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TEST REPORT

Trio Ethernet E-Series

ER45e Remote Station

tested to the

Code of Federal Regulations (CFR) 47

Part 90 –Private Land Mobile Services

Part 15 – Radio Frequency Device

for

Trio Datacom Pty Ltd

This Test Report is issued with the authority of:

Andrew Cutler- General Manager

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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1. CLIENT INFORMATION

Company Name	Trio Datacom Pty Ltd
Address	41 Aster Avenue Carrum Downs
City	Victoria, 3201
Country	Australia
Contact	Mr Richards Gipps

2. DESCRIPTION OF TEST SAMPLE

Brand Name	Trio Datacom
Model Number	ER45e
Product	Remote Station
Manufacturer	Trio Datacom
Designed in	Australia
Manufactured in	Australia
Serial Number	600077, 600202, 600205, 60066
FCC ID	NI8ER45E

3. COMPLIANCE STATEMENT AND RESULT SUMMARY

The **Trio Datacom ER45e Remote Station** complies with the limits defined in 47 CFR Part 15, 47 CFR Part 90 and 47 CFR Part 2 when tested in-accordance with the test methods described in 47 CFR Part 2.

Clause	Description	Result
90.203	Certification required	Noted
2.1046 90.205	RF power output Power and antenna height limits	Noted Complies
2.1047 2.1047(a) 2.1047(b) 90.211(a)	Modulation Characteristics Low pass filter response Modulation limiting characteristics Modulation characteristics	Noted Noted Noted Complies
2.1049 2.202 90.207 90.209 90.210	Occupied bandwidth Bandwidths Types of emissions Bandwidth limitations Emission masks	Noted Noted Complies Complies Complies
2.1051	Spurious emissions at antenna terminals	Complies
2.1053	Field strength of spurious radiation	Complies
2.1055 90.213	Frequency stability Frequency stability	Noted Complies
90.214	Transient frequency behaviour	Complies
15.111	Receiver local oscillator voltage	Complies
1.1310	Radio frequency exposure limits	Complies

4. TEST SAMPLE DESCRIPTION

The sample tested has the following specifications:

Rated Transmitter Output Power

5.0 Watts (37.0 dBm)

Transmitter FCC Part 90 frequency range

421-512 MHz

Test frequencies

Chl	Frequency MHz	Power Watts	Spacing kHz
1	425.000 Tx	5.0	12.5
2	469.000 Tx	5.0	12.5
3	425.100 Rx	5.0	12.5
4	469.100 Rx	5.0	12.5

Emission Designators / Modes of operation

Emission	Channel Bandwidth	Designator	Description
FM 9600 bps data (4-Level GFSK)	12.5 kHz	11k2F1D	9600 12.5 kHz FCC 4 Level
FM 19200 bps data (4-Level GFSK)	12.5 kHz	11k2F1D	19200 12.5 kHz FCC 4 Level
FM 9600 bps data (3-Level GFSK)	12.5 kHz	11k2F1D	9600 12.5 kHz M Series
FM 9600 bps data (2 Level GFSK)	12.5 kHz	11k2F1D	9600 12.5 kHz FCC 2 Level Non Packet
FM 1200 bps data (2-Level AFSK)	12.5 kHz	11k2F2D	1200 12.5 kHz FCC FSK Bell202 Non Packet
FM 600 bps Data (2-Level AFSK)	12.5 kHz	11k2F2D	600 12.5 kHz FCC FSK Bell202 Non Packet
FM 300 bps Data (2-Level AFSK)	12.5 kHz	11k2F2D	300 12.5 kHz FCC FSK Bell202 Non Packet
FM 9600 bps Data (2-Level GFSK)	12.5 kHz	11k2F1D	9600 12.5 kHz FCC 2 Level Superseded

5. TEST CONDITIONS

Standard Temperature and Humidity

Temperature: +15°C to + 30° maintained.
Relative Humidity: 20% to 75% observed.

Power Supply

DC Voltage supply 10 – 30 Vdc

Nominal supply voltage 13.8 Vdc

Standard Test Power Source

Standard Test Voltage: 13.8 Vdc.

Extreme Temperature

High Temperature: + 50°C maintained.
Low Temperature: - 30 °C maintained.

Extreme Test Voltages

High Voltage: 15.87 Vdc
Low Voltage: 11.73 Vdc

6. ATTESTATION

The **Trio Datacom ER45e Remote Station** complies with the Code of Federal Regulations (CFR) 47 Part 90 –Private Land Mobile Services and (CFR) 47 Part 15 – Radio Frequency Devices.

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

The client selected the test sample.

The report relates only to the sample tested.

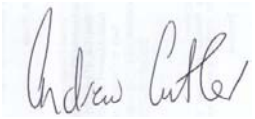
This report does not contain corrections or erasures.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.



Andrew Cutler
General Manager
EMC Technologies NZ Ltd

7. TEST RESULTS

Certification required

Certification of this device is sought for transmissions using 12.5 kHz channel spacing.

12.5 kHz channel bandwidth certification is sought for this transmitter under section 90.203(j)(3) as:

- certification has been sought after February 14, 1997 and before January 1, 2011.

- the equipment can operate with a data rate greater than 4.8 kbps per 6.25 kHz of channel bandwidth

Result: Complies.

RF power output

Measurements were carried out at the RF output terminals of the transmitter using a 30 dB power attenuator and a 50 Ω dummy load.

Measurements were carried out when the transmitter was not being modulated.

Measurements were made with the input voltage set to 13.8 Vdc and when decreased 15% to 11.73 Vdc and increased 15 % to 15.87 Vdc.

Testing was carried out at maximum power output.

Frequency (MHz)	Voltage (Vdc)	Rated (dBm)	Measured (dBm)
425.000	13.8	37.0	36.8
469.000	13.8	37.0	36.7

Frequency (MHz)	Voltage (Vdc)	Rated (dBm)	Measured (dBm)
425.000	15.87	37.0	36.4
469.000	15.87	37.0	36.3
425.000	11.73	37.0	36.4
469.000	11.73	37.0	36.3

Results are within 1 dB of the manufacturer's rated transmitter output power.

Result: Complies
Measurement Uncertainty: ±0.5 dB

Part 90.209 – Bandwidth limitations:

The authorised bandwidth is taken to be the necessary bandwidth.

The client has declared the necessary bandwidth as being the maximum authorised bandwidth of 11.25 kHz for a12.5 kHz channel spacing.

This is confirmed in the emission designations 11k2F1D and 11k2F2D.

The occupied bandwidth has been measured and compared against the occupied bandwidth declared by the client.

Measurements have been made of each modulation type using a spectrum analyser operating in peak hold mode and a 30 dB attenuator.

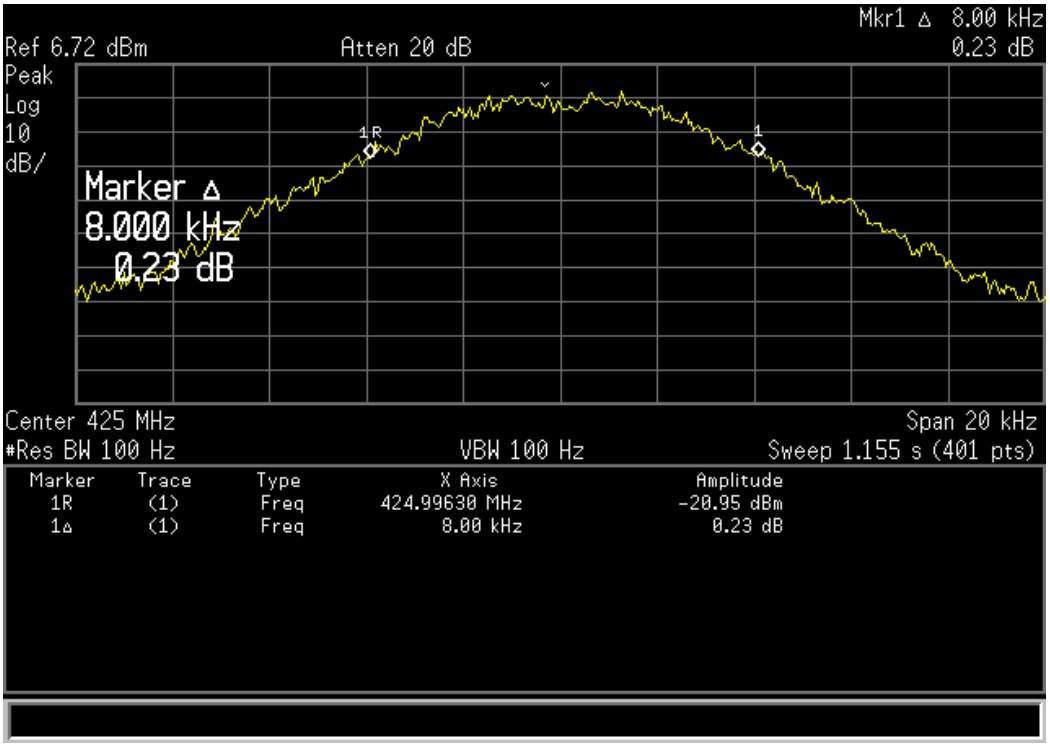
Initially power measurements are made using a resolution bandwidth of 120 kHz. This level is used as a reference level on the spectrum analyser.

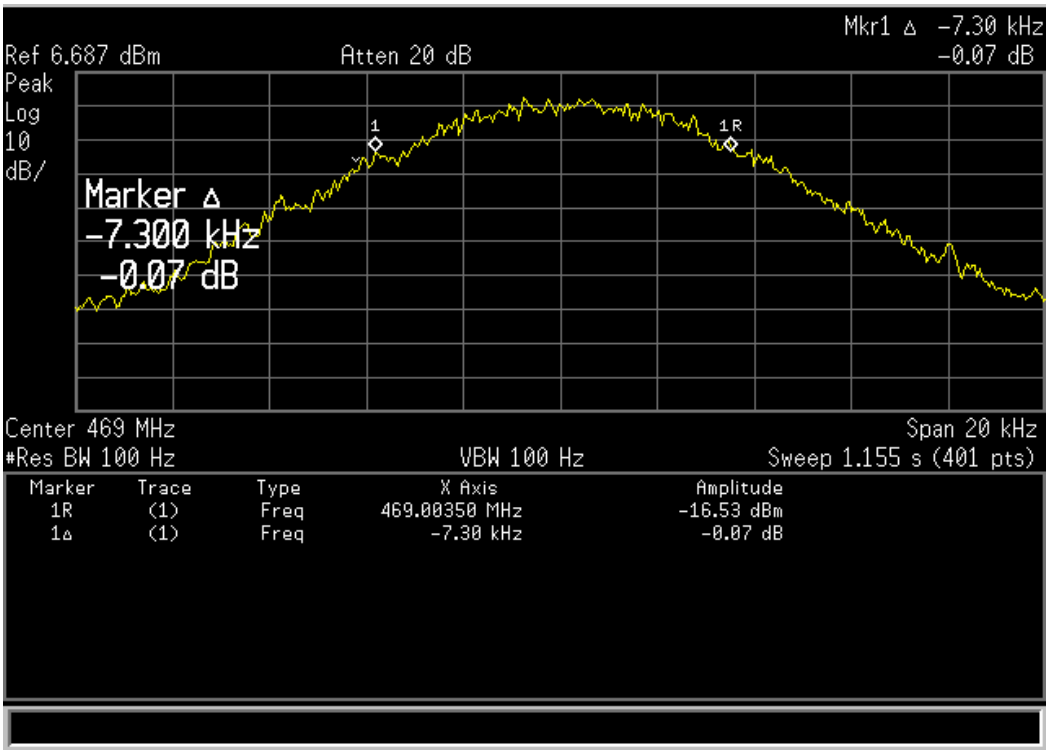
The resolution bandwidth is then changed to 100 Hz and the reference level minus 23 dB (99%) absolute bandwidth points determined.

Description	Channel Bandwidth	Designator	425.000 MHz Measured (kHz)	469.000 MHz Measured kHz
FM 9600 bps data (4-Level GFSK)	12.5 kHz	11k2F1D	8.00	7.30
FM 19200 bps data (4-Level GFSK)	12.5 kHz	11k2F1D	6.10	6.35
FM 9600 bps data (3-Level GFSK)	12.5 kHz	11k2F1D	8.10	7.95
FM 9600 bps data (2 Level GFSK)	12.5 kHz	11k2F1D	7.15	7.55
FM 1200 bps data (2-Level AFSK)	12.5 kHz	11k2F2D	9.05	8.95
FM 600 bps Data (2-Level AFSK)	12.5 kHz	11k2F2D	8.95	8.95
FM 300 bps Data (2-Level AFSK)	12.5 kHz	11k2F2D	8.85	8.95
FM 9600 bps data (2 Level Superseded)	12.5 kHz	11k2F2D	7.90	7.90

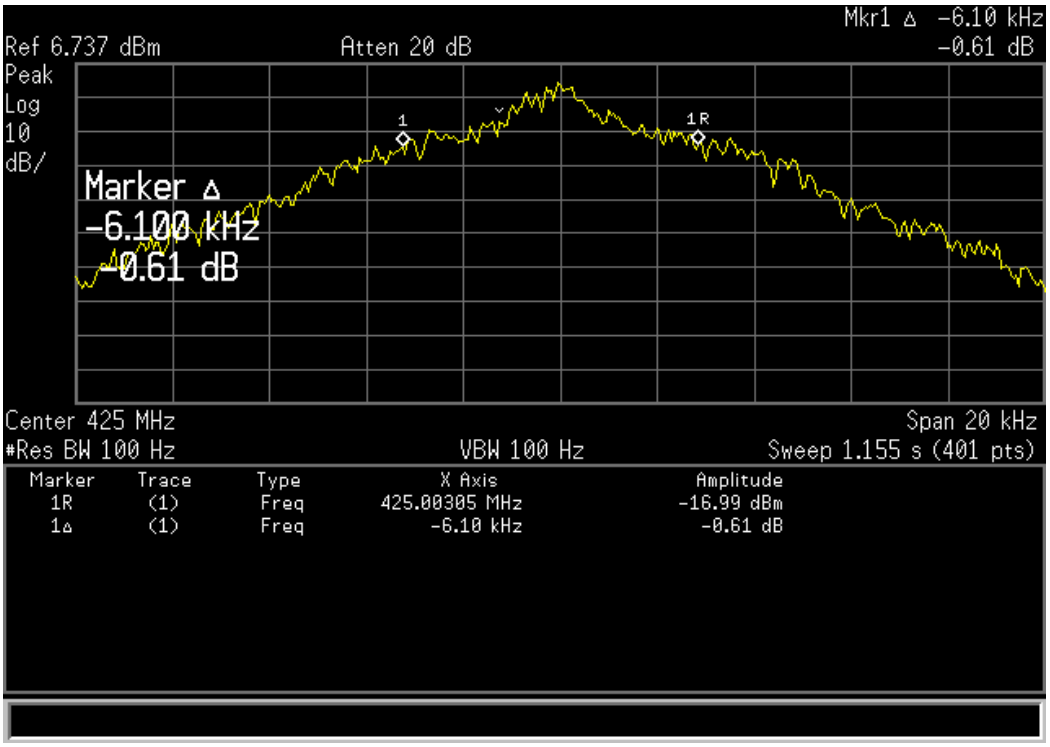
Result: Complies.

