Report On

Limited Industry Canada Testing of the Funk-Electronic Piciorgros GmbH F.E.P TMO-100/DAN In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 90 and Industry Canada RSS-119

COMMERCIAL-IN-CONFIDENCE

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Document 75915769 Report 02 Issue 4 April 2013

Product Service

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REPORT ON

Limited Industry Canada Testing of the
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In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 90 and Industry Canada RSS-119

Document 75915769 Report 02 Issue 4

April 2013

PREPARED FOR

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PREPARED BY

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APPROVED BY

Mark Jenkins
Authorised Signatory

DATED 12 April 2013

This report has been up-issued to Issue 4 to add a duty cycle description in Section 2.4.5.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 2, FCC CFR 47 Part 90 and Industry Canada RSS-119. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler A Blagg M Russell

UKAS TESTING 0141

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

Limited Industry Canada Testing of the
Funk-Electronic Piciorgros GmbH F.E.P TMO-100/DAN
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 90 and Industry Canada RSS-119

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Limited Industry Canada Testing of the Funk-Electronic Piciorgros GmbH F.E.P TMO-100/DAN to the requirements of FCC CFR 47 Part 2, FCC CFR 47 Part 90 and Industry Canada RSS-119.

Objective	To perform Limited Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Funk-Electronic Piciorgros GmbH
Model Number(s)	TMO-100/DAN
Declared Variants	TMO-100/DA1, TMO-100/DA2, TMO-100/DA3, TMO-100/DA4, TMO-100/DA5, TMO-100/DVI
Serial Number(s)	219
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 2 (2011) FCC CFR 47 Part 90 (2011) Industry Canada RSS-119 (Issue 11, 2011)
Incoming Release Date	Application Form 26 January 2012
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	N/A - Paid upfront N/A
Start of Test	19 February 2012
Finish of Test	20 July 2012
Name of Engineer(s)	G Lawler A Blagg M Russell
Related Document(s)	ANSI C63.4: 2009

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 90 and Industry Canada RSS-119 is shown below.

Section	Spec Clause			Test Description	Result	Comments/Base Standard
	Pt 2	Pt 90	RSS			
Tetra						
2.1	2.1046	90.205 (h)	-	Effective Radiated Power	Pass	
2.2	2.1047	90.207	5.2	Type of Emissions/Types of Modulation	Pass	
2.3	2.1049	90.209		Bandwidth Limitations	Pass	
2.4	2.1046	90.210	5.4	Power and Antenna Height Limits/Transmitter Output Power	Pass	
2.5	2.1051	90.210 (c)(1)(2)(3)	5.8	Emission Mask/Transmitter Unwanted Emissions	Pass	
2.6	2.1055	90.213	5.3	Frequency Stability/Transmitter Frequency Stability	Pass	
2.7	90.212			Provisions Relating to the use of Scrambling Devices and Digital Voice Modulation	-	
2.8		90.214	5.9	Transient Frequency Behaviour	Pass	

Product Service

1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	TMO-100/DAN
Part Number	
Technical Description (Please provide a brief description of the intended use of the equipment)	TETRA modem for Data and Voice applications

POWER SOURCE					
☐	AC mains	State voltage			
AC supply frequency	(Hz)				
	VAC				
	Max Current				
	Hz				
☐	Single phase	☐	Three phase		
And / Or					
☒	External DC supply				
	Nominal voltage	12-24 V	Max Current	2	A
	Extreme upper voltage	30 V			
	Extreme lower voltage	9,6 V			
Battery					
☐	Nickel Cadmium	☐	Lead acid (Vehicle regulated)		
☐	Alkaline	☐	Leclanche		
☐	Lithium	☐	Other Details :		
	Volts nominal.				
End point voltage as quoted by equipment manufacturer		V			

Product Service

FREQUENCY INFORMATION				
Frequency Range	456 to470	MHz		
Channel Spacing (where applicable)	25kHz			
Test Frequencies*	Bottom	456	MHz	Channel Number (if applicable)
	Middle	463	MHz	Channel Number (if applicable)
	Top	470	MHz	Channel Number (if applicable)
If alternate test modes are available resulting in different test frequencies please specify which mode is applicable:				

POWER CHARACTERISTICS

Maximum TX power	3W	W
Minimum TX power		W (if variable)
Is transmitter intended for :		
Continuous duty	☐ Yes	☐ No
Intermittent duty	☐ Yes	☐ No
If intermittent state DUTY CYCLE		
Transmitter ON	seconds	
Transmitter OFF	seconds	

ANTENNA CHARACTERISTICS				
☒	Antenna connector	State impedance	50	Ohm
☐	Temporary antenna connector	State impedance		Ohm
☐	Integral antenna	Gain		dBi

MODULATION CHARACTERISTICS			
☐	Amplitude	☐	Frequency
☐	Phase	☐	Other (please provide details):
Can the transmitter operate un-modulated?		☐ Yes	☐ No

CLASS OF EMISSION USED	
ITU designation or Class of Emission:	
	1
	(if applicable) 2
	(if applicable) 3
If more than three classes of emission, list separately:	

EXTREME CONDITIONS					
Extreme test voltages (Max)	30	V	Extreme test voltages (Min)	10	V
Nominal DC Voltage	12-24	V	DC Maximum Current	2	A
Maximum temperature	+70	°C	Minimum temperature	-20	°C

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature: Held on file Name: Michael D Piciorgros

Position held: CEO and Owner Date: 26 January 2012

Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Funk-Electronic Piciorgros GmbH F.E.P TMO-100/DAN.
A full technical description can be found in the manufacturer's documentation.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure.

The EUT was powered from a 18 V DC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable standards or test plan were made during testing.

1.7 MODIFICATION RECORD

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Serial Number: 219			
0	As supplied by manufacturer.	N/A	N/A
1	Software update. Zip file and test instructions sent by Marco Jakobs by email on 24/01/2012 at 15:21 to Maggie. Graeme followed email instructions to perform software update.	Graeme Lawler	24 January 2012

The table above details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Product Service

SECTION 2

TEST DETAILS

Limited Industry Canada Testing of the
Funk-Electronic Piciorgros GmbH F.E.P TMO-100/DAN
In accordance with FCC CFR 47 Part 2, FCC CFR 47 Part 90 and Industry Canada RSS-119

2.1 EFFECTIVE RADIATED POWER

2.1.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 90, Clause 90.205 (h)

2.1.2 Equipment Under Test and Modification State

TMO-100/DAN S/N: 219 - Modification State 1

2.1.3 Date of Test

19 February 2012

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Procedure

Measurements of the fundamental from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The fundamental frequency was maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. A peak detector was used with the trace set to max hold. The maximum result was recorded.

The EUT was then removed from the chamber and replaced with a substitution antenna. Using a signal generator the level was adjusted to achieve the same value on the measuring instrument as previously recorded with the EUT. The final result (ERP) was determined by a calculation using the signal generator level, antenna gain and cable loss.

The measurements were performed at a 3m distance unless otherwise stated.

2.1.6 Environmental Conditions

Ambient Temperature	19.5°C
Relative Humidity	24.0%

Product Service

2.1.7 Test Results

18.0 V DC Supply

Frequency	Result (dBm)	Result (W)
450.025 MHz	36.28	4.25
460.000 MHz	35.52	3.56
469.975 MHz	36.24	4.21

Limit

The maximum output power of the transmitter for mobile stations is 100 watts (20 dBW).

