

TEST REPORT NO: RU1244/7047  
COPY NO: .1-----  
ISSUE NO: 1  
FCC ID: NE0-1667Series

**REPORT ON THE CERTIFICATION TESTING OF A  
AERIAL FACILITIES LIMITED  
60-166701  
WITH RESPECT TO  
THE FCC RULES CFR 47, PART 90 Subpart I  
PRIVATE LAND MOBLIE REPEATER.**

TEST DATE: 25<sup>th</sup> May – 30<sup>th</sup> May 2006

TESTED BY: ----- PP D WINSTANLEY

APPROVED BY: ----- P GREEN  
PRODUCT MANAGER  
EMC

DATE: 9<sup>th</sup> October 2006-----

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**TRL COMPLIANCE LTD**

MOSS VIEW NIPE LANE UP HOLLAND WEST LANCASHIRE WN8 9PY UNITED KINGDOM

TELEPHONE +44 (0) 1695 556666 FAX +44 (0) 1695 557077

E-MAIL [test@trlcompliance.com](mailto:test@trlcompliance.com) [www.trlcompliance.com](http://www.trlcompliance.com)

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SYSTEM DIAGRAM		E
<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.		

**CERTIFICATE OF CONFORMITY & COMPLIANCE**

FCC IDENTITY: NEO-1667Series

PURPOSE OF TEST: Certification

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

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: 60-166701

EQUIPMENT TYPE: Private Land Mobile Repeater

MAXIMUM GAIN  
Uplink = 41.70 dB  
Downlink = 45.2 dB

MAXIMUM INPUT  
Uplink = - 40.70 dBm  
Downlink = - 0.1 dBm

MAXIMUM OUTPUT  
Uplink = - 0.65 dBm  
Downlink = 35.1 dBm

ANTENNA TYPE: Not applicable

CHANNEL SPACING: Wideband

FREQUENCY GENERATION: N/A

MODULATION TYPE: F3E

POWER SOURCE(s): 110Vac

TEST DATE(s): 25<sup>th</sup> May – 30<sup>th</sup> May 2006

ORDER No(s): 36615

APPLICANT: Aerial Facilities Limited

ADDRESS: Aerial House  
Asheridge Road  
Chesham  
Buckinghamshire  
HP5 2QD  
United Kingdom

TESTED BY: \_\_\_\_\_ PP  
D WINSTANLEY

APPROVED BY: \_\_\_\_\_ P GREEN  
PRODUCT  
MANAGER EMC

## APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): 60-166701

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): 36615

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 2QD  
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) : 25<sup>th</sup> May – 30<sup>th</sup> May 2006

TEST REPORT No: RU1244/7047

### 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 [ ] | Class B [X] |
|  |  | Downlink                         | Class A [ ] | Class B [X] |
| 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:                         | Narrowband                       | [ ]         |             |
|  |  | Wideband                         | [X]         |             |
| 9.   | Test Location:                           | TRL Compliance Limited           |             |             |
|  |  | Up Holland                       | [X]         |             |
|  |  | Long Green                       | [ ]         |             |
| 10.  | Modifications made during test program : | No modifications were performed. |             |             |

**System description:**

The 60-166701 is a bi-directional amplifier. The downlink is wideband and operates over the frequency range 851MHz to 869MHz .The 60-166701 input is fed by FCCID NEO60-1665Series and the output of the 60-166701 is split into 5 antenna feeds, 4 track feeds and 1 station feed.

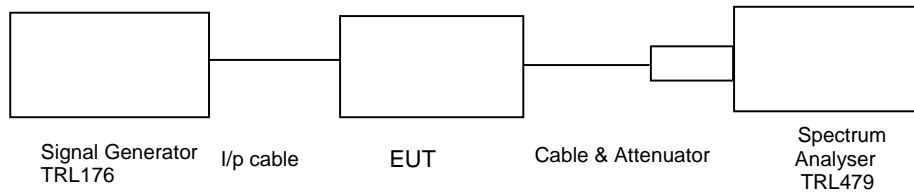
The uplink is wideband and operates over the frequency range 806MHz to 824MHz. The uplink input signals to the 60-166701 are from the 4 track feeds and 1 station feed and are combined inside the 60-166701. The output from the 60-166701 is fed into FCCID NEO60-1665Series. The uplink is channelised by FCCID NEO60-1661Series. See Annex E for system diagram.

## COMPLIANCE TESTS

### AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – UPLINK

Ambient temperature = 21 °C  
 Relative humidity = 42%  
 Supply voltage = 110Vac  
 Channel number = See test results

Radio Laboratory



Frequency MHz	Signal Generator input level dBm	Input cable loss dB	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
806	-40.7	0.4	46.5	-47.15	40.45	-0.65	30.6
815	-42.2	0.4	46.5	-47.40	41.70	-0.9	31.9
824	-41.6	0.4	46.5	-48.08	40.42	-1.58	31.02

Notes:

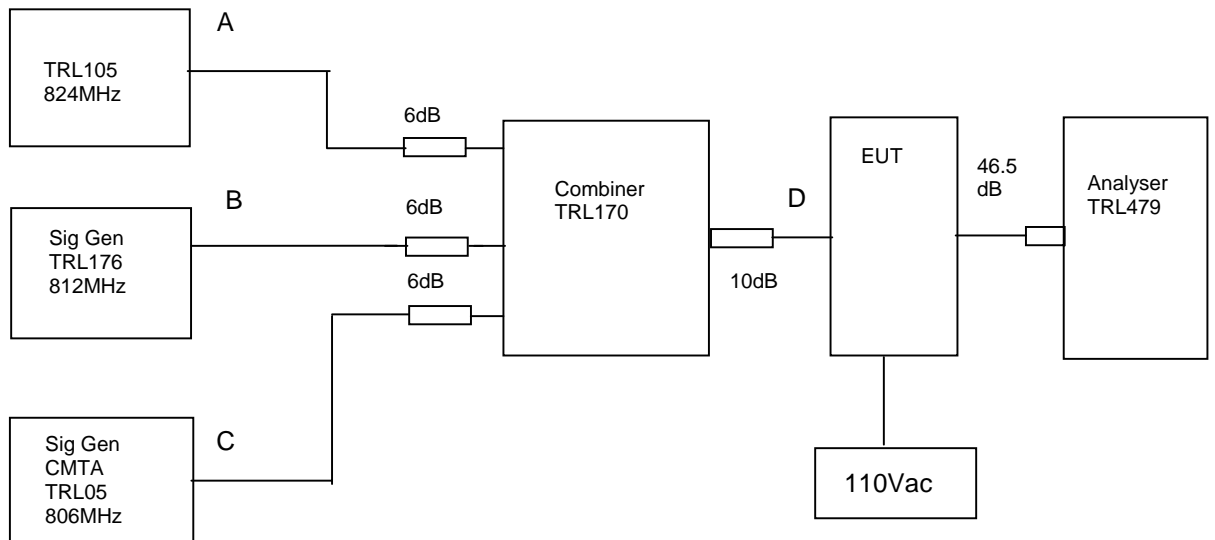
- The signal generator input was increased by 10dBs and the level of the output signal remeasured

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	BIRD	8304-300-N	N/A	220/112/222	X
CABLE	N/A	N/A	N/A	TRL274	X
I/P CABLE & ATTENUATOR	N/A	N/A	N/A	TRL246 TRL273	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X

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

Ambient temperature = 19 °C  
 Relative humidity = 46%  
 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 -40.7.dBm. The cable and attenuator loss between the EUT and the spectrum analyser was 46.5dB.

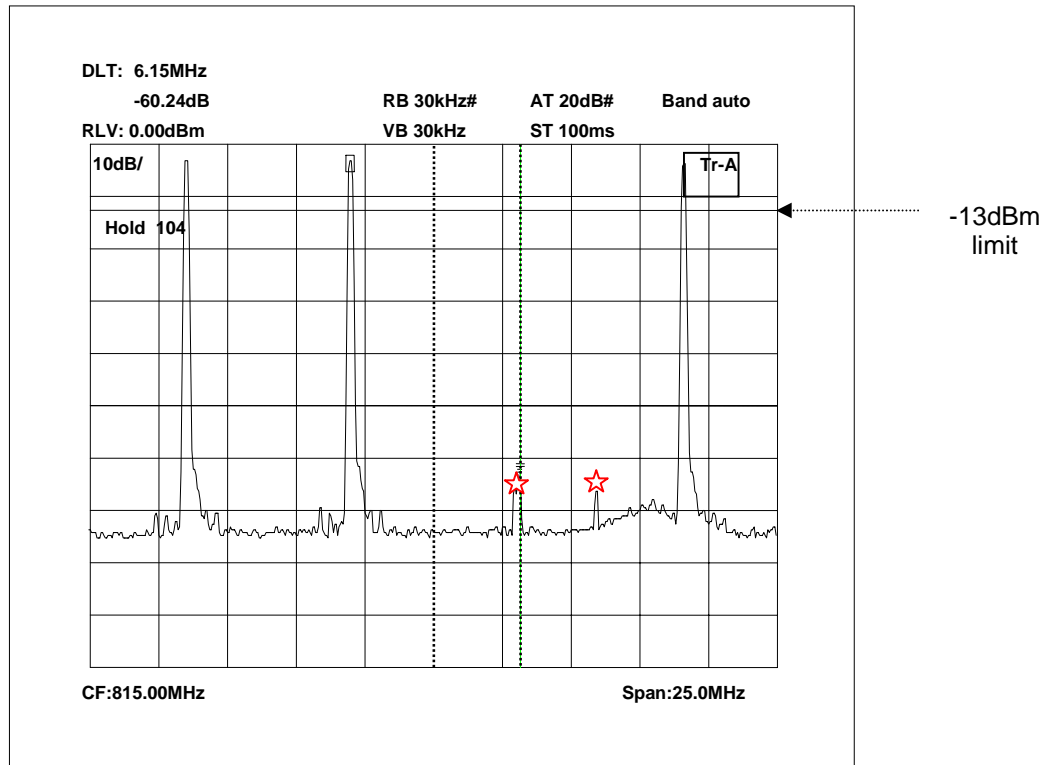
RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
824	812	806	-63.39@818.15MHz	-13

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>
SIGNAL GENERATOR	MARCONI	2042	119562/02	254	<b>X</b>
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>X</b>
COMBINER	ELCOM	RC-4-50	N/A	170	<b>X</b>

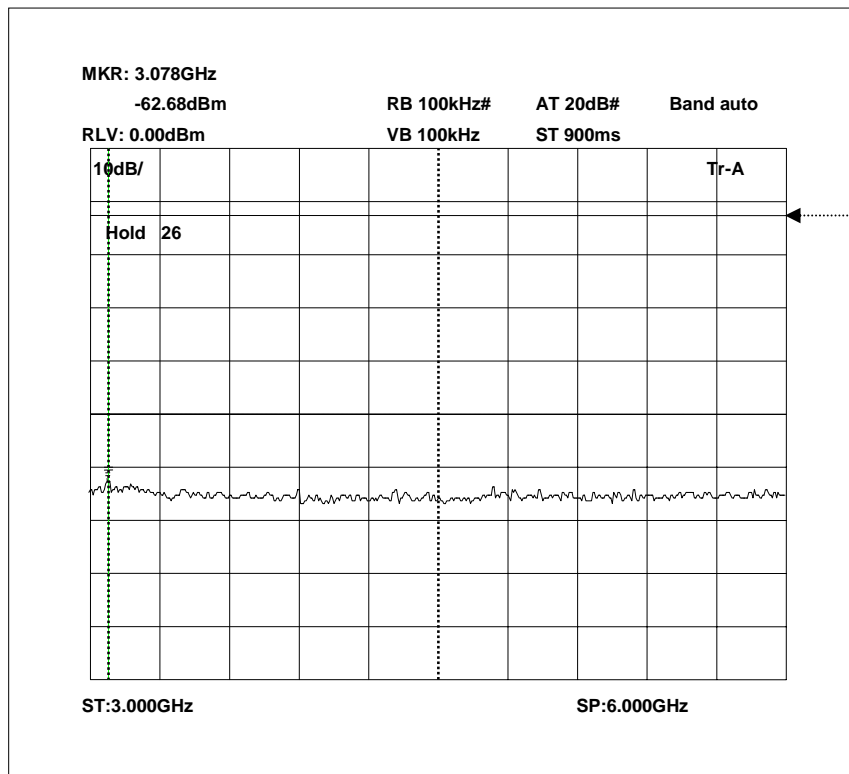
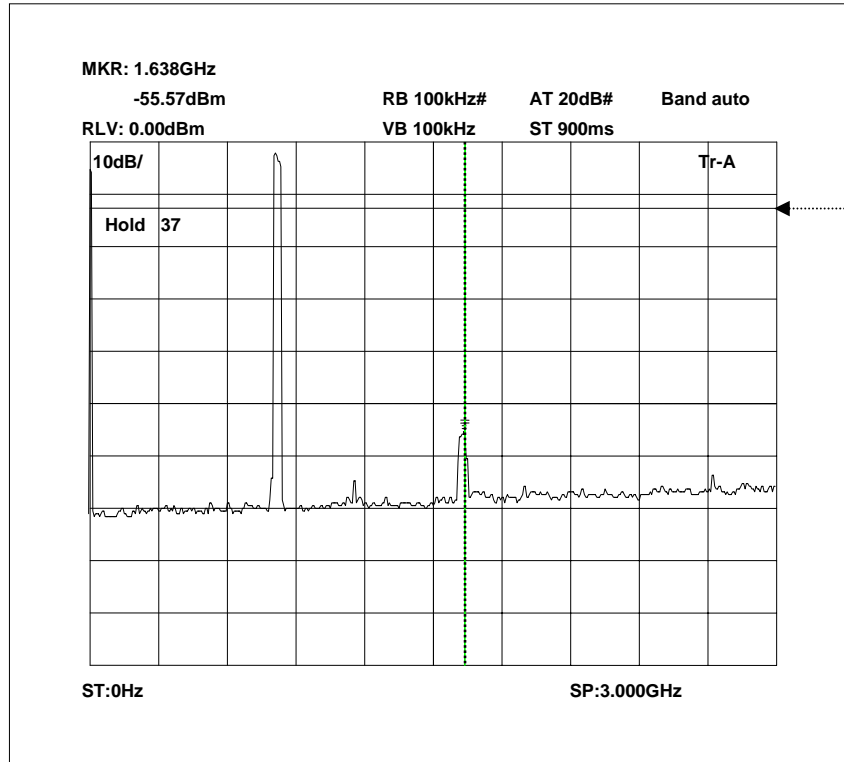
### Intermodulation Inband



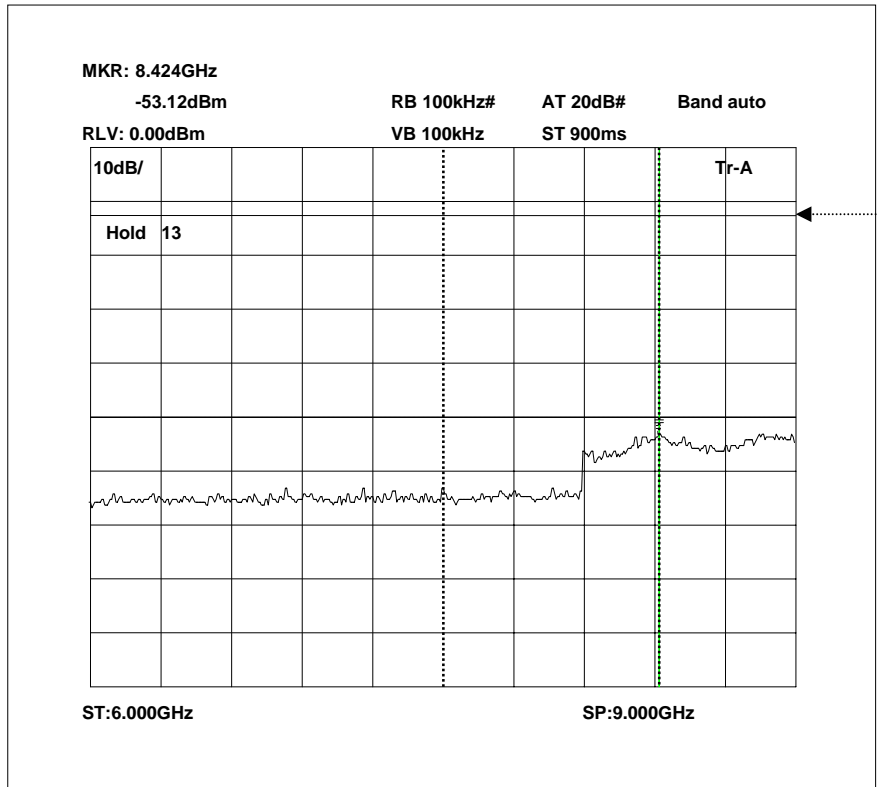
The above plot shows that all products (designated by ☆) are below the spurious limit.



### Intermodulation Wideband



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

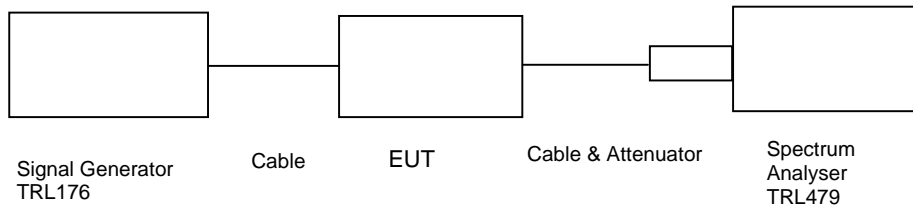


The above plot shows that there are no products outside the bands.

**TRANSMITTER TESTS**

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

Ambient temperature = 21 °C Radio Laboratory  
 Relative humidity = 45%  
 Supply voltage = 110vac  
 Channel number = See test results



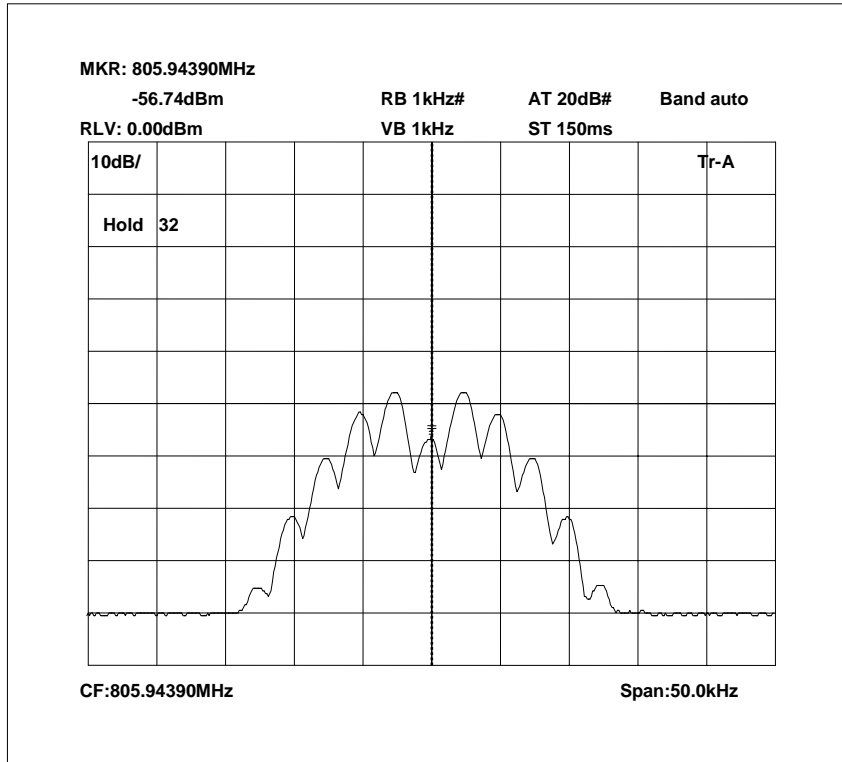
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-40.7dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

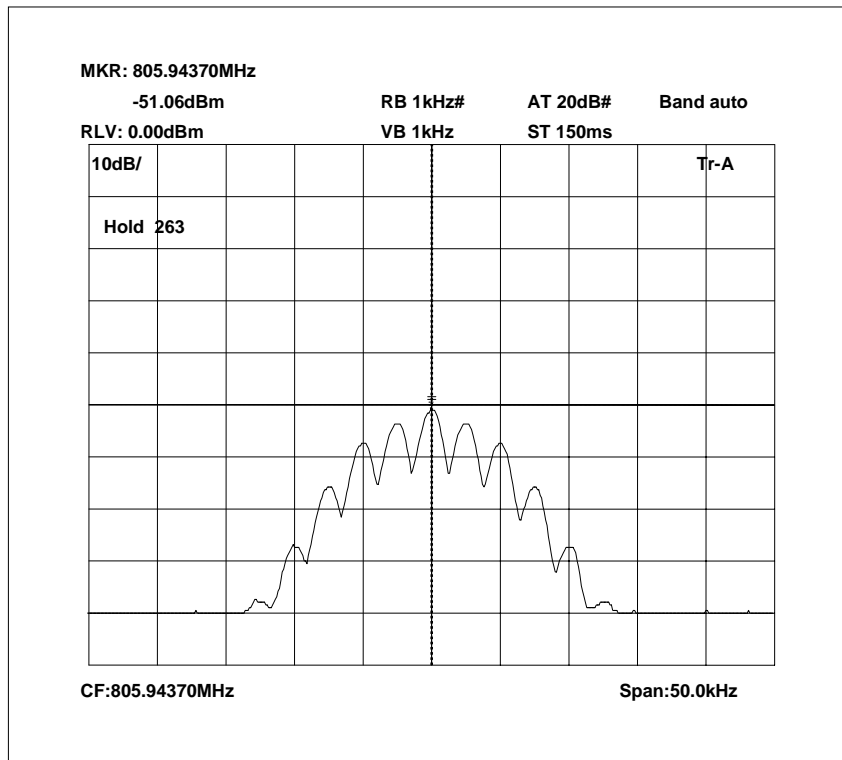
1. Cable TRL273 and attenuators TRL220/222/112 =46.5dB
2. Cable between signal generator and EUT=0.4 dB

