

TEST REPORT NO: RU1069/4858

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ISSUE NO:

FCC ID:

NEO50-0637Series

1

## REPORT ON THE CERTIFICATION TESTING OF A Aerial Facilities Limited Channelised Bi-Driectional 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 E	BY:		P GREEN PRODUCT MANAGER
DATE:	-		EMC
Distribution:			
Copy Nos:	1.	Aerial Facilities Limited	
	2.	TCB: TRL Compliance Services Limited	

3. TRL EMC

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## CONTENTS

	PAGE
CERTIFICATE OF CONFORMITY & COMPLIANCE	3
APPLICANT'S SUMMARY	4
EQUIPMENT TEST CONDITIONS	5
TESTS REQUIRED	5
TEST RESULTS	6-81

	ANNEX
PHOTOGRAPHS	А
PHOTOGRAPH No. 1: Test setup	
PHOTOGRAPH No. 2: Test setup	
APPLICANT'S SUBMISSION OF DOCUMENTATION LIST	В

### 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:	NEO50-0637S	series	
PURPOSE OF TEST:	CERTIFICATION		
TEST SPECIFICATION:	FCC RULES CFR 47, Part 90 Subpart K		
TEST RESULT:	Compliant to S	Specification	
EQUIPMENT UNDER TEST:	Channelised B	i-Driectional RF A	mplifier (50-063701)
EQUIPMENT TYPE:	Private Land N	lobile Repeater	
MAXIMIUM GAIN	83.9dB		
MAXIMUM INPUT	-56dBm		
MAXIMUM OUTPUT	25dBm		
ANTENNA TYPE:	Not applicable		
CHANNEL SPACING:	12.5kHz		
NUMBER OF CHANNELS:	3	452.050MHz 452.300MHz 452.775MHz 453.225MHz	Downlink 457.050MHz 475.300MHz 457.775MHz 457.850MHz 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> Septembe	er – 6 <sup>th</sup> October 20	003
ORDER No(s):	20424		
APPLICANT:	Aerial Facilities	s Limited	
ADDRESS:	Aerial House Latimer Park, I Chesham Buckinghamsh HP5 1TU United Kingdo	ire	
TESTED BY:			J CHARTERS
APPROVED BY:			P GREEN PRODUCT MANAGER EMC

RU1069/4856

## **APPLICANT'S SUMMARY**

EQUIPMENT UNDER TEST (EUT):	Channelised Bi-Driectional RF Amplifier (50-063701)		
EQUIPMENT TYPE:	50-063701		
PURPOSE OF TEST:	CERTIFICATION		
TEST SPECIFICATION(s):	FCC RULES CFR 47, Part 90 Subpart K		
TEST RESULT:	COMPLIANT Yes [X] No [ ]		
APPLICANT'S CATEGORY:	MANUFACTURER[X]IMPORTER[DISTRIBUTOR[TEST HOUSE[AGENT[		
APPLICANT'S ORDER No(s):	20424		
APPLICANT'S CONTACT PERSON(s):	Mr Peter Bradfield		
E-mail address:	Peterb@aerial.co.uk		
APPLICANT:	Aerial Facilities Limited		
ADDRESS:	Aerial House Latimer Park, Latimer Chesham Buckinghamshire HP5 1TU United Kingdom		
TEL:	+44 (0)1494777020		
FAX:	+44 (0)149477020		
MANUFACTURER:	Aerial Facilities Limited		
EUT(s) COUNTRY OF ORIGIN:	United Kingdom		
TEST LABORATORY:	TRL EMC		
UKAS ACCREDITATION No:	0728		
TEST DATE(s)	29 <sup>th</sup> September – 6 <sup>th</sup> October 2003		
TEST REPORT No:	RU1069/4858		

## EQUIPMENT TEST / EXAMINATIONS REQUIRED

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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 Two channel Multi-channel	[ ] [ ] [X]	
7.	Channel spacing:	Narrowband Wideband	[X] []	12.5kHz
8.	Test Location	TRL Compliance Services Up Holland Long Green	[X] []	

9. Modifications made during test program

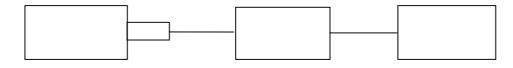
No modifications were performed.

### **COMPLIANCE TESTS**

### AMPLIFIER GAIN - CONDUCTED - PART 2.1046 - UPLINK

Ambient temperature	
Relative humidity	
Supply voltage	
Channel number	

- 20°C = =
- 54%
- Channel number
- = 115Vac
- = See test results



Spectrum Signal Generator TRL179 Attenuator TRL220 Cable TRL279 EUT Analyser TRL479

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

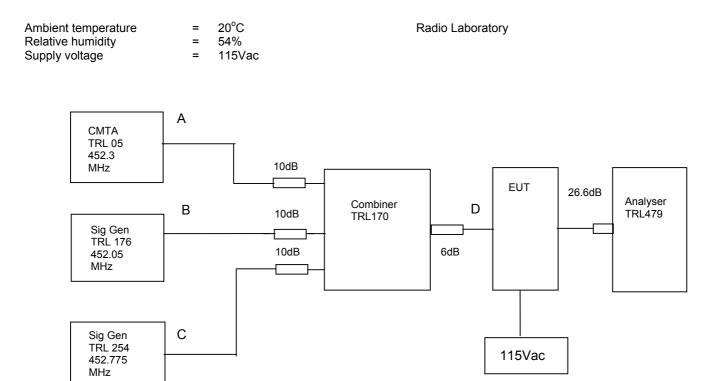
Radio Laboratory

Notes:

The level of the signal generator takes into consideration the loss from the cable.
 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	x
ATTENUATOR	BIRD	8304-300-N	N/A	220	x
CABLE	ROSENBERGER	MICRO COAX	N/A	279	x
SIGNAL GENERATOR	MARCON	2042	119388/080	179	x

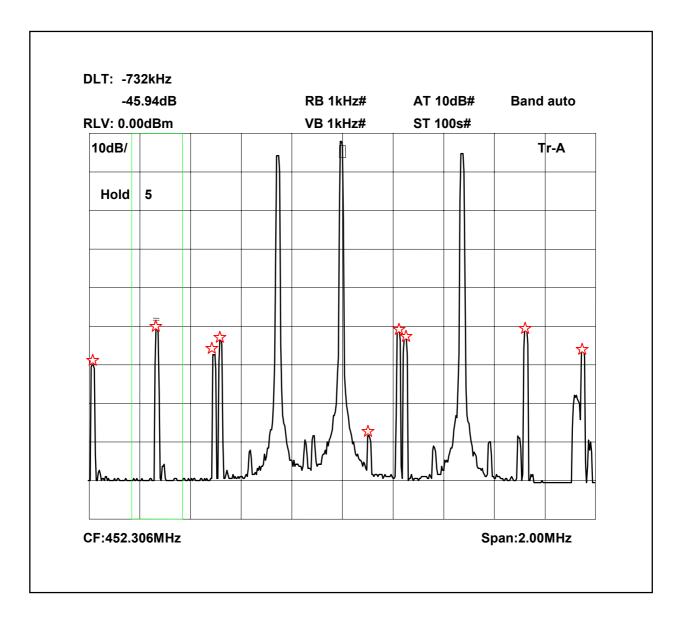
### AMPIFIER INTERMAODULATION SPURIOUS EMISSIONS - CONDUCTED - PART 2.1053- UPLINK



The Intermodualation 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.

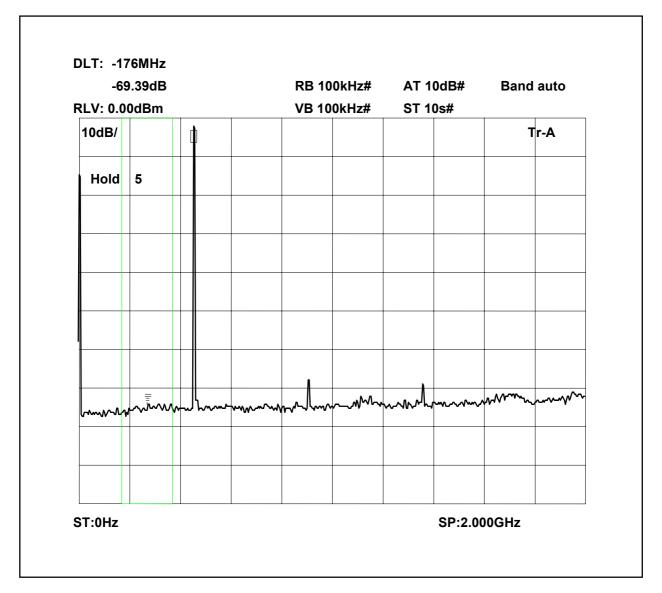
Sweep data is shown on the next page:

Intermodulaion Inband



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

Intermodulation Wideband



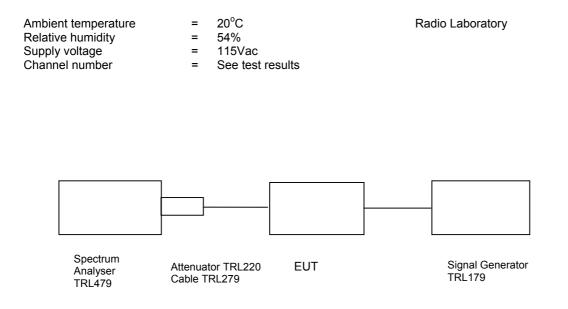
The above plot shows that there are no products outside the bands.

