

Prüfbericht-Nr.: <i>Test report no.:</i>	CN233LRC 001	Auftrags-Nr.: <i>Order no.:</i>	180242579	Seite 1 von 16 Page 1 of 16
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2023.07.11	
Auftraggeber: <i>Client:</i>	SHANGHAI HUGONG AUTO-ELECTRIC CO., LTD. No. 1288, Xiechun Road, Anting Town, Jiading District, 201804 SHANGHAI P.R. CHINA			
Prüfgegenstand: <i>Test item:</i>	Remote key			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	5722003			
Auftrags-Inhalt: <i>Order content:</i>	TÜV Rheinland – FCC Service			
Prüfgrundlage: <i>Test specification:</i>	FCC 47 CFR Part 15.203 FCC 47 CFR Part 15.231		FCC Part 15, Subpart B:2021	
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023.07.11	Refer to Photo Documentation		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003521628			
Prüfzeitraum: <i>Testing period:</i>	2023.07.11 - 2023.07.25			
Ort der Prüfung: <i>Place of testing:</i>	Refer to section 1.1			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland / CCIC (Ningbo) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	genehmigt von: <i>authorized by:</i>			
Datum: <i>Date:</i>	2023.08.23		Ausstelldatum: <i>Issue date:</i>	2023.08.23
Stellung / Position:	Keda Zhou/PE		Stellung / Position:	Feng Liang/Authorizer
Sonstiges / Other:	FCC ID: 2BCFM-KEY5722			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable
5 = mangelhaft N/T = nicht getestet				
5 = poor N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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Anmerkungen Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.</i> <i>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report. Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

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Test Summary

4.1.1 ANTENNA REQUIREMENT

Result:

Pass

4.1.2 DEACTIVATION OF THE TRANSMISSION

Result:

Pass

4.1.3 20DB EMISSION BANDWIDTH

Result:

Pass

4.1.4 FIELD STRENGTH OF FUNDAMENTAL AND UNWANTED EMISSIONS

Result:

Pass

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1. Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland /CCIC (Ningbo) Co., Ltd.

1st Floor, Building 11, Scholar Innovation Park, No.1188 Zhongguan Road, Zhenhai District, Ningbo 315200 P.R. China

FCC Designation Number: CN1237

FCC Test Firm Registration Number: 647754

The tests were conducted by TÜV Rheinland/CCIC's engineer directly in the above laboratory.

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment, Laboratory

Kind of Equipment	Type	Serial No.	Last cal. date	Cal. due date
EMI test receiver	ESR7	101929	2022.10.31	2023.10.30
Spectrum analyzer	FSV40	101412	2022.10.31	2023.10.30
Bilog Antenna	CBL6112D	49033	2021.03.15	2024.03.14
Horn antenna	HF907	102653	2020.11.25	2023.07.21
Pre-amplifier	SCU-18F	180051	2022.10.31	2023.10.30

1.3 Uncertainty of Measurement

Table 2: Measurement Uncertainty

Test Item	Expanded Measurement Uncertainty (k=2)
Conducted Emission (9-150kHz)	3.70dB
Conducted Emission (150k-30MHz)	3.30dB
Radiated Emission (30-1000MHz)	4.39dB
Radiated Emission (1-18GHz)	4.67dB

2. General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is a Remote key operating at 433.05 - 434.79MHz.

For more detail information, refer to the user's manual.

2.2 Ratings and System Details

Table 3: General Description of EUT

General Description of EUT	
FCC ID:	2BCFM-KEY5722
Rated Voltage:	DC 2.6-3.2V
Protection Class:	Class III
Technical Specification of SRD (433MHz)	
Operating Frequency band	433.05 - 434.79MHz
Modulation	ASK
Antenna Type	Microstrip line
Antenna Gain	3dBi

2.3 Independent Operation Modes

There are some modes:

Mode A: Transmitting on Operating Frequency Band: 433.05 - 434.79MHz

Mode B: Standby

Refer to the user's manual for further information.

2.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram for further information.

2.5 Submitted Documents

Circuit diagram, Schematics, PCB Layout, Label, User Manual etc.

3. Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

3.2 Test Operation and Test Software

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power was selected according to the instruction given by the manufacturer. The setting of the RF output power expected by the customer shall be fixed on the firmware of the final end product.

All testing were performed according to the procedures in ANSI C63.10: 2013.

Test Software EMC32 V10.30 was used in the radiated emission test.

More details refer to the related paragraph of this report.

3.3 Special Accessories and Auxiliary Equipment

None.

