



**COMPLIANCE
ENGINEERING**
EMC - Shielding - Environmental

90 Indian Drive
Keysborough VIC 3173 Australia
Telephone: + 61 3 9763 3079
Email: info@compeng.com.au
Web: www.compeng.com.au
ABN: 56 101 639 588

EMC Compliance Test Report

CFR 47, Chapter 1, Subpart A,
Part 15, Subpart B (class A limits)
Report Number: CE3332Rev1
August 2022

NEO Products PTY LTD
Betline TSST
Model No: 15201-GA002

The results detailed in this test report relate only to the specific sample/s tested. It is the Manufacturer's responsibility to ensure that all production units are manufactured with equivalent EMC characteristics. This report is not to be reproduced except in full, without written approval from Compliance Engineering Pty Ltd.



COMPLIANCE CERTIFICATE

Client Contact: NEO Products PTY LTD
Mike Mitchell
Telephone: 97011511
Email: mike.mitchell@neoproductsgroup.com

Device: Betline TSST
Model No: 15201-GA002
FCC ID No: 2A3TL-15201

Reference Standard: CFR 47 - Telecommunication
Chapter I - Federal Communications Commission
Subchapter A - General
Part 15 - Radio Frequency Devices
Subpart B Unintentional Radiators

Test Method: ANSI C63.4-2014:
American National Standard for Methods of Measurement of Radio-Noise
Emissions from Low-Voltage Electrical and Electronic Equipment in the range
of 9 kHz to 40 GHz.

Summary Result: Radiated RF emission measurements (Class A) **Complied**
Mains Terminal RF emissions (Class B) **Complied**

Test Date: 9th to 15th December 2021

Tests Performed by: Mohamed Elmi
Compliance Engineering Pty Ltd
90 Indian Drive, Keysborough
Victoria, Australia 3173
Telephone: +61 3 9763 3079
Email: info@compeng.com.au

The **Betline TSST (Model No: 15201-GA002)** Complies with radiated and conducted RF emission requirements detailed in CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (class A limits).

		26 th August 2022
Prepared By: Mohamed Elmi Test Engineer Compliance Engineering Pty Ltd	Approved By: Andrew Burden Technical Manager Compliance Engineering Pty Ltd	Date

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Revision History			
Revision	Issue Date	Remarks	Revised by
1	16-12-2021	Initial release	
2	26-8-2022	FCC ID Included	GM

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EMC Compliance Test Report

1. INTRODUCTION

Electromagnetic compatibility (EMC) measurements were performed on the Betline TSST (Model No: 15201-GA002) in accordance with the requirements detailed in CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class A limits).

2. RESULTS SUMMARY

CFR 47, Chapter 1, Subpart A, Part 15, Subpart B

FCC Rule	Description	Class	Result	Remark
15.107	AC conducted emissions	B	Pass	-
15.109	Radiated emissions	B	Pass	-

3. TEST SAMPLE

Equipment Under Test (<i>Information supplied by client</i>):		
Product Name	Betline TSST	
Model Number:	15201-GA002	
Brand Name(s)	-	
Serial Number:	15201-GA002-0001	
Hardware Version:	-	
NFC FCC ID No:	PD9AX201D2	
Wifi FCC ID No:	2AJYU-8PYA007	
4G Modem FCC ID No:	V5MACR1252	
Software/Firmware Version:	-	
Equipment type:	The equipment is used in sports venues and racecourses and comprises of 2 touch screens, thermal printer, a document imager, a note acceptor, barcode scanner, NFC, magstripe reader, low power PC, WIFI and a 4G modem.	
Main test frequencies:	F _{LOW}	30 MHz
	F _{HIGH}	13 GHz
Power Supply	V _{NOM} :	
	V _{MIN} :	
	V _{MAX} :	115 VAC, 60 Hz

4. CONFIGURATION

Measurements were performed on the Betline TSST (Model No: 15201-GA002) while powered from 115VAC, 60Hz

To exercises the sample to its fully operational mode two different software installed into the equipment was run during the test:

SporTech Diagnostic software: This software serves to exercise the Betslip mark scanner peripheral by simulating a slip load, slip read, and slip eject.

BurninTest software: The BurnIn test simulates a betting operation and exercises the Printer peripheral continuously.

Ethernet port was exercised during the measurements the by running a ping test to make sure it is connected to the network.

5. MODIFICATIONS

No modifications were performed on the above sample by Compliance Engineering Pty Ltd.

6. STANDARD DEVIATIONS

No deviation from the standard were performed by Compliance Engineering Pty Ltd.

7. TEST FACILITY

All measurements were performed inside Compliance Engineering's, 3m Semi-Anechoic (iOATS) and/or shielded enclosures located at 90 Indian Drive, Keysborough, Victoria, Australia.

A2LA (ISO 17025-2017) – Certificate No: 2829.01

Compliance Engineering Pty Ltd, is accredited to ISO 17025-2017 by American Association for Laboratory Accreditation (A2LA) which is an ILAC member and has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP)

All tests within this report have been conducted in accordance with Compliance Engineering's scope of A2LA accreditation.

The current full scope of accreditation can be found on the A2LA website: www.a2la.org

FCC – Registration No: 982700

Compliance Engineering Pty Ltd, has been recognized and is listed as an FCC part 47 CFR 2.948 measurement facility to perform compliance testing on equipment under Parts 15 and 18. The Designation Number is AU0006 and the Test Firm Registration Number is 982700.