# 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	x
SIGNAL GENERATOR	MARCON	2042	119562/02	254	x
СМТА	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**

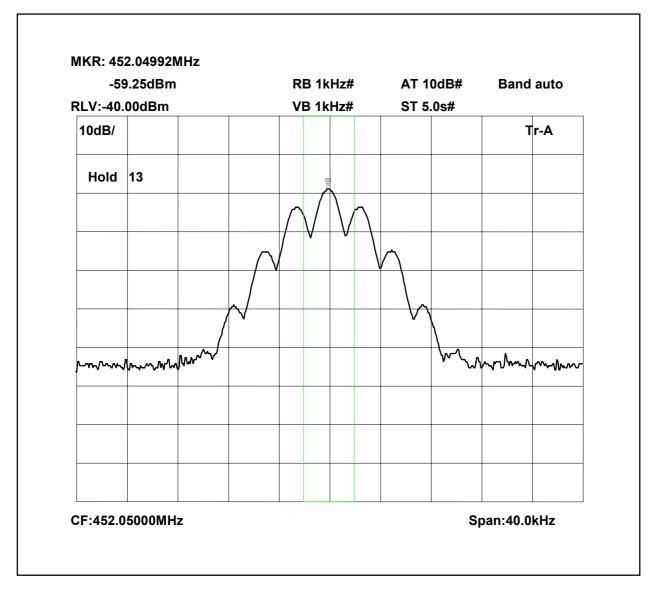
#### AMPLIFER MODULATED CHANNEL TEST - CONDUCTED - Part 2.1049- UPLINK



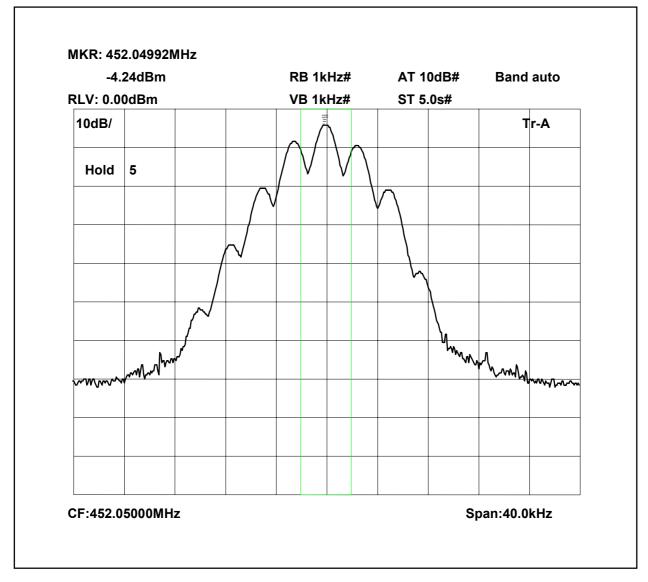
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-56.1dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

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

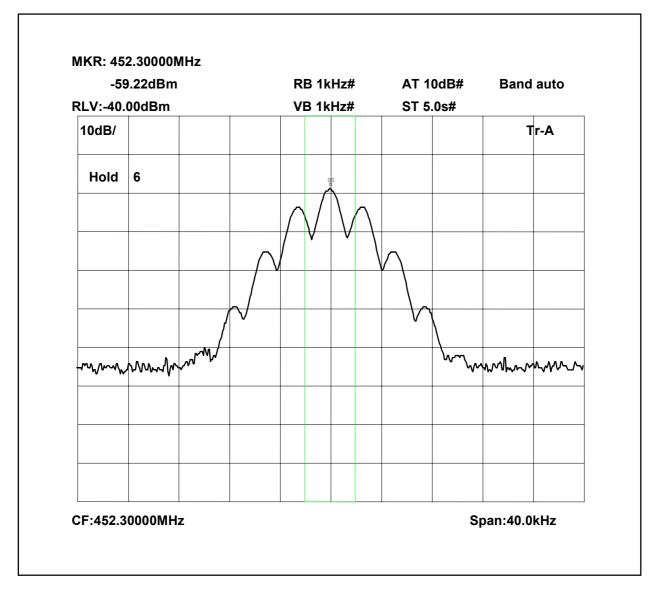


452.05MHz Signal Generator deviation set to 2.5kHz

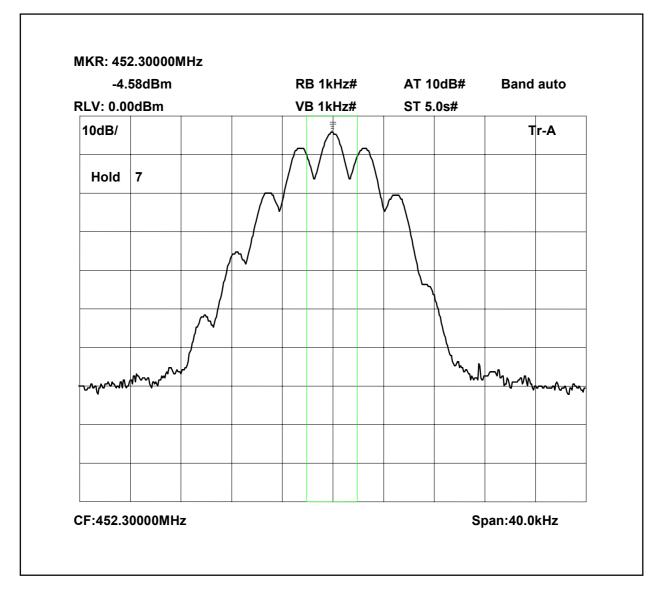


452.05MHz Signal Generator and EUT deviation set to 2.5kHz

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

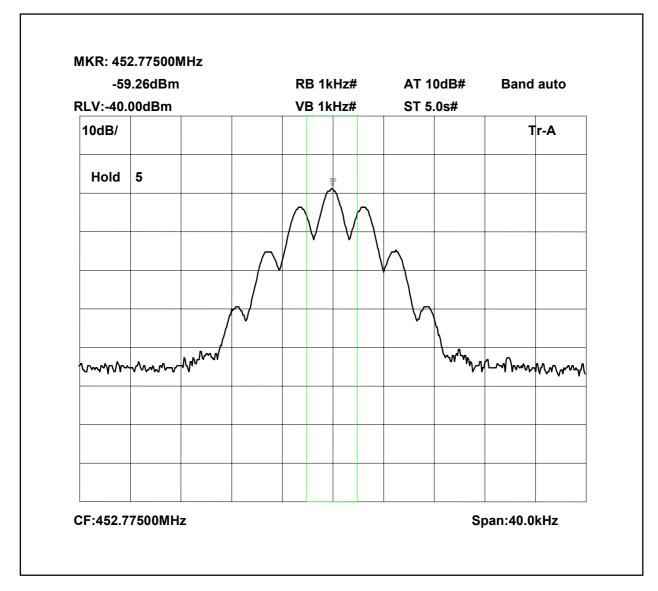


452.30MHz Signal Generator deviation set to 2.5kHz

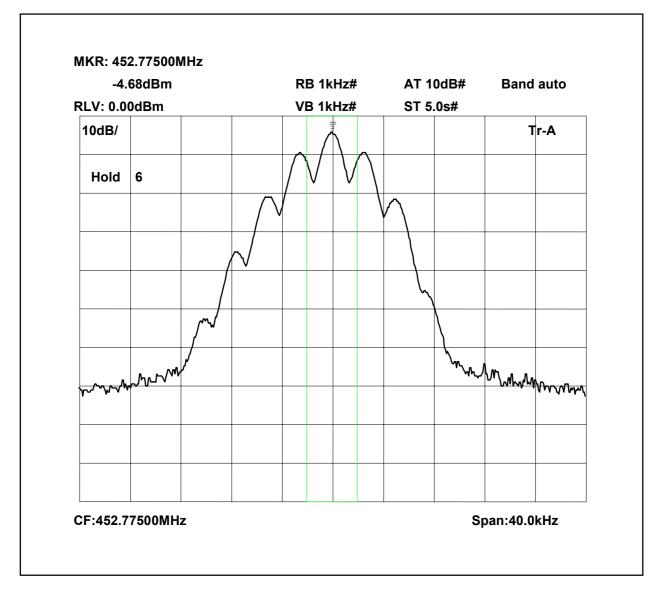


452.30MHz Signal Generator and amplifier deviation set to 2.5kHz

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

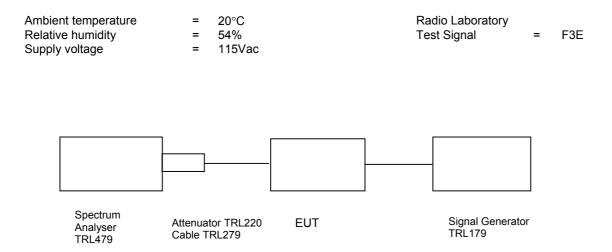
The above plots depicting the output waveshape show no measurable distortion visible, when compared to the input signal.

