



**TRL Compliance**  
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**REPORT ON THE CERTIFICATION TESTING OF AN  
AERIAL FACILITIES LIMITED  
5 CHANNEL VHF REPEATER  
WITH RESPECT TO  
THE FCC RULES CFR 47, PART 90 Subpart I  
PRIVATE LAND MOBILE REPEATER.**



TEST REPORT NO: RU1398/8310  
COPY NO: 1  
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FCC ID: NEO50-1892SERIES

**REPORT ON THE CERTIFICATION TESTING OF A  
AERIAL FACILITIES LIMITED  
5 CHANNEL VHF REPEATER  
WITH RESPECT TO  
THE FCC RULES CFR 47, PART 90 Subpart I  
PRIVATE LAND MOBILE REPEATER.**

TEST DATE: 9<sup>th</sup> – 14<sup>th</sup> November 2007

TESTED BY: \_\_\_\_\_ S HODGKINSON

APPROVED BY: \_\_\_\_\_ J CHARTERS  
RADIO SECTION  
LEADER

DATE: 18<sup>th</sup> February 2008  
\_\_\_\_\_

Distribution:

- Copy Nos:
1. Aerial Facilities Limited
  2. TCB: TRL Compliance Limited
  3. TRL Compliance Ltd

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<b>Notes:</b>			
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.			



# TRL Compliance

part of TRAC global

## CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	NEO50-1892SERIES
PURPOSE OF TEST:	Certification
TEST SPECIFICATION:	FCC RULES CFR 47, Part 90 Subpart I
TEST RESULT:	Compliant to Specification
EQUIPMENT UNDER TEST:	5 Channel VHF Repeater
EQUIPMENT TYPE:	Private Land Mobile Repeater
MAXIMUM GAIN:	Uplink 83.7dB Downlink 98.72dB
MAXIMUM INPUT:	Uplink -56.10dBm Downlink -54.18dBm
MAXIMUM OUTPUT CONDUCTED:	Uplink 22.7dBm Downlink 27.17dBm
ANTENNA TYPE:	Uplink 10 dBi Yagi antenna Downlink
CHANNEL SPACING:	Not Applicable, Wideband
FREQUENCY GENERATION:	N/A
MODULATION TYPE:	F3E
POWER SOURCE(s):	110Vac
TEST DATE(s):	9 <sup>th</sup> – 14 <sup>th</sup> November 2007
ORDER No(s):	47390
APPLICANT:	Aerial Facilities Limited
ADDRESS:	Aerial House Asheridge Road Chesham Buckinghamshire HP5 1TU
TESTED BY:	----- S HODGKINSON
APPROVED BY:	----- J CHARTERS RADIO SECTION LEADER

## APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): 5 Channel VHF Repeater

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 ORDER No(s): 47390

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

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

APPLICANT: Aerial Facilities Limited

ADDRESS: Aerial House  
Asheridge Road  
Chesham  
Buckinghamshire  
HP5 1TU  
United Kingdom

TEL: +44 (0)1494 777000

FAX: +44 (0)1494 778456

MANUFACTURER: Aerial Facilities Limited

EUT(s) COUNTRY OF ORIGIN: United Kingdom

TEST LABORATORY: TRL Compliance Ltd

UKAS ACCREDITATION No: 0728

TEST DATE(s): 9<sup>th</sup> – 14<sup>th</sup> November 2007

TEST REPORT No: RU1398/8310

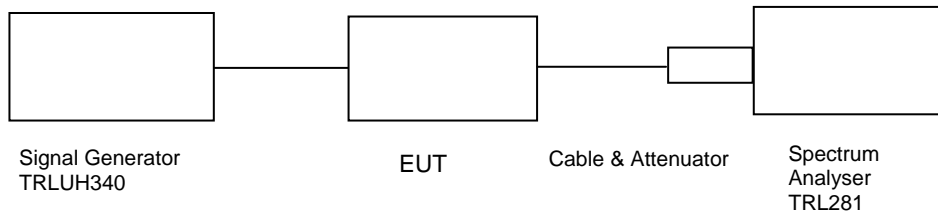


**COMPLIANCE TESTS**

**AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – UPLINK**

Ambient temperature = 20°C  
 Relative humidity = 55%  
 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
154.785	-56.10	0.21	40.5	-17.80	79.01	22.70	69.21
155.325	-62.10	0.20	40.6	-19.20	83.70	21.40	73.92
156.195	-56.20	0.23	40.5	-19.87	77.05	20.63	67.22

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

Frequency MHz	EUT Gain dB	Conducted Output Power dBm	Antenna Gain dBi	Radiated Output Power dBm
154.785	79.01	22.70	10	32.70
155.325	83.70	21.40	10	31.40
156.195	77.05	20.63	10	30.63

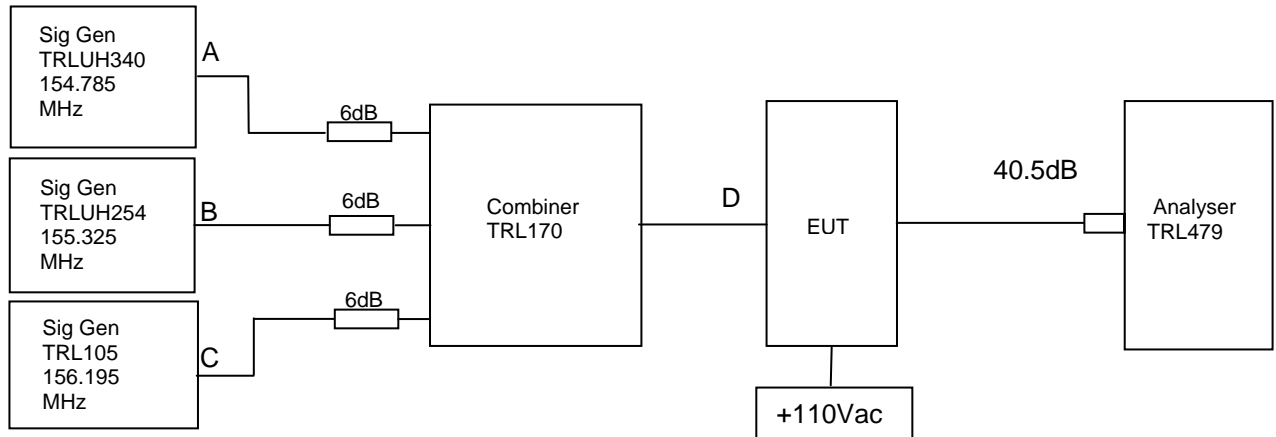
Notes: 1. The Antenna is a .

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	281	X
ATTENUATOR	BIRD	8308-200-N	N/A	103	X
ATTENUATOR	SPINNER	745357	D57224	225	X
SIGNAL GENERATOR	RHODE & SCHWARZ	SML 03	102268	UH297	X

**AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK**

Ambient temperature = 17°C  
 Relative humidity = 55%  
 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 of -56.1dBm. 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)
154.785	155.325	156.195	No significant emissions within 20dB	-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	2042	119388/080	176	X
SIGNAL GENERATOR	HP	83630B	3722A00588	UH340	X
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	X
SIGNAL GENERATOR	MARCONI	2023	112224/040	UH105	X
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	
COMBINER	ELCOM	RC-4-50	N/A	170	X



### Intermodulation Inband

MKR: 156.207MHz

20.05dBm

RB 10kHz#

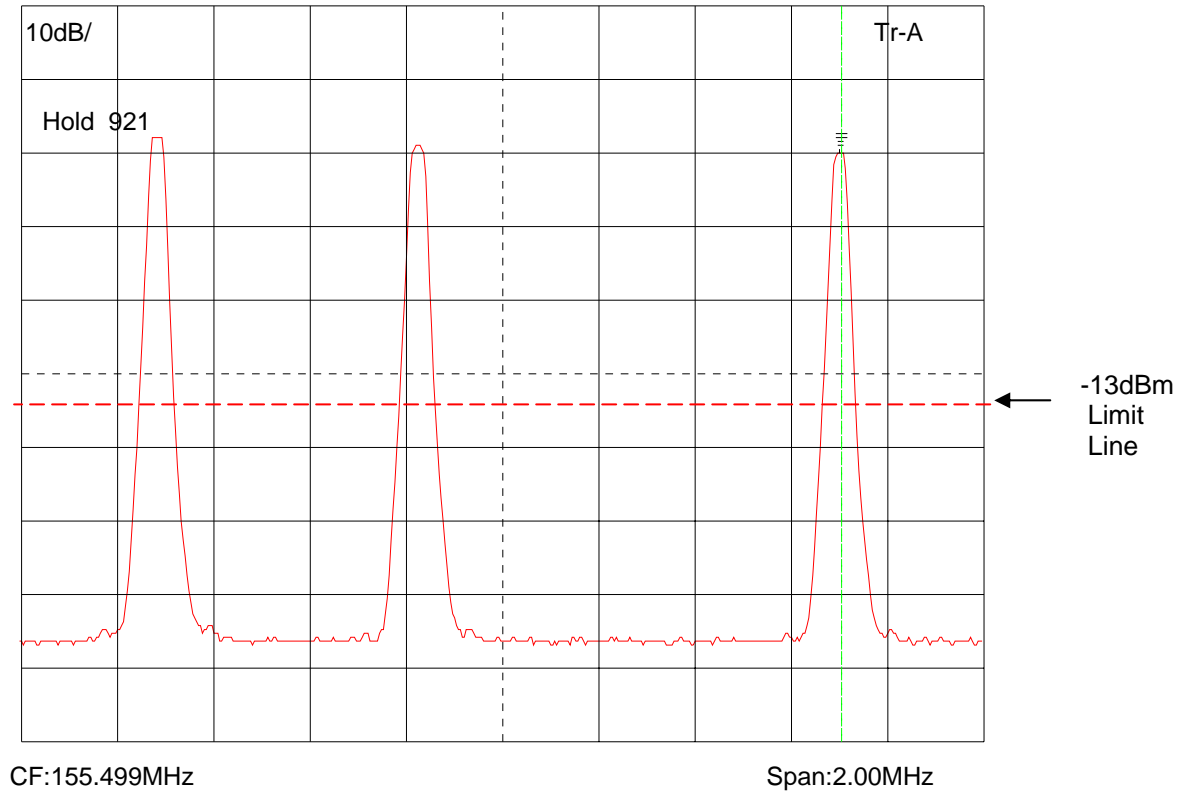
AT 10dB#

Band auto

RLV: 40.40dBm#

VB 10kHz

ST 800ms#



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

### Intermodulation Wideband

MKR: 151.82MHz

22.25dBm

RB 10kHz#

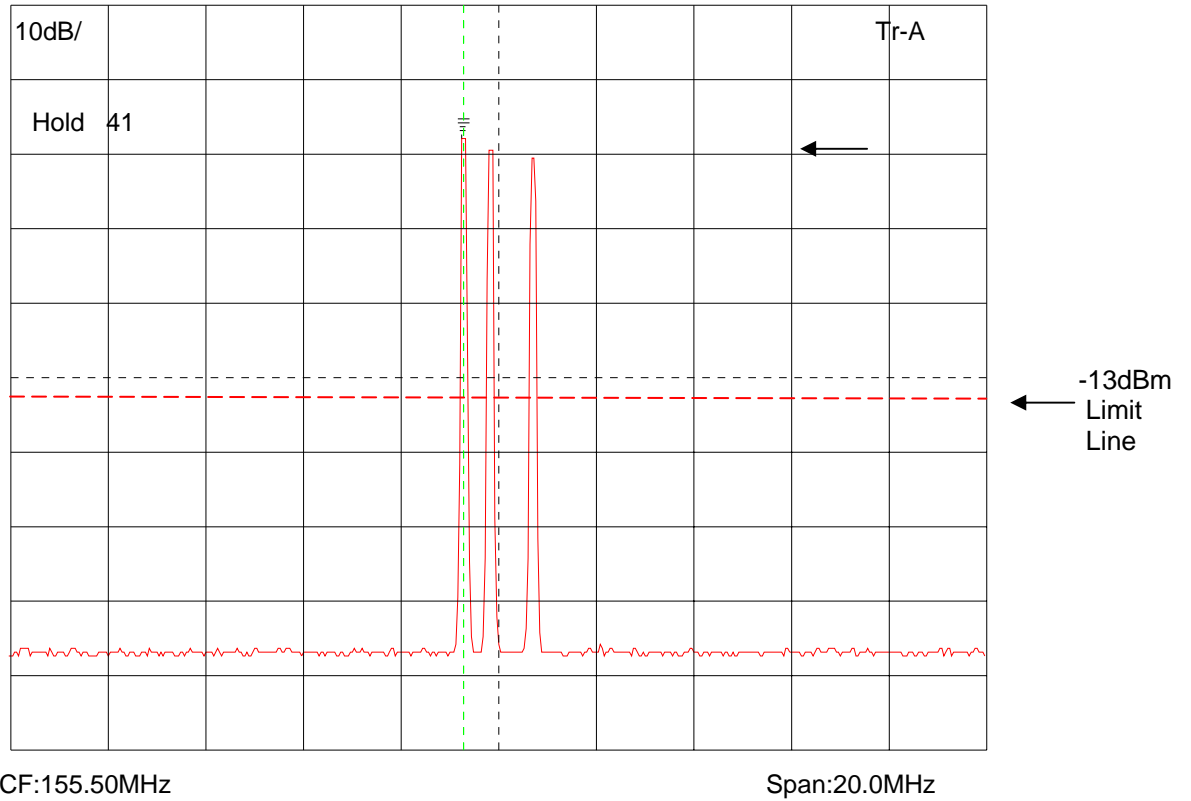
AT 10dB#

Band auto

RLV: 40.40dBm#

VB 10kHz

ST 800ms#



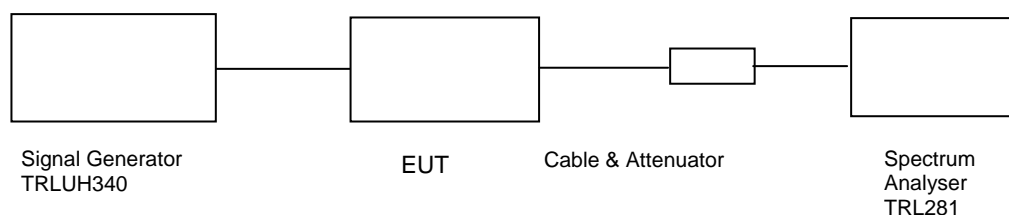
The plot shows that there are no products outside the bands.

