

TEST REPORT NO: RU1244/7036
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ISSUE NO: 1
FCC ID: NE0-1665Series

**REPORT ON THE CERTIFICATION TESTING OF A
AERIAL FACILITIES LIMITED
60-166501 CELL ENHANCER
WITH RESPECT TO
THE FCC RULES CFR 47, PART 90 Subpart I
PRIVATE LAND MOBILE REPEATER.**

TEST DATE: 23rd – 26th May 2006

TESTED BY: J CHARTERS
APPROVED BY: P GREEN
PRODUCT MANAGER
EMC
DATE: 9th October 2006

Distribution:

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

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Notes:			
1. Component failure during test	YES		<input type="checkbox"/>
	NO		<input checked="" type="checkbox"/>
2. If Yes, details of failure:			
3. The facilities used for the testing of the product contain in this report are FCC Listed.			

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY: NEO-1665Series

PURPOSE OF TEST: Certification

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

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: 60-166501 Cell Enhancer

EQUIPMENT TYPE: Private Land Mobile Repeater

MAXIMUM GAIN: Uplink = 40.53 dB
Downlink = 47.44 dB

MAXIMUM INPUT: Uplink = -29.45 dBm
Downlink = -14.48 dBm

MAXIMUM OUTPUT: Uplink = 11.08 dBm
Downlink = 32.96 dBm

ANTENNA TYPE: Not applicable

CHANNEL SPACING: Not Applicable

FREQUENCY GENERATION: N/A

MODULATION TYPE: F3E

POWER SOURCE(s): +110 Vac

TEST DATE(s): 23rd – 26th May 2006

ORDER No(s): 36615

APPLICANT: Aerial Facilities Limited

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

TESTED BY: ----- J CHARTERS

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

EQUIPMENT TEST / EXAMINATIONS REQUIRED

1.	TEST/EXAMINATION	RULE PART	APPLICABILITY	RESULT
	RF Power Output	90.205	Yes	Complies
	Audio Frequency Response	TIA EIA-603.3.2.6	N/A	N/A
	Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	N/A	N/A
	Modulation Limiting	TIA EIA-603.3.2.6	N/A	N/A
	Occupied Bandwidth	90.210	Yes	Complies
	Spurious Emissions at Antenna Terminals	90.210	Yes	Complies
	Field Strength of Spurious Emissions	90.210	Yes	Complies
	Frequency Stability	90.213	N/A(note 1)	N/A
	Transient behaviour	90.214	N/A(note 2)	N/A

Notes:

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

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

2. Product class: Uplink Class A [] Class B [X]
 Downlink Class A [] Class B [X]
3. Product Use: Private Land Mobile Repeater
4. Emission Designator: F3E
5. Temperatures: Ambient (Tnom) 21°C
6. Supply Voltages: Vnom +110 Vac

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

7. Equipment Category: Single channel []
 Two channel []
 Multi-channel [X]
8. Channel spacing: Narrowband []
 Wideband [X]
9. Test Location: TRL Compliance Limited
 Up Holland [X]
 Long Green []

10. Modifications made during test program: No modifications were performed.

System description:

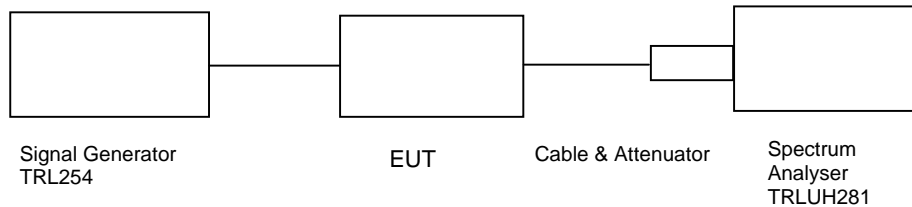
The 60-166501 is a bidirectional amplifier. The Downlink is wideband and operates over the frequency range 494.3MHz to 495.3MHz. The RF from the 60-166501 is fed via a fibre optic link using FCCIDs NEO20-0040Series and NEO20-0041Series from the 60-166101 unit, FCCID NEO60-1661Series. The downlink output consists of 4 track feeds and a station feed. The track feeds are identical and split inside the 60-166501 using a passive splitter. The station feed is coupled off before the splitter and can be 3dB less than the track feed levels. Each of these outputs is fed into a FCCID NEO60-1667Series unit. The uplink is wideband and operates over the frequency range 497.3MHz to 498.3MHz. The uplink inputs to the 60-166501 are fed from a FCCID NEO60-1667Series unit there are 5 inputs 4 track feeds and 1 station feed the track feeds are combined using a passive combiner and the station feed is coupled onto the combined signal. The uplink output is fed via a fibre optic link using FCCIDs NEO20-0040Series and NEO20-0041Series to the 60-166101 unit, FCCID NEO60-1661Series, where the RF is channelised.

COMPLIANCE TESTS

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – UPLINK

Ambient temperature = 24°C
 Relative humidity = 35%
 Supply voltage = +110 Vac
 Channel number = See test results

Radio Laboratory



Track Feed 2

Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
497.3 MHz	-29.15	10.13	-0.44	38.84	9.69	28.85
497.8 MHz	-29.85	10.13	-0.41	39.57	9.72	30.94
498.3 MHz	-29.45	10.13	-0.40	39.18	9.73	30.54

Notes:

1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 10dBs and the level of the output signal remeasured.
3. As all track feed inputs are identical track feed 2 was chosen at random.

Station Feed

Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
497.3 MHz	-24.95	10.13	-0.42	34.66	9.71	24.68
497.8 MHz	-25.65	10.13	-0.40	35.38	9.73	25.40
498.3 MHz	-25.35	10.13	-0.40	35.08	9.73	25.00

Notes:

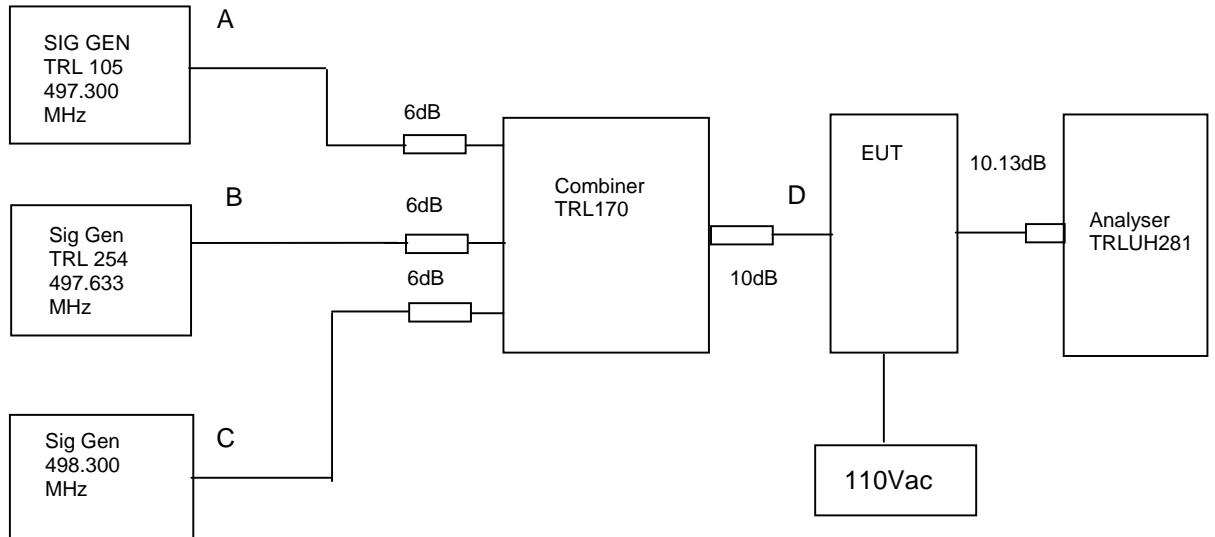
1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 10dBs and the level of the output signal remeasured.

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
ATTENUATOR	BIRD	8304-100-N	N/A	222	X
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	X

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK

Ambient temperature = 24°C
 Relative humidity = 36%
 Supply voltage = +110 Vac

Radio Laboratory



The intermodulation and spurious products were measured with the amplifier operating at maximum gain. A three tone test was conducted using the equipment as above. The input power level was adjusted so the level at point D was 10dB above the maximum input of -29.15dBm. The cable and attenuator loss between the EUT and the spectrum analyser was 10.13dB.

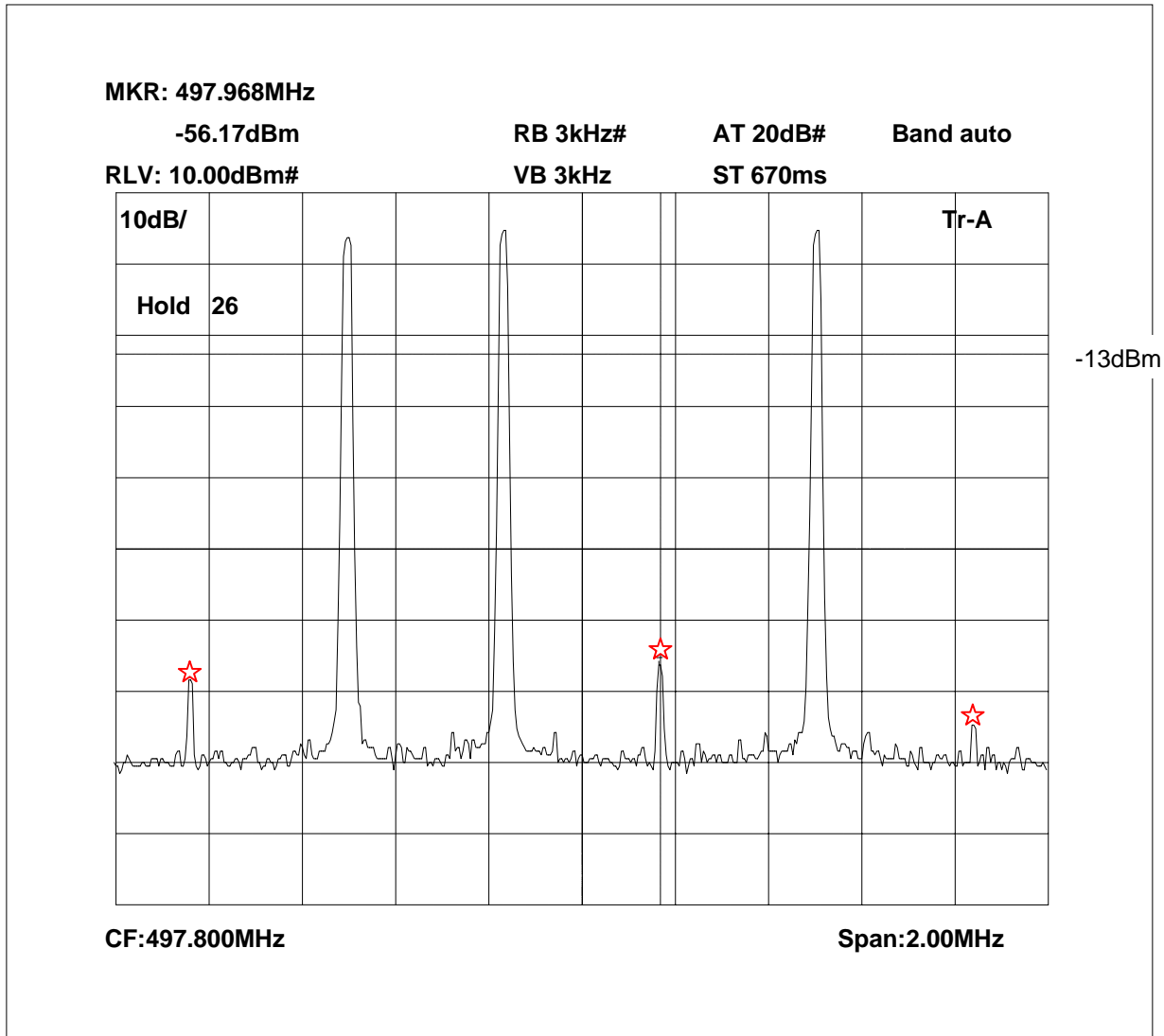
RF Input Frequency (MHz)			Highest Intermodulation Product Frequency & Level	Limit (dBm)
497.300	497.633	498.300	497.968 MHz @ -76.17 dBm	-13

