

Prüfbericht-Nr.: <i>Test report no.:</i>	DE25ET8K 001	Auftrags-Nr.: <i>Order no.:</i>	1169982 200	Seite 1 von 12 <i>Page 1 of 12</i>
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	-	Auftragsdatum: <i>Order date:</i>	2024-03-07	
Auftraggeber: <i>Client:</i>	Siemens AG GWA, Werner von Siemens Strasse 48, Amberg 92220 Germany			
Prüfgegenstand: <i>Test item:</i>	MCCB with Electronic Trip Unit (3VA2plus, 3VA6plus)			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	ETU660 LSIG			
Auftrags-Inhalt: <i>Order content:</i>	Prüfung der Funkparameter nach FCC & ISSED <i>Test of radio parameters acc. to FCC & ISSED</i>			
Prüfgrundlage: <i>Test specification:</i>	Vollprüfung / Complete test RF exposure evaluation acc. to FCC CFR 47 Part 15 Subpart C §15.247 (i) acc. to RSS-102 issue 6			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2024-11-08	For reasons of confidentiality, no photos of the EUT are included in this report. For EUT and test setup photos please see the Photo Documentation to this report Number.		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003859606-001 to 018			
Prüfzeitraum: <i>Testing period:</i>	2025-02-11 - 2025-08-04			
Ort der Prüfung: <i>Place of testing:</i>	Nürnberg <i>Nuremberg</i>			
Prüflaboratorium: <i>Testing laboratory:</i>	Wireless Labor <i>Wireless Test Lab</i>			
Prüfergebnis*: <i>Test result*:</i>	Pass			
zusammengestellt von: <i>compiled by:</i>	29.09.2025 	genehmigt von: <i>authorized by:</i>	29.09.2025 	
Datum: <i>Date:</i>	Signiert von: Primoz Erzen	Ausstellungsdatum: <i>Issue date:</i>	Signiert von: Matthias Kraeutlein	
Stellung / Position:	Sachverständige(r)/Expert	Stellung / Position:	Sachverständige(r)/Expert	
Sonstiges / <i>Other:</i>				
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>			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
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Anmerkungen Remarks

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. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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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 Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2023, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2023, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>
5	Wenn auf dem Bericht kein Akkreditierungshinweis aufgebracht ist, wurde der Bericht nicht im akkreditierten Bereich erstellt und ist folglich auch nicht vom EA MLA abgedeckt. Unabhängig davon wurde der Bericht auf Basis der allgemeinen Regeln der ISO/IEC 17000er Reihe erstellt. Mit "#" gekennzeichnete Prüfungen sind nicht Bestandteil der Akkreditierung D-PL-14169-03-00. <i>If there is no accreditation notice on the report, the report has not been produced in the accredited area and is consequently not covered by the EA MLA. Regardless of this, the report has been prepared based on the general rules of the ISO/IEC 17000 series. Tests marked with "#" are not covered by the accreditation D-PL-14169-03-00.</i>

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Produktbeschreibung
Product description

