

Test report

according to ISO/IEC 17025:2017

FCC (Federal Communications Commission) Test Firm Registration Number: 768032 Designation Number DE0022

ISED (Inovation, Science and Economic Development) CAB identifier: DE0012 ISED#: 6155A

Electromagnetic compatibility

Intentional Radiators



DAKKS Deutsche Akkreditierungsstelle D-PL-17379-01-00 D-PL-17379-01-02 D-PL-17379-01-03 Bundesnetzagentur

BNetzA-CAB-18/21-19



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Test report no .:

20/01-0029

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Location of test facility:



STC Germany GmbH Ohmstrasse 1 84160 Frontenhausen Germany

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1. Client information

Name:	Vestel Elektronik San ve Tic. A.S.
Address:	Organize Sanayi Bölgesi Vestel City, High-End 45030 MANISA TURKEY
Name of contact:	Mr. Andac Pamuk
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E-mail:	Andac.pamuk@vestel.com.tr

2. Equipment under test (EUT)

2.1 Identification of the EUT

Equipment:	Bluetooth Module (Bluetooth 4.2 without Bluetooth low energy)
Model:	17BT02
Brand name:	-/-
Serial no.:	-/-
Manufacturer:	Vestel Elektronik San ve Tic. A.S., Organize Sanayi Bölgesi, Vestel City, High-End, 45030 MANISA, TURKEY
Country of origin:	TURKEY
Power rating:	4,75 V – 5,25 V nominal 5 V – via USB
Highest frequency generated or used in the device or on which the device operates or tunes (MHz):	2.48 GHz
Date Sample Received:	16.01.2020
Tests were performed:	17.02.2020 – 25.06.2020

2.2 Additional information about the EUT:

-/-

To duplicate parts of this test report needs the written confirmation of the test laboratory.

The test results relate only to the above mentioned test sample(s).

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3. Description of the Equipment under test and test conditions

FCC-ID:	2AVQS-17BT02						
IC:	25888-17BT02						
HVIN:	240419R1						
Power:	4.75 V – 5.25 V nominal 5 V – via USB						
Cables:	Cable to test adaptor 75	cm					
	USB cable 100 cm						
Approx. Size (I x w x h):	(42 x 12 x 8) mm						
Test conditions:	The "Bluetooth Module (Bluetooth 4.2 without Blue	tooth low energy) –				
	17BT02" (= equipment u	nder test – EUT) had beei	n tested, where				
	applicable, in the followir	ng modes:					
	(1) Bluetooth 4.2: T	x mode GFSK 2402.0 MH	z				
	(2) Bluetooth 4.2: T	x mode GFSK 2441.0 MH	z				
	(3) Bluetooth 4.2: T	x mode GFSK 2480.0 MH	Z				
	(4) Bluetooth 4.2: T	x mode $\pi/4$ -DQPSK 2402	2.0 MHz				
	(5) Bluetooth 4.2: 1	x mode $\pi/4$ -DQPSK 2441	.0 MHz				
	(6) Bluetooth 4.2: 1 (7) Bluetooth 4.2: T	X mode π/4-DQPSK 2480	U.U MHZ				
	(7) Bluetooth 4.2. T	x mode 8DPSK 2402.0 M					
	(9) Bluetooth 4.2: T	x mode 8DPSK 2441.0 M	Hz				
	with controlled by a test	software with maximum R	F-output power and				
	different data rate in orde	er to find the worst case.					
Additional information:	-/-						
RF Module Model Number:	17BT02						
Frequency range:	2.400 GHz – 2.483,5 GH	lz					
Operating frequencies:	2.402 GHz – 2.480 GHz						
Module Tranmission Type:	Bluetooth 4.2 (FHSS)						
Modulation:	GFSK	π/4-DQPSK	8DPSK				
Date Rates:	1 MBit/s	2 MBit/s	3 MBit/s				
Channel separation:	1 MHz	1 MHz	1 MHz				
Number of channels:	79	79	79				
Spurious Emissions:	37.2 dBu\//m @ 3.m	37.4 dBu\//m @ 3.m	37.9 dBu\//m @ 3.m				
radiated lowest margin to limit	57.2 αΒμ v/m ⊚ 5 m	07.4 dbµ v/m ⊜ 0 m	57.5 α Β μ 7/m ⊗ 5 m				
Environmental conditions during	Ambient temperature:	20 °C					
tests:	Relative humitity	40 %					
	Atmospheric pressure	965 mbar					
Antenna specification:	Model: Printed PCB Ant	enna					
	Gain: max. 0.84 dBi						
	Type: External (with accessible antenna socket)						
	🖂 Internal (integrated, PCB antenna)						
Test standard:	- e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C						
	§15.247: Operation within the bands 902-928 MHz, 2400-2483.5						
	MHz, and 5725-5850 MHz						
	- KSS-247 ISSUE UZ FEDRUARY 2017 Digital Transmission Systems (DTSs) Frequency Henrice						
	Systems (FHSs) and Licence-Exempt Local Area Network						
	Systems (FHSS) and Licence-Exempt Local Area Network						
		63	(LE-LAN) Devices				

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Bluetooth 4.2

Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	42	2444
1	2403	43	2445
2	2404	44	2446
3	2405	45	2447
4	2406	46	2448
5	2407	47	2449
6	2408	48	2450
7	2409		
8	2410	70	2472
9	2411	71	2473
		72	2474
36	2438	73	2475
37	2439	74	2476
38	2440	75	2477
39	2441	76	2478
40	2442	77	2479
41	2443	78	2480

4. Performed measurements and results

The complete list of measurements required in e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C §15.247 is given below.

Standard:	Standard:	Test Method:			Test requirements:			
				applic	cable:	fulfil	led:	
				yes	no	yes	no	
§ 15.207	RSS-Gen issue 5	ANSI 63.10 Section 6.2	AC Mains Conducted Emissions			\square		
§ 15.209	RSS-Gen issue 5	ANSI 63.10 Section 6.3 - 6.6	Radiated Emissions	\boxtimes		\boxtimes		
§15.247	RSS-247 issue 2	ANSI 63.10 Section 7.8.7	20 dB Bandwidth	\boxtimes		\boxtimes		
§15.247	RSS-247 issue 2	ANSI 63.10 Section 7.8.5	Output Power of Fundamental Emissions			\boxtimes		
§15.247	RSS-247 issue 2	ANSI 63.10 Section 7.8.3	Number of Operating Channel	\boxtimes		\boxtimes		
§15.247	RSS-247 issue 2	ANSI 63.10 Section 7.8.2	Carrier Frequency Separation	\boxtimes		\boxtimes		
§15.247	RSS-247 issue 2	ANSI 63.10 Section 7.8.6	Band Edges Measurement			\boxtimes		
§15.247	RSS-247 issue 2	ANSI 63.10 Section 7.8.4	Occupancy Time (Dwell time)	\square		\square		
	RSS-Gen issue 5	ANSI 63.10 Section 6.9.3	99% Power Bandwidth	\boxtimes		\boxtimes		

All required / applicable tests according to the following standards were performed under Ref-No. 20/01-0029.

