Annex 1: Measurement diagrams 21-1-0178701T024a-A1

Number of pages:	24	**Date of Report:**	2023-Jan-13
Testing company:	CETECOM GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150	**Applicant:**	Actia Nordic AB
Product:	**Telematic Device**		
Model:	**104760201**		
FCC ID:	2AGKK104760201	**IC:**	20839-104760201
Testing has been carried out in accordance with:	**FCC Regulations** **Title 47 CFR, Chapter I, Subchapter A, Part 15** **Subpart C Intentional Radiators** § 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz **ISED-Regulations** **Radio Standards Specification** **RSS-Gen, Issue 5** General Requirements for Compliance of Radio Apparatus **RSS-247, Issue 2** Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Device		

Table of Contents

1 Measurement diagrams

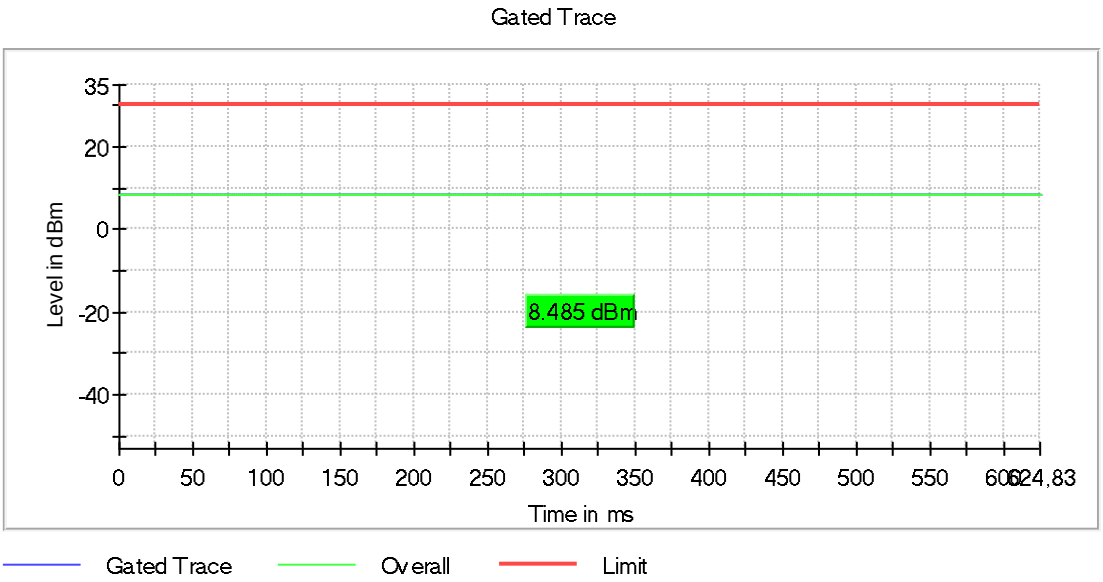
1.1 Conducted measurements

RF output power (2402 MHz; BT-LE [GFSK] (7,4 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
2402.000000	8.5	30.0	8.5	62.683	PASS



OSP PowerMeter settings

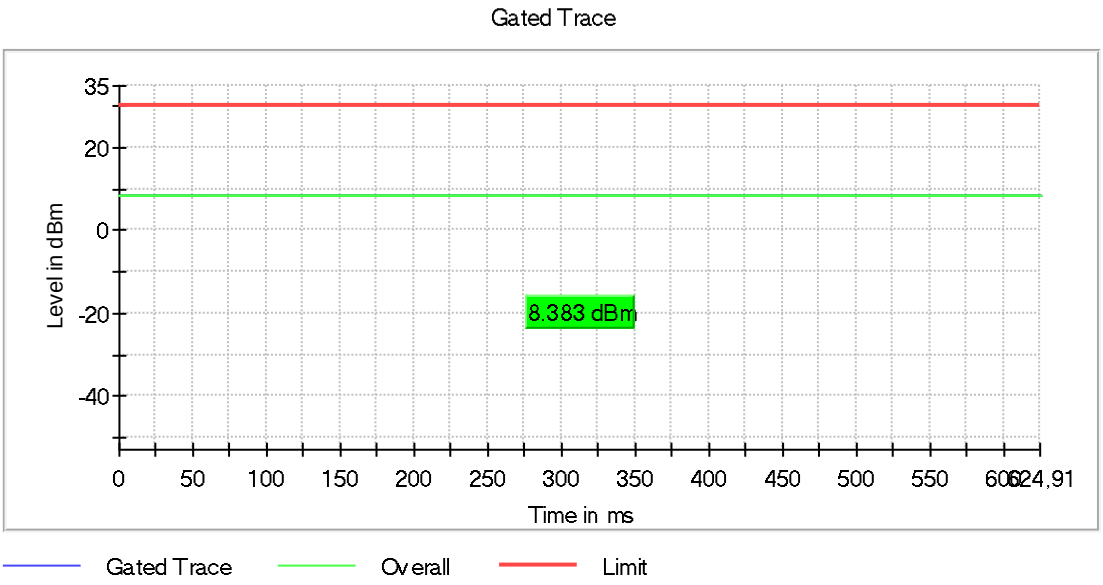
Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

RF output power (2440 MHz; BT-LE [GFSK] (7,4 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
2440.000000	8.4	30.0	8.4	62.692	PASS



OSP PowerMeter settings

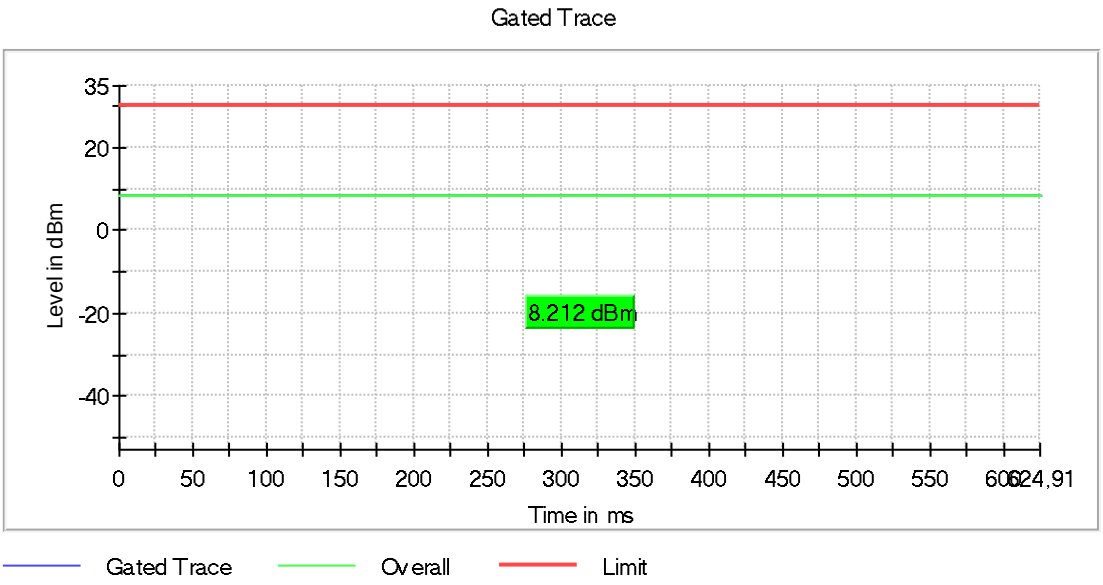
Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

RF output power (2480 MHz; BT-LE [GFSK] (7,4 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Gated RMS (dBm)	Limit Max (dBm)	Gated EIRP (dBm)	DutyCycle (%)	Result
2480.000000	8.2	30.0	8.2	62.692	PASS



