Annex 2: Measurement diagrams to
T E S T R E P O R T
No.: 6-0461-14-3-1e

According to:

FCC Part 15.247
RSS-247, Issue 1

for

Robert Bosch Car Multimedia GmbH

LCN2K70B10
Radio Navigation System
(Bluetooth 2.4GHz)

FCC ID: YBN-LCN2K70B10
IC: 9595A-LCN2K70B10
PMN: Nissan LCN2Kai
HVIN: LCN2K70B10

Laboratory Accreditation and Listings			
DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01	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
WiFi ALLIANCE AUTHORIZED RF LABORATORY	CTIA Authorized Test Lab LAB CODE 20011130-00		
accredited according to DIN EN ISO/IEC 17025			

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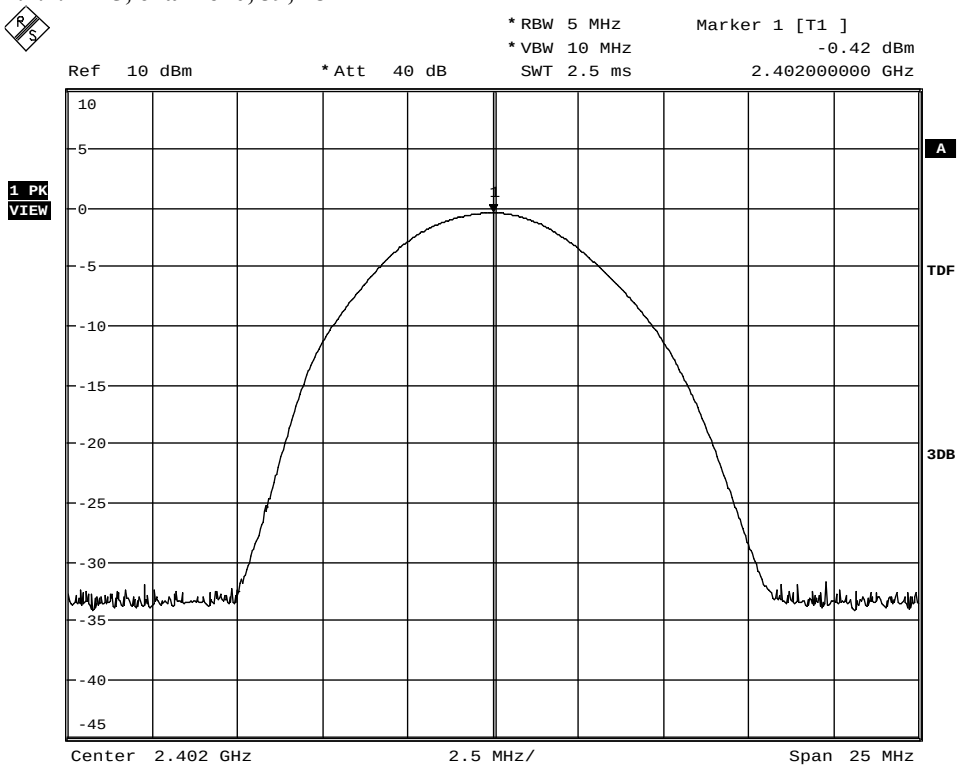
1. Conducted RF-measurements on antenna port

1.1. Conducted RF-power

1.1.1. DH5, channel 0, 39, 78



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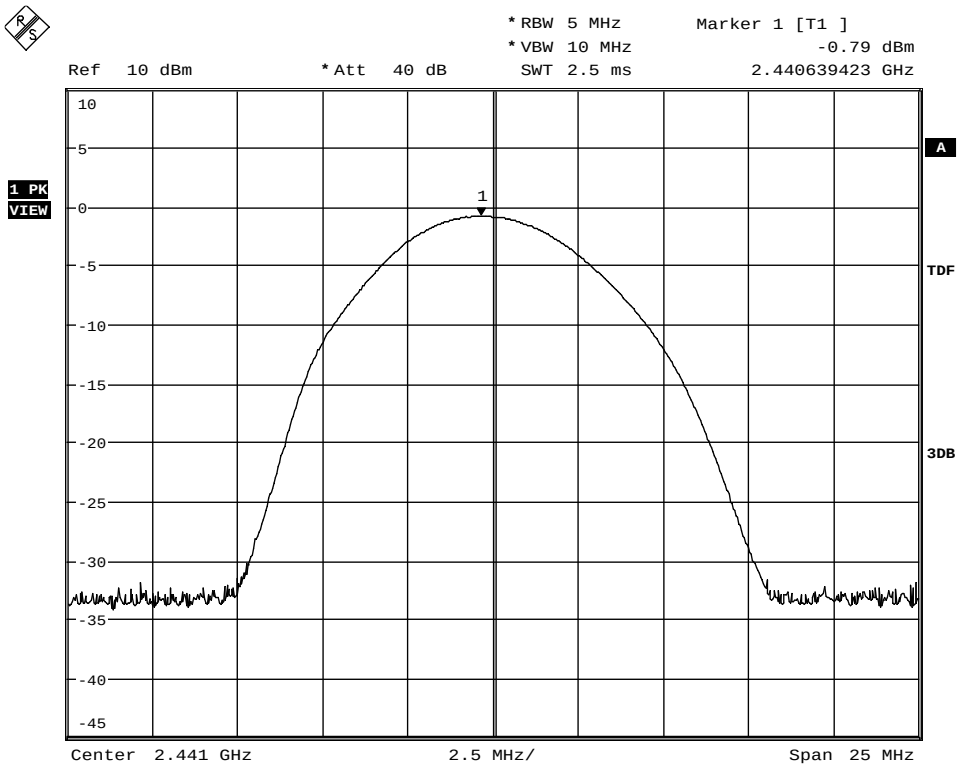

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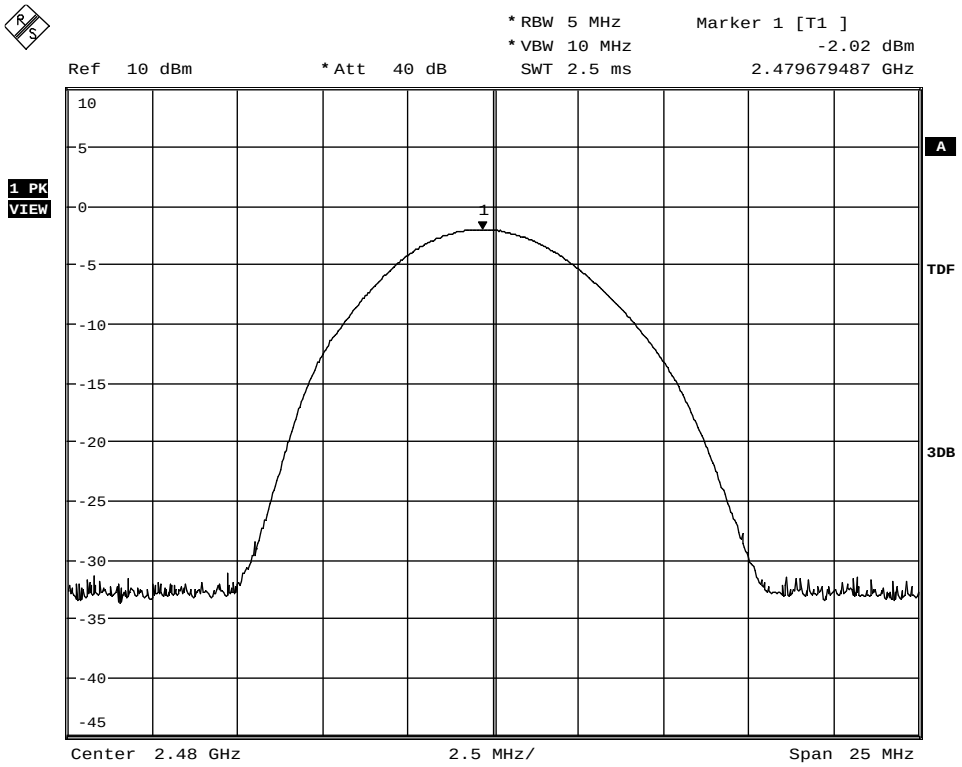

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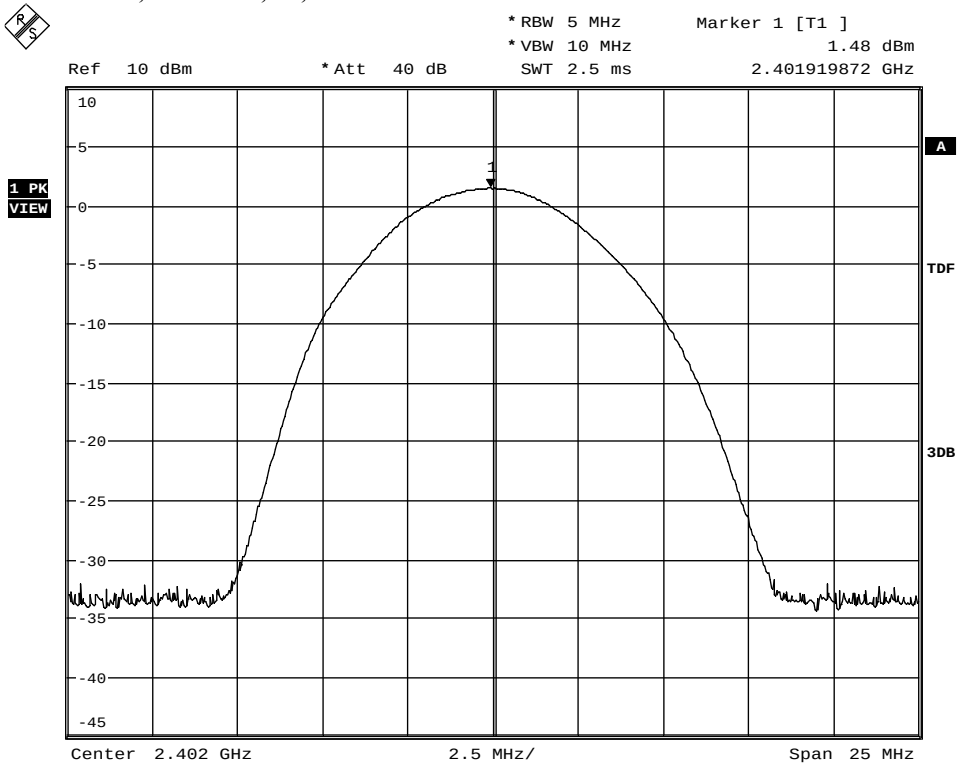
1.1.2. 2DH5, channel 0, 39, 78



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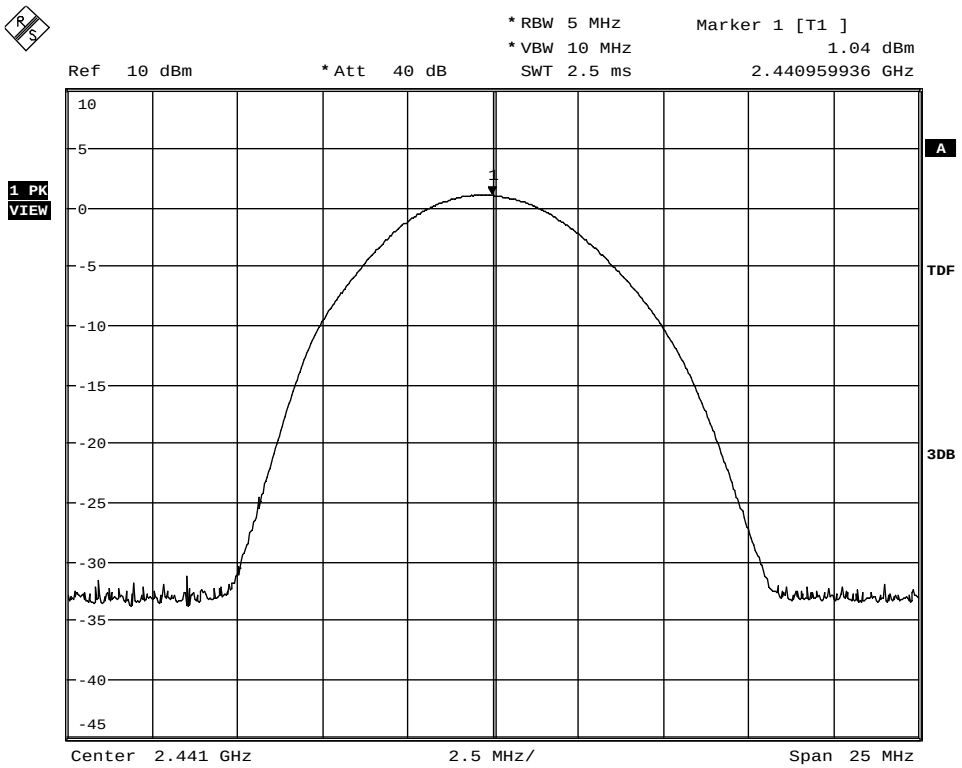

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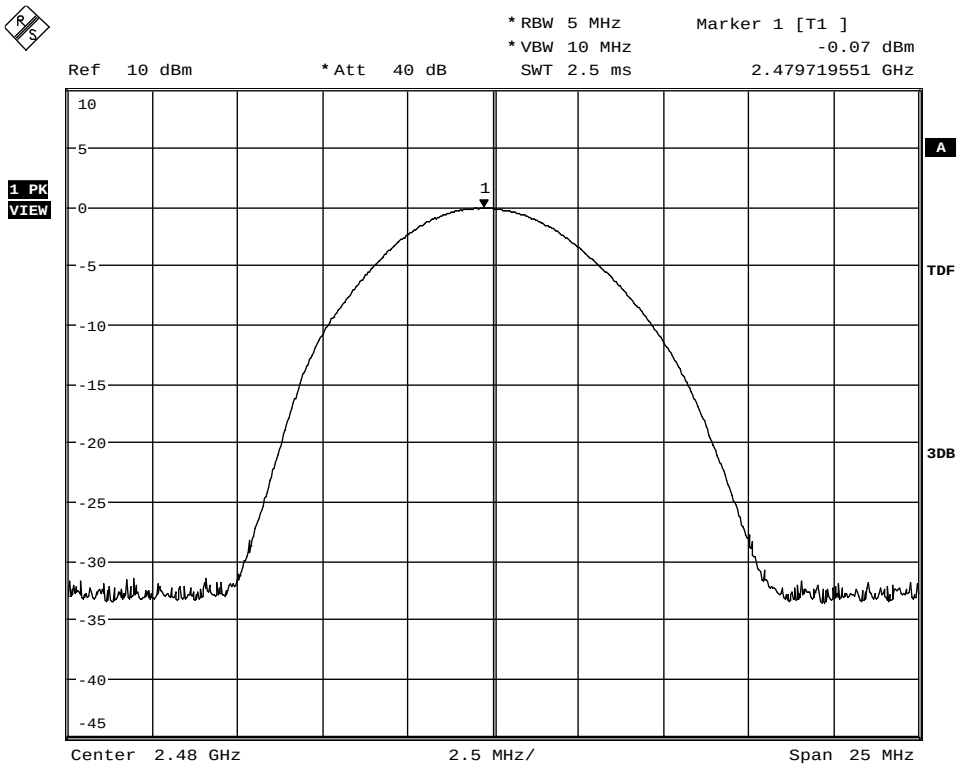

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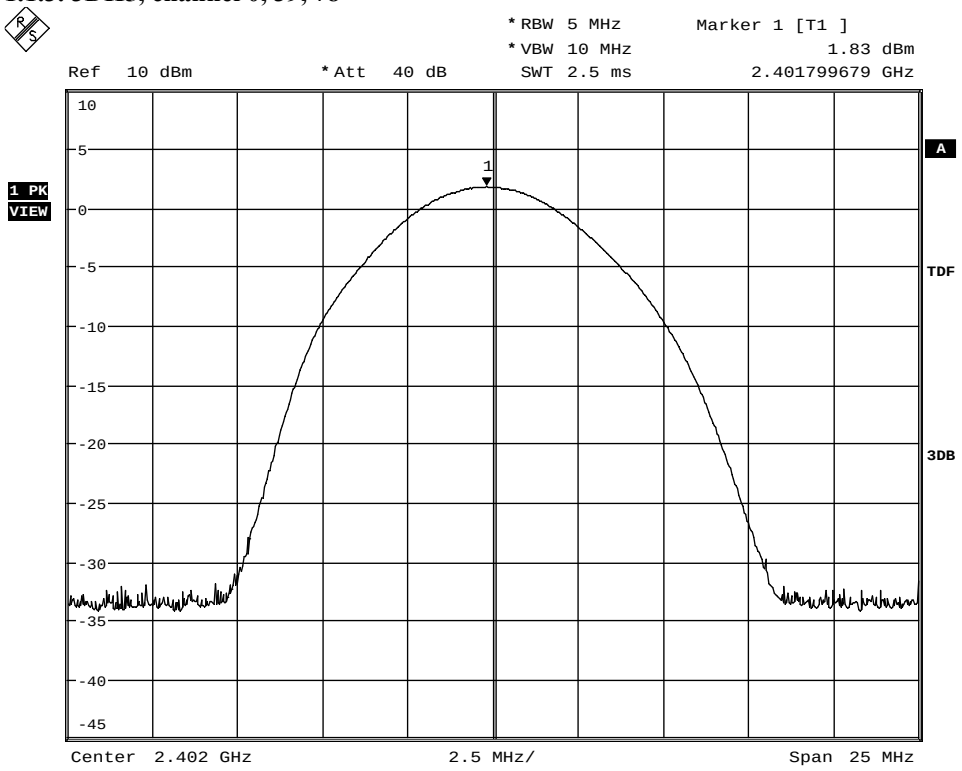
1.1.3. 3DH5, channel 0, 39, 78



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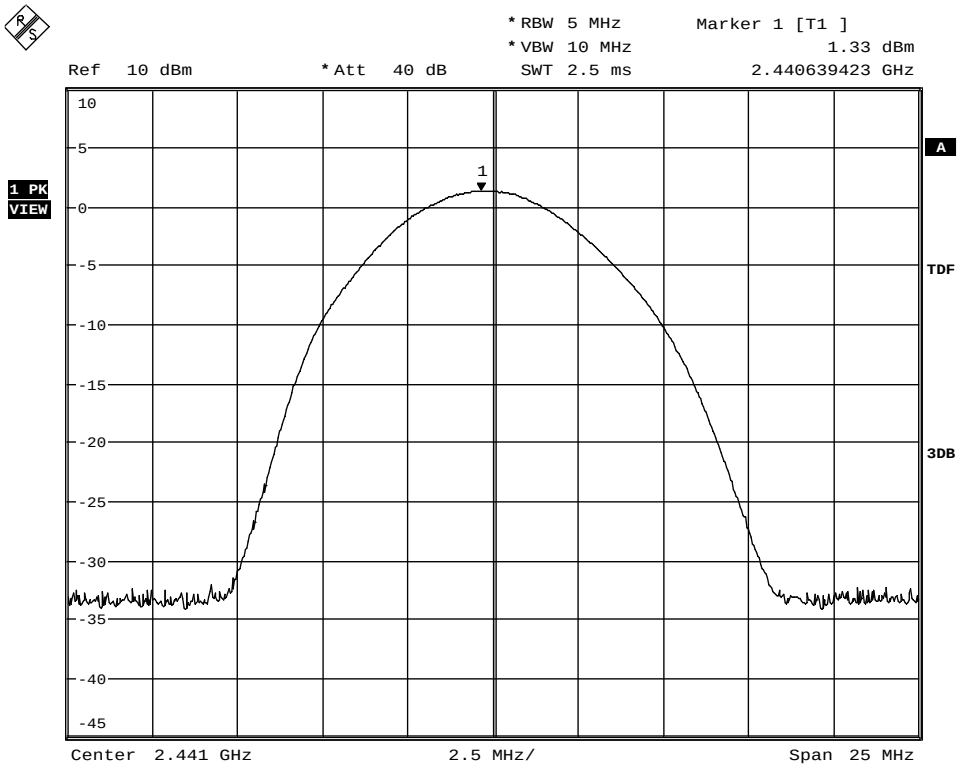

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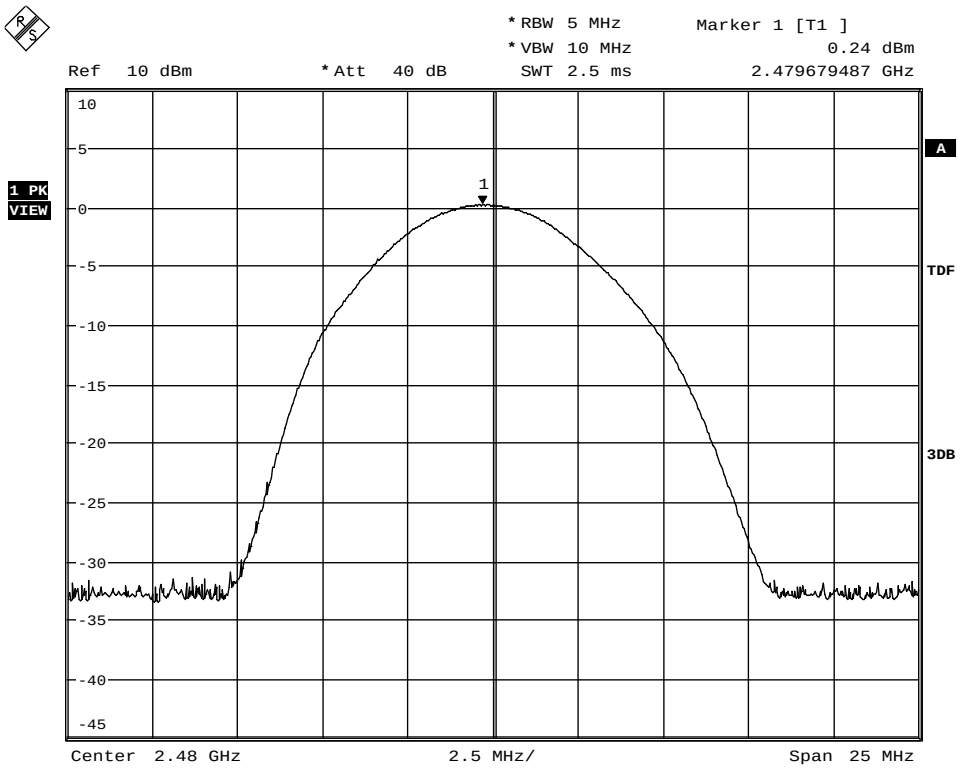

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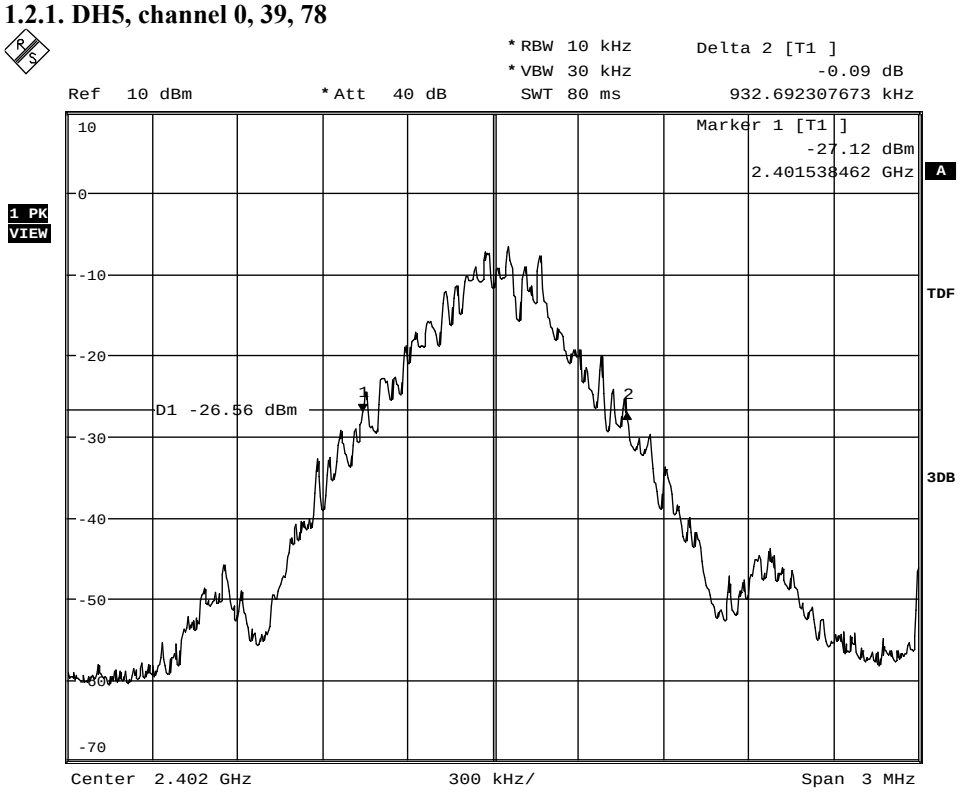
1.2. 20-dB Bandwidth

1.2.1. DH5, channel 0, 39, 78



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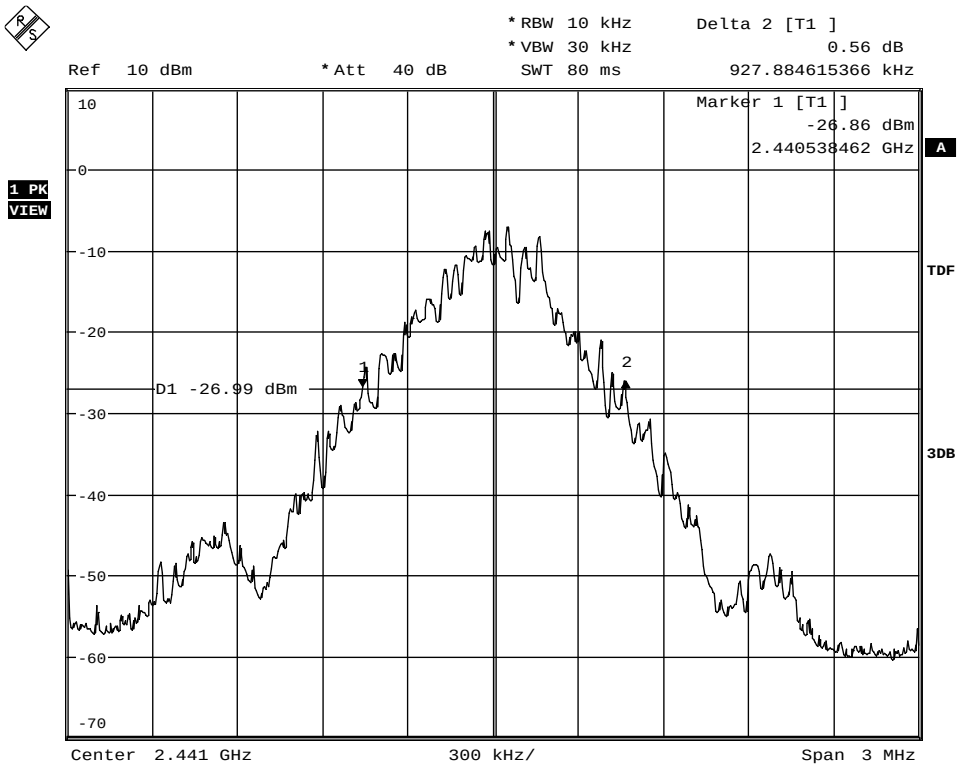

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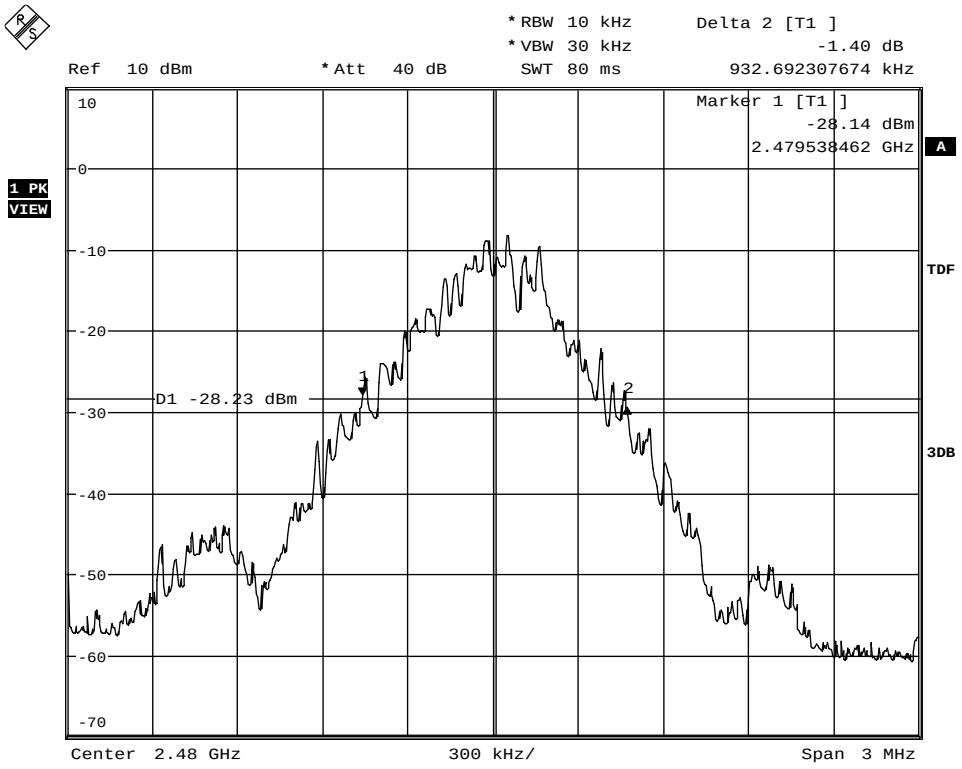

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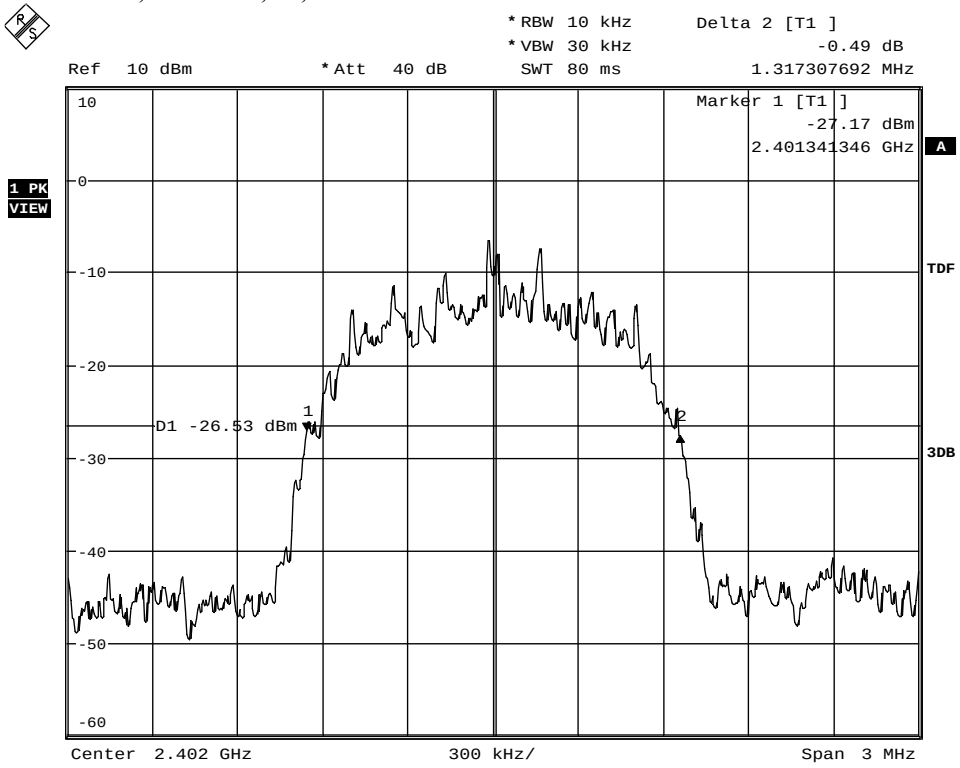
1.2.2. 2DH5, channel 0, 39, 78



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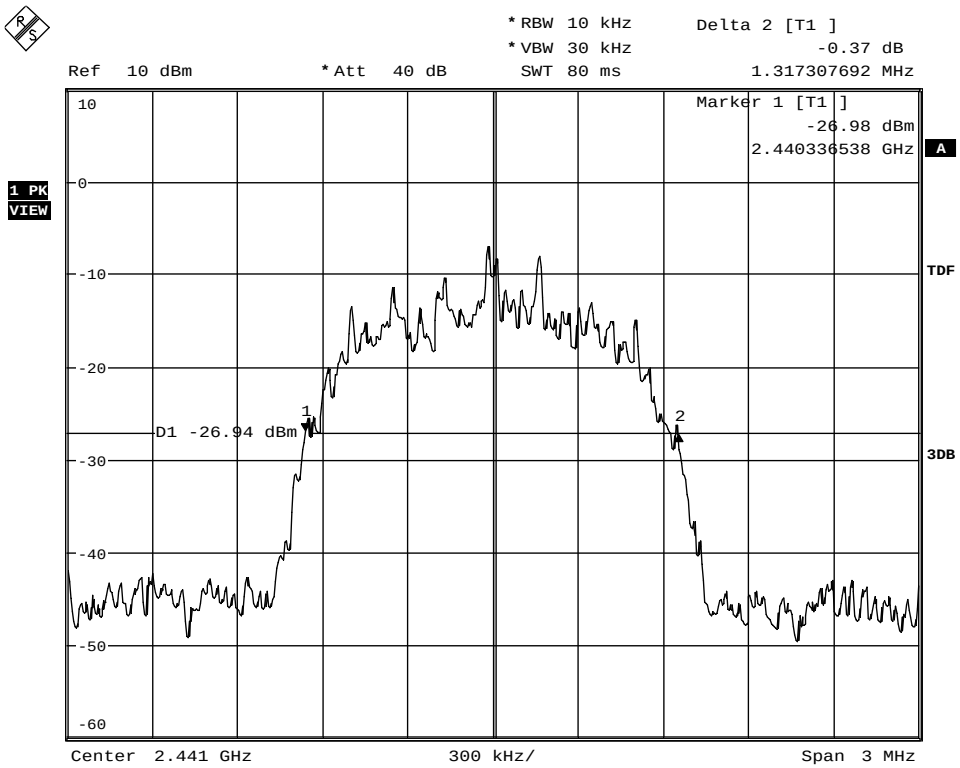

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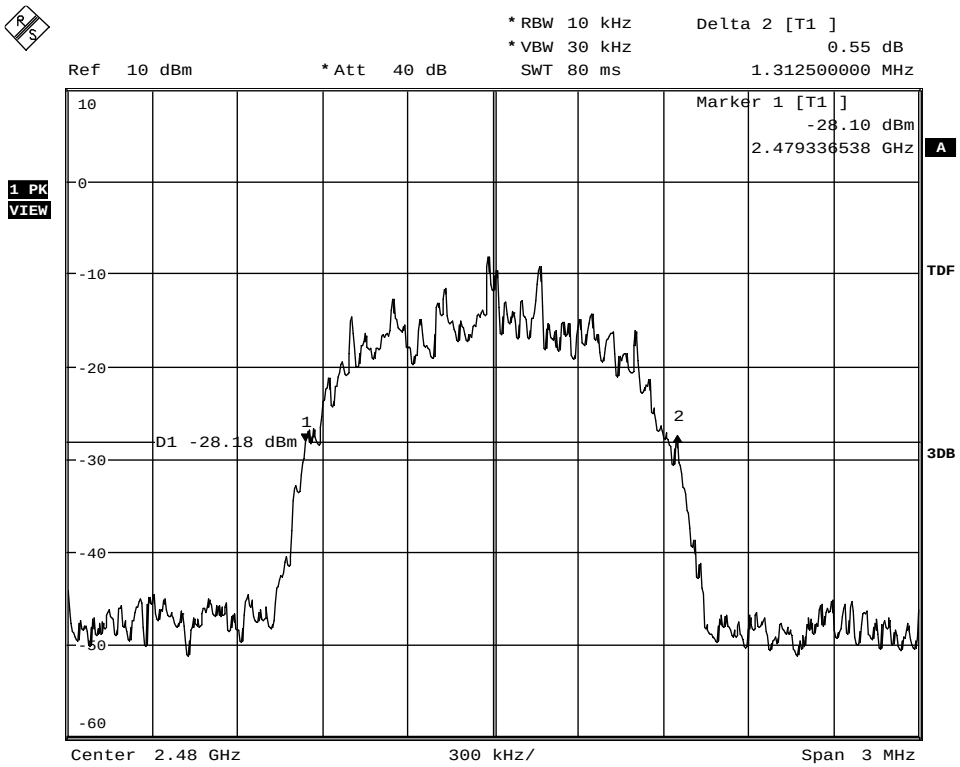

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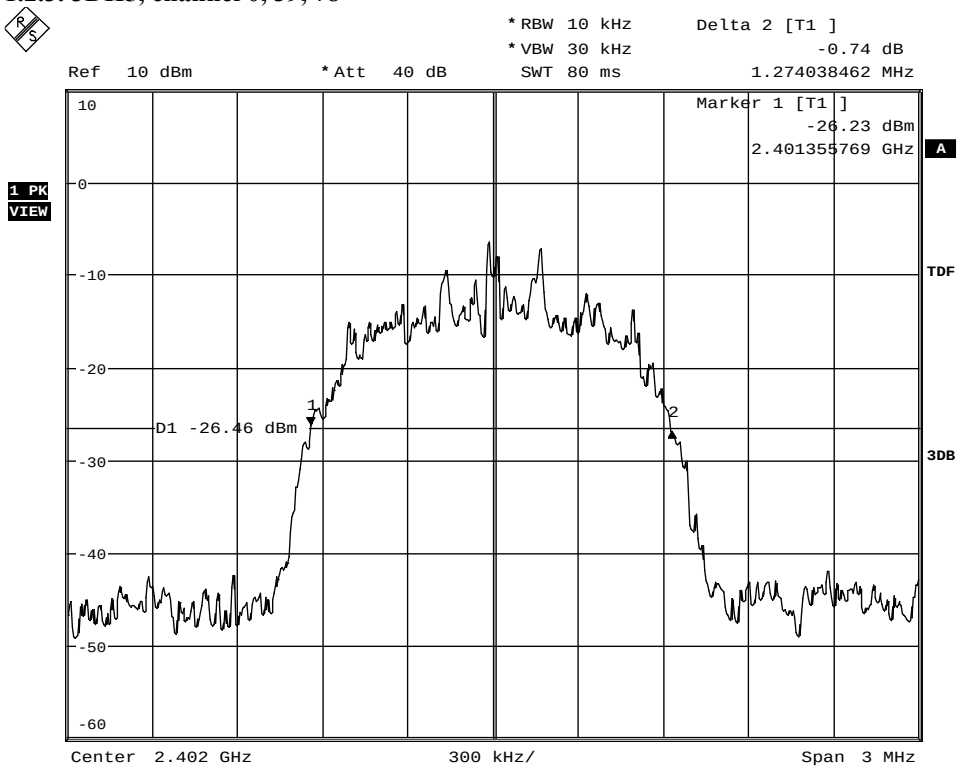
1.2.3. 3DH5, channel 0, 39, 78



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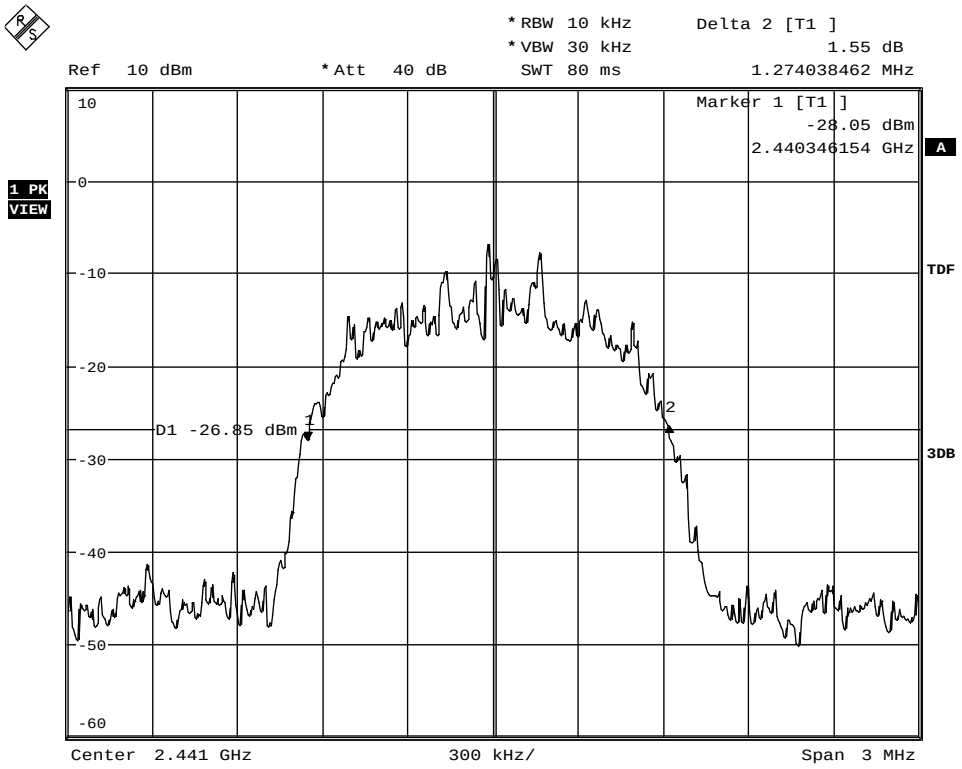

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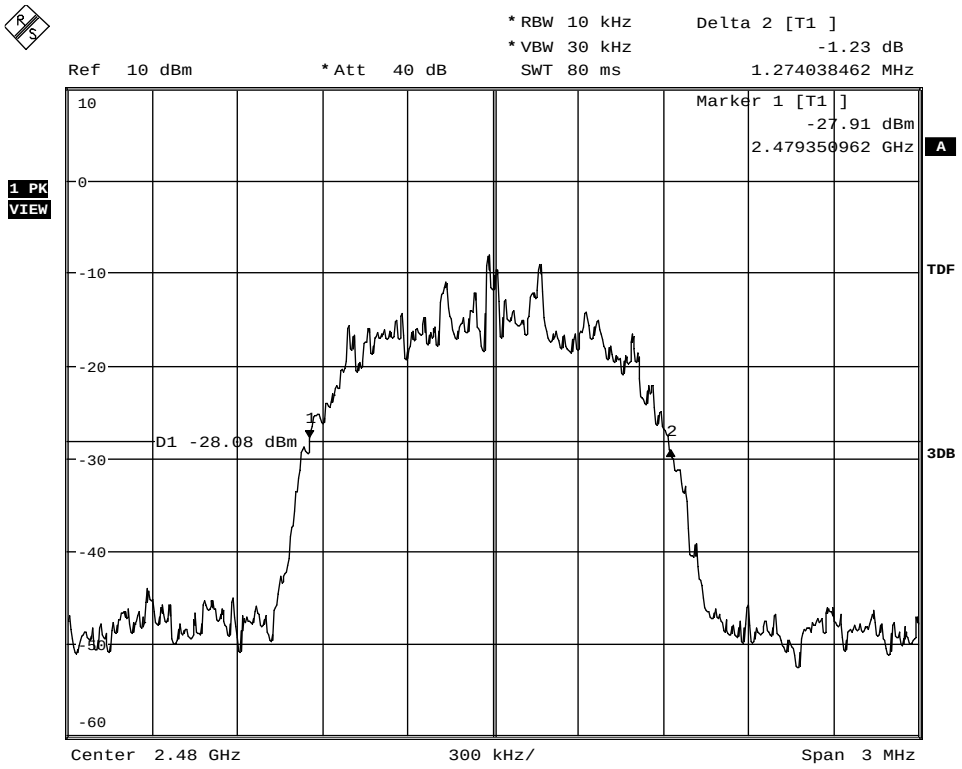

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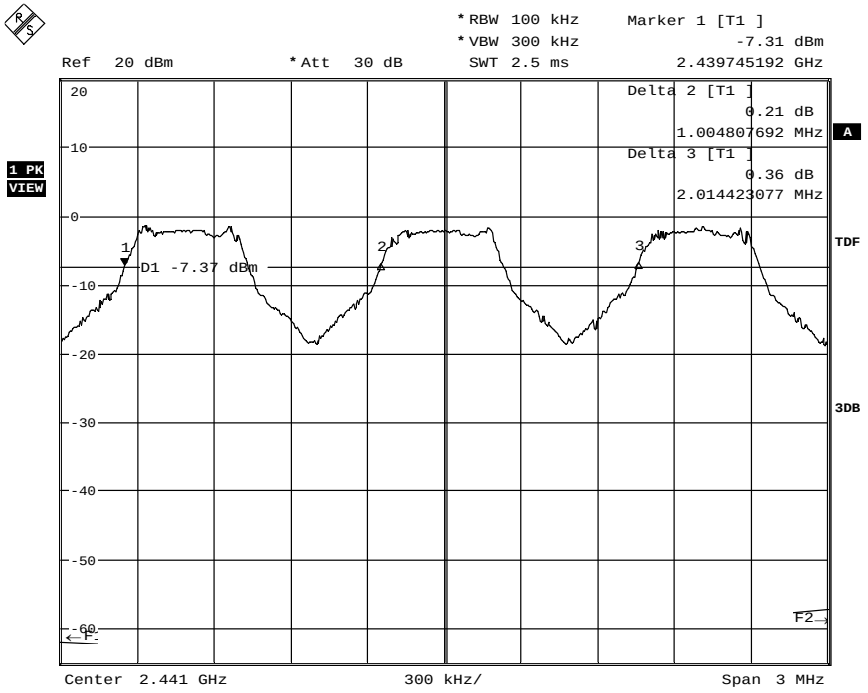
1.3. Channel carrier frequency separation



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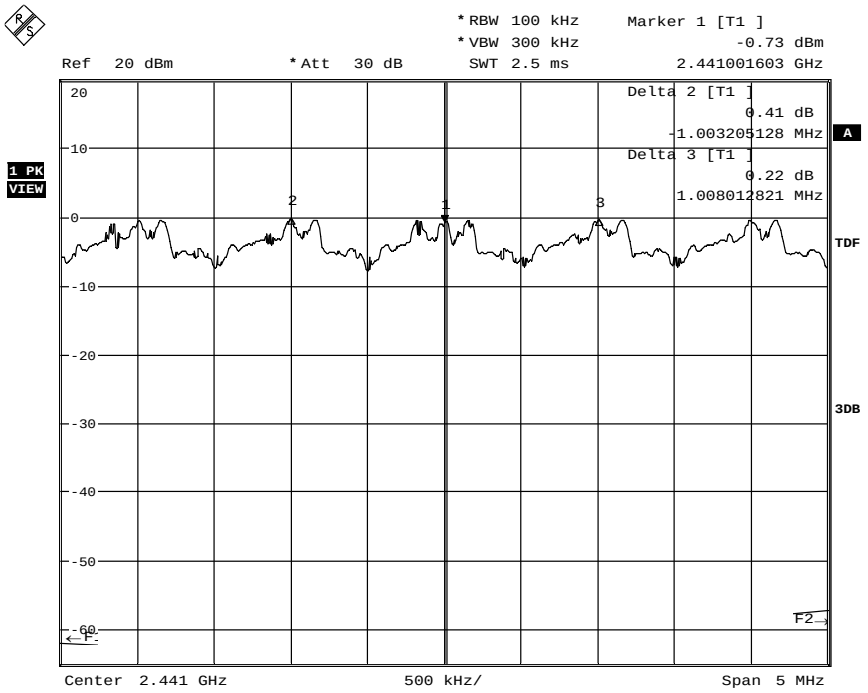
DH5 Packet type



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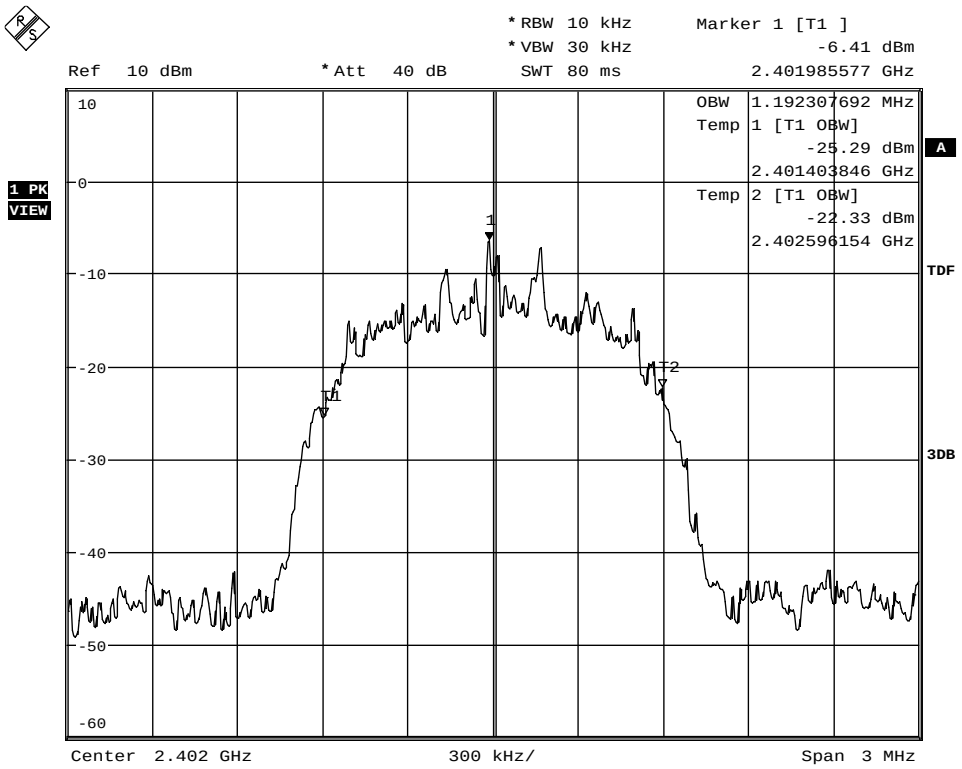
3DH5 packet type

1.4. 99% Occupied Bandwidth

1.4.1. Channel 0



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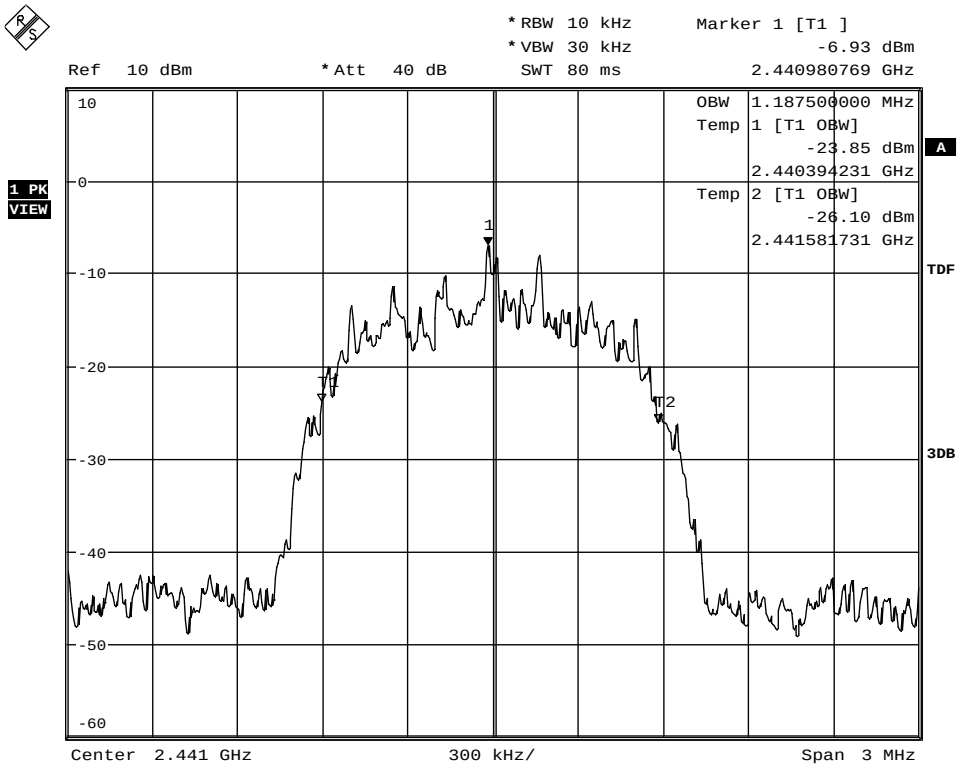
1.4.2. Channel 39



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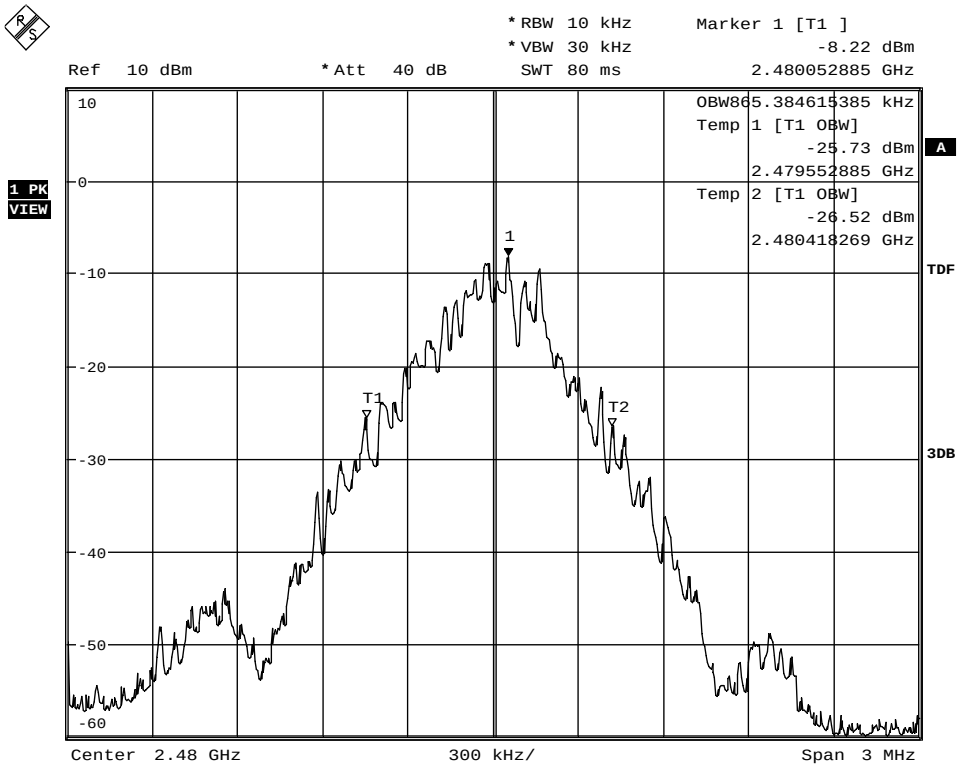
1.4.3. Channel 78



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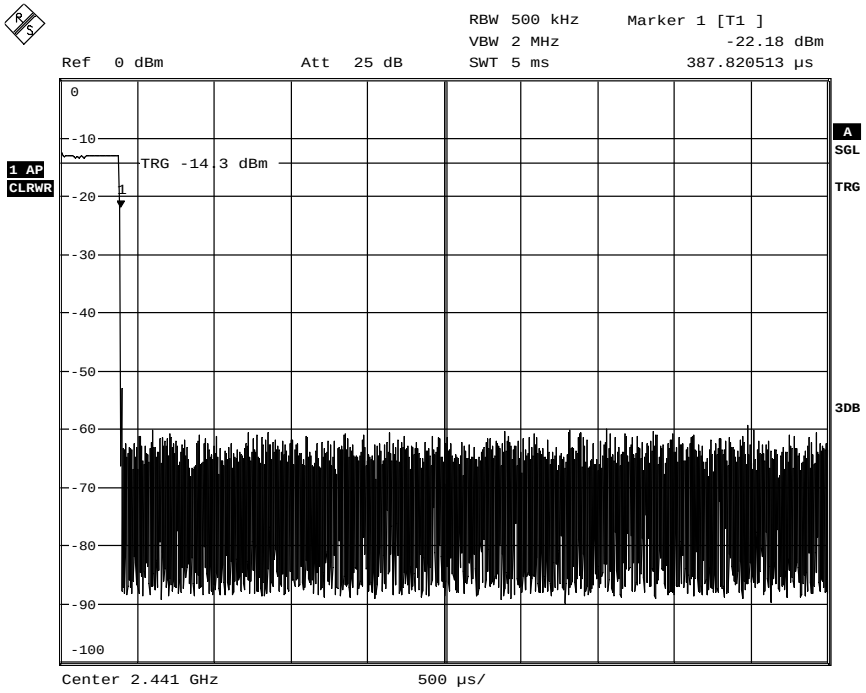
1.5. Channel average Occupancy time and number of channels

1.5.1. DH1



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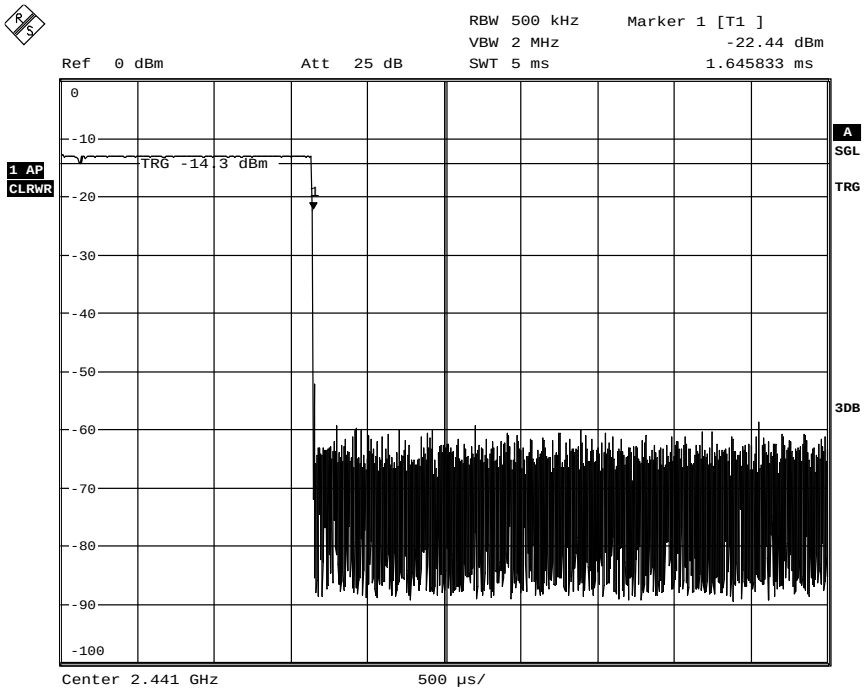
1.5.2. DH3



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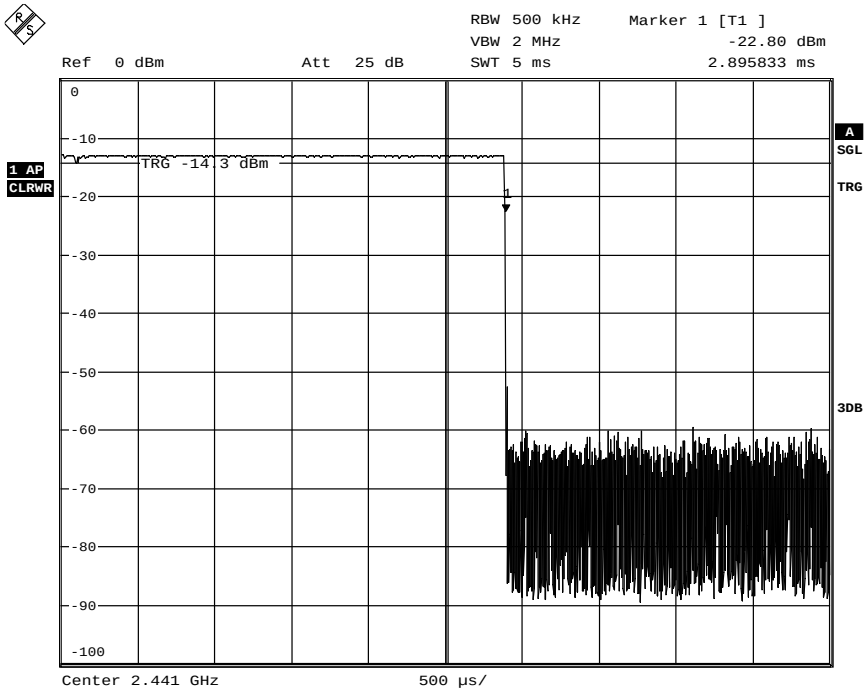
1.5.3. DH5



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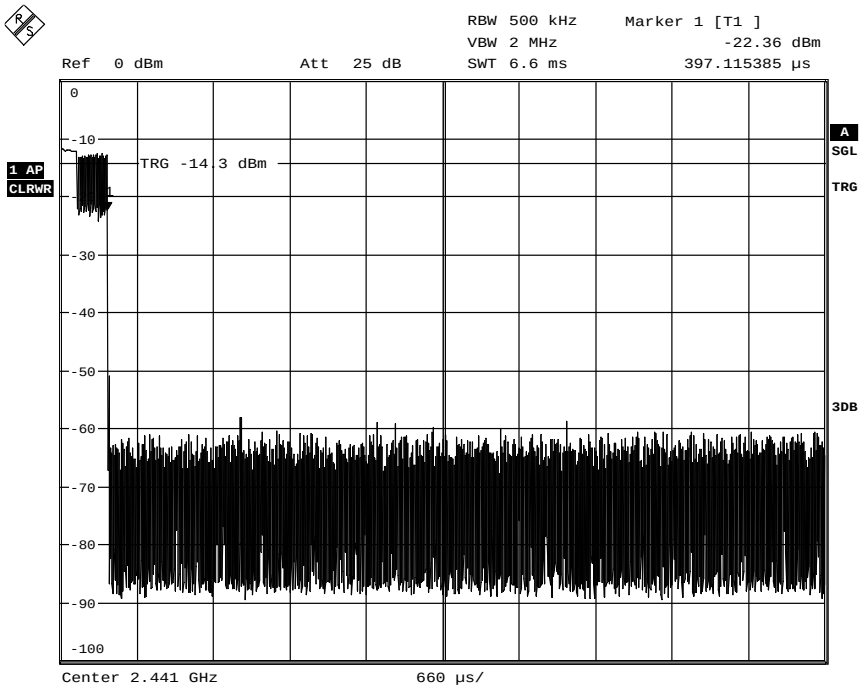
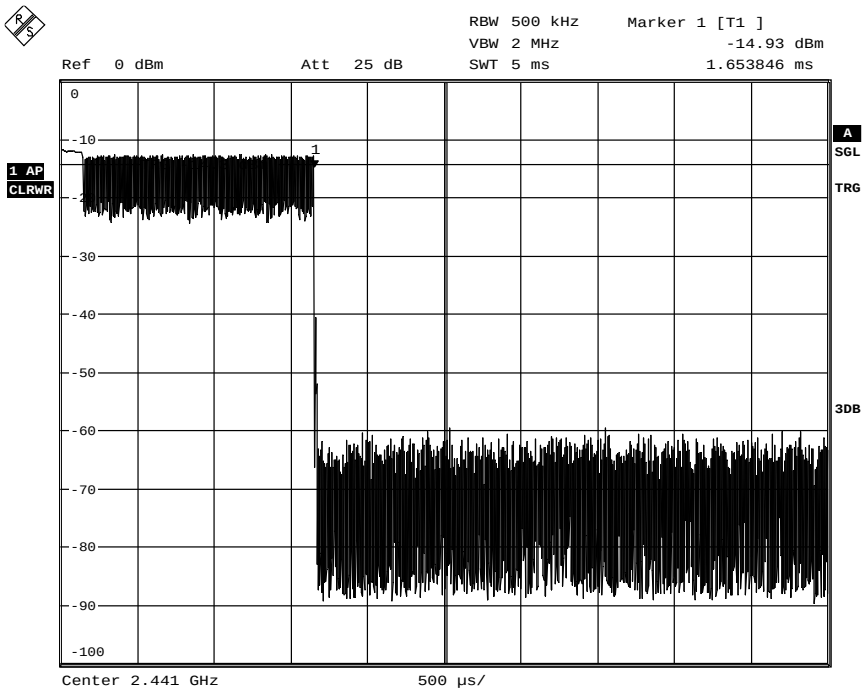
1.5.4. 2DH1



Date: 13.MAY.2015 14:29:58

1.5.5. 2DH3



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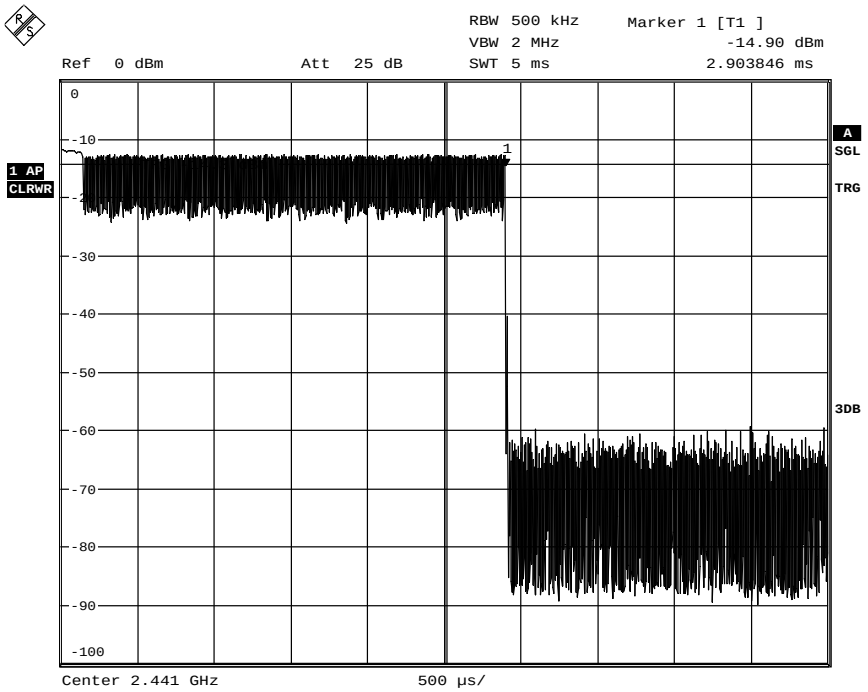
1.5.6. 2DH5



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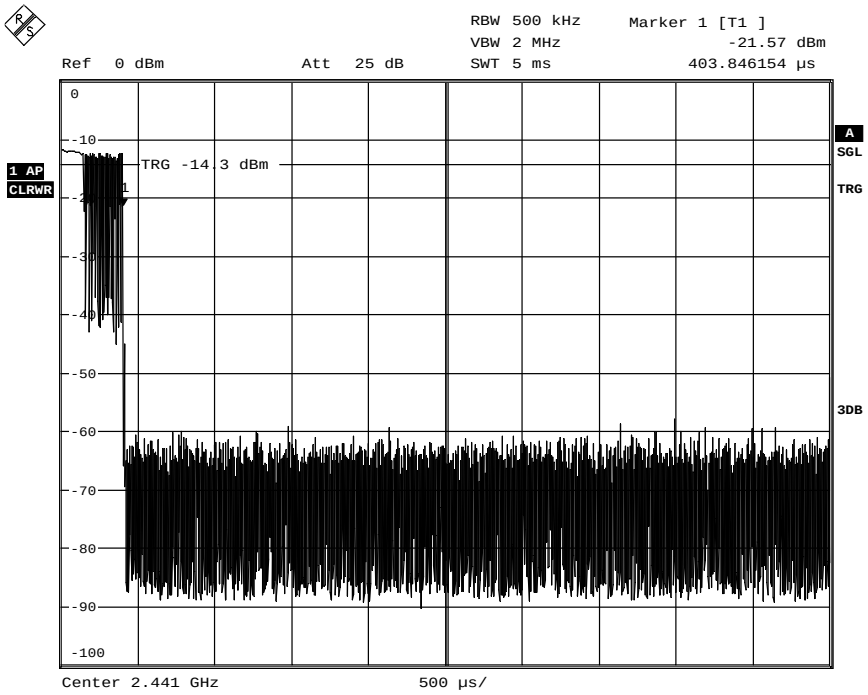
1.5.7. 3DH1



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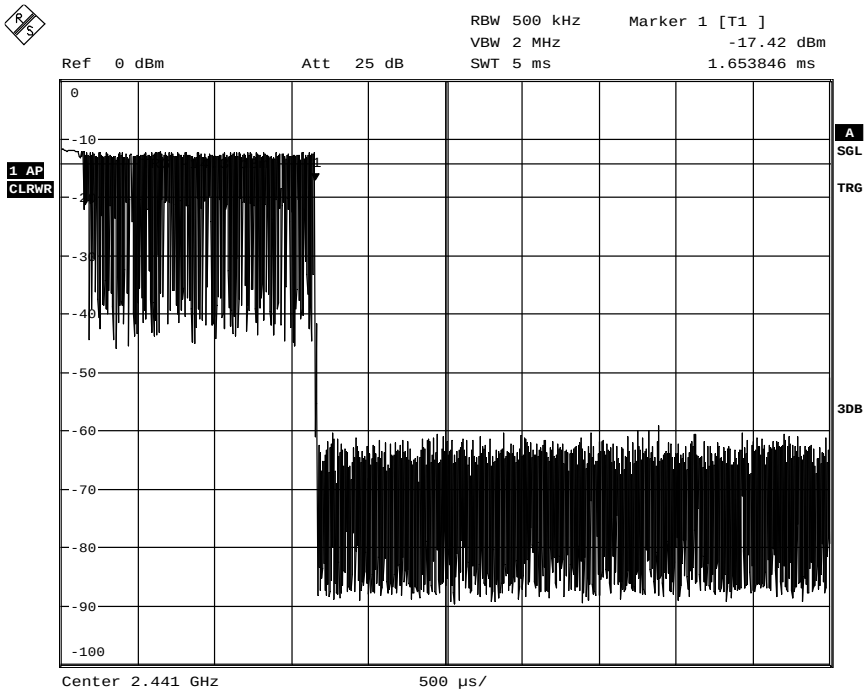
1.5.8. 3DH3



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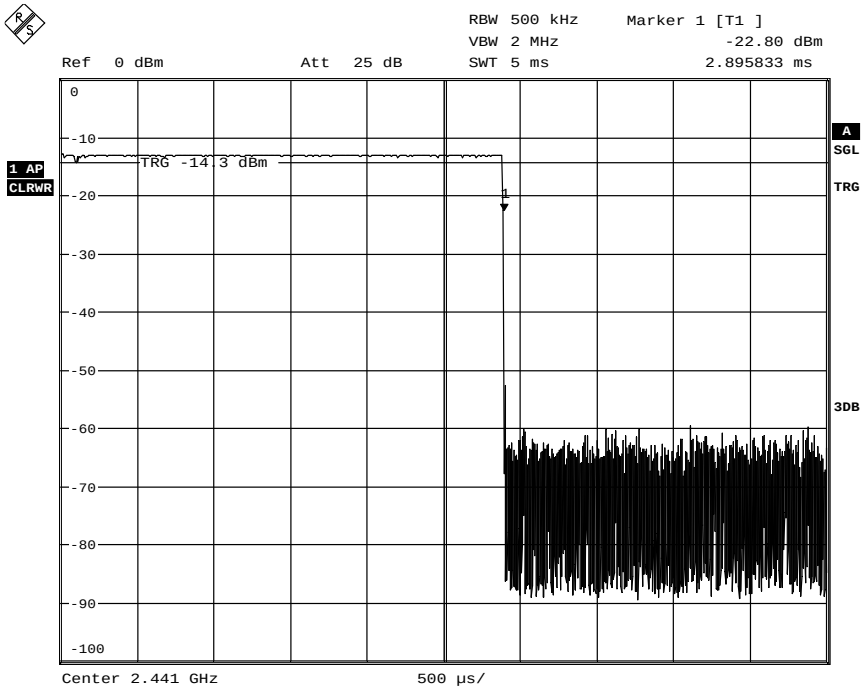
1.5.9. 3DH5