## TRANSMITTER TESTS

### AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– UPLINK

Ambient temperature = 20°C  
 Relative humidity = 55%  
 Supply voltage = 110Vac  
 Channel number = See test results

Radio Laboratory



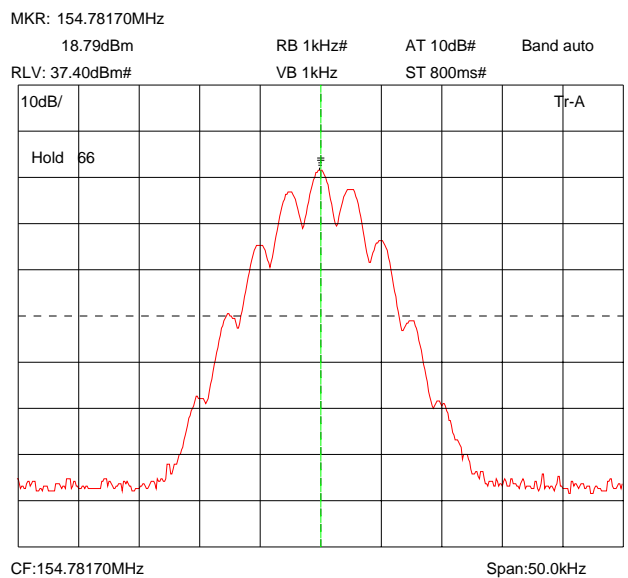
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-56.0dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

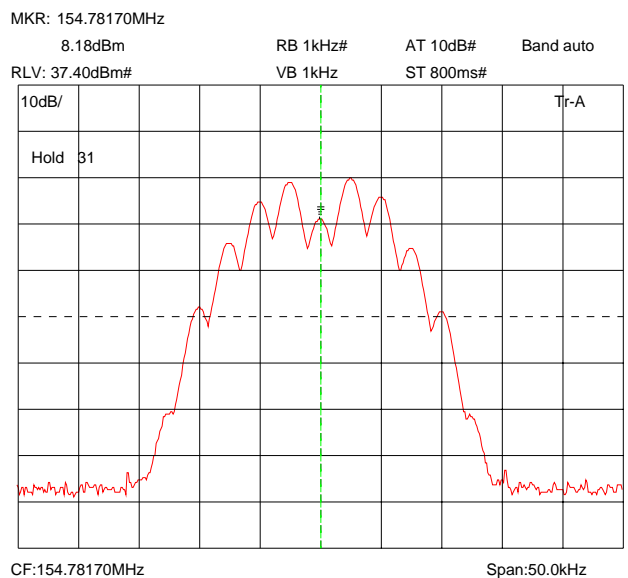
1. Cable and attenuator between EUT and spectrum analyser 40.6dB
2. Cable between signal generator and EUT 0.21dB

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	X
ATTENUATOR	SPINNER	745357	D57224	225	X
ATTENUATOR	BIRD	8308-200-N	N/A	103	X
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	X

Bottom channel 154.785MHz Signal Generator and EUT, deviation set to 2.5kHz

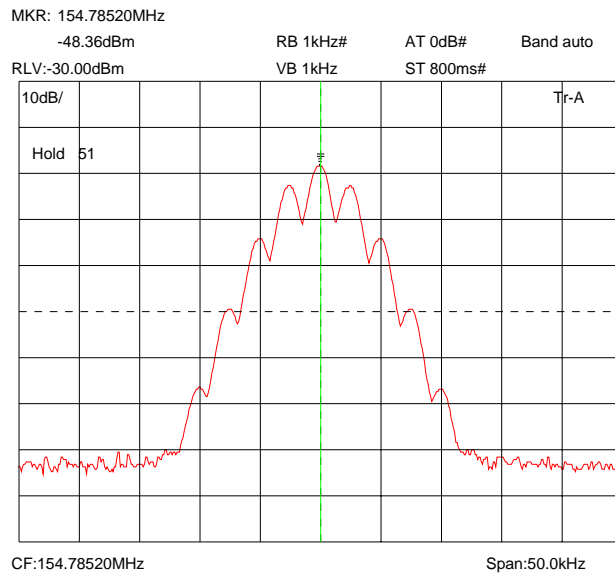


Bottom channel 154.785MHz Signal Generator and EUT, deviation set to 5kHz

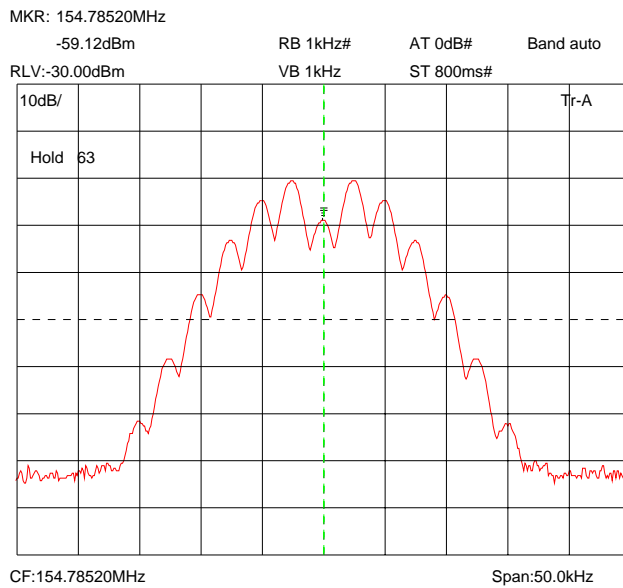


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

Bottom channel 154.785MHz Signal Generator only, deviation set to 2.5kHz

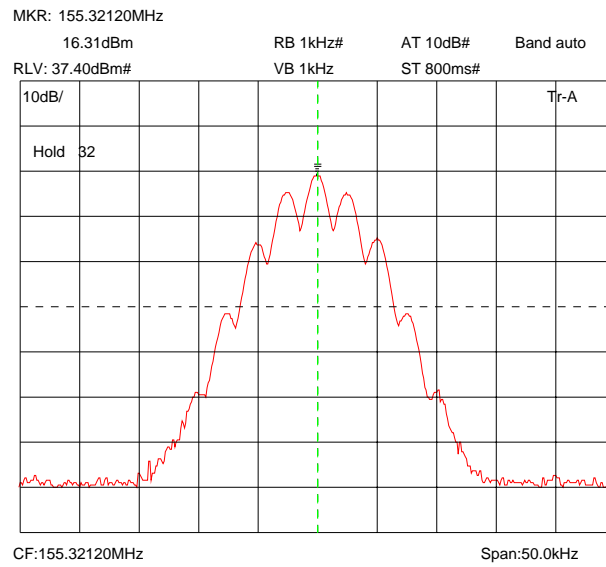


Bottom channel 154.785MHz Signal Generator only, deviation set to 5.0kHz

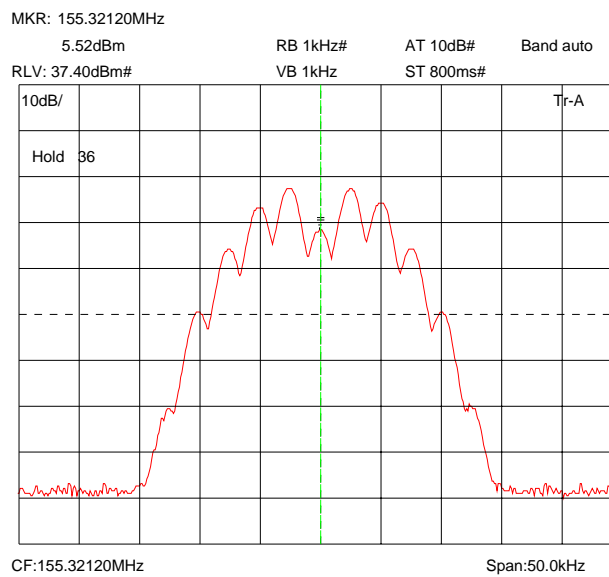


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

Middle channel 155.325MHz Signal Generator and EUT, deviation set to 2.5kHz

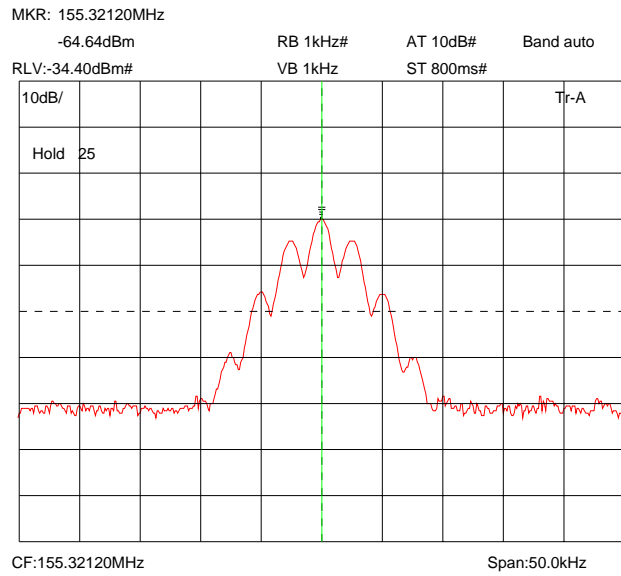


Middle channel 155.325MHz Signal Generator and EUT, deviation set to 5kHz

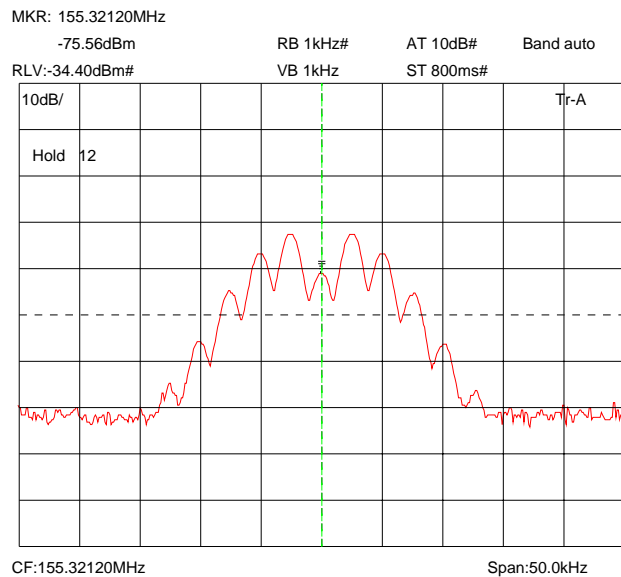


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

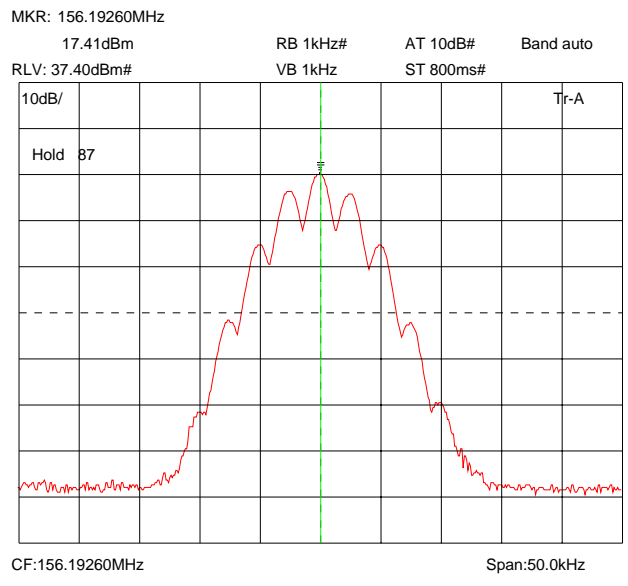
Middle channel 155.325MHz Signal Generator, deviation set to 2.5kHz



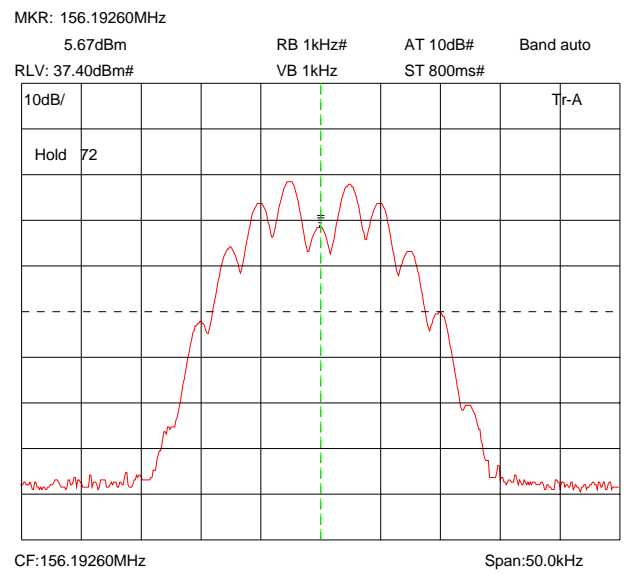
Middle channel 155.325MHz Signal Generator, deviation set to 5kHz



Top channel 156.195MHz Signal Generator and EUT, deviation set to 2.5kHz



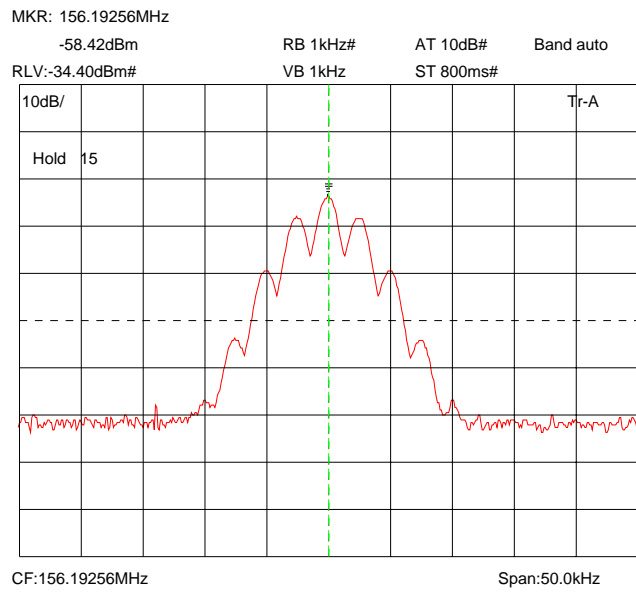
Top channel 156.195MHz Signal Generator and EUT, deviation set to 5kHz



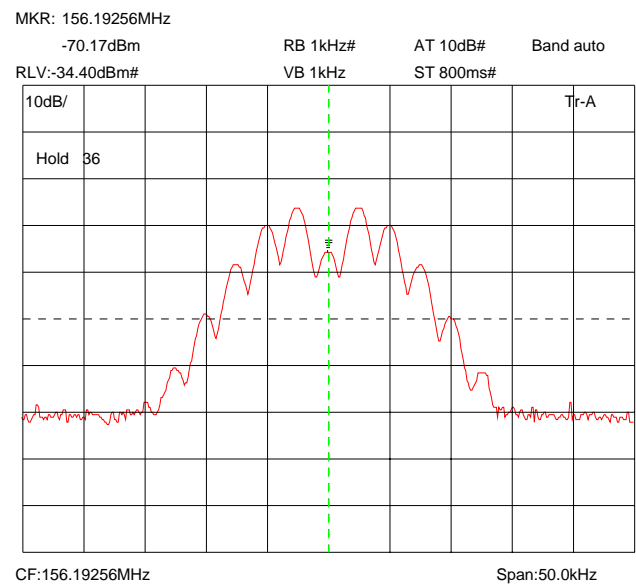
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.



