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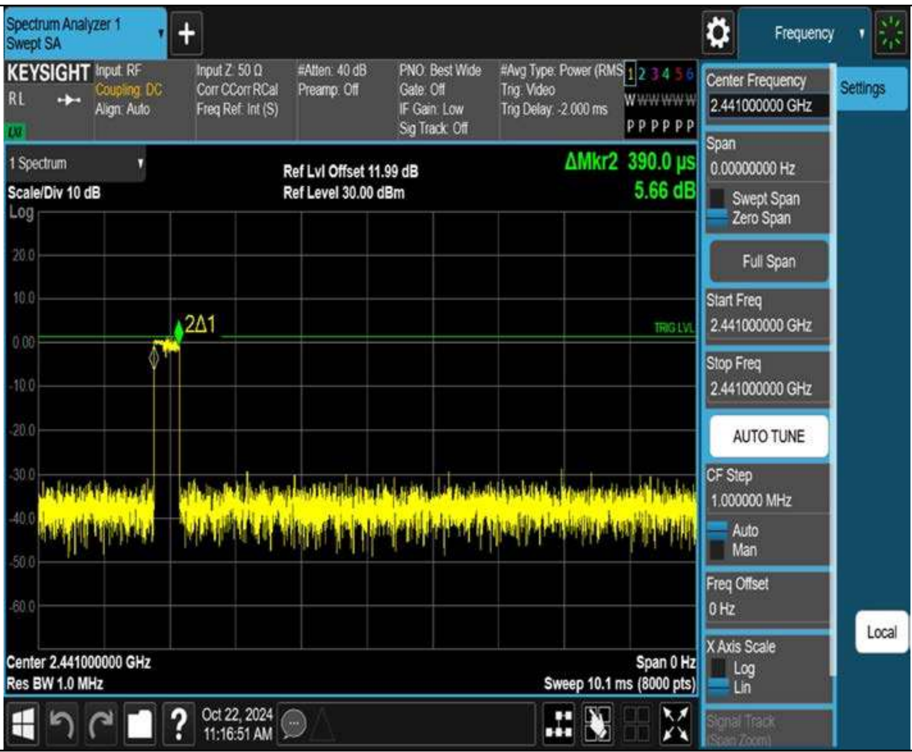
2DH3-Ant1-Hop-PASS

2DH3-Ant1-Hop-PASS

2DH5-Ant1-Hop-PASS

2DH5-Ant1-Hop-PASS



3DH1-Ant1-Hop-PASS

3DH1-Ant1-Hop-PASS

3DH3-Ant1-Hop-PASS

3DH3-Ant1-Hop-PASS

3DH5-Ant1-Hop-PASS

3DH5-Ant1-Hop-PASS

APPENDIX G - HOPPING CHANNEL SEPARATION

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	0.980	≥0.957	PASS
2DH5	Ant1	Hop	1.016	≥0.878	PASS
3DH5	Ant1	Hop	1.160	≥0.868	PASS

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Test Graphs

DH5-Ant1-Hop-PASS

2DH5-Ant1-Hop-PASS

3DH5-Ant1-Hop-PASS

APPENDIX H - BANDWIDTH

20dB Emission Bandwidth

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.948	2401.454	2402.402	---	---
DH5	Ant1	2441	0.957	2440.454	2441.411	---	---
DH5	Ant1	2480	0.948	2479.457	2480.405	---	---
2DH5	Ant1	2402	1.317	2401.265	2402.582	---	---
2DH5	Ant1	2441	1.317	2440.265	2441.582	---	---
2DH5	Ant1	2480	1.287	2479.289	2480.576	---	---
3DH5	Ant1	2402	1.299	2401.277	2402.576	---	---
3DH5	Ant1	2441	1.302	2440.274	2441.576	---	---
3DH5	Ant1	2480	1.272	2479.274	2480.546	---	---

