DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

ISED CABid: ES1909

Test report No:
NIE: 71652RRF.002A1

Test report
USA FCC Part 15.209
CANADA RSS-Gen, RSS-210

(*) Identification of item tested	Instrument Cluster incl. immobilizer for Audi Cars
(*) Trademark	Bosch
(*) Model and /or type reference	Audi FPK Gen2+
(*) Other identification of the product	Hw version: H02 Sw version: X010 FCC ID: 2AUXS-AUFPK2P IC: 25847-AUFPK2P HVIN: 0 263 742, 0 263 753
(*) Features	Immobilizer
Manufacturer	Robert Bosch GmbH Robert-Bosch-Platz 1 70839 Gerlingen, Germany
Test method requested, standard	USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits, general requirements. CANADA RSS-Gen Issue 5, Amendment 2, Feb. 2021. General Requirements for Compliance of Radio Apparatus. CANADA RSS-210 Issue 10, Amendment 1, Apr. 2020. Licence-Exempt Radio Apparatus: Category I Equipment ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager 2022.10.13 08:14:38 +02'00'
Date of issue	2022-10-13
Report template No.	FDT08_24 (*) "Data provided by the client"

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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.

DEKRA Testing and Certification S.A.U. is an FCC-recognized accredited testing laboratory with the appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification S.A.U. is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

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.

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

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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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 radiated emissions of EUT from 9 kHz to 30 MHz is: Measurement uncertainty ≤ ±3.08 dB (with factor k = 2).

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

Occupied Bandwidth: Measurement uncertainty ≤ ±1.42 kHz

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 of the model Audi FPK Gen2+ is a digital instrument cluster with an immobilizer for Audi cars.

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.

Usage of samples

Id	Control Number	Description	Model	Serial No.	Date of Reception	Application
S/01	71652_25.1	Cluster with immobilizer	Audi FPK Gen2+ (Q2 variant)	--	2022-05-04	Equipment Under Test
S/01	71652_5.1	Harness	--	--	2022-05-04	Equipment Under Test
S/01	71652_19.1	Car key	--	--	2022-05-04	Equipment Under Test
S/02	71652_25.1	Cluster with immobilizer	Audi FPK Gen2+ (Q2 variant)	--	2022-05-04	Equipment Under Test
S/02	71652_5.1	Harness	--	--	2022-05-04	Equipment Under Test
S/02	71652_19.1	Car key	--	--	2022-05-04	Auxiliary Equipment
S/03	71652_27.1	Cluster with immobilizer	Audi FPK Gen2+ (Q3 variant)	--	2022-06-16	Equipment Under Test
S/03	71652_5.1	Harness	--	--	2022-05-04	Equipment Under Test
S/03	71652_19.1	Car key	--	--	2022-05-04	Equipment Under Test
S/04	71652_27.1	Cluster with immobilizer	Audi FPK Gen2+ (Q3 variant)	--	2022-06-16	Equipment Under Test
S/04	71652_5.1	Harness	--	--	2022-05-04	Equipment Under Test
S/04	71652_19.1	Car key	--	--	2022-05-04	Auxiliary Equipment

Notes referenced to samples during the project:

Id	Type
S/01	Q2 variant. Sample used for radiated tests.
S/02	Q2 variant. Sample used for conducted tests.
S/03	Q3 variant. Sample used for radiated tests.
S/04	Q3 variant. Sample used for conducted tests.

Test sample description

Ports…… :	Port name and description	Cable						
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)			
	Main Connector	> 3m	☒	☐	☐			
	MOST-Connector	> 3m	☐	☐	☐			
	LVDS-Connector	> 3m	☐	☒	☐			
			☐	☐	☐			
			☐	☐	☐			
			☐	☐	☐			
Supplementary information to the ports…… :								
Rated power supply .....:	Voltage and Frequency			Reference poles				
				L1	L2	L3	N	PE
	☐	AC:		☐	☐	☐	☐	☐
	☐	AC:		☐	☐	☐	☐	☐
	☒	DC: 9-16V. Nominal: 12 Vdc by vehicle battery.						
	☒	DC: 2.5A at 14V.						
Rated Power .....:								
Clock frequencies.....:	125 kHz							
Other parameters .....:								
Software version .....:	X010							
Hardware version .....:	H02							
Dimensions in cm (W x H x D) ....:	18 x 32.5 x 9.3							
Mounting position .....:	☐	Table top equipment						
	☐	Wall/Ceiling mounted equipment						
	☐	Floor standing equipment						
	☐	Hand-held equipment						
	☒	Other: Cluster in the car						
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

