T E S T R E P O R T
No.: 18-1-0010801T02a

According to:
FCC Regulations
Part 1.1310
Part 2.1091

for

Robert Bosch Car Multimedia GmbH

1-DIN TCC MID

FCC-ID: **YBN-1DINTCCMID0**

Laboratory Accreditation and Listings		
ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01 Accredited EMC-Test Laboratory	Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	VCCI Voluntary Controls for Electromagnetic Emissions Reg. No.: R-4452, C-20009, T-20006, G-20013
Wi Fi ALLIANCE AUTHORIZED RF LABORATORY	ctia Authorized™ Test Lab Lab Code: 20011130-00	FEDERAL COMMUNICATIONS COMMISSION FC USA MRA US-EU 0003
accredited according to DIN EN ISO/IEC 17025		

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The listed attachments are an integral part of this report.			

1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests.

The presented Equipment Under Test (in this report, hereinafter referred as EUT) integrates a BT BDR/EDR 2.4 GHz RF Transceiver (Hopping Mode). Other implemented wireless technologies were not considered within this test report.
Following tests have been performed to show compliance with applicable FCC Part 2.1091 and FCC Part 1.1310 of the FCC CFR 47 Rules.

1.1. Summary of tests results

RF-Exposure Evaluation (separation distance user to RF-radiating element greater 20cm)						
Test cases	**Port**	**References & Limits**		**EUT set-up**	**EUT op. mode**	**Result**
		FCC Standard	Test Limit			
Radio frequency radiation exposure Requirements	Cabinet + Inter-Connecting Cables (conducted)	§2.1091 §2.1093	RF-Field Strength Limits: FCC: "general population/ uncontrolled" environment	1	1, 2, 3	Pass

Remark:

1.) Calculations based on Tune-Up Info delivered by applicant
2.) Calculations based on Antenna Gain Info delivered by applicant
3.) For additional information see TR18-1-0010801T01a

Digitally signed by martin.nunier@cetecom.com
Date: 2018.12.17 12:12:00 +01'00'

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Dipl.-Ing. Niels Jeß
Responsible for test section

B.Eng. Martin Nunier
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name:	CETECOM GmbH
Address:	Im Teelbruch 116 45219 Essen - Kettwig Germany
Responsible for testing laboratory:	Dipl.-Ing. Rachid Acharkaoui
Deputy:	Dipl.-Ing. Niels Jeß

2.2. Test location

2.2.1. Test laboratory "CTC"

Company name:	see chapter 2.1. Identification of the testing laboratory

2.3. Organizational items

Responsible for test report:	B.Eng. Martin Nunier
Responsible for project:	B.Sc. Mohamed Ahmed
Receipt of EUT:	2018-08-20
Date(s) of test:	2018-08-20 – 2018-10-15
Date of report:	2018-12-17
---	---
Version of template: 13.02	

2.4. Applicant's details

Applicant's name:	Robert Bosch Car Multimedia GmbH
Address:	Robert-Bosch-Straße 200 31137 Hildesheim Germany
Contact person:	Mr. Salvatore Miraglia

2.5. Manufacturer's details

Manufacturer's name:	please see applicant's details
Address:	please see applicant's details

3. Summary of product description

FCC ID:	YBN-1DINTCCMID0	
Product name	1-DIN TCC MID	
Exposure category	☒ General population/uncontrolled environment ☐ Occupational exposure/controlled environment	
Output power	☒ Conducted ☐ ERP ☐ EIRP ☐ Peak ☒ Source-based time-averaging	
Antenna gain	details refer Chapter 1.5	
Technology	☐ MIMO	☐ 2T2R ☐ 3T3R ☐ 4T4R
	☒ non-MIMO	☒ 1T1R ☐ 1T2R ☐ 2T1R
Evaluation type	☒ Standalone ☐ Simultaneous transmission	
Evaluation distance	☒ 20 cm	
	☐ XXX cm	declares by manufacturer
EUT type	☒ Production Unit ☐ Engineering Unit	
Device type	☒ Mobile device ☐ Fixed device	
Refer rules	☒ CFR 47 FCC Part 2.1091 ☒ CFR 47 FCC Part 1.1310 ☒ KDB 447497 D01v06 October 23, 2015 ☒ KDB 865664 D01v01r02 October 23, 2015	

