

Prüfbericht-Nr.: <i>Test Report No.:</i>	28120478 017	Auftrags-Nr.: <i>Order No.:</i>	7972585	Seite 1 von 36 <i>Page 1 of 36</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	MARELLI_BCM-HD_UE-USA	Auftragsdatum: <i>Order date:</i>	03-09-2020	
Auftraggeber: <i>Client:</i>	Marelli Europe S.p.A. - Viale Aldo Borletti 61/63 – 20010, Corbetta – Milano - Italy			
Warenzeichen: <i>Trademark:</i>	 			
Prüfgegenstand: <i>Test item:</i>	Body Computer Module – Harley Davidson			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	BHD21			
Auftrags-Inhalt: <i>Order content:</i>	Full test in acc.to			
Prüfgrundlage: <i>Test specification:</i>	FCC Cfr 47 part 15 – Subpart C - §15.207, §15.209			
Wareneingangsdatum: <i>Date of receipt:</i>	13/01/2021			
	07/04/2021			
Prüfmuster-Nr.: <i>Test sample No.:</i>	Storage no. 210023/1; 210251/1			
Prüfzeitraum: <i>Testing period:</i>	29-01-2021 08-04-2021			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland Italia S.r.l. Via E. Mattei, 3 20005 Pogliano Milanese (MI) - IT			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Italia S.r.l. Via E. Mattei, 3 20005 Pogliano Milanese (MI) - IT			
Prüfergebnis*: <i>Test result*:</i>	Pass			
Geprüft von: <i>Tested by:</i>	Francesco Lombardi	Aenehmigt von: <i>Authorized by:</i>	Roberto Radice	
Datum: <i>Date:</i>	09-04-2021 (Laboratory technician)	Datum: <i>Date:</i>	09-04-2021 (Reviewer)	
Stellung / Position	Sachverständige(r)/Expert	Stellung / Position	Sachverständige(r)/Expert	
Sonstiges / Other:	None			
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>			
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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Produktbeschreibung
Product description

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>
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. <i>As contractually agreed, this document has been signed digitally only. TÜV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TÜV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i>
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.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Messunsicherheit der in diesem Prüfbericht aufgeführten Messverfahren wird nicht in die Einhaltung der jeweiligen Grenzwerte / Betriebsbedingungen mit einbezogen. Für Emissionsprüfungen gelten die Anforderungen CISPR 16-4-2 / EN55016-4-2 (Kapitel 4.2) in aktueller Form.. <i>The measurement uncertainty of the measurement procedures listed in this test report does not include the compliance of the respective limit values / operating conditions. For emission tests the requirements, CISPR 16-4-2 / EN55016-4-2 (chapter 4.2) apply in their current form.</i>

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Product description

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Sofern mit dem Kunden keine abweichende Regelung getroffen wurde, wird eine Konformitätsbewertung grundsätzlich auf Basis der angewendeten Normen durchgeführt.

Auf Kundenwunsch wird die Aussage zur Konformität des in diesem Prüfbericht geprüften Produktes nach den Kriterien/Anforderungen der angewendeten Normen durchgeführt.

Davon abweichende Bewertungsbedingungen werden in den jeweiligen Kapiteln gesondert dokumentiert.

Unless otherwise agreed with the customer, a conformity assessment is always carried out based on the applied standards.

At the customer's request, the statement on the conformity of the product tested in this test report is carried out according to the criteria/requirements of the applied standards.

Evaluation conditions deviating from these are documented separately in the respective chapters.

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Beschreibung:
Description:

Body Computer Module – Harley Davidson

7

Modellname:
Model name:

BHD21

8

Seriennummer
Serial number

4100674–010600

9

Hersteller
Manufacturer

SI CERTIFICA CHE IL SISTEMA DI GESTIONE PER LA QUALITÀ DI
WE HEREBY CERTIFY THAT THE QUALITY MANAGEMENT SYSTEM OPERATED BY

Marelli Tepotzotlán México S.A. de C.V.

Avenida de las Industrias 20 y 21, Fraccionamiento Industrial El trébol - 54600 Tepotzotlán, Estado de México
Mexico


www.cisqautomotiv.com

10

Warenzeichen:
Trademark:



11

Netzteil
Power supply

DC power (battery vehicle)

12

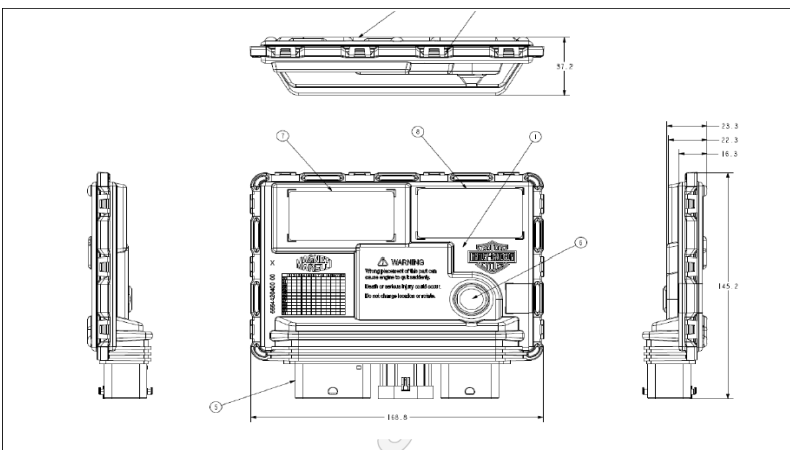
Bemessungsspannung
Rated voltage

Voltage Range Name	Voltage Range Limits	General Requirements
Max Over Voltage	VBatt > 26.0V	No Requirements
Over Voltage 2	24.0V < VBatt ≤ 26.0V	No damage to Components for 30 seconds at temperatures ≤ 30 °C
Over Voltage 1	19.0V < VBatt ≤ 24.0V	No corruption of Non-Volatile Memory.
Comms Over Voltage	16.0V < VBatt ≤ 19.0V	All serial communications operational
Normal Operating	9.0V ≤ VBatt ≤ 16.0V	Fully functional
Comms Under Voltage	7.5V ≤ VBatt < 9.0V	All serial communications operational
Under Voltage	4.5V ≤ VBatt < 7.5V	Microprocessor continues to run, starter continues to crank while starting
Low Voltage Reset	0.0V ≤ VBatt < 4.5V	System reboots on return to normal operating range ¹
Reverse Voltage	-13.0V ≤ VBatt < 0.0V	No damage to BCM components for 30 seconds at temperatures ≤ 30 °C and starter protected
Reverse Over Voltage	-24.0V ≤ VBatt < -13.0V	No Damage to BCM components for 5 seconds at temperatures ≤ 30 °C and starter protected
Max Reverse Voltage	VBatt < -24.0V	No Requirements

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Produktbeschreibung
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13	Bemessungsstrom <i>Rated current</i>	40mA (no load) – max. 48A
14	Maximale Leistung <i>Maximum power consumption</i>	250W
15	Prüflingstyp <i>Equipment type</i>	Intentional radiator (Transmitter 125KHz)
16	Gerätekategorie <i>Equipment categorie</i>	Class B
17	Hardwareversion <i>Hardware version</i>	03
18	Softwareversion <i>Software version</i>	4.02
19	Betriebstemperatur <i>Operating temperature</i>	45°C
20	Sonstiges <i>Other</i>	---
21	Abmessungen <i>Dimensions</i>	
22	Prüfmusterbereitstellung: <i>Test sample obtaining:</i>	☒ Sampling by customer ☐ Sampling by TÜV Rheinland Group ☐ others:

Produktbeschreibung
 Product description

Bild / Picture 1



Bild / Picture 2

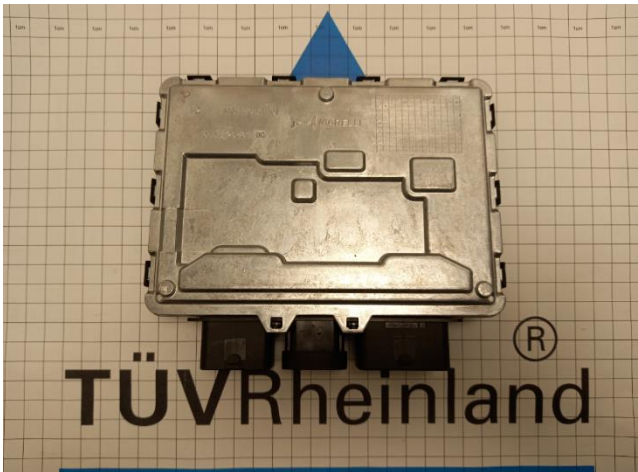


Bild / Picture 3

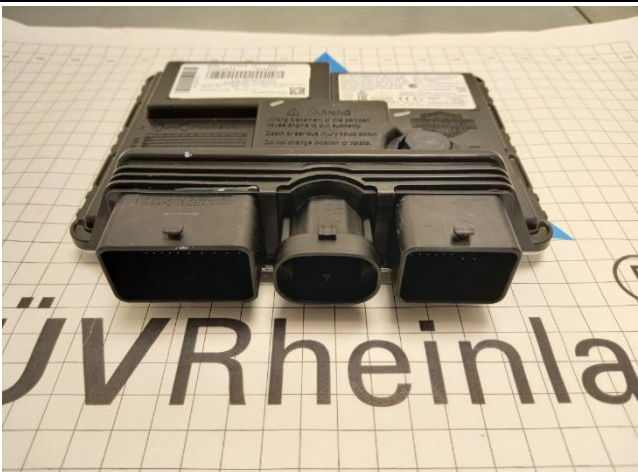
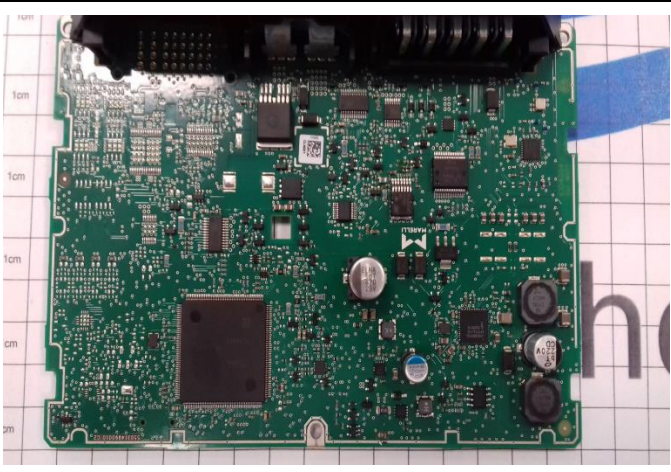


