

FCC EMC Test Report

Applicant: Shenzhen LINGDU Auto Electronics Co., Ltd.
Address of Applicant: 1801-1808 Haiyun Building, No. 468 Minzhi Avenue, Longhua, Shenzhen, China

Equipment Under Test (EUT)

Product Name: CAR DVR
Model No.: M17, BL990

FCC ID: 2ASWVM17




Applicable Standards: FCC CFR Title 47 Part 15B

Date of Sample Receipt: 22 Feb., 2022

Date of Test: 23 Feb., to 17 Apr., 2022

Date of report Issued: 18 Apr., 2022

Test Result: PASS

Tested by:	 _____	Date:	18 Apr., 2022 _____
Reviewed by:	 _____	Date:	18 Apr., 2022 _____
Approved by:	 _____	Date:	18 Apr., 2022 _____

Manager

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

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2 Version

Version No.	Date	Description
00	18 Apr., 2022	Original

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4 General Information

4.1 Client Information

Applicant:	Shenzhen LINGDU Auto Electronics Co., Ltd.
Address:	1801-1808 Haiyun Building, No. 468 Minzhi Avenue, Longhua, Shenzhen, China
Manufacturer/Factory:	Dongguan Lingdu Electronic Technology Co., Ltd
Address:	1 Longcheng Street, Qingxi Town, Dongguan City, Guangdong Province, China

4.2 General Description of E.U.T.

Product Name:	CAR DVR
Model No.:	M17, BL990
Power Supply:	Rechargeable Li-ion Battery DC3.7V, 200mAh
Adapter:	Model: XHC052500 Input: DC12-24V Output(MINI): DC 5V, 1.5A Output(USB): DC 5V, 1.0A
Test Sample Condition:	The test samples were provided in good working order with no visible defects.
Remark:	Model No.: M17, BL990 were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being model name.

4.3 Test Mode

Operating Mode	Detail Description
Working mode	Keep the EUT in Working mode
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

4.4 Description of Support Units

Manufacturer	Description	Model	S/N	FCC ID/DoC
N/A				

4.5 Description of Cable Used

Cable Type	Description	Length	From	To
Power line	Shielding	3.4m	EUT	Power source

4.6 Measurement Uncertainty

Parameter	Expanded Uncertainty (Confidence of 95%(U = 2Uc(y)))
Radiated Emission (30MHz ~ 1GHz) (3m SAC)	±4.45 dB
Radiated Emission (1GHz ~ 18GHz) (3m SAC)	±5.34 dB
Radiated Emission (18GHz ~ 40GHz) (3m SAC)	±5.34 dB
Radiated Emission (30MHz ~ 1GHz) (10m SAC)	±4.32 dB

Note: All the measurement uncertainty value were shown with a coverage $k=2$ to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

4.7 Additions to, Deviations, or Exclusions from the Method

No

4.8 Laboratory Facility

<p>The test facility is recognized, certified, or accredited by the following organizations:</p> <ul style="list-style-type: none"> ● FCC - Designation No.: CN1211 JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551. ● ISED – CAB identifier.: CN0021 The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1. ● CNAS - Registration No.: CNAS L15527 JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527. ● A2LA - Registration No.: 4346.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf
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4.9 Laboratory Location

<p>JianYan Testing Group Shenzhen Co., Ltd. Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China. Tel: +86-755-23118282, Fax: +86-755-23116366 Email: info-JYTee@lets.com, Website: http://jyt.lets.com</p>

