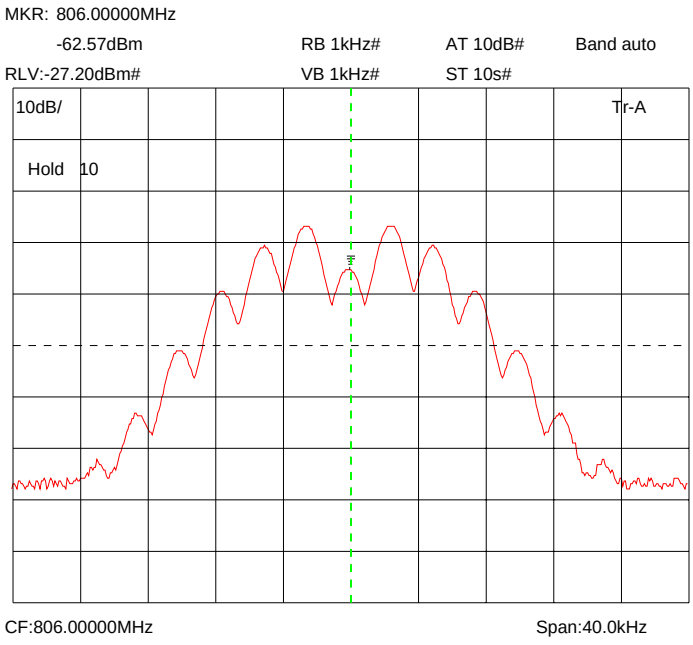


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

806.0 MHz Signal Generator and EUT deviation set to 5kHz FM

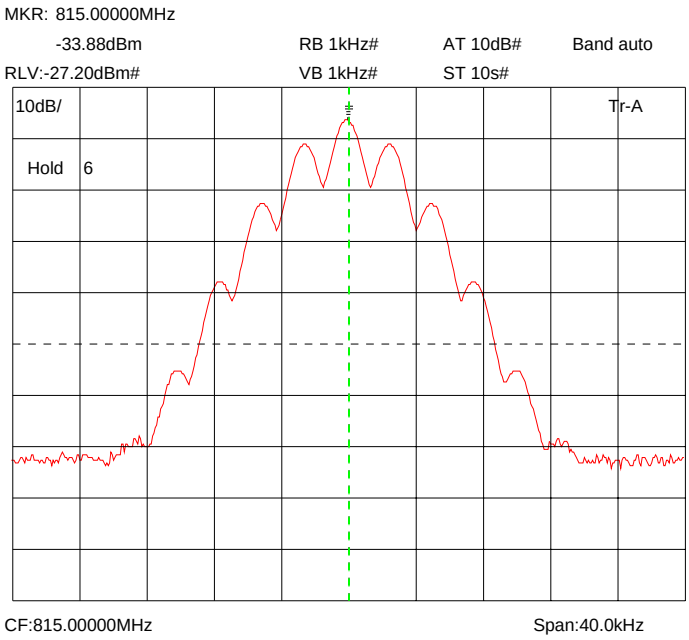


806.0 MHz Signal Generator, deviation set to 5kHz FM

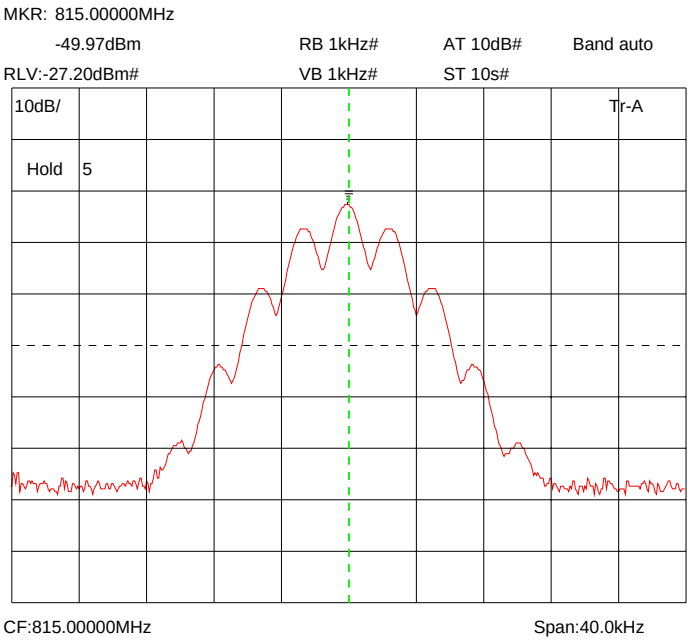


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

815.0 MHz Signal Generator and EUT, deviation set to 2.5kHz FM

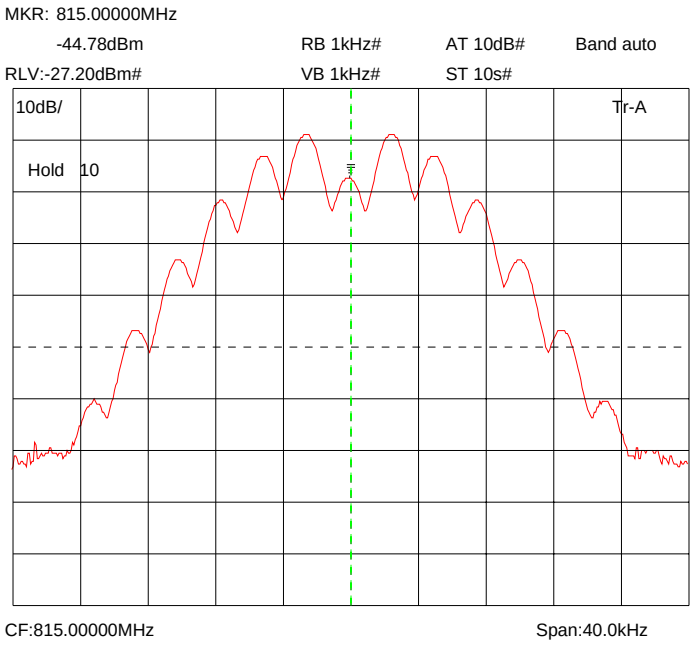


815.0 MHz Signal Generator, deviation set to 2.5kHz FM

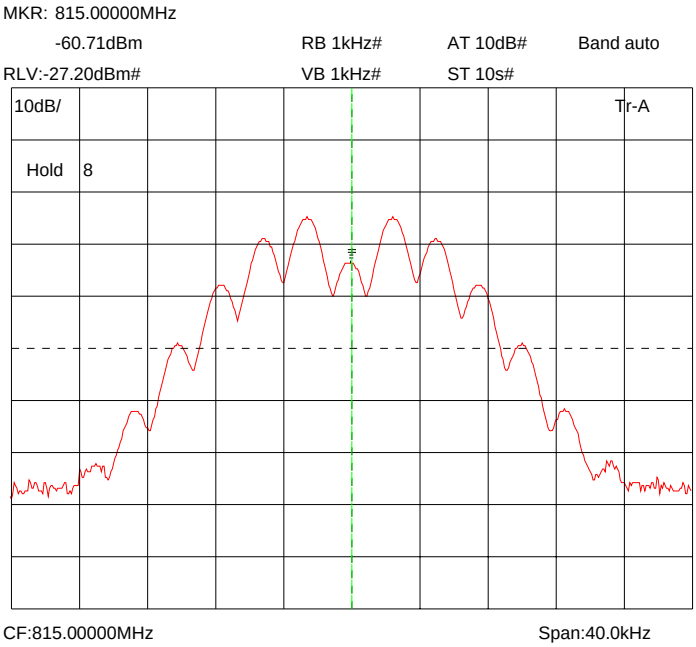


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

815.0 MHz Signal Generator and EUT, deviation set to 5kHz FM

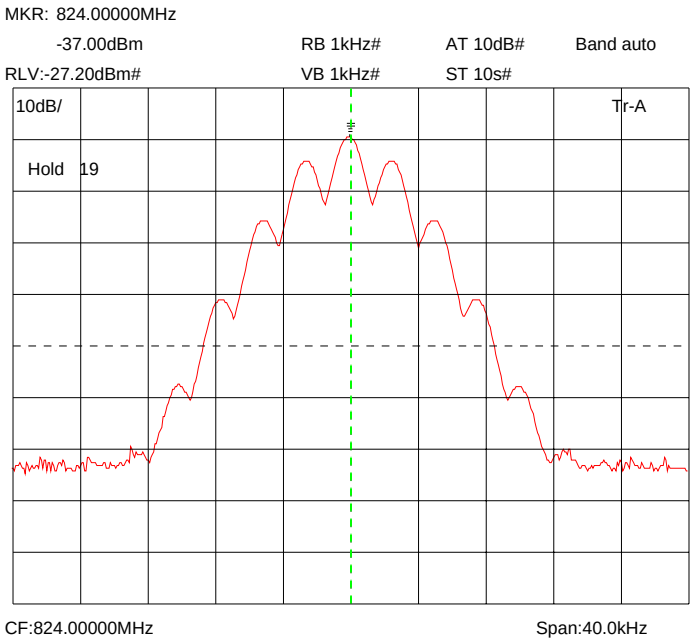


815.0 MHz Signal Generator, deviation set to 5kHz FM

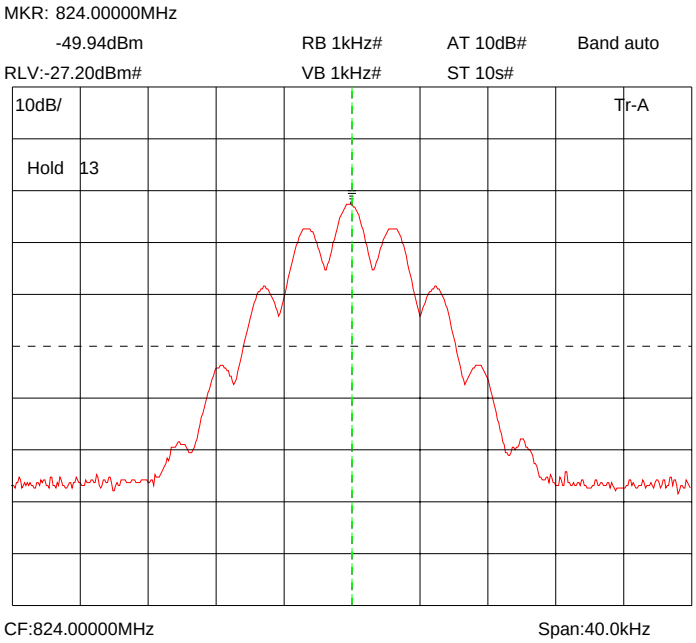


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

824.0 MHz Signal Generator and EUT, deviation set to 2.5kHz FM

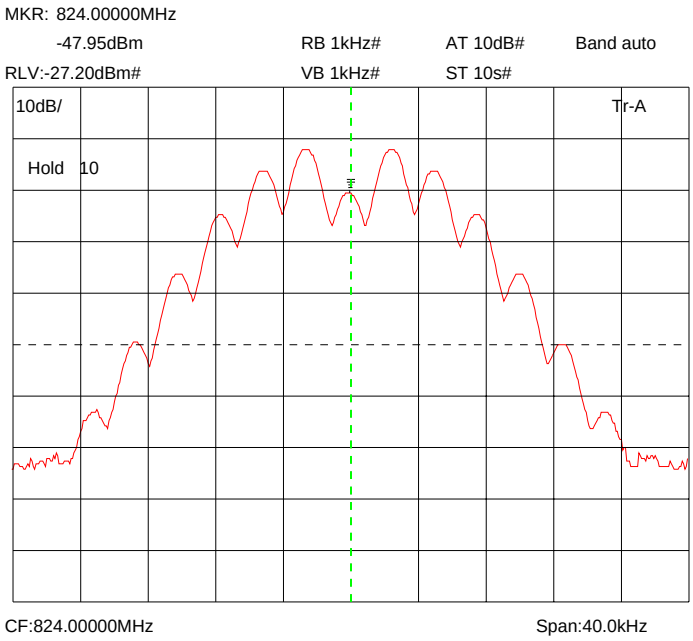


824.0 MHz Signal Generator, deviation set to 2.5kHz FM

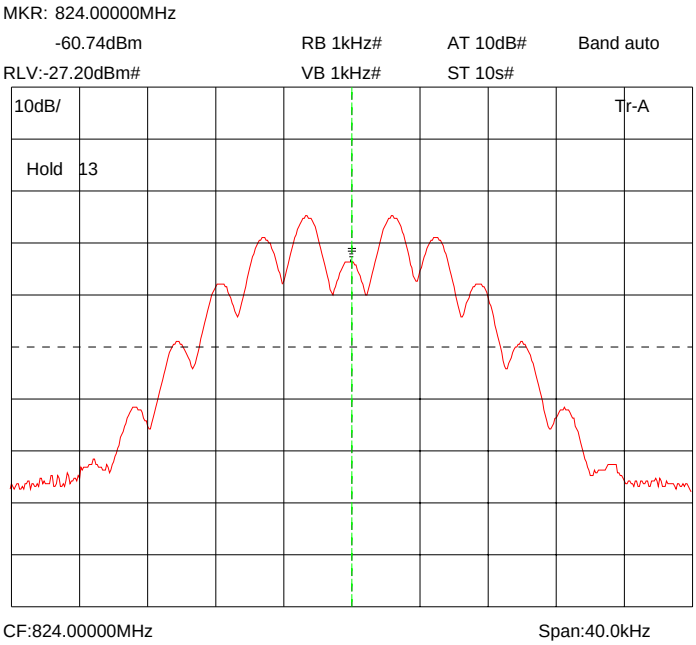


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

824.0 MHz Signal Generator and EUT, deviation set to 5kHz FM



824.0 MHz Signal Generator, deviation set to 5kHz FM

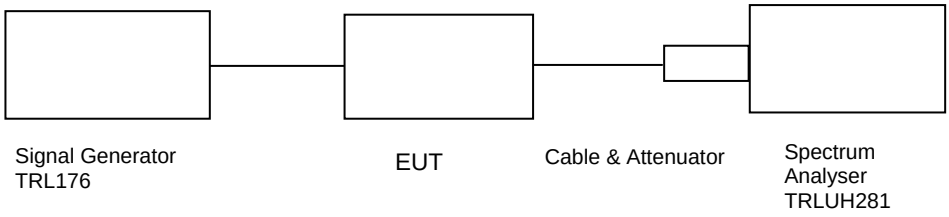


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – UPLINK

Ambient temperature	=	21°C	Radio Laboratory		
Relative humidity	=	50%	Test Signal	=	F3E
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

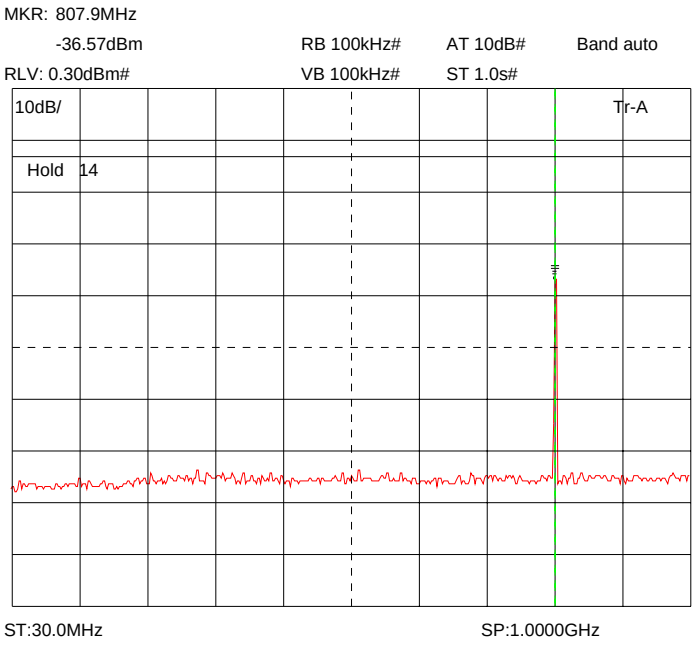
FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0Hz – 9 GHz	No Significant Emissions Within 20dB of Limit				-13

The test equipment used for the Transmitter Conducted Emissions:

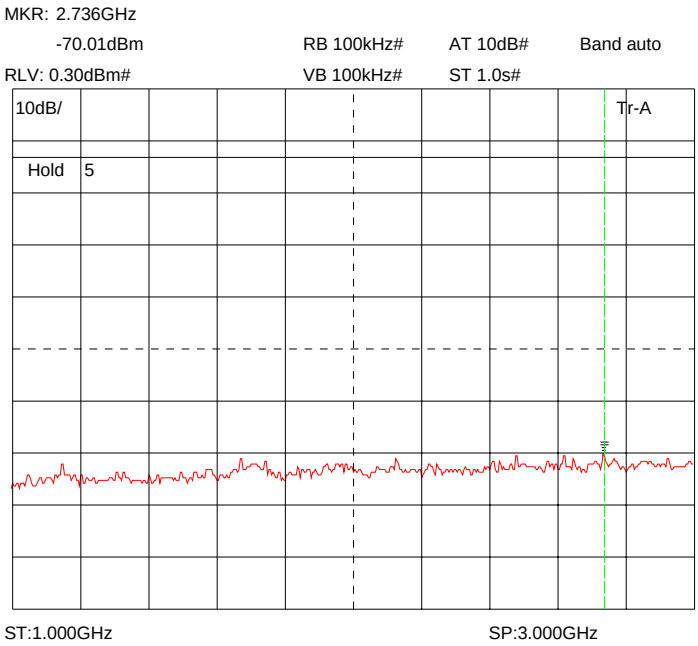
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8308-200-N	N/A	103	
CABLE	TRL	N/A	N/A	UH272	**X**
CABLE	TRL	N/A	N/A	UH378	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**

Conducted emissions Bottom Channel

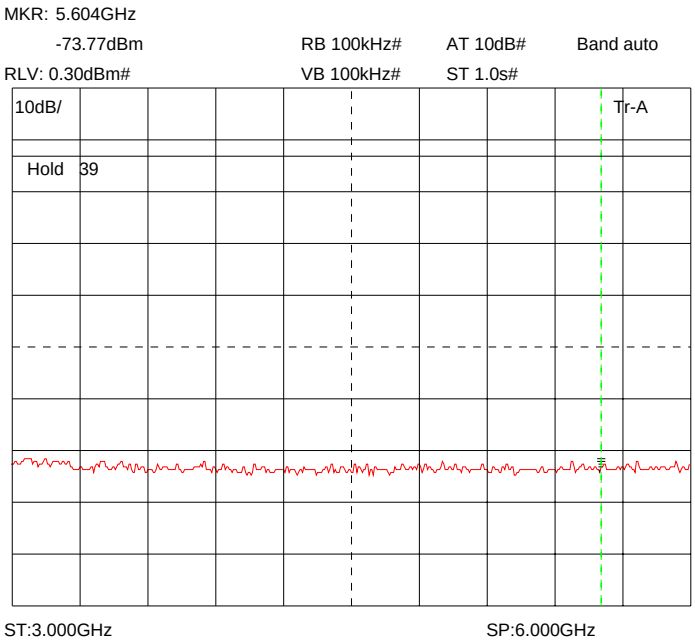
806.0MHz 30MHz – 1GHz



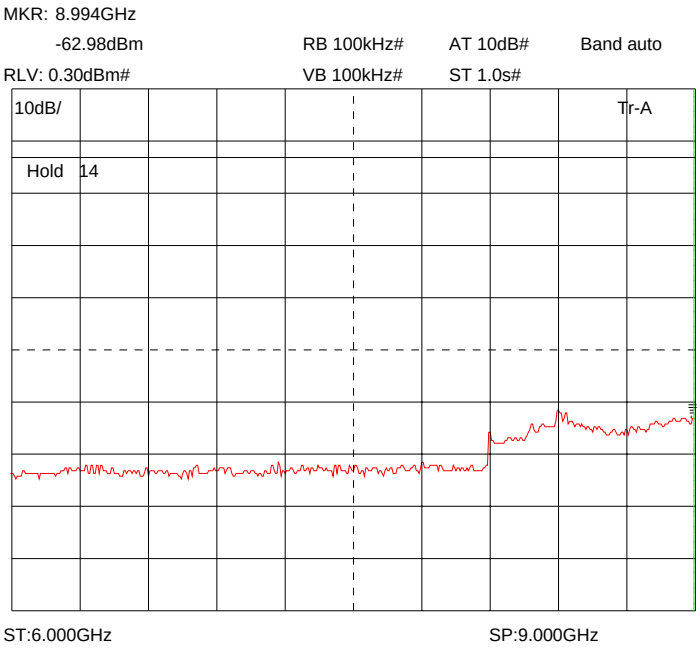
806.0MHz 1GHz – 3GHz



806.0MHz 3GHz – 6GHz

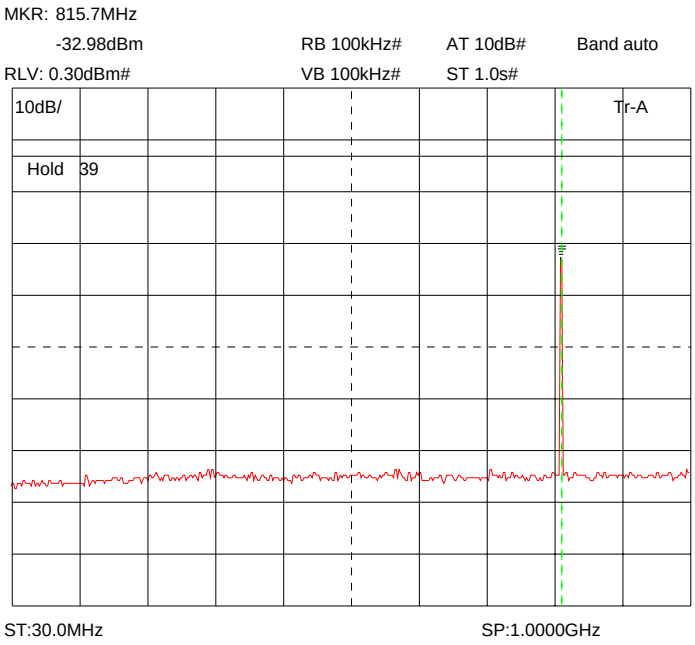


806.0MHz 6GHz – 9GHz

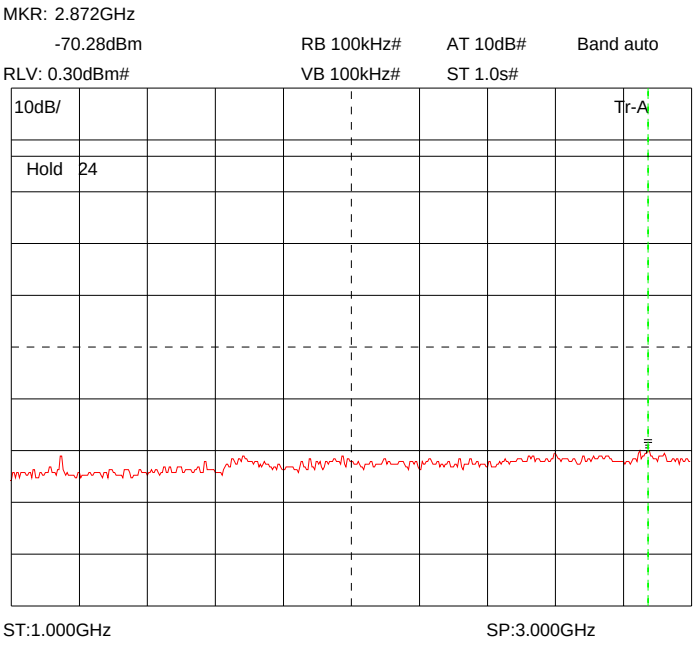


Conducted emissions Middle Channel

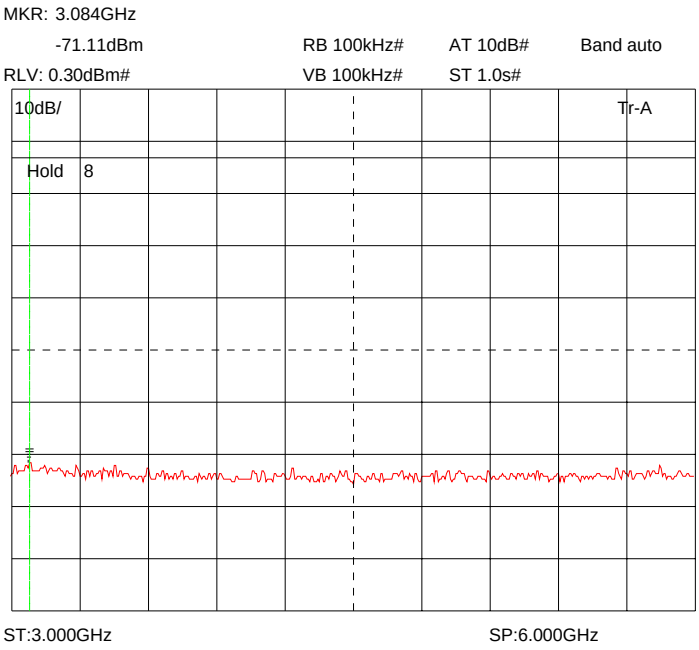
808.5MHz 30MHz – 1GHz



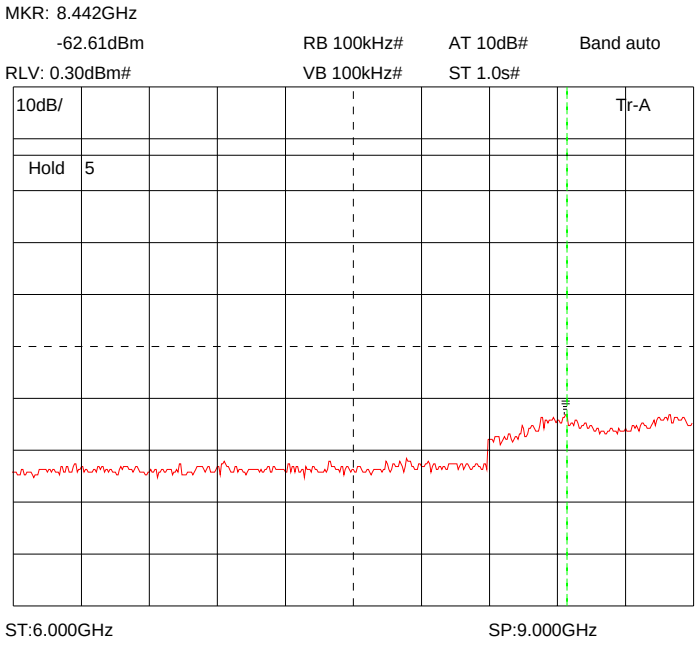
808.5MHz 1GHz – 3GHz



808.5MHz 3GHz – 6GHz

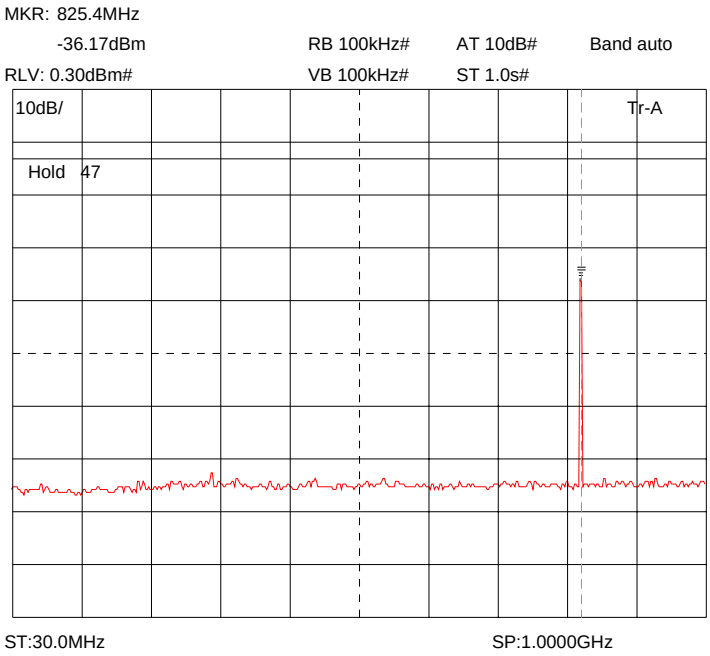


808.5MHz 6GHz – 9GHz

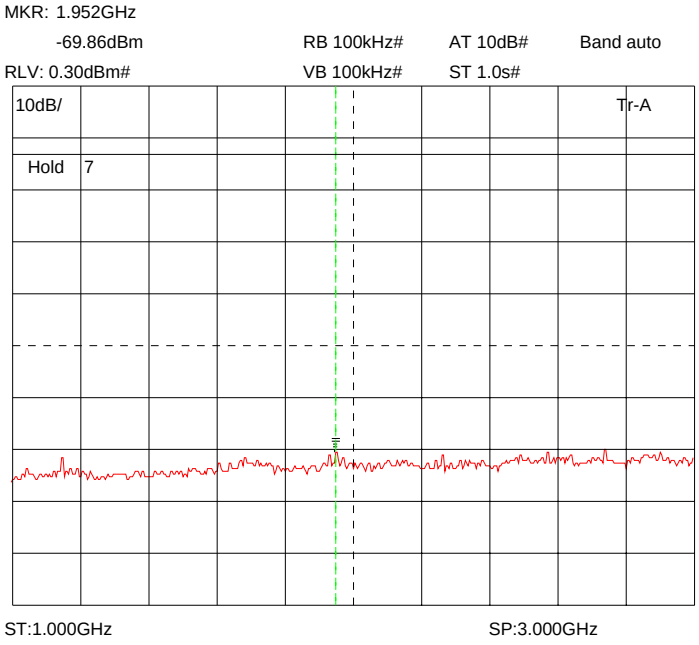


Conducted emissions Top Channel

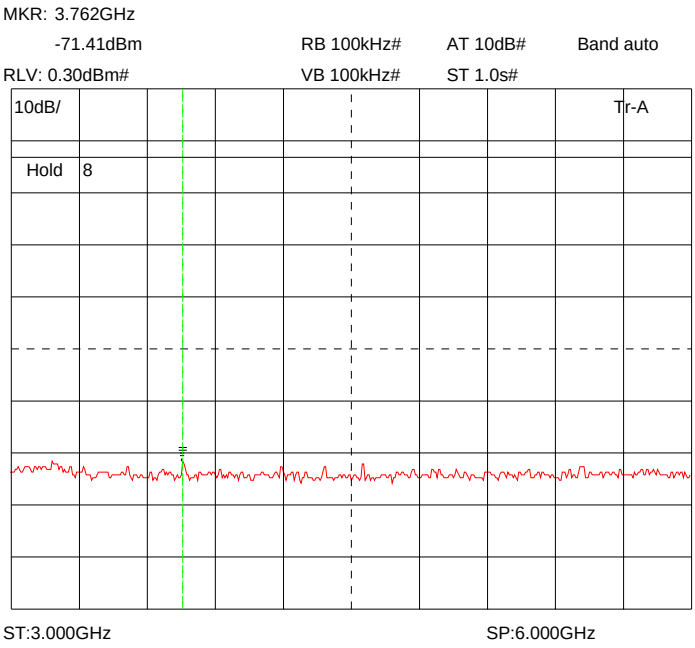
824.0MHz 30MHz – 1GHz



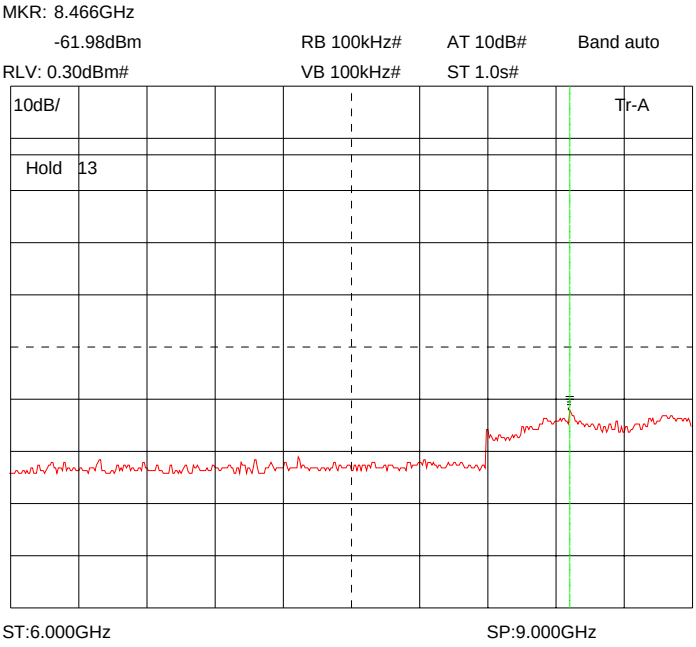
824.0MHz 1GHz – 3GHz



824.0MHz 3GHz – 6GHz



824.0MHz 6GHz – 9GHz

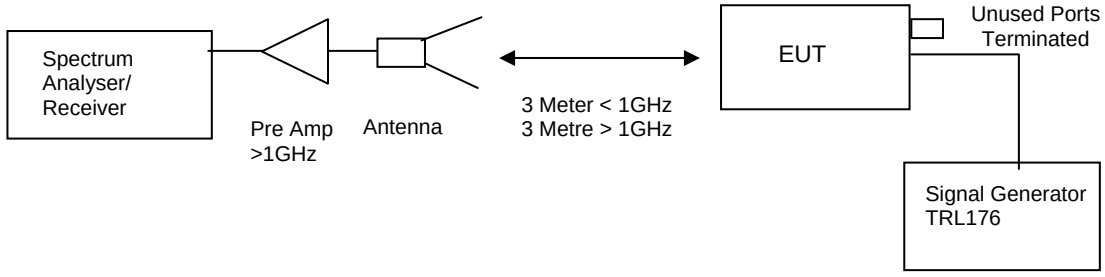


TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– UPLINK

Ambient temperature = 21°C
Relative humidity = 50%
Conditions = OATS
Supply voltage = +110Vac
Supply Frequency = N/A