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	280	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>X</b>

806 MHz Signal Generator, deviation set to 5kHz

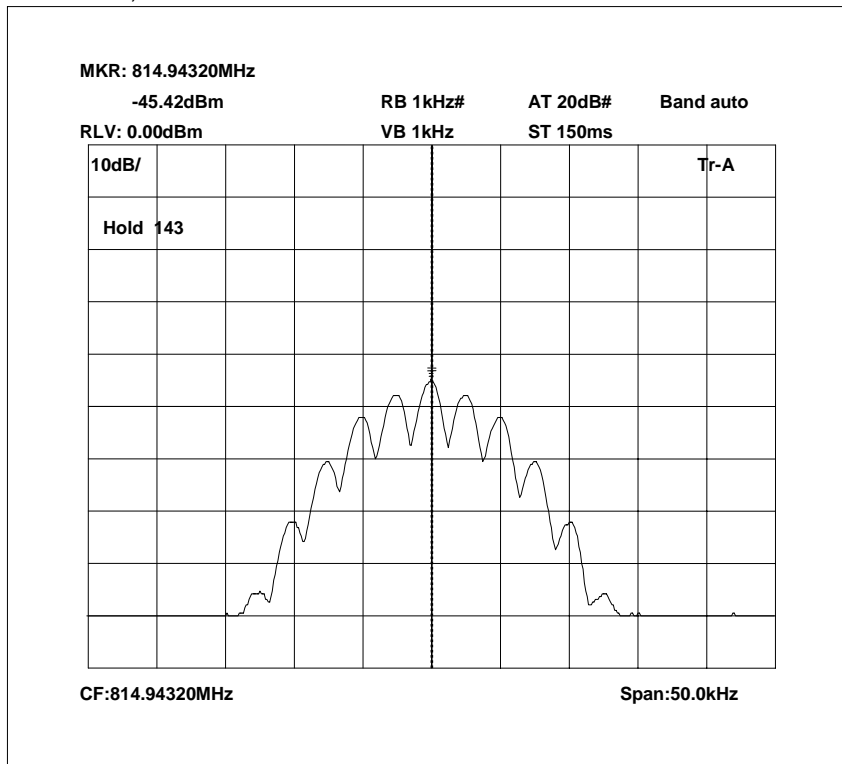


806 MHz Signal Generator and EUT, deviation set to 5kHz

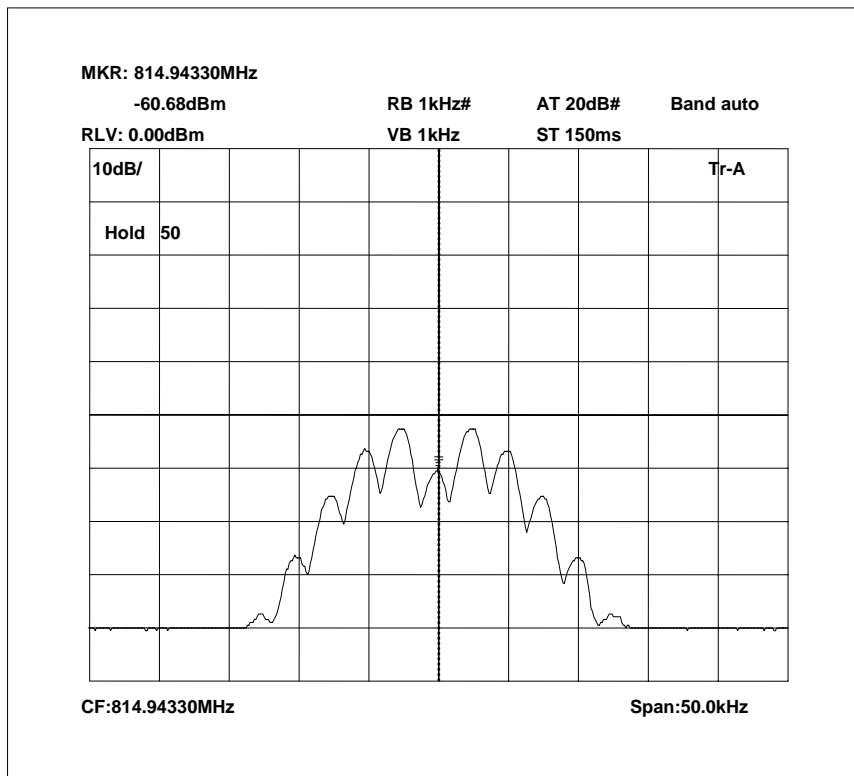


The plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

815 MHz Signal Generator, deviation set to 5kHz

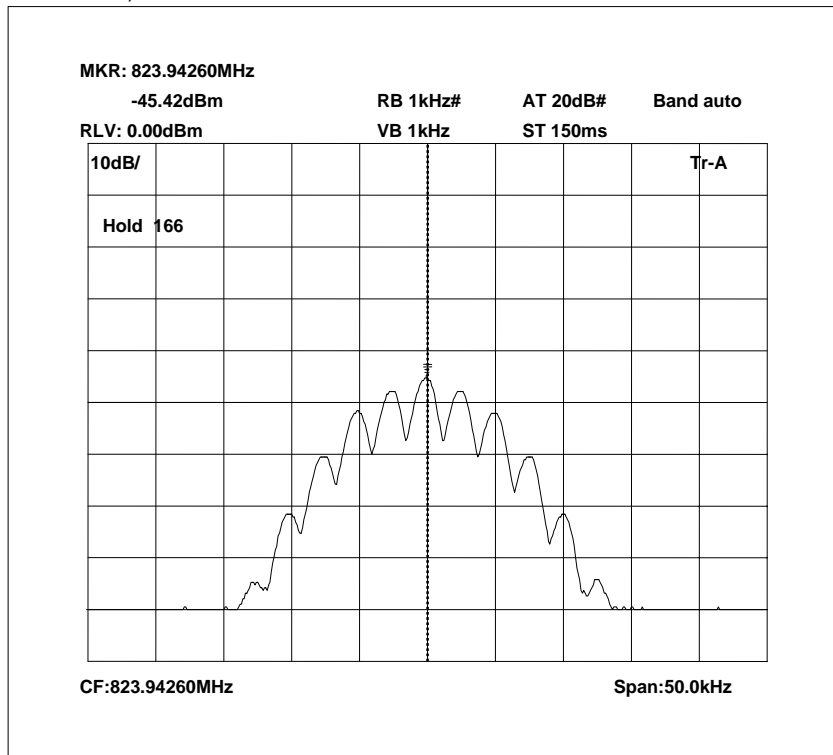


815 MHz Signal Generator and EUT, deviation set to 5kHz

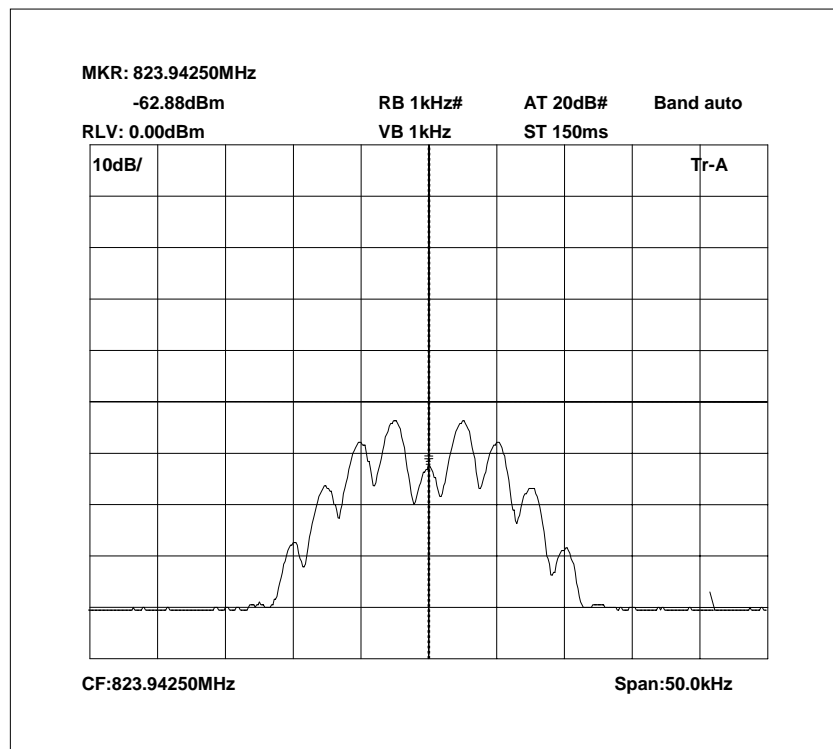


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

824 MHz Signal Generator, deviation set to 5kHz



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



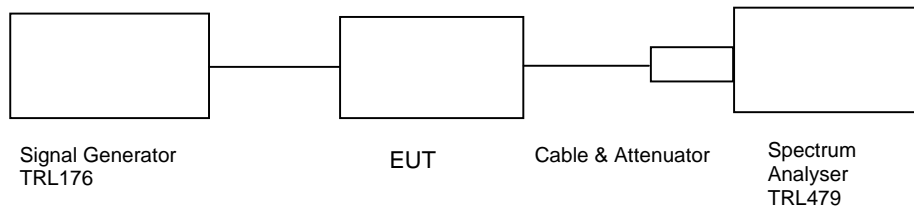
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

## TRANSMITTER TESTS

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

Ambient temperature = 21°C  
 Relative humidity = 47%  
 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  $43 + 10 \log P_{dB}$

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

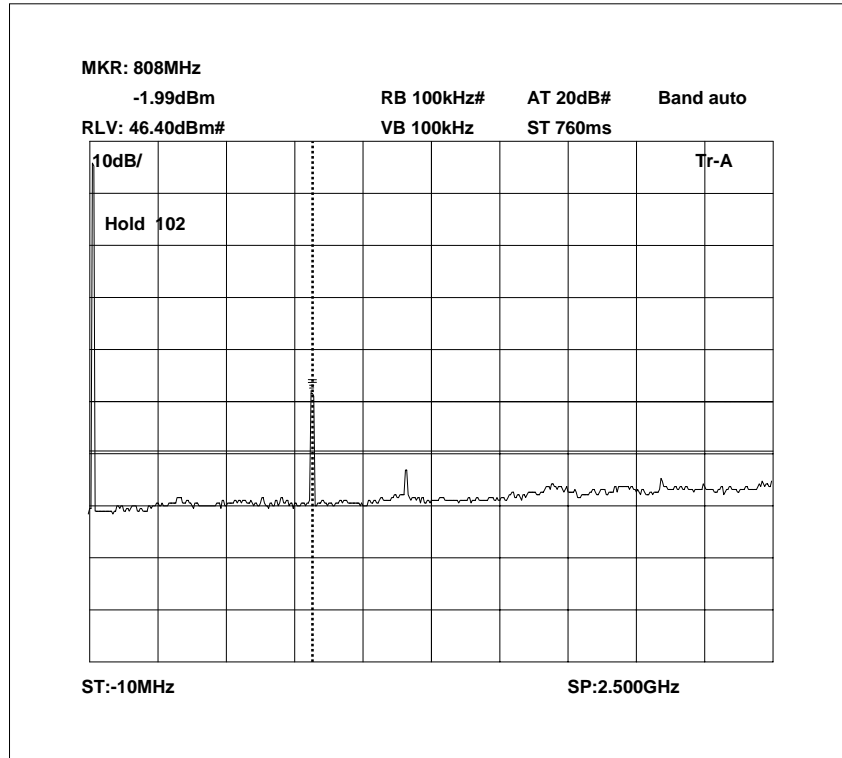
## RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0Hz – 9GHz	No Significant emissions within 10 db of the limit				-13

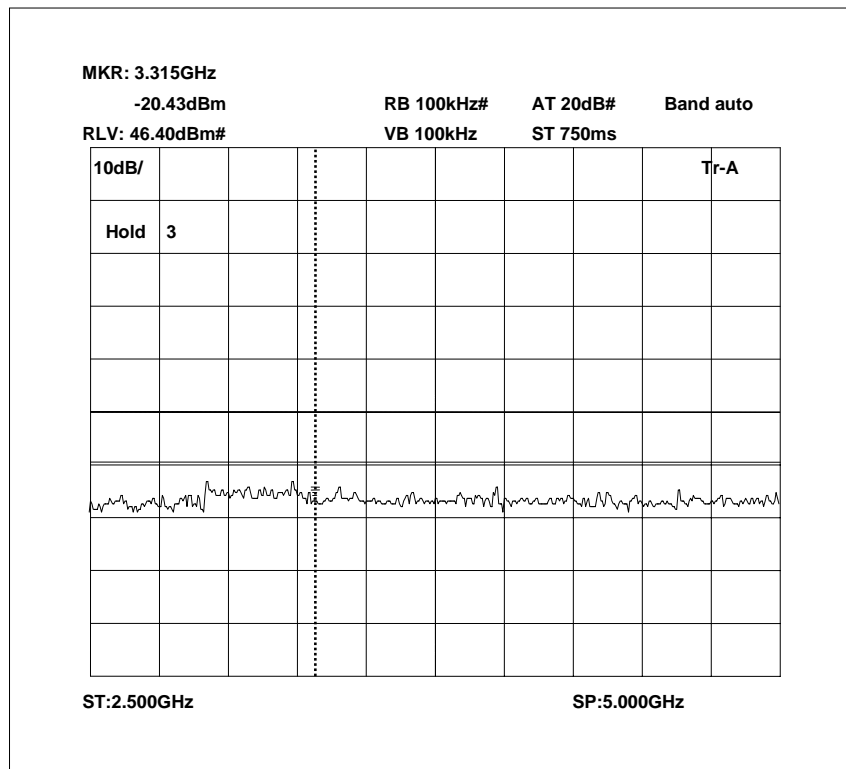
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	280	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>X</b>

