

sweeps when the device is transmitting at full power), set the sweep time > (number of points in sweep) x (symbol period) but the sweep time shall always be maintained at a value that is less than or equal to the minimum transmission time

- c) If the device cannot be configured to transmit continuously (duty cycle > 98%), and a free-running sweep must be used, set the sweep time so that the averaging is performed over multiple on/off cycles by setting the sweep time > (number of points in sweep) x (transmitter period) (i.e., the transmit on-time + the off-time). The spectrum analyzer readings shall subsequently be corrected by [10 log (1/duty cycle)]. This assumes that the transmission period and duty cycle is relatively constant (duty cycle variation $\leq \pm 2\%$).
- d) If the device cannot be configured to transmit continuously and a free-running sweep must be used, and if the transmissions exhibit a non-constant duty cycle (duty cycle variations > $\pm 2\%$), set the sweep time so that the averaging is performed over the on-period by setting the sweep time > (symbol period) x (number of points), while also maintaining the sweep time < (transmitter on-time). The trace mode shall be set to max hold, since not every display point will be averaged only over just the on-time. Thus, multiple sweeps (e.g., 100) in maximum hold are necessary to ensure that the maximum power is measured.
- 9) Allow trace to fully stabilize.

Notes:

1. Per 22.917(b), 24.238(b), 27.53(h)(3), compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
2. Per 27.53(g), compliance with this provision is based on the use of measurement instrumentation Employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.
3. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function. Please refer to the page 12.
4. The EUT was setup to maximum output power as its lowest and highest channel with all bandwidth, modulation.

KCTL Inc.

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

Report No.:
KR19-SRF0016-A

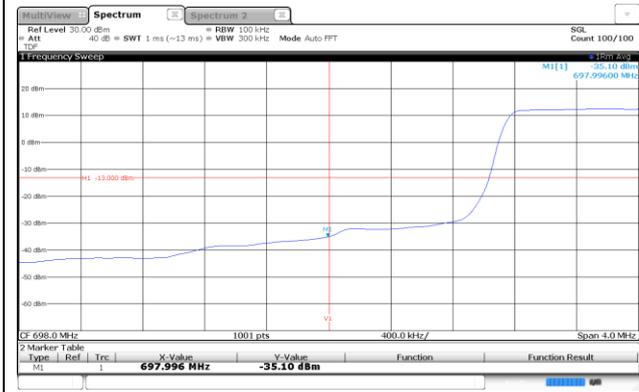
Page (122) of (279)



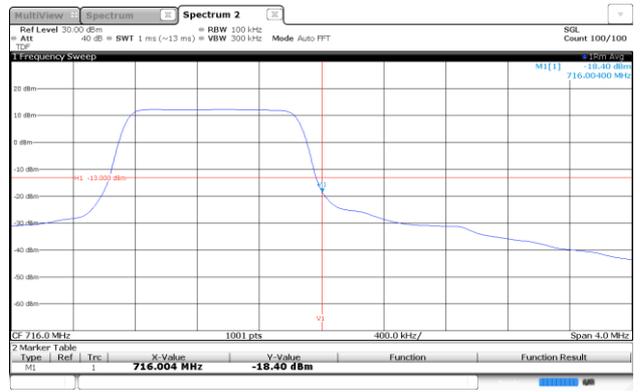
Test results

Test mode: LTE Band12

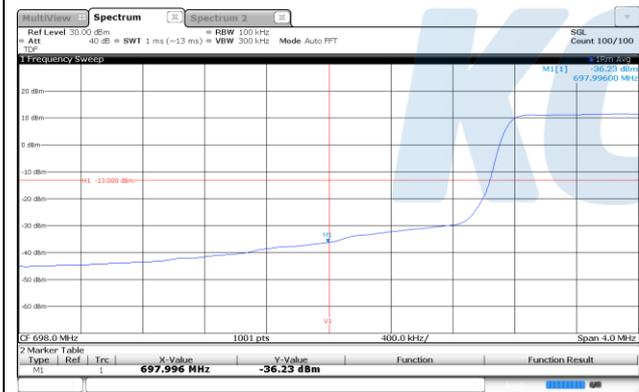
1.4M BW / QPSK/ Low ch.



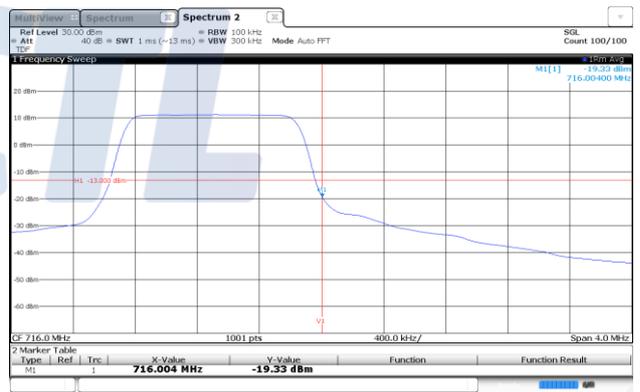
1.4M BW / QPSK/ High ch.



1.4M BW / 16QAM / Low ch.



1.4M BW / 16QAM / High ch.



KCTL Inc.

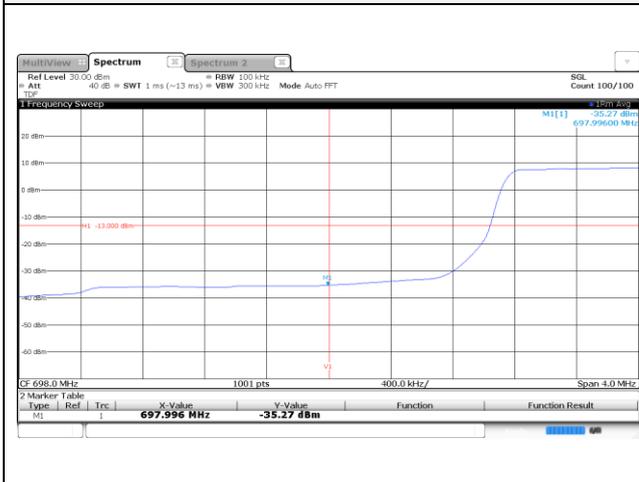
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

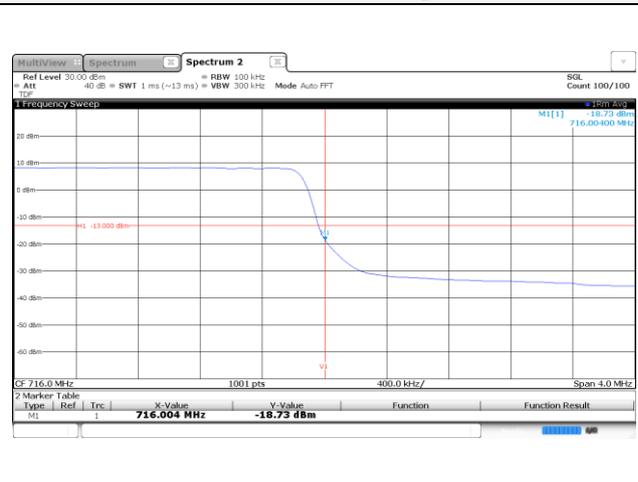
Page (123) of (279)



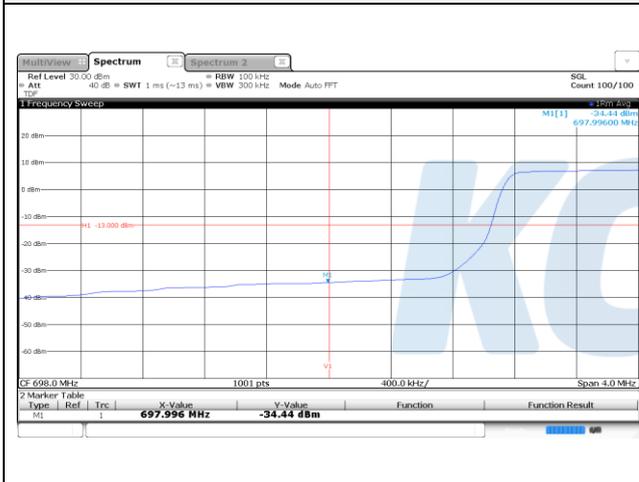
3M BW / QPSK/ Low ch.



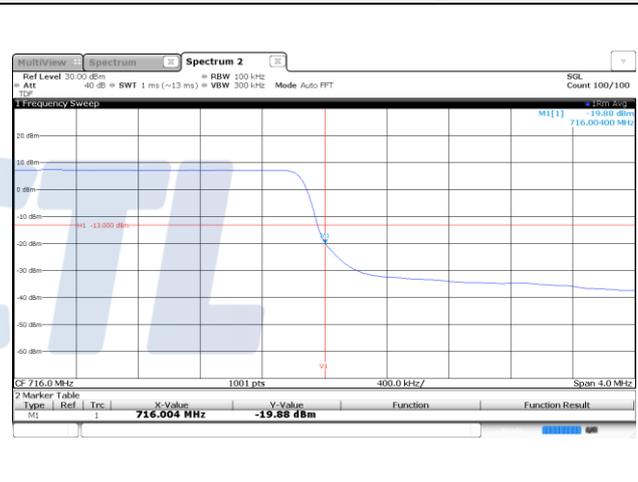
3M BW / QPSK/ High ch.



3M BW / 16QAM / Low ch.



3M BW / 16QAM / High ch.



KCTL Inc.

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

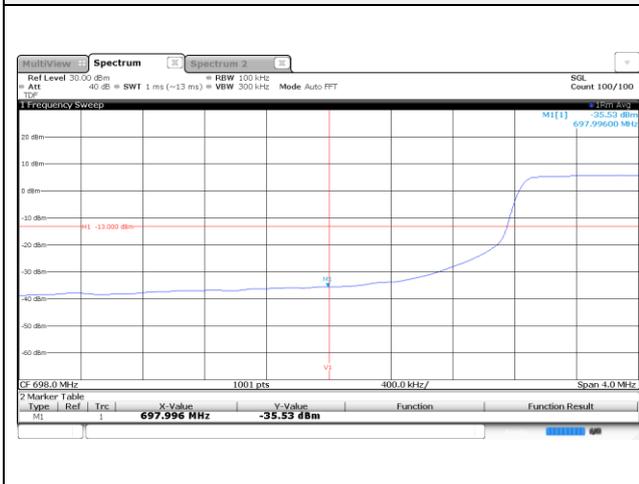
Report No.:
KR19-SRF0016-A

Page (124) of (279)

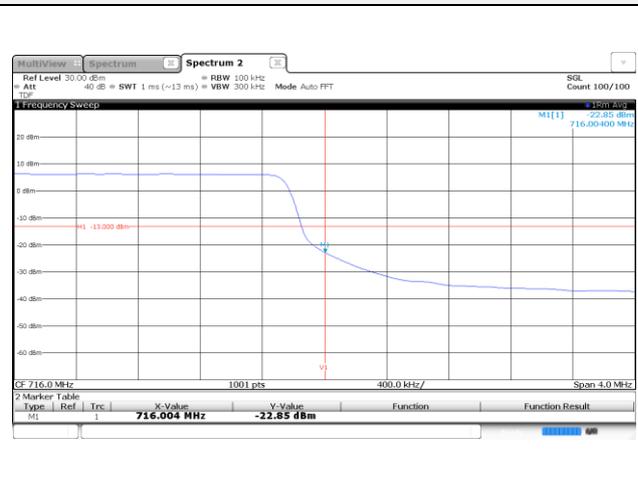


Test mode: LTE Band12/17

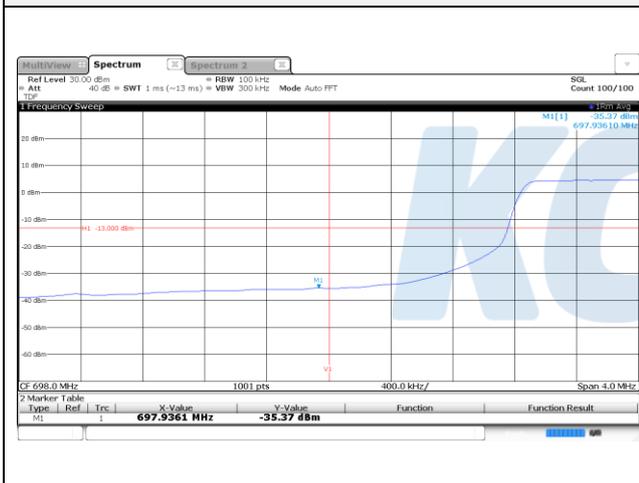
5M BW / QPSK/ Low ch.



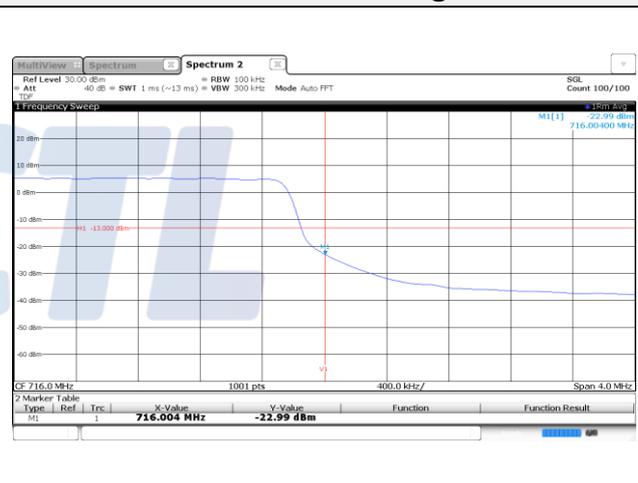
5M BW / QPSK/ High ch.



5M BW / 16QAM / Low ch.



5M BW / 16QAM / High ch.



KCTL Inc.

