

Annex 2: Measurement diagrams to
PARTIAL TEST REPORT
 No.: 6-0461-14-3-1a

According to:

FCC Part 15.247
 RSS-247, Issue 1

for

Robert Bosch Car Multimedia GmbH

LCN2K70A10
 Radio Navigation System
 (Bluetooth 2.4GHz)

FCC ID: YBN-LCN2K70A10
IC: 9595A-LCN2K70A10
 PMN: Nissan LCN2Kai
 HVIN: LCN2K70A10







Laboratory Accreditation and Listings			
 Deutsche Akkreditierungsstelle D-PL-12047-01-01	 FEDERAL COMMUNICATIONS COMMISSION USA MRA US-EU 0003	 Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	 Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2666 C-2914, T-1967, G-301
 AUTHORIZED RF LABORATORY	 LAB CODE 20011130-00		
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1. Conducted EMI measurements on AC-mains port according 15.207, class B

Not applicable since car equipment powered from car battery. (12V)

2. Radiated field strength measurements accord. §15.209&15.205

2.1. Magnetic field measurements $f < 30\text{ MHz}$

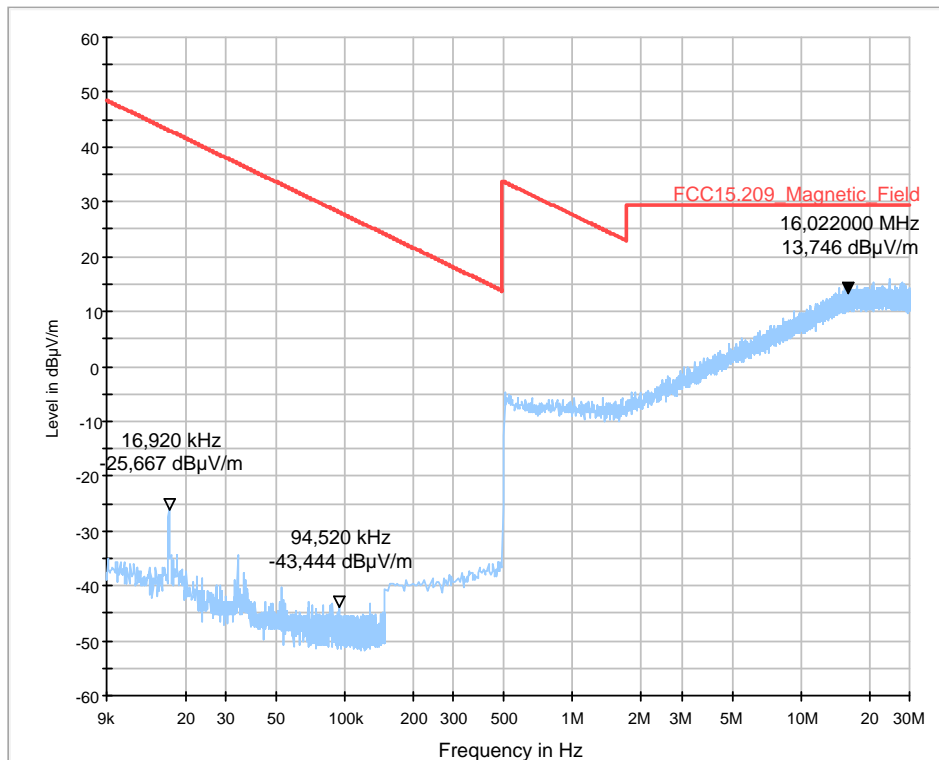
2.1.1. GFSK modulation

Diagram No. 2.01_TX_ch00_DH5

Test description:	Date: 01.06.2015 Page 1 of 1
Test site and distance:	Magnetic Field Strength Measurement related to 30/300 m distance
Version of Testsoftware:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Distance correction:	EMC32 V8.51.0
Technical Data:	used accord. table, pls. see test report
Rec. antenna (pre-scan):	Please see page 2 for detailed data of measurement setup
Used filter:	height 1.00 m, parallel and 90° to EUT polarisation
Test specification:	bypass
	FCC 15.205 § 15.209; RSS-Gen: Issue 4
Operator:	HLa
Operating conditions:	BT TX Ch:00 DH5
Power during tests:	13,5V DC
Comment 1:	Channel low
Comment 2:	