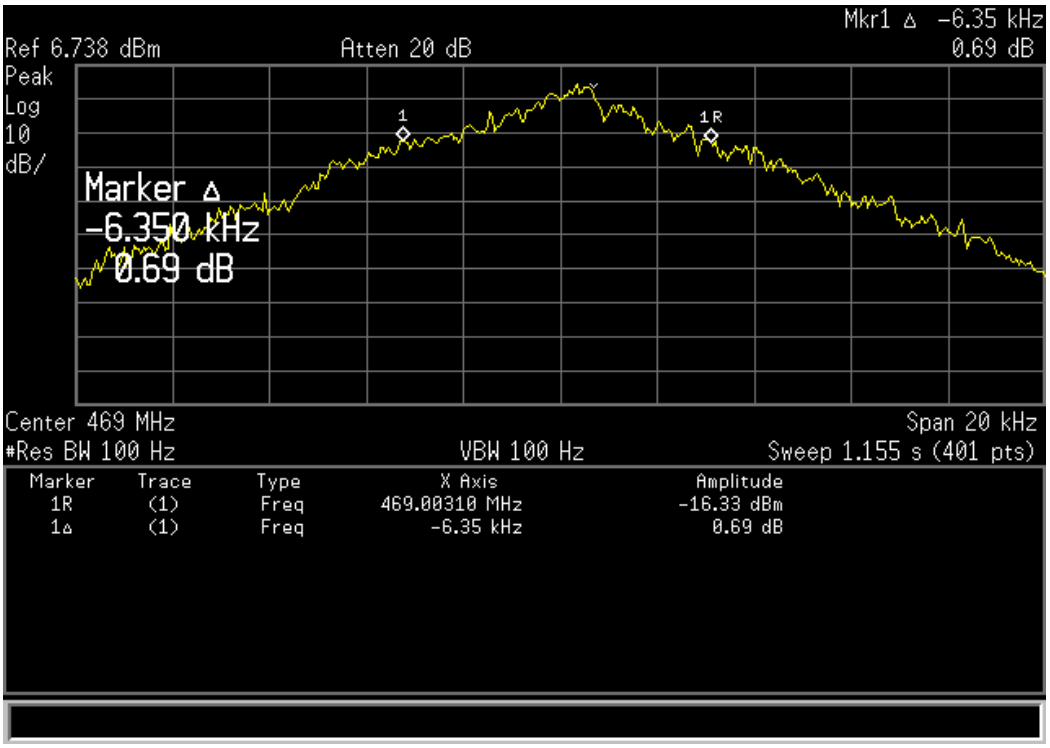
FM 9600 bps data (4-Level GFSK)



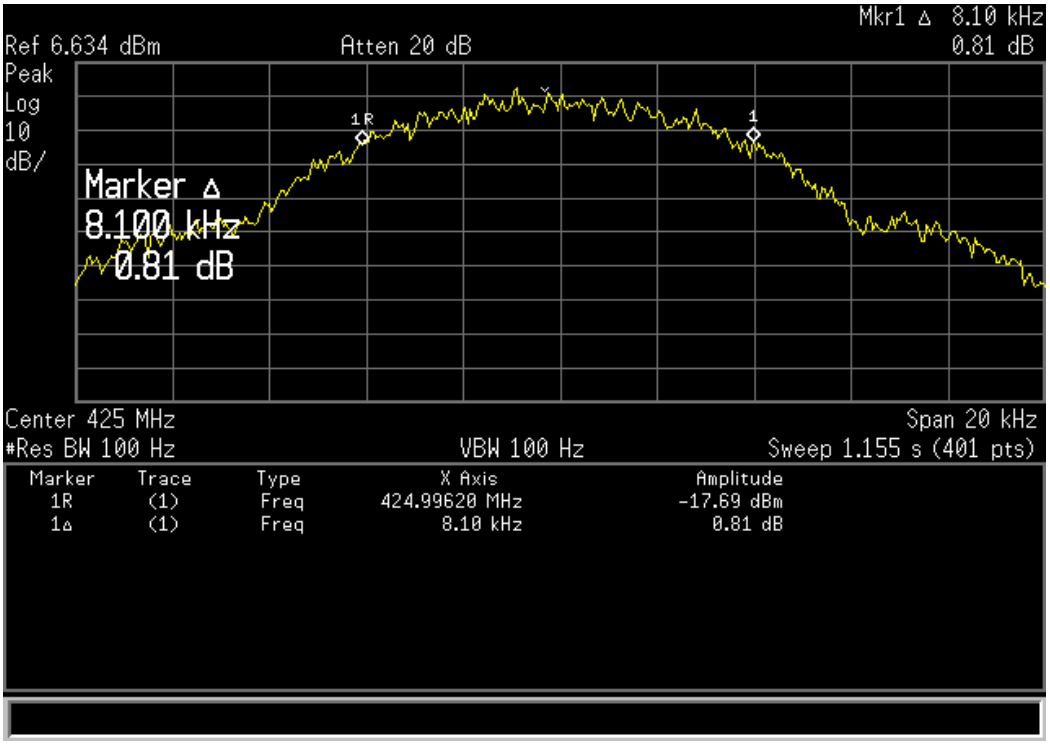


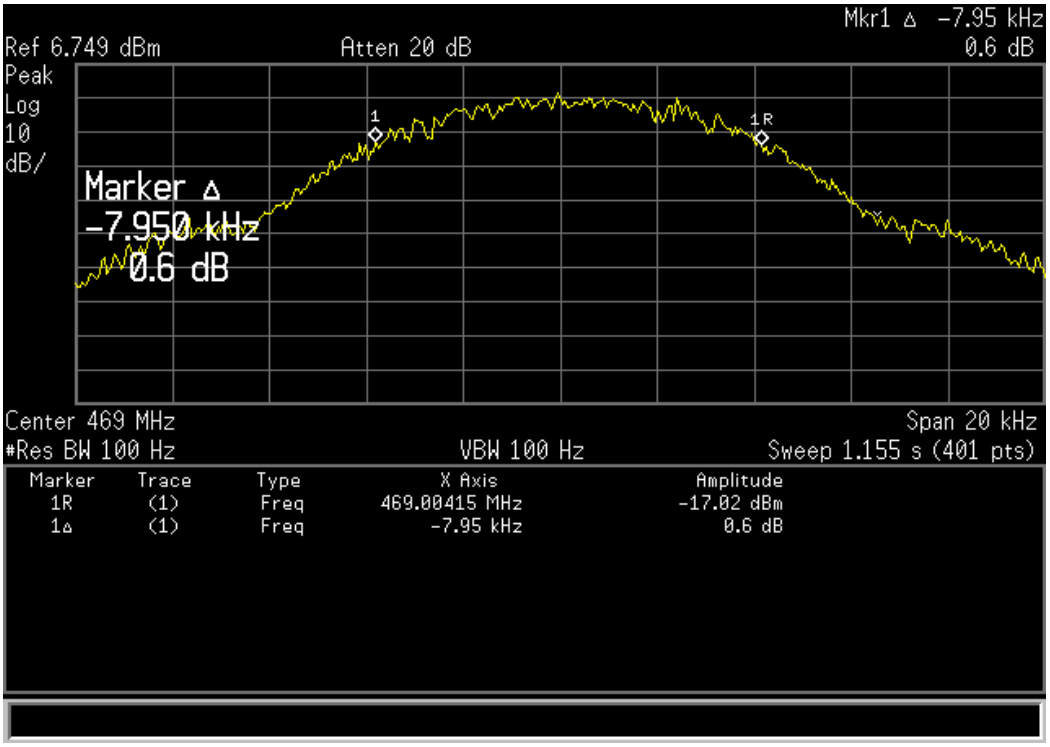
FM 19200 bps data (4-Level GFSK)



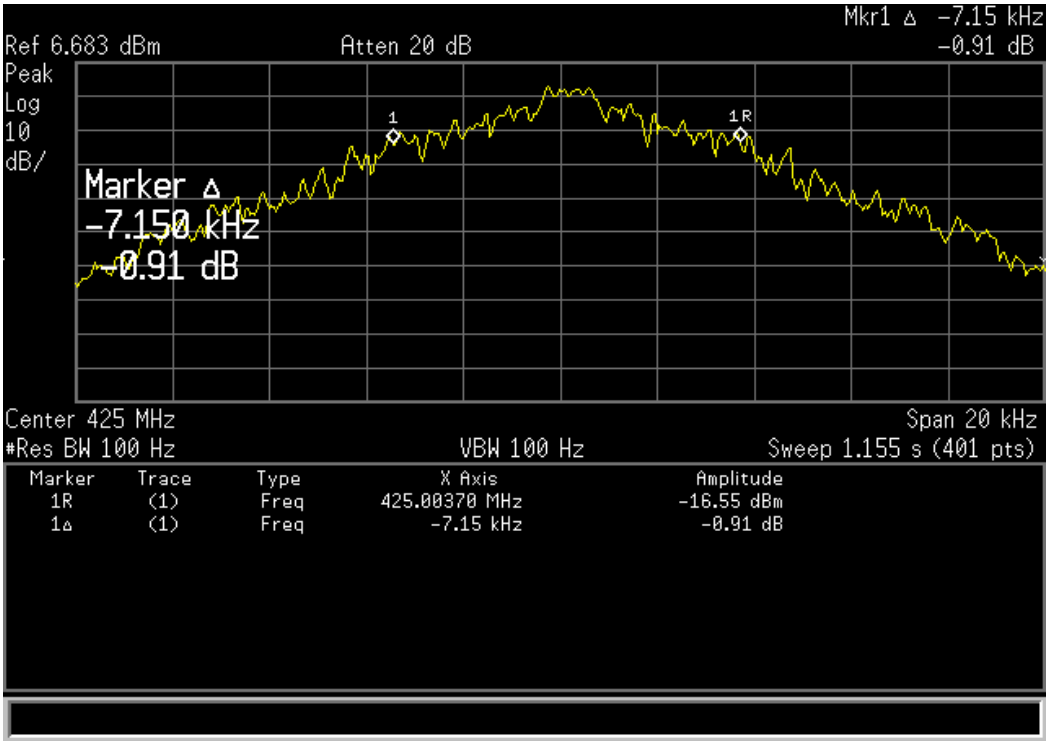


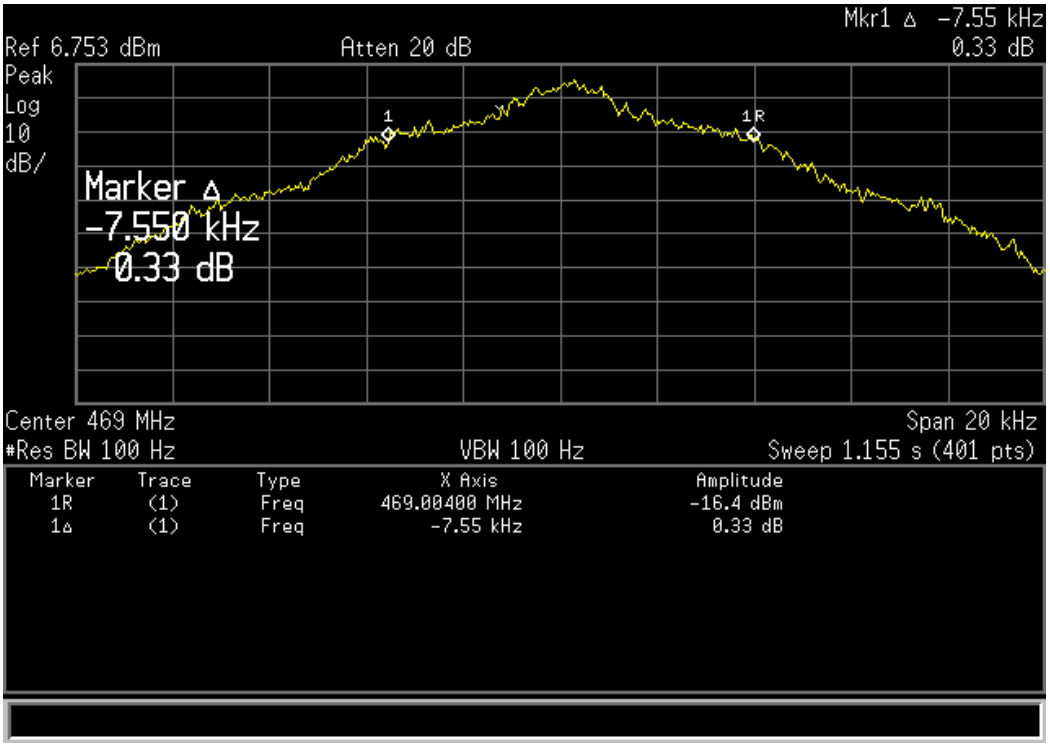
FM 9600 bps data (3-Level GFSK)



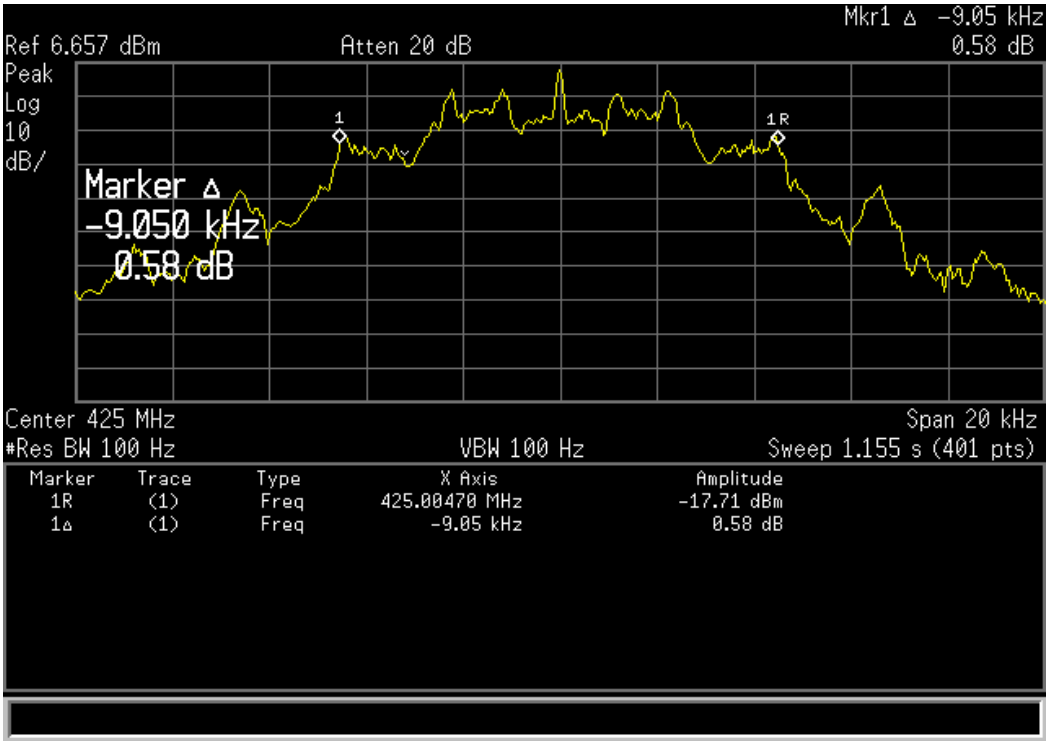


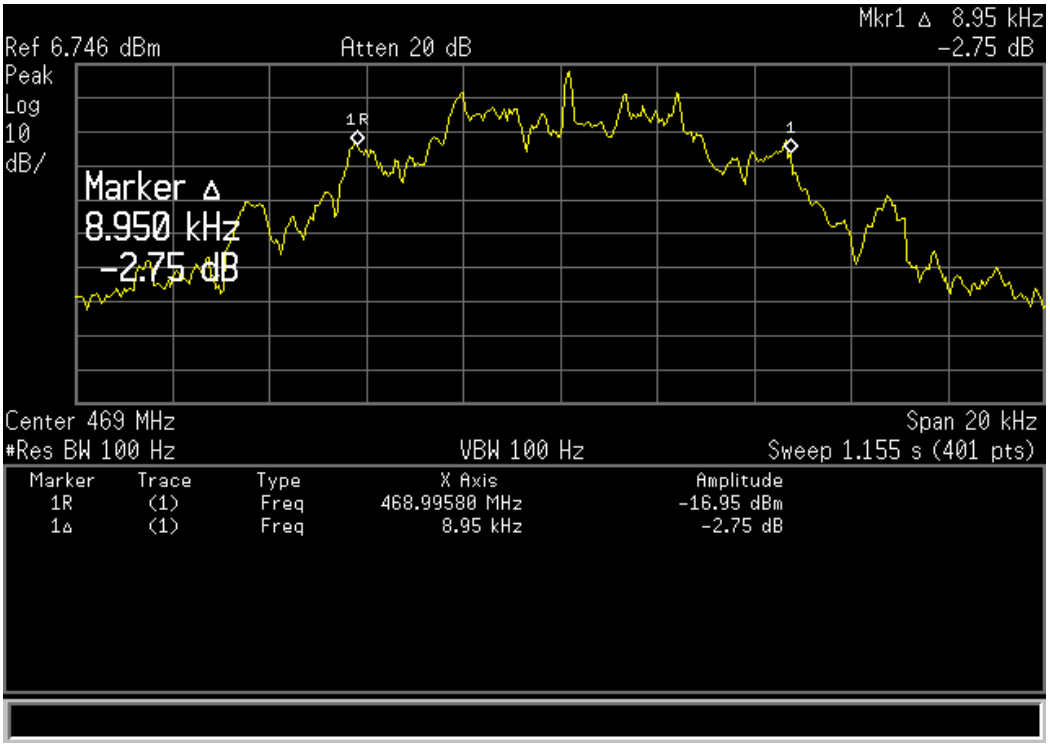
FM 9600 bps data (2 Level GFSK)



