

Annex 1: Measurement diagrams 20-1-0127501T01a-A1

Number of pages:	71	Date of Report:	2022-May-31
Testing company:	CETECOM GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150	Applicant:	ElektronikSystem i Umeå AB
Product:	LoRa device		
Model:	EMS		
Type:	-		
FCC ID:	2ANX3-EMS01	IC:	26904-EMS01
Testing has been carried out in accordance with:	Title 47 CFR, Chapter I FCC Regulations, Subchapter A Subpart C: §15.247 (DTS) RSS-247, Issue2 — Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and License-Exempt Local Area Network (LE-LAN) Devices Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".		

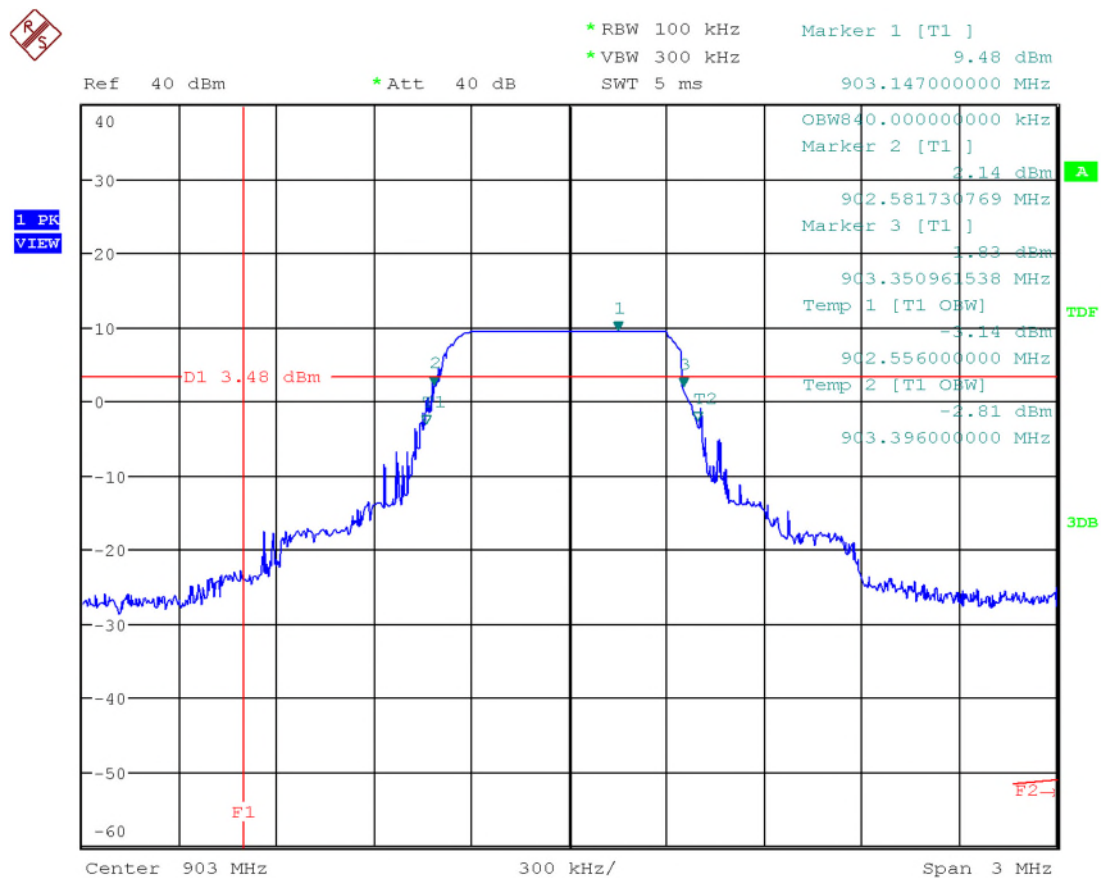
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1 Measurement diagrams

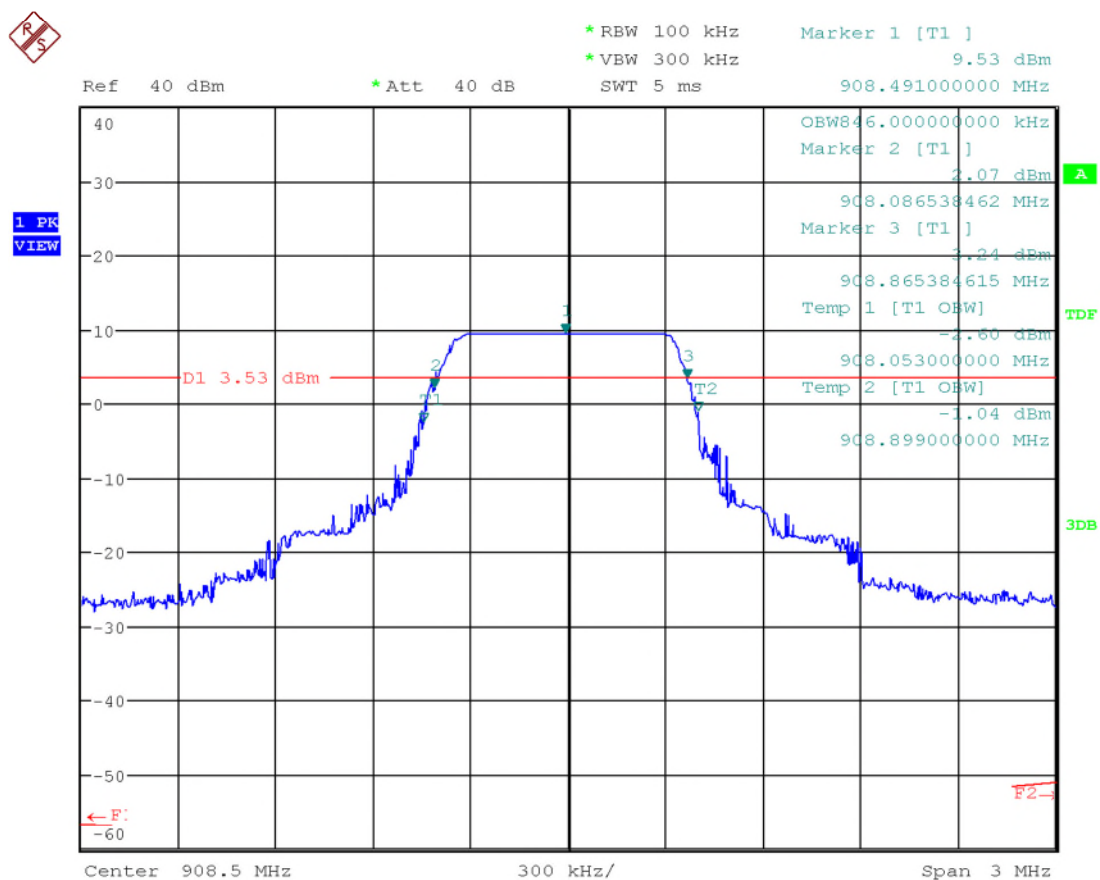
1.1 DTS mode

1.1.1 99% Occupied bandwidth + 6 dB bandwidth, §15.247(a)(2) and §2.1049(h)



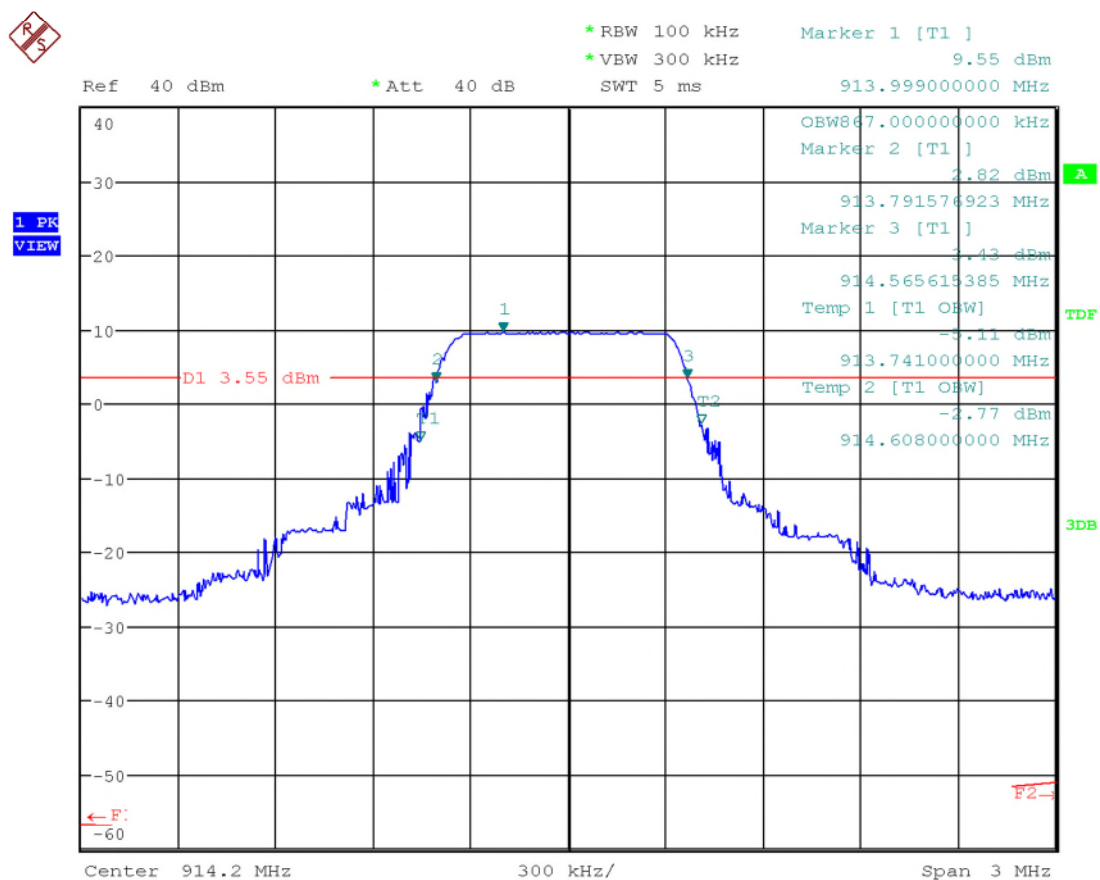
Date: 2.SEP.2021 12:34:20

Figure 1: D01_01_DTSBW+99%OBW_ChLow_DTS



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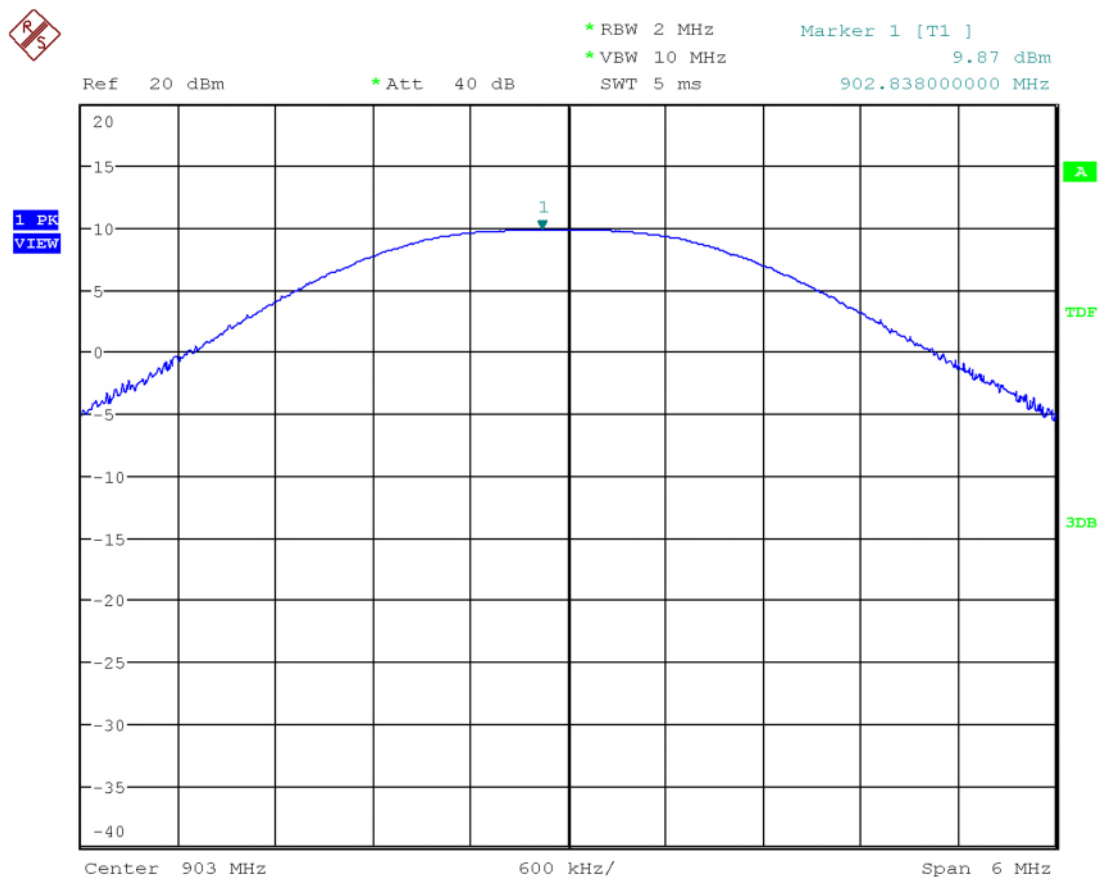
Figure 2: D01_02_DTShBW+99%OBW_ChMid_DTS