Bild / Picture 4



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Absatz		Messergebnisse - Bemerkungen	Bewertung
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Allgemeine Produktinformationen und sonstige Hinweise:
General product information and other remarks:

BCM HD (Body Computer Module Harley Davidson) manages the main functions of motorcycle electrical system, performing gateway operations between CAN networks (C-CAN) and between CAN and LIN network. The BCM HD is design to guarantee the security up to ASIL level B for same function.
On motorcycle, ECU is placed in a compartment under the saddle.

List of critical components

4.1.2	TABLE: List of critical components				
Object / part No.	Manufacturer/ trademark	Type / model	Technical data	Standard	Mark(s) of conformity ¹
PCB Logic board (material)	KUNSHAN SUHANG CIRCUIT BOARD CO LTD	SH-M1	PCB FR4 6L 1.6mm	UL94	 US (E154554)
Enclosure (plastic material)	Boardman Molded Products	N60MG40FR	V-0 Certificate of Analysis N60MG40HSL.FR.BK LOT# 1229B3457	UL94	N60MG40HS L.FR.BK
CONNECTOR	Mista S.p.A.	ForTii T11	PPA-GF30 FR(40)	UL94 V-0 IEC 60695-11- 10 – 20	 US E47960- 101240758
Contact Authorized Services should the fuse blow again.					
Never replace a blown fuse with metallic wires or other material.					
Never replace a fuse with another of higher amperage: FIRE RISK.					
Remove the key from the ignition switch and switch off all loads before replacing a fuse.					

In the follow tables are shows the derived model:

Tested model BHD21 – Class I	MM Code	Customer code	Proto level	Version
	502442050106	41000674	Proto C3	434 Mhz Class I
Derived model BHD21 – Class II	MM Code	Customer code	Proto level	Version
	502442050306	41000678	Proto C3	434 Mhz Class II
Derived model BHD21 – Class I	MM Code	Customer code	Proto level	Version
	502442050206	41000675	Proto C3	315 Mhz Class I
Derived model BHD21 – Class II	MM Code	Customer code	Proto level	Version
	502442050406	41000679	Proto C3	315 Mhz Class II

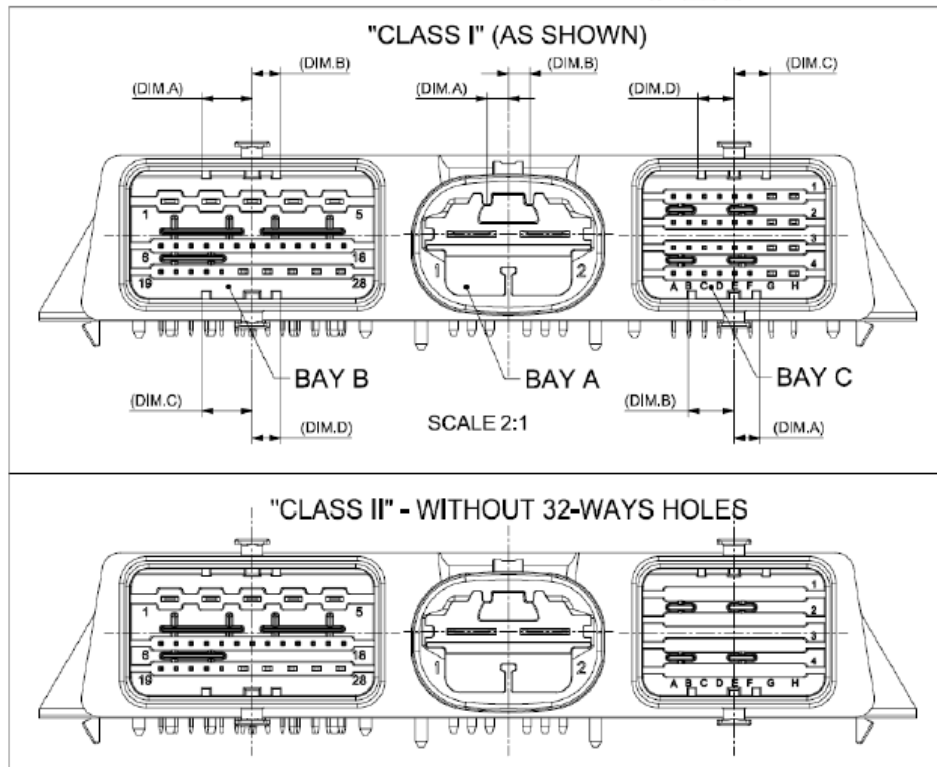
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The package showt n° 3 connectors 60 ways for Class1 and n° 2 connector 60 ways for Class2.

3.6.1 Connectors



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§15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current system containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μ V within the frequency band 535-1705 kHz, as measured using a 50 μ H/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in §15.205, §15.209, §15.221, §15.223, or §15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

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§15.209 Radiated emission limits; general requirements.

(a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other sections within this part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

(e) The provisions in §§15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

(f) In accordance with §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in §15.109 that are applicable to the incorporated digital device.

(g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

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24	Angewendete Grundnormen Applied basic standards		
	Reference document		
	47 CFR Part 15	2021-02	Radio Frequency Device
	Title 47 Part 15 Subpart C § 15.207		Radio frequency devices – Intentional Radiators Conducted Limits
	Title 47 Part 15 Subpart C § 15.209		Radio frequency devices – Intentional Radiators Radiated Emissions Limits
	ANSI C63.4	2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical Equipment in the Range of 9 kHz to 40 GHz
	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
25	Testkonfiguration Equipment used during test		

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Prüfgegenstand
Equipment under test

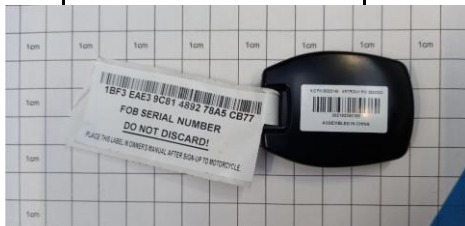
Nr. No.	Produktart Product type	Hersteller Manufacturer	Modell Model	Kommentare Comments
1	Body Computer Module – Harley Davidson	Marelli Tepotzotlan México S.A. de C.V	BHD21	None

Hilfsmittel / Peripherie
Auxiliary Equipment / Peripherals

1	Vehicle simulator	---	---	Status LEDs, monitoring communication radio between remote control and EUT
---	-------------------	-----	-----	--



2	Battery 12Vdc	---	---	for power supply EUT
3	Remote control (FOB)	---	---	Continuous TAG communication 125kHz



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26	Ein-/Ausgabeanschlüsse Input/Output ports					
	Nr. No.	Name	Art* Type*	Kabel-länge Cable length	Kabel geschirmt Cable shielded	Kommentare Comments
	1	Enclosure	N/E	—	—	None
	2	AC power port				Port not present
	3	DC power port	12Vdc	> 3 mt	Shielded cable	Battery vehicle
	4	I/O port	See §25	> 3 mt	Shielded cable	None
	5	Telecommunication port				Port not present

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27 Ein-/Ausgabeanschlüsse
Input/Output ports