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 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

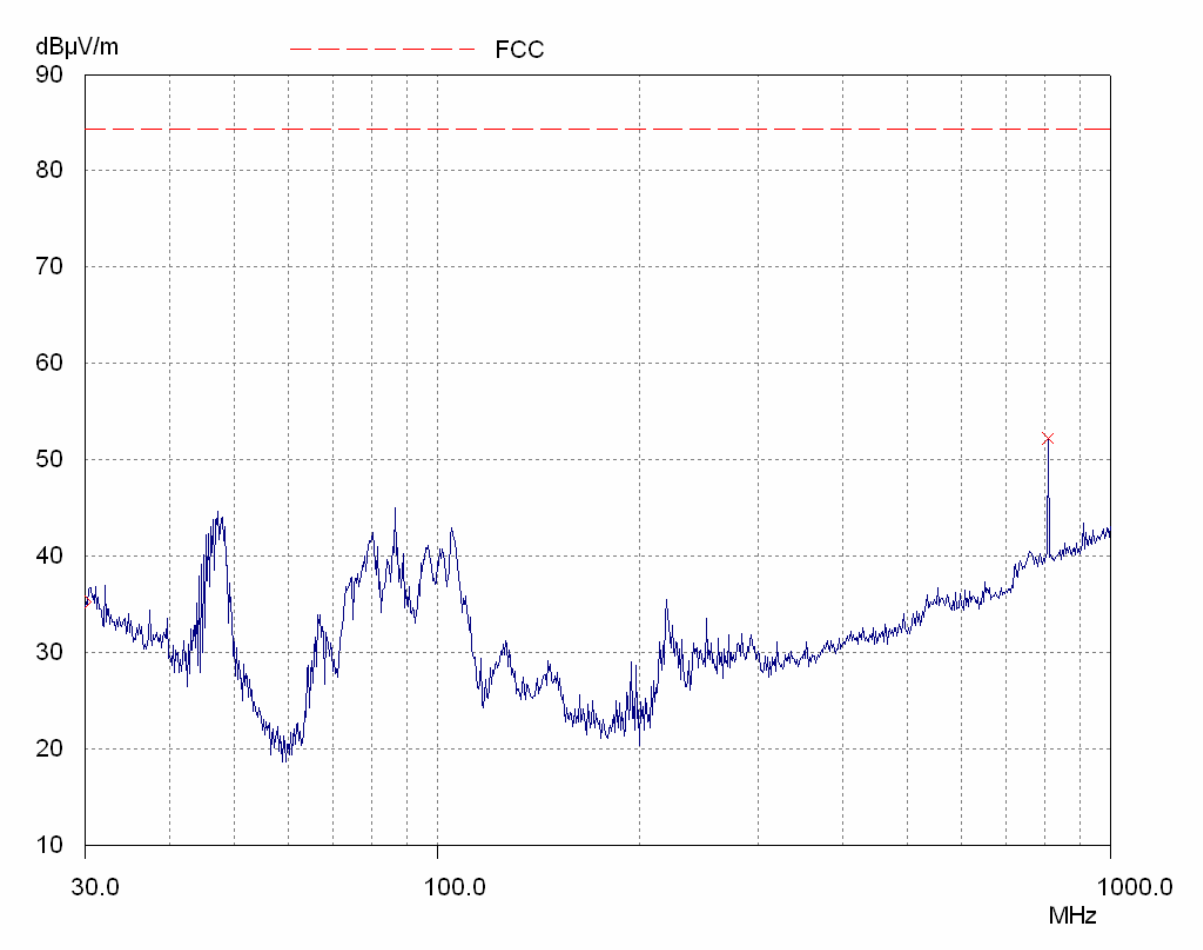
FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
0Hz – 9GHz	No Significant Emissions Within 20dB of Limit.						-13

The test equipment used for the Transmitter Spurious Emissions:

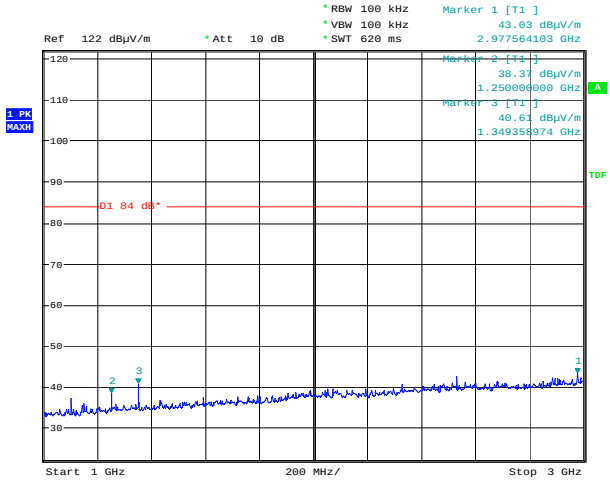
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN	EMCO	3115	9010-3580	138	**X**
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
PRE AMPLIFIER	HP	8449B	3008A016	572	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
ANTENNA	YORK	CBL611/A	1618	UH191	**X**
RECEIVER	R&S	ESVS10	825892/006	UH04	**X**

Radiated emissions Bottom Channel

806.0MHz 30MHz – 1GHz

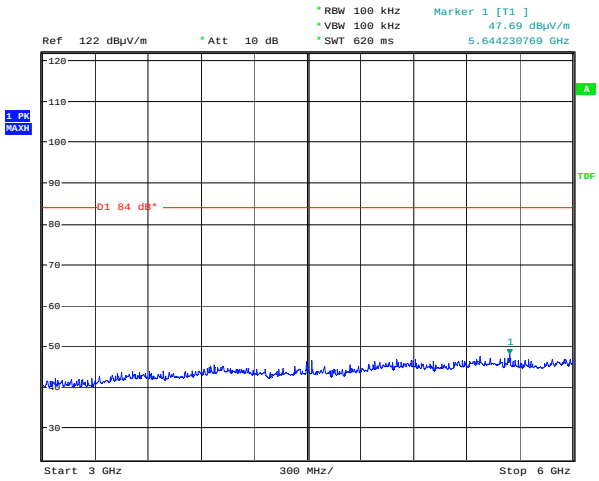


806.0MHz 1GHz – 3GHz



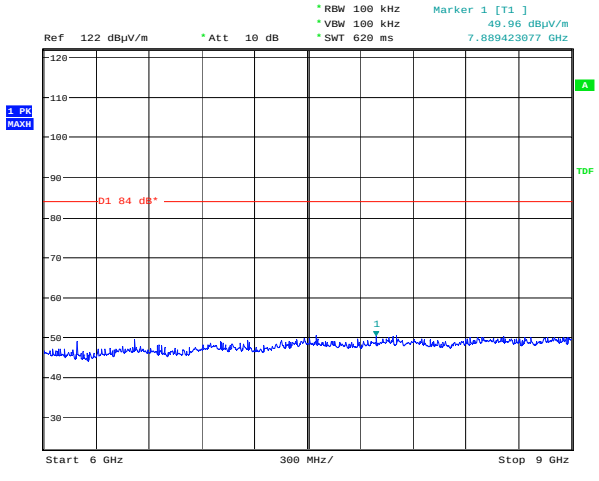
Date: 28.OCT.2009 15:44:52

806.0MHz 3GHz – 6GHz



Date: 28.OCT.2009 15:45:28

806.0MHz 6GHz – 9GHz

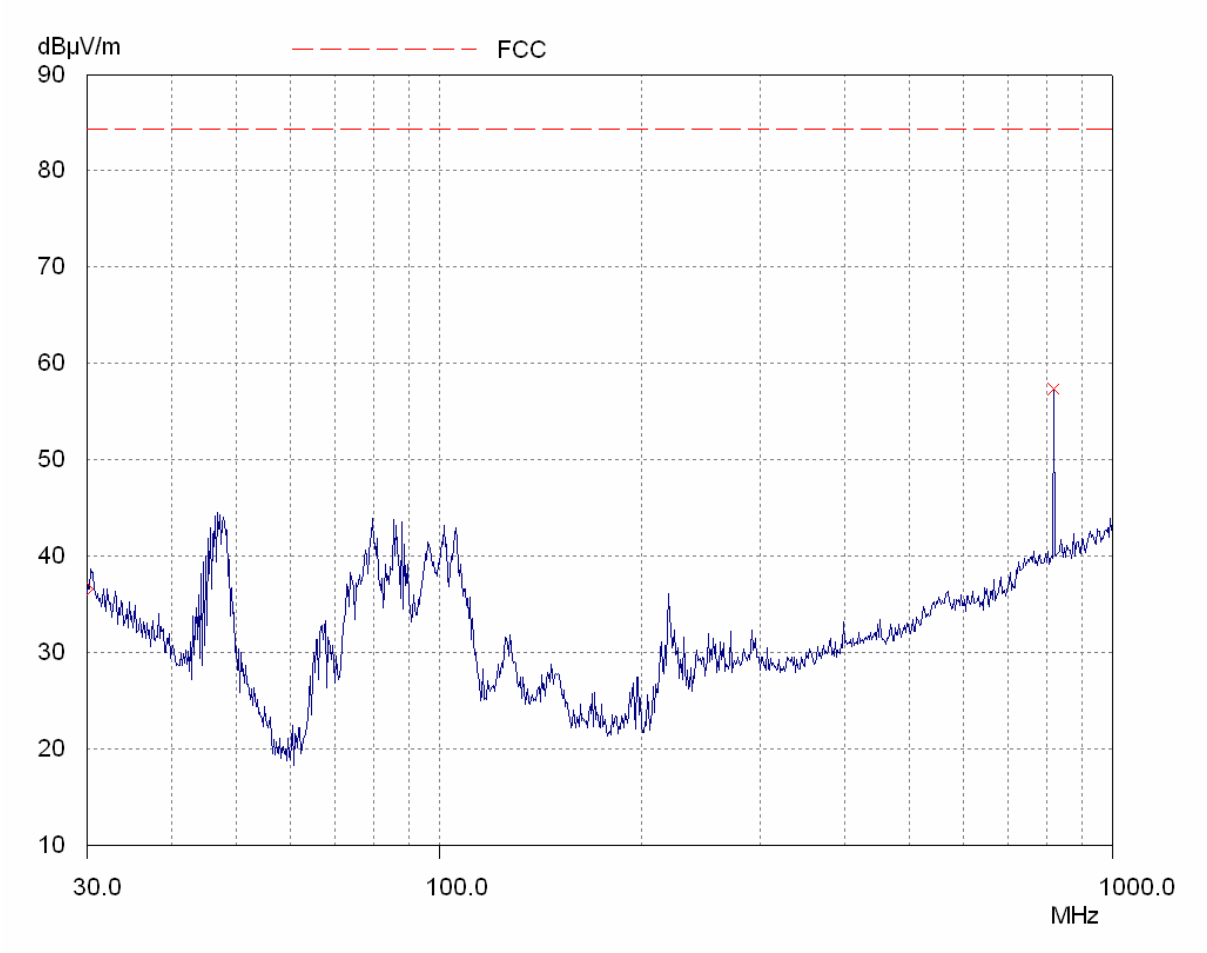


Date: 28.OCT.2009 15:46:14

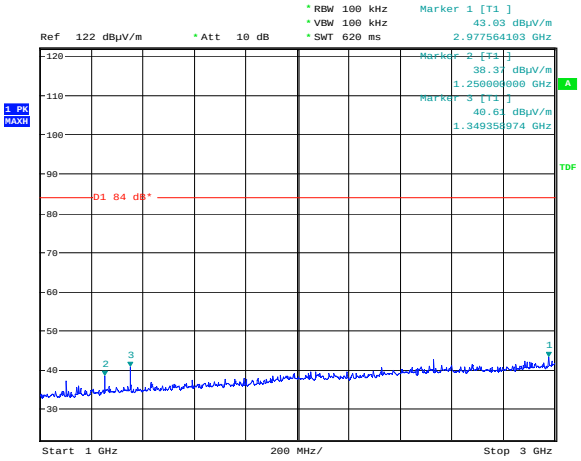
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions Middle Channel

