



TEST REPORT NO: RU1099/5314
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 ISSUE NO: 1
 FCC ID: NEO55-1248Series

**REPORT ON THE CERTIFICATION TESTING OF A
 Aerial Facilities Limited
 Cell Enhancer
 WITH RESPECT TO
 THE FCC RULES CFR 47, PART 90 Subpart I
 PRIVATE LAND MOBILE REPEATER**

TEST DATE: 5th – 24th February 2004

TESTED BY: J CHARTERS
 APPROVED BY: P GREEN
 PRODUCT MANAGER
 EMC
 DATE: 3rd March 2003.....

Distribution:

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

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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: NEO55-1248Series

PURPOSE OF TEST: CERTIFICATION

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

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: Cell Enhancer

EQUIPMENT TYPE: Private Land Mobile Repeater

MAXIMUM GAIN: +92.3 dBm (up link)

MAXIMUM INPUT: -55.4 dBm (down link)

MAXIMUM OUTPUT: +30.0 dBm

ANTENNA TYPE: Not applicable

CHANNEL SPACING: Not Applicable

NUMBER OF CHANNELS:

Channel No.	Uplink	Downlink
	380 – 395 MHz	390 – 395 MHz

FREQUENCY GENERATION: N/A

MODULATION TYPE: F3E

POWER SOURCE(s): +24Vdc

TEST DATE(s): 5th – 24th February 2004

ORDER No(s): 23174

APPLICANT: Aerial Facilities Limited

ADDRESS: Aerial House
Latimer Park, Latimer
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 Use: Private Land Mobile Repeater

3. Emission Designator: F3E

4. Temperatures: Ambient (Tnom) 21°C

5. Supply Voltages: Vnom +24 Vdc

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

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

7. Channel spacing: Narrowband
 Wideband

8. Test Location TRL Compliance Services
 Up Holland
 Long Green

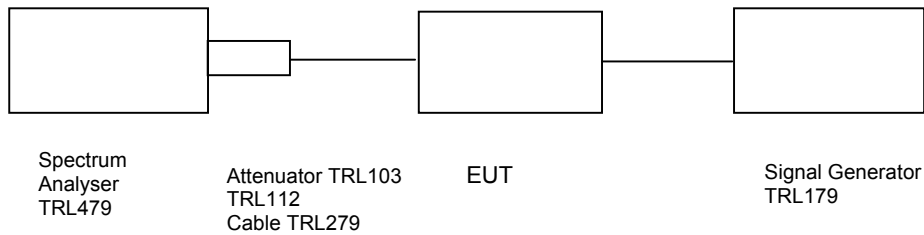
9. Modifications made during test program No modifications were performed.

COMPLIANCE TESTS

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – UPLINK

Ambient temperature = 21°C
 Relative humidity = 53%
 Supply voltage = +24 Vdc
 Channel number = See test results

Radio Laboratory



Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Gain after 20dB input level increase dBm
380.1	-61.9	29.85	0.36	92.11	92.11
382.5	-62.6	29.85	-0.08	92.39	92.39
384.9	-61.4	29.85	-0.052	91.198	91.198

Notes:

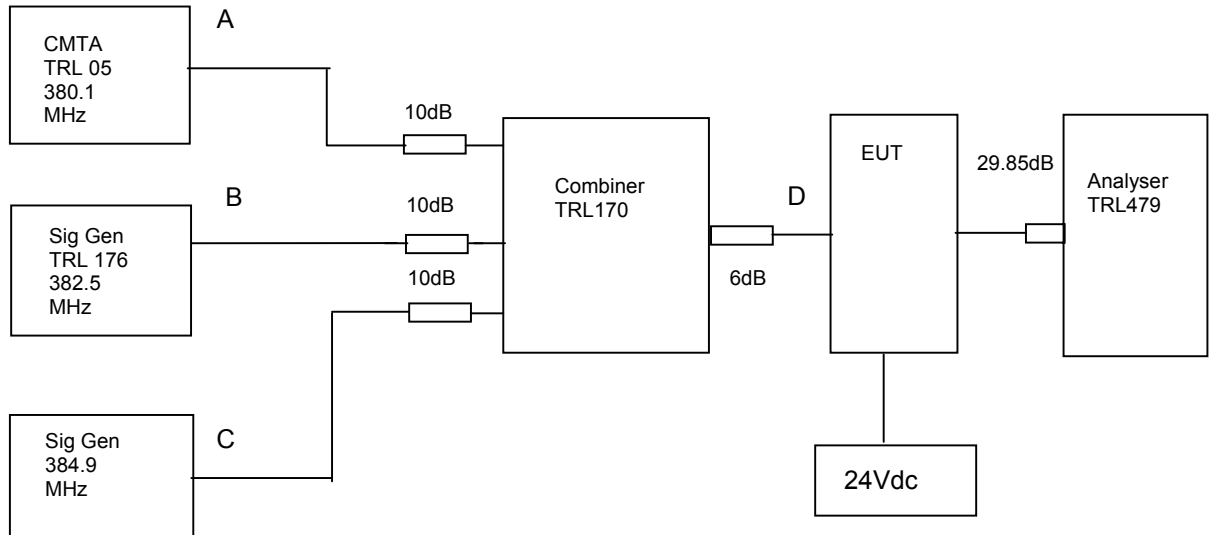
1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator output was increased by 20dBs and the level of the output signal remeasured

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	BIRD	8308-200	N/A	103	X
ATTENUATOR	BIRD	8308-100	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK

Ambient temperature = 21°C
Relative humidity = 53%
Supply voltage = +24 Vdc

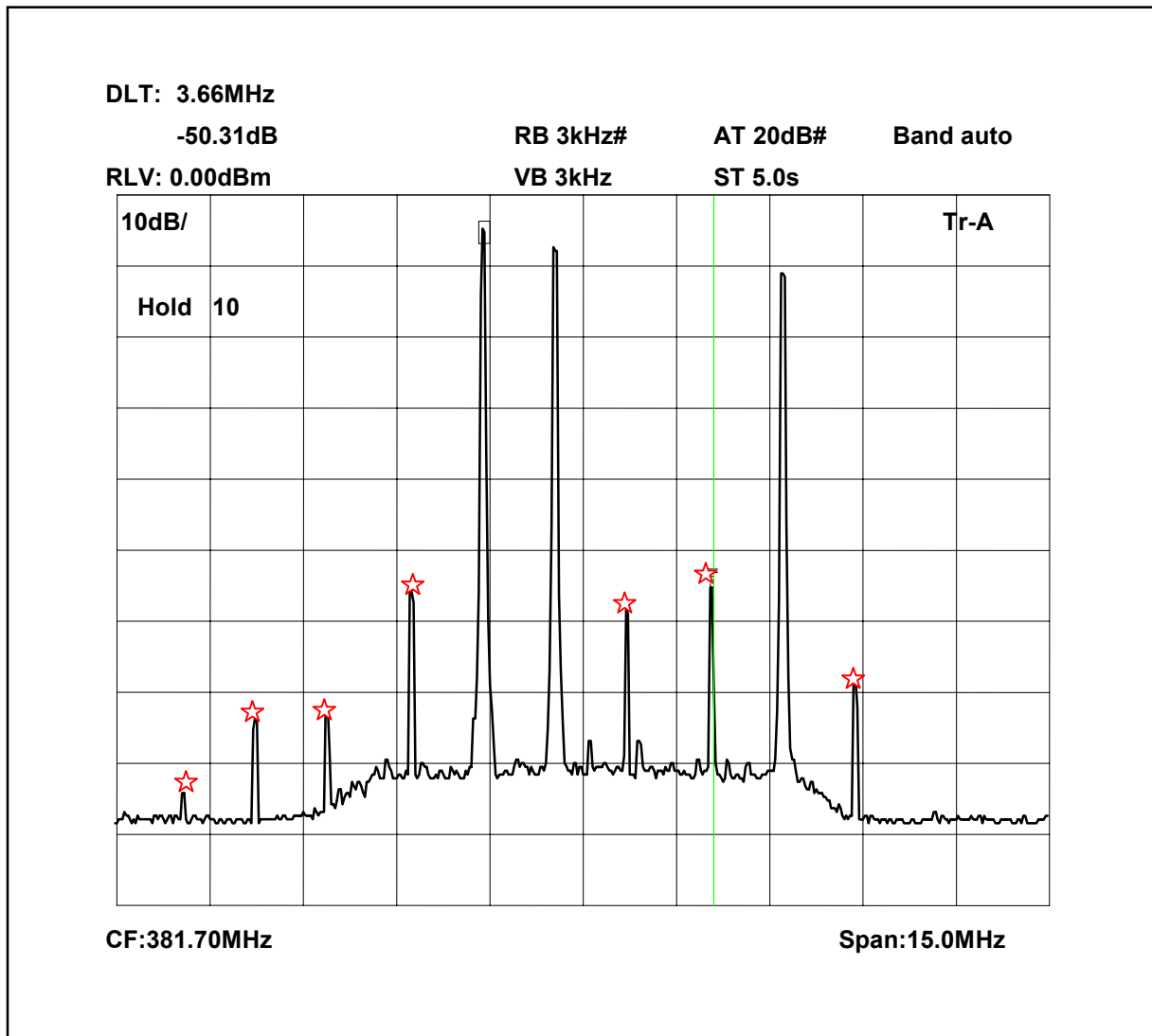
Radio Laboratory



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 the maximum input of -61.4dBm . The cable and attenuator loss between the EUT and the spectrum analyser was 29.85dB .

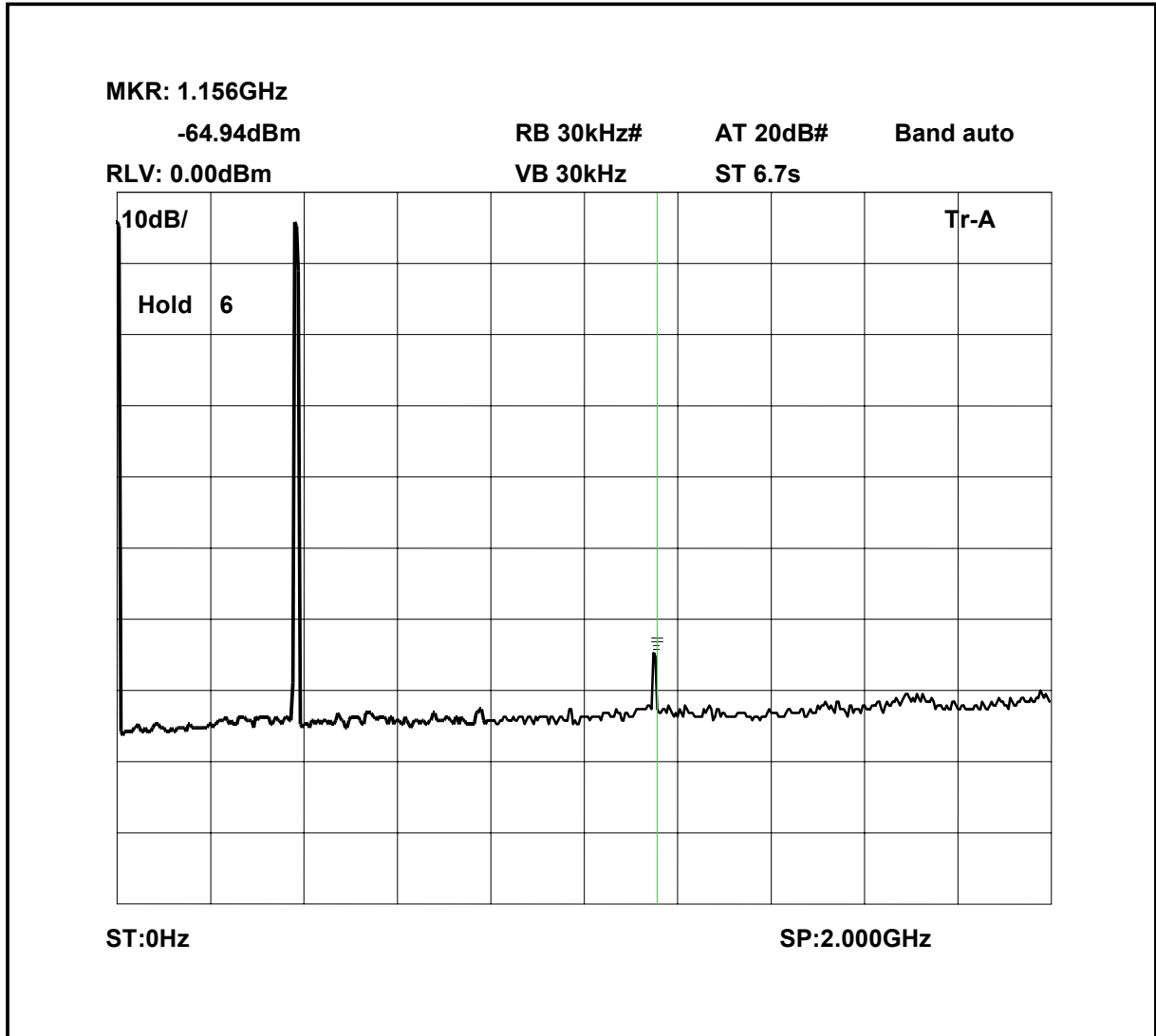
Sweep data is shown on the next page:

Intermodulation Inband



The above plot shows that all products (designated by ☆) are at least 50dB below the fundamentals level detailed on previous page .

Intermodulation Wideband



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

Test equipment used for intermodulation test

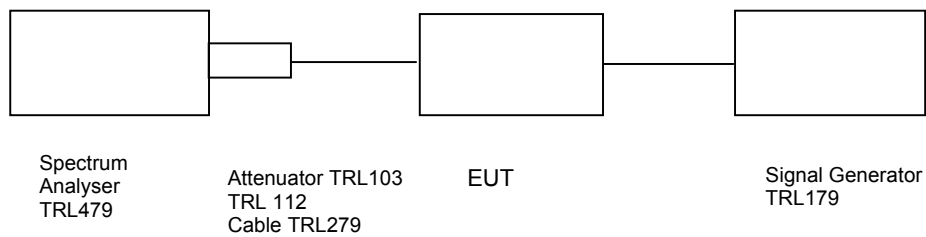
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
SIGNAL GENERATOR	ROHDE & SCHWARZ	SMR 20	834671/003	478	X
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X
COMBINER	ELCOM	RC-4-50	N/A	170	X

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– UPLINK

Ambient temperature = 24°C
Relative humidity = 48%
Supply voltage = +24 Vdc
Channel number = See test results

Radio Laboratory

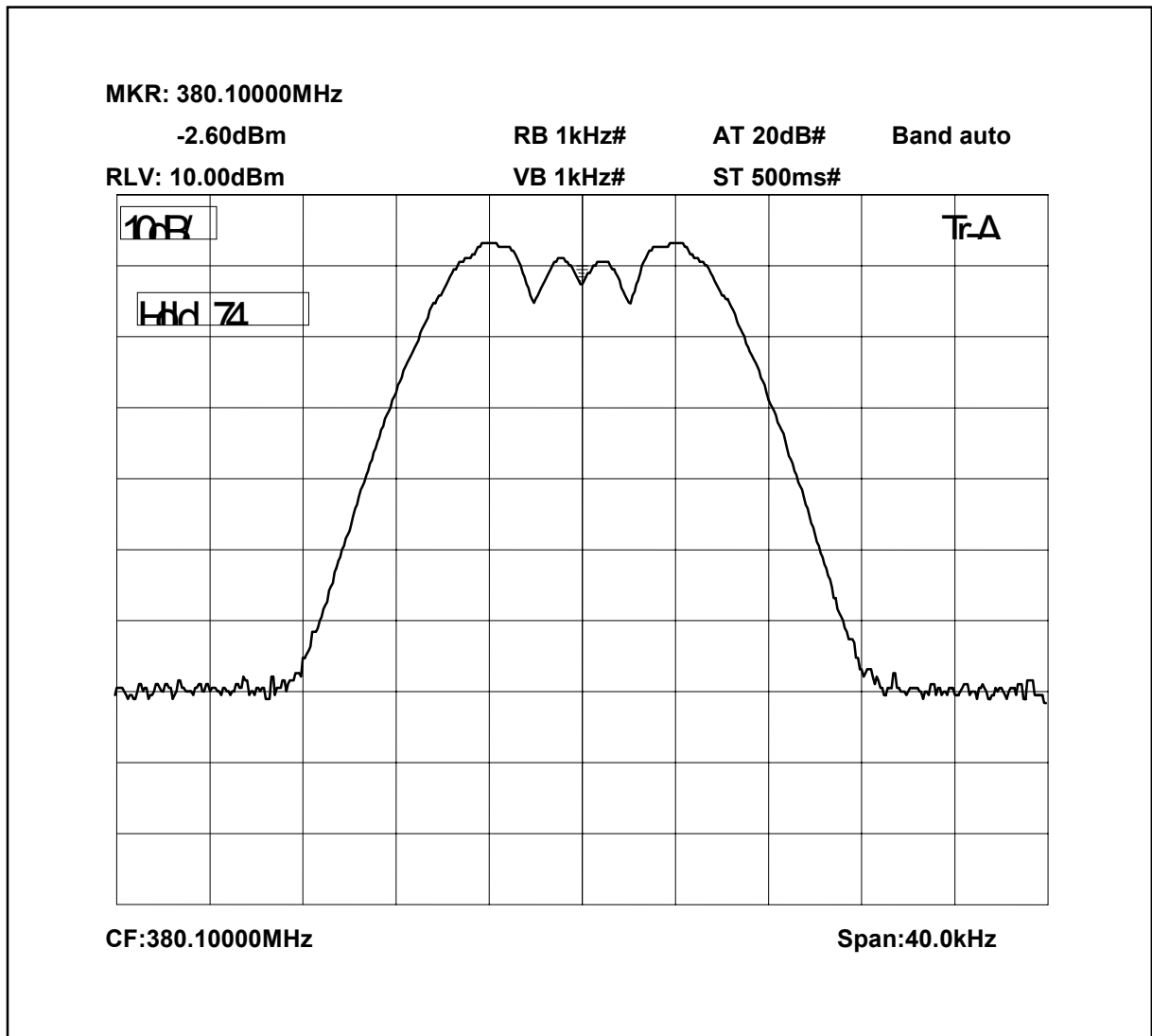


This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-61.4 dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

Note: The cables and attenuators had the following losses.