2.2 TYPE OF EMISSIONS/TYPES OF MODULATION

2.2.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1047
FCC CFR 47 Part 90, Clause 90.207
Industry Canada RSS-119, Clause 5.2

2.2.2 Equipment Under Test and Modification State

TMO-100/DAN S/N: 219 - Modification State 1

2.2.3 Date of Test

9 March 2012

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Procedure

Using a spectrum analyser and attenuator(s), the output power of the EUT was measured at the antenna terminals.

2.2.6 Environmental Conditions

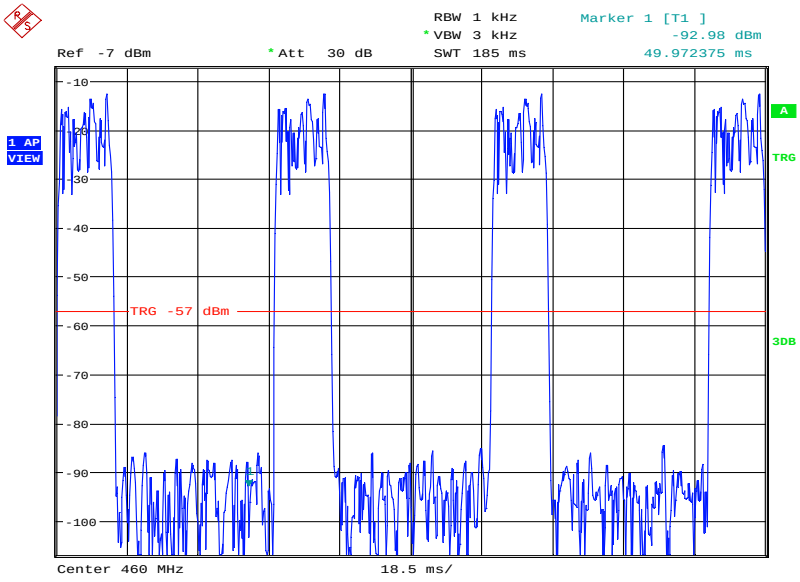
Ambient Temperature	26.0°C
Relative Humidity	27.2%

Product Service

2.2.7 Test Results

18.0 V DC Supply

460.000 MHz



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2.3 BANDWIDTH LIMITATIONS

2.3.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1049
FCC CFR 47 Part 90, Clause 90.209

2.3.2 Equipment Under Test and Modification State

TMO-100/DAN S/N: 219 - Modification State 1

2.3.3 Date of Test

6 March 2012

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

The EUT was transmitting at maximum power, with modulation. Using a resolution bandwidth of 1 kHz and a video bandwidth of 3 kHz, the -26 dBc points were established and the emission bandwidth determined.

The plot of the following pages shows the resultant display from the Spectrum Analyser.

2.3.6 Environmental Conditions

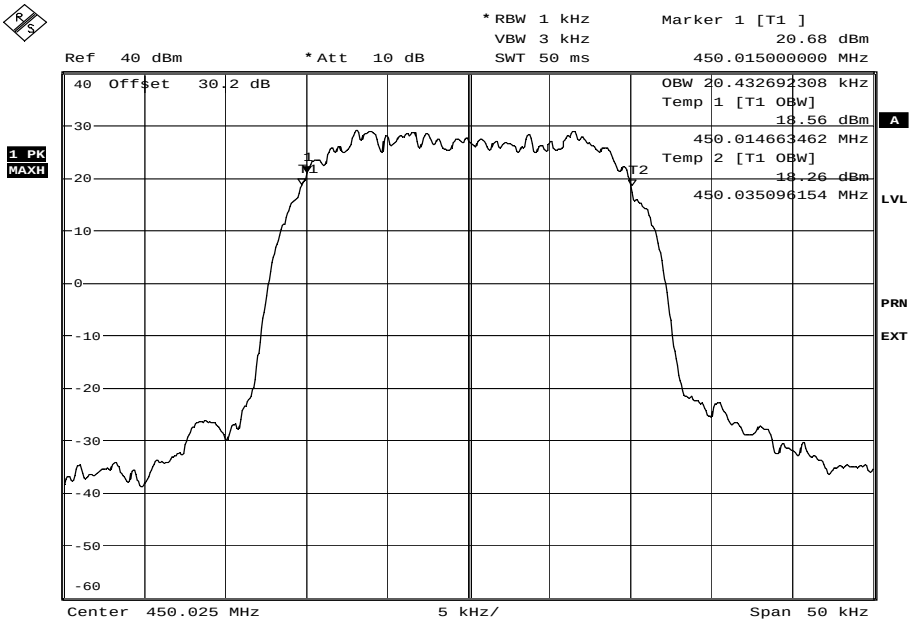
Ambient Temperature	24.7°C
Relative Humidity	16.4%

2.3.7 Test Results

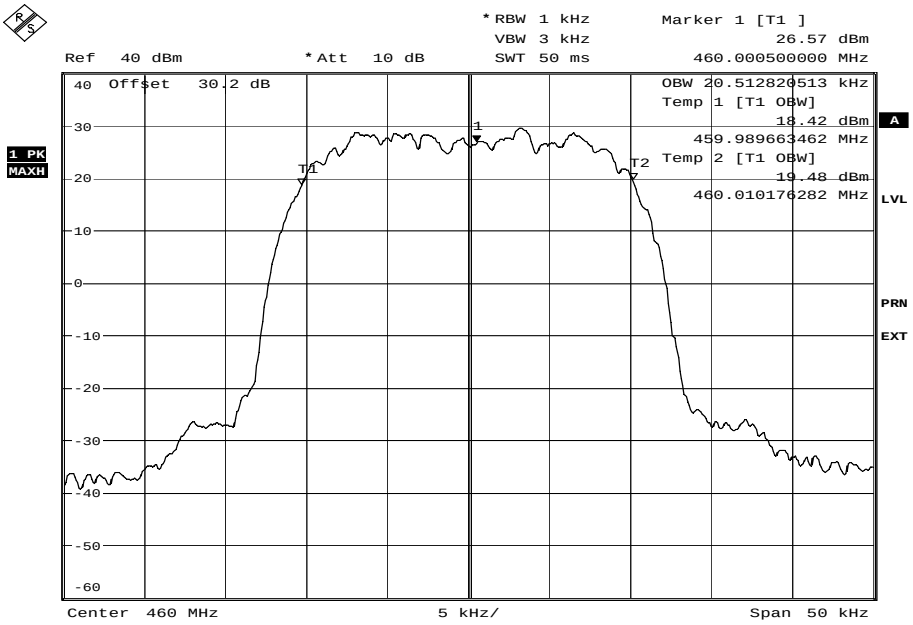
18.0 V DC Supply

Frequency	Occupied Bandwidth (kHz)
450.025 MHz	20.433
460.000 MHz	20.512
469.975 MHz	20.433

