Nemko Test Report:	28681RUS1
Applicant:	Andrew Corporation 620 Greenfield Pkwy. Garner, NC 27529 USA
Equipment Under Test: (E.U.T.)	MMR4 19”
FCC Identifier:	BCR-MMR4X19
In Accordance With:	**CFR 47 Part 90, Subpart I** Private Land Mobile Repeater
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, TX 75057-3136

TESTED BY: _____ **DATE:** 19 May 2009

David Light, Senior Wireless Engineer

APPROVED BY: _____ **DATE:** 29 May 2009

Tom Tidwell, Telecom Direct

Number of Pages: 37

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Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: MMR4 19”

Serial No.: 12

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR Part 90, Subpart I.

☒	New Submission	☐	Production Unit
☐	Class II Permissive Change	☒	Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See “ Summary of Test Data”.

NVLAP®
LAB CODE: 100426-0

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	90.635	1 kW	Complies
Occupied Bandwidth	90.210	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	Mask	Complies
Field Strength of Spurious Emissions	90.210	Mask	Complies
Frequency Stability	90.213	1 ppm	NA

Footnotes For N/A's:

(1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
(2) Since the E.U.T. is not a keyed carrier system, Transient Frequency Behavior was not performed.

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Section 2. General Equipment Specification

Supply Voltage Input: 120 Vac

Frequency Range: 484.275 to 485 MHz and 506.3 to 507.275 MHz

Type(s) of Modulation:

F3E (Voice)	F1D	F2D	D7W (QAM)	Other
☒	☒	☒	☐	☐

Output Impedance:

RF Power Output (rated): 5 W / 37 dBm

Operator Selection of Operating Frequency: None

Power Output Adjustment Capability: None

Frequency Translation:

F1-F1	F1-F2	N/A
☒	☐	☐

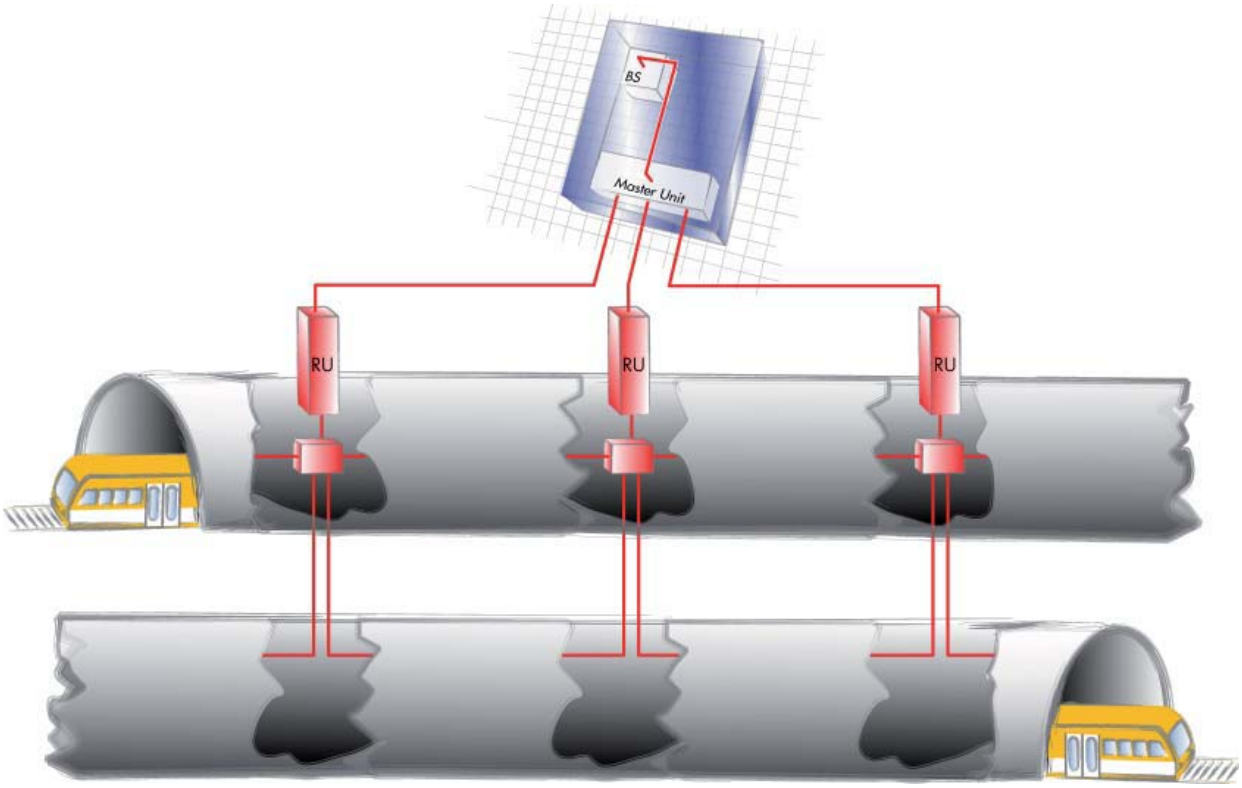
Band Selection:

Software	Duplexer Change	Fullband Coverage
☐	☐	☒

Description of EUT

The MMR4 is a single-band, multicarrier optical Remote Unit. It is used in conjunction with a Master Unit in the MMR optical distribution system.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 19 May 2009

Test Results: Complies.

Measurement Data:

	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
484 Band	Analog	34	37	5
506 Band	Analog	34	37	5
484 Band	FSK	34	37	5
506 Band	FSK	34	37	5

Equipment Used: 1036-1082-1604-1065-1469

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 19 May 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1082-1604-1065-1069

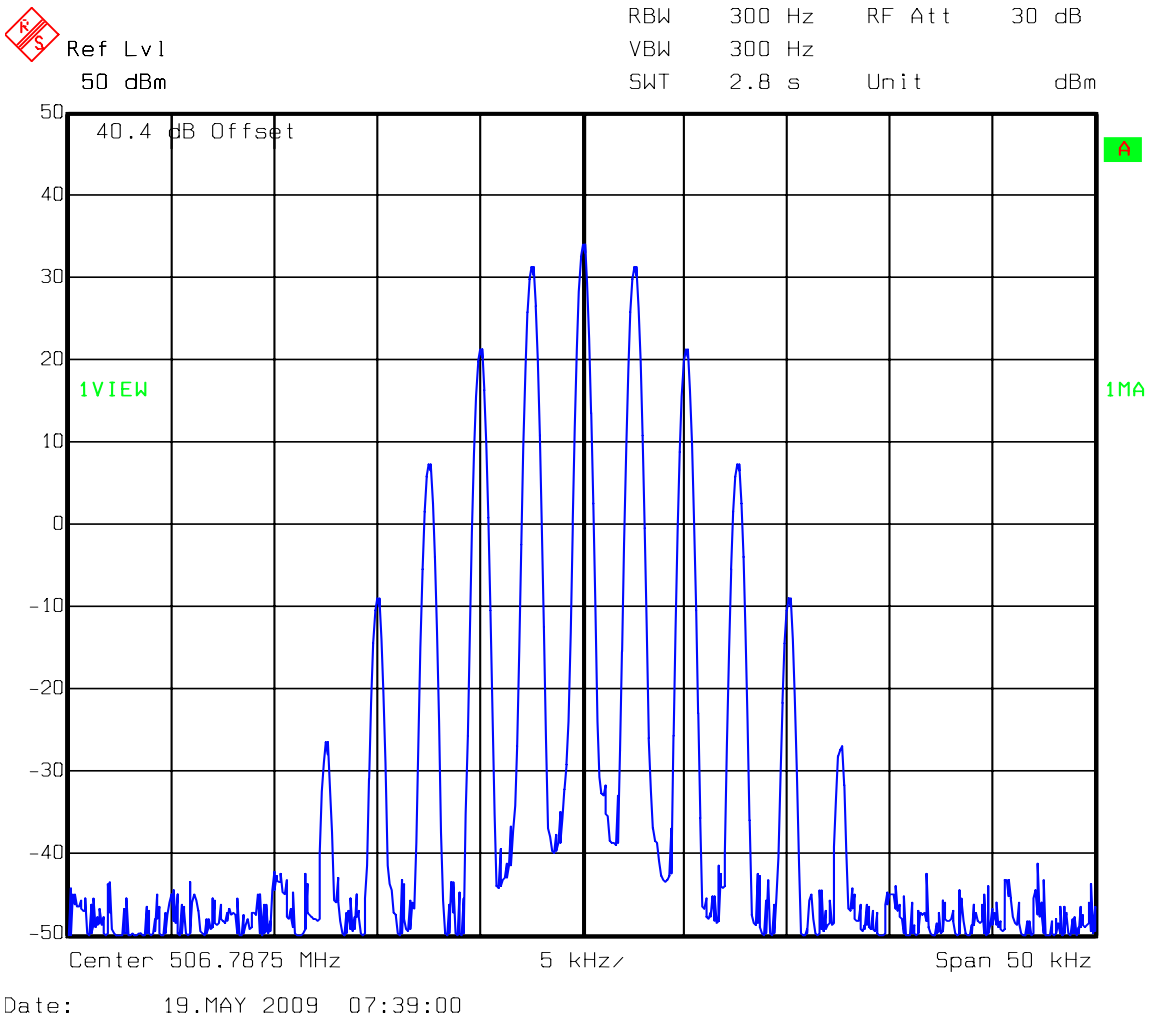
Measurement Uncertainty: $1X10^{-7}$ ppm