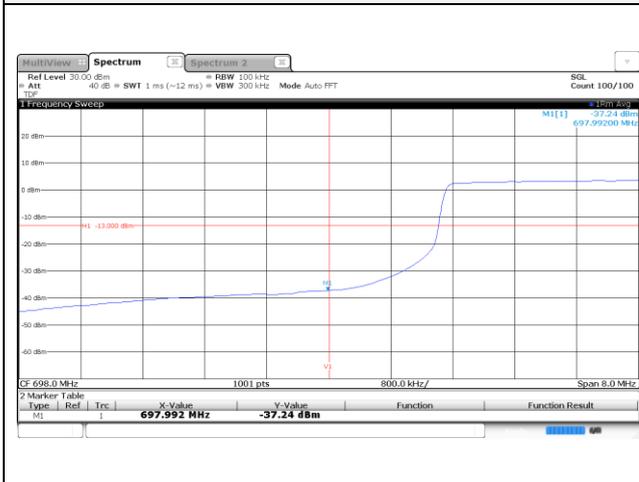
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

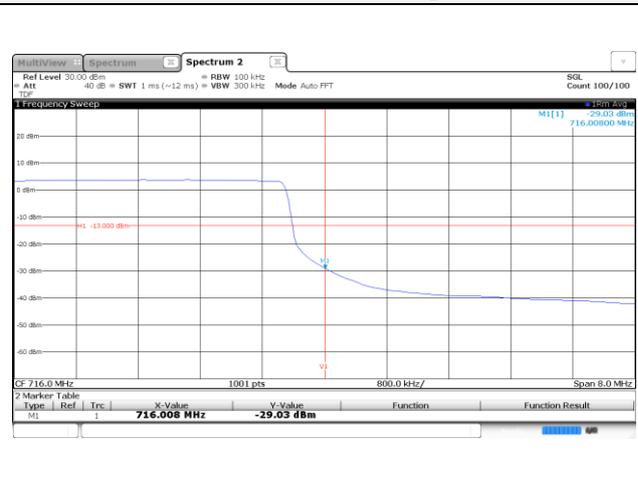
Page (125) of (279)



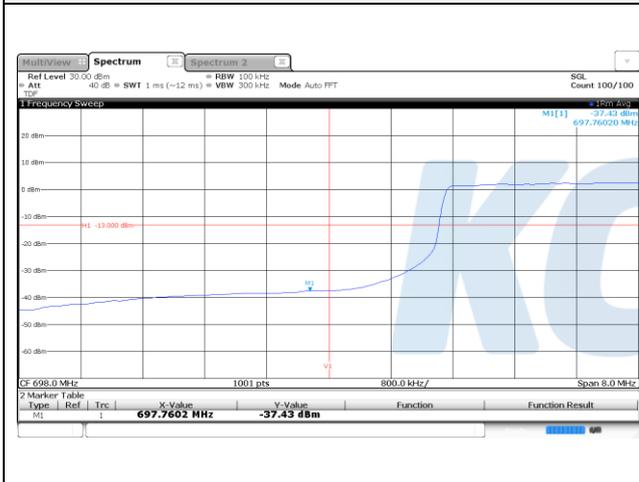
10M BW / QPSK/ Low ch.



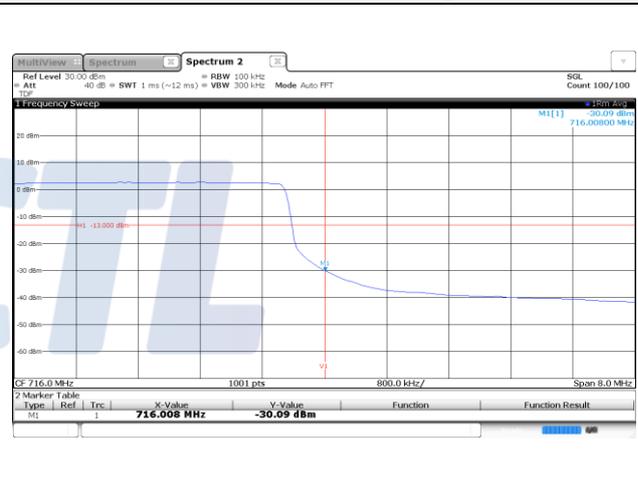
10M BW / QPSK/ High ch.



10M BW / 16QAM / Low ch.

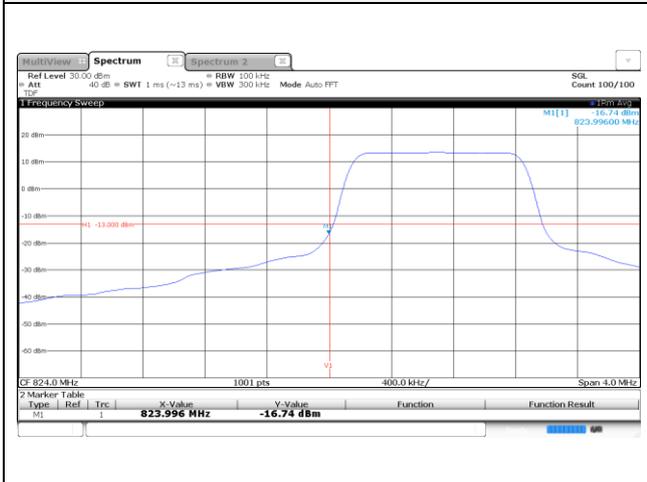


10M BW / 16QAM / High ch.

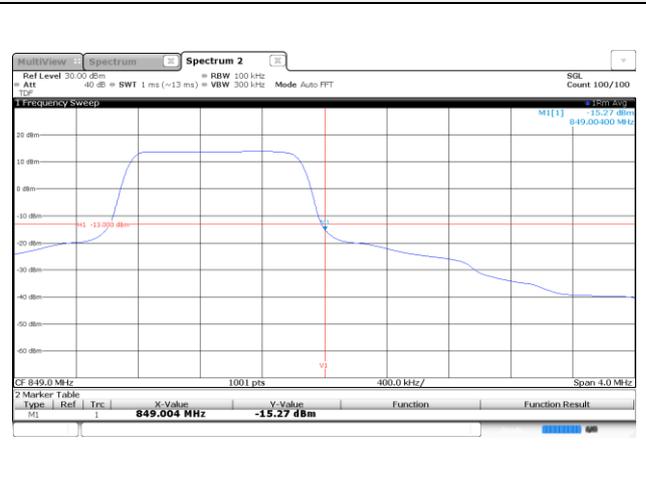


Test mode: LTE Band5

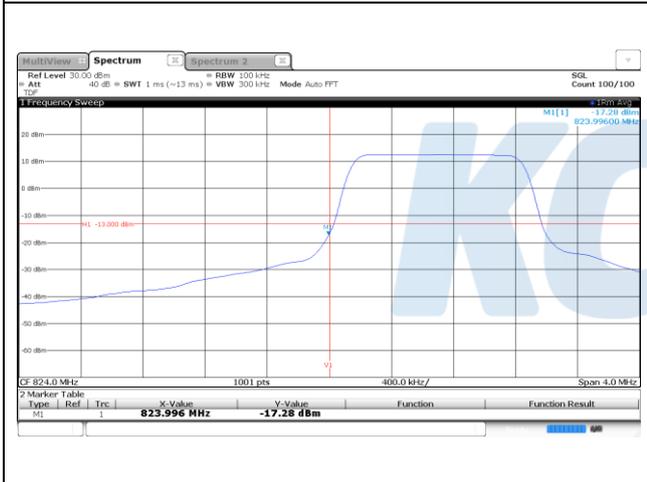
1.4M BW / QPSK/ Low ch.



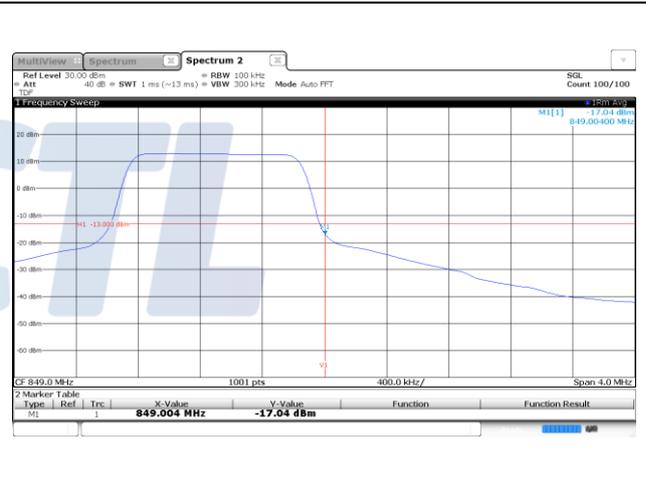
1.4M BW / QPSK/ High ch.



1.4M BW / 16QAM / Low ch.



1.4M BW / 16QAM / High ch.



KCTL Inc.

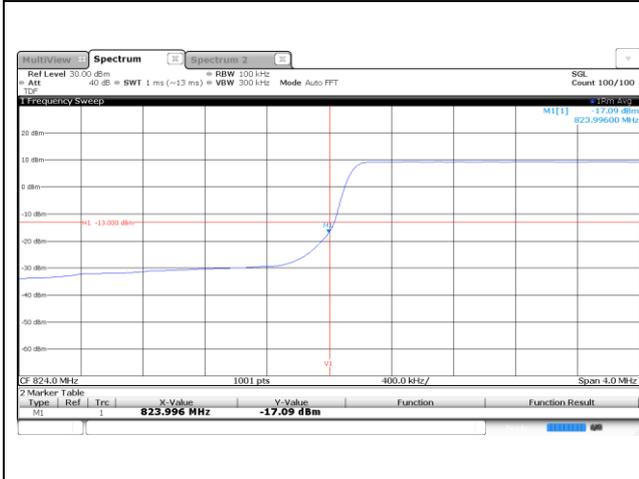
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

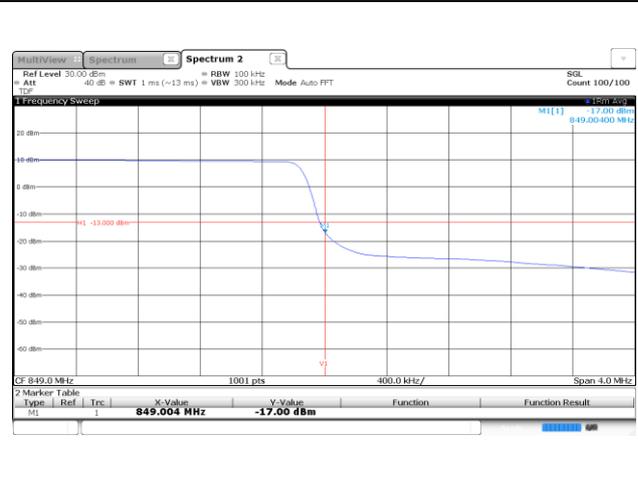
Page (127) of (279)



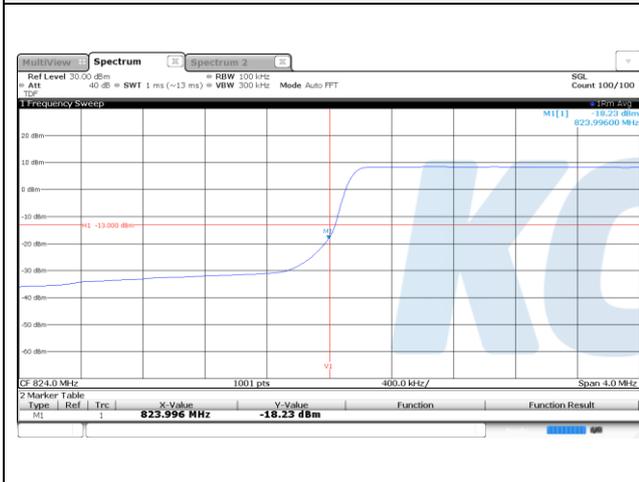
3M BW / QPSK/ Low ch.



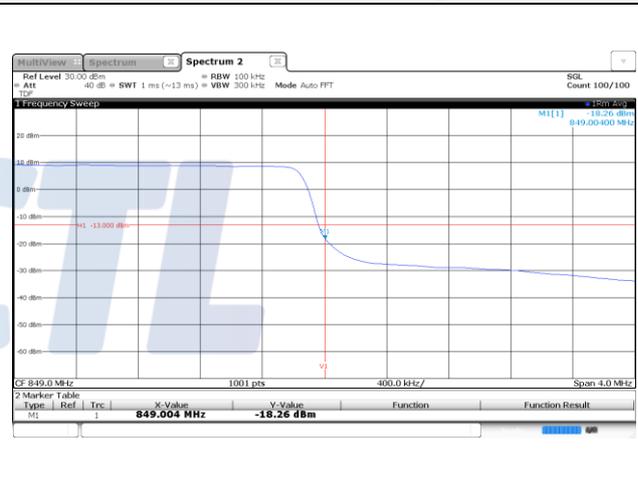
3M BW / QPSK/ High ch.



3M BW / 16QAM / Low ch.



3M BW / 16QAM / High ch.



KCTL Inc.