Pin	Driver	Pin size [mm]	Pin Cap [A]	Device Current [A]	Function H-D Map	Function Name	I/Otype	Limp home	PWM Req.	Class1	Class2
A-1	N/A	8.00	60.00	48	Dedicated	Main Power	+30_CPL	NO		x	x
A-2	HSD	8.00	60.00	15.00	Map H1	Accessory Power	OUT_HSD	NO	NO	x	x
B-1	HSD	2.80	21.00	12.00	Map H1	Starter	OUT_HSD	NO	NO	x	x
B-2	HSD	2.80	21.00	8.00	Map H1	Fuel / Coolant Pump Power	OUT_HSD	YES	NO	x	x
B-3	HSD	2.80	21.00	15.00	Map H1	Cooling System Power	OUT_HSD	NO	NO	x	x
B-4	HSD	2.80	21.00	10.00	Map H1	Powertrain System Power	OUT_HSD	YES	NO	x	x
B-5	HSD	1.50	12.00	6.00	Map H2	Low Beam	OUT_HSD	YES	NO	x	x
B-6	RX	0.64	2.50		Dedicated	UHF Antenna	UHF-IN	NO		x	x
B-7	TX	0.64	2.50		Dedicated	LF Antenna A	LF-Ant	NO		x	x
B-8	TX	0.64	2.50		Dedicated	LF Antenna B	LF-Ant	NO		x	x
B-9	LIN	0.64	2.50		Dedicated	LIN1	LIN	NO		x	x
B-10	AI	0.64	2.50	0.005	Map AI	Ign / Acc Switch	AIN-Batt	NO	NA	x	x
B-11	N/A	0.64	2.50	0.20	Dedicated	Chassis Ground	GND	NO		x	x
B-12	CAN	0.64	2.50		Dedicated	Pri CAN Hi	CAN_FD	NO		x	x
B-13	CAN	0.64	2.50		Dedicated	Pri CAN Lo	CAN_FD	NO		x	x
B-14	CAN	0.64	2.50		Dedicated	Sec CAN Lo	CAN_FD	NO		x	x
B-15	CAN	0.64	2.50		Dedicated	Sec CAN Hi	CAN_FD	NO		x	x
B-16	HSD	0.64	2.50	1.5	Map H3	Front Left Turn Signal	OUT_HSD	NO	YES	x	x
B-17	HSD	0.64	2.50	1.5	Map H3	Front Right Turn Signal	OUT_HSD	NO	YES	x	x
B-18	HSD	0.64	2.50	1.00	Map H3	Brake Lamp	OUT_HSD	YES	YES	x	x
B-19	AI	0.64	2.50	0.04	Map AI	Rear Brake Switch	AIN-Batt	NO	NA	x	x
B-20	AI	0.64	2.50	0.02 at 16V	Map AI	Run / Stop Switch	AIN-Batt	NO	NA	x	x
B-21	PWM/LSD	0.64	2.50	0.05	Map L3	Security Siren	OUT_LSD	NO	YES	x	x
B-22	HSD	0.64	2.50	1.5	Map H3	Left Rear Turn Signal	OUT_HSD	NO	YES	x	x
B-23	HSD	0.64	2.50	1.5	Map H3	Right Rear Turn Signal	OUT_HSD	NO	YES	x	x
B-24	HSD	1.50	12.00	5.00	Map H2	Power Mode WAKE	OUT_HSD	YES	NO	x	x
B-25	HSD	1.50	12.00	6.00	Map H2	High Beam	OUT_HSD	YES	NO	x	x
B-26	HSD	2.80	21.00	5.00	Map H1	VVT Power	OUT_HSD	NO	NO	x	x
B-27	HSD	1.50	12.00	6.00	Map H2	Running / Position Lamps	OUT_HSD	YES	YES	x	x
B-28	HSD	1.50	12.00	6.00	Map H2	Horn	OUT_HSD	NO	YES	x	x
C-A1	N/A	0.64	2.50	2.50	Dedicated	Chassis Ground	GND	NO		x	-
C-A2	N/A	0.64	2.50	0.02 at 16V	N/A	Unused	EMPTY	NO		x	-
C-A3	N/A	0.64	2.50		N/A	Unused	EMPTY	NO		x	-
C-A4	N/A	0.64	2.50		N/A	Auxiliary Lights Switch	AIN-Batt	NO	NA	x	-
C-B1	HSD	0.64	2.50	0.10	Map H3	Fork Lock Out / Spare Output #1	OUT_HSD	NO	NO	x	-
C-B2	AI	0.64	2.50		Map AI	Parking Brake / Spare Input #2	AIN-Batt	NO	NA	x	-
C-B3	AI	0.64	2.50	0.10	Map AI	Fork Lock / Spare Input #1	AIN-Batt	NO	NA	x	-
C-B4	AI	0.64	2.50	0.04	Map AI	Neutral Switch / Spare Input #4	AIN-Batt	NO	NA	x	-
C-C1	LIN	0.64	2.50		Dedicated	LIN2	LIN	NO		x	-
C-C2	ISI	0.64	2.50	0.10	Map ISH	ASC Front Preload Piston Position In +	AIN-VarL	NO	NA	x	-
C-C3	ISI	0.64	2.50	0.10	Map ISL	ASC Front Preload Piston Position In -	AIN-VarL	NO	NA	x	-
C-C4	ISI	0.64	2.50	0.10	Map ISL	ASC Rear Preload Piston Position In -	AIN-VarL	NO	NA	x	-
C-D1	ISI	0.64	2.50	0.10	Map ISH	ASC Rear Preload Piston Position In +	AIN-VarL	NO	NA	x	-
C-D2	ISI	0.64	2.50	0.10	Map ISH	ASC VRH Front Stroke Position In +	AIN-VarL	NO	NA	x	-
C-D3	ISI	0.64	2.50	0.10	Map ISL	ASC VRH Front Stroke Position In -	AIN-VarL	NO	NA	x	-
C-D4	ISI	0.64	2.50	0.10	Map ISL	ASC VRH Rear Stroke Position In -	AIN-VarL	NO	NA	x	-
C-E1	PWM/LSD	0.64	2.50	2.00	Map L3	ASC Front Damping Control	OUT_LSD	NO	YES	x	-
C-E2	CAN	0.64	2.50		Dedicated	Public CAN Hi	CAN_FD	NO		-	-
C-E3	N/A	0.64	2.50	2.50	Dedicated	Chassis Ground	GND	NO		x	-
C-E4	ISI	0.64	2.50	0.10	Map ISH	ASC VRH Rear Stroke Position In +	AIN-VarL	NO	NA	x	-
C-F1	PWM/LSD	0.64	2.50	2.00	Map L3	ASC Rear Damping Control	OUT_LSD	NO	YES	x	-
C-F2	CAN	0.64	2.50		Dedicated	Public CAN Lo	CAN_FD	NO		-	-
C-F3	N/A	1.50	12.00	10.00	Dedicated	Chassis Ground (Pre-Load)	GND	NO		x	-
C-F4	PWM/LSD	0.64	2.50	2.00	Map L3	ASC Rear VRH Control	OUT_LSD	NO	YES	x	-
C-G1	HSD	1.50	12.00	4.00	Map H2	ASC VRH Solenoid Valves	OUT_HSD	NO	NO	x	-
C-G2	HSD	1.50	12.00	4.00	Map H2	ASC Suspension Damping Valves	OUT_HSD	NO	NO	x	-
C-G3	HSD	1.50	12.00	4	Map H2	Aux Lamps / Spare Output #2	OUT_HSD	NO	NO	x	-
C-G4	PWM/LSD	0.64	2.50	2.00	Map L3	ASC Front VRH Control	OUT_LSD	NO	YES	x	-
C-H1	HBRDG	1.50	12.00	10	Map HBL	ASC Rear Pre-Load Adjust Motor -	OUT_HB	NO	YES	-	-
C-H2	HBRDG	1.50	12.00	10	Map HBL	ASC Rear Pre-Load Adjust Motor +	OUT_HB	NO	-	-	-
C-H3	HBRDG	1.50	12.00	5.00		Bank Light Outout	OUT_HSD	NO	YES	x	-
C-H4	HBRDG	1.50	12.00	5.00		Spare Output	OUT_HSD	NO	YES	-	-

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Absatz		Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation
28	Betriebsarten Operating modes		
	Nr. Beschreibung No. Description 1EUT setting on TX mode @ 125kHz Detaillierte Informationen finden Sie im entsprechenden Protokoll. / For details see the corresponding protocol		
29	Prüfaufbau EUT configuration		
	Der Prüfaufbau erfolgte entsprechend den Angaben der genannten EMV-Normen. Die Messungen und Tests wurden unter "worst case"-Bedingungen durchgeführt, d.h. es wurden typische Anordnungen und Betriebszustände gewählt bzw. angenommen, die maximale Störaussendung und Störimpfindlichkeit vermuten lassen (sogenannte "Ungünstigste Konfiguration"). Einzelheiten der Geräteeinstellungen sind u.a. der Fotodokumentation zu entnehmen. Soweit nicht anders angegeben, gelten diese Angaben für alle nachfolgenden Messungen. The test setup was made in accordance with mentioned FF standards. Measurements and tests were executed under "worst case" conditions. Typical EUT arrangements or operating modes were chosen or assumed which let suspect maximum emission or susceptibility (a so called "unfavourable configuration"). Details of test setup or adjustments are (particularly) shown inside the photo documentation. As far as not mentioned otherwise these statements are valid for all following tests.		
30	Klimatische Bedingungen Climatic conditions		
	Umgebungstemperatur Ambient Temperature 15 - 35 °C 22° Relative Luftfeuchte Relative Humidity 30 - 60 % 45% Luftdruck Air pressure 860 - 1060 mbar 1012		

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Absatz		Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