Robert Bosch GmbH
Robert-Bosch-Platz 1
70839 Gerlingen, Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-05-10
Date (finish)	2022-06-29

Document history

Report number	Date	Description
71652RRF.002	2022-09-20	First release
71652RRF.002A1	2022-10-13	Second release. Modification due to minor typos. This modification of test report cancels and replaces the test report 71652RRF.002.

Environmental conditions

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

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

In the semi-anechoic chamber, the following limits were not exceeded during the test:

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: Miguel Manuel López, Javier Miguel Nadales, Nicolás Salguero.

Used instrumentation:

Conducted measurements:

Equipment	Model	Manufacturer	Next Calibration
SHIELDED ROOM	S101	ETS LINDGREN	N.A.
EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2022-12-12
DC POWER SUPPLY 30V/5A	U8002A	KEYSIGHT TECHNOLOGIES	N.A.
DIGITAL MULTIMETER	179	FLUKE	2022-10-19

Radiated measurements:

Equipment	Model	Manufacturer	Next Calibration
SEMIANECHOIC ABSORBER LINED CHAMBER II	FACT 3 200 STP	ETS LINDGREN	2023-08-28
SHIELDED ROOM	S101	ETS LINDGREN	N.A.
ACTIVE LOOP ANTENNA 9 kHz-30 MHz	11966A	HEWLETT PACKARD	2022-07-17
EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2022-12-12
DC POWER SUPPLY 30 V / 5 A	U8002A	KEYSIGHT TECHNOLOGIES	N.A.
DIGITAL MULTIMETER	179	FLUKE	2022-10-19

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

125 kHz LF RFID system

FCC PART 15.209 / RSS-Gen, RSS-210 PARAGRAPH		
Requirement – Test case	**Verdict**	**Remark**
Occupied bandwidth	P	
FCC 15.209 (a) / RSS-Gen 8.9, RSS-210 7.2: General field strength and Transmitter emission limits.	P	
Supplementary information and remarks: None.		

Appendix A: Test results

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TEST CONDITIONS

(*): Declared by applicant.

POWER SUPPLY (*):

Vnominal:	12 Vdc
Type of Power Supply:	External DC.

TEST FREQUENCIES:

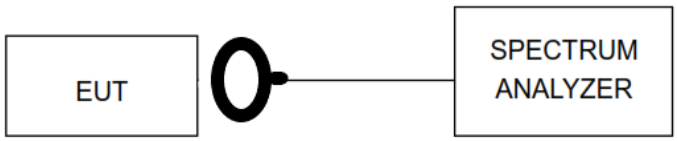
Nominal Operating Frequency:	125 kHz
Modulation:	ASK (*)

ANTENNA (*):

Type of Antenna:	Loop antenna

CONDUCTED MEASUREMENTS

The Equipment Under Test (EUT) was set up in a shielded room and it connected to the spectrum analyzer through an RF cable and a coupling device.