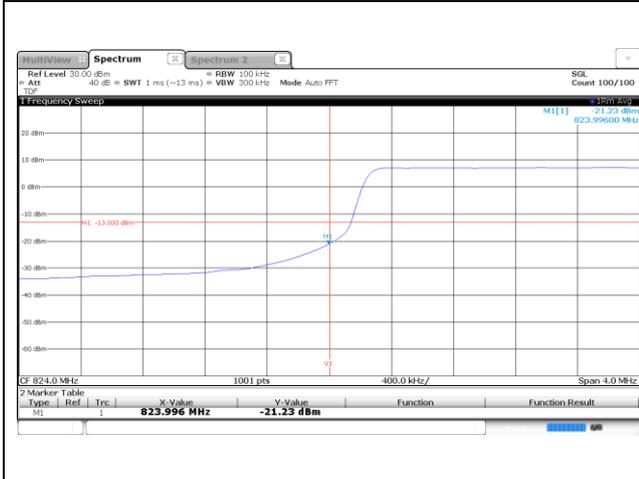
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

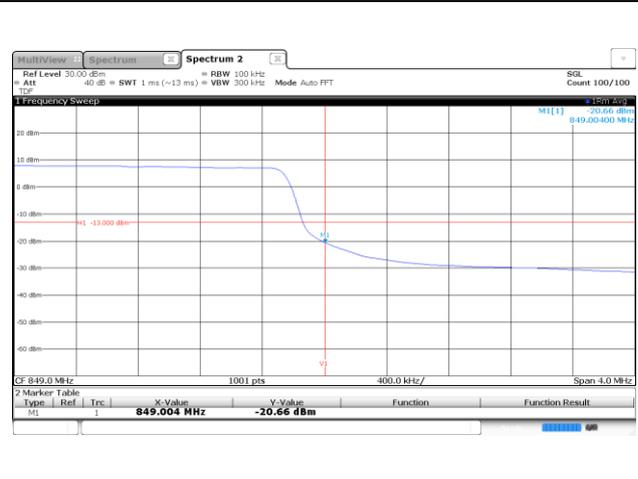
Page (128) of (279)



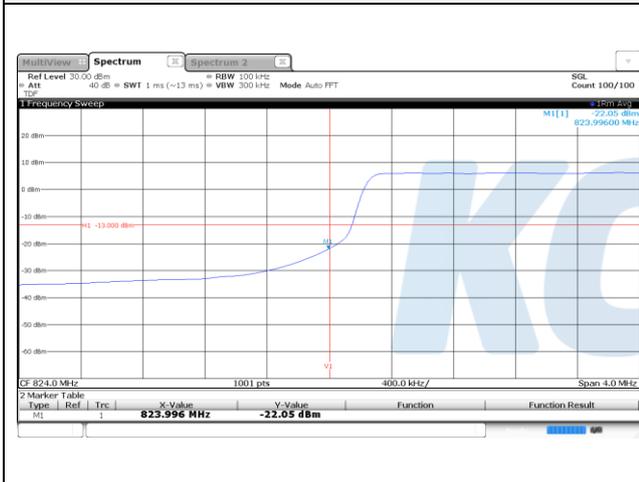
5M BW / QPSK/ Low ch.



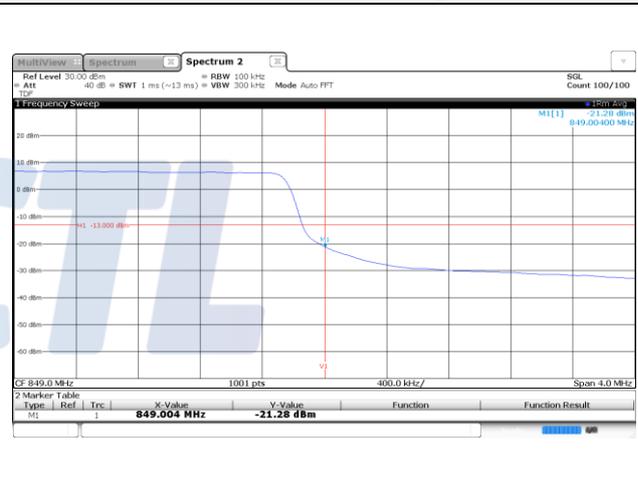
5M BW / QPSK/ High ch.



5M BW / 16QAM / Low ch.



5M BW / 16QAM / High ch.



KCTL Inc.

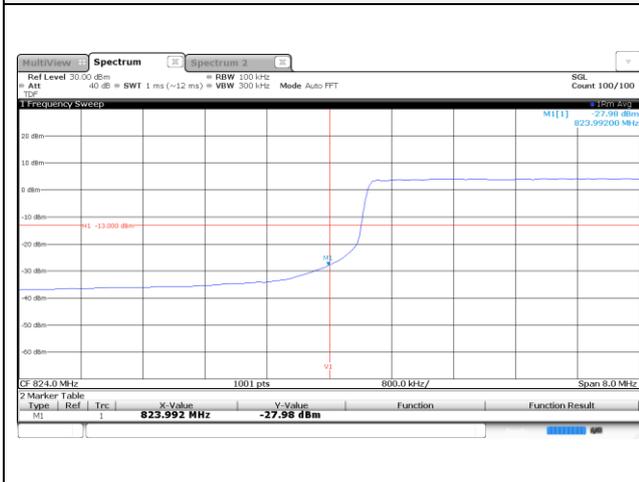
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

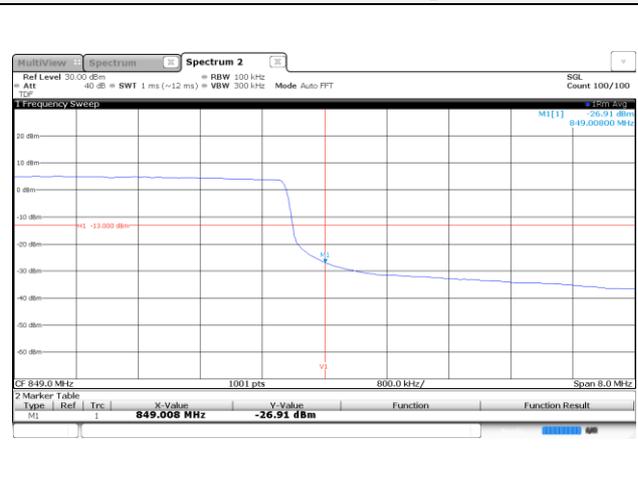
Page (129) of (279)



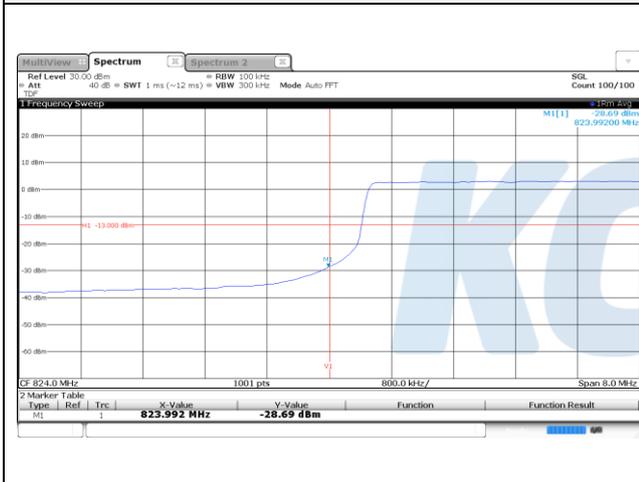
10M BW / QPSK/ Low ch.



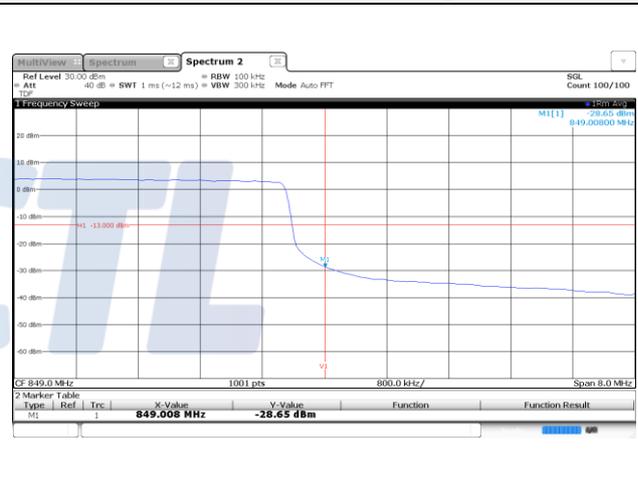
10M BW / QPSK/ High ch.



10M BW / 16QAM / Low ch.

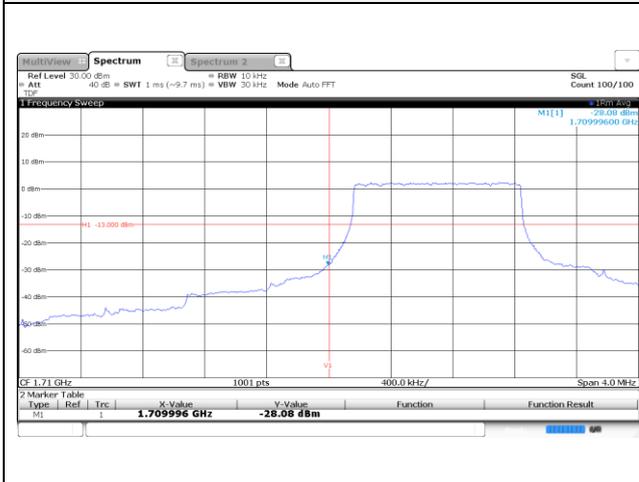


10M BW / 16QAM / High ch.

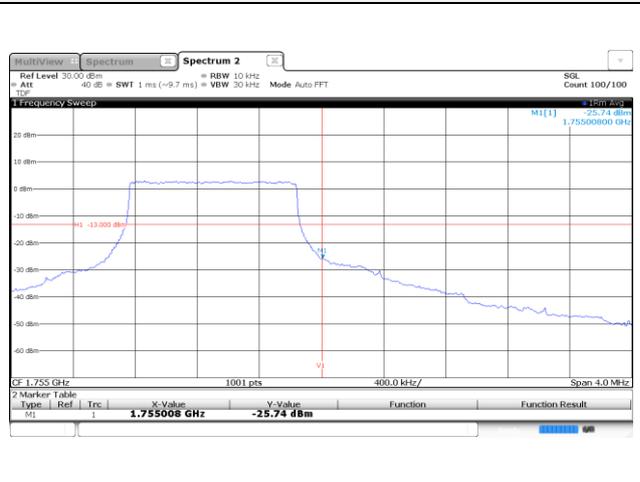


Test mode: LTE Band4

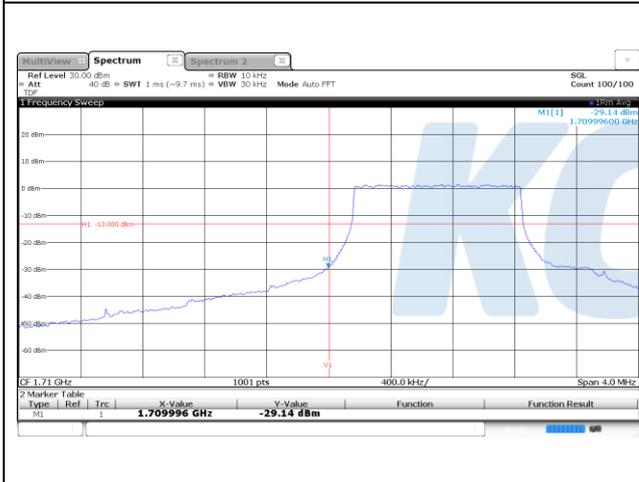
1.4M BW / QPSK/ Low ch.



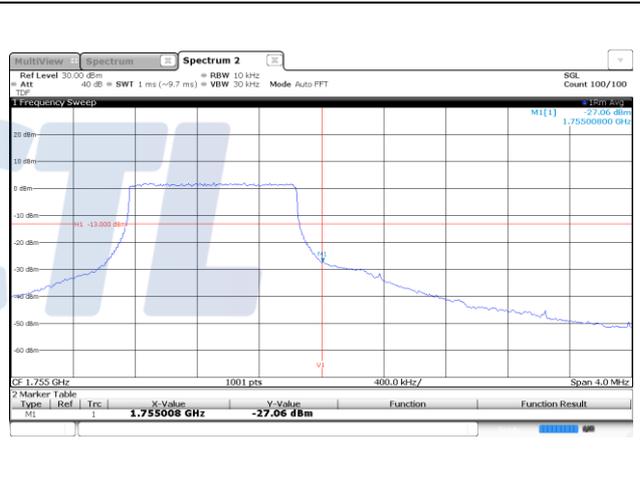
1.4M BW / QPSK/ High ch.



1.4M BW / 16QAM / Low ch.



1.4M BW / 16QAM / High ch.



KCTL Inc.

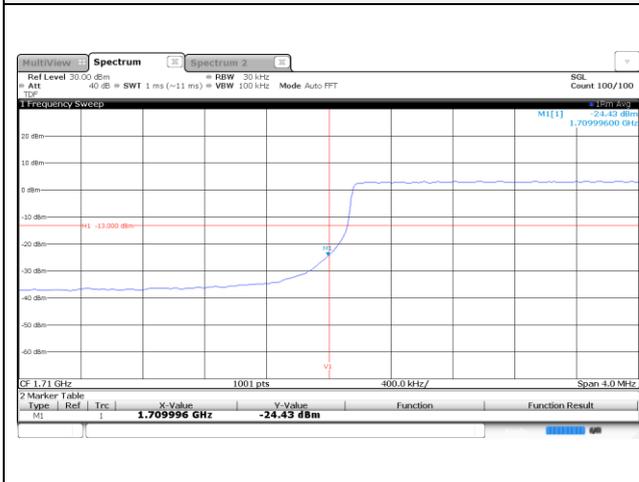
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

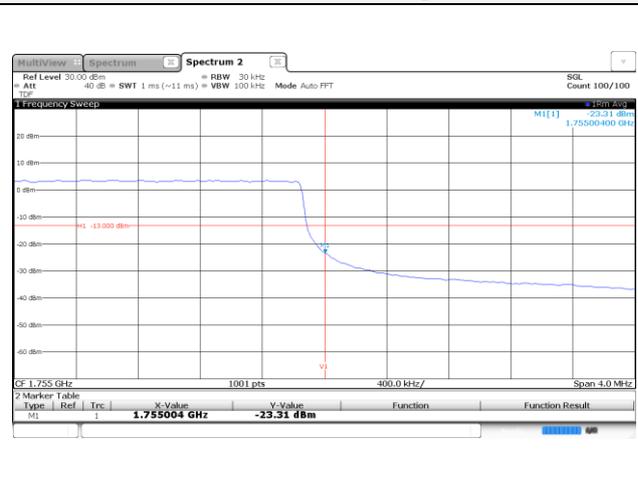
Page (131) of (279)



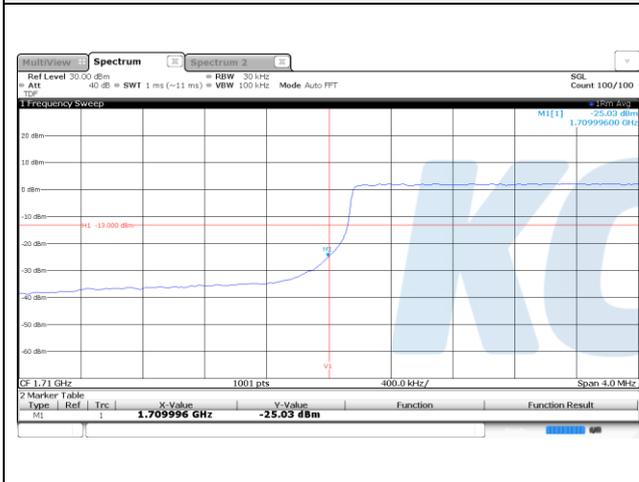
3M BW / QPSK/ Low ch.