450.025 MHz



460.000 MHz



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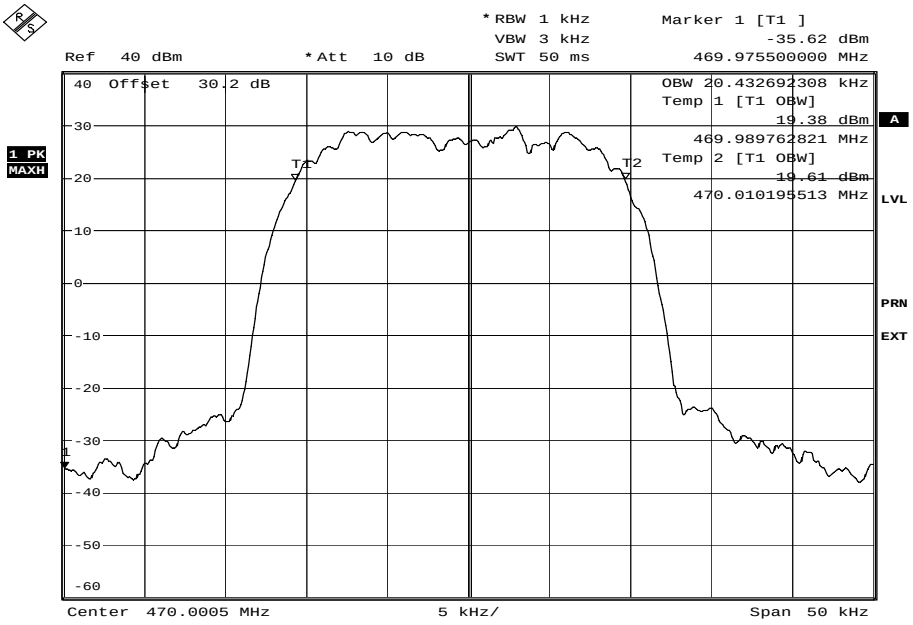
469.975 MHz



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Limit

The authorised bandwidth shall not exceed 22 kHz.

This is in accordance with the waiver FCC 11-63.

2.4 POWER AND ANTENNA HEIGHT LIMITS/TRANSMITTER OUTPUT POWER

2.4.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1046
FCC CFR 47 Part 90, Clause 90.210

2.4.2 Equipment Under Test and Modification State

TMO-100/DAN S/N: 219 - Modification State 1

2.4.3 Date of Test

6 March 2012

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Procedure

Using a spectrum analyser and attenuator(s), the output power of the EUT was measured at the antenna terminals.

The EUT was configured to transmit on Maximum Power with all timeslots active. This resulted in the EUT having a duty cycle of 100%. The path loss between the EUT and the Spectrum Analyser was measured and entered as a Reference Level Offset. Using a Spectrum Analyser with a peak detector and Max Hold, the Maximum Peak Power was measured.

2.4.6 Environmental Conditions

Ambient Temperature	23.2°C
Relative Humidity	20.9%

Product Service

2.4.7 Test Results

18.0 V DC Supply

450.025 MHz

Result (dBm)	Result (W)
36.58	4.55

460.000 MHz

Result (dBm)	Result (W)
37.03	5.047

469.975 MHz

Result (dBm)	Result (W)
36.68	4.656

Limit

FCC

	Service Area Radius (km)									
	3	8	13	16	24	32	40	48	64	80
Maximum ERP (W)[1]	2	100	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500	[2]500
Up to reference HAAT (m) [3]	15	15	15	27	63	125	250	410	950	2700

[1] Maximum ERP indicated provides for a 39 dBu signal strength at the edge of the service area per FCC Report R-6602, Fig.29 (see §73.699, Fig 10b).
[2] Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 39 dBu.
[3] When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation: $ERP_{allow} = ERP_{max} \times (HAAT_{ref} HAAT_{actual})^2$.
[4] Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 39 dBu.

Industry Canada

The output power shall be within ±1.0 dB of the manufacturer's rated power.

2.5 EMISSION MASK/TRANSMITTER UNWANTED EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1051
FCC CFR 47 Part 90, Clause 90.210 (c)(1)(2)(3)
Industry Canada RSS-119, Clause 5.8

2.5.2 Equipment Under Test and Modification State

TMO-100/DAN S/N: 219 - Modification State 1

2.5.3 Date of Test

19 February 2012, 9 March 2012, 22 March 2012 & 20 July 2012

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

Using a spectrum analyser and attenuator(s), the output power of the EUT was measured at the antenna terminals.

2.5.6 Environmental Conditions

Ambient Temperature	19.5 - 27.2°C
Relative Humidity	24.0 - 47.8%

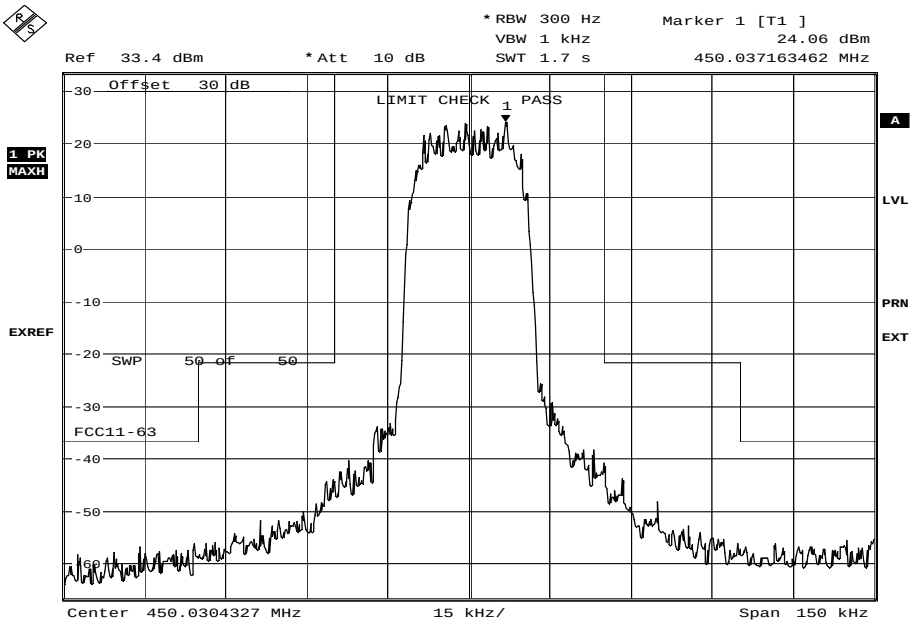
Product Service

2.5.7 Test Results

18.0 V DC Supply

Conducted

450.025 MHz



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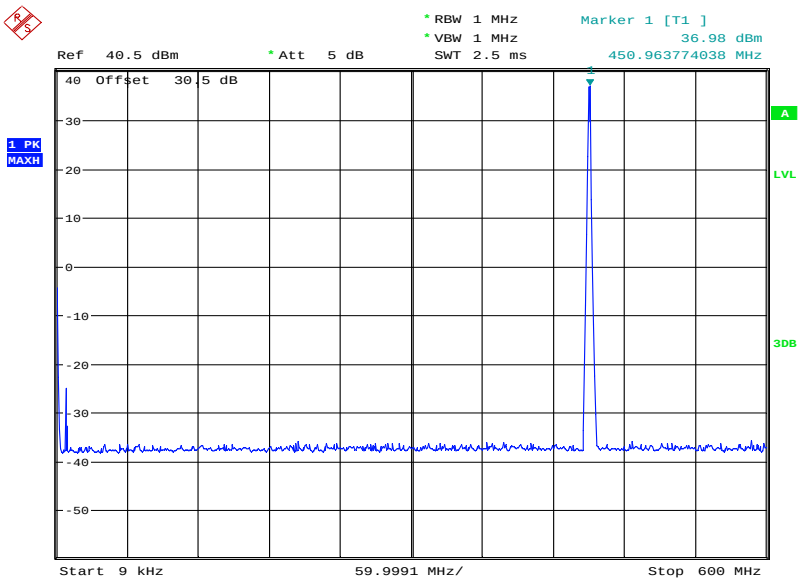
9 kHz to 600 MHz



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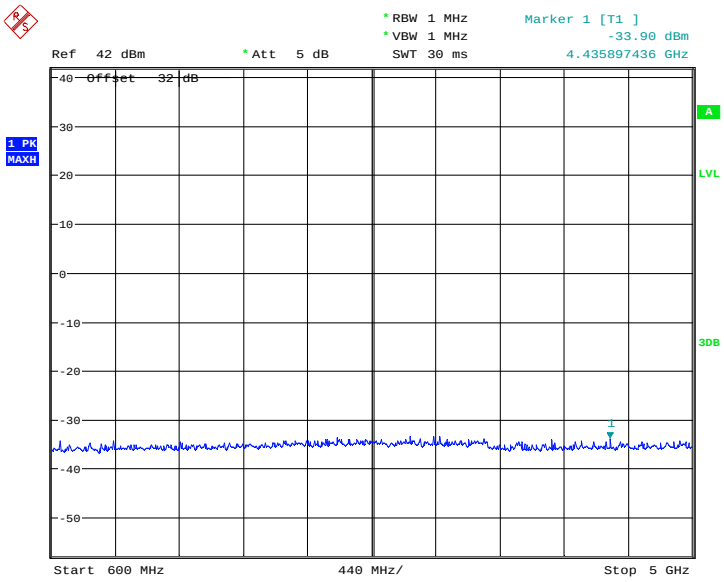
600 MHz to 5 GHz



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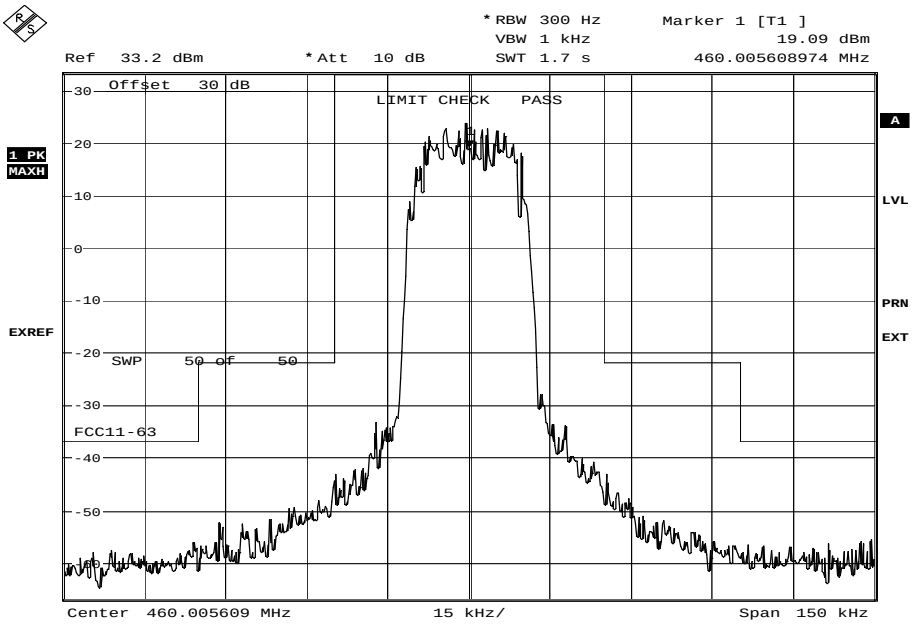
460.000 MHz



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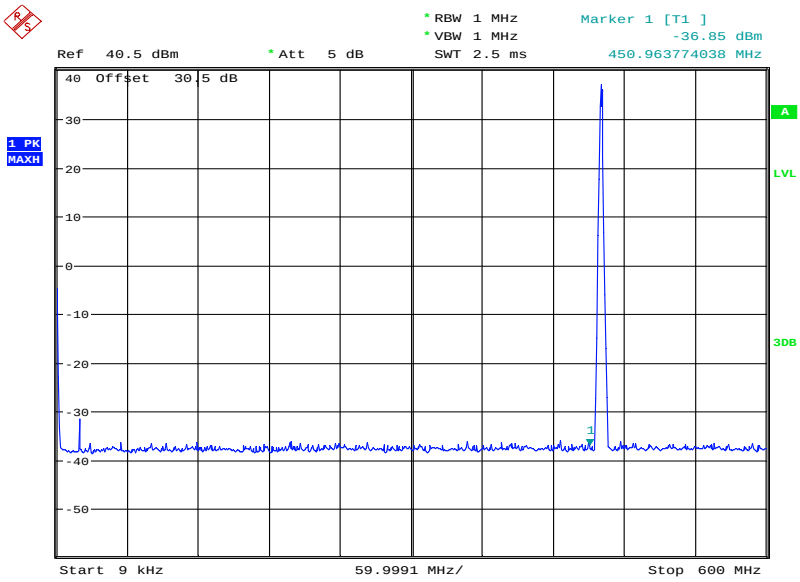
Product Service

9 kHz to 600 MHz



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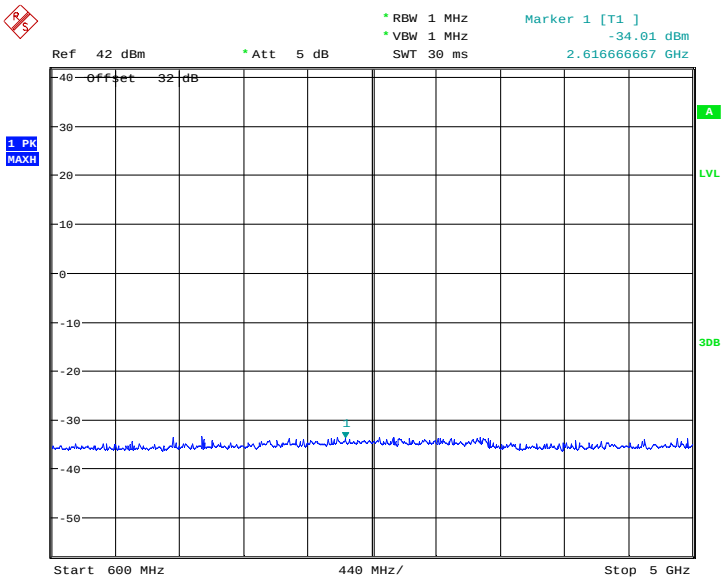
600 MHz to 5 GHz



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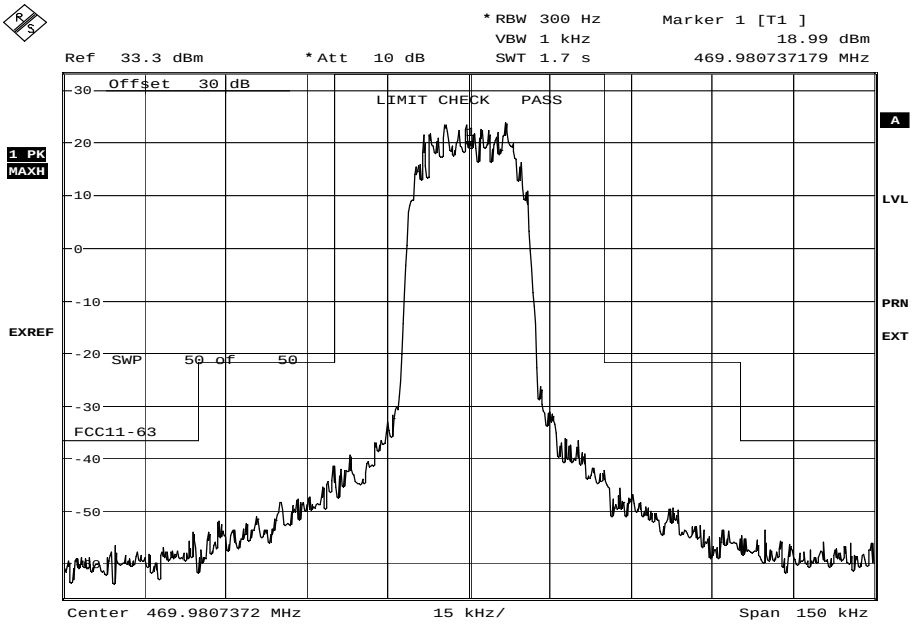
469.975 MHz