1	Test item	MCCB with Electronic Trip Unit (3VA2plus, 3VA6plus)
2	Typ-No.	ETU660 LSIG
3	Identical Types	ETU650 LSI
4	Test sample obtaining	☒ Sampling by customer ☐ Sampling by TÜV Rheinland Group ☐ others:
5	Serial-No.	-
6	Supported radio technologies evaluated in this report	BLE 5.0 and ZigBee
7	Supported radio technologies not evaluated in this report	-
8	Description of EUT	Molded Case Breaker (MCCB)
9	Max RF output power (measured)	BLE: -8.3 dBm ZigBee: -8.6 dBm
10	Operating Frequency (declared)	BLE: 2402 to 2480MHz ZigBee: 2405MHz to 2480MHz
11	Channel Bandwidth (declared)	BLE: 2MHz ZigBee: 5MHz
12	Number of Channels	BLE: 40 ZigBee: 16
13	Modulation	BLE: GFSK ZigBee: OQPSK
14	Rated Voltage / Frequency	24V DC
15	Radio IC details	EFR32MG24A410F1536IM40-BR
16	FCC ID details	FCC ID: 2AJRO-ETU6
17	IC & HVIN Details	IC: 22001-ETU6 & HVIN: ETU6
18	Radio Module / Antenna Type	☒ Radio module with antenna on module PCB ☐ Radio module with dedicated antenna ☐ Radio module with user accessible antenna connector
19	Antenna Name	Yageo/ ANT3216LL00R2400A
20	Antenna Type	☒ Integral antenna (designed as a fixed part of the EUT) ☐ Dedicated antenna (removable, obligation to be used) ☐ Permanent antenna connector
21	Antenna number of chains	1
22	Antenna Gain (declared)	5.05 dBi
23	Software / Firmware Version	ETU_SDK422_ChipSet 6.sdk
24	Hardware Versiön	TL2
25	Provided Samples	A003859606-001 to 018
26	Conducted measurements sample	A003859606-016
27	Radiated measurements sample	A003859606-018
28	Companion Device used for radio connection with the EUT	EUT in Test Mode. Therefore, no Companion Device was used.
29	Auxiliary equipment used to set up the EUT	Customer Laptop with Config Tool V16
30	Data Cable	USB type C cable was used to configure the Radio
31	Temperature Range	-25°C - +70°C
32	Environment	Indoor

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1 Registration

The measurement facilities for conducted and radiated disturbance measurements of the TÜV Rheinland LGA Products have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules. Measurement data will be accepted in conjunction with applications for Certification under Parts 15 and 18 of the Commission's Rules.

FCC Registration Number: 939976

Bundesnetzagentur Registration Number: BNetzA-CAB-17/21-16

The measurement facilities are also recognized by Innovation, Science and Economic Development (ISED) Canada to test to Canadian radio equipment requirements.

Company Number: 11235A

CAB Identifier: DE0018

2 EUT Classification

2.1 Wireless technologies and frequencies supported by the EUT.

Technology	Used Test report for evaluation	Applied standard in the used Test report FCC CFR 47 Part 15	Band (TX)	Band f _{Range} TX [MHz]	Evaluated in this report
BLE 5.0	DE25US5M 001	Subpart C - §15.247	2.4GHz	2400 – 2483.5	☒
ZigBee	DE25ZJE0 001	Subpart C - §15.247	2.4GHz	2400 – 2483.5	☒

2.2 Technical data summary taken from Test reports in 2.1

2.2.1 Maximum Time Averaged Power (conducted) used in Test report

Technology	Frequency Band (TX)	Band F _{Lowest} TX [MHz]	P _{max} conducted [dBm]	Ant. Gain [dBi]	P _{max} EIRP [dBm]
BLE 5.0	2.4GHz	2400	-8.3	5.05	-3.25
ZigBee	2.4GHz	2400	-8.6	5.05	-3.55

Measurement values from the test reports are measured conducted as dBm values (without Antenna Gain correction) and corrected to be EIRP values by using the following formula:

$$P_{\max} \text{ EIRP [dBm]} = P_{\max} \text{ conducted [dBm]} + \text{Antenna Gain [dBi]}.$$

2.3 Standard specific classification of the EUT

2.3.1 Applied FCC standards

FCC CFR 47 Part 15 Subpart C §15.247 (i)

FCC CFR 47 Part 1 Subpart I §1.1310 (limits) (e)(1) (limits)

FCC KDB 447498 D04 v01 – Interim General RF Exposure procedures Guidance (Procedures and Equipment Authorization Policies for Mobile and Portable Devices)

2.3.2 Applied ISED standards

RSS-GEN (General Requirements for Compliance of Radio Apparatus)

RSS-102 issue 6 (Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus)

Health Canada's Safety Code 6 (2015)

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2.3.3 Exposure conditions

	Type of exposure
☒	General public exposure
☐	Occupational exposure

	Separation distance – Intended usage location
☐	< 20 cm – portable
☐	Body-worn device -
☐	Limb-worn device -
☐	Head exposure device -
☐	Implanted device
☒	≥ 20 cm
☒	Fixed device (physically secured at one location, even temporarily) specific mitigation actions are required
☐	Mobile device

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3 Test results in detail FCC RF exposure evaluation

Radio frequency devices operating under the provisions of FCC CFR 47 Part 15 Subpart C - §15.247 (i) or are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093, as appropriate.