Top channel 156.195MHz Signal Generator, deviation set to 2.5kHz



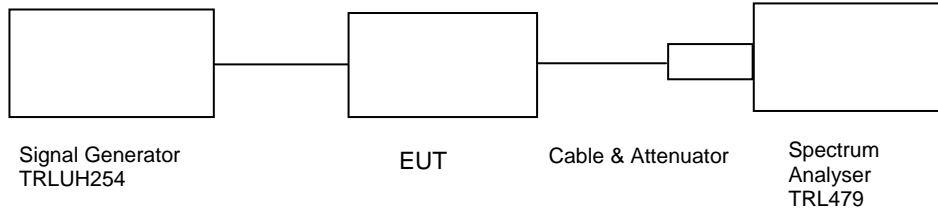
Top channel 156.195MHz Signal Generator, deviation set to 5kHz



## TRANSMITTER TESTS

### AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – UPLINK

Ambient temperature	= 20°C	Radio Laboratory	
Relative humidity	= 55%	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  $43 + 10 \log P_{dB}$

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

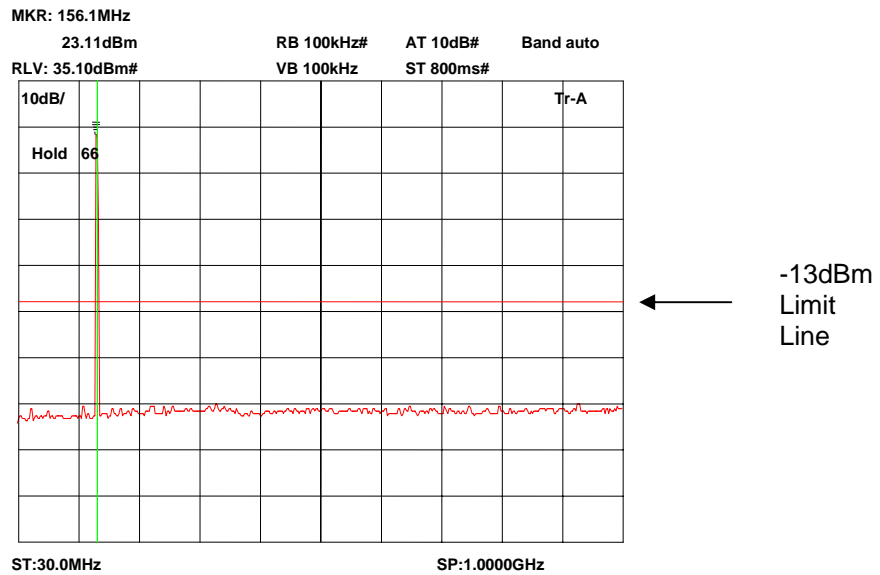
### RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0Hz – 2GHz	No Significant Emissions Within 20 dB of the Limit				-13

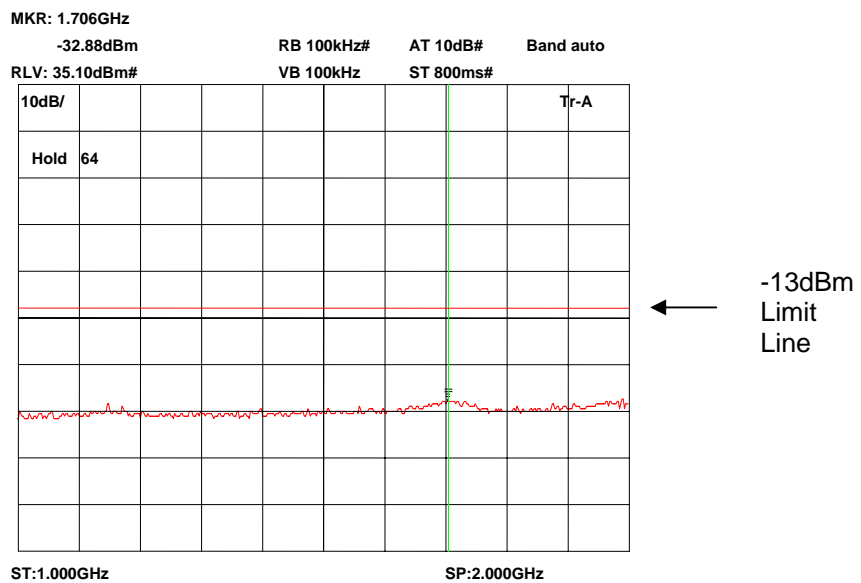
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	<b>X</b>
ATTENUATOR	SPINNER	745357	D57224	225	<b>X</b>
ATTENUATOR	BIRD	8308-200-N	N/A	103	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	<b>X</b>

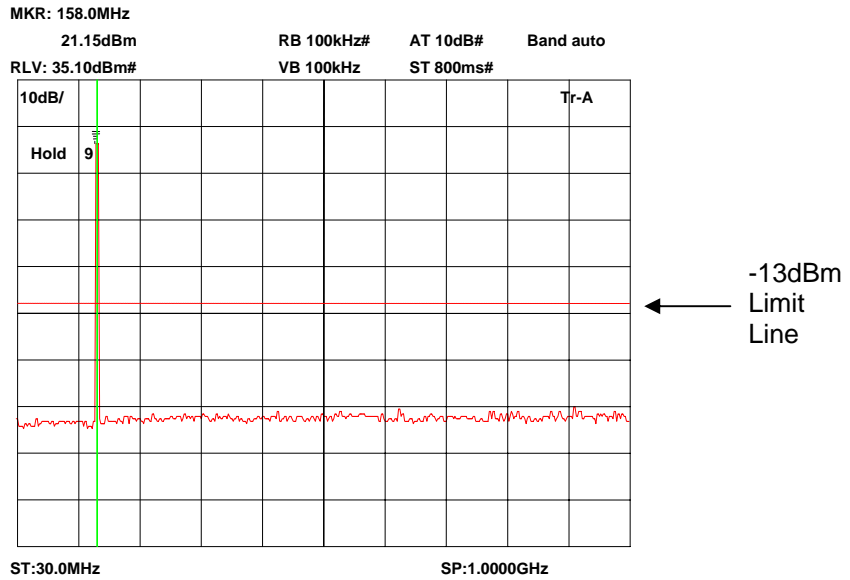
Conducted emissions bottom channel 154.785MHz 30MHz – 1GHz



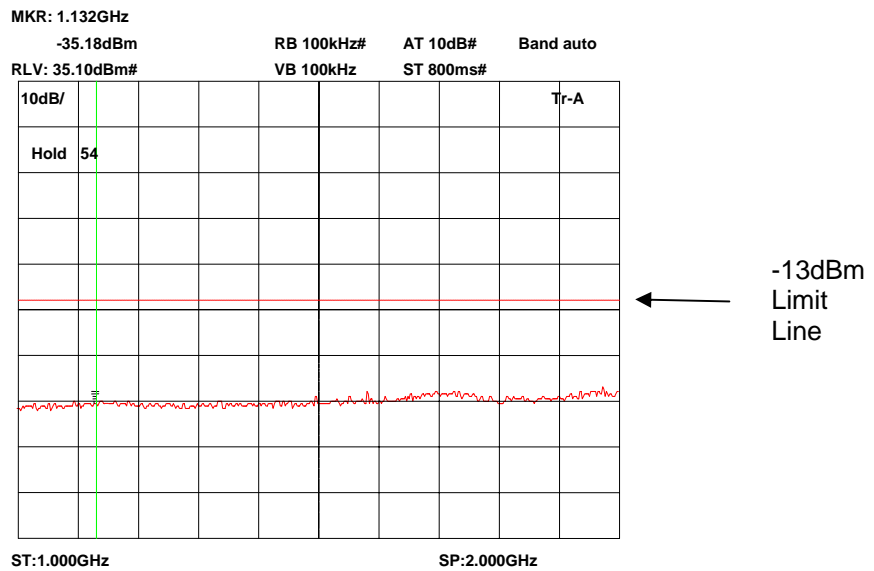
Conducted emissions bottom channel 154.785MHz 1 - 2GHz



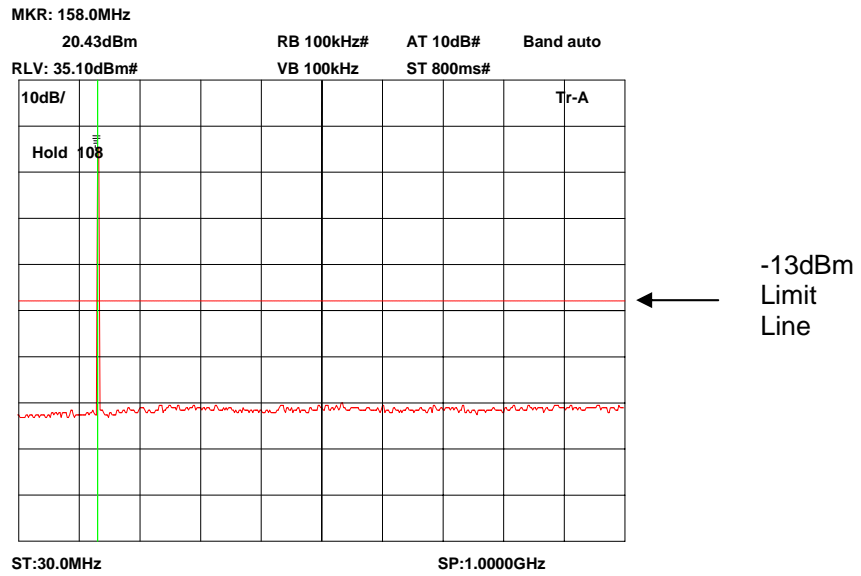
Conducted emissions Middle channel 155.325MHz 30MHz - 1GHz



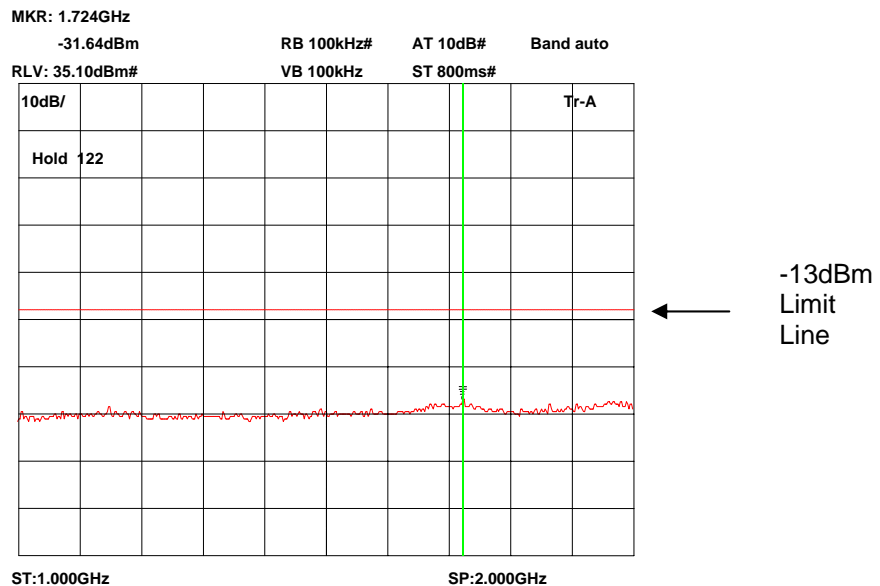
Conducted emissions Middle channel 155.325MHz 1 - 2GHz



Conducted emissions Top channel 156.195MHz 30MHz - 1GHz



Conducted emissions Top channel 156.195MHz 1 - 2GHz



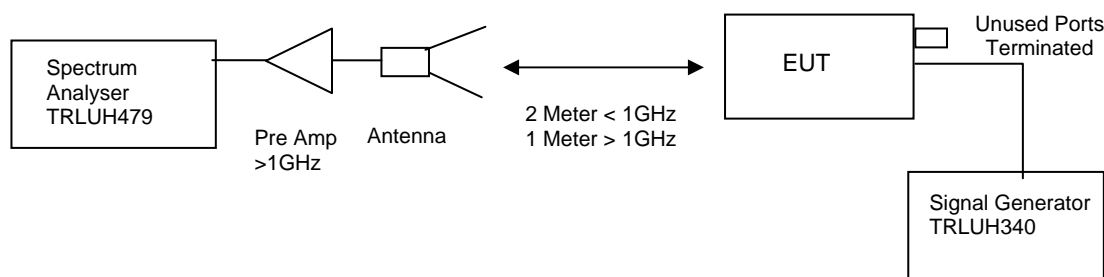
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