Sweep data is shown on the next page:

Test equipment used for intermodulation test

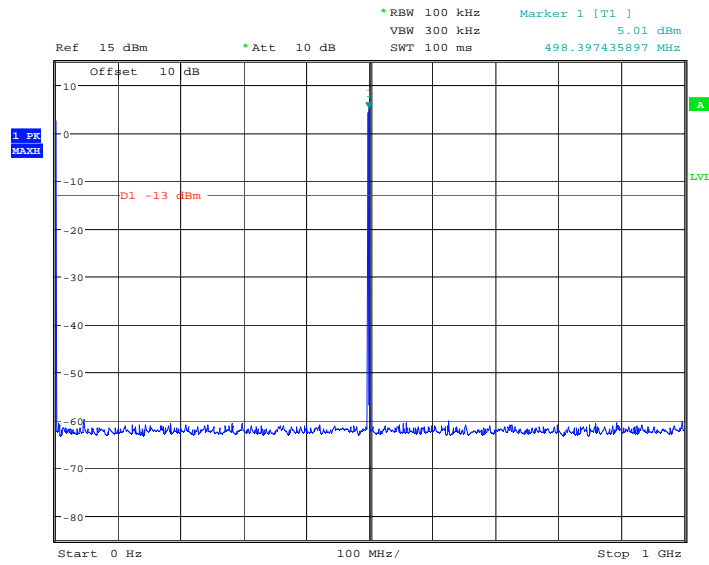
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
SIGNAL GENERATOR	ROHDE & SCHWARZ	SML20	102268	UH297	X
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
COMBINER	ELCOM	RC-4-50	N/A	170	X

Intermodulation Inband



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

Intermodulation Wideband



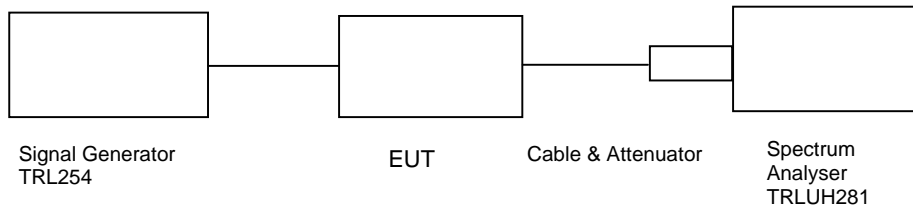
Date: 23.MAY.2006 15:02:46

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

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– UPLINK

Ambient temperature = 26°C Radio Laboratory
 Relative humidity = 34%
 Supply voltage = +110 Vac
 Channel number = See test results



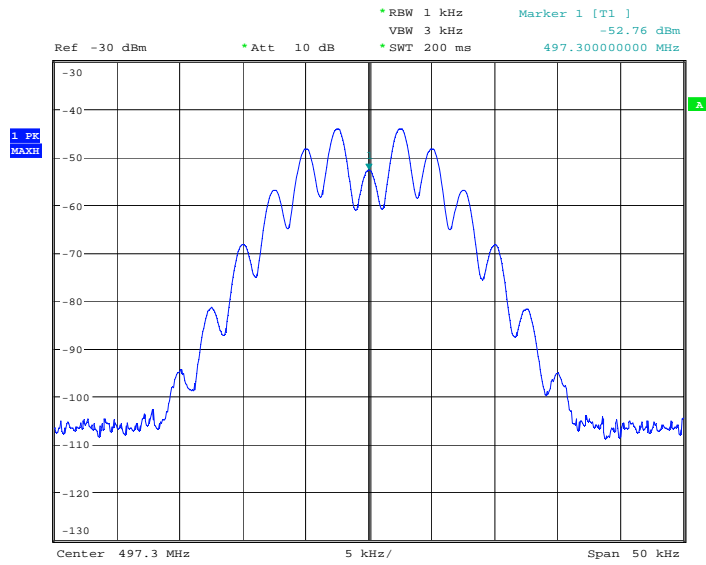
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-29.00dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

1. Cable and attenuator between EUT and Spectrum Analyser 10.13dB.
2. Cable between signal generator and EUT 0.15dB.

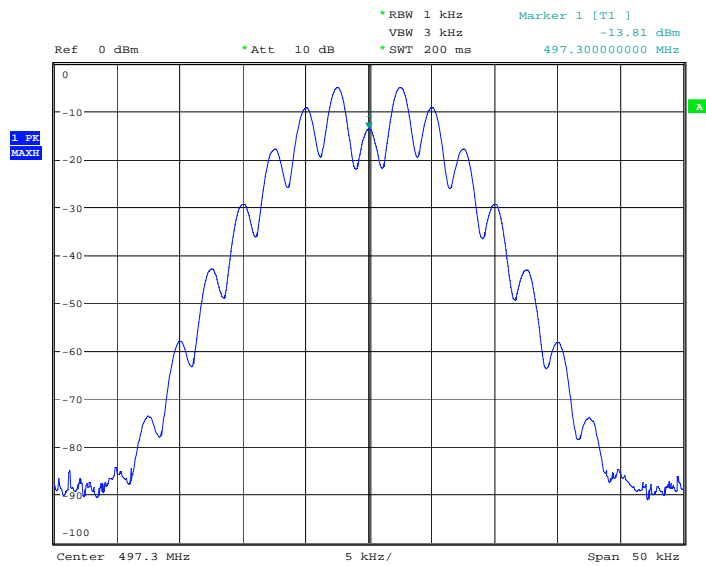
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
ATTENUATOR	BIRD	8304-100-N	N/A	222	X
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	X

497.3 MHz Signal Generator, deviation set to 5kHz



Date: 23.MAY.2006 14:08:51

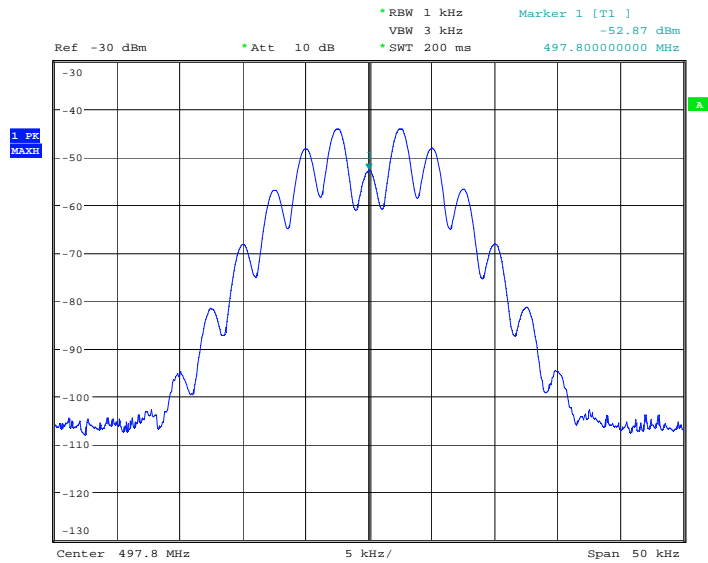
497.3 MHz Signal Generator and EUT, deviation set to 5kHz



Date: 23.MAY.2006 13:58:54

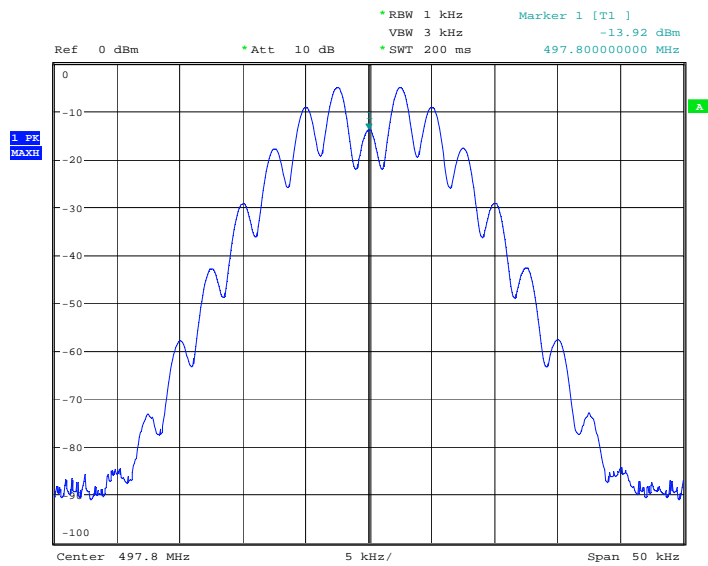
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

497.8 MHz Signal Generator, deviation set to 5kHz



Date: 23.MAY.2006 14:09:23

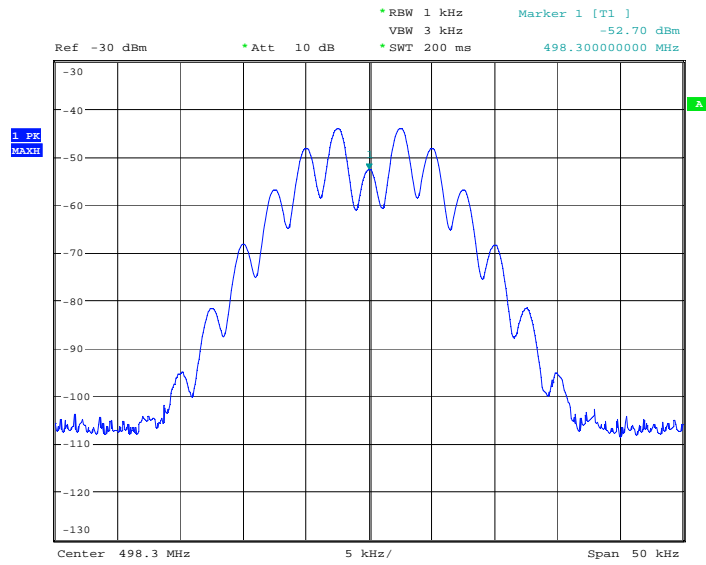
497.8 MHz Signal Generator and EUT, deviation set to 5kHz



Date: 23.MAY.2006 13:58:10

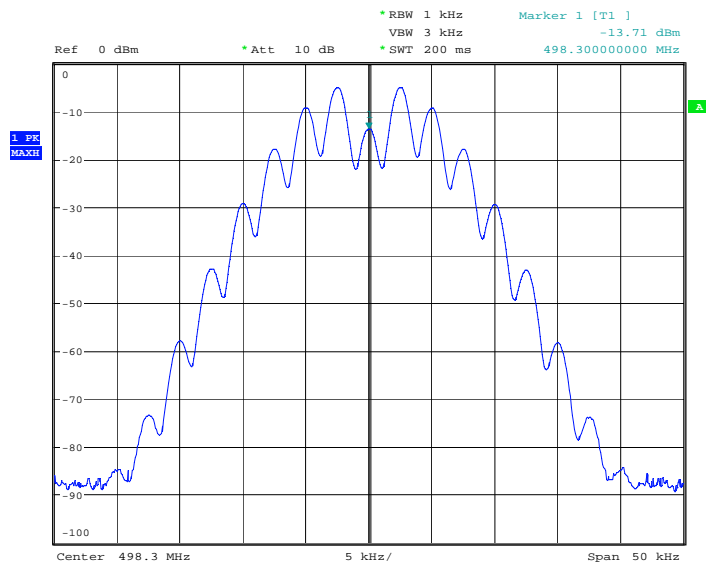
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