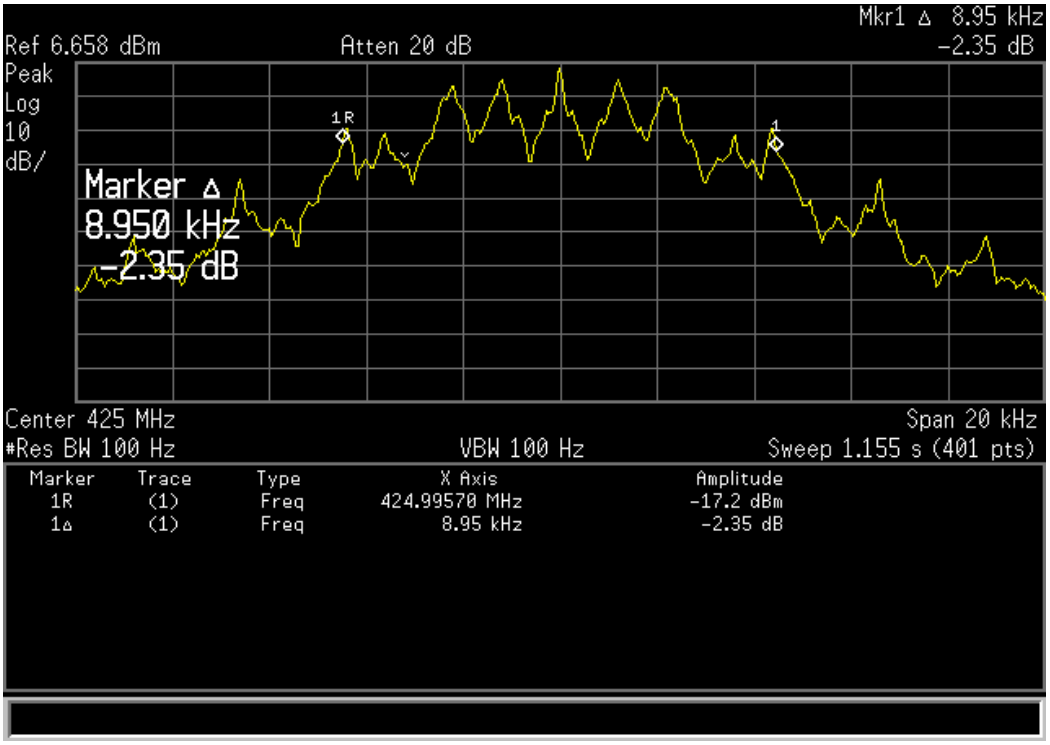


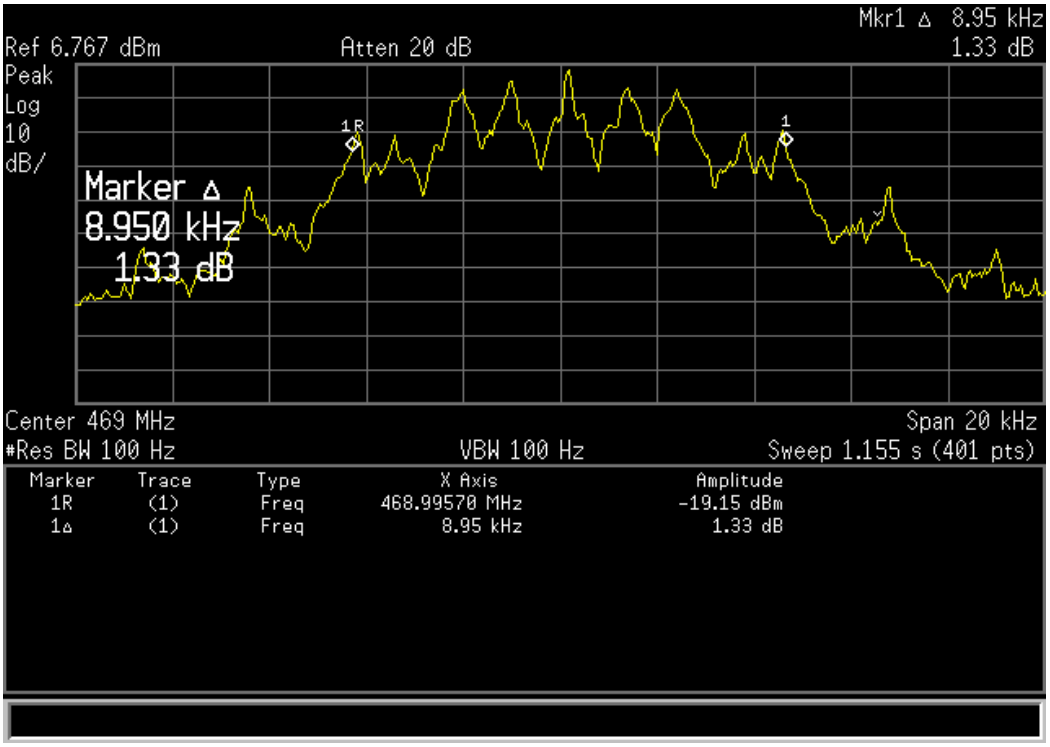
FM 1200 bps data (2-Level AFSK)



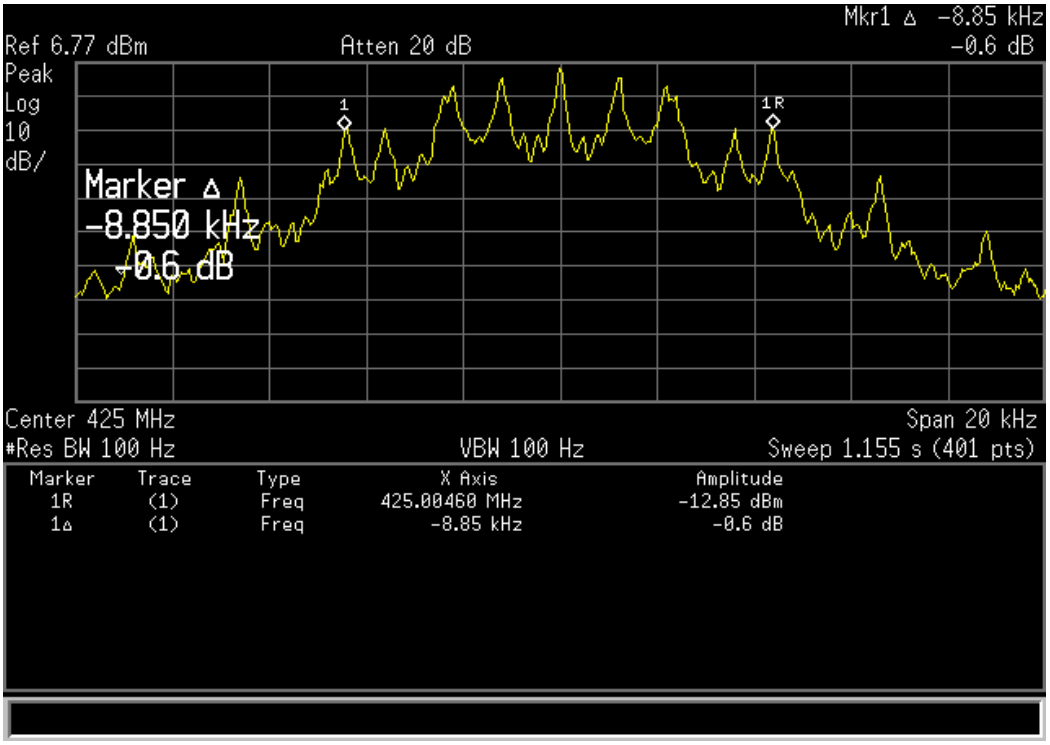


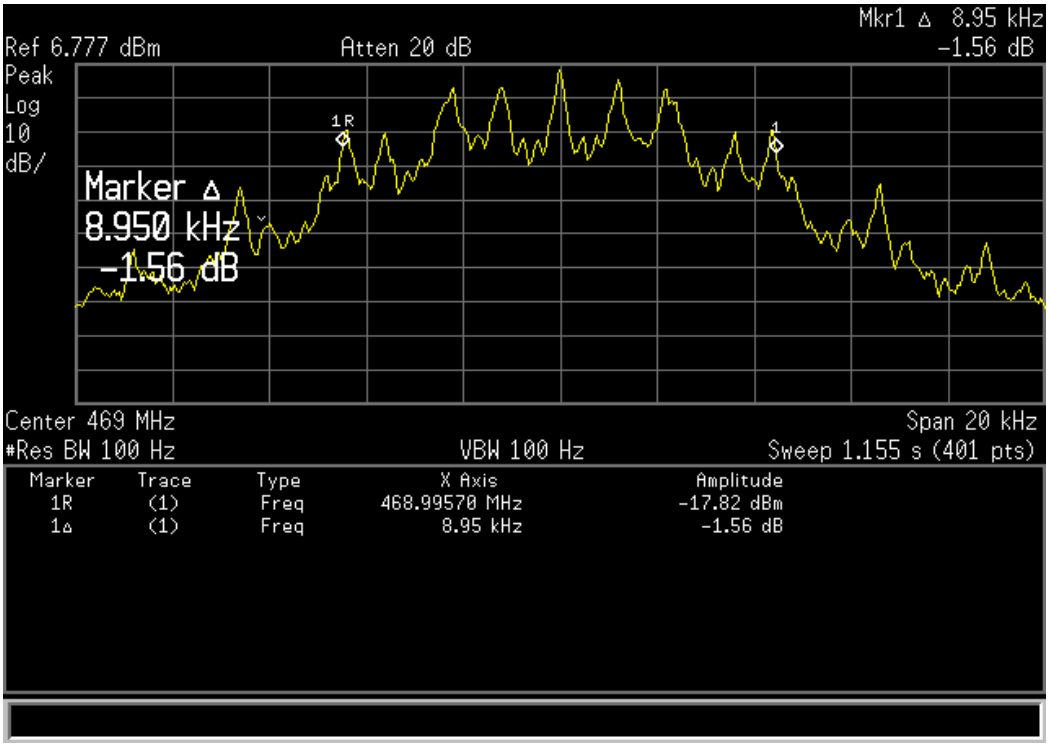
FM 600 bps Data (2-Level AFSK)



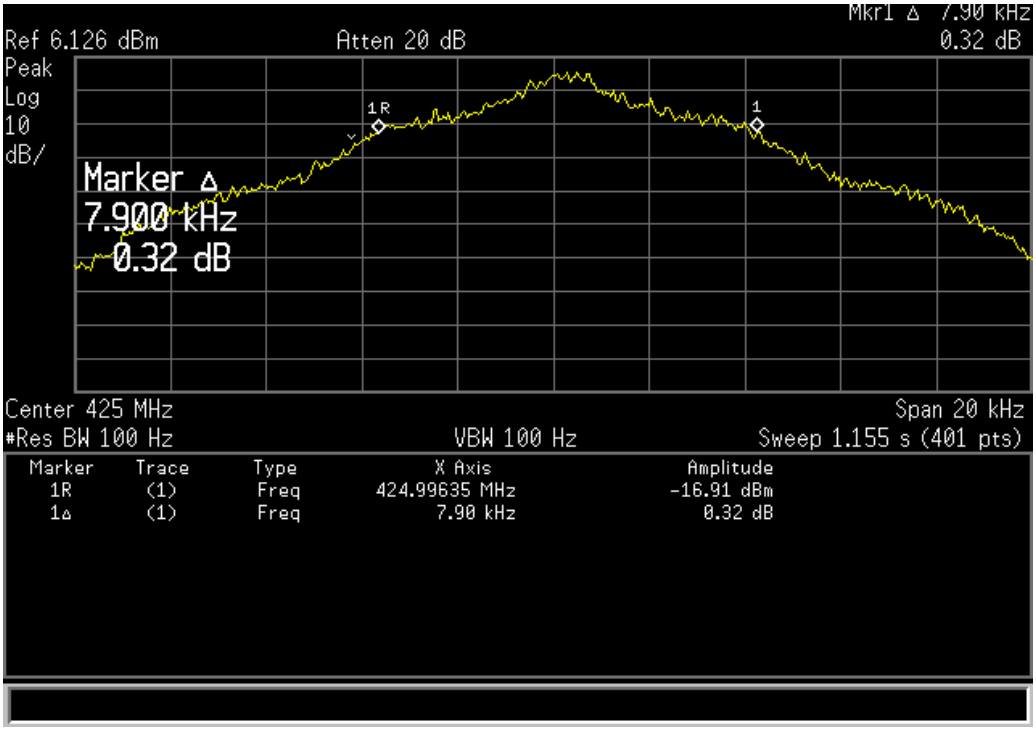


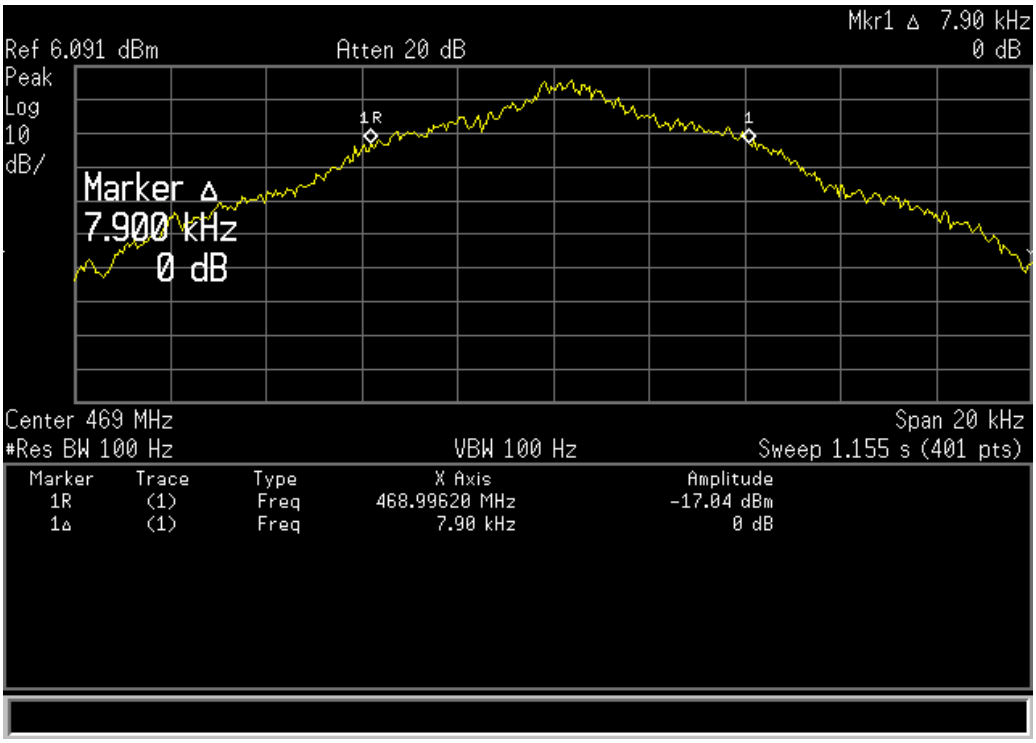
FM 300 bps Data (2-Level AFSK)





FM 9600 bps Data (2-Level Superseded)





Spectrum Masks

The spectrum masks are defined in:

Section 90.210(d) – Mask D has been applied using an authorised bandwidth of 11.25 kHz as per Section 90.209(b)(5).