Temperature: 22 °C

Relative Humidity: 35 %

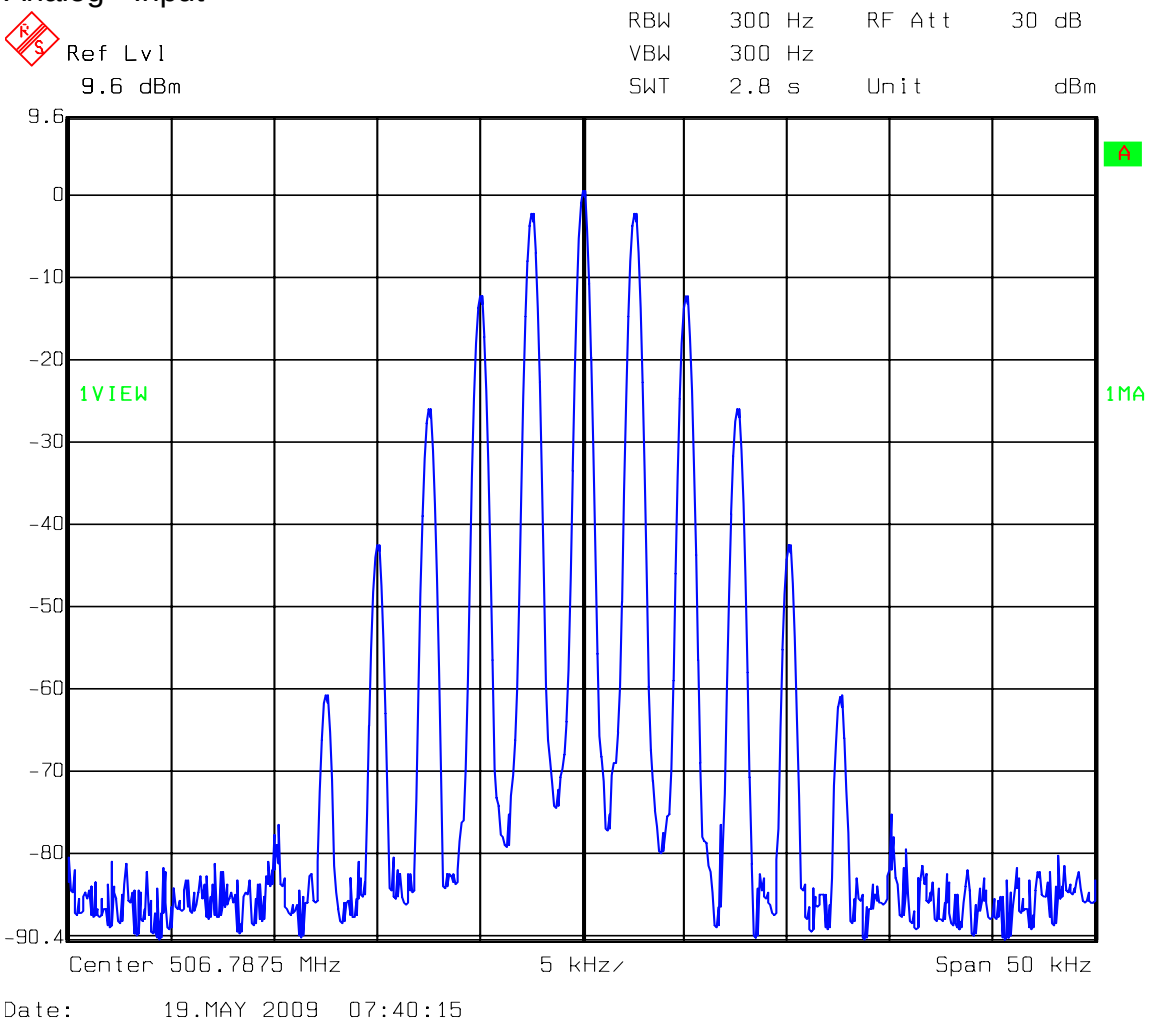
Test Data – Occupied Bandwidth

Analog
Output
2.5 kHz Tone / 3 kHz Deviation



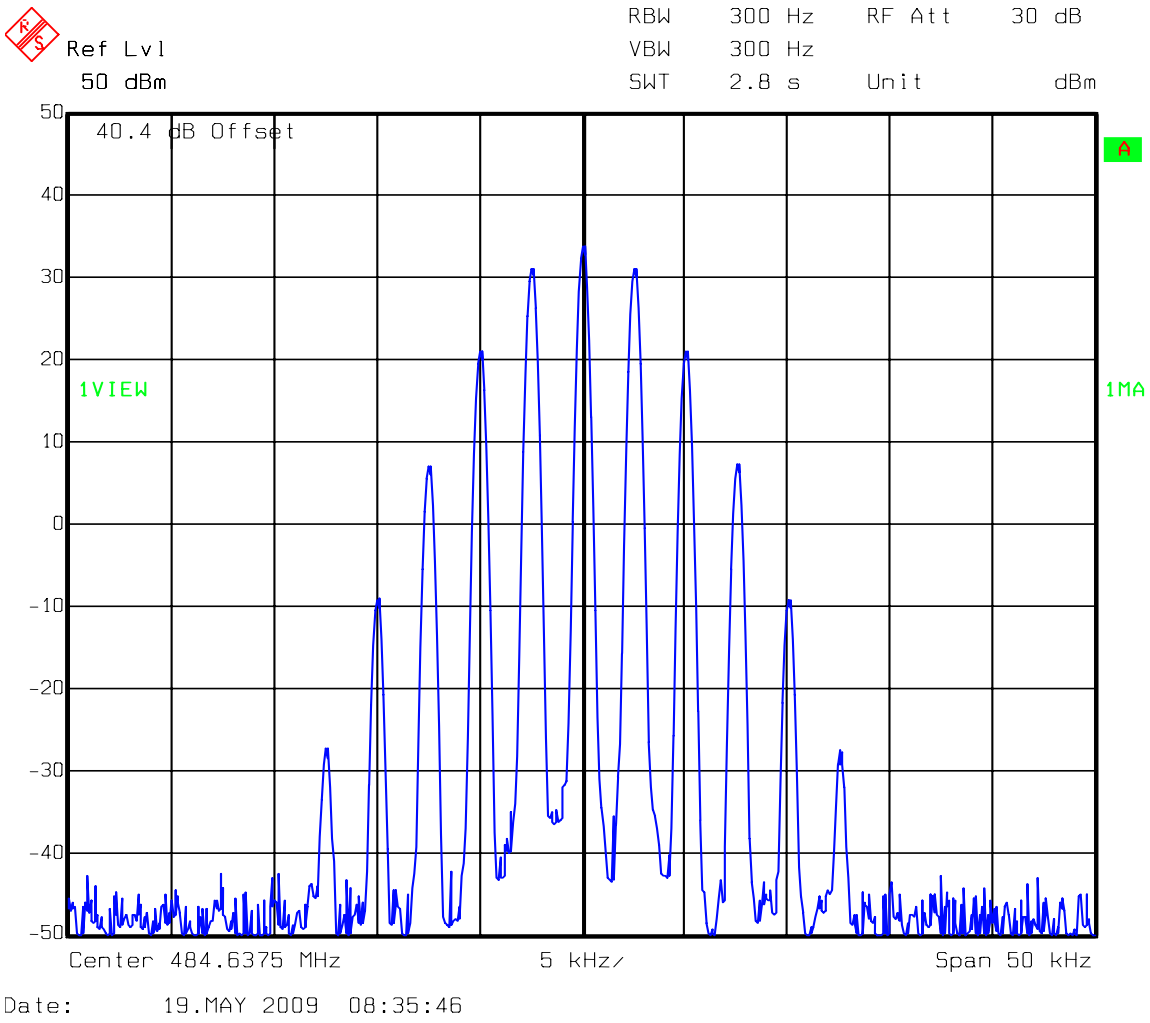
Test Data – Occupied Bandwidth

Analog - Input



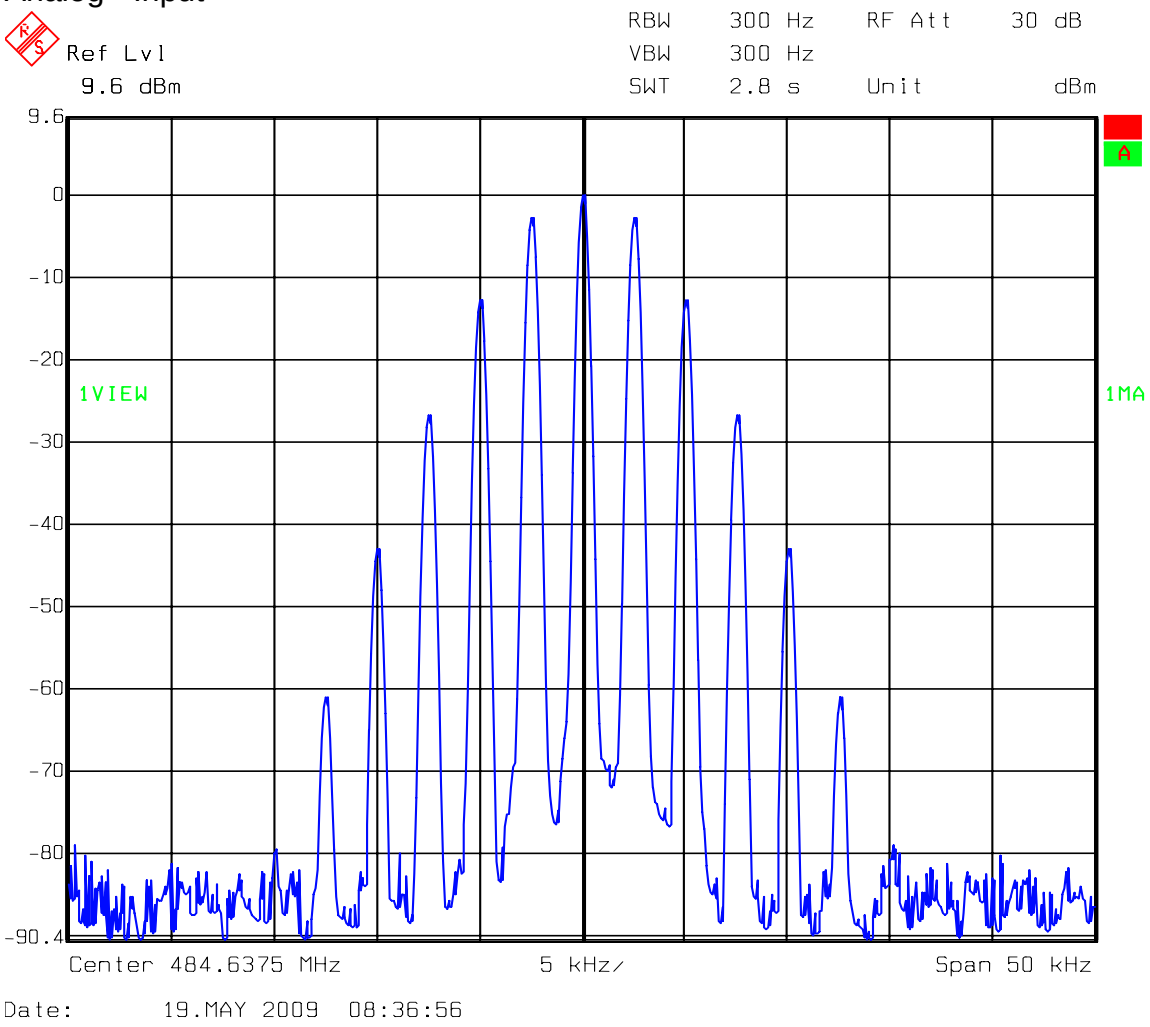
Test Data – Occupied Bandwidth

Analog