498.3 MHz Signal Generator, deviation set to 5kHz



Date: 23.MAY.2006 14:09:49

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



Date: 23.MAY.2006 13:56:51

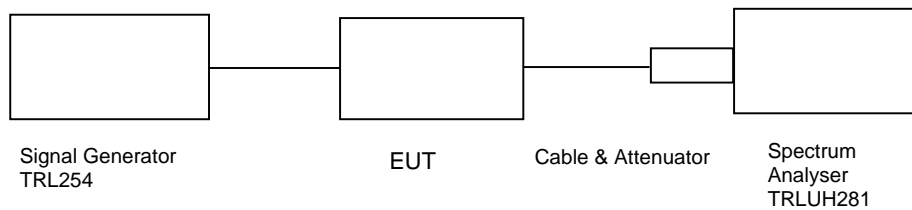
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – UPLINK

Ambient temperature = 26°C
 Relative humidity = 34%
 Supply voltage = +110 Vac

Radio Laboratory
 Test Signal = F3E



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating at maximum power and on three test frequencies.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more than 250% of the authorised bandwidth

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

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

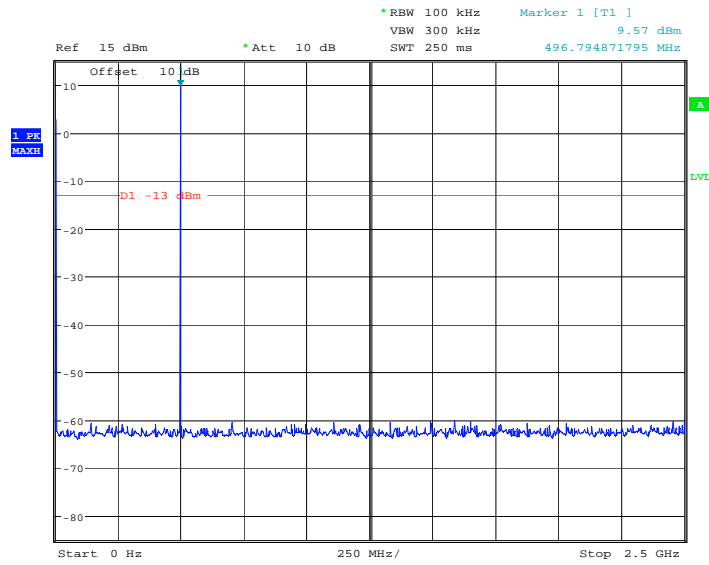
RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0 Hz – 5 GHz	No Significant Emissions Within 20 dB of the limit				-13

The test equipment used for the Transmitter Conducted Emissions:

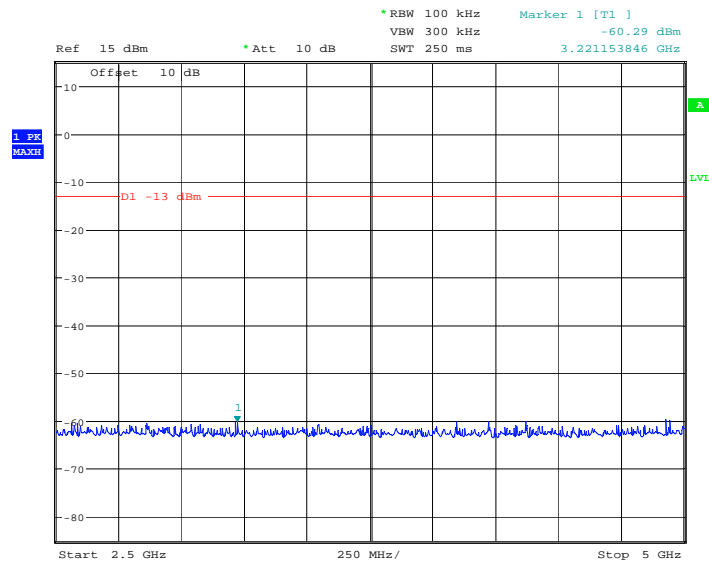
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
ATTENUATOR	BIRD	8304-100-N	N/A	222	X
SIGNAL GENERATOR	MARCONI	2042	119562/021	254	X

Conducted emissions 497.3 MHz 0 – 2.5GHz



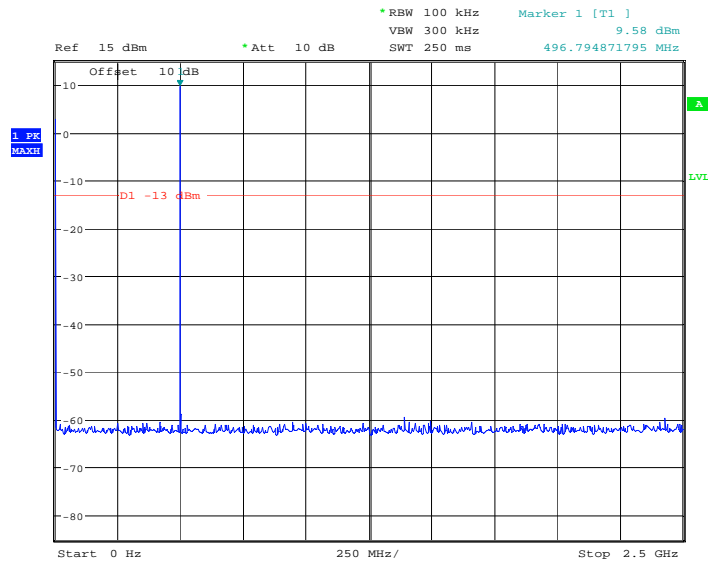
Date: 23.MAY.2006 14:28:51

Conducted emissions 497.3 MHz 2.5 – 5GHz



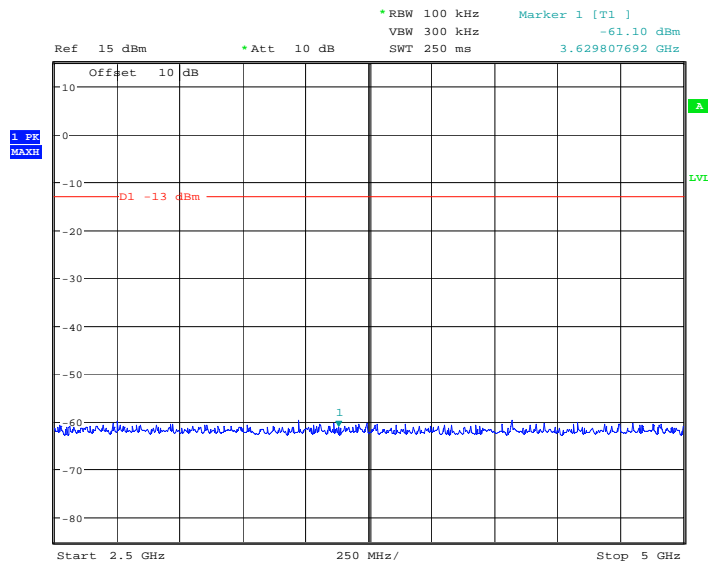
Date: 23.MAY.2006 14:29:13

Conducted emissions 497.8 MHz 0 – 2.5GHz



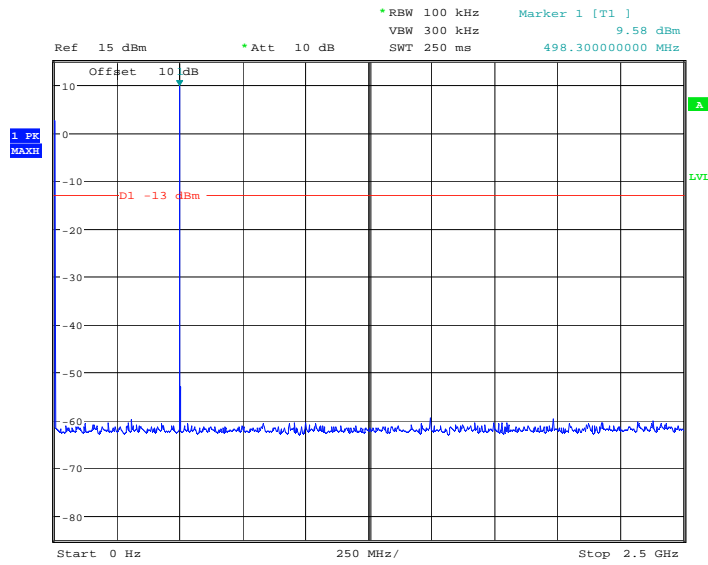
Date: 23.MAY.2006 14:28:04

Conducted emissions 497.8 MHz 2.5 – 5GHz



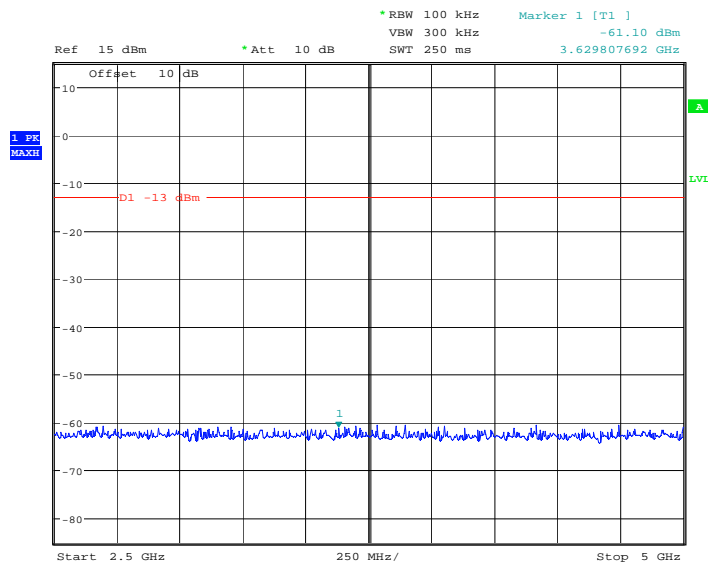
Date: 23.MAY.2006 14:27:19

Conducted emissions 498.3 MHz 0 – 2.5GHz



Date: 23.MAY.2006 14:26:18

Conducted emissions 498.3 MHz 2.5 – 5GHz



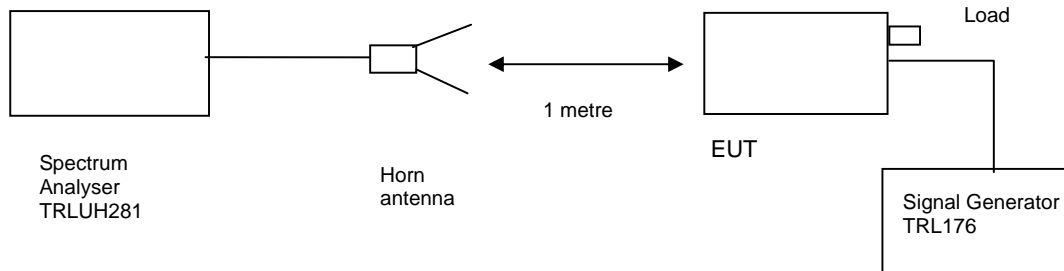
Date: 23.MAY.2006 14:26:38

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– UPLINK

Ambient temperature = 22°C
 Relative humidity = 43%
 Conditions = OATS
 Supply voltage = +110 Vac
 Supply Frequency = N/A

Test Signal = F3E



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating maximum power on three test frequencies with a 50 ohm load on the output. The unit was also tested with the signal generator replaced by another 50ohm load.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

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

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

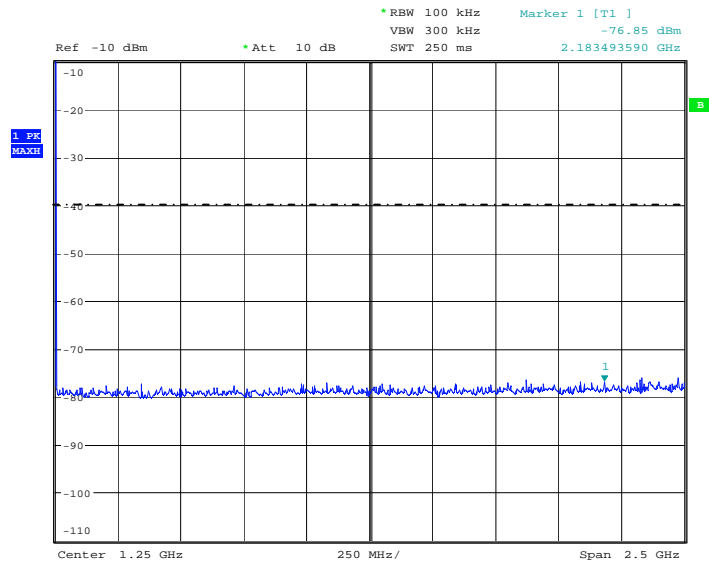
RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
0 Hz – 5 GHz	No Significant Emissions Within 20 dB of the limit						-13

