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EMC Compliance Test Report

CFR 47, Chapter 1, Subpart A,
Part 15, Subpart B (Class A limits)

Report Number: CE3356C

March 2022



TMEIC Process Technology Application Centre P/L
TLS20GW1 B0EMCB07
Model No: TLS20GW1 B0EMCB07

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

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FCC ID: **2A88XB0EMCB07**

Device: TLS20GW1 B0EMCB07
Model No: TLS20GW1 B0EMCB07
Serial No: 0x00017CAB18

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 A) **Complied**

Test Date: 7th and 15th March 2022

Tests Performed by: Mohamed Elmi
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The **TLS20GW1 B0EMCB07 (Model No: TLS20GW1 B0EMCB07)** Complies with radiated and conducted RF emission requirements detailed in CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (class A limits).

		31 st March 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	16-03-2022	Initial release	

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EMC Compliance Test Report

1. INTRODUCTION

Electromagnetic compatibility (EMC) measurements were performed on the TLS20GW1 B0EMCB07 (Model No: TLS20GW1 B0EMCB07) in accordance with the requirements detailed in CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class A limits).

2. RESULTS SUMMARY

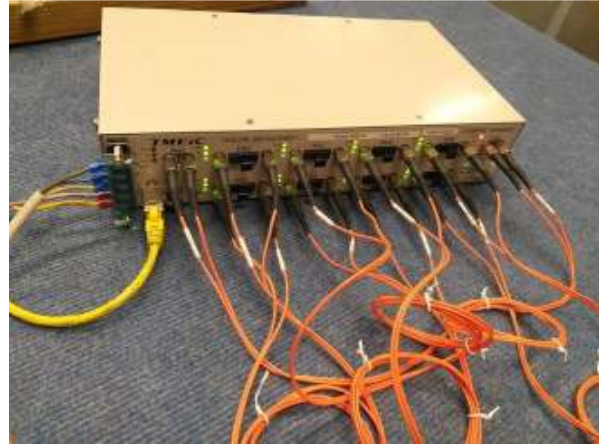
CFR 47, Chapter 1, Subpart A, Part 15, Subpart B

FCC Rule	Description	Class	Result	Remark
15.107	AC conducted emissions	A	Pass	26.4 dB under Class A limit @ 1.92 MHz
15.109	Radiated emissions	A	Pass	8.7 dB under Class A limit @ 165.9 MHz

3. TEST SAMPLE

Equipment Under Test (<i>Information supplied by client</i>):		
Product Name	TLS20GW1 B0EMCB07	
Model Number:	TLS20GW1 B0EMCB07	
Brand Name(s)	TMEIC	
Serial Number:	0x00017CAB18	
Hardware Version:	3.0	
Software/Firmware Version:	Release 1.0.3	
Equipment type:	Communications Equipment	
Power Supply	V _{NOM} :	110VAC, 240VAC
	V _{MIN} :	85VAC
	V _{MAX} :	265VAC
Interconnecting Cables		Optical fiber cable.
		Twisted pairs unshielded cable.
		Cat6a F/STC Shielded Ethernet Cable

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4. CONFIGURATION

Measurements were performed on the TLS20GW1 B0EMCB07 (Model No: TLS20GW1 B0EMCB07) while powered from 120 VAC, 60 Hz AC source.

A Digitech multimeter is used to check the Alarm contact when is closed. Under an alarm event, the contact will be opened to notify the controller.

To exercises the sample and make use its fully operational, the EUT was connected to a Dell laptop placed outside of the test chamber during the test using ethernet cable.

The laptop was in turn connected to the Dell Docking Unit, which provides network connectivity and USB connectivity to the EUT.

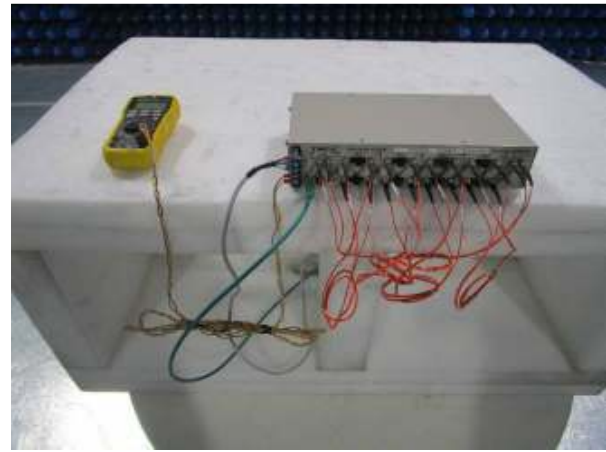
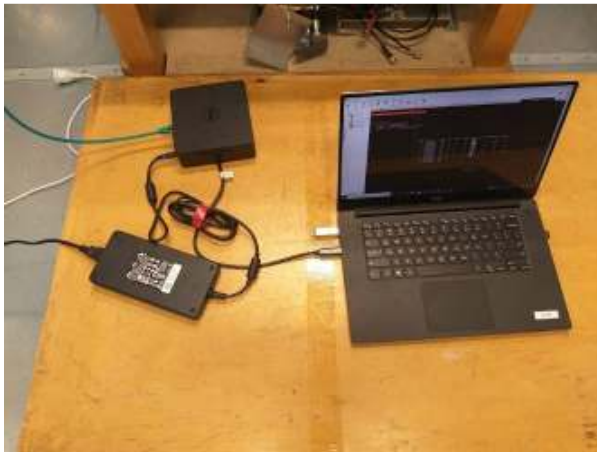
SSH MobaXterm terminal utility to was run to communicate with the TLS20GW processor Under this interface we run tlxuty LUA scripts with different parameters to monitor any errors occur during the tests.

