



RF TEST REPORT

Report No.: SET2021-09172

Product Name: Dash Cam

FCC ID: NCI-M360-D700-1

Model No. : Mobile360 D700

Dates of Testing: 08/01/2020 —06/22/2021

Applicant: VIA Technologies, Inc

Address: 8F, 535 Zhongzheng Rd. Xindian Dist. New Taipei City, Taiwan

Issued by: CCIC Southern Testing Co., Ltd.

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Test Report

Product Name Dash Cam

Brand Name VIA

Trade Name VIA

Applicant VIA Technologies, Inc

Applicant Address 8F, 535 Zhongzheng Rd. Xindian Dist. New Taipei City, Taiwan.

Manufacturer VIA Technologies, Inc

Manufacturer Address 8F, 535 Zhongzheng Rd. Xindian Dist. New Taipei City, Taiwan.

Test Standards 47 CFR FCC Part 2/22/24/27

Test Result PASS

Tested by *Vincent*

2021.07.19

Vincent, Test Engineer

Reviewed by *Chris You*

2021.07.19

Chris You, Senior Engineer

Approved by *Shuangwen Zhang*

2021.07.19

Shuangwen Zhang, Manager

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Change History		
Issue	Date	Reason for change
1.0	2021.07.19	First edition

1. GENERAL INFORMATION

1.1 EUT Description

EUT Type	Dash Cam
EUT supports Radios application	WCDMA/HSPA
Hardware Version	RA
Software Version	V2.1.0
Frequency Range	WCDMA 850MHz Tx: 826.4 - 846.6MHz (at intervals of 200kHz); Rx: 871.4 - 891.6MHz (at intervals of 200kHz) WCDMA 1900MHz Tx: 1852.4 - 1907.6MHz (at intervals of 200kHz); Rx: 1932.4 - 1987.6MHz (at intervals of 200kHz) WCDMA 1700MHz Tx: 1712.4 - 1752.6MHz (at intervals of 200kHz); Rx: 2112.4 - 2152.6MHz (at intervals of 200kHz)
Maximum Output Power to Antenna	WCDMA 850: 22.46dBm WCDMA 1900: 23.65dBm WCDMA 1700: 23.64dBm
Type of Modulation	WCDMA: QPSK(Uplink) HSDPA:QPSK(Uplink) HSUPA:QPSK(Uplink)
Antenna Type	Internal

1.2 Maximum ERP/EIRP Power, Frequency Tolerance, and Emission Designator

System	Type of Modulation	Emission Designator	Frequency Tolerance (ppm)	Maximum ERP/EIRP(W)
WCDMA 850 RMC 12.2Kbps	QPSK	4M16F9W	0.0064	0.182
WCDMA 1900 RMC 12.2Kbps	QPSK	4M15F9W	0.0083	0.213
WCDMA 1700 RMC 12.2Kbps	QPSK	4M14F9W	0.0069	0.209

1.3 Test Standards and Results

1. 47 CFR Part 2, 22(H), 24(E), 27(L)
2. ANSI C63.26:2015
3. FCC KDB 971168 D01 Power Meas. License Digital Systems v03r01

Remark:

1. This C2PC Report was based on original FCC ID: NCI-M360-D700-1, The device was change the ANT, and open LTE Band 71 via the software. Below are the test items

No.	Section	Description	Tested	Result
	FCC			
1	22.913	Effective Radiated Power	Y	PASS
	24.232	Equivalent Isotropic Radiated Power	Y	PASS
2	27.50d	Effective Radiated Power	Y	PASS
3	2.1053 22.917 24.238 27.53	Radiated Spurious Emissions	Y	PASS

1.4 Test Configuration of Equipment under Test

Antenna port conducted and radiated test items were performed according to KDB 971168 D01 Power Meas. License Digital Systems v03r01 with maximum output power.

Radiated measurements were performed with rotating EUT in different three orthogonal test planes to find the maximum emission.

