EMC Technologies (NZ) Ltd

Test Report No **090518.1a**
Report date: 7 September 2009

TEST REPORT

SIMOCO SR9180TU UHF Portable Transceiver

tested to the

Code of Federal Regulations (CFR) 47

Part 90 –Private Land Mobile Services

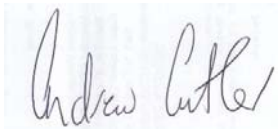
Part 22 – Public Mobile Services

Part 15 – Radio Frequency Device

for

TMC Radio Pty Ltd

This Test Report is issued with the authority of:



Andrew Cutler - General Manager

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

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1. CLIENT INFORMATION

Company Name	TMC Radio Pty Ltd
Address	1270 Ferntree Gully Road Scoresby
City	Victoria, 3179
Country	Australia
Contact	Mr Robert Stowell

2. DESCRIPTION OF TEST SAMPLE

Brand Name	SIMOCO
Model Number	SR9180TU
Product	UHF Portable Transceiver
Manufacturer	TMC Radio Pty Ltd
Designed in	Australia
Manufactured in	Taiwan
Serial Number	ET9VX09100011
FCC ID	STZSRP9170TU

3. COMPLIANCE STATEMENT AND RESULT SUMMARY

The **SIMOCO SRP9180TU UHF Portable Transceiver** complies with the limits defined in 47 CFR Part 15, 47 CFR Part 22, 47 CFR Part 90 and 47 CFR Part 2 when tested in-accordance with the test methods described in 47 CFR Part 2.

Clause	Description	Result
90.203	Certification required	Noted
2.1046 90.205	RF power output Power and antenna height limits	Noted Complies
2.1047 2.1047(a) 2.1047(b) 90.211(a)	Modulation Characteristics Low pass filter response Modulation limiting characteristics Modulation characteristics	Noted Noted Noted Complies
2.1049 2.202 22.357 22.359(a) 90.207 90.209 90.210	Occupied bandwidth Bandwidths Emission types Emission masks Types of emissions Bandwidth limitations Emission masks	Noted Noted Complies Complies Complies Complies Complies
2.1051	Spurious emissions at antenna terminals	Complies
2.1053	Field strength of spurious radiation	Complies
2.1055 22.355 90.213	Frequency stability Frequency stability Frequency stability	Noted Complies Complies
90.214	Transient frequency behaviour	Complies
15.109 15.111	Receiver radiated emissions Receiver local oscillator voltage	Complies Complies
1.1310	Radio frequency exposure limits	SAR measurements supplied in a separate report

4. TEST SAMPLE DESCRIPTION

The sample tested has the following specifications:

Rated Transmitter Output Power

5.0 Watts (36.9 dBm)

Transmitter FCC frequency range

406.1 - 480 MHz

Test frequencies

Chl	Frequency MHz	Power Watts	Spacing kHz
2	440.075	5.0	12.5
3	479.975	5.0	12.5
5	440.075	5.0	25.0
6	479.975	5.0	25.0
7	460.075	Receive only	12.5

Emission Designators / Modes of operation

11k2F3E – Analogue speech
11k2F1D – 1200 baud FFSK
8k10F1E – C4FM digital speech

16k0F3E – Analogue speech
16k0F1D – 1200 baud FFSK

Power Supply

Li-ION rechargeable battery DC voltage supply typically 7.2 Vdc

5. TEST CONDITIONS

Standard Temperature and Humidity

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

Standard Test Power Source

Standard Test Voltage: 7.2 Vdc.

Extreme Temperature

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

Extreme Test Voltages

Low Voltage: 6.5 Vdc

6. ATTESTATION

The **SIMOCO SRP9180TU UHF Portable Transceiver** complies with the Code of Federal Regulations (CFR) 47 Part 90 –Private Land Mobile Services , Part 22 – Public Land Mobile Services and 47 Part 15 – Radio Frequency Devices.

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

The client selected the test sample.

The report relates only to the sample tested.

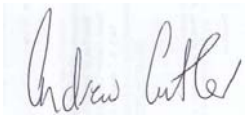
This report does not contain corrections or erasures.

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

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

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

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



Andrew Cutler
General Manager
EMC Technologies NZ Ltd

7. TEST RESULTS

Certification required

Certification of this device is sought for transmissions using 12.5 and 25 kHz channel spacing.

12.5 and 25 kHz channel bandwidth certification is sought for this transmitter under section 90.203(j)(3) as:

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

- the equipment meets the spectrum efficiency standard of one voice channel per 12.5 kHz of channel bandwidth

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

Result: Complies.

RF power output

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

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

Measurements were made with the input voltage set to 7.2 Vdc and when decreased 10% to 6.5 Vdc (minimum operational voltage).

Testing was carried out at maximum power output.

Frequency (MHz)	Voltage (Vdc)	Rated (dBm)	Measured (dBm)
440.075	7.2	36.9	36.1
479.975	7.2	36.9	36.1

Frequency (MHz)	Voltage (Vdc)	Rated (dBm)	Measured (dBm)
440.075	6.5	36.9	35.5
440.075	7.2	36.9	36.1

Limits:
Clause 90.205(h) of Part 90 specifies that in the band 450 – 470 MHz the maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and the required service area.

Clause 90.205(i) of Part 90 specifies that in the band 470- 512 MHz the maximum allowable station effective radiated power (ERP) is specified in Clause 90.307 and 90.309.

Part 22 does not specify the transmitter output power.

Result: Complies
Measurement Uncertainty: ±0.5 dB

Modulation Characteristics

This transmitter is capable of producing analogue speech and digital speech modulations.

(a) Frequency response of the audio frequency low pass filter between 100 Hz and 15 kHz.

This measurement was carried out using an audio signal generator and an audio modulation analyser.

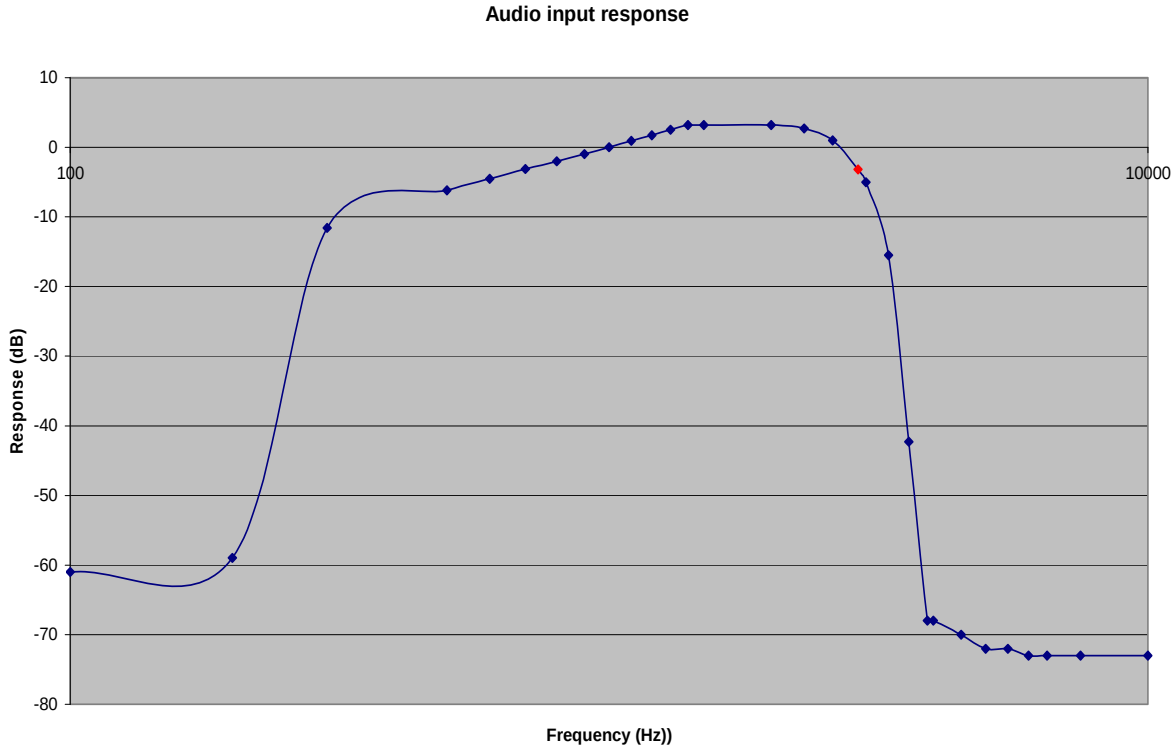
At 1 kHz an audio signal was applied which was used as a 0 dB response reference.

The frequency of the input signal was then varied and the output response noted.

This measurement was carried out from 100 Hz to 5000 Hz as required by Part 2 with further measurements carried out in order to show the full range of this filter.

The peak deviation response was found to be at 2000 Hz.

The -3dB roll off from peak deviation occurs at 2900 Hz, and is denoted as a red data series point on the following graph.

