

Annex 1: Measurement diagrams 24-1-0047701T001-TR1-A201-R02

Number of pages:	22	Date of Report:	2024-Aug-26
Testing company:	cetecom advanced GmbH Untertuerkheimer Str. 6-10 66117 Saarbruecken GERMANY	Applicant:	RAFI GmbH & Co. KG
Product: Model:	BLE low energy MCU Assembly Bluetooth Modul		
FCC ID:	2BESPSCU101916	IC:	32248-101916SCUNA
Testing has been carried out in accordance with:	FCC Regulations Title 47 CFR, Chapter I Subpart C Intentional Radiators § 15.247 Operation within the bands 2400-2483.5 MHz ISED-Regulations Radio Standards Specification RSS-Gen, Issue 5 General Requirements for Compliance of Radio Apparatus RSS-247, Issue 3 Digital Transmission Systems (DTSS)		

Measurement diagrams

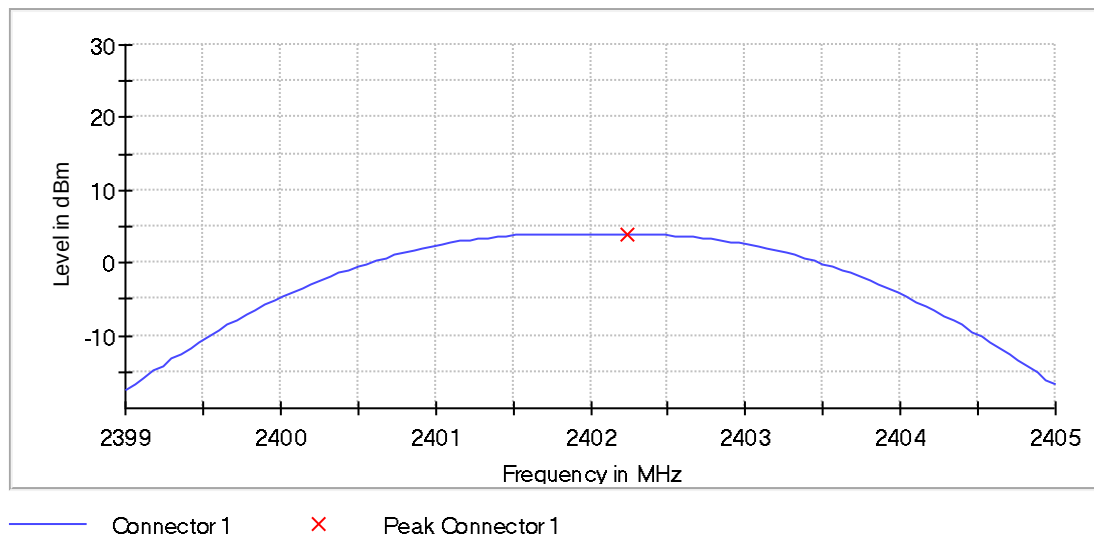
Peak output power (Sweep) (2402 MHz; BT-LE [GFSK] (10 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402.000000	3.9	30.0	PASS

Peak Power



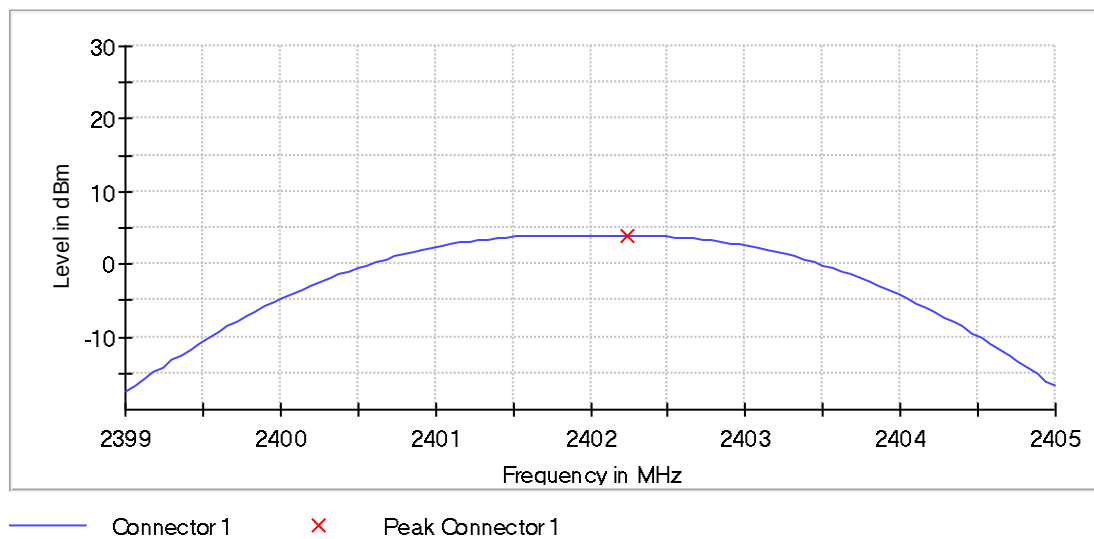
Peak output power (Sweep) (2440 MHz; BT-LE [GFSK] (10 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2440.000000	3.9	30.0	PASS

Peak Power



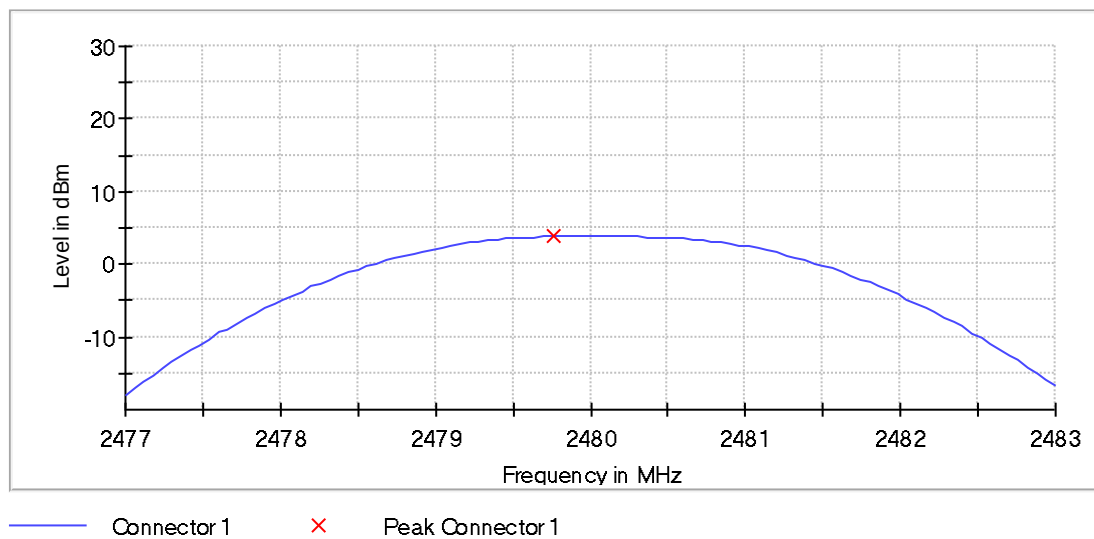
Peak output power (Sweep) (2480 MHz; BT-LE [GFSK] (10 dBm); 1 MHz)

Test according to FCC title 47 part 15 §15.247(b), KDB 558074 D01 DTS Meas Guidance v03r05 and ANSI C63.10-2013