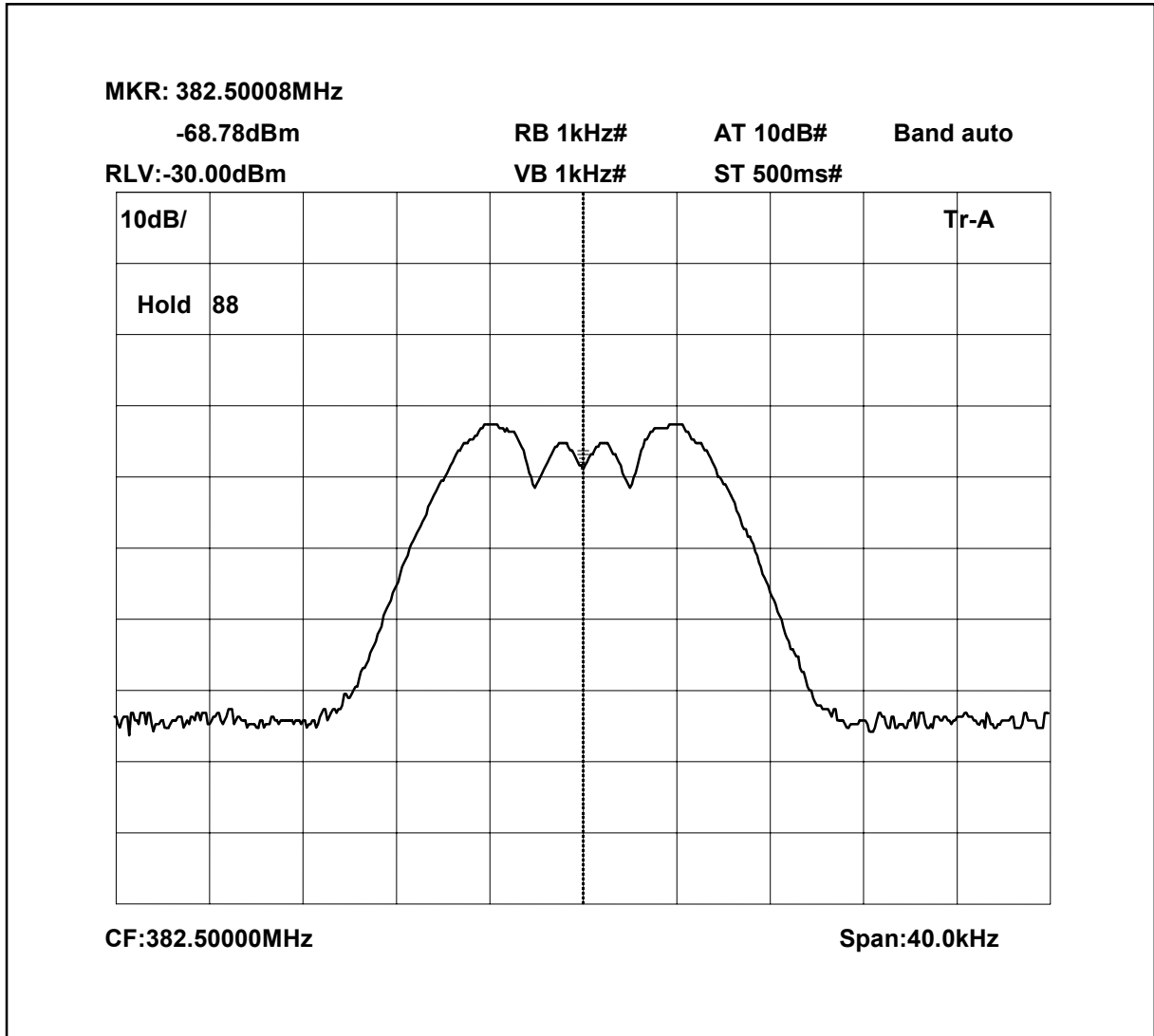
1. Cable TRL279 and attenuator TRL112 TRL103 29.85dB
2. Cable between signal generator and EUT 0.4dB

380.1MHz Signal Generator and EUT deviation set to 5kHz

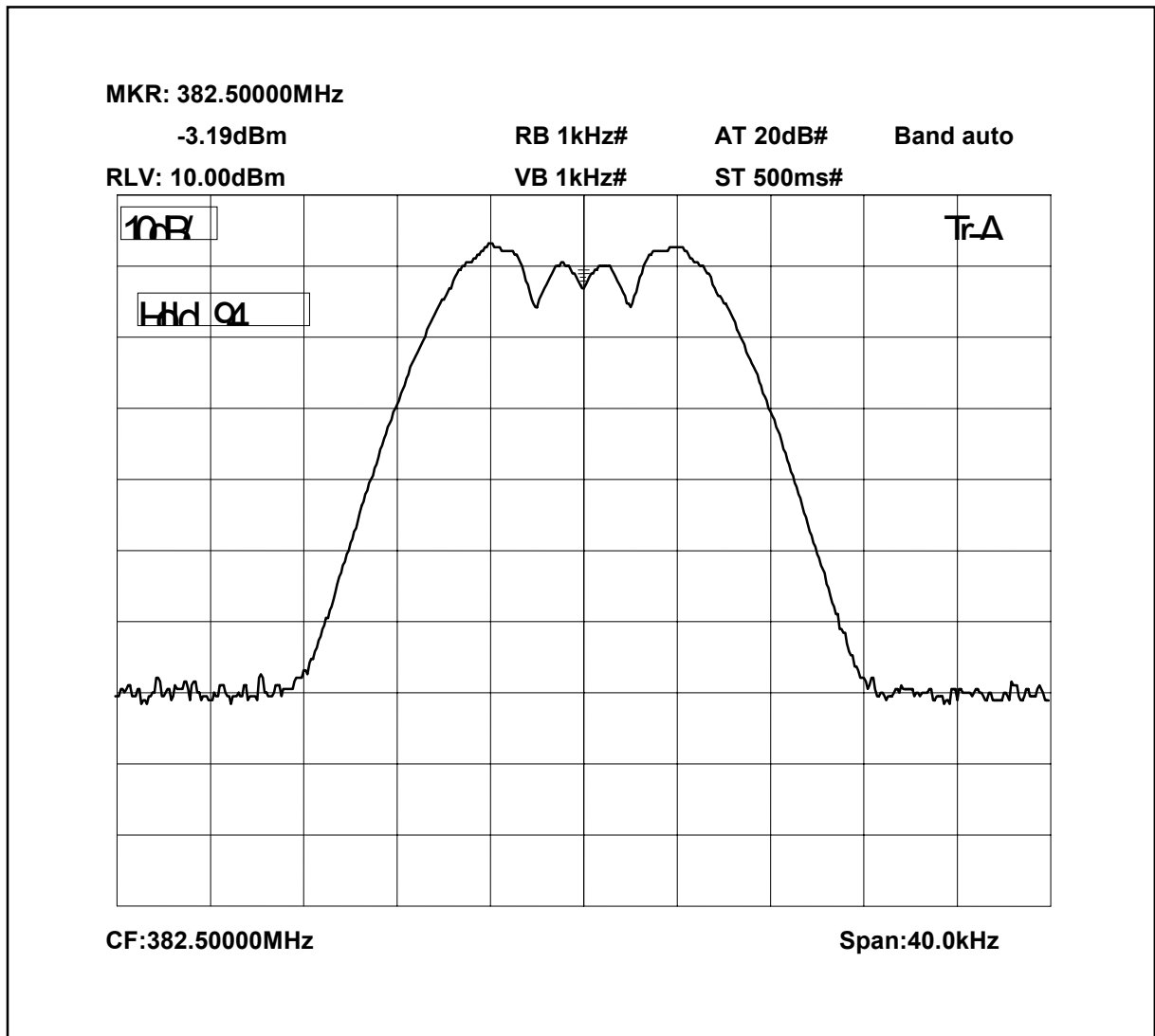


The above plots depicting the output waveshape show no measurable distortion visible. When compared to the input signal.

382.5MHz Signal Generator deviation set to 5kHz

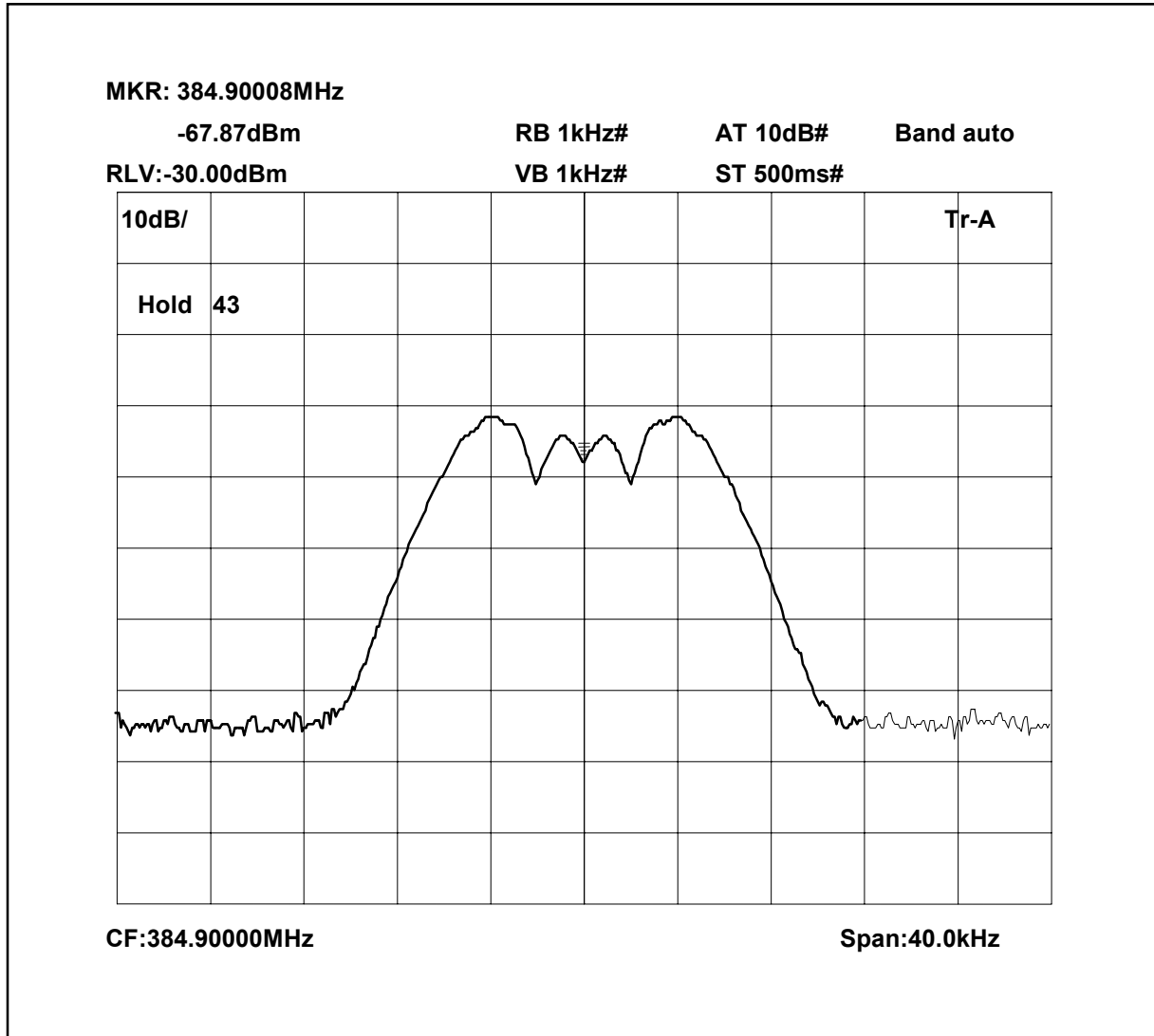


382.5MHz Signal Generator and amplifier deviation set to 5kHz

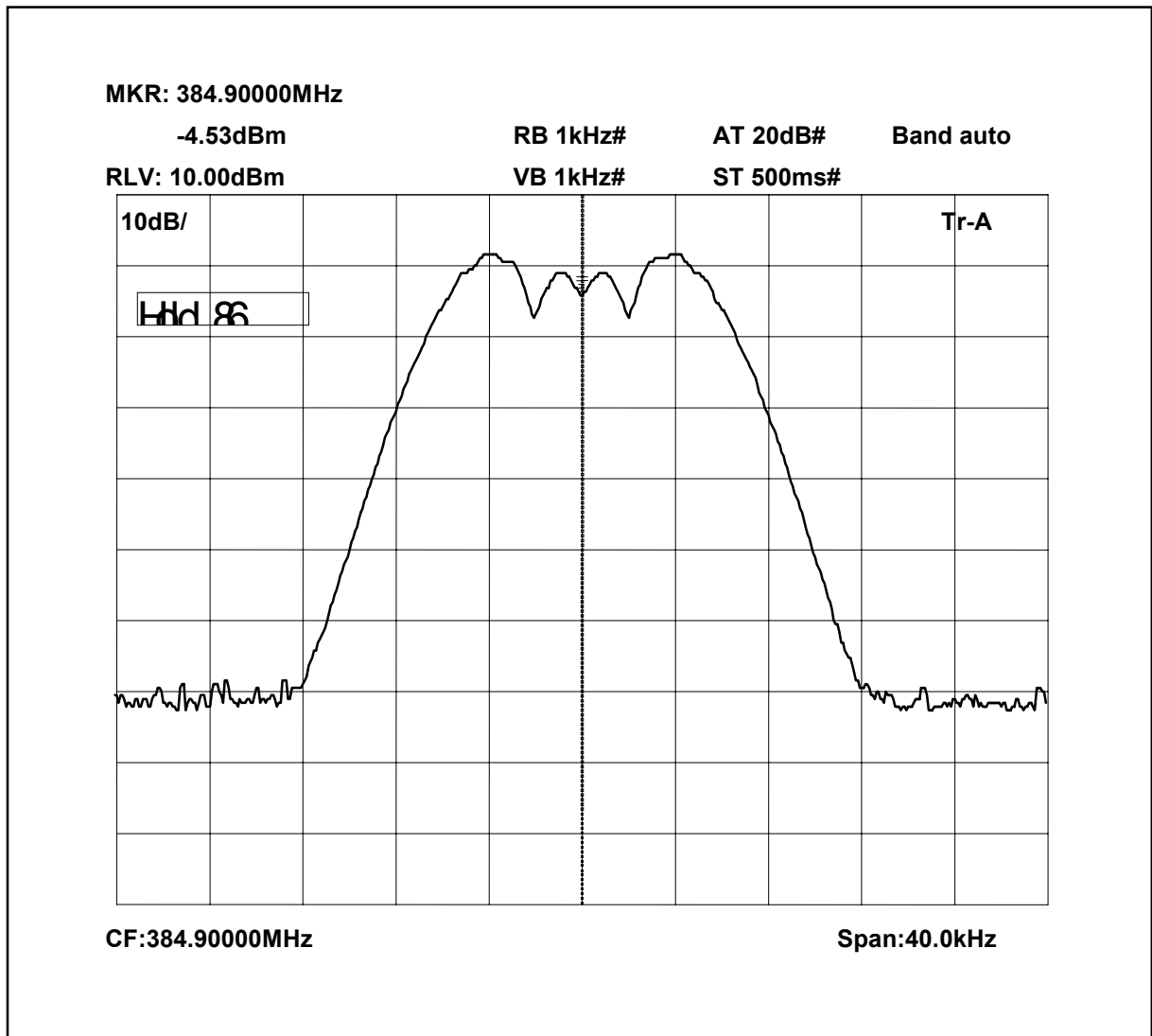


The above plots depicting the output waveshape show no measurable distortion visible. When compared to the input signal.

384.9MHz Signal Generator deviation set to 5kHz



384.9MHz Signal Generator deviation set to 5kHz



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

The test equipment used for the Transmitter Modulated Channel tests is shown overleaf:

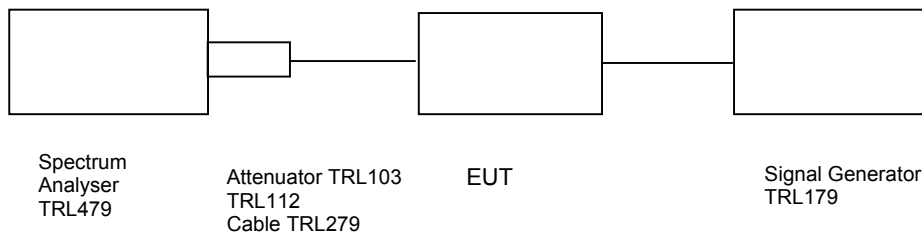
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	BIRD	8308-200	N/A	103	X
ATTENUATOR	BIRD	8308-100	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1051 dBm– UPLINK

Ambient temperature = 19°C
 Relative humidity = 45%
 Supply voltage = +24 Vdc

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

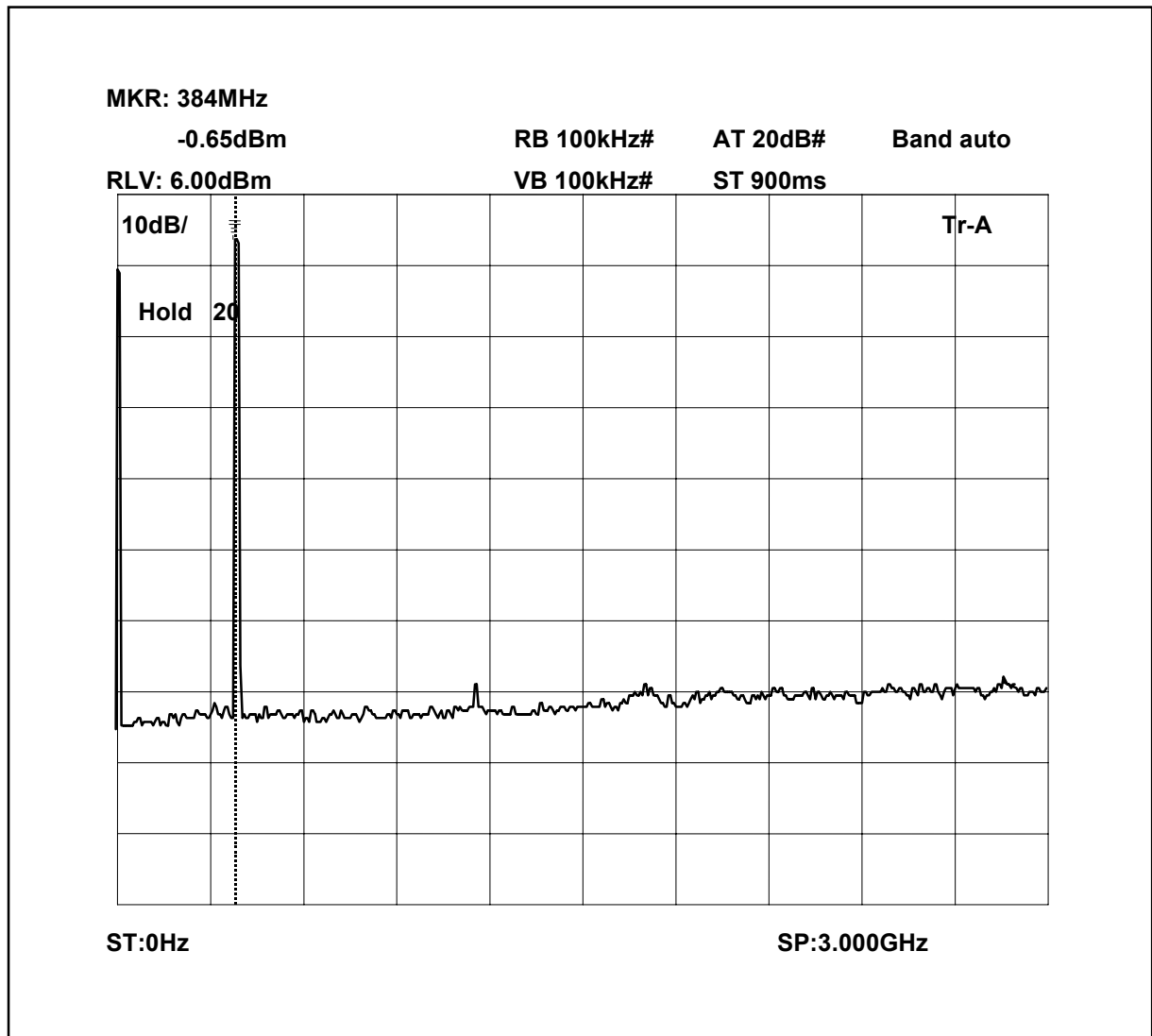
At least 43 + 10 log PdB

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

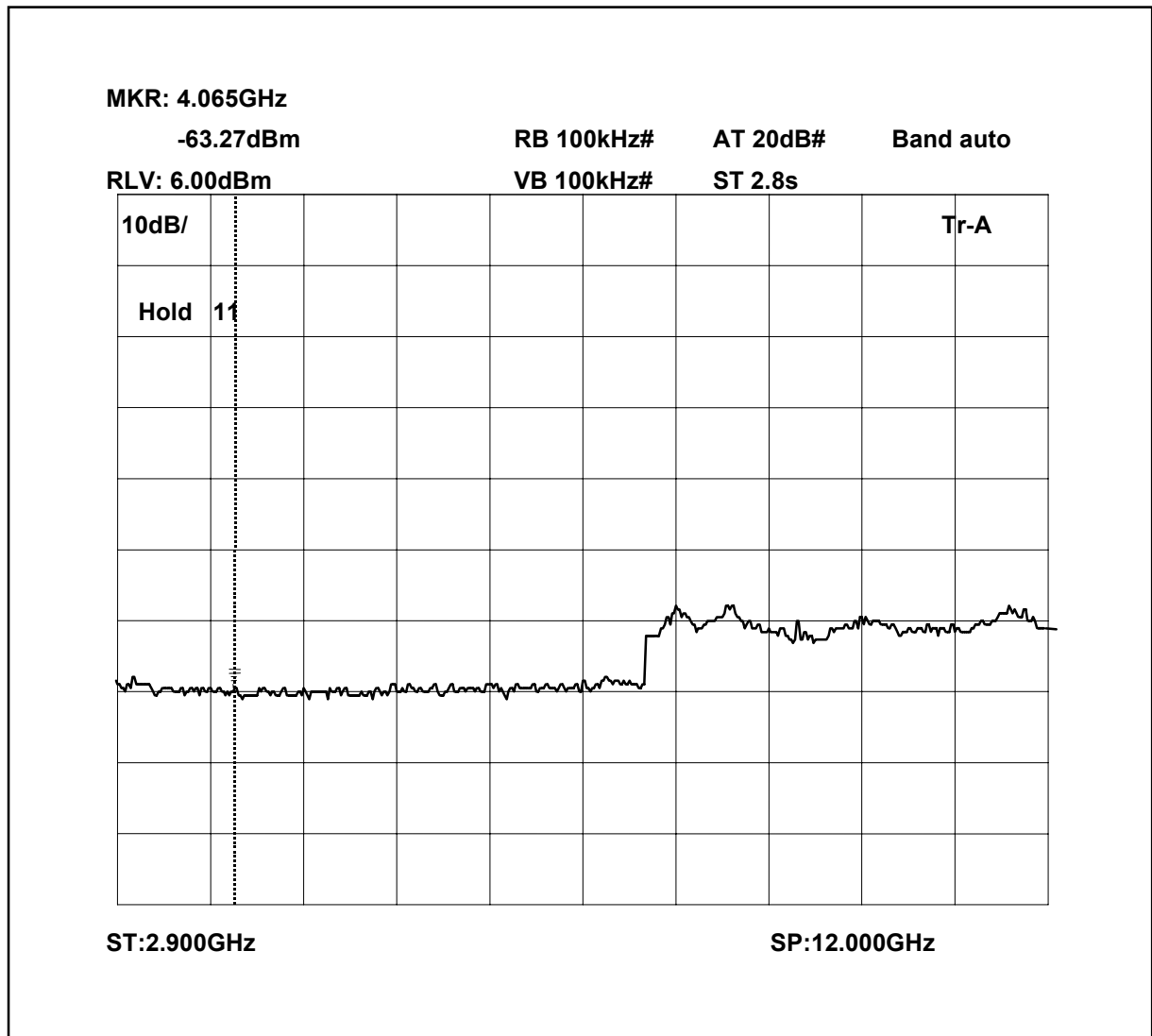
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	BIRD	8308-200	N/A	103	X
ATTENUATOR	BIRD	8308-100	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

