EMC Technologies (NZ) Ltd
PO Box 68-307, Newton
Auckland
New Zealand
Phone 09 360 0862
Fax 09 360 0861
E-Mail Address: aucklab@ihug.co.nz
Web Site: www.emctech.com.au

TEST REPORT

Trio Datacom QB450 / QP450 UHF Base Station

tested to the

Code of Federal Regulations (CFR) 47

Part 90 –Private Land Mobile Services

for

Trio Datacom Pty Ltd

This Test Report is issued with the authority of:

Andrew Cutler- General Manager

IANZ ACCREDITED LABORATORY

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

Table of Contents

1. COMPLIANCE STATEMENT

The **Trio Datacom QB450 / QP450 UHF Base Station** complies with the limits defined in 47 CFR Part 90 and 47 CFR Part 2 when tested in-accordance with the test methods described in 47 CFR Part 2 and ANSI / TIA-603-C.

2. RESULT SUMMARY

The results of testing carried out in October 2014 and February 2015 are summarised below.

Clause	Description	Result
90.203	Certification required	Noted
2.1046 90.205	RF power output Power and antenna height limits	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
1.1310	Radio frequency exposure limits	Complies

3. ATTESTATION

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.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

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

4. CLIENT INFORMATION

Company Name	Trio Datacom Pty Ltd
Address	41 Aster Avenue Carrum Downs 3201 Victoria
Country	Australia
Contact	Mr David Rowntree

5. TEST SAMPLE DESCRIPTION

Brand Name	Trio Datacom
Model Number	QB450 & QP450
Product	UHF Base Station
Manufacturer	Trio Datacom
Serial Number	700600, 700601
FCC ID	NI8QB450QP450

This report covers model numbers QB450 and QP450.

Both models are electrically identical and are configured as follows:

The QB450 uses one remote module for transmit and another module for receive allowing the base station to operate in Full Duplex mode if required.

The QP450 has two modules configured in both transmit and receive mode.

The QP450 uses one module with other module as a backup in case of failure.

Product overview

The QB450 and QP450 are UHF base stations that can be configured to have an output power between 50 mW to 10.0 W.

The radio has the following ports:

- Three Ethernet ports
- Dual RS232 data port
- USB configuration port
- Transmit Type-N connector
- Receive Type-N connector
- DC power input and output
- Three digital inputs
- Three digital outputs
- Auxiliary port for connection to a Hot Standby Controller

Internally there are five printed circuit boards.

2 radio circuit boards (modules), each of which contains the following sections:

- IQ Modulator
- Two PLL and VCO's for the transmitter and one for the receiver
- Transmitter driver circuitry and PA module
- Transmitter low pass filter and directional coupler for the Cartesian loop
- Single conversion receiver with tracking filter and ADC to digitise the IF
- FPGA to implement modem
- Microprocessor
- Main processor running Linux operating system with LAN interfaces
- 11 – 30 volt switch mode power supply

An I/O printed circuit board which contains the I/O circuitry and provides power to a Hot Standby Controller.

A low voltage printed circuit board which contains protection for the input supply rails.

A front panel printed circuit board which contains the following:

- Interface circuitry for the USB, Ethernet and serial connections
- Indicator LEDs
- Signal switching
- An Ethernet switch
- Power supplies
- LED and fan control circuitry

The sample tested has the following specifications:

Rated Transmitter Output Power

50 mW (+17.0 dBm) to 10 watts (+40 dBm)

Transmitter Certification Frequency Bands

Part 90: 421 - 512 MHz

Test frequencies

Frequency (MHz)	Power (Watts)	Emission
425.000	10.0	F1D
469.000	10.0	F1D
511.000	10.0	F1D

Power Supply

DC voltage supply typically 13.8 Vdc

Standard Temperature and Humidity

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

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: 11.0 Vdc
Low Voltage: 30.0 Vdc

6. TEST RESULTS

Certification required

Part 90.203(j)

4) Applications for part 90 certification of transmitters designed to operate on frequencies in the 150.8–162.0125 MHz, 173.2–173.4 MHz, and/or 421–512 MHz bands, received on or after January 1, 2011,

(ii) 12.5 kHz for multi-bandwidth mode equipment with a maximum channel bandwidth of 12.5 kHz if it is capable of operating on channels of 6.25 kHz or less;

(iii) 25 kHz for multi-bandwidth mode equipment with a maximum channel bandwidth of 25 kHz if it is capable of operating on channels of 6.25 kHz or less; and

(iv) Up to 25 kHz if the equipment meets the efficiency standard of paragraph (j)(5) of this section.

(5), Applications for part 90 certification of transmitters designed to operate on frequencies in the 150.8–162.0125 MHz, 173.2–173.4 MHz, and/or 421–512 MHz bands, after January 1, 2011, must include a certification that the equipment meets a spectrum efficiency standard of one voice channel per 6.25 kHz of channel bandwidth.

Additionally, if the equipment is capable of transmitting data, has transmitter output power greater than 500 mW, and has a channel bandwidth of more than 6.25 kHz, the equipment must be capable of supporting a minimum data rate of 4800 bits per second 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.

Testing was carried out at maximum power output.

Frequency (MHz)	Voltage (Vdc)	Rated (dBm)	Measured (dBm)
425.000	30.0	40.0	39.1
425.000	13.8	40.0	39.1
425.000	11.0	40.0	39.0
469.000	30.0	40.0	39.2
469.000	13.8	40.0	39.2
469.000	11.0	40.0	39.1
511.000	30.0	40.0	39.7
511.000	13.8	40.0	39.7
511.000	11.0	40.0	39.7

Limits:

Part 90 does not specify the transmitter output power.

Result: Complies.
Measurement Uncertainty: ± 0.5 dB

Emission types and bandwidth limitations:

The following emission types are used:

- F1D: Digital CPM Continuous Phase Modulation with 12.5 kHz channelling for data.
- F1D: Digital CPM Continuous Phase Modulation with 25.0 kHz channelling for data.

For 12.5 kHz Digital Modulation emission designators 9k6F1D utilising 9600 bps modulation and 11k2F1D utilising 8, 16, 24 and 32kbps have been declared by the client.

For 25.0 kHz Digital Modulation emission designators 20k0F1D has been declared by the client.

The authorised bandwidth is taken to be the necessary bandwidth.

Measurements have been made to verify this declared bandwidth with the highest modulation data rates to show worst case.

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

Measurements have been made 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.

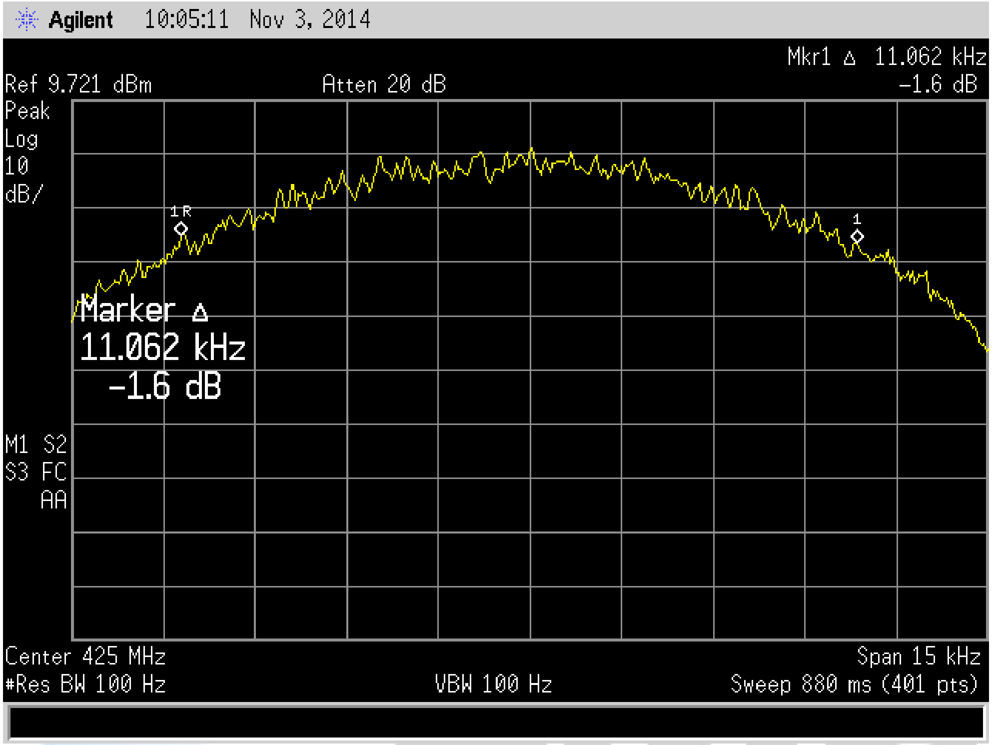
This level is used as a reference level on the spectrum analyser.

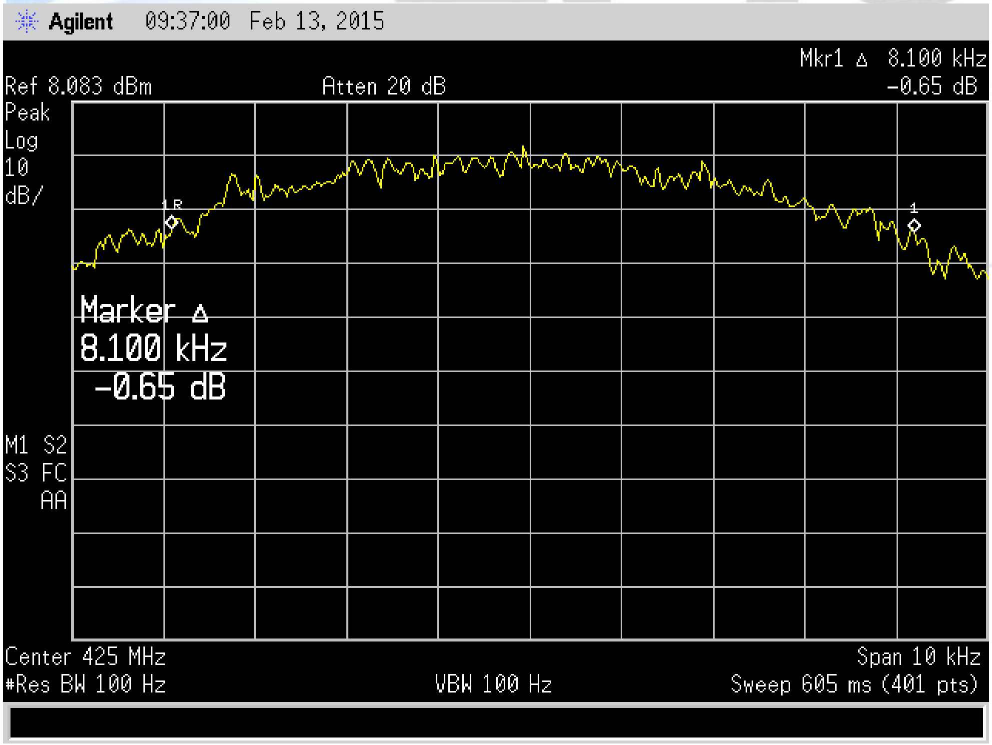
The resolution bandwidth is then changed and the reference level minus 23 dB (99%) absolute bandwidth points determined.

Result: Complies

425.000 MHz F1D – 12.5 KHz spacing

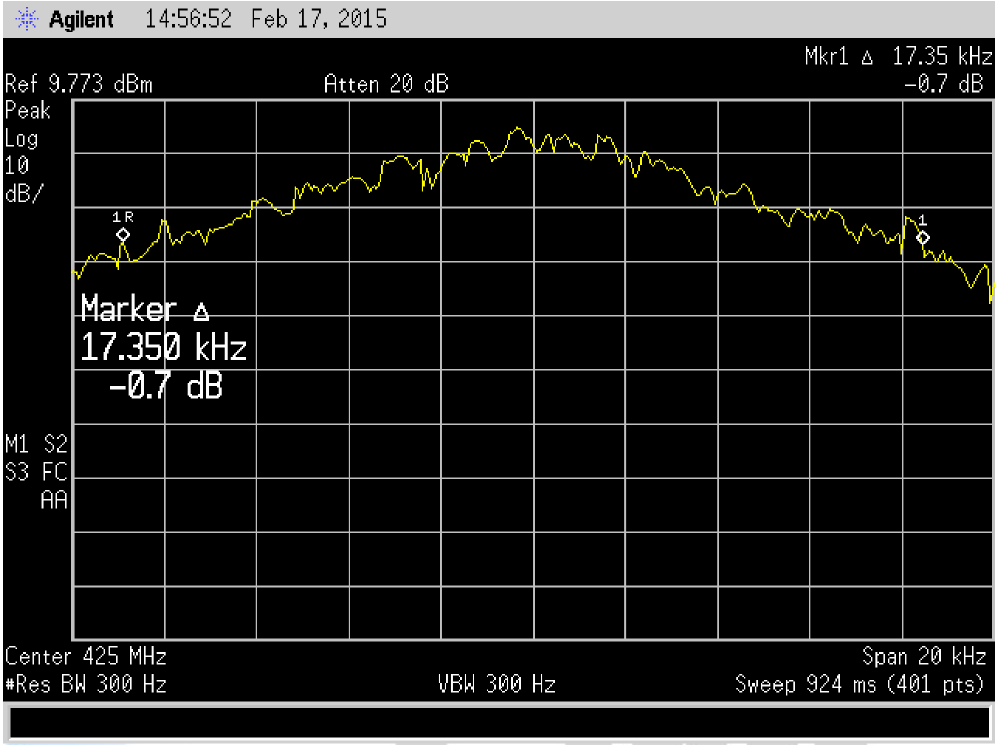
Emission	Channel	Measured	Designated
F1D	12.500 kHz	11.062 kHz	11.200 kHz
F1D	12.500 kHz	8.100 kHz	9.600 kHz





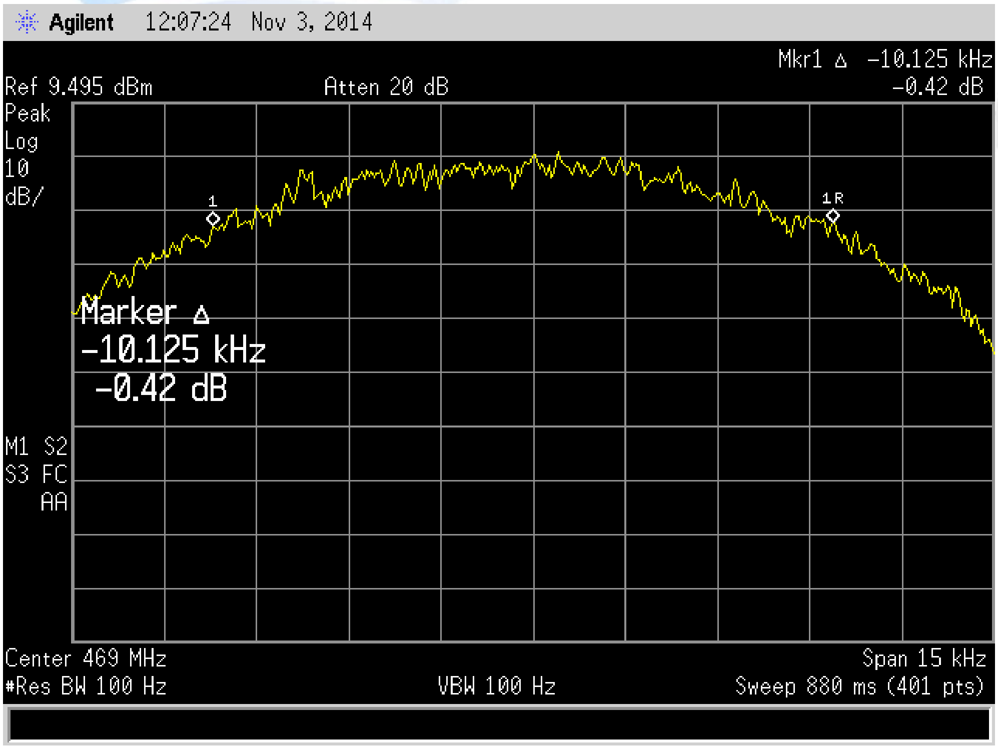
425.000 MHz F1D – 25.0 KHz spacing

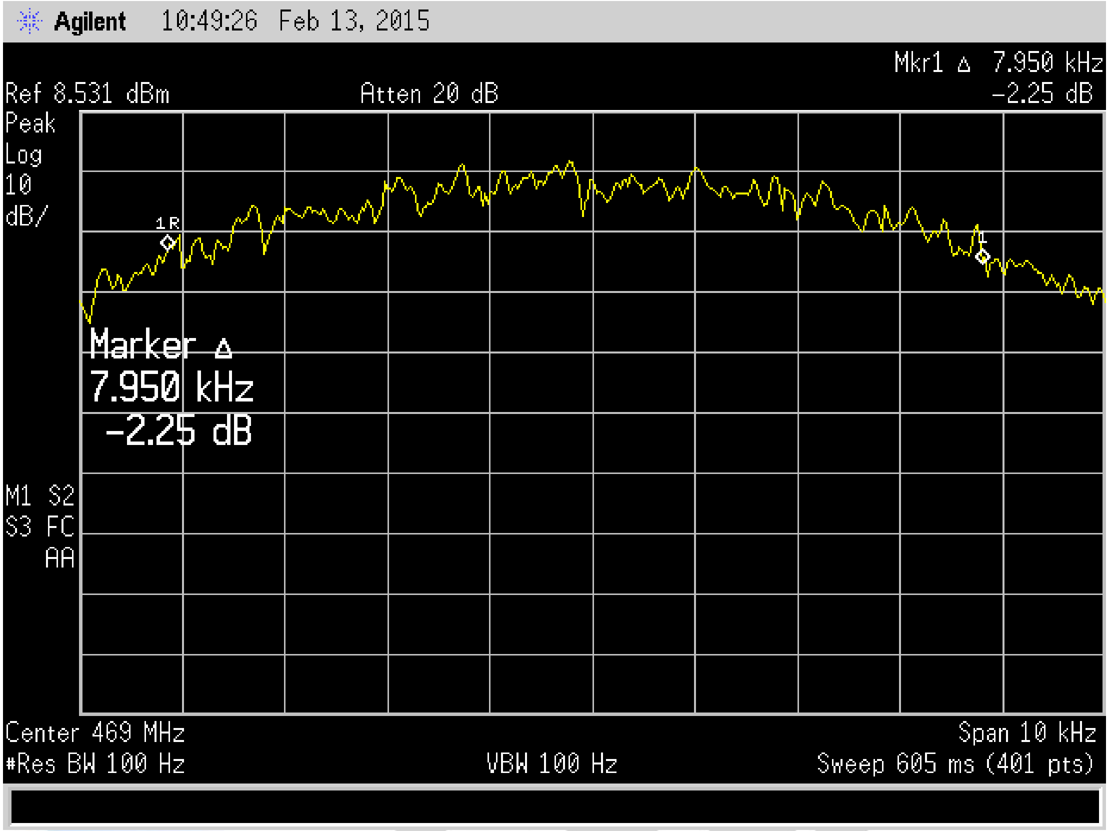
Emission	Channel	Measured	Designated
F1D	25.000 kHz	17.350 kHz	20.000 kHz



469.000 MHz F1D – 12.5 KHz spacing

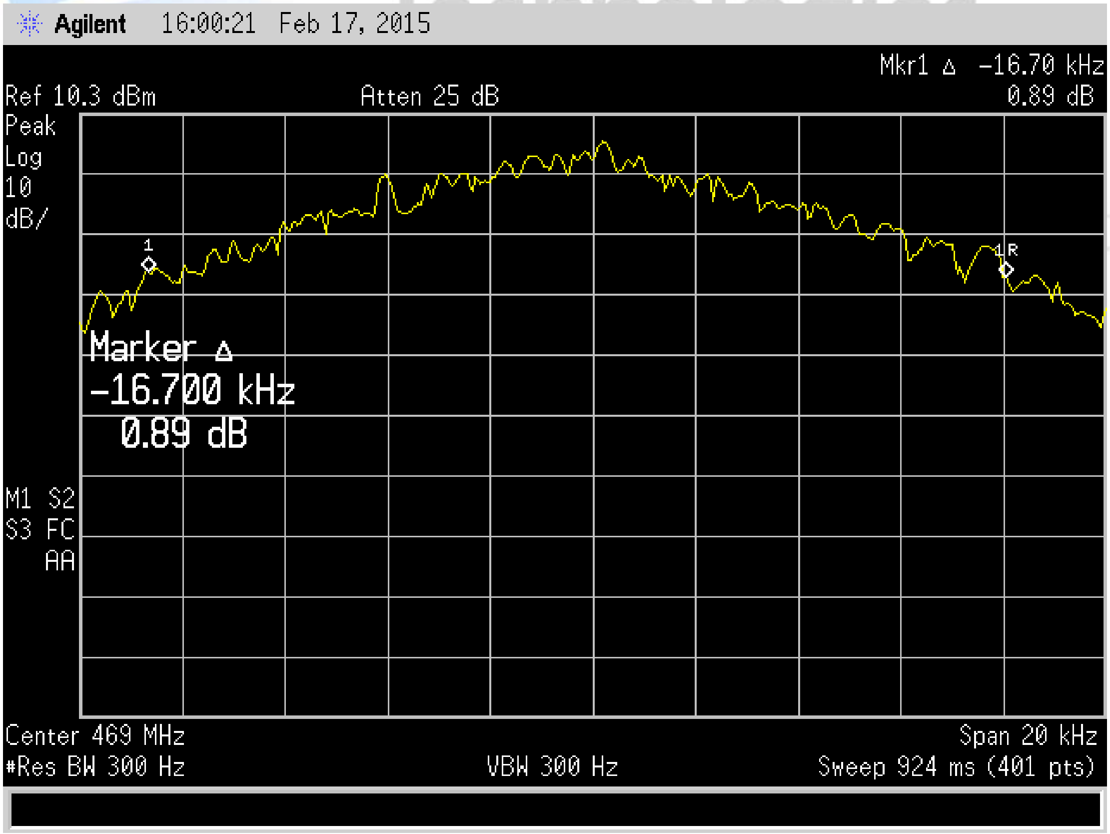
Emission	Channel	Measured	Designated
F1D	12.500 kHz	10.125 kHz	11.200 kHz
F1D	12.500 kHz	7.950 kHz	9.600 kHz





469.000 MHz F1D – 25.0 KHz spacing

Emission	Channel	Measured	Designated
F1D	25.000 kHz	16.700 kHz	20.000 kHz



Spectrum Masks

The spectrum masks are defined in:

Section 90.210(d) – Mask D has been applied as the transmitter can operate in the band 421 - 512 MHz using an authorised bandwidth of 12.5 kHz as per Section 90.209(b)(5).

Section 90.210(c) – Mask C has been applied as the transmitter can operate in the band 421 - 512 MHz using an authorised bandwidth of 25.0 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.

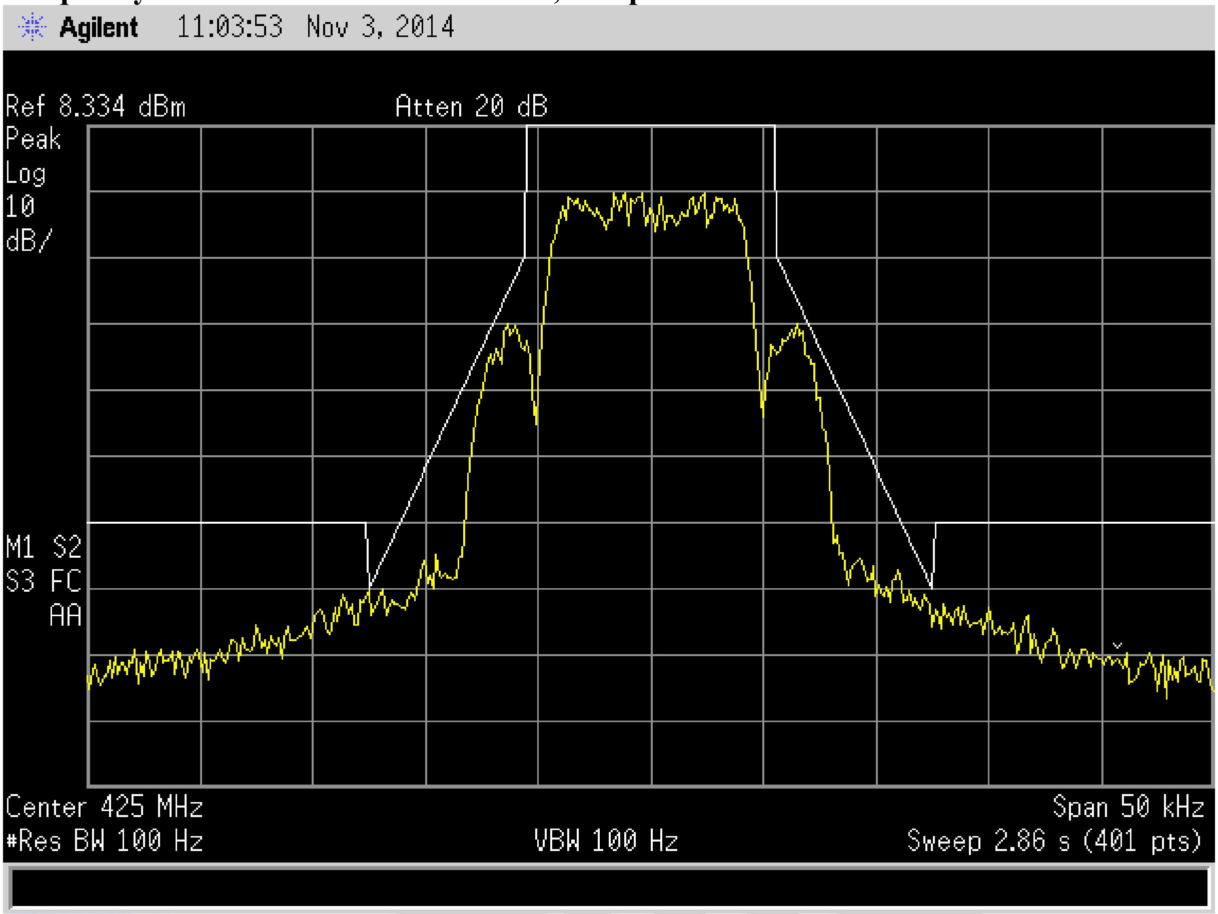
All measurements have been made with a -30 dB correction factor as a 30 dB attenuator is placed between the transmitter and the spectrum analyser.

Measurements were made in peak hold with the transmitter operating on 425 MHz, 469 MHz and 511 MHz.

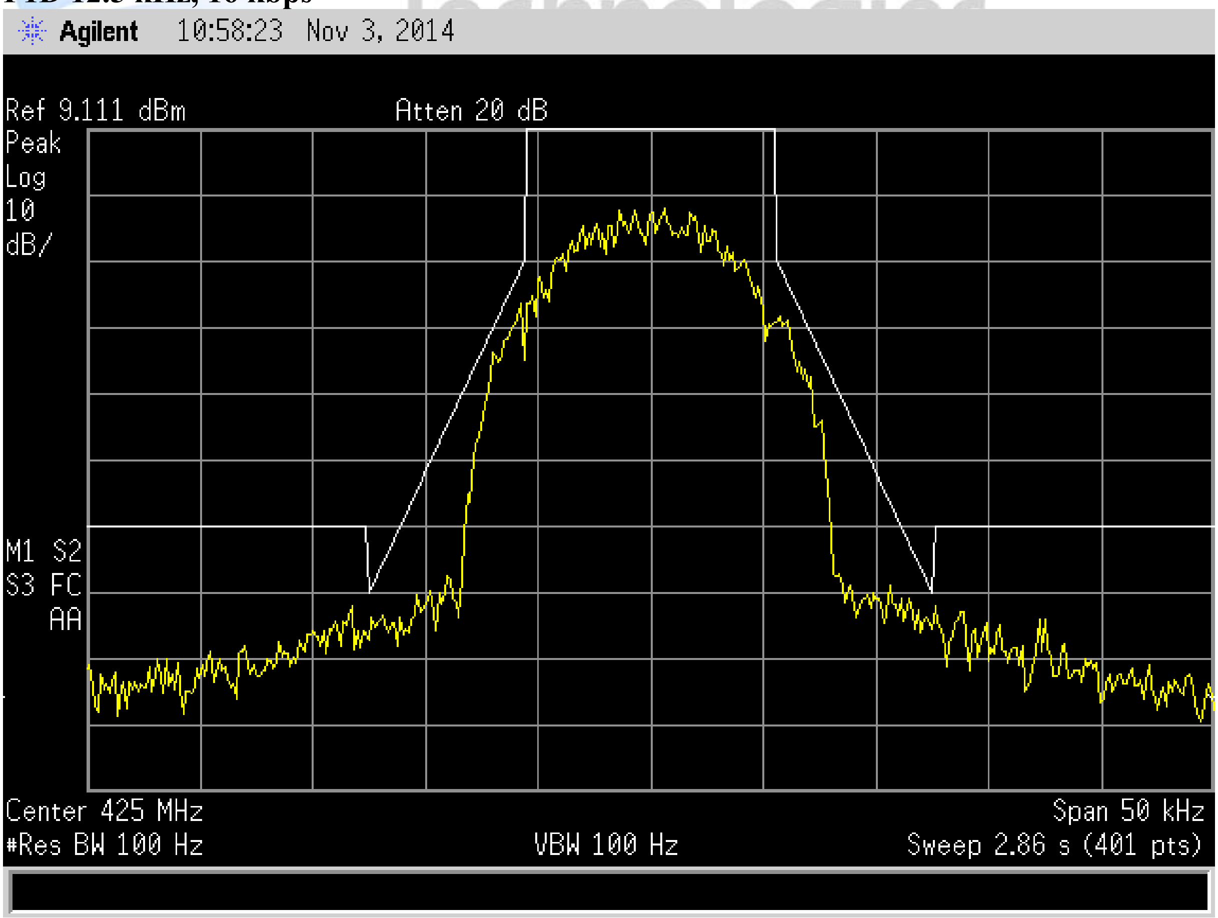
For the F1D mode the transmitter was modulated using the modulation sources internal to the transmitter as supplied by the client.

Result: Complies.

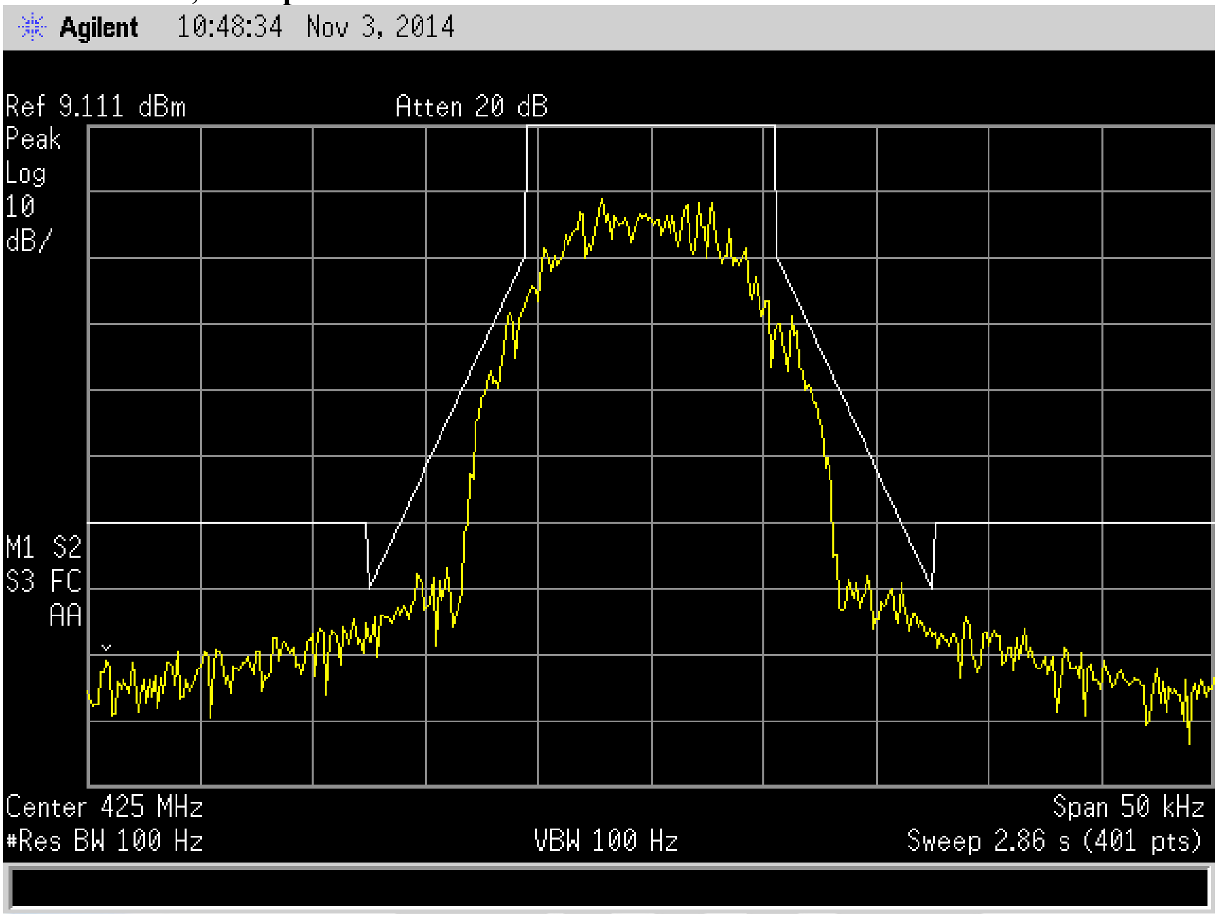
Frequency: 425.000 MHz. F1D 12.5 kHz, 8 kbps



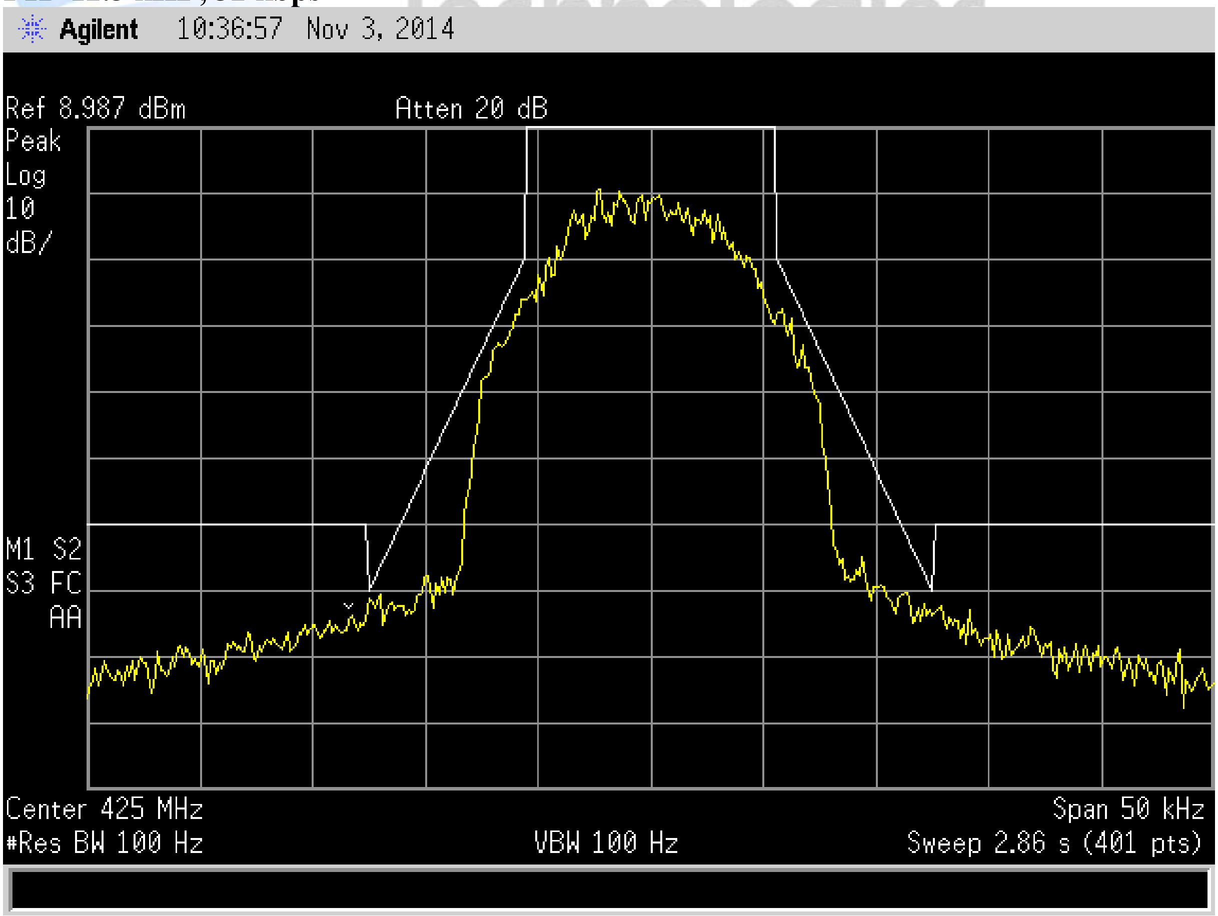
F1D 12.5 kHz, 16 kbps



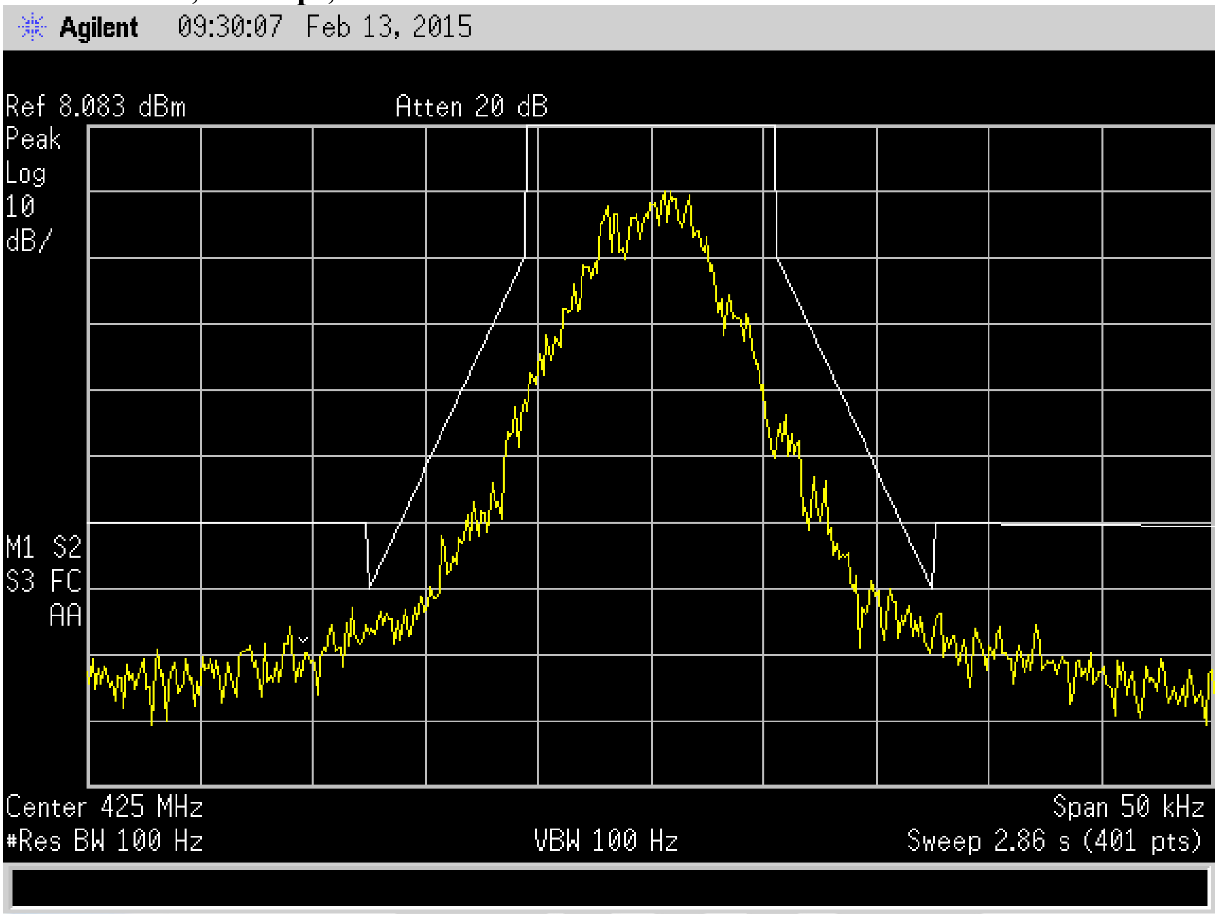
F1D 12.5 kHz, 24 kbps



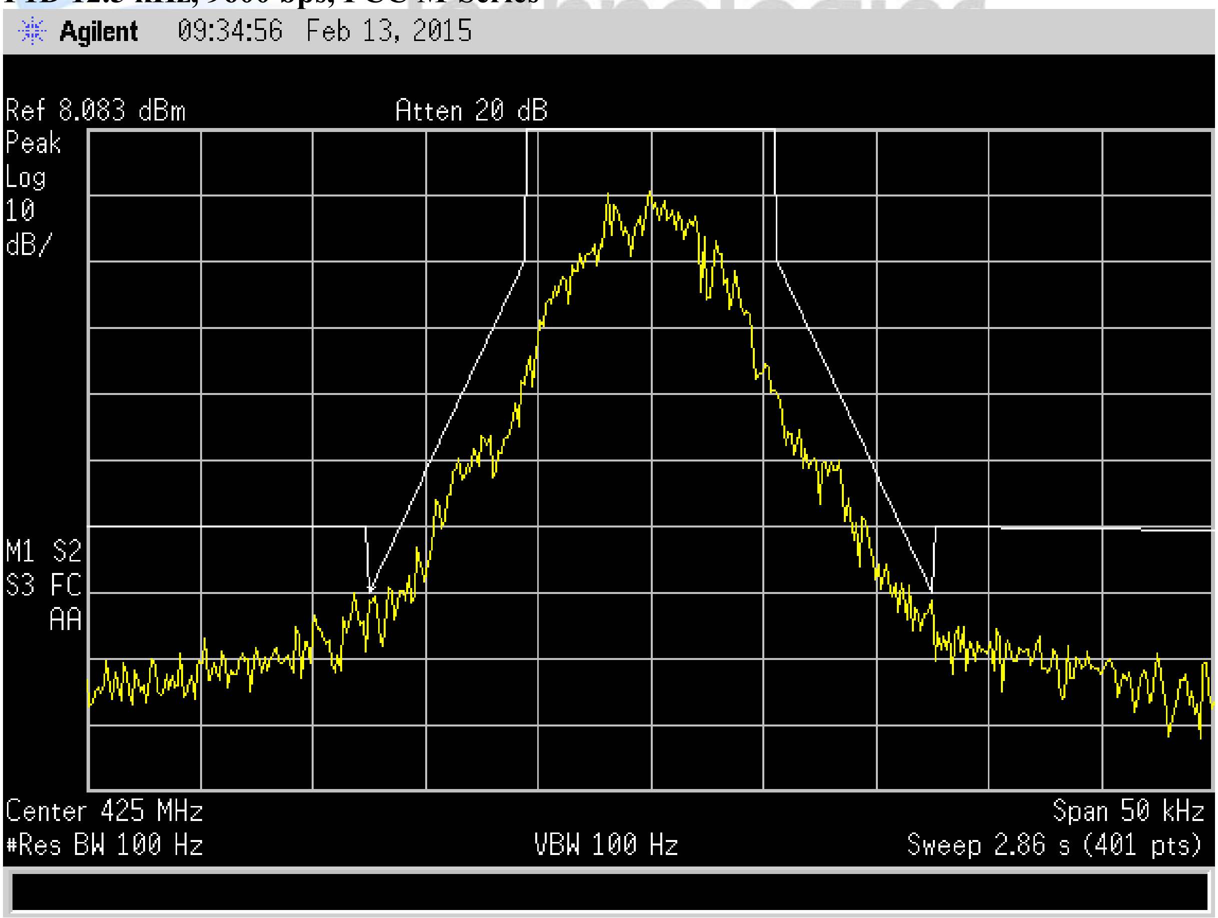
F1D 12.5 kHz , 32 kbps



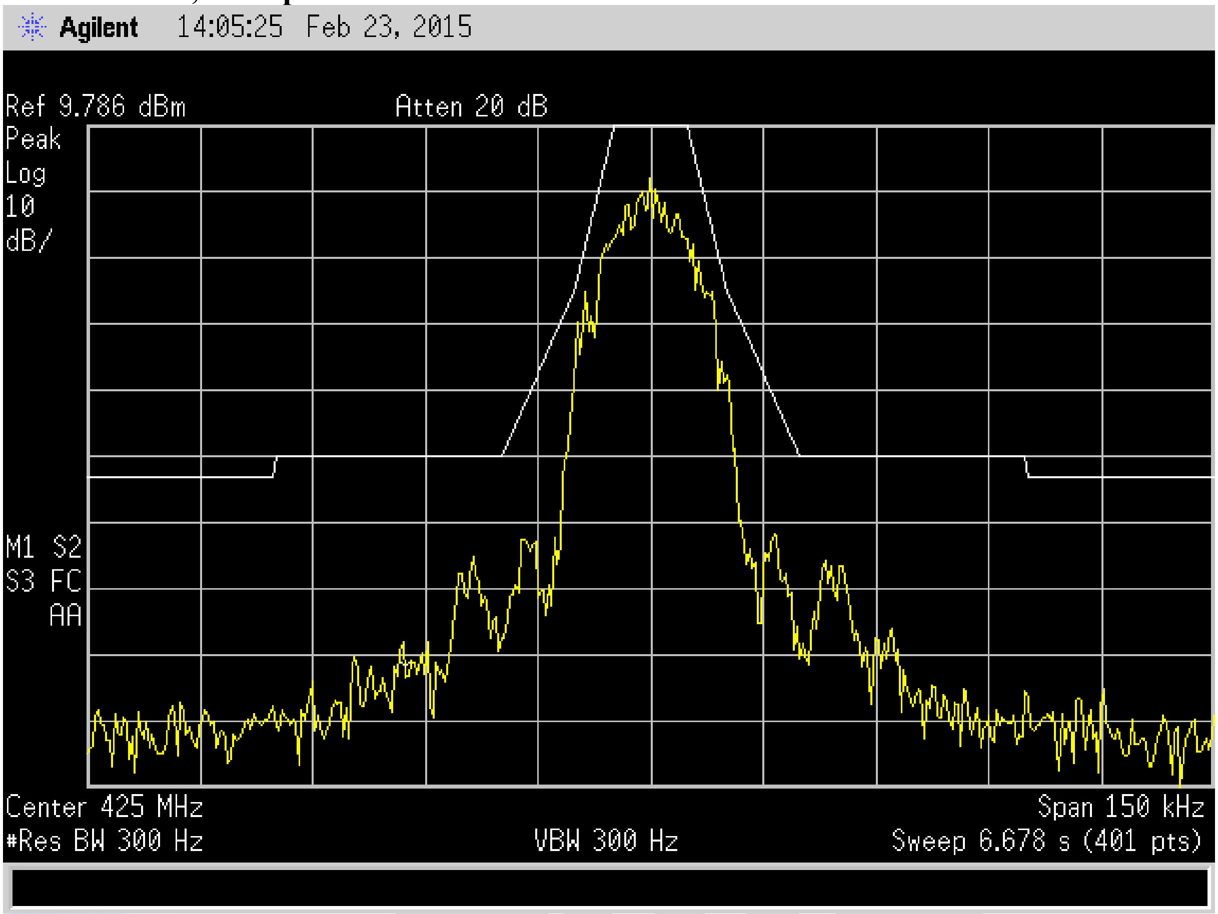
F1D 12.5 kHz, 9600 bps, FCC 4-Level



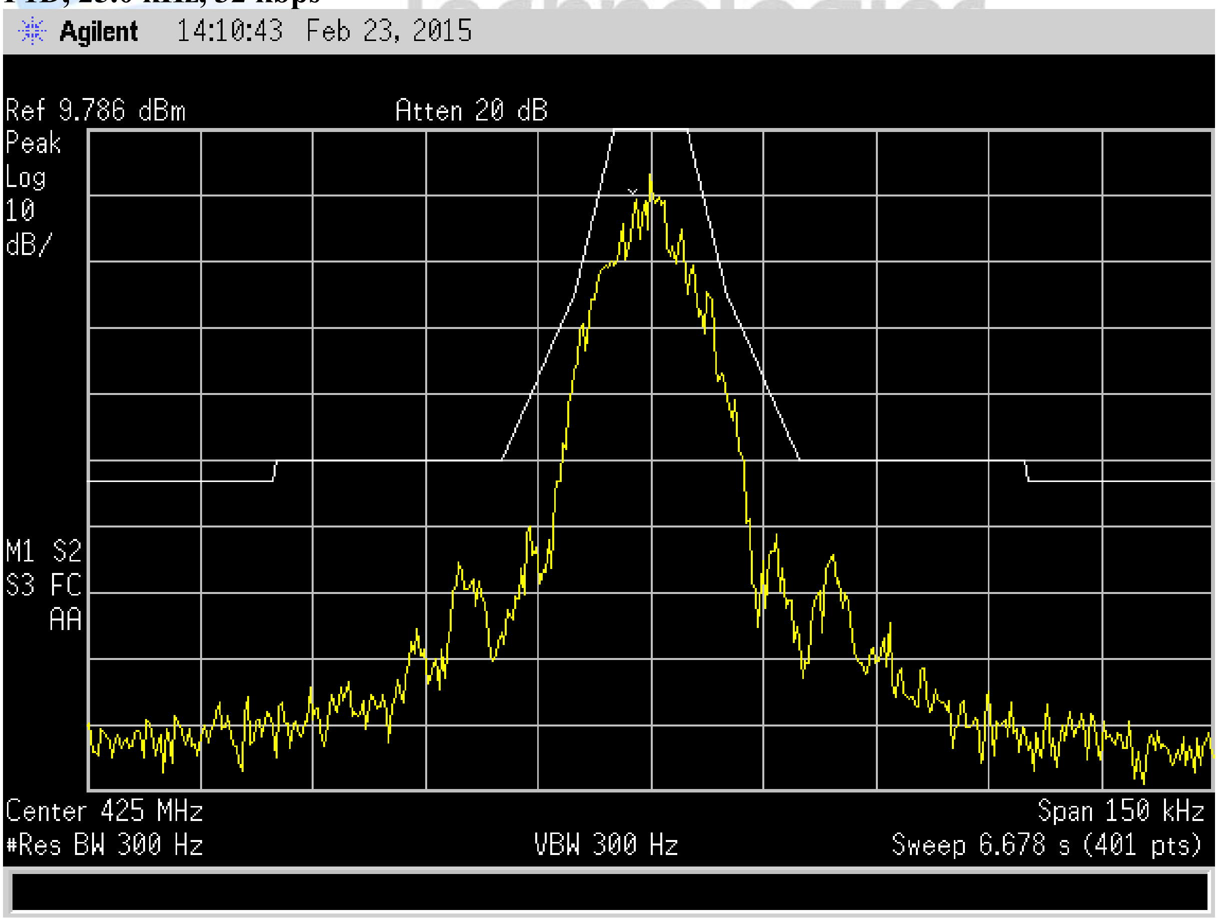
F1D 12.5 kHz, 9600 bps, FCC M-Series



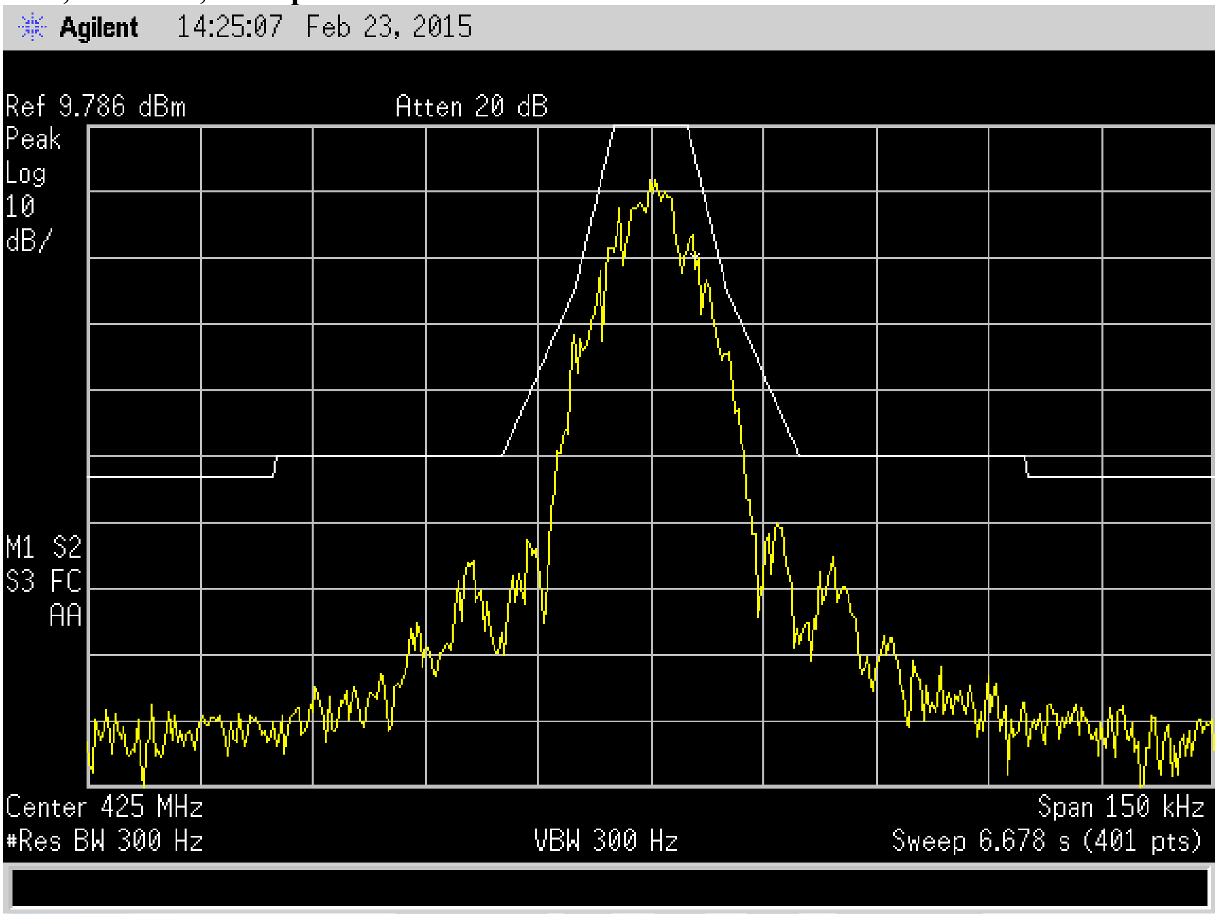
F1D 25.0 kHz, 16 kbps



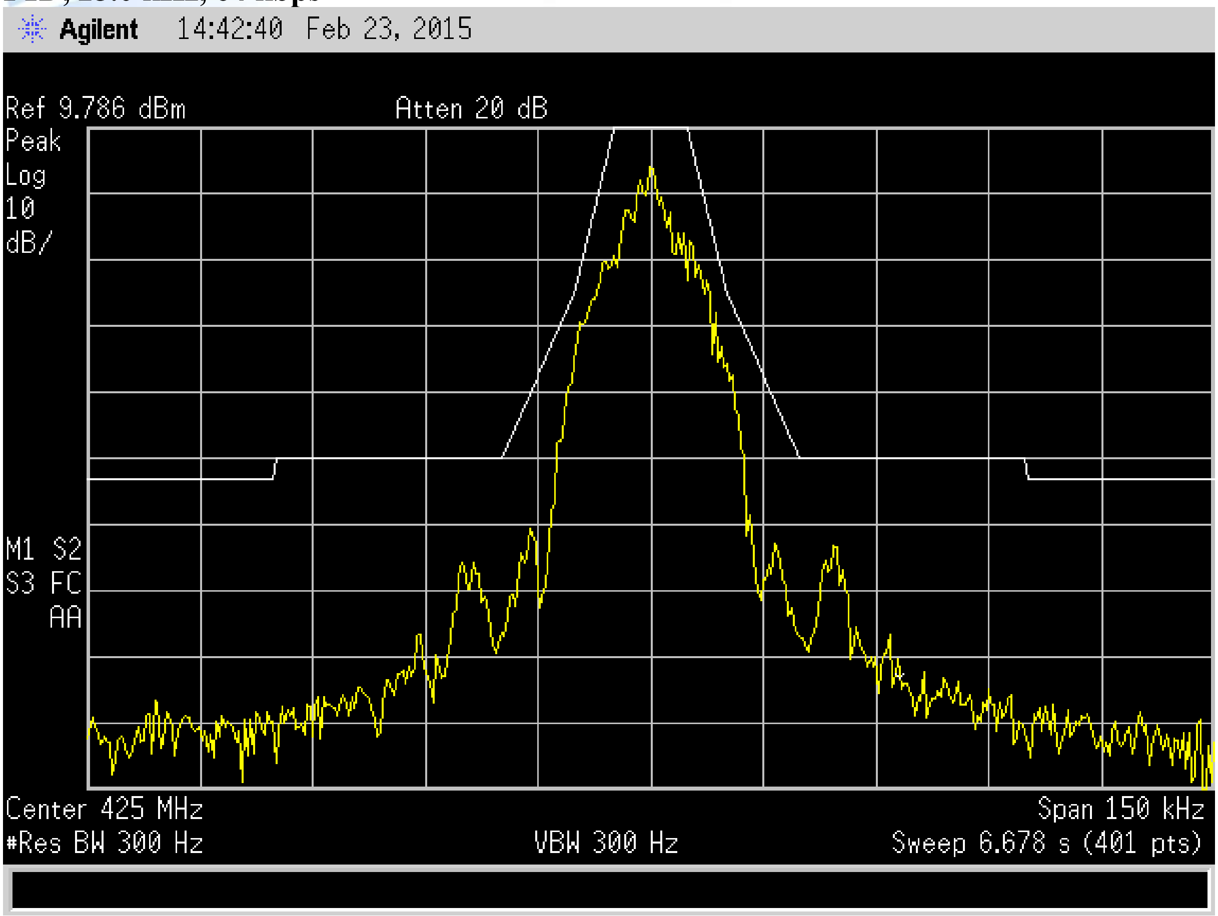
F1D, 25.0 kHz, 32 kbps



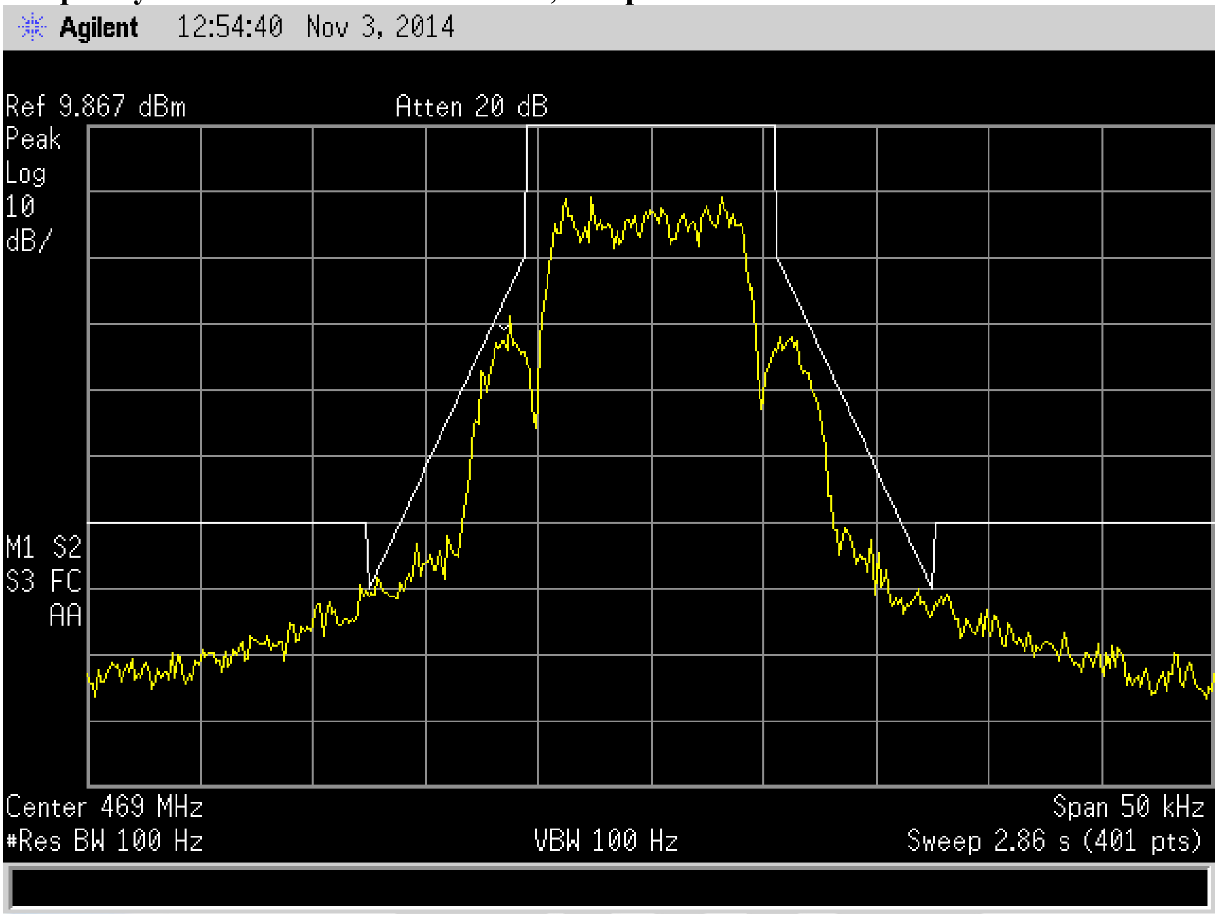
F1D, 25.0 kHz, 48 kbps



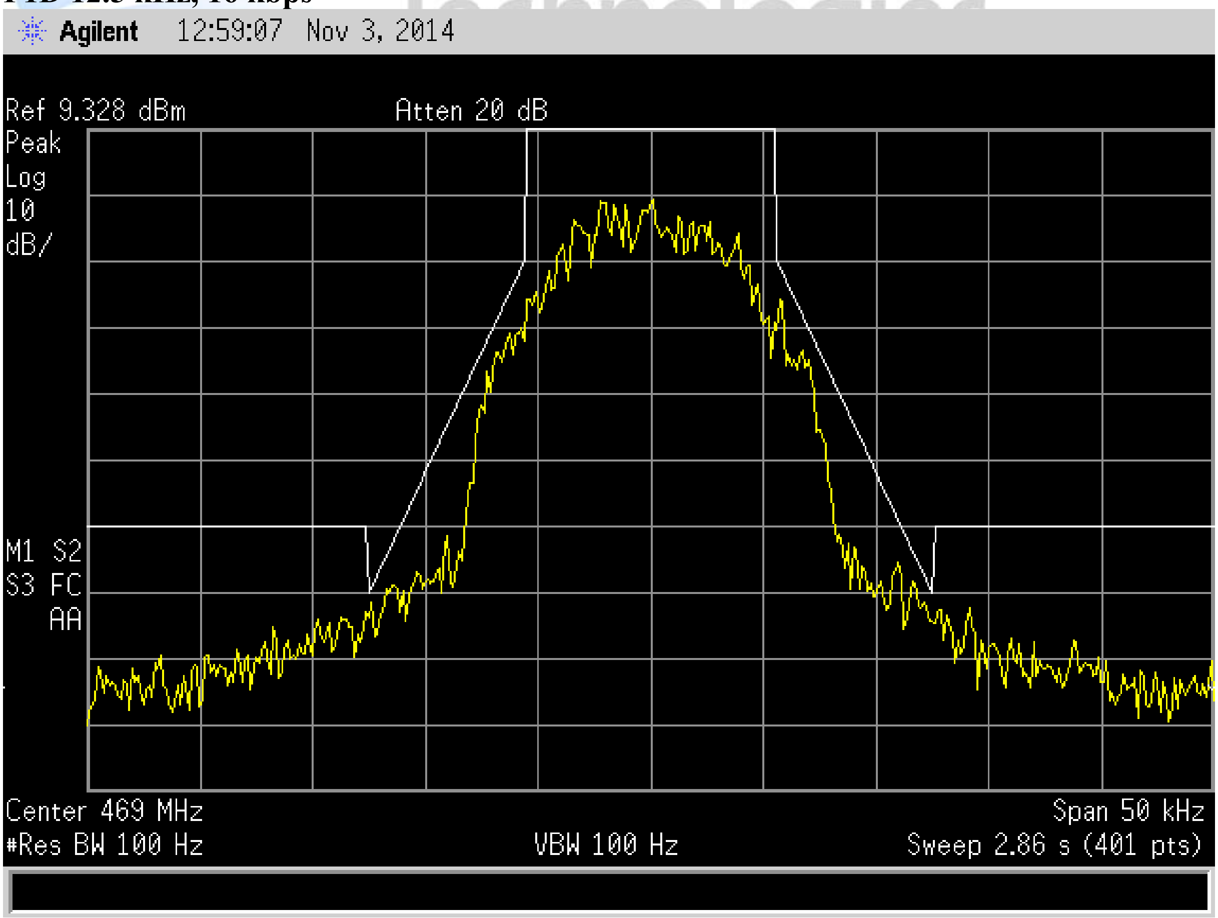
F1D, 25.0 kHz, 64 kbps



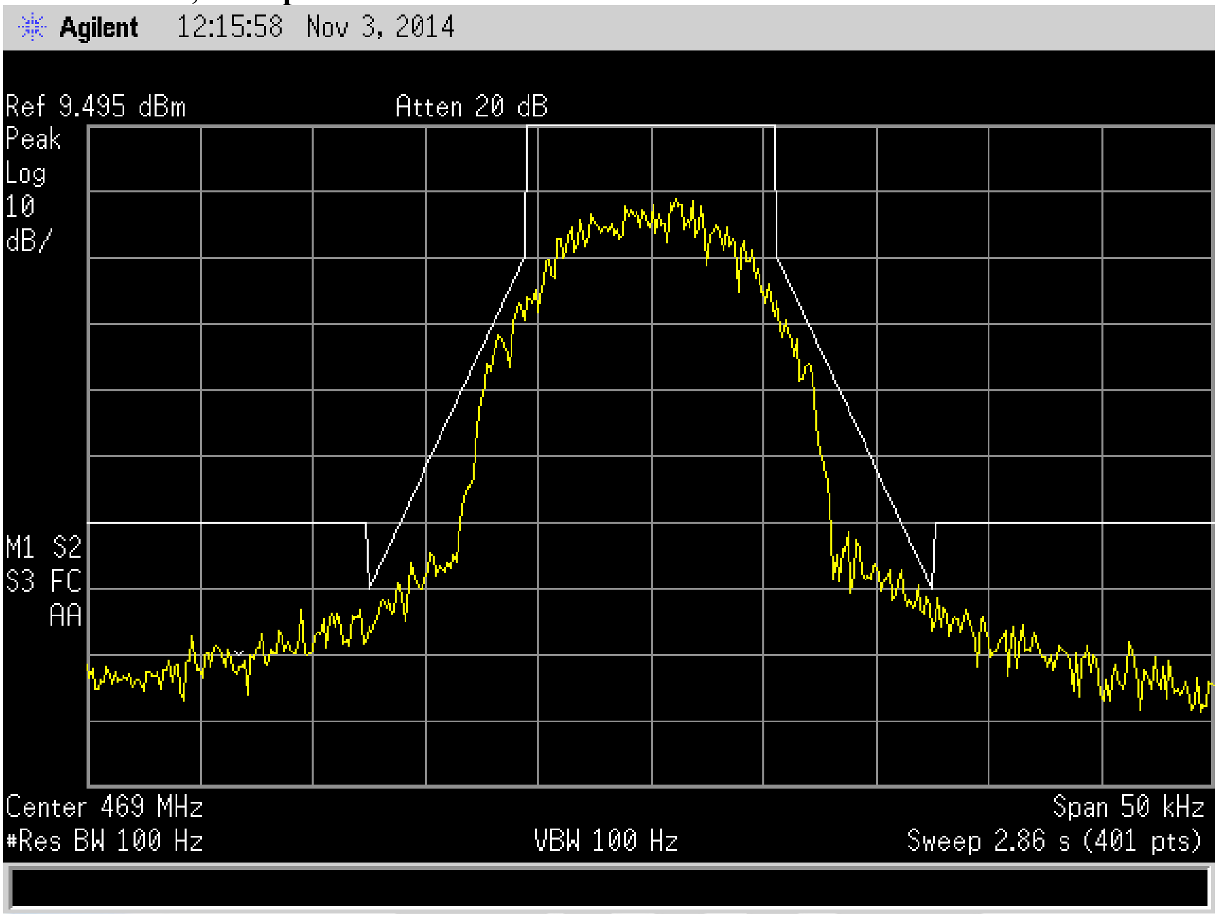
Frequency: 469.000 MHz. **F1D 12.5 kHz, 8 kbps**



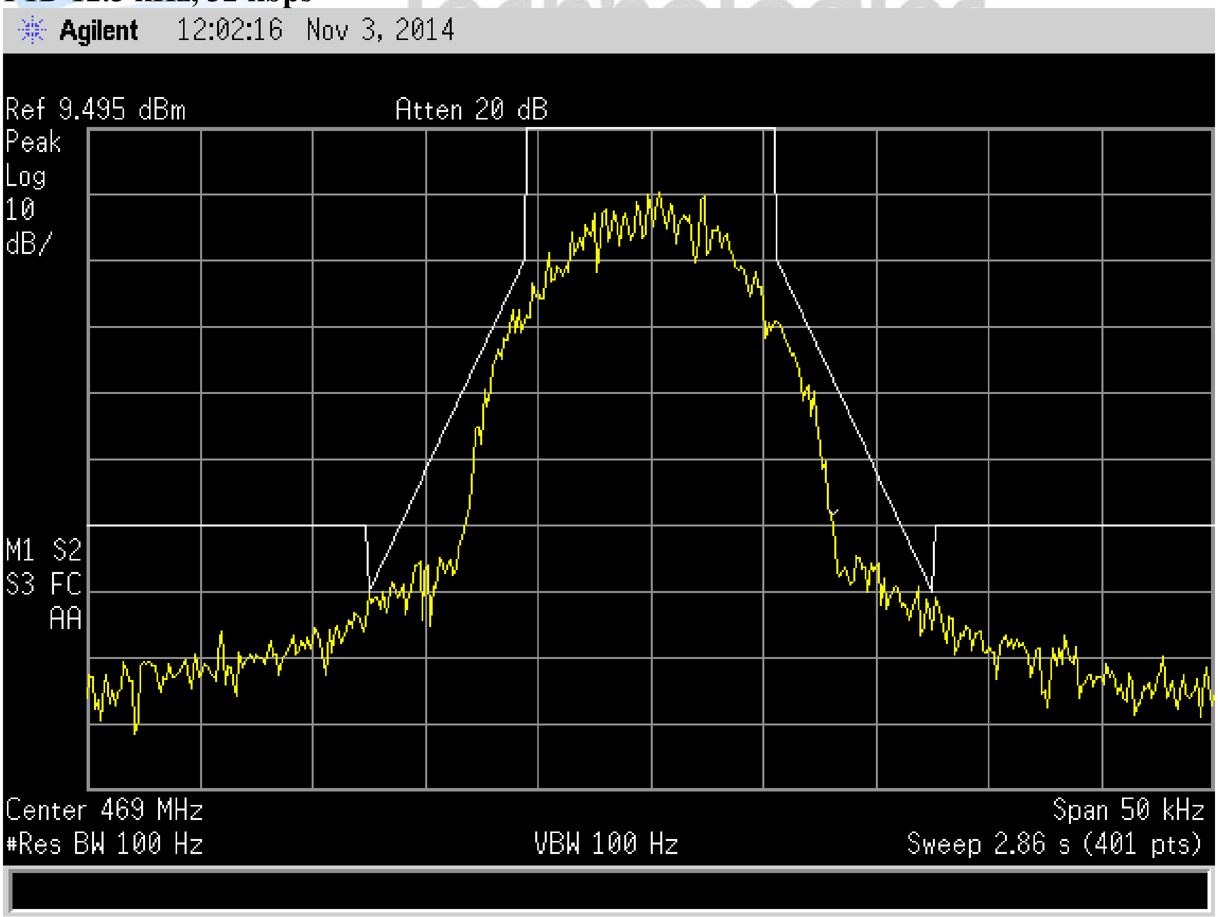
F1D 12.5 kHz, 16 kbps



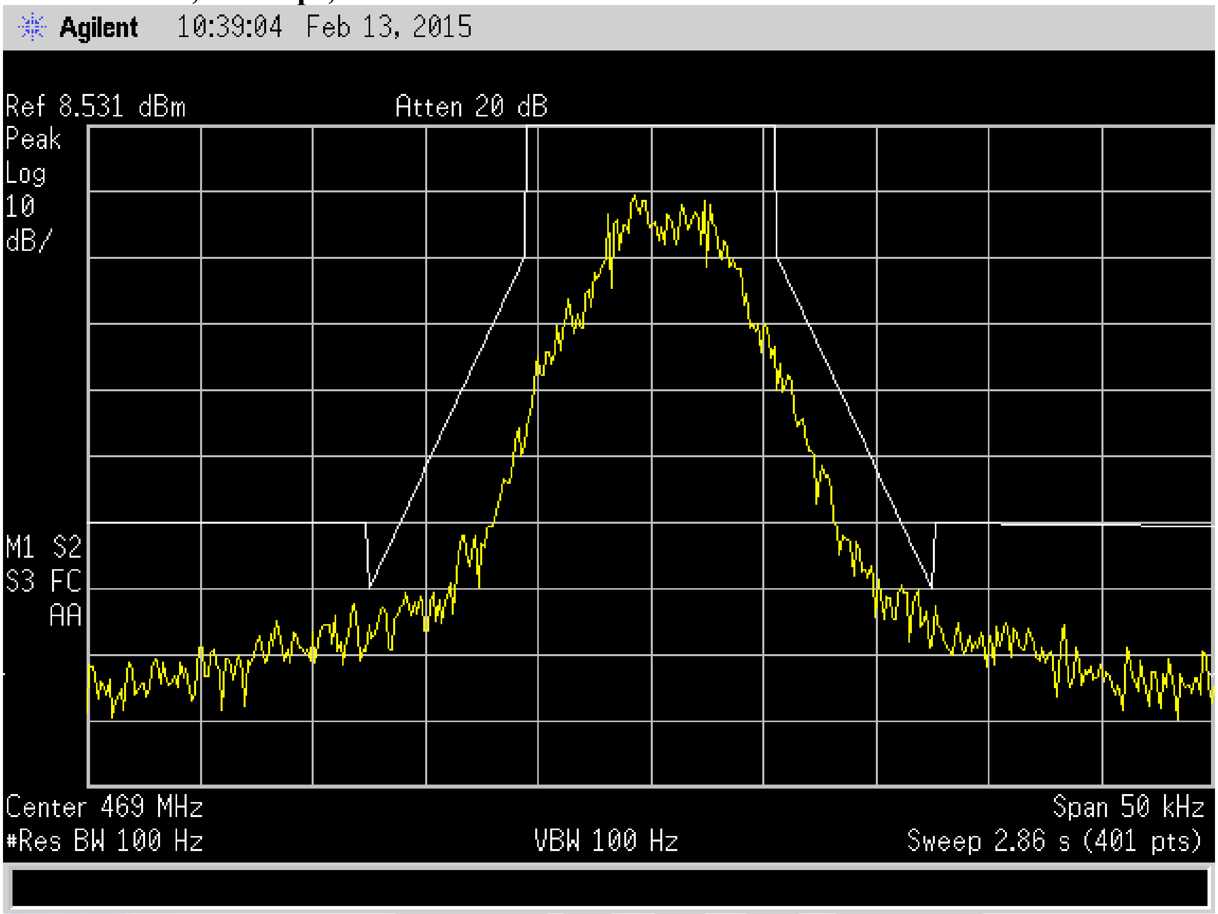
F1D 12.5 kHz, 24 kbps



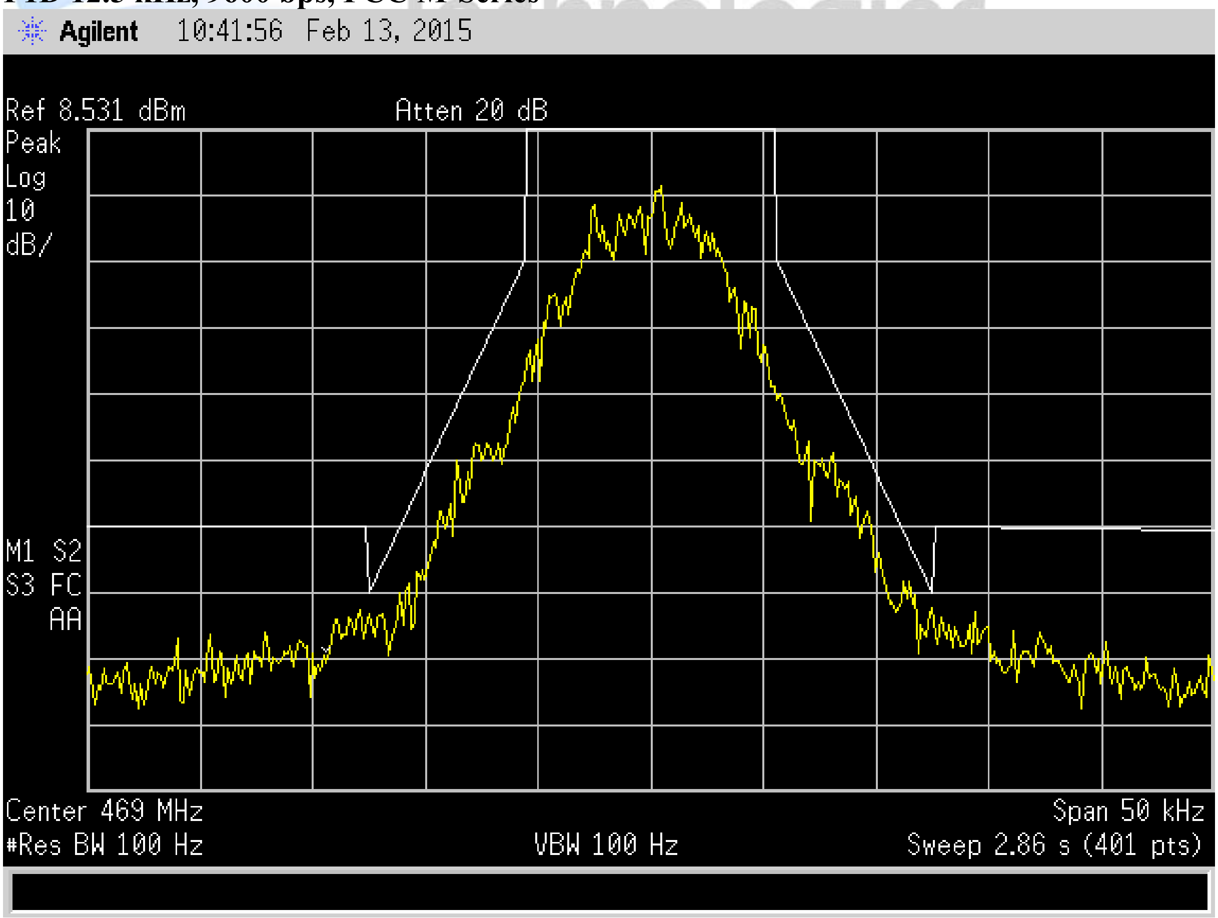
F1D 12.5 kHz, 32 kbps



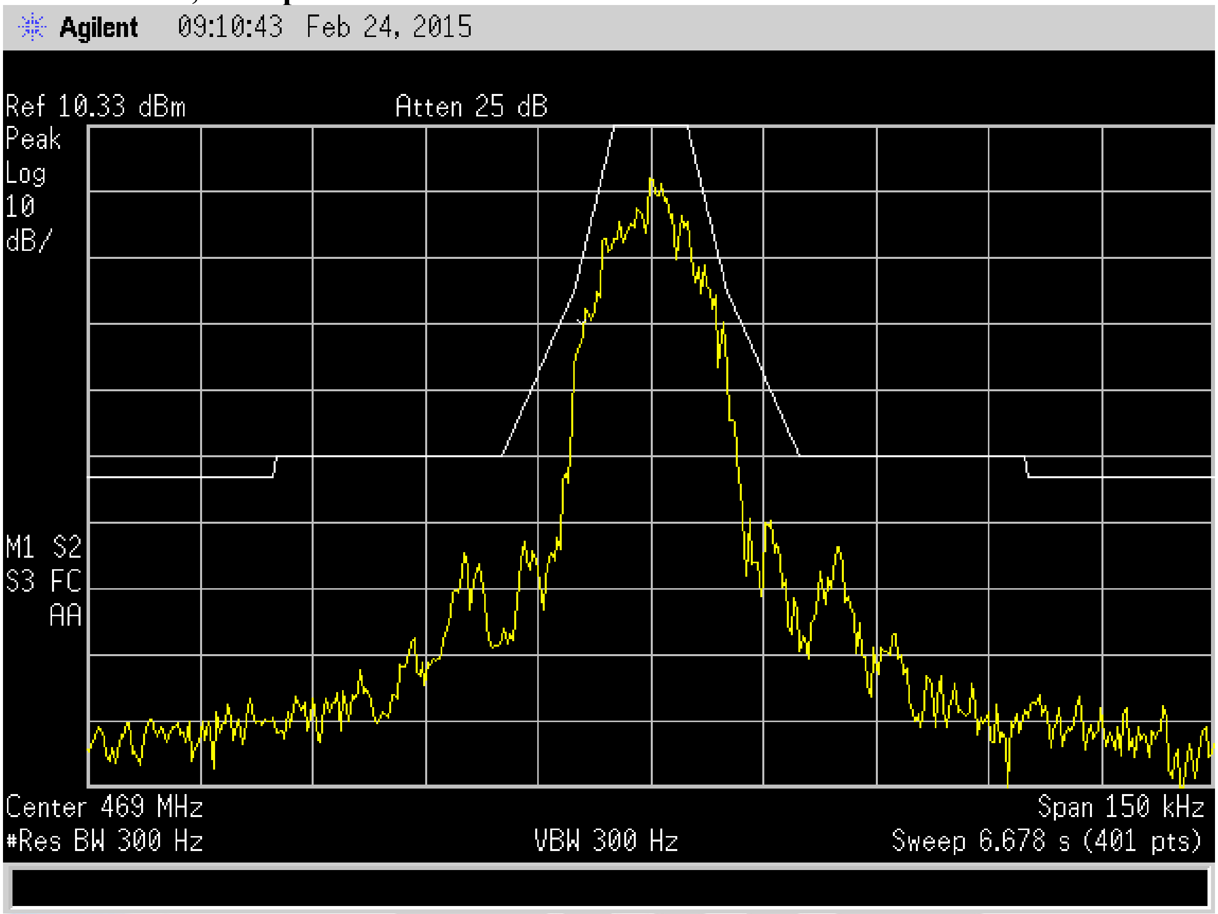
F1D 12.5 kHz, 9600 bps, FCC 4-Level



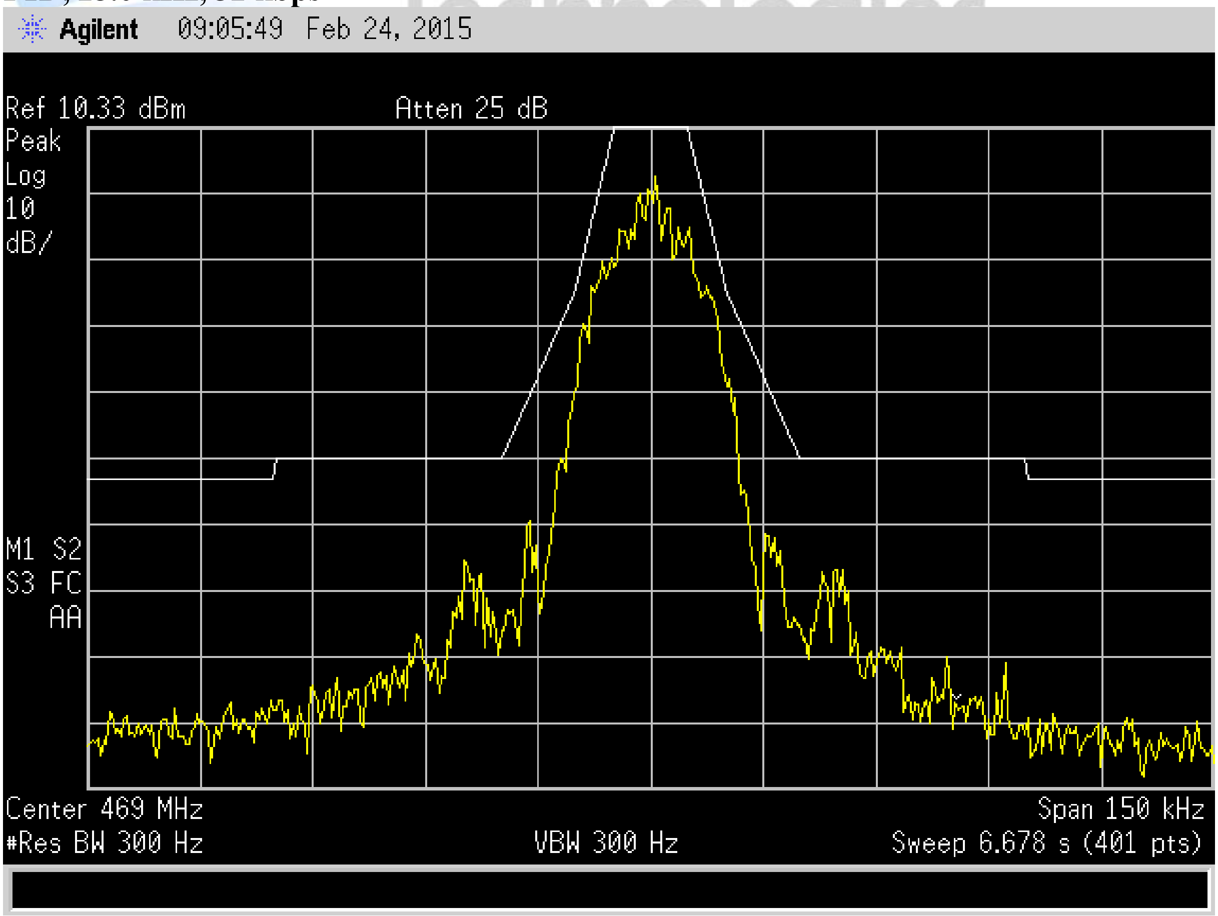
F1D 12.5 kHz, 9600 bps, FCC M-Series



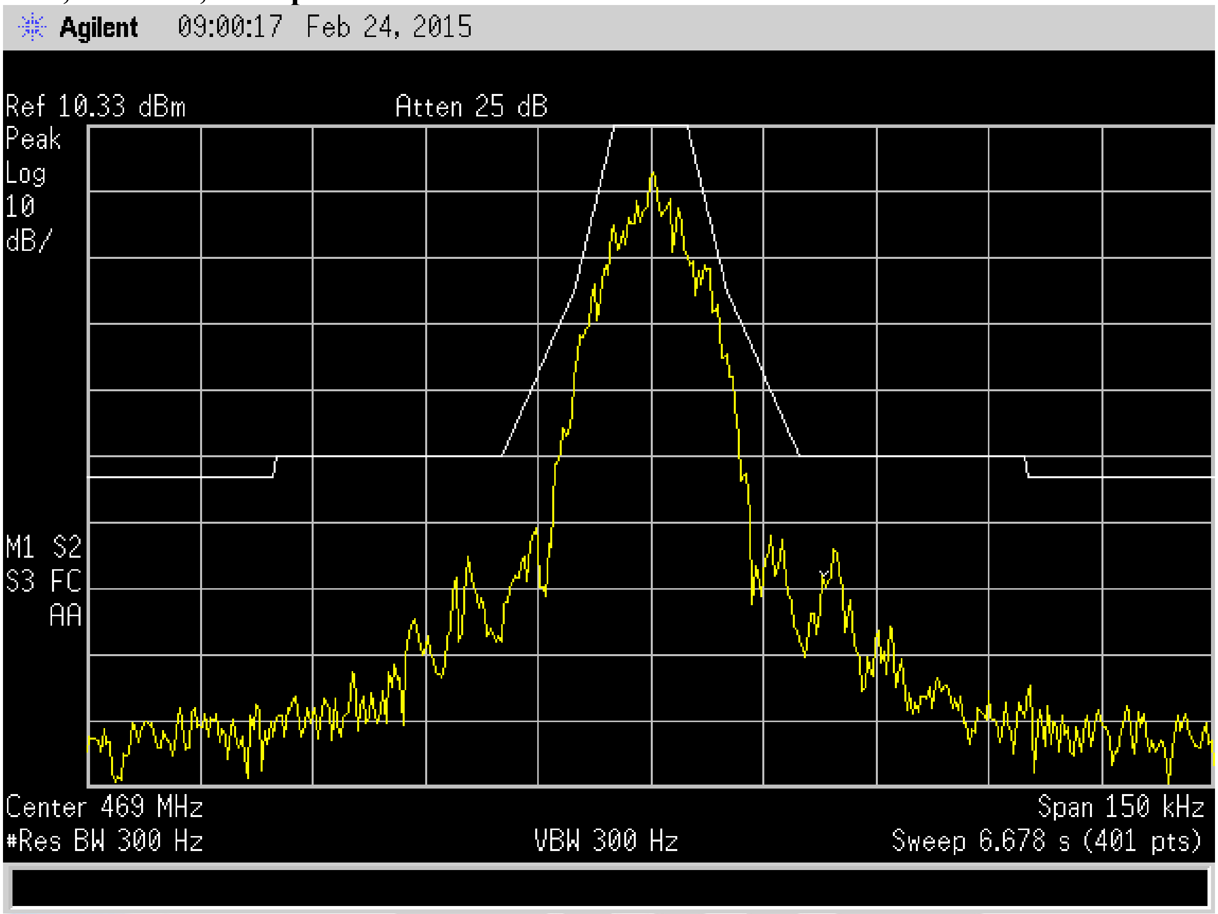
F1D 25.0 kHz, 16 kbps



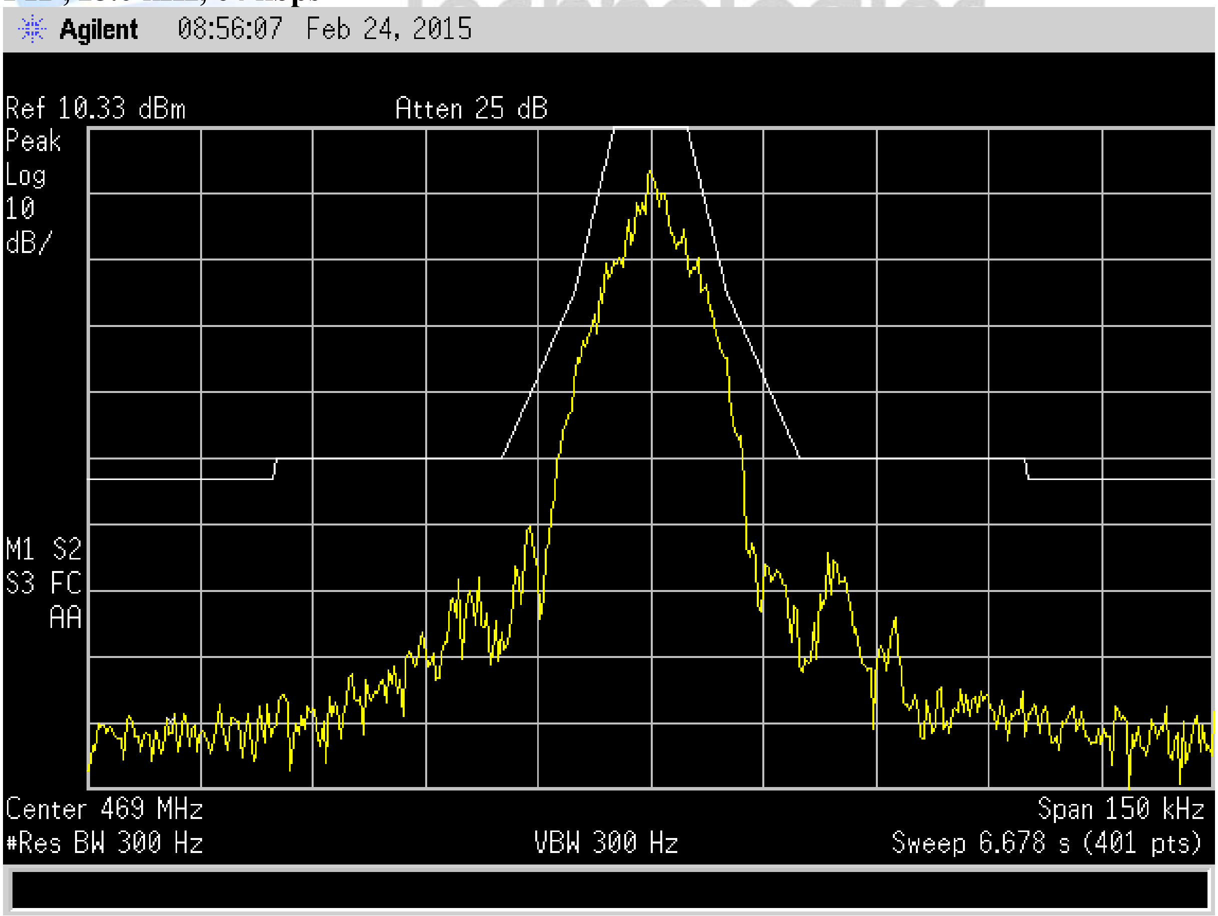
F1D, 25.0 kHz, 32 kbps



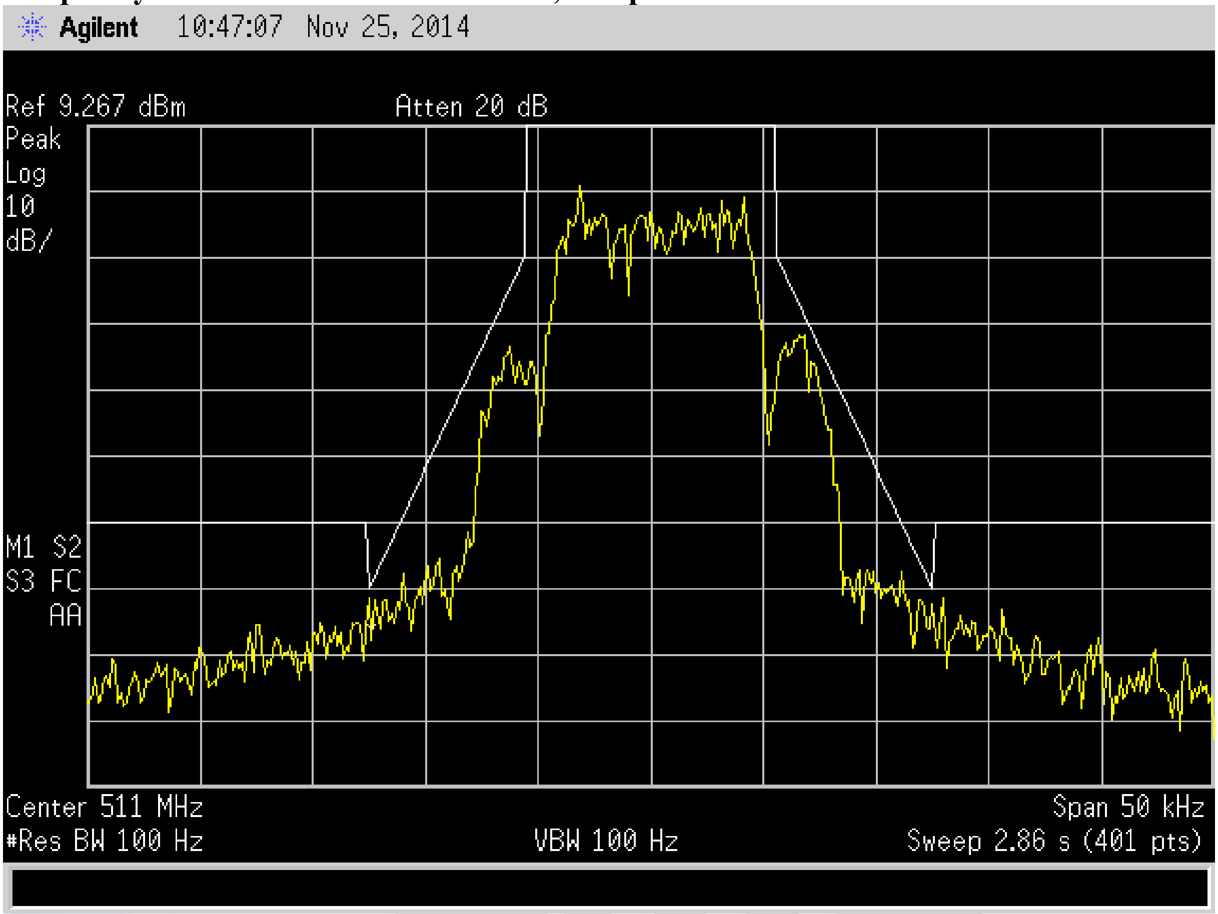
F1D, 25.0 kHz, 48 kbps



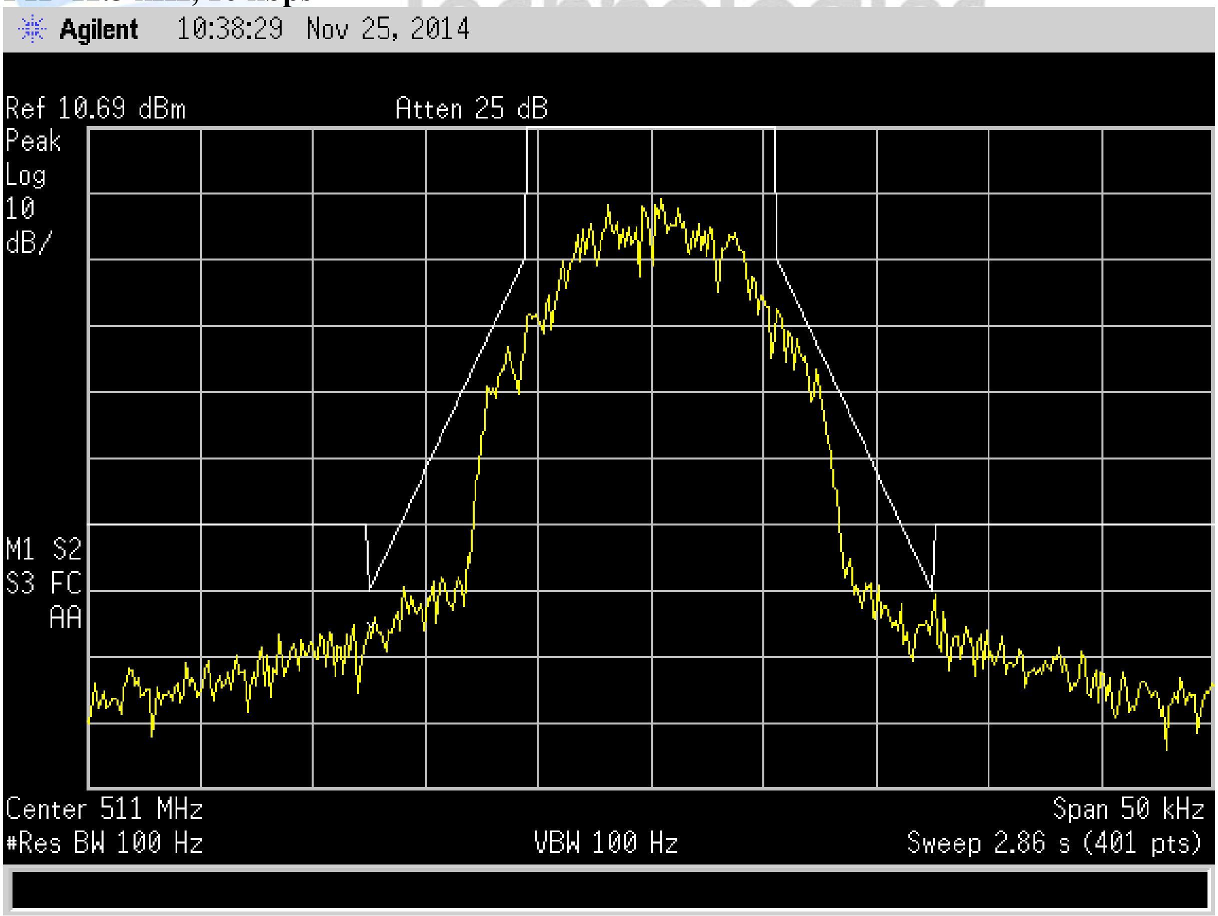
F1D, 25.0 kHz, 64 kbps



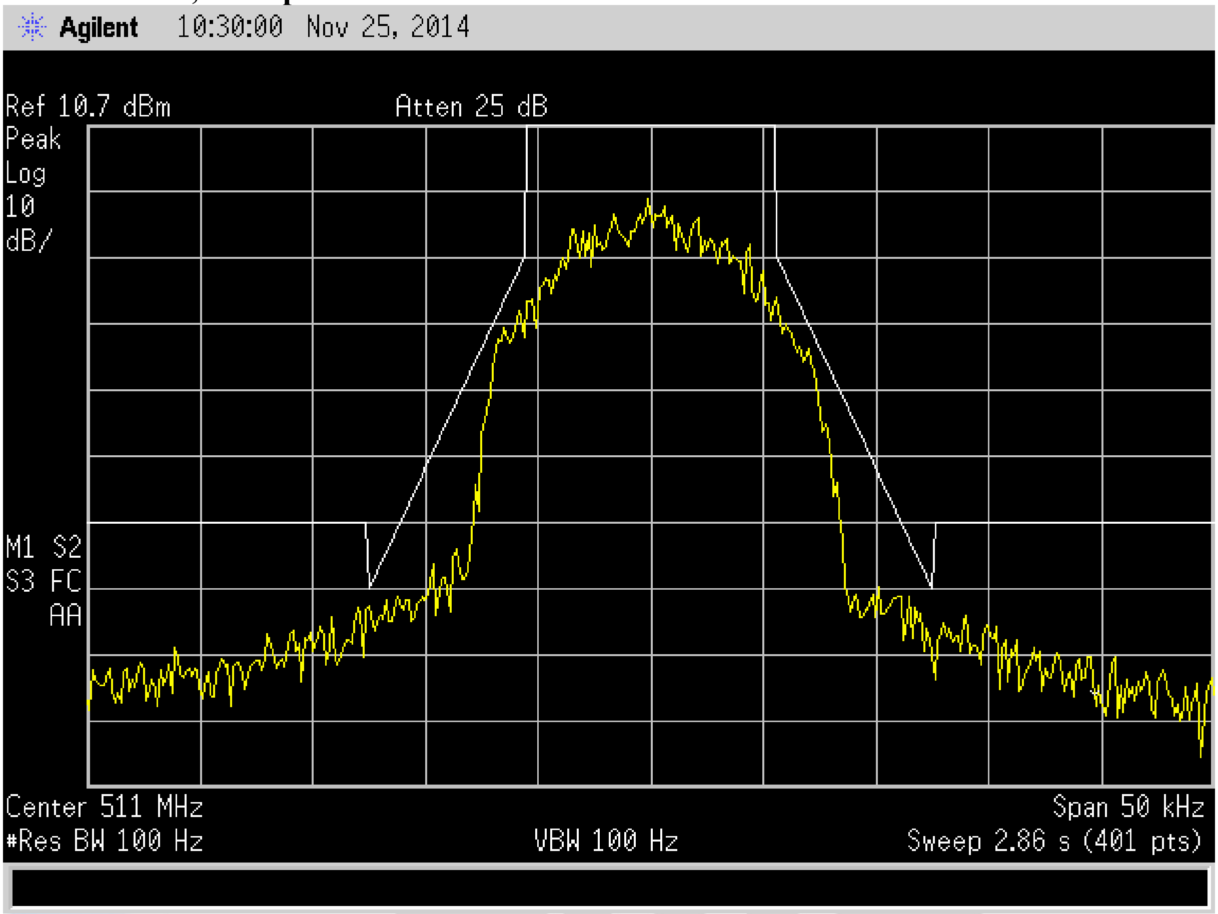
Frequency: 511.000 MHz. F1D 12.5 kHz, 8 kbps



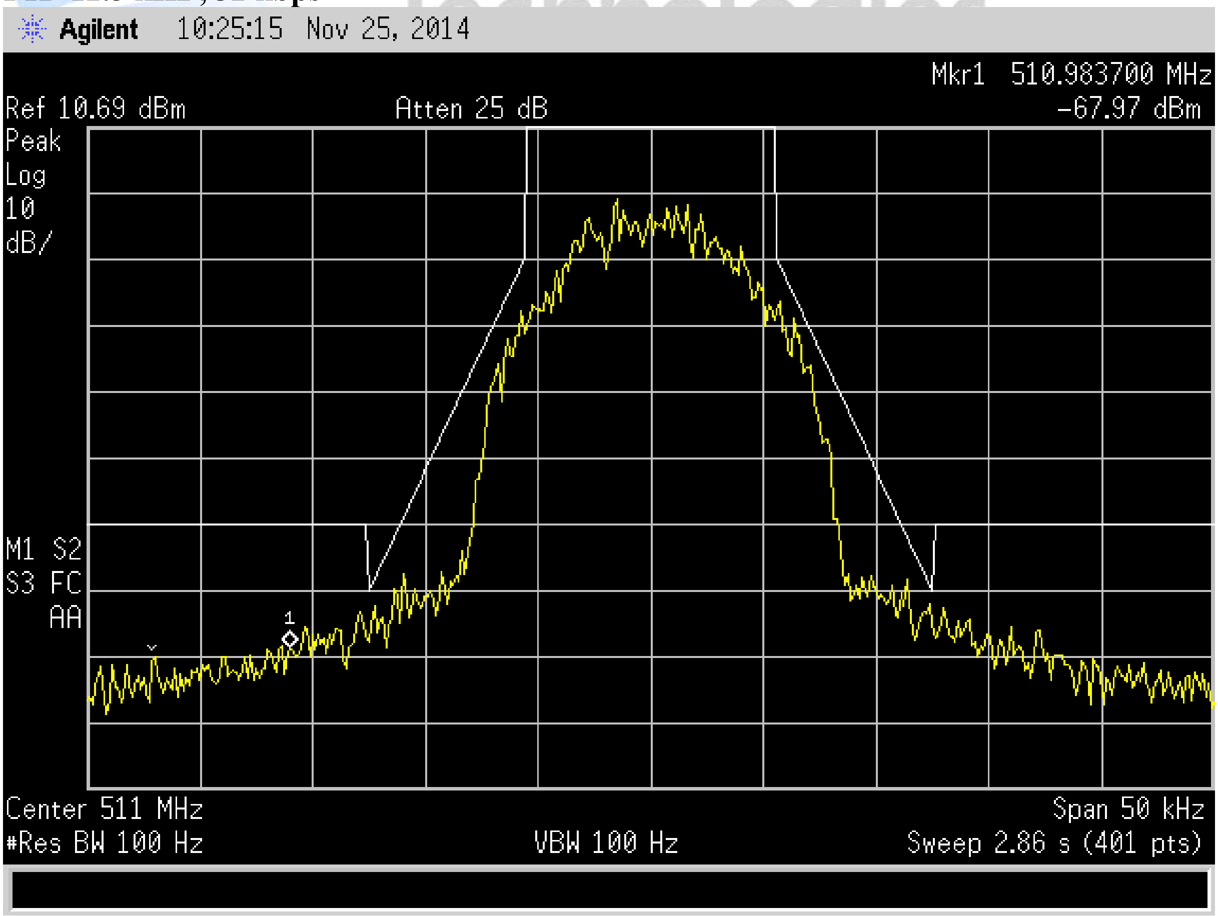
F1D 12.5 kHz, 16 kbps



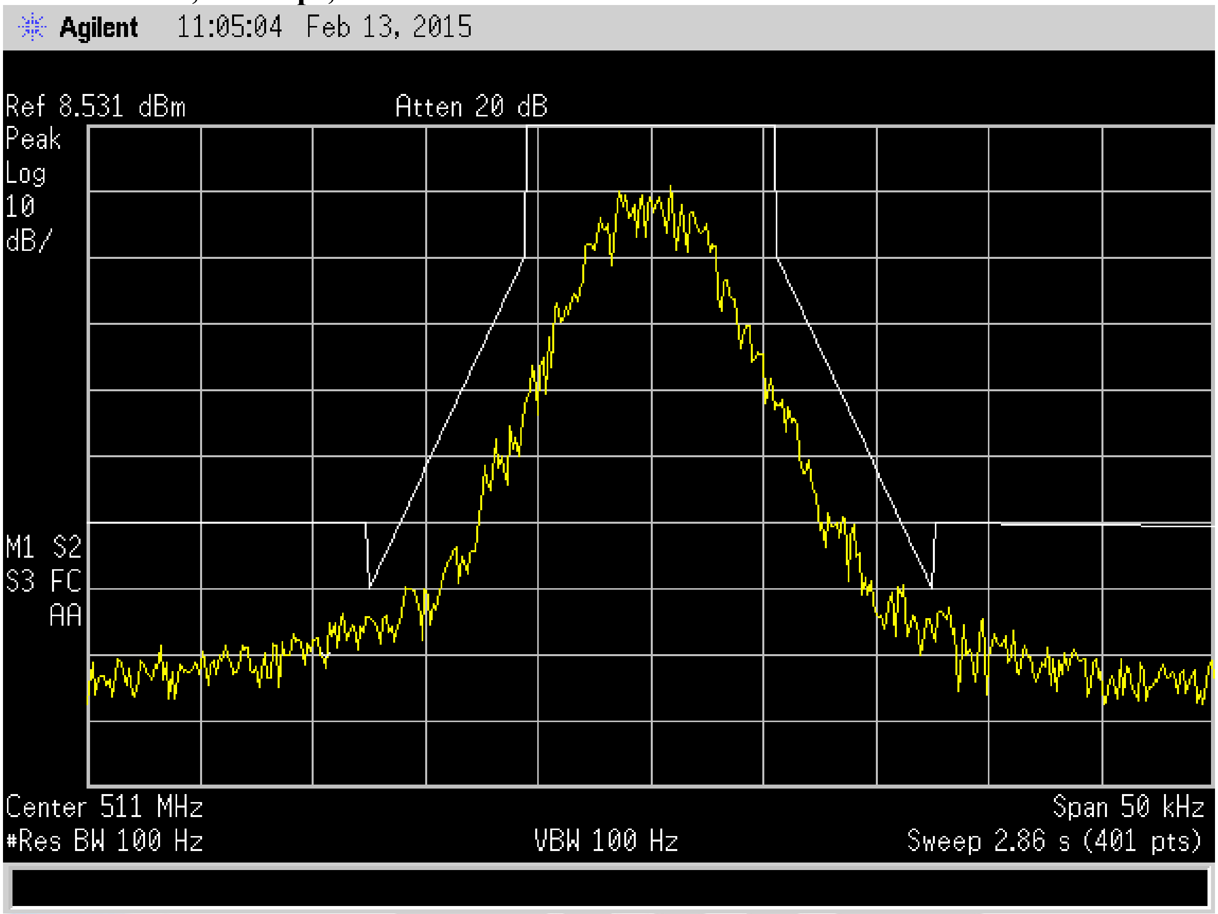
F1D 12.5 kHz, 24 kbps



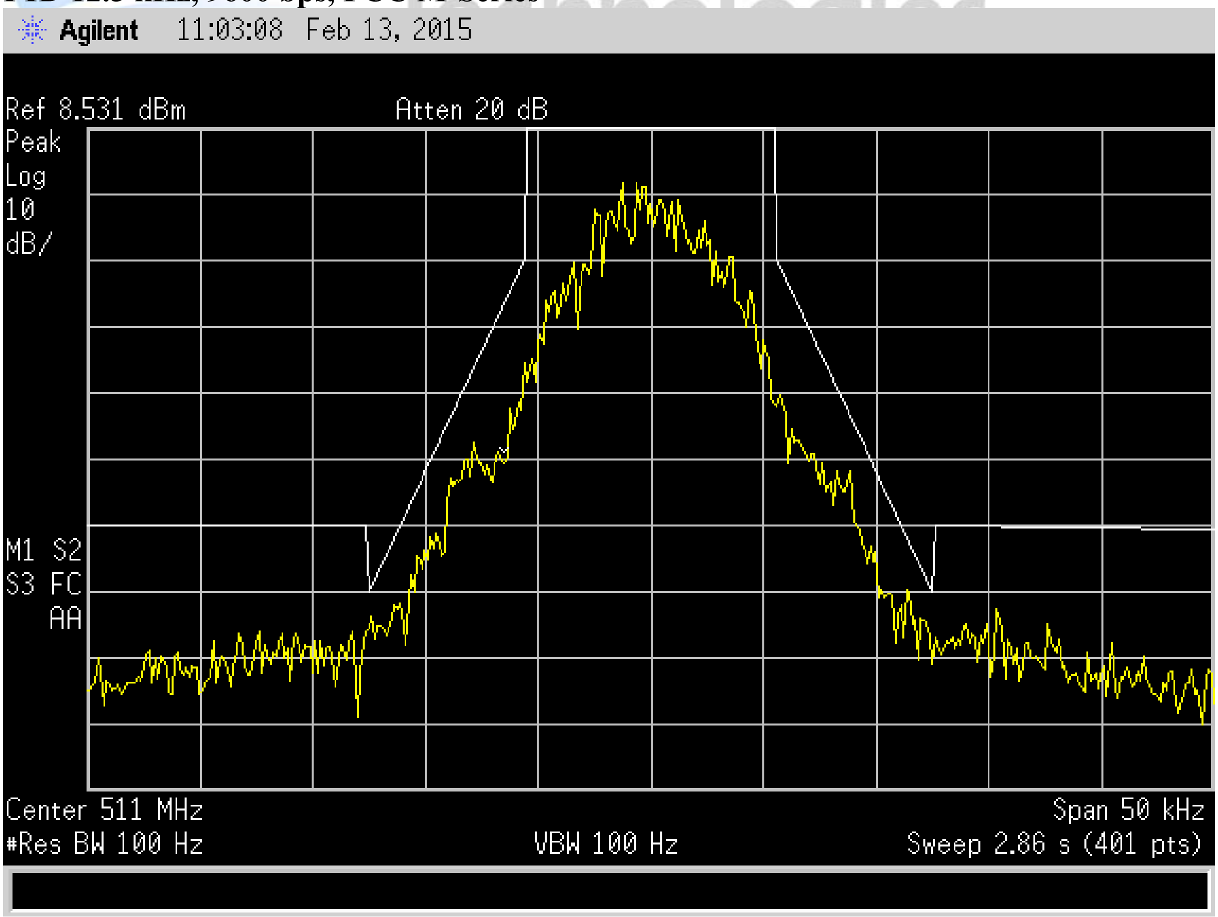
F1D 12.5 kHz , 32 kbps



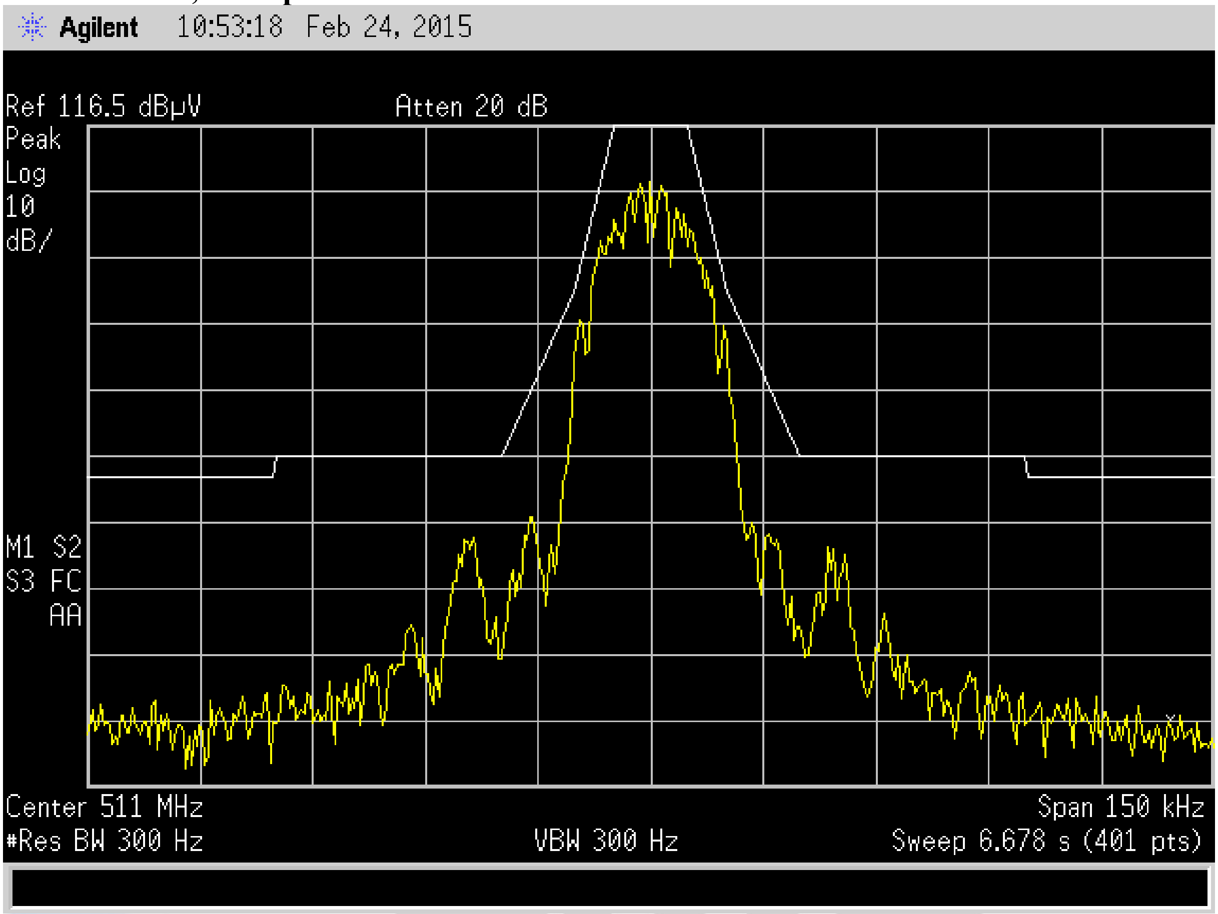
F1D 12.5 kHz, 9600 bps, FCC 4-Level



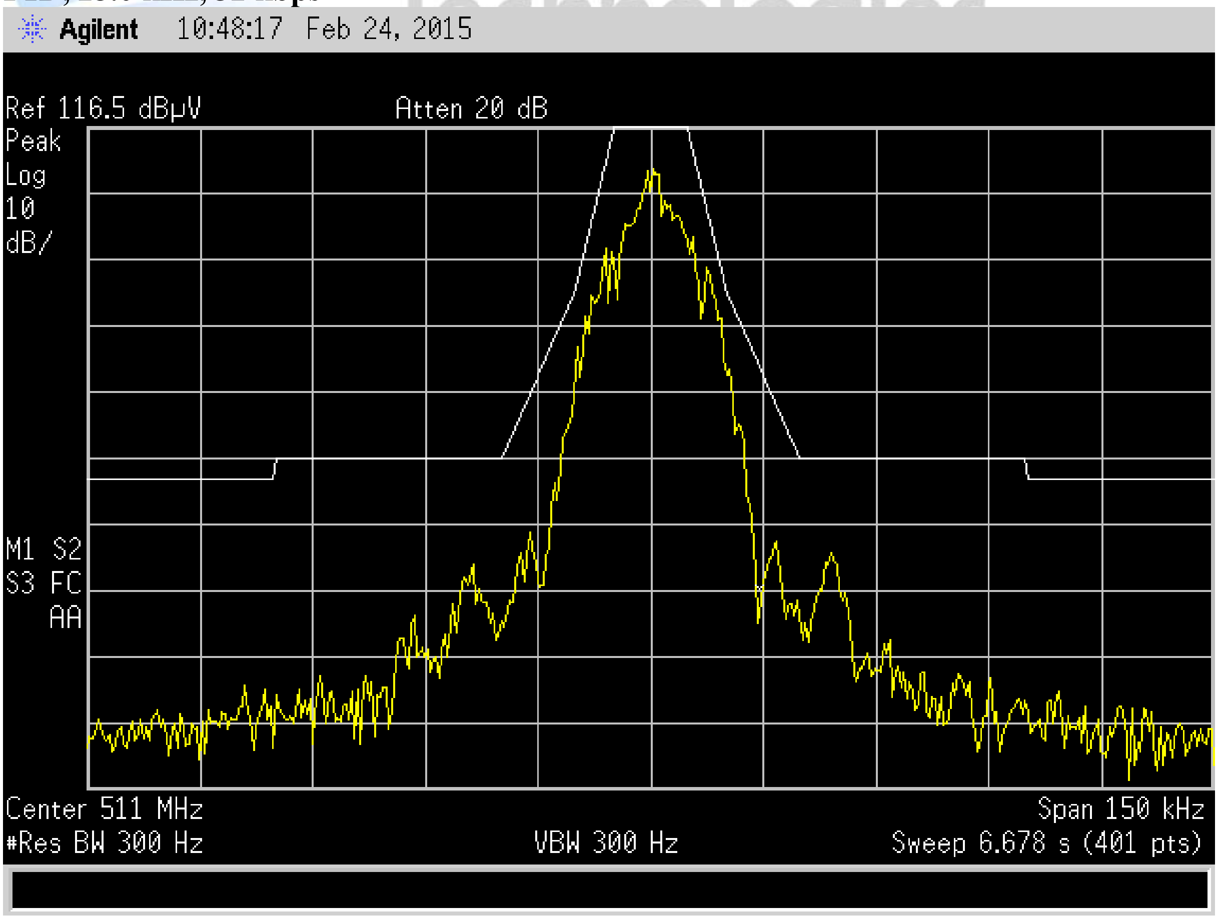
F1D 12.5 kHz, 9600 bps, FCC M-Series



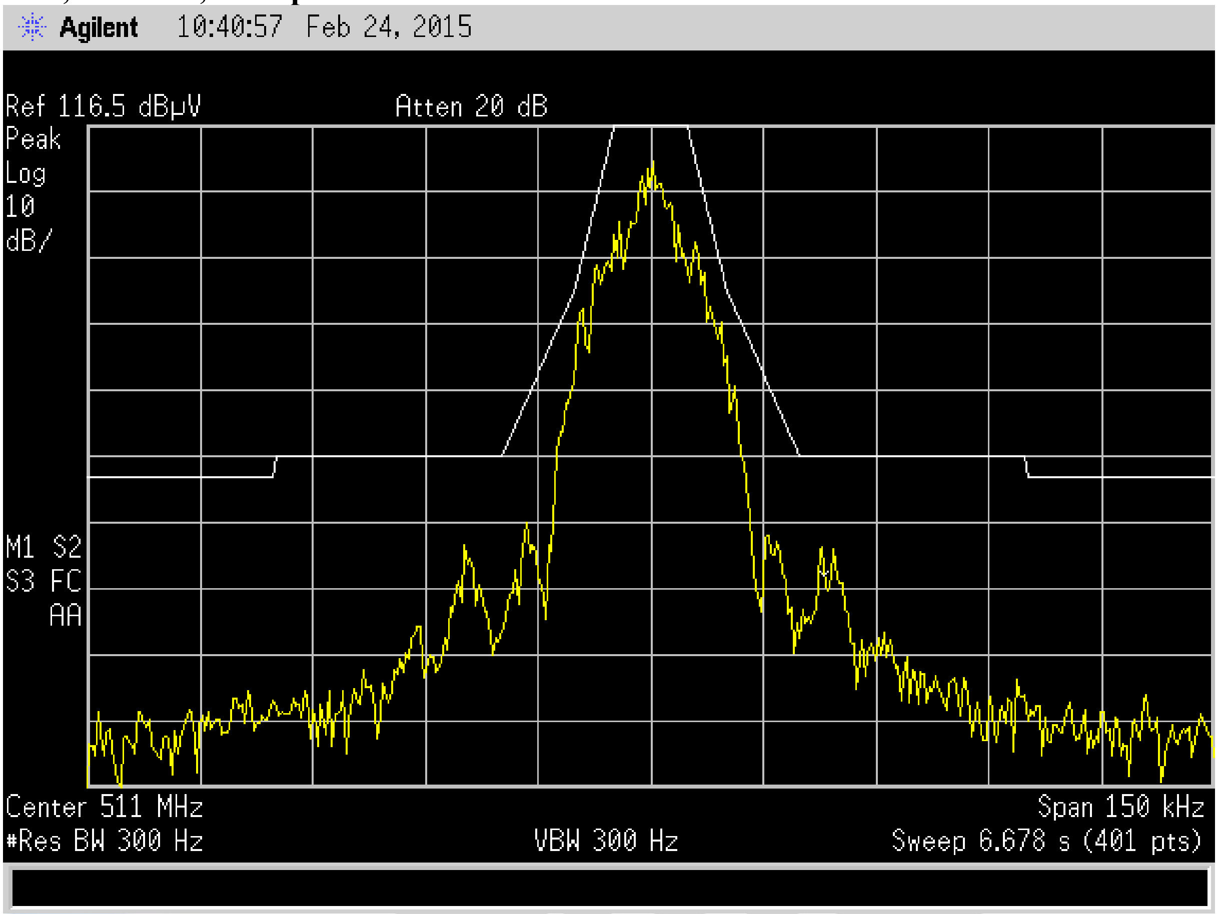
F1D 25.0 kHz, 16 kbps



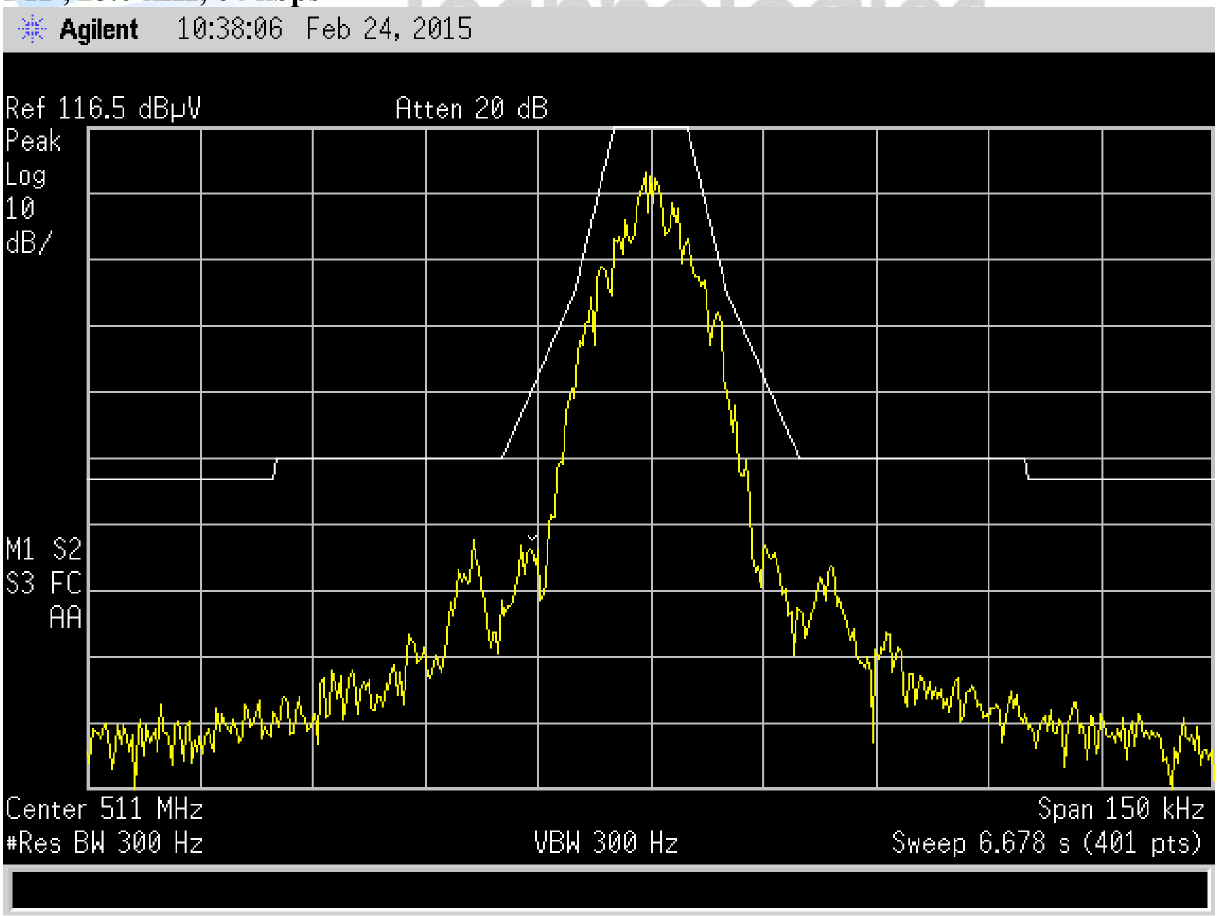
F1D, 25.0 kHz, 32 kbps



F1D, 25.0 kHz, 48 kbps



F1D, 25.0 kHz, 64 kbps



Transmitter spurious emissions at the antenna terminals

Frequency: 425.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
850.000	-74.6	-20.0
1275.000	-70.1	-20.0
1700.000	<-70.0	-20.0
2125.000	<-70.0	-20.0
2550.000	<-70.0	-20.0
2975.000	<-70.0	-20.0
3400.000	<-70.0	-20.0
3825.000	<-70.0	-20.0
4250.000	<-70.0	-20.0

Frequency: 469.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
938.000	-56.6	-20.0
1407.000	<-70.0	-20.0
1876.000	<-70.0	-20.0
2345.000	<-70.0	-20.0
2814.000	<-70.0	-20.0
3283.000	<-70.0	-20.0
3752.000	<-70.0	-20.0
4221.000	<-70.0	-20.0
4690.000	<-70.0	-20.0

Frequency: 511.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
1022.000	-73.7	-20.0
1533.000	-65.2	-20.0
2044.000	<-70.0	-20.0
2555.000	<-70.0	-20.0
3066.000	<-70.0	-20.0
3577.000	<-70.0	-20.0
4088.000	<-70.0	-20.0
4599.000	<-70.0	-20.0
5110.000	<-70.0	-20.0

No other emissions were observed.

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 spacing of 12.5 kHz.

Part 2.1051 states that emissions greater than 20 dB below the limit need not be specified.

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 10.0 watts gives a limit of –20.0 dBm.

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

Result: Complies.
Measurement Uncertainty: ± 3.3 dB

Field strength of the transmitter spurious emissions

Frequency: 425.000 MHz

Frequency (MHz)	Level (dBµV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
850.000	35.5	-61.9	-20.0	Vertical	41.9
850.000	32.8	-64.6	-20.0	Horizontal	44.6
1275.000	< 36.0	< -61.0	-20.0	Vertical	> 41.0
1275.000	< 36.0	< -61.0	-20.0	Horizontal	> 41.0
1700.000	< 40.0	< -57.0	-20.0	Vertical	> 37.0
1700.000	< 40.0	< -57.0	-20.0	Horizontal	> 37.0
2125.000	< 43.0	< -54.0	-20.0	Vertical	> 34.0
2125.000	< 43.0	< -54.0	-20.0	Horizontal	> 34.0
2550.000	< 47.0	< -40.0	-20.0	Vertical	> 20.0
2550.000	< 47.0	< -40.0	-20.0	Horizontal	> 20.0
2975.000	< 47.0	< -40.0	-20.0	Vertical	> 20.0
2975.000	< 47.0	< -40.0	-20.0	Horizontal	> 20.0
3400.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0
3400.000	< 48.0	< -49.0	-20.0	Horizontal	> 29.0
3825.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0
3825.000	< 48.0	< -49.0	-20.0	Horizontal	> 29.0
4250.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0
4250.000	< 48.0	< -49.0	-20.0	Horizontal	> 29.0

Frequency: 469.000 MHz

Frequency (MHz)	Level (dBµV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
938.000	36.4	-61.0	-20.0	Vertical	41.0
938.000	33.1	-64.3	-20.0	Horizontal	44.3
1407.000	< 38.0	< -59.0	-20.0	Vertical	> 39.0
1407.000	< 38.0	< -59.0	-20.0	Horizontal	> 39.0
1876.000	< 44.0	< -53.0	-20.0	Vertical	> 33.0
1876.000	< 44.0	< -53.0	-20.0	Horizontal	> 33.0
2345.000	< 46.0	< -51.0	-20.0	Vertical	> 31.0
2345.000	< 46.0	< -51.0	-20.0	Horizontal	> 31.0
2814.000	< 46.0	< -51.0	-20.0	Vertical	> 31.0
2814.000	< 46.0	< -51.0	-20.0	Horizontal	> 31.0
3283.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0
3283.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0
3752.000	< 48.0	< -49.0	-20.0	Horizontal	> 29.0
3752.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0
4221.000	< 48.0	< -49.0	-20.0	Horizontal	> 29.0
4221.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0
4690.000	< 48.0	< -49.0	-20.0	Horizontal	> 29.0
4690.000	< 48.0	< -49.0	-20.0	Vertical	> 29.0

Additional measurements were not made when the transmitter was operating on 511 MHz as the emission levels observed when operating on 425 and 469 MHz were very similar in level and the levels observed were very low.

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.

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 10 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.

Frequency: 425.000 MHz

Temperature (°C)	10.0 Vdc (Hz)	13.8 Vdc (Hz)	30.0 Vdc (Hz)
+50	-71.0	-93.0	-86.0
+40	-121.0	-134.0	-114.0
+30	-10.0	+4.0	+6.0
+20	+26.0	+47.0	+49.0
+10	-157.0	-145.0	-155.0
0	+11.0	-4.0	+42.0
-10	-41.0	-21.0	-29.0
-20	-22.0	-20.0	-16.0
-30	-115.0	-108.0	-125.0

Frequency: 469.000 MHz

Temperature (°C)	10.0 Vdc (Hz)	13.8 Vdc (Hz)	30.0 Vdc (Hz)
+50	-81.0	-96.0	-103.0
+40	-149.0	-152.0	-118.0
+30	-15.0	+28.0	+28.0
+20	+35.0	+32.0	+41.0
+10	+69.0	+47.0	+49.0
0	+27.0	+14.0	+33.0
-10	-224.0	-226.0	-221.0
-20	-174.0	-144.0	-157.0
-30	-258.0	-305.0	-229.0

Limit:

Part 90.213 states that fixed / base station transmitters operating between 421 – 512 MHz with 12.5 kHz channelling are required to have a frequency tolerance of 1.5 ppm.

The results give a worst case frequency error of (305 Hz / 469 MHz) 0.65 ppm.

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 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 transmitter transmit frequency of 425.000 MHz and 469.000 MHz with an output level 0.1 % (-30 dB) of the level from the transmitter with a 1 kHz tone with frequency deviation 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.

Channel Spacing (kHz)	Transient Period t_1	Frequency Period t_2	Deviation (kHz) Period t_3
12.5	Nil	Nil	Nil
25.0	Nil	Nil	Nil

Limits:

Time Interval	Period (ms)	12.5 kHz Deviation (kHz)	25 kHz Deviation (kHz)
t_1	10	± 12.5	± 25.0
t_2	25	± 6.25	± 12.5
t_3	10	± 12.5	± 25.0

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

12.5 kHz transmitter turn on 425.000 MHz

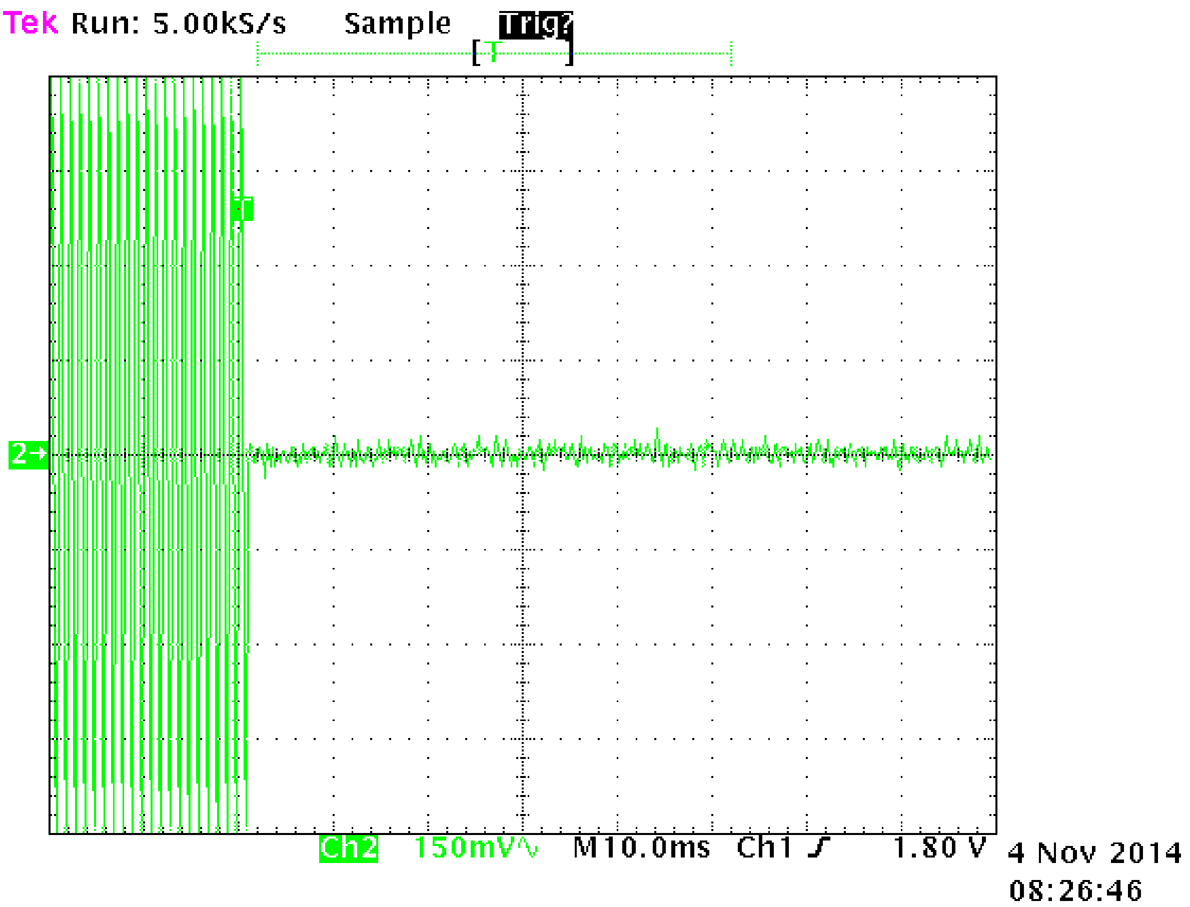
Green Trace = 1 kHz tone with FM deviation of 12.5 kHz and any transient.

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 3.0 divisions from the left-hand edge.
t2 occurs between 3.0 and 5.5 divisions from the left-hand edge.

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



12.5 kHz transmitter turn off 425.000 MHz

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

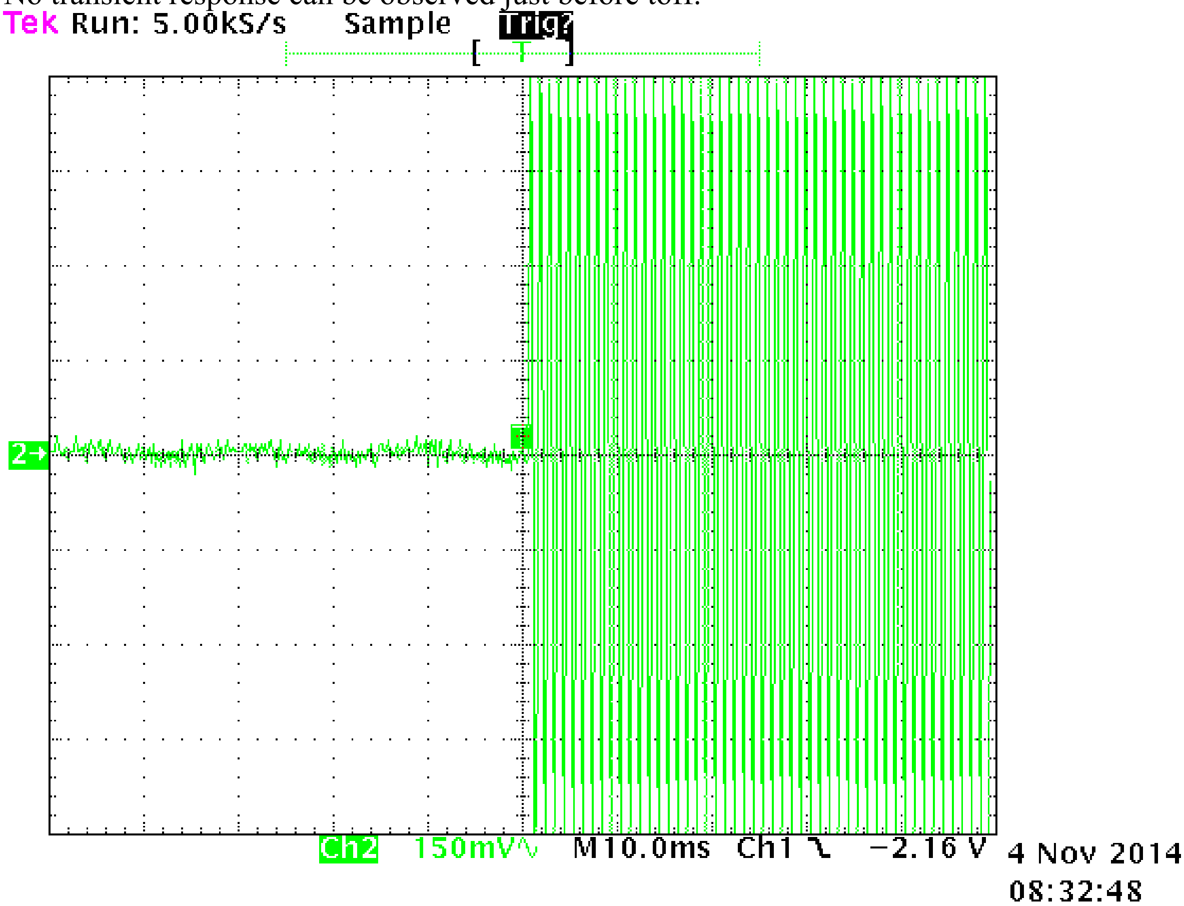
Green trace has been maximised to give full screen indication of a ± 12.5 kHz.
Therefore each Y axis division = 3.125 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

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 4.0 and 5.0 divisions from the left hand edge.

No transient response can be observed just before toff.



12.5 kHz transmitter turn on 469.000 MHz

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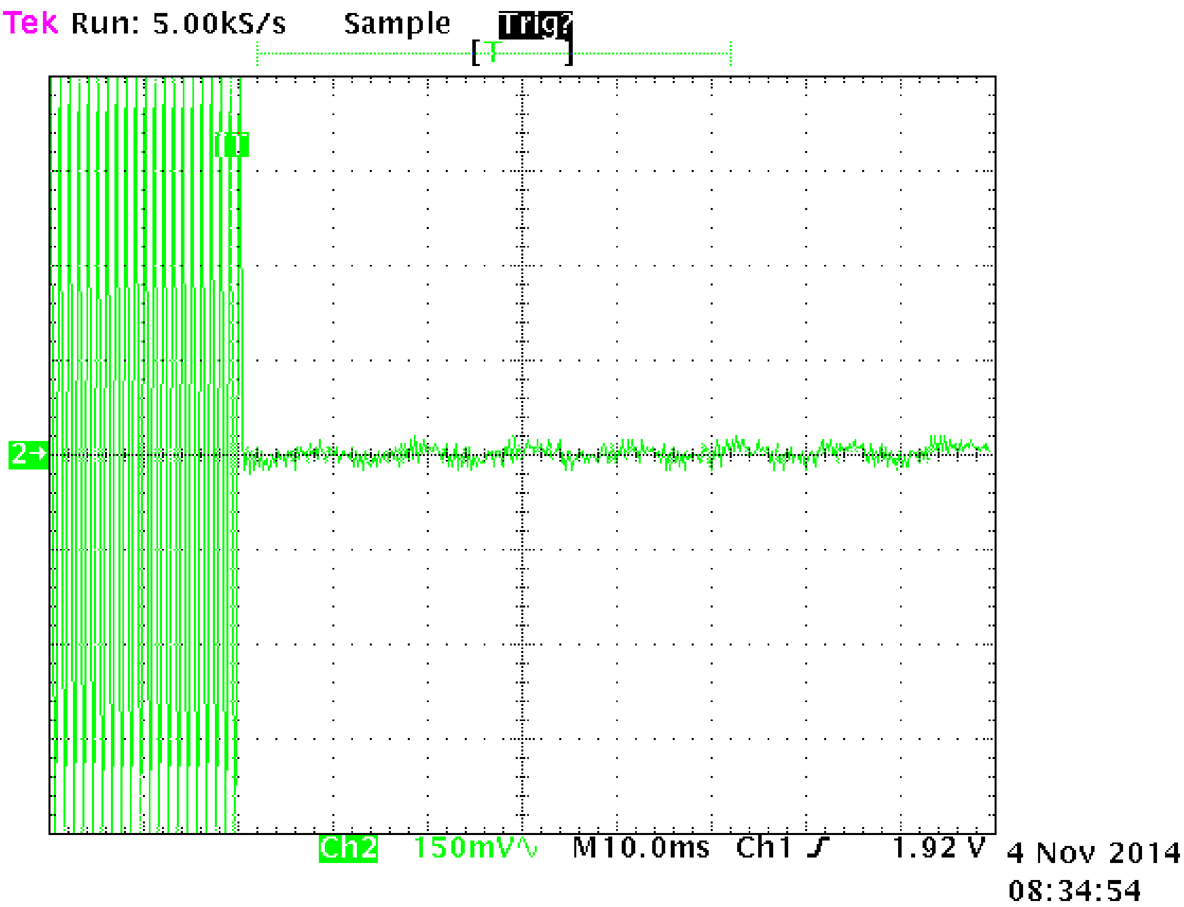

12.5 kHz transmitter turn off 469.000 MHz

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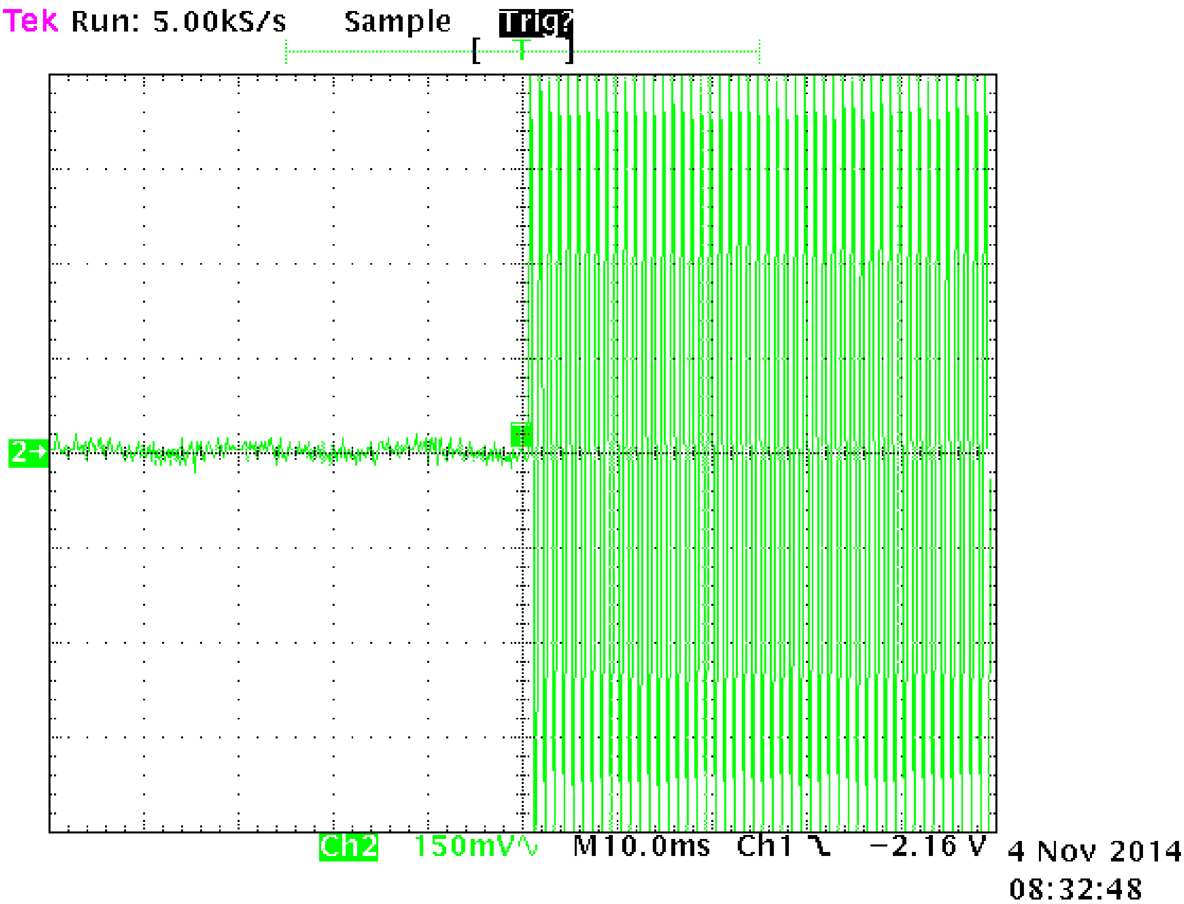
The display of the 1 kHz signal rising has been positioned 5 divisions from the left hand edge (50 ms).

This is position *t*off.

*t*3 occurs between 4.0 and 5.0 divisions from the left hand edge.

No transient response can be observed just before toff.



25.0 kHz transmitter turn on 425.000 MHz

Green Trace = 1 kHz tone with FM deviation of 25.0 kHz.

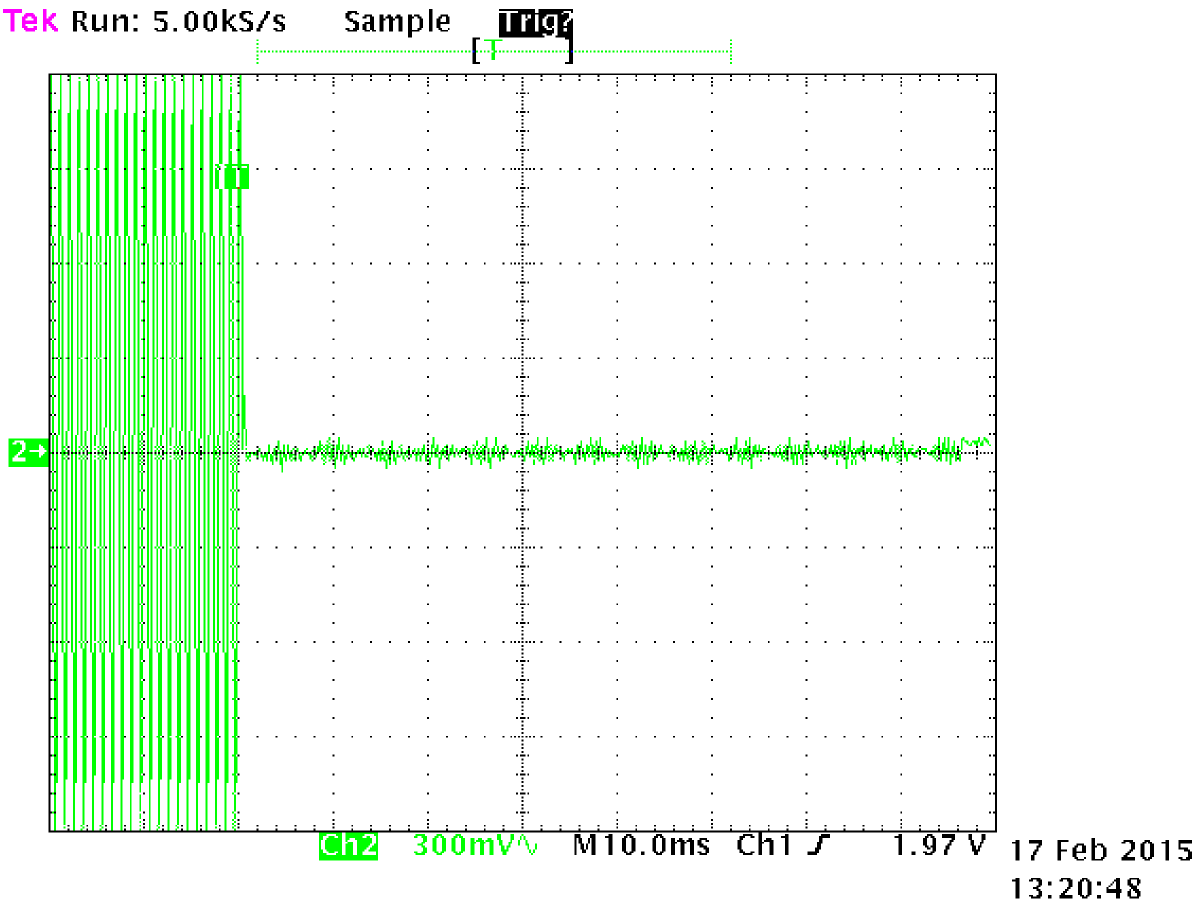
Green trace has been maximised to give full screen indication of +/- 25.0 kHz.
Therefore each Y axis division = 6.25 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

Triggering has been set to occur 2 divisions from the left hand edge (20 ms).

*t*on occurs at 20 ms.

*t*1 occurs between 2.0 and 3.0 divisions from the left hand edge.
t2 occurs between 3.0 and 5.5 divisions from the left hand edge.

No transient response can be observed during *t*1 and *t*2.



25.0 kHz transmitter turn off 425.000 MHz

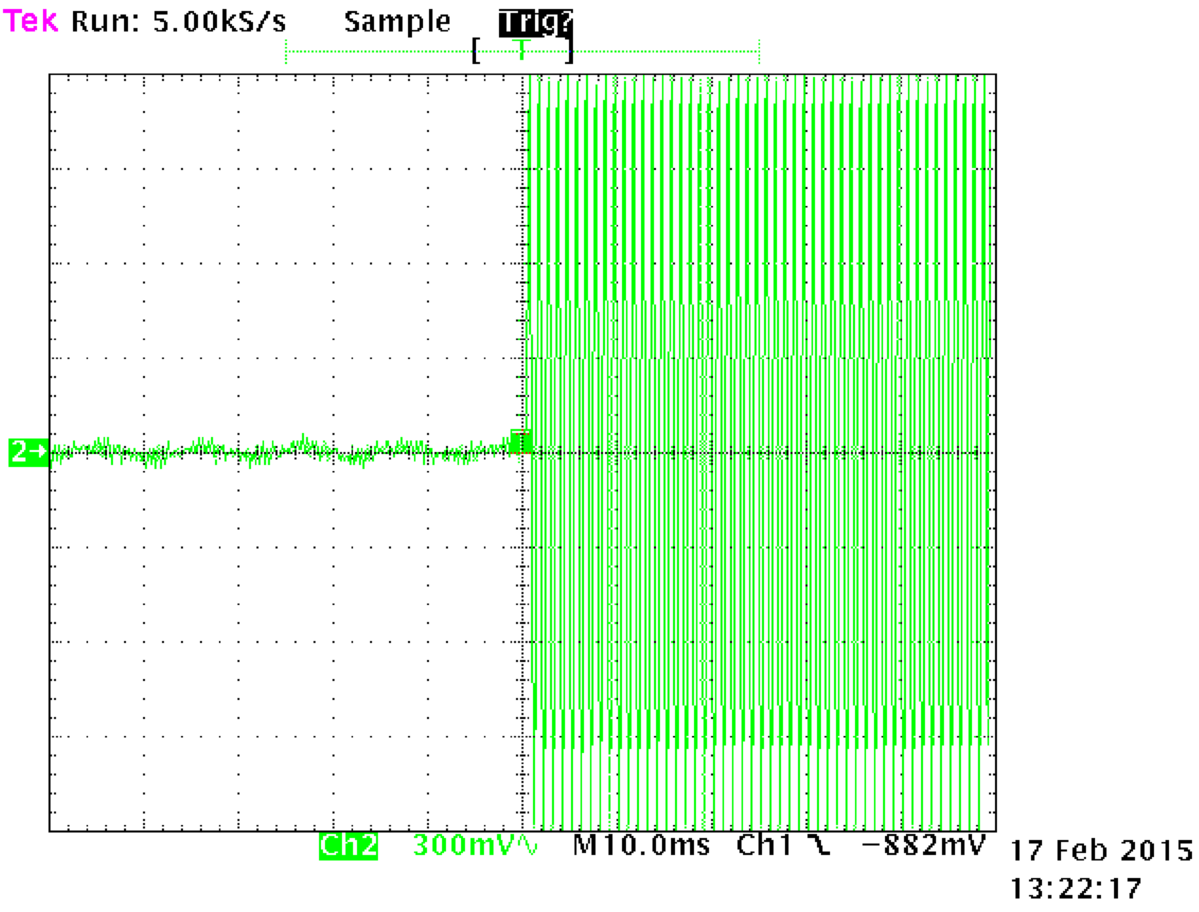
Green Trace = 1 kHz tone with FM deviation of 25.0 kHz.

Green trace has been maximised to give full screen indication of +/- 25.0 kHz.
Therefore each Y axis division = 6.25 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 4.0 and 5.0 divisions from the left hand edge..

No transient response can be observed before *t*off.



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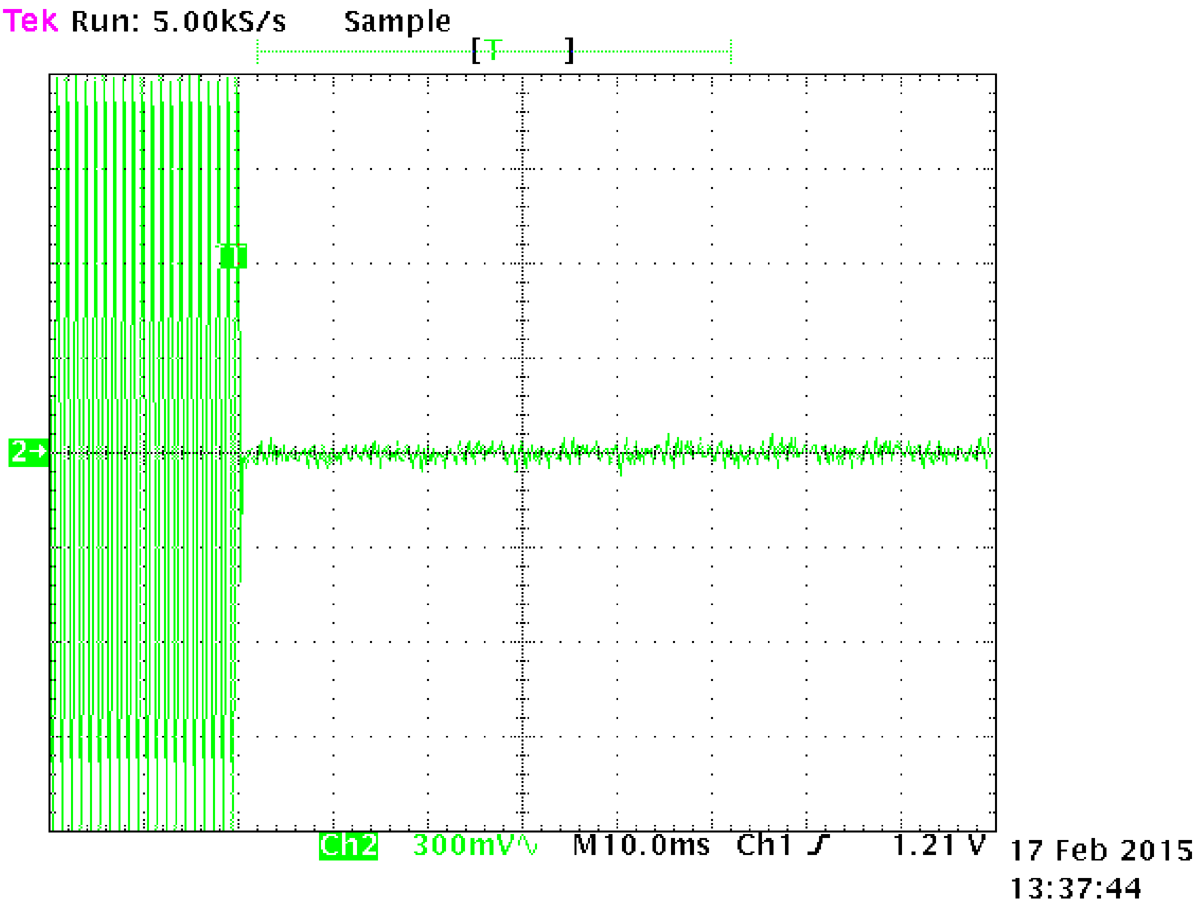
Triggering has been set to occur 2 divisions from the left hand edge (20 ms).

*t*on occurs at 20 ms.

*t*1 occurs between 2.0 and 3.0 divisions from the left hand edge.
*t*2 occurs between 3.0 and 5.5 divisions from the left hand edge.

No transient response can be observed during *t*1 and *t*2.



25.0 kHz transmitter turn off 469.000 MHz

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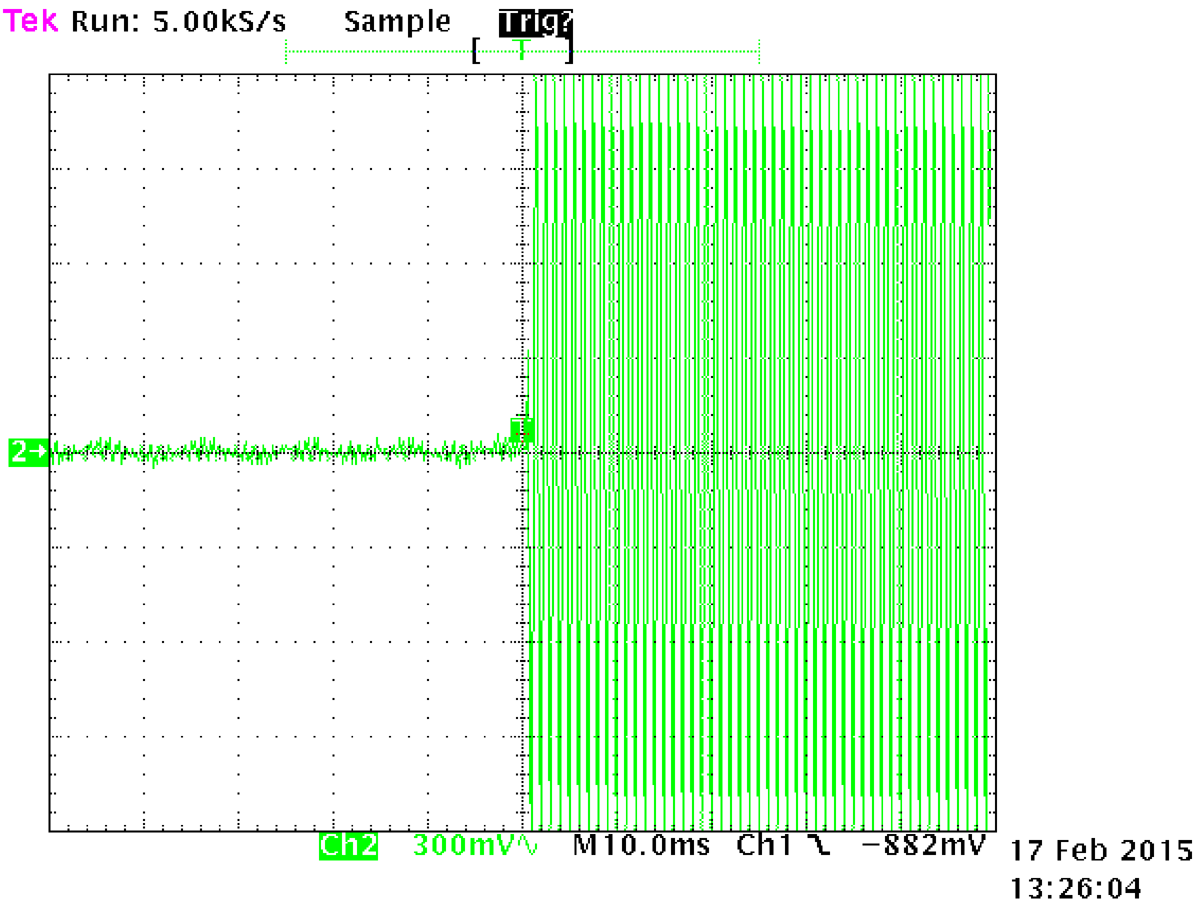


Exposure of humans to RF fields

As per FCC KDB 447498 D01 and Section 2.1091 radio frequency transmitters are required to be operated in a manner that ensures the public is not exposed to RF energy levels.

Calculations have been made using the General Public/Uncontrolled Exposure limits that are defined in Section 1.1310.

Minimum safe distances have been calculated below.

Power density, mW/cm^2 = $E^2/3770$

- General Population / Uncontrolled exposure limit will be 0.28 mW/cm^2
(f/1500 = 421 MHz/1500)

As this radio can operate over the range of 421 - 512 MHz the lowest frequency of operation in the USA, which will give the worst case result, would be 421 MHz.

The minimum distance from the antenna at which the MPE is met is calculated from the equation relating field strength in V/m, transmit power in watts, transmit antenna gain, transmitter duty cycle and separation distance in metres:

Power Density = 0.28 mW/cm^2 = $E^2/3770$

E= √ 0.28*3770

E = 32.5 V/m

The rated maximum transmitter power = 10 watts (+40 dBm).

A duty cycle of 100% as the transmitter is a base station could possibly be operated for long periods of time.

The client has declared that this transmitter can be operated using a range of antennas with various gains, from 0 to 16 dBd, as detailed in the table below.

Antenna Gains (dBd)	Max Gain (dBi)	EiRP (dBm)	EiRP (Watts)	Density (mW/cm^2)	Safe Distance (Metres)
0 to 4	6.15	46.15	41.2	0.28	1.08
4 to 8	10.15	50.15	103.5	0.28	1.71
8 to 12	14.15	54.15	260.0	0.28	2.72
12 to 16	18.15	58.15	653.1	0.28	4.31

A sample calculation for the safe distance would be:

d = √ (30 * P * G*DC) / E

d = √ (30 * 10 * 65.3 * 1.0) / 32.5

d = 4.31 metres or 431 cm

Result: Complies if the safe distances defined above are applied.

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset	Cal Due	Interval
Aerial Controller	EMCO	1090	9112-1062	3710	N/a	N/a
Aerial Mast	EMCO	1070-1	9203-1661	3708	N/a	N/a
Biconical Antenna	Schwarzbeck	BBA 9106	9594	3696	03/02/2018	3 years
VHF Balun	Schwarzbeck	VHA9103	9594	3696	03/02/2018	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	04/06/2017	3 years
Level generator	Anritsu	MG443B	M61689	E1143	21/06/2016	2 years
Log Periodic Antenna	Schwarzbeck	VUSLP 91111	9111-228	3785	01/12/2017	3 years
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552	15/04/2015	2 years
Modulation Analyzer	Hewlett Packard	8901B	2608A00782	E1090	15/04/2015	2 years
Oscilloscope	Tektronics	745A	B010643	E1569	15/04/2015	2 years
Power Attenuator	JFW	50FH-030-100	-	-	N/a	N/a
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069	N/a	N/a
Receiver	Rohde & Schwarz	ESIB-40	100171	4003	29/04/2015	1 year
Selective Level Meter	Anritsu	ML422C	M35386	E1140	03/07/2015	2 years
Signal Generator	Rohde & Schwarz	SMHU	838923/028	E1493	15/04/2015	2 years
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776	15/04/2015	1 year
Thermal chamber	Contherm	M180F	86025	E1129	01/06/2015	N/a
Thermometer	DSIR	RT200	035	E1049	01/06/2015	N/a
Turntable	EMCO	1080-1-2.1	9109-1578	3709	N/a	N/a

At the time of testing all test equipment was within calibration.

8. ACCREDITATIONS

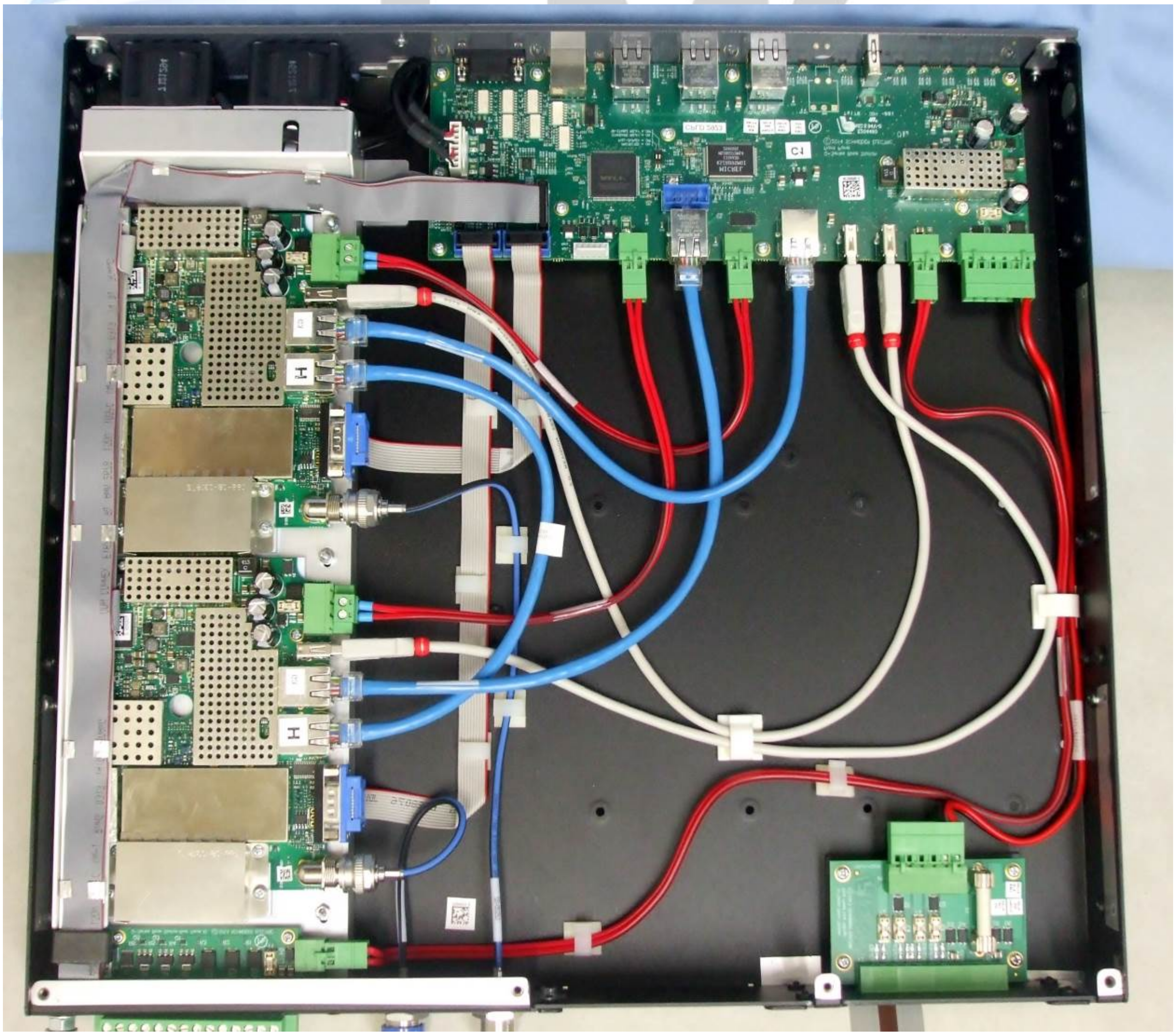
Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was updated in June 2014.

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

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

International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with various accreditation bodies in a number of economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

9. PHOTOGRAPHS



TBURQB4LN-F00E1L00

Model: QB450

ACMA: N76 FCC ID: NI8QB450QP450

RSM (NZ): Z216 IC: 4630A- QB450QP450

Input Power: 11-30VDC ⎓ 11A max

Operating Temp: -40 to 70 deg. C

WARNING: Risk of death, serious injury or equipment damage. Refer to user manual for installation procedure and safety advice.

Substitution of components may void approval or warranty.

0891 SN:700600

TBURQB4HN-F00E1L00

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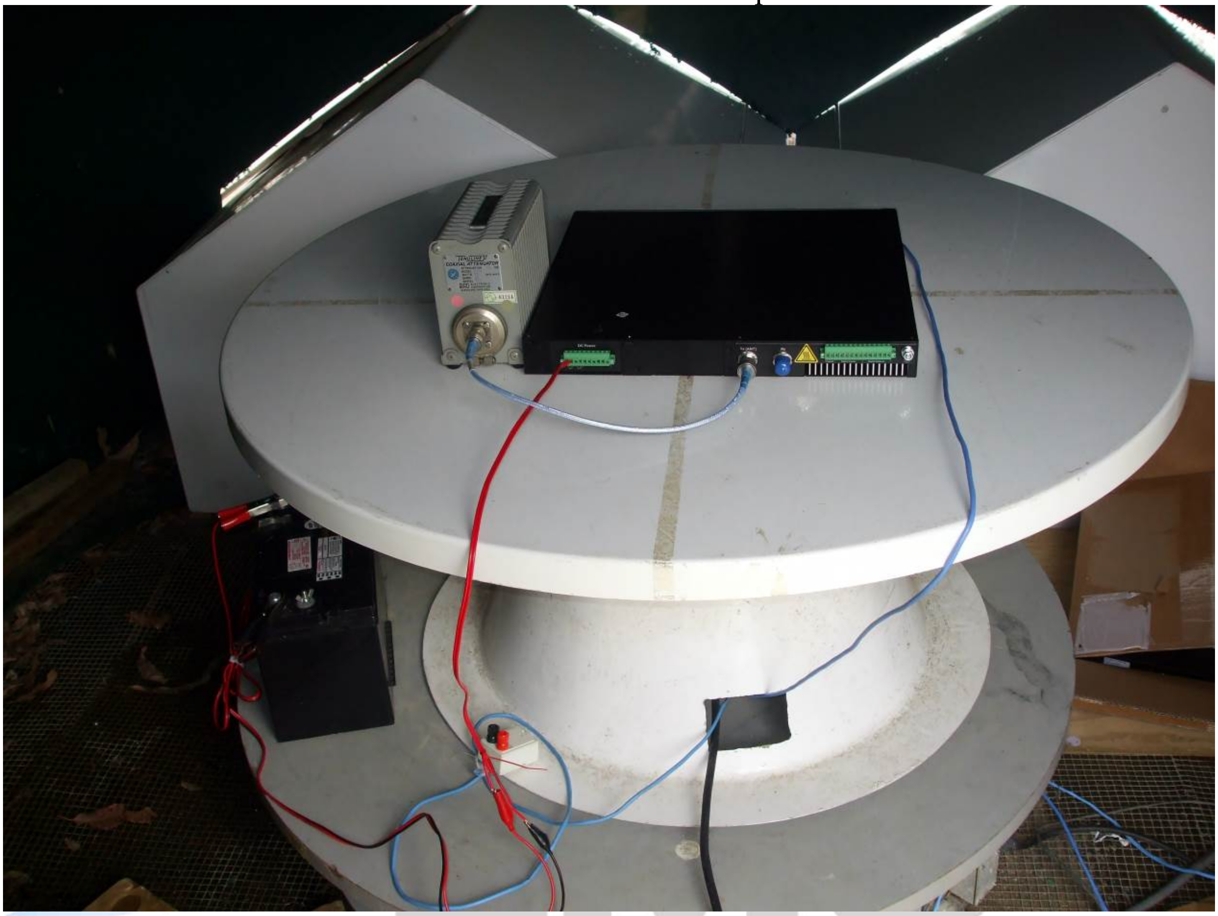
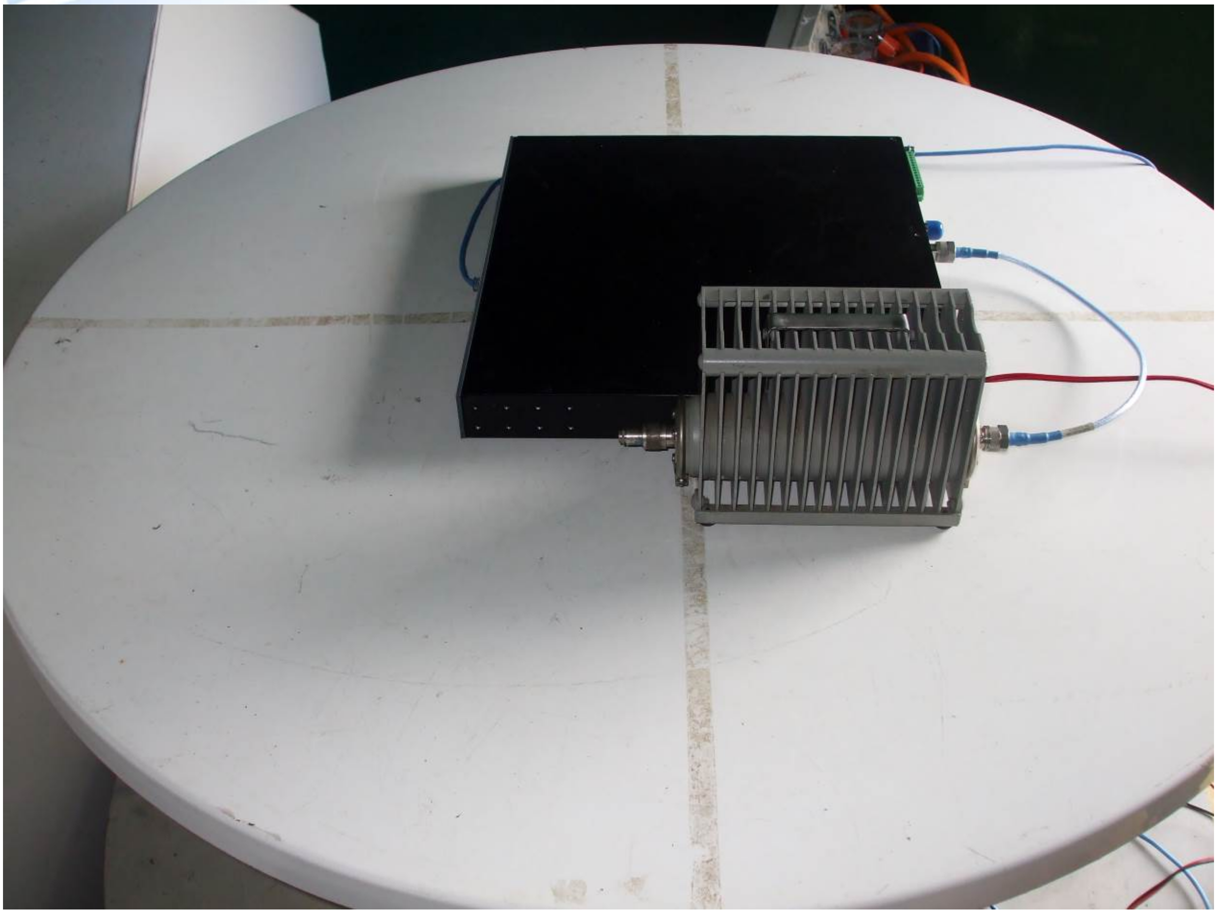
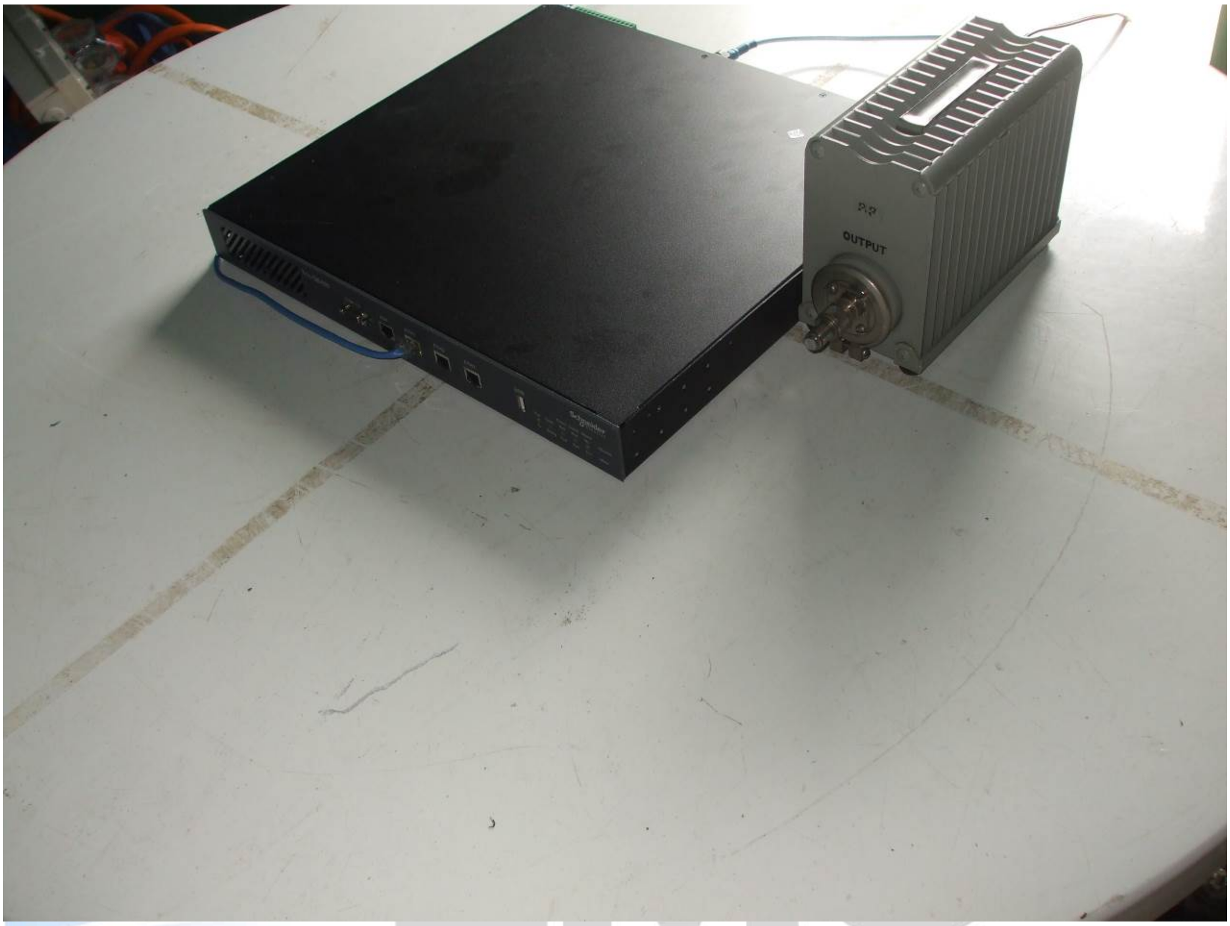
0891 SN:700601

Radiated emissions setup






OUTPUT