Conducted emissions 806MHz 0 – 2.5GHz

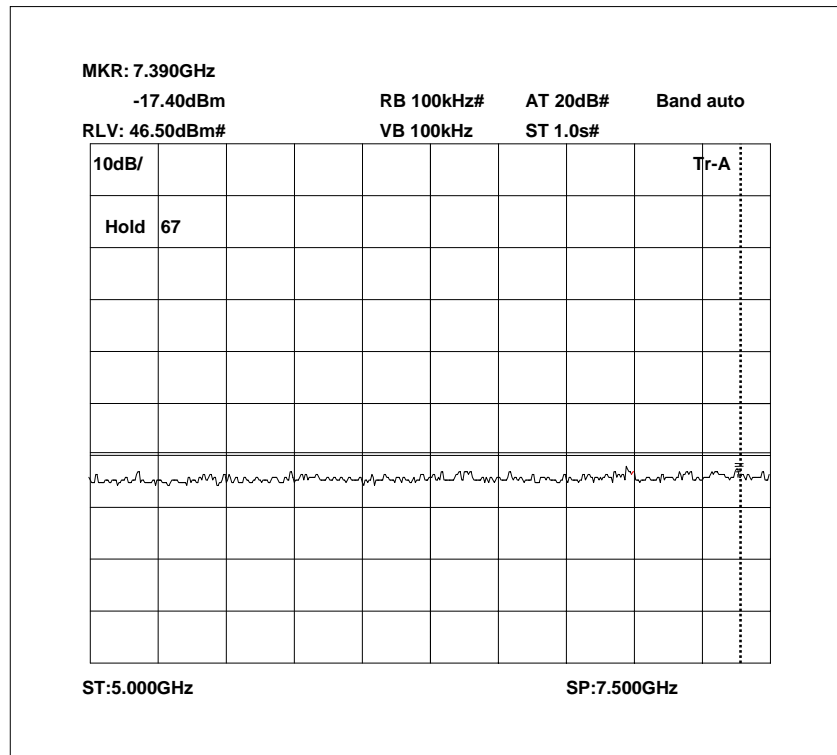


Conducted emissions 806MHz 2.5 – 5GHz

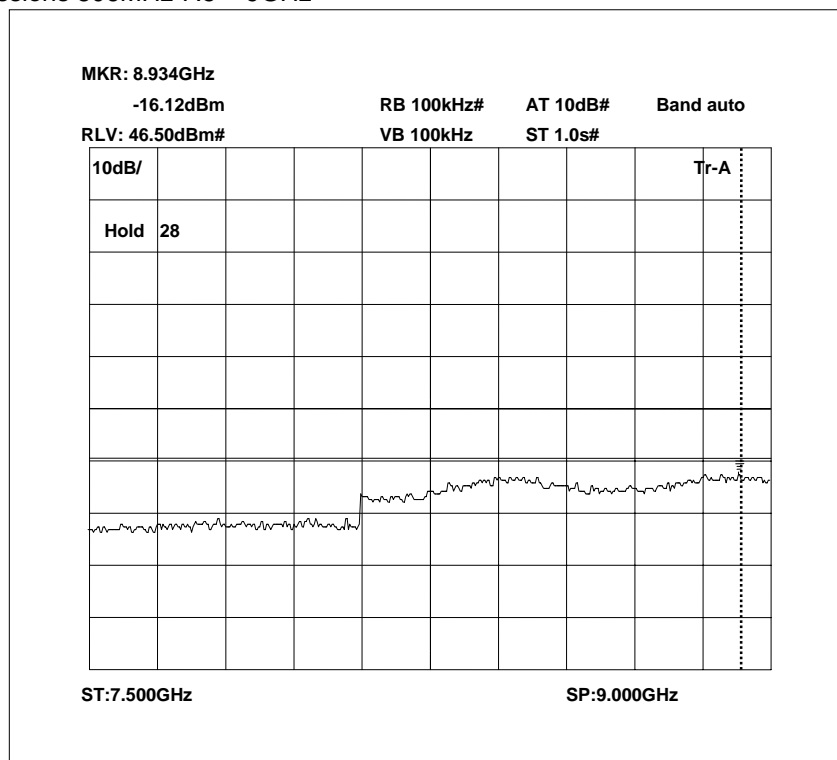




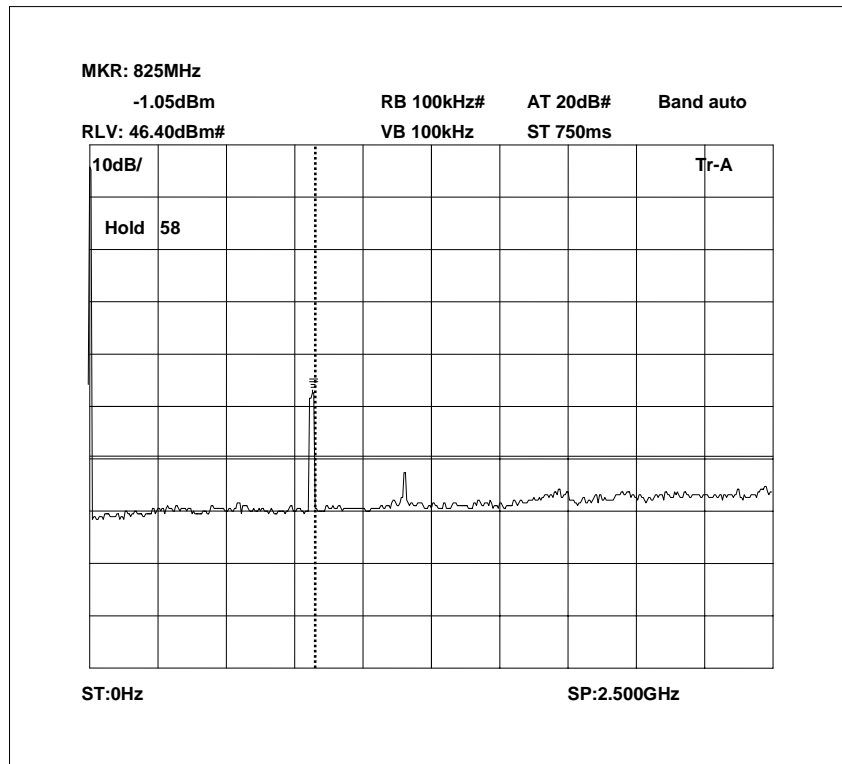
Conducted emissions 806MHz 5 – 7.5GHz



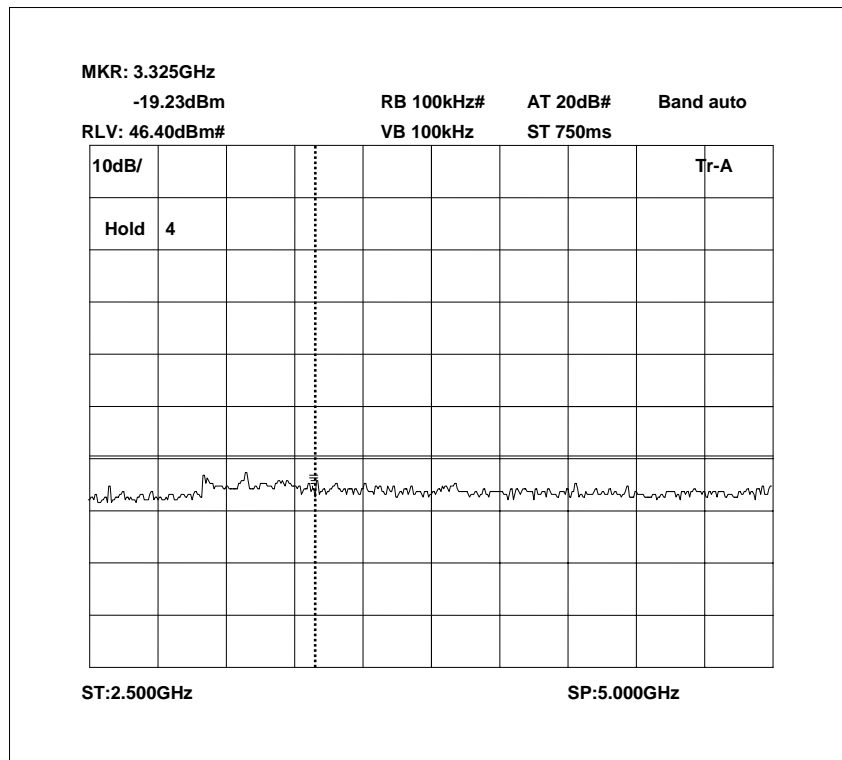
Conducted emissions 806MHz 7.5 – 9GHz



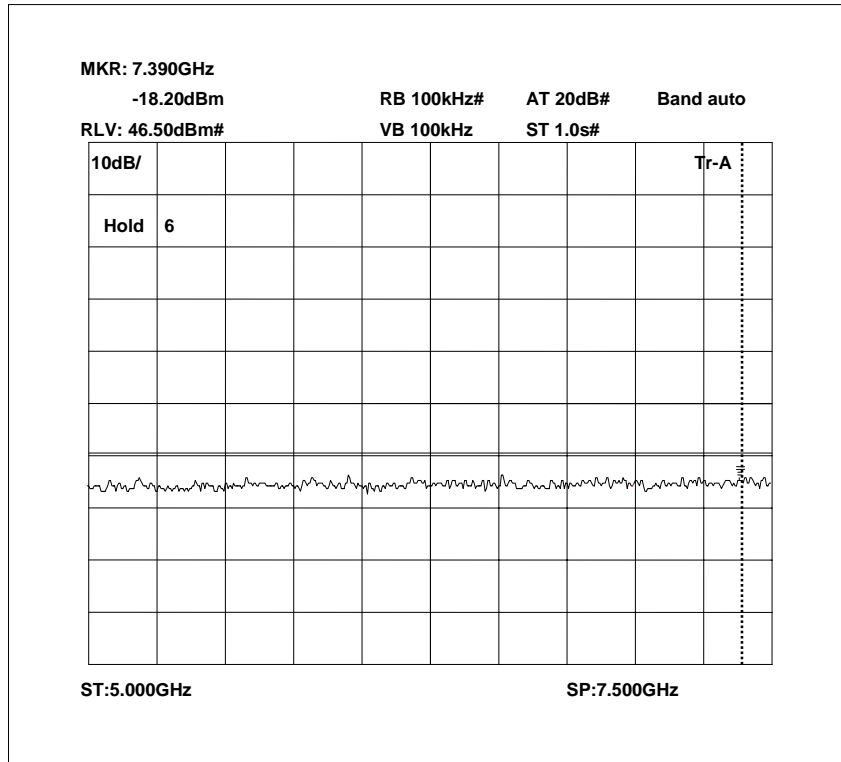
Conducted emissions 815MHz 0 – 2.5GHz



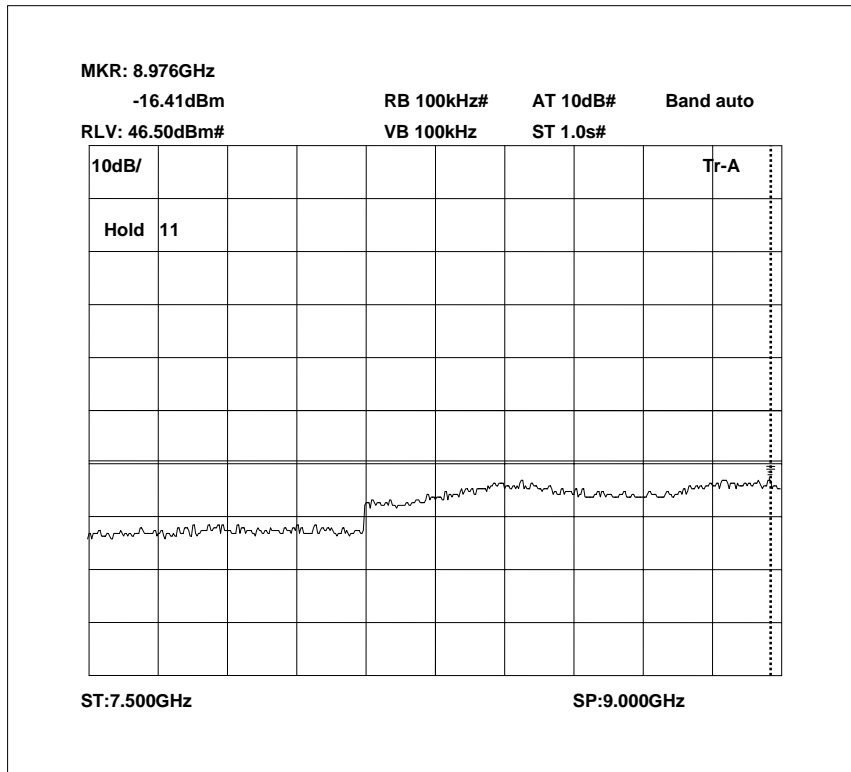
Conducted emissions 815MHz 2.5 – 5GHz



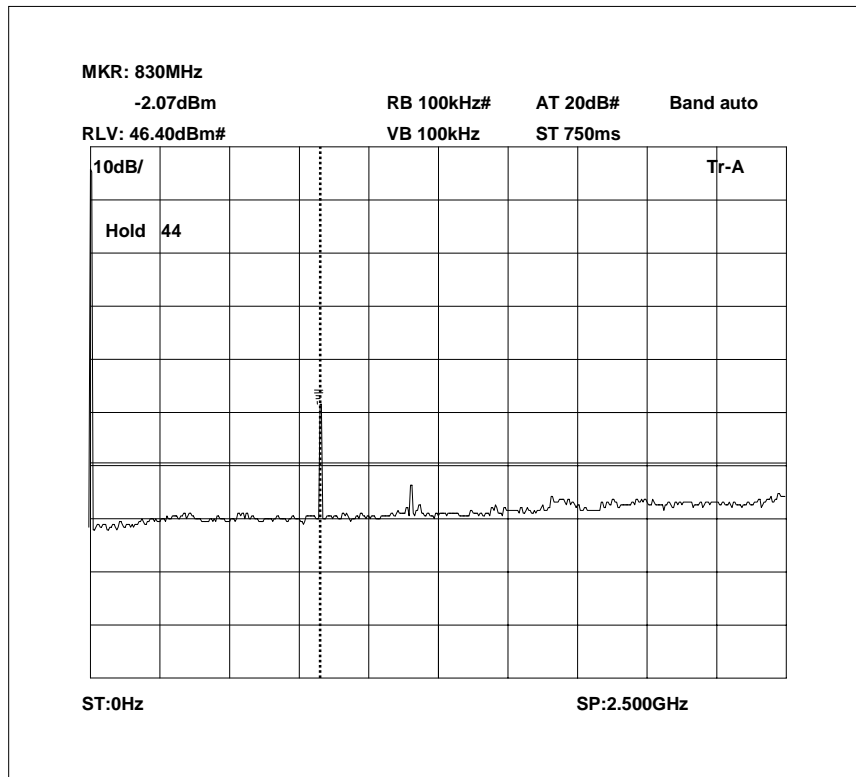
Conducted emissions 815 MHz 5 – 7.5.GHz



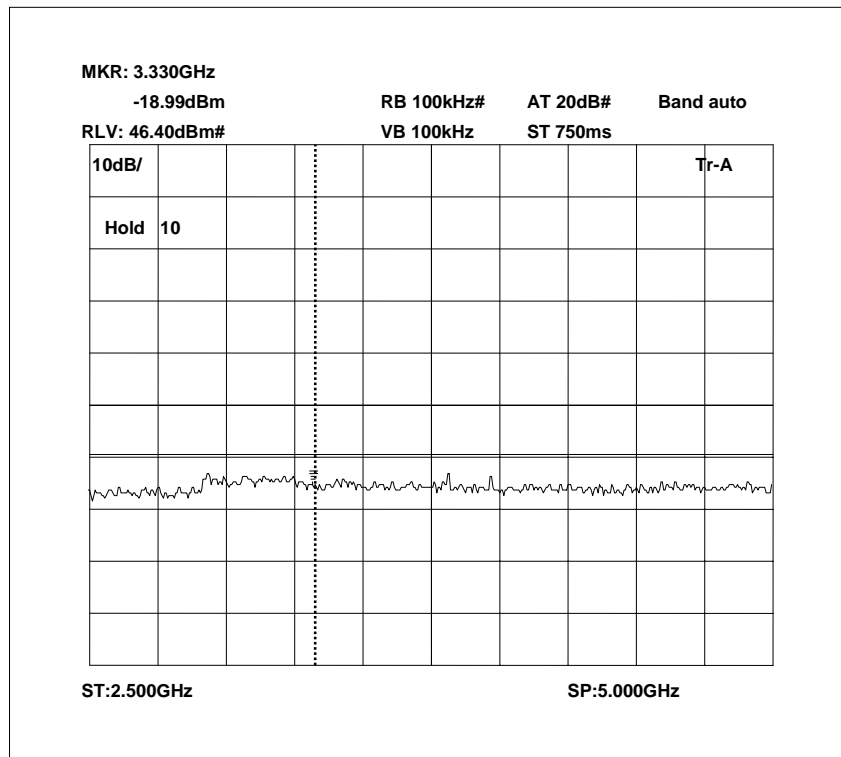
Conducted emissions 815MHz 7.5 – 9GHz



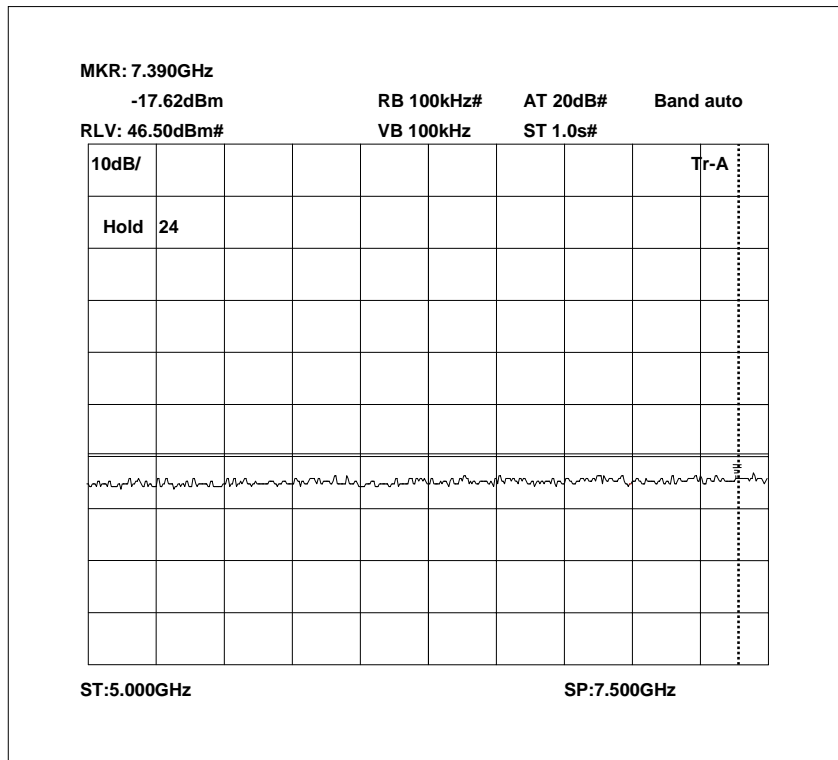
Conducted emissions 824 MHz 0 – 2.5 GHz



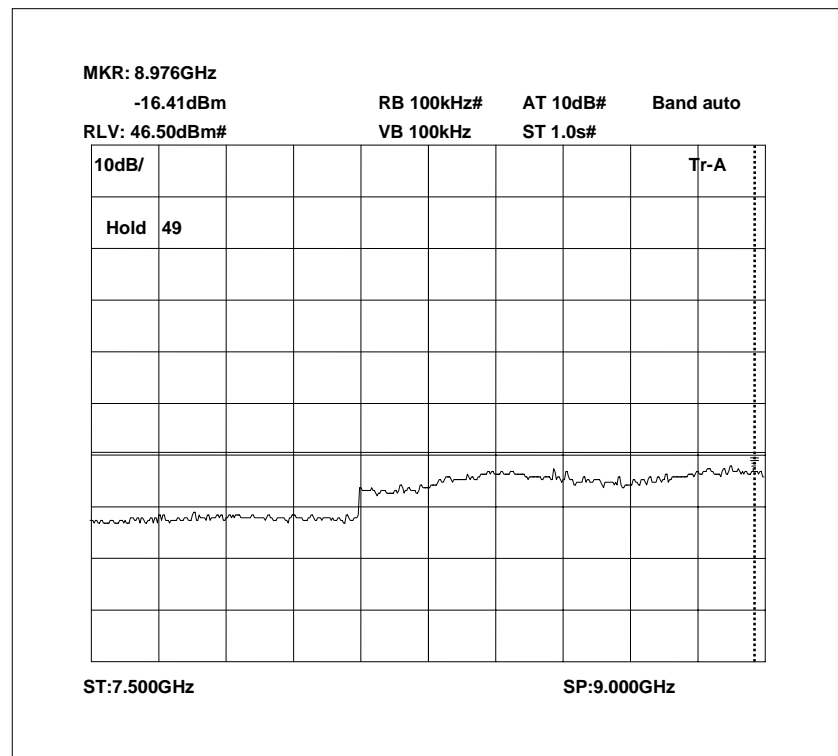
Conducted emissions 824MHz 2.5 – 5GHz



Conducted emissions 824MHz 5 – 7.5GHz



Conducted emissions 824MHz 7.5 – 9GHz

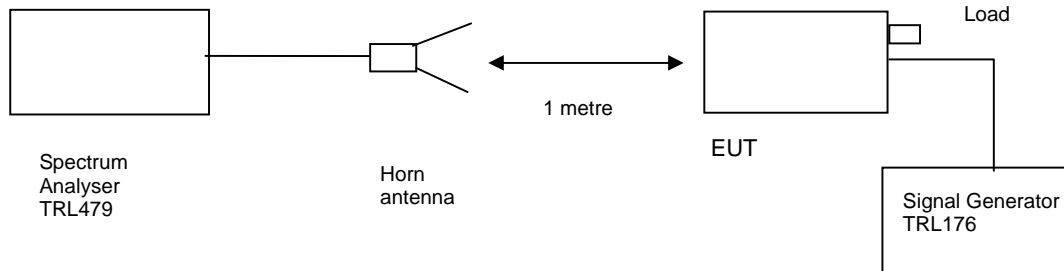


**TRANSMITTER TESTS**

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

Ambient temperature = 16°C  
 Relative humidity = 45%  
 Conditions = OATS  
 Supply voltage = 110Vac  
 Supply Frequency = 60Hz

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

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

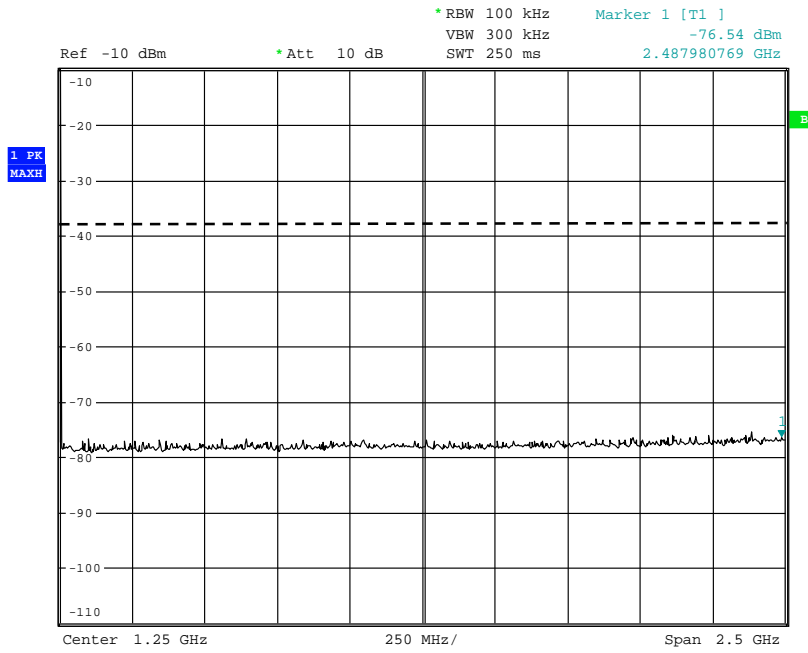
**RESULTS**

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
0 Hz – 9 GHz	No significant emissions within 20 dB of the limit						-13

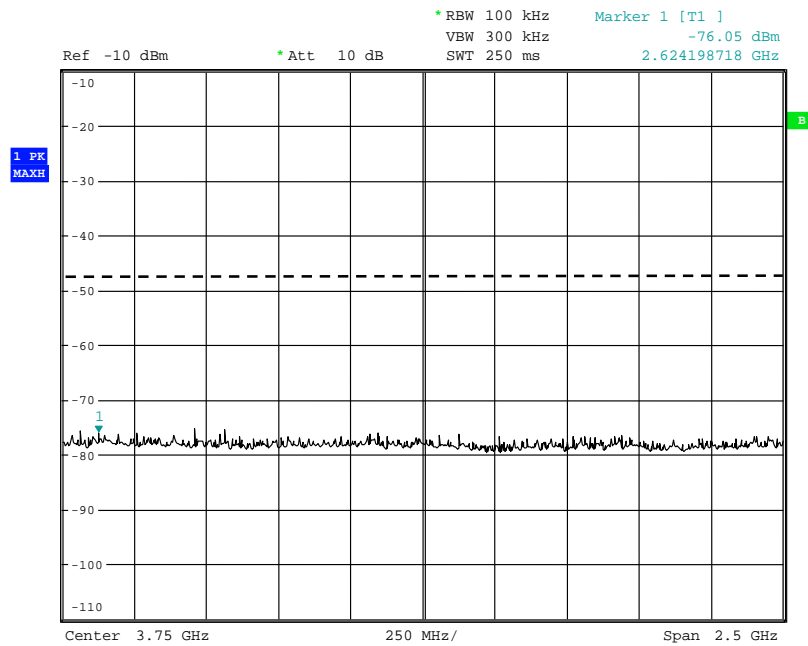
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
HORN	EMCO	3115	9010-3581	138	X
ATTENUATOR	BIRD	8304-300-N	N/A	220	X
CABLE	ROSENBERGER	MICRO COAX	N/A	280	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X