3.4 Countermeasures to Achieve ERM Compliance

The test sample which has been tested contained the noise suppression parts as described in the Circuit Diagram. No additional measures were employed to achieve compliance.

3.5 Test set-up

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

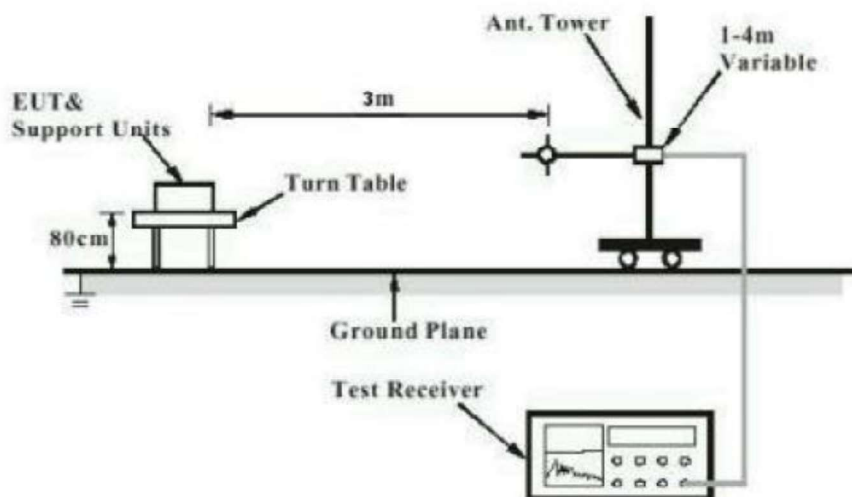


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

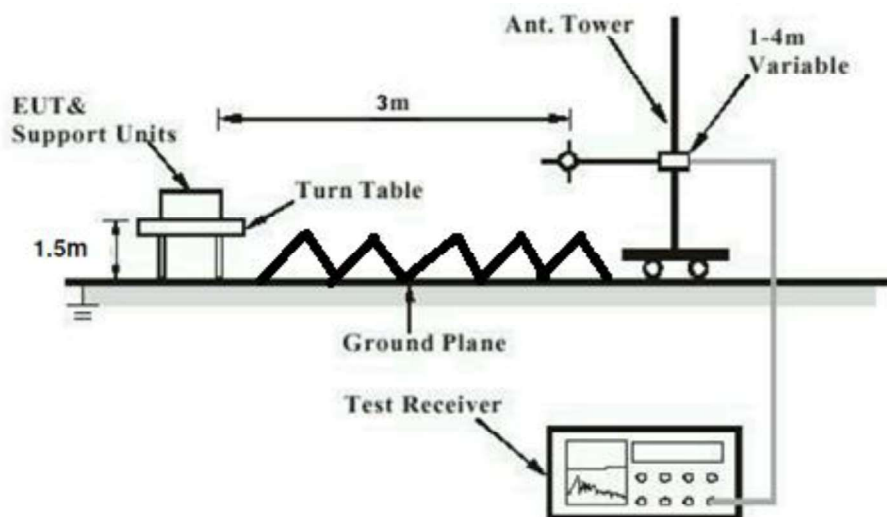
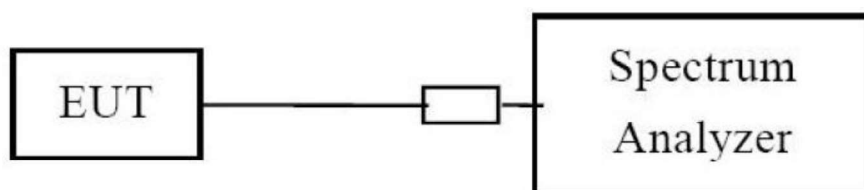


Diagram of Measurement Configuration for Conducted Transmitter Measurement



4. Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

Result:

Pass

Test Specification

Test standard

: FCC 47 CFR Part 15.203

Limit

: the use of antennas with directional gains that do not exceed 6 dBi

According to the manufacturer declared, the EUT has an integral antenna (Microstrip line antenna, Antenna Gain: 3dBi), and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Refer to EUT Photo for further details.

