



TEST REPORT NO: RU1189/6473
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ISSUE NO: 1
FCC ID: NEOCE-470BDA

**REPORT ON THE CERTIFICATION TESTING OF
AERIAL FACILITIES LIMITED
60-056101 and 60-056102
WITH RESPECT TO
THE FCC RULES CFR 47, PART 90 SUBPART I**

TEST DATE: 12th – 16th July 2005

TESTED BY: _____ J CHARTERS

APPROVED BY: _____ P GREEN
PRODUCT MANAGER
EMC

DATE: 1st December 2005

Distribution:

Copy Nos: 1. Aerial Facilities Limited
2. TCB: TRL Compliance Services Limited.
3. TRL EMC

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FS 21805

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ANNEX

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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: NEOCE-470BDA

PURPOSE OF TEST: Certification

TEST SPECIFICATION: FCC RULES CFR 47, PART 90 SUBPART I

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: 60-056101 and 60-056102

EQUIPMENT TYPE: Booster

MAXIMUM GAIN
Downlink: 470MHz: 38.4dBm 483MHz :44.3dBm
Up Link: 473MHz: 59.01dBm 486MHz : 49.3dBm

MAXIMUM INPUT
Downlink: 470MHz: -6dBm 483MHz:-7dBm
Uplink: 473MHz: -74dBm 486MHz:-64dBm

MAXIMUM OUTPUT
Downlink: 470MHz: 32.4dBm 483MHz:37.3dBm
Uplink: 473MHz: -14.99dBm 486MHz:-14.7dBm

CHANNEL SPACING: 25kHz

NUMBER OF CHANNELS:
Downlink 470MHz band Down Link 483MHz Band
470.2625MHz 483.3125MHz
470.2125MHz 483.2875MHz
483.0625MHz
483.5625MHz
482.2375MHz
Uplink 473MHz Band Uplink 486MHz Band
473.2625MHz 486.3125MHz
473.2125MHz 486.2875MHz
486.0625MHz
486.5625MHz
485.2375MHz

FREQUENCY GENERATION: N/A

MODULATION TYPE: F3E

POWER SOURCE(s): 110Vac

TEST DATE(s): 12th – 16th July 2005

ORDER No(s): 31474

APPLICANT: Aerial Facilities Limited

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

TESTED BY: _____ J CHARTERS

APPROVED BY: _____ P GREEN
PRODUCT
MANAGER EMC

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): 60-056101 and 60-056102(Downlink only)

EQUIPMENT TYPE: Booster

PURPOSE OF TEST: Certification

TEST SPECIFICATION(s): FCC RULES CFR 47, PART 90 SUBPART I

TEST RESULT: COMPLIANT Yes [X]
No []

APPLICANT'S CATEGORY: MANUFACTURER [X]
IMPORTER []
DISTRIBUTOR []
TEST HOUSE []
AGENT []

APPLICANT'S ORDER No(s): 31474

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 EMC

UKAS ACCREDITATION No: 0728

TEST DATE(s) 12th – 16th July 2005

TEST REPORT No: RU1189/6473

EQUIPMENT TEST / EXAMINATIONS REQUIRED

| 1. | TEST/EXAMINATION | RULE PART | APPLICABILITY | RESULT |
|----|---|-------------------|---------------|-----------------|
| | RF Gain | 90.205 2.1046 | 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 2.1049 | Yes | Complies |
| | Spurious Emissions at Antenna Terminals | 90.210 | Yes | Complies |
| | Field Strength of Spurious Emissions | 90.210 2.1053 | Yes | Complies |
| | Frequency Stability | 90.213 | N/A | N/A (Note 1) |
| | Transient behaviour | 90.214 | N/A | N/A (Note 1) |

Notes:

1 The EUT does not contain modulation circuitry, therefore the test was not performed.
2 The EUT does not contain any switching circuitry, therefore the test was not performed.

2. Product Use: Cell enhancer

3. Emission Designator: F3E

4. Temperatures: Ambient (T_{nom}) 26°C

5. Supply Voltages: V_{nom} 110Vac

Note: V_{nom} voltages are as stated above unless otherwise shown on the test report page

6. Equipment Category: Single channel
Two channel
Multi-channel

7. Channel spacing: Narrowband
Wideband

8. Test Location TRL Compliance Services
Up Holland
Long Green

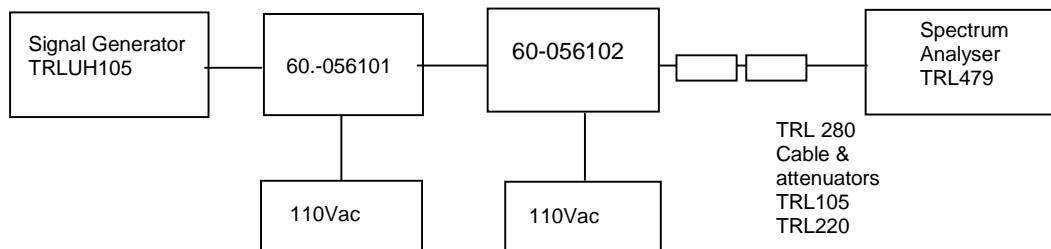
9. Modifications made during test program No modifications were performed.

10. System description The 60-056101 and 60-56102 are intended to be used as part of a larger system. They are broadband boosters with the channel filtering occurring at the above ground air interface. See Annex C for a system diagram.

COMPLIANCE TESTS

TRANSMITTER TEST – GAIN – CONDUCTED – PART 2.1046 – DOWNLINK

Ambient temperature = 18°C Radio Laboratory
 Relative humidity = 41%
 Supply voltage = 110Vac
 Channel number = See test results



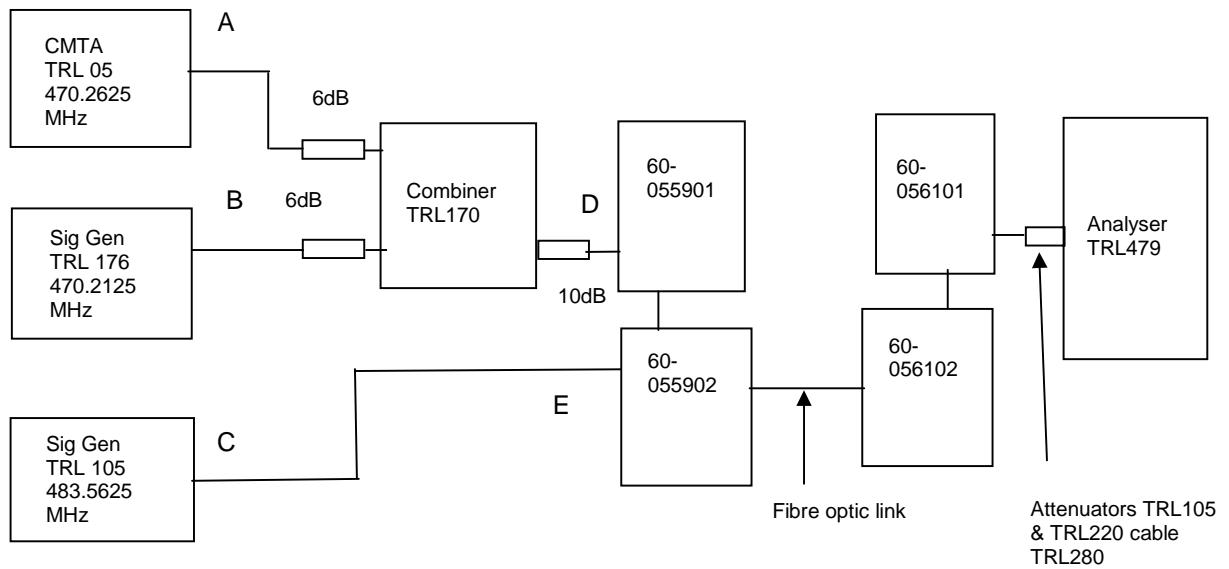
| Frequency MHz | Signal Generator Input Level dBm | Cable & attenuator Loss dB | Level at Spectrum Analyser dBm | Gain dB | Gain after 10dB increase input signal level dBm | Measured Output power dBm |
|---------------|----------------------------------|----------------------------|--------------------------------|---------|---|---------------------------|
| 469.5 | -6.0 | 46.6 | -15.76 | 36.84 | 29.5 | 30.84 |
| 469.95 | -6.0 | 46.6 | -15.71 | 36.89 | 28.5 | 30.89 |
| 470.4 | -6.0 | 46.6 | -14.2 | 38.4 | 29.0 | 32.4 |
| 482.2 | -7.0 | 46.6 | -9.46 | 44.14 | 37.4 | 37.14 |
| 482.9 | -7.0 | 46.6 | -9.27 | 44.33 | 37.8 | 37.33 |
| 483.6 | -7.0 | 46.6 | -10.8 | 42.8 | 36.95 | 35.8 |

The test was setup as above. The signal generator was to simulate an input signal to the system from a transmitter and the analyzer used to obtain the output level from the system.

| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRL No | ACTUAL EQUIPMENT USED |
|-------------------|-----------------|------------|------------|--------|-----------------------|
| SPECTRUM ANALYSER | ANRITSU | MS266C | MT26089 | 479 | X |
| ATTENUATOR | BIRD | 8302 | N/A | 105 | X |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | X |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

**TRANSMITTER TEST - INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053–
DOWNLINK**

Ambient temperature = 24°C
 Relative humidity = 43%
 Supply voltage = 110Vac



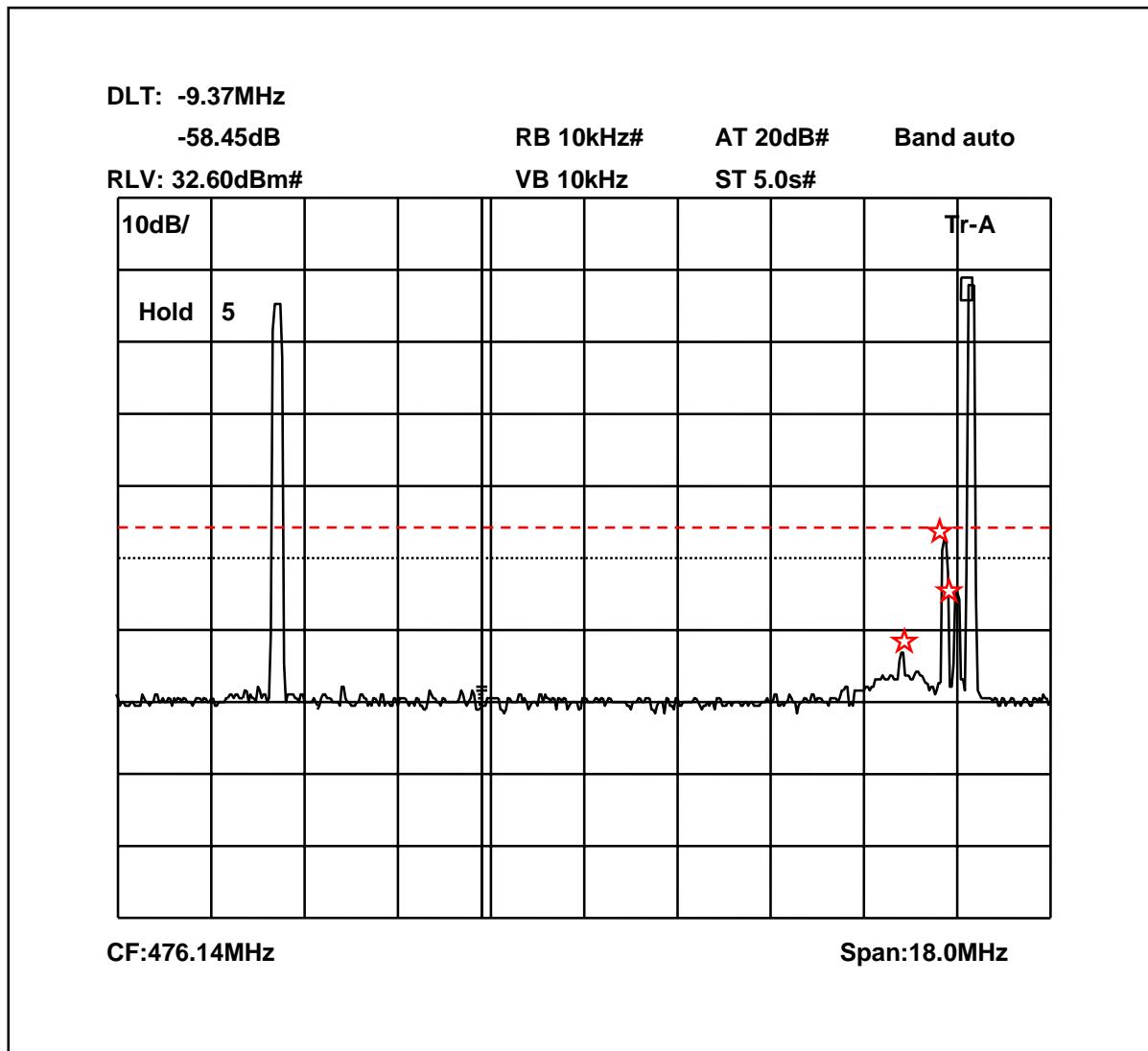
Due to the fact that the units under test will only ever be operated as a system with the channel filters contained with in units 60-055901 and 60-055902. The intermodulation products test was performed as a system. The diagram above show the setup that produced the worst case products. The intermodulation and spurious products were measured with the fibre optic system operating at maximum input level. A three tone test was conducted using the equipment as above. The input power level was adjusted so the level at point D was the maximum input -52dBm and at point E was the maximum input -62.0dBm.

Sweep data is shown on the next page:
 See Annex C for system diagram.

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 |
| SIGNAL GENERATOR | MARCONI | 2042 | 119562/02 | 254 | X |
| CMTA | ROHDE & SCHWARZ | CMTA52 | 894715/033 | 05 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |
| COMBINER | ELCOM | RC-4-50 | N/A | 170 | X |

Intermodulation Inband



The above plot shows that all products (designated by \star) are at least 5dB below the spurious limit.
 Based the 10dB above the on the -62dBm and -72dBm input to the system.

Intermodulation Wideband

MKR: 483.3MHz

22.00dBm

RB 10kHz#

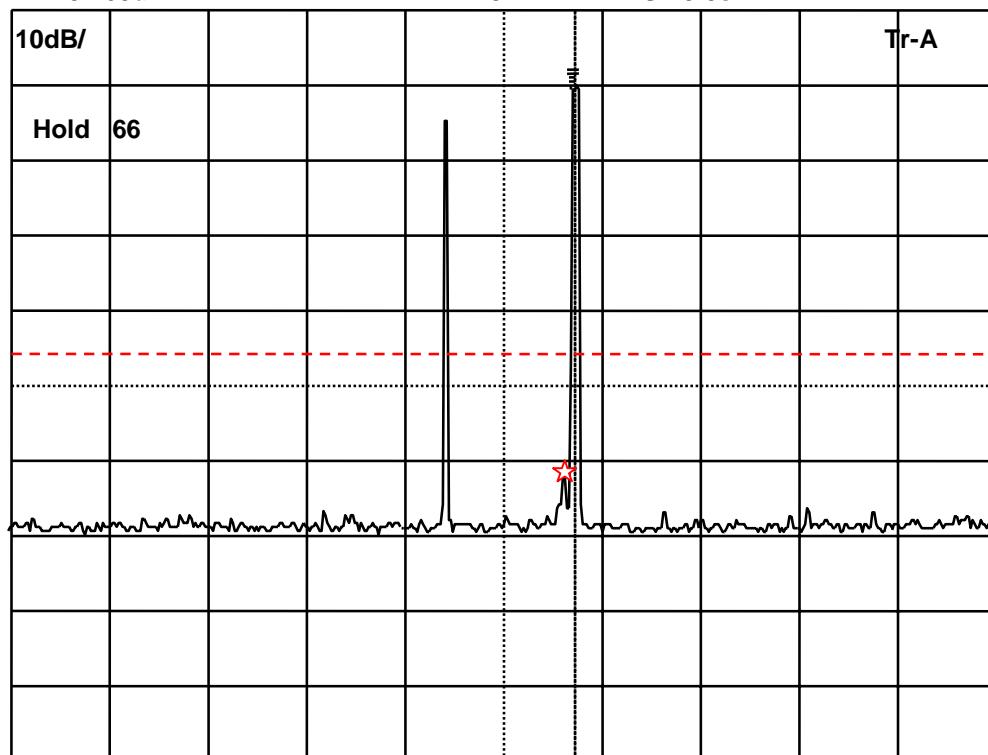
AT 20dB#

Band auto

RLV: 32.60dBm#

VB 10kHz

ST 5.0s#

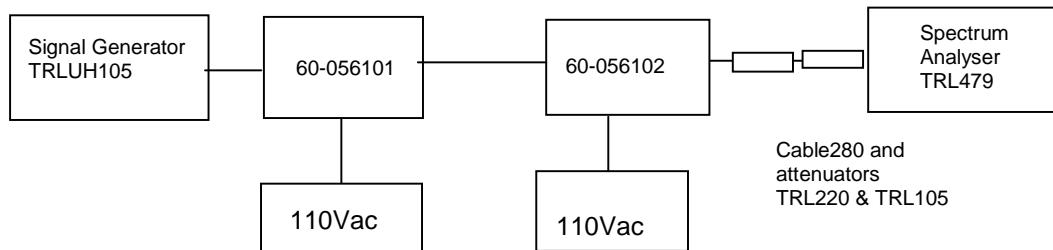


The above plot shows that all products (designated by \star) are at least 10dB below the spurious limit.
Based the 10dB above the on the -62dBm and -72dBm input to the system.

TRANSMITTER TESTS

MODULATED BANDWIDTH TEST – CONDUCTED – Part 2.1049– DOWNLINK

Ambient temperature = 18°C Radio Laboratory
 Relative humidity = 40%
 Supply voltage = 110Vac
 Channel number = See test results



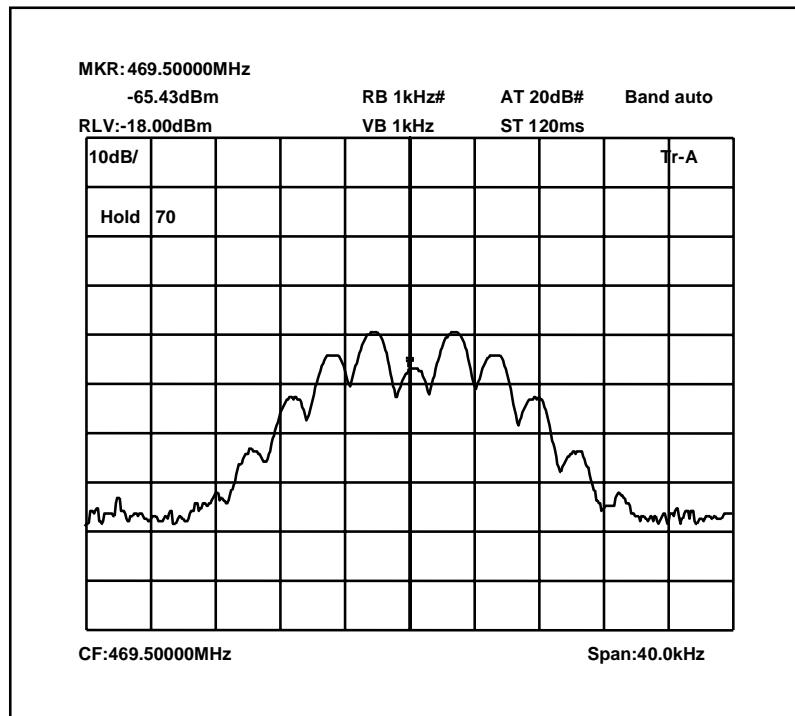
This test was performed to show that the fibre optic system does not alter the input signal in any way. The input signal was set to the maximum input level (-6dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

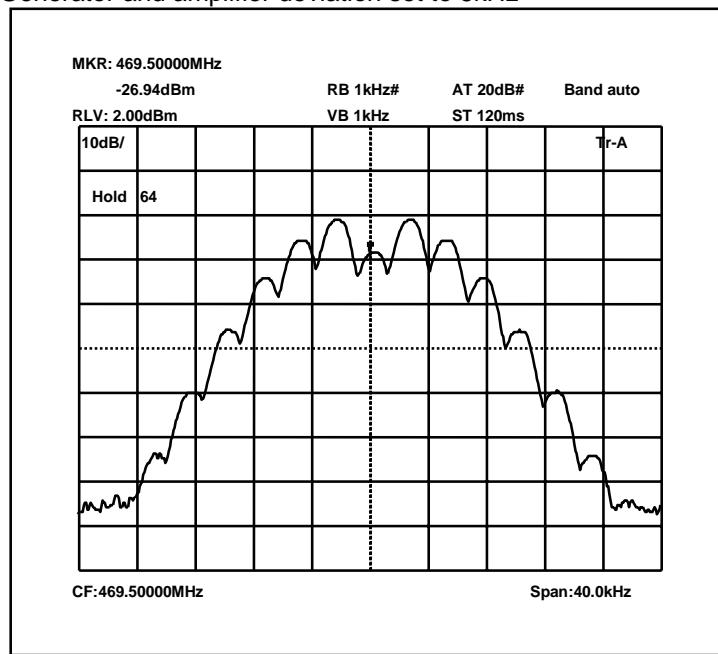
1. Cable TRL280 and Attenuators TRL220,TRL 105 between EUT and spectrum analyser= 46.6dB
2. Cable between signal generator and EUT = 0.22dB

| 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 | 105 | X |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | X |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