Output
2.5 kHz Tone / 3 kHz Deviation



Test Data – Occupied Bandwidth

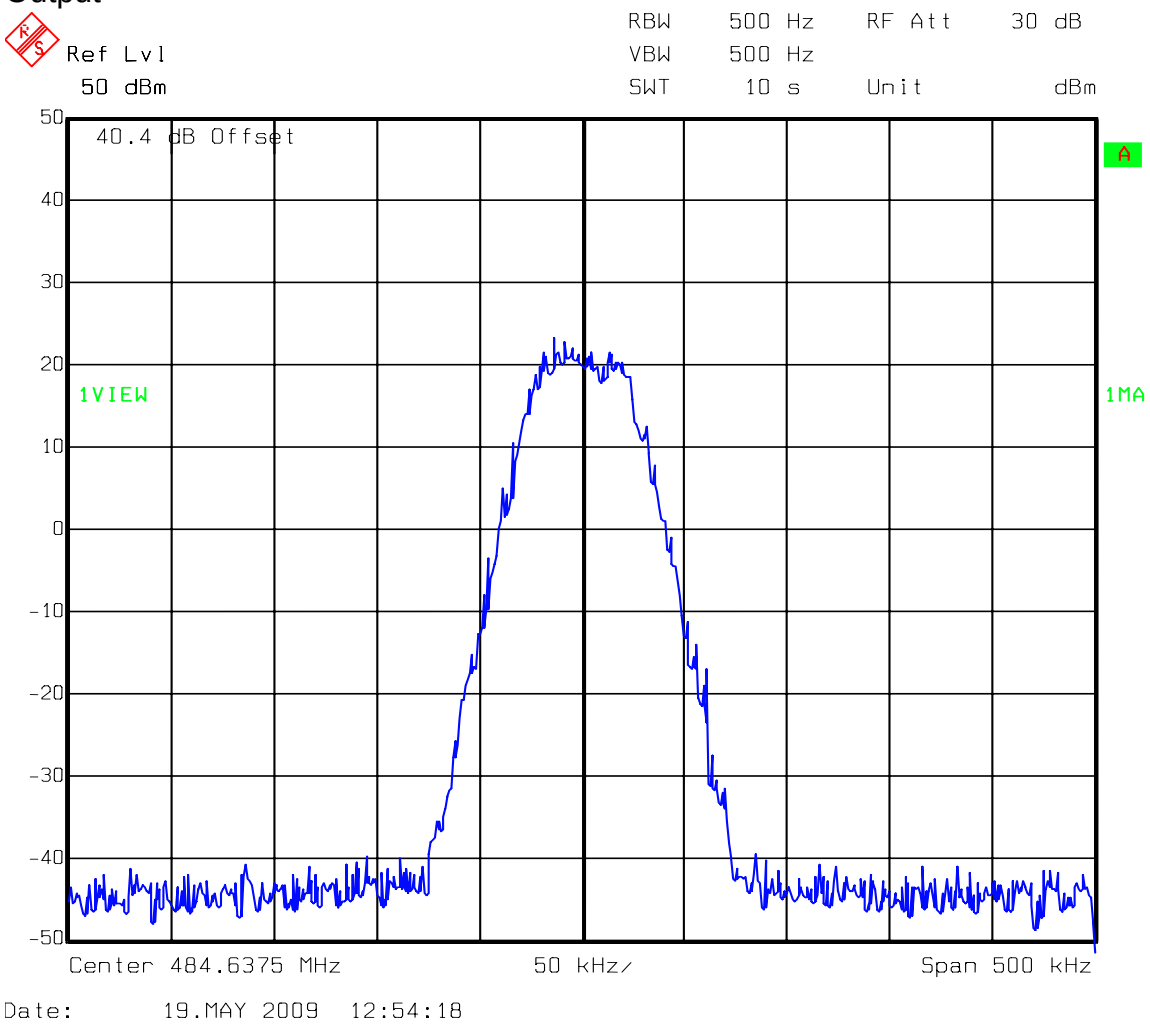
Analog - Input



Test Data – Occupied Bandwidth

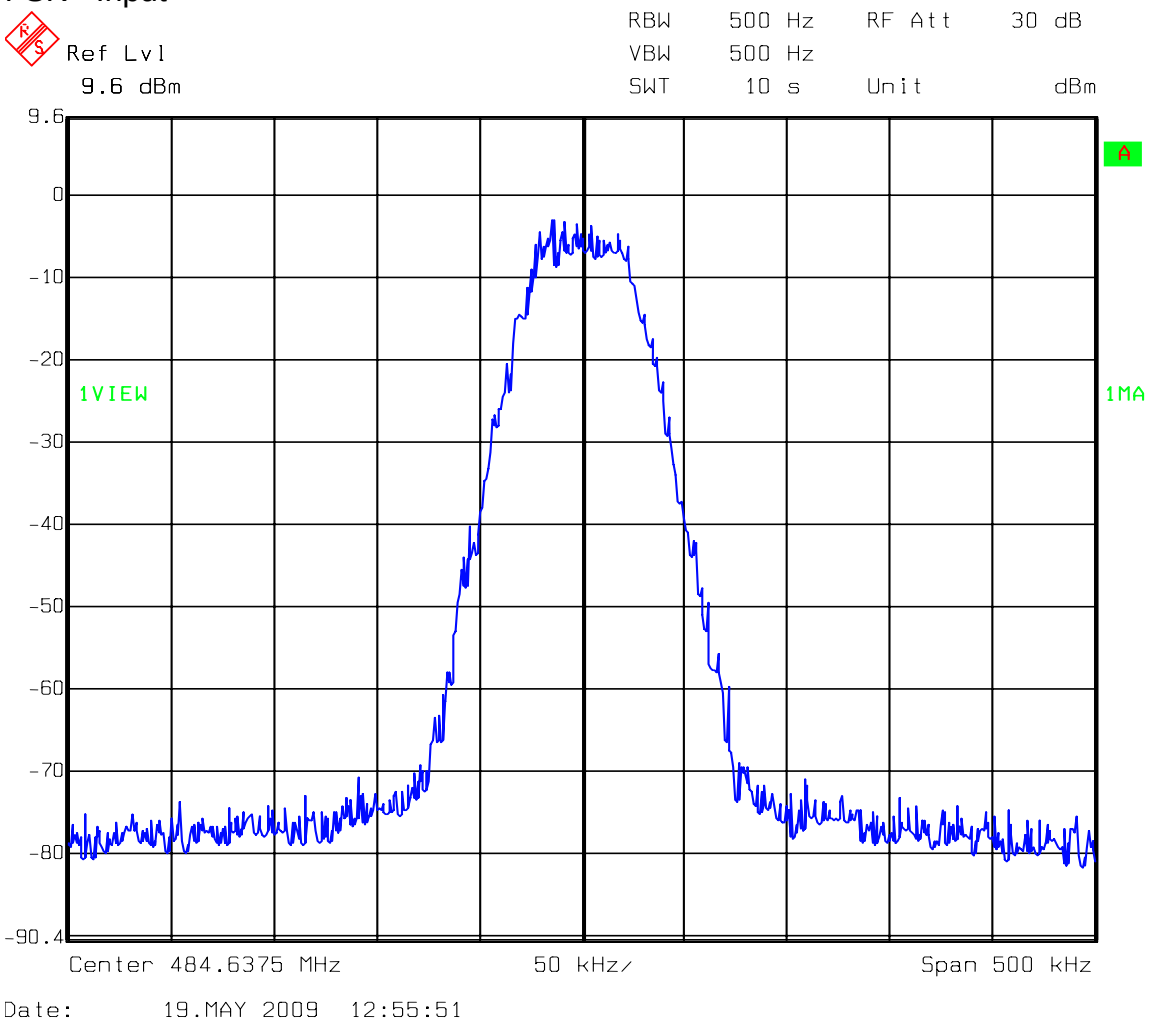
FSK

Output



Test Data – Occupied Bandwidth

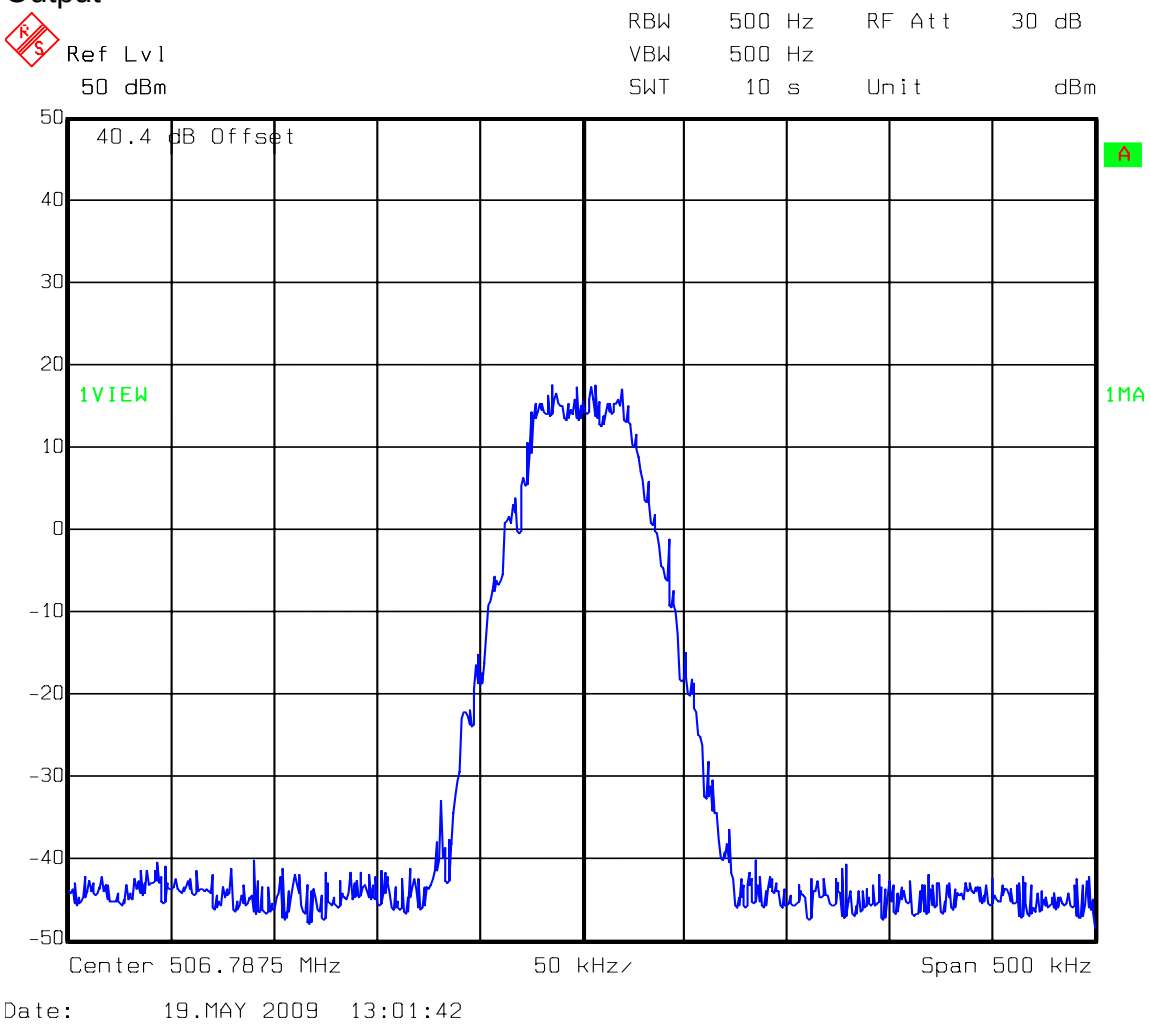
FSK - Input



Test Data – Occupied Bandwidth