Innovation, Science & Economic Development Canada (ISED) - Registration No: 27266

Compliance Engineering's 3m indoor semi-anechoic chamber (iOATS) has been accepted by Innovation, Science & Economic Development Canada (ISED) for performing radiated measurements in accordance with RSS-102, RSS-GEN, RSS-210, RSS-247, RSS-248 – ISED Canada Registration No: 27266

8. FIELD STRENGTH CALCULATION

All emission measurements are automatically calculated via the dedicated EMC software using the pre-stored calibration factors. The following equation simplifies the actual calculation performed;

$$\text{Corr.Ampl} = V_{\text{RAW}} + \text{AF} - \text{G} + \text{L}$$

Where:

Corr.Ampl = Corrected amplitude in dBμV/m (for radiated) & dBμV (for conducted)
V_{RAW} = Raw voltage receiver/analyser reading in dBμV
AF = Antenna Factor in dB (stored as a data array of factor vs frequency)
G = Preamplifier Factor in dB (stored as a data array of gain vs frequency)
L = Cable Loss Factor in dB (stored as a data array of insertion loss vs frequency)

Limit:

The FCC limits are given in units of μV/m. The following formula is used to convert the units of μV/m to dBμV/m.

$$\text{Limit (dBμV/m)} = 20 \cdot \log(\mu\text{V/m})$$

Margin:

This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example Calculation:

A peak emission is observed at 100 MHz at 21.5 dBμV. An antenna factor for that frequency is 10 dB. The preamplifier gain factor is 30 dB and the cable loss at that same frequency 1.5 dB. Hence the overall Correction Amplitude is as follows;

$$\begin{array}{ll} V_{\text{RAW}} + \text{AF} - \text{G} + \text{L} & : \quad \text{Corr.Amp} - \text{FCC Limit} = \text{Margin} \\ 31.5 + 10 - 20 + 1.5 & : \quad 23 \text{ dBμV/m} - 57.0 \text{ dBμV/m} = - 34 \text{ dB} \end{array}$$

9. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.

Measurement	Frequency / Range	Uncertainty (k=2)
Temperature (ANSI C63.4-2014)	10°C to 40°C	0.5°C
Humidity (ANSI C63.4-2014)	5% to 90%	2%
Conducted Emissions (using a 50Ω/50μH + 5μH LISN)	0.09 MHz to 30 MHz	± 4.79
Conducted Emissions (using a Voltage Probe)	0.15 MHz to 30 MHz	± 5.07
Conducted Emissions (using a 50Ω/50μH LISN)	0.15 MHz to 30 MHz	± 4.35
Radiated Emissions (Horizontal Polarisation)	30 MHz to 200 MHz	± 4.98
Radiated Emissions (Vertical Polarisation)	30 MHz to 200 MHz	± 5.23
Radiated Emissions (Horizontal Polarisation)	200 MHz to 1000 MHz	± 5.24
Radiated Emissions (Vertical Polarisation)	200 MHz to 1000 MHz	± 5.92
Radiated Emissions (STLP)	1 GHz to 6 GHz	± 5.14
Radiated Emissions (STLP)	6 GHz to 18 GHz	± 6.11
Radiated Emissions (SGH)	18 GHz to 26 GHz	± 6.11
Radiated Emissions (SGH)	26 GHz to 40 GHz	± 6.11

Note 1: These uncertainties represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Note 2: The reference uncertainty standard specifies that although the measurement uncertainty shall be documented within the test report, the actual determination of compliance shall be based on measurements without taking into account the measurement uncertainty.

10. RADIATED RF EMISSION MEASUREMENTS

10.1 REQUIREMENTS

Frequency Range:	30 MHz to the 5 th harmonic of the highest fundamental frequency, or to 40 GHz, whichever is lower.
Highest Operating frequency:	2.5 GHz
Measurement Distance:	3 meters
Limit:	FCC Part 15B (Class B)

10.2 TEST EQUIPMENT

Asset No	Equipment	Model No	Serial No	Cal
644	EMI Receiver	ESIB7	100338	Jul 22
731	Biconical Antenna	VHBB 9124+BBA 9106	9124-1461	Aug 22
733	Log Periodic Antenna	USLP 9143 B	USLP 9143B 136	Aug 22
466	Preamplifier	ABL0600-01-3440	35401	Sep 22
734	Stacked Log Periodic	STLP 9148	176	Aug 22
760	iOATS (11m x 7m x 6m)	CE-iOATS	2021	Oct 23
TER-S004	Measurement Software	Radimation	Rev: 2021.1.7	-

10.3 ENVIRONMENTAL CONDITIONS

Environment	Typical Range	Uncertainty (k=2)	Actual	Comment
Temperature	15.5°C to 24°C	0.5°C	22°C	Ok
Humidity	15% to 60%	2%	52%	Ok

10.4 PROCEDURE

In accordance with Compliance Engineering Test Procedure TP72.

Measurements are performed inside a semi-anechoic chamber that incorporates a turntable allowing the EUT to rotate a full 360°.

The EUT is supported 0.8 metres above the ground reference plane on a large polystyrene block which in turn rests on top of the turntable.

Measurements are made with the antenna positioned in both the horizontal and vertical polarisations. The measurement antenna is raised and lowered in height (1m to 4m) above the reference ground plane to obtain the maximum emission.

The distance between the EUT and the antenna is 3 metres.

A measurement scan is performed with the EUT rotated 360°, the antenna height is scanned between 1 m and 4 m and the antenna rotated to repeat the measurement for both the horizontal and vertical antenna polarization, with the receiver/spectrum analyser was configured to Max Hold whilst on Peak Detect. Quasi-peak and or average detector measurements are performed at frequencies where peak emissions are close to or exceed the applicable limit.

Plots of the accumulated measurement data, including all transducer correction factors are then produced and stored on file.