The test equipment used for the Transmitter Spurious Emissions:

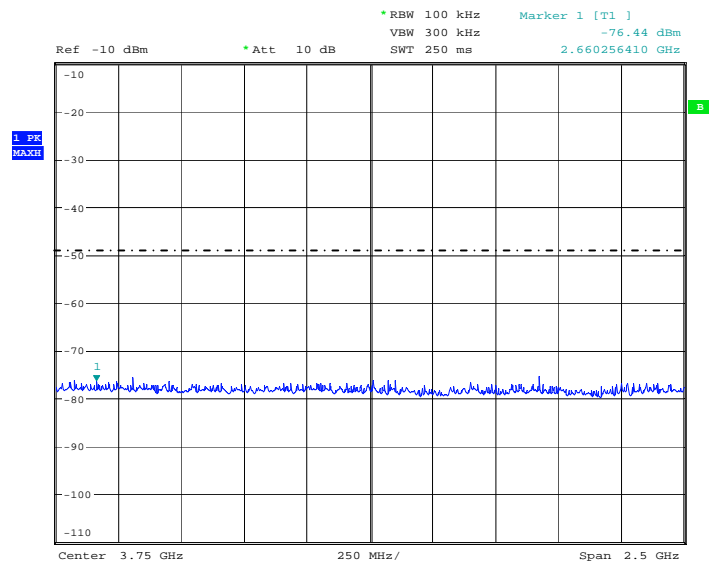
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
HORN	EMCO	3115	9010-3581	139	X
CABLE	ROSENBERGER	MICRO COAX	N/A	280	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X

Radiated emissions 497.3 MHz 0 – 2.5GHz



Date: 30.MAY.2006 14:05:32

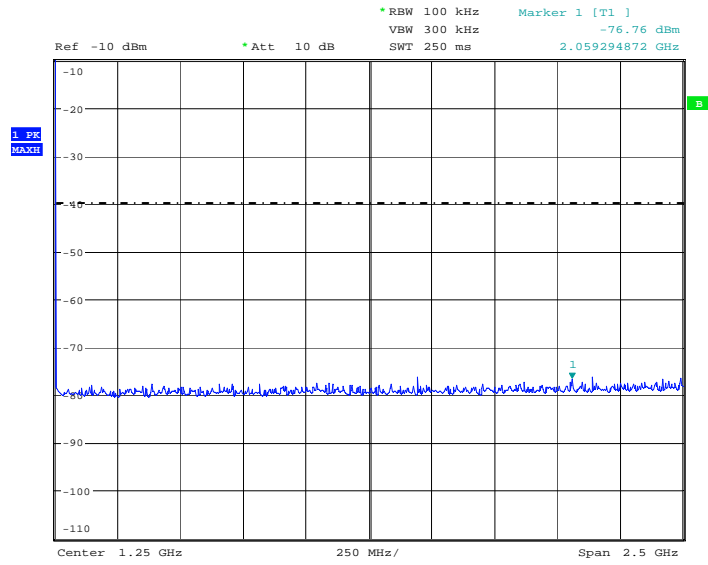
Radiated emissions 497.3 MHz 2.5 – 5GHz



Date: 30.MAY.2006 14:06:22

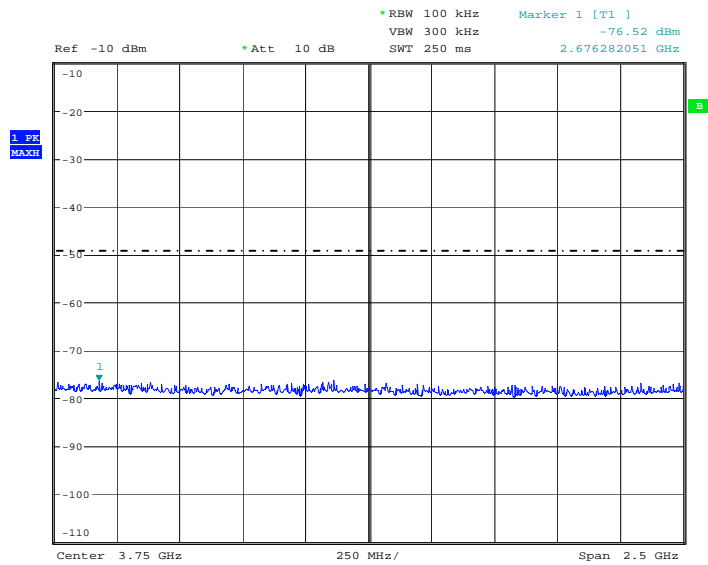
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 497.8 MHz 0 – 2.5GHz



Date: 30.MAY.2006 14:08:53

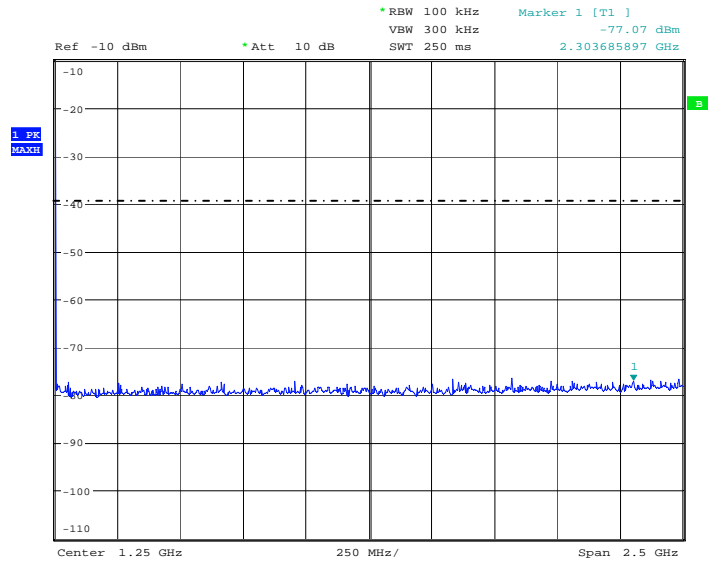
Radiated emissions 497.8 MHz 2.5 – 5GHz



Date: 30.MAY.2006 14:09:30

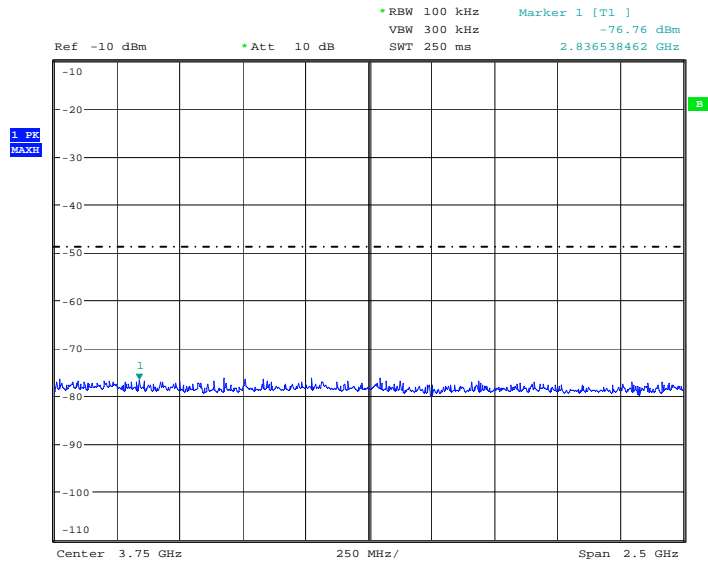
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 498.3 MHz 0 – 2.5GHz



Date: 30.MAY.2006 14:13:18

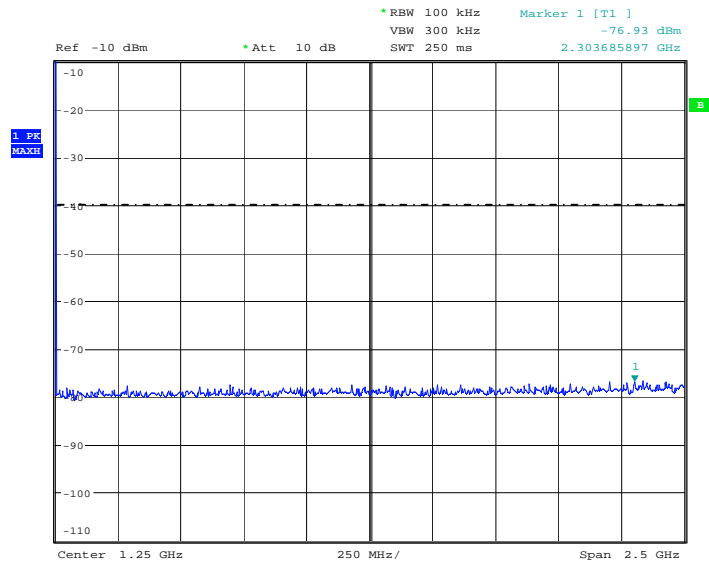
Radiated emissions 498.3 MHz 2.5 – 5GHz



Date: 30.MAY.2006 14:14:11

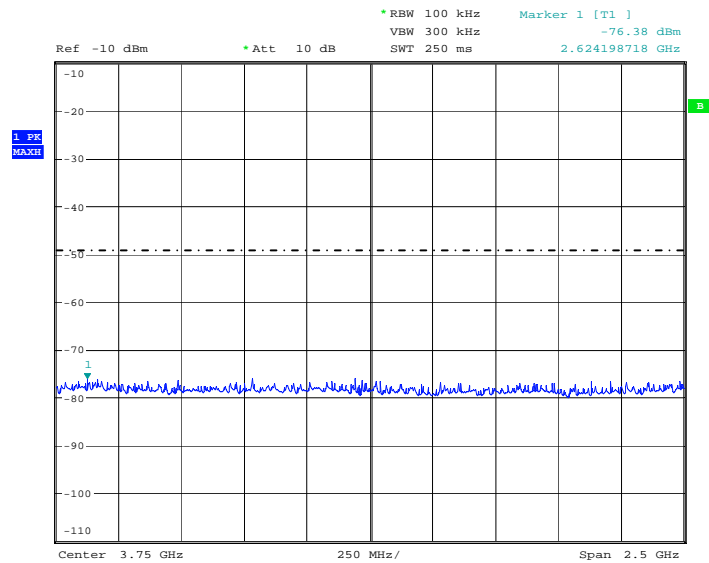
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions no input signal 0 – 2.5GHz



Date: 30.MAY.2006 14:23:49

Radiated emissions no input signal 2.5 – 5GHz



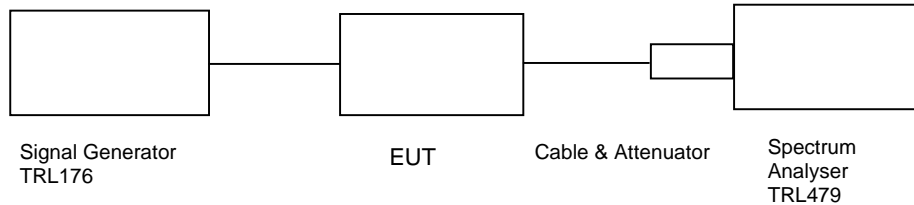
Date: 30.MAY.2006 14:24:24

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

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – DOWNLINK

Ambient temperature = 18°C
 Relative humidity = 58%
 Supply voltage = +110 Vac
 Channel number = See test results

Radio Laboratory



Track Feed 1

Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
494.3 MHz	-14.48	40.28	-7.58	47.18	32.70	36.95
494.8 MHz	-14.48	40.28	-7.43	47.33	32.85	37.17
495.3 MHz	-14.28	40.28	-8.66	45.90	31.62	35.78

Notes:

1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 10dBs and the level of the output signal remeasured

Track Feed 2

Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
494.3 MHz	-14.48	40.28	-7.44	47.32	32.84	37.07
494.8 MHz	-14.48	40.28	-7.35	47.41	32.93	37.15
495.3 MHz	-14.28	40.28	-8.70	45.86	31.58	35.90

Notes:

1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 10dBs and the level of the output signal remeasured

Track Feed 3

Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
494.3 MHz	-14.48	40.28	-7.48	47.28	32.80	37.01
494.8 MHz	-14.48	40.28	-7.33	47.43	32.95	37.17
495.3 MHz	-14.28	40.28	-8.56	46.00	31.72	36.02

Notes:

1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 10dBs and the level of the output signal remeasured

Track Feed 4

Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
494.3 MHz	-14.48	40.28	-7.44	47.32	32.84	37.04
494.8 MHz	-14.48	40.28	-7.32	47.44	32.96	37.18
495.3 MHz	-14.28	40.28	-7.81	46.75	32.47	35.87

Notes:

1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 10dBs and the level of the output signal remeasured

Station Feed

Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
494.3 MHz	-14.48	40.28	-11.73	43.03	28.55	32.76
494.8 MHz	-14.48	40.28	-11.59	43.17	28.69	32.93
495.3 MHz	-14.28	40.28	-13.29	41.27	26.99	31.47

Notes:

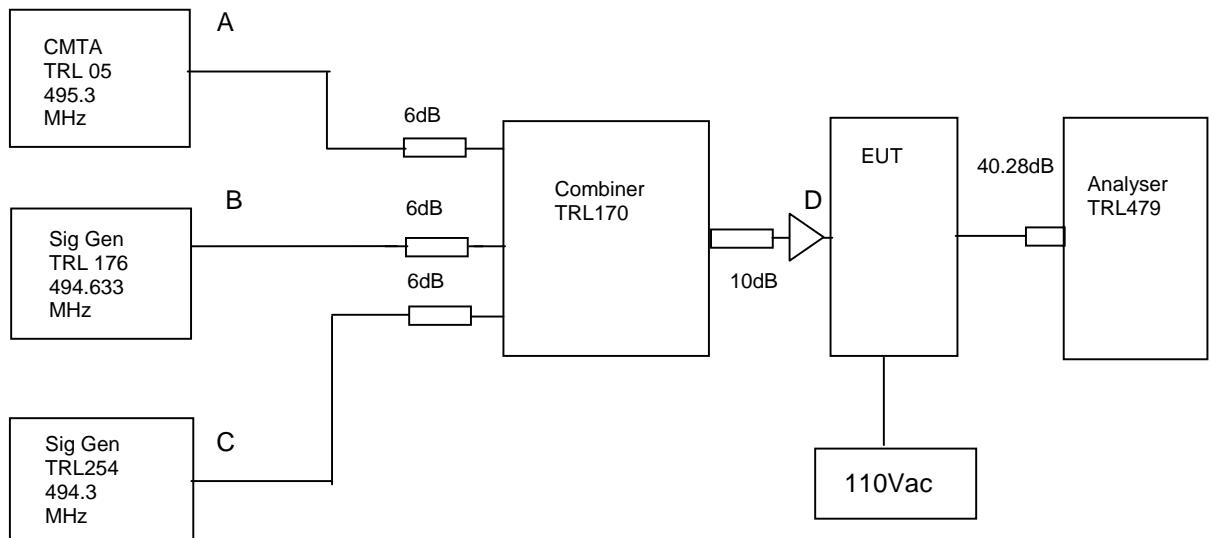
1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 10dBs and the level of the output signal remeasured

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

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– DOWNLINK

Ambient temperature = 24°C
 Relative humidity = 36%
 Supply voltage = +110 Vac

Radio Laboratory



The Intermodulation and spurious products were measured with the amplifier operating at maximum gain. A three tone test was conducted using the equipment as above. The input power level was adjusted so the level at point D was 10 dB above the maximum input of -14.0dBm. The cable and attenuators loss between the EUT and the spectrum analyser was 40.28dB.

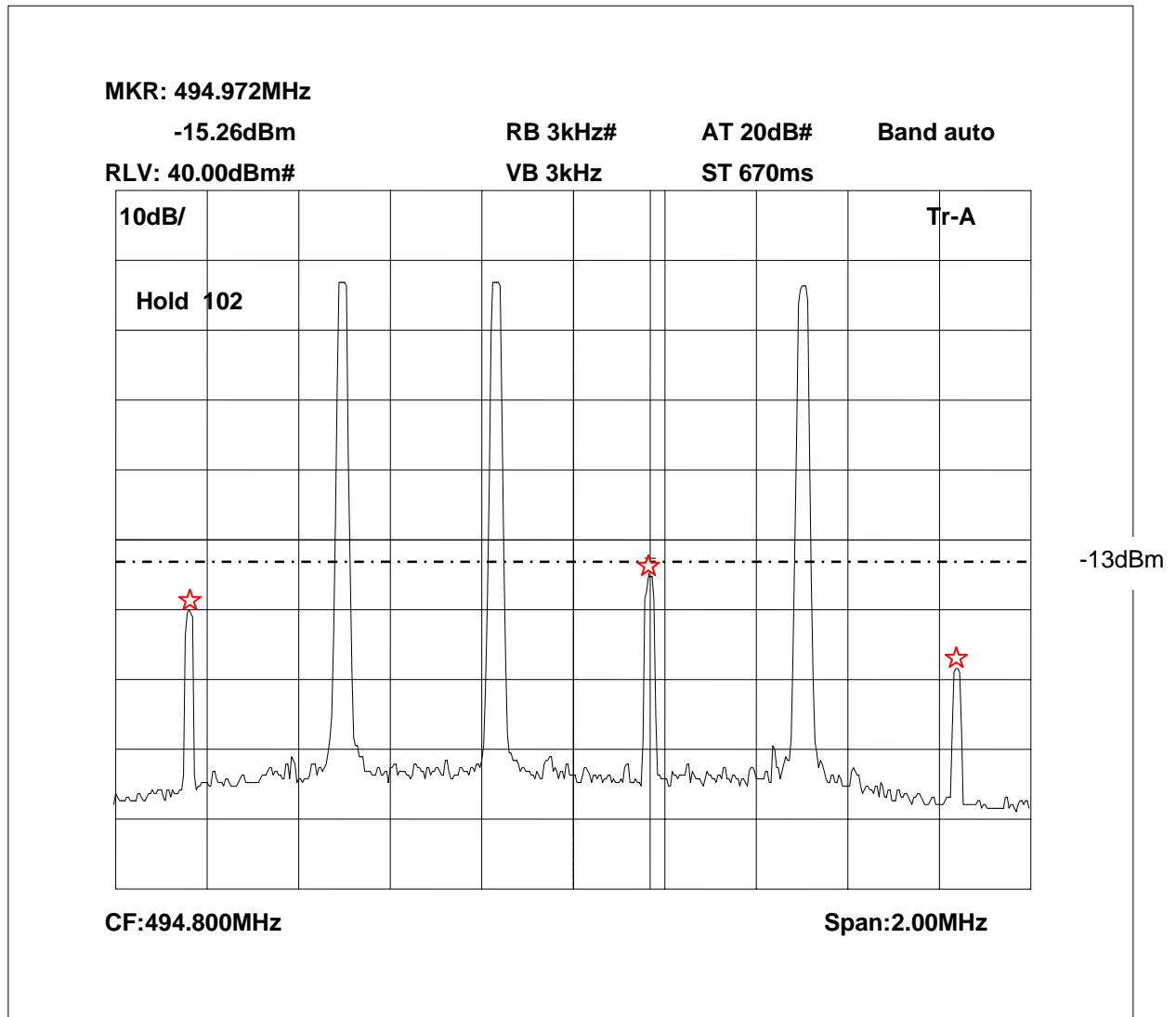
RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
494.300	494.633	495.300	494.972 MHz @ -15.26 dBm	-13

Sweep data is shown on the next page:

Test equipment used for intermodulation test

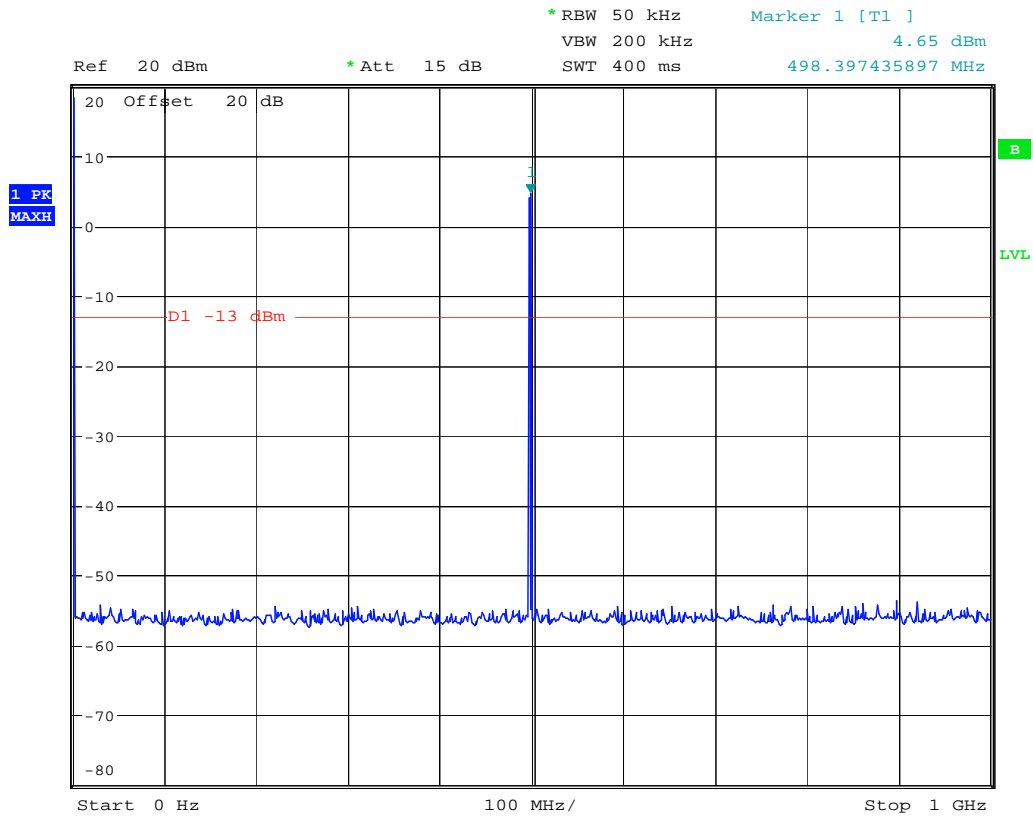
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
SIGNAL GENERATOR	MARCONI	2042	119562/02	254	X
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X
COMBINER	ELCOM	RC-4-50	N/A	170	X
AMPLIFIER	ENI	603L	1240	31	X

Intermodulation Inband



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

Intermodulation Wideband



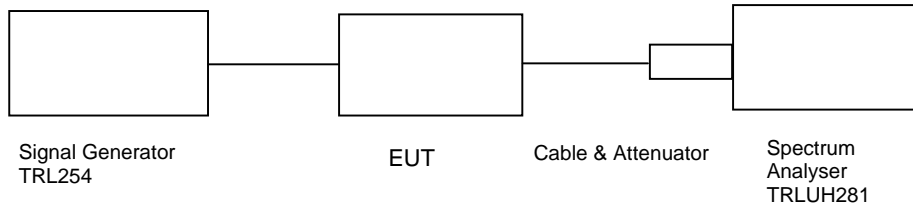
Date: 23.MAY.2006 17:13:29

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

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– DOWNLINK

Ambient temperature = 17°C Radio Laboratory
 Relative humidity = 48%
 Supply voltage = +110 Vac
 Channel number = See test results



