

APPENDIX E - NUMBER OF HOPPING FREQUENCY

Test Mode: TX Mode_1Mbps

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS

Test Graphs



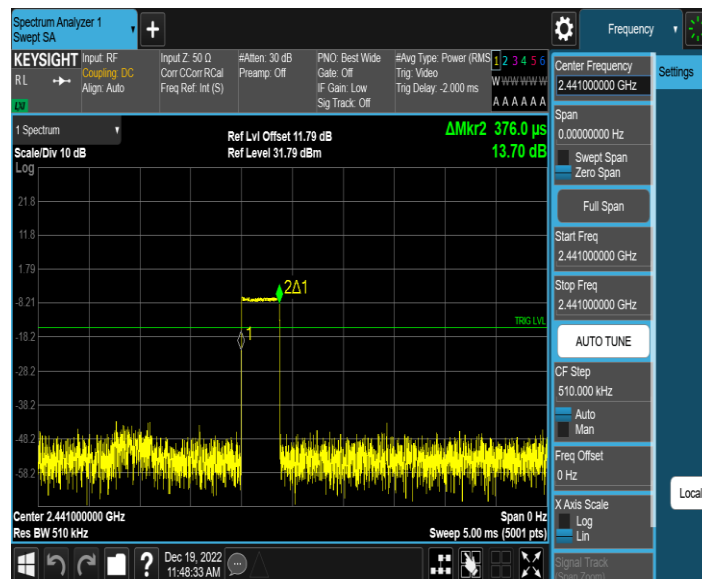
APPENDIX F - AVERAGE TIME OF OCCUPANCY

Test Mode	Hopping Mode_1Mbps
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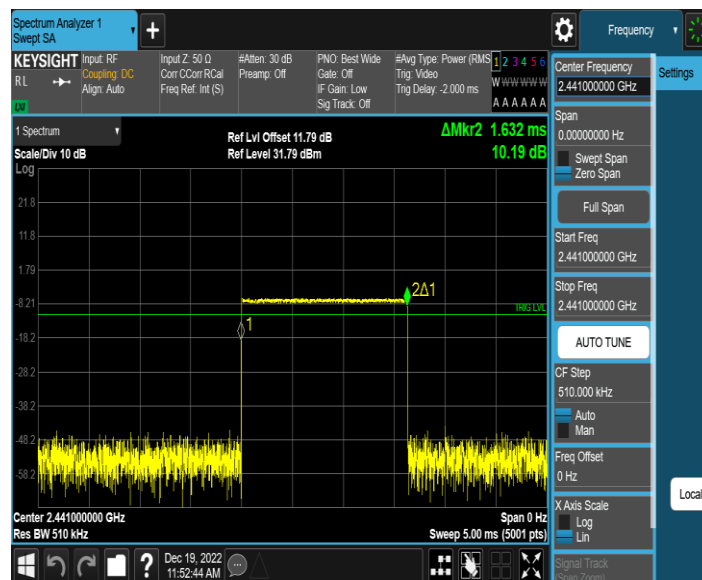
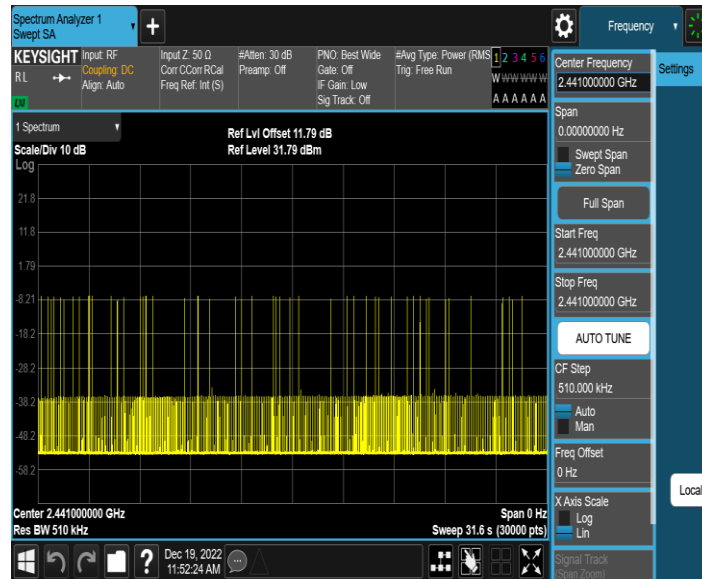
Test Mode	Antenna	Channel	Burst Width [ms]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.376	0.120	≤0.4	PASS
DH3	Ant1	Hop	1.632	0.261	≤0.4	PASS
DH5	Ant1	Hop	2.880	0.316	≤0.4	PASS