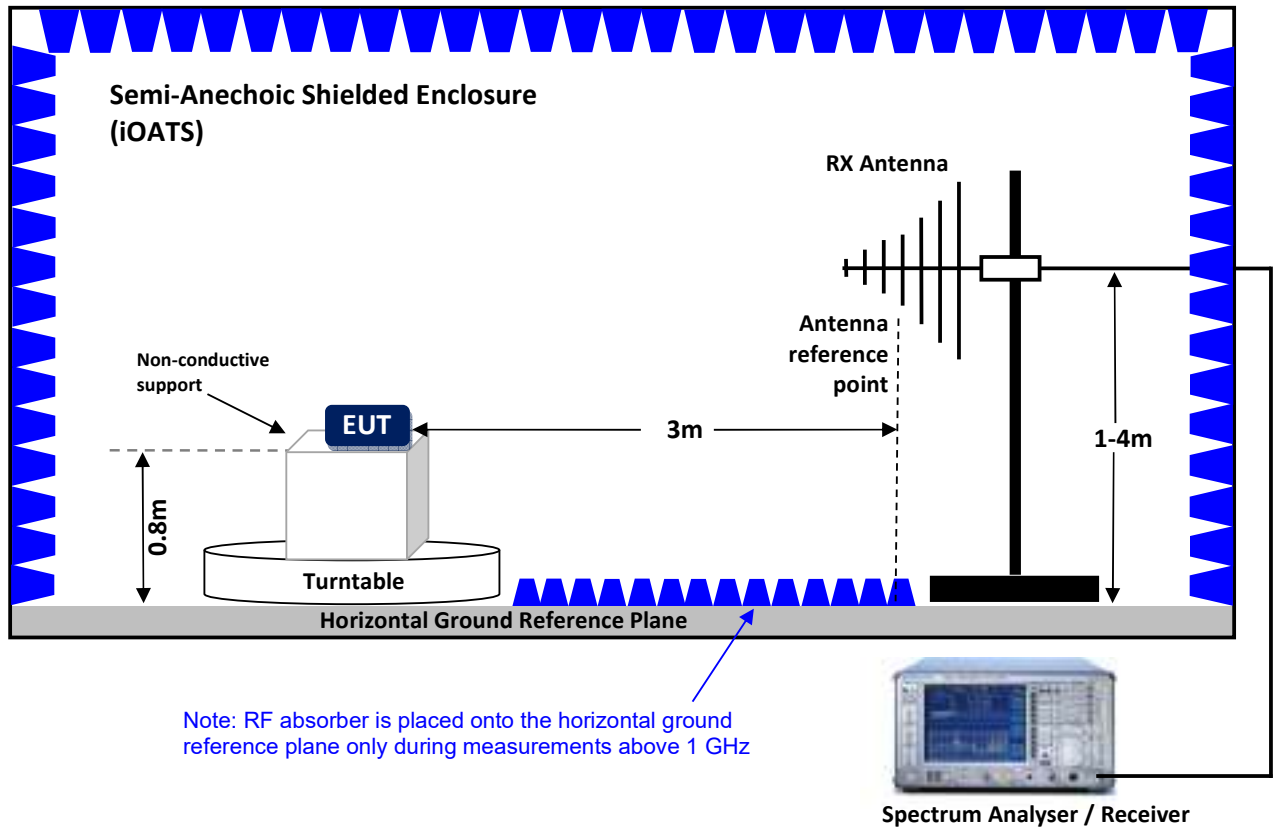
Measurements below 1 GHz:

$$RWB = 120 \text{ kHz}, VBW = 3 \times RBW$$

Measurements above 1 GHz:

RF absorber is placed on the ground reference plane between the EUT and the measuring antenna and its location size should allow the test site area comply with the CISPR 16-1-4 requirements.

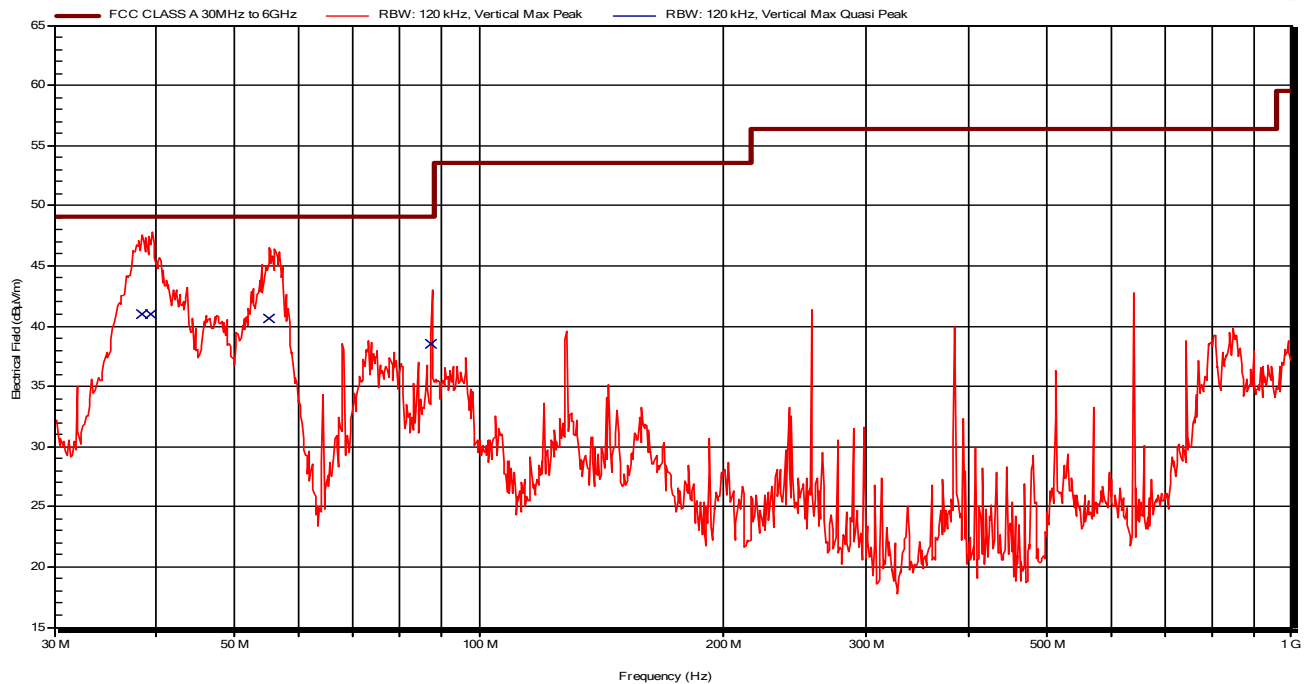
$$RWB = 1 \text{ MHz (minimum)}, VBW = 3 \times RBW$$



