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## **TEST REPORT**

### **Aprisa SR Point to Multi-Point Digital Radio**

*tested to the*

**Code of Federal Regulations (CFR) 47**

**Part 90 –Private Land Mobile Services**

*for*

**4RF Limited**

This Test Report is issued with the authority of:

A handwritten signature in black ink, appearing to read "Andrew Cutler".

**Andrew Cutler - General Manager**



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

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**EMC**  
Technologies

## 1. COMPLIANCE STATEMENT

The **Aprisa SR Point to Multi Point Digital Radio** 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 C63.4, 2002.

## 2. RESULT SUMMARY

The results of testing, carried out between 21<sup>st</sup> October and the 5<sup>th</sup> November 2013 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
2.1047 2.1047(a) 2.1047(b)	Modulation Characteristics Low pass filter response Modulation limiting characteristics	Noted Noted Noted
2.1049 2.202	Occupied bandwidth Bandwidths	Noted Noted
90.207 90.209 90.210	Types of emissions Bandwidth limitations Emission masks	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.**

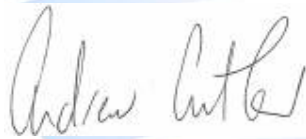
**This report does not contain corrections or erasures.**

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.

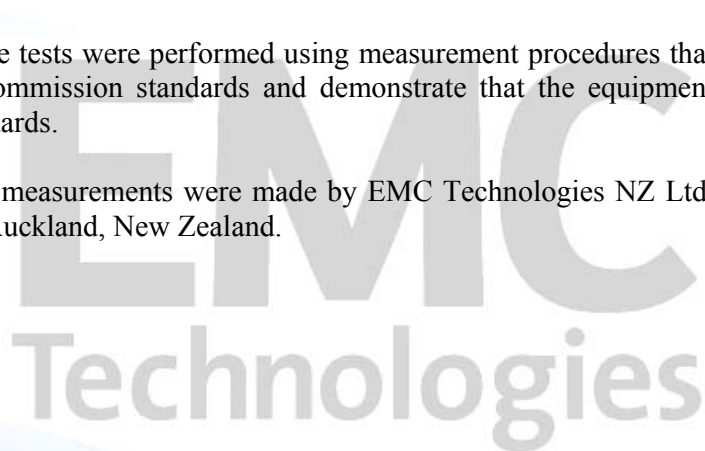
In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

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

The logo for EMC Technologies, featuring the letters 'EMC' in a large, bold, sans-serif font, with the word 'Technologies' in a smaller, regular sans-serif font directly below it. The logo is light grey and serves as a background watermark.

## 4. CLIENT INFORMATION

**Company Name** 4RF Limited

**Address** 26 Glover Street  
Ngauranga  
Wellington

**Country** New Zealand

**Contact** Mr Paul Young

## 5. TEST SAMPLE DESCRIPTION

**Brand Name** Aprisa SR

**Model Number** SR N100-001 & SR N100-011

**Product** Point to Multi Point Digital Radio

**Manufacturer** 4RF Limited

**Manufactured in** New Zealand

**Designed in** New Zealand

**Serial Numbers** R3110003947 & R3110004052

**FCC ID** UIPSR135M130

This report covers the following model variants,

Band (MHz)	Channel (kHz)	Antenna option	Model number
150 - 174	12.5	Single	SR N100-000
150 - 174	12.5	Dual	SR N100-001
150 - 174	25.0	Single	SR N100-010
150 - 174	25.0	Dual	SR N100-011

### Product overview

The 4RF Aprisa SR is a point to multi point digital radio providing secure narrowband wireless data connectivity for SCADA, infrastructure and telemetry applications.

The radios carry a combination of serial packet data and Ethernet data between the base station, repeater stations and remote stations.

The Aprisa SR is configurable as a point to multi point base station, a remote station or a repeater station.

The sample tested has the following specifications:

**Rated Transmitter Output Power**

5.0 Watts (37.0 dBm)

**Transmitter FCC frequency range**

Part 90: 150- 174 MHz

**Test frequencies**

Ch1	Frequency (MHz)	Power (Watts)	Spacing (kHz)
1	150.075	5.0	12.5 & 25.0
2	160.075	5.0	12.5 & 25.0
3	173.975	5.0	12.5 & 25.0

**Emission Designators / Modes of operation**

11k3F1D – digital data

20k0F1D – digital data

**Power Supply**

The equipment is powered using an external DC supply.

**Standard Temperature and Humidity**

Temperature: +15 °C to + 30 °C maintained.

Relative Humidity: 20% to 75% observed.

**Standard Test Power Source**

Nominal Voltage: 13.8 V dc.

Standard Test Voltage: 13.8 V dc.

**Extreme Temperature**

High Temperature: +50 °C maintained.

Low Temperature: - 30 °C maintained.

**Extreme Test Voltages**

High Voltage: 30.0 Vdc

Low Voltage: 10.0 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  $\Omega$  dummy load.

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

Testing was carried out at maximum rated power output of 5 watts (37 dBm).

Frequency (MHz)	Voltage (Vdc)	Rated (dBm)	Measured (dBm)
160.075	13.8	37.0	36.8
160.075	30.0	37.0	36.8
160.075	10.0	37.0	36.8

## Limits:

### 90.205 Power and antenna height limits,

(s) The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with § 90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 0.5$  dB



**Part 90.207 – Emission types:**

The following emission types are used:

- F1D: 4 level FSK (Frequency Shift Keying) sending data

**Part 90.209 – Bandwidth limitations:**

The authorised bandwidth is taken to be the necessary bandwidth.

Measurement has been used to determine as in cases not covered by paragraph (c) (1), (2), or (3) of section 90.209

Measurements have been made to verify the declared bandwidth.

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.