Test Graphs

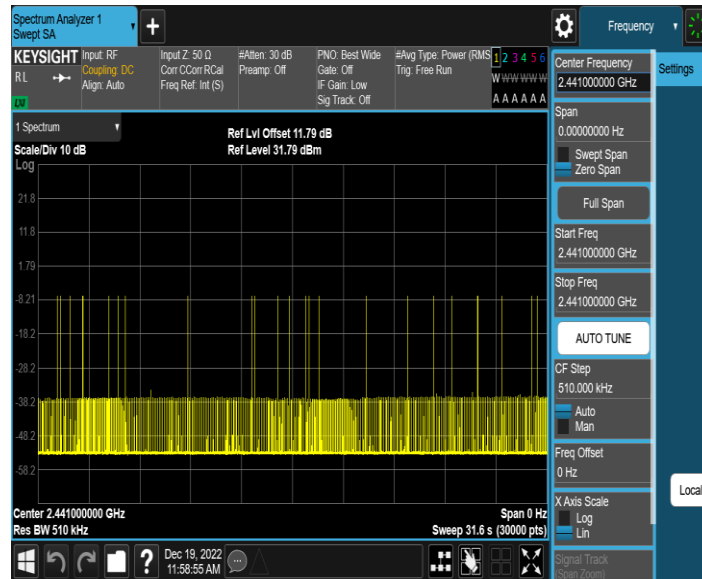
DH1_Ant1_Hop



DH3_Ant1_Hop



DH5_Ant1_Hop



APPENDIX G - HOPPING CHANNEL SEPARATION

Test Mode	Hopping Mode_1Mbps
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Test Mode	Antenna	Channel	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Hop	1.024	≥ 0.951	PASS
2DH5	Ant1	Hop	1.126	≥ 0.918	PASS

Test Graphs



APPENDIX H - BANDWIDTH

20dB Emission Bandwidth

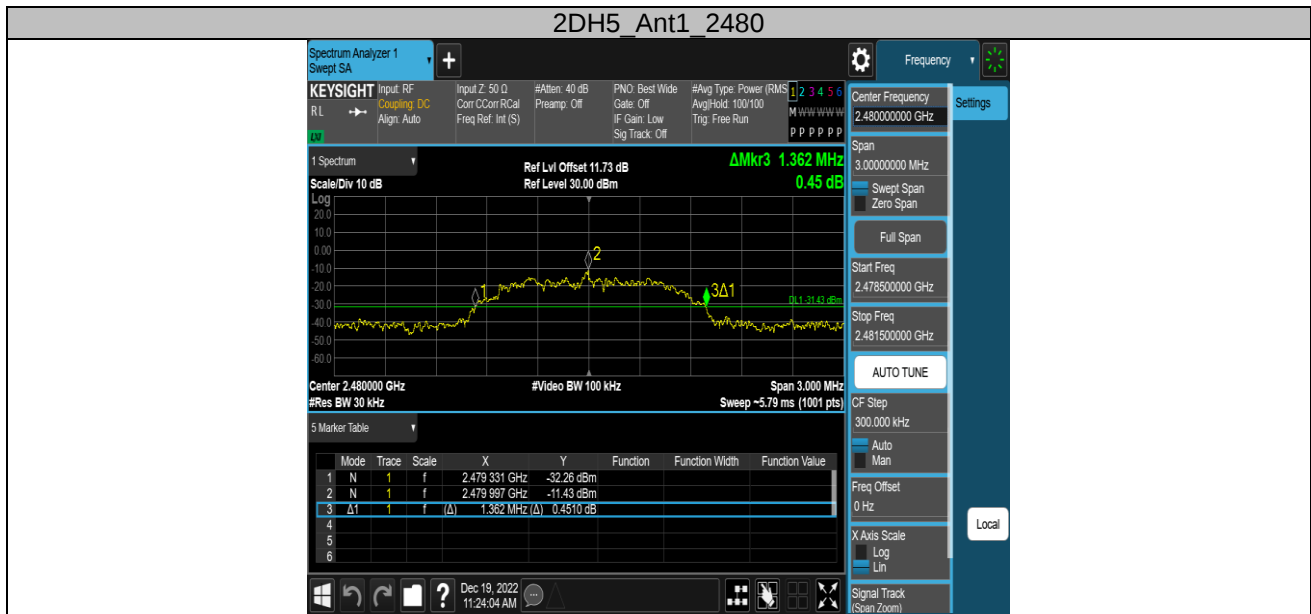
Test Mode	TX Mode _1Mbps
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Test Mode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.873	2401.547	2402.420	---	---
		2441	0.864	2440.553	2441.417	---	---
		2480	0.951	2479.535	2480.486	---	---
2DH5	Ant1	2402	1.377	2401.319	2402.696	---	---
		2441	1.344	2440.337	2441.681	---	---
		2480	1.362	2479.331	2480.693	---	---

