

TEST REPORT NO: RU1194/6803

COPY NO: 2

FCC ID: NEO50-1285Series

1

ISSUE NO:

# REPORT ON THE CERTIFICATION TESTING OF A AERIAL FACILITIES LIMITED 50-128501 CELL ENHANCER WITH RESPECT TO THE FCC RULES CFR 47, PART 90 Subpart I PRIVATE LAND MOBILE REPEATER.

TEST DATE: 5<sup>th</sup> June 2005 – 8<sup>th</sup> August 2005

| TESTED BY:    |                               | J CHARTERS                 |
|---------------|-------------------------------|----------------------------|
| APPROVED BY:  |                               | P GREEN<br>PRODUCT MANAGER |
|               |                               | EMC                        |
| DATE:         | 27 <sup>th</sup> January 2006 |                            |
| Distribution: |                               |                            |

2. TCB: TRL Compliance Limited

3. TRL Compliance Ltd

1. Aerial Facilities Limited

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| Notes:<br>1. | Component failure during test          |       | [ ]<br>[X] |
| 2.           | If Yes, details of failure:            |       |            |

The facilities used for the testing of the product contain in this report are FCC Listed.

3.

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# **CERTIFICATE OF CONFORMITY & COMPLIANCE**

NEO50-1285Series

FCC IDENTITY:

| PURPOSE OF TEST:      | Certification   |                                   |
|-----------------------|---|-----------------------------------|
| TEST SPECIFICATION:   | FCC RULES CFR 47, Part 90 Subpart I   |                                   |
| TEST RESULT:          | Compliant to Specification  |                                   |
| EQUIPMENT UNDER TEST: | 50-128501 Cell Enhancer   |                                   |
| EQUIPMENT TYPE:       | Private Land Mobile Repeater  |                                   |
| MAXIMIUM GAIN         | Uplink = 67.74 dB<br>Downlink = 72.48 dB  |                                   |
| MAXIMUM INPUT         | Uplink = -44 dBm<br>Downlink = -41 dBm  |                                   |
| MAXIMUM OUTPUT        | Uplink = 22.69 dBm<br>Downlink = 31.13 dBm (radiating cable sys                     | stem)                             |
| ANTENNA TYPE:         | Not applicable  |                                   |
| CHANNEL SPACING:      | Uplink = 1 x 275 kHz channel & 1 x 1.45<br>Downlink =1 x 275 kHz channel & 1 x 1.45 |                                   |
| NUMBER OF CHANNELS:   | Uplink 2<br>Downlink 2  |                                   |
| FREQUENCY GENERATION: | N/A   |                                   |
| MODULATION TYPE:      | F3E   |                                   |
| POWER SOURCE(s):      | +110 Vac  |                                   |
| TEST DATE(s):         | 5 <sup>th</sup> June 2005 – 8 <sup>th</sup> August 2005                             |                                   |
| ORDER No(s):          | 32088   |                                   |
| APPLICANT:            | Aerial Facilities Limited   |                                   |
| ADDRESS:              | Aerial House Asheridge Road Chesham Buckinghamshire HP5 1TU United Kingdom          |                                   |
| TESTED BY:            |   | J CHARTERS                        |
| APPROVED BY:          |   | P GREEN<br>PRODUCT<br>MANAGER EMC |

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# **APPLICANT'S SUMMARY**

| EQUIPMENT UNDER TEST (EUT):    | 50-128501 Cell Enhancer   |
|--------------------------------|---|
| 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 [X] No [ ]  |
| APPLICANT'S CATEGORY:          | MANUFACTURER [X] IMPORTER [ ] DISTRIBUTOR [ ] TEST HOUSE [ ] AGENT [ ]                    |
| APPLICANT'S ORDER No(s):       | 32088   |
| APPLICANT'S CONTACT PERSON(s): | Mr Peter Bradfield  |
| E-mail address:                | Peterb@aerial.co.uk   |
| APPLICANT:                     | Aerial Facilities Limited   |
| ADDRESS:                       | Aerial House<br>Asheridge Road<br>Chesham<br>Buckinghamshire<br>HP5 1TU<br>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)                   | 5 <sup>th</sup> June 2005 – 8 <sup>th</sup> August 2005                                   |
| TEST REPORT No:                | RU1194/6803   |

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## **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:

2 The EUT is not a keyed carrier system, therefore the test was not performed.

| 2. | Product class:                          | Up               | link                      | Class      | A [X] | Class B [ ]       |
|----|---|------------------|---------------------------|------------|-------|-------------------|
|    |   | Do               | wnlink                    | Class      | A [X] | Class B [ ]       |
| 3. | Product Use:                            | Pri              | vate Land Mobile Re       | peater     |       |                   |
| 4. | Emission Designator:                    | F3               | E                         |            |       |                   |
| 5. | Temperatures:                           | An               | nbient (Tnom)             | 21°C       |       |                   |
| 6. | Supply Voltages:                        | Vn               | om +                      | 110 Vac    |       |                   |
|    | Note: Vnom voltages are as stated above | unless otherwise | e shown on the test re    | eport page |       |                   |
| 7. | Equipment Category:                     |                  | ngle channel<br>o channel | []         |       |                   |
|    |   |                  | ulti-channel              | [ ]<br>[X] |       |                   |
| 8. | Channel spacing:                        | Na               | rrowband                  | [X]        |       | 75 kHz<br>.45 MHz |
|    |   | Wi               | deband                    | []         | 2 1   | .43 IVII IZ       |
| 9. | Test Location                           | TRL Compliance   |                           | IVI.       |       |                   |
|    |   |                  | Holland<br>ng Green       | [X]<br>[ ] |       |                   |
|    |   |                  |                           |            |       |                   |

## System description:

Modifications made during test program

10.

The 50-128501 is a bidirectional amplifier consisting of an uplink and a downlink. The uplink has 2 channels, a 275 kHz channel operating over the frequency range 499.3375MHz - 499.6125MHz and a 1.45MHz channel operating over the frequency range 492.5125MHz - 493.9625MHz. The downlink has 2 channels, a 275 kHz channel operating over the frequency range 496.3375MHz - 496.6125MHz and a 1.45MHz channel operating over the frequency range 489.5000MHz - 490.9625MHz.

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No modifications were performed.

<sup>1</sup> The EUT does not contain modulation circuitry, therefore the test was not performed.

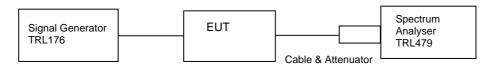
#### **COMPLIANCE TESTS**

# AMPLIFIER GAIN - CONDUCTED - PART 2.1046 - UPLINK

Ambient temperature = 23°C Radio Laboratory

Relative humidity = 47%

Supply voltage = +110 Vac & +12 Vdc Channel number = See test results



## Frequency Band - 492.5125MHz - 493.9625MHz

| Frequency<br>MHz | Voltage | Signal<br>Generator<br>input level<br>dBm | Output<br>Cable &<br>Attenuator<br>loss dB | Level at<br>Spectrum<br>Analyser<br>dBm | Gain<br>dB | Output<br>Power<br>dBm | Gain after 10dB<br>input level<br>increase<br>dBm |
|------------------|---------|---|--|---|------------|------------------------|---|
| 492.5125         | 110 Vac | -42.05                                    | 30.78                                      | -5.70                                   | 67.13      | 25.08                  | 57.08   |
| 493.2375         | 110 Vac | -45.05                                    | 30.78                                      | -4.92                                   | 70.91      | 25.86                  | 61.33   |
| 493.9625         | 110 Vac | -45.05                                    | 30.78                                      | -4.75                                   | 71.08      | 26.03                  | 61.34   |

#### Notes:

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

2. Input level is adjusted for the input cable loss.

## Frequency Band - 499.3375 MHz - 499.6125 MHz

| Frequency<br>MHz | Voltage | Signal<br>Generator<br>input level<br>dBm | Output<br>Cable &<br>Attenuator<br>loss dB | Level at<br>Spectrum<br>Analyser<br>dBm | Gain<br>dB | Output<br>Power<br>dBm | Gain after 10dB<br>input level<br>increase<br>dBm |
|------------------|---------|---|--|---|------------|------------------------|---|
| 499.3375         | 110 Vac | -44.05                                    | 30.78                                      | -8.15                                   | 66.68      | 22.63                  | 56.96   |
| 499.4750         | 110 Vac | -45.05                                    | 30.78                                      | -8.09                                   | 67.74      | 22.69                  | 58.01   |
| 499.6125         | 110 Vac | -44.05                                    | 30.78                                      | -8.27                                   | 66.56      | 22.51                  | 56.94   |

#### Notes:

- 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured
- 2. Input level is adjusted for the input cable loss

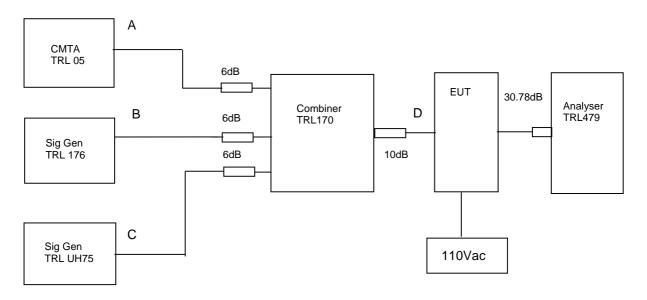
| TYPE OF EQUIPMENT    | MAKER/<br>SUPPLIER | MODEL No   | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C    | MT26089    | 479    | х                           |
| ATTENUATOR           | BIRD               | 8304-300-N | N/A        | 220    | х                           |
| ATTENUATOR           | BIRD               | 8308-200   | N/A        | 103    | х                           |
| CABLE                | ROSENBERGER        | MICRO COAX | N/A        | 280    | x                           |
| SIGNAL<br>GENERATOR  | MARCONI            | 2042       | 119388/080 | 176    | х                           |

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## AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS - CONDUCTED - PART 2.1053- UPLINK

Ambient temperature = 26°C Radio Laboratory

Relative humidity = 39% Supply voltage = +110 Vac



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 –44dBm. The cable and attenuator loss between the EUT and the spectrum analyser was 30.78dB.

| RF Input Frequency<br>(MHz) |          |          | Highest Intermodulation Product Level | Limit |
|-----------------------------|----------|----------|---------------------------------------|-------|
| TRL05                       | TRL176   | TRLUH75  | (dBm)                                 | (dBm) |
| 492.5125                    | 493.4765 | 493.9625 | -17.25 dBm @ 492.9900MHz              | -13   |
| 499.3375                    | 499.5210 | 499.6125 | -17.45 dBm @ 499.4315MHz              | -13   |

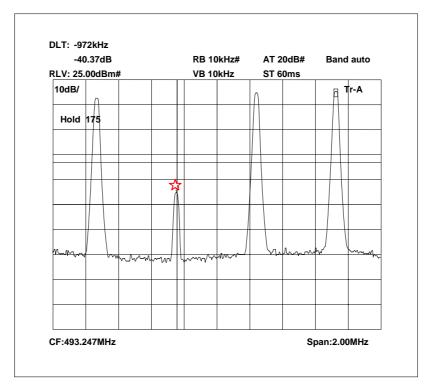
Sweep data is shown on the next page:

Test equipment used for intermodulation test

| rest equipment used for intermodulation test |                    |          |            |        |                             |  |
|--|--------------------|----------|------------|--------|-----------------------------|--|
| TYPE OF<br>EQUIPMENT                         | MAKER/<br>SUPPLIER | MODEL No | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |  |
| SPECTRUM<br>ANALYSER                         | ANRITSU            | MS2665C  | MT26089    | 479    | х                           |  |
| SIGNAL<br>GENERATOR                          | MARCONI            | 2022D    | 119215/058 | UH75   | х                           |  |
| СМТА   | ROHDE &<br>SCHWARZ | CMTA52   | 894715/033 | 05     | х                           |  |
| SIGNAL<br>GENERATOR                          | MARCONI            | 2042     | 119388/080 | 176    | х                           |  |
| COMBINER                                     | ELCOM              | RC-4-50  | N/A        | 170    | х                           |  |

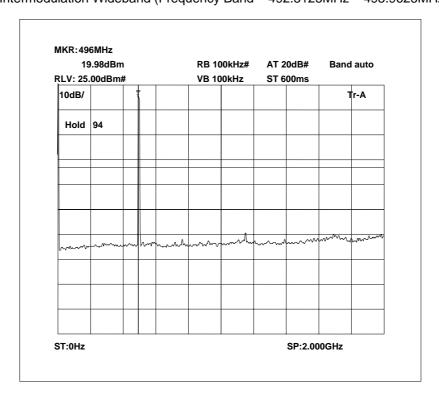
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Intermodulation Inband (Frequency Band – 492.5125MHz – 493.9625MHz)



The above plot shows that all products (designated by ☆) below the Spurious Lmit.