Result

DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2480.000000	3.8	30.0	PASS

Peak Power



2.01_BLE_ch0_laying

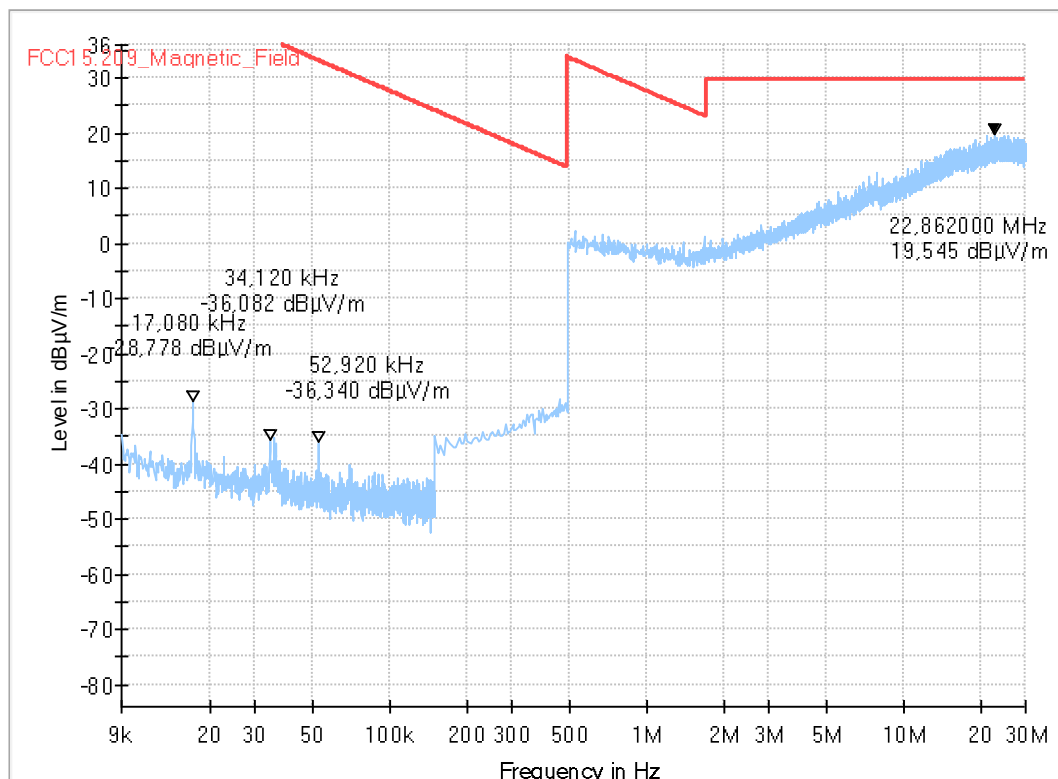
Common Information

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 V10.60.20
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:	ASa
Operating Mode:	GFSK 1Mbit ch0
Power during tests:	12V DC
Comment 1:	Channel low
Environmental Conditions:	Humidity: 44 % rH; Temperature: 20.2 °C
EUT Setup:	1
Verdict:	Passed

EUT Information

PMT number:	24-1-00477S02_C01
Power:	12 V DC

Full Spectrum



2.02_BLE_ch0_standing

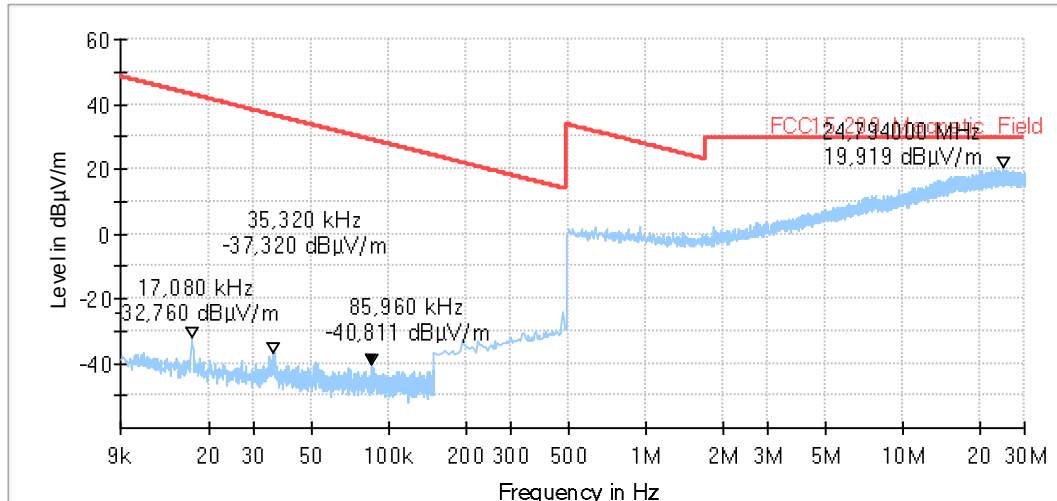
Common Information

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 V10.60.20
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:	ASa
Operating Mode:	GFSK 1Mbit ch0
Power during tests:	12V DC
Comment 1:	Channel low
Environmental Conditions:	Humidity: 44 % rH; Temperature: 20.2 °C
EUT Setup:	1
Verdict:	Passed

EUT Information

PMT number:	24-1-00477S02_C01
Power:	12 V DC

Full Spectrum



2.03_BLE_ch17

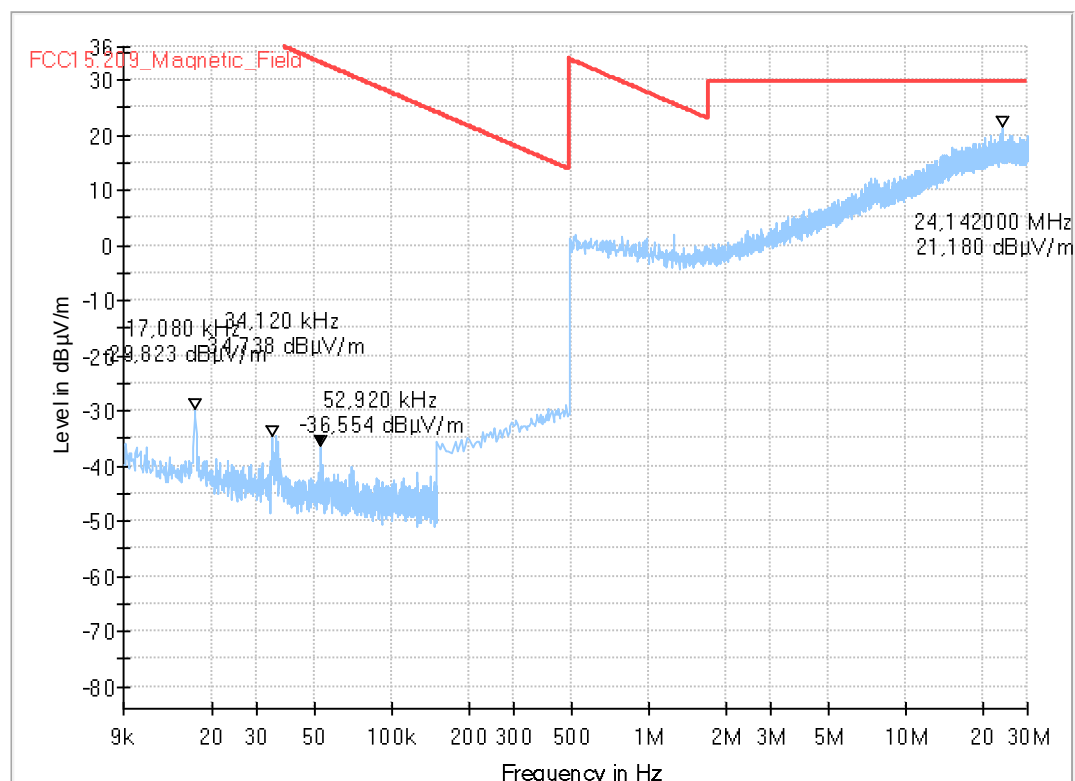
Common Information

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 V10.60.20
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:	ASa
Operating Mode:	GFSK 1Mbit ch17
Power during tests:	12 V DC
Comment 1:	Channel mid
Environmental Conditions:	Humidity: 44 % rH; Temperature: 20.2 °C
EUT Setup:	2
Verdict:	Passed

