TRL Compliance
A Cape Group Company

TEST REPORT NO: RU1194/6803

COPY NO: 2

ISSUE NO: 1

FCC ID: NEO50-1285Series

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: 5th June 2005 – 8th August 2005

TESTED BY: John Charters — J CHARTERS

Digitally signed by John Charters
DN: CN = John Charters, C = GB, O = TRL Compliance Ltd
Reason: I am the author of this document
Date: 2006.01.30 14:24:12 Z

APPROVED BY: Peter Green — P GREEN
PRODUCT MANAGER
EMC

Digitally signed by Peter Green
DN: CN = Peter Green, C = GB, O = TRL Compliance Ltd.
Reason: I am approving this document
Date: 2006.01.31 10:31:39 Z

DATE: 27th January 2006

Distribution:

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1. Aerial Facilities Limited
2. TCB: TRL Compliance Limited
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Notes:

1. Component failure during test — YES [ ] NO [X]
2. If Yes, details of failure:
3. The facilities used for the testing of the product contain in this report are FCC Listed.

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY:	NEO50-1285Series
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 Downlink = 72.48 dB
MAXIMUM INPUT	Uplink = -44 dBm Downlink = -41 dBm
MAXIMUM OUTPUT	Uplink = 22.69 dBm Downlink = 31.13 dBm (radiating cable system)
ANTENNA TYPE:	Not applicable
CHANNEL SPACING:	Uplink = 1 x 275 kHz channel & 1 x 1.45 MHz channel Downlink =1 x 275 kHz channel & 1 x 1.45 MHz channel
NUMBER OF CHANNELS:	Uplink 2 Downlink 2
FREQUENCY GENERATION:	N/A
MODULATION TYPE:	F3E
POWER SOURCE(s):	+110 Vac
TEST DATE(s):	5th June 2005 – 8th August 2005
ORDER No(s):	32088
APPLICANT:	Aerial Facilities Limited
ADDRESS:	Aerial House Asheridge Road Chesham Buckinghamshire HP5 1TU United Kingdom
TESTED BY:	John Charters Digitally signed by John Charters DN: CN = John Charters, C = GB, O = TRL Compliance Ltd Reason: I am the author of this document Date: 2006.01.30 14:24:37 Z ---------- J CHARTERS
APPROVED BY:	---------- P GREEN PRODUCT MANAGER EMC

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 Asheridge Road Chesham Buckinghamshire HP5 1TU United Kingdom
TEL:	+44 (0)1494 777000
FAX:	+44 (0)1494 778456
MANUFACTURER:	Aerial Facilities Limited
EUT(s) COUNTRY OF ORIGIN:	United Kingdom
TEST LABORATORY:	TRL EMC
UKAS ACCREDITATION No:	0728
TEST DATE(s)	5th June 2005 – 8th August 2005
TEST REPORT No:	RU1194/6803

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 [X] Class B [ ]
   Downlink Class A [X] Class B [ ]

3. Product Use: Private Land Mobile Repeater

4. Emission Designator: F3E

5. Temperatures: Ambient (Tnom) 21^{o}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 [X] 2 x 275 kHz
   2 x 1.45 MHz
   Wideband [ ]

9. Test Location TRL Compliance Limited
   Up Holland [X]
   Long Green [ ]

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

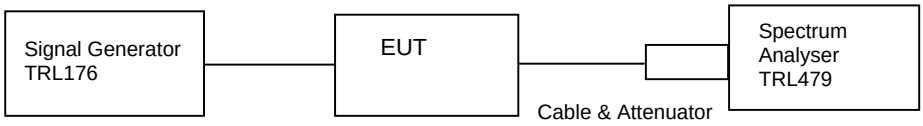
System description:

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.

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 MHz	Voltage	Signal Generator input level dBm	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase 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 MHz	Voltage	Signal Generator input level dBm	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase 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

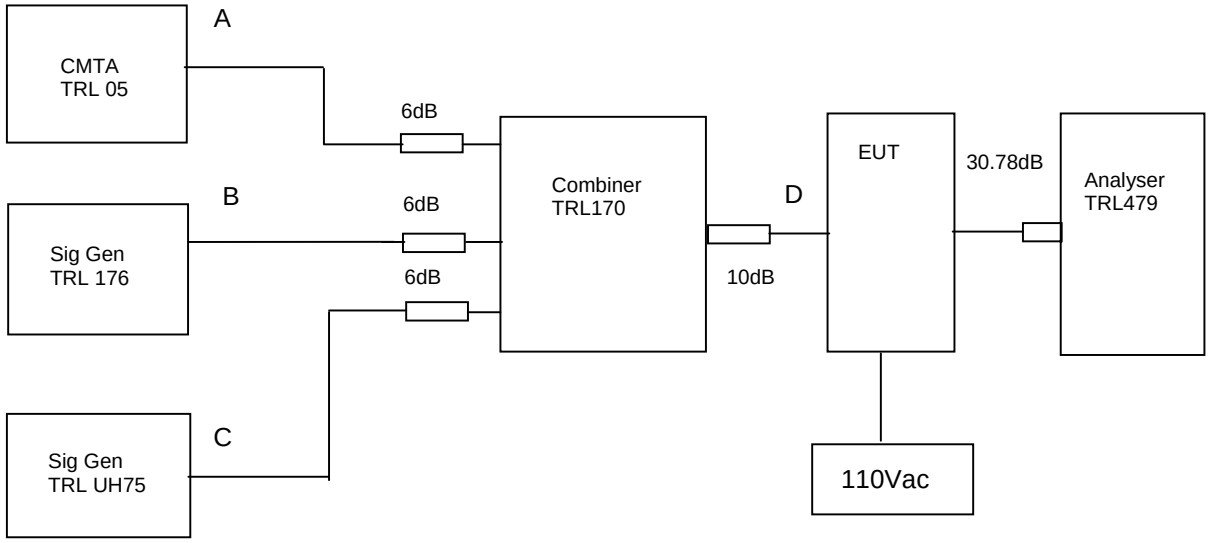
Notes:
1. The signal generator input was increased by 10dBs and the level of the output signal remeasured
2. Input level is adjusted for the input cable loss

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8304-300-N	N/A	220	**X**
ATTENUATOR	BIRD	8308-200	N/A	103	**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– UPLINK

Ambient temperature = 26°C
Relative humidity = 39%
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 –44dBm.The cable and attenuator loss between the EUT and the spectrum analyser was 30.78dB.

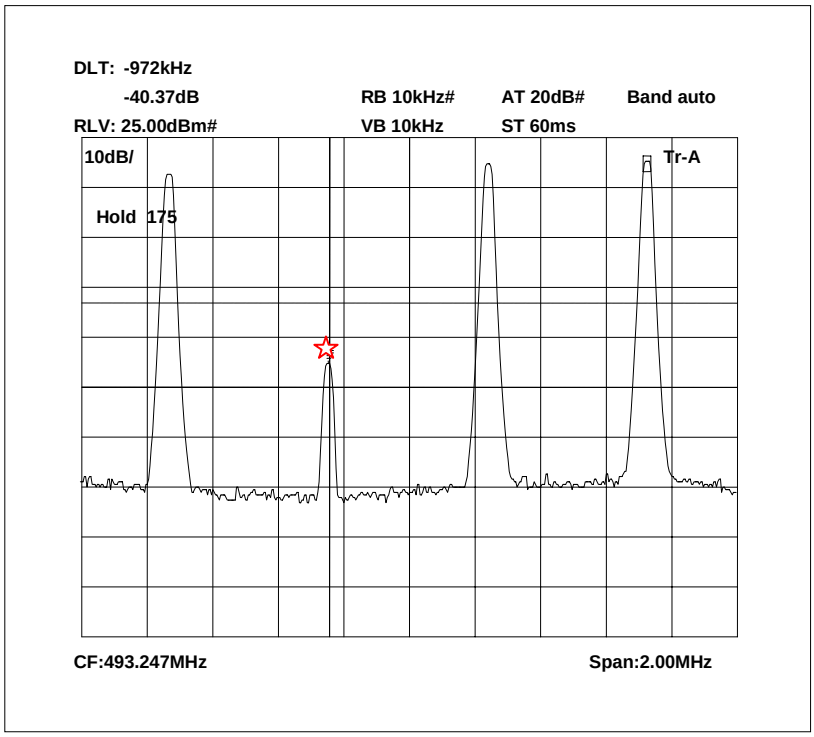
RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
TRL05	TRL176	TRLUH75		
492.5125	493.4765	493.9625	-17.25 dBm @ 492.9900MHz	-13
499.3375	499.5210	499.6125	-17.45 dBm @ 499.4315MHz	-13

Sweep data is shown on the next page:

Test equipment used for intermodulation test

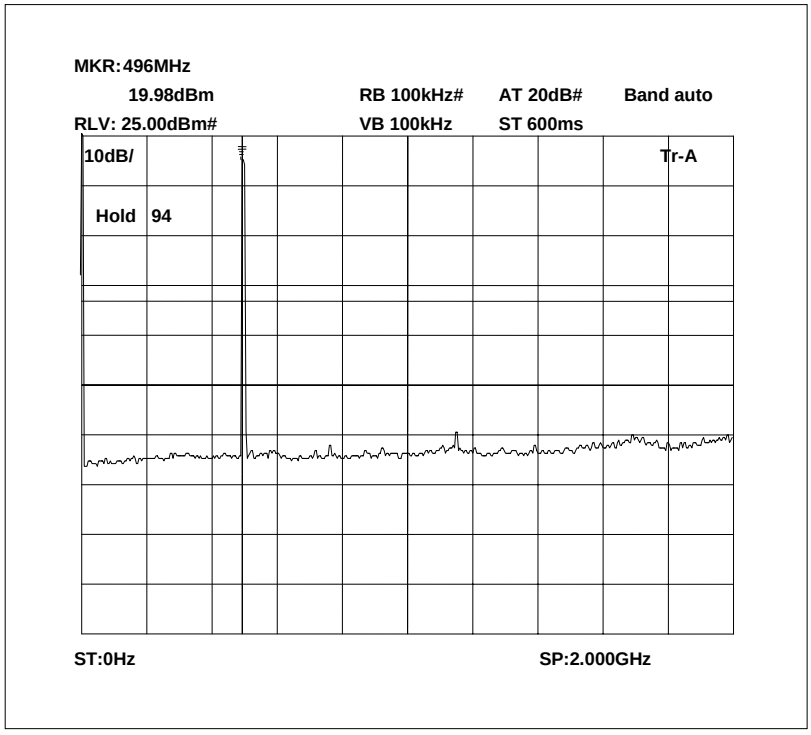
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
SIGNAL GENERATOR	MARCONI	2022D	119215/058	UH75	**X**
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
COMBINER	ELCOM	RC-4-50	N/A	170	**X**

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



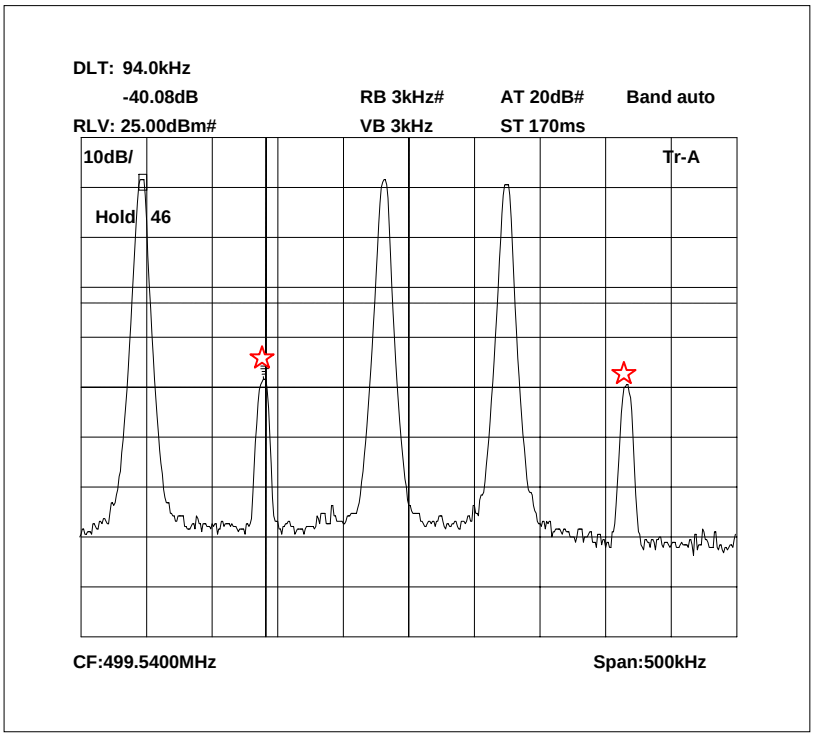
The above plot shows that all products (designated by☆) below the Spurious Lmit.

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



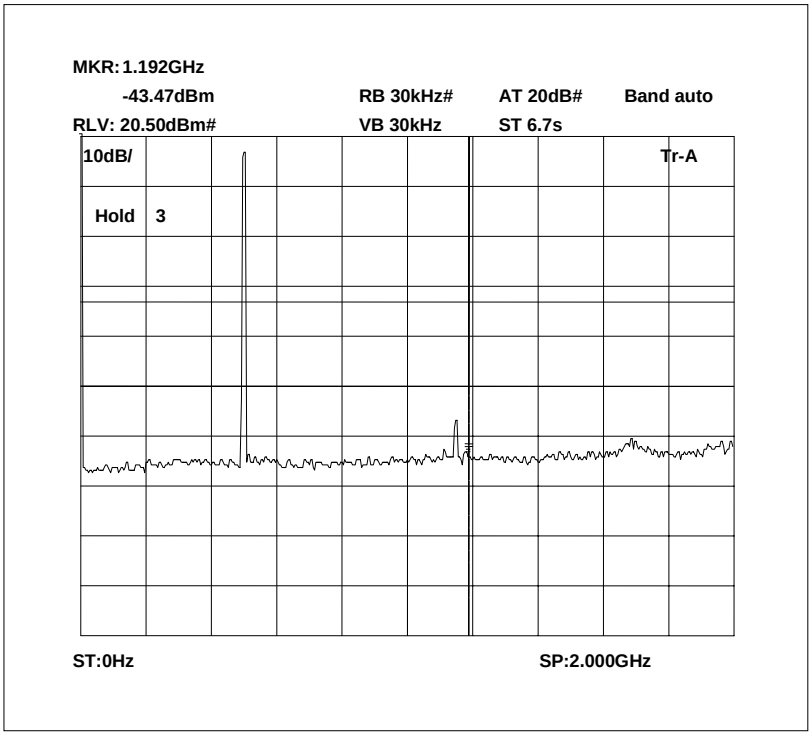
The above plot shows that there are no products outside the bands.

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)

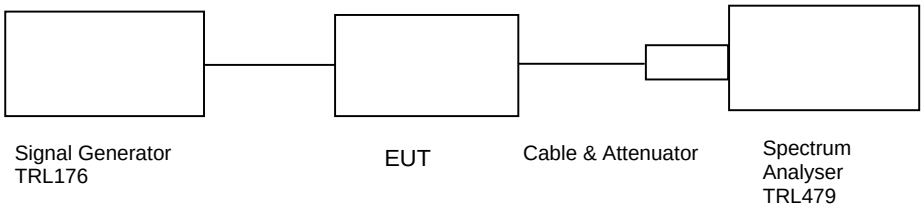


The above plot shows that there are no products outside the bands.

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	



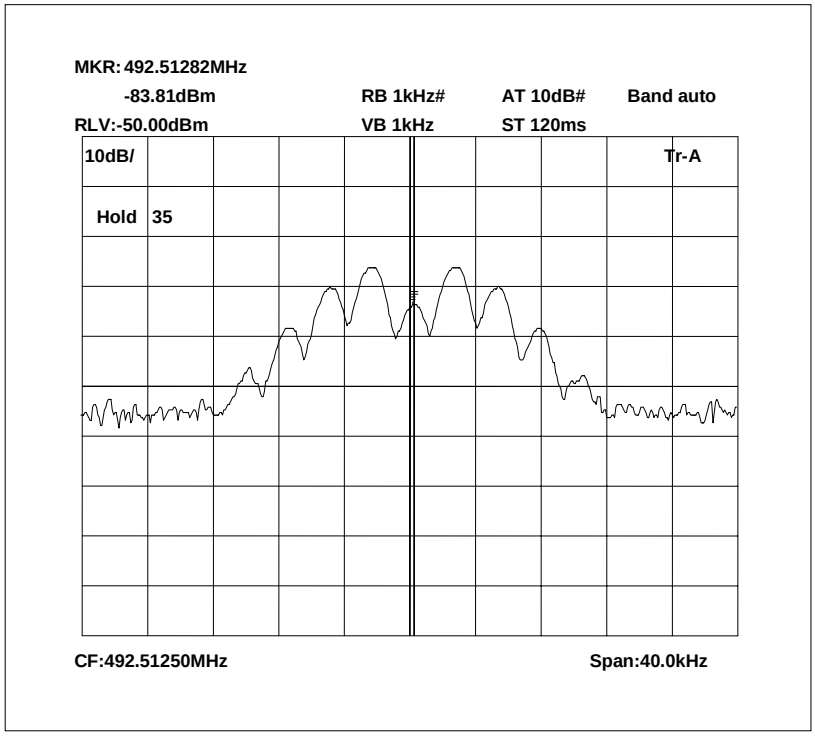
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-41dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

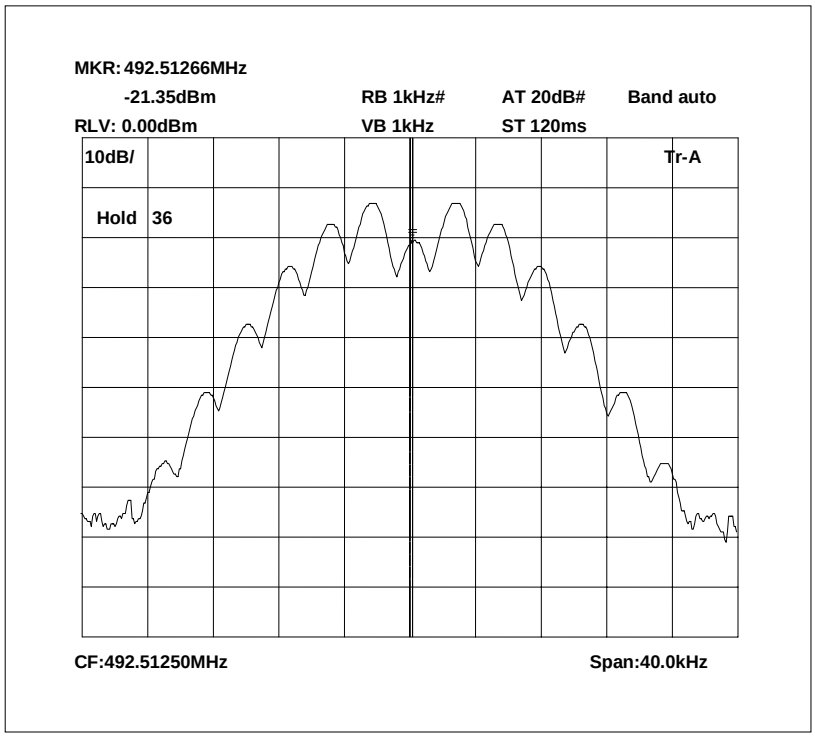
1. Cable and attenuator between EUT and Spectrum analyser 30.78dB
2. Cable between signal generator and EUT 1.05dB