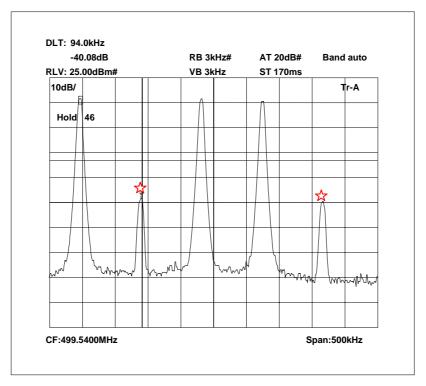
Intermodulation Wideband (Frequency Band – 492.5125MHz – 493.9625MHz)



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

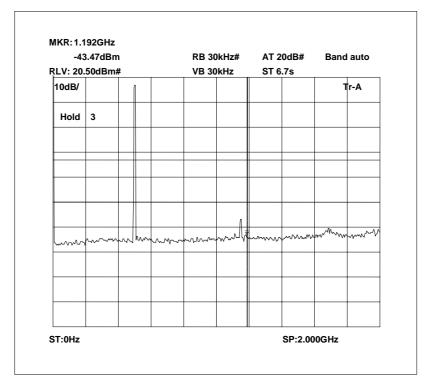
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Intermodulation Inband (Frequency Band – 499.3375 MHz – 499.6125 MHz)



The above plot shows that all products (designated by ☆) below the Spurious Limit.

Intermodulation Wideband (Frequency Band – 499.3375 MHz – 499.6125 MHz)



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

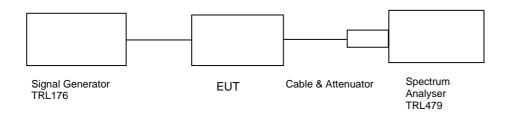
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#### TRANSMITTER TESTS

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

Ambient temperature = 26°C Radio Laboratory

Relative humidity = 41% Supply voltage = +110 Vac 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 (-41dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

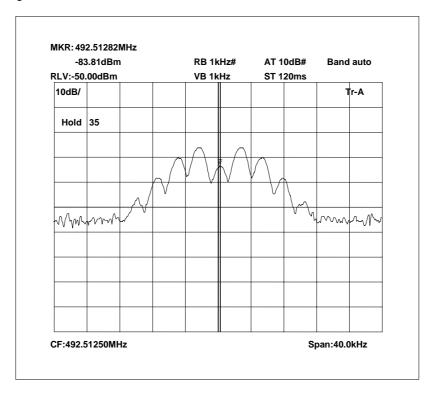
Note: The cables and attenuators had the following losses.

- 1. Cable and attenuator between EUT and Spectrum analyser 30.78dB
- 2. Cable between signal generator and EUT 1.05dB

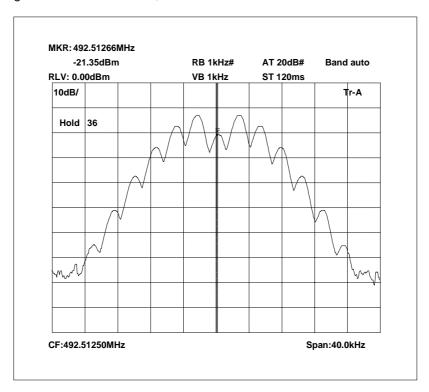
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER | MODEL No   | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C    | MT26089    | 479    | х                           |
| ATTENUATOR           | BIRD               | 8304-300-N | N/A        | 220    | х                           |
| ATTENUATOR           | BIRD               | 8308-200   | N/A        | 103    | x                           |
| CABLE                | ROSENBERGER        | MICRO COAX | N/A        | 280    | x                           |
| SIGNAL<br>GENERATOR  | MARCONI            | 2042       | 119388/080 | 176    | х                           |

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492.5125 MHz Signal Generator, deviation set to 5kHz

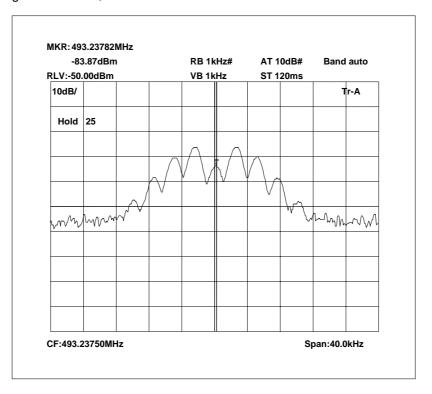


492.5125 MHz Signal Generator and EUT, deviation set to 5kHz

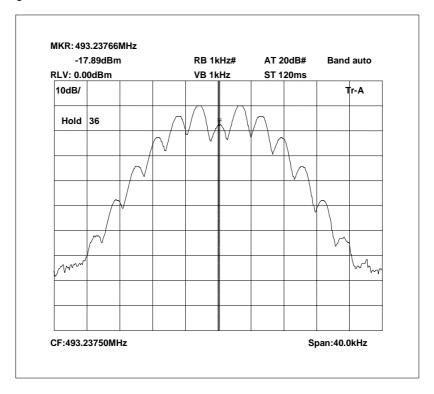


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493.2375 MHz Signal Generator, deviation set to 5kHz

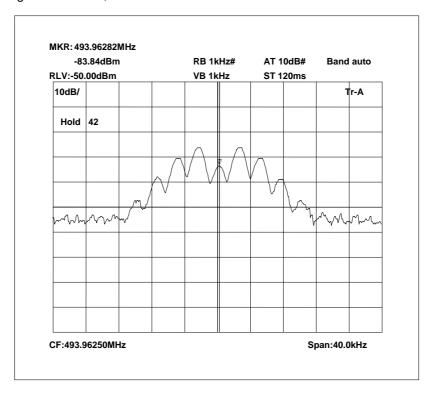


493.2375 MHz Signal Generator and EUT, deviation set to 5kHz

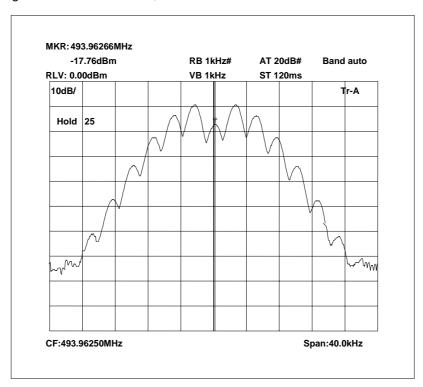


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493.9625 MHz Signal Generator, deviation set to 5kHz

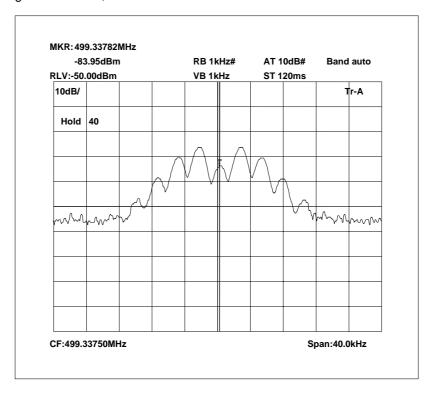


493.9625 MHz Signal Generator and EUT, deviation set to 5kHz

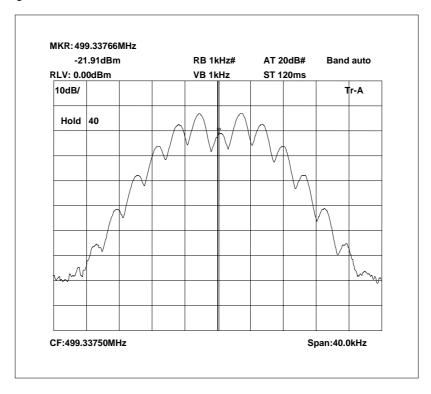


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499.3375 MHz Signal Generator, deviation set to 5kHz

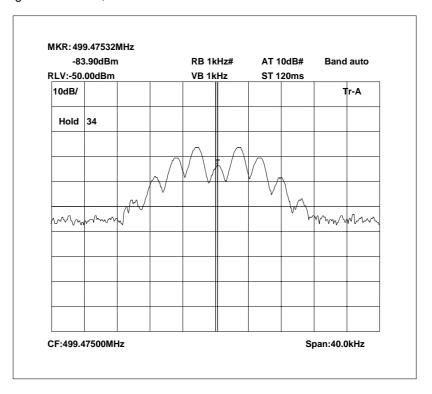


499.3375 MHz Signal Generator and EUT, deviation set to 5kHz

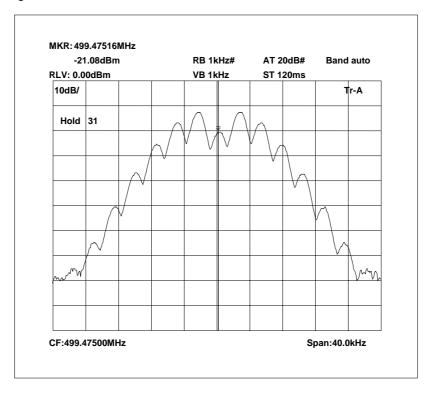


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499.4750 MHz Signal Generator, deviation set to 5kHz

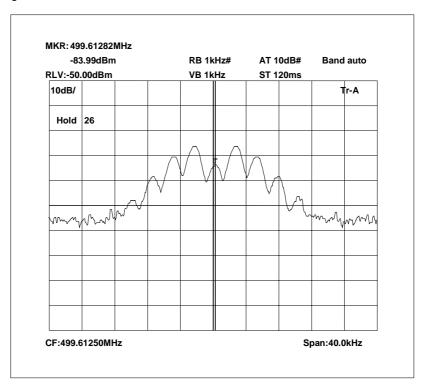


499. 4750 MHz Signal Generator and EUT, deviation set to 5kHz

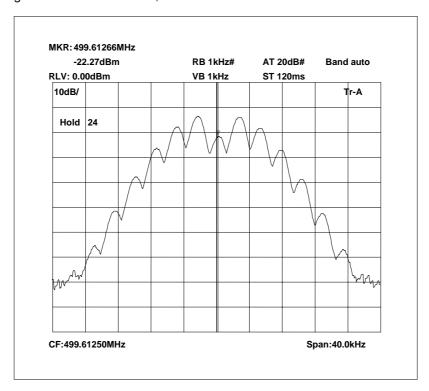


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499.6125 MHz Signal Generator, deviation set to 5kHz



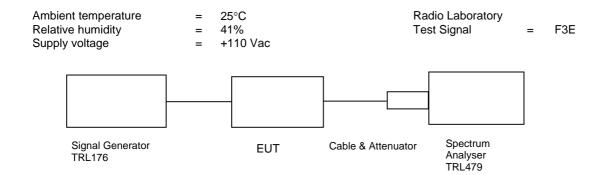
499.6125 MHz Signal Generator and EUT, deviation set to 5kHz



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#### TRANSMITTER TESTS

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



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

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

#### **RESULTS**

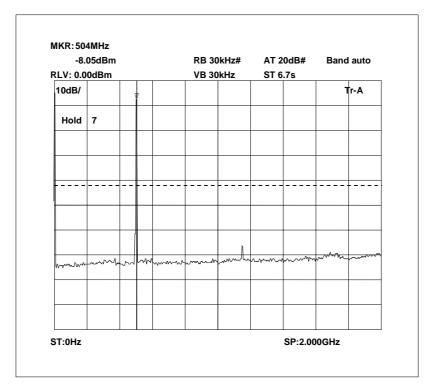
| FREQUENCY<br>RANGE | FREQ.<br>(MHz) | MEASURED<br>LEVEL<br>(dBm) | ATTENUATOR & CABLE LOSSES (dB) | EMISSION<br>LEVEL<br>(dBm) | LIMIT<br>(dBm) |
|--------------------|----------------|----------------------------|--------------------------------|----------------------------|----------------|
| 0 Hz – 5 GHz       | ١              | lo Significant Emissio     | ns Within 20 dBs of the        | limit                      | -13            |

The test equipment used for the Transmitter Conducted Emissions:

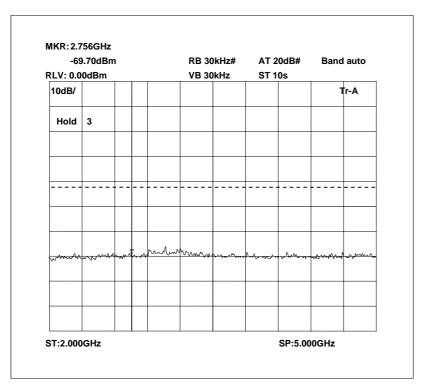
| The test equipment t | ased for the Transmitte | Outladdica Ettilosioi | io.        |        |                             |
|----------------------|-------------------------|-----------------------|------------|--------|-----------------------------|
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER      | MODEL No              | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
| SPECTRUM<br>ANALYSER | ANRITSU                 | MS2665C               | MT26089    | 479    | х                           |
| ATTENUATOR           | BIRD                    | 8304-300-N            | N/A        | 220    | х                           |
| ATTENUATOR           | BIRD                    | 8308-200              | N/A        | 103    | х                           |
| CABLE                | ROSENBERGER             | MICRO COAX            | N/A        | 280    | х                           |
| SIGNAL<br>GENERATOR  | MARCONI                 | 2042                  | 119388/080 | 176    | х                           |
| CABLE                | N/A                     | N/A                   | N/A        | UH254  | х                           |

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## Conducted emissions 492.5125 MHz 0 - 2GHz

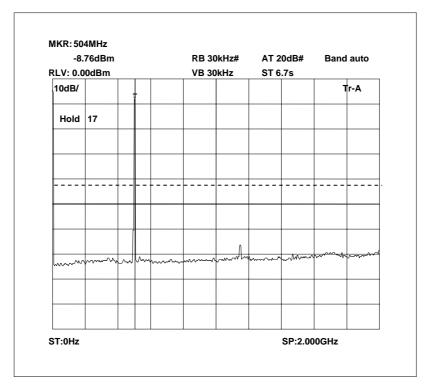


# Conducted emissions 492.5125 MHz 2 - 5GHz

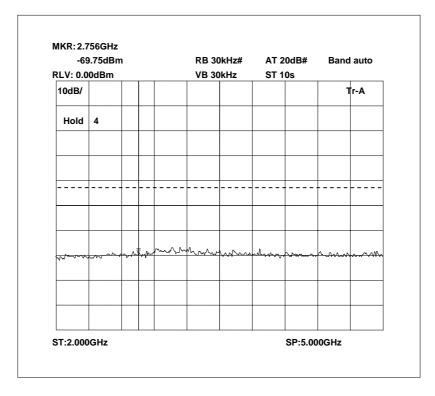


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## Conducted emissions 493.2375 MHz 0 - 2GHz

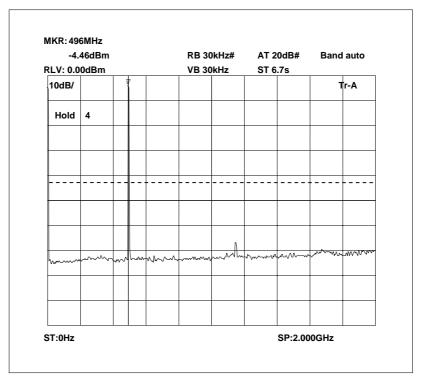


# Conducted emissions 493.2375 MHz 2 - 5GHz

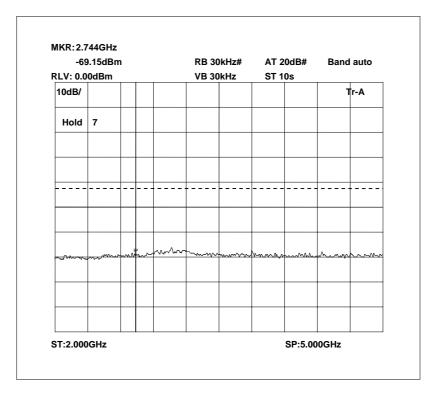


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## Conducted emissions 493.9625 MHz 0 - 2GHz

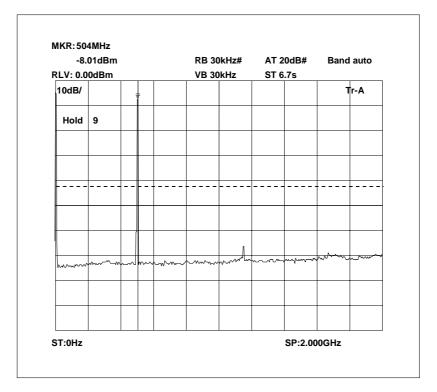


# Conducted emissions 493.9625 MHz 2 - 5GHz

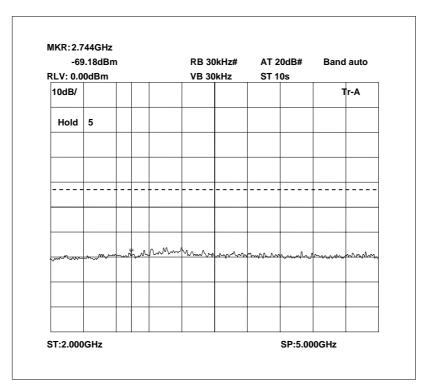


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## Conducted emissions 499.3375 MHz 0 - 2GHz

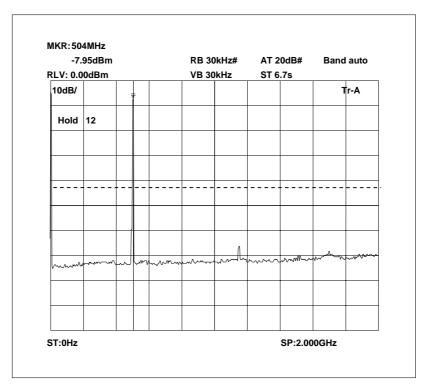


# Conducted emissions 499.3375 MHz 2 - 5GHz

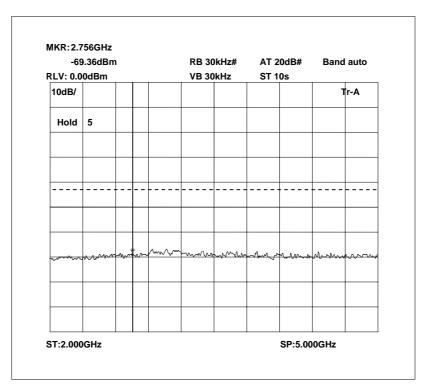


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## Conducted emissions 499.4750 MHz 0 - 2GHz

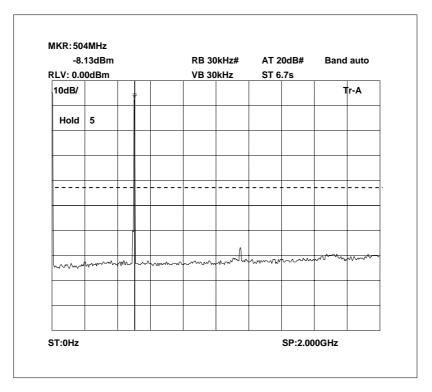


# Conducted emissions 499.4750 MHz 2 - 5GHz

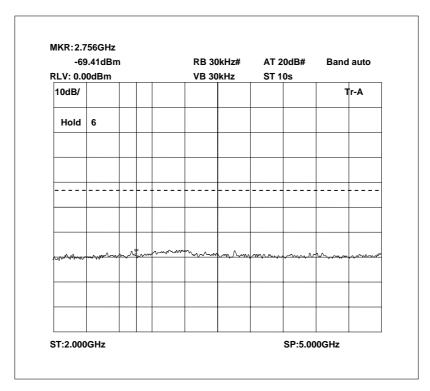


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## Conducted emissions 499.6125 MHz 0 - 2GHz



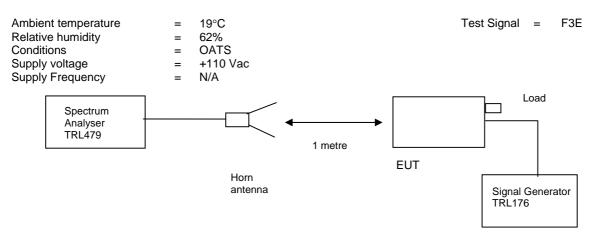
# Conducted emissions 499.6125 MHz 2 - 5GHz



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#### TRANSMITTER TESTS

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



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

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

#### **RESULTS**

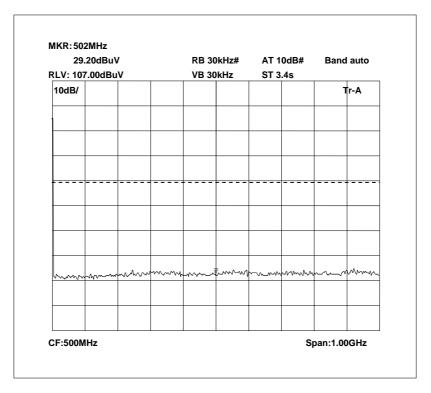
| FREQUENCY<br>RANGE | FREQ.<br>(MHz) | MEAS.<br>Rx.<br>(dBμV) | CABLE<br>LOSS<br>(dB) | ANT<br>FACTOR | FIELD<br>STRENGTH<br>(dBµV/m) | CALCULATED<br>EIRP<br>(dBm) | LIMIT<br>(dBm) |
|--------------------|----------------|------------------------|-----------------------|---------------|-------------------------------|-----------------------------|----------------|
| 0 Hz – 5 GHz       | N              | lo Significa           | nt Emissio            | ns Within 2   | 20 dBs of the                 | limit                       | -13            |

The test equipment used for the Transmitter Spurious Emissions:

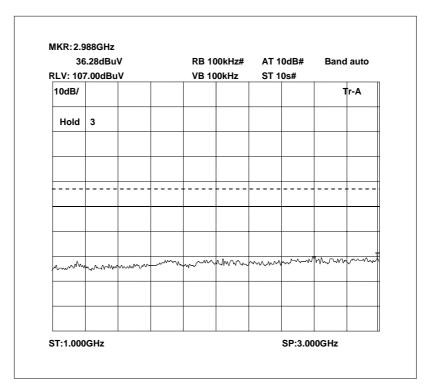
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER | MODEL No   | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C    | MT26089    | 479    | х                           |
| HORN                 | EMCO               | 3115       | 9010-3581  | 139    | х                           |
| CABLE                | ROSENBERGER        | MICRO COAX | N/A        | 280    | х                           |
| SIGNAL<br>GENERATOR  | MARCONI            | 2042       | 119388/080 | 176    | х                           |

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## Radiated emissions 492.5125 MHz 0 - 1GHz



#### Radiated emissions 492.5125 MHz 1 - 3GHz



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

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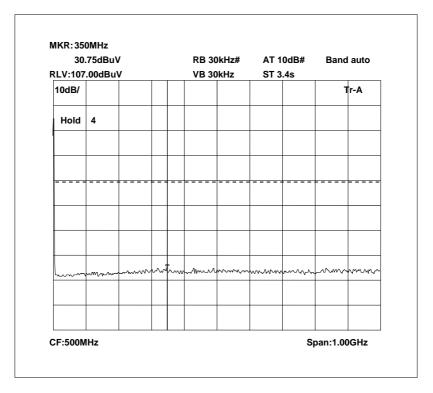
# Radiated emissions 492.5125 MHz 3 - 5GHz

| 33.23dBuV<br>RLV: 107.00dBuV |   |       |      |       | 00kHz# |      | 0dB#    | Band                                   | l auto |
|------------------------------|---|-------|------|-------|--------|------|---------|--|--------|
|                              |   |       |      | VB 10 | 00kHz  | ST 1 | ST 10s# |  |        |
| 10dB/                        |   |       |      |       |        |      | 7       | Tr-A                                   |        |
| Hold                         | 6 |       |      |       |        |      |         |  |        |
|                              |   |       |      |       |        |      |         |  |        |
|                              |   |       |      |       |        |      |         |  |        |
|                              |   |       |      |       |        |      |         |  |        |
|                              |   |       |      |       |        |      |         |  |        |
|                              |   |       |      |       |        |      |         |  |        |
| www                          | m | ~~~~~ | ~~~~ | M-10  | ~~~~   | Www  |         | ~~~\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | ~~~~   |
|                              |   |       |      |       |        |      |         |  |        |
|                              |   |       |      |       |        |      |         |  |        |
| ĺ                            |   |       |      |       |        |      |         |  |        |