Date: 2.SEP.2021 12:22:12

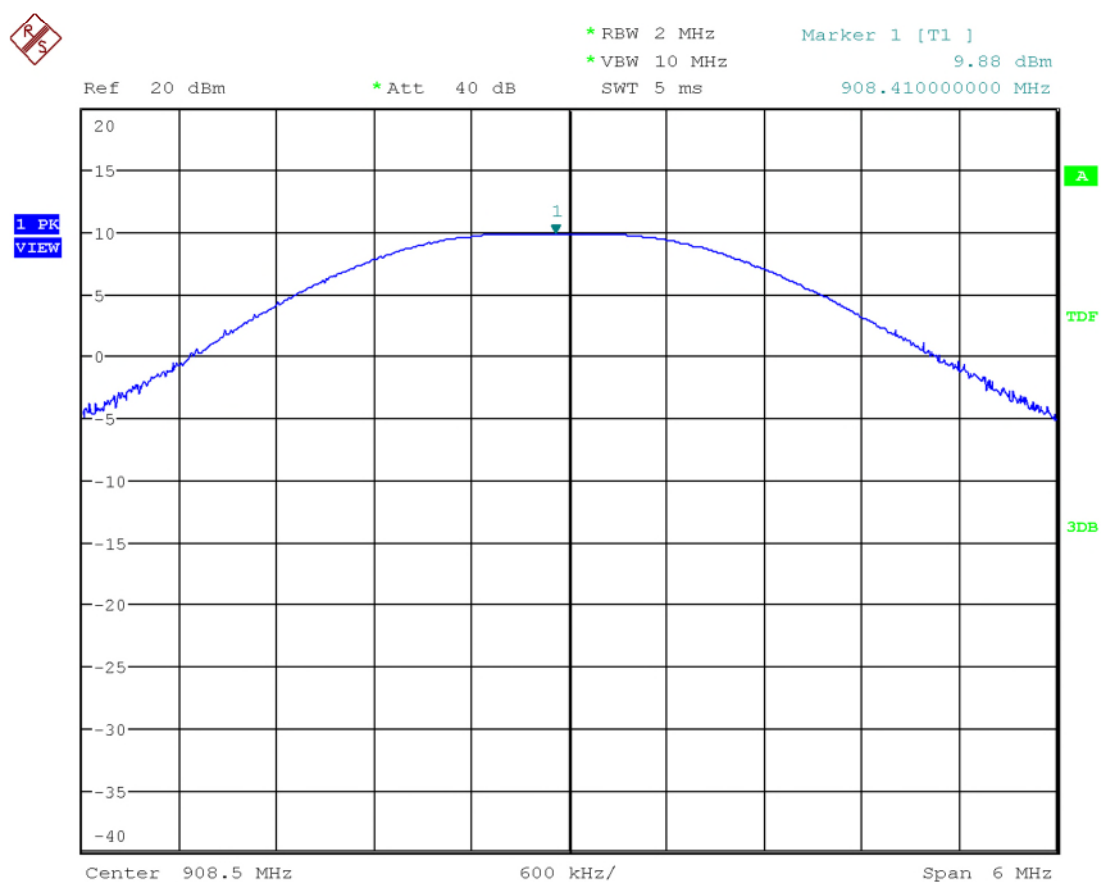
Figure 3: D01_03_DTSBW+99%OBW_ChHigh_DTS