469.50MHz Signal Generator deviation set to 5kHz

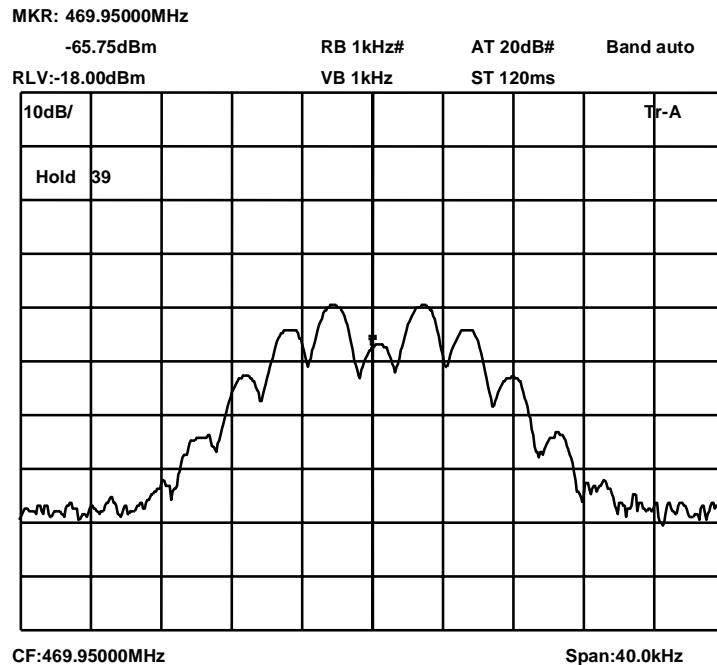


469.50MHz Signal Generator and amplifier deviation set to 5kHz

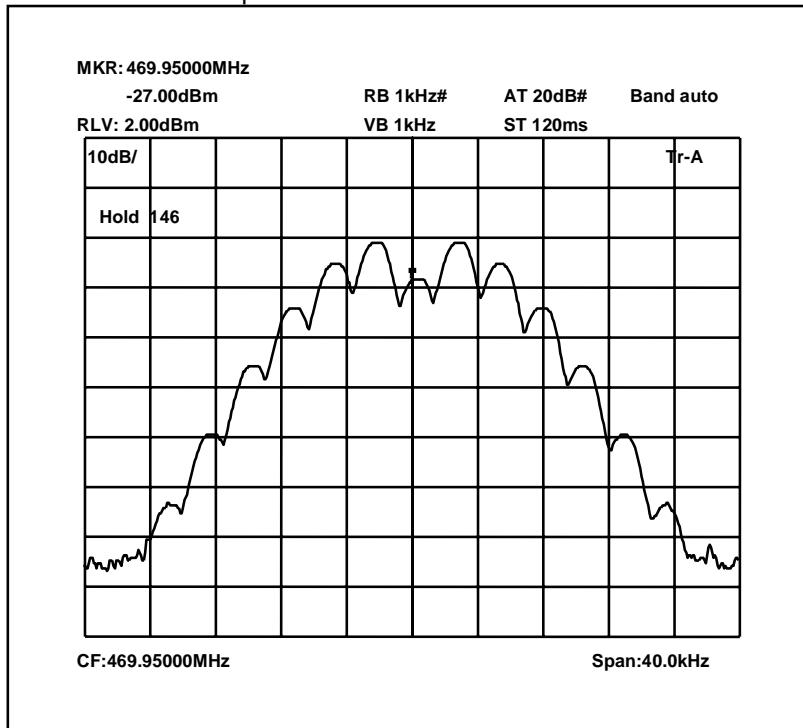


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

469.95MHz Signal Generator deviation set to 5kHz

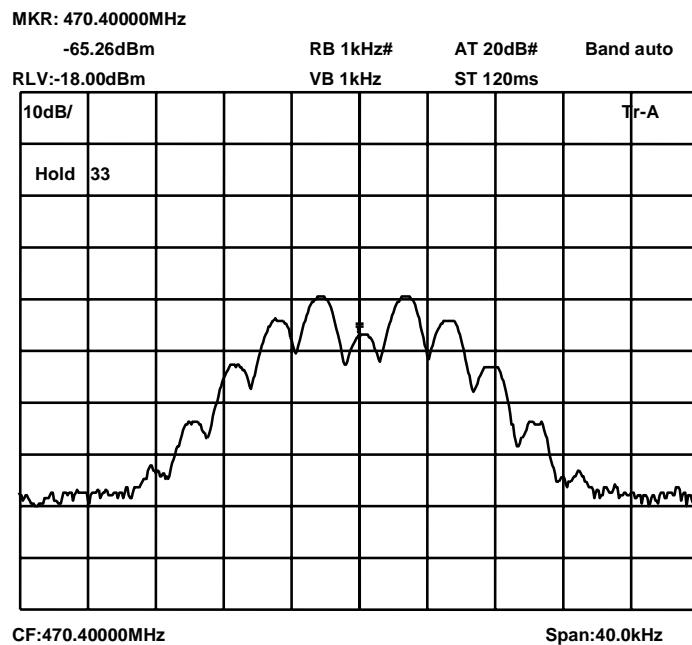


469.95MHz Signal Generator and amplifier deviation set to 5kHz

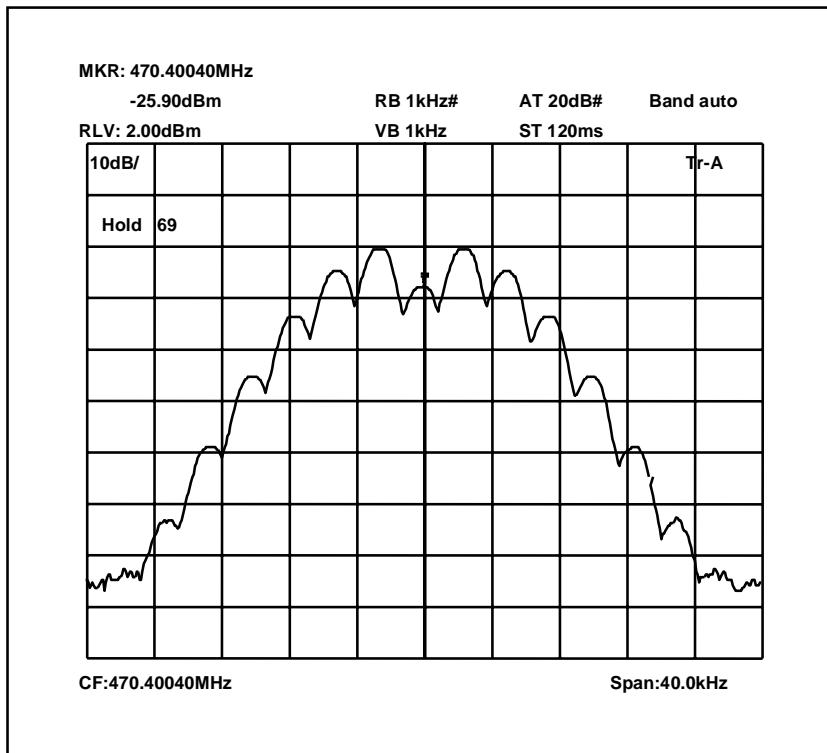


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

470.4MHz Signal Generator deviation set to 5kHz

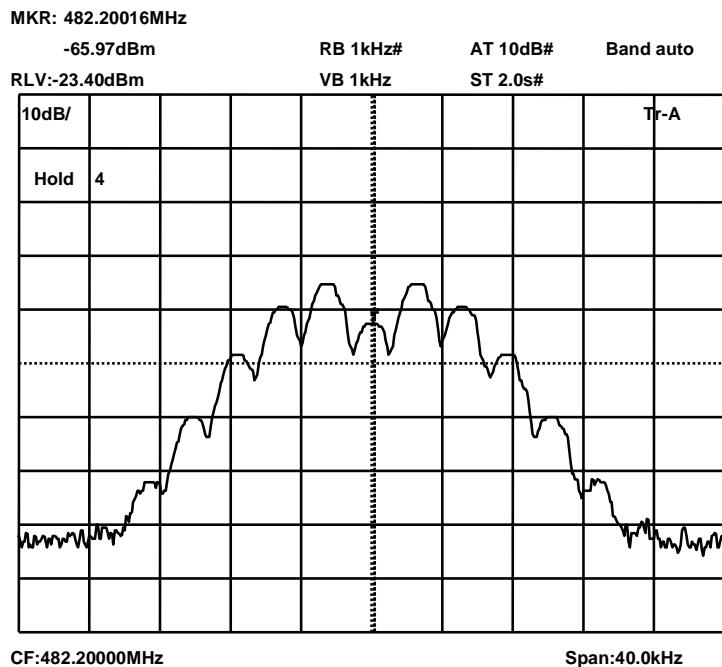


470.4MHz Signal Generator and amplifier system deviation set to 5kHz

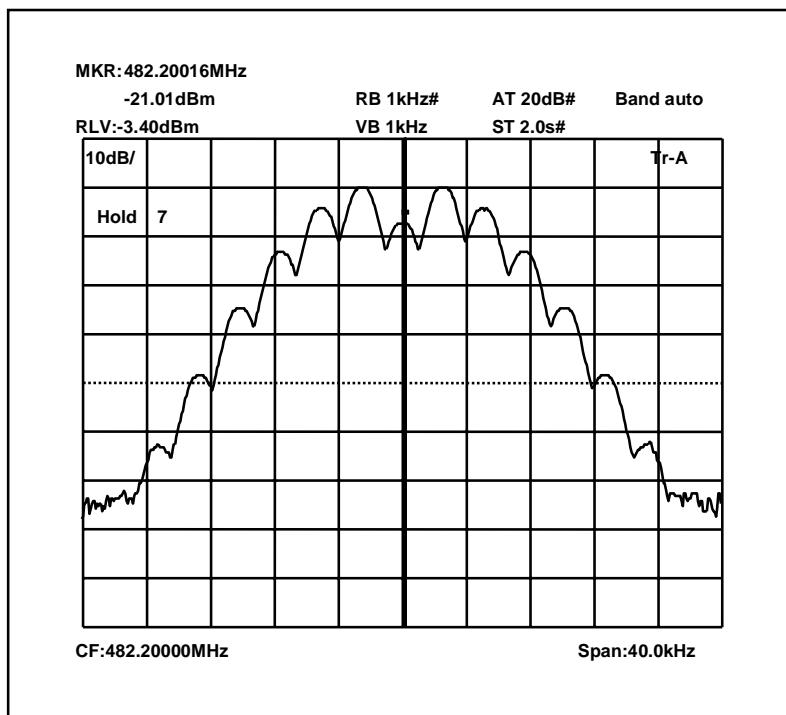


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

482.2375MHz Signal Generator deviation set to 5kHz

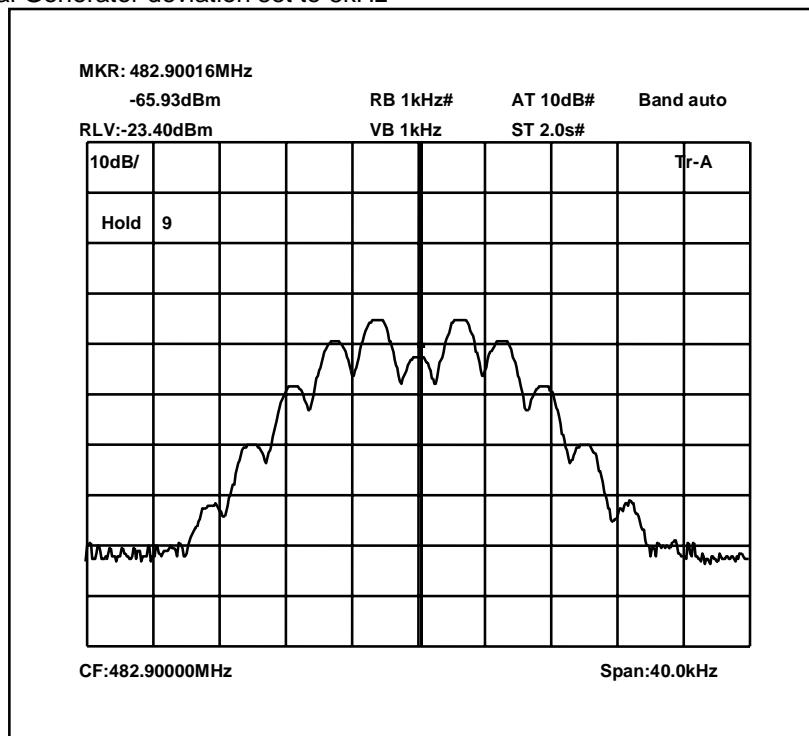


482.2375MHz Signal Generator and amplifier system deviation set to 5kHz

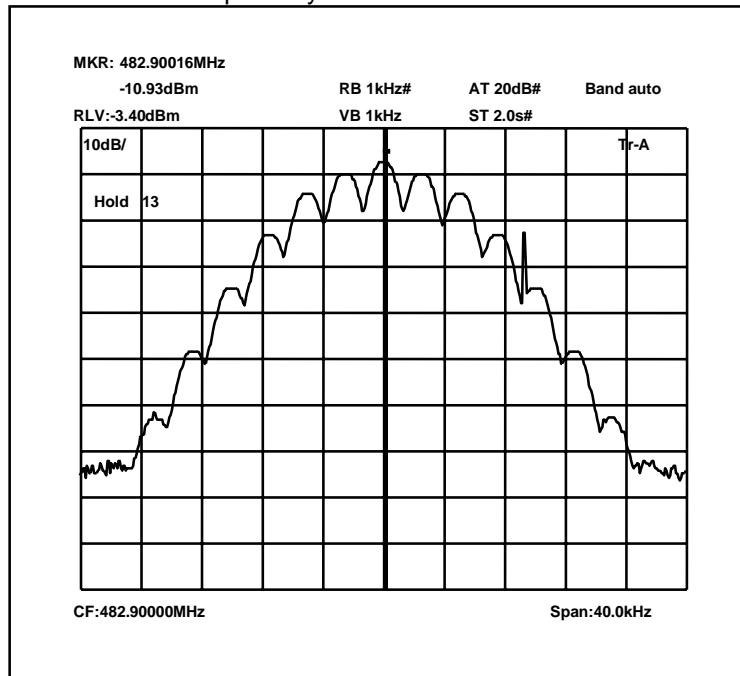


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

482.9MHz Signal Generator deviation set to 5kHz

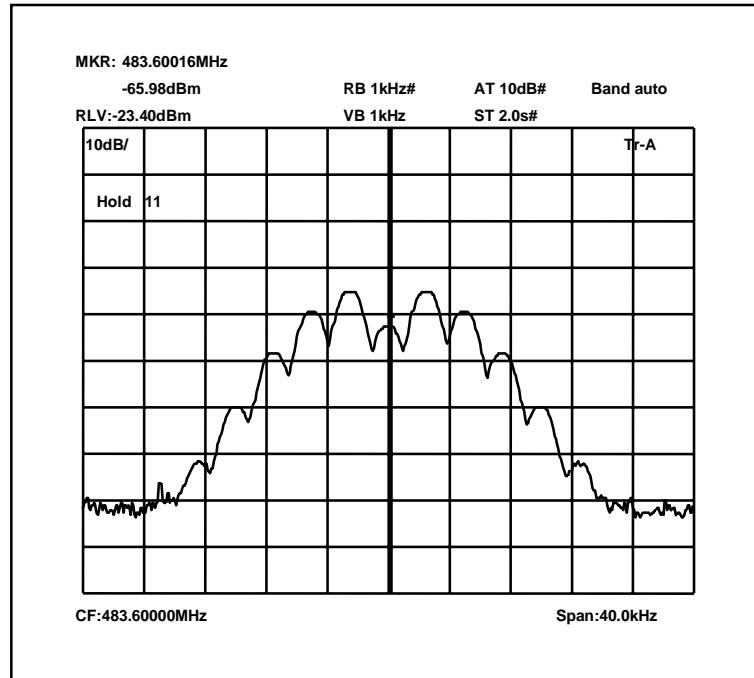


482.9MHz Signal Generator and amplifier system deviation set to 5kHz

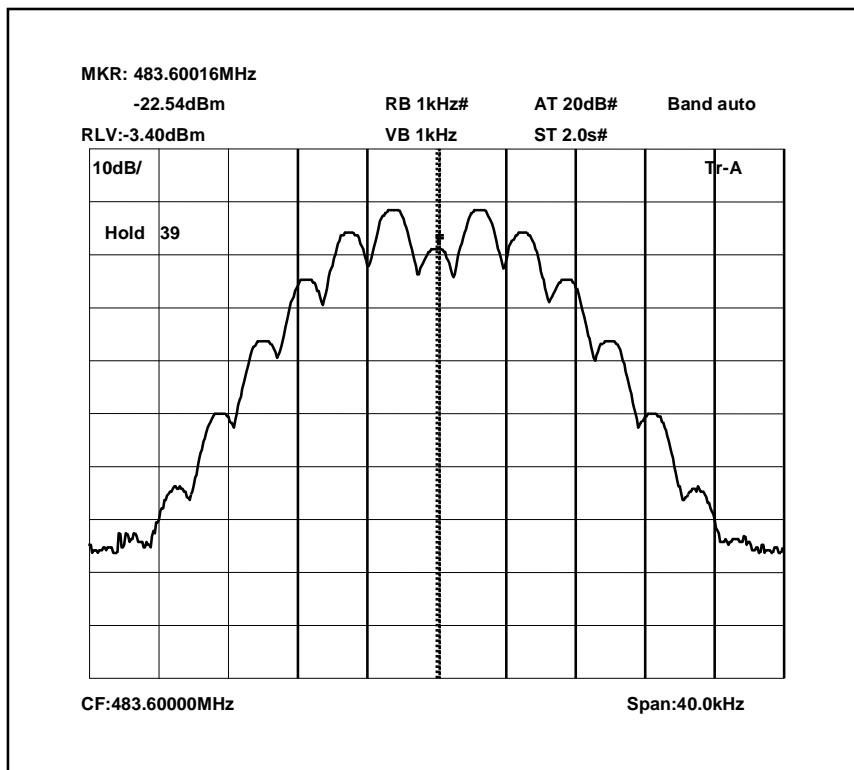


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

483.6MHz Signal Generator deviation set to 5kHz



483.6MHz Signal Generator and amplifier system deviation set to 5kHz



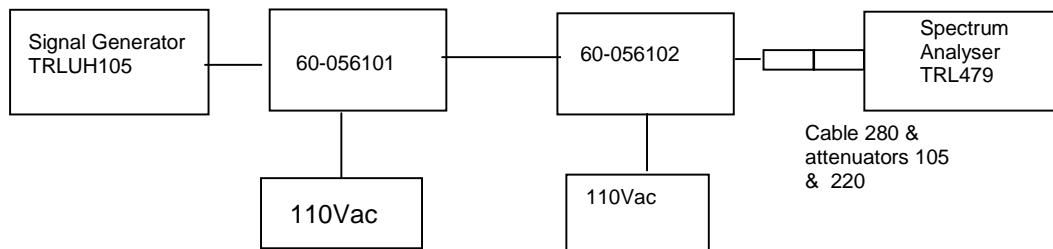
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – DOWNLINK

Ambient temperature = 18°C
 Relative humidity = 40%
 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 $43 + 10 \log P_{\text{dB}}$

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

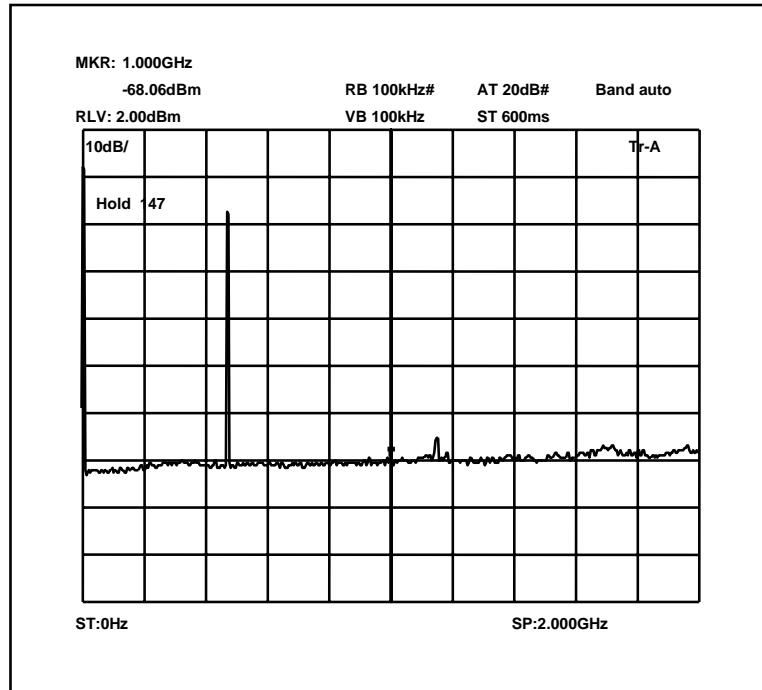
Results

No significant emissions were detected within 20dBm of limit.

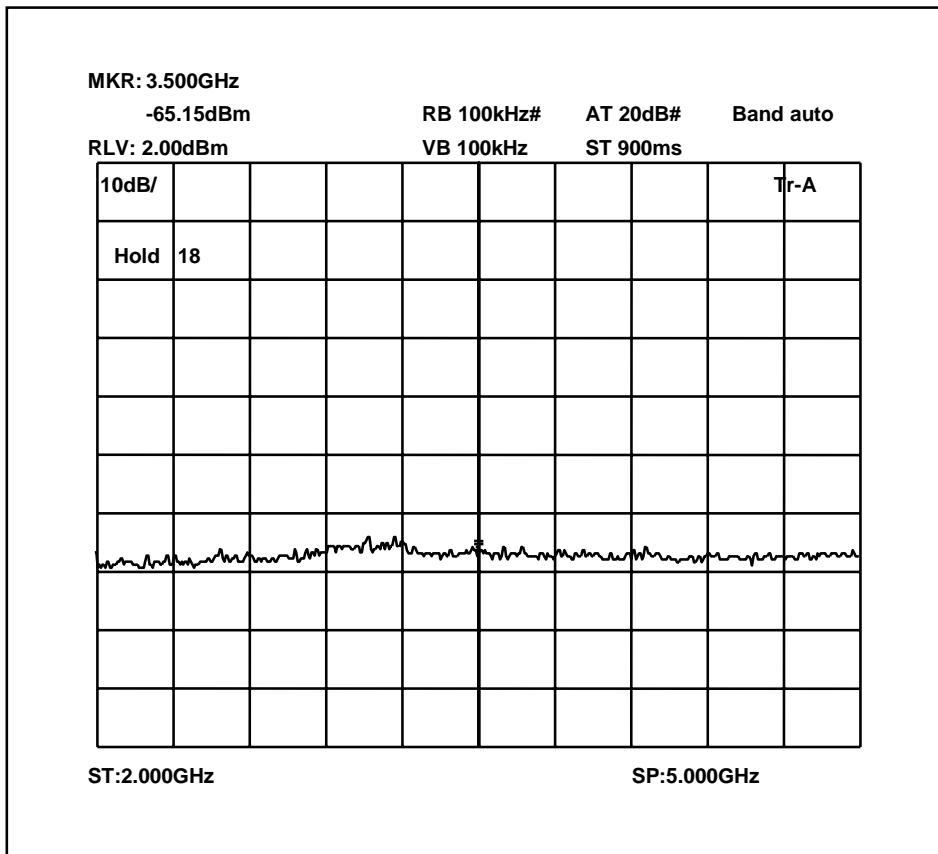
The test equipment used for the Transmitter Conducted Emissions:

| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRL No | ACTUAL EQUIPMENT USED |
|-------------------|-----------------|------------|------------|--------|-----------------------|
| SPECTRUM ANALYSER | ANRITSU | MS2665C | MT26089 | 479 | X |
| ATTENUATOR | BIRD | 8304-200 | N/A | 105 | X |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | X |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

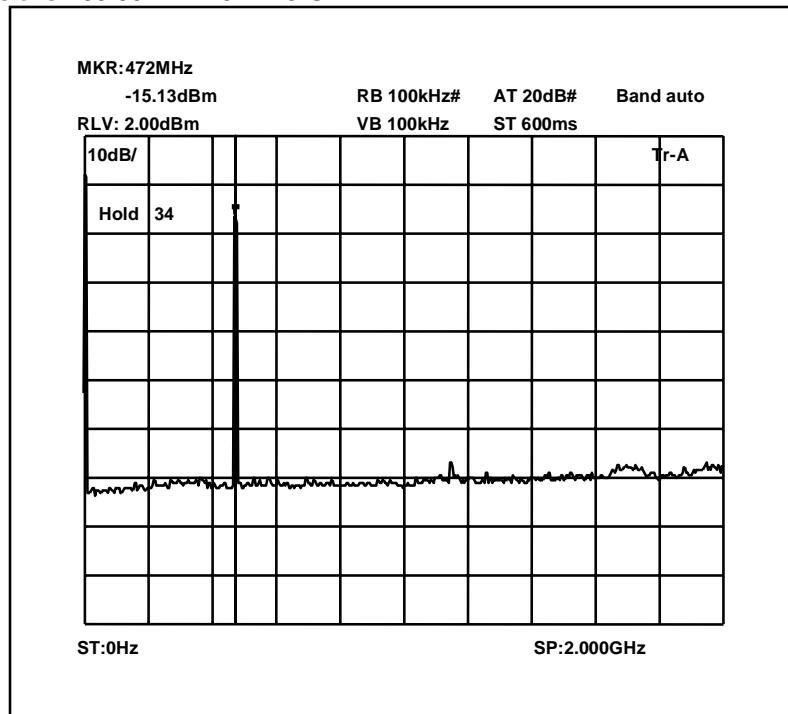
Conducted emissions 469.5 MHz – 0 – 2 GHz