Test Graphs

DH5-Ant1-2402

DH5-Ant1-2441

DH5-Ant1-2480

2DH5-Ant1-2402

2DH5-Ant1-2441

2DH5-Ant1-2480

3DH5-Ant1-2402

3DH5-Ant1-2441

	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.479 274 GHz	-23.02 dBm			
2	N	1	f	2.479 904 GHz	-2.523 dBm			
3	Δ1	1	f (Δ)	1.272 MHz (Δ)	0.08878 dB			
4								
5								
6								

3DH5-Ant1-2480

Occupied Channel Bandwidth

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.86943	2401.4857	2402.3551	---	---
DH5	Ant1	2441	0.86397	2440.4846	2441.3486	---	---
DH5	Ant1	2480	0.87439	2479.4822	2480.3565	---	---
2DH5	Ant1	2402	1.1860	2401.3304	2402.5164	---	---
2DH5	Ant1	2441	1.1768	2440.3319	2441.5087	---	---
2DH5	Ant1	2480	1.1799	2479.3303	2480.5102	---	---
3DH5	Ant1	2402	1.1996	2401.3211	2402.5207	---	---
3DH5	Ant1	2441	1.1784	2440.3342	2441.5126	---	---
3DH5	Ant1	2480	1.1838	2479.3269	2480.5107	---	---

Test Graphs

DH5-Ant1-2402

DH5-Ant1-2441

DH5-Ant1-2480

2DH5-Ant1-2402

2DH5-Ant1-2441

2DH5-Ant1-2480

3DH5-Ant1-2402

3DH5-Ant1-2441

3DH5-Ant1-2480

APPENDIX I - MAXIMUM OUTPUT POWER

Test Mode	Antenna	Frequency[MHz]	Conducted Peak Powert[dBm]	Conducted Limit[dBm]	Verdict
DH5	Ant1	2402	1.23	≤20.97	PASS
DH5	Ant1	2441	1.16	≤20.97	PASS
DH5	Ant1	2480	0.62	≤20.97	PASS
2DH5	Ant1	2402	1.99	≤20.97	PASS
2DH5	Ant1	2441	1.91	≤20.97	PASS
2DH5	Ant1	2480	1.41	≤20.97	PASS
3DH5	Ant1	2402	**2.43**	≤20.97	PASS
3DH5	Ant1	2441	2.27	≤20.97	PASS
3DH5	Ant1	2480	1.82	≤20.97	PASS