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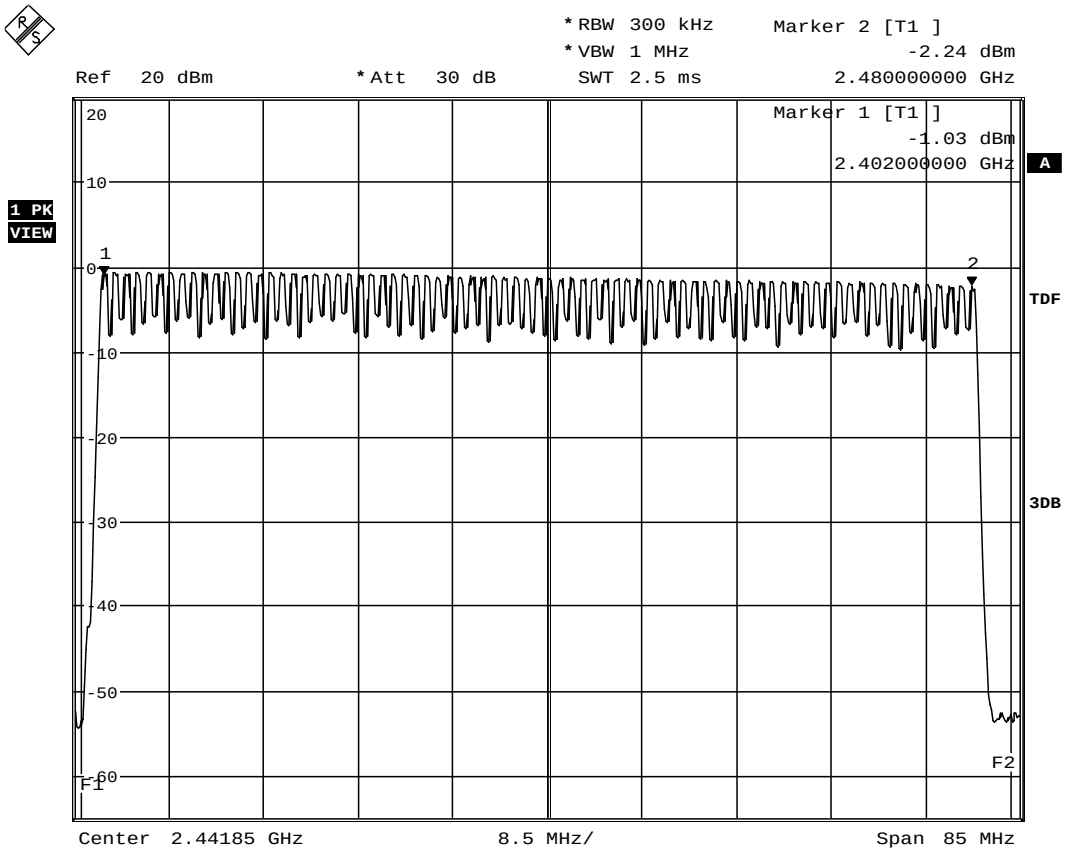
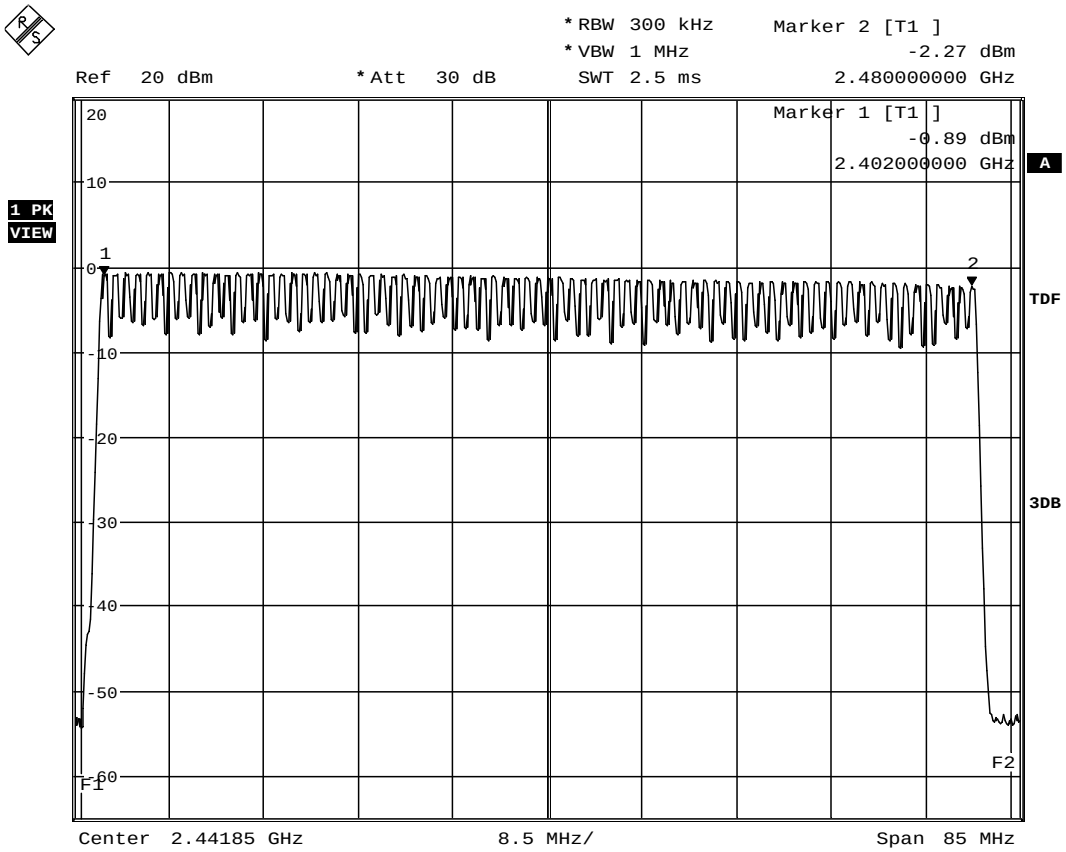
1.5.10. DH5



Date: 15.APR.2015 15:38:23

1.5.11. 2DH5



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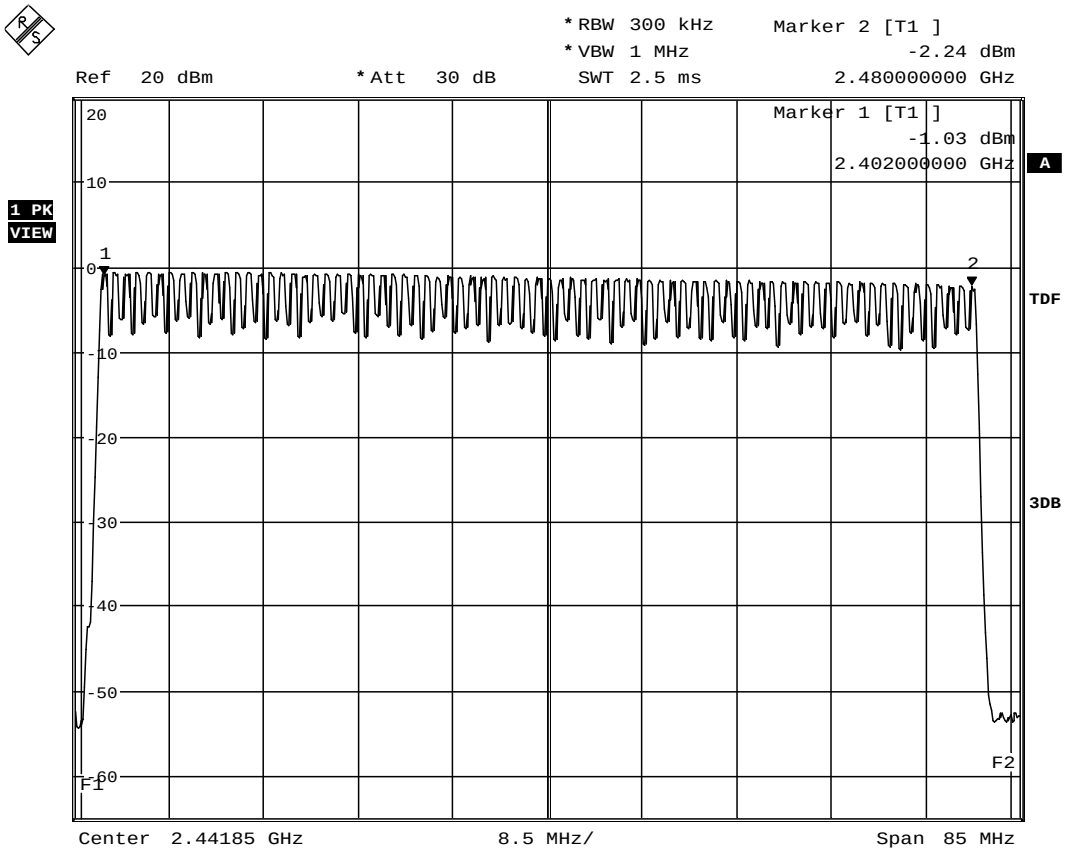
1.5.12. 3DH5



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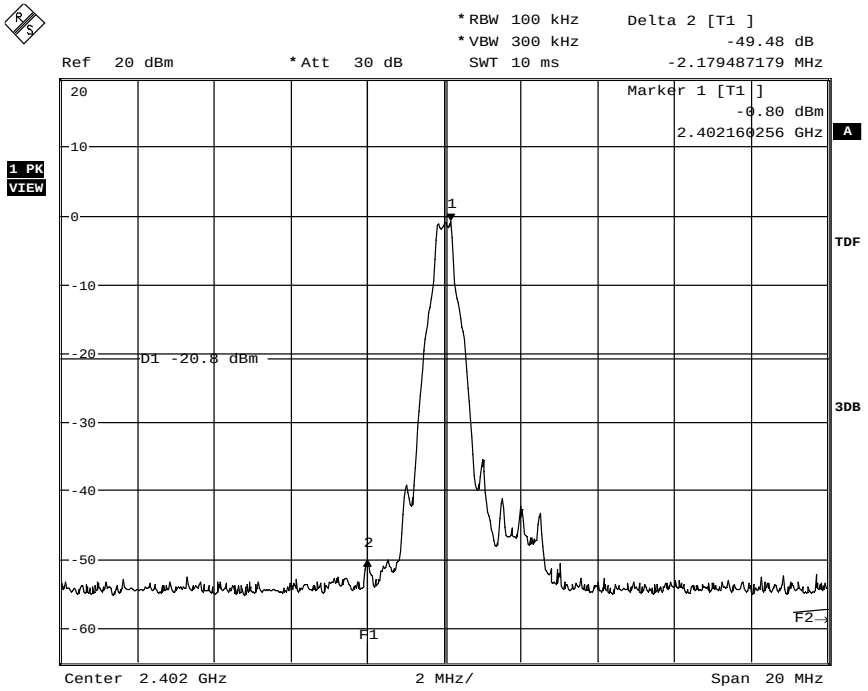
1.6. 20dBc Emissions

1.6.1. DH5

1.6.1.1. Channel 0 Reference



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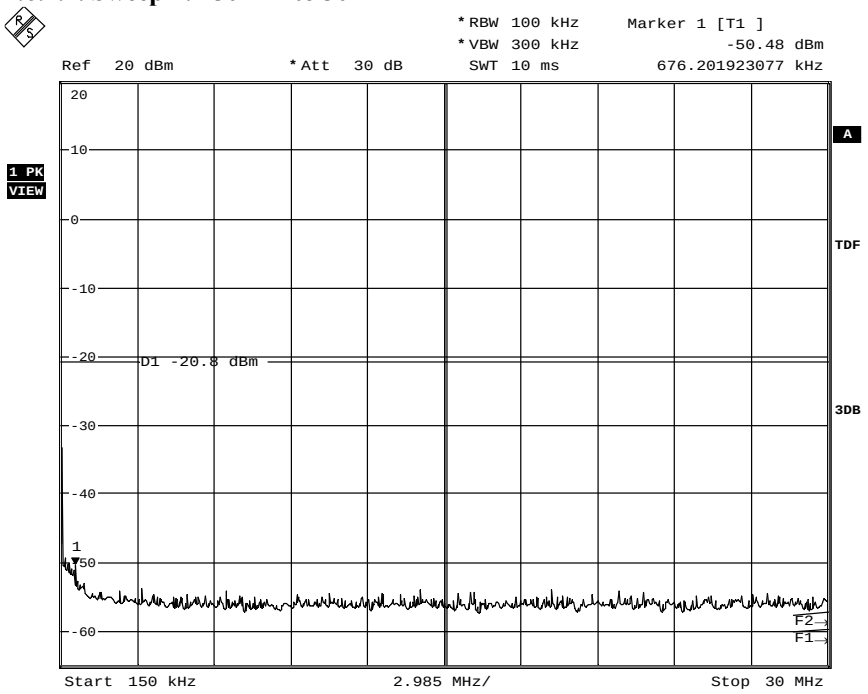
1.6.1.2. Sweep 1: 150kHz to 30MHz



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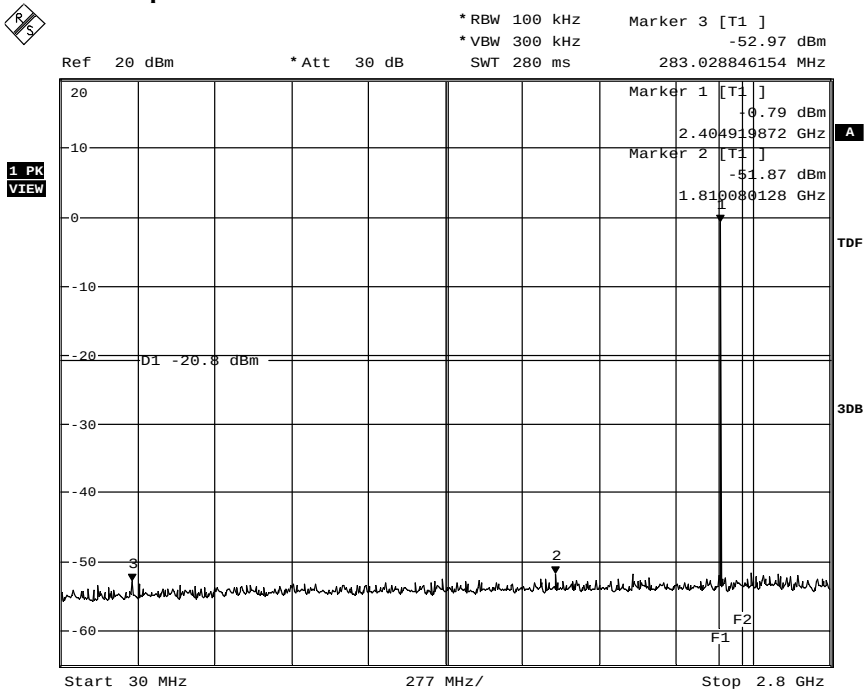
1.6.1.3. Sweep 2: 30MHz to 2.8GHz



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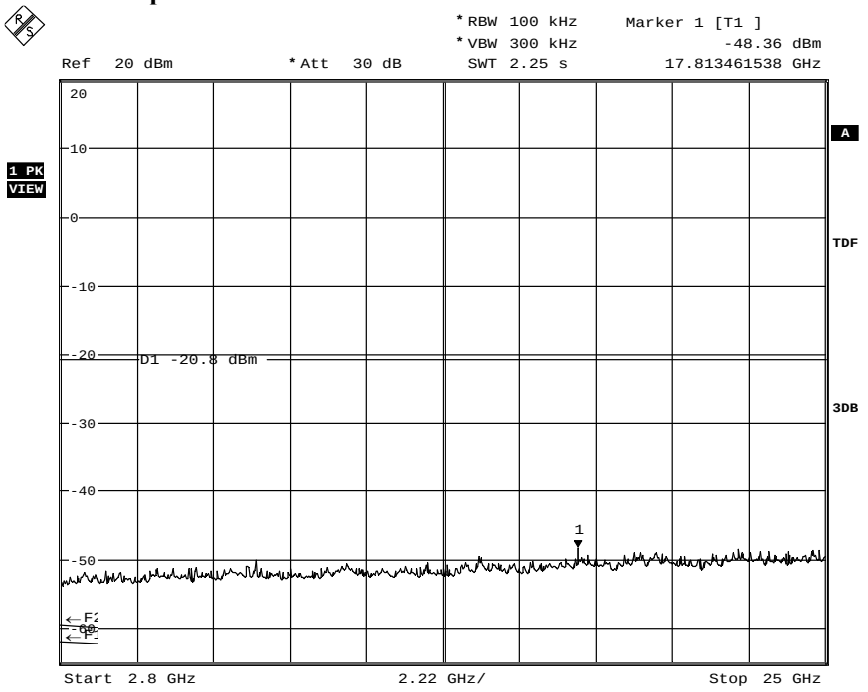
1.6.1.4. Sweep 2: 2.8GHz to 25GHz



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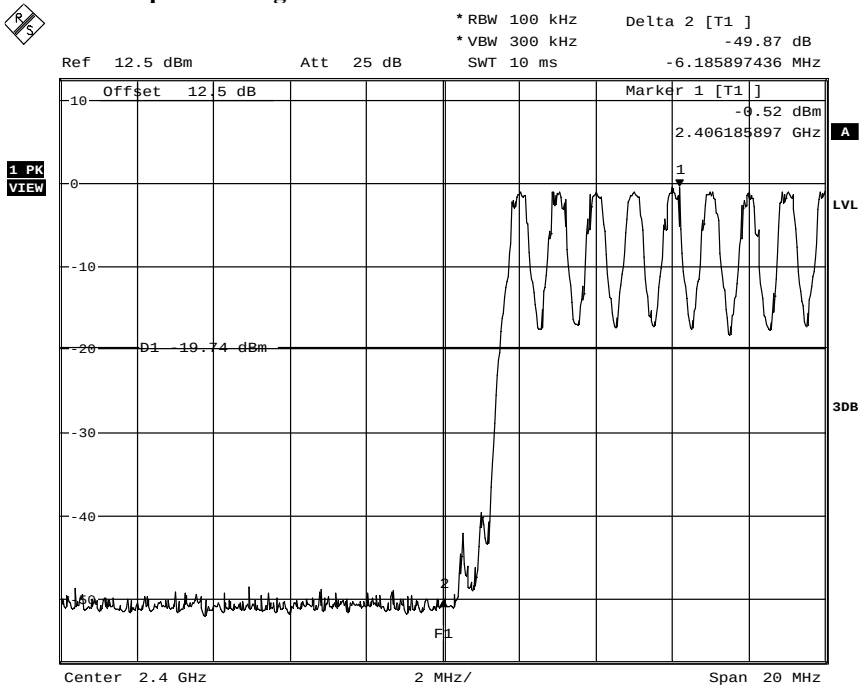
1.6.1.5. Sweep Band-Edge left at 2.4GHz



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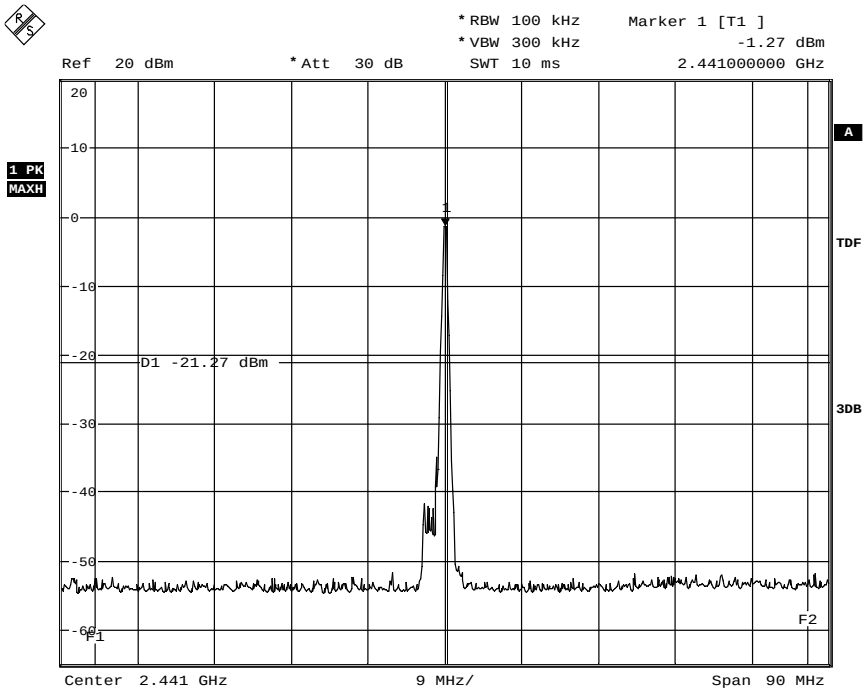
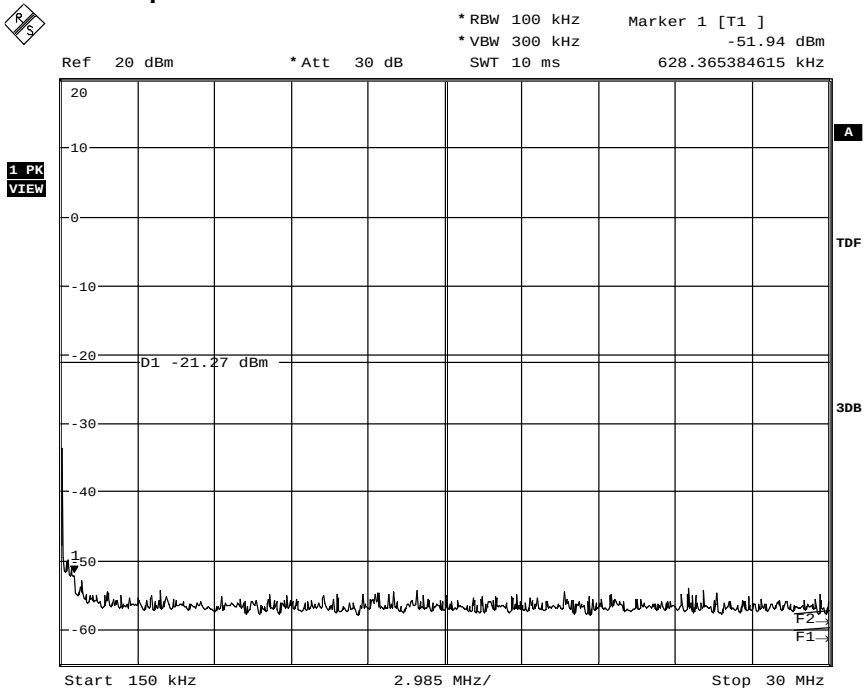
1.6.1.6. Channel 39 Reference



Date: 15.APR.2015 14:50:41

1.6.1.7. Sweep 1: 150kHz to 30MHz



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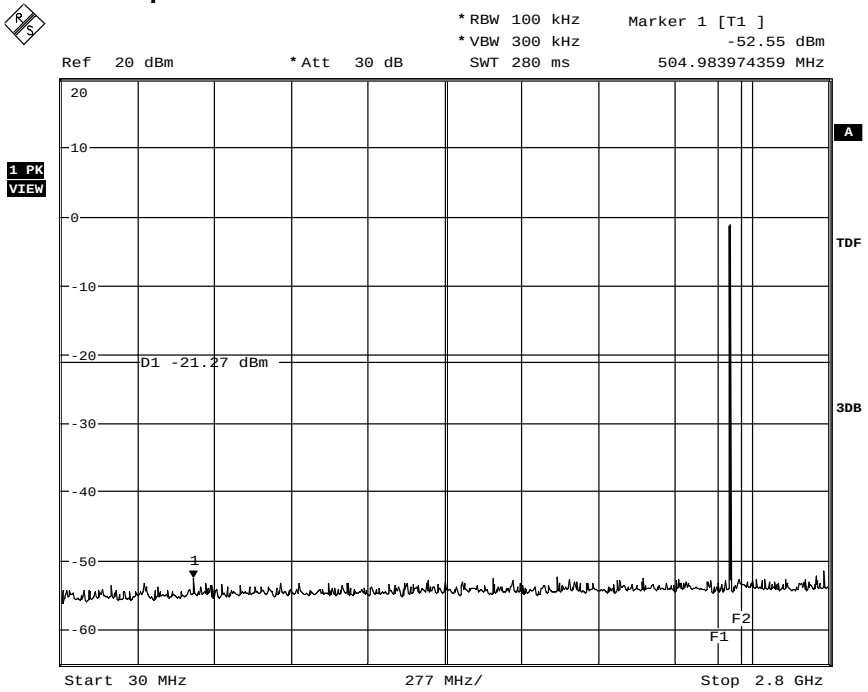
1.6.1.8. Sweep 2: 30MGHz to 2.8GHz



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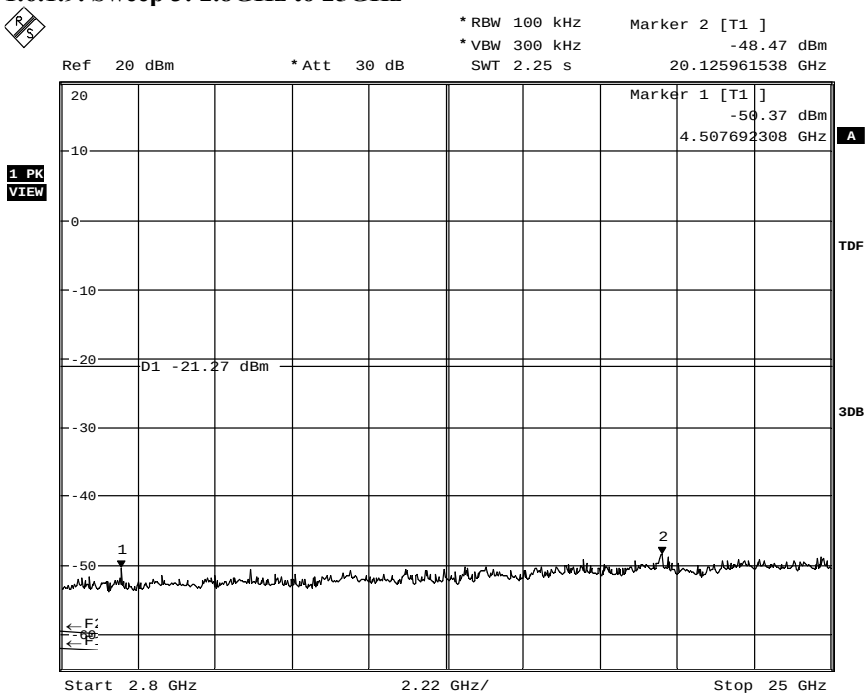
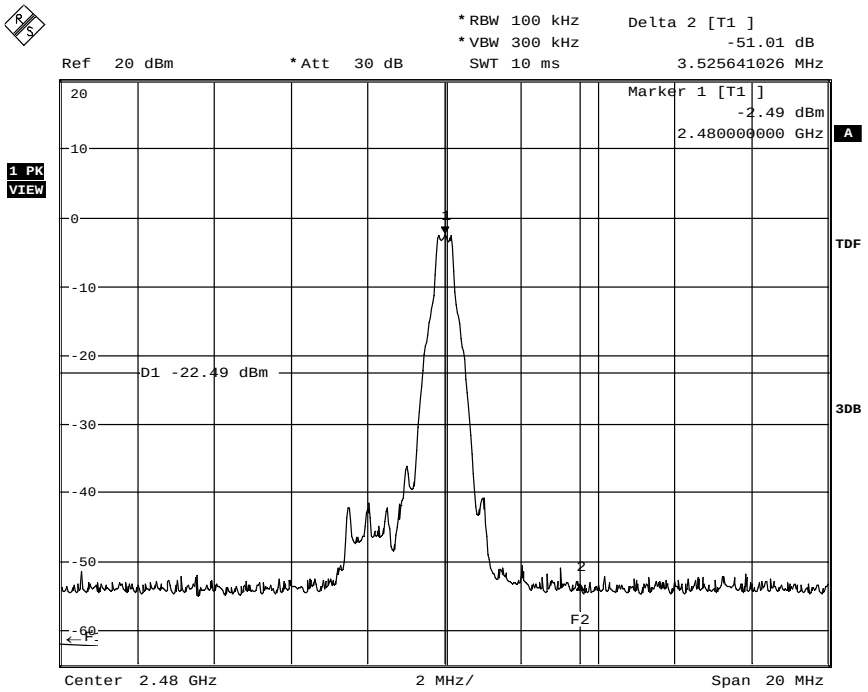
1.6.1.9. Sweep 3: 2.8GHz to 25GHz



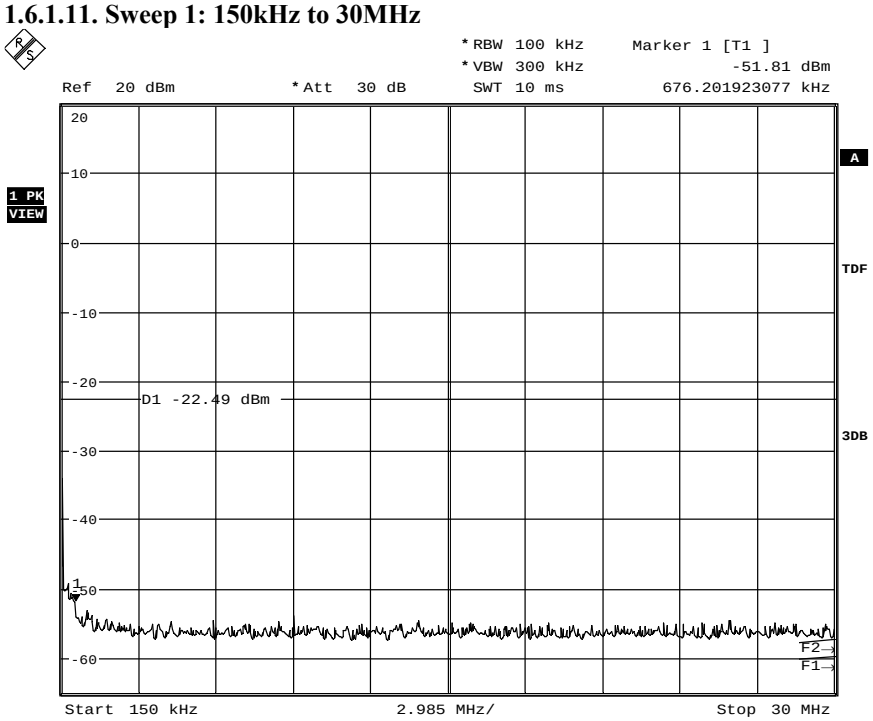
Date: 15.APR.2015 14:58:24

1.6.1.10. Channel 78 Reference



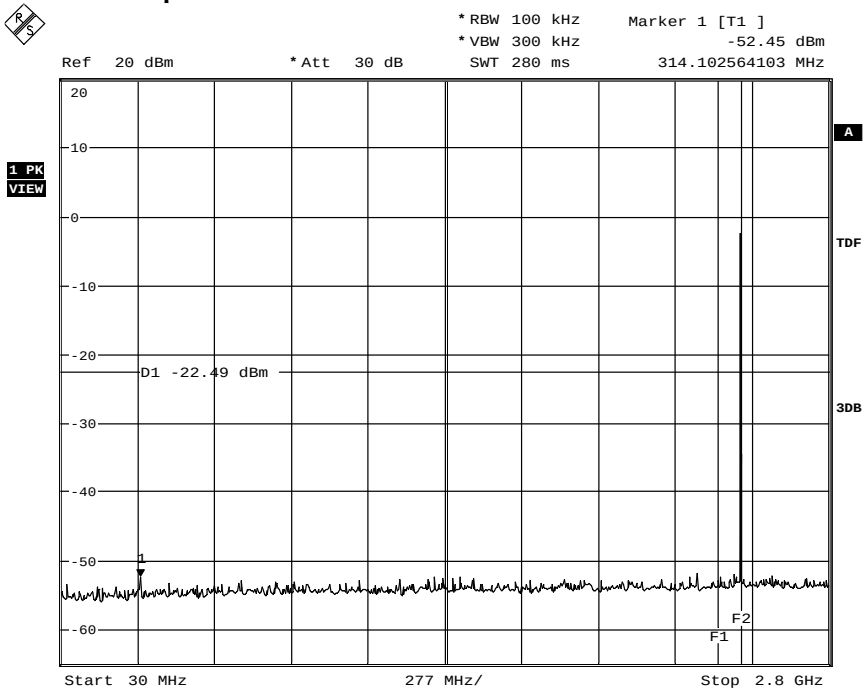
Date: 15.APR.2015 14:35:53

1.6.1.11. Sweep 1: 150kHz to 30MHz



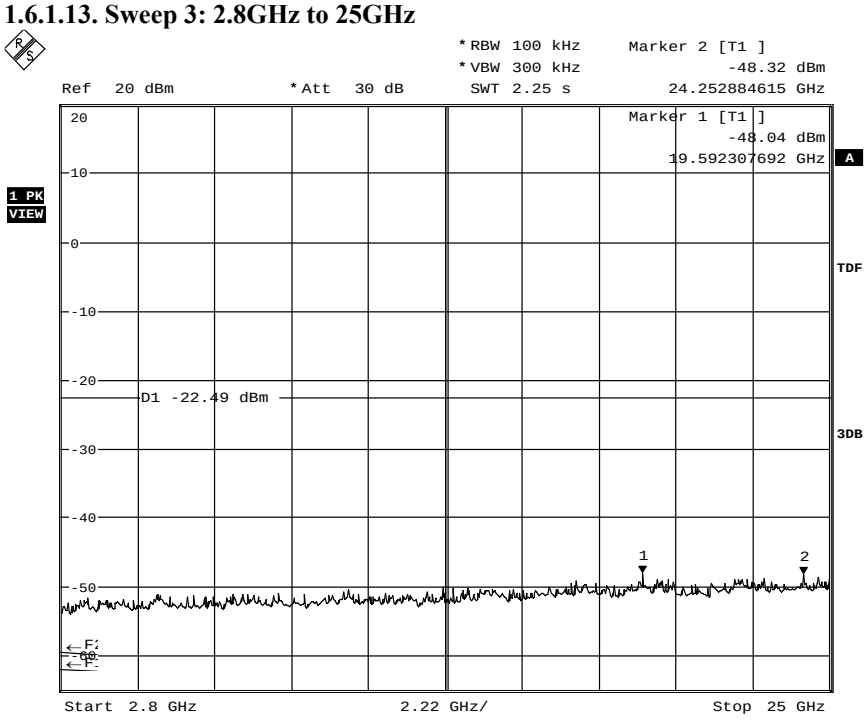
Date: 15.APR.2015 14:38:49

1.6.1.12. Sweep 2: 30MHz to 2.8GHz



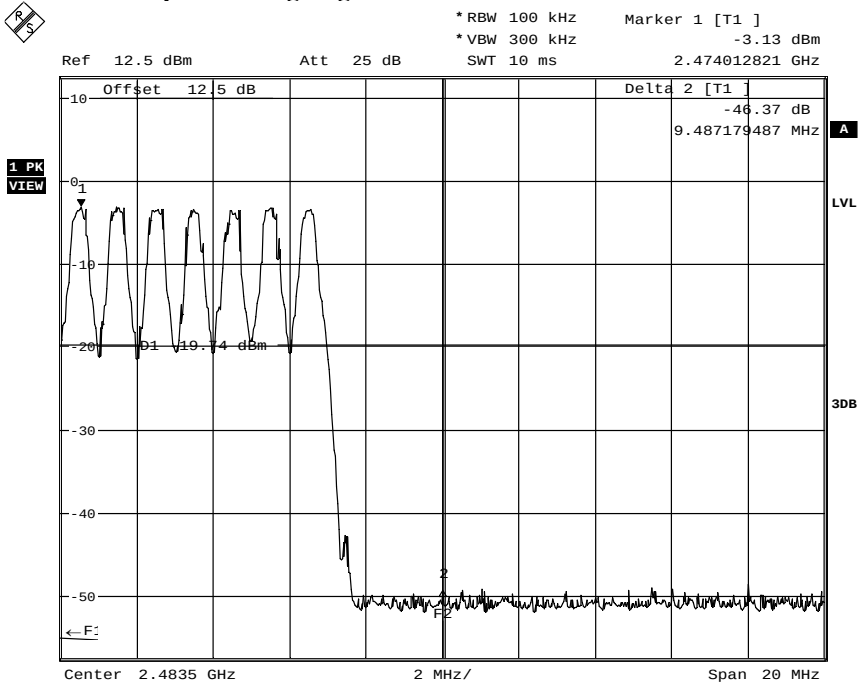
Date: 15.APR.2015 14:41:54

1.6.1.13. Sweep 3: 2.8GHz to 25GHz



Date: 15.APR.2015 14:46:25

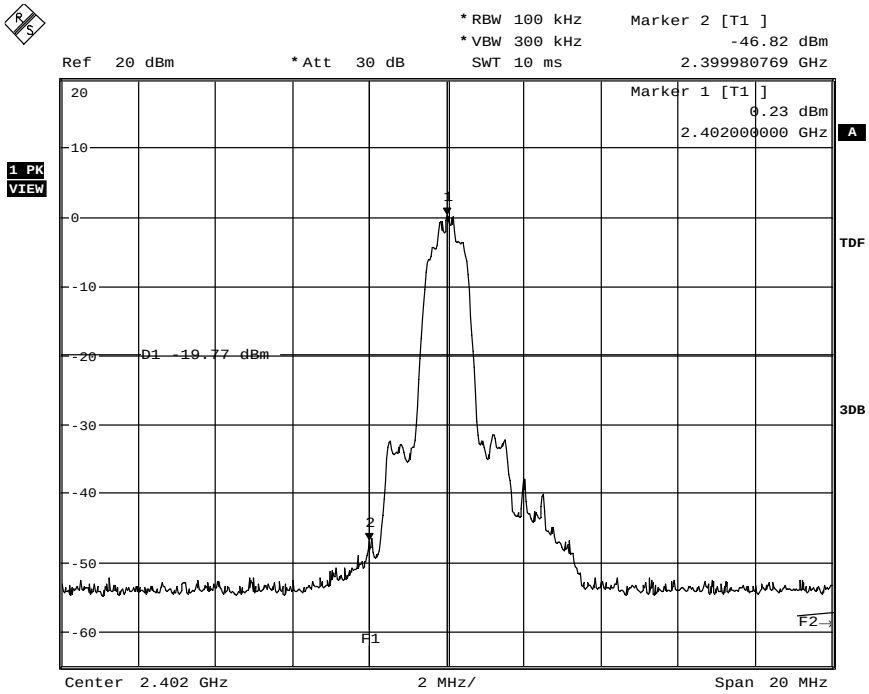
1.6.1.14. Sweep Band-Edge right at 2483.5GHz



Date: 13.MAY.2015 14:46:29

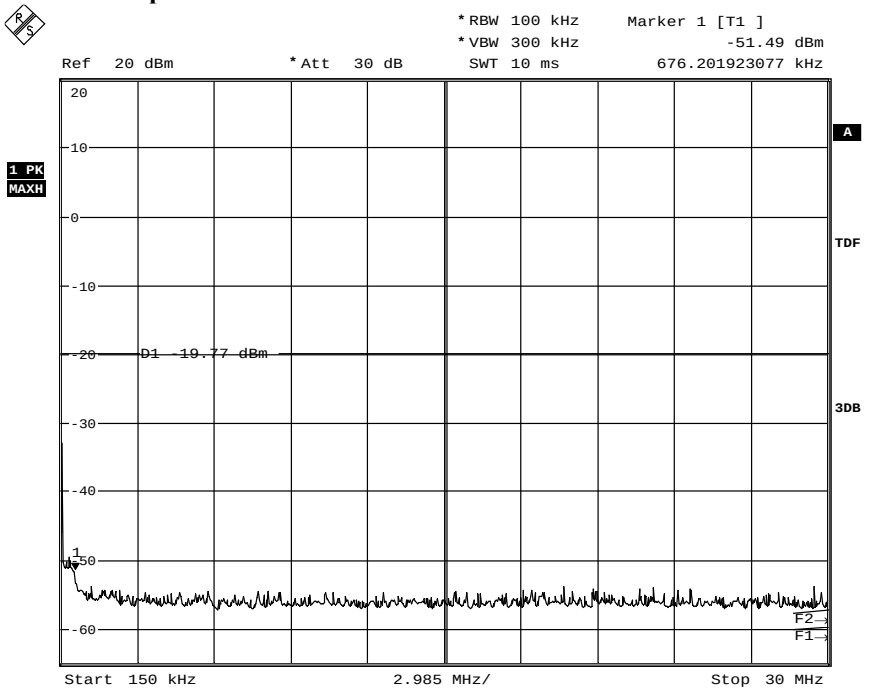
1.6.2. 2DH5

1.6.2.1. Channel 0 Reference



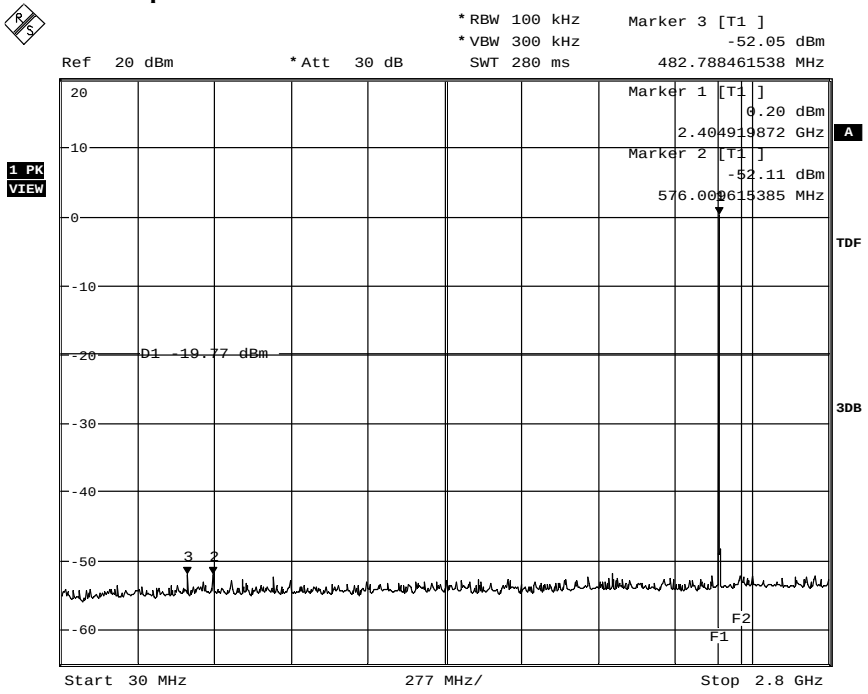
Date: 15.APR.2015 15:21:02

1.6.2.2. Sweep 1: 150kHz to 30MHz



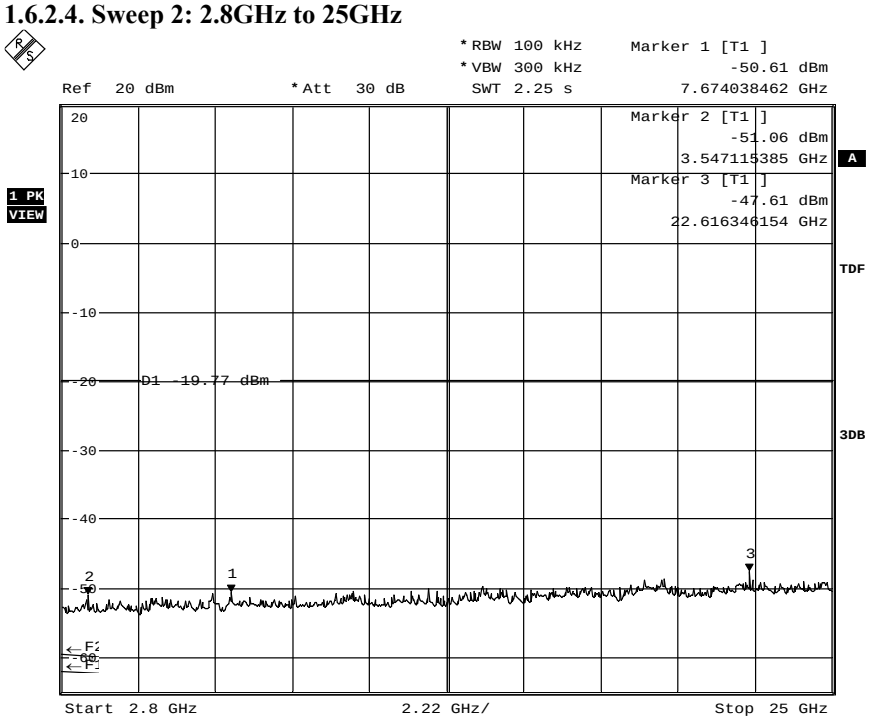
Date: 15.APR.2015 15:24:22

1.6.2.3. Sweep 2: 30MHz to 2.8GHz



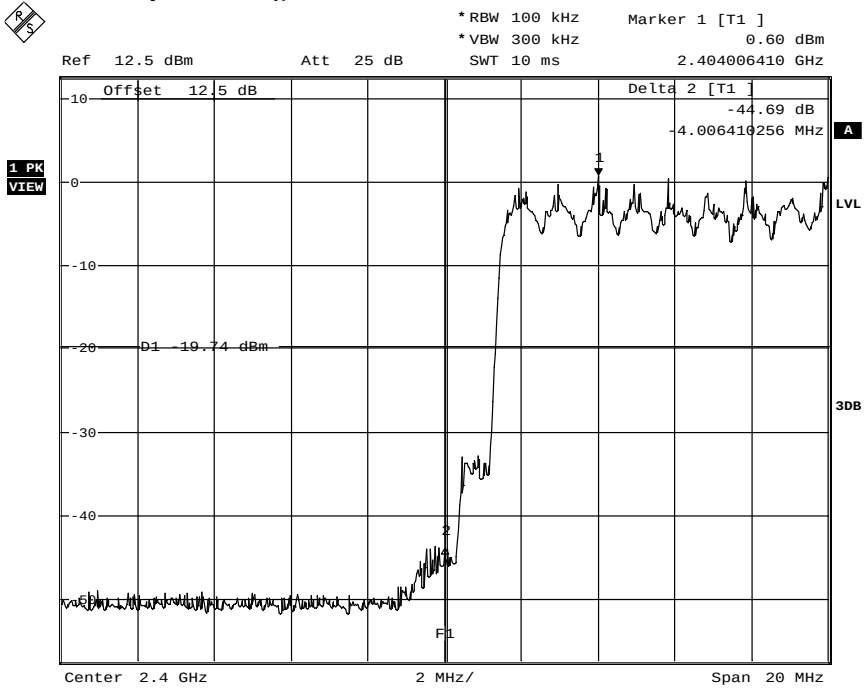
Date: 15.APR.2015 15:27:55

1.6.2.4. Sweep 2: 2.8GHz to 25GHz



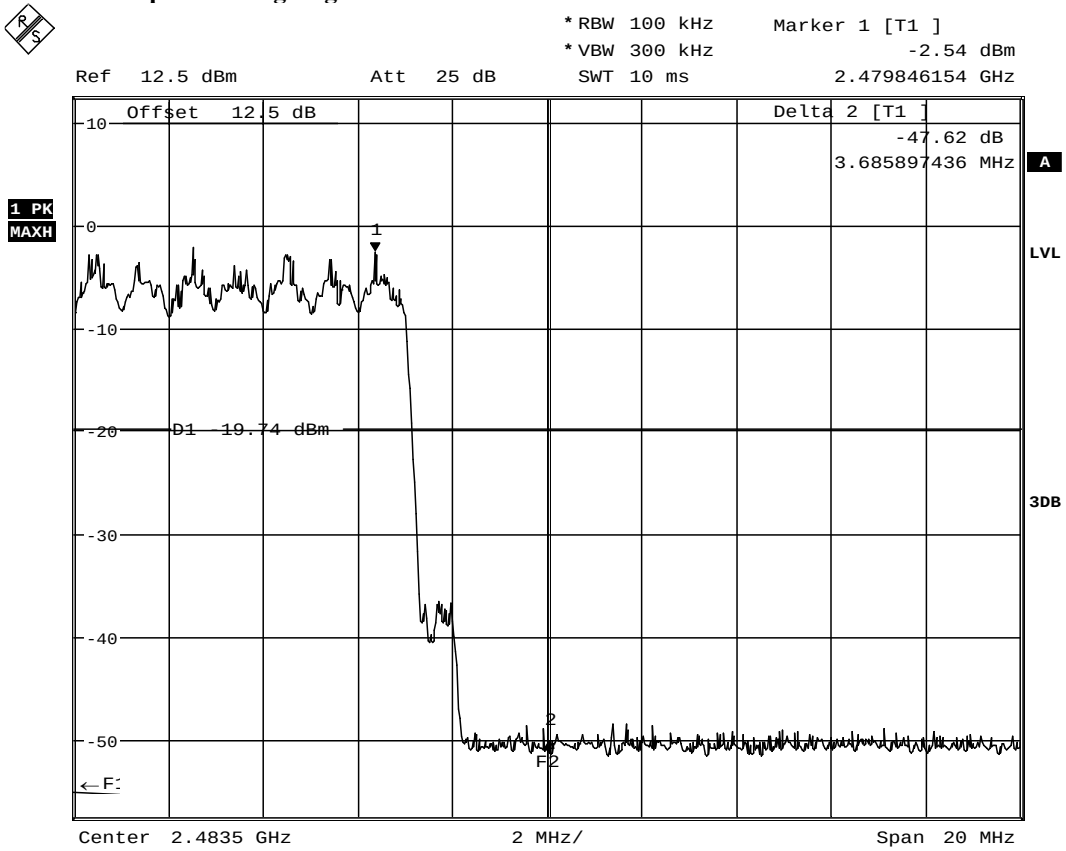
Date: 15.APR.2015 15:32:31

1.6.2.5. Sweep Band-Edge left at 2.4GHz



Date: 13.MAY.2015 14:43:16

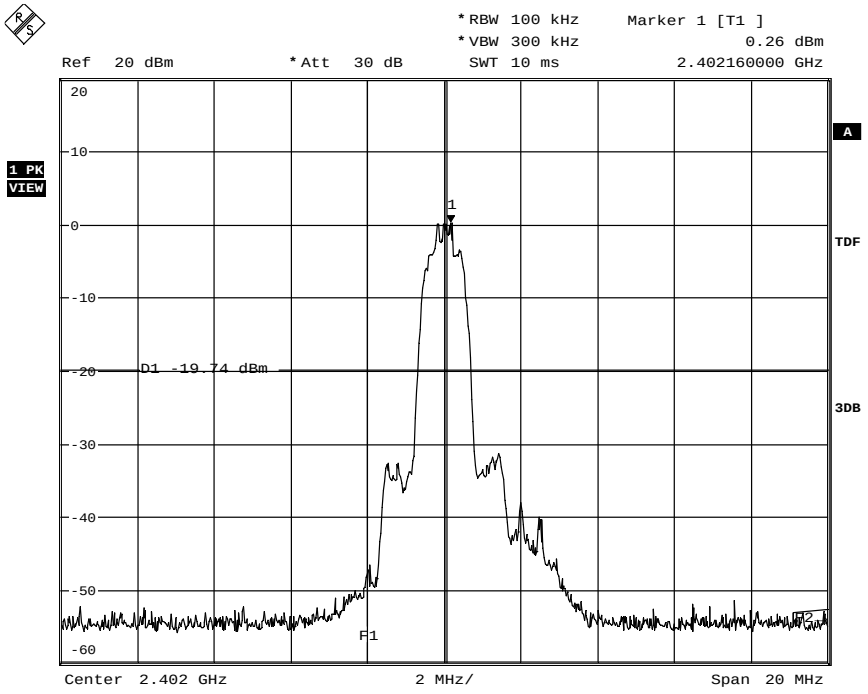
1.6.2.6. Sweep Band-Edge right at 2483.5GHz



Date: 13.MAY.2015 14:49:04

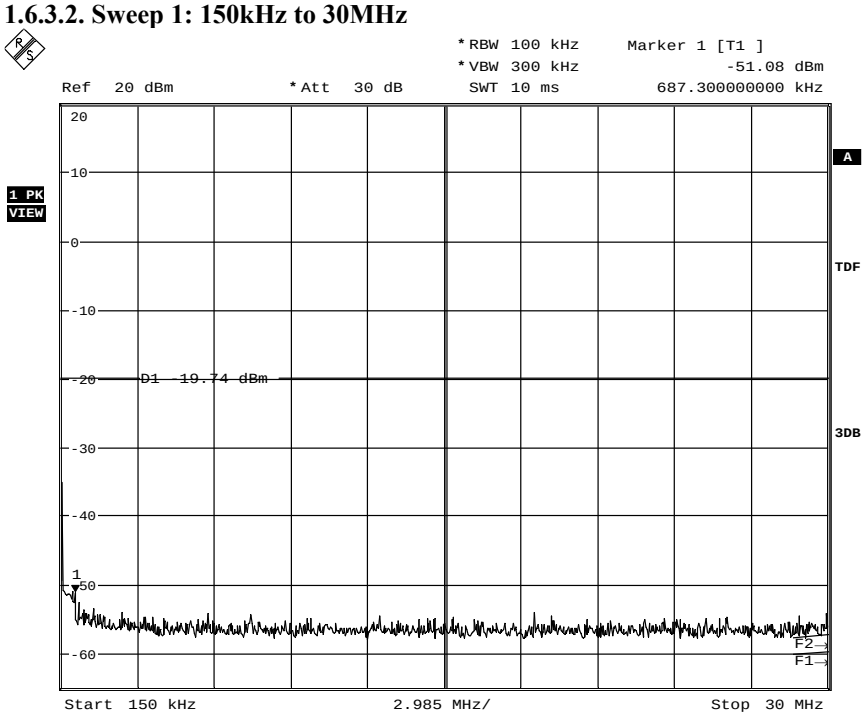
1.6.3. 3DH5

1.6.3.1. Channel 0 Reference



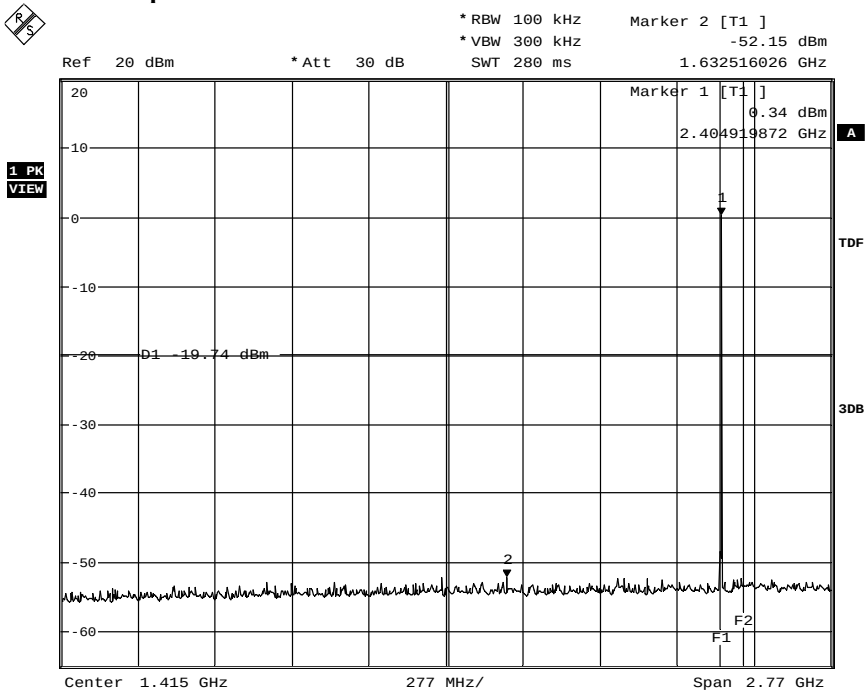
Date: 15.APR.2015 13:43:01

1.6.3.2. Sweep 1: 150kHz to 30MHz



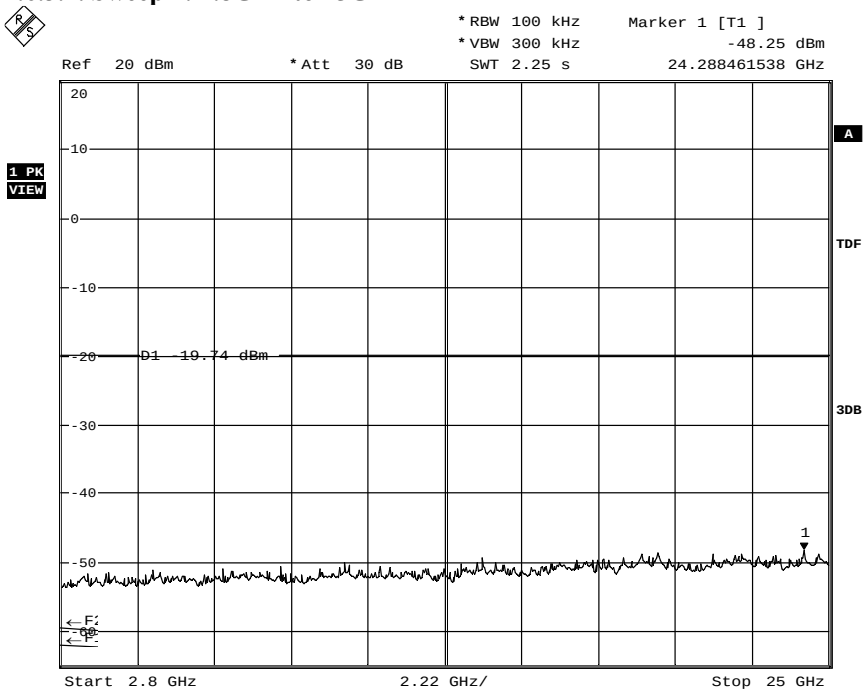
Date: 15.APR.2015 13:46:53

1.6.3.3. Sweep 2: 30MHz to 2.8GHz



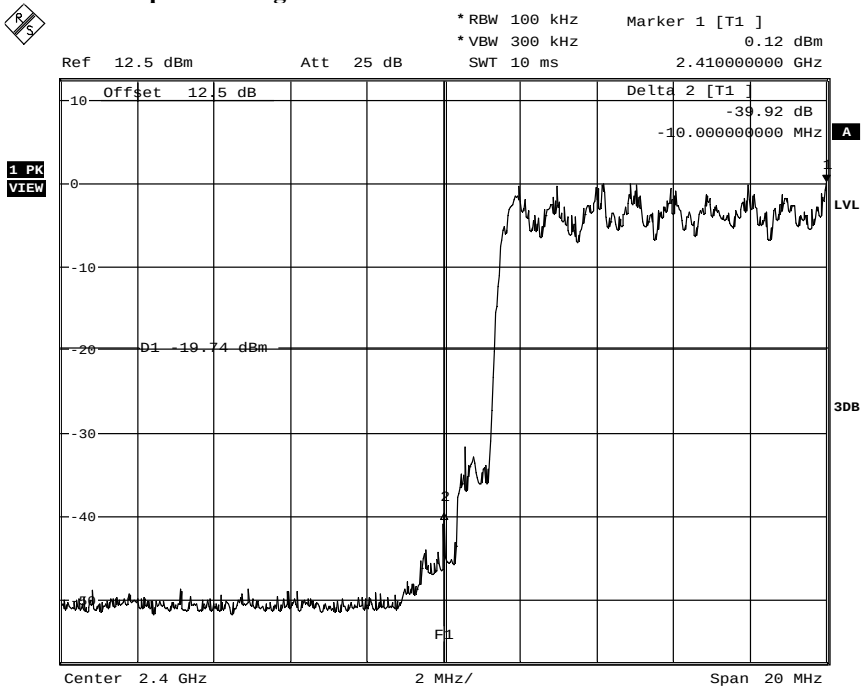
Date: 15.APR.2015 13:52:29

1.6.3.4. Sweep 2: 2.8GHz to 25GHz



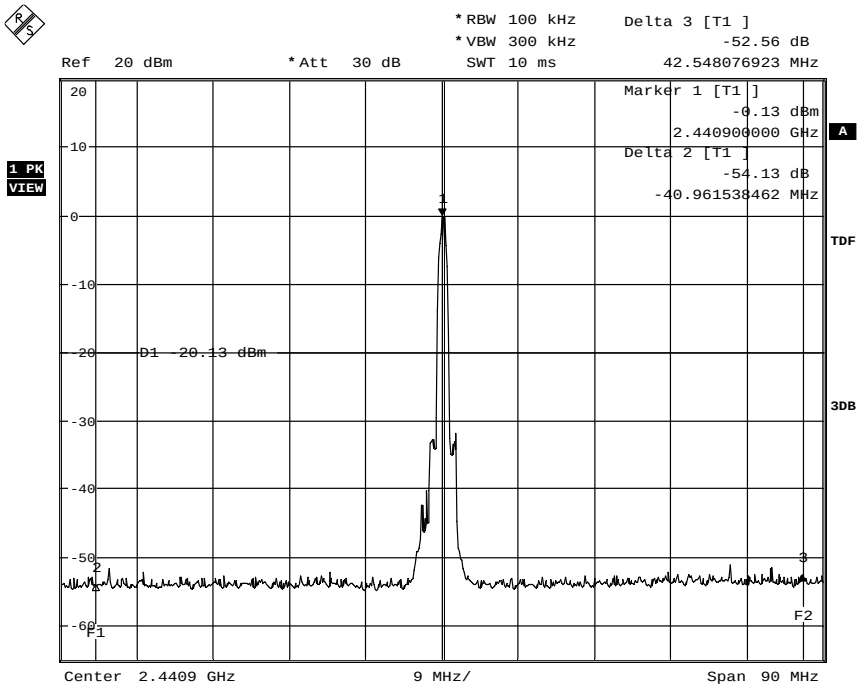
Date: 15.APR.2015 13:56:39

1.6.3.5. Sweep Band-Edge left at 2.4GHz



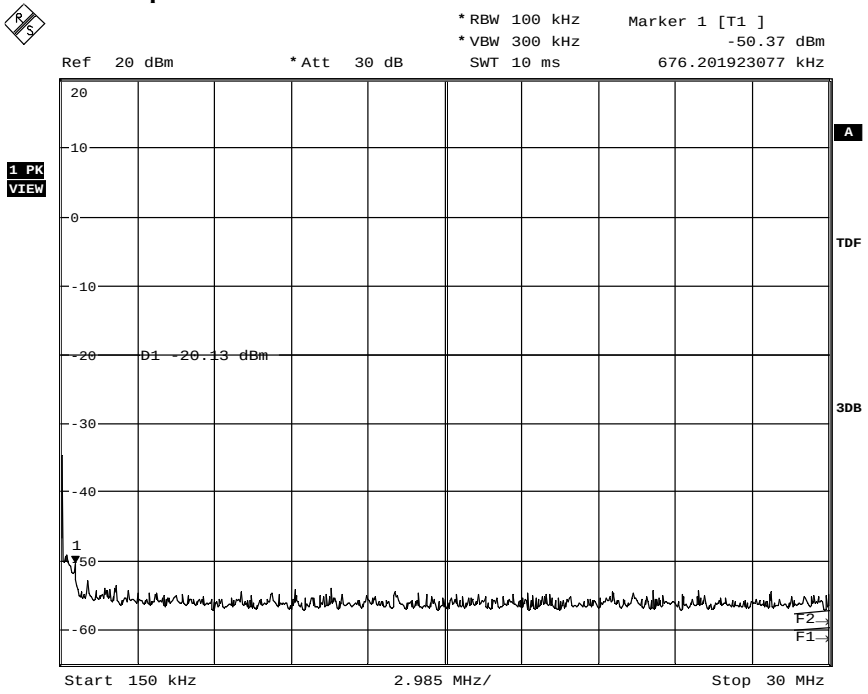
Date: 13.MAY.2015 14:40:36

1.6.3.6. Channel 39 Reference



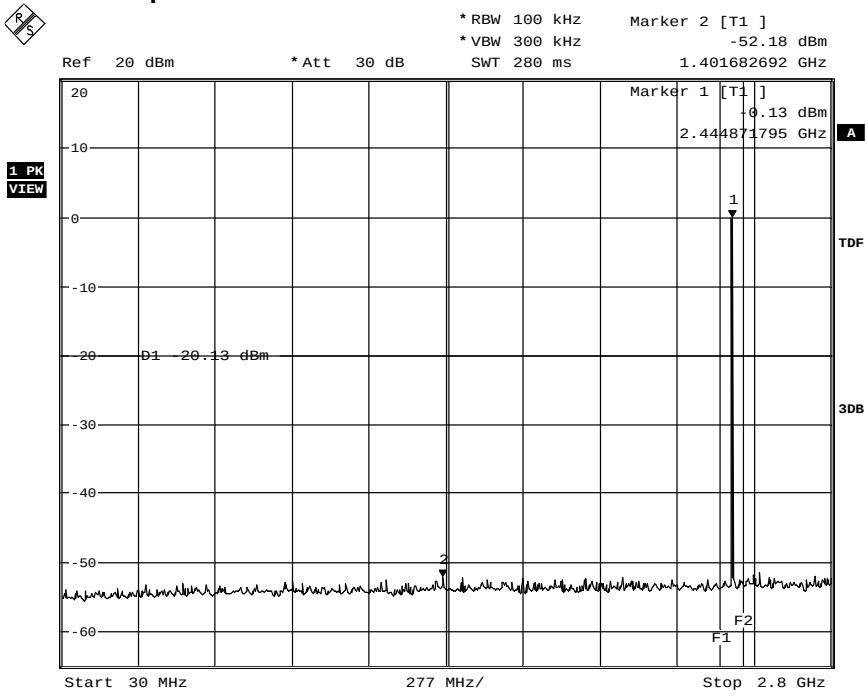
Date: 15.APR.2015 14:02:38

1.6.3.7. Sweep 1: 150kHz to 30MHz



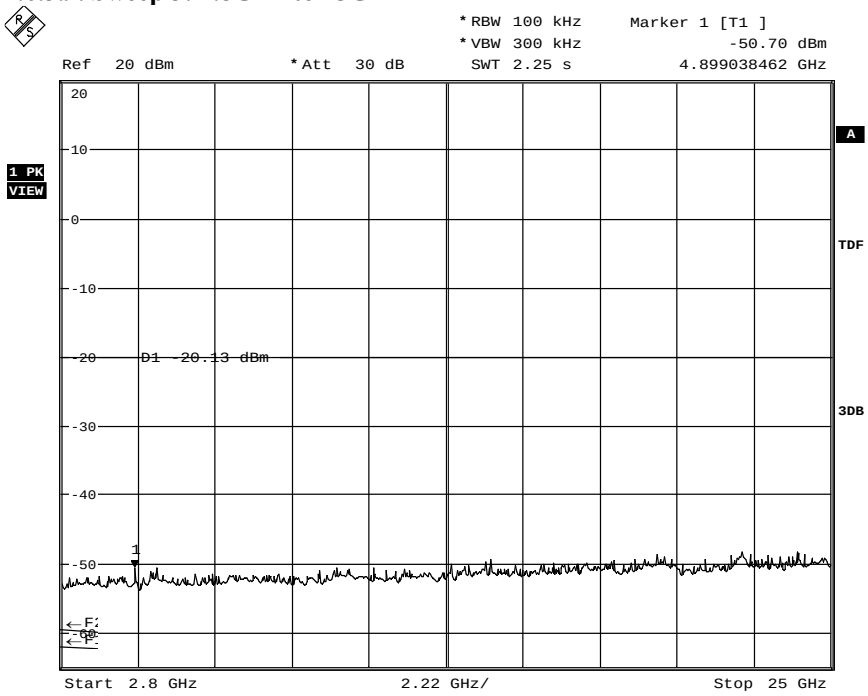
Date: 15.APR.2015 14:06:24

1.6.3.8. Sweep 2: 30MGHz to 2.8GHz



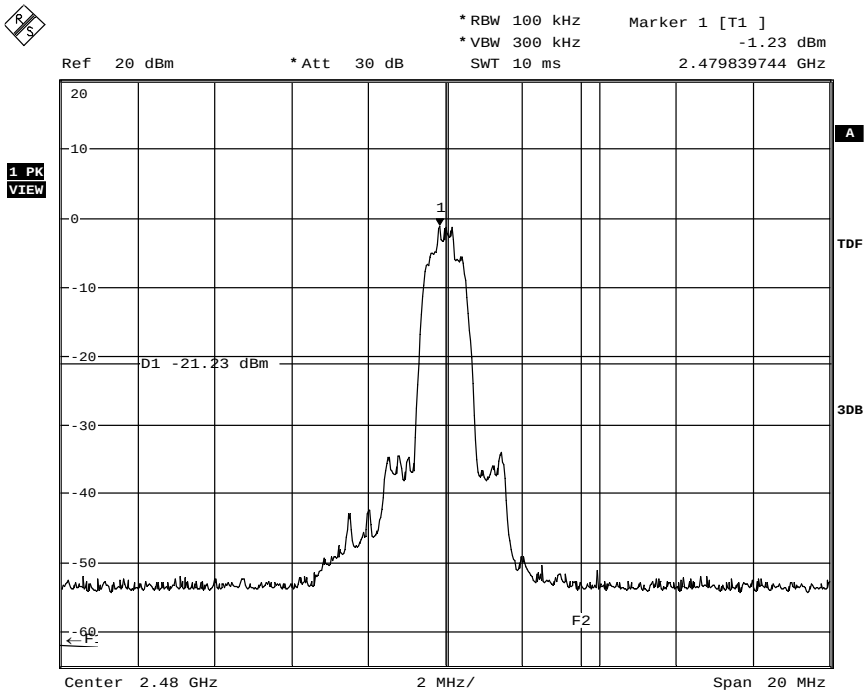
Date: 15.APR.2015 14:11:34

1.6.3.9. Sweep 3: 2.8GHz to 25GHz



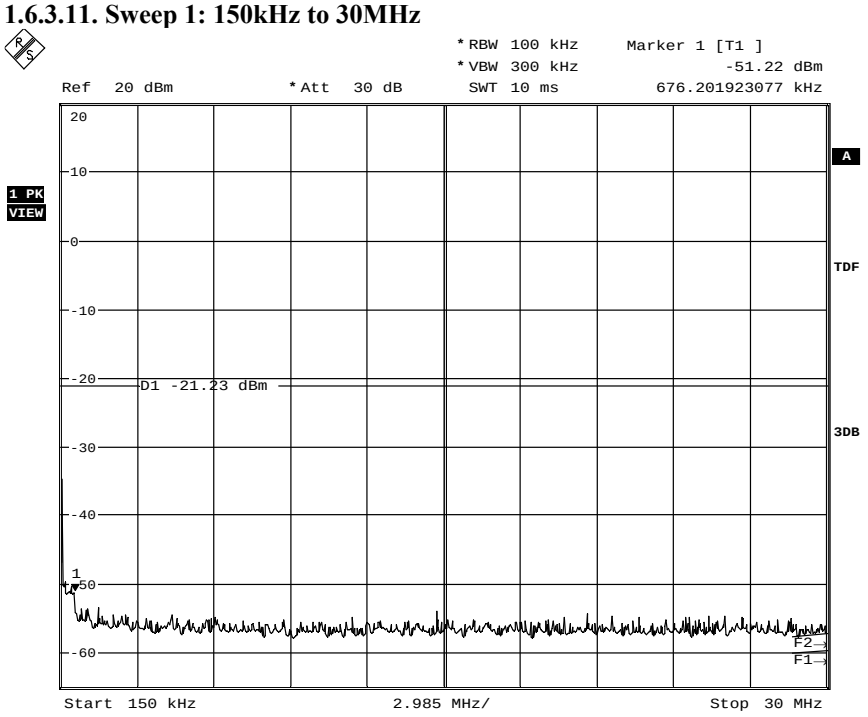
Date: 15.APR.2015 14:16:14

1.6.3.10. Channel 78 Reference



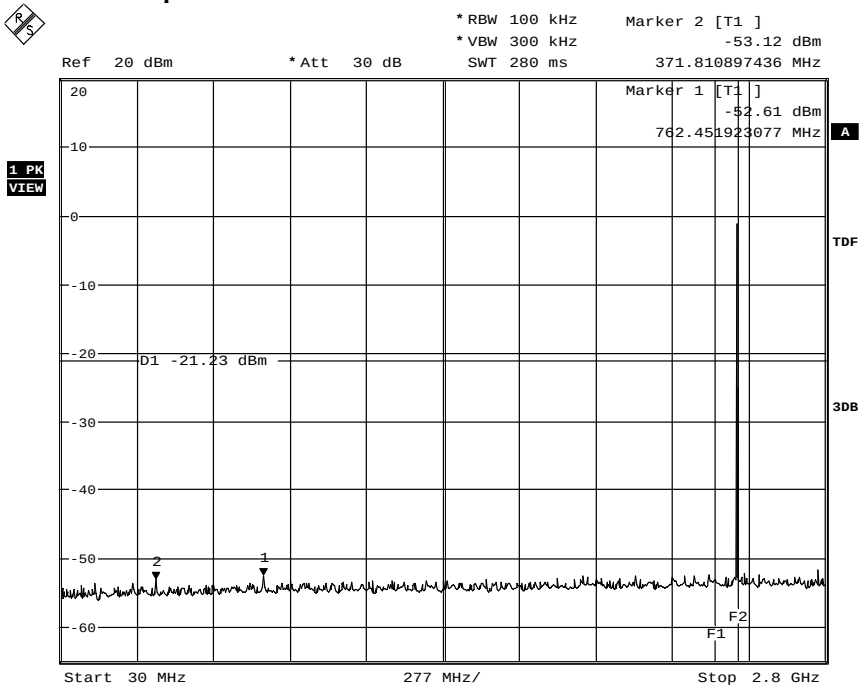
Date: 15.APR.2015 14:21:29

1.6.3.11. Sweep 1: 150kHz to 30MHz



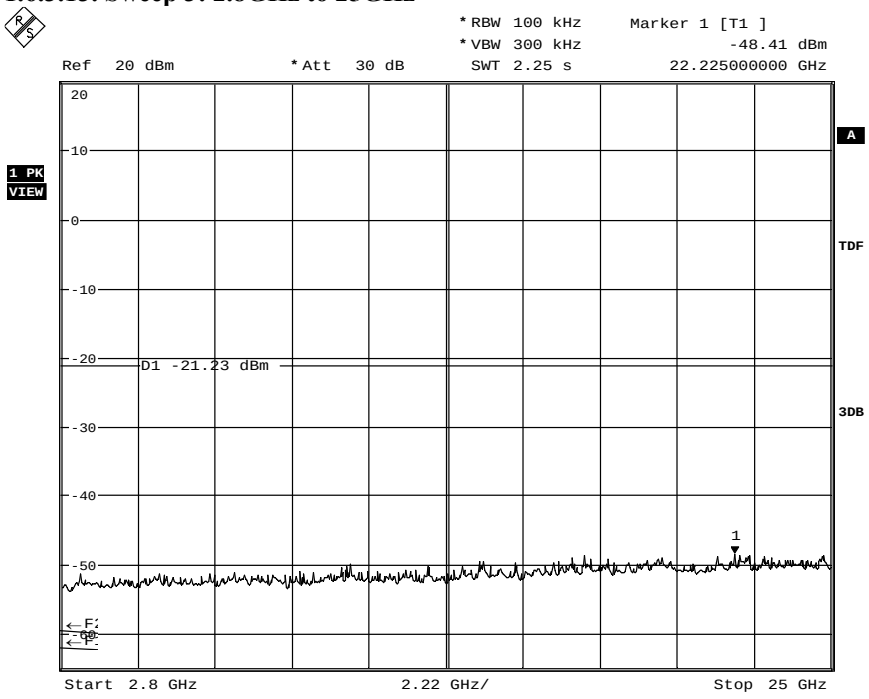
Date: 15.APR.2015 14:25:05

1.6.3.12. Sweep 2: 30MHz to 2.8GHz



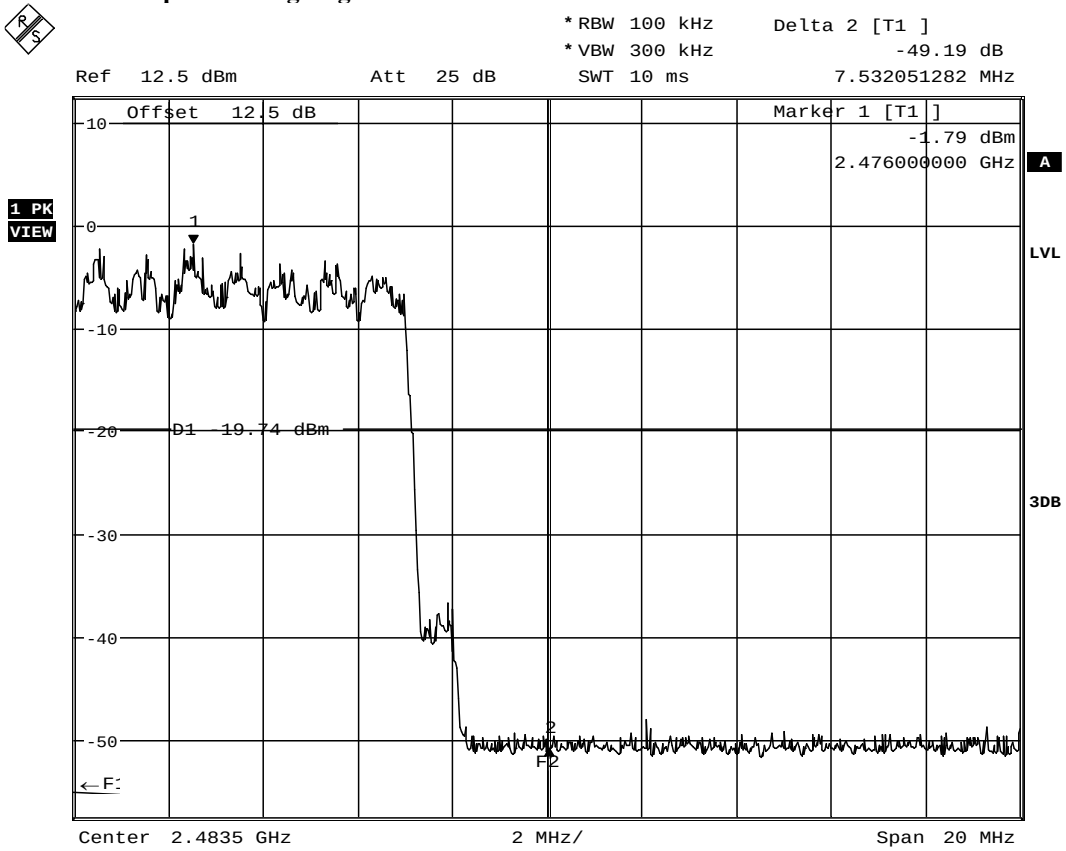
Date: 15.APR.2015 14:27:57

1.6.3.13. Sweep 3: 2.8GHz to 25GHz



Date: 15.APR.2015 14:32:20

1.6.3.14. Sweep Band-Edge right at 2483.5GHz



Date: 13.MAY.2015 14:50:46

2. Conducted EMI measurements on AC-mains port according 15.207, class B

Not applicable since powered from 12V car equipment

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

3.1. Magnetic field measurements f<30MHz

3.1.1. GFSK modulation

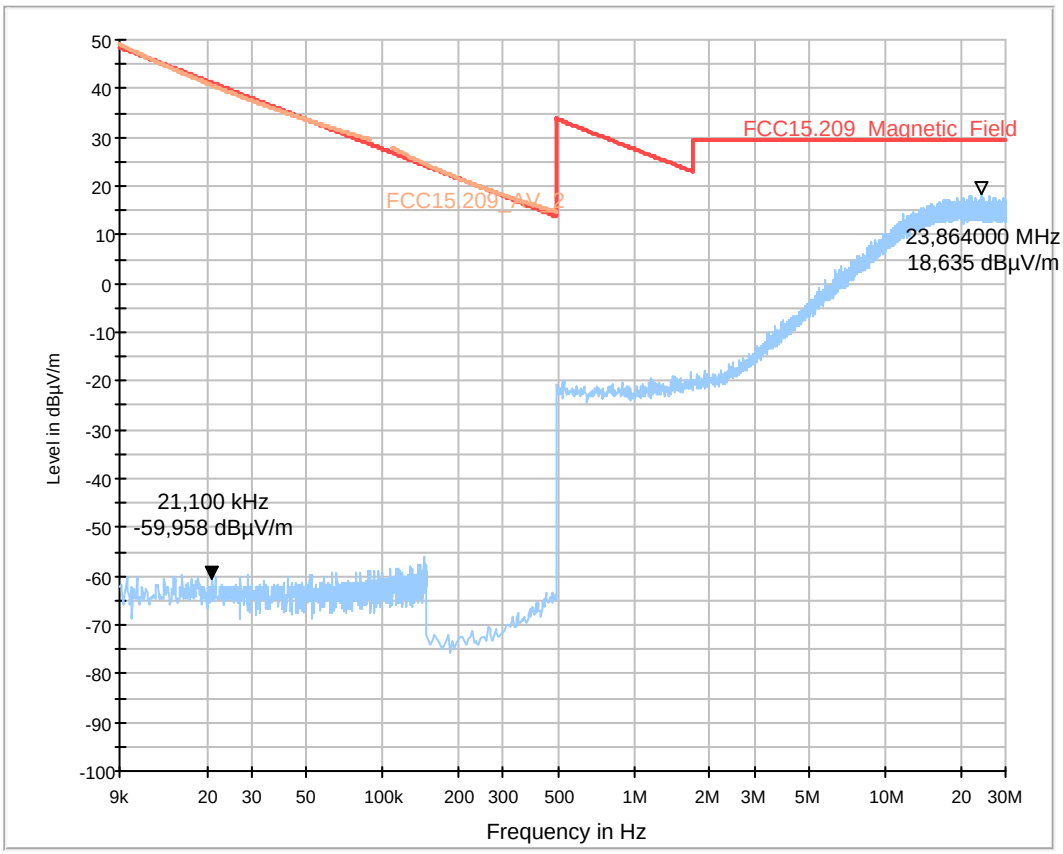
Diagram No. 2.04_TX_ch00_DH5

	Date: 23.04.2015 Page 1 of 1
Test description:	Magnetic Field Strength 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:	EMC32 V8.51.0
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 specification:	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:	
Comment 2:	

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

FCC15.209_magn hor+vert



3.1.2. π/4 DQPSK modulation

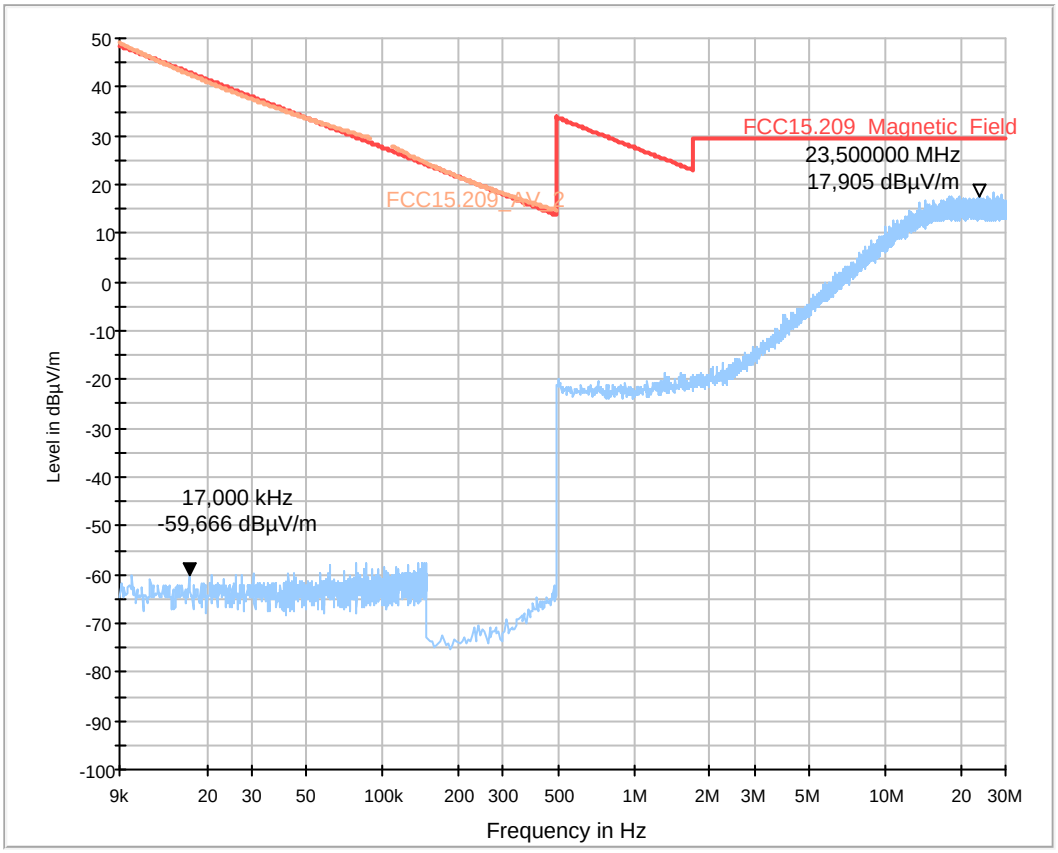
Diagram No. 2.05_TX_ch39_2DH5

	Date: 23.04.2015 Page 1 of 1
Test description:	Magnetic Field Strength 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:	EMC32 V8.51.0
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 specification:	FCC 15.205 § 15.209; RSS-Gen: Issue 4
Operator:	HLa
Operating conditions:	BT TX Ch:39 _2DH5
Power during tests:	13,5V DC
Comment 1:	
Comment 2:	

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

FCC15.209_magn hor+vert



3.1.3. 8DPSK modulation

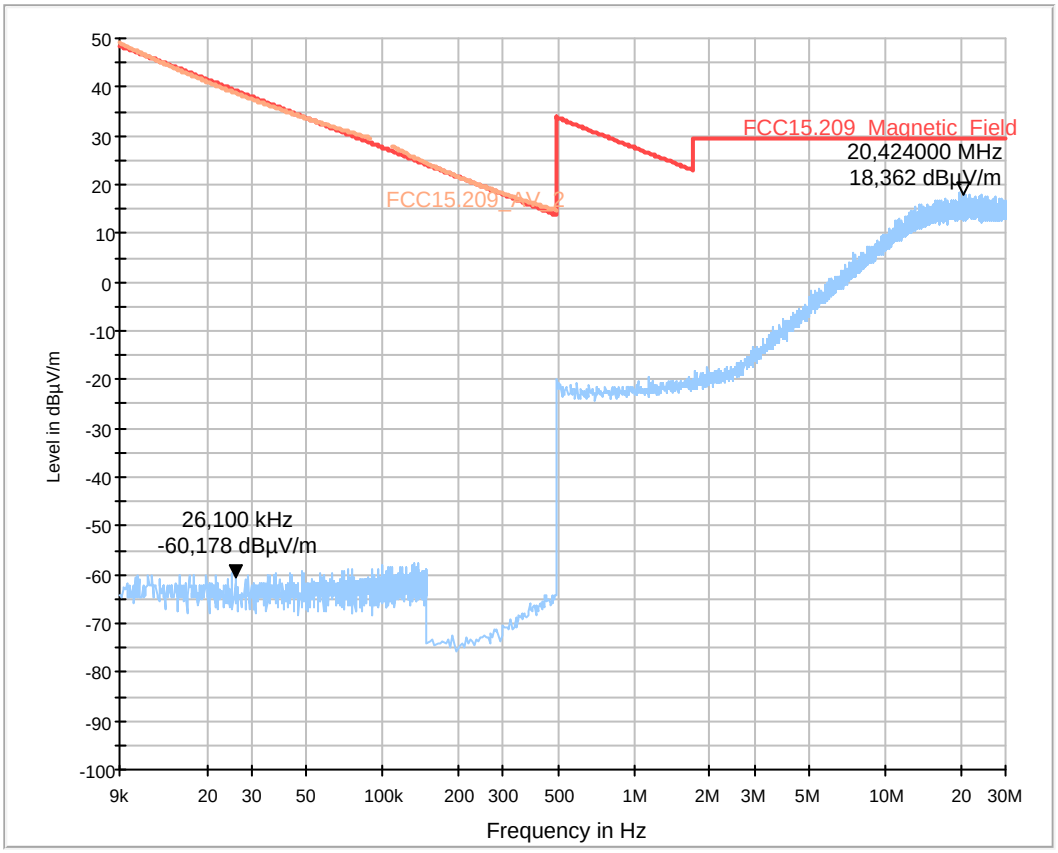
Diagram No. 2.06_TX_ch78_3DH5

	Date: 23.04.2015 Page 1 of 1
Test description:	Magnetic Field Strength 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:	EMC32 V8.51.0
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 specification:	FCC 15.205 § 15.209; RSS-Gen: Issue 4
Operator:	HLa
Operating conditions:	BT TX Ch:78 _3DH5
Power during tests:	13,5V DC
Comment 1:	
Comment 2:	

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

FCC15.209_magn hor+vert



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

3.2.1. GFSK modulation

Diagram No. 3.04_TX_ch0_DH5

22.04.2015 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 15.109 Class B; RSS-Gen. Issue 4
Operator:	HLa
Operating conditions:	BT TX Ch:00 _DH5
Power during tests:	13,5V DC
Comment 1:	

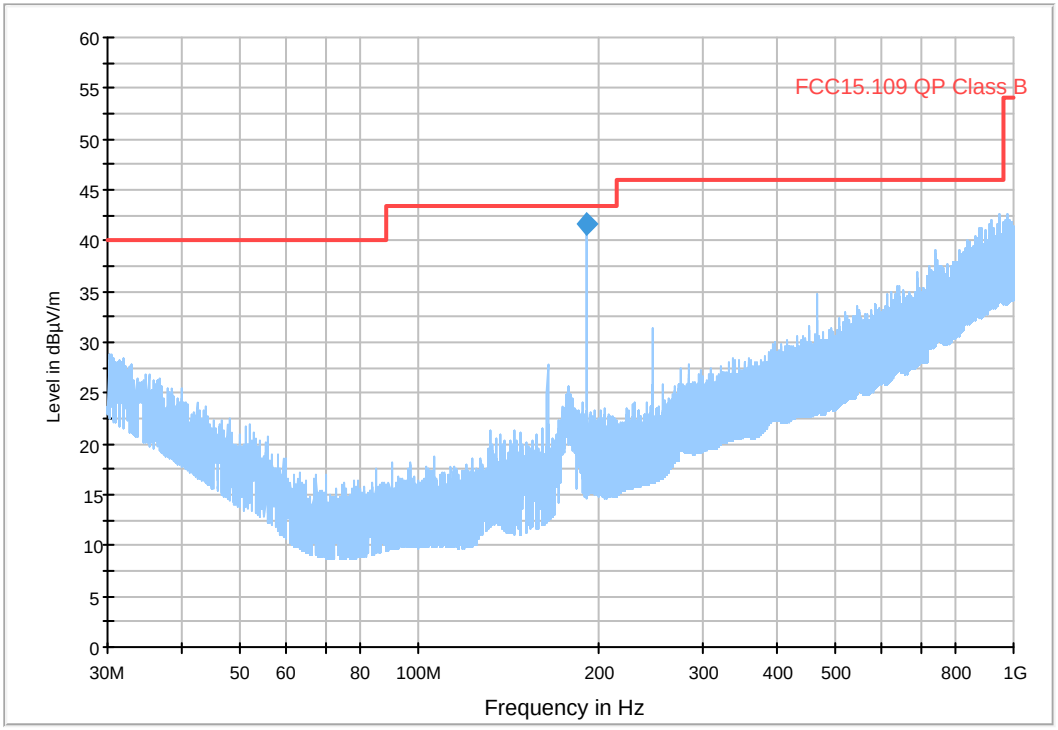
EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
192.190000	41.6	1000.0	120.000	181.0	H	288.0	12.2	1.9	43.5

FCC15.109_hor+vert



3.2.2. π/4 DQPSK modulation

Diagram No. 3.05_TX_ch39_2-DH5

	22.04.2015 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 15.109 Class B; RSS-Gen. Issue 4
Operator:	HLa
Operating conditions:	BT TX Ch:38 _2-DH5
Power during tests:	13,5V DC
Comment 1:	

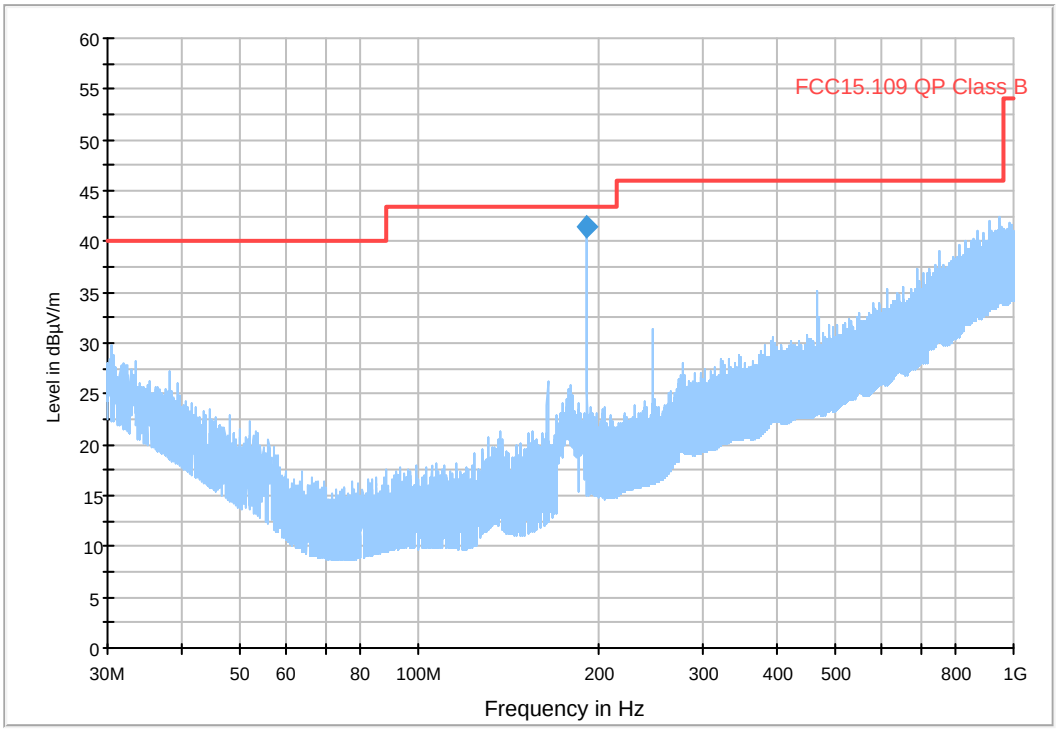
EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
192.190000	41.4	1000.0	120.000	168.0	H	279.0	12.2	2.1	43.5

FCC15.109_hor+vert



3.2.3. 8DPSK modulation

Diagram No. 3.06_TX_ch78_3-DH5

22.04.2015 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 15.109 Class B; RSS-Gen. Issue 4
Operator:	HLa
Operating conditions:	BT TX Ch:78 _3DH5
Power during tests:	13,5V DC
Comment 1:	

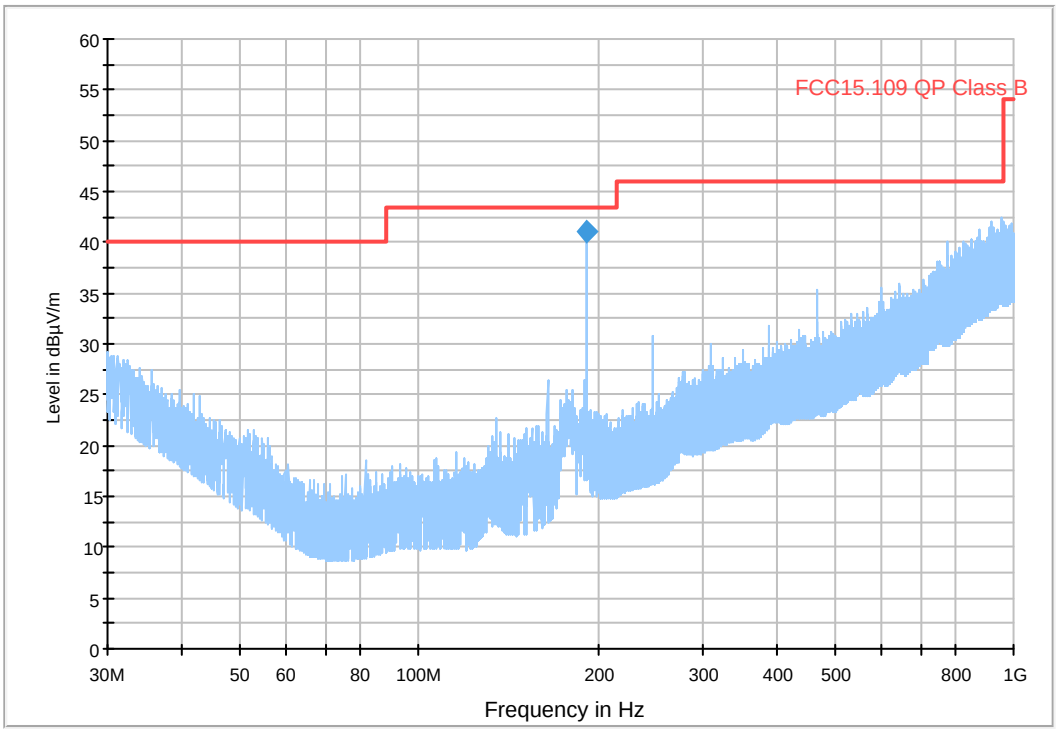
EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m	Meas. Time	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
192.180000	41.0	1000.0	120.000	172.0	H	287.0	12.2	2.5	43.5

FCC15.109_hor+vert



3.3. Field strength measurements f < 18GHz

3.3.1. GFSK modulation

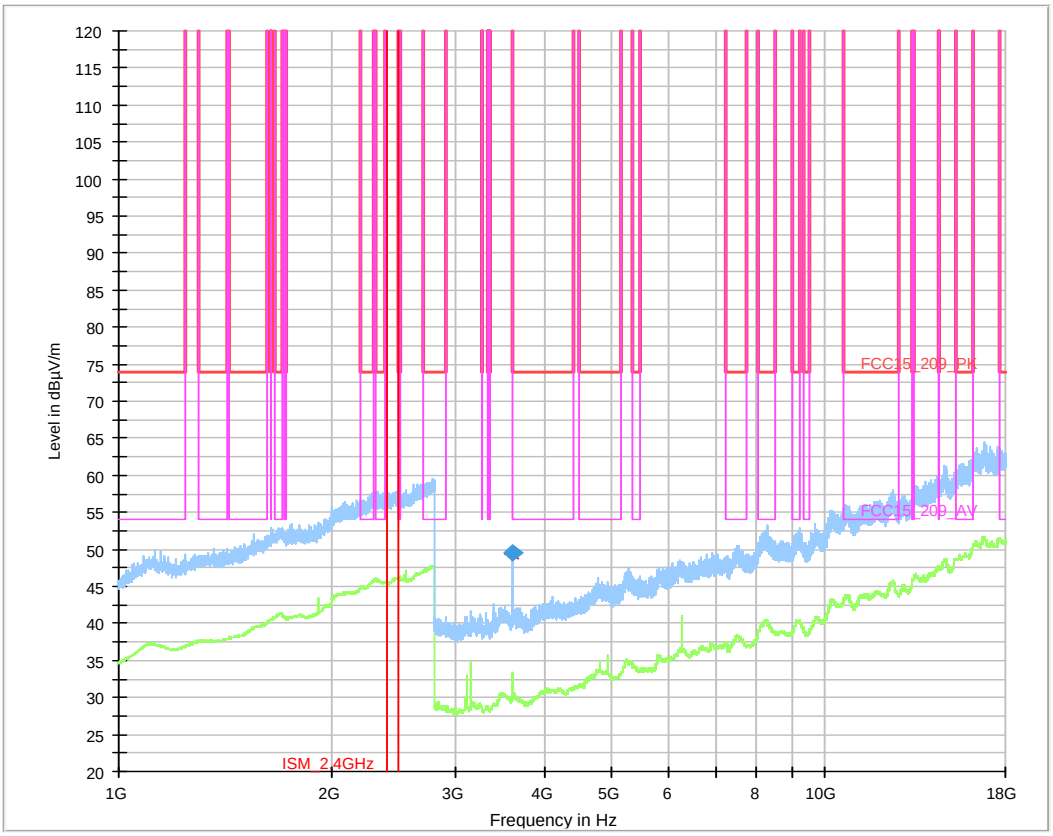
Diagram No.: 4.04_Tx_ch0_DH5

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:	MZs
Comment:	Channel no. low, DH5

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	



Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)
3612.300000	49.49	---	74.00	24.51	100.0	1000.000	155.0	V	-6.0	0.0

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Corr.	Comment
3612.300000	0.5	09:38:46 - 21.04.2015

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	RMS (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)
3612.300000	49.49	---	74.00	24.51	100.0	1000.000	155.0	V	-6.0	0.0

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Corr.	Comment
3612.300000	0.5	09:38:46 - 21.04.2015

3.3.2. π/4 DQPSK modulation

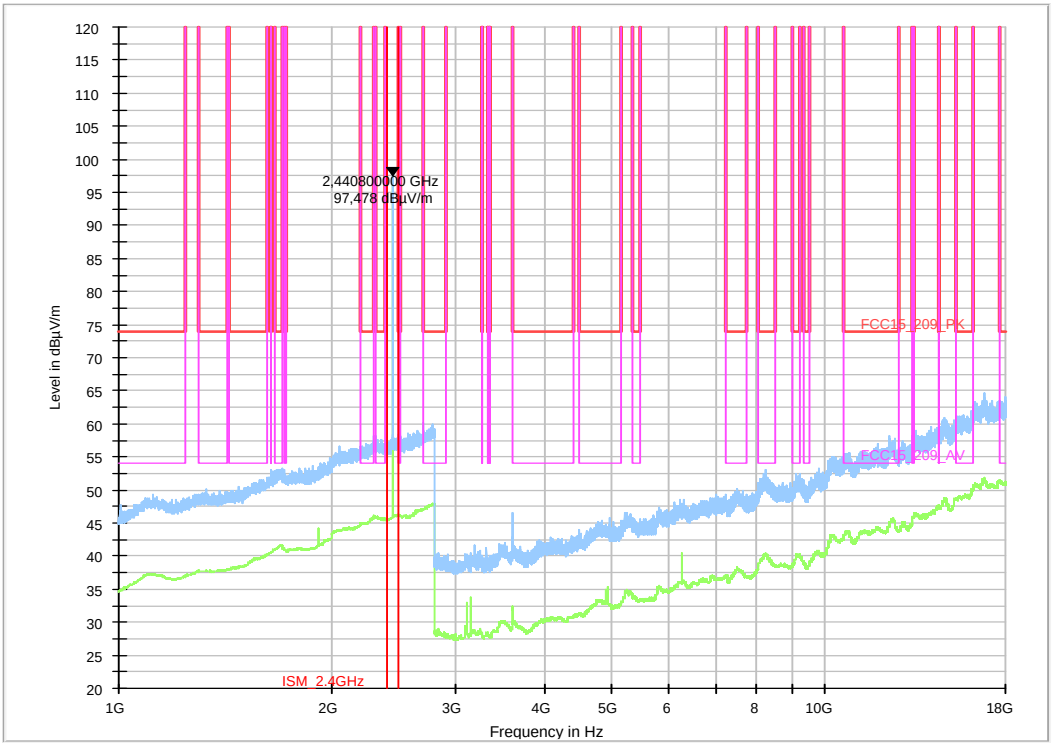
Diagram No.: 4.05_TX_ch39_2-DH5

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:	TX, continuous
Operator Name:	MZs
Comment:	Channel no. middle,2- DH5

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	



3.3.3. 8DPSK modulation

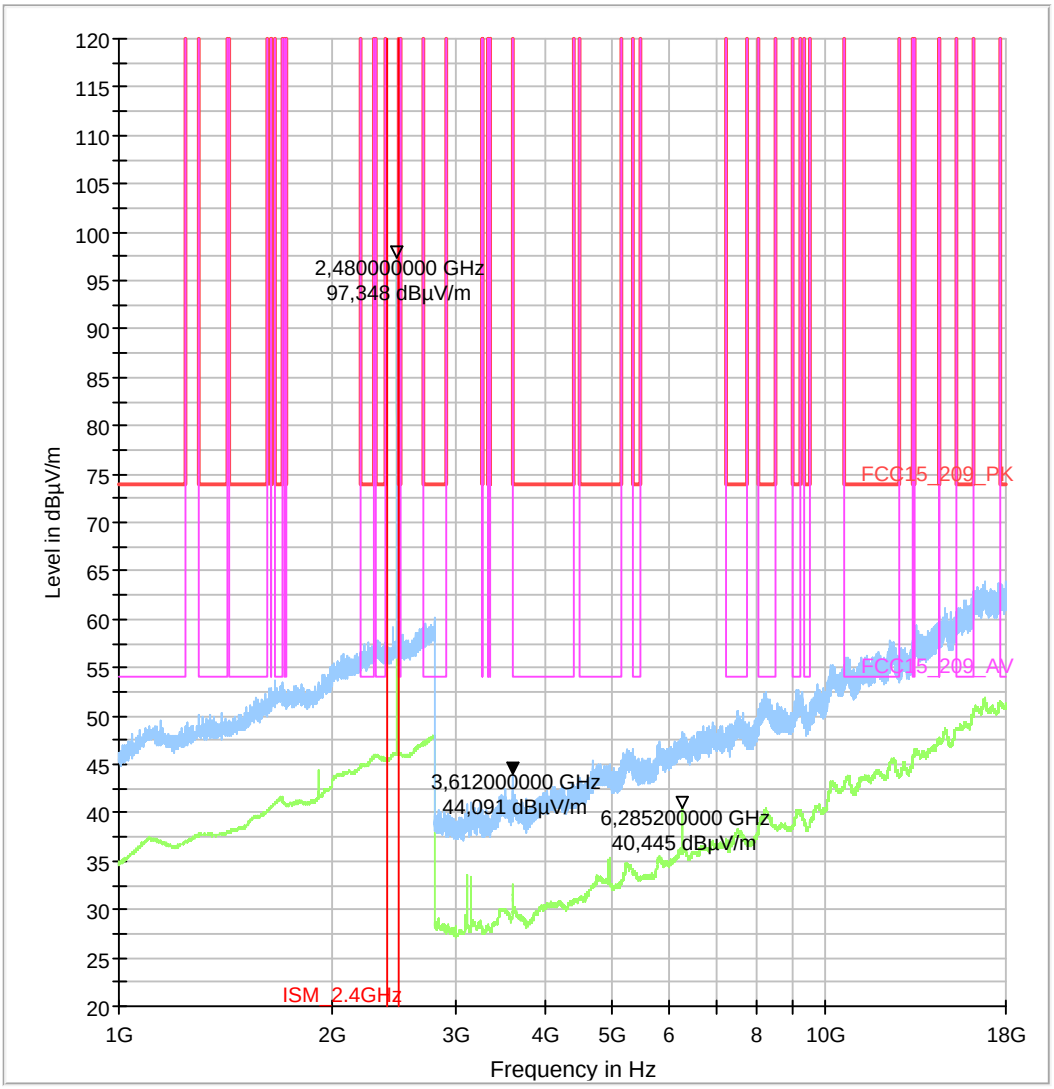
Diagram No.: 4.06_TX_ch78_3-DH5

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:	MZs
Comment:	Channel no. high, 3-DH5

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	



3.4. Field strength measurements 18GHz < f < 25GHz

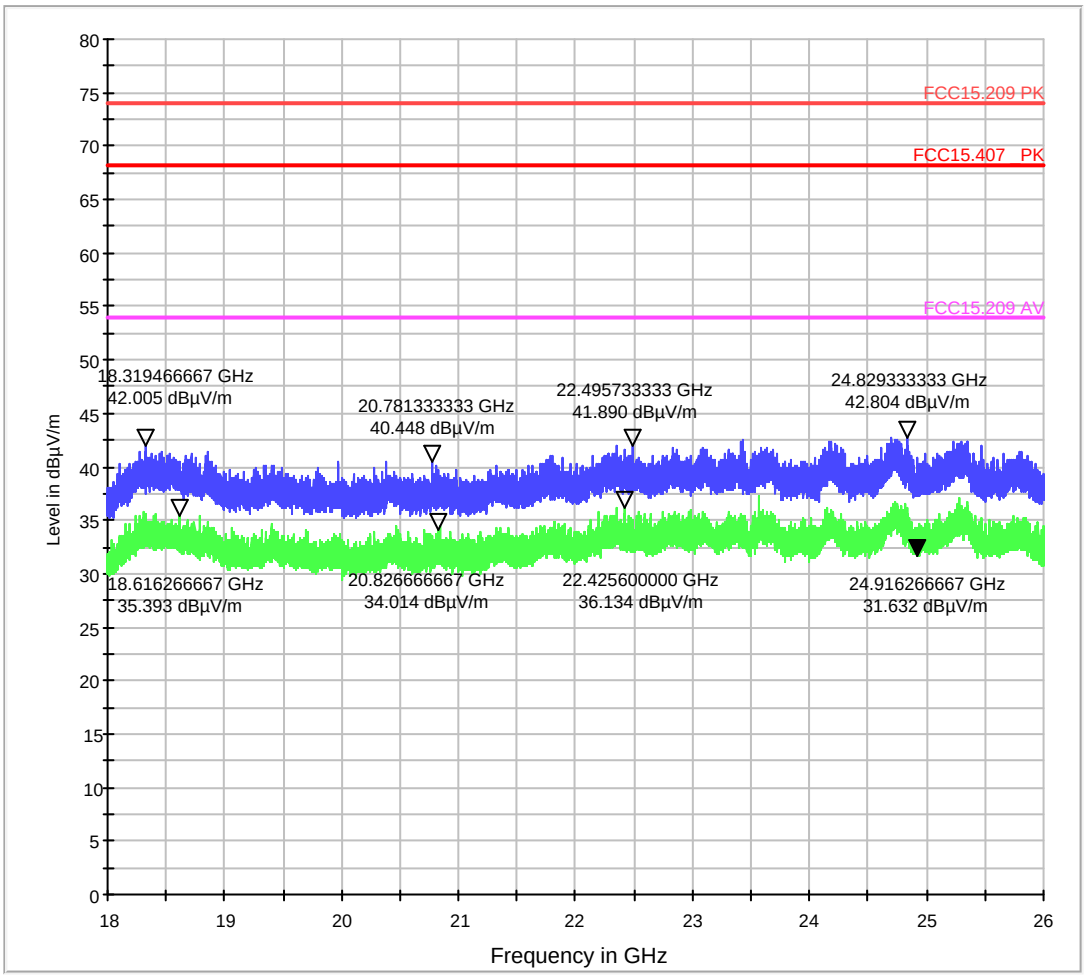
3.4.1. GFSK modulation

Diagram No.: 4.07_TX_ch0_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:	MFr
Comment:	Channel 00. DH5

FCC_Sweep_15.407_18_40GHz_Pre



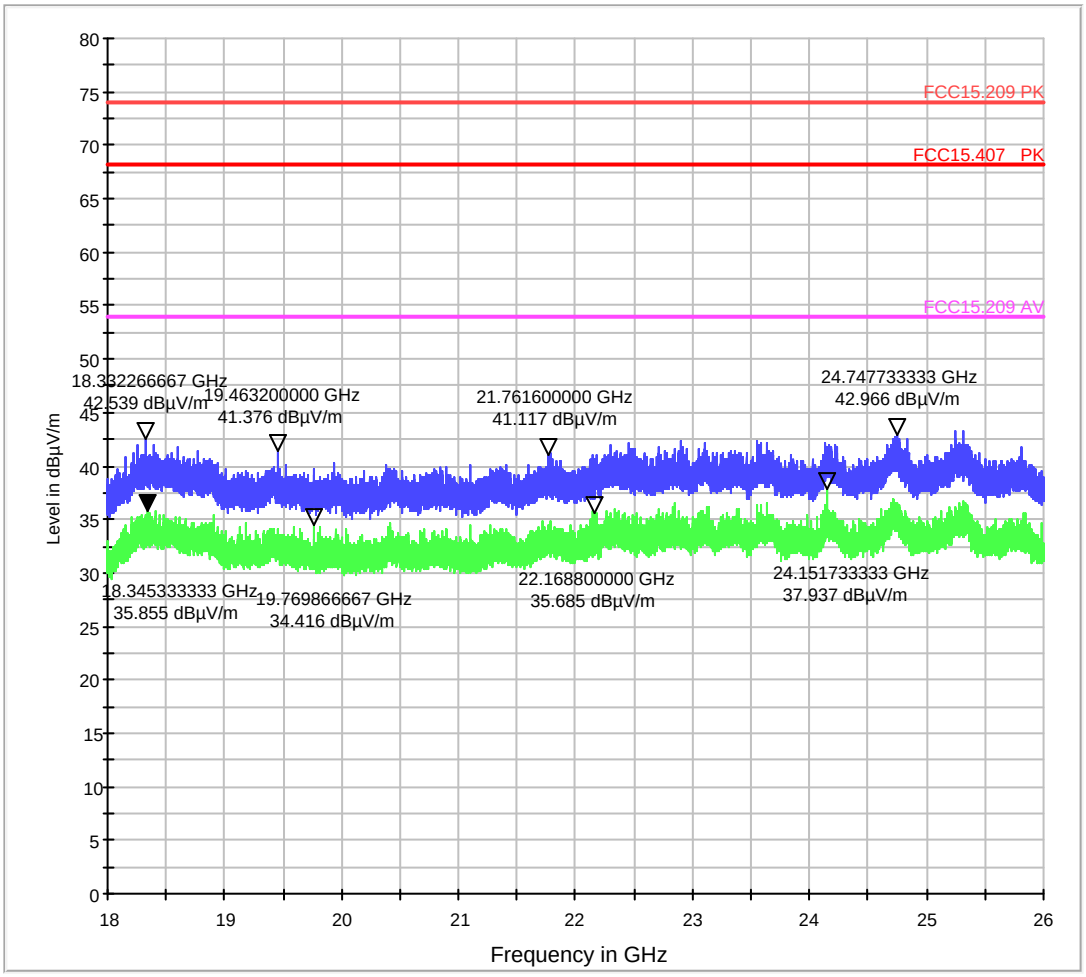
3.4.2. π/4 DQPSK modulation

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:	MFr
Comment:	Channel 39 . 2DH5

FCC_Sweep_15.407_18_40GHz_Pre



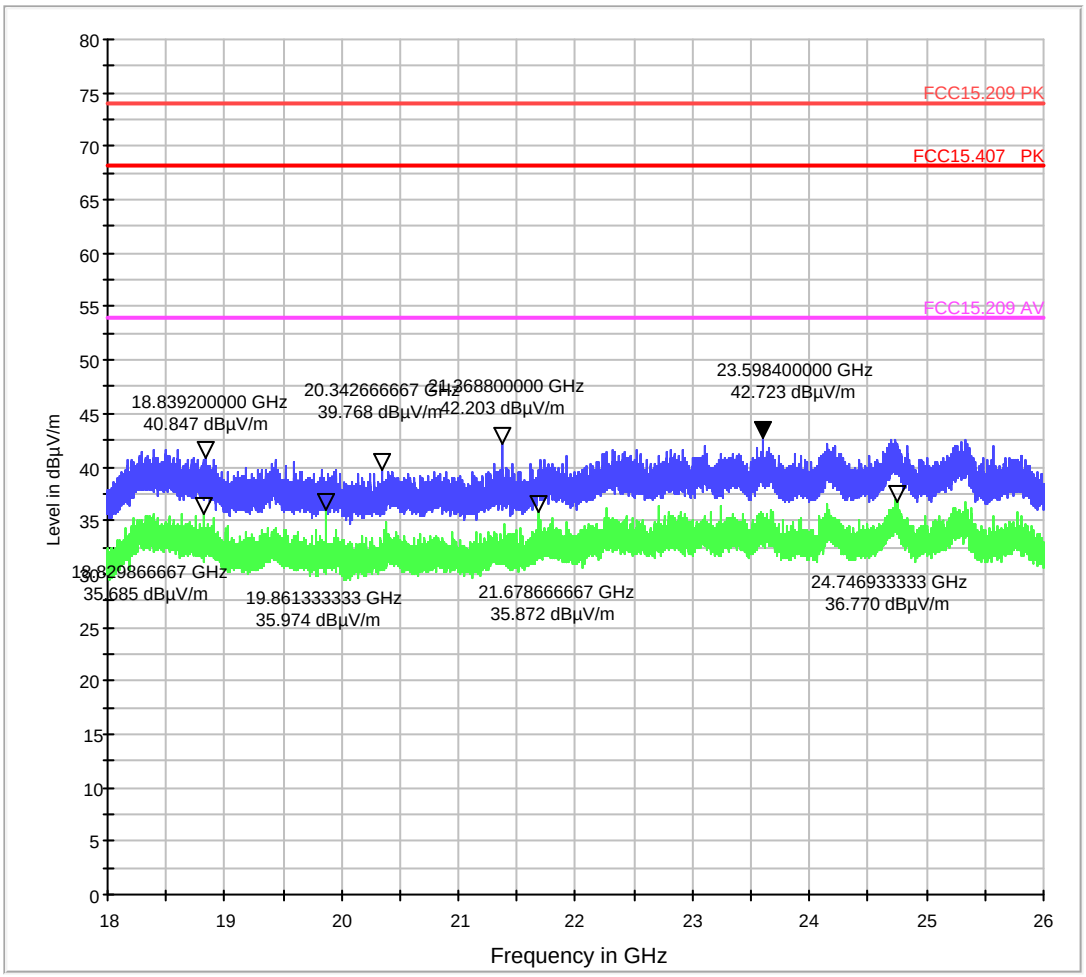
3.4.3. 8DPSK modulation

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:	TX mode continuous
Operator Name:	MFr
Comment:	Channel 78 . 3DH5

FCC_Sweep_15.407_18_40GHz_Pre



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

4.1. 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
Antenna polarisation:	horizontal/vertical
Operation mode:	TX, continuous
Operator Name:	MFr
Comment:	Channel no. low DH5

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	

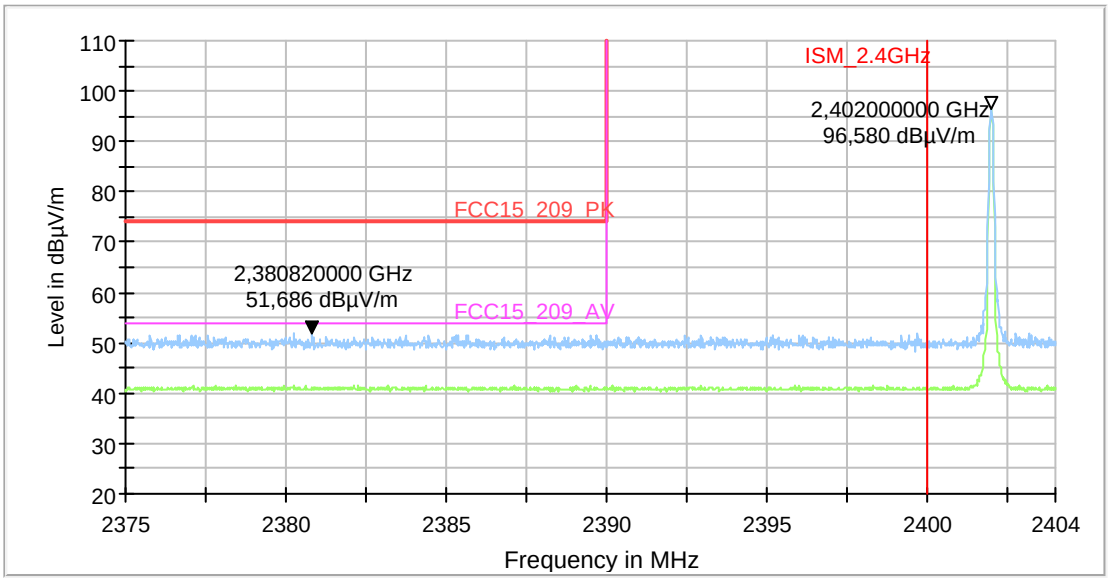


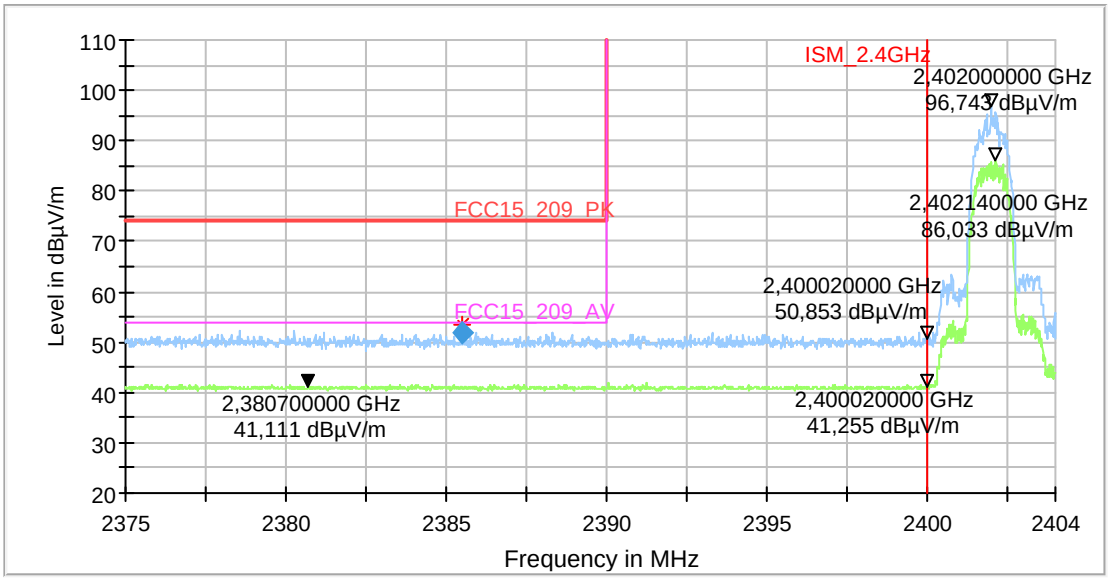
Diagram No.: 9.03_BE_low_Ch00_3-DH5

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
Antenna polarisation:	horizontal/vertical
Operation mode:	TX, continuous
Operator Name:	MFr
Comment:	Channel no00 low 3-DH5

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
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)	Height (cm)	Pol	Azimuth (deg)	Elevation (deg)
2385.520000	51.83	---	74.00	22.17	100.0	100.000	155.0	H	211.0	90.0

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Corr.	Comment
2385.520000	35.5	10:26:20 - 14.04.2015

4.2. Channel 78 (right band edge)

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:	TX, continuous
Operator Name:	Lor
Comment:	Channel78 high DH5

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	

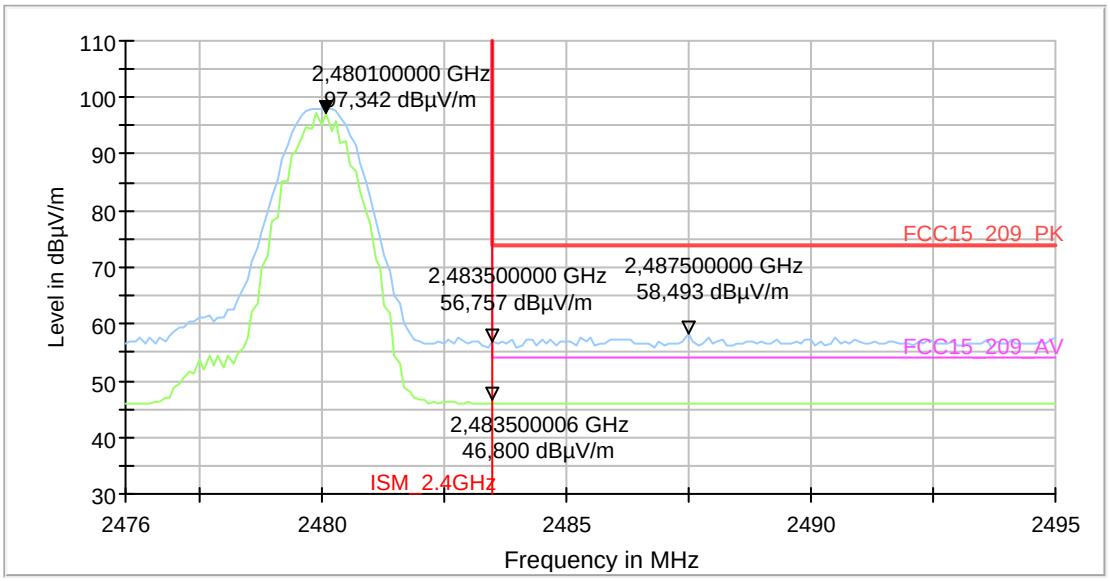


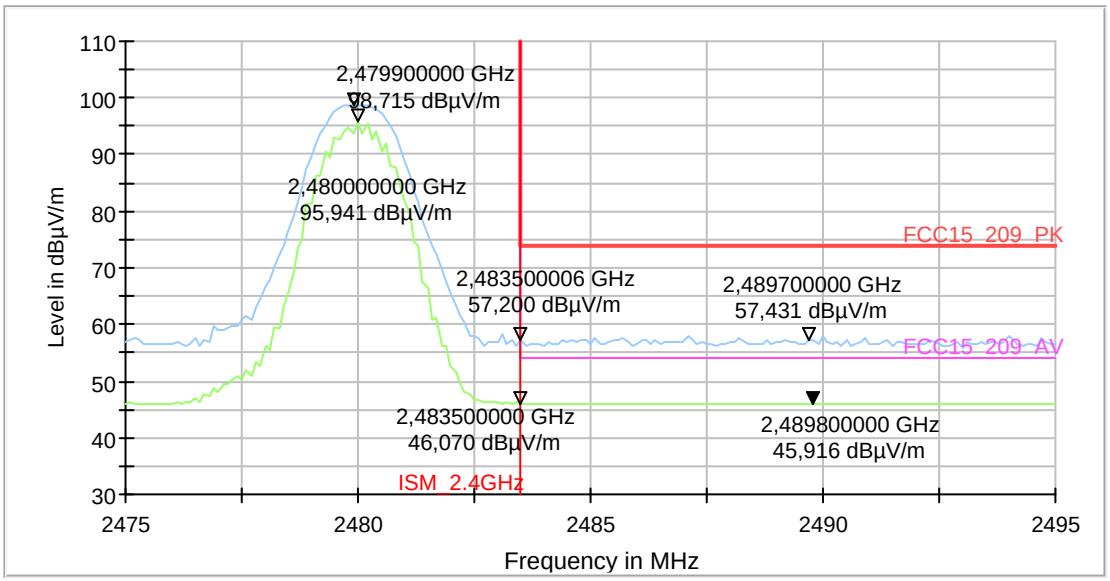
Diagram No.: 9.02_BE_high_Ch78_3DH5

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:	TX, continuous
Operator Name:	MFr
Comment:	Channel78 low 3DH5

EUT Information

Manufacturer:	Bosch
EuT:	LCN2K70B10
---	---
HW Version:	051
SW Version:	F014
Serial Number:	3130494
Connected Interfaces:	-
Power Supply:	via external power supply, nomVolt: 13.50 VDC
Comments:	



5. 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 a maximum of 5 slots)

Operation Mode	Frequency on channel (MHz)	Declared maximum conducted output power (dBm)	Antenna Gain Max. (dBi)	Max. positive tolerance according manfacturer (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	4,20	0,00	6,03	60%	0,004	2,4
	2441,0	1,33	4,20		5,53		0,004	2,1
	2480,0	0,24	4,20		4,44		0,003	1,7

Maximum calculated MPE value:		
MPE-Limit:	1	[mW/cm^2]
Highest MPE value:	0,0005	[mW/cm^2]
Margin to limit	0,9995	[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