4.1 Supporting Equipment Used During Testing

AE: Auxiliary/Associated Equipment				
Device	Manufacturer	Model No:	Serial	Comments
Dell Docking Unit	DELL	K16A	K16A001	-
Laptop	DELL	Dell Precision 5520	41464518986	-
AC/DC Power Adapter	DELL	LA24PM160	88E-2643-A02	-
Multimeter	DIGITECH	QM1321	-	-

4.2 Test Modes

Mode	Description	
AC-Powerline	General Conditions	powered from 120VAC, 60Hz AC source



5. MODIFICATIONS

To help the EUT pass the test, two ferrite beads of WE-STAR-BUENO Snap (742 758 13) were placed on both the internal mains cable and internal alarm cable.

The ferrite bead properties are detailed in the table below

properties	Test conditions	Value	Unit	Tolerance
Impedance @ 25 MHz 1 turn	25 MHz	120	Ω	±25%
Impedance @ 100 MHz 1 turn	100 MHz	200	Ω	±25%



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;

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

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 5th harmonic of the highest fundamental frequency, or 40 GHz, whichever is lower.

Highest Operating frequency: 2.4 GHz

Measurement Distance: 3 meters

Limit: FCC Part 15B (Class A)

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	24.4°C	Ok
Humidity	15% to 60%	2%	54%	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.

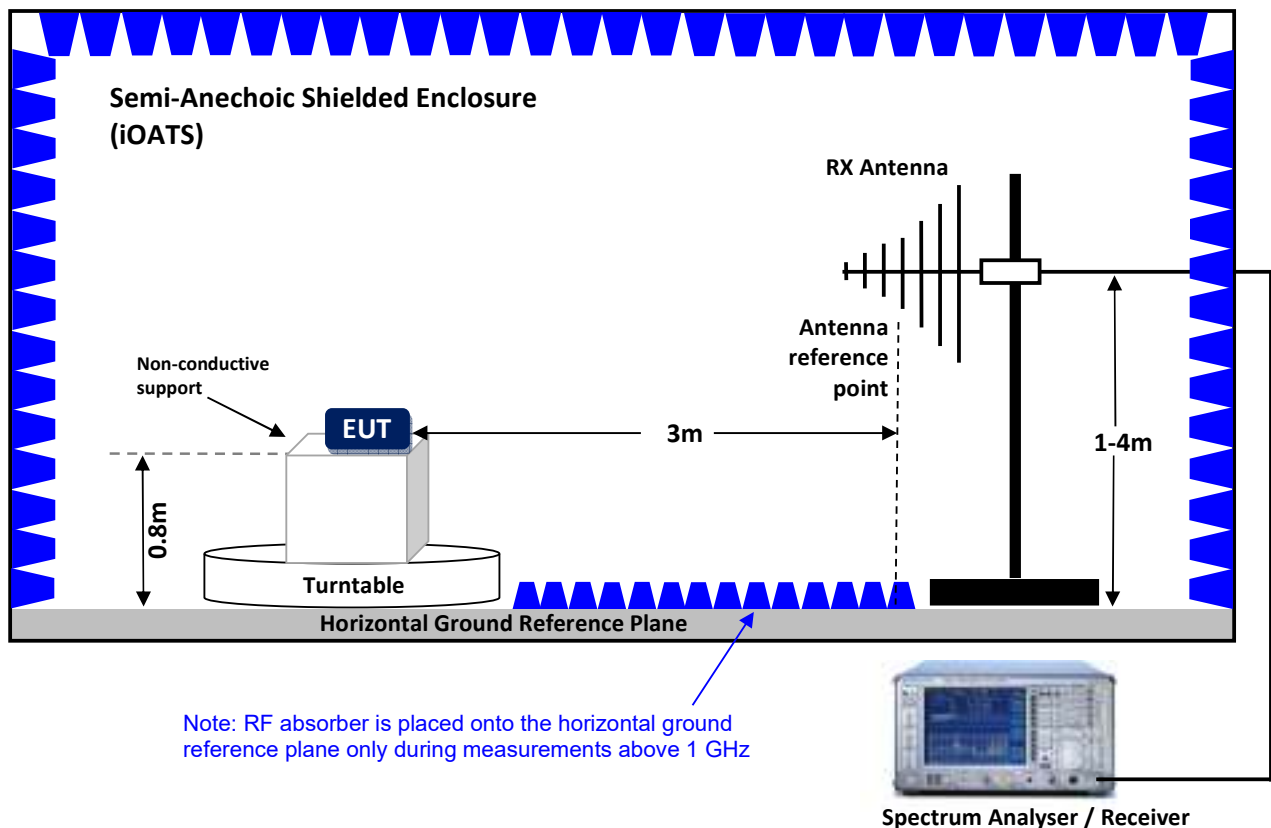
Measurements below 1 GHz:

RBW = 120 kHz, VBW = 3 x RBW

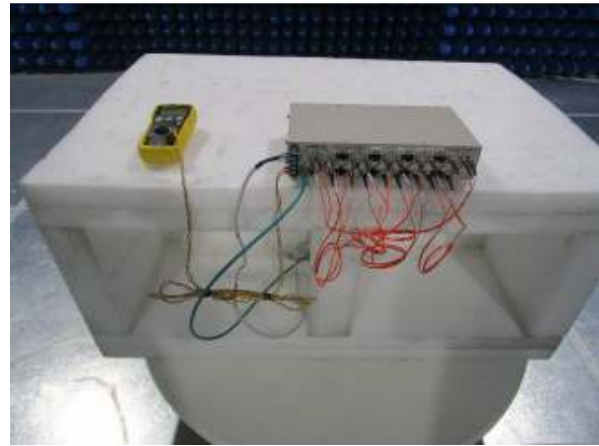
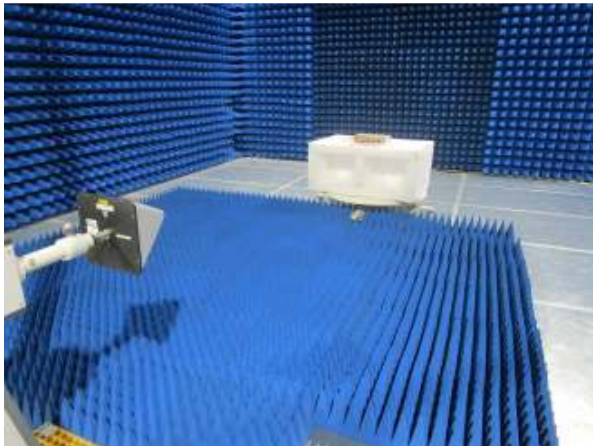
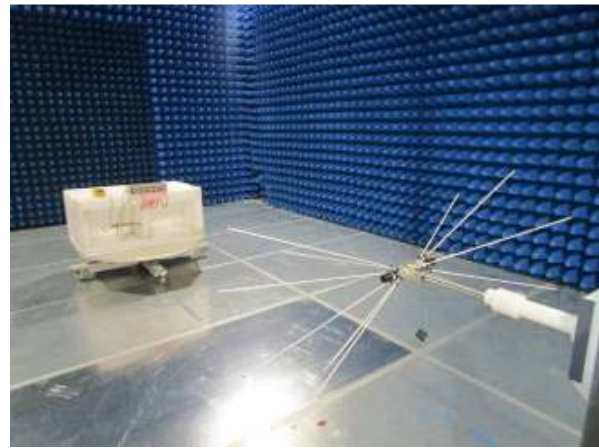
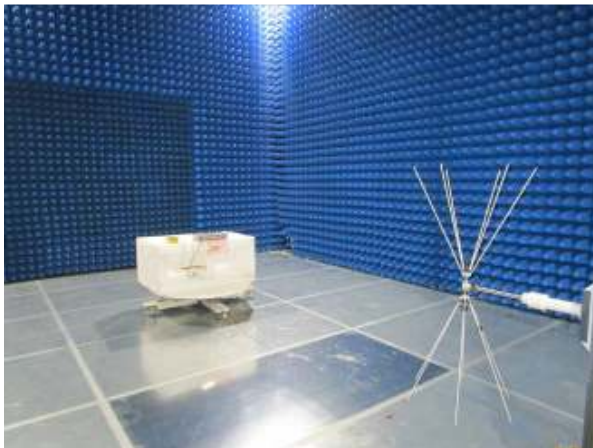
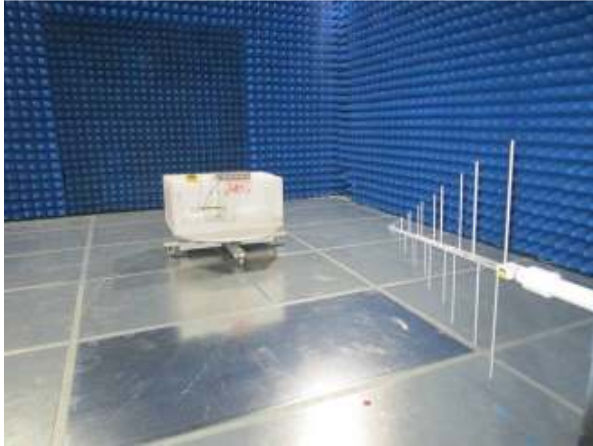
Measurements above 1 GHz:

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.