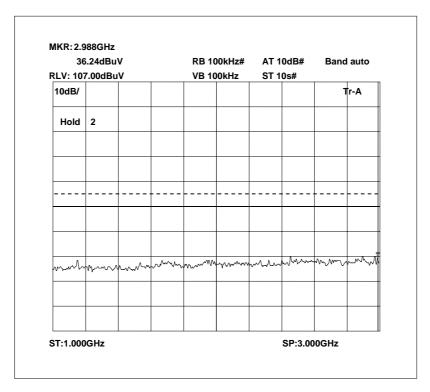
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 493.2375 MHz 0 - 1GHz



# Radiated emissions 493.2375 MHz 1 – 3GHz



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

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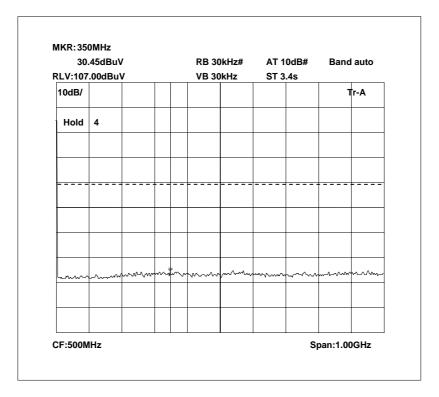
# Radiated emissions 493.2375 MHz 3 - 5GHz

| 32.66dBuV       |          |        |       | RB 10 | 00kHz# | AT 1    | 0dB#    | Band | d auto |  |
|-----------------|----------|--------|-------|-------|--------|---------|---------|------|--------|--|
| RLV: 107.00dBuV |          |        | VB 10 | 00kHz | ST 1   | ST 10s# |         |      |        |  |
| 10dB/           |          |        |       |       |        |         |         | Tr-A |        |  |
| Hold            | 3        |        |       |       |        |         |         |      |        |  |
|                 |          |        |       |       |        |         |         |      |        |  |
|                 |          |        |       |       |        |         |         |      |        |  |
|                 |          |        |       |       |        |         |         |      |        |  |
|                 |          |        |       |       |        |         |         |      |        |  |
|                 |          |        |       |       |        |         |         |      |        |  |
|                 |          |        |       |       |        |         |         |      |        |  |
| 1-M-M-MM        | mww      | H-www. | ~~~~  | mmm   | www    | www     | ~~~~~   | rwww | ······ |  |
|                 |          |        |       |       |        |         |         |      |        |  |
|                 |          |        |       |       |        |         |         |      |        |  |
|                 | )<br>GHz |        |       |       |        |         | SP:5.00 |      |        |  |

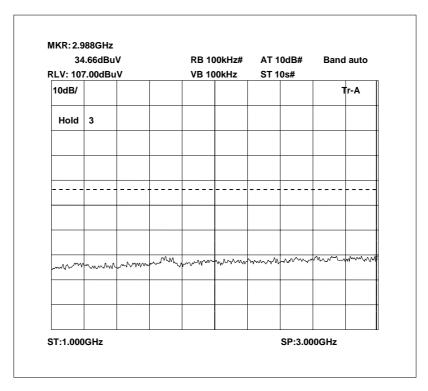
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 493.9625 MHz 0 - 1GHz



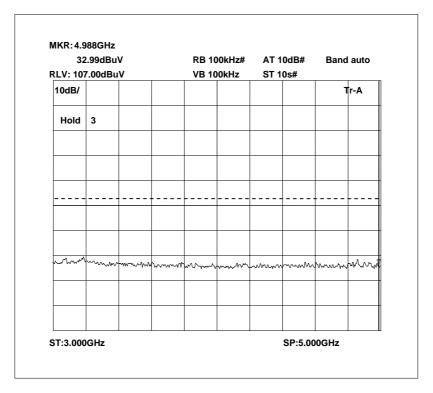
Radiated emissions 493.9625 MHz 1 - 3GHz



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

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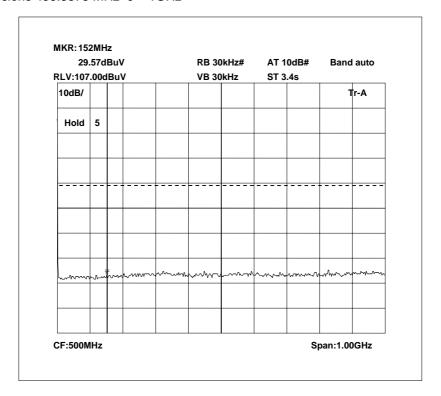
# Radiated emissions 493.9625 MHz 3 - 5GHz



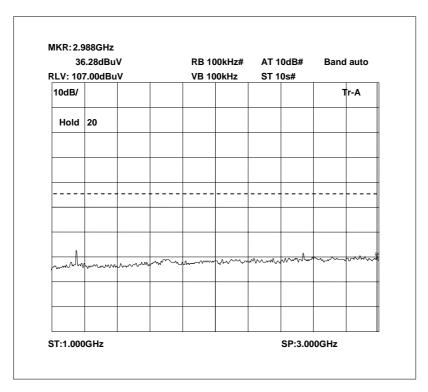
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 499.3375 MHz 0 - 1GHz



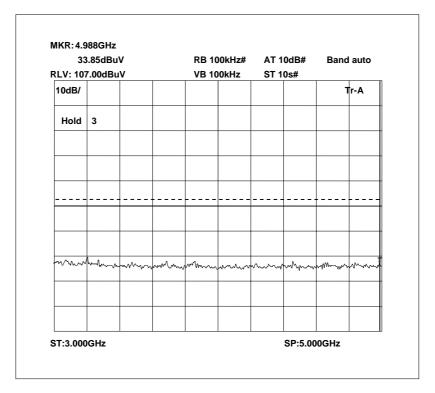
Radiated emissions 499.3375 MHz 1 – 3GHz



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

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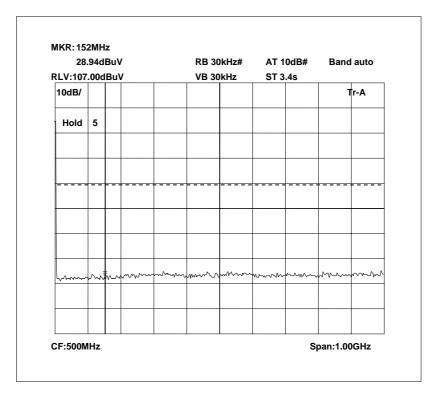
# Radiated emissions 499.3375 MHz 3 - 5GHz



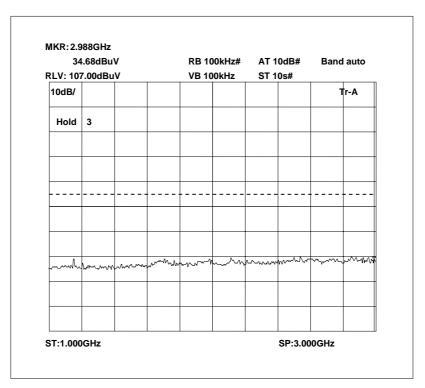
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 499.4750 MHz 0 - 1GHz



Radiated emissions 499.4750 MHz 1 - 3GHz



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

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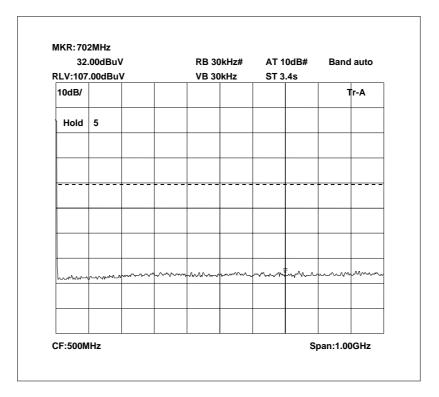
# Radiated emissions 499.4750 MHz 3 - 5GHz

| 33.33dBuV       |            |     |       | RB 10     | 00kHz# | AT 1    | 0dB#    | Band                | l auto     |
|-----------------|------------|-----|-------|-----------|--------|---------|---------|---------------------|------------|
| RLV: 107.00dBuV |            |     | VB 10 | VB 100kHz |        | ST 10s# |         |                     |            |
| 10dB/           |            |     |       |           |        |         |         | ٦                   | Tr-A       |
| Hold            | 3          |     |       |           |        |         |         |                     |            |
|                 |            |     |       |           |        |         |         |                     |            |
|                 |            |     |       |           |        |         |         |                     |            |
|                 |            |     |       |           |        |         |         |                     |            |
|                 |            |     |       |           |        |         |         |                     |            |
|                 |            |     |       |           |        |         |         |                     |            |
| . 0             | <b>.</b> . |     |       |           |        |         |         |                     |            |
|                 | ~~~~~~     | www | hww   | www       | w.~~   | M       | ~~~~    | -w- <sub>w</sub> -w | ~~\\\.^\\. |
|                 |            |     |       |           |        |         |         |                     |            |
|                 |            |     |       |           |        |         |         |                     |            |
| ST:3.000        |            |     |       |           |        |         | SP:5.00 |                     |            |

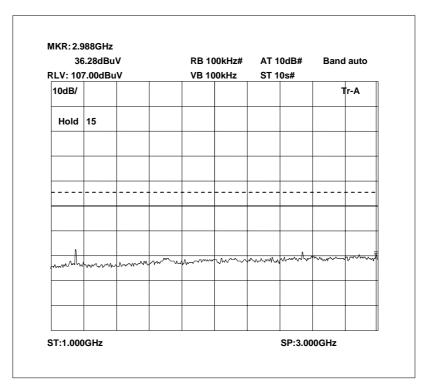
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 499.6125 MHz 0 - 1GHz



Radiated emissions 499.6125 MHz 1 - 3GHz



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

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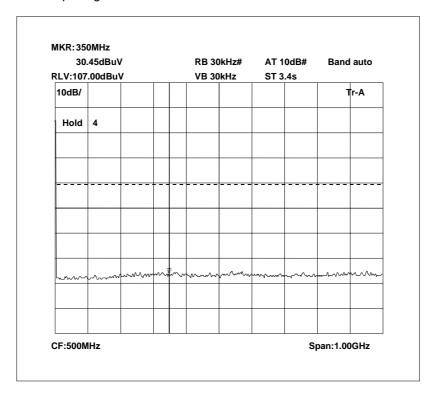
# Radiated emissions 499.6125 MHz 3 - 5GHz

| 33.57dBuV       |     |     |       |       | 00kHz# |         | 0dB# | Band | d auto |
|-----------------|-----|-----|-------|-------|--------|---------|------|------|--------|
| RLV: 107.00dBuV |     |     | VB 10 | 00kHz | ST 1   | ST 10s# |      |      |        |
| 10dB/           |     |     |       |       |        |         |      |      | Tr-A   |
| Hold            | 3   |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |
| www             | mmm | man | -~~~  | nhann | www    | www.    | ~~~~ | www  | m      |
|                 |     |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |
|                 |     |     |       |       |        |         |      |      |        |

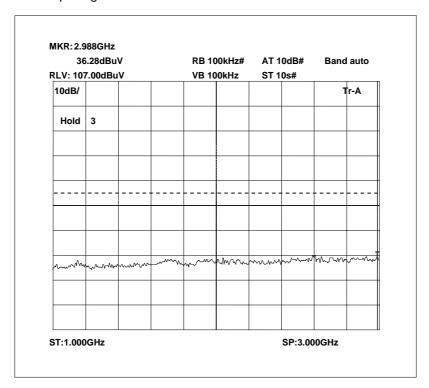
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions no input signal 0 - 1GHz



Radiated emissions no input signal 1 – 3GHz



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

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Radiated emissions no input signal 3 – 5GHz

| 32      | 2.66dBu | V    |      | RB 10 | 00kHz# | AT 1 | 0dB#    | Band | d auto        |
|---------|---------|------|------|-------|--------|------|---------|------|---------------|
| RLV: 10 | 7.00dBu | ıV   |      | VB 10 | 0kHz   | ST 1 | 0s#     |      |               |
| 10dB/   |         |      |      |       |        |      |         | -    | Tr-A          |
| Hold    | 3       |      |      |       |        |      |         |      |               |
|         |         |      |      |       |        |      |         |      |               |
|         |         |      |      |       |        |      |         |      |               |
|         |         |      |      |       |        |      |         |      |               |
|         |         |      |      |       |        |      |         |      |               |
|         |         |      |      |       |        |      |         |      |               |
|         |         |      |      |       |        |      |         |      |               |
| LW WWW  | mwww    | H-mm | www. | mmm   | ~~~~~  | www  | ~~~~~   | www  | ············· |
|         |         |      |      |       |        |      |         |      |               |
|         |         |      |      |       |        |      |         |      |               |
|         | GHz     |      |      |       |        |      | SP:5.00 |      |               |

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

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#### AMPLIFIER GAIN - CONDUCTED - PART 2.1046 - DOWNLINK

Ambient temperature = 25°C Radio Laboratory

Relative humidity = 40% Supply voltage = +110 Vac Channel number = See test results



#### Frequency Band - 489.5125 MHz - 490.9625 MHz

| Frequency<br>MHz | Voltage | Signal<br>Generator<br>input level<br>dBm | Output<br>Cable &<br>Attenuator<br>loss dB | Level at<br>Spectrum<br>Analyser<br>dBm | Gain<br>dB | Output<br>Power<br>dBm | Gain after 10dB<br>input level<br>increase<br>dBm |
|------------------|---------|---|--|---|------------|------------------------|---|
| 489.5000         | 110 Vac | -41.35                                    | 31.2                                       | -0.07                                   | 72.48      | 31.13                  | 61.55   |
| 490.23125        | 110 Vac | -39.35                                    | 31.2                                       | 1.43                                    | 71.98      | 32.63                  | 61.75   |
| 490.9625         | 110 Vac | -38.35                                    | 31.2                                       | -0.16                                   | 69.39      | 31.04                  | 61.31   |

#### Notes:

- 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured
- 2. Input level is adjusted for the input cable loss.