31	Aussage zur Messunsicherheit <i>Statement of the measurement uncertainty</i>																								
	Die in diesem Dokument genannten Daten und Ergebnisse sind wahr und genau. Der Leser wird darauf hingewiesen, dass innerhalb der Kalibrierungsgrenzen der Geräte und Einrichtungen Fehler auftreten können. Die Messunsicherheit wurde für alle Prüfungen in diesem Prüfbericht gemäß CISPR 16-4 "Anforderungen an Geräte und Einrichtungen sowie Festlegung der Verfahren zur Messung der hochfrequenten Störaussendung (Funkstörungen) und Störfestigkeit – Teil 4-2: Unsicherheiten, Statistik und Modelle zur Ableitung von Grenzwerten (Störmodell) – Messgeräte-Unsicherheit" berechnet und ist im Qualitätssicherungssystem gemäß ISO / IEC 17025 dokumentiert. Darüber hinaus können Veränderungen bei den Bauteilen und im Herstellungsprozess zu einer zusätzlichen Abweichung führen. Der Hersteller ist alleine verantwortlich dafür, dass zukünftige Geräte die einschlägigen Normen und Standards einhalten. <i>The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements" and is documented in the quality system acc. to ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation.</i> <i>The manufacturer has the sole responsibility of continued compliance of the device.</i> <table><tr><th>Test Method</th><th>Uncertainty (95%)</th><th>Coverage factor k</th></tr><tr><td>RF Conducted discontinuous emissions - range (150 kHz - 30MHz)</td><td>3,3 dB</td><td>2,0</td></tr><tr><td>RF Radiated emissions – range (30–1000) MHz</td><td>4,9 dB</td><td>2,0</td></tr><tr><td>RF Radiated emissions – range (1 – 3,6) GHz</td><td>5,1 dB</td><td>2,0</td></tr><tr><td>RF Radiated emissions – range (3,6–8) GHz</td><td>5,1 dB</td><td>2,0</td></tr><tr><td>RF Radiated emissions – range (8 – 40) GHz</td><td>5,4 dB</td><td>2,0</td></tr><tr><td>Measurement of Normalised Site Attenuation and VSWR</td><td>6,0 dB</td><td>2,0</td></tr><tr><td>Verification of RF Field Uniformity according to IEC 61000-4-3</td><td>3,4 dB</td><td>2,0</td></tr></table>	Test Method	Uncertainty (95%)	Coverage factor k	RF Conducted discontinuous emissions - range (150 kHz - 30MHz)	3,3 dB	2,0	RF Radiated emissions – range (30–1000) MHz	4,9 dB	2,0	RF Radiated emissions – range (1 – 3,6) GHz	5,1 dB	2,0	RF Radiated emissions – range (3,6–8) GHz	5,1 dB	2,0	RF Radiated emissions – range (8 – 40) GHz	5,4 dB	2,0	Measurement of Normalised Site Attenuation and VSWR	6,0 dB	2,0	Verification of RF Field Uniformity according to IEC 61000-4-3	3,4 dB	2,0
Test Method	Uncertainty (95%)	Coverage factor k																							
RF Conducted discontinuous emissions - range (150 kHz - 30MHz)	3,3 dB	2,0																							
RF Radiated emissions – range (30–1000) MHz	4,9 dB	2,0																							
RF Radiated emissions – range (1 – 3,6) GHz	5,1 dB	2,0																							
RF Radiated emissions – range (3,6–8) GHz	5,1 dB	2,0																							
RF Radiated emissions – range (8 – 40) GHz	5,4 dB	2,0																							
Measurement of Normalised Site Attenuation and VSWR	6,0 dB	2,0																							
Verification of RF Field Uniformity according to IEC 61000-4-3	3,4 dB	2,0																							

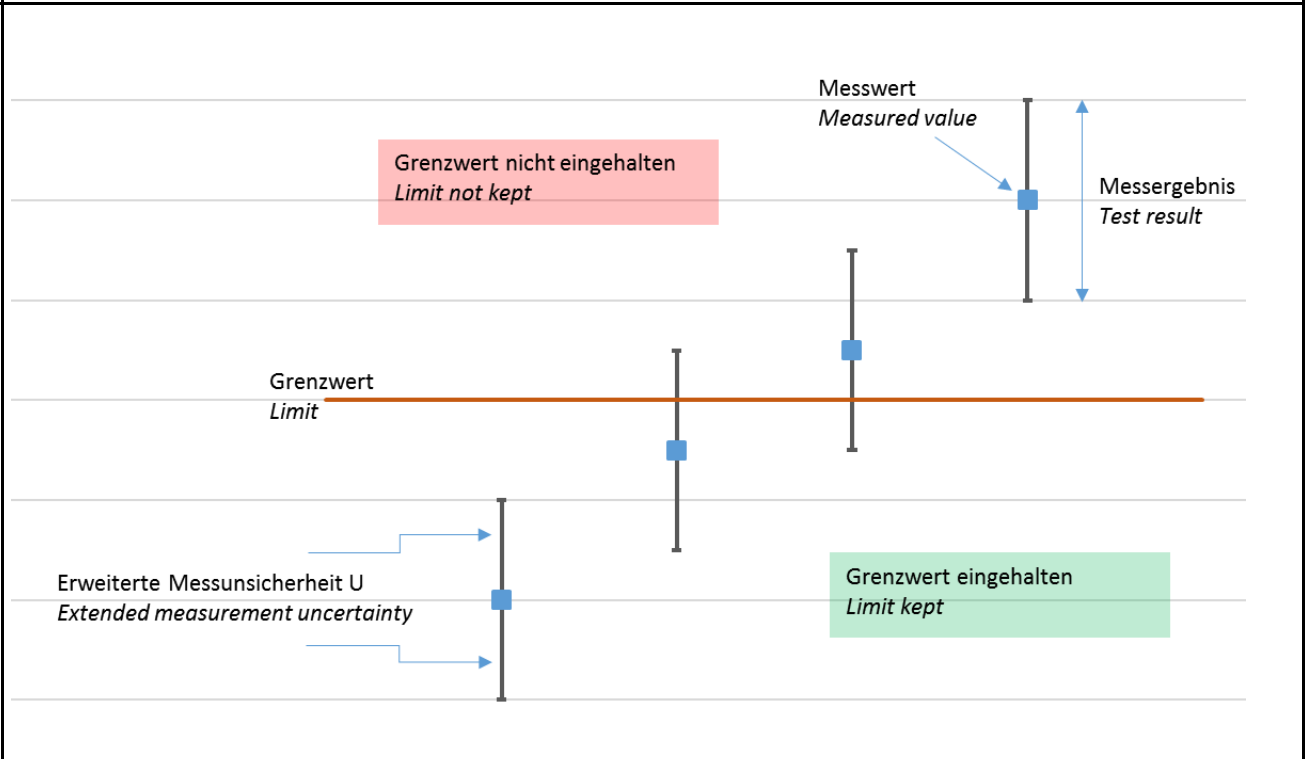
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Absatz		Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

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Beispiel zur Interpretation von Messergebnissen
Example for interpretation of measuring results



Messwert Measured value	Grenzwert Limit	Erweiterte Messunsicherheit Extended measurement uncertainty (k=2)	Messergebnis Test result
48.9 dBµV @ 16.5 MHz	50 dBµV	2.2 dB	46.7 dBµV – 51.1 dBµV

ÄNDERUNGSVERZEICHNIS
REVISION HISTORY

33	Änderungsverzeichnis <i>Change history</i>		
	Test report number	List of revisions	Date
	28120478 009	First edition	09-03-2021
	28120478 017	- Add information and graphics for radiated emission (9Khz – 30Mhz) - Change Photo documentation	09-04-2021

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EMISSIONSPRÜFUNG
EMISSION TEST

Radiated emission test (9KHz – 30MHz)

Datum des Tests <i>Test date</i>	08-04-2021
Angewendete Norm <i>Applied Standard</i>	ANSI C63-4 2014
Prüfmethode <i>Test method</i>	§ 8 of ANSI C63-4 2014
Temperatur (°C) <i>Temperature</i>	22°
Luftfeuchte (% rH) <i>Humidity</i>	45%
Luftdruck (mbar) <i>Air pressure</i>	1012
Bearbeiter <i>Tested by</i>	Francesco Lombardi
Modellbezeichnung <i>Model</i>	BHD21
Prüfmuster-Nr. <i>Test sample No.:</i>	1 (Storage 210251/1)
Betriebsart <i>Operating mode</i>	1
Anschlüsse <i>Tested terminals</i>	Enclosure
Bemerkung <i>Remarks</i>	None

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Verwendete Prüfmittel
Used test equipment

Type	Hersteller <i>Manufacturer</i>	Model	ID	Kalibriert am <i>Last calibration</i>	Kalibriert bis <i>Next calibration</i>
Semi-anechoic Chamber	ETS Lindgren	FACT3	2782378	05/2020	05/2022
Active Loop Antenna and power supply	Rohde&Schwarz	HFH2-Z2E+IN 600	9015215	05/2020	05/2023
EMI Receiver	Rohde&Schwarz	ESW44	2782867	05/2020	05/2021
Software EMC32	Rohde&Schwarz	10.60.15	---	---	---