RBW = 1 MHz (minimum), VBW = 3 x RBW



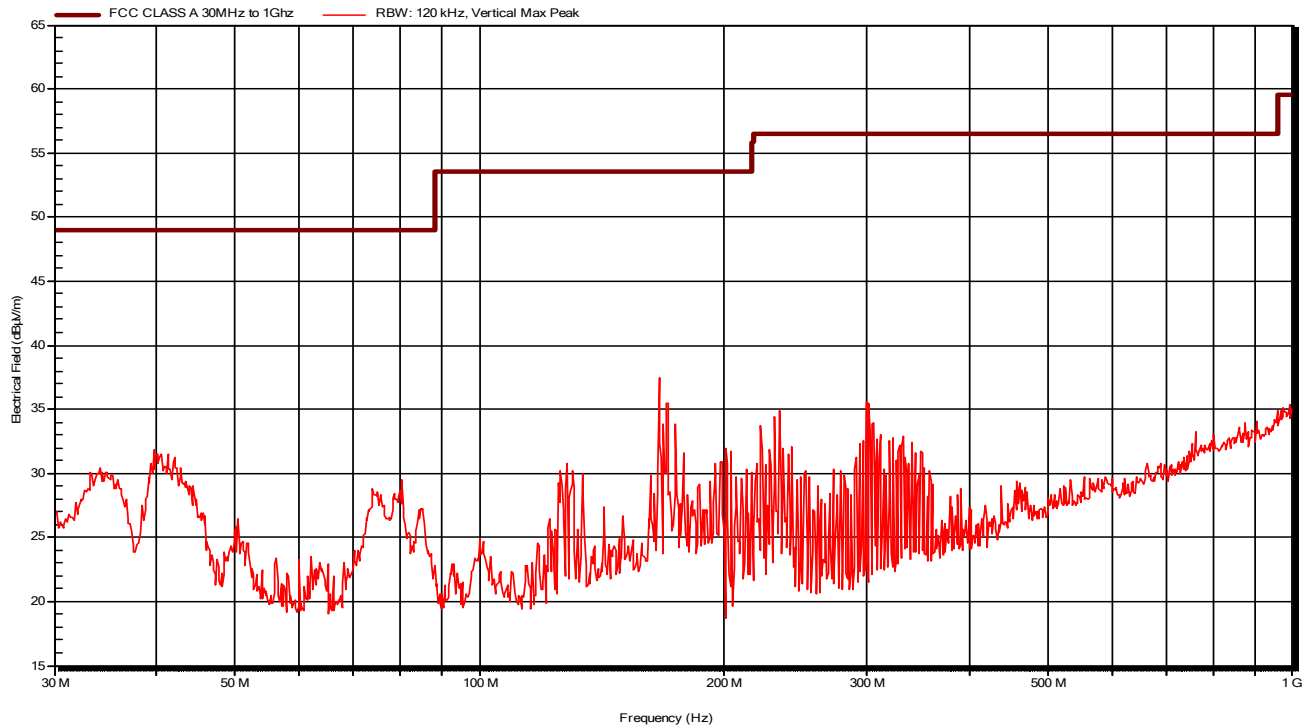
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10.5 RESULTS

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
Peak emissions were below the Average limit				Pass

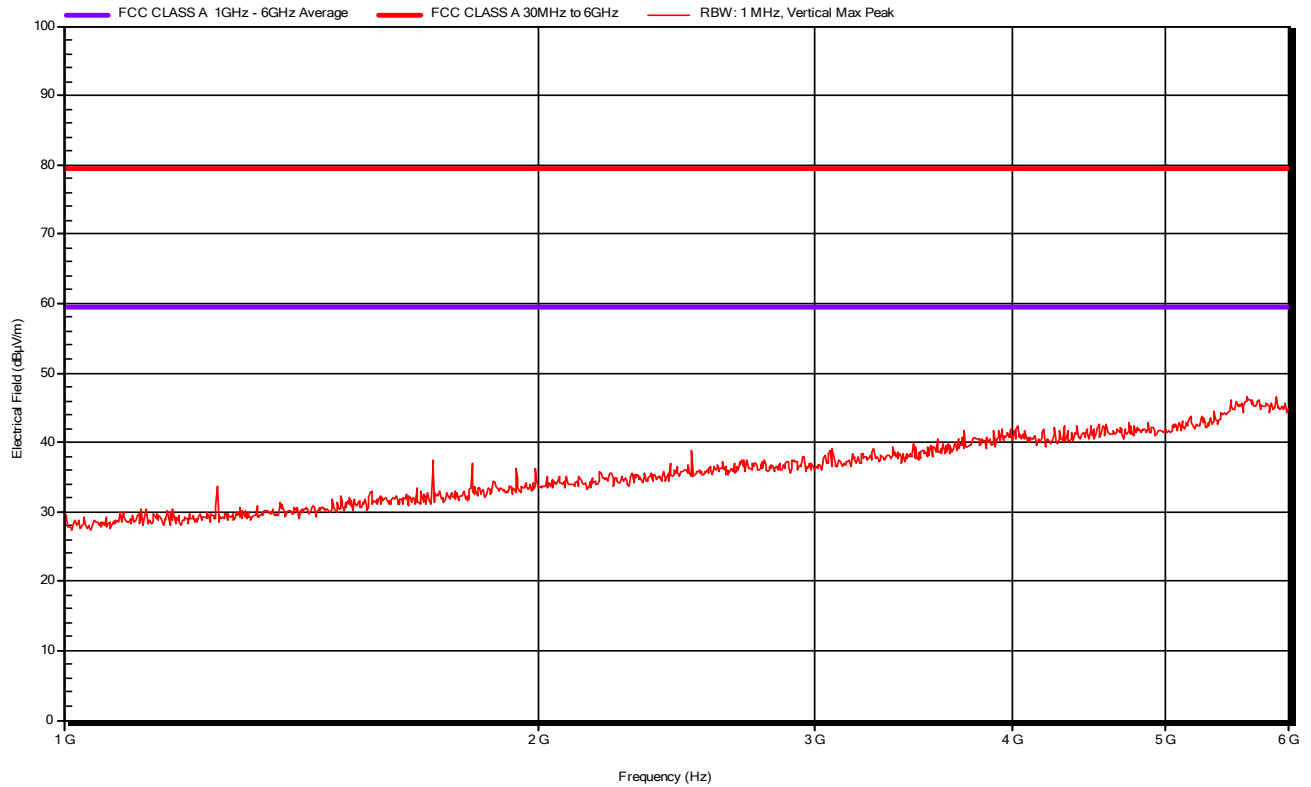
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Radiated RF Emission Measurements – Vertical Polarisation - 1 to 6 GHz							
Frequency (GHz)	Peak (dBµV/m)	Peak Limit (dBµV/m)	Average (dBµV/m)	Average Limit (dBµV/m)	Pk Delta Limit (dB)	AV Delta Limit (dB)	Result
Peak emissions were below the Average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

