Report on the FCC and IC Testing of:

DETNET SOUTH AFRICA (PTY) LTD
Blasting control of electronic detonators, Model: CE4 Commander
Handheld electronic detonator tester, Model: CE4 Tagger

In accordance with FCC 47 CFR Part 15B and ICES-003

Prepared for: DETNET SOUTH AFRICA (PTY) LTD
Block 1B, Founders Hill Office Park
Centenary Road, Modderfontein P O Box 10
1645, SOUTH AFRICA

FCC ID:	CE4 Commander:	2ARNH-15351660 and 2ARNH-1535166A
	CE4 Tagger:	2ARNH-13631680 and 2ARNH-16541610
IC:	CE4 Commander:	24476-15351660 and 24476-1535166A
	CE4 Tagger:	24476-13631680 and 24476-16541610

Product Service

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Document Number: 75943624-01 | Issue: 02

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Kim Archer	Sales Manager	Authorised Signatory	04 February 2019

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

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 47 CFR Part 15B and ICES-003. The sample tested was found to comply with the requirements defined in the applied rules.

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Graeme Lawler	Test Engineer	Testing	04 February 2019

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

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

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B: 2017 and ICES-003: 2016.

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ACCREDITATION

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).

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Product Service

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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	21 November 2018
2	To amend the FCC and IC ID's	04 February 2019

Table 1

1.2 Introduction

Applicant	DETNET SOUTH AFRICA (PTY) LTD
Manufacturer	DETNET SOUTH AFRICA (PTY) LTD
Model Number(s)	CE4 Commander CE4 Tagger
Serial Number(s)	CE4 Commander (pair 1): 1530000CF and 1530000B8 CE4 Commander (pair 2): 15300000F and 153000004 CE4 Tagger: 13600026A CE4 Tagger: Not Serialised (75943624- TSR0005)
Hardware Version(s)	CE4 Commanders (pair 1): V5 CE4 Commanders (pair 2): V5A CE4 Tagger: V3 CE4 Tagger: V4
Software Version(s)	CE4 Commander 1 (pair 1): 36230C CE4 Commander 2: (pair 2) 36230C CE4 Tagger: 36230B CE4 Tagger: 36230B
Number of Samples Tested	2 pairs of Commanders and 2 Taggers
Test Specification/Issue/Date	FCC 47 CFR Part 15B: 2017 ICES-003: 2016
Order Number Date	4500348610 23-August-2018
Date of Receipt of EUT	07-September-2018
Start of Test	18-September-2018
Finish of Test	28-October-2018
Name of Engineer(s)	Graeme Lawler
Related Document(s)	ANSI C63.4: 2014

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 15B	ICES-003			
Configuration and Mode: Idle					
2.1	15.109	6.2	Radiated Disturbance	Pass	ANSI C63.4: 2014

Table 2

Product Service

1.4 Declaration of Build Status

CE4 Commander

MAIN EUT			
MANUFACTURING DESCRIPTION	Blasting control of electronic detonators		
MANUFACTURER	DetNet South Africa		
MODEL NAME/NUMBER	CE4 Commander		
PART NUMBER			
SERIAL NUMBER			
HARDWARE VERSION	V5		
SOFTWARE VERSION	36230C		
PSU VOLTAGE/FREQUENCY/CURRENT			
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	3177.2 MHz		
FCC ID (if applicable)	2ARNH-15351660		
INDUSTRY CANADA ID (if applicable)	24476-15351660		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Free standing blast controller for testing and blasting of electronic detonators.		
COUNTRY OF ORIGIN	South Africa		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	902 – 928		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	902 – 928		
INTERMEDIATE FREQUENCIES	3 177.2 MHz		
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)			
MODULATION TYPES: (i.e. GMSK, QPSK)	ASK, CCK, BPSK, QPSK, 16QAM, 64QAM		
OUTPUT POWER (W or dBm)	30dBm		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
PSU VOLTAGE/FREQUENCY/CURRENT			
COUNTRY OF ORIGIN			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	Long range RF	WiFi Module	NFC
MANUFACTURER	900 MHz Laird Transceiver (was aerocomm)	Gain Span	ST
TYPE	AC4490LR-100	GS1011MEP	ST95HF
POWER	30dBm	18dBm	6dBm
FCC ID	KQLAC4490	YOPGS1011MEP	YCPEVALST95HF
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

I hereby declare that the information supplied is correct and complete.

Name: H van der Walt Position held: Quality and Compliance Manager
Date: 2018-09-12