## TRANSMITTER TESTS

### AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– UPLINK

Ambient temperature = 17°C  
 Relative humidity = 44%  
 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  $43 + 10 \log P_{dB}$

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

## RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 2GHz	No Significant Emissions Within 20 dB of the Limit						-13dBm

The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
HORN	EMCO	3115	9010-3580	138	X
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	
PRE AMPLIFIER	HP	8449B	3008A016	572	X
SIGNAL GENERATOR	HP	83630B	3722A00588	UH340	X
ANTENNA	YORK	CBL611/A	1618	UH191	X

Radiated emissions bottom channel 154.785MHz 30MHz – 1GHz

**MKR: 156.1MHz**

**84.73dBuV**

**RB 100kHz#**

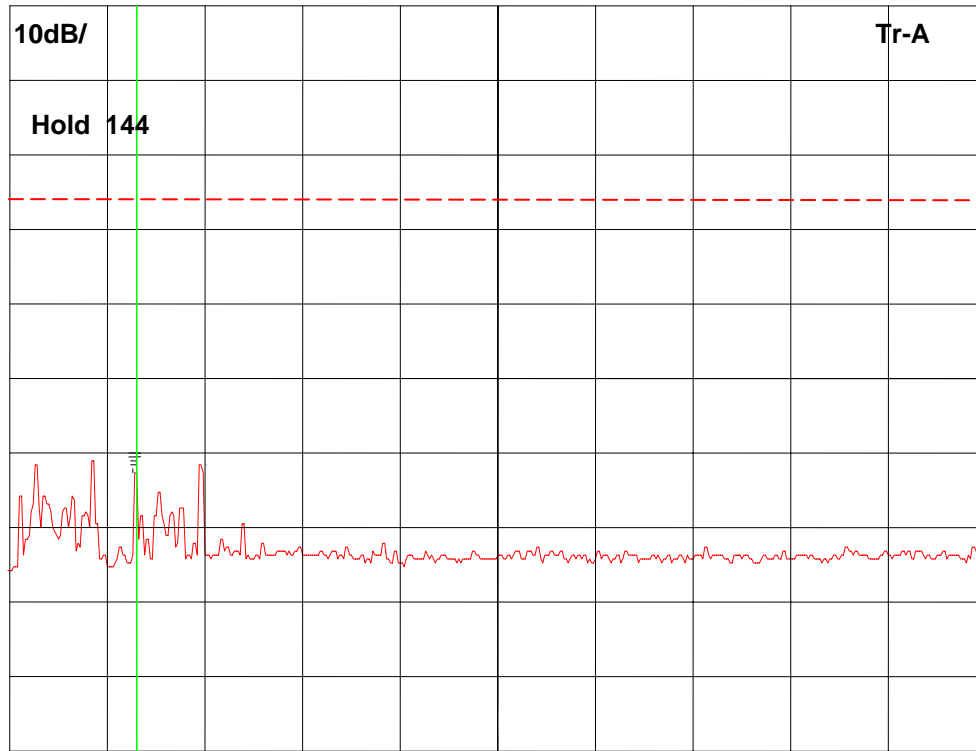
**AT 10dB#**

**Band auto**

**RLV: 147.32dBuV#**

**VB 100kHz**

**ST 800ms#**



← -13dBm  
Limit  
Line

**ST:30.0MHz**

**SP:1.0000GHz**

Radiated emissions Middle channel 155.325MHz 30MHz -1GHz

MKR: 156.1MHz

76.89dBuV

RB 100kHz#

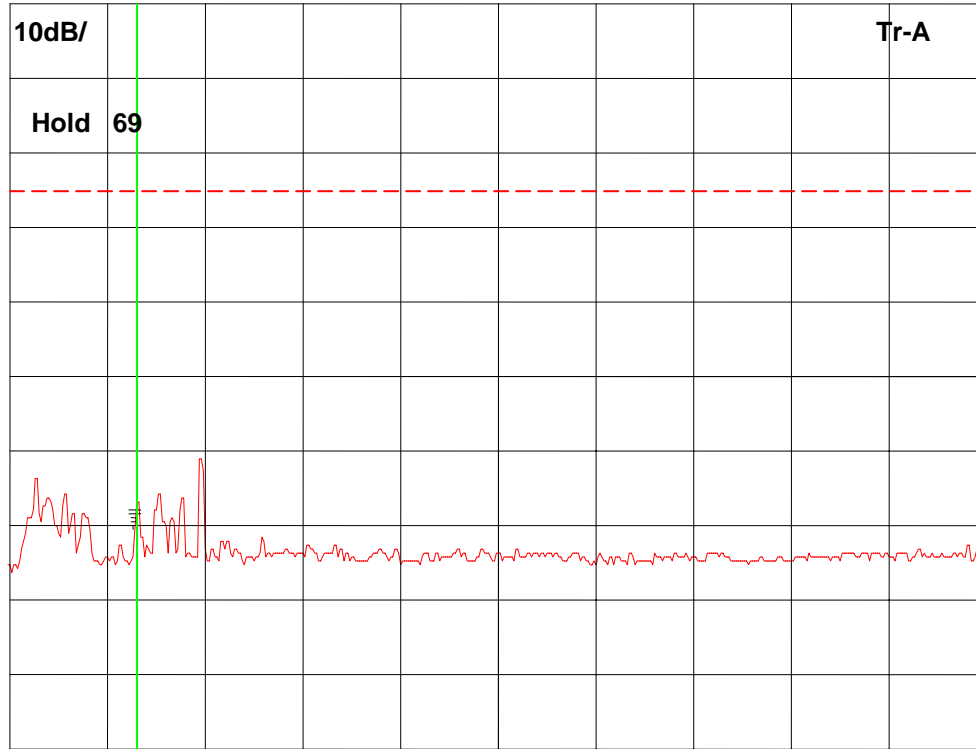
AT 10dB#

Band auto

RLV: 147.32dBuV#

VB 100kHz

ST 800ms#



-13dBm  
Limit  
Line

ST:30.0MHz

SP:1.0000GHz



Radiated emissions Top channel 156.195MHz 30MHz - 1GHz

MKR: 158.0MHz

81.10dBuV

RB 100kHz#

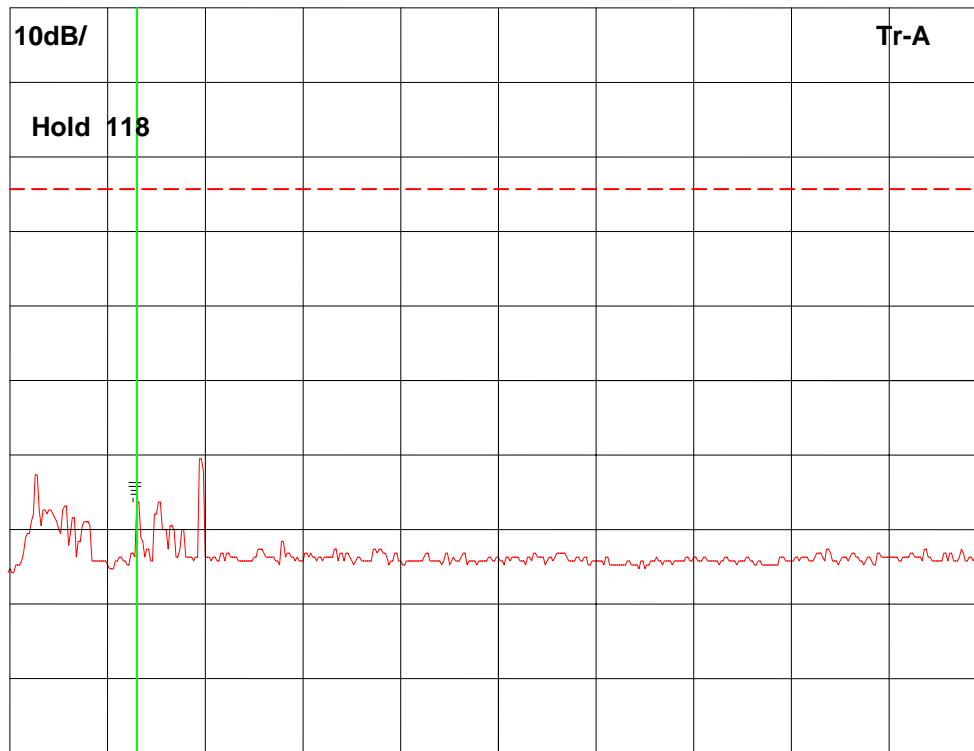
AT 10dB#

Band auto

RLV: 147.32dBuV#

VB 100kHz

ST 800ms#



-13dBm  
Limit  
Line

ST:30.0MHz

SP:1.0000GHz

Radiated emissions bottom channel 154.785MHz 1GHz - 2 GHz

**MKR: 1.712GHz**

**76.68dBuV**

**RB 100kHz#**

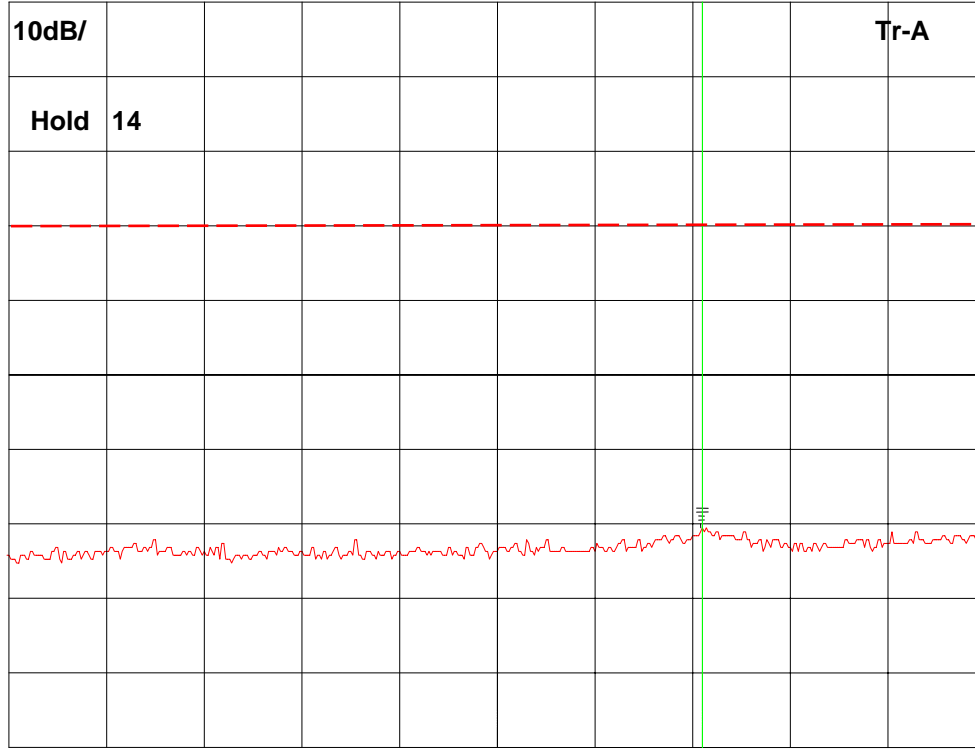
**AT 10dB#**

**Band auto**

**RLV: 147.32dBuV#**

**VB 100kHz**

**ST 800ms#**



-13dBm  
Limit  
Line

**ST:1.000GHz**

**SP:2.000GHz**

Radiated emissions Middle channel 155.325MHz 1GHz - 2GHz

MKR: 1.716GHz

76.27dBuV

RB 100kHz#

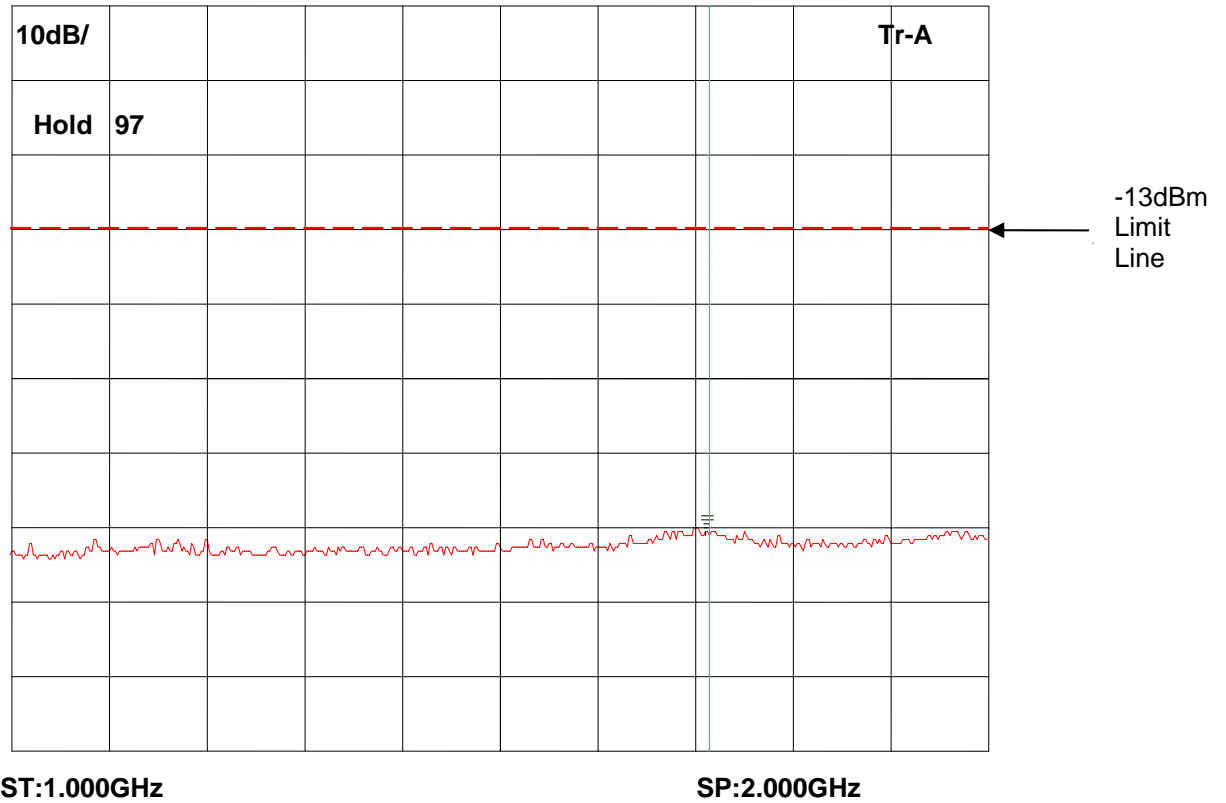
AT 10dB#

Band auto

RLV: 147.32dBuV#

VB 100kHz

ST 800ms#

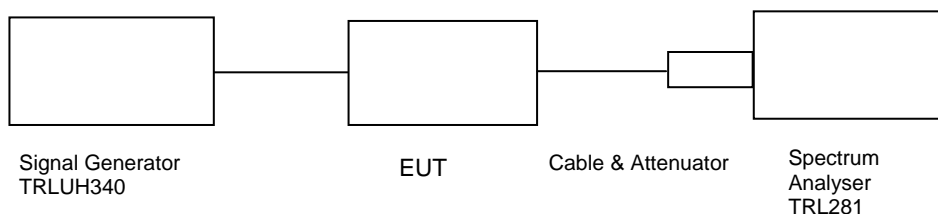




**AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – DOWNLINK**

Ambient temperature = 17°C  
 Relative humidity = 44%  
 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
154.07	-65.50	0.21	40.32	-13.15	92.88	27.17	83.01
155.70	-72.10	0.20	40.47	-14.05	98.72	26.42	89.34
158.91	-54.18	0.18	40.48	-15.08	79.58	23.22	71.70