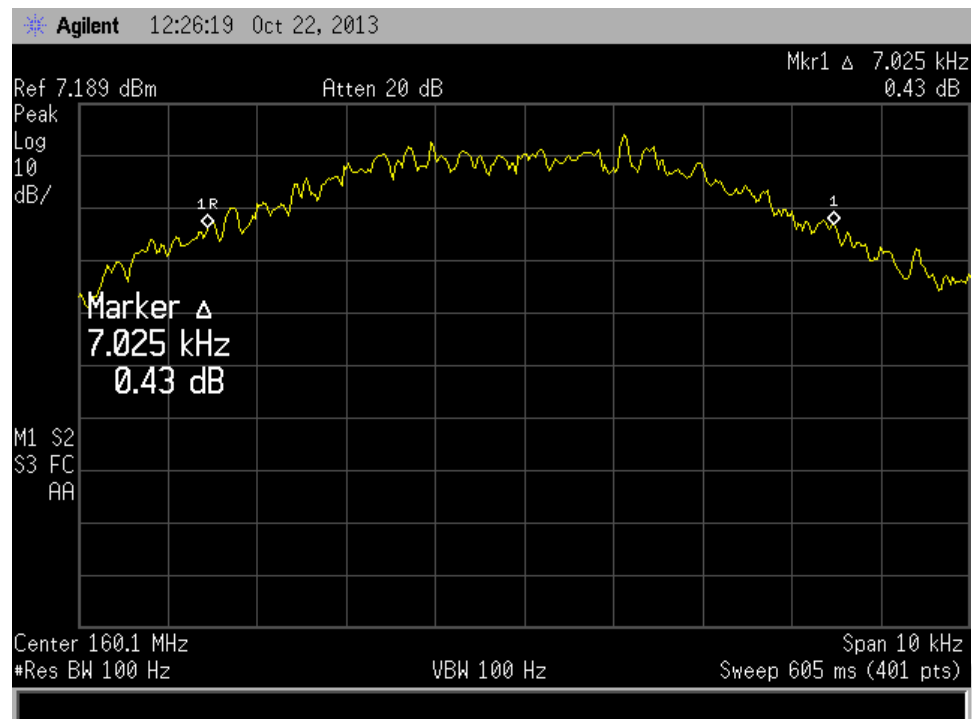
Initially power measurements are made using a resolution bandwidth of 120 kHz.

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

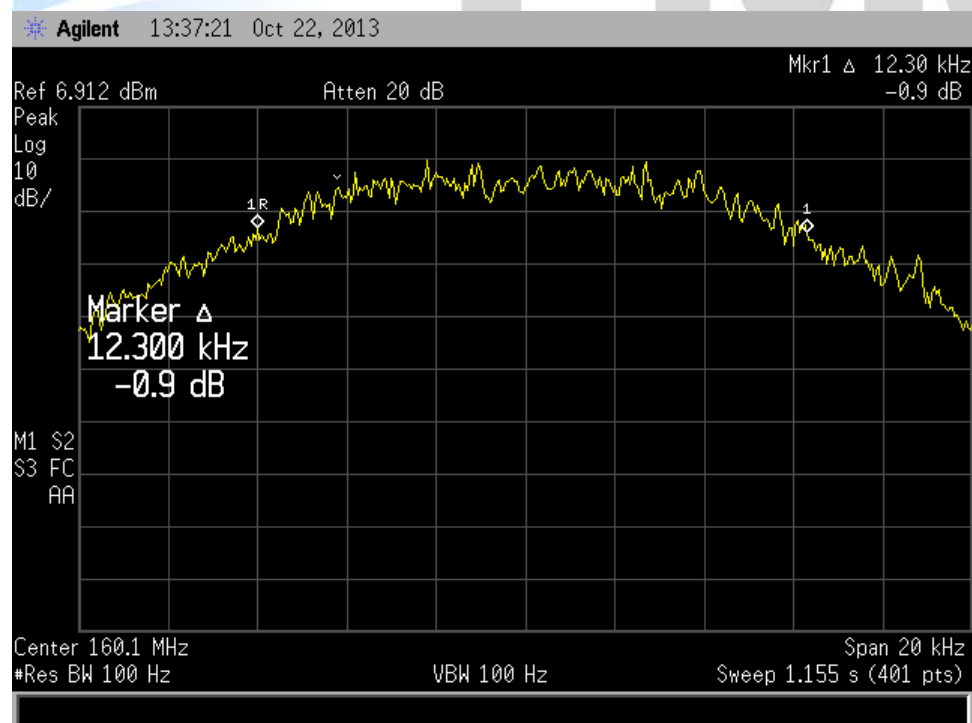
The resolution bandwidth is then changed to 100 Hz and the reference level minus 23 dB (99%) absolute bandwidth points determined.

Emission	Channel (kHz)	Measured (kHz)	Authorised Bandwidth (kHz)
F1D	12.5	7.025	11.25
F1D	25.0	12.300	20.0

## F1D 12.5 kHz channel space



## F1D 25.0 kHz channel space



**Result:** Complies.

## Spectrum Masks

Part 90.210 (2) states equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D.

Masks B and D have been applied as the transmitter has an audio low pass filter.

The transmitter can operate in the band 150-174 MHz using an authorised bandwidth of 11.25 kHz and channel spacing of 12.5 kHz and an authorised bandwidth of 20 kHz and a channel spacing of 25 kHz.

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

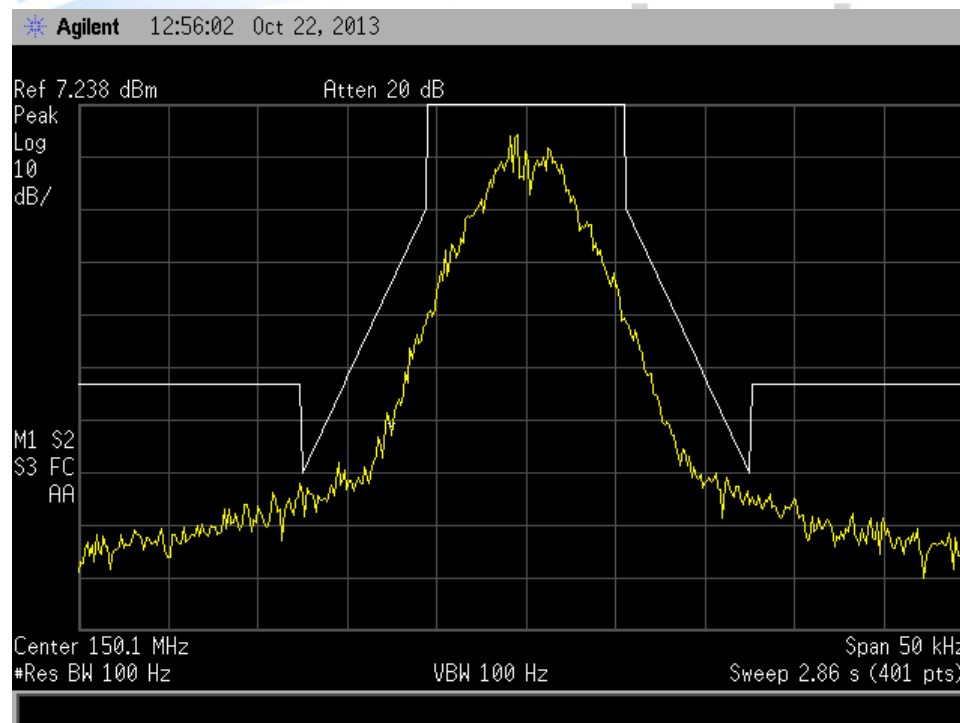
Initially power measurements are made using a resolution bandwidth of 120 kHz.