## Frequency Band - 499.3375 MHz - 499.6125 MHz

| Frequency<br>MHz | Voltage | Signal<br>Generator<br>input level<br>dBm | Output<br>Cable &<br>Attenuator<br>loss dB | Level at<br>Spectrum<br>Analyser<br>dBm | Gain<br>dB | Output<br>Power<br>dBm | Gain after 10dB<br>input level<br>increase<br>dBm |
|------------------|---------|---|--|---|------------|------------------------|---|
| 496.3375         | 110 Vac | -41.35                                    | 31.2                                       | -2.22                                   | 70.33      | 28.98                  | 61.15   |
| 496.4750         | 110 Vac | -41.35                                    | 31.2                                       | -1.53                                   | 71.02      | 29.67                  | 60.97   |
| 496.6125         | 110 Vac | -41.35                                    | 31.2                                       | -1.23                                   | 71.32      | 29.97                  | 61.32   |

#### Notes:

- 1. The signal generator input was increased by 10dBs and the level of the output signal remeasured
- 2. Input level is adjusted for the input cable loss

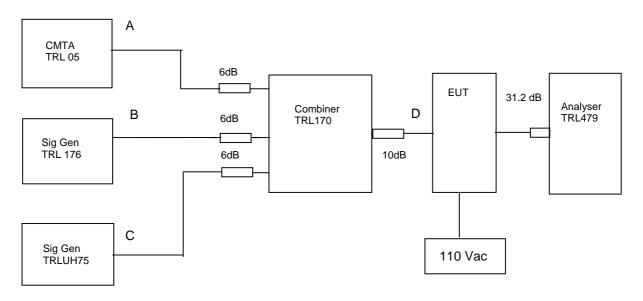
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER | MODEL No   | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C    | MT26089    | 479   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

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#### AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS - CONDUCTED - PART 2.1053- DOWNLINK

Ambient temperature = 25°C Radio Laboratory

Relative humidity = 40% Supply voltage = +110 Vac



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 -38dBm. The cable and attenuators loss between the EUT and the spectrum analyser was 31.20 dB.

| RF       | Input Frequenc<br>(MHz) | СУ       | Highest Intermodulation Product Level | Limit |
|----------|-------------------------|----------|---------------------------------------|-------|
| TRL05    | TRL176                  | TRLUH75  | (dBm)                                 | (dBm) |
| 490.9625 | 489.786                 | 489.5000 | -15.73 dBm @ 490.6860 MHz             | -13   |
| 496.6125 | 496.4125                | 496.3375 | -13.69 dBm @ 496.5125 MHz             | -13   |

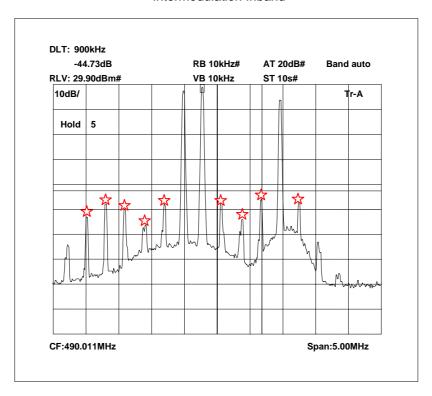
Sweep data is shown on the next page:

Test equipment used for intermodulation test

| Tool oquipinont as   |                    |          |            |        |                             |
|----------------------|--------------------|----------|------------|--------|-----------------------------|
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER | MODEL No | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C  | MT26089    | 479    | х                           |
| SIGNAL<br>GENERATOR  | MARCONI            | 2022D    | 119215/058 | UH75   | х                           |
| СМТА                 | ROHDE &<br>SCHWARZ | CMTA52   | 894715/033 | 05     | х                           |
| SIGNAL<br>GENERATOR  | MARCONI            | 2042     | 119388/080 | 176    | х                           |
| COMBINER             | ELCOM              | RC-4-50  | N/A        | 170    | х                           |

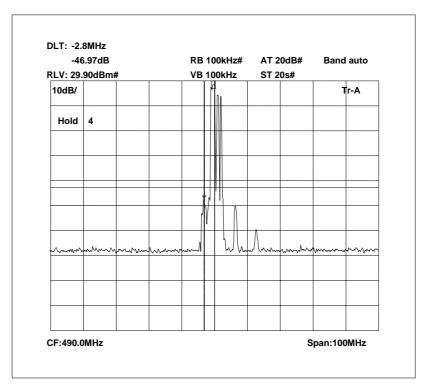
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## Intermodulation Inband



The above plot shows that all products (designated by ☆) are within 20 dB of the spurious limit.

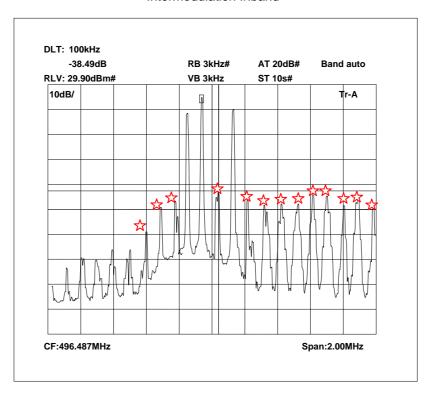
## Intermodulation Wideband



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

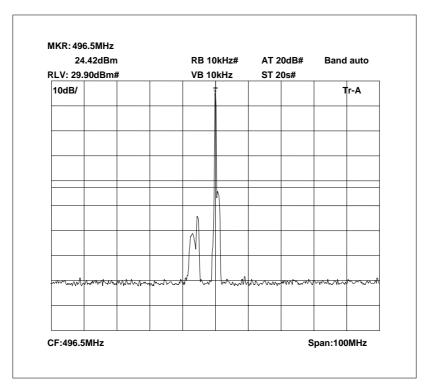
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## Intermodulation Inband



The above plot shows that all products (designated by ☆) are within 20 dB of the spurious limit.

Intermodulation Wideband



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

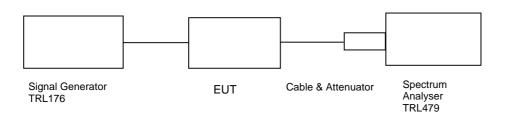
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#### TRANSMITTER TESTS

#### AMPLIFIER MODULATED CHANNEL TEST - CONDUCTED - Part 2.1049- DOWNLINK

Ambient temperature = 26°C Radio Laboratory

Relative humidity = 37% Supply voltage = +110 Vac 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 (-40dBm) 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.

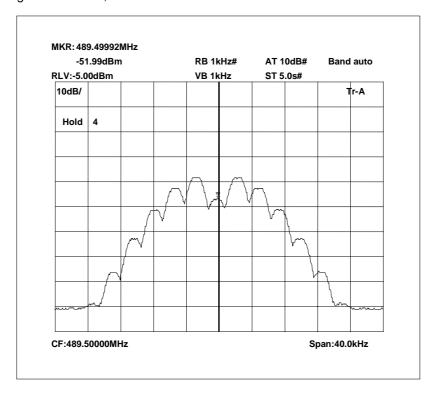
Note: The cables and attenuators had the following losses.

- 1. Cable attenuators between spectrum analyser and EUT = 32.1dB
- 2. Cable between signal generator and EUT = 0.35dB

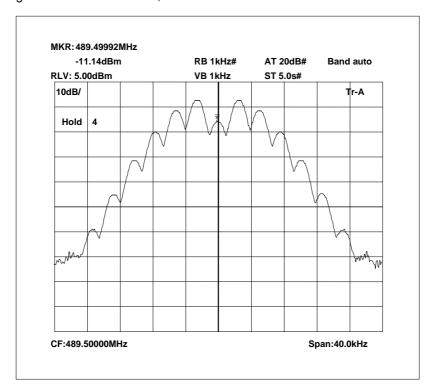
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER | MODEL No   | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C    | MT26089    | 479   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

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489.5000 MHz Signal Generator, deviation set to 5kHz

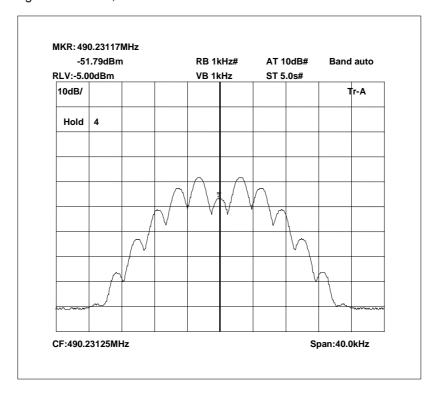


489.5000 MHz Signal Generator and EUT, deviation set to 5kHz

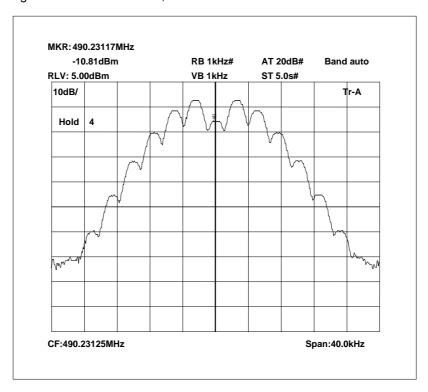


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490.23125 MHz Signal Generator, deviation set to 5kHz

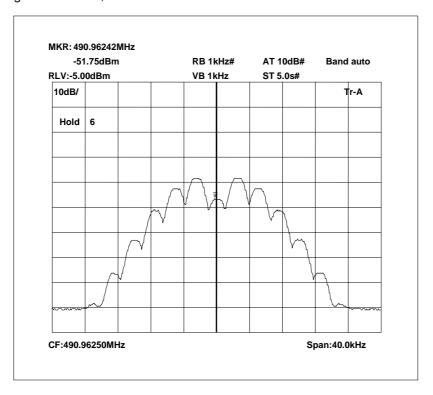


490.23125 MHz Signal Generator and EUT, deviation set to 5kHz

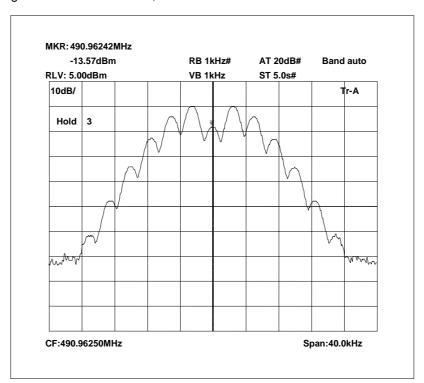


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490.9625 MHz Signal Generator, deviation set to 5kHz