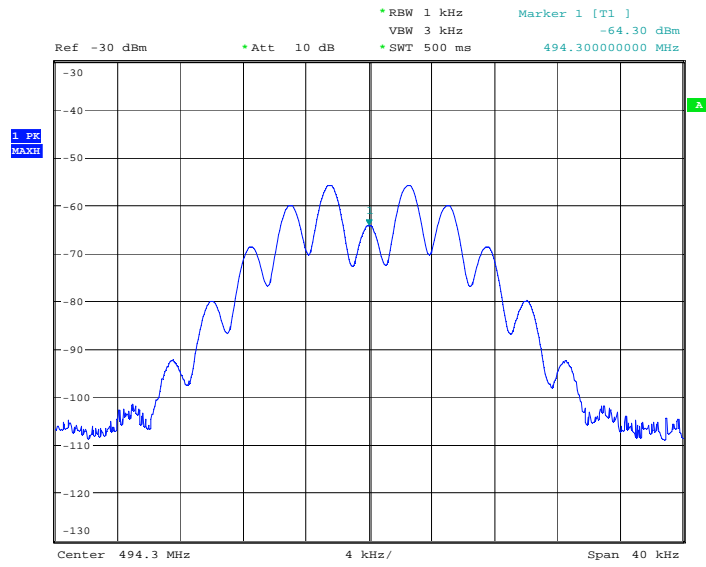
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-14.0dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

1. Cable and attenuator between EUT and spectrum analyser 40.28dB
2. Cable between signal generator and EUT 0.15dB

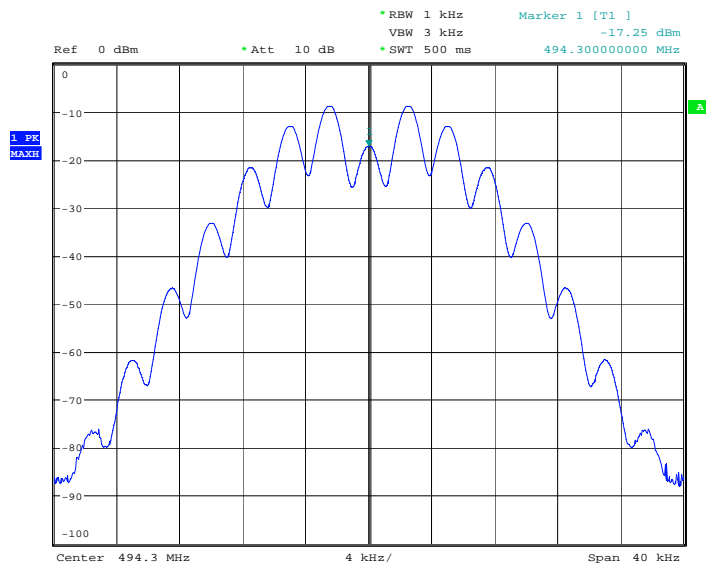
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
ATTENUATOR	BIRD	8304-200	N/A	103	X
ATTENUATOR	BIRD	8304-100-N	N/A	221	X
SIGNAL GENERATOR	MARCONI	2042	119562/02	254	X

494.3 MHz Signal Generator, deviation set to 5kHz



Date: 23.MAY.2006 10:59:22

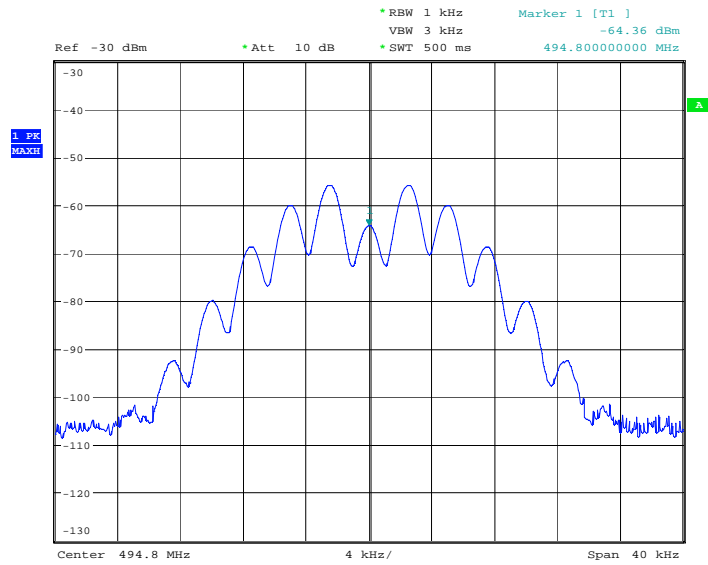
494.3 MHz Signal Generator and EUT, deviation set to 5kHz



Date: 23.MAY.2006 10:56:55

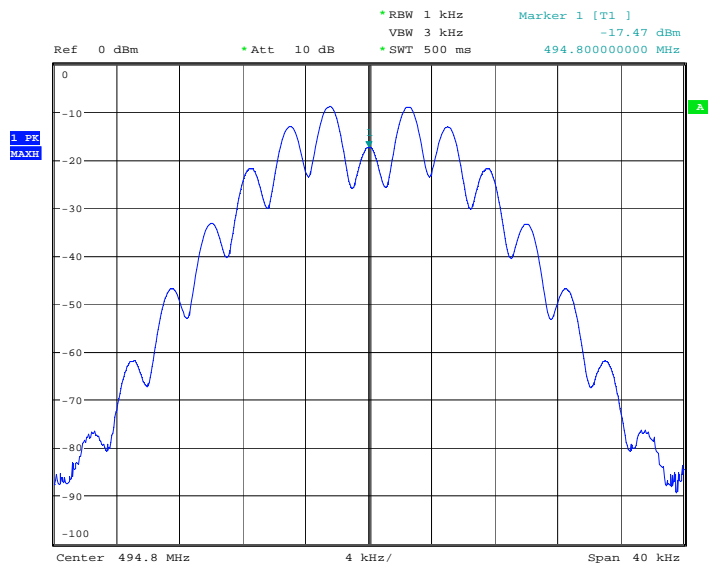
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

494.8 MHz Signal Generator, deviation set to 5kHz



Date: 23.MAY.2006 11:00:03

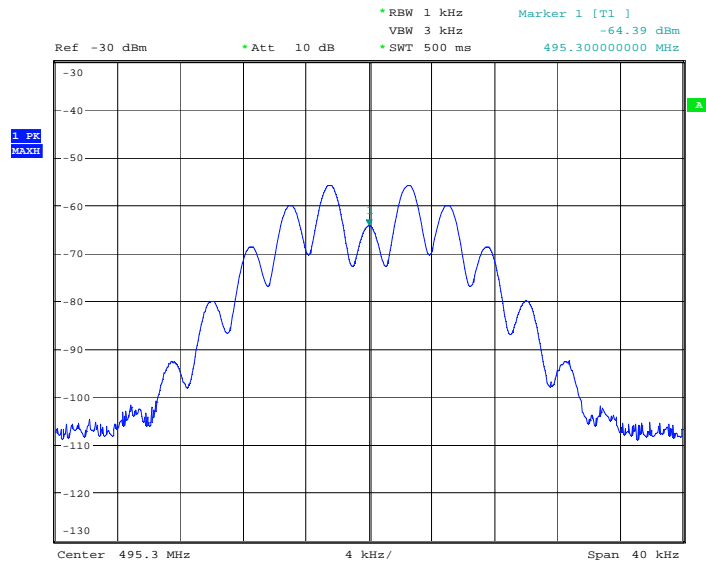
494.8 MHz Signal Generator and EUT, deviation set to 5kHz



Date: 23.MAY.2006 10:56:23

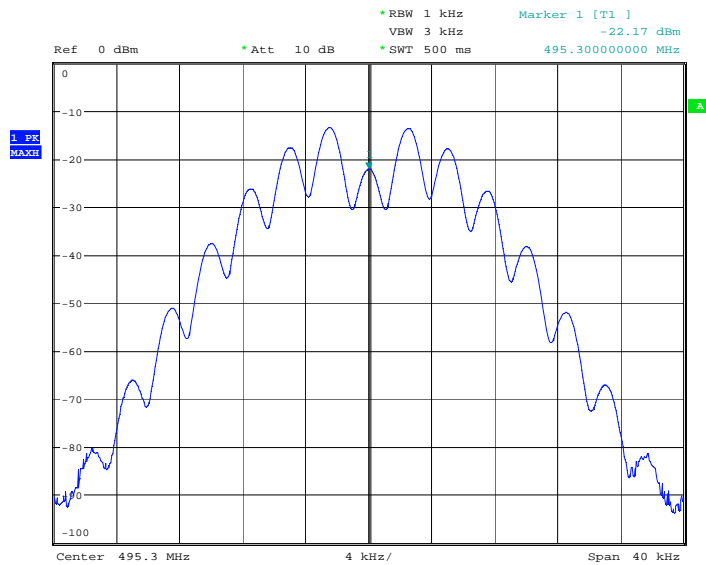
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

495.3 MHz Signal Generator, deviation set to 5kHz



Date: 23.MAY.2006 11:00:25

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



Date: 23.MAY.2006 10:55:49

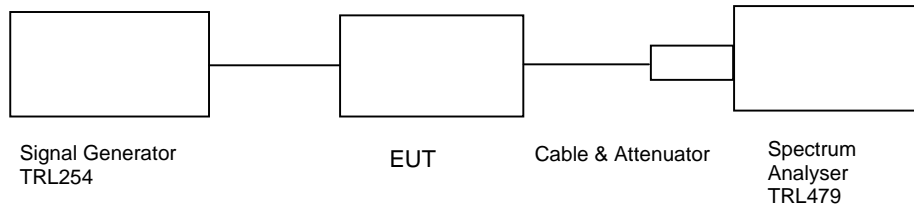
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – DOWNLINK

Ambient temperature = 24°C
 Relative humidity = 36%
 Supply voltage = +110 Vac

Radio Laboratory
 Test Signal = F3E



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating at maximum power and on three test frequencies.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more than 250% of the authorised bandwidth

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

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

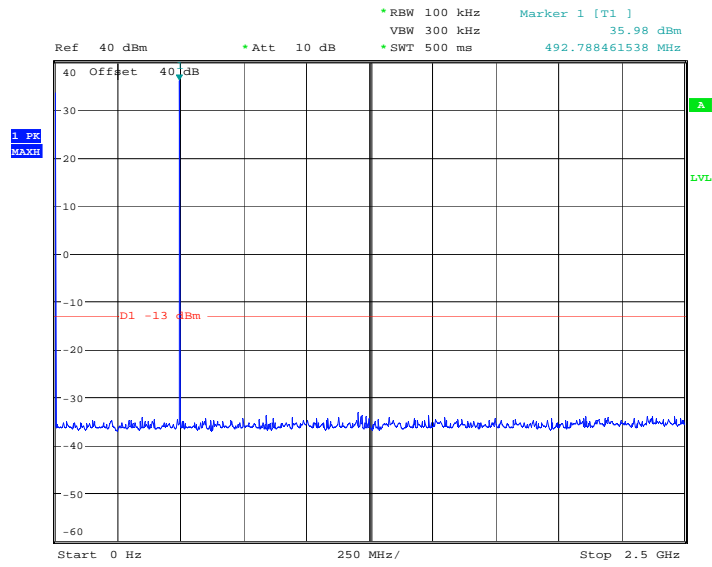
RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEASURED LEVEL (dBm)	ATTENUATOR & CABLE LOSSES (dB)	EMISSION LEVEL (dBm)	LIMIT (dBm)
0Hz – 5GHz	No Significant Emissions within 20dB of the Limit				-13

The test equipment used for the Transmitter Conducted Emissions:

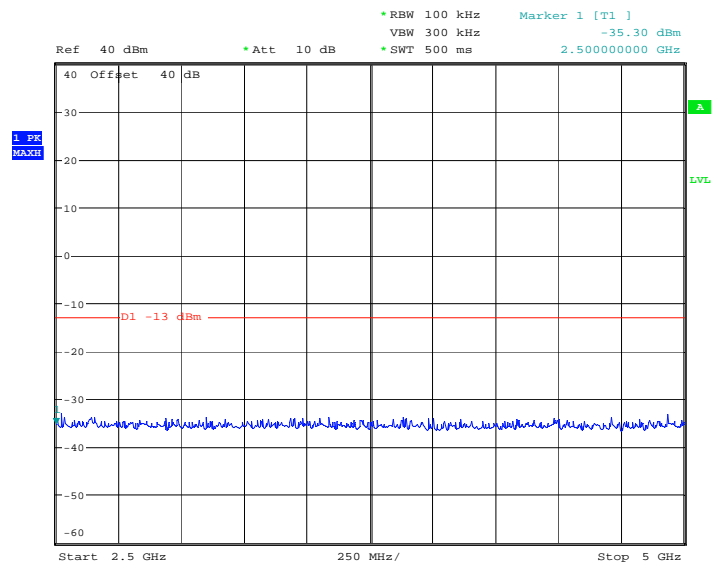
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
ATTENUATOR	BIRD	8304-200	N/A	103	X
ATTENUATOR	BIRD	8304-100-N	N/A	221	X
SIGNAL GENERATOR	MARCONI	2042	119562/02	254	X

Conducted emissions 494.3 MHz 0 – 2.5GHz



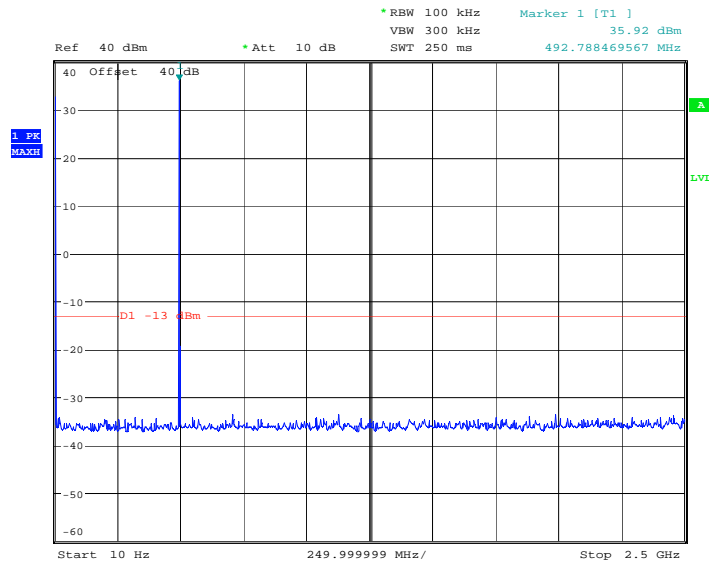
Date: 23.MAY.2006 11:29:42

Conducted emissions 494.3 MHz 2.5 – 5GHz



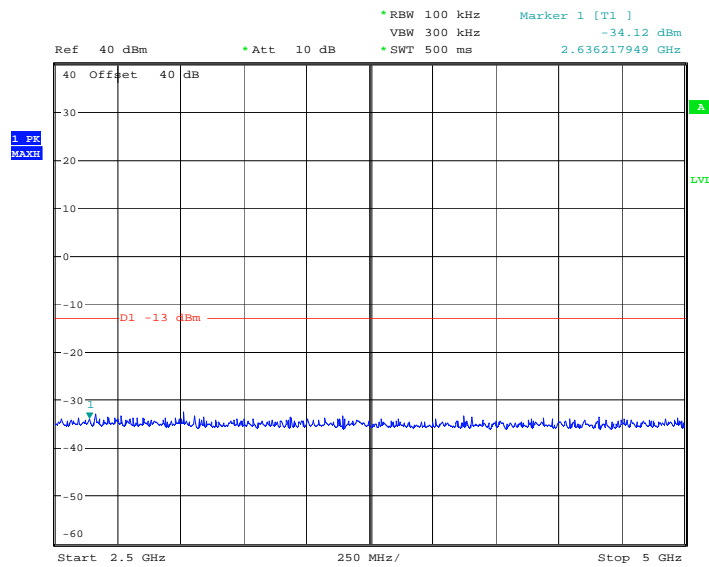
Date: 23.MAY.2006 11:30:11

Conducted emissions 494.8 MHz 0 – 2.5GHz



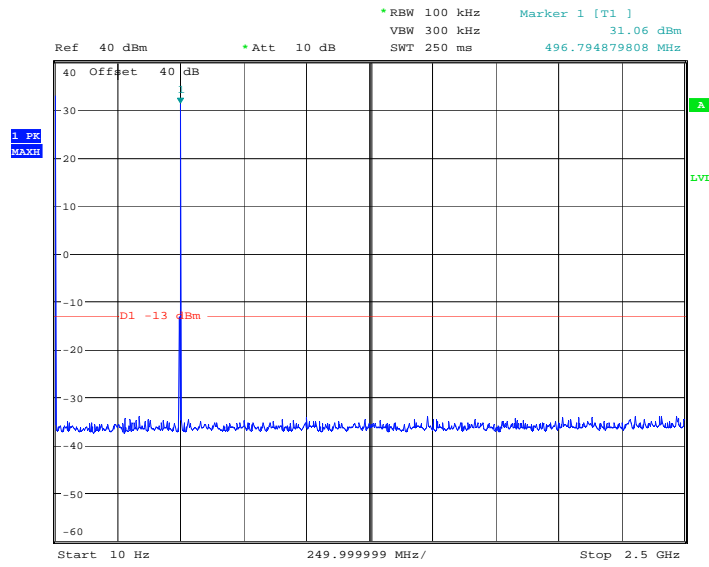
Date: 23.MAY.2006 11:40:46

Conducted emissions 494.8 MHz 2.5 – 5GHz



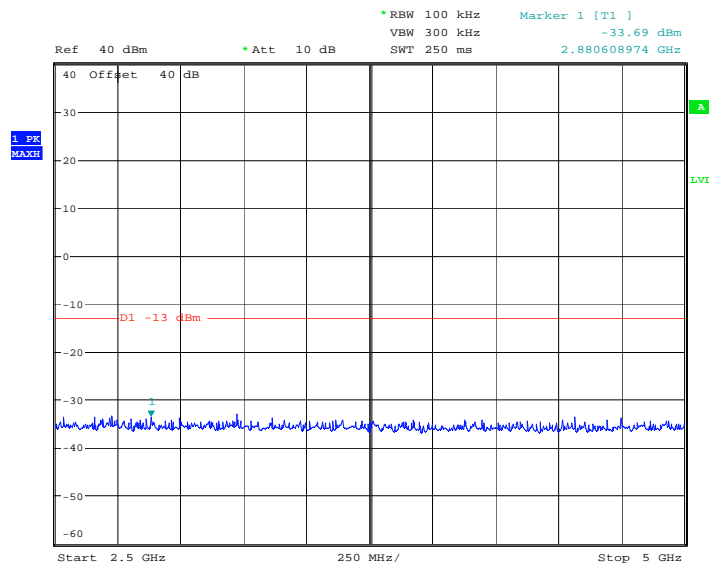
Date: 23.MAY.2006 11:31:06

Conducted emissions 495.3 MHz 0 – 2.5GHz



Date: 23.MAY.2006 11:41:09

Conducted emissions 495.3 MHz 2.5 – 5GHz



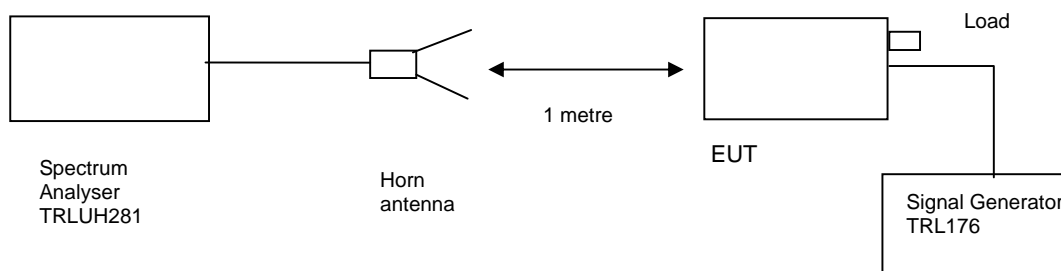
Date: 23.MAY.2006 11:41:34

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– DOWNLINK

Ambient temperature = 22°C
 Relative humidity = 43%
 Conditions = OATS
 Supply voltage = +110 Vac
 Supply Frequency = N/A

Test Signal = F3E



The test was set up as per the diagram. The level at the input was adjusted to compensate for the loss of the interconnecting cable. The unit was tested operating maximum power on three test frequencies with a 50 ohm load on the output. The unit was also tested with the signal generator replaced by another 50ohm load.

The Spurious limit was calculated as follows:

On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

At least $43 + 10 \log \text{PdB}$

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

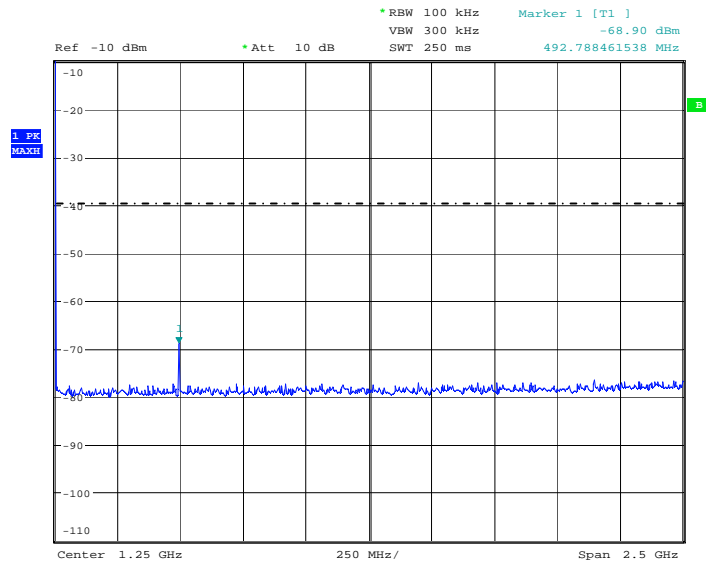
RESULTS

FREQUENCY RANGE	FREQ. (MHz)	MEAS. Rx. (dBµV)	CABLE LOSS (dB)	ANT FACTOR	FIELD STRENGTH (dBµV/m)	CALCULATED EIRP (dBm)	LIMIT (dBm)
0 Hz – 5 GHz	No Significant Emissions Within 20 dB of the limit						-13

The test equipment used for the Transmitter Spurious Emissions:

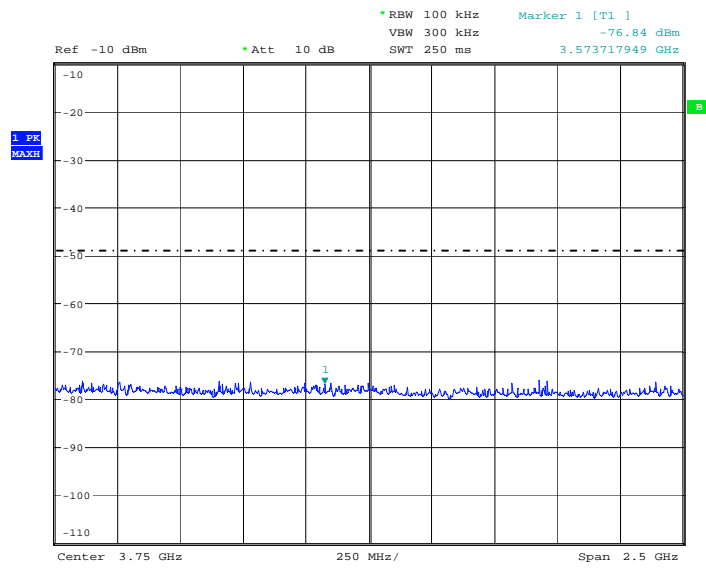
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	RHODE & SCHWARZ	FSU	200034	UH281	X
HORN	EMCO	3115	9010-3581	139	X
CABLE	ROSENBERGER	MICRO COAX	N/A	280	X
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	X