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

492.5125 MHz Signal Generator, deviation set to 5kHz

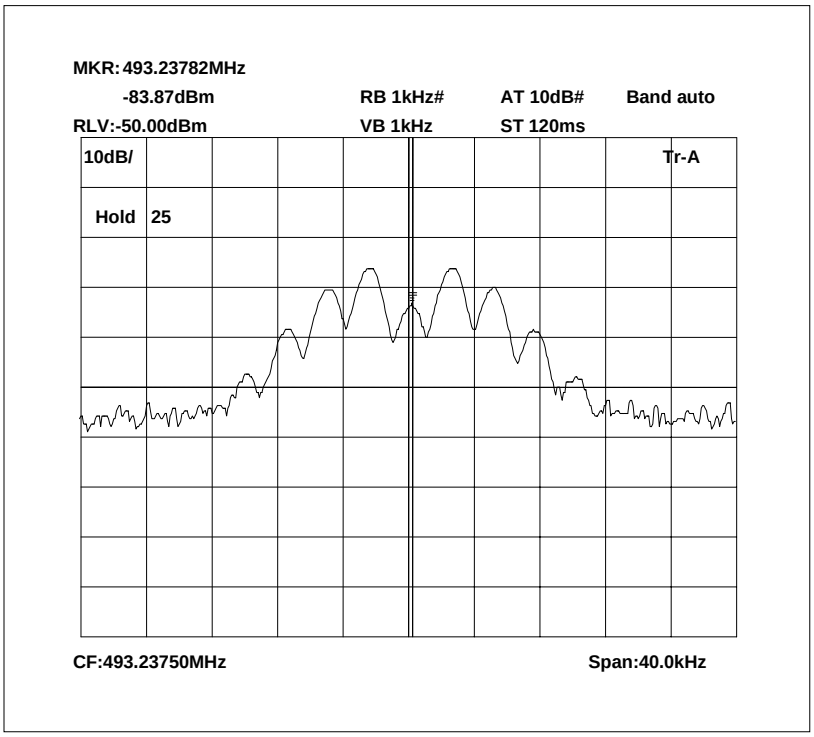


492.5125 MHz Signal Generator and EUT, deviation set to 5kHz

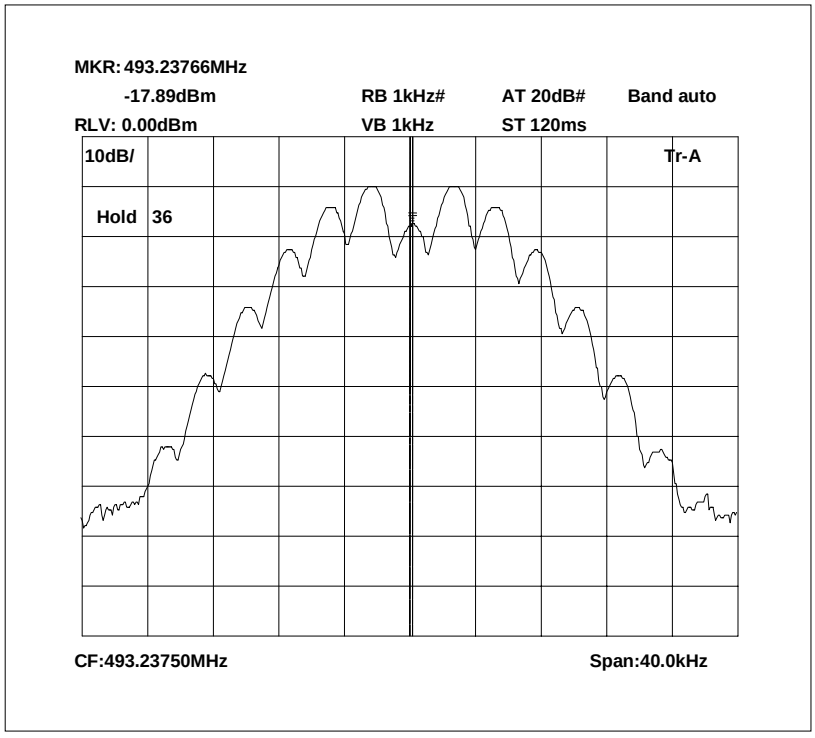


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

493.2375 MHz Signal Generator, deviation set to 5kHz

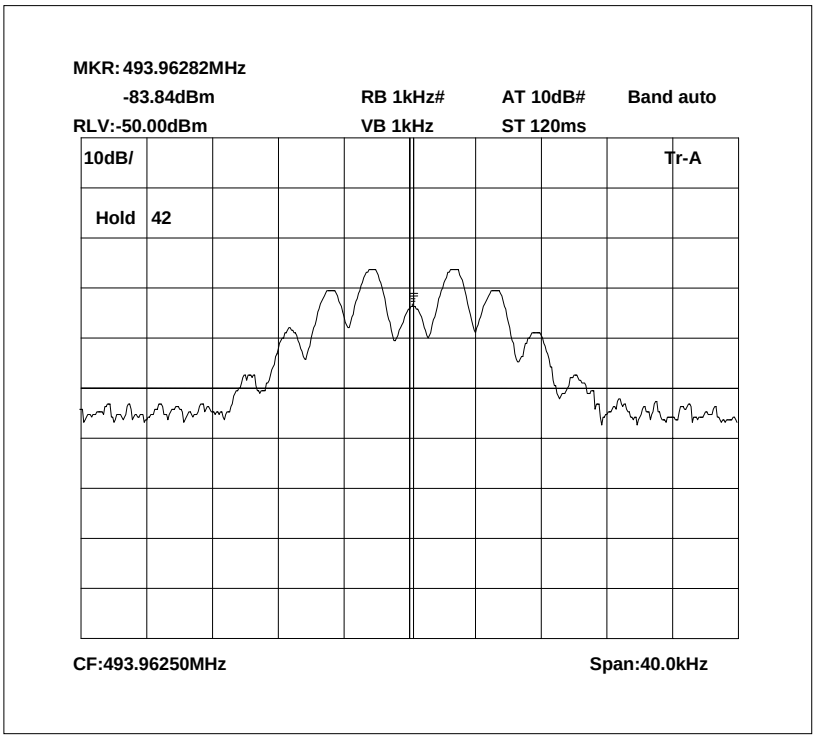


493.2375 MHz Signal Generator and EUT, deviation set to 5kHz

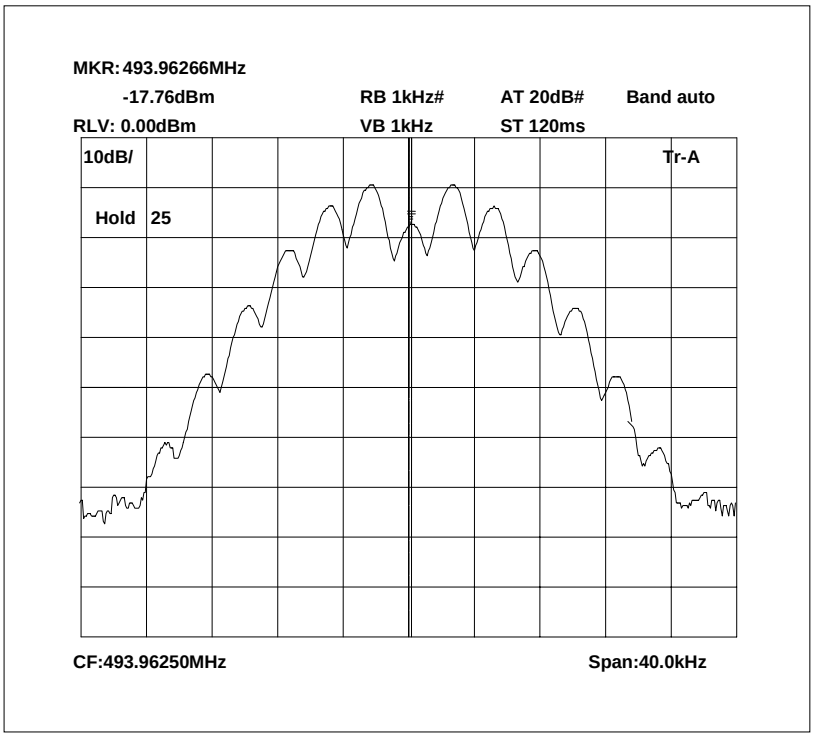


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

493.9625 MHz Signal Generator, deviation set to 5kHz

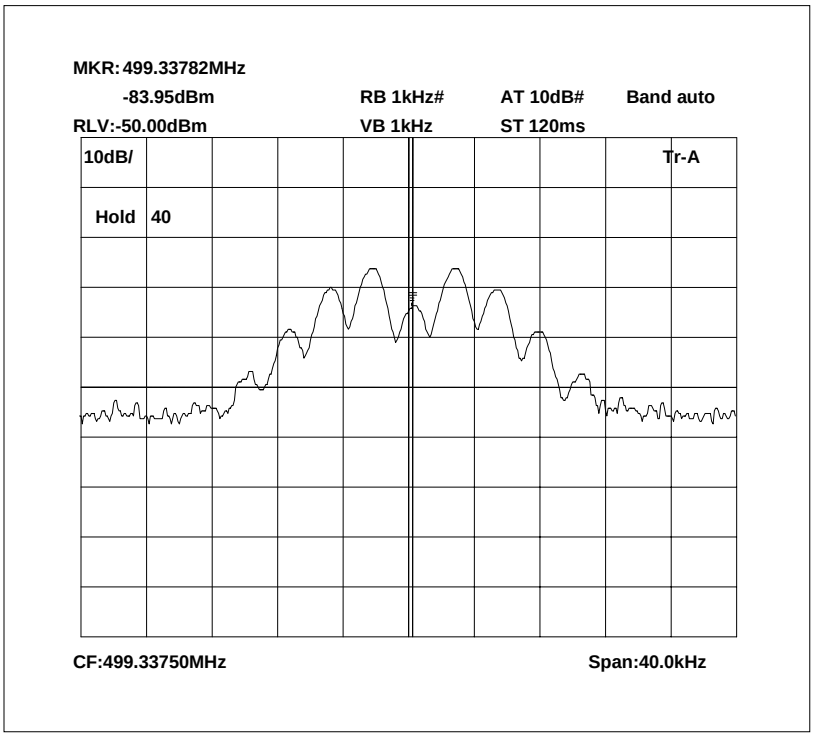


493.9625 MHz Signal Generator and EUT, deviation set to 5kHz

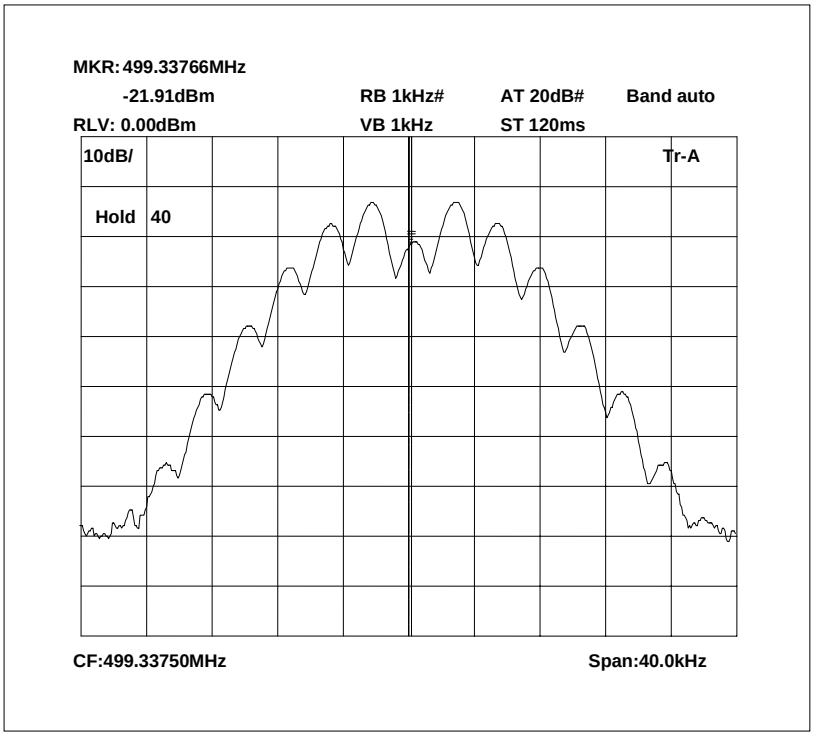


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

499.3375 MHz Signal Generator, deviation set to 5kHz

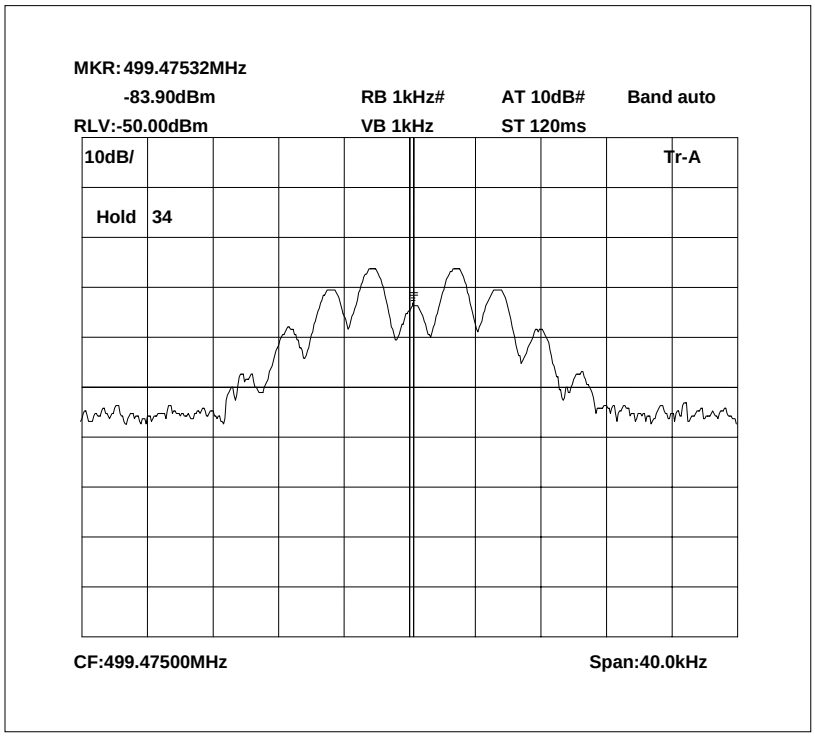


499.3375 MHz Signal Generator and EUT, deviation set to 5kHz

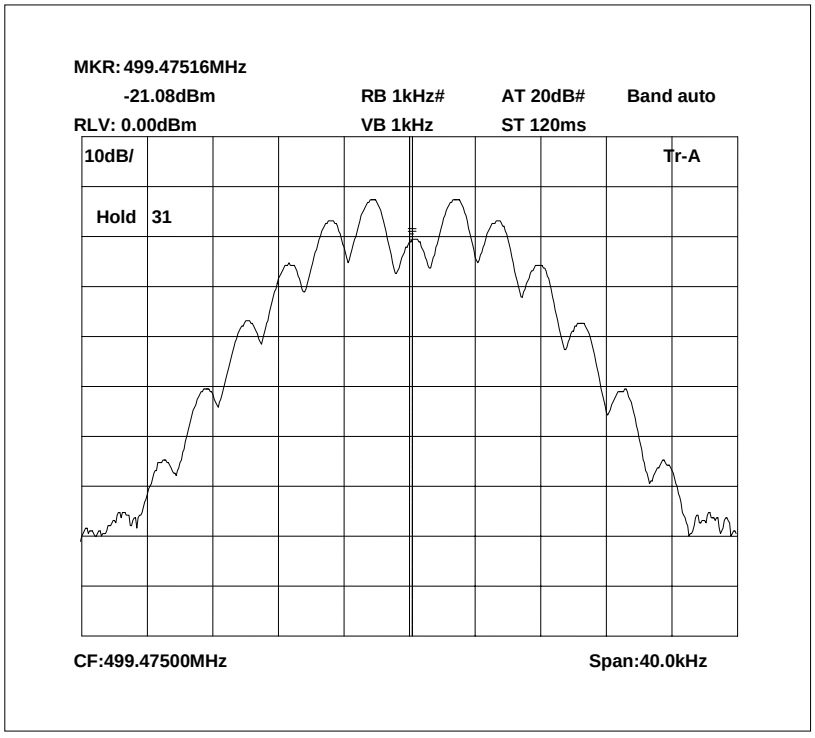


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

499.4750 MHz Signal Generator, deviation set to 5kHz

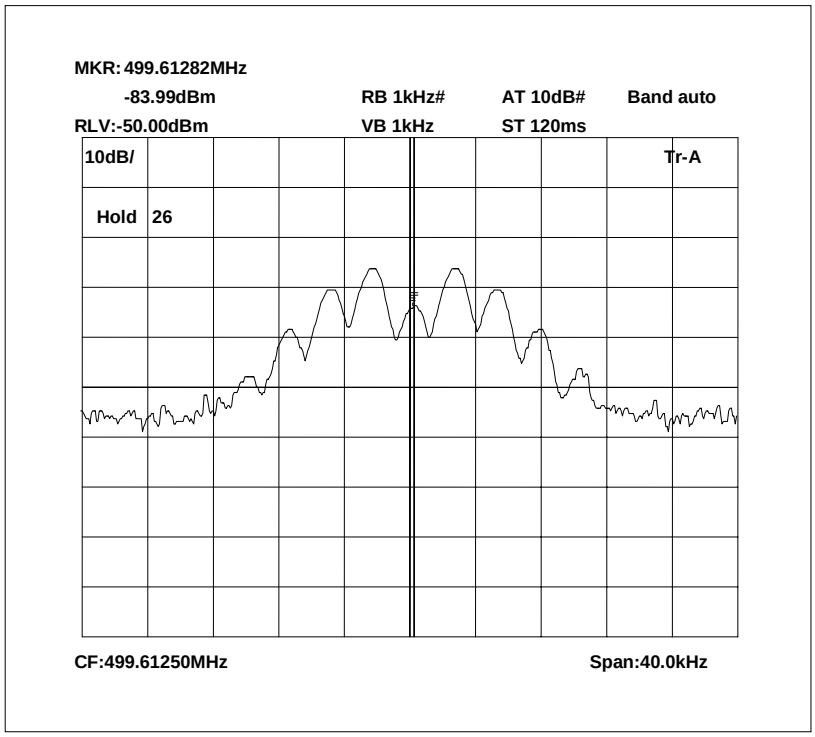


499. 4750 MHz Signal Generator and EUT, deviation set to 5kHz

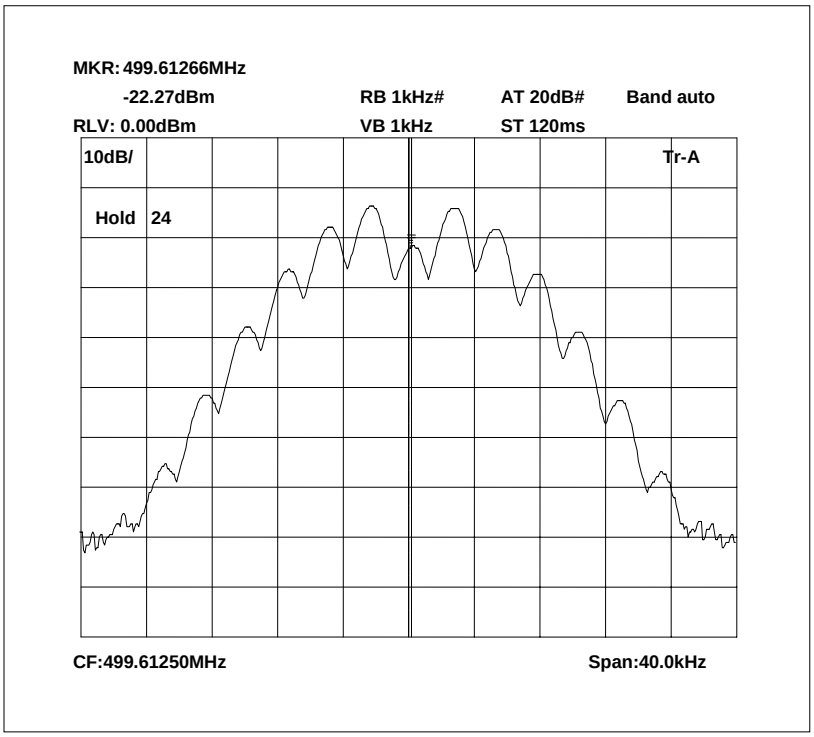


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

499.6125 MHz Signal Generator, deviation set to 5kHz



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



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

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – UPLINK

Ambient temperature	=	25°C	Radio Laboratory		
Relative humidity	=	41%	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

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

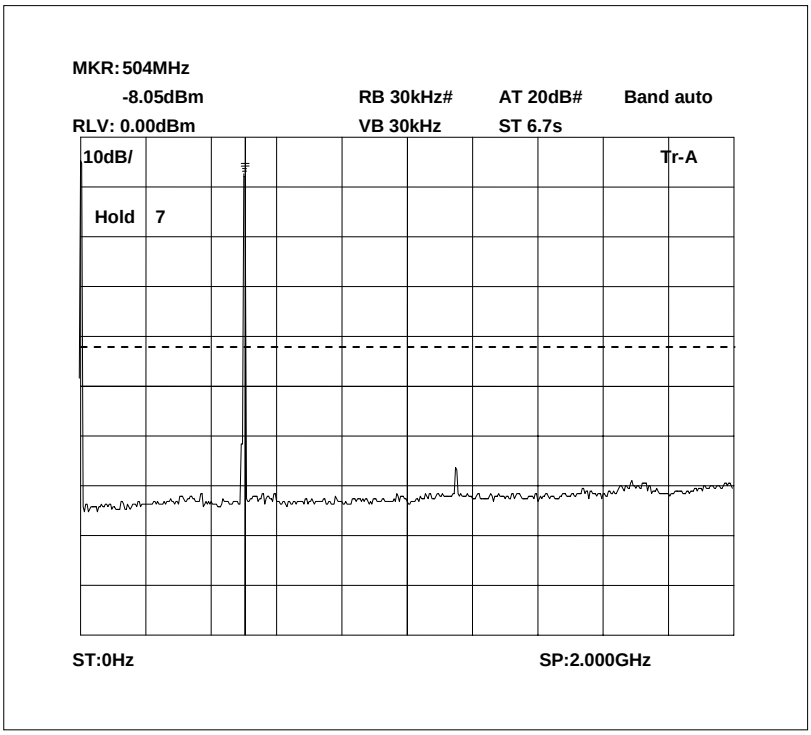
RESULTS

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 dBs of the limit				-13

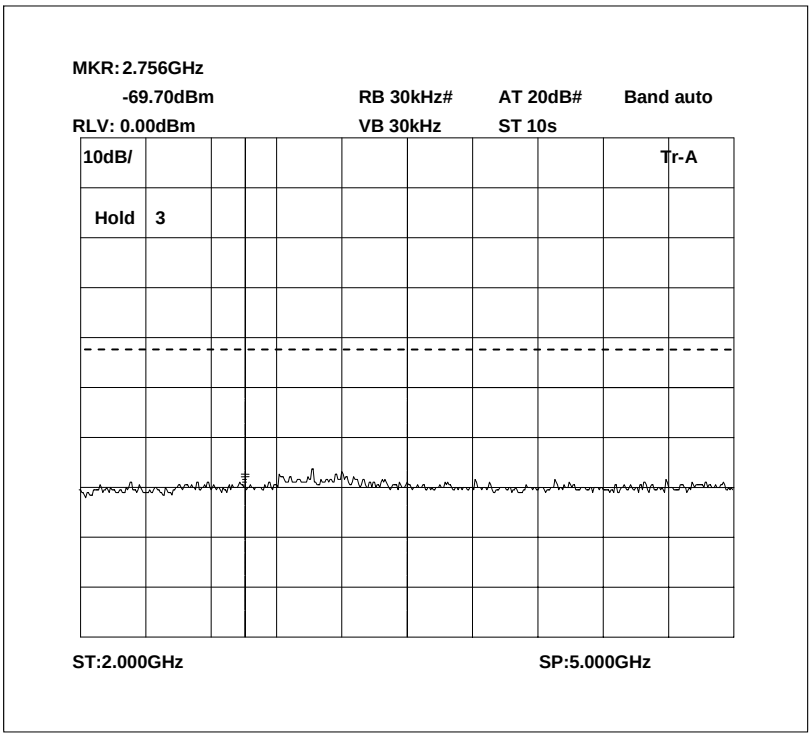
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
ATTENUATOR	BIRD	8304-300-N	N/A	220	**X**
ATTENUATOR	BIRD	8308-200	N/A	103	**X**
CABLE	ROSENBERGER	MICRO COAX	N/A	280	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
CABLE	N/A	N/A	N/A	UH254	**X**

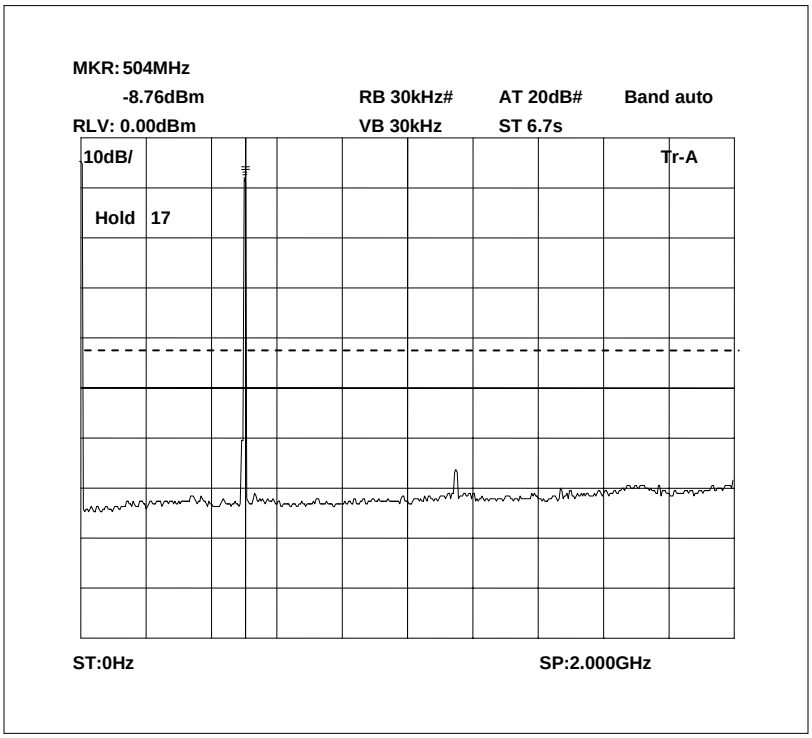
Conducted emissions 492.5125 MHz 0 – 2GHz



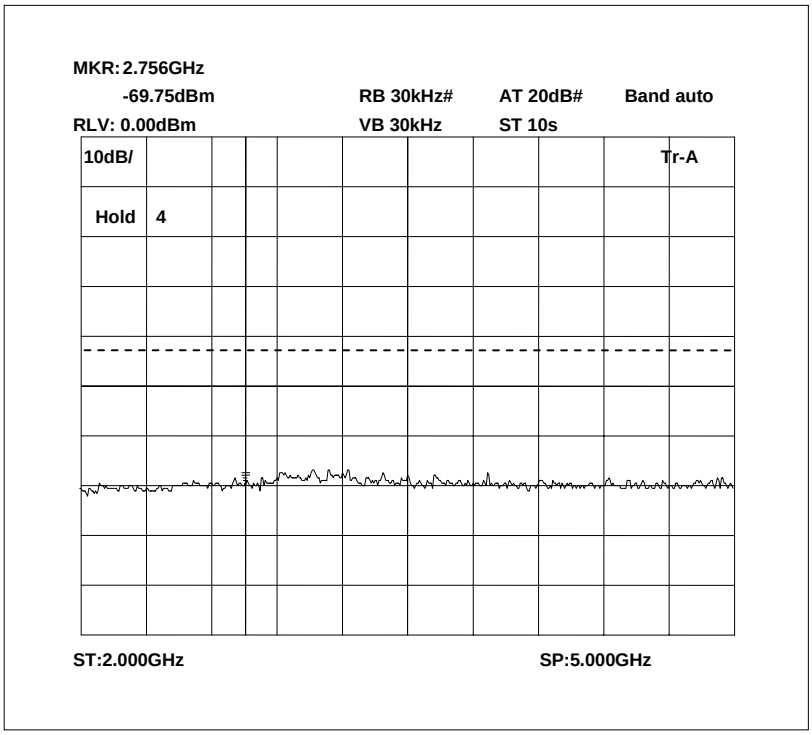
Conducted emissions 492.5125 MHz 2 – 5GHz



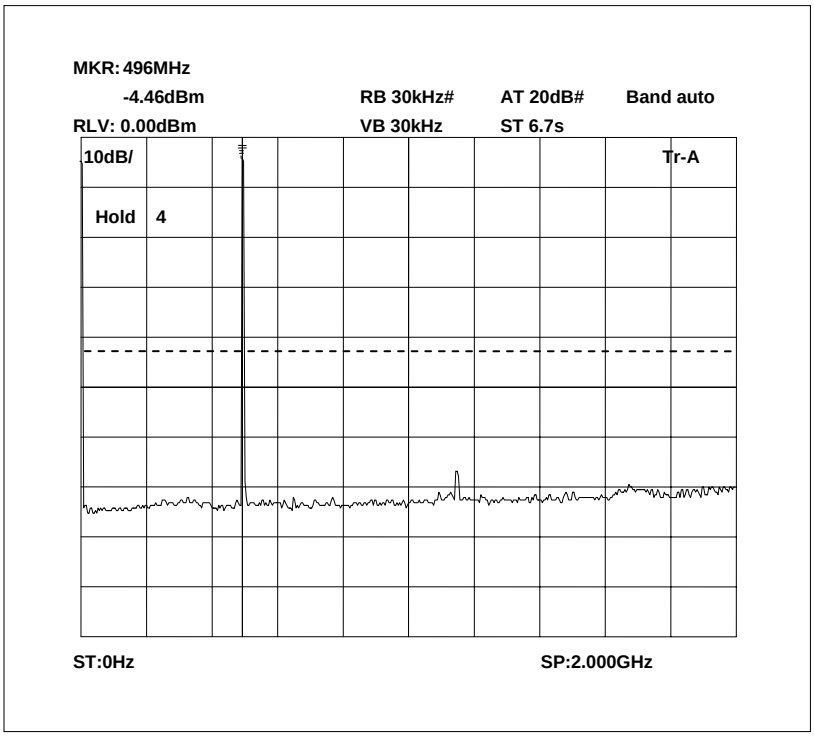
Conducted emissions 493.2375 MHz 0 – 2GHz



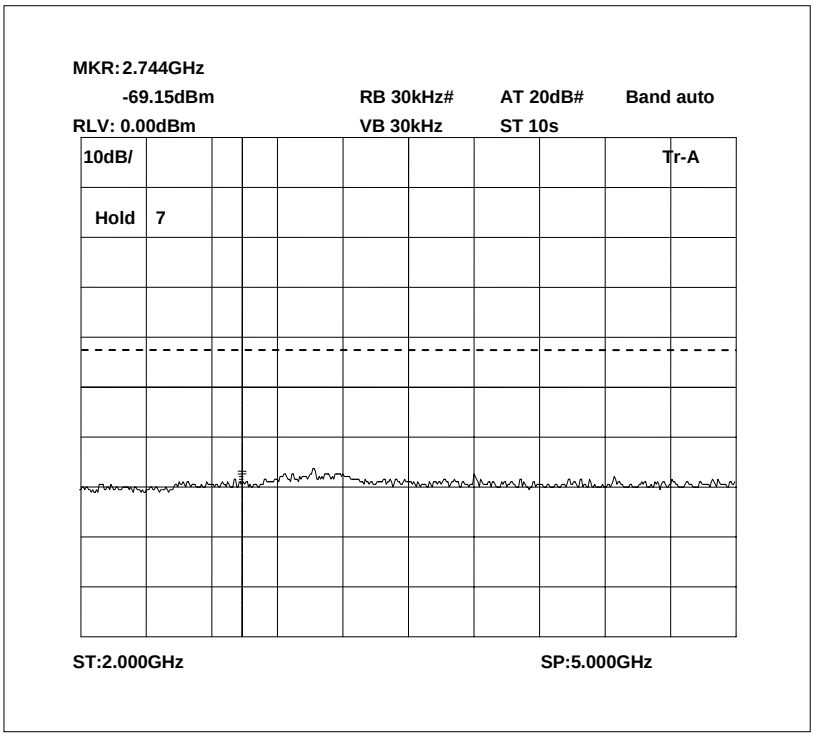
Conducted emissions 493.2375 MHz 2 – 5GHz



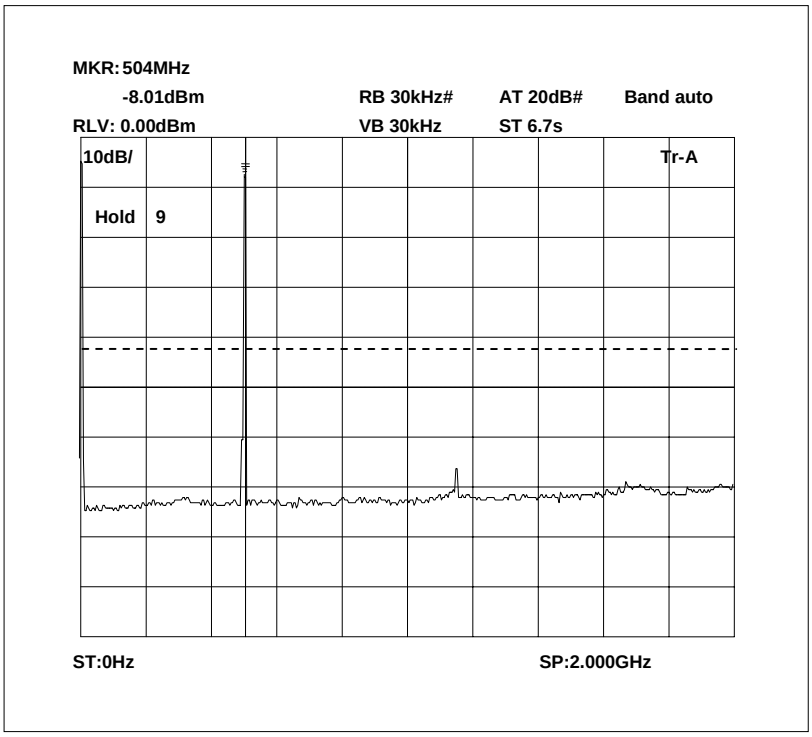
Conducted emissions 493.9625 MHz 0 – 2GHz