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC



2.1.2. $\pi/4$ DQPSK modulation

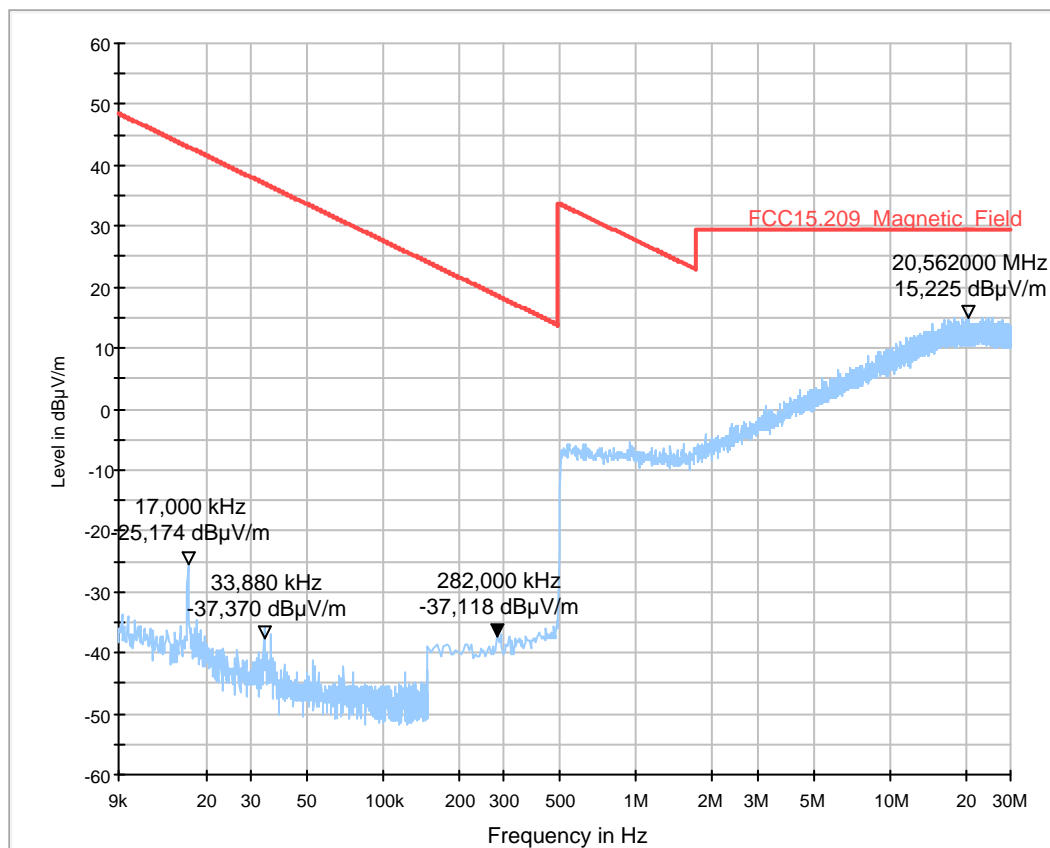
Diagram No. 2.02_TX_ch39_2-DH5

Test description:	Date: 01.06.2015 Page 1 of 1
Test site and distance:	Magnetic Field Strength Measurement related to 30/300 m distance
Version of Testsoftware:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Distance correction:	EMC32 V8.51.0
Technical Data:	used accord. table, pls. see test report
Rec. antenna (pre-scan):	Please see page 2 for detailed data of measurement setup
Used filter:	height 1.00 m, parallel and 90° to EUT polarisation
Test specification:	bypass
	FCC 15.205 § 15.209; RSS-Gen: Issue 4
Operator:	HLA
Operating conditions:	BT TX Ch:39_2-DH5
Power during tests:	13,5V DC
Comment 1:	Channel middle
Comment 2:	

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10

HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC



2.1.3. 8DPSK modulation

Diagram No. 2.03_TX_ch78_3-DH5

Test description:	Date: 01.06.2015 Page 1 of 1
Test site and distance:	Magnetic Field Strength Measurement related to 30/300 m distance
Version of Testsoftware:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Distance correction:	EMC32 V8.51.0
Technical Data:	used accord. table, pls. see test report
Rec. antenna (pre-scan):	Please see page 2 for detailed data of measurement setup
Used filter:	height 1.00 m, parallel and 90° to EUT polarisation
Test specification:	bypass
	FCC 15.205 § 15.209; RSS-Gen: Issue 4

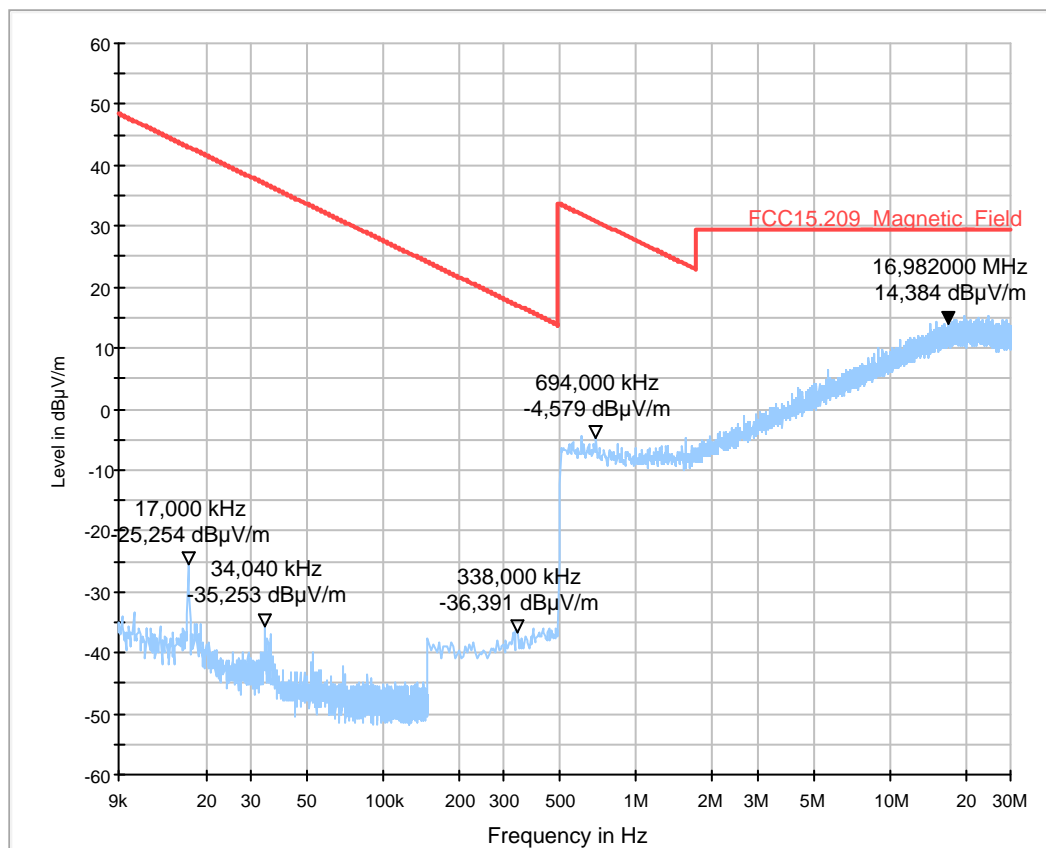
Operator:	HLA
Operating conditions:	BT TX Ch:78_3-DH5
Power during tests:	13,5V DC
Comment 1:	Channel high
Comment 2:	

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10

HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

FCC15.209_ANSI63_10_2013



2.2. Field strength measurements 30MHz <f <1GHz

2.2.1. GFSK modulation

Diagram No. 3.01_TX_ch00_DH5

29.05.2015 Page 1 of 1
 Test description: Electric Field Strength Measurement
 Test site and distance: Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
 Version of Testsoftware: EMC32 V8.51.0
 Distance correction: not used
 Used filter: not used
 Technical Data: please see page 2 for detailed data of measurement setup
 Test specification.: FCC 15.209; RSS-Gen: Issue 3

