EMC TEST REPORT

Applicant	Flextronics (Shanghai) Co., Ltd
FCC ID	2AP3PAPOC
Product	AT100 series (AT100, AT130) – Wired asset tracker TT400 series (TT400, TT401) – Wired trailer tracker FT500 series (FT500) – In-cab telematics tracker
Model	AT100-LM0Q-GL,AT130-LM0Q-GL, TT400-LM0Q-GL,FT500-LM0Q-GL TT401-LM0Q-GL
Report No.	R1908A0461-E1
Issue Date	November 22, 2019

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC Code CFR47 Part15B (2018)/ ANSI C63.4 (2014)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Wei Liu — *Performed by: Wei Liu/ Manager*

Guangchang Fan — *Approved by: Guangchang Fan/ Director*

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Summary of measurement results

Number	Test Case	Clause in FCC Rules	Conclusion
1	Radiated Emission	FCC Part15.109, ANSI C63.4-2014	PASS
2	Conducted Emission	FCC Part15.107, ANSI C63.4-2014	PASS
Test Date: August 26, 2019 ~ October 31, 2019			

1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein .Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2 Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City:	Shanghai
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2 General Description of Equipment under Test

2.1 Applicant and Manufacturer Information

Applicant	Flextronics (Shanghai) Co., Ltd
Applicant address	4F, Bldg. 10, No. 3000 Longdong Ave., Pudong New District, Shanghai, China, 201203
Manufacturer	Flex Industrial, Ltd.
Manufacturer address	Level 3, Alexander House, 35 Cybercity, Ebene, Mauritius

2.2 General information

EUT Description			
Device Type:	Portable Device		
Model:	AT100-LM0Q-GL, AT130-LM0Q-GL, TT400-LM0Q-GL, FT500-LM0Q-GL, TT401-LM0Q-GL		
IMEI:	866425038986982		
HW Version:	P2.1		
SW Version:	2.1.29		
Antenna Type:	Internal Antenna		
Frequency:	Band	Tx (MHz)	Rx (MHz)
	GSM 850	824 ~ 849	869 ~ 894
	GSM 1900	1850 ~ 1910	1930 ~ 1990
	LTE Band 2	1850 ~ 1910	1930 ~ 1990
	LTE Band 4	1710 ~ 1755	2110 ~ 2155
	LTE Band 5	824 ~ 849	869 ~ 894
	LTE Band 12	699 ~ 716	729 ~ 746
	LTE Band 13	777 ~ 787	746 ~ 756
	LTE Band 26	824 ~ 849	869 ~ 894
	NB-IOT Band 2	1850 ~ 1910	1930 ~ 1990
	NB-IOT Band 4	1710 ~ 1755	2110 ~ 2155
	NB-IOT Band 5	824 ~ 849	869 ~ 894
	NB-IOT Band 12	699 ~ 716	729 ~ 746
	NB-IOT Band 13	777 ~ 787	746 ~ 756
	NB-IOT Band 26	824 ~ 849	869 ~ 894
	Bluetooth:	2402 ~ 2480	2402 ~ 2480

Modulation:	GSM: GMSK GPRS: GMSK EGPRS: GMSK/8PSK LTE: QPSK / 16QAM NB-IOT: BPSK, QPSK Bluetooth v5.0 LE: GFSK
EUT Accessory	
Battery 1 (AT100-LM0Q-GL, FT500-LM0Q-GL)	Manufacturer: Hangzhou Future Power Technology Co., Ltd Model: FT553561P
Battery2 (AT130-LM0Q-GL, TT400-LM0Q-GL, TT401-LM0Q-GL)	Manufacturer: INVENTUS POWER, INC. – DESIGN CENTER Model: 57484-001
Note: 1.The information of the EUT is declared by the manufacturer. 2. There are more than one Battery, each one should be applied throughout the compliance test respectively, however, only the worst case (Battery1) will be recorded in this report.	