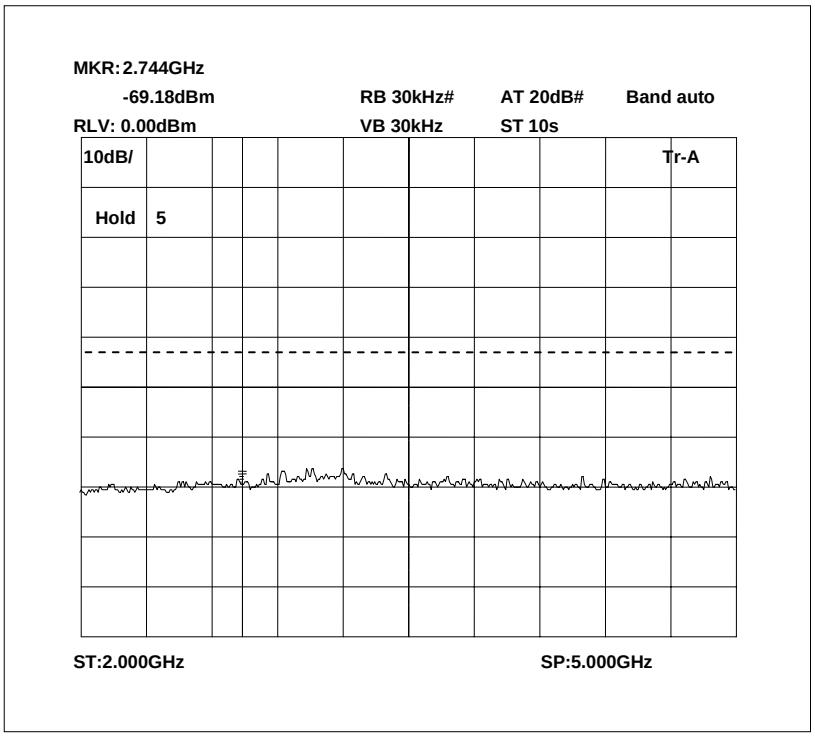
Conducted emissions 493.9625 MHz 2 – 5GHz



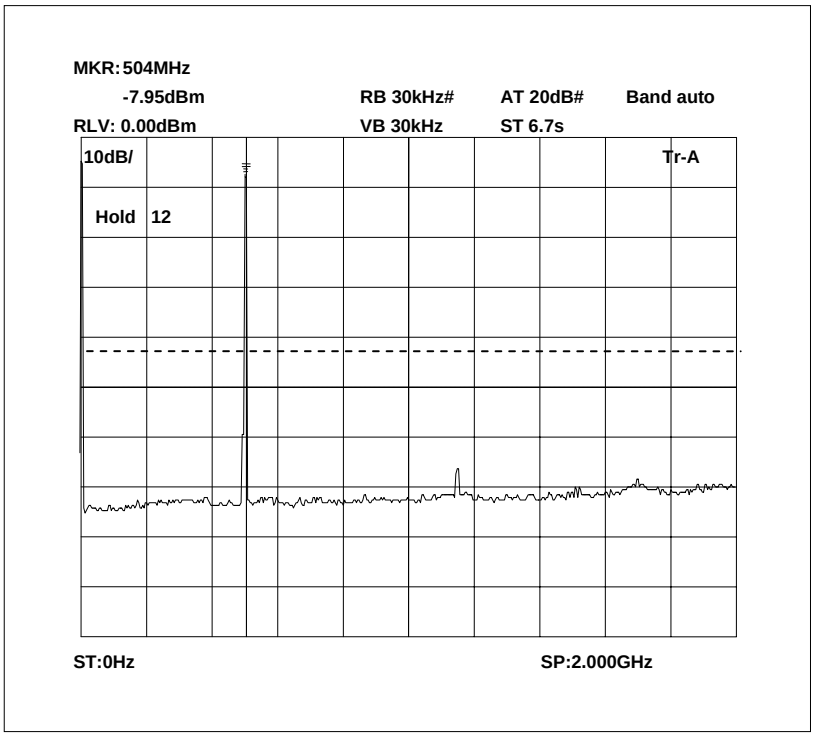
Conducted emissions 499.3375 MHz 0 – 2GHz



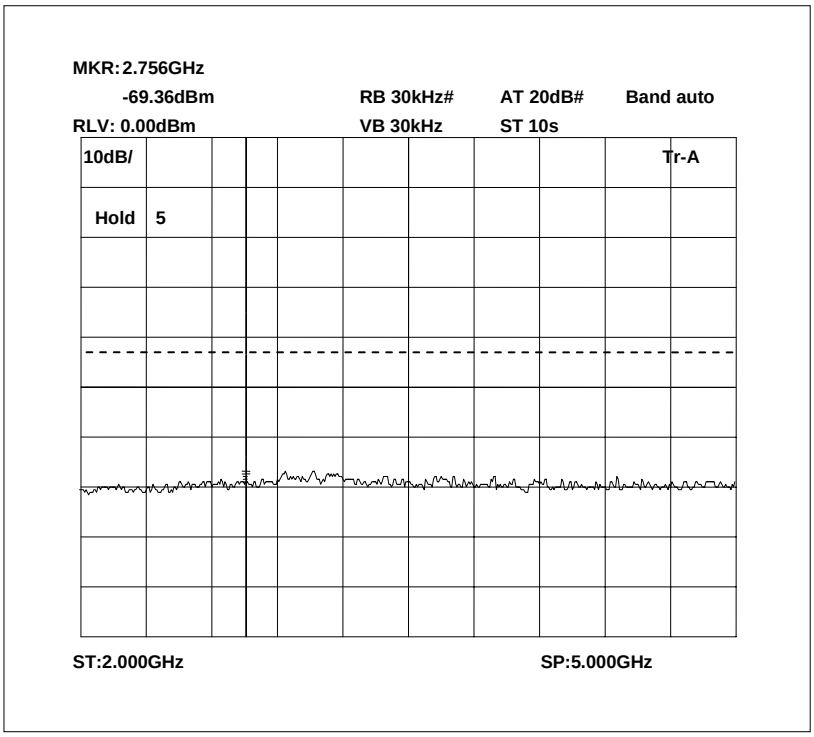
Conducted emissions 499.3375 MHz 2 – 5GHz



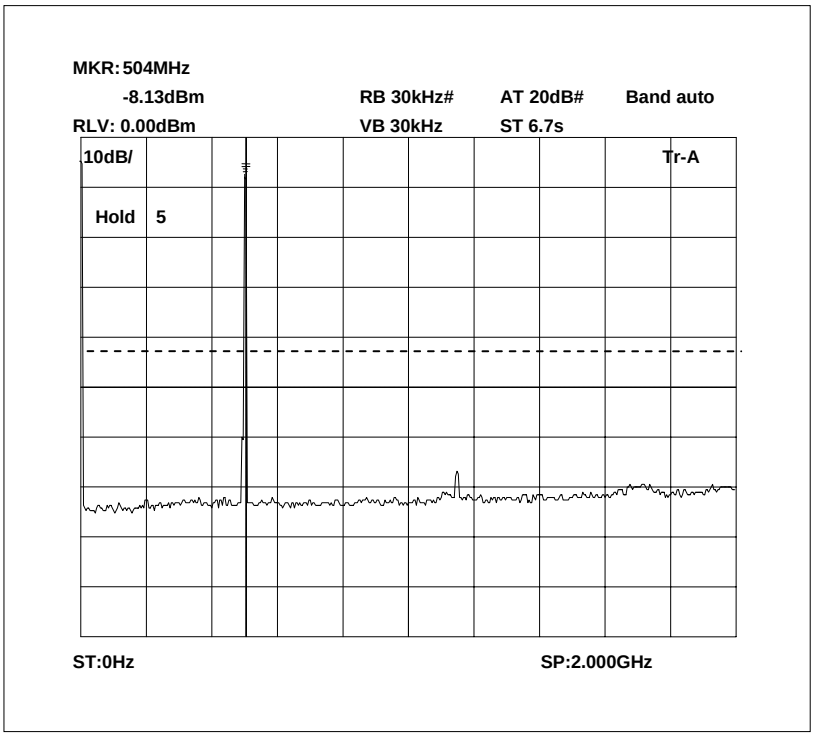
Conducted emissions 499.4750 MHz 0 – 2GHz



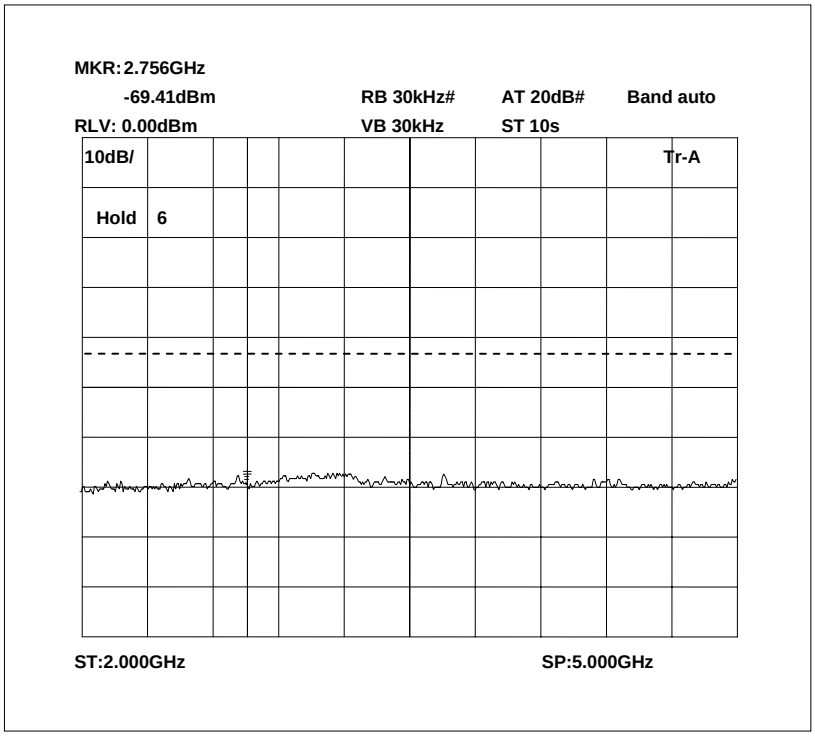
Conducted emissions 499.4750 MHz 2 – 5GHz



Conducted emissions 499.6125 MHz 0 – 2GHz



Conducted emissions 499.6125 MHz 2 – 5GHz

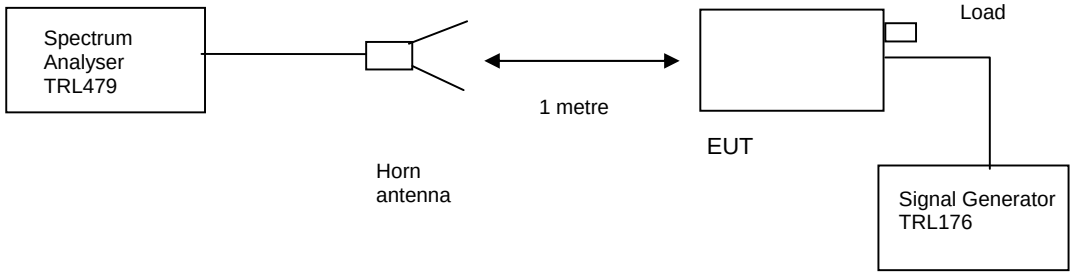


TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– UPLINK

Ambient temperature = 19°C
Relative humidity = 62%
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 PdB

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

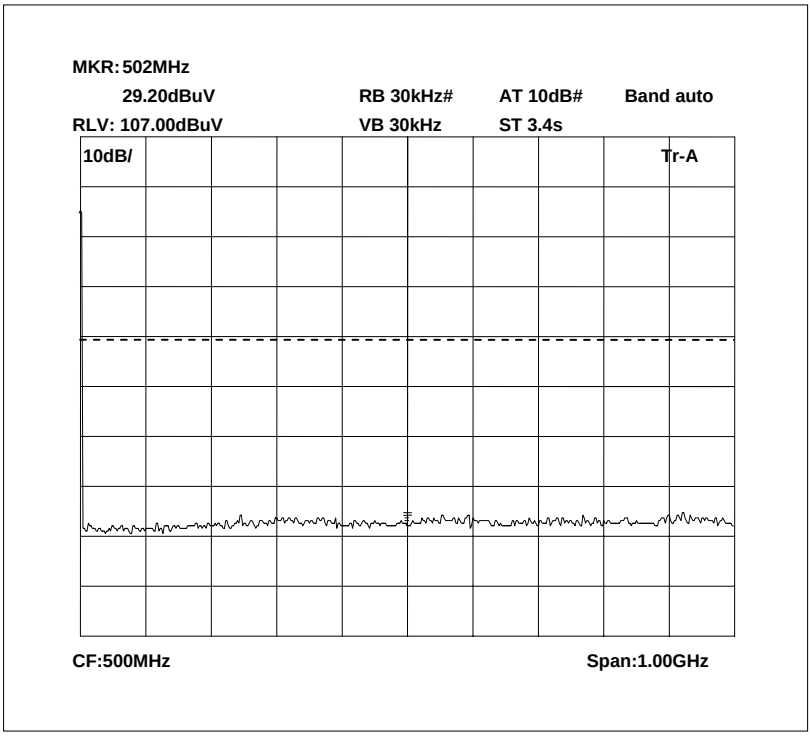
RESULTS

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 dBs of the limit						-13

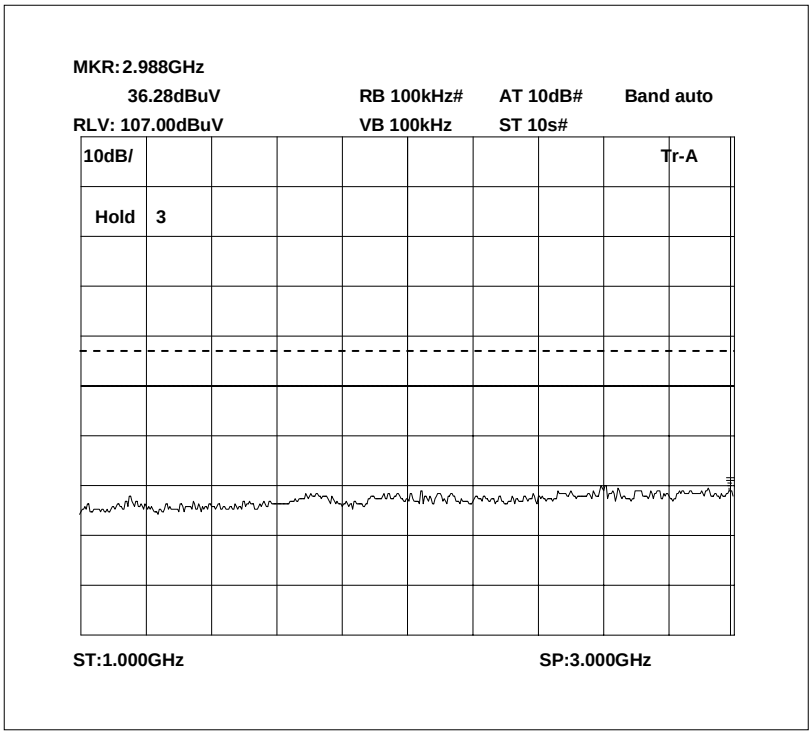
The test equipment used for the Transmitter Spurious Emissions:

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

Radiated emissions 492.5125 MHz 0 – 1GHz

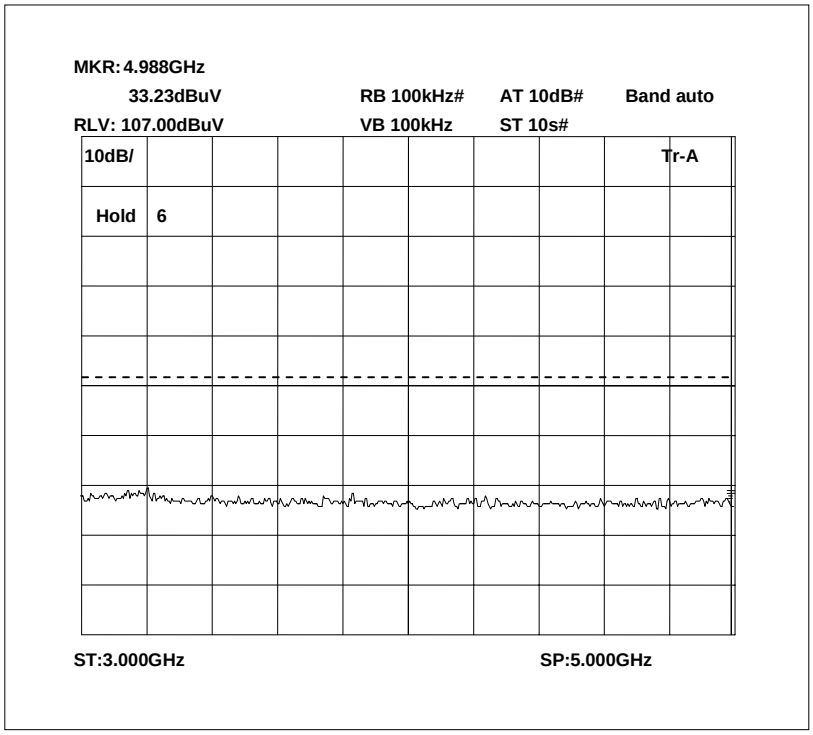


Radiated emissions 492.5125 MHz 1 – 3GHz



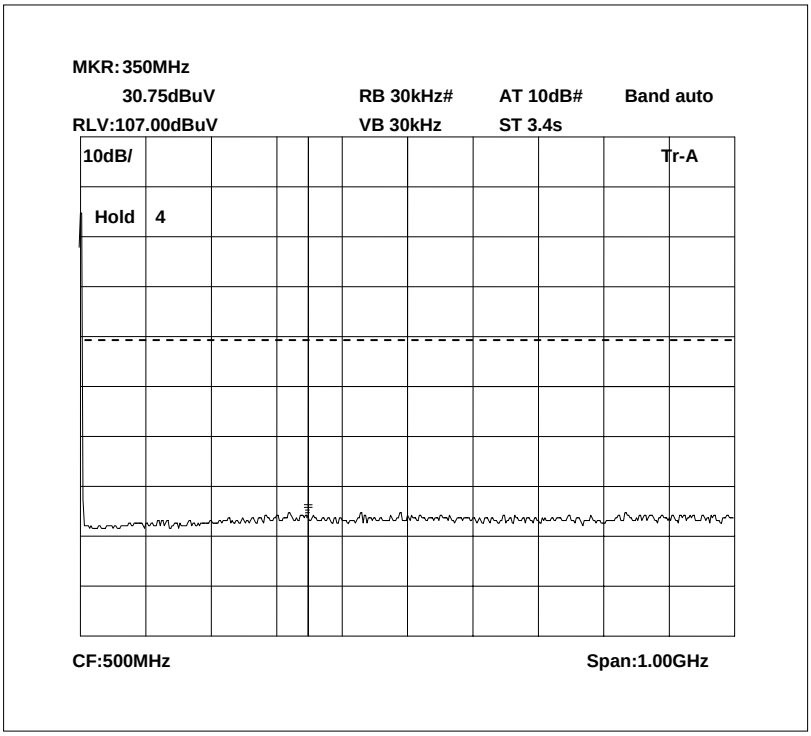
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 492.5125 MHz 3 – 5GHz

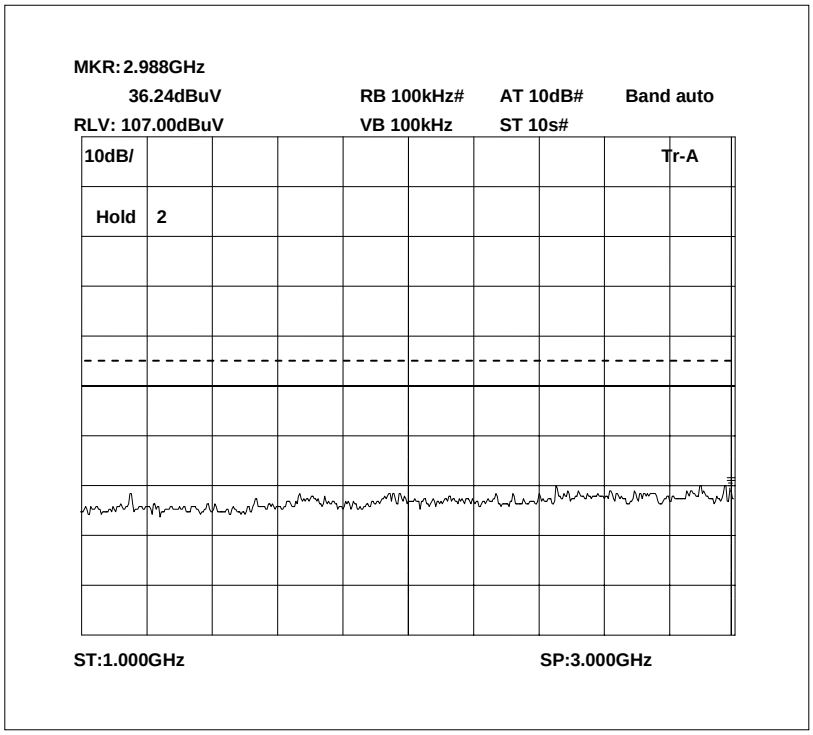


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 493.2375 MHz 0 – 1GHz

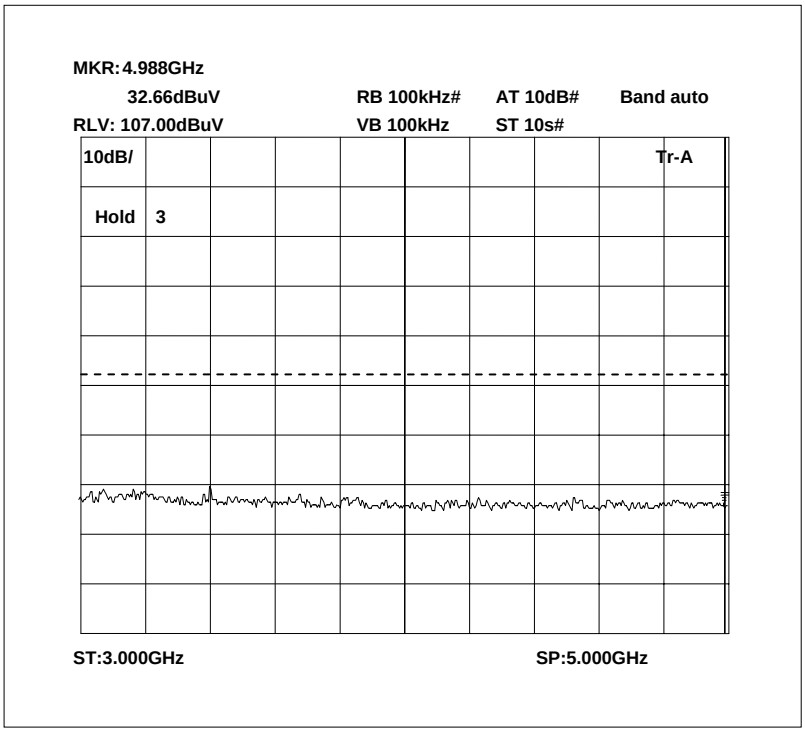


Radiated emissions 493.2375 MHz 1 – 3GHz



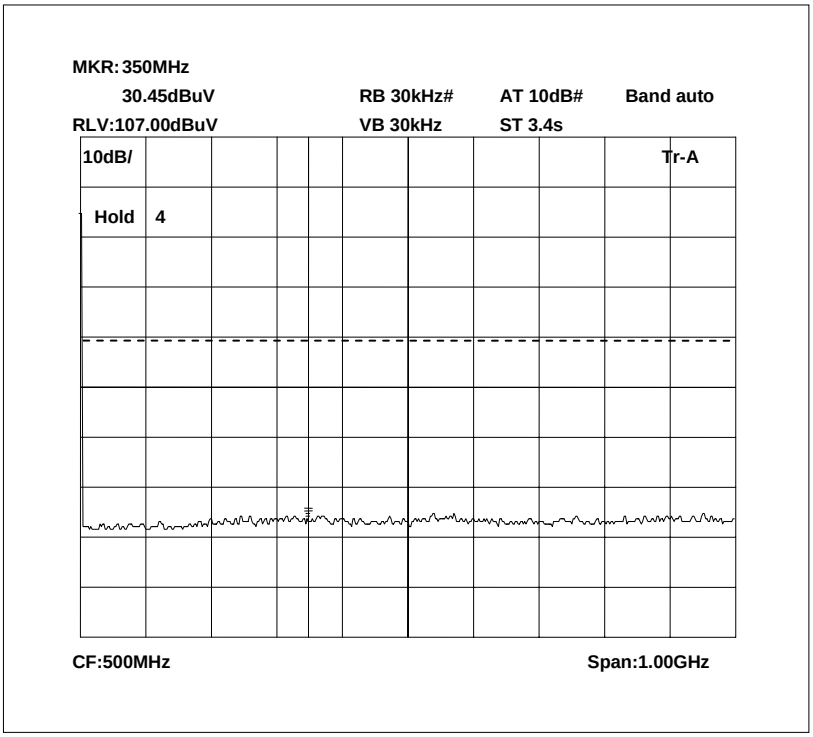
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 493.2375 MHz 3 – 5GHz