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

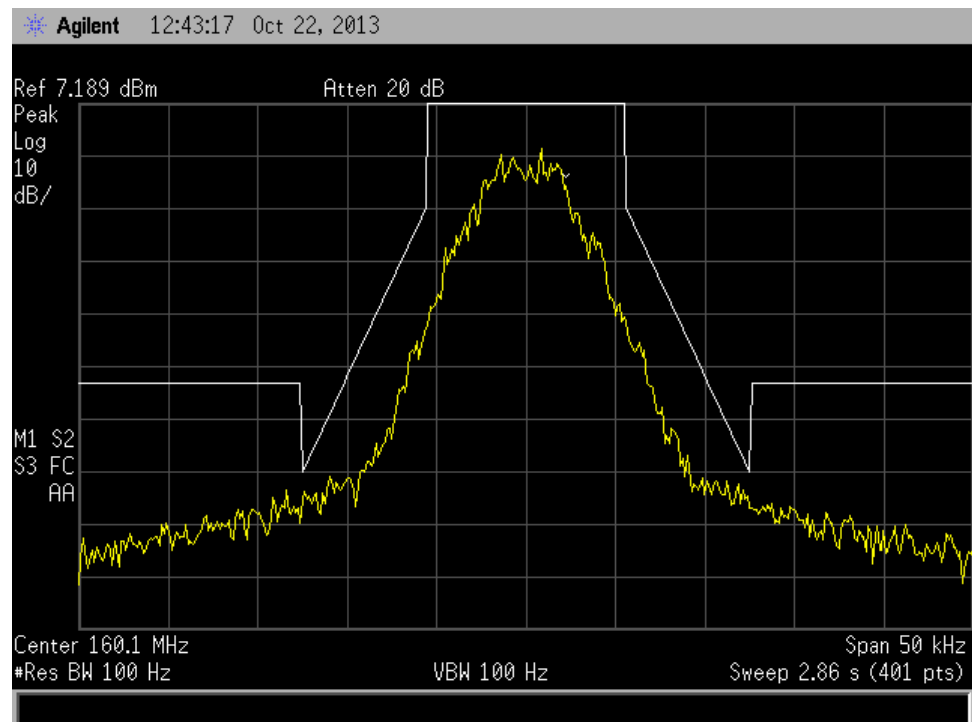
The resolution bandwidth is then changed to 100 Hz and the reference level minus 23 dB (99%) absolute bandwidth points determined.

Measurements were made with the spectrum analyser operating in peak hold centred on the allocated frequency.