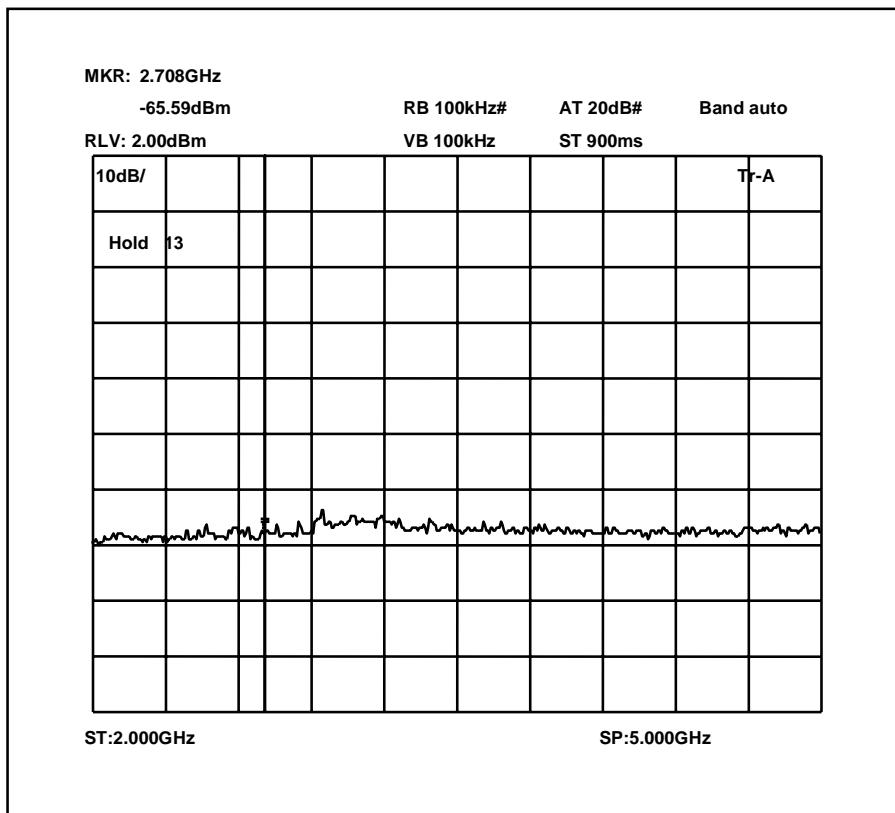
Conducted emissions 469.5MHz 2 – 5 GHz



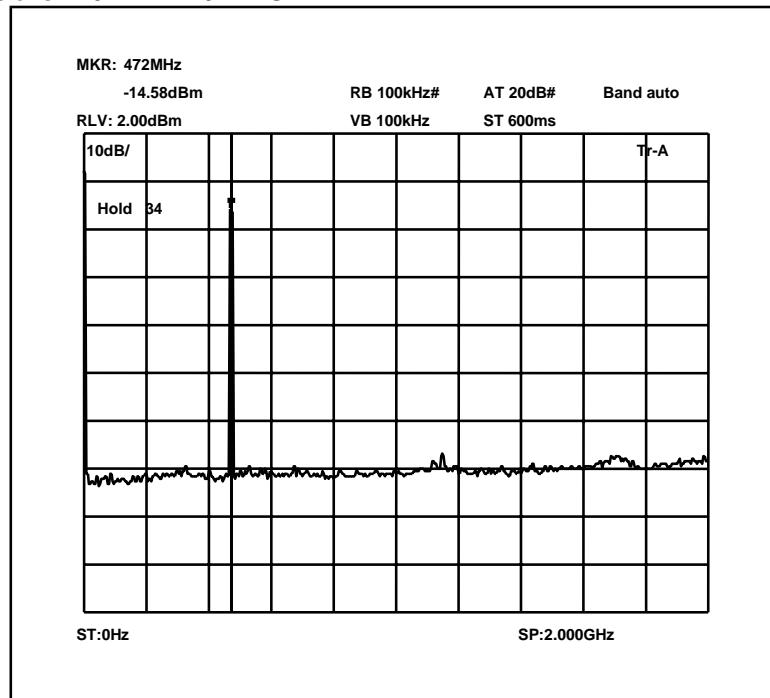
Conducted emissions 469.95MHz 0 – 2.0 GHz



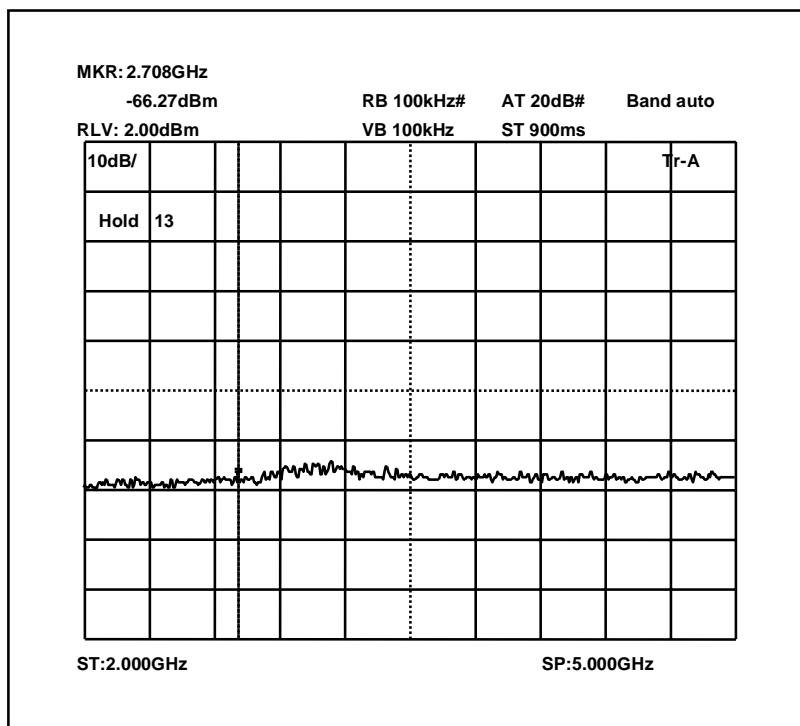
Conducted emissions 469.95MHz 2.0 – 5.0 GHz



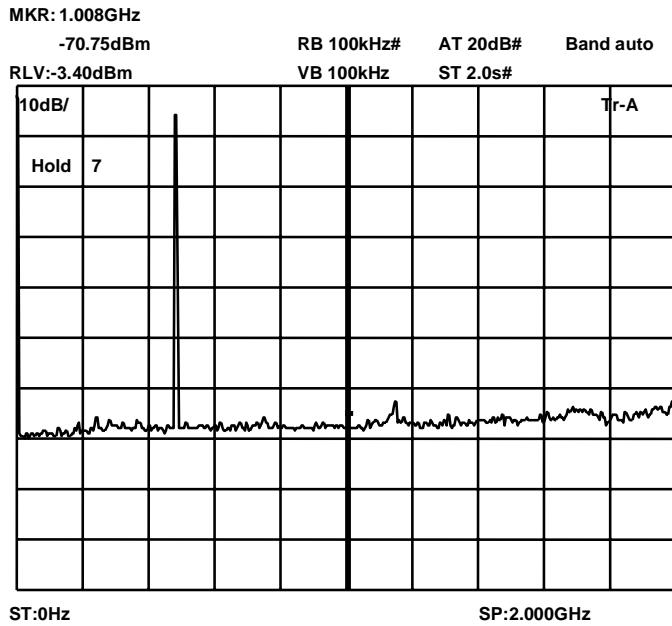
Conducted emissions 470.4MHz 0 – 2 GHz



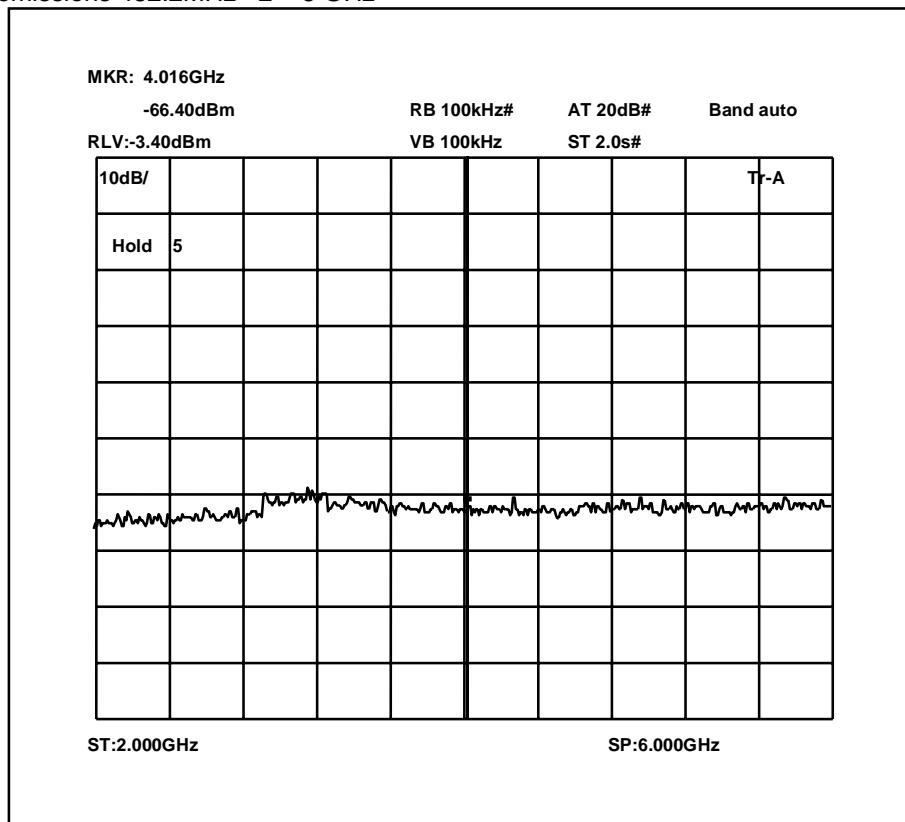
Conducted emissions 470.4MHz 2 – 5 GHz



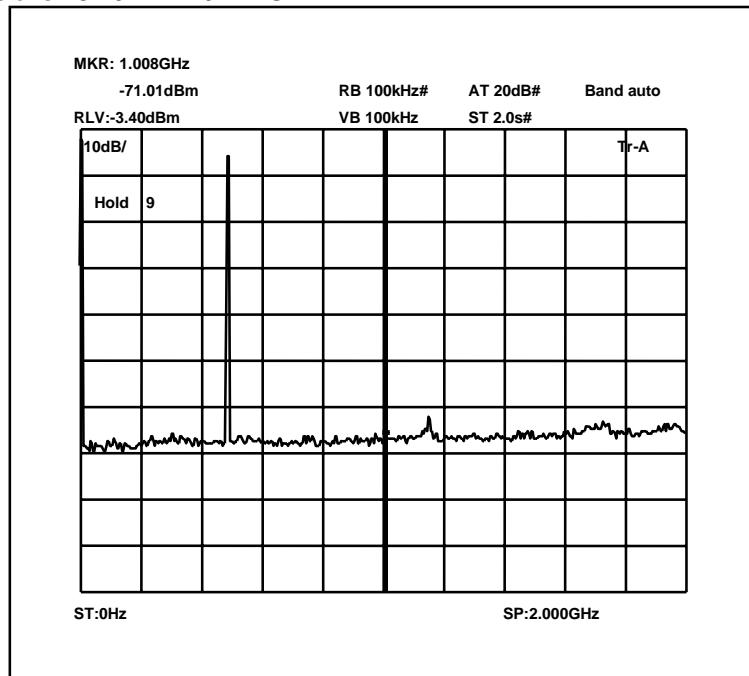
Conducted emissions 482.2MHz 0 – 2 GHz



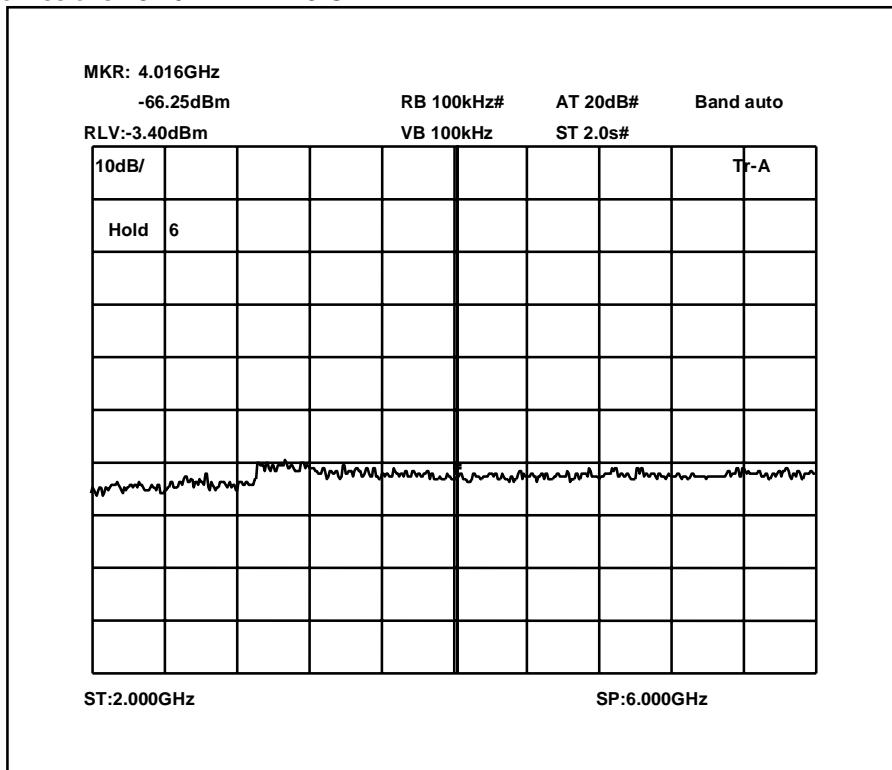
Conducted emissions 482.2MHz 2 – 5 GHz



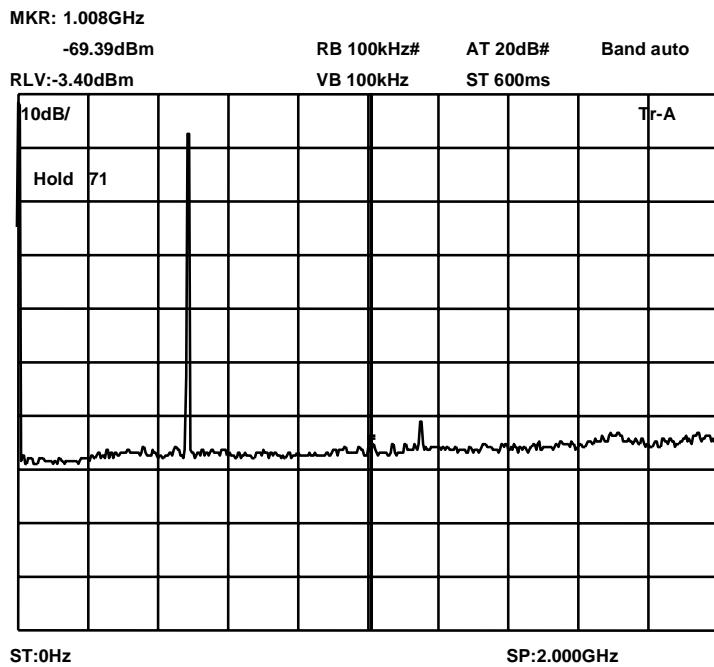
Conducted emissions 482.9MHz 0 – 2 GHz



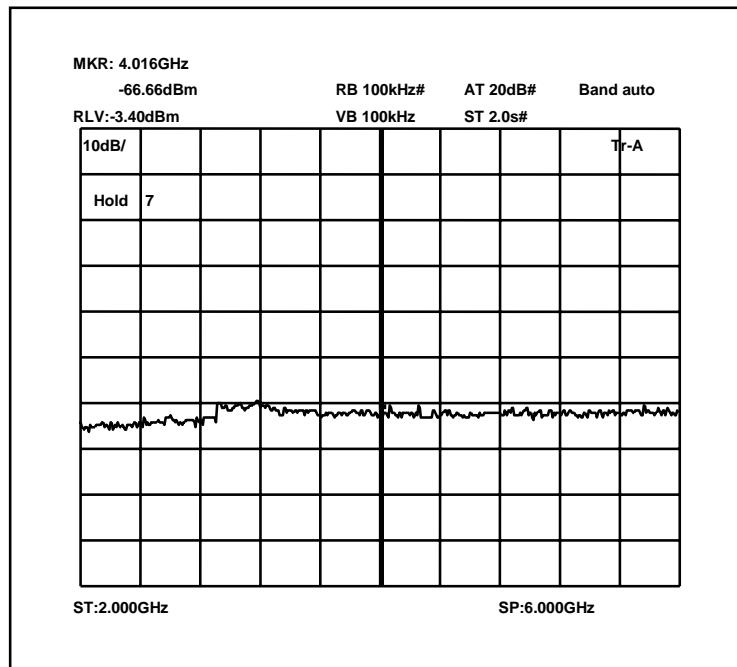
Conducted emissions 482.9MHz – 2 – 5 GHz



Conducted emissions 483.6MHz 0 – 2 GHz



Conducted emissions 483.6MHz 2 – 5 GHz

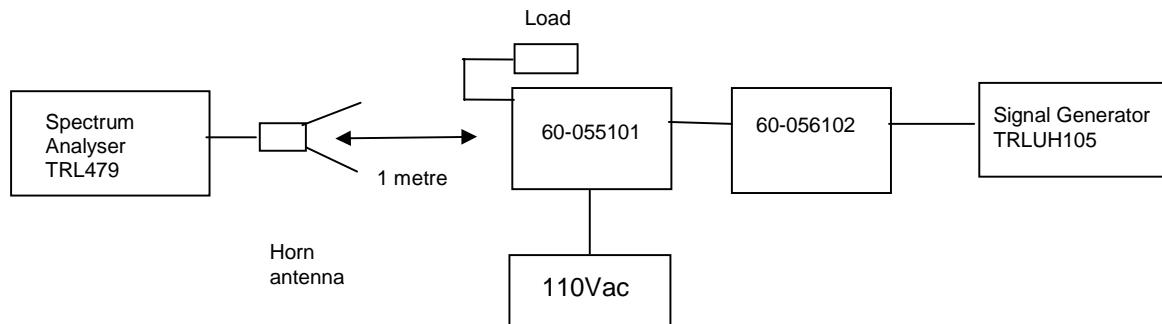


TRANSMITTER TESTS

TRANSMITTER 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 than 250% of the authorised bandwidth

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

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

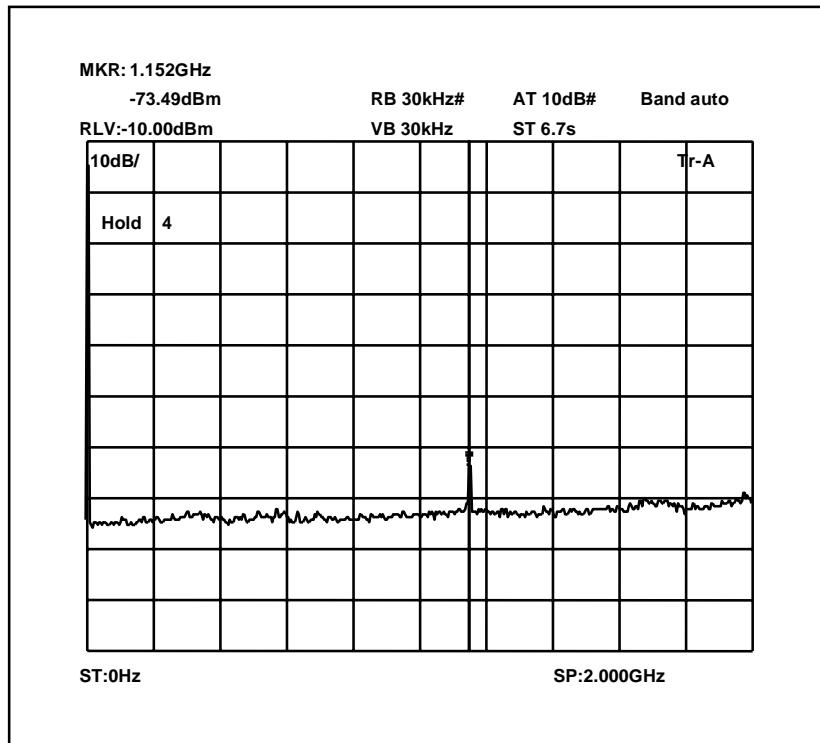
Test result

No significant emissions with 20dBm of limit.