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	x
ATTENUATOR	BIRD	8304-300-N	N/A	220	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 – UPLINK



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

The Spurious limit was calculated as follows:

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

At least 43 + 10 log PdB

(10logP<sub>watts</sub>) - (43+10log (P<sub>watts</sub> \* 1000)) = LIMIT =-13 dBm

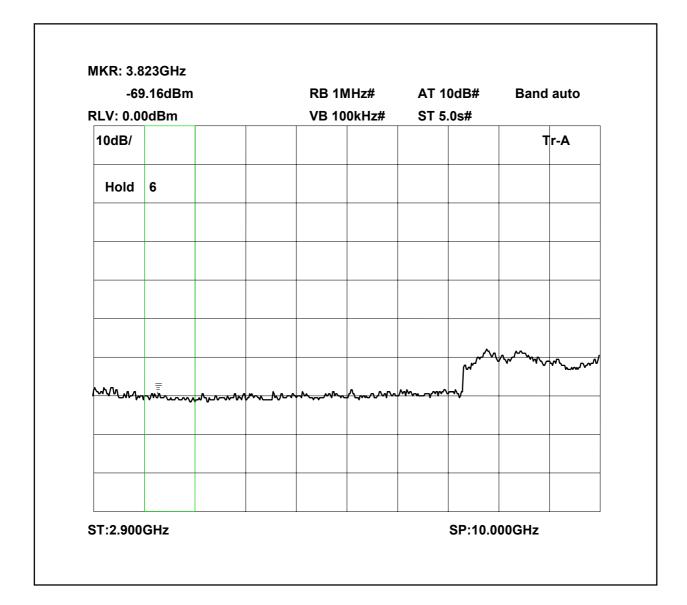
The test equipment used for the Transmitter Conducted Emissions:

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

Conducted emissions 452.05MHz 0 - 3GHz

-2	.15dl	Bm			RB 1M	/IHz#	AT 1	AT 10dB#		auto
RLV: 0.0	0dB	m			VB 10	0kHz#	ST 5	.0s#		
10dB/		Ī							٦	r-A
Hold	11									
				A						- Martin
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ST:0Hz								SP:3.0		

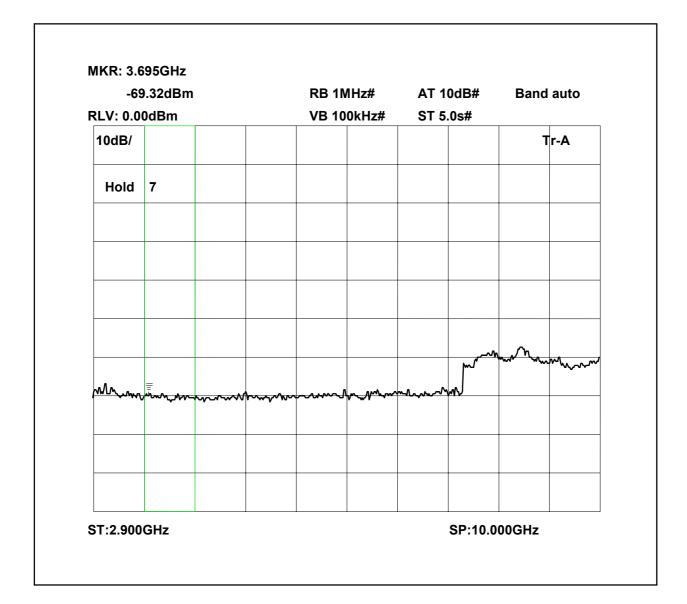
Conducted emissions 452.05MHz 2.9 - 10GHz



Conducted emissions 452.30MHz 0 - 3GHz

-2	.00d	Bm			RB 1N	1Hz#	AT 1	0dB#	Band	l auto
RLV: 0.0	)0dB	m			VB 10	0kHz#	ST 5	.0s#		
10dB/		Ī							-	Tr-A
Hold	6									
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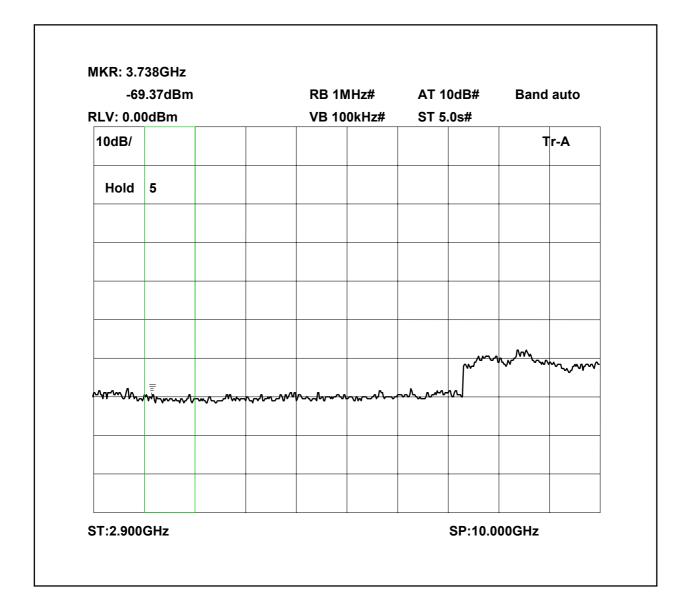
Conducted emissions 452.30MHz 2.9 - 10GHz



Conducted emissions 452.775MHz 0 - 3GHz

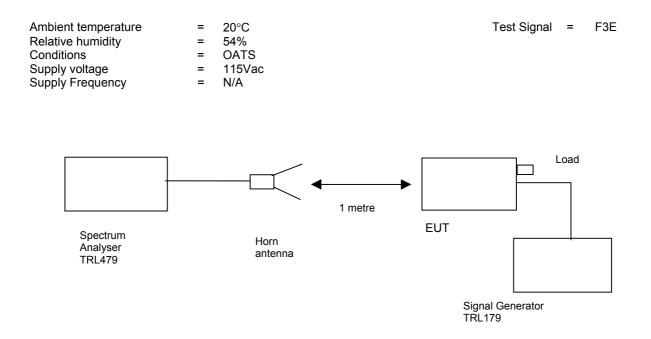
-2.	78dB	m			RB 1MHz# AT 1			0dB#	auto	
RLV: 0.0	0dBn	า			VB 10	0kHz#	ST 5	.0s#	1	
10dB/									т	r-A
Hold	8									
						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			man	- <b>h-</b>
Lmm	·~~_/'	b_^	~~~	hanger						

Conducted emissions 452.775MHz 2.9 - 10GHz



### TRANSMITTER TESTS

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



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

The Spurious limit was calculated as follows:

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

At least 43 + 10 log PdB

(10logP<sub>watts</sub>) - (43+10log (P<sub>watts</sub> \* 1000)) = LIMIT =-13 dBm

Radiated emissions 452.05MHz 0-3GHz

-

-7	6.05	5dBm		RB 1MHz# AT 10dB#			Band auto			
RLV: 0.0	)0dE	3m		VB 3	0kHz#	ST 2	.0s#			
10dB/								٦	r-A	
Hold	11									
			+ 1				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	J. m.m.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
har	m	·		****						

Radiated emissions 452.05MHz 2.9-10GHz

-60	).69dBm			RB 1MHz# AT 10c			0dB#	dB# Band auto			
RLV: 0.0	0dBm			VB 30	)kHz#	ST 2	.0s#				
10dB/									Tr-A		
Hold	11										
								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
h	mm	~~~~^^	~~~~	~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ᢆ᠕᠕᠕	ᠬ				

Radiated emissions 452.30MHz 0-3GHz

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-70	6.42	2dBm			RB 1N	1Hz#	AT 1	0dB#	# Band auto		
RLV: 0.0	0dE	3m			VB 30	kHz#	ST 2	.0s#			
10dB/									Tr-A		
Hold	8										
	<u>م</u> ـــة	^	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	h	•	_~~~	~~^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m.m.m	^	-h	
ST:0Hz								SP:3.0	00GHz		

Radiated emissions 452.30MHz 2.9-10GHz

-60	).35dBı	m		RB 1M	/Hz#	AT 1	0dB#	Band auto		
RLV: 0.0	0dBm		_	VB 30	kHz#	ST 2.	.0s#			
10dB/									Tr-A	
Hold	6									
							hww.	we the second	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
mm	-~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-^	,	~~~^m	m	~~			

Radiated emissions 452.775MHz 0-3GHz

-76	6.30d	lBm			RB 1N	/Hz#	AT 1	0dB#	Band auto		
RLV: 0.0	0dBr	n			VB 30	kHz#	ST 2	.0s#	_		
10dB/										Tr-A	
Hold	9										
	=							~~~	_w^~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
hanner	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~ <u>~</u> ~~~	~~~~	~~~~~							

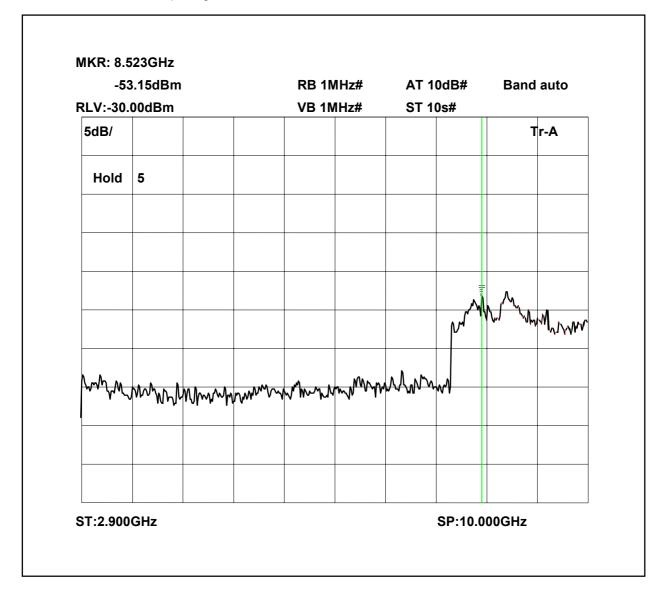
Radiated emissions 452.775MHz 2.9-10GHz

-60.33dBm RLV: 0.00dBm		RB 1MHz# VB 30kHz#		AT 1	AT 10dB#		Band auto		
				ST 2.0s#					
10dB/									Tr-A
Hold	16								
							- mm	w.the	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
www		····-	<i>^</i>	~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~		