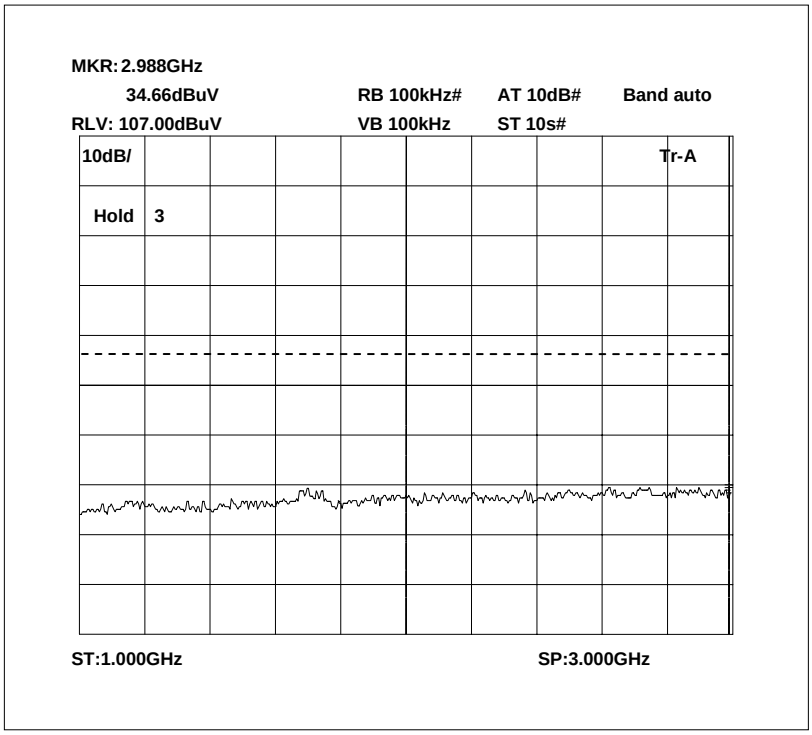


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 493.9625 MHz 0 – 1GHz

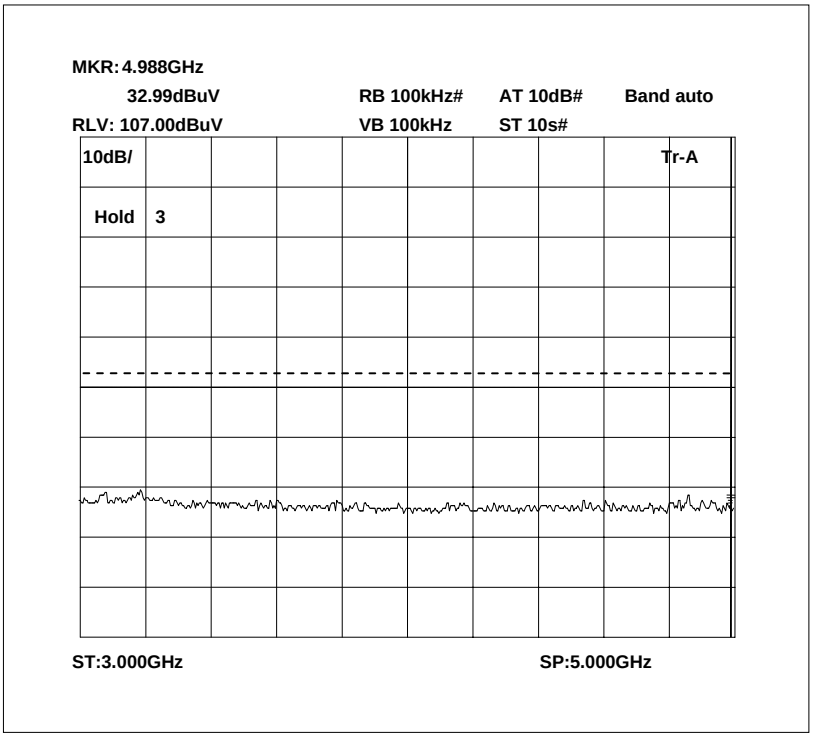


Radiated emissions 493.9625 MHz 1 – 3GHz



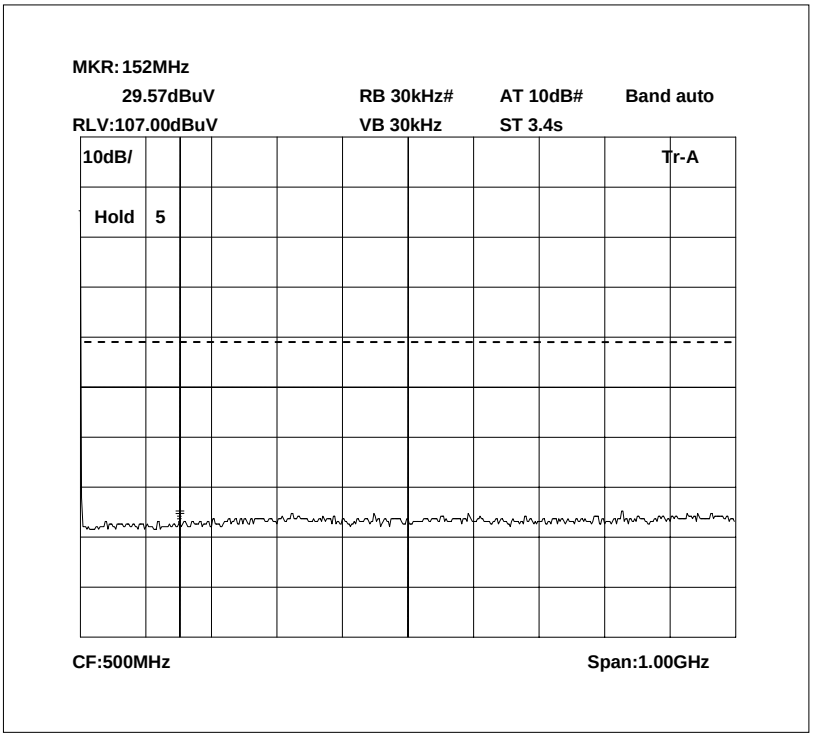
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 493.9625 MHz 3 – 5GHz

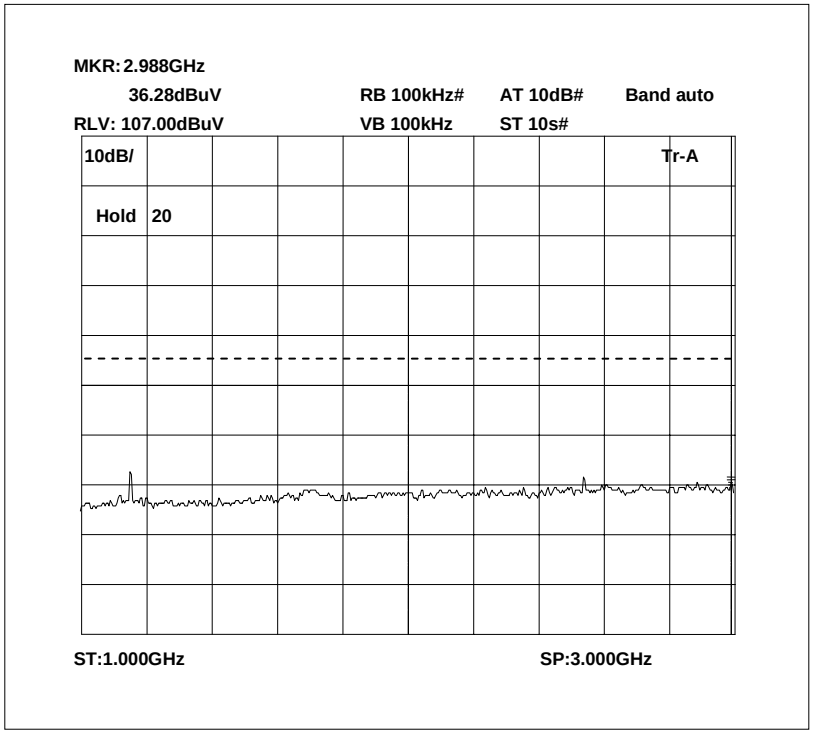


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 499.3375 MHz 0 – 1GHz

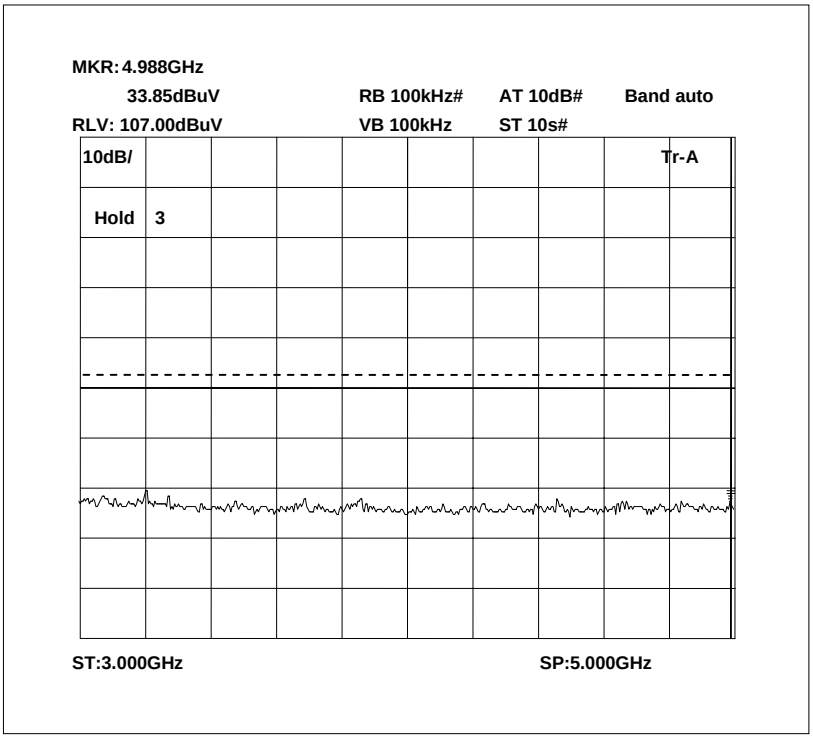


Radiated emissions 499.3375 MHz 1 – 3GHz



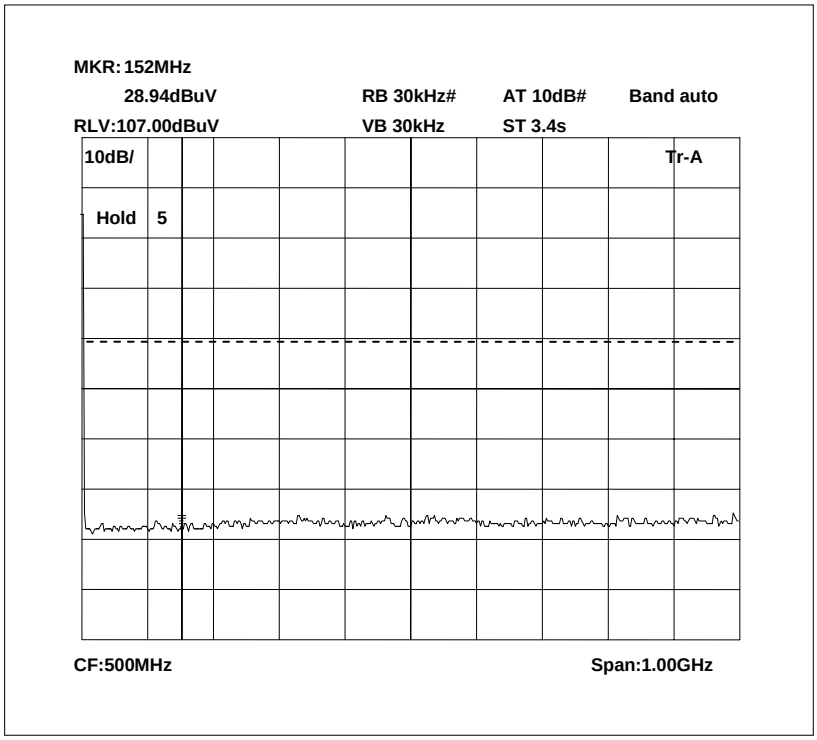
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 499.3375 MHz 3 – 5GHz

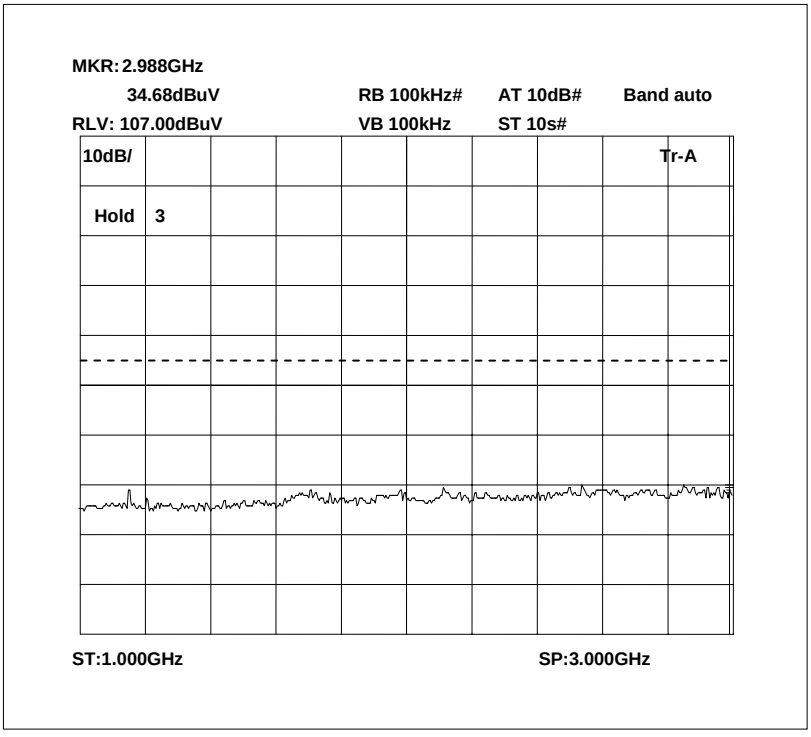


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 499.4750 MHz 0 – 1GHz

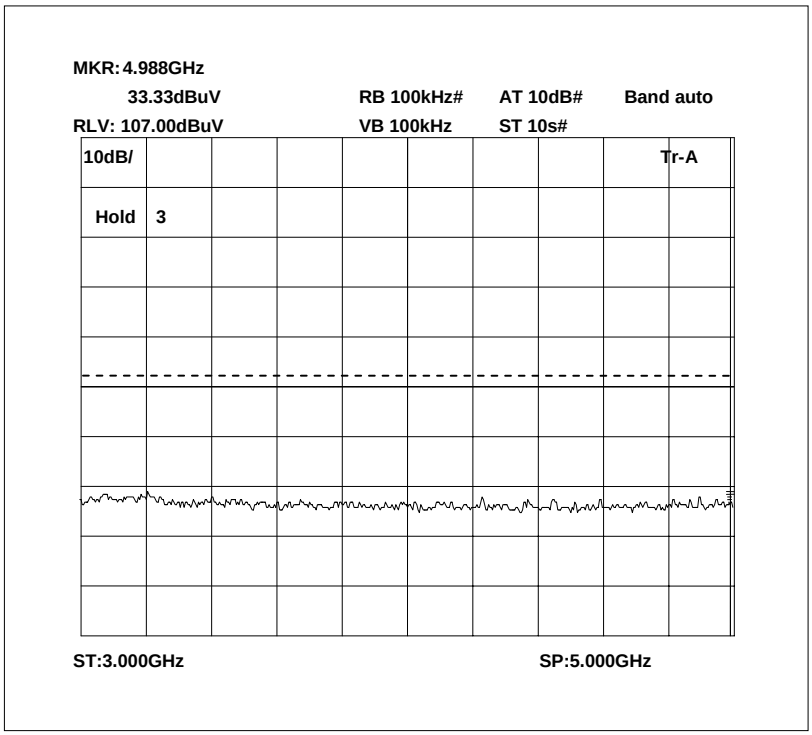


Radiated emissions 499.4750 MHz 1 – 3GHz



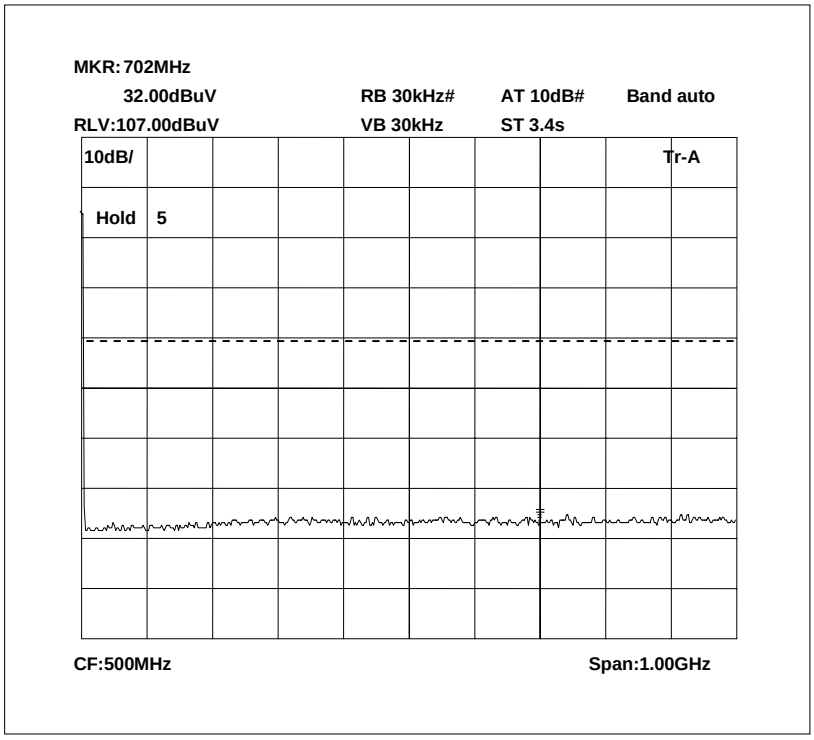
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 499.4750 MHz 3 – 5GHz

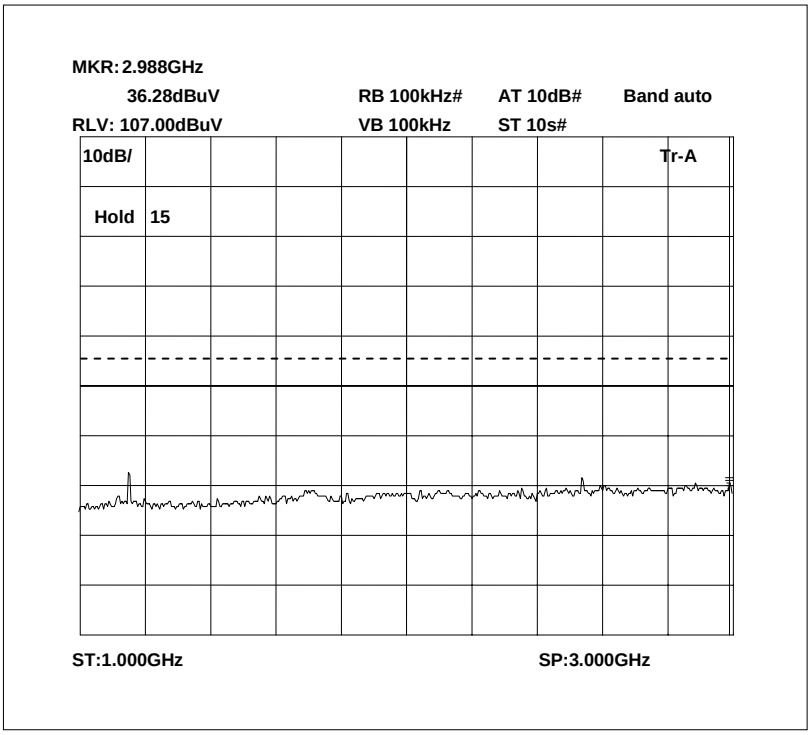


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 499.6125 MHz 0 – 1GHz

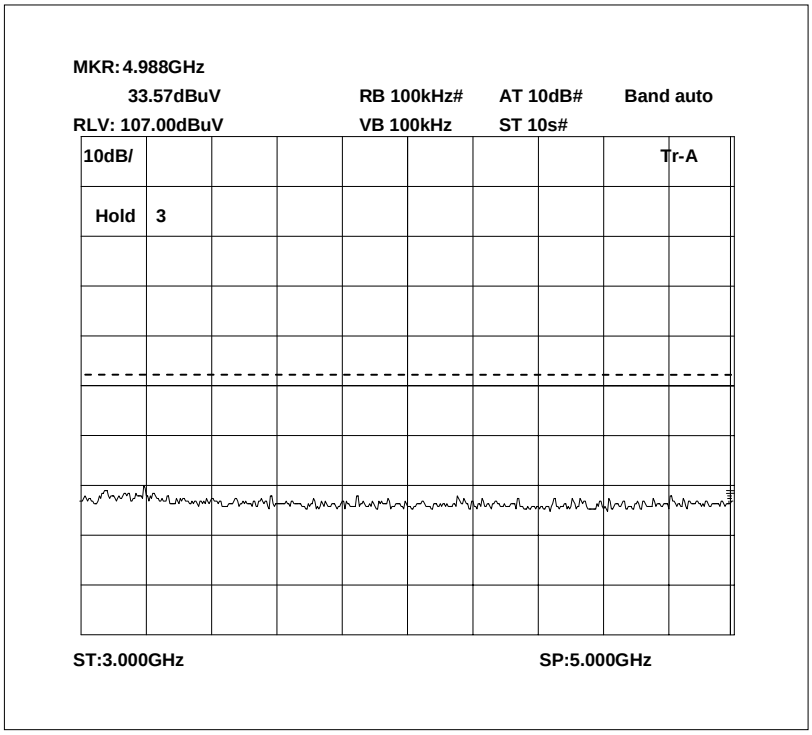


Radiated emissions 499.6125 MHz 1 – 3GHz



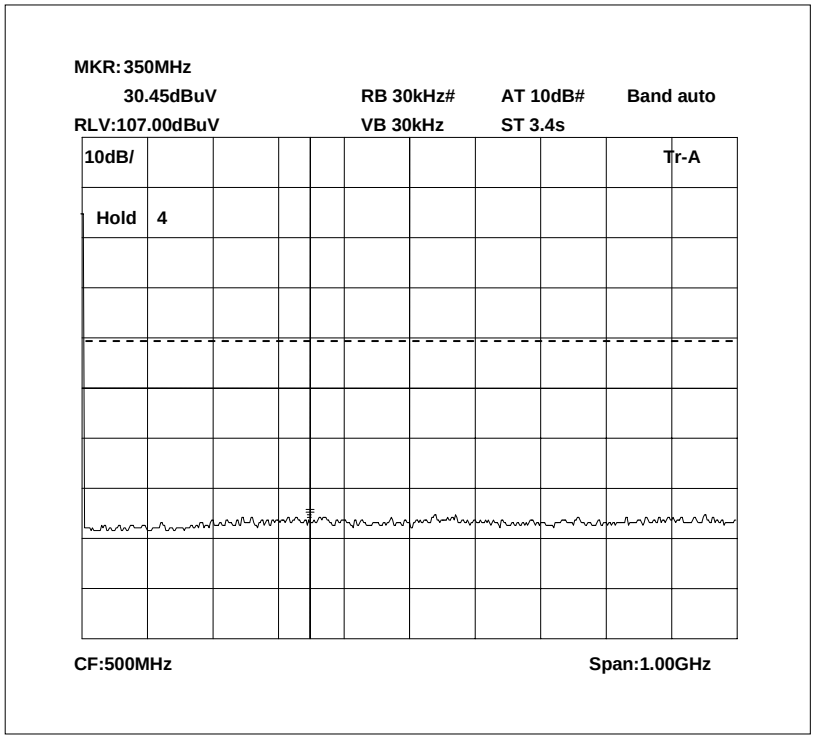
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 499.6125 MHz 3 – 5GHz

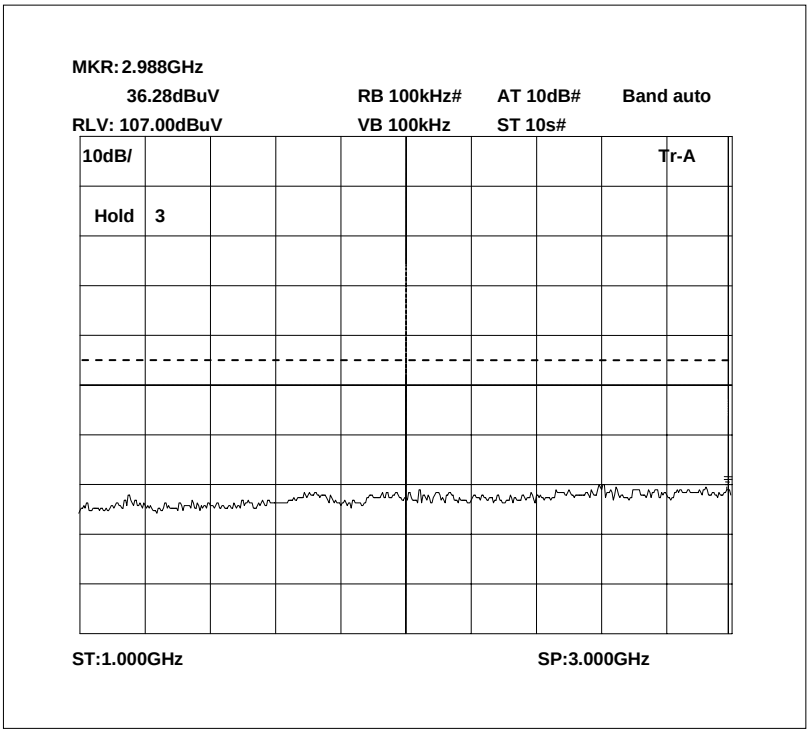


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions no input signal 0 – 1GHz

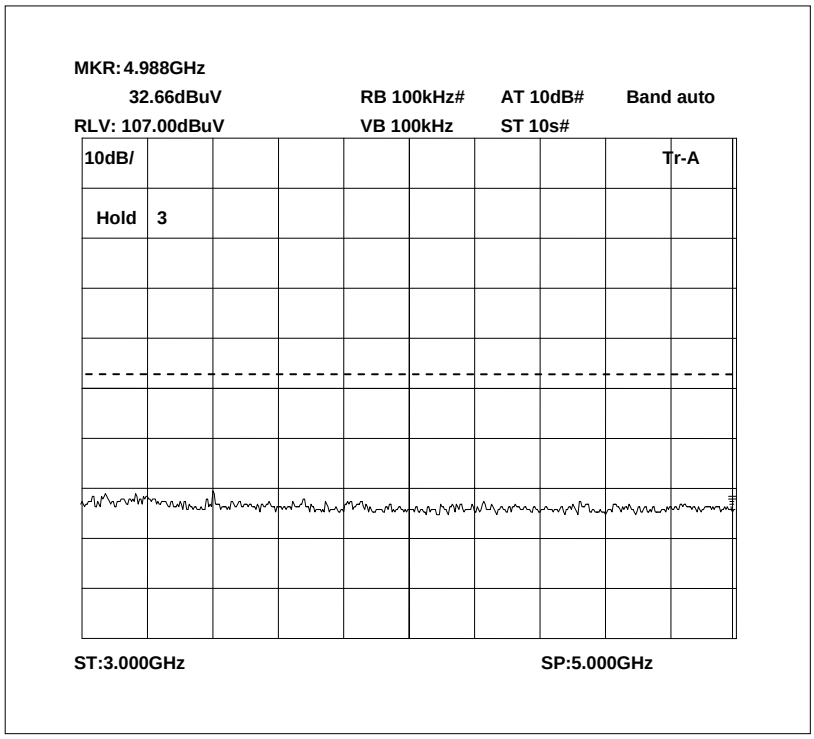


Radiated emissions no input signal 1 – 3GHz



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

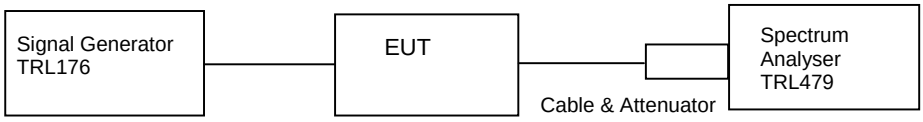
Radiated emissions no input signal 3 – 5GHz



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 = 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 MHz	Voltage	Signal Generator input level dBm	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase 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

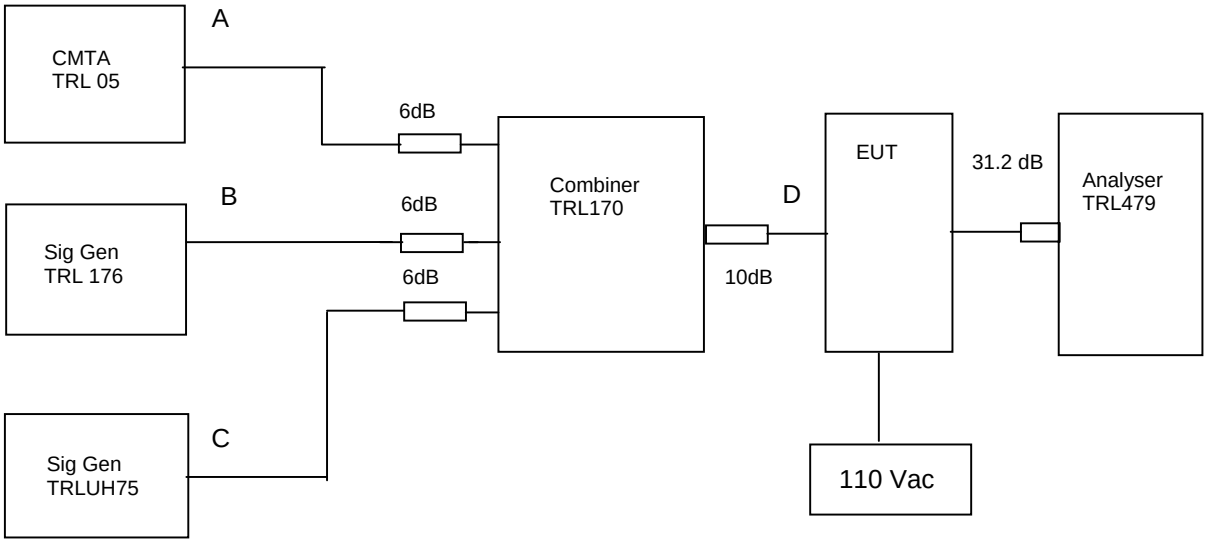
Frequency MHz	Voltage	Signal Generator input level dBm	Output Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Output Power dBm	Gain after 10dB input level increase dBm
496.3375	110 Vac	-41.35	31.2	-2.22	70.33	28.98	61.15
496.4750	110 Vac	-41.35	31.2	-1.53	71.02	29.67	60.97
496.6125	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 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 = 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.