4.10 Test Instruments List

Radiated Emission(3m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal.Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	ETS	9m*6m*6m	WXJ001-1	01-19-2021	01-18-2024
BiConiLog Antenna	Schwarzbeck	VULB9163	WXJ002	02-17-2022	02-16-2023
Biconical Antenna	Schwarzbeck	VUBA9117	WXJ002-1	06-20-2021	06-19-2022
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-2	02-17-2022	02-16-2023
Horn Antenna	Schwarzbeck	BBHA9120D	WXJ002-3	06-18-2021	06-17-2022
Pre-amplifier (30MHz ~ 1GHz)	Schwarzbeck	BBV9743B	WXG001-7	02-17-2022	02-16-2023
Pre-amplifier (1GHz ~ 18GHz)	SKET	LNPA_0118G-50	WXG001-3	02-17-2022	02-16-2023
Pre-amplifier (18GHz ~ 40GHz)	RF System	TRLA-180400G45B	WXG001-9	02-17-2022	02-16-2023
EMI Test Receiver	Rohde & Schwarz	ESRP7	WXJ003-1	02-17-2022	02-16-2023
Band Reject Filter Group	Tonscend	JS0806-F	WXJ089	N/A	
Pre-amplifier (18GHz ~ 40GHz)	RF System	TRLA-180400G45B	WXG001-9	02-17-2022	02-16-2023
Coaxial Cable (30MHz ~ 1GHz)	JYTSZ	JYT3M-1G-NN-8M	WXG001-4	02-17-2022	02-16-2023
Coaxial Cable (1GHz ~ 18GHz)	JYTSZ	JYT3M-18G-NN-8M	WXG001-5	02-17-2022	02-16-2023
Coaxial Cable (9kHz ~ 30MHz)	JYTSZ	JYT3M-1G-BB-5M	WXG001-6	02-17-2022	02-16-2023
Coaxial Cable (18GHz ~ 40GHz)	JYTSZ	JYT3M-40G-SS-8M	WXG001-7	02-17-2022	02-16-2023
Test Software	Tonscend	TS+	Version: 3.0.0.1		

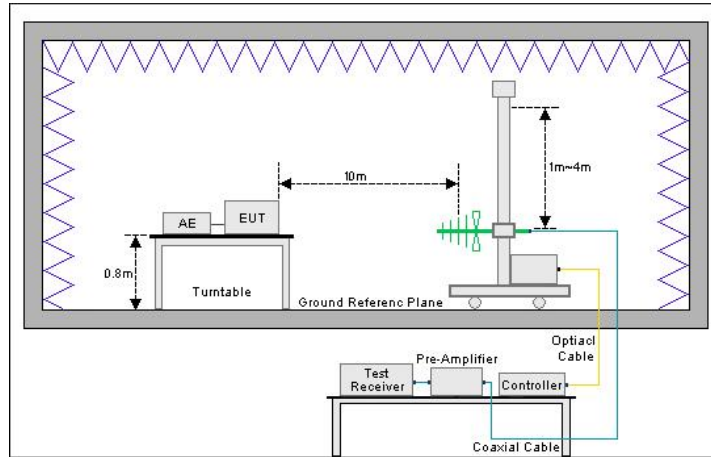
Radiated Emission(10m SAC):					
Test Equipment	Manufacturer	Model No.	Manage No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
10m SAC	ETS	RFSD-100-F/A	WXJ090	04-28-2021	04-27-2024
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-1	04-02-2021	04-01-2022
				03-30-2022	03-29-2023
BiConiLog Antenna	SCHWARZBECK	VULB 9168	WXJ090-2	04-02-2021	04-01-2022
				03-30-2022	03-29-2023
EMI Test Receiver	R&S	ESR 3	WXJ090-3	04-08-2021	04-07-2022
				03-30-2022	03-29-2023
EMI Test Receiver	R&S	ESR 3	WXJ090-4	04-08-2021	04-07-2022
				03-30-2022	03-29-2023
Low Pre-amplifier	Bost	LNA 0920N	WXG002-3	04-06-2021	04-05-2022
				03-30-2022	03-29-2023
Low Pre-amplifier	Bost	LNA 0920N	WXG002-4	04-06-2021	04-05-2022
				03-30-2022	03-29-2023
Cable	Bost	JYT10M-1G-NN-10M	XG002-7	04-02-2021	04-01-2022
				03-30-2022	03-29-2023
Cable	Bost	JYT10M-1G-NN-10M	XG002-8	04-02-2021	04-01-2022
				03-30-2022	03-29-2023
Test Software	R&S	EMC32	Version: 10.50.40		