Radiated emissions no input signal 0-3GHz

ST 20s#	Tr-A
	Tr-A
M	when we have
	M

Radiated emissions no input signal 2.9-10GHz



I he 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	220	x
CABLE	ROSENBERGER	MICRO COAX	N/A	279	x
SIGNAL GENERATOR	MARCON	2042	119388/080	179	x

## AMPLIFIER GAIN - CONDUCTED - PART 2.1046 - DOWNLINK

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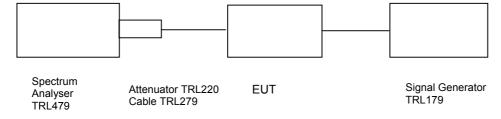
Ambient temperature Relative humidity Supply voltage Channel number

- 20°C = =
  - 54% 115Vac

See test results

Radio Laboratory





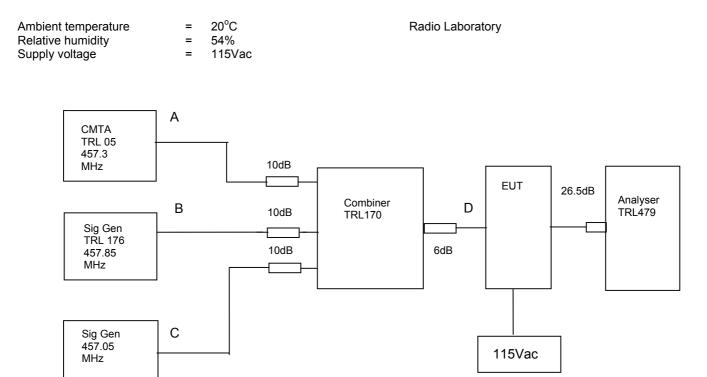
Frequency MHz	Signal Generator input level dBm	Cable & Attenuator loss dB	Level at Spectrum Analyser dBm	Gain dB	Gain after 20dB input level increase dBm
457.05MHz	-58.4	26.6	-3.9	81.95	81.95
457.30MHz	-58.6	26.6	-3.3	83.05	83.05
457.85MHz	-60.3	26.6	-3.0	83.9	83.9

Notes:

The level of the signal generator takes into consideration the loss from the cable.
 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	x
ATTENUATOR	BIRD	8304-200	N/A	103	x
ATTENUATOR	BIRD	8304-300-N	N/A	220	x
CABLE	ROSENBERGER	MICRO COAX	N/A	279	x
SIGNAL GENERATOR	MARCON	2042	119388/080	179	x

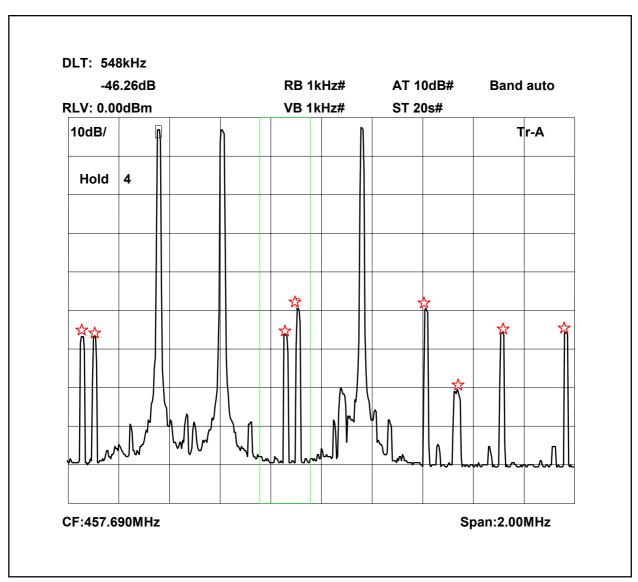
# AMPIFIER INTERMAODULATION SPURIOUS EMISSIONS - CONDUCTED - PART 2.1053- DOWNLINK



The Intermodualation 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.

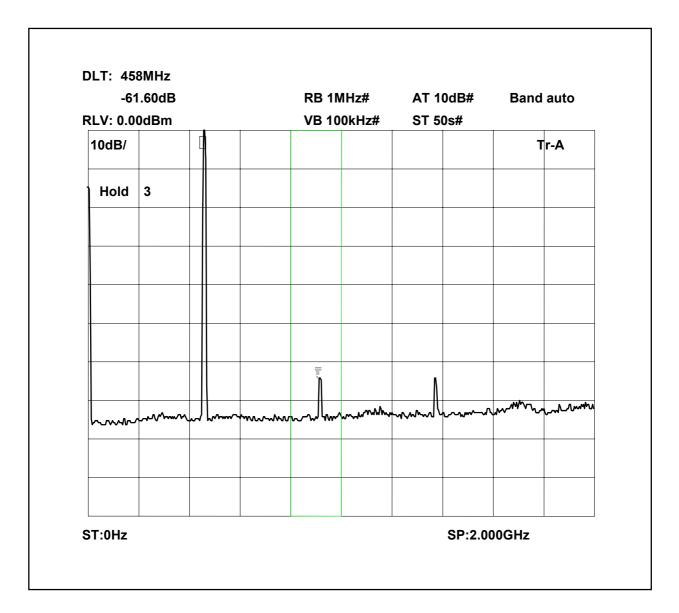
Sweep data is shown on the next page:

Intermodulaion 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	x
SIGNAL GENERATOR	MARCON	2042	119562/02	254	x
СМТА	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

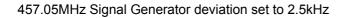
# AMPLIFER MODULATED CHANNEL TEST - CONDUCTED - Part 2.1049- DOWNLINK

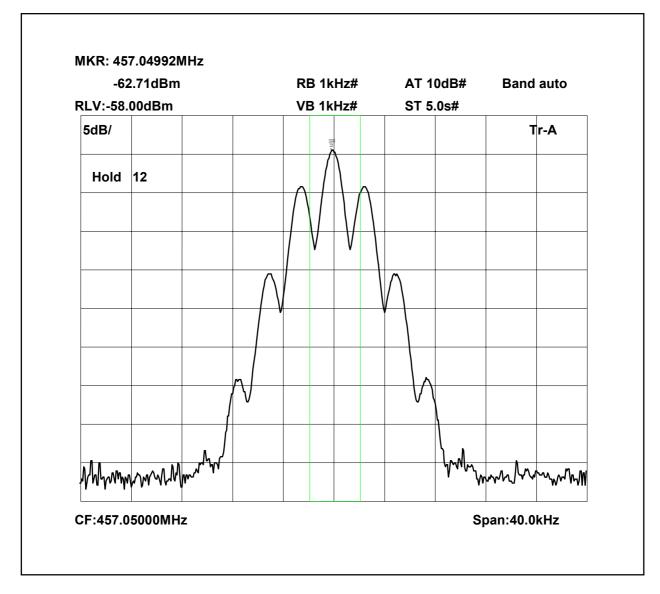
Ambient temperature Relative humidity Supply voltage Channel number	= 20°C = 54% = 115Vac = See test res	sults	Radio Laboratory
Spectrum Analyser TRL479	Attenuator TRL220 Cable TRL279	EUT	Signal Generator TRL179

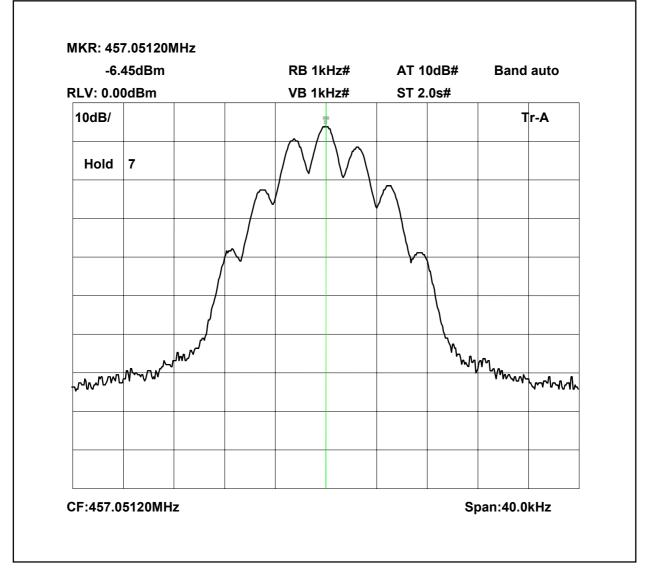
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-58.4dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

