



TEST REPORT NO: RU1069/4858  
 COPY NO: .....  
 ISSUE NO: 1  
 FCC ID: NEO50-0637Series

**REPORT ON THE CERTIFICATION TESTING OF A  
 Aerial Facilities Limited  
 Channelised Bi-Directional RF Amplifier (50-063701)  
 WITH RESPECT TO  
 THE FCC RULES CFR 47, PART 90 Subpart K  
 PRIVATE LAND MOBLIE REPEATER.**

TEST DATE: 29<sup>th</sup> September – 6<sup>th</sup> October 2003

TESTED BY: ..... J CHARTERS  
 APPROVED BY: ..... P GREEN  
 PRODUCT MANAGER  
 EMC  
 DATE: .....

Distribution:

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

THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE



## CONTENTS

	<b>PAGE</b>	
CERTIFICATE OF CONFORMITY & COMPLIANCE	3	
APPLICANT'S SUMMARY	4	
EQUIPMENT TEST CONDITIONS	5	
TESTS REQUIRED	5	
TEST RESULTS	6-81	
		<b>ANNEX</b>
PHOTOGRAPHS	A	
PHOTOGRAPH No. 1: Test setup		
PHOTOGRAPH No. 2: Test setup		
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST	B	
 <b>Notes:</b>		
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: NEO50-0637Series  
 PURPOSE OF TEST: CERTIFICATION  
 TEST SPECIFICATION: FCC RULES CFR 47, Part 90 Subpart K  
 TEST RESULT: Compliant to Specification  
 EQUIPMENT UNDER TEST: Channelised Bi-Driectional RF Amplifier (50-063701)  
 EQUIPMENT TYPE: Private Land Mobile Repeater  
 MAXIMIUM GAIN 83.9dB  
 MAXIMUM INPUT -56dBm  
 MAXIMUM OUTPUT 25dBm  
 ANTENNA TYPE: Not applicable  
 CHANNEL SPACING: 12.5kHz

NUMBER OF CHANNELS:	Channel No.	Uplink	Downlink
	1	452.050MHz	457.050MHz
	2	452.300MHz	475.300MHz
	3	452.775MHz	457.775MHz
	4	453.225MHz	457.850MHz
	5	452.850MHz	458.225MHz
	6	n/a	Simplex Chanel 452.850MHz

FREQUENCY GENERATION: N/A  
 MODULATION TYPE: F3E  
 POWER SOURCE(s): 115Vac  
 TEST DATE(s): 29<sup>th</sup> September – 6<sup>th</sup> October 2003  
 ORDER No(s): 20424  
 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.

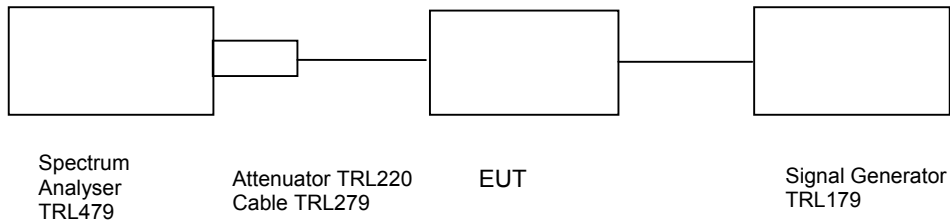
- |  |  |                                  |   |
|--|--|----------------------------------|---|
| 2.   | Product Use:                           | Private Land Mobile Repeater     |   |
| 3.   | Emission Designator:                   | F3E                              |   |
| 4.   | Temperatures:                          | Ambient (Tnom)                   | 20°C  |
| 5.   | Supply Voltages:                       | Vnom                             | 115Vac                                      |
| Note: Vnom voltages are as stated above unless otherwise shown on the test report page |  |                                  |   |
| 6.   | Equipment Category:                    | Single channel                   | <input type="checkbox"/>                    |
|  |  | Two channel                      | <input type="checkbox"/>                    |
|  |  | Multi-channel                    | <input checked="" type="checkbox"/>         |
| 7.   | Channel spacing:                       | Narrowband                       | <input checked="" type="checkbox"/> 12.5kHz |
|  |  | Wideband                         | <input type="checkbox"/>                    |
| 8.   | Test Location                          | TRL Compliance Services          |   |
|  |  | Up Holland                       | <input checked="" type="checkbox"/>         |
|  |  | Long Green                       | <input type="checkbox"/>                    |
| 9.   | Modifications made during test program | No modifications were performed. |   |

**COMPLIANCE TESTS**

**AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – UPLINK**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac  
 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
452.05MHz	-56.3	26.6	-2.1	80.9	80.9
452.30MHz	-56.2	26.6	-1.9	80.9	80.9
452.775MHz	-56.1	26.6	-2.5	81.05	81.05

Notes:

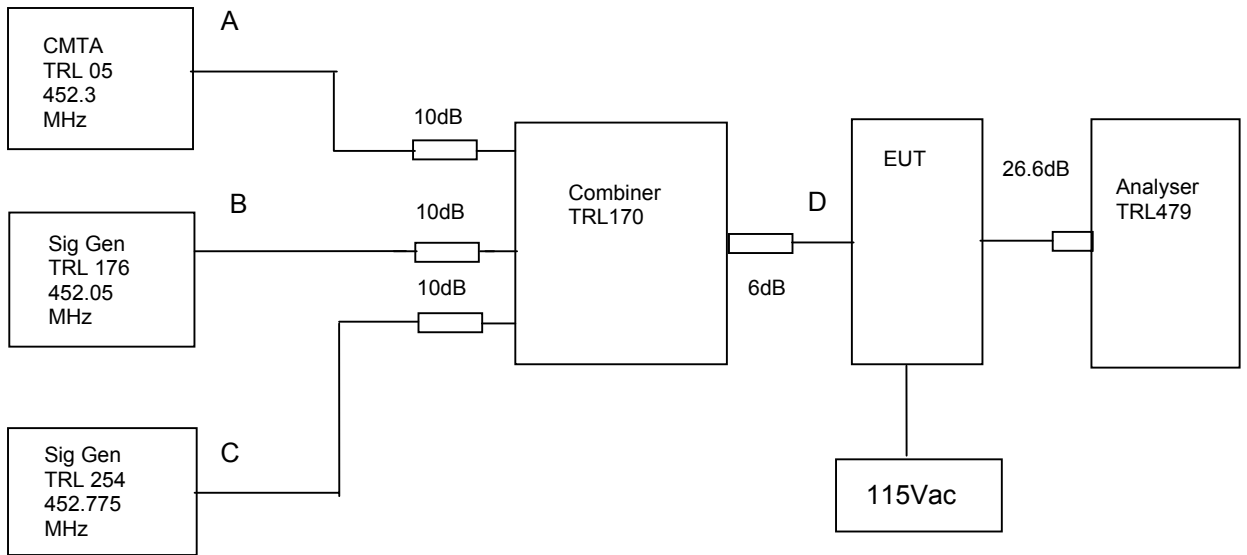
1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 20dBs and the level of the output signal remeasured

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

**AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– UPLINK**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac

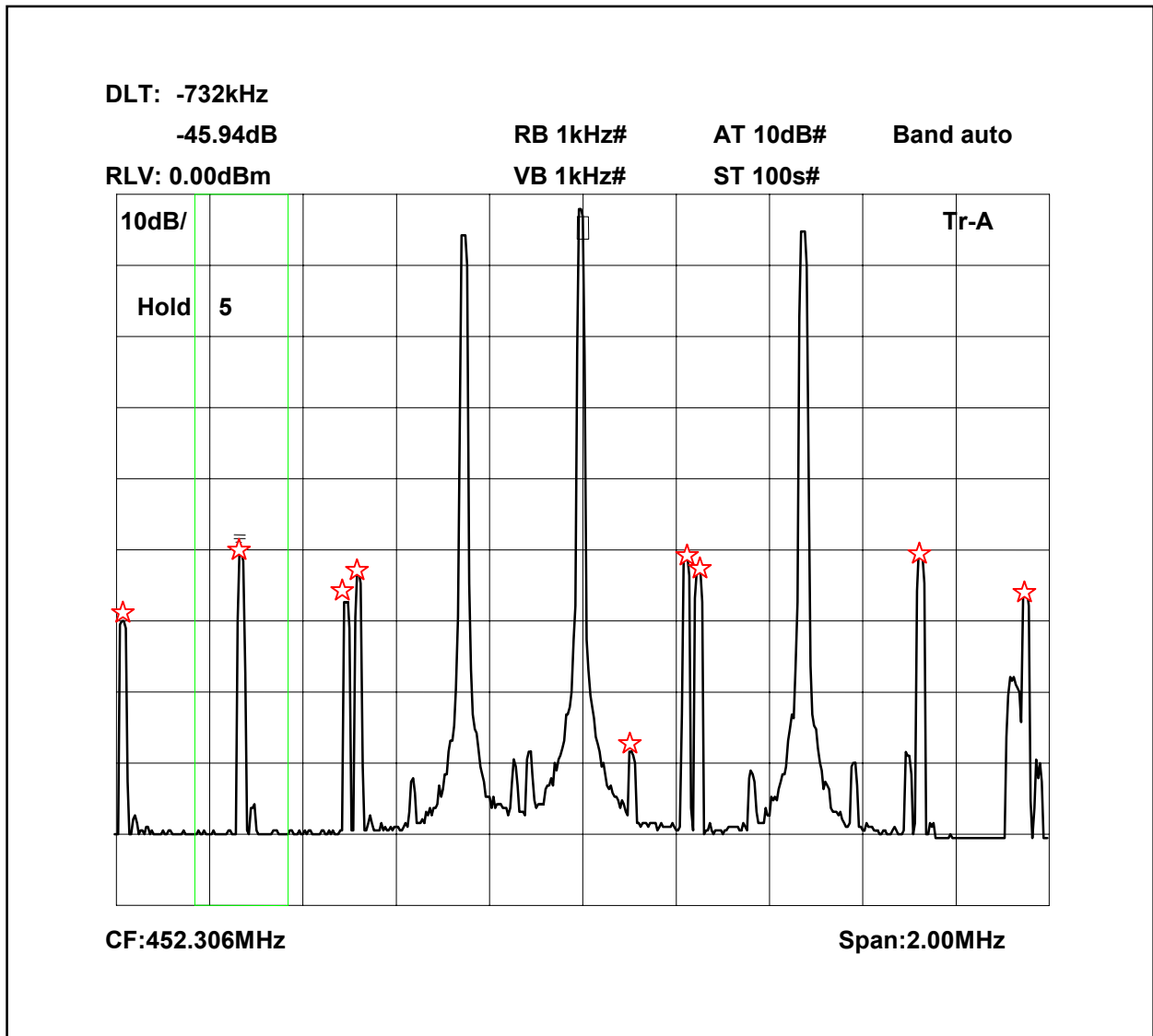
Radio Laboratory



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 -56.1dBm. The cable and attenuator loss between the EUT and the spectrum analyser was 26.6dB.

Sweep data is shown on the next page:

Intermodulation Inband



The above plot shows that all products (designated by ☆ ) are at least 40dB below the fundamentals.





Test equipment used for intermodulation test

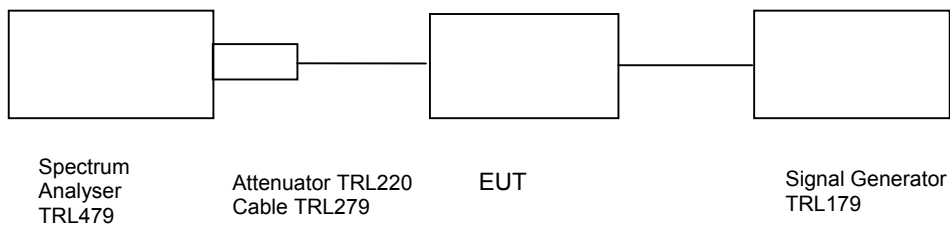
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119562/02	254	<b>X</b>
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>
COMBINER	ELCOM	RC-4-50	N/A	170	<b>X</b>

## TRANSMITTER TESTS

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

Ambient temperature = 20°C  
Relative humidity = 54%  
Supply voltage = 115Vac  
Channel number = See test results

Radio Laboratory

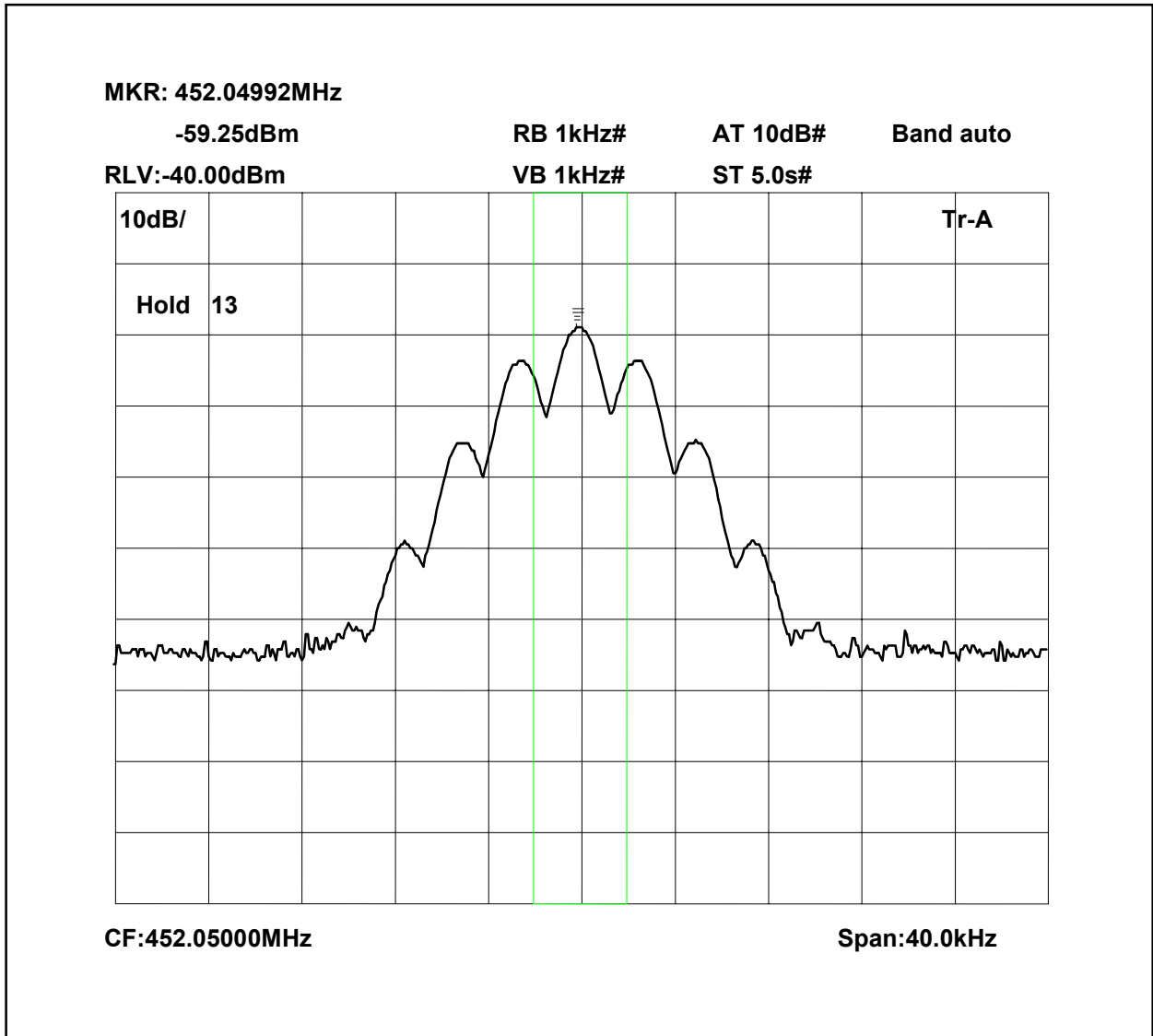


This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-56.1dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

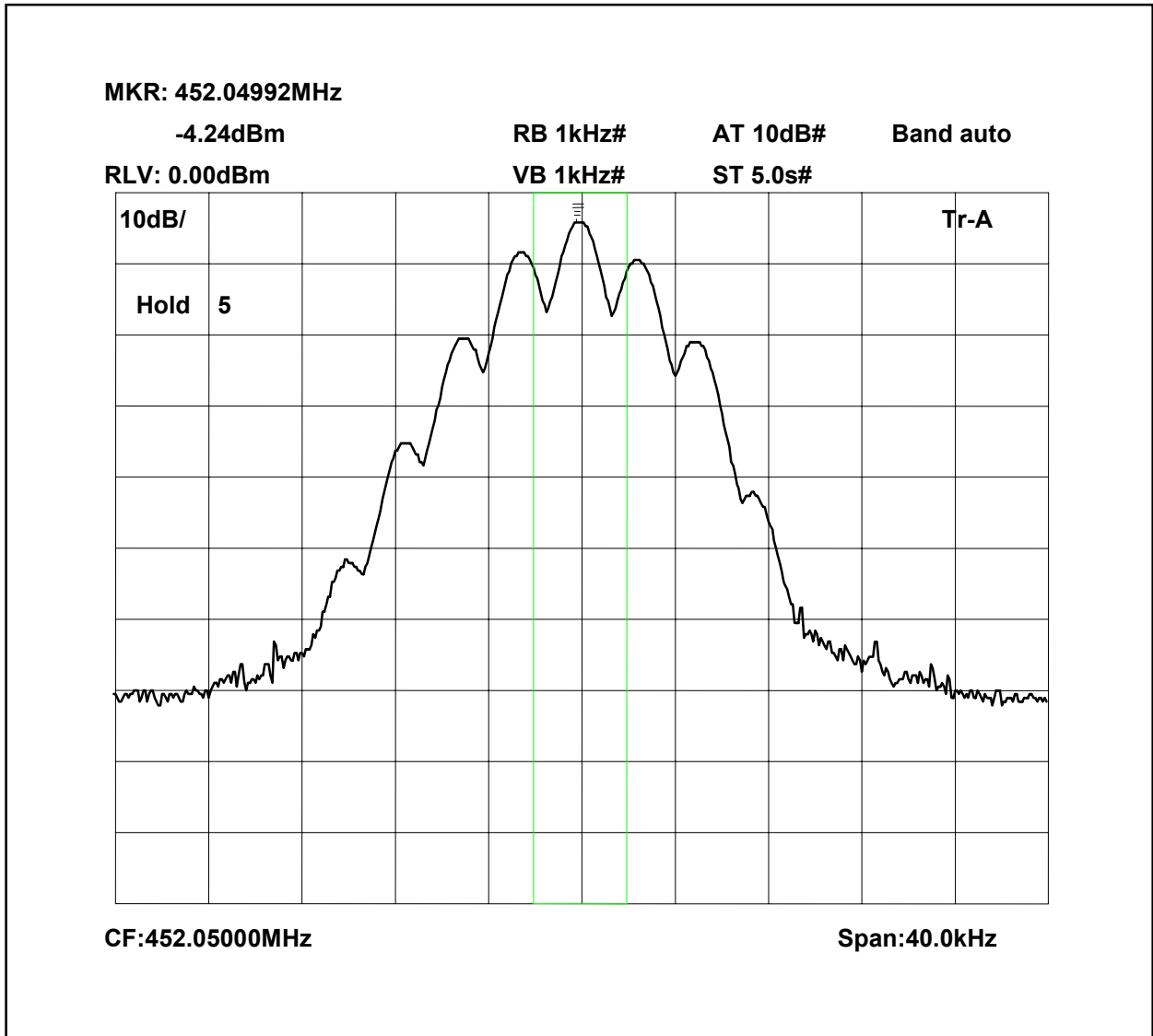
Note: The cables and attenuators had the following losses.

1. Cable TRL279 and attenuator TRL220 26.6dB
2. Cable between signal generator and EUT 0.85dB

452.05MHz Signal Generator deviation set to 2.5kHz

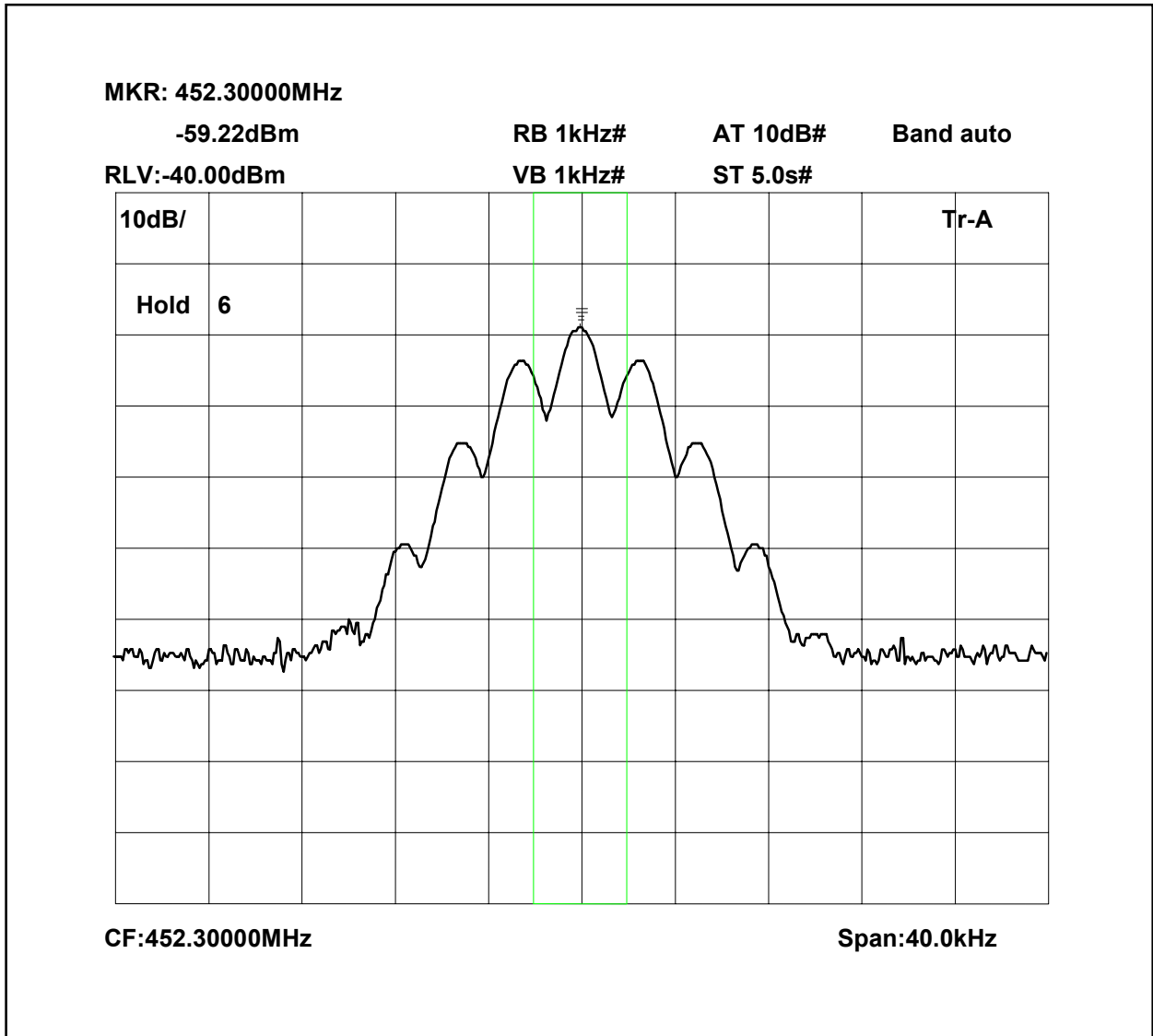


452.05MHz Signal Generator and EUT deviation set to 2.5kHz

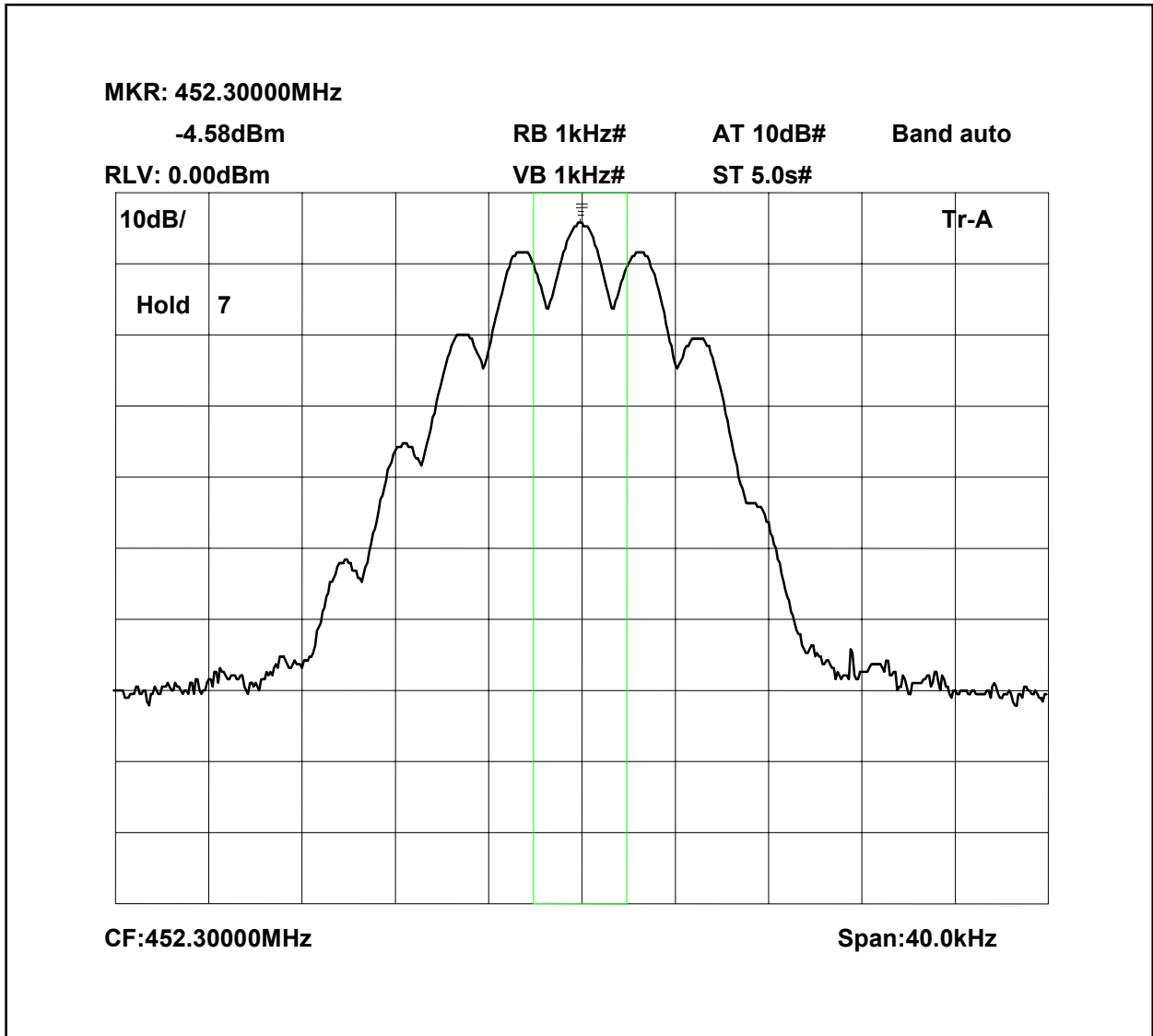


The above plots depicting the output waveshape show no measurable distortion visible, when compared to the input signal.