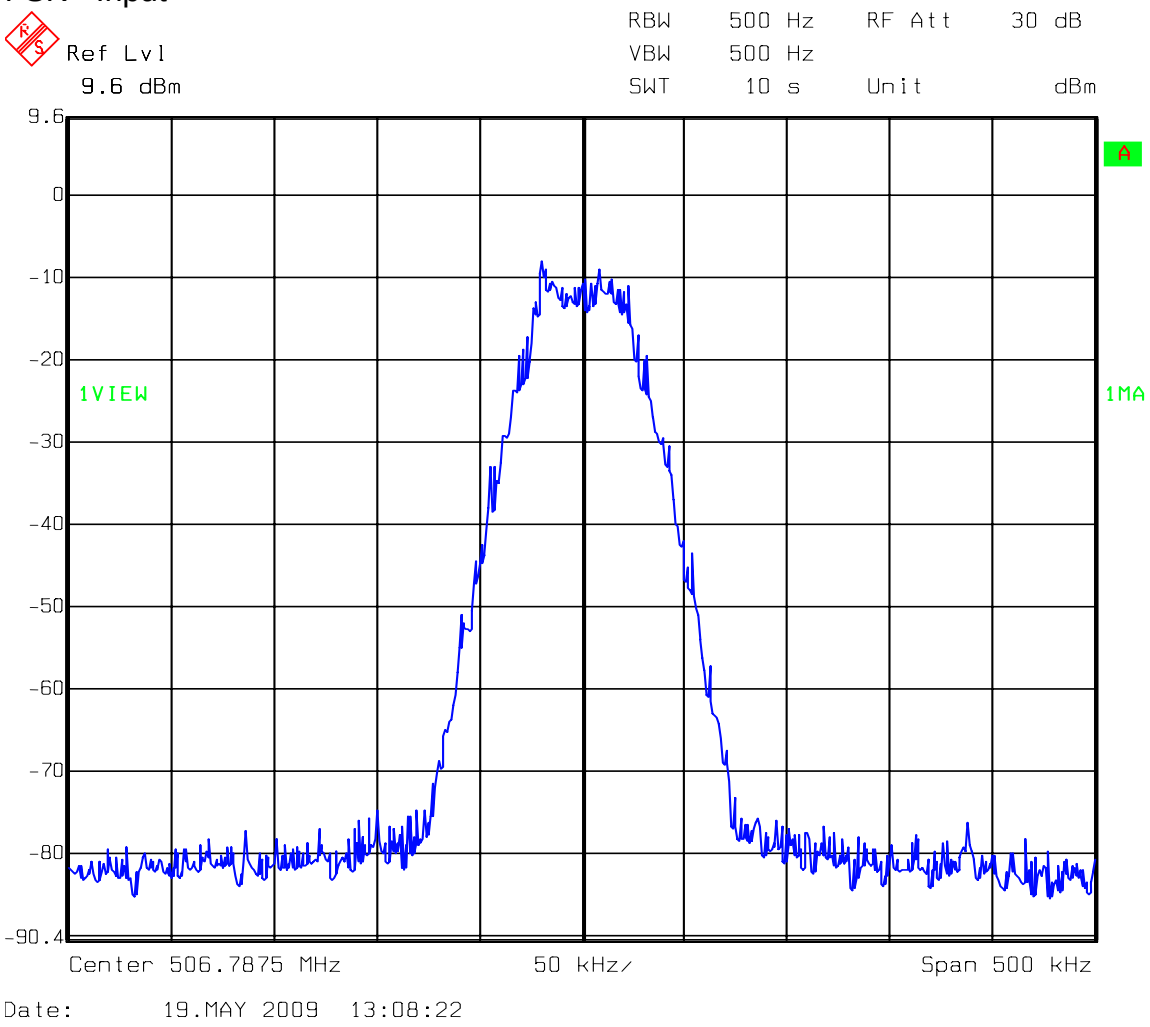
FSK

Output



Test Data – Occupied Bandwidth

FSK - Input



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 19 May 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1082-1604-1065-1469

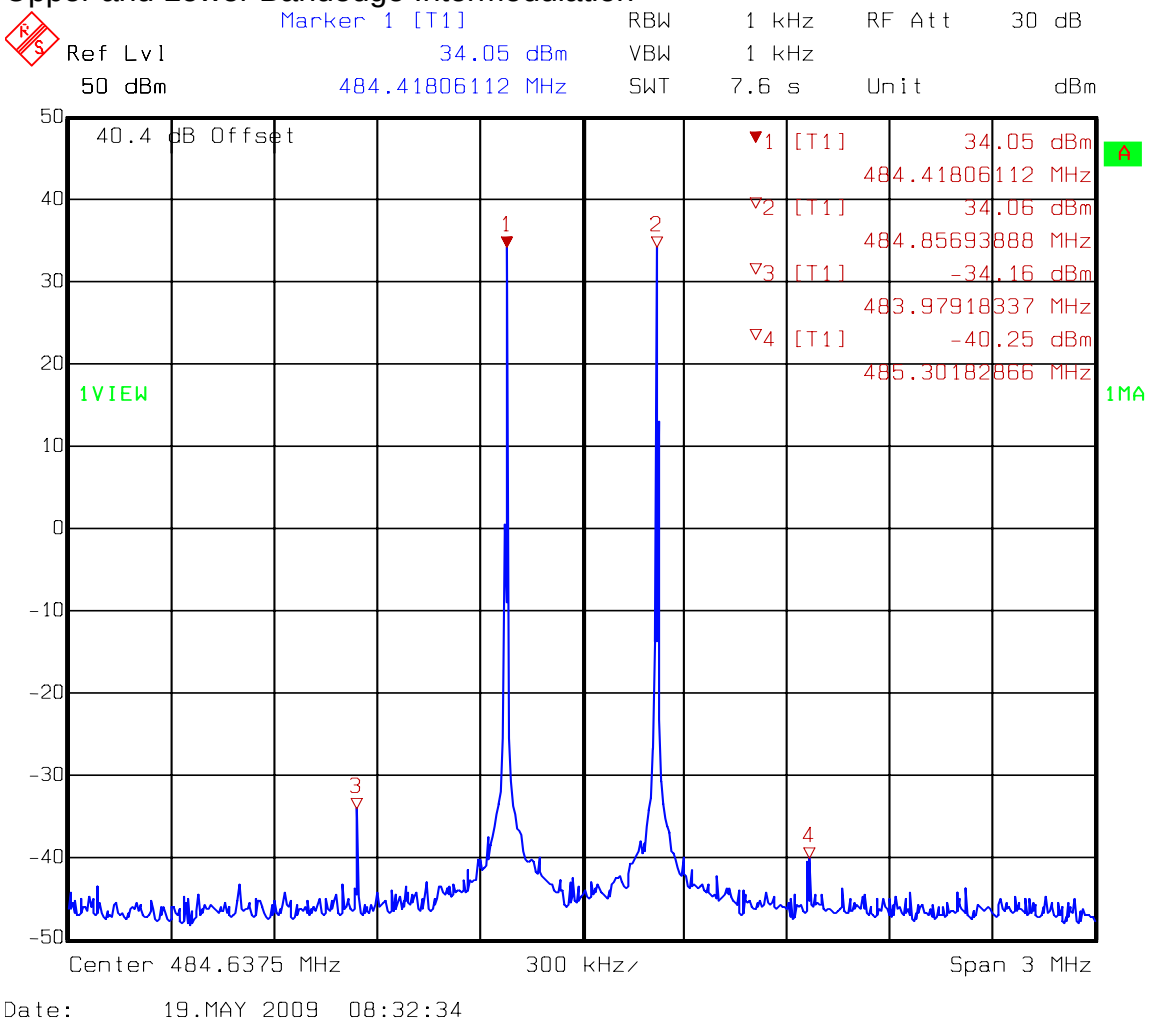
Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