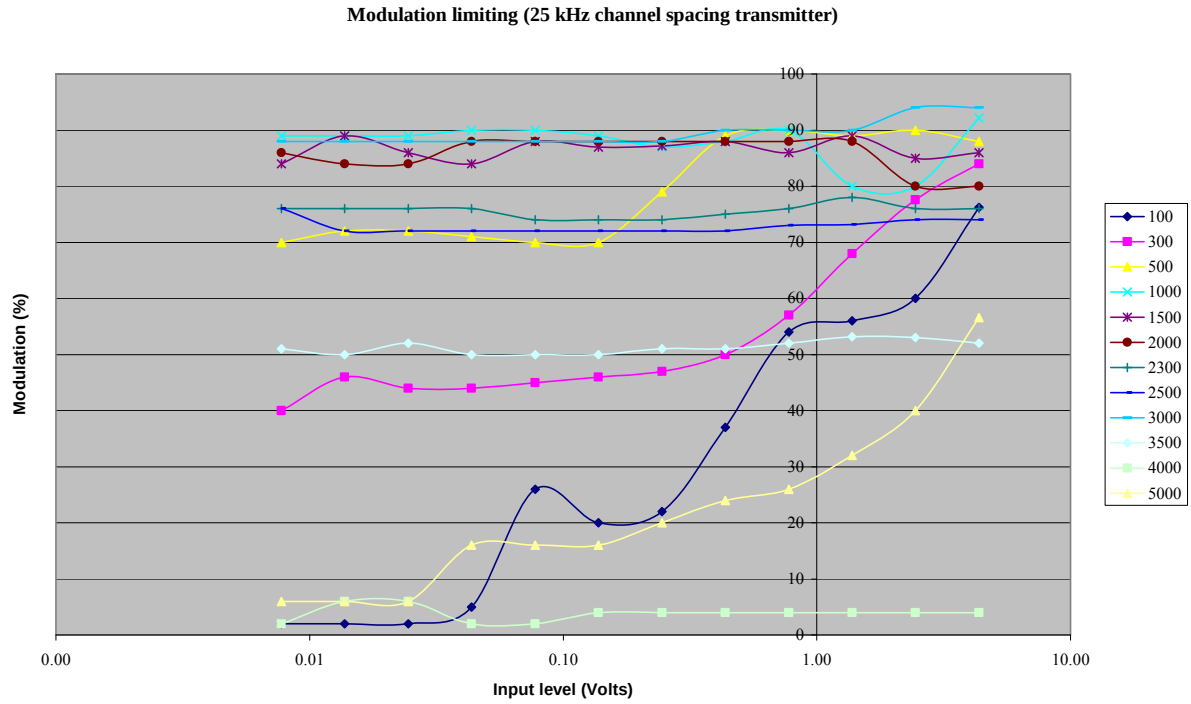


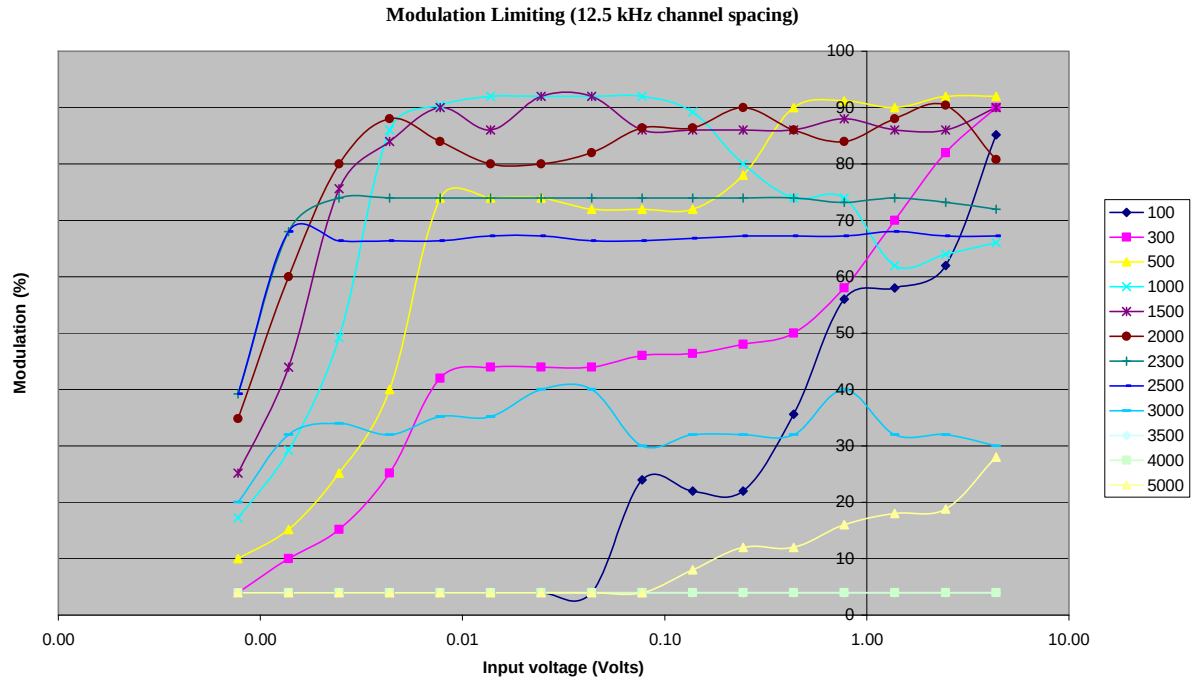
(b) A family of curves showing the percentage of modulation versus the modulation input voltage.

Measurements were made between 100 Hz to 4 kHz.

At each frequency the input voltage was slowly increased with the resulting frequency deviation of the transmitter being recorded.

This deviation was then converted to a modulation percentage where 5 kHz deviation is 100% for 25 kHz channels and 2.5 kHz deviation is 100% for 12.5 kHz channels.





(d) A curve or equivalent data that shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

The following other modulation types are used with this transmitter.

C4FM digital modulation is used for digital telephony (F1E).
1200 baud FFSK data is used for data transmissions (F1D).

Limit:
Part 90.211 – Modulation requirements states the transmitter must meet the emission requirements of 90.210. Refer to the Occupied Bandwidth measurements in this report.

Result: Complies
Measurement Uncertainty: ±1%.

Part 90.207 – Emission types:

The following emission types are used:
- F3E: Frequency modulation with analogue speech.
- F1E: Digital telephony using C4FM.
- F1D: Data transmission using 1200 baud FFSK data.

Part 90.209 – Bandwidth limitations:

The authorised bandwidth is taken to be the necessary bandwidth.

Using the formulas contained in Part 2.202 the necessary bandwidth calculation for the 25 kHz channel step emission is:

$B_n = 2 \times D + 2 \times M$
Where D = maximum deviation: 5.0 kHz
Where M = maximum modulation frequency: 3 kHz
$B_n =$ 16 kHz

Measurements show the following
$B_n = 2 \times 4750$ Hz + 2 x 2900 Hz
$B_n =$ 15.3 kHz

This is confirmed in the emission designation 16k0F3E.

Using the formulas contained in Part 2.202 the necessary bandwidth calculation for the 12.5 kHz channel step emission is:

$B_n = 2 \times D + 2 \times M$
Where D = maximum deviation: 2.5 kHz
Where M = maximum modulation frequency: 3 kHz
$B_n =$ 11 kHz

Measurements show the following
$B_n = 2 \times 2300$ Hz + 2 x 2900 Hz
$B_n =$ 10.4 kHz

This is confirmed in the emission designation 11k0F3E

For F1E according to the APCO 25 information, supplied by the client, C4FM modulation is used and the occupied bandwidth is calculated from the P25 high deviation pattern of 2827 Hz deviation at a 1200 Hz symbol rate.

$B_n = 2 \times D + 2 \times M$
Where D = high deviation pattern: 2827 kHz
Where M = symbol rate: 1200Hz
$B_n =$ 8054 Hz or 8.1 kHz

This is confirmed in the emission designation 8k10F1E

For F1D the occupied bandwidth is derived as follows

$B_n = 2 \times D + 2 \times M$
Where D = maximum deviation: 3.0 kHz
Where M = maximum modulation frequency: 2.5 kHz (12.5 kHz), 5 kHz (25 kHz)
$B_n =$ 11 kHz or 16 kHz

This is confirmed in the emission designations 11k0F1D and 16k0F1D

Part 22.359– Bandwidth limitations:

Part 22.359(a) – Analogue modulation. No authorised bandwidth is defined.

The necessary bandwidth is taken to be the authorised bandwidth.

See the previous part 90 discussions relating to the use of formulas contained in Part 2.202 to calculate the necessary bandwidths.

Measurements have also been made to verify these calculated and declared bandwidths.

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.

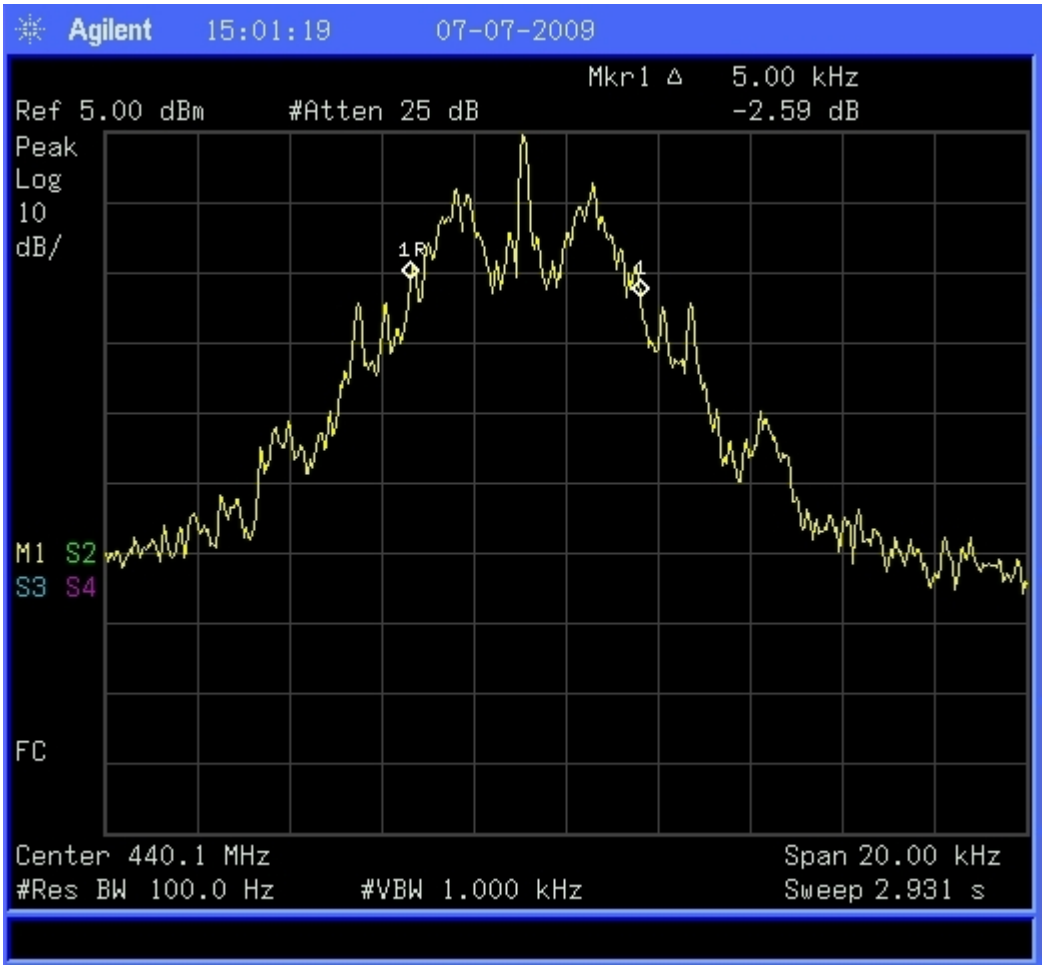
Initially power measurements are made using a resolution bandwidth of 120 kHz.

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

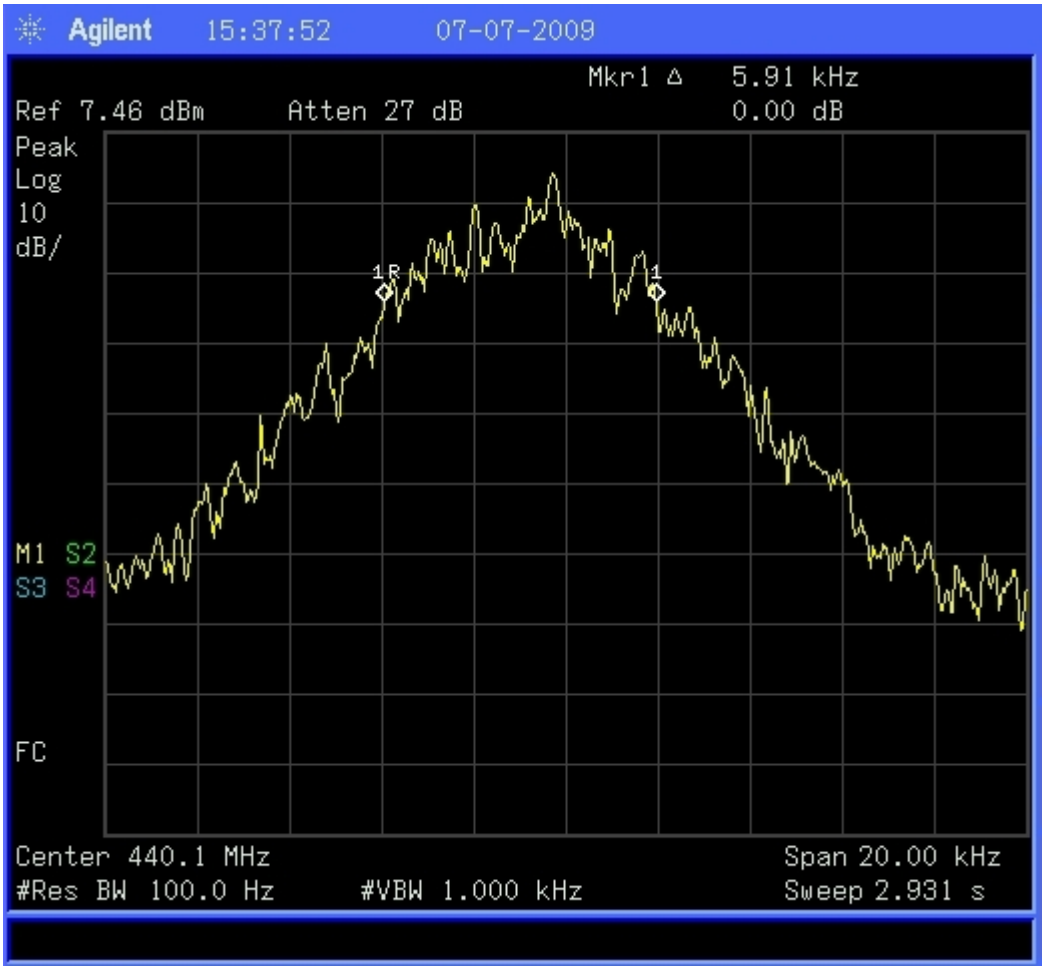
The resolution bandwidth is then changed to 100 Hz and the reference level minus 23 dB (99%) absolute bandwidth points determined