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Test Graphs

DH5-Ant1-2402-PASS

DH5-Ant1-2441-PASS

DH5-Ant1-2480-PASS

2DH5-Ant1-2402-PASS

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2DH5-Ant1-2441-PASS

2DH5-Ant1-2480-PASS

3DH5-Ant1-2402-PASS

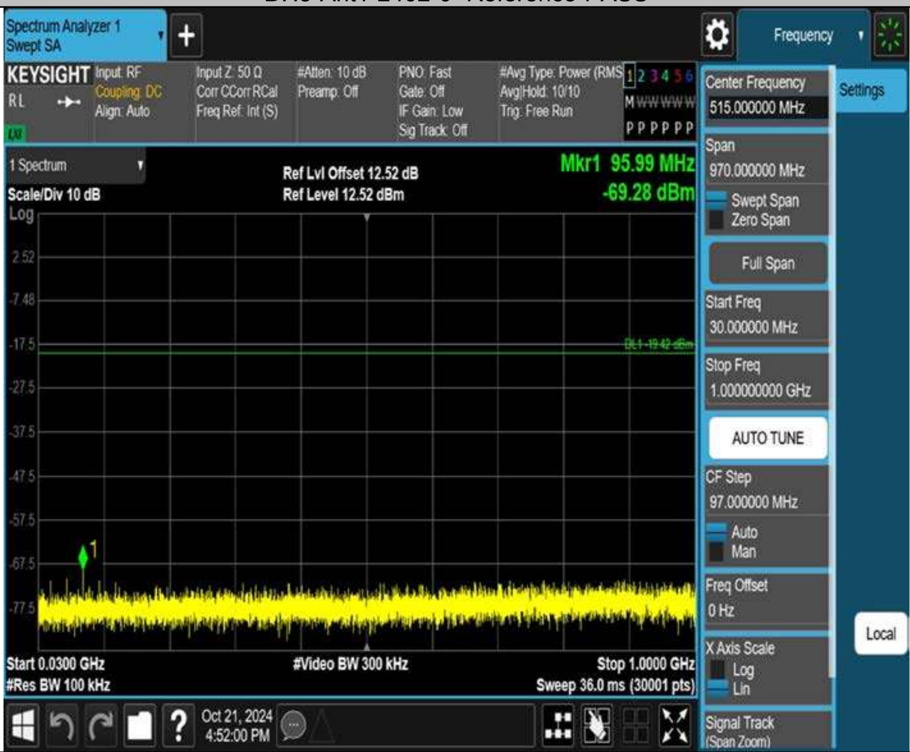
3DH5-Ant1-2441-PASS

3DH5-Ant1-2480-PASS

