DEKRA Testing and Certification, S.A.U.
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Test report No:
NIE: 67003REM.003

Test report

FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-20 Edition) & ICES-003 Issue 7 (October 2020)

(*) Identification of item tested	Telematic control unit with wireless technologies, used in automotive industry
(*) Trademark	VW AG
(*) Model and /or type reference tested	TKCMOD12N00
(*) Derived model not tested	TKCMOD12E00, TKCMOD11000, TKCMOD12C00, TKCMOD12J00, TKCMOD12R00, TKCMOD12T00 and TKCMOD13C00
Other identification of the product	FCC ID: T8GCONMOD IC: 6434ACONMOD
(*) Features	HW version: C2.3 SW version: X152
Manufacturer	Harman Becker Automotive Systems GMBH Becker-Goering-Str. 16; 76307 Karlsbad GERMANY
Test method requested, standard	FCC Rules and Regulations CFR 47, Part 15, Subpart B (10-1-20 Edition) & ICES-003 Issue 7 (October 2020)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López Martín EMC Consumer & RF Lab. Manager 2022.10.07 12:31:24 +02'00'
Date of issue	2022-10-07
Report template No	FDT08_22 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Testing and Certification 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 is a FCC recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report, FCC designation number ES0004.

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

DEKRA Testing and Certification 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 at the time of performance of the test.

DEKRA Testing and Certification 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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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.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification 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 = ± 4,9 dB for quasi-peak measurements, I = ± 4,6 dB for peak measurements (k = 2)

The total uncertainty of the measurement system for the measured radio disturbance characteristics of EUT from 1000 MHz to 26 GHz is I = ± 2,6 dB for peaks and average measurements (k = 2)

Data provided by the client

The sample consist of a telematics control unit with wireless technologies, used in automotive, equipped with one modem, OEM. This unit was designed for automotive usage and contains the following features: GSM, UMTS, LTE, 5G, GNSS, WiFi (a, b, g, n, ac), Bluetooth Low Energy (BTLE) and Bluetooth EDR.

HARMAN AUTOMOTIVE DIVISION
HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
BECKER-GOERING-STRASSE 16
76307 KARLSBAD, GERMANY

HARMAN

Declaration of similarity

To whom it may concern,

We, **Harman Becker Automotive Systems GmbH,** located in **Becker-Goering-Str. 16; 76307 Karlsbad, Germany**

Hereby declare that the following units: TKCMOD12E00, TKCMOD12N00, TKCMOD11000, TKCMOD12C00, TKCMOD12J00, TKCMOD12R00, TKCMOD12T00 and TKCMOD13C00

have integrated the same BT/Wifi chipset.

The different naming comes from country specific, features enabled or network access device type.

Targeted countries	Product Name	Type	NAD-HW	GNSS	Bluetooth WLAN	NAD Services	CV2X
Rest of the world (offline variant)	TKCMOD11000	V046	EU	x	x		
EU + some other countries	TKCMOD12E00	V037, V042, V043, V044, V049	EU	x	x	x	
Canada/Mexico/USA	TKCMOD12N00	V038, V039, V047	NA	x	x	x	
China (without CV2X)	TKCMOD12C00	V105	CN	x	x	x	
Japan	TKCMOD12J00	V045	RW	x	x	x	
rmenia/Belarus/Kazakhstan/Russia/Uzbekistan	TKCMOD12R00	V048	EU	x	x	x	
Turkey	TKCMOD12T00	V040	EU	x	x	x	
China (with CV2X)	TKCMOD13C00	V106	CN	x	x	x	x

This declaration is intended to be included in the test reports where applies

Regards

HARMAN AUTOMOTIVE DIVISION
Harman Becker Automotive Systems GmbH
Becker-Göring-Straße 16
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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

Samples undergoing test have been selected by: The client.

Id	Control Number	Description	Model	Serial Nº	Date of Reception	Application
S/01	67003B_260.1	Telematic control unit	TKCMOD12N00	---	2022-03-01	Element under test

Notes referenced to samples during the project:

None.