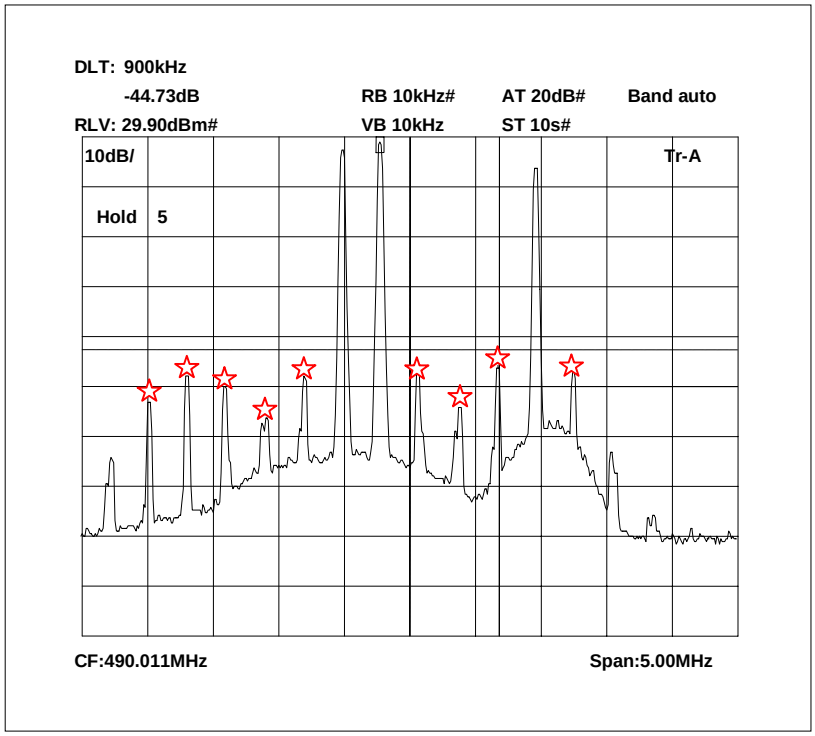
RF Input Frequency (MHz)			Highest Intermodulation Product Level (dBm)	Limit (dBm)
TRL05	TRL176	TRLUH75		
490.9625	489.786	489.5000	-15.73 dBm @ 490.6860 MHz	-13
496.6125	496.4125	496.3375	-13.69 dBm @ 496.5125 MHz	-13

Sweep data is shown on the next page:

Test equipment used for intermodulation test

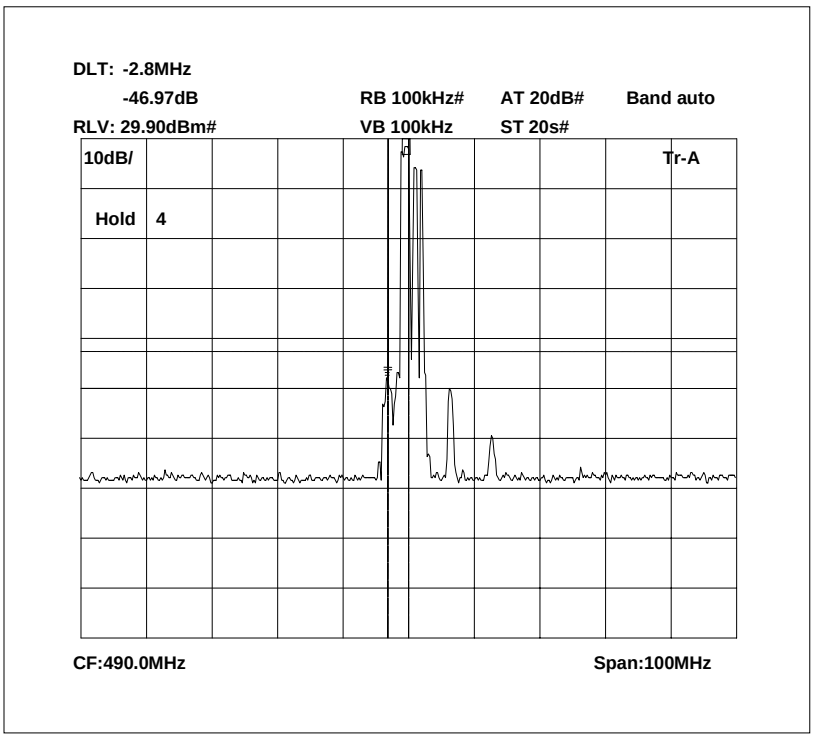
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**X**
SIGNAL GENERATOR	MARCONI	2022D	119215/058	UH75	**X**
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**
COMBINER	ELCOM	RC-4-50	N/A	170	**X**

Intermodulation Inband



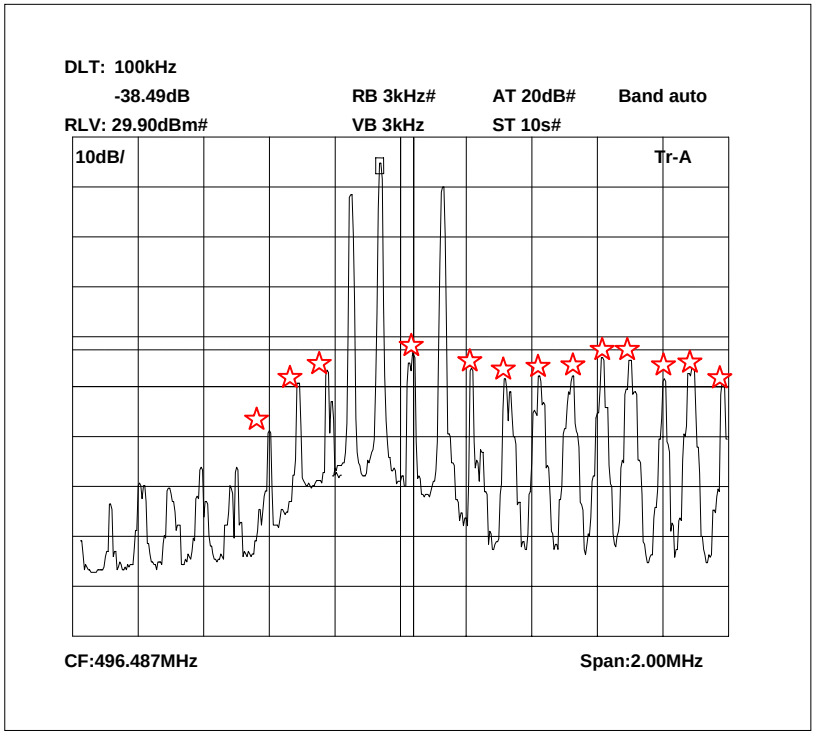
The above plot shows that all products (designated by ☆) are within 20 dB of the spurious limit.

Intermodulation Wideband



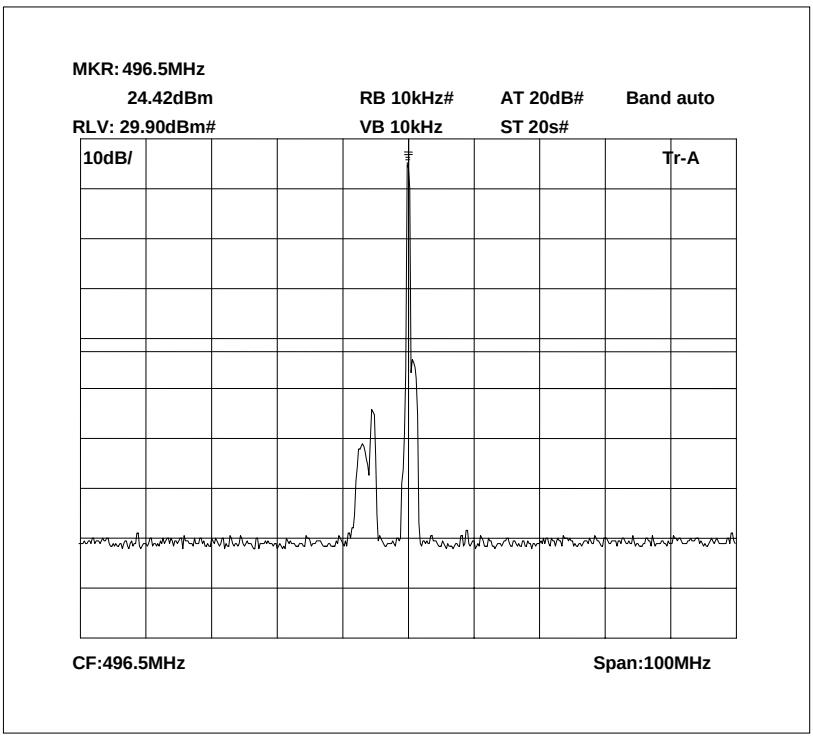
The above plot shows that there are no products outside the bands.

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.

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	

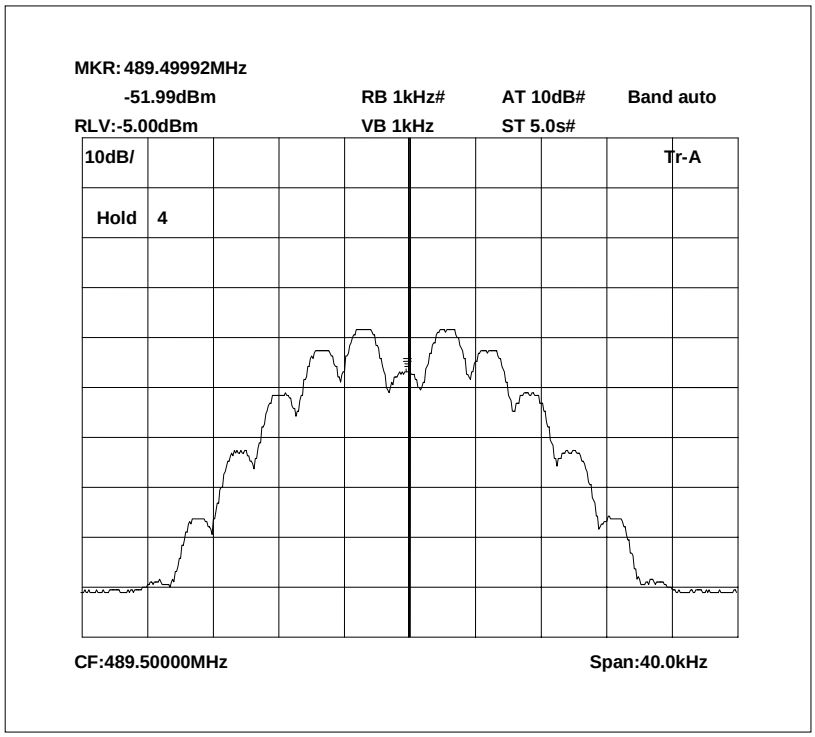
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-40dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

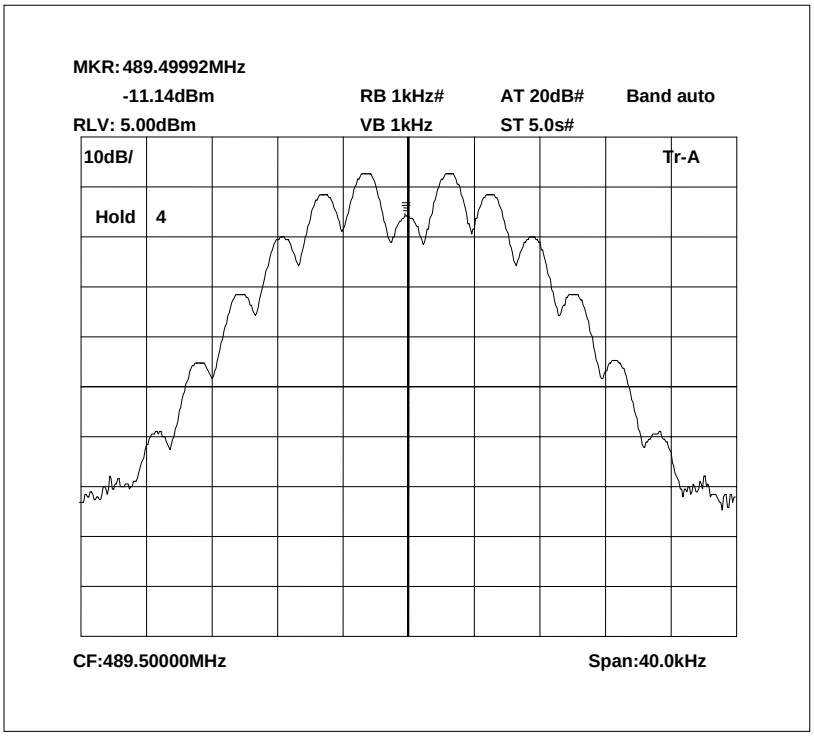
1. Cable attenuators between spectrum analyser and EUT = 32.1dB
2. Cable between signal generator and EUT = 0.35dB