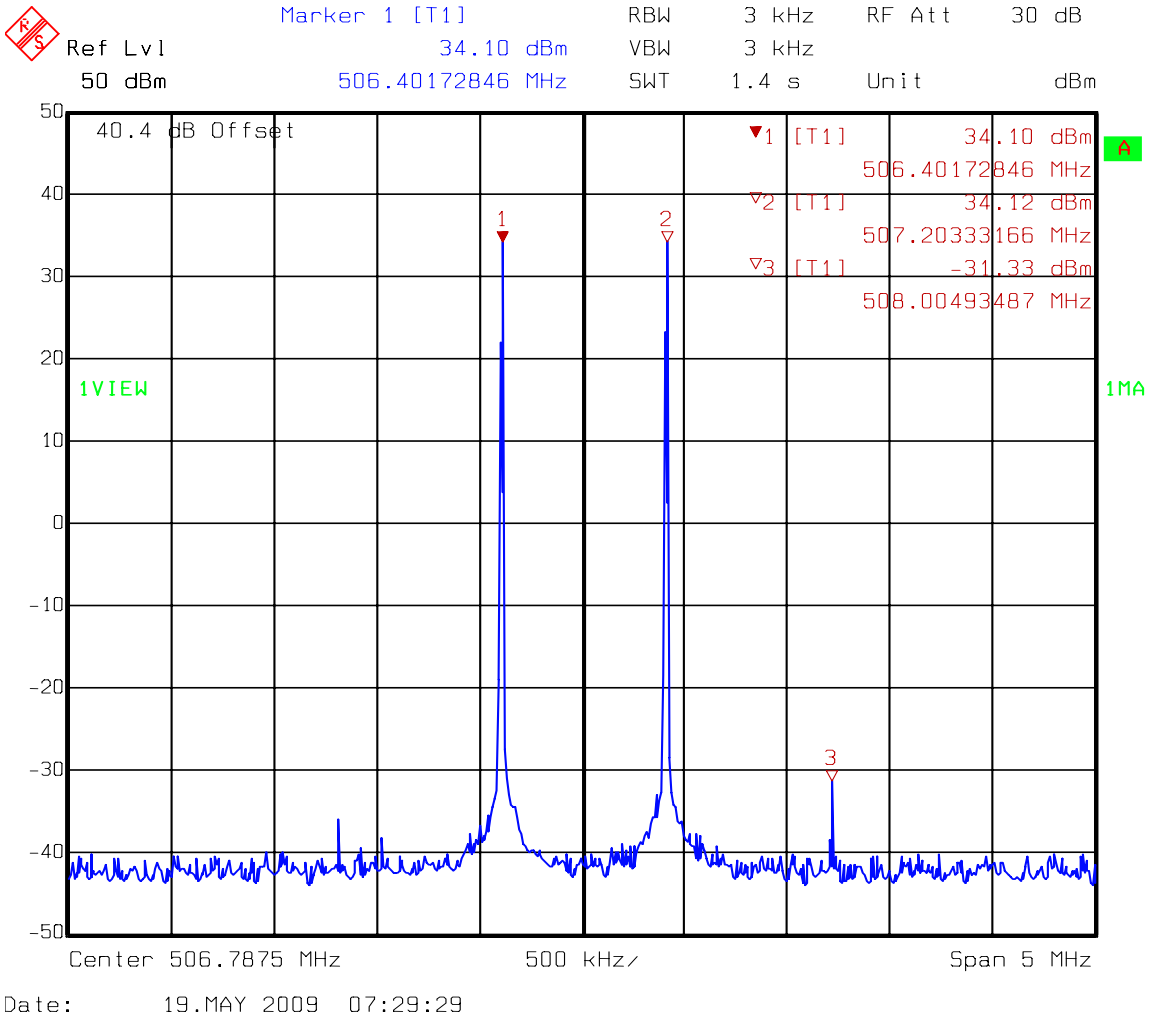
Test Data – Spurious Emissions at Antenna Terminals

Upper and Lower Bandedge Intermodulation



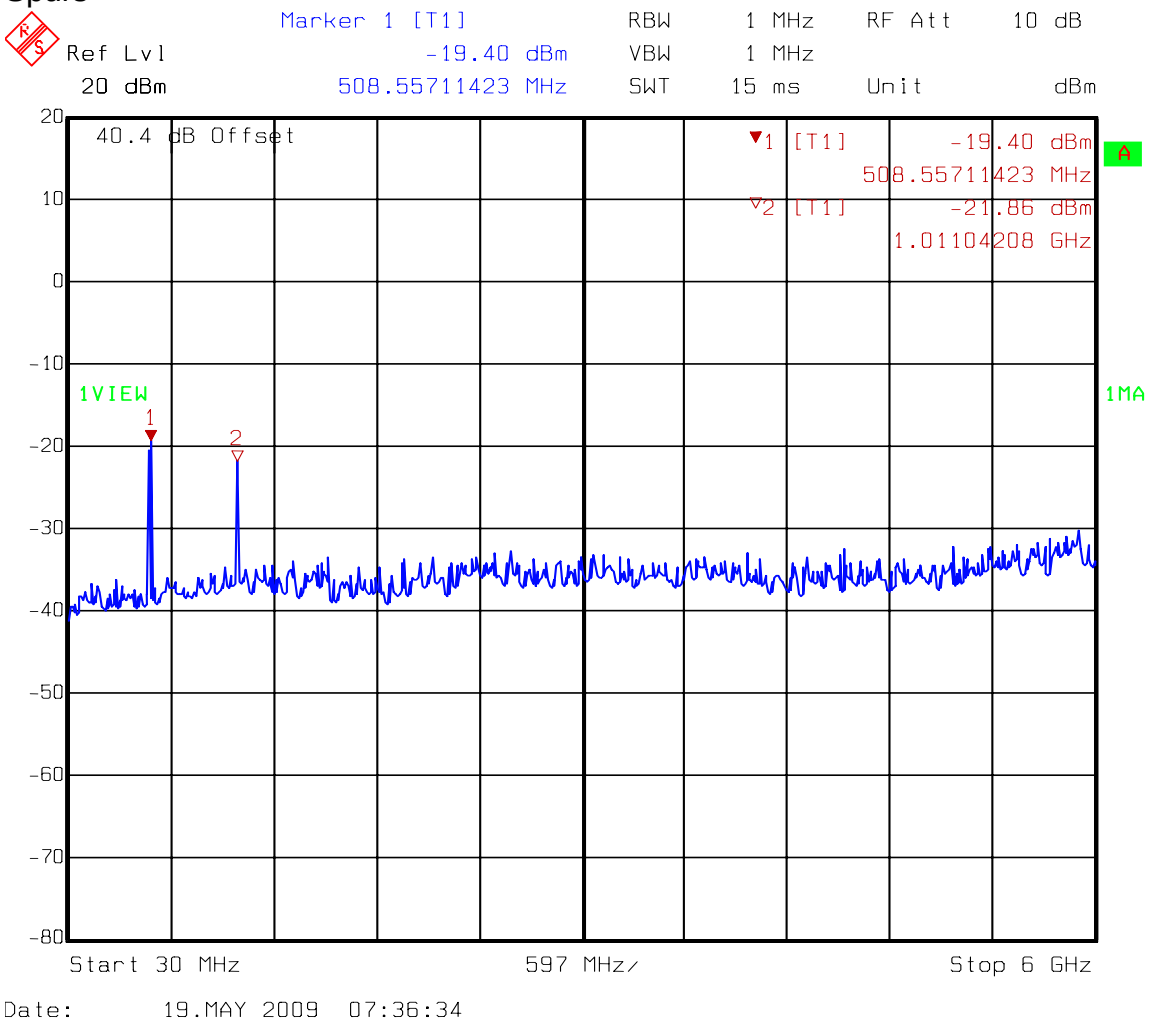
Test Data – Spurious Emissions at Antenna Terminals