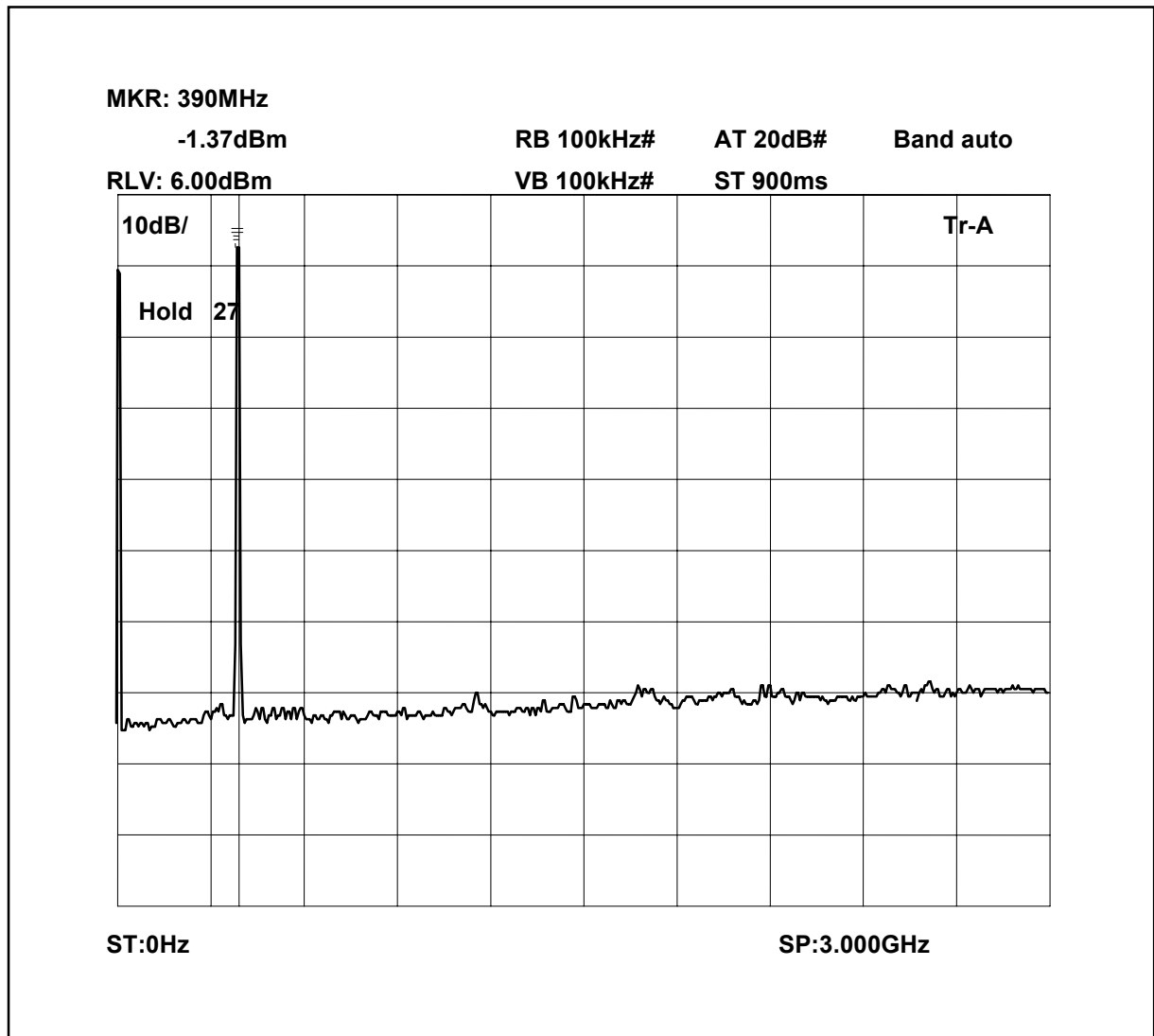
Conducted emissions 380.1MHz 0 – 3GHz



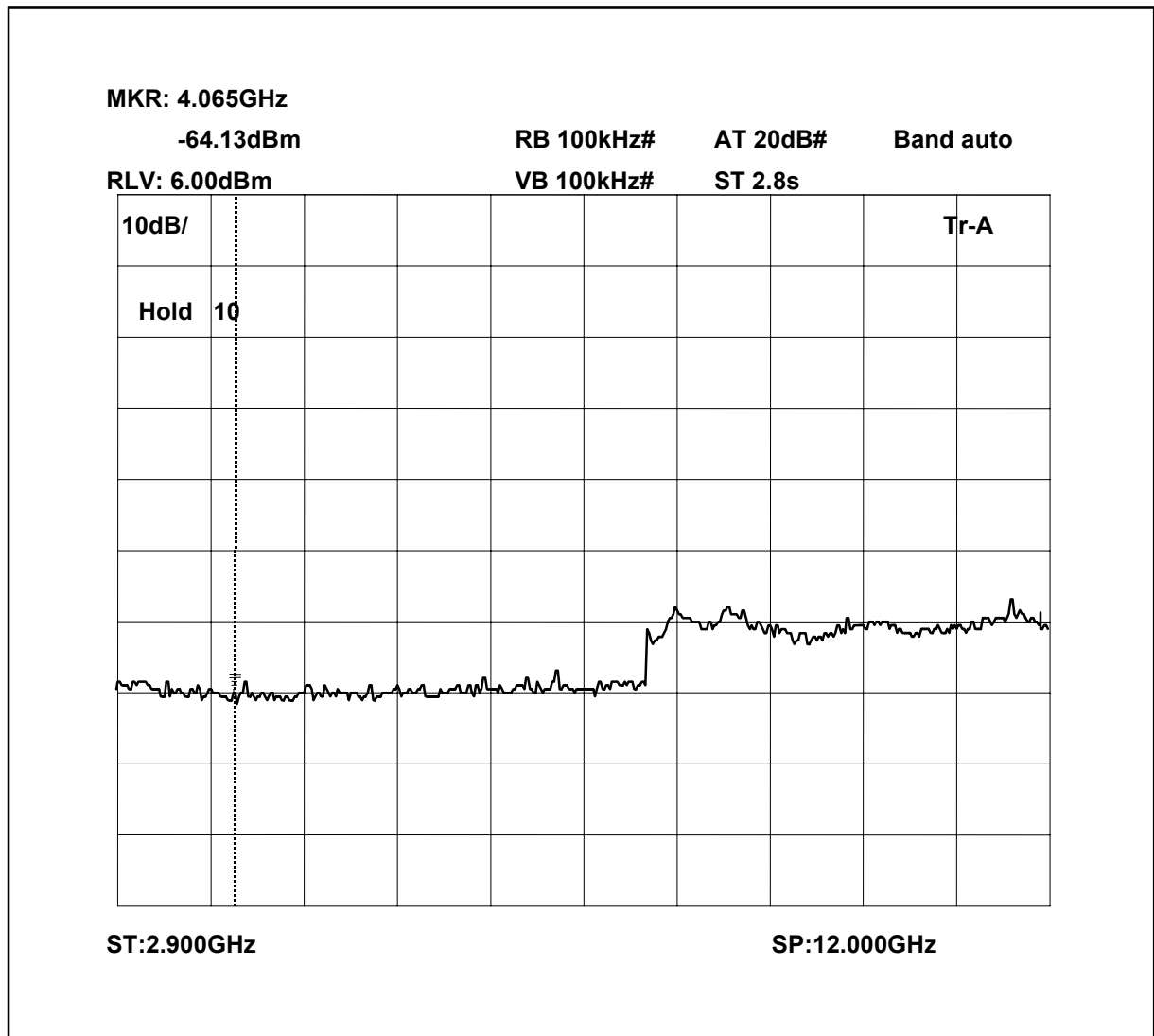
Conducted emissions 380.1MHz 2.9 - 12GHz



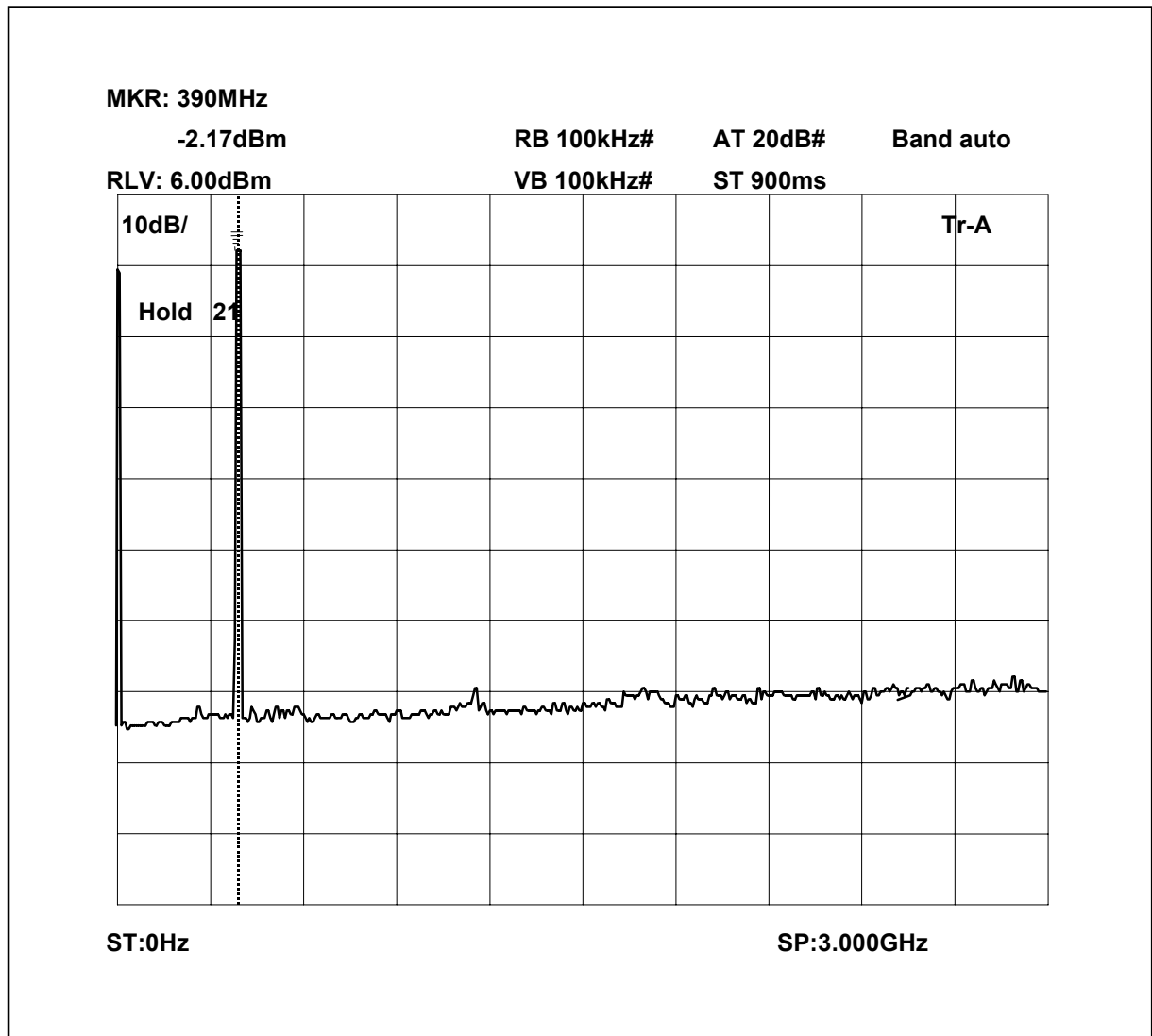
Conducted emissions 382.5 MHz 0 - 3GHz



Conducted emissions 382.5MHz 2.9 - 12GHz



Conducted emissions 384.9MHz 0 - 3GHz

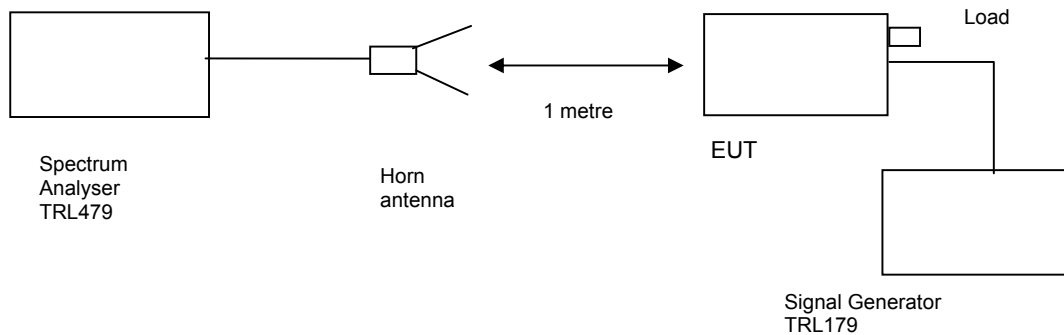


TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– UPLINK

Ambient temperature = 19°C
Relative humidity = 45%
Conditions = OATS
Supply voltage = +24 Vdc
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.

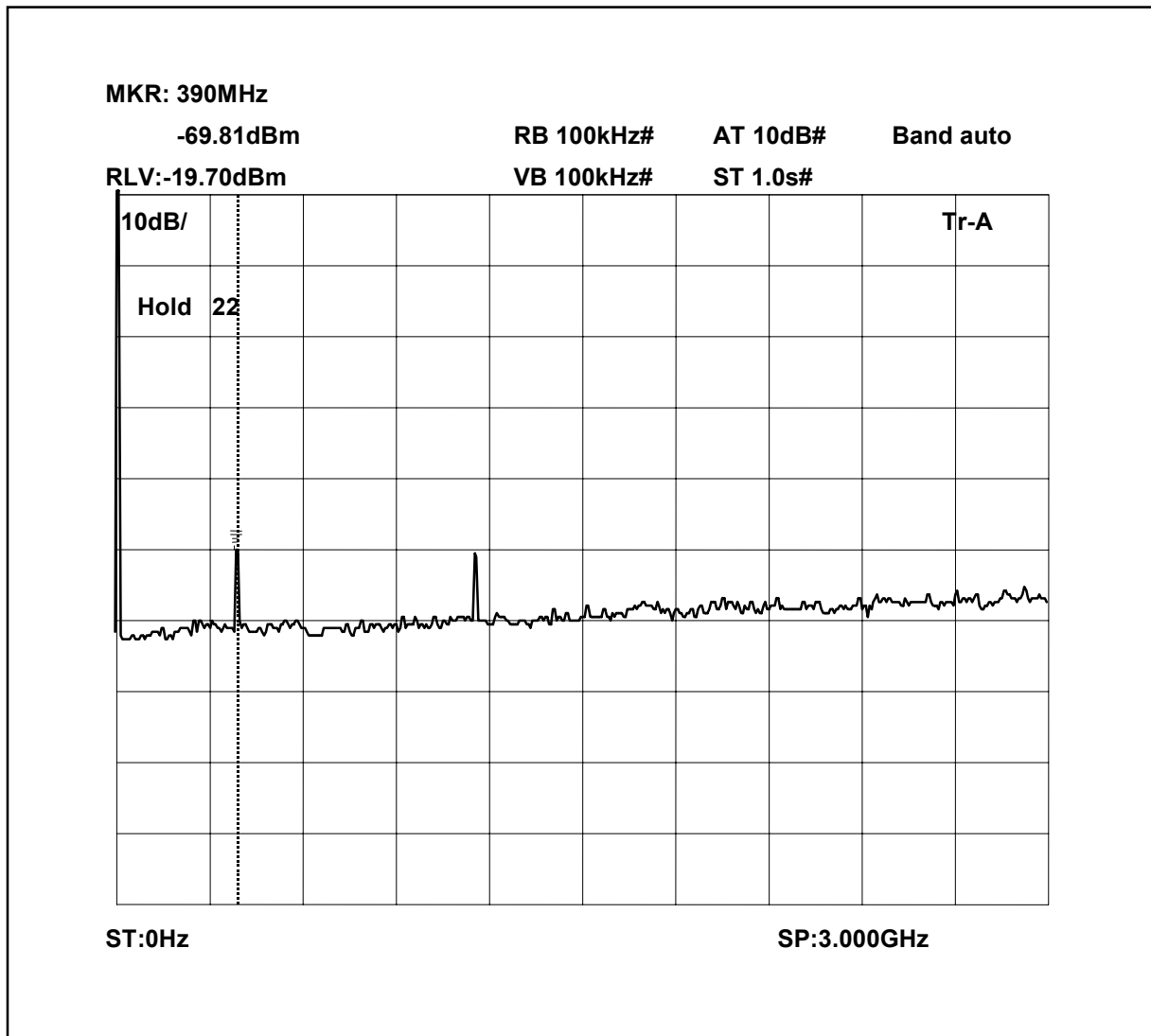
The Spurious limit was calculated as follows:

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

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

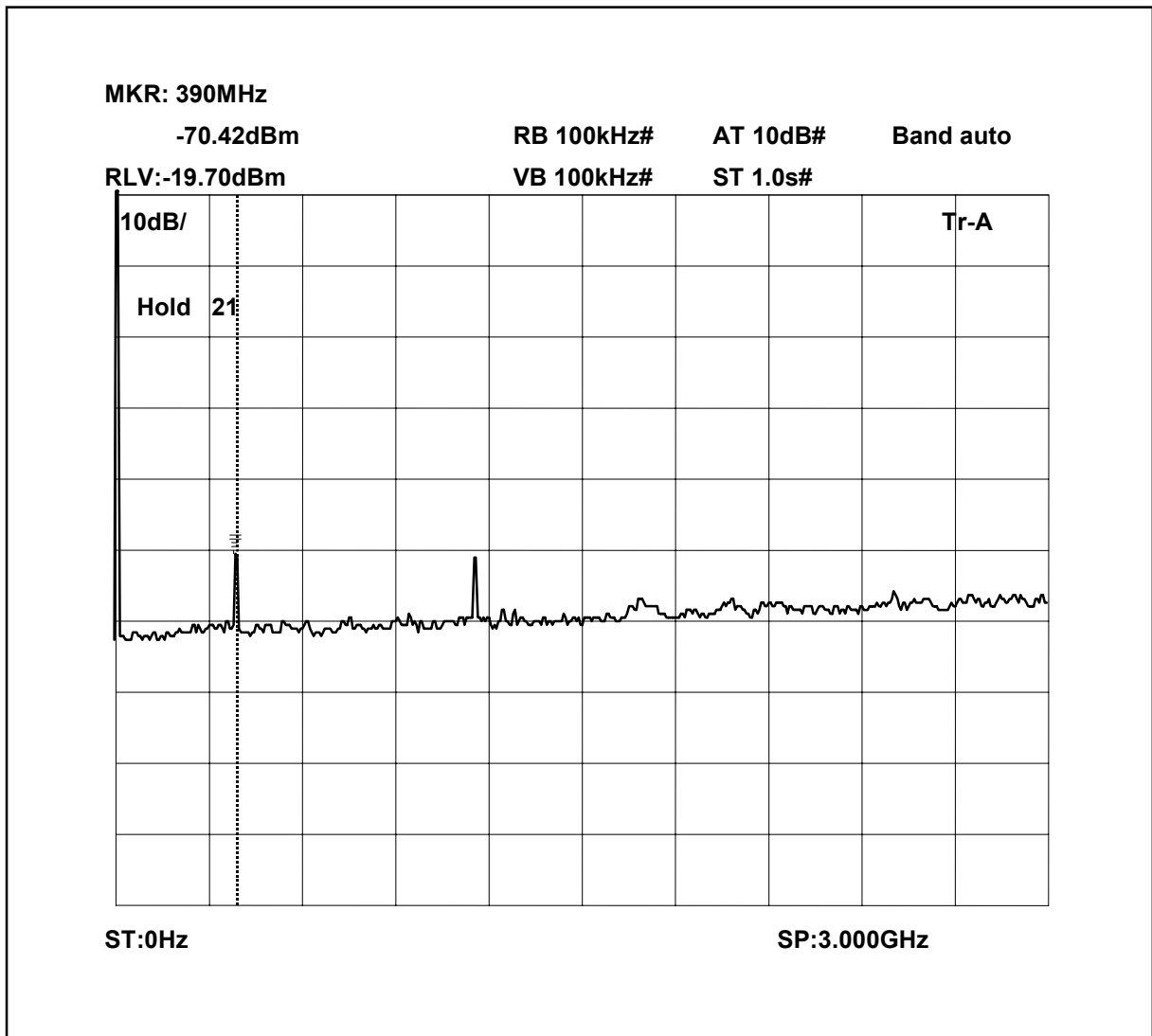
$$(10\log P_{\text{watts}}) - (43 + 10\log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$$