Coupling device

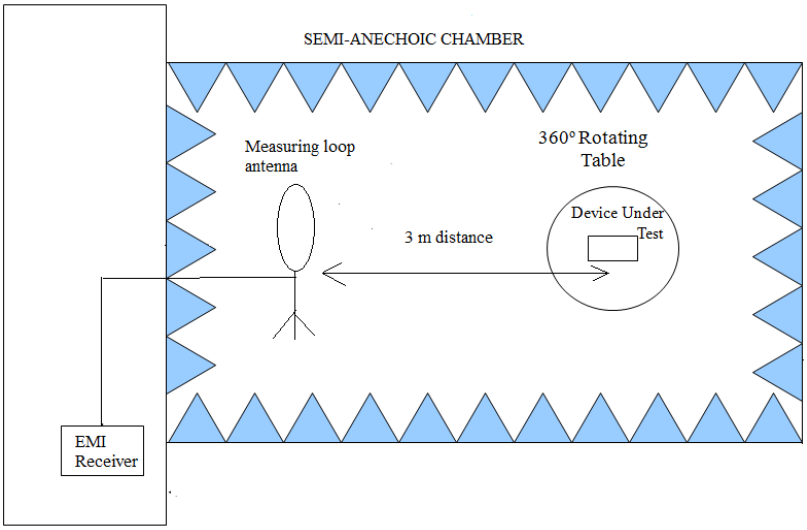
RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Loop antenna for the frequency range from 9 kHz to 30 MHz) is situated at a distance of 3 m.

For radiated emissions in the range 9 kHz to 30 MHz performed at a distance closer than the distance specified in the standard, an inverse proportionality factor of 40 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and its situation and orientation were varied to find the maximum radiated emission.
In the range between 9 kHz and 30 MHz the measurements were made in the three different orientation planes of the loop antenna to determine the maximum received field.

Radiated measurements setup f < 30 MHz:



TEST CASES DETAILS
Occupied Bandwidth

Results

- **Q2 variant**

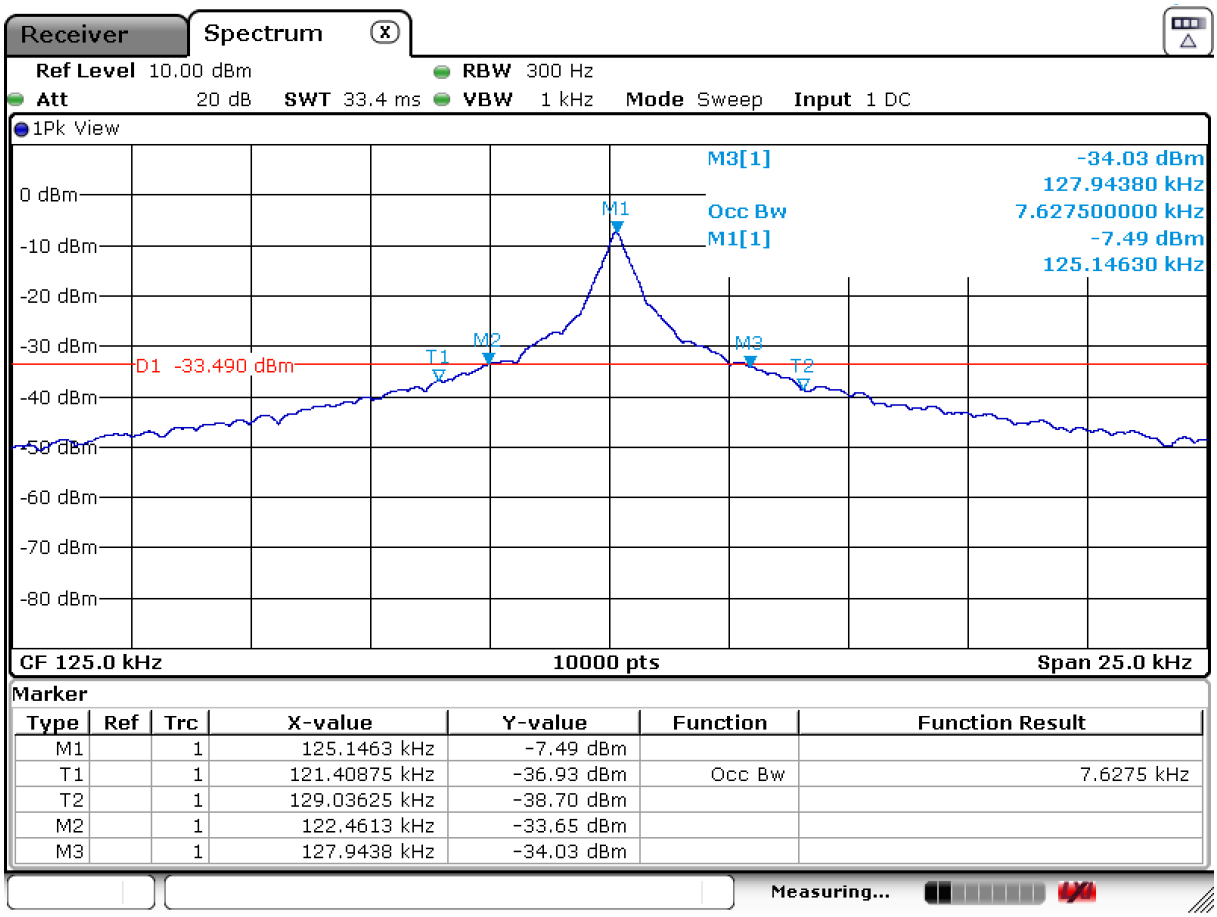
99% Bandwidth (kHz)	7.627500

- **Q3 variant**

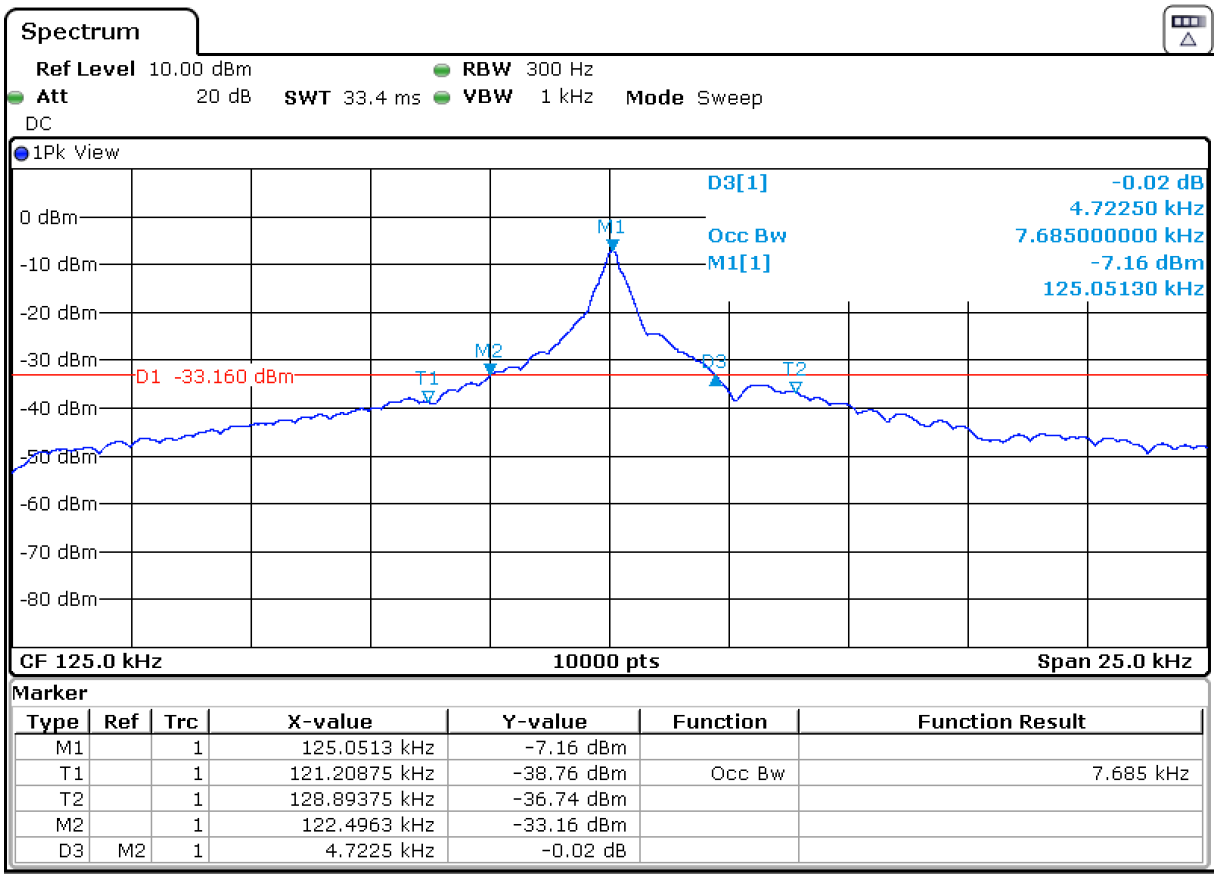
99% Bandwidth (kHz)	7.685000

Attachments

- **Q2 variant**



- **Q3 variant**



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	125.0513 kHz	-7.16 dBm		
T1		1	121.20875 kHz	-38.76 dBm	Occ Bw	7.685 kHz
T2		1	128.89375 kHz	-36.74 dBm		
M2		1	122.4963 kHz	-33.16 dBm		
D3	M2	1	4.7225 kHz	-0.02 dB		

15.209 (a) / RSS-Gen 8.9, RSS-210 7.2.
General field strength and Transmitter emission limits

Limits

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Magnetic field strength (H-Field) (µA/m)	Measurement distance (m)
0.009 - 0.490	2400 / F(kHz)	-	6.37 / F(kHz)	300
0.490 - 1.705	24000 / F(kHz)	-	63.7 / F(kHz)	30
1.705 - 30.0	30	29.54	0.08	30
30 - 88	100	40	-	3
88 - 216	150	43.5	-	3
216 - 960	200	46	-	3
Above 960	500	54	-	3

Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Results

All tests were performed in a semi-anechoic chamber at a distance of 3 m.

The spectrum was inspected from 9 kHz to 30 MHz searching for spurious signals.

The field strength is calculated by adding a correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor and cable loss.

- **Q2 variant**

  Frequency range 9 kHz – 30 MHz:

  No spurious frequencies detected at less than 20 dB below the limit.