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

Frequency MHz	EUT Gain dB	Conducted Output Power dBm	Antenna Gain dBi	Radiated Output Power dBm
154.07	92.88	27.17	10	37.17
155.70	98.72	26.42	10	36.42
158.91	79.58	23.22	10	33.22

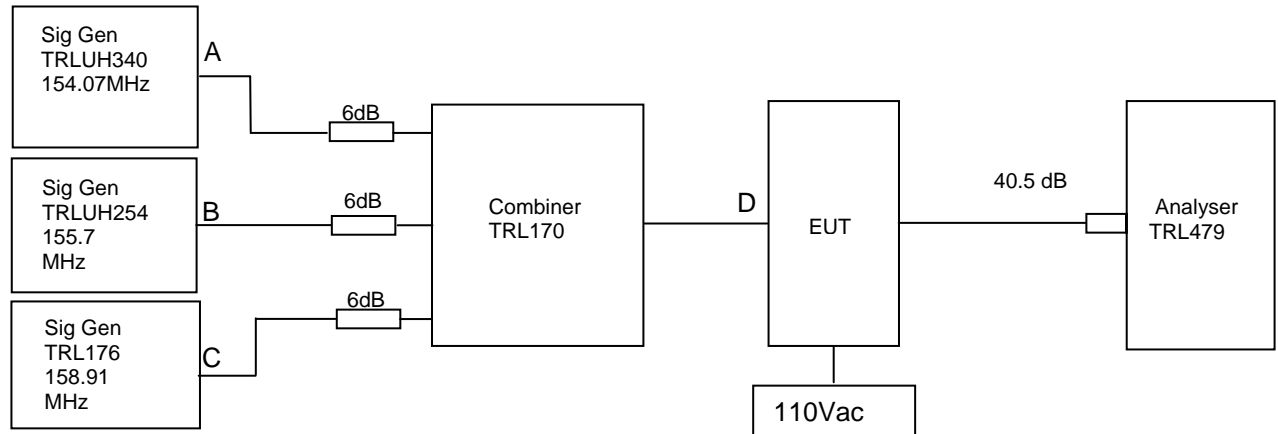
Notes: 2. The Antenna is a .

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	281	X
ATTENUATOR	BIRD	8308-200-N	N/A	103	X
ATTENUATOR	SPINNER	745357	D57224	225	X
SIGNAL GENERATOR	RHODE & SCHWARZ	SML 03	102268	UH297	X

**AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– DOWNLINK**

Ambient temperature = 20°C  
 Relative humidity = 30%  
 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 of -65.5dBm. 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)
154.07	155.7	158.91	-30.04 @ 157.32MHz	-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	<b>X</b>
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>x</b>
SIGNAL GENERATOR	HP	83630B	3722A00588	UH340	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	<b>X</b>
SIGNAL GENERATOR	MARCONI	2023	112224/040	UH105	
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	
COMBINER	ELCOM	RC-4-50	N/A	170	<b>X</b>

# Intermodulation Inband

MKR: 157.32MHz

-30.04dBm

RB 100kHz#

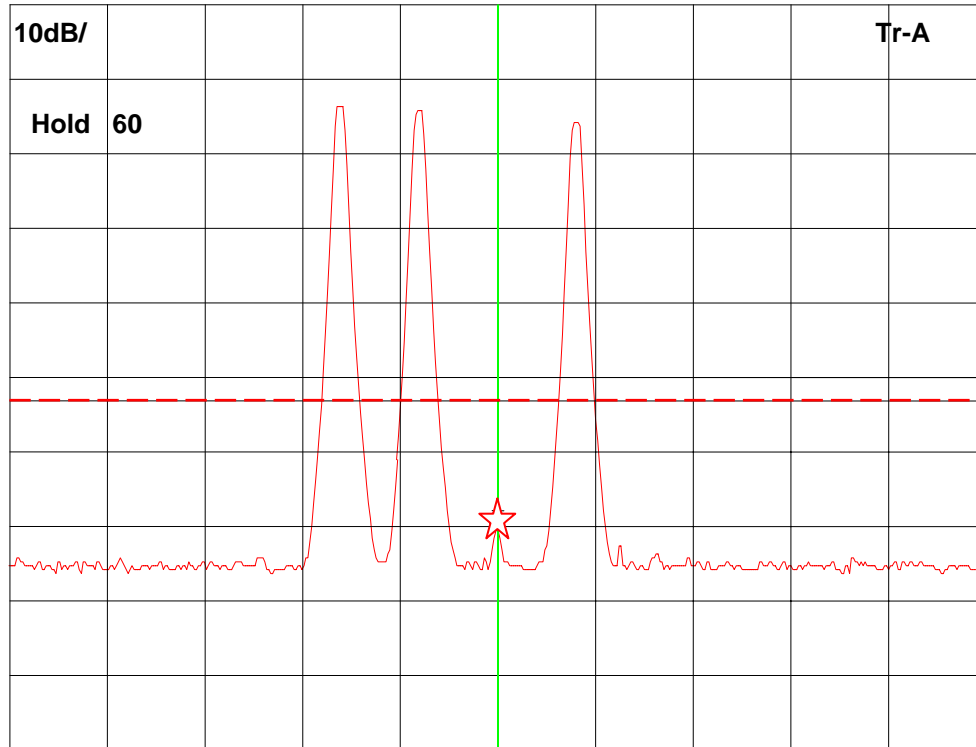
AT 10dB#

Band auto

RLV: 40.32dBm#

VB 100kHz

ST 800ms#



CF:157.32MHz

Span:20.0MHz

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

Intermodulation Wideband

MKR: 141.1MHz

-35.77dBm

RB 100kHz#

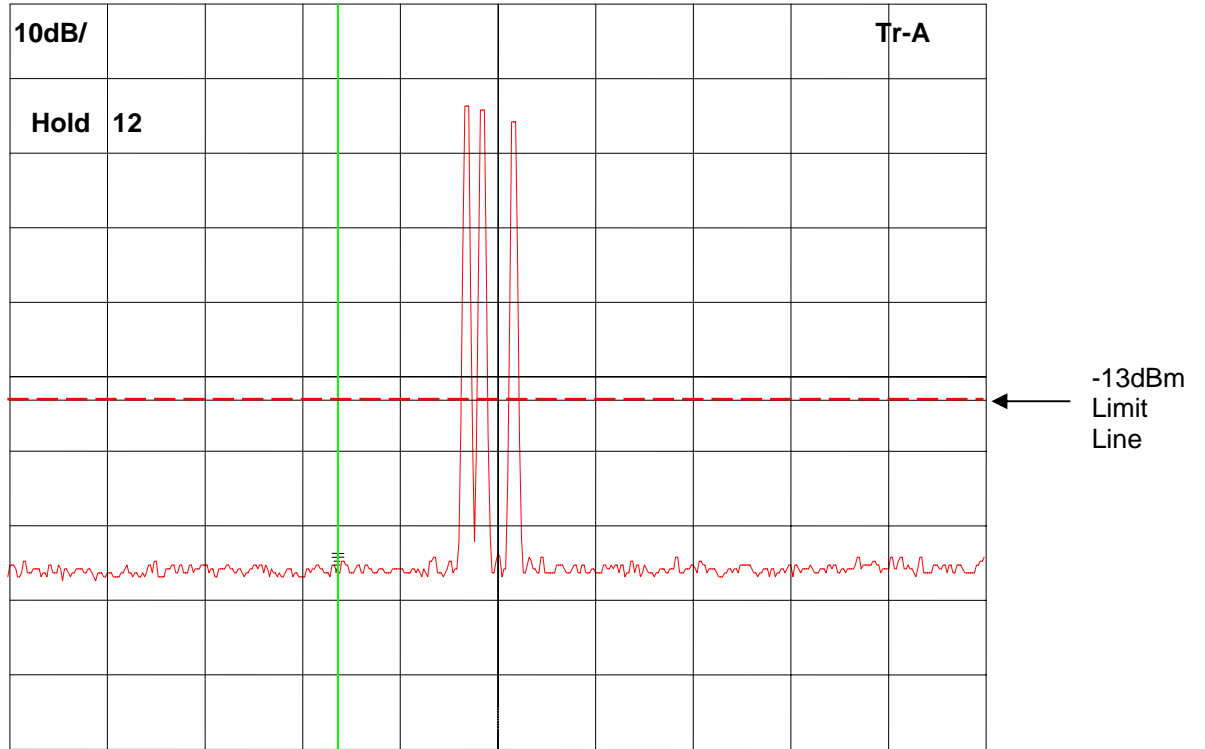
AT 10dB#

Band auto

RLV: 40.32dBm#

VB 100kHz

ST 800ms#



CF:157.3MHz

Span:100MHz

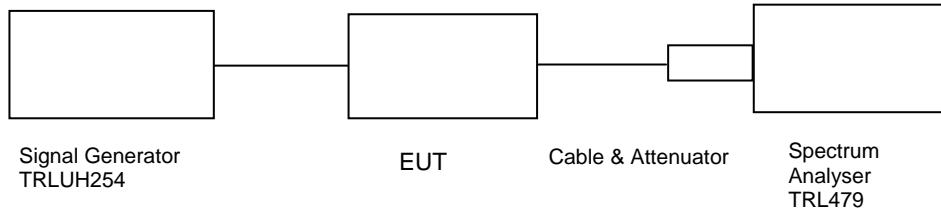
The above plot shows that there are no products outside the bands.



**TRANSMITTER TESTS**

**AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– DOWNLINK**

Ambient temperature = 17°C Radio Laboratory  
 Relative humidity = 43%  
 Supply voltage = 110Vac  
 Channel number = See test results



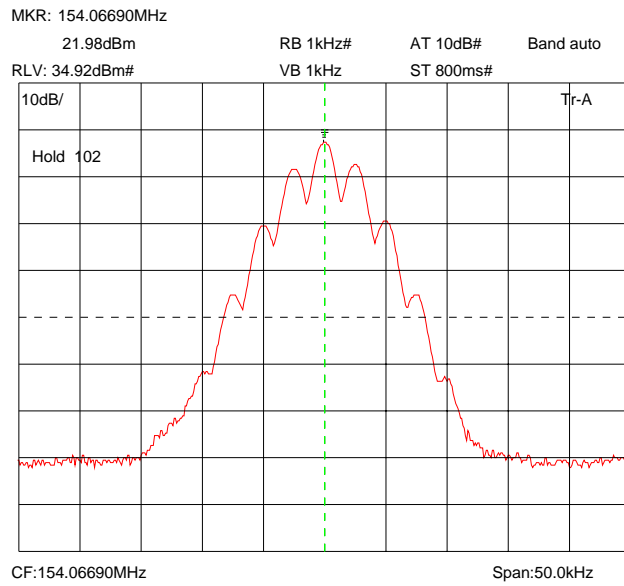
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-44.18dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

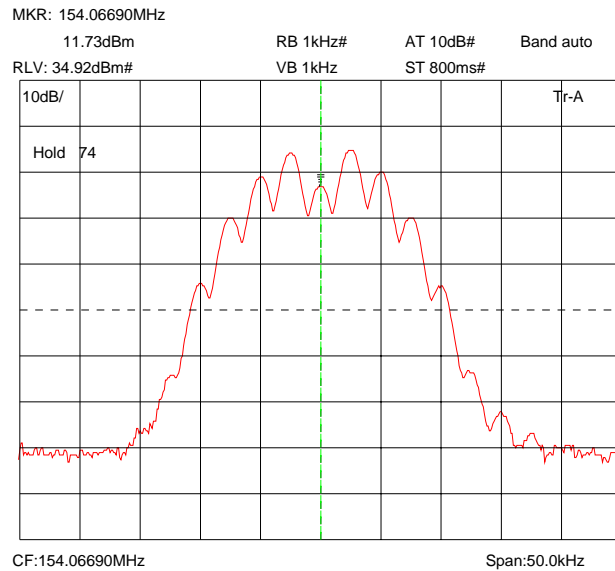
1. Cable and attenuator between EUT and spectrum analyser 40.5dB
2. Cable between signal generator and EUT 0.21dB

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	X
ATTENUATOR	SPINNER	745357	D57224	225	X
ATTENUATOR	BIRD	8308-200-N	N/A	103	X
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	X