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

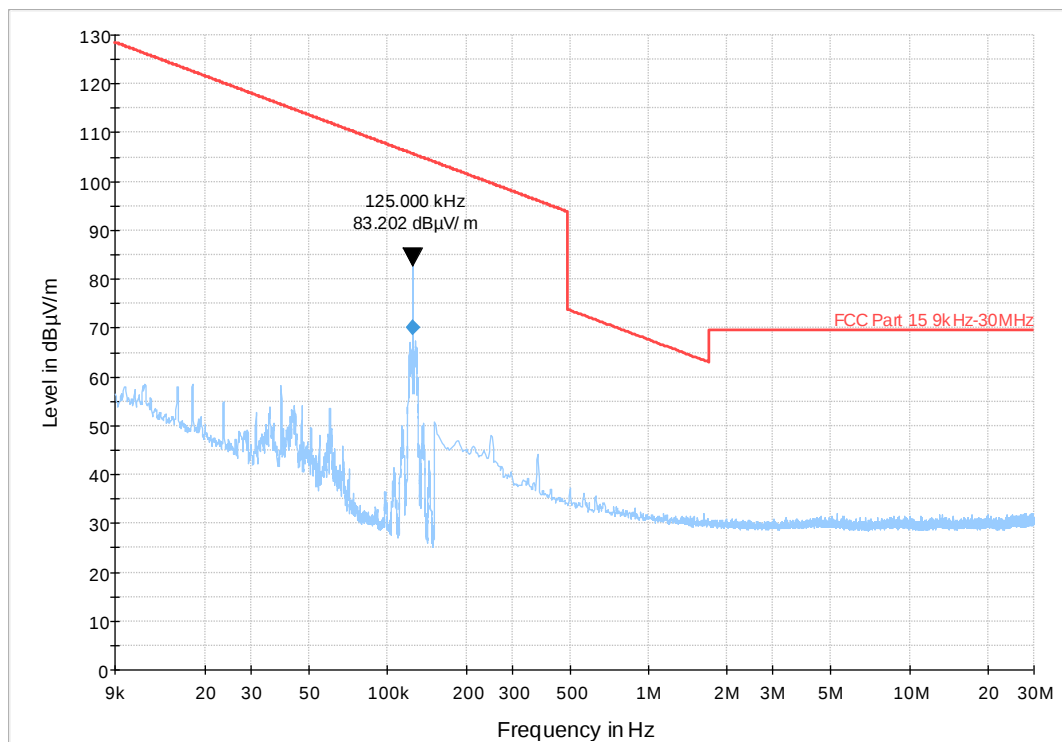
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Horizontal

Antenna EUT axis: X

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	69.98	105.65	35.67	2000.0	0.200	155.0	V	0.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

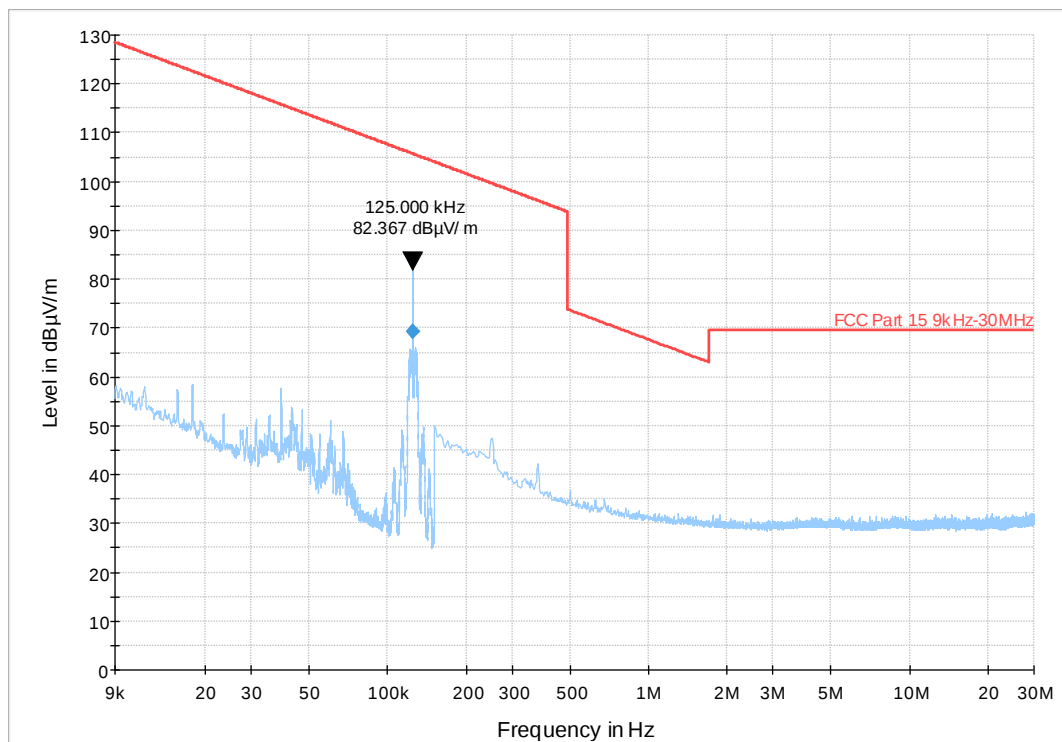
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Horizontal

Antenna EUT axis: Y

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	69.17	105.65	36.48	2000.0	0.200	155.0	V	0.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

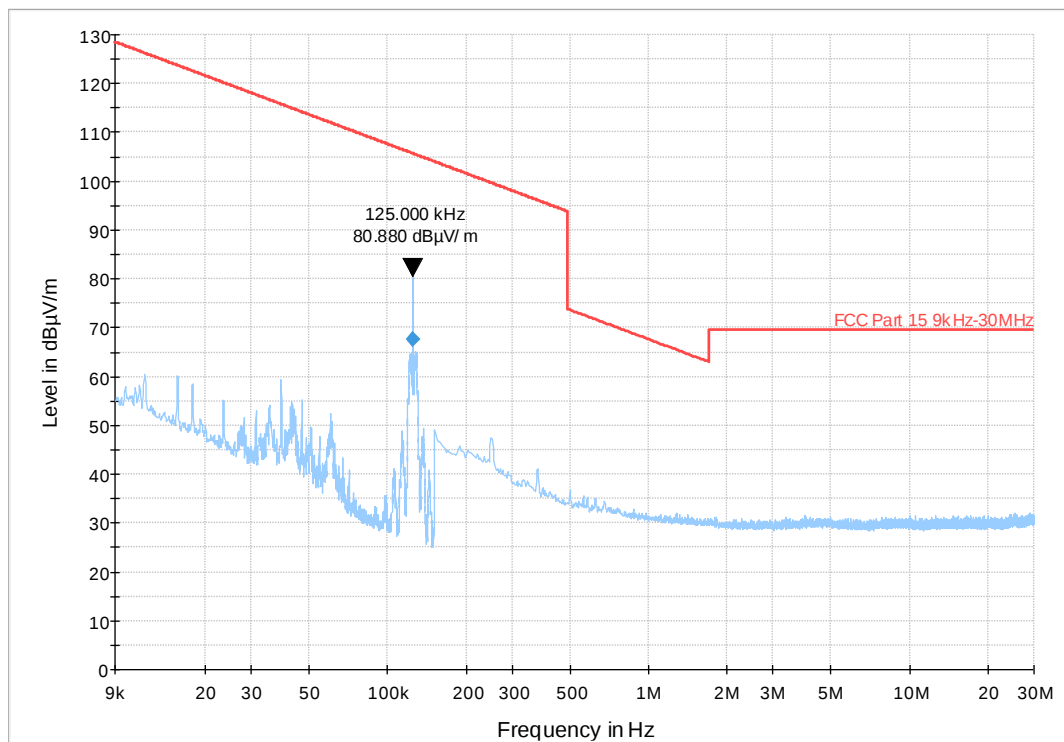
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Horizontal

Antenna EUT axis: Z

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	67.69	105.65	37.96	2000.0	0.200	155.0	V	15.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

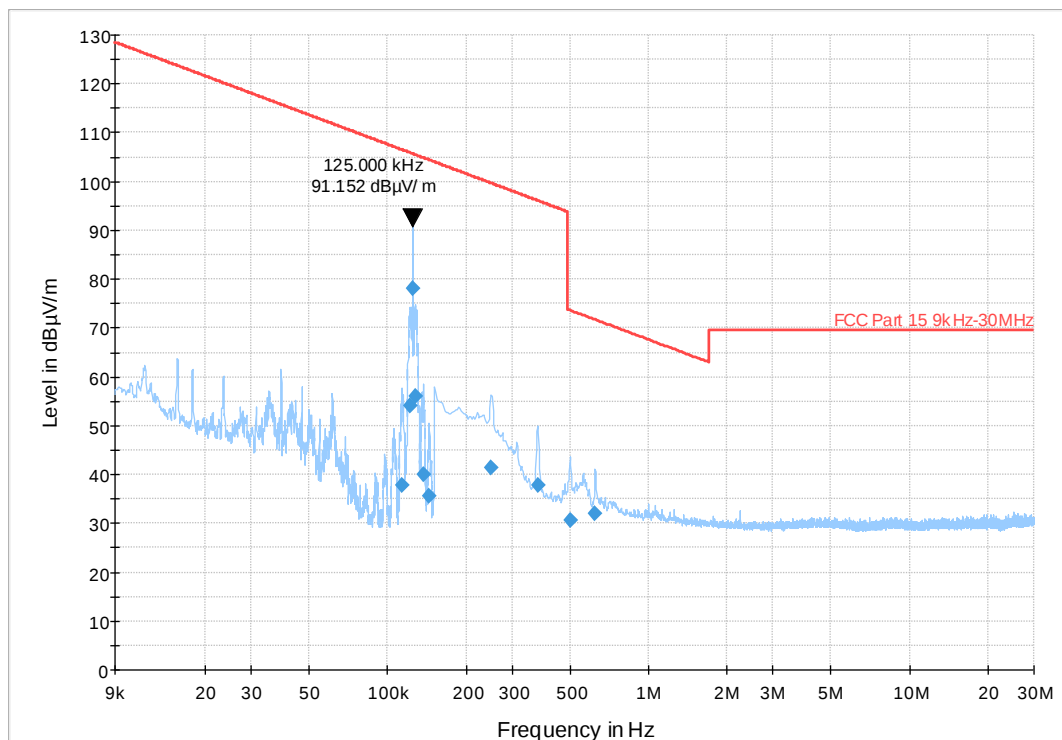
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Vertical 1