Emission	Channel	Measured	Designated
F1D	12.5 kHz	5.0 kHz	11.0 kHz
F1E	12.5 kHz	5.9 kHz	8.10 kHz
F1D	25.0 kHz	7.4 kHz	16.0 kHz

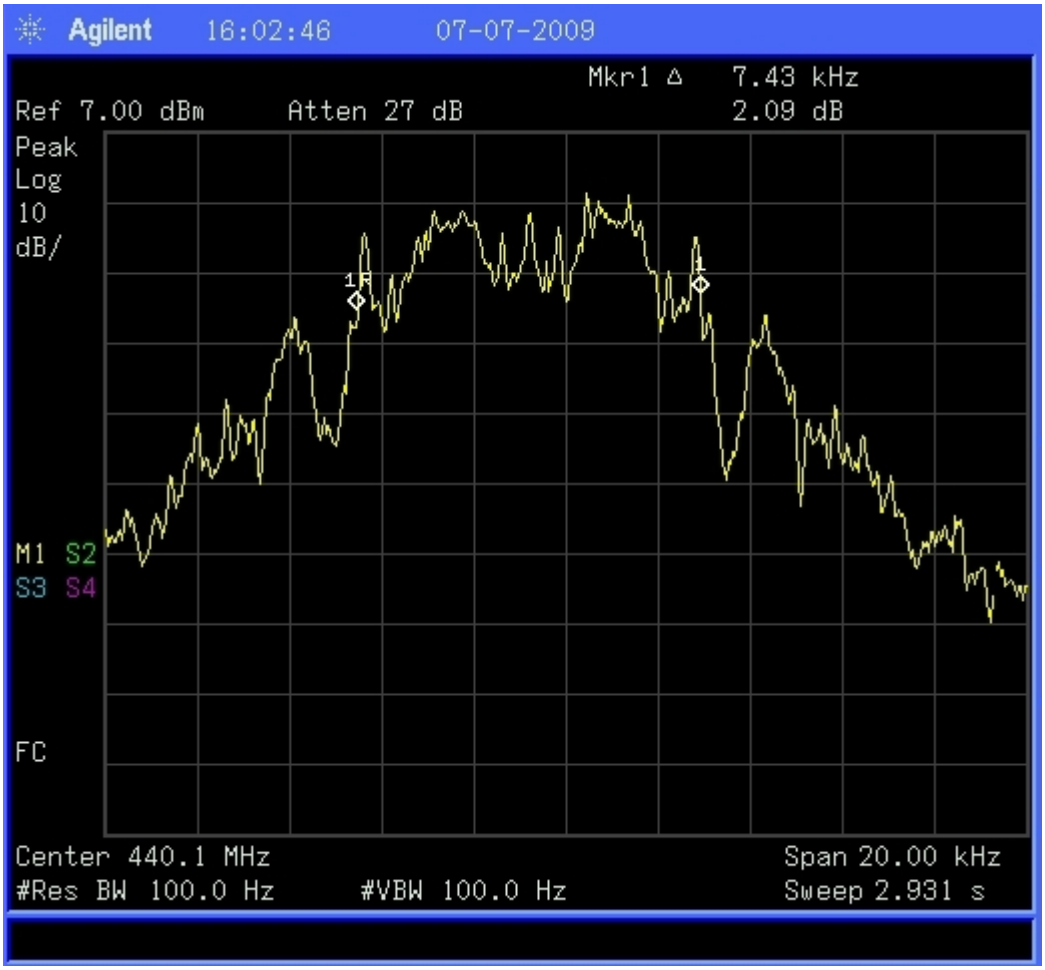
F1D – 12.5 kHz channel spacing



F1E – 12.5 KHz spacing



F1D – 25.0 kHz channel spacing



Result: Complies

Spectrum Masks

The spectrum masks are defined in:

Section 90.210(d) – Masks B and D have been applied as the transmitter can operate in the band 421-512 MHz using an authorised bandwidth of 25.0 kHz and 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.

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

Measurements were made in peak hold with the transmitter operating on 440.075 MHz.

When operating in F3E mode a 2500 Hz tone, which was found to be the frequency of maximum response, that was applied at a level 16 dB higher than that required to achieve 50% modulation.

For the F1E and F1D modes the transmitter was modulated uses modulation sources internal to the transmitter as supplied by the client.

Section 22.359(a) has been applied when analogue speech is utilised. The authorised bandwidth is taken as the necessary bandwidth which has been determined by calculation.

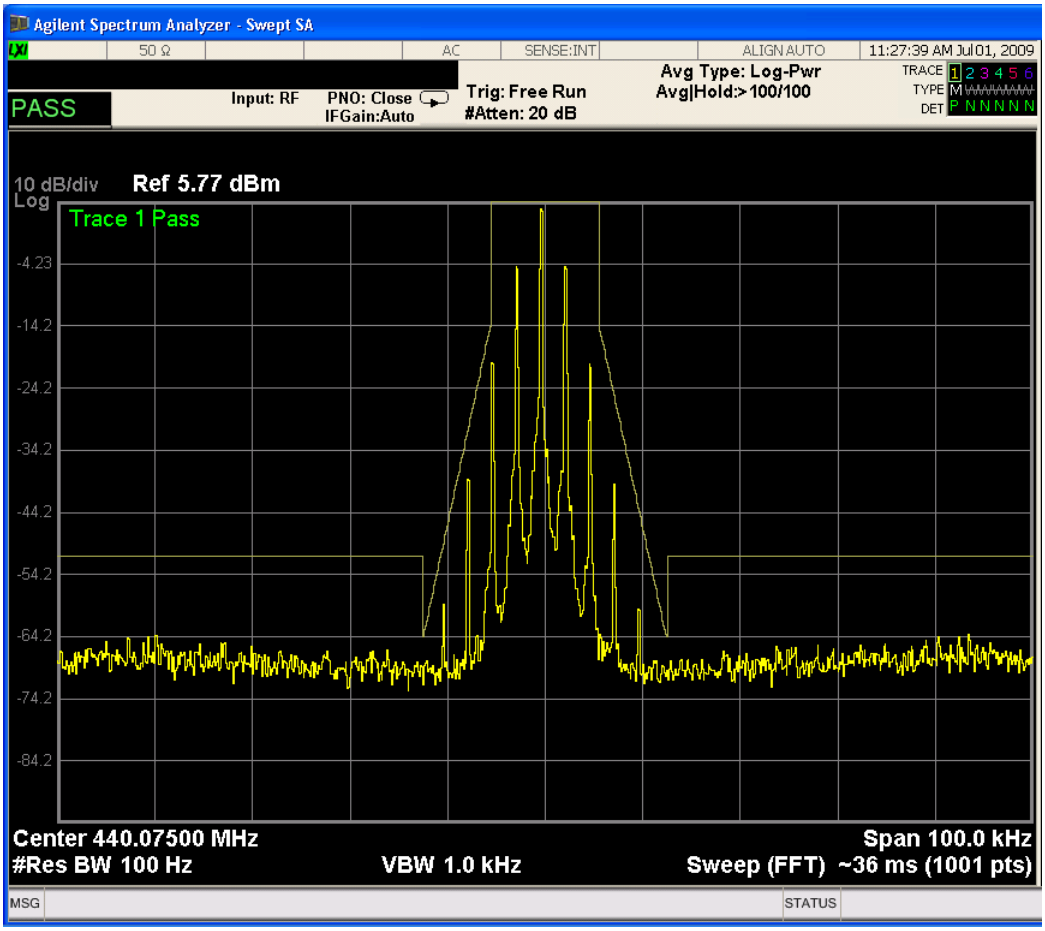
The 12.5 kHz transmitter has an authorised bandwidth (necessary bandwidth calculated) of 11 kHz applied and the 25 kHz transmitter has an authorised bandwidth of 16 kHz applied

Section 22.359(b) (1) has been applied when F1D and F1E are utilised.

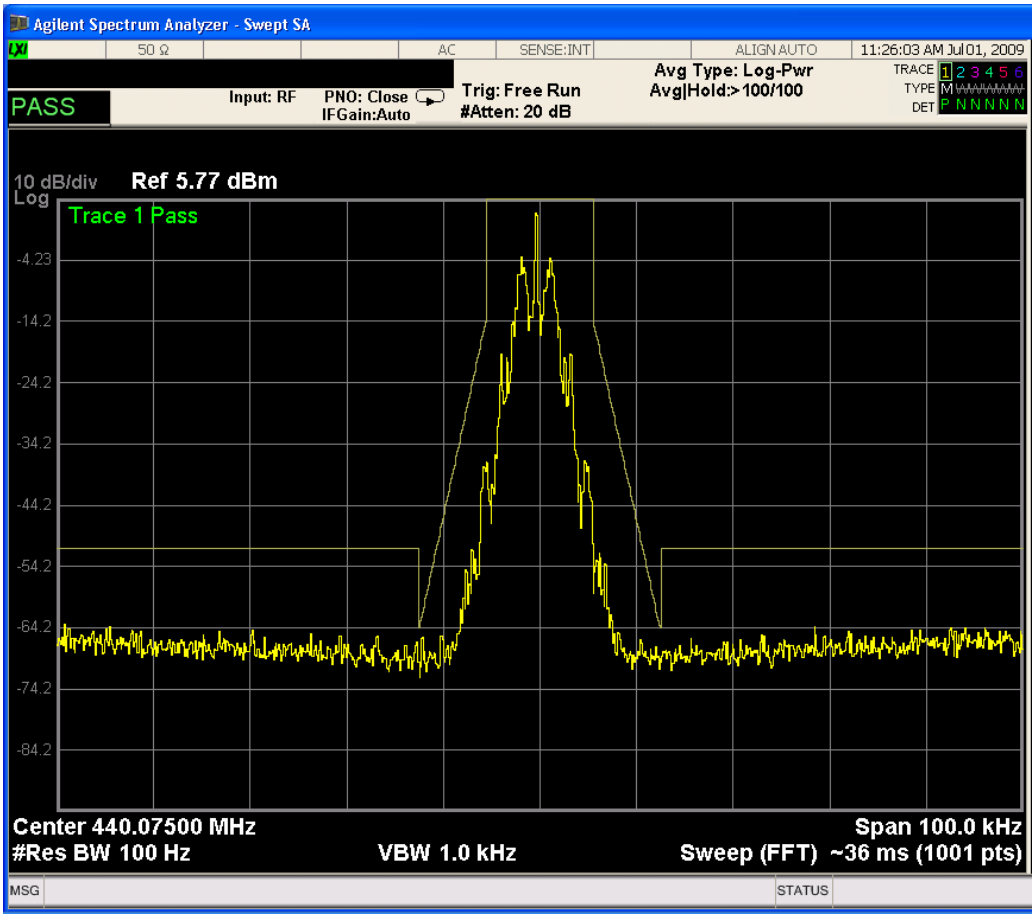
Authorised bandwidths of 7.6, 8.45 and 11.0 kHz (based upon the measured occupied bandwidths) have been applied.