5 Measurement Setup and Procedure

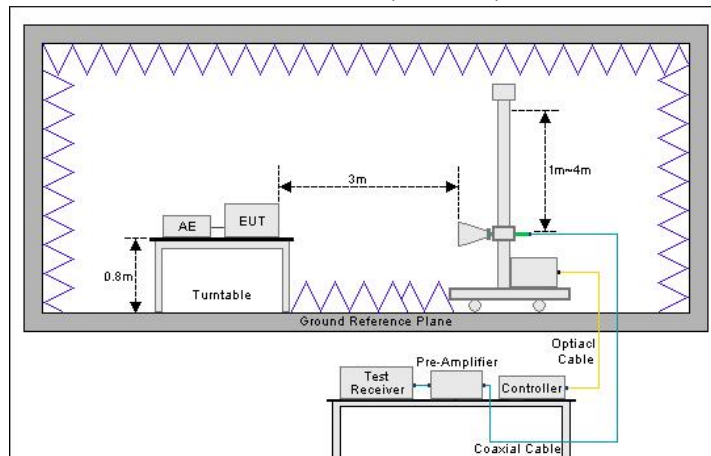
5.1 Test Setup

1) Radiated emission measurement:

Below 1GHz (10m SAC)



Above 1GHz (3m SAC)



5.2 Test Procedure

Test method	Test step
Radiated emission	<p>For below 1GHz:</p> <ol style="list-style-type: none"> 1. The EUT was placed on the tabletop of a rotating table 0.8 m the ground at a 10 m semi anechoic chamber. The measurement distance from the EUT to the receiving antenna is 10 m. 2. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data. <p>For above 1GHz:</p> <ol style="list-style-type: none"> 1. The EUT was placed on the tabletop of a rotating table 1.5 m the ground at a 3 m fully anechoic room. The measurement distance from the EUT to the receiving antenna is 3 m. 2. EUT works in each mode of operation that needs to be tested, and having the EUT continuously working, respectively on 3 axis (X, Y & Z) and considered typical configuration to obtain worst position. The highest signal levels relative to the limit shall be determined by rotating the EUT from 0° to 360° and with varying the measurement antenna height between 1 m and 4 m in vertical and horizontal polarizations. 3. Open the test software to control the test antenna and test turntable. Perform the test, save the test results, and export the test data.

6 Test Results

6.1 Summary

6.1.1 Clause and data summary

Test items	Standard clause	Test data	Result
Conducted Emission	Part 15.107	See Section 6.2	N/A
Radiated Emission	Part 15.109	See Section 6.3	Pass
Remark: 1. The EUT is a Class B digital device. 2. Pass: The EUT complies with the essential requirements in the standard. 3. N/A: Not Applicable. EUT powered by DC 12V ~ 24V.			
Test Method:	ANSI C63.4:2014		

6.1.2 Test Limit

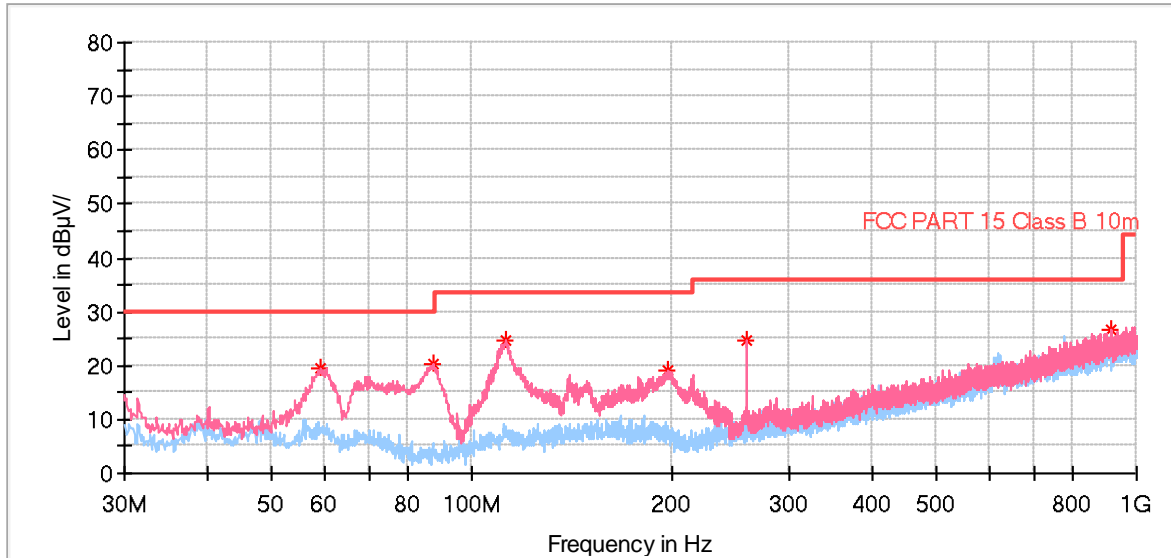
Test items	Limit				
	Frequency (MHz)	Class A Limit (dB μ V/m)		Class B Limit (dB μ V/m)	
		Quasi-Peak @ 3m	Quasi-Peak @ 10m	Quasi-Peak @ 3m	Quasi-Peak @ 10m
Radiated Emission	30 – 88	49.0	39.0	40.0	30.0
	88 – 216	53.5	43.5	43.5	33.5
	216 – 960	56.0	46.0	46.0	36.0
	960 – 1000	60.0	50.0	54.0	44.0
	Note: The more stringent limit applies at transition frequencies.				
	Frequency	Class A Limit (dB μ V/m) @ 3m		Class B Limit (dB μ V/m) @ 3m	
		Average	Peake	Average	Peake
	Above 1 GHz	60.0	80.0	54.0	74.0
Note: The measurement bandwidth shall be 1 MHz or greater.					