Antenna EUT axis: X

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.113300	37.84	106.51	68.66	2000.0	0.200	155.0	V	180.0
0.122400	54.00	105.84	51.83	2000.0	0.200	155.0	V	330.0
0.125000	78.02	105.65	27.63	2000.0	0.200	155.0	V	0.0
0.127650	56.00	105.47	49.47	2000.0	0.200	155.0	V	330.0
0.136700	40.01	104.88	64.87	2000.0	0.200	155.0	V	0.0
0.144550	35.59	104.39	68.80	2000.0	0.200	155.0	V	0.0
0.249000	41.33	99.66	58.34	5000.0	9.000	155.0	V	0.0
0.375000	37.85	96.11	58.25	5000.0	9.000	155.0	V	0.0
0.501000	30.64	73.61	42.97	5000.0	9.000	155.0	V	0.0
0.624750	32.10	71.69	39.59	5000.0	9.000	155.0	V	0.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

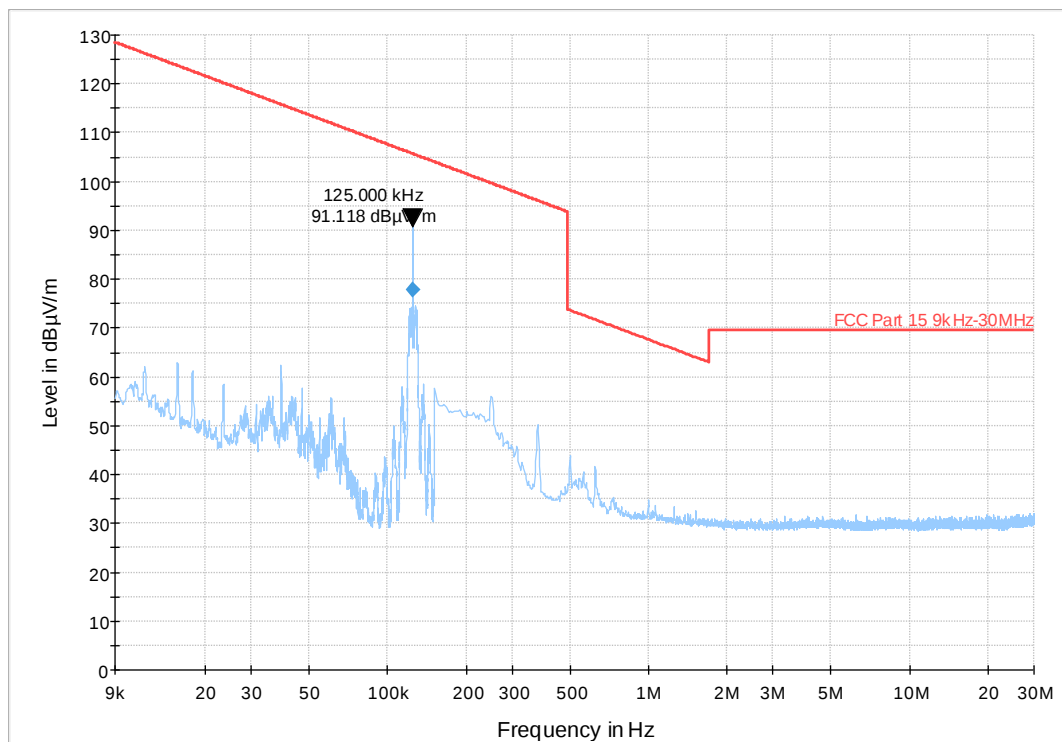
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Vertical 1

Antenna EUT axis: Y

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	77.96	105.65	27.69	2000.0	0.200	155.0	V	0.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

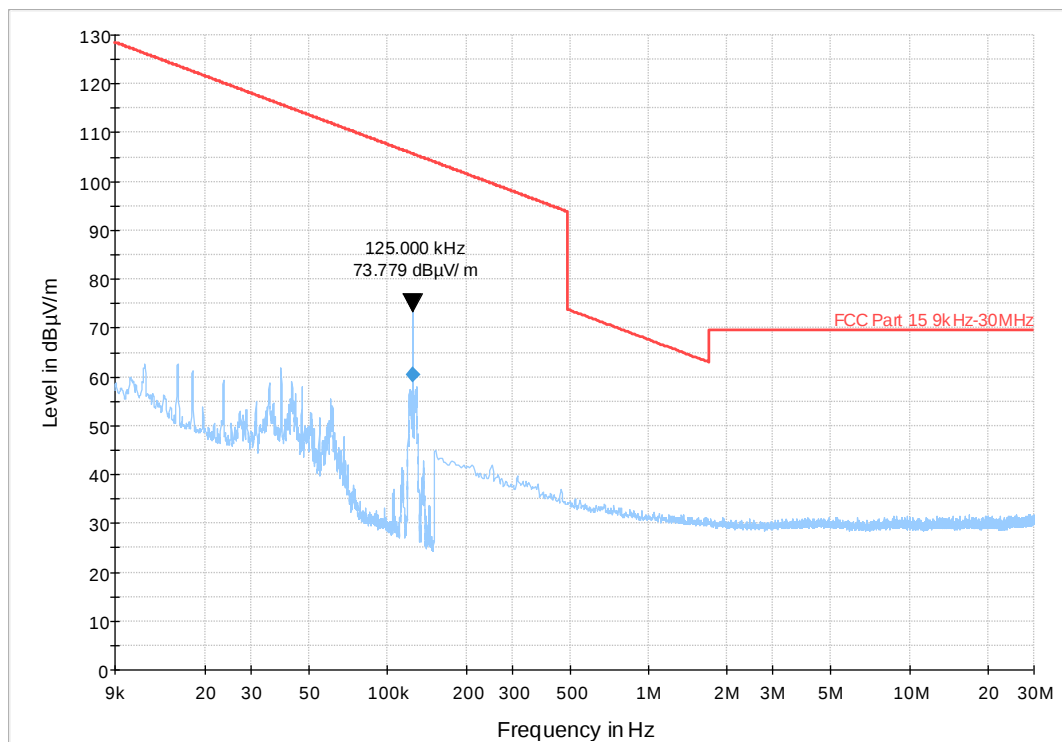
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Vertical 1

Antenna EUT axis: Z

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	60.57	105.65	45.08	2000.0	0.200	155.0	V	315.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

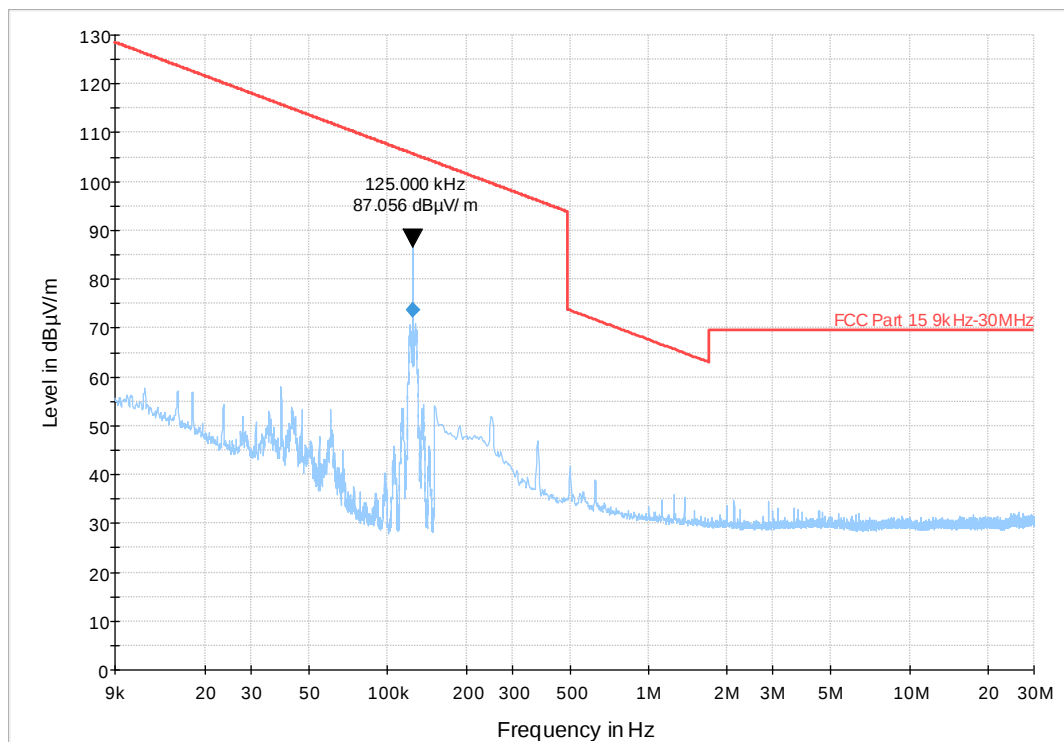
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Vertical 2

Antenna EUT axis: X

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	73.70	105.65	31.95	2000.0	0.200	155.0	V	78.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