The reference level for the following emission mask measurements has been determined using a resolution bandwidth of 120 kHz with the transmitter modulated.

A correction factor of 30 dB needs to be added to all measurements as a 30 dB attenuator was placed between the transmitter and the spectrum analyser.

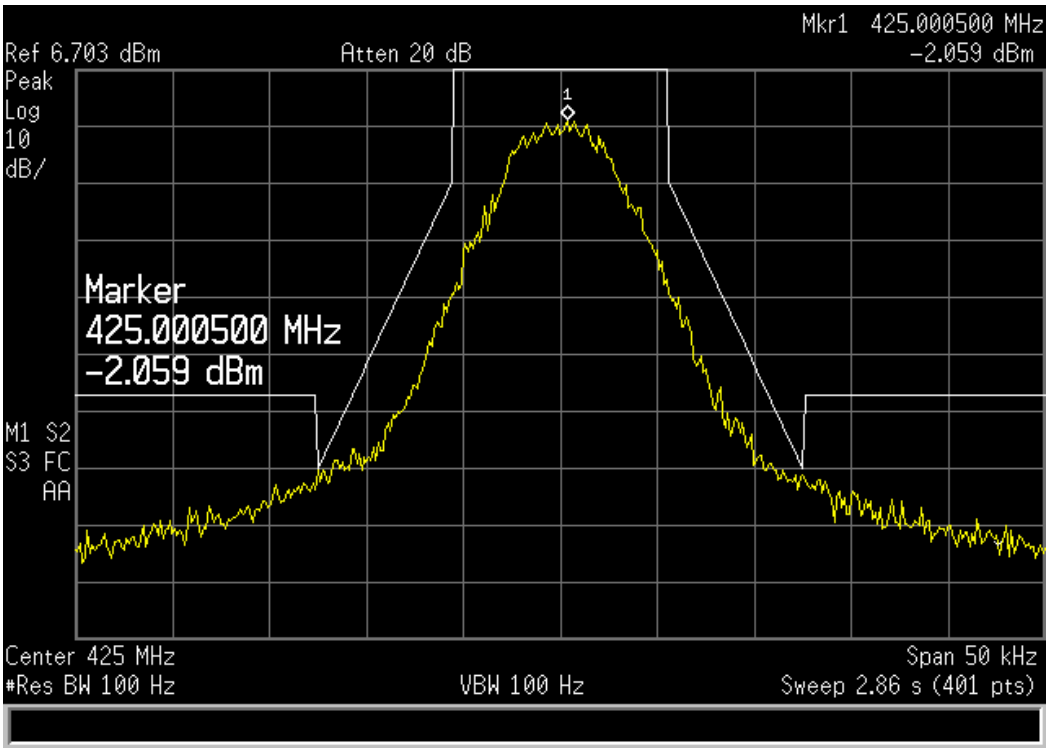
Measurements were made in peak hold with the transmitter operating on 425.000 MHz & 469.000 MHz.

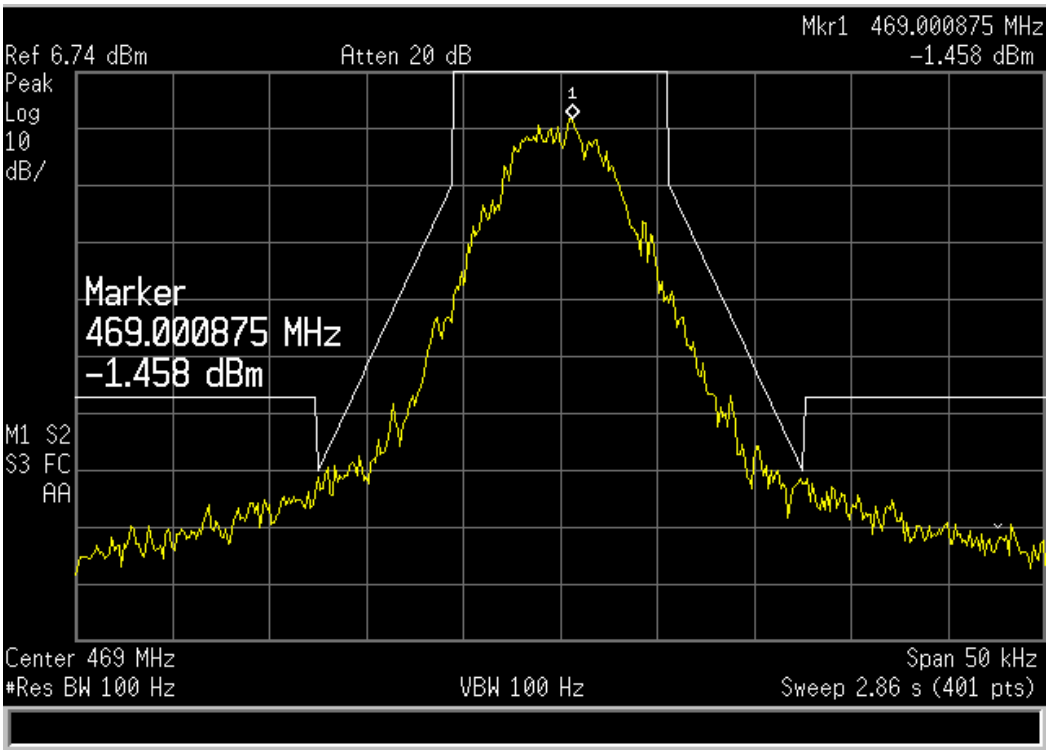
For the various data modes the transmitter was modulated using modulation sources internal to the transmitter as supplied by the client.

External non-packet modulation was performed using an Ethernet data source supplied by the client.

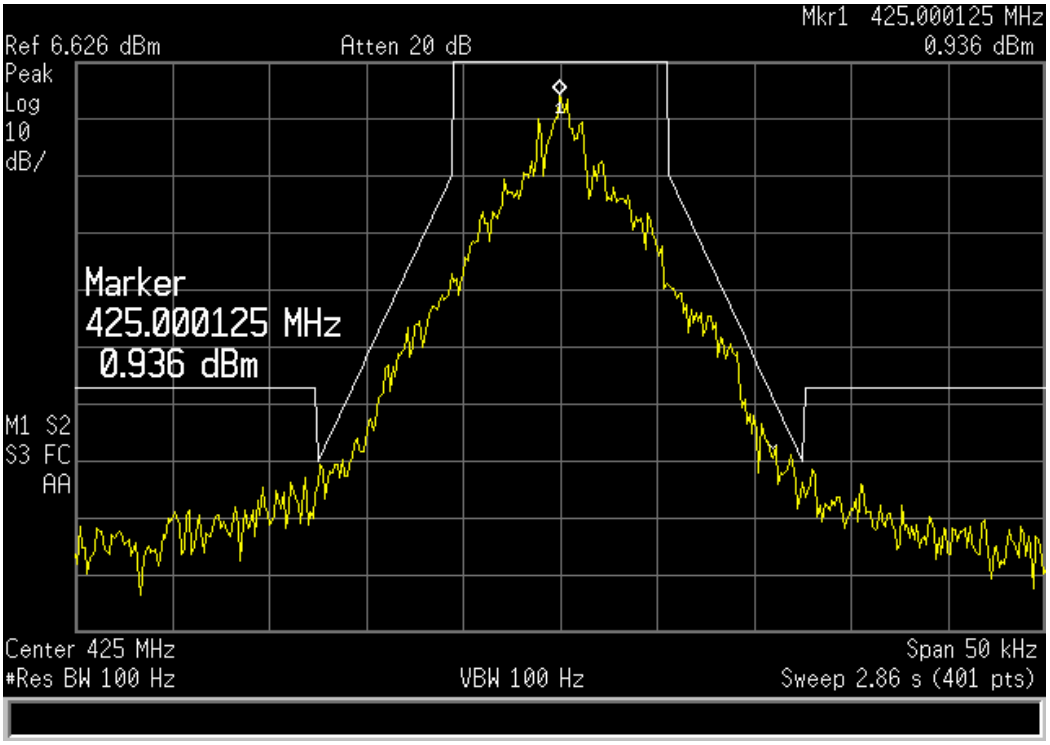
Result: Complies

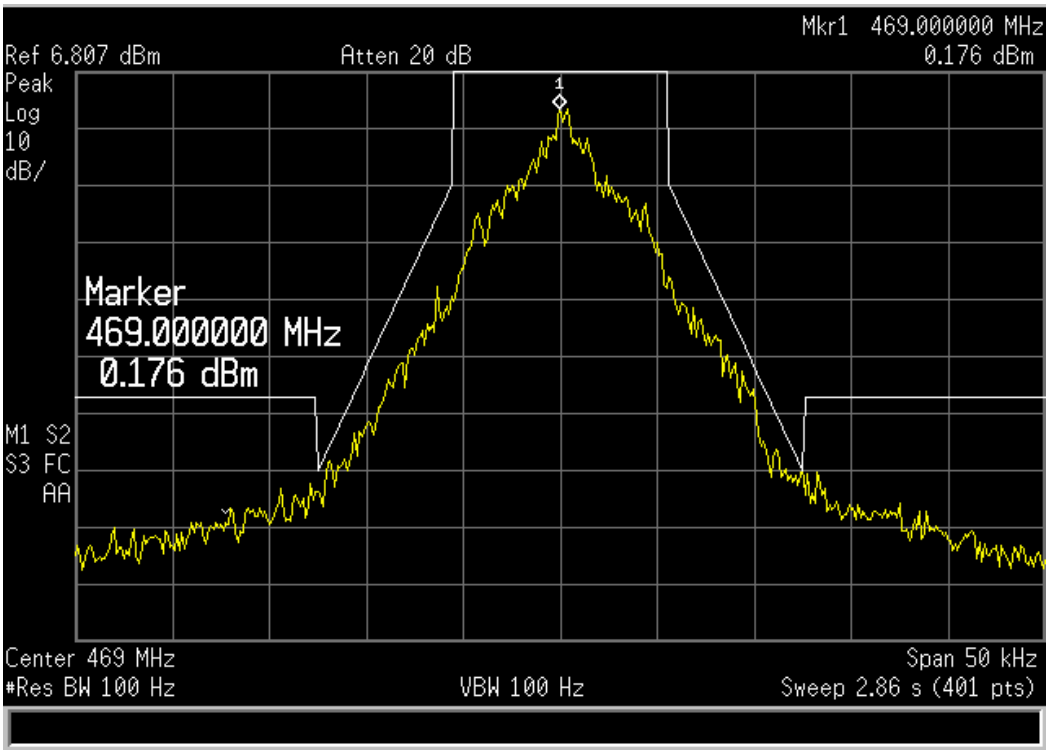
FM 9600 bps data (4-Level GFSK)



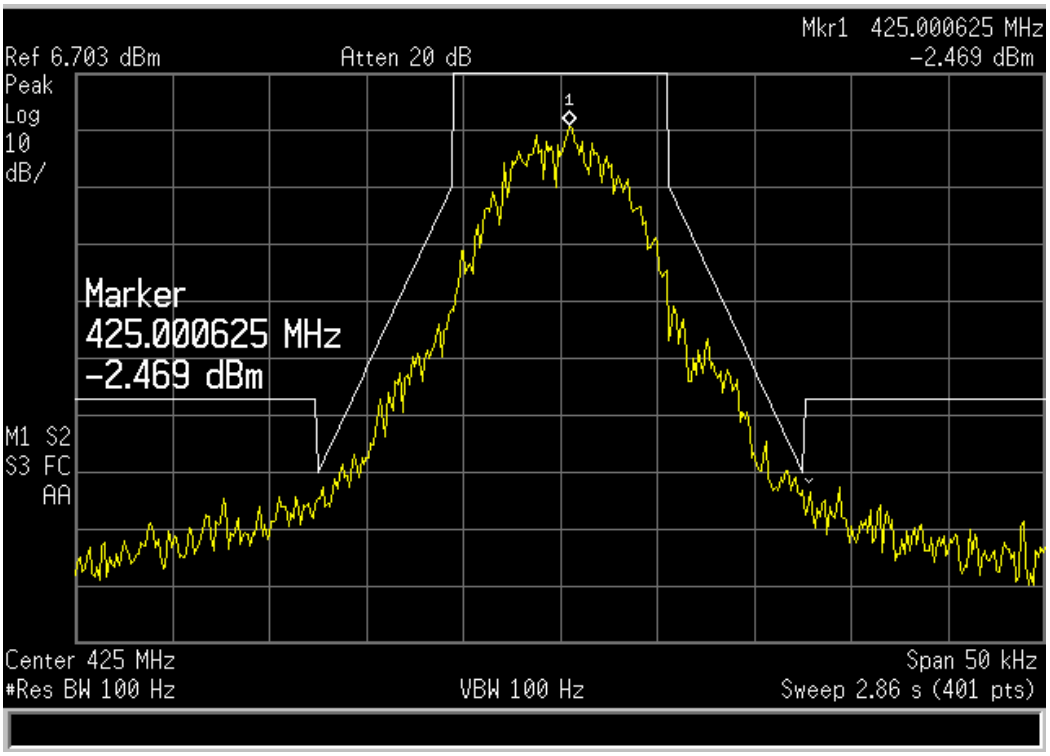


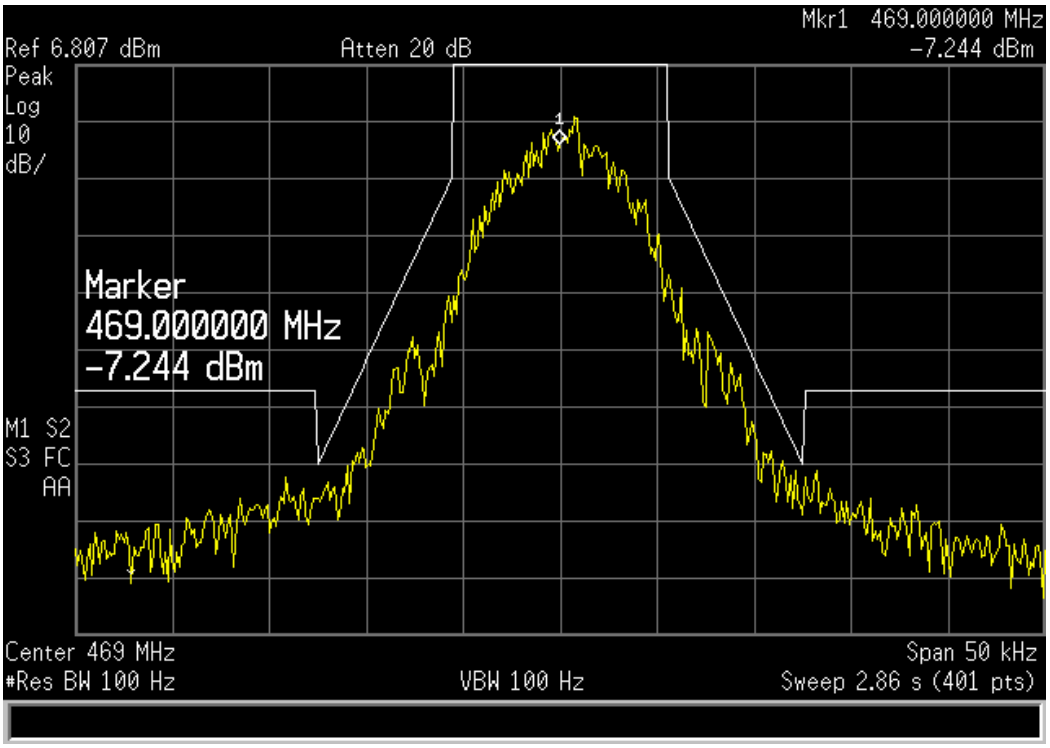
FM 19200 bps data (4-Level GFSK)