10.5 RESULTS

Radiated RF Emission Measurements – Vertical Polarisation – 30 MHz to 1GHz				
Frequency (MHz)	Quasi-Peak (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	Delta Limit (dB)	Result
39.539	40.7	49.1	-8.4	Pass
55.11	38.4	49.1	-10.7	Pass
87.375	35.1	49.1	-14.0	Pass
38.417	41	49.1	-8.1	Pass

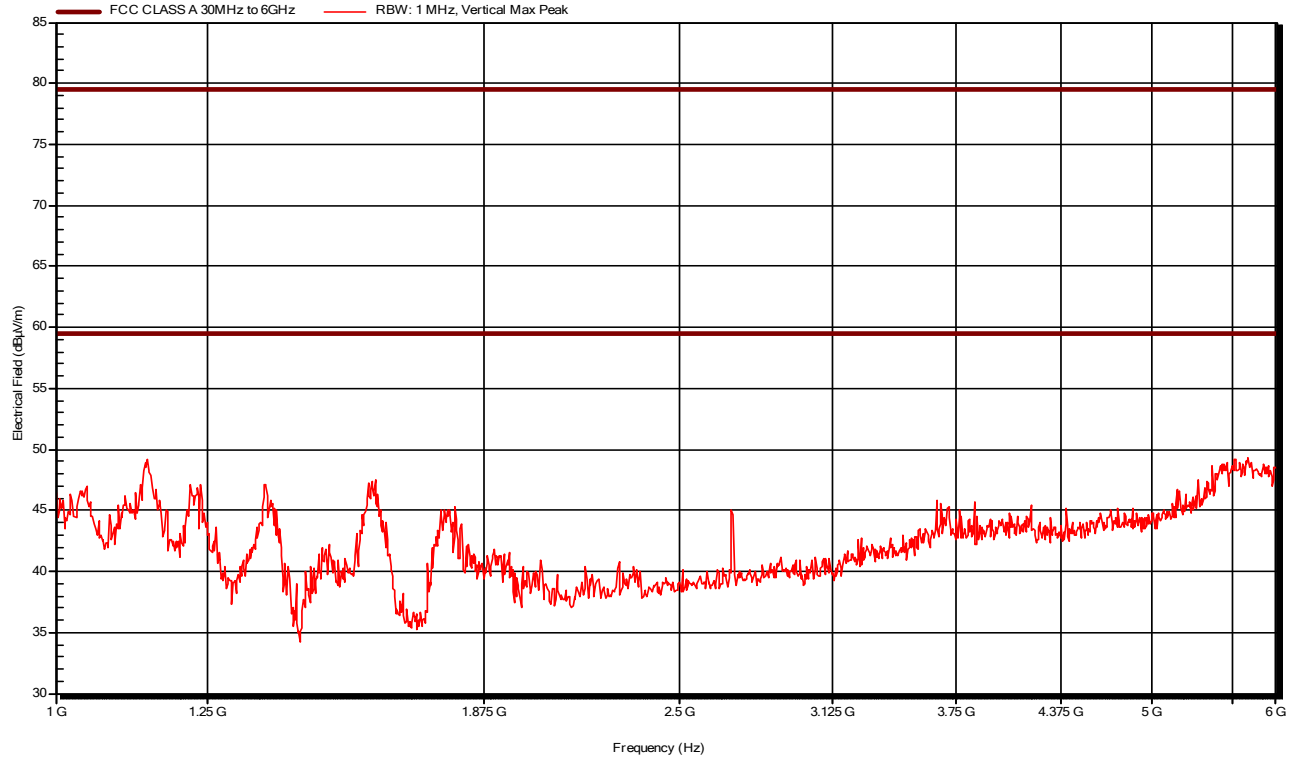
RadiMation



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Radiated RF Emission Measurements – Vertical Polarisation - 1 to 6 GHz							
Frequency (GHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Pk Delta Limit (dB)	AV Delta Limit (dB)	Result
Peak emissions were below the Average limit							Pass