Test Graphs





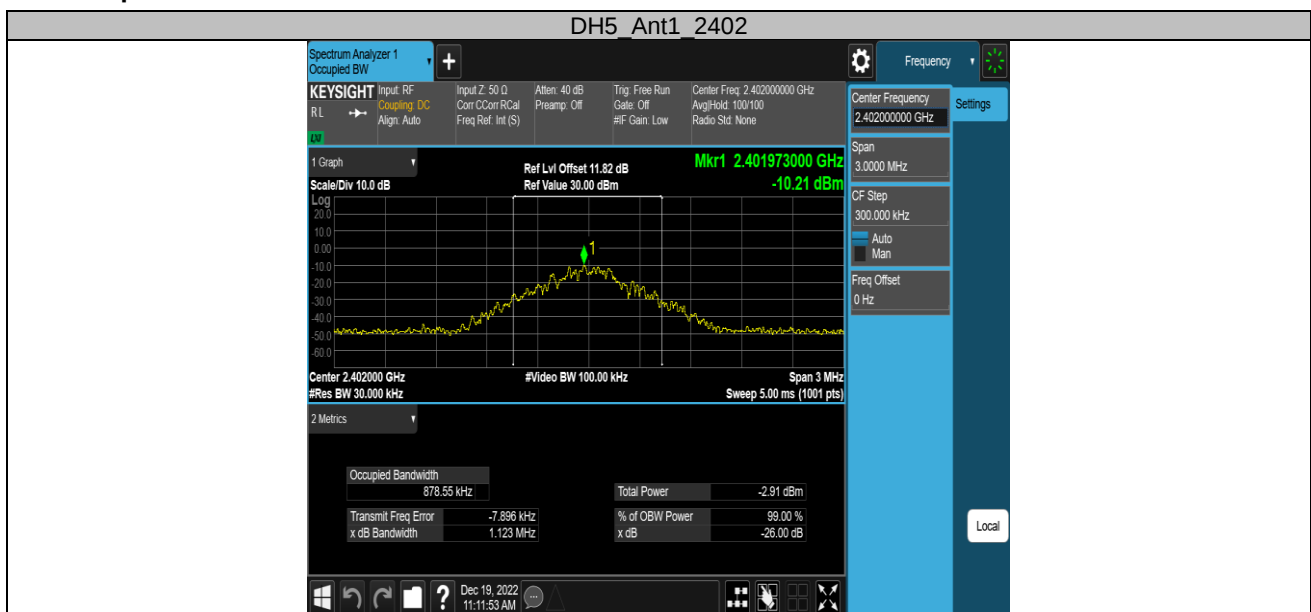


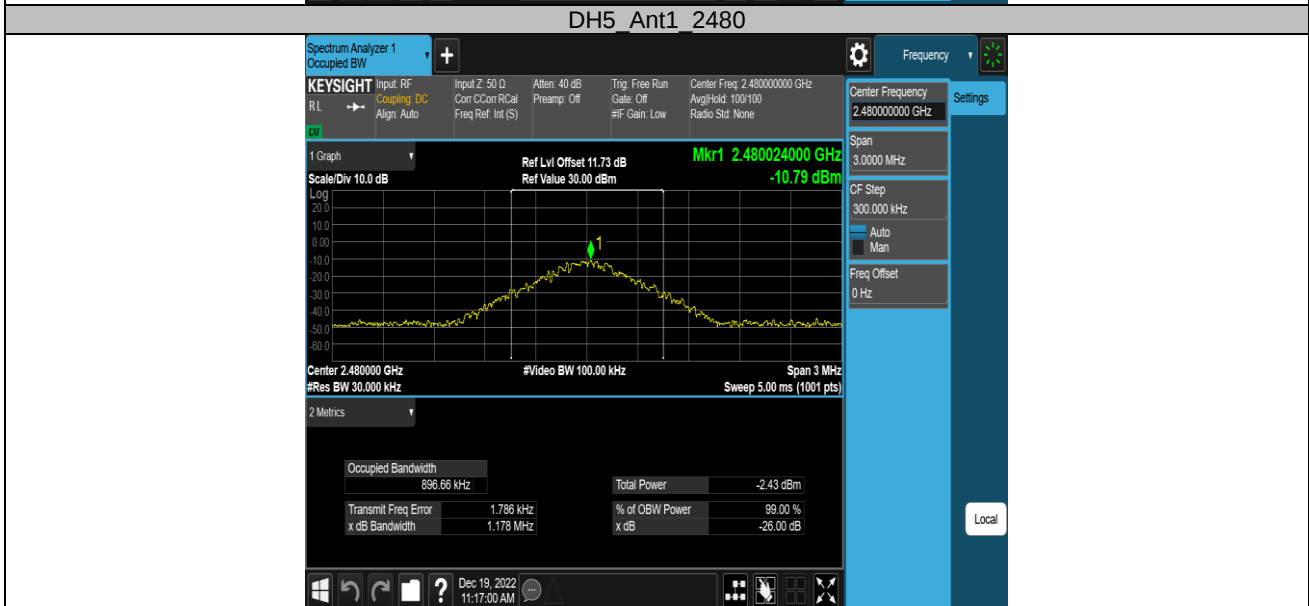
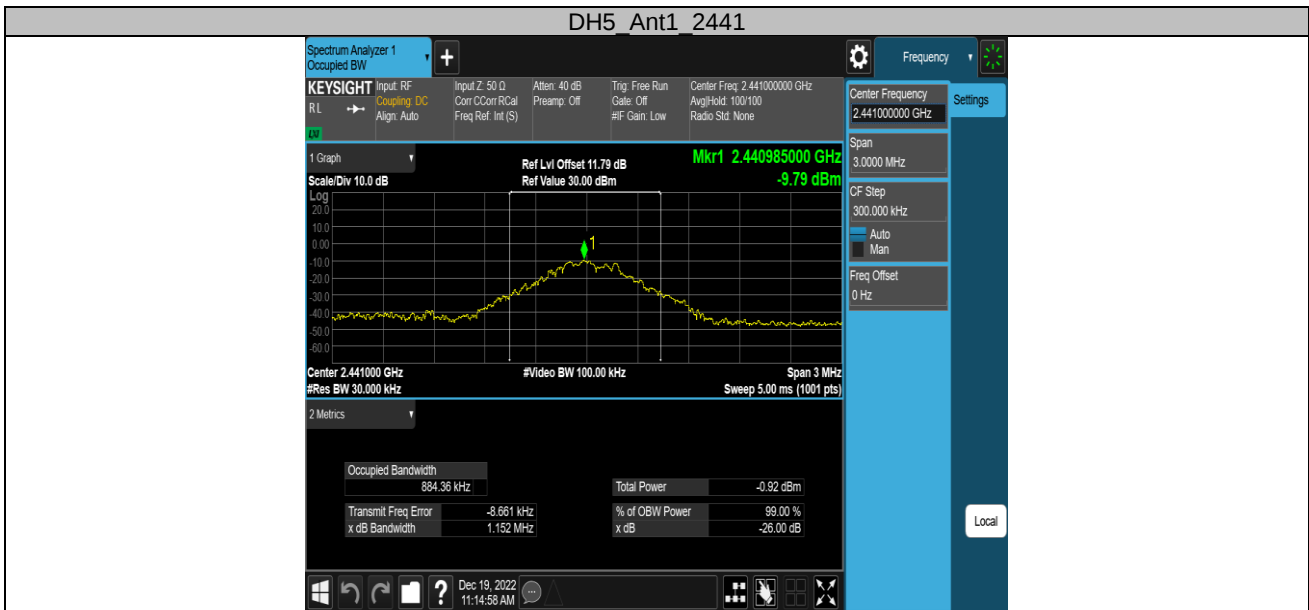
Occupied Channel Bandwidth