Radiated emissions 380.1 MHz 0-3GHz



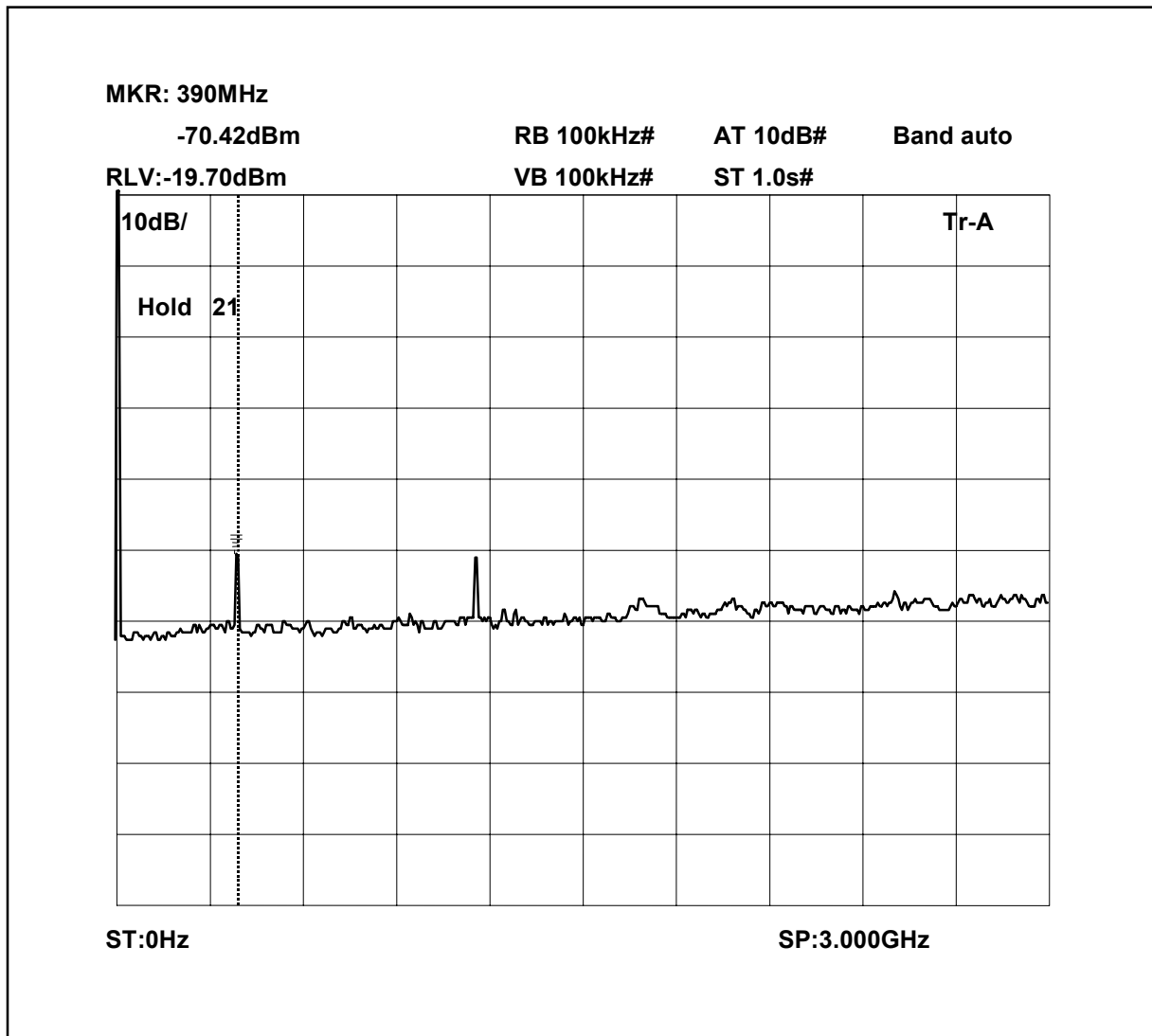
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 382.5MHz 0-3GHz



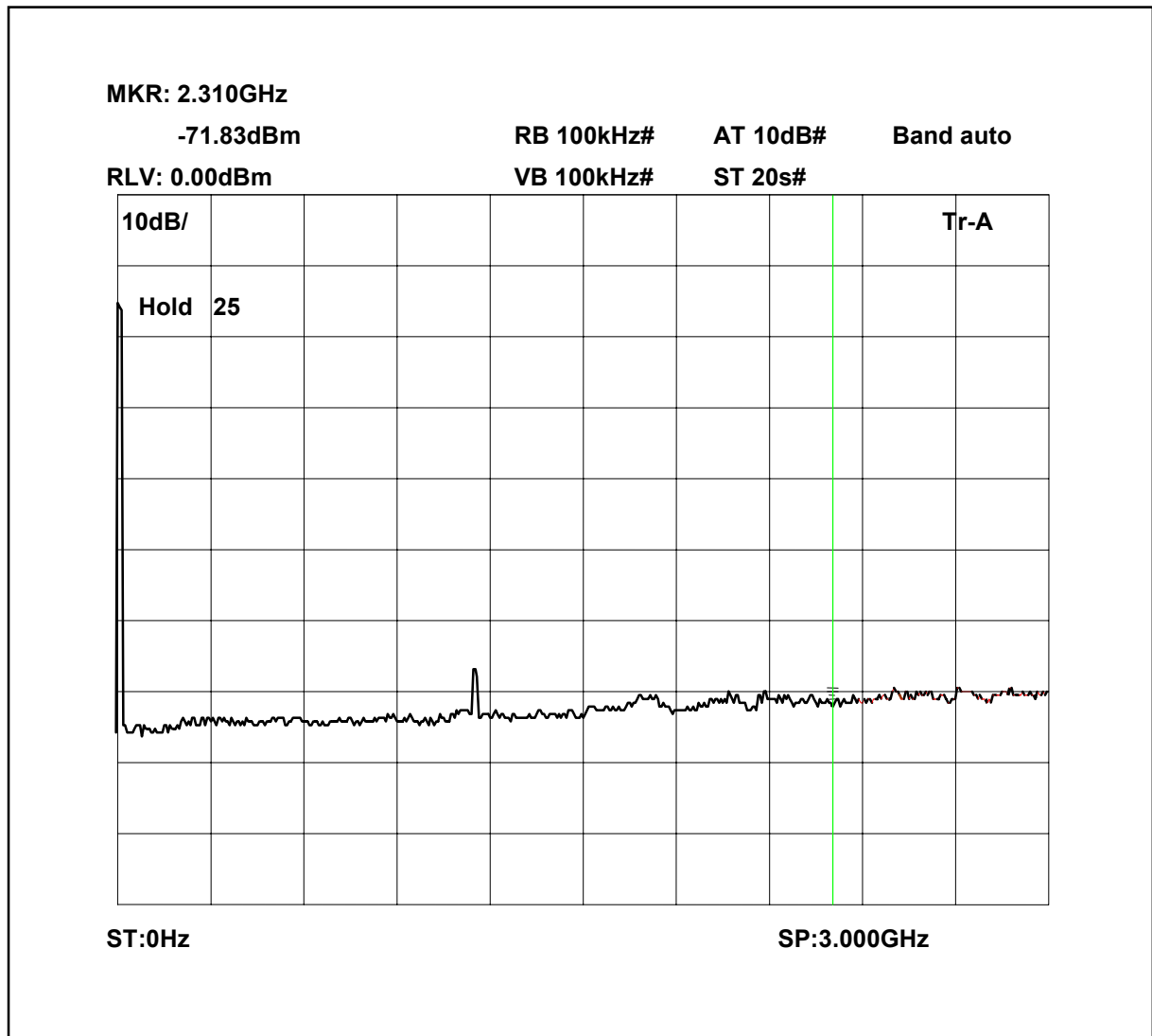
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 384.9MHz 0-3GHz



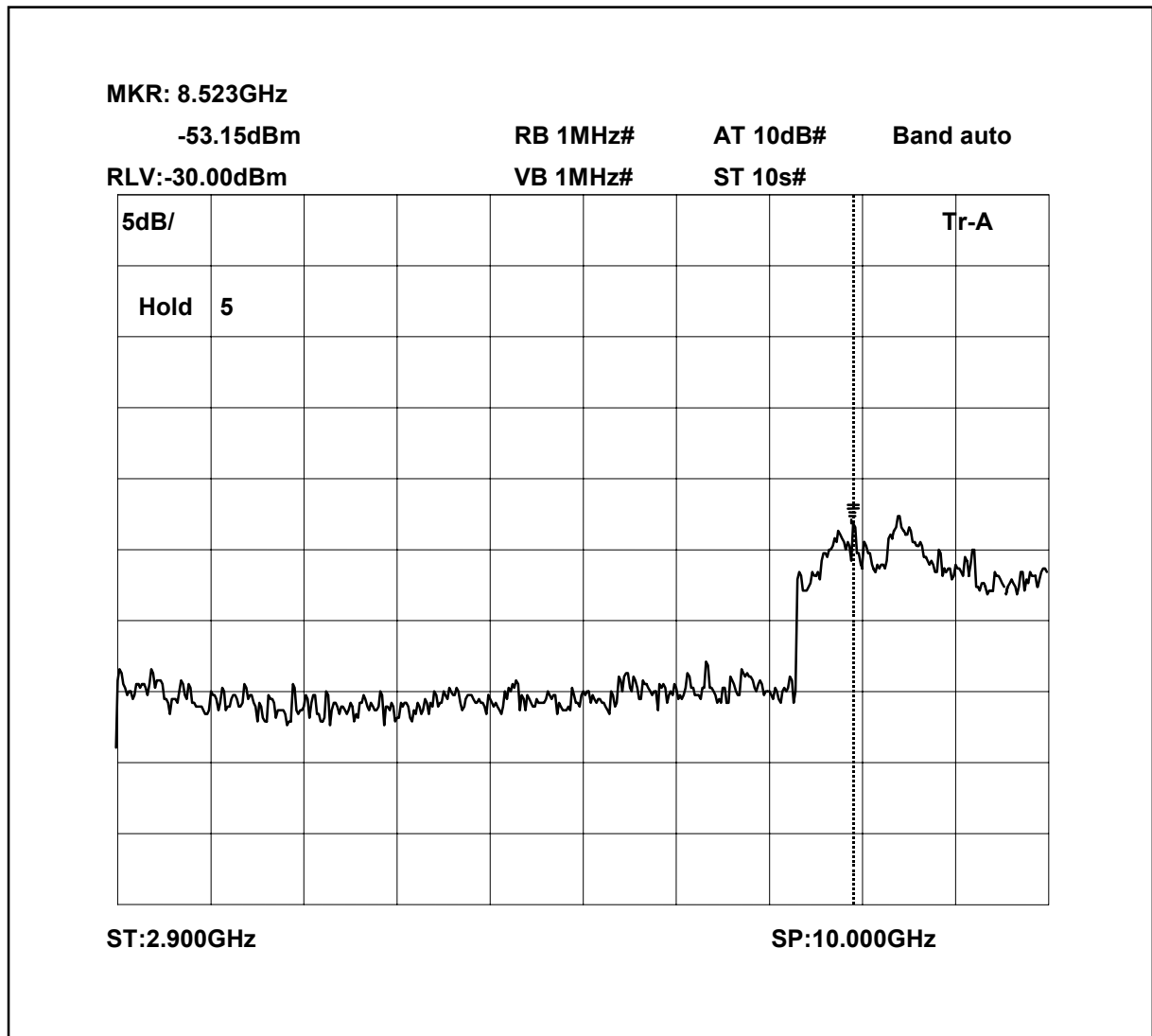
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions no input signal 0-3GHz



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

Radiated emissions no input signal 2.9-10GHz



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

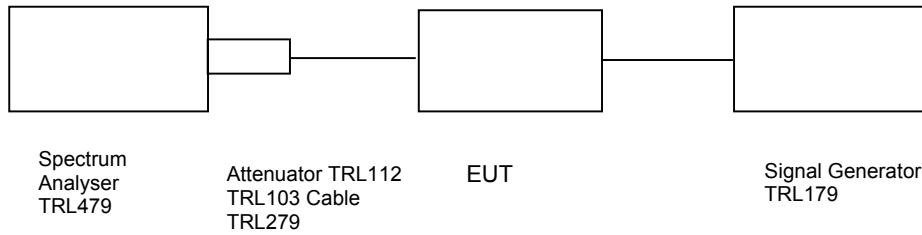
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
HORN	EMCO	3115	9010-3581	139	X
ATTENUATOR	BIRD	8304-300-N	N/A	103	X
ATTENUATOR	BIRD	8304-300-N	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
50Ω Load	PHILCO	160B-300	1643	UH139	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – DOWNLINK

Ambient temperature = 21°C
 Relative humidity = 37%
 Supply voltage = +24 Vdc
 Channel number = See test results

Radio Laboratory



Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Gain after 20dB input level increase dBm
390.1	-55.0	-29.85	-0.64	+84.6	+84.6
392.5	-57.5	-29.85	-0.79	+84.56	+84.56
394.9	-57.4	-29.85	-0.79	+86.84	+86.84

Notes:

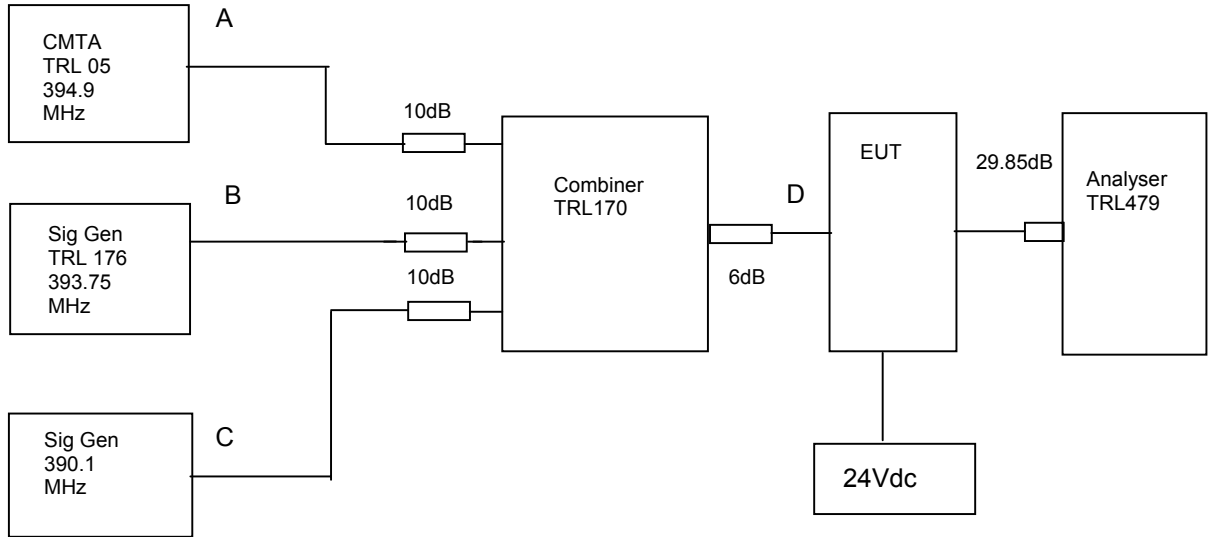
1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator output was increased by 20dBs and the level of the output signal remeasured

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	BIRD	8304-300-N	N/A	103	X
ATTENUATOR	BIRD	8304-300-N	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– DOWNLINK

Ambient temperature = 21°C
Relative humidity = 37%
Supply voltage = +24 Vdc

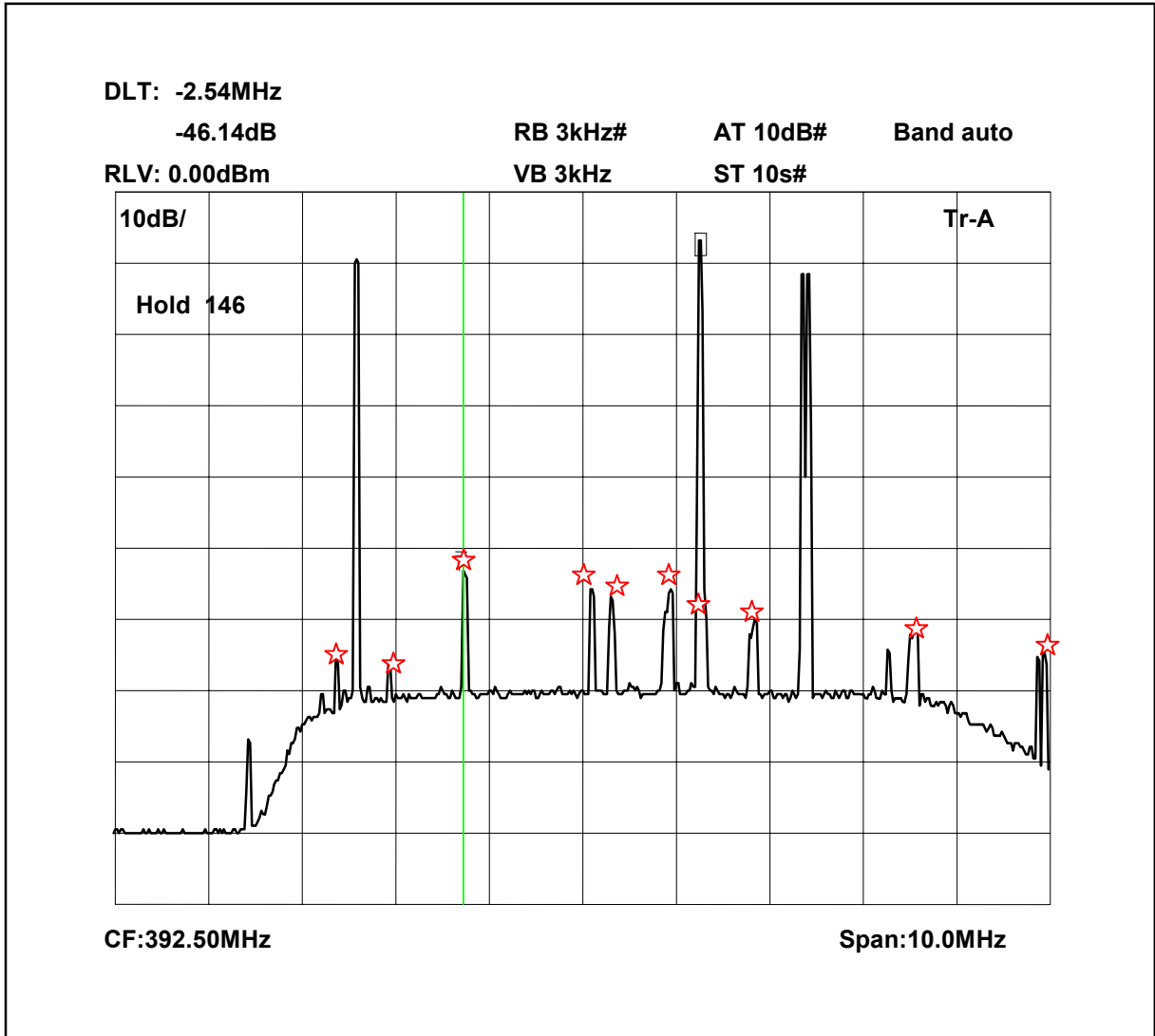
Radio Laboratory



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 the maximum input of -53.4dBm The cable and attenuators loss between the EUT and the spectrum analyser was 29.85 dB.

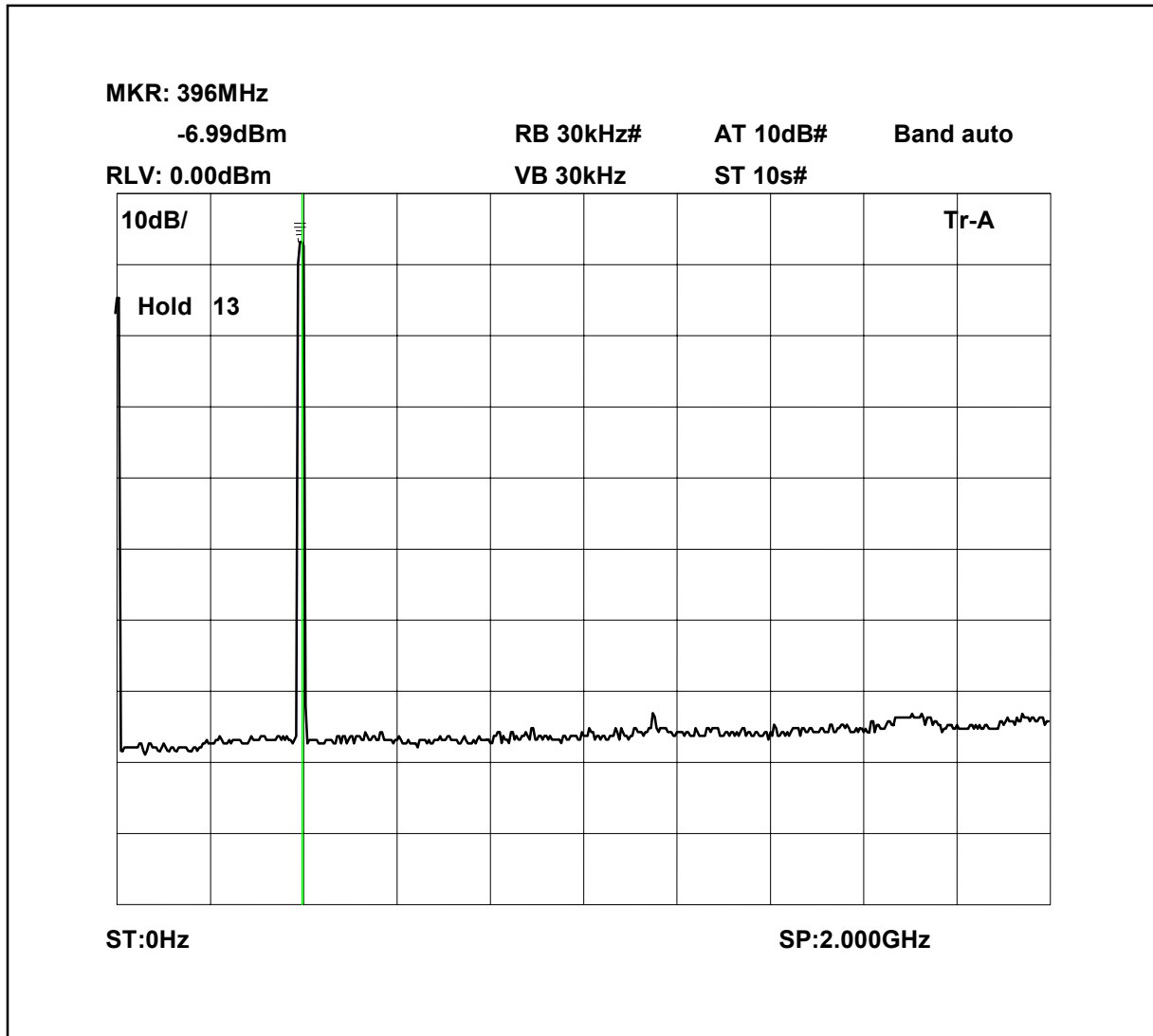
Sweep data is shown on the next page:

Intermodulation Inband



The above plot shows that all products (designated by ☆) are at least 46dB below the fundamentals level detailed on previous page .