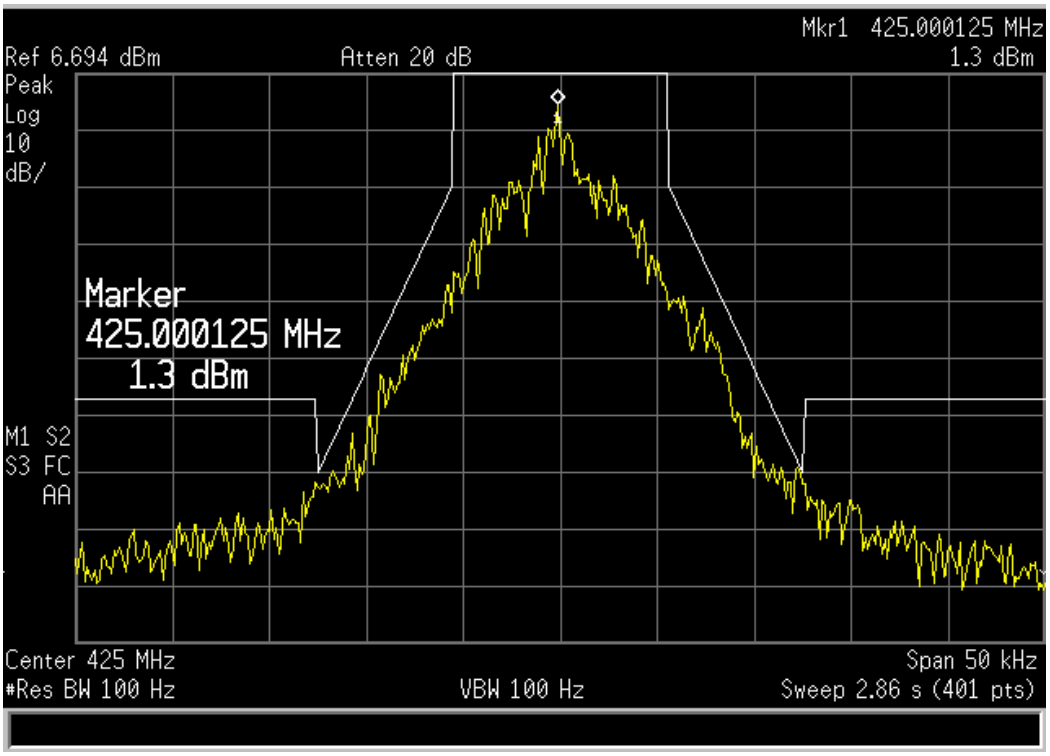


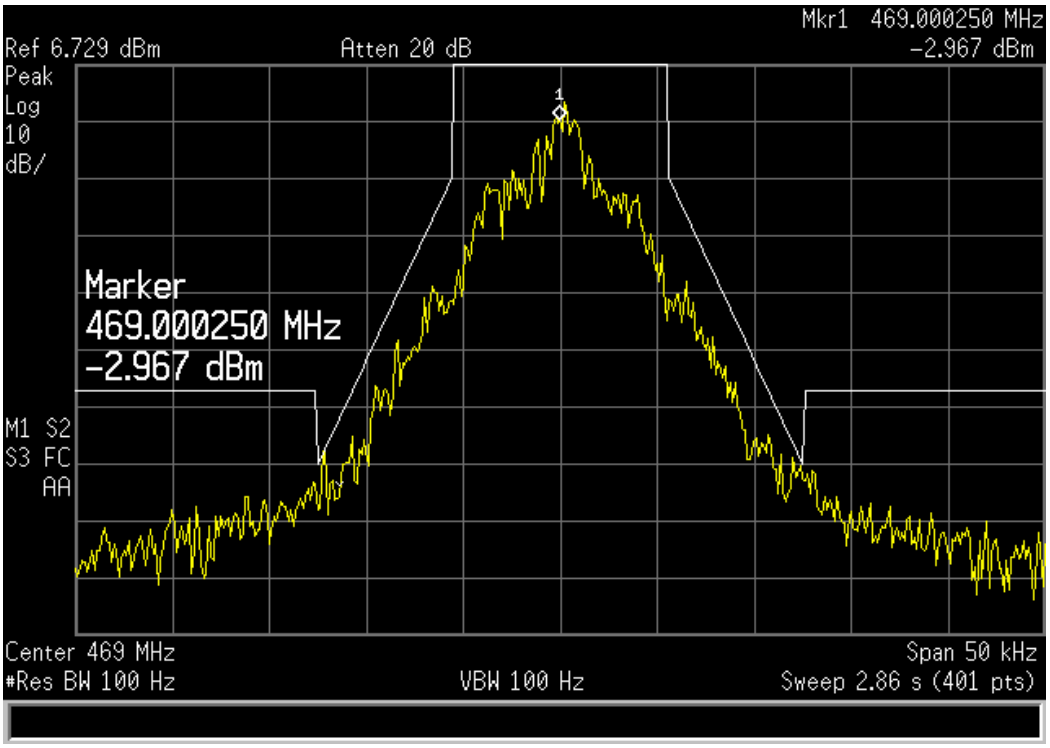
FM 9600 bps data (3-Level GFSK)



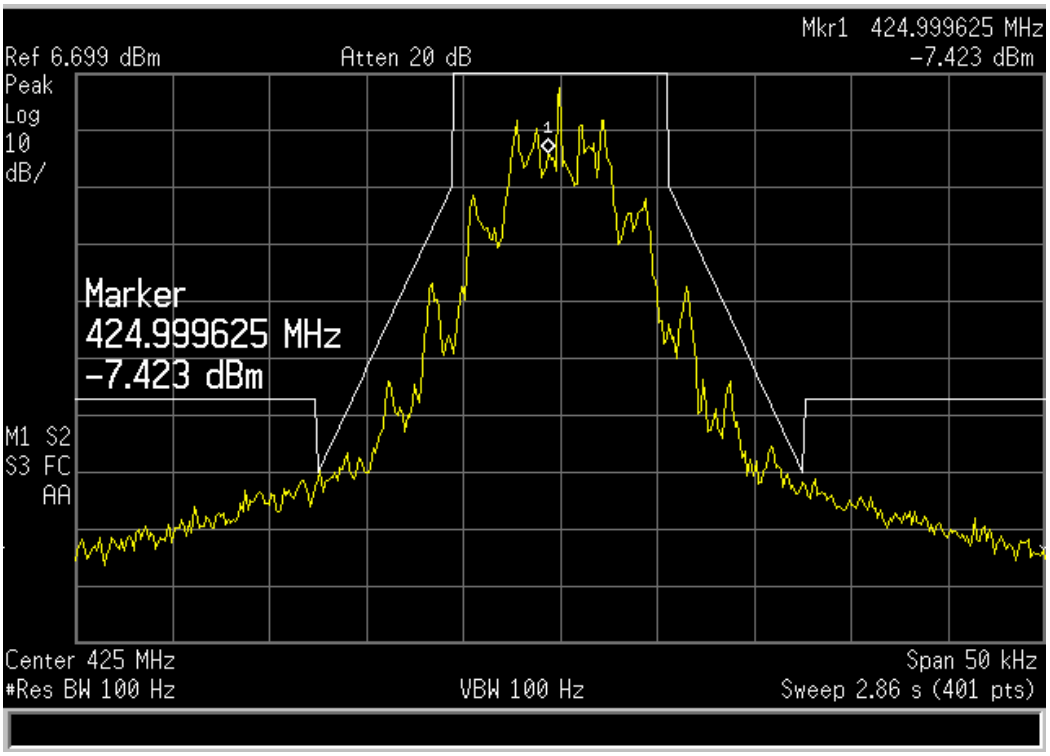


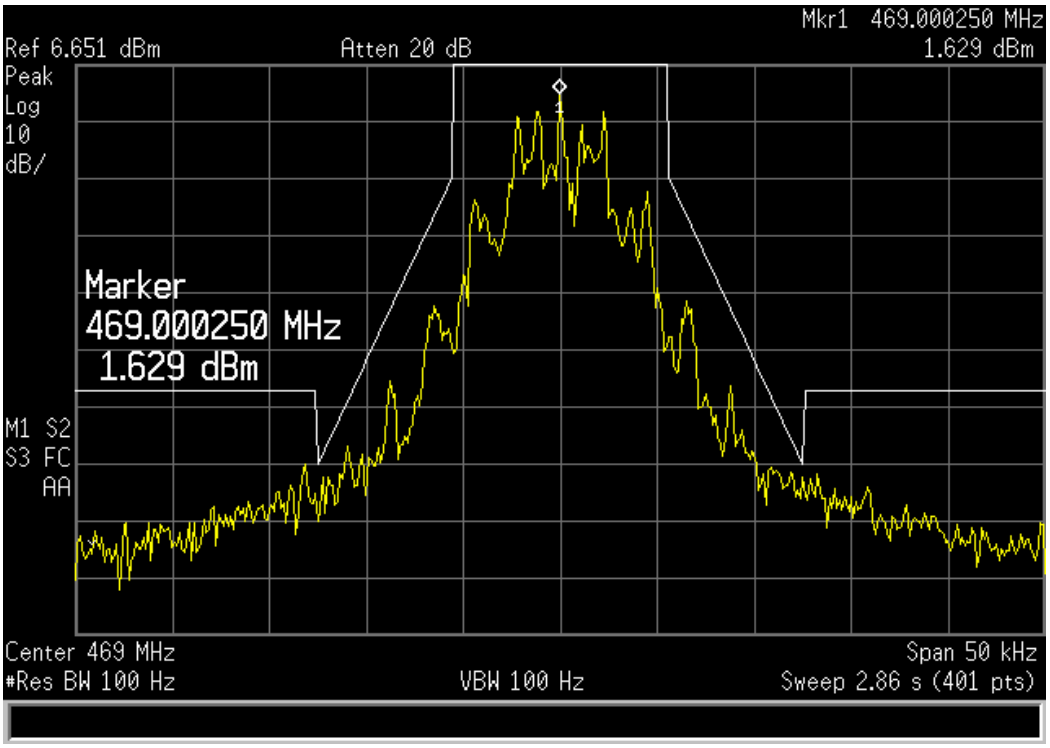
FM 9600 bps data (2 Level GFSK)



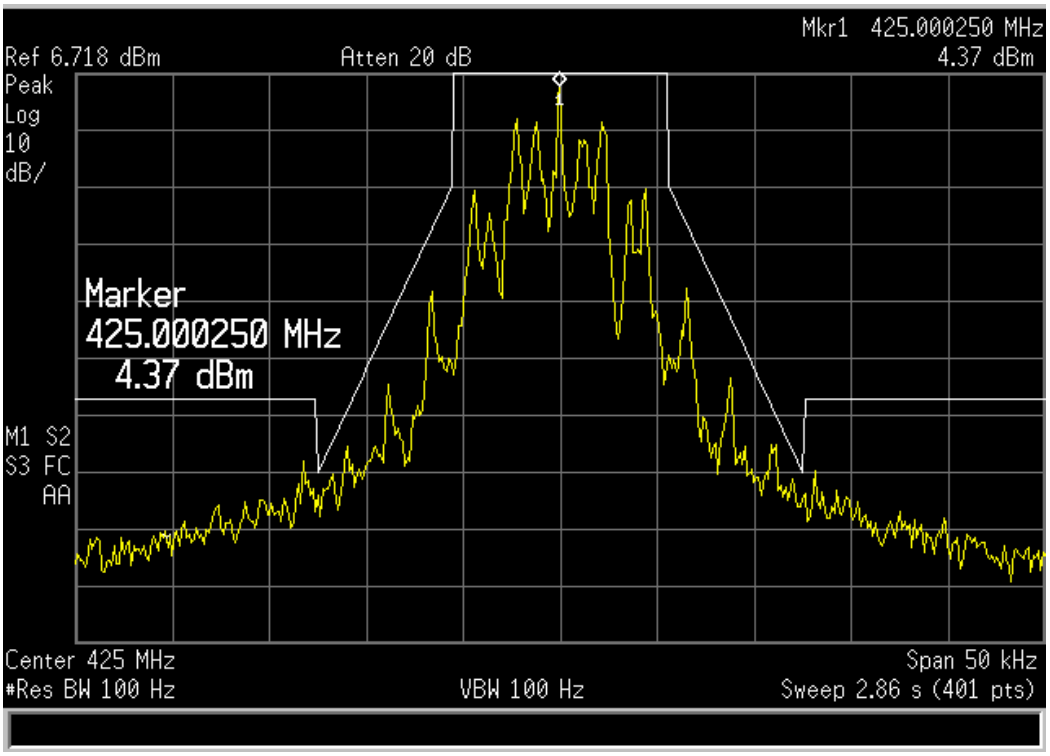


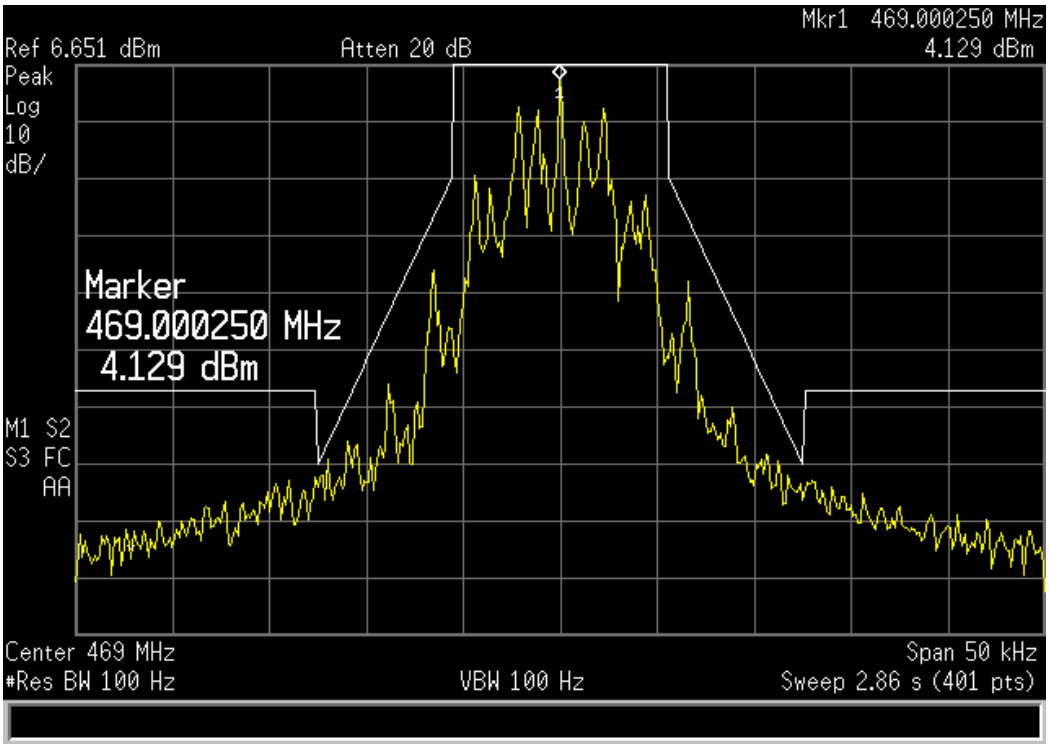
FM 1200 bps data (2-Level AFSK)