OSP PowerMeter settings

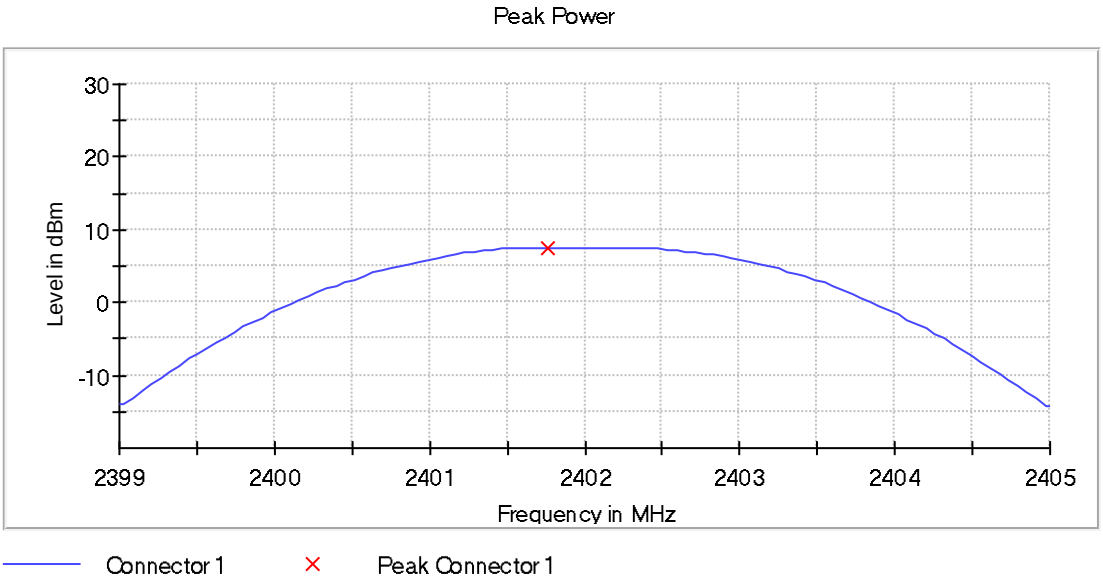
Setting	Instrument Value	Target Value
Measurement Time	1.000 s	1.000 s
Points	1000000	1000000
Time resolution	1.000 µs	1.000 µs

Peak output power (Sweep) (2402 MHz; BT-LE [GFSK] (7,4 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402.000000	7.5	30.0	PASS



Measurement

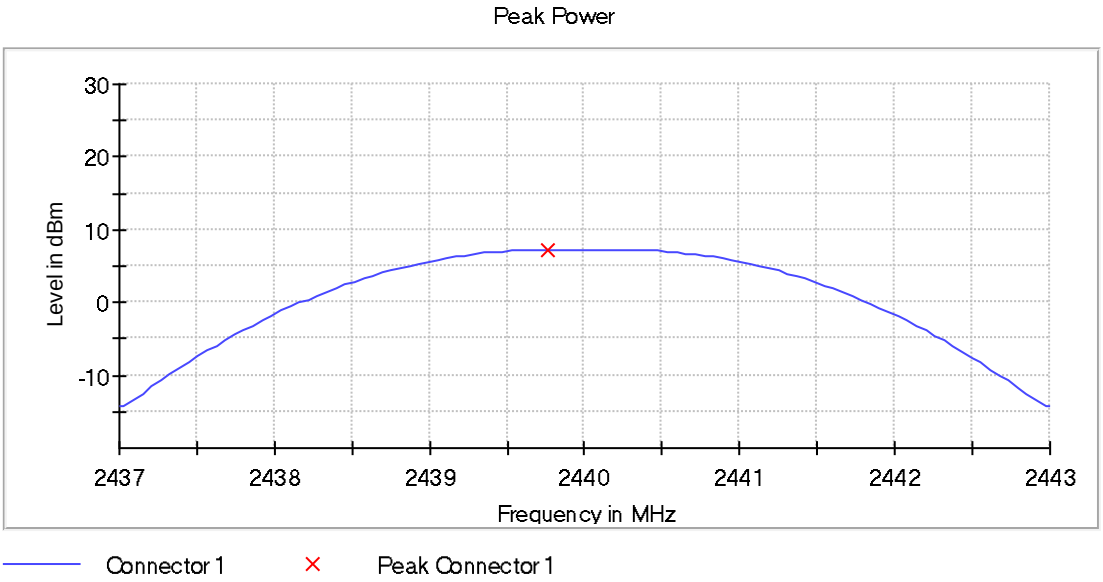
Setting	Instrument Value	Target Value
Start Frequency	2.39900 GHz	2.39900 GHz
Stop Frequency	2.40500 GHz	2.40500 GHz
Span	6.000 MHz	6.000 MHz
RBW	2.000 MHz	>= 1.000 MHz
VBW	10.000 MHz	>= 6.000 MHz
SweepPoints	101	~ 101
Sweeptime	1.000 ms	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.03 dB	0.50 dB

Peak output power (Sweep) (2440 MHz; BT-LE [GFSK] (7,4 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2440.000000	7.2	30.0	PASS



Measurement

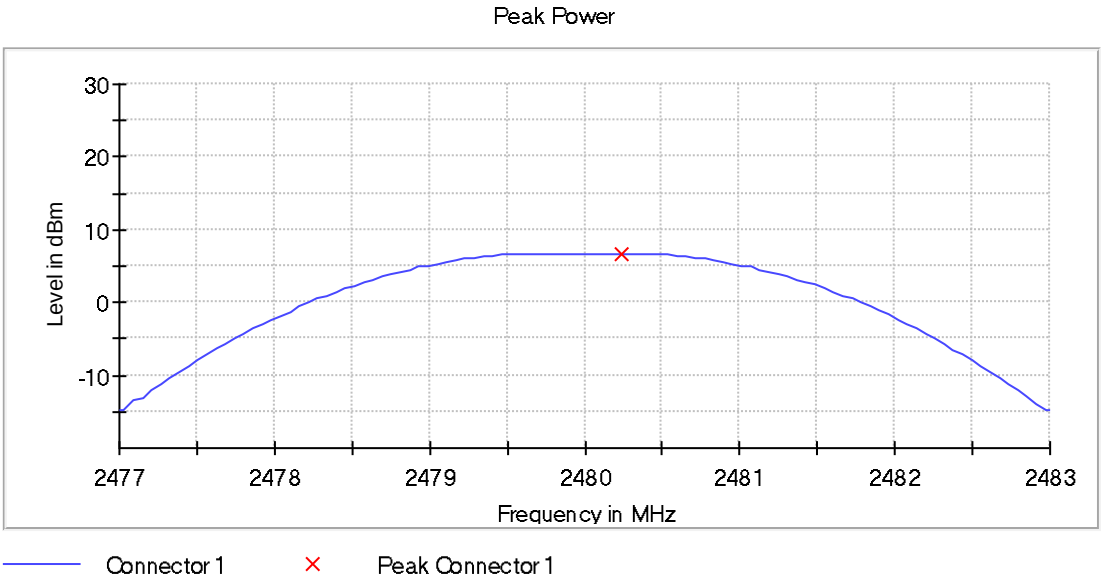
Setting	Instrument Value	Target Value
Start Frequency	2.43700 GHz	2.43700 GHz
Stop Frequency	2.44300 GHz	2.44300 GHz
Span	6.000 MHz	6.000 MHz
RBW	2.000 MHz	>= 1.000 MHz
VBW	10.000 MHz	>= 6.000 MHz
SweepPoints	101	~ 101
Sweeptime	1.000 ms	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.02 dB	0.50 dB