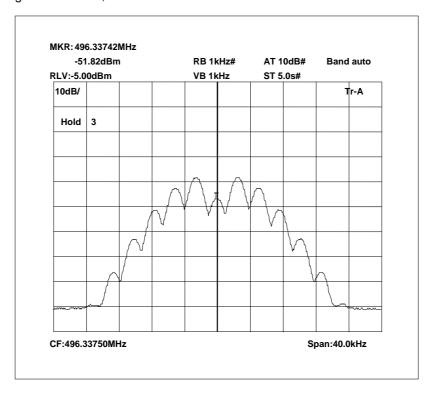


490.9625 MHz Signal Generator and EUT, deviation set to 5kHz

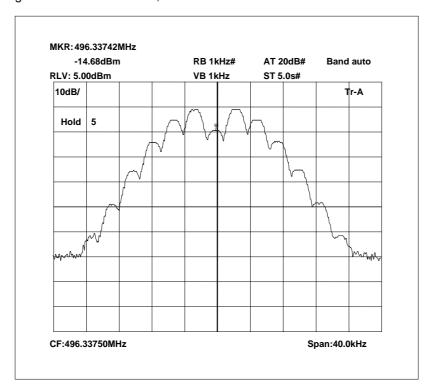


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496.3375 MHz Signal Generator, deviation set to 5kHz

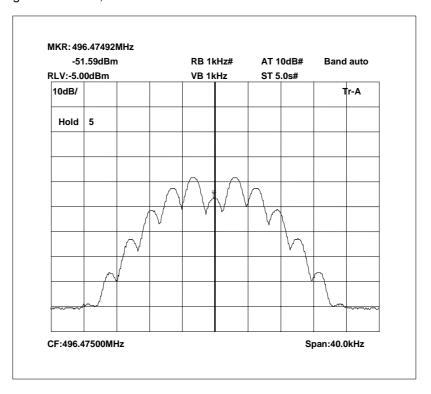


496.3375 MHz Signal Generator and EUT, deviation set to 5kHz

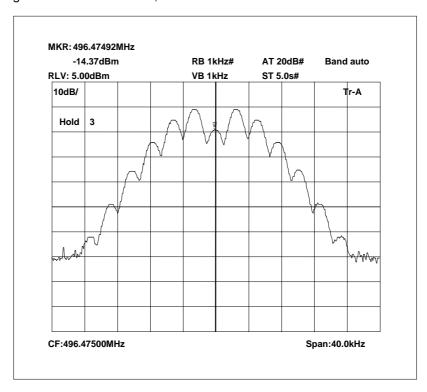


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496.4750 MHz Signal Generator, deviation set to 5kHz

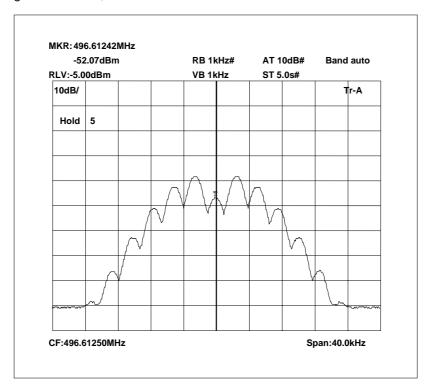


496.4750 MHz Signal Generator and EUT, deviation set to 5kHz

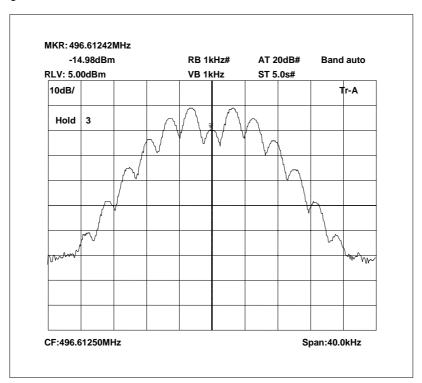


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496.6125 MHz Signal Generator, deviation set to 5kHz



496.6125 MHz Signal Generator and EUT, deviation set to 5kHz

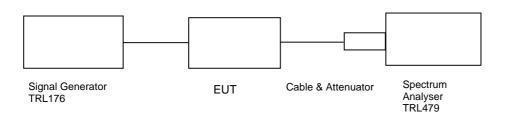


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#### TRANSMITTER TESTS

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

Ambient temperature = 25°C Radio Laboratory
Relative humidity = 40% Test Signal = F3E
Supply voltage = +110 Vac



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

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

## **RESULTS**

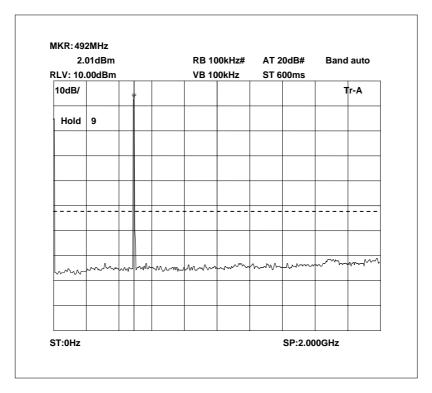
| FREQUENCY<br>RANGE | FREQ.<br>(MHz) | MEASURED<br>LEVEL<br>(dBm) | ATTENUATOR &<br>CABLE LOSSES<br>(dB) | EMISSION<br>LEVEL<br>(dBm) | LIMIT<br>(dBm) |
|--------------------|----------------|----------------------------|--------------------------------------|----------------------------|----------------|
| 0 Hz – 5 GHz       |                | No Significant Emission    | ons within 20 dB of the I            | imit                       | -13            |

The test equipment used for the Transmitter Conducted Emissions:

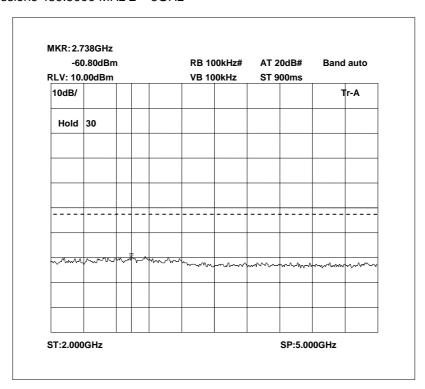
| The test equipment   | 1                  |            | <u> </u>   | t      | 1                           |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER | MODEL No   | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C    | MT26089    | 479    | х                           |
| ATTENUATOR           | BIRD               | 8304-200   | N/A        | 103    | х                           |
| ATTENUATOR           | BIRD               | 8304-300-N | N/A        | 220    | х                           |
| CABLE                | ROSENBERGER        | MICRO COAX | N/A        | 280    | х                           |
| CABLE                | N/A                | N/A        | N/A        | UH254  | х                           |
| SIGNAL<br>GENERATOR  | MARCONI            | 2042       | 119388/080 | 176    | х                           |

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## Conducted emissions 489.5000 MHz 0 - 2GHz

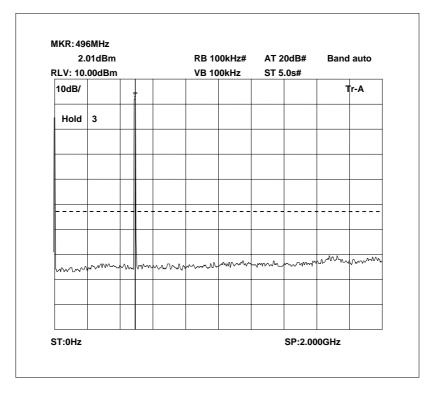


## Conducted emissions 489.5000 MHz 2 - 5GHz

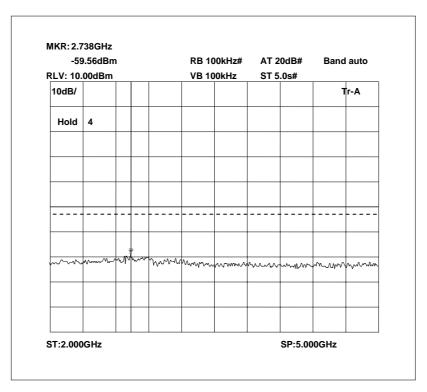


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## Conducted emissions 490.23125 MHz 0 - 2GHz

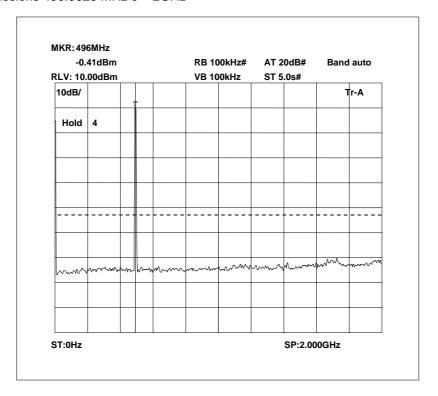


#### Conducted emissions 490.23125 MHz 2 - 5GHz

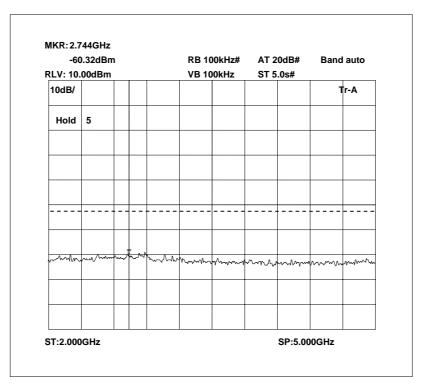


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## Conducted emissions 490.9625 MHz 0 - 2GHz

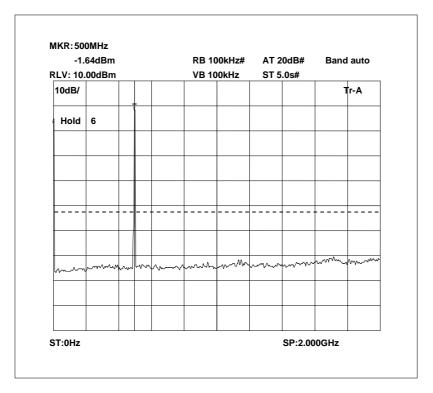


## Conducted emissions 490.9625 MHz 2 - 5GHz

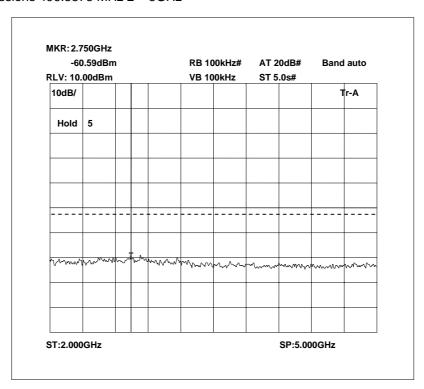


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## Conducted emissions 496.3375 MHz 0 - 2GHz

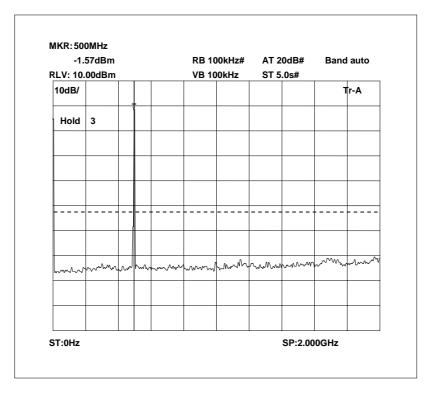


## Conducted emissions 496.3375 MHz 2 - 5GHz

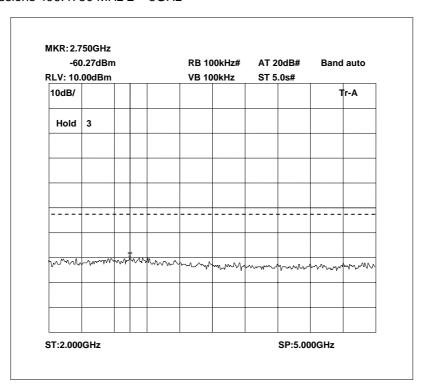


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## Conducted emissions 496.4750 MHz 0 - 2GHz

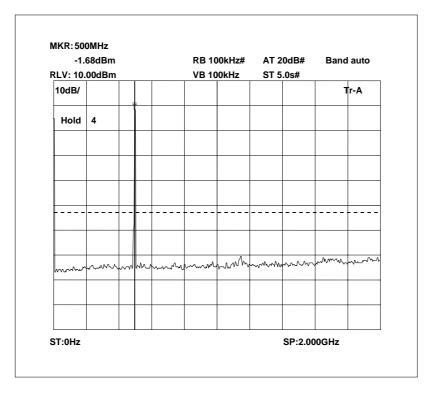


## Conducted emissions 496.4750 MHz 2 - 5GHz

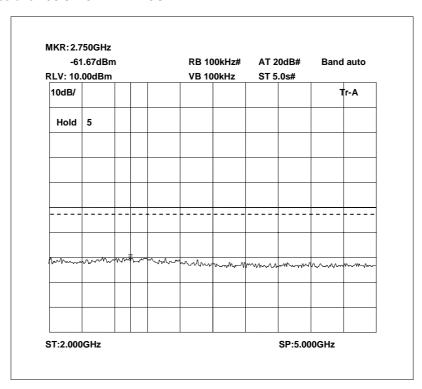


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## Conducted emissions 496.6125 MHz 0 - 2GHz