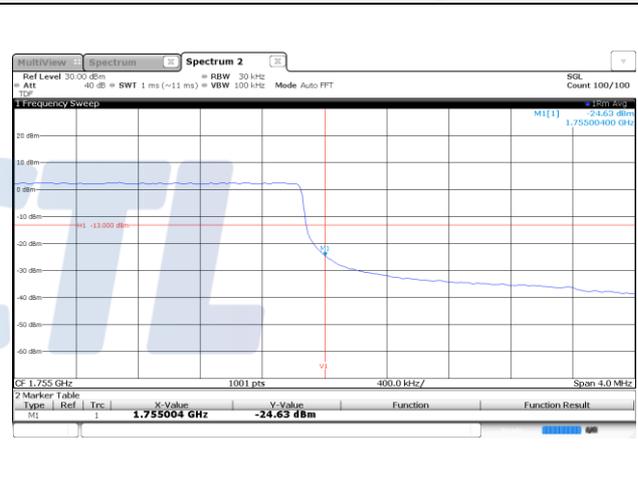
3M BW / QPSK/ High ch.



3M BW / 16QAM / Low ch.



3M BW / 16QAM / High ch.



KCTL Inc.

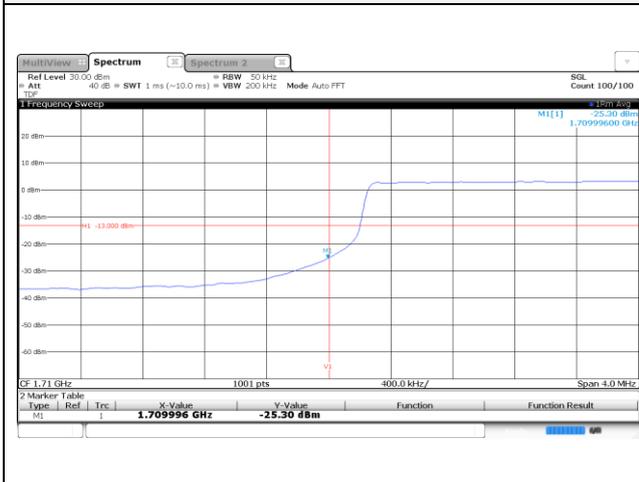
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

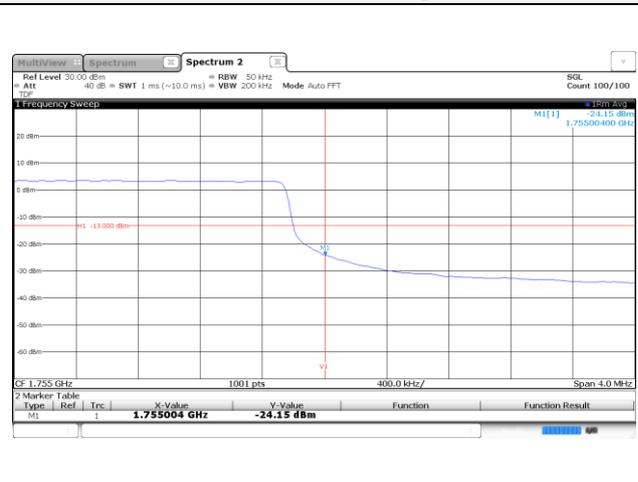
Page (132) of (279)



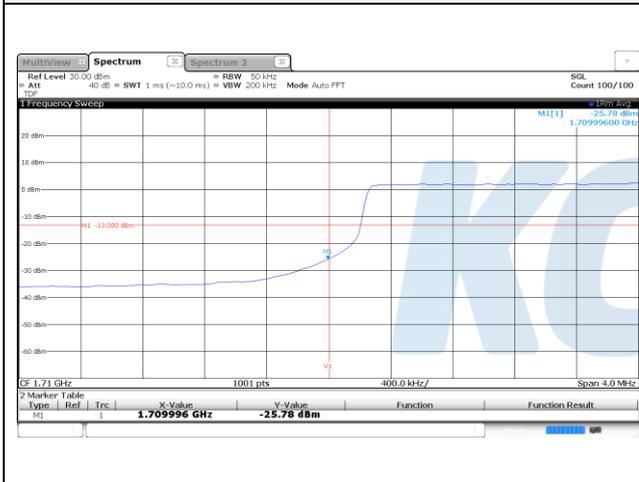
5M BW / QPSK/ Low ch.



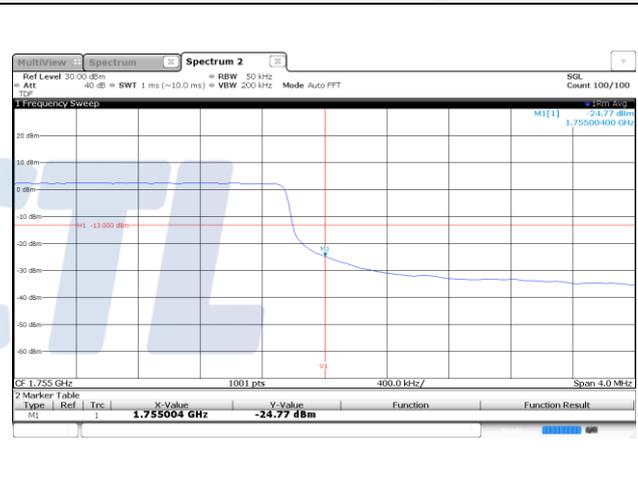
5M BW / QPSK/ High ch.



5M BW / 16QAM / Low ch.



5M BW / 16QAM / High ch.



KCTL Inc.

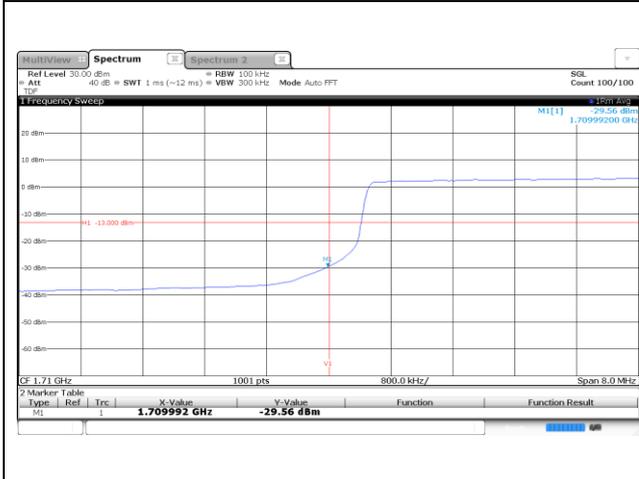
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

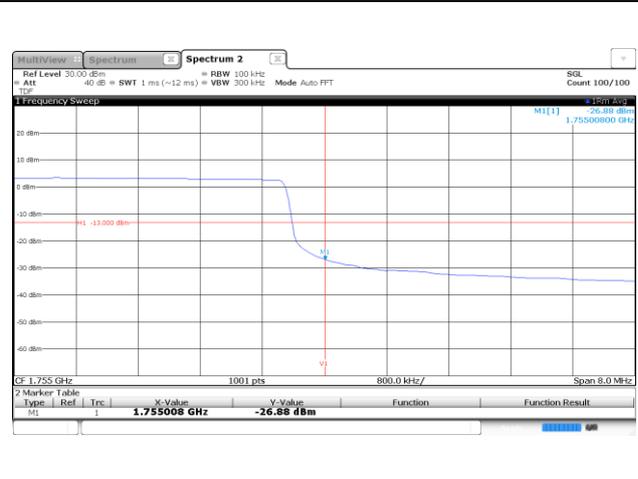
Page (133) of (279)



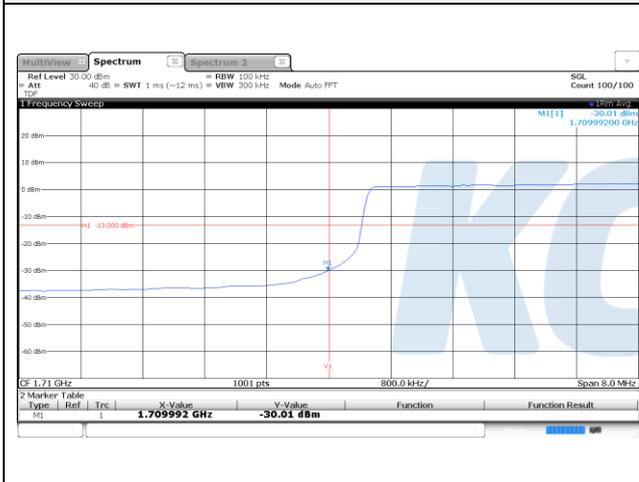
10M BW / QPSK/ Low ch.



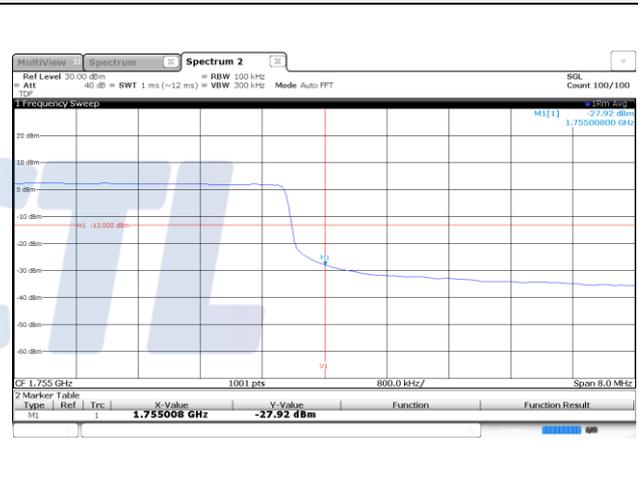
10M BW / QPSK/ High ch.



10M BW / 16QAM / Low ch.



10M BW / 16QAM / High ch.



KCTL Inc.

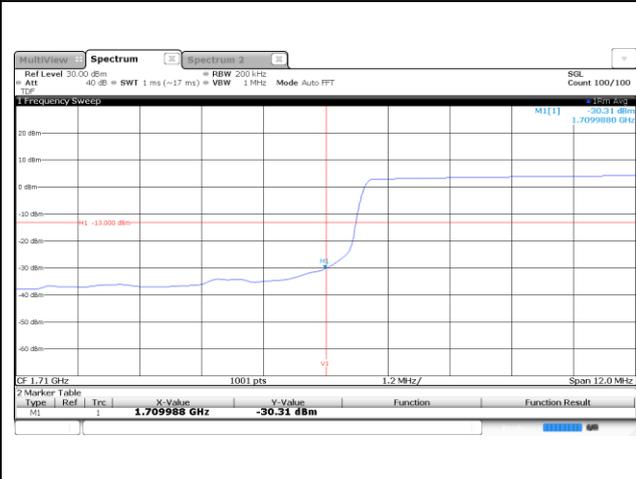
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

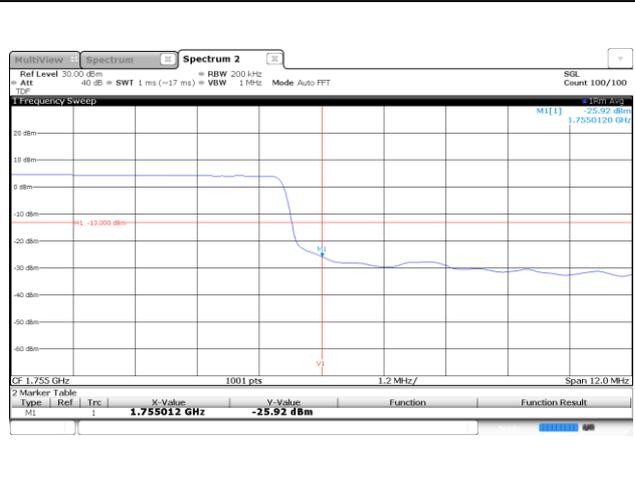
Page (134) of (279)



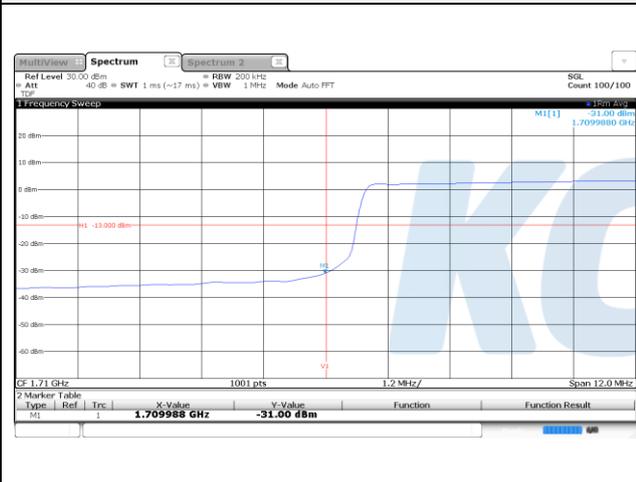
15M BW / QPSK/ Low ch.



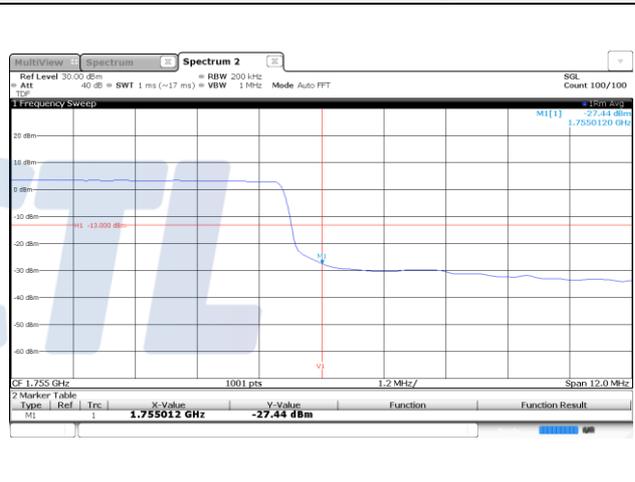
15M BW / QPSK/ High ch.