The difference between AT100-LM0Q-GL, AT130-LM0Q-GL, TT400-LM0Q-GL, FT500-LM0Q-GL, TT401-LM0Q-GL please refer to *APOC Difference Information.*
However, only the worst model FT500-LM0Q-GL will be recorded in this report.

2.3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards
FCC Code CFR47 Part15B (2018)
ANSI C63.4 (2014)

2.4 Test Mode

Test Mode	
Mode 1	External Power Supply + EUT +Idle

3 Test Case Results

3.1 Radiated Emission

Ambient condition

Temperature	Relative humidity	Pressure
24°C~26°C	45%~50%	102.5kPa

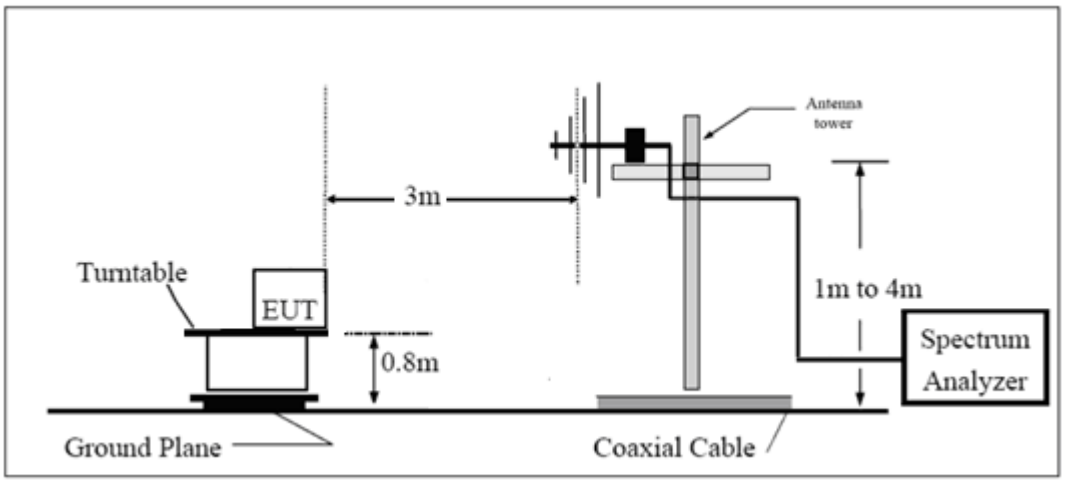
Methods of Measurement

The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The distance between EUT and receive antenna should be 3 meters. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier. During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turn table shall be rotated from 0 to 360 degrees for detecting the maximum of radiated signal level.
The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing. During the test, the EUT is worked at maximum output power.
Set the spectrum analyzer in the following:
Below 1GHz:
RBW=100 kHz / VBW=300 kHz / Sweep=AUTO
Above 1GHz:
(a) PEAK Detector: RBW=1MHz / VBW=3MHz/ Sweep=AUTO
(b) AVERAGE Detector: RBW=1MHz / VBW=3MHz / Sweep=AUTO

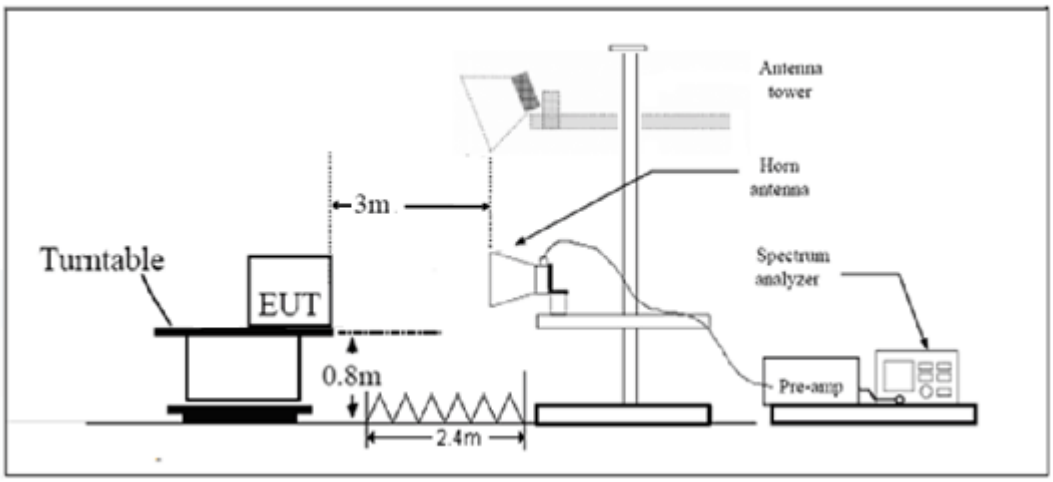
The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