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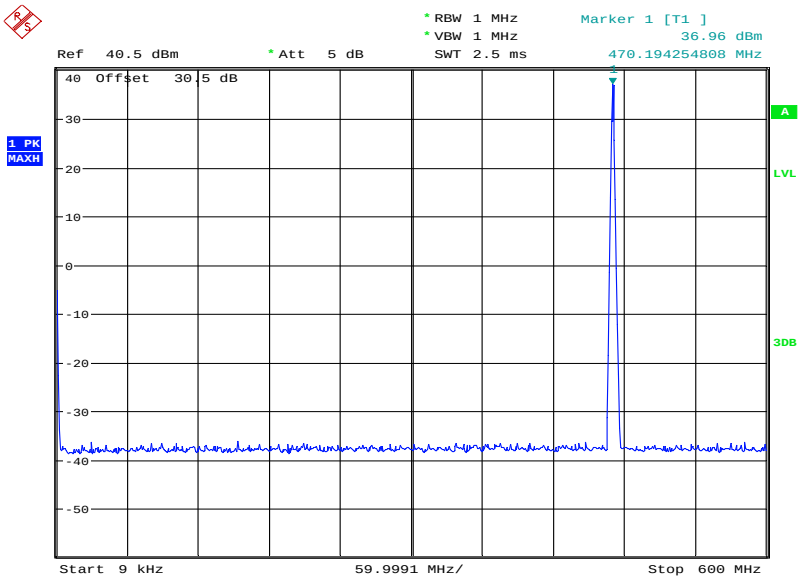
9 kHz to 600 MHz



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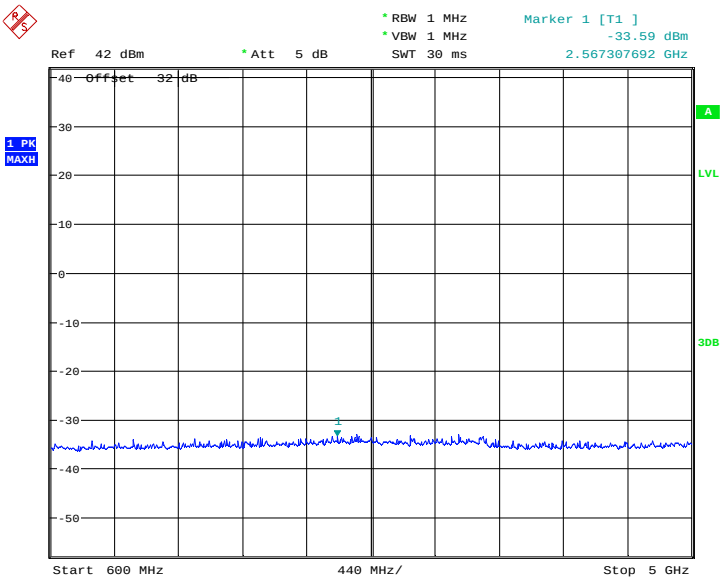
600 MHz to 5 GHz



Limit

Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 10 kHz, but no more than 250 percent of the authorized bandwidth: At least 116 log (fd/6.1) dB, or 50 + 10 log (P) dB, or 70 dB, whichever is the lesser attenuation;

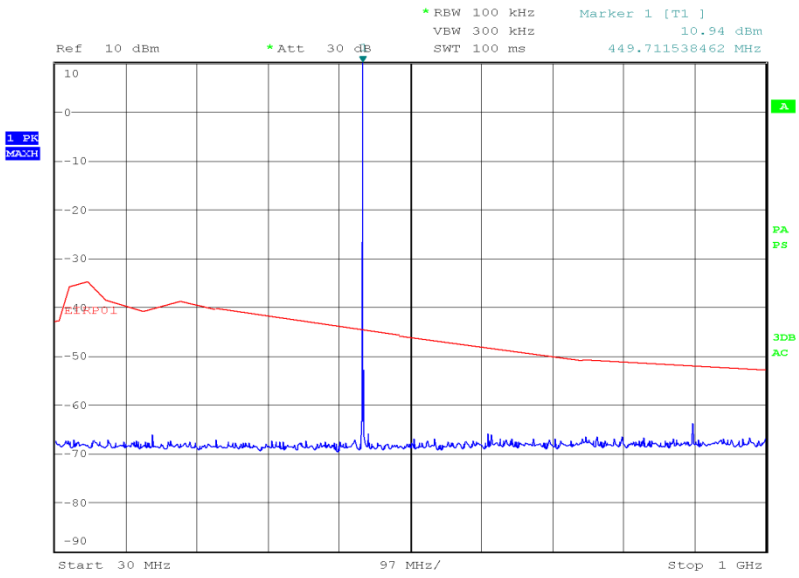
(2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.

Product Service

Radiated

450.025 MHz

30MHz to 1GHz



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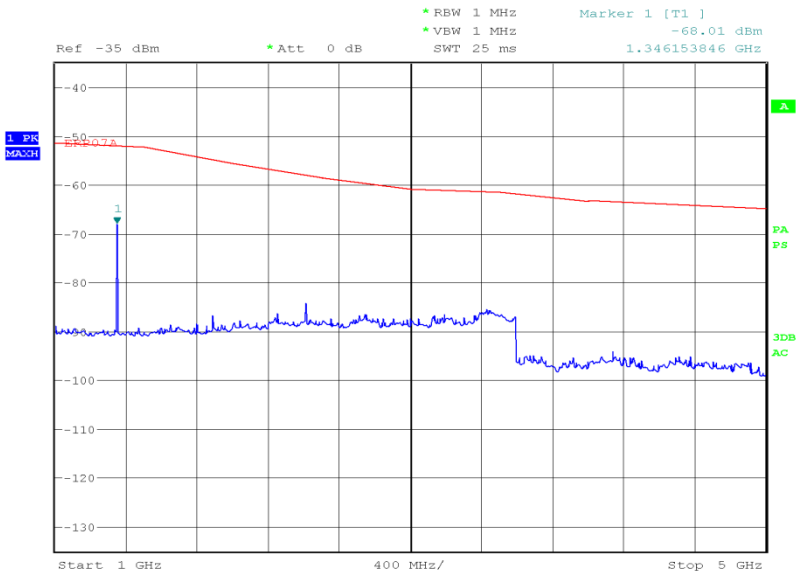
1GHz to 5GHz



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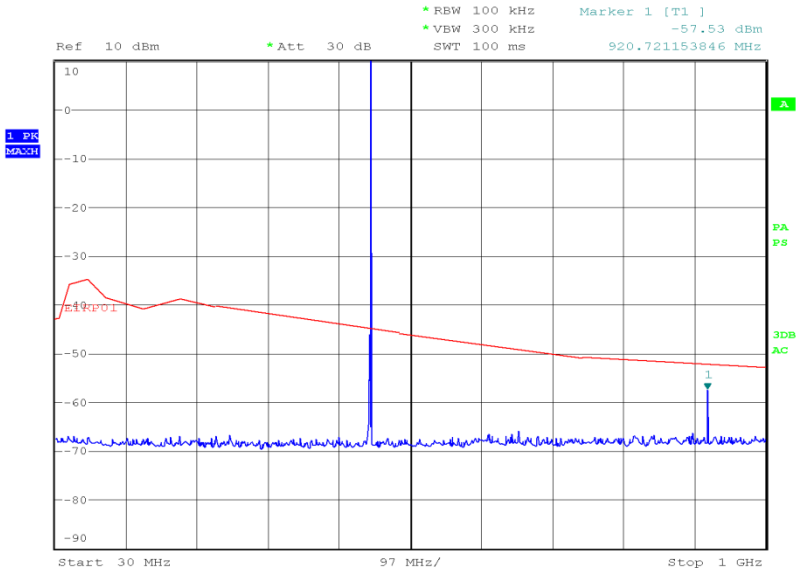
460.000 MHz