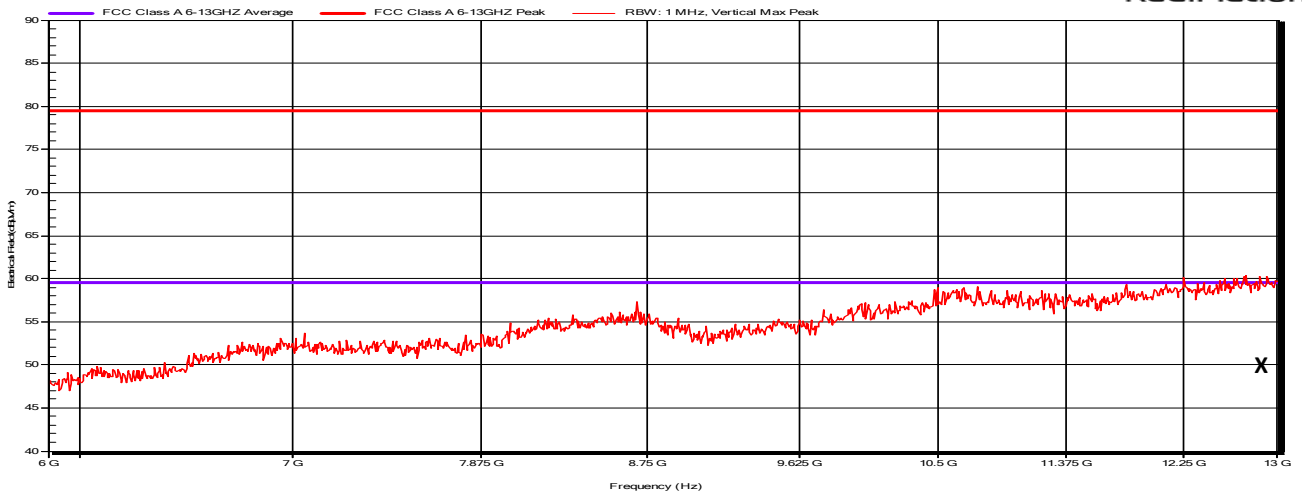
RadiMation



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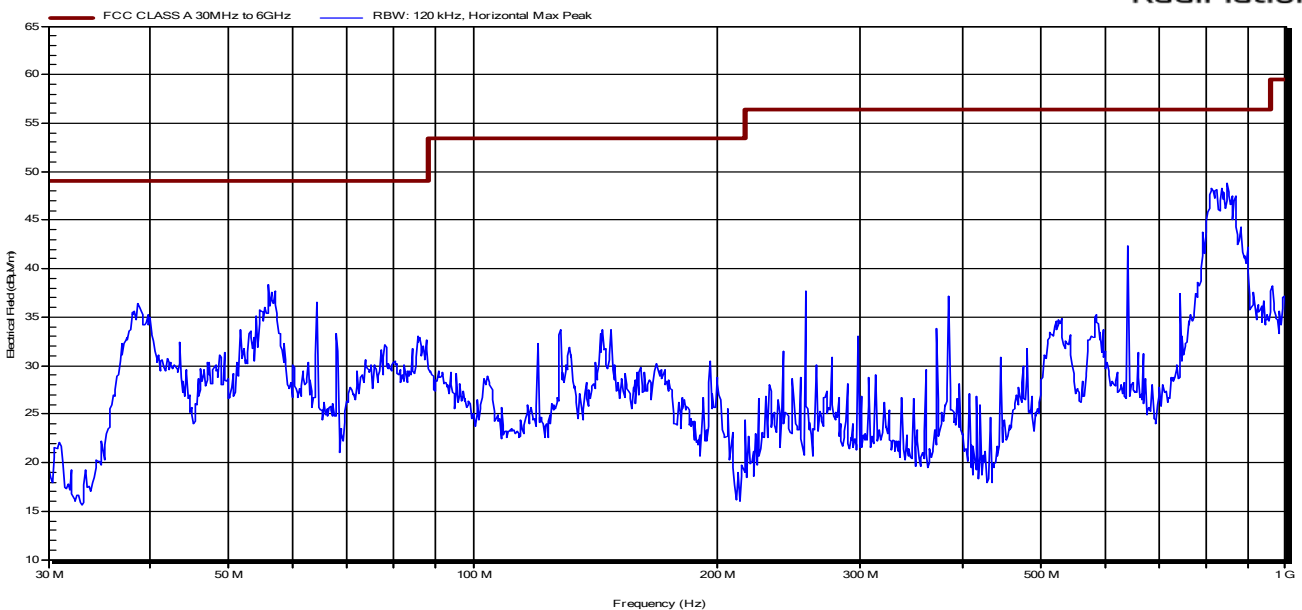
Radiated RF Emission Measurements – Vertical Polarisation - 6 to 13 GHz

Frequency (GHz)	Peak (dB μ V/m)	Peak Limit (dB μ V/m)	Average (dB μ V/m)	Average Limit (dB μ V/m)	Pk Delta Limit (dB)	AV Delta Limit (dB)	Result
12.91	59.23	79.5	49.9	59.5	-20.27	-9.6	Pass



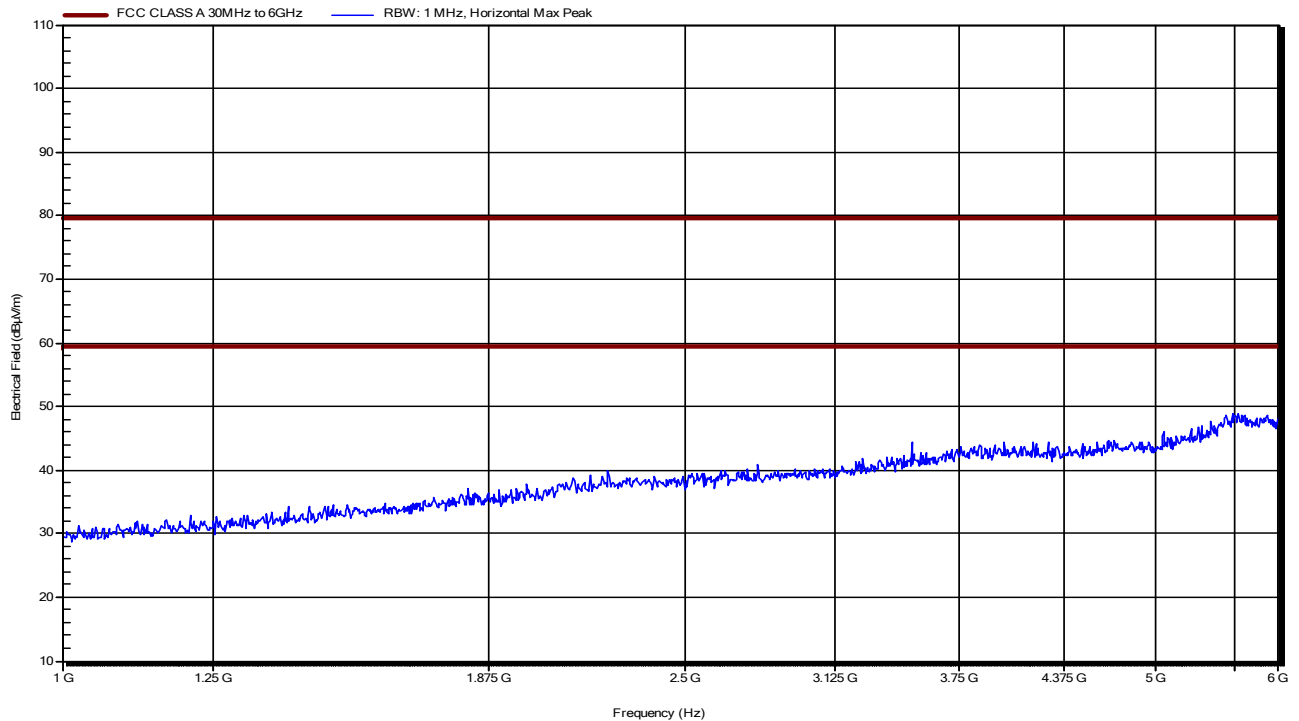
Radiated RF Emission Measurements – Horizontal Polarisation – 30 MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	Delta Limit (dB)	Result
Peak emissions were below the Average limit				Pass