452.30MHz Signal Generator deviation set to 2.5kHz

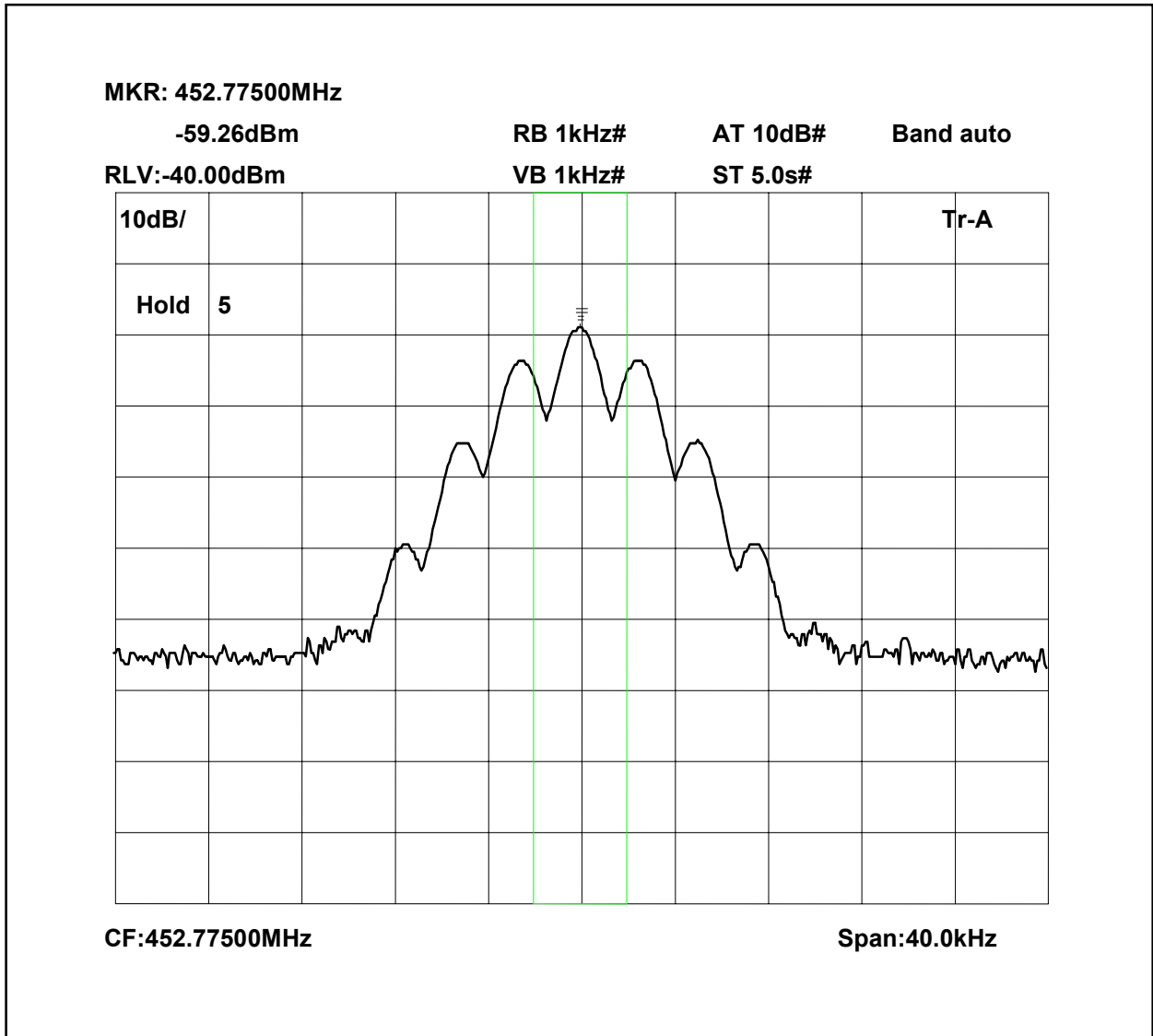


452.30MHz Signal Generator and amplifier deviation set to 2.5kHz



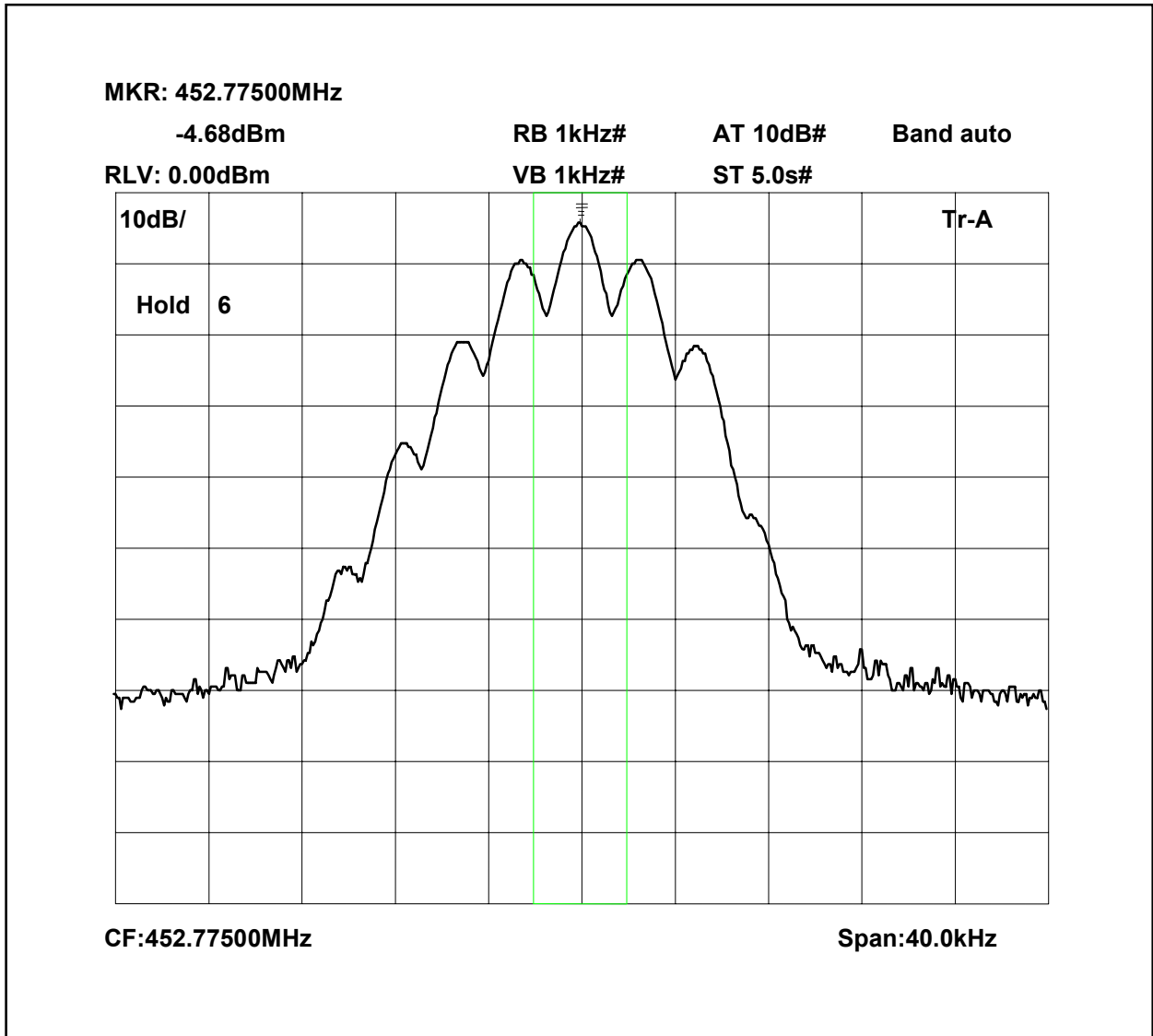
The above plots depicting the output waveshape show no measurable distortion visible when compared to the input signal.

452.775MHz Signal Generator deviation set to 2.5kHz





452.775MHz Signal Generator deviation set to 2.5kHz



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:

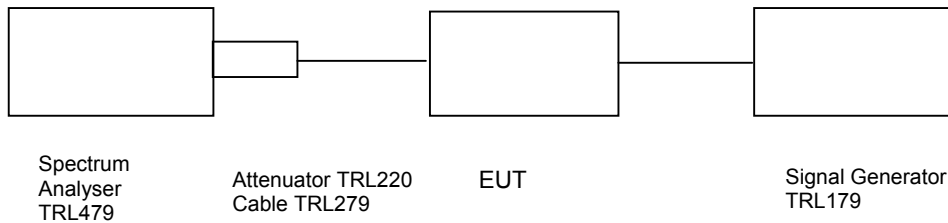
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

**TRANSMITTER TESTS**

**AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1051 – UPLINK**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac

Radio Laboratory Test Signal = F3E



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

The Spurious limit was calculated as follows:

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

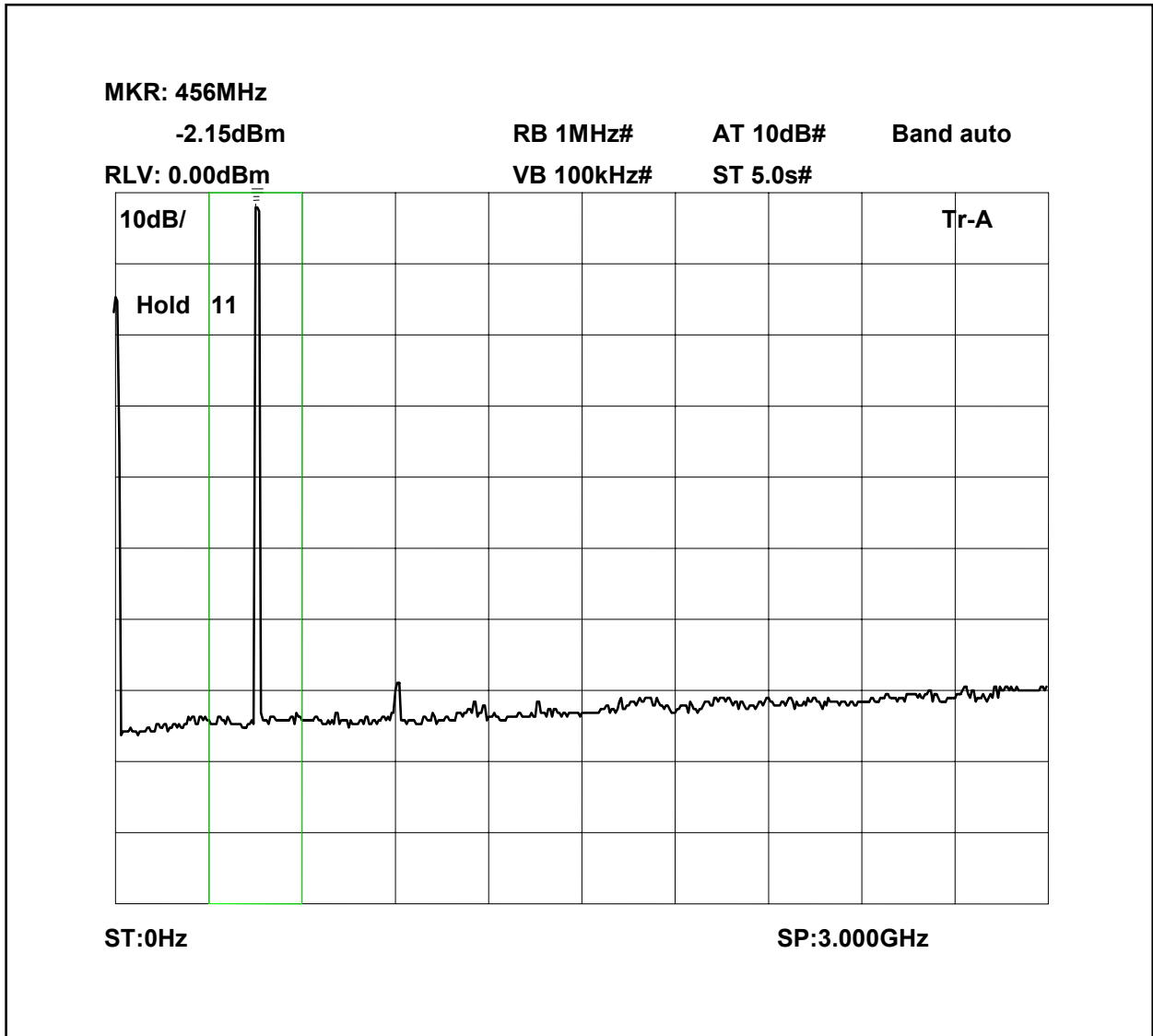
At least  $43 + 10 \log P_{dB}$

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

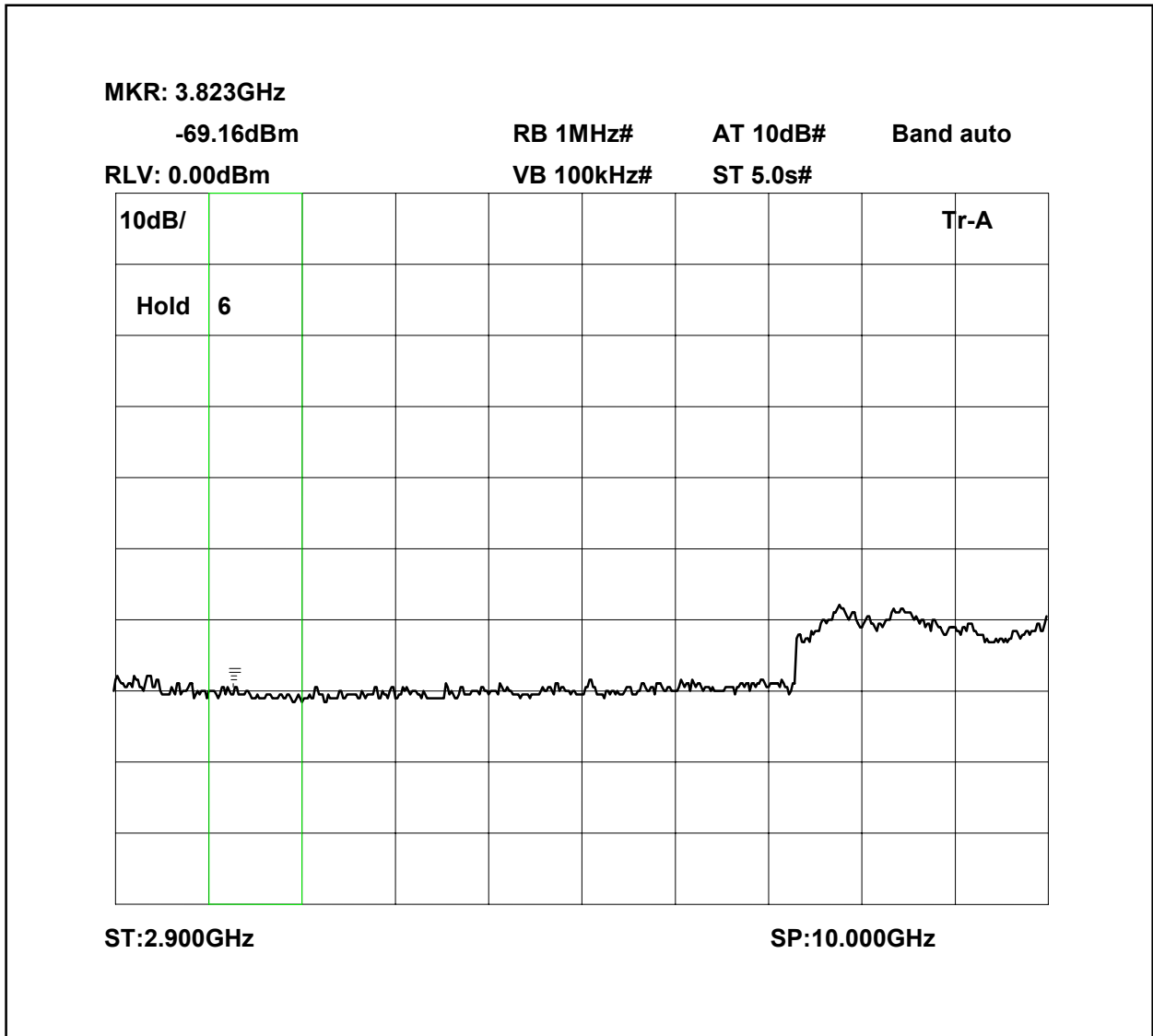
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

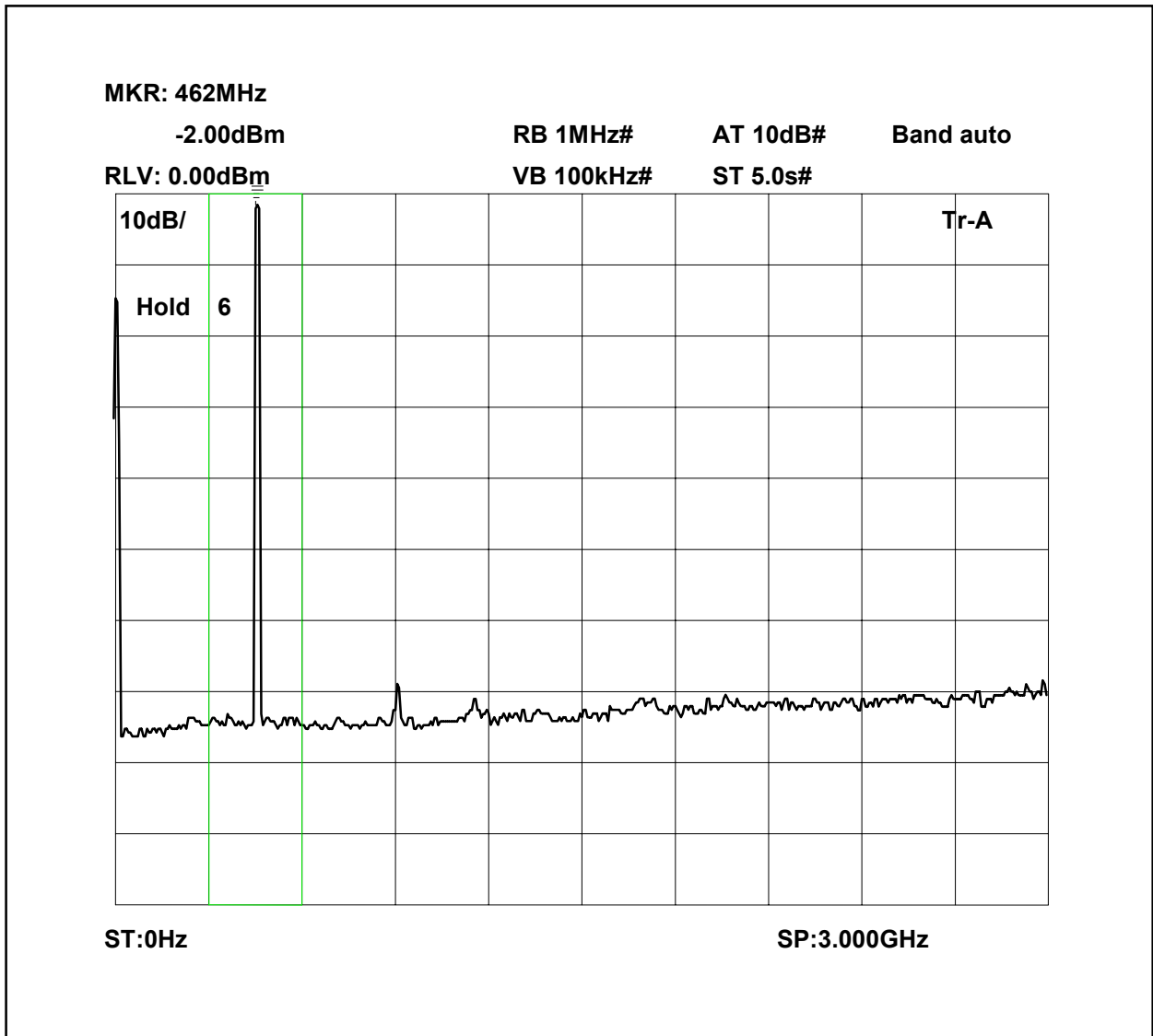
Conducted emissions 452.05MHz 0 - 3GHz



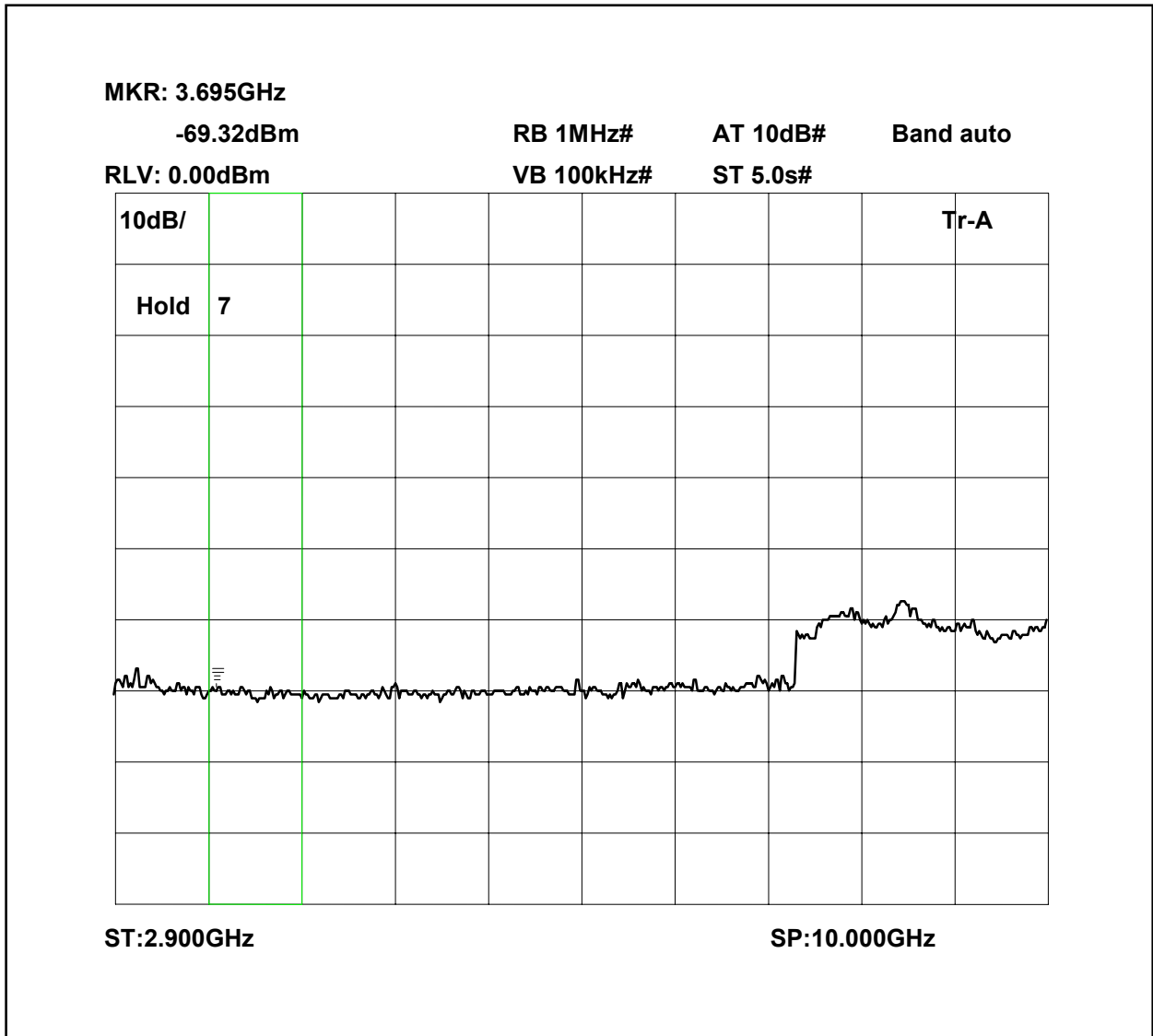
Conducted emissions 452.05MHz 2.9 - 10GHz