30MHz to 1GHz



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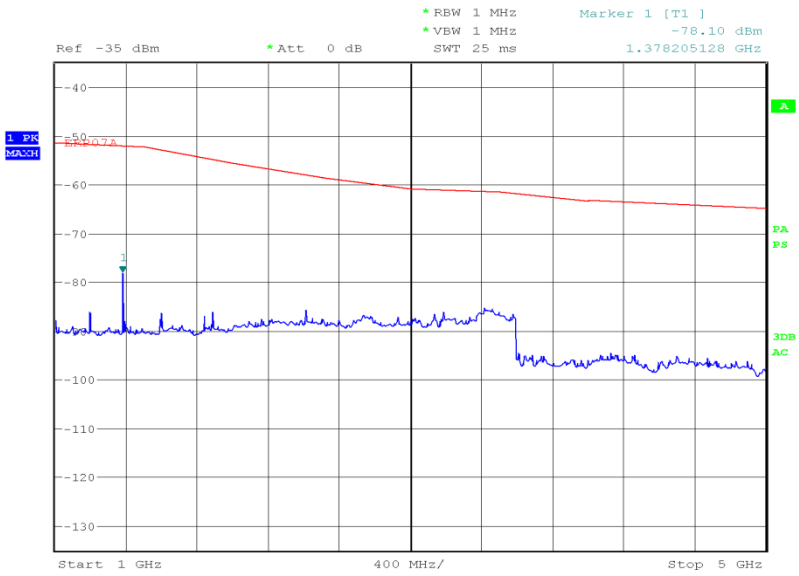
1GHz to 5GHz



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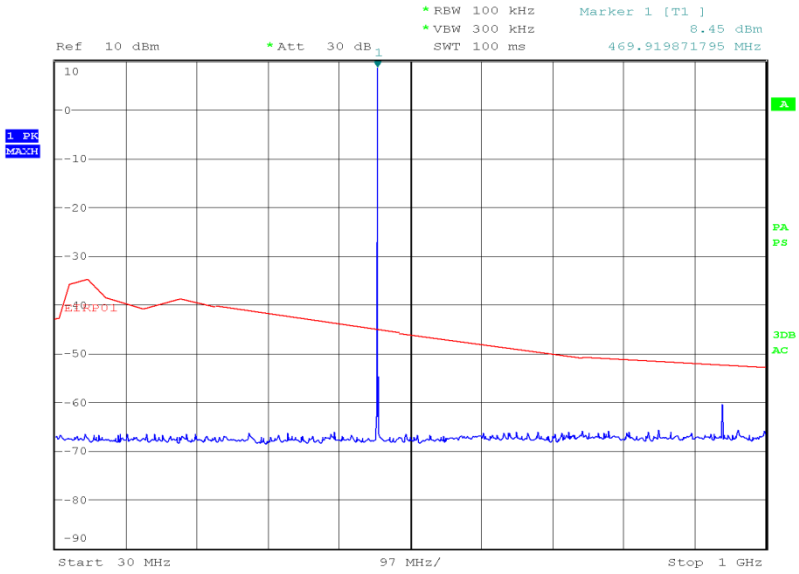
469.975 MHz

30MHz to 1GHz



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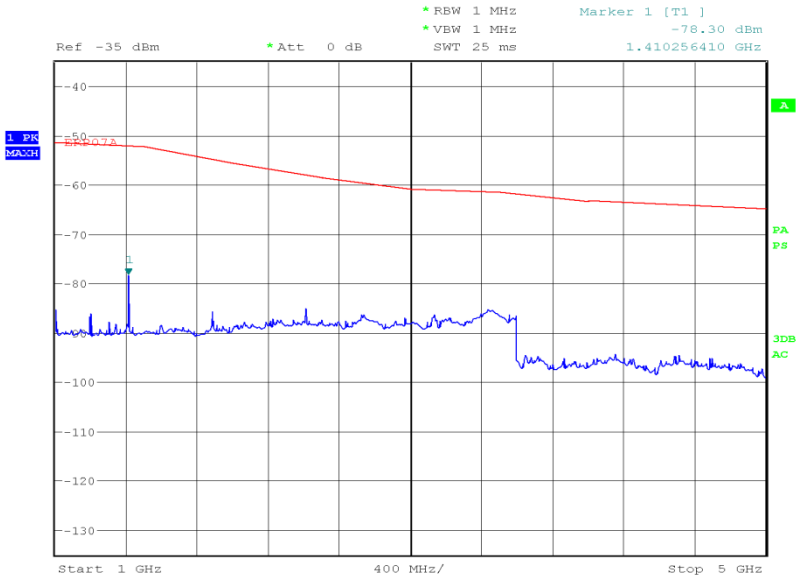
1GHz to 5GHz



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Product Service

Limit

Emission Mask G. For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

(2) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.
For 90.210 Emission Mask B & C Plots, please note there are 2 plots for each of B, M & T.

The emission mask has now been replaced with an ACP Emission Mask in accordance with Waiver FCC 11-63 Clause 90.221 which allows Emission Mask C in 90.210 to be replaced by the waiver for TETRA devices.

2.6 FREQUENCY STABILITY/TRANSMITTER FREQUENCY STABILITY

2.6.1 Specification Reference

FCC CFR 47 Part 2, Clause 2.1055
FCC CFR 47 Part 90, Clause 90.213
Industry Canada RSS-119, Clause 5.3

2.6.2 Equipment Under Test and Modification State

TMO-100/DAN S/N: 219 - Modification State 1

2.6.3 Date of Test

16 March 2012

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

The EUT was set to transmit on maximum power. In accordance with 2.1055, the temperature was varied from -30°C to +50° in 10° steps. Testing was performed on the bottom, middle and top channels.