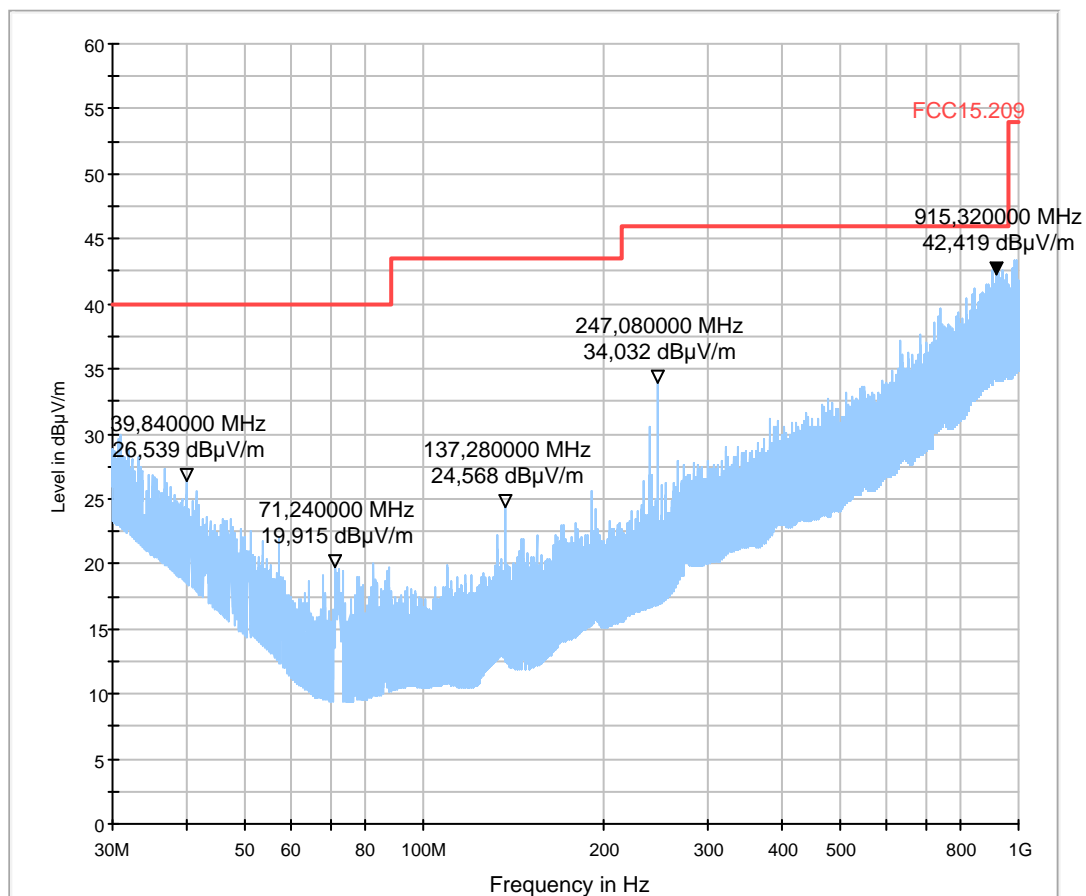
Operator: HLa
 Operating conditions: BT TX Ch:00, DH5
 Power during tests: 13.5V DC
 Comment 1: EUT standing (defined normal position)

EUT Information

Manufacturer: Bosch
 EuT: LCN2K70A10

 HW Version: 051
 SW Version: F024
 Serial Number: 3369497
 Connected Interfaces: -
 Power Supply: via external power supply, nomVolt: 13.50 VDC

01_FCC15.209_hor+vert_KP0



2.2.2. $\pi/4$ DQPSK modulation

Diagram No. 3.02_TX_ch39_2-DH5

29.05.2015 Page 1 of 1
 Test description: Electric Field Strength Measurement
 Test site and distance: Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
 Version of Testsoftware: EMC32 V8.51.0
 Distance correction: not used
 Used filter: not used
 Technical Data: please see page 2 for detailed data of measurement setup
 Test specification.: FCC 15.209; RSS-Gen: Issue 3

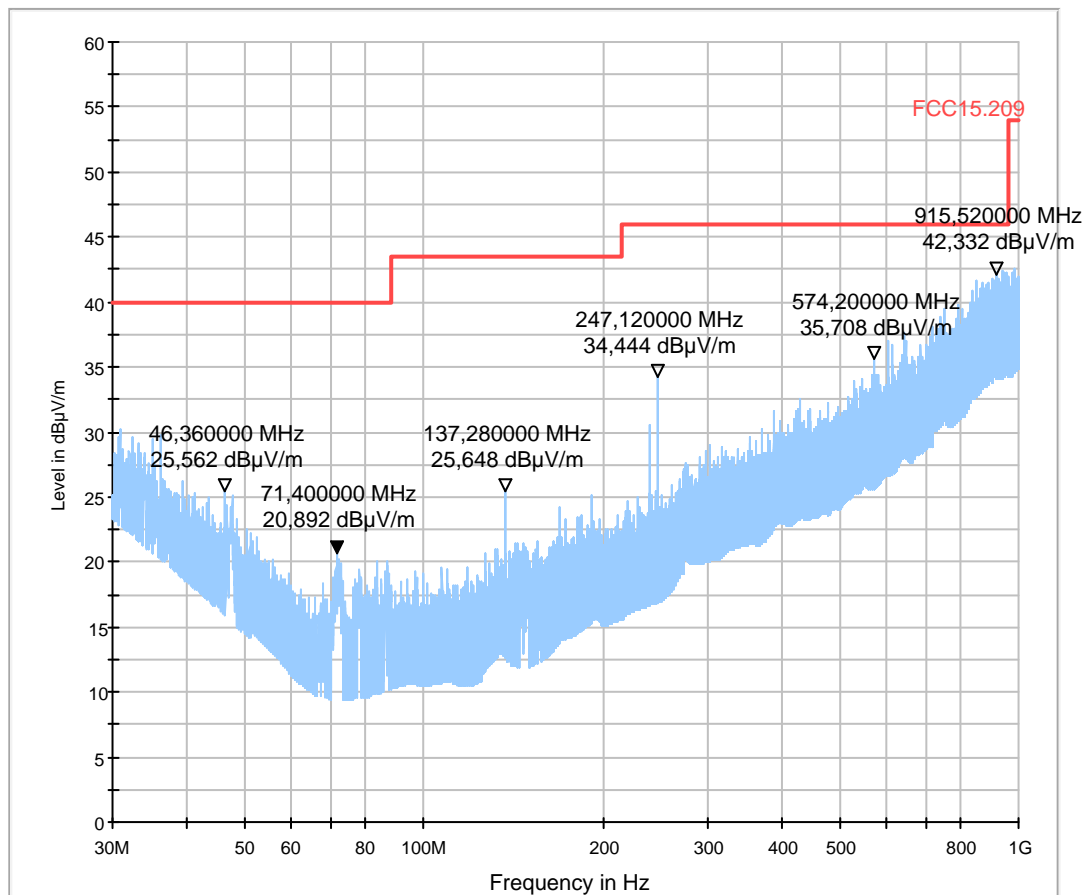
Operator: HLa
 Operating conditions: BT TX Ch:39, 2-DH5
 Power during tests: 13.5V DC
 Comment 1: EUT standing (defined normal position)

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10

HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

01_FCC15.209_hor+vert_KP0



2.2.3. 8DPSK modulation

Diagram No. 3.03_TX_ch78_3-DH5

29.05.2015 Page 1 of 1
 Electric Field Strength Measurement
 Test description:
 Test site and distance: Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
 Version of Testsoftware: EMC32 V8.51.0
 Distance correction: not used
 Used filter: not used
 Technical Data: please see page 2 for detailed data of measurement setup
 Test specification.: FCC 15.209; RSS-Gen: Issue 3

Operator: HLa
 Operating conditions: BT TX Ch:78, 3-DH5
 Power during tests: 13.5V DC
 Comment 1: EUT standing (defined normal position)

EUT Information

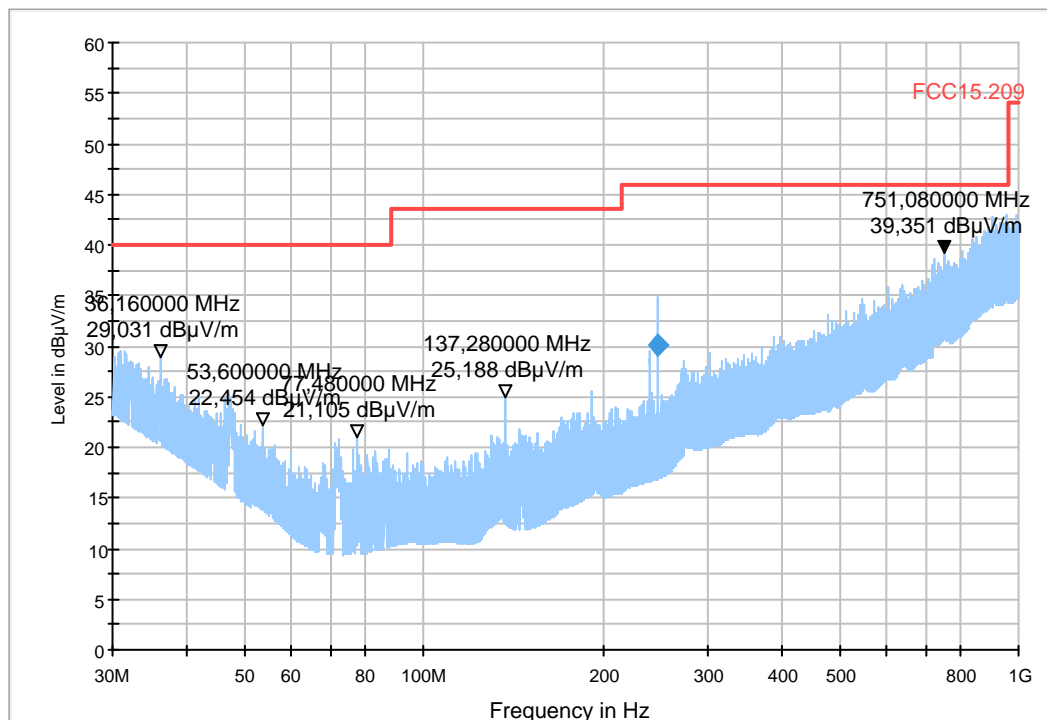
Manufacturer: Bosch
 EuT: LCN2K70A10

HW Version: 051
 SW Version: F024
 Serial Number: 3369497
 Connected Interfaces: -
 Power Supply: via external power supply, nomVolt: 13.50 VDC

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV/m)
247.110000	30.1	1000.0	120.000	105.0	V	4.0	13.2	15.90	46.00

01_FCC15.209_hor+vert_KP0



2.3. Field strength measurements $f < 18\text{GHz}$

2.3.1. GFSK modulation

Diagram No.: 4.01_TX_Ch00_DH5

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.247&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	UE transmits on channel 00 (UL = 2402.0MHz); Packet Type DH5
Operator Name:	HLA
Comment:	Channel no. low

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
-----	-----
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	

Final Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Po l	Azimuth (deg)	Elevation (deg)	Corr. (dB)
4920.980000	---	40.56	54.00	13.44	100.0	1000.000	H	90.0	90.0	4.5
4920.980000	47.52	---	74.00	26.48	100.0	1000.000	H	90.0	90.0	4.5

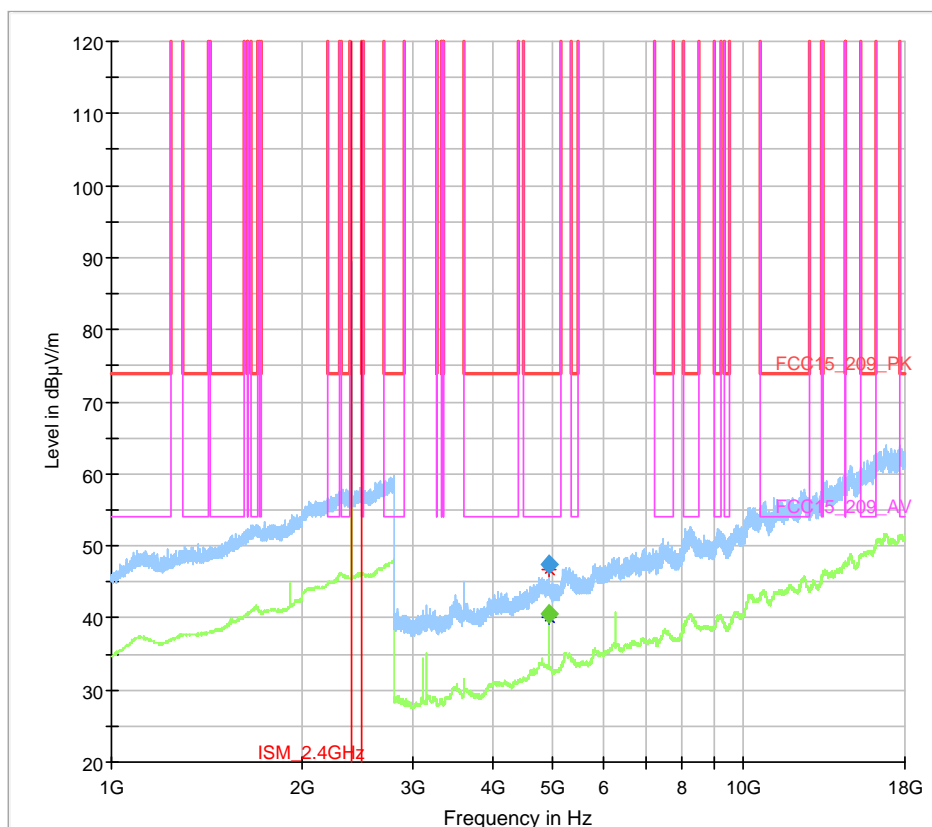


Diagram No.: 4.07_TX_ch00_DH5

Common Information

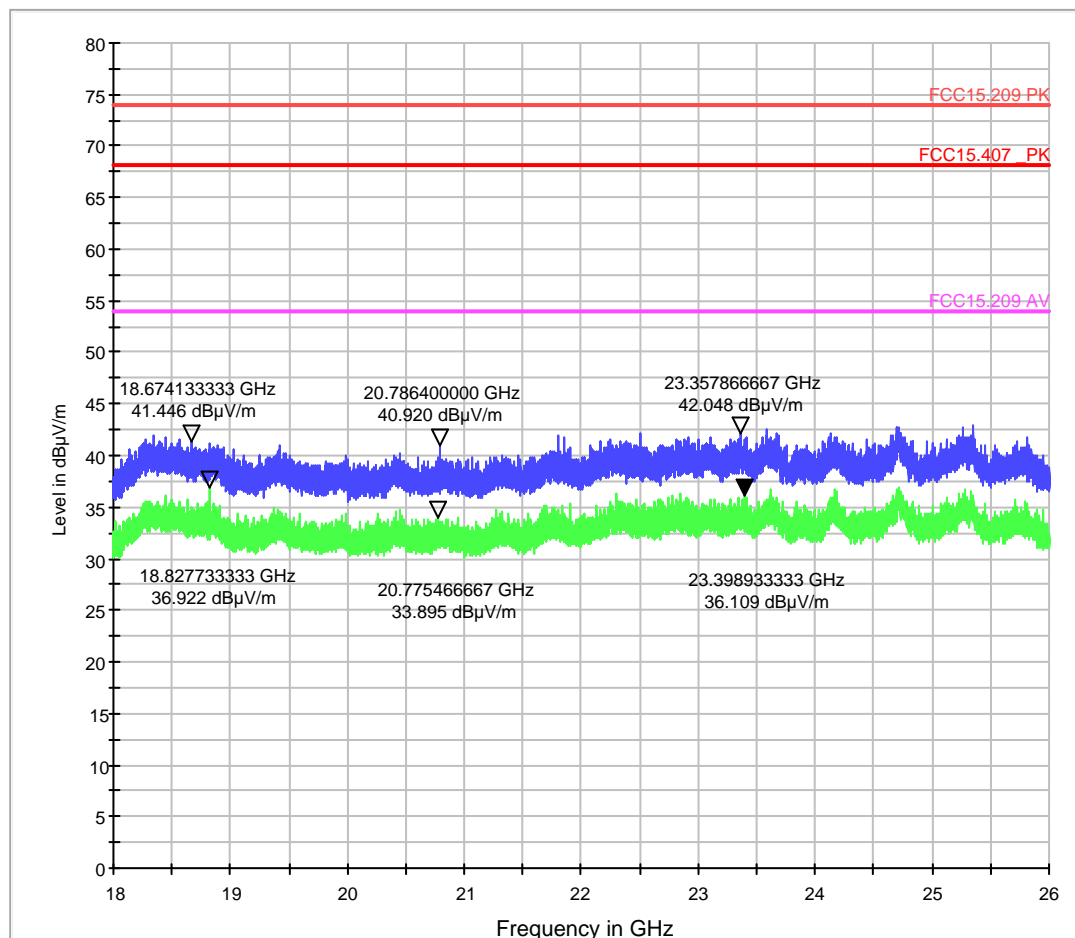
Test Description:	Radiated field strength emission in 1m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.247, 15.205&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Distance correction factor	3 to 1m: -10.5 dB applying to measurement results
SW-Version:	EMC32 V8.53.0
Operation mode:	BT TX mode on Ch00, DH5
Operator Name:	HLa
Comment:	Channel no. low

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10

HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

FCC_Sweep_15.407_18_40GHz_Pre



2.3.2. $\pi/4$ DQPSK modulation

Diagram No.: 4.02_TX_Ch39_2-DH5

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.247&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	UE transmits on channel 39(UL = 2441.0MHz); Packet Type 2-DH5
Operator Name:	HLA
Comment:	Channel no. middle=39

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	

Final Result

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Pol	Azimuth (deg)	Elevation (deg)	Corr. (dB)
3611.820000	---	30.78	54.00	23.22	100.0	1000.000	V	171.0	0.0	0.5
3612.820000	45.76	---	74.00	28.24	100.0	1000.000	H	198.0	0.0	0.5
4920.980000	47.56	---	74.00	26.44	100.0	1000.000	H	90.0	90.0	4.5
4920.980000	---	40.28	54.00	13.72	100.0	1000.000	H	91.0	90.0	4.5

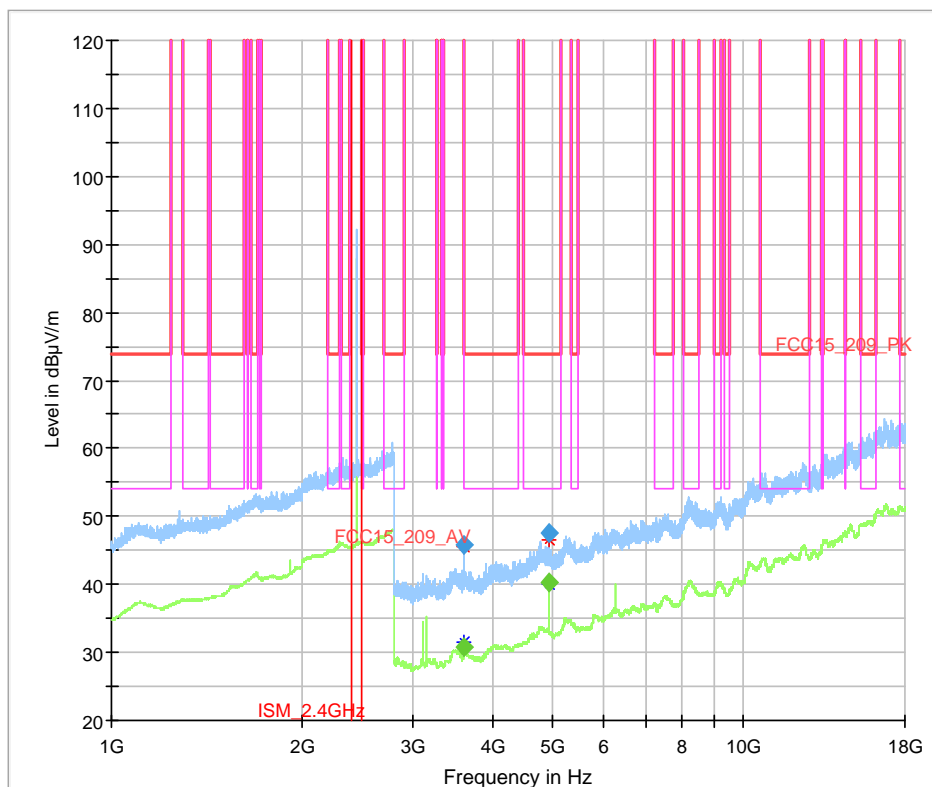


Diagram No.: 4.08_TX_ch39_2-DH5

Common Information

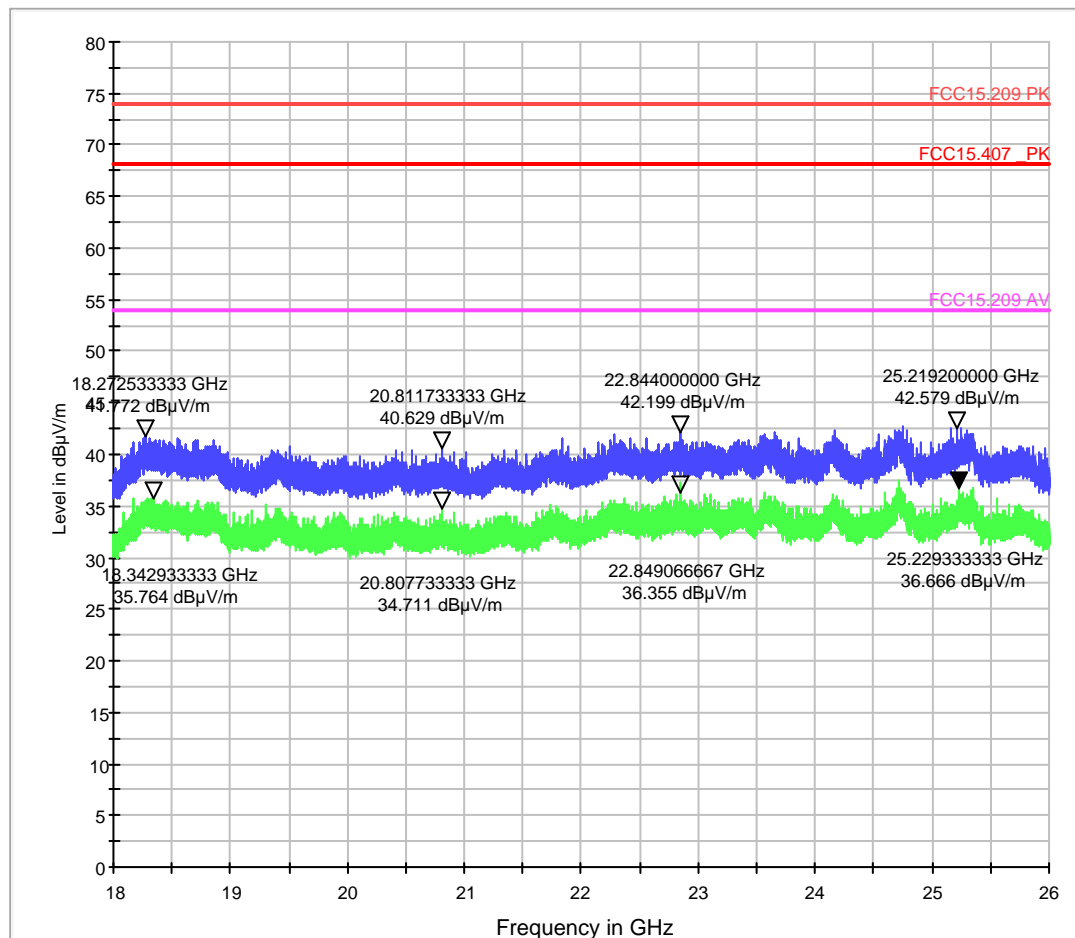
Test Description:	Radiated field strength emission in 1m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.247, 15.205&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Distance correction factor	3 to 1m: -10.5 dB applying to measurement results
SW-Version:	EMC32 V8.53.0
Operation mode:	TX mode continuous
Operator Name:	
Comment:	Channel no. middle=39

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10

HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

FCC_Sweep_15.407_18_40GHz_Pre



2.3.3. 8DPSK modulation

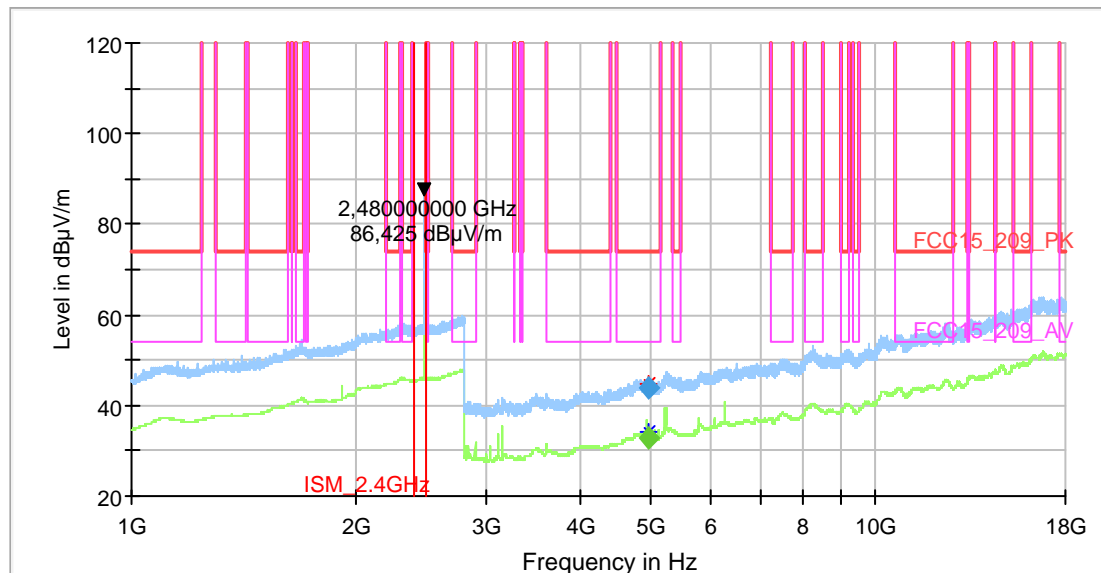
Diagram No.: 4.03_TX_Ch78_3-DH5

Common Information

Test Description:	Radiated field strength emission in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.247&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	TX, continuous
Operator Name:	Kmo
Comment:	Channel no.High=78

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	



Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Polarization	Azimuth (deg)	Elevation (deg)	Correction (dB)
4959.980000	---	32.68	54.00	21.32	100.0	1000.000	V	93.0	90.0	4.3
4959.980000	44.03	---	74.00	29.97	100.0	1000.000	V	93.0	90.0	4.3

Final Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Polarization	Azimuth (deg)	Elevation (deg)	Correction (dB)
4959.980000	---	32.68	54.00	21.32	100.0	1000.000	V	93.0	90.0	4.3
4959.980000	44.03	---	74.00	29.97	100.0	1000.000	V	93.0	90.0	4.3

Diagram No.: 4.09_TX_ch78_3-DH5

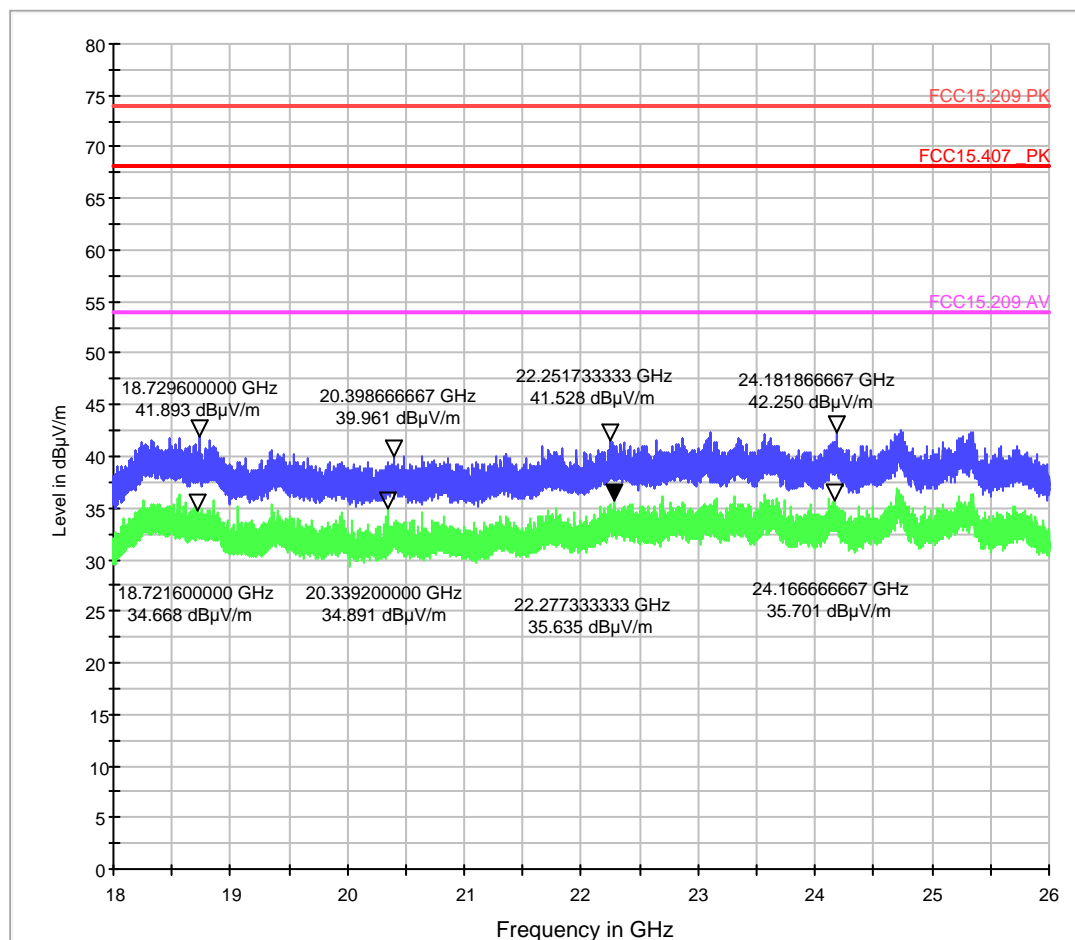
Common Information

Test Description:	Radiated field strength emission in 1m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.247, 15.205&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Distance correction factor	3 to 1m: -10.5 dB applying to measurement results
SW-Version:	EMC32 V8.53.0
Operation mode:	BT TX mode on Ch78, 3-DH5
Operator Name:	HLa
Comment:	Channel no. high=78

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
<hr/>	
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

FCC_Sweep_15.407_18_40GHz_Pre



3. Radiated band-edge measurements accord. §15.209 & §15.205 (§15.247)

3.1. Channel 0 (left band edge)

Diagram No.: 9.01_BE_low_Ch00_DH5

Common Information

Test Description:	Radiated Band-Edge Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator - EMC32 V9.15.0
Antenna polarisation:	horizontal/vertical
Operation mode:	UE transmits on channel 0 (UL = 2402.0MHz); Packet Type DH5
Operator Name:	HLA
Comment:	Channel no. low=0

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	

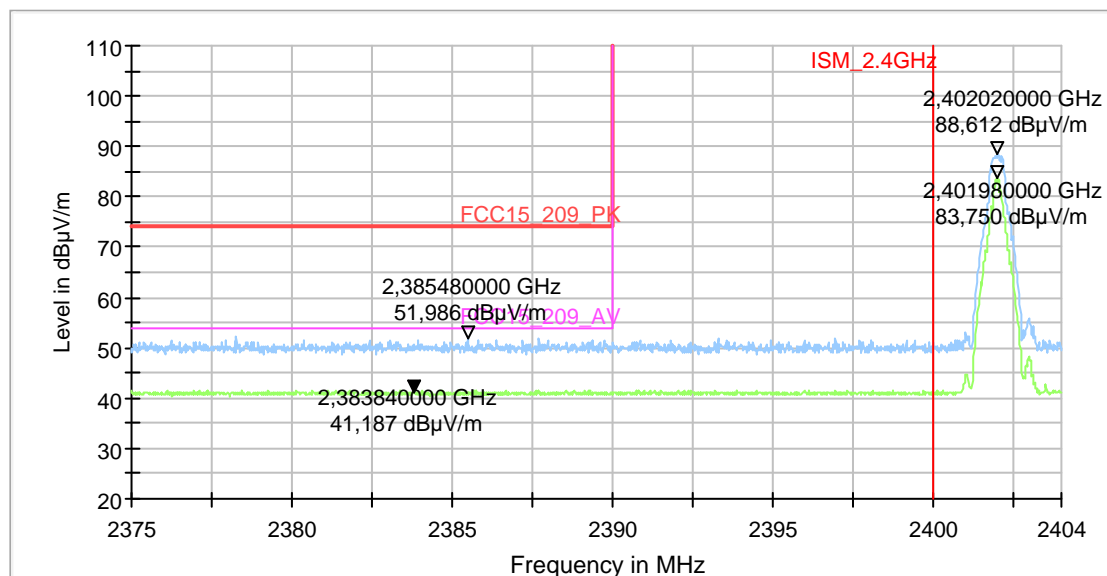


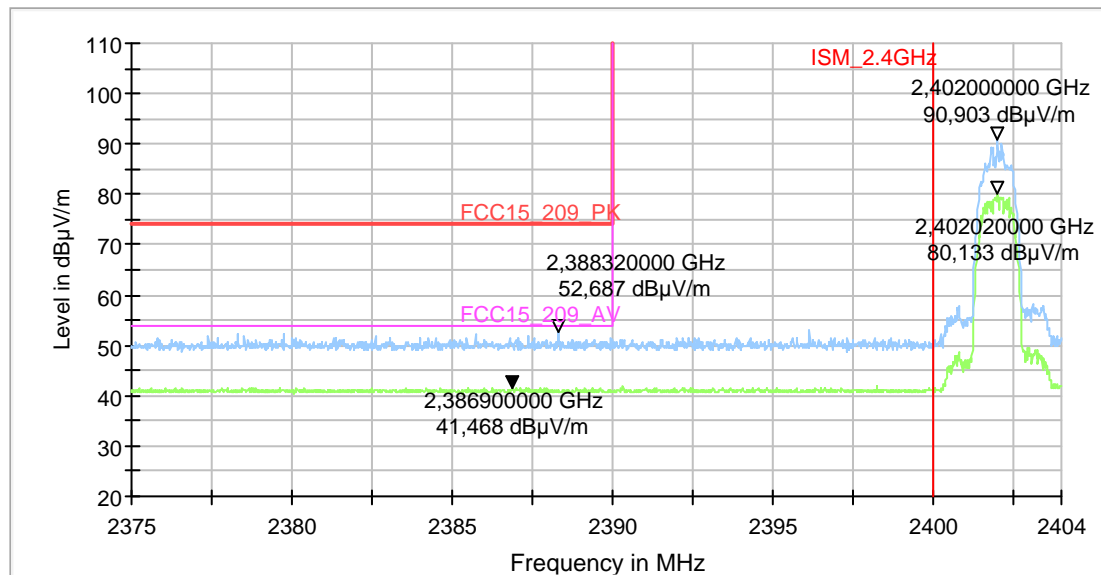
Diagram No.: 9.03_BE_low_Ch00_3-DH5

Common Information

Test Description:	Radiated Band-Edge Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator - EMC32 V9.15.0
Antenna polarisation:	horizontal/vertical
Operation mode:	UE transmits on channel 0 (UL = 2402.0MHz); Packet Type 3-DH5
Operator Name:	Hla
Comment:	Channel no. low=0