EUT Information

PMT number:	24-1-00477S06_C01
Power:	12 V DC

Full Spectrum



2.04_BLE_ch39

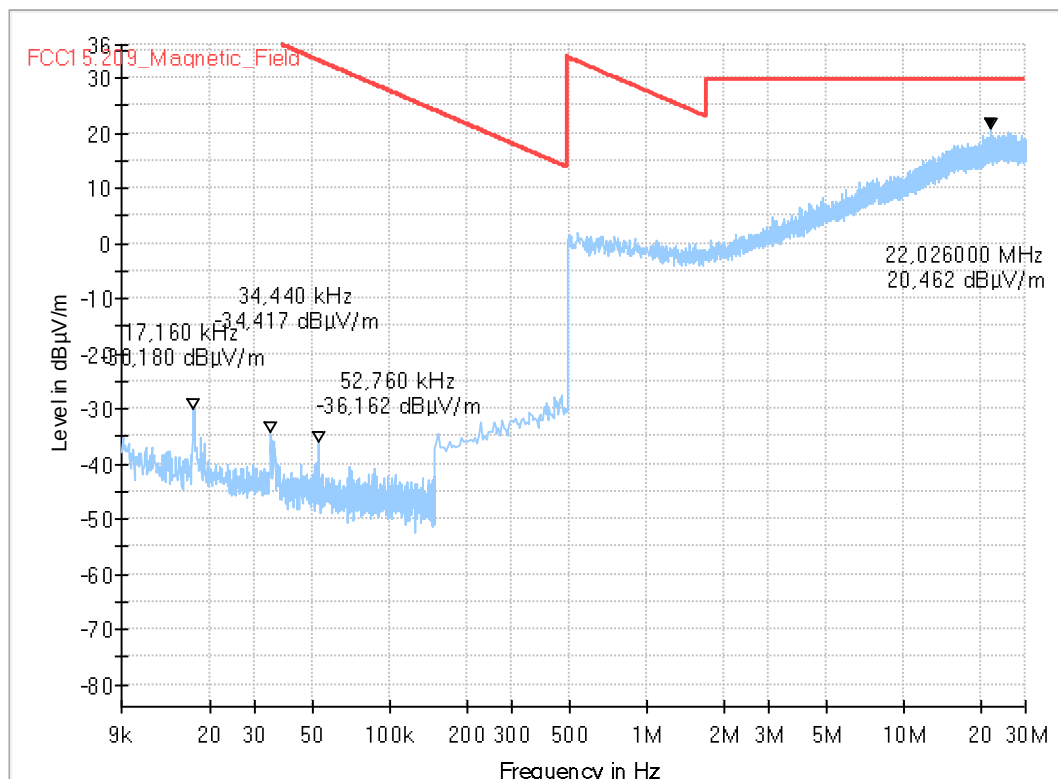
Common Information

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 V10.60.20
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:	ASa
Operating Mode:	GFSK 1Mbit ch39
Power during tests:	12 V DC
Comment 1:	Channel high
Environmental Conditions:	Humidity: 44 % rH; Temperature: 20.2 °C
EUT Setup:	3
Verdict:	Passed

EUT Information

PMT number:	24-1-00477S01_C01
Power:	12 V DC

Full Spectrum



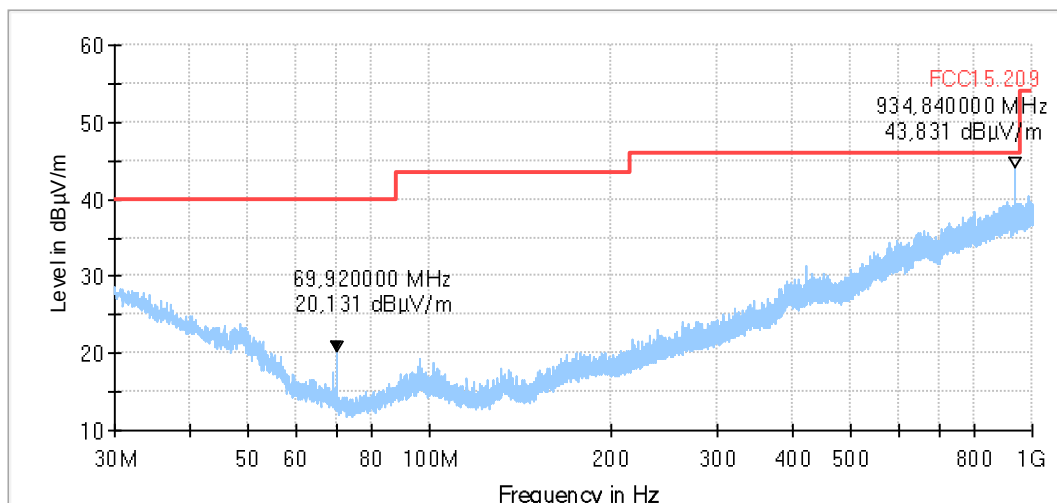
3.01_BLE_ch0

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	cetekom advanced GmbH
Test Standard:	FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation:	horizontal/vertical
Environmental Conditions:	Humidity: 41 %rH; Temperature: 21 °C
Operator Name:	SOz
EUT:	1
Operating Mode:	GFSK 1Mbit ch0
Power supply:	12 V DC
Comment:	Channel no. low
Verdict:	Passed

EUT Information

PMT number:	24-1-00477S02_C01
Power:	12 V DC



Remark: Emission at 934.84 MHz is outside from chamber and not related to results.

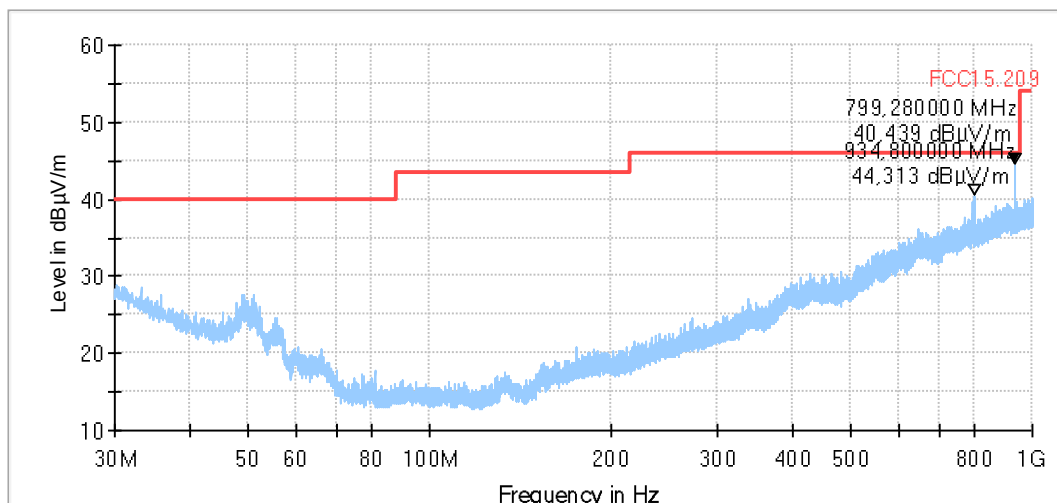
3.02_BLE_ch17

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	cetecom advanced GmbH
Test Standard:	FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation:	horizontal/vertical
Environmental Conditions:	Humidity: 41 % rH; Temperature: 21 °C
Operator Name:	SOz
EUT:	2
Operating Mode:	GFSK 1Mbit ch17
Power supply:	12 V DC
Comment:	Channel no. middle
Verdict:	Passed

EUT Information

PMT number:	24-1-00477S06_C01
Power:	12 V DC



Remark: Emission at 799.28 MHz and 934.8 MHz are outside from chamber and not related to results.