2.6.6 Environmental Conditions

Ambient Temperature	.0 - 24.6°C
Relative Humidity	.0 - 31.4%

Product Service

2.6.7 Test Results

18.0 V DC Supply

Other

Temperature Interval	Supply Voltage	Frequency Error (ppm)		
		450.025 MHz	460.000 MHz	469.975 MHz
-30°C	10.2 V DC	-0.107	-0.158	-0.158
	27.6 V DC	-0.149	-0.156	-0.156
-20°C	10.2 V DC	-0.098	-0.108	-0.115
	27.6 V DC	-0.098	-0.102	-0.130
-10°C	10.2 V DC	-0.119	-0.168	-0.177
	27.6 V DC	-0.136	-0.154	-0.182
0°C	10.2 V DC	-0.160	-0.181	-0.187
	27.6 V DC	-0.167	-0.168	-0.195
+10°C	10.2 V DC	-0.141	-0.109	-0.108
	27.6 V DC	-0.135	-0.113	-0.108
+20°C	10.2 V DC	-0.140	-0.130	-0.130
	27.6 V DC	-0.136	-0.133	-0.127
-30°C	10.2 V DC	-0.147	-0.137	-0.134
	27.6 V DC	-0.144	-0.140	-0.131
+40°C	10.2 V DC	-0.021	-0.057	-0.087
	27.6 V DC	-0.023	-0.054	-0.100
+50°C	10.2 V DC	-0.005	+0.032	+0.038
	27.6 V DC	+0.007	+0.027	+0.034
Maximum Frequency Error (Hz)		-75.058	-83.060	-91.424

Limit

The frequency error shall not exceed 5ppm

Product Service

2.7 PROVISIONS RELATING TO THE USE OF SCRAMBLING DEVICES AND DIGITAL VOICE MODULATION

2.7.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.212

2.7.2 Equipment Under Test

TMO-100/DAN

2.7.3 Test Results

Customer Supplied Information

The relevant Part 90 rule is below. I would argue that for a trunked system the highlighted exception applies as the mobiles have their transmission controlled by the base and therefore the base has to send out the station ID. (This happens automatically for TETRA but in TETRA protocol which will probably be ok for 800MHz but not yet for 450Mhz bands. Here, currently we expect that the base will interrupt transmissions either by using the control channel or by borrowing a traffic channel for the Morse code ID.

Product Service

2.8 TRANSIENT FREQUENCY BEHAVIOUR

2.8.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.214
Industry Canada RSS-119, Clause 5.9

2.8.2 Equipment Under Test and Modification State

TMO-100/DAN S/N: 219 - Modification State 1

2.8.3 Date of Test

9 March 2012

2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.5 Test Procedure

The EUT was operating at maximum power, at the bottom, middle and top channels.

Using a spectrum analyser and attenuator(s) times T_1, T_2 and T_3 were measured.

The plots on the following pages show the signal from the EUT compared to the limits of T_1, T_2 and T_3.

2.8.6 Environmental Conditions

Ambient Temperature	25.6°C
Relative Humidity	26.7%

Product Service

2.8.7 Test Results

18.0 V DC

Transient Period	Frequency Difference (kHz)		
	450.025 MHz	460.000 MHz	469.975 MHz
T_1	+ 19 kHz	< 200 Hz	< 2.5 kHz
T_2	+ 19.5 kHz	< 200 Hz	< 2.5 kHz
T_3	+ 19.5 kHz	< 200 Hz	< 2.5 kHz

Limit

Time Interval	Maximum Frequency Difference	421 to 512MHz, 25kHz Channels
T_1	± 25.0KHz	10.0ms
T_2	± 12.5kHz	25.0ms
T_3	± 25.0kHz	10.0ms

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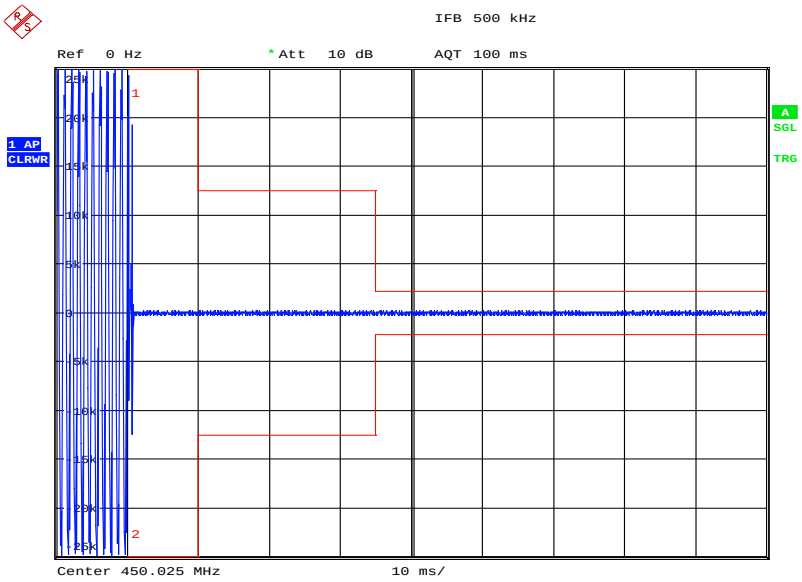
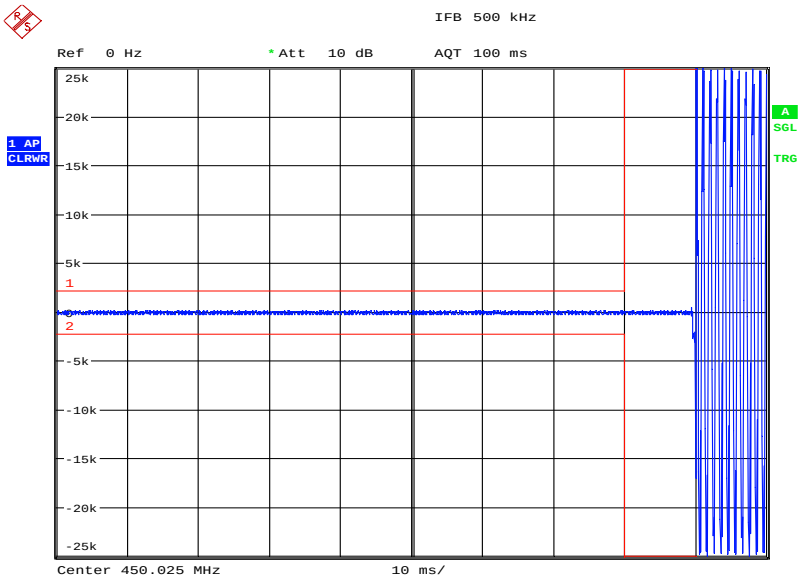
450.025 MHz

T_1 and T_2



Date: 9.MAR.2012 09:33:24

T_3



Date: 9.MAR.2012 09:34:01

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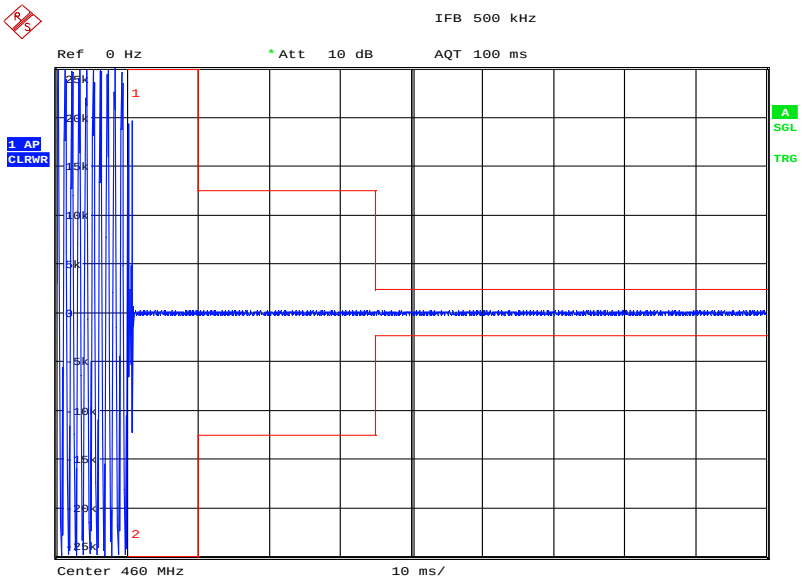
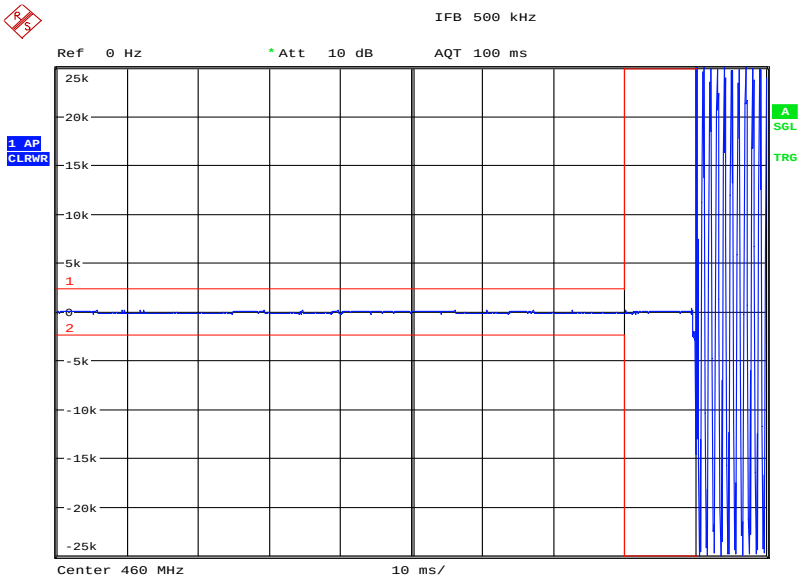
460.000 MHz