Bottom channel 154.07MHz Signal Generator and EUT, deviation set to 2.5kHz

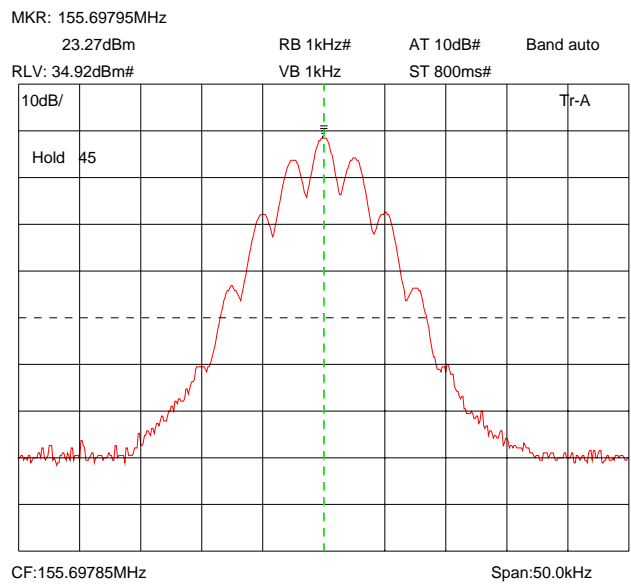


Bottom channel 154.07MHz Signal Generator and EUT, deviation set to 5kHz

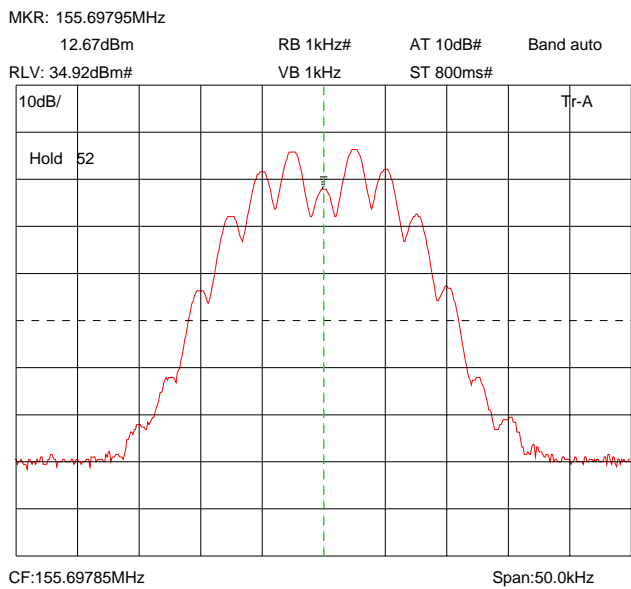


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

Middle channel 155.70MHz Signal Generator and EUT, deviation set to 2.5kHz

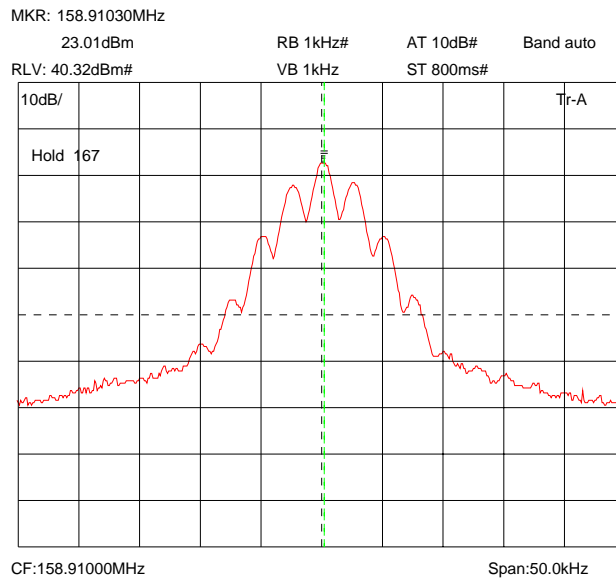


Middle channel 155.70MHz Signal Generator and EUT, deviation set to 5kHz

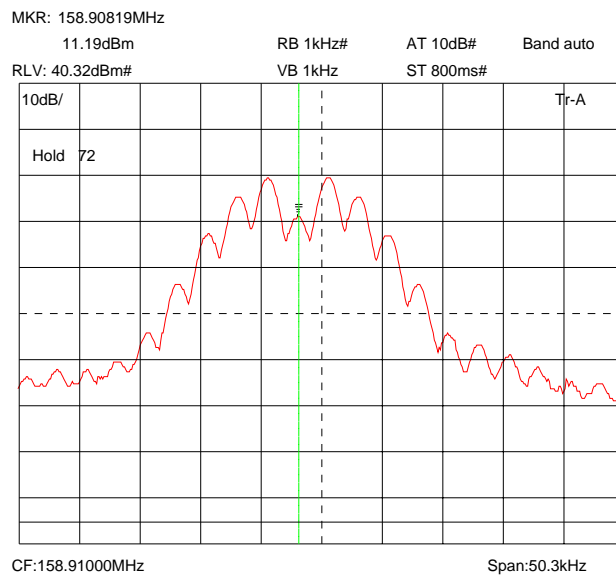


The above plots depicting the output wavsshape show no measurable distortion visible when compared to the input signal.

Top channel 158.91MHz Signal Generator and EUT, deviation set to 2.5kHz

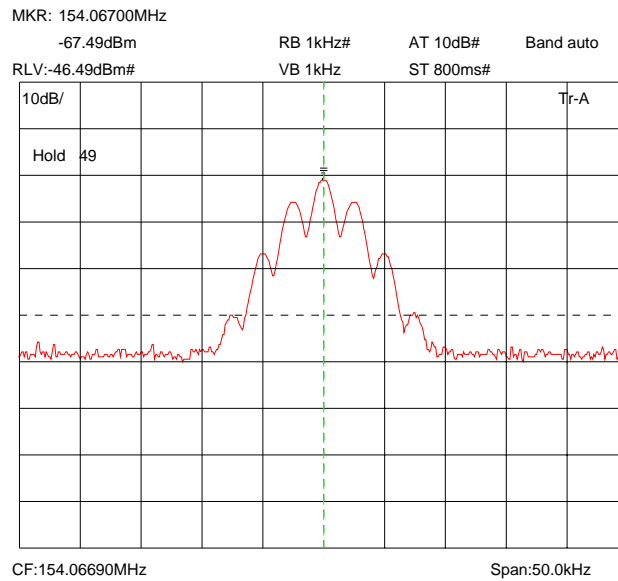


Top channel 158.91MHz Signal Generator and EUT, deviation set to 5kHz

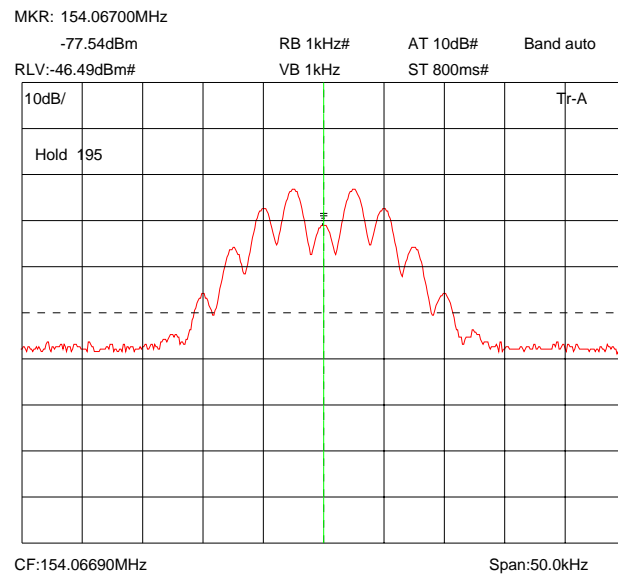


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

Bottom channel 154.07MHz Signal Generator, deviation set to 2.5kHz

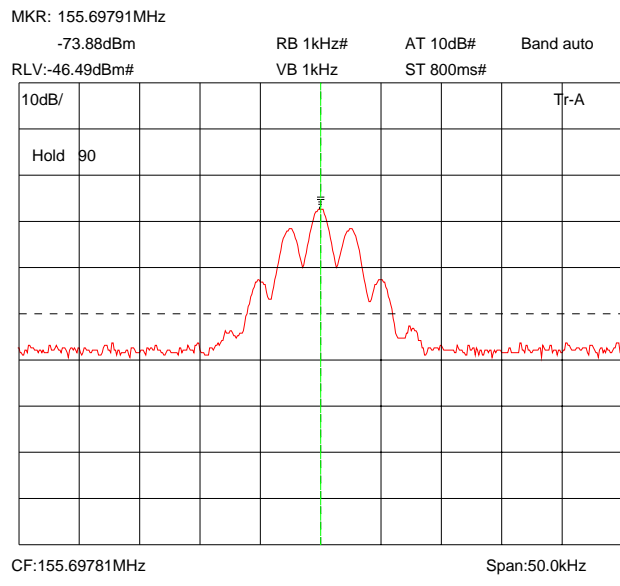


Bottom channel 154.07MHz Signal Generator, deviation set to 5kHz

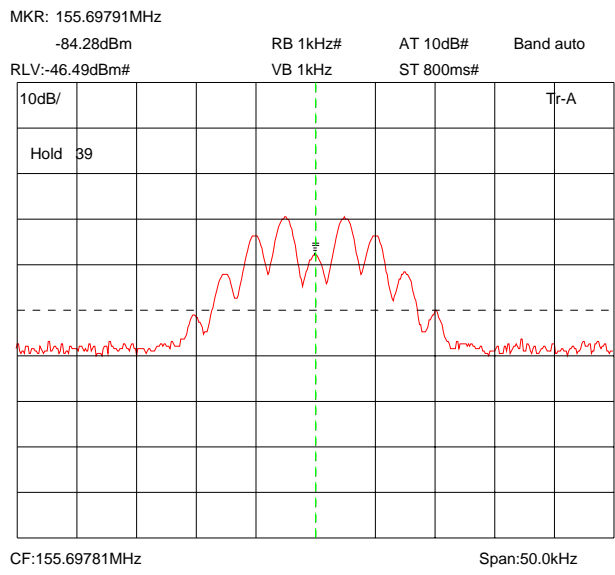


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

Middle channel 155.70MHz MHz Signal Generator, deviation set to 2.5kHz

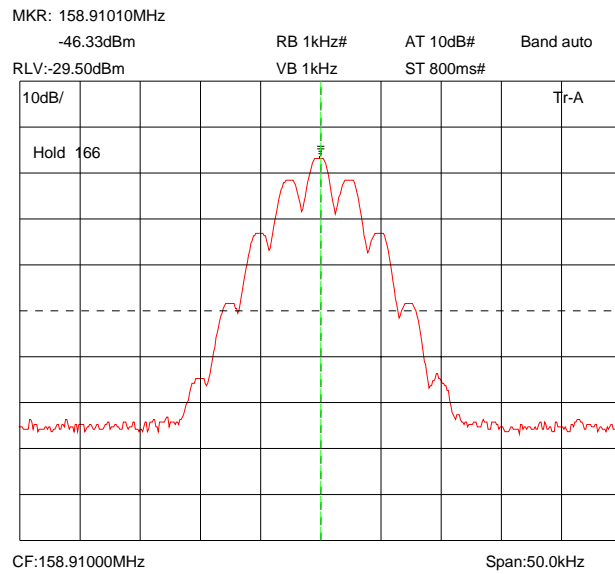


Middle channel 155.70MHz MHz Signal Generator, deviation set to 5kHz

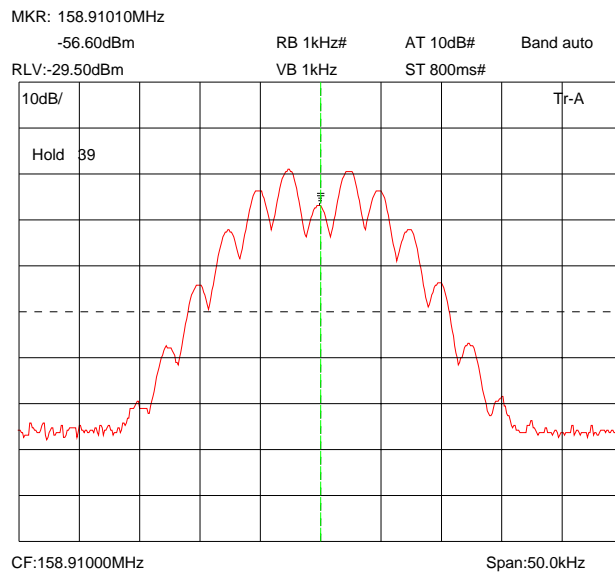


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

Top channel 158.91MHz Signal Generator, deviation set to 2.5kHz



Top channel 158.91MHz Signal Generator, deviation set to 5kHz



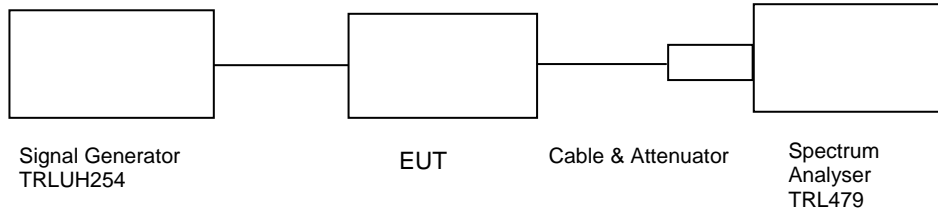
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

## TRANSMITTER TESTS

### AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – DOWNLINK

Ambient temperature = 17°C  
 Relative humidity = 43%  
 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 than 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