Result: Complies

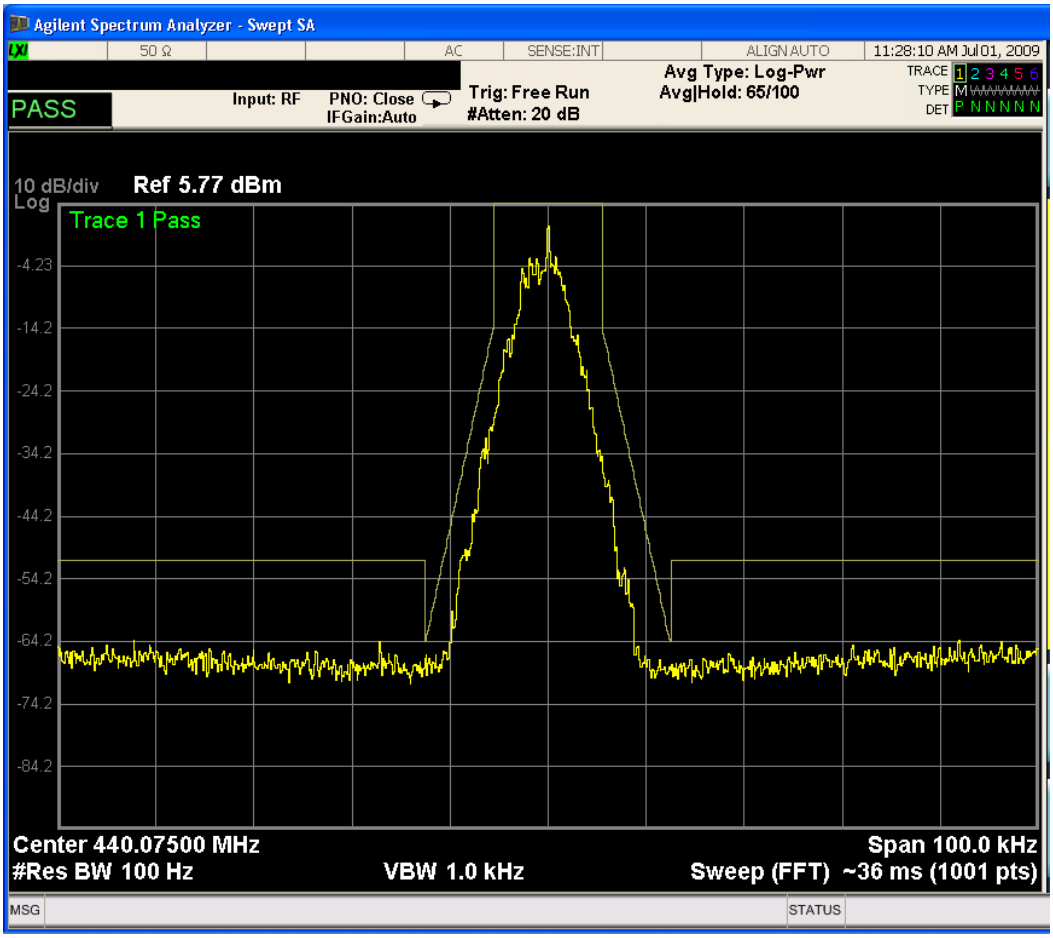
Part 90: F3E 12.5 kHz



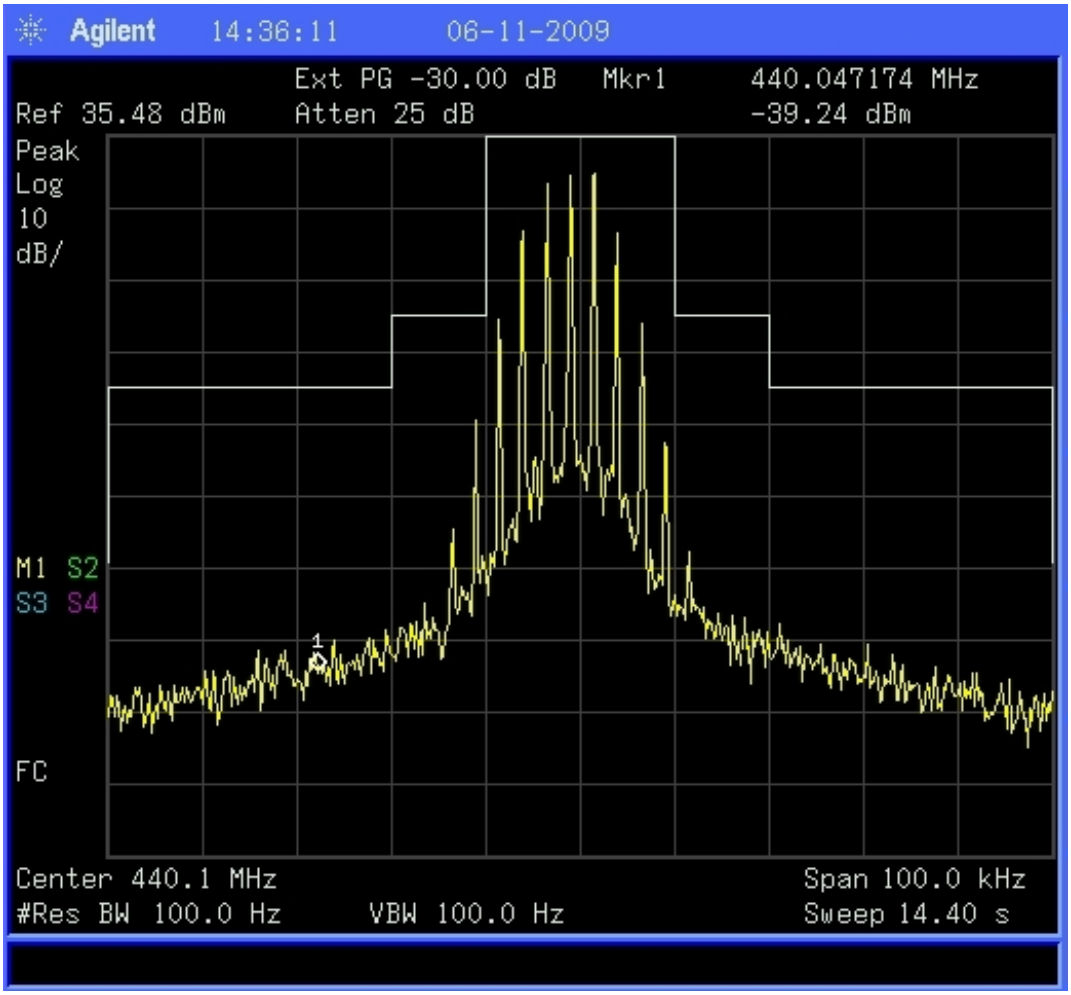
Part 90: F1D 12.5 kHz



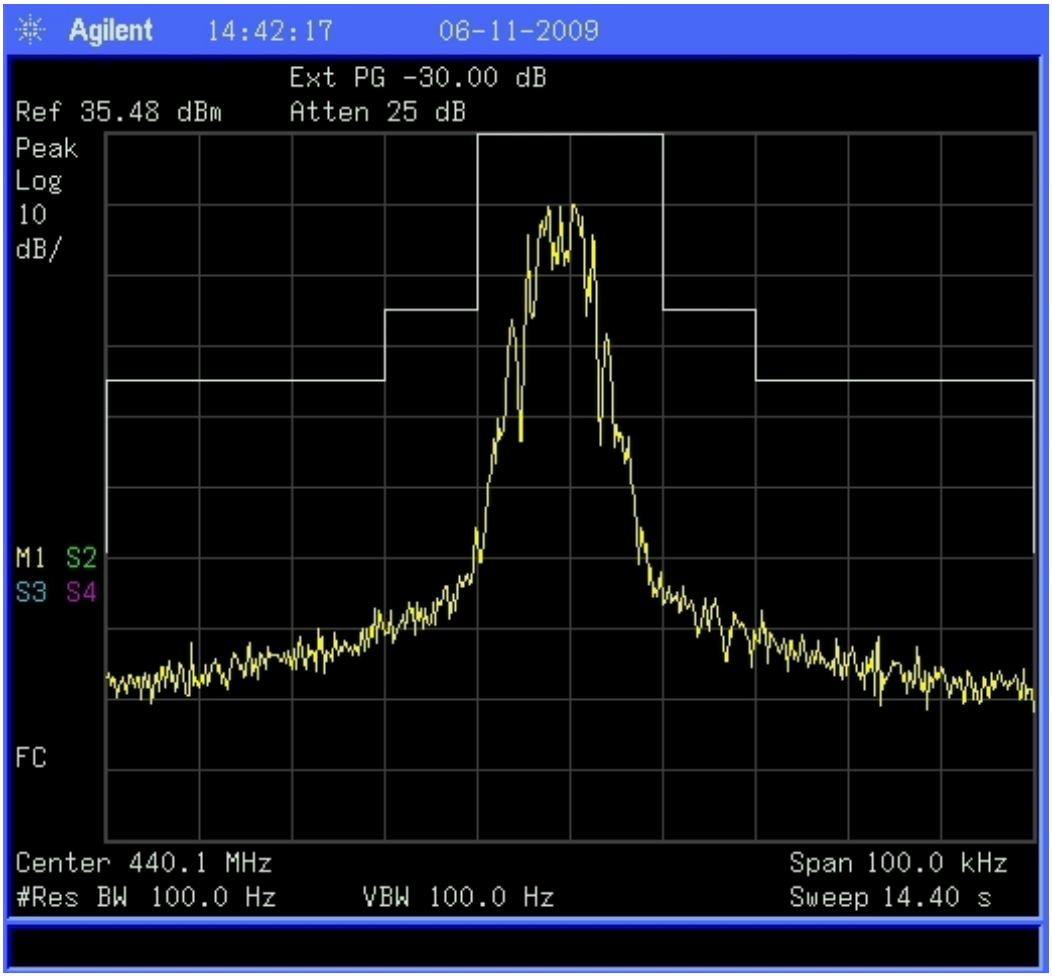
Part 90: F1E 12.5 kHz



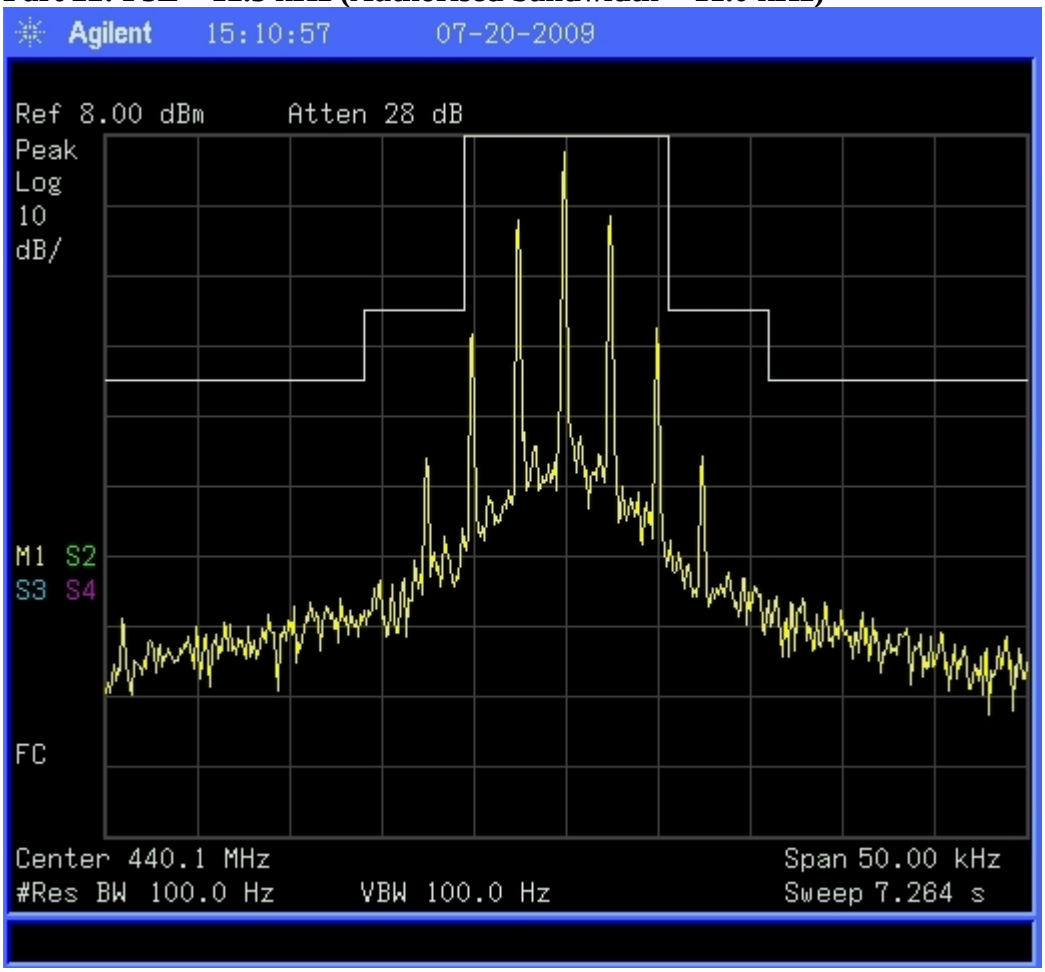
Part 90: F3E 25 kHz