T_1 and T_2



Date: 9.MAR.2012 09:36:11

T_3

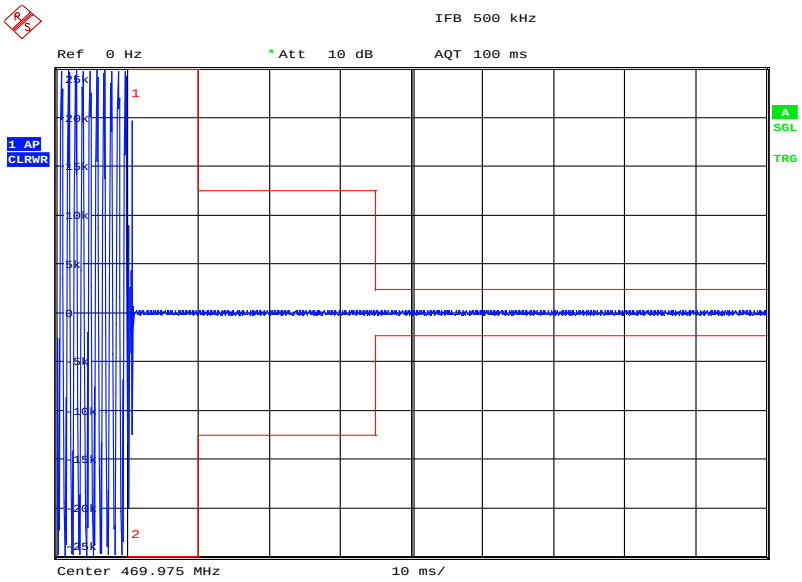


Date: 9.MAR.2012 09:36:42

Product Service

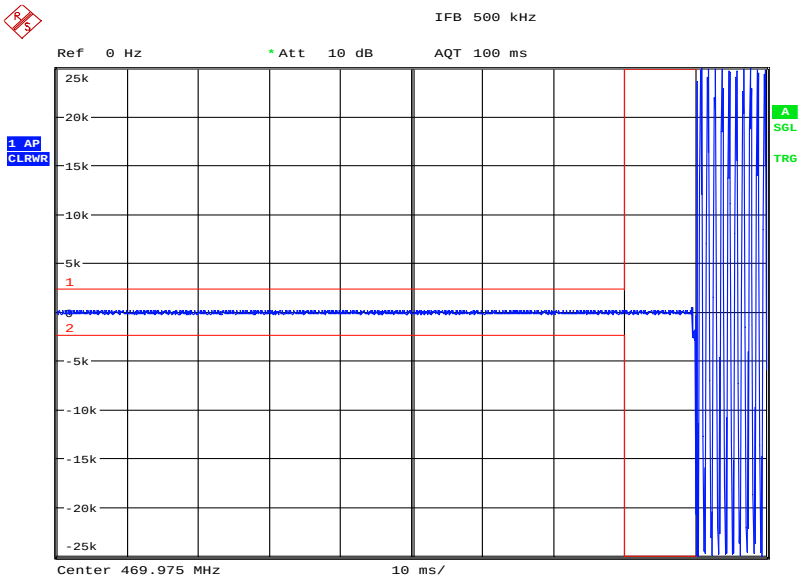
469.975 MHz

T_1 and T_2



Date: 9.MAR.2012 10:57:43

T_3



Date: 9.MAR.2012 10:58:19

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1- Effective Radiated Power					
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Antenna (Log Periodic)	Schaffner	UPA6108	3108	12	30-Mar-2012
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Section 2.2 - Type of Emissions/Types of Modulation					
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Mar-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Hygrometer	Rotronic	I-1000	2891	12	3-May-2012
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	10-Jun-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	09-May-2012
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012
Section 2.3 - Bandwidth Limitations					
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Mar-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
Hygrometer	Rotronic	I-1000	2891	12	3-May-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	12-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012
Section 2.4 - Power and Antenna Height Limits/Transmitter Output Power					
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Mar-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
Hygrometer	Rotronic	I-1000	2891	12	3-May-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	12-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Emission Mask/Transmitter Unwanted Emissions					
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
DC Power Supply Unit	Hewlett Packard	6267B	294	-	O/P Mon
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	19-Jan-2013
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	18-Nov-2012
Filter (Hi Pass)	Mini-Circuits	NHP-600	2834	-	TU
Hygrometer	Rotronic	I-1000	2891	12	3-May-2012 *
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013*
Antenna (Log Periodic)	Schaffner	UPA6108	3108	12	30-Mar-2012 *
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	27-Apr-2012 *
Attenuator (30dB, 150W)	Narda	769-30	3369	12	24-May-2012 *
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	09-May-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012 *
Section 2.6 - Frequency Stability/Transmitter Frequency Stability					
Counter	Hewlett Packard	53181A	159	12	26-May-2012
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	19-Jan-2013
Digital Temperature Indicator	Fluke	51	1385	12	6-Jan-2013
Power Supply	Hewlett Packard	6104A	1948	-	TU
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Hygrometer	Rotronic	I-1000	2891	12	3-May-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	12-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012

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Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.8 – Transient Frequency Behaviour					
Signal Generator	Rohde & Schwarz	SMG	42	12	6-Sep-2012
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
Power Divider	Weinschel	1506A	604	12	17-Mar-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	12	13-Mar-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Hygrometer	Rotronic	I-1000	2891	12	3-May-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	09-May-2012
'N' - 'N' RF Cable (2m)	Rhophase	NPS-1803-2000-NPS	3698	12	12-Jan-2013
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	12-Jan-2013
DC - 8 GHz Attenuator	Lucas Weinschel	24-30-33	3963	12	24-Jun-2012

* Equipment in calibration at time of testing.

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	MU
Effective Radiated Power	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Power and Antenna Height Limits/Transmitter Output Power	± 0.70 dB
Transient Frequency Behaviour	± 0.2 Hz
Frequency Stability/Transmitter Frequency Stability	± 42.47 Hz
Emission Mask/Transmitter Unwanted Emissions	Radiated: ± 3.08 dB Conducted: ± 3.454 dB
Type of Emissions/Types of Modulation	N/A
Bandwidth Limitations	± 16.74 kHz
Provisions Relating to the use of Scrambling Devices and Digital Voice Modulation	± 0.2 Hz

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).