Product Service

MAIN EUT			
MANUFACTURING DESCRIPTION	Blasting control of electronic detonators		
MANUFACTURER	DetNet South Africa		
MODEL NAME/NUMBER	CE4 Commander		
PART NUMBER			
SERIAL NUMBER			
HARDWARE VERSION	V5A		
SOFTWARE VERSION	36230C		
PSU VOLTAGE/FREQUENCY/CURRENT			
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	3177.2 MHz		
FCC ID (if applicable)	2ARNH-1535166A		
INDUSTRY CANADA ID (if applicable)	24476-1535166A		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Free standing blast controller for testing and blasting of electronic detonators.		
COUNTRY OF ORIGIN	South Africa		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	907.125MHz – 913.325MHz		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	902 – 928		
INTERMEDIATE FREQUENCIES	62.5KHz / 3 177.2MHz		
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	65K0FID		
MODULATION TYPES: (i.e. GMSK, QPSK)	ASK, CCK, BPSK, QPSK, 16QAM, 64QAM		
OUTPUT POWER (W or dBm)	27dBm		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
PSU VOLTAGE/FREQUENCY/CURRENT			
COUNTRY OF ORIGIN			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	Long range RF	WiFi Module	NFC
MANUFACTURER	Texas Instruments	Gain Span	ST
TYPE	CC1120	GS1011MEP	ST95HF
POWER	27dBm	18dBm	6dBm
FCC ID		YOPGS1011MEP	YCPEVALST95HF
INDUSTRY CANADA ID			
EMISSION DESIGNATOR	65K0FID		
DHSS/FHSS/COMBINED OR OTHER	Other (No SS)		
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION	RF power amplifier		
MANUFACTURER	Texas Instruments		
TYPE	CC1190		
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

I hereby declare that the information supplied is correct and complete.

Name: H van der Walt Position held: Quality and Compliance Manager
Date: 2018-09-12

CE4 Tagger

MAIN EUT			
MANUFACTURING DESCRIPTION	Handheld electronic detonator tester		
MANUFACTURER	DetNet South Africa		
MODEL NAME/NUMBER	CE4 Tagger		
PART NUMBER			
SERIAL NUMBER			
HARDWARE VERSION	V3		
SOFTWARE VERSION	36230B		
PSU VOLTAGE/FREQUENCY/CURRENT			
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	3177.2 MHz		
FCC ID (if applicable)	2ARNH-13631680		
INDUSTRY CANADA ID (if applicable)	24476-13631680		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Hand held electronic tester for use us with electronic detonators in the mining and blasting industry.		
COUNTRY OF ORIGIN	South Africa		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	2450		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	2400-2483		
INTERMEDIATE FREQUENCIES	3 177.2 MHz		
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	22M0DXD		
MODULATION TYPES: (i.e. GMSK, QPSK)	BPSK, QPSK, 16QAM, 64QAM		
OUTPUT POWER (W or dBm)	18dBm		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
PSU VOLTAGE/FREQUENCY/CURRENT			
COUNTRY OF ORIGIN			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	WiFi 2.45 GHz Module		
MANUFACTURER	Gainspan		
TYPE	GS1011MEP		
POWER	18dBm		
FCC ID	YOPGS1011MEP		
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

I hereby declare that the information supplied is correct and complete.

Name: H van der Walt Position held: Quality and Compliance Manager
Date: 2018-09-12

Product Service

MAIN EUT			
MANUFACTURING DESCRIPTION	Handheld electronic detonator tester		
MANUFACTURER	DetNet South Africa		
MODEL NAME/NUMBER	CE4 Tagger		
PART NUMBER			
SERIAL NUMBER			
HARDWARE VERSION	V4		
SOFTWARE VERSION	36230B		
PSU VOLTAGE/FREQUENCY/CURRENT			
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	3177.2 MHz		
FCC ID (if applicable)	2ARNH-16541610		
INDUSTRY CANADA ID (if applicable)	24476-16541610		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Hand held electronic tester for use us with electronic detonators in the mining and blasting industry		
COUNTRY OF ORIGIN	South Africa		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	2450		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	2400-2483		
INTERMEDIATE FREQUENCIES			
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	22M0DXD		
MODULATION TYPES: (i.e. GMSK, QPSK)	BPSK, QPSK, 16QAM, 64QAM		
OUTPUT POWER (W or dBm)	18dBm		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
PSU VOLTAGE/FREQUENCY/CURRENT			
COUNTRY OF ORIGIN			
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	WiFi 2.45 GHz Module	NFC	
MANUFACTURER	Gainspan	NXP	
TYPE	GS1011MEP	PN7150	
POWER	18dBm	28dBm	
FCC ID	YOPGS1011MEP	OWROM5575-PN7150S	
INDUSTRY CANADA ID			
EMISSION DESIGNATOR			
DHSS/FHSS/COMBINED OR OTHER			
COUNTRY OF ORIGIN			
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION			
MANUFACTURER			
TYPE			
PART NUMBER			
SERIAL NUMBER			
COUNTRY OF ORIGIN			

I hereby declare that the information supplied is correct and complete.

Name: H van der Walt Position held: Quality and Compliance Manager
Date: 2018-09-12

1.5 Product Information

1.5.1 Technical Description

CE4 Commander - Free standing blast controller for testing and blasting of electronic detonators.
CE4 Tagger - Hand held electronic tester for use us with electronic detonators in the mining and blasting industry.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

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

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
CE4 Commander (Pair 1), Serial Number: 1530000CF and 1530000B8			
0	As supplied by the customer	Not Applicable	Not Applicable
CE4 Commander (Pair 2), Serial Number: 15300000F and 153000004			
0	As supplied by the customer	Not Applicable	Not Applicable
CE4 Tagger 1, Serial Number: 13600026A			
0	As supplied by the customer	Not Applicable	Not Applicable
CE4 Tagger 2, Serial Number: Not Serialised (75943624- TSR0005)			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: Idle		
Radiated Disturbance	Graeme Lawler	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Radiated Disturbance

2.1.1 Specification Reference

FCC 47 CFR Part 15B, Clause 15.109
ICES-003, Clause 6.2

2.1.2 Equipment Under Test and Modification State

CE4 Commander (pair 1), S/N: 1530000CF and 1530000B8 - Modification State 0
CE4 Commander (pair 2), S/N: 15300000F and 153000004 - Modification State 0
CE4 Tagger, S/N: 13600026A - Modification State 0
CE4 Tagger, S/N: Not Serialised (75943624- TSR0005) - Modification State 0

2.1.3 Date of Test

18-September-2018 to 28-October-2018

2.1.4 Test Method

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive table 0.8m above a reference ground plane.

A pre-scan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarisation using a peak detector; measurements were taken at a 3m distance. Using the pre-scan list of the highest emissions detected, their bearing and associated antenna polarisation, the EUT was then formally measured using a Quasi-Peak, Peak, Average detector as appropriate. The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification.

2.1.5 Environmental Conditions

Ambient Temperature	18.1 - 22.0 °C
Relative Humidity	35.8 - 50.0 %

2.1.6 Test Results

Results for Configuration and Mode: Idle.

Tested in accordance with the Class A limits.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Highest frequency generated or used within the EUT: 3177.2 MHz
Which necessitates an upper frequency test limit of: 18 GHz

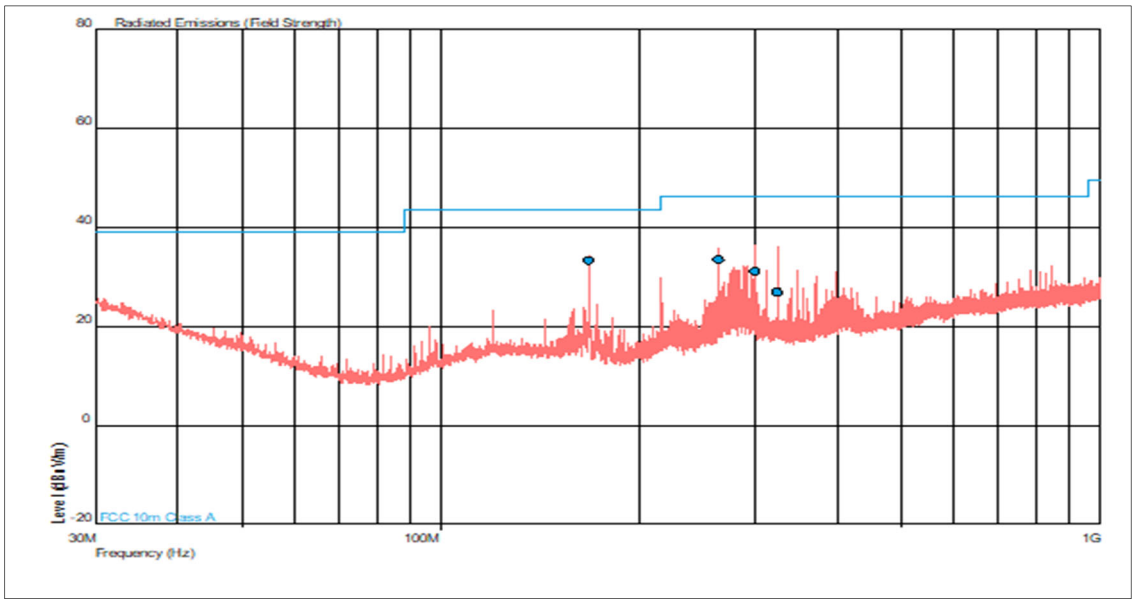

Figure 1 - Graphical Results - 30 MHz to 1 GHz
Horizontal and Vertical Polarity - EUT Orientation: X

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
168.012	33.3	43.5	-10.2	201	1.00	Vertical
263.994	33.4	46.4	-13.0	248	1.00	Horizontal
300.014	31.1	46.4	-15.3	93	1.00	Horizontal
324.021	26.9	46.4	-19.5	84	1.00	Horizontal

Table 5 - Emission Results, 30 MHz to 1 GHz - EUT Orientation: X

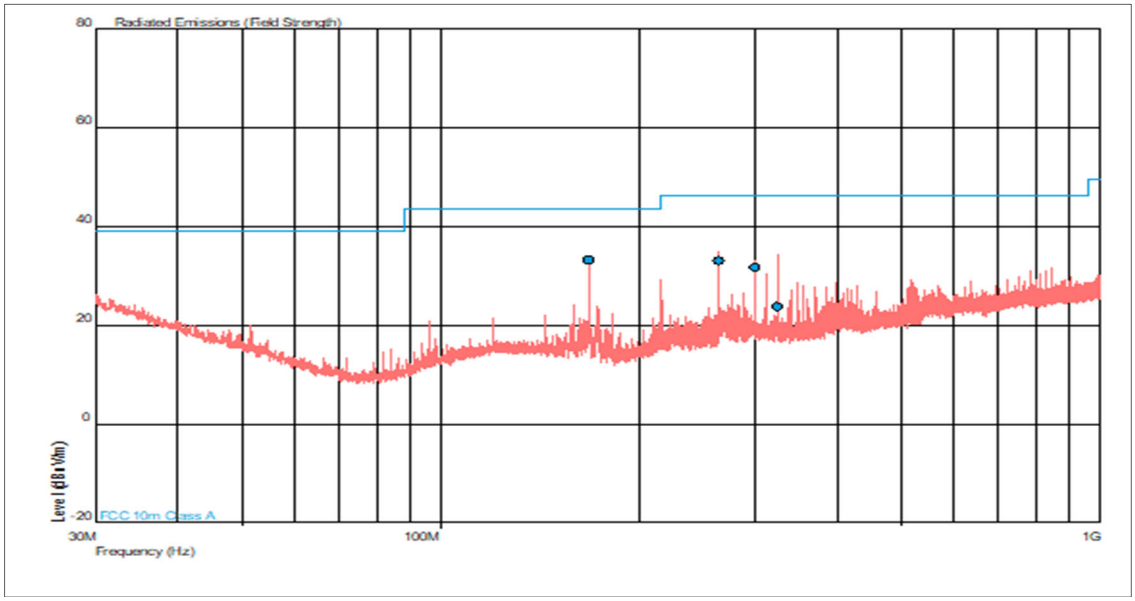

Figure 2 - Graphical Results - 30 MHz to 1 GHz
Horizontal and Vertical Polarity - EUT Orientation: Y

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
167.993	33.2	43.5	-10.3	241	1.00	Vertical
264.023	33.0	46.4	-13.4	94	1.00	Horizontal
300.028	31.6	46.4	-14.8	263	1.00	Horizontal
324.010	23.8	46.4	-22.6	236	1.00	Horizontal

Table 6 - Emission Results, 30 MHz to 1 GHz - EUT Orientation: Y

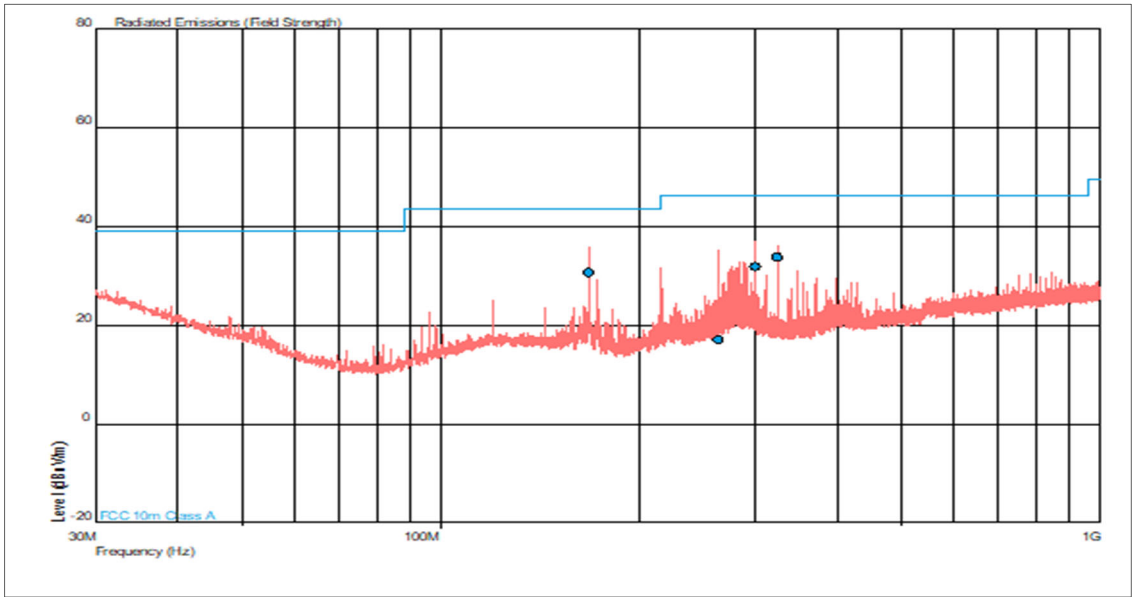

Figure 3 - Graphical Results - 30 MHz to 1 GHz
Horizontal and Vertical Polarity - EUT Orientation: Z

Frequency (MHz)	QP Level (dBuV/m)	QP Limit (dBuV/m)	QP Margin (dBuV/m)	Angle(Deg)	Height(m)	Polarity
167.996	30.7	43.5	-12.8	256	1.00	Vertical
264.036	17.1	46.4	-29.3	254	1.00	Horizontal
300.009	31.8	46.4	-14.6	272	1.00	Horizontal
324.016	33.8	46.4	-12.6	273	1.00	Horizontal

Table 7 - Emission Results, 30 MHz to 1 GHz - EUT Orientation: Z

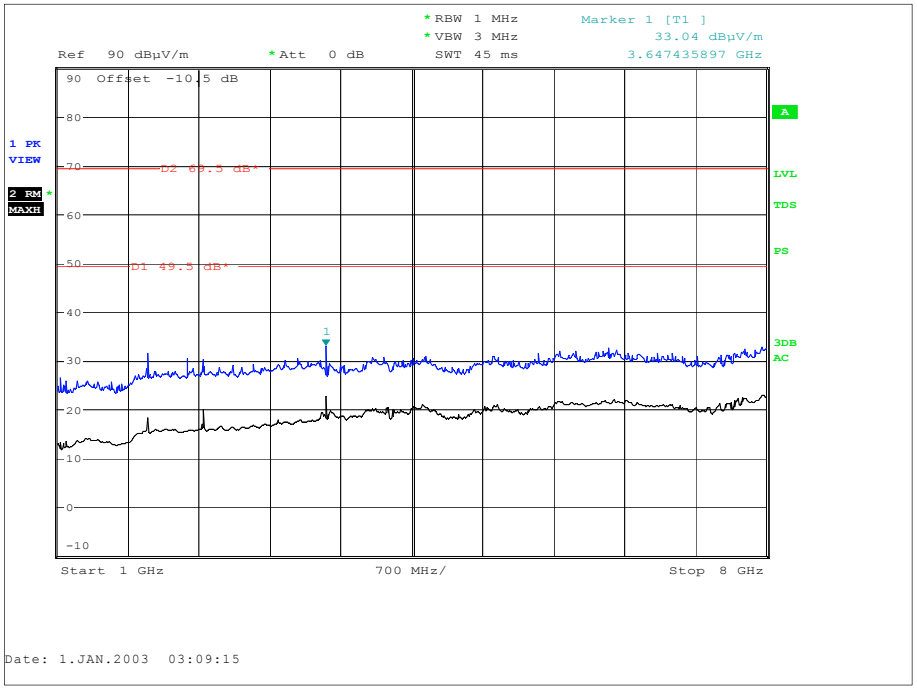

Figure 4 - Graphical Results - 1 GHz to 8 GHz
Combined Polarity - EUT Orientation: X

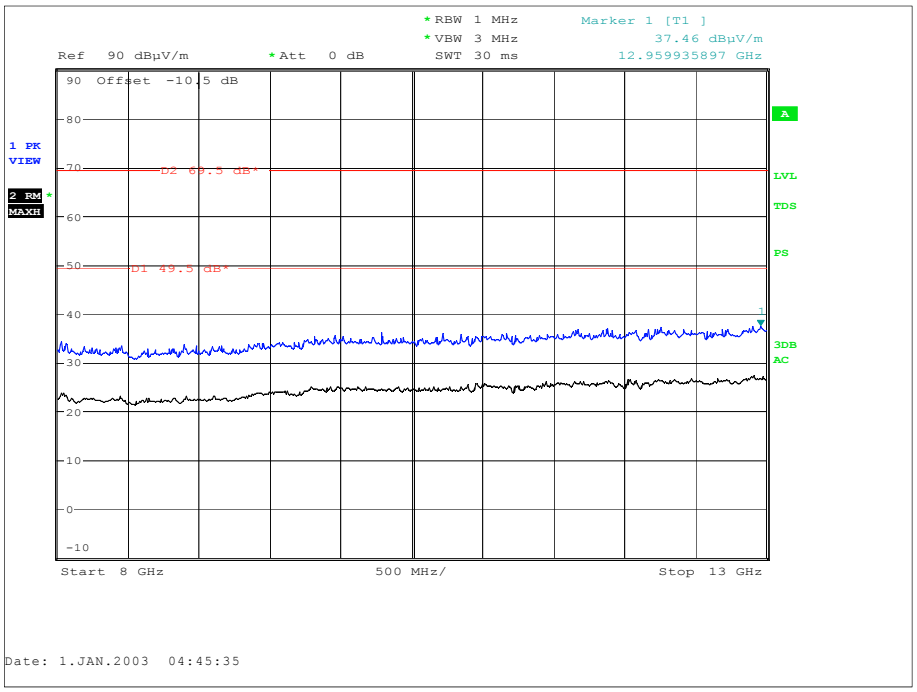

Figure 5 - Graphical Results - 8 GHz to 13 GHz
Combined Polarity - EUT Orientation: X