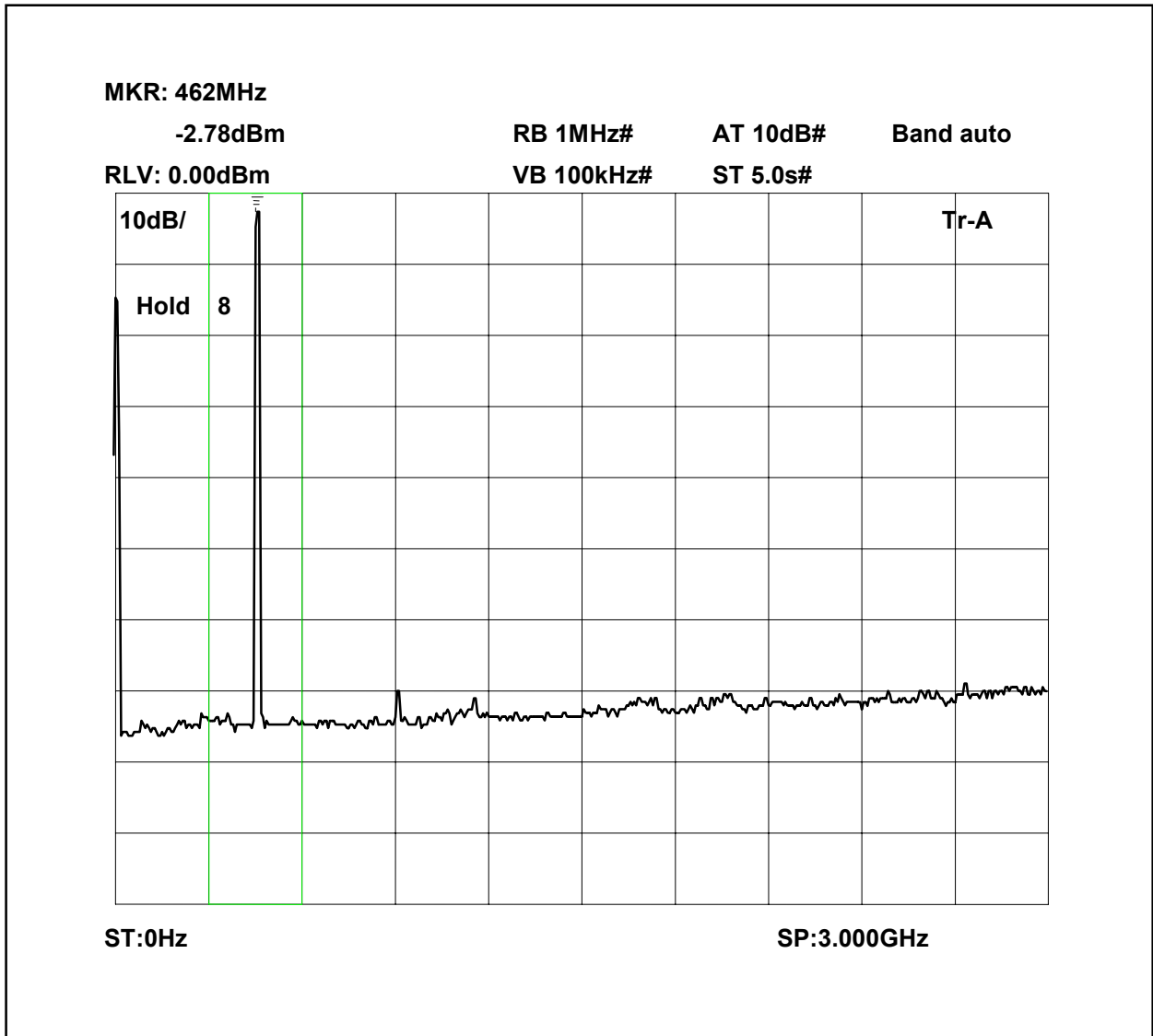
Conducted emissions 452.30MHz 0 - 3GHz



Conducted emissions 452.30MHz 2.9 - 10GHz

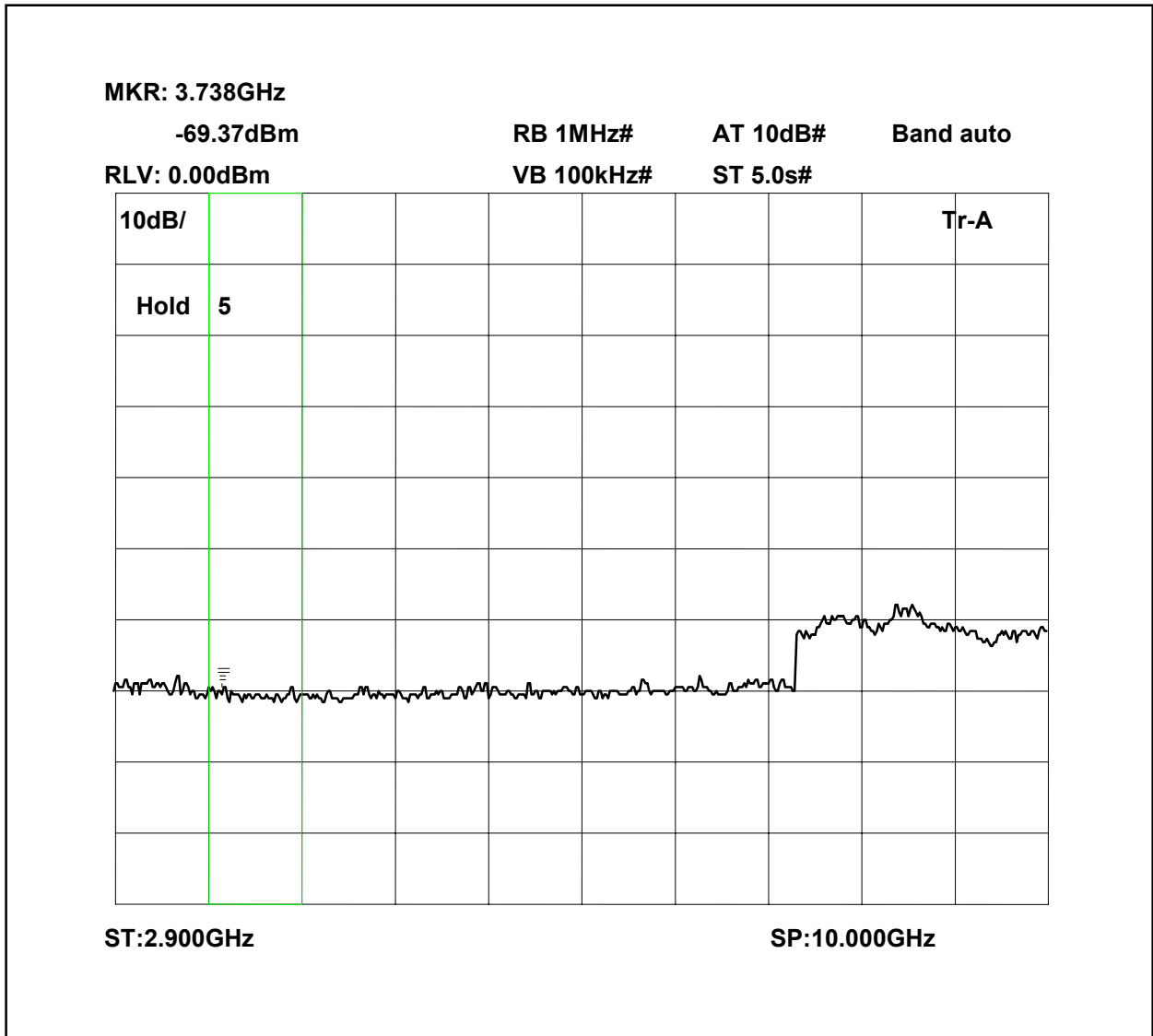


Conducted emissions 452.775MHz 0 - 3GHz





Conducted emissions 452.775MHz 2.9 - 10GHz

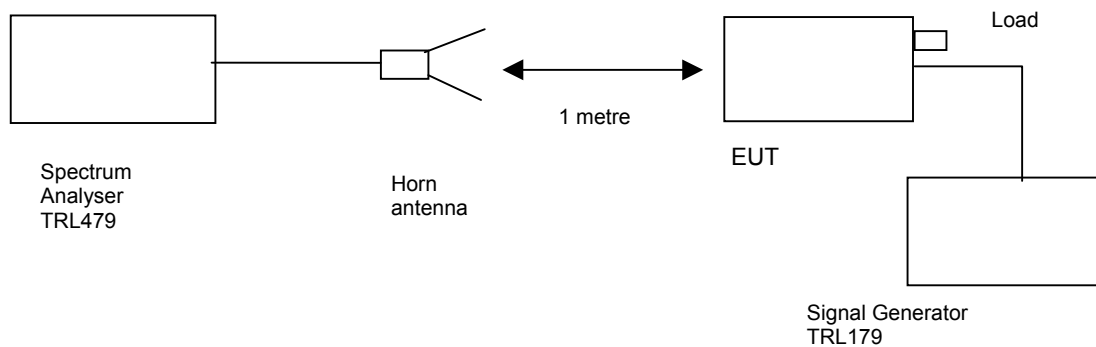


## TRANSMITTER TESTS

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

Ambient temperature = 20°C  
Relative humidity = 54%  
Conditions = OATS  
Supply voltage = 115Vac  
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.

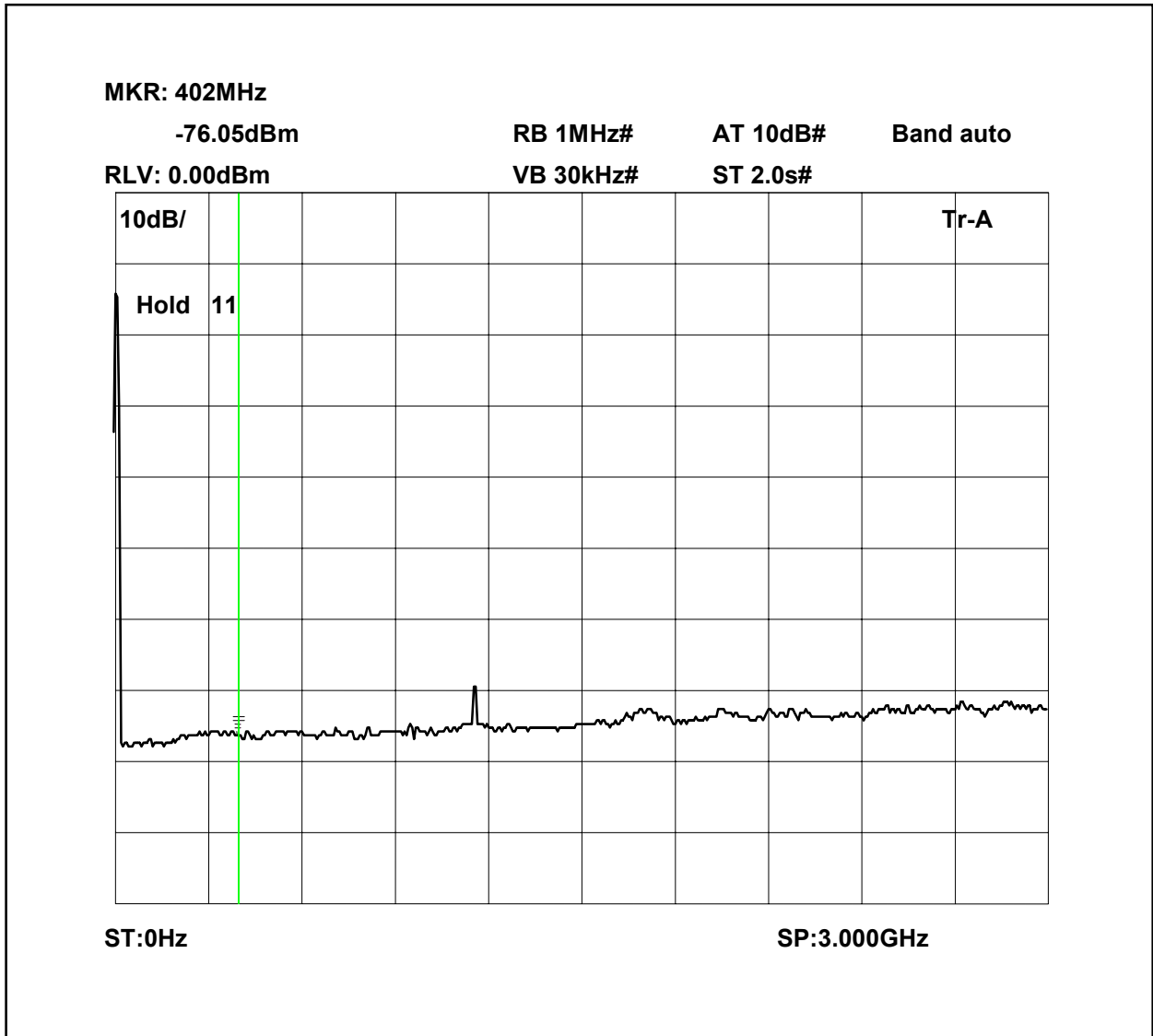
The Spurious limit was calculated as follows:

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

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

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

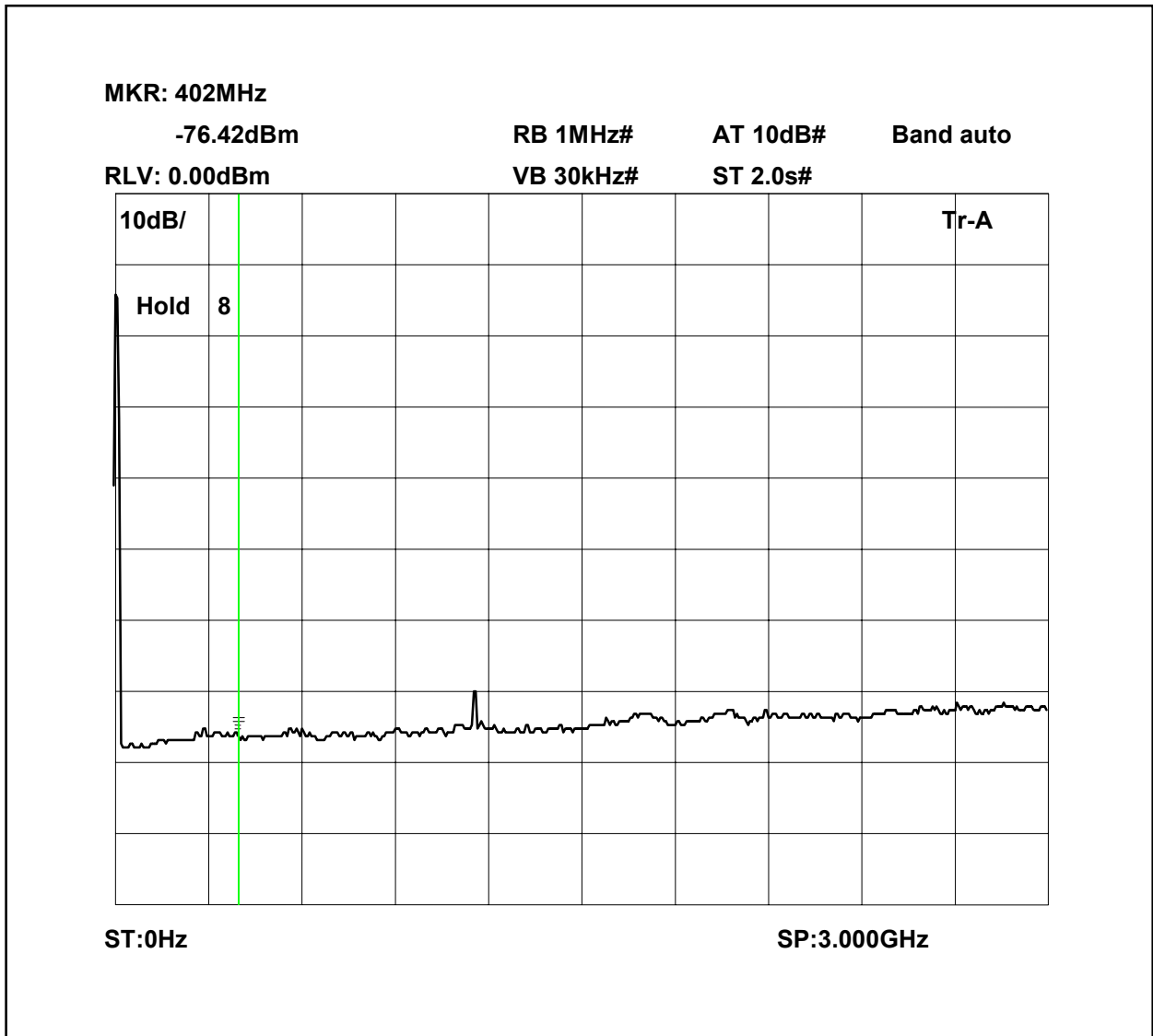
Radiated emissions 452.05MHz 0-3GHz



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



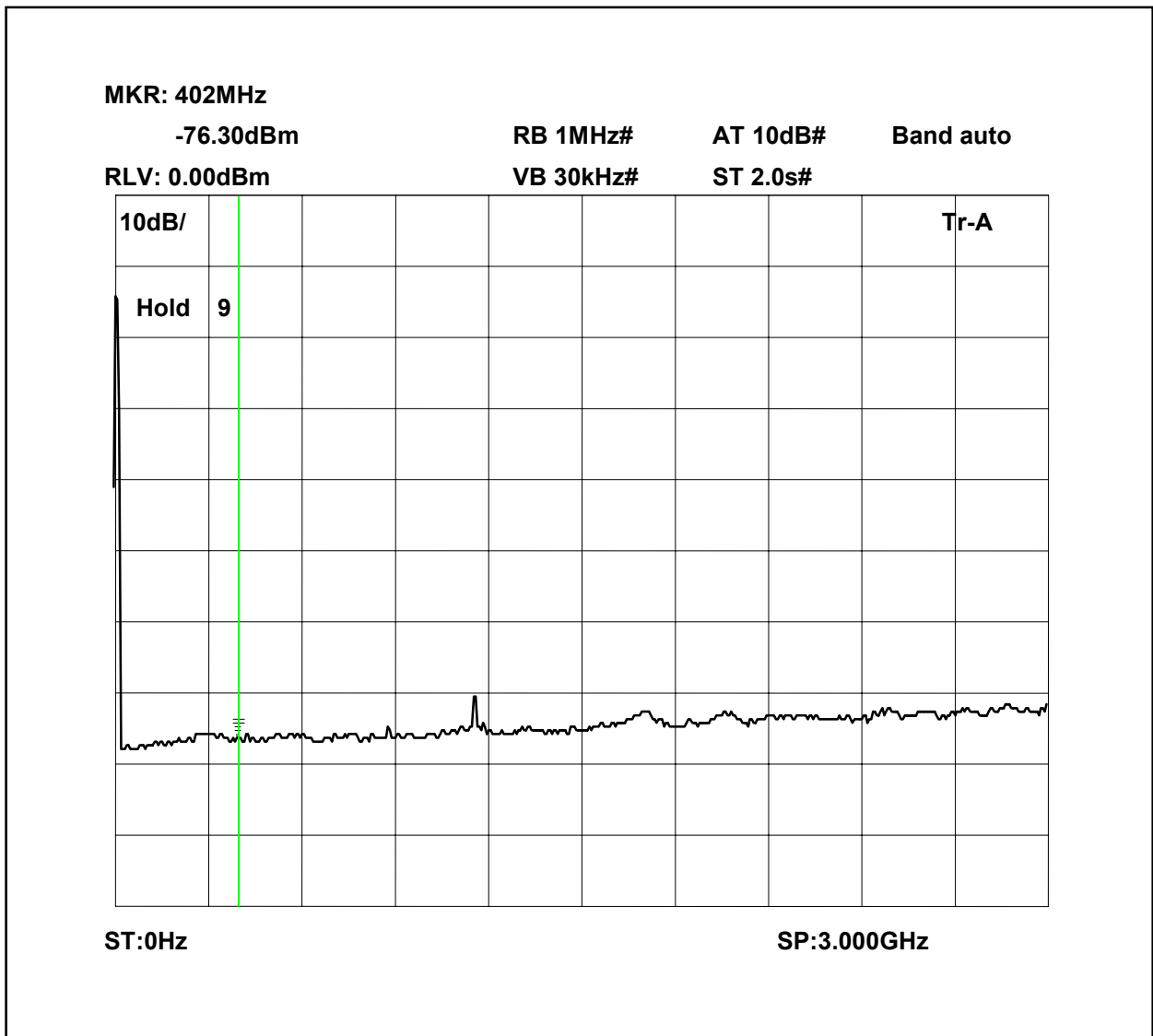
Radiated emissions 452.30MHz 0-3GHz



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



Radiated emissions 452.775MHz 0-3GHz

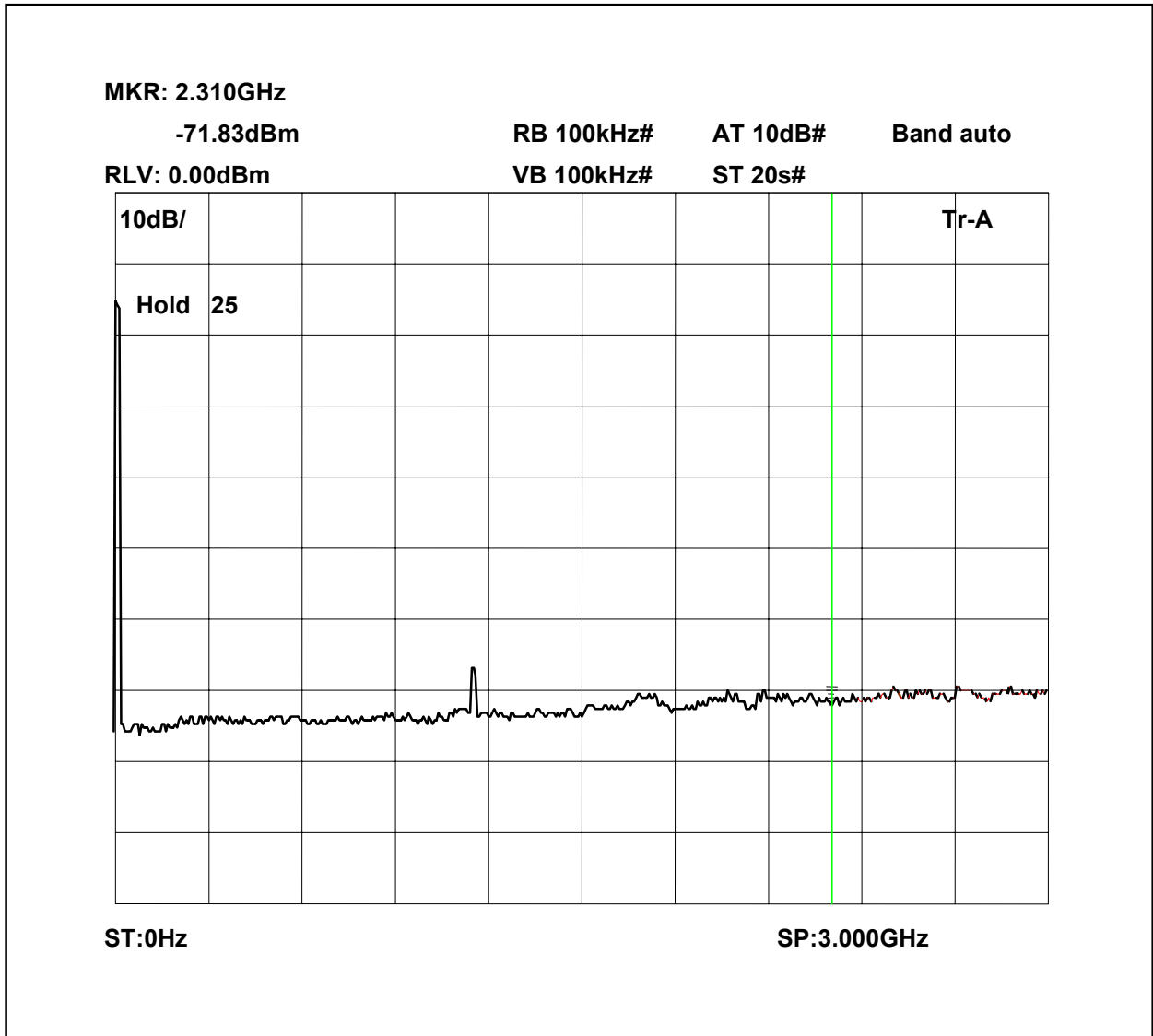


The above test results show that there were no emissions within 20dBs of the -13dBm limit.