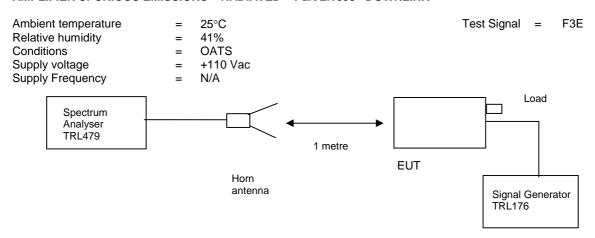
## Conducted emissions 496.6125 MHz 2 - 5GHz



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#### TRANSMITTER TESTS

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



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

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

#### **RESULTS**

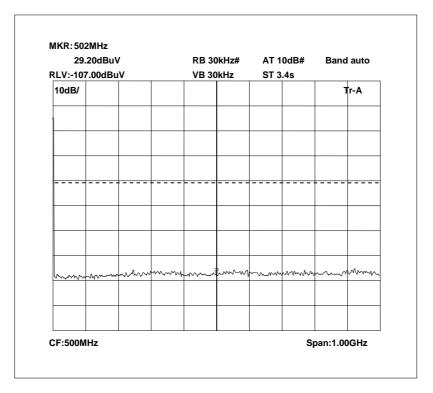
| FREQUENCY<br>RANGE | FREQ.<br>(MHz) | MEAS.<br>Rx.<br>(dBμV) | CABLE<br>LOSS<br>(dB) | ANT<br>FACTOR | FIELD<br>STRENGTH<br>(dBµV/m) | CALCULATED<br>EIRP<br>(dBm) | LIMIT<br>(dBm) |
|--------------------|----------------|------------------------|-----------------------|---------------|-------------------------------|-----------------------------|----------------|
| 0 Hz – 5 GHz       |                | No Signific            | ant Emissio           | ons within 2  | 20 dB of the l                | limit                       | -13            |

The test equipment used for the Transmitter Spurious Emissions:

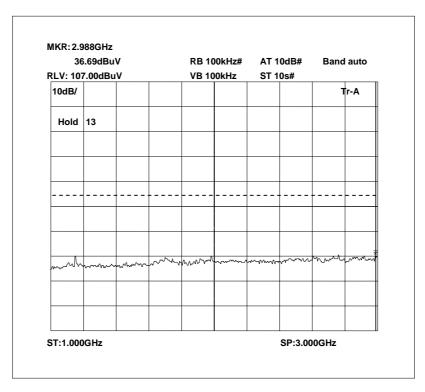
| TYPE OF<br>EQUIPMENT | MAKER/<br>SUPPLIER | MODEL No   | SERIAL No  | TRL No | ACTUAL<br>EQUIPMENT<br>USED |
|----------------------|--------------------|------------|------------|--------|-----------------------------|
| SPECTRUM<br>ANALYSER | ANRITSU            | MS2665C    | MT26089    | 479    | х                           |
| HORN                 | EMCO               | 3115       | 9010-3581  | 139    | x                           |
| CABLE                | ROSENBERGER        | MICRO COAX | N/A        | 280    | x                           |
| SIGNAL<br>GENERATOR  | MARCONI            | 2042       | 119388/080 | 176    | х                           |

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## Radiated emissions 489.5000 MHz 0 - 1GHz



## Radiated emissions 489.5000 MHz 1 - 3GHz



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

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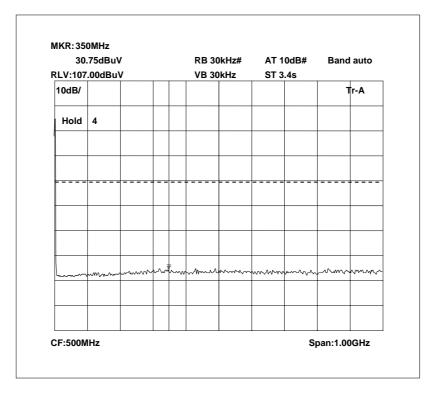
## Radiated emissions 489.5000 MHz 3 - 5GHz

| .00dBuV VB 100kHz ST 10s#  Tr-A  3   |
|--|
|  |
| 3  |
|  |
|  |
|  |
|  |
|  |
|  |
| manufacture and the second sec |
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| ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~   |

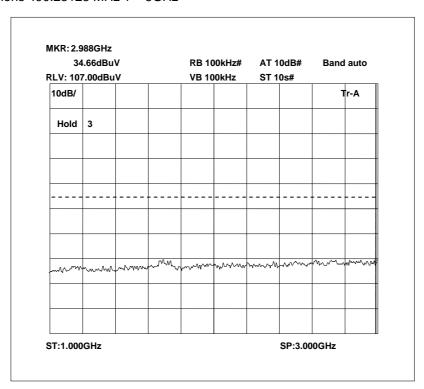
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 490.23125 MHz 0 - 1GHz



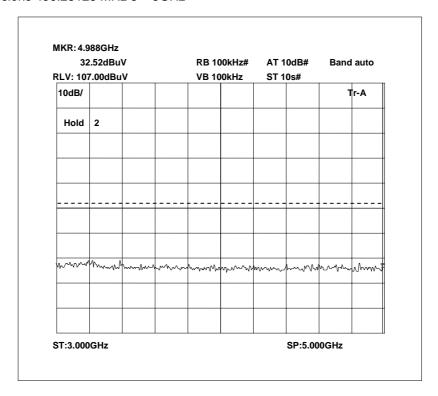
#### Radiated emissions 490.23125 MHz 1 - 3GHz



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

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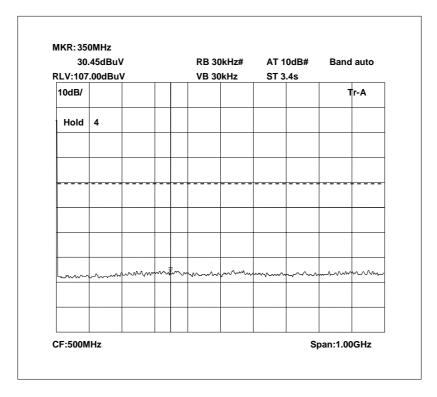
## Radiated emissions 490.23125 MHz 3 - 5GHz



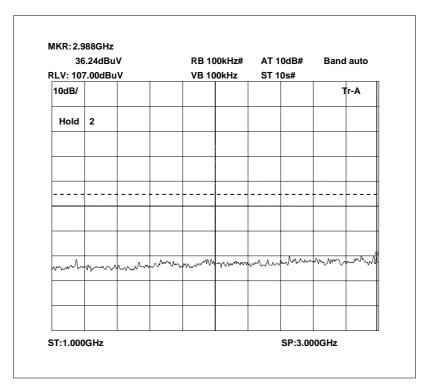
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 490.9625 MHz 0 - 1GHz



## Radiated emissions 490.9625 MHz 1 - 3GHz



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

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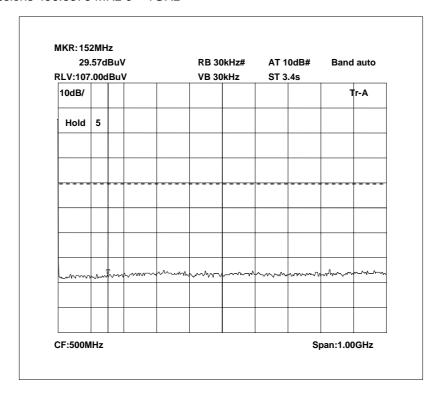
## Radiated emissions 490.9625 MHz 3 - 5GHz

|         |      |       |     | RB 100kHz#<br>VB 100kHz |       | AT 10dB#<br>ST 10s# |         | Band auto |      |
|---------|------|-------|-----|-------------------------|-------|---------------------|---------|-----------|------|
| 10dB/   |      |       |     |                         |       | <u> </u>            |         | -         | Tr-A |
| Hold    | 6    |       |     |                         |       |                     |         |           |      |
|         |      |       |     |                         |       |                     |         |           |      |
|         |      |       |     |                         |       |                     |         |           |      |
|         |      |       |     |                         |       |                     |         |           |      |
|         |      |       |     |                         |       |                     |         |           |      |
|         |      |       |     |                         |       |                     |         |           |      |
| unnum   | M    | ~~~~~ | www | Mann                    | \~~\^ | www                 |         | ~~~~      | /~~~ |
|         |      |       |     |                         |       |                     |         |           |      |
|         |      |       |     |                         |       |                     |         |           |      |
| T:3.000 | )GHz |       |     |                         |       |                     | SP:5.00 | 0GHz      |      |

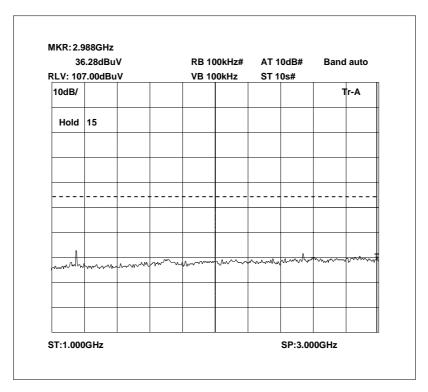
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 496.3375 MHz 0 - 1GHz



Radiated emissions 496.3375 MHz 1 - 3GHz



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

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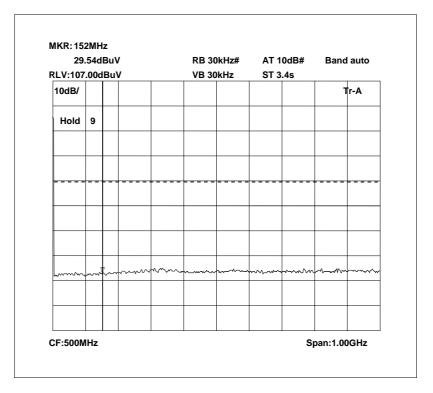
## Radiated emissions 496.3375 MHz 3 - 5GHz

| 33.85dBuV |         |      |  | RB 100kHz# |       | AT 10dB# |    | Band auto |     |
|-----------|---------|------|--|------------|-------|----------|----|-----------|-----|
| RLV: 10   | 7.00dBu | V    |  | VB 10      | 00kHz | ST 10s#  |    |           |     |
| 10dB/     |         |      |  |            |       |          |    | 7         | r-A |
| Hold      | 10      |      |  |            |       |          |    |           |     |
|           |         |      |  |            |       |          |    |           |     |
|           |         |      |  |            |       |          |    |           |     |
|           |         |      |  |            |       |          |    |           |     |
|           |         |      |  |            |       |          |    |           |     |
|           |         |      |  |            |       |          |    |           |     |
| m         | Mymmy   | ~~~~ |  | ~~~~       |       | ~~~~~    | mm | ~~~~^     | man |
|           |         |      |  |            |       |          |    |           |     |
|           |         |      |  |            |       |          |    |           |     |
|           |         |      |  |            |       |          |    |           |     |

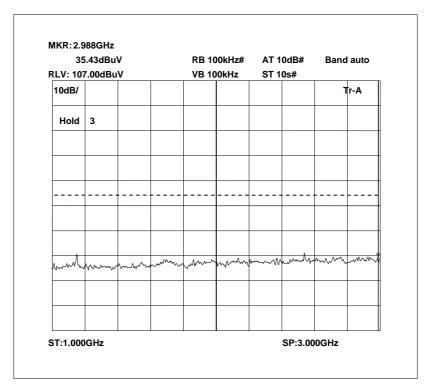
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 496.4750 MHz 0 - 1GHz