1.1.2 Maximum output power conducted, §15.247(b)(3)



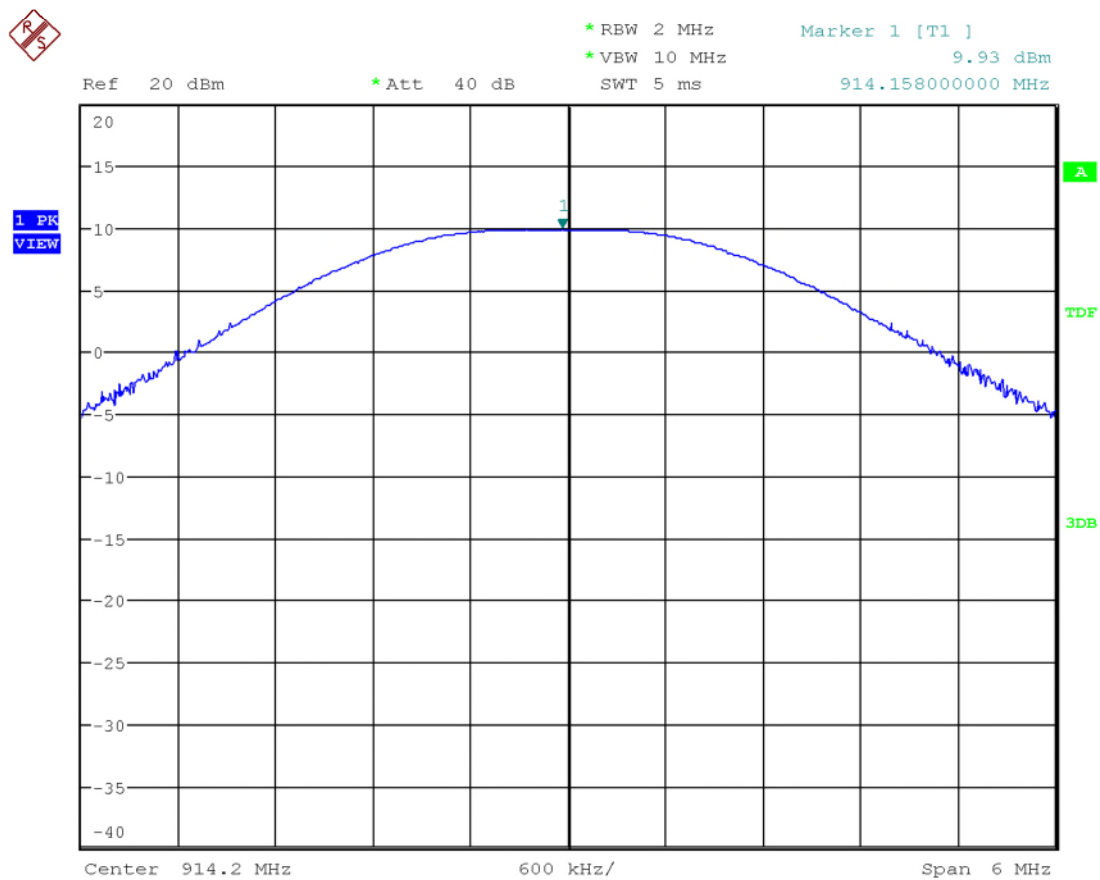
Date: 1.SEP.2021 12:09:50

Figure 4: D02_01_PKPWR_ChLow_DTS



Date: 1.SEP.2021 12:01:17

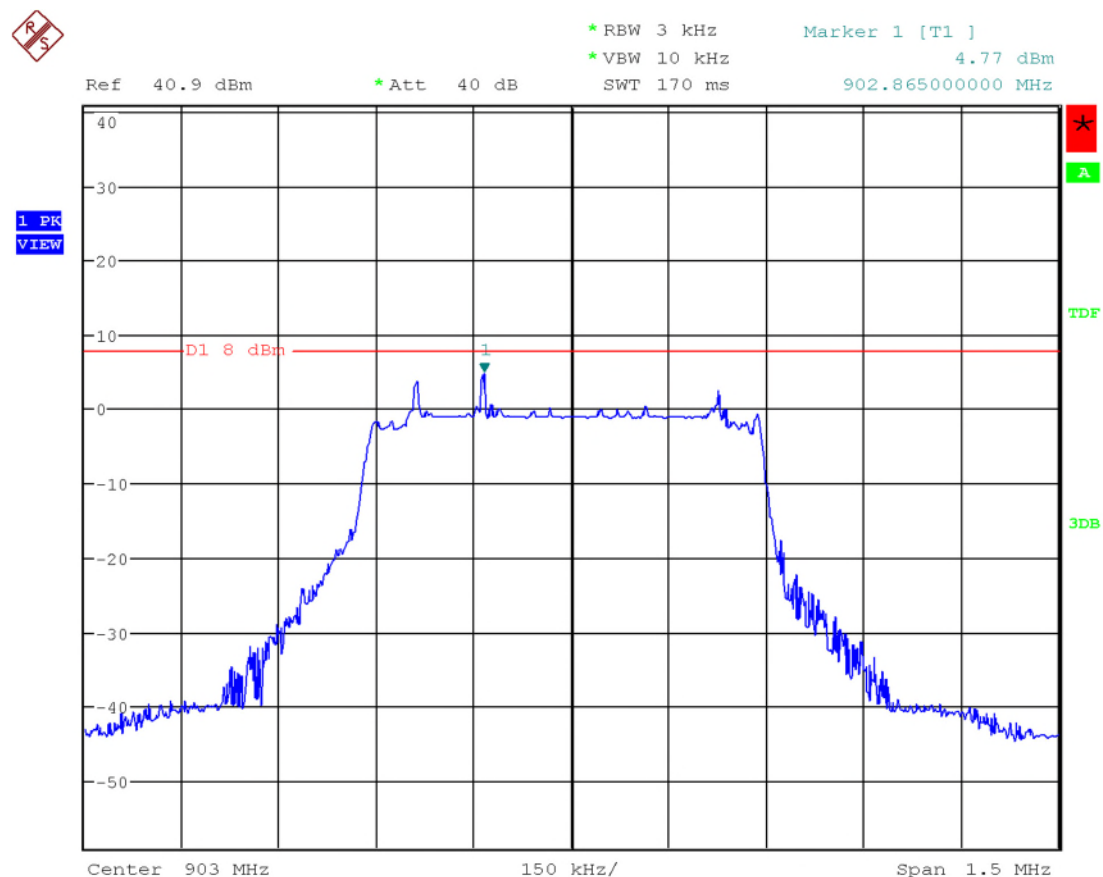
Figure 5: D02_02_PKPWR_ChMid_DTS



Date: 1.SEP.2021 12:04:21

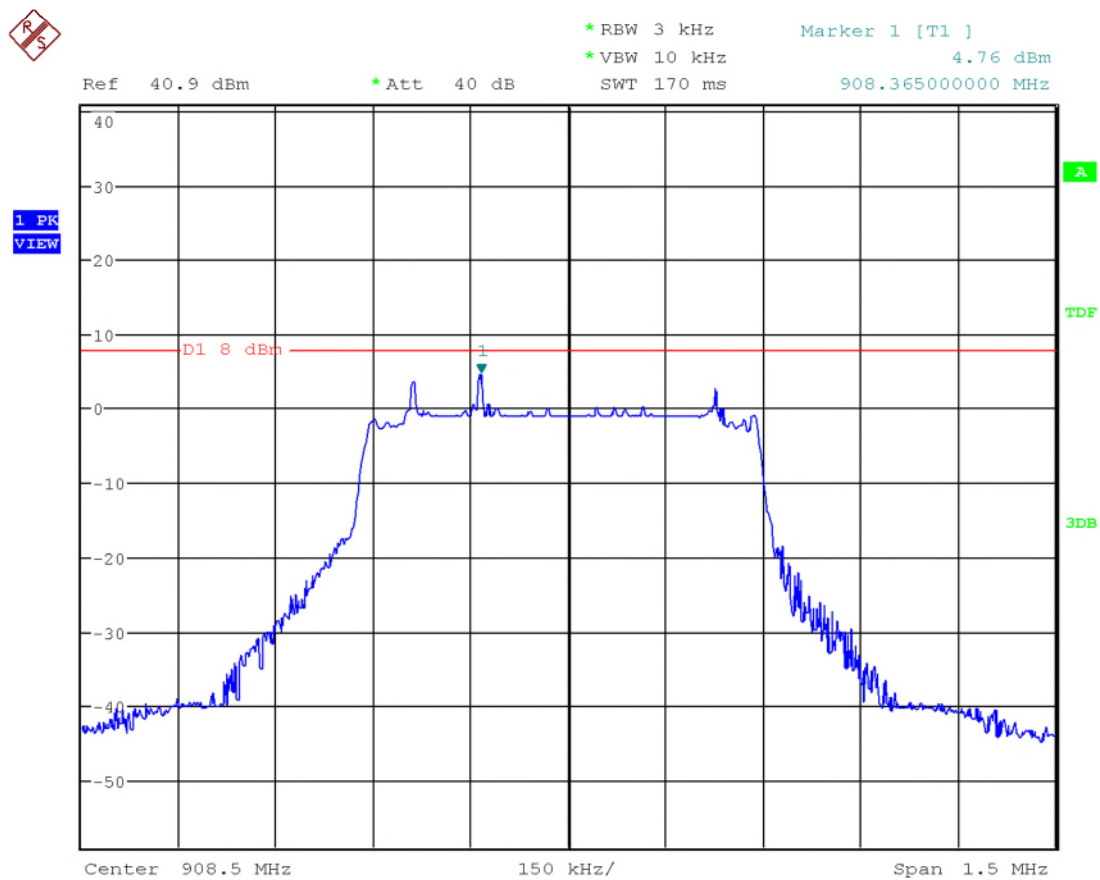
Figure 6: D02_03_PKPWR_ChHigh_DTS

1.1.3 Power spectral density conducted, §15.247(e)



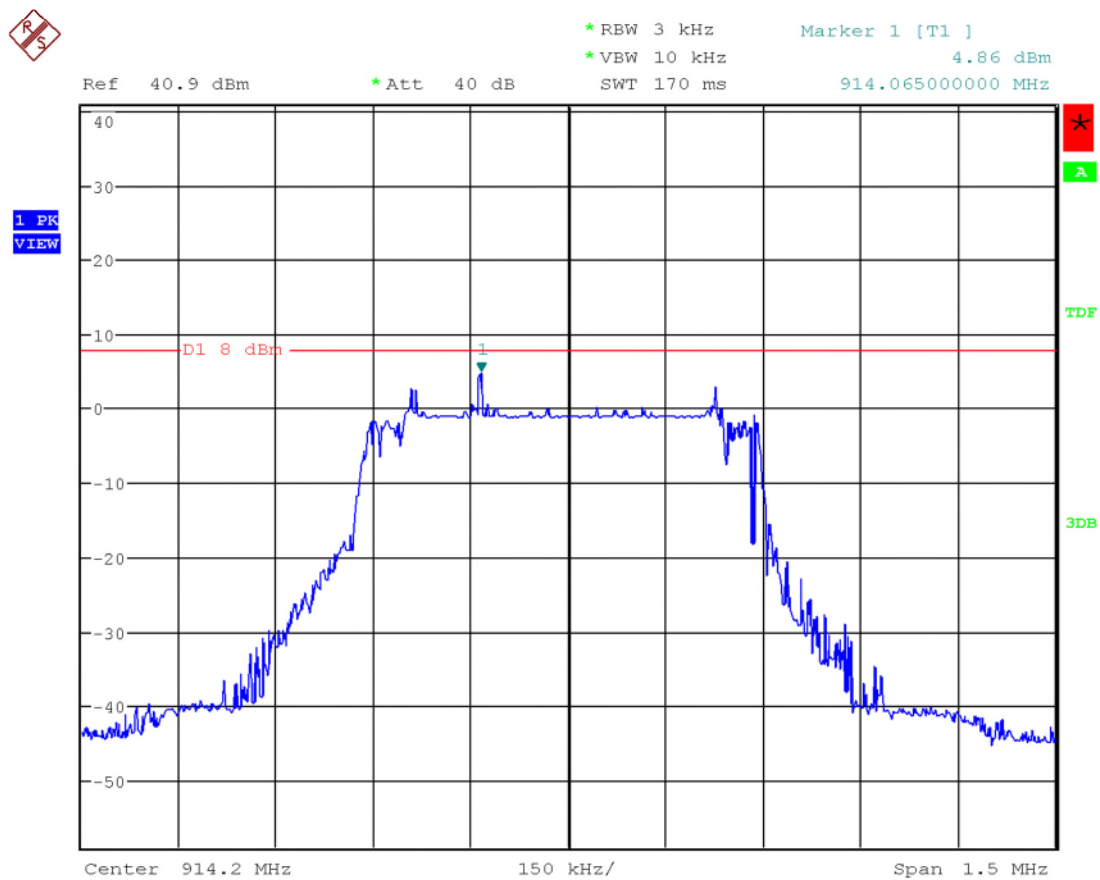
Date: 1.SEP.2021 13:46:10

Figure 7: D03_01_PKPSD_ChLow_DTS



Date: 1.SEP.2021 13:36:53

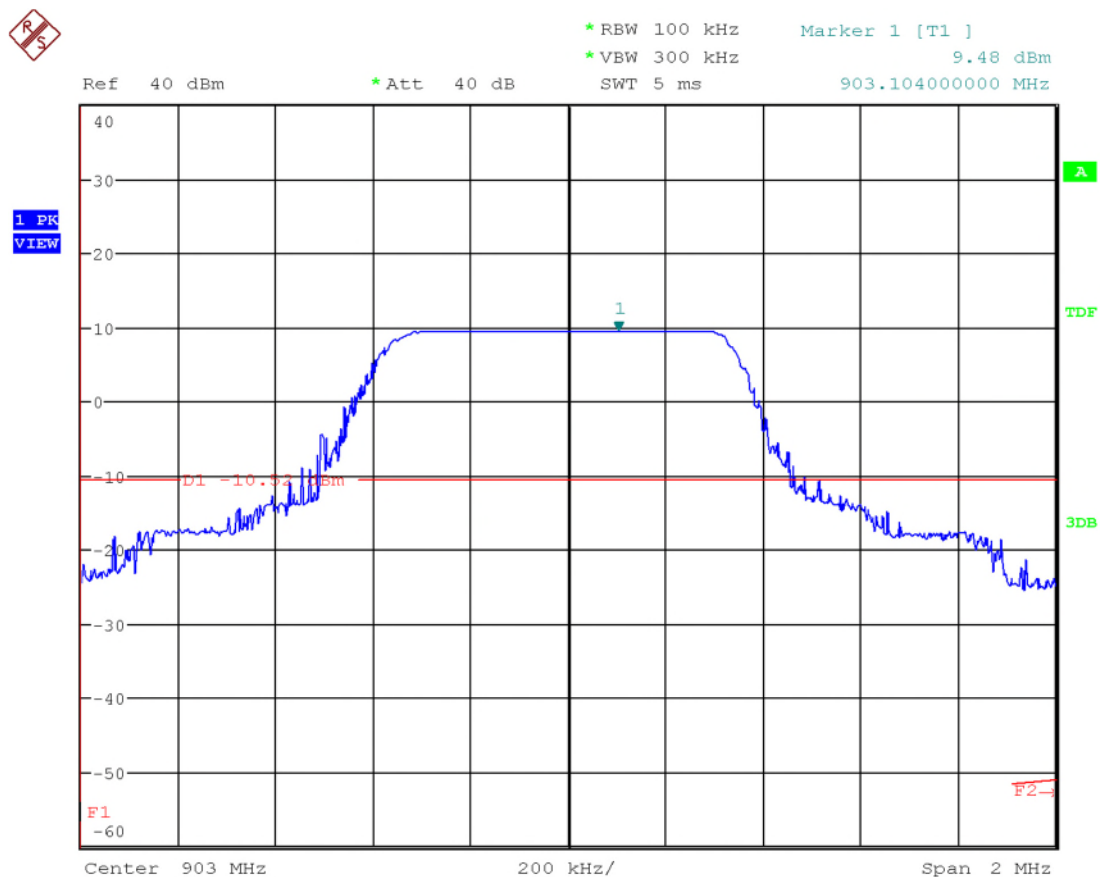
Figure 8: D03_02_PKPSD_ChMid_DTS



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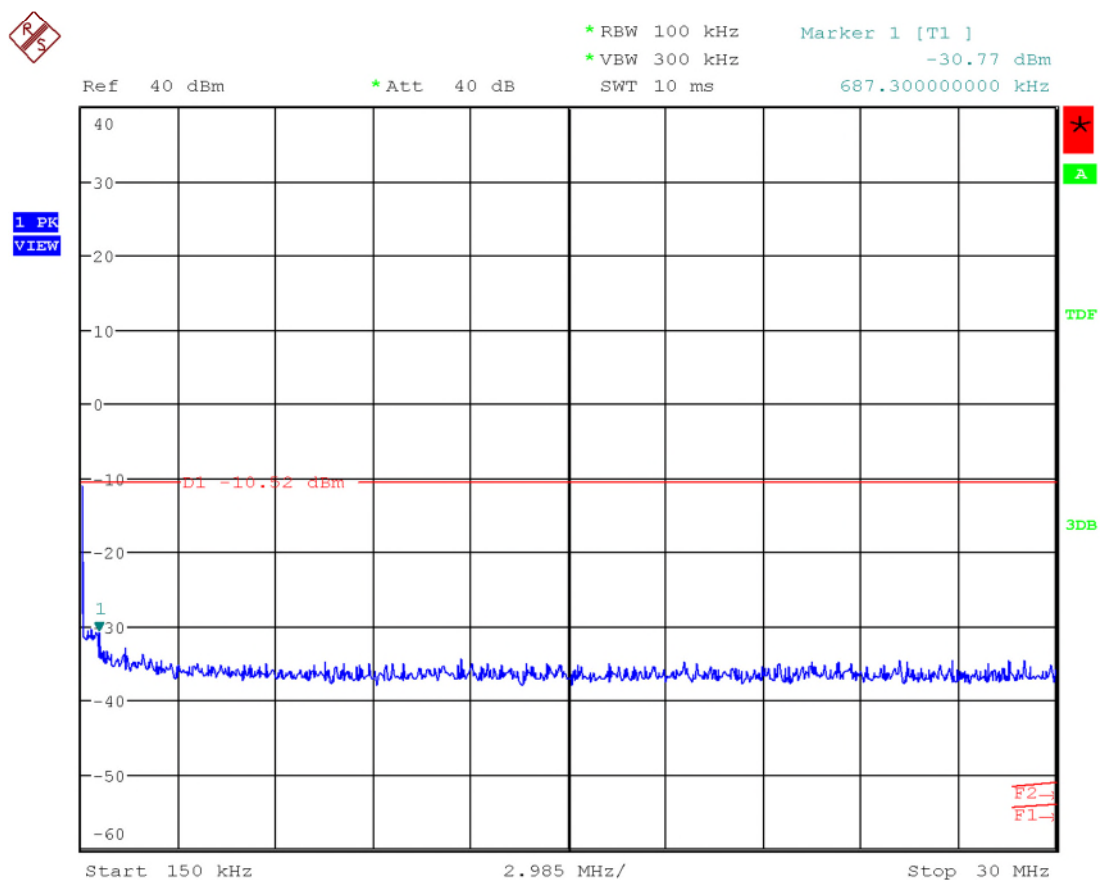
Figure 9: D03_03_PKPSD_ChHigh_DTS

1.1.4 Conducted spurious emissions, §15.247(d)



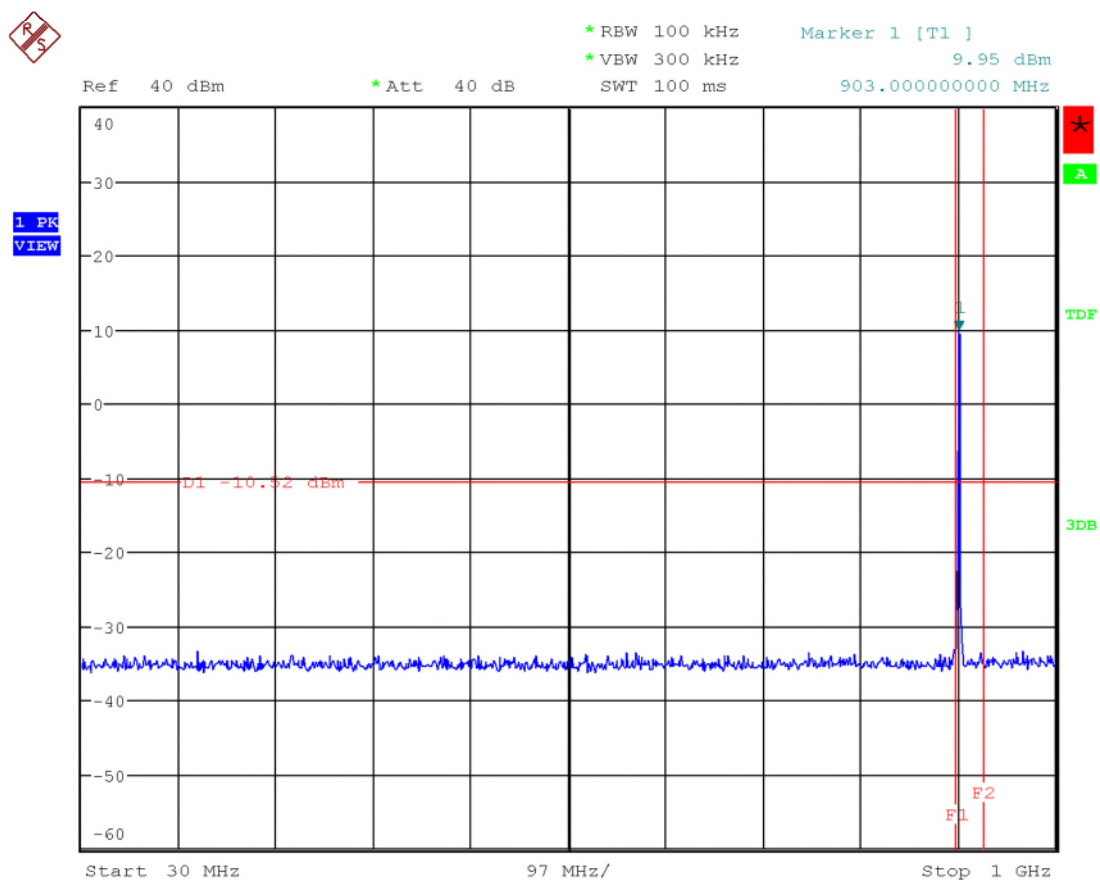
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Figure 10: D04_01_CSE20dBc_Ref_ChLow_DTS



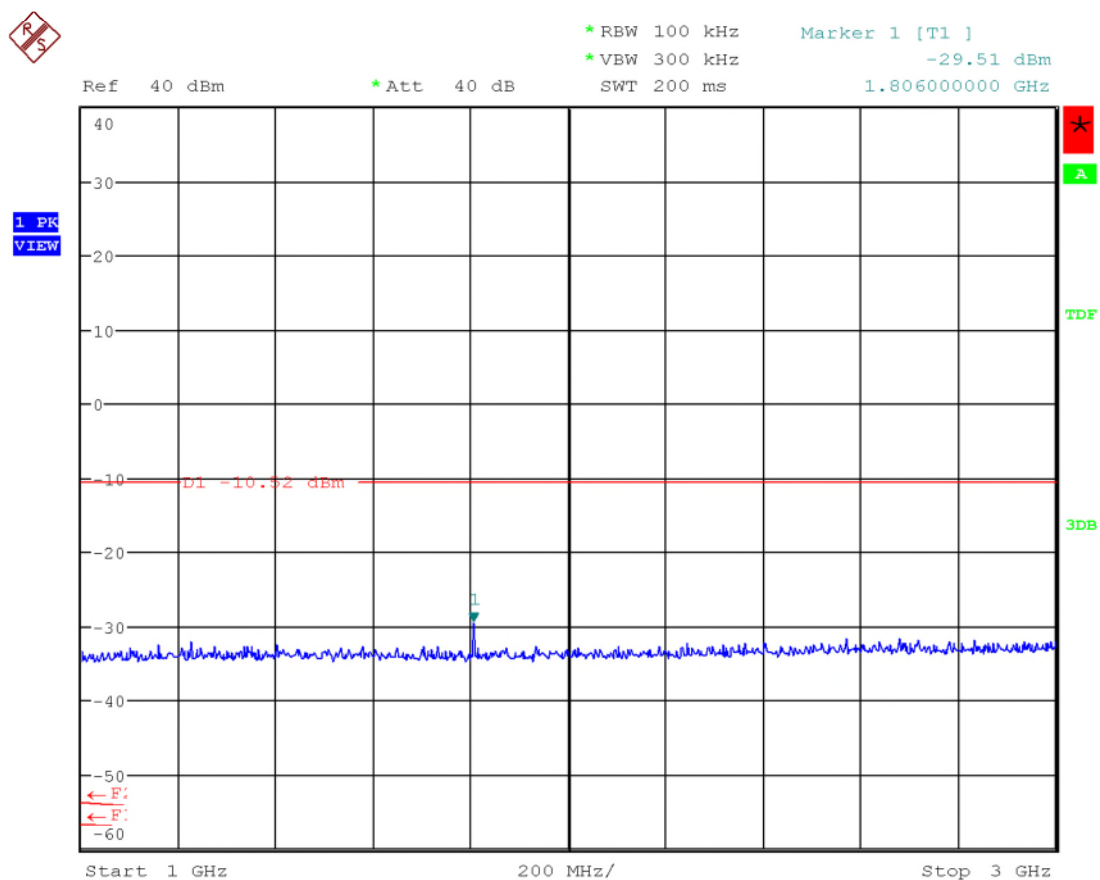
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Figure 11: D04_02_CSE20dBc_Sweep1_ChLow_DTS



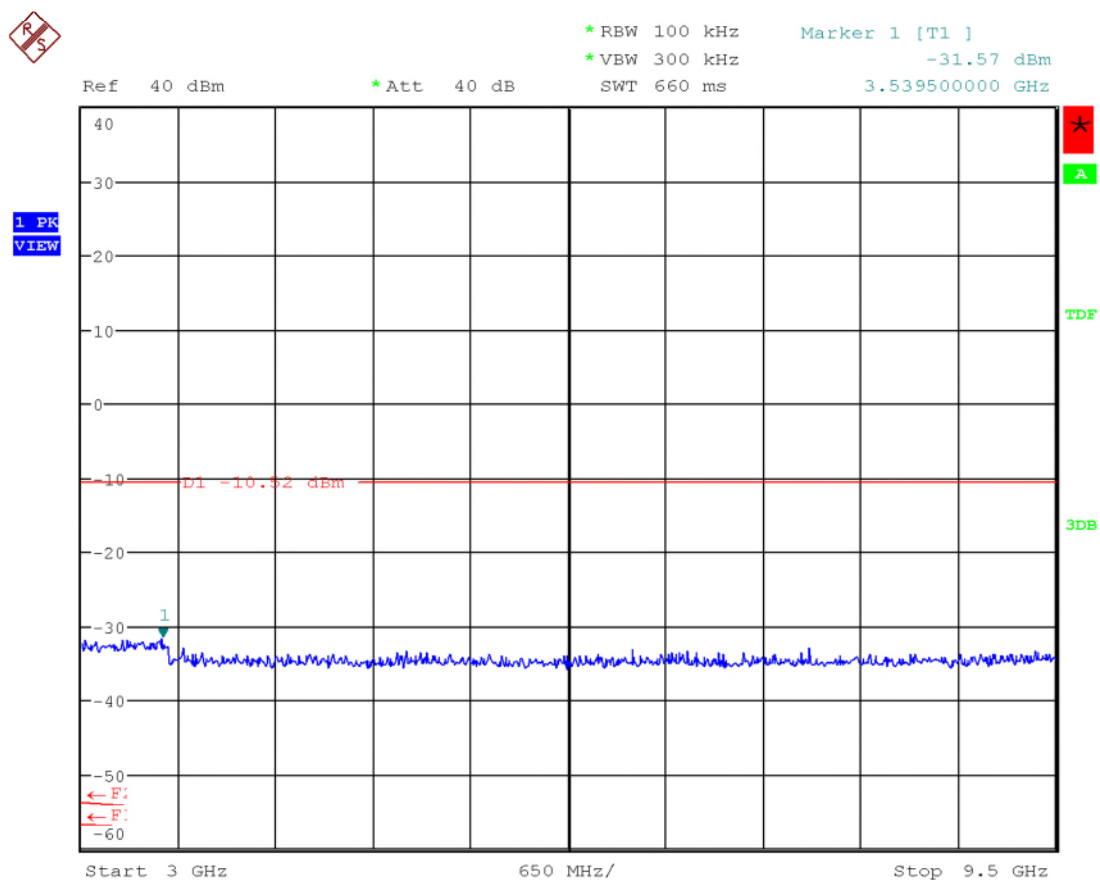
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Figure 12: D04_03_CSE20dBc_Sweep2_ChLow_DTS



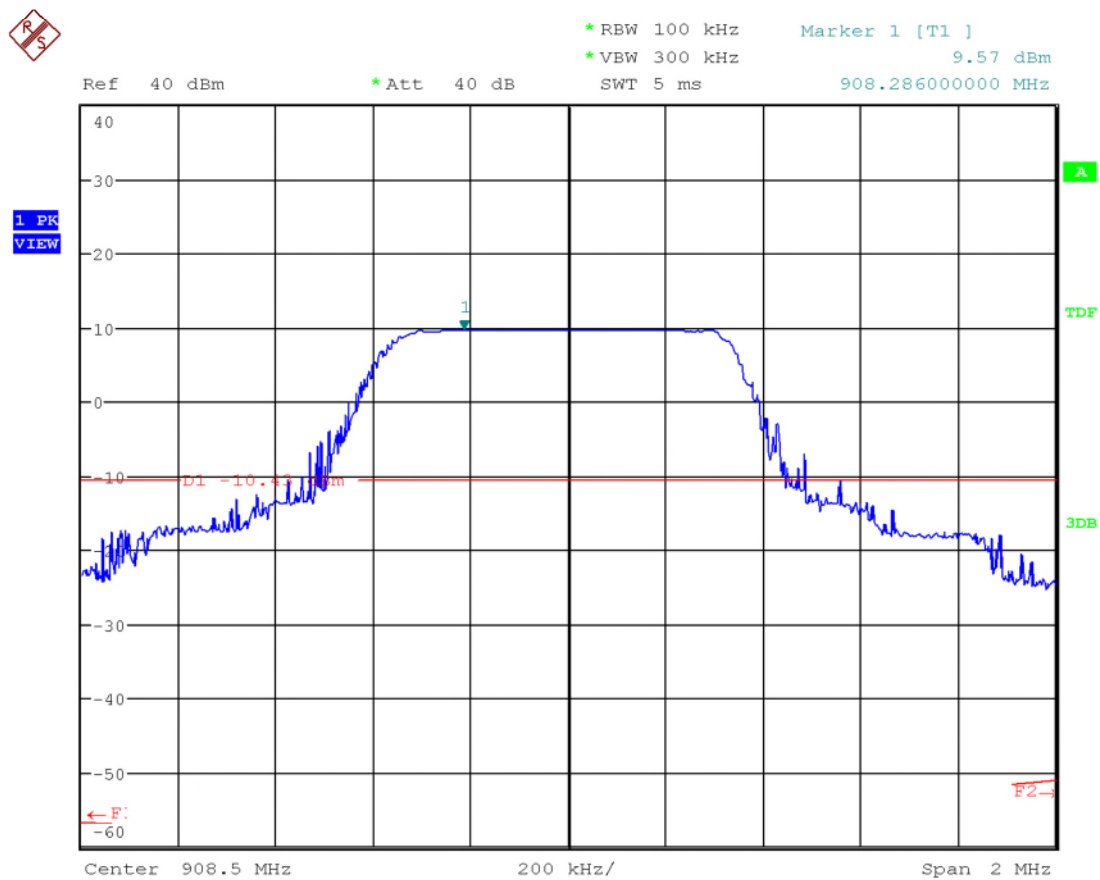
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Figure 13: D04_04_CSE20dBc_Sweep3_ChLow_DTS



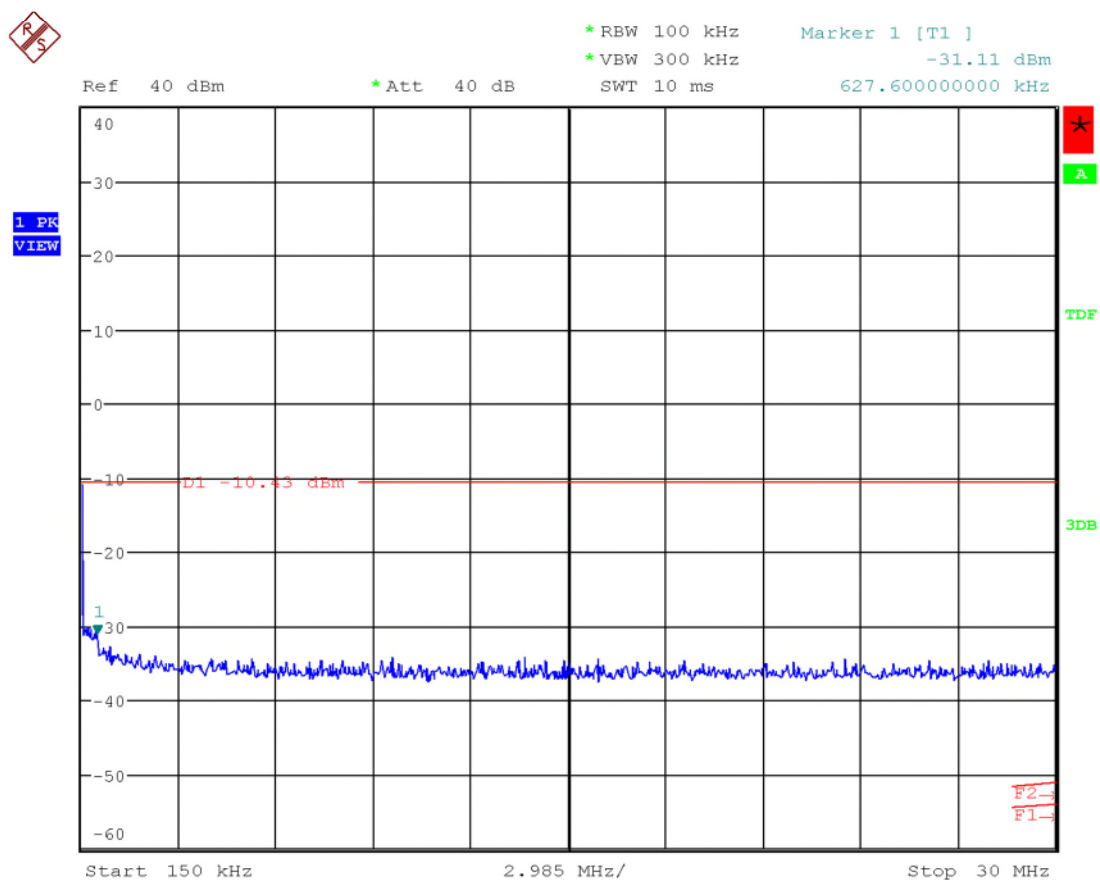
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Figure 14: D04_05_CSE20dBc_Sweep4_ChLow_DTS



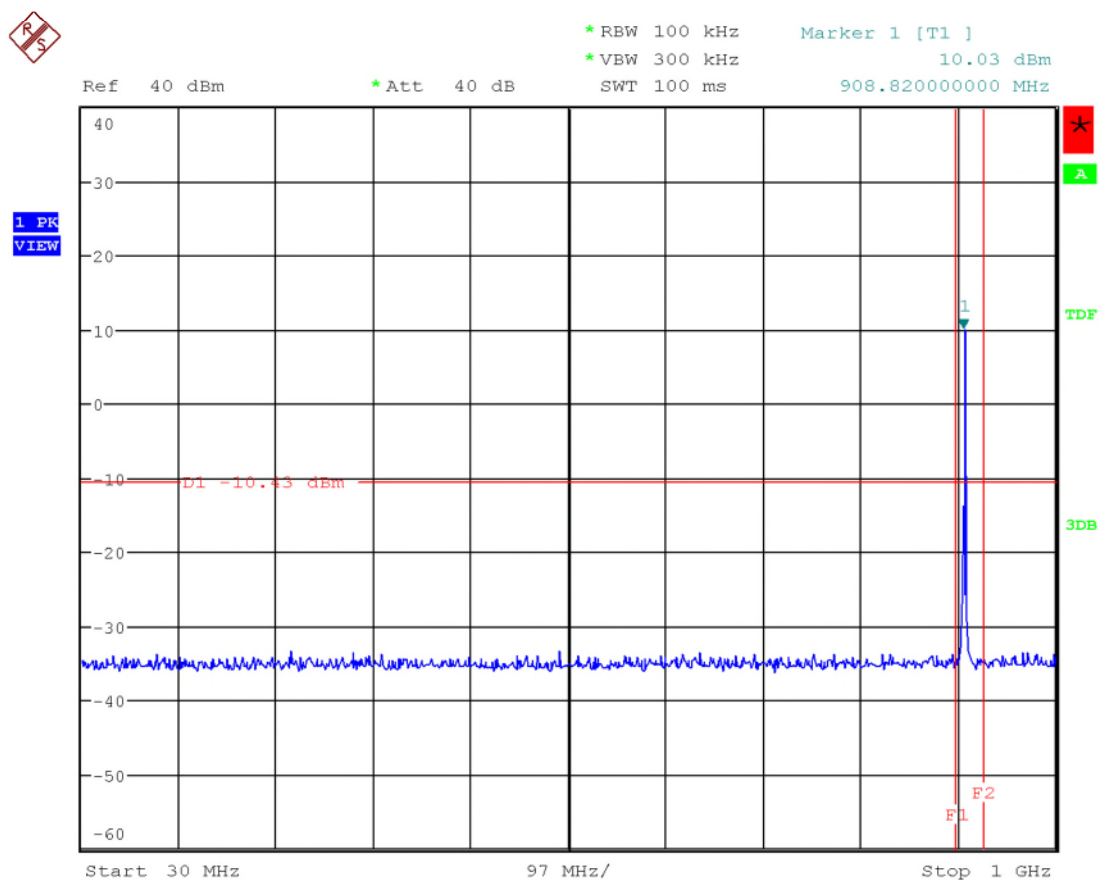
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Figure 15: D05_01_CSE20dBc_Ref_ChMid_DTS