Intermodulation Wideband



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

Test equipment used for intermodulation test

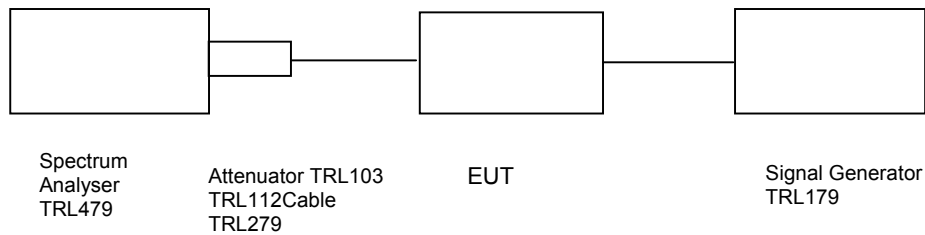
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
SIGNAL GENERATOR	ROHDE & SCHWARZ	SMR 20	834671/003	478	X
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X
COMBINER	ELCOM	RC-4-50	N/A	170	x

TRANSMITTER TESTS

AMPLIFIER MODULATED CHANNEL TEST – CONDUCTED – Part 2.1049– DOWNLINK

Ambient temperature = 24°C
Relative humidity = 48%
Supply voltage = +24 Vdc
Channel number = See test results

Radio Laboratory

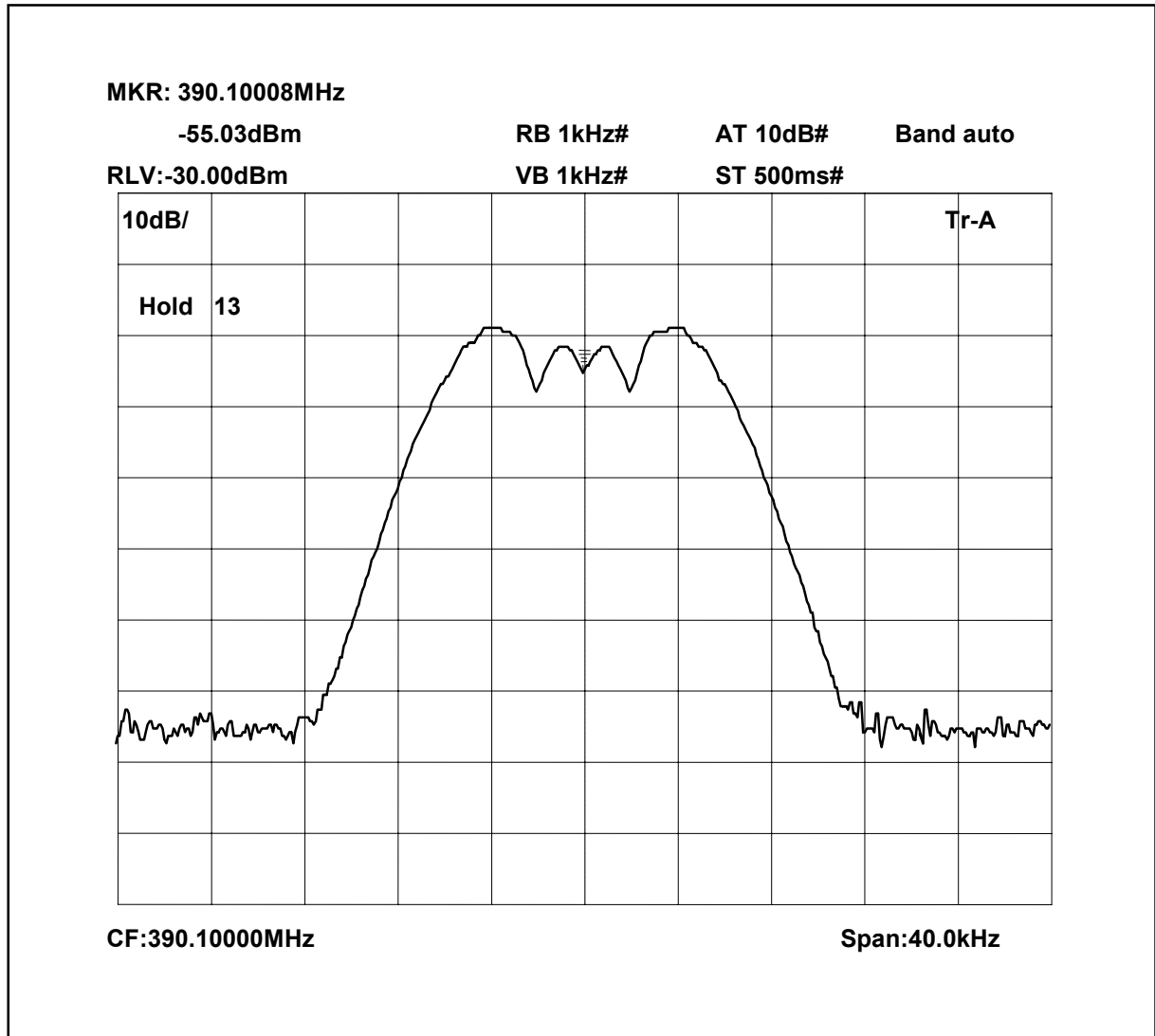


This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-55.4Bm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

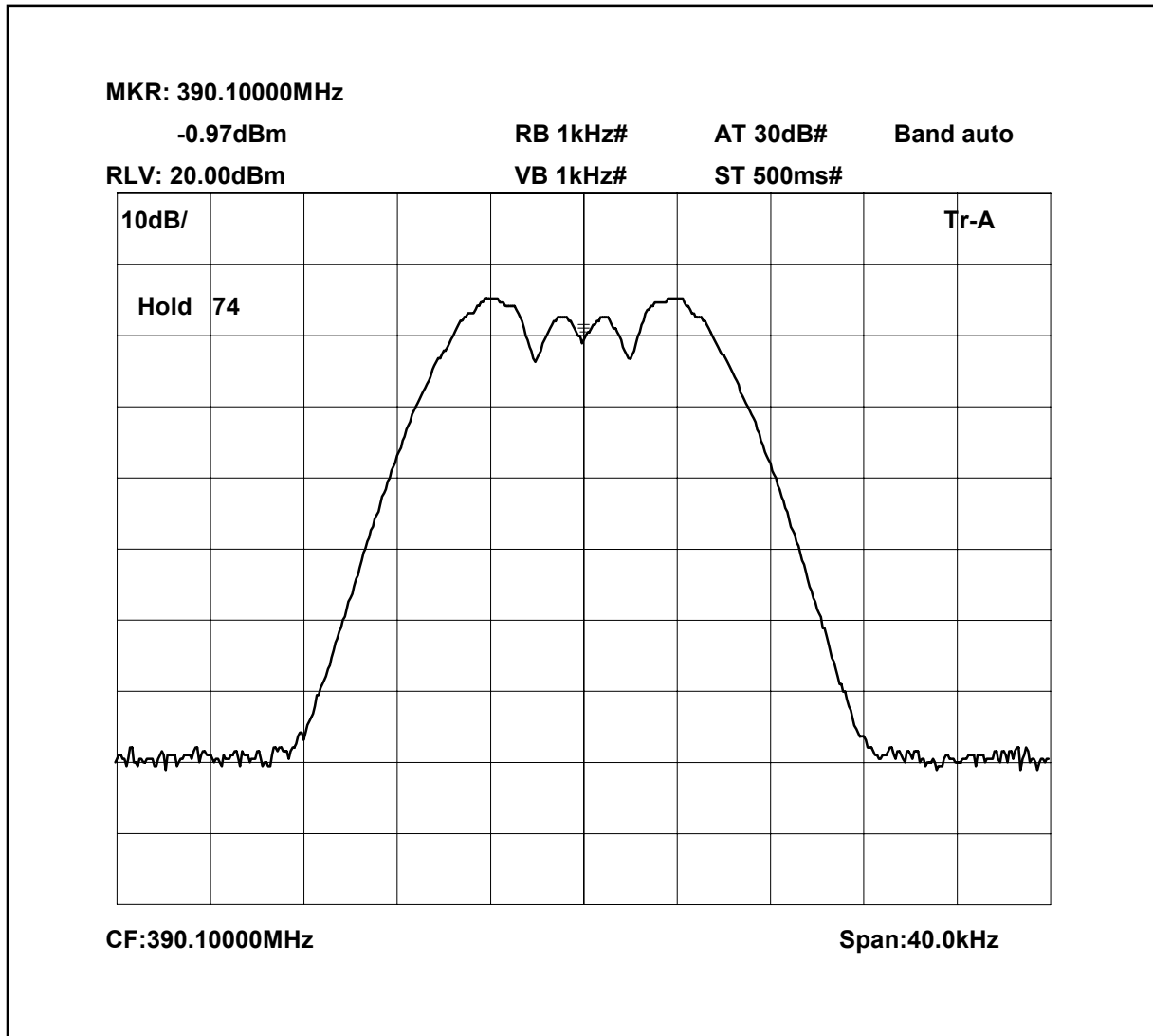
Note: The cables and attenuators had the following losses.

1. Cable TRL279 and attenuators TRL220 = 29.85dB
2. Cable between signal generator and EUT = 0.4dB

390.1MHz Signal Generator deviation set to 5kHz

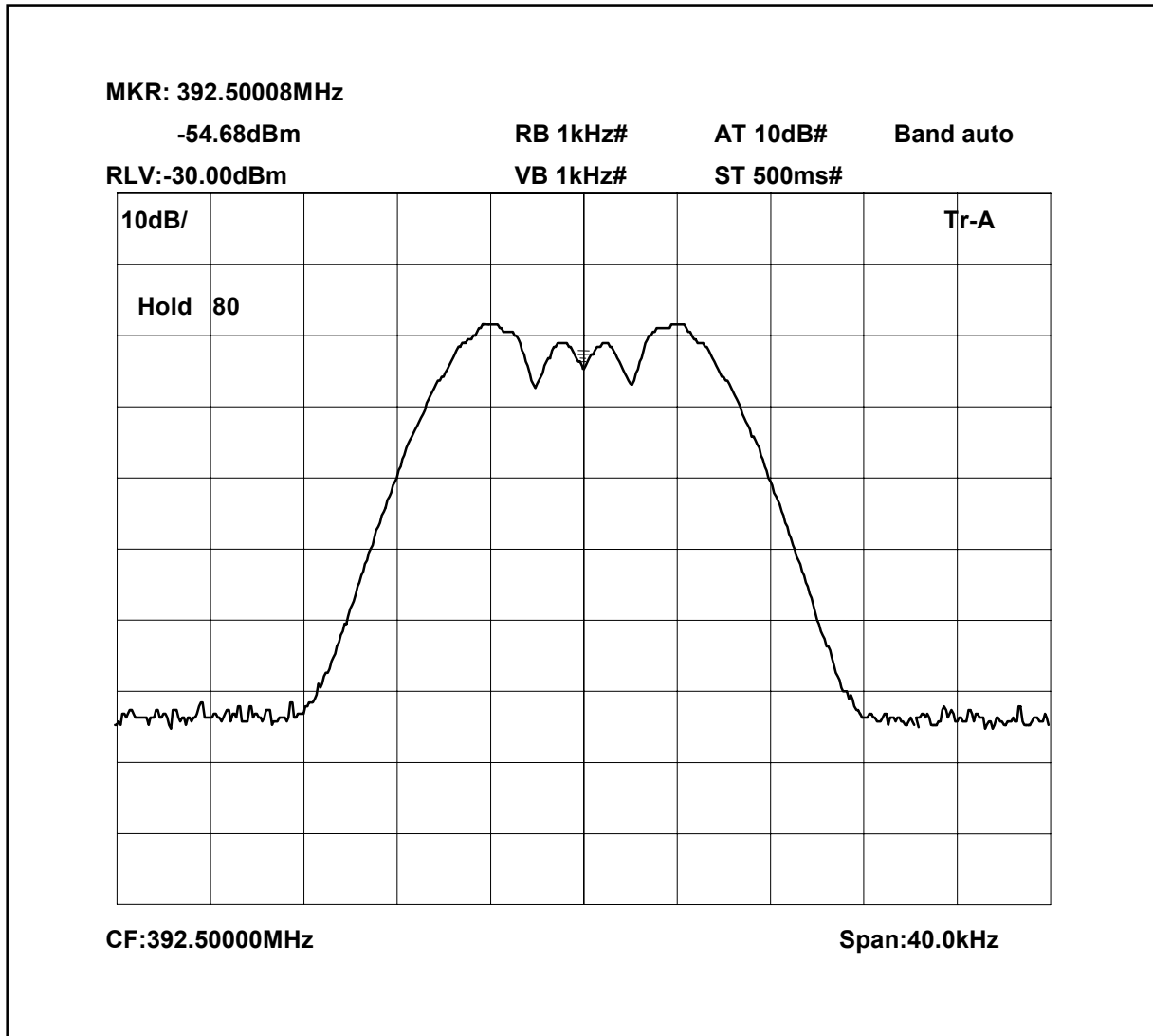


390.1MHz Signal Generator and EUT deviation set to 5kHz

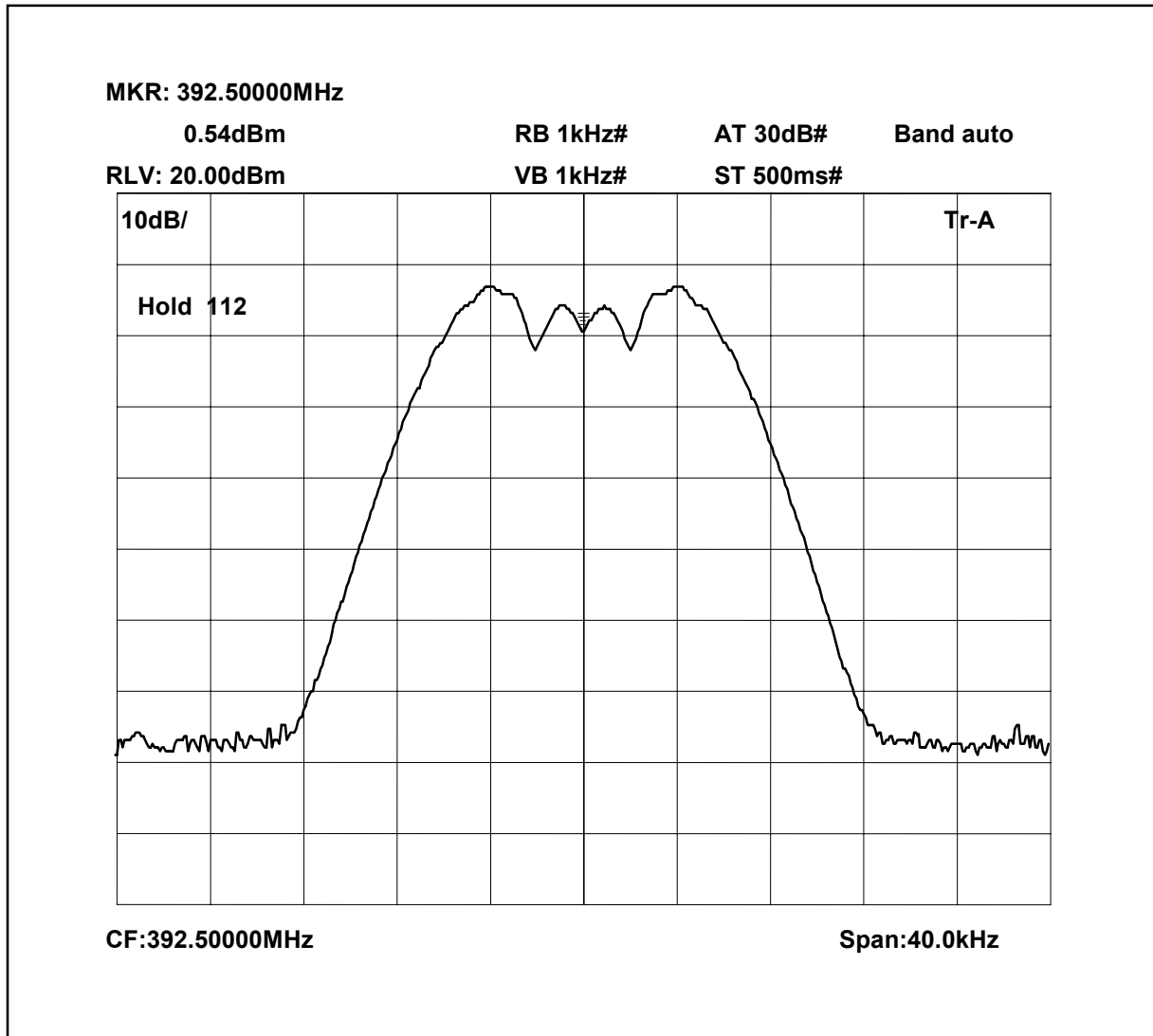


The above plots depicting the output waveshape show no measurable distortion visible. When compared to the input signal.