3.1. Refer Rules

ANSI C95.1–1999	IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
KDB 447498 D01 v06 October 23, 2015	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
KDB 865664 D01v01r02 October 23, 2015	RF Exposure Compliance Reporting and Documentation Considerations.
CFR 47 FCC Part 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.
CFR 47 FCC Part 1.1310	Radiofrequency radiation exposure limits.

3.2. EUT Technologies

Wireless Technologies	Frequency bands	Operation mode			Duty cycle
☐GSM	☐850 ☐1900	Voice (GMSK)	1 slot		☐12.5%
	☐Support DTM (Dual Transfer Mode)				
☐GPRS	☐850 ☐1900	GPRS (GMSK) Multi – Slot Class	☐ 8	1 slot (1 Up, 4 Down)	☐12.5%
			☐ 10	2 slots (2 Up, 4 Down)	☐12.5% ☐ 25%
			☐ 12	4 slots (4 Up, 4 Down)	☐12.5% ☐ 25% ☐37.5% ☐ 50%
☐EDGE	☐850 ☐1900	EDGE (8-PSK) Multi – Slot Class	☐ 8	1 slot (1 Up, 4 Down)	☐12.5%
			☐ 10	2 slots (2 Up, 4 Down)	☐12.5% ☐ 25%
			☐ 12	4 slots (4 Up, 4 Down)	☐12.5% ☐ 25% ☐37.5% ☐ 50%
☐WCDMA (UMTS)	☐Band II ☐Band IV ☐Band V	☐ UMTS Rel.99 (Voice & Data) ☐ HSDPA(Rel.5) ☐ HSUPA(Rel.6) ☐ DC-HSDPA(Rel.8) ☐ HSPA^{+}(Rel.7)			☐100%
☐CDMA (CDMA2000)	☐BC0 ☐BC1 ☐BC10	☐ 1xRTT (Voice & Data) ☐ 1xEVDO Rel.0 ☐ 1xEVDO Rel.A ☐ 1xAdvanced			☐100%
	☐Support SV-DO (1xRTT-1xEVDO)				
☐LTE-FDD	☐Band 2 ☐Band 4 ☐Band 5 ☐Band 7 ☐Band 12 ☐Band 13 ☐Band 17 ☐Band 25 ☐Band 26 ☐Band 27 ☐Band 30	☐QPSK ☐16QAM			100%
		☐Rel.11 Carrier Aggregation	☐2 Uplinks 2 Downlinks ☐2 Uplinks 3 Downlinks ☐3 Uplinks 2 Downlinks ☐3 Uplinks 3 Downlinks		
	☐Supports SV-LTE (1xRTT-LTE)				
☐LTE-TDD	☐Band 38 ☐Band 39 ☐Band 40 ☐Band 41 ☐Band 42	☐QPSK ☐16QAM			63.3% This device supports uplink –downlink configuration 0-6. The configuration with highest duty cycle was used (configuration. 0 at 63.3%)
		☐Rel.11 Carrier Aggregation	☐2 Uplinks 2 Downlinks ☐2 Uplinks 3 Downlinks ☐3 Uplinks 2 Downlinks ☐3 Uplinks 3 Downlinks		
	☐Supports SV-LTE (1xRTT-LTE)				

