

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

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<b>Testing company:</b>	CETECOM GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150	<b>Applicant:</b>	ElektronikSystem i Umeå AB
<b>Product:</b>	LoRa device		
<b>Model:</b>	EMS		
<b>Type:</b>	-		
<b>FCC ID:</b>	2ANX3-EMS01	<b>IC:</b>	26904-EMS01
<b>Testing has been carried out in accordance with:</b>	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".		

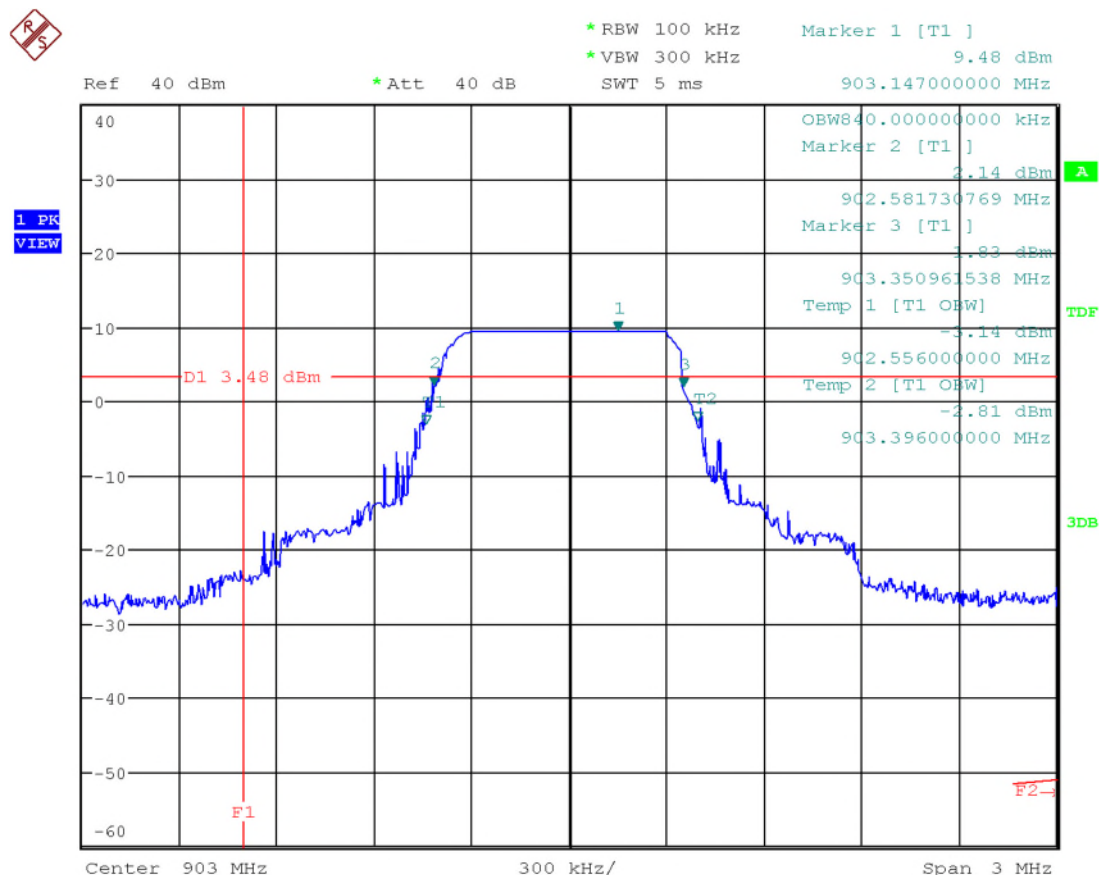
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# 1 Measurement diagrams

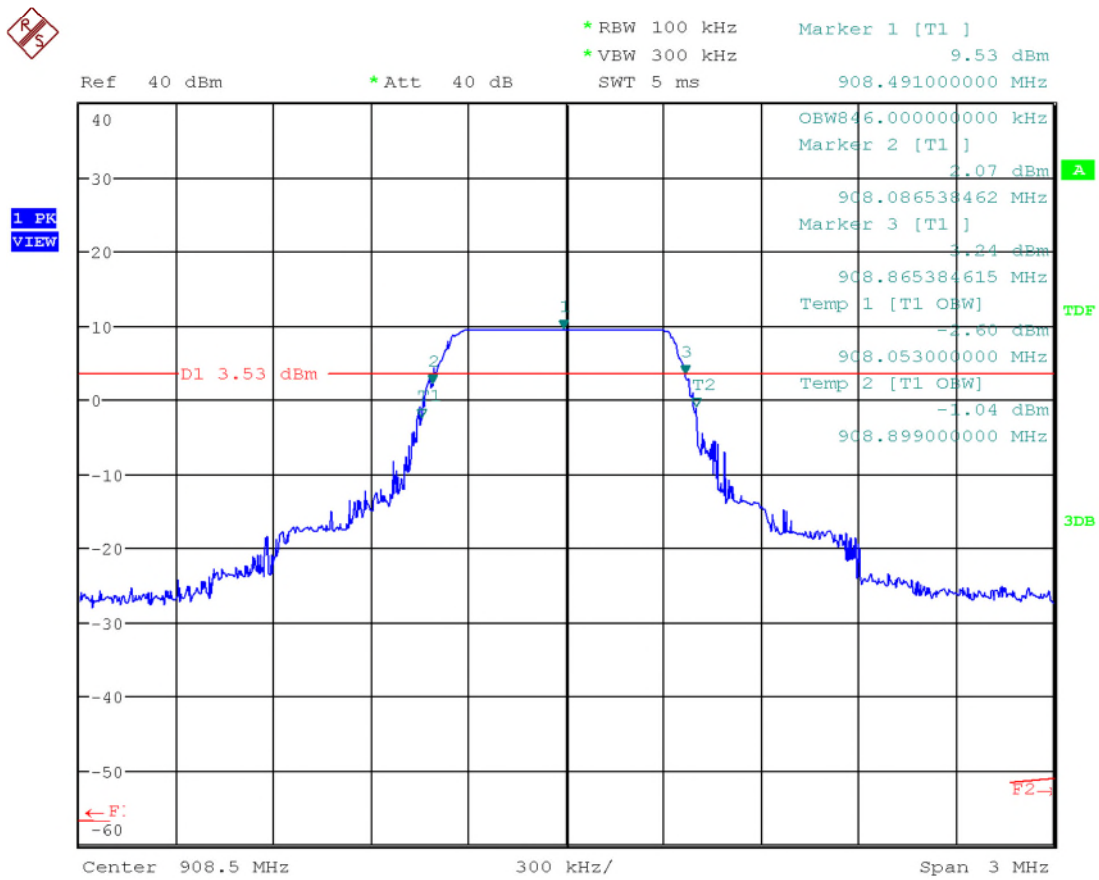
## 1.1 DTS mode

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



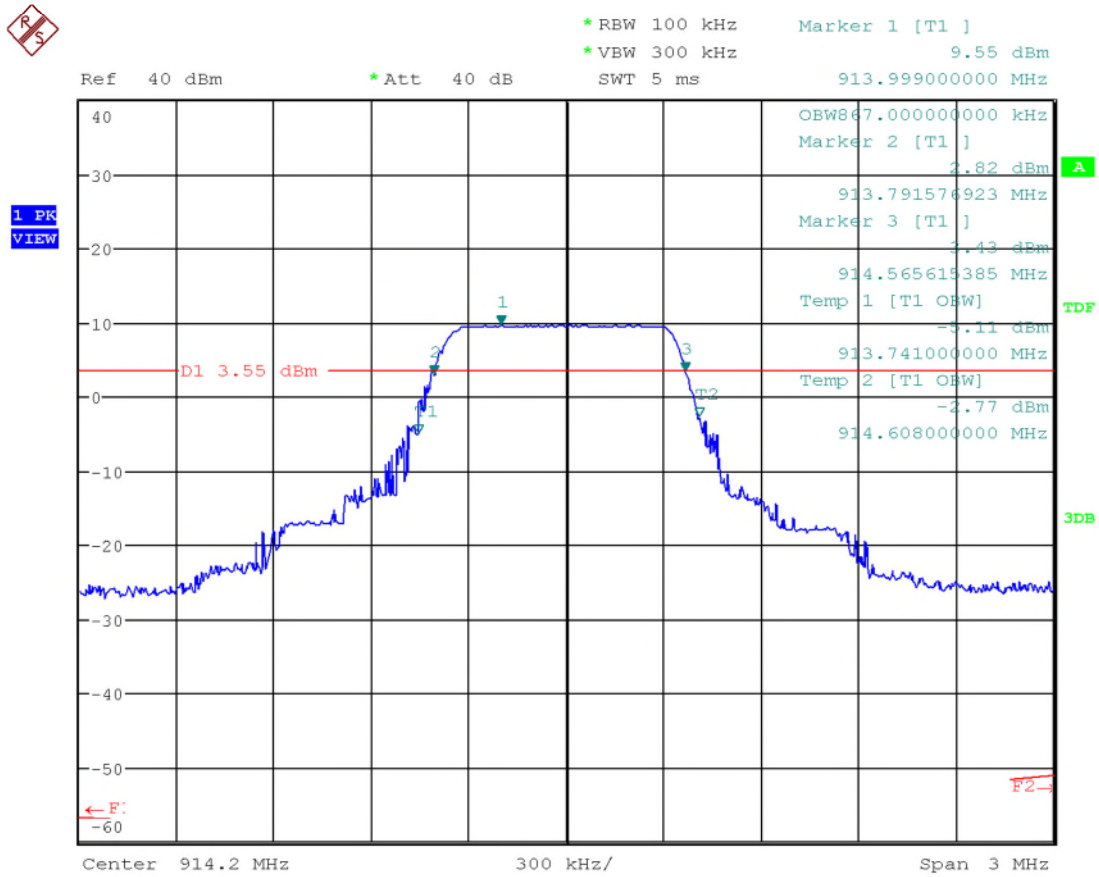
Date: 2.SEP.2021 12:34:20

Figure 1: D01\_01\_DTSBW+99%OBW\_ChLow\_DTS



Date: 2.SEP.2021 12:28:59

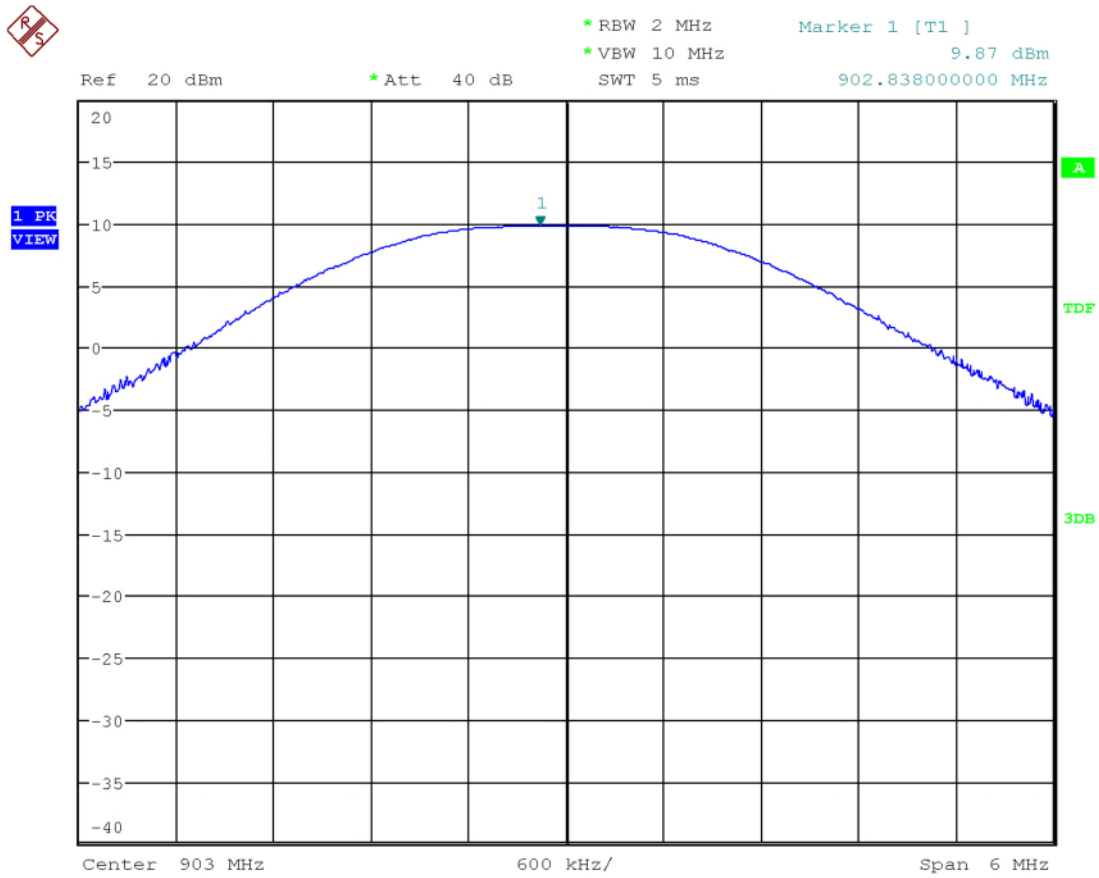
Figure 2: D01\_02\_DTSBW+99%OBW\_ChMid\_DTS