6.2 Radiated Emission

Below 1GHz:

Product Name:	CAR DVR	Product Model:	M17
Test By:	Mike	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	DC 12V		

Full Spectrum



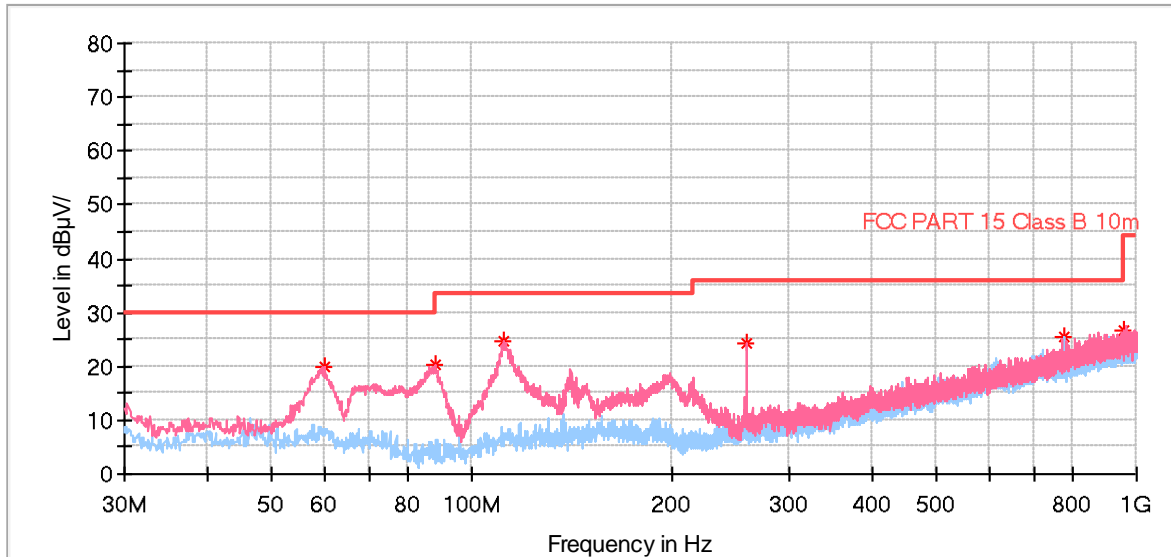
Frequency (MHz)	MaxPeak (dB µV/m)	Limit (dB µV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
912.215000	26.63	36.00	9.37	100.0	V	10.0	-0.6
259.211000	24.64	36.00	11.36	100.0	V	14.0	-15.9
112.838000	24.73	33.50	8.77	100.0	V	123.0	-17.7
197.810000	19.14	33.50	14.36	100.0	V	193.0	-18.2
87.618000	20.21	30.00	9.79	100.0	V	201.0	-20.1
59.197000	19.66	30.00	10.34	100.0	V	285.0	-16.3

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

Product Name:	CAR DVR	Product Model:	M17
Test By:	Mike	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical & Horizontal
Test Voltage:	DC 24V		

Full Spectrum



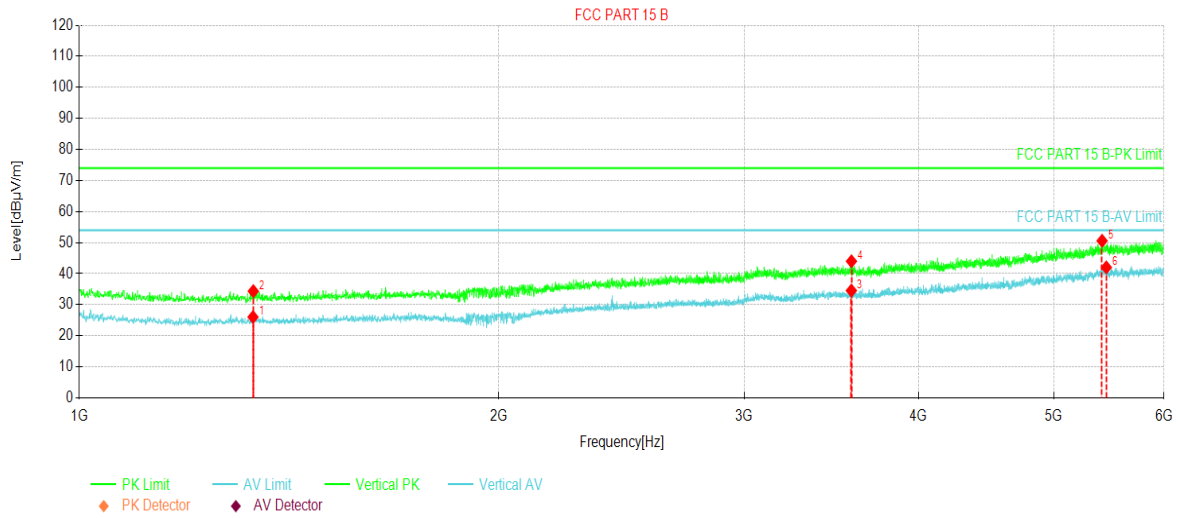
Frequency (MHz)	MaxPeak (dB µV/m)	Limit (dB µV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
60.167000	19.75	30.00	10.25	100.0	V	213.0	-16.4
87.909000	20.15	30.00	9.85	100.0	V	217.0	-20.1
111.771000	24.79	33.50	8.71	100.0	V	182.0	-17.8
259.211000	24.22	36.00	11.78	100.0	V	0.0	-15.9
777.773000	25.51	36.00	10.49	100.0	H	148.0	-3.6
958.387000	26.71	36.00	9.29	100.0	V	306.0	0.0

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

Above 1GHz:

Product Name:	CAR DVR	Product Model:	M17
Test By:	Mike	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Vertical
Test Voltage:	DC 12V		

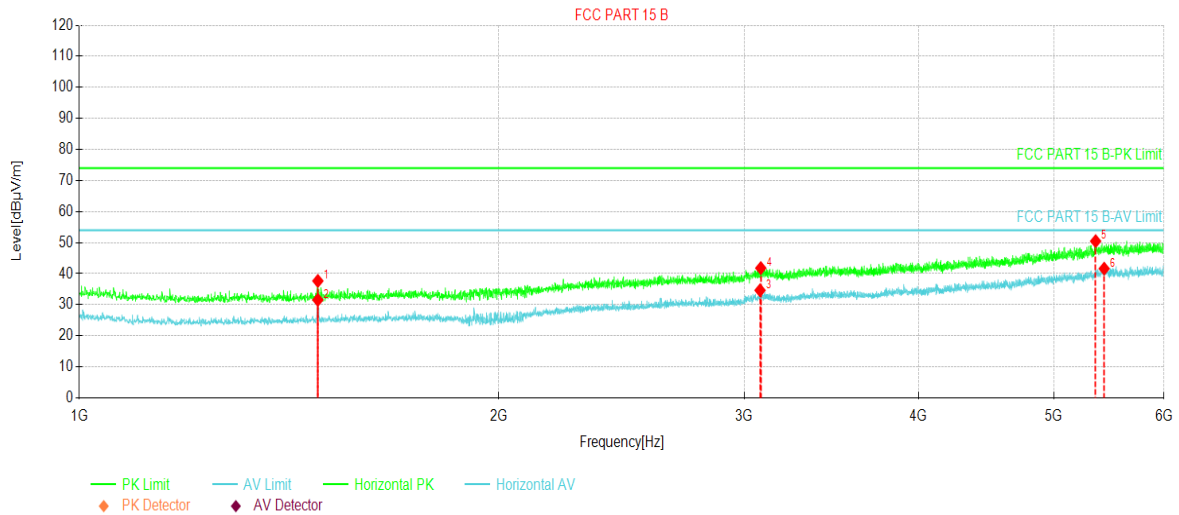


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	1332.50	49.16	26.03	-23.13	54.00	27.97	AV	Vertical
2	1333.12	57.49	34.36	-23.13	74.00	39.64	PK	Vertical
3	3580.00	49.45	34.55	-14.90	54.00	19.45	AV	Vertical
4	3580.62	58.89	43.99	-14.90	74.00	30.01	PK	Vertical
5	5416.87	56.54	50.58	-5.96	74.00	23.42	PK	Vertical
6	5455.00	48.03	42.02	-6.01	54.00	11.98	AV	Vertical

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Preamplifier Factor.

Product Name:	CAR DVR	Product Model:	M17
Test By:	Mike	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Horizontal
Test Voltage:	DC 12V		

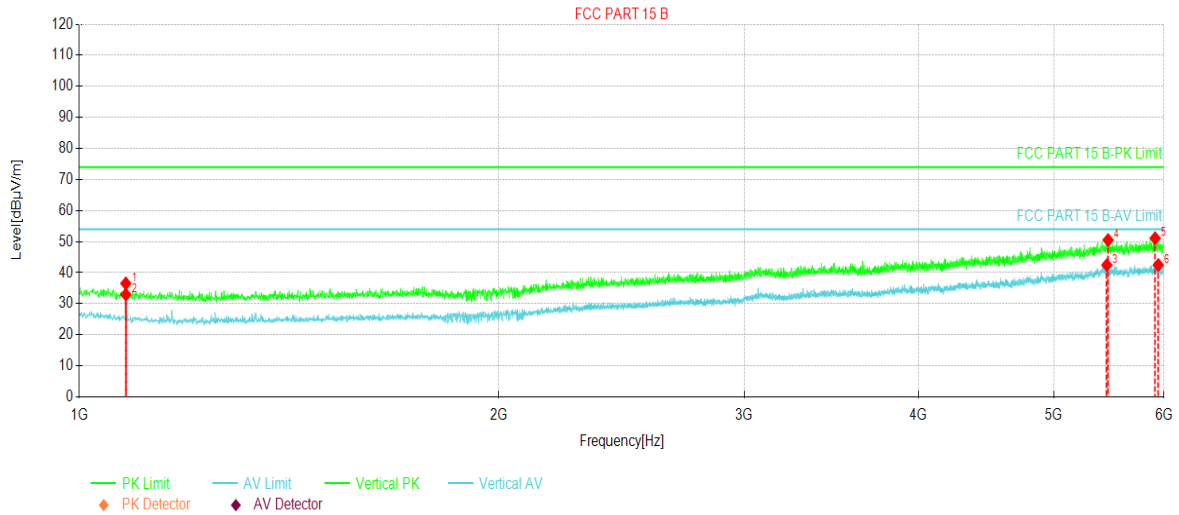


NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	1483.12	60.39	37.66	-22.73	74.00	36.34	PK	Horizontal
2	1483.12	54.29	31.56	-22.73	54.00	22.44	AV	Horizontal
3	3078.75	50.78	34.63	-16.15	54.00	19.37	AV	Horizontal
4	3082.50	57.92	41.81	-16.11	74.00	32.19	PK	Horizontal
5	5359.37	56.68	50.46	-6.22	74.00	23.54	PK	Horizontal
6	5435.62	47.60	41.62	-5.98	54.00	12.38	AV	Horizontal