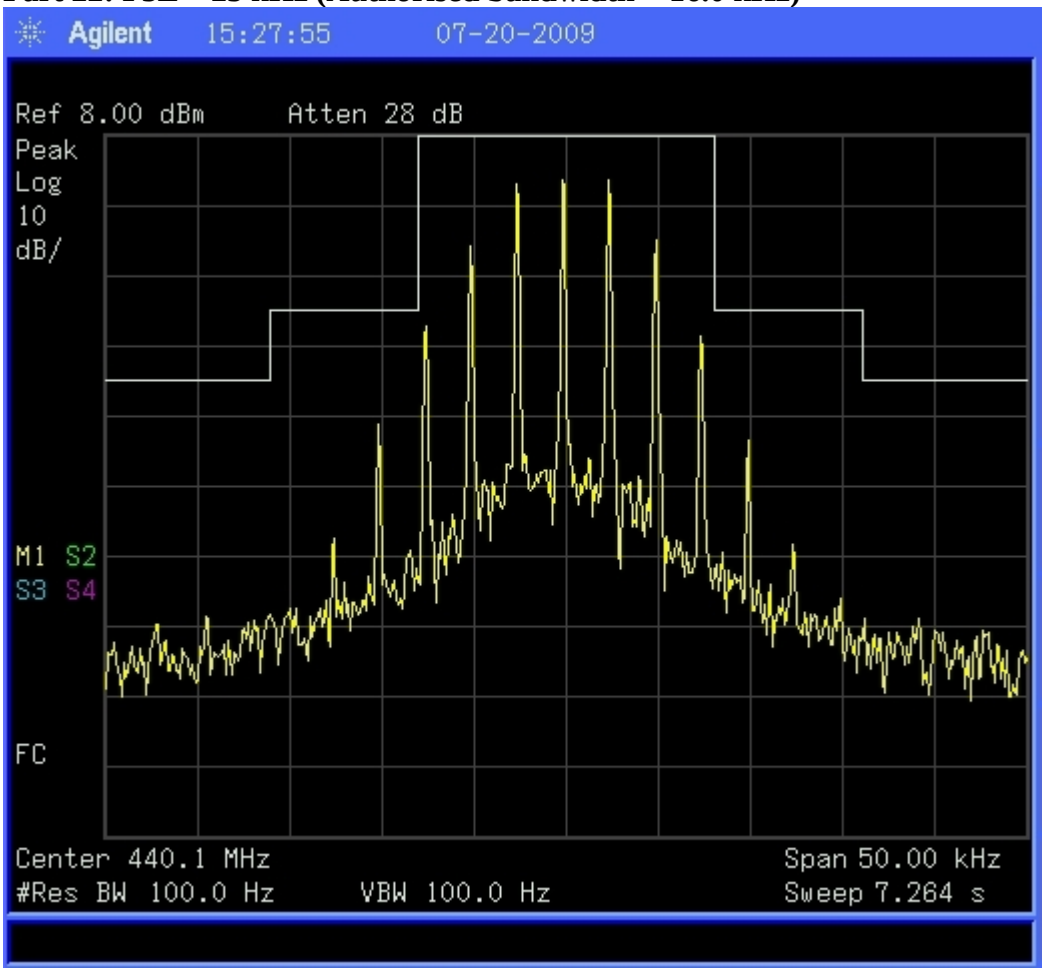
Part 90: F1D 25kHz



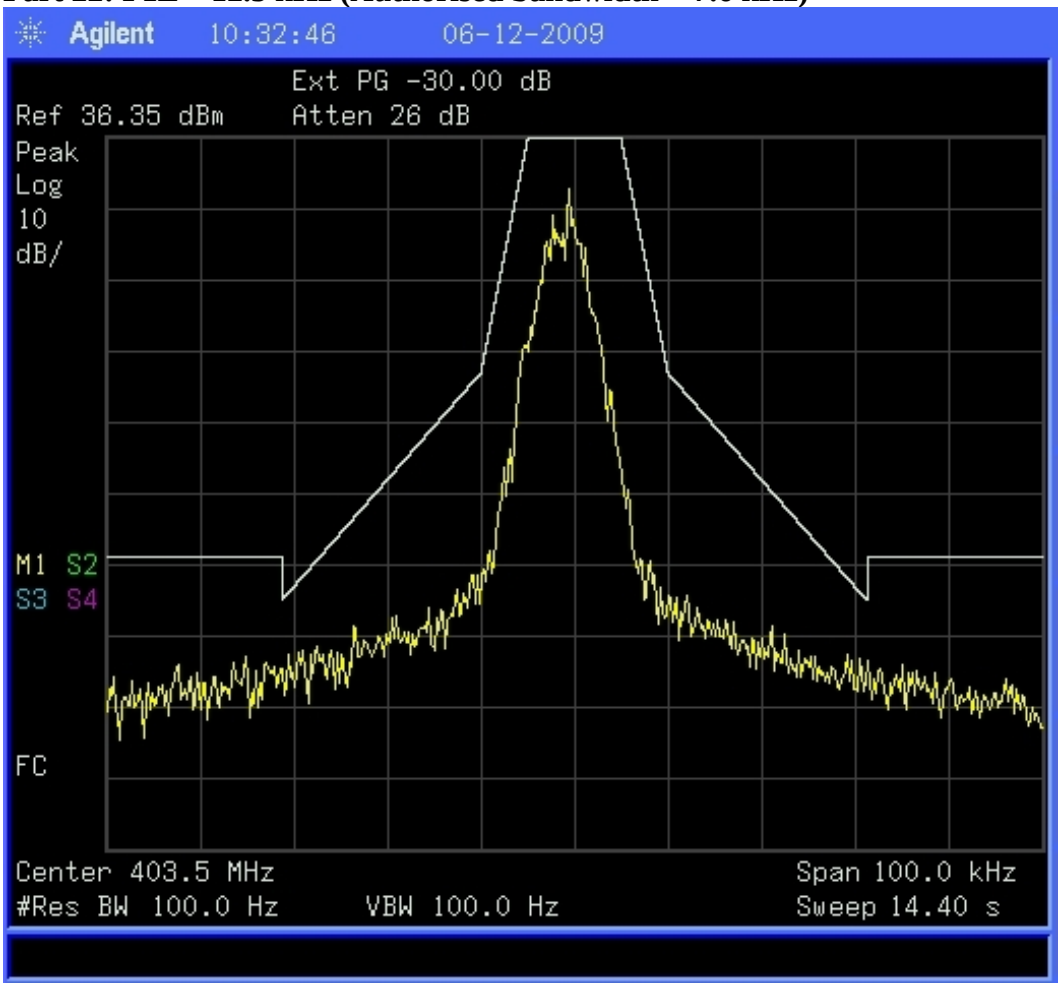
Part 22: F3E – 12.5 kHz (Authorised bandwidth = 11.0 kHz)



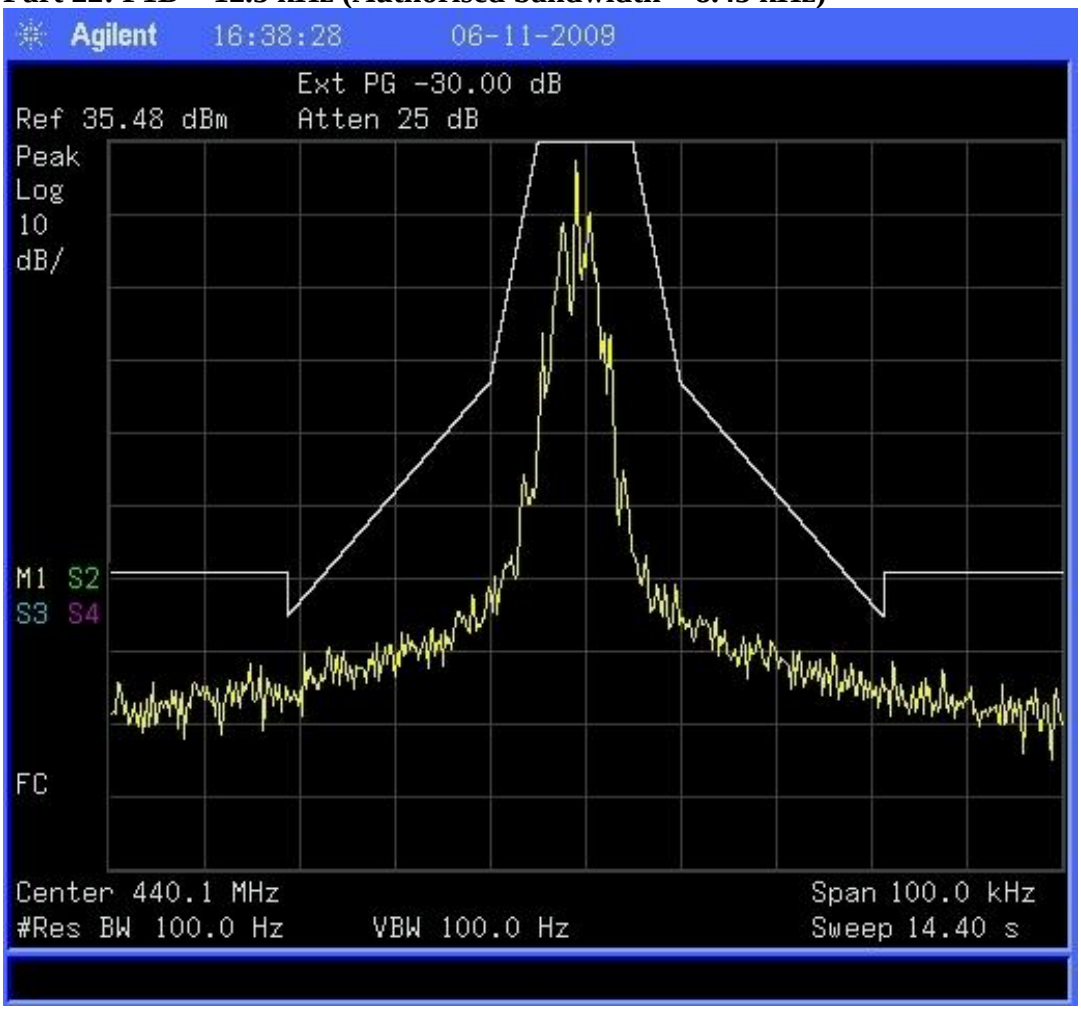
Part 22: F3E – 25 kHz (Authorised bandwidth = 16.0 kHz)