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

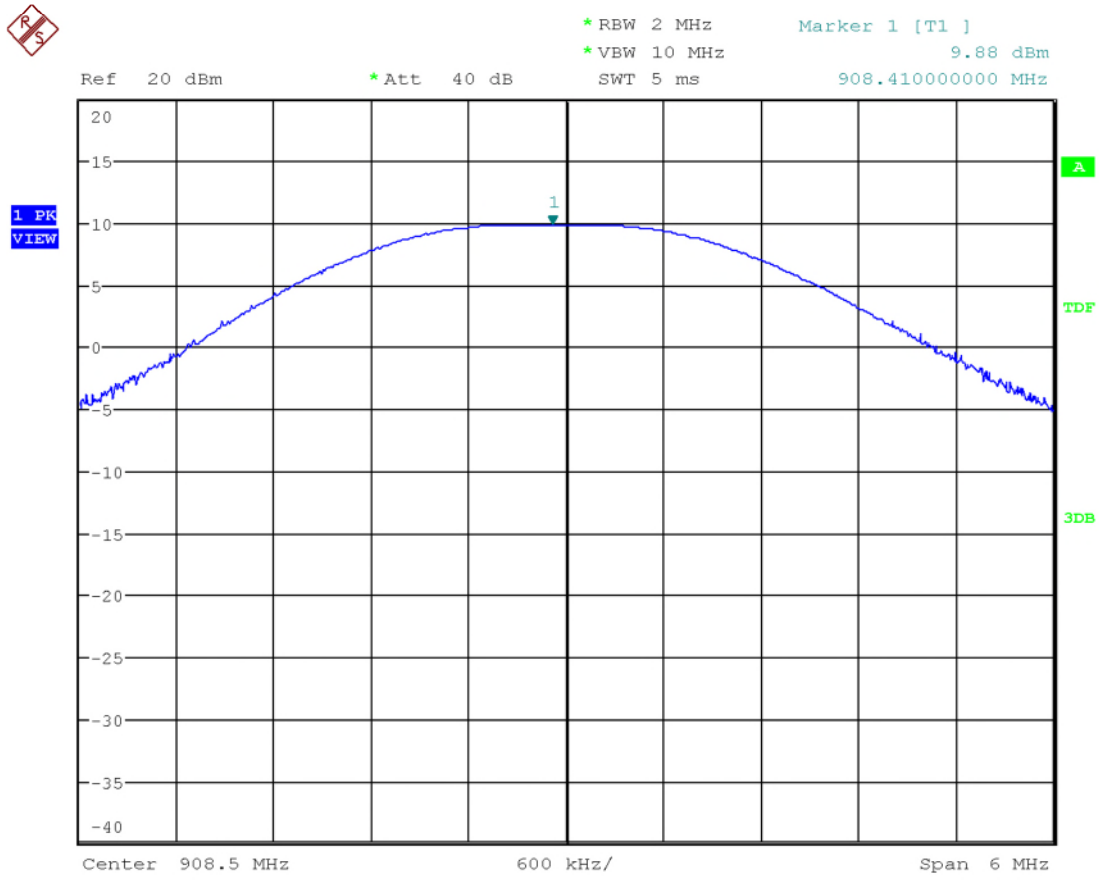
Figure 3: D01\_03\_DTSBW+99%OBW\_ChHigh\_DTS

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



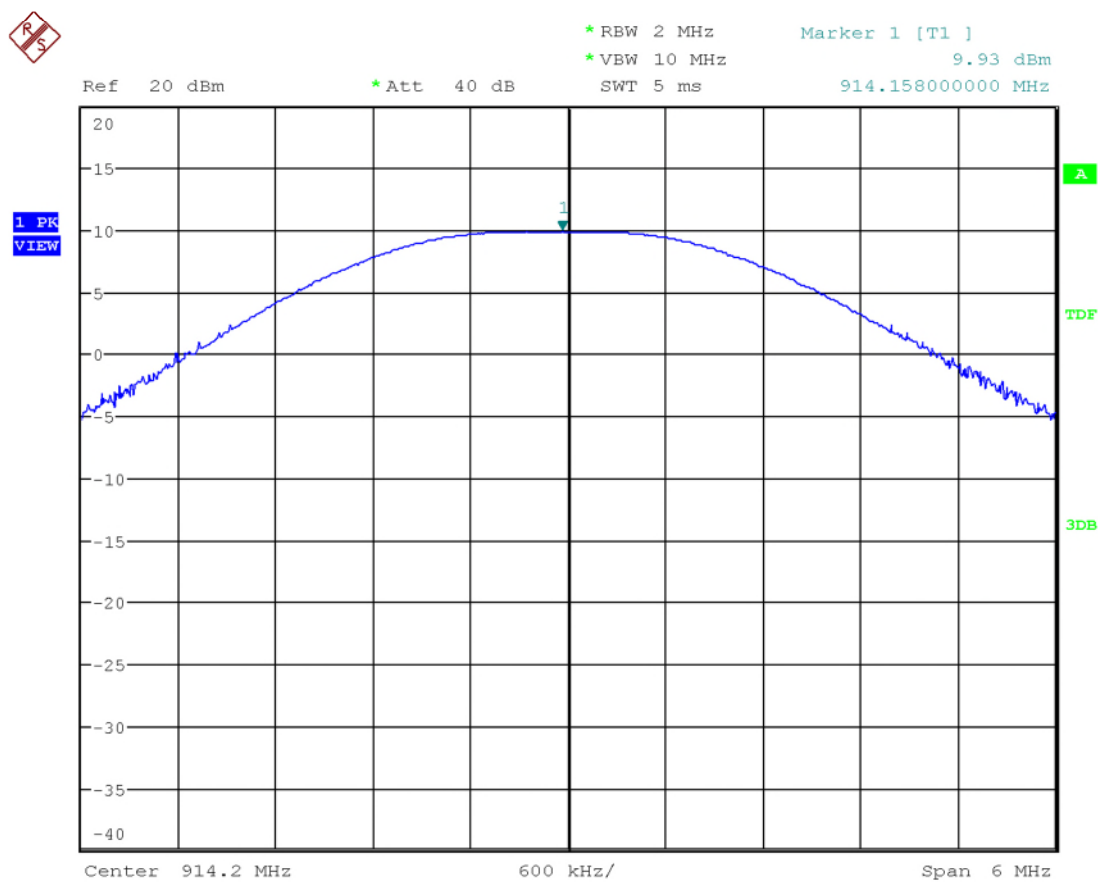
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**Figure 4: D02\_01\_PKPWR\_ChLow\_DTS**



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

Figure 5: D02\_02\_PKPWR\_ChMid\_DTS

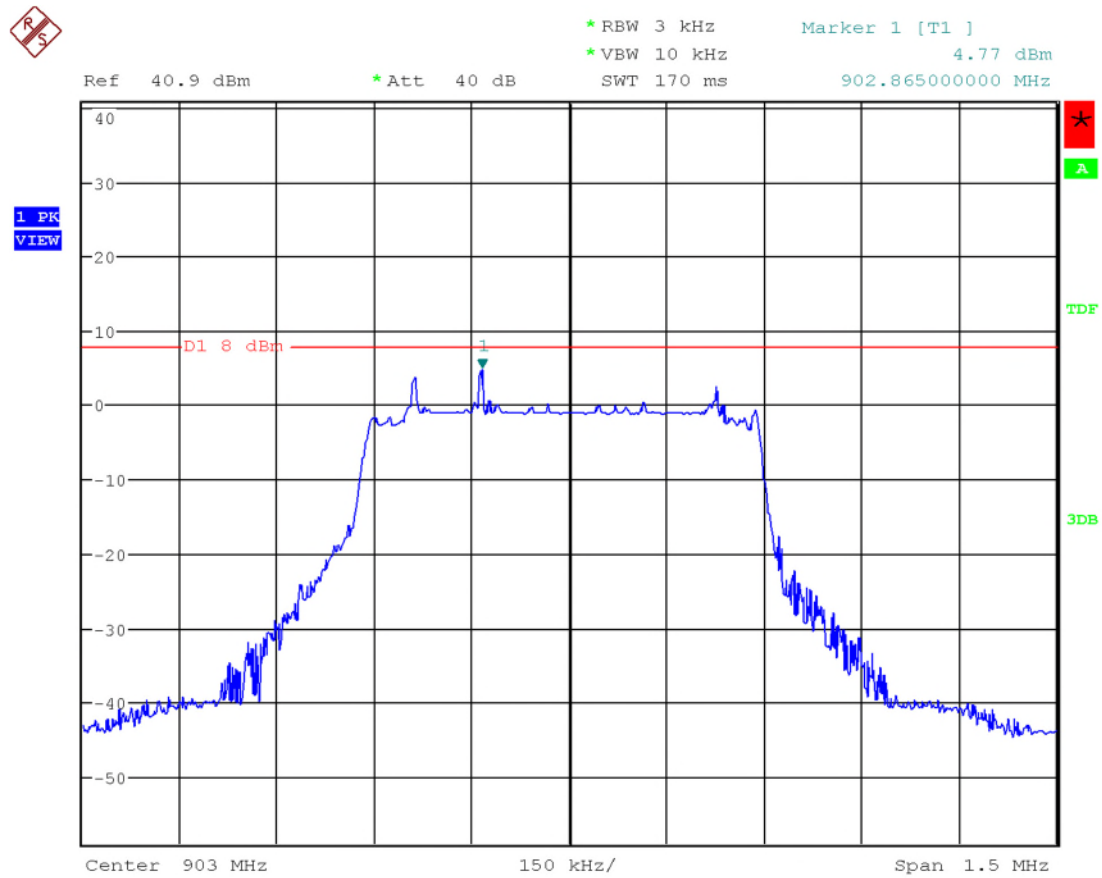


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Figure 6: D02\_03\_PKPWR\_ChHigh\_DTS