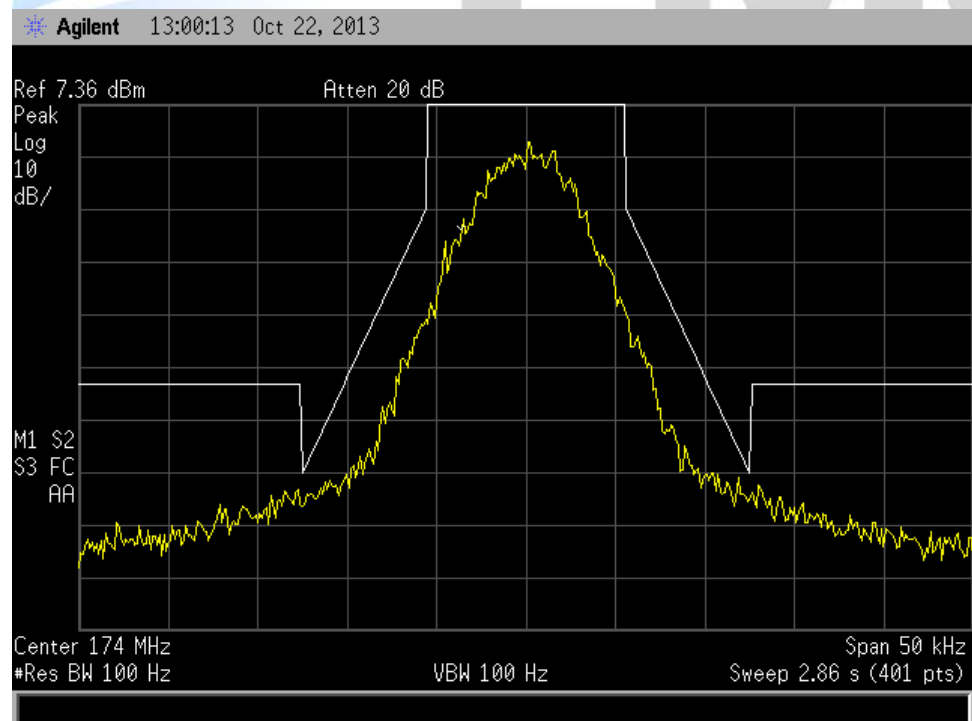
### F1D 12.5 kHz Mask D, 150.075 MHz



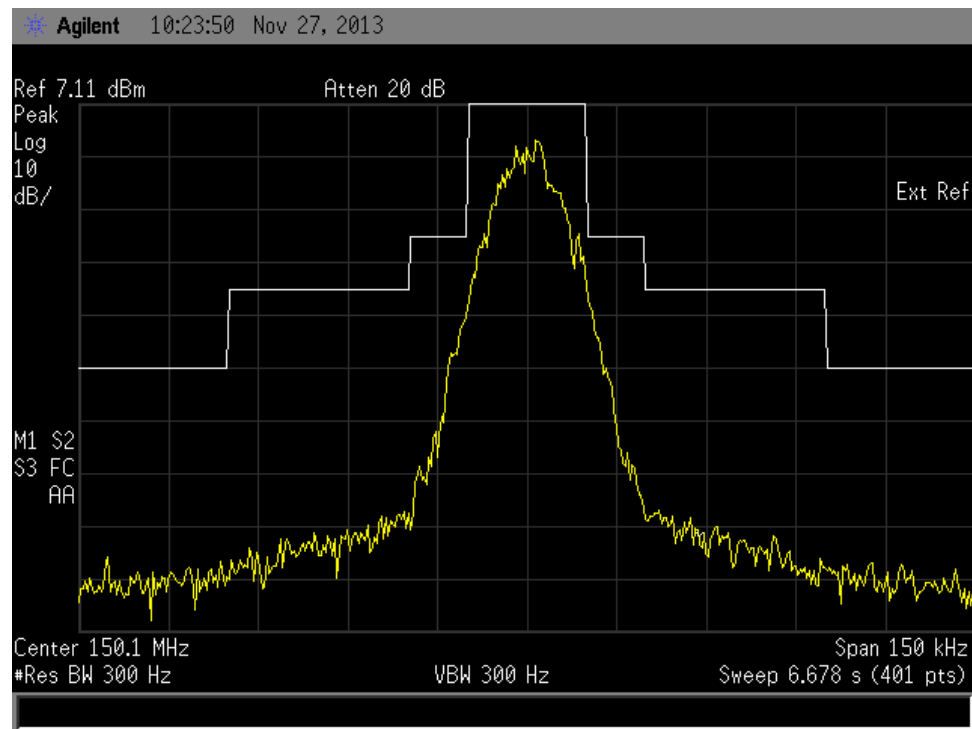
### F1D 12.5 kHz Mask D, 160.075 MHz



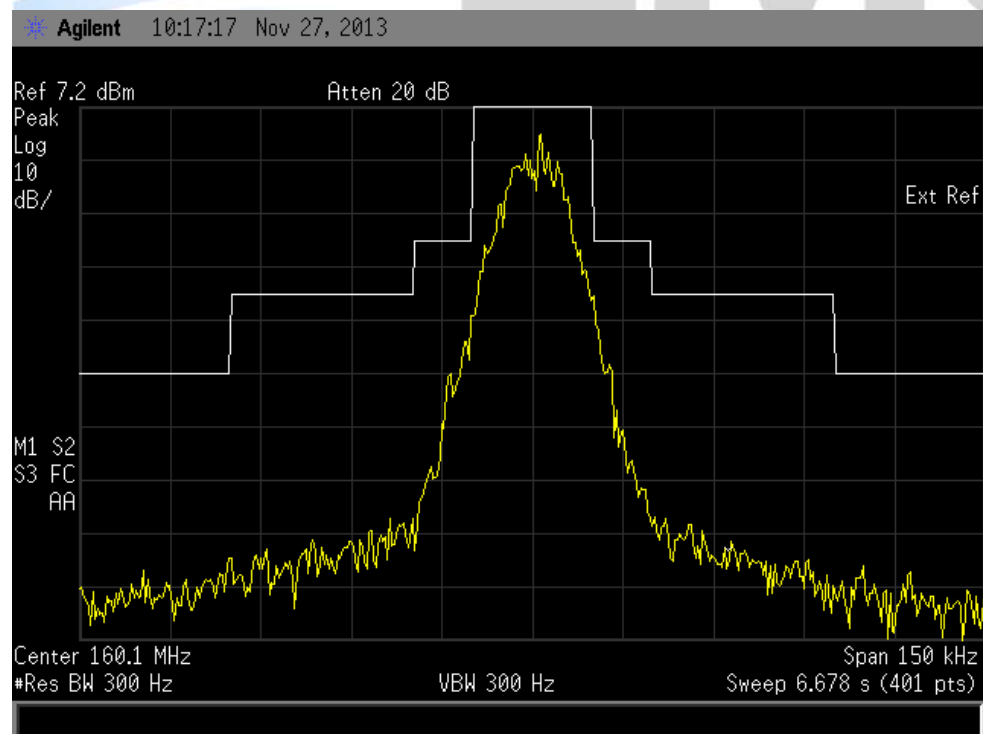
### F1D 12.5 kHz Mask D, 173.975 MHz



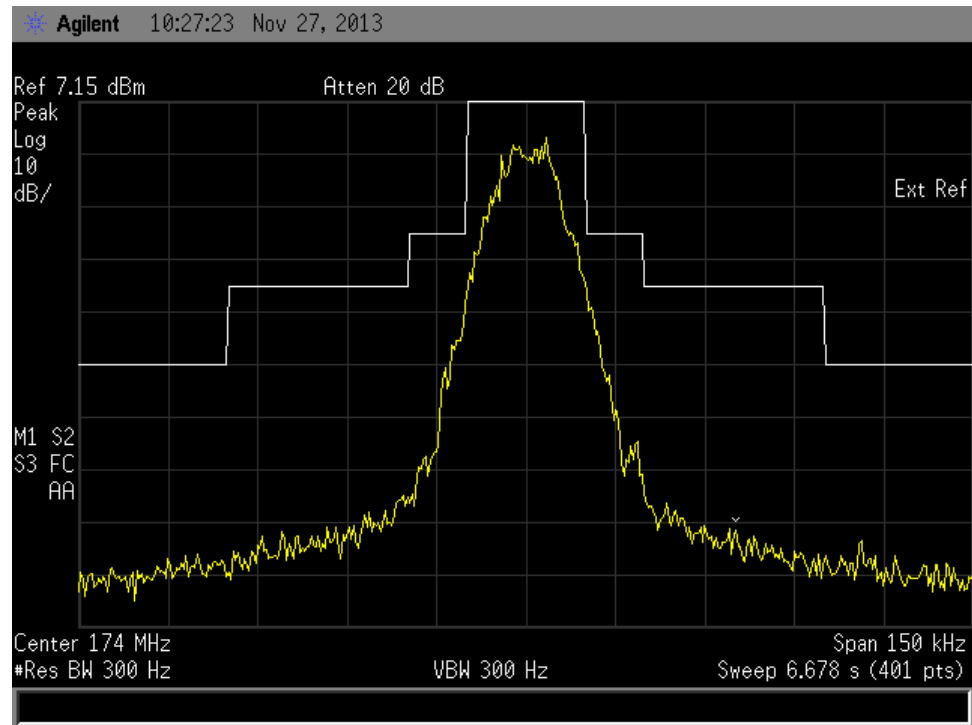
### F1D 25.0 kHz Mask B, 150.075 MHz



### F1D 25.0 kHz Mask B, 160.075 MHz



## F1D 25.0 kHz Mask B, 173.975 MHz



**Result:** Complies.

## Transmitter spurious emissions at the antenna terminals

Frequency: 150.075 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
300.150	-55.1	-20.0
450.225	-65.0	-20.0
600.300	<-80.0	-20.0
750.375	<-80.0	-20.0
900.450	<-80.0	-20.0
1050.525	<-80.0	-20.0
1200.600	<-80.0	-20.0
1350.675	<-80.0	-20.0
1500.750	<-80.0	-20.0

Frequency: 160.075 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
320.150	-56.1	-20.0
480.225	-65.5	-20.0
640.300	<-80.0	-20.0
800.375	<-80.0	-20.0
960.450	<-80.0	-20.0
1120.525	<-80.0	-20.0
1280.600	<-80.0	-20.0
1440.675	<-80.0	-20.0
1600.750	<-80.0	-20.0

Frequency: 173.975 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
347.950	-68.1	-20.0
521.925	-65.5	-20.0
695.900	<-80.0	-20.0
869.875	<-80.0	-20.0
1043.850	<-80.0	-20.0
1217.825	<-80.0	-20.0
1391.800	<-80.0	-20.0
1565.775	<-80.0	-20.0
1739.750	<-80.0	-20.0

**Limit:**

Applied mask D, 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 70.0 dB whichever is the lesser attenuation.