815.0MHz 30MHz – 1GHz

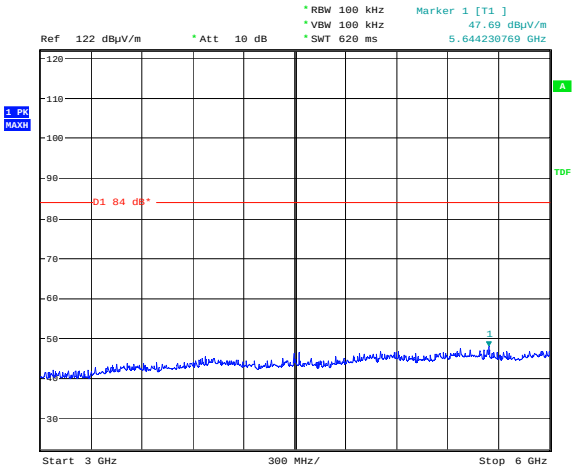


815.0MHz 1GHz – 3GHz



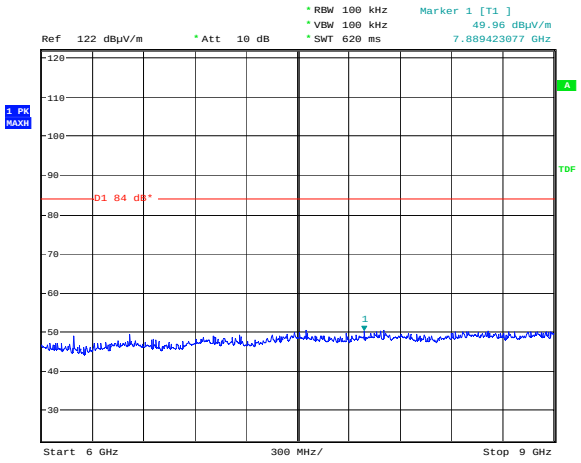
Date: 28.OCT.2009 15:44:52

815.0MHz 3GHz – 6GHz



Date: 28.OCT.2009 15:45:28

815.0MHz 6GHz – 9GHz

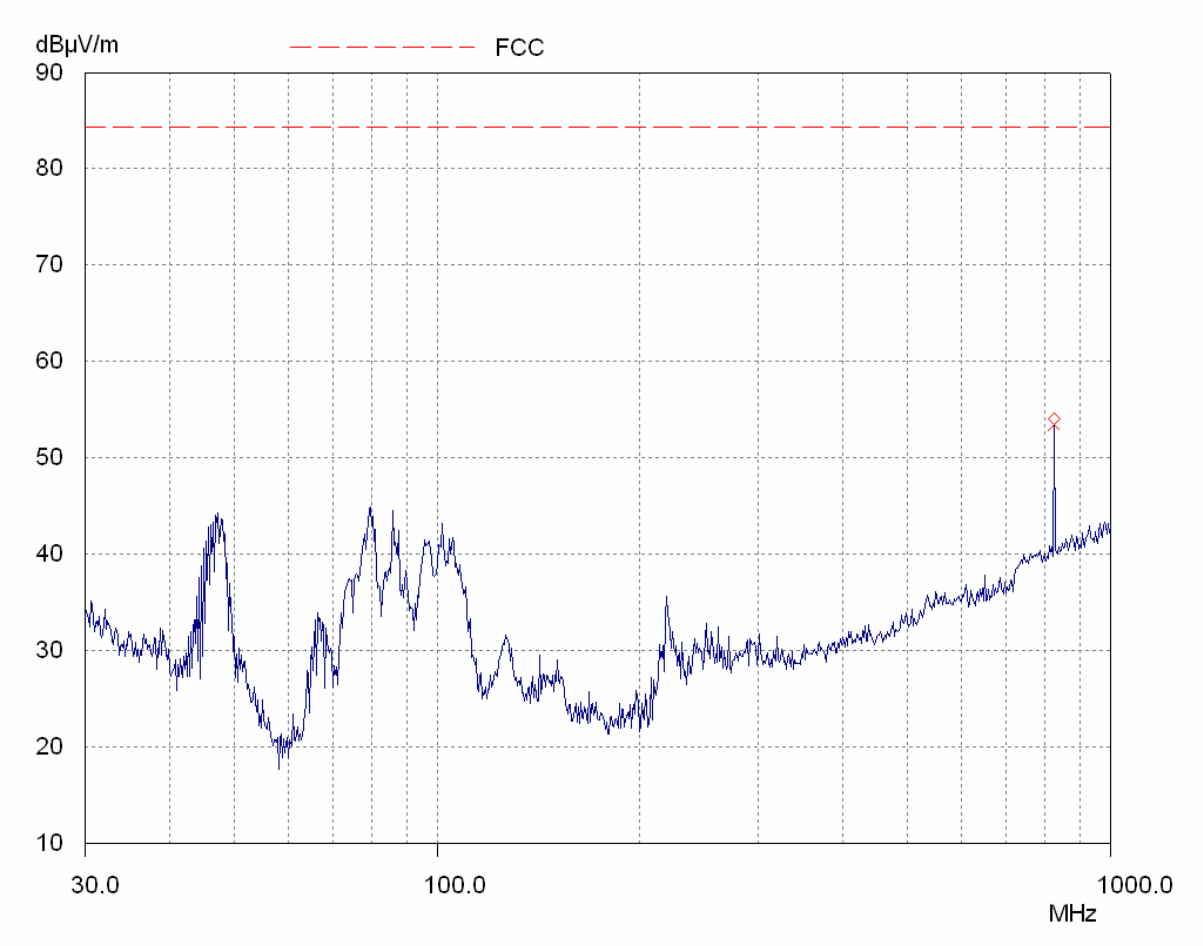


Date: 28.OCT.2009 15:46:14

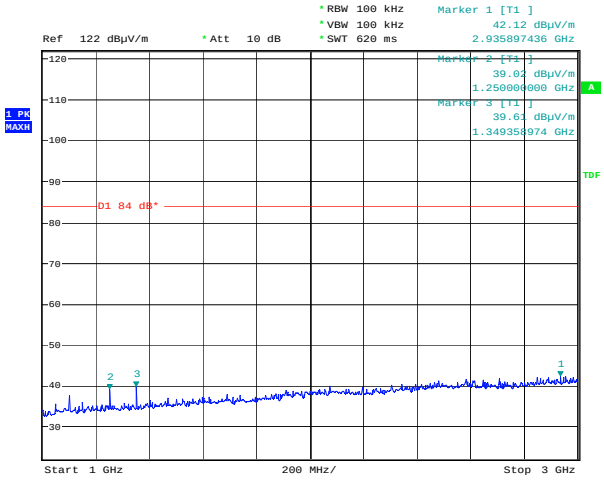
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions Top Channel

824.0MHz 30MHz – 1GHz

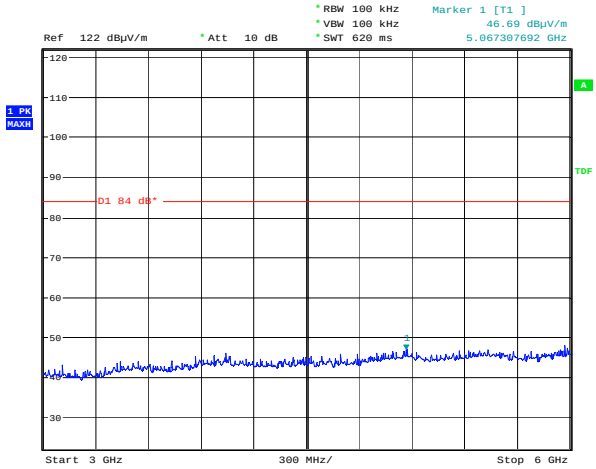


824.0MHz 1GHz – 3GHz



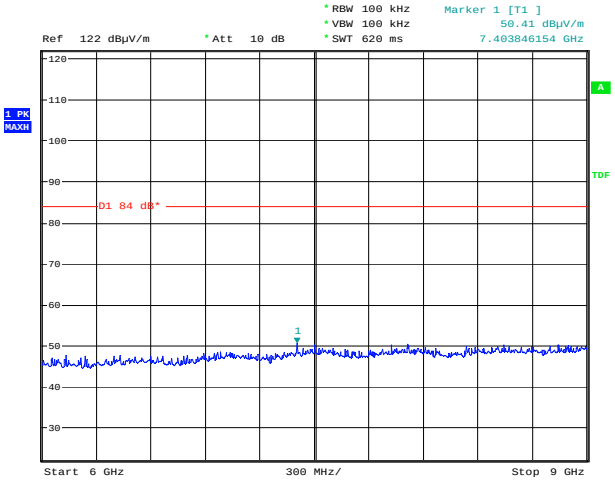
Date: 28.OCT.2009 15:50:04

824.0MHz 3GHz – 6GHz



Date: 28.OCT.2009 15:50:28

824.0MHz 6GHz – 9GHz

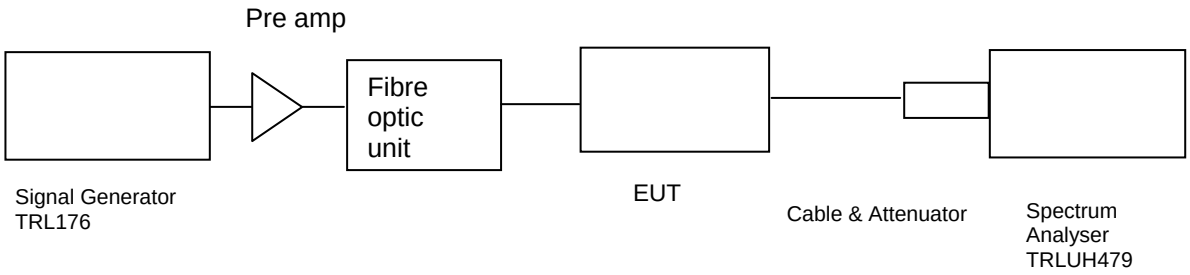


Date: 28.OCT.2009 15:50:53

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

SYSTEM GAIN/OUTPUT POWER – CONDUCTED – PART 2.1046 –DOWNLINK

Ambient temperature = 21°C Radio Laboratory
Relative humidity = 50%
Supply voltage = +110Vac
Channel number = See test results



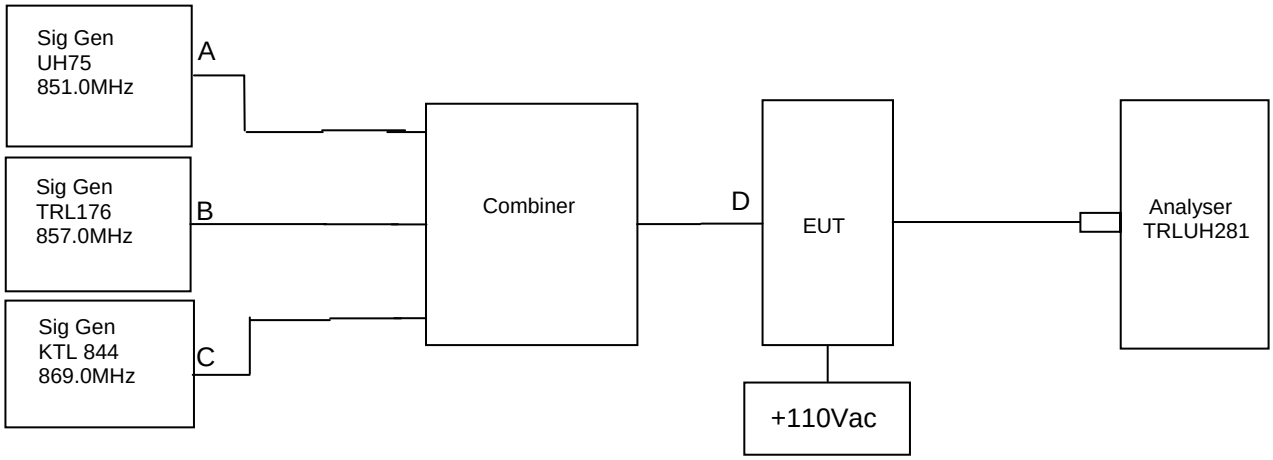
Frequency MHz	Signal Generator input level dBm	Input Gain dB	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Conducted Output Power dBm	Gain after 10dB input level increase dB
851.0	-18.5	30.80	40.67	-3.85	24.52	36.82	14.52
860.0	-19.3	30.93	40.63	-3.93	25.07	36.70	15.07
869.0	-18.3	30.92	40.76	-3.50	24.64	37.26	14.64

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	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8308-100	N/A	TRL112	**X**
ATTENUATOR	BIRD	8304-0600N	N/A	TRL266	**X**
ATTENUATOR	2 X CUSTOMER SUPPLIED 20dB ATTENUATORS			N/A	**X**
CABLE	TRL	N/A	N/A	UH273	**X**
CABLE	TRL	N/A	N/A	UH274	**X**
CABLE	TRL	N/A	N/A	UH254	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– DOWNLINK

Ambient temperature = 21°C Radio Laboratory
Relative humidity = 50%
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 at the +1dB compression point on the three carriers, the signal generators were then increased by +10dB.The cable and attenuator loss between the EUT and the spectrum analyser was 40.5dB.

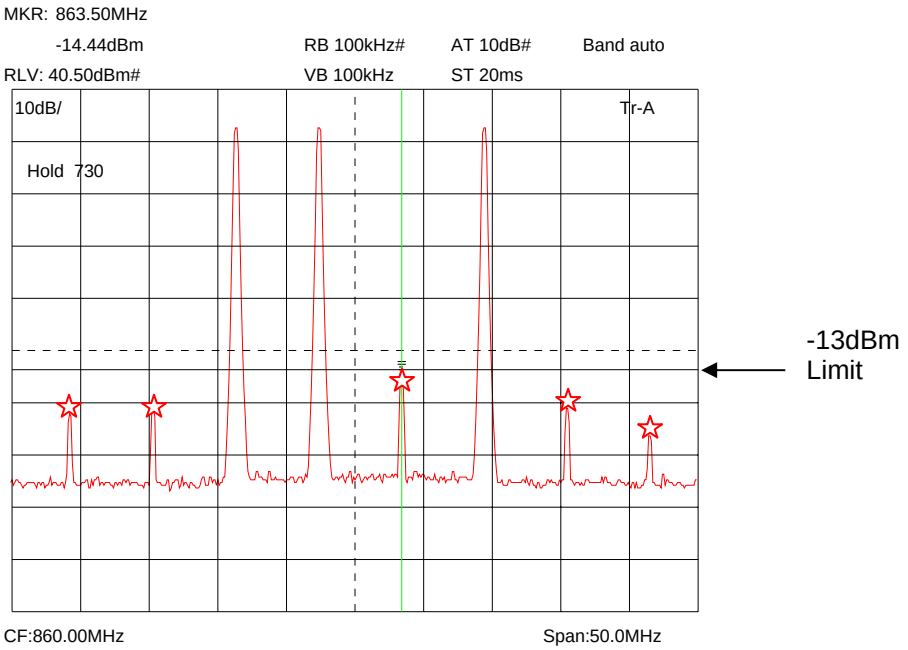
RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
851.0	857.0	869.0	-14.58@ 863.50MHz	-13

Sweep data is shown on the next page:

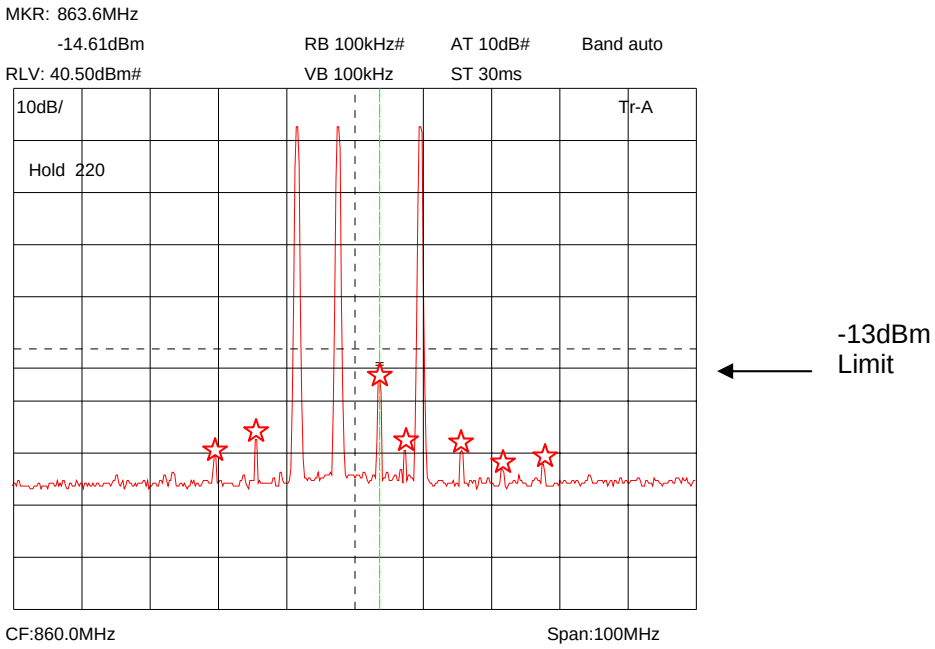
Test equipment used for intermodulation test

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
SIGNAL GENERATOR	R&S	SML 03	102268	UH297	**X**
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	**X**
SIGNAL GENERATOR	HP	83630B	3722A00588	UH340	
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	
COMBINER	ELCOM	RC-4-50	N/A	170	**X**

Intermodulation Inband



50MHz Span



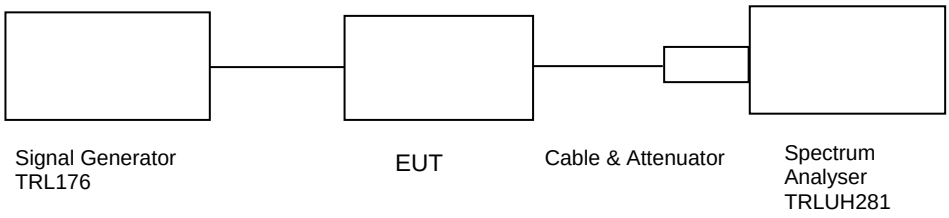
100MHz Span

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

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– DOWNLINK

Ambient temperature	=	21^{o}C	Radio Laboratory
Relative humidity	=	50%	
Supply voltage	=	+110Vac	
Channel number	=	See test results	