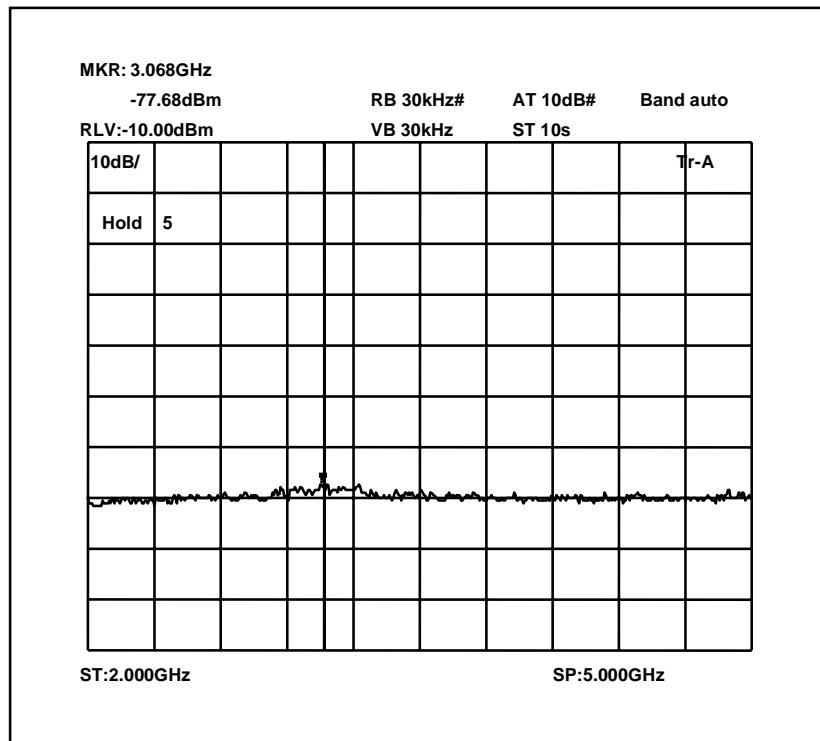
The test equipment used for the Transmitter Spurious Emissions:

| 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 | 139 | X |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | X |
| ATTENUATOR | BIRD | 8308-100 | N/A | 112 | X |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

Radiated emissions 469.50MHz 0 – 2GHz

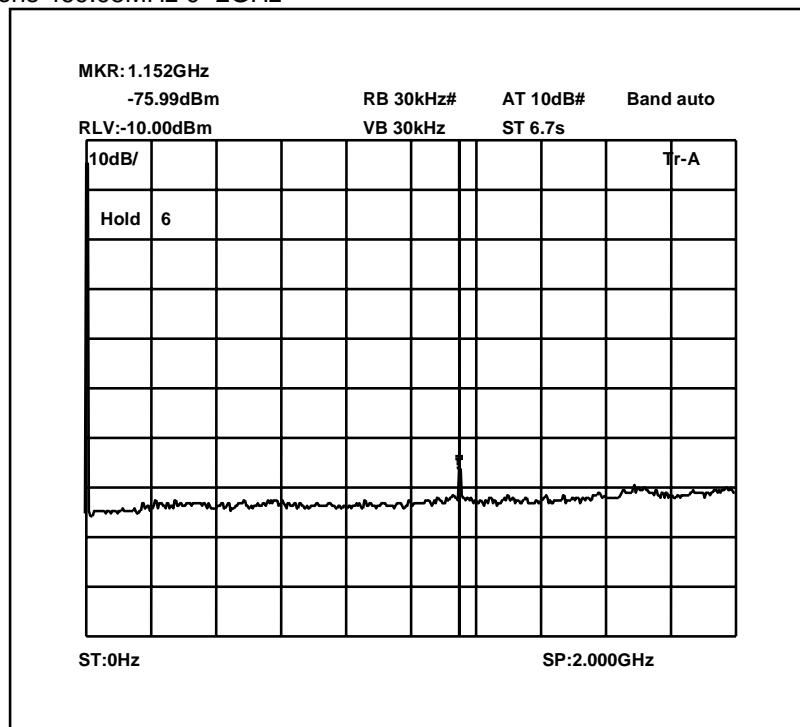


Radiated emissions 469.5 MHz 2-5GHz

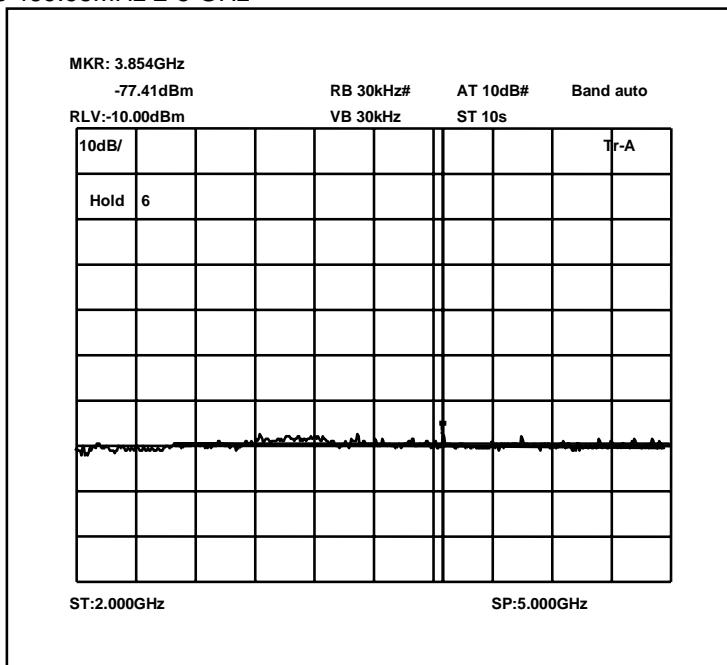


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 469.95MHz 0 -2GHz

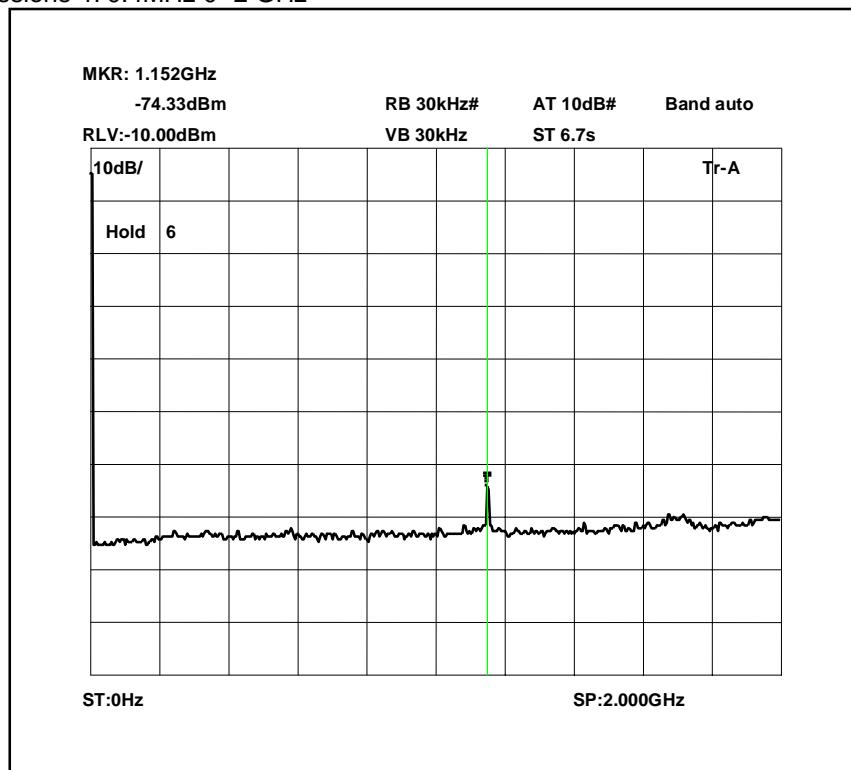


Radiated emissions 469.95MHz 2-5 GHz

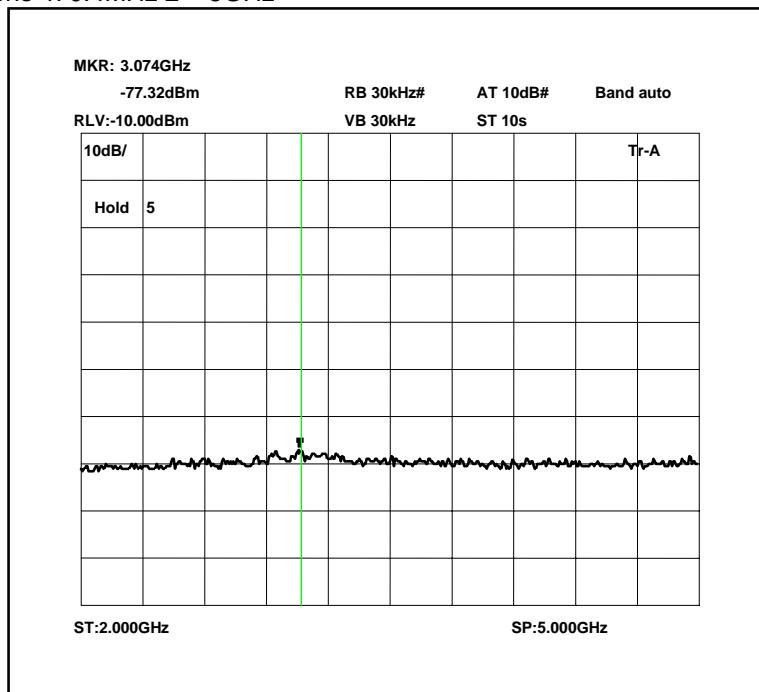


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 470.4MHz 0 -2 GHz

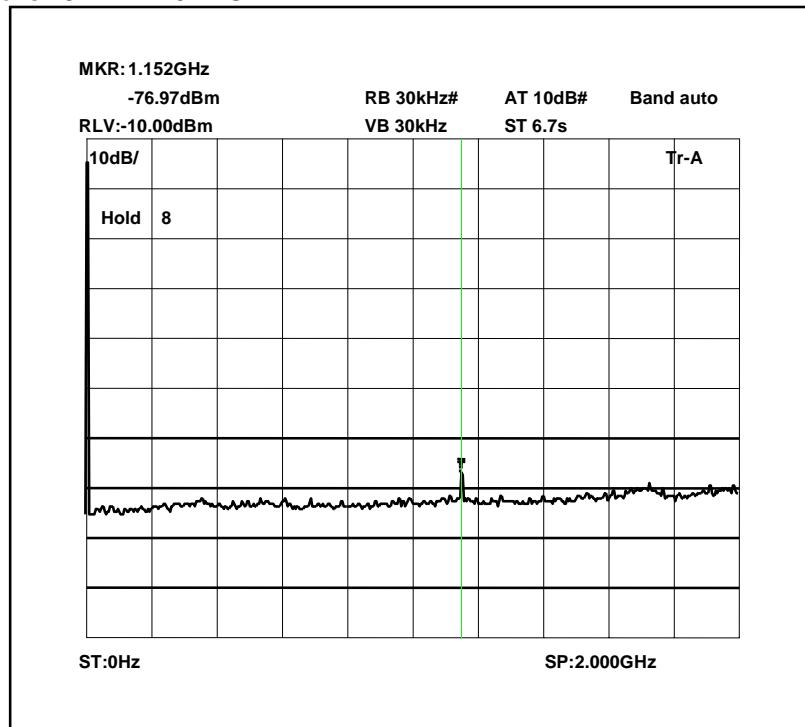


Radiated emissions 470.4MHz 2 – 5GHz

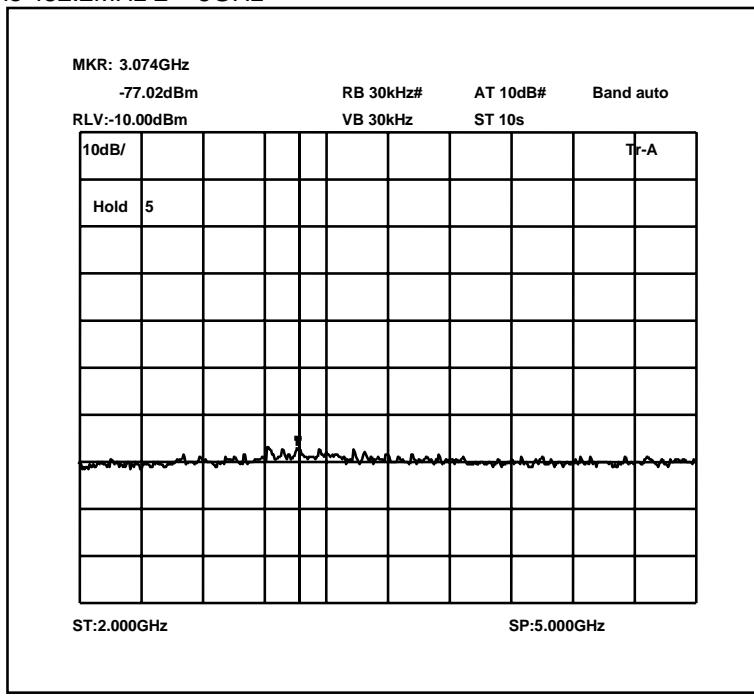


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 482.2MHz 0 -2 GHz

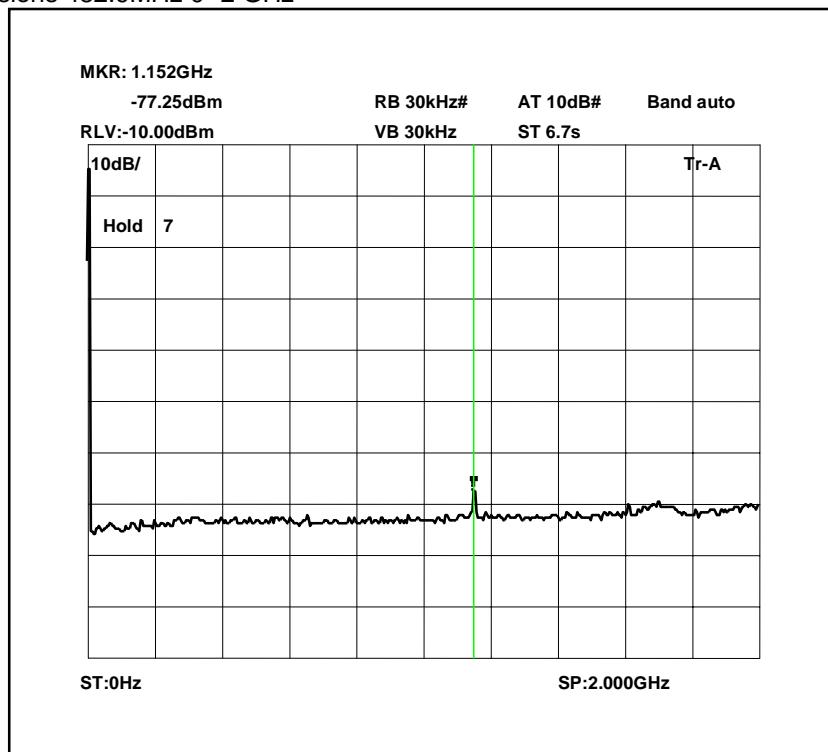


Radiated emissions 482.2MHz 2 – 5GHz

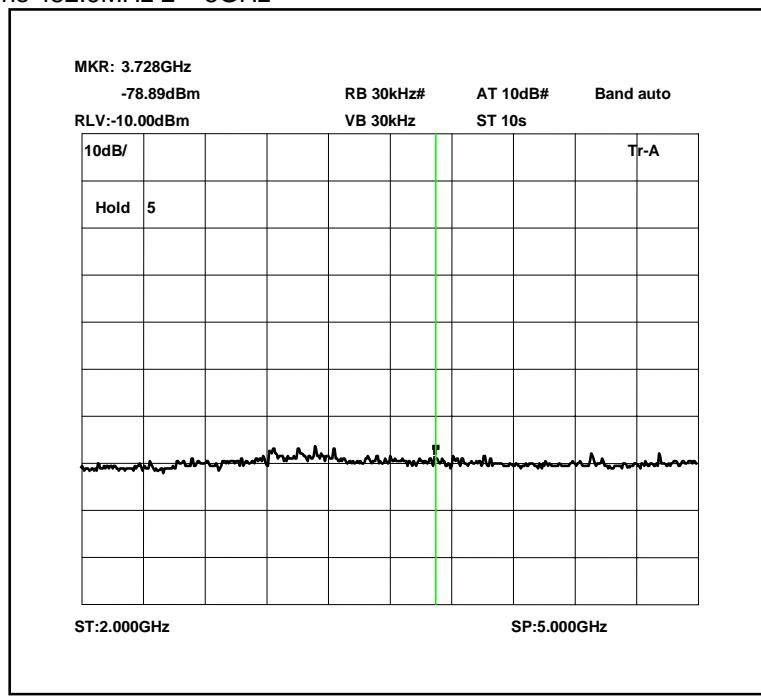


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 482.9MHz 0 -2 GHz

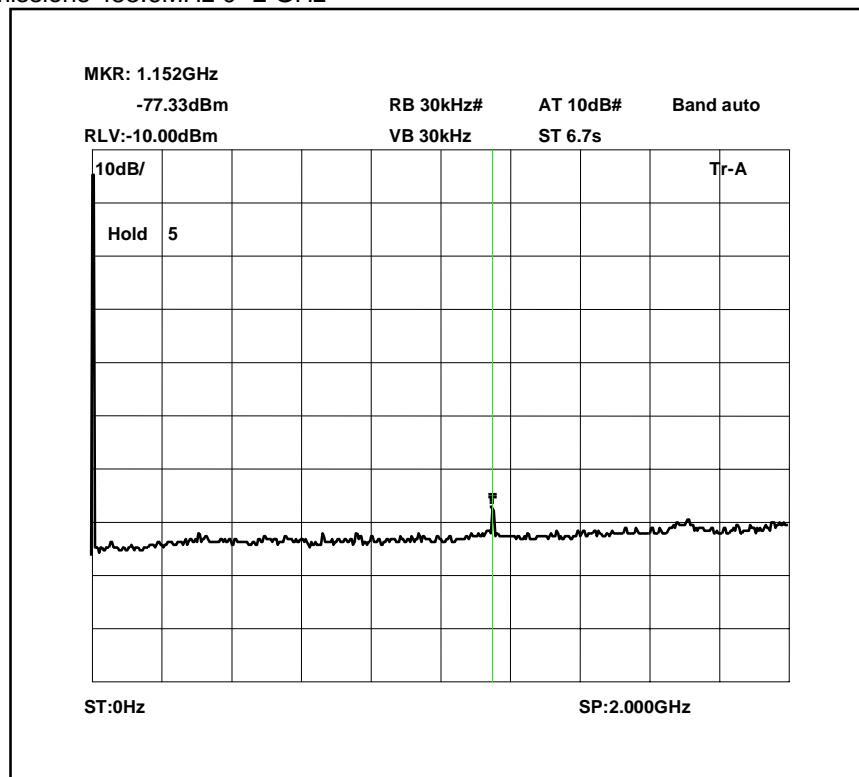


Radiated emissions 482.9MHz 2 – 5GHz

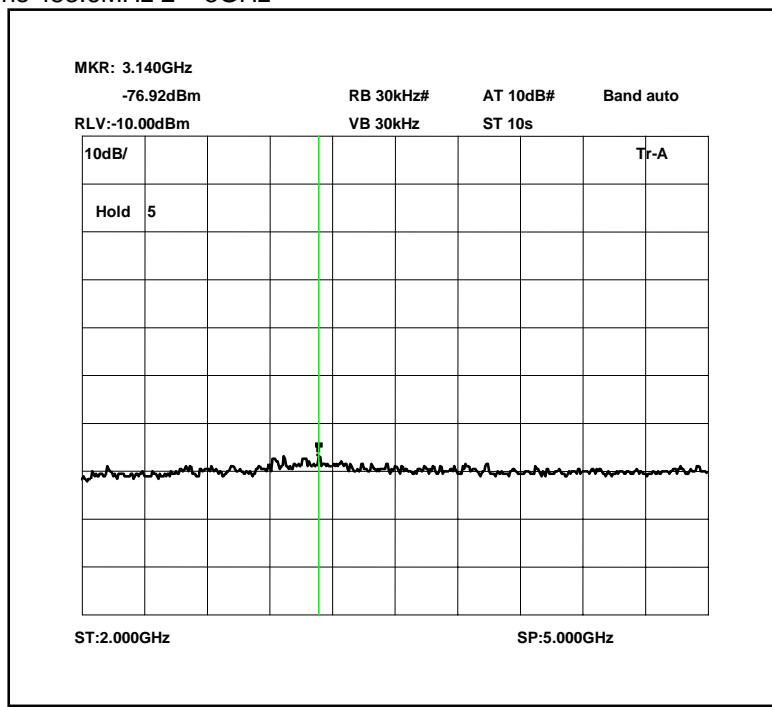


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 483.6MHz 0 -2 GHz

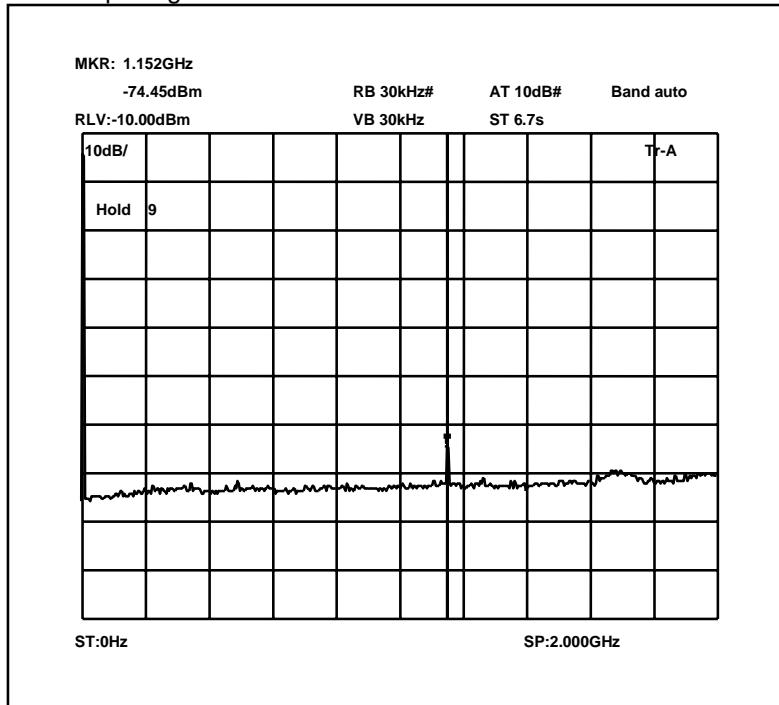


Radiated emissions 483.6MHz 2 – 5GHz

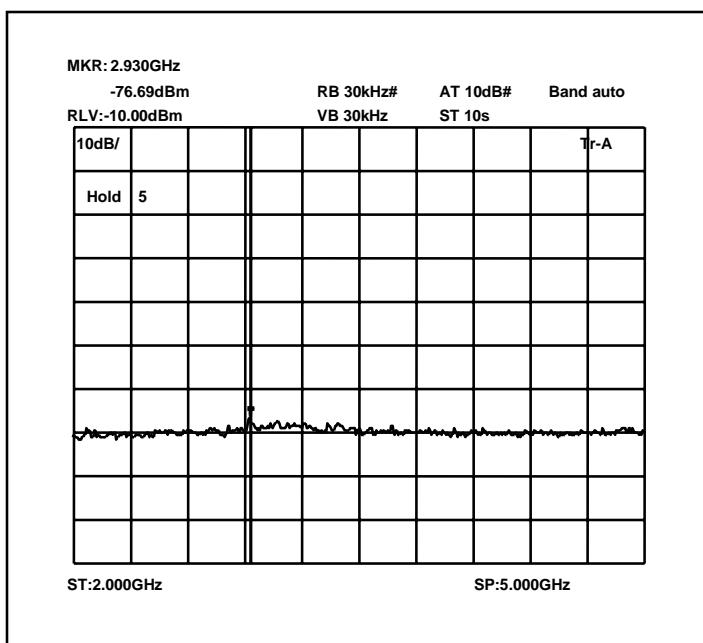


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions no input signal 0 -2GHz



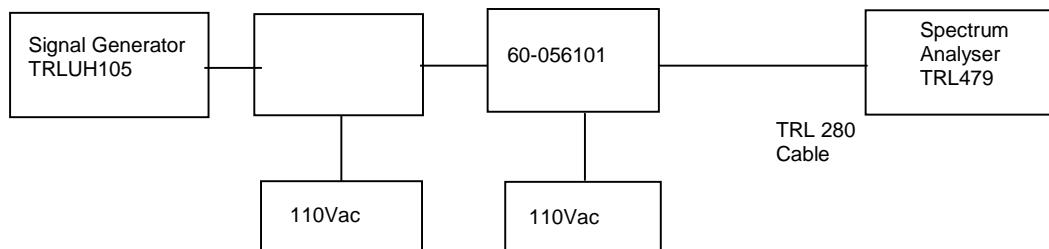
Radiated emissions no signal 2- 5 GHz



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

TRANSMITTER TEST – GAIN – CONDUCTED – PART 2.1046 – UPLINK

Ambient temperature = 24°C
 Relative humidity = 53%
 Supply voltage = 110Vac
 Channel number = See test results



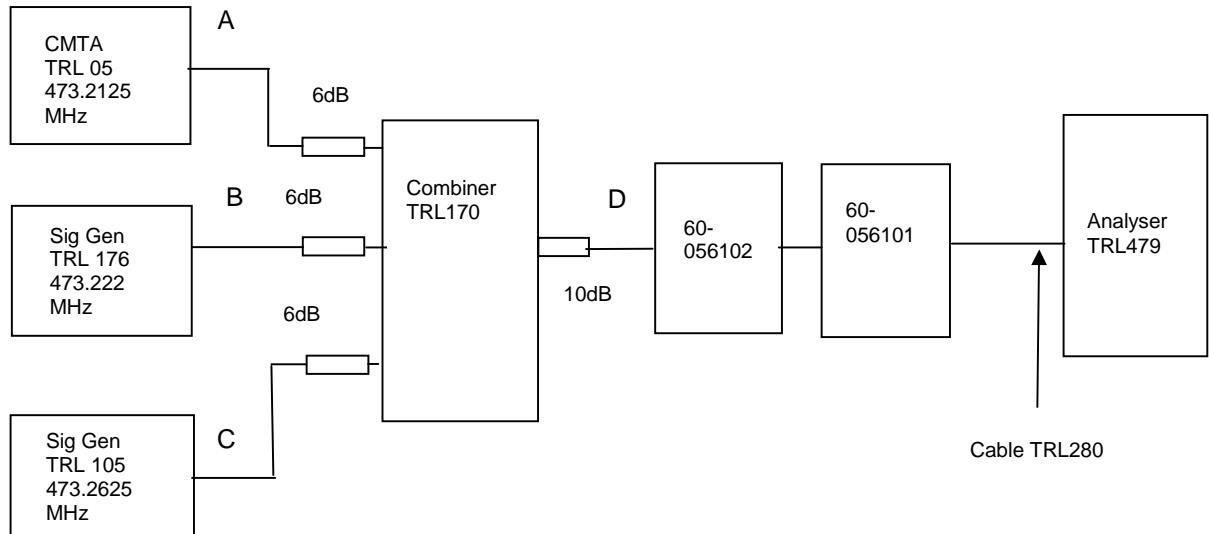
| Frequency MHz | Signal Generator Input Level dBm | Cable Loss dB | Level at Spectrum Analyser dBm | Gain dB | Gain after 10dB increase input signal level dBm | Measured Output power dBm |
|------------------|--|---------------------|--------------------------------------|------------|--|---------------------------------|
| 473.2125 | -74.0 | 0.3 | -15.35 | 58.95 | 48.95 | -15.05 |
| 473.2375 | -74.0 | 0.3 | -15.36 | 58.94 | 48.97 | -15.06 |
| 473.2625 | -74.0 | 0.3 | -15.29 | 59.01 | 49.05 | -14.99 |
| 485.2375 | -63.0 | 0.3 | -14.26 | 49.04 | 39.14 | -13.96 |
| 485.9000 | -64.0 | 0.3 | -14.95 | 49.35 | 39.88 | -14.65 |
| 486.5625 | -62.0 | 0.3 | -13.08 | 49.22 | 39.69 | -12.78 |

The test was setup as above. The signal generator was to simulate an input signal to the system from a transmitter and the analyzer used to obtain the output level from the system.

| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRL No | ACTUAL EQUIPMENT USED |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| SPECTRUM ANALYSER | ANRITSU | MS266C | MT26089 | 479 | X |
| ATTENUATOR | BIRD | 8302 | N/A | 105 | |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

TRANSMITTER TEST - INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK

Ambient temperature = 26°C
 Relative humidity = 41%
 Supply voltage = 110Vac



The intermodulation products test was performed as a system. The intermodulation and spurious products were measured with the fibre optic system operating at maximum input level. A three tone test was conducted using the equipment as above. The input power level was adjusted so the level at point D was the maximum input -62dBm.