392.5MHz Signal Generator deviation set to 5kHz

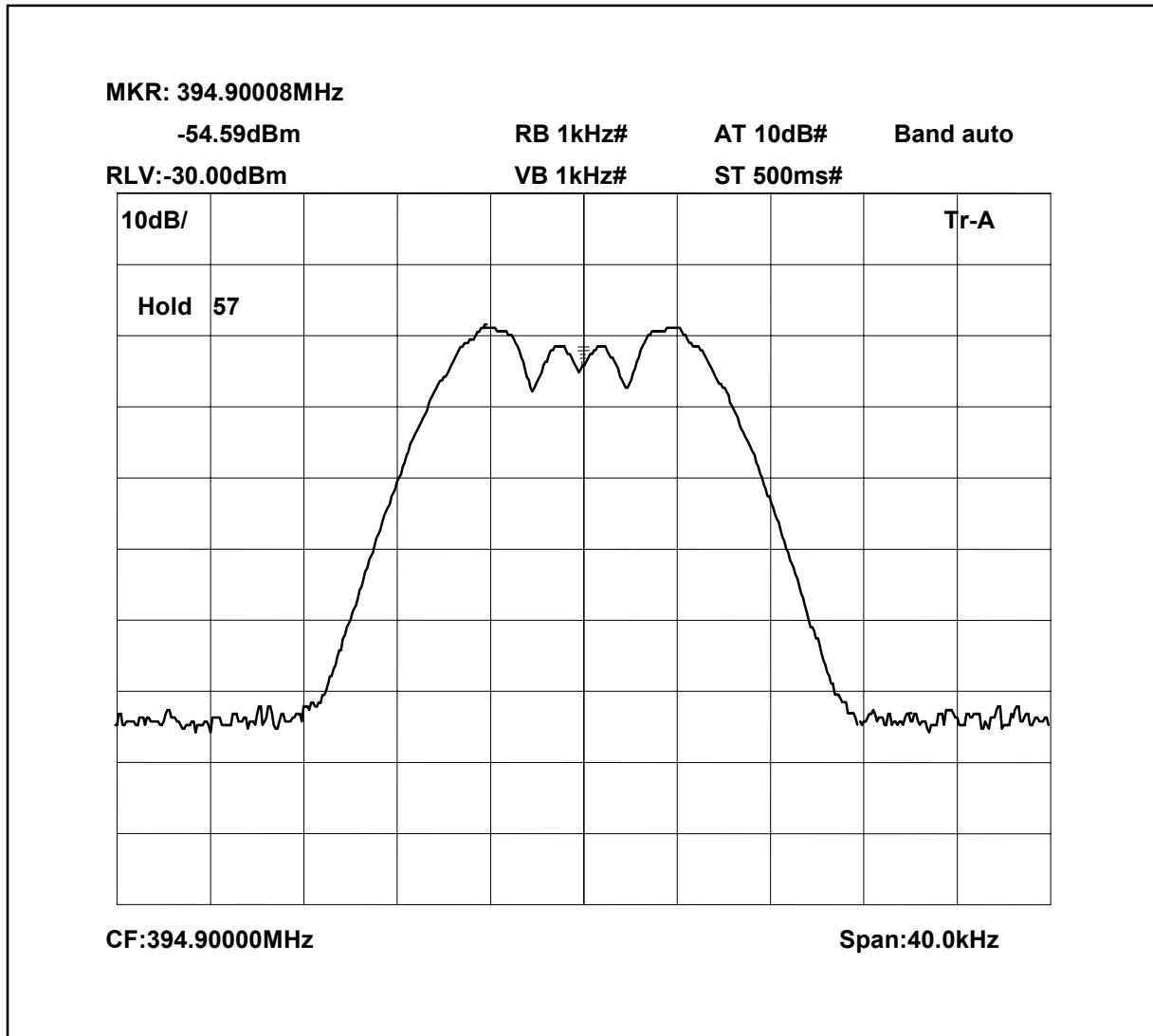


392.5MHz Signal Generator and amplifier deviation set to 5kHz

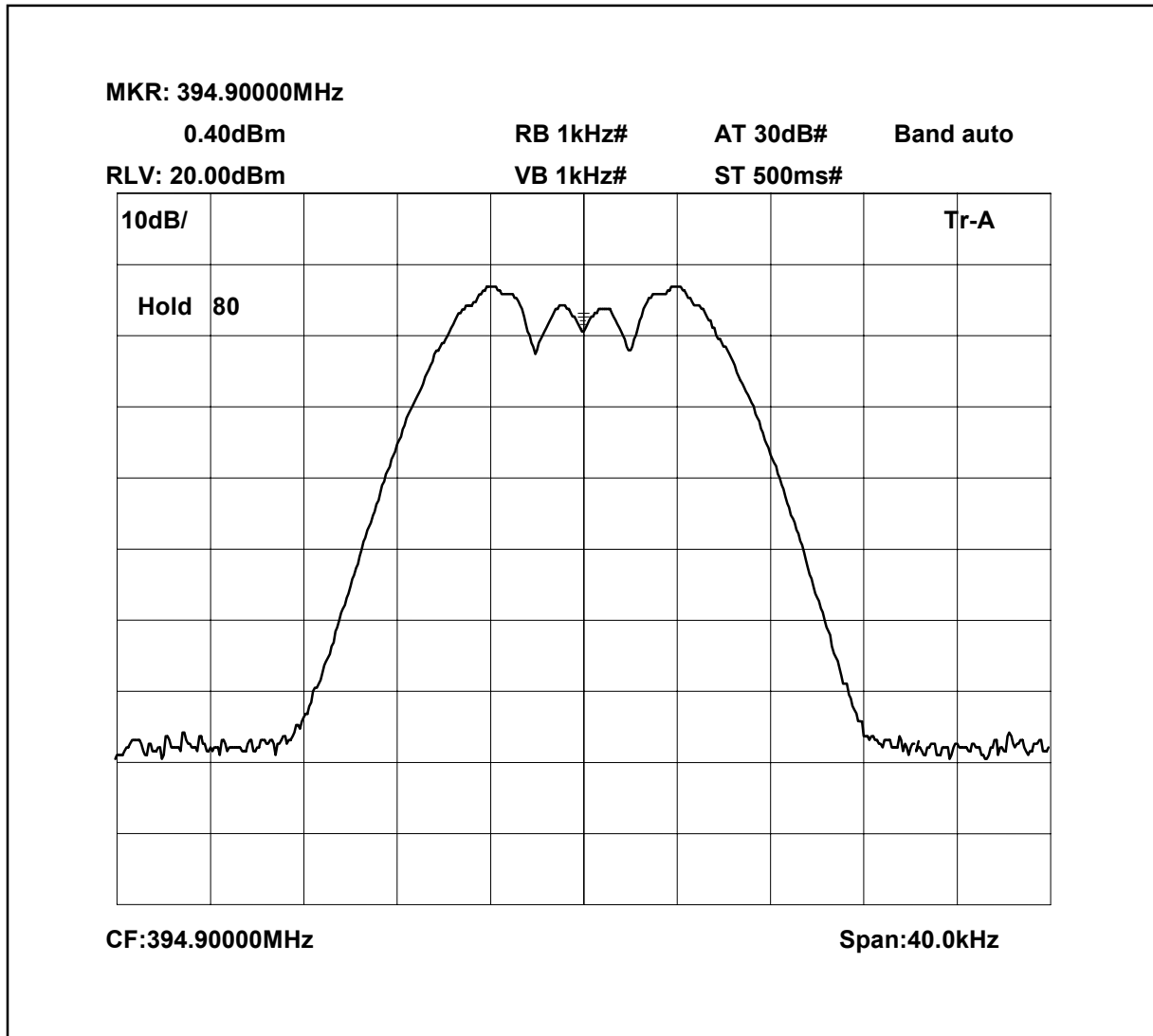


The above plots depicting the output waveshape show no measurable distortion visible. When compared to the input signal.

394.9MHz Signal Generator deviation set to 5kHz



394.9MHz Signal Generator deviation set to 5kHz



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

The test equipment used for the Transmitter modulated channel tests is shown overleaf:

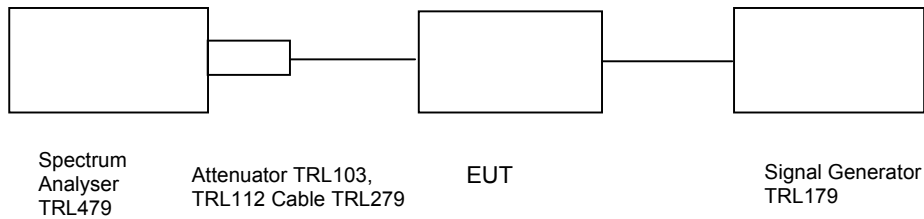
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
ATTENUATOR	BIRD	8304-200	N/A	103	X
ATTENUATOR	BIRD	8304-100	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1057 dBm– DOWNLINK

Ambient temperature = 24°C
 Relative humidity = 48%
 Supply voltage = +24 Vdc

Radio Laboratory Test Signal = F3E



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

The Spurious limit was calculated as follows:

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

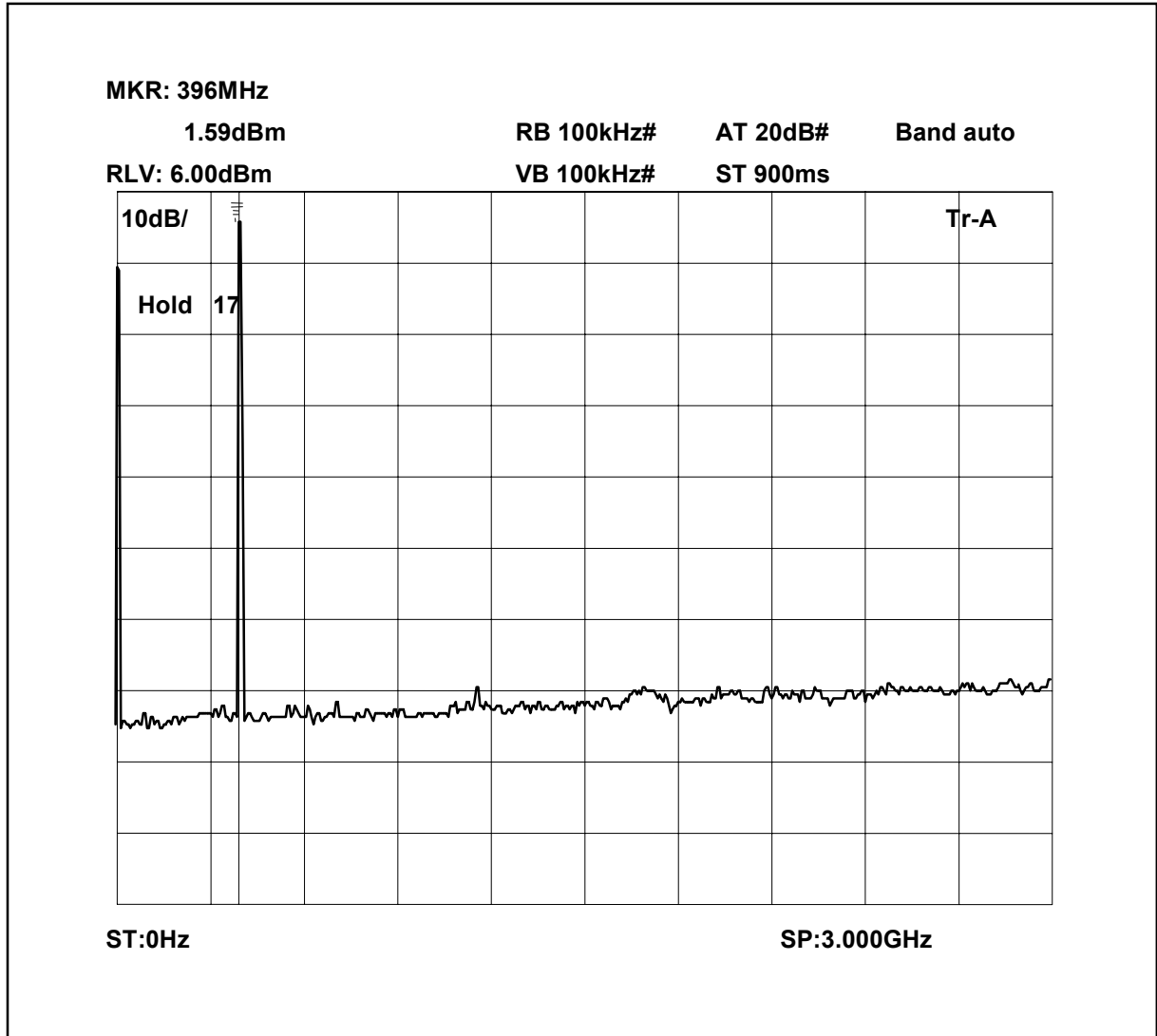
At least 43 + 10 log PdB

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

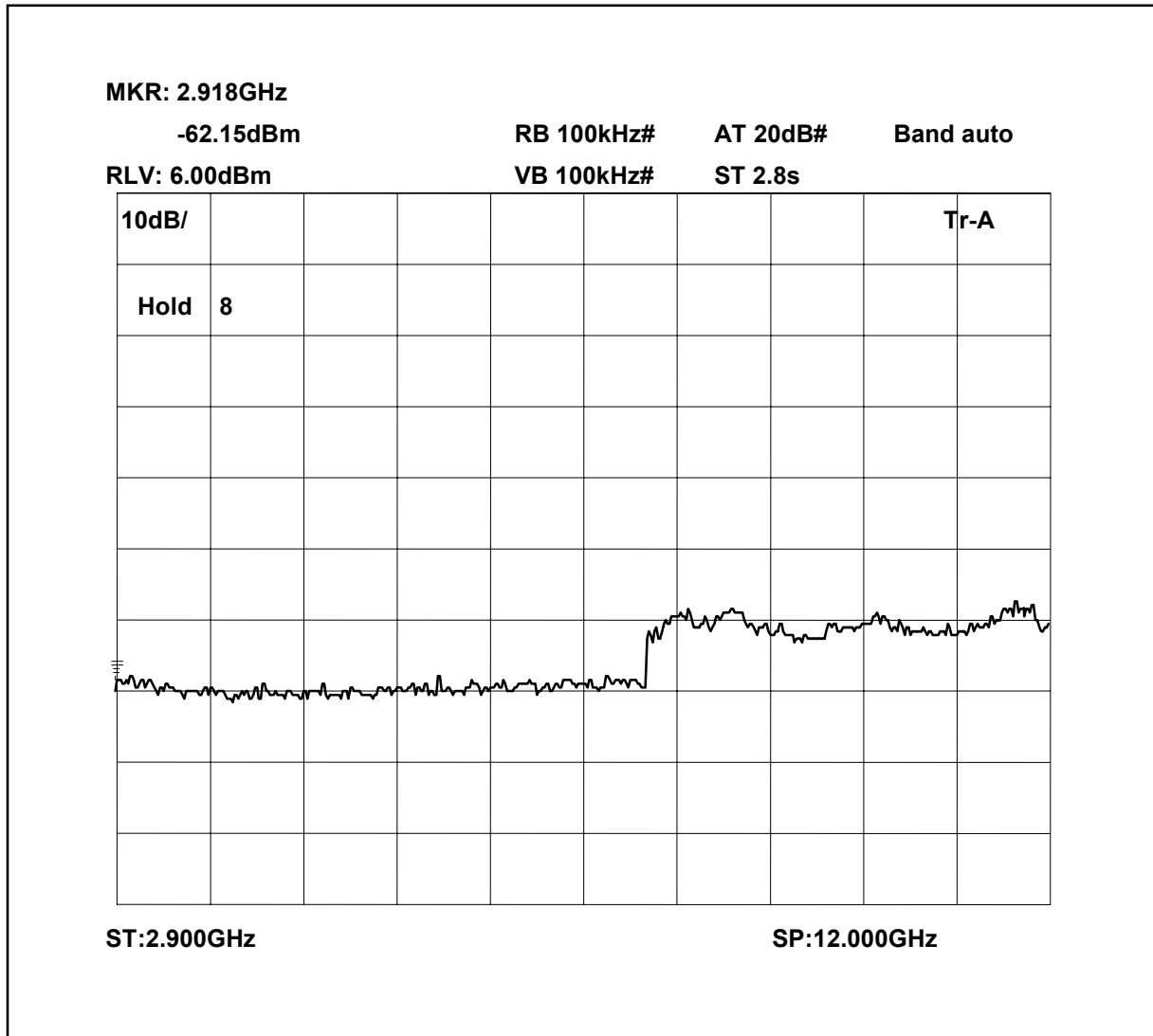
The test equipment used for the Transmitter Conducted Emissions:

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	8304-100	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

