

KCTL Inc.

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Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

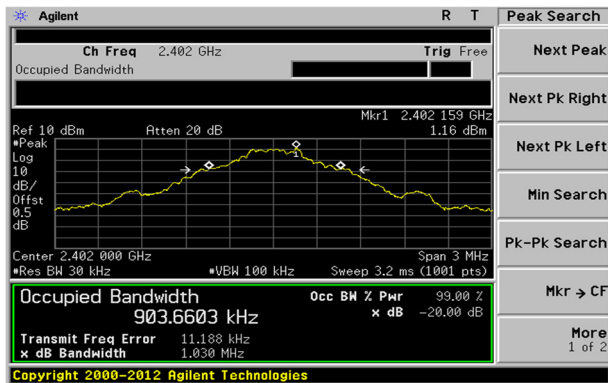
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KR20-SRF0043

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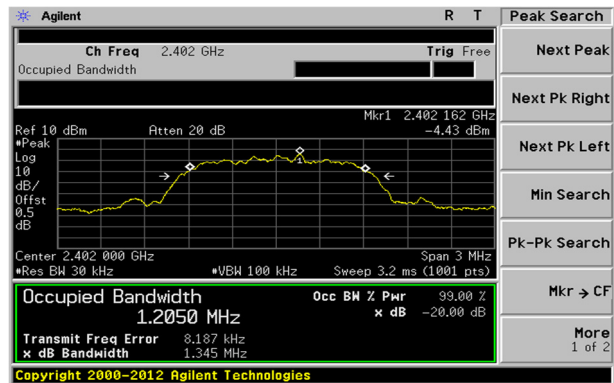
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99 % bandwidth

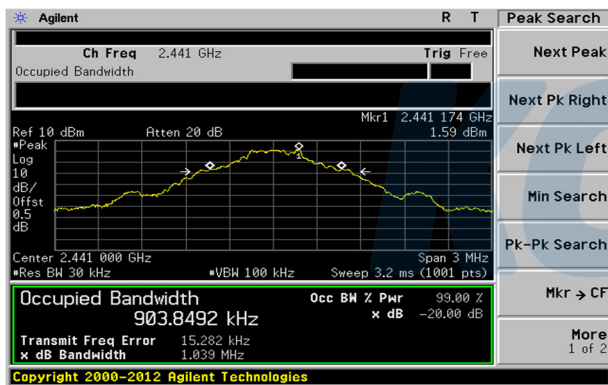
GFSK / Low ch.



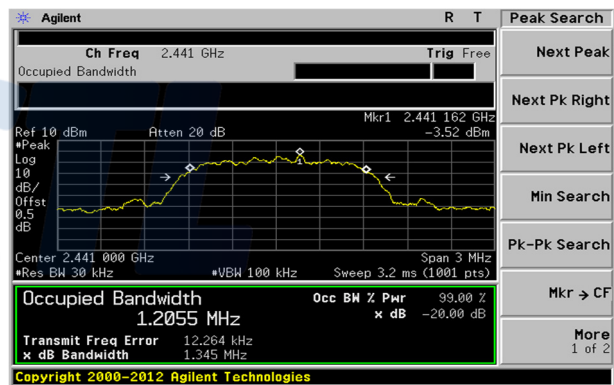
$\pi/4$ DQPSK / Low ch.



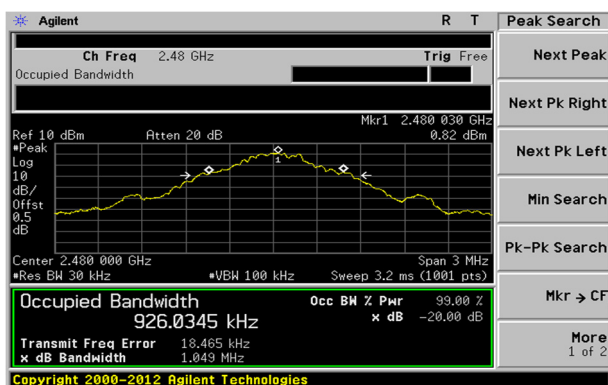
GFSK / Mid ch.



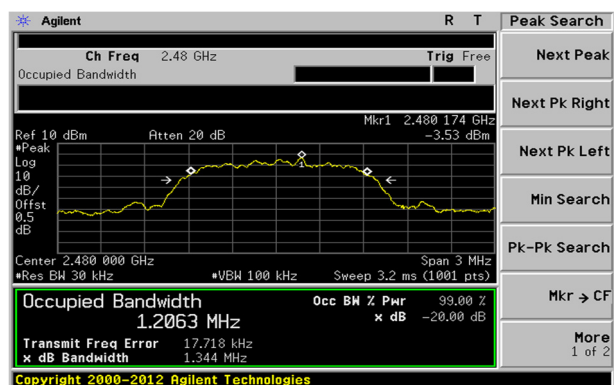
$\pi/4$ DQPSK / Mid ch.