Test result:

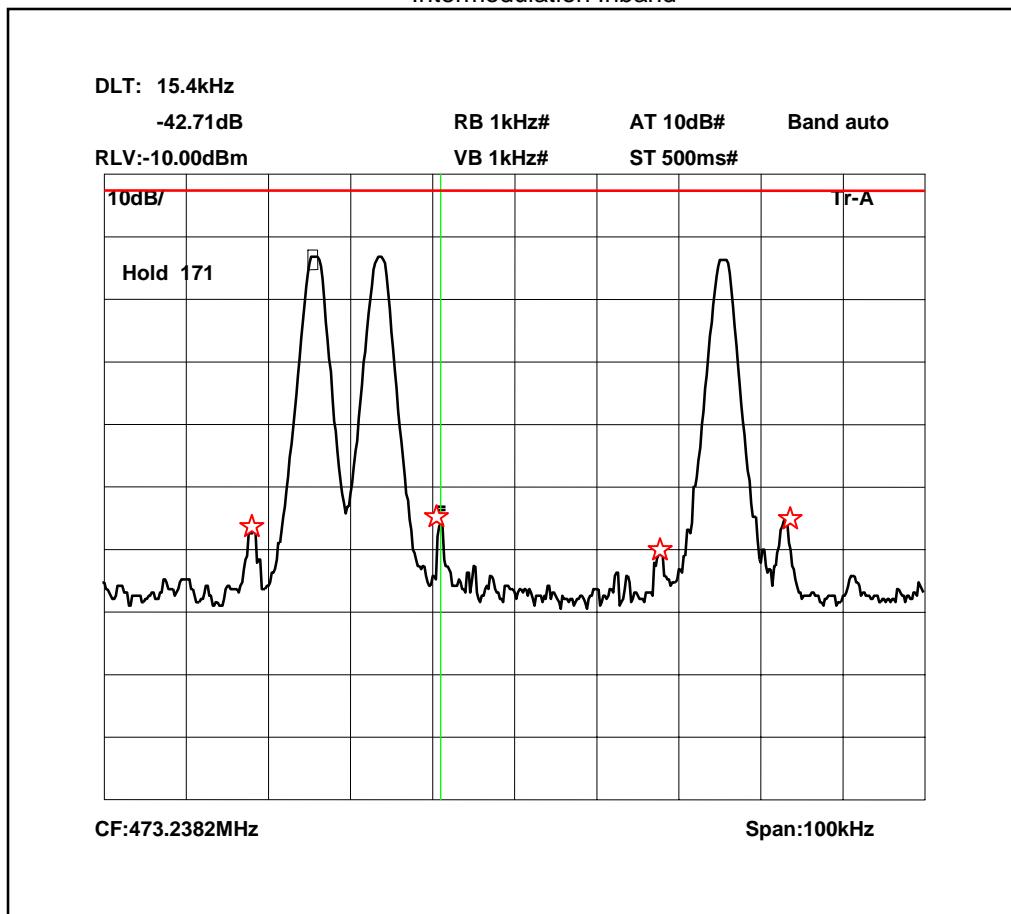
Measured as compliant

Sweep data is shown on the next page

Test equipment used for intermodulation test

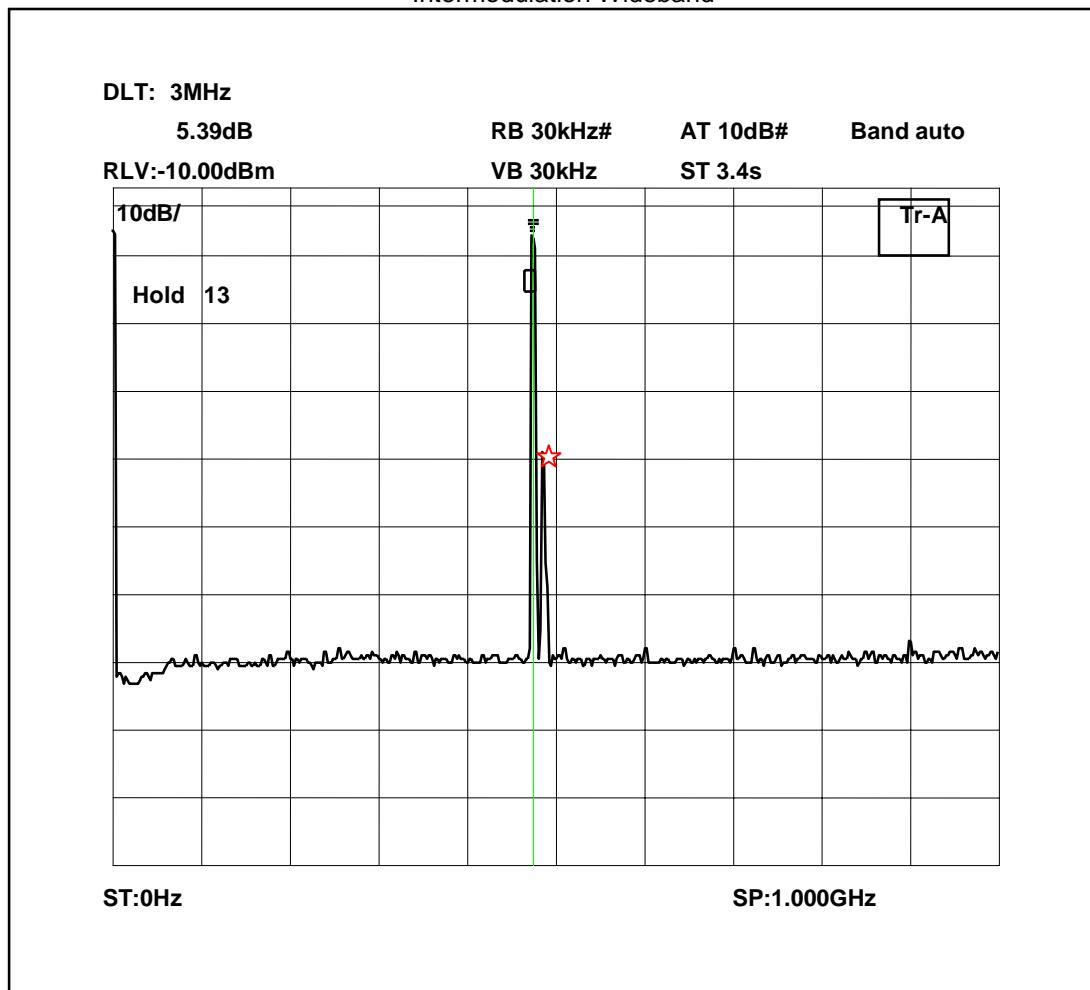
| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRL No | ACTUAL EQUIPMENT USED |
|-------------------|-----------------|----------|------------|--------|-----------------------|
| SPECTRUM ANALYSER | ANRITSU | MS2665C | MT26089 | 479 | X |
| SIGNAL GENERATOR | MARCONI | 2042 | 119562/02 | 254 | X |
| CMTA | ROHDE & SCHWARZ | CMTA52 | 894715/033 | 05 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |
| COMBINER | ELCOM | RC-4-50 | N/A | 170 | x |

Intermodulation Inband



The above plot shows that all products (designated by \star) are at least 40dB below the spurious limit.
Based on -62dBm input to the system.

Intermodulation Wideband



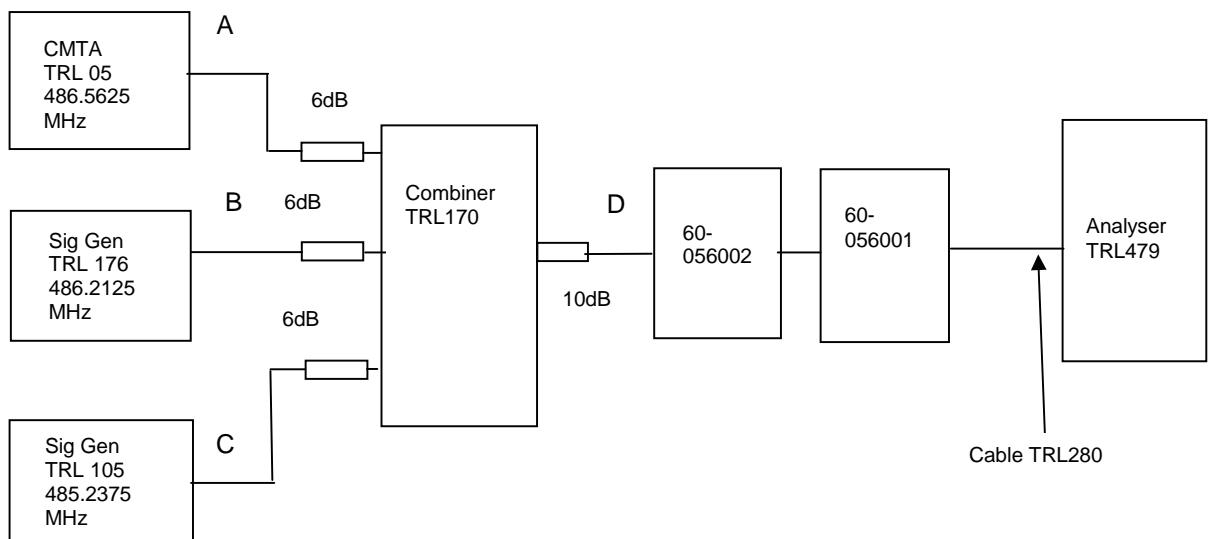
The above plot shows that all products (designated by \star) are at least 30dB below the spurious limit.

Based on -62dBm input to the system

TRANSMITTER TEST - INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK

Ambient temperature = 26°C
 Relative humidity = 41%
 Supply voltage = 110Vac

Radio Laboratory



The intermodulation products test was performed as a system. The intermodulation and spurious products were measured with the fibre optic system operating at maximum input level. A three tone test was conducted using the equipment as above. The input power level was adjusted so the level at point D was the maximum input -51dBm.

Test result:

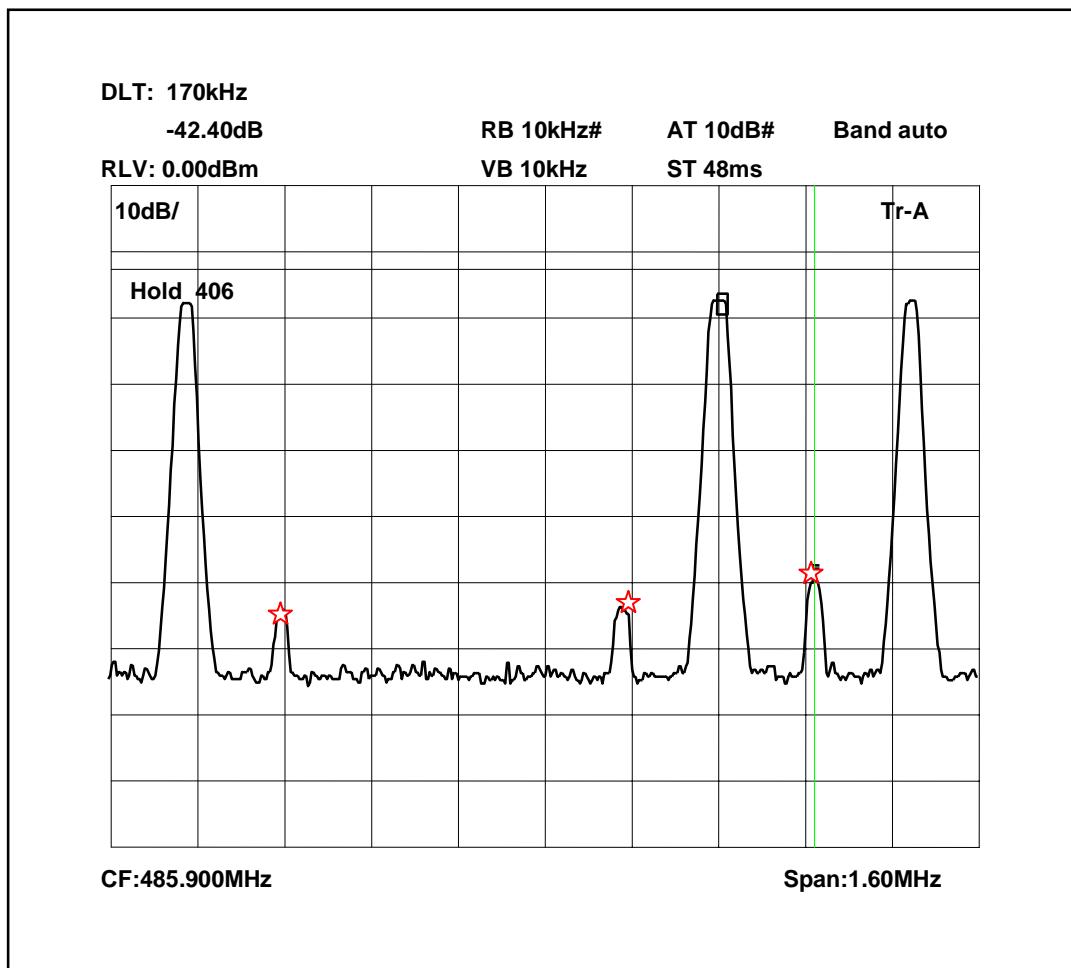
Measured as compliant

Sweep data is shown on the next page

Test equipment used for intermodulation test

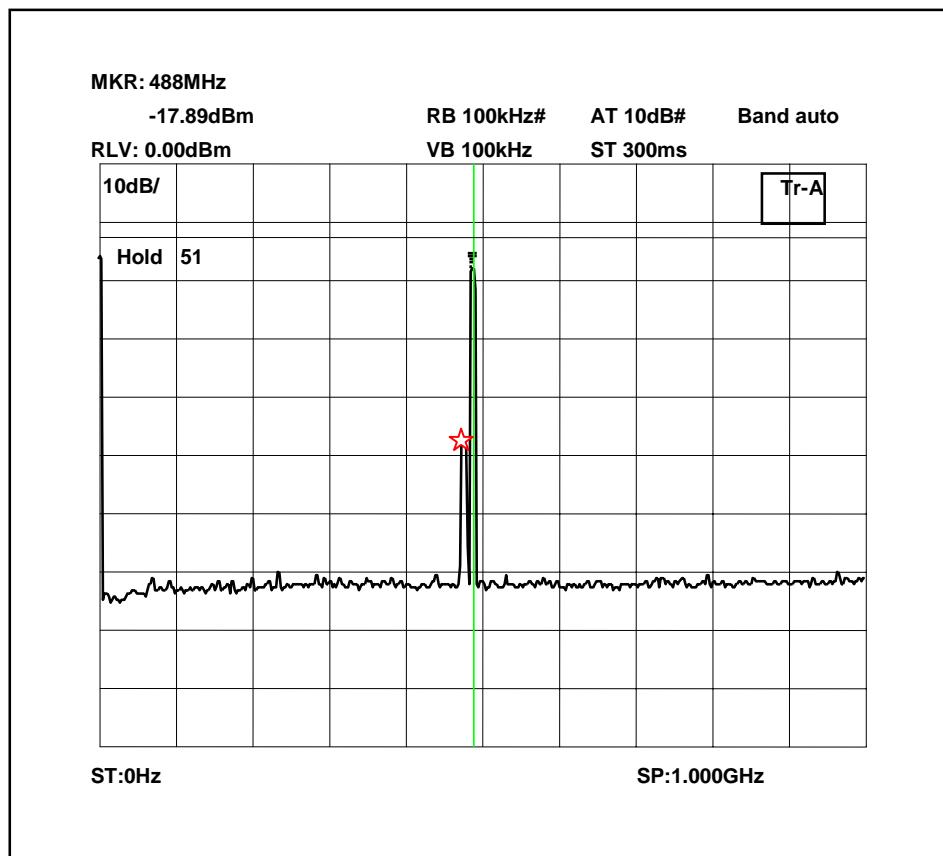
| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRL No | ACTUAL EQUIPMENT USED |
|-------------------|-----------------|----------|------------|--------|-----------------------|
| SPECTRUM ANALYSER | ANRITSU | MS2665C | MT26089 | 479 | X |
| SIGNAL GENERATOR | MARCONI | 2042 | 119562/02 | 254 | X |
| CMTA | ROHDE & SCHWARZ | CMTA52 | 894715/033 | 05 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |
| COMBINER | ELCOM | RC-4-50 | N/A | 170 | X |

Intermodulation Inband



The above plot shows that all products (designated by \star) are at least 40dB below the spurious limit.
Based on -51dBm input to the system.

Intermodulation Wideband



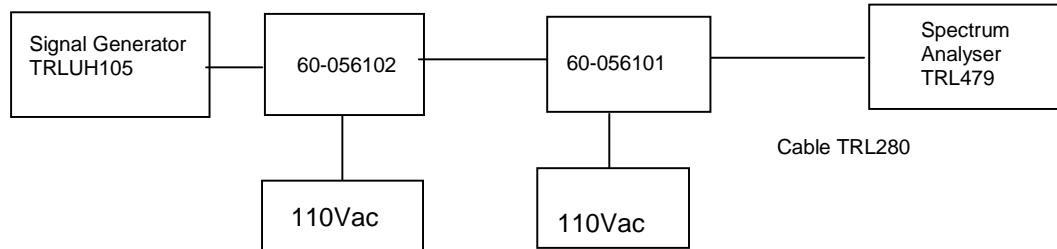
The above plot shows that all products (designated by \star) are at least 30dB below the spurious limit.

Based on -51dBm the input to the system.

TRANSMITTER TESTS

MODULATED BANDWIDTH TEST – CONDUCTED – Part 2.1049– UPLINK

Ambient temperature = 18°C
 Relative humidity = 40%
 Supply voltage = 110Vac
 Channel number = See test results



This test was performed to show that the fibre optic system does not alter the input signal in any way. The input signal was set to the maximum input level 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.

Input level 470MHz -74dBm

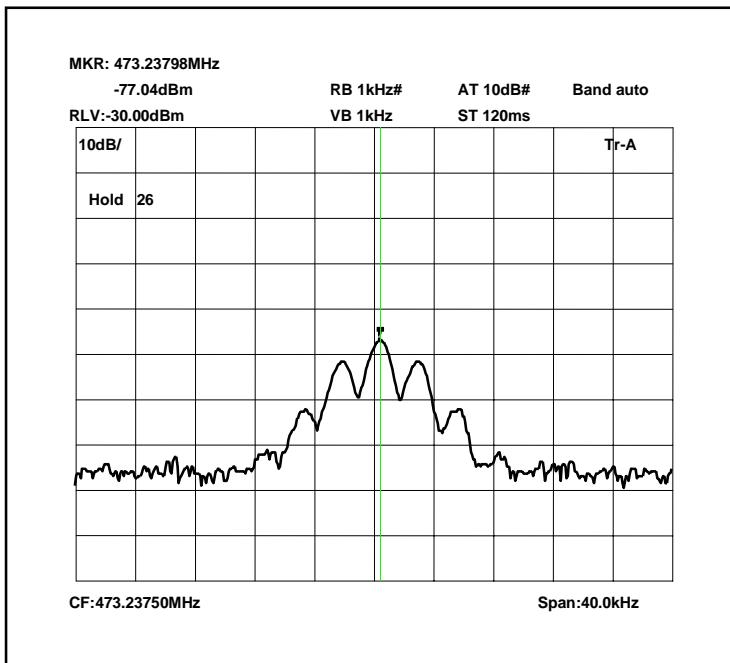
Input level 480Mhz -62dBm

Note: The cables and attenuators had the following losses.

