

FCC CERTIFICATION TEST REPORT

Report No.: DDT-B21112203-2E02

Applicant	:	Nauto, Inc.
Address	:	220 Portage Avenue, Palo Alto, California 94306
Equipment under Test	:	In-vehicle Camera
Model No.	:	Nauto 3
Trade Mark	:	Nauto
FCC ID	:	2AKJ5-N3
Manufacturer	:	Nauto, Inc.
Address	:	220 Portage Avenue, Palo Alto, California 94306

Issued By: Tianjin Dongdian Testing Service Co., Ltd.

Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park
Development Area, Tianjin, China.

Tel: +86-22-58038033, E-mail: ddt@dgddt.com, <http://www.ddttest.com>



REPORT

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Test Report Declare

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Test Standard Used:

FCC Rules and Regulations Part 15 Subpart C.

Test Procedure Used:

ANSI C63.10:2013

We Declare:

The equipment described above is tested by Tianjin Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Tianjin Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No.:	DDT-B21112203-2E02		
Date of Receipt:	Nov. 22, 2021	Date of Test:	Nov. 22, 2021 ~ Dec. 17, 2021

Prepared By:

Sunny Zhang

Sunny Zhang/Engineer

Approved By:

Aaron Zhang

Aaron Zhang/EMC Manager

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Tianjin Dongdian Testing Service Co., Ltd.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.



Revision History

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Dec. 17, 2021	

1. Summary of Test Results

Description of Test Item	Standard	Verdict
Maximum Peak Output Power	FCC Part 15: 15.247(b)(1) ANSI C63.10:2013	Pass ²
20dB Bandwidth and 99% Bandwidth	FCC Part 15: 15.215 ANSI C63.10:2013	Pass ¹
Carrier Frequency Separation	FCC Part 15: 15.247(a)(1) ANSI C63.10:2013	Pass ¹
Number of Hopping Channel	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10:2013	Pass ¹
Dwell Time	FCC Part 15: 15.247(a)(1)(iii) ANSI C63.10:2013	Pass ¹
Band Edge Compliance (conducted method)	FCC Part 15: 15.209 FCC Part 15: 15.247 ANSI C63.10: 2013	Pass ¹
RF Conducted Spurious Emissions	FCC Part 15: 15.209 FCC Part 15: 15.247 ANSI C63.10: 2013	Pass ¹
Radiated Emission	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10:2013	Pass ²
Emission in restricted frequency bands	FCC Part 15: 15.205 FCC Part 15: 15.209 FCC Part 15: 15.247(d) ANSI C63.10:2013	Pass ²
Power Line Conducted Emissions	FCC Part 15: 15.207 ANSI C63.10:2013	Pass ¹

Note1:

The above "pass¹" items data are refer from the original report issued by SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch(Date of Test: 2019/5/10 ~ 2019/6/2), The detailed data can refer to Appendix-Bluetooth.

Note2:

The above "pass²" item is tested by Tianjin Dongdian Testing Service Co., Ltd.

2. General Test Information

2.1. Description of EUT

EUT* Name	: In-vehicle Camera
Model Number	: Nauto 3
EUT Function Description	: Please reference user manual of this device
Power Supply	: DC 12V
Radio Specification	: Bluetooth V5.0 LE +EDR
Operation Frequency	: 2402 MHz - 2480 MHz
Modulation	: GFSK, $\pi/4$ -DQPSK, 8DPSK
Data Rate	: 1 Mbps, 2 Mbps, 3 Mbps
Antenna Type	: Integrated antenna, maximum PK gain: -3.4 dBi
Sample Number	: N/A

Note: EUT is the ab. of equipment under test.

Channel information					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	27	2429	54	2456
1	2403	28	2430	55	2457
2	2404	29	2431	56	2458
3	2405	30	2432	57	2459
4	2406	31	2433	58	2460
5	2407	32	2434	59	2461
6	2408	33	2435	60	2462
7	2409	34	2436	61	2463
8	2410	35	2437	62	2464
9	2411	36	2438	63	2465
10	2412	37	2439	64	2466
11	2413	38	2440	65	2467
12	2414	39	2441	66	2468
13	2415	40	2442	67	2469
14	2416	41	2443	68	2470
15	2417	42	2444	69	2471
16	2418	43	2445	70	2472
17	2419	44	2446	71	2473
18	2420	45	2447	72	2474
19	2421	46	2448	73	2475
20	2422	47	2449	74	2476
21	2423	48	2450	75	2477
22	2424	49	2451	76	2478
23	2425	50	2452	77	2479
24	2426	51	2453	78	2480
25	2427	52	2454		
26	2428	53	2455		

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number	Description	SN
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Assistant equipment	Manufacturer	Model number	EMC Compliance	SN
N/A	N/A	N/A	N/A	N/A

2.4. Block diagram of EUT configuration for test



Test software: QRCT.exe

The test software was used to control EUT work in Continuous Tx mode, and select test channel, wireless mode as below table.

Tested mode, channel, information			
Mode	Setting Tx Power	Channel	Frequency (MHz)
GFSK hopping on Tx mode	8	CH0 to CH78	2402 to 2480
$\pi/4$ -DQPSK hopping on Tx mode	8	CH0 to CH78	2402 to 2480
8DPSK hopping on Tx mode	8	CH0 to CH78	2402 to 2480
GFSK hopping off Tx mode	8	CH0	2402
	8	CH38	2440
	8	CH78	2480
$\pi/4$ -DQPSK hopping off Tx mode	8	CH0	2402
	8	CH38	2440
	8	CH78	2480
8DPSK hopping off Tx mode	8	CH0	2402
	8	CH38	2440
	8	CH78	2480

2.5. Deviations of test standard

No deviation.

2.6. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature range:	21-25 °C
Humidity range:	25-75%
Pressure range:	86-106 kPa

2.7. Test laboratory

Tianjin Dongdian Testing Service Co., Ltd.

Address: Building D-1, No. 19, Weisi Road, Microelectronics Industrial Park Development Area, Tianjin, China.

Tel: +86-22-58038033, <http://www.ddttest.com>, Email: ddt@dgddt.com

NVLAP (National Voluntary Laboratory Accreditation Program) CODE: 500036-0

CNAS (China National Accreditation Service for Conformity Assessment) CODE: L13402

FCC Designation Number: CN5004; FCC Test Firm Registration Number: 368676

ISED (Innovation, Science and Economic Development Canada) Company Number: 27768

Conformity Assessment Body Identifier: CN0125

VCCI Facility Registration Number: C-20089, T-20093, R-20125, G-20122

2.8. Measurement uncertainty

Test Item	Uncertainty
Bandwidth	0.14%
Peak Output Power (Conducted) (Spectrum Analyzer)	0.12 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	0.32 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Peak Output Power (Conducted) (Power Sensor)	0.51 dB
Power Spectral Density	0.12 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	0.32 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
Frequencies Stability	6.7×10^{-8} (Antenna couple method)
	3.4×10^{-8} (Conducted method)
Conducted Spurious Emissions	0.12 dB ($10 \text{ MHz} \leq f < 3.6 \text{ GHz}$);
	0.32 dB ($3.6 \text{ GHz} \leq f < 8 \text{ GHz}$)
	0.52 dB ($8 \text{ GHz} \leq f < 22 \text{ GHz}$)
Uncertainty for Radio Frequency (RBW < 20 kHz)	3×10^{-7}
Temperature	$\pm 2^{\circ}\text{C}$
Humidity	$\pm 1\%$
Uncertainty for Radiation Emission Test (30 MHz - 1 GHz)	2.72 dB (Antenna Polarize: V)
	2.72 dB (Antenna Polarize: H)
Uncertainty for Radiation Emission Test (1 GHz - 40 GHz)	2.74 dB (1 - 6 GHz)
	2.72 dB (6 GHz - 18 GHz)
	3.54 dB (18 GHz - 26 GHz)
	4.30 dB (26 GHz - 40 GHz)
Uncertainty for Power Line Conduction Emission Test	3.40 dB (150 kHz - 30 MHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment Used During Test

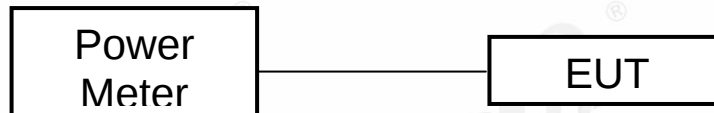
Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Connected Test (MWRFTest system)					
Microwave Signal Generator	R&S	SMF100A	101396	2021/05/25	1 Year
MXG Vector Signal Generator	Agilent	N5182A	MY50143288	2021/03/08	1 Year
EMI Test Receiver	R&S	ESU26	100243	2021/03/03	1 Year
Wideband Radio Communication Tester	R&S	CMW500	158800	2021/05/14	1 Year
Power Detector	MWRFTest	MW100-PS B	MW201203008	2021/03/31	1 Year
DC Power Supply	inSTEK	PSP-2010	EH131319	2021/02/27	1 Year
Test Software	MWRFTest	MTS8310	V03	N/A	N/A
Radiated Emission -10m EMI Chamber					
EXA Signal Analyzer	Keysight	N9010A	MY53281492	2021/03/31	1 Year
Active Loop Antenna	R&S	HFH2-Z2	100269	2021/05/08	1 Year
Double-Ridged Guide Horn Antenna	ETS-LINDGR EN	3115	00102808	2021/03/16	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	2021/04/21	1 Year
Broadband Horn Antenna	TESEQ	BHA 9118	31754	2021/10/12	1 Year
Low noise amplifier	MITEQ	TPA0118-36	0914	2021/02/03	1 Year
EMI Test Receiver	R&S	ESCI	101024	2021/03/03	1 Year
EMI Test Receiver	R&S	ESCI	101030	2021/05/15	1 Year
Bilog Antenna	TESEQ	CBL6112D	29068	2020/10/12	2 Year
Bilog Antenna	TESEQ	CBL6112D	29069	2020/10/12	2 Year
Amplifier	Sonoma	310N	300913	2021/03/03	1 Year
Amplifier	Sonoma	310N	300914	2021/03/03	1 Year
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Ant Mast	Innco	MA4000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
Mast Controller	Innco	CO2000	N/A	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector1	N/A	N/A
RF Selector 4CH	TOYO	NS4904N	Selector2	N/A	N/A
Test software	TOYO	EP5/RSE	Ver 1.9.1	N/A	N/A
Test software	Audix	E3	V 6.11111b	N/A	N/A
Power Line Conducted Emissions Test					
Test Receiver	R&S	ESCI	101397	2021/03/03	1 Year
LISN	R&S	ENV216	101122	2021/03/31	1 Year
Test software	TOYO	EP5/CE	V 5.4.40	N/A	N/A

4. Maximum Peak Output Power

4.1. Re-Test statement

The EUT is operating at the same power level with the original testing of SGS-CSTC Standards Technical Services, Co., Ltd. Shenzhen Branch.

4.2. Block diagram of test setup



4.3. Limits

For frequency hopping systems operating in the 2400-2483.5MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band is 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band is 0.125 watts, the E.I.R.P shall not exceed 4W.

4.4. Test procedure

Connect each EUT's antenna output to power sensor by RF cable and attenuator. Measure the PK output power of each antenna port by power sensor.

4.5. Test result

Remark

	The Original Reports	Re-Test Reports
File name:	test report	DDT-B21112203-1E02
Test location:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch	Tianjin Dongdian Testing Service Co., Ltd.

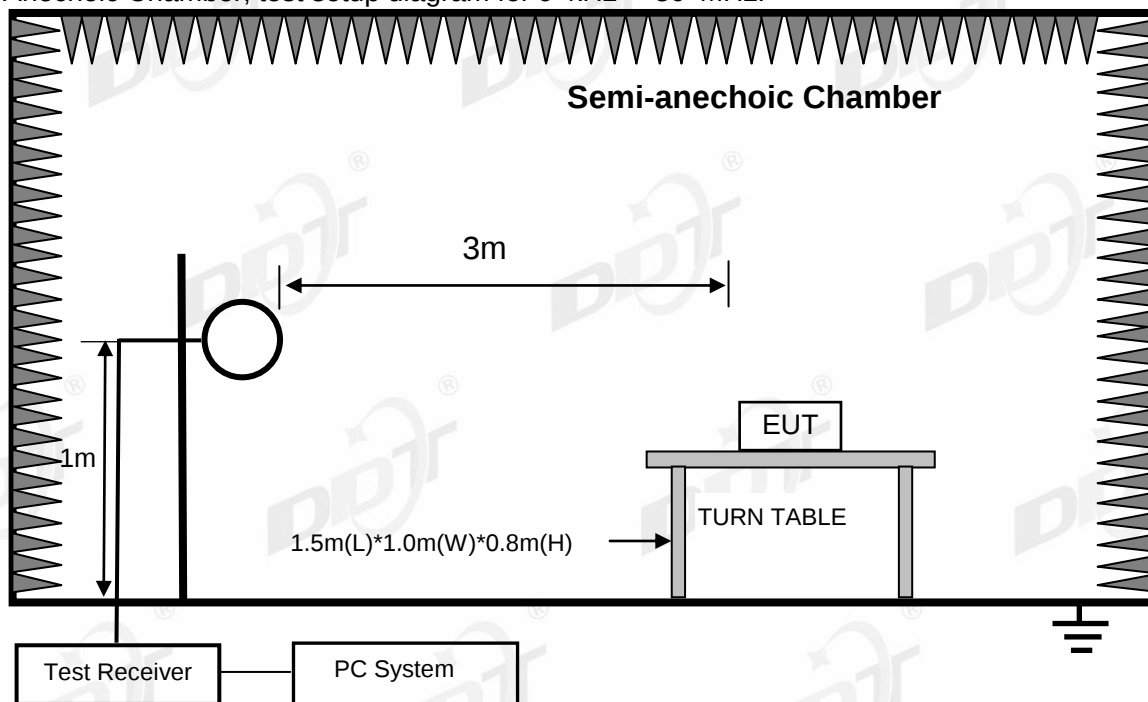
Power

Mode	Test Channel	The Original Reports Level [dBm]	Re-Test Reports Level [dBm]	Power level
GFSK	Lowest	7.29	7.33	8
	Middle	7.43	7.32	8
	Highest	8.21	8.14	8
π /4DQPSK	Lowest	10.03	9.79	8
	Middle	10.40	9.99	8
	Highest	10.66	10.37	8
8DPSK	Lowest	10.43	10.25	8
	Middle	10.75	10.62	8
	Highest	10.97	10.81	8

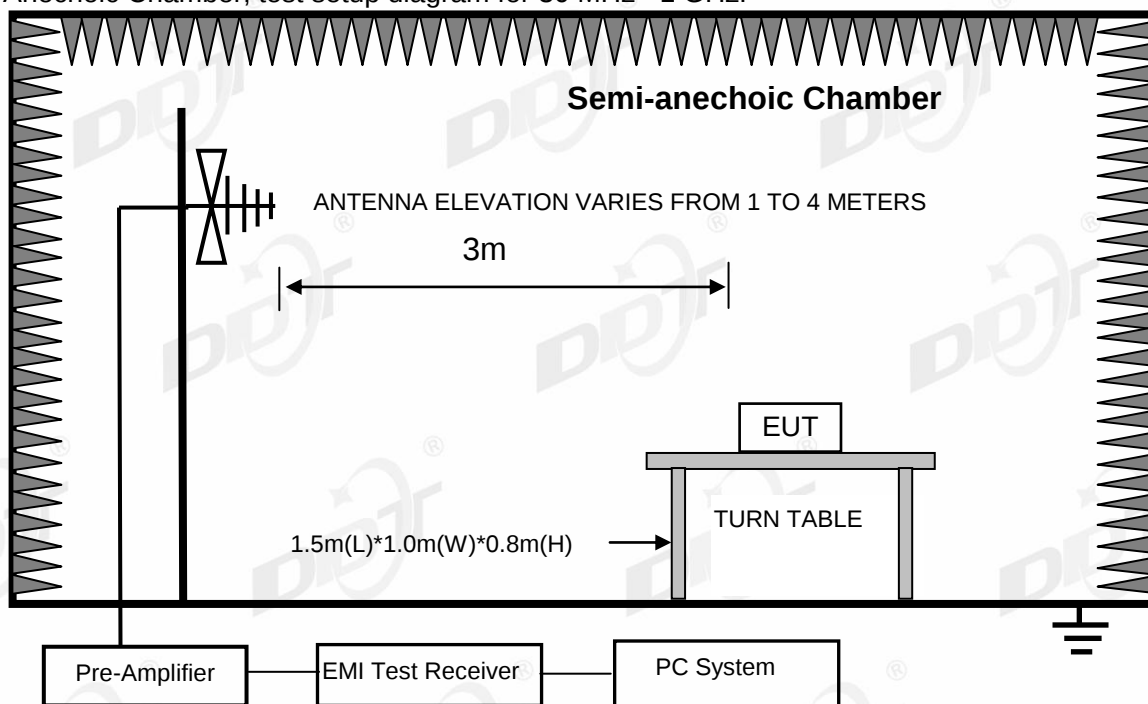
5. Radiated Emission

5.1. Block diagram of test setup

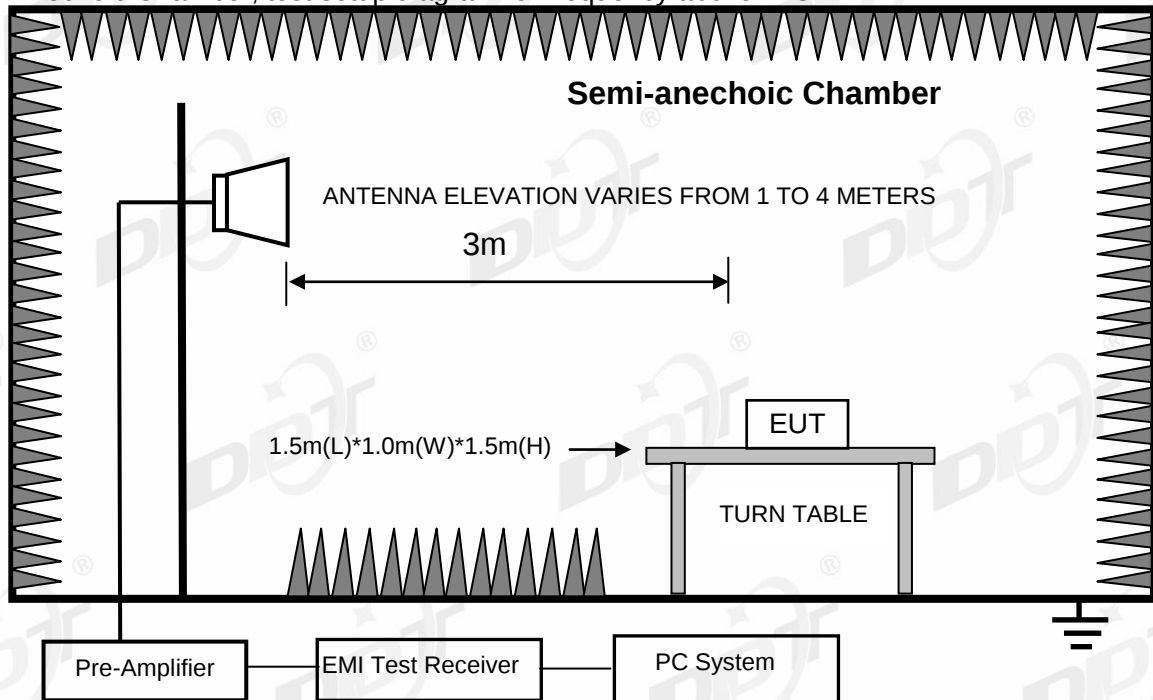
Anechoic Chamber, test setup diagram for 9 kHz - 30 MHz:



Anechoic Chamber, test setup diagram for 30 MHz - 1 GHz:



Anechoic Chamber, test setup diagram for frequency above 1 GHz:



Note: For harmonic emissions test an appropriate high pass filter was inserted in the input port of AMP.

5.2. Limit

(1) FCC 15.205 Restricted frequency band

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.1772&4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.2072&4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

²Above 38.6

(2) FCC 15.209 Limit.

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V/m}$	$\text{dB}(\mu\text{V})/\text{m}$
0.009 ~ 0.490	300	2400/F(kHz)	67.6-20log(F)
0.490 ~ 1.705	30	24000/F(kHz)	87.6-20log(F)
1.705 ~ 30.0	30	30	29.54
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz and above 1000 MHz, radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30 MHz, measurement may be performed at a distance closer than that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3\text{m}}(\text{dB}\mu\text{V}/\text{m}) = \text{Limit}_{30\text{m}}(\text{dB}\mu\text{V}/\text{m}) + 40\text{Log}(30\text{m}/3\text{m})$$

(3) Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20 dB below the fundamental emissions or comply with 15.209 limits.

5.3. Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1G and 150 cm above the ground plane inside a fully-anechoic chamber for above 1G.

(2) Test antenna was located 3 m from the EUT on an adjustable mast, and the antenna used as below table.

Test frequency range	Test antenna used	Test antenna distance
9 kHz - 30 MHz	Active Loop antenna	3 m
30 MHz - 1 GHz	Trilog Broadband Antenna	3 m
1 GHz - 18 GHz	Double Ridged Horn Antenna (1 GHz - 18 GHz)	3 m
18 GHz - 40 GHz	Horn Antenna (18 GHz - 40 GHz)	3 m

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also

is positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. For measurement above 30 MHz, the trilob Broadband Antenna or Horn Antenna was located 3 m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

(3) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9 kHz to 25 GHz:

(a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated 360 degree, the antenna height was varied from 1 m to 4 m (Except loop antenna, it's fixed 1 m above ground.)

(b) Change work frequency or channel of device if practicable.

(c) Change modulation type of device if practicable.

(d) Change power supply range from 85% to 115% of the rated supply voltage

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9 kHz to 25 GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18 GHz to 25 GHz, so below final test was performed with frequency range from 9 kHz to 18 GHz.

(4) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipment and all of the interface cables were changed according to ANSI C63.10:2013 on Radiated Emission test.

(5) The emissions from 9 kHz to 1 GHz were measured based on CISPR QP detector except for the frequency bands 9 - 90 kHz, 110 - 490 kHz, for emissions from 9 kHz - 90 kHz, 110 kHz - 490 kHz and above 1 GHz were measured based on average detector, for emissions above 1 GHz, peak emissions also be measured and need comply with Peak limit.

(6) The emissions from 9 kHz to 1 GHz, QP or average values were measured with EMI receiver with below RBW.

Frequency band	RBW
9 kHz - 150 kHz	200 Hz
150 kHz - 30 MHz	9 kHz
30 MHz - 1 GHz	120 kHz

(7) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1 MHz, VBW is set at 3 MHz for Peak measure; According ANSI C63.10:2013 clause 4.1.4.2.2 procedure for average measure.

(8) X axis, Y axis, Z axis are tested, and worse setup X axis is reported.

5.4. Test result

Pass. (See below detailed test result)

All the emissions except fundamental emission from 9 kHz to 25 GHz were comply with 15.209 limits.

Note1: According exploratory test, the emission levels are 20 dB below the limit detected from 9 kHz to 30 MHz and 18 GHz to 25 GHz, so the final test was performed with frequency range from 30 MHz to 18 GHz and recorded in below.

Note2: For emissions below 1 GHz, according exploratory explorer test, when change Tx mode and channel, have no distinct influence on emissions level, so for emissions below 1 GHz, the final test was only performed with EUT working in DH5 transmitting mode.

Note3: For emissions above 1 GHz. If peak results comply with AV limit, AV Result is deemed to comply with AV limit.

Radiated Emission test (below 1 GHz)

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

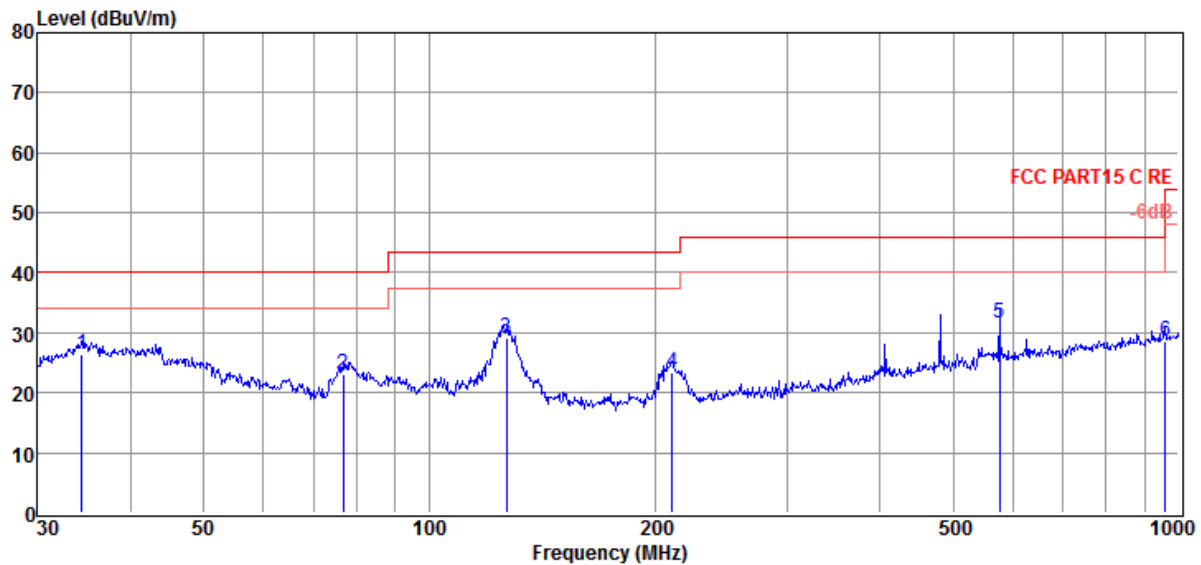
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5

Data: 61



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	34.40	-9.73	26.49	40.00	-13.51	182	74	QP	VERTICAL
2	76.78	-22.23	23.13	40.00	-16.87	183	201	QP	VERTICAL
3	126.77	-17.09	29.28	43.50	-14.22	159	233	QP	VERTICAL
4	210.79	-18.08	23.28	43.50	-20.22	176	97	QP	VERTICAL
5	576.64	-10.82	31.70	46.00	-14.30	160	138	QP	VERTICAL
6	958.79	-8.00	28.71	46.00	-17.29	184	42	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. Margin QP (Quasi-Peak) = Level QP - Limit

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

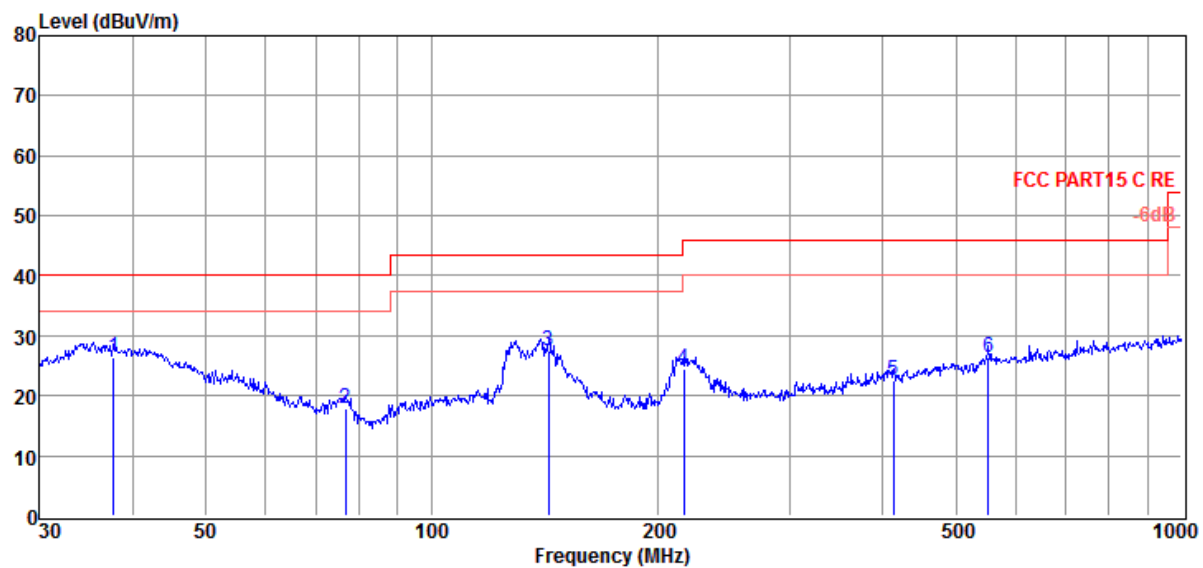
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5

Data: 62



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	37.68	-11.54	26.52	40.00	-13.48	173	40	QP	HORIZONTAL
2	76.78	-22.23	17.99	40.00	-22.01	190	346	QP	HORIZONTAL
3	143.33	-18.13	27.61	43.50	-15.89	151	266	QP	HORIZONTAL
4	216.78	-17.80	24.42	46.00	-21.58	156	279	QP	HORIZONTAL
5	413.27	-13.11	22.60	46.00	-23.40	166	274	QP	HORIZONTAL
6	552.88	-10.47	26.27	46.00	-19.73	168	116	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. Margin QP (Quasi-Peak) = Level QP - Limit

3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

Radiated Emission test (1 GHz - 3G Hz)

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

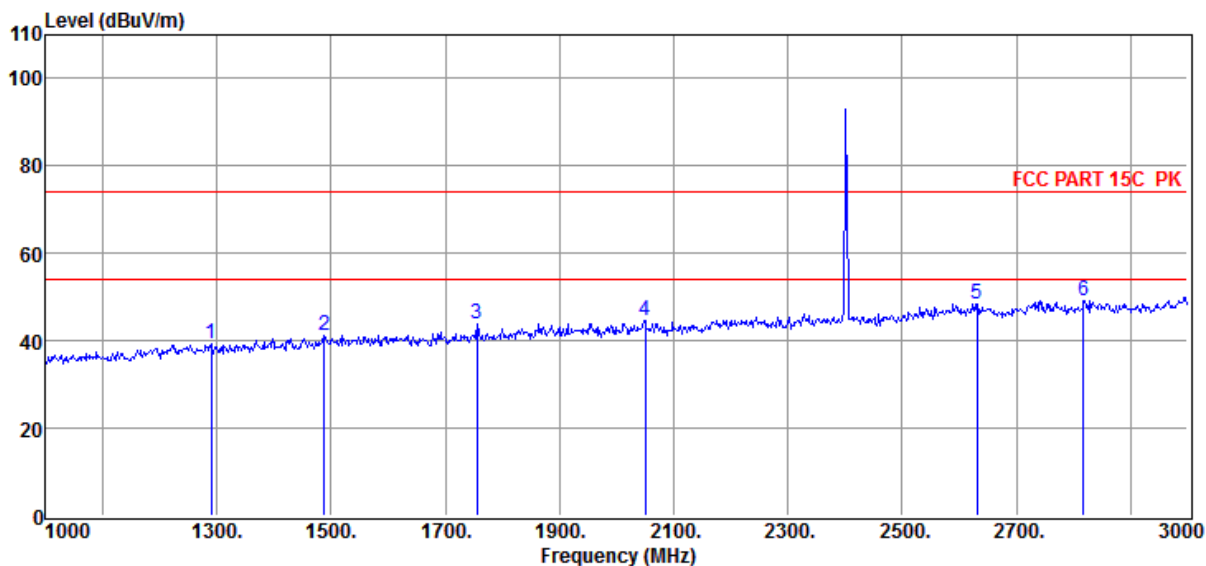
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2402MHz

Data: 91



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1290.00	44.00	29.10	-33.80	39.30	74.00	-34.70	Peak	VERTICAL
2	1488.00	44.47	30.38	-33.46	41.39	74.00	-32.61	Peak	VERTICAL
3	1756.00	45.16	31.44	-32.84	43.76	74.00	-30.24	Peak	VERTICAL
4	2050.00	43.49	33.50	-32.34	44.65	74.00	-29.35	Peak	VERTICAL
5	2632.00	42.89	36.74	-31.22	48.41	74.00	-25.59	Peak	VERTICAL
6	2818.00	42.78	37.44	-30.95	49.27	74.00	-24.73	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

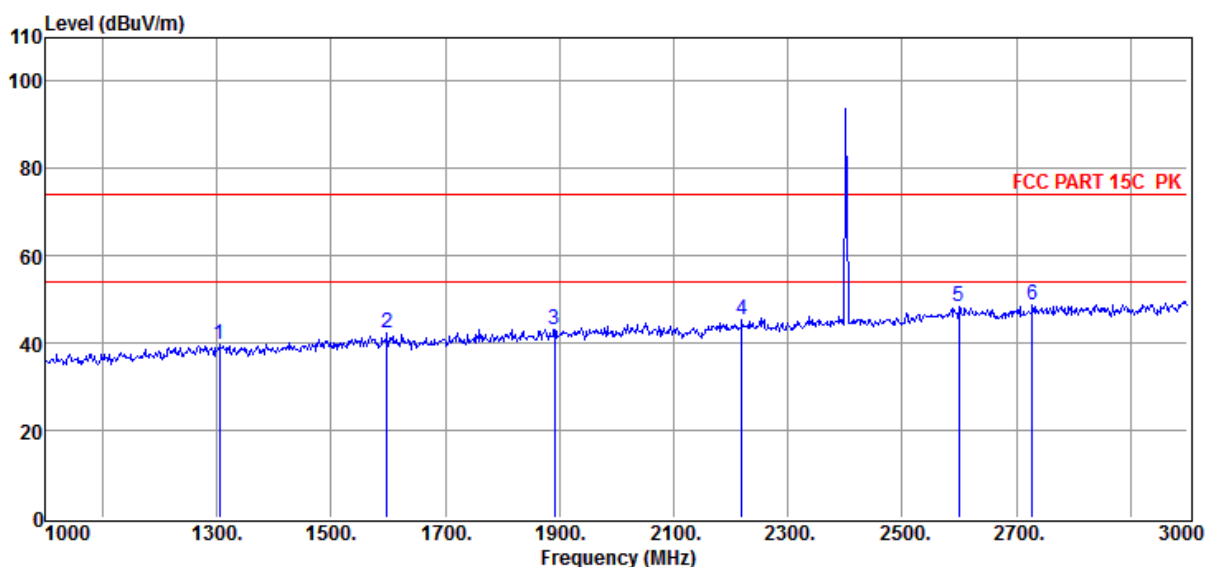
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2402MHz

Data: 92



Item (Mark)	Freq. (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Detector	Polarization
1	1304.00	44.30	29.12	-33.78	39.64	74.00	-34.36	Peak	HORIZONTAL
2	1598.00	44.73	30.99	-33.28	42.44	74.00	-31.56	Peak	HORIZONTAL
3	1892.00	43.31	32.54	-32.65	43.20	74.00	-30.80	Peak	HORIZONTAL
4	2220.00	42.93	34.32	-31.95	45.30	74.00	-28.70	Peak	HORIZONTAL
5	2600.00	42.44	37.00	-31.09	48.35	74.00	-25.65	Peak	HORIZONTAL
6	2728.00	42.45	37.14	-30.81	48.78	74.00	-25.22	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

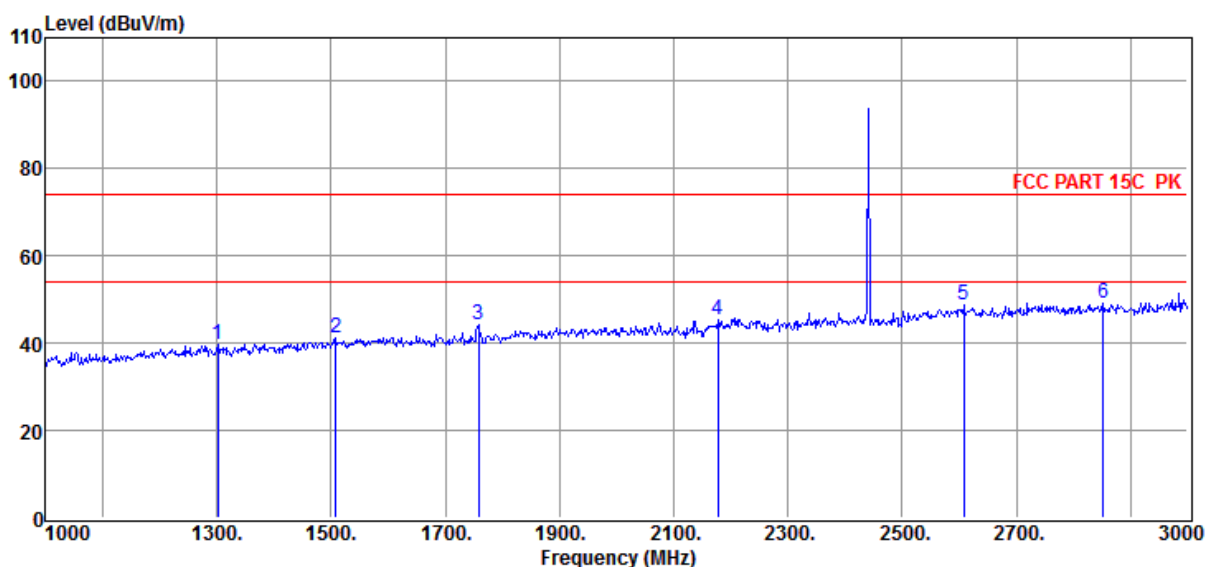
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2441MHz

Data: 93



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1302.00	44.19	29.11	-33.78	39.52	74.00	-34.48	Peak	HORIZONTAL
2	1508.00	43.94	30.55	-33.42	41.07	74.00	-32.93	Peak	HORIZONTAL
3	1758.00	45.75	31.45	-32.84	44.36	74.00	-29.64	Peak	HORIZONTAL
4	2178.00	43.59	33.92	-32.08	45.43	74.00	-28.57	Peak	HORIZONTAL
5	2608.00	42.94	36.94	-31.12	48.76	74.00	-25.24	Peak	HORIZONTAL
6	2852.00	42.51	37.69	-30.97	49.23	74.00	-24.77	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

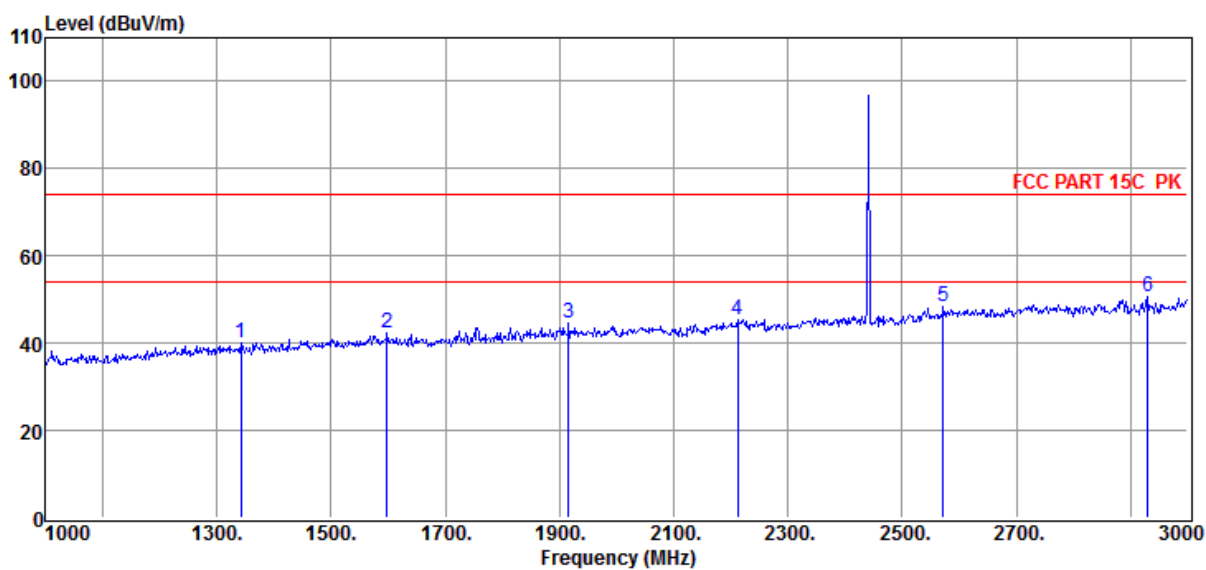
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2441MHz

Data: 94



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1342.00	44.44	29.27	-33.68	40.03	74.00	-33.97	Peak	VERTICAL
2	1598.00	44.69	30.99	-33.28	42.40	74.00	-31.60	Peak	VERTICAL
3	1916.00	44.43	32.63	-32.58	44.48	74.00	-29.52	Peak	VERTICAL
4	2212.00	43.10	34.35	-31.98	45.47	74.00	-28.53	Peak	VERTICAL
5	2572.00	43.19	36.44	-31.16	48.47	74.00	-25.53	Peak	VERTICAL
6	2930.00	43.86	37.32	-30.55	50.63	74.00	-23.37	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

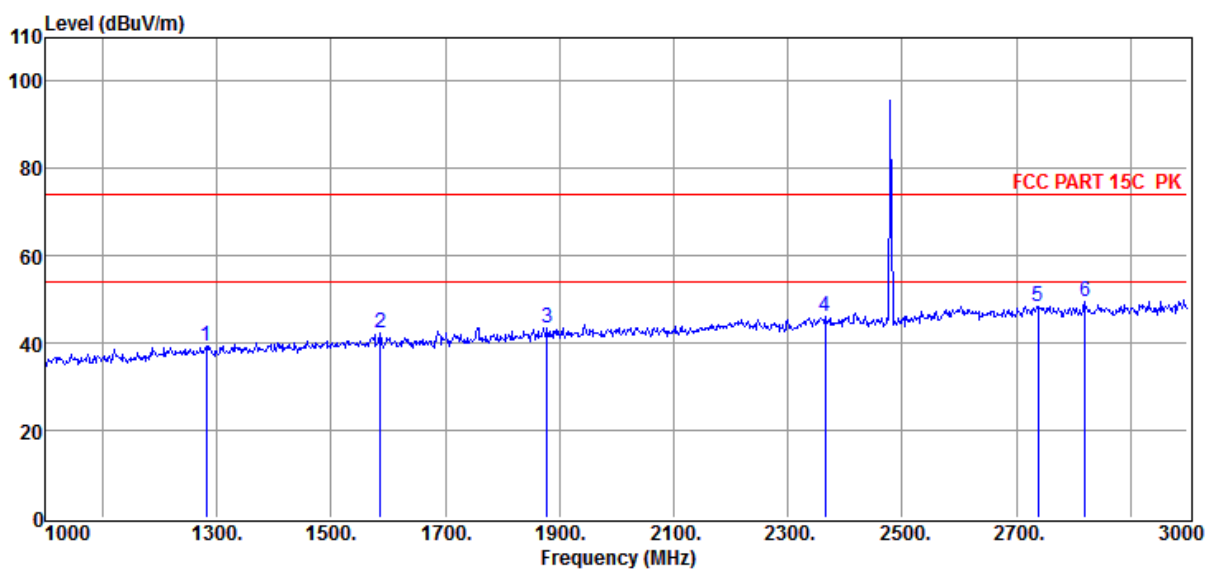
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2480MHz

Data: 95



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1282.00	43.94	29.10	-33.80	39.24	74.00	-34.76	Peak	VERTICAL
2	1586.00	44.58	30.94	-33.27	42.25	74.00	-31.75	Peak	VERTICAL
3	1878.00	43.57	32.42	-32.61	43.38	74.00	-30.62	Peak	VERTICAL
4	2366.00	42.83	34.76	-31.53	46.06	74.00	-27.94	Peak	VERTICAL
5	2738.00	42.05	37.26	-30.78	48.53	74.00	-25.47	Peak	VERTICAL
6	2820.00	43.16	37.46	-30.95	49.67	74.00	-24.33	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

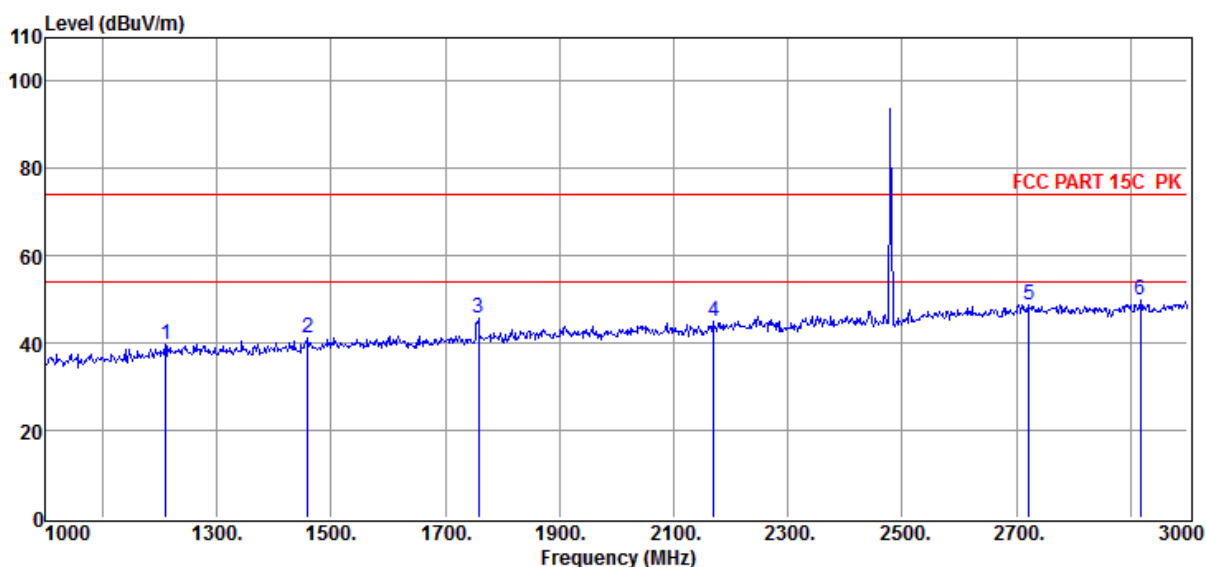
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2480MHz

Data: 96



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	1210.00	44.94	28.78	-33.98	39.74	74.00	-34.26	Peak	HORIZONTAL
2	1460.00	44.60	30.10	-33.47	41.23	74.00	-32.77	Peak	HORIZONTAL
3	1758.00	47.01	31.45	-32.84	45.62	74.00	-28.38	Peak	HORIZONTAL
4	2170.00	43.32	33.74	-32.10	44.96	74.00	-29.04	Peak	HORIZONTAL
5	2722.00	42.64	37.06	-30.83	48.87	74.00	-25.13	Peak	HORIZONTAL
6	2918.00	42.90	37.39	-30.54	49.75	74.00	-24.25	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission test (3 GHz – 18GHz)

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

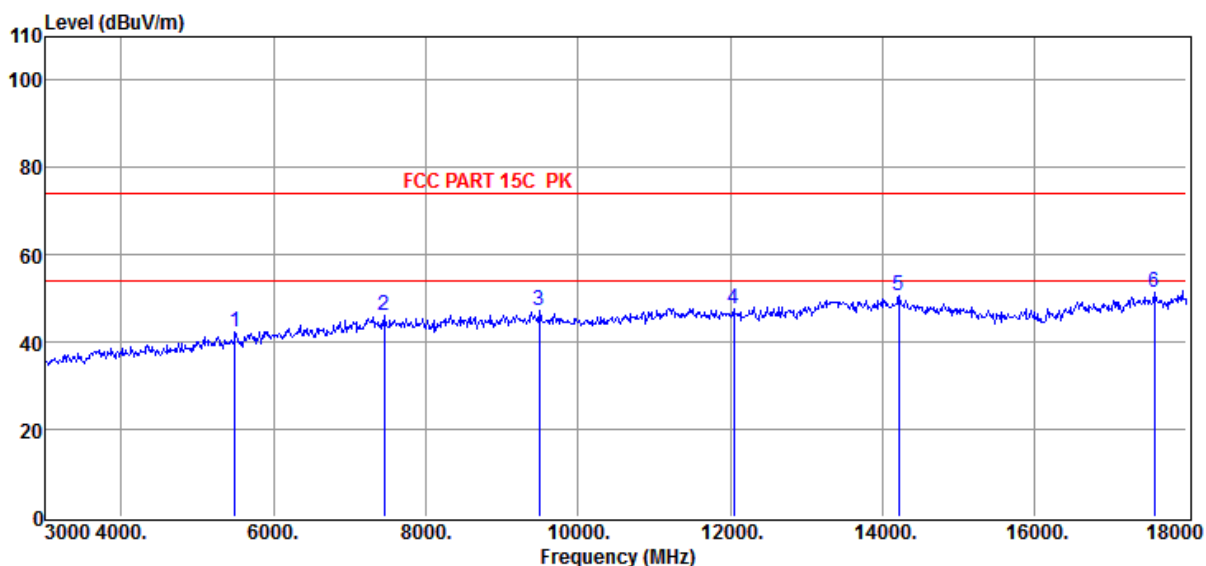
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2402MHz

Data: 49



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	5490.00	2.28	42.19	74.00	-31.81	190	199	Peak	HORIZONTAL
2	7455.00	6.51	46.20	74.00	-27.80	165	153	Peak	HORIZONTAL
3	9495.00	7.80	47.24	74.00	-26.76	150	129	Peak	HORIZONTAL
4	12045.00	9.84	47.67	74.00	-26.33	175	133	Peak	HORIZONTAL
5	14220.00	13.82	50.60	74.00	-23.40	169	129	Peak	HORIZONTAL
6	17580.00	15.46	51.30	74.00	-22.70	156	39	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

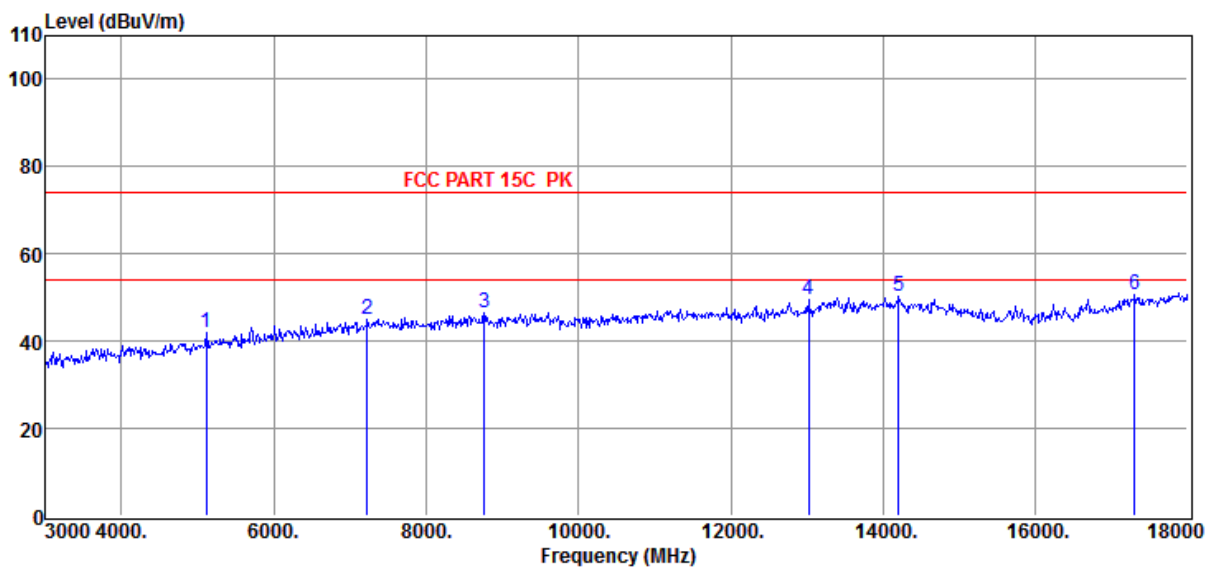
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2402MHz

Data: 50



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	5115.00	1.66	41.80	74.00	-32.20	172	124	Peak	VERTICAL
2	7230.00	6.10	44.85	74.00	-29.15	168	20	Peak	VERTICAL
3	8760.00	6.67	46.57	74.00	-27.43	171	156	Peak	VERTICAL
4	13020.00	9.96	49.54	74.00	-24.46	167	293	Peak	VERTICAL
5	14205.00	14.01	50.39	74.00	-23.61	165	12	Peak	VERTICAL
6	17310.00	15.80	50.46	74.00	-23.54	174	99	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

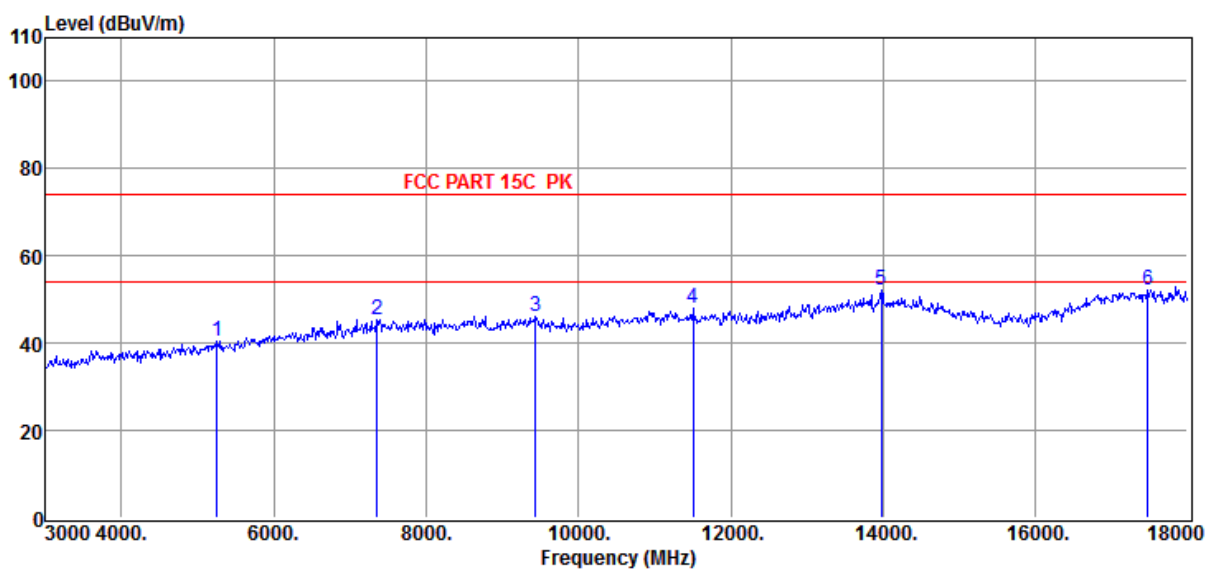
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2441MHz

Data: 51



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	5250.00	2.09	40.43	74.00	-33.57	152	308	Peak	VERTICAL
2	7350.00	6.57	45.34	74.00	-28.66	189	270	Peak	VERTICAL
3	9435.00	8.05	46.04	74.00	-27.96	156	172	Peak	VERTICAL
4	11505.00	10.09	47.95	74.00	-26.05	179	199	Peak	VERTICAL
5	13980.00	12.92	51.99	74.00	-22.01	183	17	Peak	VERTICAL
6	17475.00	15.60	52.16	74.00	-21.84	174	206	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

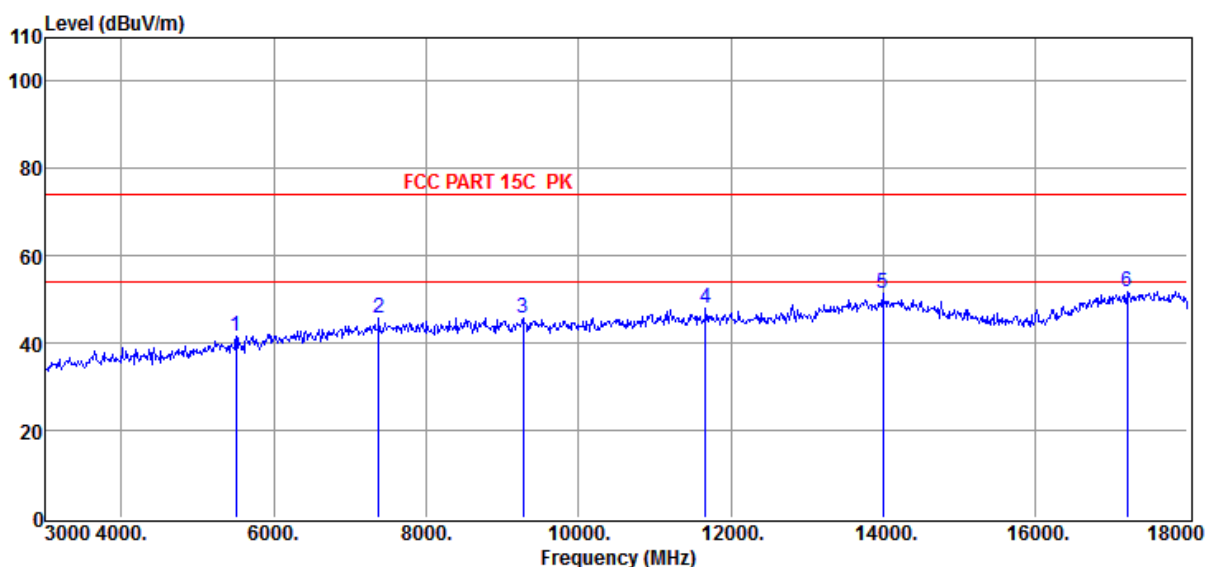
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2441MHz

Data: 52



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	5505.00	2.26	41.59	74.00	-32.41	169	348	Peak	HORIZONTAL
2	7380.00	6.30	45.76	74.00	-28.24	156	135	Peak	HORIZONTAL
3	9270.00	7.55	45.79	74.00	-28.21	190	225	Peak	HORIZONTAL
4	11670.00	10.04	47.83	74.00	-26.17	172	293	Peak	HORIZONTAL
5	13995.00	12.98	51.22	74.00	-22.78	178	142	Peak	HORIZONTAL
6	17205.00	15.57	51.78	74.00	-22.22	158	93	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

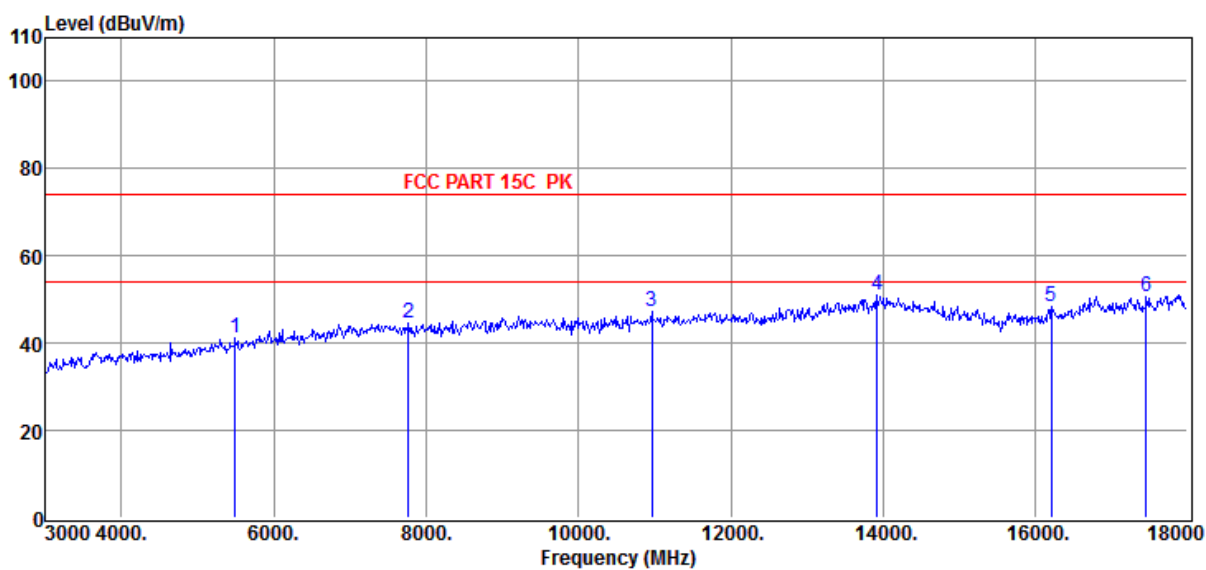
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2480MHz

Data: 53



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	5490.00	2.28	41.28	74.00	-32.72	164	168	Peak	HORIZONTAL
2	7770.00	6.20	44.44	74.00	-29.56	154	39	Peak	HORIZONTAL
3	10965.00	9.74	47.07	74.00	-26.93	160	325	Peak	HORIZONTAL
4	13920.00	12.66	50.85	74.00	-23.15	178	359	Peak	HORIZONTAL
5	16215.00	11.37	48.37	74.00	-25.63	173	70	Peak	HORIZONTAL
6	17460.00	15.59	50.76	74.00	-23.24	184	22	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

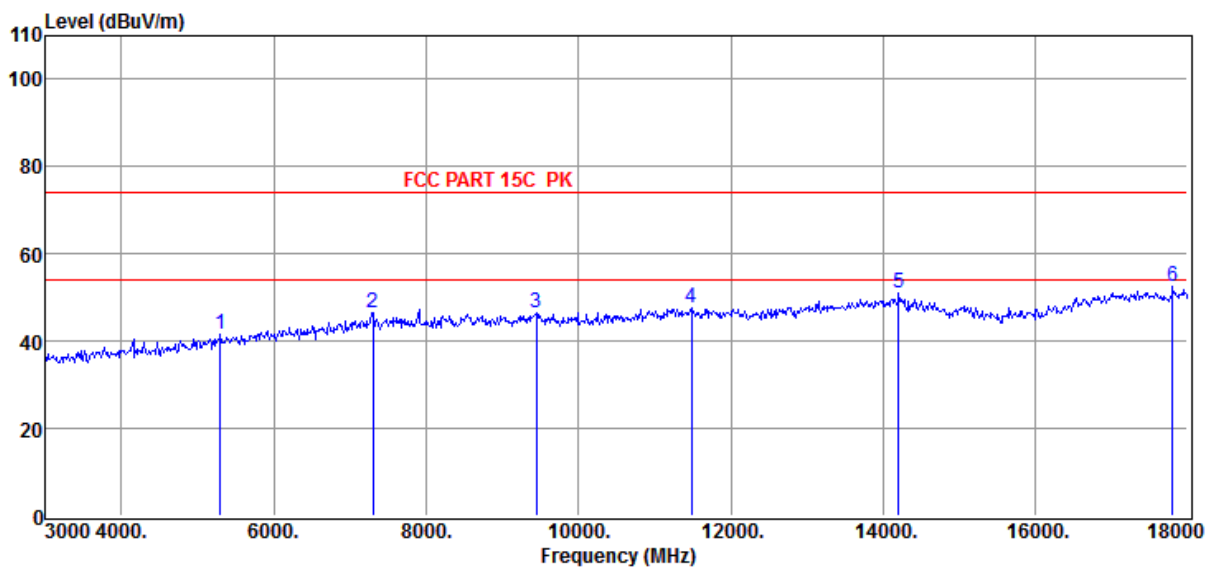
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2480MHz

Data: 54



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	5295.00	1.81	41.58	74.00	-32.42	163	121	Peak	VERTICAL
2	7305.00	6.30	46.61	74.00	-27.39	180	226	Peak	VERTICAL
3	9450.00	7.98	46.44	74.00	-27.56	164	100	Peak	VERTICAL
4	11490.00	10.09	47.77	74.00	-26.23	164	75	Peak	VERTICAL
5	14205.00	14.01	51.13	74.00	-22.87	154	154	Peak	VERTICAL
6	17805.00	15.30	52.47	74.00	-21.53	174	94	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

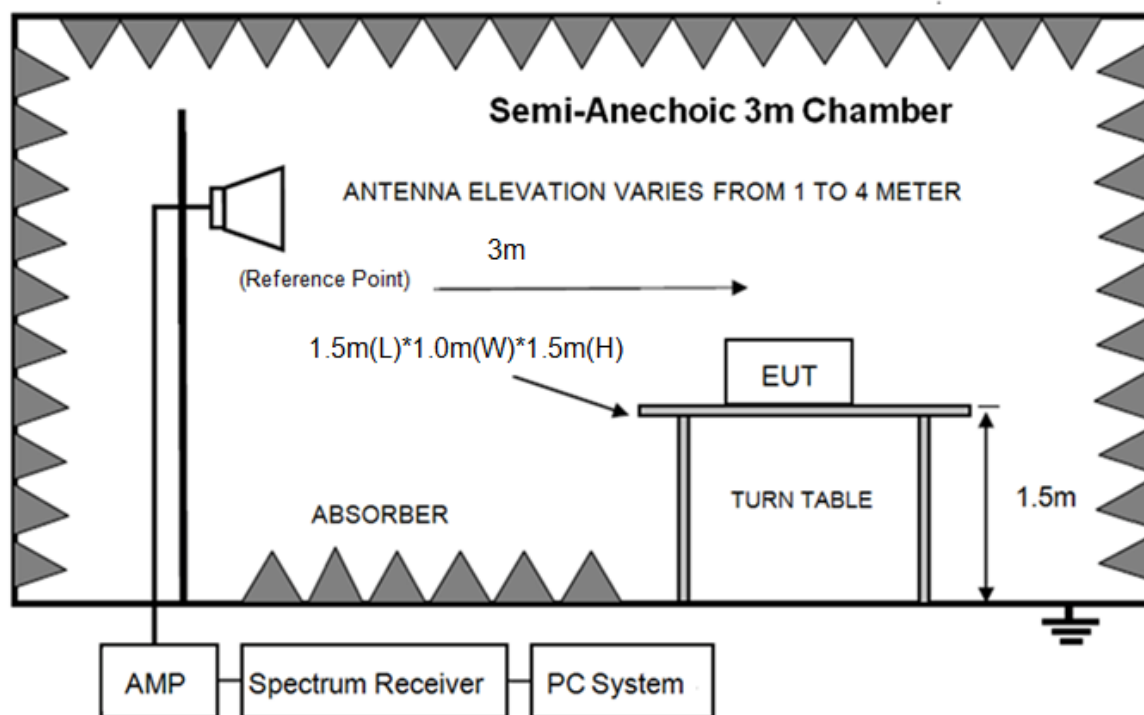
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

6. Band Edge Compliance (Radiated Method)

6.1. Block diagram of test setup



6.2. Limit

All restriction band should comply with 15.209, other emission should be at least 20 dB below the fundamental.

6.3. Test Procedure

Same with clause 10.3 except change investigated frequency range from 2310 MHz to 2410 MHz and 2470 MHz to 2500 MHz.

Remark: All restriction band have been tested, and only the worst case is shown in report.