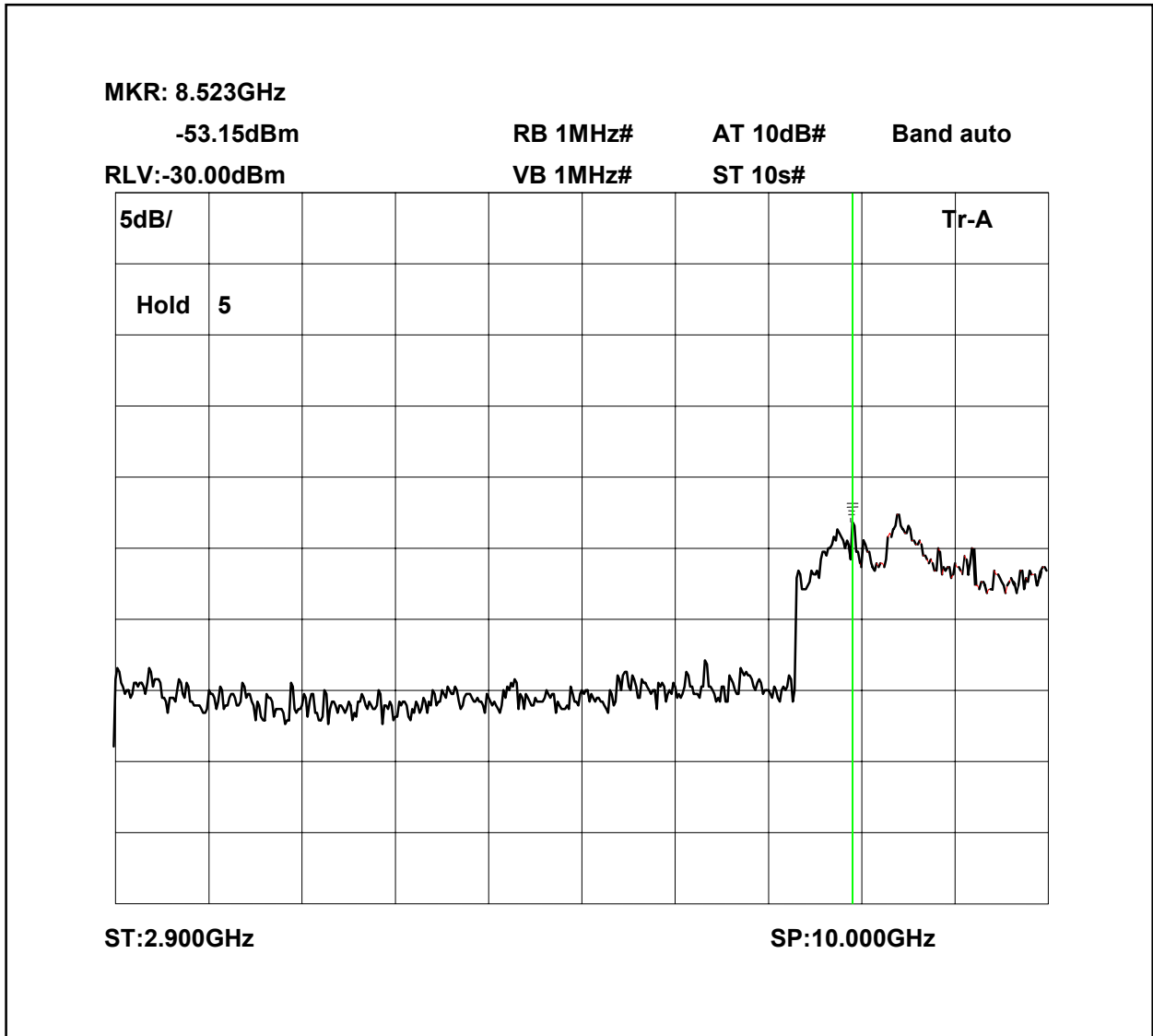


Radiated emissions no input signal 0-3GHz



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.

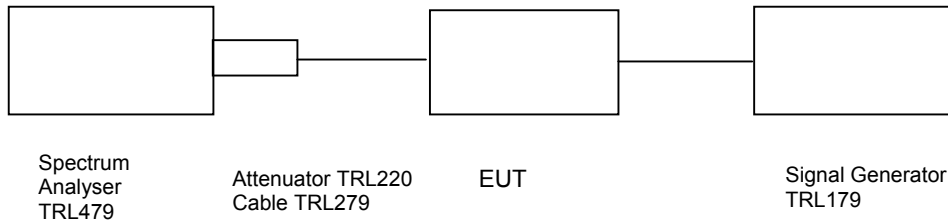
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
HORN	EMCO	3115	9010-3581	139	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

**AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – DOWNLINK**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac  
 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
457.05MHz	-58.4	26.6	-3.9	81.95	81.95
457.30MHz	-58.6	26.6	-3.3	83.05	83.05
457.85MHz	-60.3	26.6	-3.0	83.9	83.9

Notes:

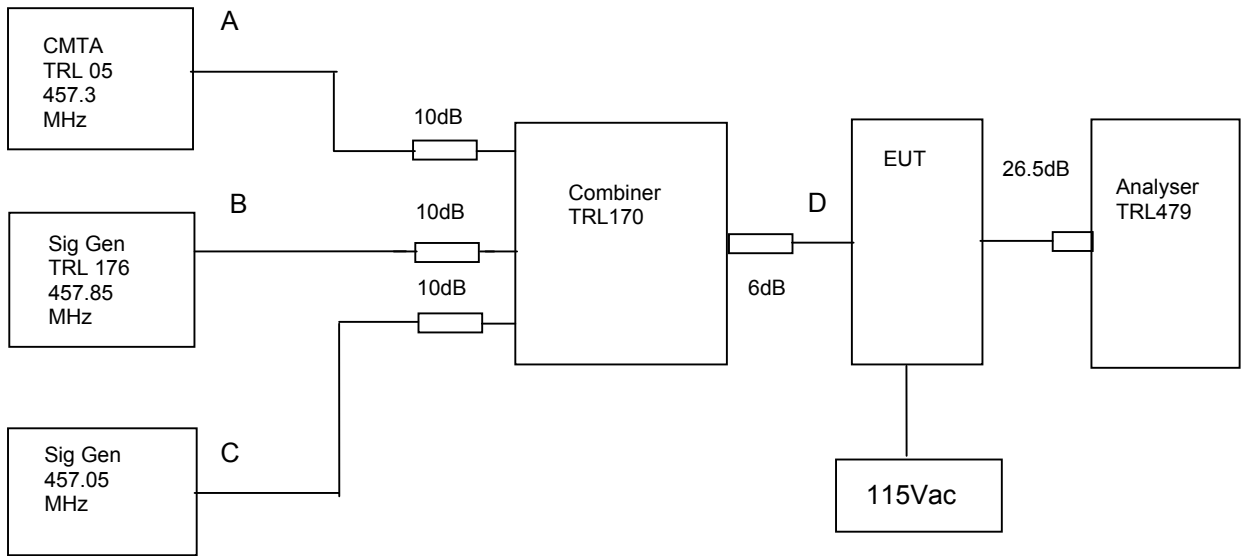
1. The level of the signal generator takes into consideration the loss from the cable.
2. The signal generator input was increased by 20dBs and the level of the output signal remeasured

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-200	N/A	103	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

**AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– DOWNLINK**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac

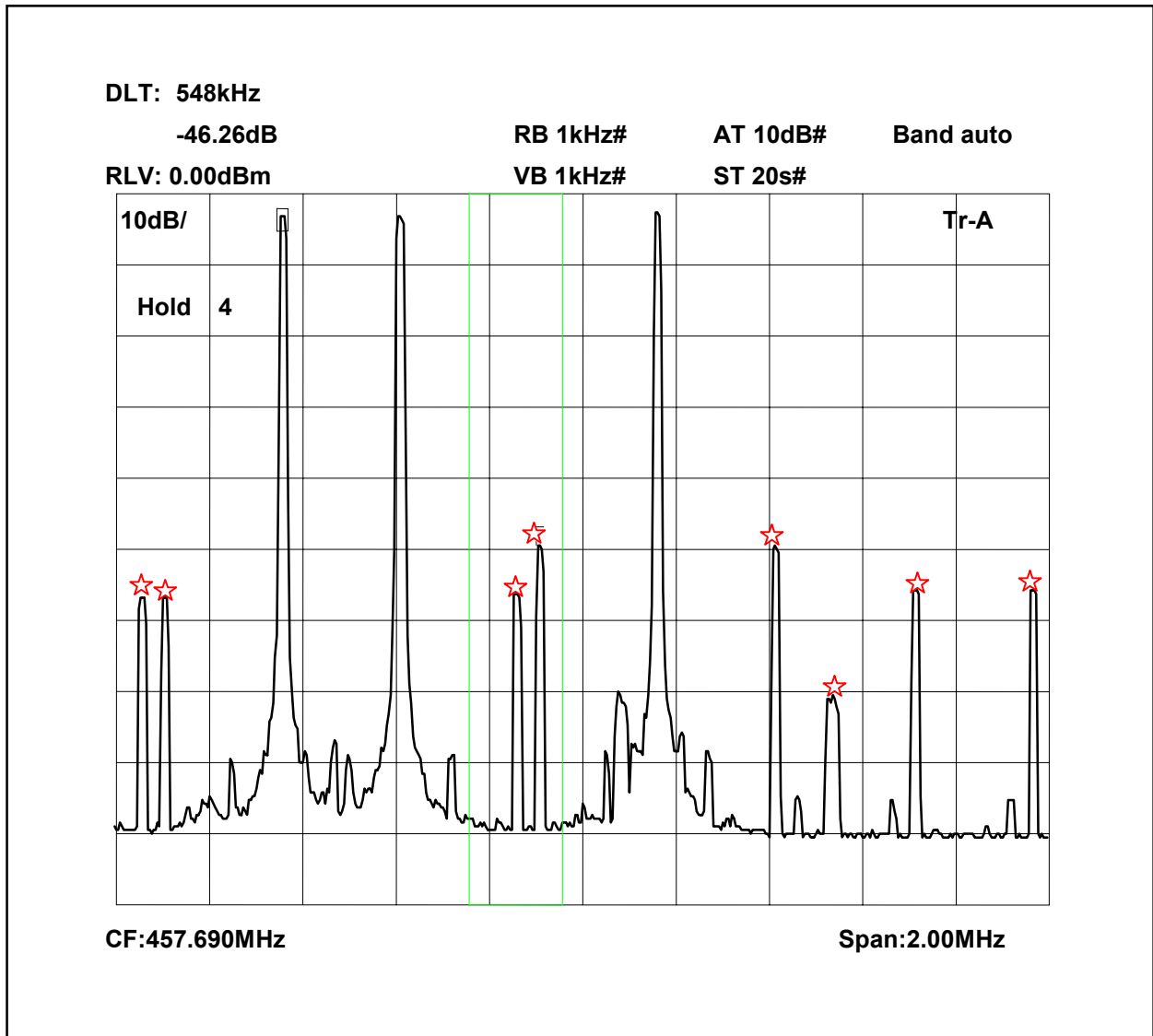
Radio Laboratory



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 -58.4dBm. The cable and attenuators loss between the EUT and the spectrum analyser was 26.6dB.

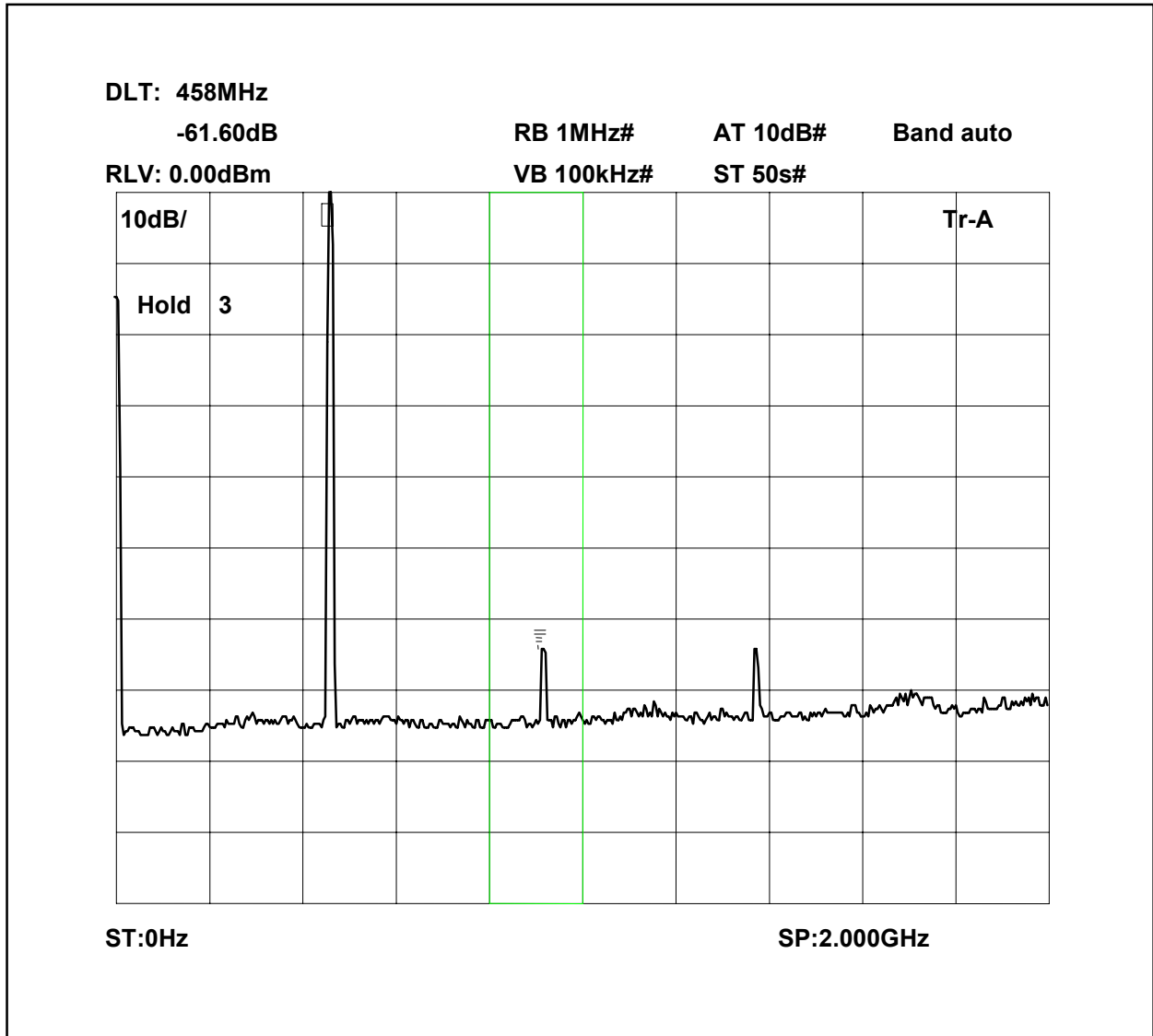
Sweep data is shown on the next page:

Intermodulation Inband



The above plot shows that all products (designated by ☆ ) are at least 40dB below the fundamentals.

Intermodulation Wideband



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

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	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119562/02	254	<b>X</b>
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>
COMBINER	ELCOM	RC-4-50	N/A	170	<b>x</b>

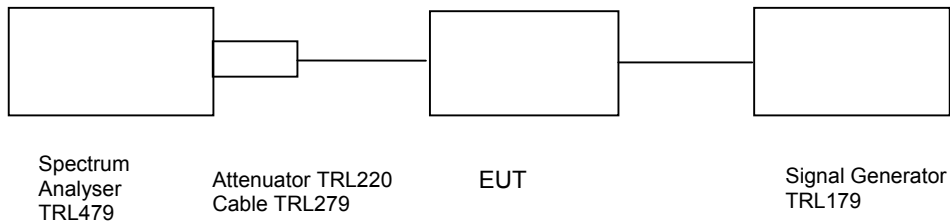


## TRANSMITTER TESTS

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

Ambient temperature = 20°C  
Relative humidity = 54%  
Supply voltage = 115Vac  
Channel number = See test results

Radio Laboratory

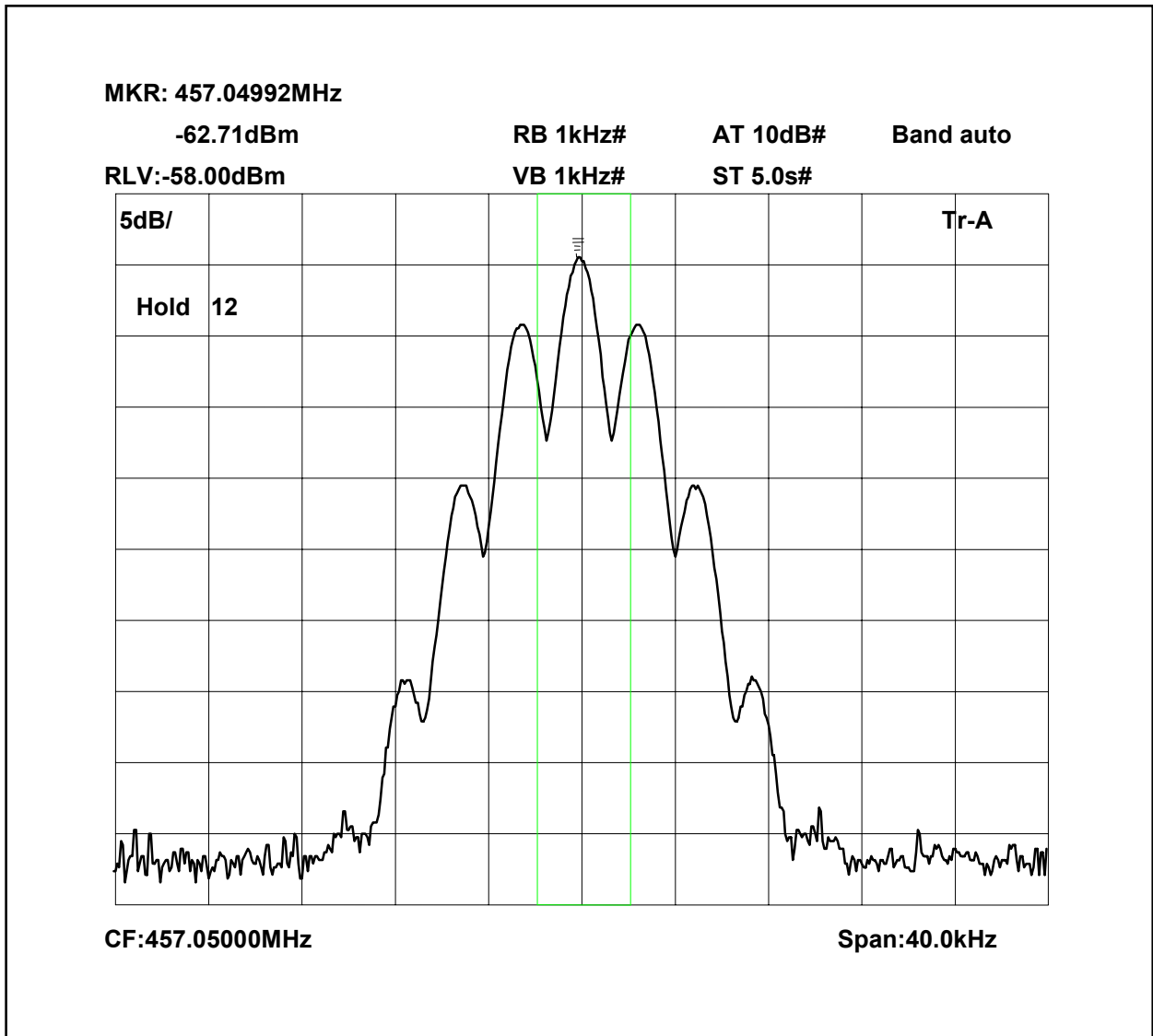


This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-58.4dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

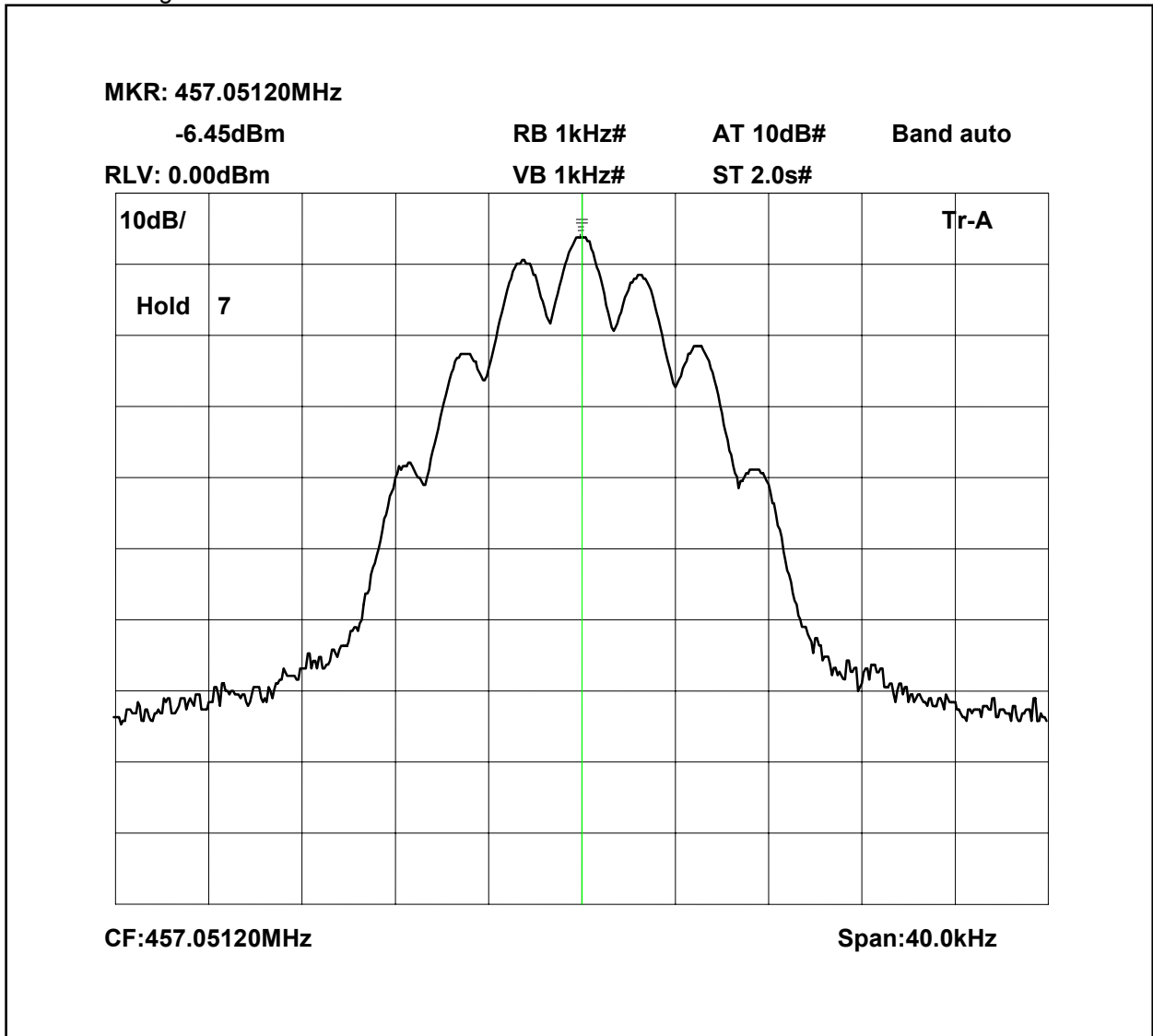
Note: The cables and attenuators had the following losses.