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4.1.2 Deactivation of the Transmission

Result:

Pass

Test Specification

Test standard : FCC 47 CFR Part 15.231

Basic standard : ANSI C63.10: 2013

Test requirement : CFR47 FCC Part 15.231 (a)(1)

Limits : A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Test suite : Shielded Room

Test Setup

Date of testing : 2023.07.19

Test environment: : Normal test conditions

Operational mode : Mode A

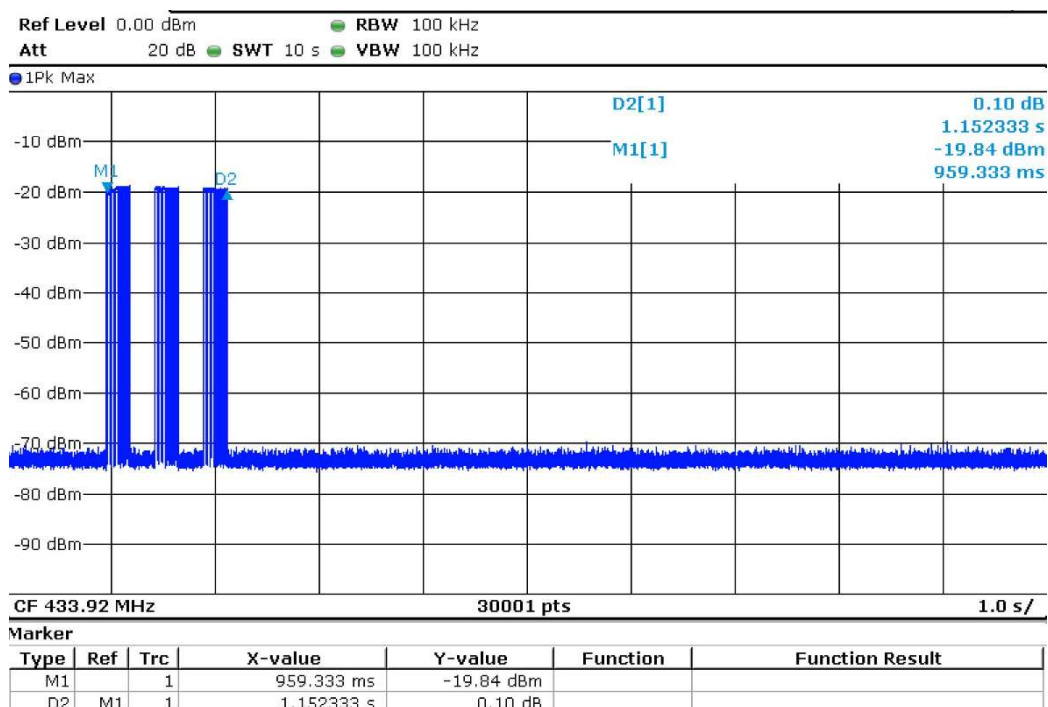
Temperature : 23°C

Relative humidity : 56%

Atmospheric pressure : 101.2 kPa

Figure 1: Test Results of Deactivation of the Transmission

Activated mode	Duration Time (S)	Limit (S)
Manually	1.15	≤5



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4.1.3 20dB Emission Bandwidth

Result:

Pass

Test Specification

Test standard : FCC 47 CFR Part 15.231
Basic standard : ANSI C63.10: 2013
Test requirement : CFR47 FCC Part 15.231 (c)
Limit : CFR47 FCC Part 15.231 (c)
Test suite : Shielded Room

