

Annex 4: Measurement Diagrams to
PARTIAL TEST REPORT
 No.: 3-0071-13-6-4a-C1

According to:
FCC Regulations
 Part 15.109, Part15.247

IC-Regulations
 RSS-Gen, Issue 3
 RSS-210, Issue 8

for

Harman Becker Automotive Systems, Inc.

Automotive Infotainment Head Unit VP4 GT
 (Bluetooth®)

FCC-ID: QNG-BE2810
 IC: 6434C-BE2810







Laboratory Accreditation and Listings			
 Deutsche Akkreditierungsstelle D-PL-12047-01-01	 FEDERAL COMMUNICATIONS COMMISSION USA Reg. No.: 736496 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. Measurement diagrams

1.1. 20dB bandwidth

Not tested, see modular approval of the Bluetooth® module

1.2. 99% Occupied bandwidth

Not tested, see modular approval of the Bluetooth® module

1.3. 20dBc conducted emissions

Not tested, see modular approval of the Bluetooth® module

1.4. Maximum peak conducted power

Not tested, see modular approval of the Bluetooth® module

Below also some diagrams showing the maximum value for different modulation types:

1.5. Power spectral density

Not tested, see modular approval of the Bluetooth® module

1.6. Conducted emissions on AC-mains

Not applicable, car equipment powered by 12 V DC

1.7. Radiated field strength (§15.109, Class B)

1.7.1. Radiated magnetic field strength measurements (f<30MHz)

Diagram No. 2.01_BT_Ch0_DH5

Test description:	Magnetic Fieldstrength Measurement related to 30/300 m distance
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Version of Testsoftware:	8.51.0
Distance correction:	used accord. table, pls. see test report
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test specification.:	FCC 15.209; RSS-Gen: Issue 3
Measured EUT sides:	front, right, left, rear
Operator:	dpa
Operating conditions:	Bluetooth Ch0 DH5
Comment 1:	-