Test sample description

Ports..... :	Port name and description	Cable						
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)			
	RF connector – code		[ ]	[X]	[ ]			
	RF connector – code		[X]	[X]	[ ]			
	RF connector – code		[X]	[ ]	[ ]			
Supplementary information to the ports..... :	.....							
Rated power supply .....:	Voltage and Frequency	Reference poles						
		L1	L2	L3	N	PE		
	[X] DC: 12V car battery (4.8 VDC inside of TCU)							
Rated Power .....:	12V DC							
Clock frequencies .....:	25MHz; 26MHz; 32,768kHz; 49,58MHz;							
Other parameters.....:	See Technical description							
Software version .....:	X152							
Hardware version.....:	C2.3							
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 telematics control unit							
Modules/parts .....:	Module/parts of test item	Type	Manufacturer					
	.....	.....	.....					
Accessories (not part of the test item).....:	Description	Type	Manufacturer					
	Cable Harness	.....	.....					
	2G/3G/4G/5G Antenna	.....	Hirschmann / Molex					
	eCall button/LED	.....	.....					
	SOS Loudspeaker	.....	.....					
	Wake-up unit Box	.....	.....					
Documents as provided by the applicant.....:	Description	File name	Issue date					
	Technical Description	.....	.....					

Identification of the client

Harman Becker Automotive Systems GmbH
Becker Göring Strasse 16.
76307. Karlsbad. Germany.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-03-22
Date (finish)	2022-03-23

Document history

Report number	Date	Description
67003REM.003	2022-10-07	First release

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. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

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

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

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. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The test have been performed by the technical personnel: Carlos Haro López

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Testing verdicts

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

List of equipment used during the test

Control No.	Equipment	Model	Manufacturer	Next Calibration
8866	EMI TEST RECEIVER 2Hz-44GHz	ESW44	ROHDE AND SCHWARZ	2023-09-21
6132	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2023-04-05
6126	ETHERNET TEMPERATURE AND HUMIDITY LOGGER	HWg-STE	HW GROUP	2023-04-05
4612	HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2024-07-13
5641	HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	EST LINDGREN	2024-09-15
8788	PREAMPLIFIER 30dB 500MHz-18GHz	BBV 9718 C	SCHWARZBECK	2022-06-07
6064	SEMIANECHOIC ABSORBER LINED CHAMBER	SAC-3	FRANKONIA	--
6329	SHIELDED ROOM	---	FRANKONIA	--

Summary

Test Specification.	Requirement – Test case	Verdict	Remark
FCC CFR 47, Part 15, Subpart B (10-1-20 Edition) & ICES-003 Issue 7 (October 2020)	RE Radiated emission. Electromagnetic field measure	Pass	---
	CE Conducted emission	N/A	(1)
Supplementary information and remarks: (1) This test is not applicable because EUT is powered in DC			

Appendix A: Test results

APPENDIX A CONTENT

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Description of the operation modes

The operation modes described in this paragraph constitute a functionality of the sample under test for itself.

The operation modes used by the samples to which the present report refers, are shown in the following table:

Id	Description
OM/01	EUT ON. GPS in RX mode. WiFi OFF. Bluetooth OFF. Cellular (2G/3G/4G/5G) searching network. Power supply: 12Vdc.

Test standards version applied

The product standards and test standards applied for each test cases are shown in the following table:

Product Test Standard	Test standard	Requirement – Test case
FCC CFR 47, Part 15, Subpart B (10-1-20 Edition) & ICES-003 Issue 7 (October 2020)	ANSI C63.4 (2014)	RE Radiated emission.