Peak output power (Sweep) (2480 MHz; BT-LE [GFSK] (7,4 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v05r02 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2480.000000	6.7	30.0	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47700 GHz	2.47700 GHz
Stop Frequency	2.48300 GHz	2.48300 GHz
Span	6.000 MHz	6.000 MHz
RBW	2.000 MHz	>= 1.000 MHz
VBW	10.000 MHz	>= 6.000 MHz
SweepPoints	101	~ 101
Sweeptime	1.000 ms	AUTO
Reference Level	10.000 dBm	10.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	max. 150
Stable	3 / 3	3
Max Stable Difference	0.02 dB	0.50 dB

1.2 Radiated measurements

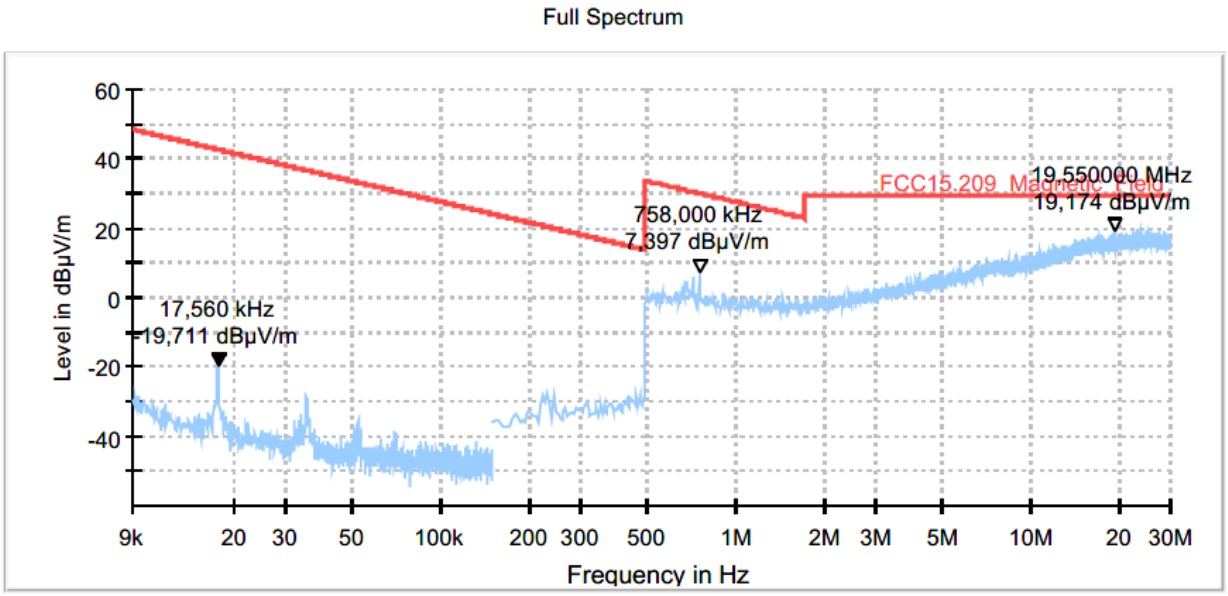
2.01a_BLE_ch00_standing

Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	HLa
Operating Mode:	BLE_ch00
Verdict:	Passed

EUT Information

PMT number	21-1-01787S53_C01



2.01b_BLE_ch00_laying

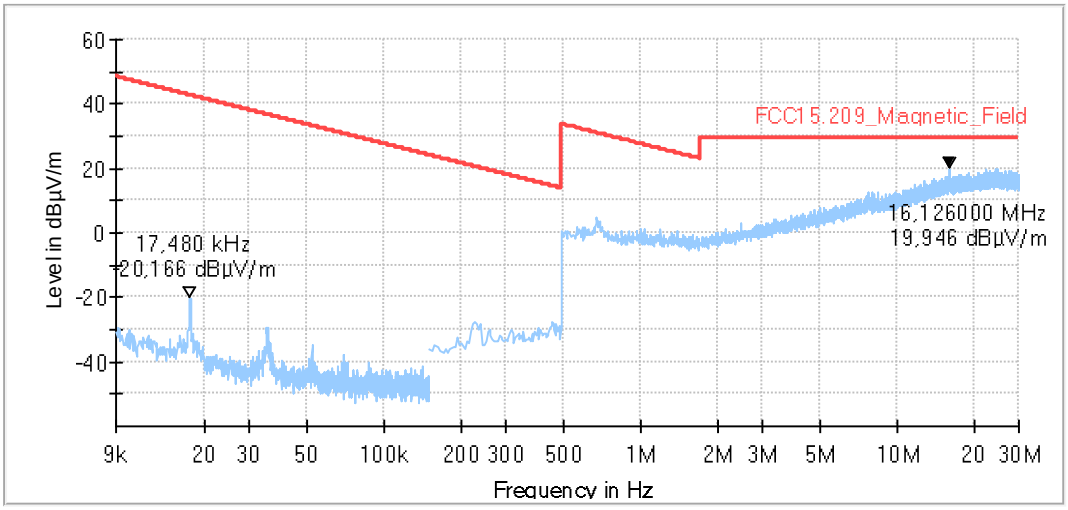
Common Information

Test description:	Magnetic Field Strength Measurement related to 30/300 m distance
Test Site Location:	Ref.-Nr. 441 Semi Anechoic Chamber (SAC1) with 3 m measurement distance
Version of Testsoftware:	EMC32 V10.50.0
Distance correction:	used accord. table, pls. see test report
Technical Data:	Please see page 2 for detailed data of measurement setup
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test Standard:	FCC 15.205 § 15.209; RSS-Gen: Issue 5
Operator:	HLa
Operating Mode:	BLE_ch00
Verdict:	Passed

EUT Information

PMT number	21-1-01787S53_C01

Full Spectrum



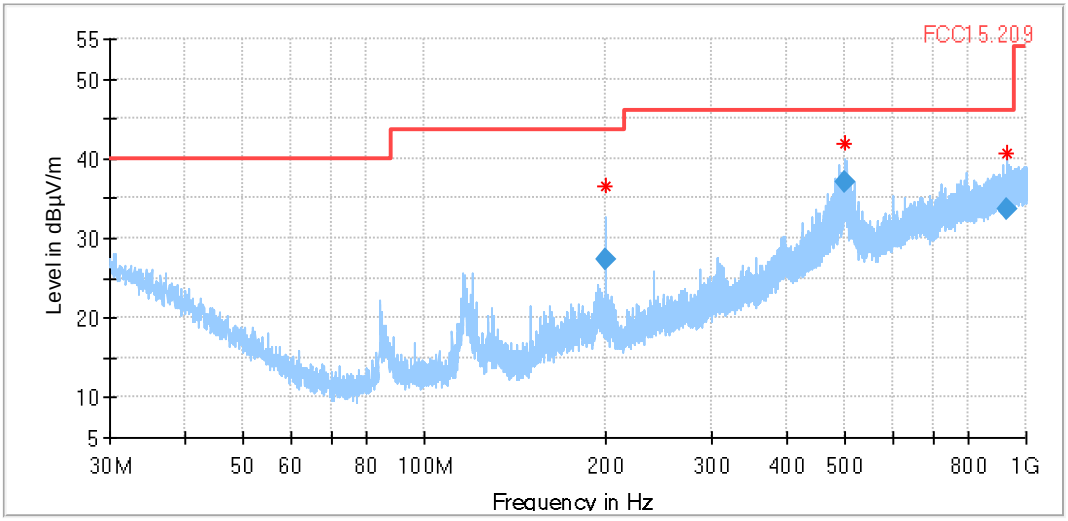
3.01a_BLE_ch00_standing

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation:	horizontal/vertical
Environmental Conditions:	Humidity : 48%rH; Temperature: 21°C
Operator Name:	HLa
Operating Mode:	b_BLE_ch00
Verdict:	Passed

EUT Information

PMT Sample number: 21-1-0178701S51_C01



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)
199.990000	27.29	43.50	16.21	120.000	109.0	V	202.0	11.0	0.0	1.3
497.830000	36.98	46.00	9.02	120.000	108.0	V	17.0	19.7	0.0	2.3
927.710000	33.76	46.00	12.24	120.000	191.0	V	190.0	27.0	0.0	3.4

(continuation of the "Final_Result" table from column 18 ...)