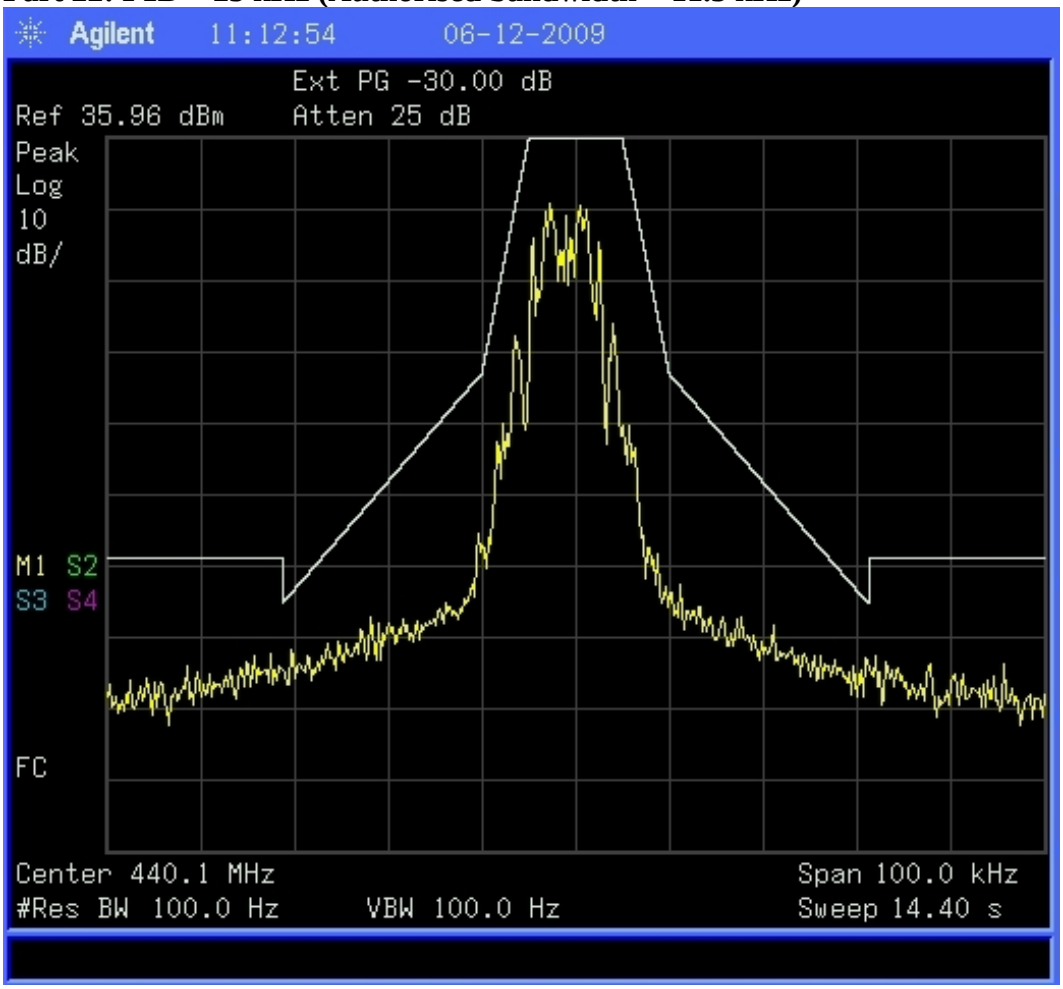
Part 22: F1E – 12.5 kHz (Authorised bandwidth = 7.6 kHz)



Part 22: F1D – 12.5 kHz (Authorised bandwidth = 8.45 kHz)



Part 22: F1D – 25 kHz (Authorised bandwidth = 11.3 kHz)



Transmitter spurious emissions at the antenna terminals

Frequency: 440.075 MHz

Spurious emission (MHz)	Emission level (dBm)	Limit (dBm)
880.150	-55.1	-20.0
1320.225	-46.0	-20.0
1760.300	-53.0	-20.0
2.200.375	-51.0	-20.0
2640.450	-47.3	-20.0
3080.525	-61.0	-20.0
3520.600	-55.3	-20.0
4400.750	-67.5	-20.0

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

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

Part 2.1051 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 5.0 watts gives a limit of –20.0 dBm.

Some emissions less that –40 dBm have been reported for completeness.

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

Result: Complies
Measurement Uncertainty: ±3.3 dB

Receiver spurious emissions at antenna terminals

Receive frequency: 440.075 MHz

Frequency (MHz)	Level (dBm)	Limit (dBm)
395.075	-85.0	-57.0
1.975.375	-84.0	-57.0

Receive frequency: 479.975 MHz

Frequency (MHz)	Level (dBm)	Limit (dBm)
434.975	-76.0	-57.0
2174.875	-75.2	-57.0
2609.850	-78.0	-57.0
3479.800	-76.0	-57.0

The receiver has an intermediate frequency of 45 MHz

No other emissions within 30 dB of the limit were observed.

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

Result: Complies
Measurement Uncertainty: ±3.3 dB

Field strength of the transmitter spurious emissions

Frequency: 440.075 MHz

Frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
880.1500	42.0	-55.4	-20.0	Vertical	35.4
880.1500	46.3	-51.1	-20.0	Horizontal	31.1
1320.2250	44.6	-52.8	-20.0	Vertical	32.8
1320.2250	50.4	-47.0	-20.0	Horizontal	27.0
1760.3000	38.1	-59.3	-20.0	Vertical	39.3
1760.3000	46.0	-51.4	-20.0	Horizontal	31.4
2200.3750	50.0	-47.4	-20.0	Vertical	27.4
2200.3750	55.0	-42.4	-20.0	Horizontal	22.4
2640.4500	50.6	-46.8	-20.0	Vertical	26.8
2640.4500	59.4	-38.0	-20.0	Horizontal	18.0
3080.525	50.9	-44.3	-20.0	Vertical	24.3
3080.525	53.9	-41.3	-20.0	Horizontal	21.3
3520.600	38.8	-56.4	-20.0	Vertical	36.4
3520.600	49.8	-45.4	-20.0	Horizontal	25.4
3960.675	40.1	-55.1	-20.0	Vertical	35.1
3960.675	34.1	-61.1	-20.0	Horizontal	41.1
4400.750	41.7	-53.5	-20.0	Vertical	33.5
4400.750	45.7	-49.5	-20.0	Horizontal	29.5

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

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

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

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland. Details of this site have been filed with the Commission, Registration Number: 90838, which was last updated on January 18th, 2007

Testing was carried out using the substitution method where by the power level of each emission was determined by replacing the transmitter with a dipole antenna that was connected to a signal generator.

The signal generator output level was increased until the same field strength level was observed at each emission frequency.

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

Limit:

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

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

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

Result: Complies
Measurement Uncertainty: ±4.1 dB

Field strength of the receiver spurious emissions

Frequency: 440.075 MHz

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Antenna	Margin (dB)
395.0750	22.0	46.0	Vertical	24.0
395.0750	27.5	46.0	Horizontal	18.5
790.1500	21.5	46.0	Vertical	24.5
790.1500	24.0	46.0	Horizontal	22.0
1185.2250	28.2	54.0	Vertical	25.8
1185.2250	29.0	54.0	Horizontal	25.0
1580.3000	-	54.0	Vertical	-
1580.3000	-	54.0	Horizontal	-
1975.3750	33.2	54.0	Vertical	20.8
1975.3750	36.0	54.0	Horizontal	18.0
2370.4500	-	54.0	Vertical	-
2370.4500	38.2	54.0	Horizontal	15.8

Frequency: 460.075 MHz

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Antenna	Margin (dB)
415.0750	25.6	46.0	Horizontal	20.4
415.0750	24.0	46.0	Vertical	22.0
415.0750	25.6	46.0	Horizontal	20.4
830.1500	26.7	46.0	Horizontal	19.3
830.1500	25.0	46.0	Vertical	21.0
830.1500	26.7	46.0	Horizontal	19.3
1245.2250	28.0	54.0	Horizontal	26.0
1245.2250	28.5	54.0	Vertical	25.5
1660.3000	30.6	54.0	Horizontal	23.4
1660.3000	-	54.0	Vertical	-
2075.3750	-	54.0	Horizontal	-
2075.3750	37.1	54.0	Vertical	16.9
2490.4500	-	54.0	Horizontal	-
2490.4500	-	54.0	Vertical	-

The receiver has an intermediate frequency of 45 MHz

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 on January 18th, 2007.

Below 1000 MHz a quasi peak detector was used with a bandwidth of 120 kHz.

Above 1000 MHz an average detector was used with a bandwidth of 1 MHz.

The receiver was tested while receiving continuously while attached to a dummy load.

Limit:
The field strength limits as per CFR 47 Part 15, section 15.109 have been applied.

Result: Complies
Measurement Uncertainty: ±4.1 dB

Frequency Stability

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

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

Measurements were made with the supply decreased 10% from nominal battery voltage supply.

Frequency: 440.075 MHz

Temperature	Voltage 6.48 Vdc	Voltage 7.2 Vdc
+50°C	-431.0	-425.0
+40°C	-380.0	-403.0
+30°C	-429.0	-436.0
+20°C	-418.0	-421.0
+10°C	-391.0	-409.0
0°C	-383.0	-407.0
-10°C	-451.0	-445.0
-20°C	-487.0	-483.0
-30°C	-565.0	-559.0

Limit:
Part 22.355 and Part 90.213 state that mobile station transmitters operating between 421 – 512 MHz with 12.5 kHz channelling are required to have a frequency tolerance of 2.5 ppm.

This transmitter was tested on 440.0750 MHz. 2.5 ppm = 2.5 x 440 = 1100 Hz.