TYPE OF 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**

489.5000 MHz Signal Generator, deviation set to 5kHz

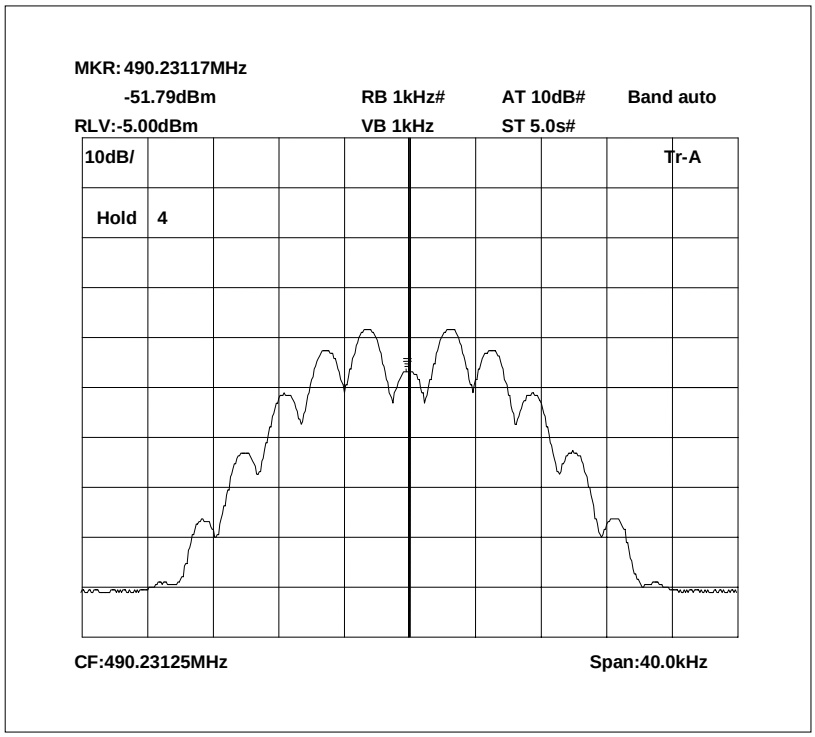


489.5000 MHz Signal Generator and EUT, deviation set to 5kHz

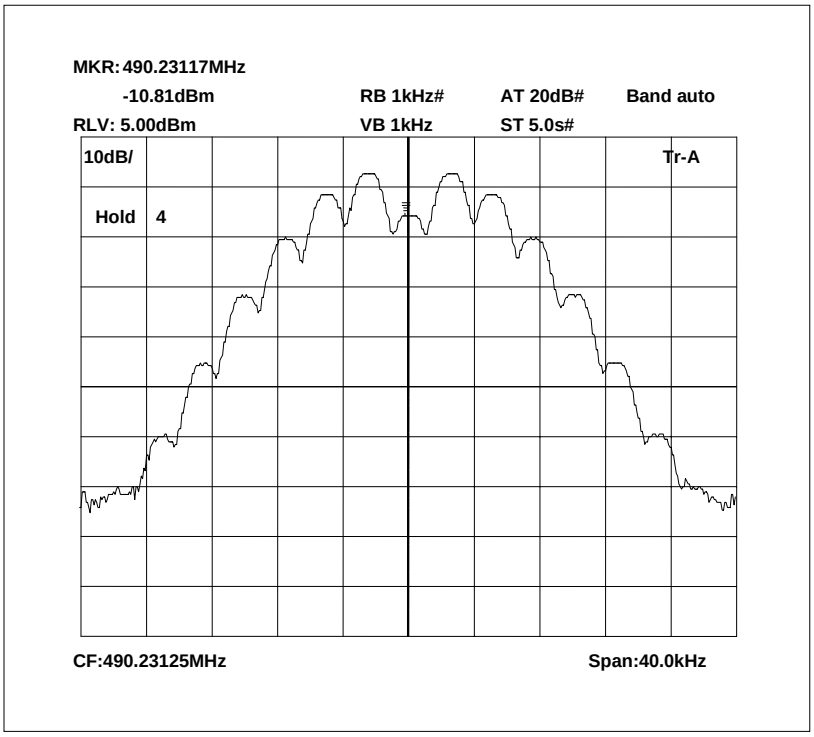


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

490.23125 MHz Signal Generator, deviation set to 5kHz

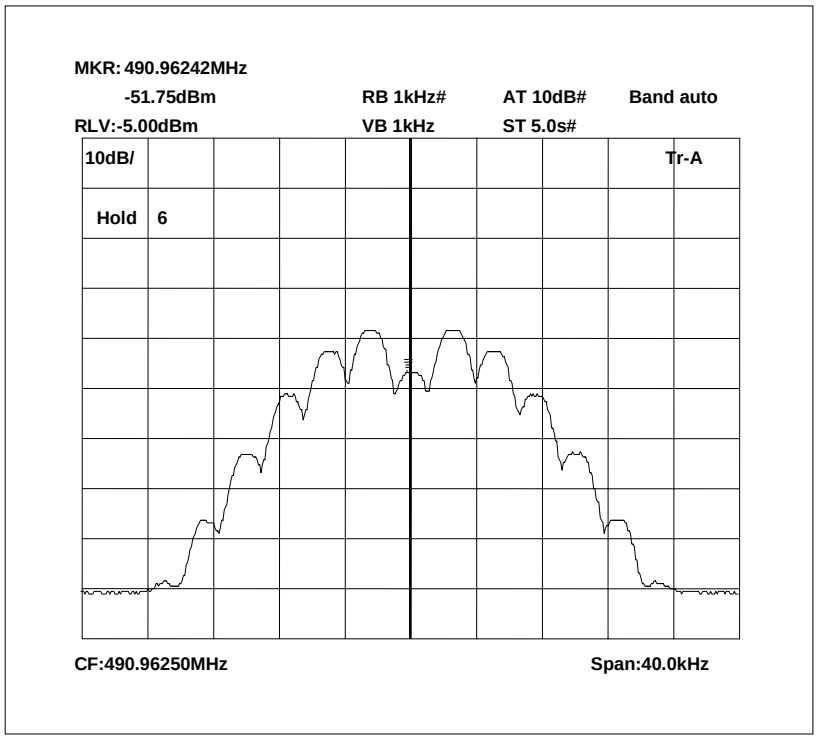


490.23125 MHz Signal Generator and EUT, deviation set to 5kHz

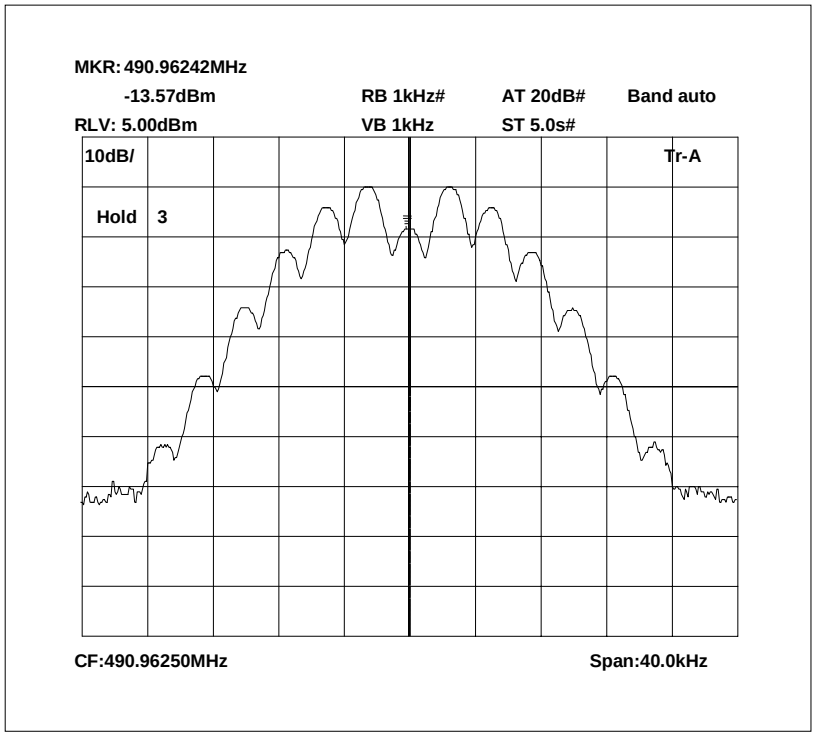


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

490.9625 MHz Signal Generator, deviation set to 5kHz

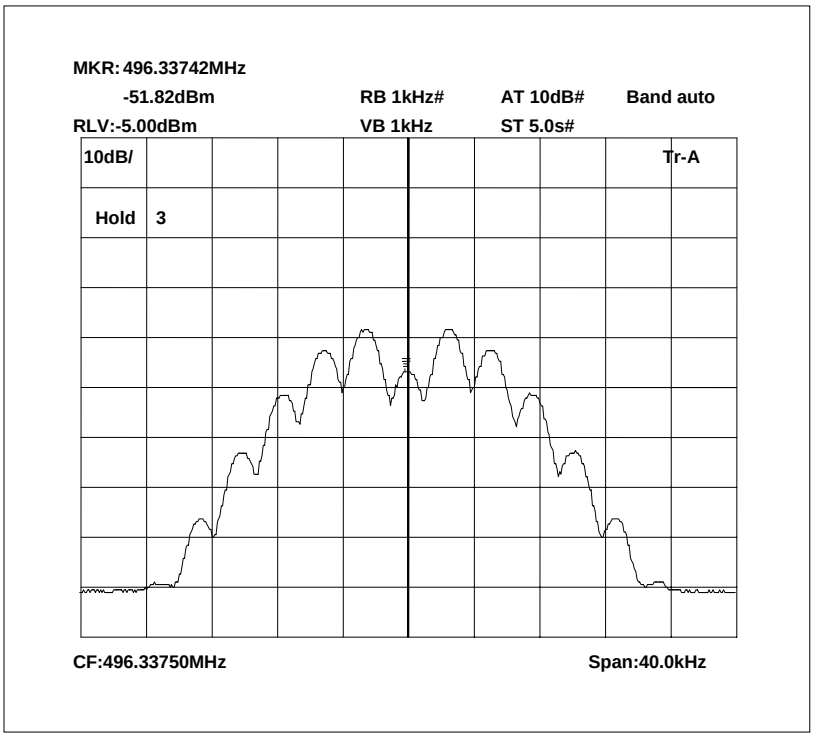


490.9625 MHz Signal Generator and EUT, deviation set to 5kHz

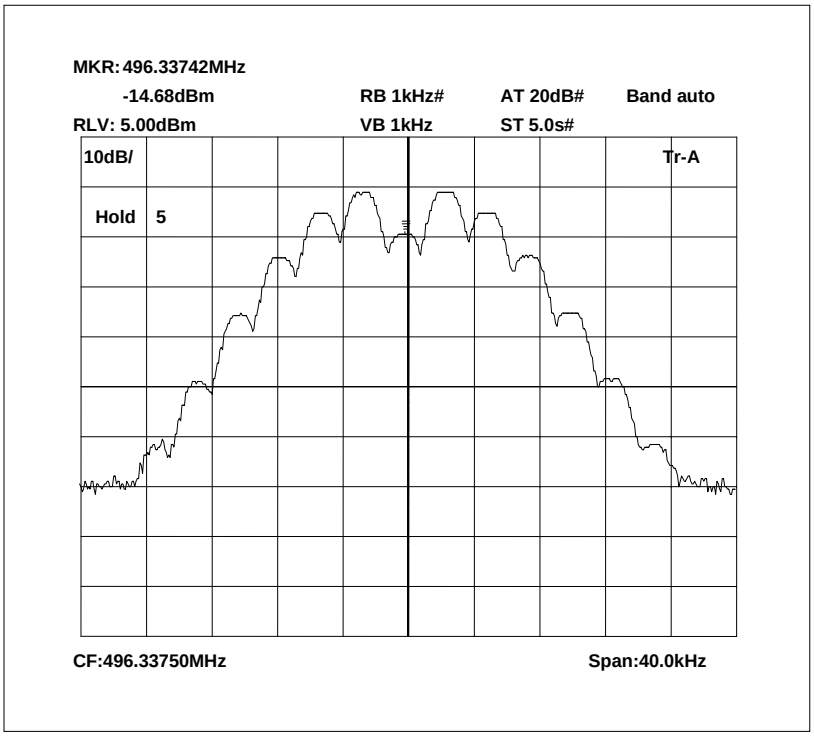


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

496.3375 MHz Signal Generator, deviation set to 5kHz

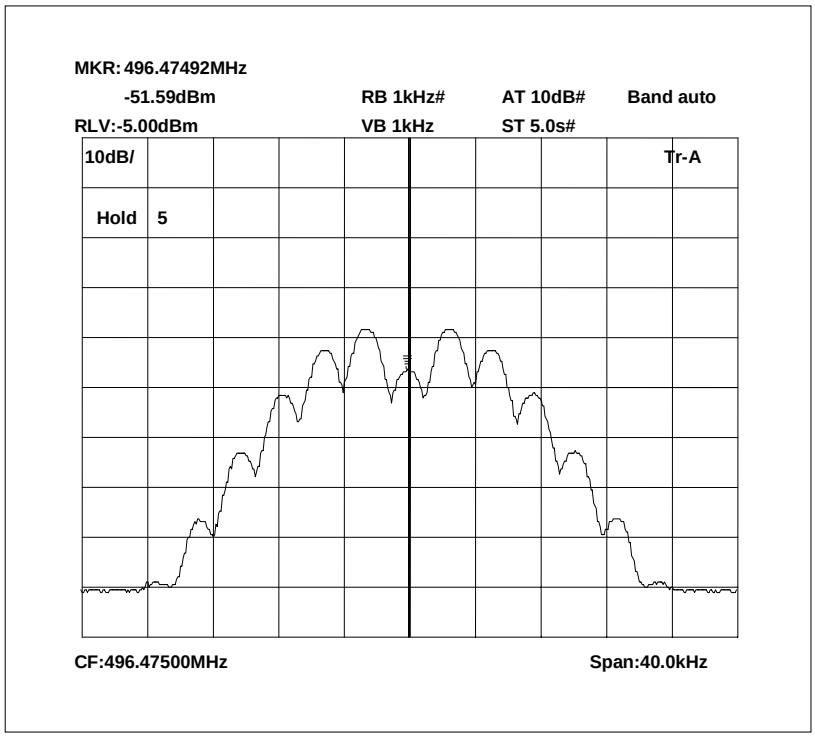


496.3375 MHz Signal Generator and EUT, deviation set to 5kHz

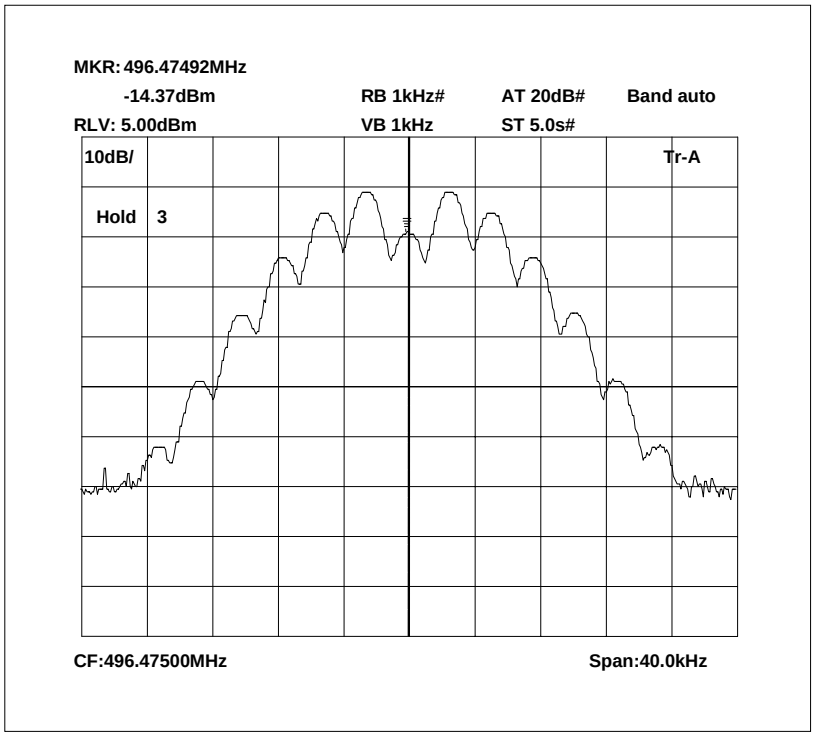


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

496.4750 MHz Signal Generator, deviation set to 5kHz

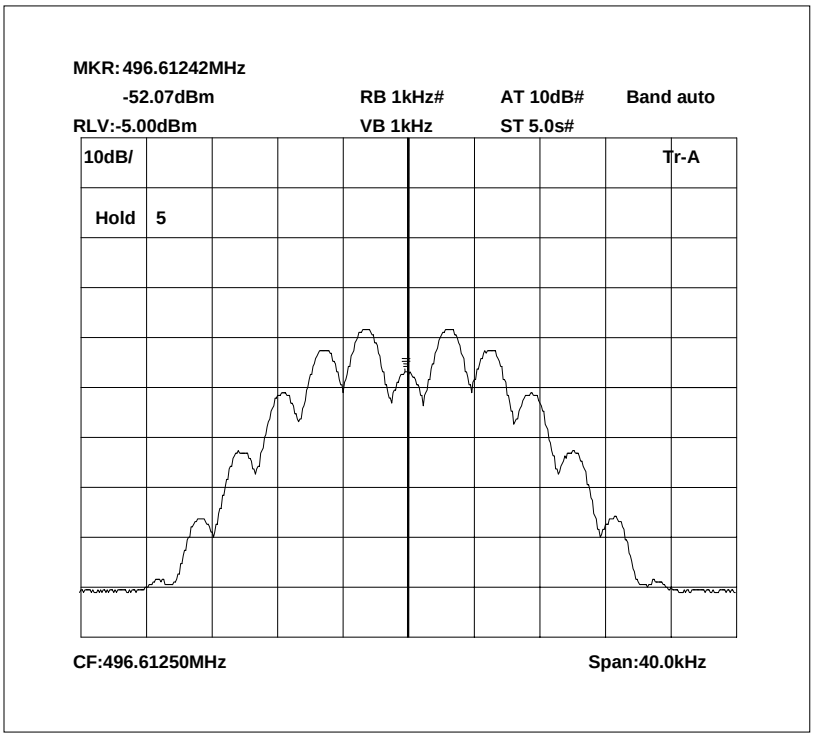


496.4750 MHz Signal Generator and EUT, deviation set to 5kHz

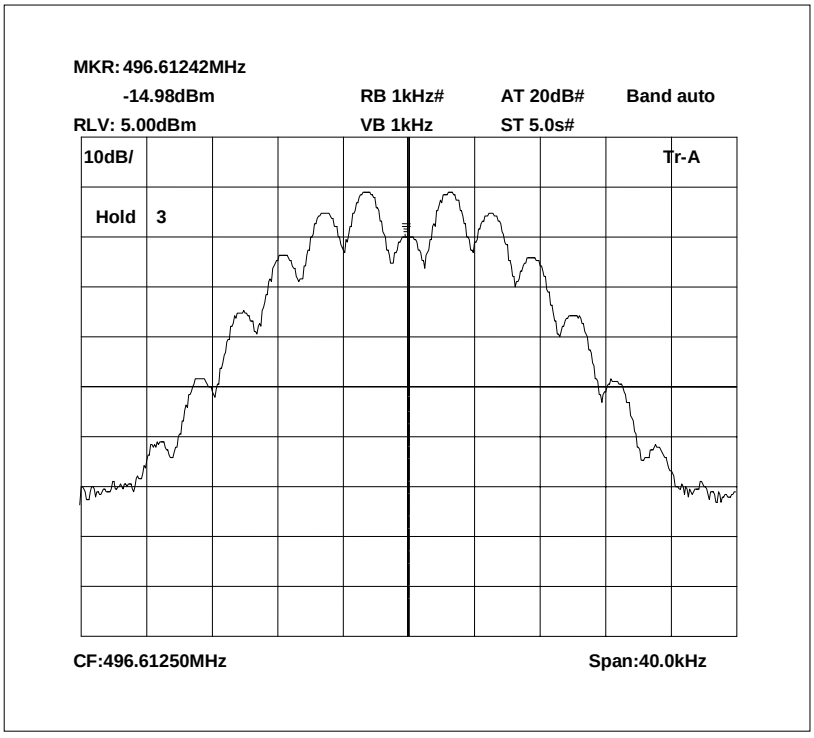


The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

496.6125 MHz Signal Generator, deviation set to 5kHz



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



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

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1053 – DOWNLINK

Ambient temperature	=	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

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

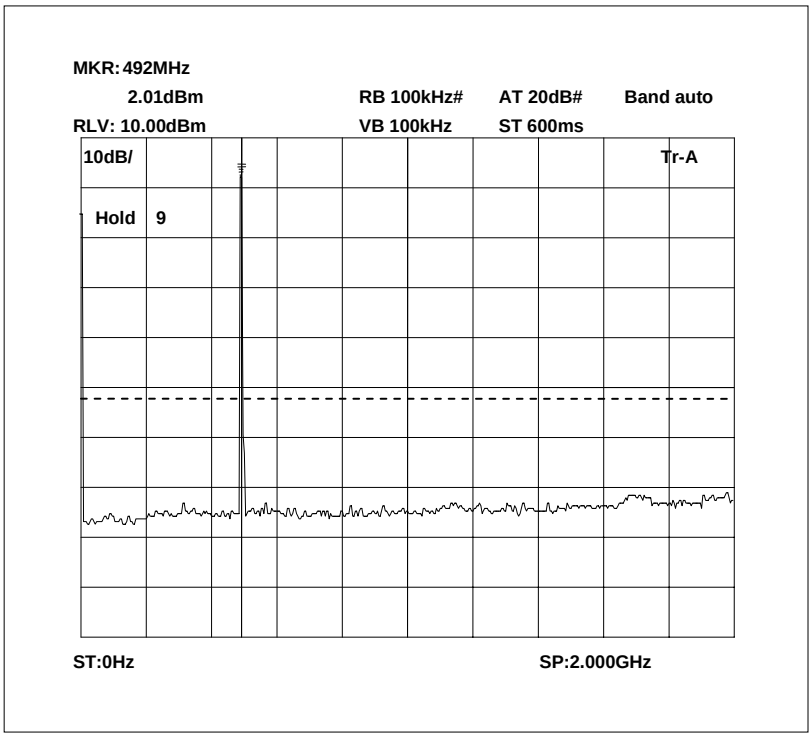
RESULTS

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

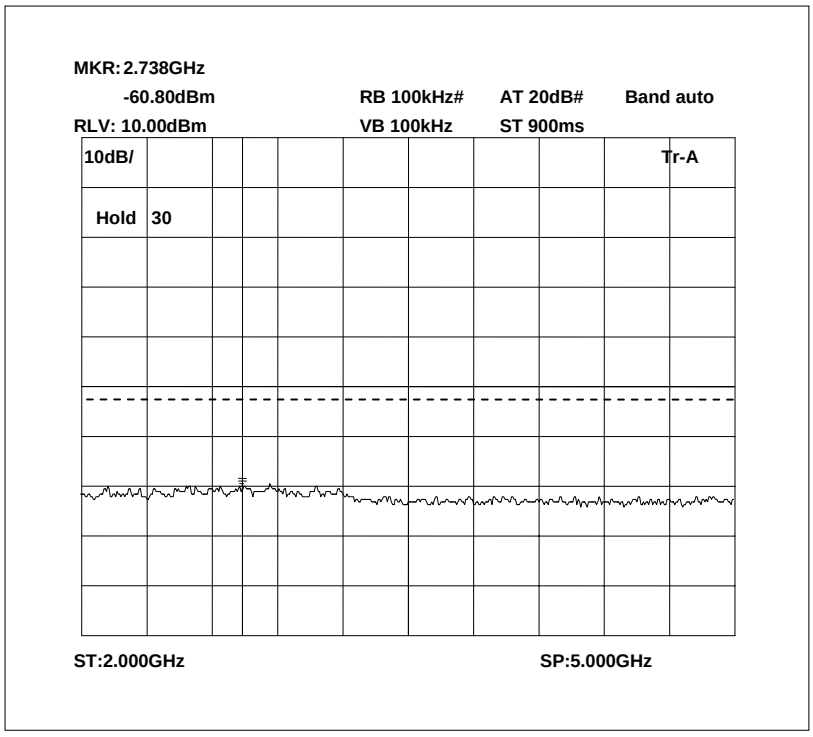
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	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**
CABLE	N/A	N/A	N/A	UH254	**X**
SIGNAL GENERATOR	MARCONI	2042	119388/080	176	**X**

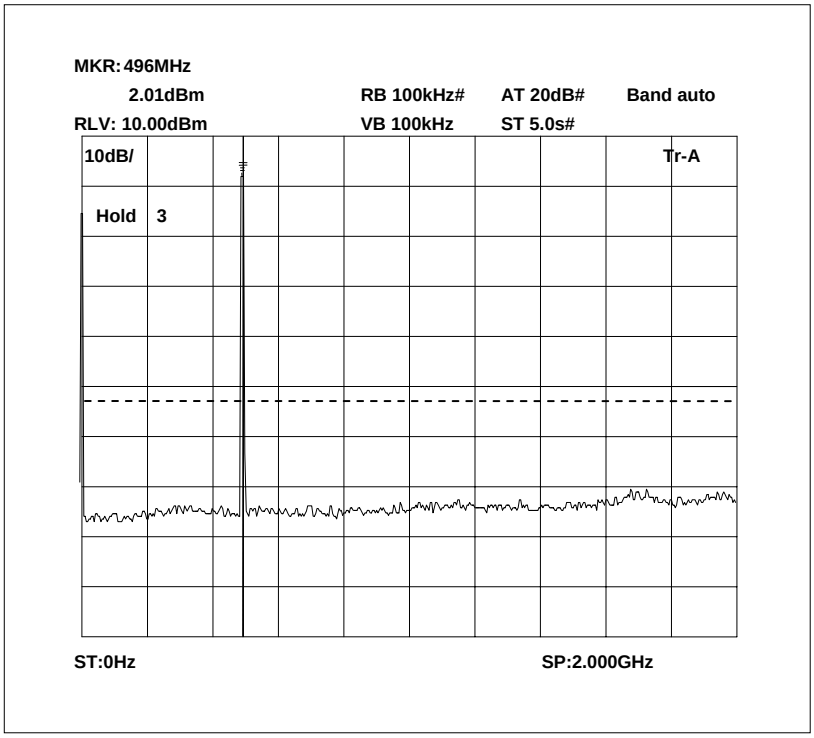
Conducted emissions 489.5000 MHz 0 – 2GHz



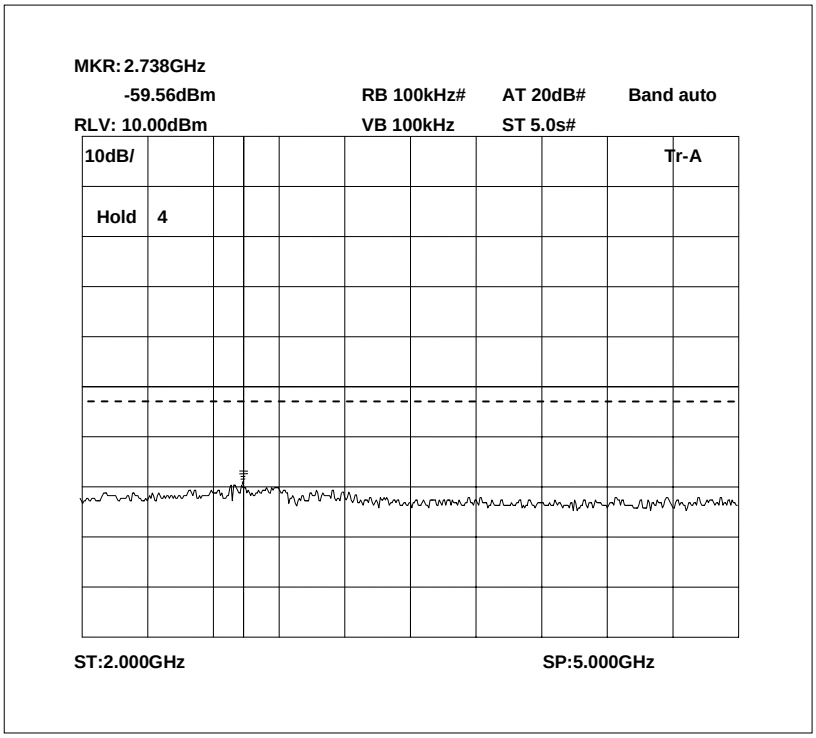
Conducted emissions 489.5000 MHz 2 – 5GHz



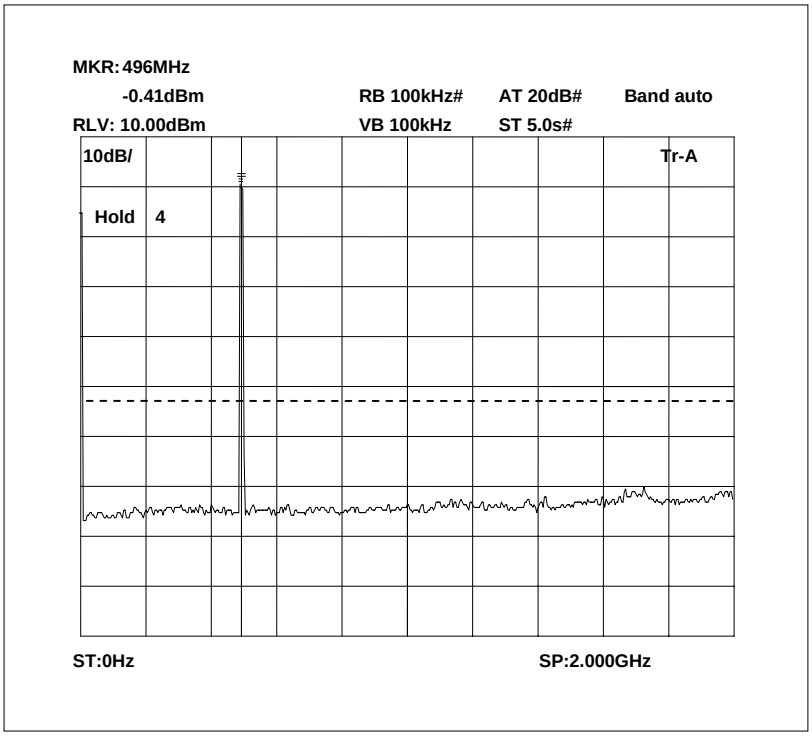
Conducted emissions 490.23125 MHz 0 – 2GHz



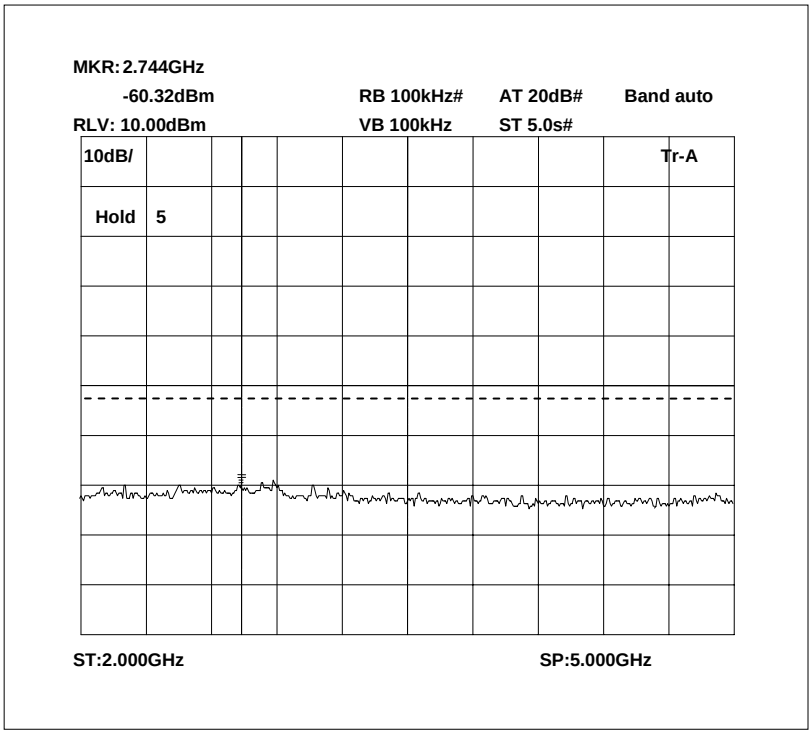
Conducted emissions 490.23125 MHz 2 – 5GHz



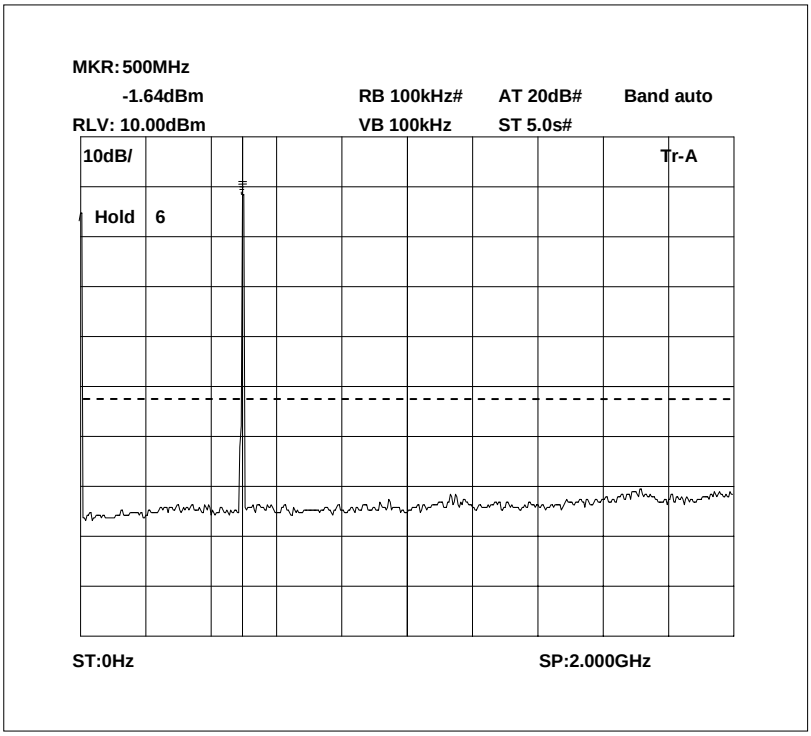
Conducted emissions 490.9625 MHz 0 – 2GHz



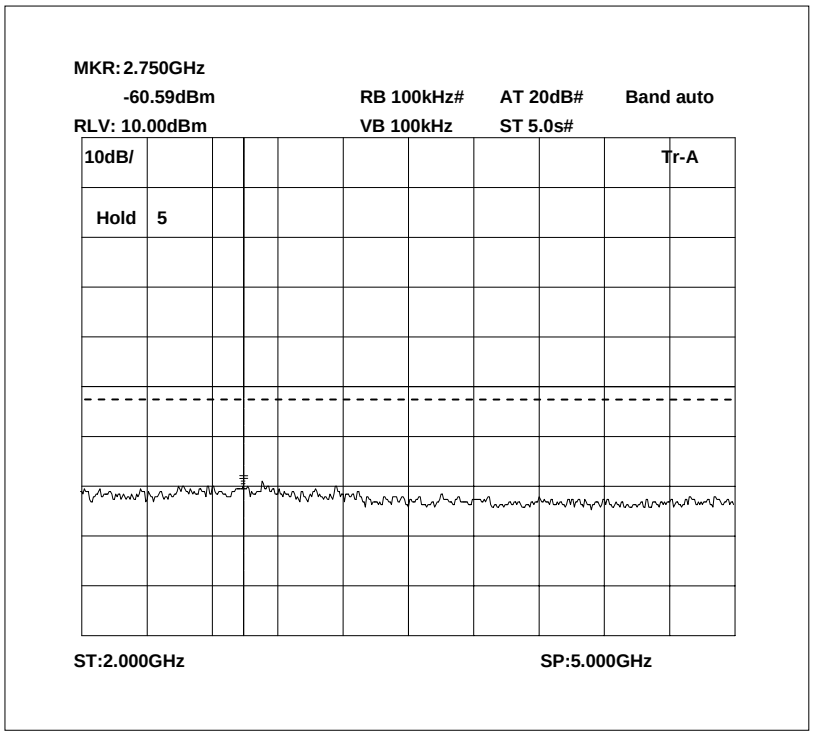
Conducted emissions 490.9625 MHz 2 – 5GHz



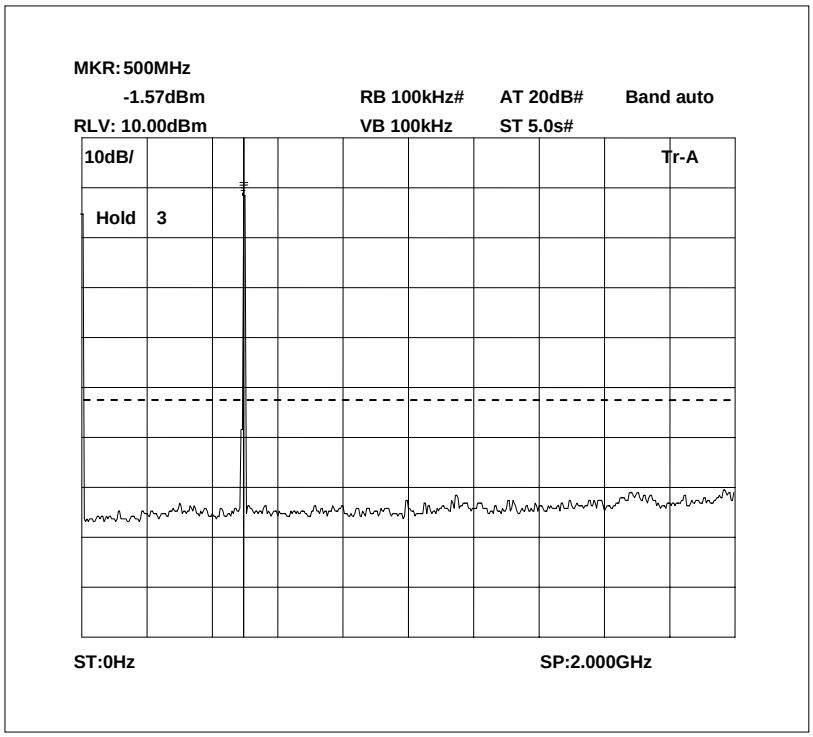
Conducted emissions 496.3375 MHz 0 – 2GHz