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

FCC15.209_magn hor+vert

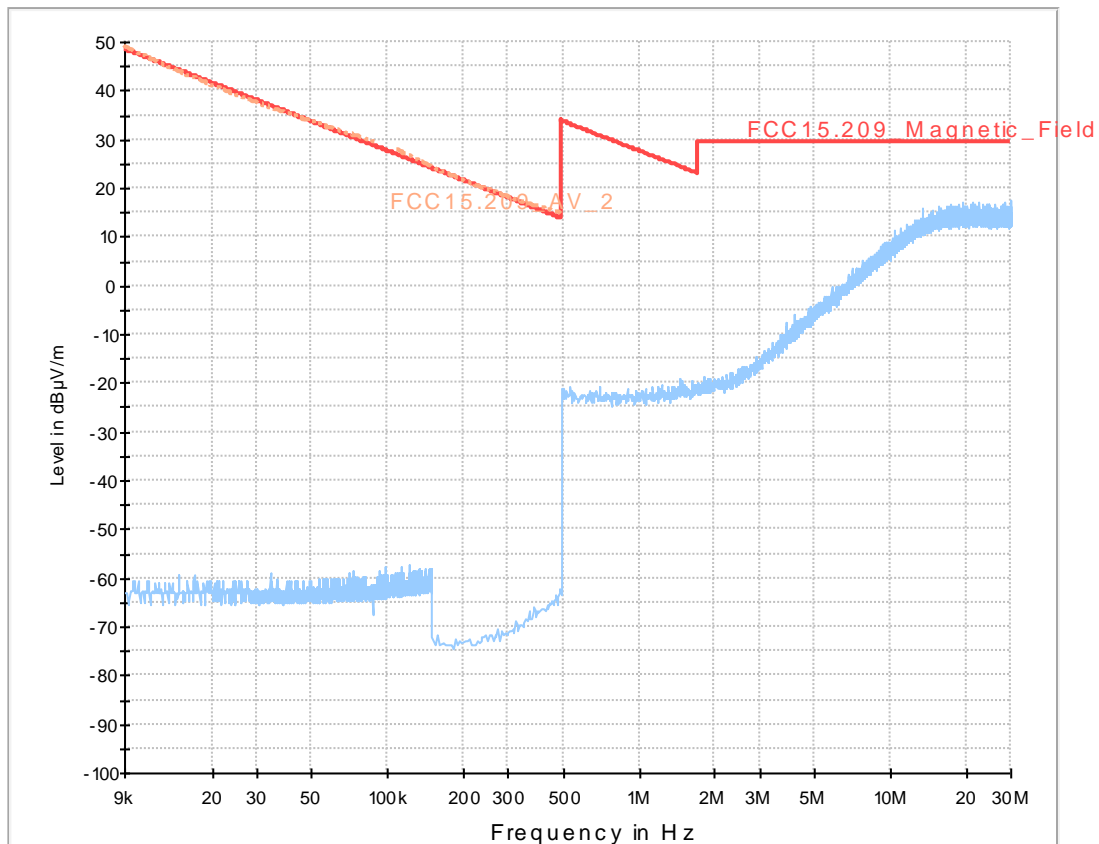


Diagram No. 2.02_BT_Ch78_3-DH5

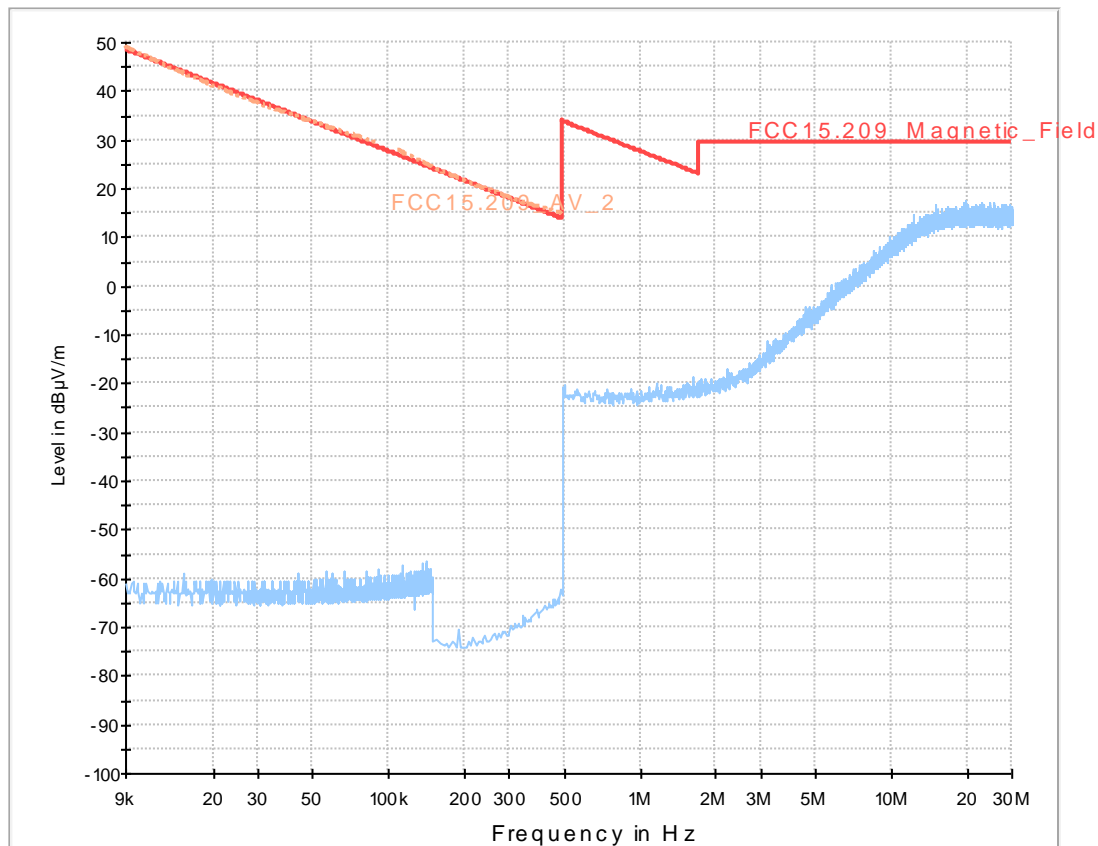
Test description:	Magnetic Fieldstrength Measurement related to 30/300 m distance
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Version of Testsoftware:	8.51.0
Distance correction:	used accord. table, pls. see test report
Rec. antenna (pre-scan):	height 1.00 m, parallel and 90° to EUT polarisation
Used filter:	bypass
Test specification.:	FCC 15.209; RSS-Gen: Issue 3
Measured EUT sides:	front, right, left, rear
Operator:	dpa
Operating conditions:	Bluetooth TX-Mode Ch78; 3-DH5
Comment 1:	-

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

FCC15.209_magn hor+vert



1.7.2. Radiated field strength (30MHz < f < 1GHz)

Diagram No. 3.01_BT_Ch0_DH5

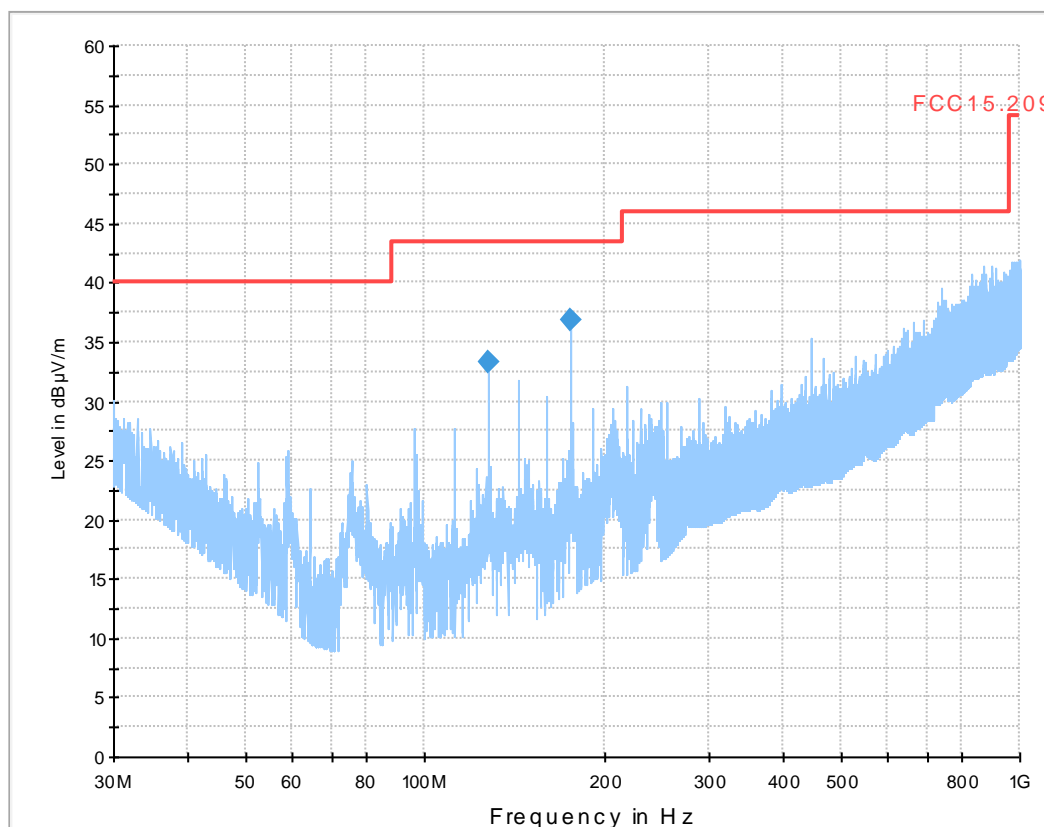
Test description:	Electric Field Strength Measurement
Test site and distance:	Ref.-Nr. 441 Semi Anechoic Room (SAR) with 3 m measurement distance
Version of Testsoftware:	EMC32 V8.51.0
Distance correction:	not used
Used filter:	not used
Test specification.:	FCC 15.209; RSS-Gen: Issue 3
Measured EUT sides:	front, right, left, rear
Operator:	Dpa
Operating conditions:	Bluetooth TX-Mode, DH5, Channel 0
Comment 1:	--

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

01_FCC15.209_hor+vert_KP0



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
128.000000	33.2	1000.0	120.000	105.0	V	155.0	9.0	10.30	43.50
176.000000	36.8	1000.0	120.000	186.0	H	154.0	10.9	6.70	43.50

