

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-1903-FC001-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 : March 02, 2019 to March 19, 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

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REVISION HISTORY

The revision history for this document is shown in table.

Test Report No.	Issue Date	Description
HCT-EM-1903-FC001	March 12, 2019	Initial Release
HCT-EM-1903-FC001-R1	May 07, 2019	Edit typos and add CB band



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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 B4: TX 1 710 MHz to 1 755 MHz RX 2 110 MHz to 2 155 MHz LTE B12: TX 699 MHz to 716 MHz RX 729 MHz to 746 MHz LTE B25: TX 1 850 MHz to 1 915 MHz RX 1 930 MHz to 1 995 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
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 (12 V / 24 V)	N	N/A	(P)1.5
	I/O (DATA)	N/A	N	(D)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 (12 V / 24 V)	N/A	N/A	Y	Both end
	I/O (DATA)	N/A	N/A	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	04.06.2017
☐ Trilog Antenna	Schwarzbeck	VULB 9168	00847	2 year	04.13.2018
☒ 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
☐ Trilog Antenna	Schwarzbeck	VULB 9168	185	2 year	04.19.2017
☐ 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	00847	2 year	04.13.2018
☒ 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 ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)	Antenna Distance (m)	Field Strength ($\mu\text{V/m}$)	Quasi-Peak (dB $\mu\text{V/m}$)
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 (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	Peak (dB $\mu\text{V/m}$)	Average (dB $\mu\text{V/m}$)	
Above 1 000	3	80	60	74	54	

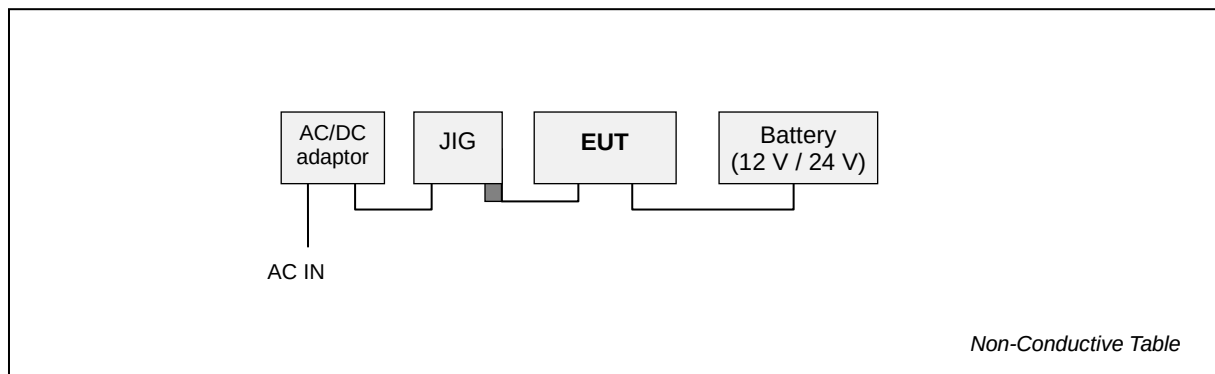


3.2.1 Frequency Range of Radiated Measurements

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:

OBD +GPS+ LTE 4 band RX Receiving mode
OBD +GPS+ LTE 12 band RX Receiving mode
OBD +GPS+ LTE 25 band RX Receiving mode

NOTE.

All mode of operation were verified and the worst case configuration result was indicated in test report.

4.2 Radiated Emission

During preliminary tests, the following operating mode was investigated:

Operation Mode:

OBD +GPS+ LTE 4 band RX Receiving mode
OBD +GPS+ LTE 12 band RX Receiving mode
OBD +GPS+ LTE 25 band RX Receiving mode

NOTE.

All mode of operation were verified and the worst case configuration result was indicated in test report.



5. CONDUCTED AND RADIATED EMISSION TEST SUMMARY

5.1 Conducted Emission

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

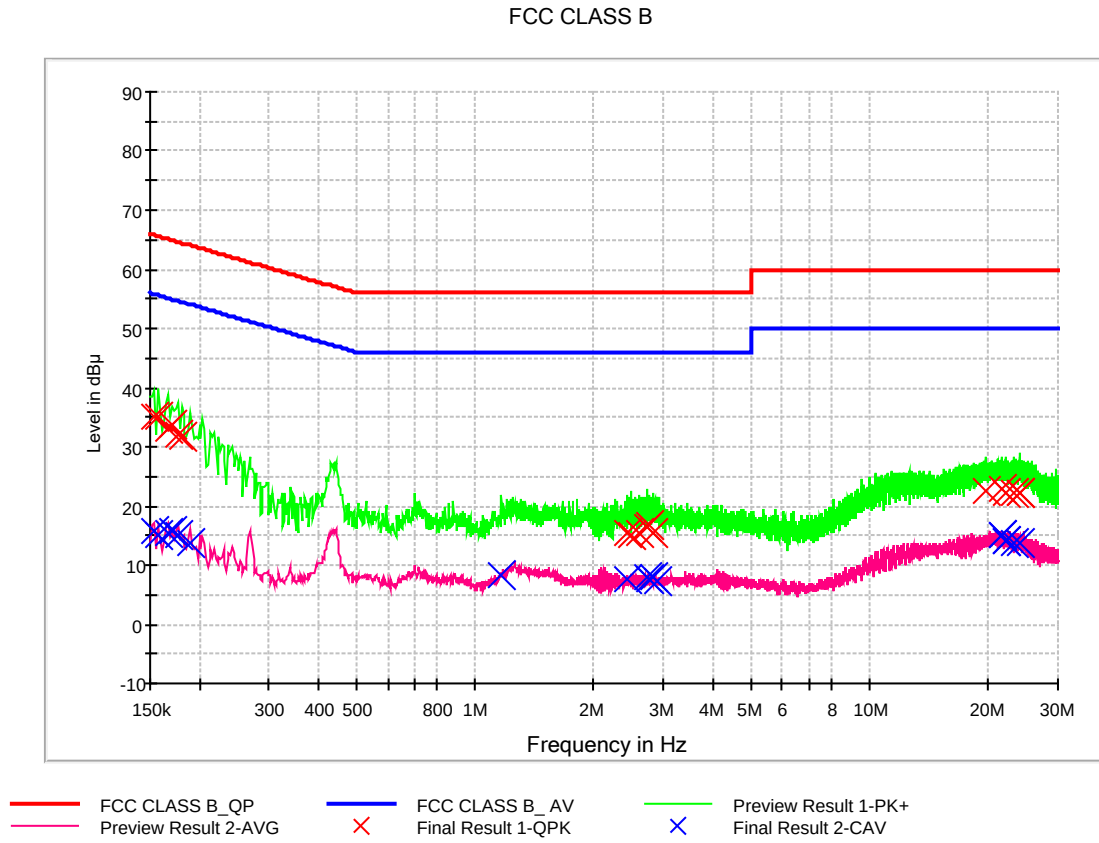
Applicable Standards	FCC PART 15 Subpart B Class B ANSI C63.4-2014
Detector	Quasi-Peak, CISPR-Average
Bandwidth	9 kHz (6 dB)
Kind of Test Site	Shielded Room
Temperature	21.4 / 23.5 °C
Relative Humidity	42.9 / 40.2 %
Test Date	March 02 / March 18, 2019

- 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, OBD +GPS+ LTE 4 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	35.0	9.000	L1	9.6	30.8	65.8
0.158000	35.1	9.000	L1	9.6	30.5	65.6
0.166000	32.9	9.000	L1	9.6	32.2	65.2
0.170000	33.8	9.000	L1	9.6	31.1	65.0
0.176000	32.0	9.000	L1	9.6	32.6	64.7
0.180000	31.8	9.000	L1	9.6	32.7	64.5
2.420000	15.5	9.000	L1	9.8	40.6	56.0
2.490000	15.2	9.000	L1	9.8	40.8	56.0
2.596000	15.4	9.000	L1	9.8	40.6	56.0
2.726000	16.3	9.000	L1	9.8	39.7	56.0
2.774000	16.7	9.000	L1	9.8	39.3	56.0
2.818000	15.4	9.000	L1	9.8	40.6	56.0
19.776000	22.6	9.000	L1	10.2	37.4	60.0
21.644000	22.7	9.000	L1	10.2	37.3	60.0
22.230000	22.1	9.000	L1	10.2	37.9	60.0
23.214000	22.1	9.000	L1	10.2	37.9	60.0
23.954000	22.1	9.000	L1	10.2	37.9	60.0
23.978000	22.4	9.000	L1	10.2	37.6	60.0