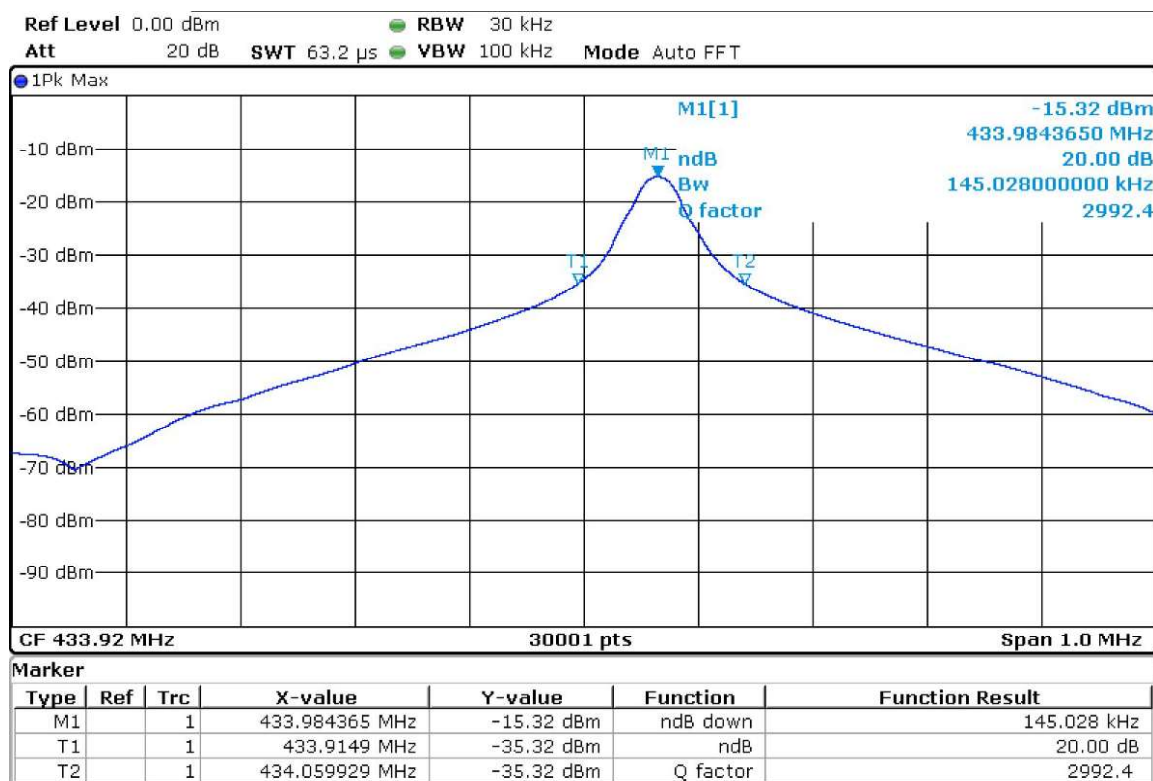
Test Setup

Date of testing : 2023.07.19
Test environment : Normal test conditions
Operational mode : Mode A
Temperature : 23°C
Relative humidity : 56%
Atmospheric pressure : 101.2 kPa

Figure 2: Test Results of 20dB Emission Bandwidth

Bandwidth (kHz)
145

Limit (kHz)
≤1085



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4.1.4 Field strength of fundamental and Unwanted Emissions

Result:

Pass

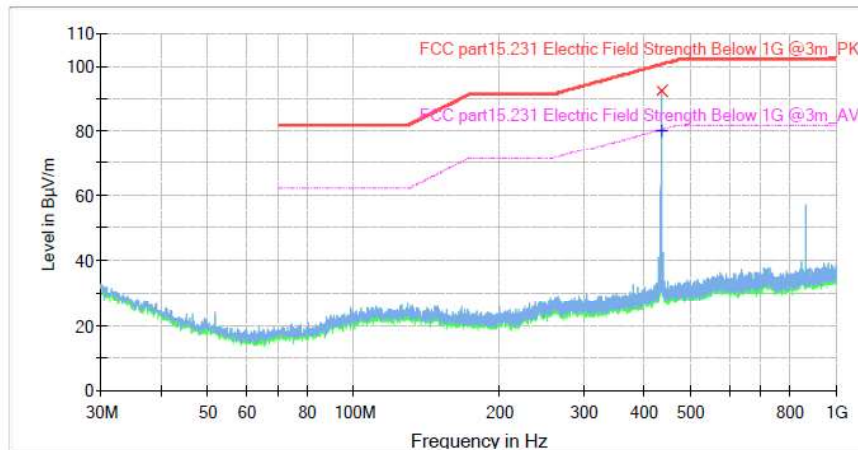
Test Specification	
Test standard	: FCC 47 CFR Part 15.231 CFR47 FCC Part 15.205 CFR47 FCC Part 15.209
Basic standard	: ANSI C63.10: 2013
Test requirement	: CFR47 FCC Part 15.231 (b)(1)(2)(3)
Limits	: CFR47 FCC Part 15.231 (b)
Test suite	: 3m Semi Anechoic Room

Test Setup

Date of testing	: 2023.07.24-2023.07.25
Test environment	: Normal test conditions
Operational mode	: Mode A
Temperature	: 23°C
Relative humidity	: 56%
Atmospheric pressure	: 101.2 kPa