Upper and Lower Bandedge Intermodulation



Test Data – Spurious Emissions at Antenna Terminals

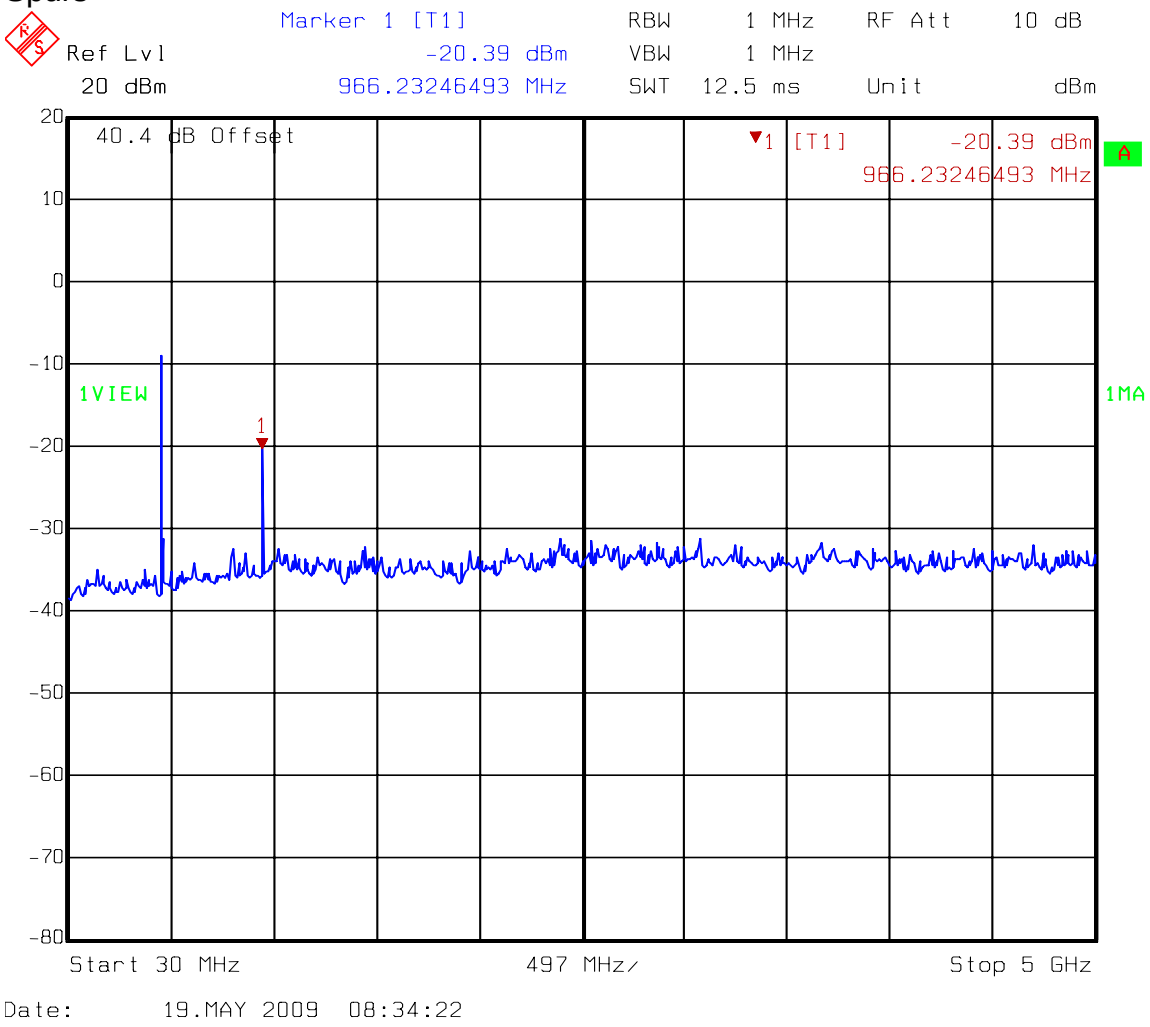
Spurs



Carrier notched

Test Data – Spurious Emissions at Antenna Terminals

Spurs

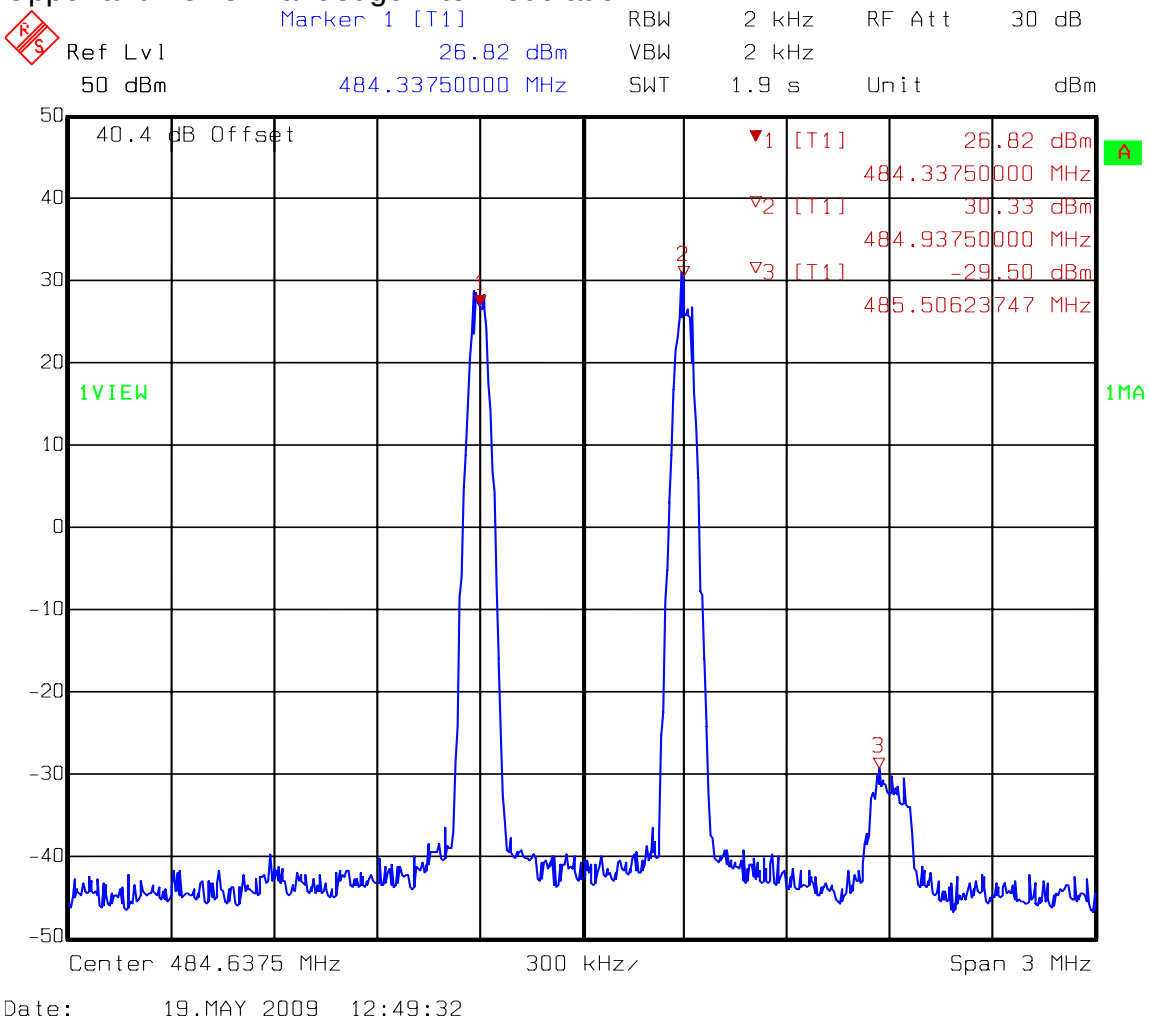


Carrier notched

Test Data – Spurious Emissions at Antenna Terminals

FSK

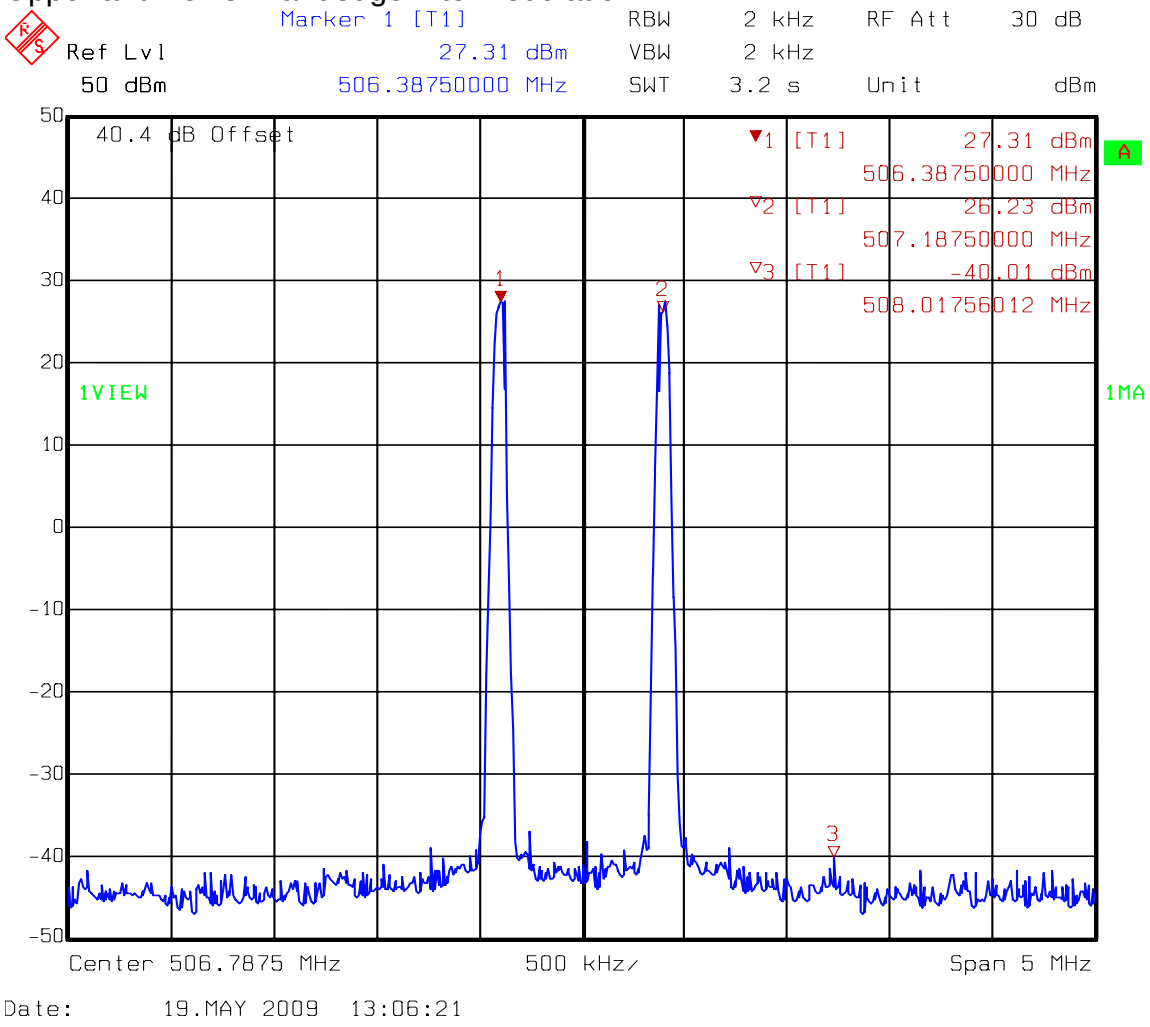
Upper and Lower Bandedge Intermodulation