Test Cases Details

RE Radiated emission. Electromagnetic field measure

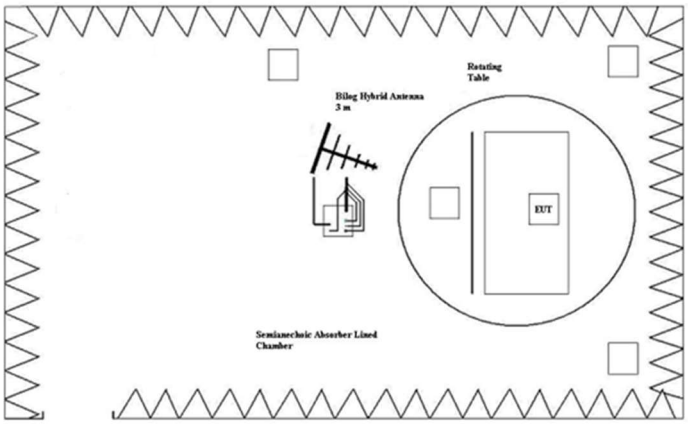
Limits of interference Class B

The applied limit for radiated emissions, 3 m distance, according to the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-1-20 Edition), Secs. 15.109 & ICES-003 Issue 7 (October 2020)

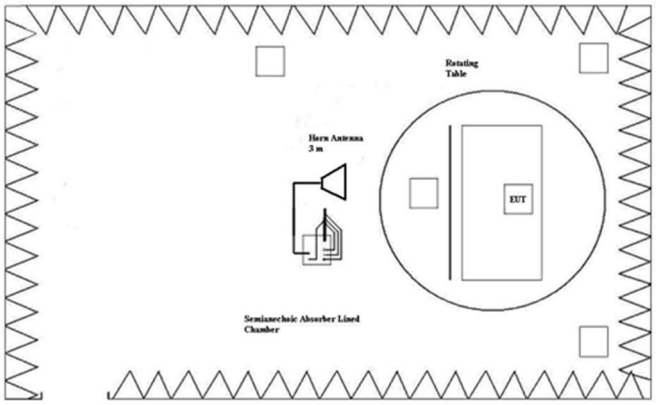
Frequency range (MHz)	FCC Part 15B		ICES-003 Issue 7		FCC Part 15B & ICES-003 Issue 7	
	QP Limit for 3 m		QP Limit for 3 m		PK Limit for 3 m	AVG Limit for 3 m
	(μV/m)	(dBμV/m)	(μV/m)	(dBμV/m)	(dBμV/m)	(dBμV/m)
30 to 88	100	40	100	40	---	---
88 to 216	150	43.5	150	43.5	---	---
216 to 230	200	46	200	46	---	---
230 to 960	200	46	224	47		
960 to 1000	500	54	500	54	---	---
Above 1000	---	---	---	---	74	54

Limits according to FCC Part 15B, are equal or more stringent than those of ICES-003 Issue 7.

Setup for measurements



Setup for measurements < 1GHz.



Setup for measurements > 1GHz.

Results

S/	OM	Code	Freq Rng (MHz)	V
01	OM/01	RE0101LR	[30, 1000]	P
01	OM/01	RE0101HR	[1000, 17000]	P
01	OM/01	RE0101HR2	[17000, 26000]	P

Note: Range: f>12.75 GHz. Test required only to the 5th harmonics of the maximum internal work frequency in the EUT.