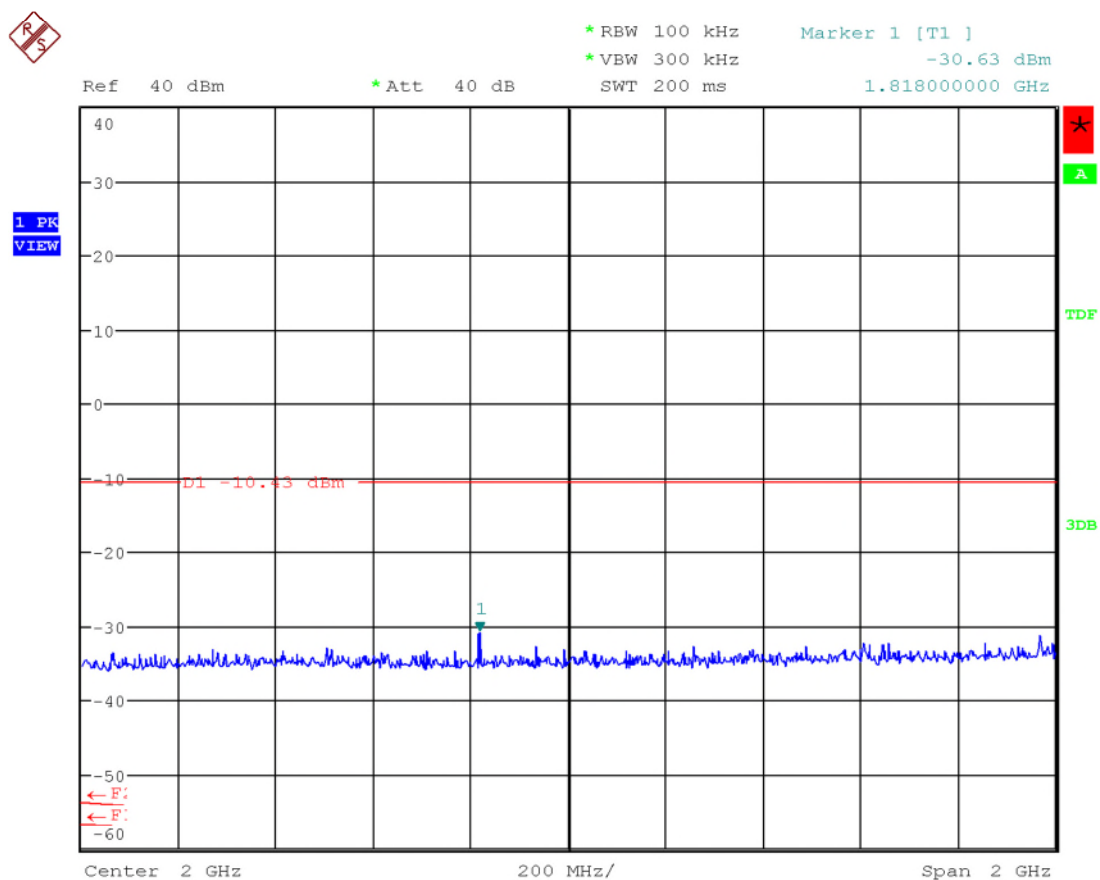
Date: 1.SEP.2021 16:13:13

Figure 16: D05_02_CSE20dBc_Sweep1_ChMid_DTS



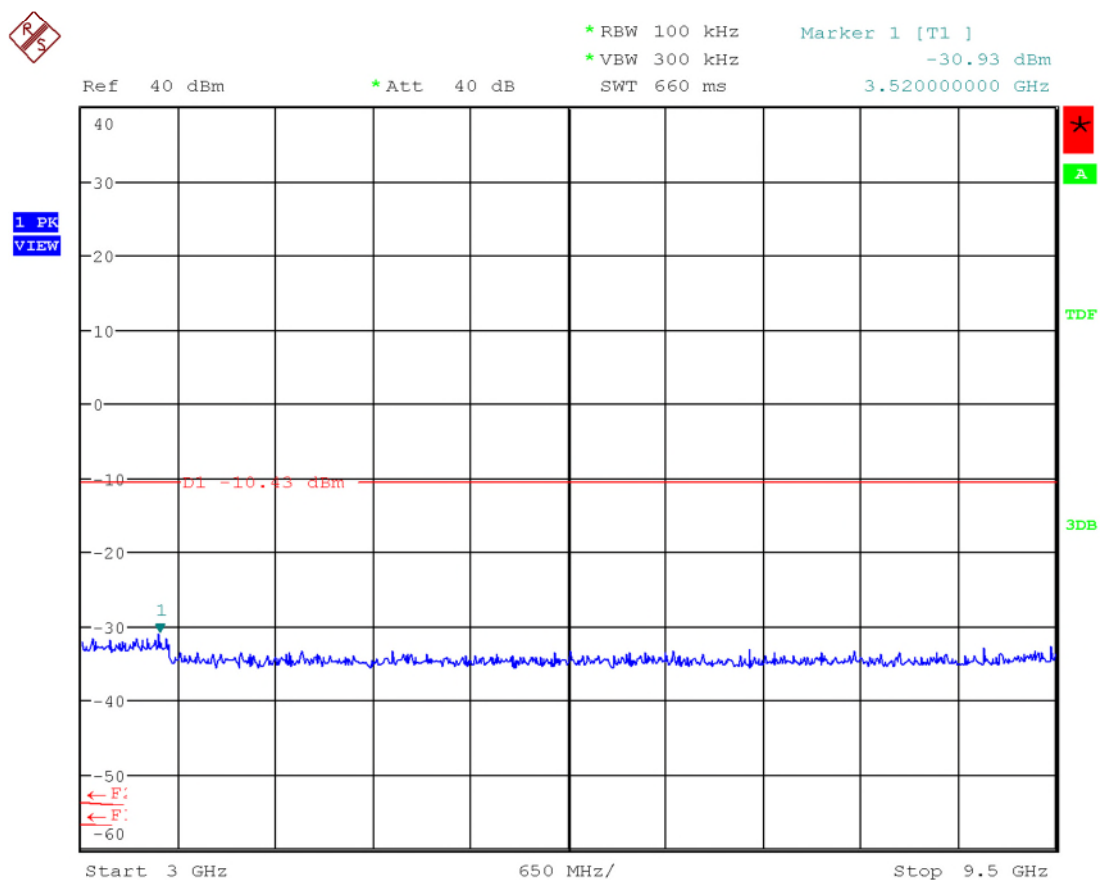
Date: 1.SEP.2021 16:07:19

Figure 17: D05_03_CSE20dBc_Sweep2_ChMid_DTS



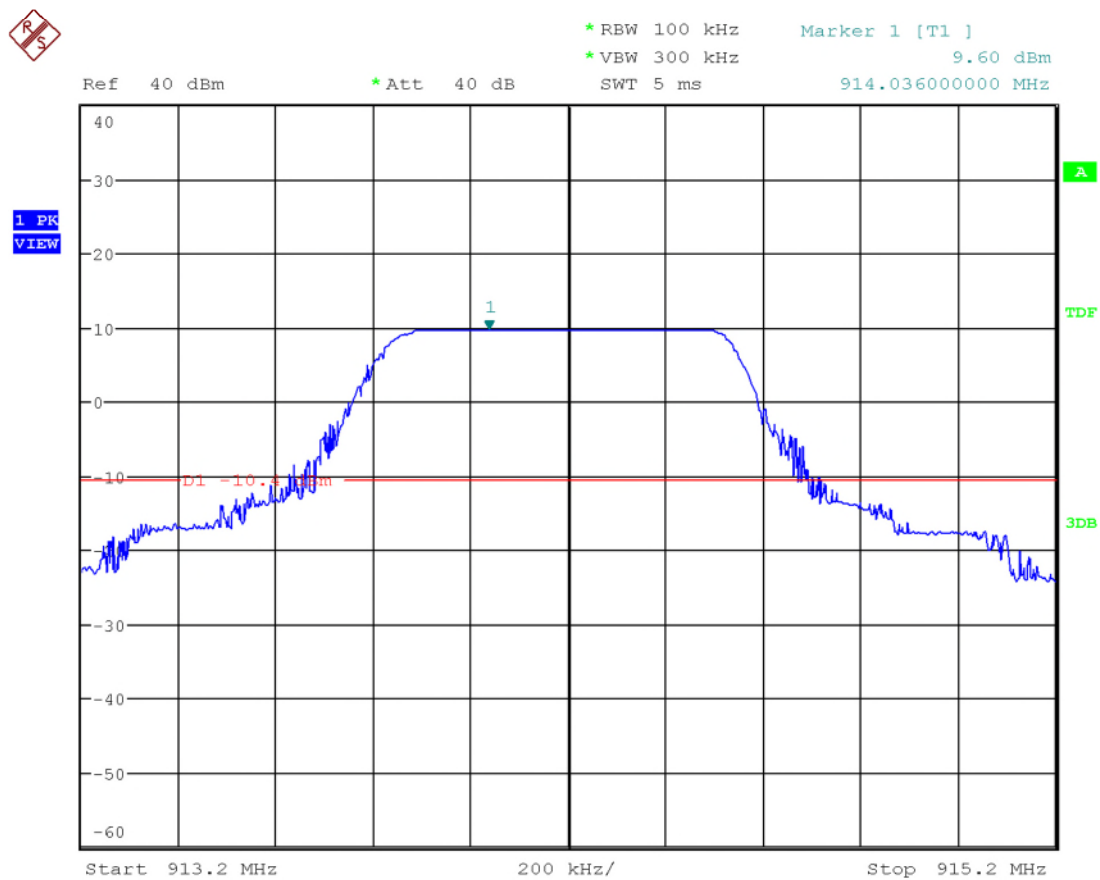
Date: 1.SEP.2021 16:03:04

Figure 18: D05_04_CSE20dBc_Sweep3_ChMid_DTS



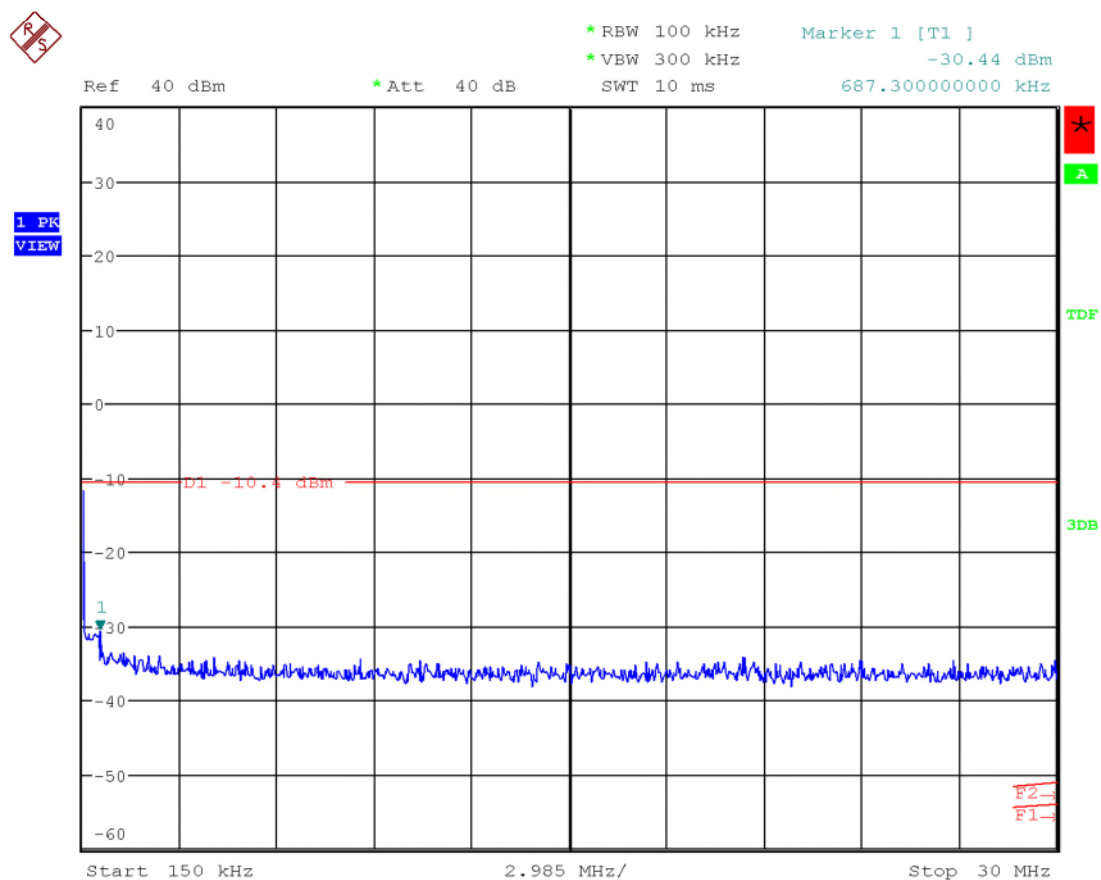
Date: 1.SEP.2021 16:00:47

Figure 19: D05_05_CSE20dBc_Sweep4_ChMid_DTS



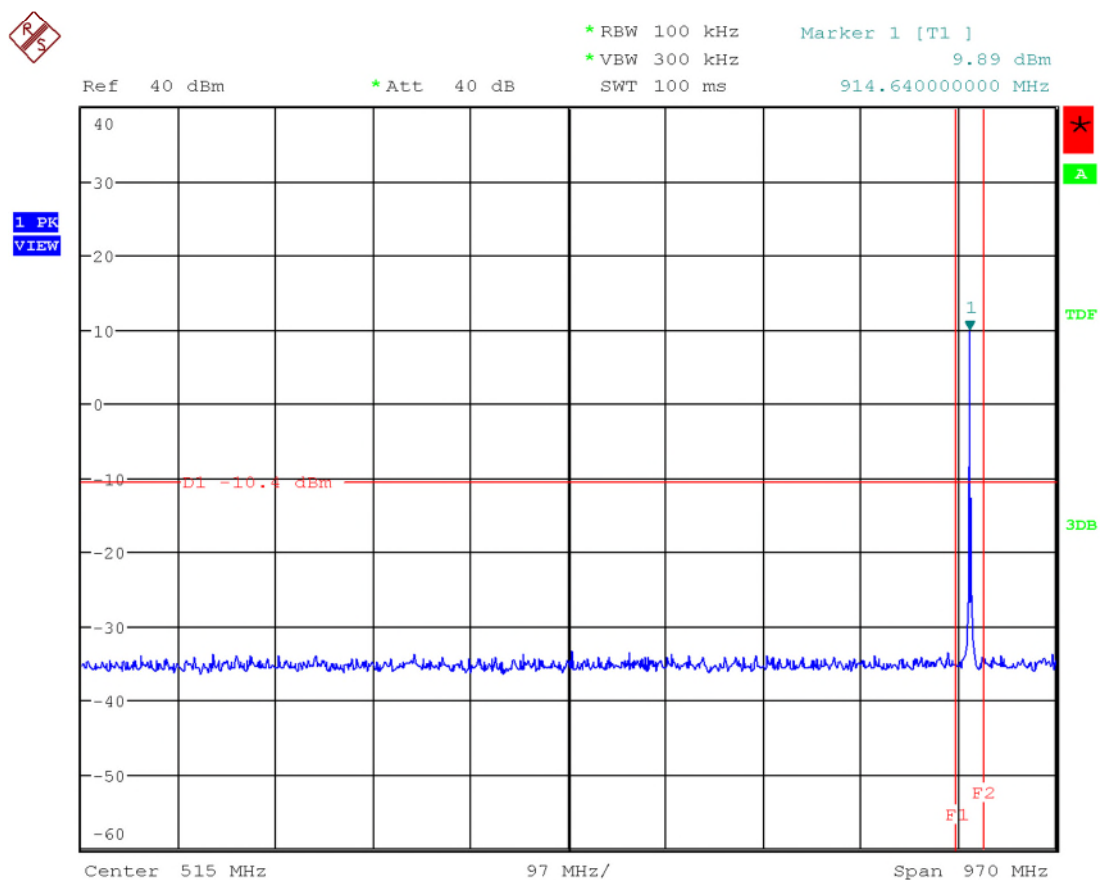
Date: 1.SEP.2021 14:20:39

Figure 20: D06_01_CSE20dBc_Ref_ChHigh_DTS



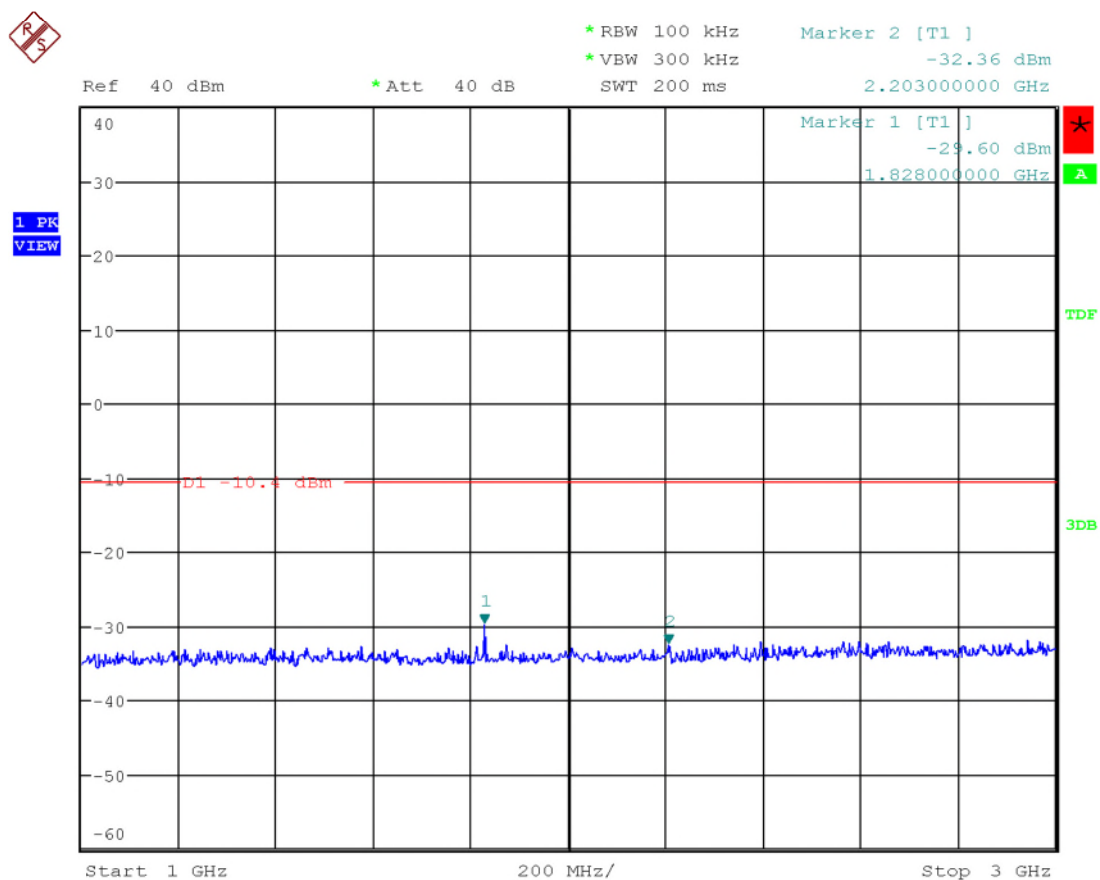
Date: 1.SEP.2021 14:39:26

Figure 21: D06_02_CSE20dBc_Sweep1_ChHigh_DTS



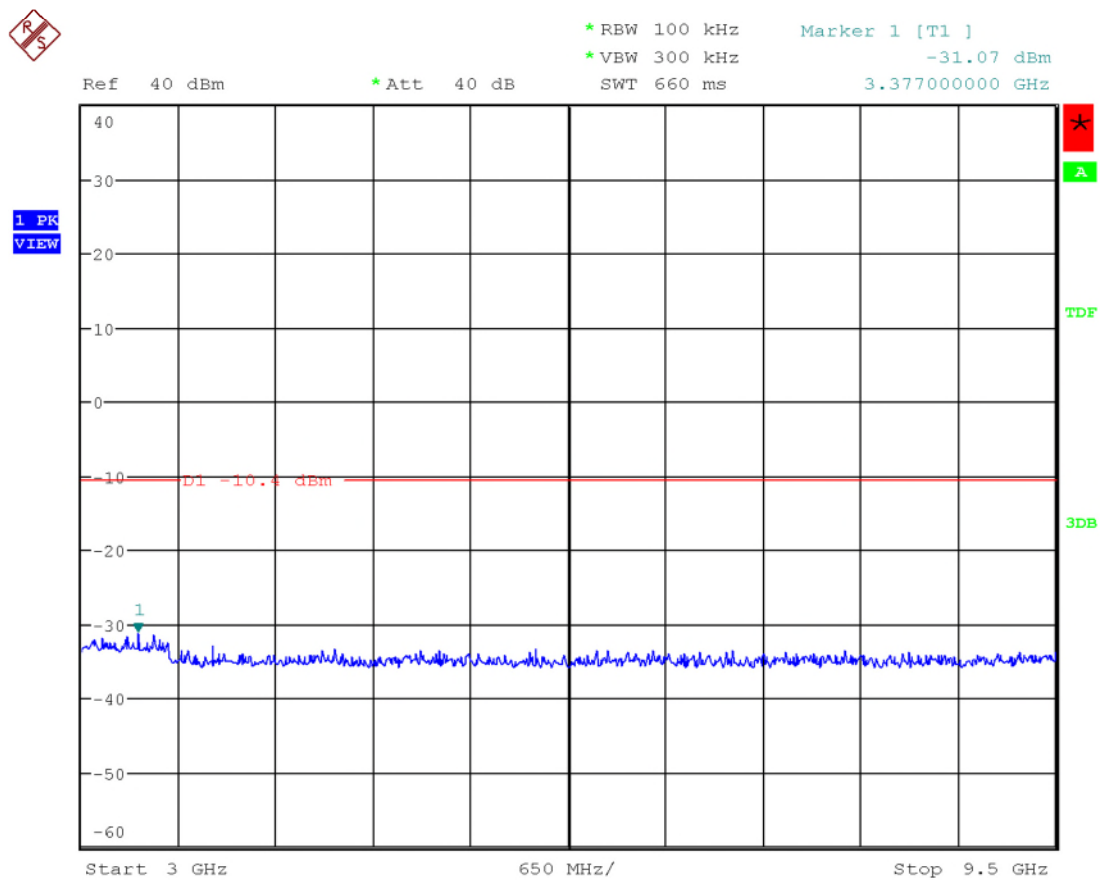
Date: 1.SEP.2021 14:36:15

Figure 22: D06_03_CSE20dBc_Sweep2_ChHigh_DTS



Date: 1.SEP.2021 14:31:34