The spectrum has been investigated up to the 10<sup>th</sup> harmonic of the transmitter.

A rated power of 5.0 watts gives a limit of -20 dBm.

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<sup>th</sup> harmonic if the transmitter operates below 10 GHz.

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 3.3$  dB





## Field strength of the transmitter spurious emissions

In transmit mode the transmitter was tested while transmitting continuously while attached to a dummy load.

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 July 2013

**Frequency:** 150.075 MHz

Frequency (MHz)	Level (dB $\mu$ V/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
300.1500	21.5	-75.9	-20.0	Vertical	55.9
300.1500	35.4	-62.0	-20.0	Horizontal	42.0
450.2250	28.3	-69.1	-20.0	Vertical	49.1
450.2250	30.8	-66.6	-20.0	Horizontal	46.6
600.3000	27.7	-69.7	-20.0	Vertical	49.7
600.3000	31.6	-65.8	-20.0	Horizontal	45.8
750.3750	25.4	-72.0	-20.0	Vertical	52.0
750.3750	25.4	-72.0	-20.0	Horizontal	52.0
900.4500	28.6	-68.8	-20.0	Vertical	48.8
900.4500	28.6	-68.8	-20.0	Horizontal	48.8
1050.5250	30.3	-67.1	-20.0	Vertical	47.1
1050.5250	30.3	-67.1	-20.0	Horizontal	47.1
1200.6000	32.0	-65.4	-20.0	Vertical	45.4
1200.6000	32.0	-65.4	-20.0	Horizontal	45.4
1350.6750	34.0	-63.4	-20.0	Vertical	43.4
1350.6750	34.0	-63.4	-20.0	Horizontal	43.4
1500.7500	35.0	-62.4	-20.0	Vertical	42.4
1500.7500	35.0	-62.4	-20.0	Horizontal	42.4

### 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<sup>th</sup> harmonic.

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 4.1$  dB

**Frequency:** 160.075 MHz

Frequency (MHz)	Level (dB $\mu$ V/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
320.1500	23.1	-74.3	-20.0	Vertical	54.3
320.1500	38.6	-58.8	-20.0	Horizontal	38.8
480.2250	26.8	-70.6	-20.0	Vertical	50.6
480.2250	26.8	-70.6	-20.0	Horizontal	50.6
640.3000	23.2	-74.2	-20.0	Vertical	54.2
640.3000	25.1	-72.3	-20.0	Horizontal	52.3
800.3750	25.4	-72.0	-20.0	Vertical	52.0
800.3750	25.4	-72.0	-20.0	Horizontal	52.0
960.4500	28.6	-68.8	-20.0	Vertical	48.8
960.4500	28.6	-68.8	-20.0	Horizontal	48.8
1120.5250	30.3	-67.1	-20.0	Vertical	47.1
1120.5250	30.3	-67.1	-20.0	Horizontal	47.1
1280.6000	32.0	-65.4	-20.0	Vertical	45.4
1280.6000	32.0	-65.4	-20.0	Horizontal	45.4
1440.6750	34.0	-63.4	-20.0	Vertical	43.4
1440.6750	34.0	-63.4	-20.0	Horizontal	43.4
1600.7500	35.0	-62.4	-20.0	Vertical	42.4
1600.7500	35.0	-62.4	-20.0	Horizontal	42.4

**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<sup>th</sup> harmonic.

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 4.1$  dB

**Frequency:** 173.975 MHz

Frequency (MHz)	Level (dB $\mu$ V/m)	Level (dBm)	Limit (dBm)	Polarity	Margin (dB)
347.9500	23.1	-74.3	-20.0	Vertical	54.3
347.9500	29.8	-67.6	-20.0	Horizontal	47.6
521.9250	26.8	-70.6	-20.0	Vertical	50.6
521.9250	26.8	-70.6	-20.0	Horizontal	50.6
695.9000	23.2	-74.2	-20.0	Vertical	54.2
695.9000	23.2	-74.2	-20.0	Horizontal	54.2
869.8750	25.4	-72.0	-20.0	Vertical	52.0
869.8750	25.4	-72.0	-20.0	Horizontal	52.0
1043.8500	28.6	-68.8	-20.0	Vertical	48.8
1043.8500	28.6	-68.8	-20.0	Horizontal	48.8
1217.8250	30.3	-67.1	-20.0	Vertical	47.1
1217.8250	30.3	-67.1	-20.0	Horizontal	47.1
1391.8000	32.0	-65.4	-20.0	Vertical	45.4
1391.8000	32.0	-65.4	-20.0	Horizontal	45.4
1565.7750	34.0	-63.4	-20.0	Vertical	43.4
1565.7750	34.0	-63.4	-20.0	Horizontal	43.4
1739.7500	35.0	-62.4	-20.0	Vertical	42.4
1739.7500	35.0	-62.4	-20.0	Horizontal	42.4

**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<sup>th</sup> harmonic.

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 4.1$  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:** 160.075 MHz

Temperature (°C)	Voltage (10.0 Vdc)	Frequency Error (Hz)	
		Voltage (13.8 Vdc)	Voltage (30.0 Vdc)
+50	-21.0	-10.0	-17.0
+40	-15.0	-13.0	-14.0
+30	-8.0	-5.0	-12.0
+20	+4.0	+3.0	+3.0
+10	+11.0	+9.0	+15.0
0	+10.0	+8.0	+17.0
-10	-13.0	-13.0	-11.0
-20	-45.0	-27.0	-33.0
-30	-50.0	-46.0	-41.0

### Limit:

Part 90.213 states in the 150-174 MHz band, fixed and base stations with a 12.5 kHz channel bandwidth must have a frequency stability of 2.5 ppm. Fixed and base stations with a 6.25 kHz channel bandwidth must have a frequency stability of 1.0 ppm.

The 12.5 kHz channel bandwidth Part 90 frequency stability requirement has been applied to this transmitter.

This transmitter was tested on 160.075 MHz.

$$2.5 \text{ ppm} = 2.5 \times 160.075 = 400 \text{ Hz.}$$

**Result:** Complies.

**Measurement Uncertainty:**  $\pm 30 \text{ Hz}$ .

## Transient frequency behaviour

Transient frequency behaviour measurements are applicable to wide band and narrow band transmitters operating in the frequency band 150 - 174 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 with an 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.