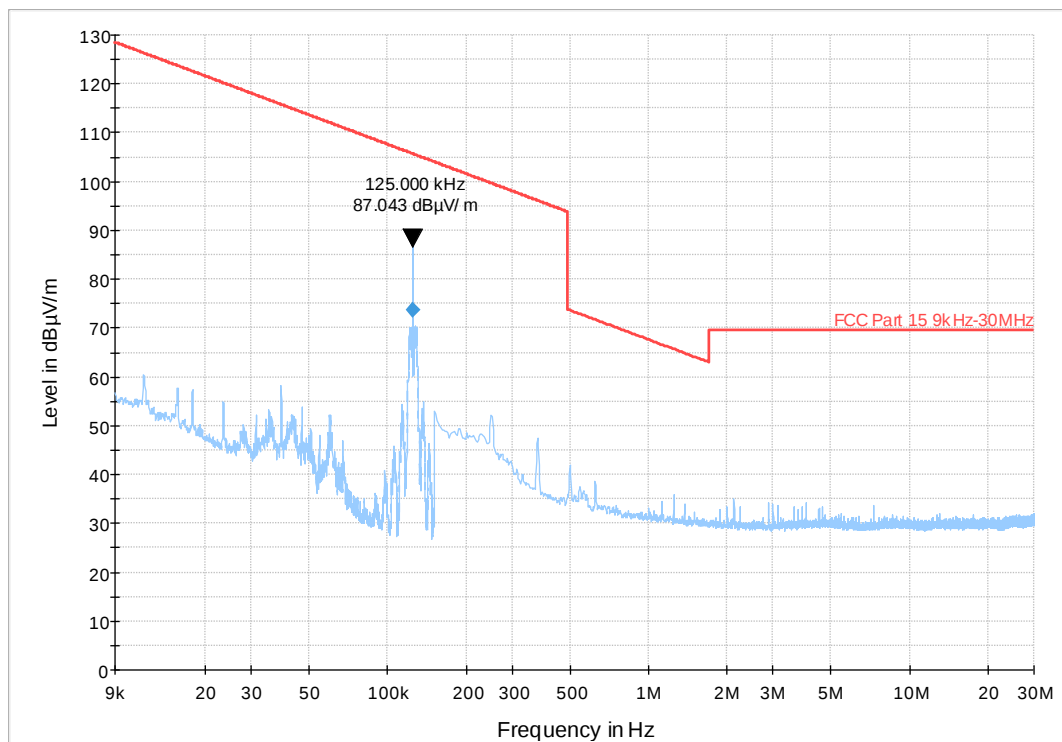
Frequency scan 9kHz-30MHz

Measurement distance: 3m.

Antenna polarization: Vertical 2

Antenna EUT axis: Y

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	73.63	105.65	32.02	2000.0	0.200	155.0	V	78.0

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Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

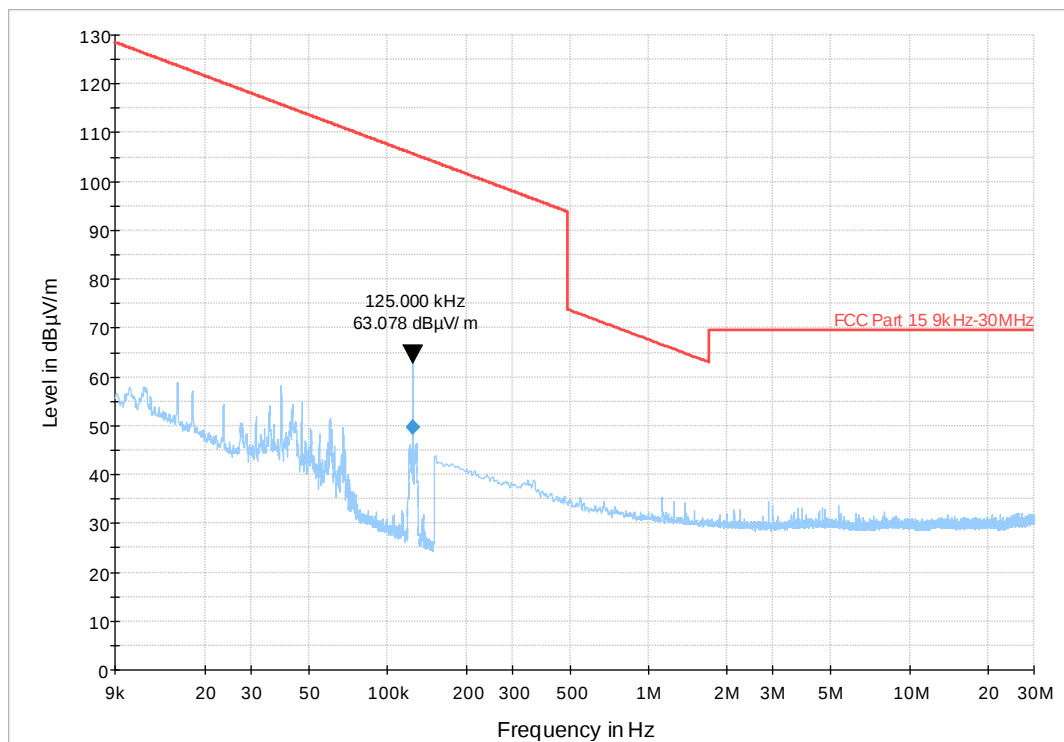
Frequency scan 9KHz-30MHz

Measurement distance: 3m.

Antenna polarization: Vertical 2

Antenna EUT axis: Z

Full Spectrum



Final Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
0.125000	49.75	105.65	55.90	2000.0	0.200	155.0	V	75.0

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Radiated emission test (30MHz – 1GHz)

Datum des Tests <i>Test date</i>	29-01-2021
Angewendete Norm <i>Applied Standard</i>	ANSI C63-4 2014
Prüfmethode <i>Test method</i>	§ 8 of ANSI C63-4 2014
Temperatur (°C) <i>Temperature</i>	22°
Luftfeuchte (% rH) <i>Humidity</i>	45%
Luftdruck (mbar) <i>Air pressure</i>	1012
Bearbeiter <i>Tested by</i>	Francesco Lombardi
Modellbezeichnung <i>Model</i>	BHD21
Prüfmuster-Nr. <i>Test sample No.:</i>	1 (Storage 210023/1)
Betriebsart <i>Operating mode</i>	1
Anschlüsse <i>Tested terminals</i>	Enclosure
Bemerkung <i>Remarks</i>	None

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Verwendete Prüfmittel
Used test equipment

Type	Hersteller <i>Manufacturer</i>	Model	ID	Kalibriert am <i>Last calibration</i>	Kalibriert bis <i>Next calibration</i>
Semi-anechoic Chamber	ETS Lindgren	FACT3	2782378	05/2020	05/2022
Biconical Antenna	ETS Lindgren	3142E	2782354	09/2018	09/2021
EMI Receiver	Rohde&Schwarz	ESW44	2782867	05/2020	05/2021
Software EMC32	Rohde&Schwarz	10.60.15	---	---	---

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Messdiagramme zu
Graphical presentation of radiated emission

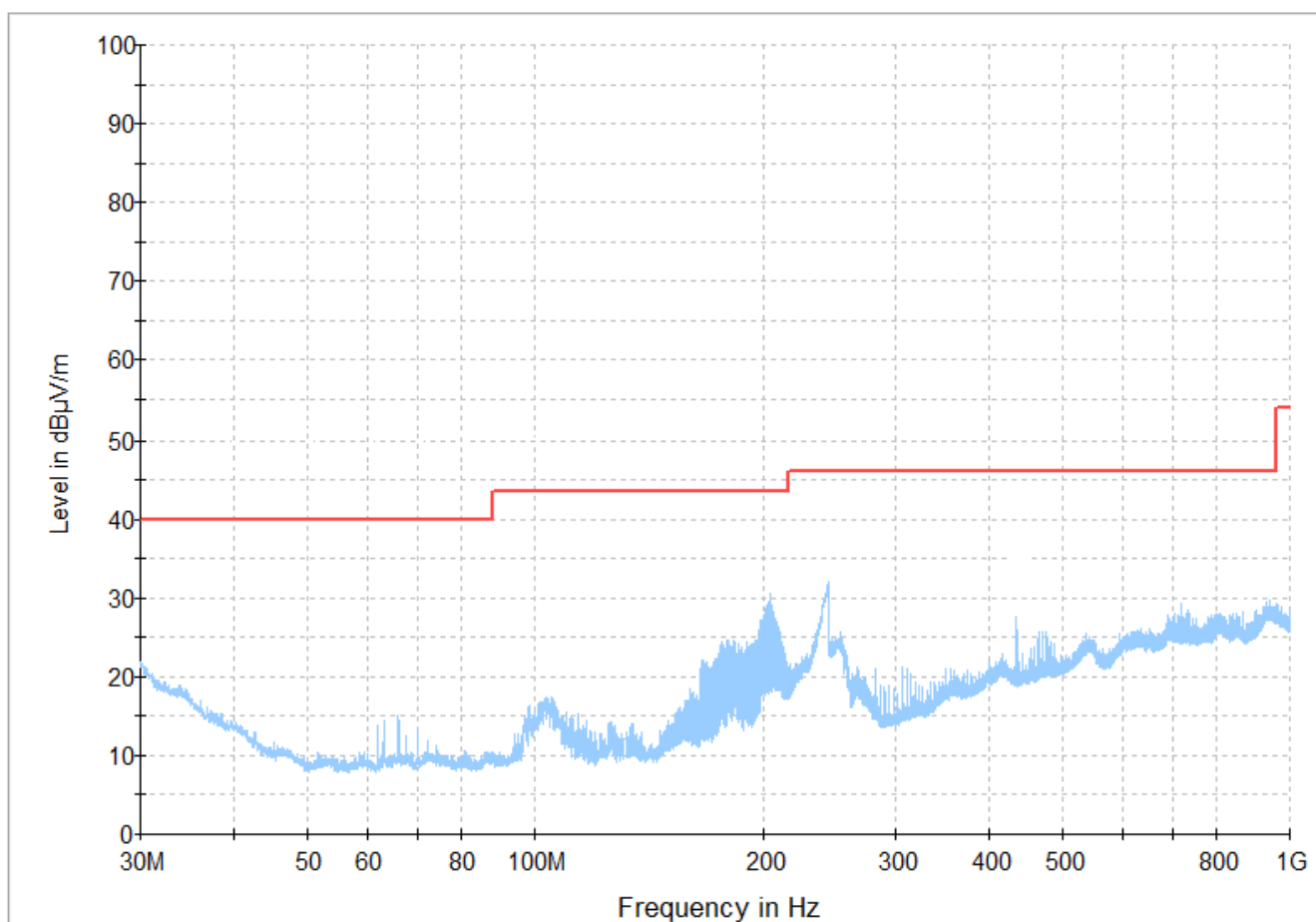
Radiated emission

Polarization Horizontal

Frequency scan 30-1000MHz

Measurement distance: 3m.