GFSK / High ch.



$\pi/4$ DQPSK / High ch.



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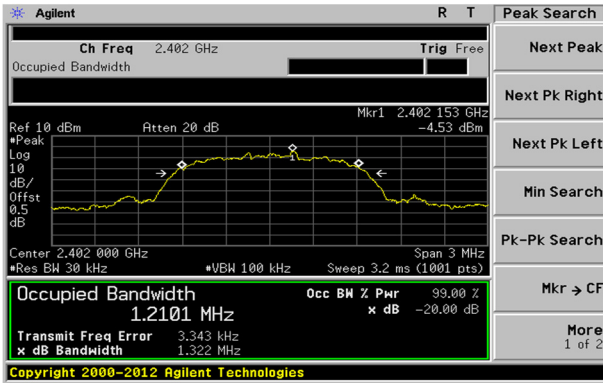
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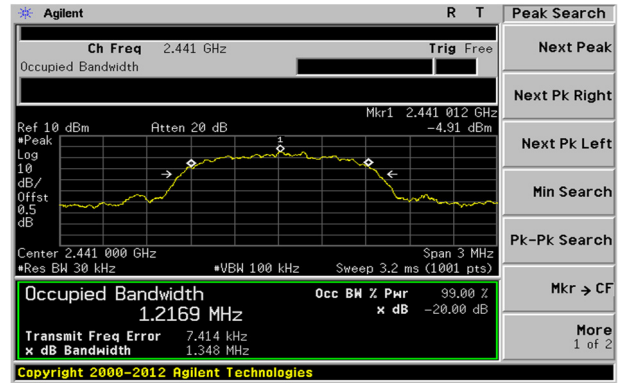
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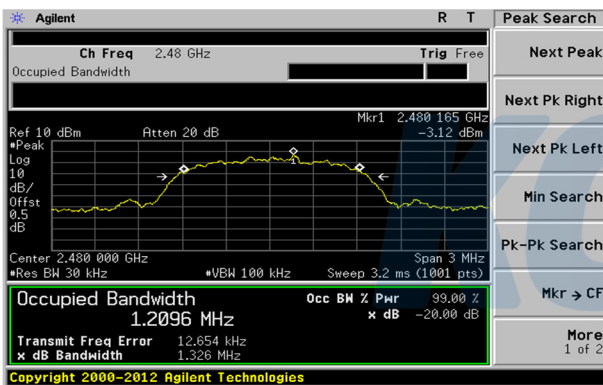
8DPSK / Low ch.



8DPSK / Mid ch.



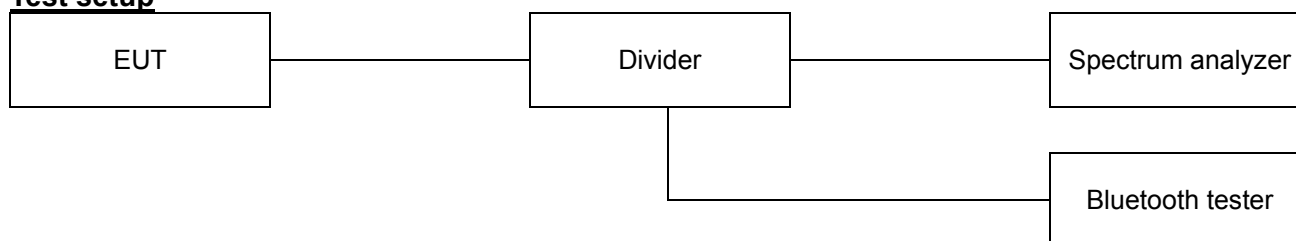
8DPSK / High ch.



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7.4. Number of hopping channels

Test setup



Limit

According to §15.247(a)(1)(iii), frequency hopping systems in the 2 400-2 483.5 MHz band shall use at least 15 channels.

Test procedure

ANSI C63.10-2013 - Section 7.8.3

Test settings

- Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
- RBW: To identify clearly the individual channels, set the RBW to less than 30 % of the channel spacing or the 20 dB bandwidth, whichever is smaller.
- VBW $\geq$ RBW.
- Sweep: Auto.
- Detector function: Peak.
- Trace: Max hold.
- Allow the trace to stabilize.

It might prove necessary to break the span up into subranges to show clearly all of the hopping frequencies. Compliance of an EUT with the appropriate regulatory limit shall be determined for the number of hopping channels. A plot of the data shall be included in the test report.