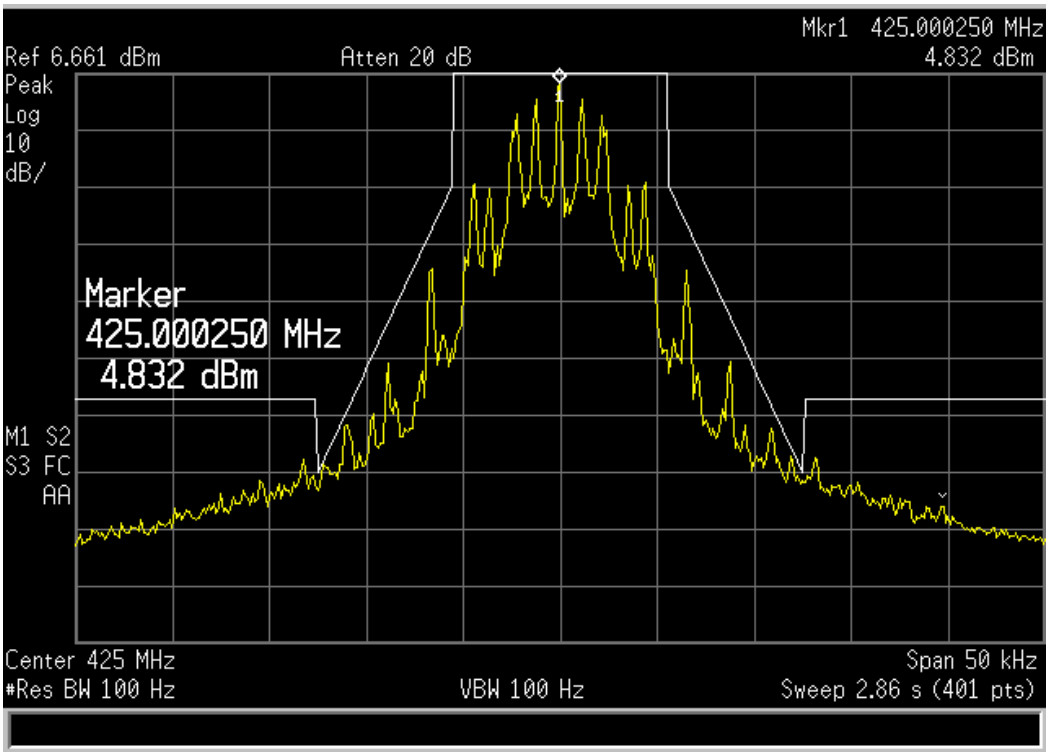


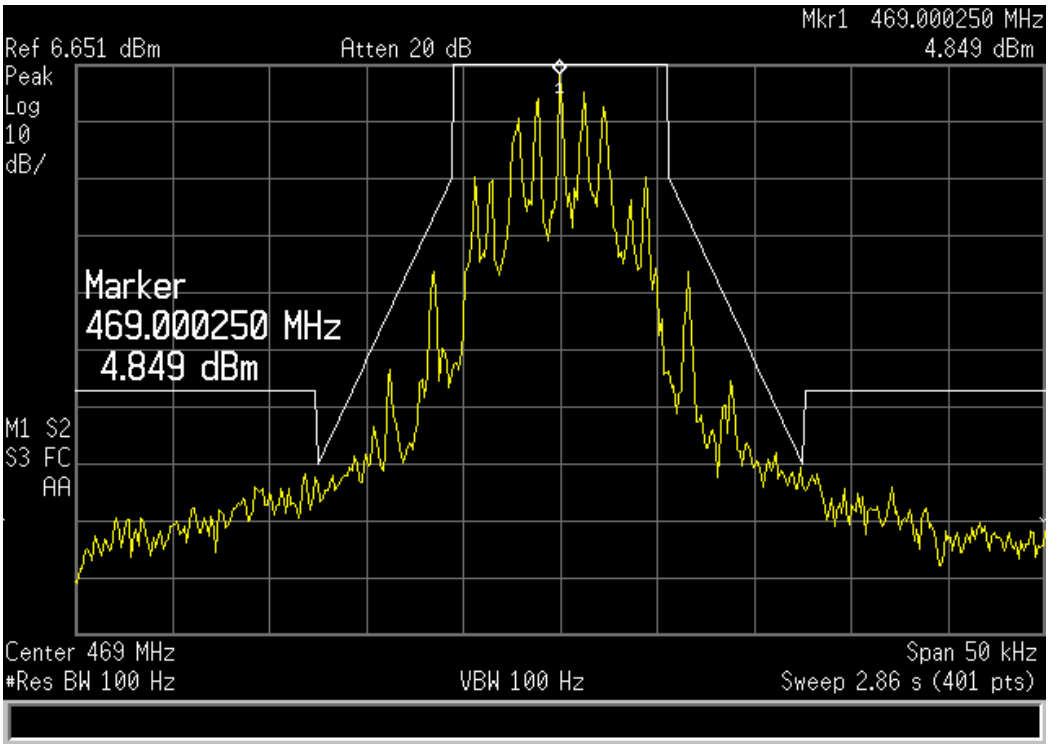
FM 600 bps Data (2-Level AFSK)



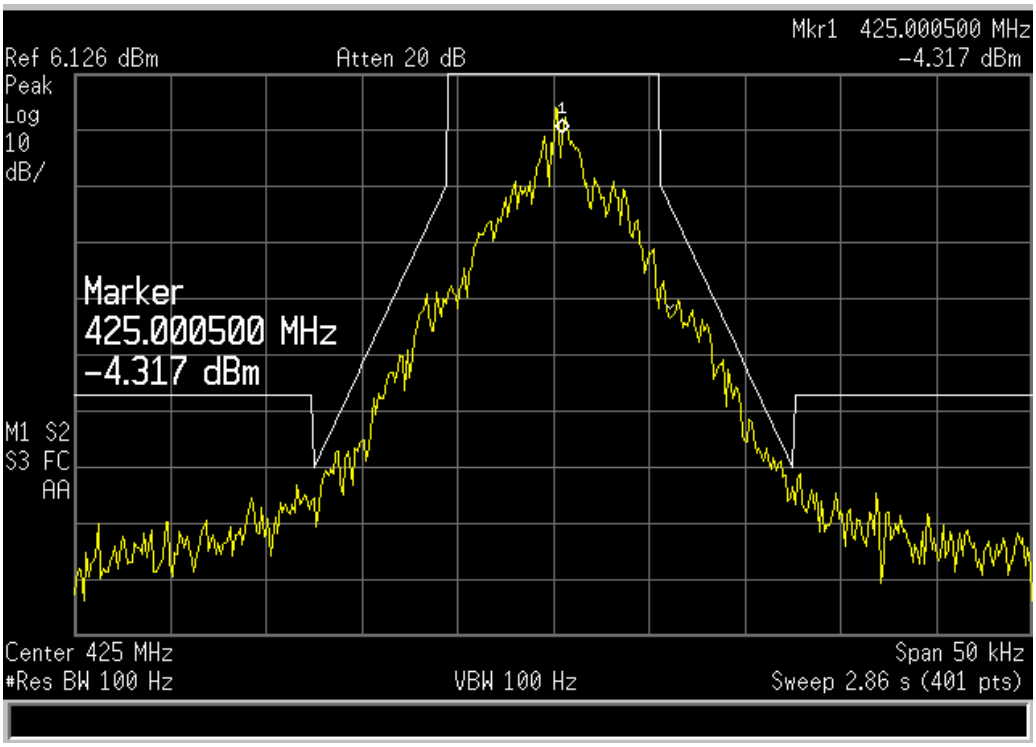


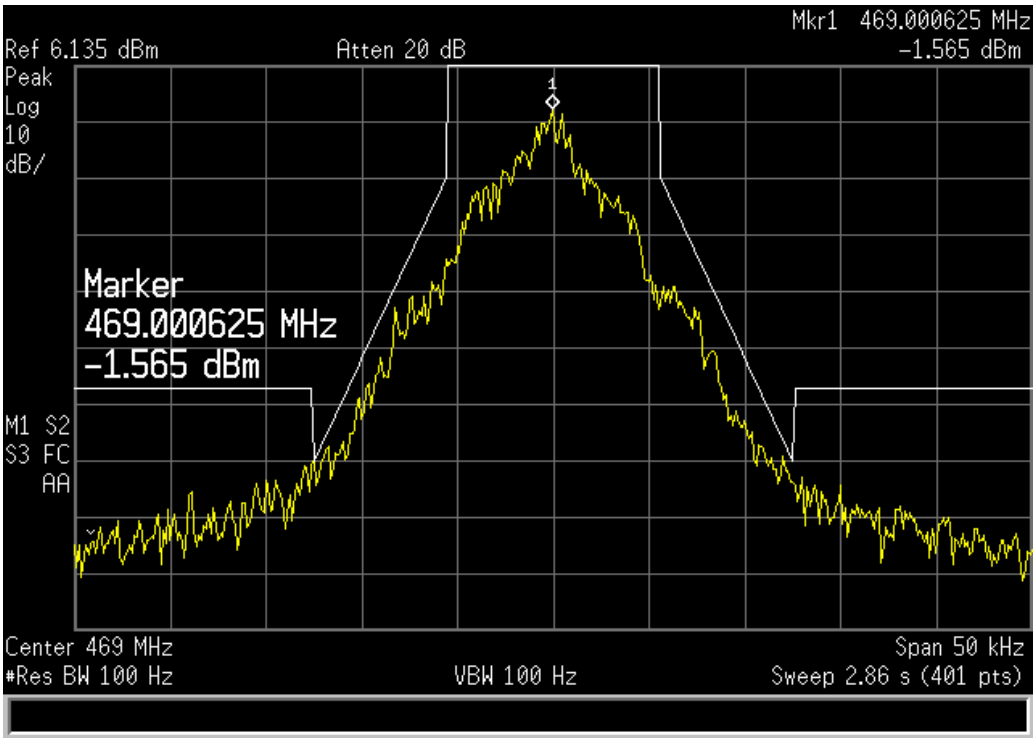
FM 300 bps Data (2-Level AFSK)





FM 9600 bps Data (2-Level Superseded)





Transmitter spurious emissions at the antenna terminals

Frequency: 425.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
850.000	-57.6	-20.0
1275.000	-54.0	-20.0
1700.000	-45.0	-20.0

Frequency: 469.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
938.000	-53.5	-20.0
1407.000	-46.6	-20.0
1876.000	-57.5	-20.0

Limit:
Part 90.210(d) Mask D, (3) on any frequency removed from the centre of the authorised bandwidth by a displacement frequency of more than 12.5 kHz shall be attenuated by at least 50 + 10 log (P) or 70 dB whichever is the lesser attenuation.

The spurious emission limit defined by Mask D has been applied as this transmitter can operate using channel spacings of 12.5 kHz.

Part 2.1057 states that the spectrum should be investigated up to the 10^{th} harmonic if the transmitter operates below 10 GHz.

A rated power of 5.0 watts gives a limit of –20.0 dBm.

No measurements were made above the 10^{th} harmonic.

Result: Complies
Measurement Uncertainty: ±3.3 dB

Receiver spurious emissions at antenna terminals

The receiver has an intermediate frequency of 86.1625 MHz.

The receiver was tested at 425.100 & 469.100 MHz

No emissions greater than -90 dBm were observed.

Limit:
In accordance with CFR 47 Part 15, section 15.111 the power of any emission at the antenna terminal should not exceed 2 nW (–57.0 dBm).

Result: Complies
Measurement Uncertainty: **±3.3 dB**

Field strength of the transmitter spurious emissions

Frequency: 425.000 MHz

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)	Result
850.0000	45.2	-50.0	-20.0	Vertical	30.0	Pass
850.0000	42.6	-52.6	-20.0	Horizontal	32.6	Pass
1275.0000	36.5	-58.7	-20.0	Vertical	38.7	Pass
1275.0000	36.0	-59.2	-20.0	Horizontal	39.2	Pass
1700.0000	41.0	-54.2	-20.0	Vertical	34.2	Pass
1700.0000	39.5	-55.7	-20.0	Horizontal	35.7	Pass
2125.0000	40.1	-55.1	-20.0	Vertical	35.1	Pass
2125.0000	39.5	-55.7	-20.0	Horizontal	35.7	Pass
2550.0000	44.0	-51.2	-20.0	Vertical	31.2	Pass
2550.0000	44.0	-51.2	-20.0	Horizontal	31.2	Pass
2975.0000	<50	-	-20.0	Vertical	-	Pass
2975.0000	<50	-	-20.0	Horizontal	-	Pass
3400.0000	<50	-	-20.0	Vertical	-	Pass
3400.0000	<50	-	-20.0	Horizontal	-	Pass
3825.0000	<50	-	-20.0	Vertical	-	Pass
3825.0000	<50	-	-20.0	Horizontal	-	Pass
4250.0000	<50	-	-20.0	Vertical	-	Pass
4250.0000	<50	-	-20.0	Horizontal	-	Pass

Frequency: 469.000 MHz

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)	Result
938.0000	37.2	-58.0	-20.0	Vertical	38.0	Pass
938.0000	37.5	-57.7	-20.0	Horizontal	37.7	Pass
1407.0000	37.0	-58.2	-20.0	Vertical	38.2	Pass
1407.0000	38.2	-57.0	-20.0	Horizontal	37.0	Pass
1876.0000	39.0	-56.2	-20.0	Vertical	36.2	Pass
1876.0000	40.1	-55.1	-20.0	Horizontal	35.1	Pass
2345.0000	41.2	-54.0	-20.0	Vertical	34.0	Pass
2345.0000	41.1	-54.1	-20.0	Horizontal	34.1	Pass
2814.0000	<50	-	-20.0	Vertical	-	Pass
2814.0000	<50	-	-20.0	Horizontal	-	Pass
3283.0000	<50	-	-20.0	Vertical	-	Pass
3283.0000	<50	-	-20.0	Horizontal	-	Pass
3752.0000	<50	-	-20.0	Vertical	-	Pass
3752.0000	<50	-	-20.0	Horizontal	-	Pass
4221.0000	<50	-	-20.0	Vertical	-	Pass
4221.0000	<50	-	-20.0	Horizontal	-	Pass
4690.0000	<50	-	-20.0	Vertical	-	Pass
4690.0000	<50	-	-20.0	Horizontal	-	Pass

The transmitter was tested while transmitting continuously while attached to a dummy load.

When operating in transmit mode no significant emissions were detected between the harmonic emissions that were detected.

Device was tested on an open area test site at a distance of 3 metres.

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland.

Details of this site have been filed with the Commission, Registration Number: 90838, which was last updated in January 2010

The level recorded is the signal generator output level in dBm less any gains / losses due to the coax cable and the dipole antenna.

Limit:

All spurious emissions are to be attenuated by at least 50 + 10 log (P).

The rated power of 5 watts gives a limit of –20 dBm.

No measurements were made above the 10^{th} harmonic.