APPENDIX J - CONDUCTED SPURIOUS EMISSION

Test Graphs

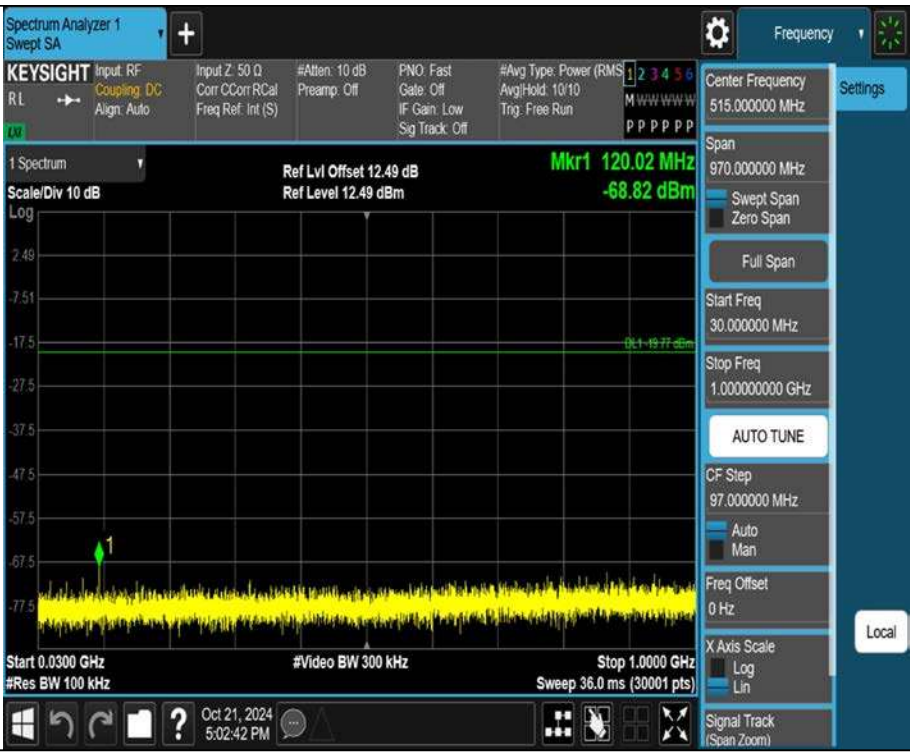
DH5-Ant1-2402-0~Reference-PASS



DH5-Ant1-2402-30~1000-PASS

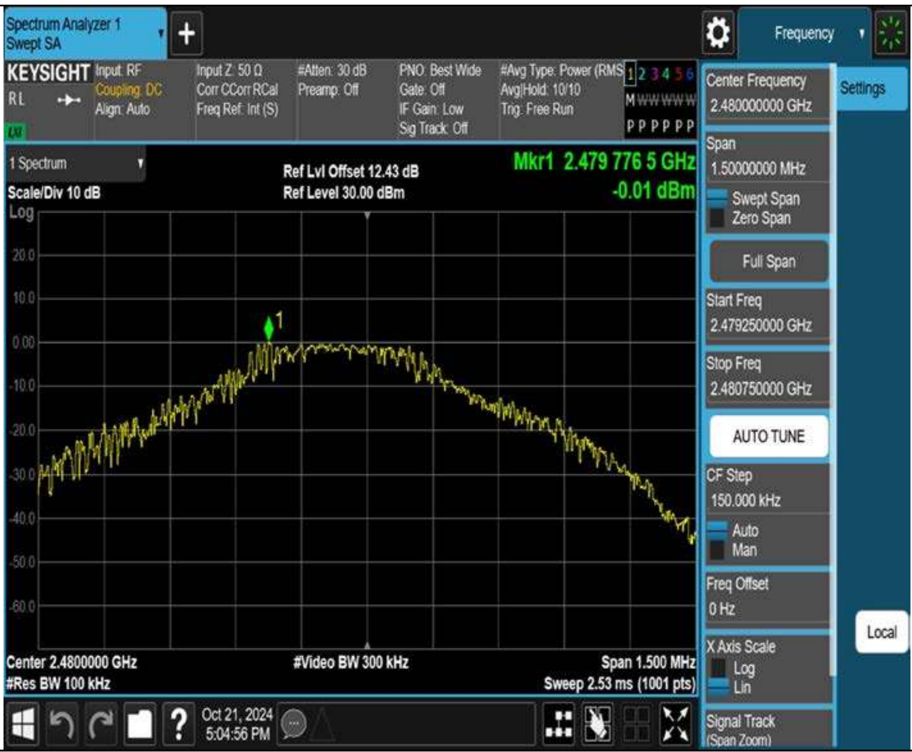
DH5-Ant1-2402-1000~26500-PASS

DH5-Ant1-2441-0~Reference-PASS



DH5-Ant1-2441-30~1000-PASS

DH5-Ant1-2441-1000~26500-PASS

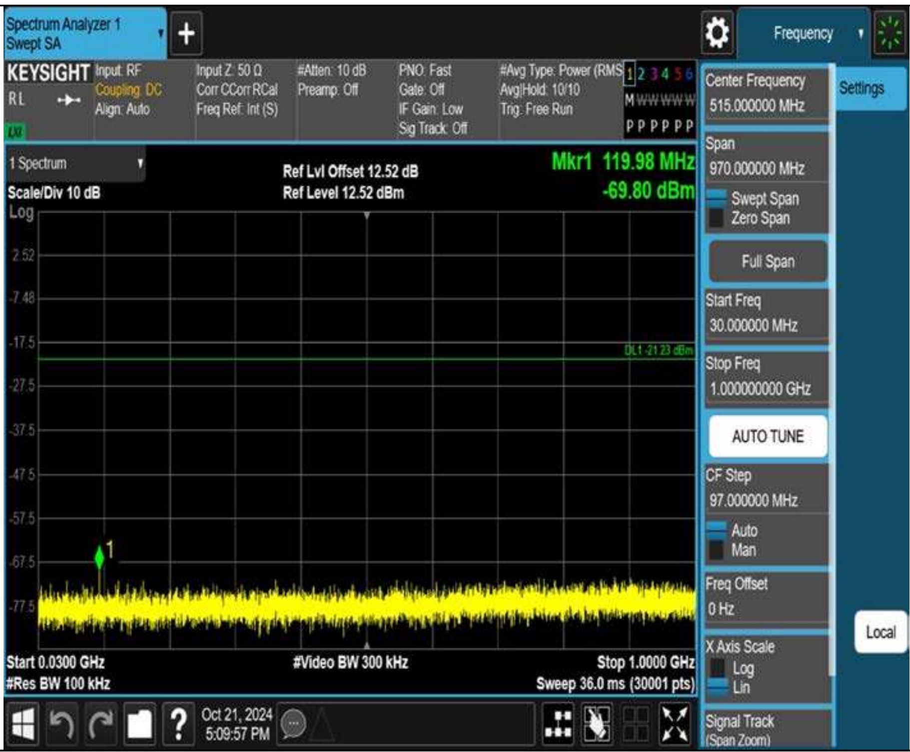