Radiated emissions were investigated as following frequency range:

1. 30 MHz to 9000 MHz for WCDMA Band V.
2. 30 MHz to 20000 MHz for WCDMA Band II.
3. 30 MHz to 18000 MHz for WCDMA Band IV.

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Modes		
Band	Radiated TCs	Conducted TCs
WCDMA Band V	RMC 12.2Kbps Link	RMC 12.2Kbps Link
WCDMA Band II	RMC 12.2Kbps Link	RMC 12.2Kbps Link
WCDMA Band IV	RMC 12.2Kbps Link	RMC 12.2Kbps Link

Note: The maximum power levels are chosen to test as the worst case configuration as follows:

RMC 12.2Kbps mode for WCDMA band V,

RMC 12.2Kbps mode for WCDMA band II,

RMC 12.2Kbps mode for WCDMA band IV, only these modes were used for all tests.

1.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 6B and 10dB attenuator.

Example:

$$\begin{aligned}\text{Offset (dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 7.5 + 10 = 17.5(\text{dB})\end{aligned}$$



1.6 Facilities and Accreditations

1.6.1 Test Facilities

CNAS-Lab Code: L1659

CCIC-SET is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L1659.

FCC-Registration No.: CN1283

CCIC Southern Testing Co., Ltd EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN1283, valid time is until April 19th, 2023.

ISED Registration: 11185A-1

CAB identifier: CN0064

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until April 19th, 2023.

A2LA Code: 5721.01

CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17025. The accreditation certificate number is 5721.01.

1.6.2 Test Environment Conditions

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

Temperature (°C):	15°C- 35°C
Relative Humidity (%):	30% -60%
Atmospheric Pressure (kPa):	86KPa-106KPa

2. TEST REQUIREMENTS

2.1 Transmitter Radiated Power (EIRP/ERP)

2.1.1 Requirement

The substitution method, in ANSI C63.26:2015, was used for ERP/EIRP measurement, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v03r01. The ERP of mobile transmitters must not exceed 7 Watts (Cellular Band) and the EIRP of mobile transmitters are limited to 2 Watts (PCS Band) and 1 Watts (AWS Band).

2.1.2 Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.1.3 Test Procedures

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.2.1. (for CDMA/WCDMA), Section 5.2.2.2 (for GSM/GSM/GPRS) and ANSI / TIA-603-D-2010 Section 2.2.17.
2. The EUT was placed on a turntable 1.5 meters high in a fully anechoic chamber.
3. The EUT was placed 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. GSM operating modes: Set RBW= 1MHz, VBW= 3MHz, RMS detector over burst;
UMTS operating modes: Set RBW= 100 kHz, VBW= 300 kHz, RMS detector over frame, and use channel power option with bandwidth=5MHz, per KDB 971168 D01 v03r01.
5. The table was rotated 360 degrees to determine the position of the highest radiated power.
6. The height of the receiving antenna is adjusted to look for the maximum ERP/EIRP.
7. Taking the record of maximum ERP/EIRP.

8. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.

9. The conducted power at the terminal of the dipole antenna is measured.

10. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.

11. $\text{ERP/EIRP} = \text{Ps} + \text{Et} - \text{Es} + \text{Gs} = \text{Ps} + \text{Rt} - \text{Rs} + \text{Gs}$

Ps (dBm): Input power to substitution antenna.

Gs (dBi or dBd): Substitution antenna Gain.

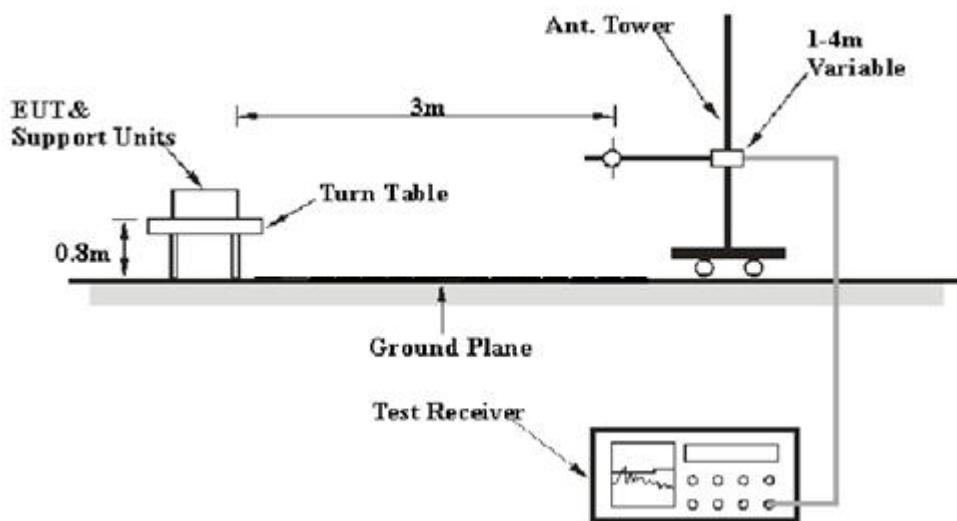
$\text{Et} = \text{Rt} + \text{AF}$ $\text{Es} = \text{Rs} + \text{AF}$

AF (dB/m): Receive antenna factor

Rt : The highest received signal in spectrum analyzer for EUT.

Rs : The highest received signal in spectrum analyzer for substitution antenna.

2.1.4 Test Setup



2.1.5 Test Result of Transmitter Radiated Power

Test Notes:

1. This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, HSUPA capabilities. All configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2Kbps.
3. This unit was tested with its standard battery.
4. The worst case test configuration was found in the vertical positioning where the EUT is laying on its side. The data reported in the tables below were measured in this test setup.

Band	Channel	Frequency (MHz)	Antenna Pol (H/V)	Measured ERP dBm	Limit dBm	Verdict
WCDMA 850MHz	4132	826.4	H	22.09	38.5	PASS
			V	22.17		
	4175	835	H	22.12		PASS
			V	22.59		
	4233	846.6	H	22.27		
			V	22.54		PASS

Band	Channel	Frequency (MHz)	Antenna Pol (H/V)	Measured EIRP dBm	Limit dBm	Verdict
WCDMA 1900MHz	9262	1852.4	H	23.18	33	PASS
			V	22.74		
	9400	1880	H	23.09		PASS
			V	22.57		
	9538	1907.6	H	23.29		
			V	22.37		PASS

Band	Channel	Frequency (MHz)	Antenna Pol (H/V)	Measured EIRP dBm	Limit dBm	Verdict
WCDMA 1700MHz	1312	1712.4	V	22.59	30	PASS
			H	22.37		
	1413	1732.4	V	22.22		PASS
			H	23.20		
	1513	1752.6	V	22.18		
			H	22.87		PASS

2.2 Radiated Spurious Emissions

2.2.1 Requirement

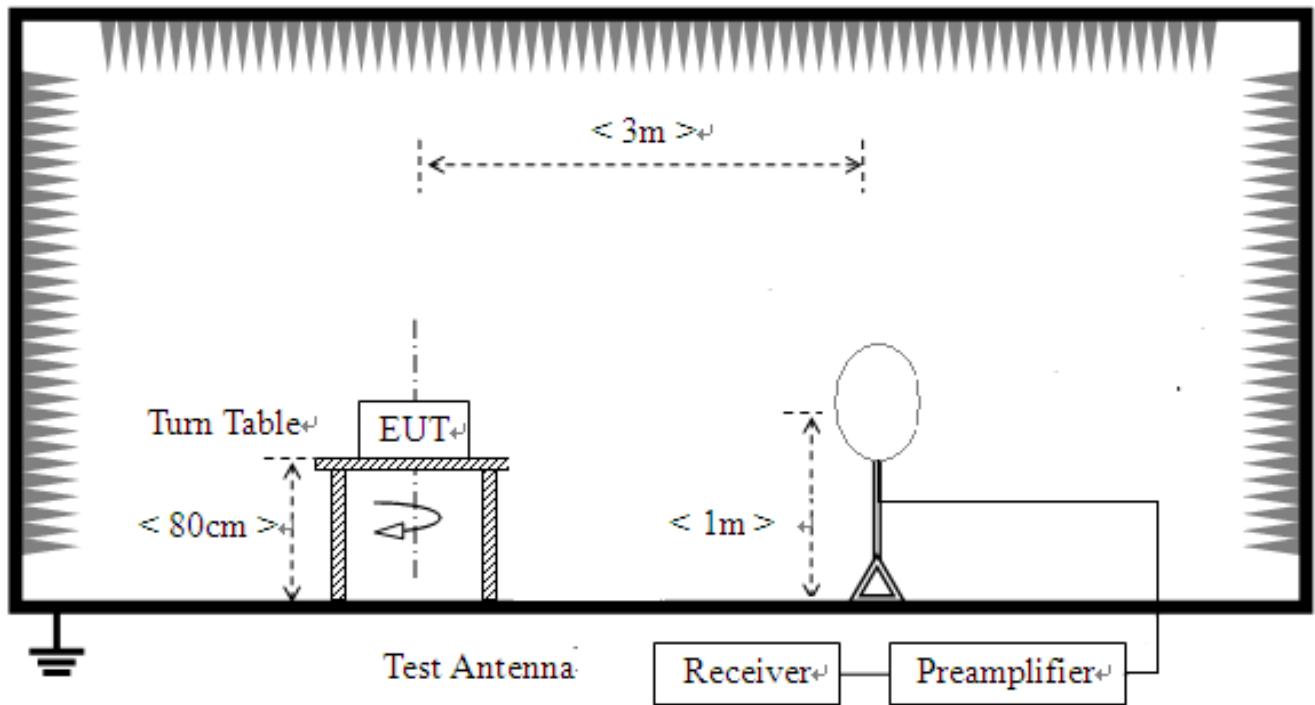
The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least $43 + 10 \log (P)$ dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

2.2.2 Measuring Instruments

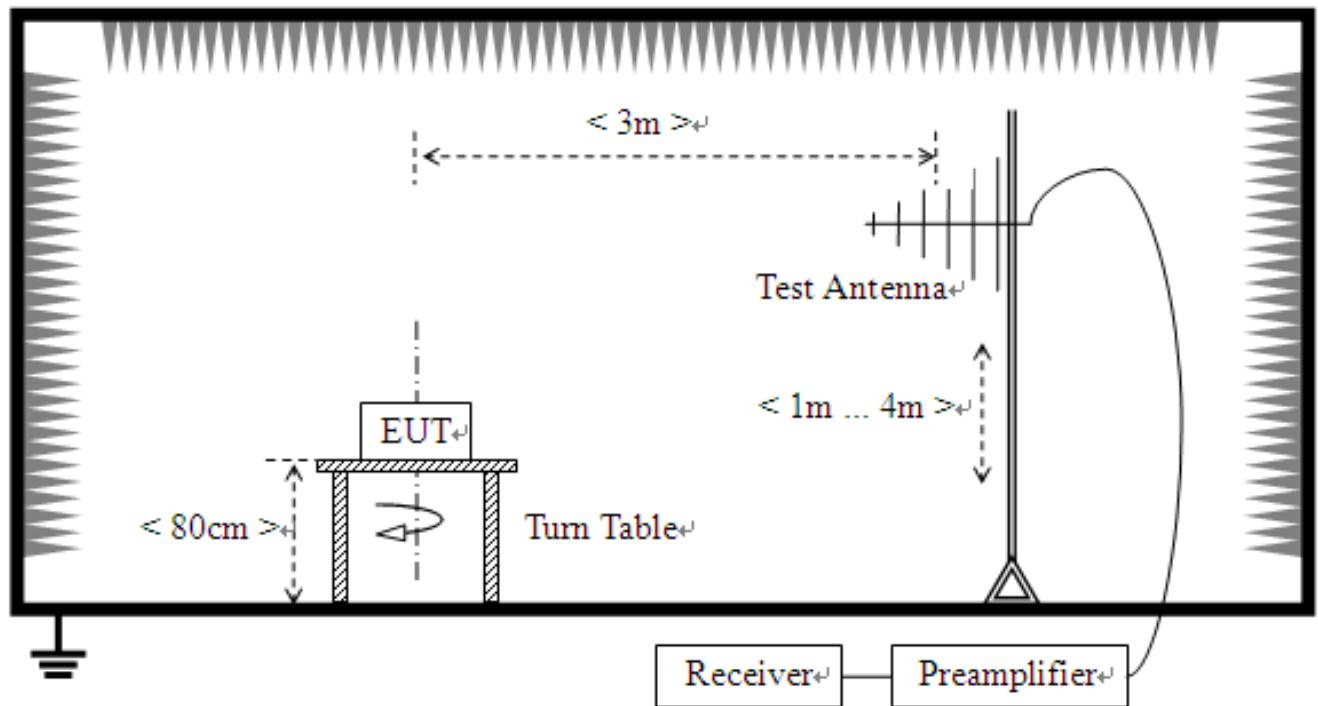
The measuring equipment is listed in the section 3 of this test report.

2.2.3 Test Setup

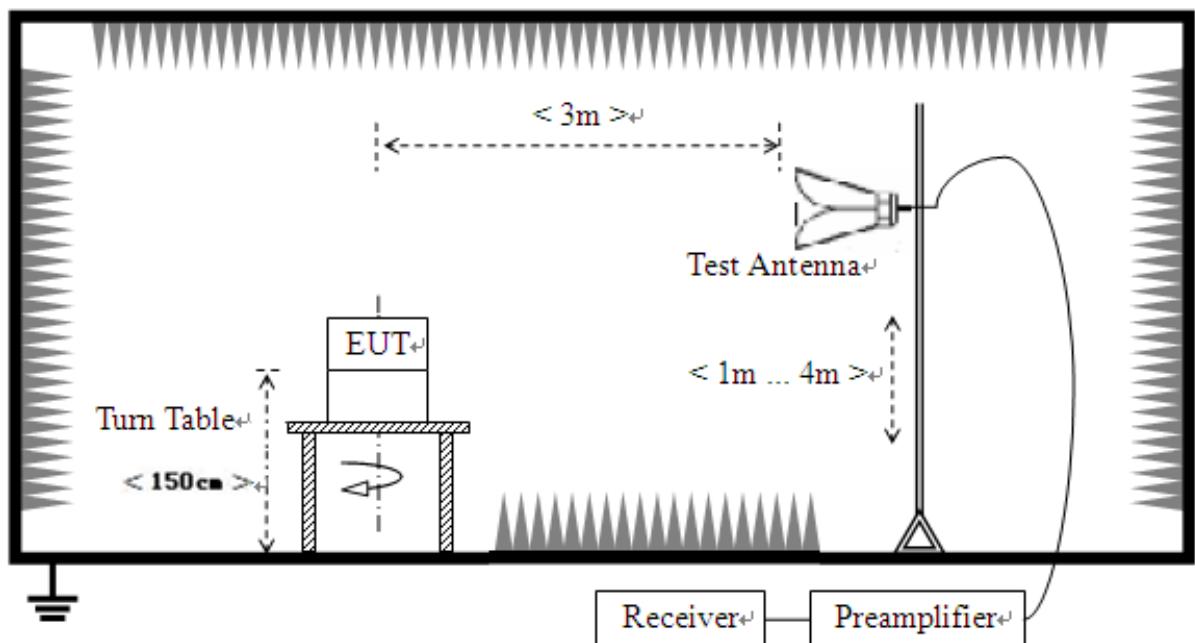
For radiated emissions from 9 kHz to 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



2.2.4 Test Procedures

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8.
2. The EUT was placed on a rotatable wooden table 0.8/1.5 meters above the ground.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
4. The table was rotated 360 degrees to determine the position of the highest spurious emission.
5. The height of the receiving antenna is varied between one meter and four meters to search for the maximum spurious emission for both horizontal and vertical polarizations.
6. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking record of maximum spurious emission.
7. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
8. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
9. Taking the record of output power at antenna port.
10. Repeat step 7 to step 8 for another polarization.
11. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
12. The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P(Watts)
$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$
$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)}$$
$$= -13 \text{ dBm.}$$
13. This device employs GMSK technology with GSM and GPRS capabilities. All configurations were investigated and the worst case emissions were found in GSM mode.
14. This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, HSUPA capabilities. All configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2Kbps.
15. This unit was tested with its standard battery.
16. All Spurious Emission tests were performed in X, Y, Z axis direction and low, middle, high channel. And only the worst axis test condition was recorded in this test report.
17. The spectrum is measured from 9 KHz to the 10th harmonic of the fundamental frequency

of the transmitter using CISPR quasi peak detector below 1GHz. The worst case emissions are reported however emissions whose levels were not within 20dB of the respective limits were not reported.

18. For 9KHz to 30MHz: the amplitude of spurious emissions are attenuated by more than 20dB below the permissible value has no need to be reported.

2.2.5 Test Results of Radiated Spurious Emissions

Note: 1. (Absolute)Level=Reading Level + Factor

Worst-Case test data provide as below:

WCDMA 850 Middle Channel

30MHz~10GHz:

Suspected List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	517.427	-105.46	-72.64	-13.00	59.64	32.82	Horizontal
2	1298.14	-57.40	-59.53	-13.00	46.53	-2.13	Horizontal
3	2294.64	-57.37	-54.44	-13.00	41.44	2.93	Horizontal
4	2874.93	-58.05	-51.78	-13.00	38.78	6.27	Horizontal
5	3726.36	-59.65	-49.25	-13.00	36.25	10.40	Horizontal
6	9641.32	-64.69	-35.08	-13.00	22.08	29.61	Horizontal

Suspected List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	62.0420	-93.65	-73.16	-13.00	60.16	20.49	Vertical
2	468.878	-107.44	-77.17	-13.00	64.17	30.27	Vertical
3	608.698	-106.04	-72.45	-13.00	59.45	33.59	Vertical
4	1209.10	-60.55	-62.13	-13.00	49.13	-1.58	Vertical
5	2156.57	-58.31	-55.44	-13.00	42.44	2.87	Vertical
6	3796.39	-60.57	-50.23	-13.00	37.23	10.34	Vertical

Worst-Case test data provide as below:

WCDMA 1900 Middle Channel

30MHz~20GHz:

Suspected List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	508.688	-106.34	-73.74	-13.00	60.74	32.60	Horizontal
2	656.276	-106.65	-71.82	-13.00	58.82	34.83	Horizontal
3	945.625	-106.98	-69.58	-13.00	56.58	37.40	Horizontal
4	3028.02	-58.07	-48.84	-13.00	35.84	9.23	Horizontal
5	3756.75	-60.33	-49.87	-13.00	36.87	10.46	Horizontal
6	9697.69	-63.83	-33.20	-13.00	20.20	30.63	Horizontal

Suspected List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	68.8388	-94.57	-73.49	-13.00	60.49	21.08	Vertical
2	830.080	-107.22	-71.60	-13.00	58.60	35.62	Vertical
3	1234.23	-62.06	-63.74	-13.00	50.74	-1.68	Vertical
4	3224.22	-61.68	-52.18	-13.00	39.18	9.50	Vertical
5	3756.75	-59.88	-49.53	-13.00	36.53	10.35	Vertical
6	9554.55	-62.33	-33.56	-13.00	20.56	28.77	Vertical

Worst-Case test data provide as below:

WCDMA 1700 Middle Channel

30MHz~20GHz:

Suspected List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	35.1751	-87.95	-65.2	-13	52.2	22.75	Horizontal
2	63.9613	-85.32	-65.98	-13	52.98	19.34	Horizontal
3	553.004	-86.73	-55.22	-13	42.22	31.51	Horizontal
4	2417.88	-56.52	-52.71	-13	39.71	3.81	Horizontal
5	3031.20	-58.38	-49.18	-13	36.18	9.20	Horizontal
6	5424.33	-59.06	-44.34	-13	31.34	14.72	Horizontal

Suspected List							
NO.	Freq. [MHz]	Reading [dBm]	Level [dBm]	Limit [dBm]	Margin [dB]	Factor [dB]	Polarity
1	41.6439	-86.42	-66.49	-13	53.49	19.93	Vertical
2	63.9613	-85.38	-64.87	-13	51.87	20.51	Vertical
3	749.980	-88.58	-52.65	-13	39.65	35.93	Vertical
4	2671.93	-57.28	-51.04	-13	38.04	6.24	Vertical
5	3819.16	-58.59	-48.32	-13	35.32	10.27	Vertical
6	5541.35	-59.10	-43.67	-13	30.67	15.43	Vertical

2.3 Transmit antenna

2.3.1 Applicable Standard

According to RSS GEN issue5 6.8, The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below). When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer. The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

2.3.2 Antenna Information

Antenna Category: Internal Antenna

Internal Antenna were pasted to inner side of plastic chassis and contacted to antenna springs which were soldered on PCB.

Antenna General Information:

No.	EUT	Operating frequency range	Ant. Type	Ant. Gain (Max)
1	Dash Cam	WCDMA Band2: 1852.4-1907.6 MHz WCDMA Band4: 1712.4-1752.6 MHz WCDMA Band5: 826.4-846.4 MHz	Internal	3.54dBi

2.3.3 Result: comply

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

3. LIST OF MEASURING EQUIPMENT

Description	Manufacturer	Model	Serial No.	Cal. Date	Due Date	Remark
EMI Test Receiver	R&S	ESW26	A180502935	2020.08.13	2021.08.12	Radiation
Loop Antenna	Schwarz beck	HFH2-Z2	100047	2019.04.26	2022.04.25	Radiation
Broadband antenna (30MHz~1GHz)	Schwarbeck	BBHA 9120 J	A190503537	2019.01.07	2022.01.06	Radiation
Broadband antenna (30MHz~1GHz)	R&S	VULB9160	A0805560	2019.05.24	2022.05.23	Radiation
Double ridge horn antenna (1GHz~18GHz)	R&S	HF906	100150	2019.04.27	2022.04.26	Radiation
Double ridge horn antenna (1GHz~18GHz)	R&S	HF906	100149	2019.04.17	2022.04.16	Radiation
Horn antenna (18GHz~26.5GHz)	AR	AT4510	A0804450	2020.06.19	2023.06.18	Radiation
Horn antenna (18GHz~26.5GHz)	AR	AT4003A	0329293	2020.09.17	2021.09.16	Radiation
Amplifier 30M~1GHz	MILMEGA	80RF1000-10004	A140101634	2020.09.22	2023.09.21	Radiation
Amplifier 1G~18GHz	MILMEGA	AS0104R-800/400	A160302517	2021.01.26	2022.01.25	Radiation
Spectrum Analyzer	KEYSIGHT	N9030A	A160702554	2021.04.26	2022.04.25	Conducted
Test Receiver	R&S	ESIB7	A0501375	2020.06.24	2021.06.23	Conducted
Temperature chamber	TABAI	PS-232	A8708054	2020.10.30	2021.10.29	Conducted
Wideband Radio Communication tester	R&S	CMW500	A130101034	2019.07.30	2021.07.29	Conducted
Power Supply	R&S	WYJ-60100	A141102031	2020.01.16	2023.01.15	Conducted
Test software	ECIT	Eagle	V2.0	N/A	N/A	Conducted

4. UNCERTAINTY OF EVALUATION

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. 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.

Uncertainty of Conducted Emission Measurement (150KHz~30MHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_{c(y)}$)	2.8dB
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Uncertainty of Radiated Emission Measurement (30MHz~1GHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_{c(y)}$)	3.91dB
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Uncertainty of Radiated Emission Measurement (1GHz~18GHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_{c(y)}$)	4.5dB
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Uncertainty of Radiated Emission Measurement (18GHz~40GHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_{c(y)}$)	4.9dB
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** END OF REPORT **