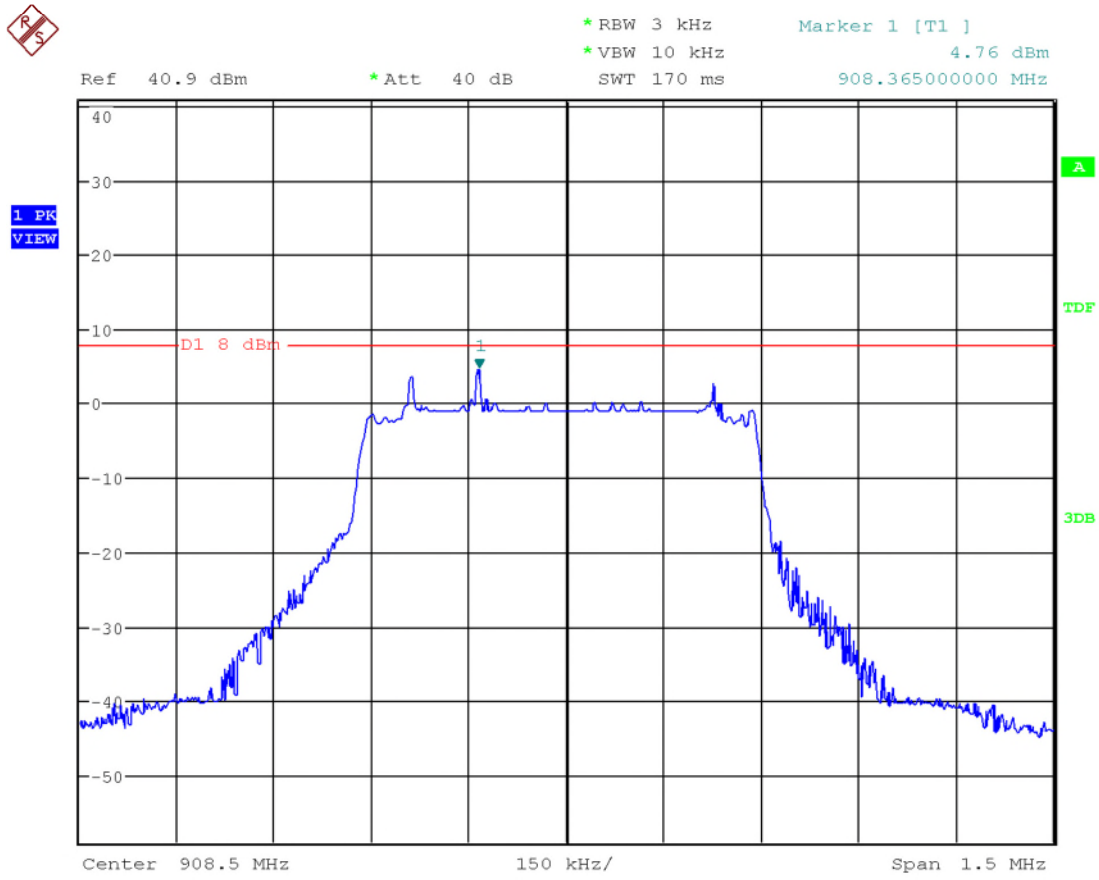


### 1.1.3 Power spectral density conducted, §15.247(e)



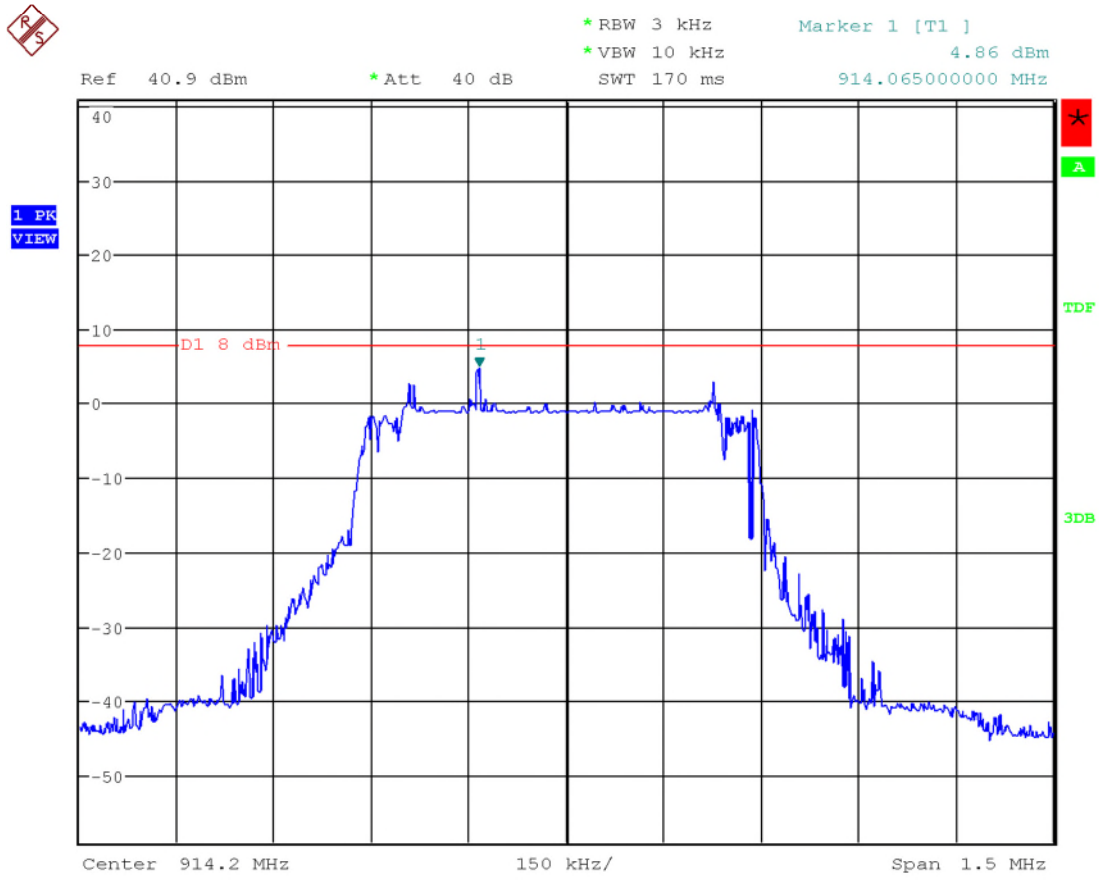
Date: 1.SEP.2021 13:46:10

Figure 7: D03\_01\_PKPSD\_ChLow\_DTS



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

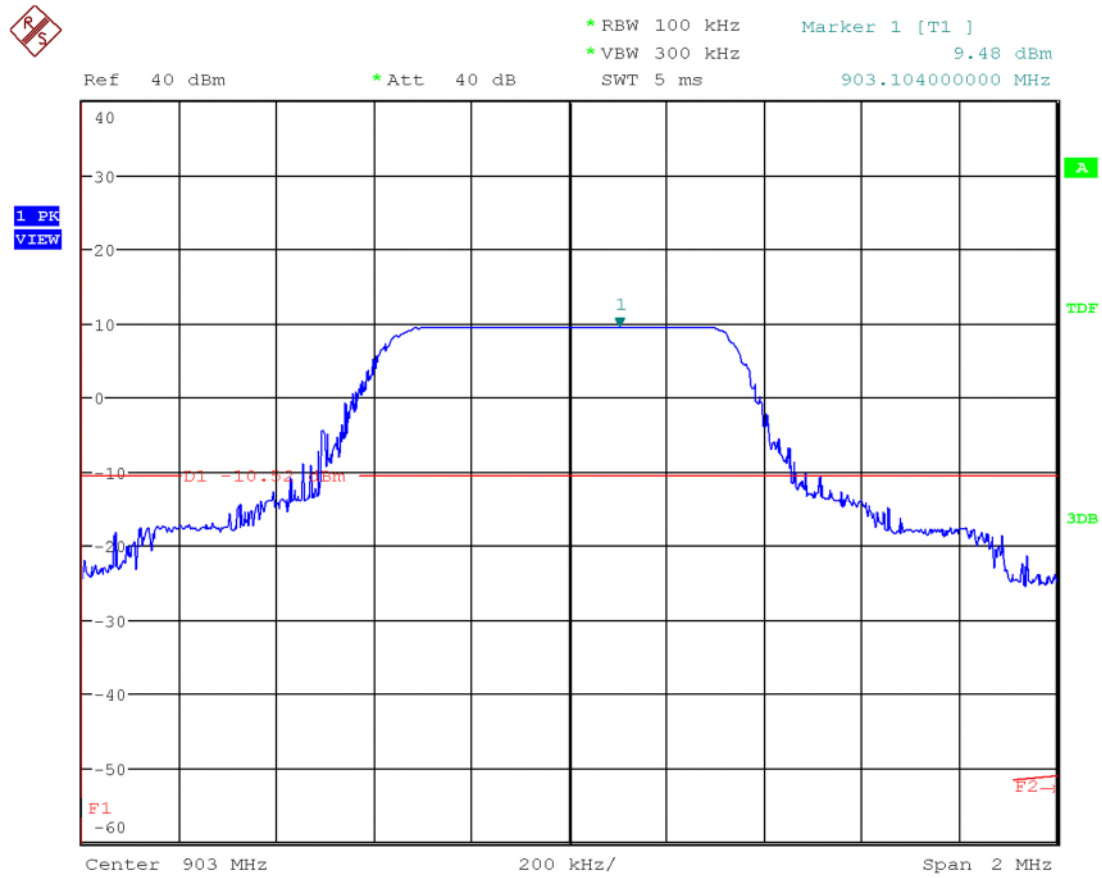
Figure 8: D03\_02\_PKPSD\_ChMid\_DTS



Date: 1.SEP.2021 13:39:29

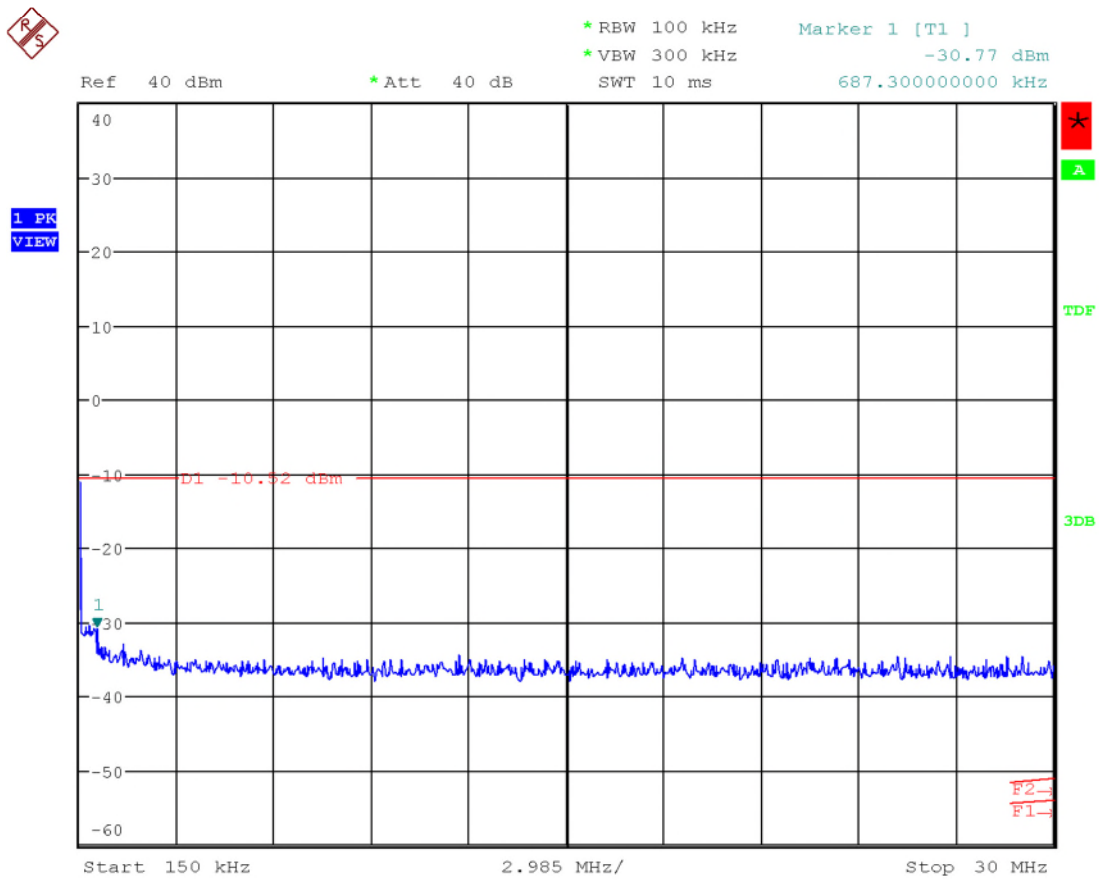
Figure 9: D03\_03\_PKPSD\_ChHigh\_DTS

### 1.1.4 Conducted spurious emissions, §15.247(d)



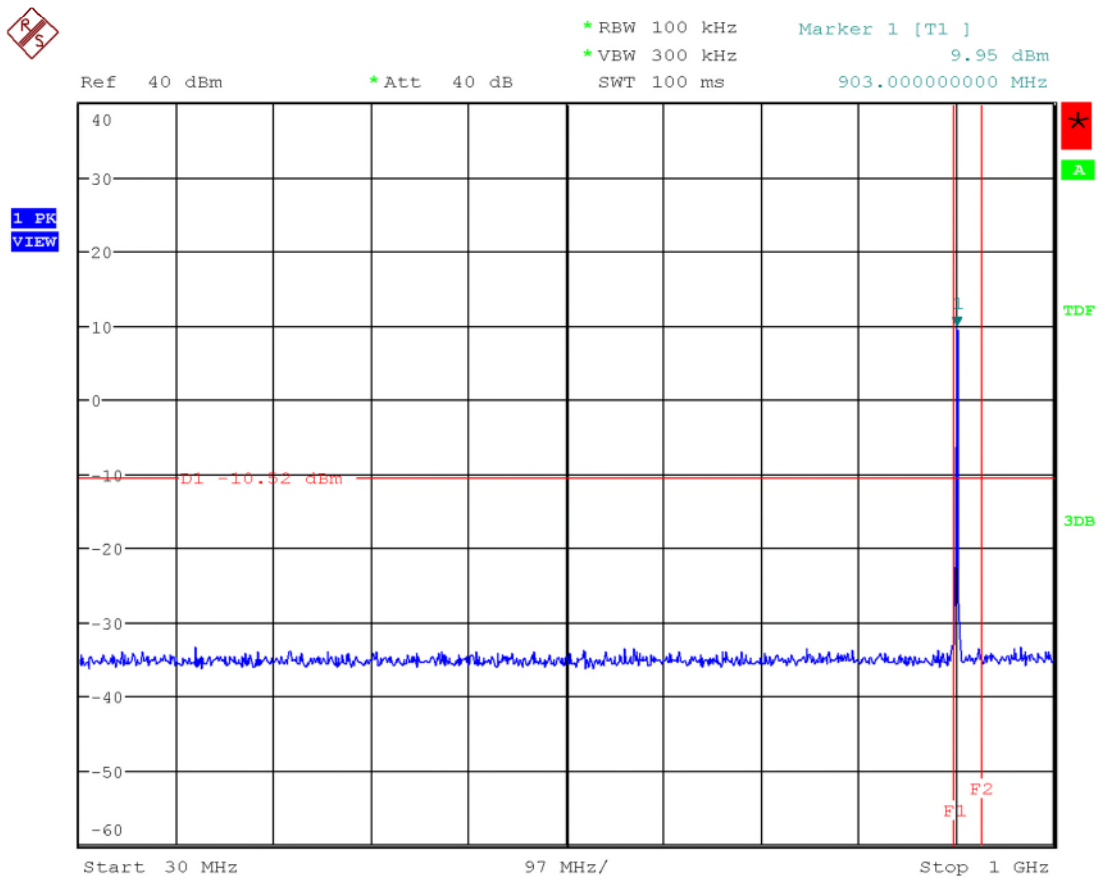
Date: 1.SEP.2021 14:43:40

Figure 10: D04\_01\_CSE20dBc\_Ref\_ChLow\_DTS



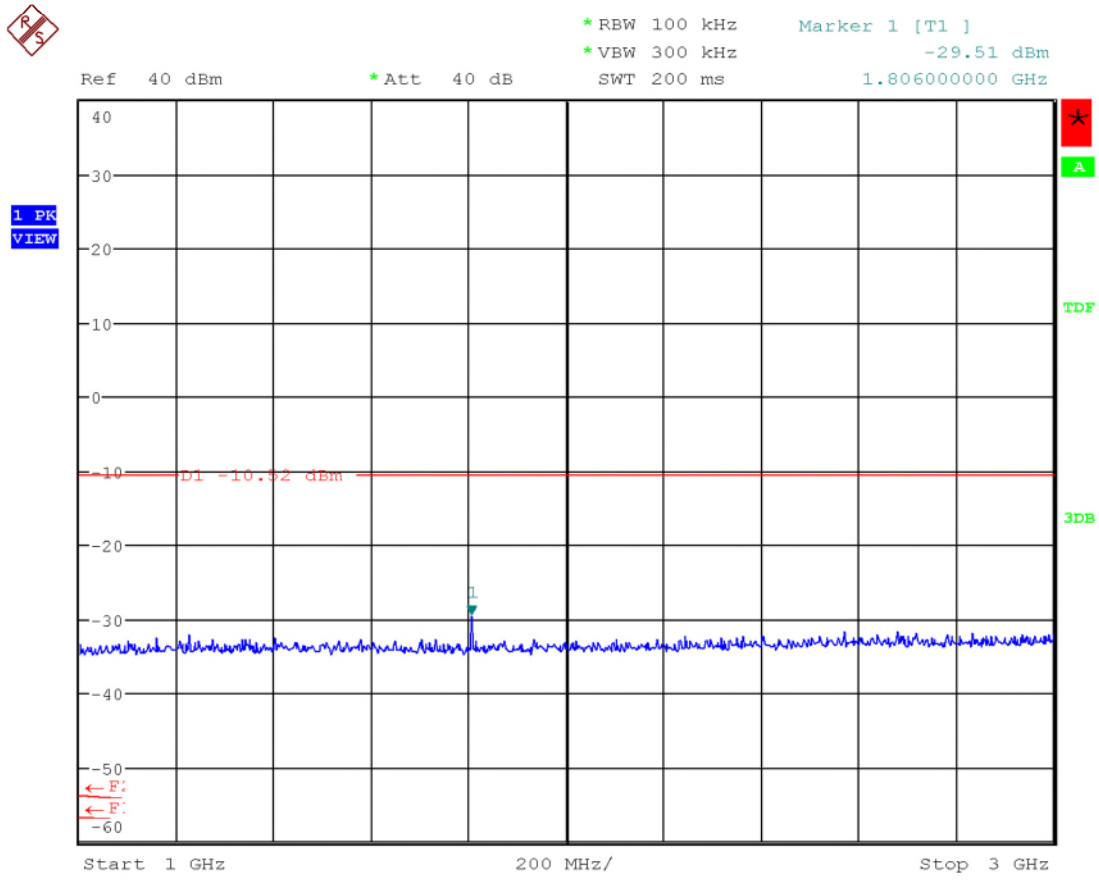
Date: 1.SEP.2021 15:17:40

Figure 11: D04\_02\_CSE20dBc\_Sweep1\_ChLow\_DTS



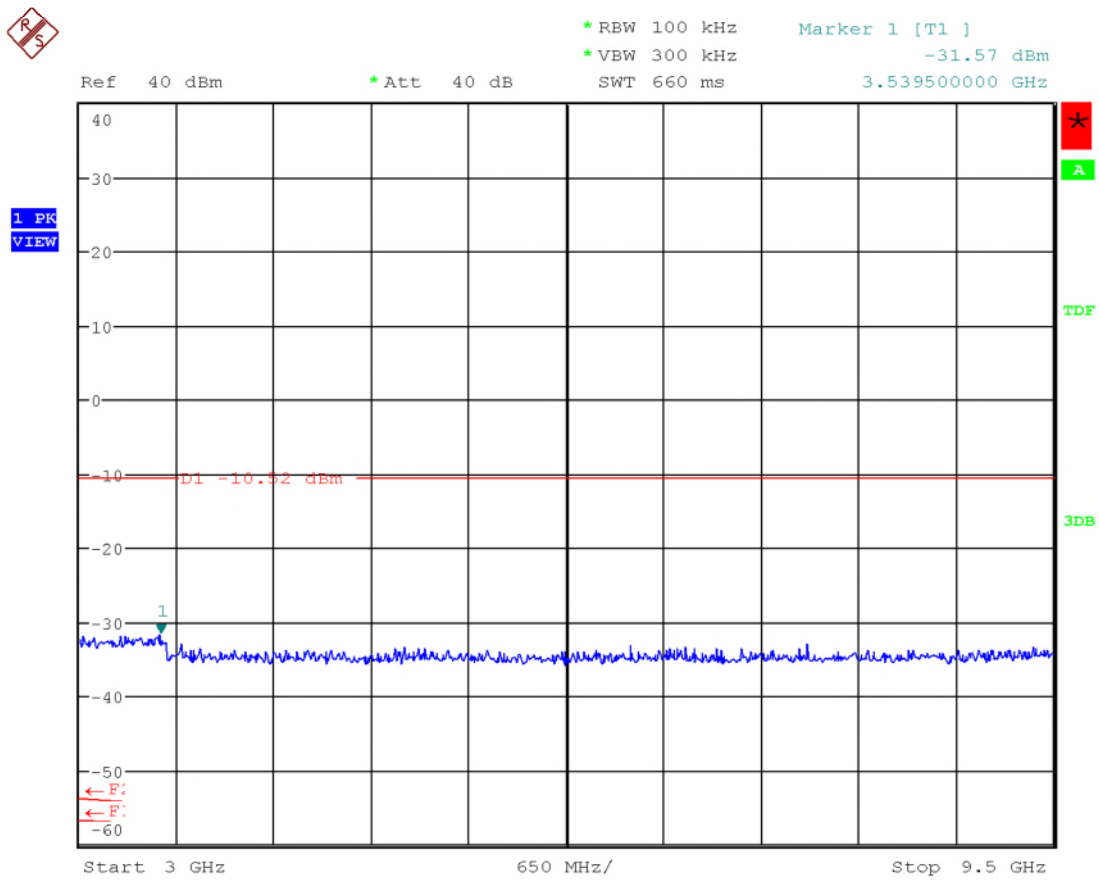
Date: 1.SEP.2021 15:11:30

Figure 12: D04\_03\_CSE20dBc\_Sweep2\_ChLow\_DTS



Date: 1.SEP.2021 15:07:44

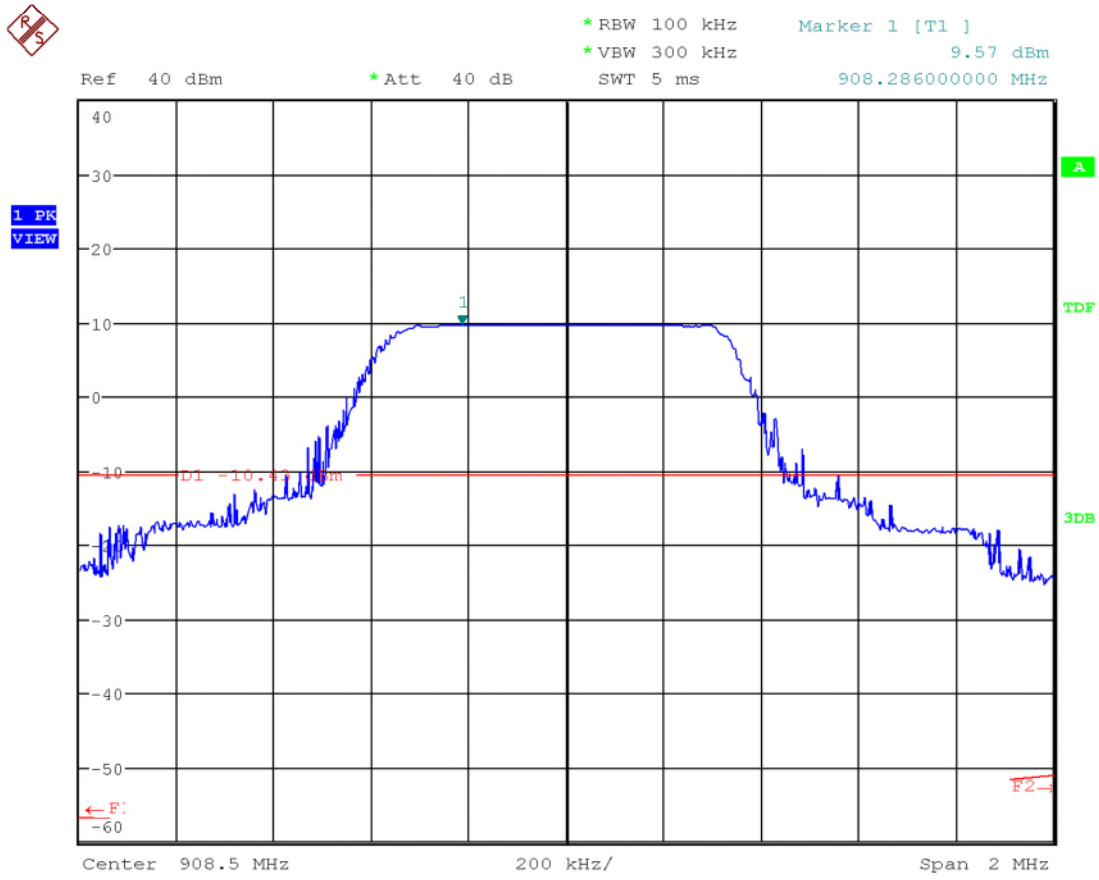
Figure 13: D04\_04\_CSE20dBc\_Sweep3\_ChLow\_DTS



Date: 1.SEP.2021 14:52:20

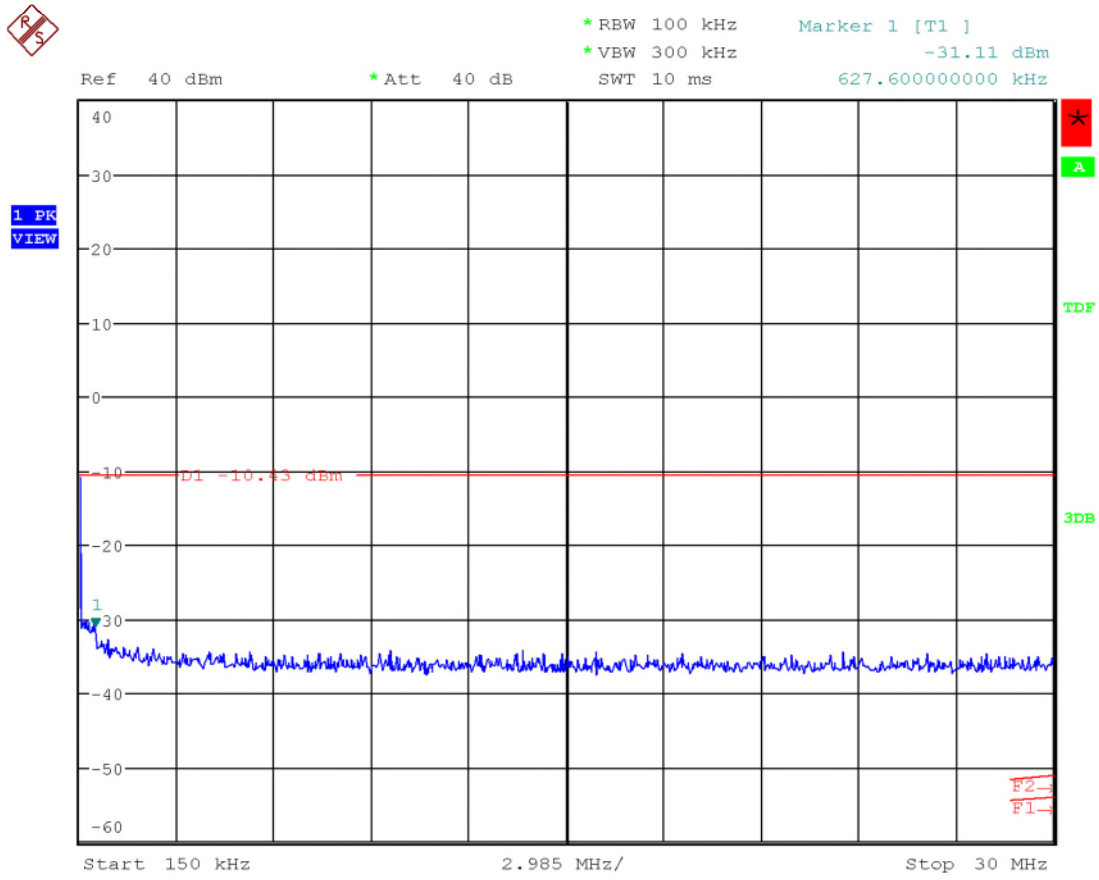
Figure 14: D04\_05\_CSE20dBc\_Sweep4\_ChLow\_DTS





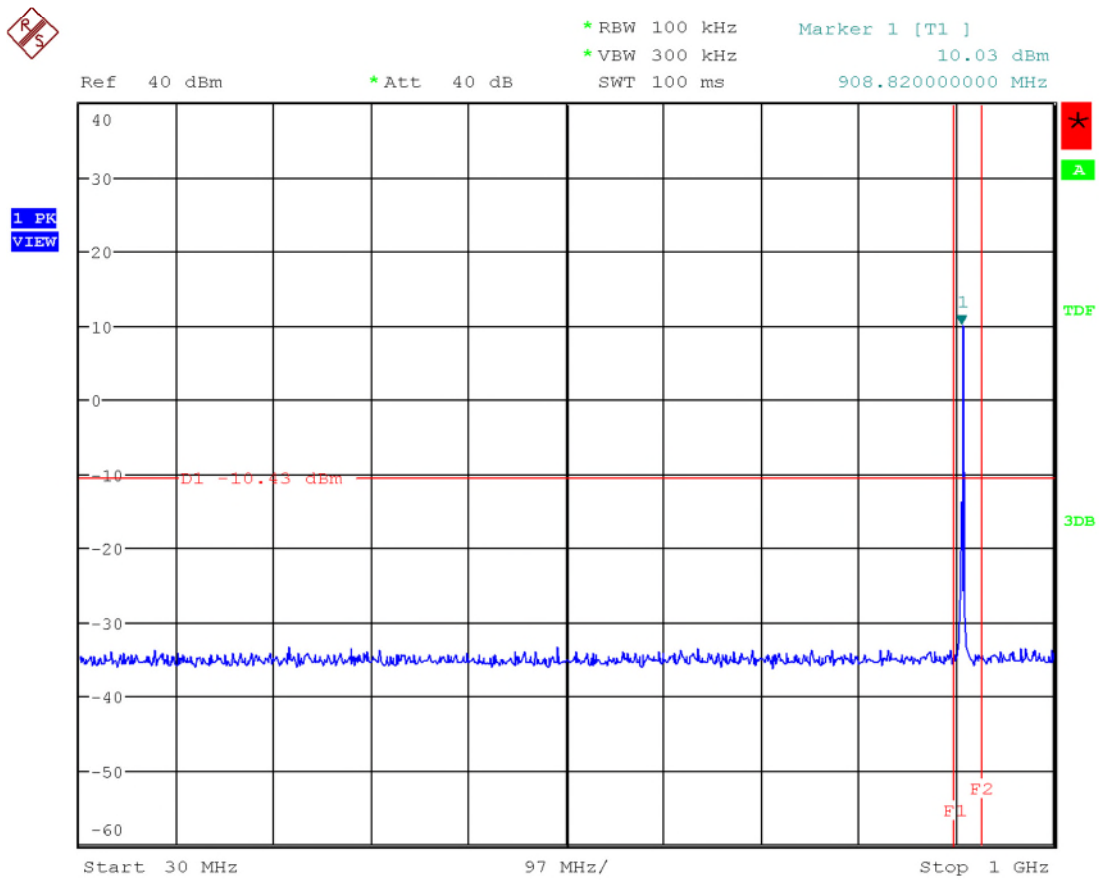
Date: 1.SEP.2021 15:50:49

Figure 15: D05\_01\_CSE20dBc\_Ref\_ChMid\_DTS



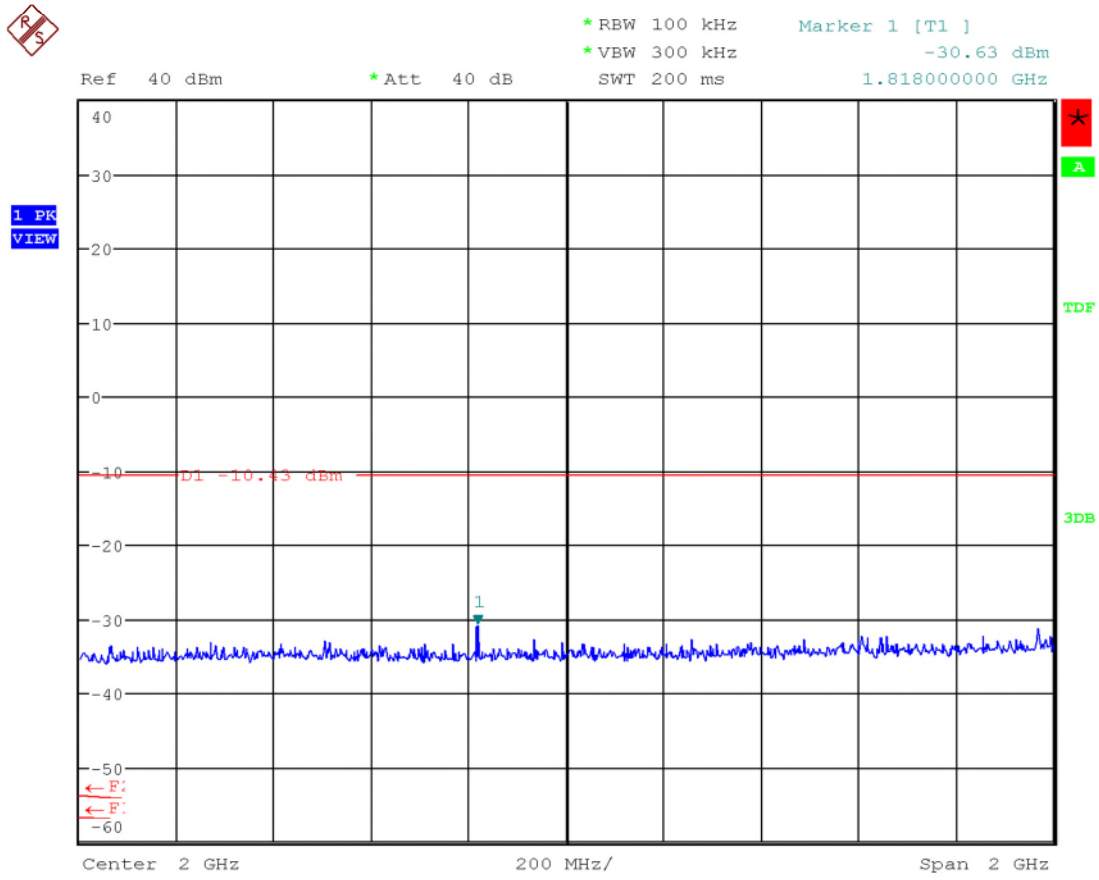
Date: 1.SEP.2021 16:13:13

Figure 16: D05\_02\_CSE20dBc\_Sweep1\_ChMid\_DTS



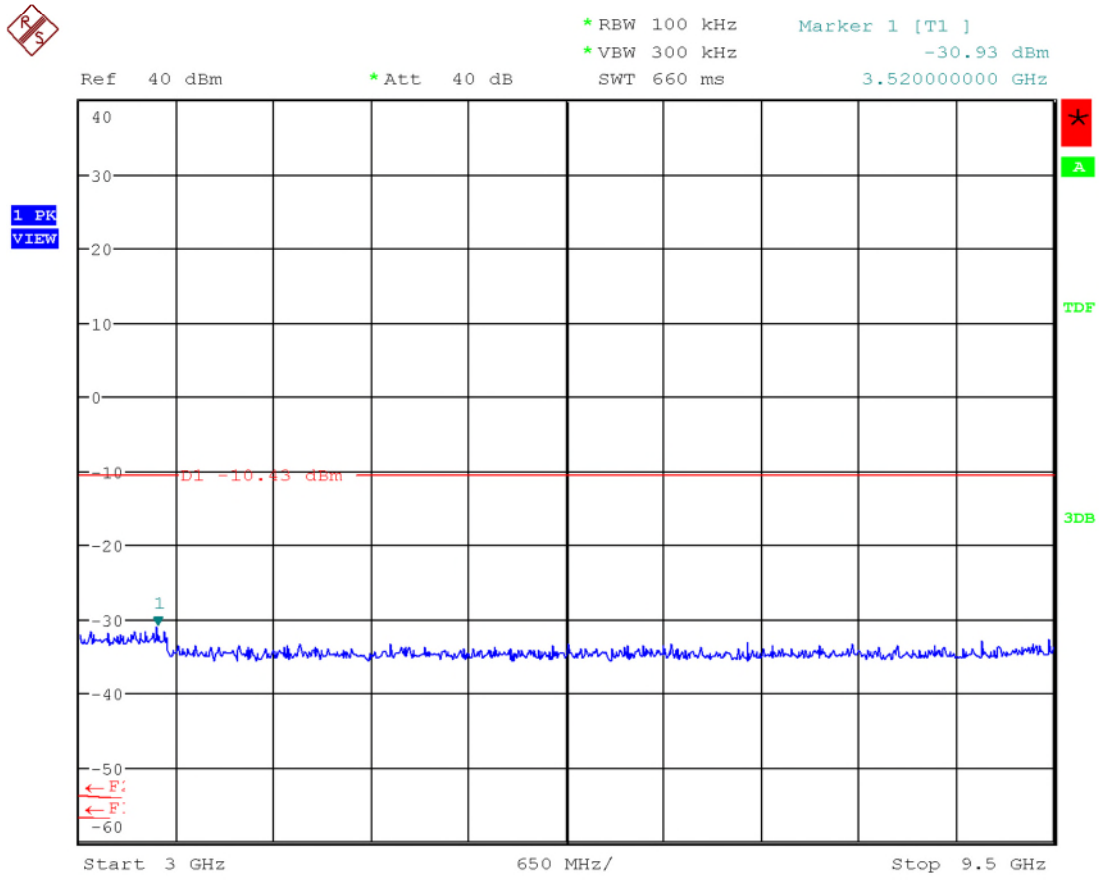
Date: 1.SEP.2021 16:07:19

Figure 17: D05\_03\_CSE20dBc\_Sweep2\_ChMid\_DTS



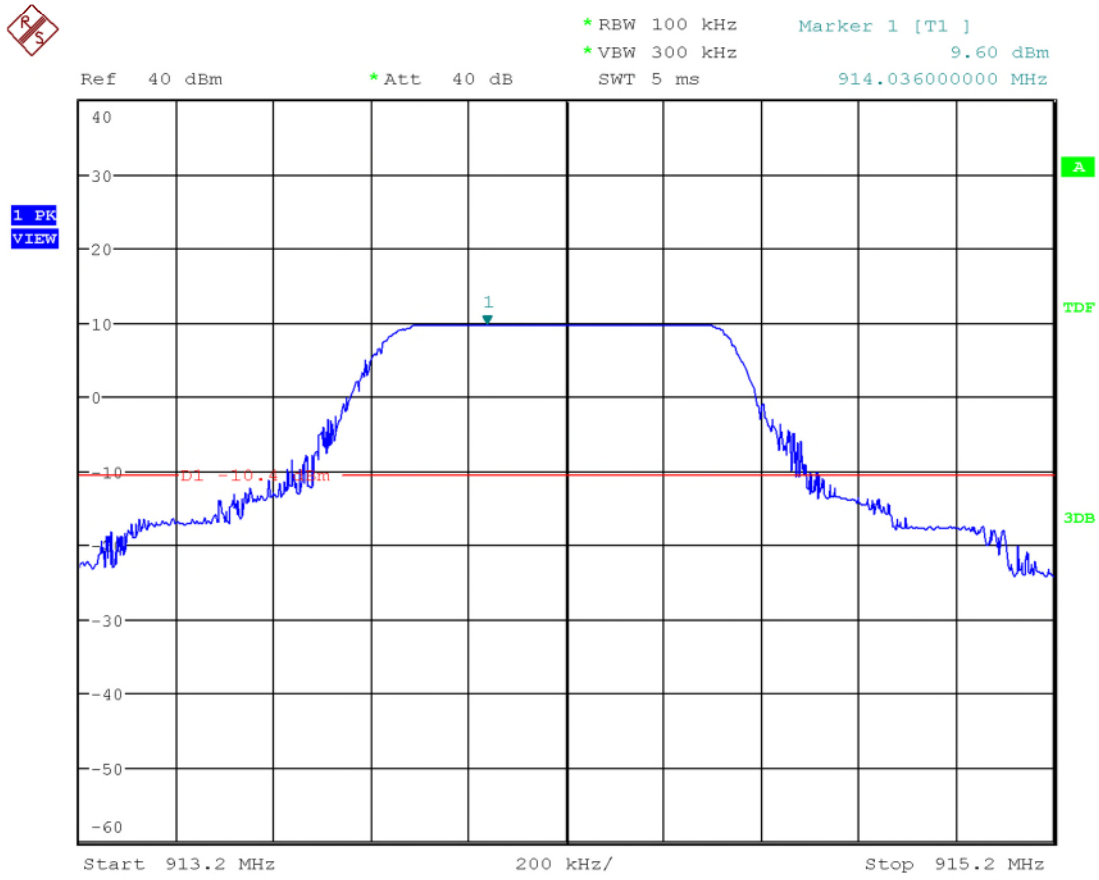
Date: 1.SEP.2021 16:03:04

Figure 18: D05\_04\_CSE20dBc\_Sweep3\_ChMid\_DTS



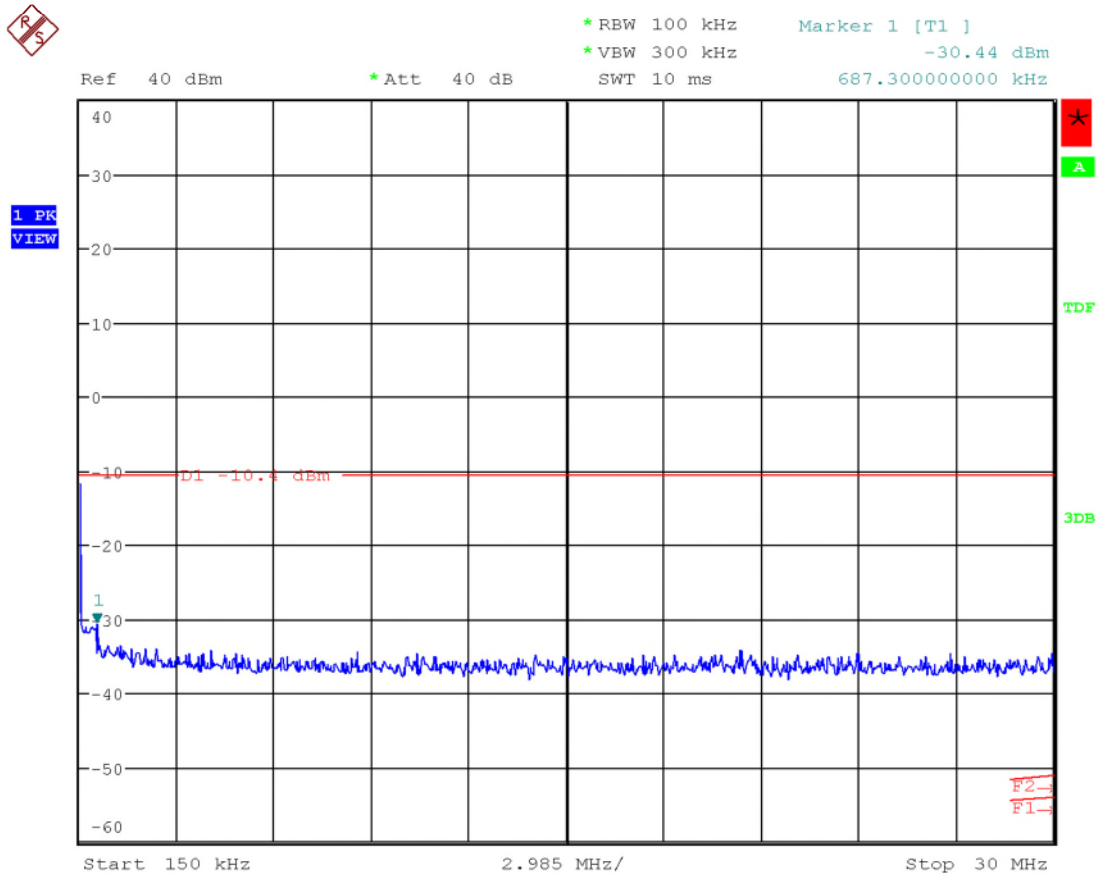
Date: 1.SEP.2021 16:00:47

Figure 19: D05\_05\_CSE20dBc\_Sweep4\_ChMid\_DTS



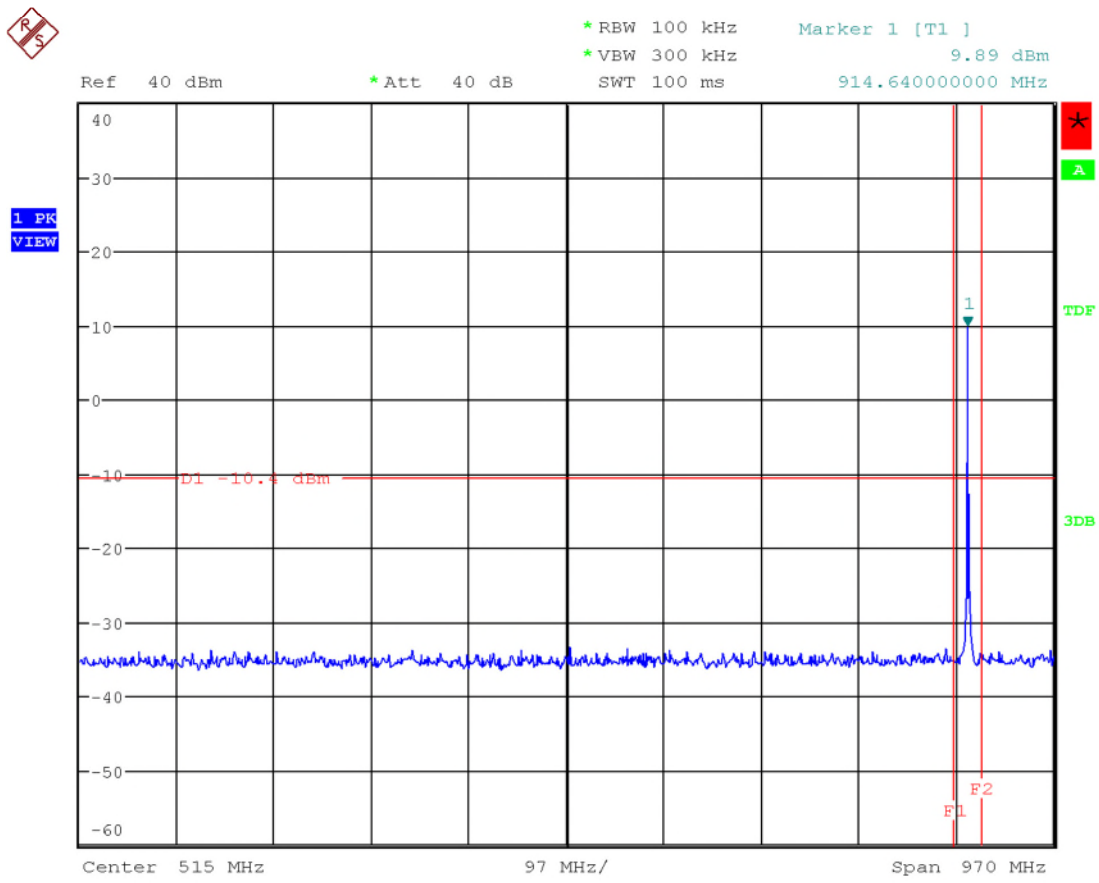
Date: 1.SEP.2021 14:20:39

Figure 20: D06\_01\_CSE20dBc\_Ref\_ChHigh\_DTS



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

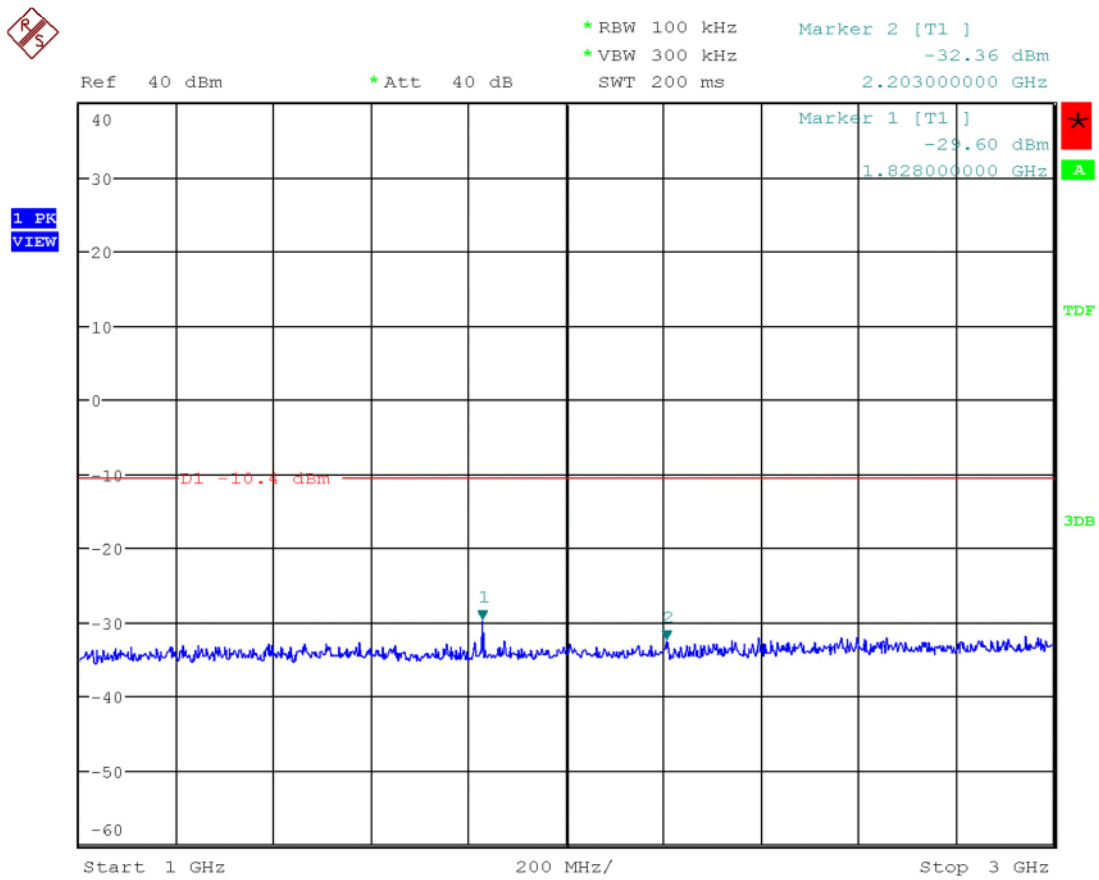
Figure 21: D06\_02\_CSE20dBc\_Sweep1\_ChHigh\_DTS



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

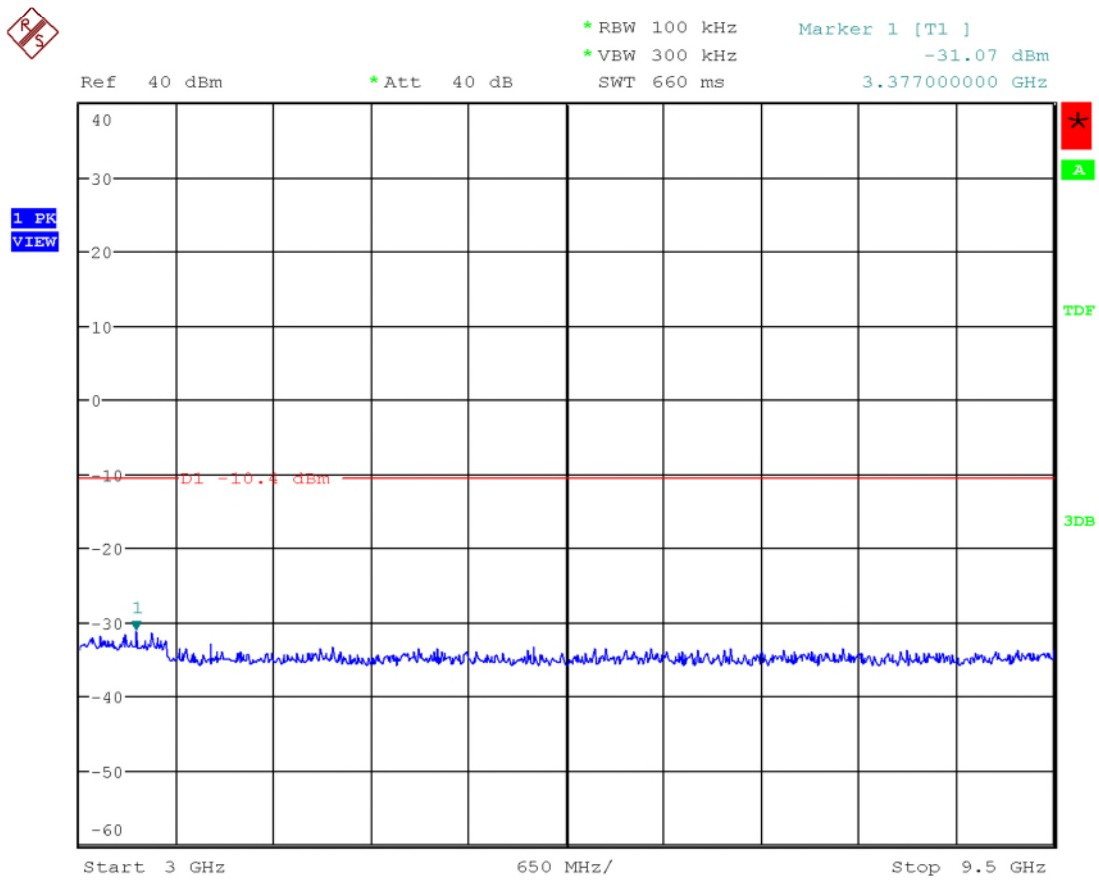
Figure 22: D06\_03\_CSE20dBc\_Sweep2\_ChHigh\_DTS





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

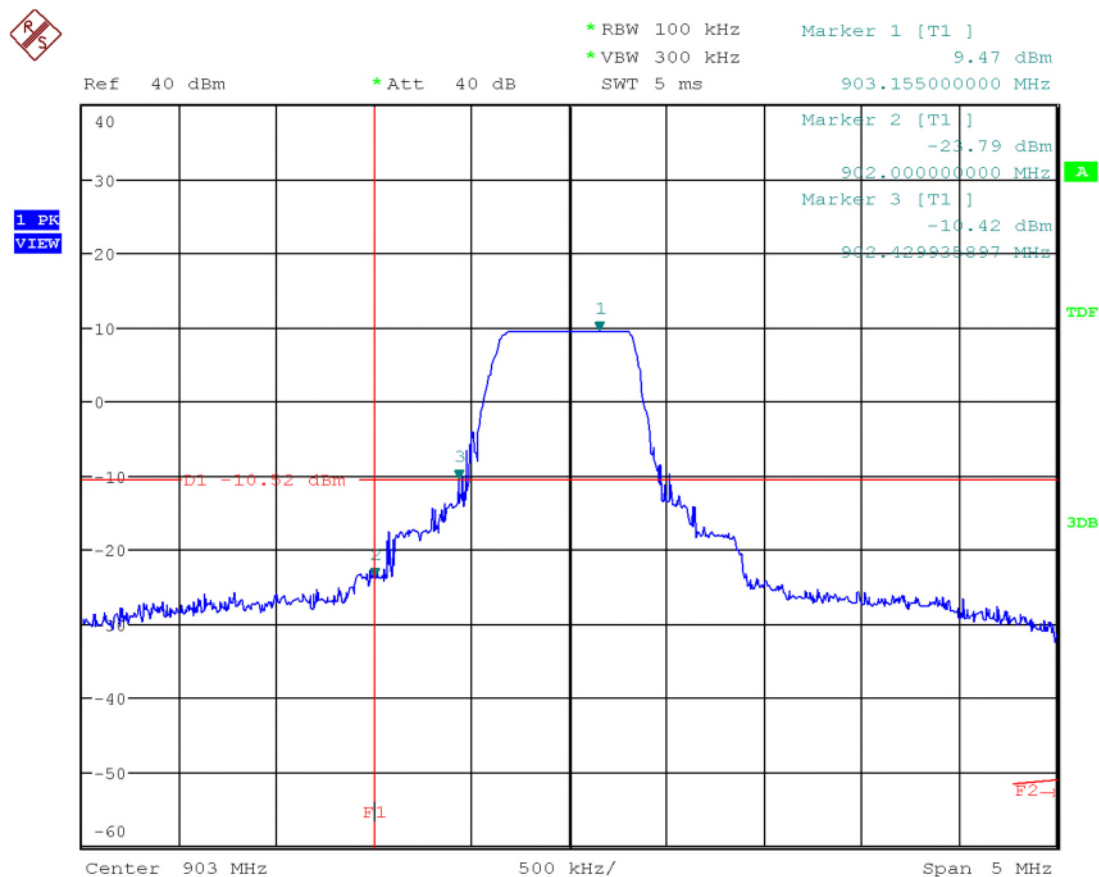
Figure 23: D06\_04\_CSE20dBc\_Sweep3\_ChHigh\_DTS



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

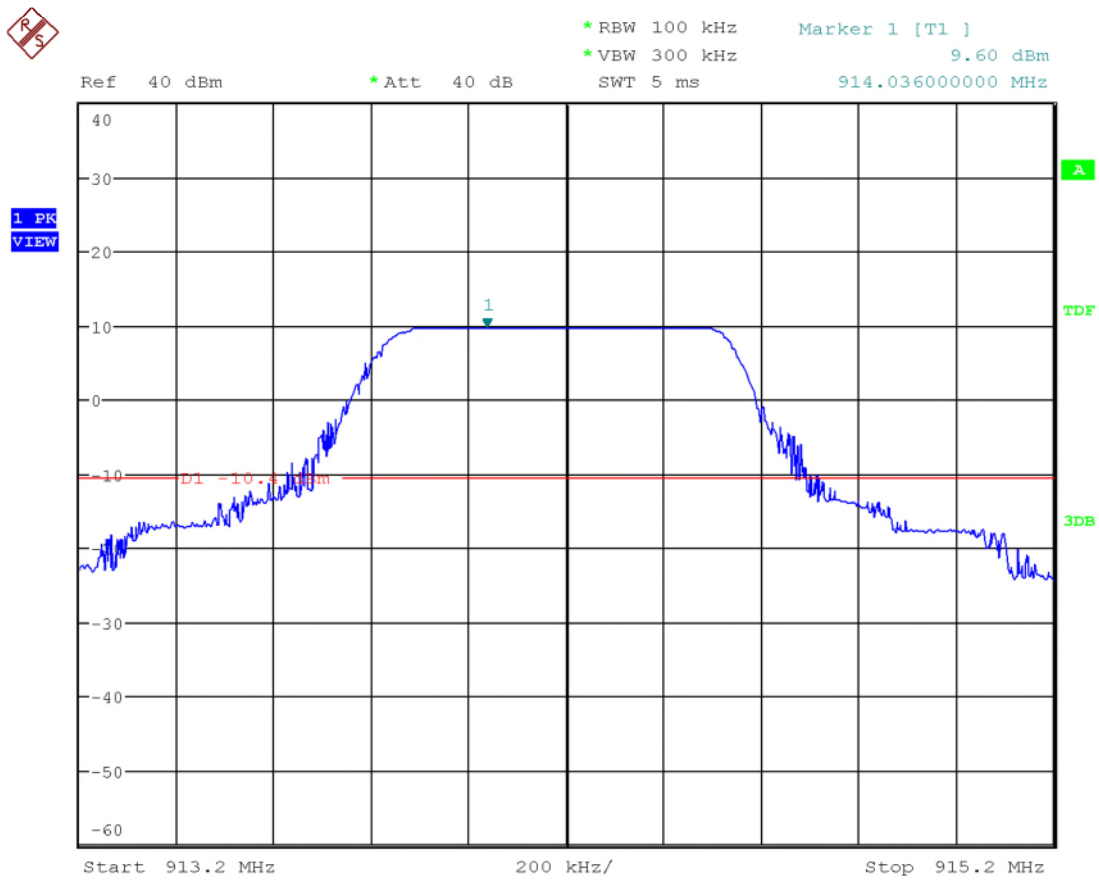
Figure 24: D06\_05\_CSE20dBc\_Sweep4\_ChHigh\_DTS

### 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**

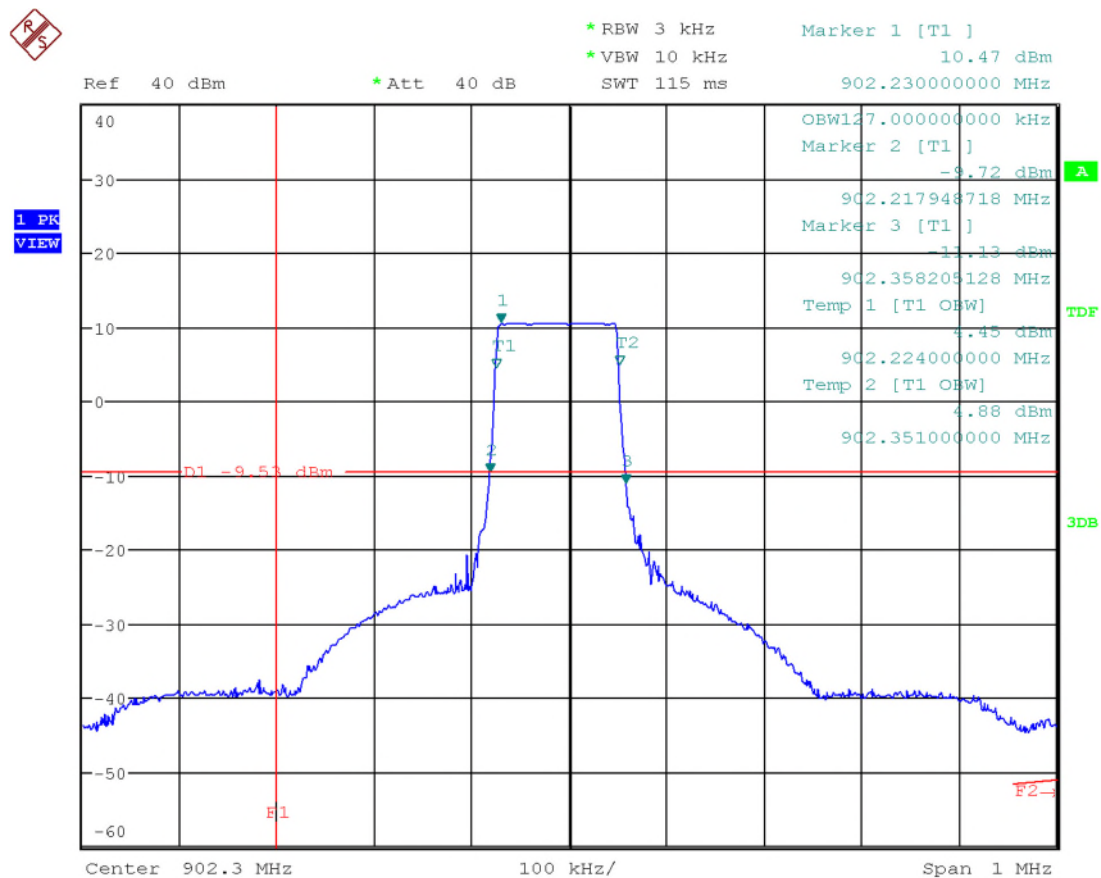
Remark: since the channel bandwidth of 500 kHz in respect to the margin of the band edge at 928 MHz is 14 MHz, the measurement is uncritical