Wireless Technologies	Frequency bands	Operation mode		Duty cycle
☐Wi-Fi	☐2.4GHz	☐IEEE 802.11b	☐2412 – 2462 MHz ☐2412 – 2472 MHz	☐50%
		☐IEEE 802.11g	☐2412 – 2462 MHz ☐2412 – 2472 MHz	☐50%
		☐IEEE 802.11n HT20	☐2412 – 2462 MHz ☐2412 – 2472 MHz	☐50%
		☐IEEE 802.11n HT40	☐2422 – 2452 MHz	☐50%
	☐5GHz	☐IEEE 802.11a	☐5180 – 5240 MHz ☐5260 – 5320 MHz ☐5500 – 5700 MHz ☐5745 – 5825 MHz	☐50%
		☐IEEE 802.11n HT20	☐5180 – 5240 MHz ☐5260 – 5320 MHz ☐5500 – 5700 MHz ☐5745 – 5825 MHz	☐50%
		☐IEEE 802.11n HT40	☐5190 – 5230 MHz ☐5270 – 5310 MHz ☐5510 – 5670 MHz ☐5755 – 5795 MHz	☐50%
		☐IEEE 802.11ac VHT20	☐5180 – 5240 MHz ☐5260 – 5320 MHz ☐5500 – 5700 MHz ☐5745 – 5825 MHz	☐50%
		☐IEEE 802.11ac VHT40	☐5190 – 5230 MHz ☐5270 – 5310 MHz ☐5510 – 5670 MHz ☐5755 – 5795 MHz	☐50%
		☐IEEE 802.11ac VHT80	☐5210 – 5210 MHz ☐5290 – 5290 MHz ☐5530 – 5530 MHz ☐5775 – 5775 MHz	☐50%
	☐Supports Band gap channels			
☐Others	☐2.4GHz	☐ 1 MHz Bandwidth	☐2402 – 2472 MHz	☐100%
☒Bluetooth	☒2.4GHz	☒Version 2.1+EDR		☒77.5%
		☒Version 3.0+HS		☒77.5%
		☐Version 4.0		☐100%
		☐Version 4.1+EDR		☐77.5%
		☐Version 4.2+EDR		☐77.5%

3.3. Antenna Information

Wireless Technologies	Frequency bands	Antenna type	Maximum antenna gain	
☐GSM	☐850	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐GSM	☐1900	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐WCDMA (UMTS)	☐Band II	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band IV	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band V	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐CDMA (CDMA2000)	☐CDMA800	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐CDMA1900	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐LTE-FDD	☐Band 2	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 4	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	

Wireless Technologies	Frequency bands	Antenna type	Maximum antenna gain	
	☐Band 5	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 7	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 12	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 13	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 17	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 25	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 26	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 27	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	

Wireless Technologies	Frequency bands	Antenna type	Maximum antenna gain	
☐LTE-TDD	☐Band 38	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 39	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 40	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 41	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
	☐Band 42	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
☐Wi-Fi	☐2.4GHz	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
		☐PIFA ☐PCB ☐	☐Antenna 2	
	☐5GHz	☐PIFA ☐PCB ☐	☐Antenna 0	
		☐PIFA ☐PCB ☐	☐Antenna 1	
		☐PIFA ☐PCB ☐	☐Antenna 2	
☐Others	☐2.4GHz	☐PIFA ☐PCB	☐Antenna 0	
		☐PIFA ☐PCB	☐Antenna 1	
		☐PIFA ☐PCB	☐Antenna 2	
☒Bluetooth	☒2.4GHz	☐PIFA ☒PCB	☒Antenna 0	1.6 dBi gain max

3.4. EUT, Auxiliary Equipment (AE)

Short descrip-tion*)	EUT	Type	S/N serial number	HW hardware status	SW software status
EUT A	1-DIN TCC MID (radiated sample)	Radio with Bluetooth	078000001648	18/20	0401
EUT B	1-DIN TCC MID (conducted sample)	Radio with Bluetooth	078000001563	18/20	0401

AE short descrip-tion *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	Main Cable Harness	-	-	-	-
AE 2	USB to UART cable	-	-	-	-
AE 3	Dell Notebook (ctc522013)	Latitude E6430	GB3WXY1	Intel Core I5	Windows 7 Professional (64bit)

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report.