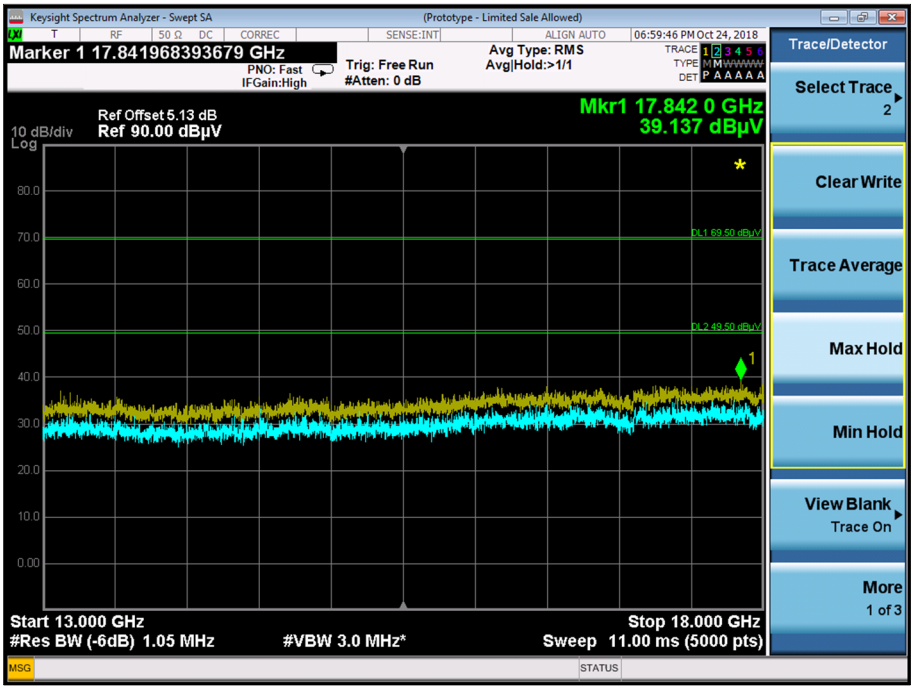

Figure 6 - Graphical Results - 13 GHz to 18 GHz
Combined Polarity - EUT Orientation: X

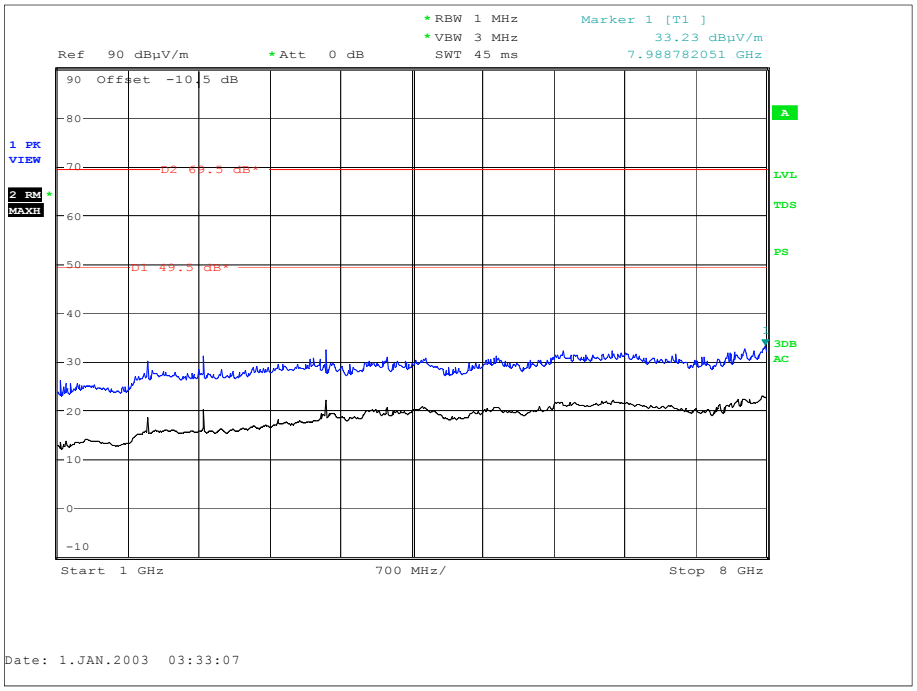

Figure 7 - Graphical Results - 1 GHz to 8 GHz
Combined Polarity - EUT Orientation: Y

Product Service

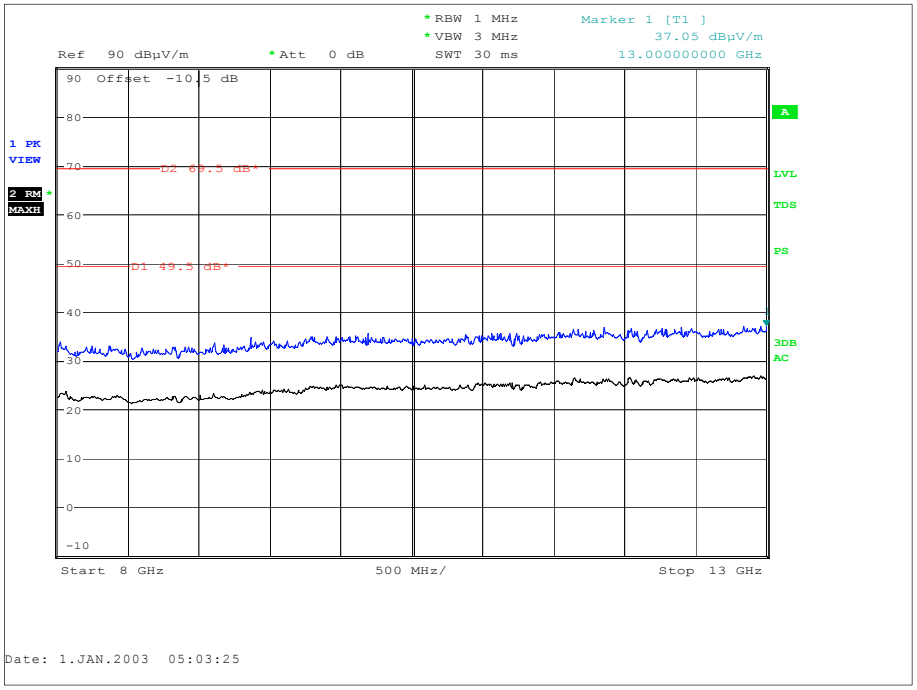

Figure 8 - Graphical Results - 8 GHz to 13 GHz
Combined Polarity - EUT Orientation: Y