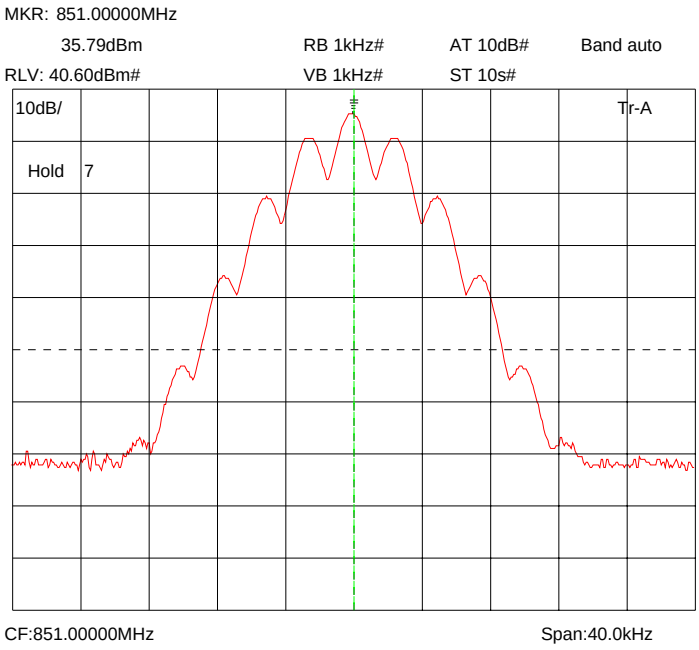
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (+15dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

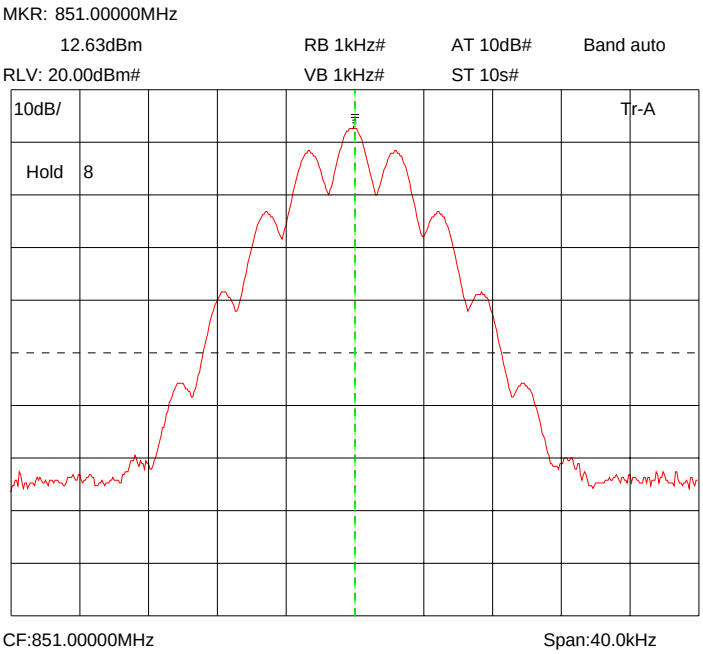
1. Cable and attenuator between EUT and spectrum analyser 40.5dB
2. Cable between signal generator and EUT 0.24dB

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8308-100	N/A	TRL112	**X**
ATTENUATOR	BIRD	8304-0600N	N/A	TRL266	**X**
ATTENUATOR	2 X CUSTOMER SUPPLIED 20dB ATTENUATORS	N/A	N/A	N/A	**X**
CABLE	TRL	N/A	N/A	UH273	**X**
CABLE	TRL	N/A	N/A	UH274	**X**