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
-----	-----
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	



3.2. Channel 78 (right band edge)

Diagram No.: 9.02_BE_high_Ch78_3-DH5

Common Information

Test Description:	Radiated Band-Edge Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	UE transmits on channel 78 (UL = 2480.0MHz); Packet Type 3-DH5
Operator Name:	HLA
Comment:	Channel no. high=78

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	

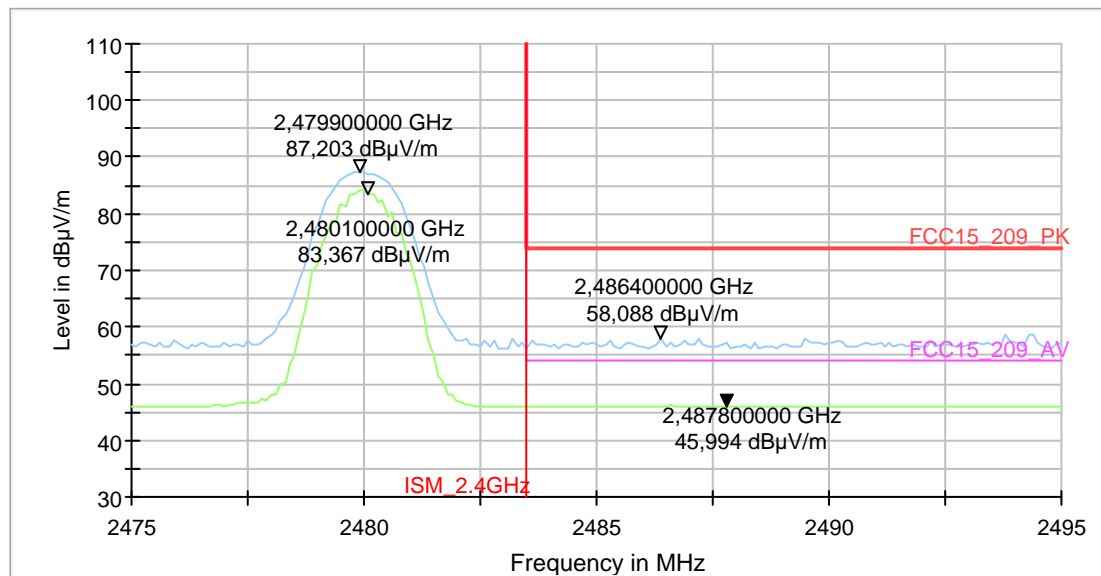


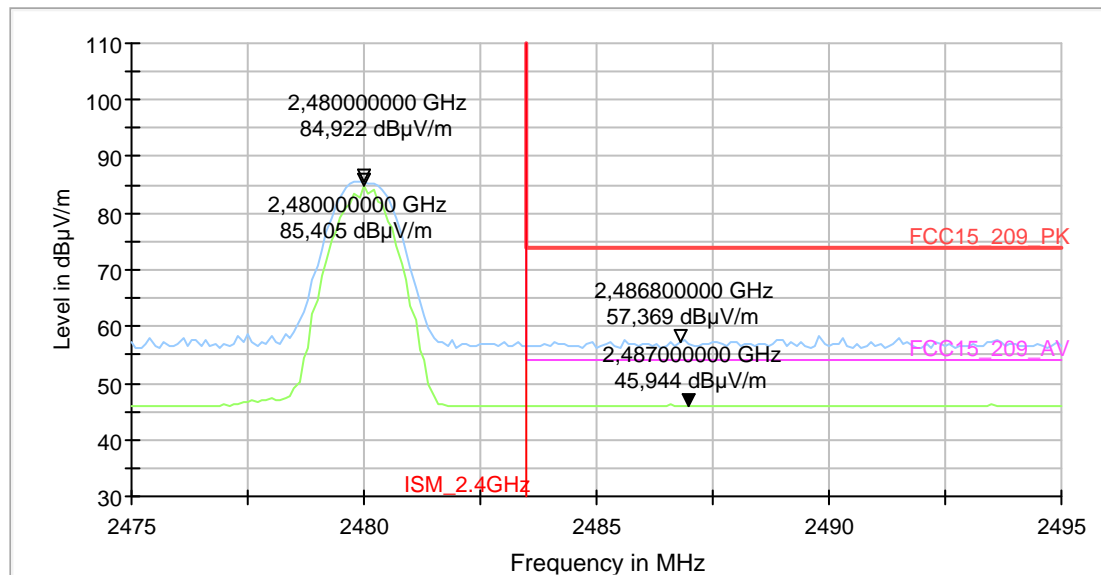
Diagram No.: 9.04_BE_high_Ch78_DH5

Common Information

Test Description:	Radiated Band-Edge Emissions in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	FCC 15.205&15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operation mode:	UE transmits on channel 78 (UL = 2480.0MHz); Packet Type DH5
Operator Name:	HLa
Comment:	Channel no. high=78

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70A10
HW Version:	051
SW Version:	F024
Serial Number:	3369497
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	



4. MPE calculation

A minimum distance to the user of 20cm is assumed.

Following calculations show assumption with the limits with a duty-cycle of 60%. (3 active slots, maximum of possible 5 slots)

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Antenna Gain Max. (dBi)	Max. positive tolerance according manufacturer (dB)	Declared maximum output power (Measured+ Tune-up) (dBm)	Duty cycle	Declared Maximum conducted output power (W)	Equivalent conducted output power (maximum conducted output power x duty cycle) (mW)
BT 2.4GHz	2402,0	1,83	1,00	0,00	2,83	60%	0,002	1,2
	2441,0	1,33	1,00		2,33		0,002	1,0
	2480,0	0,24	1,00		1,24		0,001	0,8

Maximum calculated MPE value:		
MPE-Limit:	1	[mW/cm ^2]
Highest MPE value:	0,0002	[mW/cm ^2]
Margin to limit	0,9998	[mW/cm ^2]

Note: the device is exempt from routine (RF exposure) evaluation because the eirp exemption limit for 2480MHz is 33.7dBm (see 2.5.2 of RSS-102 i5) which is way above the eirp of the BT transmitter under consideration