

EMI TEST REPORT

FCC CERTIFICATION

Applicant:**JASTECH CO.,LTD****C-402, Pangyo-ro 242 Boondang-Gu Seongnam-Si
Gyeonggi-Do 13487 South Korea****Date of Issue: May 07, 2019****Test Report No. HCT-EM-1904-FC020-R1****Test Site: HCT CO., LTD.****FCC ID:****2ASMR-JTLC-2000**

Rule Part(s) / Standard(s) : FCC CFR 47 PART 15 Subpart B Class B
ANSI C63.4-2014

Model Name : JTLC-2000

EUT Type : von-U41

Manufacturer : JASTECH CO.,LTD

Date of Test : April 15, 2019 to April 21, 2019

The device bearing the trade name and model specified above, has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2014. (See Test Report if any modifications were made for compliance)

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

HCT certifies that no party to application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C 862

Tested By

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REVISION HISTORY

The revision history for this document is shown in table.

Test Report No.	Issue Date	Description
HCT-EM-1904-FC020	April 25, 2019	Initial Release
HCT-EM-1904-FC020-R1	May 07, 2019	Edit typos



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1. GENERAL INFORMATION

1.1 Description of EUT

The EUT is Vehicle Tracking and Diagnostic Device.

FCC ID	2ASMR-JTLC-2000
Model	JTLC-2000
EUT type	von-U41
Frequency band	LTE B2: TX 1 850 MHz to 1 910 MHz RX 1 930 MHz to 1 990 MHz LTE B5: TX 824 MHz to 849 MHz RX 869 MHz to 894 MHz LTE B26: TX 814 MHz to 849 MHz RX 859 MHz to 894 MHz
Power voltage	12 VDC to 24 VDC
Manufacturer	JASTECH CO.,LTD

1.2 Tested System Details

All equipment descriptions used in the tested system (including inserted cards) are:

Equipment	Model No.	Serial Number	Manufacturer
EUT	JTLC-2000	-	JASTECH
AC/DC Adaptor	SW42-12003500-W	-	POWER TEK
Notebook PC	ProBook6560b	5CB2053MXF	HP
Notebook PC Adaptor	Series PPP009L-E	-	LITE-ON TECHNOLOGY (CHANGZHOU)
Gateway	TL-WR747N	-	TP Link
Gateway Adaptor	T090060-2H1	-	TP Link
Mouse	AA-SM7PCP	CN57BA590363 4BDV8JK7B5029	Acrox Technologies
AC/DC Adaptor	SW42-12003500-W	-	POWER TEK
JIG	ECU sim 2000		ScanTool.net LLC
Battery 1	BX80L		ATLAS BX
Battery 2	BX80L		ATLAS BX



1.3 Cable Description

Product Name	Port	Power Cord Shielded (Y/N)	I/O Cable Shielded (Y/N)	Length (m)
EUT	DC IN (12V/24V)	N	N/A	(P)1.5
	I/O(DATA)	N/A	N	(D)1.8
	Micro USB	N/A	N	(D)1.2
Notebook PC	USB	N/A	N	(D) 1.2
	RJ 45	N/A	N	(D) 1.6
	Mouse	N/A	Y	(D) 1.8
	DC IN	N	N/A	(P) 1.8

1.4 Noise Suppression Parts on Cable. (I/O Cable)

Product Name	Port	Ferrite Bead (Y/N)	Location	Metal Hood (Y/N)	Location
EUT	DC IN (12V/24V)	N/A	N/A	Y	Both end
	I/O(DATA)	N/A	N/A	Y	Both end
	Micro USB	N/A	N/A	Y	Both end
Notebook PC	USB	N/A	N/A	Y	Both end
	RJ 45	N/A	N/A	Y	Both end
	Mouse	N/A	N/A	Y	Both end
	DC IN	Y	Notebook PC end	Y	Both end



1.5 Test Facility

Test site is located at 74, SEOICHEON-RO, 578BEON-GIL, MAJANG-MYEON, ICHEON-SI, GYEONGGI-DO, SOUTH KOREA. Those measurement facilities are constructed in conformance with the requirements of ANSI C63.4-2014. The Normalized site attenuations (30 MHz to 1GHz) and Site validation (1 GHz to 18 GHz) were performed in accordance with the standard in ANSI C63.4-2014

Measurement Facilities	Registration Number
Radiated Field strength measurement facility 3 m Semi Anechoic chamber	90661
Radiated Field strength measurement facility 10 m Semi Anechoic chamber	

1.6 Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturers recommendations for utilizing calibration equipment's, which is traceable to recognized national standards.

Especially, all antenna for measurement is calibrated in accordance with the requirements of C63.5 (Version : 2006).

1.7. Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded Uncertainty (dB)
Conducted Emission (0.15 MHz to 30 MHz)	1.82 dB
3 m Radiated Emissions (30 MHz to 1 GHz)	5.20 dB
3 m Radiated Emissions (1 GHz to 18 GHz)	5.24 dB
3 m Radiated Emissions (18 GHz to 40 GHz)	5.40 dB



2 LIST OF TEST EQUIPMENT

Type	Manufacturer	Model Name	Serial Number	Calibration Cycle	CAL Date
<u>Conducted Emission</u>					
☒ EMI Test Receiver	Rohde & Schwarz	ESCI	100584	1 year	06.25.2018
☒ LISN	Rohde & Schwarz	ENV216	102245	1 year	12.12.2018
☒ LISN	Rohde & Schwarz	ENV216	100073	1 year	05.03.2018
☒ Software	Rohde & Schwarz	EMC32 VER8.54.0	-	-	-
<u>Radiated Emission</u>					
-For measurement below 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	07.27.2018
☒ Trilog Antenna	Schwarzbeck	VULB 9168	760	2 year	03.22.2019
☒ Antenna master	INNCO Systems	MA4640-XP-ET	-	-	N/A
☒ Antenna master controller	INNCO Systems	CO3000	CO3000/870/35990515/L	-	N/A
☒ Turn Table	INNCO Systems	1060-2M	-	-	N/A
☒ Turn Table controller	INNCO Systems	CO2000	CO2000/095/7590304/L	-	N/A
☐ Low Noise Amplifier	TESTEK	TK-PA01S	160014-L	1 year	01.21.2019
☐ EMI Test Receiver	Rohde & Schwarz	ESU26	100241	1 year	08.14.2018
☐ EMI Test Receiver	Rohde & Schwarz	ESU40	100361	1 year	10.11.2018
☐ Antenna master	INNCO Systems	MA4000-EP	-	N/A	-
☐ Turn Table	INNCO Systems	DT6000/DT3000-5T	-	N/A	-
☒ Software	Rohde & Schwarz	EMC32 VER.9.20.00	-	-	-
-For measurement above 1 GHz					
☒ EMI Test Receiver	Rohde & Schwarz	ESU40	100524	1 year	07.27.2018
☒ Antenna master	INNCO Systems	MA4640-XP-ET	-	N/A	-
☒ Antenna master controller	INNCO Systems	CO 3000	CO 3000/870/35990515/L	N/A	-
☒ Turn Table	INNCO Systems	1060-2M	-	N/A	-
☒ Turn Table controller	INNCO Systems	CO2000	CO2000/095/5790304/L	N/A	-
☒ Horn Antenna	Schwarzbeck	BBHA 9120D	01836	2 year	05.14.2018
☒ Low Noise Amplifier	TESTEK	TK-PA18H	170034-L	1 year	03.04.2019
☐ Power Amplifier	TESTEK	TK-PA1840H	170030-L	1 year	12.17.2018
☐ Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170#786	2 year	12.05.2017
☐ Antenna master	HD GmbH	MA240	240/520	N/A	-
☐ EMI Test Receiver	Rohde & Schwarz	ESU26	100241	1 year	08.14.2018
☐ Turn Table	INNCO Systems	DT3000-3T	DT3000/69	N/A	-
☒ Software	Rohde & Schwarz	EMC32 VER8.40.0	-	-	-



3. DESCRIPTION OF TEST

3.1 Measurement of Conducted Emission

The test procedure was in accordance with ANSI C63.4-2014

- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN).
If the EUT is connected to the PC through USB, the AC power-line adapter of the PC is directly connected to a line impedance stabilization network (LISN).
Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both conducted lines are measured in Quasi-Peak and Average mode, including the worst-case data points for each tested configuration.
- c. The frequency range from 150 kHz to 30 MHz was searched.

[Conducted Emission Limit]

Frequency (MHz)	Resolution Bandwidth (kHz)	Class A		Class B	
		Quasi-Peak (dBμV)	Average (dBμV)	Quasi-Peak (dBμV)	Average (dBμV)
0.15 to 0.5	9	79	66	66 to 56*	56 to 46*
0.5 to 5	9	73	60	56	46
5 to 30	9	73	60	60	50

**Decreases with the logarithm of the frequency.*



3.2 Measurement of Radiated Emission

The test procedure was in accordance with ANSI C63.4-2014

- The EUT was placed on the top of a turn table 0.8 meters above the ground at a semi anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 m away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from 1 m to 4 m above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 m to 4 m and the turn table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- The test-receiver system was set to Peak and Average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. (1 GHz to 40 GHz)

[Radiated Emission Limits]

Frequency (MHz)	Class A			Class B		
	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)	Antenna Distance (m)	Field Strength (μV/m)	Quasi-Peak (dBμV/m)
30 to 88	10	90	39.0	3	100	40.0
88 to 216	10	150	43.5	3	150	43.5
216 to 960	10	210	46.4	3	200	46.0
Above 960	10	300	49.5	3	500	54.0
Frequency (MHz)	Antenna Distance (m)	Class A		Class B		
		Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)	
Above 1 000	3	80	60	74	54	

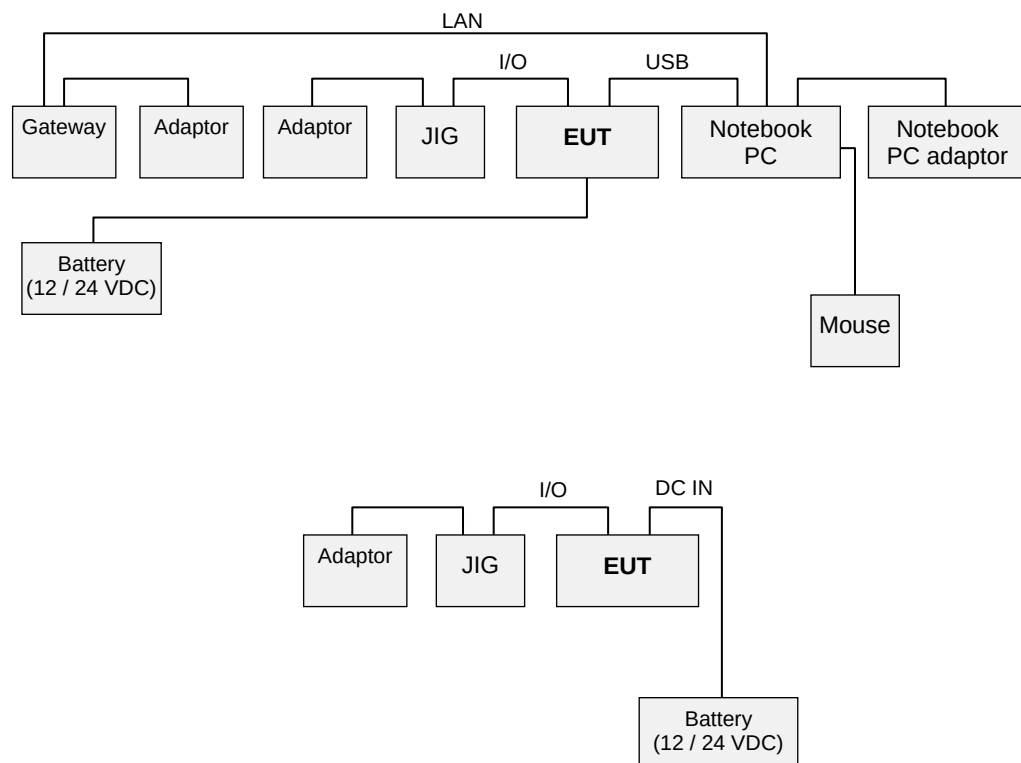


3.2.1 Frequency Range of Radiated Measurements

An unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a Radiated Emission limit is specified, up to the frequency shown in the following table

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 to 108	1 000
108 to 500	2 000
500 to 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

3.3 Configuration of Tested System





4. PRELIMINARY TEST

4.1 Conducted Emission

During preliminary tests, the following operating mode was investigated:

Operation Mode:

DATA LINK mode
OBD +GPS+ LTE 2 BAND RX Receiving mode
OBD +GPS+ LTE 26 BAND RX Receiving mode

NOTE.

1. All mode of operation were verified and the worst case configuration result was indicated in test report.
2. The 5th LTE band is included in the 26th LTE band frequency band.

4.2 Radiated Emission

During preliminary tests, the following operating mode was investigated:

Operation Mode:

DATA LINK mode
OBD +GPS+ LTE 2 BAND RX Receiving mode
OBD +GPS+ LTE 26 BAND RX Receiving mode

NOTE.

1. All mode of operation were verified and the worst case configuration result was indicated in test report.
2. The 5th LTE band is included in the 26th LTE band frequency band.



5. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

5.1 Conducted Emission

The test results of conducted emission at mains ports provide the following information:

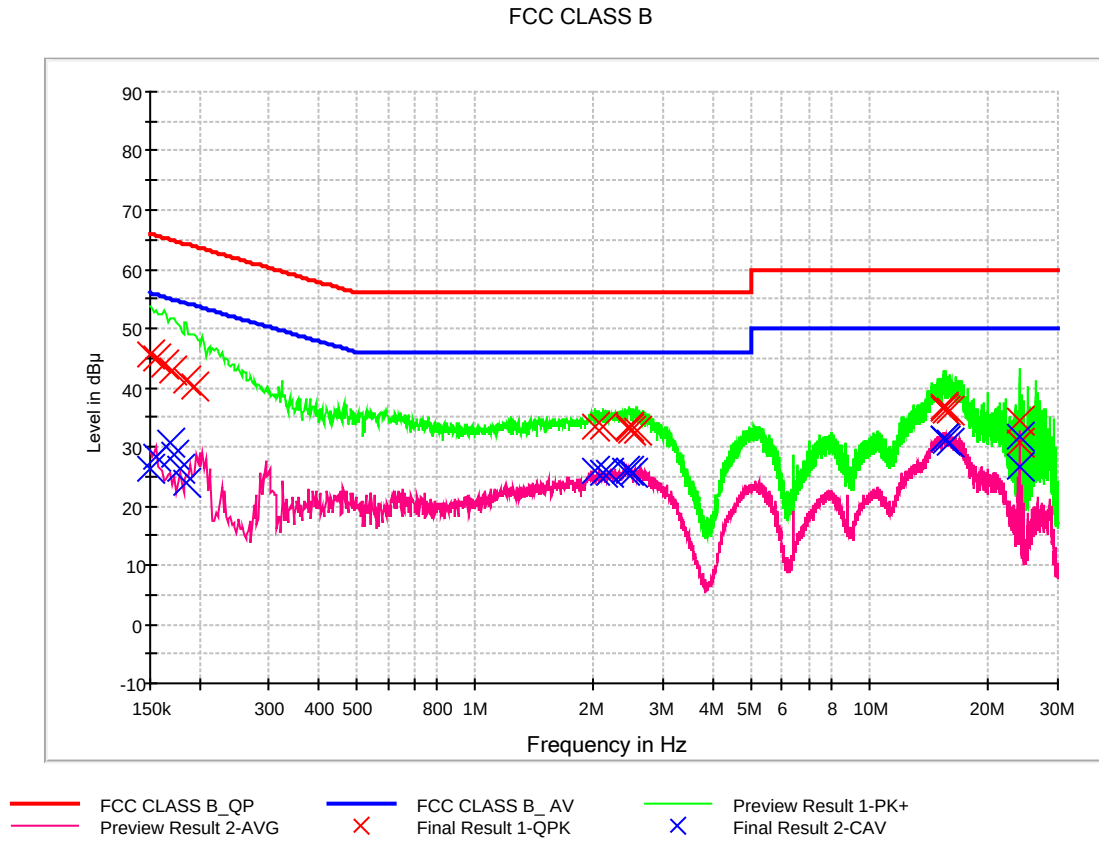
Applicable Standards	FCC PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Kind of Test Site	Shielded Room
Temperature	21.5 °C
Relative Humidity	42.6 %
Test Date	April 15, 2019

- Calculation Formula:

1. Conductor L1 = Hot, Conductor N = Neutral
2. Corr. = LISN Factor + Cable Loss
3. QuasiPeak or CAverage= Receiver Reading + Corr.
4. Margin = Limit – QuasiPeak or CAverage



Figure 1: Conducted Emission, DATA LINK mode, Line (L1)





QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	45.7	9.000	L1	9.6	20.3	66.0
0.156000	44.8	9.000	L1	9.6	20.8	65.7
0.162000	44.1	9.000	L1	9.6	21.3	65.4
0.170000	43.0	9.000	L1	9.6	22.0	65.0
0.186000	41.1	9.000	L1	9.7	23.1	64.2
0.194000	40.2	9.000	L1	9.7	23.7	63.9
2.004000	33.3	9.000	L1	9.7	22.7	56.0
2.110000	33.3	9.000	L1	9.7	22.7	56.0
2.450000	33.2	9.000	L1	9.8	22.8	56.0
2.456000	33.2	9.000	L1	9.8	22.8	56.0
2.476000	32.9	9.000	L1	9.8	23.1	56.0
2.568000	32.6	9.000	L1	9.8	23.4	56.0
15.434000	36.5	9.000	L1	10.1	23.5	60.0
15.450000	36.9	9.000	L1	10.1	23.1	60.0
15.496000	36.0	9.000	L1	10.1	24.0	60.0
15.868000	35.9	9.000	L1	10.1	24.1	60.0
24.000000	34.3	9.000	L1	10.2	25.7	60.0
24.096000	30.8	9.000	L1	10.2	29.2	60.0

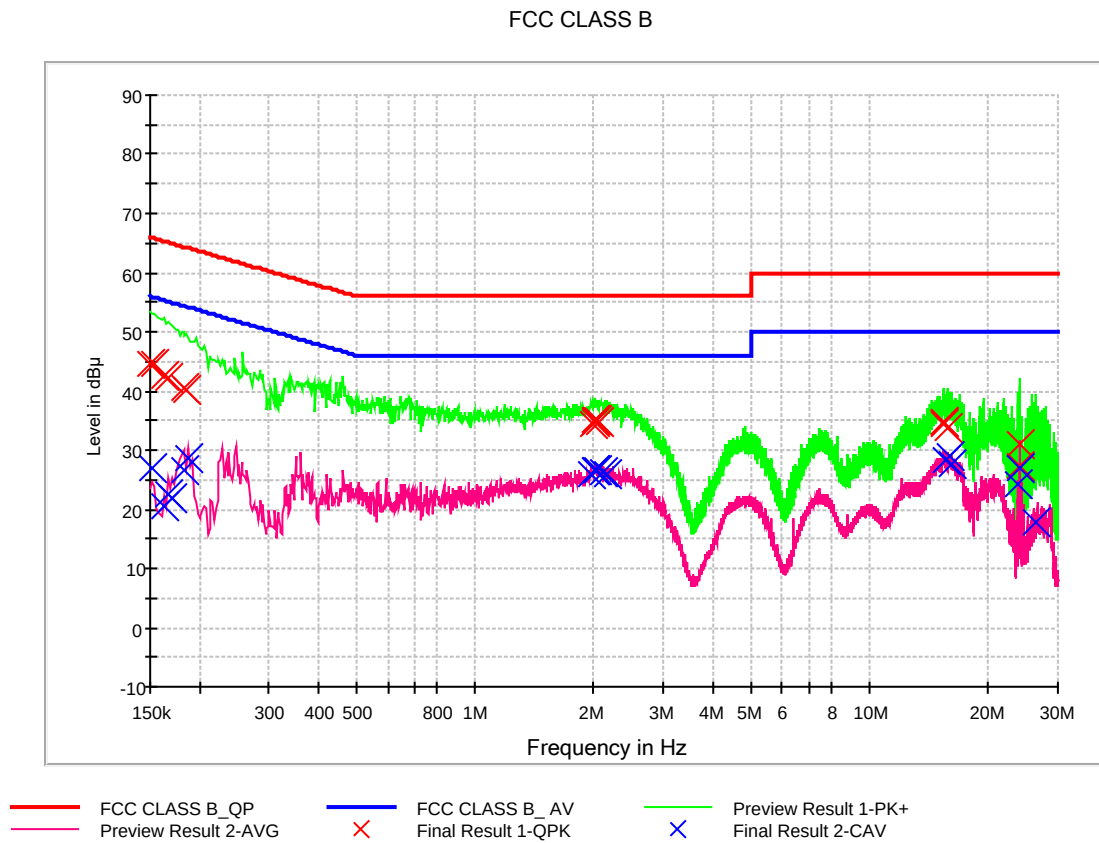


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	26.2	9.000	L1	9.6	29.8	56.0
0.156000	28.4	9.000	L1	9.6	27.2	55.7
0.168000	30.6	9.000	L1	9.6	24.5	55.1
0.172000	28.7	9.000	L1	9.6	26.2	54.9
0.178000	26.2	9.000	L1	9.6	28.4	54.6
0.186000	23.8	9.000	L1	9.7	30.4	54.2
2.004000	25.8	9.000	L1	9.7	20.2	46.0
2.110000	25.8	9.000	L1	9.7	20.2	46.0
2.186000	25.7	9.000	L1	9.7	20.3	46.0
2.402000	25.9	9.000	L1	9.8	20.1	46.0
2.450000	25.8	9.000	L1	9.8	20.2	46.0
2.514000	25.7	9.000	L1	9.8	20.3	46.0
15.434000	31.2	9.000	L1	10.1	18.8	50.0
15.442000	31.5	9.000	L1	10.1	18.5	50.0
15.552000	31.0	9.000	L1	10.1	19.0	50.0
15.868000	30.7	9.000	L1	10.1	19.3	50.0
24.000000	31.6	9.000	L1	10.2	18.4	50.0
24.096000	26.7	9.000	L1	10.2	23.3	50.0



Figure 2: Conducted Emission, DATA LINK mode, Line (N)





QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	44.6	9.000	N	9.6	21.4	66.0
0.154000	44.5	9.000	N	9.6	21.3	65.8
0.162000	42.6	9.000	N	9.6	22.8	65.4
0.166000	42.1	9.000	N	9.6	23.1	65.2
0.182000	40.6	9.000	N	9.6	23.8	64.4
0.186000	40.3	9.000	N	9.6	23.9	64.2
1.982000	34.4	9.000	N	9.7	21.6	56.0
2.004000	34.9	9.000	N	9.7	21.1	56.0
2.014000	35.1	9.000	N	9.7	20.9	56.0
2.022000	35.1	9.000	N	9.7	20.9	56.0
2.030000	34.9	9.000	N	9.7	21.1	56.0
2.056000	34.8	9.000	N	9.7	21.2	56.0
15.440000	34.5	9.000	N	10.1	25.5	60.0
15.448000	34.7	9.000	N	10.1	25.3	60.0
15.458000	34.9	9.000	N	10.1	25.1	60.0
15.830000	33.6	9.000	N	10.1	26.4	60.0
23.898000	31.1	9.000	N	10.2	28.9	60.0
23.994000	27.5	9.000	N	10.2	32.5	60.0

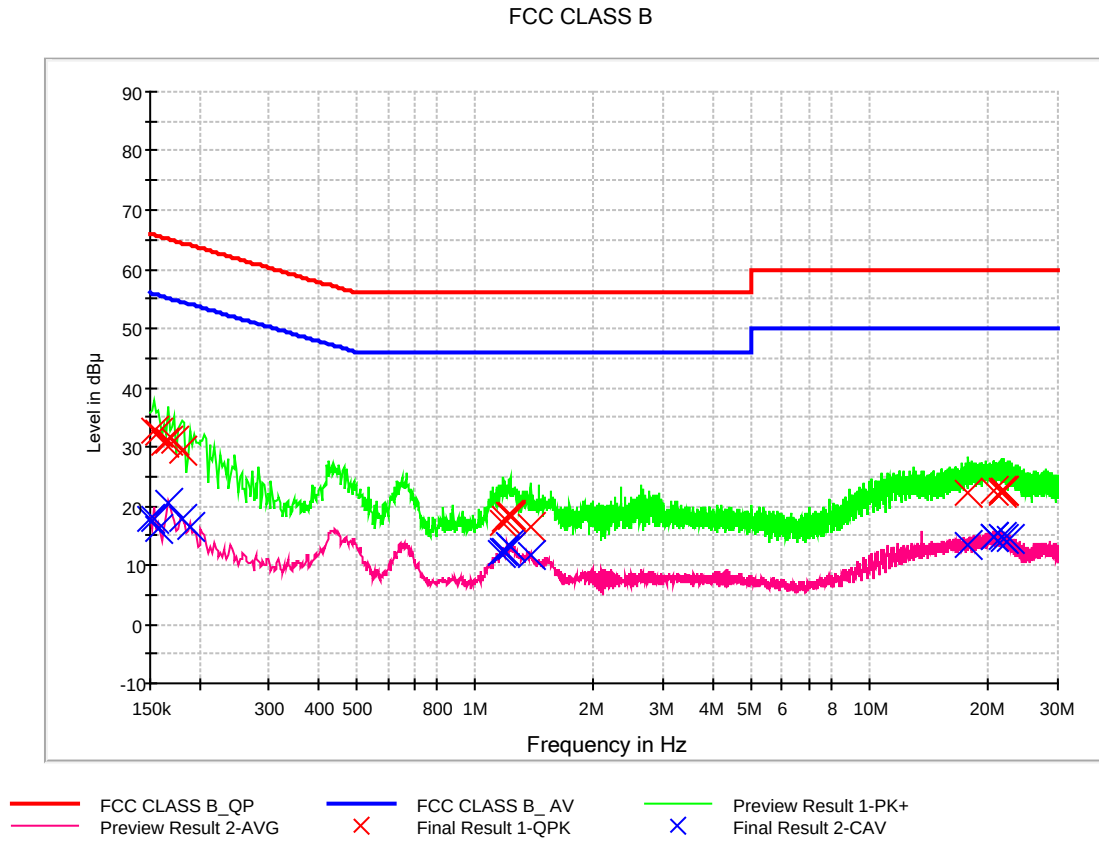


CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	26.8	9.000	N	9.6	29.1	55.9
0.162000	20.5	9.000	N	9.6	34.8	55.4
0.166000	22.6	9.000	N	9.6	32.6	55.2
0.170000	21.9	9.000	N	9.6	33.0	55.0
0.182000	26.5	9.000	N	9.6	27.9	54.4
0.188000	28.5	9.000	N	9.6	25.6	54.1
1.968000	26.0	9.000	N	9.7	20.0	46.0
2.012000	26.7	9.000	N	9.7	19.3	46.0
2.024000	26.8	9.000	N	9.7	19.2	46.0
2.030000	26.8	9.000	N	9.7	19.2	46.0
2.100000	26.1	9.000	N	9.7	19.9	46.0
2.154000	25.9	9.000	N	9.7	20.1	46.0
15.508000	28.2	9.000	N	10.1	21.8	50.0
15.932000	28.9	9.000	N	10.1	21.1	50.0
16.202000	27.6	9.000	N	10.1	22.4	50.0
23.802000	24.4	9.000	N	10.2	25.6	50.0
23.898000	26.8	9.000	N	10.2	23.2	50.0
26.516000	17.8	9.000	N	10.3	32.2	50.0



Figure 3: Conducted Emission, OBD +GPS+ LTE 2 Band (Middle) RX Receiving mode, Line (L1)





QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	32.7	9.000	L1	9.6	33.1	65.8
0.158000	32.5	9.000	L1	9.6	33.1	65.6
0.162000	30.7	9.000	L1	9.6	34.6	65.4
0.166000	31.1	9.000	L1	9.6	34.1	65.2
0.172000	31.1	9.000	L1	9.6	33.8	64.9
0.180000	29.5	9.000	L1	9.6	35.0	64.5
1.180000	17.3	9.000	L1	9.7	38.7	56.0
1.186000	17.7	9.000	L1	9.7	38.3	56.0
1.216000	18.5	9.000	L1	9.7	37.5	56.0
1.226000	18.3	9.000	L1	9.7	37.7	56.0
1.230000	18.0	9.000	L1	9.7	38.0	56.0
1.378000	16.4	9.000	L1	9.8	39.6	56.0
17.826000	22.1	9.000	L1	10.1	37.9	60.0
20.708000	22.6	9.000	L1	10.2	37.4	60.0
21.530000	22.3	9.000	L1	10.2	37.7	60.0
21.746000	22.5	9.000	L1	10.2	37.5	60.0
21.764000	22.6	9.000	L1	10.2	37.4	60.0
21.980000	22.5	9.000	L1	10.2	37.5	60.0

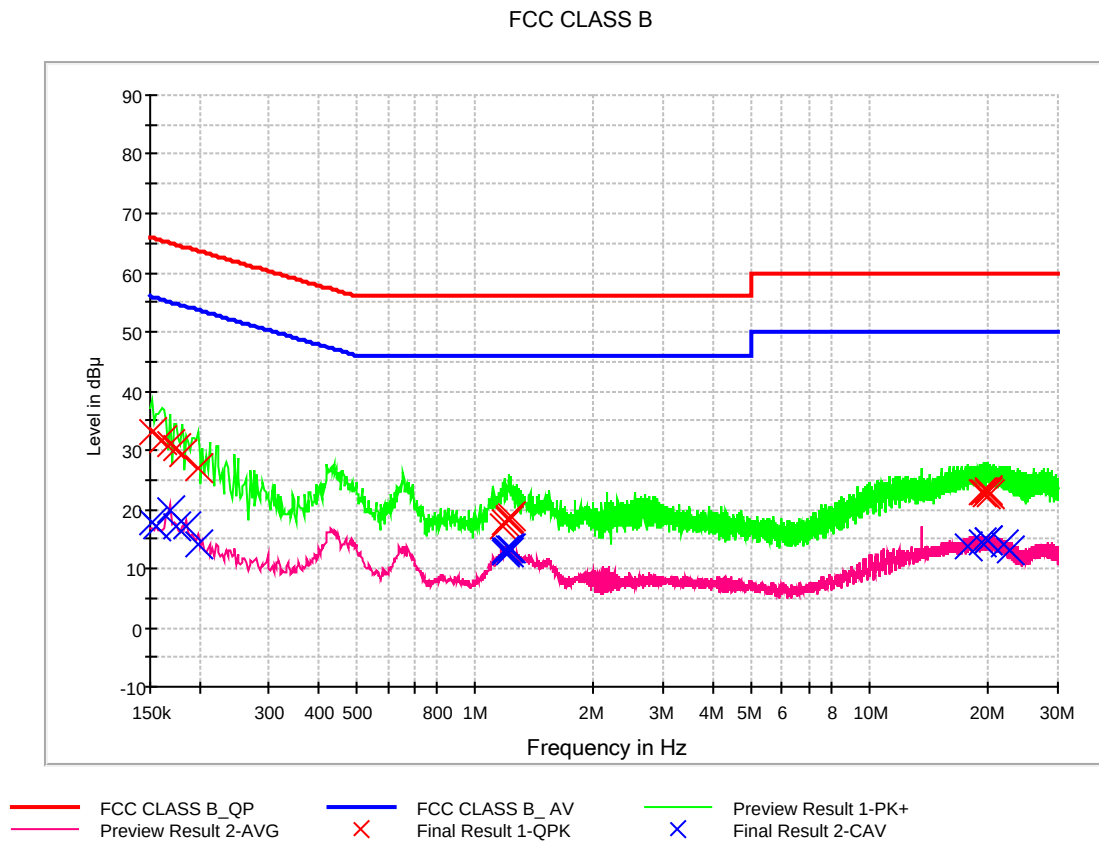


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	17.9	9.000	L1	9.6	38.1	56.0
0.154000	17.7	9.000	L1	9.6	38.1	55.8
0.158000	16.1	9.000	L1	9.6	39.5	55.6
0.166000	20.4	9.000	L1	9.6	34.7	55.2
0.180000	17.8	9.000	L1	9.6	36.7	54.5
0.190000	16.3	9.000	L1	9.7	37.7	54.0
1.162000	11.9	9.000	L1	9.7	34.1	46.0
1.180000	12.2	9.000	L1	9.7	33.8	46.0
1.194000	12.5	9.000	L1	9.7	33.5	46.0
1.214000	13.3	9.000	L1	9.7	32.7	46.0
1.226000	13.0	9.000	L1	9.7	33.0	46.0
1.378000	11.8	9.000	L1	9.8	34.2	46.0
17.826000	13.5	9.000	L1	10.1	36.5	50.0
20.560000	14.9	9.000	L1	10.2	35.1	50.0
20.708000	14.6	9.000	L1	10.2	35.4	50.0
21.746000	14.6	9.000	L1	10.2	35.4	50.0
21.764000	14.5	9.000	L1	10.2	35.5	50.0
22.592000	14.3	9.000	L1	10.2	35.7	50.0



Figure 4: Conducted Emission, OBD +GPS+ LTE 2 Band (Middle) RX Receiving mode, Line (N)





QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	33.1	9.000	N	9.6	32.8	65.9
0.160000	31.6	9.000	N	9.6	33.9	65.5
0.168000	30.9	9.000	N	9.6	34.2	65.1
0.174000	30.3	9.000	N	9.6	34.5	64.8
0.180000	29.4	9.000	N	9.6	35.1	64.5
0.198000	27.0	9.000	N	9.6	36.7	63.7
1.178000	17.2	9.000	N	9.7	38.8	56.0
1.184000	17.8	9.000	N	9.7	38.2	56.0
1.214000	18.6	9.000	N	9.7	37.4	56.0
1.218000	18.1	9.000	N	9.7	37.9	56.0
1.224000	18.6	9.000	N	9.7	37.4	56.0
1.236000	18.7	9.000	N	9.7	37.3	56.0
19.148000	22.9	9.000	N	10.1	37.1	60.0
19.428000	22.8	9.000	N	10.1	37.2	60.0
19.784000	22.6	9.000	N	10.2	37.4	60.0
19.856000	23.2	9.000	N	10.2	36.8	60.0
19.976000	22.8	9.000	N	10.2	37.2	60.0
20.124000	22.5	9.000	N	10.2	37.5	60.0

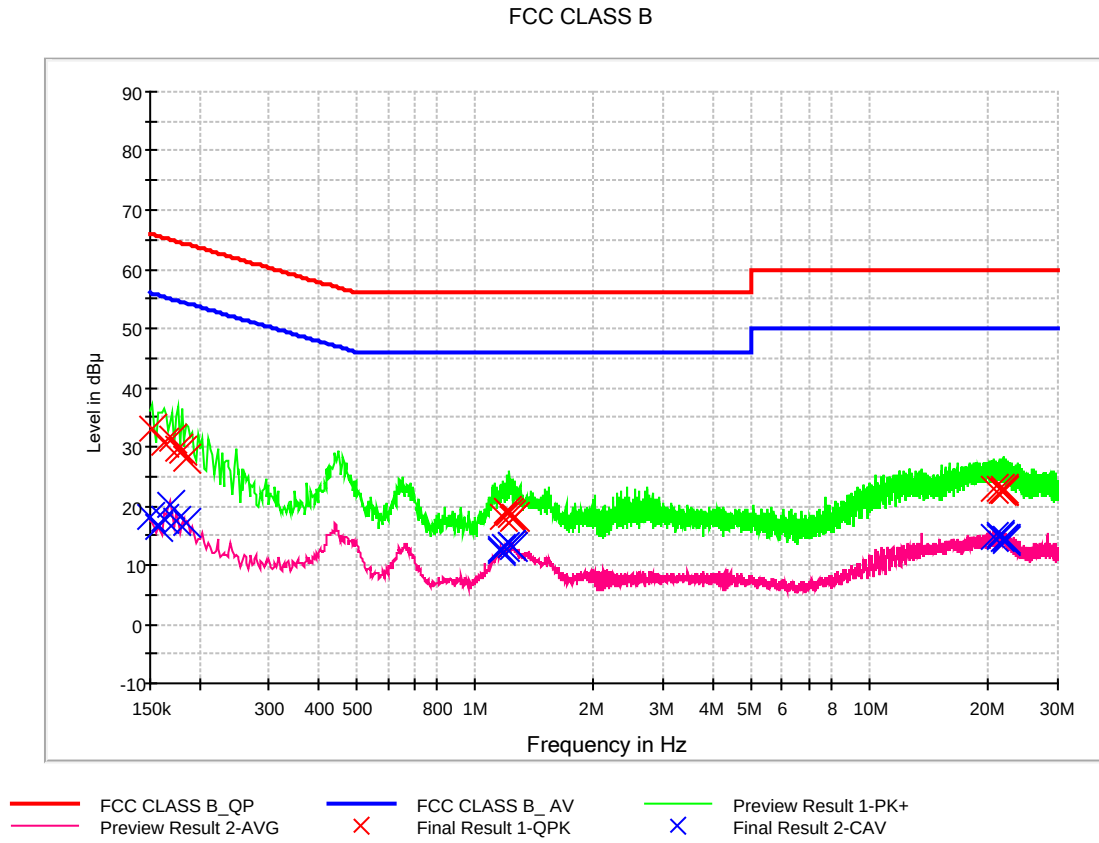


CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	17.7	9.000	N	9.6	38.2	55.9
0.156000	17.1	9.000	N	9.6	38.6	55.7
0.168000	19.8	9.000	N	9.6	35.2	55.1
0.174000	17.0	9.000	N	9.6	37.8	54.8
0.186000	17.0	9.000	N	9.6	37.2	54.2
0.198000	13.9	9.000	N	9.6	39.8	53.7
1.184000	12.7	9.000	N	9.7	33.3	46.0
1.192000	13.0	9.000	N	9.7	33.0	46.0
1.210000	13.1	9.000	N	9.7	32.9	46.0
1.214000	13.3	9.000	N	9.7	32.7	46.0
1.222000	12.8	9.000	N	9.7	33.2	46.0
1.234000	13.3	9.000	N	9.7	32.7	46.0
17.788000	13.8	9.000	N	10.1	36.2	50.0
19.238000	14.4	9.000	N	10.1	35.6	50.0
19.902000	14.9	9.000	N	10.2	35.1	50.0
19.976000	14.6	9.000	N	10.2	35.4	50.0
21.786000	14.0	9.000	N	10.2	36.0	50.0
22.528000	13.2	9.000	N	10.2	36.8	50.0



Figure 5: Conducted Emission, OBD +GPS+ LTE 26 band (LOW) RX Receiving mode, Line (L1)





QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	33.2	9.000	L1	9.6	32.7	65.9
0.162000	30.8	9.000	L1	9.6	34.6	65.4
0.170000	31.4	9.000	L1	9.6	33.6	65.0
0.176000	29.8	9.000	L1	9.6	34.9	64.7
0.180000	29.4	9.000	L1	9.6	35.1	64.5
0.186000	27.8	9.000	L1	9.7	36.4	64.2
1.180000	18.1	9.000	L1	9.7	37.9	56.0
1.210000	19.2	9.000	L1	9.7	36.8	56.0
1.224000	18.8	9.000	L1	9.7	37.2	56.0
1.230000	18.6	9.000	L1	9.7	37.4	56.0
1.248000	17.8	9.000	L1	9.7	38.2	56.0
1.258000	18.0	9.000	L1	9.8	38.0	56.0
20.536000	22.8	9.000	L1	10.2	37.2	60.0
21.324000	22.8	9.000	L1	10.2	37.2	60.0
21.728000	22.5	9.000	L1	10.2	37.5	60.0
21.760000	22.6	9.000	L1	10.2	37.4	60.0
21.794000	22.7	9.000	L1	10.2	37.3	60.0
21.820000	22.7	9.000	L1	10.2	37.3	60.0

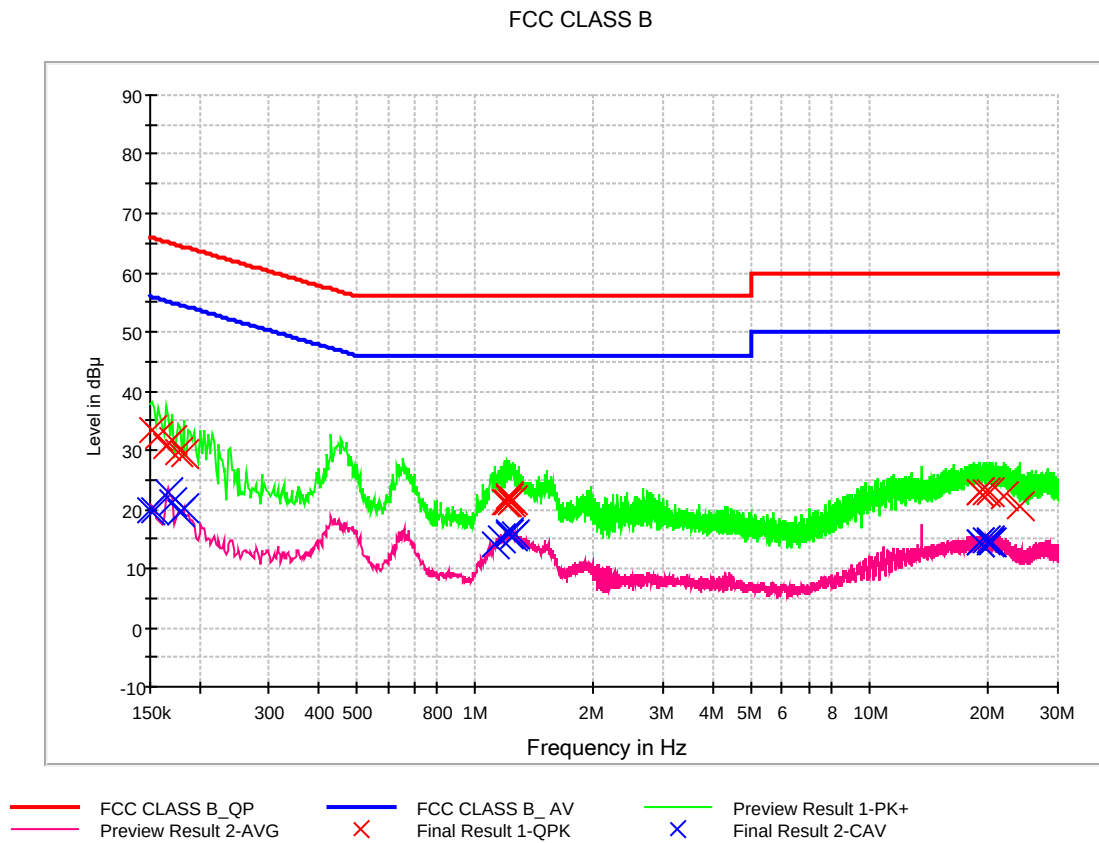


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	18.0	9.000	L1	9.6	38.0	56.0
0.158000	16.4	9.000	L1	9.6	39.2	55.6
0.162000	17.9	9.000	L1	9.6	37.5	55.4
0.168000	20.3	9.000	L1	9.6	34.8	55.1
0.174000	17.3	9.000	L1	9.6	37.5	54.8
0.186000	17.0	9.000	L1	9.7	37.2	54.2
1.156000	12.5	9.000	L1	9.7	33.5	46.0
1.168000	12.7	9.000	L1	9.7	33.3	46.0
1.188000	13.0	9.000	L1	9.7	33.0	46.0
1.230000	13.3	9.000	L1	9.7	32.7	46.0
1.238000	13.5	9.000	L1	9.7	32.5	46.0
1.248000	13.1	9.000	L1	9.7	32.9	46.0
20.536000	14.7	9.000	L1	10.2	35.3	50.0
21.284000	15.0	9.000	L1	10.2	35.0	50.0
21.324000	14.9	9.000	L1	10.2	35.1	50.0
21.760000	14.6	9.000	L1	10.2	35.4	50.0
22.182000	14.2	9.000	L1	10.2	35.8	50.0
22.230000	14.4	9.000	L1	10.2	35.6	50.0



Figure 6: Conducted Emission, OBD +GPS+ LTE 26 band (LOW) RX Receiving mode, Line (N)





QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	33.4	9.000	N	9.6	32.5	65.9
0.158000	32.5	9.000	N	9.6	33.1	65.6
0.164000	30.8	9.000	N	9.6	34.4	65.3
0.170000	31.9	9.000	N	9.6	33.1	65.0
0.176000	29.7	9.000	N	9.6	34.9	64.7
0.182000	29.4	9.000	N	9.6	35.0	64.4
1.184000	21.2	9.000	N	9.7	34.8	56.0
1.210000	21.2	9.000	N	9.7	34.8	56.0
1.220000	21.9	9.000	N	9.7	34.1	56.0
1.224000	22.1	9.000	N	9.7	33.9	56.0
1.230000	21.0	9.000	N	9.7	35.0	56.0
1.252000	21.4	9.000	N	9.7	34.6	56.0
18.914000	22.8	9.000	N	10.1	37.2	60.0
19.052000	22.8	9.000	N	10.1	37.2	60.0
19.608000	22.8	9.000	N	10.2	37.2	60.0
20.256000	23.0	9.000	N	10.2	37.0	60.0
21.836000	22.3	9.000	N	10.2	37.7	60.0
24.142000	20.7	9.000	N	10.2	39.4	60.0

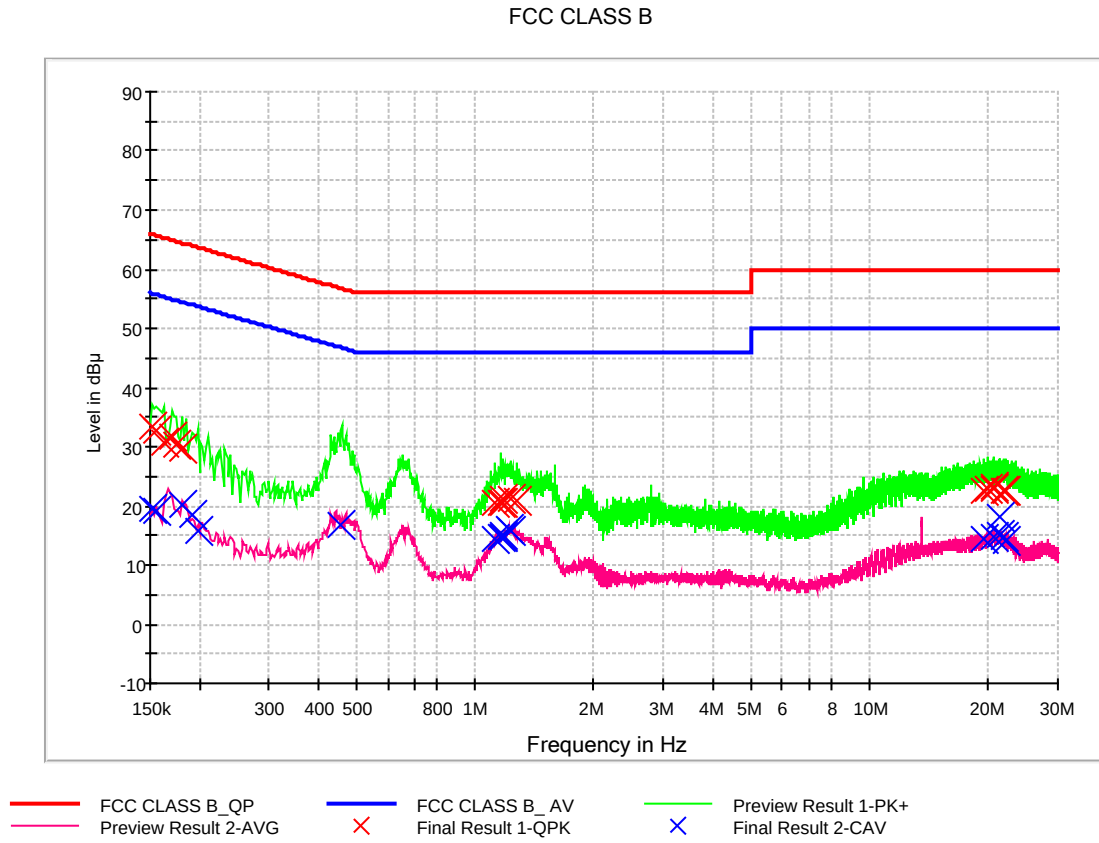


CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	20.0	9.000	N	9.6	36.0	56.0
0.154000	19.7	9.000	N	9.6	36.1	55.8
0.166000	23.0	9.000	N	9.6	32.1	55.2
0.170000	21.1	9.000	N	9.6	33.9	55.0
0.178000	19.4	9.000	N	9.6	35.2	54.6
0.182000	20.1	9.000	N	9.6	34.3	54.4
1.126000	14.2	9.000	N	9.7	31.8	46.0
1.166000	15.2	9.000	N	9.7	30.8	46.0
1.212000	16.0	9.000	N	9.7	30.0	46.0
1.220000	15.6	9.000	N	9.7	30.4	46.0
1.246000	15.5	9.000	N	9.7	30.5	46.0
1.256000	15.8	9.000	N	9.7	30.2	46.0
18.914000	14.2	9.000	N	10.1	35.8	50.0
19.052000	14.6	9.000	N	10.1	35.4	50.0
19.608000	14.7	9.000	N	10.2	35.3	50.0
20.168000	14.3	9.000	N	10.2	35.7	50.0
20.256000	14.8	9.000	N	10.2	35.2	50.0
20.406000	14.4	9.000	N	10.2	35.6	50.0



Figure 7: Conducted Emission, OBD +GPS+ LTE 26 band (Middle) RX Receiving mode, Line (L1)





QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	33.4	9.000	L1	9.6	32.5	65.9
0.156000	32.8	9.000	L1	9.6	32.8	65.7
0.162000	30.8	9.000	L1	9.6	34.6	65.4
0.170000	31.7	9.000	L1	9.6	33.3	65.0
0.174000	30.5	9.000	L1	9.6	34.3	64.8
0.180000	29.6	9.000	L1	9.6	34.8	64.5
1.124000	20.6	9.000	L1	9.7	35.4	56.0
1.158000	20.4	9.000	L1	9.7	35.6	56.0
1.176000	21.1	9.000	L1	9.7	34.9	56.0
1.180000	20.5	9.000	L1	9.7	35.5	56.0
1.228000	21.2	9.000	L1	9.7	34.8	56.0
1.272000	20.7	9.000	L1	9.8	35.3	56.0
19.426000	22.5	9.000	L1	10.1	37.5	60.0
19.840000	22.9	9.000	L1	10.2	37.1	60.0
20.582000	23.2	9.000	L1	10.2	36.8	60.0
20.600000	23.0	9.000	L1	10.2	37.0	60.0
21.760000	22.7	9.000	L1	10.2	37.3	60.0
22.178000	22.5	9.000	L1	10.2	37.5	60.0

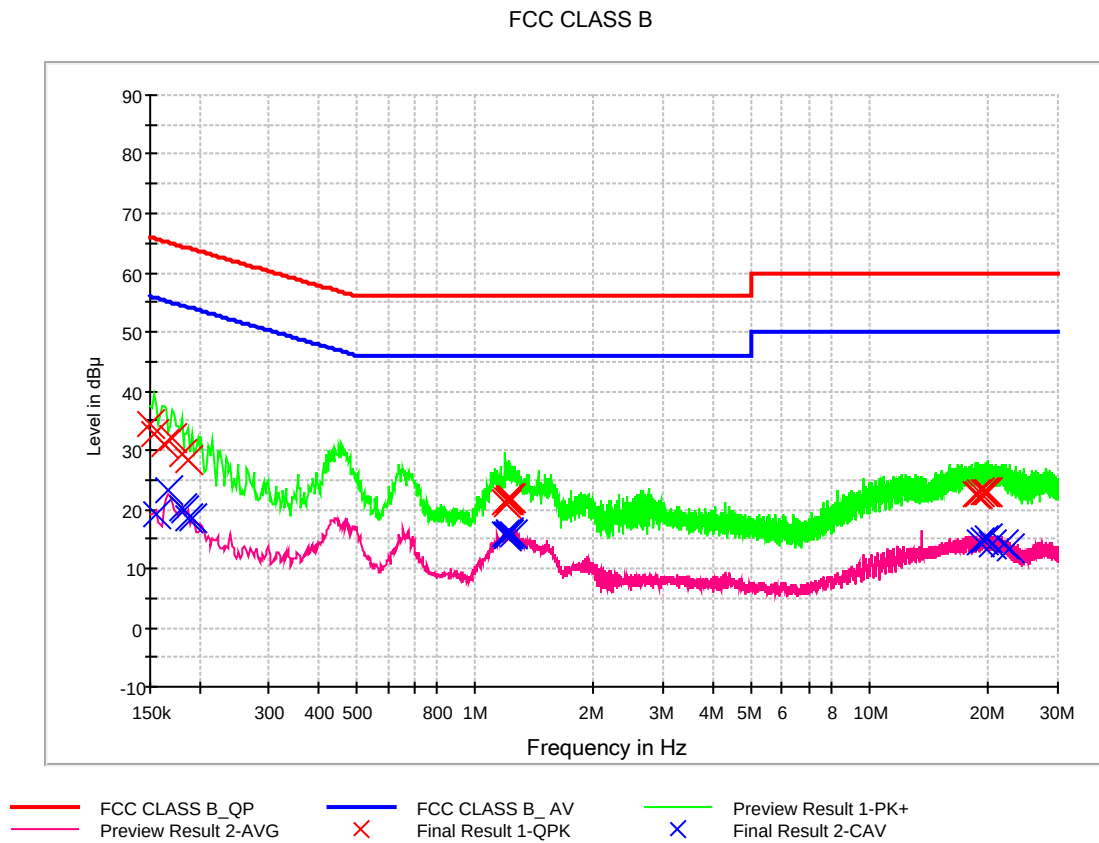


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	19.6	9.000	L1	9.6	36.3	55.9
0.156000	19.2	9.000	L1	9.6	36.4	55.7
0.180000	20.0	9.000	L1	9.6	34.5	54.5
0.192000	18.6	9.000	L1	9.7	35.4	53.9
0.198000	15.7	9.000	L1	9.7	38.0	53.7
0.458000	16.9	9.000	L1	9.7	29.9	46.7
1.124000	14.3	9.000	L1	9.7	31.7	46.0
1.158000	14.8	9.000	L1	9.7	31.2	46.0
1.176000	15.2	9.000	L1	9.7	30.8	46.0
1.180000	14.9	9.000	L1	9.7	31.1	46.0
1.216000	16.2	9.000	L1	9.7	29.8	46.0
1.228000	15.7	9.000	L1	9.7	30.3	46.0
19.426000	14.4	9.000	L1	10.1	35.6	50.0
20.582000	14.9	9.000	L1	10.2	35.1	50.0
21.402000	18.2	9.000	L1	10.2	31.8	50.0
21.410000	14.9	9.000	L1	10.2	35.1	50.0
21.760000	14.8	9.000	L1	10.2	35.2	50.0
22.178000	14.2	9.000	L1	10.2	35.8	50.0



Figure 8: Conducted Emission, OBD +GPS+ LTE 26 band (Middle) RX Receiving mode, Line (N)





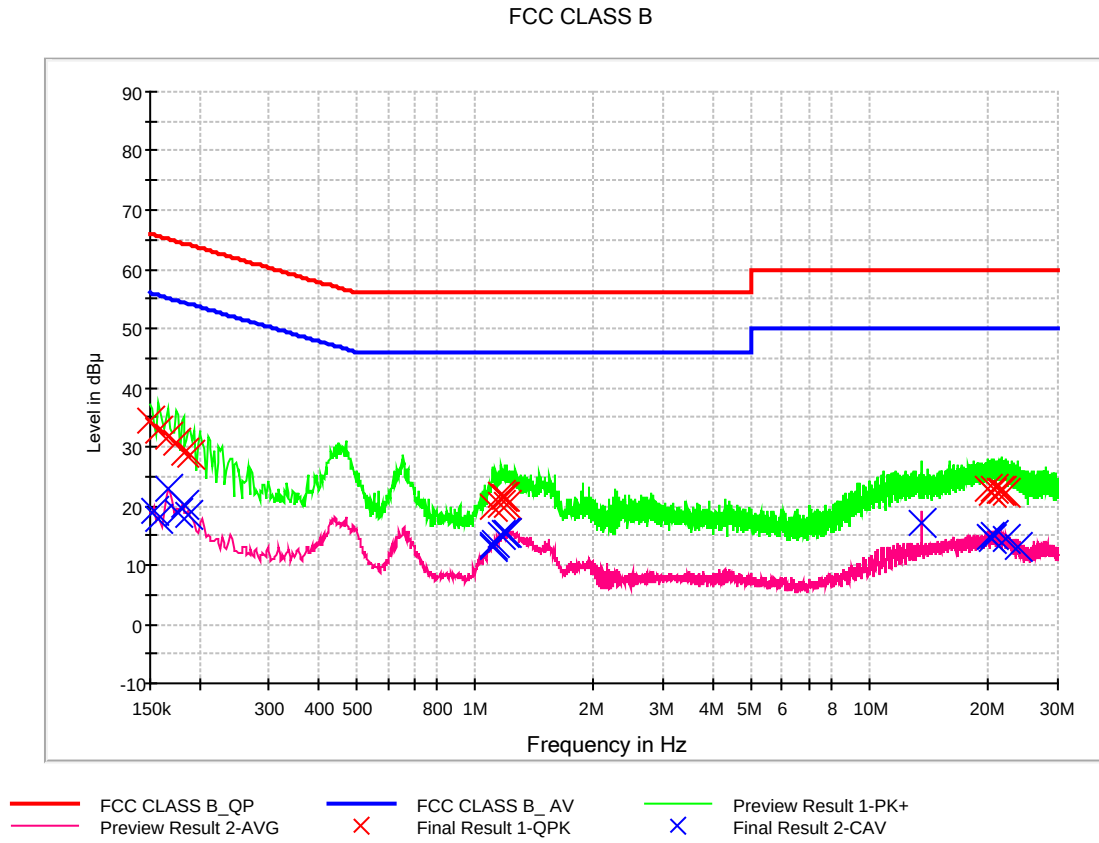
QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	34.3	9.000	N	9.6	31.7	66.0
0.154000	32.8	9.000	N	9.6	33.0	65.8
0.162000	31.0	9.000	N	9.6	34.3	65.4
0.170000	31.9	9.000	N	9.6	33.1	65.0
0.180000	29.5	9.000	N	9.6	35.0	64.5
0.188000	28.2	9.000	N	9.6	35.9	64.1
1.188000	21.2	9.000	N	9.7	34.8	56.0
1.200000	21.6	9.000	N	9.7	34.4	56.0
1.206000	21.0	9.000	N	9.7	35.0	56.0
1.214000	21.6	9.000	N	9.7	34.4	56.0
1.218000	21.9	9.000	N	9.7	34.1	56.0
1.238000	21.7	9.000	N	9.7	34.3	56.0
18.484000	22.6	9.000	N	10.1	37.4	60.0
18.728000	22.7	9.000	N	10.1	37.3	60.0
19.030000	22.8	9.000	N	10.1	37.2	60.0
19.546000	23.0	9.000	N	10.2	37.0	60.0
19.580000	23.0	9.000	N	10.2	37.0	60.0
19.846000	22.9	9.000	N	10.2	37.1	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.156000	19.0	9.000	N	9.6	36.6	55.7
0.166000	23.2	9.000	N	9.6	32.0	55.2
0.180000	20.1	9.000	N	9.6	34.4	54.5
0.184000	19.9	9.000	N	9.6	34.4	54.3
0.188000	18.4	9.000	N	9.6	35.7	54.1
0.192000	18.3	9.000	N	9.6	35.6	53.9
1.188000	15.6	9.000	N	9.7	30.4	46.0
1.206000	15.6	9.000	N	9.7	30.4	46.0
1.210000	15.7	9.000	N	9.7	30.3	46.0
1.214000	16.0	9.000	N	9.7	30.0	46.0
1.218000	15.8	9.000	N	9.7	30.2	46.0
1.244000	15.7	9.000	N	9.7	30.3	46.0
19.030000	14.5	9.000	N	10.1	35.5	50.0
19.440000	14.7	9.000	N	10.1	35.3	50.0
19.926000	14.9	9.000	N	10.2	35.1	50.0
20.512000	14.1	9.000	N	10.2	35.9	50.0
21.972000	14.2	9.000	N	10.2	35.8	50.0
22.556000	13.3	9.000	N	10.2	36.7	50.0

**Figure 9: Conducted Emission, OBD +GPS+ LTE 26 band (HIGH) RX Receiving mode, Line (L1)**



QuasiPeak Final Result, Line (L1)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	34.3	9.000	L1	9.6	31.7	66.0
0.158000	32.7	9.000	L1	9.6	32.9	65.6
0.166000	31.8	9.000	L1	9.6	33.4	65.2
0.174000	30.6	9.000	L1	9.6	34.1	64.8
0.182000	29.0	9.000	L1	9.6	35.4	64.4
0.190000	28.7	9.000	L1	9.7	35.4	64.0
1.104000	20.0	9.000	L1	9.7	36.0	56.0
1.164000	21.8	9.000	L1	9.7	34.2	56.0
1.168000	20.3	9.000	L1	9.7	35.7	56.0
1.174000	21.4	9.000	L1	9.7	34.6	56.0
1.192000	21.4	9.000	L1	9.7	34.6	56.0
1.206000	20.3	9.000	L1	9.7	35.7	56.0
19.928000	22.8	9.000	L1	10.2	37.2	60.0
20.472000	22.3	9.000	L1	10.2	37.7	60.0
20.722000	22.8	9.000	L1	10.2	37.2	60.0
21.452000	22.6	9.000	L1	10.2	37.4	60.0
21.716000	22.7	9.000	L1	10.2	37.3	60.0
22.256000	22.2	9.000	L1	10.2	37.8	60.0

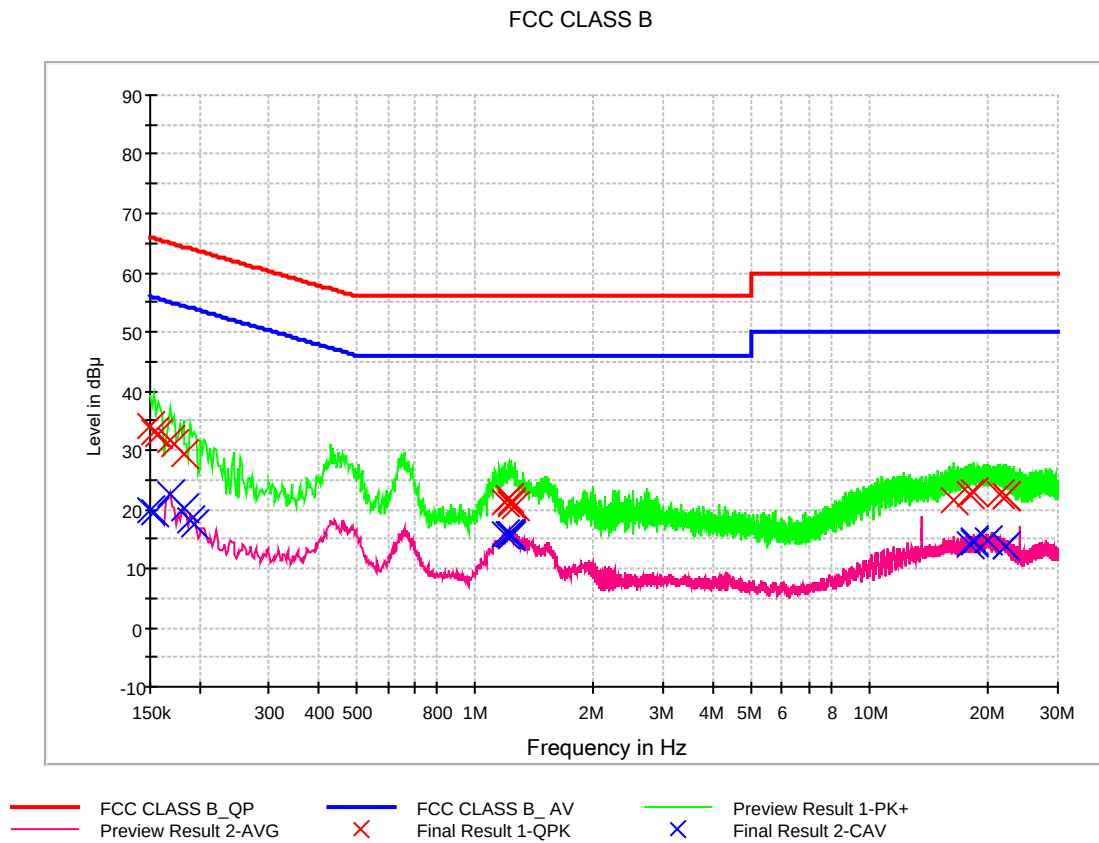


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	19.2	9.000	L1	9.6	36.6	55.8
0.158000	17.7	9.000	L1	9.6	37.8	55.6
0.166000	22.7	9.000	L1	9.6	32.4	55.2
0.176000	18.9	9.000	L1	9.6	35.8	54.7
0.182000	20.1	9.000	L1	9.6	34.2	54.4
0.188000	18.4	9.000	L1	9.7	35.7	54.1
1.104000	13.0	9.000	L1	9.7	33.0	46.0
1.110000	13.4	9.000	L1	9.7	32.6	46.0
1.128000	13.8	9.000	L1	9.7	32.2	46.0
1.166000	15.0	9.000	L1	9.7	31.0	46.0
1.188000	15.3	9.000	L1	9.7	30.7	46.0
1.206000	15.3	9.000	L1	9.7	30.7	46.0
13.560000	17.2	9.000	L1	10.0	32.8	50.0
20.210000	14.7	9.000	L1	10.2	35.3	50.0
20.472000	14.4	9.000	L1	10.2	35.6	50.0
20.722000	15.0	9.000	L1	10.2	35.0	50.0
22.256000	14.3	9.000	L1	10.2	35.7	50.0
23.826000	13.2	9.000	L1	10.2	36.8	50.0



Figure 10: Conducted Emission, OBD +GPS+ LTE 26 band (HIGH) RX Receiving mode, Line (N)





QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	34.1	9.000	N	9.6	31.9	66.0
0.154000	33.1	9.000	N	9.6	32.7	65.8
0.158000	32.9	9.000	N	9.6	32.7	65.6
0.168000	31.6	9.000	N	9.6	33.4	65.1
0.172000	31.1	9.000	N	9.6	33.7	64.9
0.182000	29.3	9.000	N	9.6	35.1	64.4
1.188000	21.3	9.000	N	9.7	34.7	56.0
1.212000	21.8	9.000	N	9.7	34.2	56.0
1.222000	21.9	9.000	N	9.7	34.1	56.0
1.234000	21.1	9.000	N	9.7	34.9	56.0
1.238000	20.8	9.000	N	9.7	35.2	56.0
1.256000	20.5	9.000	N	9.7	35.5	56.0
16.376000	21.7	9.000	N	10.1	38.3	60.0
17.928000	22.7	9.000	N	10.1	37.3	60.0
18.338000	22.8	9.000	N	10.1	37.2	60.0
21.408000	22.5	9.000	N	10.2	37.5	60.0
22.170000	22.3	9.000	N	10.2	37.7	60.0
22.222000	22.1	9.000	N	10.2	37.9	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	19.8	9.000	N	9.6	36.2	56.0
0.154000	19.5	9.000	N	9.6	36.3	55.8
0.168000	22.5	9.000	N	9.6	32.5	55.1
0.182000	20.0	9.000	N	9.6	34.4	54.4
0.190000	18.2	9.000	N	9.6	35.8	54.0
0.194000	17.4	9.000	N	9.6	36.5	53.9
1.190000	15.6	9.000	N	9.7	30.4	46.0
1.212000	15.9	9.000	N	9.7	30.1	46.0
1.216000	15.8	9.000	N	9.7	30.2	46.0
1.230000	15.7	9.000	N	9.7	30.3	46.0
1.234000	15.8	9.000	N	9.7	30.2	46.0
1.238000	15.4	9.000	N	9.7	30.6	46.0
17.918000	14.0	9.000	N	10.1	36.0	50.0
18.318000	14.4	9.000	N	10.1	35.6	50.0
18.338000	14.6	9.000	N	10.1	35.4	50.0
20.014000	14.6	9.000	N	10.2	35.4	50.0
22.170000	13.8	9.000	N	10.2	36.2	50.0
22.222000	13.8	9.000	N	10.2	36.2	50.0



5.2 Radiated Emission

The test results of radiated emission provide the following information:

For Measurement Below 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Quasi-Peak
Bandwidth	120 kHz (6 dB)
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.5 / 24.2 / 23.6 °C
Relative Humidity	43.6 / 44.5 / 43.1 %
Test Date	April 16 / April 17 / April 21, 2019

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. QuasiPeak = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor + Cable Loss
4. Margin = Limit - QuasiPeak



DATA LINK mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
60.037600	28.4	99.9	V	30.0	19.7	11.6	40.0
71.991200	35.8	99.8	V	108.0	17.3	4.2	40.0
86.425600	32.1	125.0	V	221.0	14.6	7.9	40.0
88.672800	31.4	99.8	V	179.0	14.4	12.1	43.5
242.619200	36.1	99.8	H	108.0	18.7	9.9	46.0
262.698400	40.6	99.8	H	108.0	19.3	5.4	46.0
262.686400	40.0	99.8	V	108.0	19.3	6.0	46.0
263.132400	41.0	99.8	H	108.0	19.4	5.0	46.0

[12 V] OBD +GPS+ LTE 2 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.660133	25.3	99.9	V	112.0	18.7	14.7	40.0
54.088800	30.6	99.8	V	277.0	20.0	9.4	40.0
83.914400	29.1	116.7	V	254.0	14.8	10.9	40.0
85.996800	30.9	119.9	V	112.0	14.6	9.1	40.0
159.928000	18.2	225.3	H	329.0	19.9	25.3	43.5
268.972800	17.6	208.8	H	203.0	19.5	28.4	46.0

[12 V] OBD +GPS+ LTE 26 band (LOW) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
54.648800	30.2	99.8	V	279.0	19.9	9.8	40.0
66.470400	22.3	99.8	V	30.0	18.5	17.7	40.0
84.956000	31.5	99.8	V	176.0	14.7	8.5	40.0
85.363200	31.6	99.8	V	160.0	14.7	8.4	40.0
312.952800	20.0	117.8	H	0.0	20.8	26.0	46.0
629.528000	27.9	117.7	H	30.0	27.9	18.1	46.0



[12 V] OBD +GPS+ LTE 26 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.121034	24.3	99.8	V	187.0	18.7	15.7	40.0
53.924800	30.7	99.8	V	272.0	20.0	9.3	40.0
69.028800	24.5	99.8	V	323.0	18.0	15.6	40.0
84.642400	30.9	117.8	V	177.0	14.7	9.1	40.0
86.462400	30.9	99.8	V	166.0	14.6	9.1	40.0
445.730400	22.6	207.8	V	318.0	24.0	23.4	46.0

[12 V] OBD +GPS+ LTE 26 band (HIGH) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
36.776000	16.8	325.1	V	346.0	19.3	23.2	40.0
53.983200	33.2	99.8	V	32.0	20.0	6.8	40.0
54.181600	33.5	99.8	V	19.0	20.0	6.5	40.0
86.197600	32.7	99.8	V	301.0	14.6	7.3	40.0
86.472800	32.8	99.8	V	286.0	14.6	7.2	40.0
640.139200	27.9	175.0	V	233.0	28.1	18.1	46.0

[24 V] OBD +GPS+ LTE 2 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.843349	22.5	192.9	V	305.0	18.8	17.5	40.0
53.290400	30.8	99.8	V	270.0	20.0	9.2	40.0
68.253600	17.4	207.9	V	158.0	18.1	22.6	40.0
84.748800	30.5	100.0	V	103.0	14.7	9.5	40.0
85.297600	31.5	99.8	V	178.0	14.7	8.5	40.0
562.547200	29.2	225.1	H	344.0	26.7	16.8	46.0



[24 V] OBD +GPS+ LTE 26 band (LOW) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
32.251200	18.6	225.1	V	87.0	18.9	21.4	40.0
54.163200	33.1	117.9	V	191.0	20.0	6.9	40.0
85.692000	32.6	99.8	V	269.0	14.6	7.4	40.0
87.035200	32.3	99.8	V	298.0	14.5	7.7	40.0
609.368000	27.6	99.8	V	57.0	27.7	18.4	46.0
955.905600	32.1	375.0	V	151.0	32.0	13.9	46.0

[24 V] OBD +GPS+ LTE 26 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.434054	25.1	99.8	V	80.0	18.7	14.9	40.0
54.370400	30.5	99.8	V	279.0	19.9	9.5	40.0
85.526400	31.5	99.8	V	160.0	14.7	8.5	40.0
85.576000	31.3	99.8	V	190.0	14.7	8.7	40.0
351.302400	20.6	99.8	H	340.0	21.8	25.4	46.0
693.960000	28.5	225.3	V	318.0	28.7	17.5	46.0

[24 V] OBD +GPS+ LTE 26 band (HIGH) RX Receiving mode

Frequency (MHz)	Quasi Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
30.677344	18.6	209.8	V	30.0	18.7	21.4	40.0
53.063200	33.2	99.8	V	225.0	20.0	6.8	40.0
54.682400	33.5	99.8	V	27.0	19.9	6.5	40.0
85.726400	32.2	99.9	V	245.0	14.6	7.8	40.0
85.913600	32.0	99.8	V	234.0	14.6	8.0	40.0
638.620000	27.9	274.9	H	30.0	28.0	18.1	46.0



For Measurement Above 1 GHz

Rule Part / Standard	FCC PART 15 Subpart B Class B
Detector	Peak mode: Peak (RBW: 1 MHz, VBW: 3 MHz) CISPR-Average mode: Peak (RBW: 1 MHz, VBW: 10 Hz)
Highest Operating Frequency	1 910 MHz
Tested Frequency Range	1 GHz to 18 GHz
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.5 / 24.3 °C
Relative Humidity	43.6 / 43.4 %
Test Date	April 16 / April 18, 2019

- Calculation Formula:

1. POL. H = Horizontal, POL. V = Vertical
2. Peak or CAverage = Reading (Receiver Reading) + Corr.
3. Corr. (Correction Factor) = Antenna Factor+ Cable Loss –Amplifier Gain
4. Margin = Limit - Peak or CAverage



DATA LINK mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1400.085000	51.8	199.6	V	215.0	-26.1	22.2	74.0
1400.135000	52.0	206.4	V	214.0	-26.1	22.0	74.0
1796.800000	44.7	99.8	V	135.0	-25.4	29.3	74.0
2396.970000	44.7	99.7	V	218.0	-23.9	29.3	74.0
5887.780000	43.9	99.7	V	69.0	-15.0	30.1	74.0
10259.205000	48.3	150.0	V	49.0	-4.4	25.7	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1400.085000	49.8	199.6	V	215.0	-26.1	4.2	54.0
1400.135000	50.2	206.4	V	214.0	-26.1	3.8	54.0
1796.800000	25.9	99.8	V	135.0	-25.4	28.1	54.0
2396.970000	27.2	99.7	V	218.0	-23.9	26.8	54.0
5887.780000	36.3	99.7	V	69.0	-15.0	17.7	54.0
10259.205000	35.5	150.0	V	49.0	-4.4	18.5	54.0



[12 V] OBD +GPS+ LTE 2 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2855.355000	35.6	230.5	H	0.0	-21.8	38.4	74.0
5032.165000	39.5	125.6	H	219.0	-15.9	34.5	74.0
7747.045000	45.4	216.4	V	78.0	-9.3	28.6	74.0
9147.655000	48.0	110.4	V	253.0	-6.3	26.0	74.0
9845.890000	47.8	99.9	V	54.0	-5.4	26.2	74.0
10960.460000	49.5	150.0	V	99.0	-2.7	24.5	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2855.355000	22.1	230.5	H	0.0	-21.8	31.9	54.0
5032.165000	26.6	125.6	H	219.0	-15.9	27.4	54.0
7747.045000	32.2	216.4	V	78.0	-9.3	21.8	54.0
9147.655000	35.4	110.4	V	253.0	-6.3	18.6	54.0
9845.890000	35.1	99.9	V	54.0	-5.4	18.9	54.0
10960.460000	36.1	150.0	V	99.0	-2.7	17.9	54.0

[12 V] OBD +GPS+ LTE 26 band (LOW) RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1795.470000	32.0	249.9	V	233.0	-25.4	42.0	74.0
5643.280000	39.2	149.7	V	42.0	-15.3	34.8	74.0
7333.450000	43.4	110.4	V	164.0	-9.9	30.6	74.0
9513.225000	48.9	149.9	V	198.0	-5.4	25.1	74.0
10316.980000	47.3	249.9	V	28.0	-4.2	26.7	74.0
10898.725000	48.1	99.9	H	11.0	-2.8	25.9	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1795.470000	19.3	249.9	V	233.0	-25.4	34.7	54.0
5643.280000	26.2	149.7	V	42.0	-15.3	27.8	54.0
7333.450000	30.9	110.4	V	164.0	-9.9	23.1	54.0
9513.225000	35.6	149.9	V	198.0	-5.4	18.4	54.0
10316.980000	34.7	249.9	V	28.0	-4.2	19.3	54.0
10898.725000	35.3	99.9	H	11.0	-2.8	18.7	54.0



[12 V] OBD +GPS+ LTE 26 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1919.750000	34.8	138.6	H	248.0	-25.3	39.2	74.0
3114.435000	35.2	230.4	H	37.0	-21.0	38.8	74.0
4982.085000	39.3	215.4	V	162.0	-16.0	34.7	74.0
7396.680000	45.3	150.0	V	309.0	-9.7	28.7	74.0
9477.740000	48.5	159.5	V	276.0	-5.4	25.5	74.0
10929.875000	48.4	175.5	V	62.0	-2.8	25.6	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1919.750000	24.9	138.6	H	248.0	-25.3	29.1	54.0
3114.435000	22.5	230.4	H	37.0	-21.0	31.5	54.0
4982.085000	26.2	215.4	V	162.0	-16.0	27.8	54.0
7396.680000	31.7	150.0	V	309.0	-9.7	22.3	54.0
9477.740000	35.8	159.5	V	276.0	-5.4	18.2	54.0
10929.875000	35.8	175.5	V	62.0	-2.8	18.2	54.0

[24 V] OBD +GPS+ LTE 26 (HIGH) band RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2781.325000	33.7	125.8	H	287.0	-22.1	40.3	74.0
4902.600000	38.9	249.8	V	325.0	-16.2	35.1	74.0
5305.035000	38.6	249.9	V	47.0	-15.6	35.4	74.0
7386.180000	44.2	249.9	V	347.0	-9.8	29.8	74.0
9202.820000	47.1	124.8	V	205.0	-6.2	26.9	74.0
10836.610000	47.6	124.7	V	234.0	-3.0	26.4	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2781.325000	21.4	125.8	H	287.0	-22.1	32.6	54.0
4902.600000	26.0	249.8	V	325.0	-16.2	28.0	54.0
5305.035000	26.0	249.9	V	47.0	-15.6	28.0	54.0
7386.180000	31.4	249.9	V	347.0	-9.8	22.6	54.0
9202.820000	34.8	124.8	V	205.0	-6.2	19.2	54.0
10836.610000	34.9	124.7	V	234.0	-3.0	19.1	54.0



[24 V] OBD +GPS+ LTE 2 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1663.115000	33.1	150.1	H	50.0	-25.5	40.9	74.0
3073.270000	35.0	176.4	V	319.0	-21.0	39.0	74.0
4112.485000	36.3	199.5	H	62.0	-19.2	37.7	74.0
6678.805000	42.4	149.5	V	296.0	-11.6	31.6	74.0
7374.390000	44.5	249.8	H	251.0	-9.8	29.5	74.0
9187.375000	48.0	149.5	H	77.0	-6.2	26.0	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1663.115000	20.0	150.1	H	50.0	-25.5	34.0	54.0
3073.270000	22.5	176.4	V	319.0	-21.0	31.5	54.0
4112.485000	23.6	199.5	H	62.0	-19.2	30.4	54.0
6678.805000	29.5	149.5	V	296.0	-11.6	24.5	54.0
7374.390000	31.6	249.8	H	251.0	-9.8	22.4	54.0
9187.375000	35.2	149.5	H	77.0	-6.2	18.8	54.0

[24 V] OBD +GPS+ LTE 26 band (LOW) RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1375.570000	33.2	188.6	V	97.0	-26.2	40.8	74.0
5619.165000	39.2	99.9	V	176.0	-15.3	34.8	74.0
7398.210000	44.9	99.8	H	167.0	-9.7	29.1	74.0
9213.110000	47.6	150.0	H	303.0	-6.1	26.4	74.0
9843.395000	47.1	199.6	H	90.0	-5.4	26.9	74.0
11193.415000	48.0	249.9	V	46.0	-2.6	26.0	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1375.570000	20.3	188.6	V	97.0	-26.2	33.7	54.0
5619.165000	26.3	99.9	V	176.0	-15.3	27.7	54.0
7398.210000	31.5	99.8	H	167.0	-9.7	22.5	54.0
9213.110000	34.9	150.0	H	303.0	-6.1	19.1	54.0
9843.395000	34.5	199.6	H	90.0	-5.4	19.5	54.0
11193.415000	34.8	249.9	V	46.0	-2.6	19.2	54.0



[24 V] OBD +GPS+ LTE 26 band (MIDDLE) RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1407.935000	32.4	189.6	V	78.0	-26.0	41.6	74.0
2871.565000	34.7	203.4	H	233.0	-21.7	39.3	74.0
5265.510000	38.9	149.6	H	136.0	-15.6	35.1	74.0
7348.115000	43.9	149.5	H	344.0	-9.9	30.1	74.0
9198.905000	48.2	160.7	H	4.0	-6.2	25.8	74.0
10781.910000	47.7	249.9	V	274.0	-3.1	26.3	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1407.935000	19.5	189.6	V	78.0	-26.0	34.5	54.0
2871.565000	21.9	203.4	H	233.0	-21.7	32.1	54.0
5265.510000	26.4	149.6	H	136.0	-15.6	27.6	54.0
7348.115000	31.1	149.5	H	344.0	-9.9	22.9	54.0
9198.905000	34.9	160.7	H	4.0	-6.2	19.1	54.0
10781.910000	35.0	249.9	V	274.0	-3.1	19.0	54.0

[24 V] OBD +GPS+ LTE 26 band (HIGH) RX Receiving mode

Frequency (MHz)	Peak (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2895.650000	34.5	125.8	V	328.0	-21.6	39.5	74.0
4928.085000	39.6	126.8	H	341.0	-16.1	34.4	74.0
7327.265000	43.4	217.5	V	225.0	-10.0	30.6	74.0
8553.310000	45.8	199.6	H	11.0	-8.3	28.2	74.0
9866.425000	48.2	149.7	H	94.0	-5.4	25.8	74.0
11229.290000	47.7	150.0	V	275.0	-2.6	26.3	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2895.650000	21.8	125.8	V	328.0	-21.6	32.2	54.0
4928.085000	26.1	126.8	H	341.0	-16.1	27.9	54.0
7327.265000	30.9	217.5	V	225.0	-10.0	23.1	54.0
8553.310000	32.9	199.6	H	11.0	-8.3	21.1	54.0
9866.425000	34.9	149.7	H	94.0	-5.4	19.1	54.0
11229.290000	34.8	150.0	V	275.0	-2.6	19.2	54.0



6. CONCLUSION

The data collected shows that the **EUT Type: von-U41, Model: JTLC-2000** complies with §15.107 and §15.109 of the FCC rules.



7. APPENDIX A. TEST SETUP PHOTO

Please refer to ANNEX A

8. APPENDIX B. INTERNAL PHOTO

Please refer to ANNEX B

9. APPENDIX C. INTERNAL PHOTO

Please refer to ANNEX C

- End of Test Report -