Radiated emissions 494.3 MHz 0 – 2.5GHz



Date: 30.MAY.2006 12:44:14

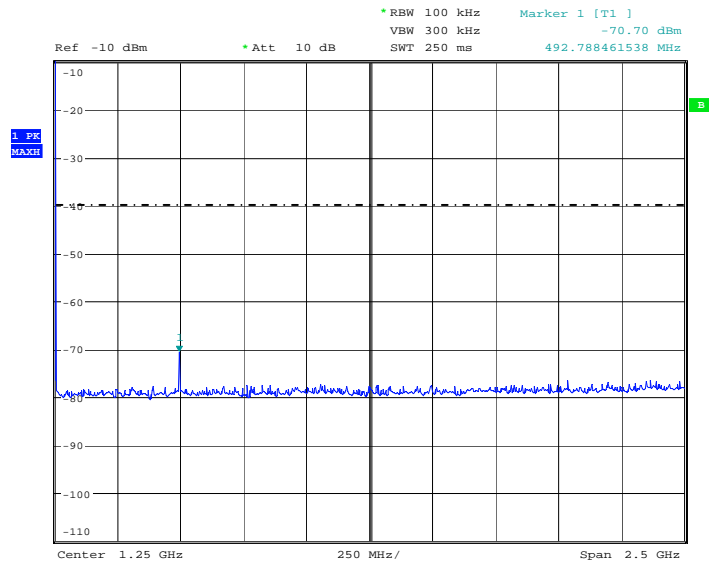
Radiated emissions 494.3 MHz 2.5 – 5GHz



Date: 30.MAY.2006 12:44:47

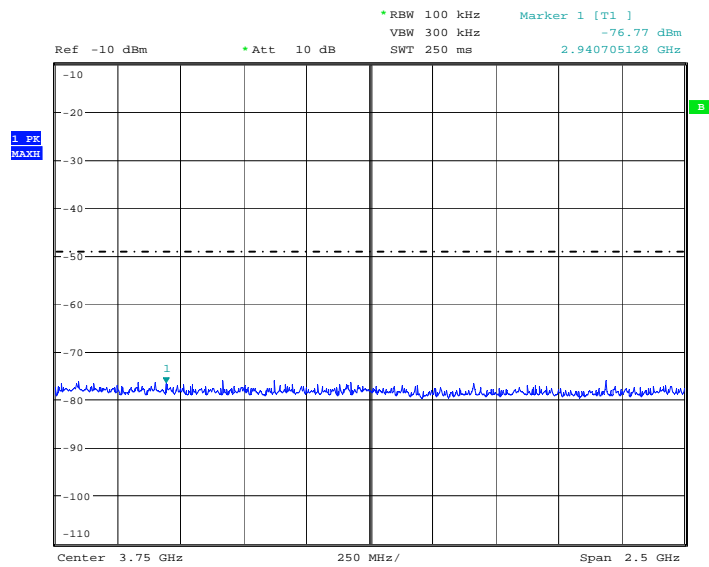
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 494.8 MHz 0 – 2.5GHz



Date: 30.MAY.2006 12:48:25

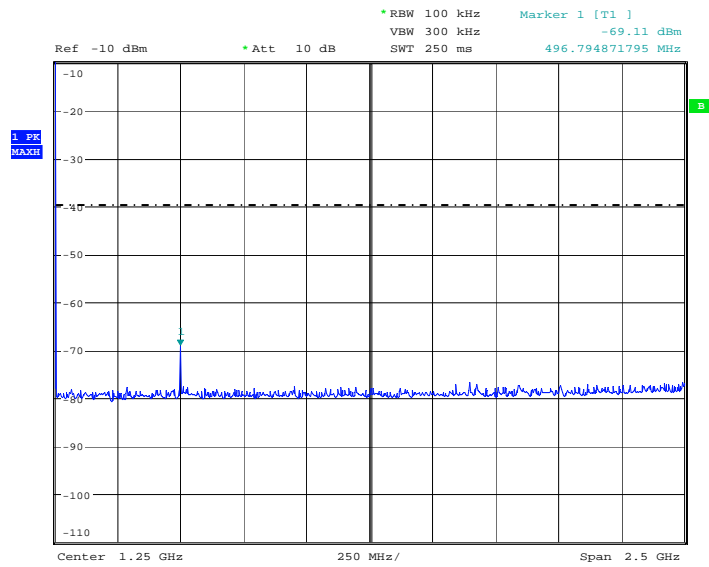
Radiated emissions 494.8 MHz 2.5 – 5GHz



Date: 30.MAY.2006 12:49:11

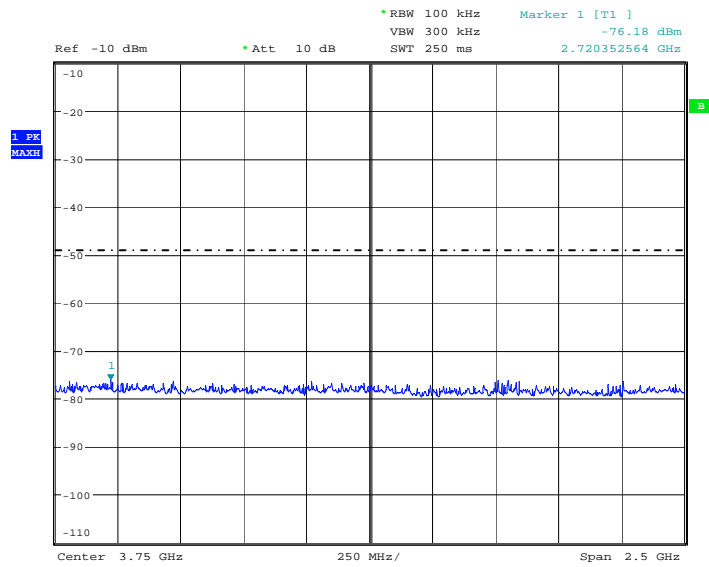
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 495.3 MHz 0 – 2.5GHz



Date: 30.MAY.2006 12:52:19

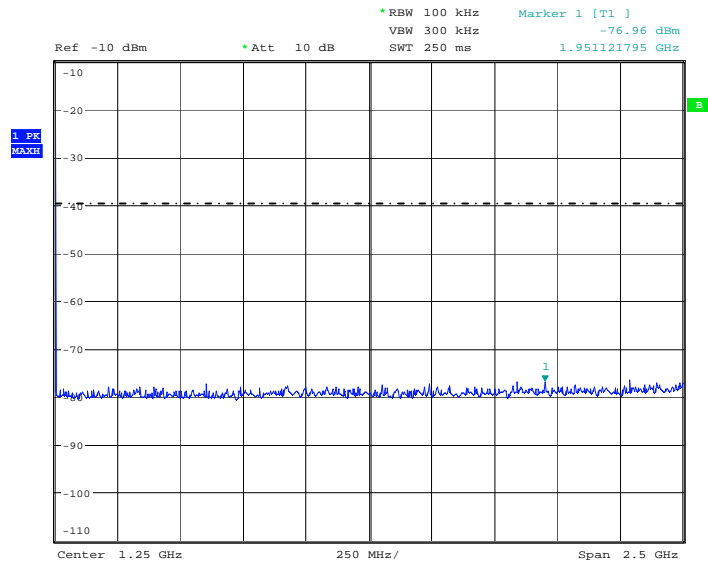
Radiated emissions 495.3 MHz 2.5 – 5GHz



Date: 30.MAY.2006 12:53:00

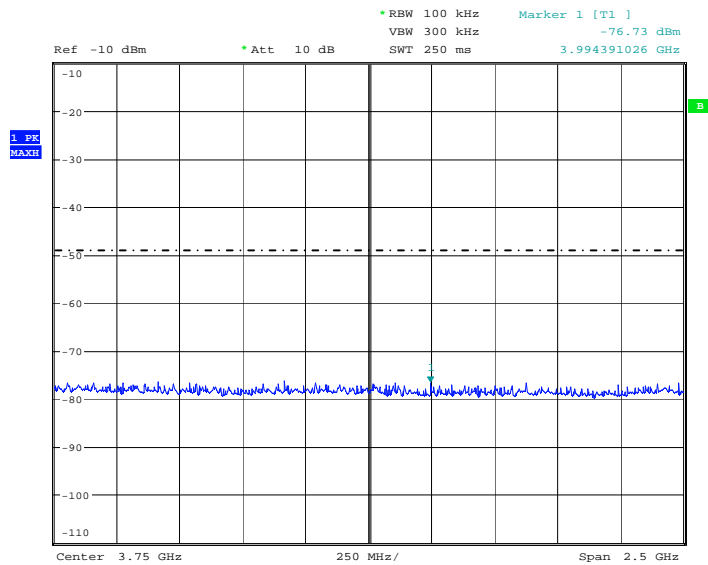
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions no input signal 0 – 2.5GHz



Date: 30.MAY.2006 14:25:15

Radiated emissions no input signal 2.5 – 5GHz



Date: 30.MAY.2006 14:26:05

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

ANNEX A
PHOTOGRAPHS

PHOTOGRAPH No. 1

TEST SETUP



PHOTOGRAPH No. 2

TEST SETUP



ANNEX B
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

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

ANNEX C
EQUIPMENT CALIBRATION

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For Calibration
UH281	Spectrum Analyser	R&S			
UH297	Signal Generator	R&S	21/04/2006	12	21/04/2007
L005	CMTA	R&S	05/12/2005	12	05/12/2006
L031	Power Amp	ENI		Calibrate in Use	
L103	Attenuator	Bird		Calibrate in Use	
L138	1-18GHz Horn	EMCO	15/04/2005	24	15/04/2007
L139	1-18GHz Horn	EMCO	03/05/2005	24	03/05/2007
L170	Combiner	Elcom		Calibrate in Use	
L176	Signal Generator	Marconi	15/02/2006	12	15/02/2007
L220	Attenuator	Bird		Calibrate in Use	
L222	Attenuator	Bird		Calibrate in Use	
L280	18GHz Cable	Rosenberger	05/01/2006	12	05/01/2007
L254	Signal Generator	Marconi	04/01/2006	12	04/01/2007
L479	Analyser	Anritsu	18/11/2005	12	18/11/2006

ANNEX D
MEASUREMENT UNCERTAINTY

Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95% confidence where no required test level exists.

[1] Adjacent Channel Power

Uncertainty in test result = **1.86dB**

[2] Carrier Power

Uncertainty in test result (Equipment - TRLUH120) = **2.18dB**

Uncertainty in test result (Equipment – TRL05) = **1.08dB**

Uncertainty in test result (Equipment – TRL479) = **2.48dB**

[3] Effective Radiated Power

Uncertainty in test result = **4.71dB**

[4] Spurious Emissions

Uncertainty in test result = **4.75dB**

[5] Maximum frequency error

Uncertainty in test result (Equipment - TRLUH120) = **119ppm**

Uncertainty in test result (Equipment – TRL05) = **0.113ppm**

Uncertainty in test result (Equipment – TRL479) = **0.265ppm**

[6] Radiated Emissions, field strength OATS 14kHz-18GHz Electric Field

Uncertainty in test result (14kHz – 30MHz) = **4.8dB**, Uncertainty in test result (30MHz – 1GHz) = **4.6dB**, Uncertainty in test result (1GHz-18GHz) = **4.7dB**

[7] Frequency deviation

Uncertainty in test result = **3.2%**

[8] Magnetic Field Emissions

Uncertainty in test result = **2.3dB**

[9] Conducted Spurious

Uncertainty in test result (Equipment TRL479) Up to 8.1GHz = **3.31dB**

Uncertainty in test result (Equipment TRL479) 8.1GHz – 15.3GHz = **4.43dB**

Uncertainty in test result (Equipment TRL479) 15.3GHz – 21GHz = **5.34dB**

Uncertainty in test result (Equipment TRLUH120) Up to 26GHz = **3.14dB**

[10] Channel Bandwidth

Uncertainty in test result = **15.5%**

[11] Amplitude and Time Measurement – Oscilloscope

Uncertainty in overall test level = **2.1dB**, Uncertainty in time measurement = **0.59%**, Uncertainty in Amplitude measurement = **0.82%**

[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

ANNEX E
SYSTEM DIAGRAM