Result: Complies
Measurement Uncertainty: ±4.1 dB

Frequency Stability

Frequency stability measurements were between - 30 °C and + 50°C in 10°C increments.

At each temperature the transmitter was given a period of 30 minutes to stabilise. The transmitter was then turned on and the frequency error measured after a period of 1 minute.

Measurements were made with the input voltage set to 13.8 Vdc and when decreased 15% to 11.73 Vdc and increased 15 % to 15.87 Vdc.

Frequency: 425.000 MHz

Temperature	Voltage 11.73 Vdc	Voltage 13.8 Vdc	Voltage 15.87 Vdc
+50°C	-25.0	-23.0	-23.0
+40°C	-99.0	-98.0	-99.0
+30°C	-107.0	-104.0	-105.0
+20°C	-7.0	-5.0	-9.0
+10°C	-91.0	-89.0	-86.0
0°C	-93.0	-95.0	-95.0
-10°C	-83.0	-83.0	-81.0
-20°C	+54.0	+53.0	+53.0
-30°C	+14.0	+14.0	+14.0

Frequency: 469.000 MHz

Temperature	Voltage 11.73 Vdc	Voltage 13.8 Vdc	Voltage 15.87 Vdc
+50°C	-90.0	-86.0	-87.0
+40°C	-98.0	-100.0	-101.0
+30°C	-91.0	-93.0	-91.0
+20°C	-12.0	-15.0	-18.0
+10°C	-87.0	-85.0	-88.0
0°C	-90.0	-89.0	-91.0
-10°C	-33.0	-25.0	-31.0
-20°C	-28.0	-27.0	-25.0
-30°C	-95.0	-95.0	-94.0

Limit:
Part 90.213 states that fixed and base station transmitters operating between 421-512 MHz with 12.5 kHz channelling are required to have a frequency tolerance of 2.5 ppm.

This transmitter was tested on 425.000 MHz. 2.5 ppm = 2.5 x 425.000 = 1063 Hz.

This transmitter was tested on 469.000 MHz. 2.5 ppm = 2.5 x 469.000 = 1173 Hz.

Result: Complies
Measurement Uncertainty: ±30 Hz

Transient frequency behaviour

Transient frequency behaviour measurements are applicable to wide band and narrow band transmitters operating in the frequency band 421-512 MHz. Measurements were carried out at 425.000 MHz & 469.000 MHz using the method described in TIA-603 and EN 300-086. In summary this method calls for the use of an external signal generator tuned to the centre frequency with a output level 0.1 % (-30 dB) of the level from the transmitter with a 1 kHz tone with a frequency deviation of 12.5 kHz being applied to the input of a modulation analyser along with the output from the transmitter.

The modulation analyser produces an amplitude difference signal and a frequency difference signal, which are applied to the input of a storage oscilloscope.

The unmodulated transmitter is then keyed which produces a trigger pulse that is AC coupled to the oscilloscope that produces a display on the screen.

The result of the change in the ratio of power between the test signal from the signal generator and the transmitter output will produce 2 separate sides on the oscilloscope picture. One will show the 1000 Hz test modulation and the other will be the frequency difference of the transmitter versus time.

Frequency (MHz)	Period t_1 (kHz)	Period t_2 (kHz)	Period t_3 (kHz)
425.000	<12.5	<6.25	<12.5
469.000	<12.5	<6.25	<12.5

Limits:

Time Interval	Period	12.5 kHz Deviation (kHz)
t_1	5 ms	± 12.5
t_2	20 ms	± 6.25
t_3	5 ms	± 12.5

Result: Complies
Measurement Uncertainty: Frequency difference ±1.6 kHz, Time period ±1 ms

12.5 kHz transmitter turn on

Nominal Frequency: 425.000 MHz

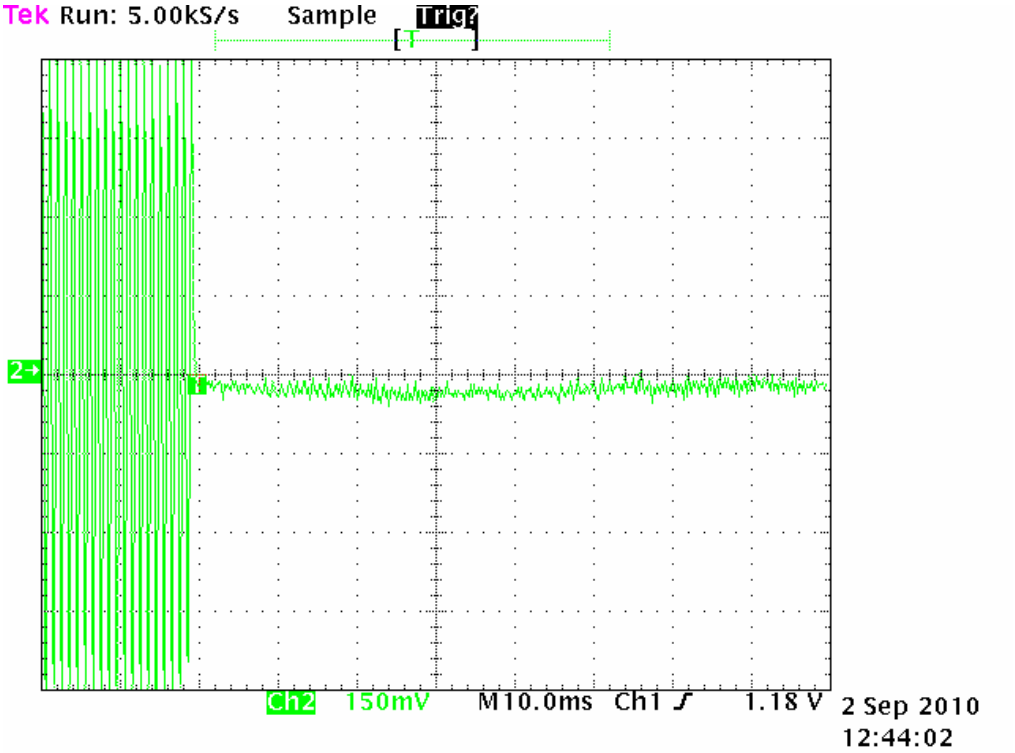
Green Trace = 1 kHz tone with FM deviation of 12.5 kHz and any transient.

Green trace has been maximised to give full screen indication of a ±12.5 kHz.
Therefore each Y axis division = 3.125 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

Triggering has been set to occur 2 divisions from the left hand edge (20 ms). This is position *t*on.

*t*1 occurs between 2.0 and 2.5 divisions from the left-hand edge.
t2 occurs between 2.5 and 4.5 divisions from the left-hand edge.

No transient can be observed just after *t*on.



12.5 kHz transmitter turn off

Nominal Frequency: 425.000 MHz

Green Trace = 1 kHz tone with FM deviation of 12.5 kHz and any transient.

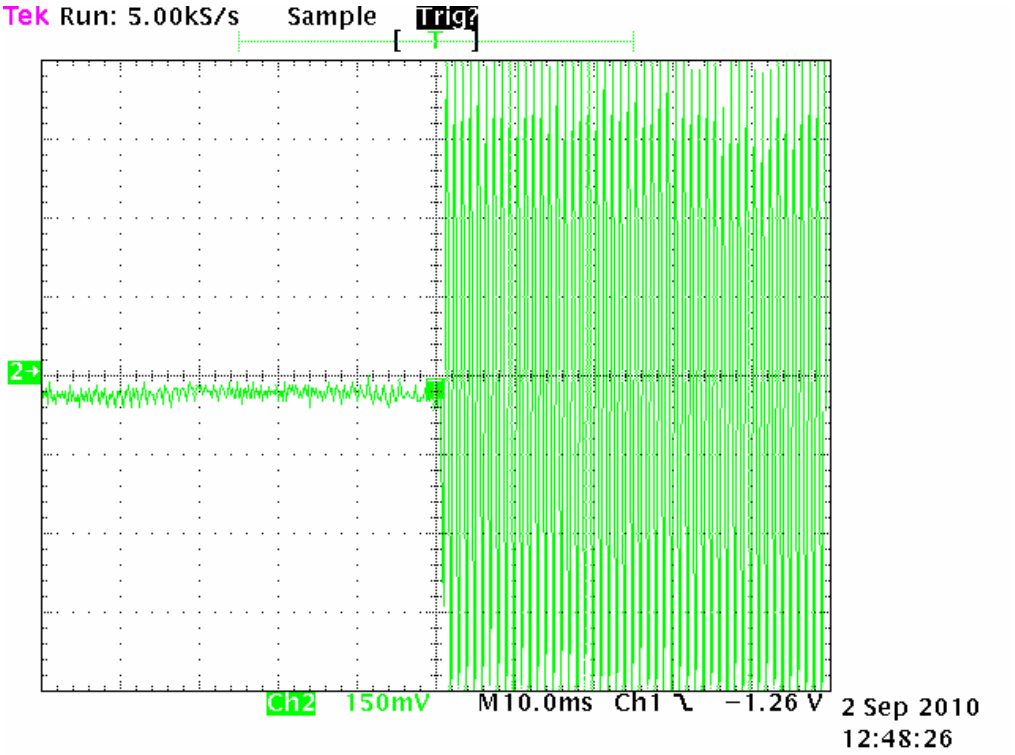
Green trace has been maximised to give full screen indication of a ± 12.5 kHz.
Therefore each Y axis division = 3.125 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

The display of the 1 kHz signal rising has been positioned 5 divisions from the left hand edge (50 ms).

This is position *t*off.

*t*3 occurs between 4.5 and 5.0 divisions from the left hand edge.

No transient response can be observed just before toff.



12.5 kHz transmitter turn on

Nominal Frequency: 469.000 MHz

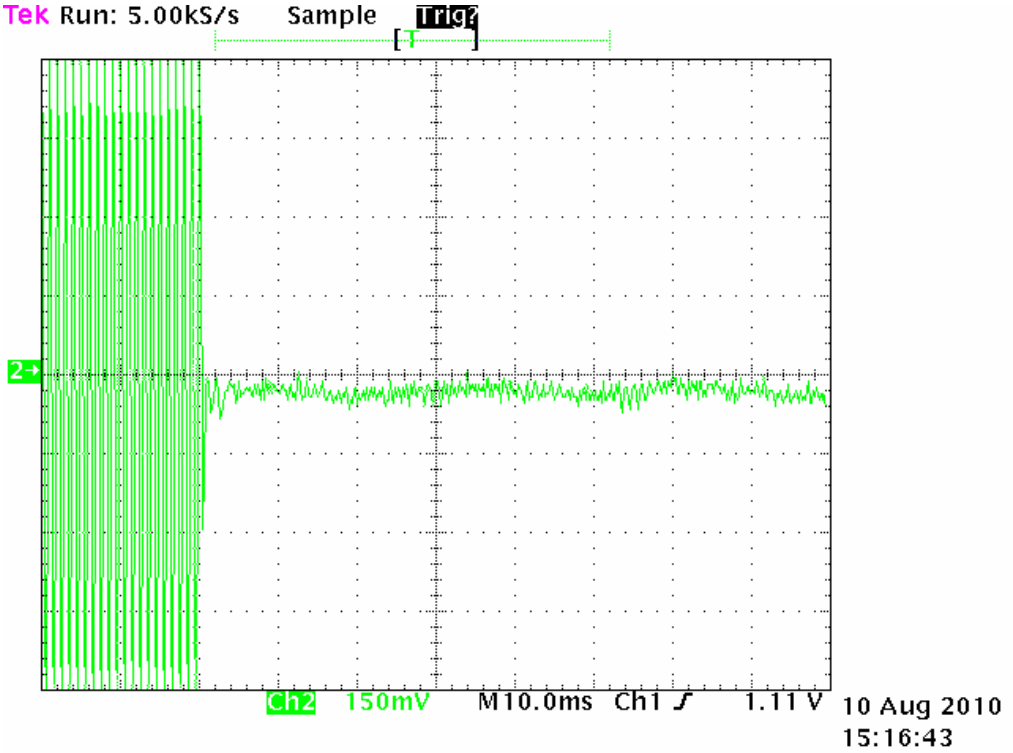
Green Trace = 1 kHz tone with FM deviation of 12.5 kHz and any transient.

Green trace has been maximised to give full screen indication of a ±12.5 kHz.
Therefore each Y axis division = 3.125 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

Triggering has been set to occur 2 divisions from the left hand edge (20 ms). This is position *t*on.

*t*1 occurs between 2.0 and 2.5 divisions from the left-hand edge.
t2 occurs between 2.5 and 4.5 divisions from the left-hand edge.

No transient can be observed just after *t*on.



12.5 kHz transmitter turn off

Nominal Frequency: 469.000 MHz

Green Trace = 1 kHz tone with FM deviation of 12.5 kHz and any transient.

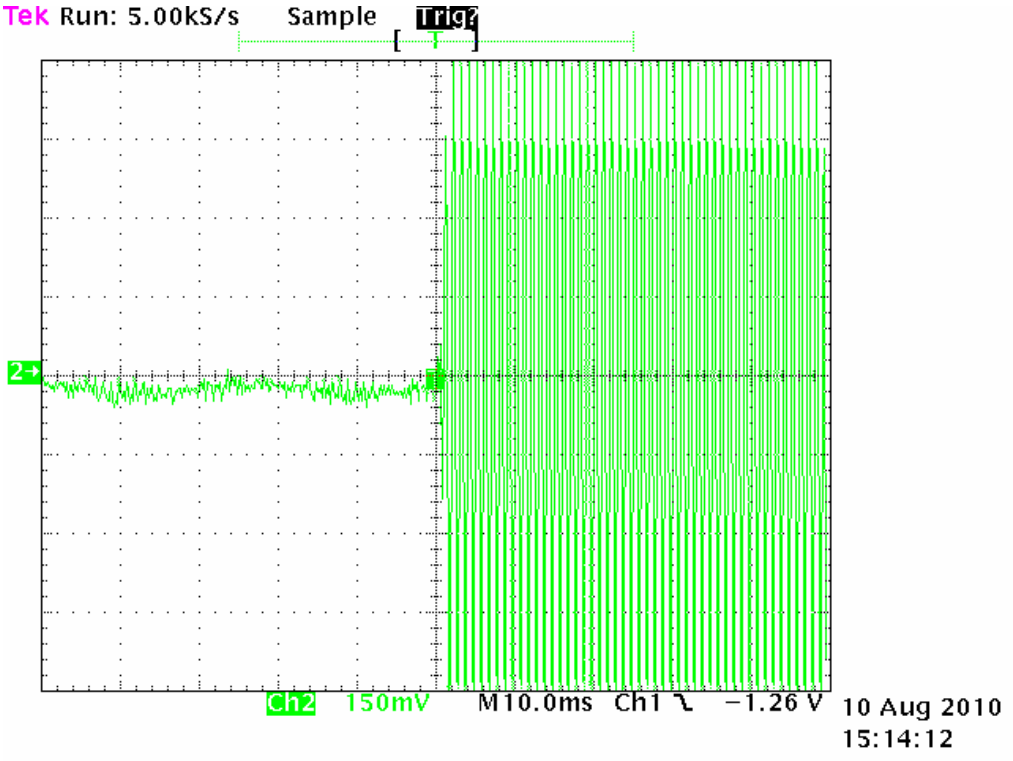
Green trace has been maximised to give full screen indication of a ± 12.5 kHz.
Therefore each Y axis division = 3.125 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

The display of the 1 kHz signal rising has been positioned 5 divisions from the left hand edge (50 ms).

This is position *t*off.

*t*3 occurs between 4.5 and 5.0 divisions from the left hand edge.

No transient response can be observed just before toff.



Radio Frequency Hazard Information

The power level of this transmitter can be set between +15 and +37 dBm.