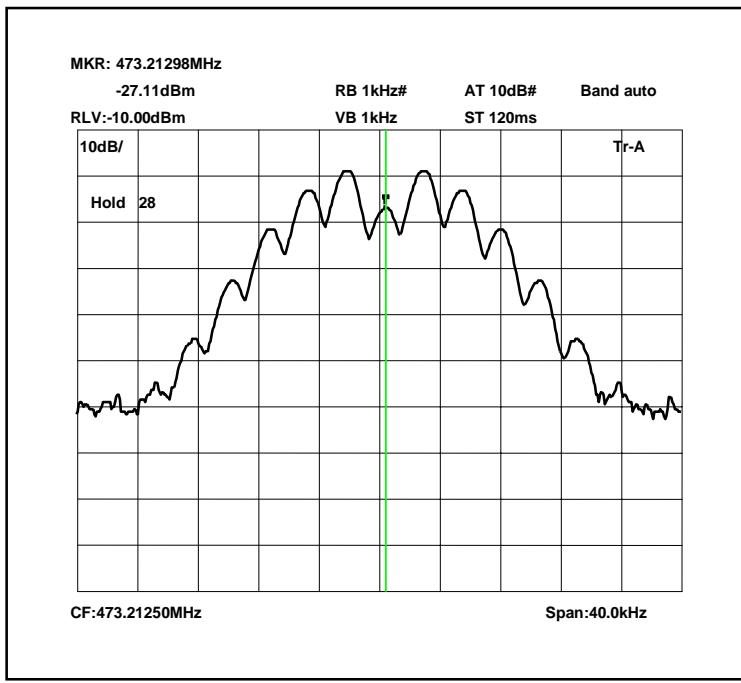
1. Cable TRL280 between EUT and spectrum analyser= 0.3dB
2. Cable between signal generator and EUT = 0.22dB

| 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 | 105 | X |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | X |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

473.2125MHz Signal Generator deviation set to 5kHz

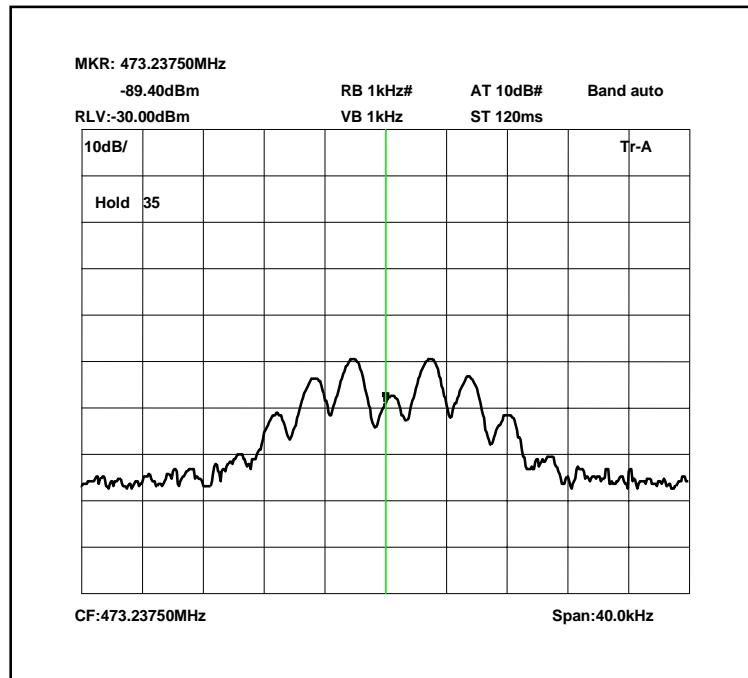


473.2125MHz Signal Generator and amplifier deviation set to 5kHz

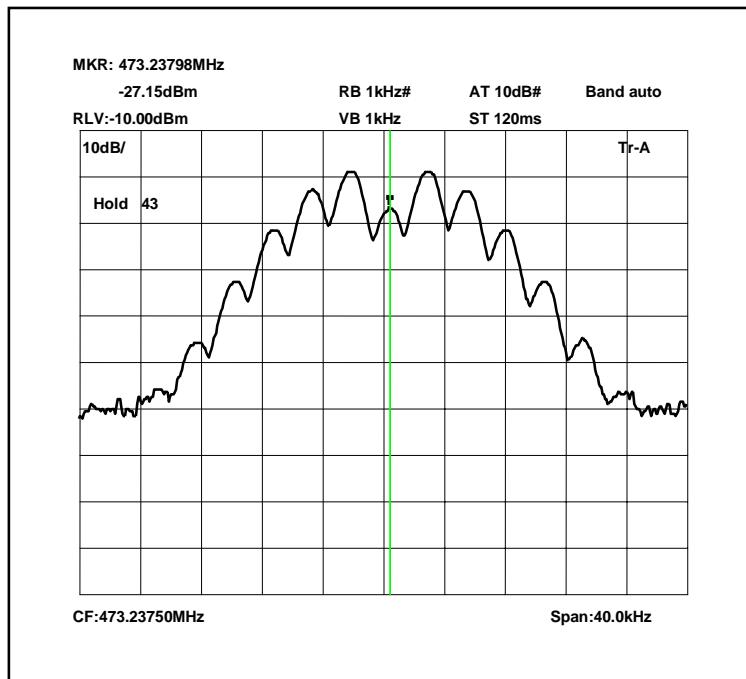


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

473.2375MHz Signal Generator deviation set to 5kHz

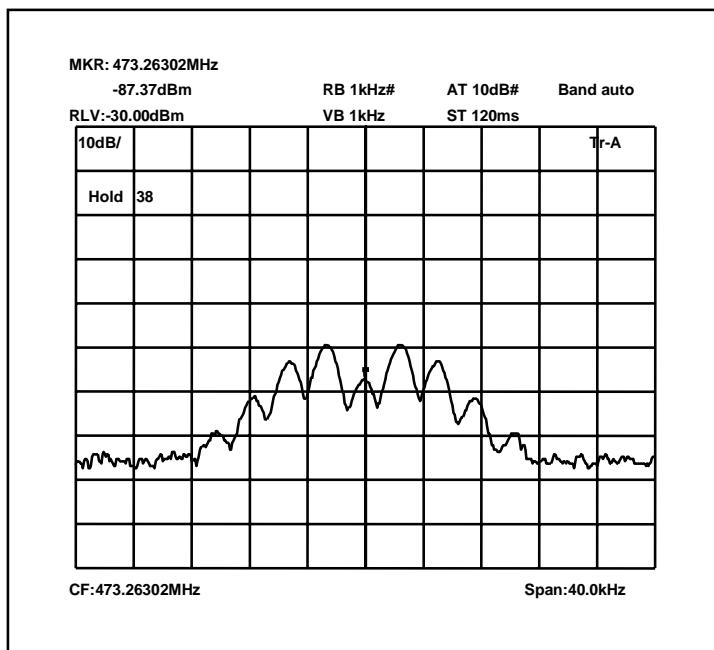


473.2375MHz Signal Generator and amplifier deviation set to 5kHz

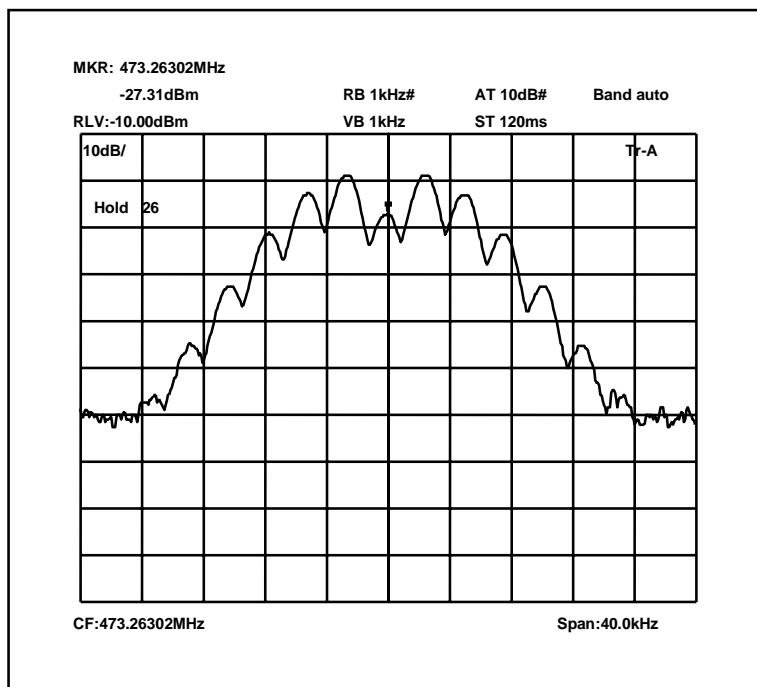


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

473.2625MHz Signal Generator deviation set to 5kHz

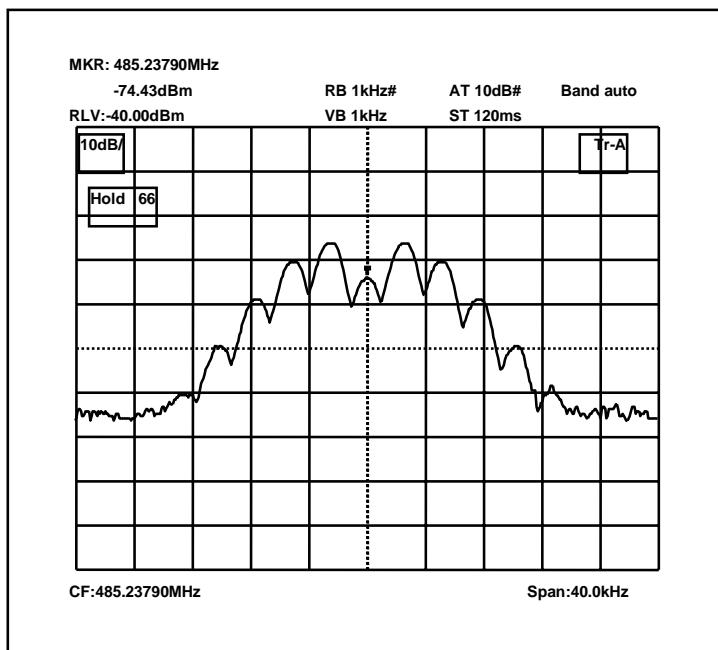


473.2625MHz Signal Generator and amplifier system deviation set to 5kHz

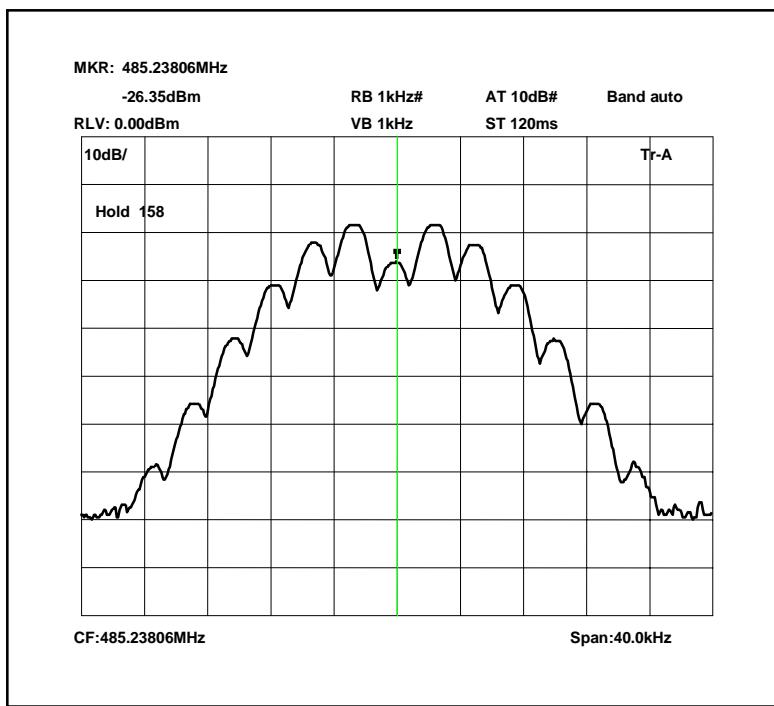


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

485.2375MHz Signal Generator deviation set to 5kHz

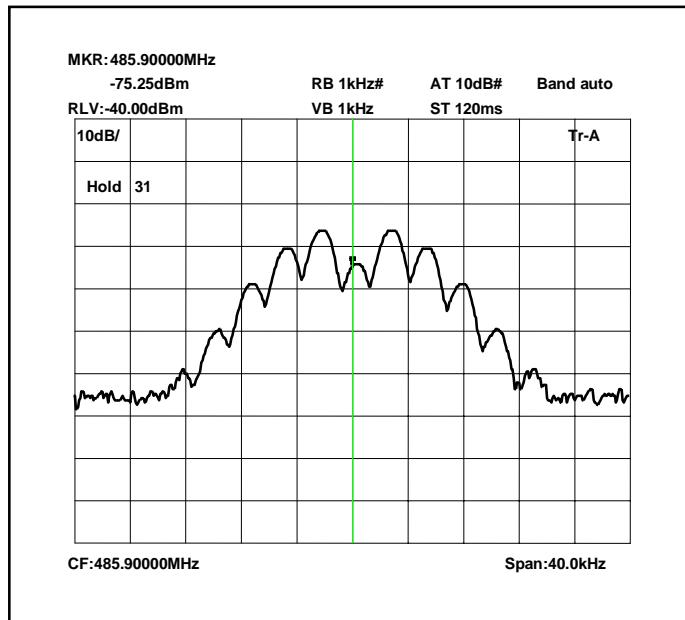


485.2375MHz Signal Generator and amplifier system deviation set to 5kHz

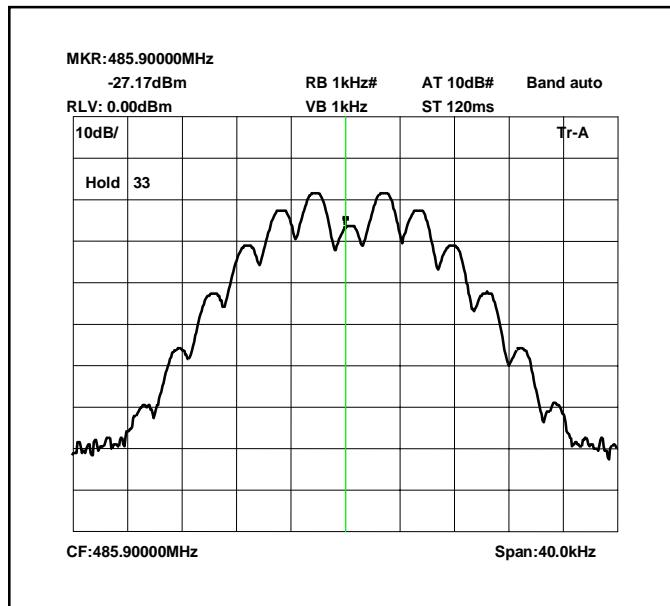


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

485.900MHz Signal Generator deviation set to 5kHz

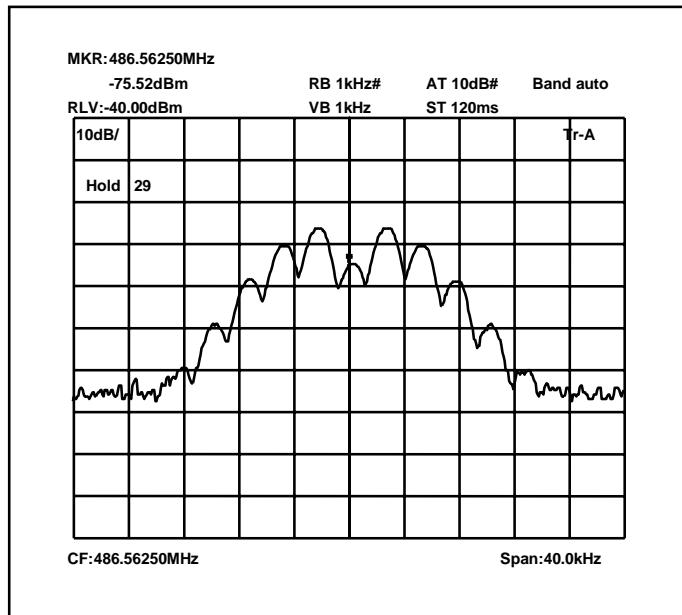


485.900MHz Signal Generator and amplifier system deviation set to 5kHz

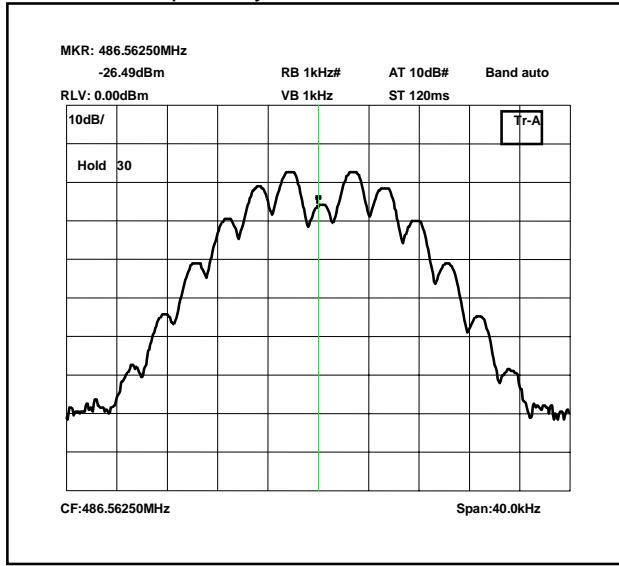


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

486.5625MHz Signal Generator deviation set to 5kHz



4865625MHz Signal Generator and amplifier system deviation set to 5kHz



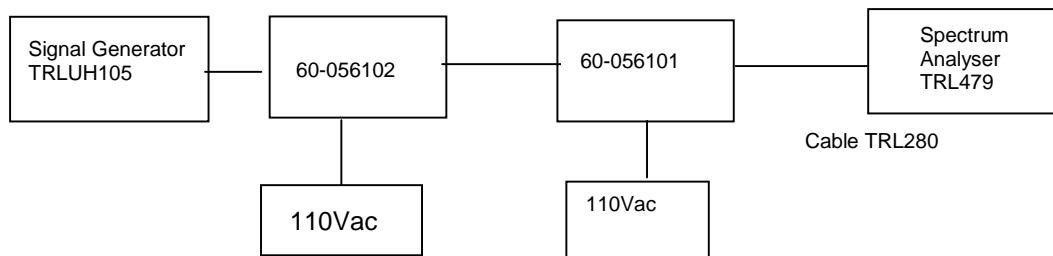
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – UPLINK

Ambient temperature = 18°C
 Relative humidity = 40%
 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 $43 + 10 \log P_{dB}$

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

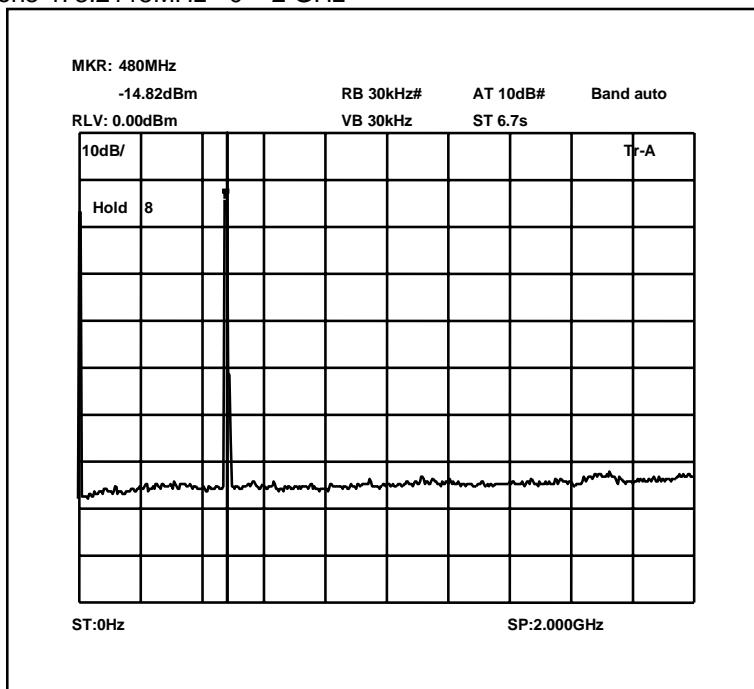
Results

No significant emissions were detected within 20dBm of limit.

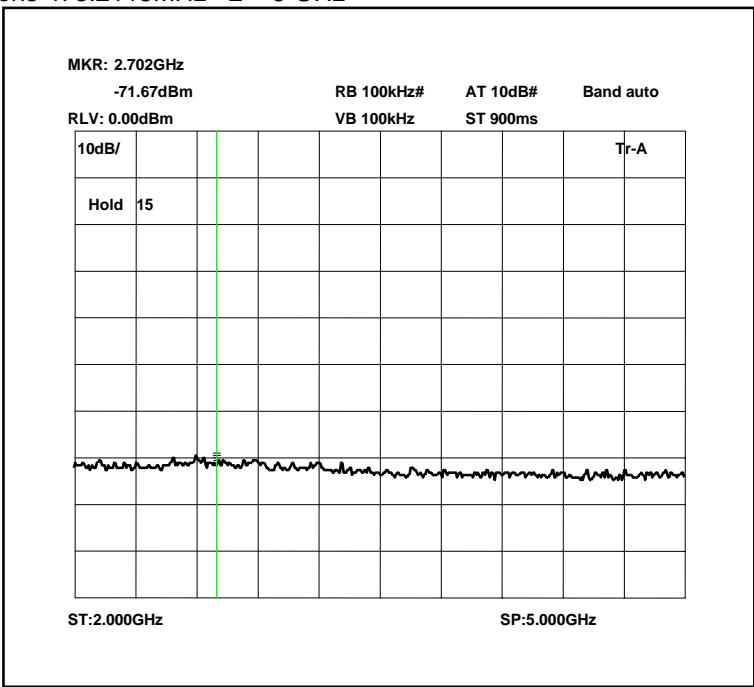
The test equipment used for the Transmitter Conducted Emissions:

| TYPE OF EQUIPMENT | MAKER/ SUPPLIER | MODEL No | SERIAL No | TRL No | ACTUAL EQUIPMENT USED |
|-------------------|-----------------|------------|------------|--------|-----------------------|
| SPECTRUM ANALYSER | ANRITSU | MS2665C | MT26089 | 479 | X |
| ATTENUATOR | BIRD | 8304-200 | N/A | 105 | |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

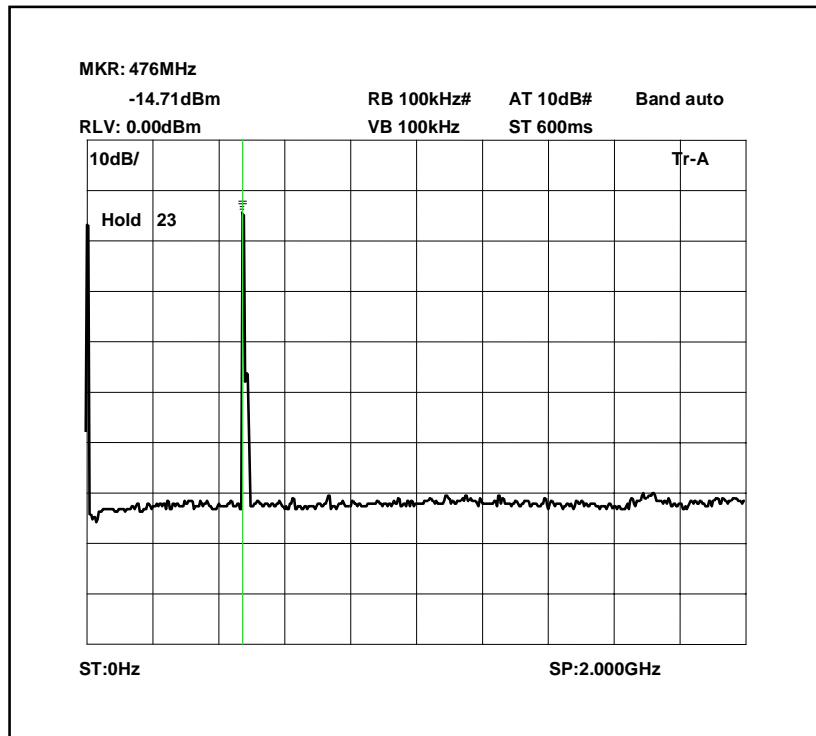
Conducted emissions 473.2115MHz 0 – 2 GHz