Frequency (MHz)	Trd Corr. (dB/m)	Raw Rec (dBµV)	Comment
199.990000	9.7	16.3	20:19:01 - 30.11.2022
497.830000	17.3	17.3	20:24:09 - 30.11.2022
927.710000	23.6	6.8	20:29:31 - 30.11.2022

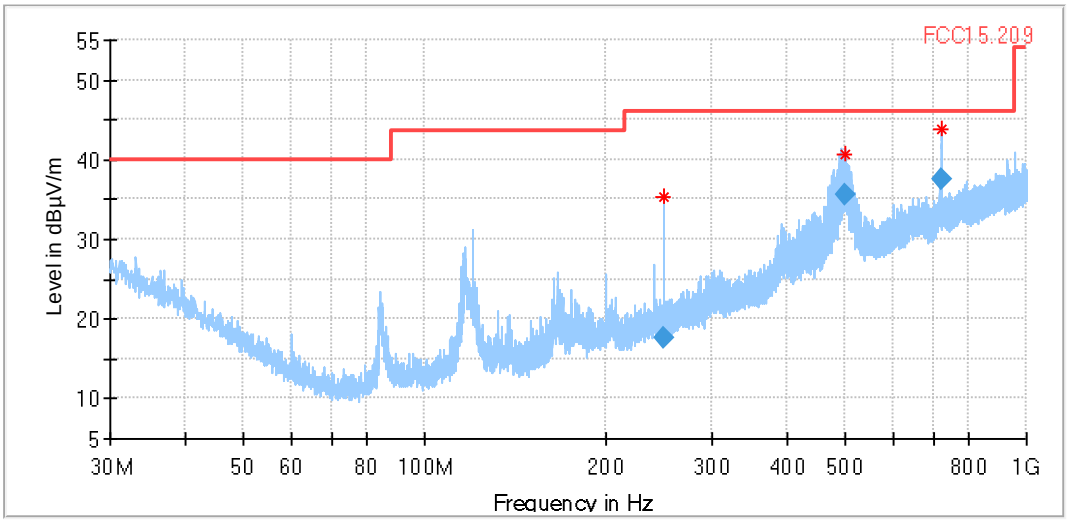
3.01b_BLE_ch00_laying

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation:	horizontal/vertical
Environmental Conditions:	Humidity : 48%rH; Temperature: 21°C
Operator Name:	HLa
Operating Mode:	b_BLE_ch00
Verdict:	Passed

EUT Information

PMT Sample number:	21-1-0178701S51_C01



Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)	Preamp (dB)
249.950000	17.67	46.00	28.33	120.000	130.0	V	243.0	13.0	0.0	1.6
499.350000	35.55	46.00	10.45	120.000	183.0	H	32.0	19.6	0.0	2.3
724.070000	37.47	46.00	8.53	120.000	181.0	H	2.0	25.1	0.0	2.9

(continuation of the "Final_Result" table from column 18 ...)

Frequency (MHz)	Trd Corr. (dB/m)	Raw Rec (dBµV)	Comment
249.950000	11.4	4.7	19:54:33 - 30.11.2022
499.350000	17.3	15.9	19:49:16 - 30.11.2022
724.070000	22.2	12.3	19:43:43 - 30.11.2022

4.01a_RSE_TX_Ch00_Low_EUT_standing

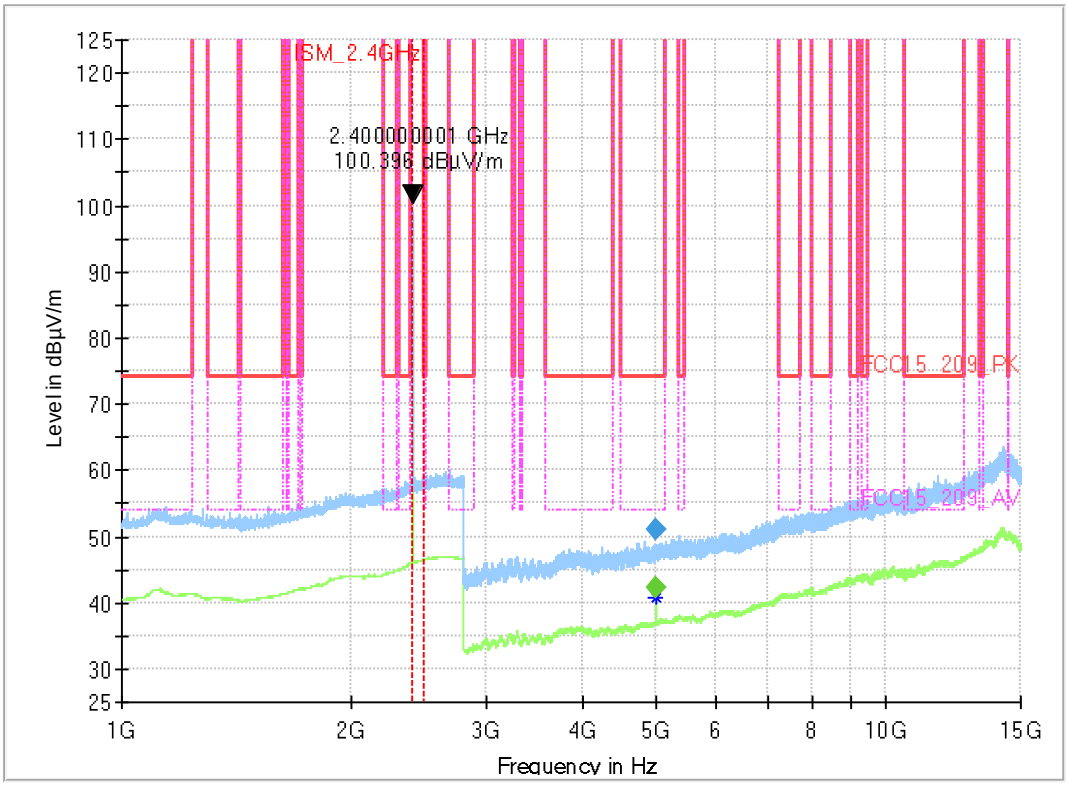
Common Information

Test Description:	Radiated Filed Strength Emission@3m distance
Test Site Location:	CETECOM GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	TX BTLE, Ch00
Environmental Conditions:	Humidity: 38%rH; Temperature: 20.2°C
Operator:	Lor
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01

Full Spectrum



Final_Result

Frequency (MHz)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)
4999.479616	42.26	54.00	11.74	100.0	150.0	H	12.0	0.3	-32.9
4999.479616	---	74.00	23.05	100.0	150.0	H	12.0	0.3	-32.9

(continuation of the "Final_Result" table from column 17 ...)