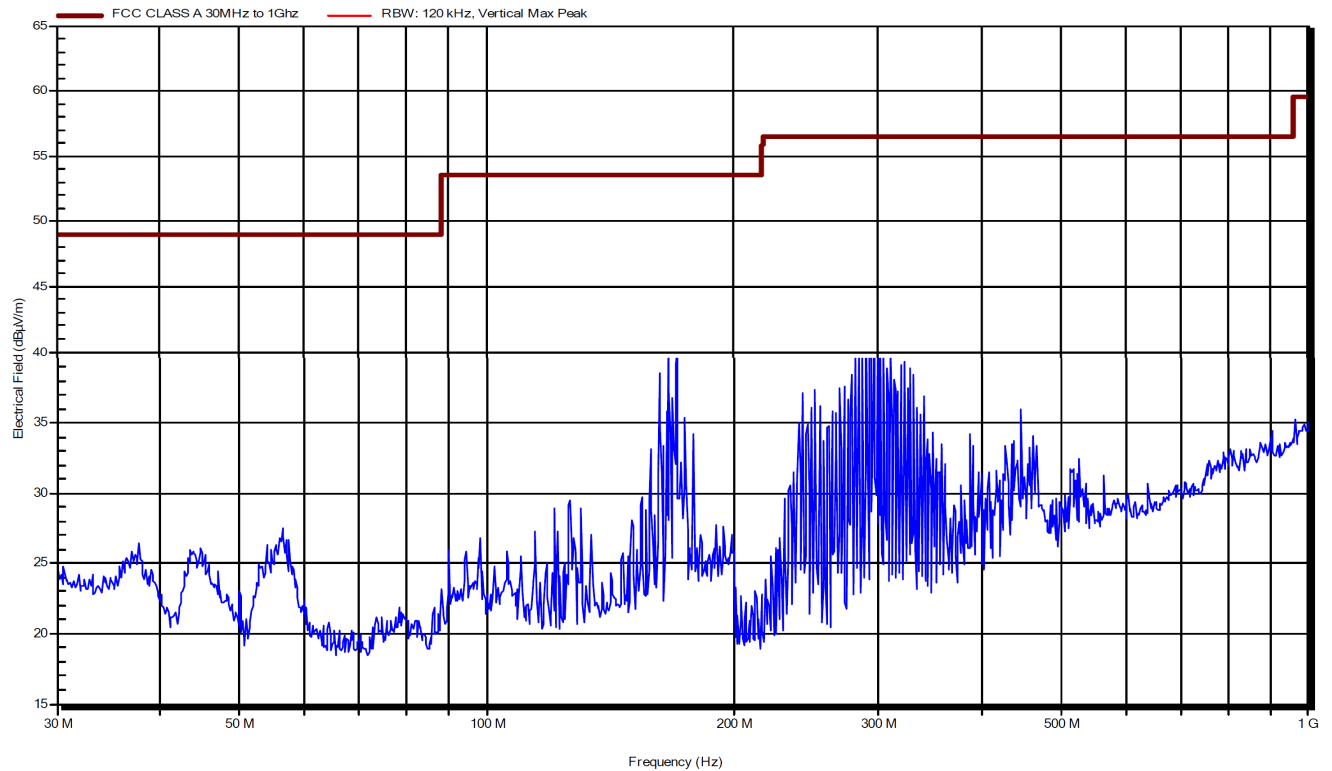
RadiMation



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Radiated RF Emission Measurements – Horizontal Polarisation – 30 MHz to 1 GHz				
Frequency (MHz)	Quasi-Peak (dB μ V/m)	Quasi-Peak Limit (dB μ V/m)	Delta Limit (dB)	Result
165.9	41.3	50	-8.7	Pass