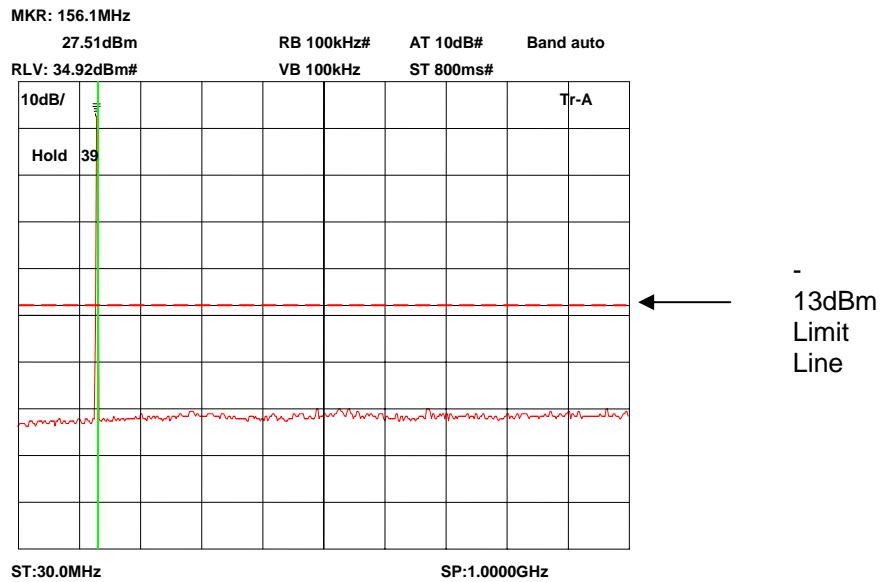
FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0Hz – 2GHz	No Significant Emissions Within 20 dB of the limit				-13

The test equipment used for the Transmitter Conducted Emissions:

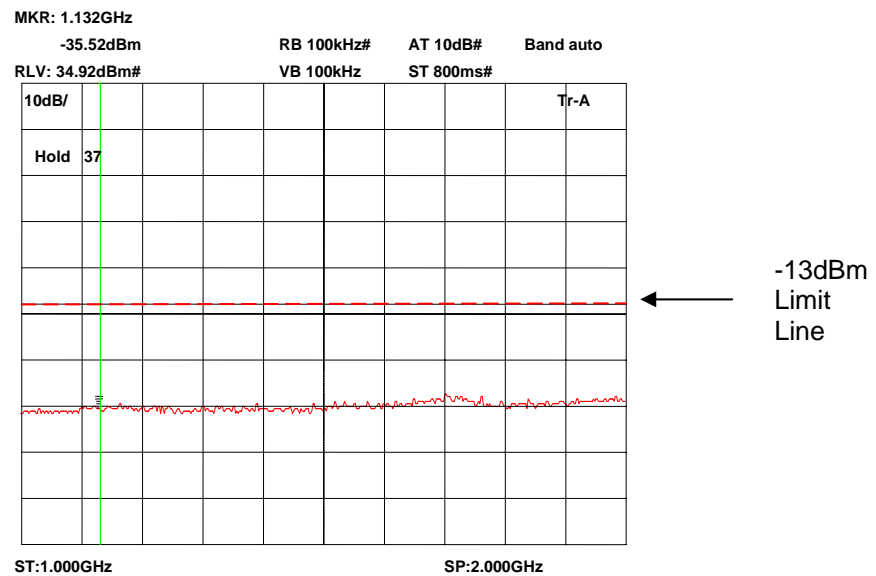
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	SPINNER	745357	D57224	225	X
ATTENUATOR	BIRD	8308-200-N	N/A	103	X
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	X



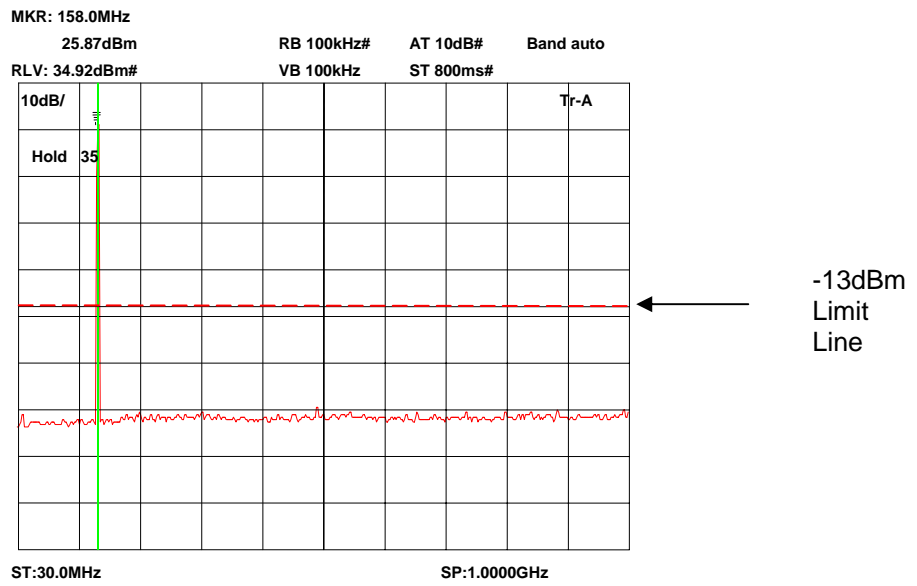
Conducted emissions bottom channel 154.07MHz 30MHz – 1GHz



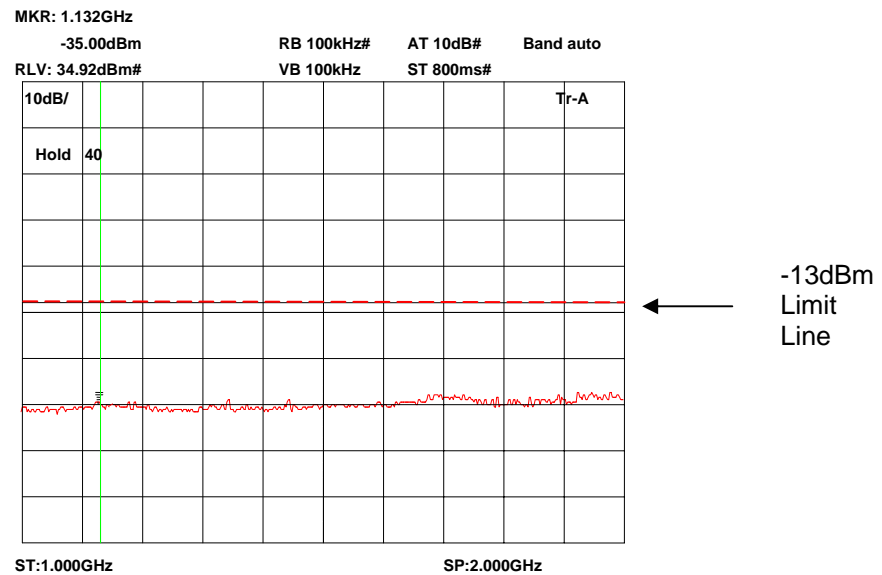
Conducted emissions bottom channel 154.07MHz 1GHz – 2GHz



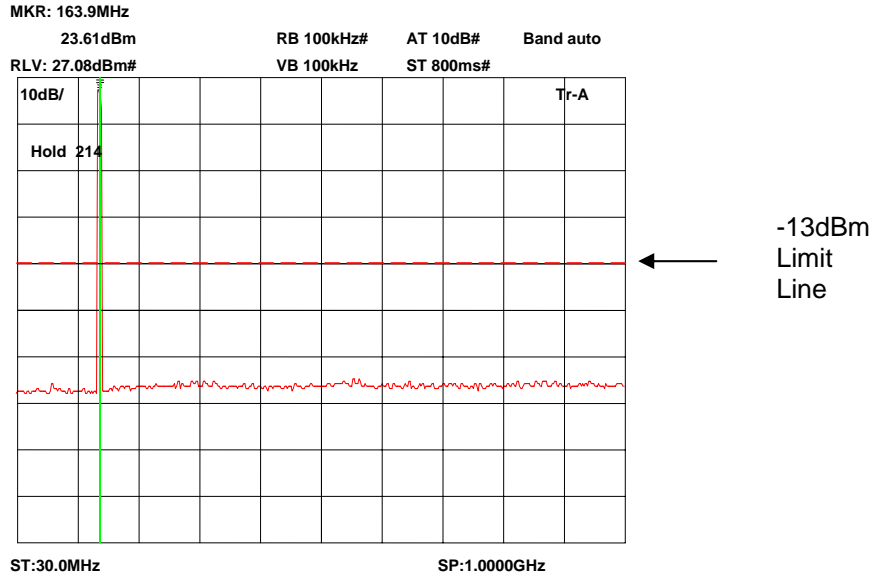
Conducted emissions Middle channel 157.70MHz 30MHz – 1GHz



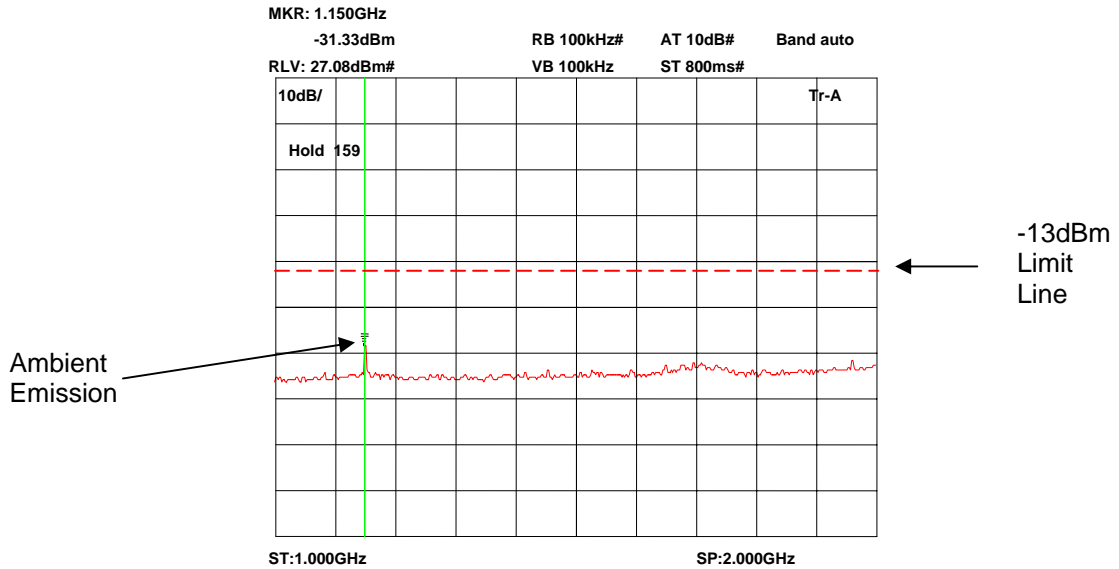
Conducted emissions Middle channel 157.70MHz 1GHz - 2GHz



Conducted emissions Top channel 158.91MHz 30MHz – 1GHz



Conducted emissions Top channel 158.91MHz 1GHz - 2GHz



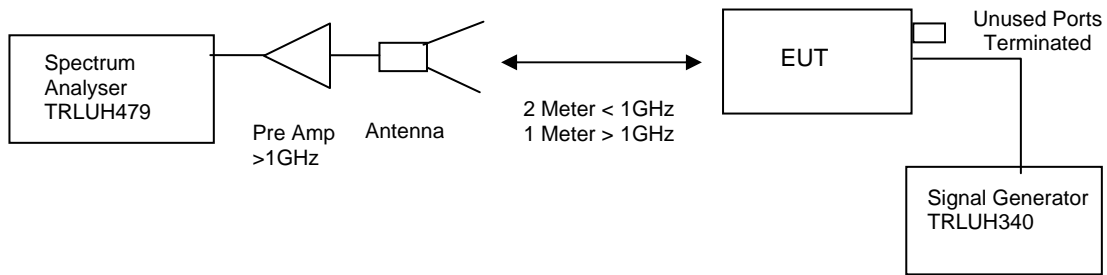
The above test results show that there were no emissions within 20dBs of the -13dBm limit

**TRANSMITTER TESTS**

**AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– DOWNLINK**

Ambient temperature = 17°C  
 Relative humidity = 44%  
 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  $43 + 10 \log P_{dB}$

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

**RESULTS**

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
30MHz – 2GHz	No Significant Emissions Within 20dBs of the Limit						-13dBm

The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>x</b>
HORN	EMCO	3115	9010-3580	138	<b>X</b>
SPECTRUM ANALYSER	R&S	FSU46	200034	UH281	
PRE AMPLIFIER	HP	8449B	3008A016	572	<b>X</b>
SIGNAL GENERATOR	HP	83630B	3722A00588	UH340	<b>X</b>
ANTENNA	YORK	CBL611/A	1618	UH191	<b>X</b>