1. Cable TRL279 and attenuators TRL220 = 26.6dB
2. Cable between signal generator and EUT = 0.85dB

457.05MHz Signal Generator deviation set to 2.5kHz

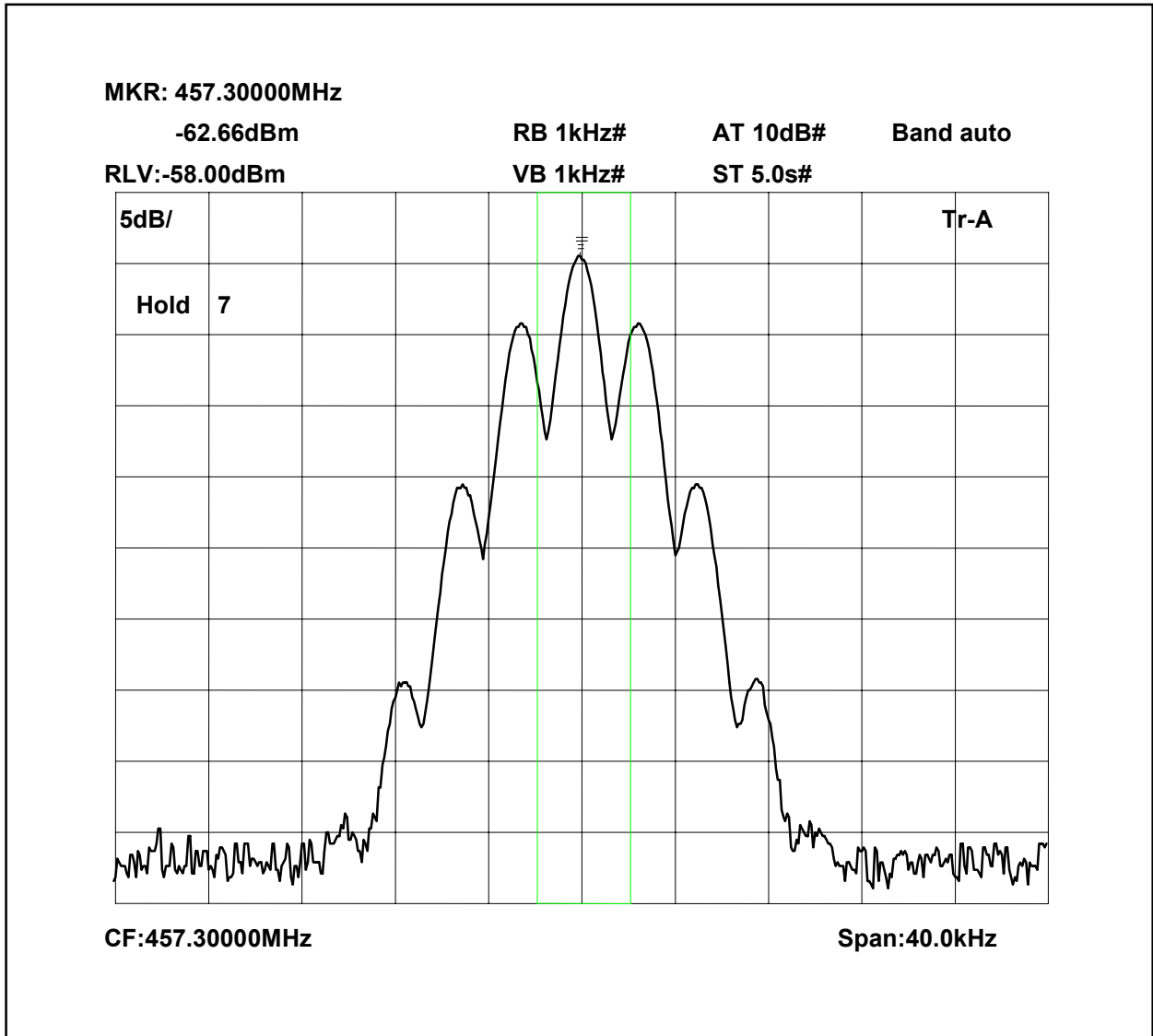


457.05MHz Signal Generator and EUT deviation set to 2.5kHz

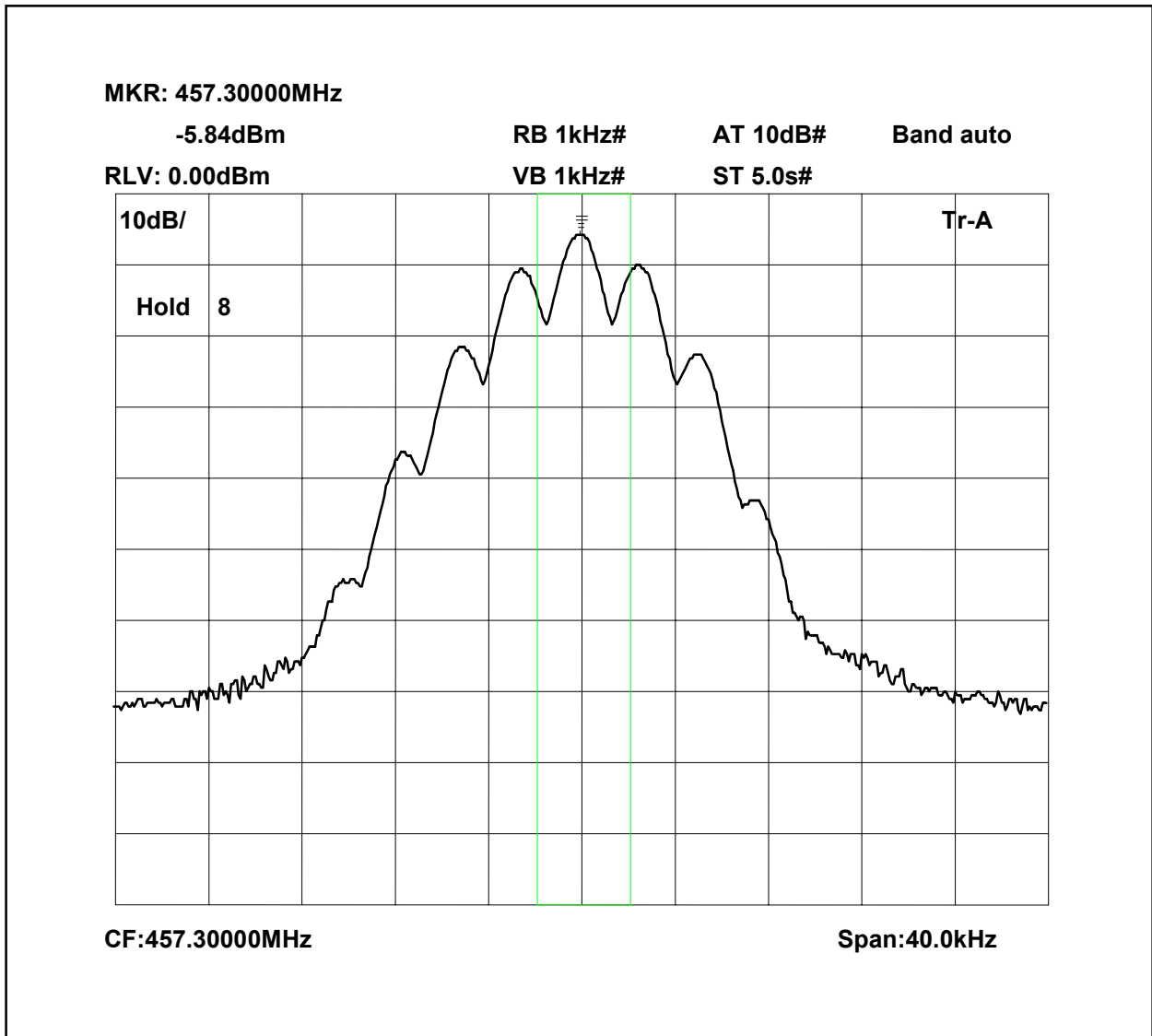


The above plots depicting the output waveshape show no measurable distortion visible, when compared to the input signal.

457.30MHz Signal Generator deviation set to 2.5kHz

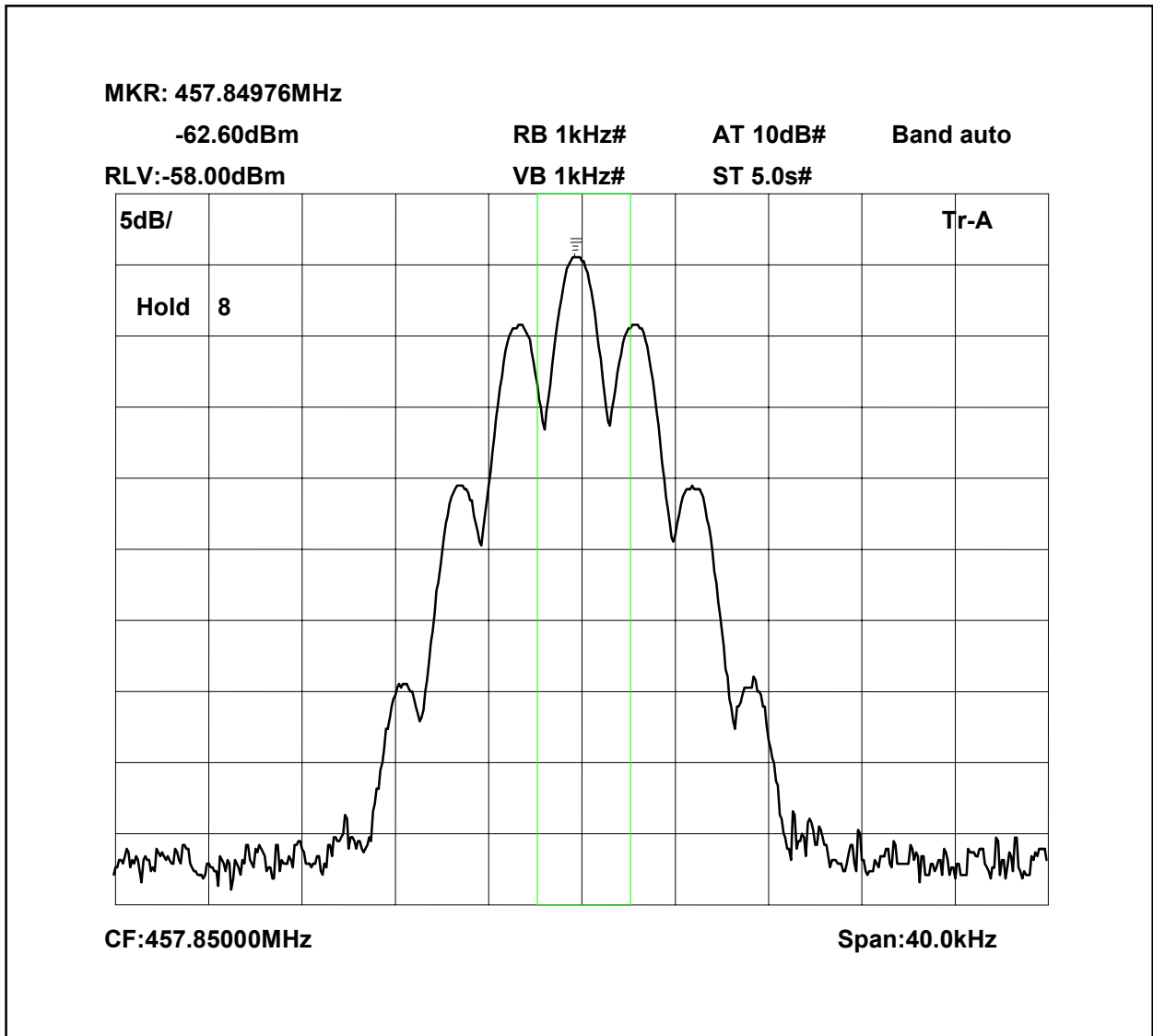


457.30MHz Signal Generator and amplifier deviation set to 2.5kHz

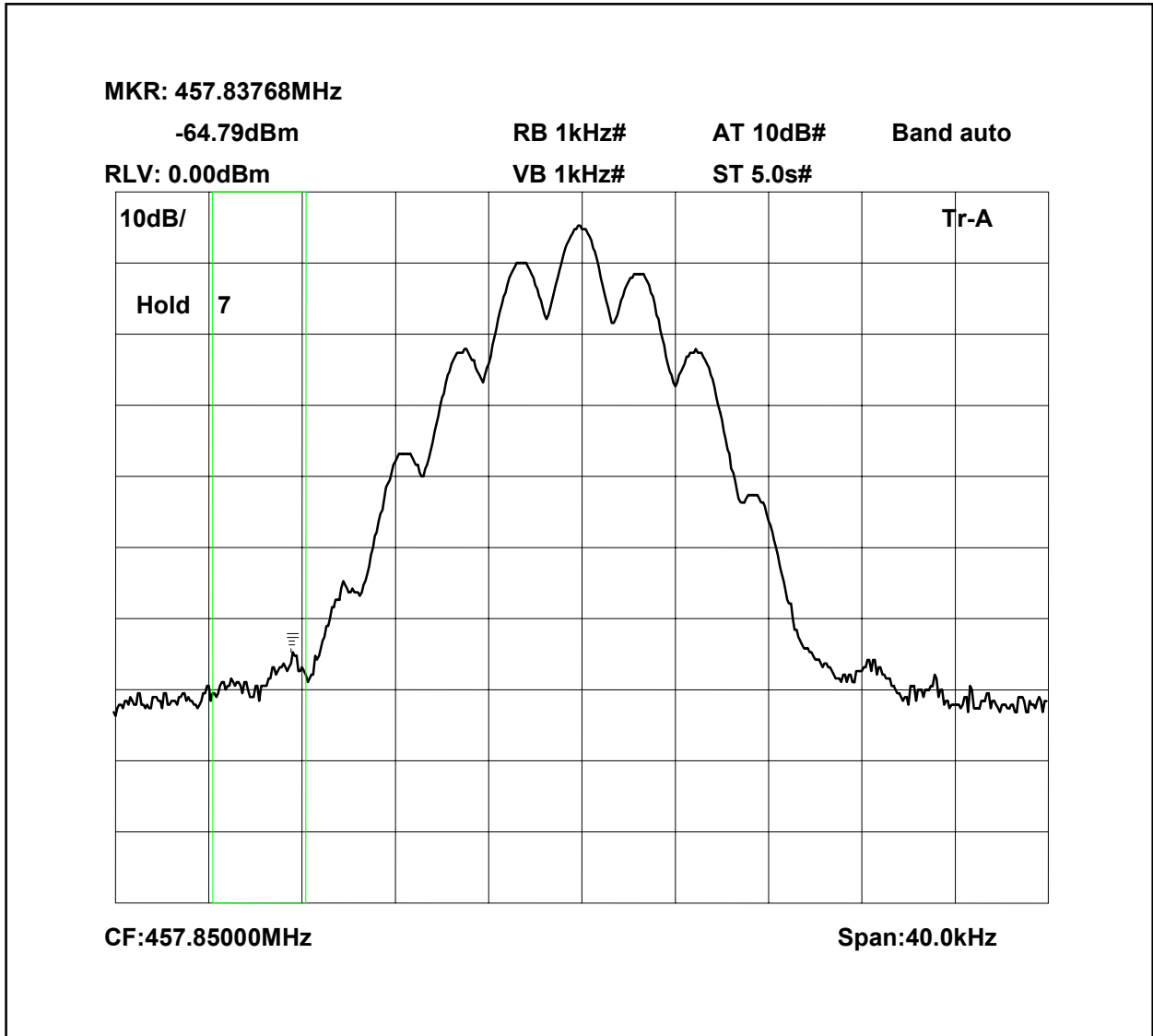


The above plots depicting the output waveshape show no measurable distortion visible, when compared to the input signal.

457.85MHz Signal Generator deviation set to 2.5kHz



457.85MHz Signal Generator deviation set to 2.5kHz



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	<b>X</b>
ATTENUATOR	BIRD	8304-200	N/A	103	
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

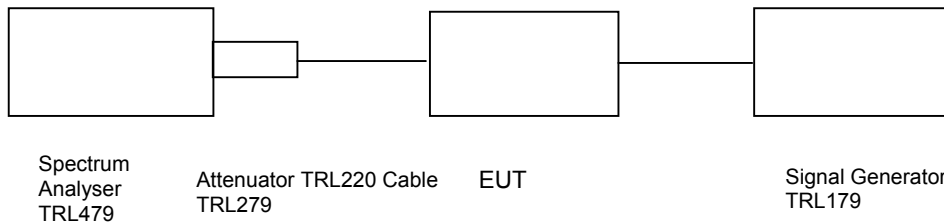


**TRANSMITTER TESTS**

**AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1051 – DOWNLINK**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac

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

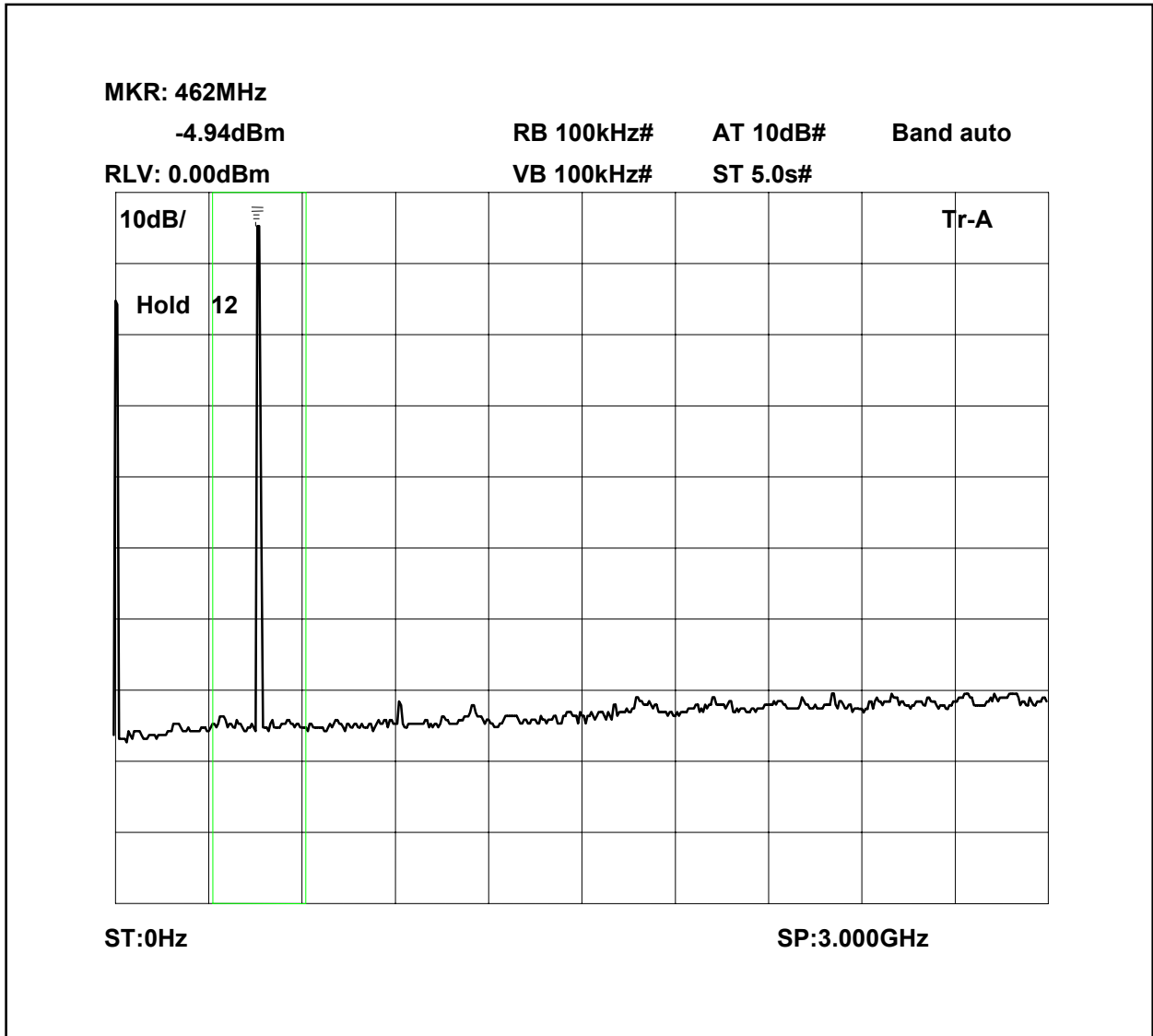
At least 43 + 10 log PdB

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

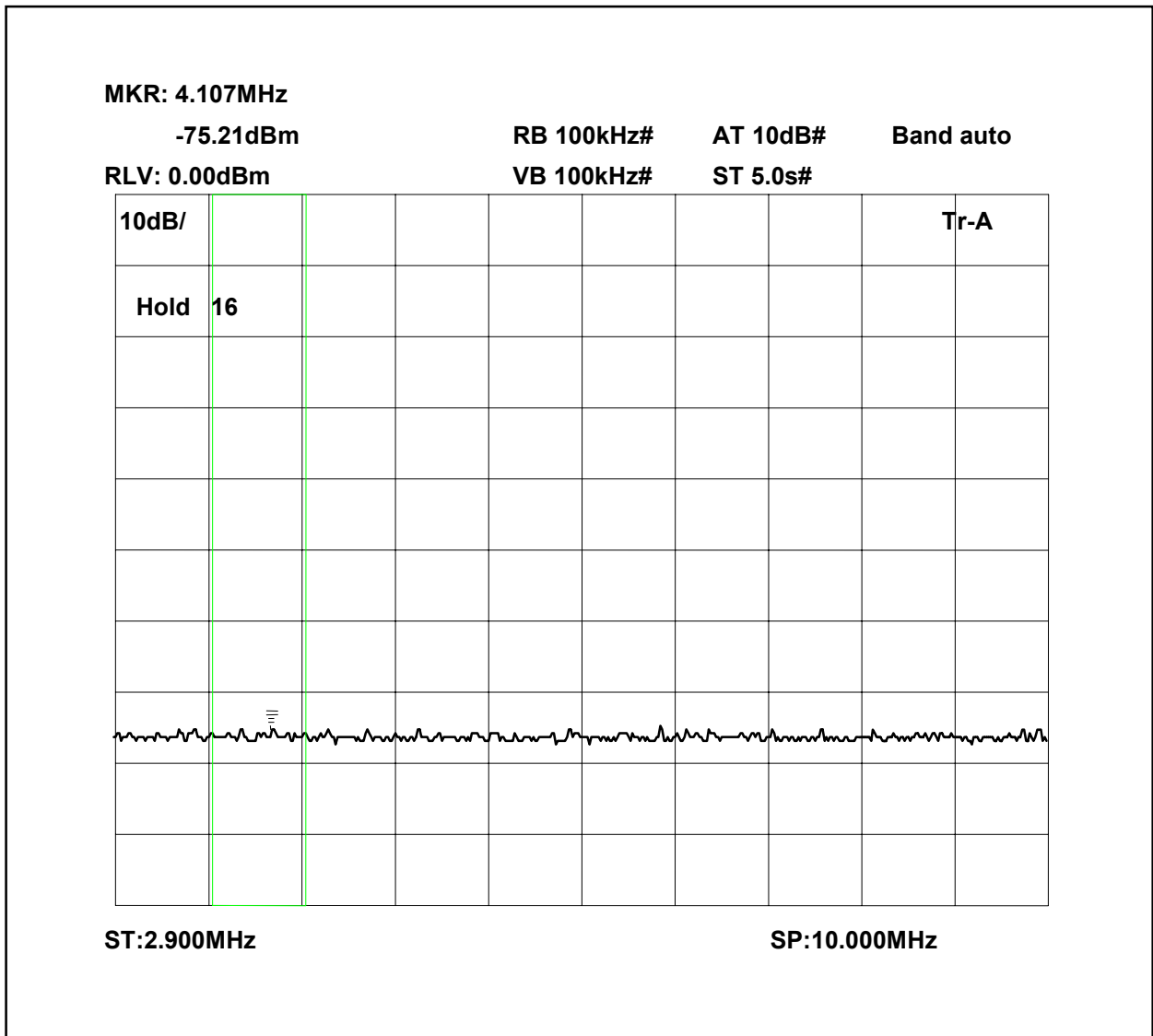
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-200	N/A	103	
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