### Radiated emissions 806MHz 0 – 2.5GHz

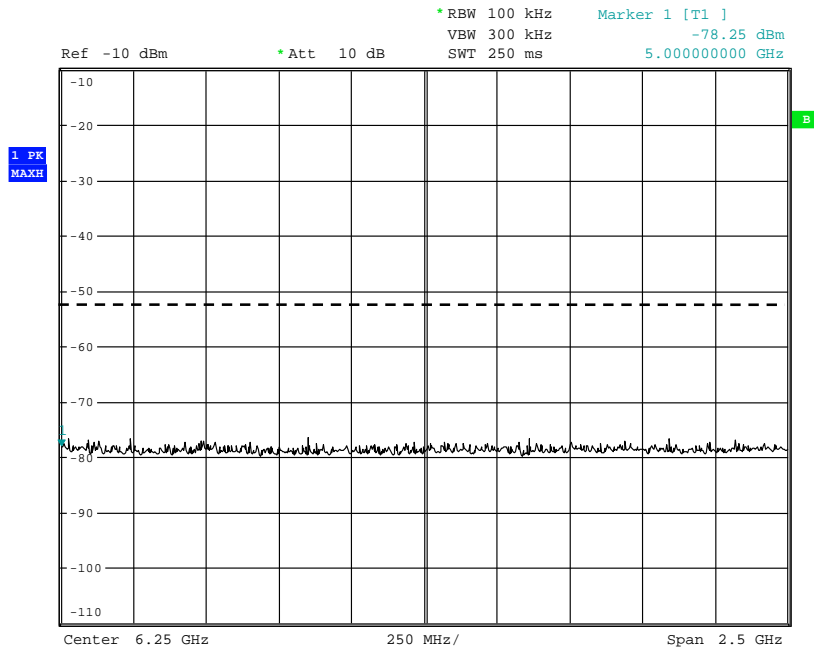


### Radiated emissions 806MHz 2.5 – 5GHz

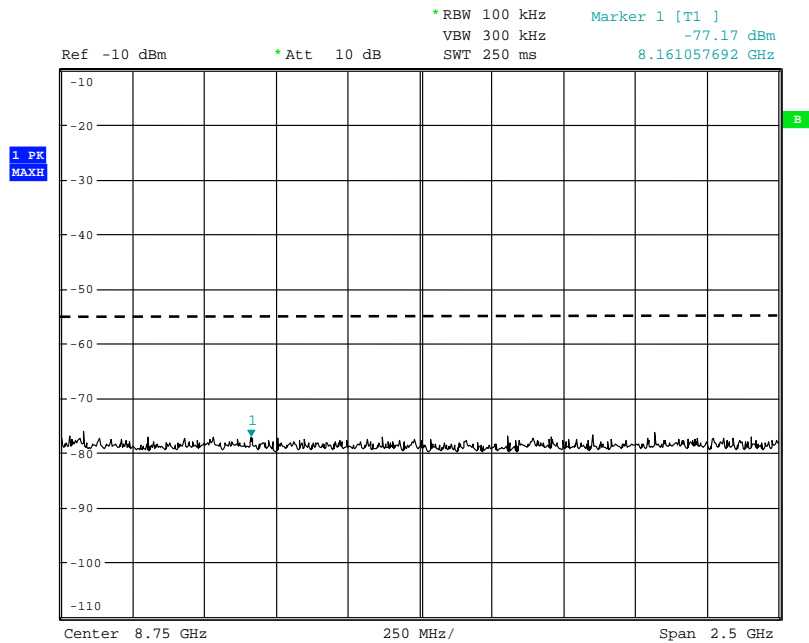


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions 806MHz 5 – 7.5GHz



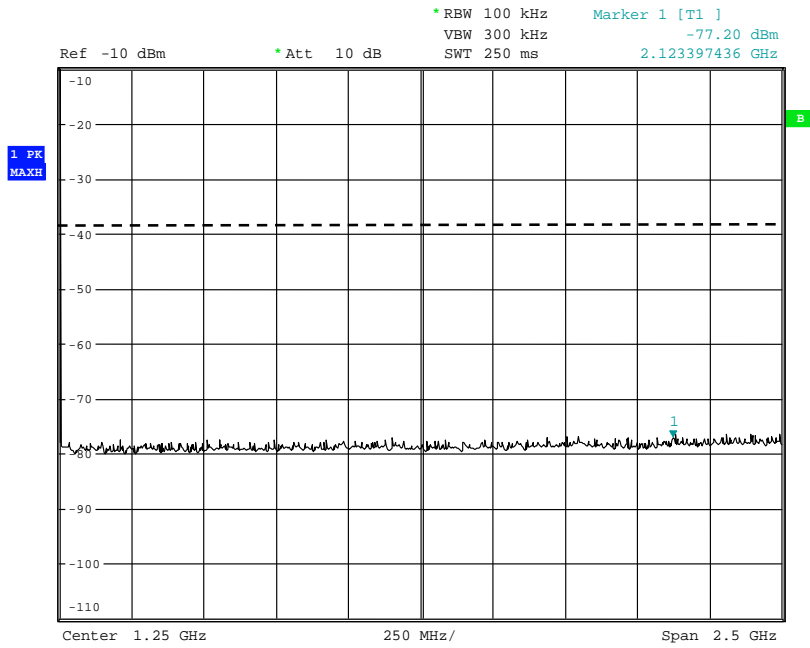
### Radiated emissions 806MHz 7.5 –10GHz



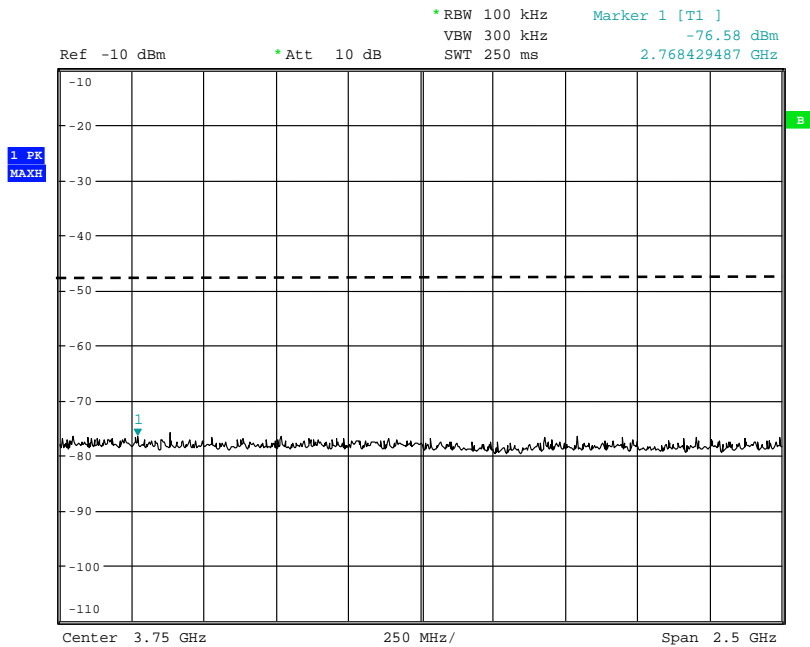
The above test results show that there were no emissions within 20dBs of the -13dBm limit.



### Radiated emissions 815MHz 0 – 2.5GHz

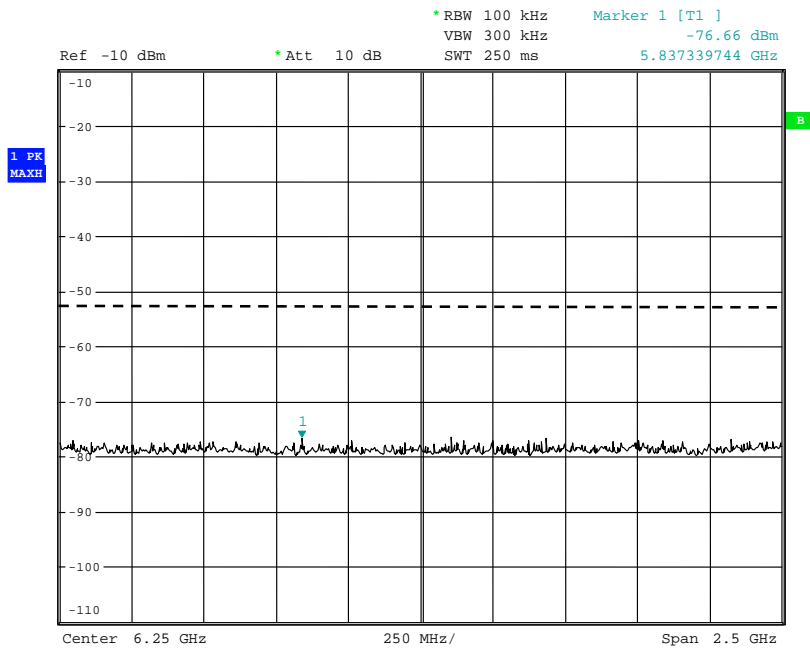


### Radiated emissions 815 MHz 2.5 – 5GHz

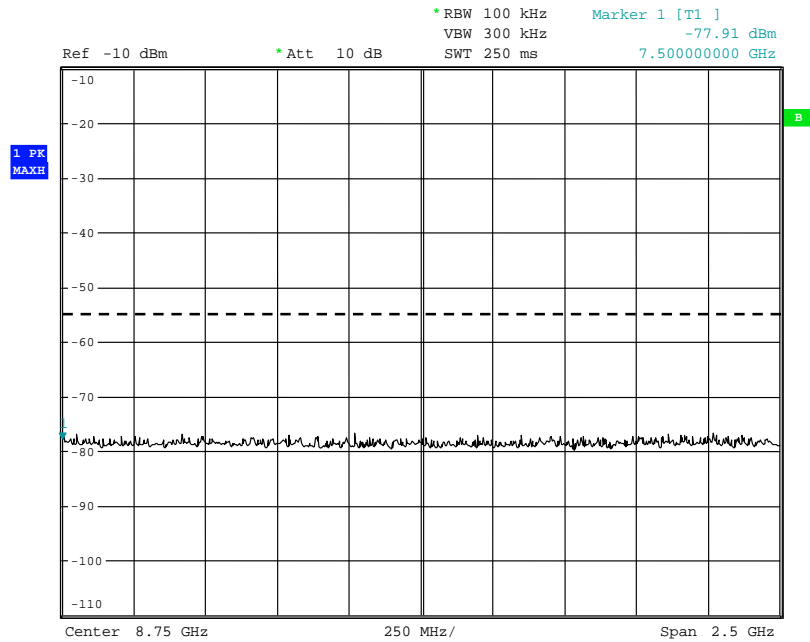


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions 815 MHz 5 -- 7.5GHz

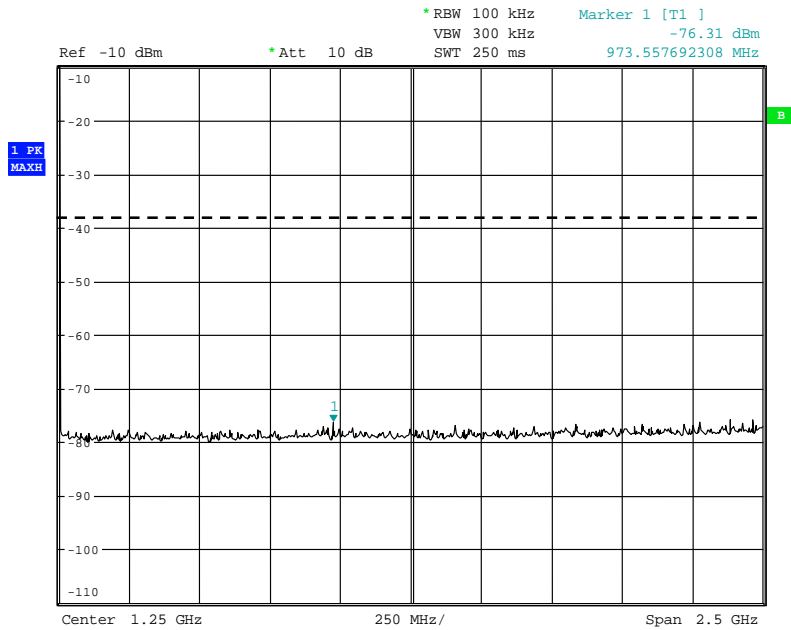


### Radiated emissions 815 MHz 7.5 --10GHz

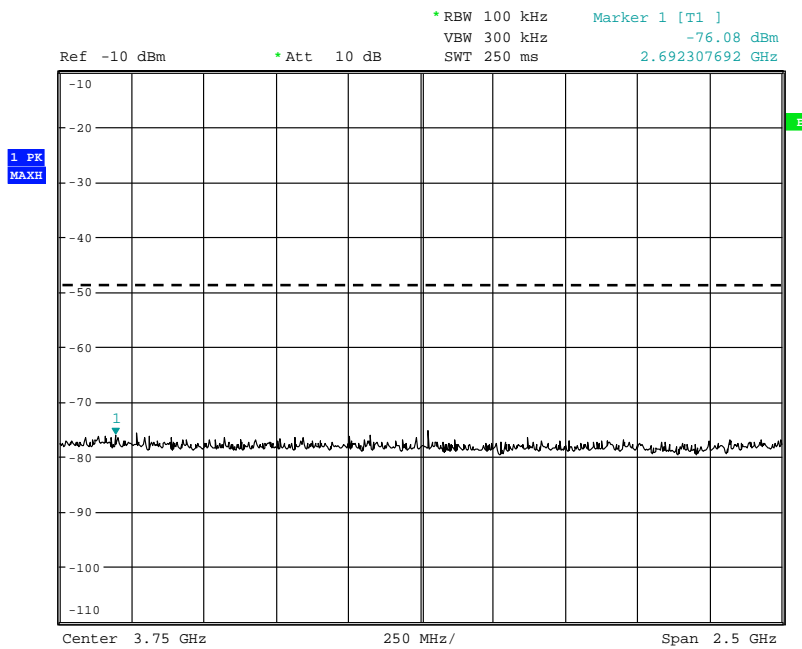


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions 824 MHz 0 – 2.5GHz

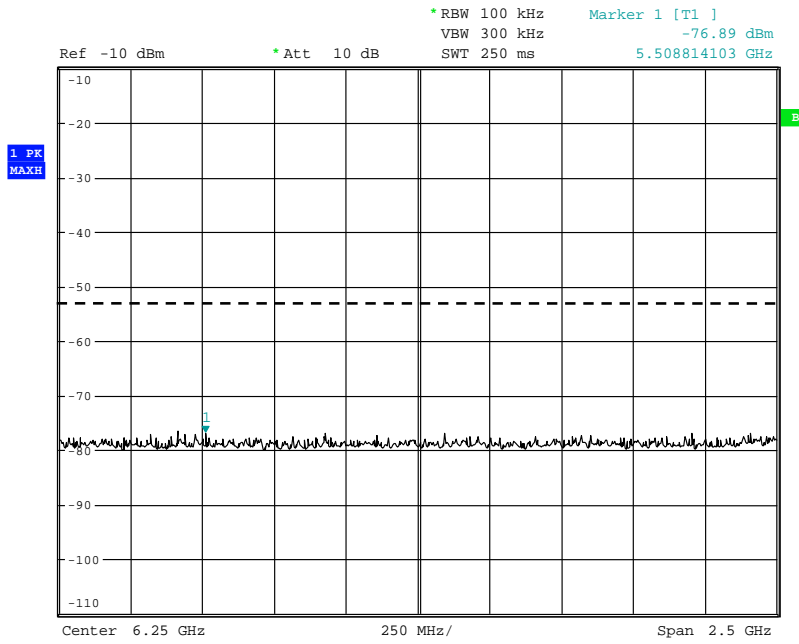


### Radiated emissions 824 MHz 2.5 – 5GHz

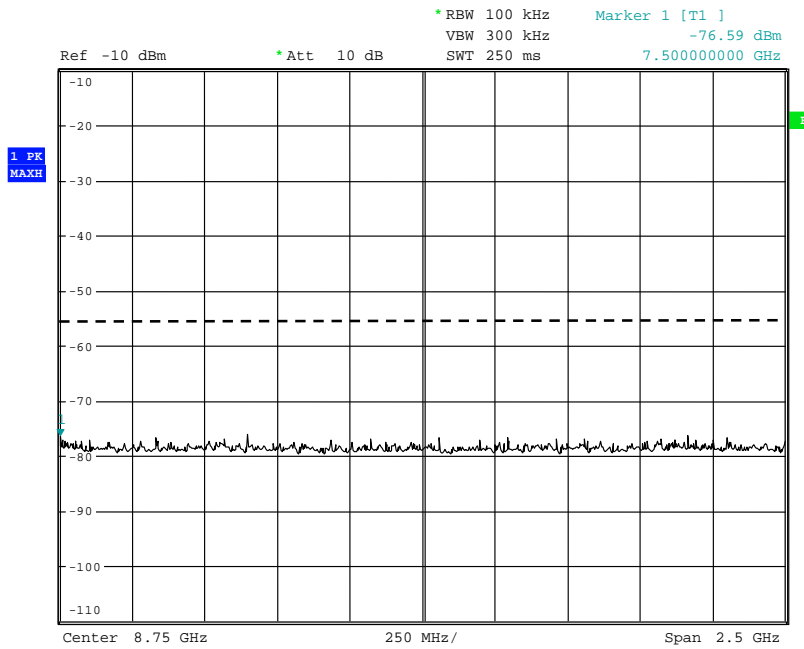


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions 498.3 MHz 5 – 7.5GHz

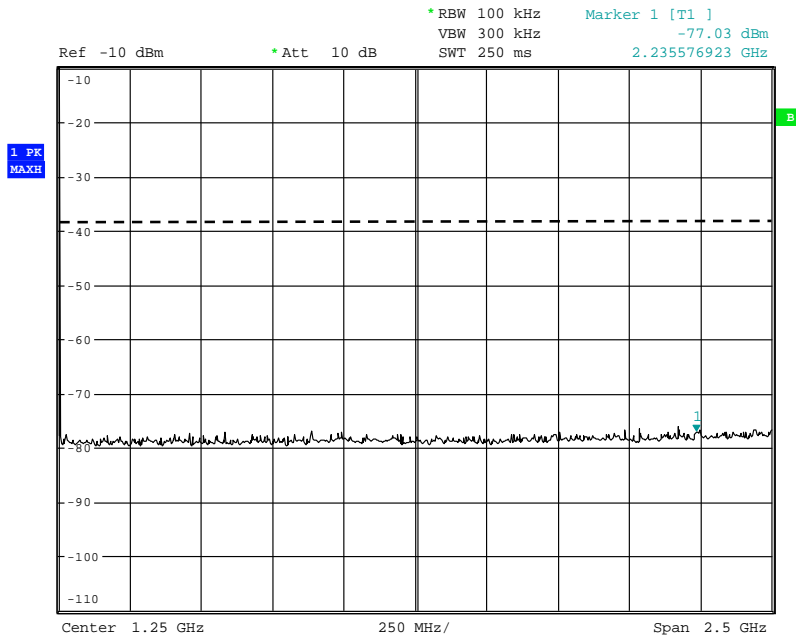


### Radiated emissions 498.3 MHz 7.5 – 10GHz

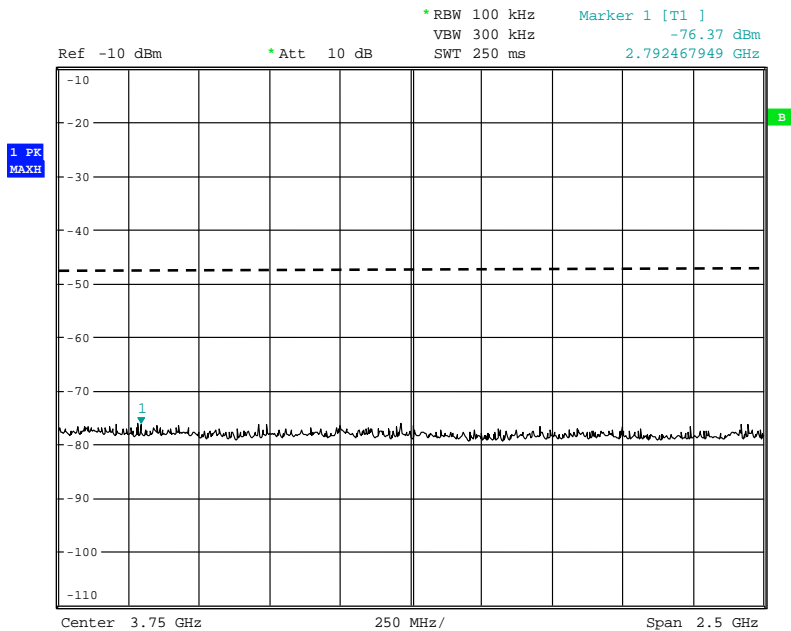


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions no input signal 0 – 2.5GHz

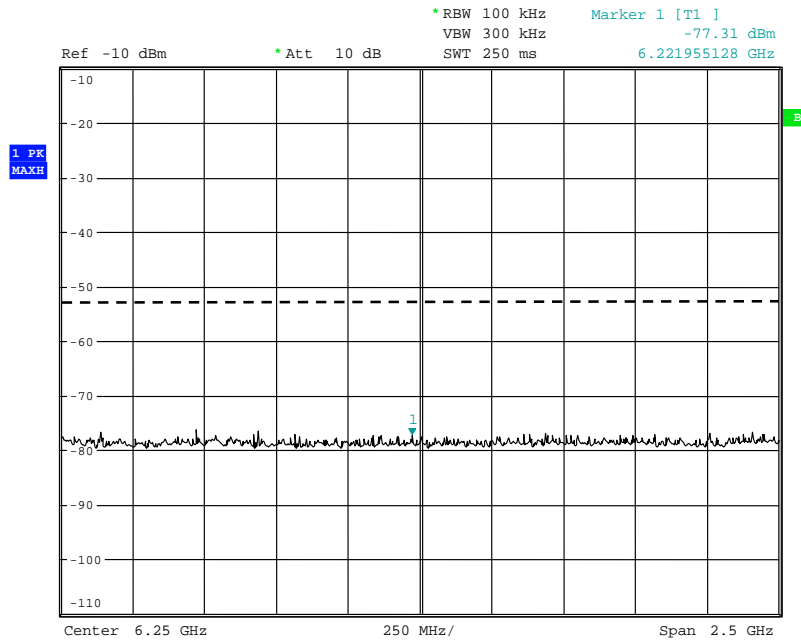


### Radiated emissions no input signal 2.5 – 5GHz

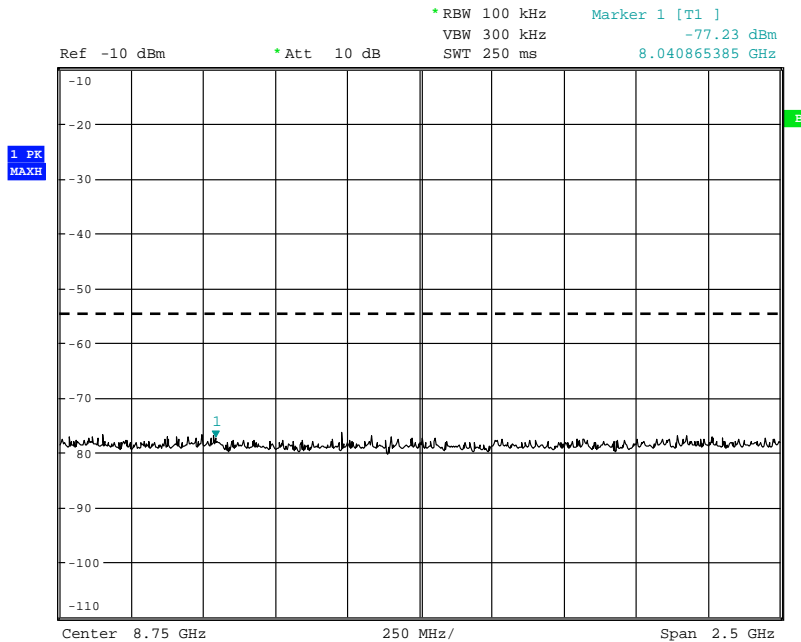


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions no input signal 5 – 7.5GHz