Test results

Mode	Number of hopping channel	Limit
GFSK	79	≥ 15
$\pi/4$ DQPSK	79	≥ 15
8DPSK	79	≥ 15

Note :

In case of AFH mode, minimum number of hopping channels is 20.

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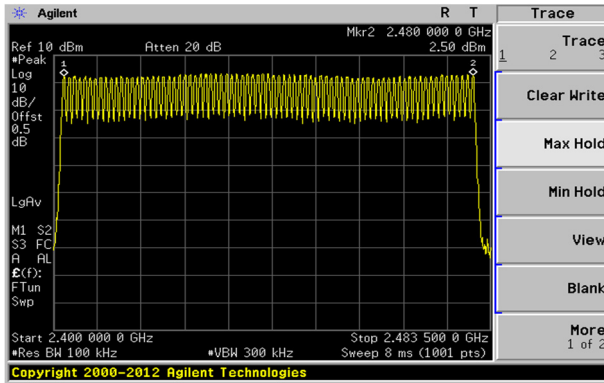
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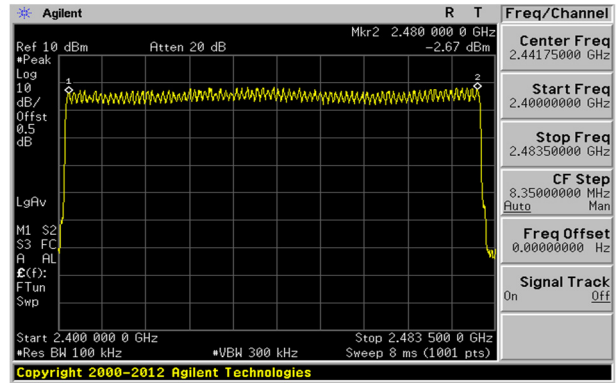
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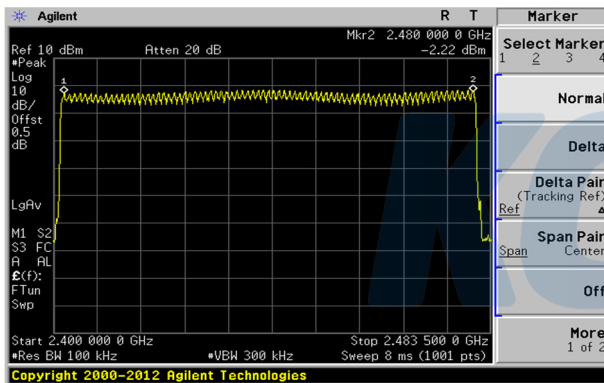
GFSK



$\pi/4$ DQPSK



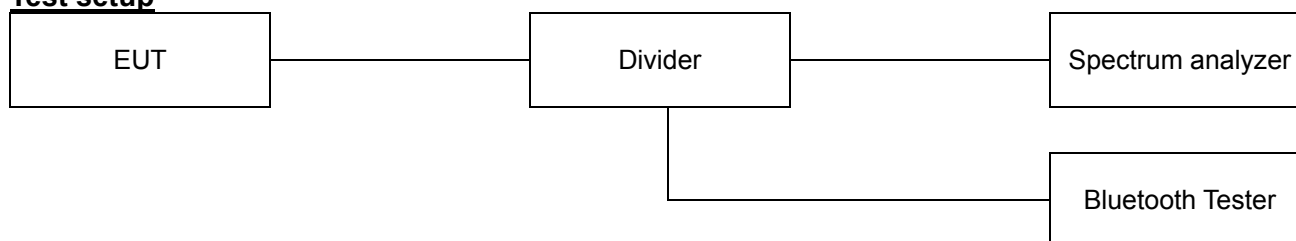
8DPSK



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7.5. Time of occupancy(Dwell time)

Test setup



Limit

According to §15.247(a)(1)(iii), frequency hopping systems in the 2 400-2 483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test procedure

ANSI C63.10-2013 - Section 7.8.4

Test settings

- Span: Zero span, centered on a hopping channel.
- RBW $\leq$ channel spacing and $\gg 1 / T$, where T is the expected dwell time per channel.
- Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
- Detector function: Peak.
- Trace: Max hold.
- Use the marker-delta function to determine the transmit time per hop. If this value varies with different modes of operation (data rate, modulation format, number of hopping channels, etc.), then repeat this test for each variation in transmit time.

Test results**- Non-AFH**

Modulation	Frequency (MHz)	Pulse Width (ms)	Hopping rate (hop/s)	Number of Channels	Result (s)	Limit (s)
DH1	2 441	0.383	800.000	79	0.122	0.400
DH3	2 441	1.640	400.000	79	0.262	0.400
DH5	2 441	2.887	266.667	79	0.308	0.400
2-DH1	2 441	0.388	800.000	79	0.124	0.400
2-DH3	2 441	1.636	400.000	79	0.262	0.400
2-DH5	2 441	2.887	266.667	79	0.308	0.400
3-DH1	2 441	0.387	800.000	79	0.124	0.400
3-DH3	2 441	1.636	400.000	79	0.262	0.400
3-DH5	2 441	2.887	266.667	79	0.308	0.400

- AFH

Modulation	Frequency (MHz)	Pulse Width (ms)	Hopping rate (hop/s)	Number of Channels	Result (s)	Limit (s)
DH1	2 441	0.383	400.000	20	0.061	0.400
DH3	2 441	1.640	200.000	20	0.131	0.400
DH5	2 441	2.887	133.333	20	0.154	0.400
2-DH1	2 441	0.388	400.000	20	0.062	0.400
2-DH3	2 441	1.636	200.000	20	0.131	0.400
2-DH5	2 441	2.887	133.333	20	0.154	0.400
3-DH1	2 441	0.387	400.000	20	0.062	0.400
3-DH3	2 441	1.636	200.000	20	0.131	0.400
3-DH5	2 441	2.887	133.333	20	0.154	0.400

Notes:

1. Non-AFH

- Period Time: 0.4 sec x 79 channels = 31.6 sec
- Result (s)= (Hopping rate (hop/s/slot) / 79 channels) x 31.6 sec x Pulse width (ms)

2. AFH

- Period Time: 0.4 sec x 20 channels = 8 sec
- Result (s)= (Hopping rate (hop/s/slot) / 20 channels) x 8 sec x Pulse width (ms)

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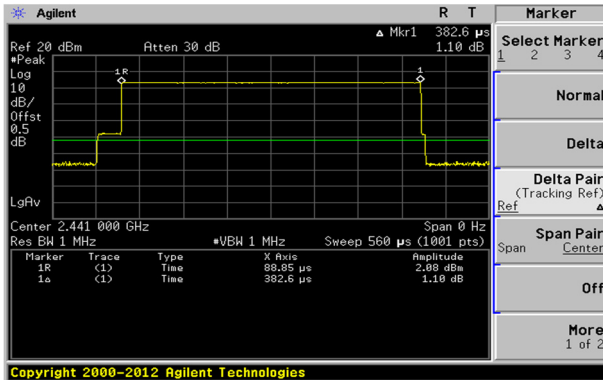
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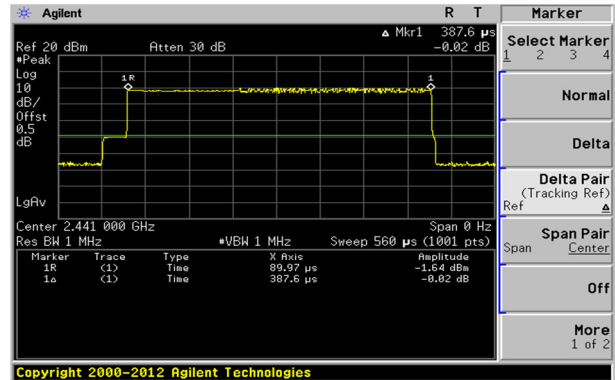
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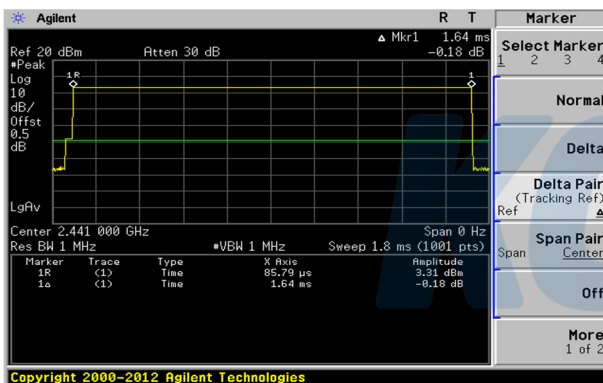
GFSK / DH1