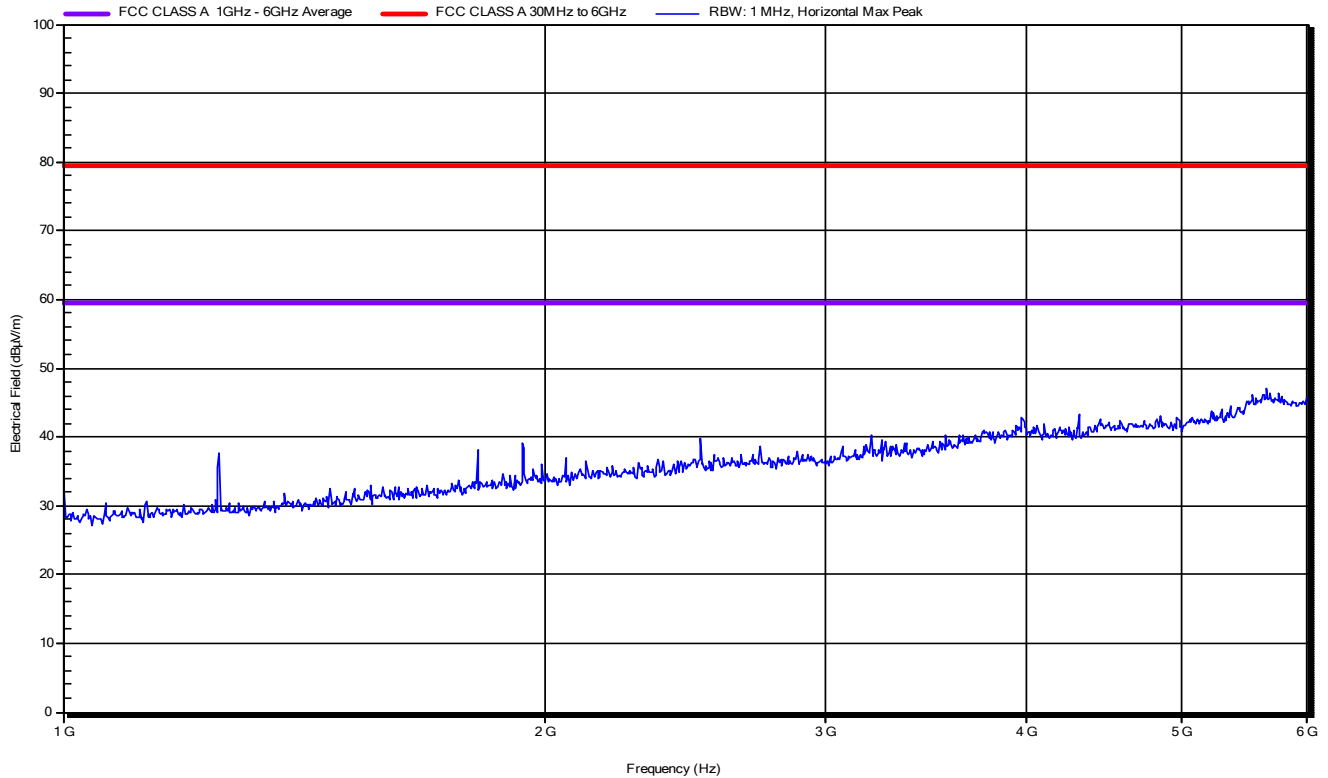
RadiMation



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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



10.6 ASSESSMENT

The TLS20GW1 B0EMCB07 (Model No: TLS20GW1 B0EMCB07) complies with the CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class A limits) radiated RF emission requirements

11. MAINS TERMINAL DISTURBANCE VOLTAGE EMISSION MEASUREMENTS

11.1 REQUIREMENTS

Frequency Range: 0.15 MHz to 30 MHz
 Limit: FCC Part 15B (Class A)

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 23
230	Transient Limiter	TL250-10B	383	Feb 23
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	22°C	Ok
Humidity	15% to 60%	2%	57%	Ok

11.4 PROCEDURE

In accordance with Compliance Engineering Test Procedure TP72.

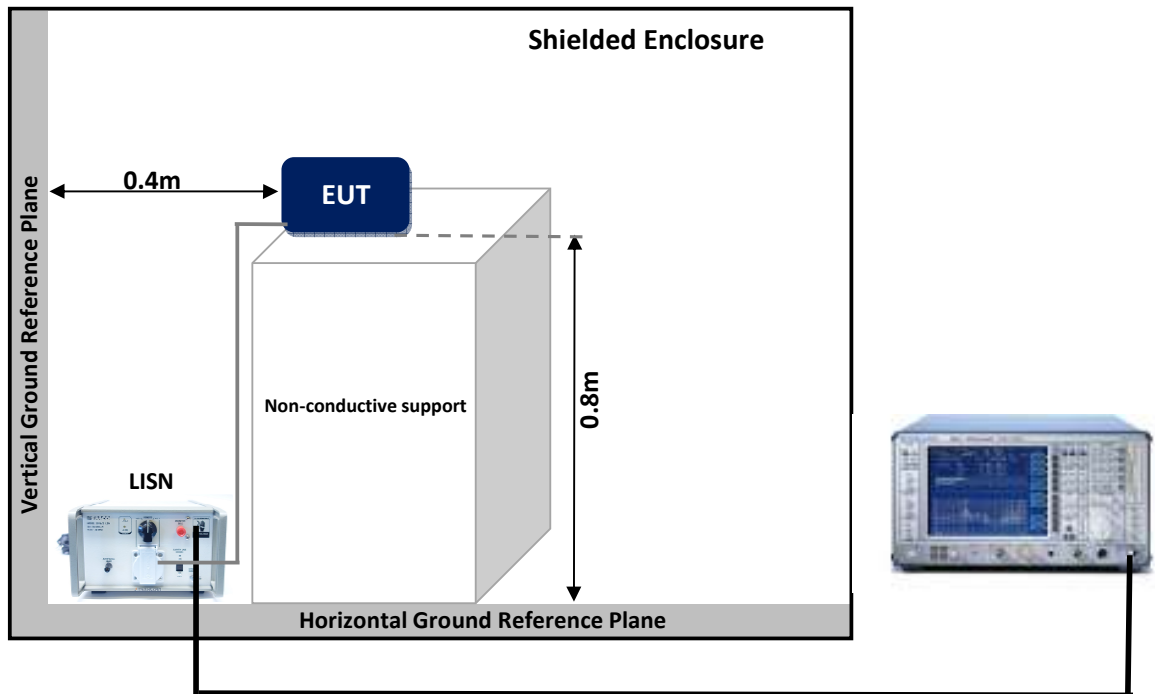
The EUT is placed on a non-conductive support 0.8 metres above the ground reference plane. The vertical conducting plane is located 0.4 metres to the rear of the device.