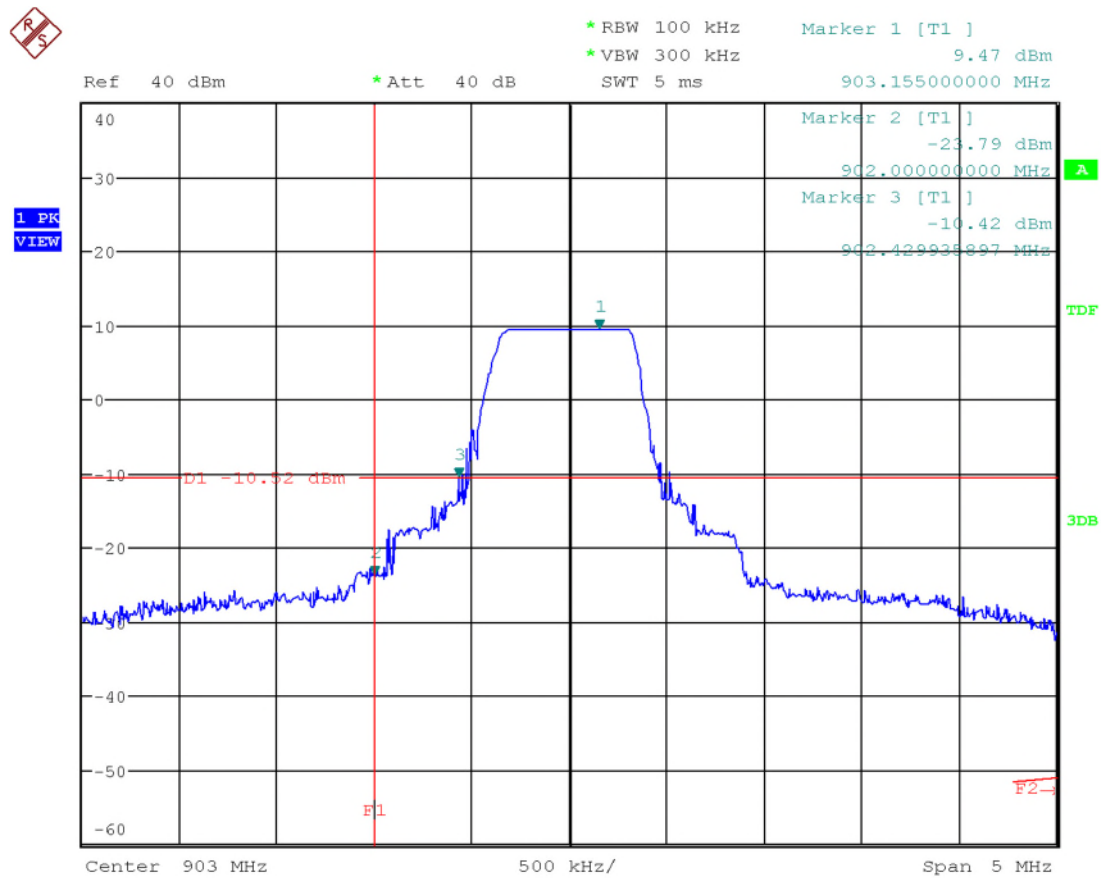
Figure 23: D06_04_CSE20dBc_Sweep3_ChHigh_DTS



Date: 1.SEP.2021 14:25:34

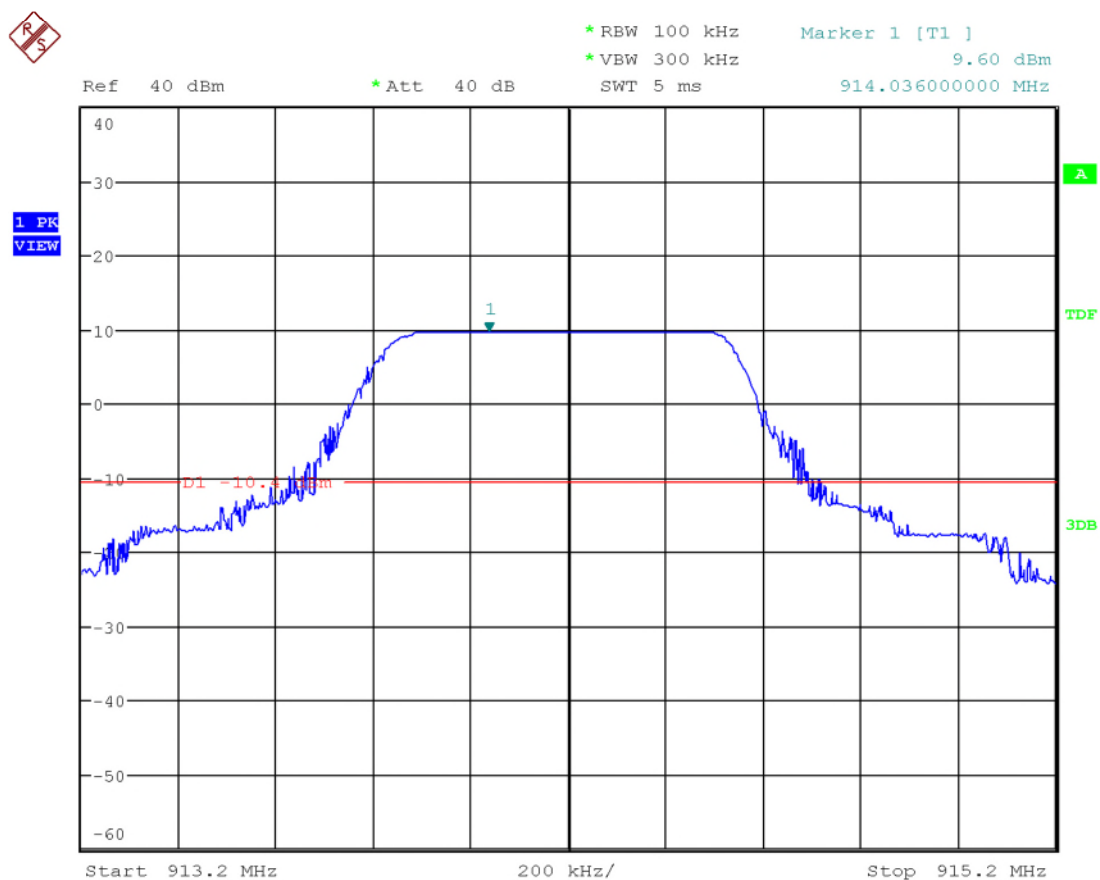
Figure 24: D06_05_CSE20dBc_Sweep4_ChHigh_DTS

1.1.5 Conducted Band-Edge emissions, §15.247(d)



Date: 1.SEP.2021 15:25:41

Figure 25: D07_1_BE_Low_DTS



Date: 1.SEP.2021 14:20:39

Figure 26: D07_2_BE_High_DTS

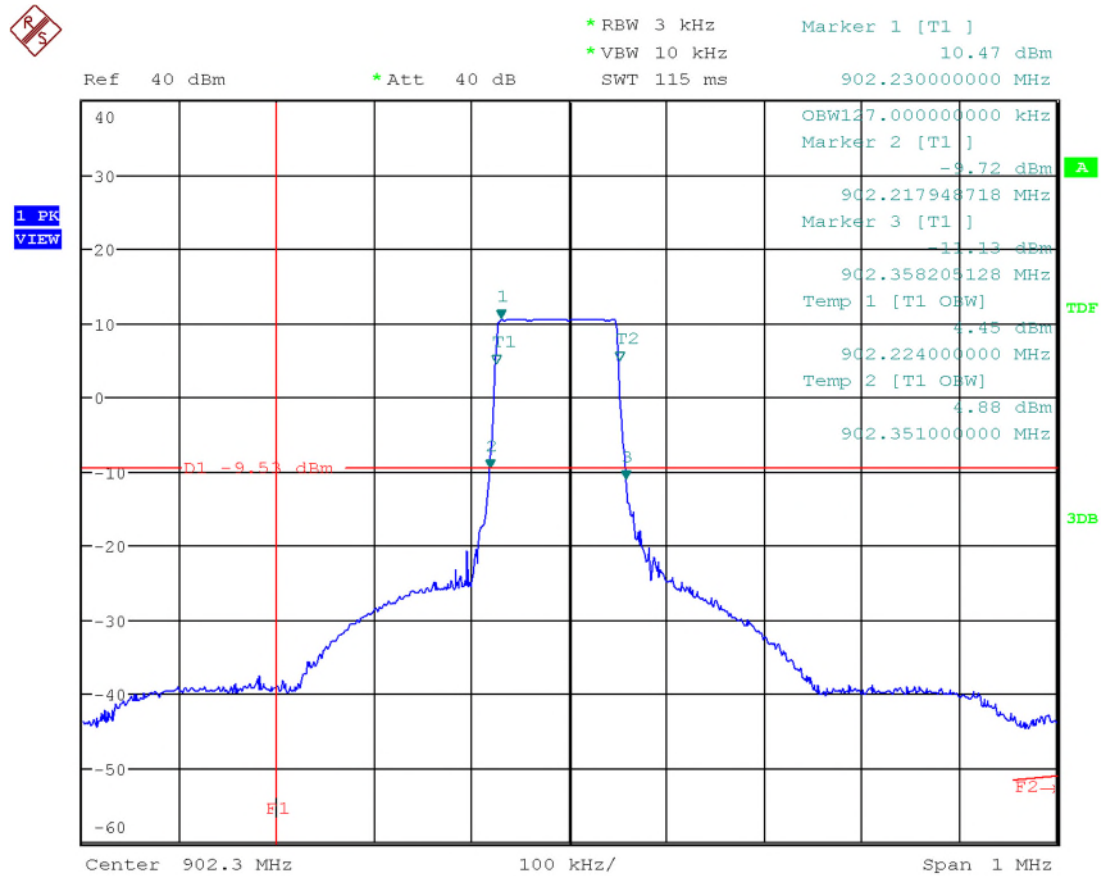
Remark: since the channel bandwidth of 500 kHz in respect to the margin of the band edge at 928 MHz is 14 MHz, the measurement is uncritical

1.1.6 Radiated spurious emissions

FHSS mode is determined to be the worst case EUT mode, so radiated spurious emissions were only performed in that mode.
See chapter 1.2.9 for radiated plots.

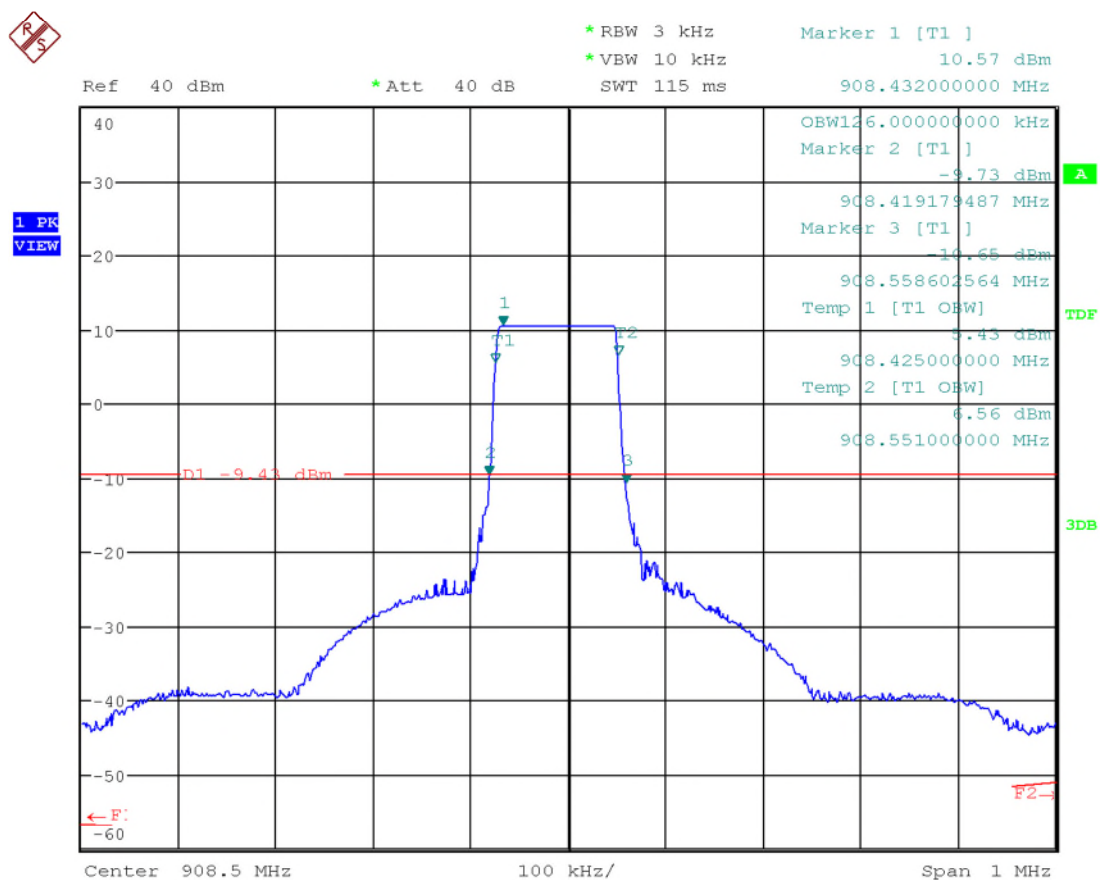
1.2 FHSS mode

1.2.1 99% Occupied bandwidth + 20 dB bandwidth, §15.247(a)(1)