### **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.

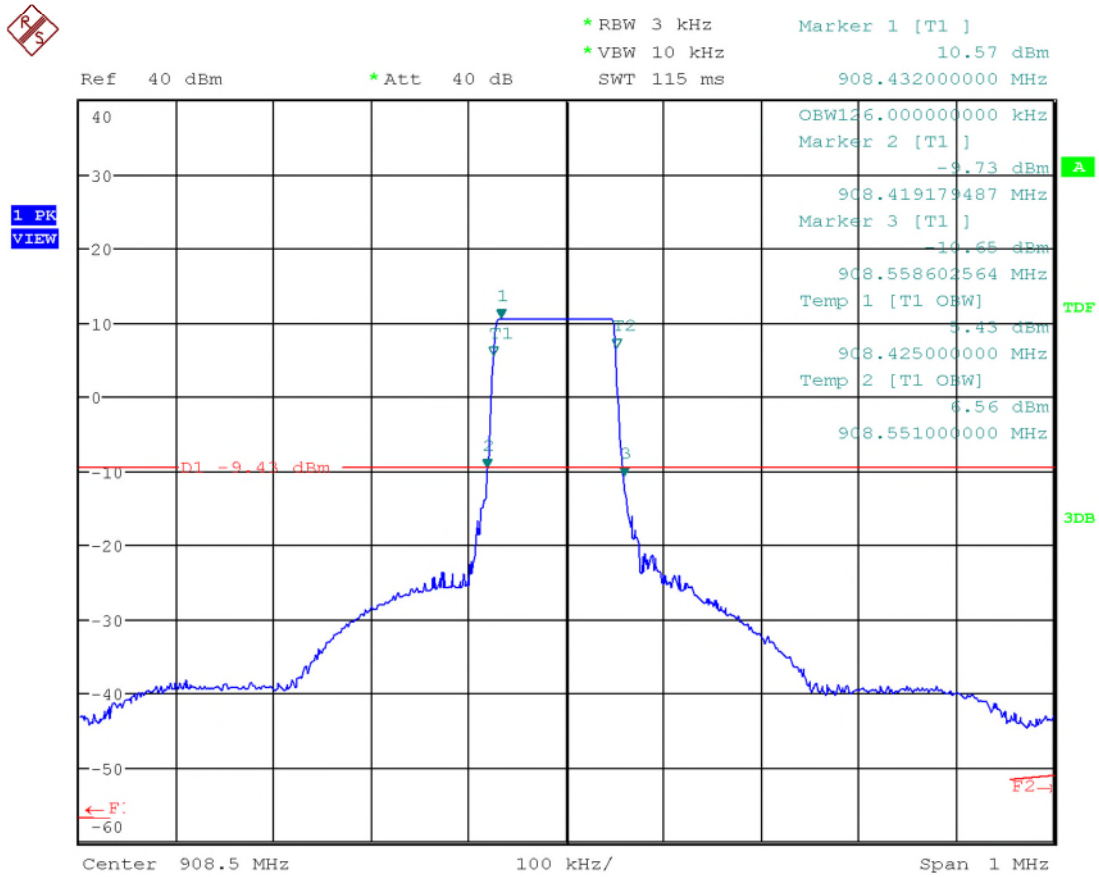
## 1.2 FHSS mode

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



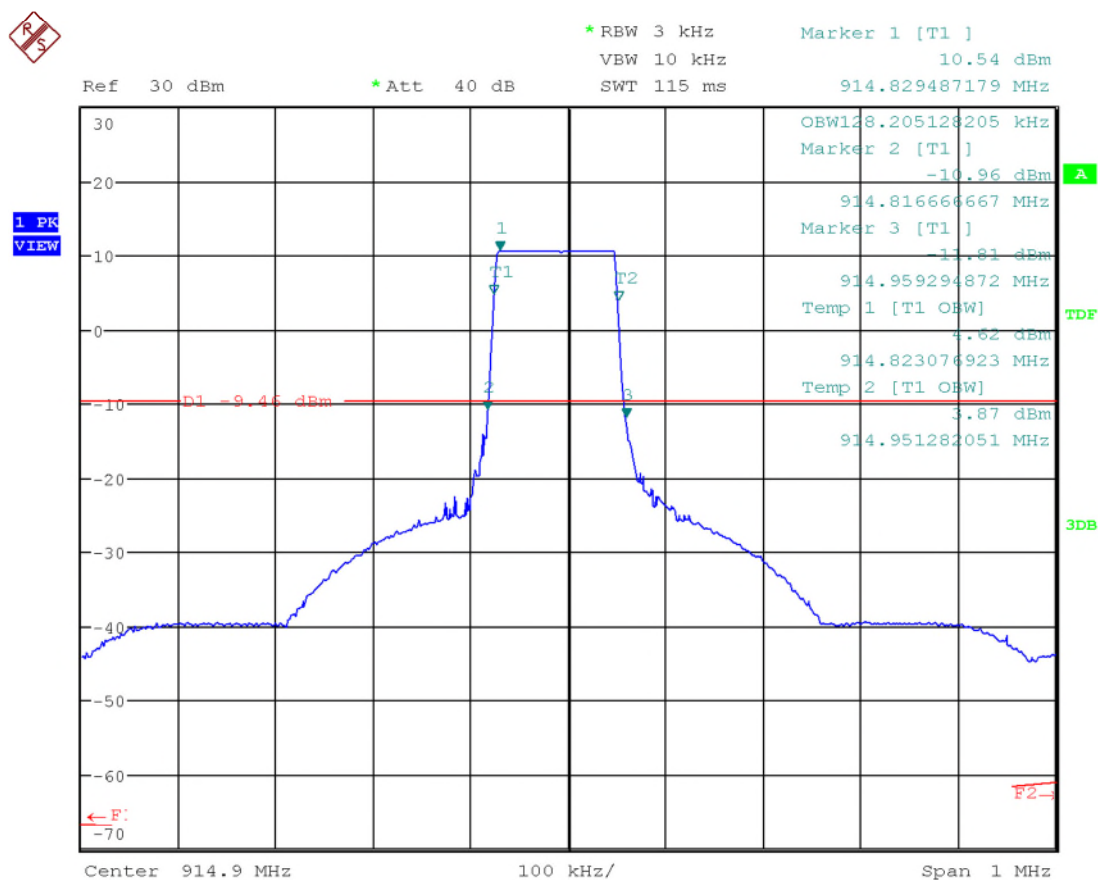
Date: 3.SEP.2021 15:11:29

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

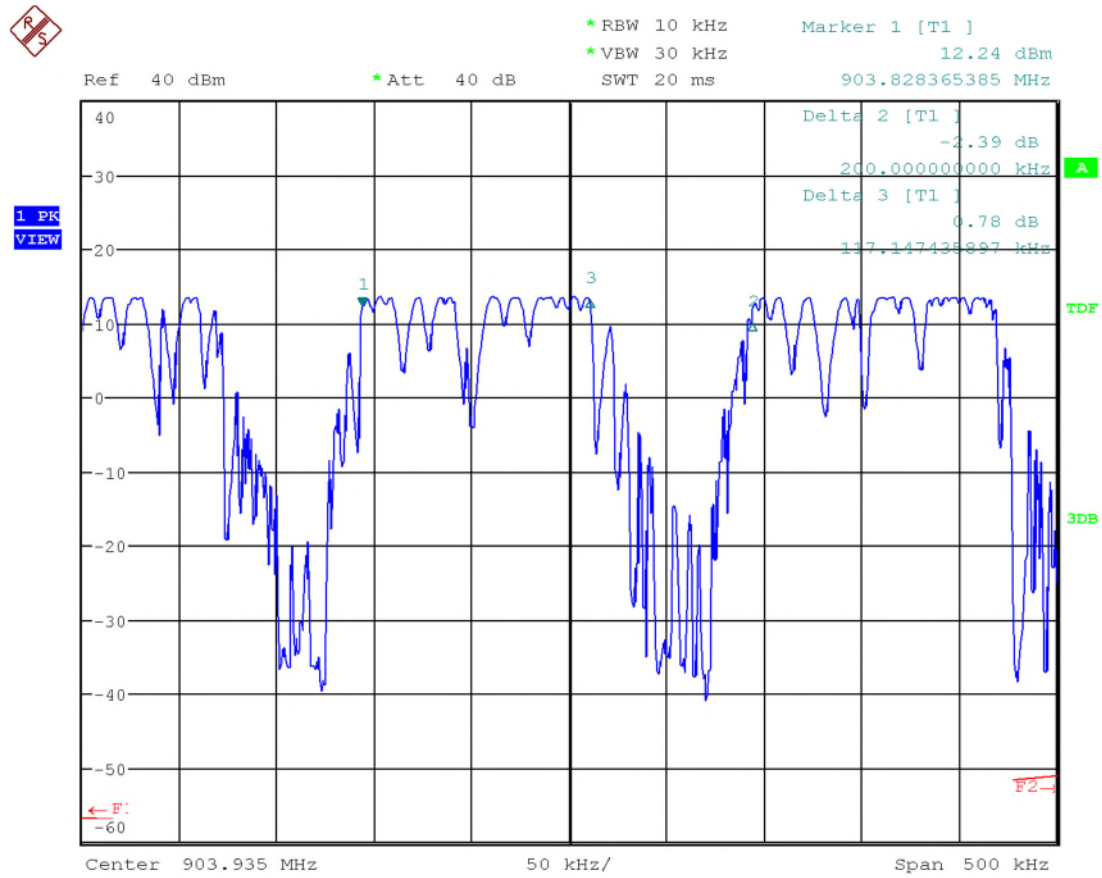


Date: 5.MAY.2022 16:56:41

Figure 29: D08\_03\_FHSSBW+99%OBW\_ChHigh\_FHSS



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

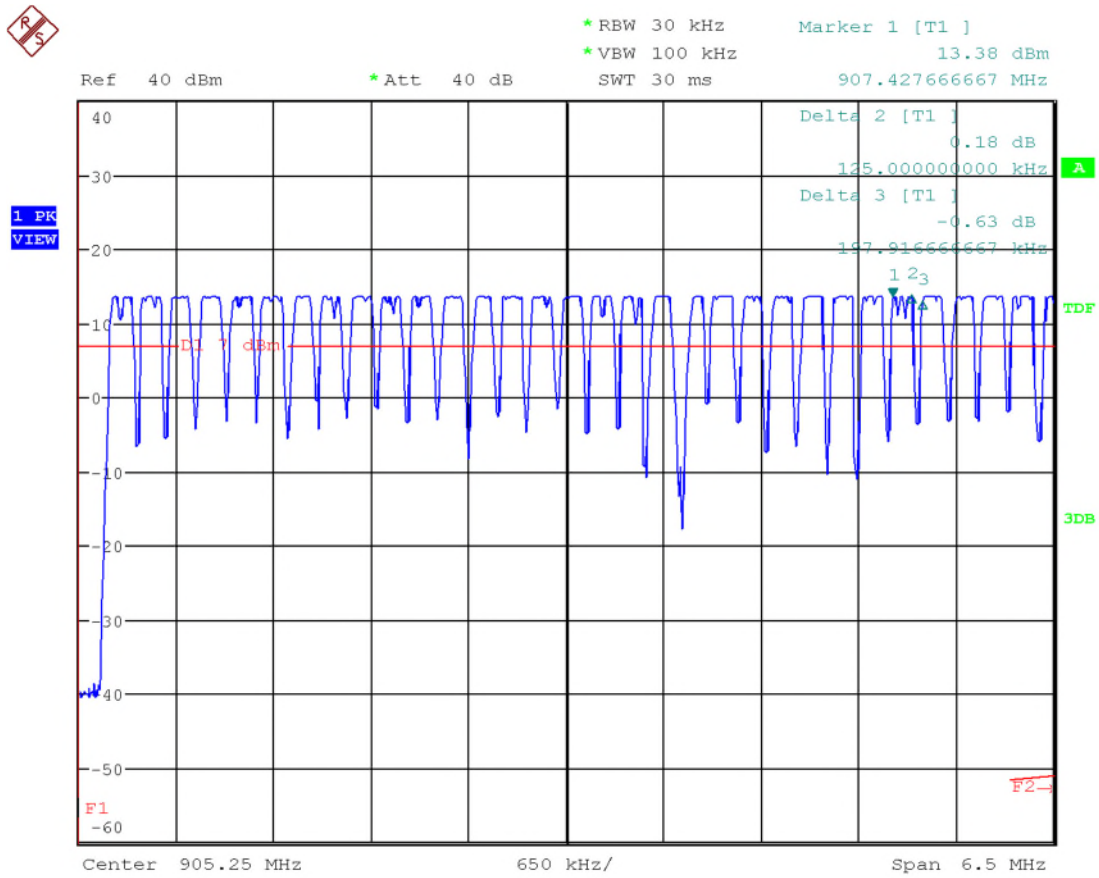


Date: 2.SEP.2021 13:37:28

**Figure 30: D09\_01\_FreqSep\_FHSS**

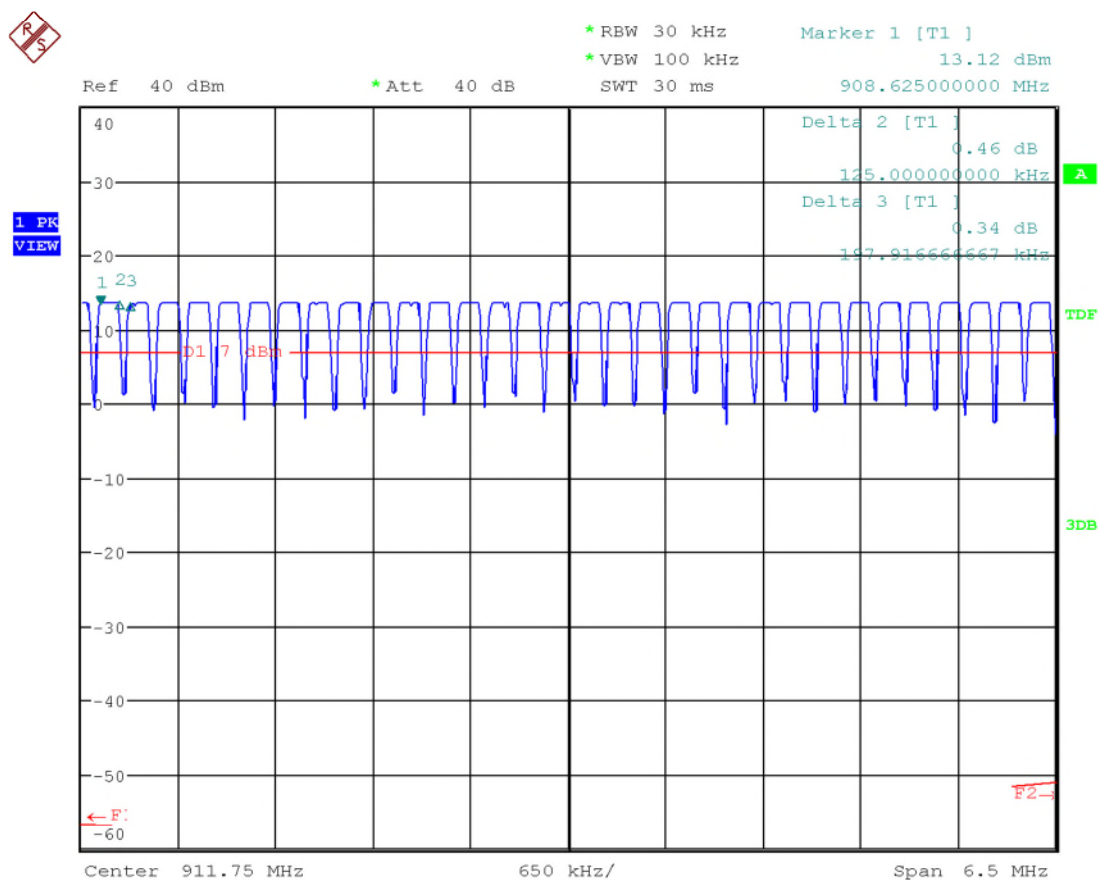
Channel distance: measured between Marker1 and Delta Marker2.

### 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