Test Setup

Below 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Antenna Tower meets ANSI C63.4 requirements for measurements above 1 GHz by keeping the antenna aimed at the EUT during the antenna's ascent/ descent along the antenna mast.

Limits

Frequency (MHz)	Field Strength (dBμV/m)	Detector
30 -88	40.0	Quasi-peak
88-216	43.5	Quasi-peak
216 – 960	46.0	Quasi-peak
960-1000	54.0	Quasi-peak
1000-5th harmonic of the highest frequency or 40GHz,which is lower	54 74	Average Peak

Measurement Uncertainty

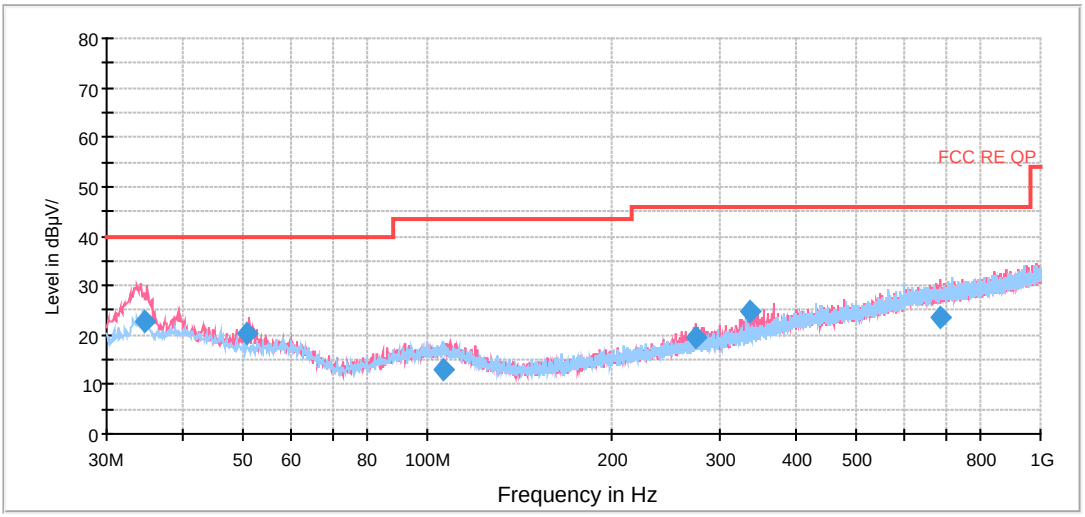
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
30MHz~200MHz	4.02 dB
200MHz~1000MHz	3.28 dB
1GHz~18GHz	3.70 dB
18GHz~26.5GHz	5.78 dB
26.5GHz~40GHz	5.82 dB

Test Results

Sweep the whole frequency band through the range from 30MHz to the 5th harmonic of the carrier, the Emissions in the frequency band 18GHz- 26.5GHz is more than 20dB below the limit are not reported.