### Radiated emissions no input signal 7.5 – 10GHz

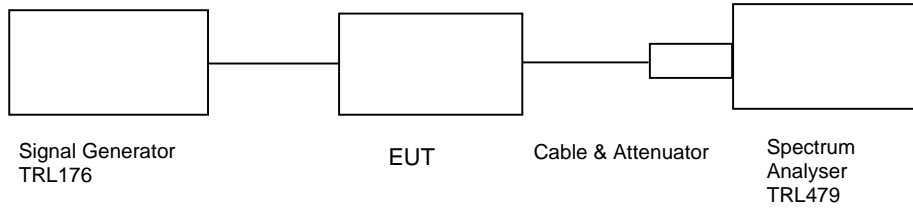


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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

Ambient temperature = 21 °C  
 Relative humidity = 42%  
 Supply voltage = 110Vac  
 Channel number = See test results

Radio Laboratory



Frequency MHz	Signal Generator input level dBm	Input Cable Loss dB	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
851	-10.3	0.4	46.5	-12.82	44.38	33.68	33.68
860	-10.5	0.4	46.5	-12.20	45.20	34.30	34.40
869	-10.1	0.4	46.5	-12.88	44.12	33.62	33.92

Notes:

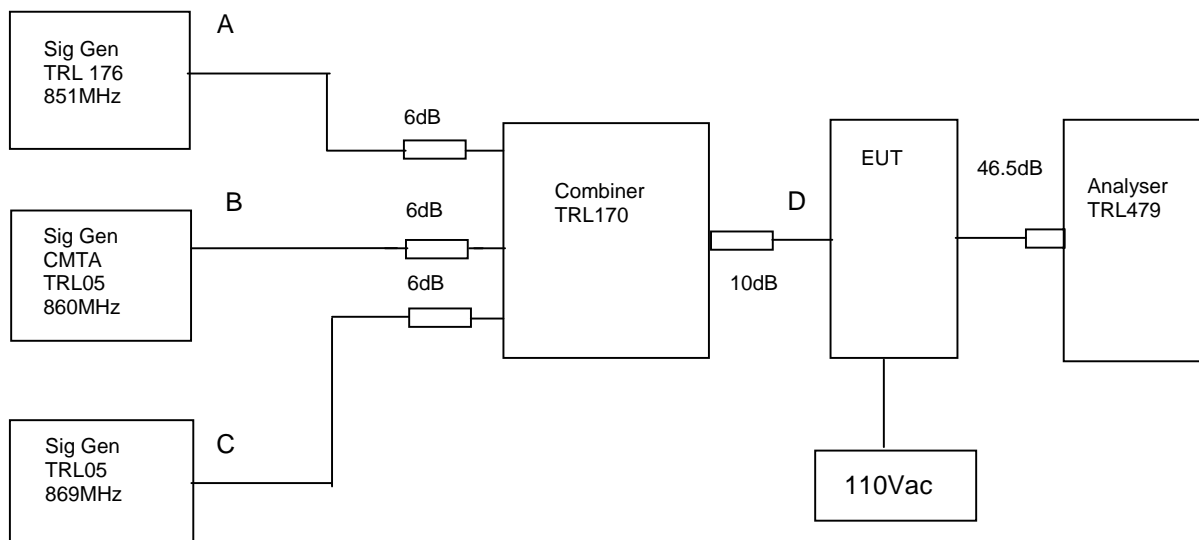
- The signal generator input was increased by 10dBs and the level of the output signal remeasured

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	BIRD	8304-200	N/A	103	X
ATTENUATOR	BIRD	8304-300-N	N/A	220	X
CABLE	ROSENBERGER	MICRO COAX	N/A	280	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X

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

Ambient temperature = 18°C  
 Relative humidity = 48%  
 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 10 dB above the maximum input of 0dBm. The cable and attenuators loss between the EUT and the spectrum analyser was 46.5 dB.

RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
851	860	869	-20.36dB@863.08MHz	-13

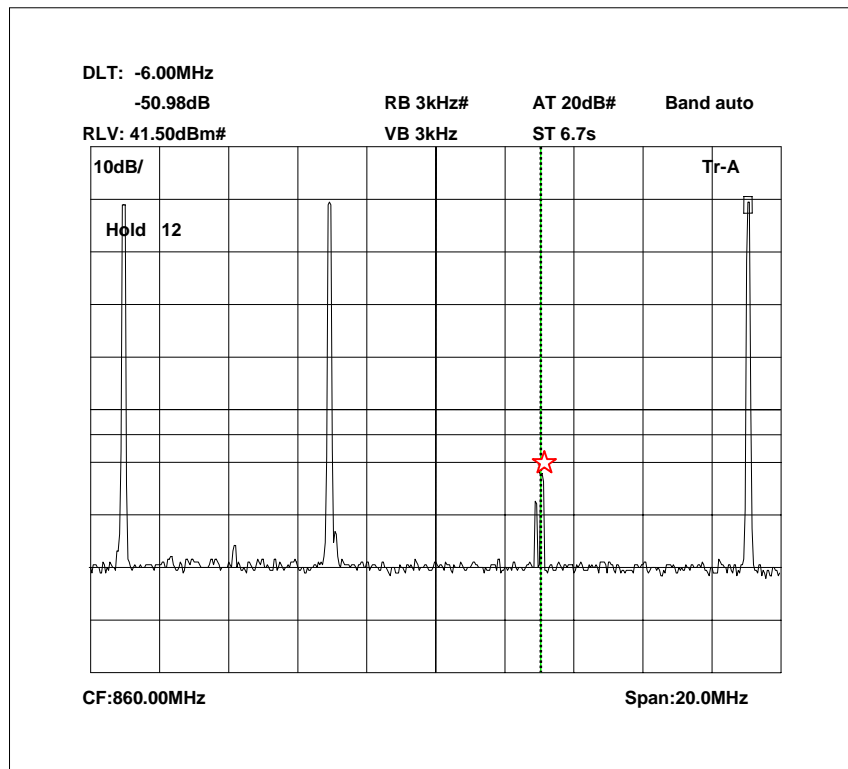
Sweep data is shown on the next page:

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>
SIGNAL GENERATOR	MARCONI	2042	119562/02	254	<b>X</b>
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>X</b>
COMBINER	ELCOM	RC-4-50	N/A	170	<b>x</b>
PREAMP	AGILENT	8449B	3008A01610	572	<b>x</b>

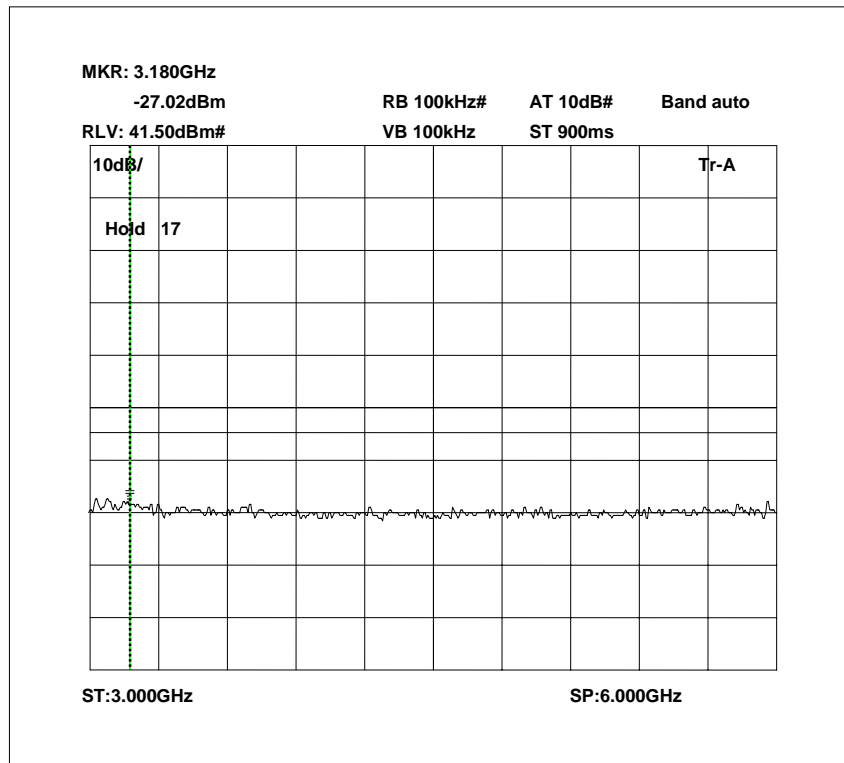
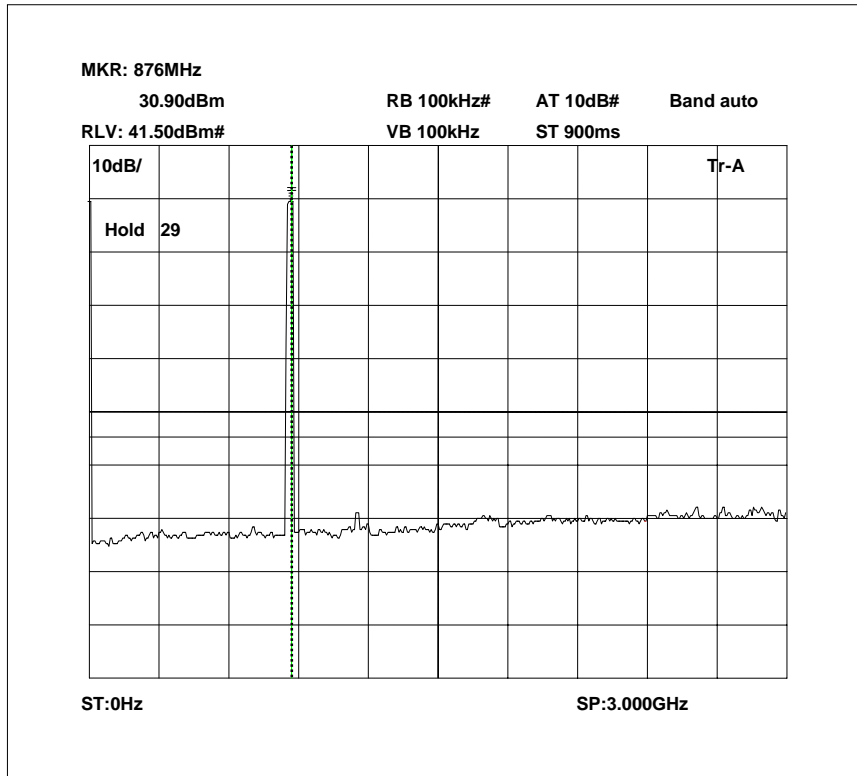


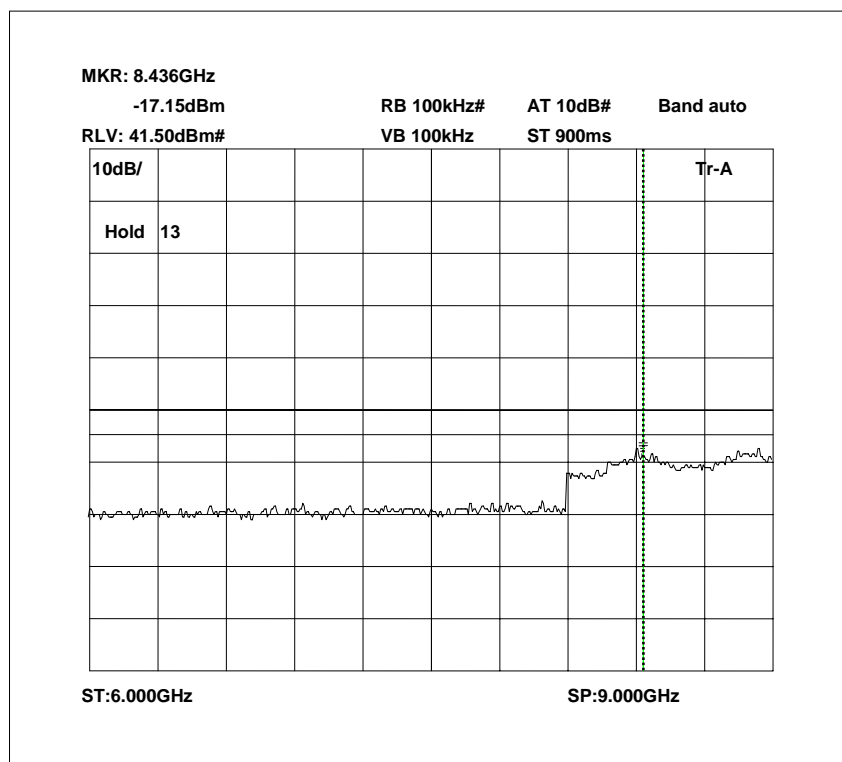
# Intermodulation Inband



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

### Intermodulation Wideband



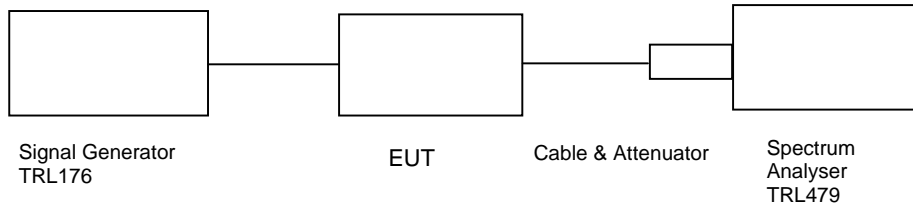


The above plot shows that there are no products outside the bands.

**TRANSMITTER TESTS**

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

Ambient temperature = 21 °C Radio Laboratory  
 Relative humidity = 42%  
 Supply voltage = 110Vac  
 Channel number = See test results



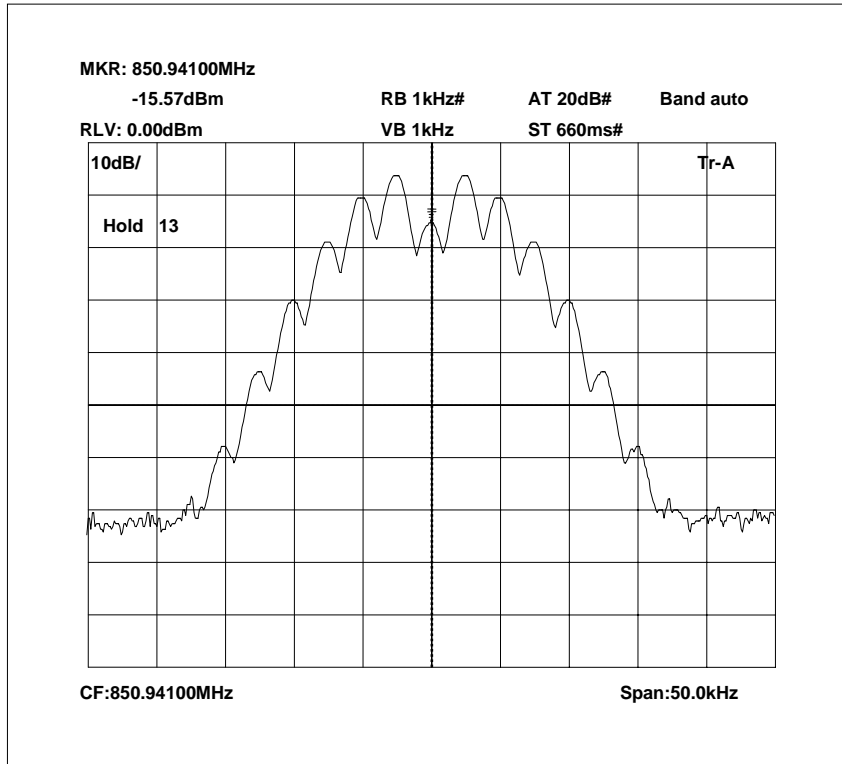
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-10.1dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

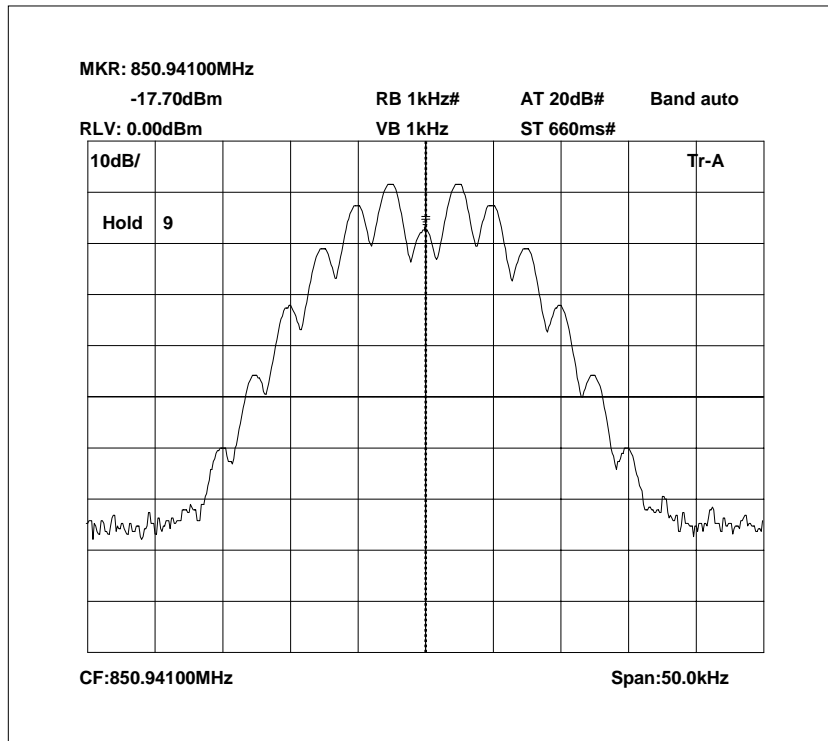
1. Cable TRL273 and attenuators TRL220/TRL112/TRL222 =46.5dB
2. Cable between signal generator and EUT = 0.4dB

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-200	N/A	103	
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	280	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>X</b>