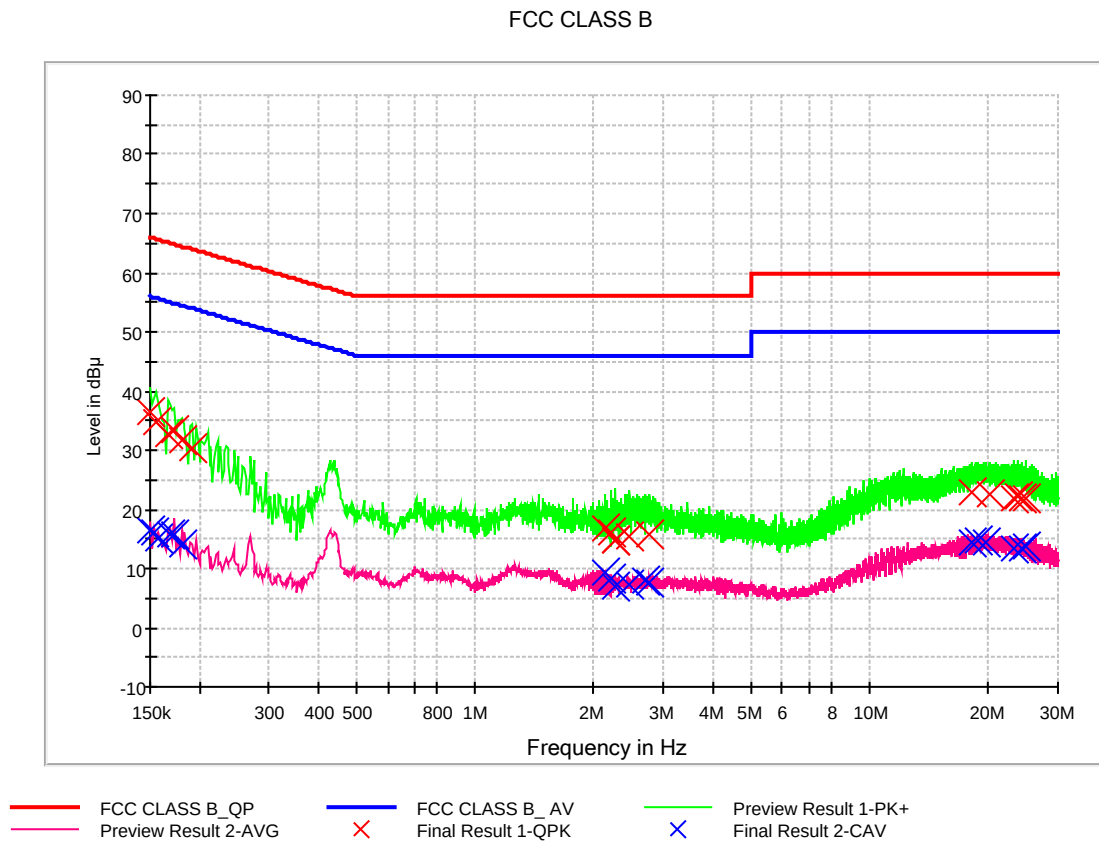


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.154000	15.9	9.000	L1	9.6	39.9	55.8
0.158000	15.1	9.000	L1	9.6	40.5	55.6
0.166000	15.6	9.000	L1	9.6	39.6	55.2
0.170000	15.6	9.000	L1	9.6	39.4	55.0
0.176000	15.0	9.000	L1	9.6	39.7	54.7
0.190000	13.7	9.000	L1	9.7	40.3	54.0
1.168000	8.2	9.000	L1	9.7	37.8	46.0
2.420000	7.5	9.000	L1	9.8	38.5	46.0
2.726000	7.9	9.000	L1	9.8	38.1	46.0
2.746000	7.8	9.000	L1	9.8	38.2	46.0
2.818000	7.9	9.000	L1	9.8	38.2	46.0
2.876000	7.3	9.000	L1	9.8	38.7	46.0
21.644000	15.0	9.000	L1	10.2	35.0	50.0
21.662000	15.1	9.000	L1	10.2	34.9	50.0
22.148000	14.1	9.000	L1	10.2	35.9	50.0
22.254000	14.1	9.000	L1	10.2	35.9	50.0
23.214000	13.6	9.000	L1	10.2	36.4	50.0
23.962000	13.7	9.000	L1	10.2	36.3	50.0



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





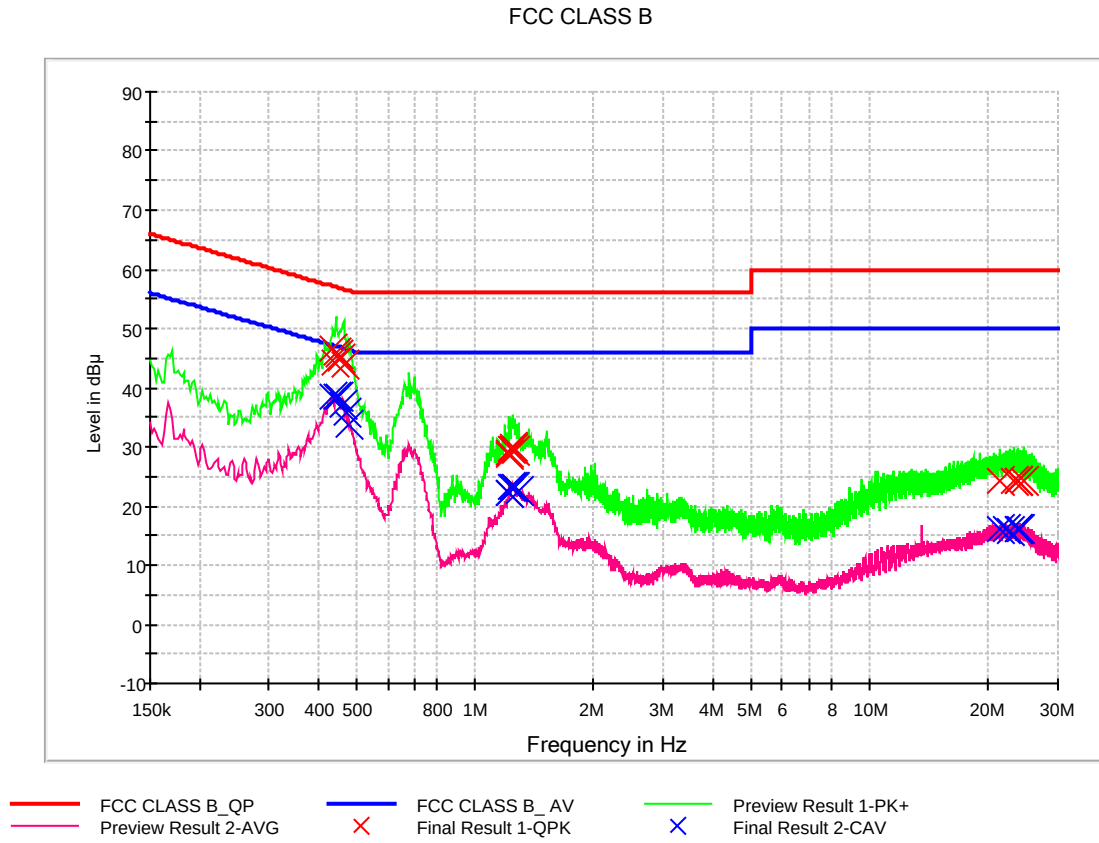
QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	36.3	9.000	N	9.6	29.7	66.0
0.156000	34.9	9.000	N	9.6	30.8	65.7
0.166000	32.7	9.000	N	9.6	32.5	65.2
0.172000	33.3	9.000	N	9.6	31.5	64.9
0.180000	31.7	9.000	N	9.6	32.8	64.5
0.192000	30.5	9.000	N	9.6	33.5	63.9
2.142000	16.8	9.000	N	9.7	39.2	56.0
2.212000	16.1	9.000	N	9.7	39.9	56.0
2.262000	14.6	9.000	N	9.7	41.4	56.0
2.266000	14.6	9.000	N	9.7	41.4	56.0
2.468000	15.5	9.000	N	9.7	40.5	56.0
2.758000	15.6	9.000	N	9.8	40.4	56.0
18.138000	22.9	9.000	N	10.1	37.1	60.0
20.258000	22.6	9.000	N	10.2	37.4	60.0
23.240000	21.8	9.000	N	10.2	38.2	60.0
23.786000	22.3	9.000	N	10.2	37.7	60.0
24.340000	22.0	9.000	N	10.2	38.0	60.0
24.902000	22.0	9.000	N	10.2	38.0	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	16.3	9.000	N	9.6	39.7	56.0
0.154000	16.0	9.000	N	9.6	39.7	55.8
0.158000	15.1	9.000	N	9.6	40.5	55.6
0.168000	15.8	9.000	N	9.6	39.2	55.1
0.172000	15.8	9.000	N	9.6	39.1	54.9
0.180000	14.0	9.000	N	9.6	40.5	54.5
2.142000	9.4	9.000	N	9.7	36.6	46.0
2.212000	8.3	9.000	N	9.7	37.7	46.0
2.266000	7.0	9.000	N	9.7	39.0	46.0
2.468000	7.2	9.000	N	9.7	38.8	46.0
2.710000	7.9	9.000	N	9.7	38.1	46.0
2.758000	7.5	9.000	N	9.8	38.5	46.0
18.138000	14.4	9.000	N	10.1	35.6	50.0
18.762000	14.7	9.000	N	10.1	35.3	50.0
19.726000	14.6	9.000	N	10.2	35.4	50.0
23.240000	13.4	9.000	N	10.2	36.6	50.0
24.340000	13.4	9.000	N	10.2	36.6	50.0
24.902000	13.6	9.000	N	10.2	36.4	50.0

**Figure 3: Conducted Emission, OBD +GPS+ LTE 12 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)
0.436000	46.6	9.000	L1	9.7	10.6	57.1
0.440000	44.4	9.000	L1	9.7	12.7	57.1
0.444000	45.8	9.000	L1	9.7	11.1	57.0
0.450000	45.7	9.000	L1	9.7	11.2	56.9
0.454000	45.1	9.000	L1	9.7	11.7	56.8
0.464000	44.0	9.000	L1	9.7	12.6	56.6
1.220000	28.9	9.000	L1	9.7	27.1	56.0
1.224000	28.8	9.000	L1	9.7	27.2	56.0
1.238000	29.7	9.000	L1	9.7	26.3	56.0
1.244000	30.0	9.000	L1	9.7	26.0	56.0
1.250000	29.7	9.000	L1	9.8	26.3	56.0
1.264000	29.3	9.000	L1	9.8	26.8	56.0
21.308000	24.1	9.000	L1	10.2	35.9	60.0
23.288000	24.2	9.000	L1	10.2	35.8	60.0
23.656000	24.4	9.000	L1	10.2	35.6	60.0
23.774000	24.3	9.000	L1	10.2	35.7	60.0
23.816000	24.1	9.000	L1	10.2	35.9	60.0
24.476000	24.3	9.000	L1	10.2	35.7	60.0

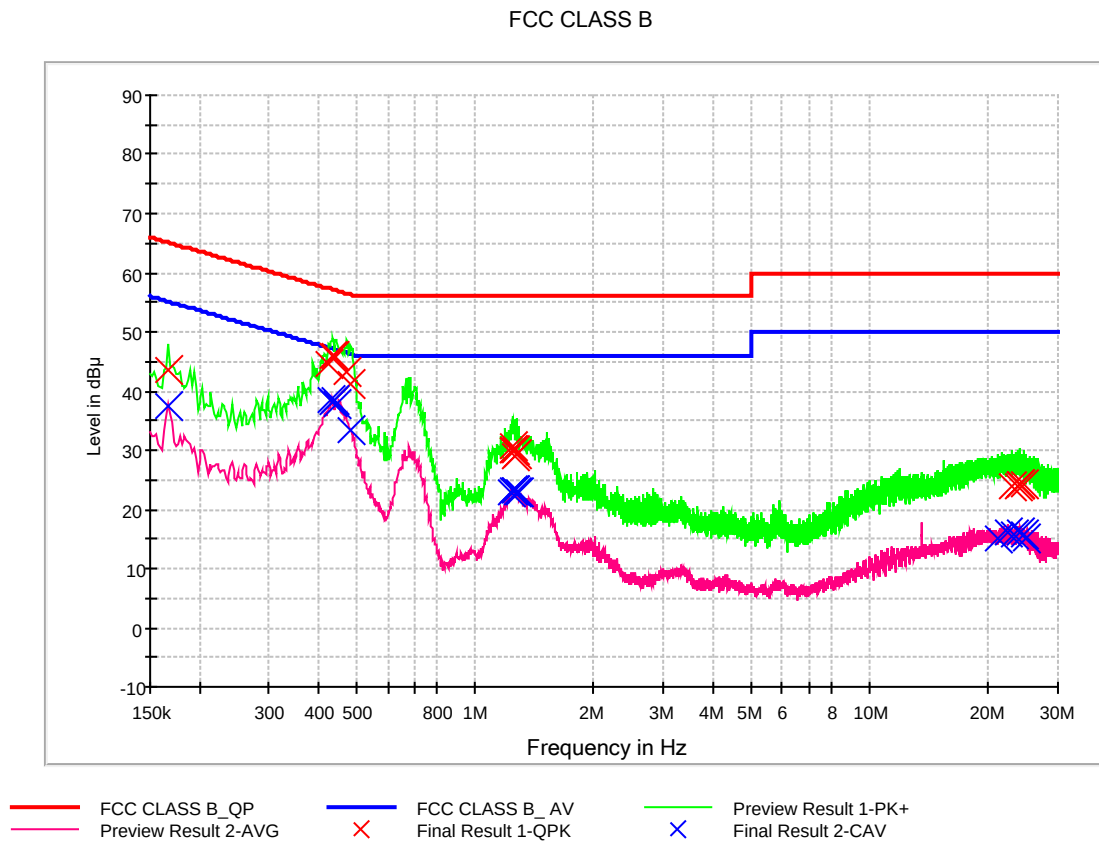


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.434000	38.6	9.000	L1	9.7	8.5	47.2
0.444000	38.6	9.000	L1	9.7	8.4	47.0
0.452000	38.4	9.000	L1	9.7	8.5	46.8
0.462000	37.1	9.000	L1	9.7	9.6	46.7
0.470000	35.7	9.000	L1	9.7	10.8	46.5
0.480000	33.9	9.000	L1	9.7	12.5	46.3
1.220000	22.1	9.000	L1	9.7	23.9	46.0
1.224000	22.3	9.000	L1	9.7	23.7	46.0
1.238000	23.1	9.000	L1	9.7	22.9	46.0
1.252000	23.2	9.000	L1	9.8	22.8	46.0
1.264000	23.1	9.000	L1	9.8	22.9	46.0
1.286000	22.5	9.000	L1	9.8	23.5	46.0
21.308000	16.1	9.000	L1	10.2	33.9	50.0
22.262000	16.1	9.000	L1	10.2	33.9	50.0
22.542000	15.8	9.000	L1	10.2	34.2	50.0
23.656000	16.1	9.000	L1	10.2	33.9	50.0
23.774000	16.3	9.000	L1	10.2	33.7	50.0
24.028000	16.2	9.000	L1	10.2	33.8	50.0



Figure 4: Conducted Emission, OBD +GPS+ LTE 12 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)
0.166000	43.7	9.000	N	9.6	21.5	65.2
0.426000	44.5	9.000	N	9.6	12.8	57.3
0.436000	46.1	9.000	N	9.6	11.1	57.1
0.442000	45.9	9.000	N	9.6	11.2	57.0
0.474000	43.3	9.000	N	9.6	13.2	56.4
0.484000	41.1	9.000	N	9.7	15.2	56.3
1.240000	30.1	9.000	N	9.7	25.9	56.0
1.246000	30.0	9.000	N	9.7	26.0	56.0
1.250000	30.7	9.000	N	9.7	25.3	56.0
1.254000	30.1	9.000	N	9.7	25.9	56.0
1.258000	29.1	9.000	N	9.7	26.9	56.0
1.274000	29.3	9.000	N	9.7	26.7	56.0
22.820000	24.0	9.000	N	10.2	36.0	60.0
23.616000	24.0	9.000	N	10.2	36.0	60.0
23.998000	24.4	9.000	N	10.2	35.6	60.0
24.010000	24.1	9.000	N	10.2	35.9	60.0
24.140000	24.3	9.000	N	10.2	35.7	60.0
24.468000	24.1	9.000	N	10.2	35.9	60.0

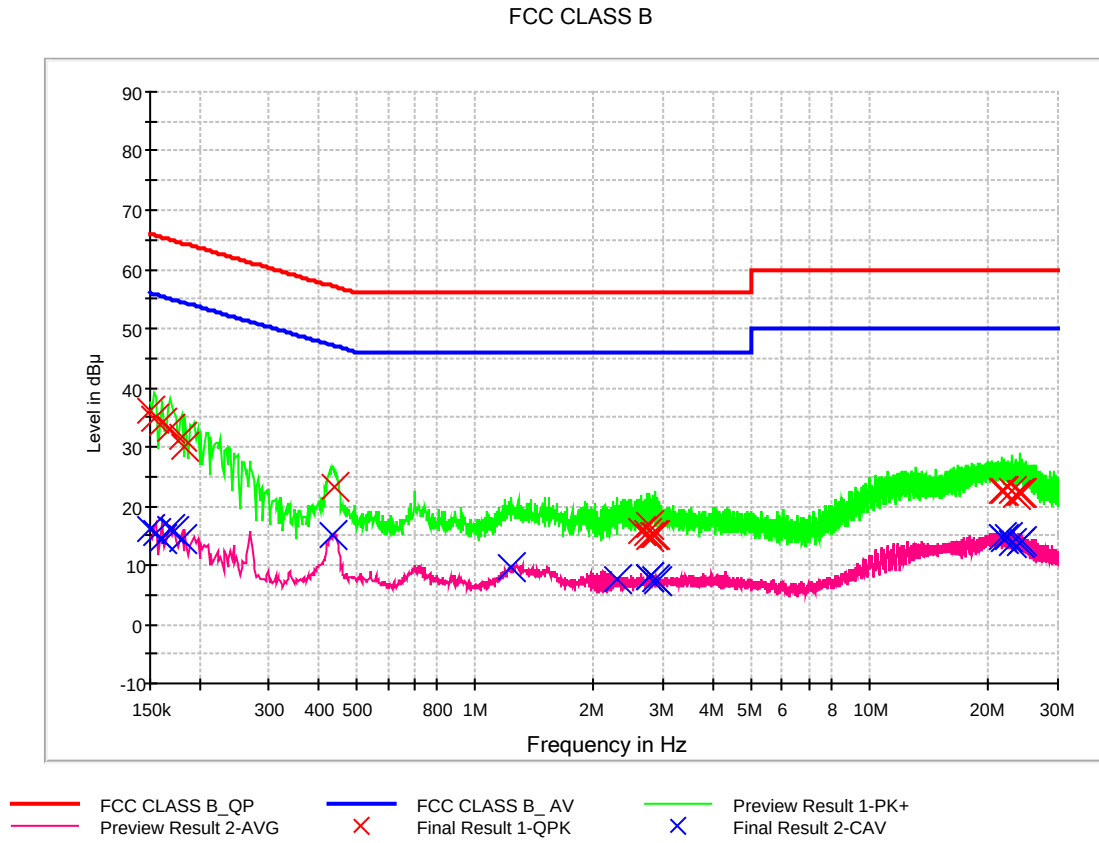


CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.166000	37.3	9.000	N	9.6	17.8	55.2
0.432000	38.6	9.000	N	9.6	8.6	47.2
0.436000	38.1	9.000	N	9.6	9.1	47.1
0.442000	38.5	9.000	N	9.6	8.5	47.0
0.446000	38.0	9.000	N	9.6	9.0	46.9
0.484000	33.2	9.000	N	9.7	13.0	46.3
1.236000	23.0	9.000	N	9.7	23.0	46.0
1.246000	23.1	9.000	N	9.7	22.9	46.0
1.254000	23.2	9.000	N	9.7	22.8	46.0
1.260000	23.3	9.000	N	9.7	22.7	46.0
1.274000	23.0	9.000	N	9.7	23.0	46.0
1.290000	22.7	9.000	N	9.7	23.3	46.0
21.158000	15.2	9.000	N	10.2	34.8	50.0
22.412000	16.1	9.000	N	10.2	33.9	50.0
23.156000	15.7	9.000	N	10.2	34.3	50.0
24.140000	16.1	9.000	N	10.2	33.9	50.0
24.468000	15.8	9.000	N	10.2	34.2	50.0
24.756000	15.0	9.000	N	10.2	35.0	50.0



Figure 5: Conducted Emission, OBD +GPS+ LTE 12 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)
0.150000	36.0	9.000	L1	9.6	30.0	66.0
0.154000	34.8	9.000	L1	9.6	30.9	65.8
0.160000	33.9	9.000	L1	9.6	31.5	65.5
0.168000	33.0	9.000	L1	9.6	32.0	65.1
0.180000	31.6	9.000	L1	9.6	32.9	64.5
0.184000	29.9	9.000	L1	9.6	34.4	64.3
0.442000	23.1	9.000	L1	9.7	33.9	57.0
2.636000	15.7	9.000	L1	9.8	40.3	56.0
2.716000	15.3	9.000	L1	9.8	40.7	56.0
2.756000	14.8	9.000	L1	9.8	41.2	56.0
2.772000	16.7	9.000	L1	9.8	39.3	56.0
2.836000	15.2	9.000	L1	9.8	40.8	56.0
2.870000	15.2	9.000	L1	9.8	40.8	56.0
21.640000	22.7	9.000	L1	10.2	37.3	60.0
21.926000	22.5	9.000	L1	10.2	37.5	60.0
22.812000	22.4	9.000	L1	10.2	37.6	60.0
23.554000	22.0	9.000	L1	10.2	38.0	60.0
23.986000	22.3	9.000	L1	10.2	37.7	60.0
24.426000	22.2	9.000	L1	10.2	37.8	60.0

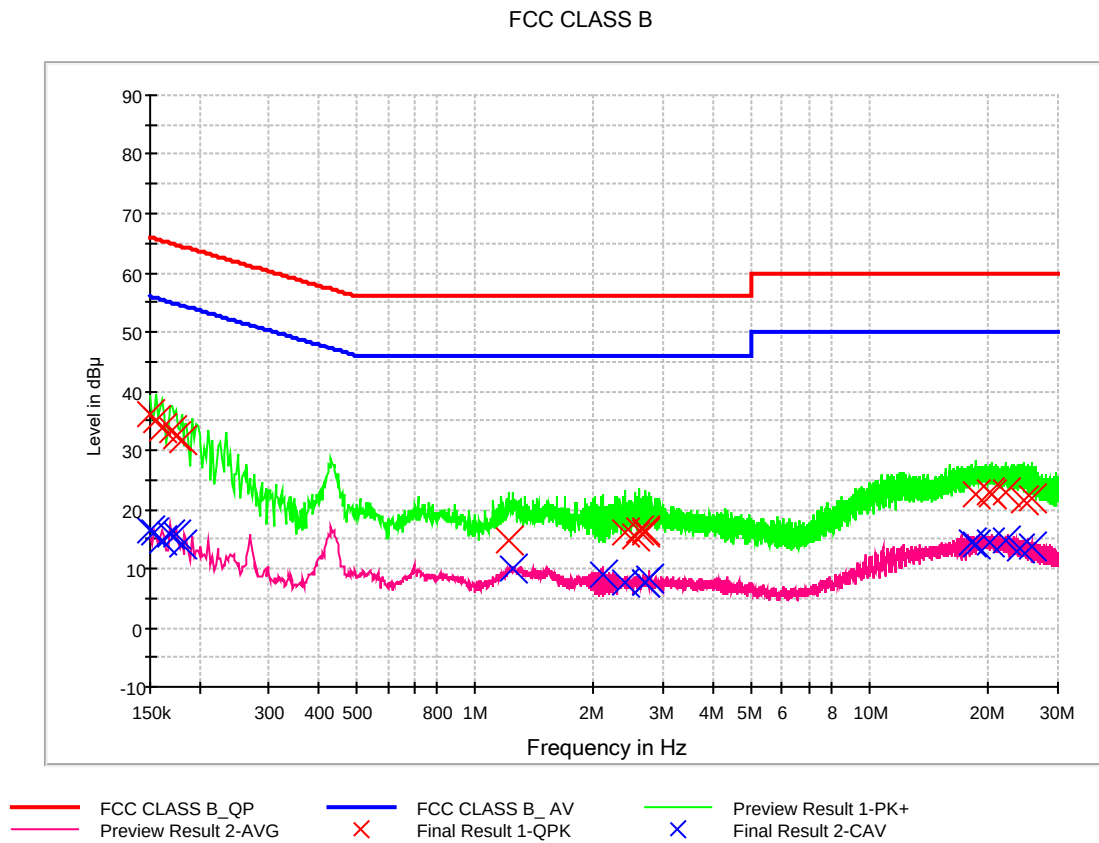


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	16.1	9.000	L1	9.6	39.9	56.0
0.156000	15.5	9.000	L1	9.6	40.2	55.7
0.160000	14.5	9.000	L1	9.6	41.0	55.5
0.168000	15.9	9.000	L1	9.6	39.1	55.1
0.172000	15.8	9.000	L1	9.6	39.1	54.9
0.180000	14.3	9.000	L1	9.6	40.2	54.5
0.436000	15.1	9.000	L1	9.7	32.0	47.1
1.238000	9.7	9.000	L1	9.7	36.3	46.0
2.296000	7.8	9.000	L1	9.7	38.2	46.0
2.750000	8.0	9.000	L1	9.8	38.0	46.0
2.772000	8.0	9.000	L1	9.8	38.0	46.0
2.870000	7.5	9.000	L1	9.8	38.5	46.0
2.894000	7.4	9.000	L1	9.8	38.6	46.0
21.640000	14.8	9.000	L1	10.2	35.2	50.0
21.754000	14.5	9.000	L1	10.2	35.5	50.0
22.364000	14.7	9.000	L1	10.2	35.3	50.0
22.818000	13.9	9.000	L1	10.2	36.1	50.0
23.986000	13.8	9.000	L1	10.2	36.2	50.0
24.426000	14.0	9.000	L1	10.2	36.0	50.0



Figure 6: Conducted Emission, OBD +GPS+ LTE 12 band (Middle) RX Receiving mode, Line (N)





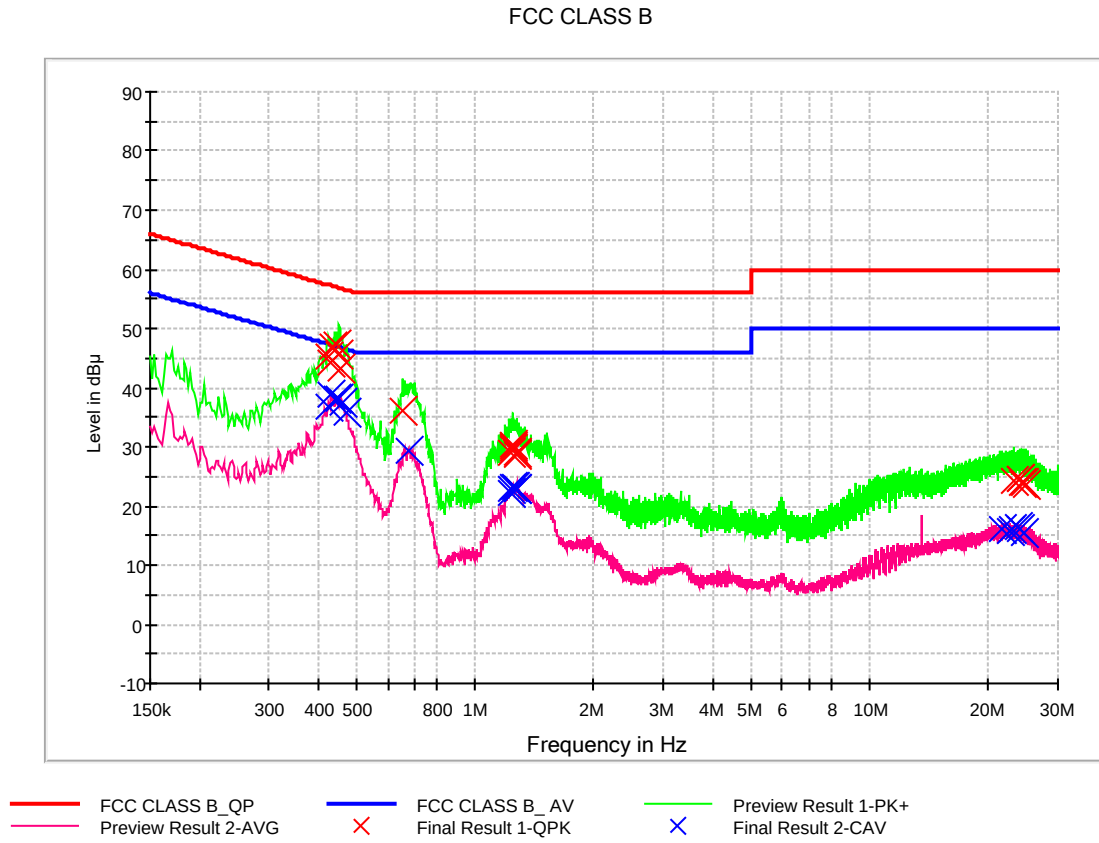
QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	36.1	9.000	N	9.6	29.9	66.0
0.156000	35.0	9.000	N	9.6	30.7	65.7
0.160000	33.8	9.000	N	9.6	31.7	65.5
0.170000	33.4	9.000	N	9.6	31.5	65.0
0.174000	32.4	9.000	N	9.6	32.4	64.8
0.180000	31.6	9.000	N	9.6	32.9	64.5
1.220000	14.9	9.000	N	9.7	41.1	56.0
2.400000	16.1	9.000	N	9.7	39.9	56.0
2.534000	15.5	9.000	N	9.7	40.5	56.0
2.612000	16.6	9.000	N	9.7	39.4	56.0
2.690000	16.3	9.000	N	9.7	39.7	56.0
2.694000	16.1	9.000	N	9.7	39.9	56.0
18.630000	22.6	9.000	N	10.1	37.4	60.0
20.220000	22.8	9.000	N	10.2	37.2	60.0
20.420000	22.5	9.000	N	10.2	37.5	60.0
22.030000	22.7	9.000	N	10.2	37.3	60.0
24.696000	21.4	9.000	N	10.2	38.6	60.0
25.642000	21.9	9.000	N	10.3	38.1	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	16.4	9.000	N	9.6	39.6	56.0
0.154000	16.0	9.000	N	9.6	39.8	55.8
0.160000	14.8	9.000	N	9.6	40.7	55.5
0.168000	15.8	9.000	N	9.6	39.2	55.1
0.174000	15.7	9.000	N	9.6	39.1	54.8
0.180000	14.2	9.000	N	9.6	40.3	54.5
1.244000	9.8	9.000	N	9.7	36.2	46.0
2.100000	9.1	9.000	N	9.7	36.9	46.0
2.400000	7.8	9.000	N	9.7	38.2	46.0
2.690000	7.6	9.000	N	9.7	38.4	46.0
2.694000	7.6	9.000	N	9.7	38.4	46.0
2.774000	8.4	9.000	N	9.8	37.6	46.0
18.132000	14.4	9.000	N	10.1	35.6	50.0
18.630000	14.0	9.000	N	10.1	36.0	50.0
20.220000	14.5	9.000	N	10.2	35.5	50.0
22.030000	14.8	9.000	N	10.2	35.2	50.0
23.946000	13.4	9.000	N	10.2	36.6	50.0
25.642000	13.7	9.000	N	10.3	36.3	50.0

**Figure 7: Conducted Emission, OBD +GPS+ LTE 12 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)
0.426000	48.6	9.000	L1	9.7	8.7	57.3
0.430000	48.4	9.000	L1	9.7	8.8	57.3
0.434000	48.0	9.000	L1	9.7	9.1	57.2
0.444000	49.3	9.000	L1	9.7	7.7	57.0
0.452000	50.7	9.000	L1	9.7	6.1	56.8
0.458000	48.7	9.000	L1	9.7	8.1	56.7
0.656000	41.4	9.000	L1	9.7	14.6	56.0
1.232000	34.9	9.000	L1	9.7	21.1	56.0
1.242000	35.7	9.000	L1	9.7	20.3	56.0
1.246000	34.8	9.000	L1	9.7	21.2	56.0
1.252000	35.0	9.000	L1	9.8	21.0	56.0
1.274000	34.8	9.000	L1	9.8	21.2	56.0
1.278000	34.8	9.000	L1	9.8	21.2	56.0
23.296000	29.9	9.000	L1	10.2	30.1	60.0
24.064000	29.5	9.000	L1	10.2	30.5	60.0
24.094000	29.5	9.000	L1	10.2	30.5	60.0
24.242000	29.7	9.000	L1	10.2	30.3	60.0
24.582000	29.6	9.000	L1	10.2	30.4	60.0
24.868000	29.5	9.000	L1	10.2	30.5	60.0

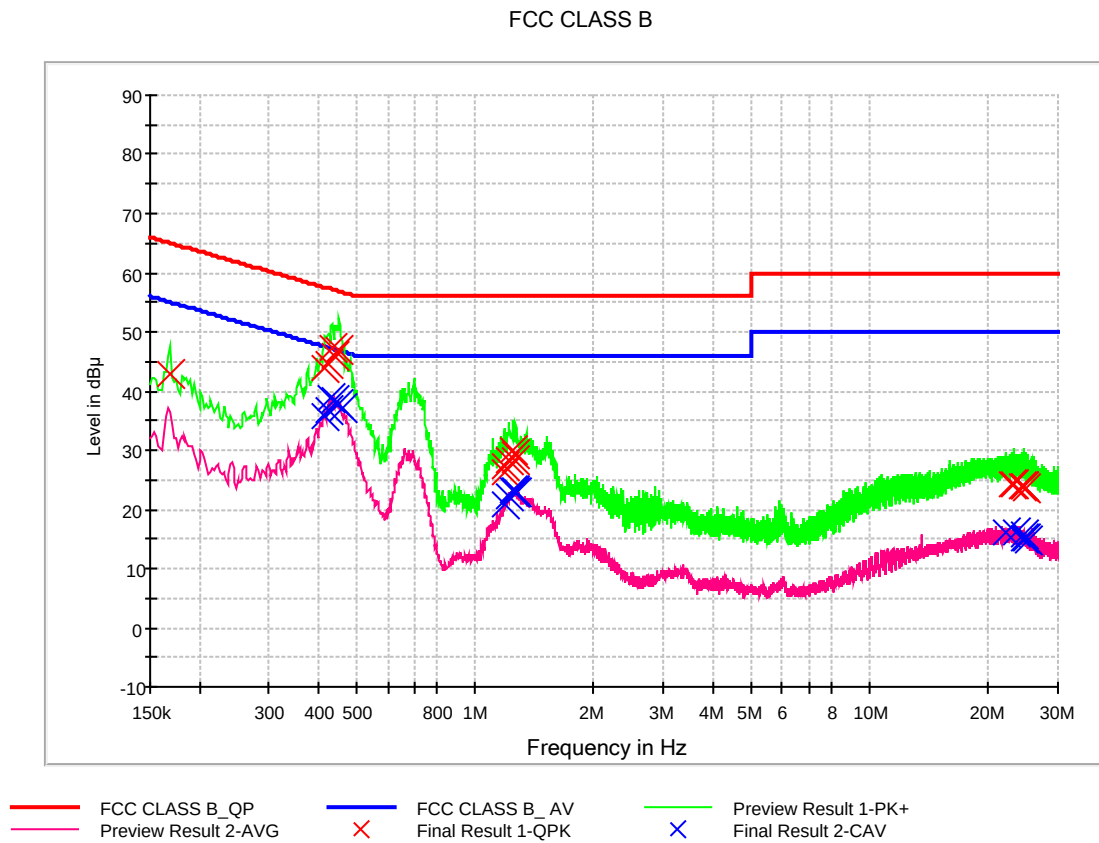


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.426000	37.3	9.000	L1	9.7	10.0	47.3
0.432000	38.3	9.000	L1	9.7	8.9	47.2
0.444000	38.6	9.000	L1	9.7	8.4	47.0
0.452000	38.6	9.000	L1	9.7	8.3	46.8
0.462000	37.4	9.000	L1	9.7	9.2	46.7
0.472000	35.8	9.000	L1	9.7	10.7	46.5
0.676000	29.8	9.000	L1	9.7	16.2	46.0
1.226000	22.2	9.000	L1	9.7	23.8	46.0
1.234000	23.0	9.000	L1	9.7	23.0	46.0
1.242000	23.7	9.000	L1	9.7	22.3	46.0
1.260000	23.5	9.000	L1	9.8	22.5	46.0
1.268000	23.7	9.000	L1	9.8	22.3	46.0
1.278000	23.5	9.000	L1	9.8	22.5	46.0
21.748000	16.7	9.000	L1	10.2	33.3	50.0
22.542000	16.5	9.000	L1	10.2	33.5	50.0
22.974000	16.7	9.000	L1	10.2	33.3	50.0
23.706000	16.7	9.000	L1	10.2	33.3	50.0
24.094000	16.8	9.000	L1	10.2	33.2	50.0
24.582000	16.2	9.000	L1	10.2	33.8	50.0



Figure 8: Conducted Emission, OBD +GPS+ LTE 12 band (HIGH) RX Receiving mode, Line (N)





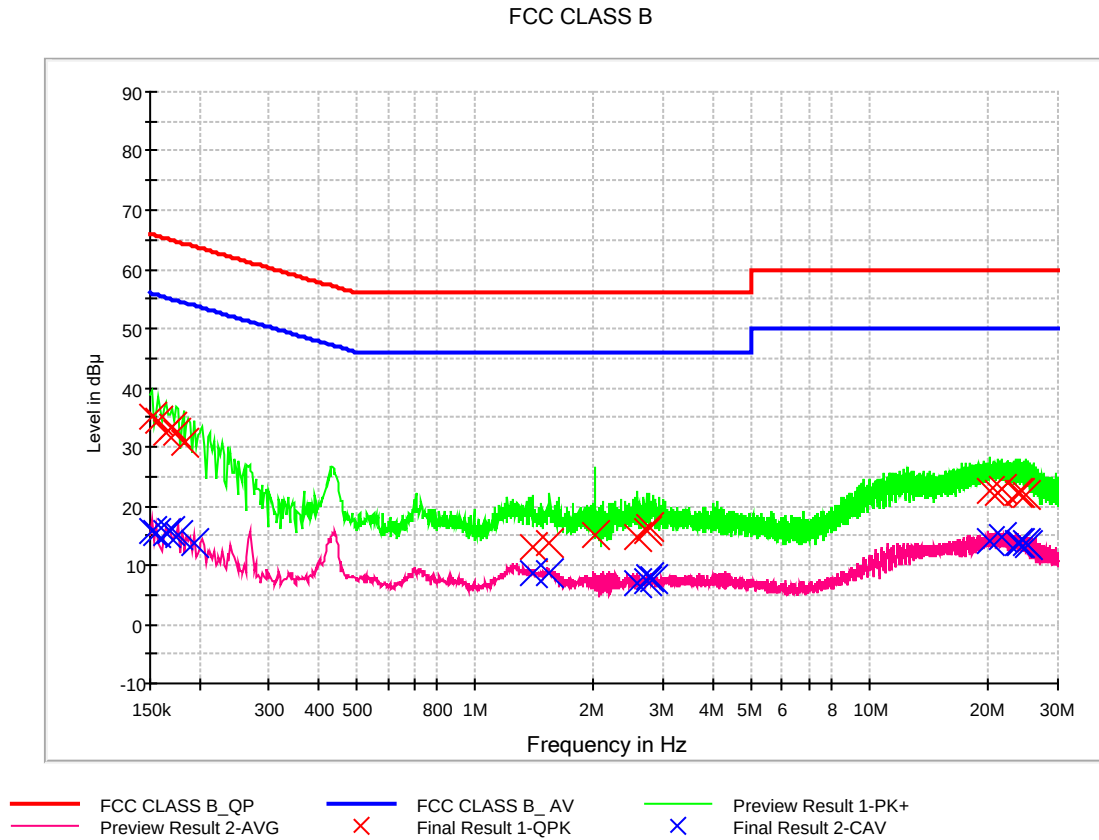
QuasiPeak Final Result, Line (N)

Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.168000	42.8	9.000	N	9.6	22.3	65.1
0.416000	44.0	9.000	N	9.6	13.5	57.5
0.426000	44.6	9.000	N	9.6	12.7	57.3
0.434000	47.2	9.000	N	9.6	10.0	57.2
0.442000	45.8	9.000	N	9.6	11.2	57.0
0.452000	46.9	9.000	N	9.6	10.0	56.8
1.184000	26.1	9.000	N	9.7	29.9	56.0
1.192000	27.3	9.000	N	9.7	28.7	56.0
1.218000	28.2	9.000	N	9.7	27.8	56.0
1.246000	30.1	9.000	N	9.7	25.9	56.0
1.256000	28.4	9.000	N	9.7	27.6	56.0
1.266000	29.4	9.000	N	9.7	26.6	56.0
22.962000	24.1	9.000	N	10.2	35.9	60.0
23.290000	24.2	9.000	N	10.2	35.8	60.0
24.194000	23.9	9.000	N	10.2	36.1	60.0
24.536000	23.9	9.000	N	10.2	36.1	60.0
24.588000	23.8	9.000	N	10.2	36.2	60.0
24.854000	23.5	9.000	N	10.2	36.5	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.416000	35.8	9.000	N	9.6	11.8	47.5
0.424000	36.9	9.000	N	9.6	10.5	47.4
0.432000	38.7	9.000	N	9.6	8.5	47.2
0.442000	38.4	9.000	N	9.6	8.6	47.0
0.450000	37.7	9.000	N	9.6	9.2	46.9
0.462000	37.2	9.000	N	9.6	9.4	46.7
1.192000	20.8	9.000	N	9.7	25.2	46.0
1.218000	22.2	9.000	N	9.7	23.8	46.0
1.246000	23.1	9.000	N	9.7	22.9	46.0
1.254000	23.3	9.000	N	9.7	22.7	46.0
1.266000	22.9	9.000	N	9.7	23.1	46.0
1.272000	22.7	9.000	N	9.7	23.3	46.0
22.252000	16.0	9.000	N	10.2	34.0	50.0
23.332000	16.2	9.000	N	10.2	33.8	50.0
24.488000	15.7	9.000	N	10.2	34.4	50.0
24.588000	15.2	9.000	N	10.2	34.8	50.0
24.854000	15.1	9.000	N	10.2	34.9	50.0
25.054000	14.9	9.000	N	10.2	35.1	50.0

**Figure 9: Conducted Emission, OBD +GPS+ LTE 25 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	35.1	9.000	L1	9.6	30.8	65.9
0.158000	34.5	9.000	L1	9.6	31.0	65.6
0.164000	32.4	9.000	L1	9.6	32.8	65.3
0.170000	33.3	9.000	L1	9.6	31.7	65.0
0.174000	32.3	9.000	L1	9.6	32.5	64.8
0.182000	30.7	9.000	L1	9.6	33.7	64.4
1.402000	12.9	9.000	L1	9.8	43.1	56.0
1.546000	13.6	9.000	L1	9.8	42.4	56.0
2.004000	15.1	9.000	L1	9.7	40.9	56.0
2.580000	14.9	9.000	L1	9.8	41.1	56.0
2.712000	15.7	9.000	L1	9.8	40.3	56.0
2.774000	16.5	9.000	L1	9.8	39.5	56.0
20.082000	22.7	9.000	L1	10.2	37.3	60.0
21.142000	22.2	9.000	L1	10.2	37.8	60.0
21.690000	22.9	9.000	L1	10.2	37.1	60.0
23.614000	22.2	9.000	L1	10.2	37.8	60.0
23.970000	22.1	9.000	L1	10.2	37.9	60.0
24.860000	22.0	9.000	L1	10.2	38.0	60.0

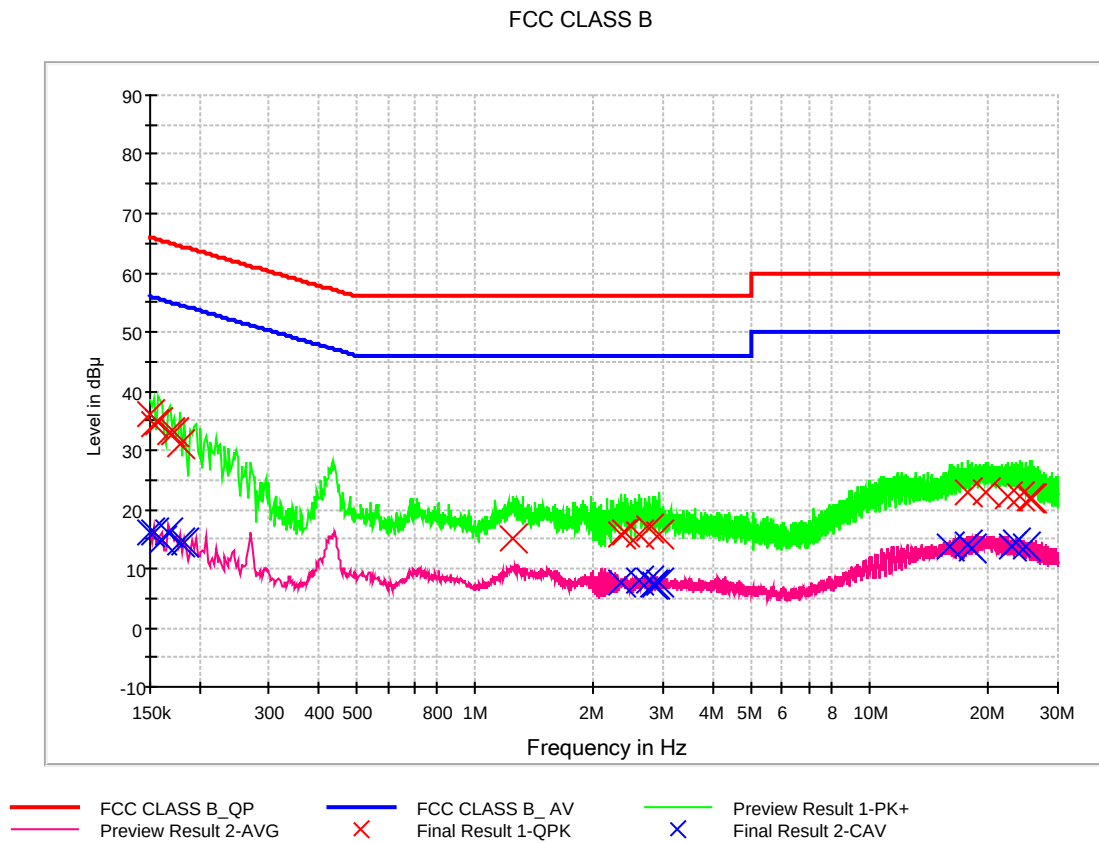


CAverage Final Result, Line (L1)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.152000	15.8	9.000	L1	9.6	40.1	55.9
0.156000	15.6	9.000	L1	9.6	40.1	55.7
0.164000	15.5	9.000	L1	9.6	39.8	55.3
0.168000	15.9	9.000	L1	9.6	39.2	55.1
0.176000	14.9	9.000	L1	9.6	39.8	54.7
0.194000	13.8	9.000	L1	9.7	40.1	53.9
1.402000	8.8	9.000	L1	9.8	37.2	46.0
1.546000	8.8	9.000	L1	9.8	37.2	46.0
2.580000	7.0	9.000	L1	9.8	39.0	46.0
2.712000	7.4	9.000	L1	9.8	38.6	46.0
2.774000	8.1	9.000	L1	9.8	37.9	46.0
2.838000	7.7	9.000	L1	9.8	38.3	46.0
20.080000	14.2	9.000	L1	10.2	35.8	50.0
21.690000	14.9	9.000	L1	10.2	35.1	50.0
23.614000	13.7	9.000	L1	10.2	36.3	50.0
23.970000	13.8	9.000	L1	10.2	36.2	50.0
24.860000	13.7	9.000	L1	10.2	36.3	50.0
25.220000	13.3	9.000	L1	10.2	36.7	50.0



Figure 10: Conducted Emission, OBD +GPS+ LTE 25 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	36.0	9.000	N	9.6	30.0	66.0
0.154000	34.5	9.000	N	9.6	31.2	65.8
0.158000	34.6	9.000	N	9.6	31.0	65.6
0.168000	33.0	9.000	N	9.6	32.1	65.1
0.172000	32.9	9.000	N	9.6	32.0	64.9
0.178000	31.1	9.000	N	9.6	33.5	64.6
1.250000	15.0	9.000	N	9.7	41.0	56.0
2.352000	15.9	9.000	N	9.7	40.1	56.0
2.400000	16.1	9.000	N	9.7	39.9	56.0
2.616000	15.9	9.000	N	9.7	40.1	56.0
2.752000	16.7	9.000	N	9.8	39.3	56.0
2.926000	15.6	9.000	N	9.8	40.4	56.0
17.810000	22.8	9.000	N	10.1	37.2	60.0
19.752000	23.0	9.000	N	10.2	37.0	60.0
22.292000	22.3	9.000	N	10.2	37.7	60.0
24.046000	22.2	9.000	N	10.2	37.8	60.0
25.596000	21.9	9.000	N	10.3	38.1	60.0
25.686000	21.8	9.000	N	10.3	38.2	60.0



CAverage Final Result, Line (N)

Frequency (MHz)	CAverage (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.150000	16.3	9.000	N	9.6	39.7	56.0
0.154000	16.0	9.000	N	9.6	39.7	55.8
0.160000	14.6	9.000	N	9.6	40.8	55.5
0.166000	16.1	9.000	N	9.6	39.1	55.2
0.178000	14.4	9.000	N	9.6	40.2	54.6
0.184000	14.5	9.000	N	9.6	39.8	54.3
2.352000	7.6	9.000	N	9.7	38.4	46.0
2.616000	7.8	9.000	N	9.7	38.2	46.0
2.752000	8.0	9.000	N	9.8	38.0	46.0
2.826000	7.4	9.000	N	9.8	38.6	46.0
2.850000	7.3	9.000	N	9.8	38.7	46.0
2.926000	7.7	9.000	N	9.8	38.3	46.0
15.898000	13.6	9.000	N	10.1	36.4	50.0
17.810000	14.0	9.000	N	10.1	36.0	50.0
18.242000	13.4	9.000	N	10.1	36.6	50.0
22.796000	13.8	9.000	N	10.2	36.2	50.0
23.380000	14.2	9.000	N	10.2	35.8	50.0
24.950000	13.6	9.000	N	10.2	36.4	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	22.3 / 23.0 / 24.2 / 21.9 °C
Relative Humidity	39.8 / 41.5 / 40.5 / 39.4 %
Test Date	March 04 / March 06 / March 07 / March 18, 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



[12 V] OBD +GPS+ LTE 4 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)
31.060987	24.4	99.9	V	103.0	18.8	15.6	40.0
54.368000	28.7	99.9	V	346.0	20.1	11.3	40.0
79.596000	25.2	99.8	V	300.0	15.7	14.8	40.0
84.873600	32.4	99.8	V	296.0	15.0	7.6	40.0
85.543200	32.5	99.8	V	324.0	14.9	7.5	40.0
335.940800	25.0	174.7	V	42.0	21.4	21.0	46.0

[12 V] OBD +GPS+ LTE 12 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)
32.312000	26.5	99.8	V	145.0	18.5	13.5	40.0
54.484800	29.4	99.7	V	289.0	20.0	10.6	40.0
62.207200	28.6	99.9	V	311.0	19.2	11.4	40.0
84.010400	30.5	125.3	V	229.0	15.3	9.5	40.0
154.470400	18.6	174.9	V	96.0	20.1	24.9	43.5
866.232000	30.4	174.7	V	30.0	30.7	15.6	46.0

[12 V] OBD +GPS+ LTE 12 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)
31.902400	25.7	99.9	V	76.0	18.9	14.3	40.0
54.977600	29.2	99.7	V	328.0	20.0	10.8	40.0
71.979200	21.3	99.8	V	235.0	17.5	18.7	40.0
81.698400	26.4	99.8	V	197.0	15.4	13.6	40.0
85.212000	32.4	99.9	V	303.0	15.0	7.6	40.0
335.966400	27.6	174.8	V	161.0	21.4	18.4	46.0



[12 V] OBD +GPS+ LTE 12 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)
31.743200	26.4	99.8	V	103.0	18.5	13.6	40.0
54.372000	29.6	99.8	V	294.0	20.0	10.4	40.0
61.798400	28.6	99.9	V	275.0	19.3	11.4	40.0
83.278400	31.0	99.9	V	326.0	15.4	9.0	40.0
85.853600	29.8	99.8	V	264.0	15.0	10.2	40.0
675.453600	28.3	275.0	H	69.0	28.4	17.7	46.0

[12 V] OBD +GPS+ LTE 25 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)
31.495392	25.9	99.9	V	88.0	18.8	14.1	40.0
54.595200	29.0	99.7	V	265.0	20.0	11.0	40.0
62.645600	25.6	99.8	V	299.0	19.3	14.4	40.0
82.261600	27.8	99.8	V	1.0	15.4	12.2	40.0
84.941600	32.5	99.9	V	269.0	15.0	7.5	40.0
85.917600	32.5	99.8	V	308.0	14.9	7.5	40.0



[24 V] OBD +GPS+ LTE 4 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)
31.979200	29.0	100.0	V	284.0	18.9	11.0	40.0
41.719200	25.0	117.9	V	320.0	19.8	15.0	40.0
42.997600	25.0	174.8	V	238.0	19.8	15.0	40.0
53.971200	33.0	117.8	V	110.0	20.1	7.0	40.0
84.119200	33.0	125.3	V	289.0	15.1	7.0	40.0
85.395200	32.0	100.0	V	234.0	15.0	8.0	40.0

[24 V] OBD +GPS+ LTE 12 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)
31.744800	26.0	99.8	V	168.0	18.5	14.0	40.0
54.396000	29.0	99.8	V	256.0	20.0	11.0	40.0
61.544800	29.6	99.9	V	277.0	19.3	10.4	40.0
81.997600	29.5	100.0	V	311.0	15.5	10.5	40.0
86.478400	28.1	99.8	V	0.0	14.9	11.9	40.0
689.792800	28.4	99.9	V	98.0	28.6	17.6	46.0

[24 V] OBD +GPS+ LTE 12 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)
30.452800	29.0	100.0	V	111.0	18.7	11.0	40.0
46.752000	25.0	100.0	V	161.0	20.1	15.0	40.0
54.256000	32.0	115.8	V	108.0	20.1	8.0	40.0
69.847200	26.0	100.0	V	30.0	18.0	14.0	40.0
83.414400	33.0	100.0	V	289.0	15.2	7.0	40.0
85.792800	32.0	100.0	V	311.0	14.9	8.0	40.0



[24 V] OBD +GPS+ LTE 12 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)
32.747200	26.5	99.8	V	103.0	18.6	13.5	40.0
54.587200	29.4	99.8	V	271.0	20.0	10.6	40.0
61.682400	28.8	99.8	V	312.0	19.3	11.2	40.0
84.127200	31.5	99.7	V	253.0	15.2	8.5	40.0
86.860800	28.2	99.8	V	336.0	14.8	11.8	40.0
683.795200	28.2	308.8	H	45.0	28.5	17.8	46.0

[24 V] OBD +GPS+ LTE 25 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)
32.634400	25.0	225.1	V	278.0	18.9	15.0	40.0
34.195200	25.0	174.9	V	268.0	19.1	15.0	40.0
41.181600	25.0	174.9	V	314.0	19.7	15.0	40.0
53.991200	33.0	100.0	V	309.0	20.1	7.0	40.0
85.471200	33.0	100.0	V	289.0	14.9	7.0	40.0
85.860000	32.0	125.2	V	322.0	14.9	8.0	40.0



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	1 905 MHz
Tested Frequency Range	1 GHz to 18 GHz
Kind of Test Site	3 m semi anechoic chamber
Temperature	23.2 / 23.0 / 24.2 / 23.6 °C
Relative Humidity	39.6 / 41.7 / 40.5 / 42.9 %
Test Date	March 05 / March 06 / March 07 / March 19, 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



[12 V] OBD +GPS+ LTE 4 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)
1727.090000	24.2	99.9	V	174.0	-27.3	49.8	74.0
2719.990000	27.0	160.5	V	51.0	-24.0	47.0	74.0
4207.250000	29.8	217.5	H	255.0	-20.3	44.2	74.0
5943.470000	29.3	275.5	V	260.0	-17.2	44.7	74.0
7961.775000	34.7	306.4	H	181.0	-12.4	39.3	74.0
9455.130000	36.8	230.6	V	195.0	-10.2	37.2	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1727.090000	11.0	99.9	V	174.0	-27.3	43.0	54.0
2719.990000	14.1	160.5	V	51.0	-24.0	39.9	54.0
4207.250000	16.9	217.5	H	255.0	-20.3	37.1	54.0
5943.470000	16.6	275.5	V	260.0	-17.2	37.4	54.0
7961.775000	20.9	306.4	H	181.0	-12.4	33.1	54.0
9455.130000	23.9	230.6	V	195.0	-10.2	30.1	54.0

[12 V] OBD +GPS+ LTE 12 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)
5228.280000	39.5	99.9	V	346.0	-15.7	34.5	74.0
7515.050000	44.7	150.0	H	52.0	-9.4	29.3	74.0
8434.850000	46.6	160.5	V	131.0	-8.5	27.4	74.0
9350.690000	47.5	111.4	V	305.0	-5.8	26.5	74.0
10299.985000	48.8	198.4	H	80.0	-4.3	25.2	74.0
10782.920000	48.0	249.4	V	20.0	-3.1	26.0	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
5228.280000	26.7	99.9	V	346.0	-15.7	27.3	54.0
7515.050000	31.7	150.0	H	52.0	-9.4	22.3	54.0
8434.850000	33.0	160.5	V	131.0	-8.5	21.0	54.0
9350.690000	34.9	111.4	V	305.0	-5.8	19.1	54.0
10299.985000	35.1	198.4	H	80.0	-4.3	18.9	54.0
10782.920000	35.4	249.4	V	20.0	-3.1	18.6	54.0



[12 V] OBD +GPS+ LTE 12 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)
1826.490000	23.4	308.7	V	224.0	-27.1	50.6	74.0
5490.285000	29.8	350.0	V	22.0	-17.8	44.2	74.0
7465.080000	33.3	111.4	H	328.0	-12.8	40.7	74.0
8695.920000	34.7	350.0	V	12.0	-12.2	39.3	74.0
10085.405000	36.8	199.6	V	232.0	-9.0	37.2	74.0
10834.635000	39.5	111.4	H	224.0	-6.1	34.5	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1826.490000	10.7	308.7	V	224.0	-27.1	43.3	54.0
5490.285000	16.8	350.0	V	22.0	-17.8	37.2	54.0
7465.080000	20.1	111.4	H	328.0	-12.8	33.9	54.0
8695.920000	21.9	350.0	V	12.0	-12.2	32.1	54.0
10085.405000	24.4	199.6	V	232.0	-9.0	29.6	54.0
10834.635000	26.1	111.4	H	224.0	-6.1	27.9	54.0

[12 V] OBD +GPS+ LTE 12 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)
3686.970000	35.7	261.4	V	121.0	-20.3	38.3	74.0
5101.335000	39.8	99.9	V	68.0	-15.8	34.2	74.0
7432.765000	44.8	350.0	H	302.0	-9.6	29.2	74.0
8833.440000	46.2	150.0	V	276.0	-7.3	27.8	74.0
9238.015000	47.6	149.5	V	169.0	-6.1	26.4	74.0
10323.540000	47.8	350.0	H	238.0	-4.2	26.2	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3686.970000	22.8	261.4	V	121.0	-20.3	31.2	54.0
5101.335000	26.3	100.0	V	68.0	-15.8	27.7	54.0
7432.765000	31.9	350.0	H	302.0	-9.6	22.1	54.0
8833.440000	33.8	150.0	V	276.0	-7.3	20.2	54.0
9238.015000	35.0	149.5	V	169.0	-6.1	19.0	54.0
10323.540000	35.4	350.0	H	238.0	-4.2	18.6	54.0



[12 V] OBD +GPS+ LTE 25 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)
1362.860000	22.9	322.4	H	164.0	-28.3	51.1	74.0
3082.055000	28.1	350.0	H	246.0	-22.7	45.9	74.0
4644.045000	29.4	150.0	H	28.0	-19.2	44.6	74.0
6198.470000	29.8	249.9	V	160.0	-16.3	44.2	74.0
7664.020000	33.6	218.6	V	288.0	-12.6	40.4	74.0
9085.145000	36.7	162.6	H	100.0	-11.1	37.3	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1362.860000	9.9	322.4	H	164.0	-28.3	44.1	54.0
3082.055000	15.2	350.0	H	246.0	-22.7	38.8	54.0
4644.045000	16.8	150.0	H	28.0	-19.2	37.2	54.0
6198.470000	16.9	249.9	V	160.0	-16.3	37.1	54.0
7664.020000	20.8	218.6	V	288.0	-12.6	33.2	54.0
9085.145000	23.4	162.6	H	100.0	-11.1	30.6	54.0



[24 V] OBD +GPS+ LTE 4 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)
1362.110000	30.4	99.9	H	0.0	-20.8	43.6	74.0
3095.870000	33.7	99.9	V	0.0	-16.6	40.3	74.0
4896.980000	38.1	150.1	H	224.0	-10.9	35.9	74.0
7313.815000	42.9	150.3	V	98.0	-4.1	31.1	74.0
9784.560000	46.6	150.1	V	54.0	-0.2	27.4	74.0
10860.525000	47.6	134.8	V	325.0	3.1	26.4	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
1362.110000	17.5	99.9	H	0.0	-20.8	36.5	54.0
3095.870000	21.3	99.9	V	0.0	-16.6	32.7	54.0
4896.980000	24.8	150.1	H	224.0	-10.9	29.2	54.0
7313.815000	29.1	150.3	V	98.0	-4.1	24.9	54.0
9784.560000	33.6	150.1	V	54.0	-0.2	20.4	54.0
10860.525000	35.2	134.8	V	325.0	3.1	18.8	54.0

[24 V] OBD +GPS+ LTE 12 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)
4660.815000	38.0	248.4	V	72.0	-17.1	36.0	74.0
5343.100000	39.7	277.4	V	278.0	-15.5	34.3	74.0
7563.235000	45.0	137.5	H	264.0	-9.4	29.0	74.0
8834.805000	46.3	150.0	H	248.0	-7.3	27.7	74.0
9744.660000	47.8	150.0	V	55.0	-5.4	26.2	74.0
10618.940000	48.8	336.5	H	20.0	-3.4	25.2	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
4660.815000	25.7	248.4	V	72.0	-17.1	28.3	54.0
5343.100000	26.2	277.4	V	278.0	-15.5	27.8	54.0
7563.235000	31.7	137.5	H	264.0	-9.4	22.3	54.0
8834.805000	33.7	150.0	H	248.0	-7.3	20.3	54.0
9744.660000	34.6	150.0	V	55.0	-5.4	19.4	54.0
10618.940000	36.0	336.5	H	20.0	-3.4	18.0	54.0



[24 V] OBD +GPS+ LTE 12 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)
2691.745000	32.8	150.3	H	162.0	-17.8	41.2	74.0
4350.325000	35.0	150.1	V	39.0	-13.4	39.0	74.0
5295.670000	37.3	99.7	V	54.0	-9.8	36.7	74.0
7444.375000	42.4	99.8	H	332.0	-3.6	31.6	74.0
9477.055000	46.8	99.9	H	50.0	-0.5	27.2	74.0
11177.275000	48.0	133.8	V	354.0	3.5	26.0	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
2691.745000	20.4	150.3	H	162.0	-17.8	33.6	54.0
4350.325000	22.3	150.1	V	39.0	-13.4	31.7	54.0
5295.670000	24.7	99.7	V	54.0	-9.8	29.3	54.0
7444.375000	29.2	99.8	H	332.0	-3.6	24.8	54.0
9477.055000	33.6	99.9	H	50.0	-0.5	20.4	54.0
11177.275000	35.3	133.8	V	354.0	3.5	18.7	54.0

[24 V] OBD +GPS+ LTE 12 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)
5631.740000	39.2	299.4	V	4.0	-15.3	34.8	74.0
7416.070000	44.6	149.6	V	136.0	-9.7	29.4	74.0
8042.375000	45.1	230.5	V	11.0	-9.0	28.9	74.0
8421.240000	45.0	160.5	V	342.0	-8.5	29.0	74.0
9516.530000	48.7	160.5	V	149.0	-5.4	25.3	74.0
10265.865000	48.1	248.4	V	100.0	-4.4	25.9	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
5631.740000	26.2	299.4	V	4.0	-15.3	27.8	54.0
7416.070000	31.8	149.6	V	136.0	-9.7	22.2	54.0
8042.375000	32.4	230.5	V	11.0	-9.0	21.6	54.0
8421.240000	32.7	160.5	V	342.0	-8.5	21.3	54.0
9516.530000	36.0	160.5	V	149.0	-5.4	18.0	54.0
10265.865000	35.3	248.4	V	100.0	-4.4	18.7	54.0



[24 V] OBD +GPS+ LTE 25 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)
3441.005000	34.1	139.6	V	50.0	-15.8	39.9	74.0
5097.190000	37.6	126.6	V	12.0	-10.2	36.4	74.0
6438.515000	39.7	139.6	V	287.0	-6.2	34.3	74.0
7556.190000	43.0	99.8	H	227.0	-3.4	31.0	74.0
9846.060000	45.9	99.7	H	325.0	-0.2	28.1	74.0
11862.135000	46.9	150.0	V	260.0	3.5	27.1	74.0

Frequency (MHz)	CAverage (dBμV/m)	Antenna Height (cm)	POL. (H/V)	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)
3441.005000	21.2	139.6	V	50.0	-15.8	32.8	54.0
5097.190000	24.8	126.6	V	12.0	-10.2	29.2	54.0
6438.515000	27.2	139.6	V	287.0	-6.2	26.8	54.0
7556.190000	29.8	99.8	H	227.0	-3.4	24.2	54.0
9846.060000	33.3	99.7	H	325.0	-0.2	20.7	54.0
11862.135000	34.2	150.0	V	260.0	3.5	19.8	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 Appendix A

8. APPENDIX B. INTERNAL PHOTO

Please refer to Appendix B

9. APPENDIX C. INTERNAL PHOTO

Please refer to Appendix C

- End of Test Report -