6.4. Test result

Pass. (See below detailed test result)

Remark: hopping on and hopping off mode all have been test, hopping off mode is worse and reported only.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

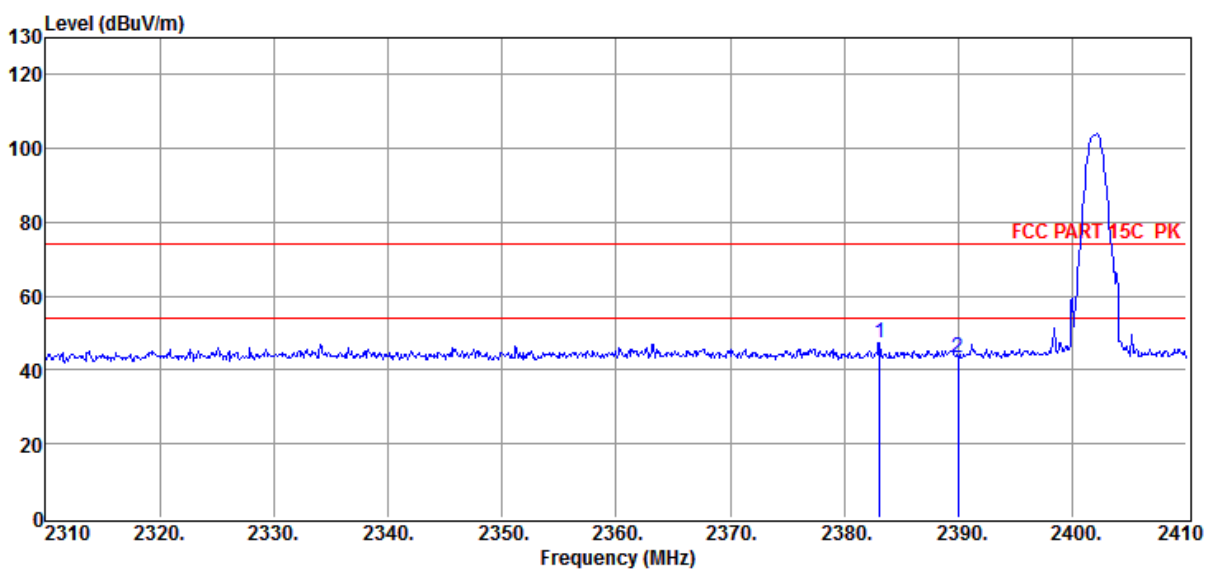
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2402MHz

Data: 41



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2383.10	3.28	47.57	74.00	-26.43	185	19	Peak	VERTICAL
2	2390.00	3.30	43.32	74.00	-30.68	189	35	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

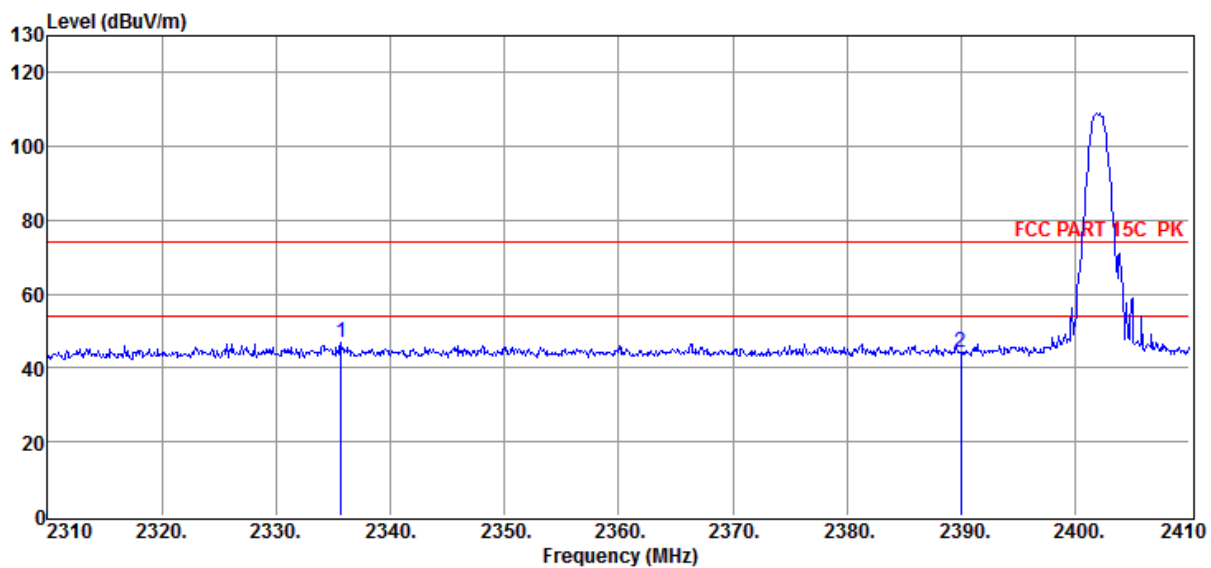
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2402MHz

Data: 42



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2335.70	2.82	46.86	74.00	-27.14	176	102	Peak	HORIZONTAL
2	2390.00	3.30	44.01	74.00	-29.99	159	13	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

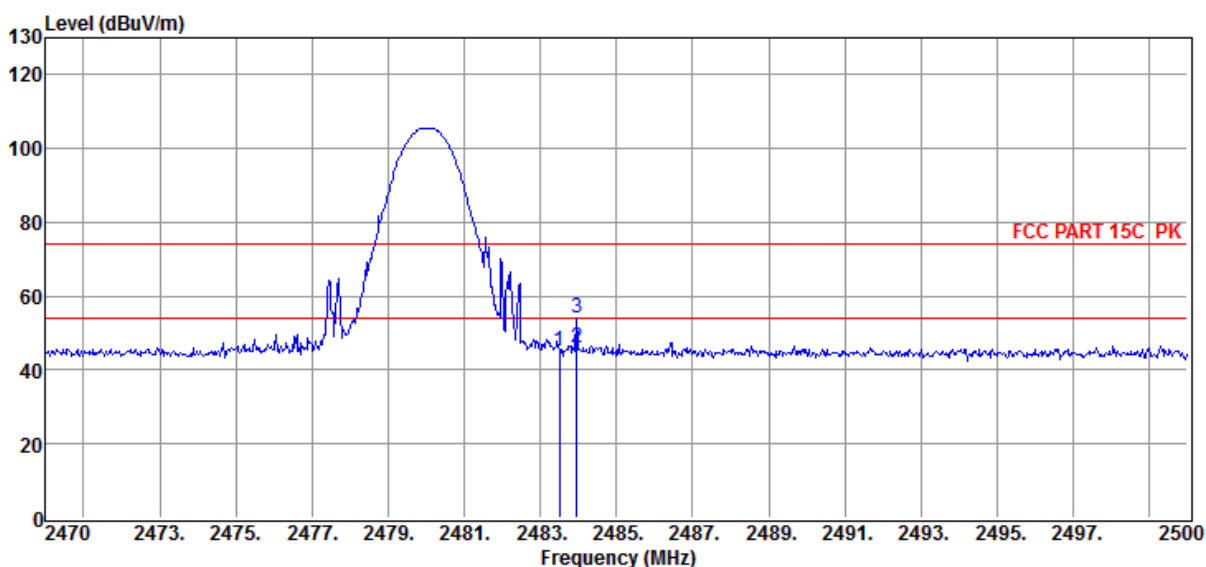
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2480MHz

Data: 43



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2483.50	3.52	44.94	74.00	-29.06	178	265	Peak	HORIZONTAL
2	2483.95	3.52	45.80	54.00	-8.20	177	27	Average	HORIZONTAL
3	2483.95	3.52	53.86	74.00	-20.14	177	319	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

Radiated Emission Test Result

Test Site : 10m Chamber

Test Date : 12-14-2021

Tested By : Sunny

EUT : In-vehicle Camera

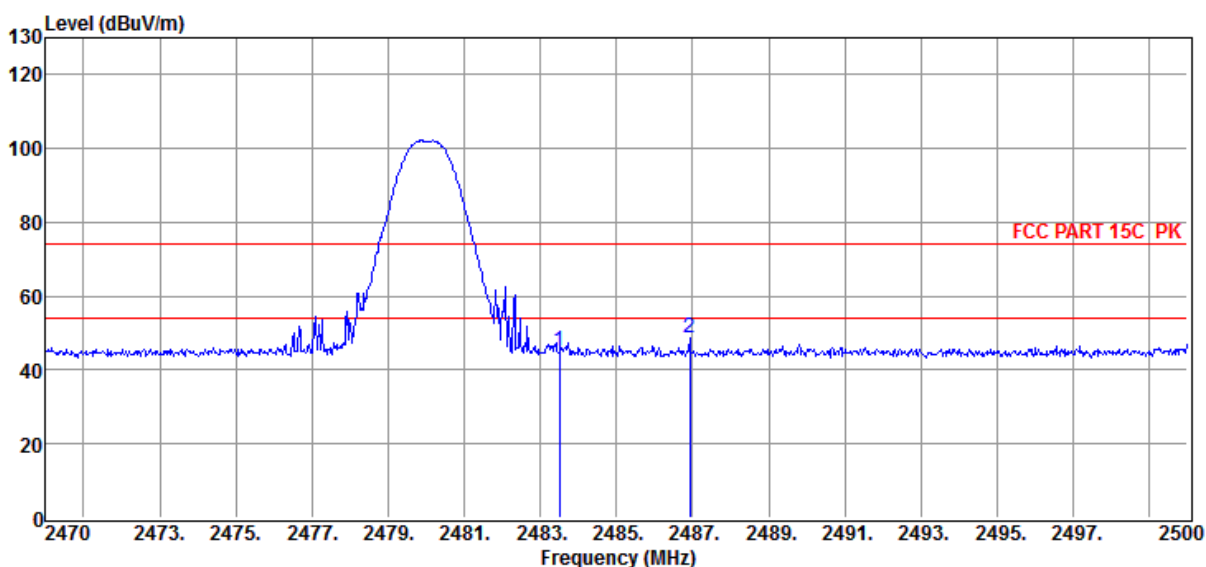
Model Number : Nauto 3

Power Supply : DC 12V

Test Mode : Tx mode

Memo : DH5 2480MHz

Data: 44



Item (Mark)	Freq. (MHz)	Factor (dB)	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Height (cm)	Angle (deg)	Detector	Polarization
1	2483.50	3.52	45.20	74.00	-28.80	157	272	Peak	VERTICAL
2	2486.92	3.55	48.80	74.00	-25.20	188	194	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.

2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.

3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

4. Margin = Result Level - Limit.

7. APPENDIXES

The below appendix was detail result tested by SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch (Date of Test: 2019/5/10 ~ 2019/6/2)

Appendix	Item
Appendix	Bluetooth