851 MHz Signal Generator, deviation set to 5kHz

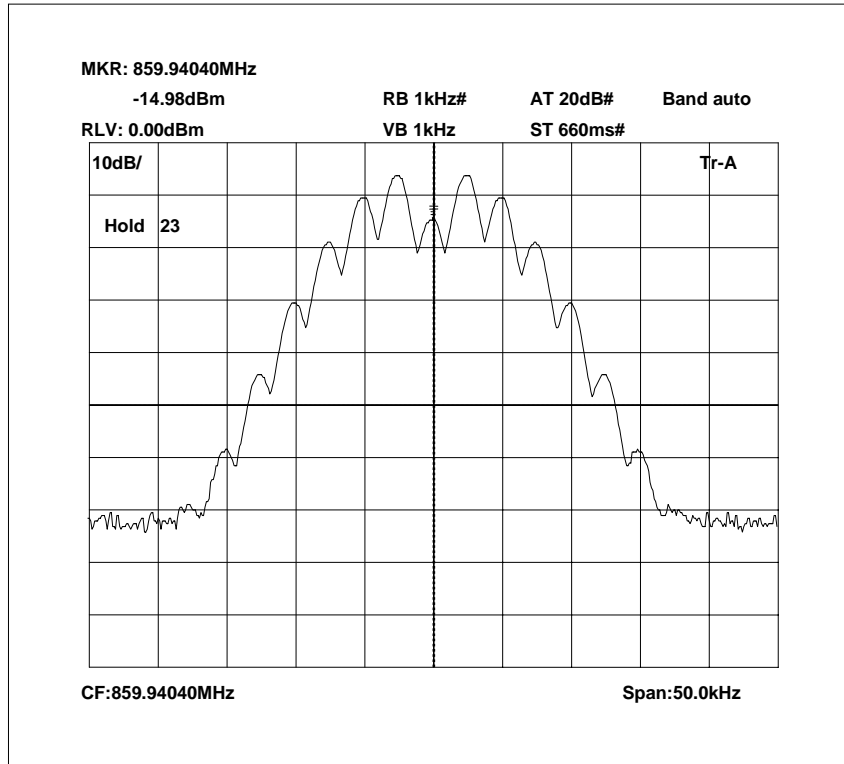


851 MHz Signal Generator and EUT, deviation set to 5kHz

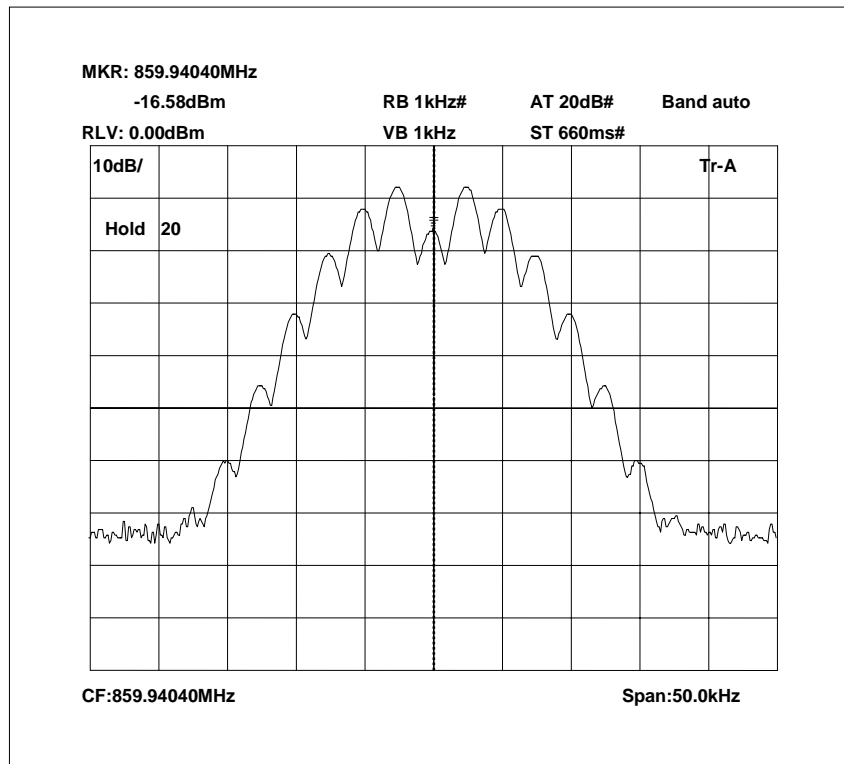


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

860 MHz Signal Generator, deviation set to 5kHz

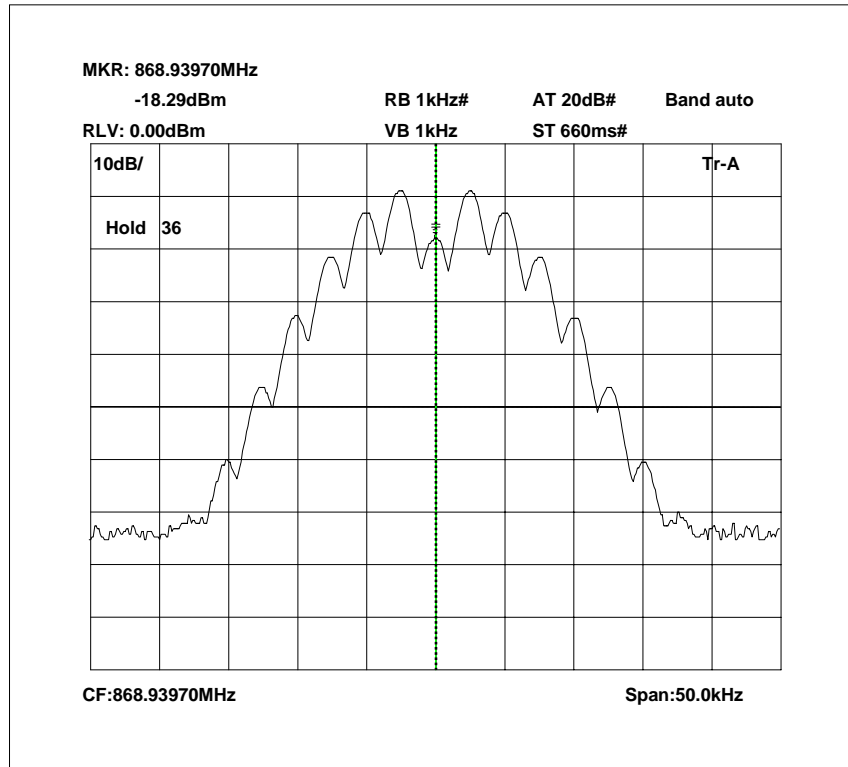


860 MHz Signal Generator and EUT, deviation set to 5kHz

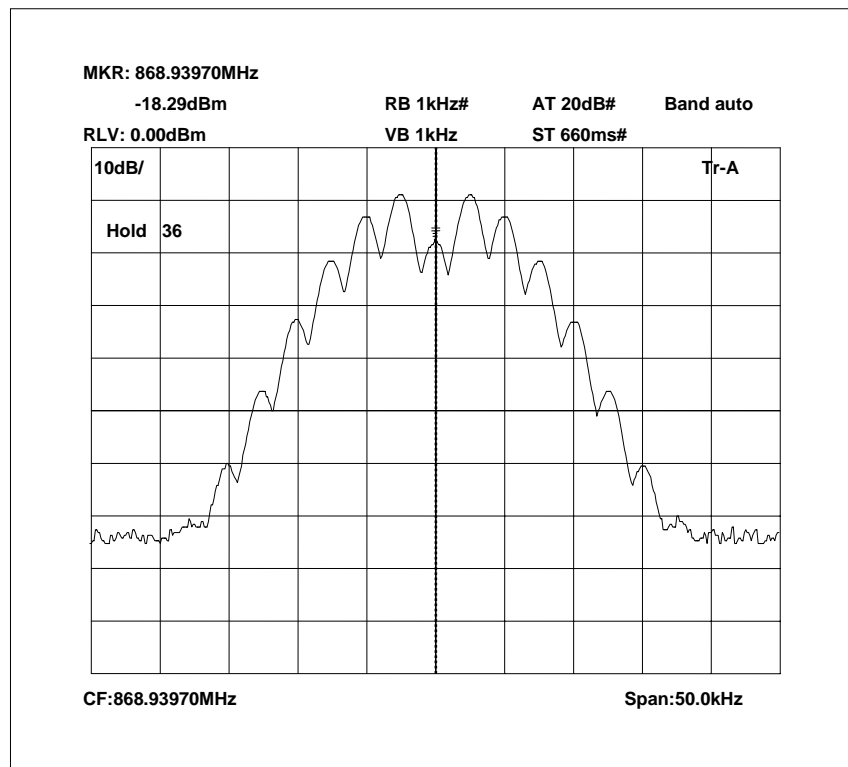


The above plots depicting the output wavsshape show no measurable distortion visible when compared to the input signal.

869 MHz Signal Generator, deviation set to 5kHz



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

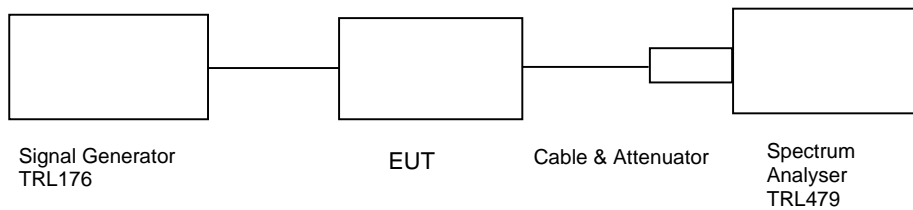


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

**TRANSMITTER TESTS**

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

Ambient temperature = 23°C  
 Relative humidity = 36%  
 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**

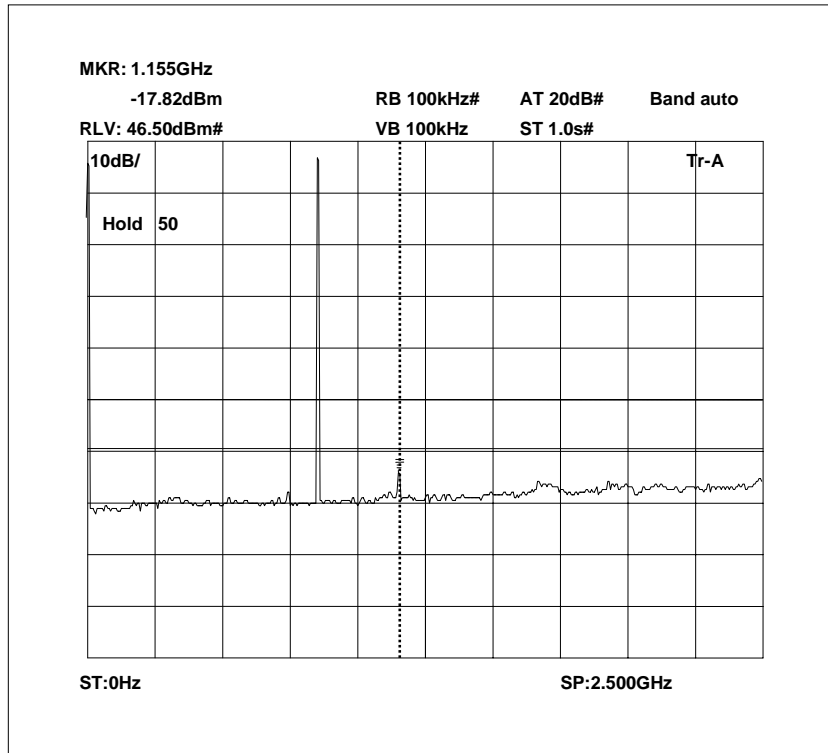
FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0 Hz – 9 GHz	No Significant Emissions within 10 dB of the limit				-13

The test equipment used for the Transmitter Conducted Emissions:

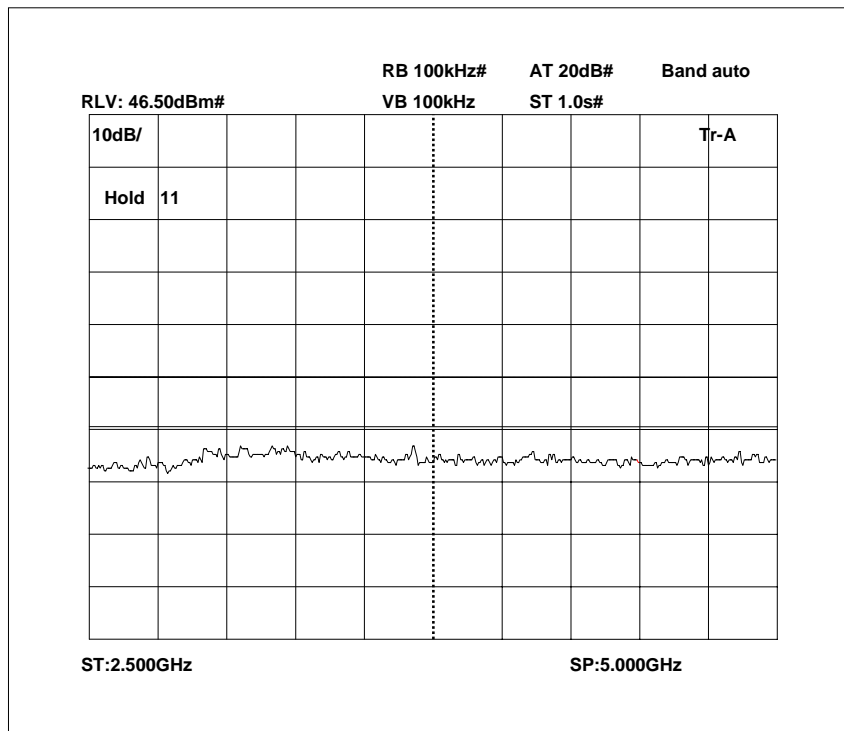
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-200	N/A	103	
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	280	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>X</b>



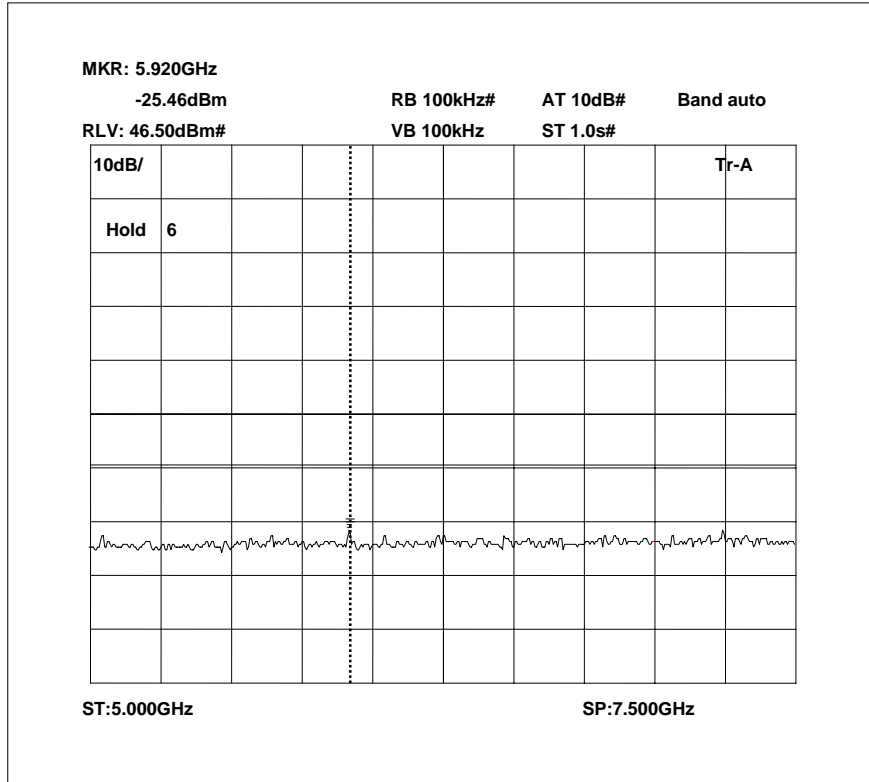
Conducted emissions 851MHz 0 – 2.5GHz



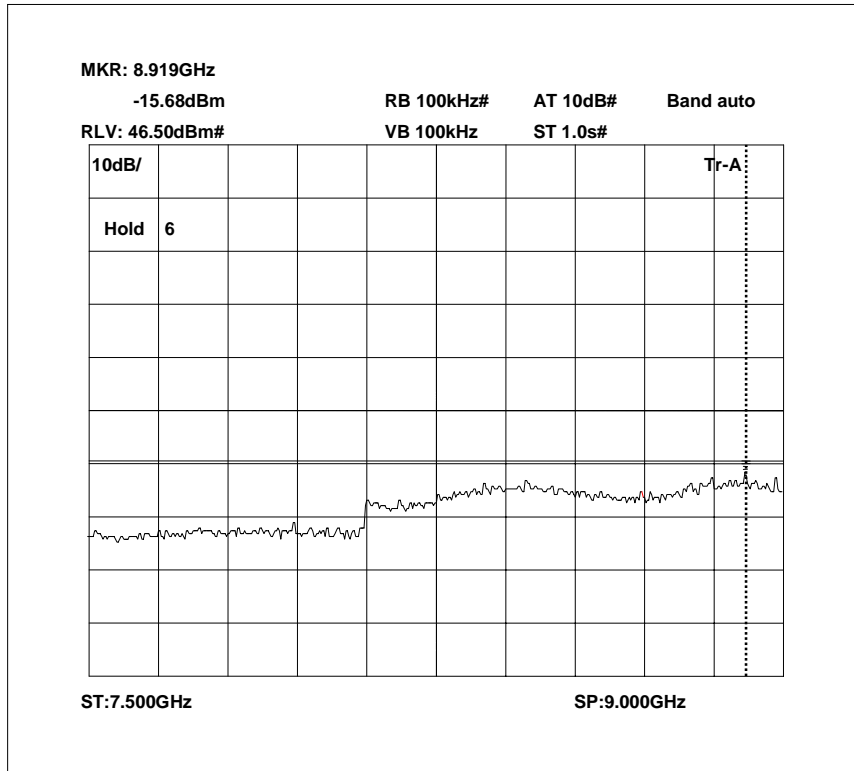
Conducted emissions 851MHz 2.5 – 5GHz



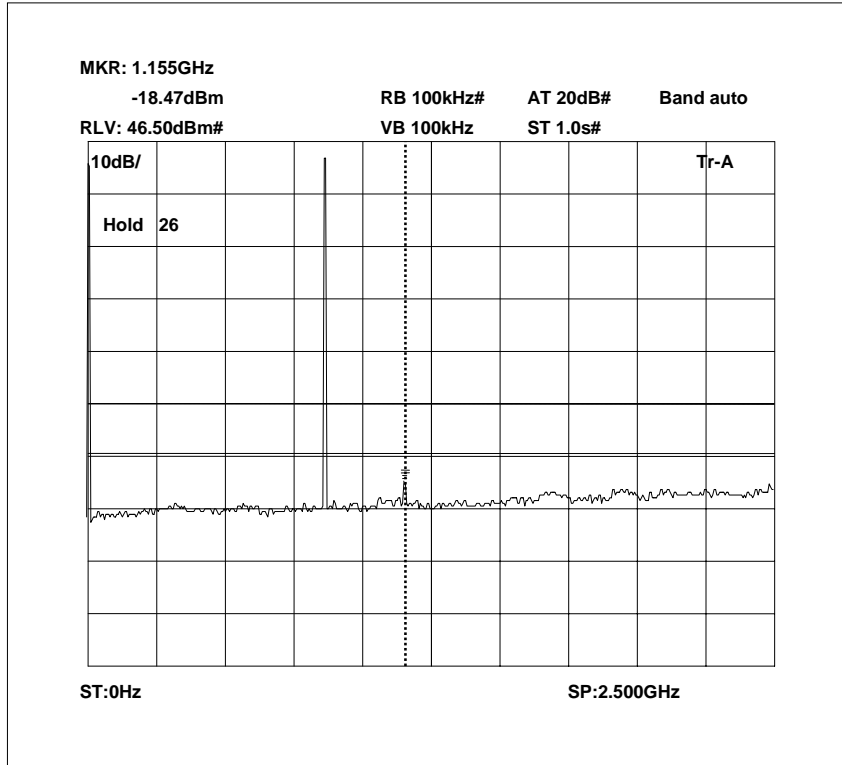
Conducted emissions 851MHz 5 – 7.5GHz



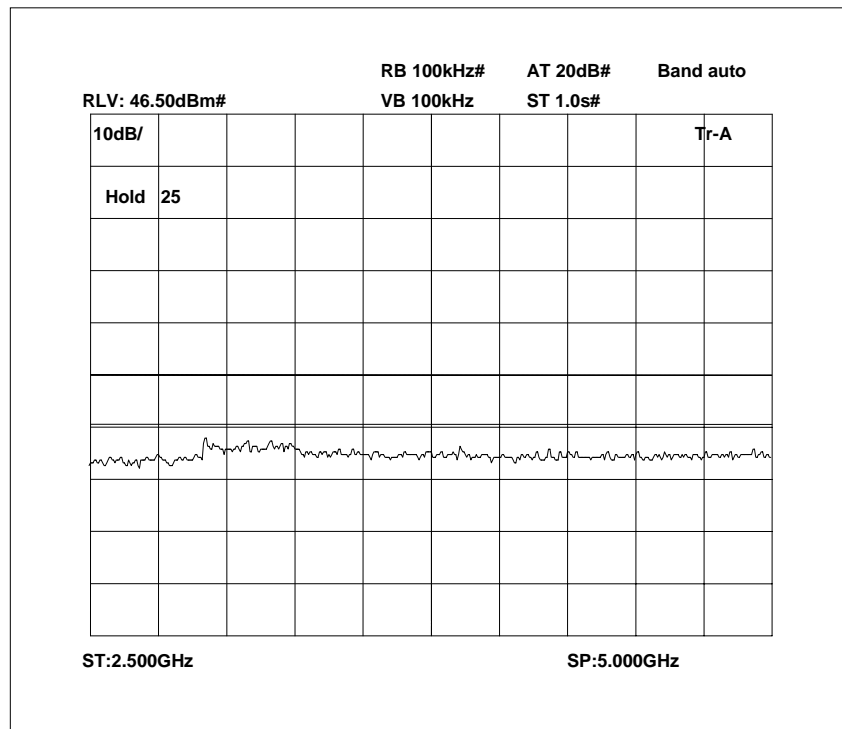
Conducted emissions 851MHz 7.5 – 9GHz



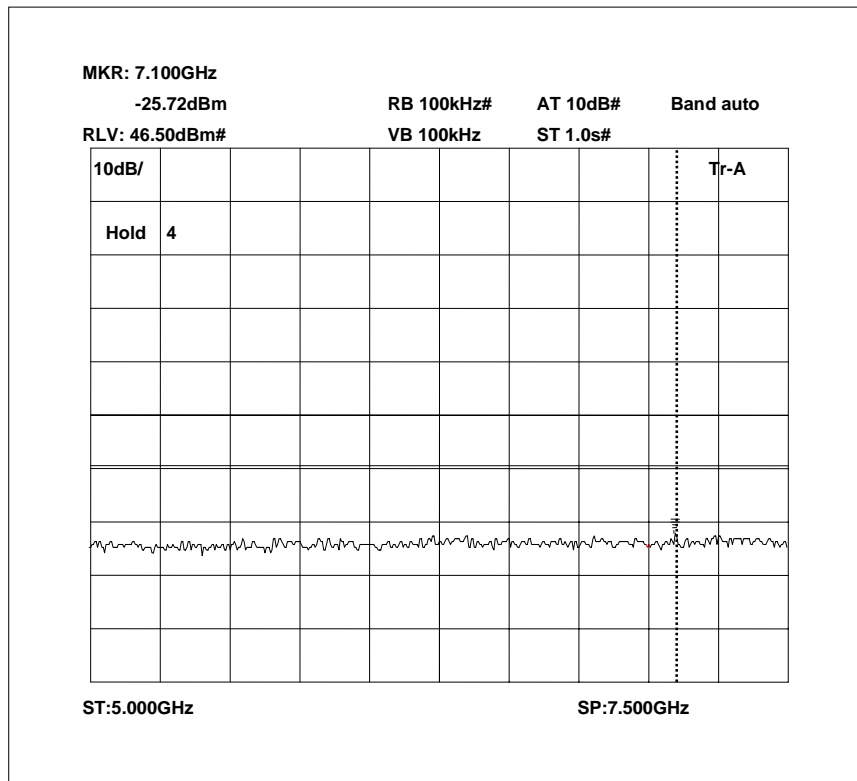
Conducted emissions 860MHz 0 – 2.5GHz



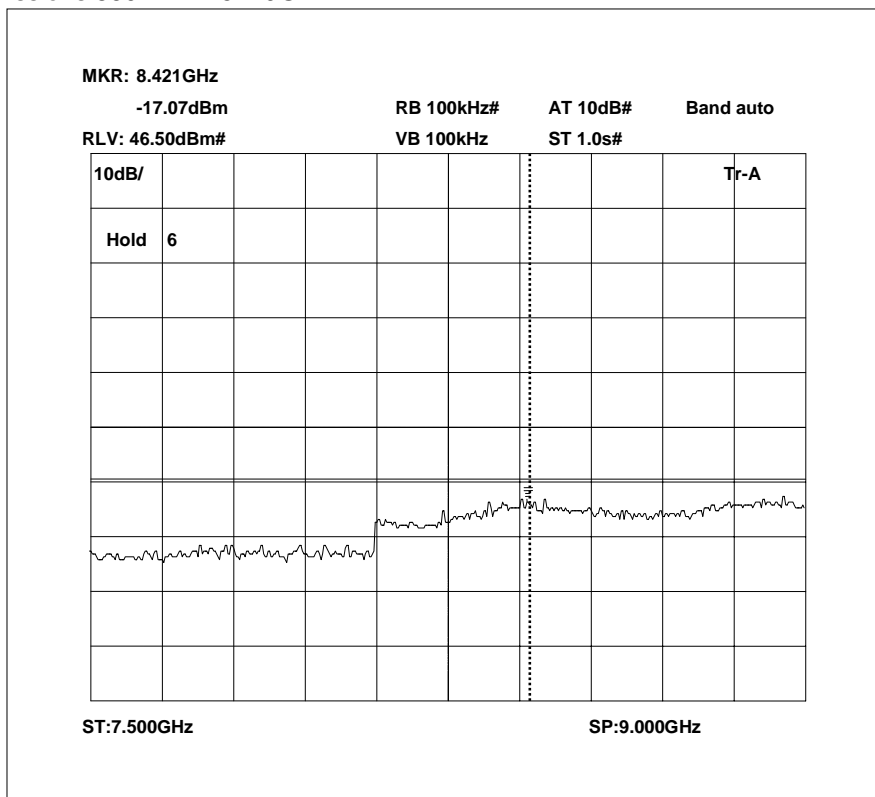
Conducted emissions 860MHz 2.5 – 5GHz



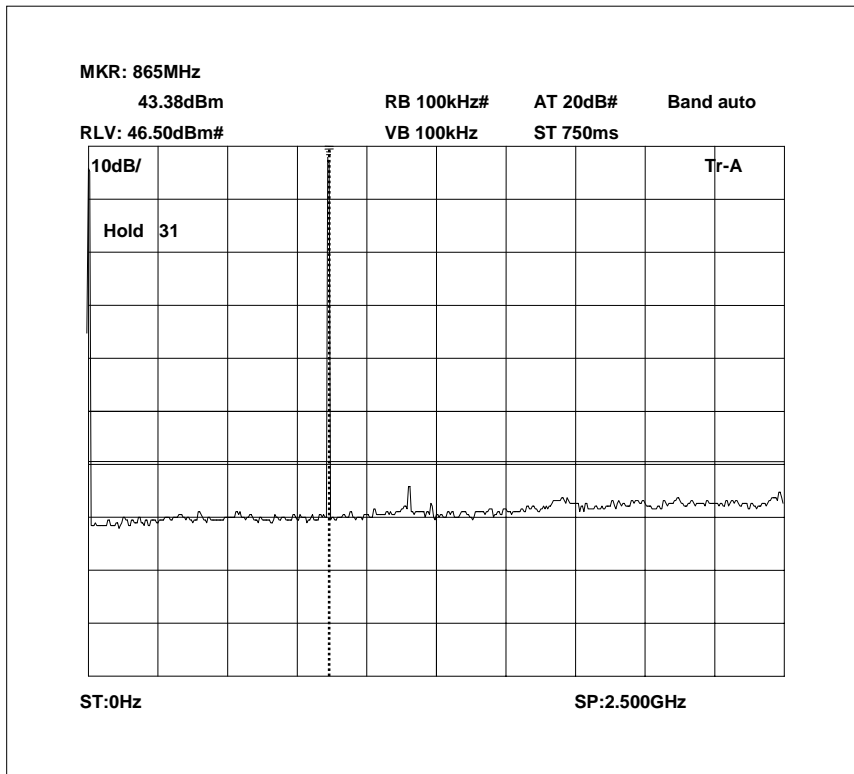
Conducted emissions 860MHz 5 – 7.5GHz



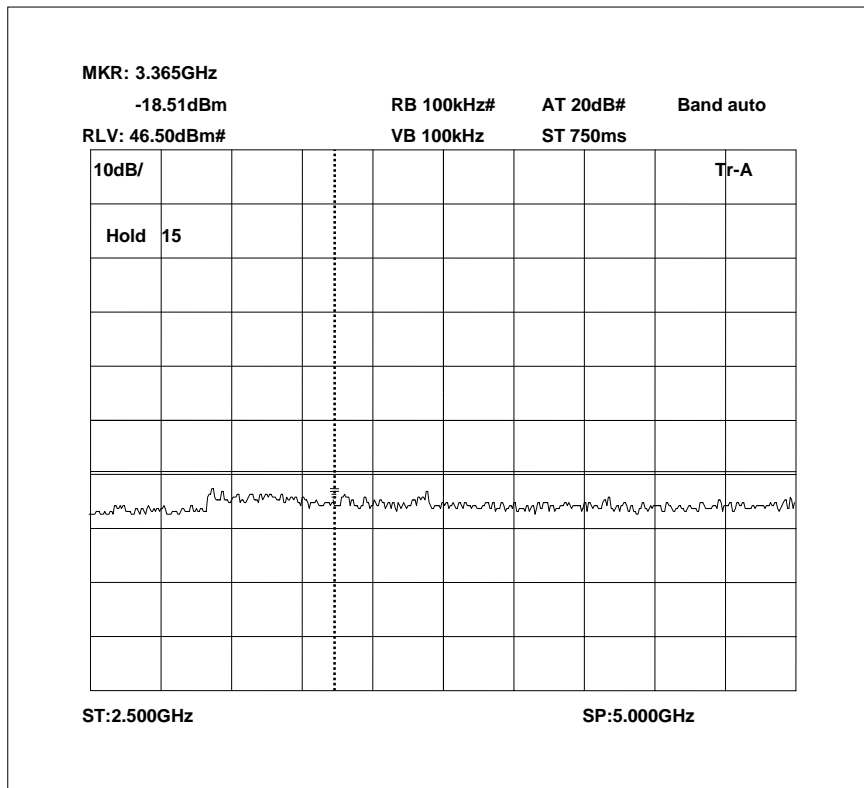
Conducted emissions 860MHz 7.5 – 9GHz



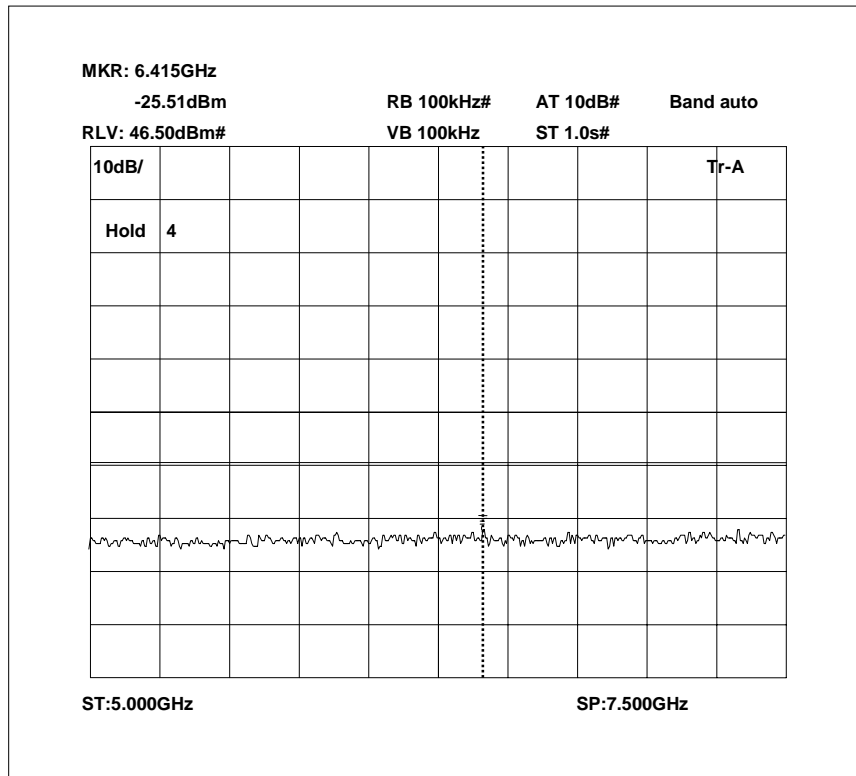
Conducted emissions 869 MHz 0 – 2.5GHz



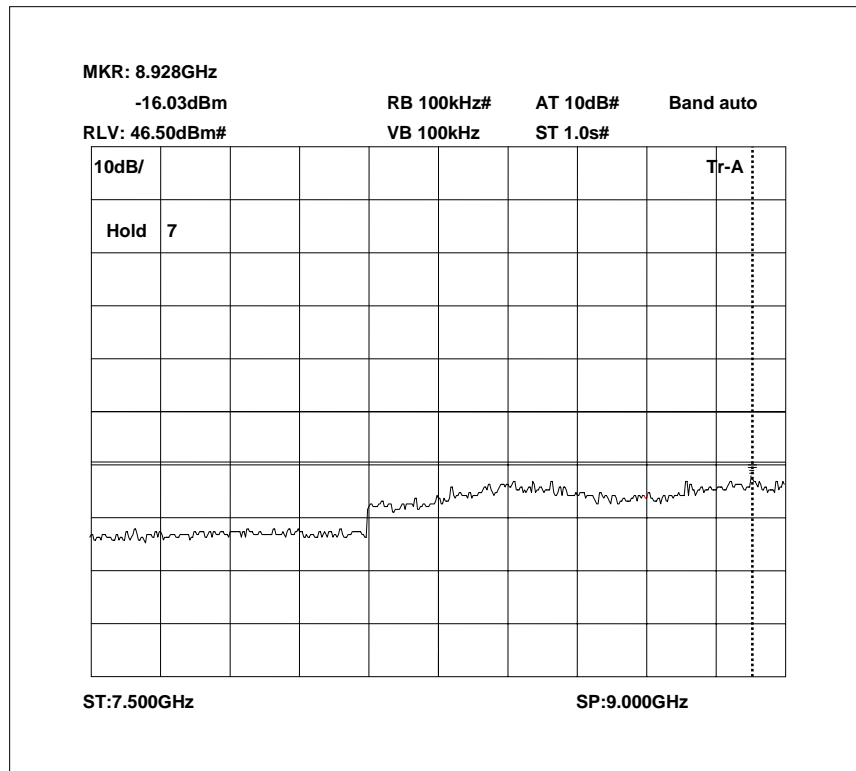
Conducted emissions 869 MHz 2.5 -- 5GHz



Conducted emissions 869MHz 5 – 7.5GHz



Conducted emissions 869MHz 7.5 -- 9GHz

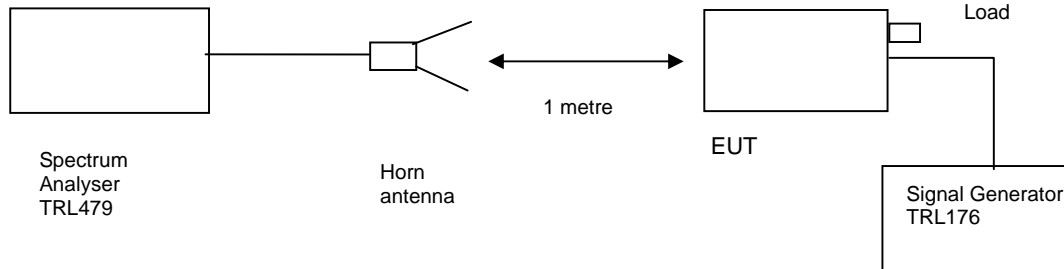


## TRANSMITTER TESTS

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

Ambient temperature = 16°C  
 Relative humidity = 45%  
 Conditions = OATS  
 Supply voltage = 110Vac  
 Supply Frequency = 60Hz

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  $43 + 10 \log P_{dB}$

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

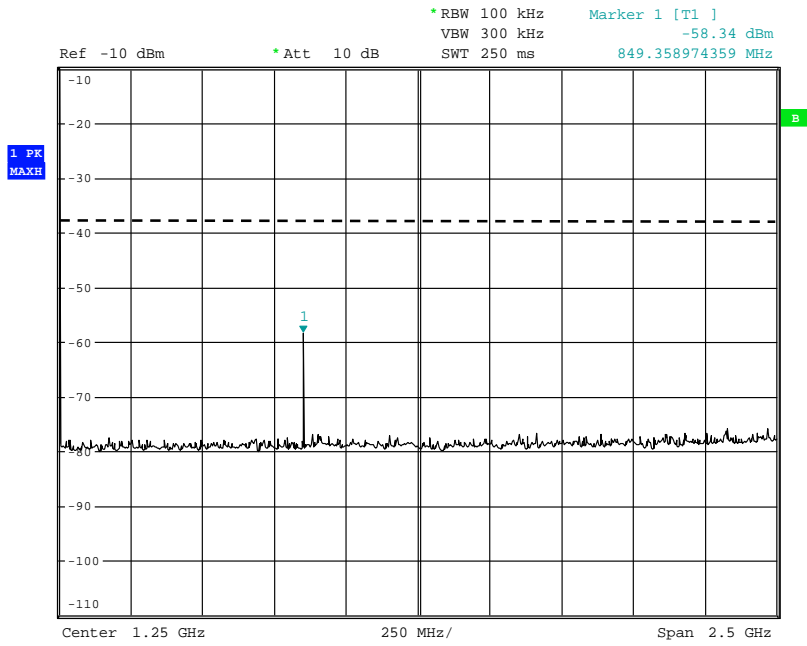
## RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
0 Hz – 9 GHz	No Significant Emissions Within 10 dB of the limit						-13

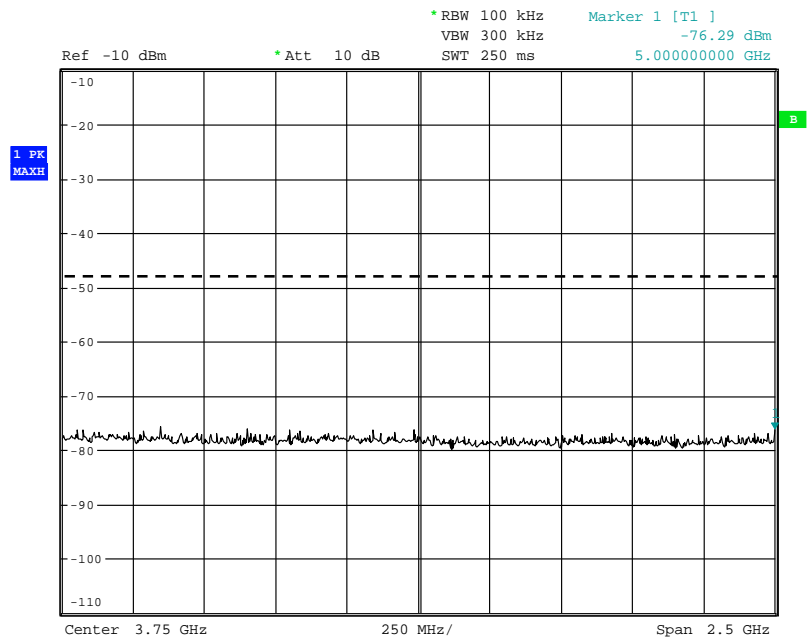
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
HORN	EMCO	3115	9010-3581	138	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
ATTENUATOR	BIRD	8308-100	N/A	112	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	280	<b>X</b>
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	<b>X</b>

### Radiated emissions 851 MHz 0 – 2.5GHz

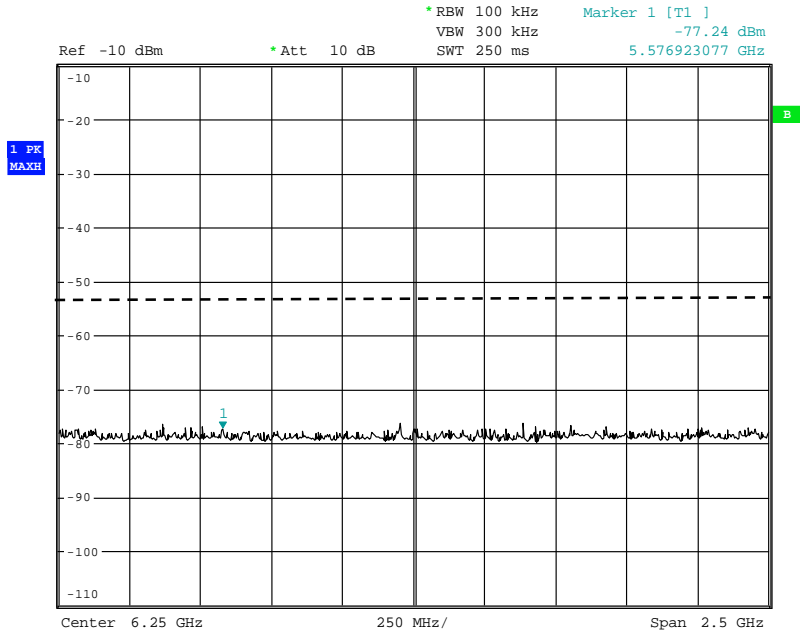


### Radiated emissions 851 MHz 2.5 – 5GHz

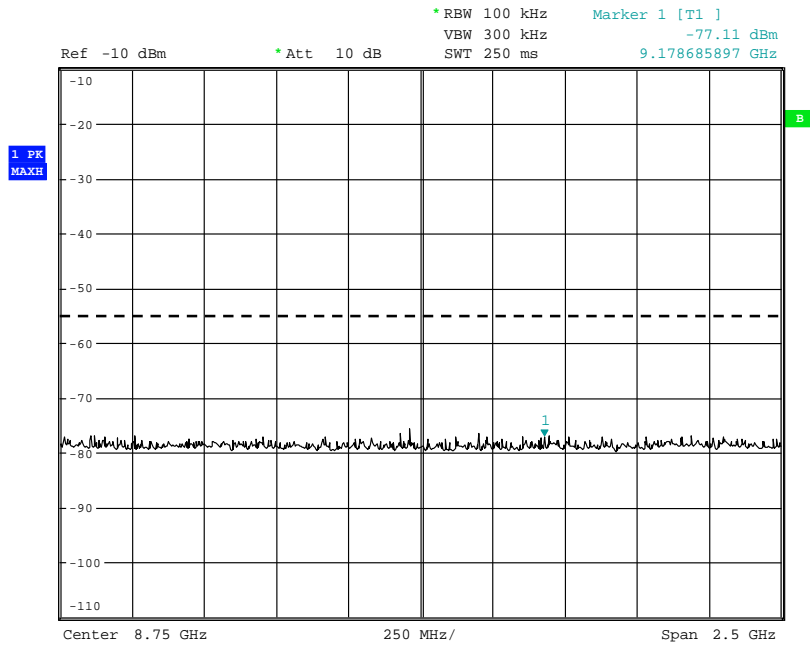




Radiated emissions 851 MHz 5 – 7.5GHz

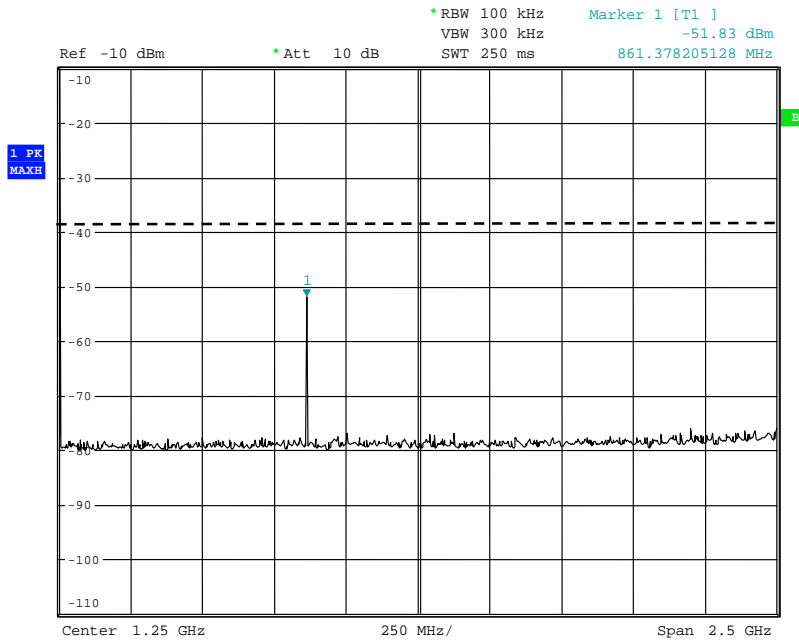


Radiated emissions 851 MHz 7.5 – 10GHz

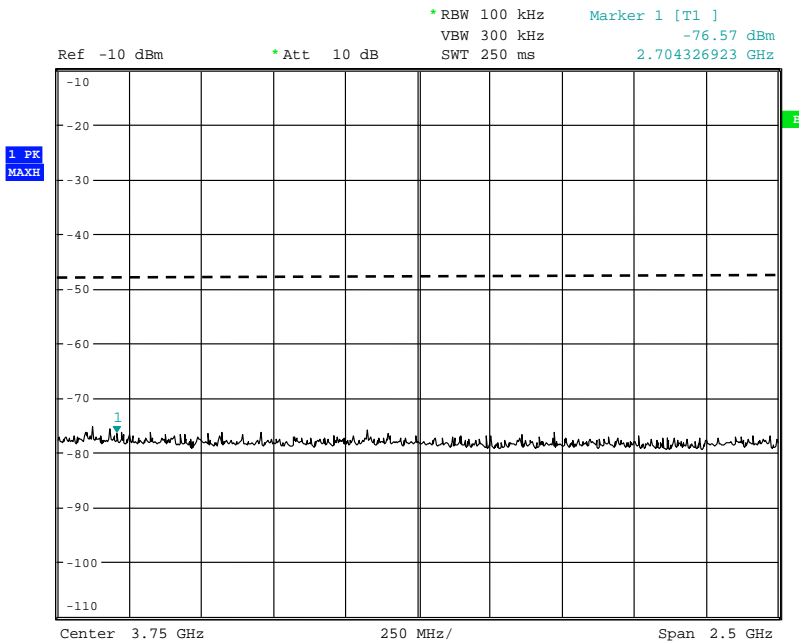


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions 860 MHz 0 – 2.5GHz

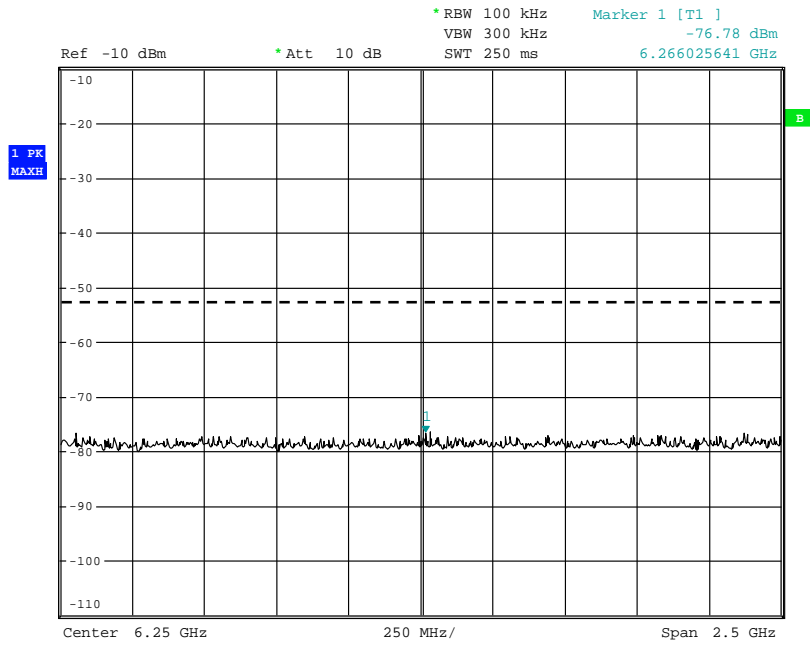


### Radiated emissions 860 MHz 2.5 – 5GHz

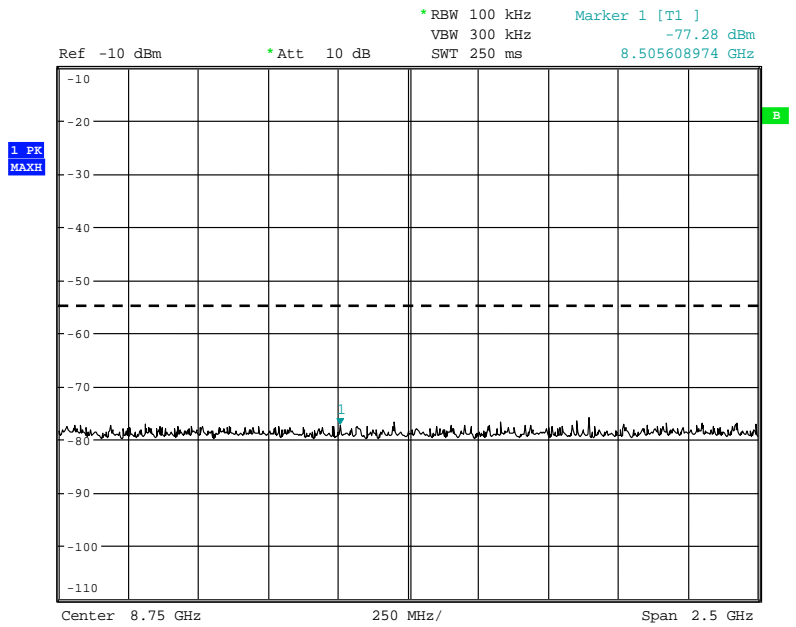


The above test results show that there were no emissions within 20dBs of the -13dBm limit

### Radiated emissions 860 MHz 5 – 7.5GHz

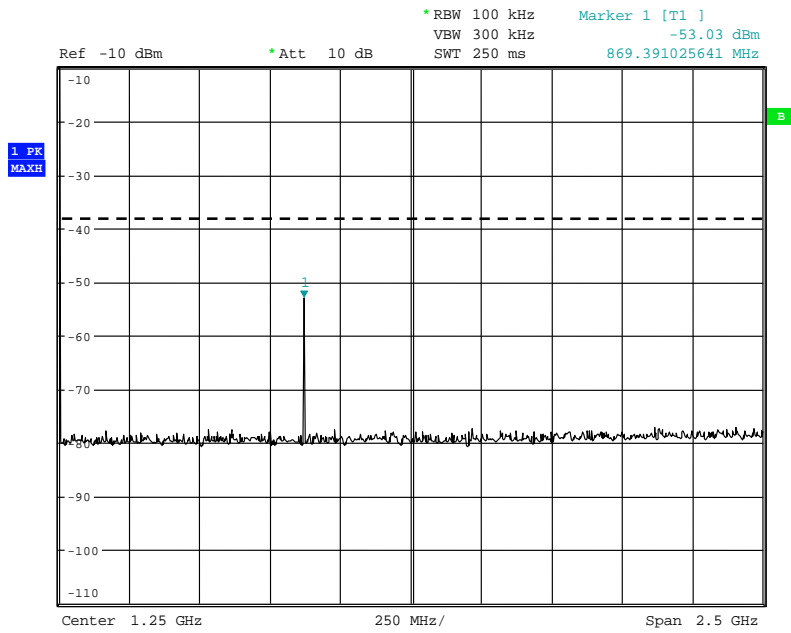


### Radiated emissions 860 MHz 7.5 – 10GHz

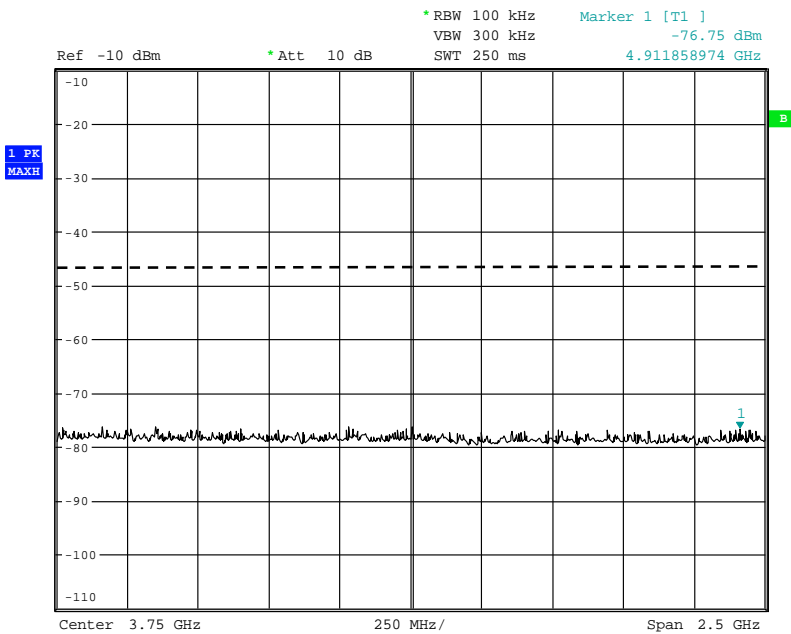


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions 869 MHz 0 – 2.5GHz

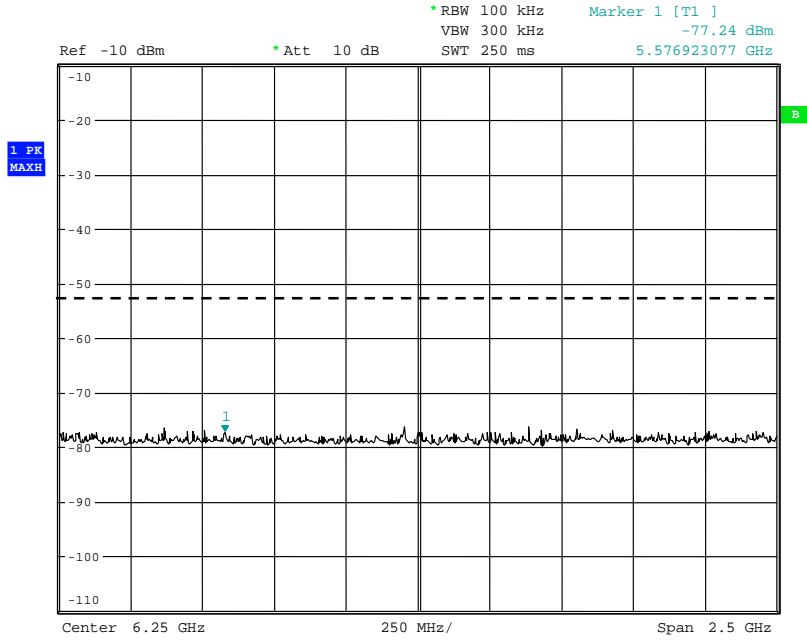


### Radiated emissions 869 MHz 2.5 – 5GHz

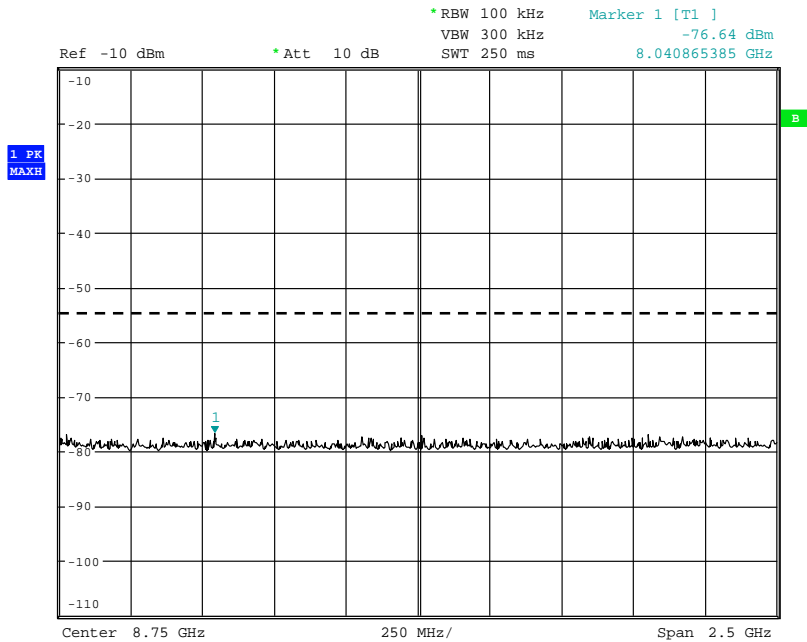


The above test results show that there were no emissions within 20dBs of the -13dBm limit

### Radiated emissions 869 MHz 5 – 7.5GHz

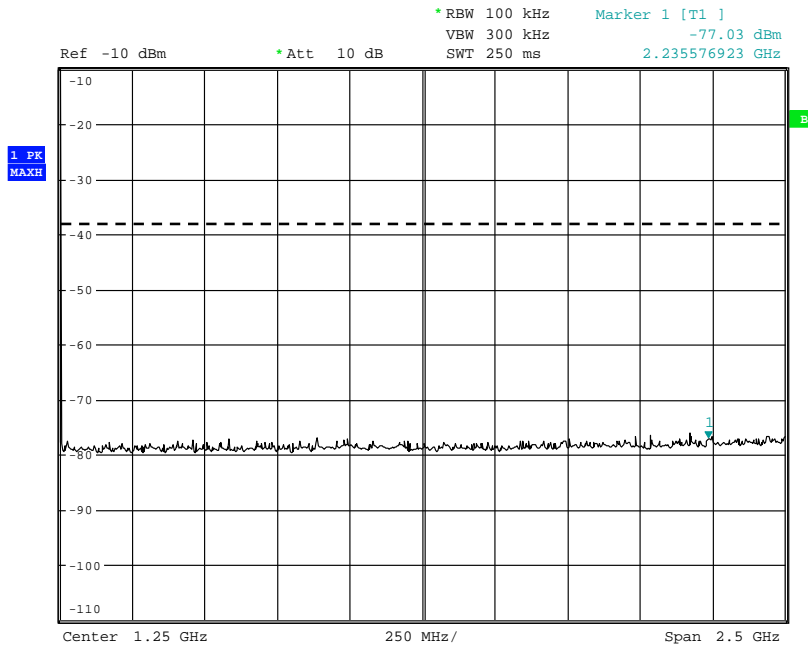


### Radiated emissions 869 MHz 7.5 – 10GHz

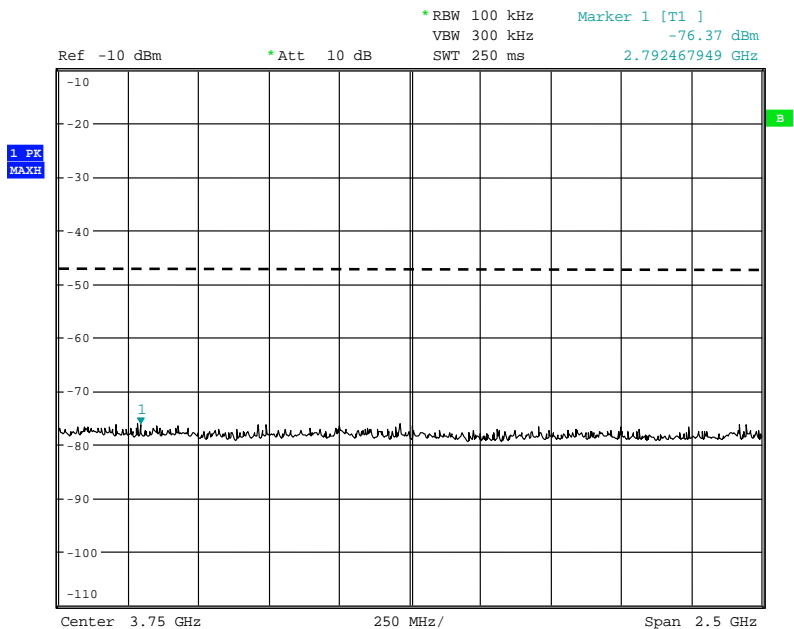


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions no input signal 0 – 2.5GHz

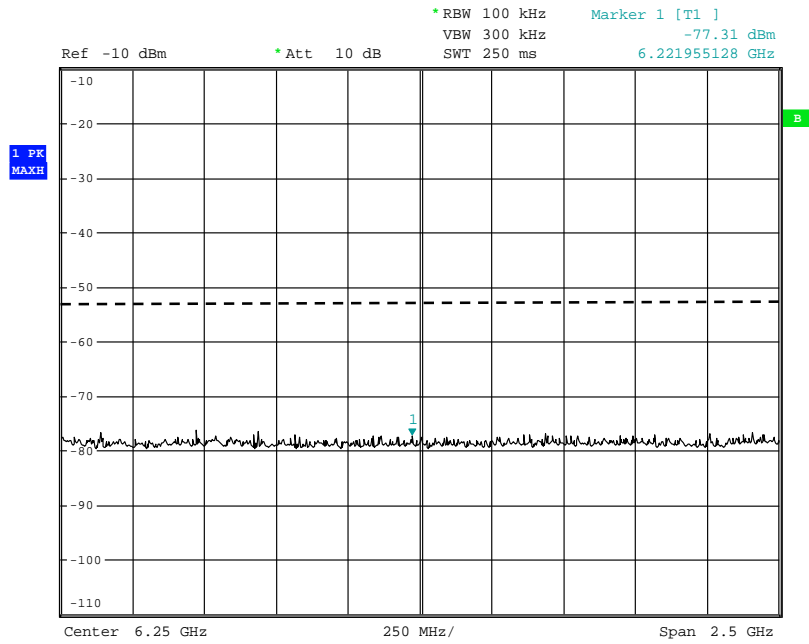


### Radiated emissions no input signal 2.5 – 5GHz

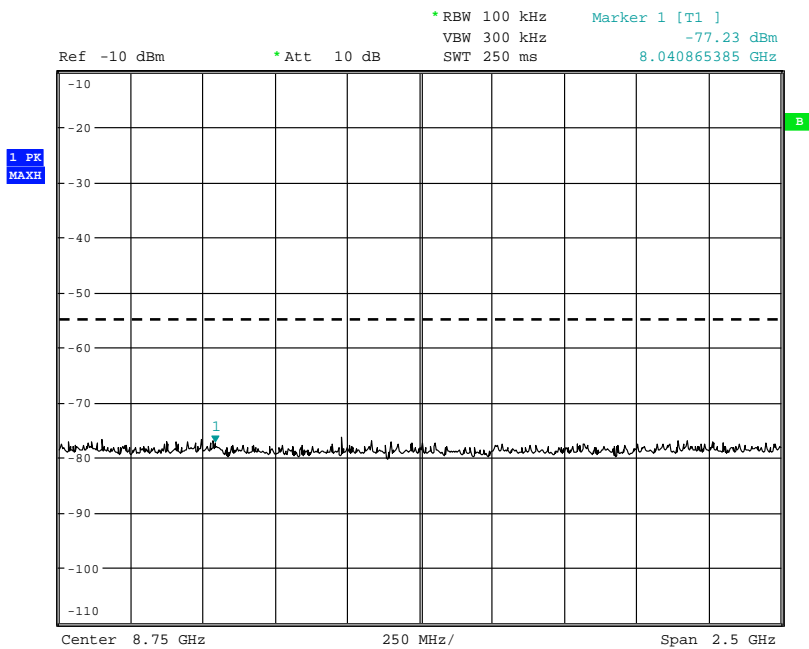


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

### Radiated emissions no input signal 5 – 7.5GHz



### Radiated emissions no input signal 7.5 – 10GHz



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

TEST SETUP



**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	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
i.	COMPONENT LOCATION	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
j.	PCB TRACK LAYOUT	-	Tx	[ ]
		-	Rx	[ ]
		-	PSU	[ ]
		-	AUX	[ ]
k.	BILL OF MATERIALS	-	Tx	[ ]
		-	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
UH281	Spectrum Analyser	R&S			
UH297	Signal Generator	R&S	21/04/2006	12	21/04/2007
L005	CMTA	R&S	05/12/2005	12	05/12/2006
L031	Power Amp	ENI		Calibrate in Use	
L103	Attenuator	Bird		Calibrate in Use	
L138	1-18GHz Horn	EMCO	15/04/2005	24	15/04/2007
L139	1-18GHz Horn	EMCO	03/05/2005	24	03/05/2007
L170	Combiner	Elcom		Calibrate in Use	
L176	Signal Generator	Marconi	15/02/2006	12	15/02/2007
L220	Attenuator	Bird		Calibrate in Use	
L222	Attenuator	Bird		Calibrate in Use	
L280	18GHz Cable	Rosenberger	05/01/2006	12	05/01/2007
L254	Signal Generator	Marconi	04/01/2006	12	04/01/2007
L479	Analyser	Anritsu	18/11/2005	12	18/11/2006

**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**



**ANNEX E**  
**SYSTEM DIAGRAM**