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



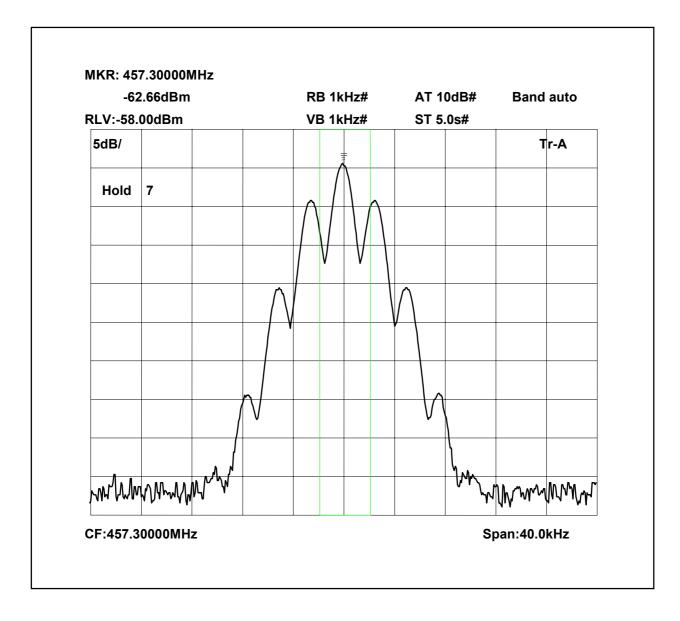


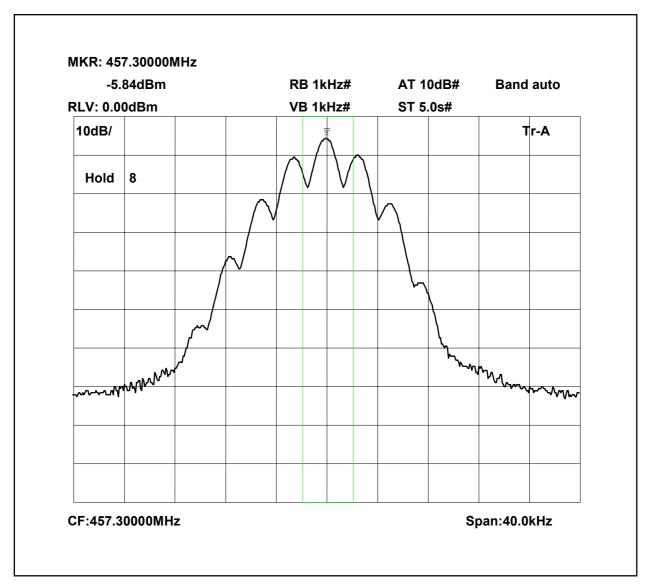


457.05MHz Signal Generator and EUT deviation set to 2.5kHz

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

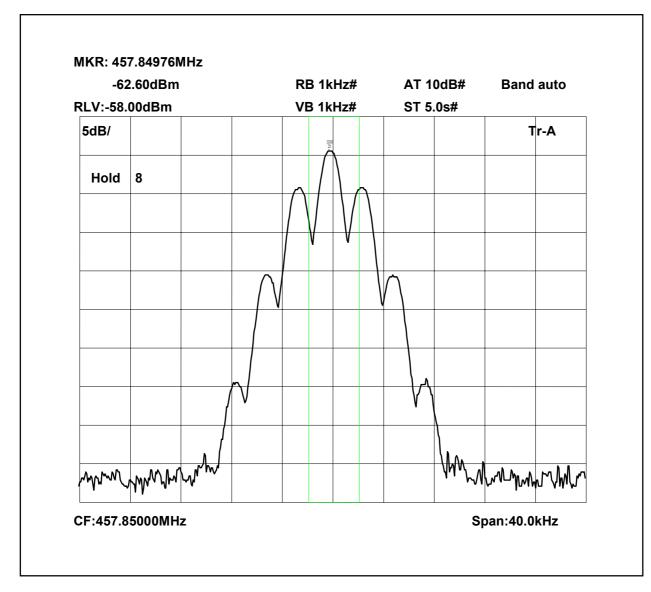
457.30MHz Signal Generator deviation set to 2.5kHz



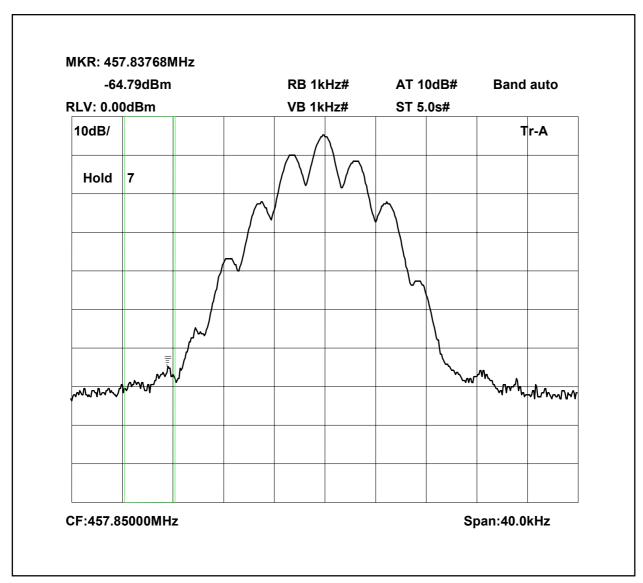


457.30MHz Signal Generator and amplifier deviation set to 2.5kHz

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

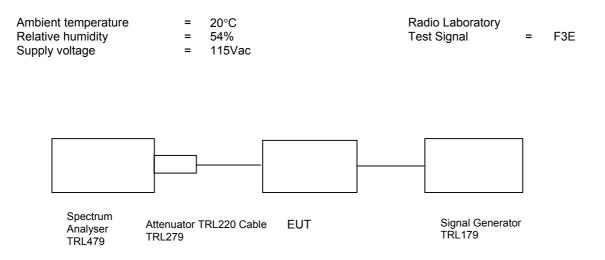
The above plots depicting the output waveshape show no measurable distortion visible, when compared to the input signal.

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	x
ATTENUATOR	BIRD	8304-200	N/A	103	
ATTENUATOR	BIRD	8304-300-N	N/A	220	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 - DOWNLINK



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

The Spurious limit was calculated as follows:

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

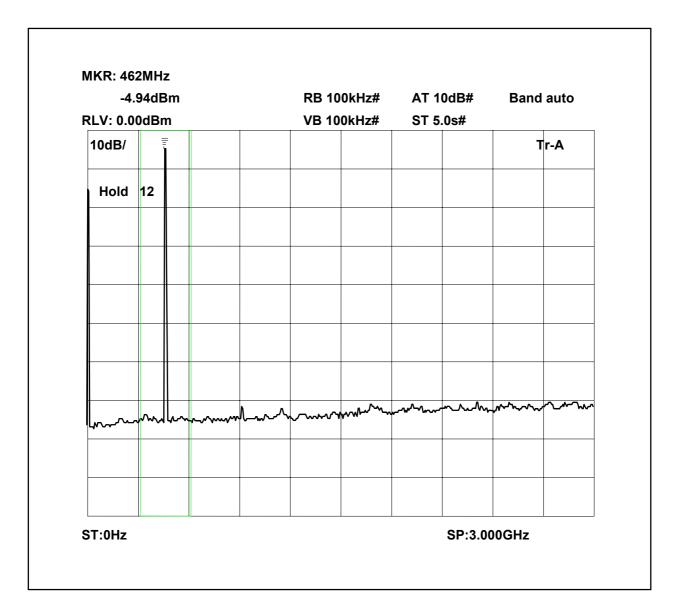
At least 43 + 10 log PdB

(10logP<sub>watts</sub>) - (43+10log (P<sub>watts</sub> \* 1000)) = LIMIT =-13 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	
ATTENUATOR	BIRD	8304-300-N	N/A	220	x
CABLE	ROSENBERGER	MICRO COAX	N/A	279	x
SIGNAL GENERATOR	MARCON	2042	119388/080	179	x

Conducted emissions 457.05MHz 0-3GHz



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-7	5.21dBm	1		RB 100kHz#		AT 1	AT 10dB#		l auto
RLV: 0.0	0dBm			VB 100kHz#		ST 5	ST 5.0s#		
10dB/	10dB/							Tr-A	
Hold	16								
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Conducted emissions 457.30MHz 0-3GHz

-3.	76d	Bm			RB 10	0kHz#	AT 1	0dB#	Band	auto
RLV: 0.0	0dB	m			VB 10	0kHz#	ST 5	.0s#		
10dB/	:	Ţ							т	r-A
Hold	10									
L	ww	J	mmmmm	hann	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	_~~^~	Marthann	~~^^^^^	ᡣ᠕᠕
ST:0Hz								SP:3.00		

Conducted emissions 457.30MHz 2.9-10GHz

-7	5.50dBm			RB 100kHz# AT 1			10dB# Band auto		
RLV: 0.0	0dBm			VB 100kHz# ST 5.			.0s#		
10dB/							Tr-A		
Hold	16								
han	~~ <u>~</u> ~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	·····	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	w	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~L
	MHz						SP:10.0		

Conducted emissions 457.85MHz 0-3GHz

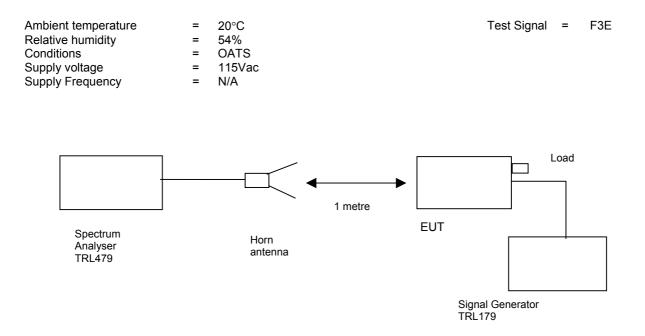
-3.	44d	3m			RB 10	0kHz#	AT 1	AT 10dB#		d auto
RLV: 0.0	0dBi	m			VB 10	0kHz#	ST 5.0s#			
10dB/	:	Ī							Tr-A	
Hold	18									
				Amment		᠕ᠰᠰ᠕	مساسمها	mm		how
hunn	<b>%</b> ~~~	Ihm	~~n/mp~~							
ST:0Hz	I							SP:3.0	00047	