Figure 3: Field strength of fundamental

Fundamental, Horizontal



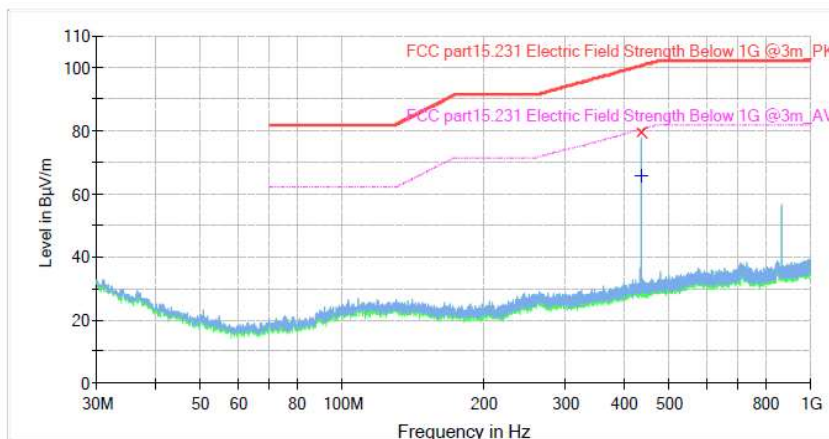
Limit and Margin-PK

Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
434.000000	92.5	1000.0	120.000	200.0	H	11.0	24.6	8.1	100.6

Limit and Margin-AV

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
434.000000	80.2	1000.0	120.000	200.0	H	11.0	24.6	0.4	80.6

Fundamental, Vertical



Limit and Margin-PK

Frequency (MHz)	MaxPeak (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
434.000000	79.6	1000.0	120.000	100.0	V	11.0	24.6	21.0	100.6

Limit and Margin-AV

Frequency (MHz)	Average (dBμV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
434.000000	66.0	1000.0	120.000	100.0	V	11.0	24.6	14.6	80.6

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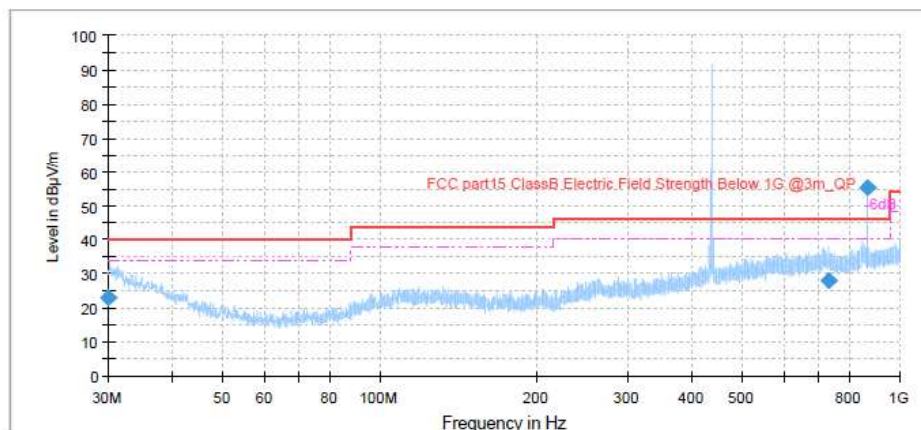
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Figure 4: Spectral Diagrams, Radiated Spurious Emission