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)
$t_1$	5	$\pm 12.5$	$\pm 25.0$
$t_2$	20	$\pm 6.25$	$\pm 12.5$
$t_3$	5	$\pm 12.5$	$\pm 25.0$

**Result:** Complies.

**Measurement Uncertainty:** Frequency difference  $\pm 1.6$  kHz, Time period  $\pm 1$  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  $\pm 12.5$  kHz.

Therefore each Y axis division = 3.125 kHz per division.

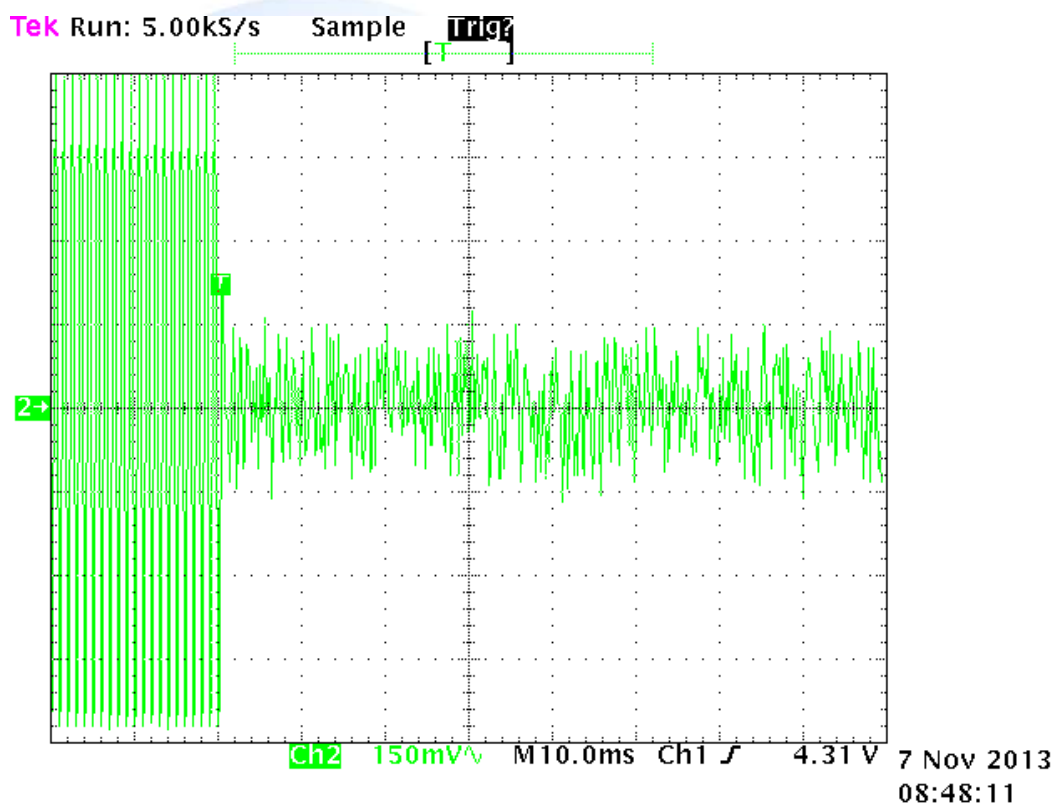
The X axis has been set to a sweep rate of 10 ms/division.

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.

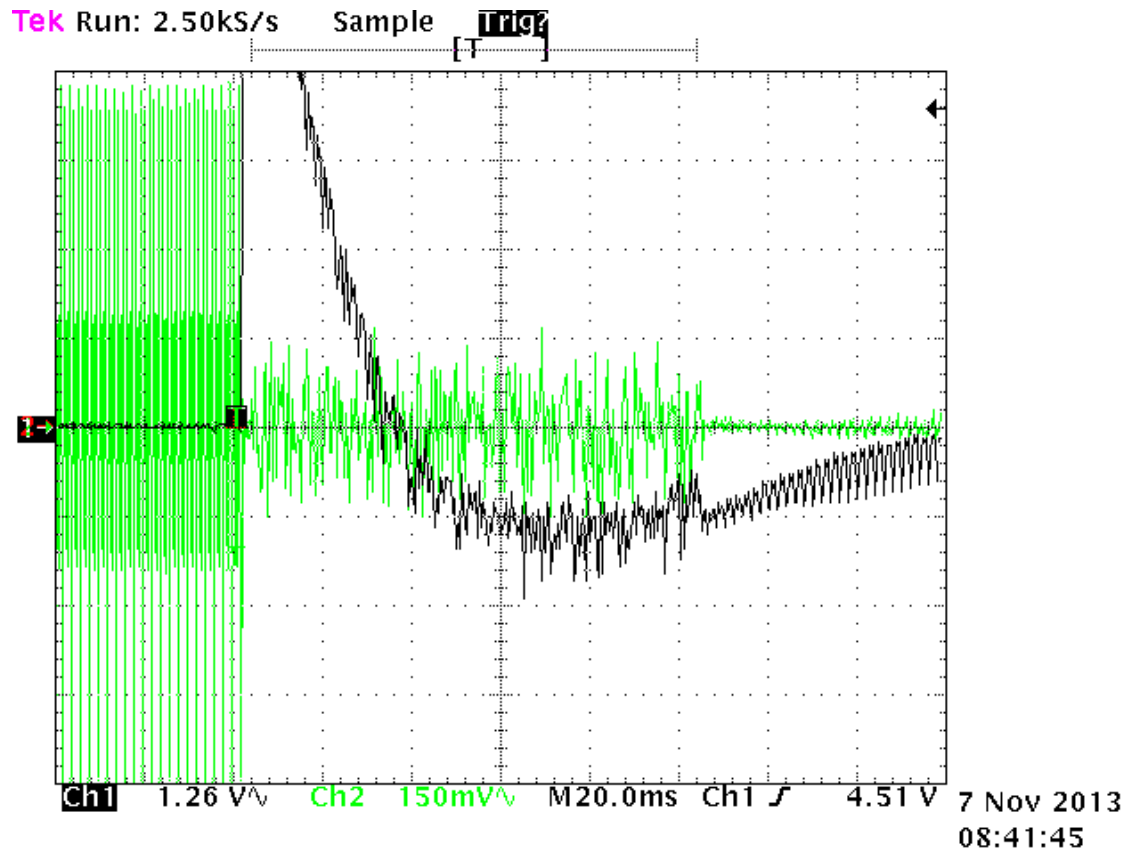
No transient response can be observed during  $t_1$  and  $t_2$ . The  $t_{on}$  ramp time for the transmitter can be observed for 100 ms period.