Conducted emissions 457.85MHz 2.9-10GHz

-7	5.18dBm	1		RB 100kHz#			AT 10dB# Band auto			
RLV: 0.0	0dBm			VB 10	0kHz#	ST 5	.0s#			
10dB/								1	Tr-A	
Hold	13									
	Ę									
^^	Mm~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	-w-nhm	m	v~~~~~	w~~W	him	w	·····	

#### TRANSMITTER TESTS

# AMPLIFIER SPURIOUS EMISSIONS – RADIATED – Part 2.1053– DOWNLINK



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

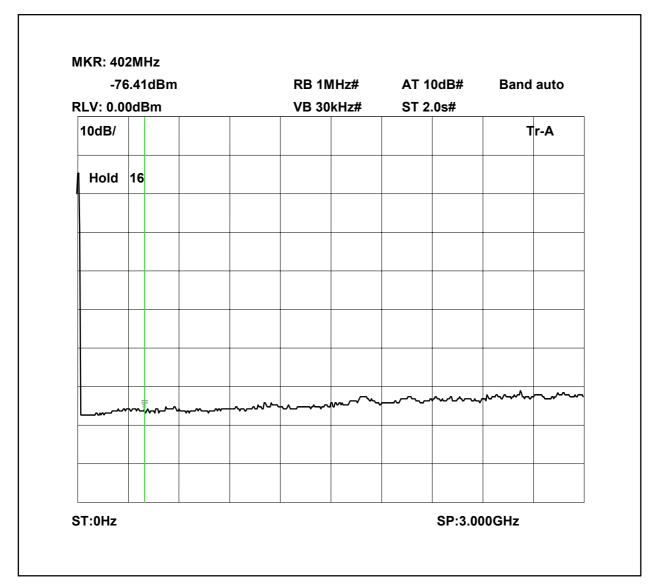
The Spurious limit was calculated as follows:

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

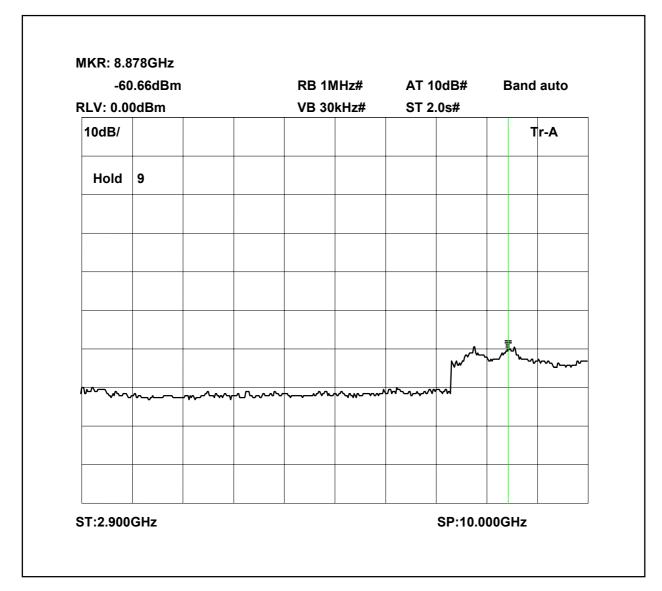
At least 43 + 10 log PdB

(10logP<sub>watts</sub>) - (43+10log (P<sub>watts</sub> \* 1000)) = LIMIT =-13 dBm