Radiated RF Emission Measurements – Horizontal Polarisation - 1 to 6 GHz							
Frequency (GHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Pk Delta Limit (dB)	AV Delta Limit (dB)	Result
Peak emissions were below the Average limit							Pass

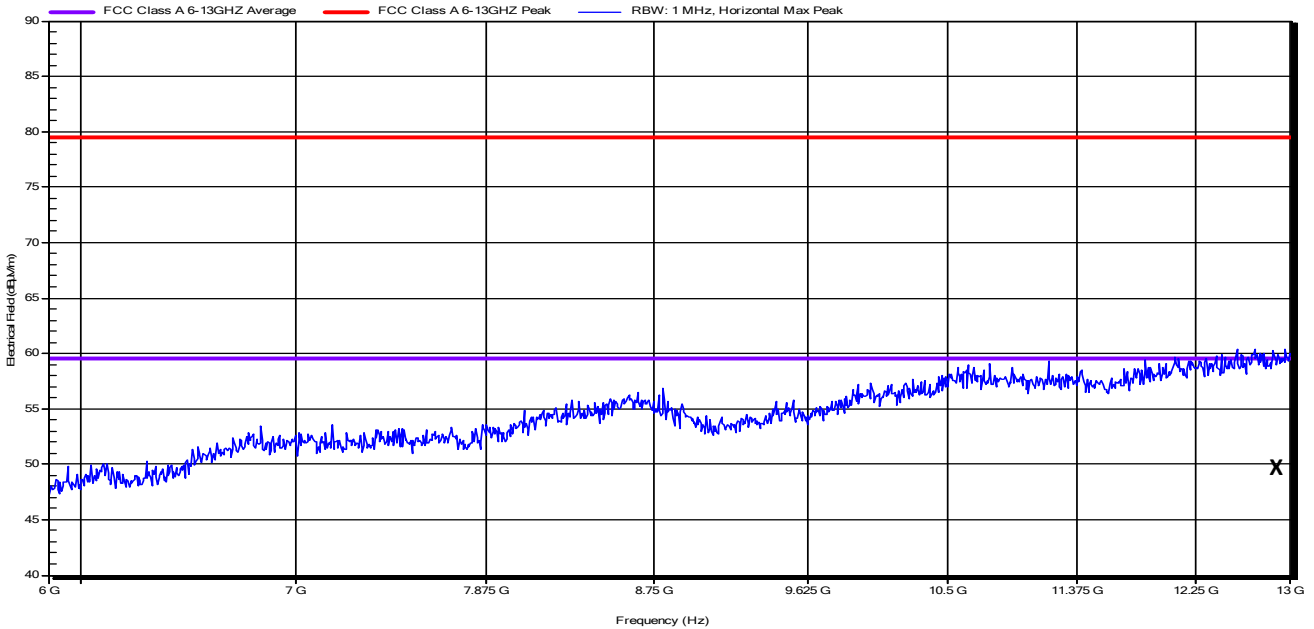
RadiMation



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Radiated RF Emission Measurements – Horizontal Polarisation - 6 to 13 GHz							
Frequency (GHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Pk Delta Limit (dB)	AV Delta Limit (dB)	Result
12.91	60.2	79.5	50.3	59.5	-19.3	-9.2	Pass

RadiMation



10.6 ASSESSMENT

The Betline TSST (Model No: 15201-GA002) complies with the CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class A limits) radiated RF emission requirements

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11. MAINS TERMINAL DISTURBANCE VOLTAGE EMISSION MEASUREMENTS

11.1 REQUIREMENTS

Frequency Range: 0.15 MHz to 30 MHz
 Measurement Distance: 3 meters
 Limit: FCC Part 15B (Class B)

11.2 TEST EQUIPMENT

Asset	Equipment	Model No	Serial No	Cal Due
644	EMI Receiver 7 GHz	ESIB7	100338	Jul 22
34	LISN	3816/2AS	9605-1047	Dec 22
229	High Pass Filter	FEH0.15B	1247	Feb 22
230	Transient Limiter	TL250-10B	383	Feb 22
TER-S004	Measurement Software	Radimation	Rev: 2021.1.7	-

11.3 ENVIRONMENTAL CONDITIONS

Environment	Typical Range	Uncertainty (k=2)	Actual	Comment
Temperature	15.5°C to 24°C	0.5°C	19°C	Ok
Humidity	15% to 60%	2%	52%	Ok

11.4 PROCEDURE

In accordance with Compliance Engineering Test Procedure TP72.