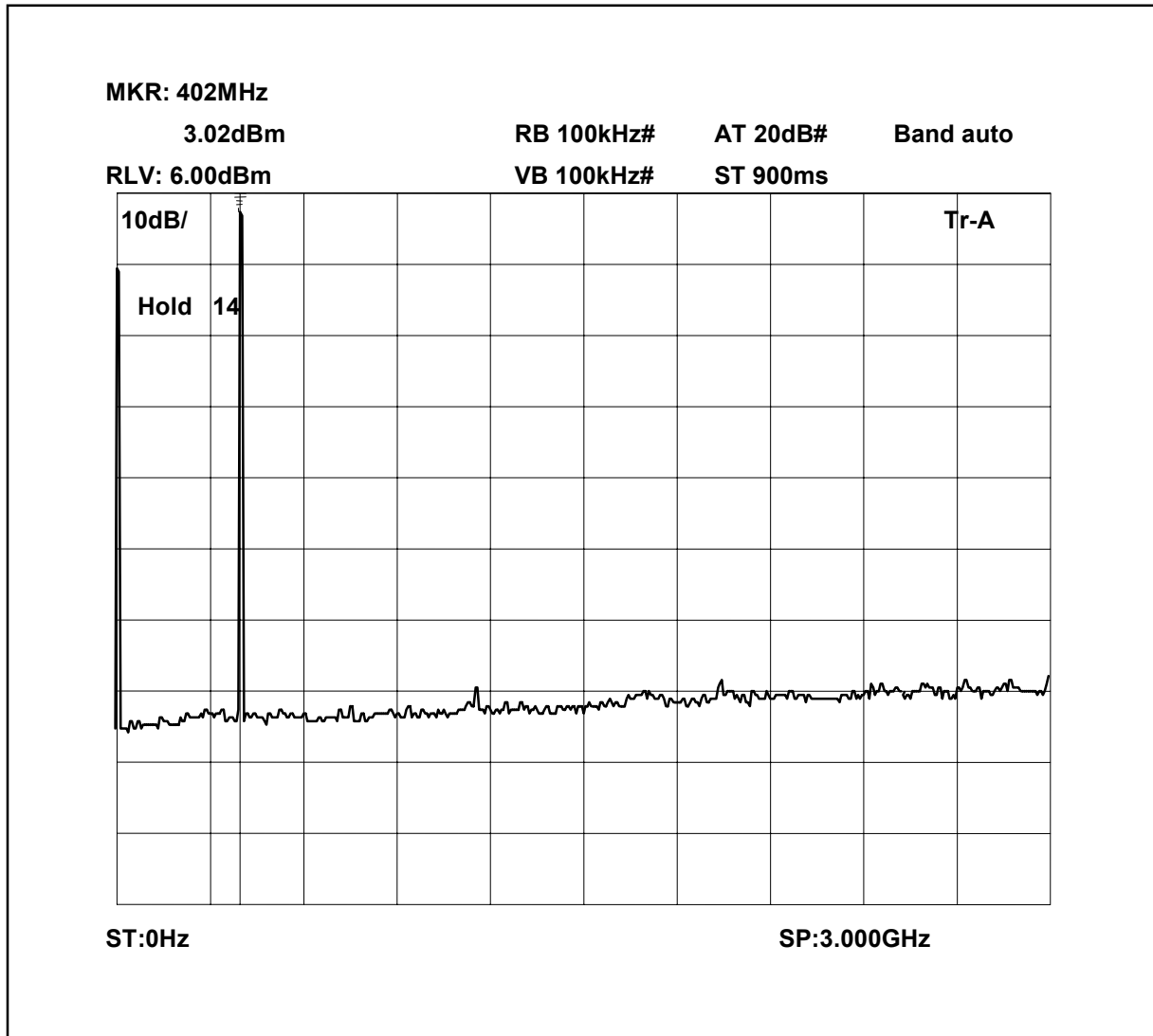
Conducted emissions 390.1MHz 0-3GHz



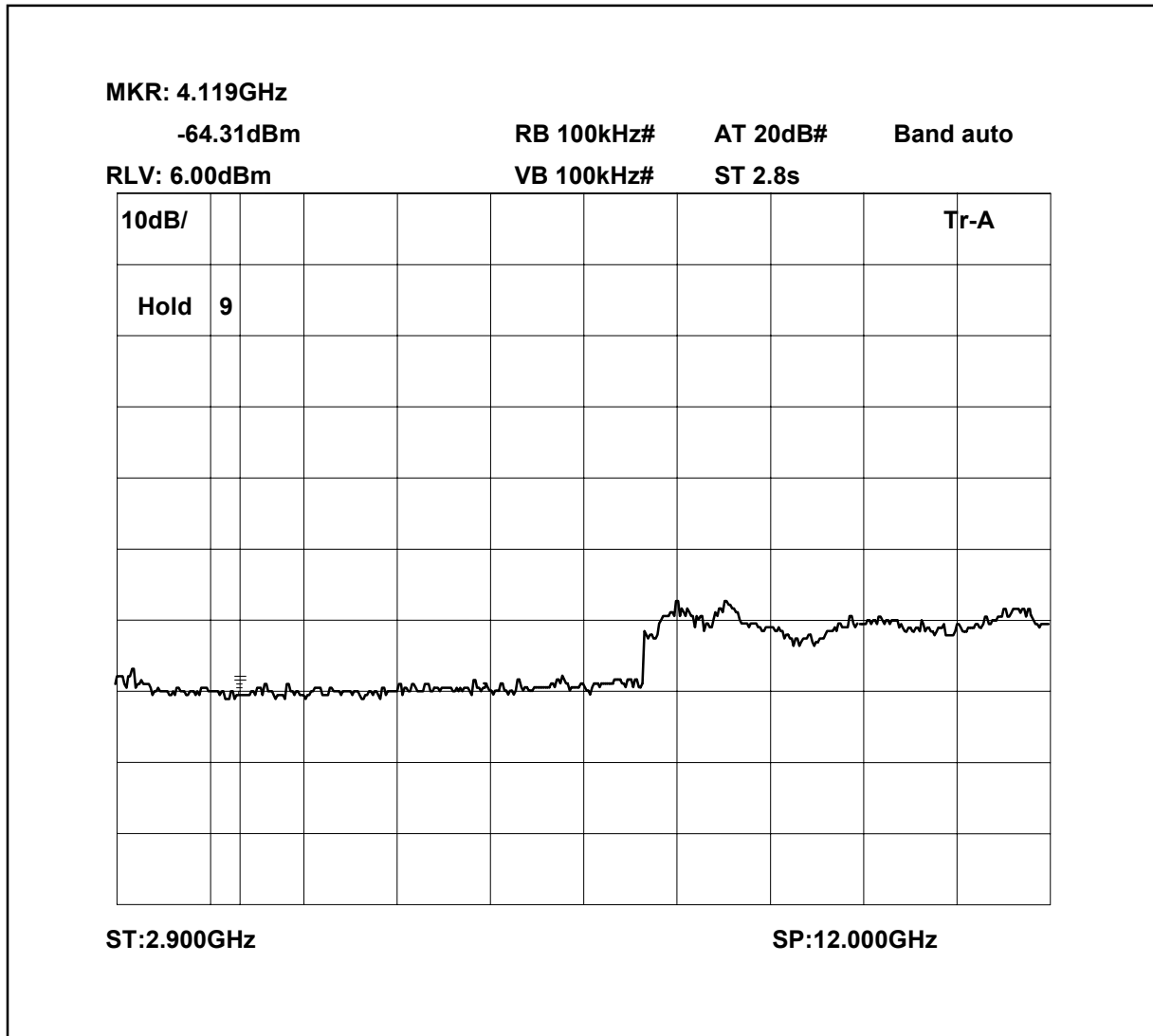
Conducted emissions 390.1 MHz 2.9-10GHz



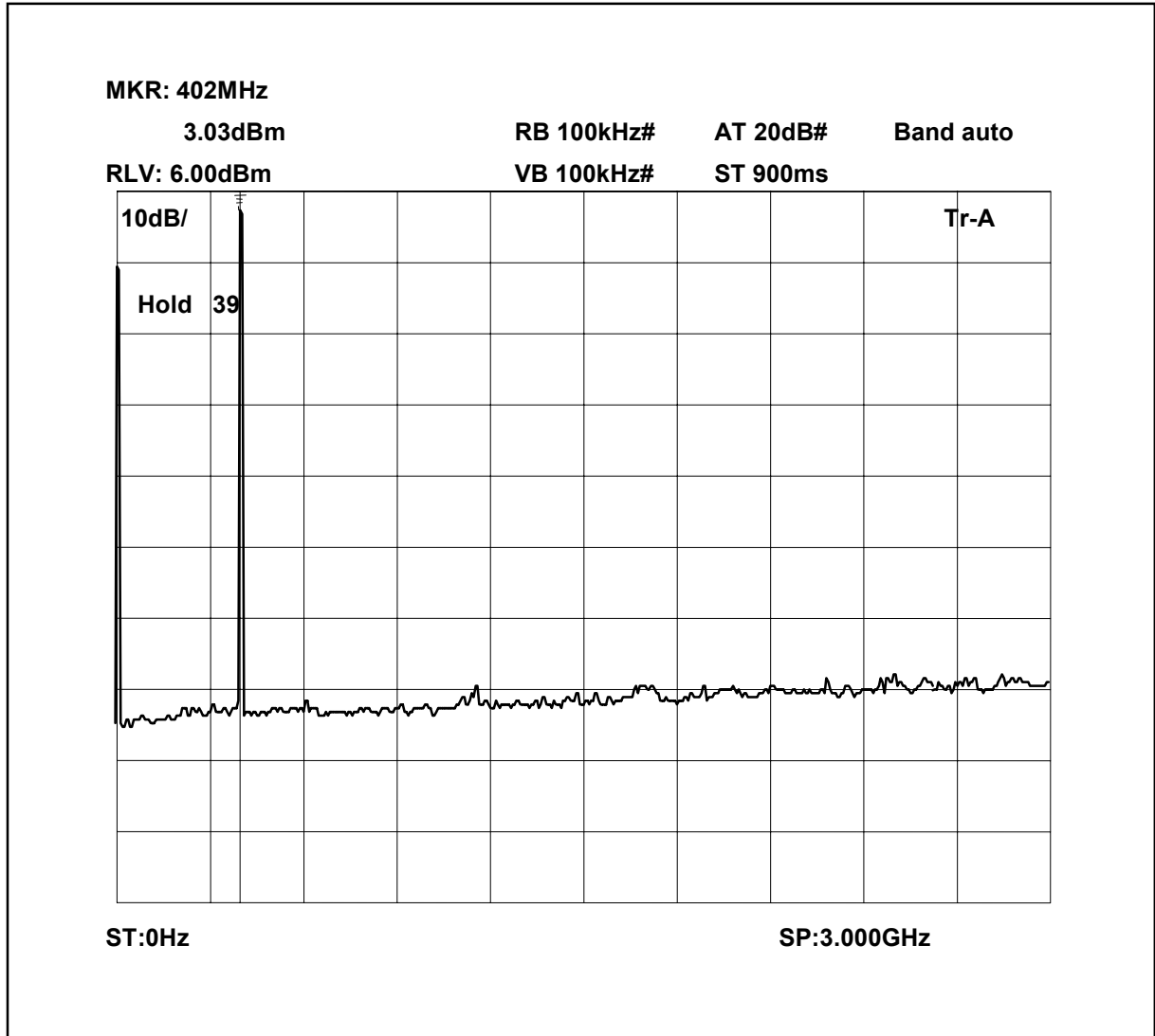
Conducted emissions 392.5 MHz 0-3GHz



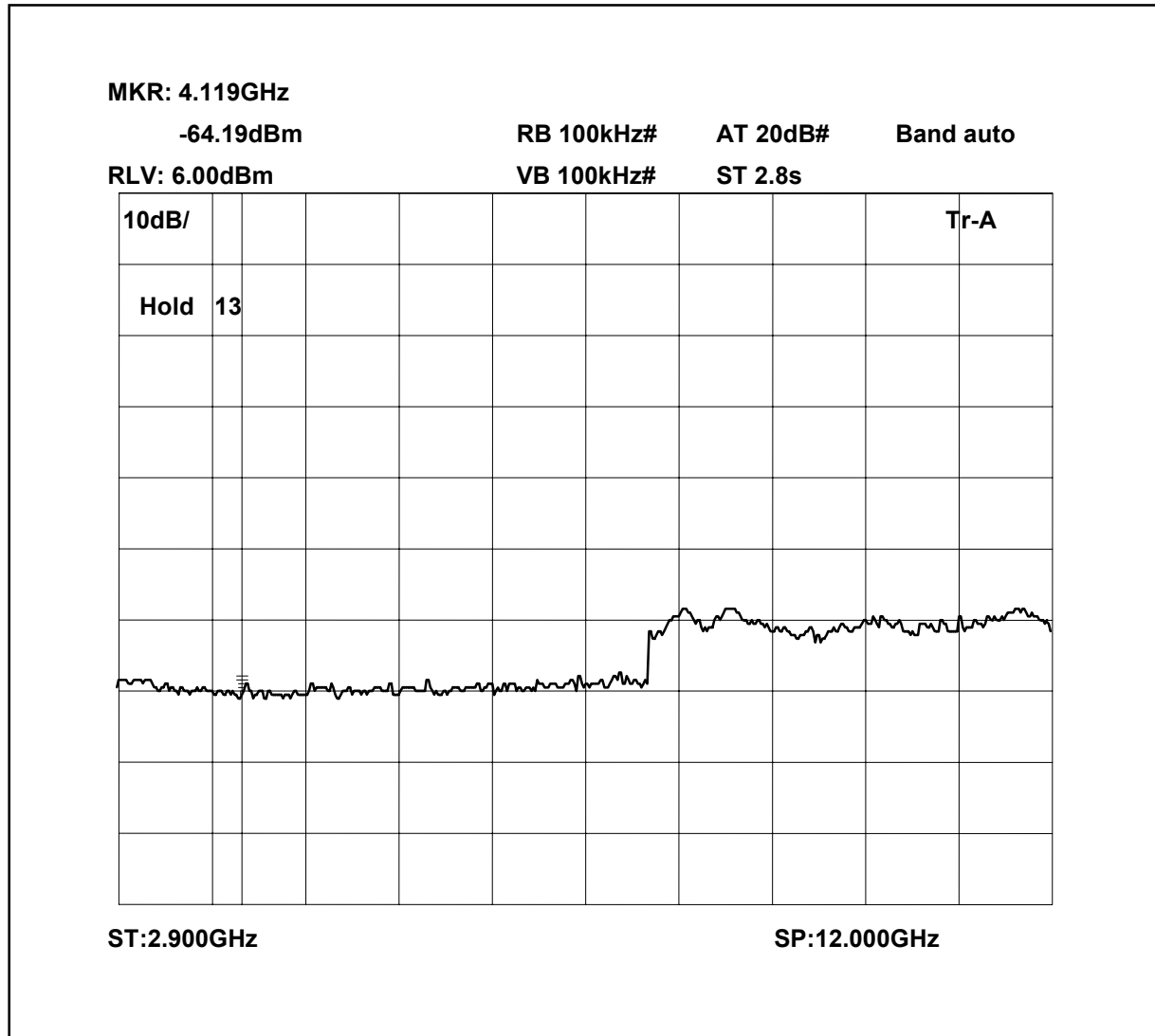
Conducted emissions 392.5MHz 2.9-10GHz



Conducted emissions 394.9MHz 0-3GHz



Conducted emissions 394.9MHz 2.9-10GHz

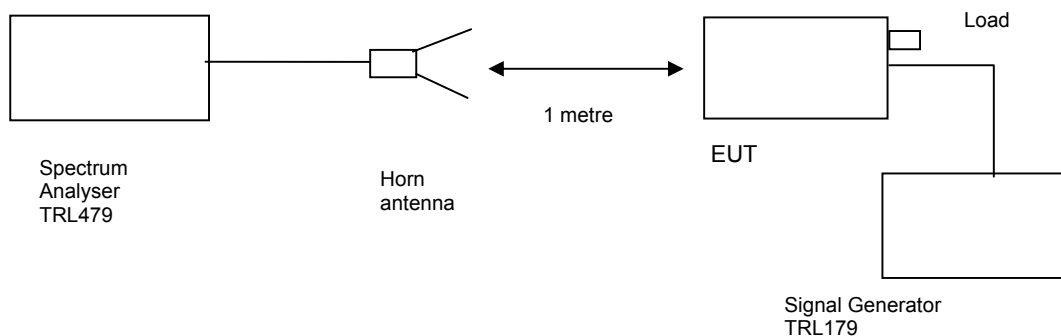


TRANSMITTER TESTS

AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– DOWNLINK

Ambient temperature = 10°C
Relative humidity = 43%
Conditions = OATS
Supply voltage = +24 Vdc
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.

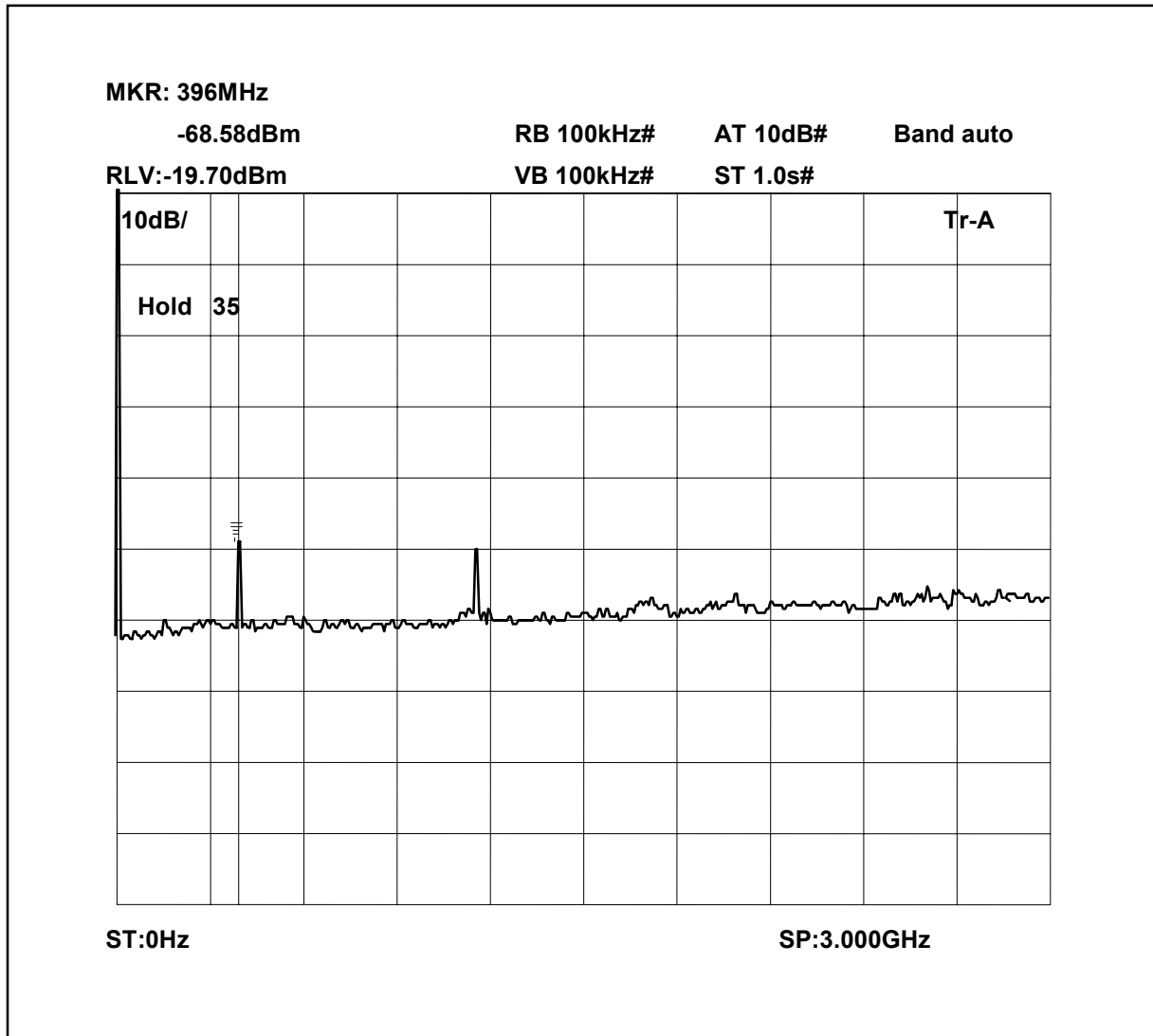
The Spurious limit was calculated as follows:

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

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

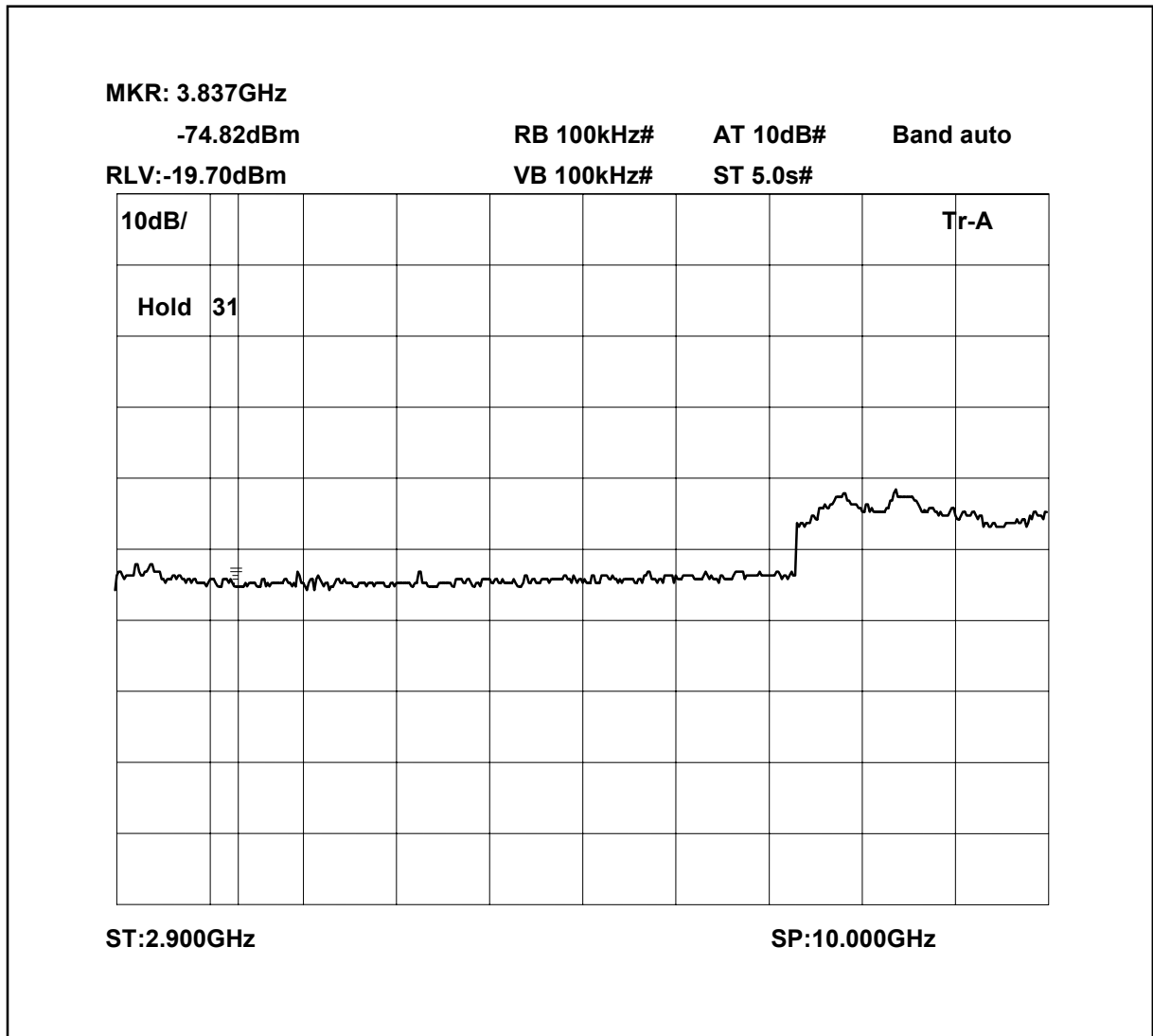
$$(10 \log P_{\text{watts}}) - (43 + 10 \log (P_{\text{watts}} * 1000)) = \text{LIMIT} = -13 \text{ dBm}$$

Radiated emissions 390.1MHz 0-3GHz



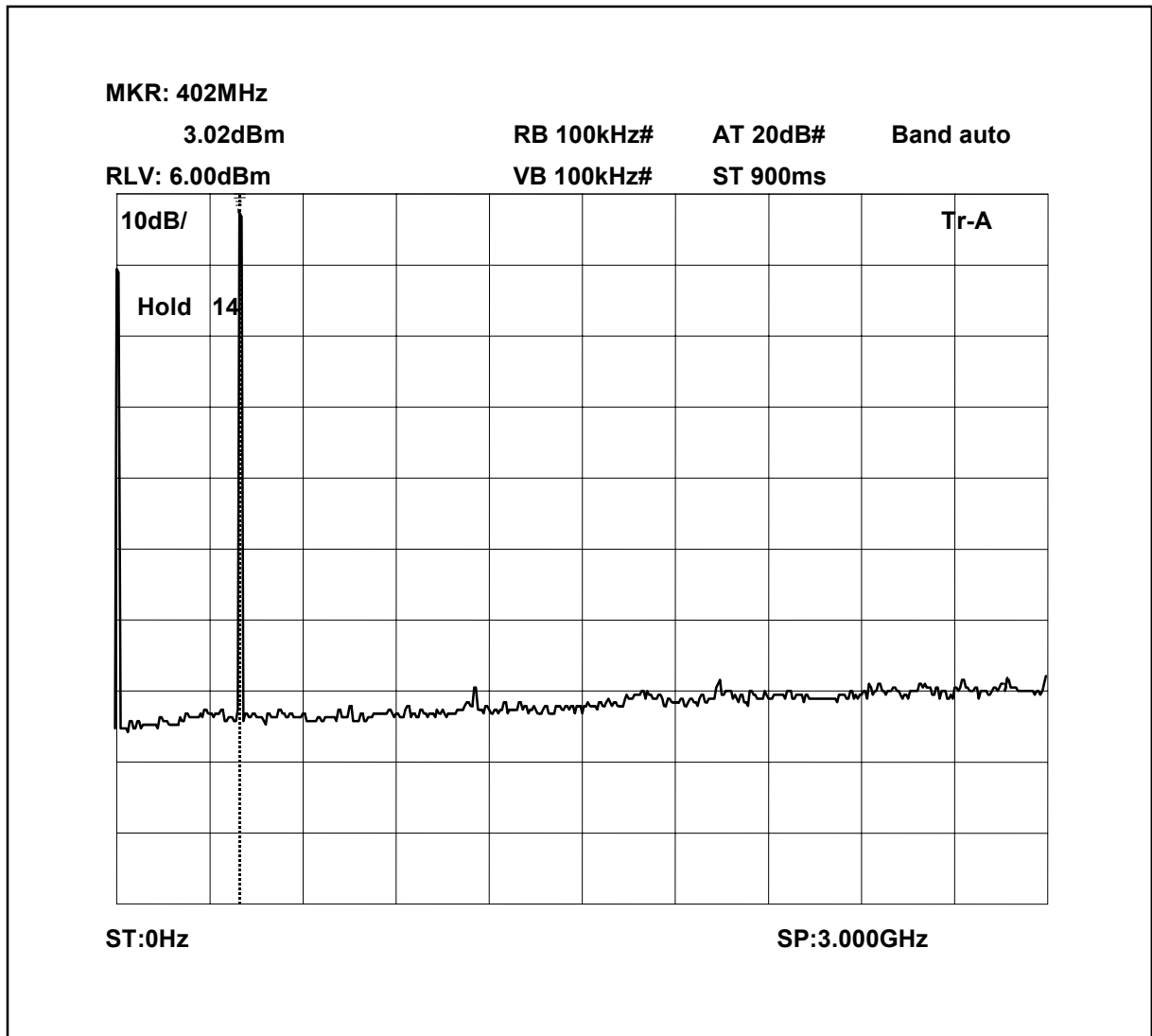
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 390.1MHz 2.9-10GHz