DH5-Ant1-2480-0~Reference-PASS

DH5-Ant1-2480-30~1000-PASS

DH5-Ant1-2480-1000~26500-PASS

2DH5-Ant1-2402-0~Reference-PASS



2DH5-Ant1-2402-30~1000-PASS

2DH5-Ant1-2402-1000~26500-PASS

2DH5-Ant1-2441-0~Reference-PASS

2DH5-Ant1-2441-30~1000-PASS

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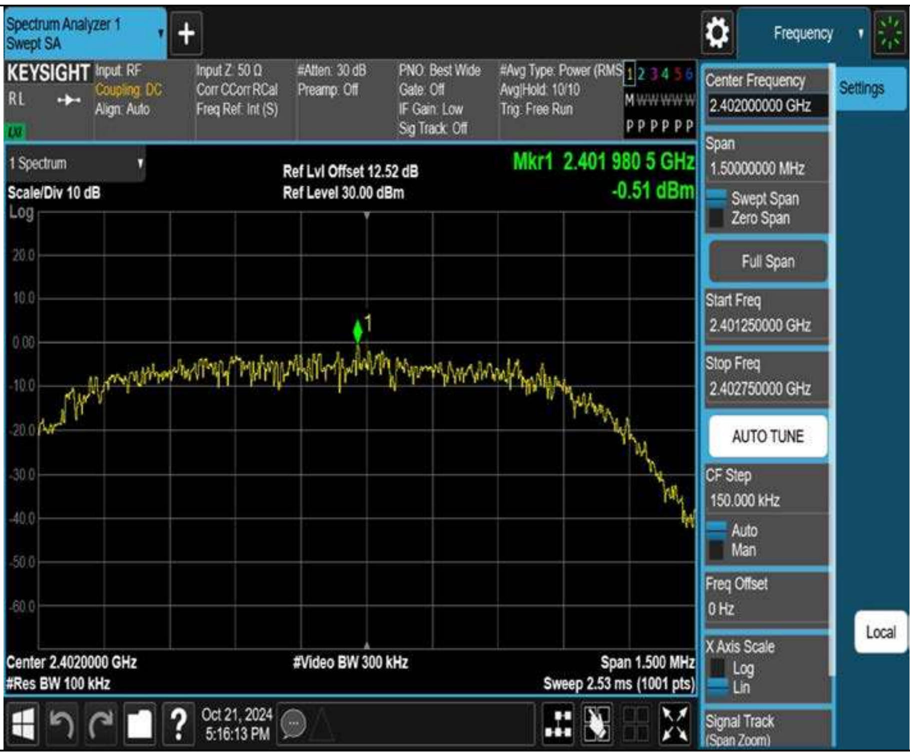
2DH5-Ant1-2441-1000~26500-PASS