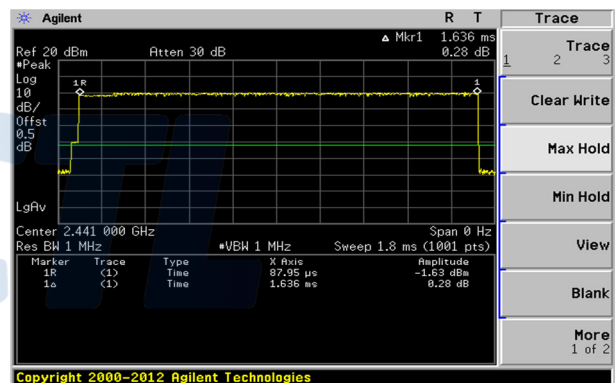
$\pi/4$ DQPSK / 2-DH1



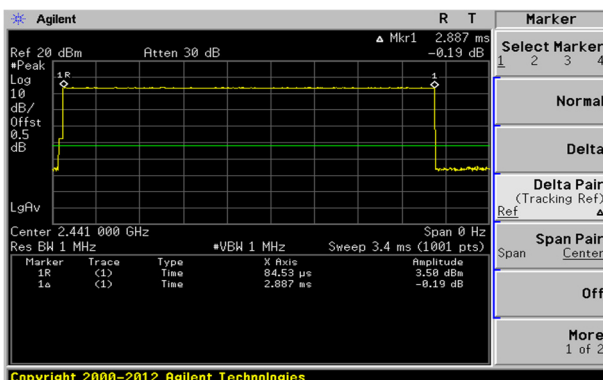
GFSK / DH3



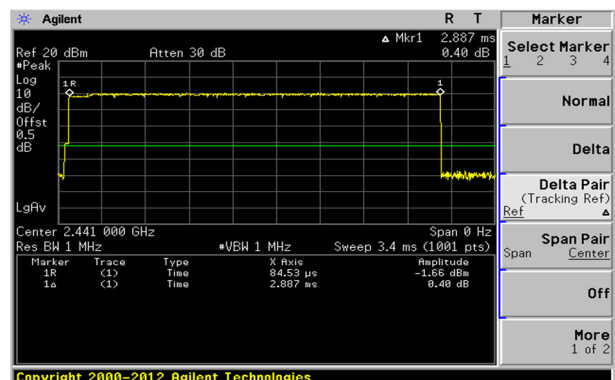
$\pi/4$ DQPSK / 2-DH3



GFSK / DH5



$\pi/4$ DQPSK / 2-DH5



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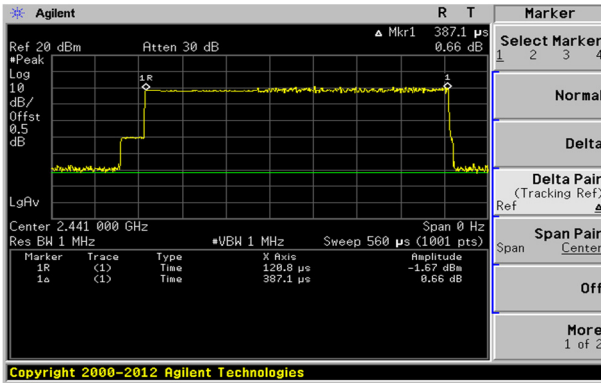
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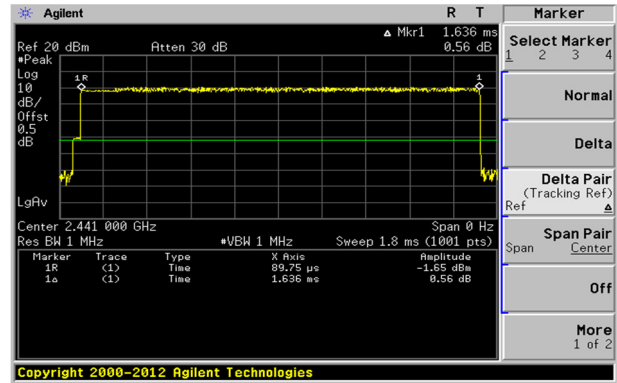
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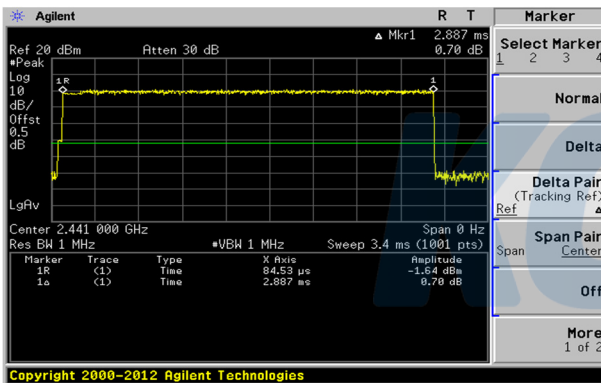
8DPSK / 3-DH1



8DPSK / 3-DH3



8DPSK / 3-DH5



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