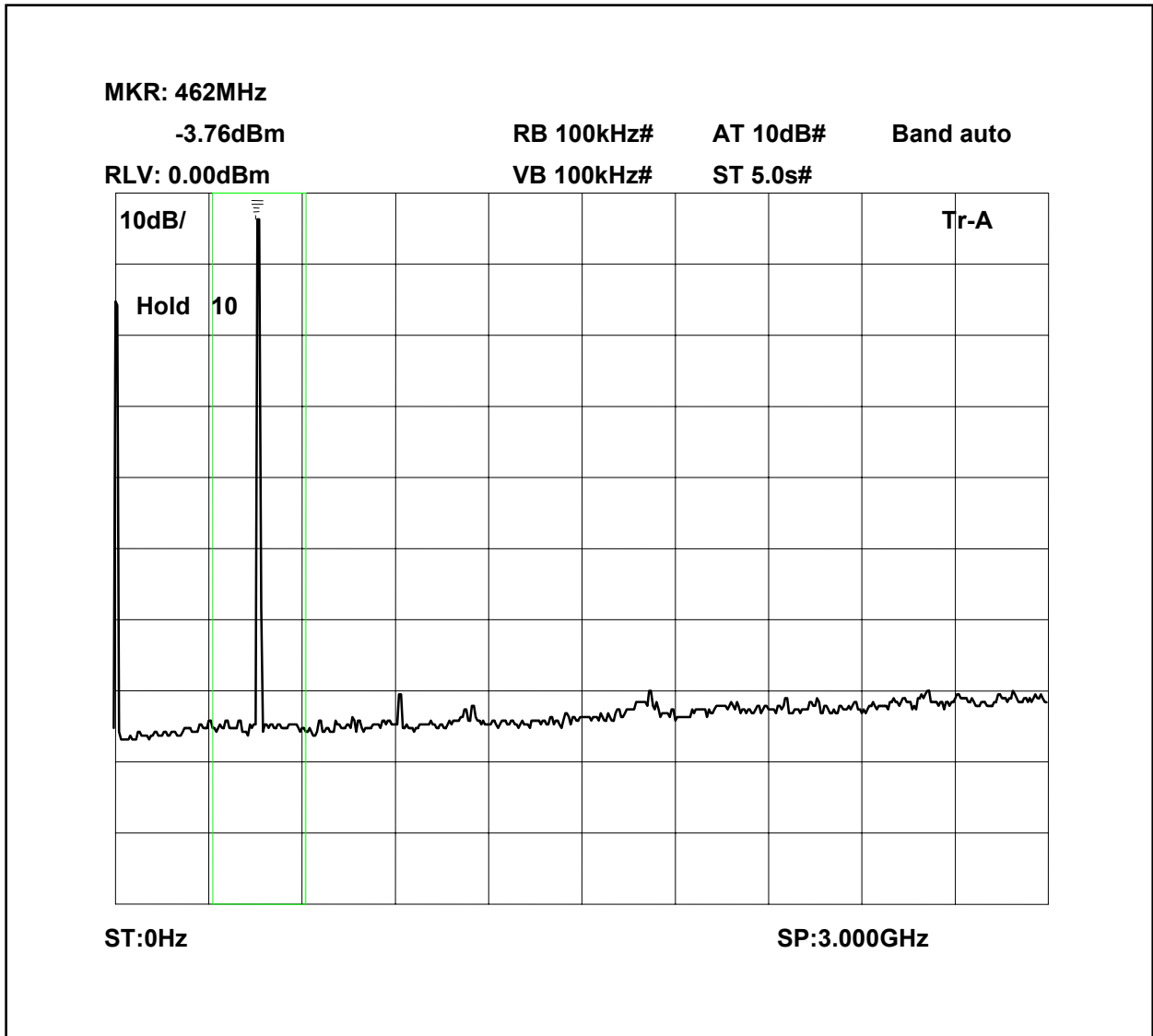
Conducted emissions 457.05MHz 0-3GHz



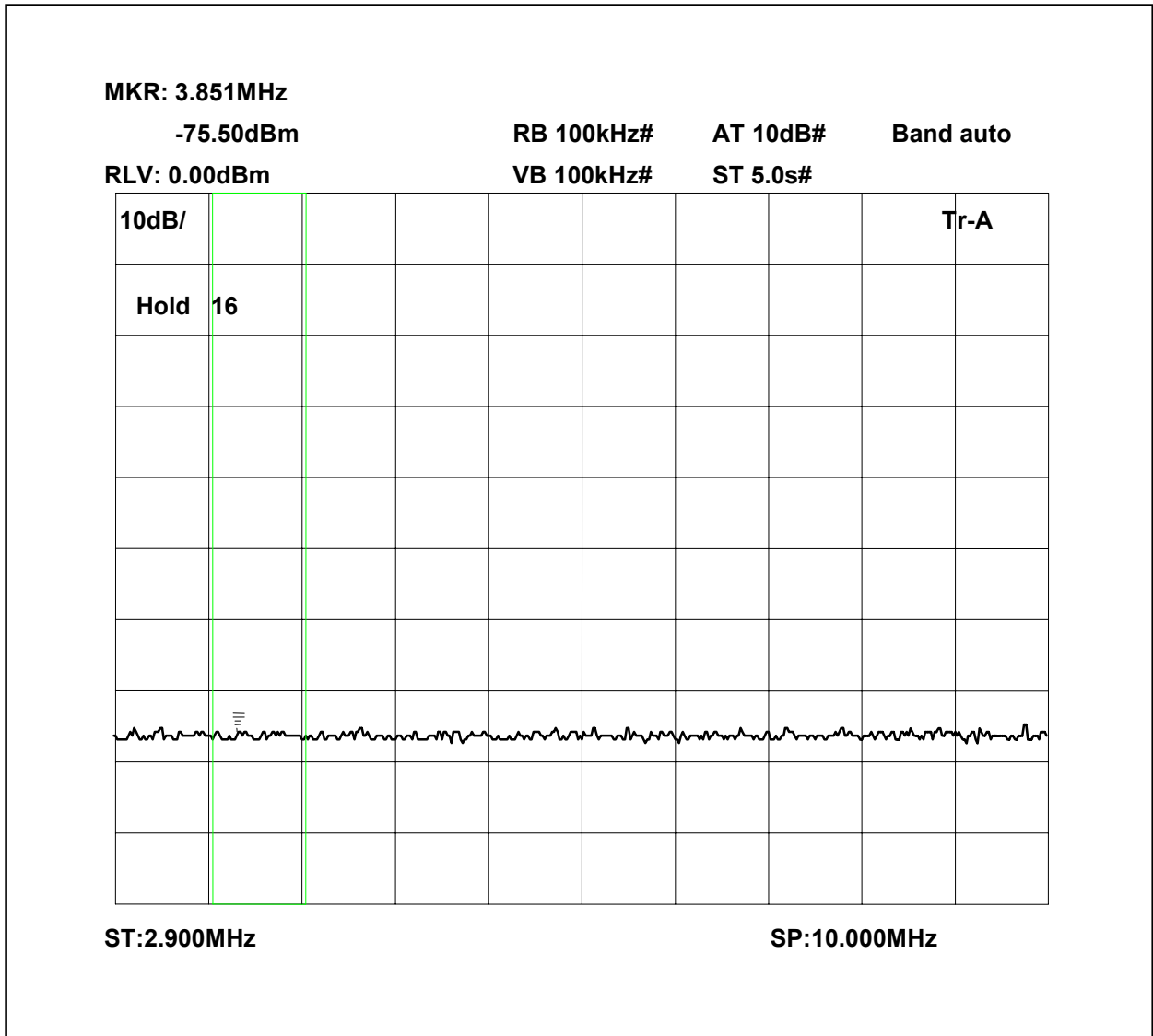
Conducted emissions 457.05MHz 2.9-10GHz



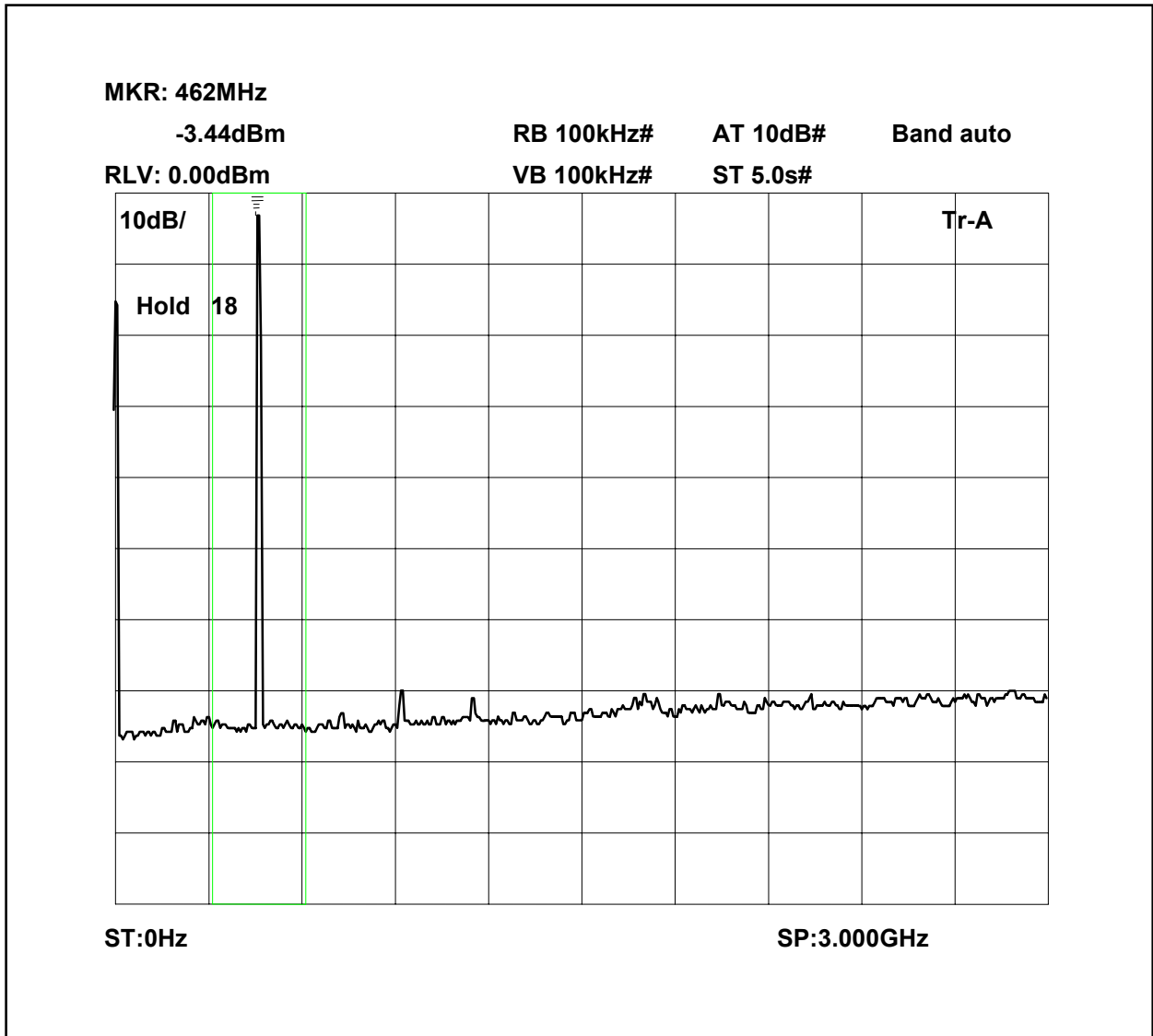
Conducted emissions 457.30MHz 0-3GHz



Conducted emissions 457.30MHz 2.9-10GHz



Conducted emissions 457.85MHz 0-3GHz



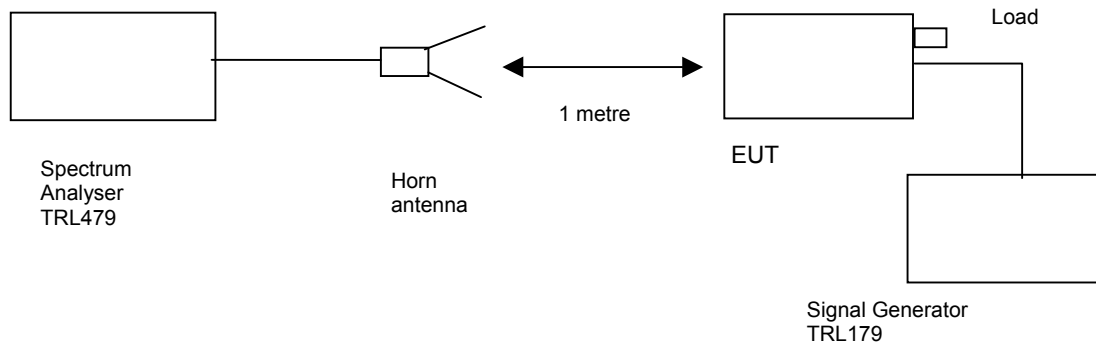


## TRANSMITTER TESTS

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

Ambient temperature = 20°C  
Relative humidity = 54%  
Conditions = OATS  
Supply voltage = 115Vac  
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:

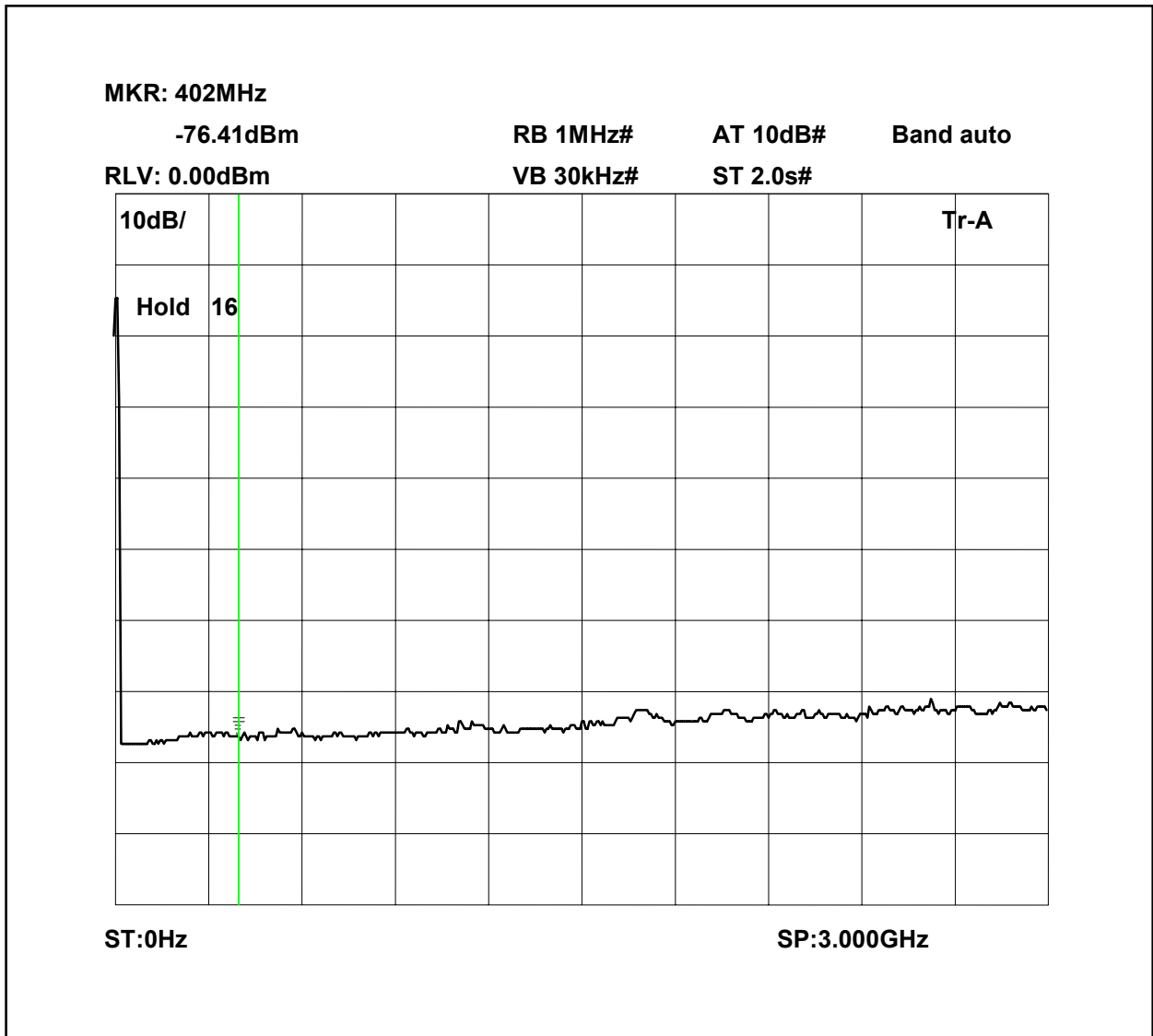
On any frequency removed from the assigned frequency by more that 250% of the authorised bandwidth