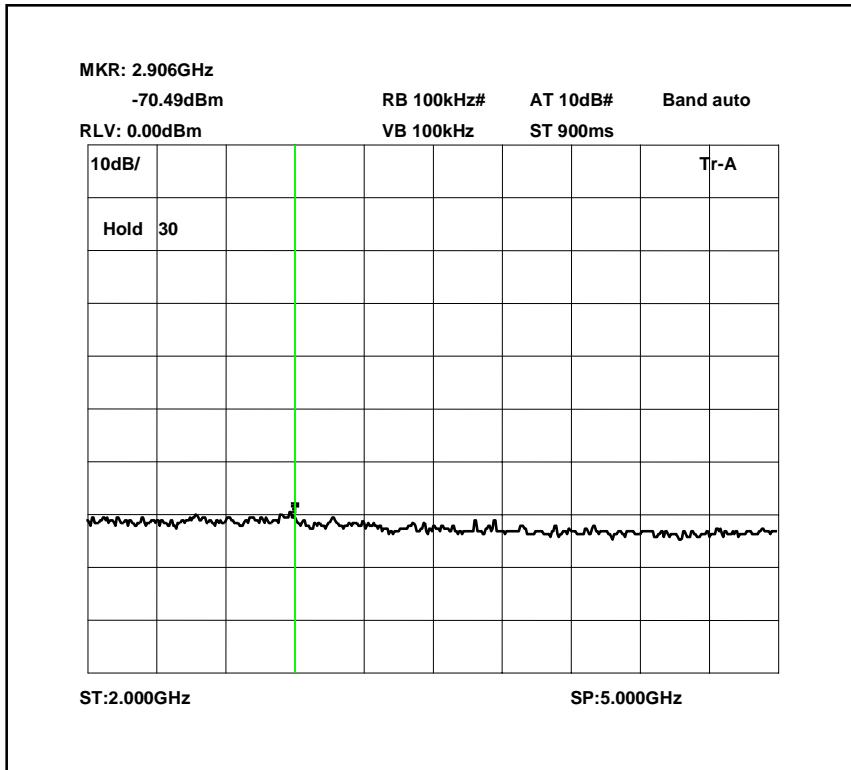
Conducted emissions 473.2115MHz 2 – 5 GHz



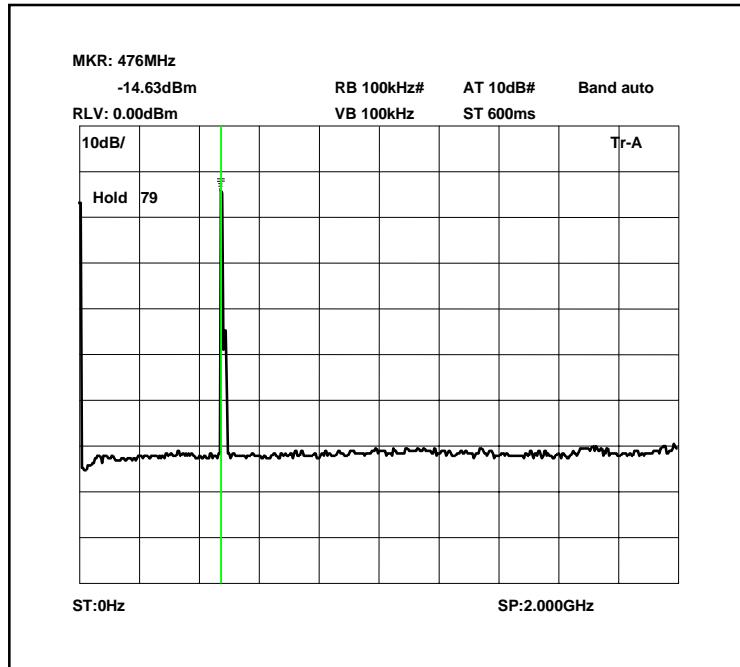
Conducted emissions 473.2375MHz 0 – 2.0 GHz



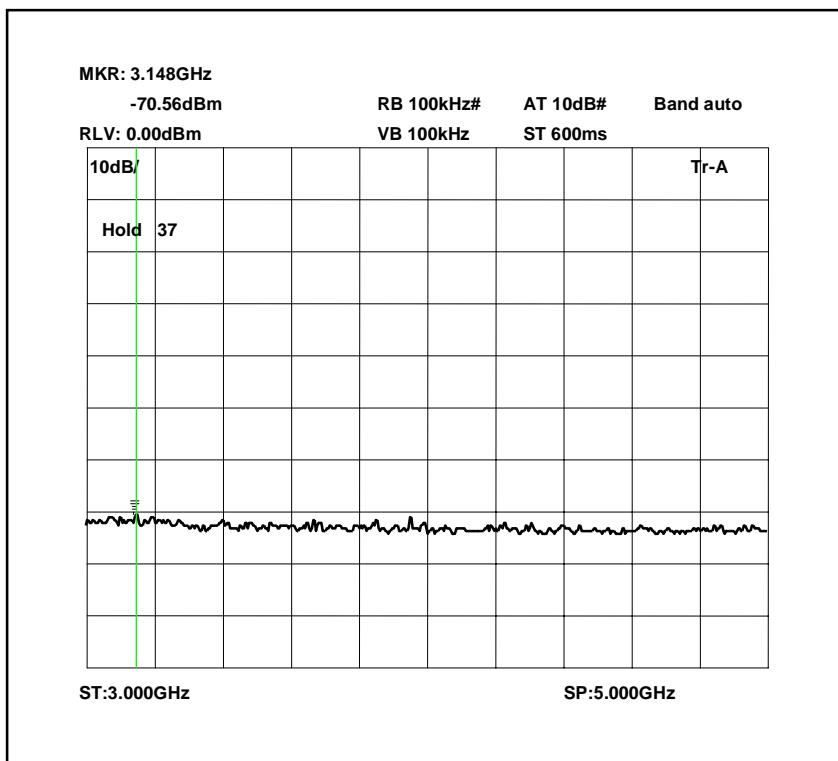
Conducted emissions 473.2375MHz 2.0 – 5.0 GHz



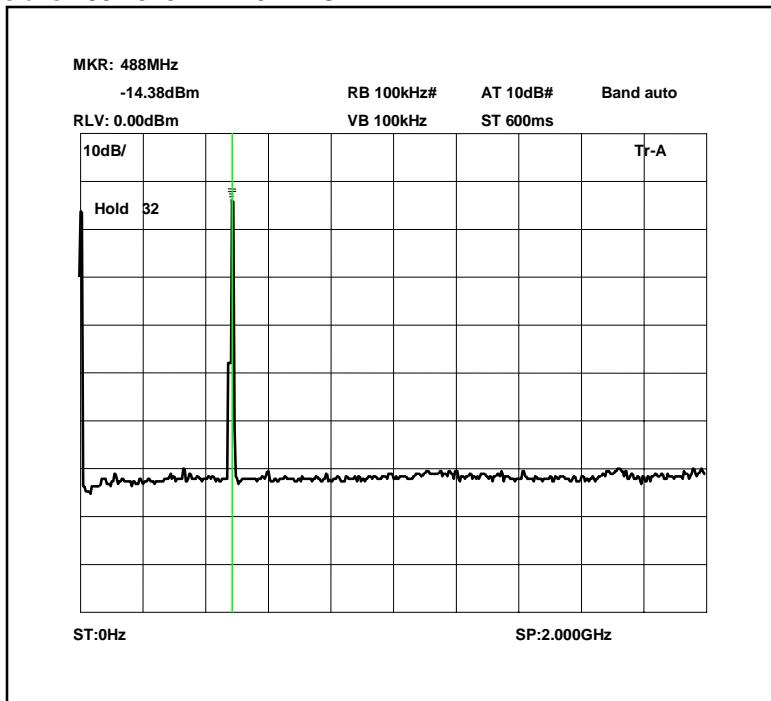
Conducted emissions 473.2625MHz 0 – 2 GHz



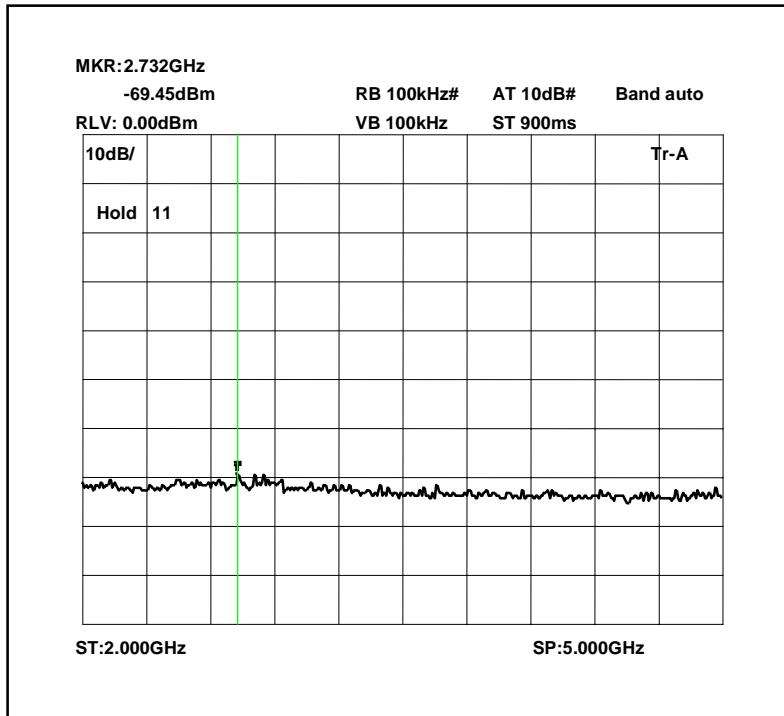
Conducted emissions 473.2625MHz 2 – 5 GHz



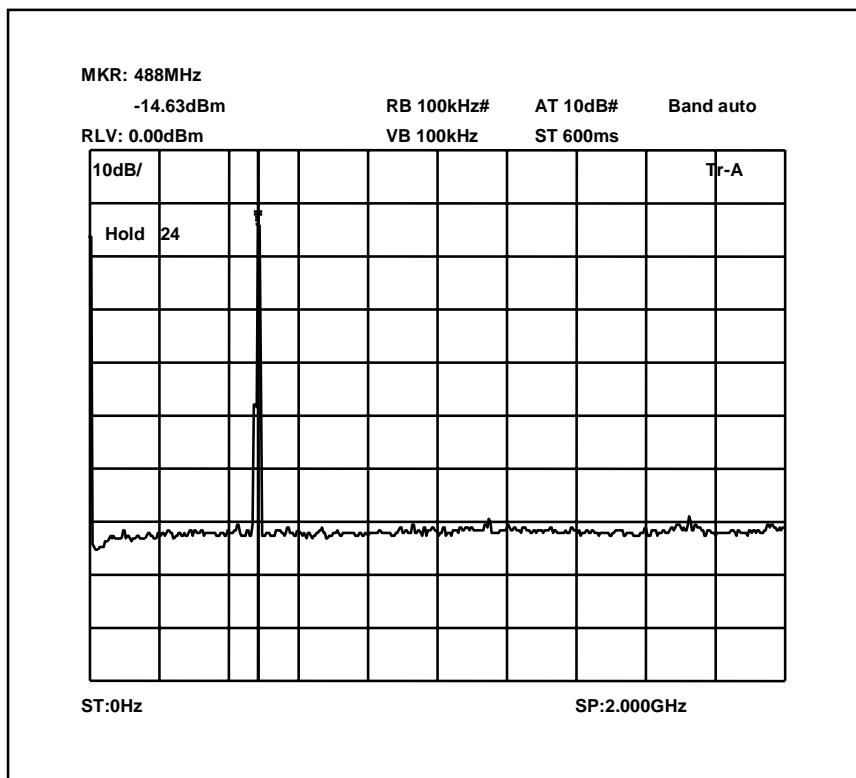
Conducted emissions 485.2375MHz 0 – 2 GHz



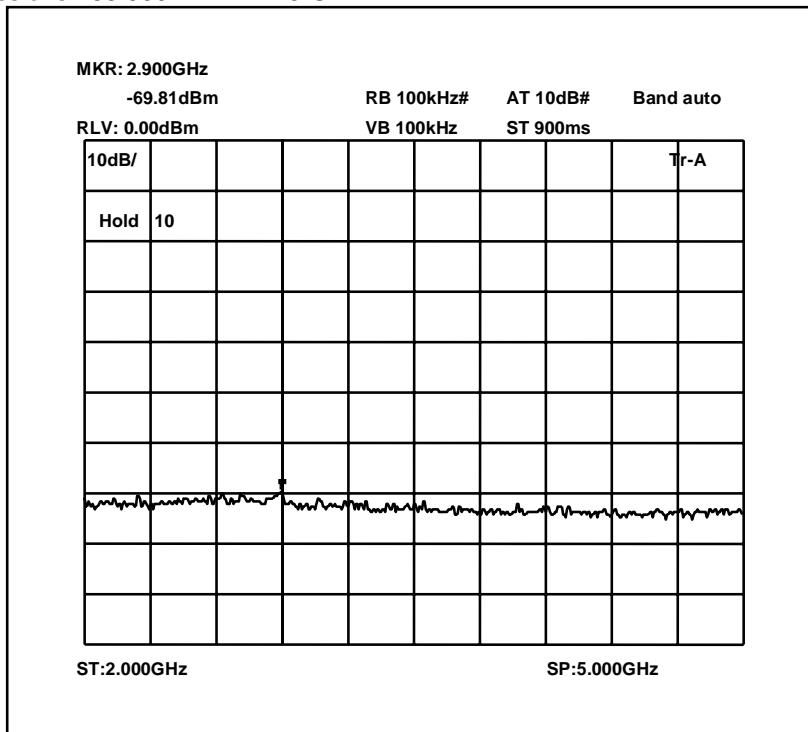
Conducted emissions 485.2375MHz 2 – 5 GHz



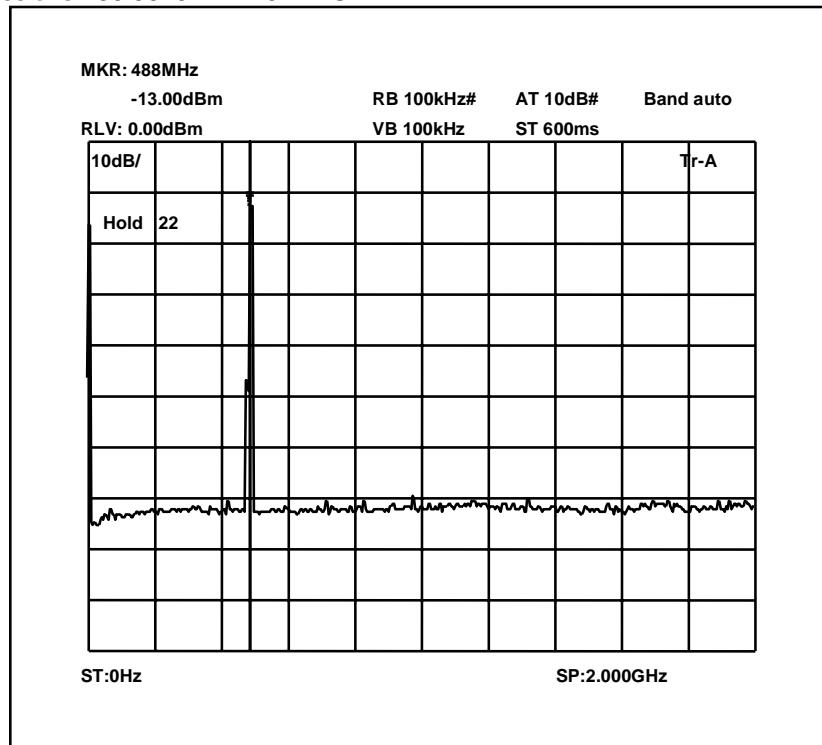
Conducted emissions 485.900MHz 0 – 2 GHz



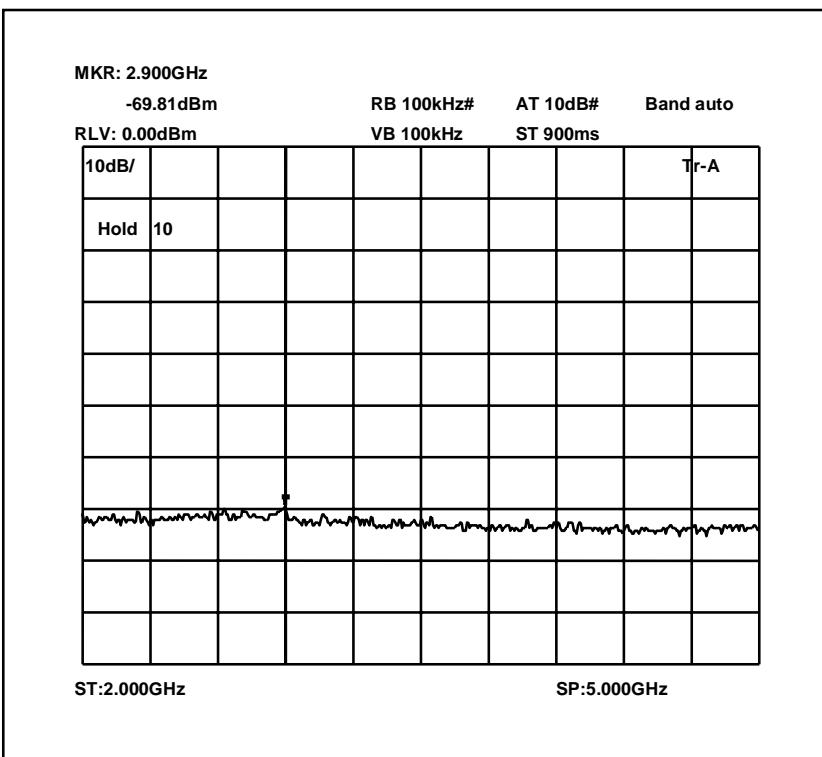
Conducted emissions 485.900MHz 2 – 5 GHz



Conducted emissions 486.5625MHz 0 – 2 GHz



Conducted emissions 486.5625MHz 2 - 5 GHz

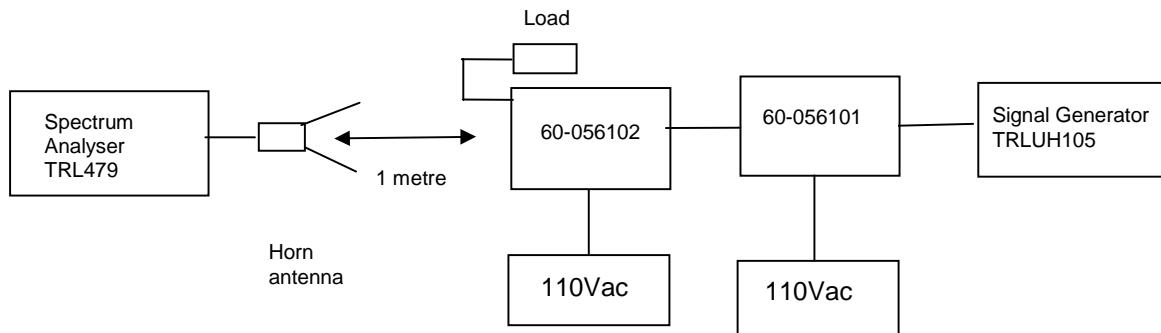


TRANSMITTER TESTS

TRANSMITTER 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 than 250% of the authorised bandwidth

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

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

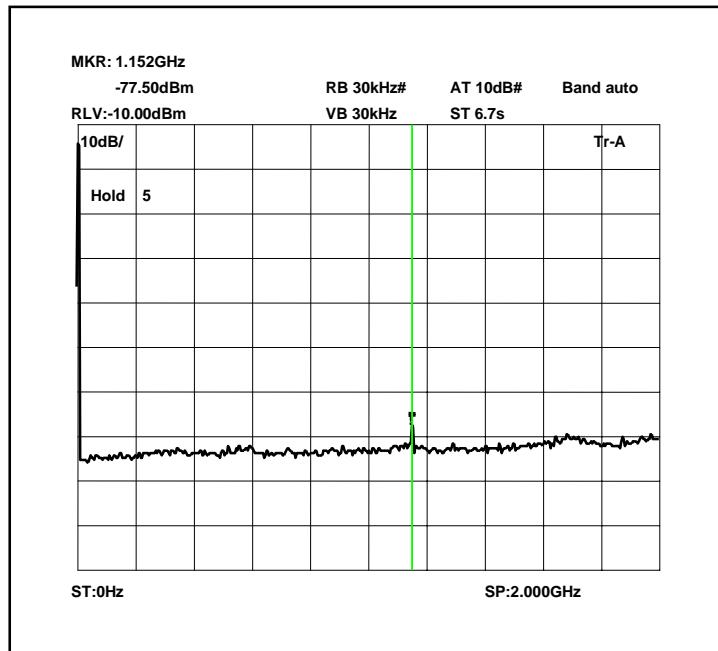
Test result

No significant emissions with 20dBm of limit.