Diagram No. 3.02_BT_Ch39_2-DH5

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
Test specification.:	FCC 15.209; RSS-Gen: Issue 3
Measured EUT sides:	front, right, left, rear

Operator:	Dpa
Operating conditions:	Bluetooth TX-Mode, 2-DH5, Channel 39
Comment 1:	--

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
176.010000	37.2	1000.0	120.000	190.0	H	166.0	10.9	6.30	43.50
843.520000	29.8	1000.0	120.000	199.0	H	267.0	26.0	16.20	46.00

01_FCC15.209_hor+vert_KP0

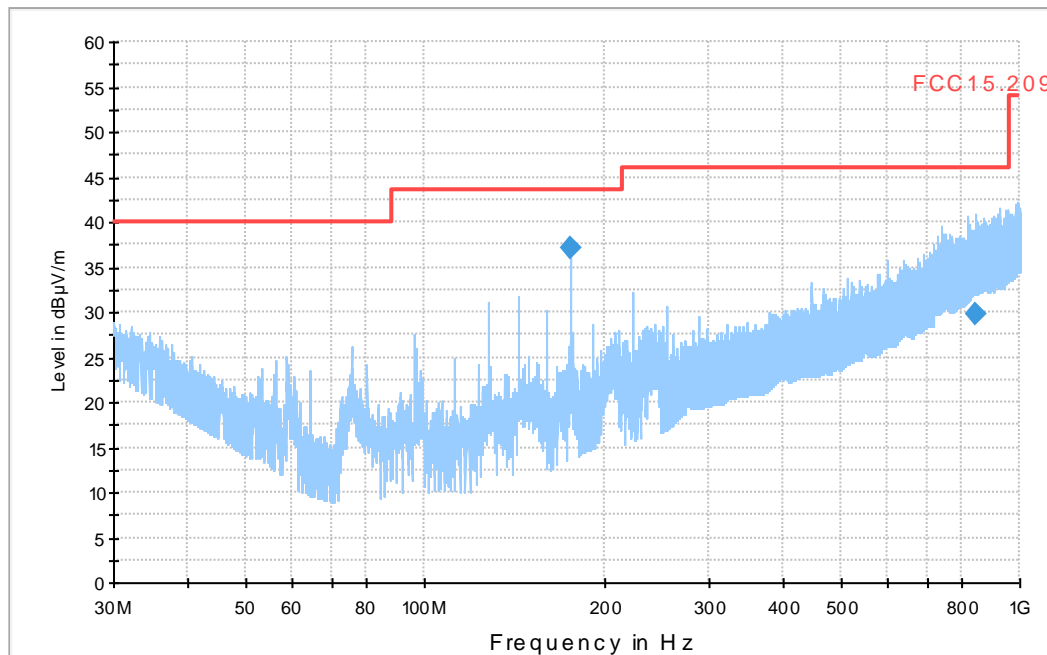


Diagram No. 3.03_BT_Ch78_3-DH5

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
Measured EUT sides:	front, right, left, rear
Test specification.:	FCC 15.209; RSS-Gen: Issue 3
Operator:	Dpa
Operating conditions:	Bluetooth TX-Mode, 3-DH5, Channel 78
Comment 1:	--

EUT Information

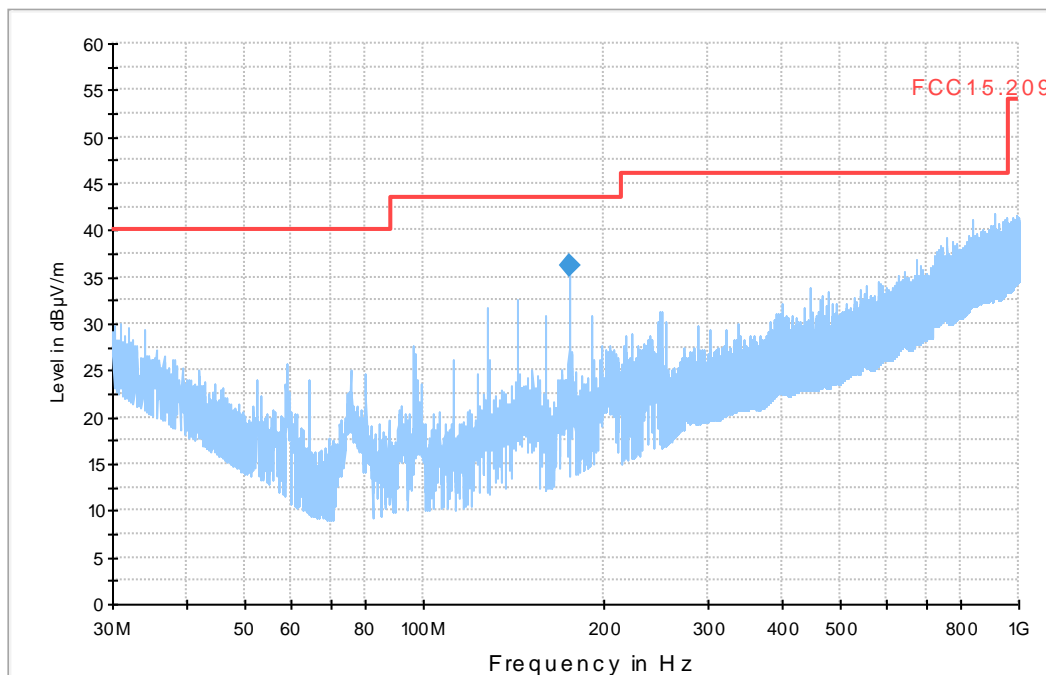
Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margi n (dB)	Limit (dBµV/m)
175.990000	36.2	1000.0	120.000	208.0	H	161.0	10.9	7.30	43.50

01_FCC15.209_hor+vert_KP0



1.7.3. Radiated field strength in Tx Mode (1GHz < f < 18GHz)

Diagram No.: 4.01_ BT_DH5_Ch0_DH5

Common Information

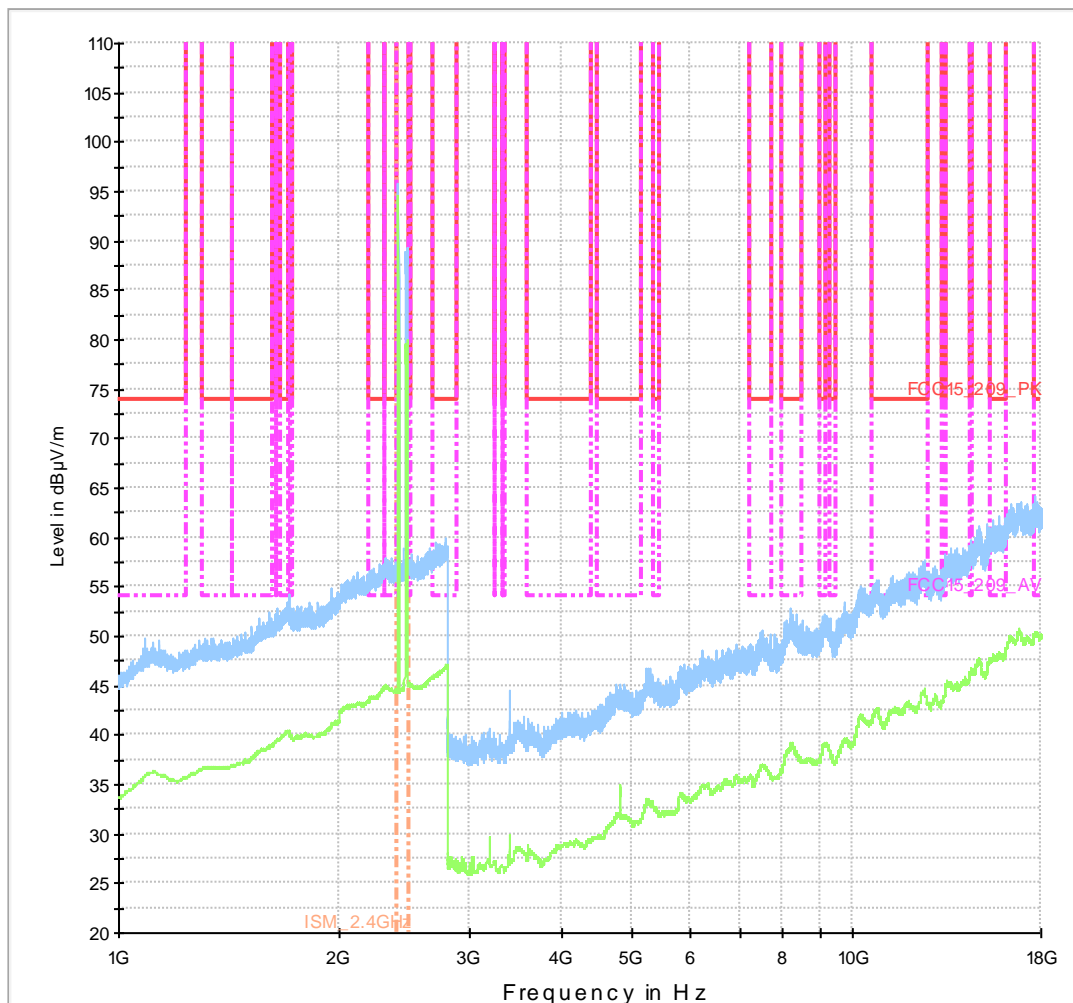
Test Description:	Radiated field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operator Name:	cta
Comment:	Bluetooth TX-Mode, DH5, Channel 0
Op. Mode:	Bluetooth

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

00431_SM1_KP1_BT_1.5ms



EMI Auto Test Template: 00431_SM1_KP1_BT_1.5ms

Diagram No.: 4.02_BT_Ch39_2-DH5

Common Information

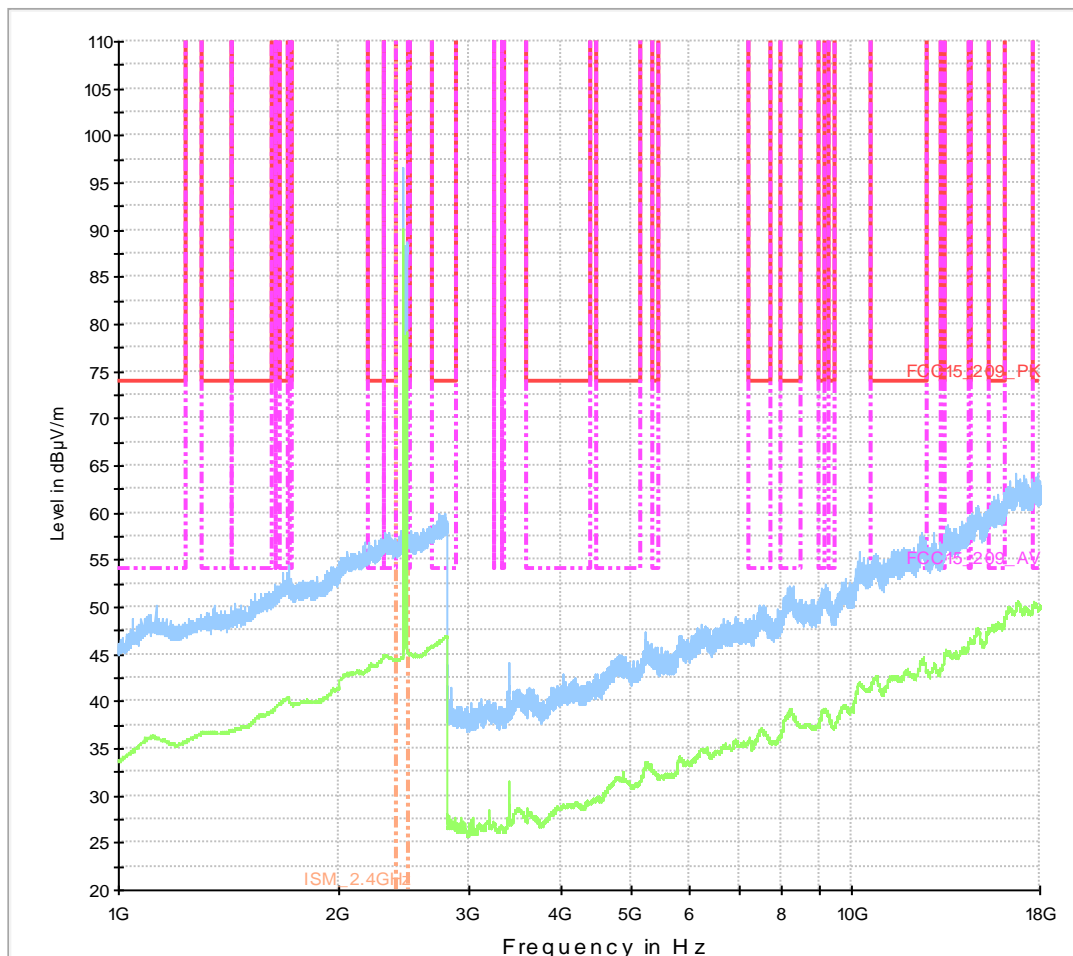
Test Description:	Radiated field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operator Name:	cta
Op. Mode:	Bluetooth TX-Mode, 2-DH5, Channel 39

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

00431_SM1_KP1_BT_1.5ms



EMI Auto Test Template: 00431_SM1_KP1_BT_1.5ms

Diagram No.: 4.03_BT_Ch78_3-DH5

Common Information

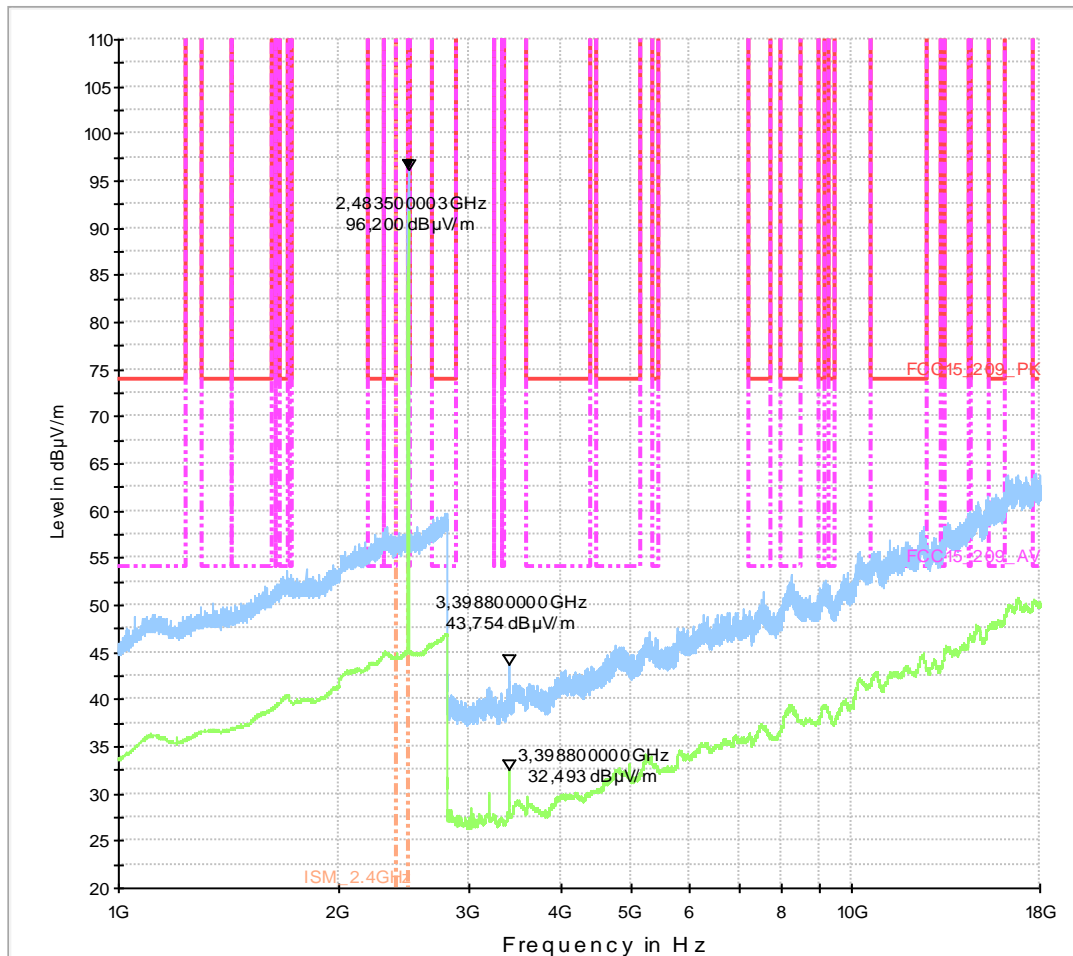
Test Description:	Radiated field strength emission accord. §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operator Name:	Lor
Op. Mode:	Bluetooth TX-Mode, 3-DH5, Channel 78