3.1 Maximum Permissible Exposure Evaluation (MPE) Mobile device or fixed RF source

3.1.1 Description

For operations within the frequency range of 300 kHz and 6 GHz (inclusive), the limits for maximum permissible exposure (MPE), derived from whole-body SAR limits and listed in Table 1 to § 1.1310(e)(1), may be used instead of whole-body SAR limits to evaluate the environmental impact of human exposure to RF radiation as specified in § 1.1307(b) of this part, except for portable devices as defined in § 2.1093 of this chapter as these evaluations shall be performed according to the SAR provisions in § 2.1093.

3.1.2 Limits

Limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields from §1.1310(e)(1) are shown in the table below.

Table 1 to § 1.1310(e)(1) - Limits for Maximum Permissible Exposure (MPE)				
Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

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

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3.1.3 Evaluation for Technologies assumed to be in far field at the distance d

In the far-field zone of an electromagnetic source, electric field strength, magnetic field strength and power density are interrelated by simple mathematical expressions, where any one of these parameters defines the remaining two.

For the MPE evaluation the maximum measured output powers $P_{\max}$ for each Band from the above-mentioned test reports are considered.

With these, the respective power densities S in a distance of d can be calculated with $S = \frac{P_{\max}}{4\pi d^2}$. For this calculation $P_{\max}$ has to be specified as or transferred to an EIRP Value.

As some limits are frequency dependent, for each Band the limit is calculated based of the lowest band edge frequency f_{Lowest} .

Technology	Frequency Band	d [cm]	f_{Lowest} [MHz]	$P_{\max}$ EIRP [dBm] Note 1	$P_{\max}$ Including tune-up tolerance EIRP [dBm] Note 2	$P_{\max}$ EIRP [mW]	S [mW/cm ²]	S_L [mW/cm ²]	S/ S_L
BLE 5.0	2.4GHz	20	2400	-8.3	-3.25	0.47	0.000094	1.0000	0.0001
ZigBee	2.4GHz	20	2400	-8.6	-3.55	0.44	0.000088	1.0000	0.0001

Note 1: Measurement values from the above-mentioned test reports are measured conducted as dBm values (without Antenna Gain correction) and corrected to be EIRP values by using the following formula:
 $P_{\max} \text{ EIRP [dBm]} = P_{\max} \text{ conducted [dBm]} + \text{Antenna Gain [dBi]}$; (Declared Antenna Gain = 5.05 dBi)

Note 2: A tune-up tolerance of 0.5 dB is considered for the MPE evaluation, as declared by the customer.

Note 3: Only one of the BLE or ZigBee radios operate at any given time.

3.1.4 Final evaluation

The equipment meets the requirements according to §15.247 (i) since the calculated result for the power density is below the applicable limit from §1.1310(e)(1)

3.1.5 Final test result

Final test result	Pass
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4 Test results in detail ISED RF exposure Compliance

Radio frequency devices operating under the provisions of RSS-Gen are subject to the radio frequency radiation exposure requirements specified in RSS-102.

Test reduction methods employed to reduce the testing burden and ensure timely access to the Canadian market are accepted. However, the allowance to apply test reduction methods does not constitute an exemption from compliance with the applicable exposure limit(s) and the other relevant requirements. The use of any test reduction methods for certification purposes does not prevent ISED from employing enforcement measures regarding non-compliances with Health Canada's Safety Code 6 limits specified in this document; including those that are outside of the scope of test reduction methods.

The specific test reduction methods for NS, SAR, APD, IPD and FRL are outlined in each specific standard.

4.1 ISED Maximum Exposure Requirements

According to RSS-102 issue 6, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6 (2015) and its Notice. Any updates to Safety Code 6 and/or its Notice will supersede the values outlined in RSS-102 issue 6

4.1.1 . Electric and Magnetic Field Strength (3 kHz - 10 MHz)

4.1.2 Electric Field Strength, Magnetic Field Strength and Power Density (10 MHz - 300 GHz)

According to the limits of human exposure in Safety Code 6 clause 2.2.2:

To ensure compliance with the basic restrictions at frequencies between 10 MHz and 300 GHz, the reference levels for electric- and magnetic-field strength and power density must be complied with.