A maximum power level of +37 dBm (5 watts) has been used in these calculations.

Although the duty cycle is generally low, a duty cycle of 100% is assumed for these calculations.

The power density formula is: $S = P / (4 \pi r^2)$ where:

S= Power Density (W/m^2)
P= Transmitter Power (W) x Antenna Gain (In linear units relative to isotropic).
r = Distance from the observation point to the antenna.

The user manual states a safe distance that should be maintained from the antenna of any system that uses this transmitter based upon the gain of the antenna being used.

The limits contained within CFR 47 Part 1.1311 TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE), (B) Limits for General Population / Uncontrolled Exposure have been applied.

The relevant limit for the range 300 – 1500 MHz is $f/1500$ mW/cm^2

The radio operates over the frequency range of 421 to 512 MHz so the limit has a minimum value at f= 421 MHz.

The limit at this frequency is: $421/1500 = 0.281$ $mW/cm^2 = 2.81$ W/m^2.

A nominal power density of 2.0 W/m^2 has been applied as a safe level.

The following table details the minimum safe distance for various antenna combinations and with the transmitter operating at maximum power (5 watts).

Range of Antenna Gains (dBd)	Maximum Antenna Gain (dBi)	Worst Case EIRP (W)	Power Density (W/m^2)	Safe distance in user manual (metres)
0 to 4	6.15	20.60	1.980	0.91
4 to 8	10.15	51.76	1.986	1.44
8 to 12	14.15	130.0	1.990	2.28
12 to 16	18.15	326.57	1.994	3.61

For example:

An antenna with a maximum antenna gain of 4 dBd (gain over a dipole) is to be used.

This antenna gain converts to 6.15 dBi (gain over an isotropic antenna).

Converting this gain to a linear gain using 10^(6.15/10) gives a gain of 4.121.

The radiated power will therefore be 5 W x 4.121 which gives an EIRP power of 20.60 Watts.

Cable losses have been ignored to give a worst case result.

The safe distance for this antenna would therefore be calculated from: $S = P / (4 \pi r^2)$

Therefore

$2.00\ W/m^2 = 20.60\ W / (4 \pi r^2)$

Re-arranging the formula gives

r = square root (20.60 W / (2.00 W/m² 4 π))
r = 0.91 metres

Result: Complies if the safe distances detailed in the above table, which is derived from the user manual for this transmitter, are applied.

8. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset	Cal Due
Aerial Controller	EMCO	1090	9112-1062	3710	N/a
Aerial Mast	EMCO	1070-1	9203-1661	3708	N/a
Audio Analyzer	Hewlett Packard	8903A	2216A01713	E1146	29 Sept 2011
Biconical Antenna	Schwarzbeck	BBA 9106	-	3802	30 Jan 2011
Frequency Counter	Hewlett Packard	HP 5342A	1916A01713	E1224	9 Oct 2010
Level generator	Anritsu	MG443B	M61689	E1143	2 Oct 2010
Log Periodic	Schwarzbeck	VUSLP9111	9111-228	3785	3 Mar 2013
Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595	7 Apr 2011
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552	21 Oct 2010
Modulation Analyzer	Hewlett Packard	8901B	2608A00782	E1090	27 Jan 2012
Oscilloscope	Tektronics	745A	B010643	1569	9 Oct 2010
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069	N/a
RF Power Meter	Hewlett Packard	HP 436A	2512A22439	E1198	29 Oct 2011
Selective Level Meter	Anritsu	ML422C	M35386	E1140	29 Sept 2011
Signal Generator	Rohde & Schwarz	SMHU58	838923/028	E1493	22 Oct 2010
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776	14 Oct 2010
Spectrum Analyzer	Rohde & Schwarz	ESIB 40	100171	4003	10 Jun 2011
Thermal chamber	Contherm	M180F	86025	E1129	N/a
Thermometer	DSIR	RT200	035	E1049	17 Nov 2010
Turntable	EMCO	1080-1-2.1	9109-1578	3709	N/a
Horn antenna	Electrometrics	RGA-60	6234	E1494	3 May 2011

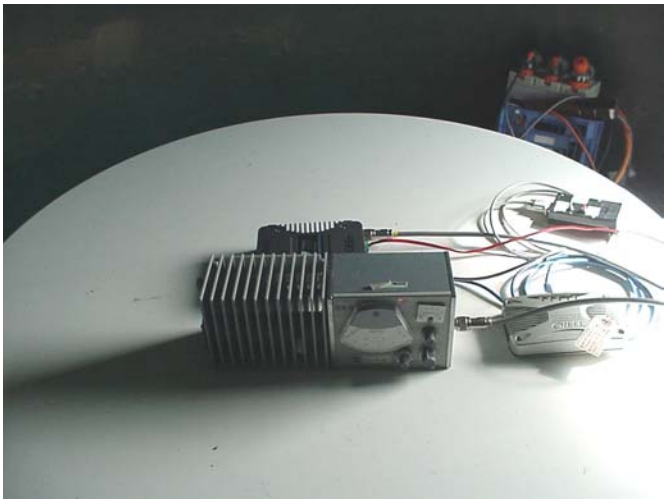
9. ACCREDITATIONS

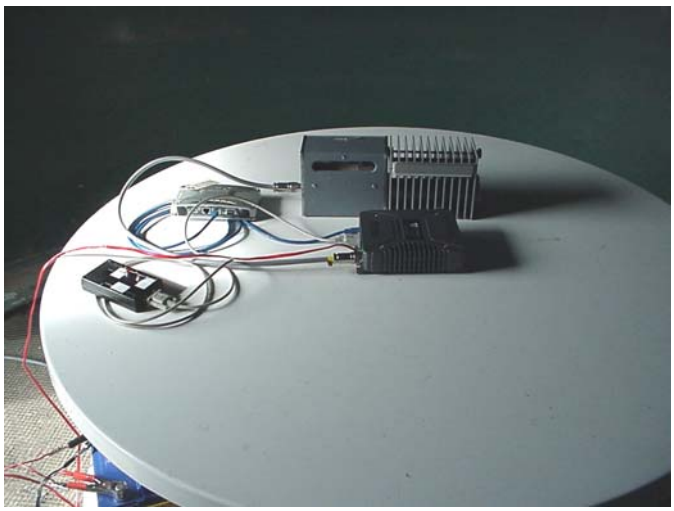
Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was last updated in January 2010.

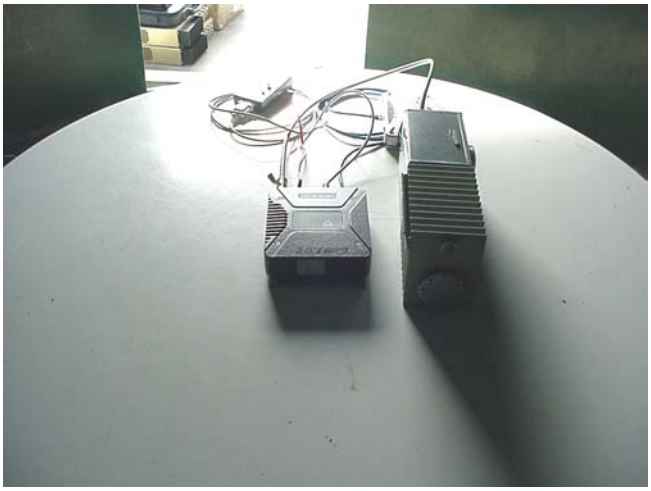
All testing has been carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to ISO/IEC 17025.

All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to ISO/IEC 17025.

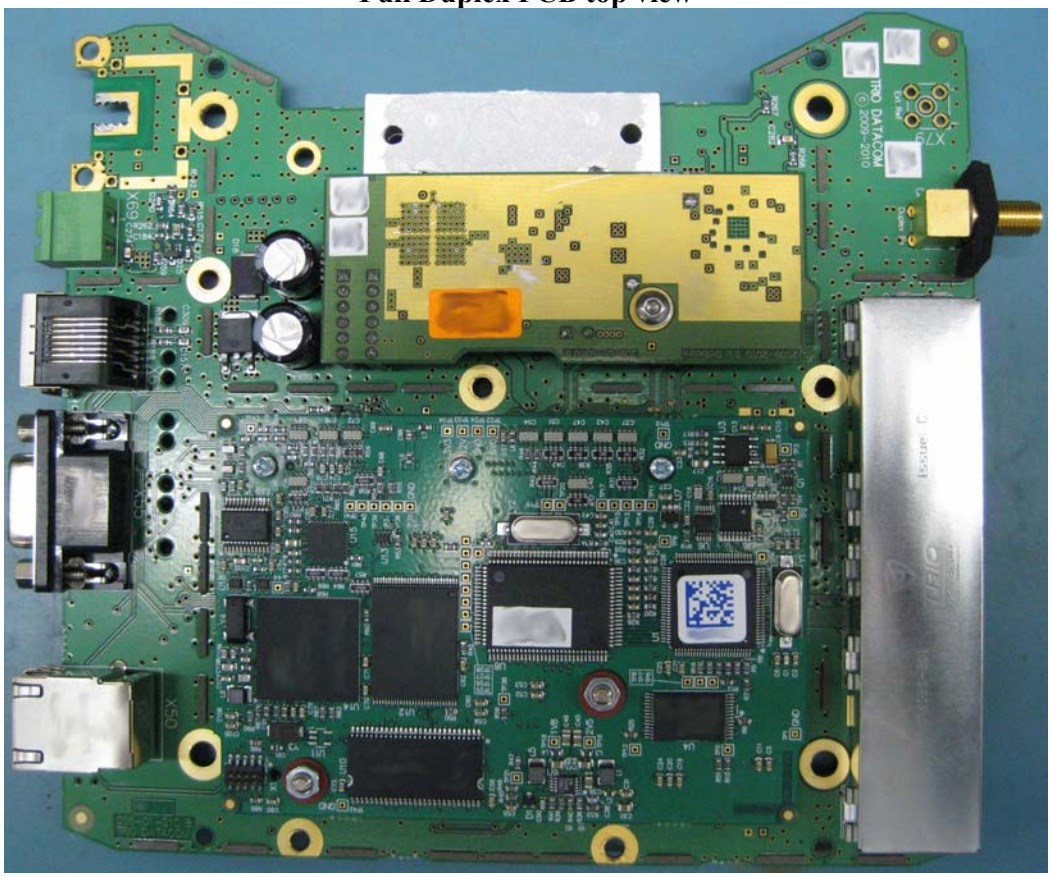
Radiated emissions test set up



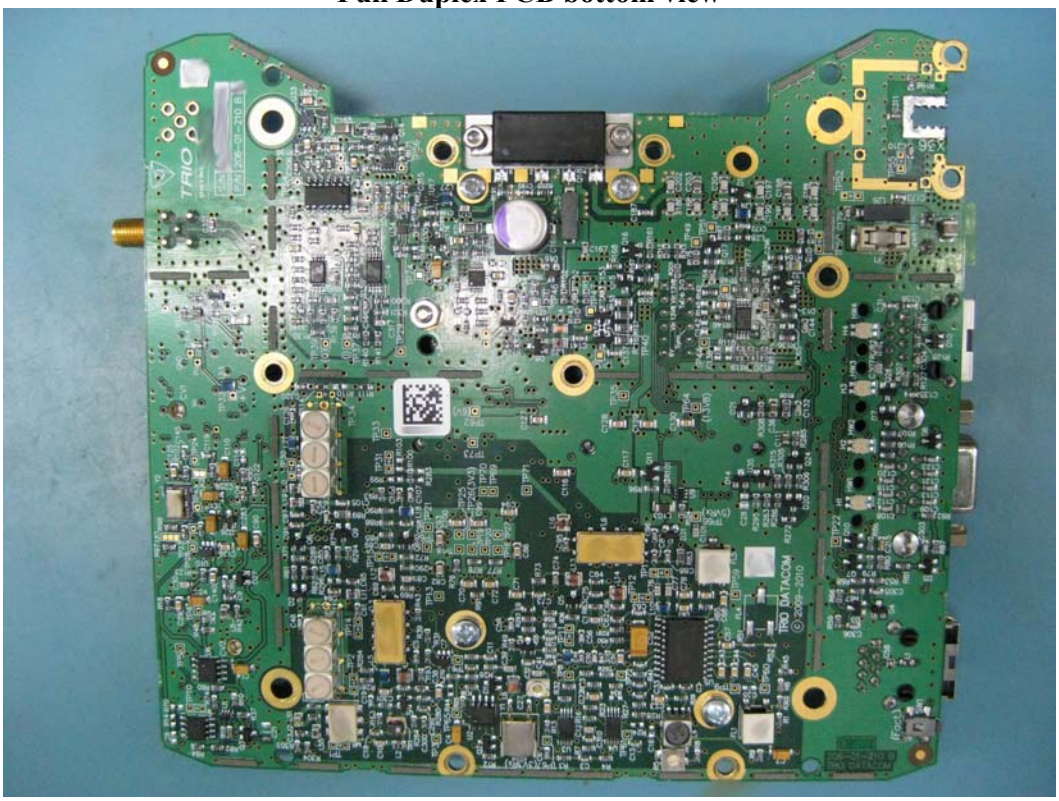




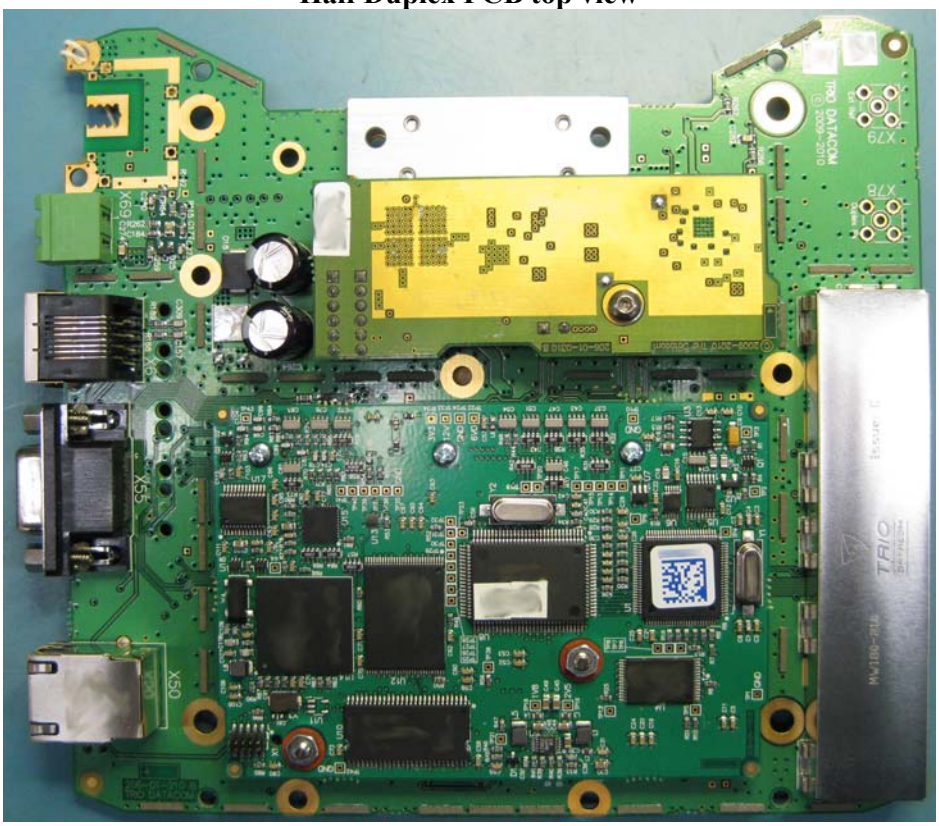
Internal Photo's
Full Duplex PCB top view



Full Duplex PCB bottom view



Half Duplex PCB top view



Half duplex PCB bottom view