  Maximum field strength of fundamental emission:

Frequency (kHz)	125.08
Maximum field strength (E-field, dBµV/m) measured at 3 m (average detector)	74.60
Magnetic field strength (H-Field), dBµA/m) measured at 3 m (average detector)	23.10
Maximum field strength (E-field, dBµV/m) extrapolated to 300 m (40 dB/decade)	-5.40
Magnetic field strength (H-field, dBµA/m) extrapolated to 300 m (40 dB/decade)	-56.90
Maximum field strength (µV/m) extrapolated to 300 m (40 dB/decade)	0.537
Maximum field strength (µA/m) extrapolated to 300 m (40 dB/decade)	0.001
Maximum field strength limit (µV/m) at 300 m at measured carrier frequency (125.08 kHz)	19.188

- **Q3 variant**

  Frequency range 9 kHz – 30 MHz:

  No spurious frequencies detected at less than 20 dB below the limit.

  Maximum field strength of fundamental emission:

Frequency (kHz)	125.01
Maximum field strength (E-field, dBµV/m) measured at 3 m (average detector)	72.50
Magnetic field strength (H-Field), dBµA/m) measured at 3 m (average detector)	21.00
Maximum field strength (E-field, dBµV/m) extrapolated to 300 m (40 dB/decade)	-7.50
Magnetic field strength (H-field, dBµA/m) extrapolated to 300 m (40 dB/decade)	-59.00
Maximum field strength (µV/m) extrapolated to 300 m (40 dB/decade)	0.422
Maximum field strength (µA/m) extrapolated to 300 m (40 dB/decade)	0.001
Maximum field strength limit (µV/m) at 300 m at measured carrier frequency (125.01 kHz)	19.198

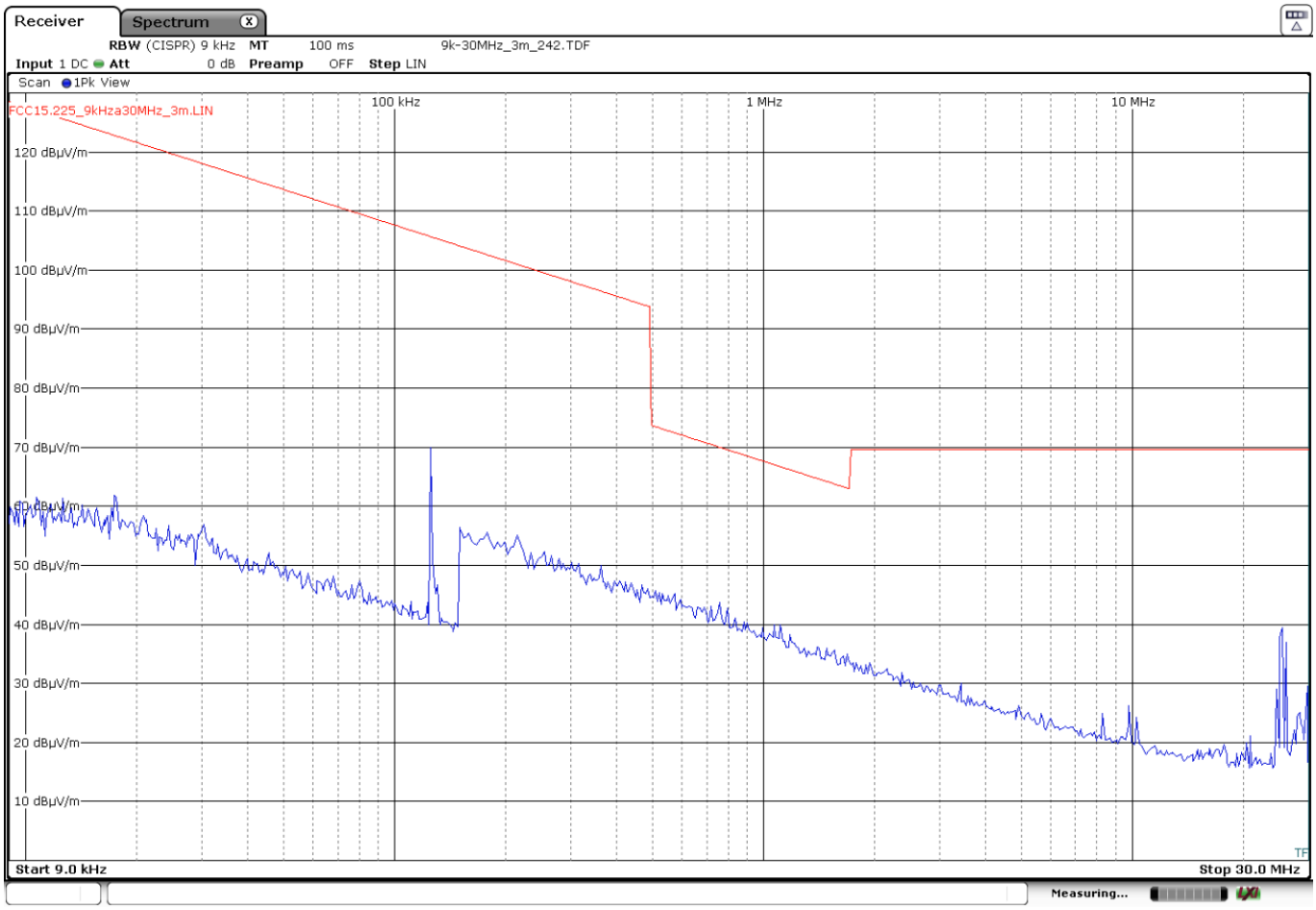
Verdict

Pass

Attachments

- **Q2 variant**

  Frequency range 9 kHz – 30 MHz



Resolution bandwidth:

200 Hz for 9 kHz ≤ f ≤ 150 kHz
9 kHz for 150 kHz ≤ f ≤ 30 MHz

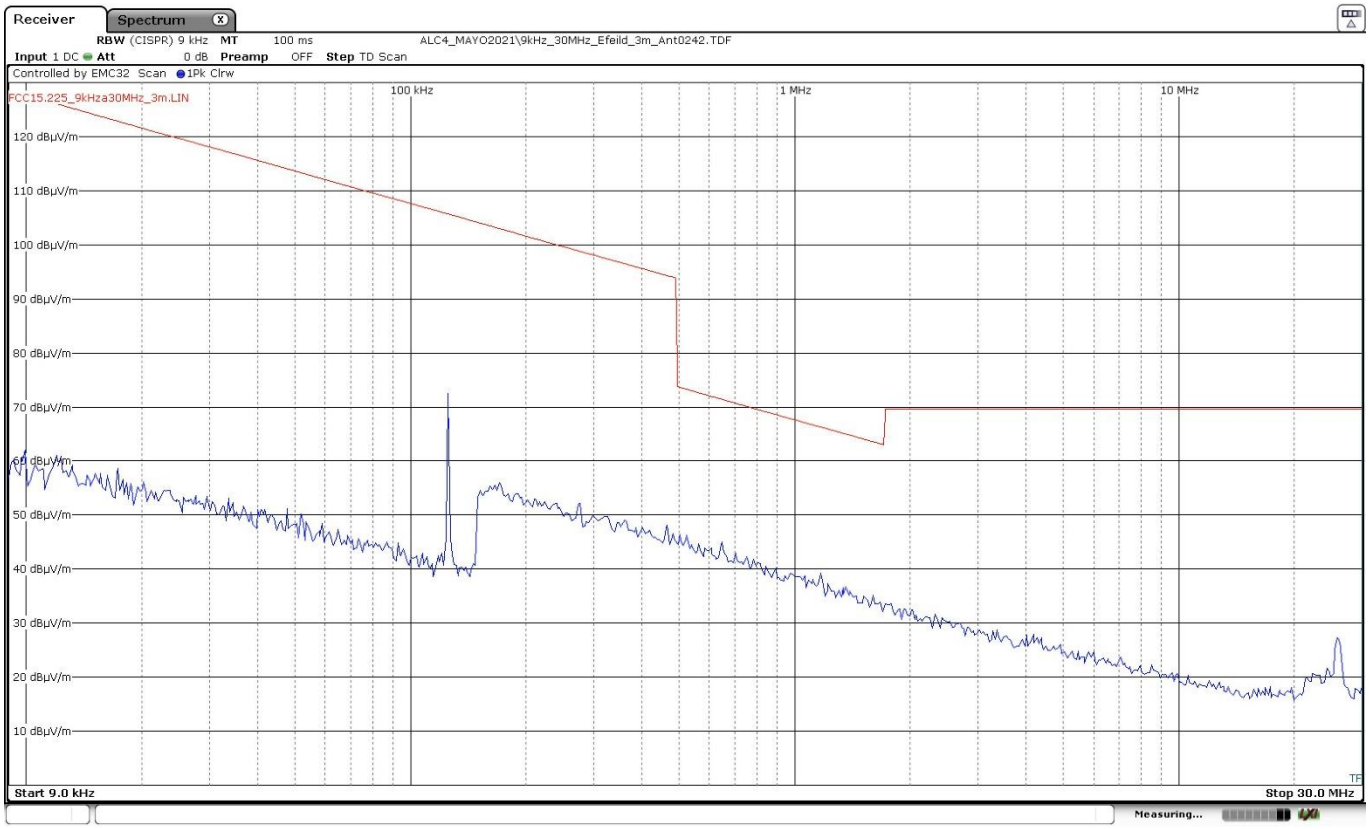
Notes:

The scan is performed with peak detector. The peaks closest to the limit are re-measured with the detector type as specified in FCC §15.209.

The limits shown in the above plot are extrapolated to 3 meters. The highest peak is the carrier frequency.

- **Q3 variant**

  Frequency range 9 kHz – 30 MHz



Resolution bandwidth:

200 Hz for 9 kHz ≤ f ≤ 150 kHz
9 kHz for 150 kHz ≤ f ≤ 30 MHz

Notes:

The scan is performed with peak detector. The peaks closest to the limit are re-measured with the detector type as specified in FCC §15.209.

The limits shown in the above plot are extrapolated to 3 meters. The highest peak is the carrier frequency.