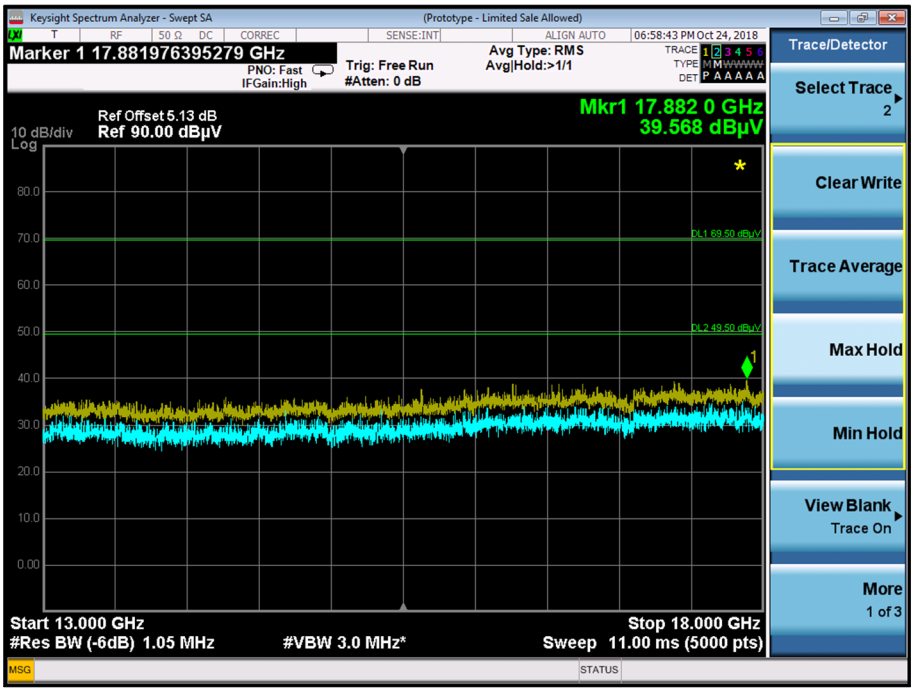

Figure 9 - Graphical Results - 13 GHz to 18 GHz
Combined Polarity - EUT Orientation: Y

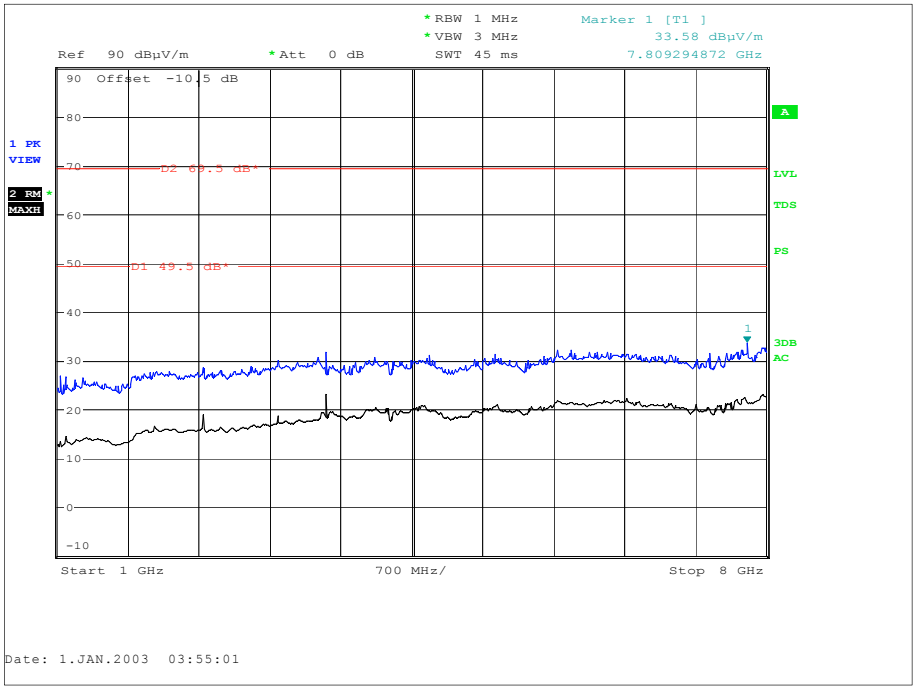

Figure 10 - Graphical Results - 1 GHz to 8 GHz
Combined Polarity - EUT Orientation: Z