851.0MHz Signal Generator and EUT, deviation set to 2.5kHz

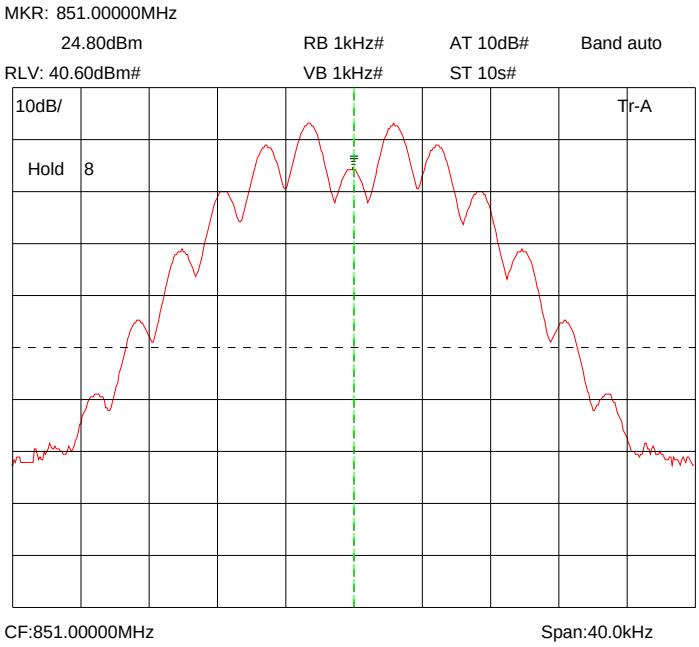


851.0MHz Signal Generator deviation set to 2.5kHz

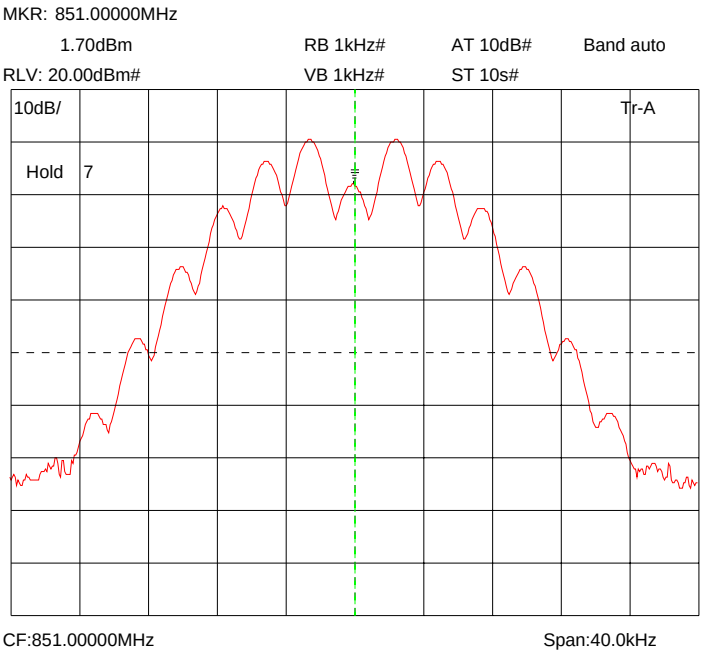


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

851.0MHz Signal Generator and EUT, deviation set to 5.0kHz

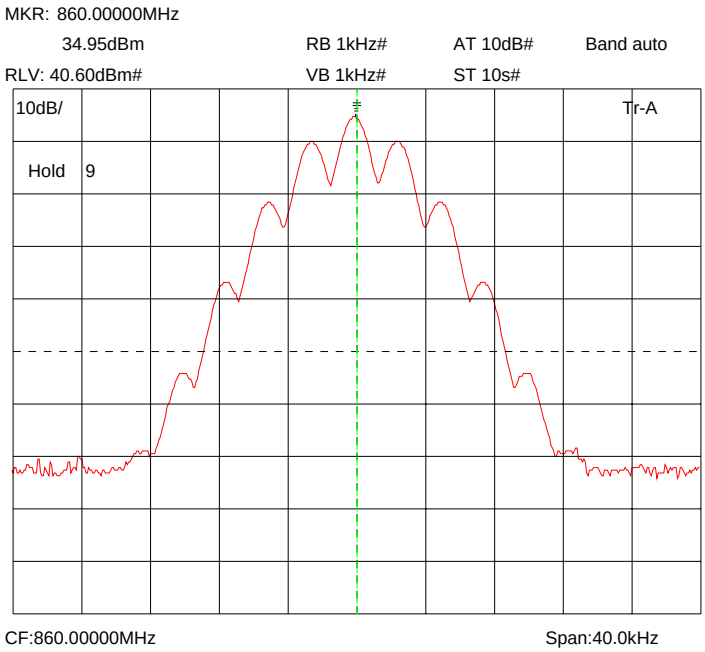


851.0MHz Signal Generator, deviation set to 5.0kHz

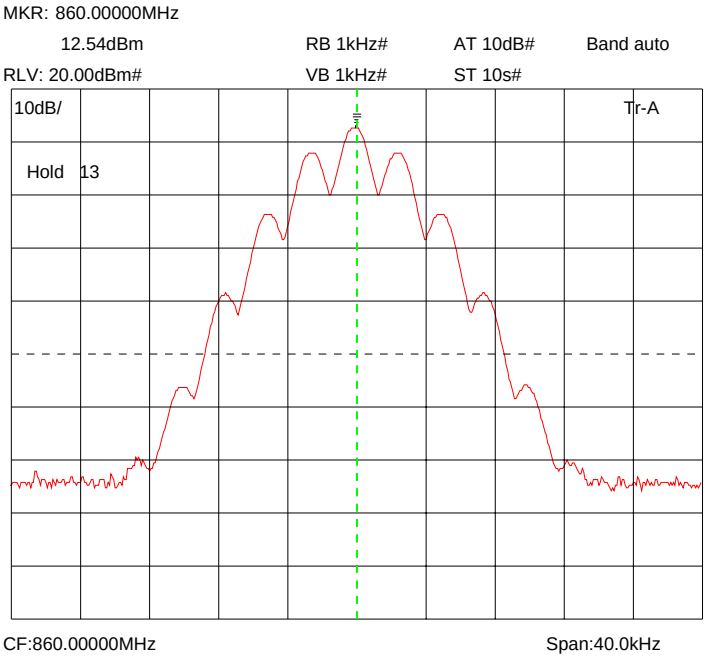


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

860.0MHz Signal Generator and EUT, deviation set to 2.5kHz

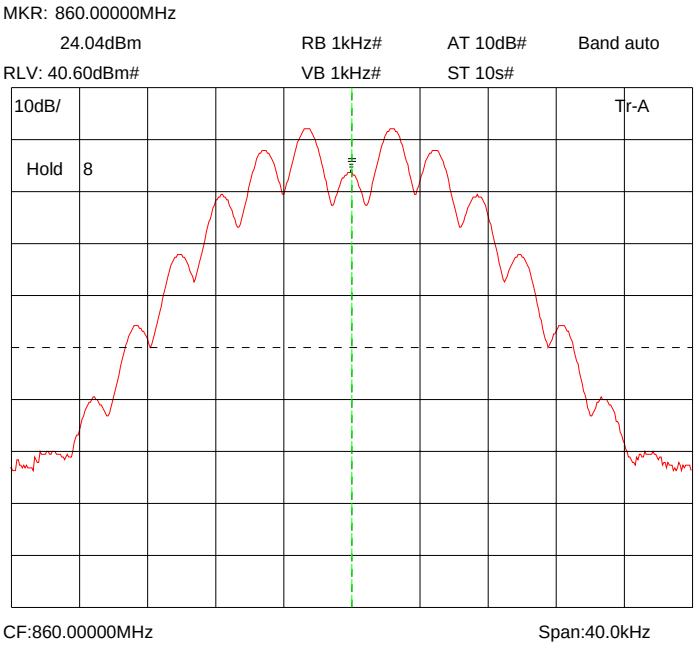


860.0MHz Signal Generator, deviation set to 2.5kHz

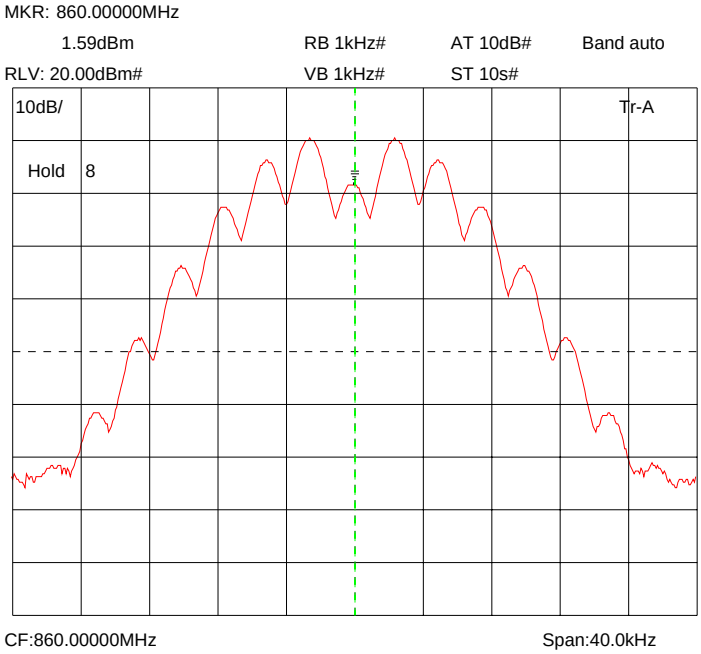


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

860.0MHz Signal Generator and EUT, deviation set to 5kHz

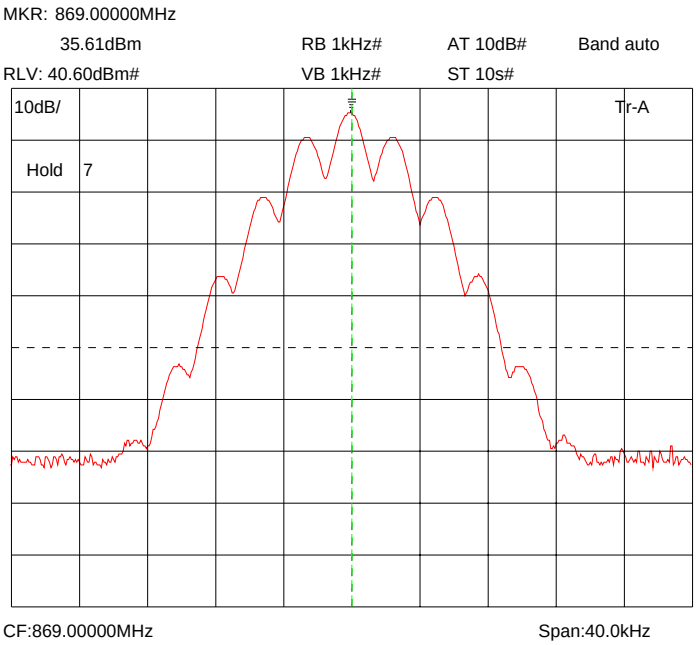


860.0MHz Signal Generator, deviation set to 5kHz

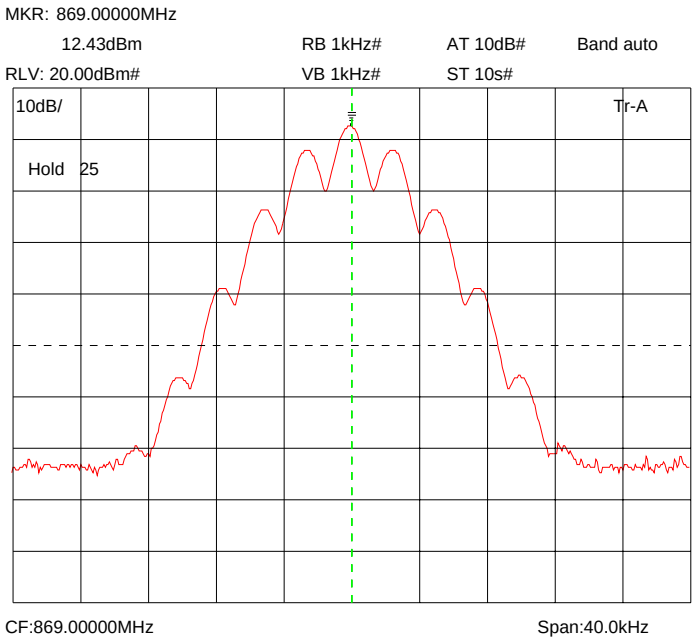


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

869.0MHz Signal Generator and EUT, deviation set to 2.5kHz

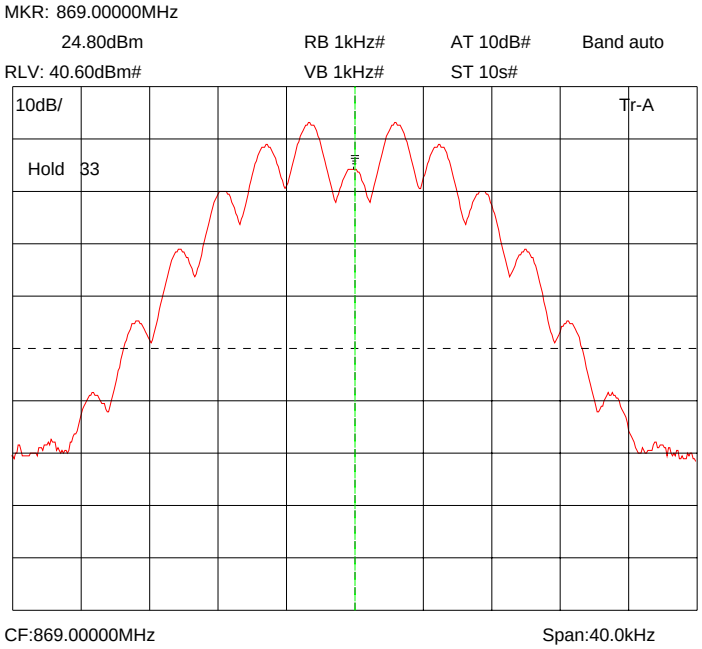


869.0MHz Signal Generator, deviation set to 2.5kHz

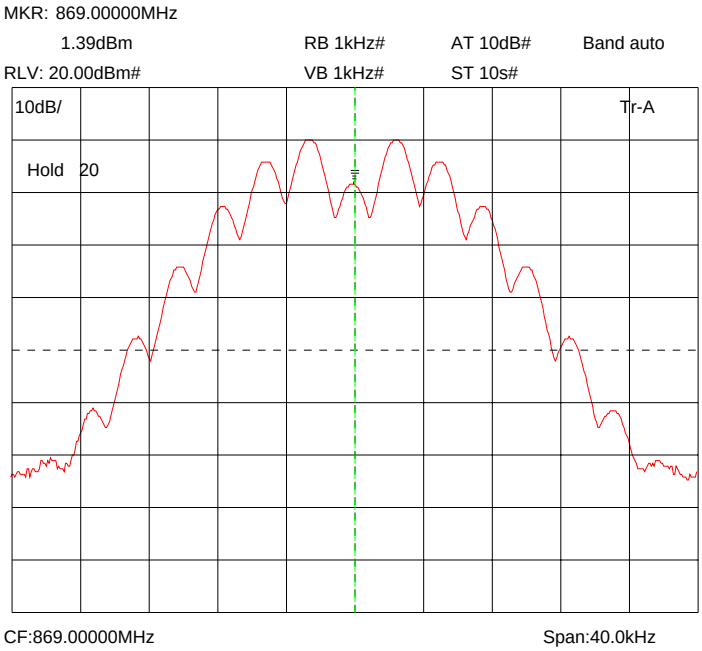


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

869.0MHz Signal Generator and EUT, deviation set to 5kHz



869.0MHz Signal Generator, deviation set to 5kHz



The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – DOWNLINK

Ambient temperature	=	21°C	Radio Laboratory		
Relative humidity	=	50%	Test Signal	=	F3E
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

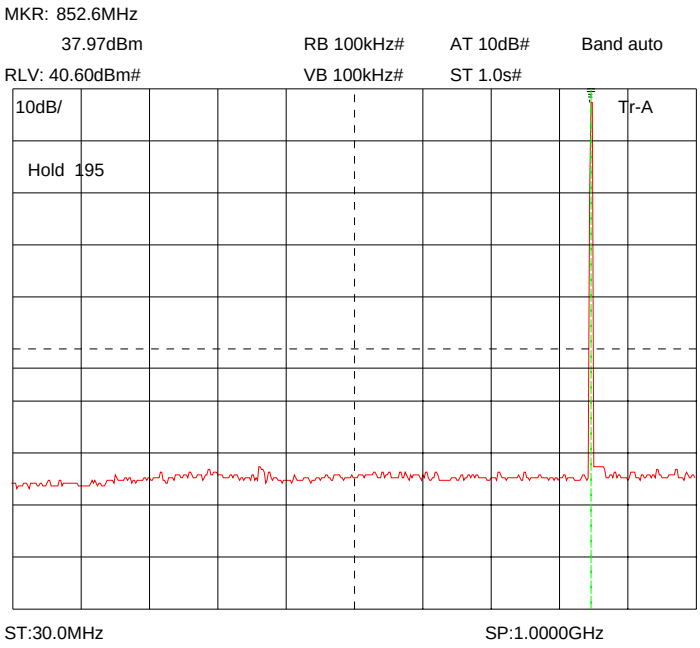
FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0Hz – 9GHz	No Significant Emissions Within 20dB of the limit.				-13

The test equipment used for the Transmitter Conducted Emissions:

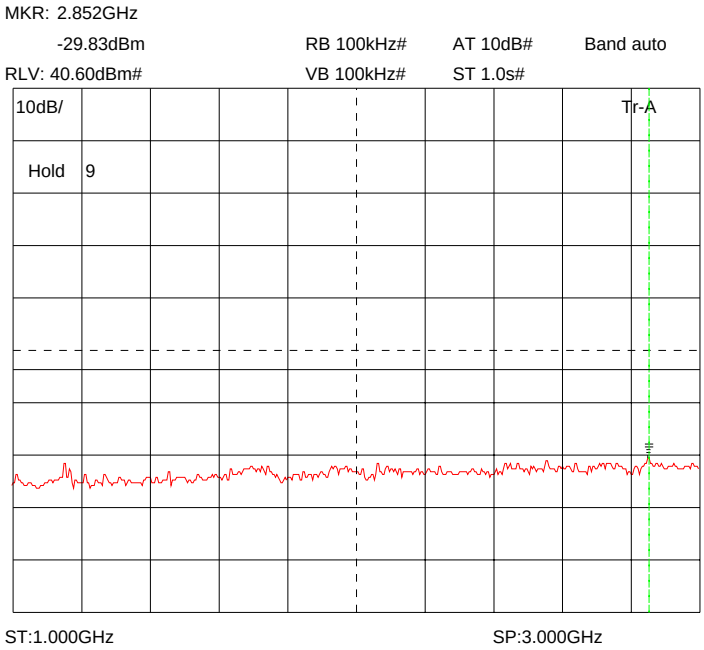
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8308-100	N/A	TRL112	**X**
ATTENUATOR	BIRD	8304-0600N	N/A	TRL266	**X**
ATTENUATOR	2 X CUSTOMER SUPPLIED 20dB ATTENUATORS	N/A	N/A	N/A	**X**
CABLE	TRL	N/A	N/A	UH273	**X**
CABLE	TRL	N/A	N/A	UH274	**X**