- e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C §15.247 with test Method according to ANSI C63.10-2013

-RSS-247 issue 02 February 2017 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

- e-CFR data is current as of June 23, 2020

Remark: -/-



5. AC Mains conducted emissions

Applied standards

-e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C, § 15.207 Conducted limits -RSS-Gen issue 05 section 8.8

Test site

Measurements of conducted emission from EUT was made in the shielded chamber (DC - 10GHz) located in the test facility.

Test equipment and test set up

Test equipment used for conducted measurements on Mains as given in clause Test equipment of this report.

Test setup used for conducted measurements on Mains as given in clause Test setups of this report.

Detector function selection and bandwidth

In conducted emissions measurement CISPR quasi-peak- and average-detector were used. The bandwidth of the detector of instrument is 10 kHz over the frequency range of 150 kHz to 30 MHz.

Frequency range to be scanned

For conducted emission measurements, the spectrum in the range of 150 kHz to 30 MHz was investigated.

Test conditions and configuration of EUT

The EUT was configured and operated under following operation modes:

- 1. EUT active Transmitting 8DPSK in hopping mode
- 2. EUT active Transmitting $\pi/4$ -DQPSK in hopping mode
- 3. EUT active Transmitting GFSK in hopping mode
- 4. EUT active Receiving

All modes are investigated by operating the EUT in a range of typical modes of operation, with typical cable positions, and with a typical system equipment configuration and arrangement. For each mode of operation and for each ac power current-carrying conductor, cable manipulation are performed within the range of likely configurations. The highest values measured are shown in the table below. The corresponding configuration is shown in the "Photo(s) of test setup".

The EUT was placed on a 80 cm high non metallic table. Measurements were performed on the AC terminals of the Host AC-Adaptor (Laptop), on neutral (N)- and live (L1)-wire had been performed.

Requirements

Frequency Range	Quasi-Peak Limits	Average Limits				
[MHz]	[dBµV]	[dBµV]				
0.15 - 0.5	66 to 56 Note 1	56 to 46 Note 1				
0.5 - 5.0	56	46				
5.0 - 30.0 60 50						
Note 1: The level decreases linearly with the logarithm of the frequency						

Measurement

Measruement performed on 24.02.2020

As worst cases the mode No. 1. with Transmitting 8DPSK in hopping mode was found and documented in this report.









The six highest emissions for each port (L/N)/detector are as following:

Frequency [MHz]	Reading of test receiver	Detector	Port	loss of cable between LISN and test	LISN correction [dB]	AC power line conducted	Limit [dBµV]	Result
	[αΒμν]			receiver [dB]		emission		
(1)	(2)	(3)	(4)	(5)	(6)	[αΒμν] (7)	(8)	(9)
(1)	(2)	(5)	(+)	(3)		(')	(0)	(3)
0.44	38.3	QP	N	0.10	0.10	38.5	57.2	Pass
0.48	36.8	QP	N	0.10	0.10	37.0	56.4	Pass
-/-	-/-	QP	N	0.10	0.10	-/-	-/-	Pass
-/-	-/-	QP	N	0.10	0.10	-/-	-/-	Pass
-/-	-/-	QP	N	0.10	0.10	-/-	-/-	Pass
-/-	-/-	QP	Ν	0.10	0.10	-/-	-/-	Pass
0.44	32.9	AV	Ν	0.10	0.10	33.1	47.2	Pass
0.48	35.5	AV	Ν	0.10	0.10	35.7	46.4	Pass
-/-	-/-	AV	Ν	0.10	0.10	-/-	-/-	Pass
-/-	-/-	AV	Ν	0.10	0.10	-/-	-/-	Pass
-/-	-/-	AV	Ν	0.10	0.10	-/-	-/-	Pass
-/-	-/-	AV	Ν	0.10	0.10	-/-	-/-	Pass
0.44	38.1	QP	L1	0.10	0.10	38.3	57.2	Pass
0.48	36.5	QP	L1	0.10	0.10	36.7	56.4	Pass
-/-	-/-	QP	L1	0.10	0.10	-/-	-/-	Pass
-/-	-/-	QP	L1	0.10	0.10	-/-	-/-	Pass
-/-	-/-	QP	L1	0.10	0.10	-/-	-/-	Pass
-/-	-/-	QP	L1	0.10	0.10	-/-	-/-	Pass
0.44	33.6	AV	L1	0.10	0.10	33.8	47.2	Pass
0.48	34.9	AV	L1	0.10	0.10	35.1	46.4	Pass
-/-	-/-	AV	L1	0.10	0.10	-/-	-/-	Pass
-/-	-/-	AV	L1	0.10	0.10	-/-	-/-	Pass
-/-	-/-	AV	L1	0.10	0.10	-/-	-/-	Pass
-/-	-/-	AV	L1	0.10	0.10	-/-	-/-	Pass

(1) = test frequency

(2) = Reading of test receiver in $dB\mu V$ without correction factors

(3) = used detector

(4) = tested port Phase (live, L1) or Neutral (N)

(5) = loss of cable between LISN and test receiver in dB

(6) = correction factor of LISN in dB

(7) = Reading of test receiver [dBµV] (2) + loss of cable between Line impedance stabilisation network (LISN) and test receiver (dB) (5) + LISN correction [dB] (6)

(8) = relevant limit in $dB\mu V$

(9) = comparison between Limit $[dB\mu V]$ (7) / (8) and AC power line conducted emission $[dB\mu V]$

Results

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the **Conducted Emission**.



6. Radiated emission measurements

Test site

Measurement of radiated emissions from EUT was made in the semi-anechoic chamber SAC3 (DC to 40 GHz) located in the test facility.

Test equipment and test set up

Test equipment used for radiated measurements as given in clause Test equipment of this report. Test setup used for radiated measurements as given in clause Test setups of this report.

Detector function selection and bandwidth

In radiated emissions measurement, an EMI test receiver that have CISPR detectors was used.

Frequency range	Resolution Bandwidth
9KHz – 150kHz (Quasi Peak & Average* Detector)	200Hz
150KHz – 30MHz (Quasi Peak & Average* Detector)	9kHz
30MHz – 1GHz (Quasi Peak Detector)	120kHz
Above 1GHz (Peak & Average Detector)	1MHz

*Average Detector only in specify frequency range.

Antennas

Measurements were made using a calibrated loop antenna in the range 9 kHz - 30 MHz, as well as a calibrated bilog antenna in the range of 30 to 1000 MHz to determine the emission characteristics of the EUT. Measurements were also made for both horizontal and vertical polarization.

The horizontal distance between the receiving antenna and the EUT was 3 meters.

In the range of 1 GHz to 26 GHz measurements were made using a calibrated horn antenna to determine the emission characteristics of the EUT. Measurements were also made for both horizontal and vertical polarization. The horizontal distance between the receiving antenna and the EUT was 3 meters.

Frequency range to be scanned

For radiated emissions measurements, the spectrum in the range of 9kHz MHz to 26 GHz was investigated as the highest frequency generated/used in the EUT is 2.480 GHz.

Test conditions and configuration of EUT

The EUT was configured and operated under following operation modes:

- 1. EUT active Transmitting 8DPSK in single frequency mode
- 2. EUT active Transmitting $\pi/4$ -DQPSK in single frequency mode
- 3. EUT active Transmitting GFSK in single frequency mode
- 4. EUT active Receiving

During test the EUT was operated as specified in the user manual of the EUT. For frequencies below 1000 MHz the EUT was placed on a 80 cm and for frequencies above 1000 MHz the RF Transmitter modul was placed on a 150 cm high non metallic table placed on the turntable. The EUT was rotated and the antenna height was varied between 1 m to 4 m to find the maximum RF energy generated from EUT. The procedure according to ANSI C63.10:2013 is used and all modes are investigated by operating the EUT in a range of typical modes of operation, with typical cable positions, and with a typical system equipment configuration and arrangement. For each mode of operation, cable manipulation are performed within the range of likely configurations. The highest values measured are shown in the table below.

As worst cases the mode No. 1. Transmitting 8DPSK in single frequency mode was found and documented in this report.

Remarks:

-Correction factor included antenna factor and cable attenuation.

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Applied standards

-e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C, § 15.209 Radiated emission limits -RSS-Gen issue 05 section 8.9

Requirements

acc. e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C, § 15.209 Radiated emission limits

Frequency MHz	Limits [µV/m] Quasi-peak	Limits [dBµV/m] Quasi-peak	Limits [µV/m] Average	Limits [dBµV/m] Average	Test distance [m]
0.009 - 0.090	-/-	-/-	2400/F (kHz)	48.5 – 28.5	300
0.090 - 0.110	2400/F (kHz)	28.5 – 26.8	-/-	-/-	300
0.110 - 0.490	-/-	-/-	2400/F (kHz)	26.8 – 13.8	300
0.490 - 1.705	24000/F (kHz)	33.8 - 23.0	-/-	-/-	30
1.705 - 30.0	30	29.5	-/-	-/-	30

acc. RSS-Gen issue 05 section 8.9

Frequency MHz	Limits [µA/m] Quasi-peak	Limits [dBµA/m] Quasi-peak	Limits [µA/m] Average	Limits [dBµA/m] Average	Test distance [m]
0.009 - 0.090	-/-	-/-	6.37/F (kHz)	-3 – -23.0	300
0.090 - 0.110	6.37/F (kHz)	-23.0 – -24.7	-/-	-/-	300
0.110 - 0.490	-/-	-/-	6.37/F (kHz)	-24.7 – -37.7	300
0.490 - 1.705	63.7/F (kHz)	-17.7 – -28.5	-/-	-/-	30
1.705 - 30.0	0.08	-22	-/-	-/-	30

acc. e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C, § 15.209 Radiated emission limits and RSS-Gen issue 05 section 8.9

Frequency MHz	Limits [µV/m] Quasi-peak	Limits [dBµV/m] Quasi-peak	Limits [µV/m] Average	Limits [dBµV/m] Average	Test distance [m]
30 - 88	100	40	-/-	-/-	3
88 - 216	150	43.5	-/-	-/-	3
216 - 960	200	46	-/-	-/-	3
960 - 1000	500	54	-/-	-/-	3
Above 1000	-/-	-/-	500	54	3

Measurements

The Measurement was performed on: 21.02.2020, 24.02.2020 and 25.06.2020

Result 9 kHz – 30 MHz

In the frequency range 9 kHz – 30 MHz the EUT had been scanned in a distance of 3 m and the Limit were corrected to the test distance of 3 m using a factor with 40 dB/decade acc. to § 15.31 (f)(2).

All emissions in the frequency range 9 kHz – 30 MHz are at least 20 dB below the relevant limit.



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Result 30 MHz – 1000 MHz

Operation Mode No.: 1. Transmitting 8DPSK in single frequency

MEANS: EMISSION NOT COUNTED FOR JUDGEMENT the highest points found 20d / SINGEL FREQ >> = = = = = = = >> > 20/01-0029 TRANS.-/REC.-SYSTEM fail [] 2020 RFI suppression parts ESVS Operating mode: TRANSMITTING BT BDPSK / 2480 MHz / Test equipment: Hohde & Schwarz E CHASE CBL 6111 X Jun test distance 3m Connected sets: HOST COMPUTER 52 SS Result: pass Ref.-No.: 2 Product: 1 Sample: 0 Date: 2 Operator: 1 freg. t 39.16 39.16 38.16 38.16 38.68 52.68 950.68 955.68 955.68 955.68 955.68 955.84 89 - IF ANY 1000 1000 [MHZ] f [MHZ] 500 500 Interference Radiation 30 MHz - 1000 MHz acc. FCC § 15.209 / RSS-Gen -(0)onta σ 300 300 C ·H D iΖ + C 200 200 0 υ > 150 150 enna antenna 100 100 nt 80 80 σ 60 60 Germany GmbH ₪ m 50 50 S ທ 0 0 40 40 Ü U 00 00 STC 10L 30 dBuV/m 30 20 701 10 20 09 20 40 30 20 60 50 40 30

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Frequency [MHz]	Detector	Antenna polarization	Radiated emission [dBµV/m]	Radiated emission [µV/m]	Limit [dBµV/m] (3 m)	Limit [µV/m] (3 m)	Result
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
39.16	QP	v	37.90	78.52	40.00	100	Pass
38.16	QP	V	37.80	77.62	40.00	100	Pass
44.04	QP	V	37.60	75.86	40.00	100	Pass
42.68	QP	v	37.40	74.13	40.00	100	Pass
54.68	QP	V	37.30	73.28	40.00	100	Pass
-/-	QP	V	-/-	-/-	-/-	-/-	-/-
950.80	QP	Н	37.03	71.04	46.00	200	Pass
934.60	QP	Н	36.87	69.74	46.00	200	Pass
929.84	QP	Н	36.83	69.42	46.00	200	Pass
907.84	QP	Н	36.45	66.45	46.00	200	Pass
898.88	QP	Н	36.37	66.45	46.00	200	Pass
-/-	QP	Н	-/-	-/-	-/-	-/-	-/-

The six highest emissions for each polarization (H/V) in the frequency range 30 MHz - 1000 MHz are as following:

- (1) = test frequency
- (2) = used detector quasi peak (QP), peak, average (AV)
- (3) = polarization of the test antenna (Horizontal/Vertical)
- (4) = Reading of test receiver $[dB\mu V]$ + correction factor
- (5) = 10 ^ ((Radiated emission [dBµV/m] (5))/20)
- (6) = relevant limit in $dB\mu V/m$
- (7) = relevant limit in μ V/m
- (8) = comparison between Limit $[dB\mu V/m]$ (6) and Radiated emission $[dB\mu V/m]$ (4)

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Result 1 GHz – 7 GHz

Operation Mode No.: 1. Transmitting 8DPSK at single frequency

TESTED	MANY	IT 5/ Interference acc. to FCC § 15.2	6 radiation 09 / RSS-Gen	<u>.</u>	ST	
RefNo.:	20/01-0029					
Product:	Transmitting/R	eceiving System				
Sample:	01					
Date:	25.06.2020					
Operator:	ТМ				pass fa	ail
Remarks:	BSF (2.4GHz /	11243) connected		Result:		
Operation m	ode: Tx BT / 8DP	SK / 2480 MHz / Sing	le Frequency			
Spectrum	Receiver	×				
Input 1 AC	RBW (EMI) 1 MHz	MT 1 s	IT56-1-6GHz.TD	F		
Scan @1Av	Maxo2Pk Max	Preamp OFF Step 10 s	buan			
Limit Ch	eck	PASS				
90 dBjrv/mT50	5-1-76HZ-PEAK-F6	G-GLAS PASS				
80 dBµV/m—						
IT56-1-7GHZ-Р 70 иврууш	EAK-FCC-Class B.LIN					
60 dBµV/m						
IT56-1-7GHZ-A	V-FCC-Class B.LIN				A . buterstard	har
40 dBµV/m		and the second	www. Augurehan	mannen		
ennema	mar Muentheren	mon work when and the same		Maria	mantinen	the work
30 dBµV/m-		ununululy the	for and the sector of the sect			
20 dBi/V/m-	Manulmondhow					
20 apprilli						
10 dBµV/m—						
					TF	
Start 1.0 GH	z				Stop 7.0	GHz
		Polarisa	tion: V			
	Detecto	r		Detector		

		Detector Average					Detector Peak		
Frequ. [GHz]	Level [dBµV/m]	Margin to Limit [dB]	Limit [dBµV/m]	Result	Frequ. [GHz]	Level [dBµV/m]	Margin to Limit [dB]	Limit [dBµV/m]	Result
2,4800	37,46	N/A	N/A	pass	1-7	-/-	>20	74	pass
5,7288	37,42	-16,58	54,00	pass					
6,3773	37,41	-16,59	54,00	pass					
6,5328	37,49	-16,51	54,00	pass					
6,9998	38,61	-15,39	54,00	pass					



TESTED

IT 5/6 Interference radiation acc. to FCC § 15.209 / RSS-Gen



Ref.-No.: 20/01-0029

Operation mode: Tx BT / 8DPSK / 2480 MHz / Single Frequency

Spectrum Receiver 🗵	
RBW (EMI) 1 MHz MT 1 S IT56-1-6GHz.TDF	<u> </u>
Input 1 AC Att 0 dB Preamp OFF Step TD Scan	
Scan 🗧 1 Av Max 🔤 2 Pk Max	
Limit Check PASS	
Line IT56-1-7GHZ-AV-FCC-Class B PASS	
90 dBjrv/mT56-1-7CHZ-PEAK-FGG-CLA8-PA88	
00 dBx4//m	
ou deployment	
Yo uspy/ii-	
60 dBuV/m	
IT56-1-7GHZ-AV-FCC-Class B.LIN	
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40 dBµV/m	-0-7
as he and a designation the more statement of the second statement of the seco	
30 dBuV/m	
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- marked her marked have the second have the s	
20 dBµV/m-	
10 dBµV/m-	
Ť	
Start 1.0 GHz Stop 7.0 G	iHz

Polarisation: H									
Detector Average						Detector Peak			
Frequ. [GHz]	Level [dBµV/m]	Margin to Limit [dB]	Limit [dBµV/m]	Result	Frequ. [GHz]	Level [dBµV/m]	Margin to Limit [dB]	Limit [dBµV/m]	Result
2,4800	35,60	N/A	N/A	pass	1-7	-/-	>20	74	pass
5,5718	37,29	-16,71	54,00	pass					
6,1433	37,57	-16,43	54,00	pass					
6,2993	37,50	-16,50	54,00	pass					
6,4588	37,78	-16,22	54,00	pass					
7,0000	38,99	-15,01	54,00	pass					

Result 7GHz – 26GHz

All emissions in the frequency range 7 GHz – 26 GHz are at least 20 dB below the relevant limit

Results

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the **Radiated Emissions**.



7. Operation within the band 902-928 MHz, 2400-2483,5 MHz and 5725-5850 MHz

Applied standards

-e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C §15.247 -RSS-247 issue 2

7.1. 20 dB Spectrum Bandwidth Measurement

Applied standards

-e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C §15.247 (a) (1) -RSS-247 issue 2 Section 5.1 (a)

Limit

The minimum 20 dB bandwidth shall be at least 25 kHz.

Test equipment and test set up

Test equipment used for conducted measurements as given in clause Test equipment of this report. Test setup used for conducted measurements as given in clause Test setups of this report.

Description

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Measurement

The Measurement was performed on: 25.06.2020

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Lowest Operating Frequency – GFSK



Middle Operating Frequency - GFSK

MultiView 😁	Spectrum								
Ref Level 20.00	dBm BodB SMT	110 up (ar9 2 mp)	RBW 10 kHz	Mada Auto E	-Ť				
1 Frequency Sw	eep	+19 μs (**0.2 ms)	IDN JO KHZ	Mode Adto H					1Pk Max
								D3[1]	1.52 dB
								1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	919.10 kHz
10 dBm									
								2.	44081770 GHz
0 dBm				M1					
-10 dBm-				Mmm	MAA				
10 dbm			ΛA	W	1 C M	<u>^</u>			
-20 dBm			12 AMACH V		3 h				
H1	-23.410 dBm	0				WIAA			
		a MA				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0		
-30 dBm					2	8	VIAA		
		AW					VV		
-40 dBm-	0 0/						V		
-50 dBm	My M					5. C	M	mm	10
								νV	'N
~60 dBm-									
									"WWW
CF 2.441 GHz		I	1001 pts		25	0.0 kHz/			Span 2.5 MHz
2 Marker Table									
Type Ref	Trc	X-Value		Y-Value		Function		Function Re	esult
M1	1 2	.4408177 GH	z ·	-3.41 dBm					
M2 D3 M2	1	2.440538 GH	L -2 7	1.52 dB					
Channel	Erogur		<u>-</u>	20 dB Ban	dwidth [ku	7]	Limit [kH=1		Posult
Channel	Freque					-]		r	Coult
39		2441	1	9	19.1		25		Pass

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Highest Operating Frequency - GFSK



Lowest Operating Frequency - $\pi/4$ DQPSK

MultiView 😁	Spectrum				
Ref Level 20.00		RBW 10 kHz			10.00
1 Frequency Swe	eep	VBW 30 KHZ Mode Auto P			1Pk Max
					D3[1] 0.13 dB 1.18880 MHz
10 uBm					2.40182020 GHz
0 dBm		M1			
-10 dBm	A	n man how	www.havhar		
-20 dBm	-23.390 dBm		V V		
-30 dBm	1			VM	
-40 dBm	MMM			M.	mmmm
-60 dBm					27 .
CF 2.402 GHz		1001 pts	250.0 kHz/		Span 2.5 MHz
2 Marker Table Type Ref M1 M2 D3 M2	Trc X-Value 1 2.4018202 GH 1 2.4013806 GH 1 1.1888 MH	Y-Value z -3.39 dBm z -23.62 dBm z 0.13 dB	Function	Fu	inction Result
Channel	Frequency [MHz]	20 dB Ban	dwidth [kHz]	Limit [kHz]	Result
0	2402	11	88.8	25	Pass

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Middle Operating Frequency - π/4 DQPSK



Highest Operating Frequency - $\pi/4$ DQPSK

MultiView 😁	Spectrum				
Ref Level 20.00	dBm	RBW 10 kHz			1428 - 31
1 Frequency Swe	eep	VBW 30 KHZ Mode Autor	FI		1Pk Max
I frequency own					M2[1] -23.43 dBm 2.47938060 GHz
10 dBm					-M1[1]
					2.47981770 GHz
0.40m		541			
-10 dBm-	~/~	MMM MW	M M MM	h	
-20 dBm-		V		hg3	
-30 dBm				M	
-40 dBm				h	
	M			· w l	man
-60 dBm					
CF 2.48 GHz		1001 pts	250.0 kHz/		Span 2.5 MHz
2 Marker Table					
Type Ref	Trc X-Value	Y-Value	Function	Fu	inction Result
M1 M2 D3 M2	1 2.4798177 GHz 1 2.4793806 GHz 1 1.1863 MHz	-3.35 dBm -23.43 dBm 0.70 dB			
Channel	Frequency [MHz]	20 dB Ban	dwidth [kHz]	Limit [kHz]	Result
79	2480	11	86.3	25	Pass

Lowest Operating Frequency - 8DPSK



Middle Operating Frequency - 8DPSK

MultiView 😁	Spectrum								
Ref Level 20.00	dBm		RBW 10 kHz	Manda Anta E					
1 Frequency Swo	eep	ri9 µs (~8.2 ms)	VBYY SUKHZ	Mode Auto Fi					1Pk Max
								D3[1]	0.40 dB
10 dBm								M1[1]2	1.21630 MHz - 3.62 dBm 44114990 GHz
0 dBm					Mi				
-10 dBm			MrMm	AM	MA	Mm	<u>.</u>		
-20 dBm		M2 MV	V.v.		·*	- V	Ma		
-30 dBm	-23.620 dBm	- MARINA					M		
-40 dBm	MMM	1					V	MM	www
-60 dBm									
CE 2 441 GHz			1001 nts	3	25				Spap 2.5 MHz
2 Marker Table			1001 pts	2	23				opun 2.0 Miliz
Type Ref M1 M2 D3 M2	Trc 1 2. 1 2. 1 2.	X-Value 4411499 GH 4403531 GH 1.2163 MH	IZ -2 IZ -2	Y-Value -3.62 dBm 23.67 dBm 0.40 dB		Function		Function R	esult
Channel	Freque	ency [MHz]		20 dB Ban	dwidth [kH:	z]	Limit [kH	z]	Result
39		2441		12	16.3		25		Pass

Highest Operating Frequency - 8DPSK



Results

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the **20 dB Bandwidth**.

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7.2. Output Power of Fundamental Emissions Maximum Peak Output Power

Applied standards

-e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C §15.247 (b) (1) -RSS-247 Issue 2 section 5.4 (b)

Limits for Peak Output Power of Fundamental (EIRP)

For FHSS in the 2400 – 2483.5 MHz Band the maximum peak output power shall not exceeded the following limits:

For frequency hopping systems employing at least 75 hopping channels: 1 Watt For frequency hopping systems employing less then 75 hopping channels: 0.125 Watt The e.i.r.p shall not exceed 4 Watt.

Test equipment and test set up

Test equipment used for conducted measurements as given in clause Test equipment of this report. Test setup used for conducted measurements as given in clause Test setups of this report.

Description

For the conducted measurement, the RF output of the EUT was connected to the Analyzer. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in Watt.