15M BW / 16QAM / Low ch.



15M BW / 16QAM / High ch.



KCTL Inc.

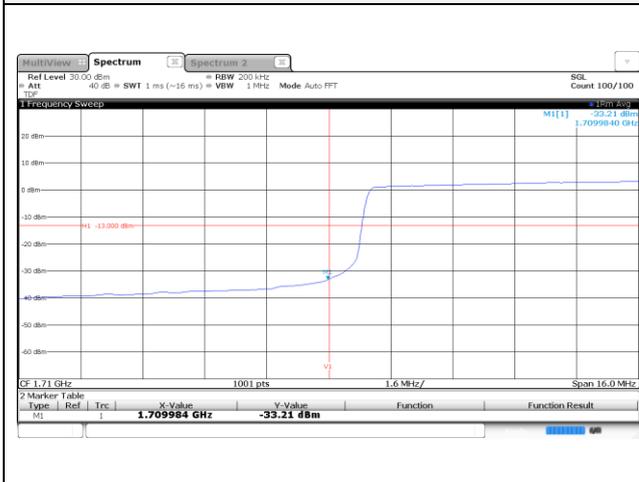
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

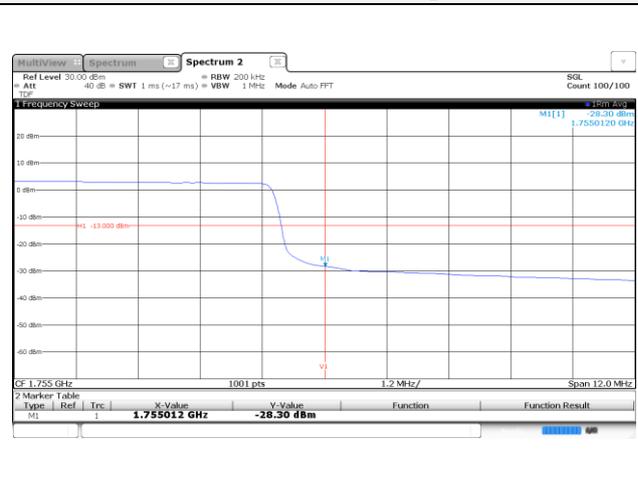
Page (135) of (279)



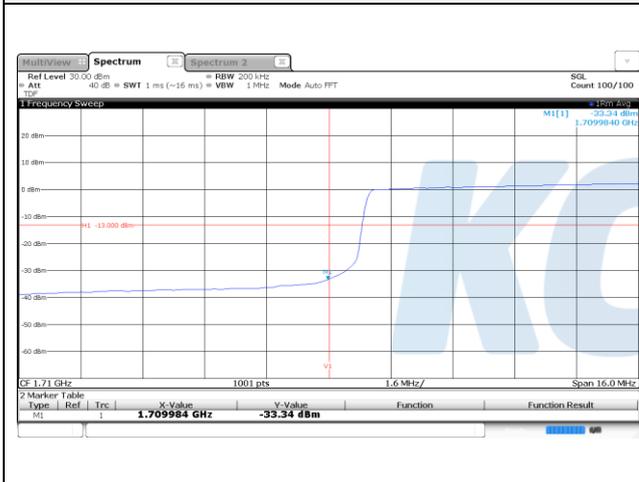
20M BW / QPSK/ Low ch.



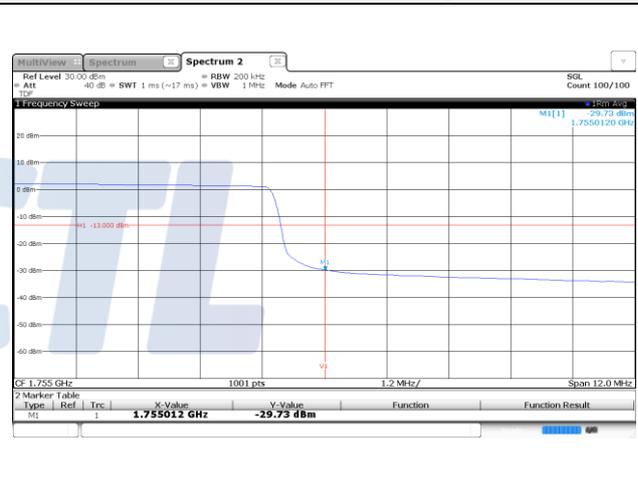
20M BW / QPSK/ High ch.



20M BW / 16QAM / Low ch.

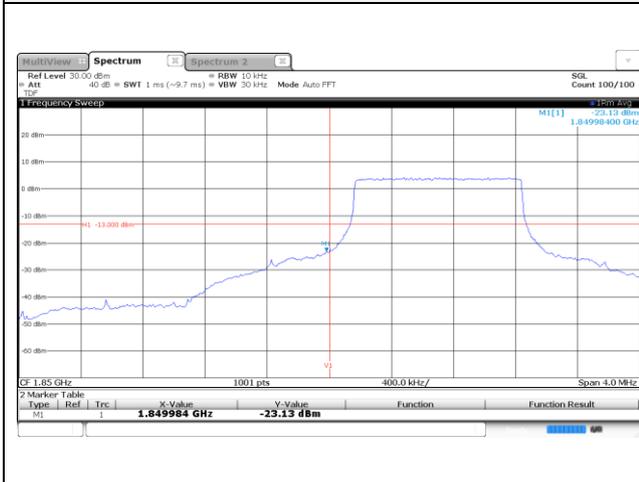


20M BW / 16QAM / High ch.

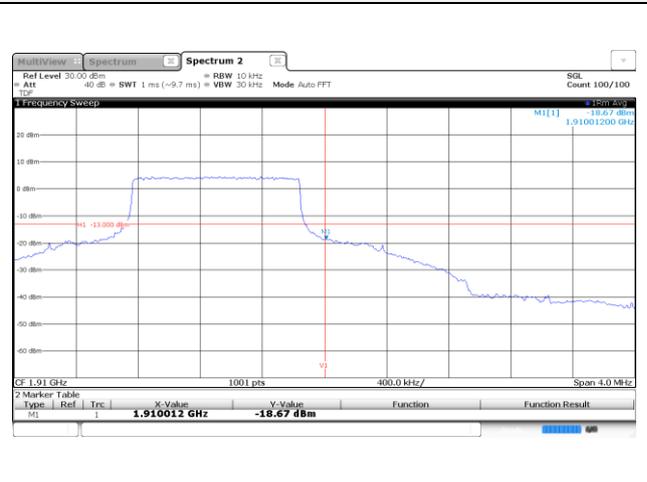


Test mode: LTE Band2

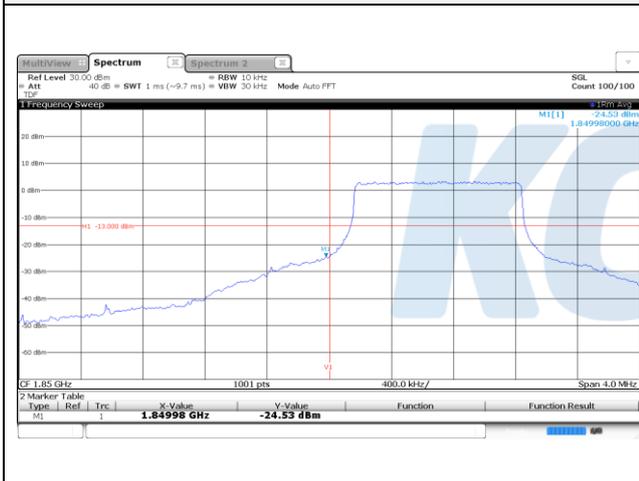
1.4M BW / QPSK/ Low ch.



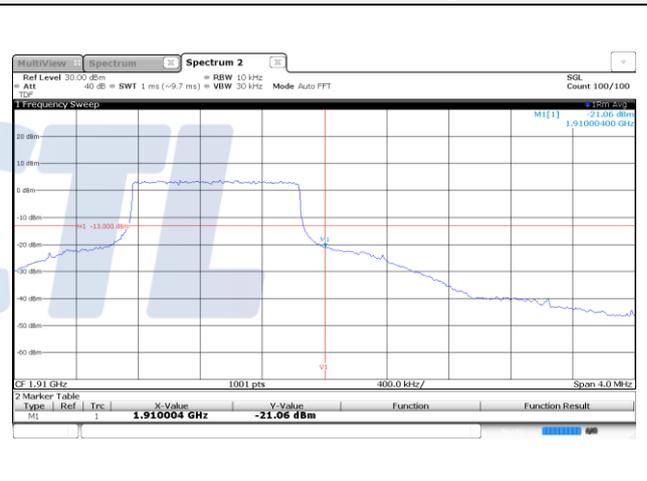
1.4M BW / QPSK/ High ch.



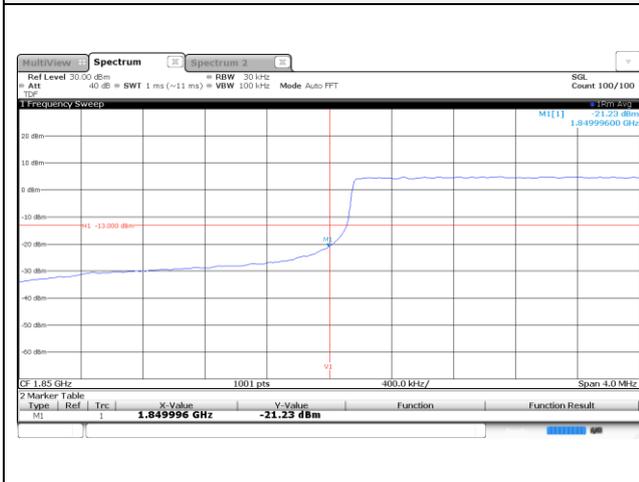
1.4M BW / 16QAM / Low ch.



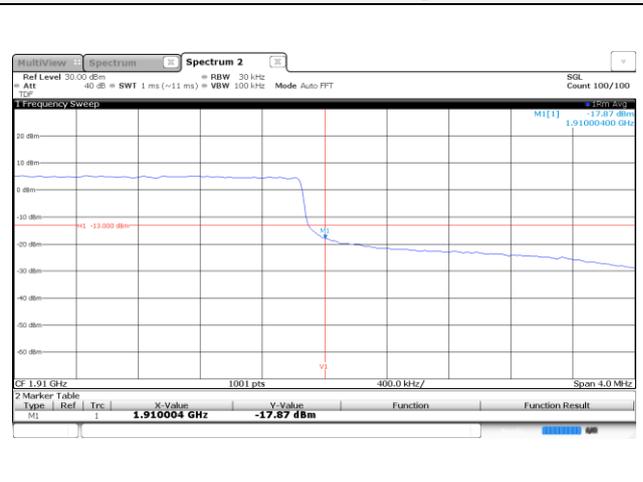
1.4M BW / 16QAM / High ch.



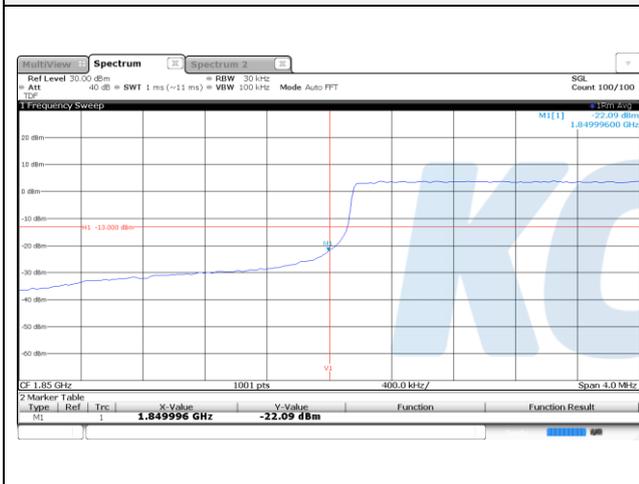
3M BW / QPSK/ Low ch.



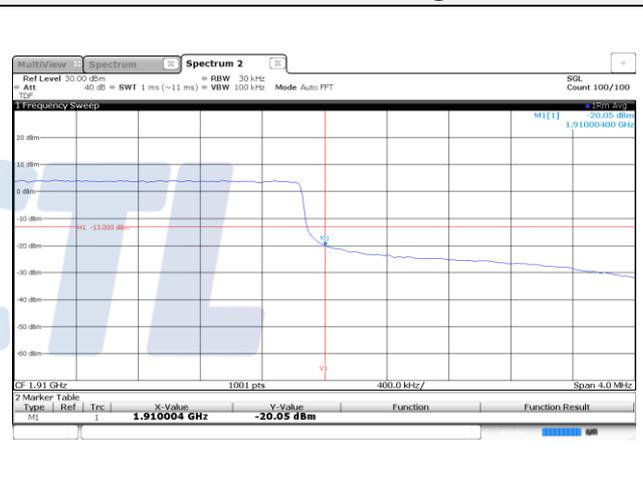
3M BW / QPSK/ High ch.



3M BW / 16QAM / Low ch.



3M BW / 16QAM / High ch.



KCTL Inc.

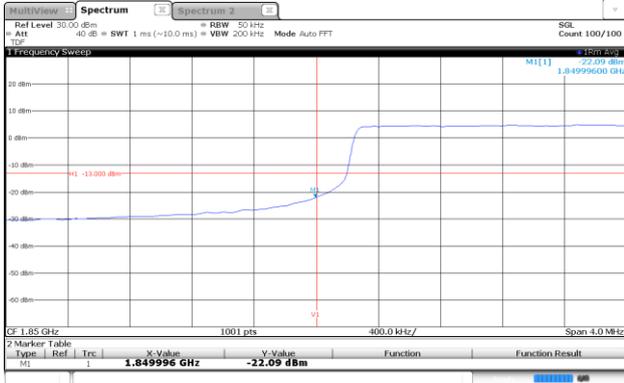
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

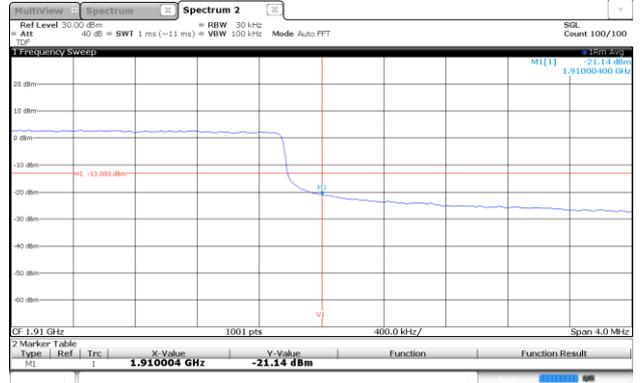
Page (138) of (279)



5M BW / QPSK/ Low ch.



5M BW / QPSK/ High ch.



5M BW / 16QAM / Low ch.



5M BW / 16QAM / High ch.



KCTL Inc.

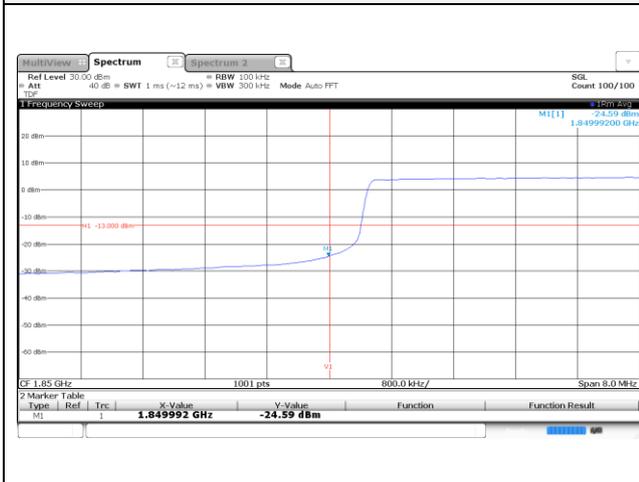
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

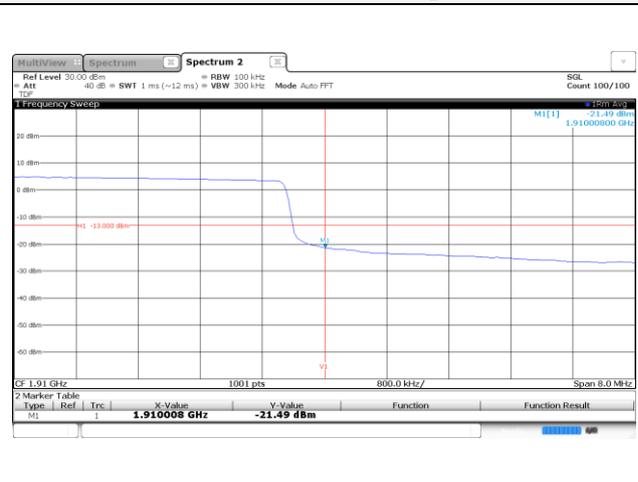
Page (139) of (279)



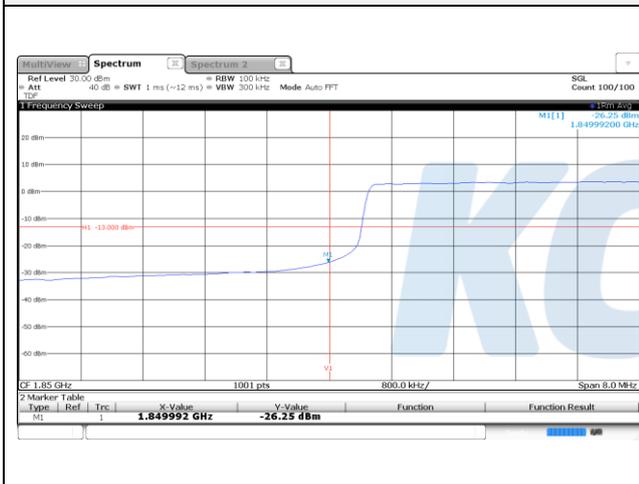
10M BW / QPSK/ Low ch.



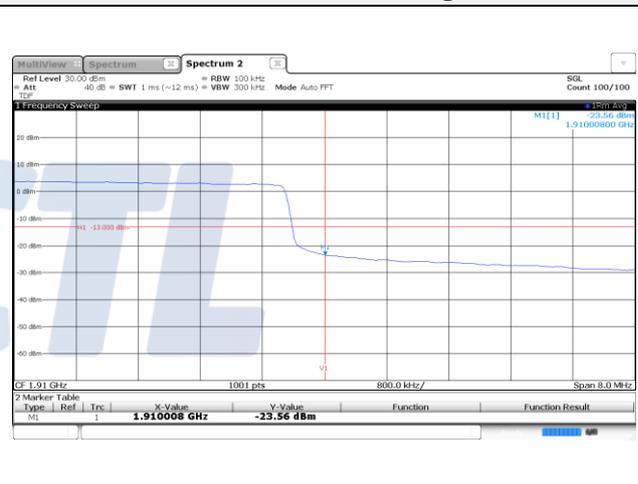
10M BW / QPSK/ High ch.



10M BW / 16QAM / Low ch.



10M BW / 16QAM / High ch.



KCTL Inc.

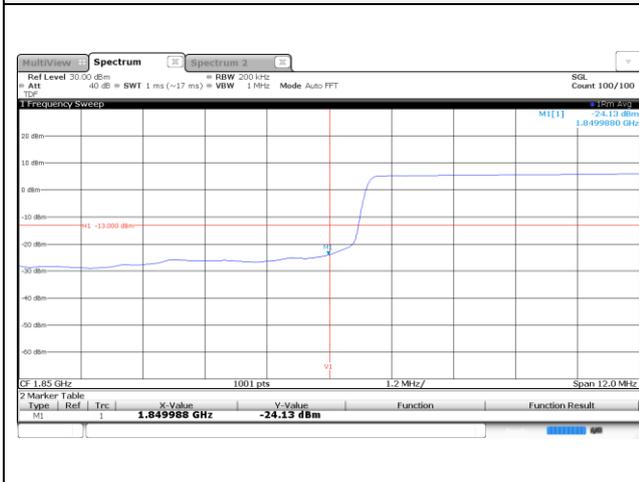
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

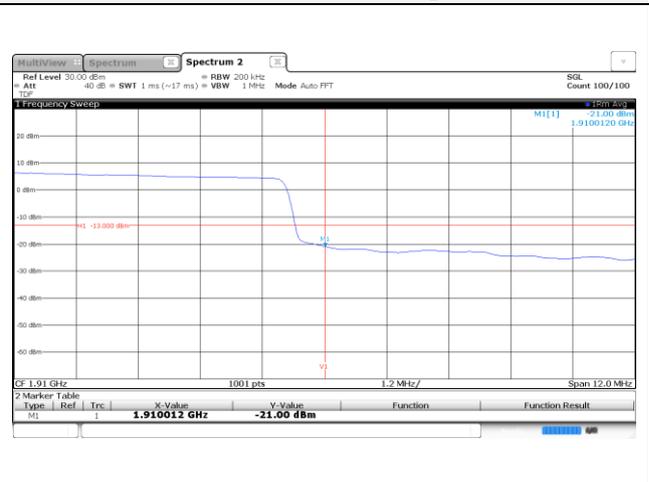
Page (140) of (279)



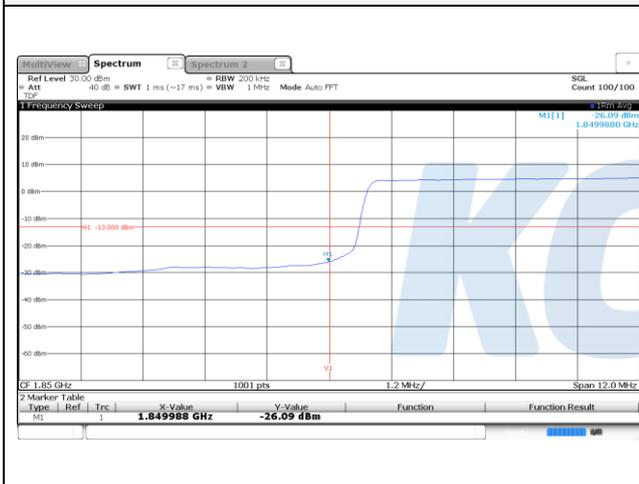
15M BW / QPSK/ Low ch.



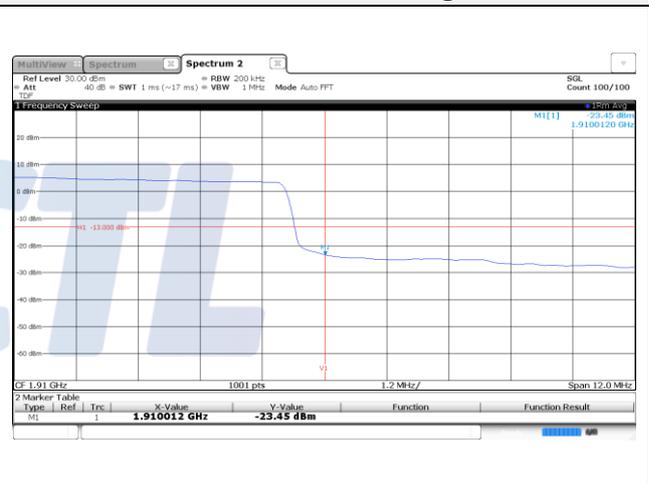
15M BW / QPSK/ High ch.



15M BW / 16QAM / Low ch.



15M BW / 16QAM / High ch.



KCTL Inc.

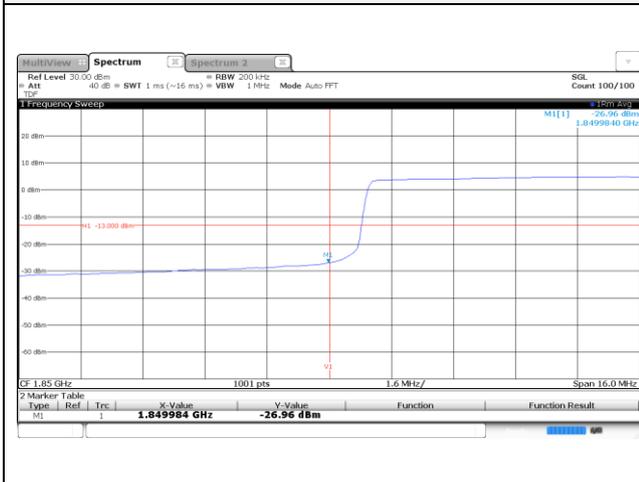
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

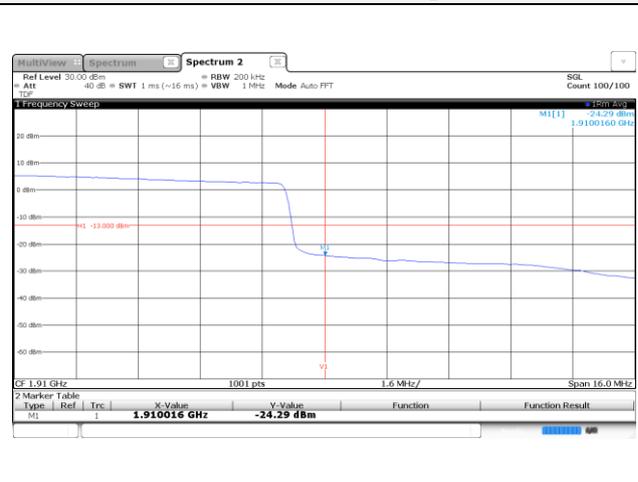
Page (141) of (279)



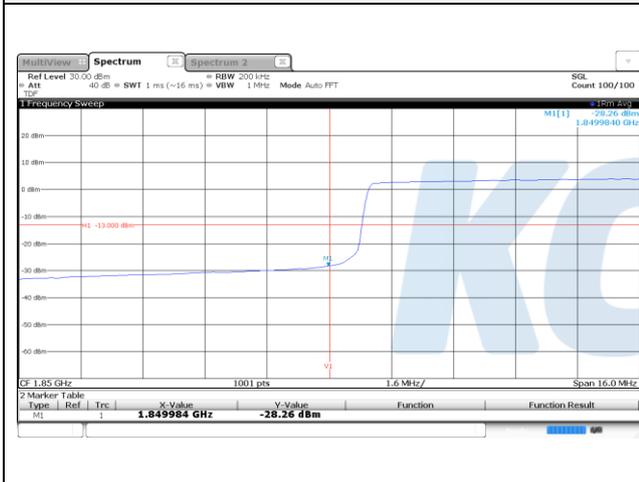
20M BW / QPSK/ Low ch.



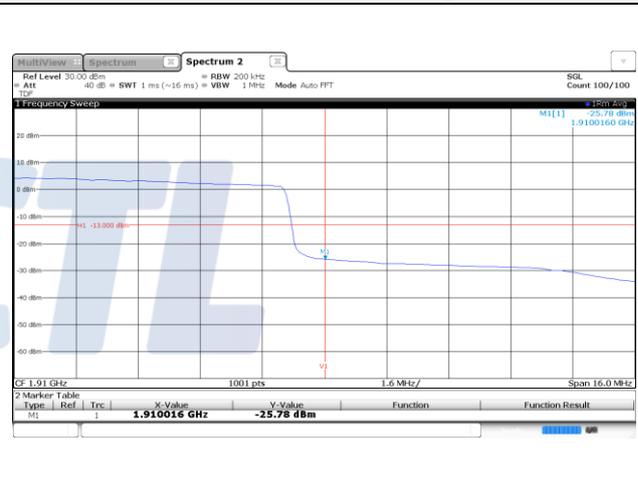
20M BW / QPSK/ High ch.



20M BW / 16QAM / Low ch.