Result: Complies
Measurement Uncertainty: ±30 Hz

Transient frequency behaviour

Transient frequency behaviour measurements are applicable to wide band and narrow band transmitters operating in the frequency band 421-512 MHz. Measurements were carried out at 440.075 MHz using the method described in TIA-603 and EN 300-086. In summary this method calls for the use of an external signal generator tuned to 440.075 MHz with a output level 0.1 % (-30 dB) of the level from the transmitter with a 1 kHz tone with a frequency deviation of 12.5 kHz being applied to the input of a modulation analyser along with the output from the transmitter.

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

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

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

Channel Spacing	Period t_1 (kHz)	Period t_2 (kHz)	Period t_3 (kHz)
12.5 kHz	nil	nil	nil
25.0 kHz	nil	nil	nil

Limits:

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

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

12.5 kHz transmitter turn on

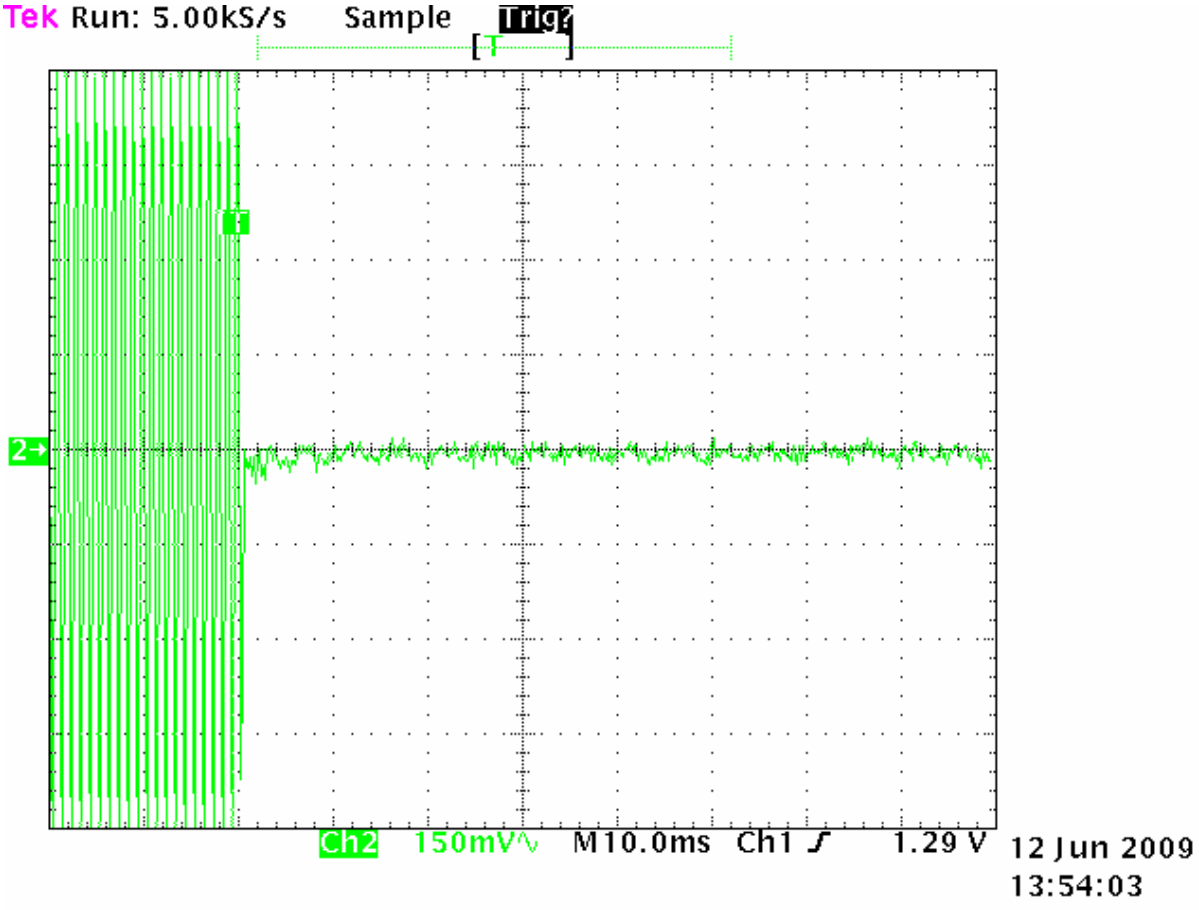
Green Trace = 1 kHz tone with FM deviation of 12.5 kHz and any transient.

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.



12.5 kHz transmitter turn off

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

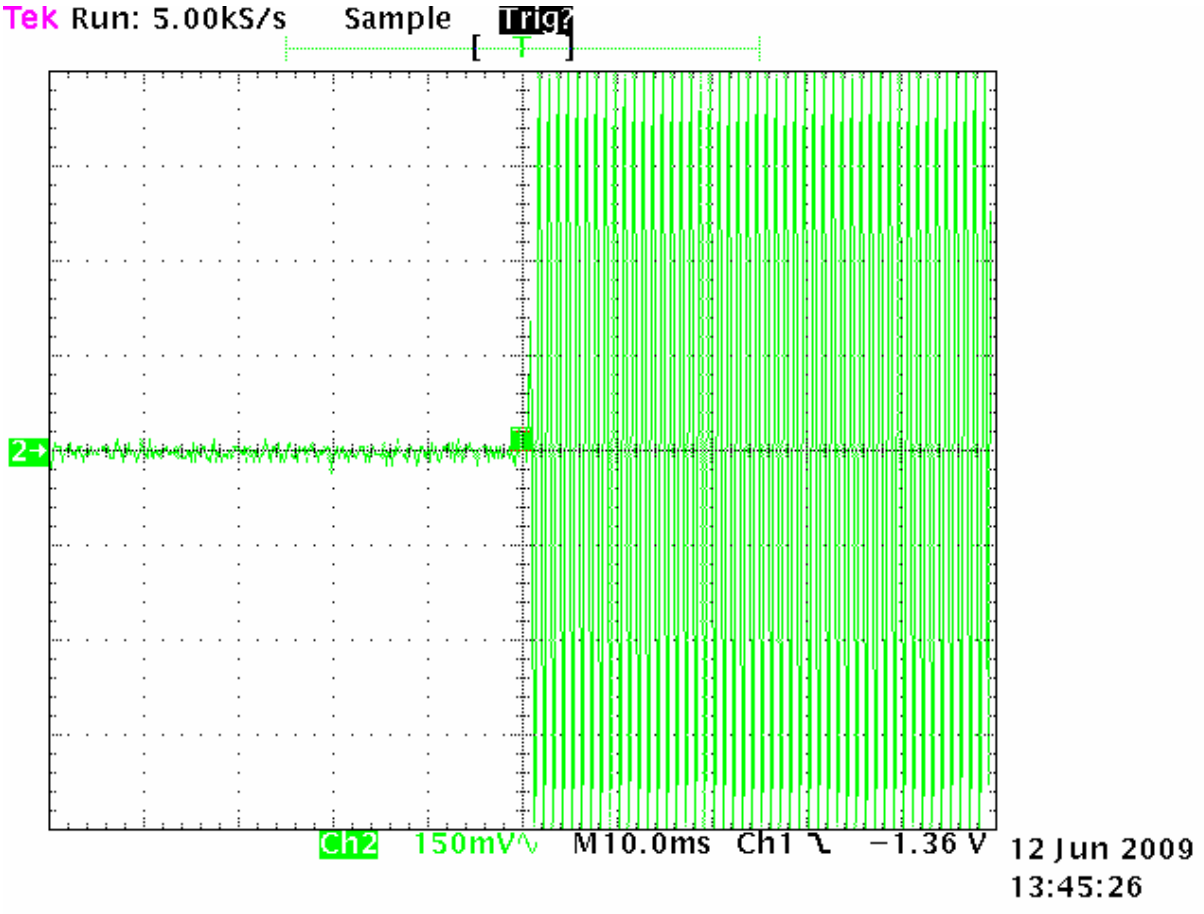
Green trace has been maximised to give full screen indication of a ± 12.5 kHz.
Therefore each Y axis division = 3.125 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

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.



25 kHz transmitter turn on

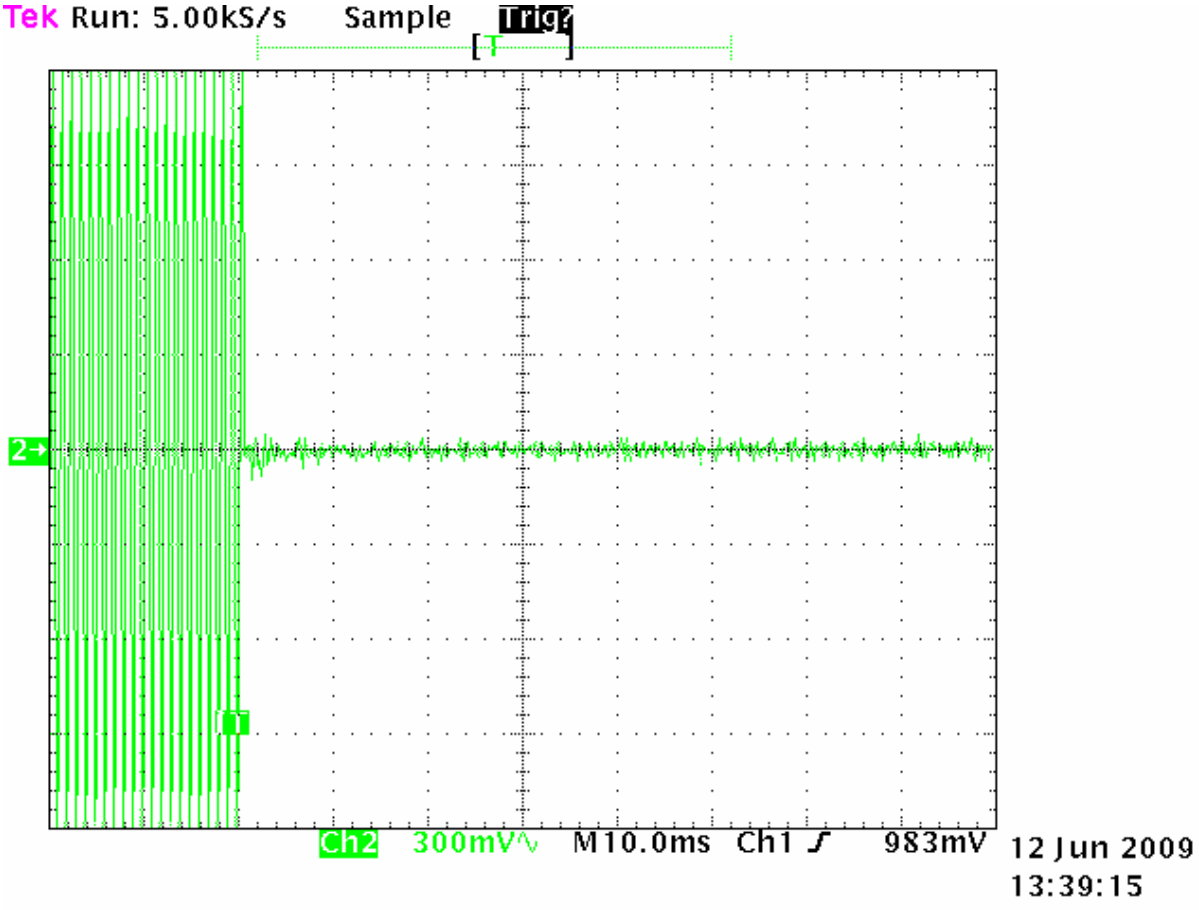
Green Trace = 1 kHz tone with FM deviation of 25 kHz and any transient.