Measurement

The Measurement was performed on: 25.06.2020

Lowest operating frequency – GFSK

MultiView 🕄 Spectrum									
Ref Level 30.0	DO dBm		RBW 2 MHz						1028
1 Frequency S	weep	I I.UI MS	VBW 5 MHZ	Node Auto Sweep					1Pk Max
	and a statement of the							M1[1]	3.79 dBm
								2	40202400 GHz
20 dBm	-	-			8	· · · · · · · · · · · · · · · · · · ·			
10 dBm									
					P 11				
0 dBm									
-10 dBm-									
-20 dBm-			-			~			
EU GDIII									
-30 dBm									
-40 dBm									
-50 dBm									
00 4511									
CF 2.402 GHz			1	001 pts	U	600.0 kHz/		1	Span 6.0 MHz
2 Marker Tabl	e								
Type Ref	Trc	X-Val		Y-Value		Function		Function R	esult
M1	1	2.40202	4 UNZ	2.79 abi					

Middle Operating Frequency – GFSK

MultiView	🕄 Spe	ctrum	J									
Ref Level 30	.00 dBm			RBW	2 MHz	Mucrosoften						
Att	40 dB	SWT :	1.01 ms	VBW	5 MHz	Mode	Auto Sweep					1 Dk Mox
1 Frequency (sweep										M1[1] 2	3.98 dBm 44103000 GHz
20 dBm												
10 dBm								M1				
0 dBm												
-10 dBm					4							
-20 dBm										2		
-30 dBm												
-40 uBm												
-50 dBm					-							
CF 2.441 GHz			L		1	.001 pt	s		600).0 kHz/	 	Span 6.0 MHz
2 Marker Tab	le											
Type Re	f Trc		X-\ 2.441	/alue 03 GH	7		Y-Value 3.98 dBm	-		Function	Function R	esult

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Highest Operating Frequency – GFSK

MultiView 😁 Spectru	um) 🛛					
Ref Level 30.00 dBm	• RBW 2 MH	Z				
Att 40 dB SW	T 1.01 ms VBW 5 MH	z Mode Auto Sweep				
1 Frequency Sweep						IPk Max
					M1[1]	3.88 dBm
					2	.48006590 GHz
20 dBm						
10 dBm						
10 0011			MI			
0 dBm						
-10 dBm					1	-
-20 dBm						
100.000						
-30 dBm			**			
40 40 -						
-40 UBM						
-50 dBm			-		 	
CF 2.48 GHz		1001 pts	60	00.0 kHz/	 	Span 6.0 MHz
2 Marker Table						14
Type Ref Trc	X-Value	Y-Value		Function	Function R	esult
M1 1	2.4800659 GHz	3.88 dBm				

Maximum output power conducted measurement - GFSK												
Channel	Frequency	Reading of Analyzer	Cable Loss	Output	Power	Lir	Result					
	נויודבן	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[mW]					
0	2402	3.79	1.2	4.99	3.16	30	1000	Pass				
39	2441	3.98	1.2	5.18	3.30	30	1000	Pass				
78	2480	3.88	1.2	5.08	3.22	30	1000	Pass				

Lowest operating frequency – $\pi/4$ -DQPSK

MultiView 8	Spect	rum	1								
Ref Level 30.0	00 dBm		· RB	W 2 MHz							
Att	40 dB 5	WT 1.01	ms VB	W 5 MHz	Mode Au	to Sweep					
1 Frequency Sv	weep	_									1Pk Max
										M1[1]	4.45 dBm
										2	40210790 GHz
20 dBm		2		-			_	5			
10 dBm	1						MI	<i></i>			
					-		V				
0 d0m											
U UBIN-									1		
-10 dBm		5									-
and the second s											
-20 dBm				-			í 1	2			
-30 dBm-											
-40 dBm									22		
-50 dBm											-
CF 2.402 GHz				1	.001 pts			600.0 kHz/		4	Span 6.0 MHz
2 Marker Table	2				•						
Type Ref	Trc		X-Value			Y-Value		Function		Function R	esult
M1	1	2.40	21079	GHz	4.	45 dBm					

Middle Operating Frequency – $\pi/4$ -DQPSK

MultiView	Spect	trum	J										
Ref Level 30.0	00 dBm		7	■ RBW	2 MHz	Manuto entre							
Att	40 dB 5	SWT 1.	01 ms	VBW	5 MHz	Mode	Auto Sweep						1 Dk May
T H Equency 5	weep											M1[1]	4.52 dBm 44105990 GHz
20 dBm													
10 dBm	-							M1					
0 dBm		-					6						
-10 dBm													
To down													1
-20 dBm													
-30 dBm					e								
-40 dBm					-								
-50 dBm													
CF 2.441 GHz					1	1001 pt	S		60	00.0 kHz/	~		Span 6.0 MHz
2 Marker Tabl	e					1					E		
M1	1 Irc	2.4	X-V 44105	alue 599 Gl	Hz		4.52 dBn	n		Function		Function R	esult

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Highest Operating Frequency – $\pi/4$ -DQPSK

MultiView	😁 Spe	ectrum	i 1												
Ref Level 30	.00 dBm			• RBW	2 MHz										-
Att	40 dB	SWT	1.01 ms	VBW	5 MHz	Mode	Auto Swee	Р							
1 Frequency S	Sweep							46					_		1Pk Max
														M1[1]	4.32 dBm
														2	48007190 GHz
20 dBm	-									-					
10 dBm			_				-			_					
								Ma							
0 dBm	-														
				-											
-10 dBm			2												
-20 dBm	-														
-30 dBm											ź				
-40 dBm			_												
-50 dBm															
CE 2 49 CH-						1001				600.0 4					Spap 6.0 Mil-
CF 2.46 GHZ	200					1001 p	15			000.0 KI	nz/				span 0.0 MHz
Z Marker Tab	ie f Tro	T	V 1	Value		т	V Volue	-	1	Euro	otion	-		Eurotion E	agult
M1	1 1 1 1 1 1	2	.4800	719 GI	Hz	-	4.32 dB	e Sm		Fund	CUUT		_	FUNCTION F	esuit

Maximum output power conducted measurement - π /4-DQPSK												
Channel	Frequency	Reading of Analyzer	Cable	Output	Power	Liı	Result					
onamer	[MHz]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[mW]					
0	2402	4.45	1.2	5.65	3.67	30	1000	Pass				
39	2441	4.52	1.2	5.72	3.73	30	1000	Pass				
78	2480	4.32	1.2	5.52	3.56	30	1000	Pass				