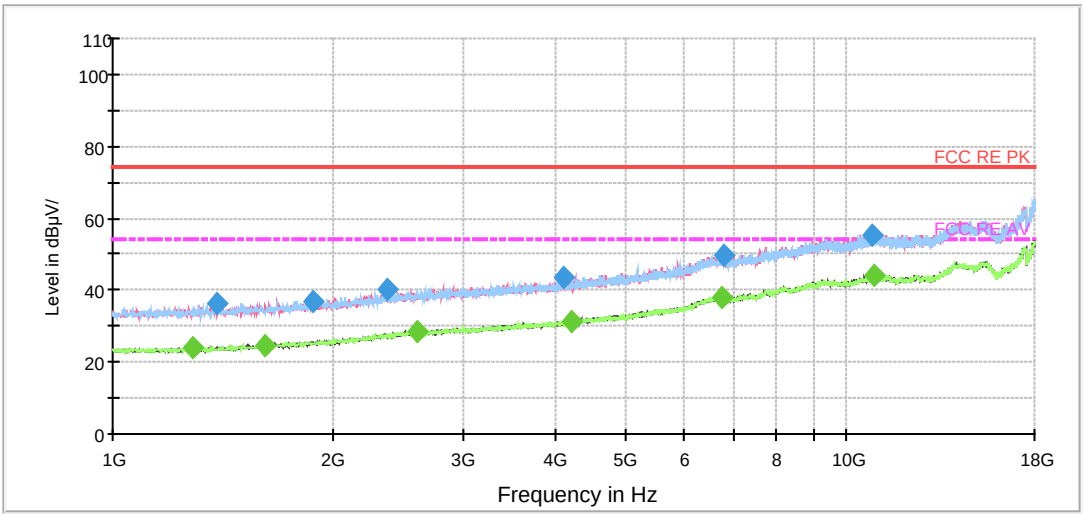
The following graphs display the maximum values of horizontal and vertical by software.
For above 1GHz, Blue trace uses the peak detection, Green trace uses the average detection.



Radiated Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
34.482500	22.8	100.0	V	26.0	16.1	17.2	40.0
50.860000	20.3	125.0	V	27.0	13.6	19.7	40.0
106.228750	13.0	125.0	H	237.0	13.5	30.5	43.5
273.637500	19.7	100.0	V	26.0	14.6	26.3	46.0
336.438750	24.6	114.0	V	0.0	16.9	21.4	46.0
684.752500	23.8	175.0	V	335.0	23.8	22.3	46.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)
2. Margin = Limit – Quasi-Peak



Radiated Emission from 1GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1382.500000	36.5	200.0	V	2.0	-10.7	37.5	74.0
1871.250000	36.7	100.0	V	161.0	-9.2	37.3	74.0
2360.000000	39.9	100.0	V	286.0	-7.0	34.1	74.0
4100.375000	43.4	200.0	H	357.0	-2.4	30.6	74.0
6799.125000	49.8	200.0	H	356.0	5.1	24.2	74.0
10804.750000	55.4	100.0	H	102.0	13.4	18.6	74.0

Frequency (MHz)	Average (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
1282.625000	24.0	200.0	H	60.0	-11.0	30.0	54.0
1607.750000	24.8	200.0	H	294.0	-10.0	29.2	54.0
2593.750000	28.5	100.0	H	121.0	-6.2	25.5	54.0
4223.625000	31.5	100.0	H	0.0	-2.1	22.5	54.0
6752.375000	38.0	100.0	V	286.0	5.0	16.0	54.0
10881.250000	44.2	200.0	V	17.0	13.5	9.8	54.0

3.2 Conducted Emission

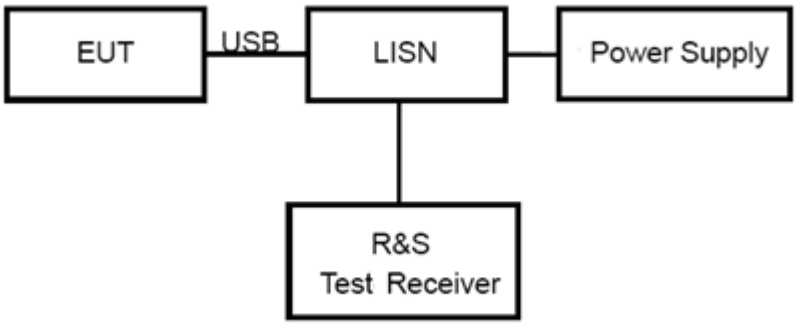
Ambient condition

Temperature	Relative humidity	Pressure
24°C ~26°C	50%~55%	102.5kPa

Methods of Measurement

The EUT is placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.4-2014. Connect the AC power line of the EUT to the L.I.S.N. Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9 kHz, VBW is set to 30kHz. The measurement result should include both L line and N line.

Test Setup



Note: Power Supply is AC Power source and it is used to change the voltage 120V/60Hz.

Limits

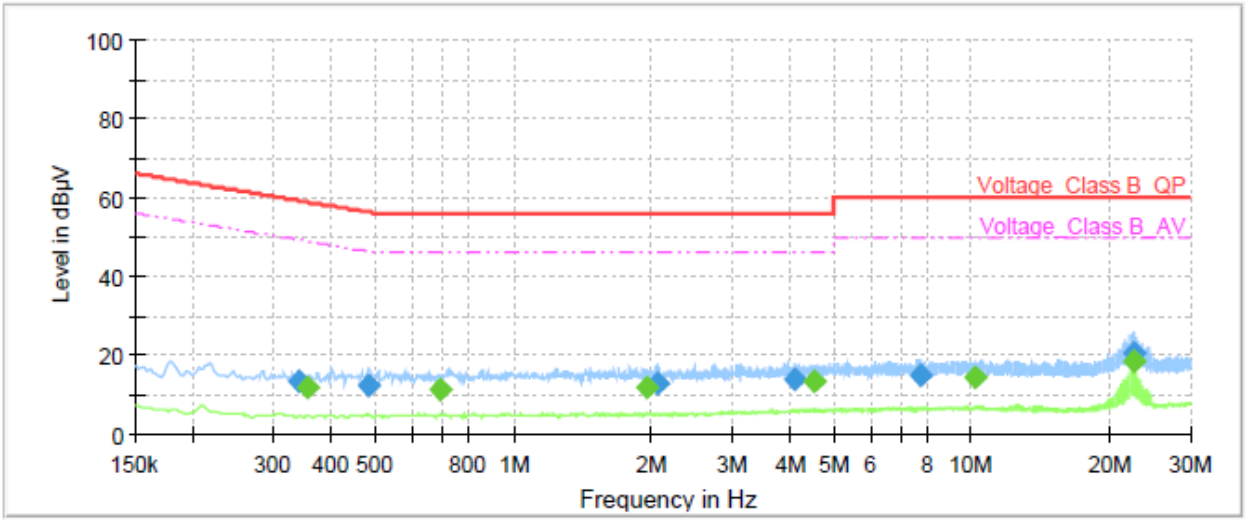
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96. U= 2.57 dB.

Test Results

Following plots, Blue trace uses the peak detection; Green trace uses the average detection.

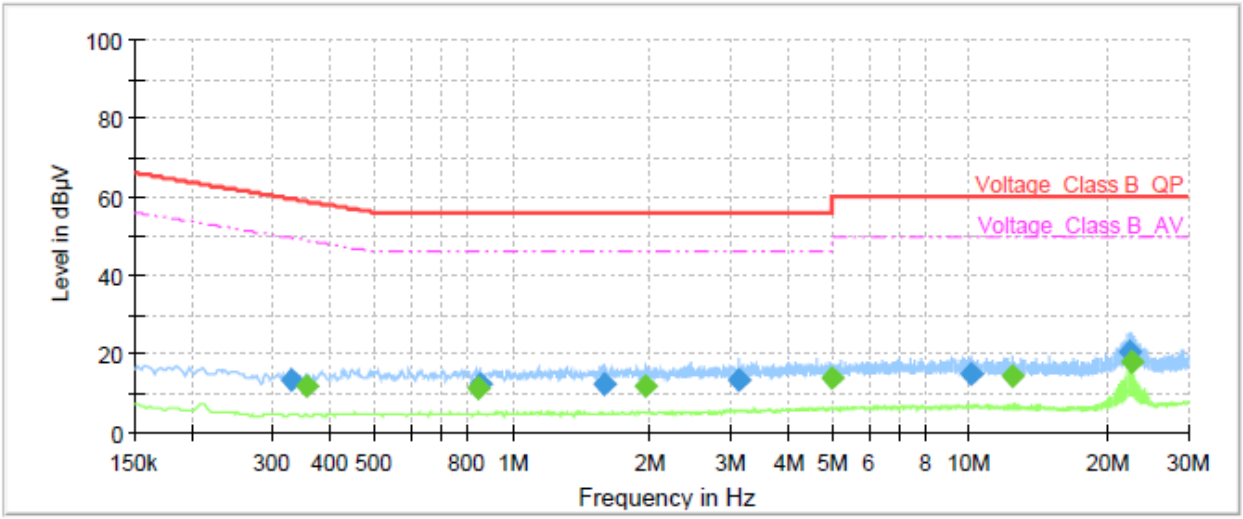


Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.34	13.33	---	59.17	45.84	1000.0	9.000	L1	ON	19.18
0.35	---	11.64	48.85	37.21	1000.0	9.000	L1	ON	19.18
0.48	12.40	---	56.29	43.89	1000.0	9.000	L1	ON	19.23
0.69	---	11.53	46.00	34.47	1000.0	9.000	L1	ON	19.28
1.96	---	11.88	46.00	34.12	1000.0	9.000	L1	ON	19.14
2.05	12.73	---	56.00	43.27	1000.0	9.000	L1	ON	19.11
4.11	13.98	---	56.00	42.02	1000.0	9.000	L1	ON	19.07
4.52	---	13.50	46.00	32.50	1000.0	9.000	L1	ON	19.10
7.76	14.65	---	60.00	45.35	1000.0	9.000	L1	ON	19.21
10.18	---	14.31	50.00	35.69	1000.0	9.000	L1	ON	19.41
22.53	---	18.38	50.00	31.62	1000.0	9.000	L1	ON	19.53
22.65	20.43	---	60.00	39.57	1000.0	9.000	L1	ON	19.55

Remark: Correct factor=cable loss + LISN factor

L line

Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.33	13.49	---	59.45	45.96	1000.0	9.000	N	ON	19.19
0.36	---	11.68	48.80	37.12	1000.0	9.000	N	ON	19.18
0.84	---	11.49	46.00	34.51	1000.0	9.000	N	ON	19.24
0.85	12.32	---	56.00	43.68	1000.0	9.000	N	ON	19.24
1.59	12.45	---	56.00	43.55	1000.0	9.000	N	ON	19.19
1.95	---	11.94	46.00	34.06	1000.0	9.000	N	ON	19.14
3.13	13.49	---	56.00	42.51	1000.0	9.000	N	ON	19.09
4.99	---	13.59	46.00	32.41	1000.0	9.000	N	ON	19.08
10.04	14.95	---	60.00	45.05	1000.0	9.000	N	ON	19.42
12.37	---	14.14	50.00	35.86	1000.0	9.000	N	ON	19.40
22.46	20.60	---	60.00	39.40	1000.0	9.000	N	ON	19.44
22.53	---	18.15	50.00	31.85	1000.0	9.000	N	ON	19.45

Remark: Correct factor=cable loss + LISN factor

N line

Conducted Emission from 150 KHz to 30 MHz

4 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Time
Spectrum Analyzer	R&S	FSV40	15195-01-00	2019-05-19	2020-05-18
EMI Test Receiver	R&S	ESCI	100948	2019-05-19	2020-05-18
Trilog Antenna	SCHWARZBECK	VULB 9163	9163-201	2017-11-18	2019-11-17
Horn Antenna	R&S	HF907	100126	2018-07-07	2020-07-06
Standard Gain Horn	ETS-Lindgren	3160-09	00102643	2018-06-20	2020-06-19
EMI Test Receiver	R&S	ESR	101667	2019-05-19	2020-05-18
LISN	R&S	ENV216	101171	2016-12-16	2019-12-15
Bore Sight Antenna mast	ETS	2171B	00058752	/	/
Test software	EMC32	R&S	9.26.0	/	/

*******END OF REPORT *******