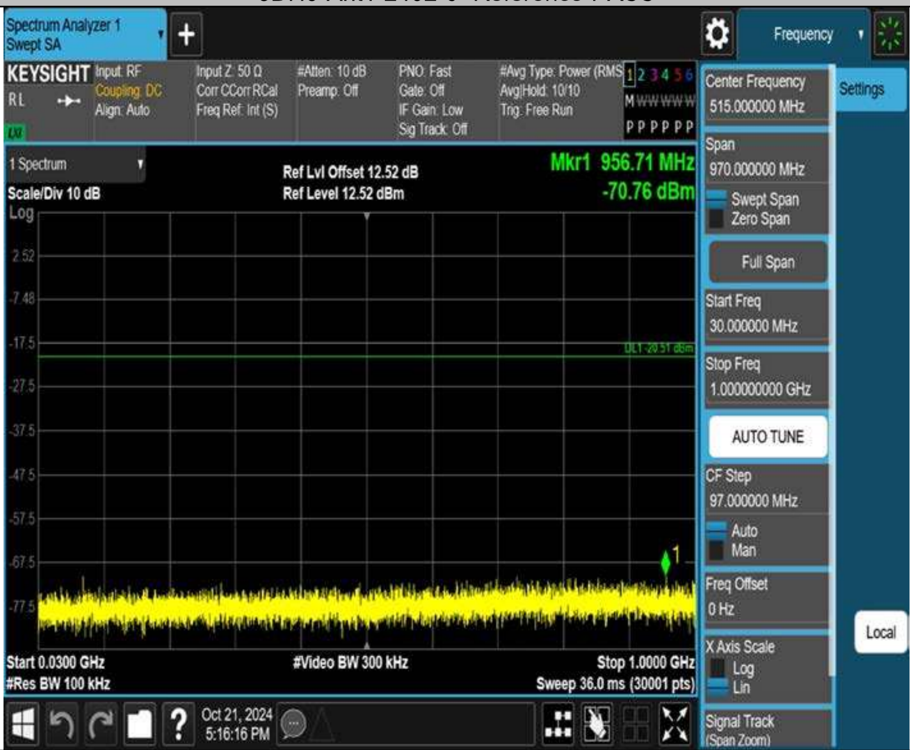
2DH5-Ant1-2480-0~Reference-PASS

2DH5-Ant1-2480-30~1000-PASS

2DH5-Ant1-2480-1000~26500-PASS



3DH5-Ant1-2402-0~Reference-PASS



3DH5-Ant1-2402-30~1000-PASS

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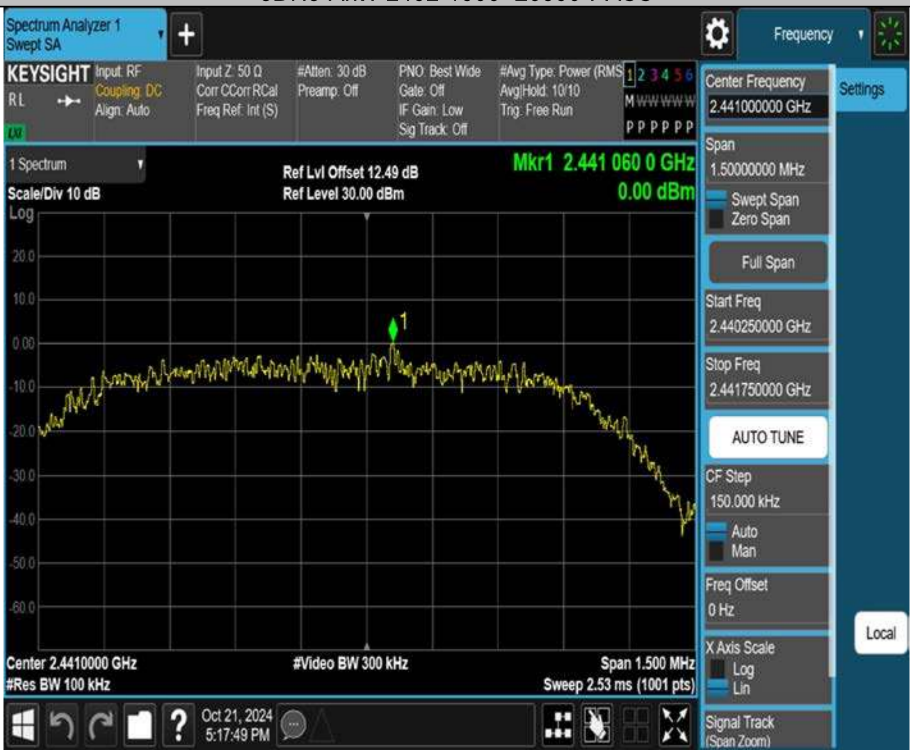
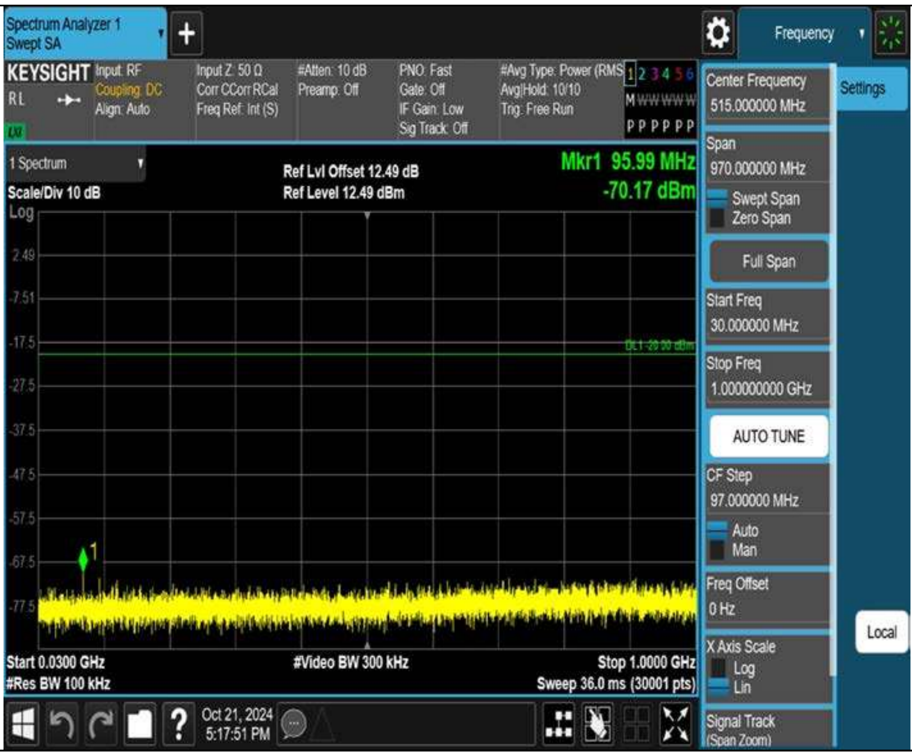
3DH5-Ant1-2402-1000~26500-PASS