Lowest operating frequency – 8DPSK

MultiView	B Spect	rum	1							
Ref Level 30.0	00 dBm		• RBW	2 MHz						
Att	40 dB S	WT 1.01 m	ns VBW	5 MHz I	Mode Auto	Sweep				
1 Frequency S	weep								111517	IPK Max
									MILI	4.46 dBm
									Ζ.	40214990 GHZ
20 dBm										
10 dBm	6			1						
							M1			
0 dBm	6	-							8	
10 d0m							4			
-10 uBm										/
-20 dBm							-		 	
-30 dBm										
-40 dBm									 	
-22										
-50 dBm							6	-		
	-							2 55 55		
CF 2.402 GHz		1.0		10	001 pts			600.0 kHz/		Span 6.0 MHz
2 Marker Table	e								1000	
Type Ref	Trc	> 402	-Value	U-7	Y-			Function	Function Re	esult
MI	1	2.402	1422 0	Π Ζ	4.40					

Middle Operating Frequency – 8DPSK

MultiView	🕄 Spe	ctrum										
Ref Level 30.	00 dBm			RBW	2 MHz							
Att	40 dB	SWT	1.01 ms	VBW	5 MHz	Mode	Auto Sweep					1 Dk Mov
I Frequency a	sweep										M1[1]	4 59 dBm
											2	44114390 GHz
00 d0m							-					11111050 012
20 0611												
10 10					-							
10 dBm-								M1				
U dBm-												
-10 dBm	-		-									
And the second s												
-20 dBm	-						-					
-30 dBm	-				12							
-40 dBm					12				~			
1 for the reaction of the second												
-50 dBm												
ostost sectores												
000 0 111 5												
CF 2.441 GHz						1001 pt	s		600.0 kHz/			Span 6.0 MHz
2 Marker Tab	le f Tro	1	~ `	alua		1	V-Value		Eurotion		Eurotion D	acult
M1	1	2	.4411	439 G	Hz	-	4.58 dBm		FUNCTION	1	FUNCTION	esuit

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Highest Operating Frequency – 8DPSK

MultiView	MultiView 😁 Spectrum											
Ref Level 30.0	DO dBm		• RBW	2 MHz								
Att	40 dB 5	GWT 1.01 m	ns VBW	5 MHz Mo	ode Auto Sweep							
1 Frequency S	weep								MILII	IPK Max		
									MILI	4,47 dBm		
00 40 4	-						0		L	10004000 0112		
20 ubiii												
10 dBm	6	-		4								
						M1						
0 dBm	-											
-10 dBm		2										
and the second s												
-20 dBm												
-30 dBm												
-40 dBm												
-50 dBm												
CE 2.48 GHz				100	1 pts		600.0 kHz/			Span 6.0 MHz		
2 Marker Table	3											
Type Ref	Trc	Х	-Value		Y-Value		Function		Function R	esult		
M1	1	2.480	0048 GH	Z	4.47 dBm							

Maximum output power conducted measurement - 8DPSK											
Channel	Frequency	Reading of	Cable	Output	Power	Lii	Booult				
	[MHz]	[dBm]	[dB]	[dBm]	[mW]	[dBm]	[mW]	Result			
0	2402	4.46	1.2	5.66	3.68	30	1000	Pass			
39	2441	4.58	1.2	<mark>5.78</mark>	<mark>3.78</mark>	30	1000	Pass			
78	2480	4.47	1.2	5.67	3.69	30	1000	Pass			

Results

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements of **Output Power of Fundamental Emissions**.

7.3. Number of Operating Channel

Applied standards

-e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C §15.247 (a) (1) (iii) -RSS-247 issue 2 Section 5.1 (d)

Limit

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Test equipment and test set up

Test equipment used for conducted measurements as given in clause Test equipment of this report. Test setup used for conducted measurements as given in clause Test setups of this report.

Description

Frequency range	Bandwidth			
2.4 GHz – 2.4835 GHz (Peak Detector)	RBW:	100 kHz		
	VBW:	≥ RBW		

Measurement

The Measurement was performed on: 18.02.2020

GFSK: 79 of 79 Channel

MultiVie	w 8	Spe	ctrum	J									
Ref Level	20.0	0 dBm	SWT -	1.02 ms	RBW VBW	100 kHz	Ande	Auto Sween					
1 Frequen	icy Sv	veep	3111.	1.02 1115	VDW	JUU KI IZ IN	noue	e Auto Sweep					1Pk Max
												M2[1]	-7.67 dBm
												N41E17	4800000 GHz
10 dBm				2		1			3			MILI	4020000 GHz
0 dBm													
MI													MO
MANAN	hnh	nnnn	nnnh	nnnn	1000	nnnnnn	nn	00000000	100000000	000000000	DDDDDDDD	hnnnnnnn	nnnnn
-10 (dBm)	1111						TH,						1114111
- 441,111(W11				ЦИШ	[[4]]]][[4]			11111111111		1 M M M M M M M M M M M M M M M M M M M		61777641
-20 dBm								┋╋╋╋╋╋	\\\\\\\\\\	╞┊┊┊┊┊┊┊┊		┟╫╫╫╟╟╟╫╟	
1111	111	1111	1141	1111	11.	i farin	1 .	1.1.1.2.2.2.11	f - f - i	L T T V V T KU		11431143	
-30 dBm													
30 abii													
-40 dBm	-					10							
-50 dBm						5							
f60 dBm										8			anney
2.4 GHz						100	1 pts	S	8.	 35 MHz/			2.4835 GHz

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π /4-DQPSK: 79 of 79 Channel

MultiView	😁 Spectrum	ı]								
Ref Level 2	0.00 dBm	1.02 mg	RBW VBW	100 kHz	a Auto Cuison					
1 Frequency	Sweep	1.02 ms	VDYY	SUU KHZ MIOU	e Auto Sweep					1Pk Max
									M2[1]	-7.80 dBm
									2	.4800000 GHz
10 dBm		2							M1[1]	-7.84 dBm
									2	4020000 GHz
0 dBm										
M1										M2
-1 Abar A h h	hamanaha	MAMAP	ANAA	ANNNAAAP	100000000	1111000000	100008000	እእስለለለስስ	አስስለለስለለ	DAAAM
700000	00000000000	11111	VVVV	1111111111	<u> </u>	11111111111	00000000000	INAAAAAAA	111111111111	VVVVV
								saura con a con	1. 1.	
-20 dBm					<i>i</i>	4				
-30 dBm-										
										0
-40 dBm		-		6	-					
-50 dBm		20					5			
- 1										N I
60 dBm										
1										(~~~NN
2.4 GHz				1001 pt	l	8.	.35 MHz/			2.4835 GHz
Distance										
8DPSK- 7	9 of 79 Cha	annol								
MultiView	Spectrum	i L								
Ref Level 2	0.00 dBm	1.02	RBW VBW	100 kHz	a Auto Curear					
1 Frequency	Sweep	1.U2 MS	VBW	SUU KHZ MOO	e Auto Sweep					1Pk Max
									M2[1]	-7.59 dBm
									2	.4800000 GHz