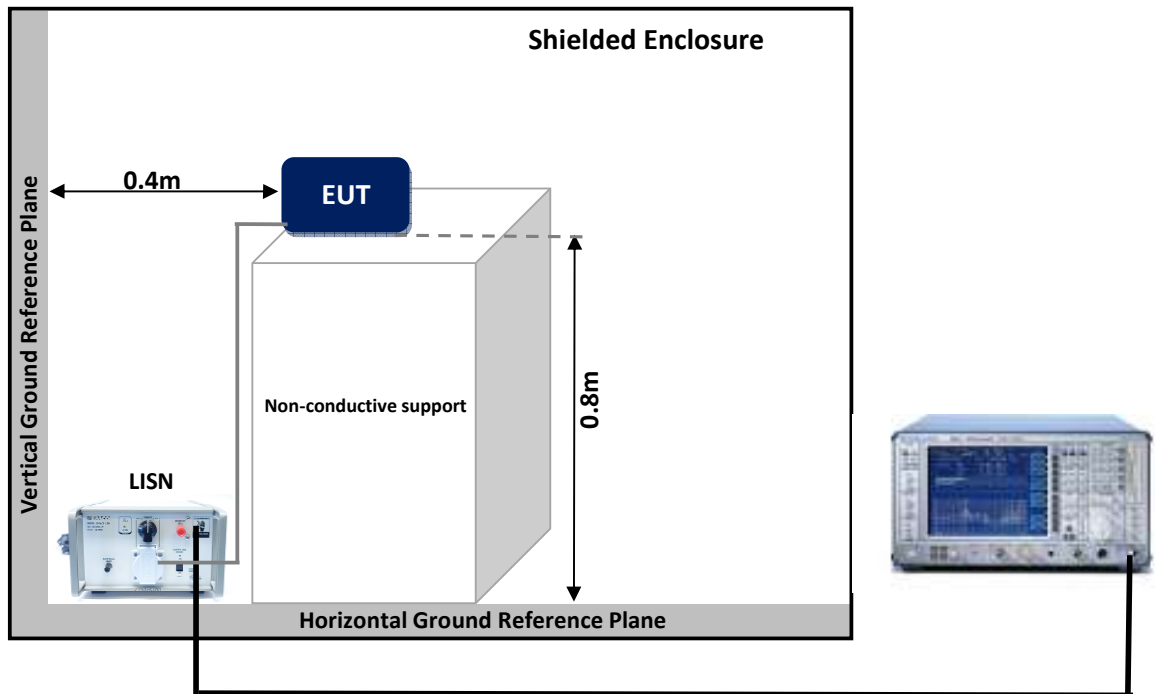
The EUT is placed on a non-conductive support 0.8 metres above the ground reference plane. The vertical conducting plane is located 0.4 metres to the rear of the device.

Measurement scans are performed over the specified (0.15 - 30 MHz) frequency band on both the active and neutral lines, via a 50Ω Line Impedance Stabilization Network (LISN) located 0.8 metres away from the test sample. All other accessories are connected to another separate LISN.

The test receiver is set to Peak Detect with the specified bandwidth (IF Bandwidth of 9 kHz) whilst on Max Hold mode.

Measurement scans are also repeated using the Average Detector and Quasi-Peak detector functions on emissions close to or exceeding the applicable limit.

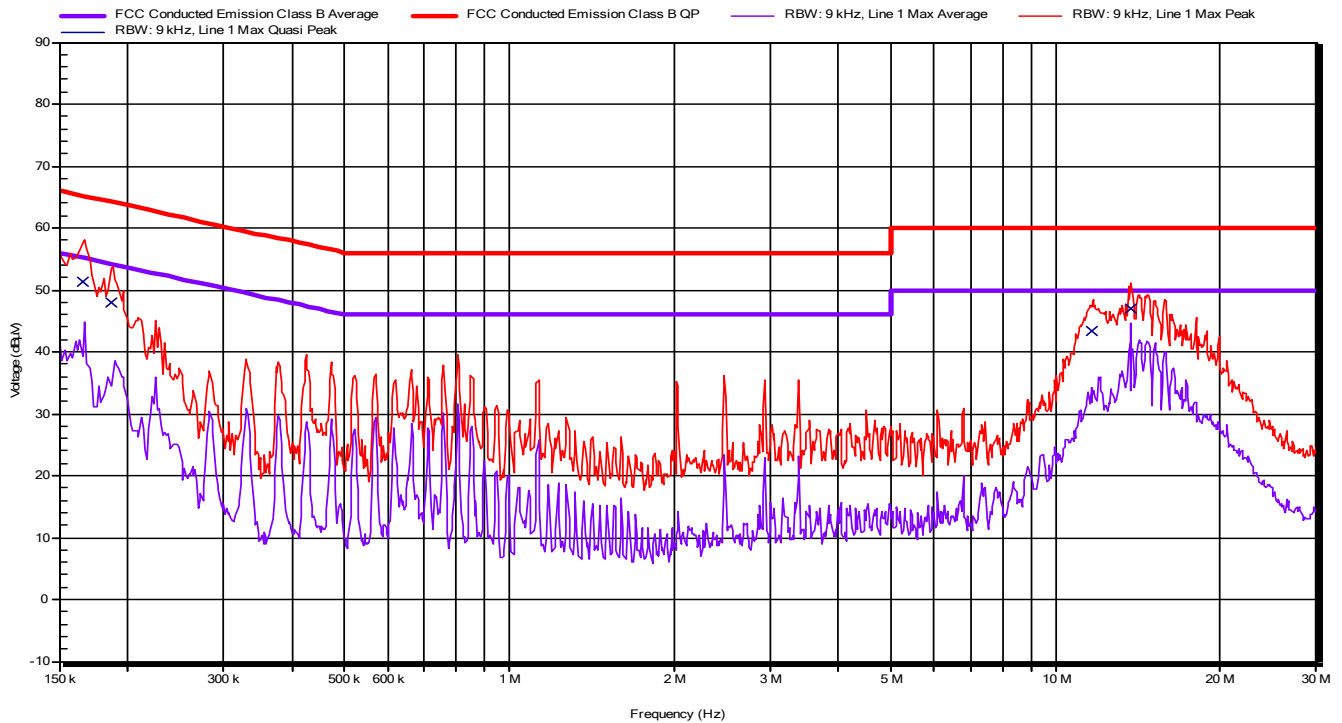
Plots of the accumulated measurement data, including all transducer correction factors are then produced and stored on file.