Conducted emissions Bottom Channel

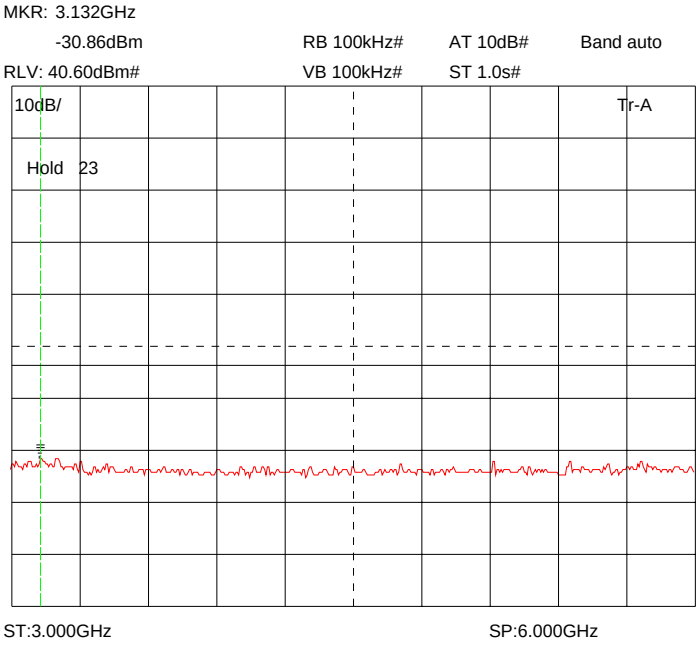
851.0MHz 30MHz – 1GHz



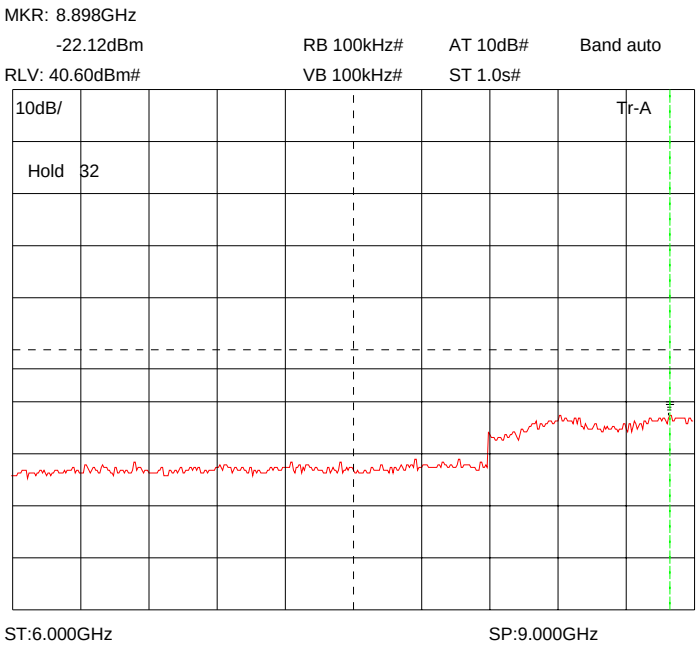
851.0MHz 1GHz – 3GHz



851.0MHz 3GHz – 6GHz

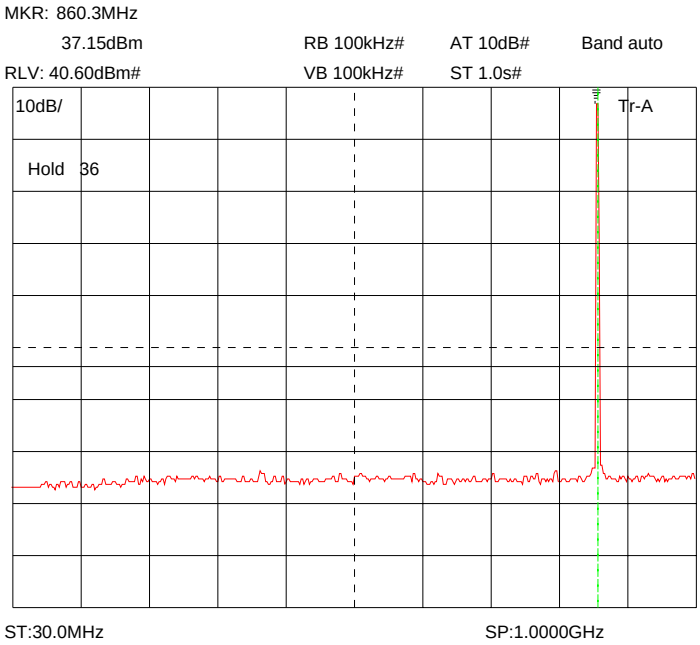


851.0MHz 6GHz – 9GHz

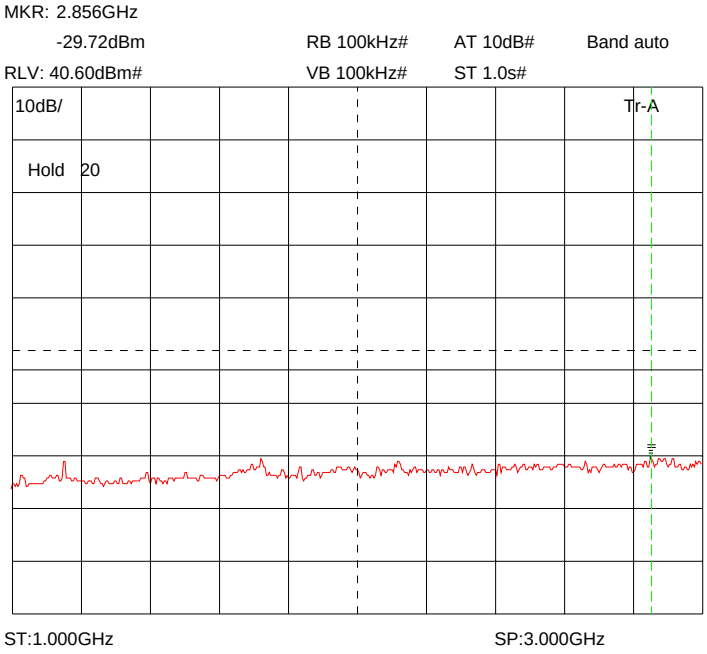


Conducted emissions Middle Channel

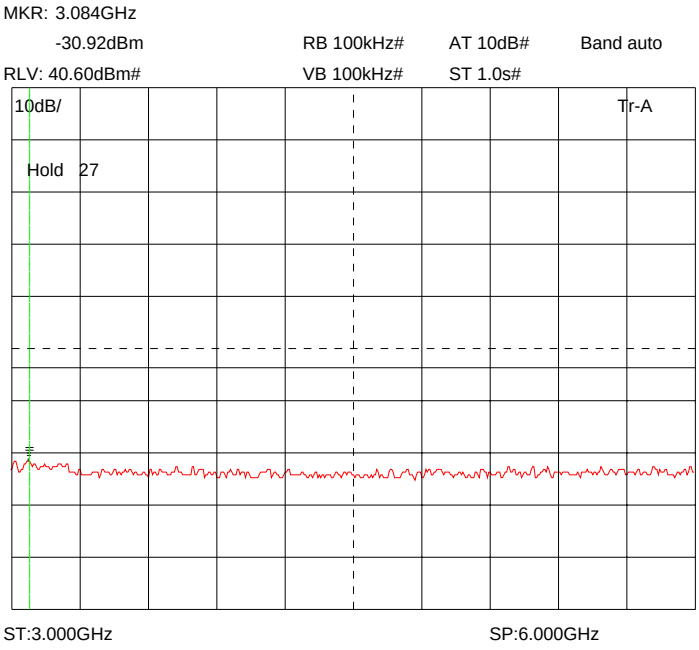
851.0MHz 30MHz – 3GHz



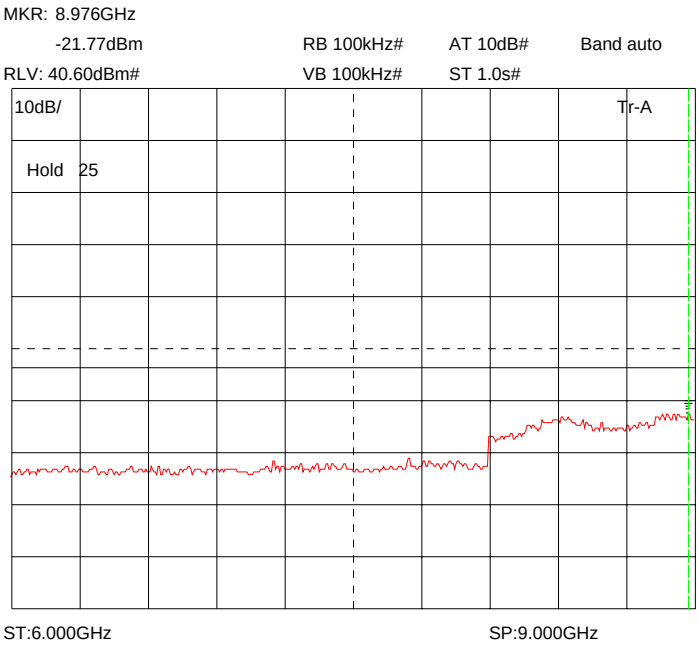
851.0MHz 1GHz – 3GHz



851.0MHz 3GHz – 6GHz

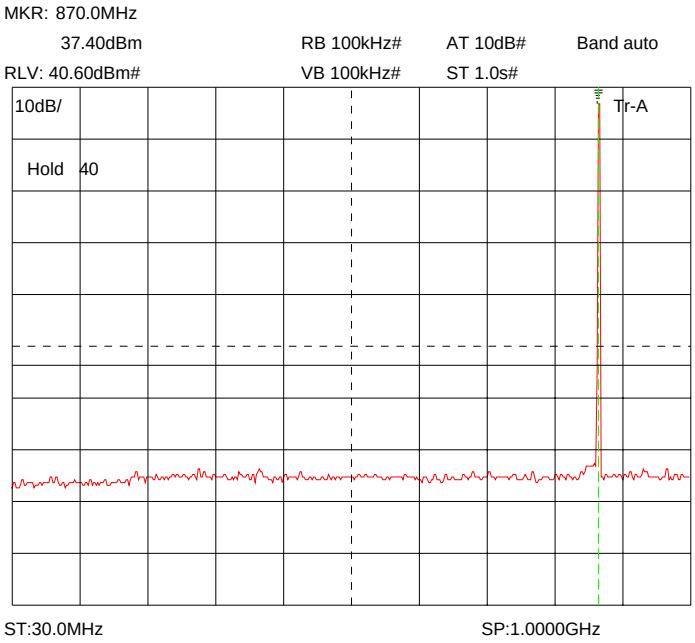


851.0MHz 6GHz – 9GHz

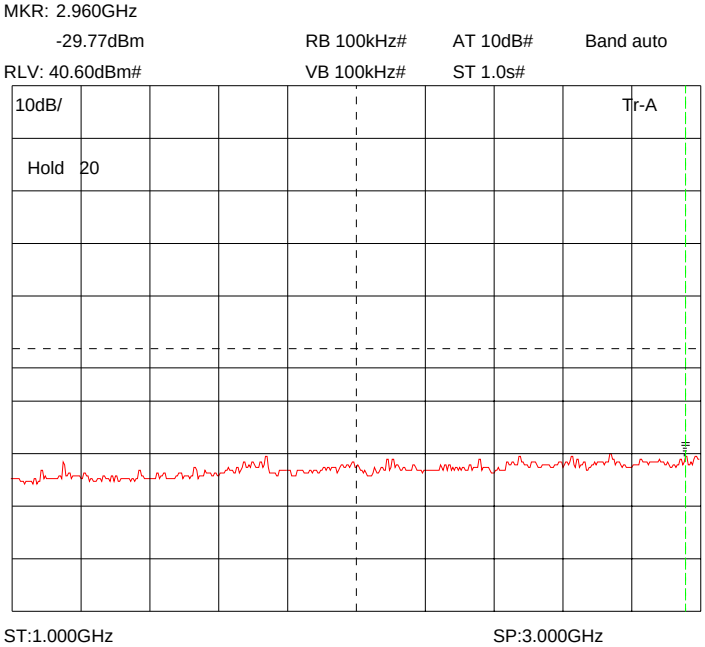


Conducted emissions Top Channel

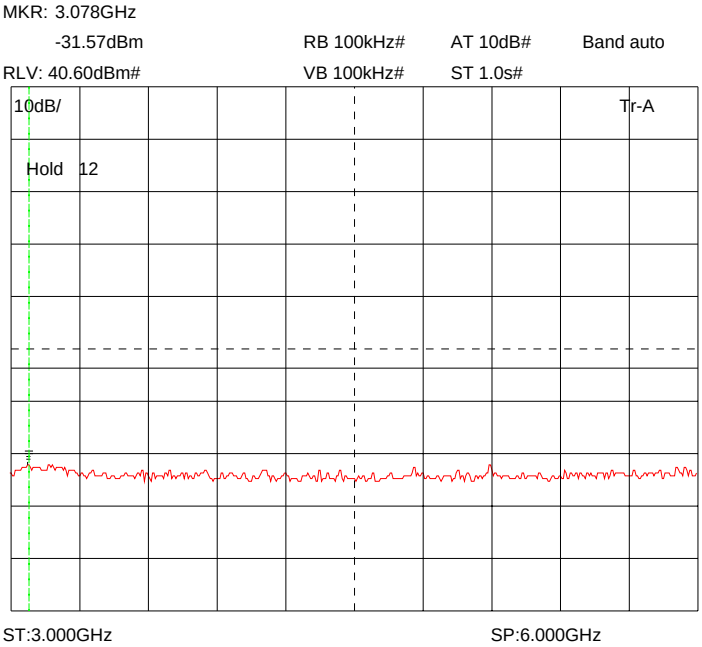
869.0MHz 30MHz – 1GHz



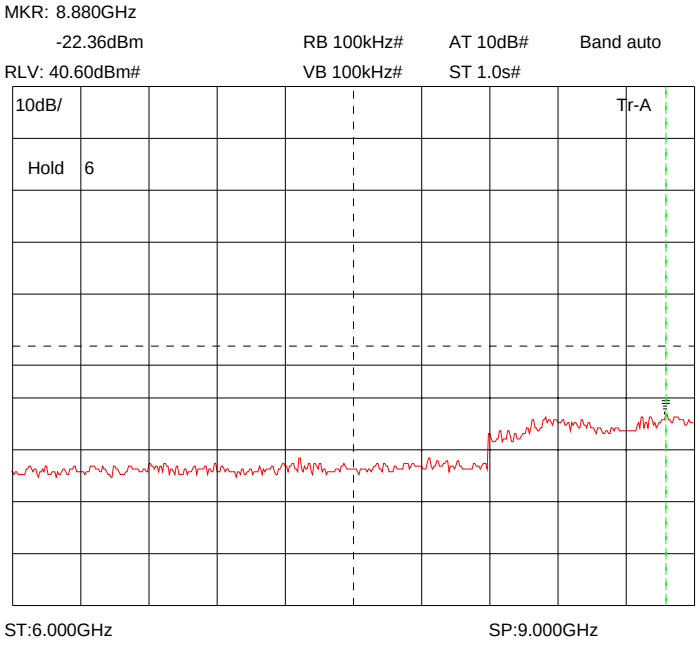
869.0MHz 1GHz – 3GHz



869.0MHz 3GHz – 6GHz



869.0MHz 6GHz – 9GHz

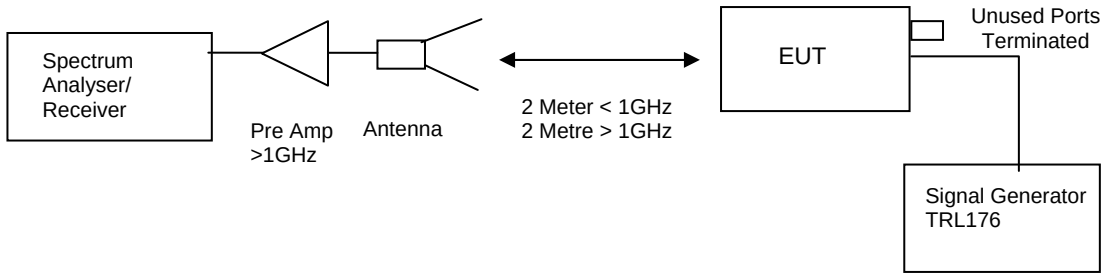


TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– DOWNLINK

Ambient temperature = 21°C
Relative humidity = 50%
Conditions = OATS
Supply voltage = +110Vac
Supply Frequency = N/A

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 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

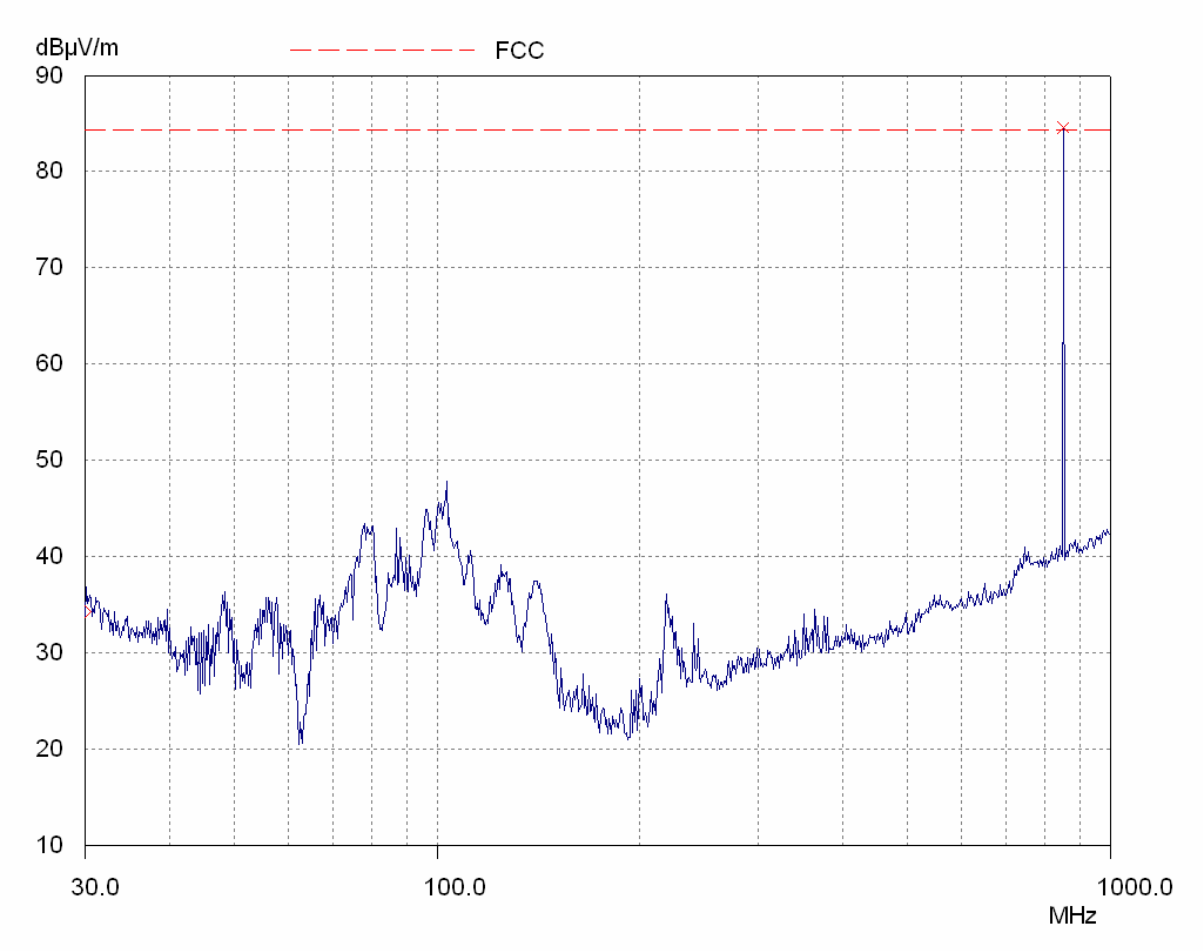
FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 9GHz	No Significant Emissions Within 20 dB of the Limit						-13

The test equipment used for the Transmitter Spurious Emissions:

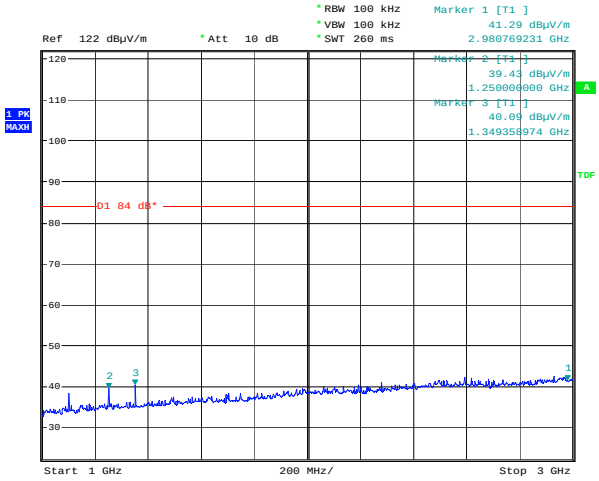
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
HORN	EMCO	3115	9010-3580	138	**X**
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	**X**
PRE AMPLIFIER	HP	8449B	3008A016	572	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
ANTENNA	YORK	CBL611/A	1618	UH191	**X**
RECEIVER	R&S	ESVS10	825892/006	UH04	**X**