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

Product Name:	CAR DVR	Product Model:	M17
Test By:	Mike	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Vertical
Test Voltage:	DC 24V		

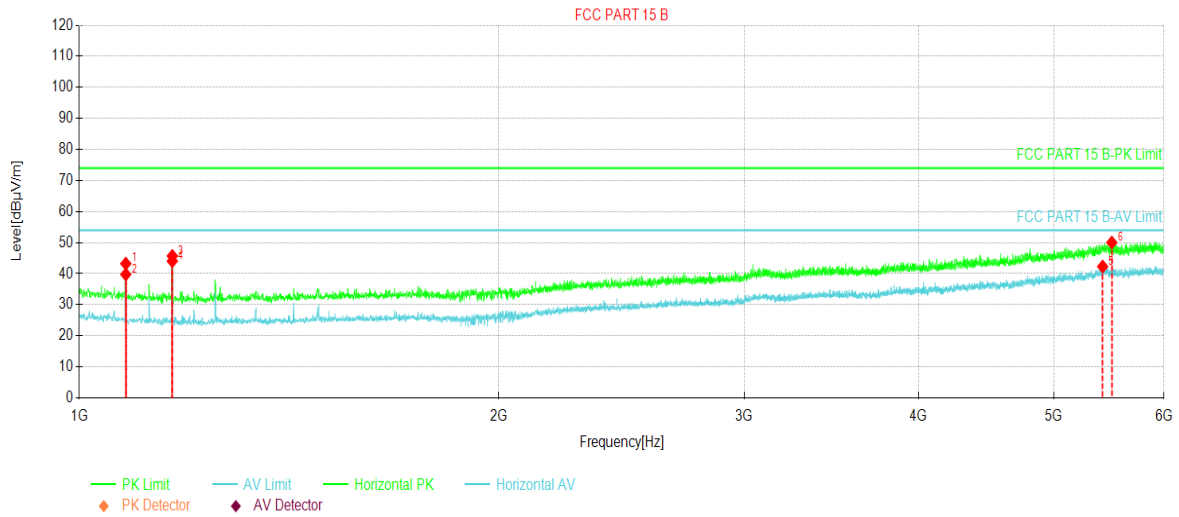


NO.	Freq. [MHz]	Reading [dBuV/m]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Polarity
1	1080.00	59.32	36.53	-22.79	74.00	37.47	PK	Vertical
2	1080.00	55.74	32.95	-22.79	54.00	21.05	AV	Vertical
3	5459.37	48.46	42.44	-6.02	54.00	11.56	AV	Vertical
4	5470.62	56.55	50.51	-6.04	74.00	23.49	PK	Vertical
5	5912.50	55.92	51.09	-4.83	74.00	22.91	PK	Vertical
6	5943.75	47.38	42.48	-4.90	54.00	11.52	AV	Vertical

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

Product Name:	CAR DVR	Product Model:	M17
Test By:	Mike	Test mode:	Working mode
Test Frequency:	1000 MHz ~ 6000 MHz	Polarization:	Horizontal
Test Voltage:	DC 24V		



NO.	Freq. [MHz]	Reading [dBµV/m]	Level [dBµV/m]	Factor [dB]	Limit [dBµV/m]	Margin [dB]	Trace	Polarity
1	1080.00	66.02	43.23	-22.79	74.00	30.77	PK	Horizontal
2	1080.00	62.56	39.77	-22.79	54.00	14.23	AV	Horizontal
3	1166.25	69.11	45.70	-23.41	74.00	28.30	PK	Horizontal
4	1166.25	67.46	44.05	-23.41	54.00	9.95	AV	Horizontal
5	5421.87	48.24	42.28	-5.96	54.00	11.72	AV	Horizontal
6	5504.37	56.11	50.03	-6.08	74.00	23.97	PK	Horizontal

Remark:

1. Level = Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor.

-----End of report-----