								M2[1]	-7.59 d	Bm
								2	4800000	Hz
								M1[1]	-7.86 d	Rm
10 dBm		5			2			wit[i]	7.80 0	DIT
								2	.4020000 0	iHz
									Í	
									1	
0 dBm						<u>.</u>				
M1							and the second second second second		M2	
AAAAAAA	ANALANA	ANAMANNA	A A A A A A A A	000000000	1 A B A A A A A A	AAAAAAAAA	ALABAAAA	1 D A A A A A A A A	AAAA	
-10 dBm		<u> </u>		HANAMANN			44444488			
1444444	W \mathsf	V V V V V V V V V V	$\forall \psi \forall \forall$	UNNNNNNN	44VV44VV	MMMAAAAA.	1000000000	140044400	WWWW	
1.4.1.4	a k k M - w - k	Les Age of A	A CARL CONTRACTOR OF A CARL			and the second second second				
-20 dBm									1	
									1	
									i l	
-30 aBm										
									i l	
									i 🦷	
-40 dBm-										
o ubin										
									i Y	
10										
-50 dBm										
									1	
N.									1	
-60 dBm										
J										Murr
									1	-
									1	
2.4 CHz			1001 pt		8	25 MHz /		I	2 4835 C	Hz
			1001 pt	3	0,	JJ 14112/			2,4033 0	112]

Results

From the measurement data obtained, the tested sample was considered to have **COMPLIED** with the requirements for the **Number of Hopping Frequencies.**

7.4. Channel Center Frequency

Test Requirements:

Frequency hopping system in the 2400-2483.5MHz band shall use at least 79 (Channel 0 to 78) non-overlapping channels.

The EUT operates in according with the Bluetooth system specification within the 2400 - 2483.5 MHz frequency band. RF channels for Bluetooth systems are spaced 1 MHz and are ordered in channel number k. In order to comply with out-of-band regulations, a lower frequency guard band of 2.0 MHz and a higher frequency guard band of 3.5MHz is used.

The operating frequencies of each channel are as follows:

First RF channel start from 2400MHz + 2MHz guard band = 2402MHz Frequency of RF Channel = 2402+(k+1) MHz, k = 0,...,78 (Channel separation = 1MHz)

7.5. Carrier Frequency Separation

Test Requirements

-e-CFR Title 47 Chapter I Subchapter A Part 15 Subpart C §15.247 (a) (1) -RSS-247 issue 2 Section 5.1 (b)

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test equipment and test set up

Test equipment used for conducted measurements as given in clause Test equipment of this report. Test setup used for conducted measurements as given in clause Test setups of this report.

Detector function selection and bandwidth

For the measurement, an EMI test receiver that have CISPR peak detector was used.

Descripton

Frequency range wide enough to capture the peaks of two adjacent channels. (Peak Detector)

Limits

GFSK: The measured maximum bandwidth* 2/3 = 919.1 kHz * 2/3 = 612.7 kHz

π/4 DQPSK:

The measured maximum bandwidth * 2/3 = 1188.8 kHz * 2/3 = 792.5 kHz

8DPSK:

The measured maximum bandwidth * 2/3 = 1216.3 kHz * 2/3 = 810.9 kHz

Measurement

The Measurement was performed on: 18.02.2020

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Lowest Operating Frequency – GFSK



Middle Operating Frequency – GFSK

MultiView 8	Spectrum			~						
Att	20 dBm SWT 4	419 µs (~8.0 ms)	VBW 10 kHz	: Mode Auto Ff	-1					
1 Frequency Sv	weep								1Pk Max	
								D2[1]	0.16 dB	
									1.00050 MHz	
0 dBm					0			MILI	-14.36 dBm-	
								۷.	43981720 GHZ	
-10 dBm		M1	-							
		X				02				
Jac Admil		M N	MMMMAA			MMMM	A		Mamm	
20 Juli I		V I	· · · /rh		0	V.V.	M/M.			
ha AP	1	ANN	v I	A.A	NM	1	han	A	NW	
-30 dBm	han . I	MV V ·		0000	Mr.		100	A ANY	· Y ·	
	WAA AI			, ۱۹ <i>۸۱</i> ۳	M		۳۷ <u>۱</u> ,	NA. AF		
-40 dBm	- ~~~ V V			* 1 M	V		0	VNV V		
-50 dBm						8				
-60 dBm					1	2 				
-70 dBm										
CF 2.4405 GHz			1001 pts	\$	30	0.0 kHz/			Span 3.0 MHz	
2 Marker Table	e _		1			_				
Iype Ref	Type Ret Irc X-Value Y-Value Function Function Result Mt 1 23292172 L14 26 dBm Function Function Result									
D2 M1	1	1.0005 M	Hž .	0.16 dB						

Highest Operating Frequency – GFSK



Summary of Channel seperation measurements – GFSK					
Tested Channel	Channel seperation [kHz]	Limit = 2/3 BW [kHz]	Result		
Lowest	1000.5	> 612.7	Pass		
Middle	1001.5	> 612.7	Pass		
Highest	1001.0	> 612.7	Pass		

Lowest Operating Frequency – $\pi/4$ DQPSK



Middle Operating Frequency – π/4 DQPSK



Highest Operating Frequency – $\pi/4$ DQPSK



Summary of Channel seperation measurements – $\pi/4$ DQPSK					
Tested Channel	Channel seperation [kHz]	Limit = 2/3 BW [kHz]	Result		
Lowest	1000.5	> 792.5	Pass		
Middle	1001.0	> 792.5	Pass		
Highest	1001.0	> 792.5	Pass		

Lowest Operating Frequency – 8DPSK



Middle Operating Frequency – 8DPSK



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Highest Operating Frequency – 8DPSK



Summary of Channel seperation measurements – 8DPSK					
Tested Channel	Channel seperation [kHz]	Limit = 2/3 BW [kHz]	Result		
Lowest	1001.0	> 810.9	Pass		
Middle	1001.0	> 810.9	Pass		
Highest	1001.0	> 810.9	Pass		