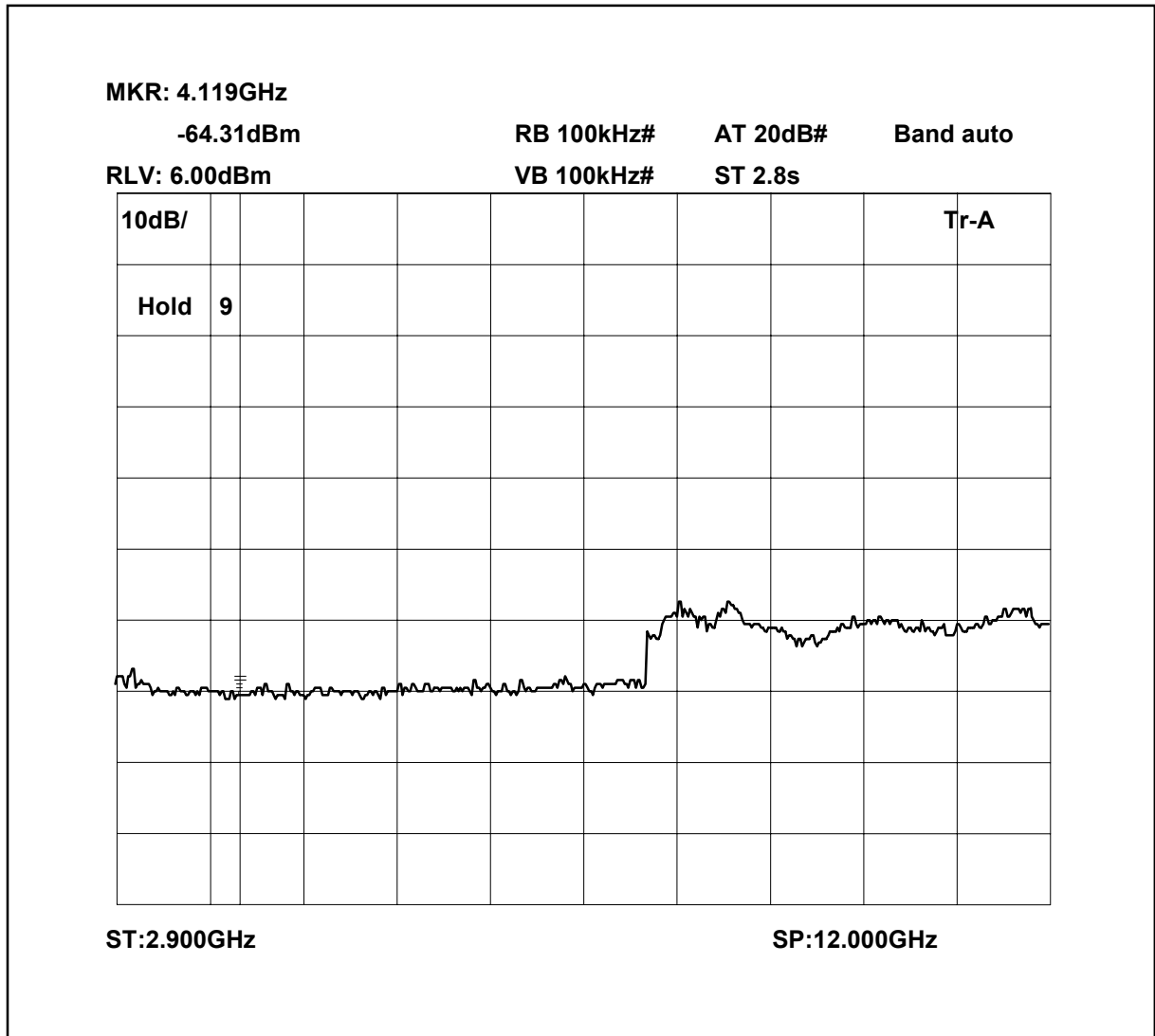
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 392.5MHz 0-3GHz



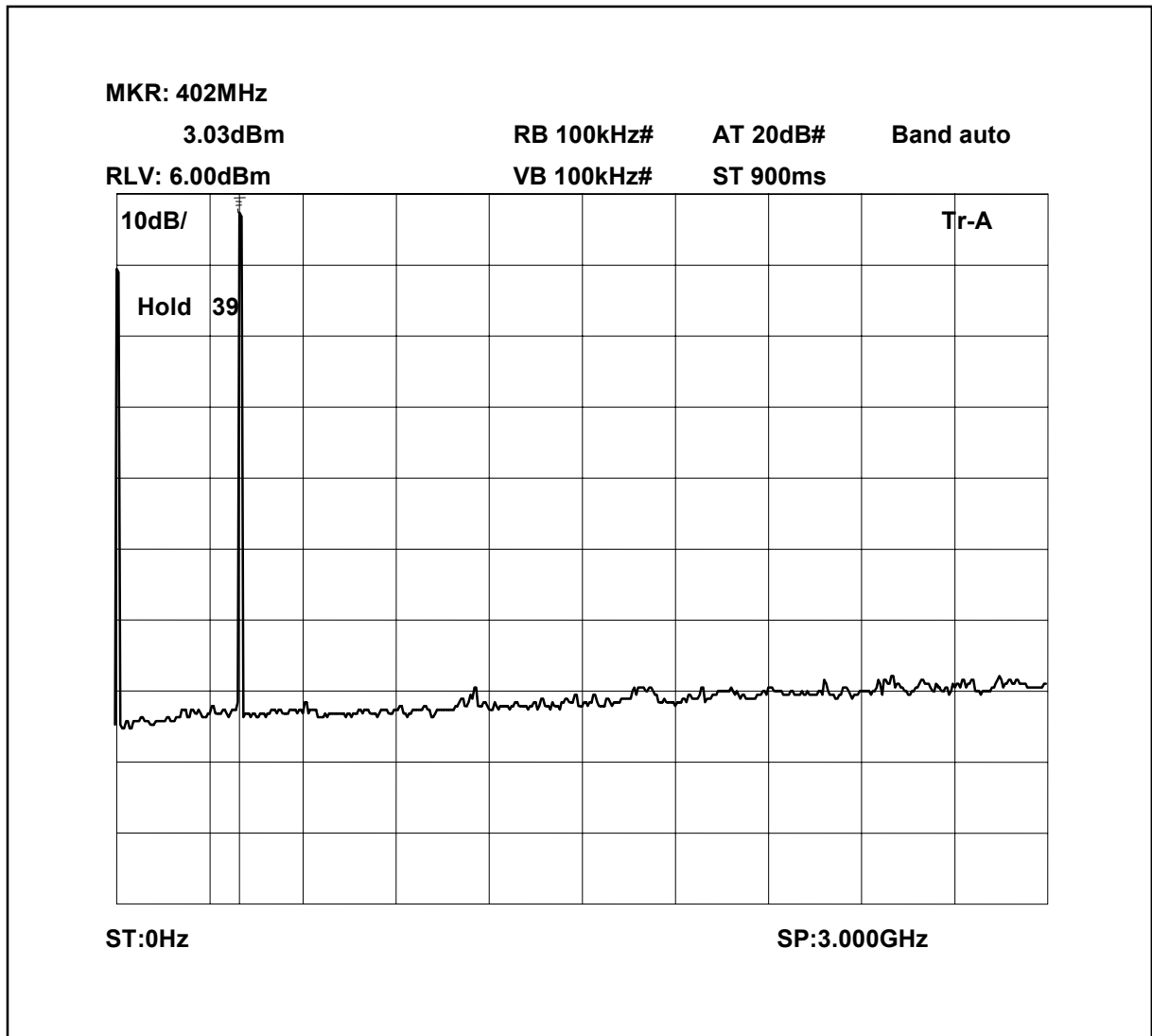
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 392.5MHz 2.9-10GHz



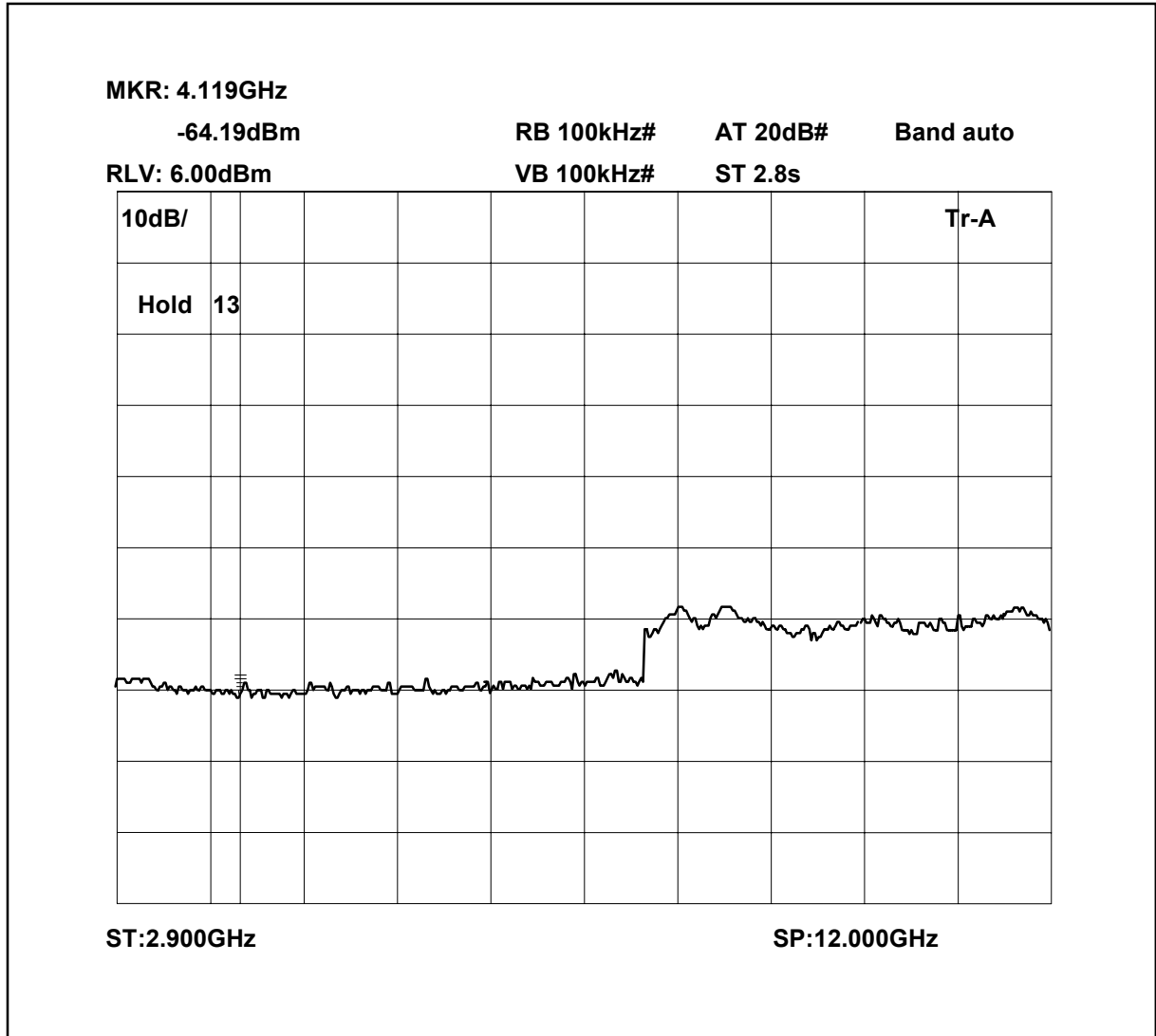
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 394.9MHz 0-3GHz



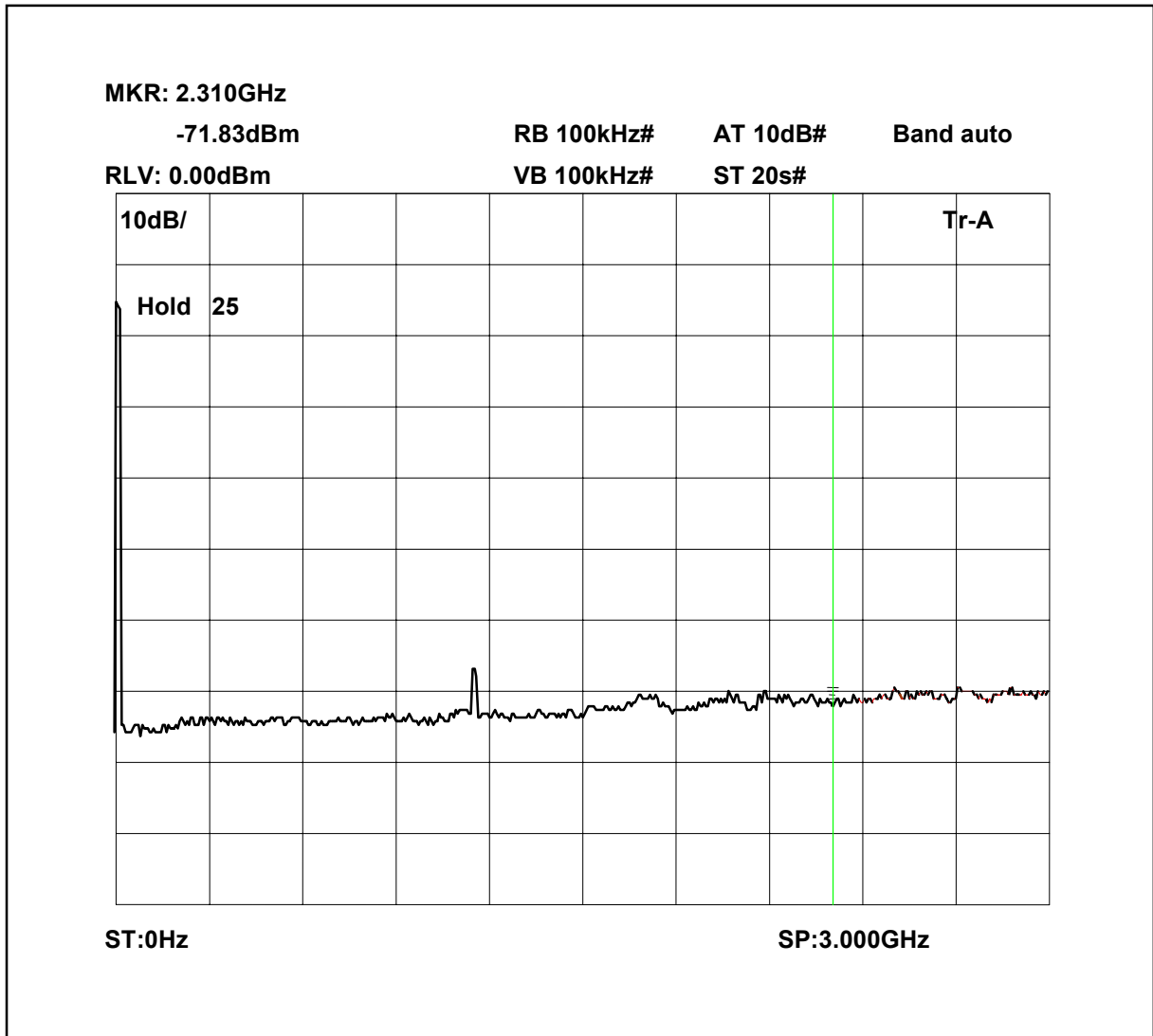
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 394.9MHz 2.9-12GHz



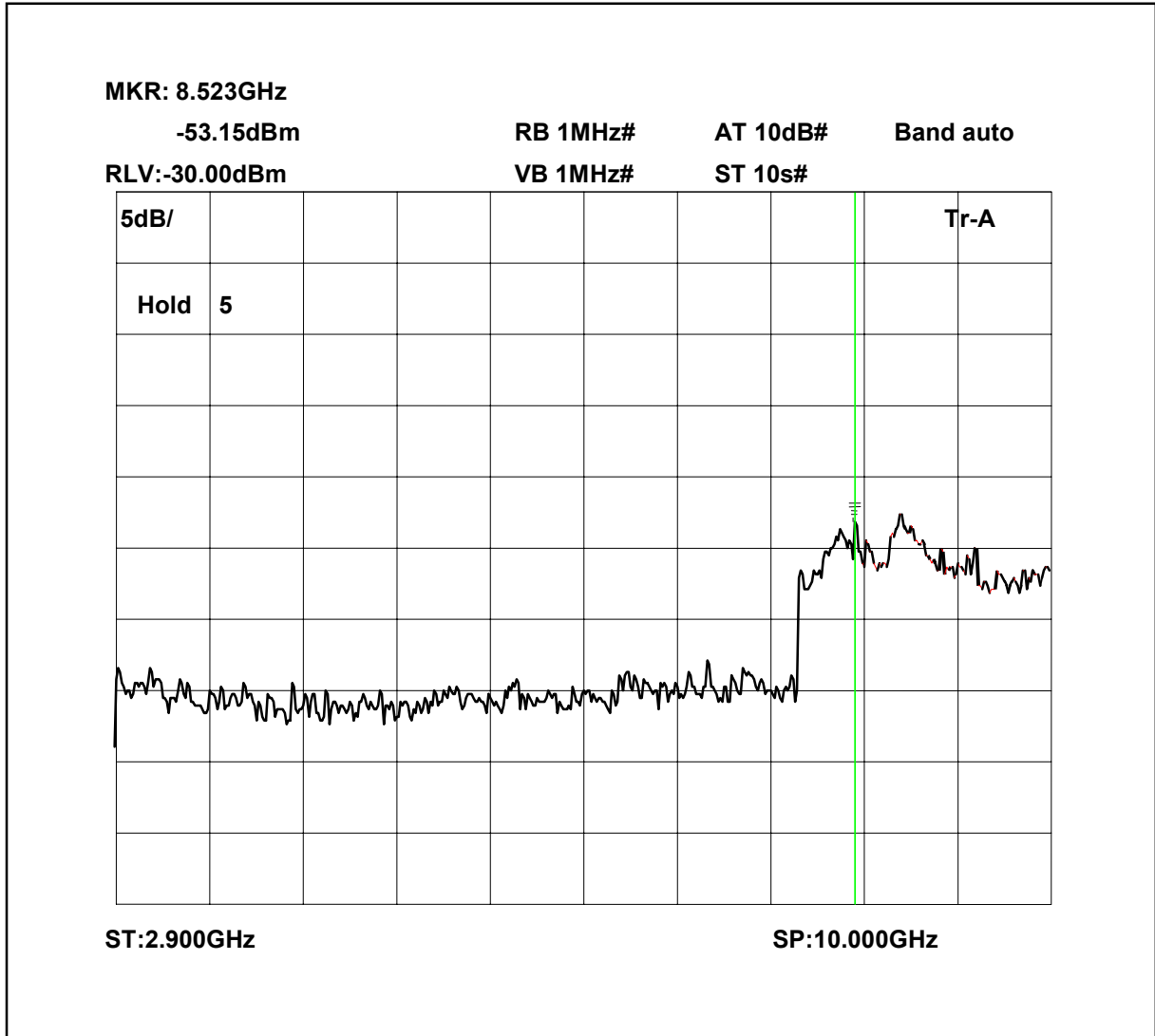
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions no input signal 0-3GHz



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

Radiated emissions no input signal 2.9-10GHz



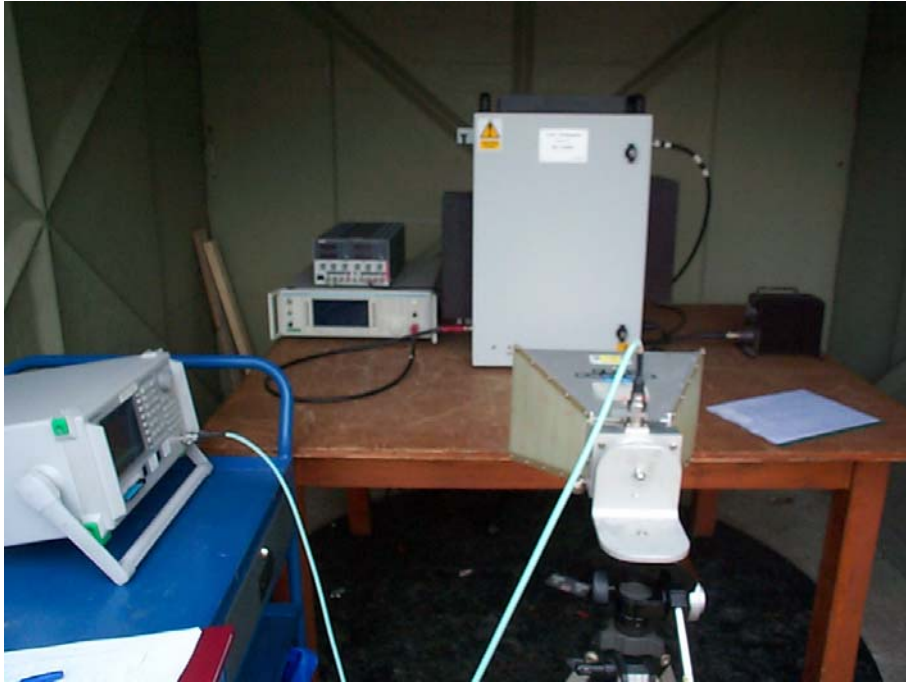
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	X
HORN	EMCO	3115	9010-3581	139	X
ATTENUATOR	BIRD	8308-200	N/A	103	X
ATTENUATOR	BIRD	8308-100	N/A	112	X
CABLE	ROSENBERGER	MICRO COAX	N/A	279	X
SIGNAL GENERATOR	MARCON	2042	119388/080	179	X

ANNEX A
PHOTOGRAPHS





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	[X]
		-	Rx	[]
		-	PSU	[]
		-	AUX	[]
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