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

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



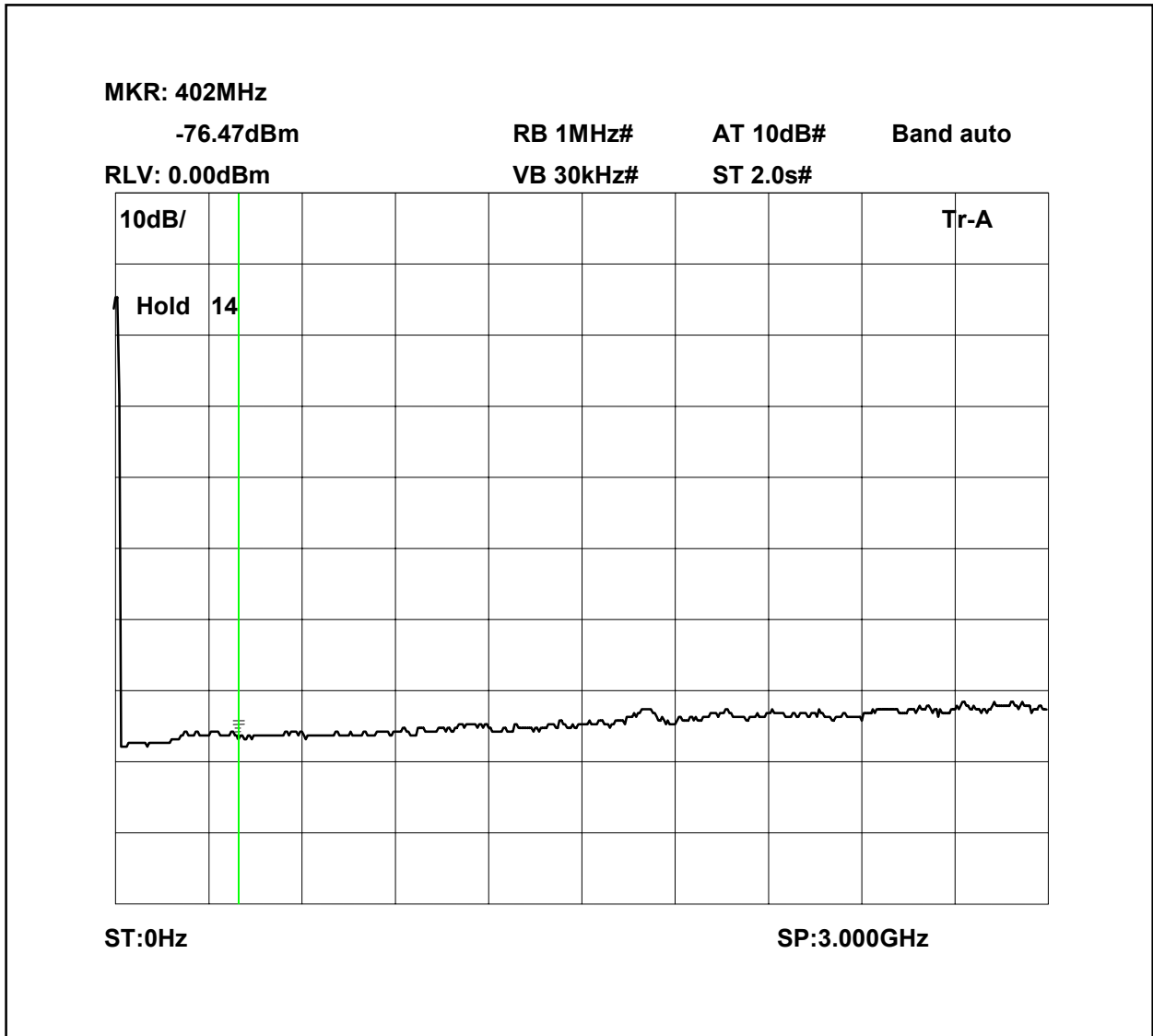
Radiated emissions 457.05MHz 0-3GHz



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



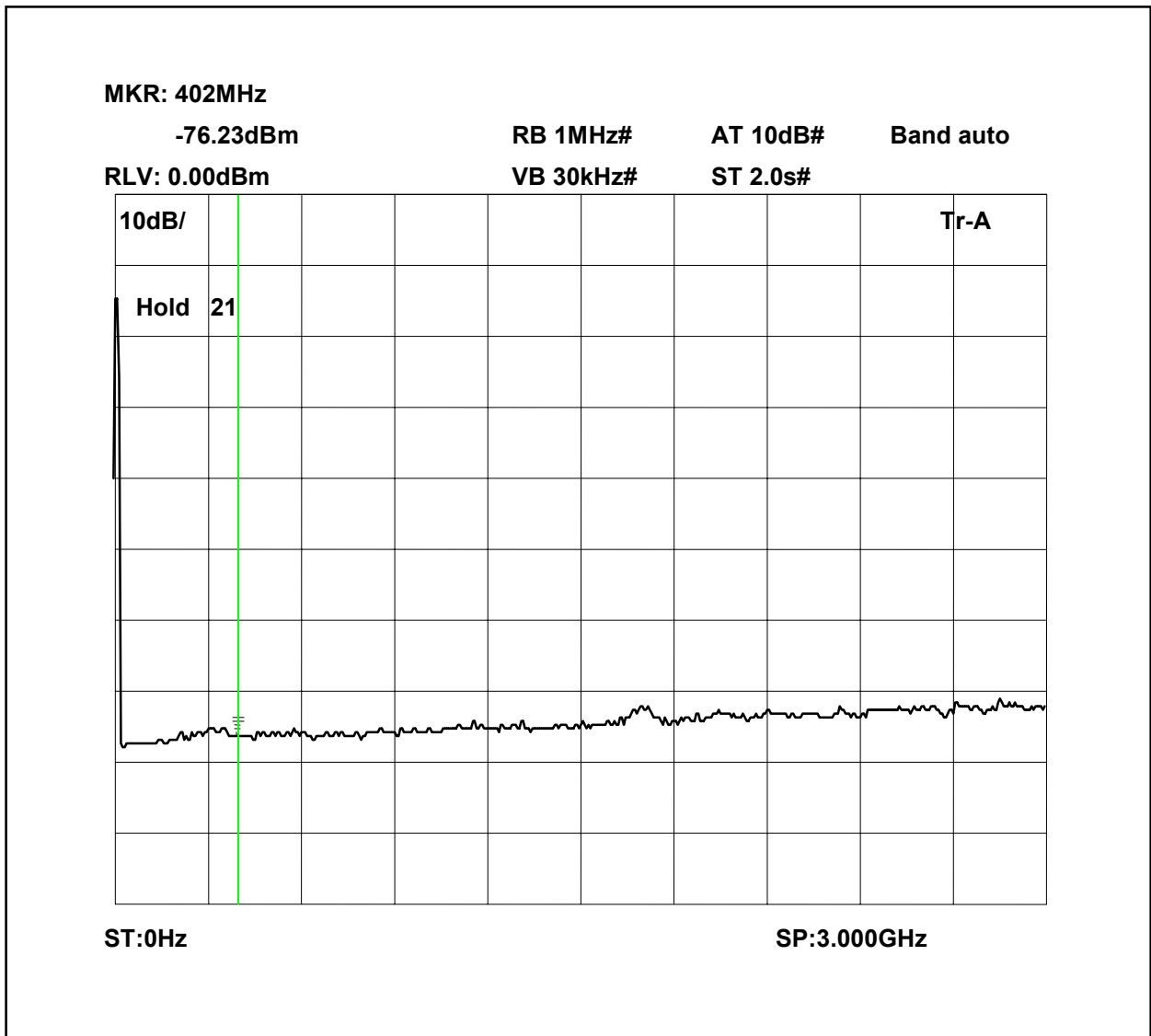
Radiated emissions 457.30MHz 0-3GHz



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

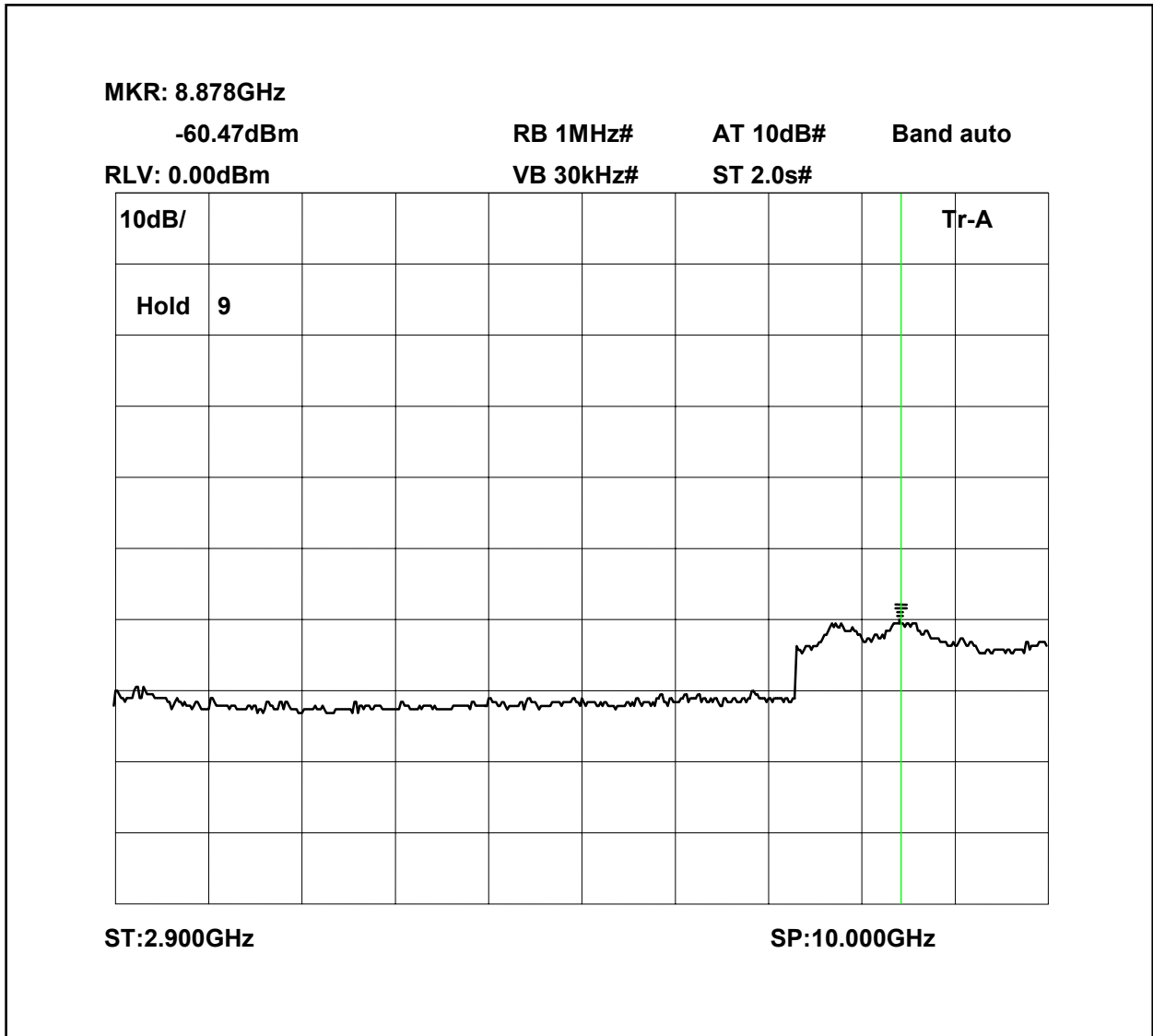


Radiated emissions 457.85MHz 0-3GHz



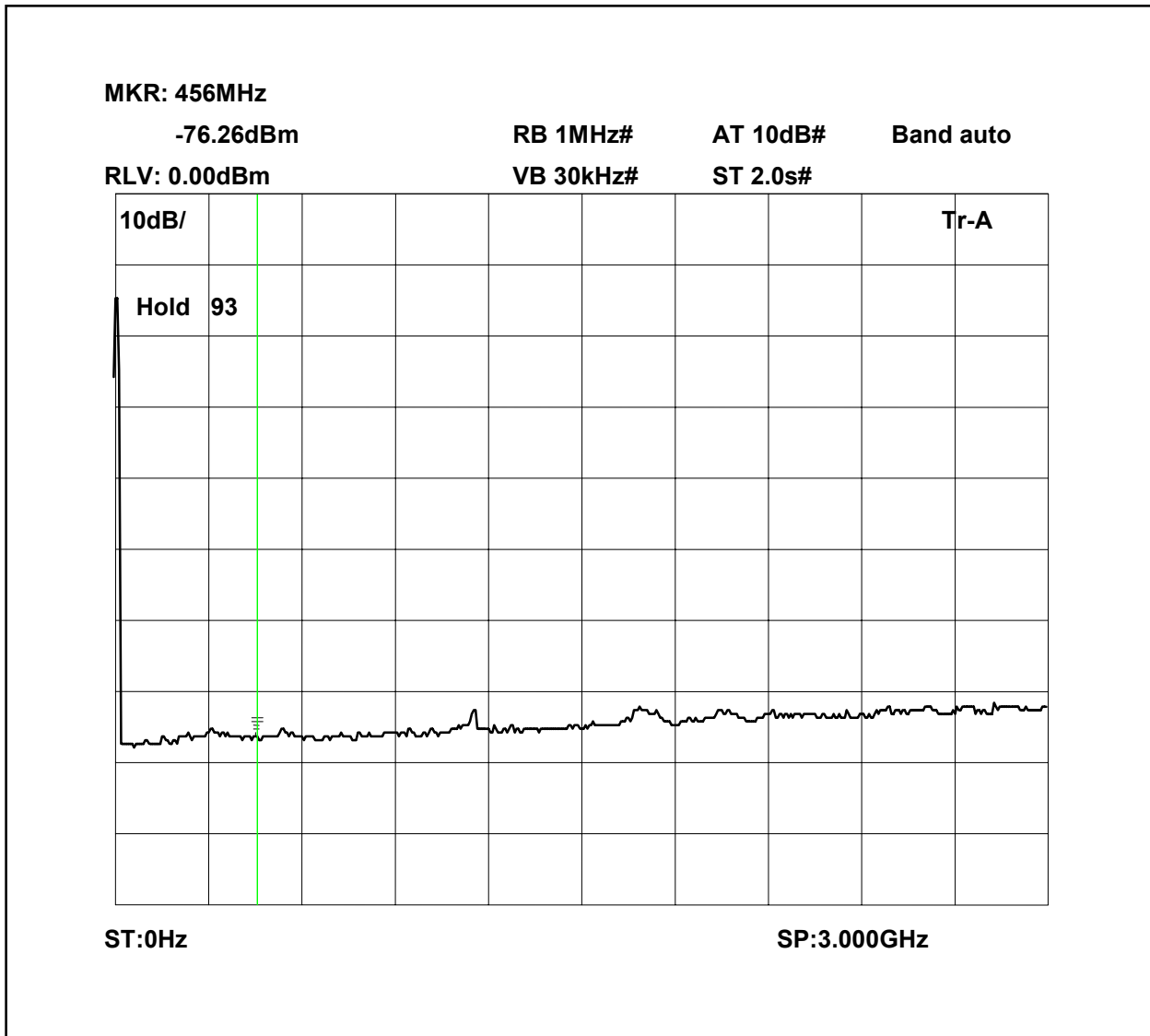
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

Radiated emissions 457.85MHz 2.9-10GHz



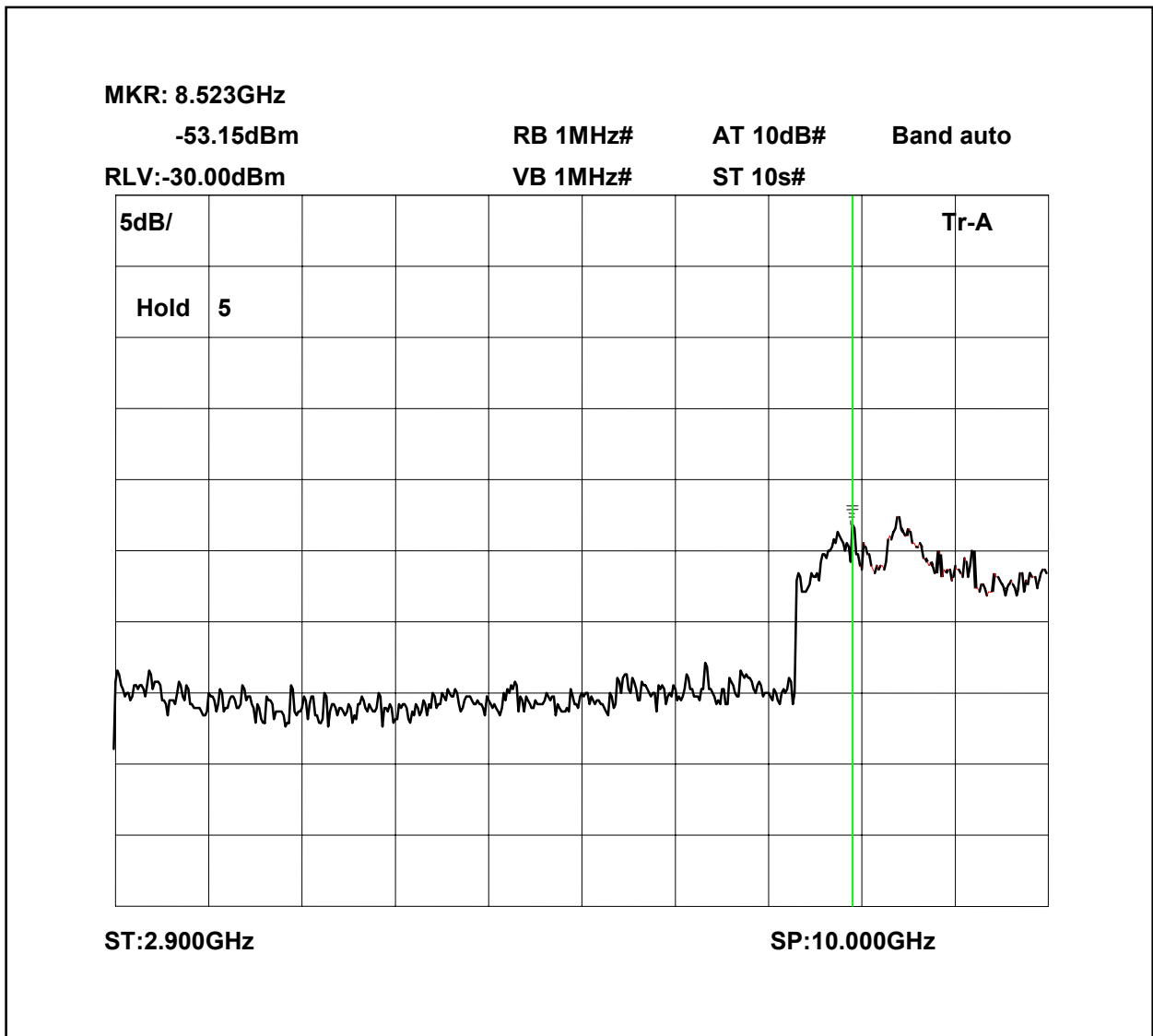
The above test results show that there were no emissions within 20dBs of the -13dBm limit.

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:

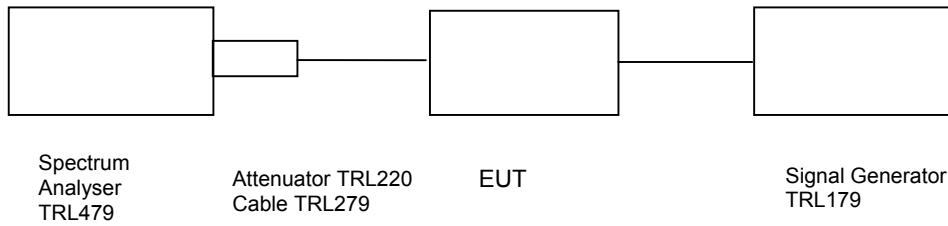
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
HORN	EMCO	3115	9010-3581	139	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
ATTENUATOR	BIRD	8308-100	N/A	112	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

**COMPLIANCE TESTS**

**AMPLIFIER GAIN – CONDUCTED – PART 2.1046 – SIMPLEX**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac  
 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
452.85MHz	-55.5	26.6	-4.45	77.65	77.65

Notes:

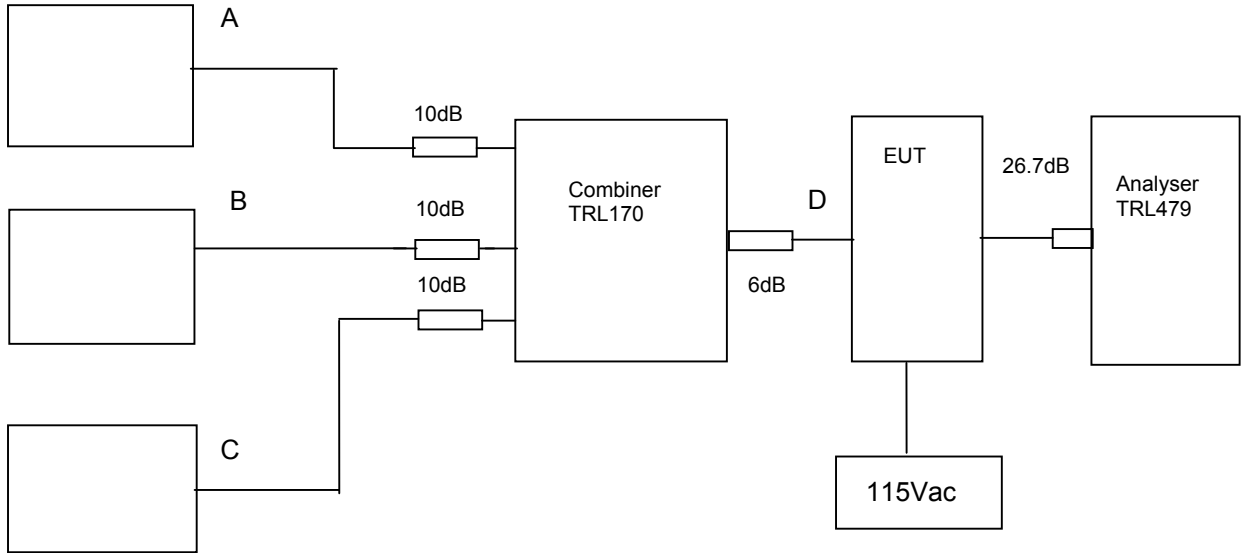
- 1.The level of the signal generator takes into consideration the loss from the cable.
- 2.The signal generator input was increased by 20dBs and the level of the output signal remeasured

TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

**AMPLIFIER INTERMODULATION SPURIOUS EMISSIONS – CONDUCTED – PART 2.1053– SMIPLEX**

Ambient temperature = N/A  
Relative humidity = N/A  
Supply voltage = 115Vac

Radio Laboratory



The Intermodulation and spurious products test was not performed as the this part of the unit only has one channel and separate RF inputs and outputs.

Test equipment used for intermodulation test

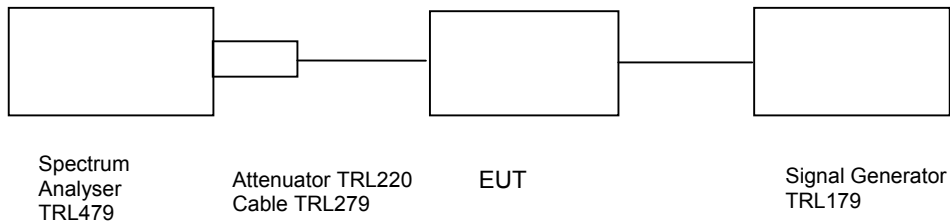
TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	
SIGNAL GENERATOR	MARCON	2042	119562/02	254	
CMTA	ROHDE & SCHWARZ	CMTA52	894715/033	05	
SIGNAL GENERATOR	MARCON	2042	119388/080	179	
COMBINER	ELCOM	RC-4-50	N/A	170	

## TRANSMITTER TESTS

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

Ambient temperature = 20°C  
Relative humidity = 54%  
Supply voltage = 115Vac  
Channel number = See test results

Radio Laboratory

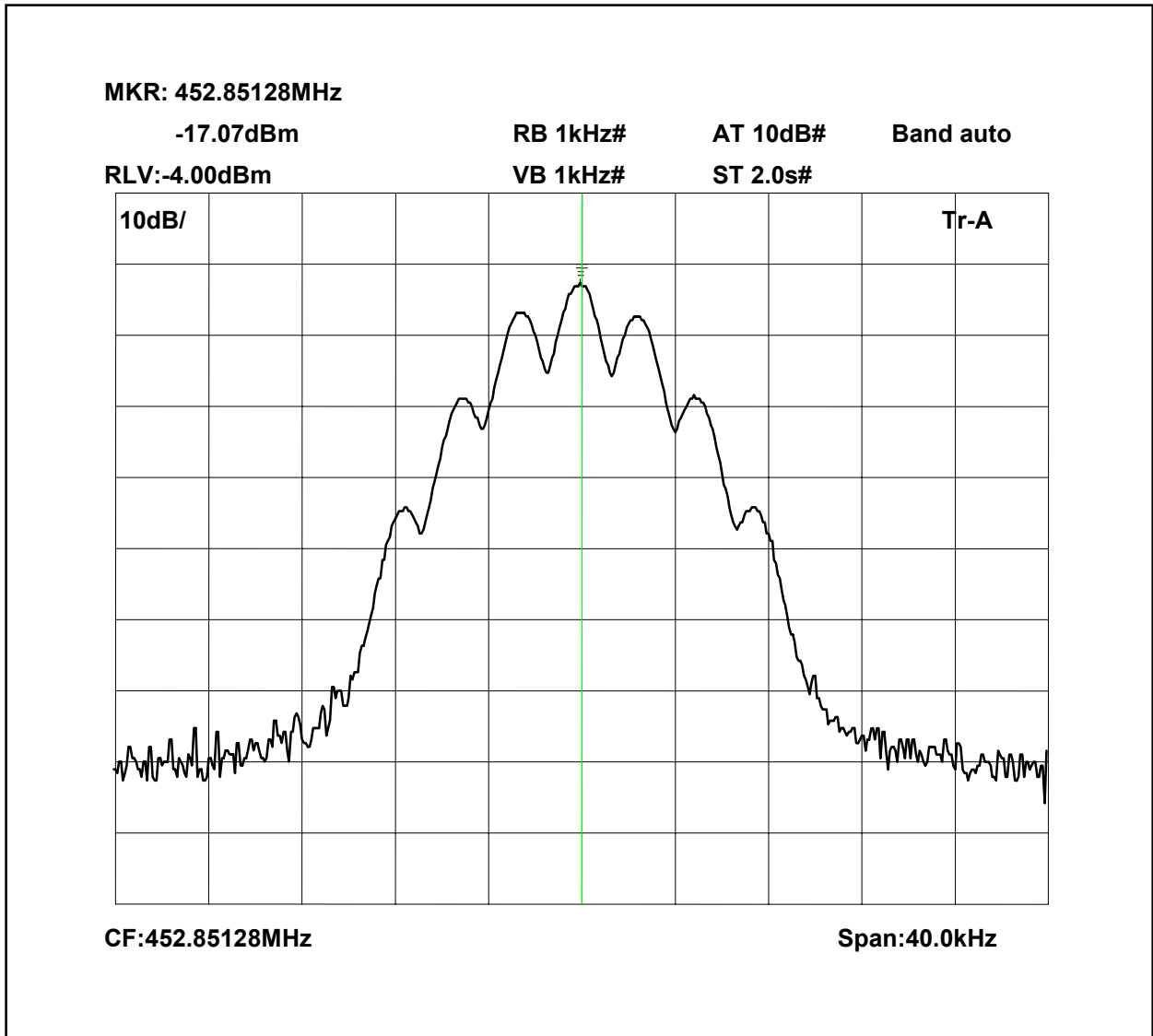


This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-29.1dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

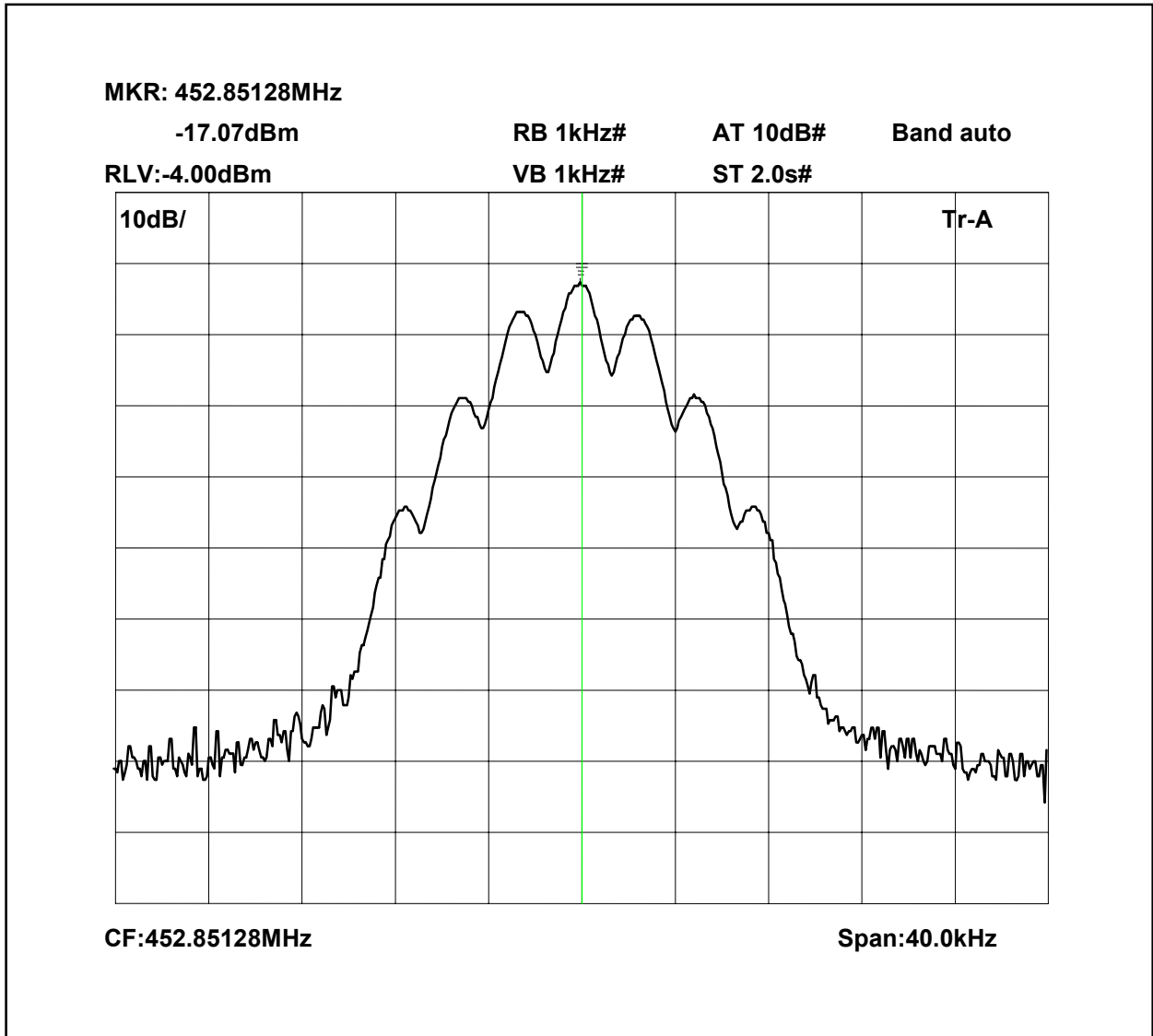
Note: The cables and attenuators had the following losses.