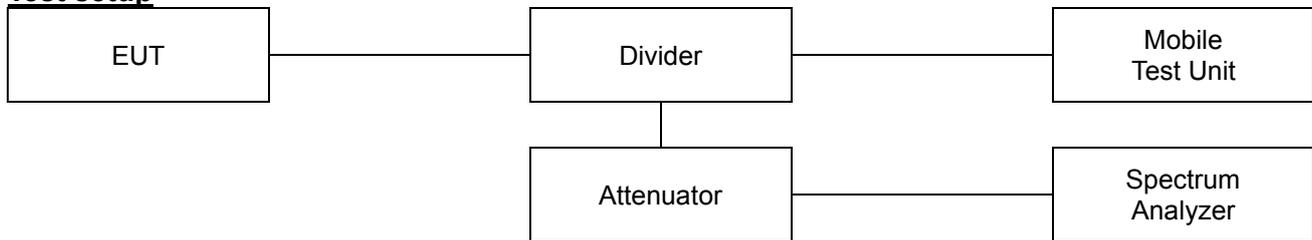


20M BW / 16QAM / High ch.



7.4. Peak to Average Power Ratio (PAPR)

Test setup



Limit

According to §22.913(d), §24.232(d), the peak-to-average ratio(PAR) of the transmission must not exceed 13 dB.

According to §27.50(d)(5), the peak-to-average ratio(PAR) of the transmission may not exceed 13 dB.

Test procedure

971168 D01 v03r01 - Section 5.7.2
ANSI 63.26-2015 – Section 5.2.3.4

Test settings

5.2.3.4 Measurement of peak power in a broadband noise-like signal using CCDF

- 1) Set resolution/measurement bandwidth \geq OBW or specified reference bandwidth
- 2) Set the number of counts to a value that stabilizes the measured CCDF curve.
- 3) Set the measurement interval as follows:
 - a) For continuous transmissions, set to the greater of $[10 \times (\text{number of points in sweep}) \times (\text{transmission symbol period})]$ or 1 ms.
 - b) For burst transmissions, employ an external trigger that is synchronized with the EUT burst timing sequence, or use the internal burst trigger with a trigger level that allows the burst to stabilize. Set the measurement interval to a time that is less than or equal to the burst duration.
 - c) If there are several carriers in a single antenna port, the peak power shall be determined for each individual carrier (by disabling the other carriers while measuring the required carrier) and the total peak power calculated from the sum of the individual carrier peak powers.
- 4) Record the maximum PAPR level associated with a probability of 0.1%

5.2.6 Peak-to-average power ratio

Use one of the procedures presented in 5.2(ANSI C63.26-2015) to measure the total peak power and record as P_{PK} .

Use one of the applicable procedure presented 5.2(ANSI C63.26-2015) to measure the total average power and record as P_{AG} . Determine the P.A.P.R from:

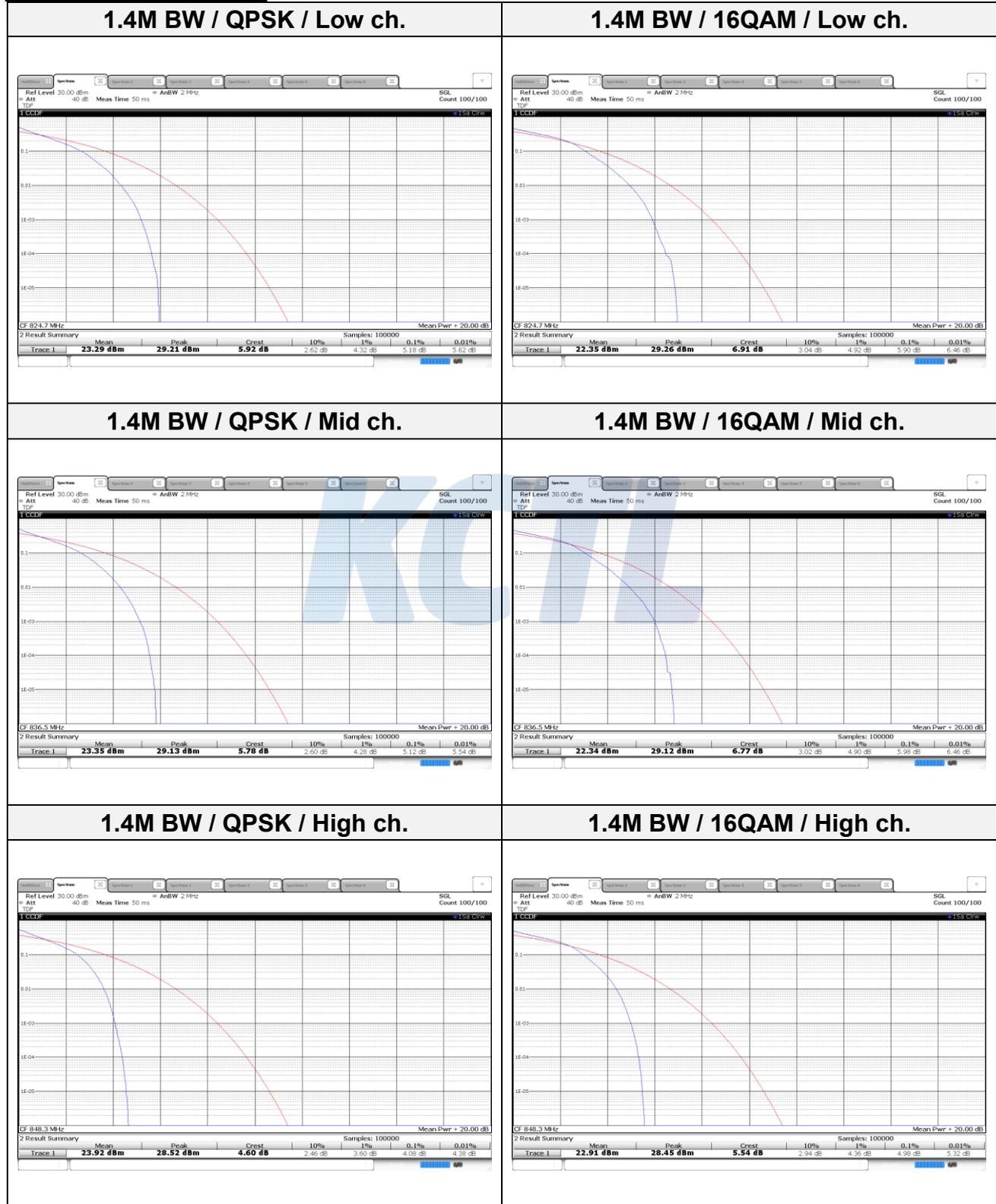
$$PAPR(\text{dB}) = P_{PK}(\text{dBm or dBW}) - P_{AG}(\text{dBm or dBW})$$

Notes:

1. All path loss of frequency range was investigated and compensated to spectrum analyzer as TDF function. Please refer to the page 12.

Test results

Test mode: LTE Band5



KCTL Inc.

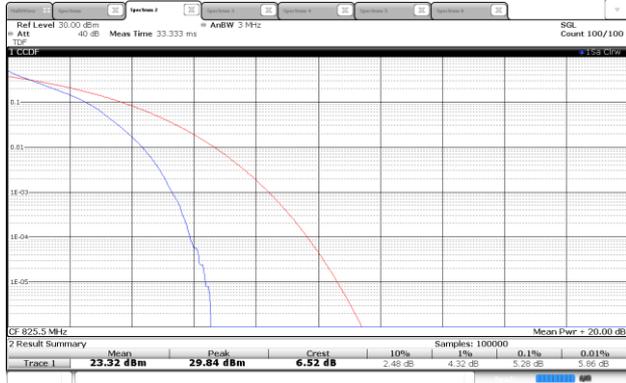
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

Page (144) of (279)



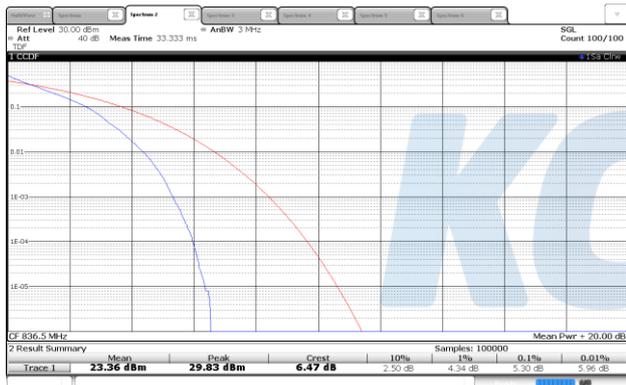
3M BW / QPSK / Low ch.



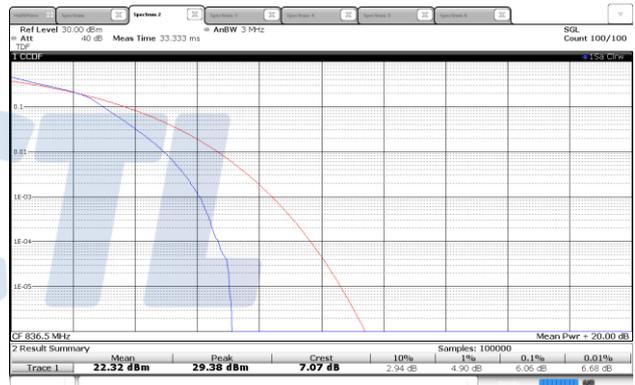
3M BW / 16QAM / Low ch.



3M BW / QPSK / Mid ch.



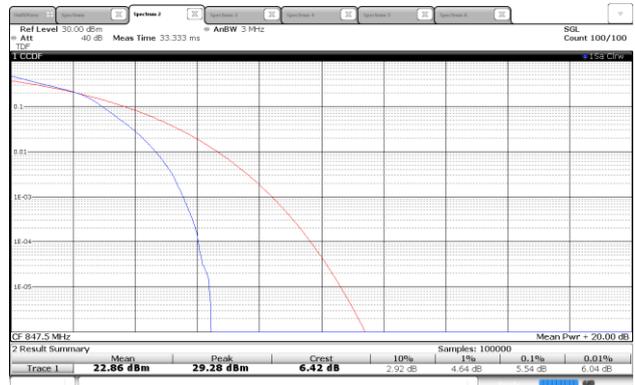
3M BW / 16QAM / Mid ch.



3M BW / QPSK / High ch.



3M BW / 16QAM / High ch.



KCTL Inc.

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

Report No.:
KR19-SRF0016-A

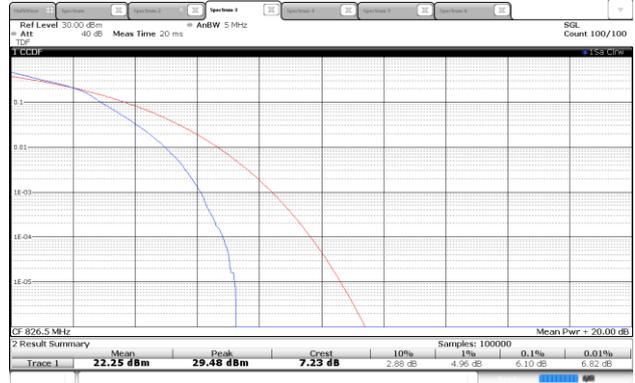
Page (145) of (279)



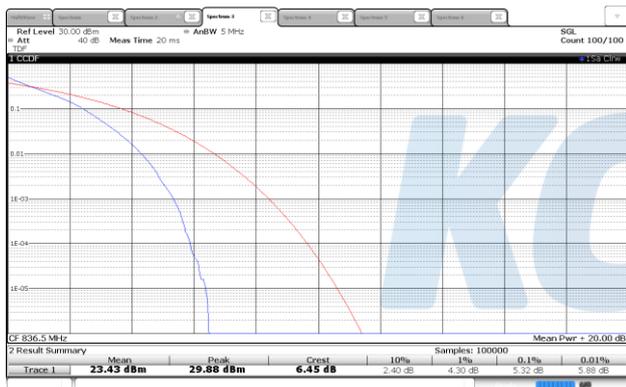
5M BW / QPSK / Low ch.



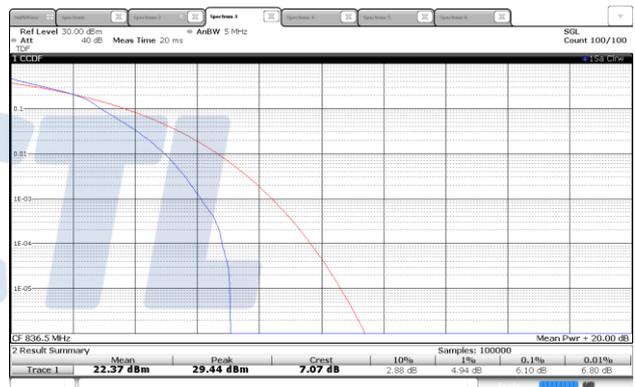
5M BW / 16QAM / Low ch.



5M BW / QPSK / Mid ch.



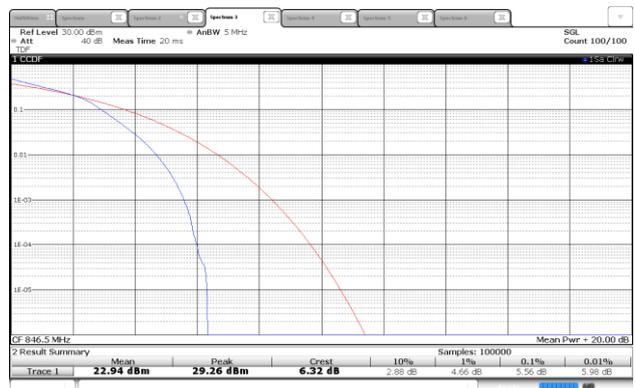
5M BW / 16QAM / Mid ch.



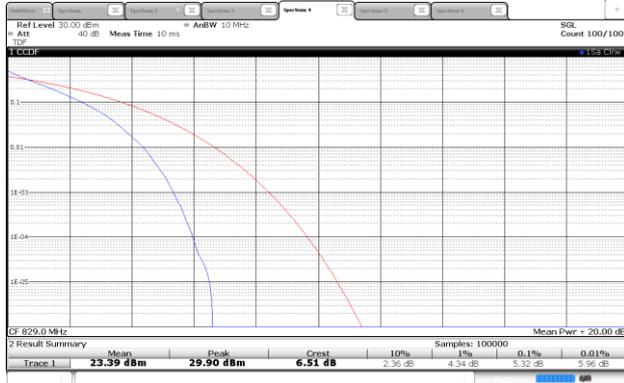
5M BW / QPSK / High ch.