Test Data – Spurious Emissions at Antenna Terminals

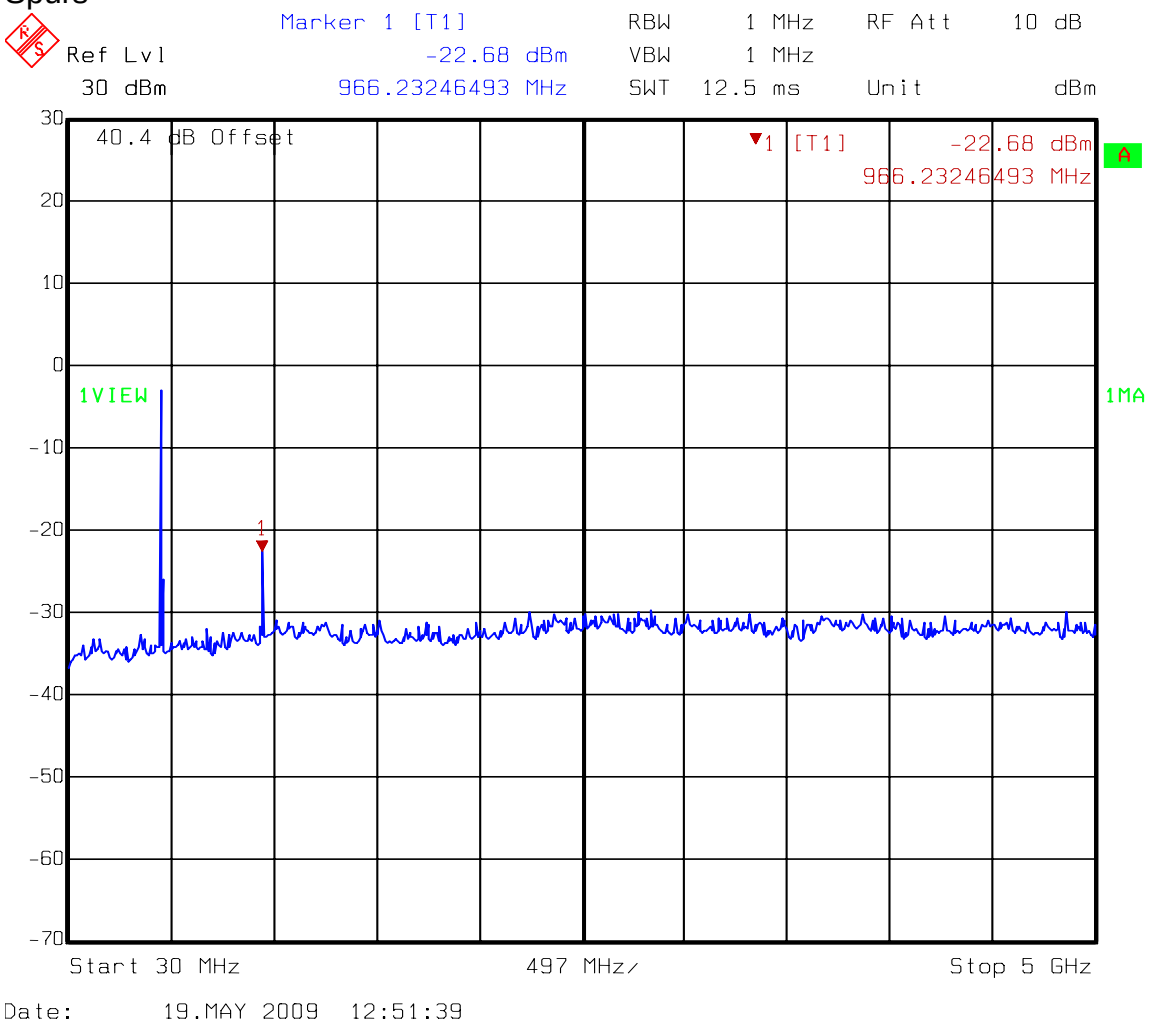
FSK

Upper and Lower Bandedge Intermodulation



Test Data – Spurious Emissions at Antenna Terminals

FSK
Spurs

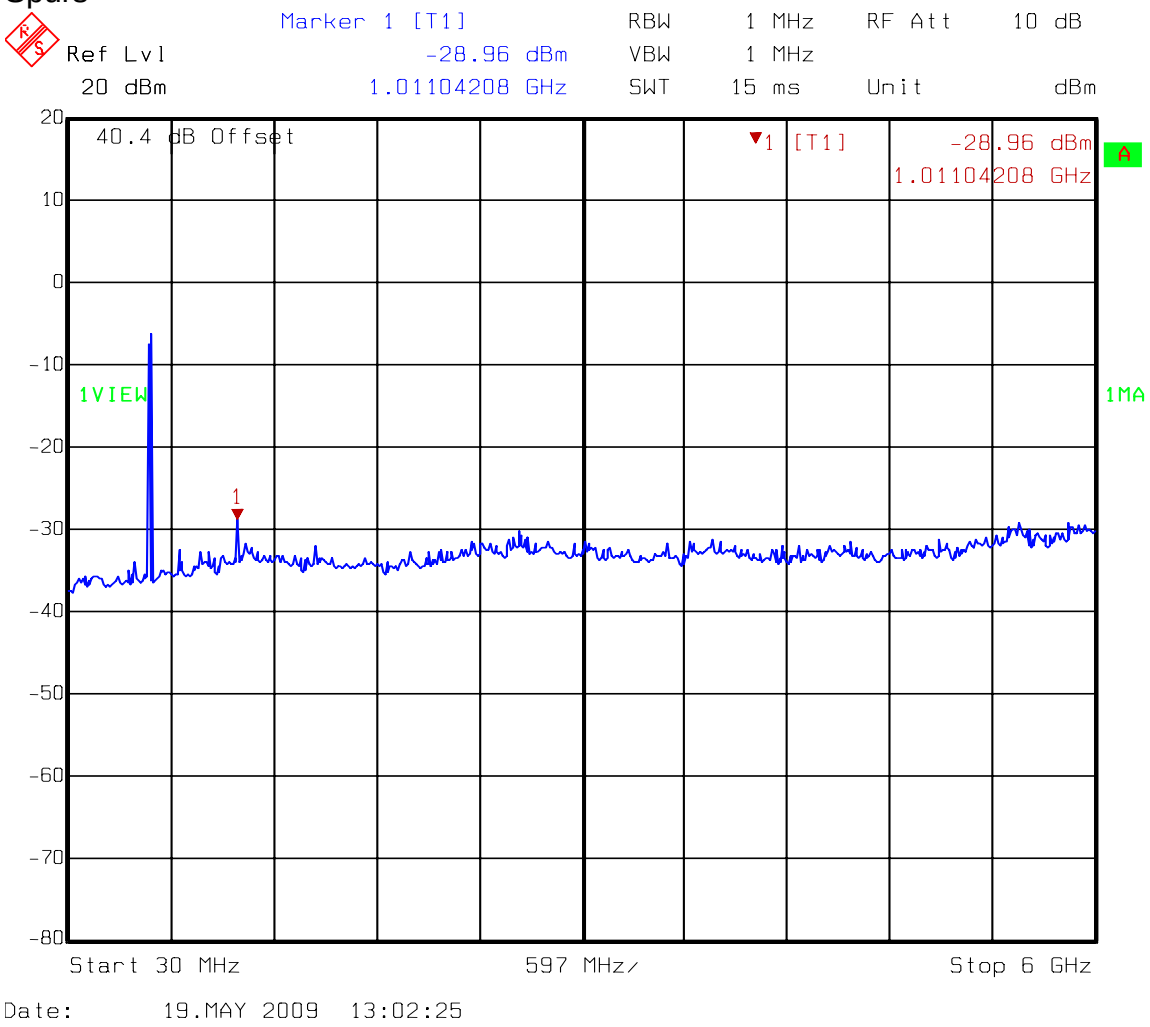


Carrier notched

Test Data – Spurious Emissions at Antenna Terminals

FSK

Spurs



Carrier notched

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: David Light	DATE: 18 May 2009

Test Results: Complies.

Test Data: The spectrum was searched from 30 MHz to the tenth harmonic of the carrier. There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz
Peak detector

Equipment Used: 1763-1769-1783-1785-993

Measurement Uncertainty: +/-1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

Note: See page A5 for applicable limit.

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	01/19/09	01/20/11
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1604	ATTENUATOR	NARDA 776B-20	NONE	N/A	N/A
1065	ATTENUATOR	NARDA 776B-10	NONE	CBU	N/A
1763	Bilog Antenna	Schaffner CBL 6111D	22926	11/04/08	11/04/09
1767	EMI Test Receiver 20Hz - 26.5 GHz - 150 - +30 dBm LC	ROHDE & SCHWARZ ESIB26	837491/0002	09/20/07	09/20/09
1783	Cable	Nemko? 0	0	06/12/08	06/12/09
1785	Preamplifier	A.H. SYSTEMS PAM-0126	143	04/06/09	04/06/10
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/31/09

ANNEX A - TEST METHODOLOGIES

NAME OF TEST: RF Power Output	**PARA. NO.: 2.985**

Minimum Standard: Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

Method Of Measurement:

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

Integral Antenna:
The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

NAME OF TEST: Spurious Emissions at Antenna Terminals **PARA. NO.: 2.991**

Minimum Standard: 90.210, Table 1

Table 1

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

MASK	Spurious Limit
A,B,C,G,H,I	-13dBm
D,J	-20dBm
E,F,K	-25dBm

Test Method: RBW: 1% of emission bandwidth in the 0 - 1 GHz range.
1 MHz at frequencies above 1 GHz.
VBW: $\Rightarrow$ RBW

The spectrum is searched up to 10 times the fundamental frequency.

NAME OF TEST: Occupied Bandwidth **PARA. NO.: 2.989**

Minimum Standard: Not defined. Input/Output

Method Of Measurement:

Analog

Spectrum analyzer settings:
RBW=VBW=300 Hz
Span: 100 kHz
Sweep: Auto

iDEN

RBW=VBW= 300 Hz
Span: 100 kHz
Sweep: Auto

NAME OF TEST: Field Strength of Spurious **PARA. NO.: 2.993**

Minimum Standard: Para. No. 90.210, see table 1 for applicable mask.