Verdict

Pass

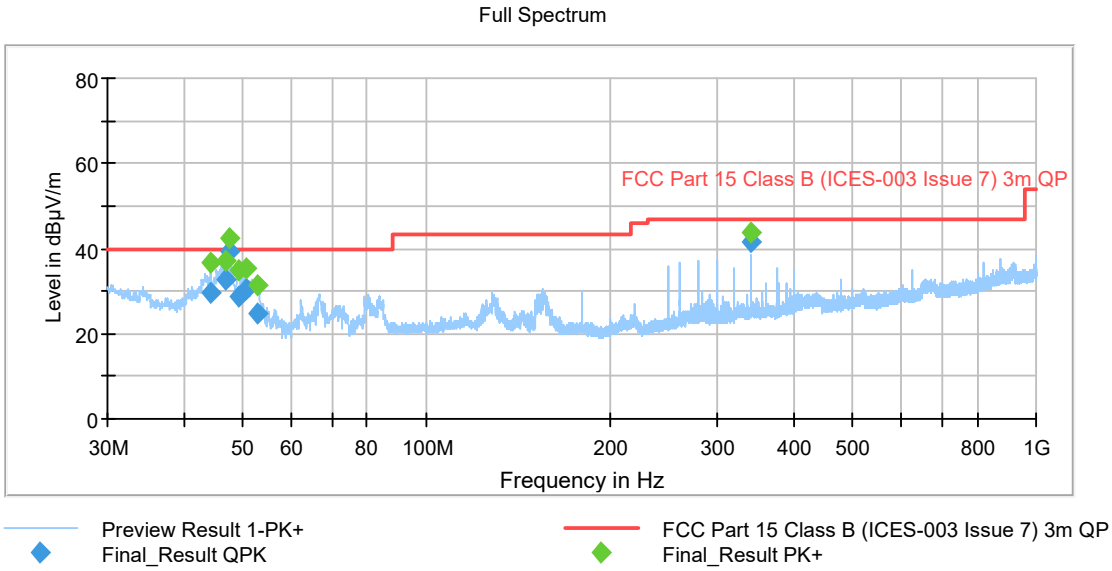
Attachments

EMC Test Code = RE0101LR, Frequency Range MHz = [30, 1000]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. GPS in RX mode. WiFi OFF. Bluetooth OFF. Cellular (2G/3G/4G/5G) searching network. Power supply: 12Vdc.

Images:



Final_Result

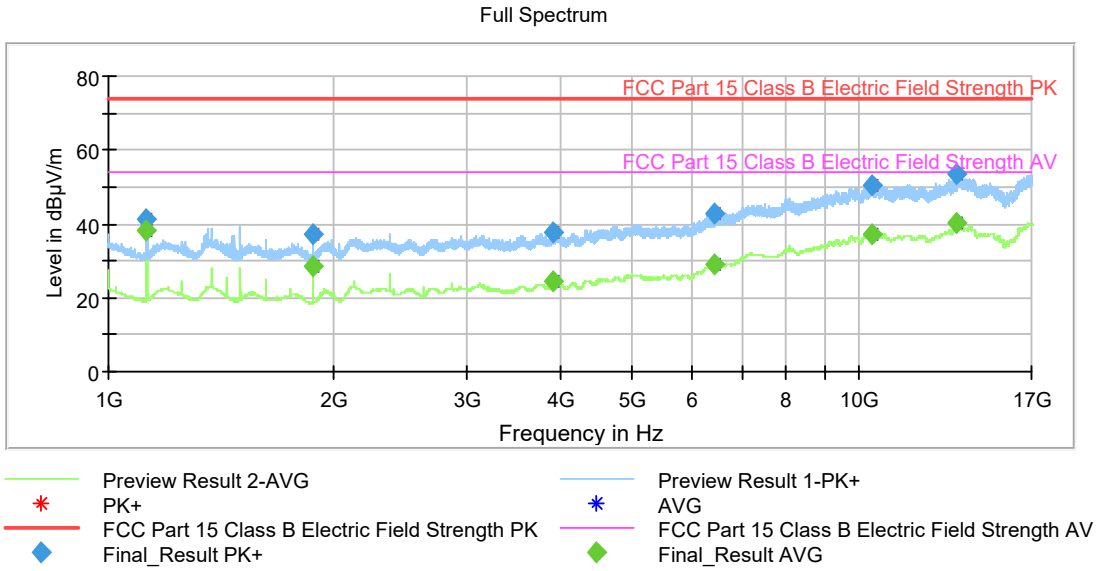
Frequency (MHz)	QuasiPeak (dBµV/m)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
44.286000	29.83	---	40.00	10.17	108.0	V	30.0
44.286000	---	36.88	---	---	108.0	V	30.0
46.890000	32.51	---	40.00	7.49	112.0	V	172.0
46.890000	---	37.32	---	---	112.0	V	172.0
47.662000	39.15	---	40.00	0.85	109.0	V	151.0
47.662000	---	42.42	---	---	109.0	V	151.0
49.299000	28.73	---	40.00	11.27	106.0	V	120.0
49.299000	---	35.00	---	---	106.0	V	120.0
50.658000	---	35.23	---	---	100.0	V	117.0
50.658000	30.65	---	40.00	9.35	100.0	V	117.0
52.828000	---	31.18	---	---	135.0	V	118.0
52.828000	24.82	---	40.00	15.18	135.0	V	118.0
339.999000	---	43.71	46.00	4.49	104.0	V	40.0
339.999000	41.51	---	47.00	5.49	104.0	V	40.0

EMC Test Code = RE0101HR, Frequency Range MHz = [1000, 17000]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. GPS in RX mode. WiFi OFF. Bluetooth OFF. Cellular (2G/3G/4G/5G) searching network. Power supply: 12Vdc.