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.

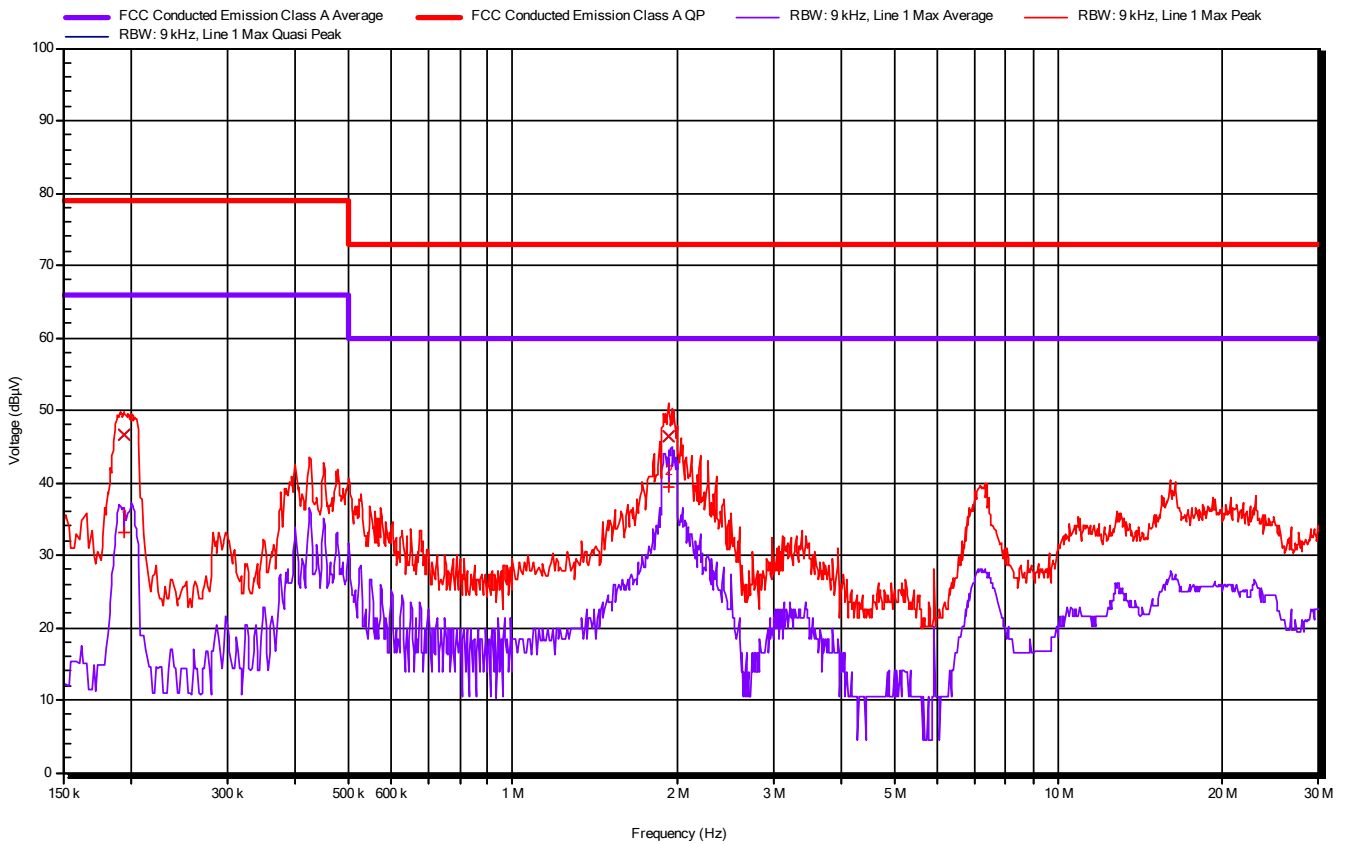
Plots of the accumulated measurement data, including all transducer correction factors are then produced and stored on file.