#### Radiated emissions 496.4750 MHz 1 - 3GHz



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

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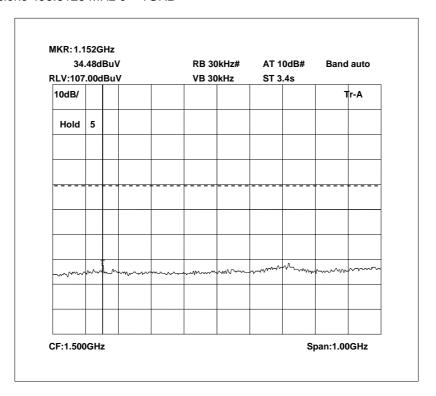
## Radiated emissions 496.4750 MHz 3 - 5GHz

| 33.57dBuV<br>RLV: 107.00dBuV |          |     | RB 100kHz#                             |           | AT 10dB# |         | Band auto |    |      |
|------------------------------|----------|-----|--|-----------|----------|---------|-----------|----|------|
|                              |          |     | VB 10                                  | VB 100kHz |          | ST 10s# |           | -  |      |
| 10dB/                        |          |     |  |           |          |         |           | -  | Tr-A |
| Hold                         | 3        |     |  |           |          |         |           |    |      |
|                              |          |     |  |           |          |         |           |    |      |
|                              |          |     |  |           |          |         |           |    |      |
|                              |          |     |  |           |          |         |           |    |      |
|                              |          |     |  |           |          |         |           |    | +    |
|                              |          |     |  |           |          |         |           |    |      |
| 0 mil                        |          |     |  |           |          |         |           |    |      |
| W-W-V-                       | M. COLON | who | ~~~\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\ | mmm       | Mmn      | M~~~    | ~~~~      | mm | 1    |
|                              |          |     |  |           |          |         |           |    |      |
|                              |          |     |  |           |          |         |           |    |      |
| ST:3.000                     |          |     |  |           |          |         | SP:5.00   |    |      |

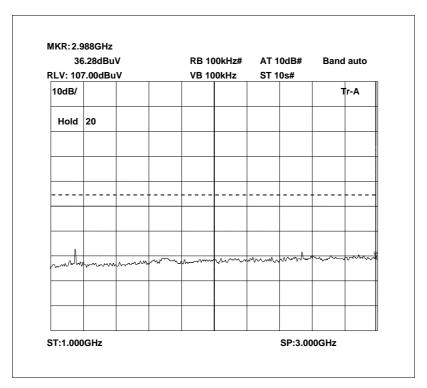
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions 496.6125 MHz 0 - 1GHz



## Radiated emissions 496.6125 MHz 1 - 3GHz



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

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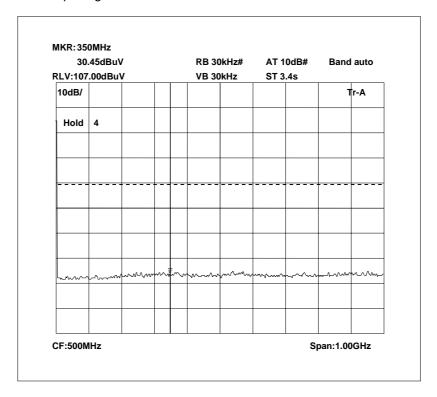
## Radiated emissions 496.6125 MHz 3 - 5GHz

| 33              |          |    | AT 1    | AT 10dB# Band<br>ST 10s# |     | Band auto |         |       |         |
|-----------------|----------|----|---------|--------------------------|-----|-----------|---------|-------|---------|
| RLV: 107.00dBuV |          |    | ST 1    |                          |     |           |         |       |         |
| 10dB/           |          |    |         |                          |     |           |         | -     | Tr-A    |
| Hold            | 3        |    |         |                          |     |           |         |       |         |
|                 |          |    |         |                          |     |           |         |       |         |
|                 |          |    |         |                          |     |           |         |       |         |
|                 |          |    |         |                          |     |           |         |       |         |
|                 |          |    |         |                          |     |           |         |       |         |
|                 |          |    |         |                          |     |           |         |       |         |
|                 | <b>.</b> |    |         |                          |     |           |         |       |         |
| D.W. 1-W. 0.    | , mwww   | mm | Marra 1 | W.W.W.W.                 | www | M         | ~~~~    | -~~~~ | M-NI\-M |
|                 |          |    |         |                          |     |           |         |       |         |
|                 |          |    |         |                          |     |           |         |       |         |
| ST:3.000        |          |    |         |                          |     |           | SP:5.00 |       |         |

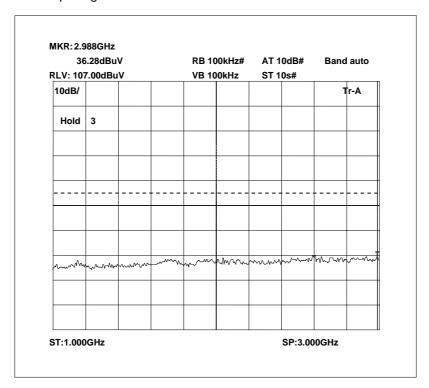
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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## Radiated emissions no input signal 0 - 1GHz



Radiated emissions no input signal 1 – 3GHz



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

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Radiated emissions no input signal 3 – 5GHz

| 32.66dBuV<br>RLV: 107.00dBuV |        |         | RB 100kHz#<br>VB 100kHz |        | AT 10dB#<br>ST 10s# |     | Band auto |      |         |
|------------------------------|--------|---------|-------------------------|--------|---------------------|-----|-----------|------|---------|
|                              |        |         |                         |        |                     |     |           |      | 10dB/   |
| Hold                         | 3      |         |                         |        |                     |     |           |      |         |
|                              |        |         |                         |        |                     |     |           |      |         |
|                              |        |         |                         |        |                     |     |           |      |         |
|                              |        |         |                         |        |                     |     |           |      |         |
|                              |        |         |                         |        |                     |     |           |      |         |
|                              |        |         |                         |        |                     |     |           |      |         |
| ~~~~~w                       | Man. 1 | A       |                         | m.a    |                     |     |           |      | =       |
|                              | ~ vov  | 2400mhr | ma hor                  | rrw_~. | www                 | www | ~~~~~     | ~~~~ | MAN MAN |
|                              |        |         |                         |        |                     |     |           |      |         |
|                              |        |         |                         |        |                     |     |           |      |         |

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

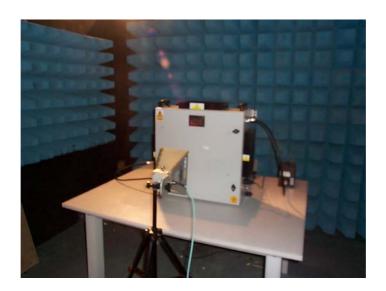
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## ANNEX A PHOTOGRAPHS

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## PHOTOGRAPH No. 1

## **TEST SETUP**



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# ANNEX B APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

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## APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

| a. | ТСВ  | -           | APPLICATION<br>FEE                     | [X]               |
|----|--|-------------|--|-------------------|
| b. | AGENT'S LETTER OF AUTHORISATION            | -           |  | [X]               |
| C. | MODEL(s) vs IDENTITY                       | -           |  | []                |
| d. | ALTERNATIVE TRADE NAME DECLARATION(s)      | -           |  | []                |
| e. | LABELLING                                  | -<br>-<br>- | PHOTOGRAPHS<br>DECLARATION<br>DRAWINGS | [ ]<br>[ ]<br>[ ] |
| f. | TECHNICAL DESCRIPTION                      | -           |  | [X]               |
| g. | BLOCK DIAGRAMS                             | -<br>-<br>- | Tx<br>Rx<br>PSU<br>AUX                 | [X]<br>[ ]<br>[ ] |
| h. | CIRCUIT DIAGRAMS                           | -<br>-<br>- | Tx<br>Rx<br>PSU<br>AUX                 | [ ]<br>[ ]<br>[ ] |
| i. | COMPONENT LOCATION                         | -<br>-<br>- | Tx<br>Rx<br>PSU<br>AUX                 | [ ]<br>[ ]<br>[ ] |
| j. | PCB TRACK LAYOUT                           | -<br>-<br>- | Tx<br>Rx<br>PSU<br>AUX                 | []<br>[]<br>[]    |
| k. | BILL OF MATERIALS                          | -<br>-<br>- | Tx<br>Rx<br>PSU<br>AUX                 | []<br>[]<br>[]    |
| l. | USER INSTALLATION / OPERATING INSTRUCTIONS | -           |  | [X]               |

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# ANNEX C EQUIPMENT CALIBRATION

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## **EQUIPMENT CALIBRATION**

| TRL    | Equipment             |                 | Last Cal    | Calibration      | Due For     |
|--------|-----------------------|-----------------|-------------|------------------|-------------|
| Number | Type                  | Manufacturer    | Calibration | Period           | Calibration |
| UH006  | 3m Range ERP CAL      | TRL             | 06/01/2006  | 12               | 06/01/2007  |
| UH028  | Log Periodic Ant      | Schwarbeck      | 28/04/2005  | 24               | 28/04/2007  |
| UH029  | Bicone Antenna        | Schwarbeck      | 27/04/2005  | 24               | 27/04/2007  |
| UH041  | Multimeter            | <b>AVOmeter</b> | 14/12/2004  | 12               | 14/12/2005  |
| UH075  | Signal Generator      | Marconi         | 22/03/2005  | 12               | 22/03/2006  |
| UH120  | Spectrum Analyser     | Marconi         | 15/03/2005  | 12               | 15/03/2006  |
| UH122  | Oscilloscope          | Tektronix       | 07/06/2005  | 24               | 07/06/2007  |
| UH132  | Power meter           | Marconi         | 15/12/2004  | 12               | 15/12/2005  |
| UH162  | ERP Cable Cal         | TRL             | 06/01/2006  | 12               | 06/01/2007  |
| UH179  | Power Sensor          | Marconi         | 14/12/2004  | 12               | 14/12/2005  |
| UH228  | Power Sensor          | Marconi         | 15/12/2004  | 12               | 15/12/2005  |
| UH253  | 1m Cable N type       | TRL             | 05/01/2006  | 12               | 05/01/2007  |
| UH254  | 1m Cable N type       | TRL             | 05/01/2006  | 12               | 05/01/2007  |
| UH265  | Notch filer           | Telonic         | 24/06/2005  | 12               | 24/06/2006  |
| L005   | CMTA                  | R&S             | 05/12/2005  | 12               | 05/12/2006  |
| L007   | Loop Antenna          | R&S             | 29/03/2005  | 24               | 29/03/2007  |
| 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  |
| L176   | Signal Generator      | Marconi         | 31/01/2005  | 12               | 31/01/2006  |
| L193   | Bicone Antenna        | Chase           | 12/10/2003  | 24               | 12/10/2005  |
| L203   | Log Periodic Ant      | Chase           | 21/10/2003  | 24               | 21/10/2005  |
| L220   | Attenuator            | Bird            |             | Calibrate in use |             |
| L280   | 18GHz Cable           | Rosenberger     | 05/01/2006  | 12               | 05/01/2007  |
| L343   | CCIR Noise Filter     | TRL             | 07/06/2005  | 12               | 07/06/2006  |
| L426   | Temperature Indicator | Fluke           | 14/12/2004  | 12               | 14/12/2005  |
| L479   | Analyser              | Anritsu         | 18/11/2005  | 12               | 18/11/2006  |
| L552   | Signal Generator      | Agilent         | 25/04/2005  | 12               | 25/04/2006  |

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## ANNEX D MEASUREMENT UNCERTAINTY

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#### 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 (16Hz-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

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## ANNEX E SYSTEM DIAGRAM

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#### 50-128501 Low noise Amplifier Low noise 1 Watt Power Channel Selective 489.5125-490.9625 Bandpass Filter 489.5125-490.9625 Bandpass Filter Amplifier Amplifier Module **₹**| dΒ 30dB 30dB 30dB∕ Switched Low noise Low noise 1 Watt Power Attenuator **Channel Selective** 496.3375-496.6125 Bandpass Filter 496.3375-496.6125 Bandpass Filter Amplifier Amplifier Amplifier Module +++++++ ₹ DodB dΒ 30dB 30dB 30dB BASE 30dB Switched Attenuator Notch Reject Filter 30dB **MOBILE** Switched Attenuator Low noise Channel Selective 1 Watt Power Low noise Amplifier Amplifier Module Directional Directional Bandpass Filter Amplifier Bandpass Filter Coupler Coupler $\approx$ $\approx$ dB 30dE 30d₽ Switched Attenuator 492.5125-493.9625 492.5125-493.9625 1 Watt Power Low noise **Channel Selective** Module Bandpass Filter Amplifier Amplifier Bandpass Filter Amplifier 0dB ○ 350 dB 37d**B** 30dB **3**0d₿ 499.3375-499.6125 499.3375-499.6125

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