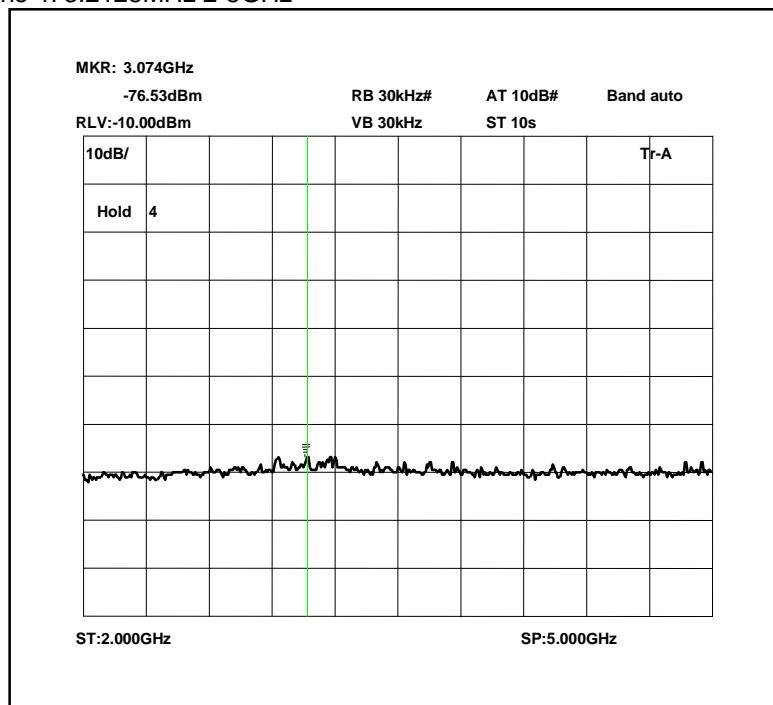
The test equipment used for the Transmitter Spurious Emissions:

| 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 | 139 | X |
| ATTENUATOR | BIRD | 8304-300-N | N/A | 220 | X |
| ATTENUATOR | BIRD | 8308-100 | N/A | 112 | X |
| CABLE | ROSENBERGER | MICRO COAX | N/A | 280 | X |
| SIGNAL GENERATOR | MARCONI | 2023 | 112224/040 | UH105 | X |

Radiated emissions 473.2125MHz 0 – 2GHz

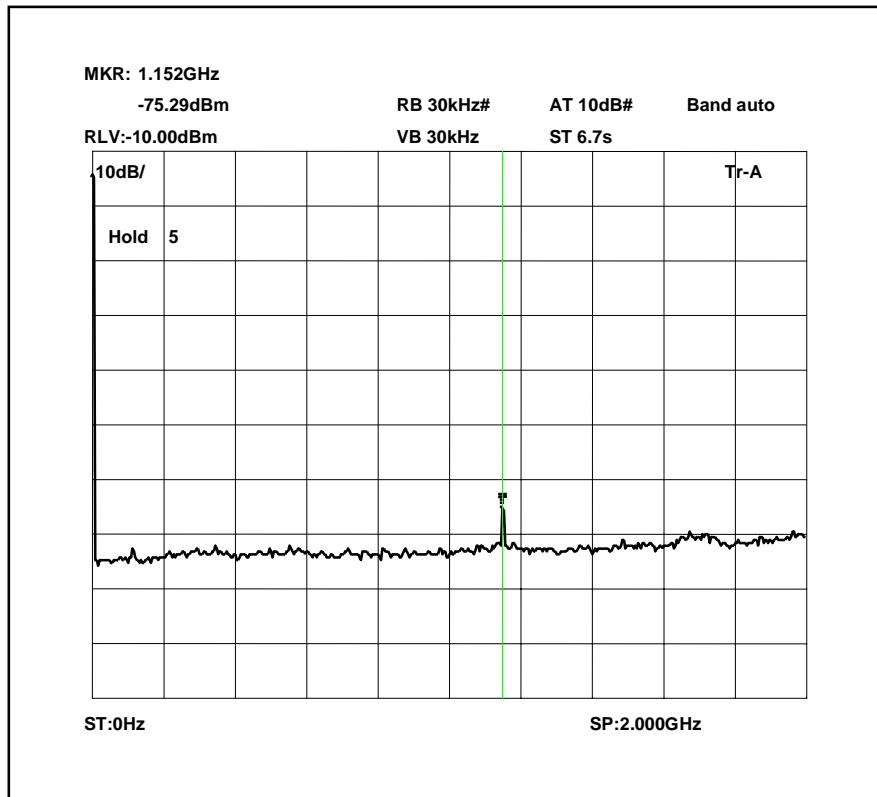


Radiated emissions 473.2125MHz 2-5GHz

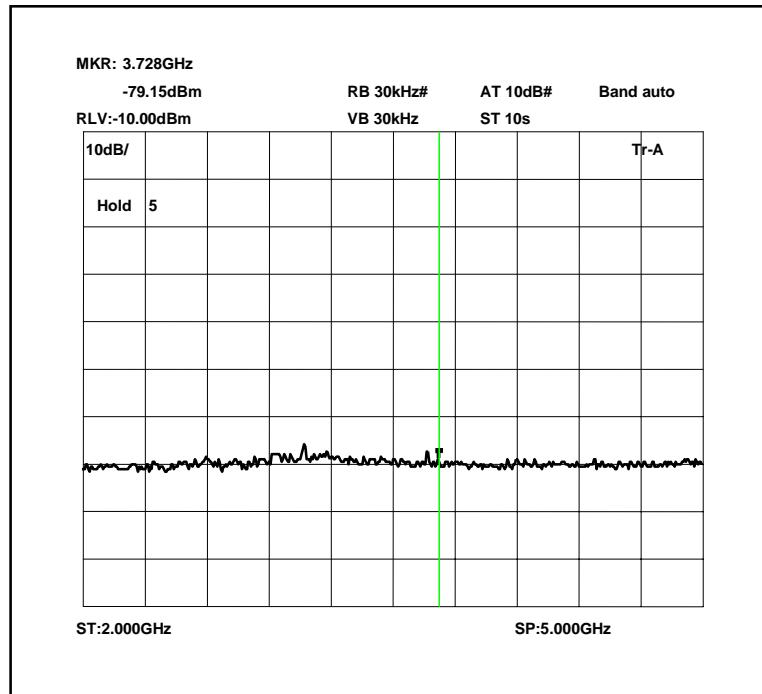


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 473.2MHz 0 -2GHz

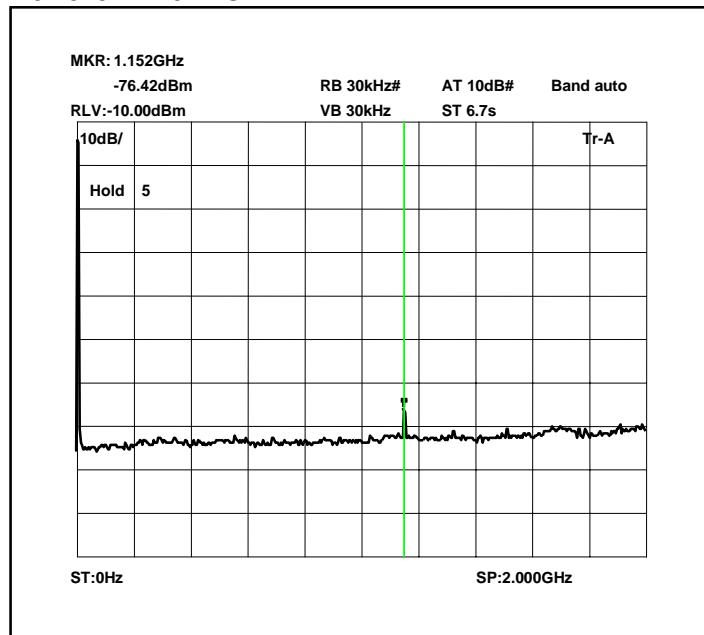


Radiated emissions 473.2MHz 2-5 GHz

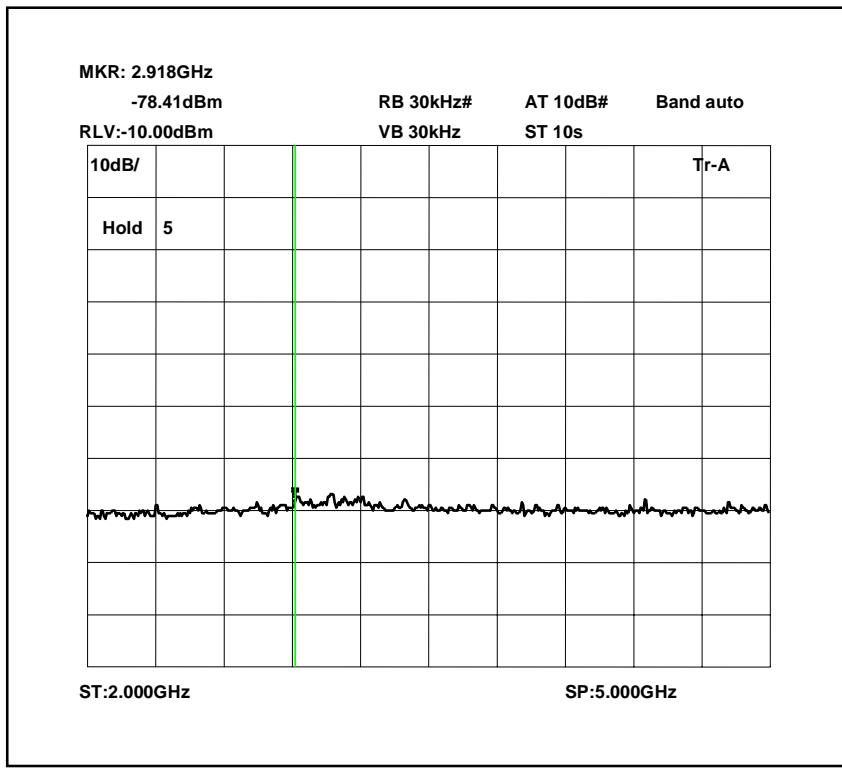


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 473.2525MHz 0 -2 GHz

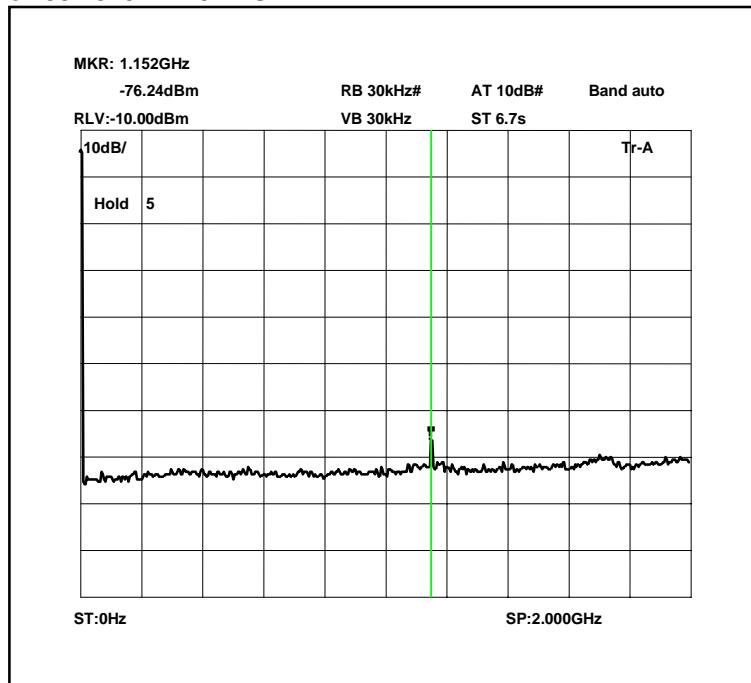


Radiated emissions 473.2525MHz 2 – 5GHz

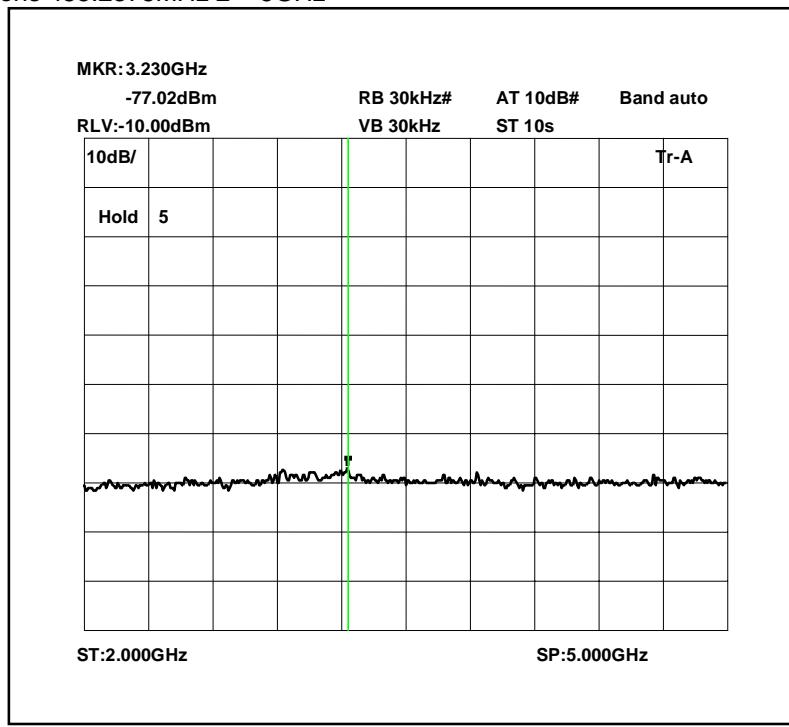


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 485.2375MHz 0 -2 GHz

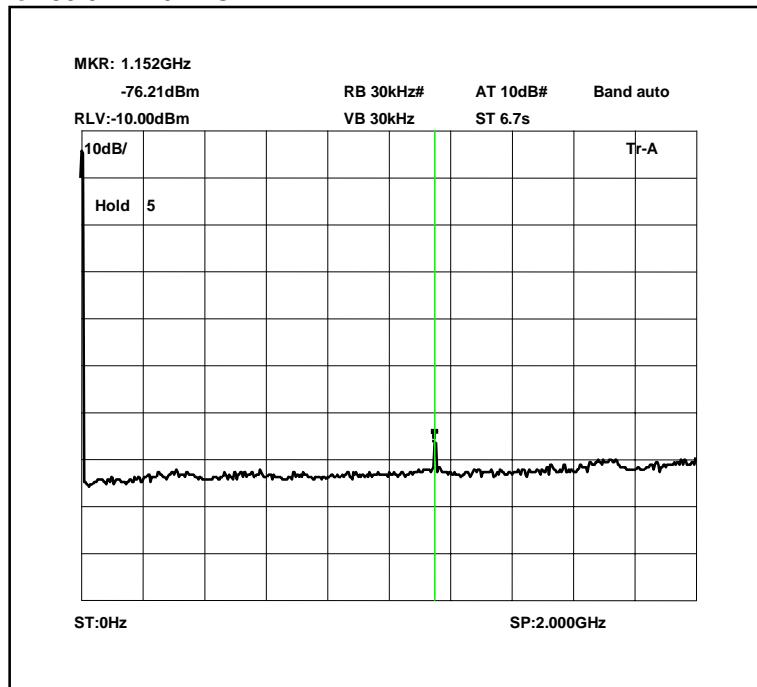


Radiated emissions 485.2375MHz 2 – 5GHz

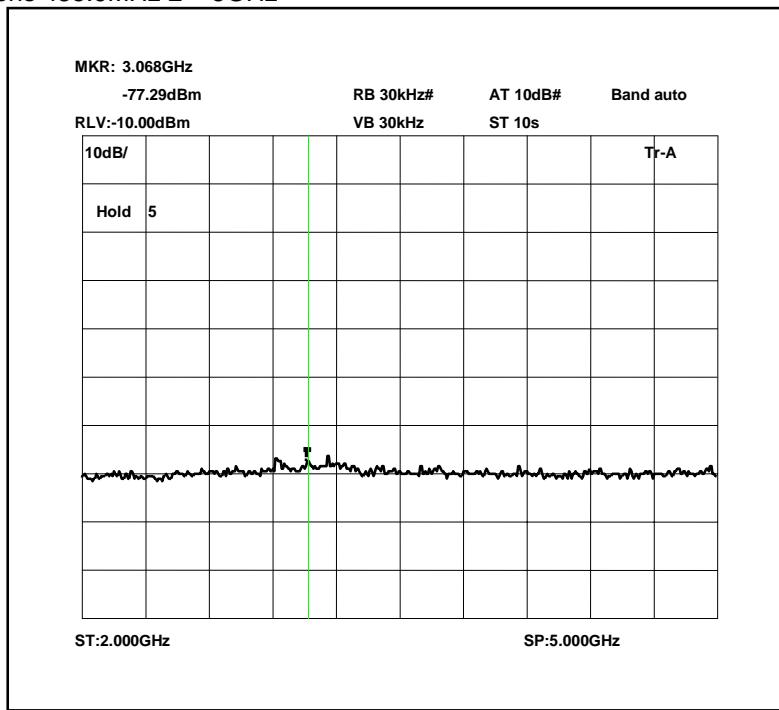


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 485.9MHz 0 -2 GHz

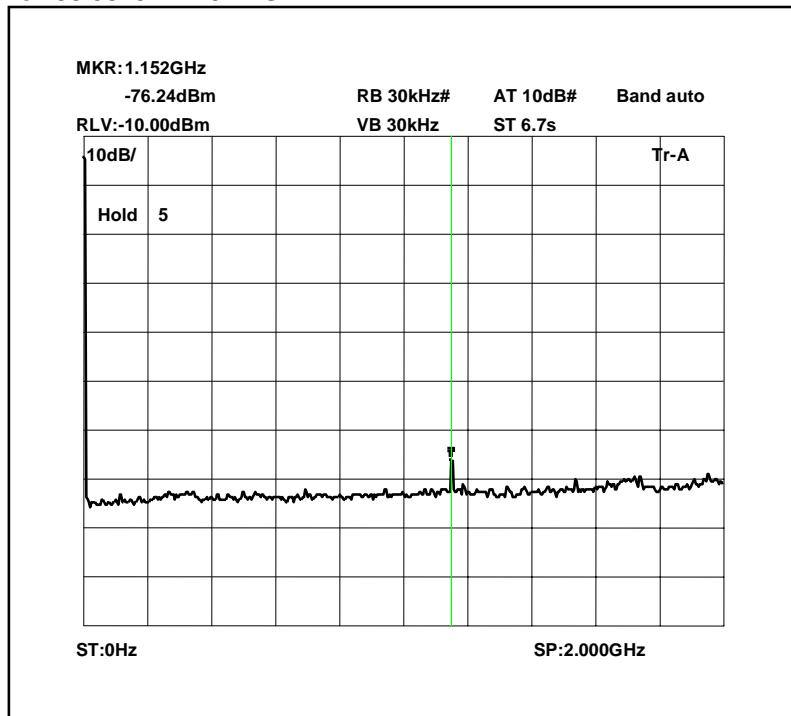


Radiated emissions 485.9MHz 2 – 5GHz

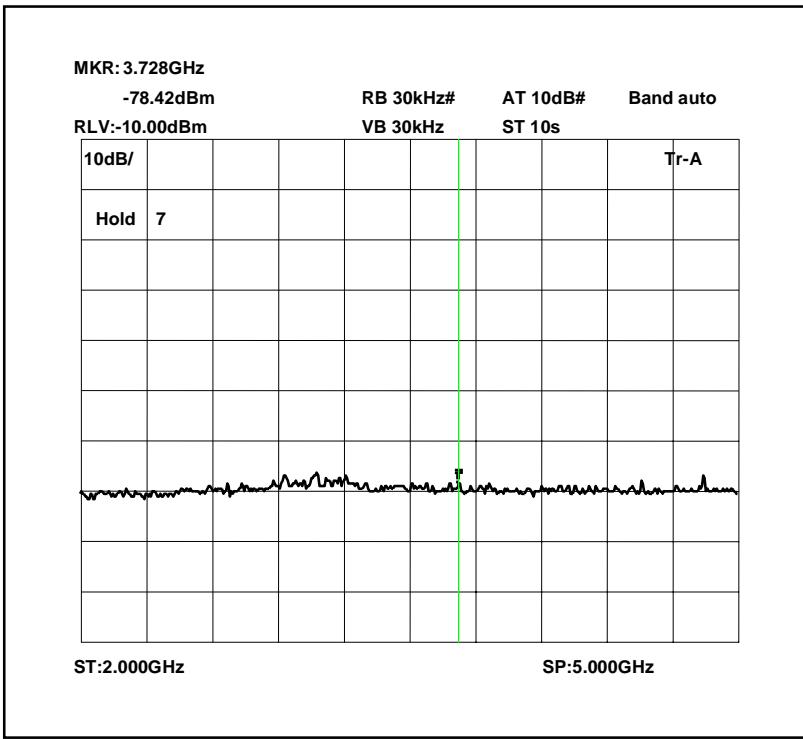


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 486.5625MHz 0 -2 GHz

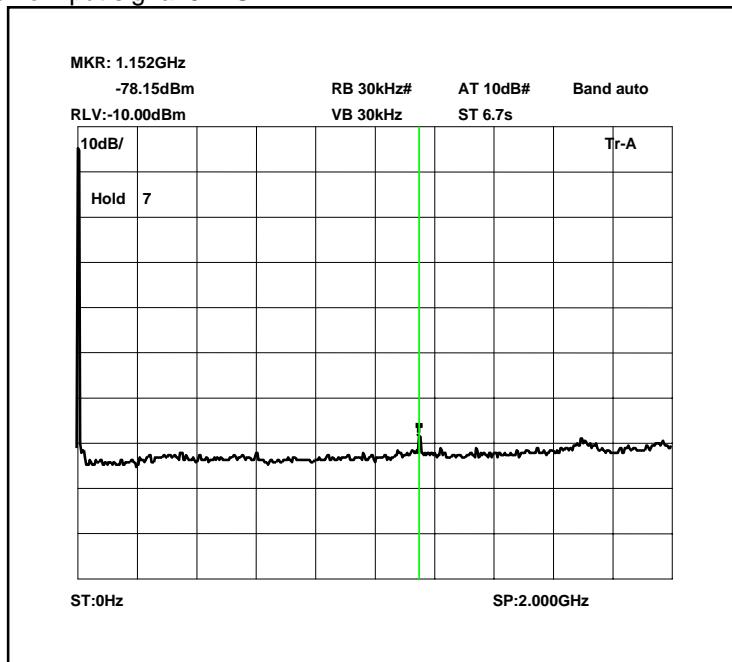


Radiated emissions 486.5625MHz 2 – 5GHz

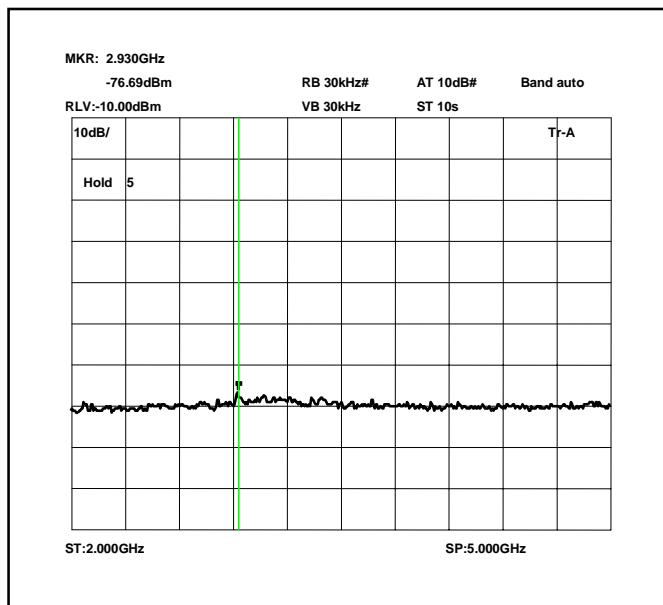


The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions no input signal 0 -2GHz



Radiated emissions no signal 2- 5 GHz



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
TEST EQUIPMENT CALIBRATION DETAILS

TEST EQUIPMENT CALIBRATION DETAILS

| TRL Number | Equipment Type | Manufacturer | Last Cal Calibration | Calibration Period |
|------------|-----------------------|--------------|----------------------|--------------------|
| UH006 | 3m Range ERP CAL | TRL | 01/03/05 | 12 |
| UH028 | Log Periodic Ant | Schwarbeck | 28/04/05 | 24 |
| UH029 | Bicone Antenna | Schwarbeck | 27/04/05 | 24 |
| UH041 | Multimeter | AVOMeter | 14/12/04 | 12 |
| UH120 | Spectrum Analyser | Marconi | 15/03/05 | 12 |
| UH122 | Oscilloscope | Tektronix | 07/06/05 | 24 |
| UH162 | ERP Cable Cal | TRL | 23/05/05 | 12 |
| UH179 | Power Sensor | Marconi | 14/12/04 | 12 |
| UH228 | Power Sensor | Marconi | 17/01/05 | 12 |
| UH253 | 1m Cable N type | TRL | 10/01/05 | 12 |
| UH254 | 1m Cable N type | TRL | 10/01/05 | 12 |
| L005 | CMTA | R&S | 22/10/04 | 12 |
| L007 | Loop Antenna | R&S | 29/03/05 | 24 |
| L138 | 1-18GHz Horn | EMCO | 15/04/05 | 24 |
| L139 | 1-18GHz Horn | EMCO | 03/05/05 | 24 |
| L176 | Signal Generator | Marconi | 31/01/05 | 12 |
| L193 | Bicone Antenna | Chase | 12/10/03 | 24 |
| L203 | Log Periodic Ant | Chase | 21/10/03 | 24 |
| L254 | Signal Generator | Marconi | 13/12/04 | 12 |
| L280 | 18GHz Cable | Rosenberger | 10/01/05 | 12 |
| L343 | CCIR Noise Filter | TRL | 07/06/05 | 12 |
| | Temperature Indicator | Fluke | 14/12/04 | 12 |
| L426 | Signal Generator | R&S | 19/05/04 | 12 |
| L478 | Analyser | Anritsu | 05/10/04 | 12 |
| L479 | Signal Generator | Agilent | 25/04/05 | 12 |
| L552 | | | | |

ANNEX C
SYSTEM DIAGRAM