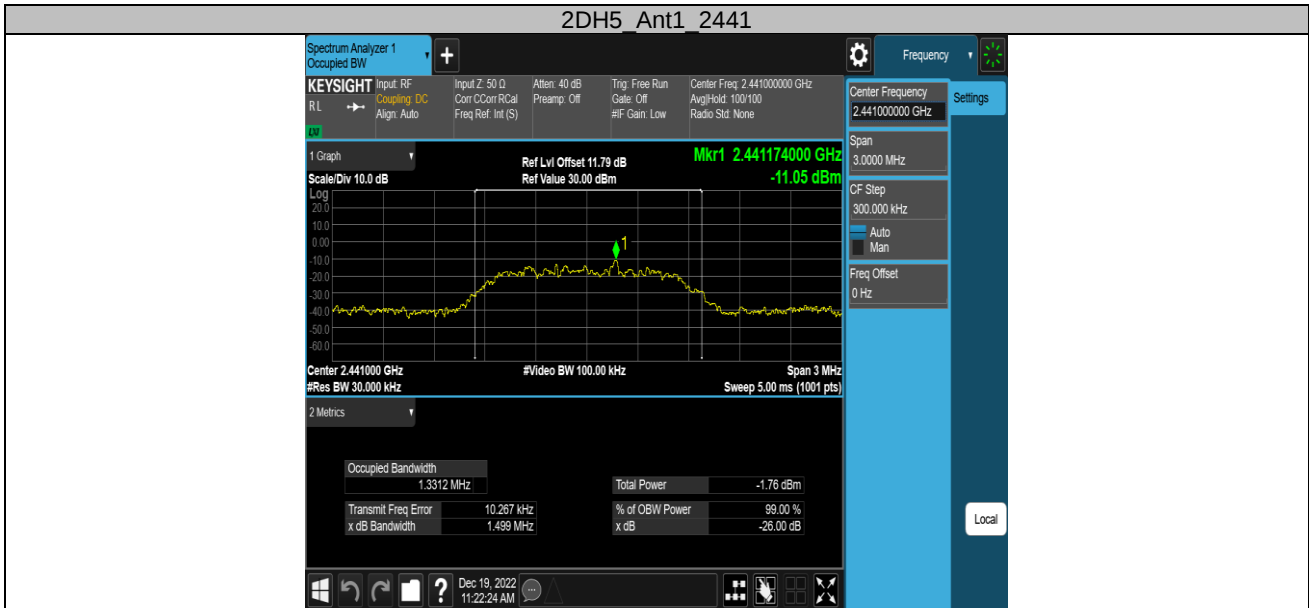
Test Mode	TX Mode _3Mbps
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TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.87855	2401.5528	2402.4314	---	---
		2441	0.88436	2440.5492	2441.4335	---	---
		2480	0.89666	2479.5535	2480.4501	---	---
2DH5	Ant1	2402	1.3413	2401.3396	2402.6809	---	---
		2441	1.3312	2440.3447	2441.6759	---	---
		2480	1.3186	2479.3477	2480.6663	---	---