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

00431_SM1_KP1_BT_1.5ms



EMI Auto Test Template: 00431_SM1_KP1_BT_1.5ms

1.7.4. Radiated field strength in receiving Mode (1GHz < f < 16GHz)

4.04 BT Rx-Mode, Ch39

Common Information

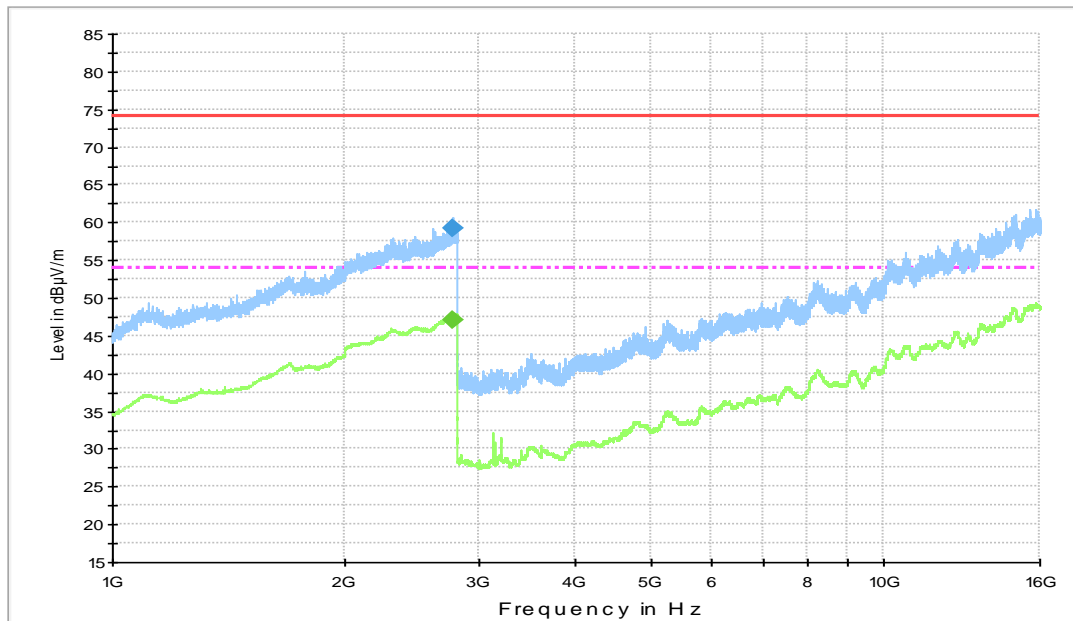
Test Description:	Radiated Filed Strength Emission
Test Site Location:	CETECOM GmbH Essen
Test Site:	Fully Anechoic Room (FAR)
Test Standard:	FCC Part 15.109
Section:	15.109
Operating Mode:	BT Rx-Mode, Ch39
Equipment Class:	Class B
Environmental Conditions:	Humidity: 29%rH; Temperature: 24°C
Operator:	Dpa

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

030442_FCC_Part15.109_Unint_Rad_Class_B_1G-20G_ESU40



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2772.200000	59.1	100.0	1000.000	V	14.0	90.0	37.8	14.9	74.0

Final Result 2

Frequency (MHz)	RMS (dBµV/m)	Meas. Time	Bandwidth (kHz)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2772.200000	47.1	100.0	1000.000	V	14.0	90.0	37.8	6.9	54.0

1.7.5. Band-edge compliance radiated (field strength in 3m distance)

1.7.5.1 Channel low, DH5 packet type

Diagram No.: 9.01_ BT_DH5_Ch0_DH5

Common Information

Test Description: Radiated Band-Edge Low-Channel, §15.247 in 3m distance
 Test Site: CETECOM GmbH Essen
 Test Standard: §15.205 & 15.209 Intentional Radiator
 Antenna polarisation: horizontal/vertical

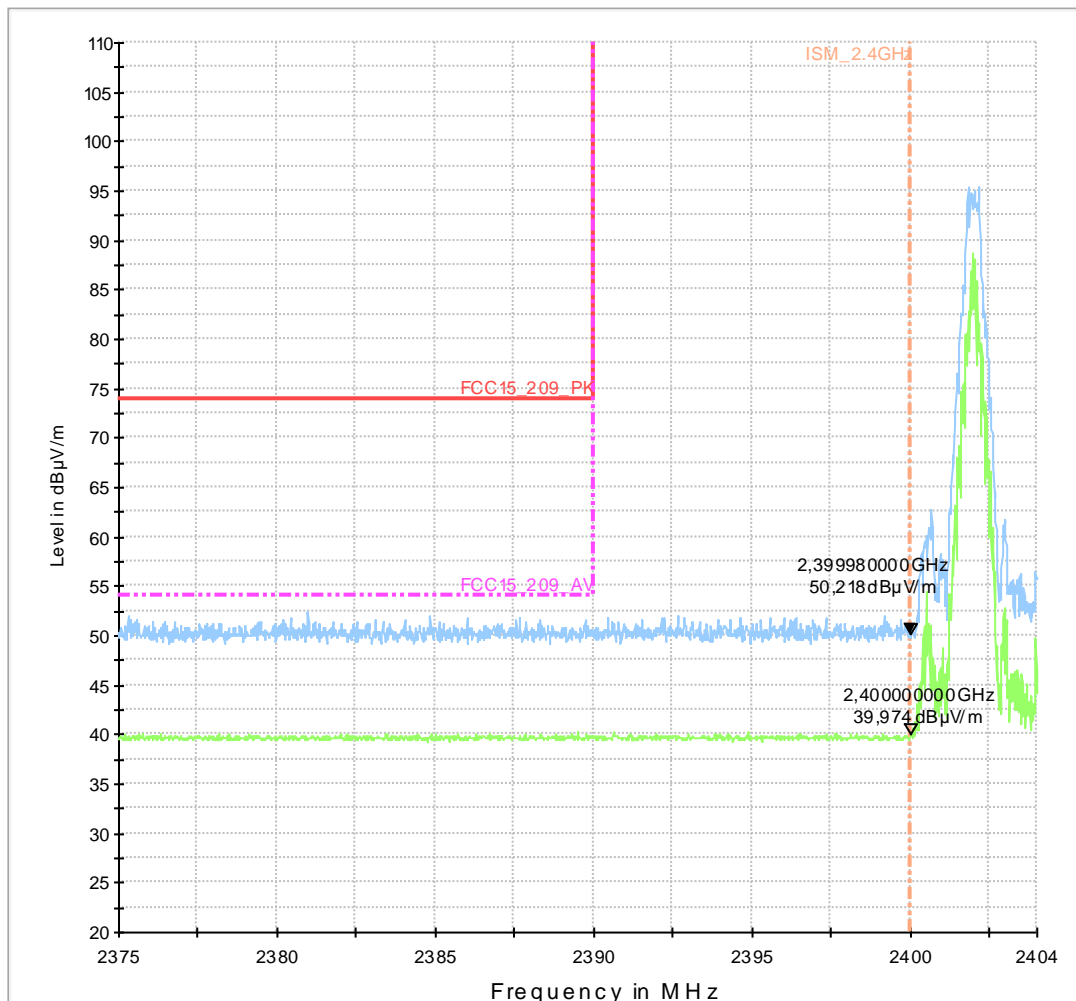
Operator Name: Lor
 Comment: Channel no.0 low , DH5
 Op. Mode: Bluetooth

EUT Information

Manufacturer: Harman Becker Automotive Systems
 EUT: VP4 GT

 HW version: F149M 6163USA
 SW version: tbd
 Config: --
 Serial number: SN-2
 Connected Interfaces: Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
 Power Supply: 12V DC
 Comments: --