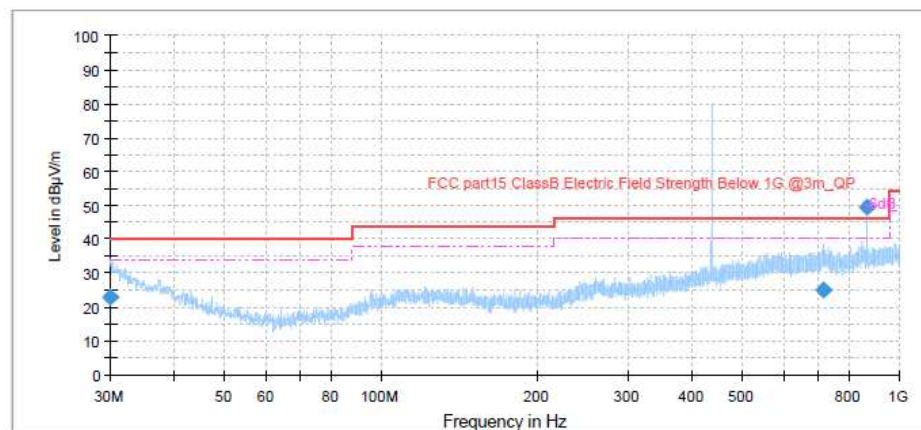
30MHz-1000MHz, Horizontal



Final Result

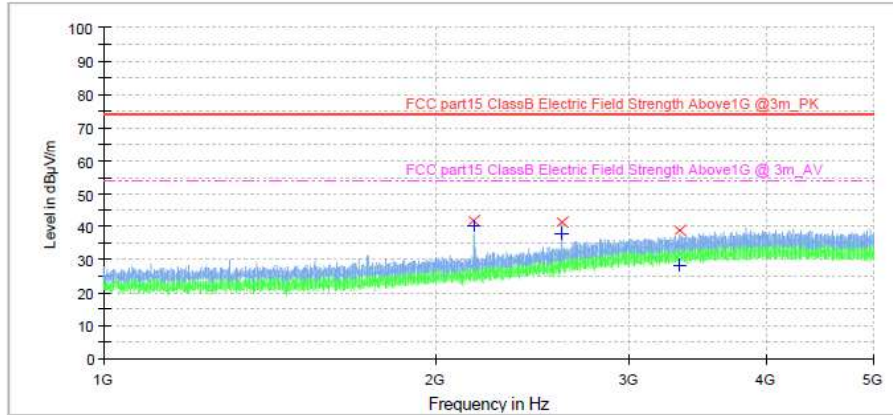
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.080000	22.95	40.00	17.05	1000.0	120.000	126.0	H	20.0	25.9
729.416111	27.88	46.00	18.12	1000.0	120.000	146.0	H	84.0	28.0
867.966111	55.40	60.60	6.50	1000.0	120.000	104.0	H	13.0	29.5

30MHz-1000MHz, Vertical



Final Result

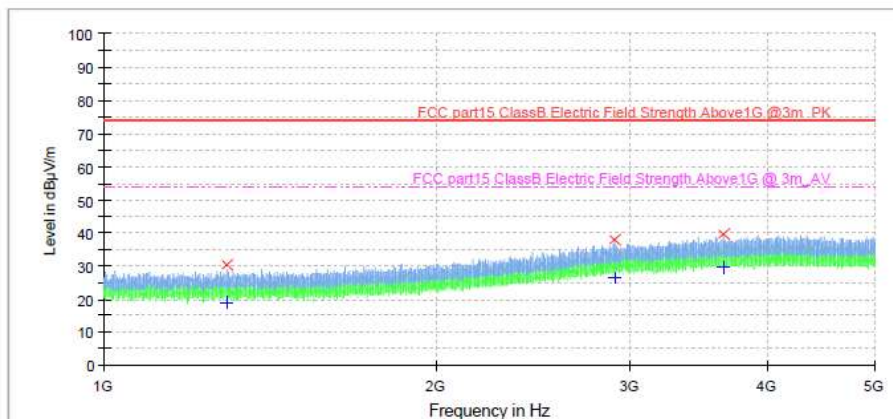
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
30.063333	22.92	40.00	17.08	1000.0	120.000	132.0	V	104.0	25.9
713.817778	25.00	46.00	21.00	1000.0	120.000	150.0	V	133.0	27.8
867.992222	49.39	60.60	12.51	1000.0	120.000	100.0	V	216.0	29.5

1GHz-5GHz, Horizontal

Limit and Margin-PK

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
2169.720000	42.0	1000.0	1000.000	150.0	H	0.0	-7.5	32.0	74.0
2603.405000	41.4	1000.0	1000.000	150.0	H	0.0	-5.4	32.6	74.0
3330.155000	38.9	1000.0	1000.000	150.0	H	0.0	-2.4	35.2	74.0

Limit and Margin-AV

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
2169.720000	40.0	1000.0	1000.000	150.0	H	0.0	-7.5	14.0	54.0
2603.405000	37.9	1000.0	1000.000	150.0	H	0.0	5.4	16.1	54.0
3330.155000	28.5	1000.0	1000.000	150.0	H	0.0	-2.4	25.5	54.0

1GHz-5GHz, Vertical

Limit and Margin-PK

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - PK+ (dB)	Limit - PK+ (dBµV/m)
1294.500000	30.4	1000.0	1000.000	150.0	V	0.0	-12.9	43.6	74.0
2903.500000	37.9	1000.0	1000.000	150.0	V	0.0	-3.8	36.1	74.0
3644.125000	39.9	1000.0	1000.000	150.0	V	0.0	-1.5	34.1	74.0

Limit and Margin-AV

Frequency (MHz)	Average (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dBµV/m)
1294.500000	19.4	1000.0	1000.000	150.0	V	0.0	-12.9	34.6	54.0
2903.500000	26.9	1000.0	1000.000	150.0	V	0.0	-3.8	27.1	54.0
3644.125000	29.6	1000.0	1000.000	150.0	V	0.0	-1.5	24.4	54.0

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