Further analysis of the Ton is shown below; the horizontal time base has been extended to 20 ms to show the 100ms ramp time of the Transmitter.

The Green Trace = 1 kHz tone with FM deviation of 25 kHz.

The Black trace = transmitter amplitude response.



### 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  $\pm 12.5$  kHz.

Therefore each Y axis division = 3.125 kHz per division.

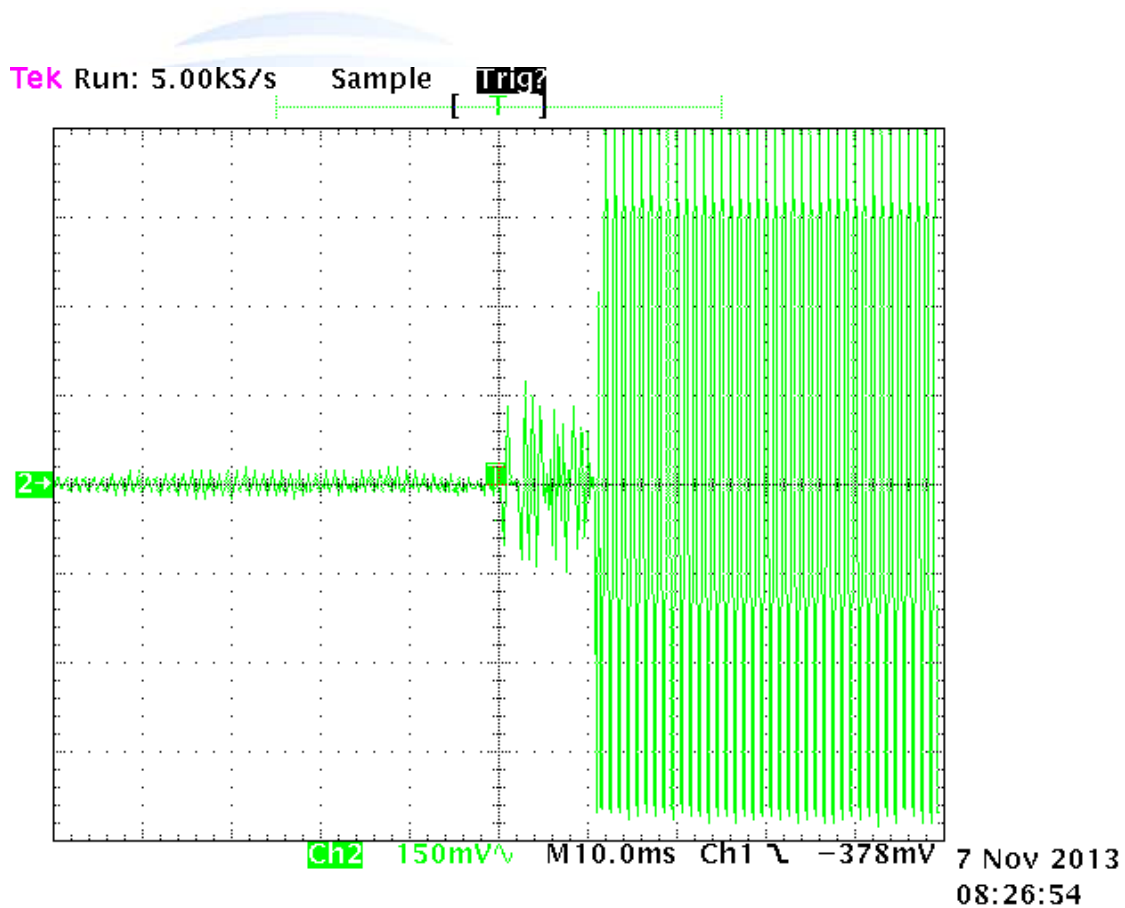
The X axis has been set to a sweep rate of 10 ms/division.

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

This is position *toff*.

*t3* occurs between 4.5 and 5.0 divisions from the left hand edge.

No transient response can be observed before *toff*. The *toff* ramp time for the transmitter can be observed for 10 ms period.





## 25.0 kHz transmitter turn on

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.

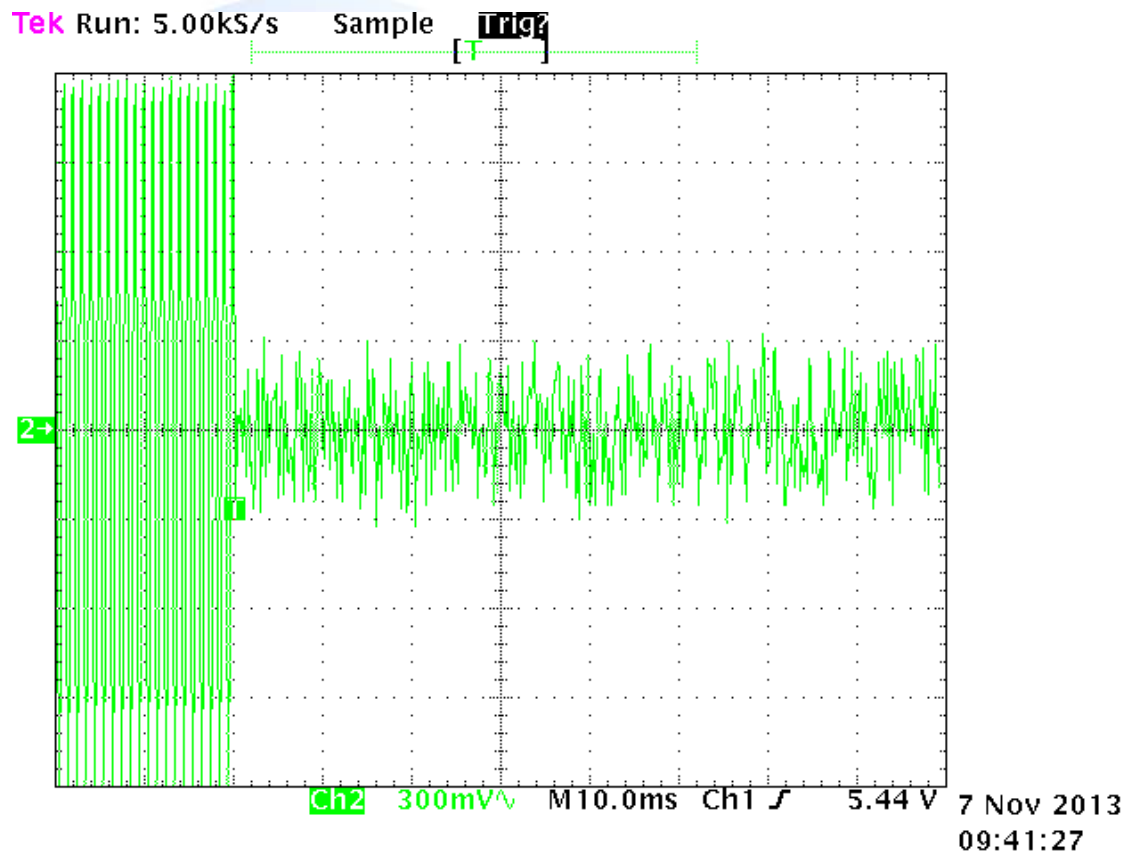
Triggering has been set to occur 2 divisions from the left hand edge (20 mS).