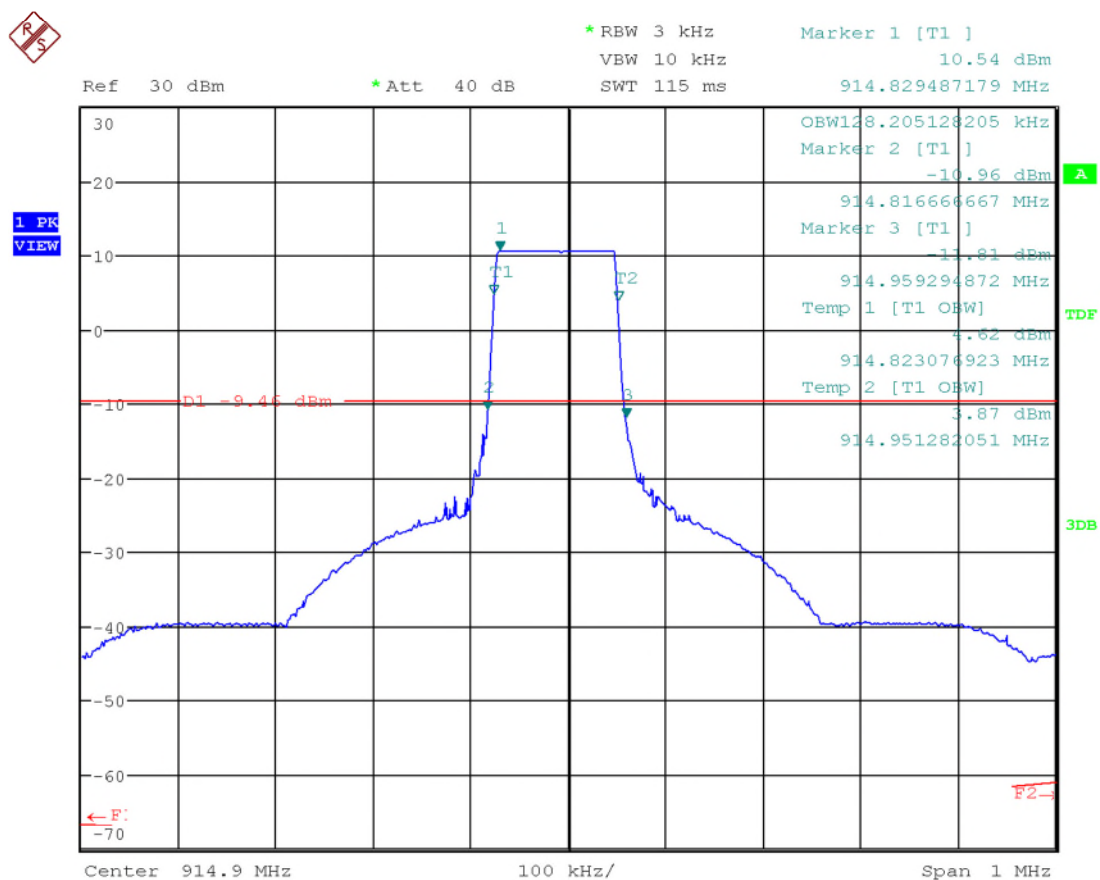
Date: 3.SEP.2021 15:11:29

Figure 27: D08_01_FHSSBW+99%OBW_ChLow_FHSS



Date: 2.SEP.2021 15:20:26

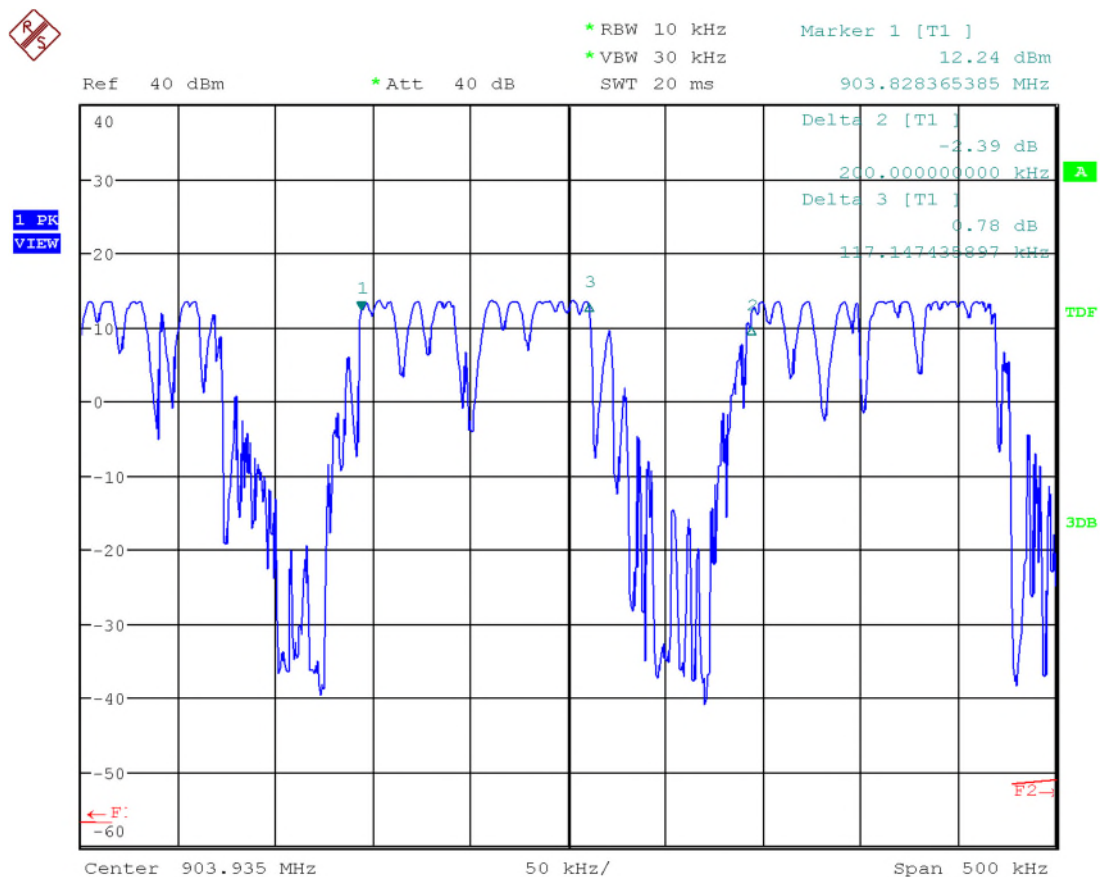
Figure 28: D08_02_FHSSBW+99%OBW_ChMid_FHSS



Date: 5.MAY.2022 16:56:41

Figure 29: D08_03_FHSSBW+99%OBW_ChHigh_FHSS

1.2.2 Channel separation, §15.247(a)(1)

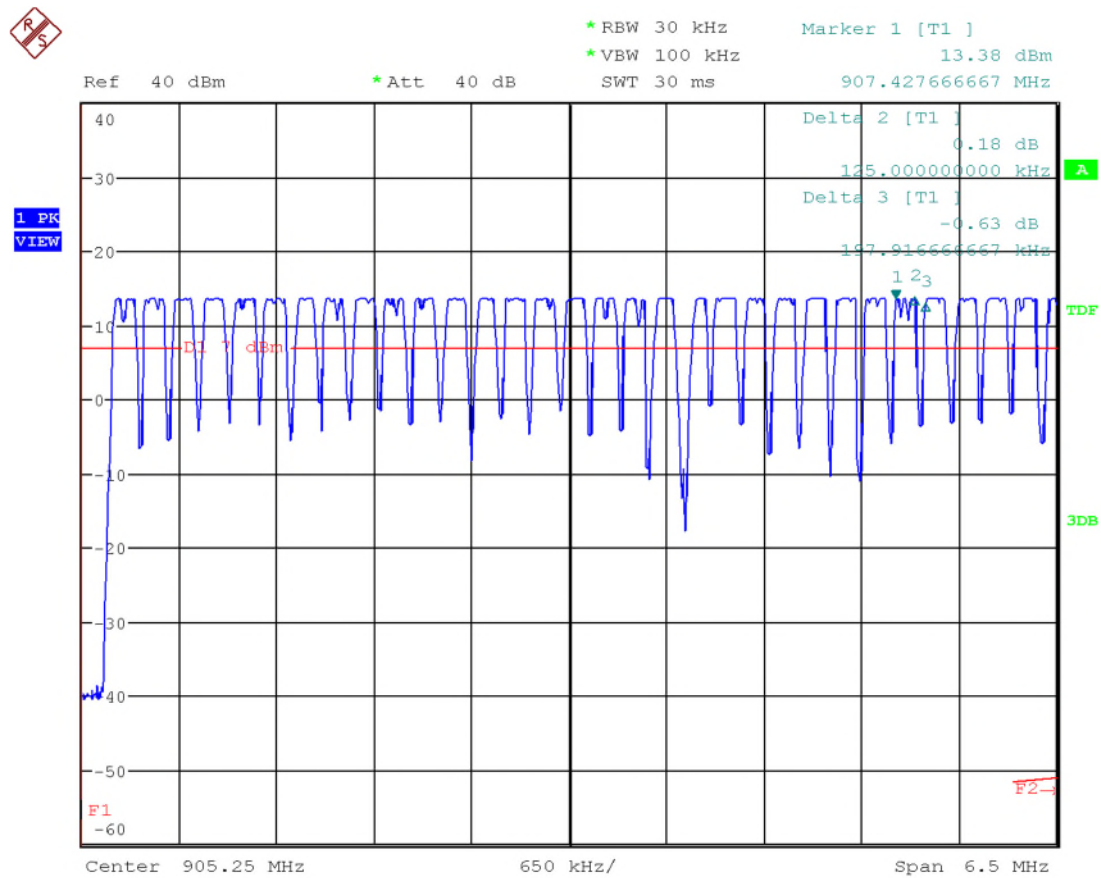


Date: 2.SEP.2021 13:37:28

Figure 30: D09_01_FreqSep_FHSS

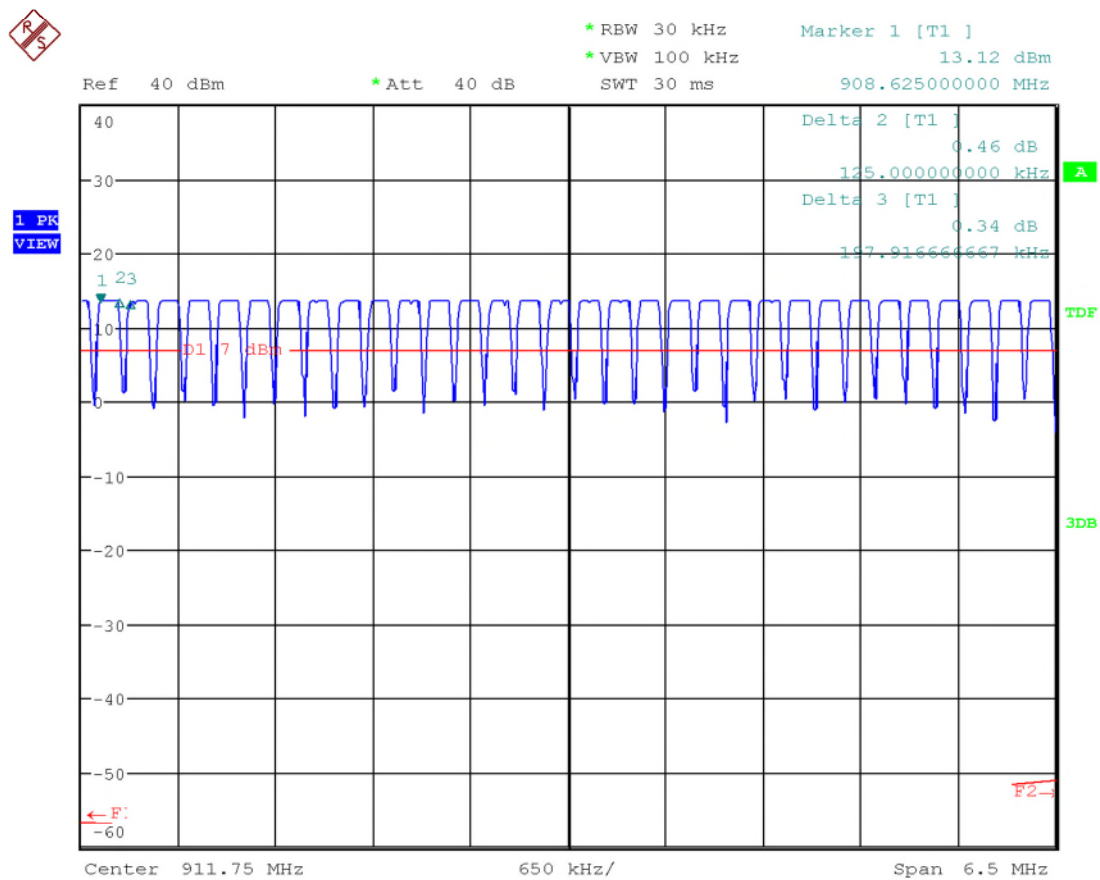
Channel distance: measured between Marker1 and Delta Marker2.

1.2.3 Number of hopping frequencies, 15.247(a)(1)(i)



Date: 2.SEP.2021 16:47:56

Figure 31: D10_01_#OfHopFreqs_FHSS_902M-908.5M



Date: 3.SEP.2021 10:39:06

Figure 32: D10_02_#OfHopFreqs_FHSS_908.5M-915M