00431_BE_Low_SM1_KP1_BT_2ms



1.7.5.3 Channel High, 3DH5 packet type

Diagram No.: 9.03_BT_Ch78_3-DH5

Common Information

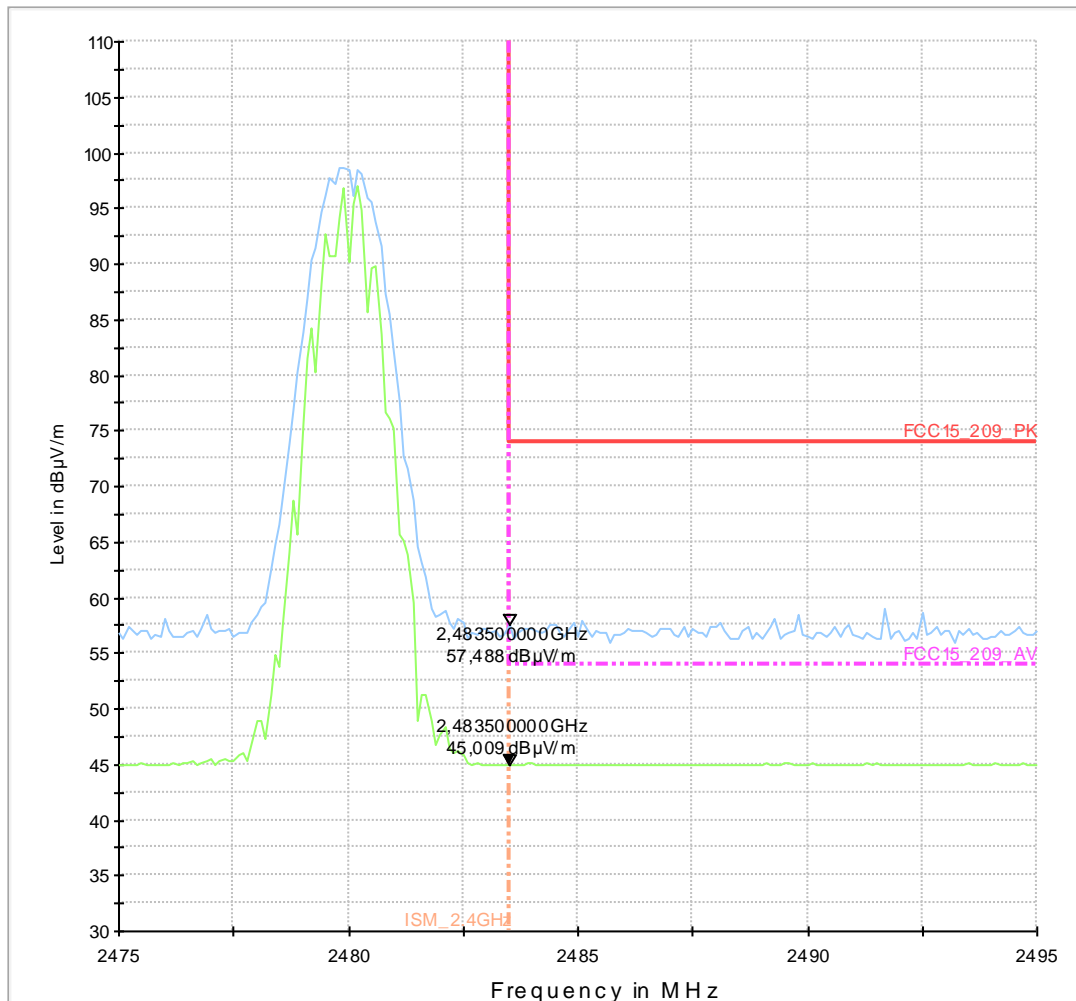
Test Description:	Radiated Band-Edge High-Channel, §15.247 in 3m distance
Test Site:	CETECOM GmbH Essen
Test Standard:	§15.205 & 15.209 Intentional Radiator
Antenna polarisation:	horizontal/vertical
Operator Name:	Lor
Comment:	Channel no.78 high, DH5
Op. Mode:	Bluetooth

EUT Information

Manufacturer:	Harman Becker Automotive Systems
EUT:	VP4 GT

HW version:	F149M 6163USA
SW version:	tbd
Config:	--
Serial number:	SN-2
Connected Interfaces:	Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
Power Supply:	12V DC
Comments:	--

00431_BE_High_SM1_KP1_BT_2ms



1.7.6. Field strength of carrier (radiated in 3m distance)

7.07_BT_Ch0_DH5

Common Information

Test Description: Radiated field strength emission accord. §15.247 in 3m distance
 Test Site: CETECOM GmbH Essen
 Test Standard: §15.205 &15.209 Intentional Radiator
 Antenna polarisation: horizontal/vertical

Operator Name: GAR
 Comment: CH0, DH5
 Op. Mode: Bluetooth

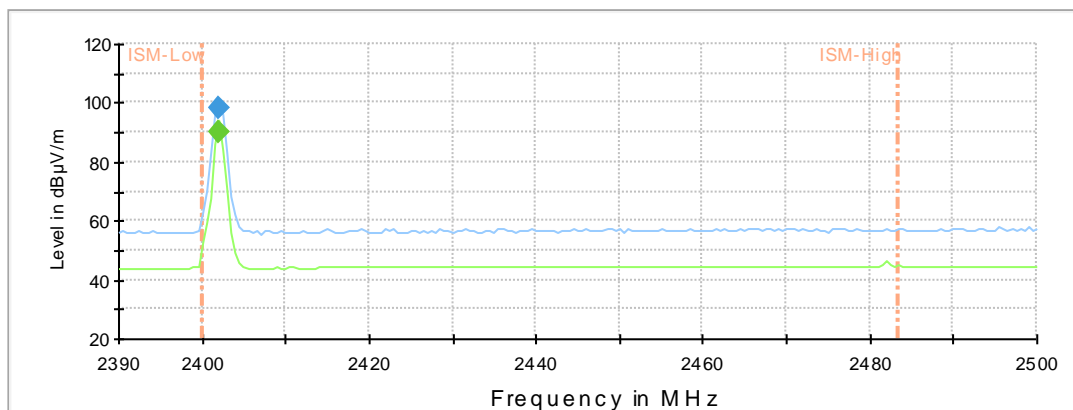
EUT Information

Manufacturer: Harman Becker Automotive Systems
 EUT: VP4 GT

 HW version: F149M 6163USA
 SW version: tbd
 Config: --
 Serial number: SN-1
 Connected Interfaces: Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna

Power Supply: 12V DC
 Comments: --

Carrier_measurement_SM1_PA0_KP1_BT



----- ISM-Low ----- ISM-High --- Preview Result 1-PK+
 --- Preview Result 2-AVG ◆ Final Result 1-PK+ ◆ Final Result 2-AVG

Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2402.000000	98.5	100.0	1000.000	155.0	V	94.0	90.0	35.5	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2402.000000	90.4	100.0	1000.000	155.0	V	91.0	90.0	35.5	

7.08_BT_Ch39_2-DH5

Common Information

Test Description: Radiated field strength emission accord. §15.247 in 3m distance
 Test Site: CETECOM GmbH Essen
 Test Standard: §15.205 &15.209 Intentional Radiator
 Antenna polarisation: horizontal/vertical

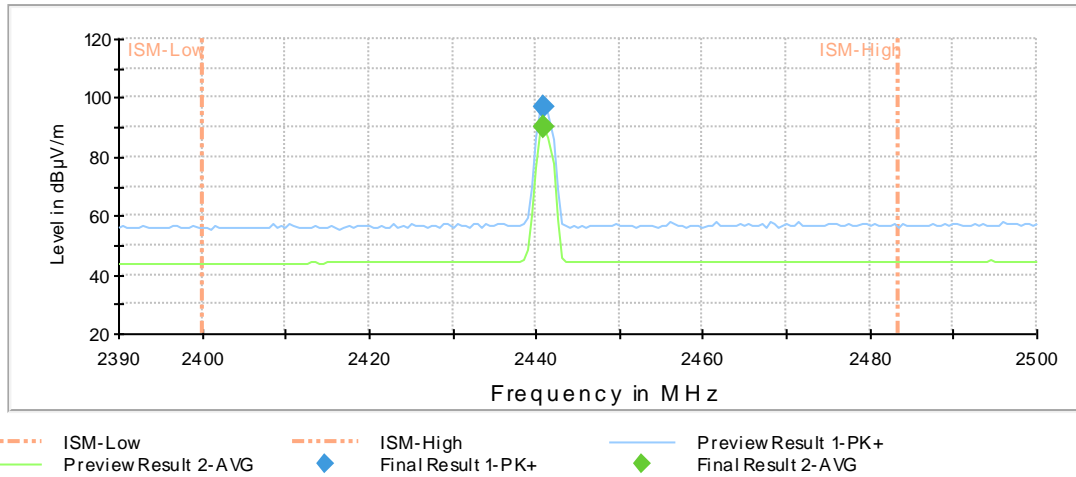
Operator Name: GAr
 Comment: CH39, 2-DH5
 Op. Mode: Bluetooth

EUT Information

Manufacturer: Harman Becker Automotive Systems
 EUT: VP4 GT

 HW version: F149M 6163USA
 SW version: tbd
 Config: --
 Serial number: SN-1
 Connected Interfaces: Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
 Power Supply: 12V DC
 Comments: --

Carrier_measurement_SM1_PA0_KP1_BT



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2441.000000	97.1	100.0	1000.000	155.0	V	91.0	90.0	35.6	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2441.000000	90.1	100.0	1000.000	155.0	V	91.0	90.0	35.6	

7.09_BT_Ch78_3-DH5

Common Information

Test Description: Radiated field strength emission accord. §15.247 in 3m distance
 Test Site: CETECOM GmbH Essen
 Test Standard: §15.205 &15.209 Intentional Radiator
 Antenna polarisation: horizontal/vertical

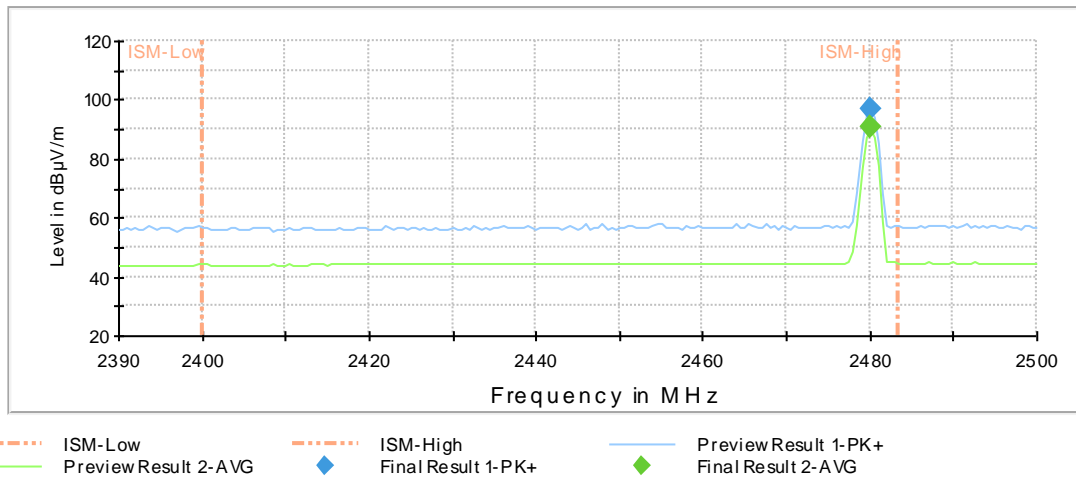
Operator Name: GAr
 Comment: CH78, 3-DH5
 Op. Mode: Bluetooth

EUT Information

Manufacturer: Harman Becker Automotive Systems
 EUT: VP4 GT

 HW version: F149M 6163USA
 SW version: tbd
 Config: --
 Serial number: SN-1
 Connected Interfaces: Main Wiring Harness, CAN Gateway Harness, Always On Module, Bluetooth Antenna, WLAN Antenna
 Power Supply: 12V DC
 Comments: --

Carrier_measurement_SM1_PA0_KP1_BT



Final Result 1

Frequency (MHz)	MaxPeak (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2480.000000	96.9	100.0	1000.000	155.0	V	94.0	90.0	35.7	

Final Result 2

Frequency (MHz)	Average (dBµV/m)	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Elevation (deg)	Corr. (dB)	Comment
2480.000000	91.0	100.0	1000.000	155.0	V	167.0	90.0	35.7	