Test Graphs





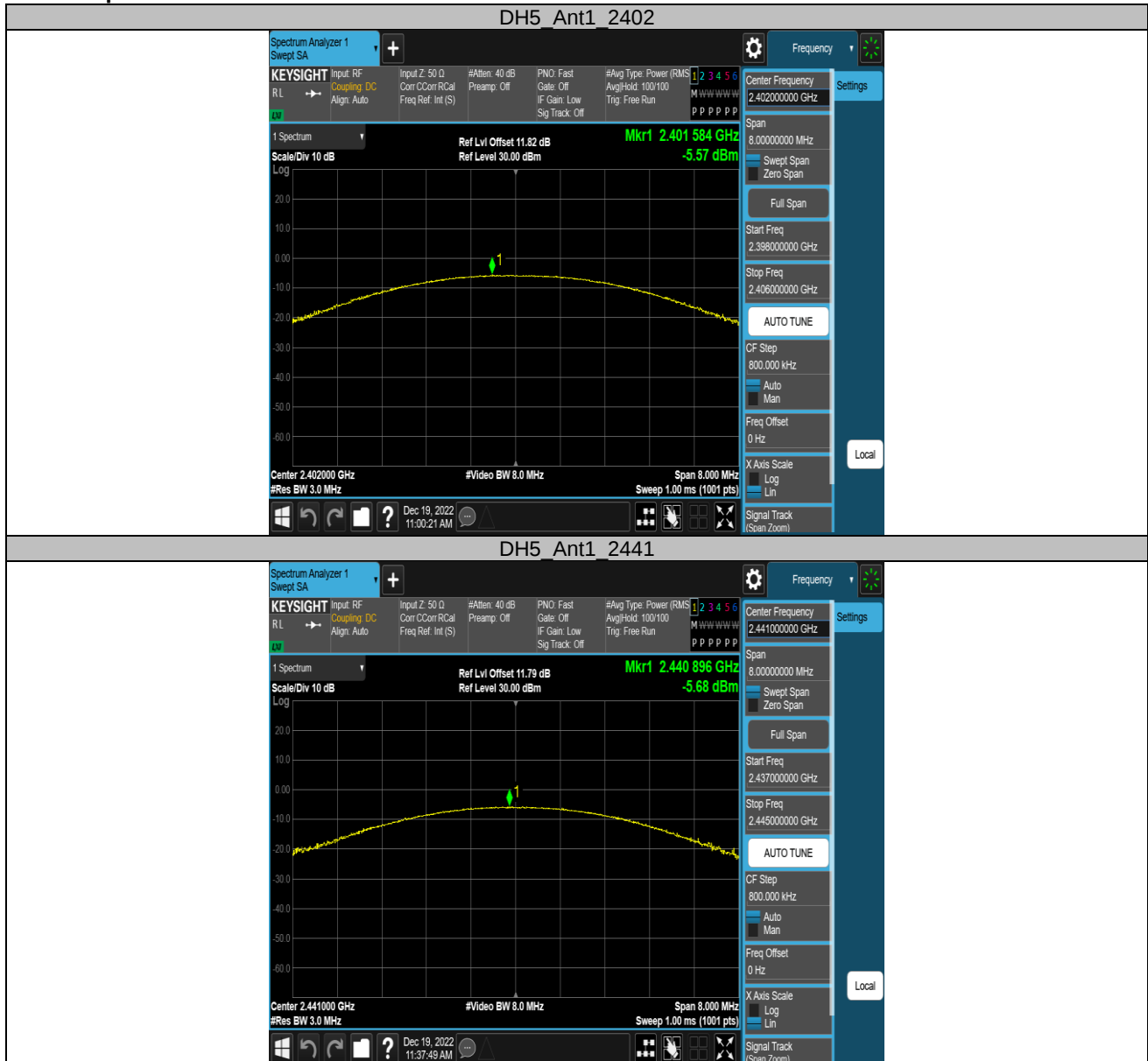


APPENDIX I - MAXIMUM OUTPUT POWER

Test Mode	TX Mode _1Mbps
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Test Mode	Antenna	Channel	Conducted Peak Power [dBm]	Conducted Limit [dBm]	Verdict
DH5	Ant1	2402	-5.57	≤20.97	PASS
		2441	-5.68	≤30	PASS
		2480	-6.32	≤30	PASS
2DH5	Ant1	2402	-5.37	≤20.97	PASS
		2441	-5.48	≤20.97	PASS
		2480	-6.51	≤20.97	PASS