$t_{on}$  occurs at 20 mS.

$t_1$  occurs between 2.0 and 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 response can be observed during  $t_1$  and  $t_2$ . The  $t_{on}$  ramp time for the transmitter can be observed for 100 ms period.



## 25.0 kHz transmitter turn off

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.

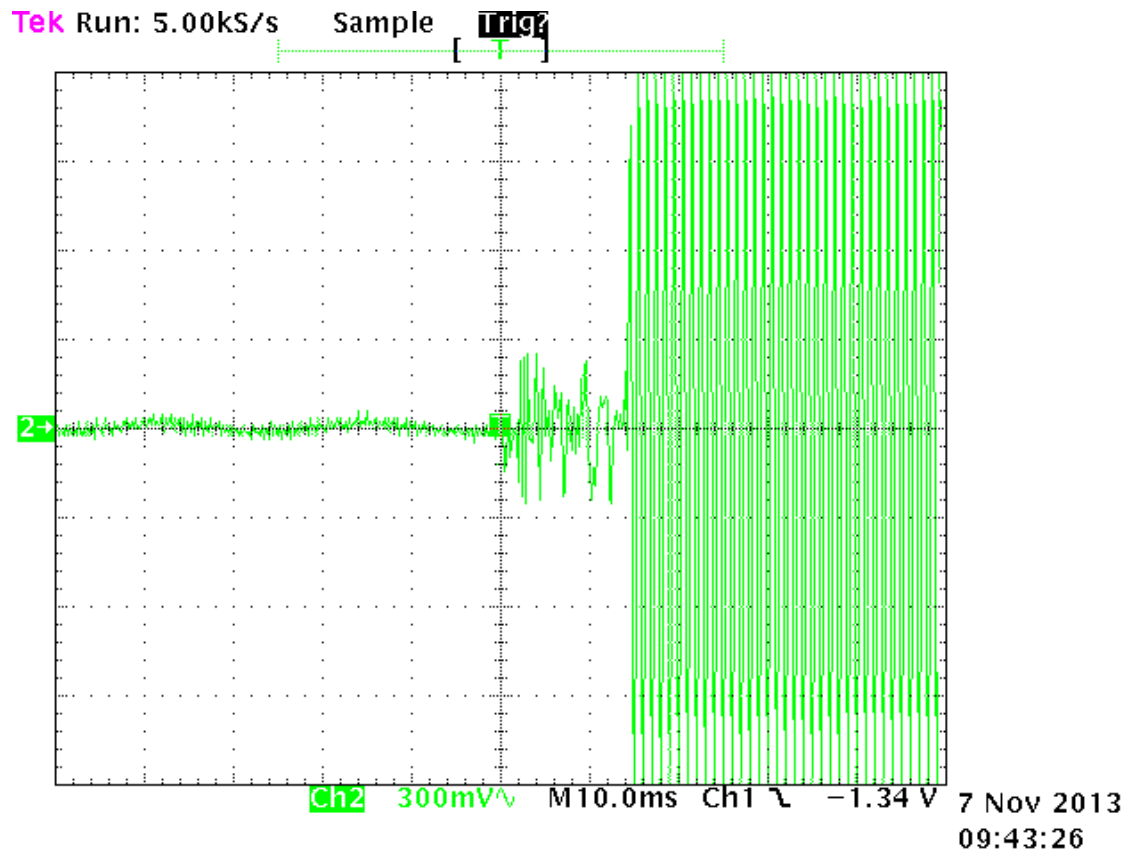
Therefore each Y axis division = 6.25 kHz per division.

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 *toff*.

$t_3$  occurs between 4.5 and 5.0 divisions from the left hand edge..

No transient response can be observed before *toff*. The *toff* ramp time for the transmitter can be observed for 10 ms period.



## Exposure of humans to RF fields

As per Section 1.1310 mobile transmitters are required to be operated in a manner that ensures the public is not exposed to RF energy levels in accordance with OST/OET Bulletin Number 65.

Calculations have been made using the General Public Exposure limits.

Minimum safe distances have been calculated below at 160.075 MHz.

$$\text{Power density, mW/cm}^2 = E^2 / 3770$$

- General Public / Uncontrolled exposure limit will be 0.2 mW/cm<sup>2</sup> or 27.5 V/m.

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:

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

The rated maximum transmitter power (P) = 5 watts.

Transmitter is operated using an antenna with a gain (G) of up to 20 (+13 dBi).

The client has declared a duty cycle (DC) of 100% (1)

### General Public / Uncontrolled

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

$$d = \sqrt{30 * 5 * 20 * 1} / 32.5$$

$$d = 1.68 \text{ metres or } 168 \text{ cm}$$

**Result:** Complies if the above safe distance is defined in the user manual for this equipment.

## 7. 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
Turntable	EMCO	1080-1-2.1	9109-1578	3709	N/a
VHF Balun	Schwarzbeck	VHA9103	-	3603	12/01/2015
Biconical Antenna	Schwarzbeck	BBA 9106	-	3612	12/01/2015
Log Periodic	Schwarzbeck	VUSLP 91111	9111-228	3785	12/01/2015
Horn Antenna	Electrometrics	RGA-60	6234	E1494	04/07/2014
Measuring receiver	Rohde & Schwarz	ESIB-40	100171	EMC4003	10/04/2014
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552	15/01/2015
Oscilloscope	Tektronics	745A	B010643	E1569	15/01/2015
Power Attenuator	Weinschel	49-20-43	GC104	E1308	N/a
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069	N/a
Signal Generator	Rohde & Schwarz	SMHU	838923/028	E1493	22/01/2015
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	RFS 3776	26/02/2015
Thermal chamber	Contherm	M180F	86025	E1129	01/06/2015
Thermometer	DSIR	RT200	035	E1049	01/06/2015

## 8. 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 July 2013.

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.

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:







Open Air Test Site setup:

