

Test Report No:
81844RRF.004A1

Test Report

ETSI EN 303 345-1 V1.1.1 (2019-06)

ETSI EN 303 345-3 V1.1.1 (2021-06)

(*) Identification of item tested	R2EX All-In-One Unit
(*) Trademark	Marelli
(*) Model and /or type reference	HUR2XE10B1
Other identification of the product	N/A
(*) Features	AM/FM/DAB rx, BT 5.0, WLAN 5.8GHz, 2G/3G/4G modem, GNSS rx HW version: PTD3 SW version: R19.2
Manufacturer	Marelli Europe S.p.A. V.le A. Borletti 61/63 - 20011 Corbetta (MI) - ITALY
Test method requested, standard	Broadcast Sound Receivers; Part 1: Generic requirements and measuring methods ETSI EN 303 345-1 V1.1.1 (2019-06). Broadcast Sound Receivers; Part 3: FM broadcast sound service; Harmonised Standard for access to radio spectrum. ETSI EN 303 345-3 V1.1.1 (2021-06).
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Manuel Gómez Galván EMC Consumer & RF Lab. Manager
Date of issue	2026-02-09
Report template No	FDT08_25 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
Clean audio 10 s	Clean audio on 10 seconds
Mod	Modulation
SNR	Signal to Noise Ratio
Tuned Freq. Band	Tuned Frequency Band
Unwanted Freq Offset	Unwanted Frequency Offset
Unwanted Freq.	Unwanted Frequency
Unwanted Freq. N	Unwanted Frequency N
Wanted Ctr. Freq.	Wanted Signal Center Frequency

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 30 MHz to 1000 MHz is $I = \pm 5$ dB for quasi-peak measurements, $I = \pm 4,7$ dB for peak measurements ($k = 2$).

The total uncertainty of the measurement system for the conducted testing of EUT is:

Sensitivity: Measurement uncertainty $\leq \pm 0,79$ dB

Adjacent Channel Selectivity: Measurement uncertainty $\leq \pm 0,99$ dB

Blocking: Measurement uncertainty $\leq \pm 1,00$ dB

Conducted disturbance characteristics of EUT from 150 kHz to 1000 MHz is $I = \pm 3,9$ dB for quasi-peak measurements, $I = \pm 3,2$ dB for peak measurements ($k = 2$).

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample consists of an Automotive All-In-One Unit, including Infotainment and Telematics functions.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results. The laboratory is not responsible for such information and it is not covered by accreditation.

Usage of samples

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	81844B_25.1	All-In-One Unit	HUR2XE10B1	1J6JF900AC5F	2025-06-24	Element Under Test
S/01	81844B_77.1	Shark Antenna	--	--	2025-07-17	Element Under Test
S/01	81844B_78.1	Antenna TBM 2 LTE2	--	--	2025-07-17	Element Under Test
S/01	81844B_1.1	Display R2EX	--	--	2025-06-09	Auxiliary Element
S/01	81844B_12.1	Fakra - Fakra 4 ways Cable (Long)	--	--	2025-06-09	Auxiliary Element
S/01	81844B_14.1	Fakra - Fakra 4 ways Cable (Long)	--	--	2025-06-09	Auxiliary Element
S/01	81844B_16.1	Fakra Cable	--	--	2025-06-09	Auxiliary Element
S/01	81844B_23.1	CANBOX	--	2149-14	2025-06-24	Auxiliary Element
S/01	81844B_33.1	Fakra Cable	--	--	2025-06-24	Auxiliary Element
S/01	81844B_36.1	Fakra Cable	--	--	2025-06-24	Auxiliary Element
S/01	81844B_38.1	USB Cable	--	--	2025-06-24	Auxiliary Element
S/01	81844B_39.1	USB Adapter	--	--	2025-06-24	Auxiliary Element
S/01	81844B_4.1	TLS AUDIO	--	--	2025-06-09	Auxiliary Element
S/01	81844B_44.1	MAIN Harness	--	--	2025-06-24	Auxiliary Element
S/01	81844B_5.1	TLS 1	--	--	2025-06-09	Auxiliary Element
S/01	81844B_6.1	TLS 2	--	--	2025-06-09	Auxiliary Element
S/01	81844B_7.1	USB213C	--	--	2025-06-09	Auxiliary Element
S/01	81844B_8.1	USB Cable	--	--	2025-06-09	Auxiliary Element
S/01	81844B_9.1	USB Adapter	--	--	2025-06-09	Auxiliary Element

Notes referenced to samples during the project.

Id	Type
S/01	Sample used for testing

Test sample description

Ports..... :	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Connector A (black, main harness)	>3	[X]	[]	[]		
	Connector B (grey, main harness)	>3	[X]	[]	[]		
	Connector C (FM/AM, DAB, WIFI/BT ANT1, WIFI/BT ANT2)	>3	[X]	[X]	[]		
	Connector D (display)	>3	[X]	[X]	[]		
	Connector E (GNSS, CAM, LTE, GSM)	>3	[X]	[X]	[]		
	Connector F (USB)	>3	[X]	[X]	[]		
Supplementary information to the ports..... :	the shielding in Connetor C and E is intended on each single signal, not on overall connector						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	[]	AC:	[]	[]	[]	[]	[]
	[]	AC:	[]	[]	[]	[]	[]
	[X]	DC: 13,5 Vdc (Vmin-Vmax: 9 - 16 Vdc)					
	[]	DC: shielded cables: any voltage inside is <13.5Vdc					
Rated Power							
Clock frequencies.....							
Other parameters							
Software version	R19.2						
Hardware version	PTD3						
Dimensions in cm (W x H x D)							
Mounting position	[]	Table top equipment					
	[]	Wall/Ceiling mounted equipment					
	[]	Floor standing equipment					

	[]	Hand-held equipment		
	[X]	Other: automotive interior environment, installation in the dashboard of vehicles		
Modules/parts.....:	Module/parts of test item		Type	Manufacturer
				
				
				
				
Accessories (not part of the test item)	Description		Type	Manufacturer
				
				
				
Documents as provided by the applicant	Description		File name	Issue date
				
				
				
				

⁽³⁾ Only for Medical Equipment

Identification of the client

Marelli Europe S.p.A.
V.le A. Borletti 61/63 - 20011 Corbetta (MI) - ITALY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U. C/ Severo Ochoa, 6 - Parque Tecnológico de Andalucía; 29590 Campanillas (Málaga) (Location B) C/ Margarita Salas Boulevard, 26 - Parque Tecnológico de Andalucía; 29590 Campanillas (Málaga) (Location D)
Date (start)	2025-09-16
Date (finish)	2025-10-31

Document history

Report number	Date	Description
81844RRF.004	2026-01-28	First release.
81844RRF.004	2026-02-09	Second release. Test report updated due to minor typos (SW version modification). This modified test report cancels and replaces test report 81844RRF.004.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Miguel Manuel López and Victoria Olmedo

Used instrumentation:

Control No.	Equipment	Model	Manufacturer	Next Calibration
08164	SHIELDED ROOM	P29419	ALBATROSS PROJECTS GMBH	N/A
05559	AUDIO ANALYZER	UPV	ROHDE AND SCHWARZ	2026-07-16
06163	BROADCAST TEST CENTER	BTC	ROHDE AND SCHWARZ	2027-04-11
03295	DC POWER SUPPLY	N5745A	AGILENT TECHNOLOGIES	N/A
07755	DIGITAL MULTIMETER	175	FLUKE	2025-11-25
00634	POWER DIVIDER, DC-2GHZ	4901-17A	SHUNNER	2026-02-10
06064	SEMIANECHOIC ABSORBER LINED CHAMBER	SAC-3	FRANKONIA	N/A
06329	SHIELDED ROOM	--	FRANKONIA	N/A
06132	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2026-04-28
06126	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2026-04-22
08866	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2026-06-12
03541	HYBRID BILOG ANTENNA 30MHz-6GHz	JB6	SUNOL SCIENCES CORPORATION	2028-04-17
04848	SOFTWARE FOR EMC/RF TESTING	EMC32	ROHDE AND SCHWARZ	N/A
07853	EMI RECEIVER 10Hz-30MHz	PMM 9010F	NARDA	2026-04-05
03327	RED ARTIFICIAL ITE	S501	SCHAFFNER	2026-12-16
10418	EMI TEST RECEIVER 1Hz-26.5GHz	ESW26	ROHDE & SCHWARZ	N/A
07822	EMC SOFTWARE	RADIMATION	DARE INSTRUMENTS	N/A

Testing verdicts

Fail	F
Inconclusive	I
Not applicable	N/A
Not measured	N/M
Pass	P

Summary

ETSI EN 303 345-3 V1.1.1 PARAGRAPH		
Requirement – Test case		Verdict
4.2	Sensitivity	P
4.3	Adjacent channel selectivity and blocking	P
4.4	Unwanted emissions in the spurious domain	P
<u>Supplementary information and remarks:</u> None.		

Appendix A: Test results

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TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal: 13.5 Vdc.
Type of Power Supply: DC External (Car Battery and Car Alternator).

TEMPERATURE (*):

Tnormal: +15 to +35 °C

DEVICE UNDER TEST		
MODULATION SUPPORTED	BAND SUPPORTED	TEST FREQUENCY
FM	VHF Band II	98 MHz

TEST CASES DETAILS

4.2 Sensitivity

Limits

The limits for sensitivity specified in table 2 shall apply. Each figure quoted is the required level of wanted signal which provides a given level of audio quality. The audio impairment criteria relevant for these tests is that the audio SNR ≥ 40 dBQ ref $\pm 60,8$ kHz deviation, and that there shall be 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).

Table 2: FM sensitivity requirements

De-modulation	Tuned frequency band	Wanted signal centre frequency (MHz)	Required sensitivity limit	
			Conducted (dBm)	Radiated (dBµV/m)
FM	VHF band II	98	-90	50 (see note)
NOTE: For products with an integral antenna, the requirement is relaxed to 67 dBµV/m.				

Results

Tuned Freq. Band	Wanted Ctr. Freq. (MHz)	Required sensitivity (dBm)	SNR (dBQ)	Clean audio 10 s
VHF band II	98.00	-67.00	56.11	Yes

Verdict

Pass

4.3 (Blocking) Adjacent channel selectivity and blocking

Limits

The limits for selectivity and blocking specified in table 4 shall apply with the channel spacings given in table 3. Each figure quoted is the minimum acceptable level of unwanted signal, relative to that of the wanted signal, which provides a given level of audio quality. The audio impairment criteria relevant for these tests is that the audio SNR ≥ 40 dBQ ref $\pm 60,8$ kHz deviation, and that there shall be 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).

Table 4: Adjacent channel selectivity and blocking requirements

De-modulation (see note 1)	Tuned frequency band	C Wanted signal centre frequency (MHz)	C Wanted signal level		Required I/C ratio (see notes 2 and 3)			
			Conducted (dBm)	Radiated (dB μ V/m)	N = 2 (dB)	N = 3 (dB)	N = 4 (dB)	Blocking (dB)
FM (built-in or integral antenna)	VHF band II	98	n/a	56 (see note 4)	-15	-3	8	20
FM (external antenna)	VHF band II	98	-84	n/a	3	17	30	30
NOTE 1: The ACS and blocking requirements are currently separated into different limits for radiated and conducted testing methods. These limits are likely to be unified in a future revision of the present document. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.								
NOTE 2: The frequency of the interferer shall be calculated using the channel spacing data in table 3 for each of the 6 defined adjacent channels $N = \{-4, -3, -2, +2, +3, +4\}$ and the two blocking offsets. Each row of table 4 thus defines 8 individual tests.								
NOTE 3: The minimum level of I for the relevant level of impairment is calculated by adding the I/C ratio to the wanted C level.								
NOTE 4: The wanted signal level for receivers with integral antenna is 73 dB μ V/m.								

Results

Tuned Freq. Band	Wanted Ctr. Freq. (MHz)	Unwanted Freq. (MHz)	Unwanted Freq Offset (MHz)	SNR (dBQ)	Clean audio 10 s
VHF band II	98.00	97.20	-0.80	56,23	Yes
		98.80	0.80	56,22	Yes

Verdict

Pass

4.3 (Selectivity) Adjacent channel selectivity and blocking

Limits

The limits for selectivity and blocking specified in table 4 shall apply with the channel spacings given in table 3. Each figure quoted is the minimum acceptable level of unwanted signal, relative to that of the wanted signal, which provides a given level of audio quality. The audio impairment criteria relevant for these tests is that the audio SNR ≥ 40 dBQ ref $\pm 60,8$ kHz deviation, and that there shall be 10 seconds of audio with no subjective impairments (e.g. clicks resulting from FM threshold effects).

Table 4: Adjacent channel selectivity and blocking requirements

De-modulation (see note 1)	Tuned frequency band	C Wanted signal centre frequency (MHz)	C Wanted signal level		Required I/C ratio (see notes 2 and 3)			
			Conducted (dBm)	Radiated (dB μ V/m)	N = 2 (dB)	N = 3 (dB)	N = 4 (dB)	Blocking (dB)
FM (built-in or integral antenna)	VHF band II	98	n/a	56 (see note 4)	-15	-3	8	20
FM (external antenna)	VHF band II	98	-84	n/a	3	17	30	30
NOTE 1: The ACS and blocking requirements are currently separated into different limits for radiated and conducted testing methods. These limits are likely to be unified in a future revision of the present document. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.								
NOTE 2: The frequency of the interferer shall be calculated using the channel spacing data in table 3 for each of the 6 defined adjacent channels $N = \{-4, -3, -2, +2, +3, +4\}$ and the two blocking offsets. Each row of table 4 thus defines 8 individual tests.								
NOTE 3: The minimum level of I for the relevant level of impairment is calculated by adding the I/C ratio to the wanted C level.								
NOTE 4: The wanted signal level for receivers with integral antenna is 73 dB μ V/m.								

Results

Tuned Freq. Band	Wanted Ctr. Freq. (MHz)	Unwanted Freq. N	Unwanted Freq. (MHz)	SNR (dBQ)	Clean audio 10 s
VHF band II	98.00	-4	97,8	56,06	Yes
		-3	97,7	56,08	Yes
		-2	97,6	56,09	Yes
		2	98,2	56,21	Yes
		3	98,3	56,11	Yes
		4	98,4	56,19	Yes

Verdict

Pass

4.4: Unwanted emissions in the spurious domain

Limits

The limits for conducted (differential voltage) spurious domain emissions for an external RF port are specified in EN 55032 [4], table A.13, clause 13.3 for all receivers except car radios, or clause 13.4 for car radios.

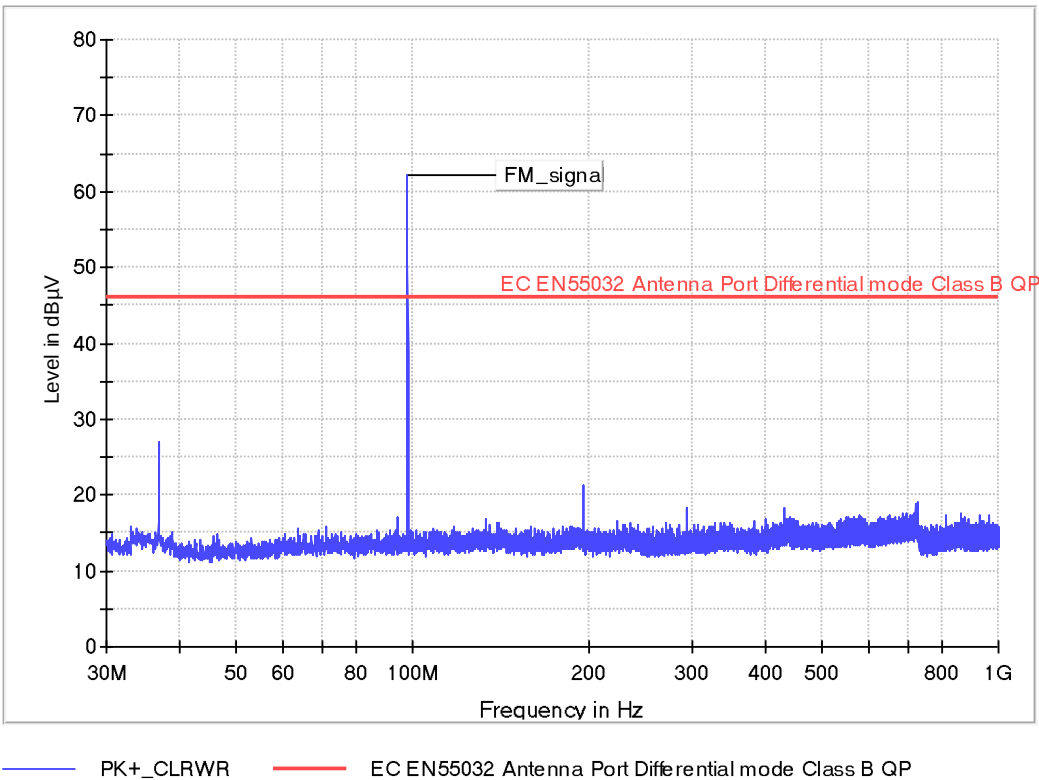
The limits for radiated spurious domain emissions are specified in EN 55032 [4], tables A.4, A5 and A6.

Results

- Conducted Differential Voltage from the external RF port:

- EN 55032 Class B Antenna port1 Splitter FM:

EC EN55032 Antenna Port Differential mode FM Power divider 6044



The signal at 98 MHz shown in the graph is the desired FM signal injected by the RF generator. At the antenna port, the desired level signal is 60 dBuV due to the use of a 6 dB power divider.

Subrange Maxima

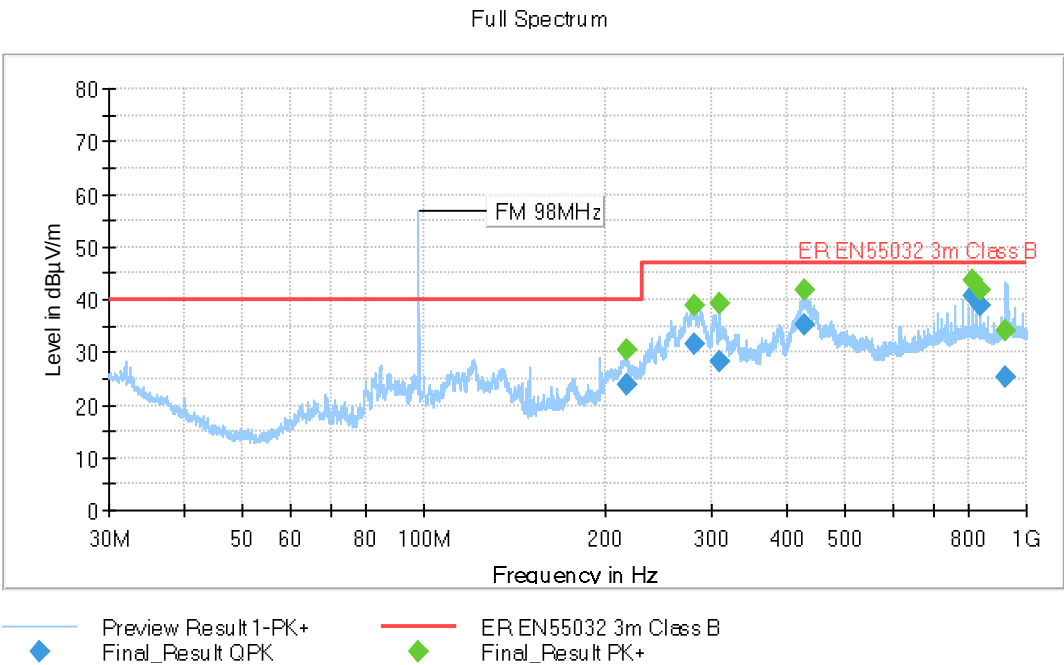
Frequency (MHz)	Peak (dBμV)
98.000000	62.1

Verdict

Pass

• Radiated Emissions EN 55032, from the cabinet and structure of the equipment:

- Frequency Range 30 MHz - 1 GHz:



Maximizations

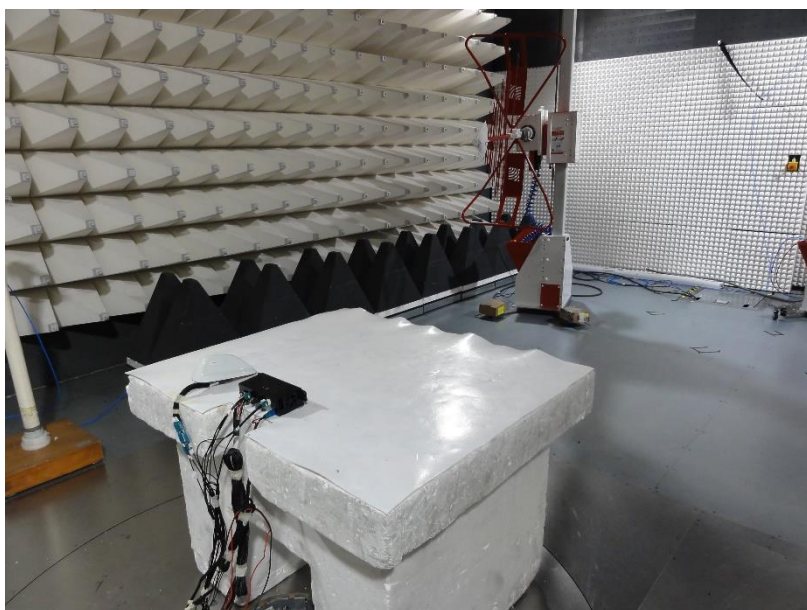
Frequency(MHz)	QuasiPeak(dBµV/m)	MaxPeak(dBµV/m)	Limit(dBµV/m)	Margin(dB)	Height (cm)	Pol	Azimuth (deg)
217.453000	---	30.48	---	---	146.0	H	44.0
217.453000	23.92	---	40.00	16.08	146.0	H	44.0
280.790000	---	38.73	---	---	126.0	H	99.0
280.790000	31.48	---	47.00	15.52	126.0	H	99.0
308.393000	28.09	---	47.00	18.91	121.0	H	27.0
308.393000	---	39.10	---	---	121.0	H	27.0
428.196000	35.07	---	47.00	11.93	115.0	V	12.0
428.196000	---	41.69	---	---	115.0	V	12.0
811.008000	40.79	---	47.00	6.21	137.0	V	-12.0
811.008000	---	43.52	---	---	137.0	V	-12.0
835.588000	39.01	---	47.00	7.99	126.0	V	-46.0
835.588000	---	41.79	---	---	126.0	V	-46.0
925.049000	---	34.04	---	---	303.0	H	-58.0
925.049000	25.27	---	47.00	21.73	303.0	H	-58.0

Verdict

Pass

Appendix B: Photographs

RADIATED SETUP



CONDUCTED SETUP