Method Of Measurement: TIA/EIA-603-1992

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

MASK	Spurious Limit
A,B,C,G,H,I	-13dBm
D,J	-20dBm
E,F,K	-25dBm

NAME OF TEST: Frequency Stability **PARA. NO.: 2.995**

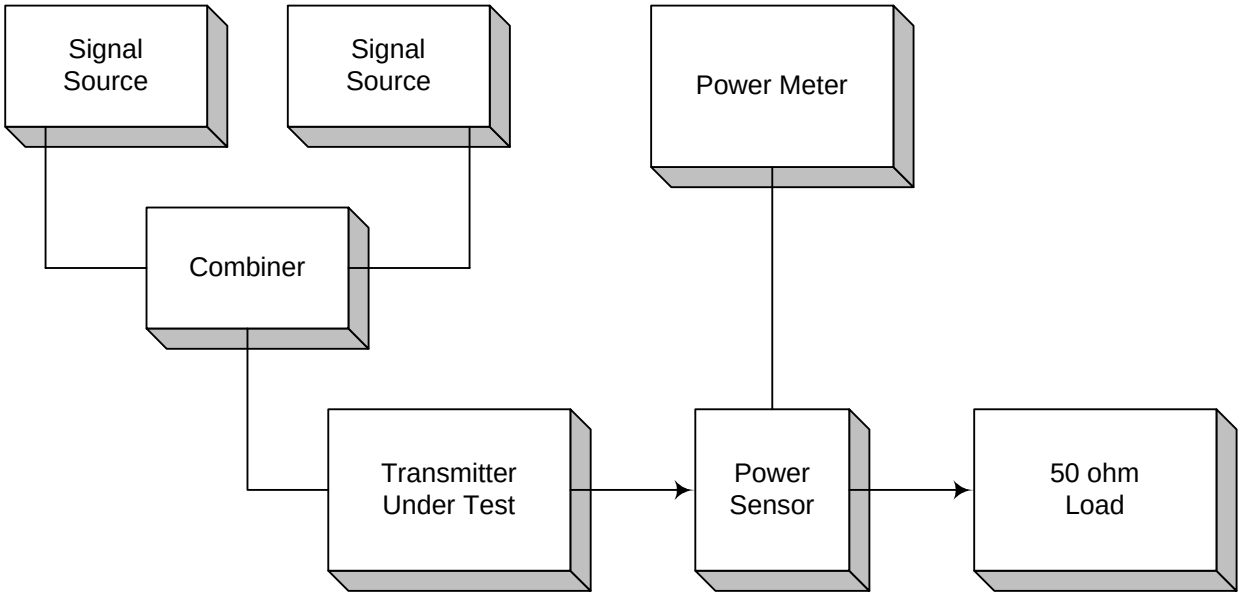
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

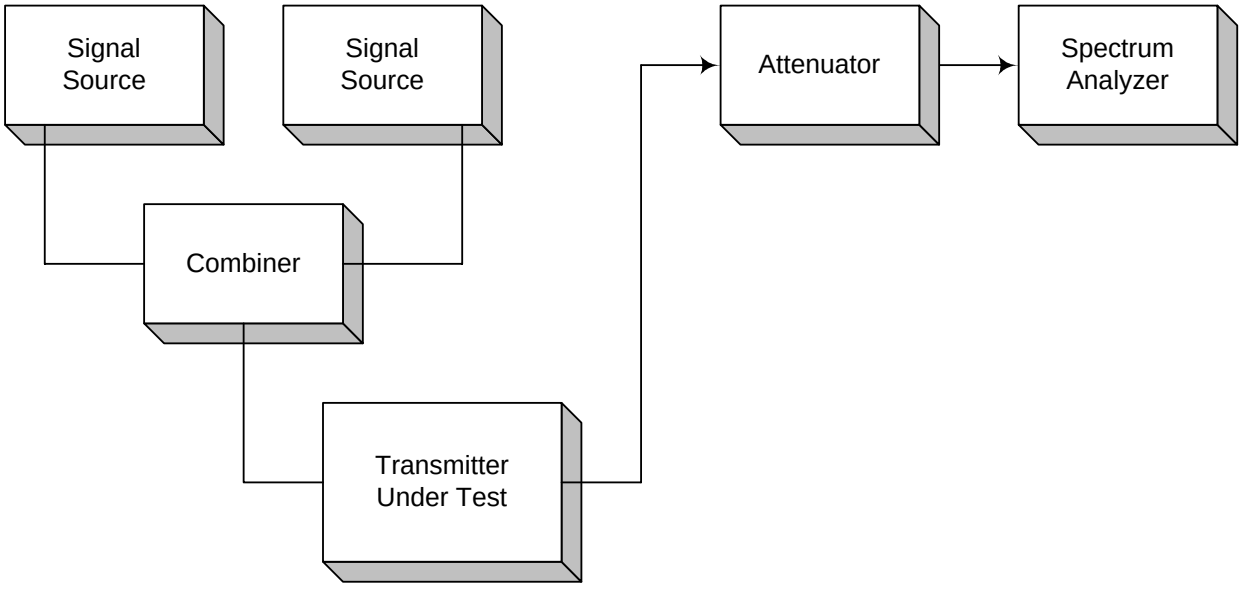
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

ANNEX B - TEST DIAGRAMS

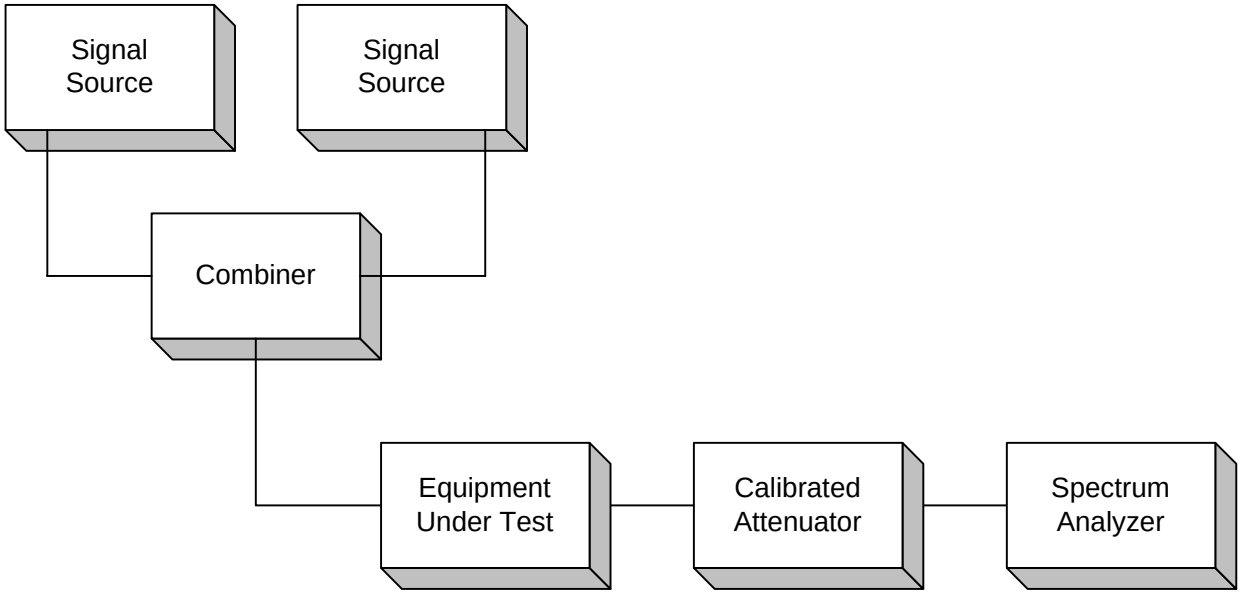
Para. No. 2.985 - R.F. Power Output



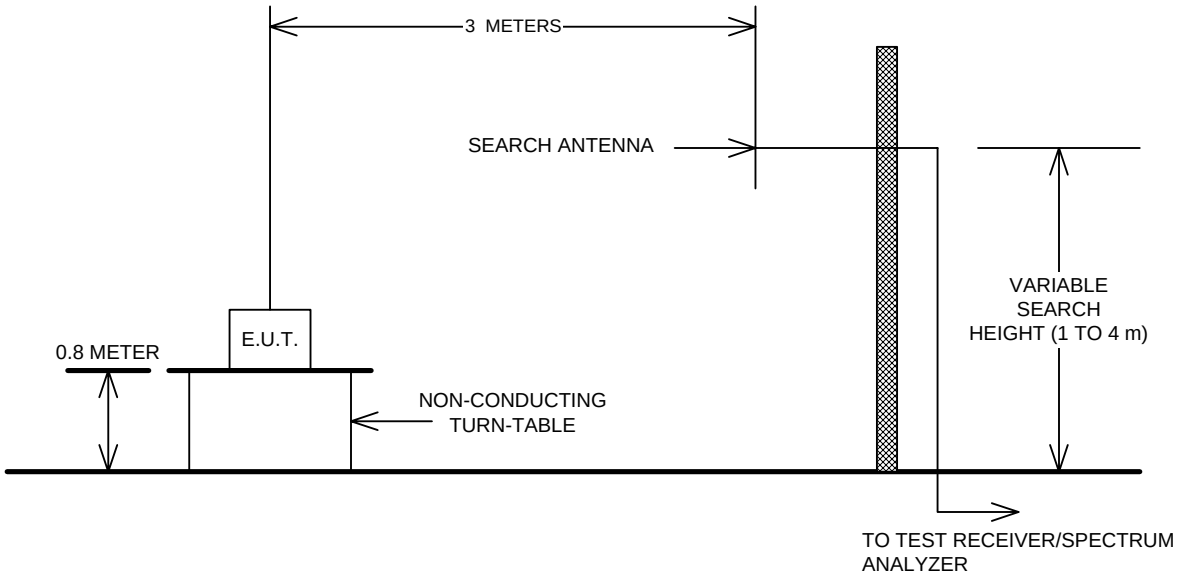
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability