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TEST REPORT

Trio Datacom QR150 VHF Remote Station

tested to the

Code of Federal Regulations (CFR) 47

Part 90 –Private Land Mobile Services

for

Trio Datacom Pty Ltd
(a wholly owned company of Schneider Electric)

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

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1. COMPLIANCE STATEMENT

The **Trio Datacom QR150 VHF Remote 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-D-2010.

2. RESULT SUMMARY

The results of testing carried out in October and December 2016 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	Not tested
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 (a wholly owned company of Schneider Electric)

Address 1 Acacia Place
Notting Hill
Victoria 3168

Country Australia

Contact Mr Ernest Fardin

5. TEST SAMPLE DESCRIPTION

Brand Name Trio Datacom

Model Number QR150

Product VHF Remote Station

Manufacturer Trio Datacom

Serial Number 800140

FCC I.D NI8QR150

Rated Transmitter Output Power

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

Transmitter Certification Range

Part 90: 150 - 174 MHz

Test frequencies

Frequency (MHz)	Power (Watts)	Emission
155.000	10.0	F1D
160.000	10.0	F1D
173.375	10.0	F1D

Testing was initially carried out on 150.100 MHz which showed compliance however this frequency falls outside of the frequency range allowed for Part 90 certification.

Limited testing results have been provided on 155.000 MHz as testing on 160.000 and 173.375 MHz is indicative of the performance of the radio over the range of 150 - 174 MHz.

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:	15.9 Vdc
Low Voltage:	11.7 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;

(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)
155.000	15.9	40.0	39.8
155.000	13.8	40.0	39.8
155.000	11.7	40.0	39.7
160.000	15.9	40.0	39.9
160.000	13.8	40.0	39.8
160.000	11.7	40.0	39.8
173.375	15.9	40.0	39.9
173.375	13.8	40.0	39.8
173.375	11.7	40.0	39.8

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 a channel bandwidth of 12.5 kHz.

An emission designator of 11k2F1D 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 using the various modulation types and data rates that this radio can support at each test frequency.

Measurements were made using a spectrum analyser that was operating in occupied bandwidth mode with the 99% power points being determined automatically.

The analyser was set up with a span of 15 kHz with a resolution bandwidth of 100 Hz and a video bandwidth of 100 Hz while operating in peak hold mode.

Attached to the input of the spectrum analyser was an external 30 dB attenuator.

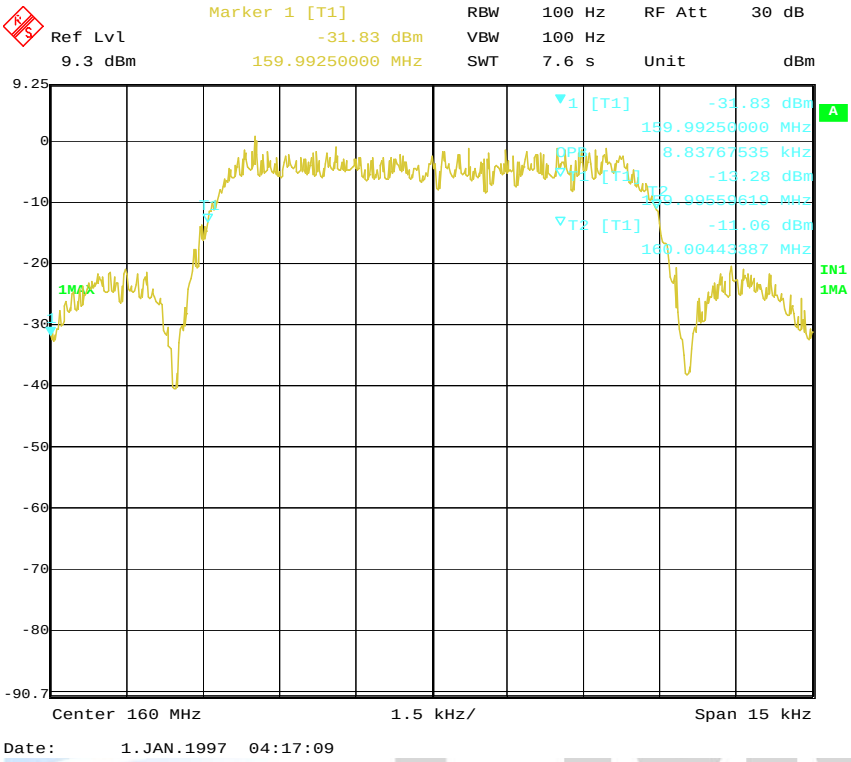
Testing was carried out on 160.000 MHz and 173.375 MHz which is indicative of the performance of the radio over the range of 150 - 174 MHz

Testing was also carried out on 150.100 MHz which showed compliance however this frequency falls outside of the frequency range allowed for Part 90 certification and these results have not been provided in this test report.

Result: Complies

160.000 MHz F1D – 12.5 kHz spacing, 8 kbps

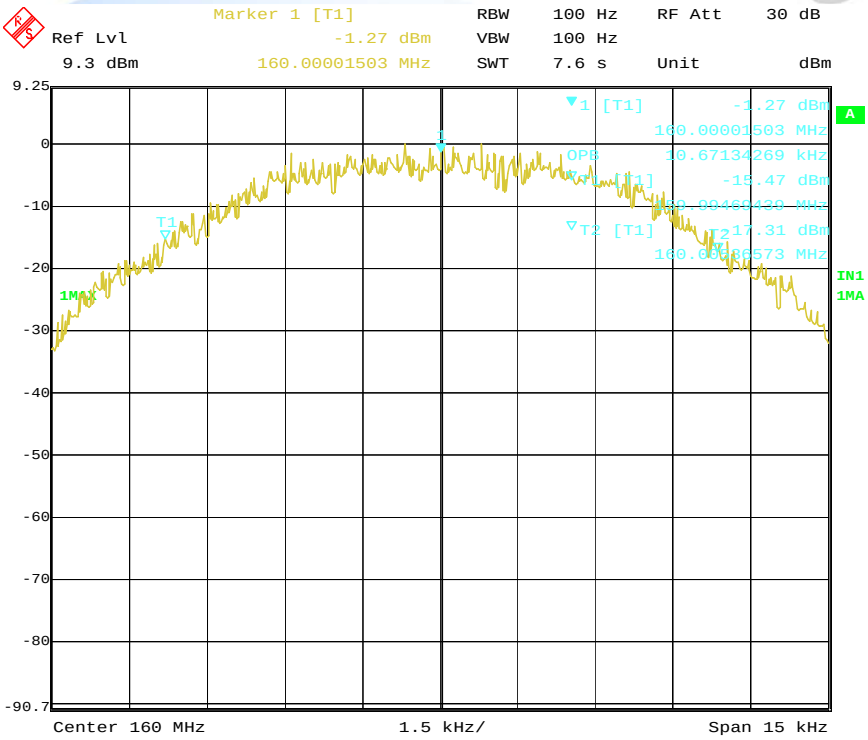
Emission	Channel	Measured	Designated
F1D	12.500 kHz	8.8 kHz	11.250 kHz



Date: 1.JAN.1997 04:17:09

160.000 MHz F1D – 12.5 kHz spacing, 16 kbps

Emission	Channel	Measured	Designated
F1D	12.500 kHz	10.6 kHz	11.250 kHz



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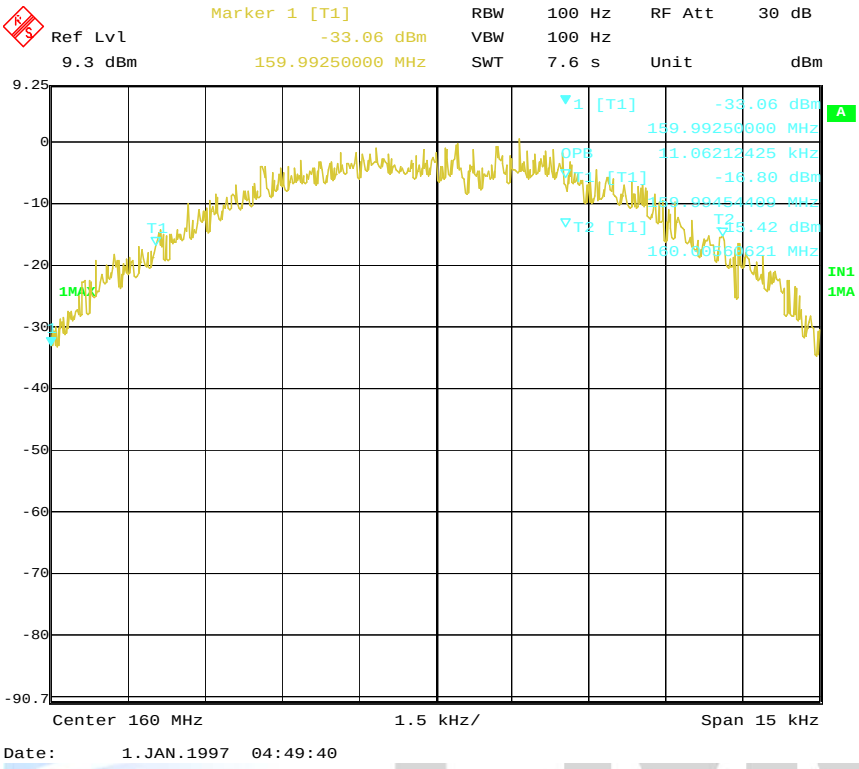
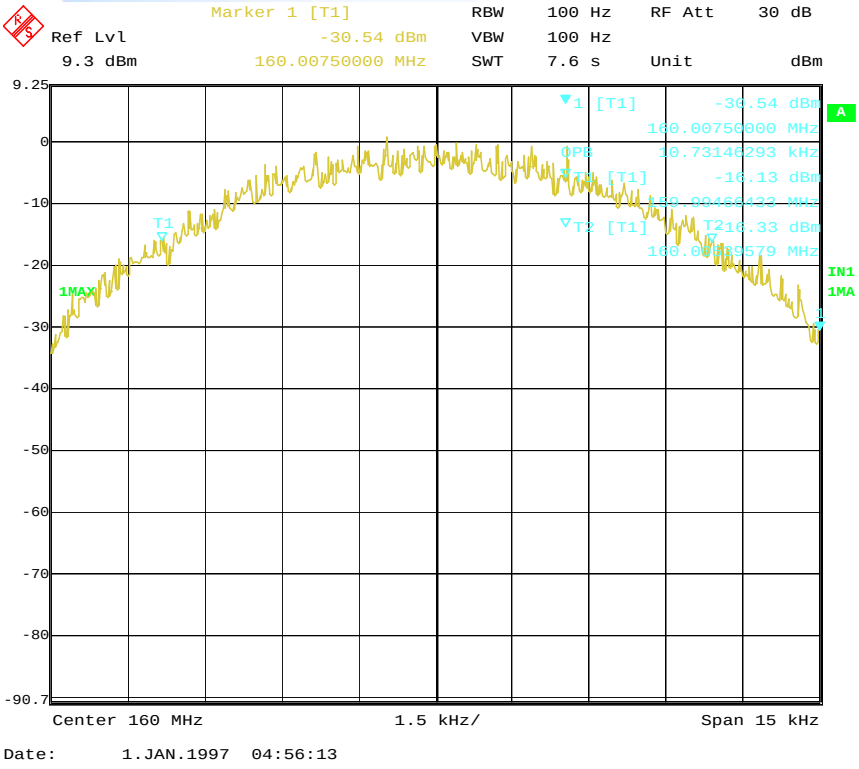
160.000 MHz F1D – 12.5 kHz spacing, 24 kbps

Emission	Channel	Measured	Designated
F1D	12.500 kHz	11.0 kHz	11.250 kHz



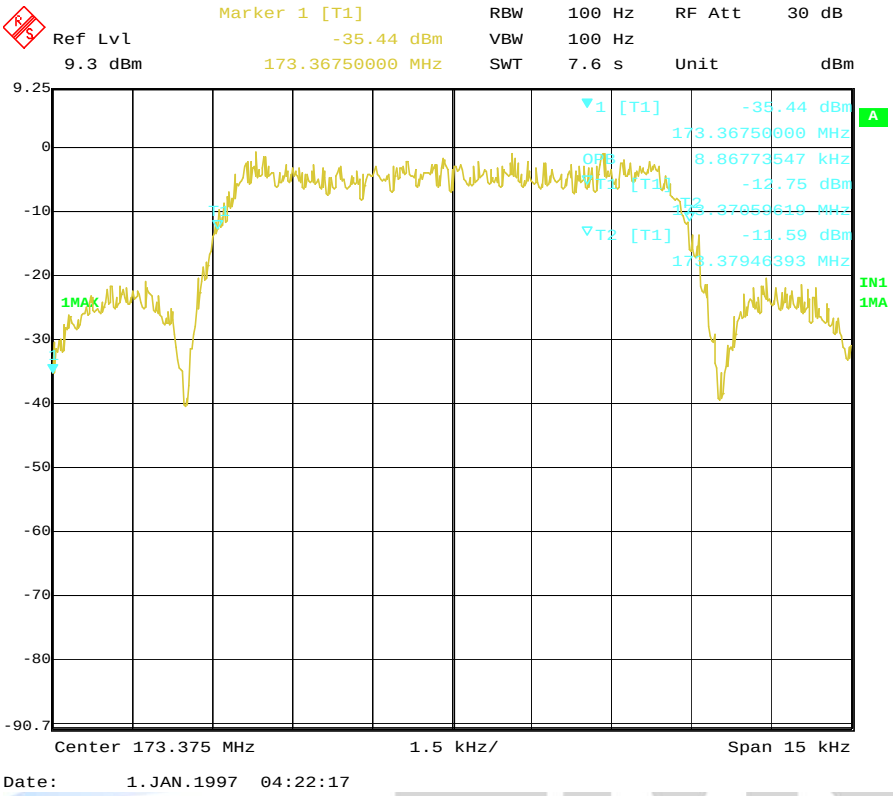
160.000 MHz F1D – 12.5 kHz spacing, 32 kbps

Emission	Channel	Measured	Designated
F1D	12.500 kHz	10.7 kHz	11.250 kHz



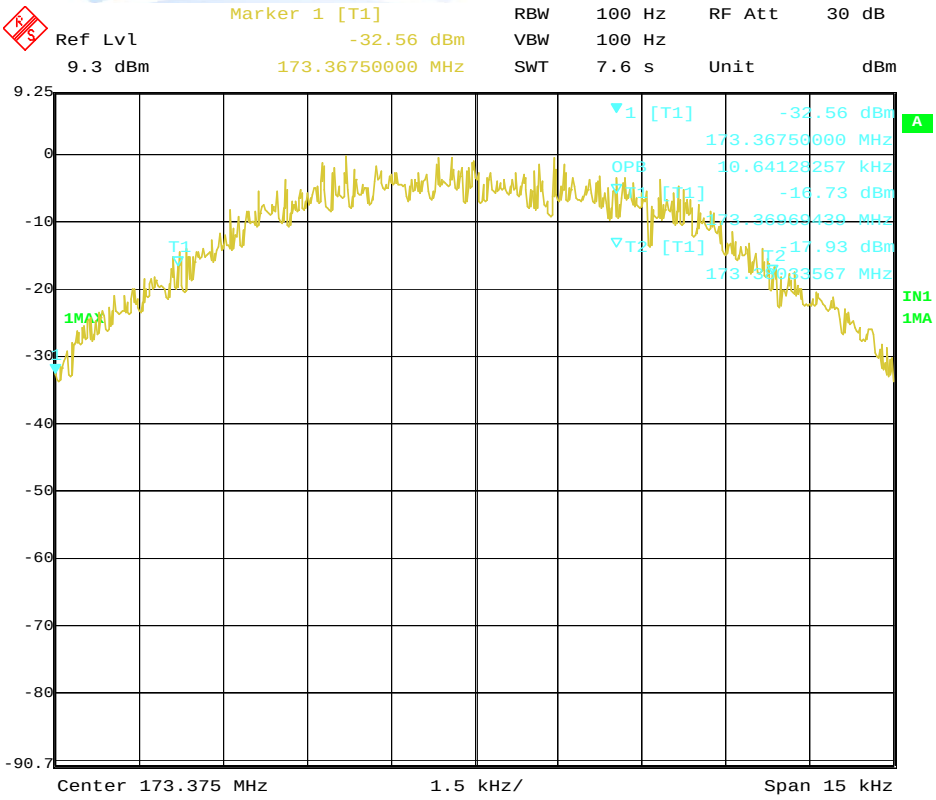
173.375 MHz F1D – 12.5 kHz spacing, 8 kbps

Emission	Channel	Measured	Designated
F1D	12.500 kHz	8.8 kHz	11.250 kHz



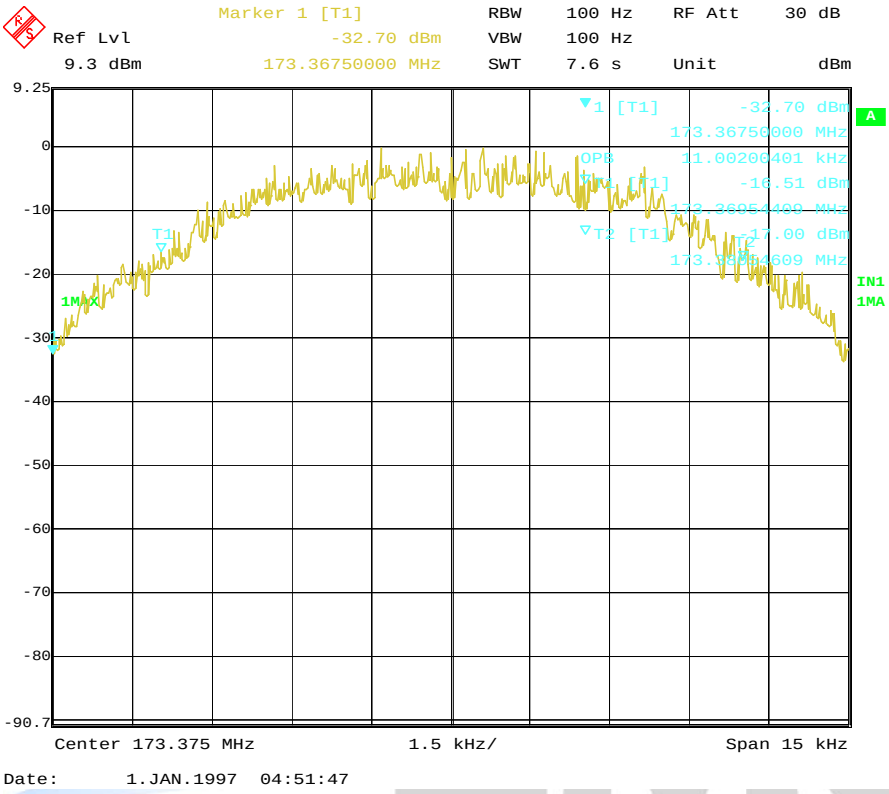
173.375 MHz F1D – 12.5 kHz spacing, 16 kbps

Emission	Channel	Measured	Designated
F1D	12.500 kHz	10.6 kHz	11.250 kHz



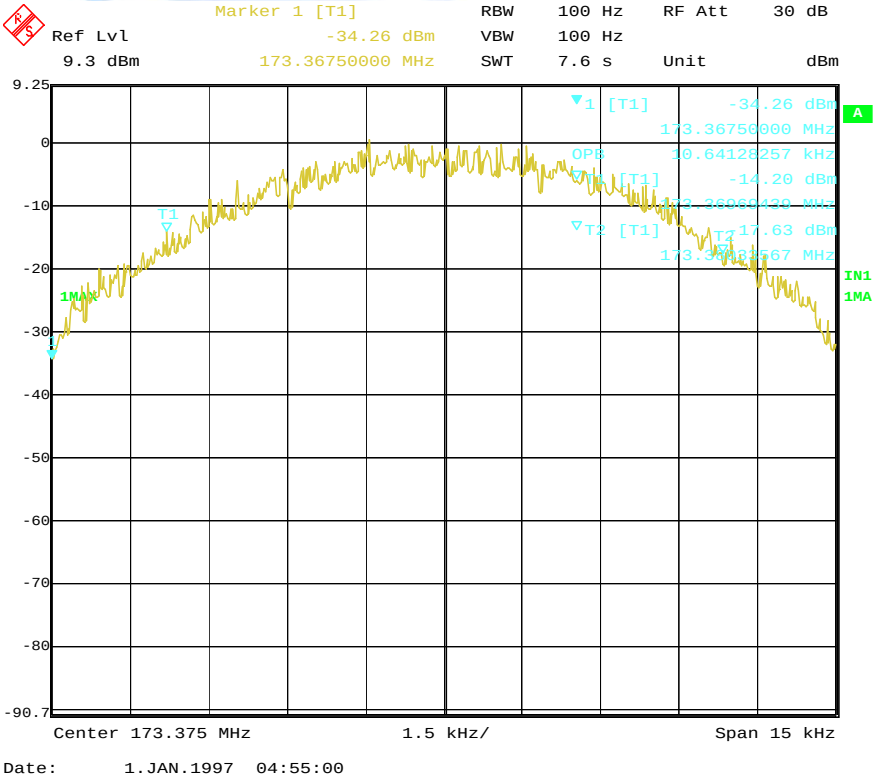
173.375 MHz F1D – 12.5 kHz spacing, 24 kbps

Emission	Channel	Measured	Designated
F1D	12.500 kHz	11.0 kHz	11.250 kHz



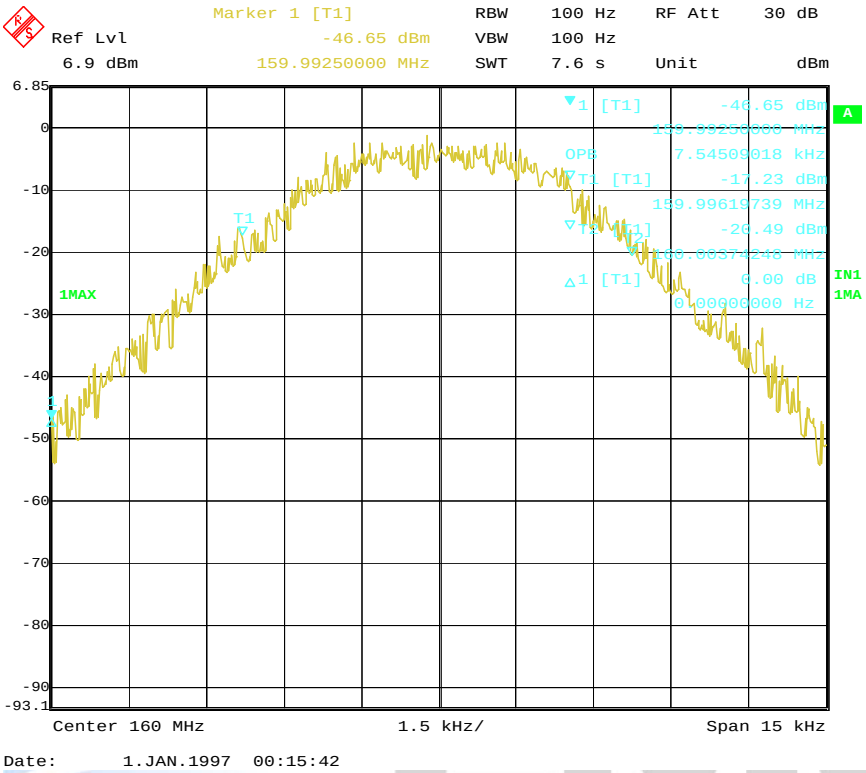
173.375 MHz F1D – 12.5 kHz spacing, 32 kbps

Emission	Channel	Measured	Designated
F1D	12.500 kHz	10.6 kHz	11.250 kHz



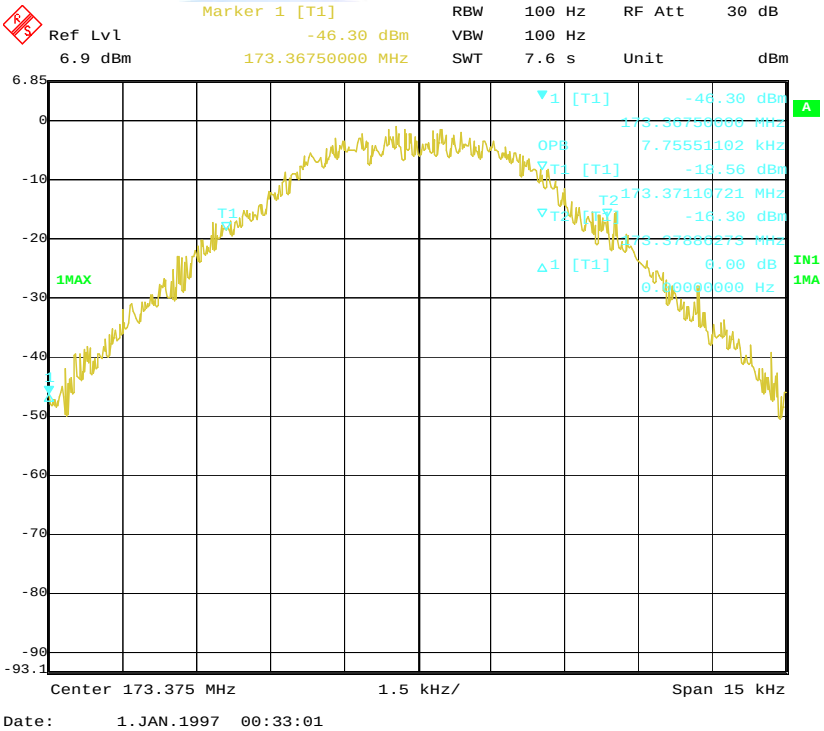
160.000 MHz F1D – 12.5 kHz spacing, FCC 4-level

Emission	Channel	Measured	Designated
F1D	12.500 kHz	7.5 kHz	11.250 kHz



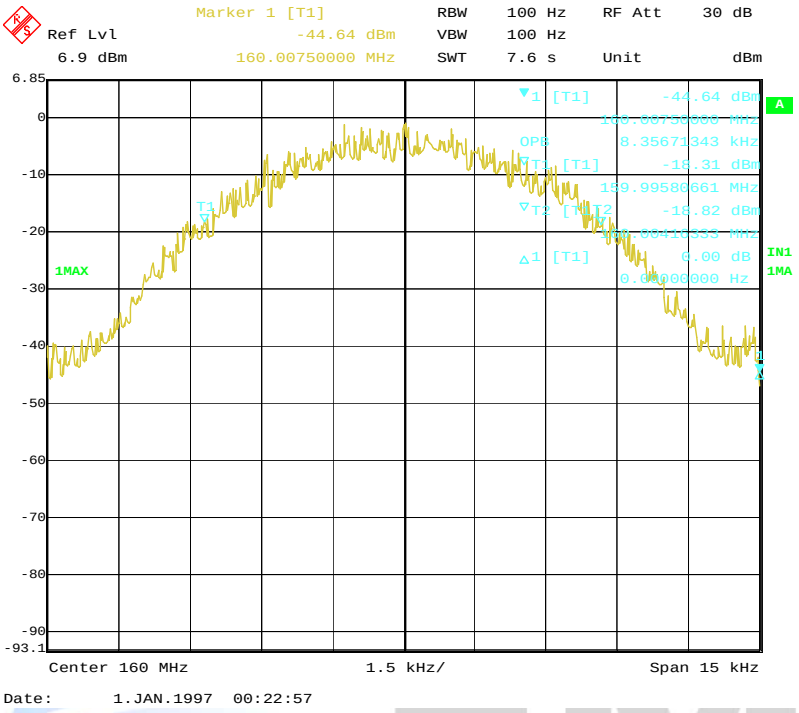
173.375 MHz F1D – 12.5 kHz spacing, FCC 4-level

Emission	Channel	Measured	Designated
F1D	12.500 kHz	7.7 kHz	11.250 kHz



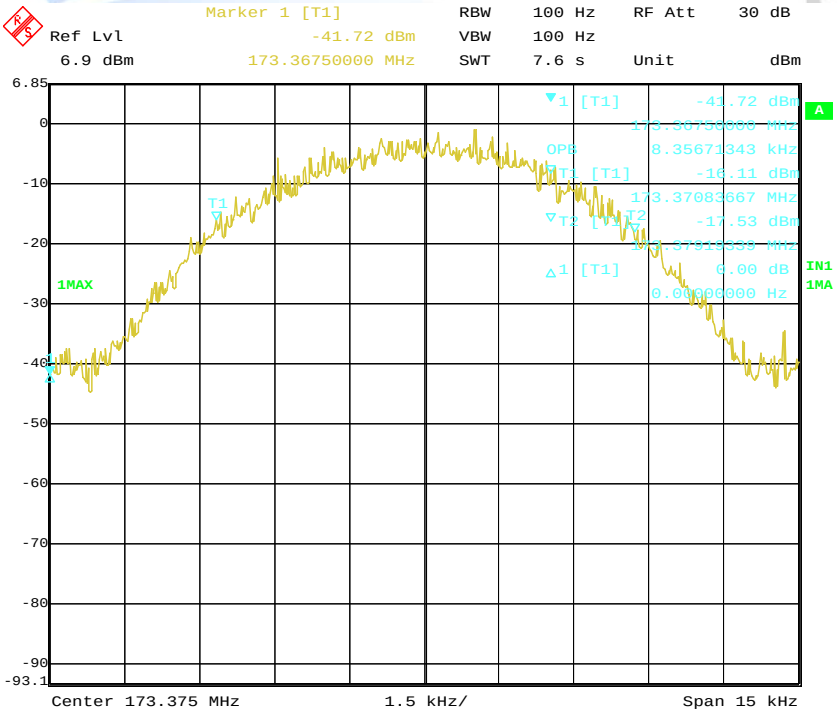
160.000 MHz F1D – 12.5 kHz spacing, FCC M-Series

Emission	Channel	Measured	Designated
F1D	12.500 kHz	8.3 kHz	11.250 kHz



173.375 MHz F1D – 12.5 kHz spacing, FCC M-Series

Emission	Channel	Measured	Designated
F1D	12.500 kHz	8.3 kHz	11.250 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 150.050 - 174.00 MHz using an authorised bandwidth of 12.5 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.

For all measurements a 30 dB attenuator is placed between the transmitter and the spectrum analyser. Measurements were made in peak hold

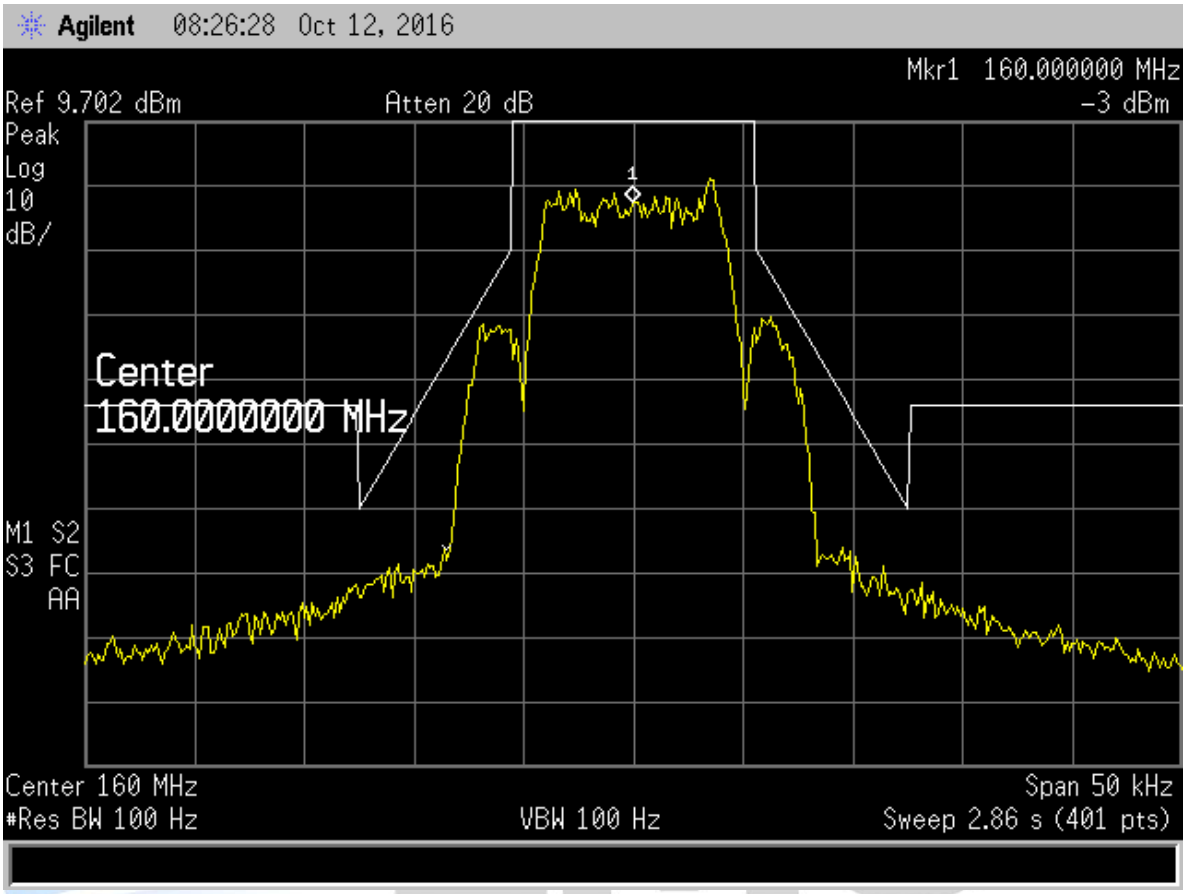
For the F1D mode the transmitter was modulated using the modulation sources internal to the transmitter as supplied by the client.

Testing was carried out on 160.000 MHz and 173.375 MHz which is indicative of the performance of the radio over the range of 150 - 174 MHz

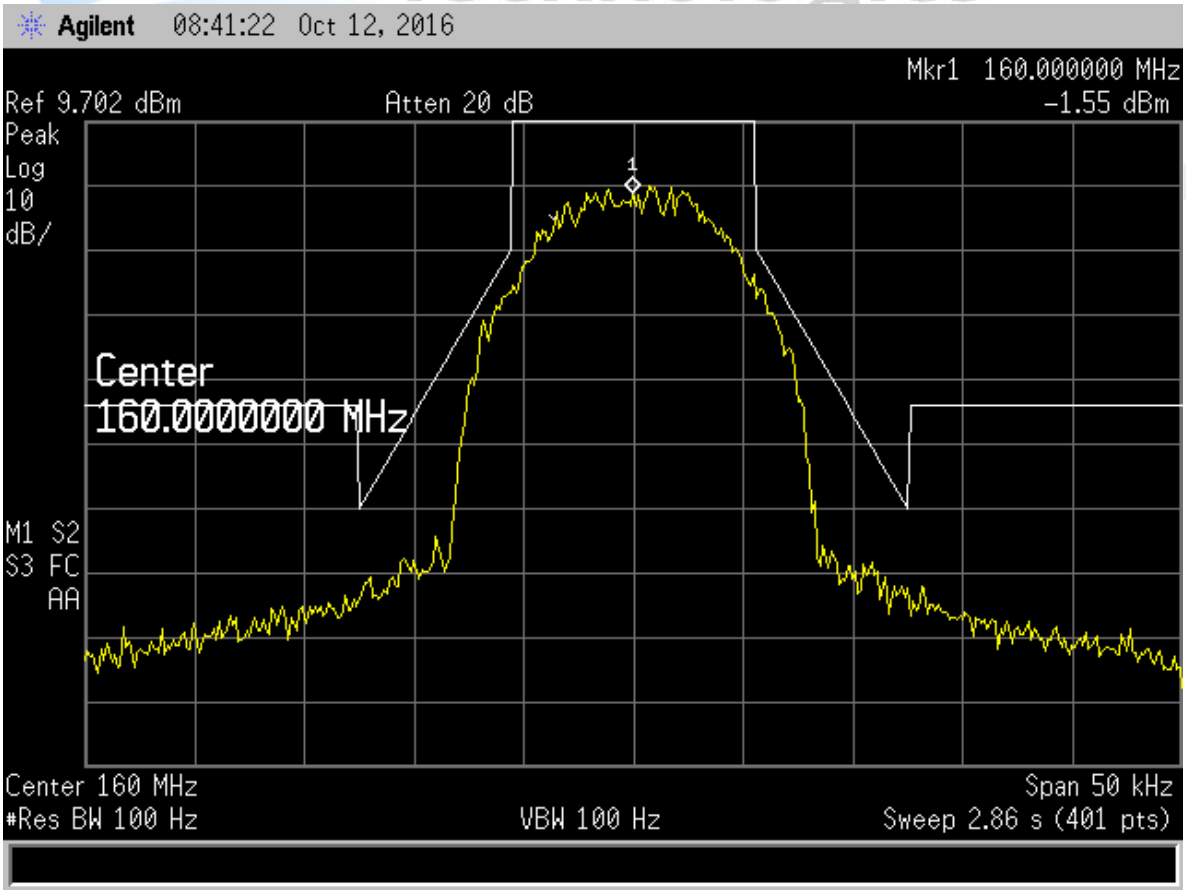
Testing was also carried out on 150.100 MHz which showed compliance however this frequency falls outside of the frequency range allowed for Part 90 certification and these results have not been provided in this test report.

Result: Complies.

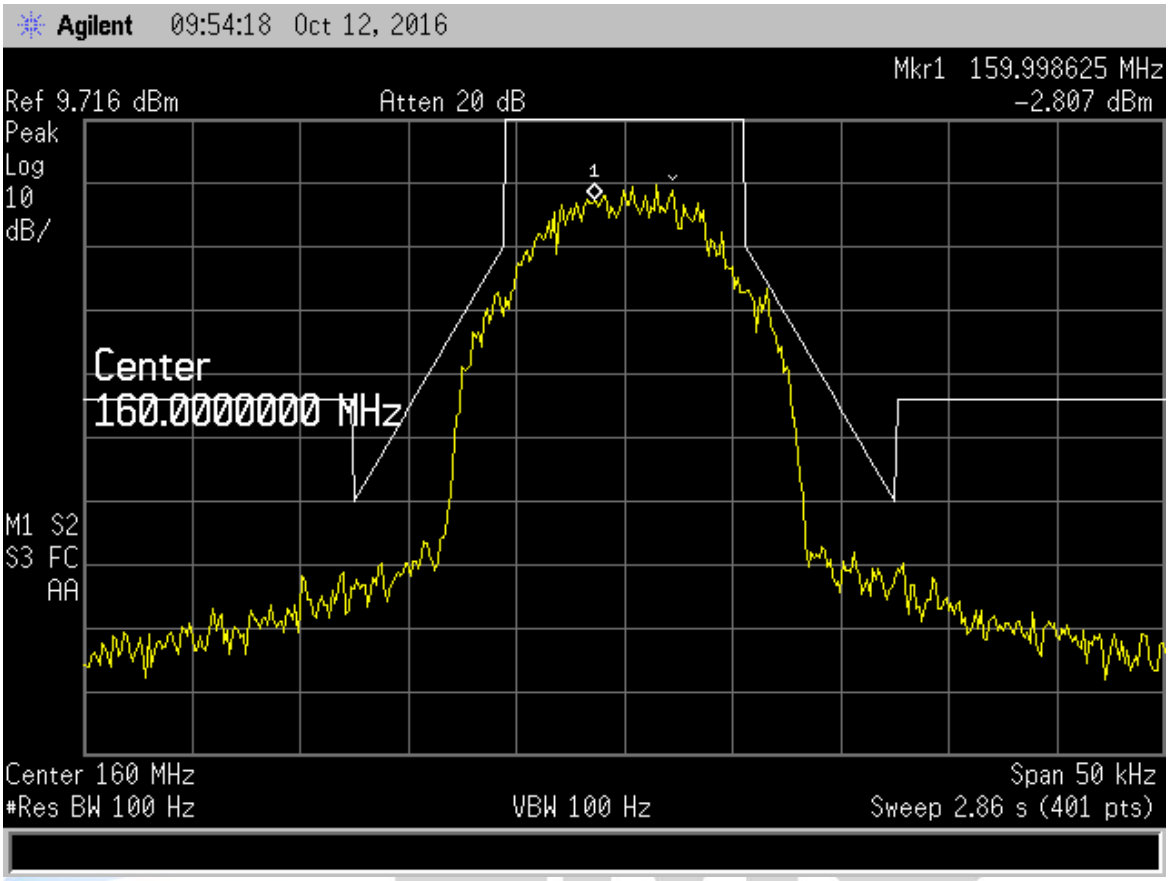
160.000 MHz F1D 12.5 kHz, 8 kbps



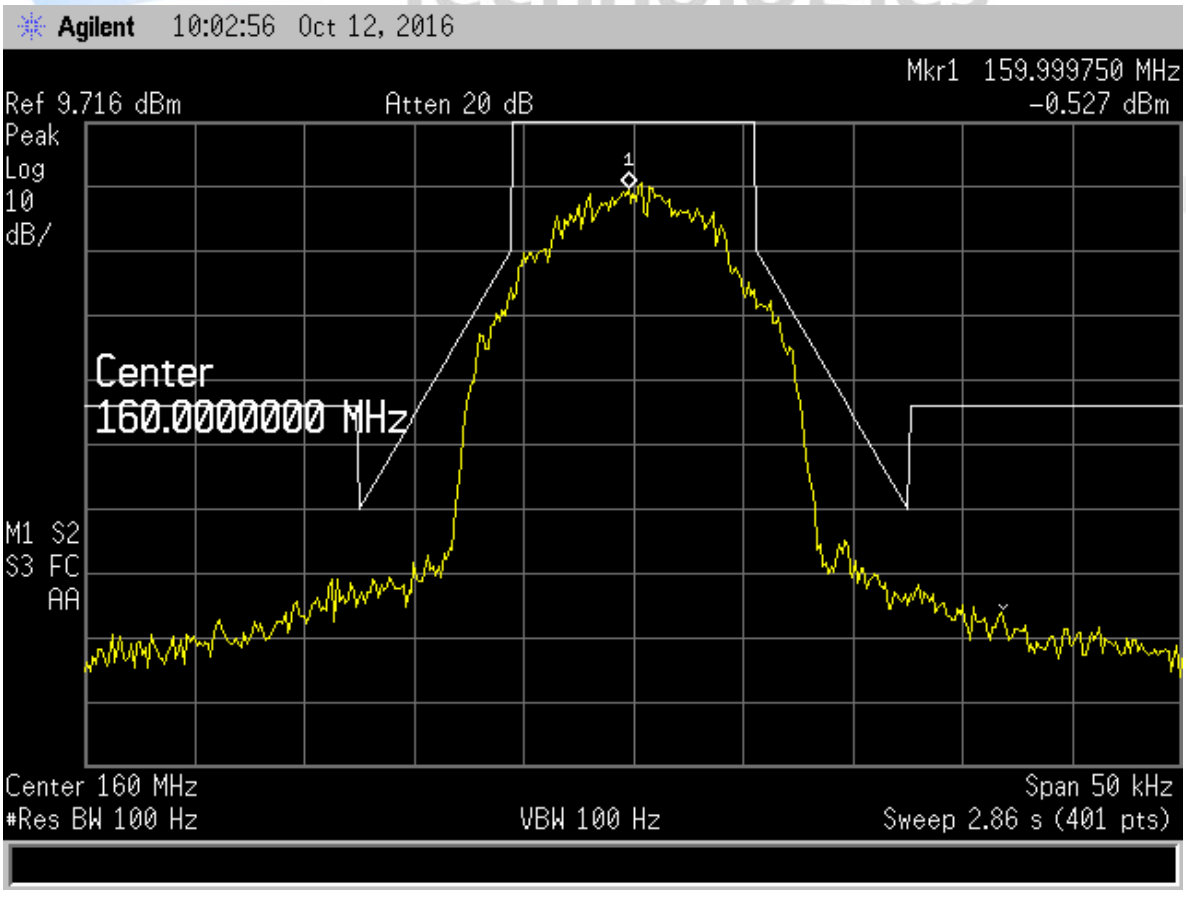
160.000 MHz F1D 12.5 kHz, 16 kbps



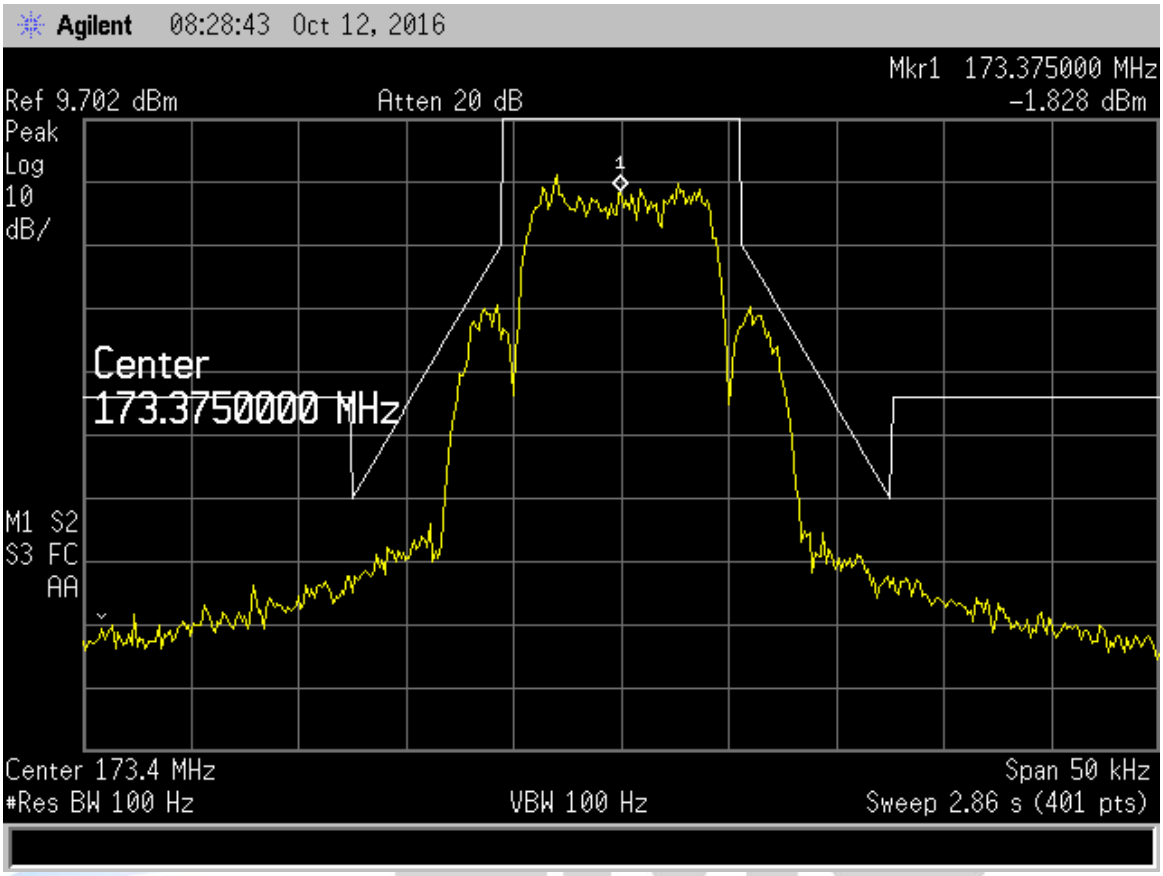
160.000 MHz F1D 12.5 kHz, 24 kbps



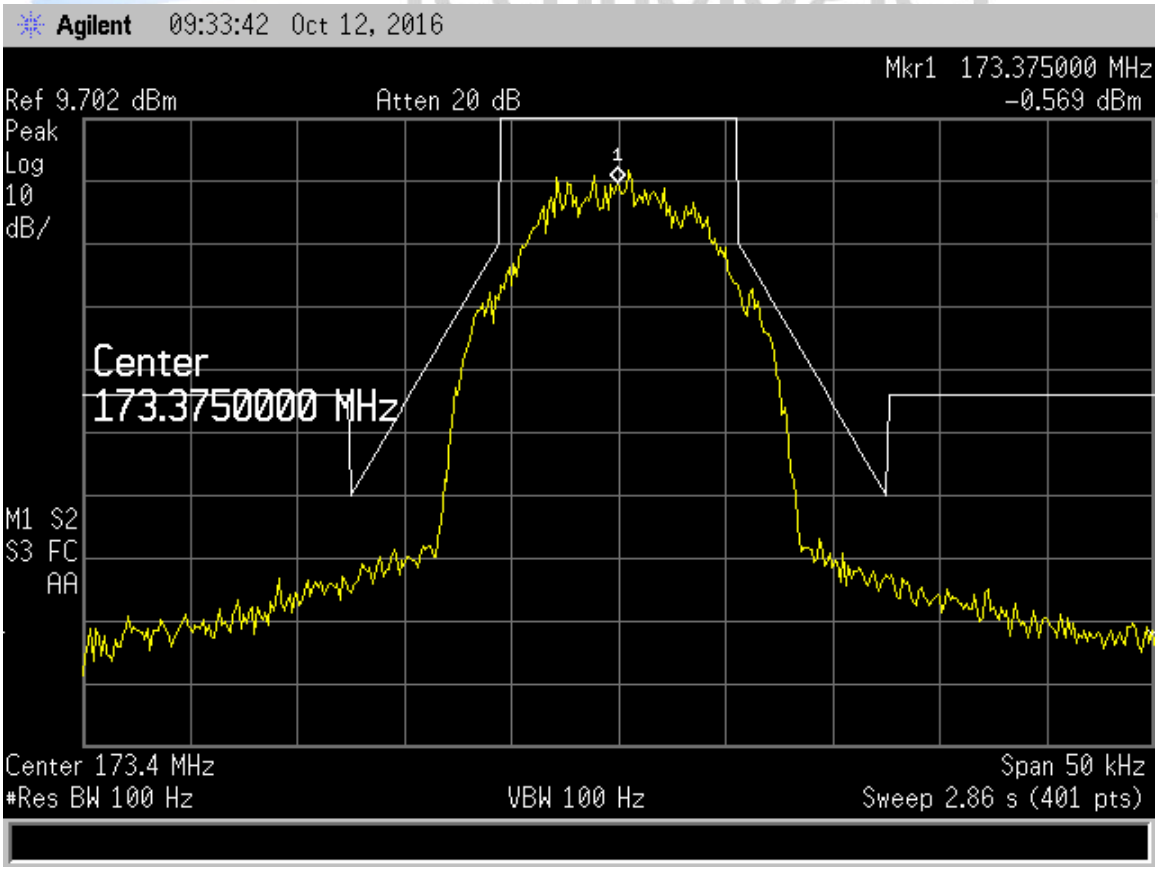
160.000 MHz F1D 12.5 kHz, 32 kbps



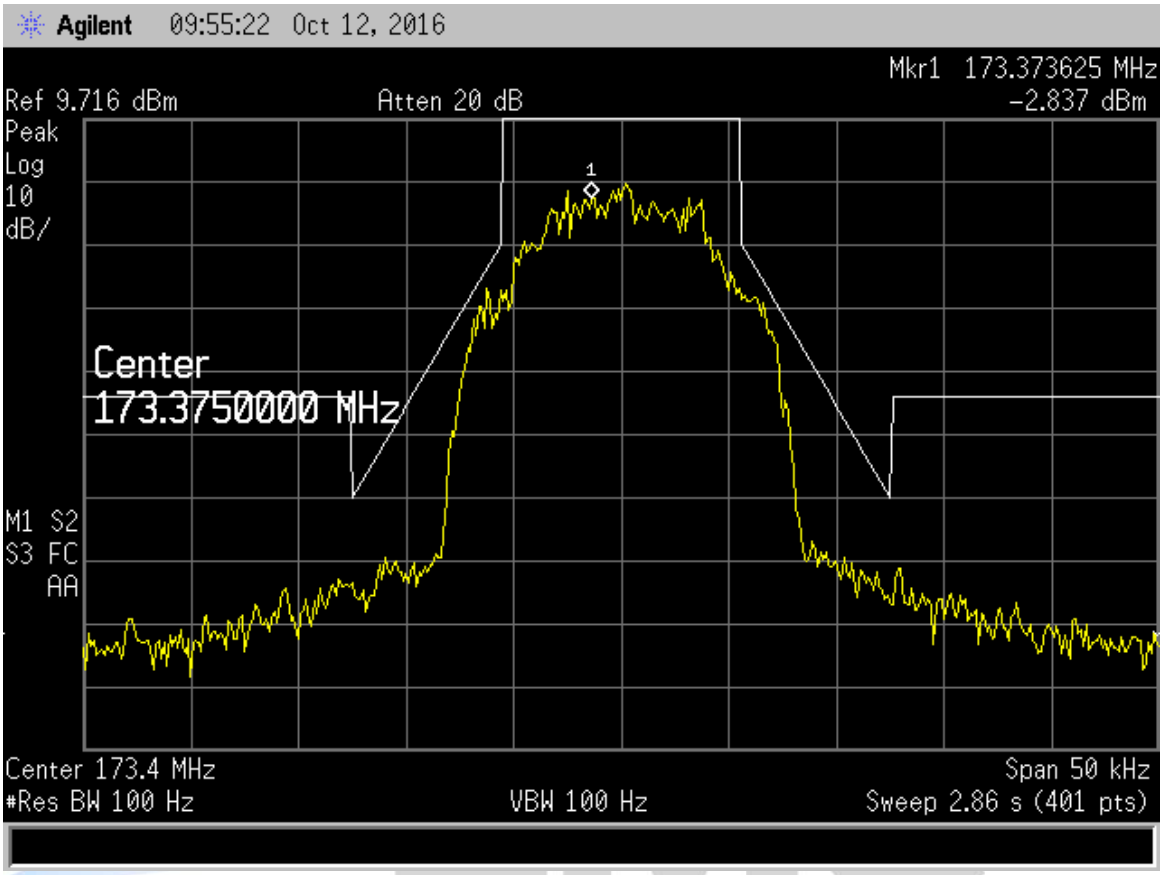
173.375 MHz F1D 12.5 kHz, 8 kbps



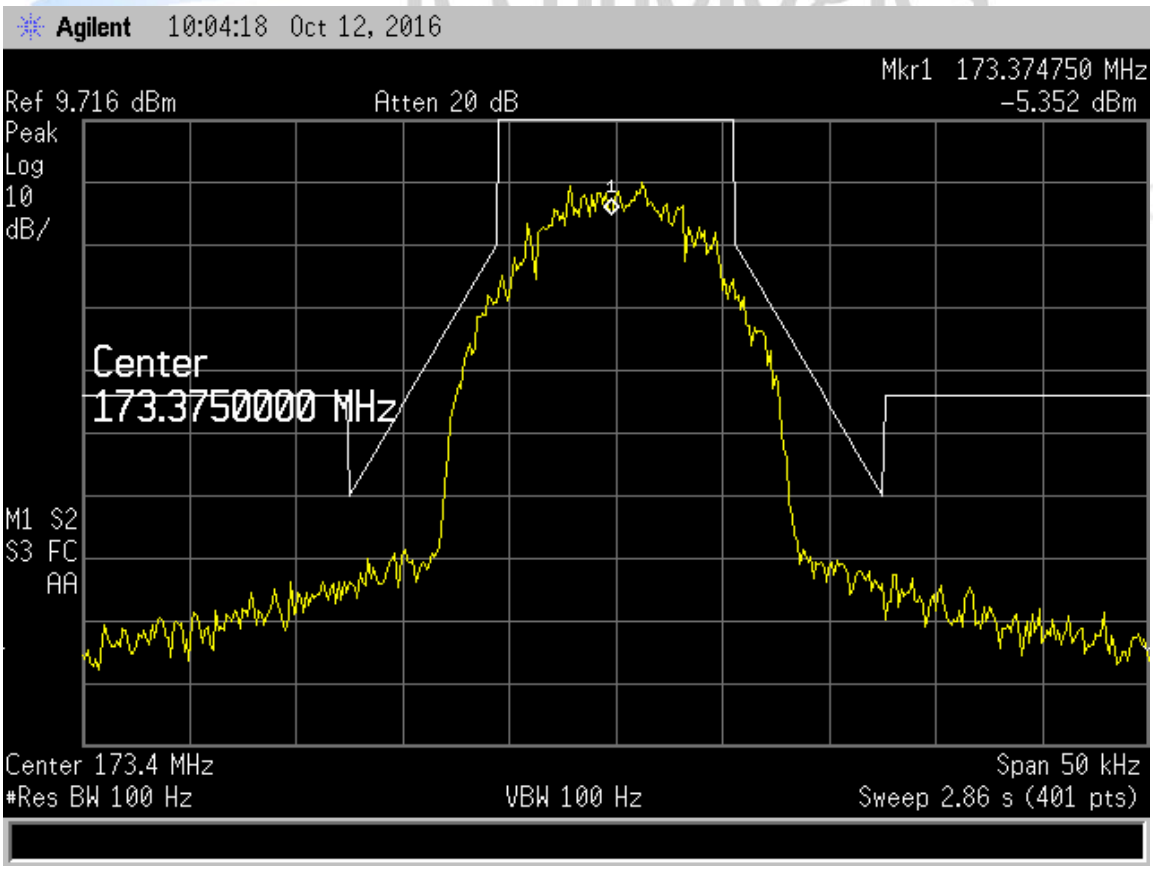
173.375 MHz F1D 12.5 kHz, 16 kbps



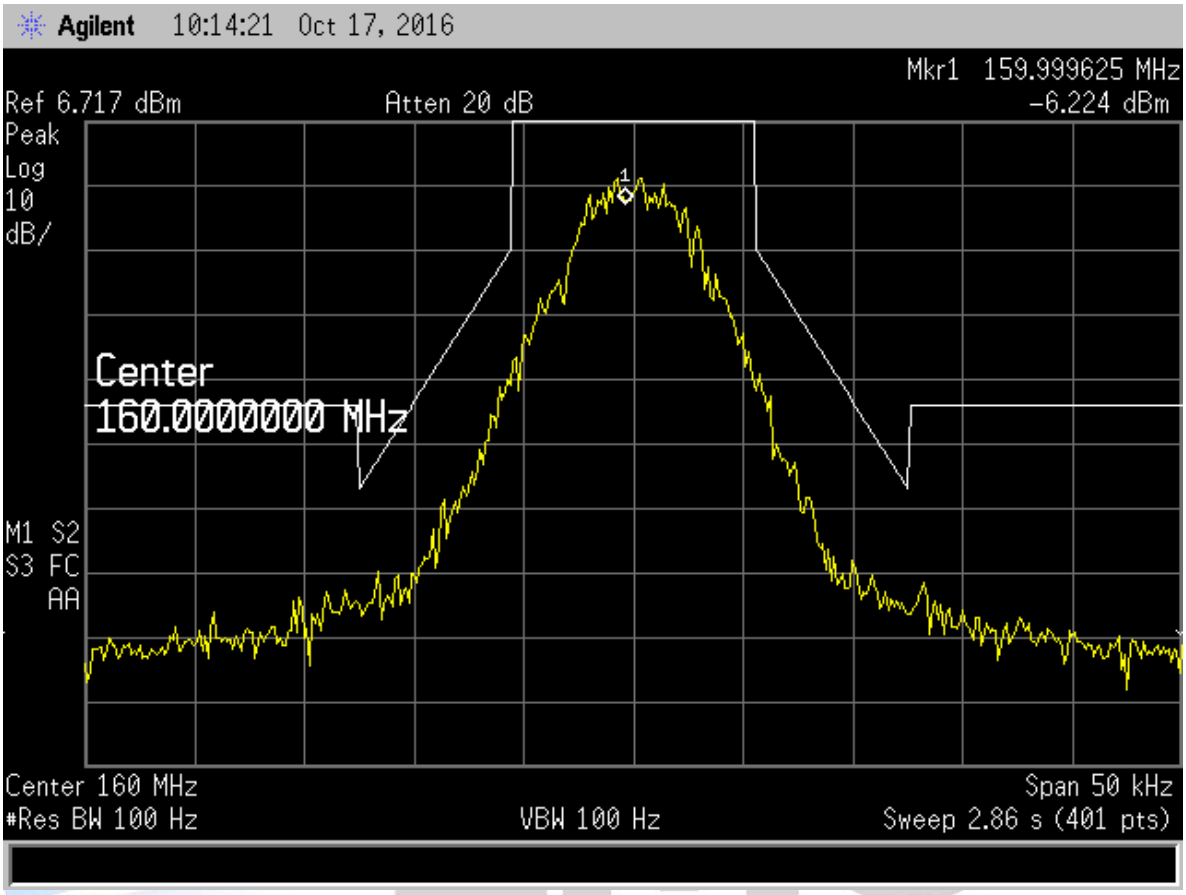
173.375 MHz F1D 12.5 kHz, 24 kbps



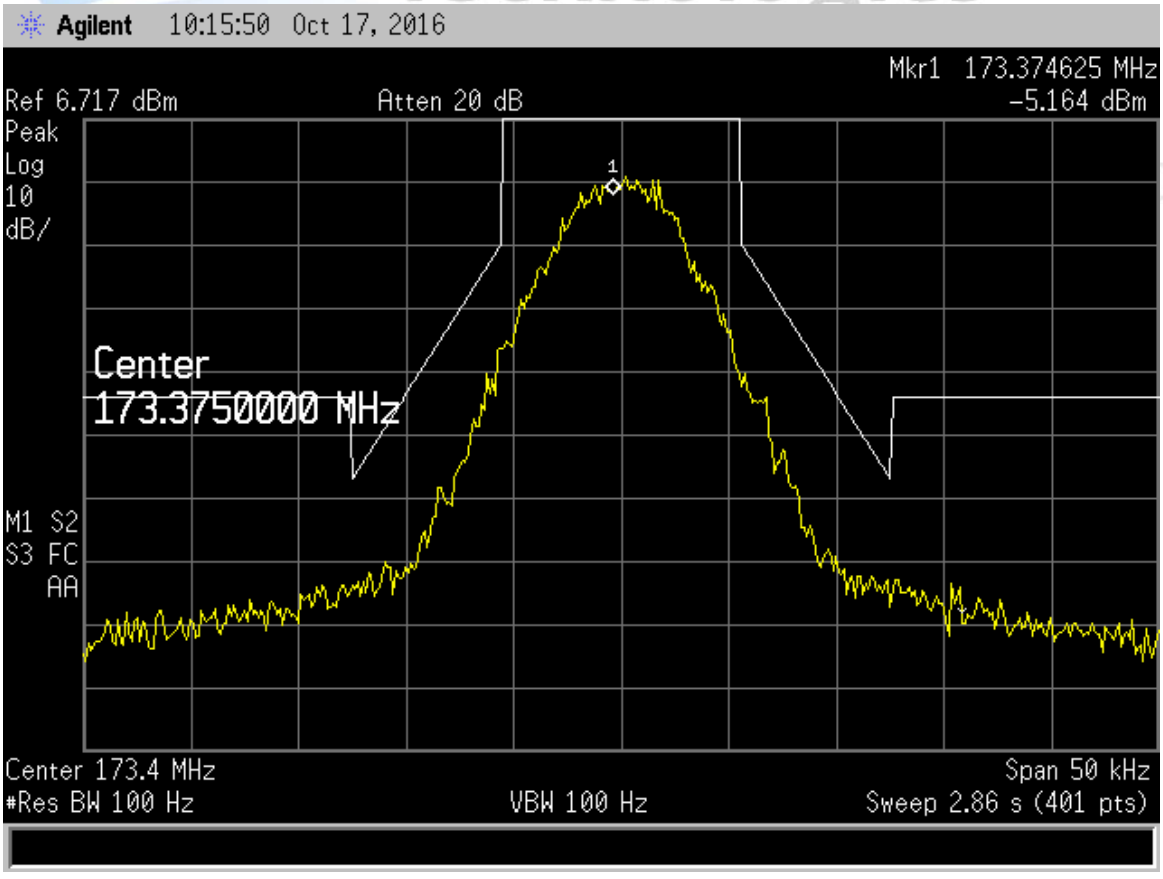
173.375 MHz F1D 12.5 kHz, 32 kbps



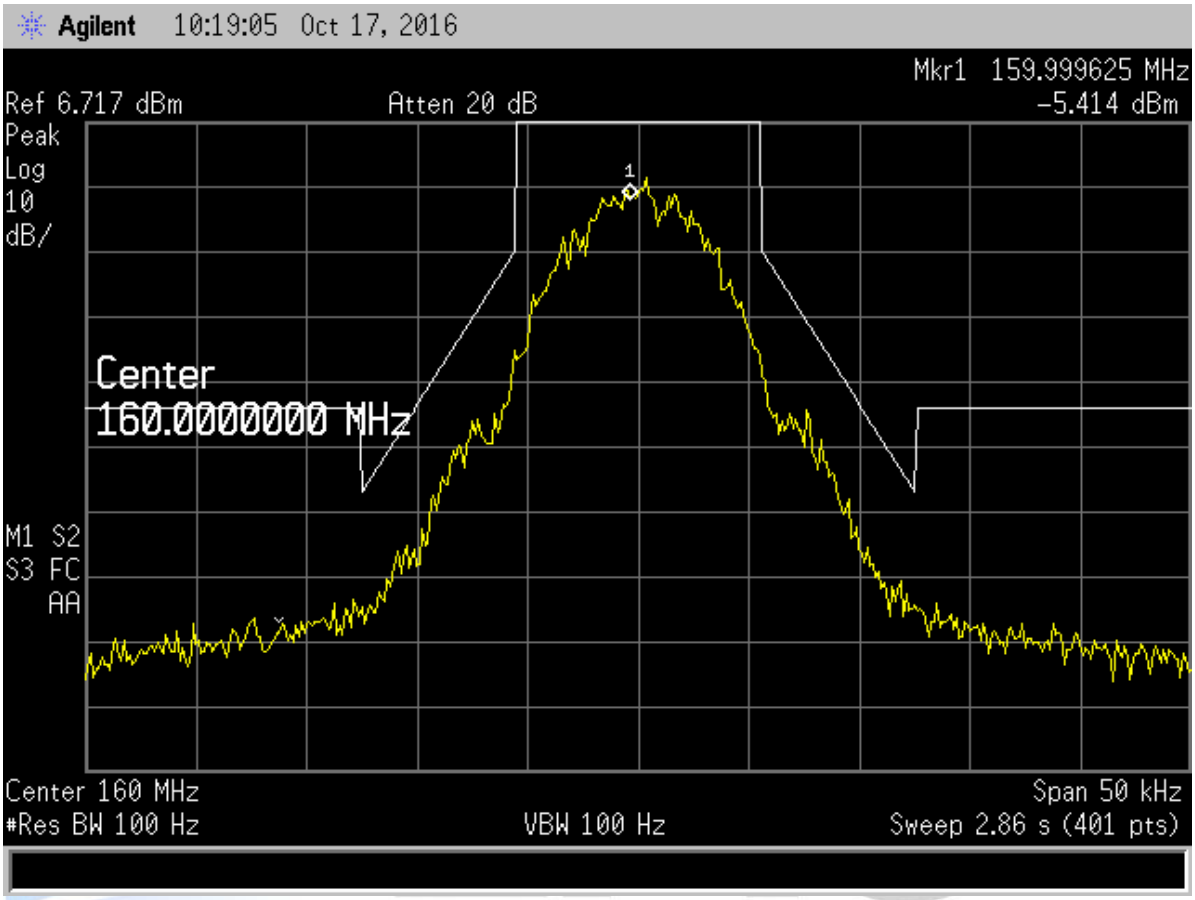
160.000 MHz 9600bps 12.5 kHz FCC 4 Level



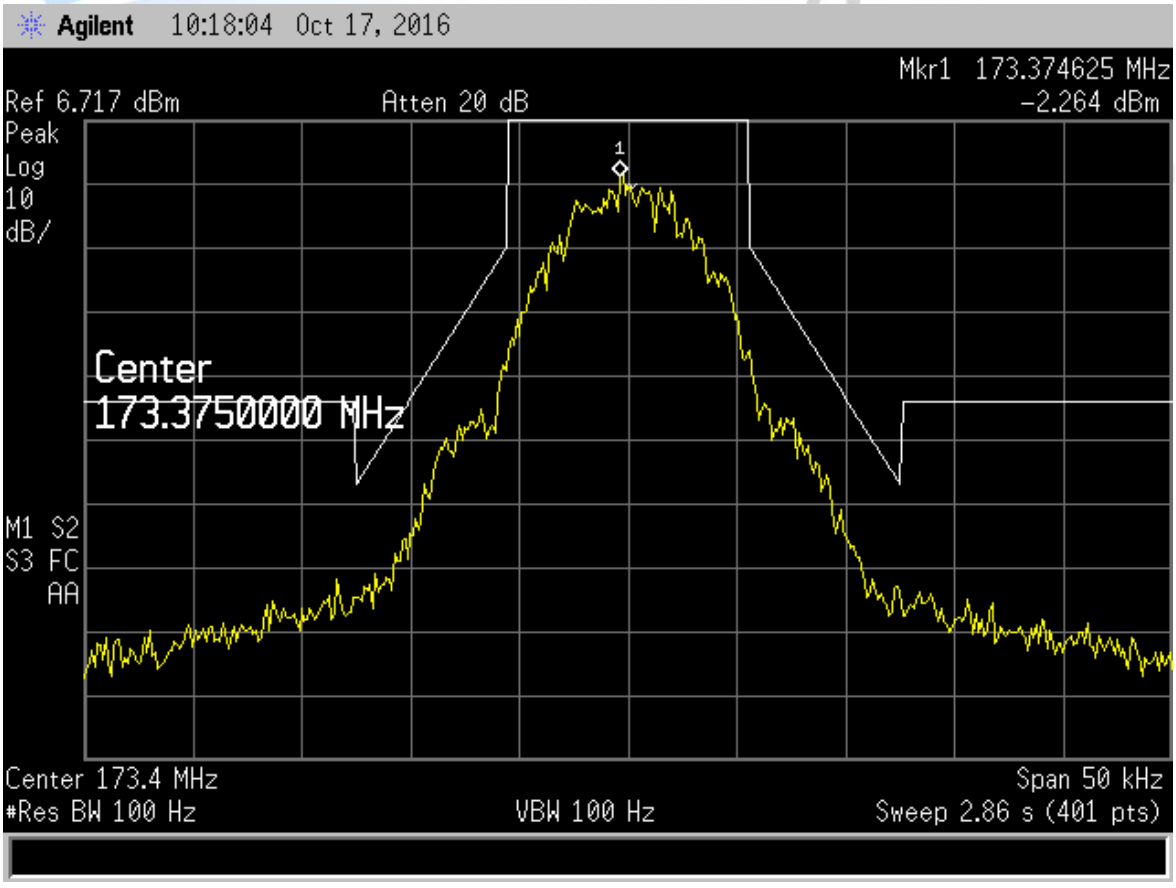
173.375 MHz 9600bps 12.5 kHz FCC 4 Level



160.000 MHz 9600bps 12.5 kHz FCC MSeries



173.375 MHz 9600bps 12.5 kHz FCC MSeries



Transmitter spurious emissions at the antenna terminals

Frequency: 155.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
310.000	-60.0*	-20.0
465.000	-70.0*	-20.0
620.000	-70.0*	-20.0
775.000	-70.0*	-20.0
930.000	-70.0*	-20.0
1085.000	-70.0*	-20.0
1240.000	-70.0*	-20.0
1395.000	-70.0*	-20.0
1550.000	-70.0*	-20.0

* Noise floor measurement.

Frequency: 160.000 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
320.000	-60.0*	-20.0
480.000	-70.0*	-20.0
640.000	-70.0*	-20.0
800.000	-70.0*	-20.0
960.000	-70.0*	-20.0
1120.000	-70.0*	-20.0
1280.000	-70.0*	-20.0
1440.000	-70.0*	-20.0
1600.000	-70.0*	-20.0

* Noise floor measurement.

Frequency: 173.375 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
346.750	-60.0*	-20.0
520.125	-70.0*	-20.0
693.500	-70.0*	-20.0
866.875	-70.0*	-20.0
1040.250	-70.0*	-20.0
1213.625	-70.0*	-20.0
1387.000	-70.0*	-20.0
1560.375	-70.0*	-20.0
1733.750	-70.0*	-20.0

* Noise floor measurement.

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

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

Nominal Frequency: 155.000 MHz

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)	Result
310.000	33.4	-64.0	-20.0	Vertical	44.0	Pass
	42.0	-55.4	-20.0	Horizontal	35.4	Pass
465.000	*26.7	-70.7	-20.0	Vertical	50.7	Pass
	*26.8	-70.6	-20.0	Horizontal	50.6	Pass
620.000	*33.7	-63.7	-20.0	Vertical	43.7	Pass
	*34.8	-62.6	-20.0	Horizontal	42.6	Pass
775.000	*29.9	-67.5	-20.0	Vertical	47.5	Pass
	*29.7	-67.7	-20.0	Horizontal	47.7	Pass
930.000	*30.1	-67.3	-20.0	Vertical	47.3	Pass
	*29.4	-68.0	-20.0	Horizontal	48.0	Pass
1085.000	*35.1	-62.3	-20.0	Vertical	42.3	Pass
	*34.4	-63.0	-20.0	Horizontal	43.0	Pass
1240.000	*36.6	-60.8	-20.0	Vertical	40.8	Pass
	*36.5	-60.9	-20.0	Horizontal	40.9	Pass
1395.000	*37.1	-60.3	-20.0	Vertical	40.3	Pass
	*37.2	-60.2	-20.0	Horizontal	40.2	Pass
1550.000	*38.5	-58.9	-20.0	Vertical	38.9	Pass
	*38.9	-58.5	-20.0	Horizontal	38.5	Pass

* Noise floor measurement

Nominal Frequency: 160.000 MHz

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)	Result
320.2000	38.6	-58.8	-20.0	Vertical	38.8	Pass
	48.1	-49.3	-20.0	Horizontal	29.3	Pass
480.3000	*31.5	-65.9	-20.0	Vertical	45.9	Pass
	*32.7	-64.7	-20.0	Horizontal	44.7	Pass
640.4000	*36.5	-60.9	-20.0	Vertical	40.9	Pass
	*39.3	-58.1	-20.0	Horizontal	38.1	Pass
800.5000	*27.2	-70.2	-20.0	Vertical	50.2	Pass
	*28.5	-68.9	-20.0	Horizontal	48.9	Pass
960.6000	*33.2	-64.2	-20.0	Vertical	44.2	Pass
	*33.1	-64.3	-20.0	Horizontal	44.3	Pass
1120.7000	*35.9	-61.5	-20.0	Vertical	41.5	Pass
	*36.4	-61.0	-20.0	Horizontal	41.0	Pass
1280.8000	*37.4	-60.0	-20.0	Vertical	40.0	Pass
	*37.4	-60.0	-20.0	Horizontal	40.0	Pass
1440.9000	*38.3	-59.1	-20.0	Vertical	39.1	Pass
	*38.3	-59.1	-20.0	Horizontal	39.1	Pass
1601.0000	*39.6	-57.8	-20.0	Vertical	37.8	Pass
	*39.5	-57.9	-20.0	Horizontal	37.9	Pass

* Noise floor measurement

Nominal Frequency: 173.375 MHz

Frequency (MHz)	Level (dBuV/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)	Result
346.7500	42.5	-54.9	-20.0	Vertical	34.9	Pass
	51.2	-46.2	-20.0	Horizontal	26.2	Pass
520.1250	*30.9	-66.5	-20.0	Vertical	46.5	Pass
	*31.1	-66.3	-20.0	Horizontal	46.3	Pass
693.5000	*32.1	-65.3	-20.0	Vertical	45.3	Pass
	*33.9	-63.5	-20.0	Horizontal	43.5	Pass
866.8750	*26.4	-71.0	-20.0	Vertical	51.0	Pass
	*26.1	-71.3	-20.0	Horizontal	51.3	Pass
1040.2500	*34.3	-63.1	-20.0	Vertical	43.1	Pass
	*34.3	-63.1	-20.0	Horizontal	43.1	Pass
1213.6250	*37.9	-59.5	-20.0	Vertical	39.5	Pass
	*37.9	-59.5	-20.0	Horizontal	39.5	Pass
1387.0000	*37.5	-59.9	-20.0	Vertical	39.9	Pass
	*37.5	-59.9	-20.0	Horizontal	39.9	Pass
1560.3750	*38.9	-58.5	-20.0	Vertical	38.5	Pass
	*38.9	-58.5	-20.0	Horizontal	38.5	Pass
1733.7500	*40.8	-56.6	-20.0	Vertical	36.6	Pass
	*40.8	-56.6	-20.0	Horizontal	36.6	Pass

* Noise floor measurement

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 10th 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: 155.000 MHz

Temperature (°C)	11.7 Vdc (Hz)	13.8 Vdc (Hz)	15.9 Vdc (Hz)
+50	-1	-1	-1
+40	0	0	0
+30	+1	+1	+1
+20	-3	-3	-3
+10	+10	+10	+10
0	+8	+8	+8
-10	+5	+5	+5
-20	+2	+2	+2
-30	+3	+3	+3

Frequency: 160.100 MHz

Temperature (°C)	11.7 Vdc (Hz)	13.8 Vdc (Hz)	15.9 Vdc (Hz)
+50	-1	-1	-1
+40	+1	+1	+1
+30	+1	+1	+1
+20	-3	-3	-3
+10	+10	+10	+10
0	+9	+9	+9
-10	+6	+6	+6
-20	+2	+2	+2
-30	+3	+4	+4

Frequency: 173.375 MHz

Temperature (°C)	11.7 Vdc (Hz)	13.8 Vdc (Hz)	15.9 Vdc (Hz)
+50	-1	-1	-1
+40	+1	+1	+1
+30	+1	+1	+1
+20	-3	-3	-4
+10	+12	+12	+12
0	+9	+9	+9
-10	+6	+6	+6
-20	+1	+1	+1
-30	+4	+4	+4

Limit:

Part 90.213 states that fixed station transmitters operating between 150 – 175 MHz with 12.5 kHz channelling are required to have a frequency tolerance of 1.5 ppm.

A worst case error of 0.066 ppm (10 Hz / 150.1 MHz) was observed.

Result: Complies.
Measurement Uncertainty: ± 30 Hz

Transient frequency behaviour

Measurements were carried out using the method described in TIA-603 and EN 300-086.

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

Limits:

Time Interval	Period (ms)	12.5 kHz Deviation (kHz)	25 kHz Deviation (kHz)
t_1	5	± 12.5	± 25.0
t_2	20	± 6.25	± 12.5
t_3	5	± 12.5	± 25.0

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

12.5 kHz transmitter turn on

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

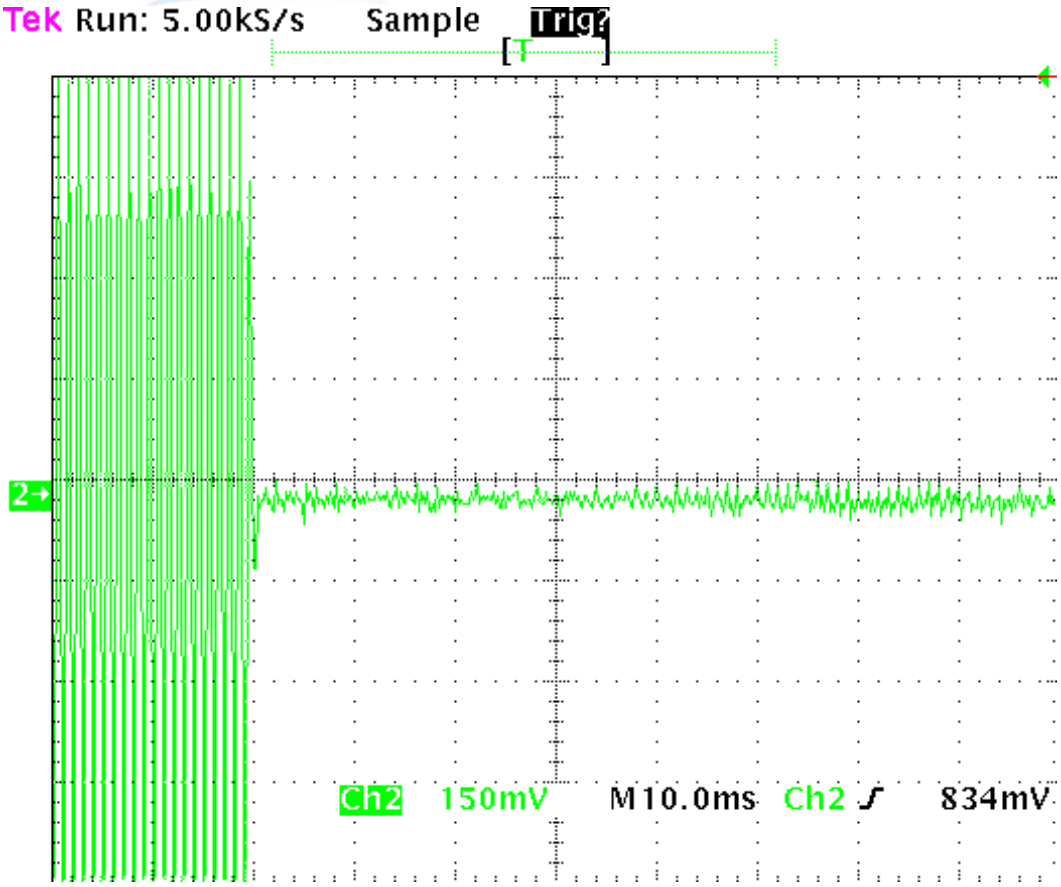
Green trace has been maximised to give full screen indication of a ±12.5 kHz.
Therefore each Y axis division = 3.125 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

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

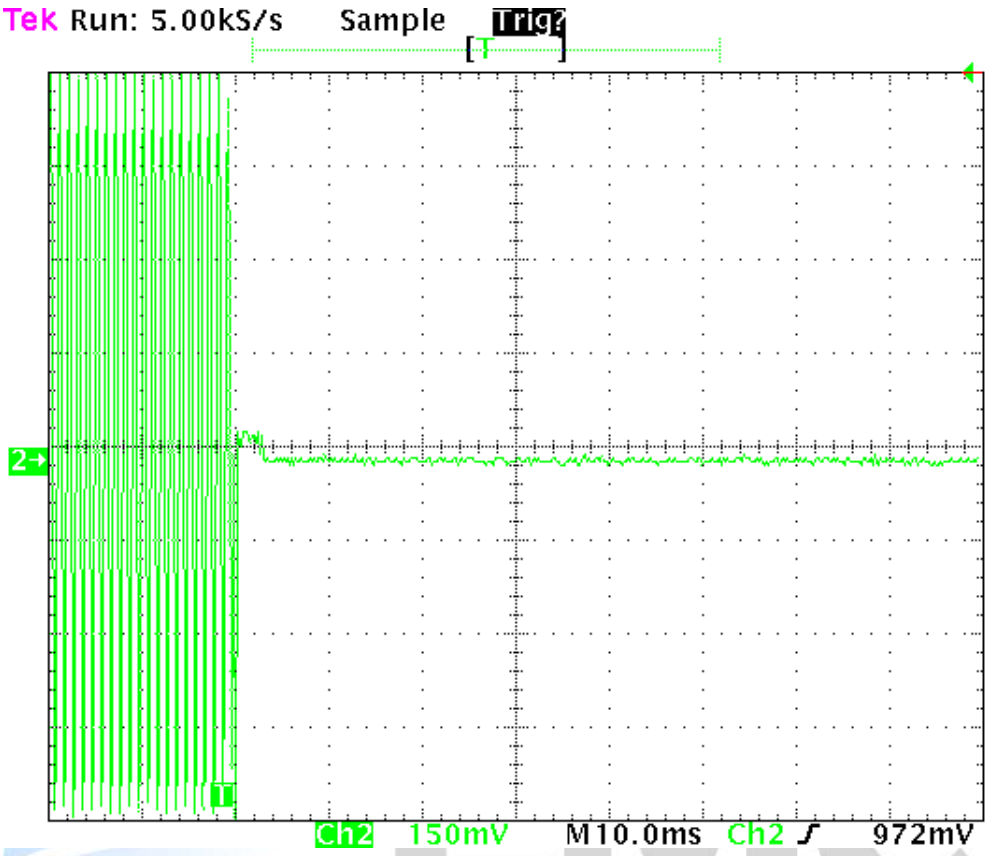
*t*1 occurs between 2.0 and 2.5 divisions from the left-hand edge.
*t*2 occurs between 2.5 and 4.5 divisions from the left-hand edge.

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

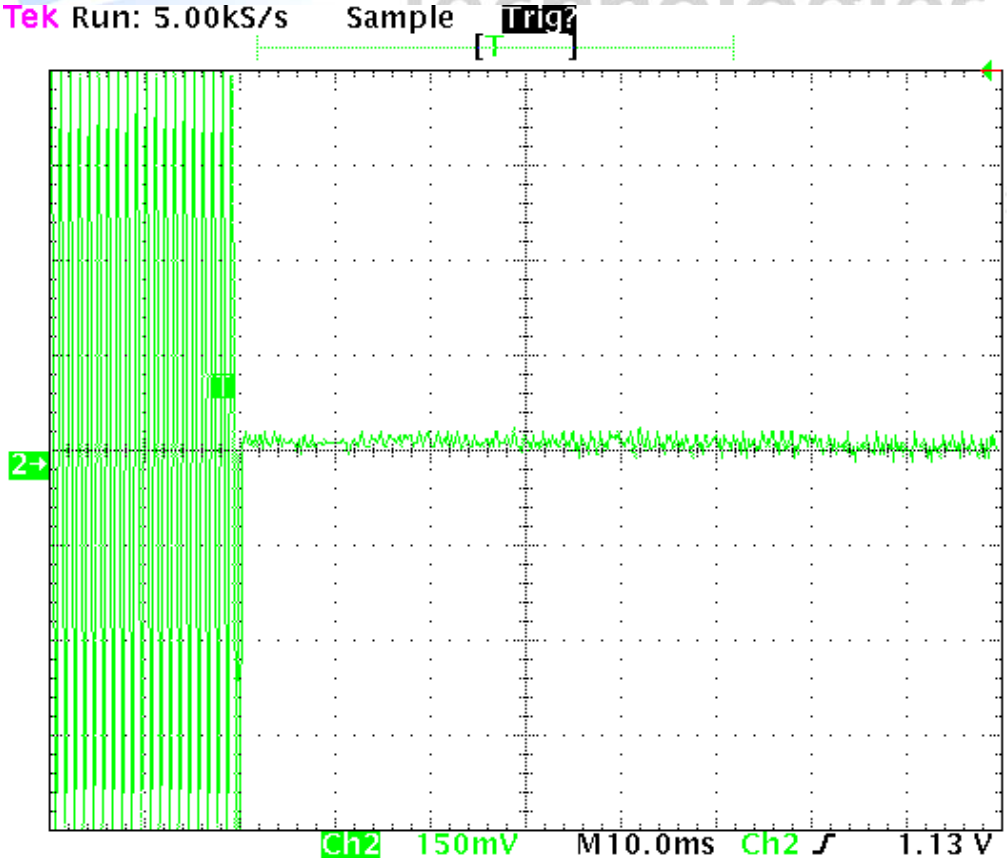
Frequency: 155.000 MHz



Frequency: 160.000 MHz



Frequency: 173.375 MHz



12.5 kHz transmitter turn off

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.

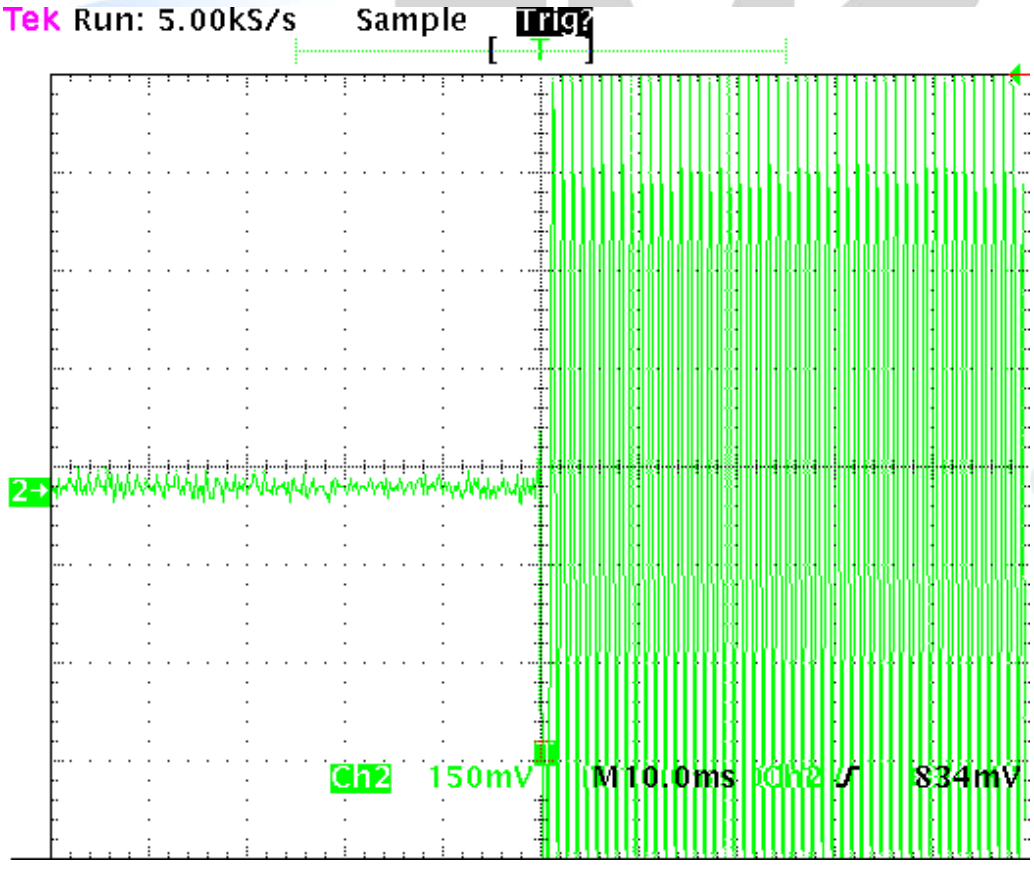
The display of the 1 kHz signal rising has been positioned 5 divisions from the left hand edge (50 ms).

This is position *t*off.

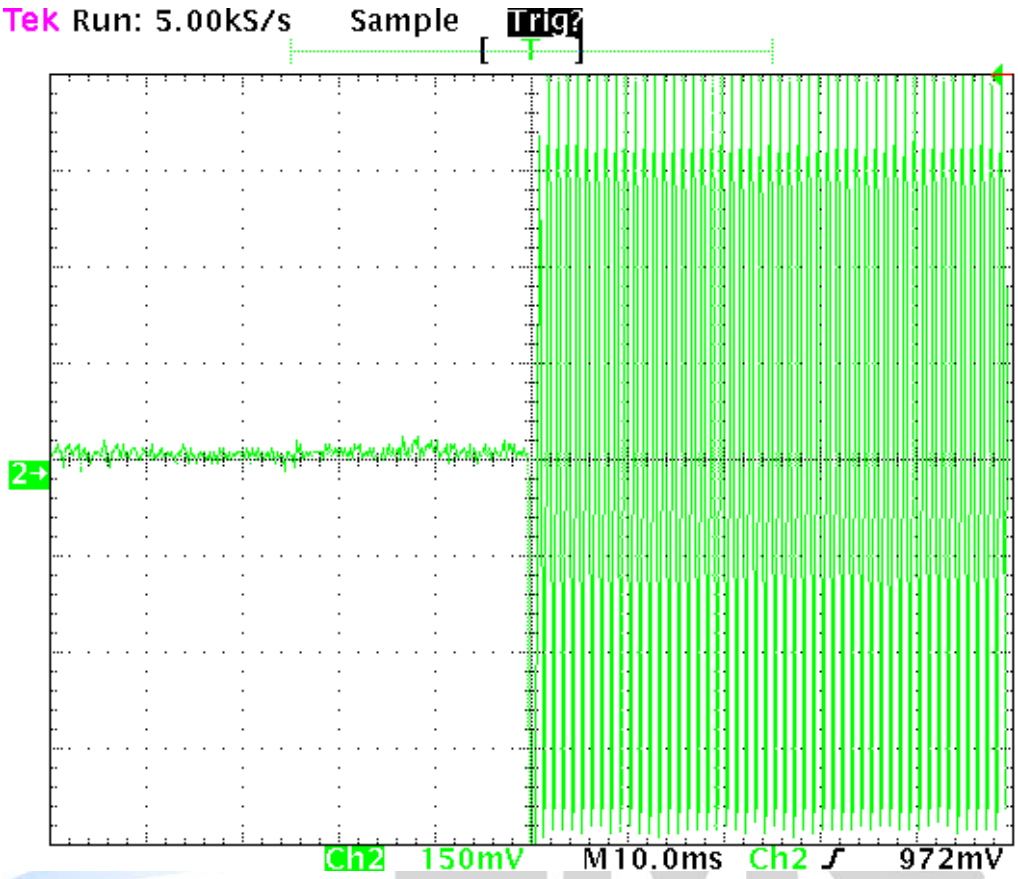
*t*3 occurs between 4.5 and 5.0 divisions from the left hand edge.

No transient response can be observed just before toff.

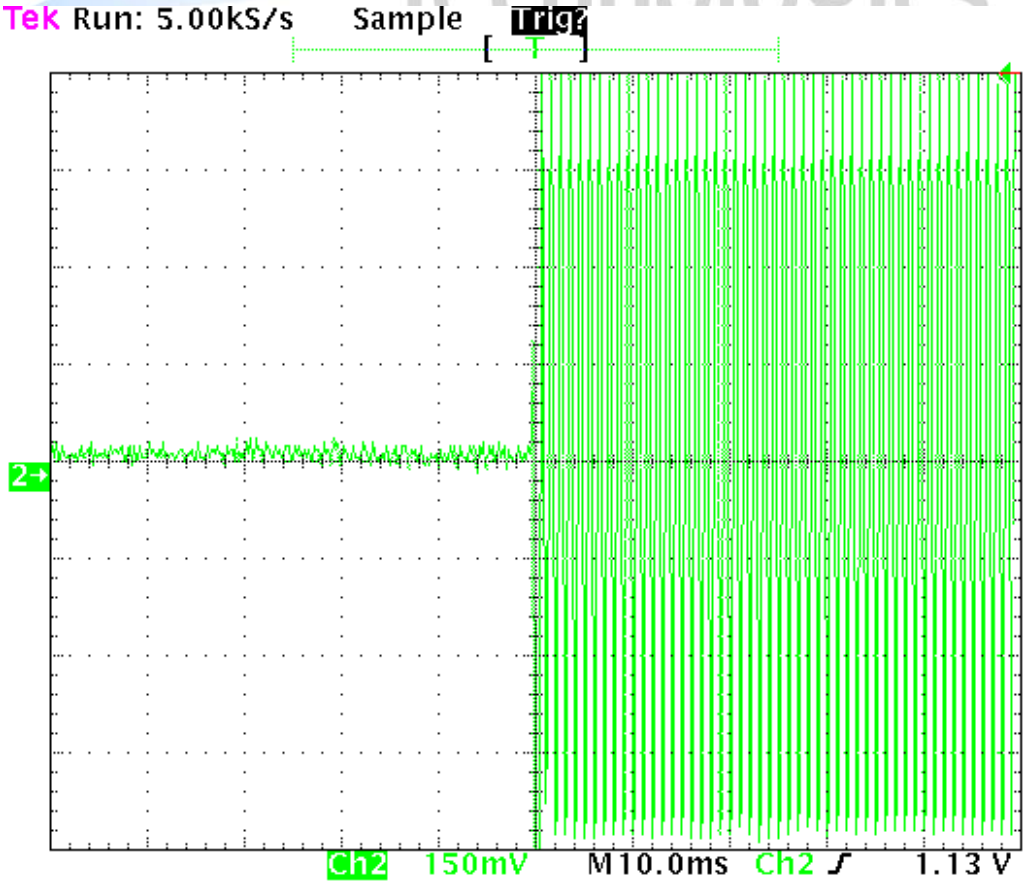
Frequency: 155.000 MHz



Frequency: 160.000 MHz



Frequency: 173.375 MHz



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 is 0.2 mW/cm^2

As this radio can operate over the range of 150 - 174 MHz the lowest frequency of operation in the USA, which will give the worst case result, would be 150 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 = 0.2 $mW/cm^2 = E^2/3770$

$E = \sqrt{0.2*3770}$

E = 27.4 V/m

As the tune up procedure allows a power output of +40 dBm +/- 1 dB a maximum power of +41 dBm (12.6 watts) has been applied to the calculations below.

A duty cycle of 100% has been applied as the transmitter is a base station that 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)	Tx Power (dBm)	EiRP (dBm)	EiRP (Watts)	E Limit (V/m)	Safe Distance (Metres)
0 to 4	6.15	41.0	47.15	51.9	27.4	1.44
4 to 8	10.15	41.0	51.15	130.3	27.4	2.28
8 to 12	14.15	41.0	55.15	327.3	27.4	3.62
12 to 16	18.15	41.0	59.15	822.2	27.4	5.73

A sample calculation for the safe distance would be:

$d = \sqrt{(30 * P * G*DC) / E}$

$d = \sqrt{(30 * 822.2 * 1.0) / 27.4}$

d = 5.73 metres

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	-	3612	03/02/2018	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	04/06/2017	3 years
Level generator	Anritsu	MG443B	M61689	E1143	01/06/2017	2 years
Log Periodic Antenna	Schwarzbeck	VUSLP 91111	9111-228	3785	17/12/2017	3 years
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552	19/06/2017	2 years
Modulation Analyzer	Hewlett Packard	8901B	2608A00782	E1090	13/10/2018	2 years
Oscilloscope	Tektronics	745A	B010643	E1569	19/06/2017	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	16/04/2017	1 year
Selective Level Meter	Anritsu	ML422C	M35386	E1140	19/05/2017	2 years
Signal Generator	Rohde & Schwarz	SMHU	838923/028	E1493	19/06/2017	2 years
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776	08/09/2017	1 year
Thermal chamber	Contherm	M180F	86025	E1129	N/a	N/a
Thermometer	DSIR	RT200	035	E1049	N/a	N/a
Turntable	EMCO	1080-1-2.1	9109-1578	3709	N/a	N/a
VHF Balun	Schwarzbeck	VHA9103	-	3603	03/02/2018	3 years

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.

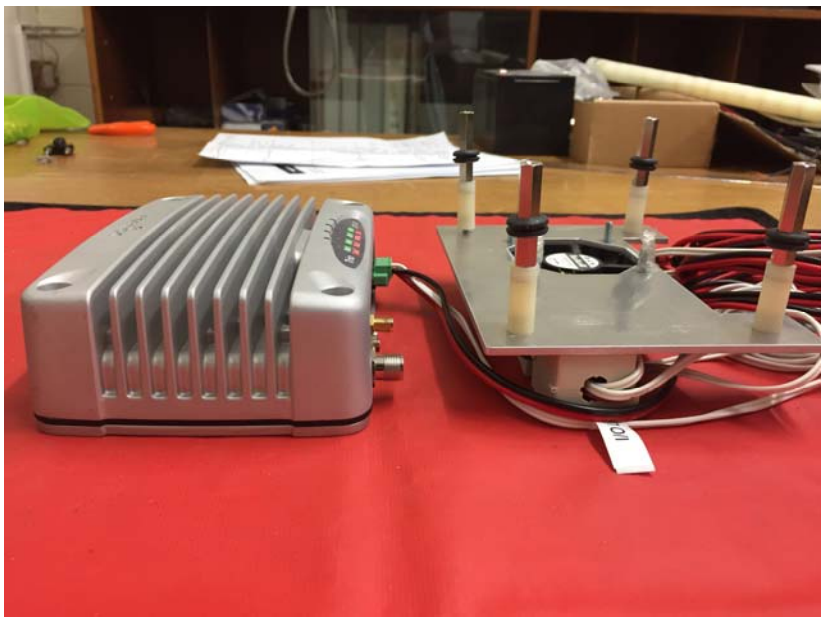
All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

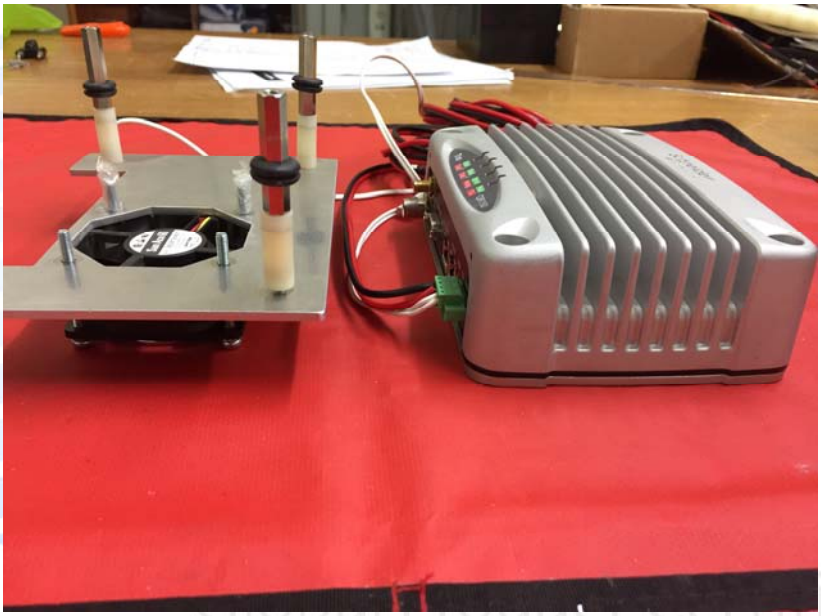
All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.

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.

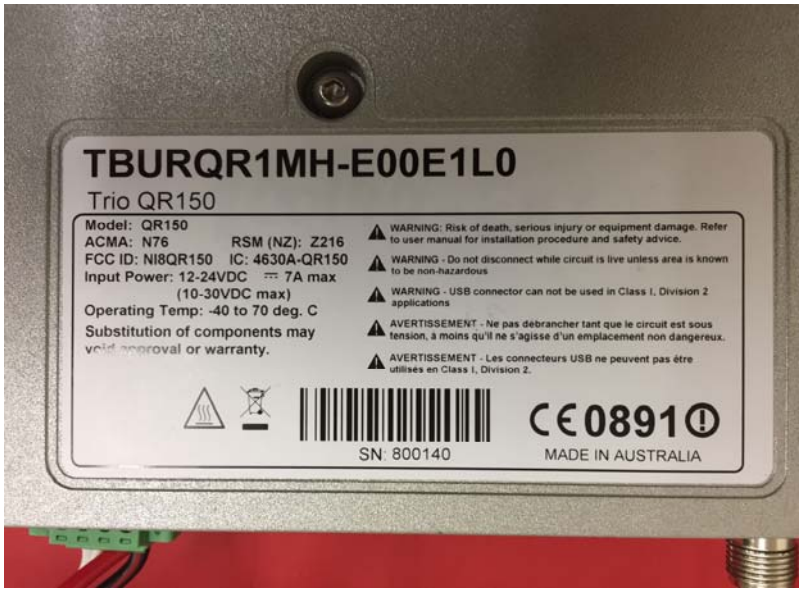
9. PHOTOGRAPHS

External Photos QR Radio





Label



Radiated emissions test set up photos