11.5 RESULTS

Mains Terminal Emission Measurements – Active Line							
Frequency (MHz)	Quasi-peak (dBμV)	Quasi-peak Limit (dBμV)	Delta QP Limit (dB)	Average (dBμV)	Average Limit (dBμV)	Delta AVG Limit (dB)	Result
0.194	46.6	79	-32.4	33	66	-33	Pass
1.926	46.4	73	-26.6	39.4	60	-20.6	Pass

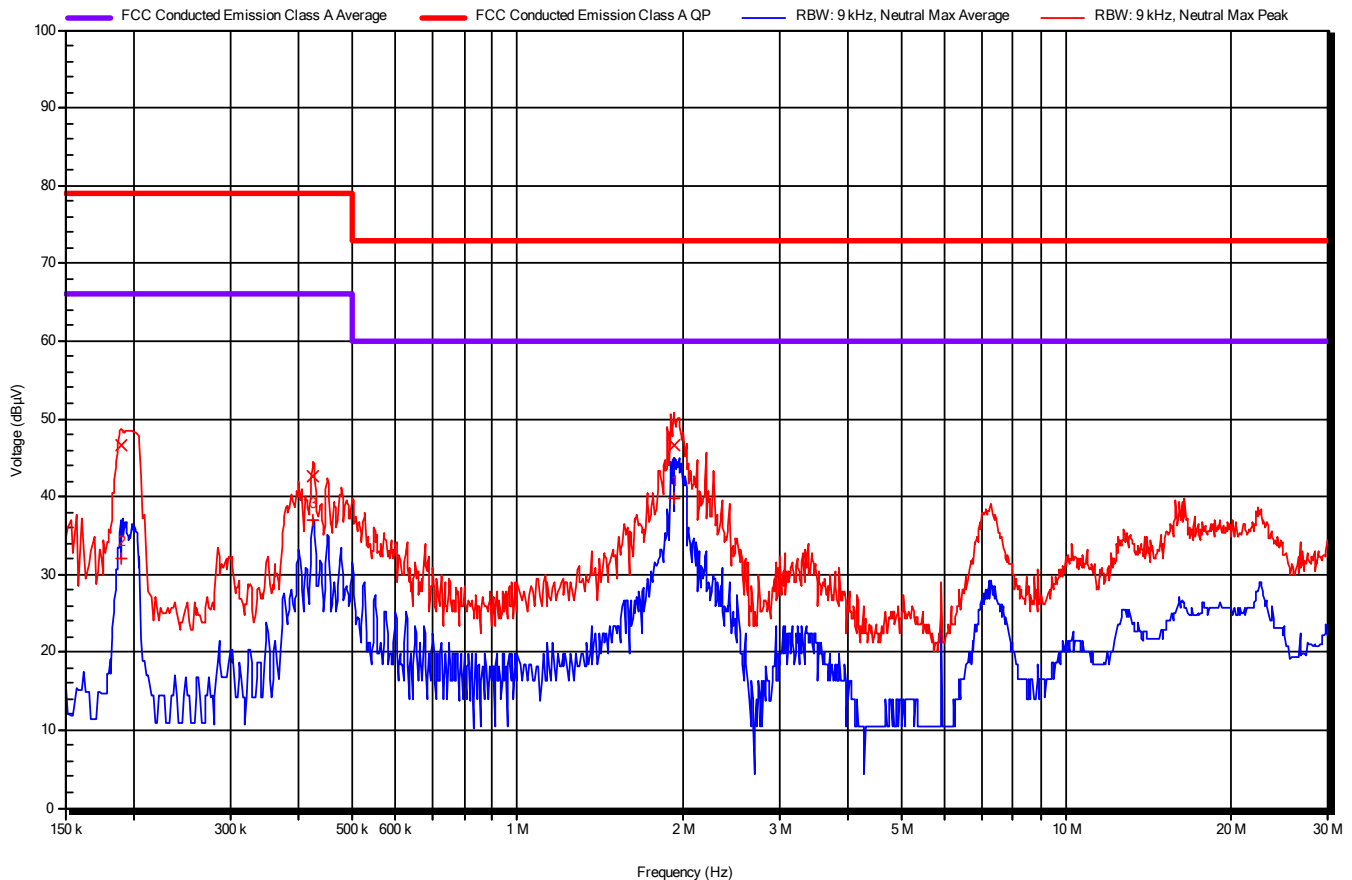
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Mains Terminal Emission Measurements – Neutral Line							
Frequency (MHz)	Quasi-peak (dBμV)	Quasi-peak Limit (dBμV)	Delta QP Limit (dB)	Average (dBμV)	Average Limit (dBμV)	Delta AVG Limit (dB)	Result
1.926	46.6	73	-26.4	39.9	60	-20.1	Pass
0.190	46.5	79	-32.5	32.0	66	-34.0	Pass
0.424	42.7	79	-36.3	36.9	66	-29.1	Pass

RadiMation



11.6 ASSESSMENT

The TLS20GW1 B0EMCB07 (Model No: TLS20GW1 B0EMCB07) complied with the CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class A limits) conducted RF emission requirements.

12. CONCLUSION

The **TLS20GW1 B0EMCB07 (Model No: TLS20GW1 B0EMCB07)** Complies with the conducted and radiated RF emission requirements detailed in CFR 47, Chapter 1, Subpart A, Part 15, Subpart B (Class A limits).