Images:



Final_Result

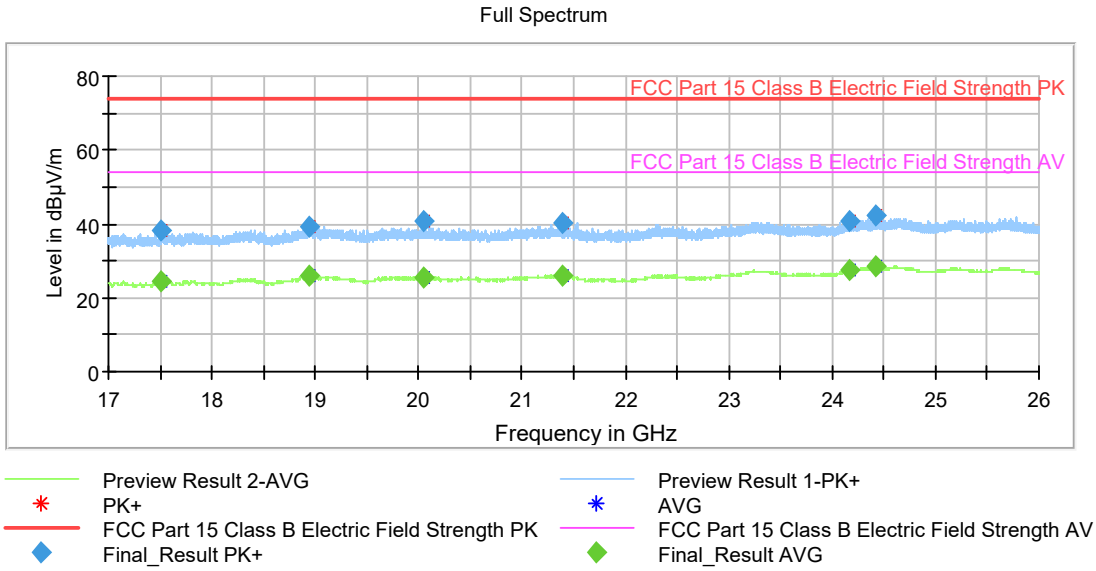
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1124.800000	---	38.04	53.97	15.93
1124.800000	41.46	---	73.97	32.51
1875.200000	---	28.48	53.97	25.49
1875.200000	37.12	---	73.97	36.85
3909.200000	37.53	---	73.97	36.44
3909.200000	---	24.48	53.97	29.49
6412.000000	43.04	---	73.97	30.93
6412.000000	---	28.99	53.97	24.98
10391.600000	50.66	---	73.97	23.31
10391.600000	---	37.38	53.97	16.59
13530.800000	53.41	---	73.97	20.56
13530.800000	---	40.02	53.97	13.95

EMC Test Code = RE0101HR2, Frequency Range MHz = [17000, 26000]

Sample ID: S/01

Operation Mode: OM/01. EUT ON. GPS in RX mode. WiFi OFF. Bluetooth OFF. Cellular (2G/3G/4G/5G) searching network. Power supply: 12Vdc.

Images:



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)
17516.000000	38.20	---	73.97	35.77
17516.000000	---	24.62	53.97	29.35
18938.800000	---	25.84	53.97	28.13
18938.800000	39.36	---	73.97	34.61
20048.400000	---	25.70	53.97	28.27
20048.400000	40.70	---	73.97	33.27
21384.000000	---	26.03	53.97	27.94
21384.000000	40.11	---	73.97	33.86
24159.600000	40.93	---	73.97	33.04
24159.600000	---	27.63	53.97	26.34
24430.000000	42.08	---	73.97	31.89
24430.000000	---	28.31	53.97	25.66