11.5 RESULTS

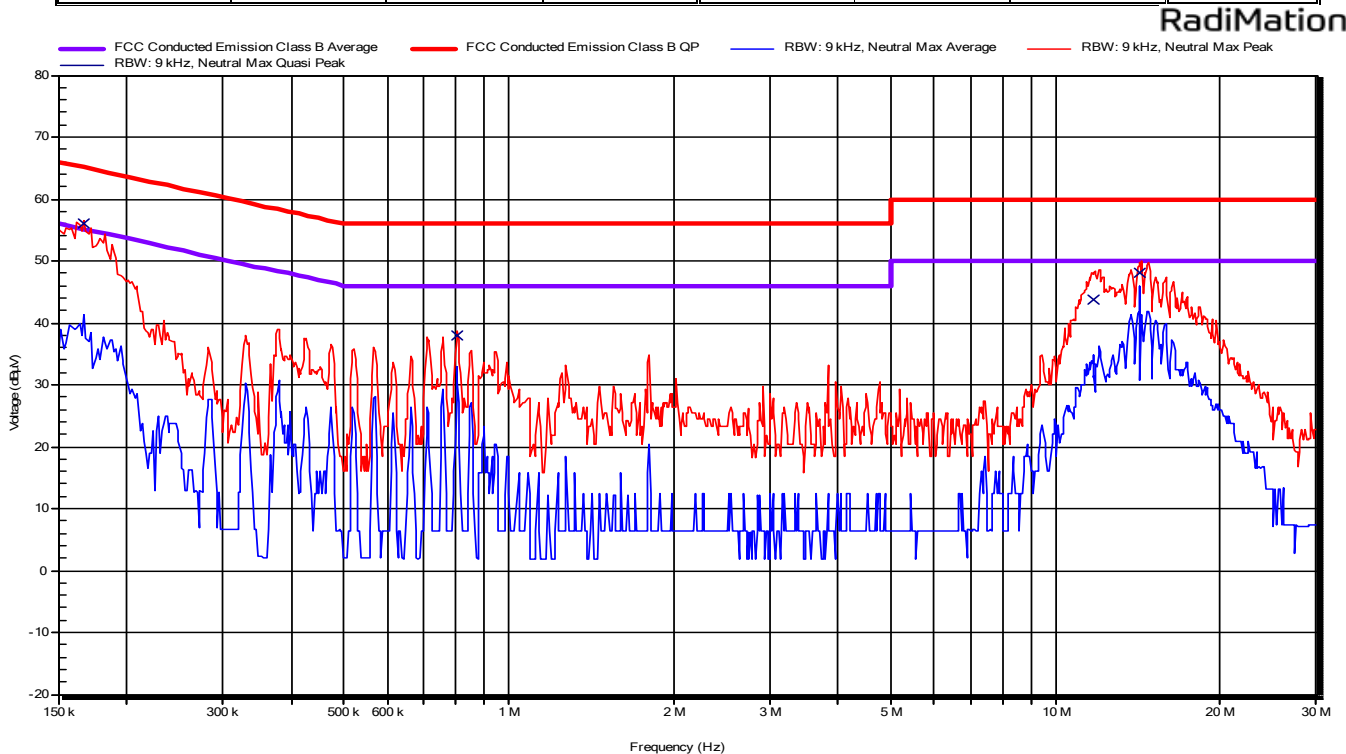
Mains Terminal Emission Measurements – Active Line							
Frequency (kHz)	Quasi-peak (dBμV)	Quasi-peak Limit (dBμV)	Delta QP Limit (dB)	Average (dBμV)	Average Limit (dBμV)	Delta AVG Limit (dB)	Result
165.3	51.3	65.2	-13.9	39.2	55.2	-16.0 dB	Pass
13.7	47	47	-13.0	44.6	50	-5.4 dB	Pass
11.6	43.3	43.3	-16.7	31.8	50	-18.2 dB	Pass
187.4	48	48	-16.2	34.5	54.1	-19.7 dB	Pass

Radiation



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Mains Terminal Emission Measurements – Neutral Line							
Frequency (kHz)	Quasi-peak (dBμV)	Quasi-peak Limit (dBμV)	Delta QP Limit (dB)	Average (dBμV)	Average Limit (dBμV)	Delta AVG Limit (dB)	Result
14.2	48.1	60	-11.9	45.8	50	-4.2	Pass
167.0	56.1	65.1	-9.0	41.3	55.1	-13.8	Pass
804.1	38	56	-18.0	32.9	46	-13.1	Pass
11.7	43.7	60	-16.3	31.4	50	-18.6	Pass



11.6 ASSESSMENT

The Betline TSST (Model No: 15201-GA002) complied with the CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class B limits) conducted RF emission requirements.

12. CONCLUSION

The **Betline TSST (Model No: 15201-GA002)** Complies with the conducted and radiated RF emission requirements detailed in CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class A limits).