Frequency (MHz)	Preamp (dB)	Trd Corr. (dB/m)	Raw Rec (dBµV)	Comment
4999.479616	0.0	33.2	41.9	3:36:11 PM - 12/1/2022
4999.479616	0.0	33.2	50.6	3:36:11 PM - 12/1/2022

4.01b_RSE_TX_Ch00_Low_EUT_laying

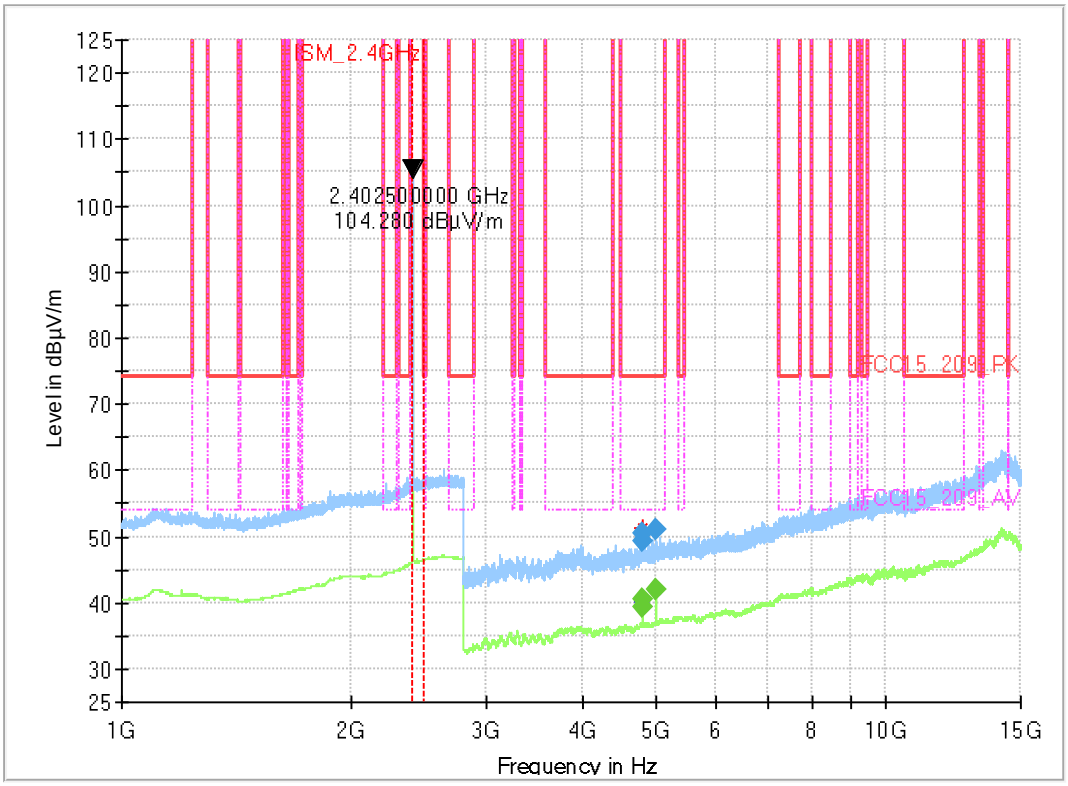
Common Information

Test Description:	Radiated Filed Strength Emission@3m distance
Test Site Location:	CETECOM GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	TX BTLE, Ch00
Environmental Conditions:	Humidity: 44%rH; Temperature: 19.5°C
Operator:	Lor
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01

Full Spectrum



Final_Result_PK+

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)
4803.398846	50.33	74.00	23.67	1000.000	150.0	V	147.0	-0.4	-33.3
4803.475578	49.40	74.00	24.60	1000.000	150.0	V	144.0	-0.4	-33.3
4999.431924	50.94	74.00	23.06	1000.000	150.0	V	241.0	0.3	-32.9

(continuation of the "Final_Result_PK+" table from column 12 ...)

Frequency (MHz)	Trd Corr. (dB/m)	Raw Rec (dBµV)	Comment
4803.398846	32.9	50.7	4:13:29 PM - 12/1/2022
4803.475578	32.9	49.8	4:12:17 PM - 12/1/2022
4999.431924	33.2	50.6	4:14:49 PM - 12/1/2022

Final_Result_RMS

Frequency (MHz)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Sig Path (dB)
4803.398846	40.37	54.00	13.63	1000.000	150.0	V	147.0	-0.4	-33.3
4803.475578	39.44	54.00	14.56	1000.000	150.0	V	144.0	-0.4	-33.3
4999.431924	42.10	54.00	11.90	1000.000	150.0	V	241.0	0.3	-32.9

(continuation of the "Final_Result_RMS" table from column 12 ...)

Frequency (MHz)	Trd Corr. (dB/m)	Raw Rec (dBµV)	Comment
4803.398846	32.9	40.7	4:13:29 PM - 12/1/2022
4803.475578	32.9	39.8	4:12:17 PM - 12/1/2022
4999.431924	33.2	41.8	4:14:50 PM - 12/1/2022

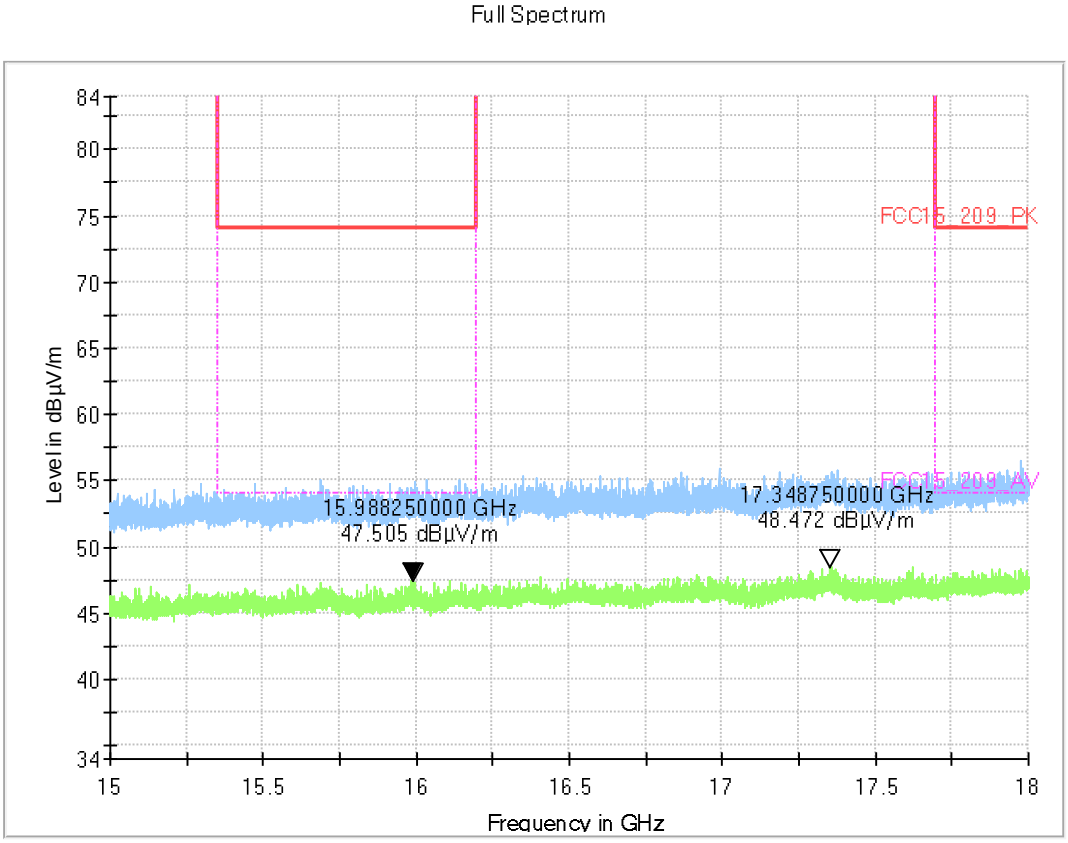
4.02a_RSE_TX_Ch00_Low_15G-18G_EUT_standing

Common Information

Test Description:	Radiated Filed Strength Emission@3m distance
Test Site Location:	CETECOM GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	TX BTLE, Ch00
SW:	EMC32 V10.60.20
Environmental Conditions:	Humidity: 37%rH; Temperature: 20.5°C
Operator:	Lor
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01



4.02b_RSE_TX_Ch00_Low_15G-18G_EUT_laying

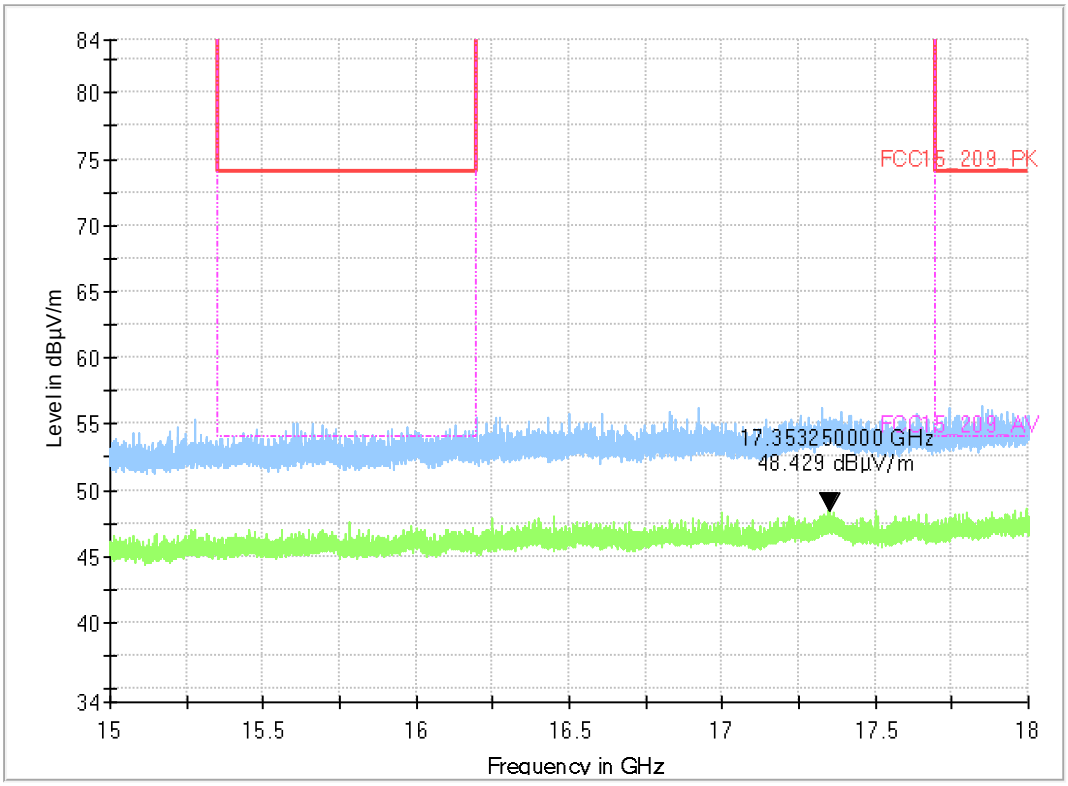
Common Information

Test Description:	Radiated Filed Strength Emission@3m distance
Test Site Location:	CETECOM GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	TX BTLE, Ch00
Environmental Conditions:	Humidity: 37%rH; Temperature: 20.5°C
Operator:	Lor
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01

Full Spectrum



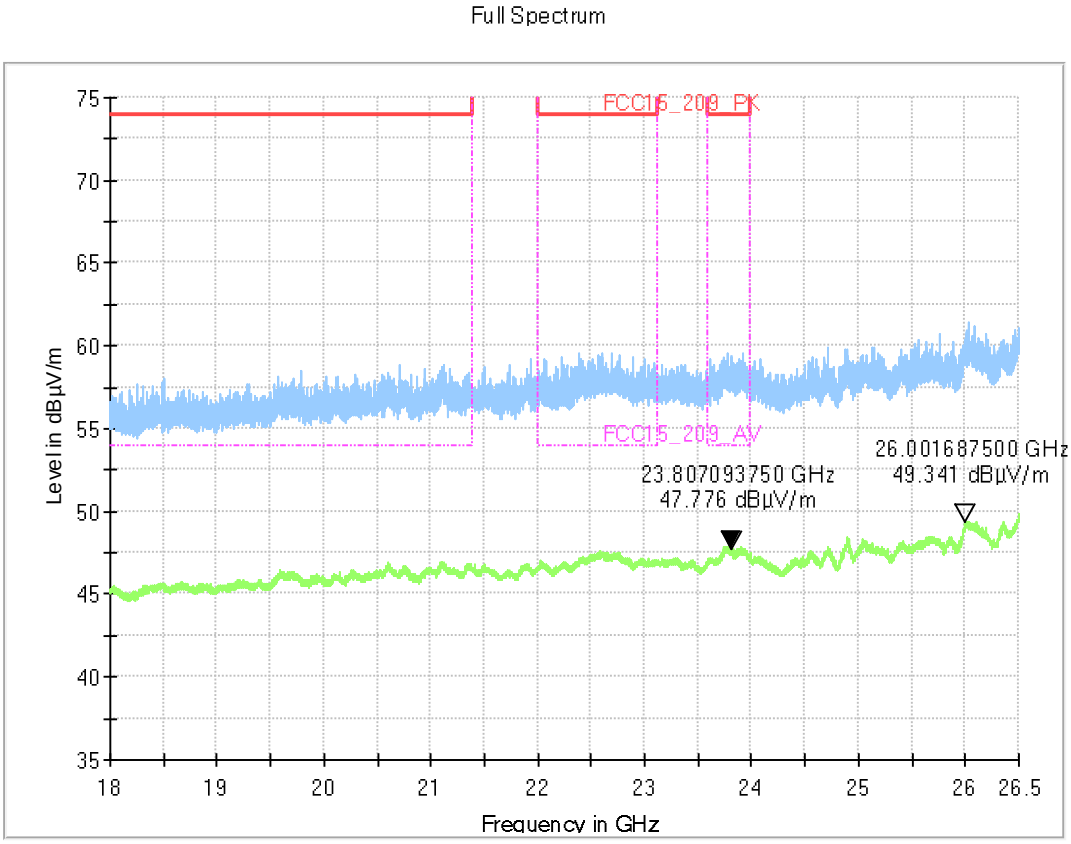
4.03a_RSE_TX_Ch00_Low_18G-26.5GHz_EUT_standing

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator / RSS-Gen., Issue 5
Antenna polarisation:	horizontal/vertical
Operating Mode:	BTLE / Ch00
Operator:	Lor
Comment:	Channel no. low
Environmental Conditions:	T=19.7°C, Hum=34%rH
EUT Setup:	S50
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01