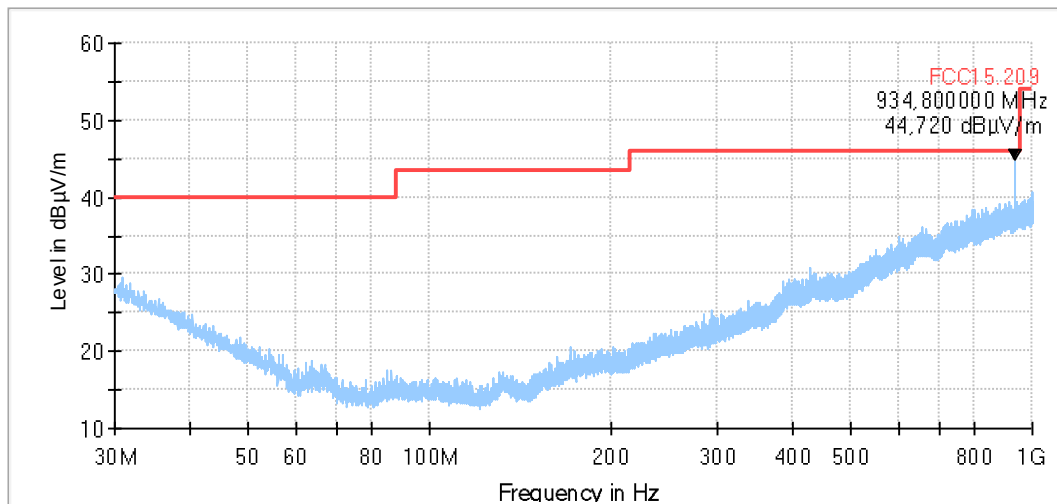
3.03_BLE_ch39

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	cetekom advanced GmbH
Test Standard:	FCC 15.205&15.209 & RSS Gen. Issue 5
Antenna polarisation:	horizontal/vertical
Environmental Conditions:	Humidity: 41 % rH; Temperature: 21 °C
Operator Name:	SOz
EUT:	3
Operating Mode:	GFSK 1Mbit ch39
Power supply:	12 V DC
Comment:	Channel no. high
Verdict:	Passed

EUT Information

PMT number:	24-1-00477S01_C01
Power:	12 V DC



Remark: Emission at 934.8 MHz is outside from chamber and not related to results.

4.01_BLE_ch0

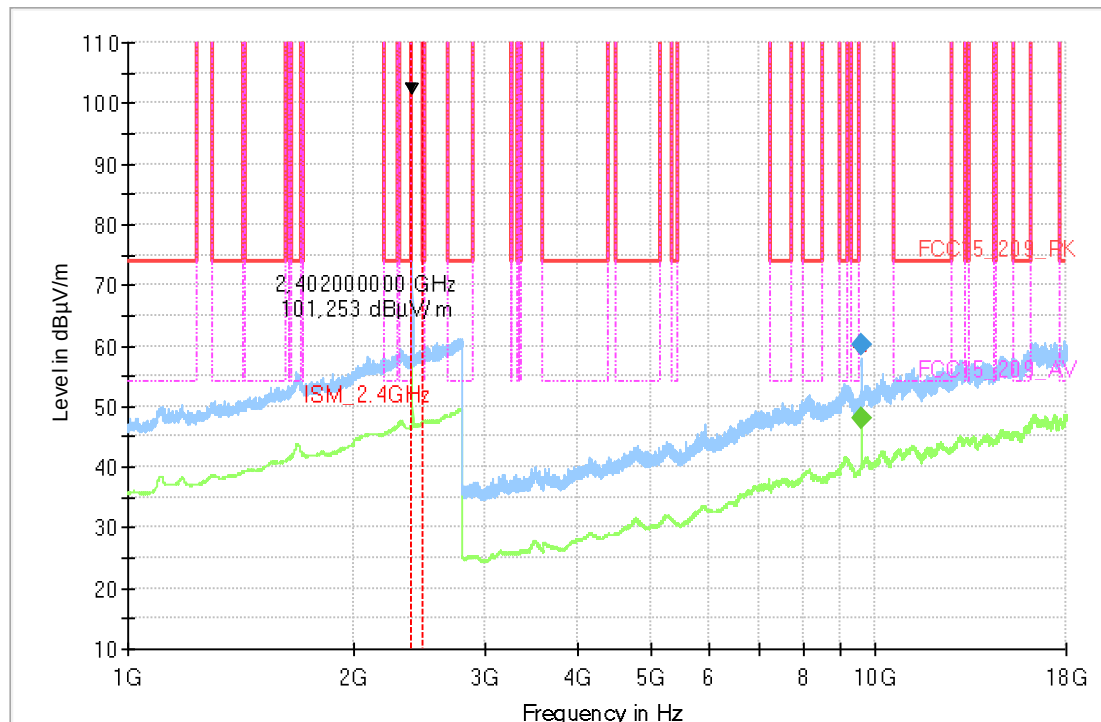
Common Information

Test Description:	Radiated field strength emission
Test Site:	Fully Anechoic Chamber (FAC1) - EMC32 V10.60.20
Test Standard:	FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
Antenna polarisation:	horizontal/vertical
Operating Mode:	GFSK 1Mbit ch0
Operator:	KTe
Environmental Conditions:	Humidity: 50 % rH; Temperature: 20 °C
Verdict:	Passed

EUT Information

Sample:	24-1-00477S02_C01
Power Supply :	12 V DC

Full Spectrum



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth (Hz)	Height	Pol	Azimuth	Elevation
9607.200000	---	48.09	150.00	101.91	100.0	1000.000	155.0	H	48.0	90.0
9607.200000	60.28	---	150.00	89.72	100.0	1000.000	155.0	H	45.0	90.0