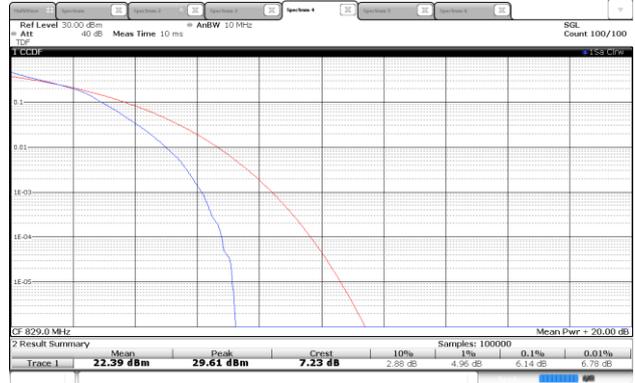
5M BW / 16QAM / High ch.



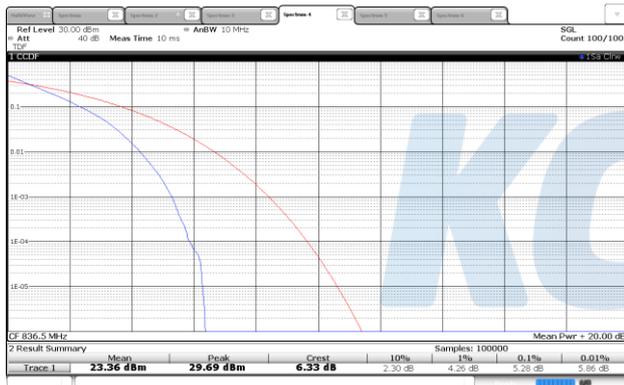
10M BW / QPSK / Low ch.



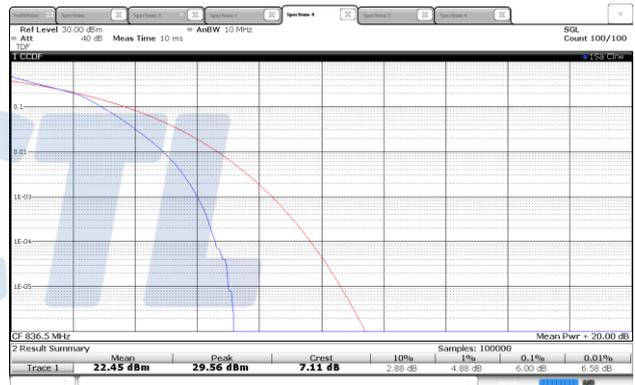
10M BW / 16QAM / Low ch.



10M BW / QPSK / Mid ch.



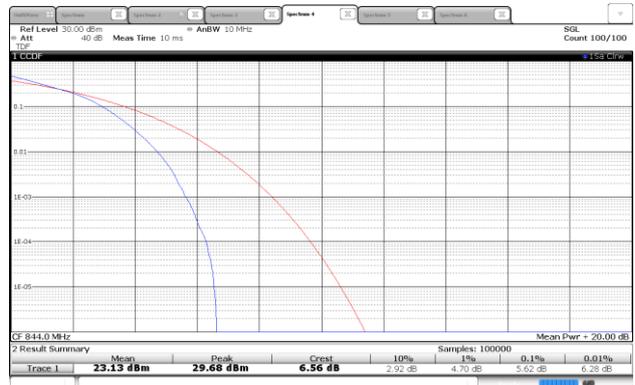
10M BW / 16QAM / Mid ch.



10M BW / QPSK / High ch.

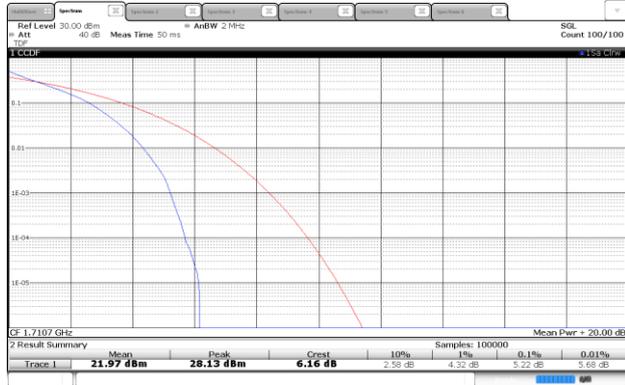


10M BW / 16QAM / High ch.



Test mode: LTE Band4

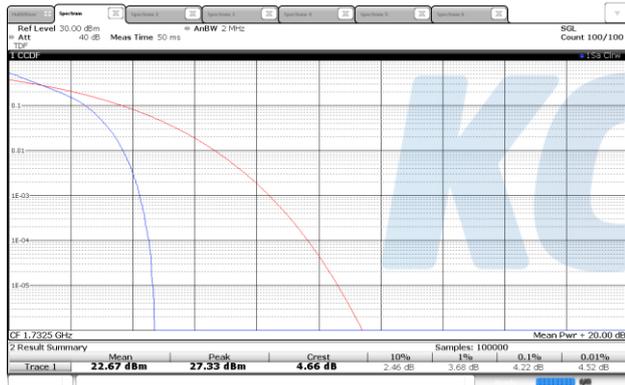
1.4M BW / QPSK / Low ch.



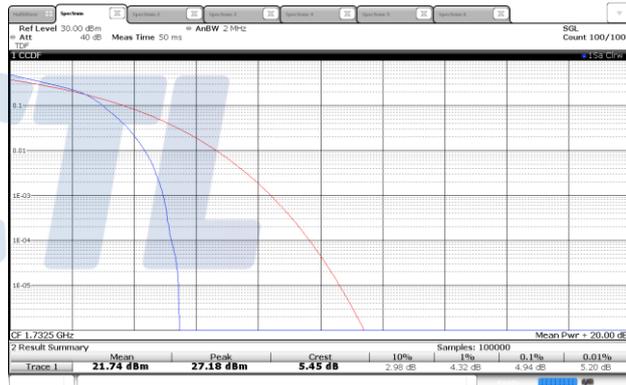
1.4M BW / 16QAM / Low ch.



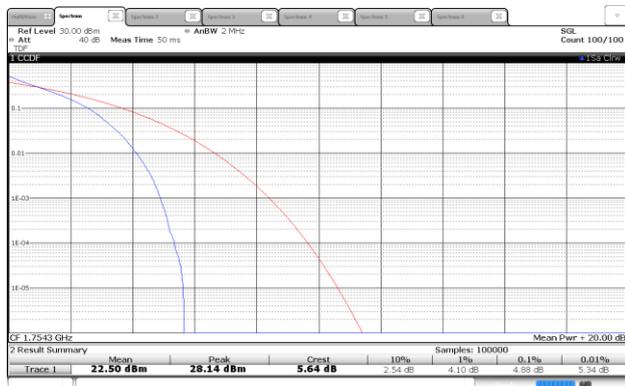
1.4M BW / QPSK / Mid ch.



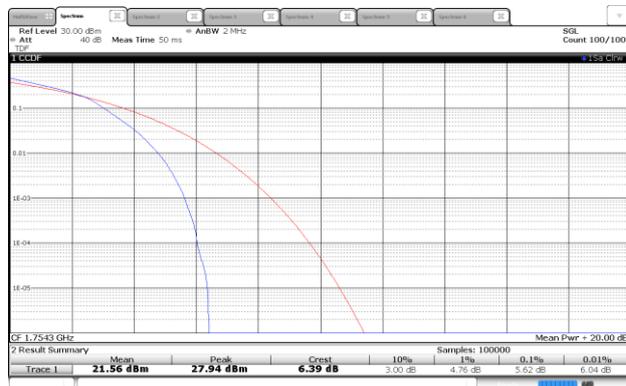
1.4M BW / 16QAM / Mid ch.



1.4M BW / QPSK / High ch.



1.4M BW / 16QAM / High ch.



KCTL Inc.

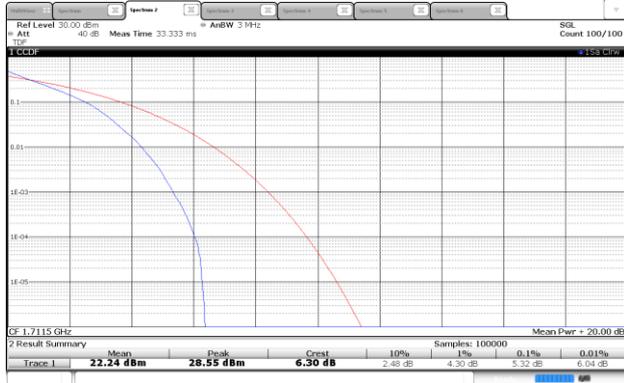
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

Report No.:
KR19-SRF0016-A

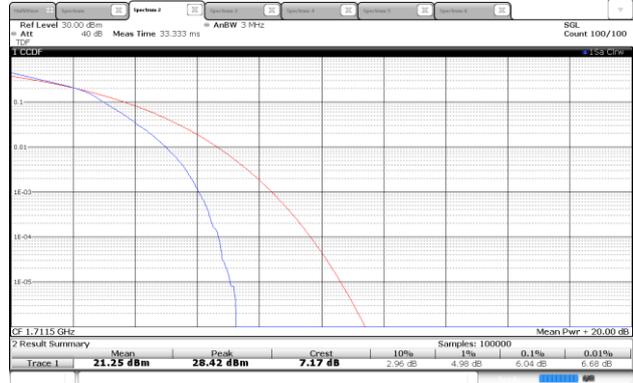
Page (148) of (279)



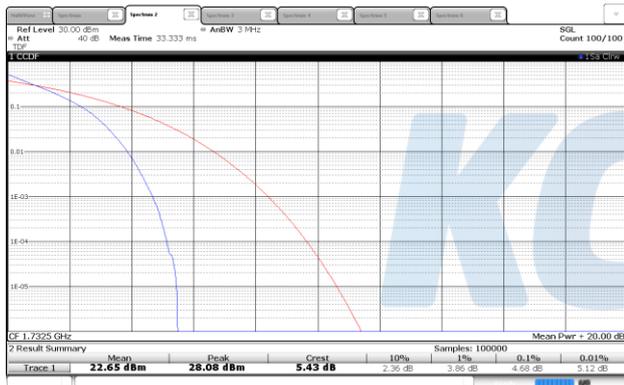
3M BW / QPSK / Low ch.



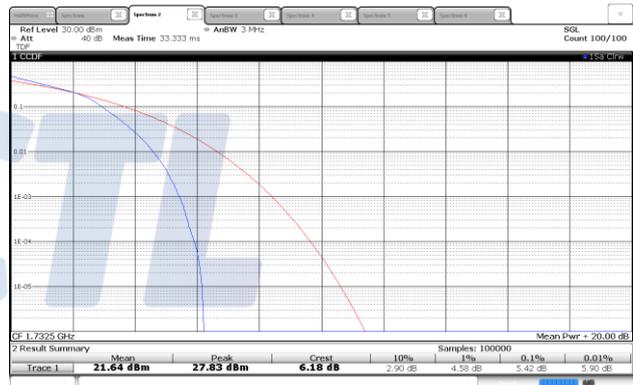
3M BW / 16QAM / Low ch.



3M BW / QPSK / Mid ch.



3M BW / 16QAM / Mid ch.



3M BW / QPSK / High ch.



3M BW / 16QAM / High ch.



KCTL Inc.

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

Report No.:
KR19-SRF0016-A

Page (149) of (279)



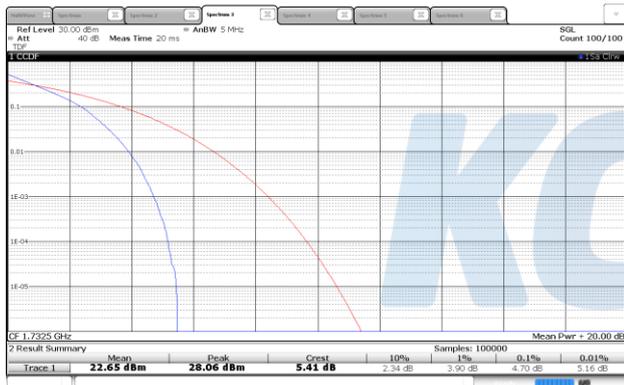
5M BW / QPSK / Low ch.



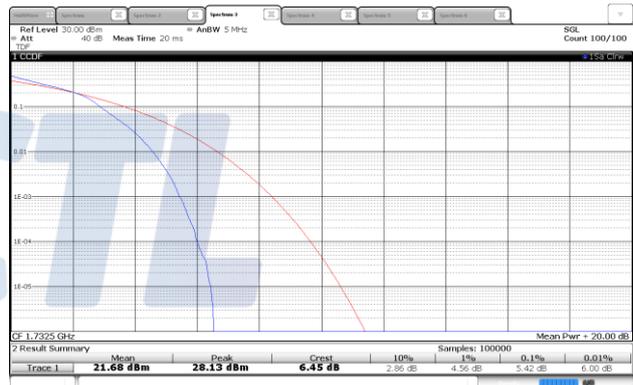
5M BW / 16QAM / Low ch.



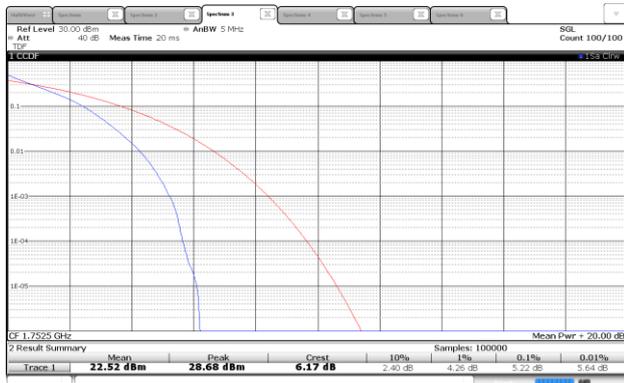
5M BW / QPSK / Mid ch.



5M BW / 16QAM / Mid ch.



5M BW / QPSK / High ch.



5M BW / 16QAM / High ch.