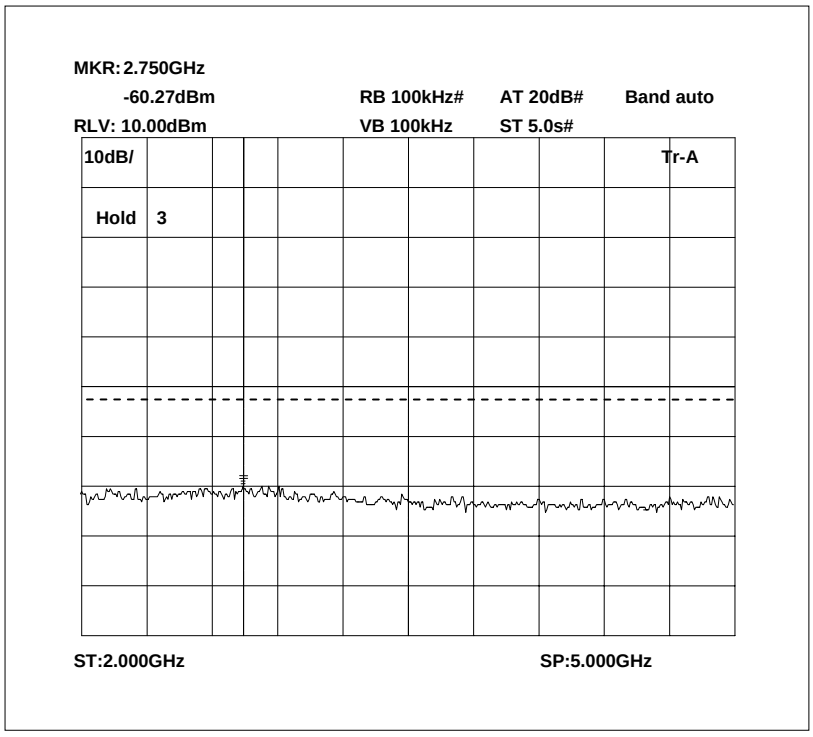
Conducted emissions 496.3375 MHz 2 – 5GHz



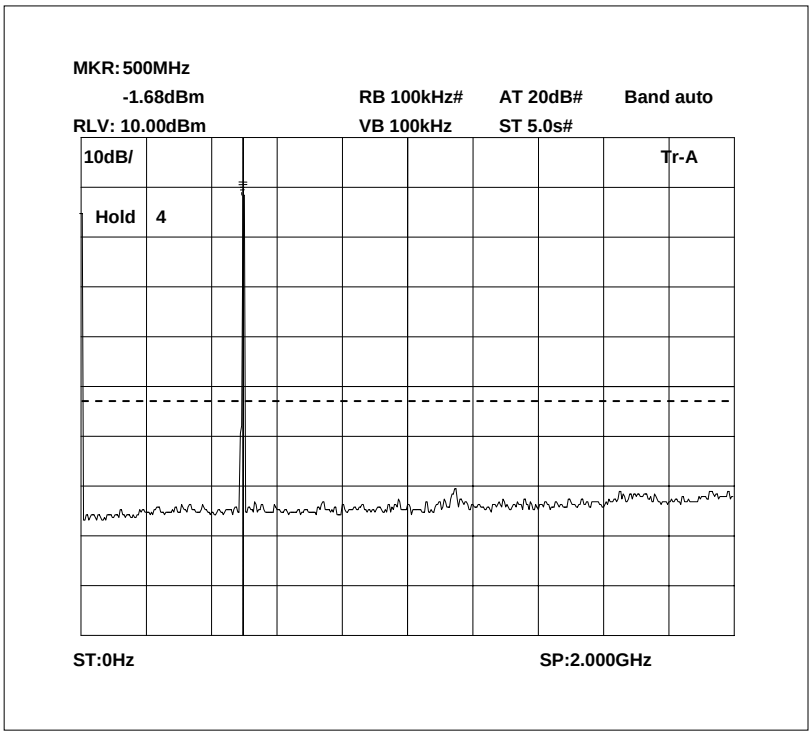
Conducted emissions 496.4750 MHz 0 – 2GHz



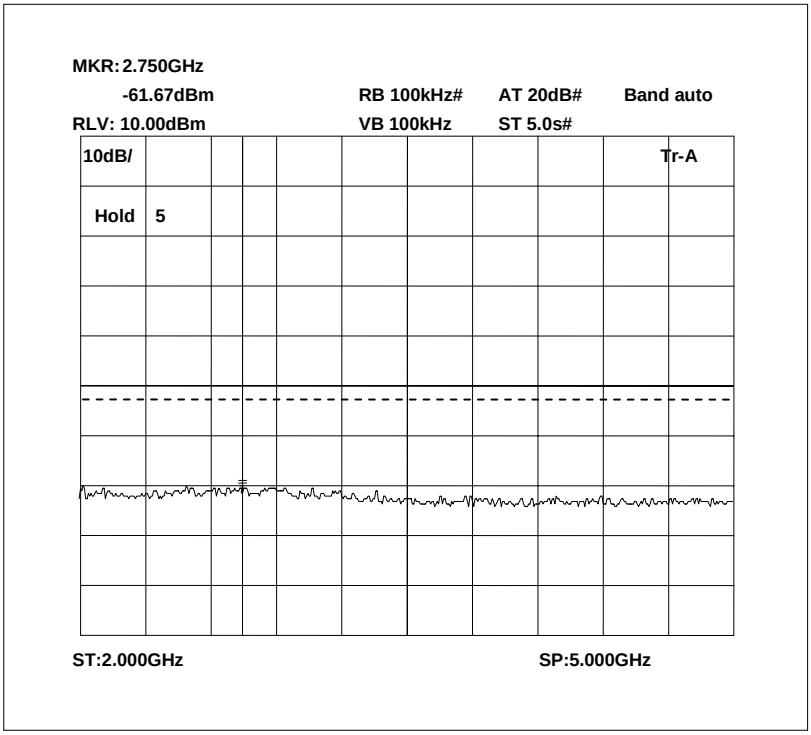
Conducted emissions 496.4750 MHz 2 – 5GHz



Conducted emissions 496.6125 MHz 0 – 2GHz



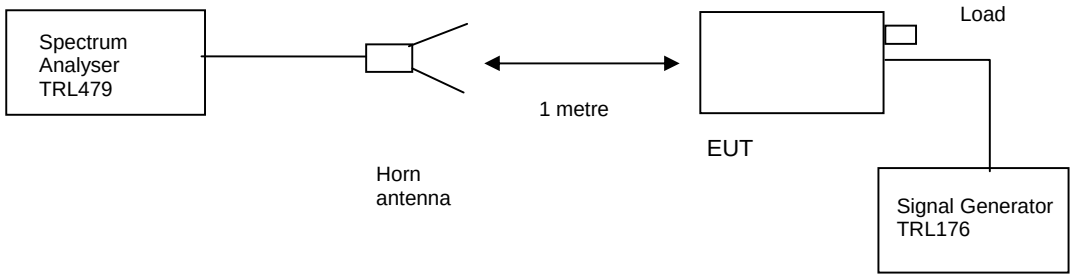
Conducted emissions 496.6125 MHz 2 – 5GHz



TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– DOWNLINK

Ambient temperature	=	25°C	Test Signal	=	F3E
Relative humidity	=	41%			
Conditions	=	OATS			
Supply voltage	=	+110 Vac			
Supply Frequency	=	N/A			



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

The Spurious limit was calculated as follows:

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

At least 43 + 10 log PdB

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

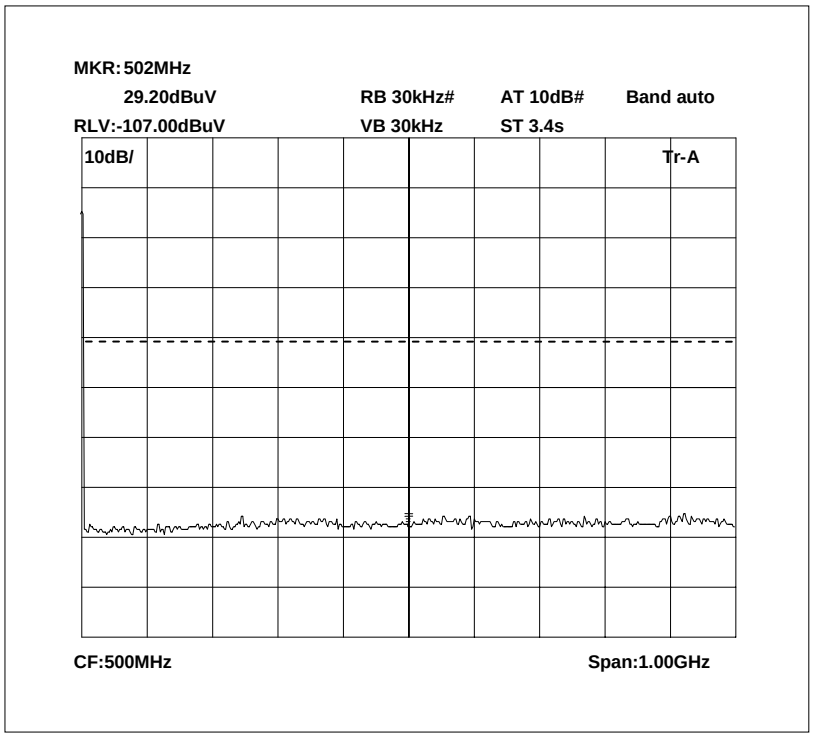
RESULTS

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

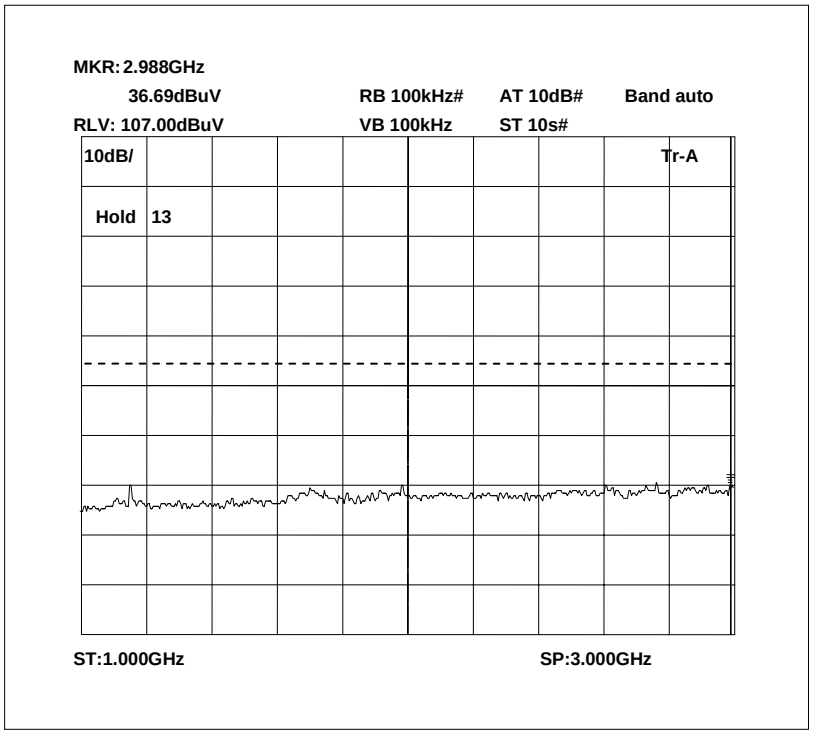
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	**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 489.5000 MHz 0 – 1GHz

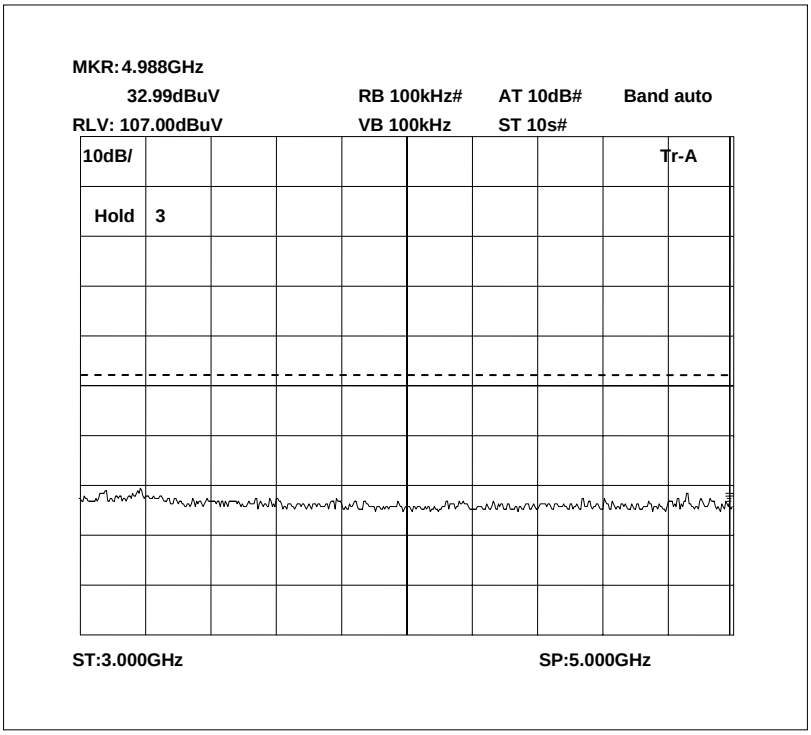


Radiated emissions 489.5000 MHz 1 – 3GHz



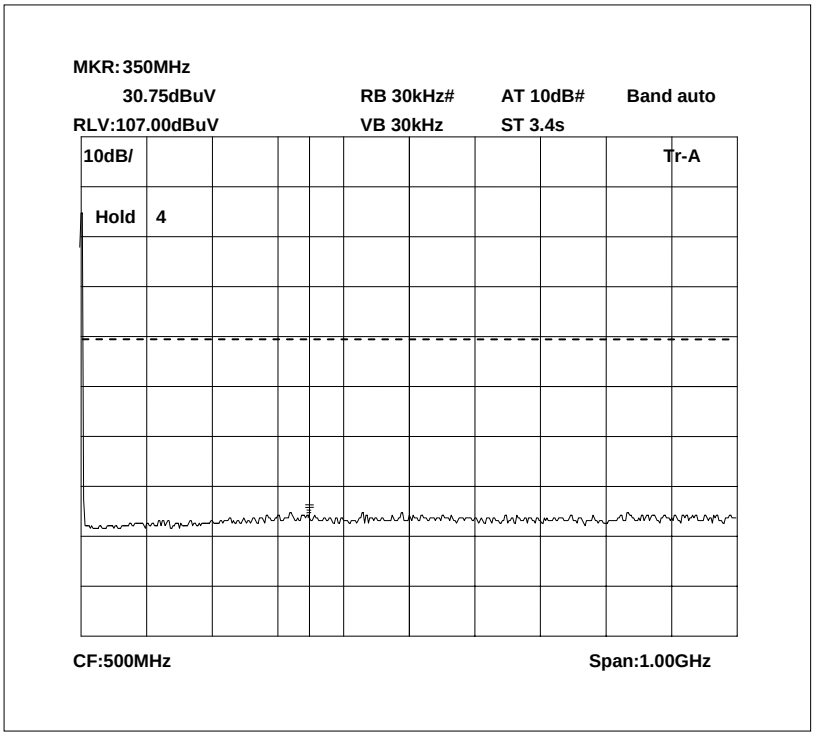
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 489.5000 MHz 3 – 5GHz

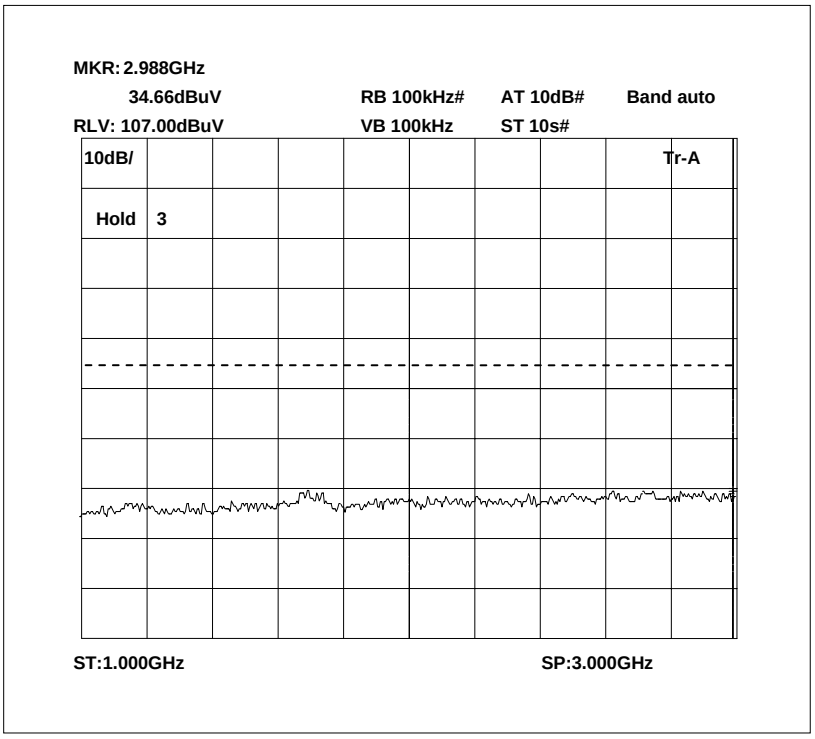


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 490.23125 MHz 0 – 1GHz

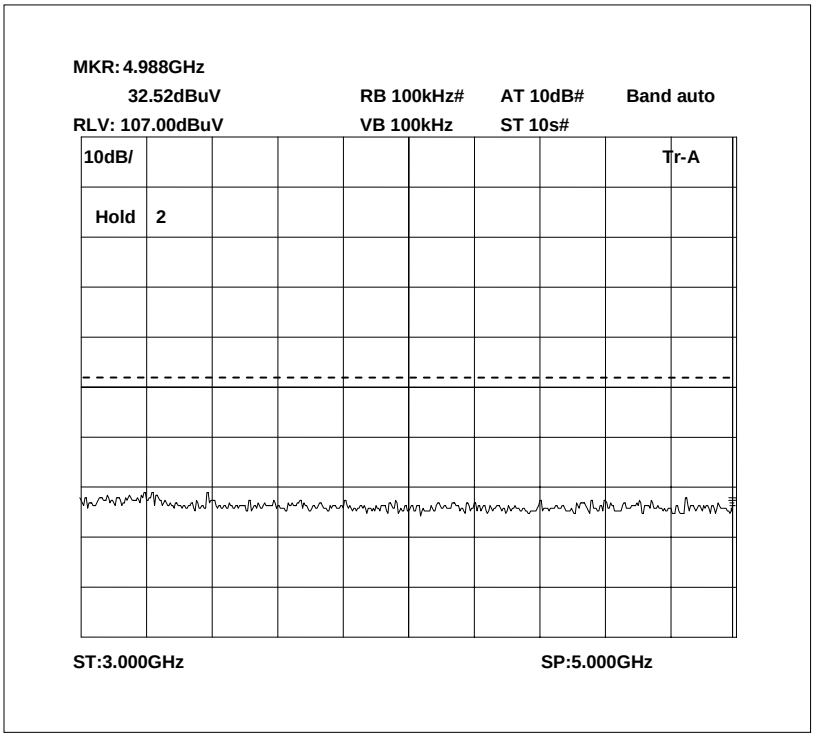


Radiated emissions 490.23125 MHz 1 – 3GHz



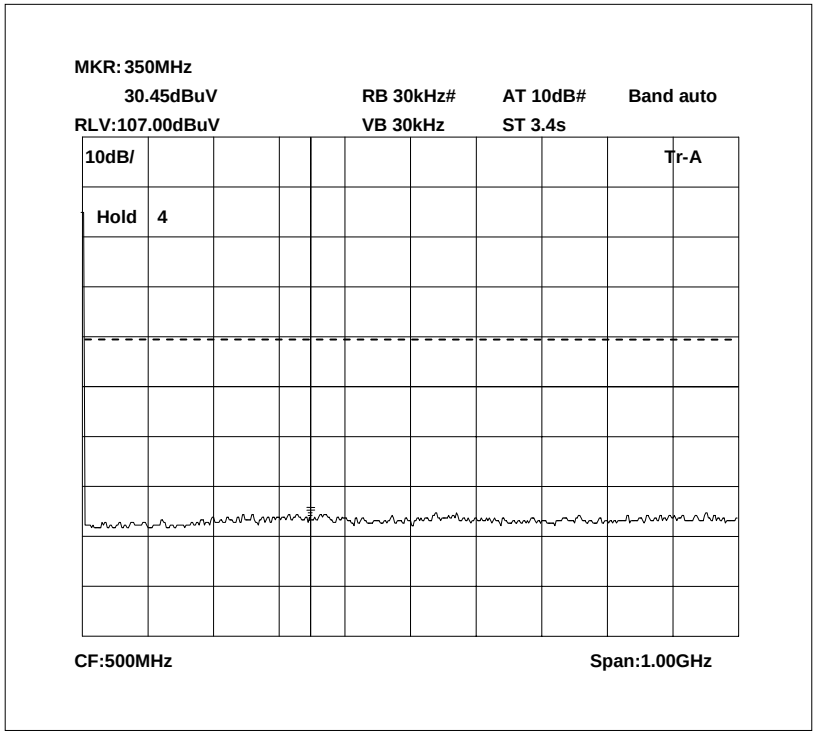
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 490.23125 MHz 3 – 5GHz

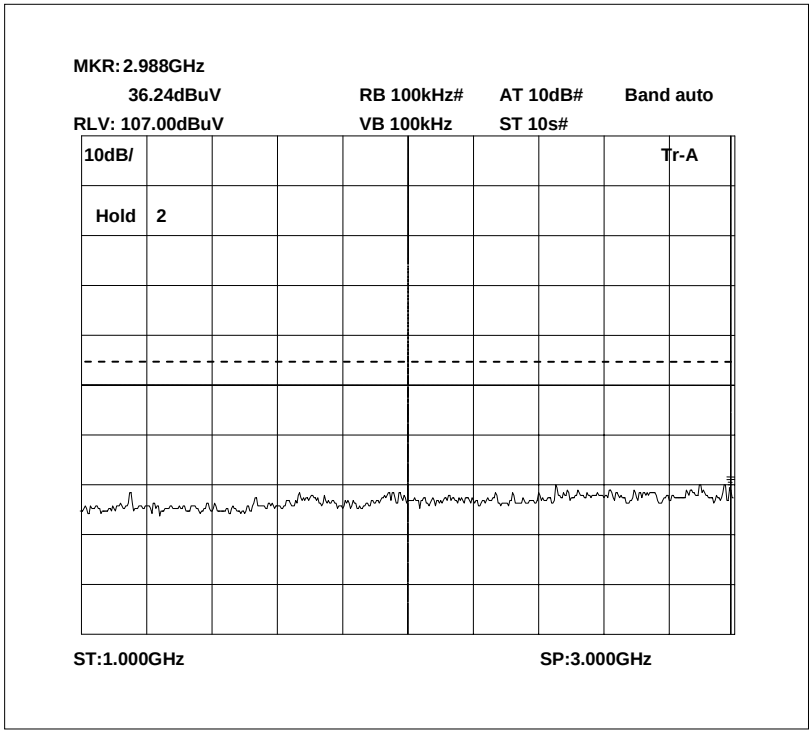


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 490.9625 MHz 0 – 1GHz

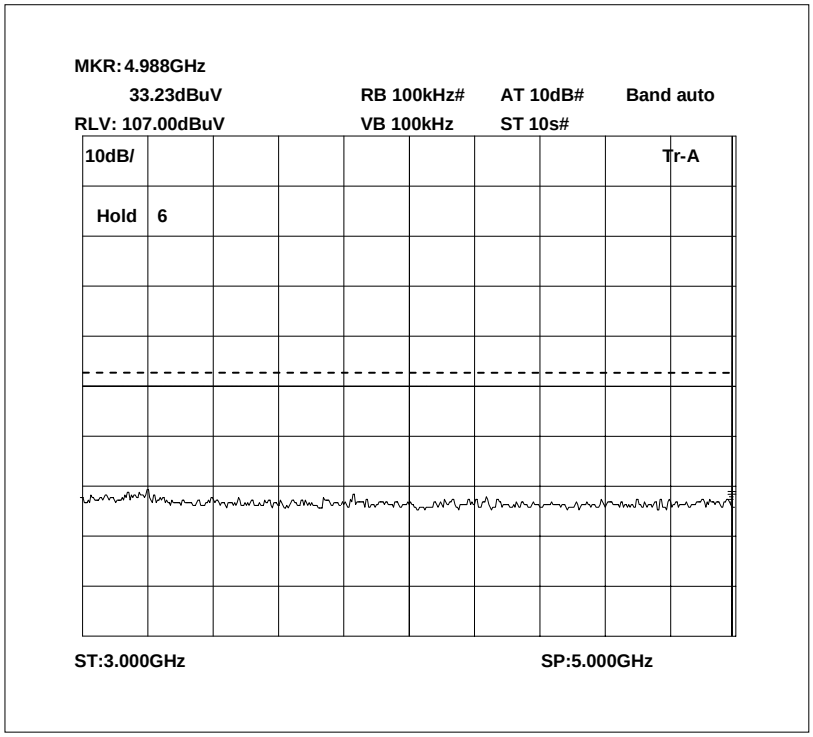


Radiated emissions 490.9625 MHz 1 – 3GHz



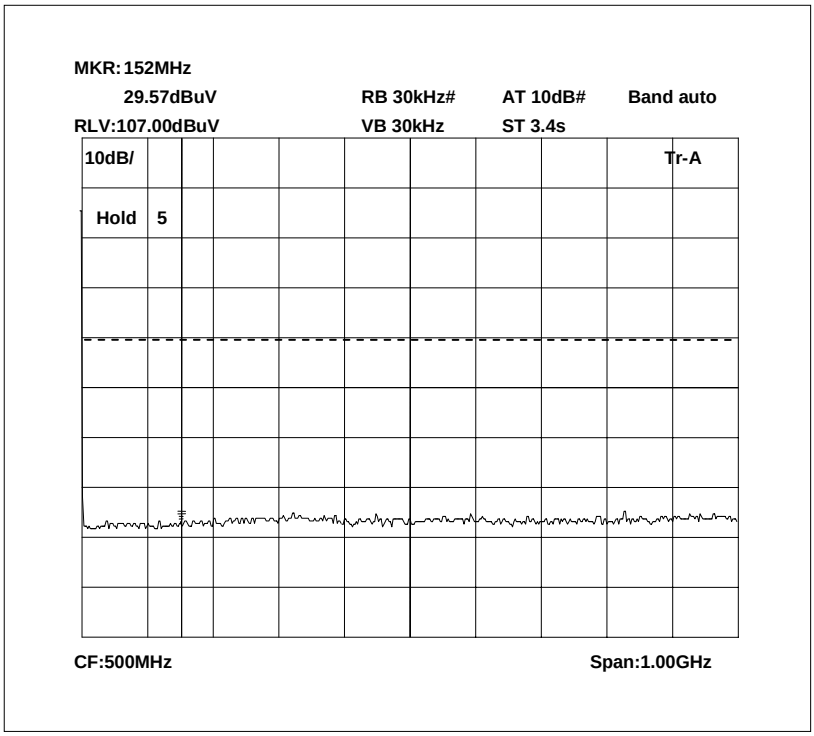
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 490.9625 MHz 3 – 5GHz

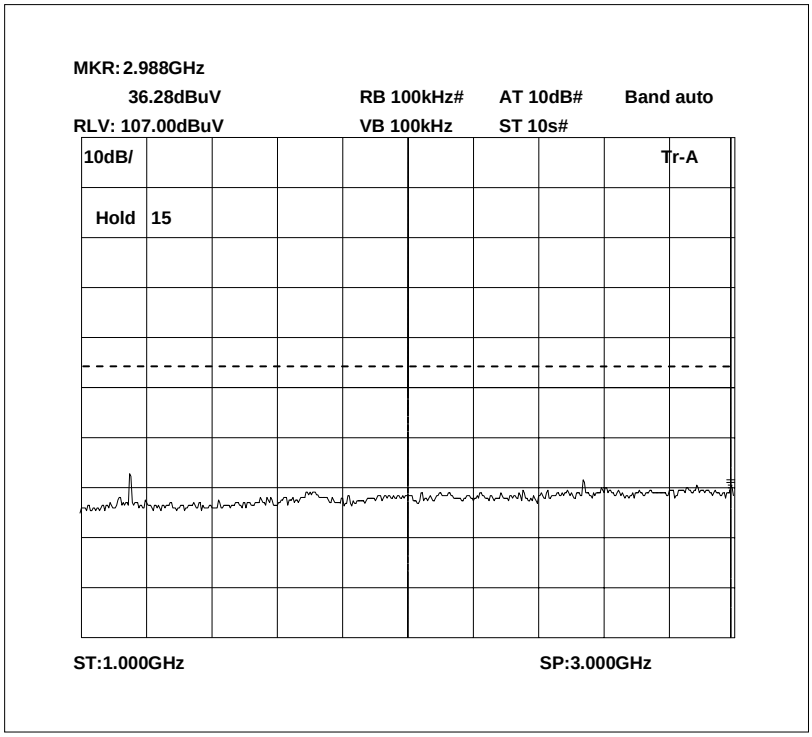


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 496.3375 MHz 0 – 1GHz

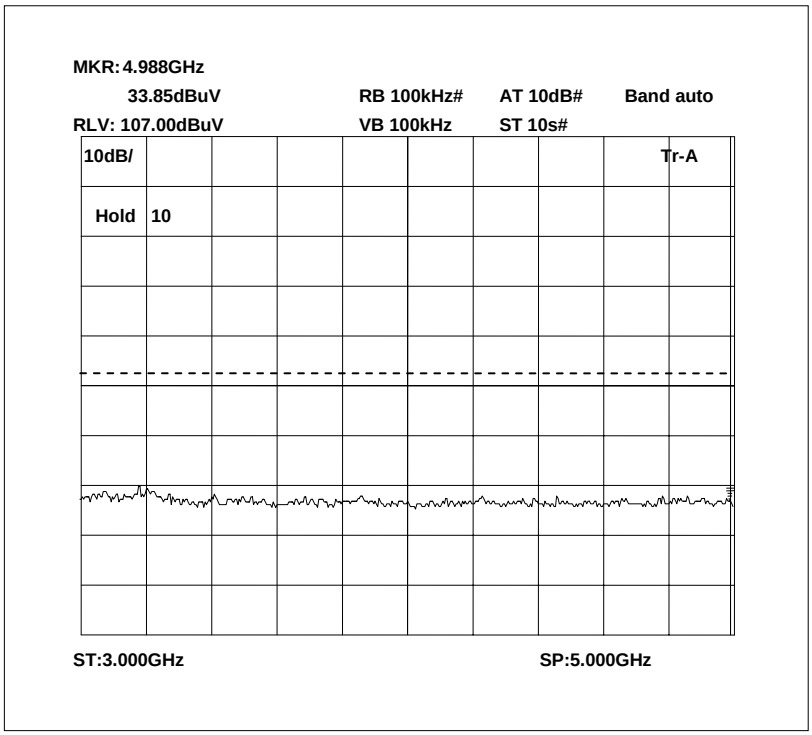


Radiated emissions 496.3375 MHz 1 – 3GHz



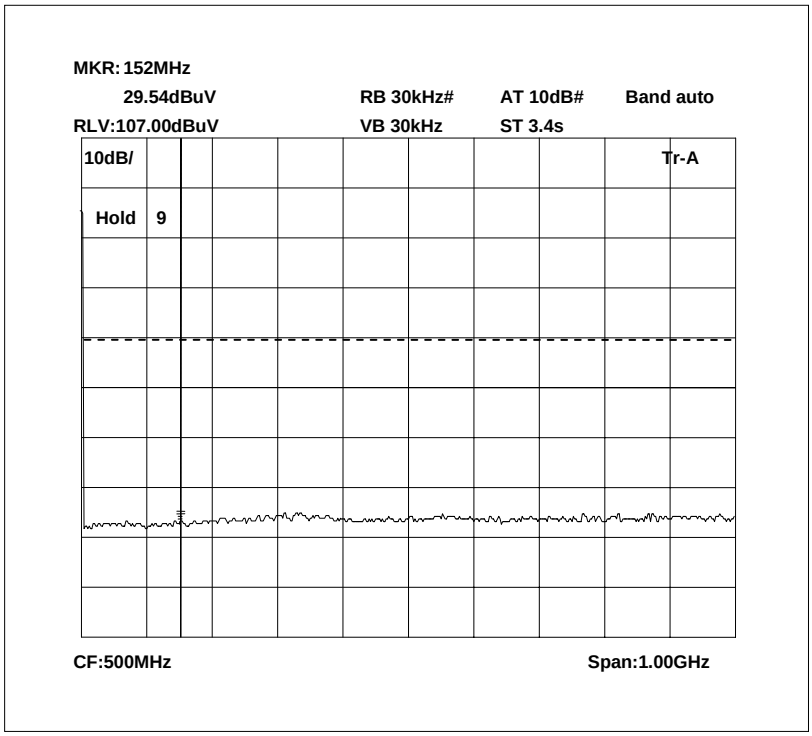
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 496.3375 MHz 3 – 5GHz

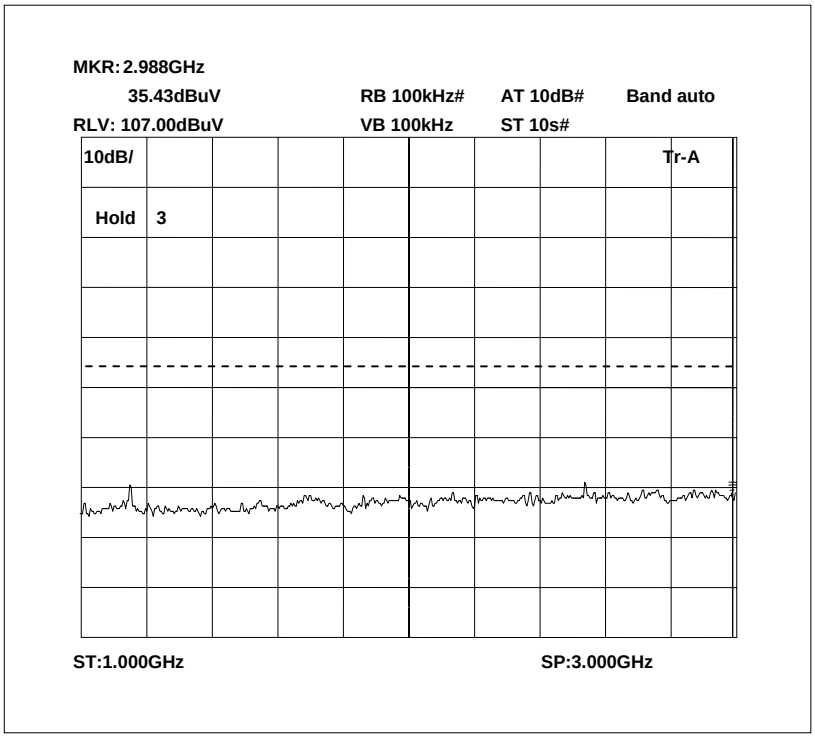


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 496.4750 MHz 0 – 1GHz

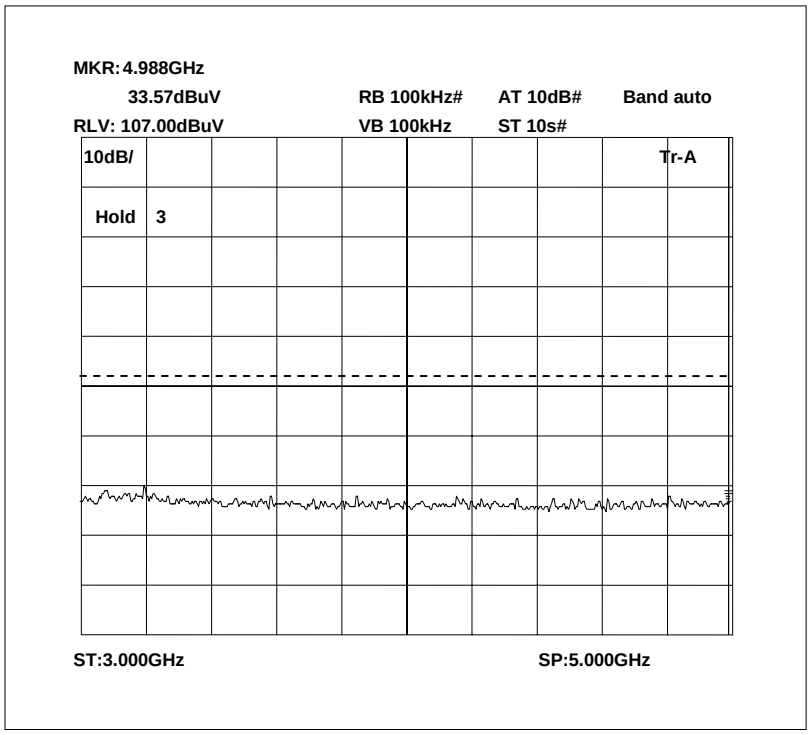


Radiated emissions 496.4750 MHz 1 – 3GHz



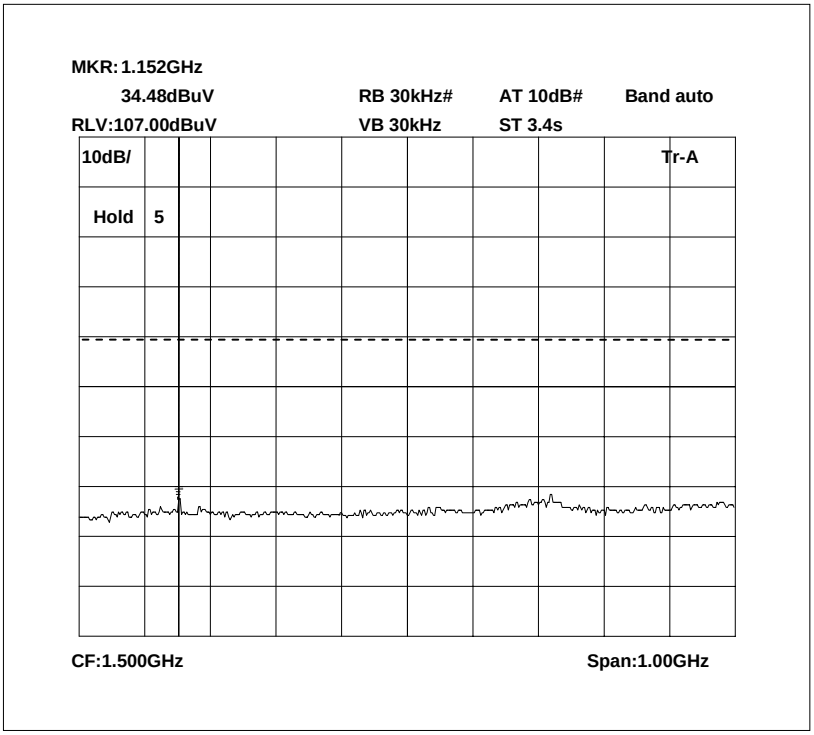
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 496.4750 MHz 3 – 5GHz

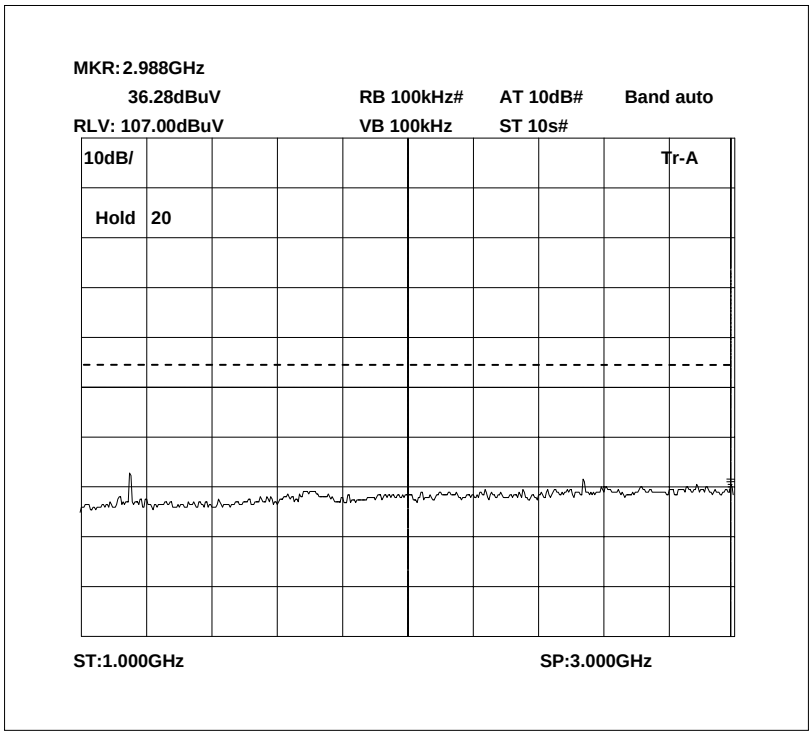


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 496.6125 MHz 0 – 1GHz

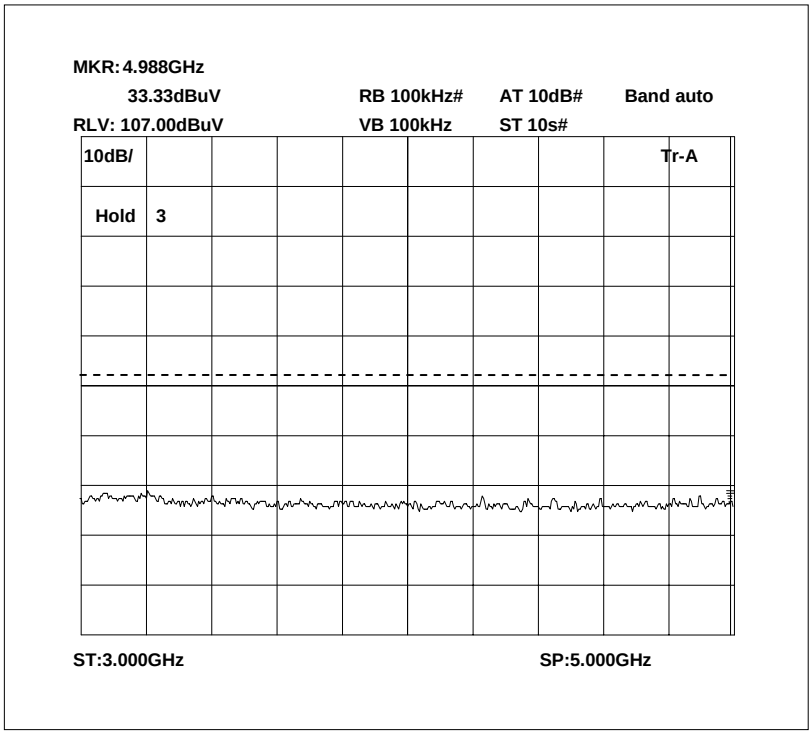


Radiated emissions 496.6125 MHz 1 – 3GHz



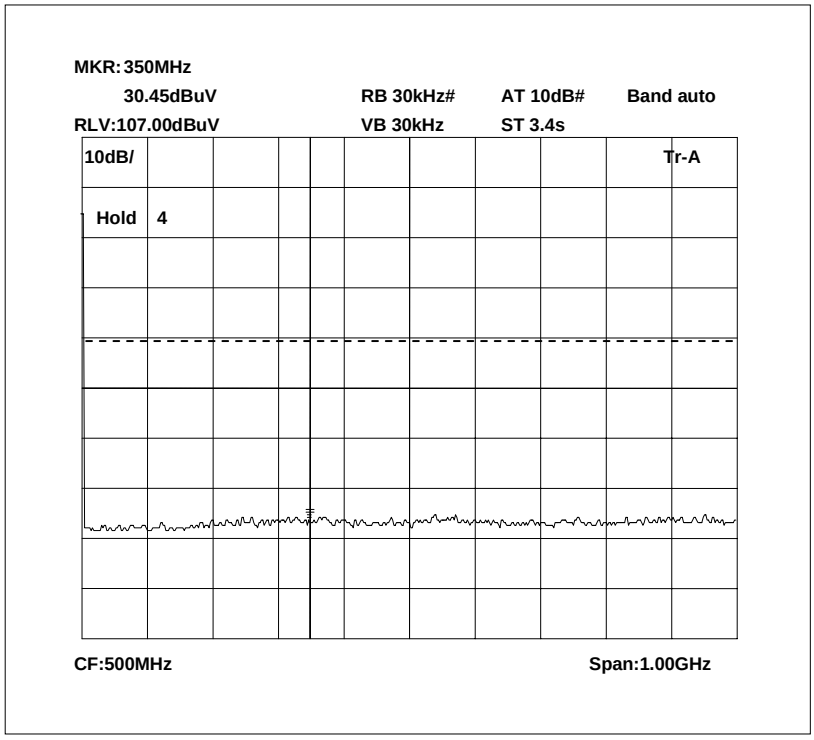
The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions 496.6125 MHz 3 – 5GHz

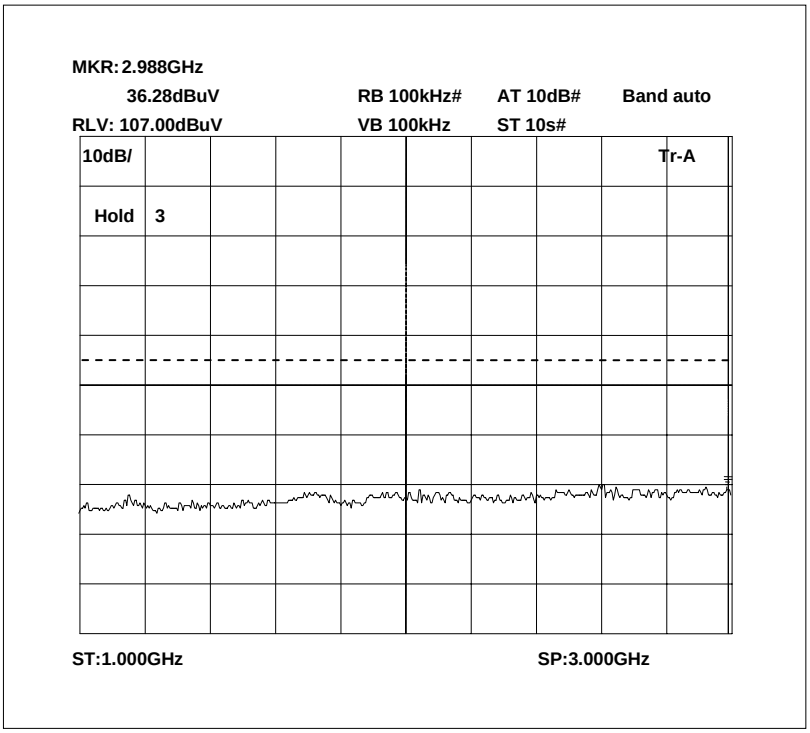


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

Radiated emissions no input signal 0 – 1GHz

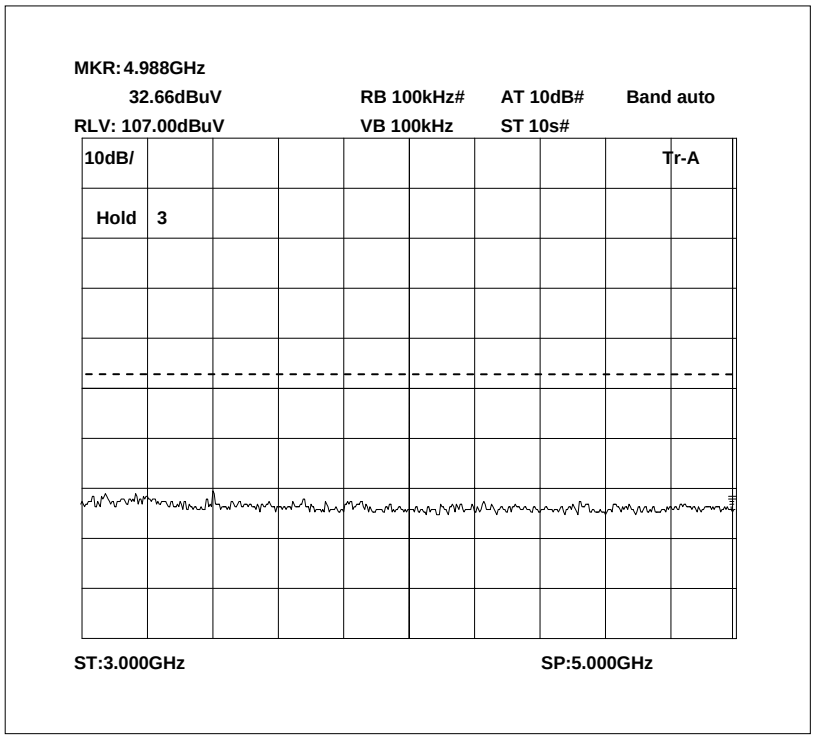


Radiated emissions no input signal 1 – 3GHz



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

Radiated emissions no input signal 3 – 5GHz

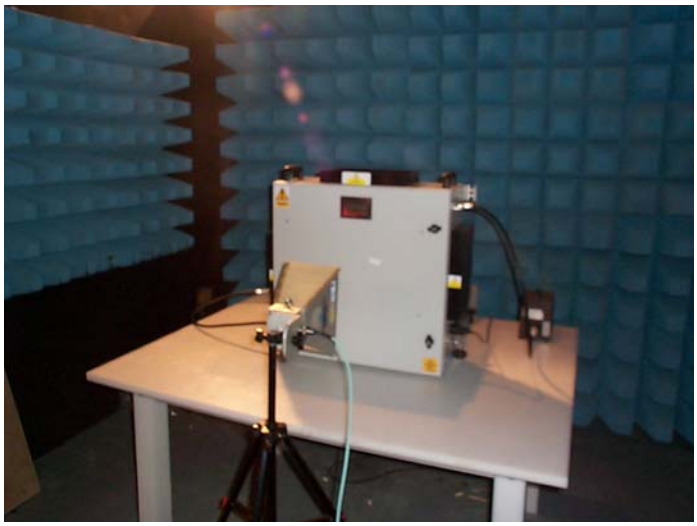


The above test results show that there were no emissions within 20dBs of the –13dBm limit.

ANNEX A

PHOTOGRAPHS

PHOTOGRAPH No. 1 **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

EQUIPMENT CALIBRATION

TRL Number	Equipment Type	Manufacturer	Last Cal Calibration	Calibration Period	Due For 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	AVOmeter	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

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%**

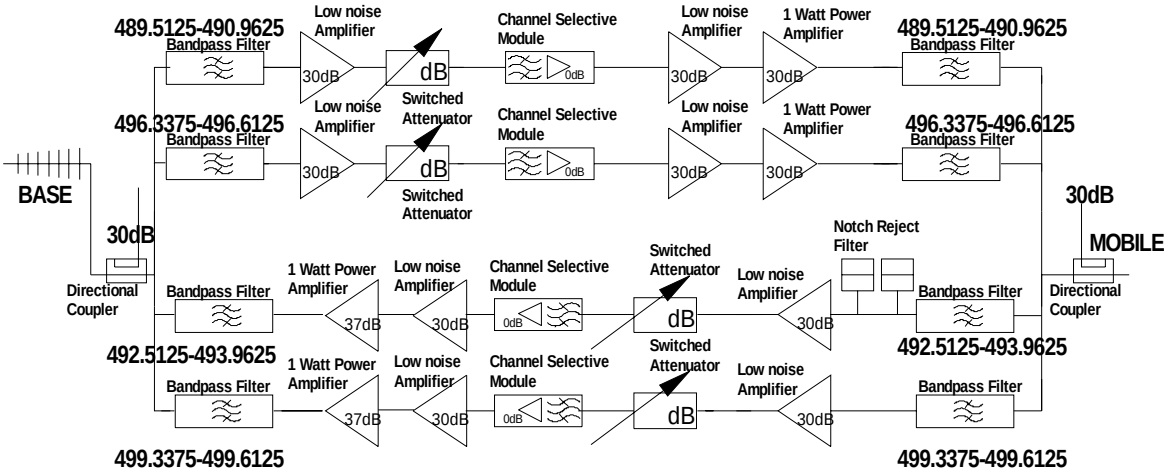
[11] Power Line Conduction

Uncertainty in test result = **3.4dB**

ANNEX E

SYSTEM DIAGRAM

50-128501


489.5125-490.9625
Bandpass Filter
Low noise Amplifier
30dB
dB
Switched Attenuator
Channel Selective Module
0dB
Low noise Amplifier
30dB
1 Watt Power Amplifier
30dB
489.5125-490.9625
Bandpass Filter
496.3375-496.6125
Bandpass Filter
Low noise Amplifier
30dB
dB
Switched Attenuator
Channel Selective Module
0dB
Low noise Amplifier
30dB
1 Watt Power Amplifier
30dB
496.3375-496.6125
Bandpass Filter
BASE
30dB
Directional Coupler
30dB
MOBILE
Notch Reject Filter
Bandpass Filter
1 Watt Power Amplifier
37dB
Low noise Amplifier
30dB
Channel Selective Module
0dB
Switched Attenuator
dB
Low noise Amplifier
30dB
Bandpass Filter
Directional Coupler
492.5125-493.9625
Bandpass Filter
1 Watt Power Amplifier
37dB
Low noise Amplifier
30dB
Channel Selective Module
0dB
Switched Attenuator
dB
Low noise Amplifier
30dB
Bandpass Filter
492.5125-493.9625
499.3375-499.6125
499.3375-499.6125