Table 5. Reference Levels for Electric Field Strength, Magnetic Field Strength and Power Density in Uncontrolled Environments

Frequency (MHz)	Electric Field Strength (E_{RL}), (V/m, RMS)	Magnetic Field Strength (H_{RL}), (A/m, RMS)	Power Density (S_{RL}), (W/m ²)	Reference Period (minutes)
10 - 20	27.46	0.0728	2	6
20 - 48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{0.5}$	6
48 - 300	22.06	0.05852	1.291	6
300 - 6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000 - 15000	61.4	0.163	10	6
15000 - 150000	61.4	0.163	10	$616000 / f^{1.2}$
150000 - 300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000 / f^{1.2}$

Frequency, f , is in MHz.

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Table 6. Reference Levels for Electric Field Strength, Magnetic Field Strength and Power Density in Controlled Environments

Frequency (MHz)	Electric Field Strength (E _{RL}), (V/m, RMS)	Magnetic Field Strength (H _{RL}), (A/m, RMS)	Power Density (S _{RL}), (W/m ²)	Reference Period (minutes)
10 - 20	61.4	0.163	10	6
20 - 48	129.8 / $f^{0.25}$	0.3444 / $f^{0.25}$	44.72 / $f^{0.5}$	6
48 - 100	49.33	0.1309	6.455	6
100 - 6000	15.60 $f^{0.25}$	0.04138 $f^{0.25}$	0.6455 $f^{0.5}$	6
6000 - 15000	137	0.364	50	6
15000 - 150000	137	0.364	50	616000 / $f^{1.2}$
150000 - 300000	0.354 $f^{0.5}$	9.40×10 ⁻⁴ $f^{0.5}$	3.33×10 ⁻⁴ f	616000 / $f^{1.2}$

Frequency, f , is in MHz.

4.1.2.1 Evaluation for Technologies assumed to be in far field at the distance d

In the far-field zone of an electromagnetic source, electric field strength, magnetic field strength and power density are interrelated by simple mathematical expressions, where any one of these parameters defines the remaining two.

For the Maximum Exposure evaluation the maximum measured output powers $P_{\max}$ for each Band from the above-mentioned test reports are considered.

With these, the respective power densities S in a distance of d can be calculated with $S = \frac{P_{\max}}{4\pi d^2}$. For this calculation $P_{\max}$ has to be specified as or transferred to an EIRP Value.

As some limits are frequency dependent, for each Band the limit is calculated based of the lowest band edge frequency f_{Lowest} .

Technology	Frequency Band	d [cm]	f_{Lowest} [MHz]	$P_{\max}$ EIRP [dBm] Note 1	$P_{\max}$ Including tune-up tolerance EIRP [dBm] Note 2	$P_{\max}$ EIRP [mW]	S [W/m ²]	S_L [W/m ²]	S/S_L
BLE 5.0	2.4GHz	20	2400	-8.3	-3.25	0.47	0.000935	5.34776	0.0002
ZigBee	2.4GHz	20	2400	-8.6	-3.55	0.44	0.000875	5.34776	0.0002

Note 1: Measurement values from the above-mentioned test reports are measured conducted as dBm values (without Antenna Gain correction) and corrected to be EIRP values by using the following formula:
 $P_{\max} \text{ EIRP [dBm]} = P_{\max} \text{ conducted [dBm]} + \text{Antenna Gain [dBi]}$; (Declared Antenna Gain = 5.05 dBi)

Note 2: A tune-up tolerance of 0.5 dB is considered for the MPE evaluation, as declared by the customer.

Note 3: Only one of the BLE or ZigBee radios operate at any given time.

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4.1.3 Final evaluation

The equipment meets the requirements according to Safety Code 6 clause 2.2.2 since the calculated result for the power density is below the applicable limit.

4.1.4 Final test result

The equipment is compliant according to Health Canada Safety Code 6 (2015).

Final test result	Pass
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Änderungsverzeichnis
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5 Change history

Revision Number	List of revisions
001	Initial Release
Note: Latest revision report will replace all previous reports.	

Ende des Prüfberichts
End of Test Report