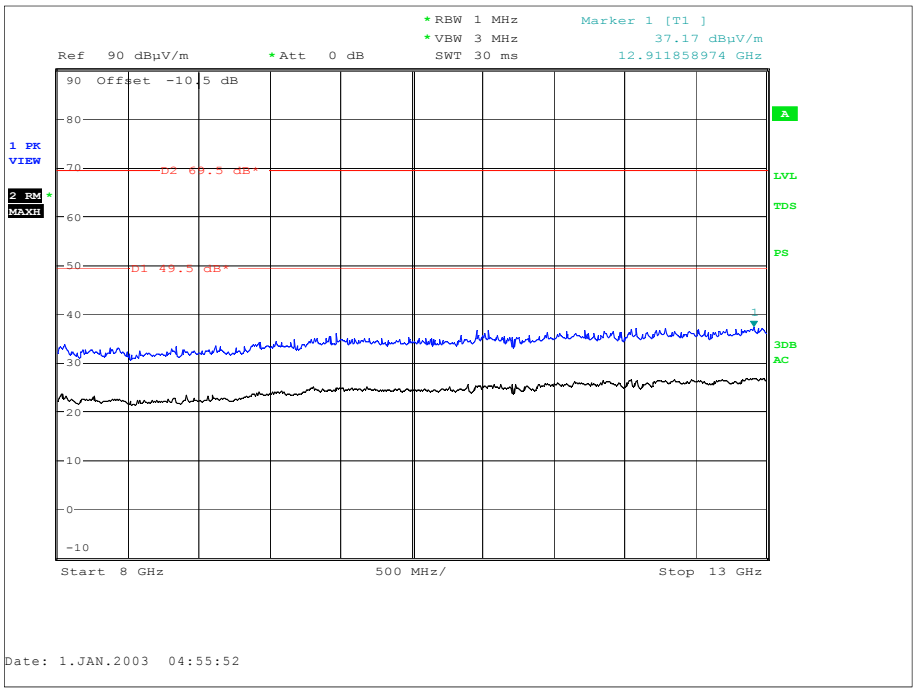

Figure 11 - Graphical Results - 8 GHz to 13 GHz
Combined Polarity - EUT Orientation: Z

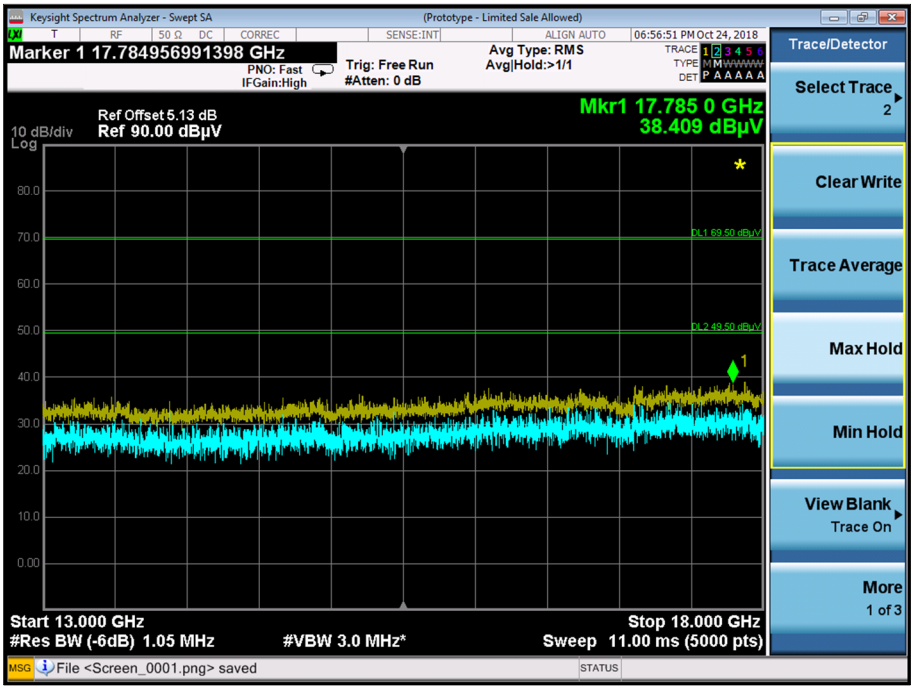

Figure 12 - Graphical Results - 13 GHz to 18 GHz
Combined Polarity - EUT Orientation: Z

No emissions were detected within 10 dB of the limit.

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Turntable Controller	Heinrich Diesel	HD 050	280	-	TU
Pre-Amplifier	Phase One	PS04-0086	1533	12	12-Jan-2019
Screened Room (7)	Siemens	S M	1547	36	21-Jan-2021
Comb Generator	Schaffner	RSG1000	3034	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	Maturo Gmbh	NCD	3917	-	TU
1GHz to 8GHz Low Noise Amplifier	Wright Technologies	APS04-0085	4365	12	18-Oct-2018
Suspended Substrate Highpass Filter	Advance Power Components	11SH10-3000/X18000-O/O	4412	12	15-Jun-2019
1 metre K-Type Cable	Florida Labs	KMS-180SP-39.4-KMS	4520	12	13-Feb-2019
Double Ridged Waveguide Horn Antenna	ETS-Lindgren	3117	4722	12	01-Mar-2019
N to N cable, 4m	Rhophase	2303-002-TUVS	4849	12	18-Dec-2018
N to N cable, 4m	Rhophase	2303-002-TUVS	4850	12	18-Dec-2018
Cable (26.5GHz	Rosenberger	LU7-133-5000	5019	-	O/P Mon
Cable (40GHz	Rosenberger	LU1-001-2000	5020	-	O/P Mon

Table 8

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Radiated Disturbance	30 MHz to 1 GHz, Bilog Antenna, ±5.2 dB 1 GHz to 40 GHz, Horn Antenna, ±6.3 dB

Table 9