Radiated emissions bottom channel 154.07MHz 30MHz – 1GHz

**MKR: 158.0MHz**

**79.40dBuV**

**RB 100kHz#**

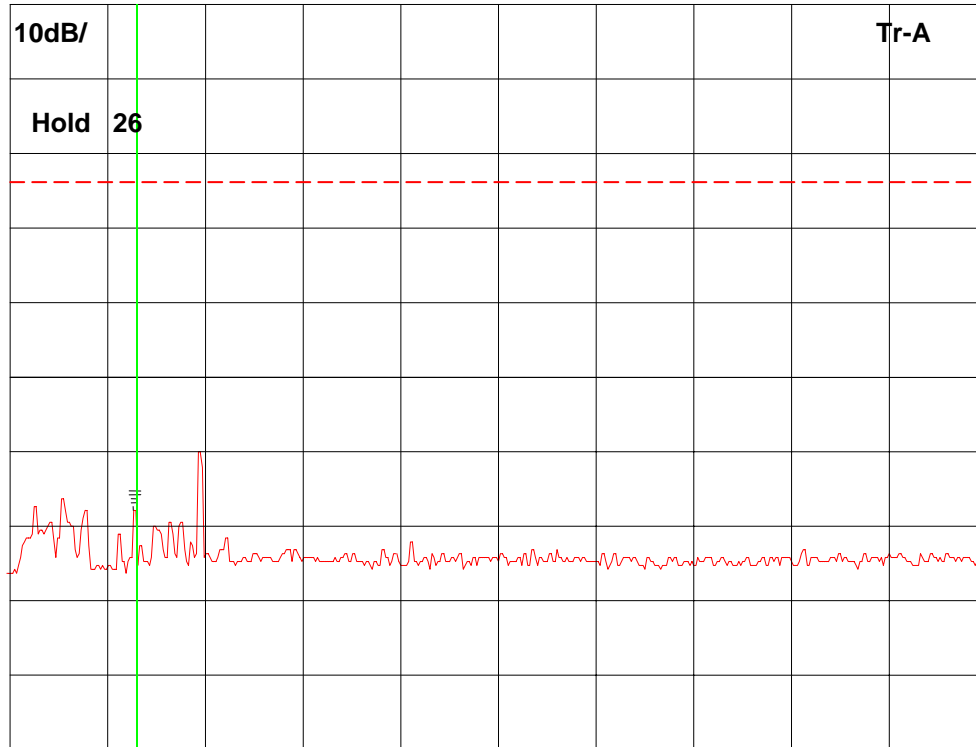
**AT 10dB#**

**Band auto**

**RLV: 147.32dBuV#**

**VB 100kHz**

**ST 800ms#**



-13dBm  
Limit  
Line

**ST:30.0MHz**

**SP:1.0000GHz**

Radiated emissions Middle channel 157.70MHz 30MHz – 1GHz

MKR: 156.1MHz

85.20dBuV

RB 100kHz#

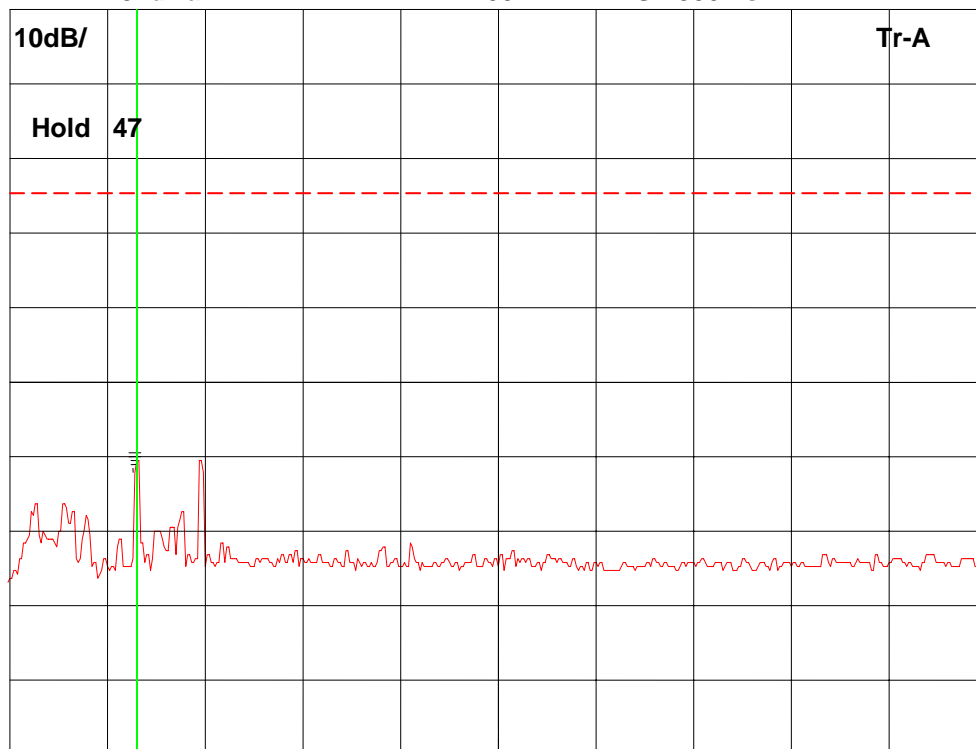
AT 10dB#

Band auto

RLV: 147.32dBuV#

VB 100kHz

ST 800ms#



-13dBm  
Limit  
Line

ST:30.0MHz

SP:1.0000GHz

Radiated emissions Top channel 158.91MHz 30MHz – 1GHz

**MKR: 160.0MHz**

**83.12dBuV**

**RB 100kHz#**

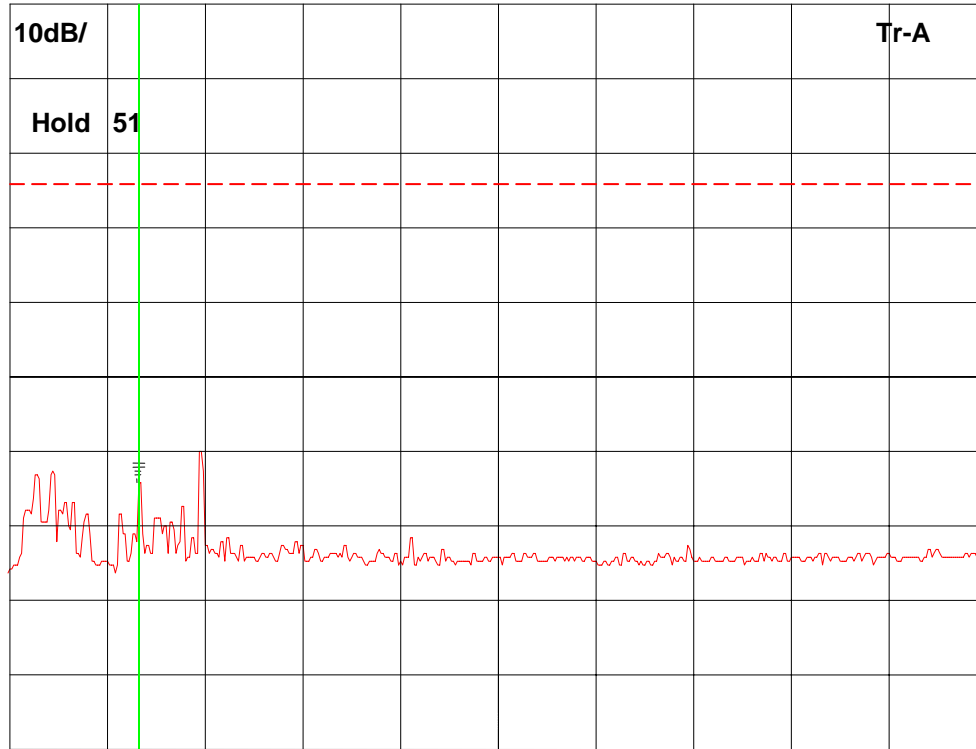
**AT 10dB#**

**Band auto**

**RLV: 147.32dBuV#**

**VB 100kHz**

**ST 800ms#**



**ST:30.0MHz**

**SP:1.0000GHz**

Radiated emissions bottom channel 154.07MHz 1GHz - 2GHz

**MKR: 1.154GHz**

**79.33dBuV**

**RB 100kHz#**

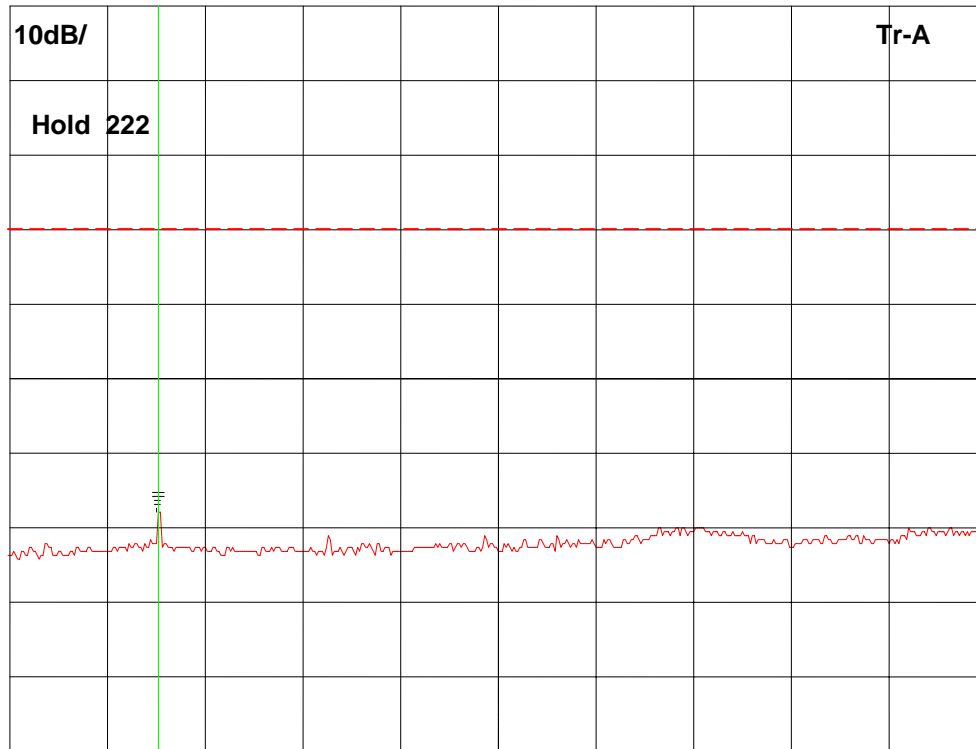
**AT 10dB#**

**Band auto**

**RLV: 147.32dBuV#**

**VB 100kHz**

**ST 800ms#**





Radiated emissions Middle channel 157.70MHz 30MHz – 1GHz

MKR: 1.706GHz

77.32dBuV

RB 100kHz#

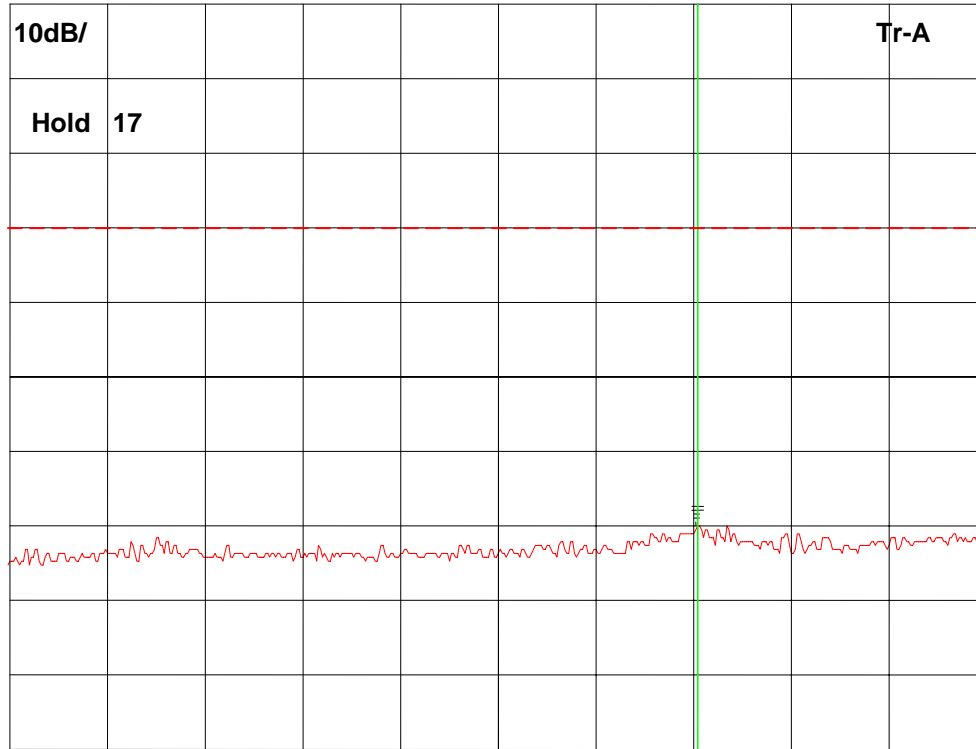
AT 10dB#

Band auto

RLV: 147.32dBuV#

VB 100kHz

ST 800ms#



-13dBm  
Limit  
Line

ST:1.000GHz

SP:2.000GHz



**ANNEX A**  
**PHOTOGRAPHS**





**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	-		[X]
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		[ ]
e.	LABELLING	-	PHOTOGRAPHS	[X]
		-	DECLARATION	[X]
		-	DRAWINGS	[X]
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**



TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH06/07	IC OATS Submission	TRL	01/06/2007	24	01/06/2009
UH006	3m Range ERP CAL	TRL	08/12/2006	12	08/12/2007
UH028	Log Periodic Ant	Schwarbeck	30/05/2007	24	30/05/2009
UH029	Bicone Antenna	Schwarbeck	22/05/2007	24	22/05/2009
UH041	Multimeter	AVOmeter	04/01/2007	12	04/01/2008
UH089	Signal Generator	Marconi	09/01/2007	12	09/01/2008
UH093	Bilog Antenna	Chase	21/05/2007	24	21/05/2009
UH105	Signal Generator	Marconi	31/05/2007	12	31/05/2008
UH132	Power meter	Marconi	10/01/2007	12	10/01/2008
UH162	ERP Cable Cal	TRL	02/01/2007	12	02/01/2008
UH228	Power Sensor	Marconi	15/01/2007	12	15/01/2008
UH253	1m Cable N type	TRL	07/12/2006	12	07/12/2007
UH254	1m Cable N type	TRL	07/12/2006	12	07/12/2007
UH265	Notch filer	Telonic	11/01/2006	24	11/01/2008
UH269	1m Cable N type	TRL	07/12/2006	12	07/12/2007
UH270	1m Cable N type	TRL	07/12/2006	12	07/12/2007
UH271	1.5m Cable N type	TRL	07/12/2006	12	07/12/2007
UH272	1.5m Cable N type	TRL	07/12/2006	12	07/12/2007
UH273	2m Cable N type	TRL	07/12/2006	12	07/12/2007
UH274	2m Cable N type	TRL	07/12/2006	12	07/12/2007
UH281	Spectrum Analyser	R&S	24/07/2006	12	24/07/2007
UH297	Signal Generator	R&S	30/05/2007	12	30/05/2008
UH340	Signal Generator	HP	29/06/2006	12	29/06/2007
L005	CMTA	R&S	10/01/2007	12	10/01/2008
L007	Loop Antenna	R&S	22/05/2007	24	22/05/2009
L103	Attenuator	Bird		Calibrate in Use	
L112	Attenuator	Bird		Calibrate in Use	
L138	1-18GHz Horn	EMCO	23/05/2007	24	23/05/2009
L139	1-18GHz Horn	EMCO	23/05/2007	24	23/05/2009
L170	Combiner	Elcom		Calibrate in Use	
L176	Signal Generator	Marconi	01/03/2007	12	01/03/2008
L220	Attenuator	Bird		Calibrate in Use	
L426	Temperature Indicator	Fluke	09/01/2007	12	09/01/2008
L479	Analyser	Anritsu	09/01/2007	12	09/01/2008
L572	Pre Amplifier	HP		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%**