3.5. EUT set-ups

EUT set-up no.*)	Combination of EUT and AE	Remarks
set. 1	EUT B	only for theoretical calculation

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

3.6. EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional Information
op. 1	Bluetooth FHSS Modes* DH5	Tune-Up Information maximum conducted output power
op. 2	Bluetooth FHSS Modes* 2DH5	Tune-Up Information maximum conducted output power
op. 3	Bluetooth FHSS Modes* 3DH5	Tune-Up Information maximum conducted output power

*) EUT operating mode no. is used to simplify the test report.

4. Measurements

4.1. Radio Frequency Exposure Evaluation §2.1091

4.2.Test location

test location	☒ CETECOM Essen	☐	☐
	For Evaluation instruments are not needed. Results are determined by calculation based on applicants delivered Tune-Up procedure.		

4.3. Evaluation Rules for FCC Standard

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

4.4. Limits for FCC Standard

Table 1: LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

(A) Limits for Occupational/Controlled Exposure				
Frequency range [MHz]	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [mW/cm²]	Averaging time [minutes]
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f²)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--		6
1500-100,000	--	--		6
(B) Limits for General Population/Uncontrolled Exposure				
Frequency range [MHz]	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [mW/cm²]	Averaging time [minutes]
0.3-3.0	614	1.63	*(100)	30
3.0-30	824/f	2.19/f	*(180/f²)	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f=frequency in MHz
*Plane-wave equivalent power density

NOTE1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. These limits apply to amateur station licensees and members of their immediate household as discussed in the text.

NOTE2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. As discussed in the text, these limits apply to neighbours living near amateur radio stations.

4.5. MPE Calculation method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{EIRP}{4\pi R^2} = \frac{P * G}{4\pi R^2}$$

$$G_{NUMERIC} = \frac{S * 4\pi R^2}{P}$$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the centre of radiation of the antenna

4.6. Evaluation Method

4.6.1. Standalone

Valid for BT Mode:
• The peak power was checked on 3 frequencies (lowest/middle/highest) within each operable band and the results compared to applicant's declared power values (tune-up info).
• No duty-cycle correction factor is applicable
Please find in the following tables the calculations based on applicants tune-up information for the power values.

Results for FCC Standard

Distance	20	cm

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Antenna Gain (dBi)	Declared maximum EIRP (Measured+ Tune-up) (dBm)	Duty cycle %	Declared Maximum output power (W)	Equivalent conducted output power (output power x duty cycle) (mW)	MPE Limit (mW/cm^2)	MPE-Value (mW/cm^2)	Margin to Limit: (mW/cm^2)	Fraction for Co-Location calculations	Max. Fraction-Value within Frequency-Band
Bluetooth BDR/EDR	2402.0	4.9	1.6	6.5	100%	0.0045	4.5	1.0000	0.00089	0.9991	0.000889	0.0008886
	2442.0	4.9	1.6	6.5		0.0045	4.5	1.0000	0.00089	0.9991	0.000889	
	2480.0	4.9	1.6	6.5		0.0045	4.5	1.0000	0.00089	0.9991	0.000889	

Maximum calculated MPE value:		
Lowest MPE-Limit:	1.0000	[mW/cm^2]
Highest MPE value:	0.0009	[mW/cm^2]
Lowest Margin to limit:	0.9991	[mW/cm^2]

1. Output power including tune-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer;
4. Depending on output power and antenna gain only the worst case is reported;

4.6.2. Simultaneous Transmission MPE

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
$\sum$ of MPE ratios ≤ 1.0

Transmitter is not using simultaneous transmission operation.

4.7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

5. Measurement uncertainties, Instruments and Ancillary

Please refer to the following test reports:

FCC BT BDR/EDR: TR18-1-0010801T01a

6. Versions of test reports (change history)

Version	Applied changes	Date of release
--	Initial release	2018-12-17
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END OF TEST REPORT