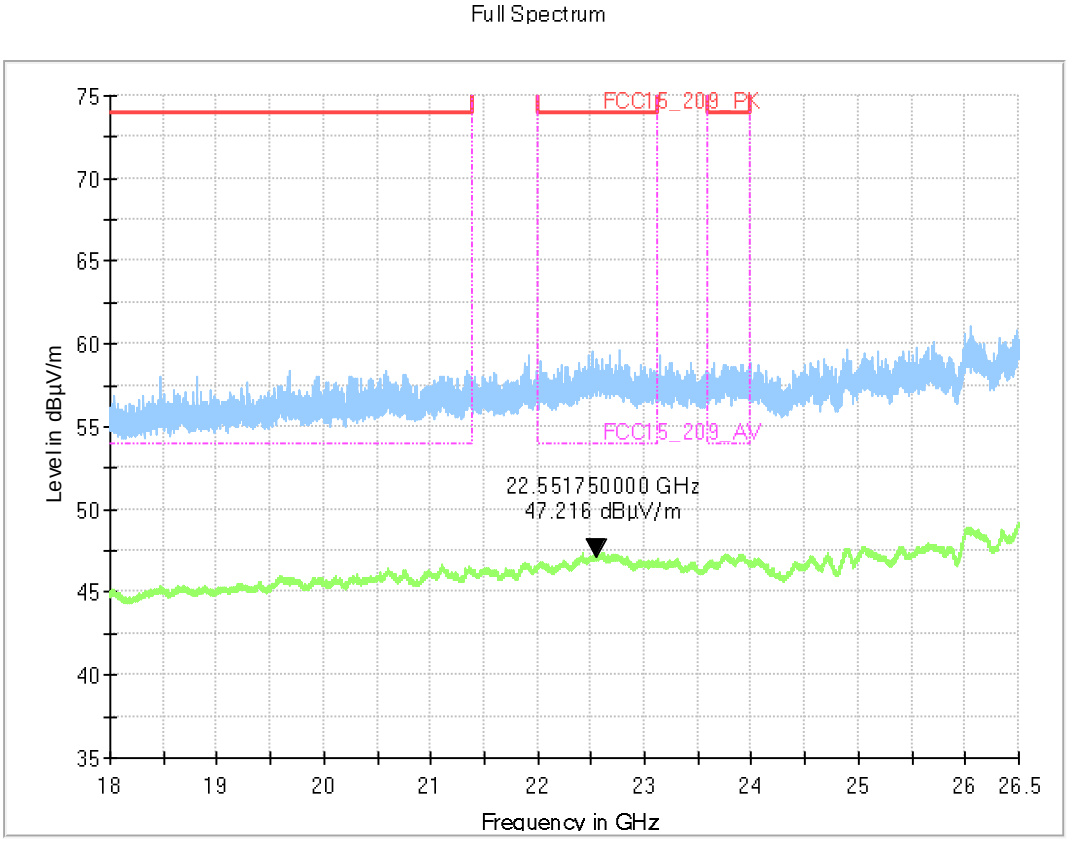
4.03b_RSE_TX_Ch00_Low_18G-26.5GHz_EUT_laying

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator / RSS-Gen., Issue 5
Antenna polarisation:	horizontal/vertical
SW-used:	EMC32 V10.60.20
Operating Mode:	BTLE / Ch00
Operator:	Lor
Comment:	Channel no. low=00
Environmental Conditions:	T=19.7°C, Hum=34%rH
EUT Setup:	S50
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01



9.1a_BE_low_Ch00_EUT_standing

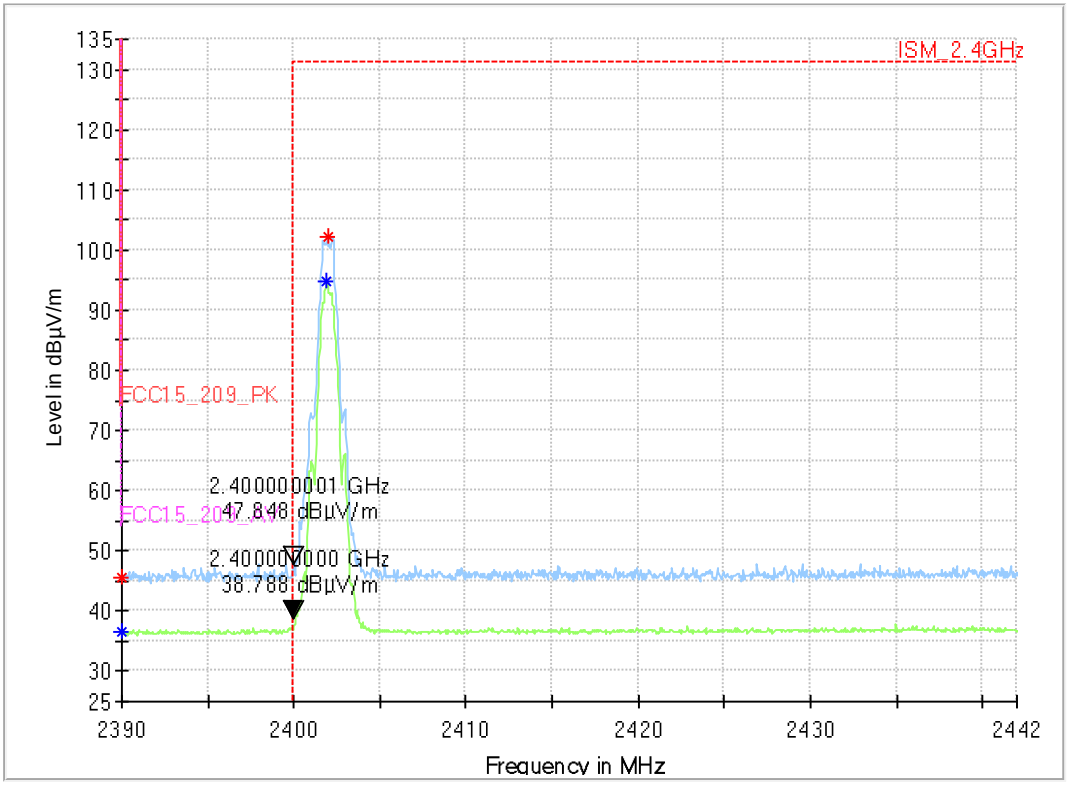
Common Information

Test Description:	Band-Edge: Radiated Field Strength Emissions Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator / RSS-Gen., Issue 5
Antenna polarisation:	horizontal/vertical
SW-used:	EMC32 V10.60.20
Operating Mode:	BTLE / Ch00
Operator:	Lor
Comment:	Channel no. low
EUT Setup:	S50
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01

Full Spectrum



Data Reduction D1 [1]

Frequency (MHz)	PK+_MAXH (dBµV/m)	RMS_MAXH (dBµV/m)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Meas. Time (ms)	Bandwidth (kHz)
2390.000000	45.6	36.2	150.0	152.0	34.3	500.000	100.000000
2401.960000	102.3	94.7	150.0	350.0	34.2	500.000	100.000000

Data Reduction D2 [1]

Frequency (MHz)	PK+_MAXH (dBµV/m)	RMS_MAXH (dBµV/m)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Meas. Time (ms)	Bandwidth (kHz)
2390.000000	45.2	36.5	150.0	205.0	34.3	500.000	100.000000
2401.908000	101.1	94.9	150.0	348.0	34.2	500.000	100.000000

9.1b_BE_low_Ch00_EUT_laying

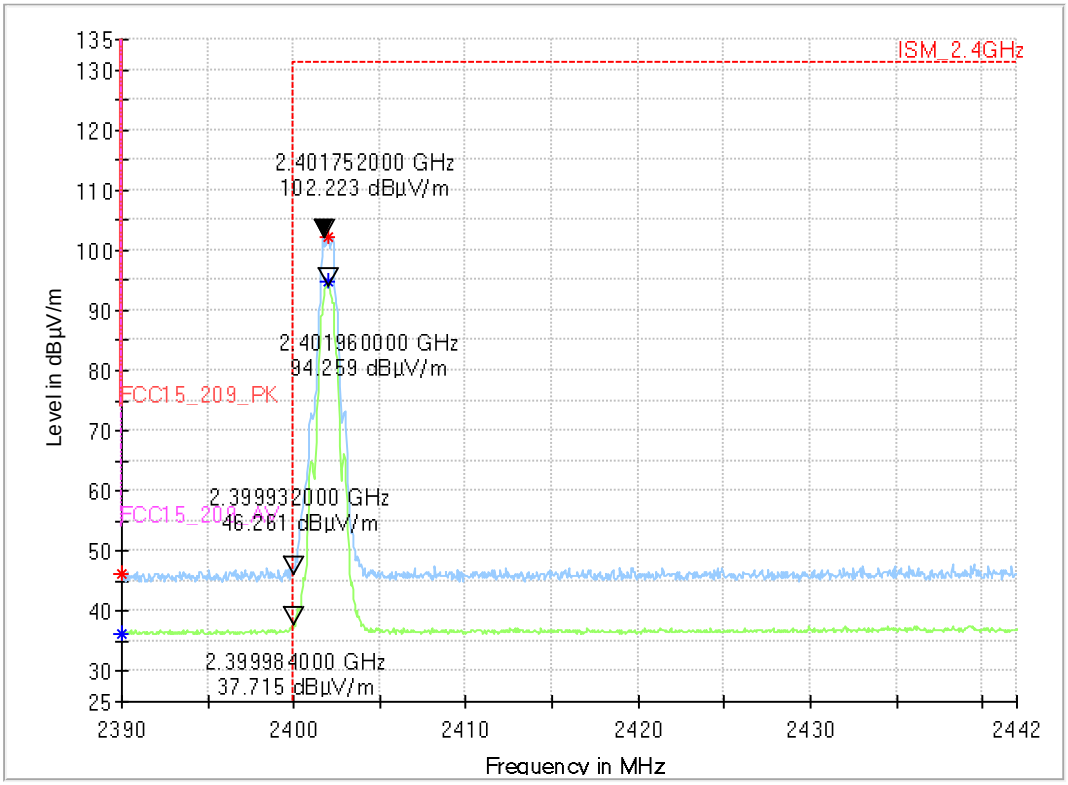
Common Information

Test Description:	Band-Edge: Radiated Field Strength Emissions Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator / RSS-Gen., Issue 5
Antenna polarisation:	horizontal/vertical
SW-used:	EMC32 V10.60.20
Operating Mode:	BTLE / Ch00
Operator:	Lor
Comment:	Channel no. low=00
EUT Setup:	S50
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01

Full Spectrum



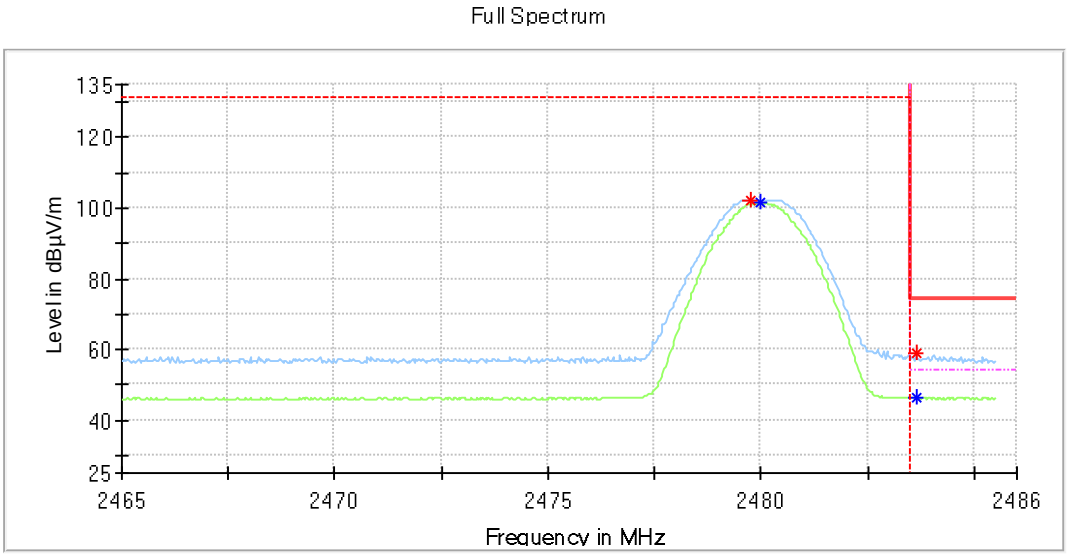
9.2a_BE_high_Ch27_EUT_standing

Common Information

Test Description:	Band-Edge: Radiated Field Strength Emissions Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator / RSS-Gen., Issue 5
Antenna polarisation:	horizontal/vertical
Meas. SW-used	EMC32 V10.60.20
Operating Mode:	BTLE / Ch27 (highest)
Operator:	Lor
Comment:	Channel no. high = 27
EUT Setup:	S50
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01



Data Reduction D1 [1]

Frequency (MHz)	PK+_MAXH (dBµV/m)	RMS_MAXH (dBµV/m)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Meas. Time (ms)	Bandwidth (kHz)
2479.771500	102.4	101.3	150.0	350.0	34.4	300.000	1000.000000
2483.624000	58.8	46.2	150.0	22.0	34.4	300.000	1000.000000

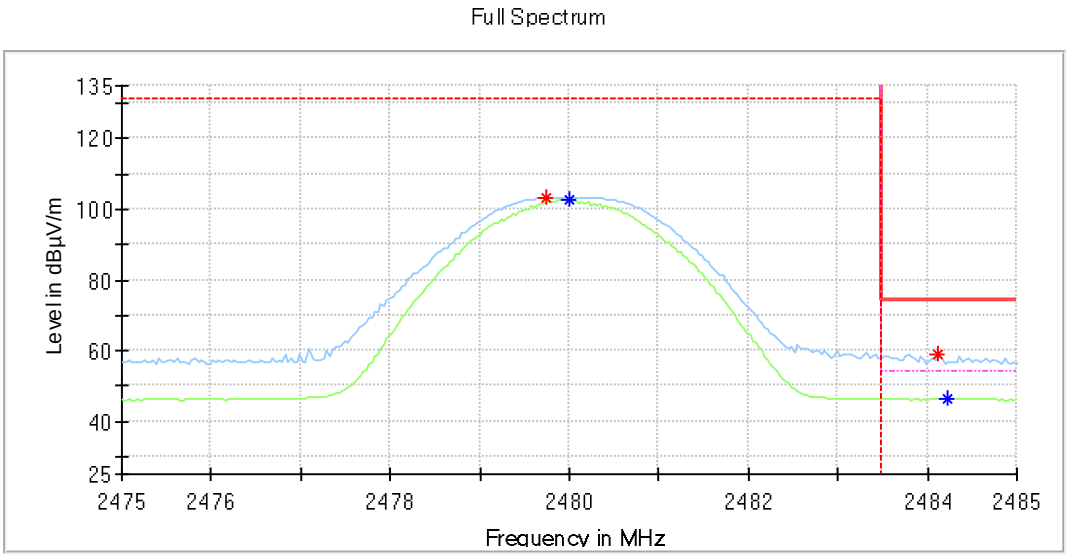
9.2b_BE_high_Ch27_EUT_laying

Common Information

Test Description:	Band-Edge: Radiated Field Strength Emissions Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator / RSS-Gen., Issue 5
Antenna polarisation:	horizontal/vertical
Meas. SW-used	EMC32 V10.60.20
Operating Mode:	BTLE / Ch27 (highest)
Operator:	Lor
Comment:	Channel no. high = 27
EUT Setup:	S50
Verdict:	Passed

EUT Information

PMT Sample Nr.	21-1-01787S50_C01



Data Reduction D1 [1]

Frequency (MHz)	PK+_MAXH (dBµV/m)	RMS_MAXH (dBµV/m)	Height (cm)	Azimuth (deg)	Corr. (dB/m)	Meas. Time (ms)	Bandwidth (kHz)
2479.738000	103.2	101.9	150.0	359.0	34.4	300.000	1000.000000
2484.126500	59.0	46.2	150.0	13.0	34.4	300.000	1000.000000

End Of Annex 1