3. Cable TRL279 and attenuator TRL220 26.6dB
4. Cable between signal generator and EUT 0.4dB

452.85MHz Signal Generator deviation set to 2.5kHz



452.85MHz Signal Generator and EUT deviation set to 2.5kHz



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

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

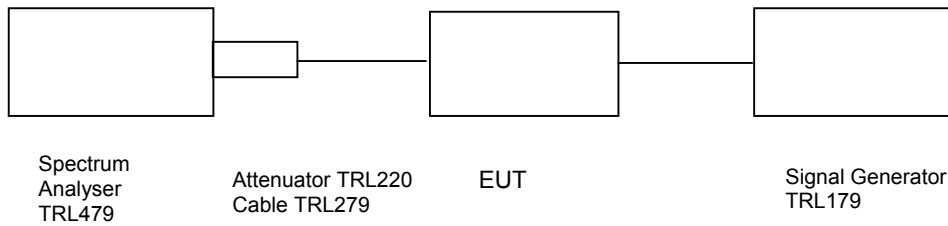


**TRANSMITTER TESTS**

**AMPLIFIER SPURIOUS EMISSIONS – CONDUCTED – Part 2.1051 – UPLINK**

Ambient temperature = 20°C  
 Relative humidity = 54%  
 Supply voltage = 115Vac

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

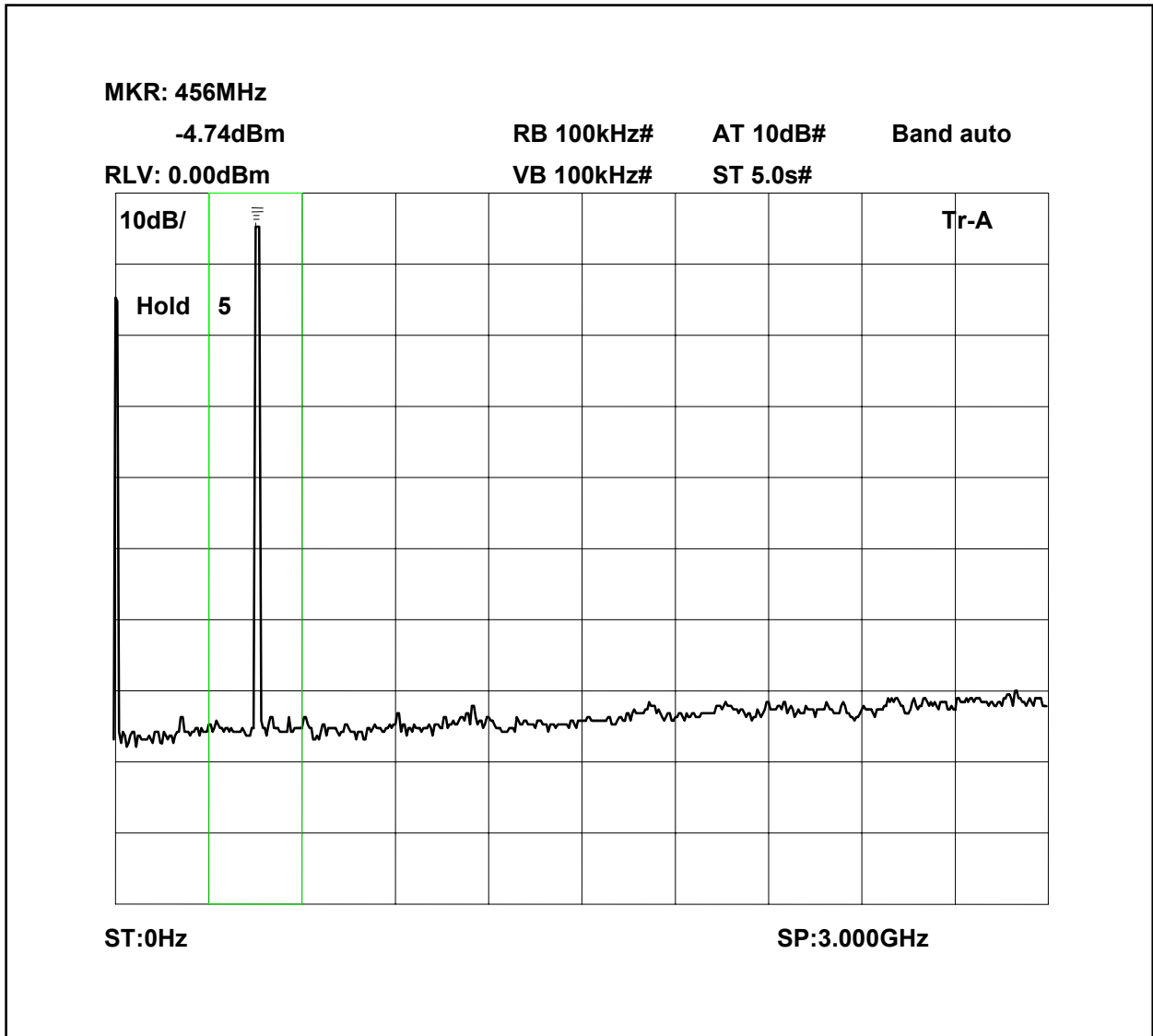
At least 43 + 10 log PdB

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

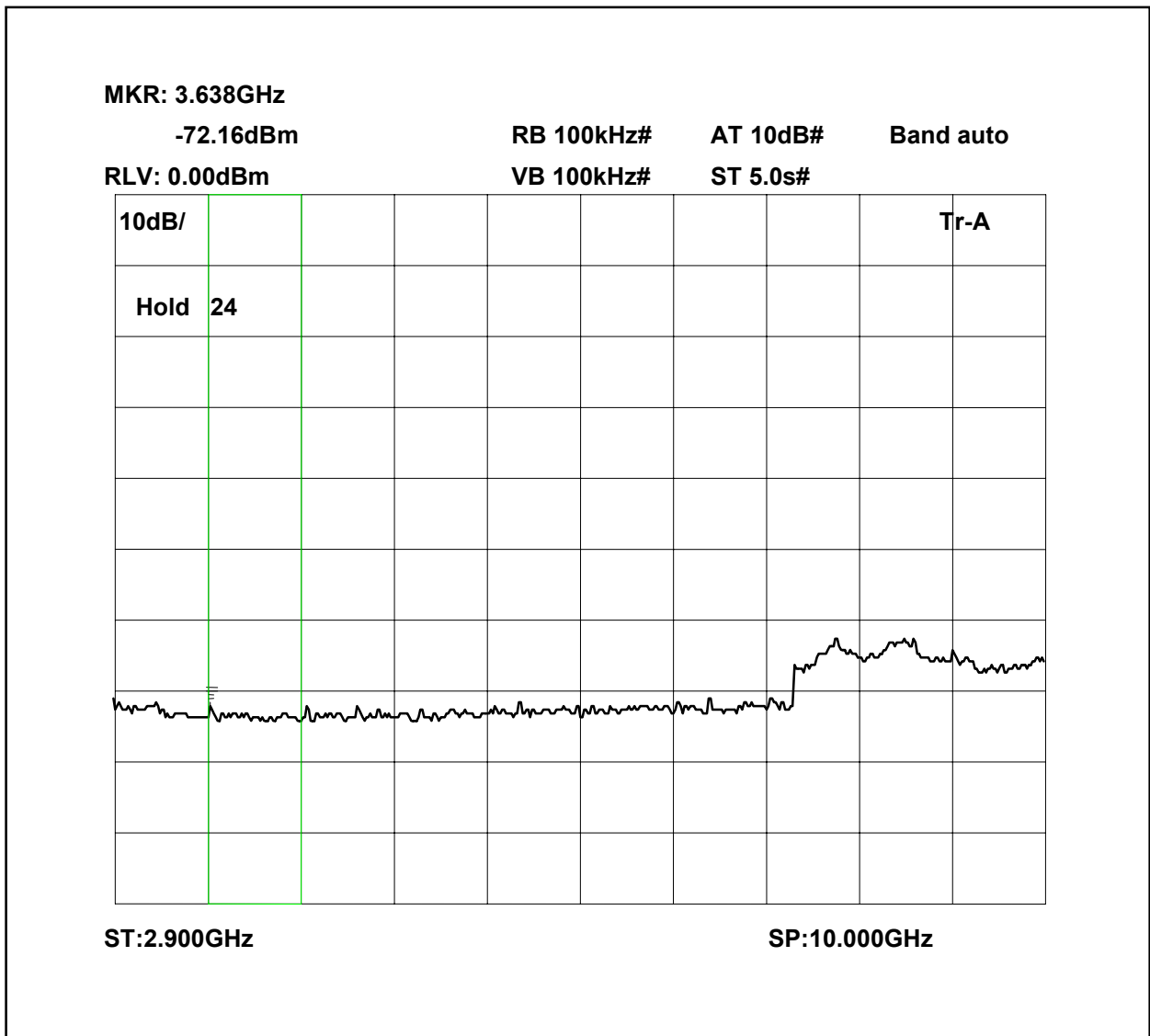
The test equipment used for the Transmitter Conducted Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

Conducted emissions 452.85MHz 0 - 3GHz



Conducted emissions 452.85MHz 2.9 - 5GHz

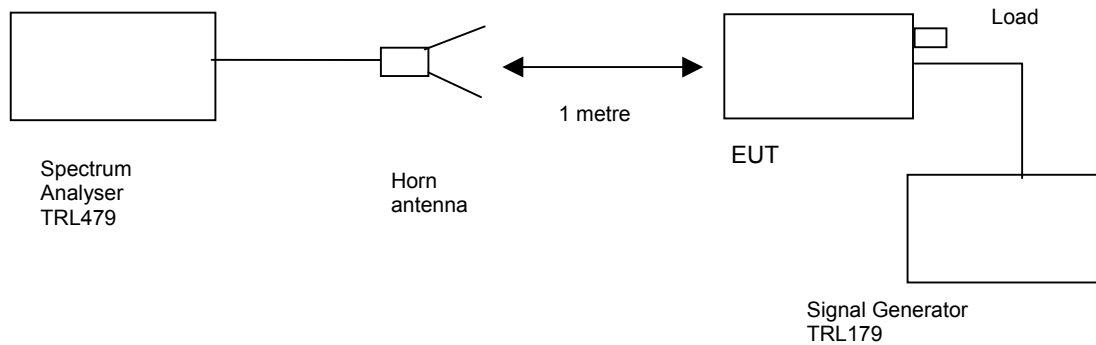


## TRANSMITTER TESTS

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

Ambient temperature = 20°C  
Relative humidity = 54%  
Conditions = OATS  
Supply voltage = 115Vac  
Supply Frequency = N/A

Test Signal = F3E



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

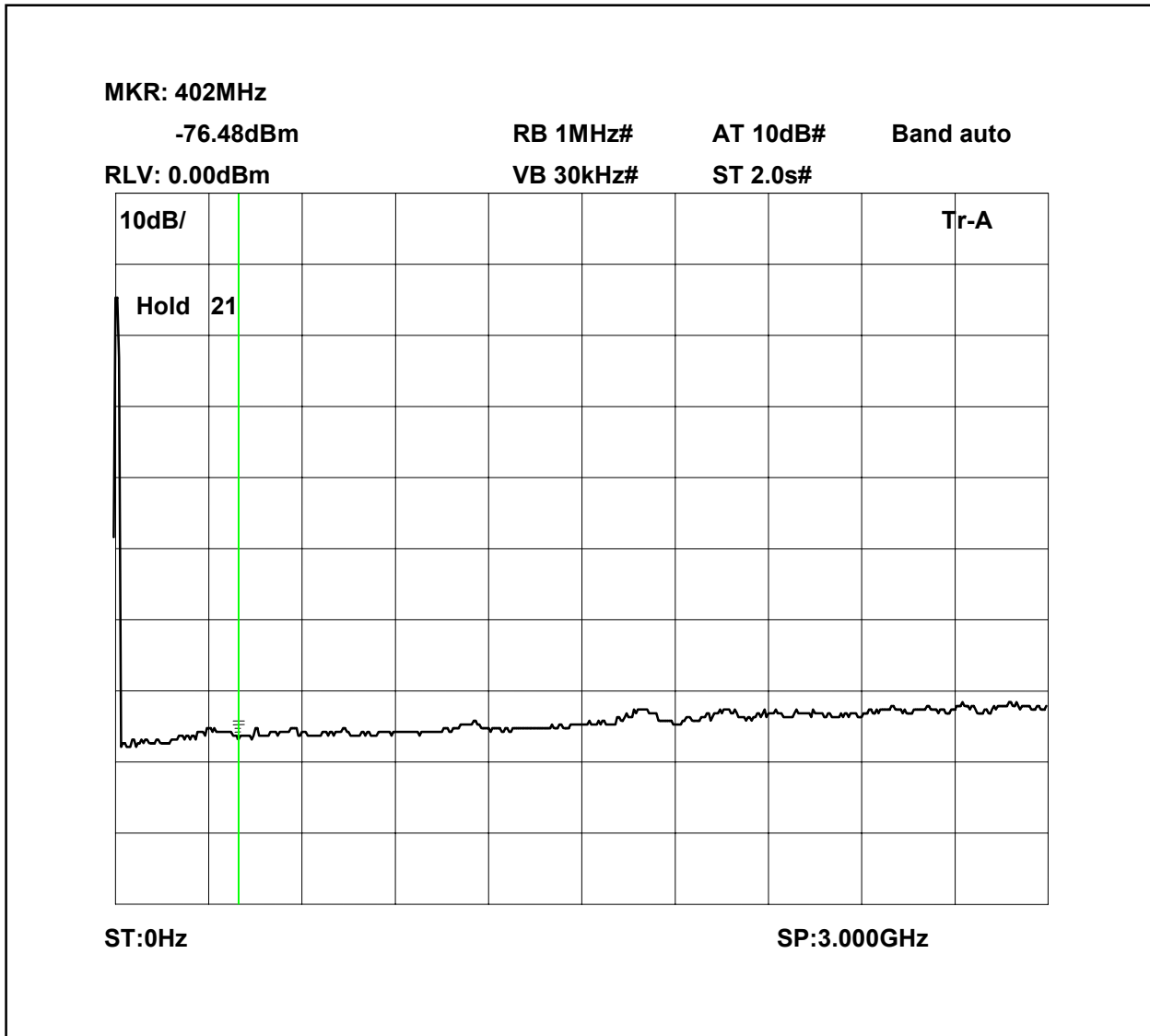
The Spurious limit was calculated as follows:

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

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

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

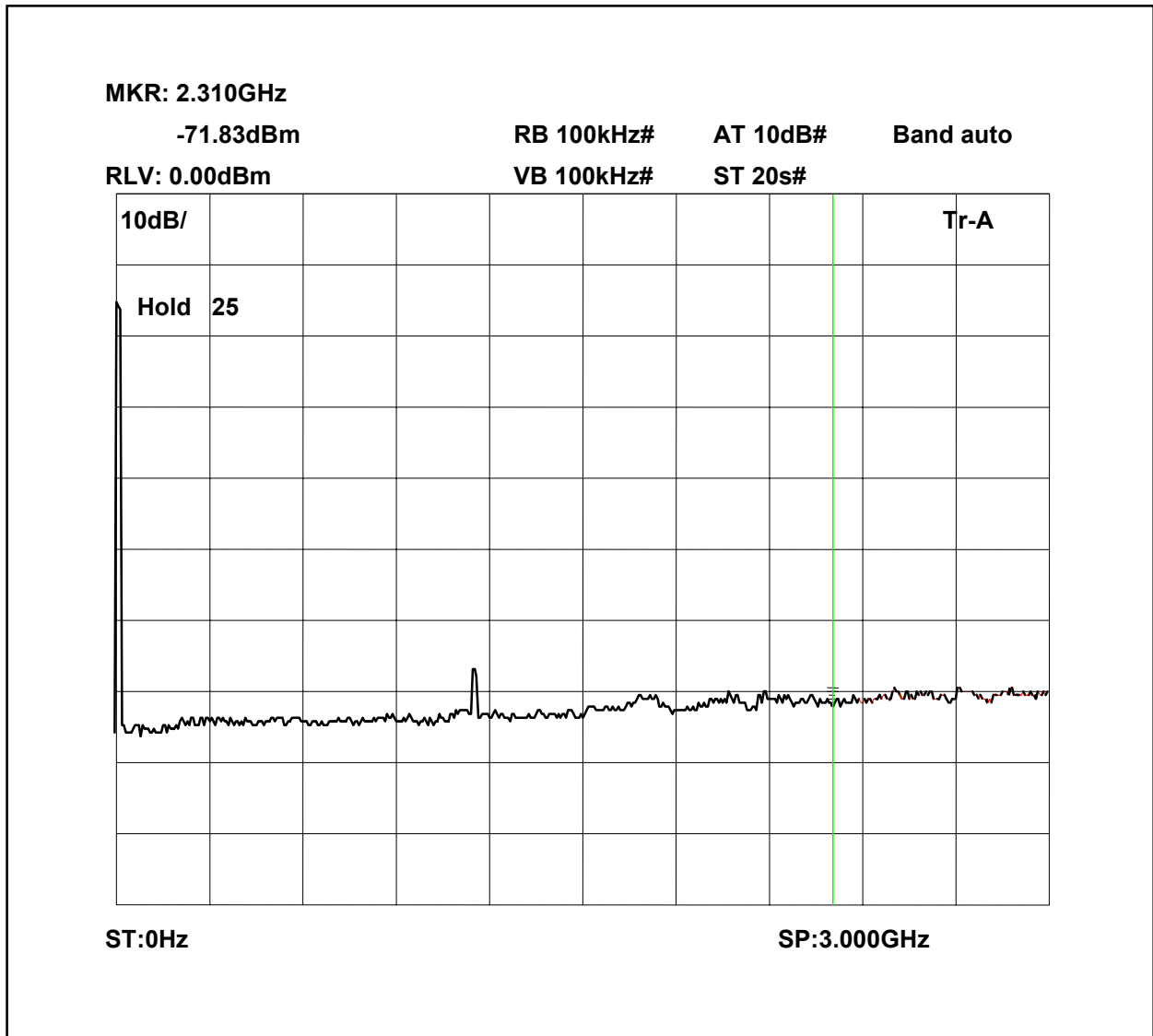
Radiated emissions 452.85MHz 0-3GHz



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.





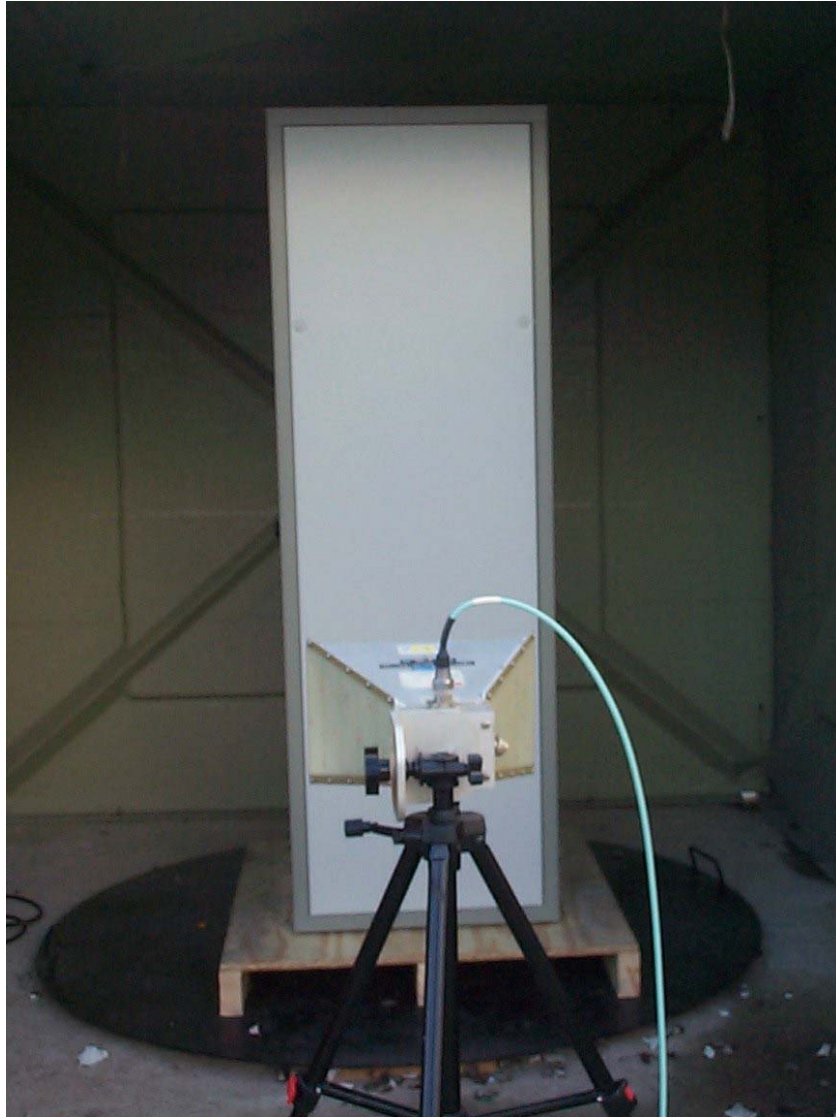
The test equipment used for the Transmitter Spurious Emissions:

TYPE OF EQUIPMENT	MAKER/SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	<b>X</b>
HORN	EMCO	3115	9010-3581	139	<b>X</b>
ATTENUATOR	BIRD	8304-300-N	N/A	220	<b>X</b>
CABLE	ROSENBERGER	MICRO COAX	N/A	279	<b>X</b>
SIGNAL GENERATOR	MARCON	2042	119388/080	179	<b>X</b>

**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	<input checked="" type="checkbox"/>
		-	FEE	<input checked="" type="checkbox"/>
b.	AGENT'S LETTER OF AUTHORISATION	-		<input checked="" type="checkbox"/>
c.	MODEL(s) vs IDENTITY	-		<input type="checkbox"/>
d.	ALTERNATIVE TRADE NAME DECLARATION(s)	-		<input type="checkbox"/>
e.	LABELLING	-	PHOTOGRAPHS	<input type="checkbox"/>
		-	DECLARATION	<input type="checkbox"/>
		-	DRAWINGS	<input type="checkbox"/>
f.	TECHNICAL DESCRIPTION	-		<input checked="" type="checkbox"/>
g.	BLOCK DIAGRAMS	-	Tx	<input checked="" type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
h.	CIRCUIT DIAGRAMS	-	Tx	<input type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
i.	COMPONENT LOCATION	-	Tx	<input type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
j.	PCB TRACK LAYOUT	-	Tx	<input type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
k.	BILL OF MATERIALS	-	Tx	<input type="checkbox"/>
		-	Rx	<input type="checkbox"/>
		-	PSU	<input type="checkbox"/>
		-	AUX	<input type="checkbox"/>
l.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		<input checked="" type="checkbox"/>