Radiated emissions Bottom Channel

851.0MHz 30MHz – 1GHz

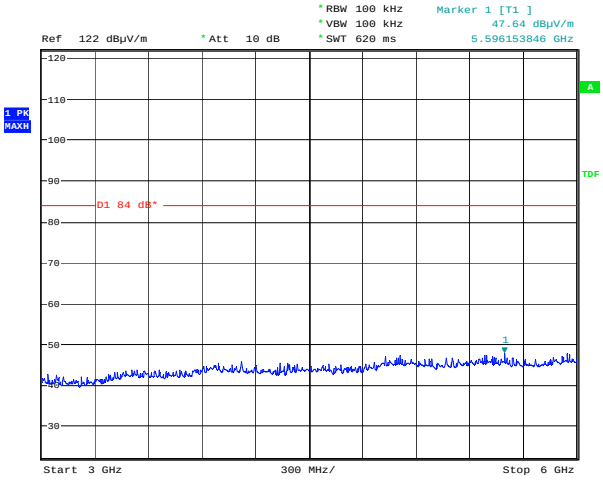


851.0MHz 1GHz – 3GHz



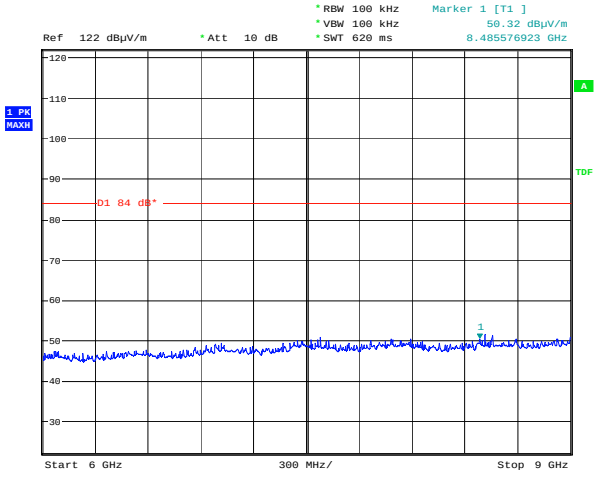
Date: 28.OCT.2009 15:38:42

851.0MHz 3GHz – 6GHz



Date: 28.OCT.2009 15:39:19

851.0MHz 6GHz – 9GHz

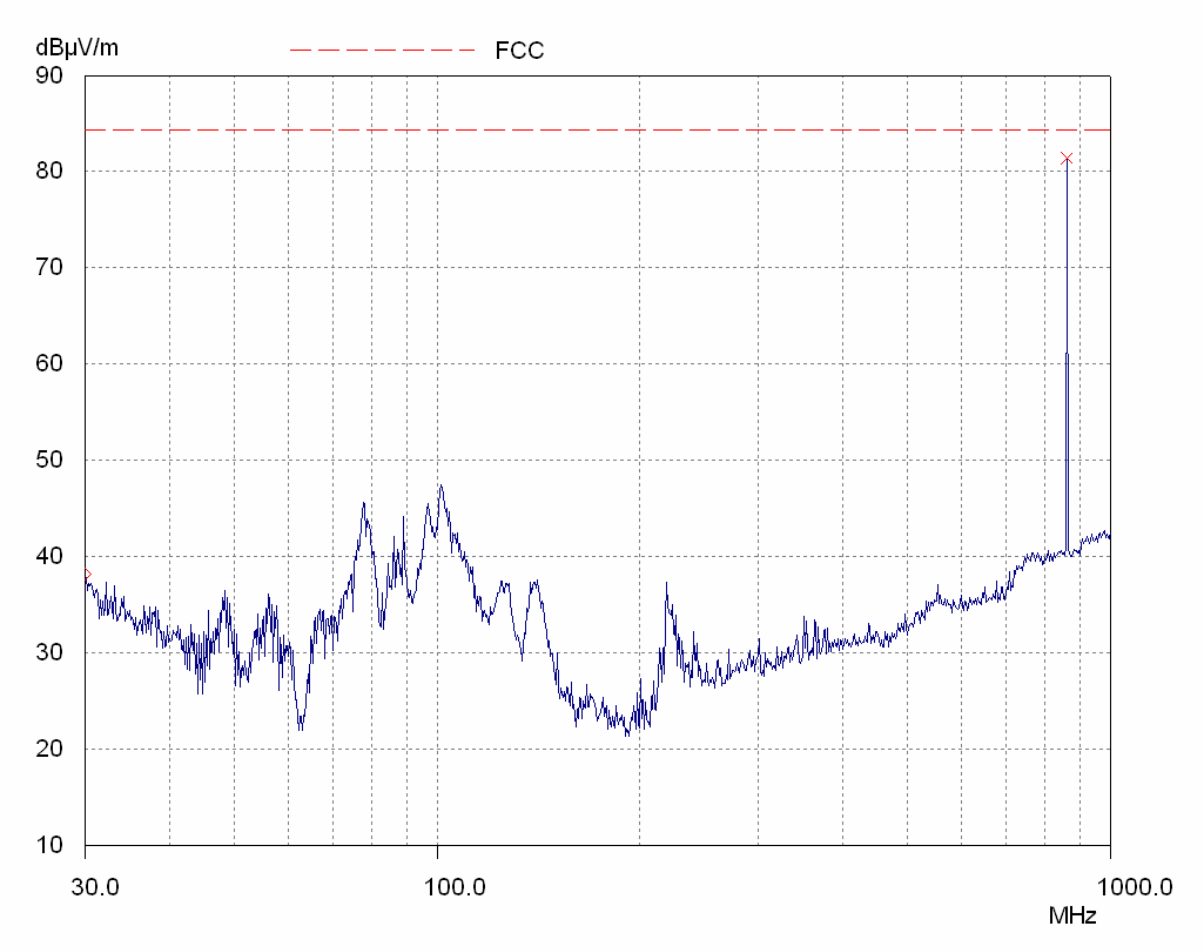


Date: 28.OCT.2009 15:39:58

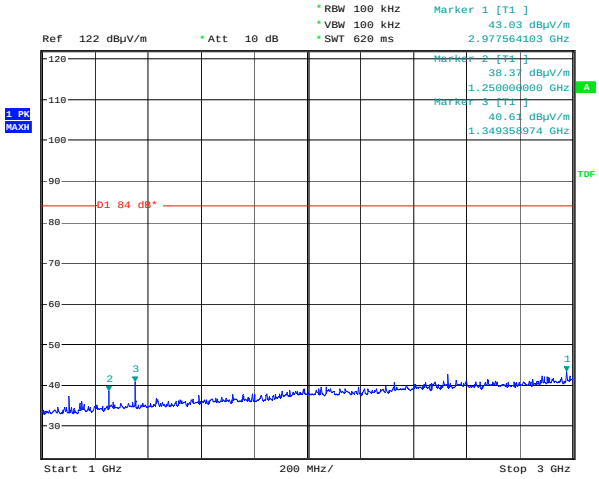
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions Middle Channel

860.0MHz 30MHz – 1GHz

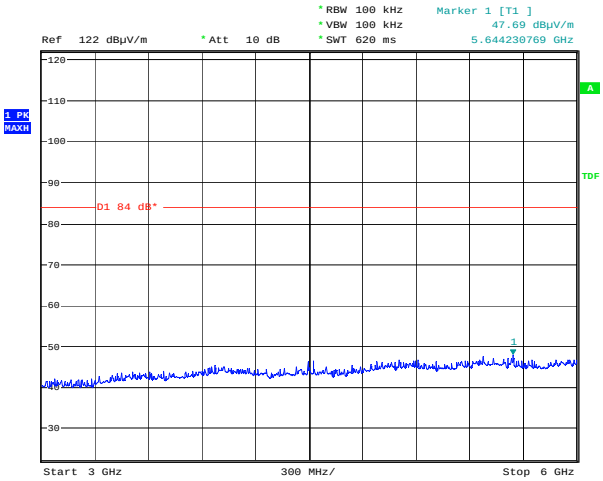


860.0MHz 1GHz – 3GHz



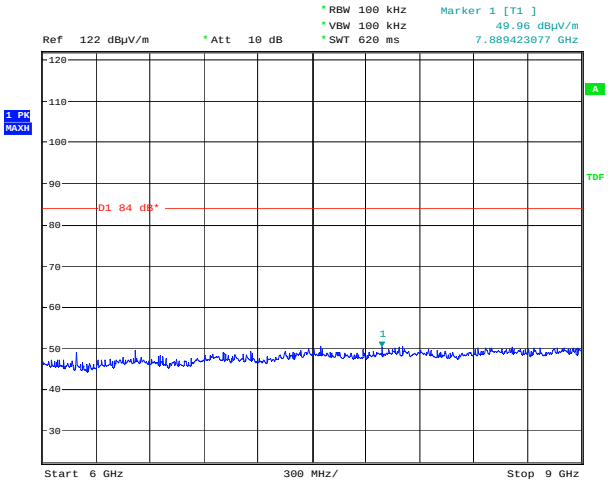
Date: 28.OCT.2009 15:44:52

860.0MHz 3GHz – 6GHz



Date: 28.OCT.2009 15:45:28

860.0MHz 6GHz – 9GHz

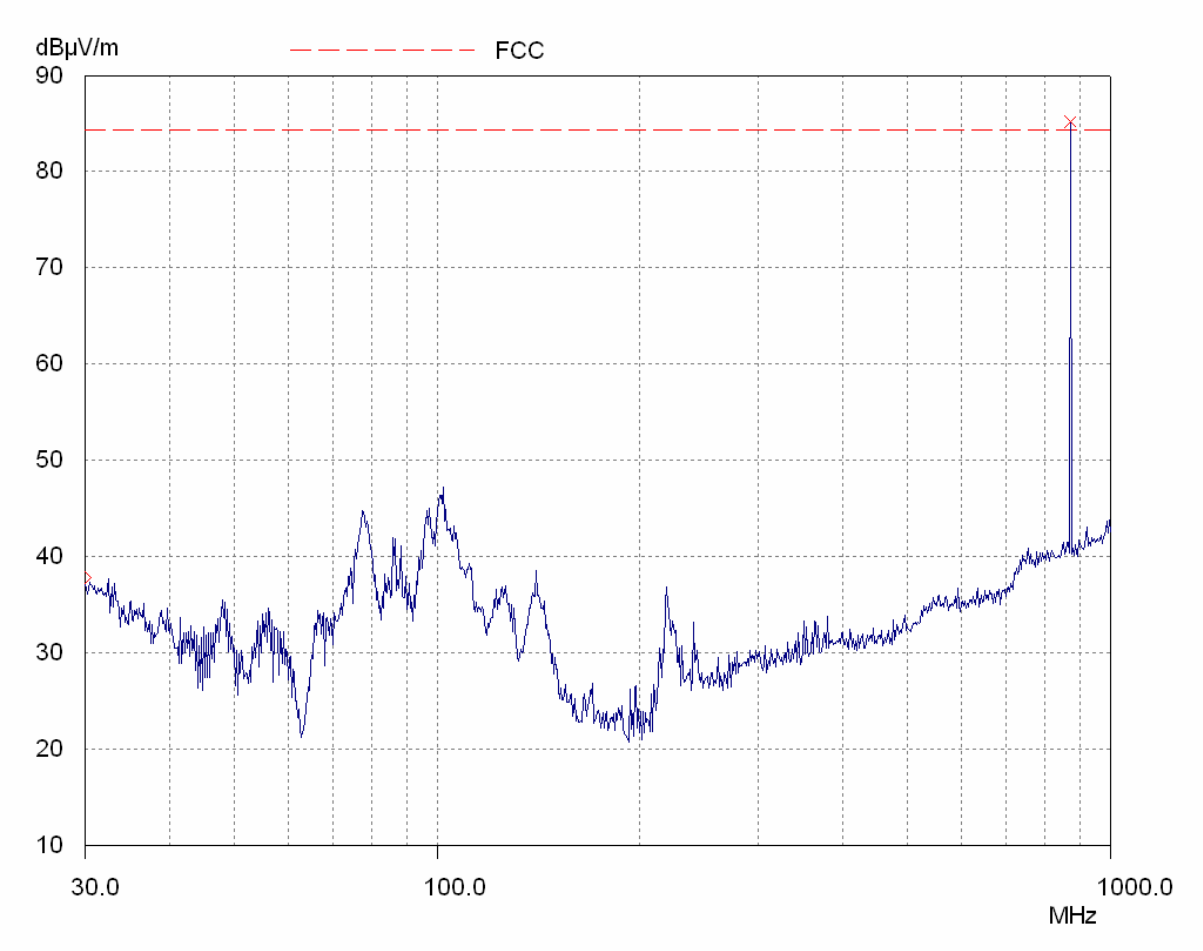


Date: 28.OCT.2009 15:46:14

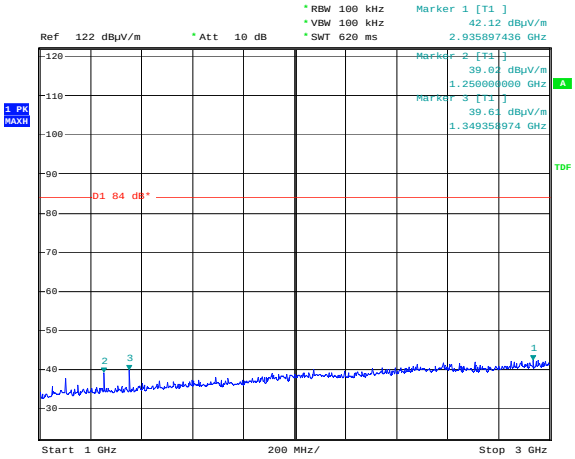
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions Top Channel

869.0MHz 30MHz – 1GHz

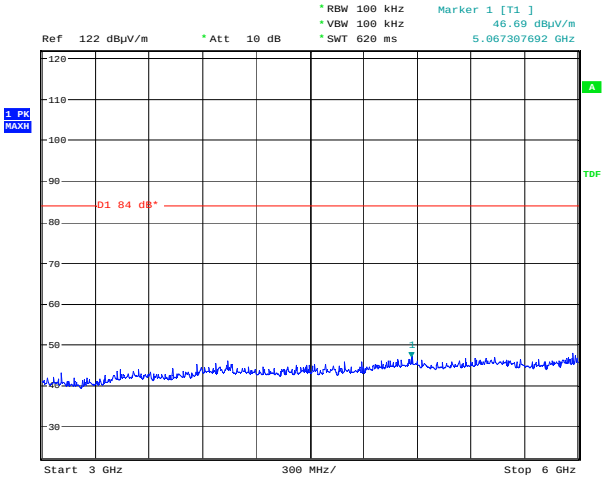


869.0MHz 1GHz – 3GHz



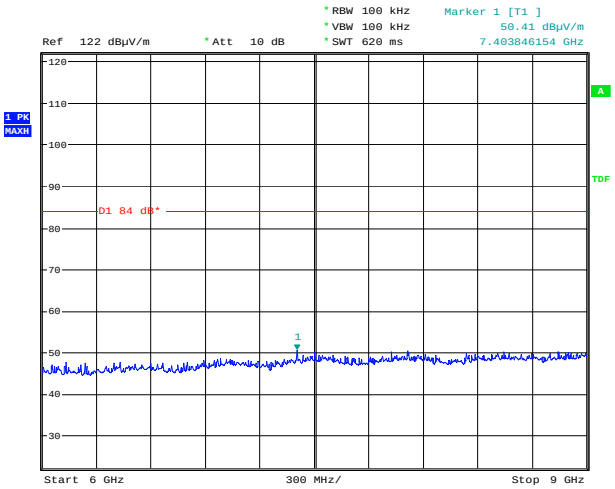
Date: 28.OCT.2009 15:50:04

869.0MHz 3GHz – 6GHz



Date: 28.OCT.2009 15:50:28

869.0MHz 3GHz – 6GHz



Date: 28.OCT.2009 15:50:53

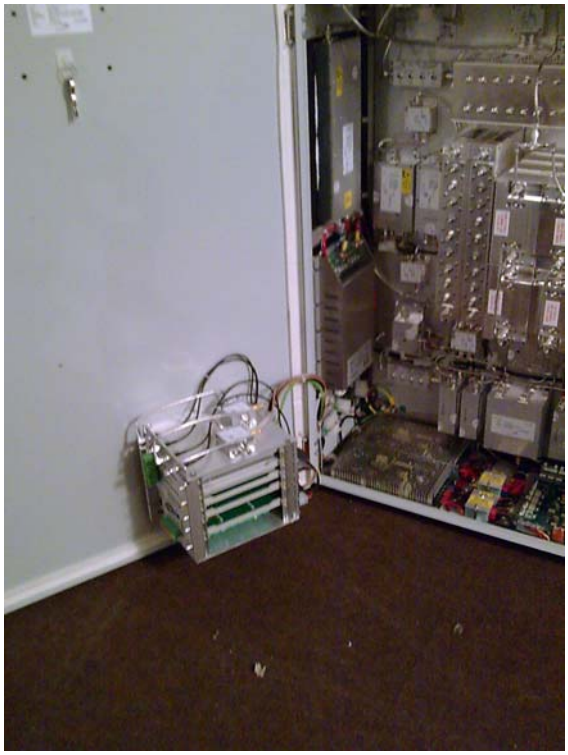
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

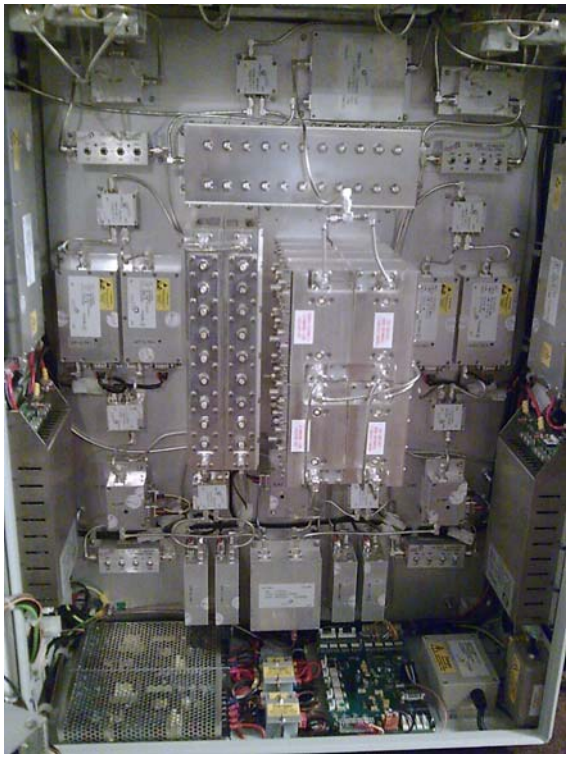
ANNEX A

PHOTOGRAPHS

PHOTOGRAPH No. 1 **TEST SETUP**

PHOTOGRAPH No. EQUIPMENT OVERVIEW DOOR OPEN





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	[ ]
		-	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	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[ ]
		-	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
UH06/07	IC OATS Submission	TRaC	02/07/2009	24	02/07/2011
UH06/07	NSA Calibration	TRaC	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
UH093	Bilog	Chase	03/06/2009	24	03/06/2010
UH105	Signal Generator	Marconi	23/06/2009	12	23/06/2010
UH162	ERP Cable Cal	TRaC	01/03/2009	12	01/03/2010
UH225	Attenuator	Spinner	Calibrate In Use		
UH253	1m Cable N type	TRaC	15/07/2009	12	15/07/2010
UH254	1m Cable N type	TRaC	15/07/2009	12	15/07/2010
UH269	1m Cable N type	TRaC	15/07/2009	12	15/07/2010
UH270	1m Cable N type	TRaC	15/07/2009	12	15/07/2010
UH271	1.5m Cable N type	TRaC	15/07/2009	12	15/07/2010
UH272	1.5m Cable N type	TRaC	15/07/2009	12	15/07/2010
UH273	2m Cable N type	TRaC	15/07/2009	12	15/07/2010
UH274	2m Cable N type	TRaC	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
L103	Attenuator	Bird	Calibrate in Use		
L138	1-18GHz Horn	EMCO	10/09/2009	24	10/09/2011
L139	1-18GHz Horn	EMCO	17/08/2009	24	17/08/2011
L170	Combiner	Elcom	Calibrate in Use		
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
L222	Attenuator	Bird	Calibrate in Use		
L254	Signal Generator	Marconi	25/02/2009	12	25/02/2010
L572	Pre Amp	Agilent	15/07/2009	12	15/07/2010
TRL112	Attenuator	Bird	Calibrate in Use		
TRL266	Attenuator	Bird	Calibrate in Use		
TRL103	Attenuator	Bird	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%**