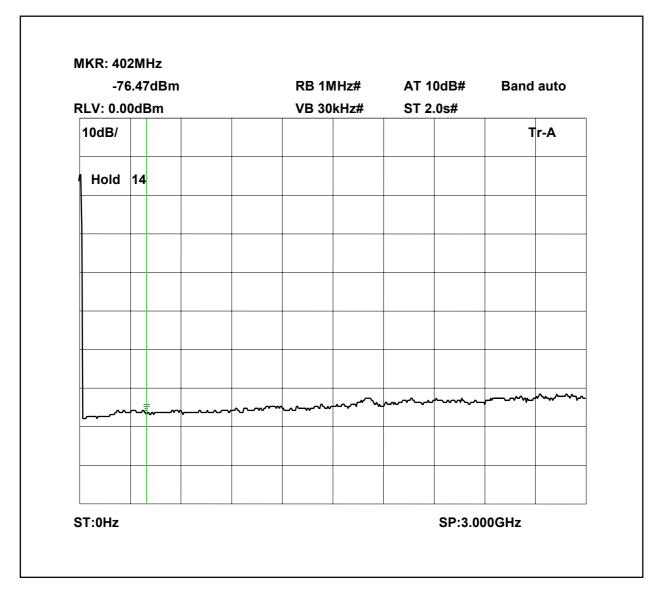
Radiated emissions 457.05MHz 0-3GHz



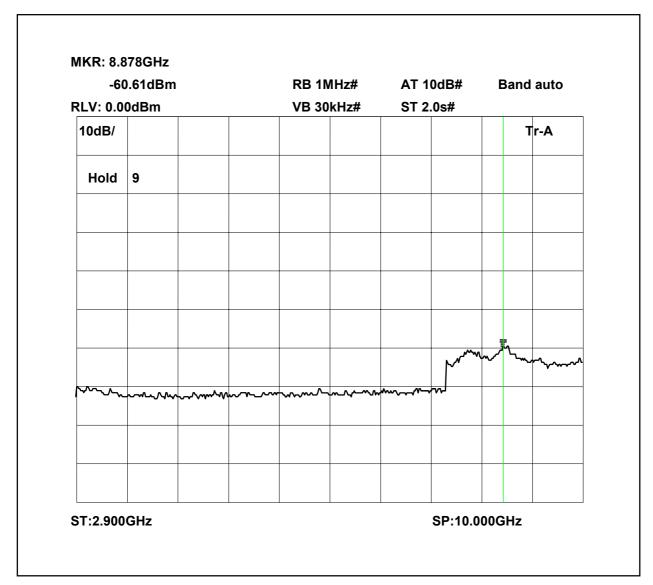
Radiated emissions 457.05MHz 2.9-10GHz



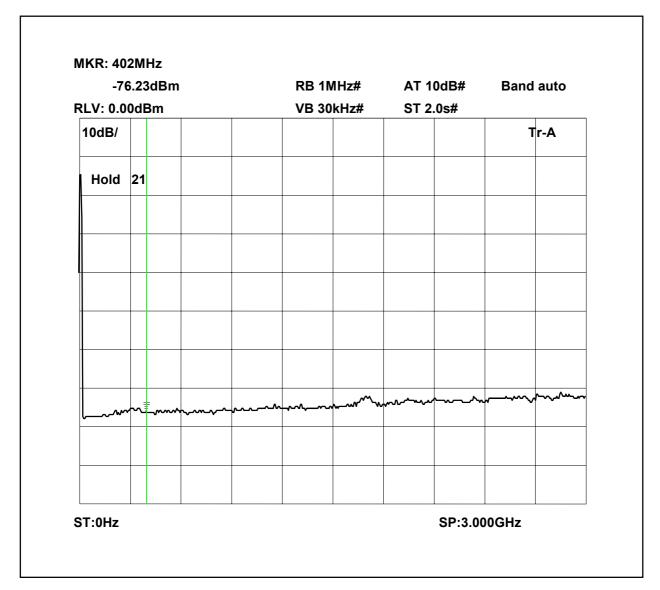
Radiated emissions 457.30MHz 0-3GHz



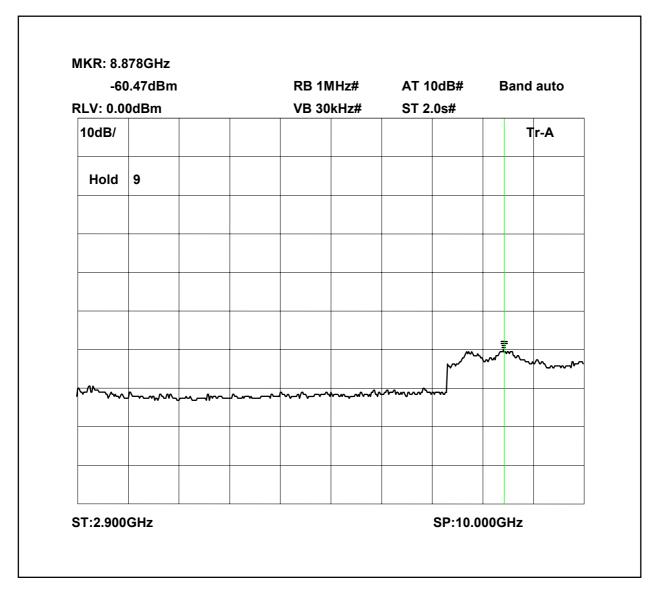
Radiated emissions 457.30MHz 2.9-10GHz



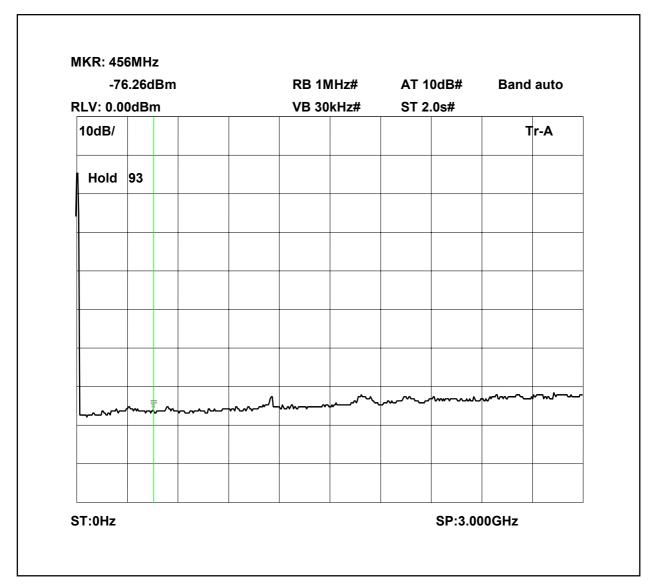
Radiated emissions 457.85MHz 0-3GHz



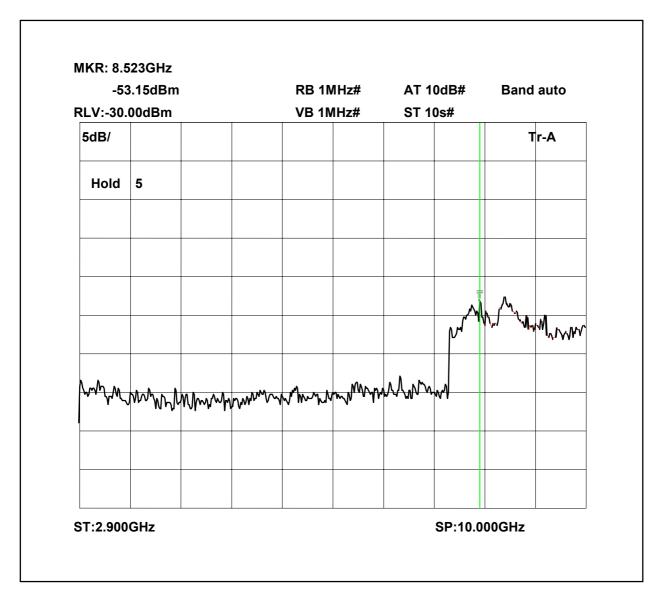
Radiated emissions 457.85MHz 2.9-10GHz



Radiated emissions no input signal 0-3GHz



Radiated emissions no input signal 2.9-10GHz



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	220	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

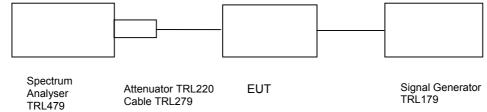
### **COMPLIANCE TESTS**

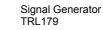
# AMPLIFIER GAIN - CONDUCTED - PART 2.1046 - SIMPLEX

Ambient temperature=20°CRelative humidity=54%Image: temperature=115VacImage: temperature=115Vac Supply voltage Channel number = See test results

Cable TRL279

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:

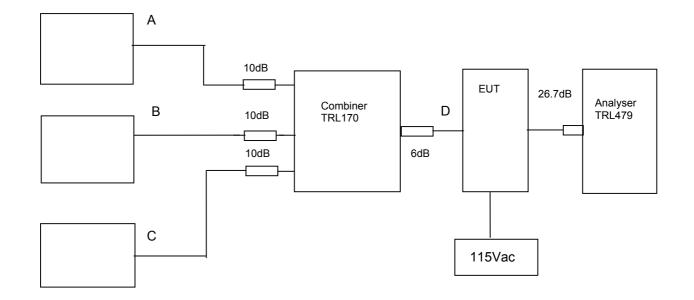
1. The level of the signal generator takes into consideration the loss from the cable.

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	x
ATTENUATOR	BIRD	8304-300-N	N/A	220	x
CABLE	ROSENBERGER	MICRO COAX	N/A	279	x
SIGNAL GENERATOR	MARCON	2042	119388/080	179	x

# AMPIFIER INTERMAODULATION SPURIOUS EMISSIONS - CONDUCTED - PART 2.1053- SMIPLEX





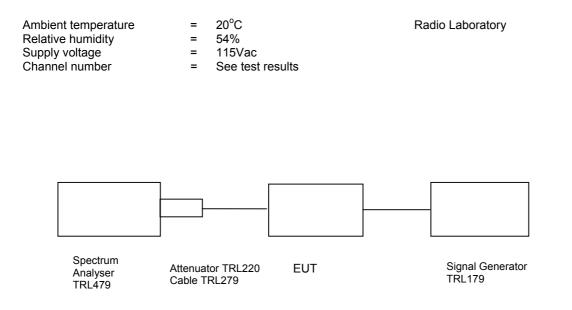
The Intermodualation and spurious products test was not performed as the this part of the unit only has one channel and separate RF inputs and outputs.

# 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	
СМТА	ROHDE & SCHWARZ	CMTA52	894715/033	05	
SIGNAL GENERATOR	MARCON	2042	119388/080	179	
COMBINER	ELCOM	RC-4-50	N/A	170	

### TRANSMITTER TESTS

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

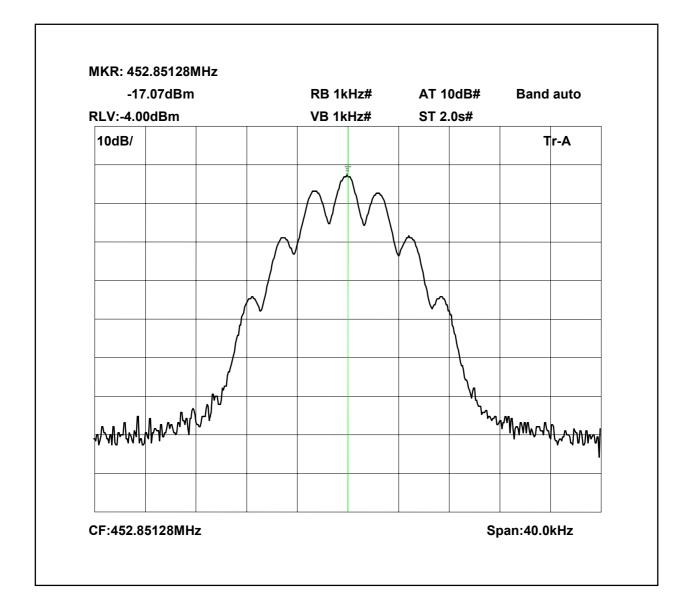


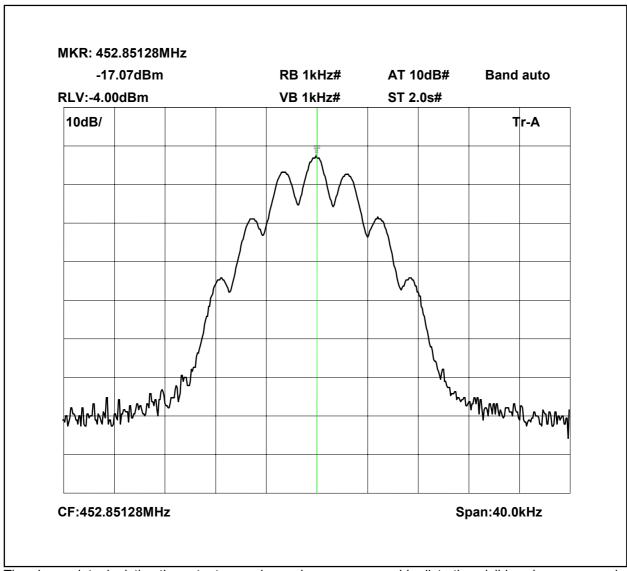
This test was performed to show that the amplifier does not alter the input signal in any way. The input signal was set to the maximum input level (-29.1dBm) and modulated with a 2500Hz tone. The plots show the signal measured at the signal generator and the signal measured at the output of the EUT.

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





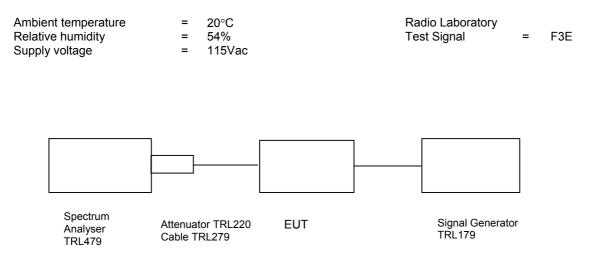
452.85MHz Signal Generator and EUT deviation set to 2.5kHz

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	x
ATTENUATOR	BIRD	8304-300-N	N/A	220	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 – UPLINK



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

The Spurious limit was calculated as follows:

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

At least 43 + 10 log PdB

(10logP<sub>watts</sub>) - (43+10log (P<sub>watts</sub> \* 1000)) = LIMIT =-13 dBm

The test equipment used for the Transmitter Conducted Emissions:

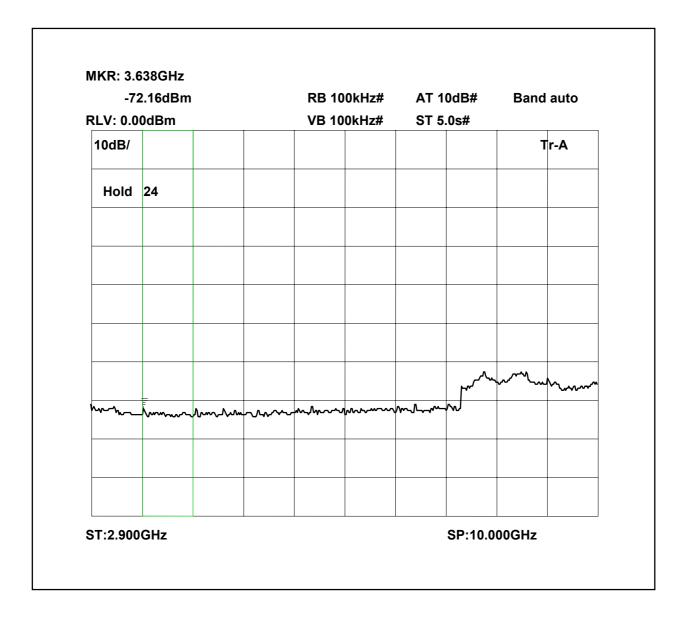
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	x
ATTENUATOR	BIRD	8304-300-N	N/A	220	x
CABLE	ROSENBERGER	MICRO COAX	N/A	279	x
SIGNAL GENERATOR	MARCON	2042	119388/080	179	x