3DH5-Ant1-2441-0~Reference-PASS

海蕴
HAIYUN



3DH5-Ant1-2441-30~1000-PASS

3DH5-Ant1-2441-1000~26500-PASS

3DH5-Ant1-2480-0~Reference-PASS

3DH5-Ant1-2480-30~1000-PASS

3DH5-Ant1-2480-1000~26500-PASS

Band edge

DH5-Ant1-2402-PASS

DH5-Ant1-2480-PASS

DH5-Ant1-Hop_2402-PASS

DH5-Ant1-Hop_2480-PASS

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2DH5-Ant1-2402-PASS

2DH5-Ant1-2480-PASS

	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.403 740 GHz	-5.001 dBm			
2	N	1	f	2.400 000 GHz	-51.21 dBm			
3	N	1	f	2.390 000 GHz	-51.54 dBm			
4	N	1	f	2.310 000 GHz	-52.84 dBm			
5	N	1	f	2.399 015 GHz	-48.65 dBm			
6								

2DH5-Ant1-Hop_2402-PASS

	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value
1	N	1	f	2.477 92 GHz	-2.884 dBm			
2	N	1	f	2.483 50 GHz	-50.39 dBm			
3	N	1	f	2.500 00 GHz	-50.81 dBm			
4	N	1	f	2.496 88 GHz	-47.35 dBm			
5								
6								

2DH5-Ant1-Hop_2480-PASS

3DH5-Ant1-2402-PASS

3DH5-Ant1-2480-PASS

3DH5-Ant1-Hop_2402-PASS

3DH5-Ant1-Hop_2480-PASS

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 μs. 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 µs). 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.

Statement

1. The report is invalid without the official seal or special seal of Shenzhen Haiyun Standard Technology Co., Ltd. (hereinafter referred to as the unit).

2. The report is invalid without the signature of the approver.

3. The report is invalid if altered arbitrarily.

4. The report shall not be partially copied without the written approval of the unit.

5. The reported test results are only valid for the tested samples.

6. If there is any objection to the test report, it shall be submitted to the test unit within 15 days from the date of receiving the report, and the overdue shall not be accepted.

Shenzhen Haiyun Standard Technology Co., Ltd.

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Email: service@hy-lab.cn

End of Test Report