4.02_BLE_ch0_AntH

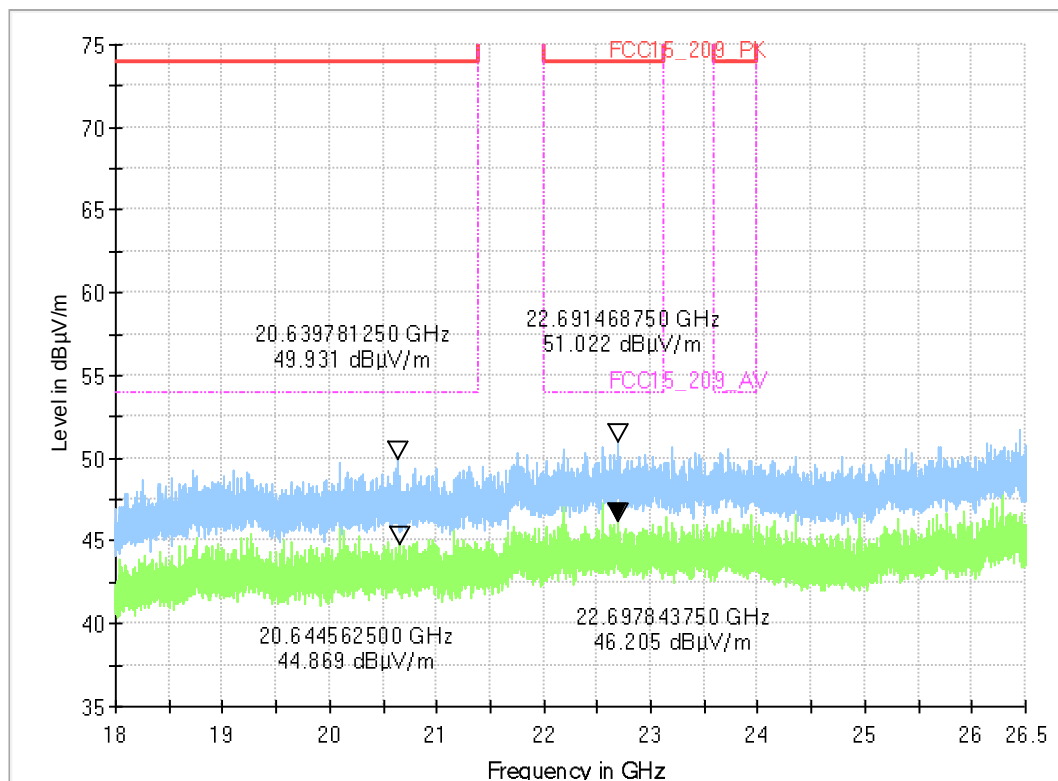
Common Information

Test Description:	Radiated Field Strength Emission
Test Site Location:	cetecom advanced Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC - Testing Part 15.247 & RSS-247, Issue 5
Operating Mode:	GFSK 1Mbit ch0
Environmental Conditions:	Humidity: 51 % rH; Temperature: 19 °C
SW-Version:	EMC32 V10.60.20
Operator:	KTe
Set-up:	1
Verdict:	Passed
Comment:	Antenna horizontal

EUT Information

PMT Sample Nr.	24-1-00477S02_C01
power:	12 V DC

Full Spectrum



4.03_BLE_ch0_AntV

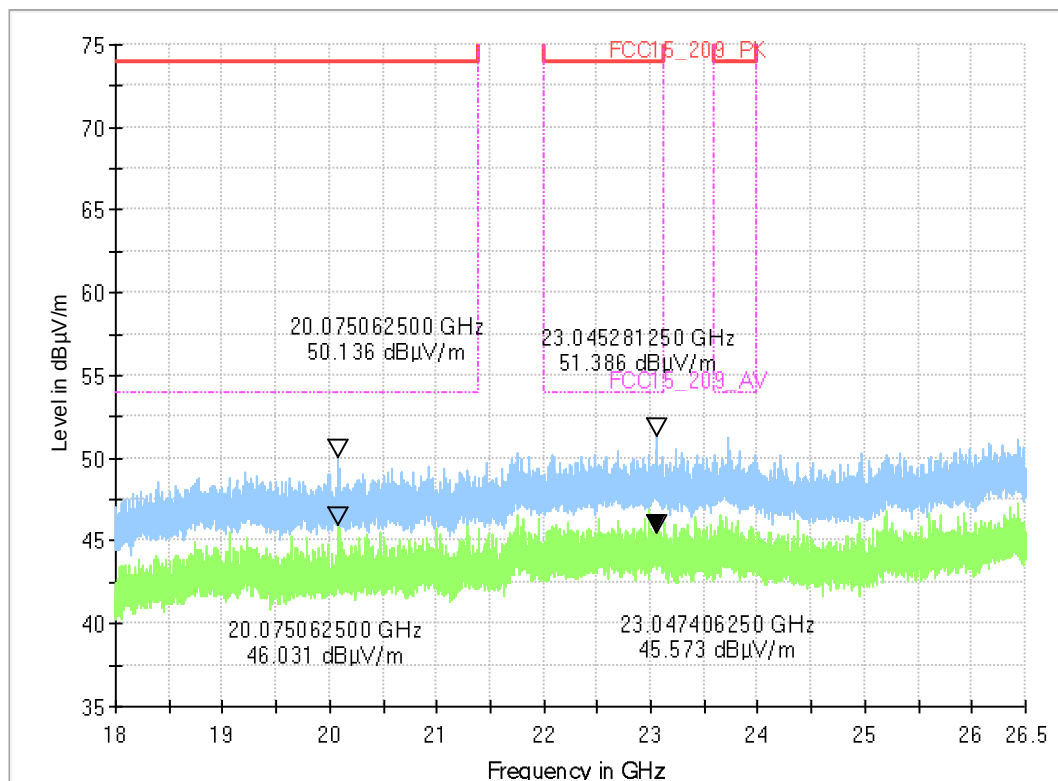
Common Information

Test Description:	Radiated Field Strength Emission
Test Site Location:	cetecom advanced Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC - Testing Part 15.247 & RSS-247, Issue 5
Operating Mode:	GFSK 1Mbit ch0
Environmental Conditions:	Humidity: 51 % rH; Temperature: 19°C
SW-Version:	EMC32 V10.60.20
Operator:	KTe
Set-up:	2
Verdict:	Passed
Comment:	Antenna vertical

EUT Information

PMT Sample Nr.	24-1-00477S02_C01
power:	12 V DC

Full Spectrum



4.04_BLE_ch17

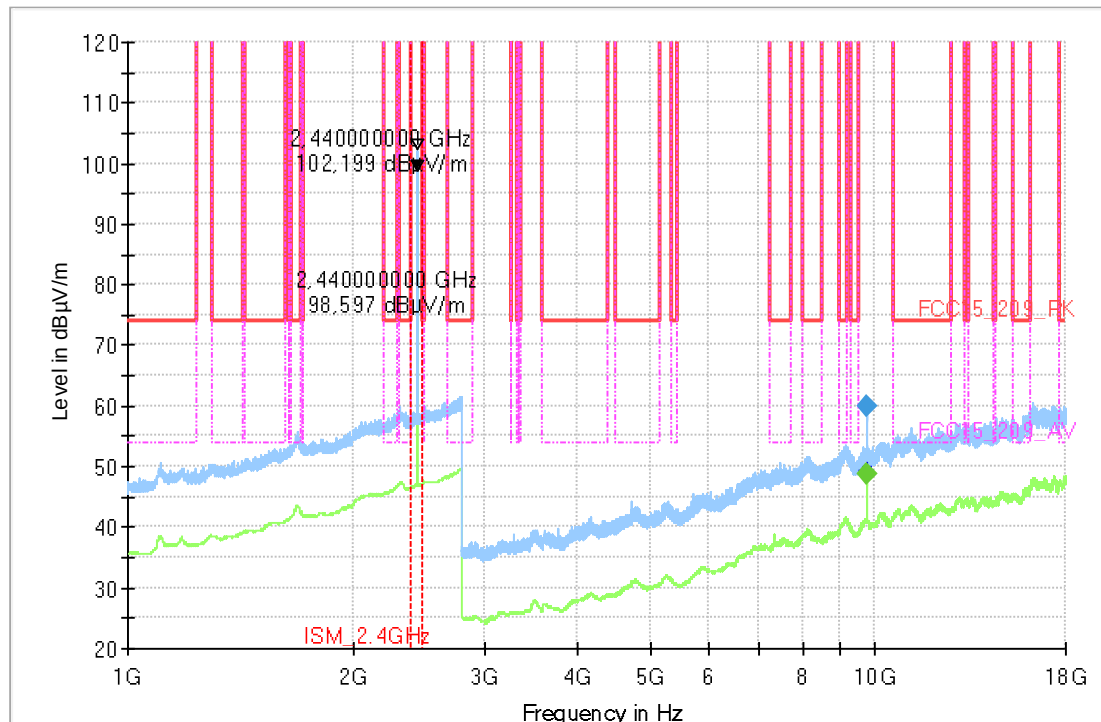
Common Information

Test Description:	Radiated field strength emission
Test Site:	Fully Anechoic Chamber (FAC1) - EMC32 V10.60.20
Test Standard:	FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
Antenna polarisation:	horizontal/vertical
Operating Mode:	GFSK 1Mbit ch17
Operator:	ASa / KTe
Environmental Conditions:	Humidity: 50 % rH; Temperature: 20 °C
Set-up:	2
Verdict:	Passed

EUT Information

Sample:	24-1-00477S06_C01
Power Supply :	12 V DC

Full Spectrum



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth (Hz)	Height	Pol	Azimuth	Elevation
9759.200000	---	48.67	150.00	101.33	100.0	1000.000	155.0	H	57.0	90.0
9761.200000	59.88	---	150.00	90.12	100.0	1000.000	155.0	H	57.0	90.0

4.05_BLE_ch17_AntH

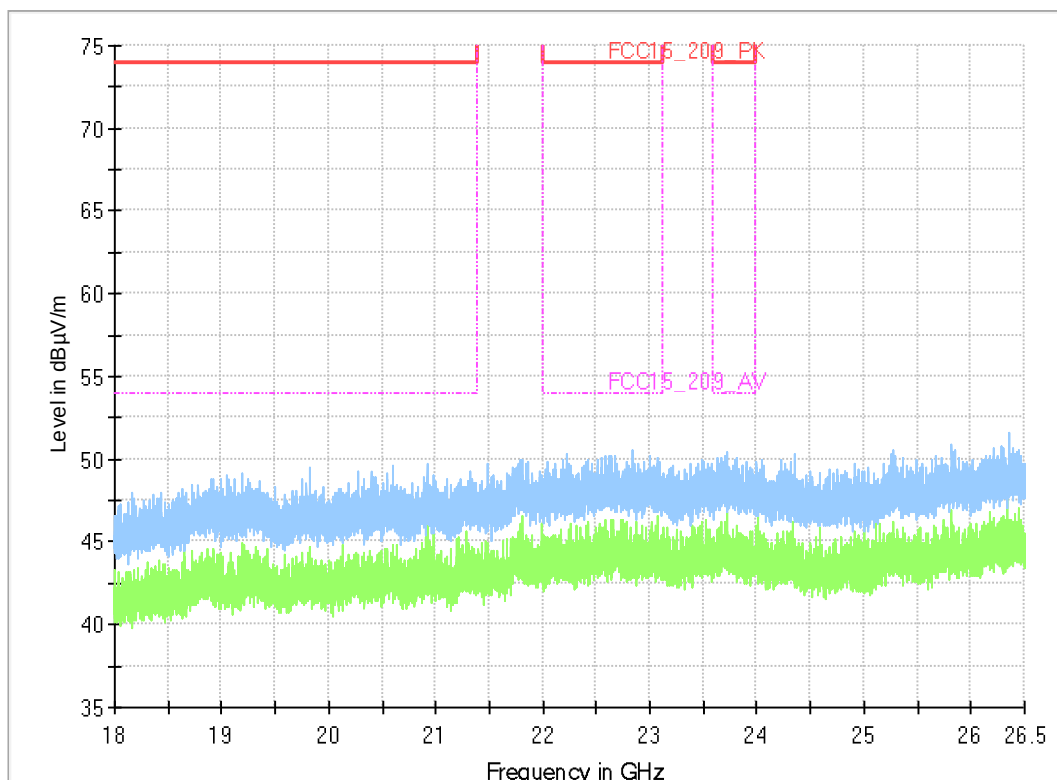
Common Information

Test Description:	Radiated Field Strength Emission@3m distance
Test Site Location:	cetecom advanced GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	GFSK 1Mbit ch17
Environmental Conditions:	Humidity: 51 % rH; Temperature: 19 °C
SW-Version:	EMC32 V10.60.20
Operator:	ASa
Set-up:	2
Verdict:	Passed

EUT Information

PMT Sample Nr.	24-1-00477S06_C01
power:	12 V DC

Full Spectrum



4.06_BLE_ch17_AntV

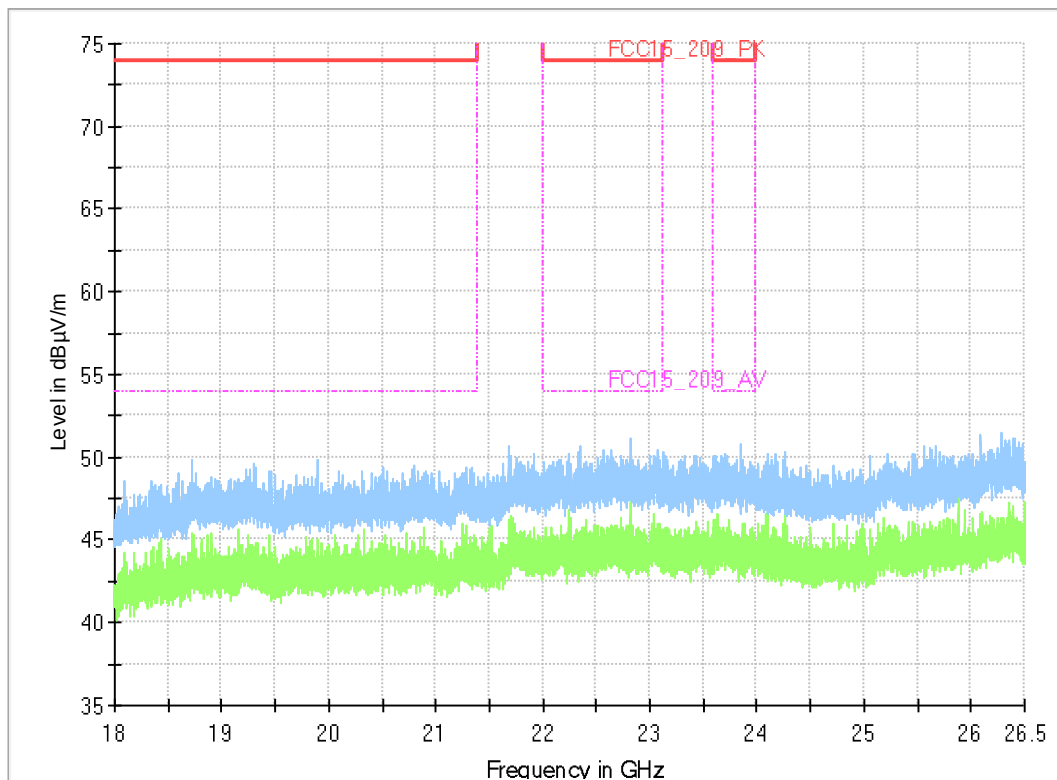
Common Information

Test Description:	Radiated Field Strength Emission@3m distance
Test Site Location:	cetecom advanced GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	GFSK 1Mbit ch17
Environmental Conditions:	Humidity: 45 % rH; Temperature: 21 °C
SW-Version:	EMC32 V10.60.20
Operator:	ASa
Set-up:	2
Verdict:	Passed

EUT Information

PMT Sample Nr.	24-1-00477S06_C01
power:	12 V DC

Full Spectrum



4.07_BLE_ch39

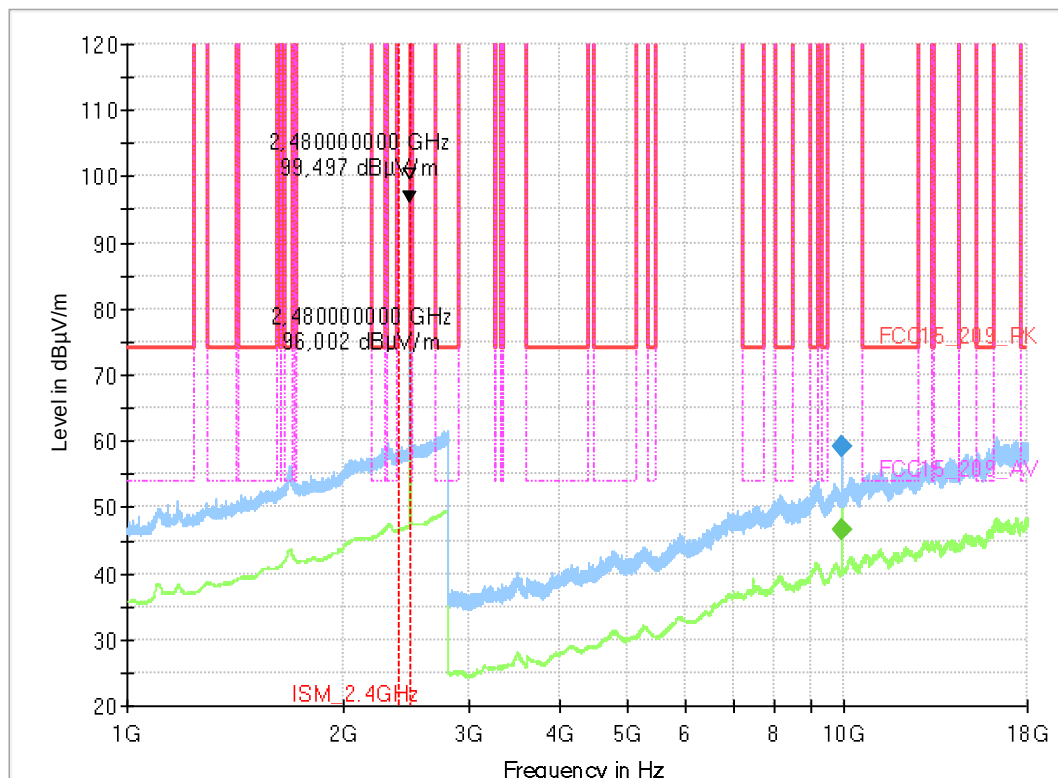
Common Information

Test Description:	Radiated field strength emission
Test Site:	Fully Anechoic Chamber (FAC1) - EMC32 V10.60.20
Test Standard:	FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
Antenna polarisation:	horizontal/vertical
Operating Mode:	GFSK 1Mbit ch39
Operator:	ASa
Environmental Conditions:	Humidity: 50 % rH; Temperature: 20 °C
Verdict:	Passed

EUT Information

Sample:	24-1-00477S01_C01
Power Supply :	12 V DC

Full Spectrum



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin	Meas. Time (ms)	Bandwidth	Height	Pol	Azimuth	Elevation
9919.200000	59.25	---	150.00	90.75	100.0	1000.000	155.0	H	50.0	90.0
9921.200000	---	46.66	150.00	103.34	100.0	1000.000	155.0	H	52.0	90.0

4.08_BLE_ch39_AntH

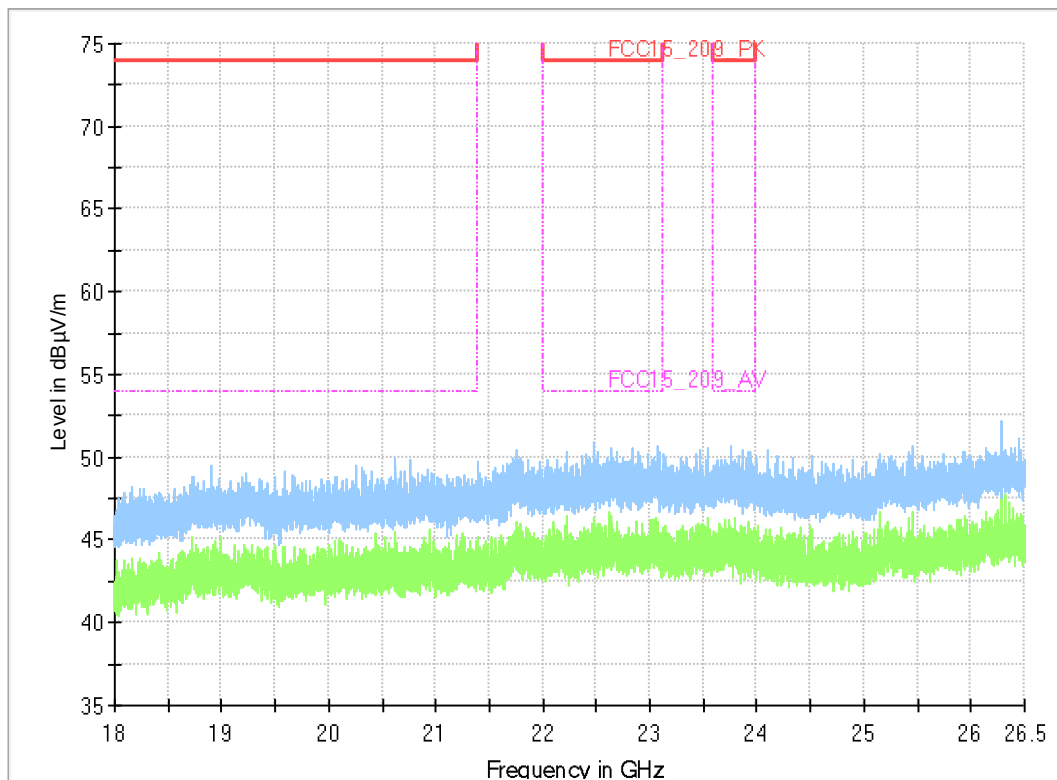
Common Information

Test Description:	Radiated Field Strength Emission@3m distance
Test Site Location:	cetecom advanced GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	GFSK 1Mbit ch39
Environmental Conditions:	Humidity: 37 % rH; Temperature: 22.6 °C
SW-Version:	EMC32 V10.60.20
Operator:	SOz
Set-up:	3
Verdict:	Passed

EUT Information

PMT Sample Nr.	24-1-00477S01_C01
power:	12 V DC

Full Spectrum



4.09_BLE_ch39_AntV

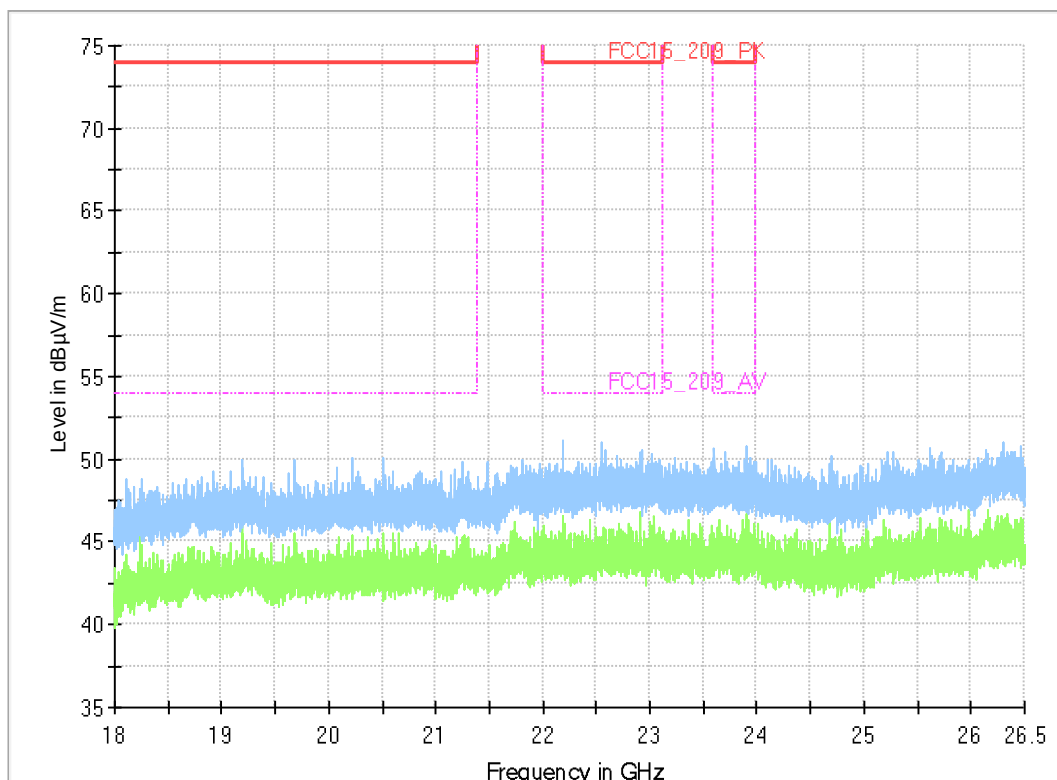
Common Information

Test Description:	Radiated Field Strength Emission@3m distance
Test Site Location:	cetecom advanced GmbH Essen
Test Site:	Fully Anechoic Room (FAR2)
Test Standard:	FCC 15.209 & RSS-Gen, Issue 5
Operating Mode:	GFSK 1Mbit ch39
Environmental Conditions:	Humidity: 37 % rH; Temperature: 22.6 °C
SW-Version:	EMC32 V10.60.20
Operator:	ASa
Set-up:	3
Verdict:	Passed