Conducted emissions 452.85MHz 0 - 3GHz

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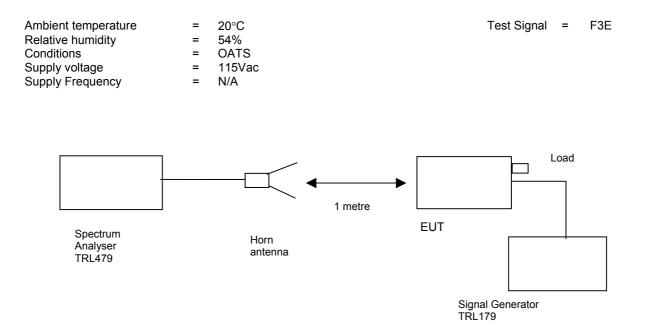
-4.74dBm			RB 10	RB 100kHz# AT 10dB#		0dB#	Band	auto		
RLV: 0.0	0dB	m			VB 100kHz#		ST 5.0s#			
10dB/		Ī							7	r-A
Hold	5									
mm	r Mmr	lh.	$\sim$	harrenth	mm	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	᠂᠕ᠬ᠇ᢇ᠕ᢩ	~~~~~~	mww
ST:0Hz								SP:3.00	00GH7	

Conducted emissions 452.85MHz 2.9 - 5GHz



#### TRANSMITTER TESTS

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



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

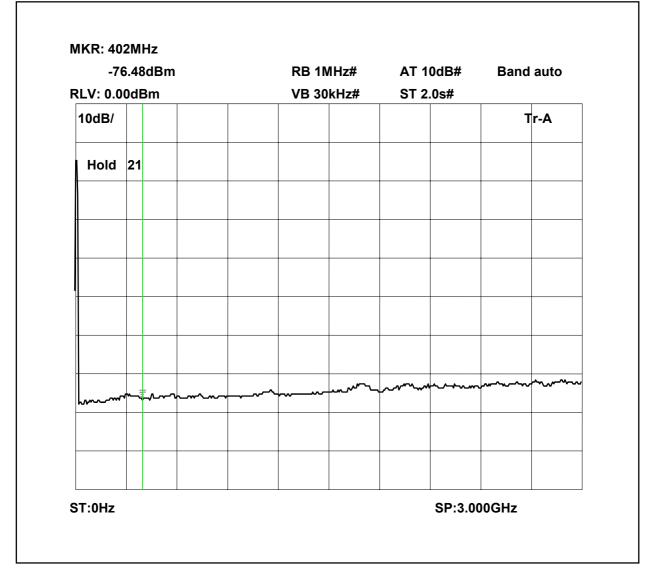
The Spurious limit was calculated as follows:

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

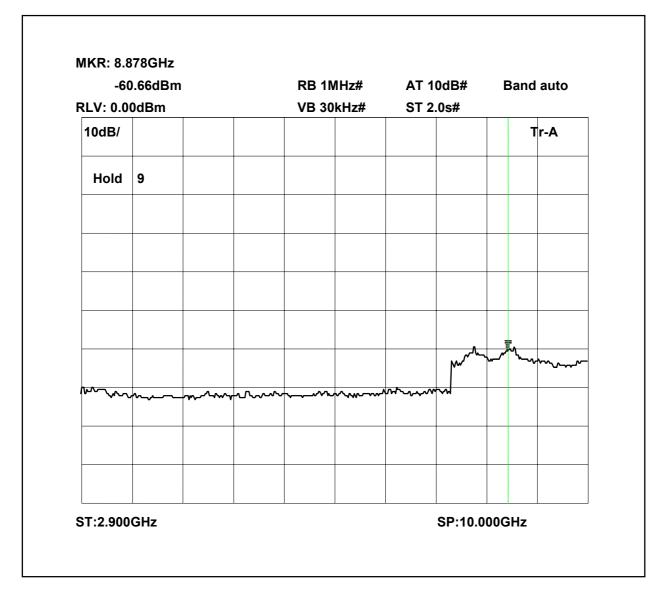
At least 43 + 10 log PdB

(10logP<sub>watts</sub>) - (43+10log (P<sub>watts</sub> \* 1000)) = LIMIT =-13 dBm

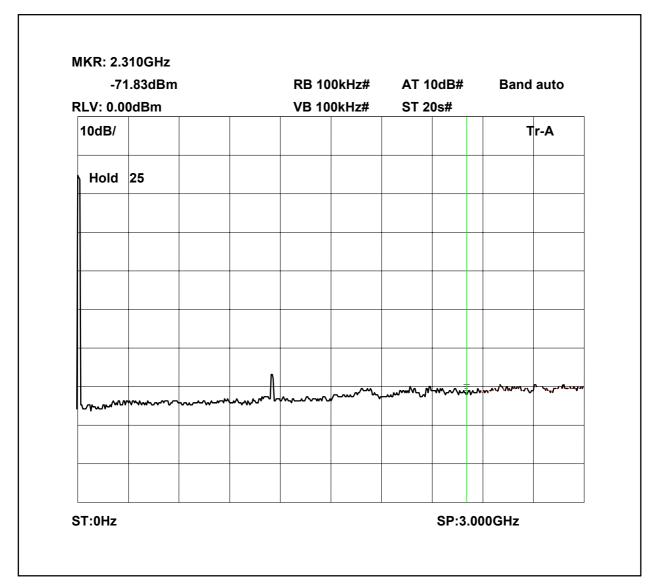
Radiated emissions 452.85MHz 0-3GHz



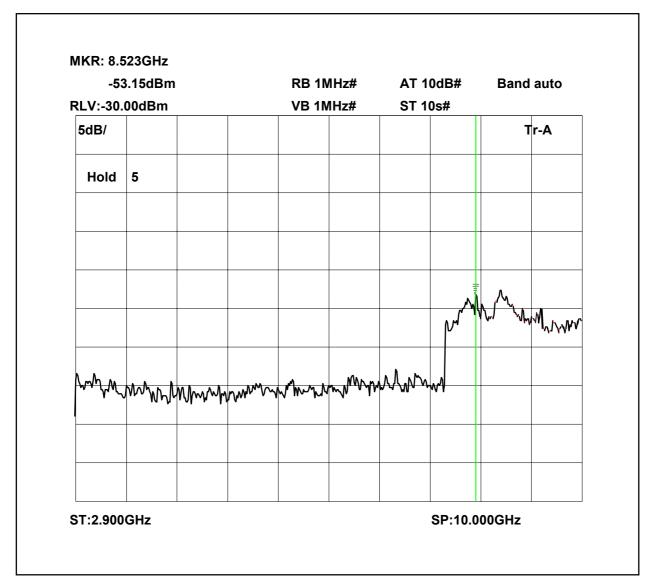
Radiated emissions 452.85MHz 2.9-10GHz



Radiated emissions no input signal 0-3GHz



Radiated emissions no input signal 2.9-10GHz



The test equipment used for the Transmitter Spurious Emissions:

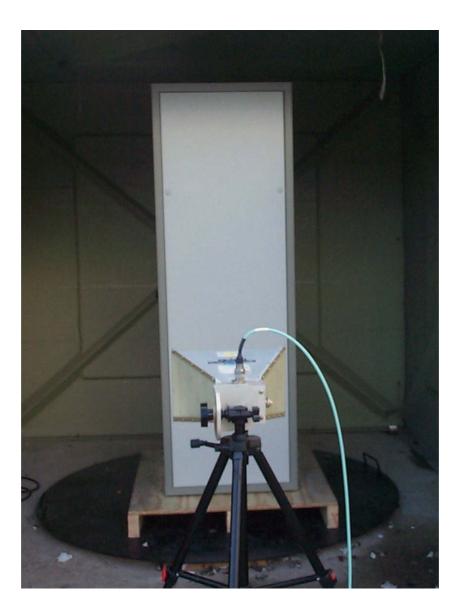
TYPE OF EQUIPMENT	MAKER/ SUPPLIER	MODEL No	SERIAL No	TRL No	ACTUAL EQUIPMENT USED
SPECTRUM ANALYSER	ANRITSU	MS2665C	MT26089	479	х
HORN	EMCO	3115	9010-3581	139	x
ATTENUATOR	BIRD	8304-300-N	N/A	220	х
CABLE	ROSENBERGER	MICRO COAX	N/A	279	x
SIGNAL GENERATOR	MARCON	2042	119388/080	179	x

ANNEX A

PHOTOGRAPHS

## PHOTOGRAPH No. 1

**TEST SETUP** 



### PHOTOGRAPH No. 2

## **TEST SETUP**



ANNEX B

APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

# APPLICANT'S SUBMISSION OF DOCUMENTATION LIST

a.	ТСВ	-	APPLICATION FEE	[X] [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 Rx PSU AUX	[X] [] [] []
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	[] [] []
I.	USER INSTALLATION / OPERATING INSTRUCTIONS	-		[X]

RF335 iss02