Green trace has been maximised to give full screen indication of a ±25 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). This is position *t*on.

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

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



25 kHz transmitter turn off

Green Trace = 1 kHz tone with FM deviation of 25 kHz and any transient.

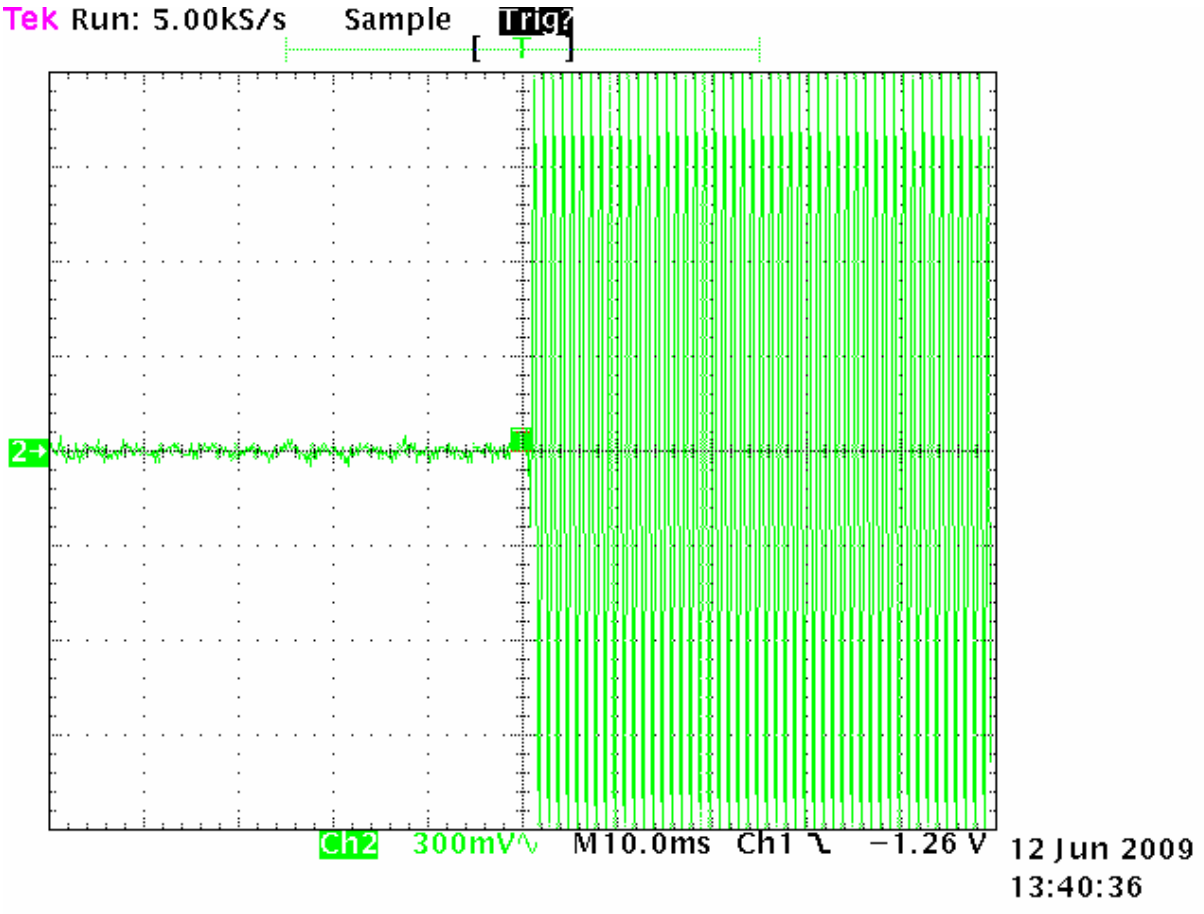
Green trace has been maximised to give full screen indication of a ± 25 kHz.
Therefore each Y axis division = 6.25 kHz per division.
The X axis has been set to a sweep rate of 10 ms/division.

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 4.5 and 5.0 divisions from the left hand edge.

No transient can be observed just before toff.



8. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset
Aerial Controller	EMCO	1090	9112-1062	RFS 3710
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708
Attenuator 10 dB	Hewlett Packard	HP8491A	24838	E1329
Attenuator 20 dB	Weinschel	49-20-43	GC-104	E1308
Audio Analyzer	Hewlett Packard	8903A	2216A01713	E1146
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612
Frequency Counter	Hewlett Packard	HP 5342A	1916A01713	E1224
Level generator	Anritsu	MG443B	M61689	E1143
Log Periodic	Schwarzbeck	VUSLP9111	9111-228	3785
Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595
Modulation Analyzer	Rohde & Schwarz	FMA	837807/020	E1552
Modulation Analyzer	Hewlett Packard	8901B	2608A00782	E1090
Oscilloscope	Tektronics	745A	B010643	1569
Power Attenuator	Weinschel	49-20-43	GC104	E1308
Power Supply	Hewlett Packard	6032A	2743A-02859	E1069
RF Power Meter	Hewlett Packard	HP 436A	2512A22439	E1198
Selective Level Meter	Anritsu	ML422C	M35386	E1140
Signal Generator	Rohde & Schwarz	SMHU.58	838923/028	E1493
Spectrum Analyzer	Agilent	N9320A	CN063000567	E4002
Spectrum Analyzer	Hewlett Packard	EXA	-	-
Thermal chamber	Contherm	M180F	86025	E1129
Thermometer	DSIR	RT200	035	E1049
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709
Horn antenna	Electrometrics	RGA-60	6234	E1494
Pre Amplifier	Hewlett Packard	8349B	2644A01659	-

9. ACCREDITATIONS

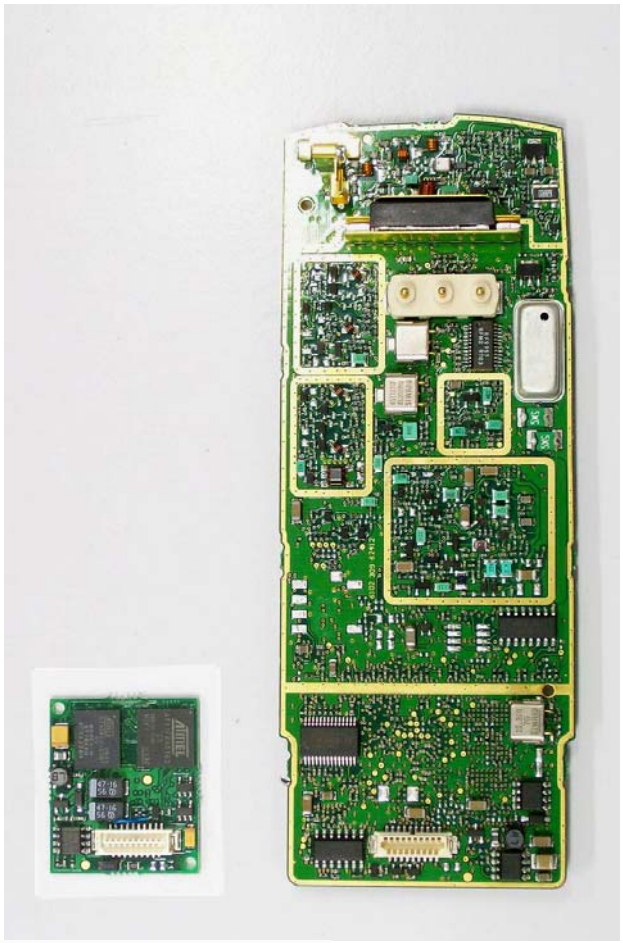
Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was last updated on January 18th, 2007.

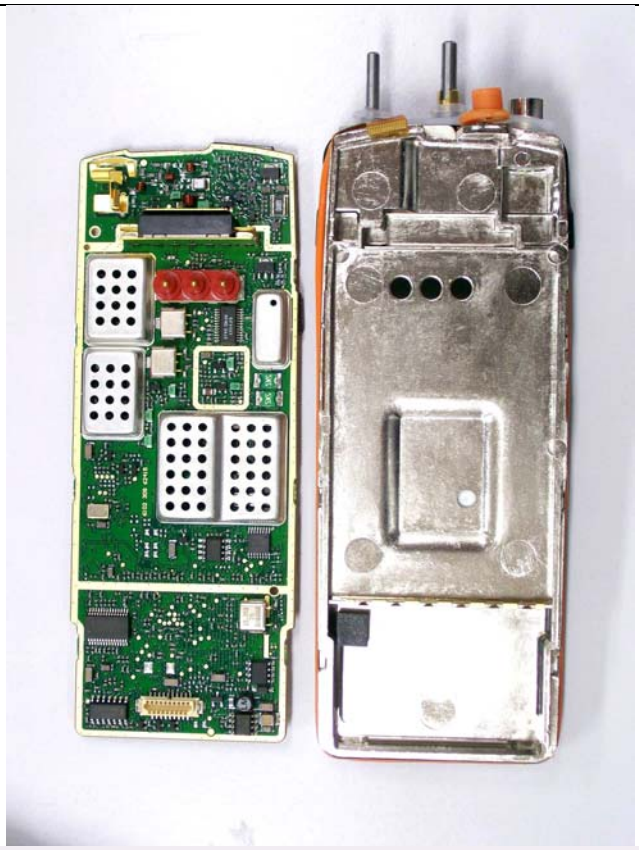
All testing has been carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to ISO/IEC 17025.

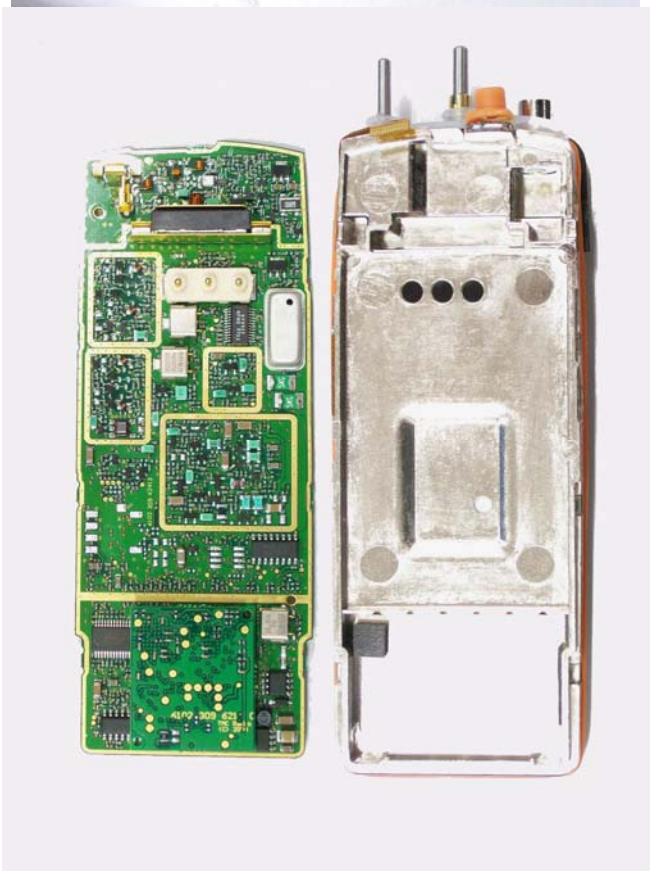
All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to ISO/IEC 17025.

10. PHOTOGRAPH (S)

External views







Radiated Emissions Setup