EUT Information

PMT Sample Nr.	24-1-00477S01_C01
power:	12 V DC

Full Spectrum



9.01_BLE_ch0

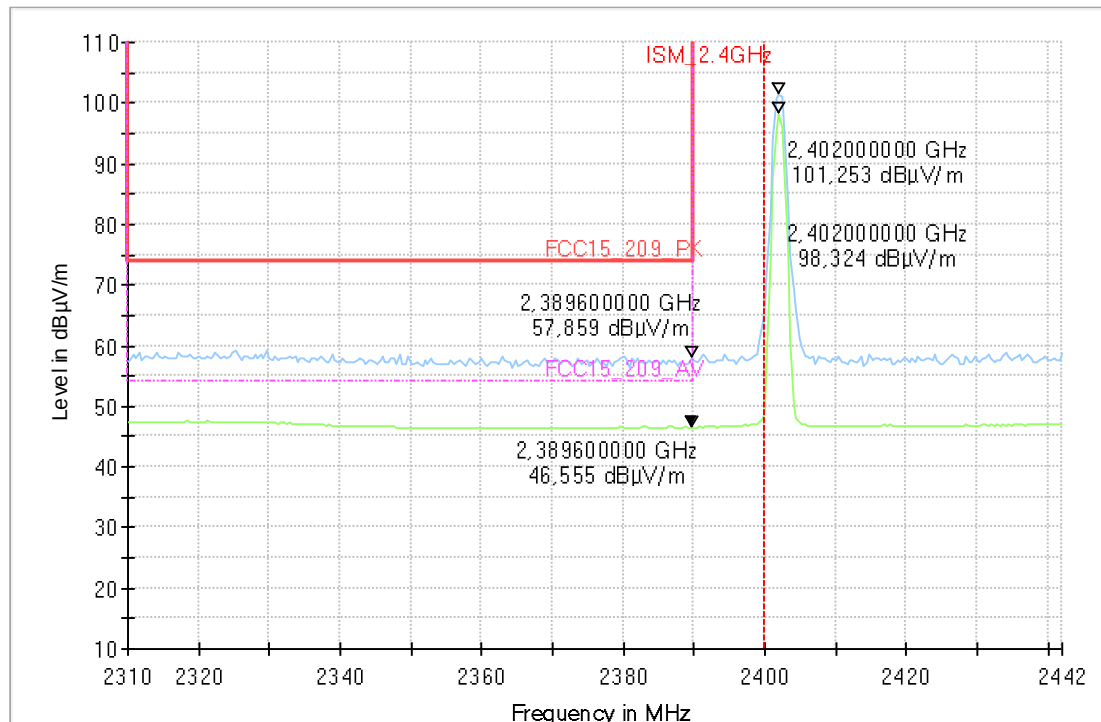
Common Information

Test Description:	Band-Edge: Radiated Field Strength Emissions Emissions
Test Site:	Fully Anechoic Chamber (FAC1) - EMC32 V10.60.20
Test Standard:	FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
Antenna polarisation:	horizontal/vertical
Operating Mode:	GFSK 1Mbit ch0
Operator:	KTe
Environmental Conditions:	Humidity: 50 % rH; Temperature: 20 °C
EUT Setup:	1
Verdict:	Passed

EUT Information

Sample:	24-1-00477S02_C01
Power Supply :	12 V DC

Full Spectrum



9.02_BLE_ch39

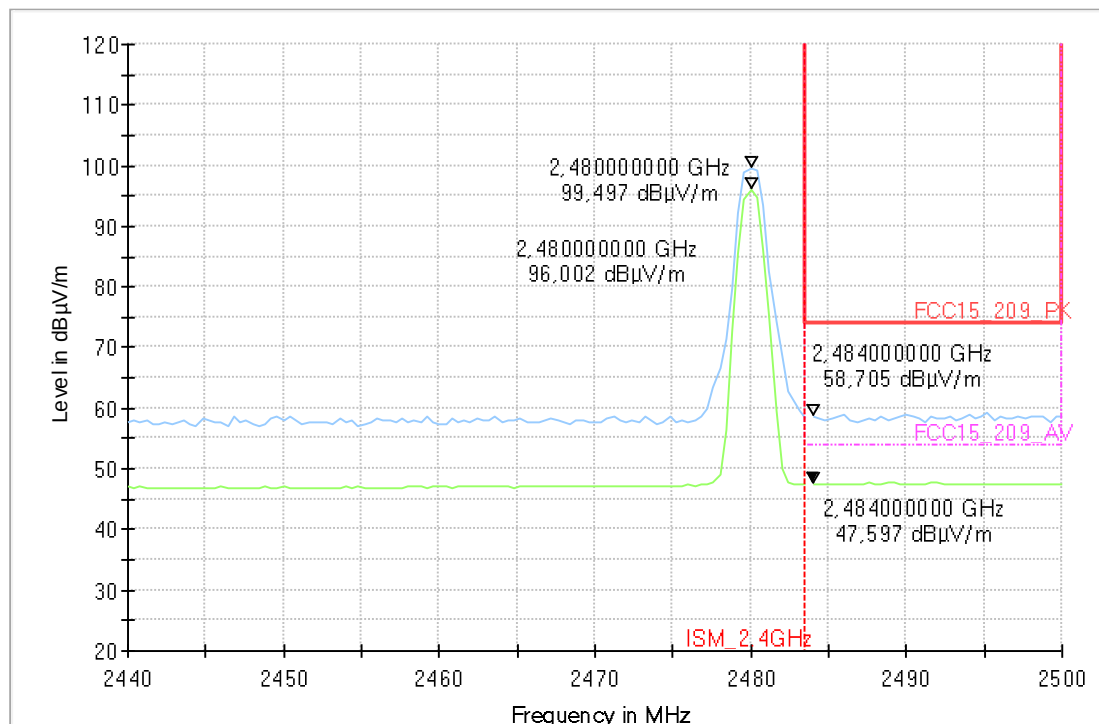
Common Information

Test Description:	Band-Edge: Radiated Field Strength Emissions Emissions
Test Site:	Fully Anechoic Chamber (FAC1) - EMC32 V10.60.20
Test Standard:	FCC 15.247&15.209 Intentional Radiator / RSS-Gen, Issue 5
Antenna polarisation:	horizontal/vertical
Operating Mode:	GFSK 1Mbit ch39
Operator:	KTe
Environmental Conditions:	Humidity: 50 % rH; Temperature: 20 °C
EUT Setup:	3
Verdict:	Passed

EUT Information

Sample:	24-1-00477S01_C01
Power Supply :	12 V DC

Full Spectrum



End Of Annex 1