Full Spectrum



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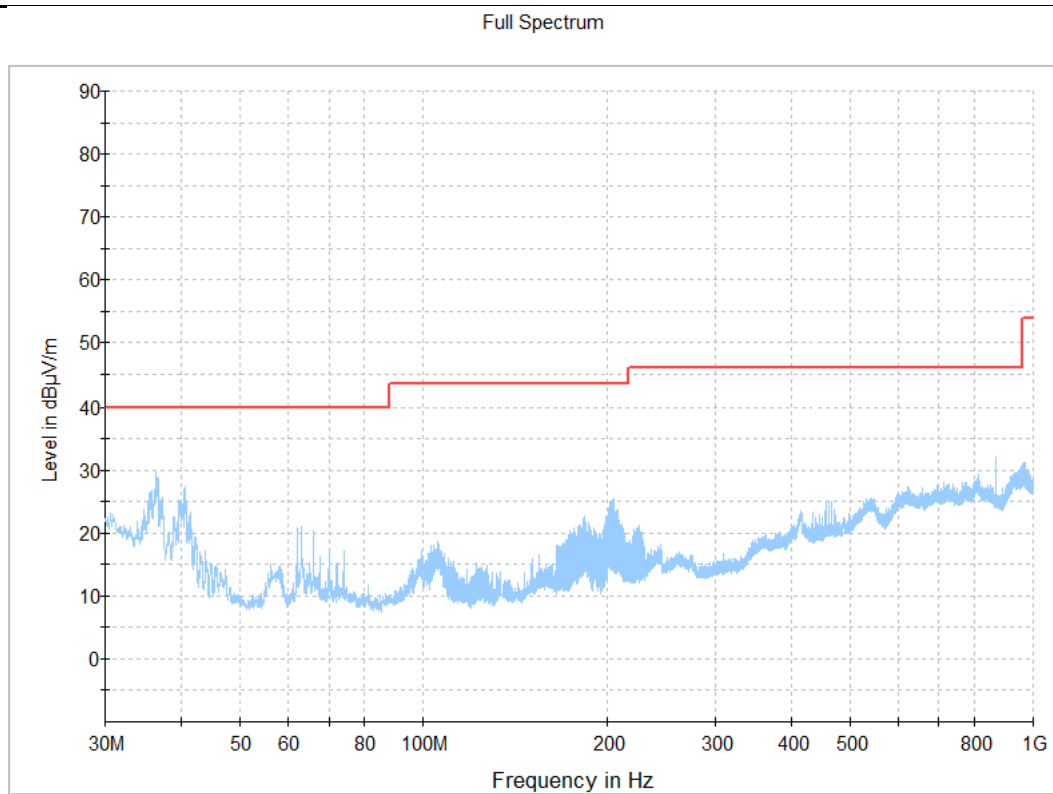
Messdiagramme zu
Graphical presentation of radiated emission

Radiated emission

Antenna polarization: Vertical

Frequency scan 30-1000MHz

Measurement distance: 3m.



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Conducted emission test

Datum des Tests <i>Test date</i>	---
Angewendete Norm <i>Applied Standard</i>	ANSI C63-4 2013
Prüfmethode <i>Test method</i>	§ 7 of ANSI C63-4 2013
Temperatur (°C) <i>Temperature</i>	---
Luftfeuchte (% rH) <i>Humidity</i>	---
Luftdruck (mbar) <i>Air pressure</i>	---
Bearbeiter <i>Tested by</i>	---
Modellbezeichnung <i>Model</i>	---
Prüfmuster-Nr. <i>Test sample No.:</i>	---
Betriebsart <i>Operating mode</i>	---
Anschlüsse <i>Tested terminals</i>	AC mains input/Output port
Bemerkung <i>Remarks</i>	EUT powered by vehicle battery In acc.to FCC part 15.207 (d): "Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits."
Software Version	---

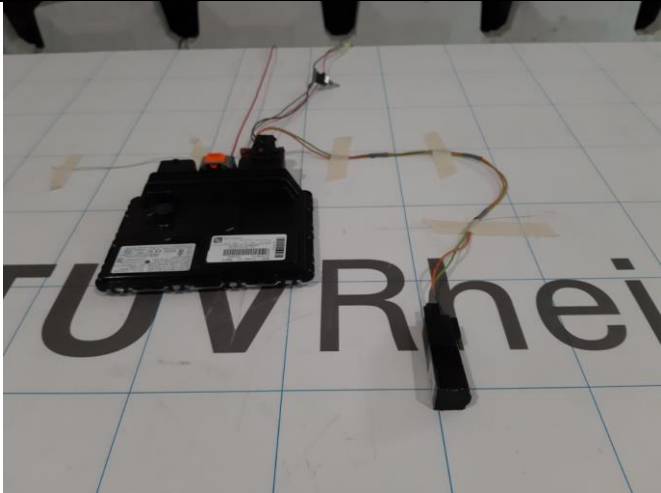
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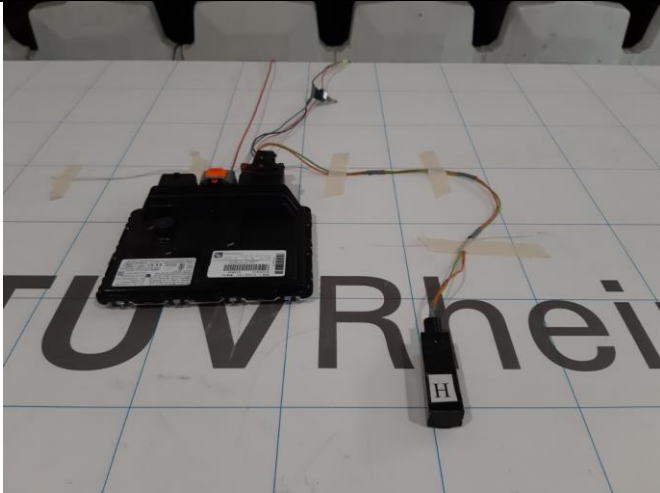
FOTODOKUMENTATION
 PHOTO DOCUMENTATION

EUT Testaufbau
 EUT Test setup (Antenna EUT axis)

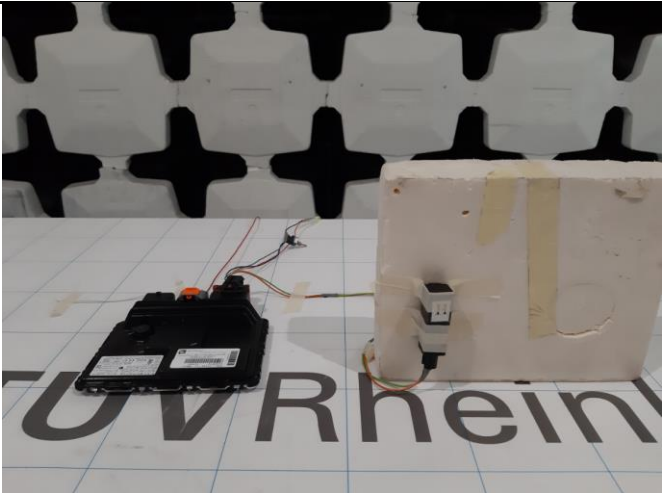
Asse Y



Asse X



Asse Z



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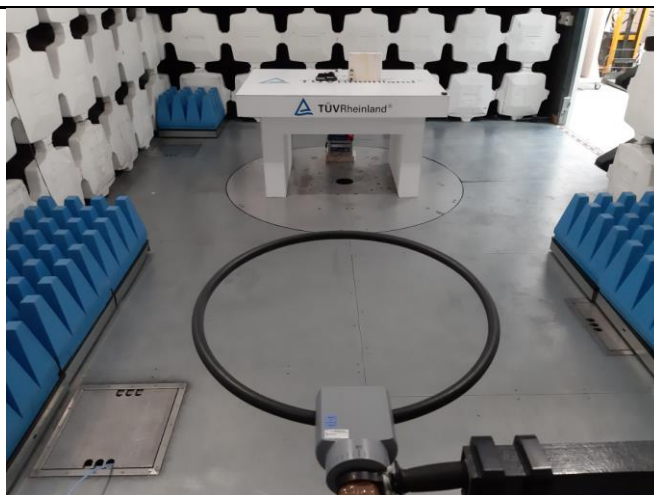
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EUT Testaufbau

EUT Test setup radiate emission (9KHz – 30Mhz)

Antenna polarization: H



Antenna polarization: V1



Antenna polarization: V2



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---END OF TEST REPORT---