Test Graphs





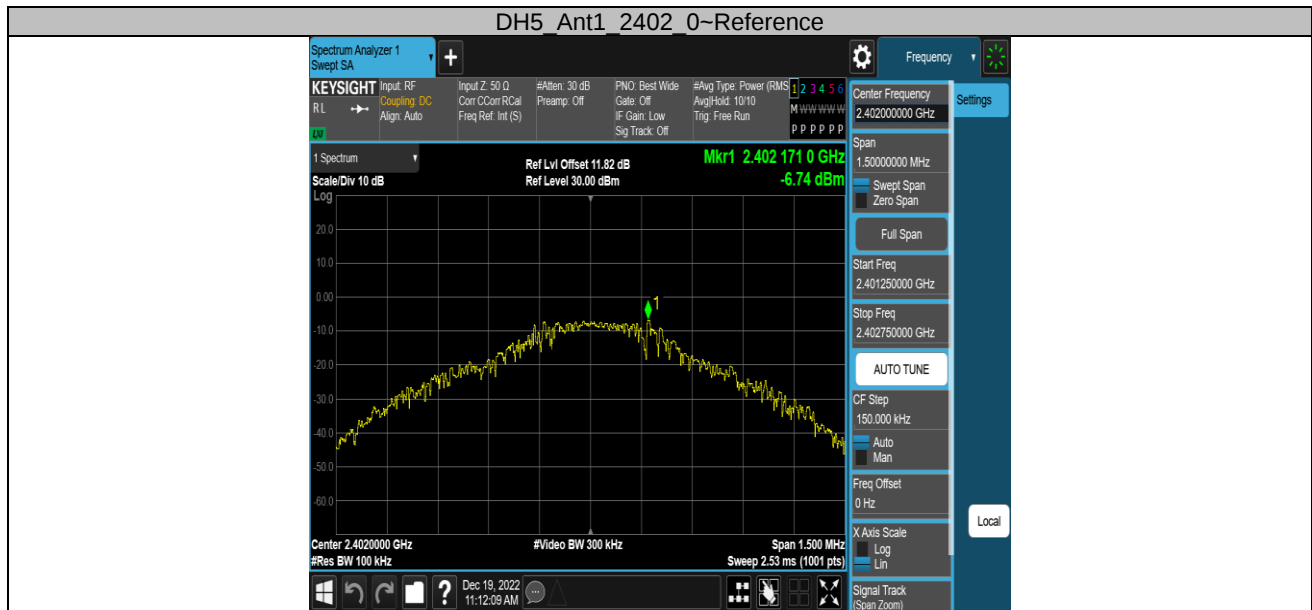


APPENDIX J - CONDUCTED SPURIOUS EMISSION

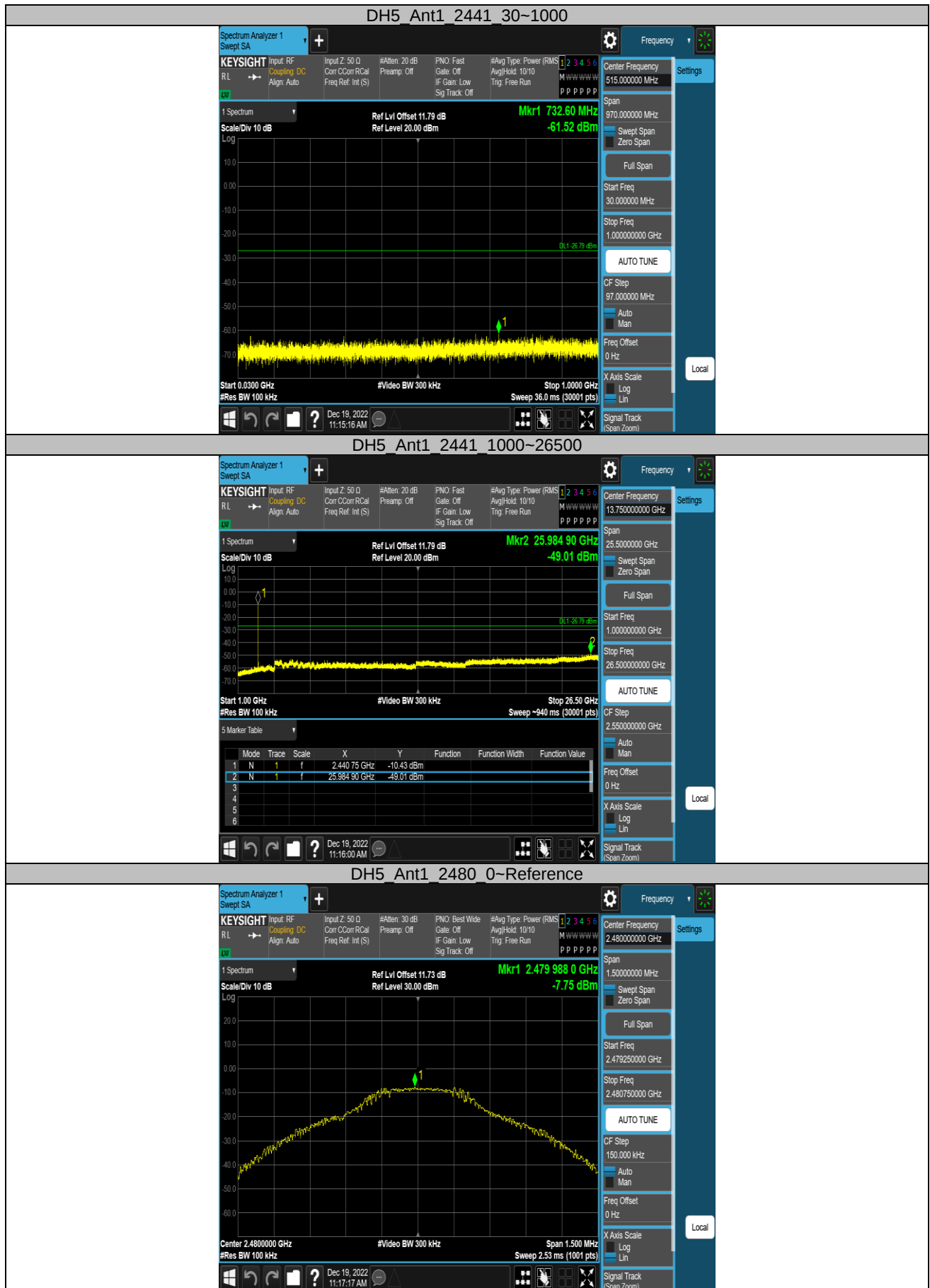
Test Mode	TX Mode _1Mbps
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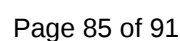
Test Mode	Antenna	Channel	Freq Range [MHz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	-6.74	-6.74	---	PASS
			30~1000	-6.74	-61.91	≤-26.74	PASS
			1000~26500	-6.74	-49.22	≤-26.74	PASS
		2441	Reference	-6.79	-6.79	---	PASS
			30~1000	-6.79	-61.52	≤-26.79	PASS
			1000~26500	-6.79	-49.01	≤-26.79	PASS
		2480	Reference	-7.75	-7.75	---	PASS
			30~1000	-7.75	-62.2	≤-27.75	PASS
			1000~26500	-7.75	-41.53	≤-27.75	PASS
2DH5	Ant1	2402	Reference	-6.71	-6.71	---	PASS
			30~1000	-6.71	-62	≤-26.71	PASS
			1000~26500	-6.71	-49.56	≤-26.71	PASS
		2441	Reference	-6.69	-6.69	---	PASS
			30~1000	-6.69	-60.58	≤-26.69	PASS
			1000~26500	-6.69	-48.97	≤-26.69	PASS
		2480	Reference	-7.48	-7.48	---	PASS
			30~1000	-7.48	-60.63	≤-27.48	PASS
			1000~26500	-7.48	-48.42	≤-27.48	PASS

Test Graphs















APPENDIX K - DECLARATION FOR BLUETOOTH DEVICE

1. Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device has no influence on the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.

Only a different hopping sequence will be used. For this reason the check of these RF parameters in one op-mode is sufficient.

2. Frequency range of a Bluetooth device:

Hereby we declare that the maximum frequency of this device is: 2402 - 2480MHz. This is according to the Bluetooth Core Specification (+ critical errata) for devices which will be operated in the USA.

This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E). Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification are not supported by this device.

3. Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organised in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for each Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4. Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:

40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67, 56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59, 72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75, 09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06, 01, 51, 03, 55, 05, 04

5. Equally average use of frequencies in data mode and behaviour for short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:

- a) LAP/UAP of the master of the connection.
- b) Internal master clock.

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 μ s. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire.

LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR- operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour:

The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 μ s). The hopping sequence will always differ from the first one.

6. Receiver input bandwidth and behaviour for repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.

Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

End of Test Report