

XMit 2019.09.05

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet. For Multiband operation, measurements were taken at the lower band edge of the lower band and the upper band edge of the upper band.

The spectrum was scanned below the lower band edge and above the higher band edge.

All limits were adjusted by a factor of [-10*log((N)] to account for the device operation as a N port MIMO transmitter, as per FCC KDB 622911.

For Bands 12 and 14, the adjustment factor is $-10*\log(4) = -6$ dB. The Bands 12 and 14 adjusted limit is -19 dBm. For Band 29, the adjustment factor is $-10*\log(2) = -3$ dB. The Band 29 adjusted limit is -16 dBm.

Per FCC section 27.53(g), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the RRH may operate as a 4 port MIMO transmitter for Band 12.

FCC 27.53(g) requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 27.53(g) requires a >30 kHz measurement bandwidth for emissions between 100 kHz outside of the RRH operating frequency range and band edge of the operating frequency range.

Report No. NOKI0004.1



EUT: AHLBBA RRH
Serial Number: K9193514835
Customer: Nokia Solutions and Networks Work Order: NOKI0004
Date: 18-Nov-19
Temperature: 22.7 °C Humidity: 29.9% RH Barometric Pres.: 1019 mbar Project: None
Tested by: Jonathan Kiefer
TEST SPECIFICATIONS Power: 54VDC Test Method Job Site: TX09 ANSI C63.26:2015 COMMENTS Band 12 band edge measurements. Tested on highest power antenna port (Port 1). EUT is operated at 100% duty cycle. DEVIATIONS FROM TEST STANDARD Jonathan Kiefer Configuration # 2 Signature Value (dBm) Limit (dBm) Result QPSK Modulation LTE5 Bandwidth Lower Band Edge Measurement 1 -28.691 Pass Measurement 2 -25.806 -19 Pass Upper Band Edge Pass Pass Measurement 1 -26.853 Measurement 2 LTE10 Bandwidth Lower Band Edge Measurement 1 Measurement 2 -31.322 -27.472 -19 -19 Pass Pass Upper Band Edge Measurement 1 -30.92 -19 -19 Pass Measurement 2 -27.547 Pass 16QAM Modulation LTE5 Bandwidth Lower Band Edge Measurement 1 Measurement 2 -19 -19 Pass Pass -28,719 Upper Band Edge Measurement 1 -27.263 Pass -19 Measurement 2 -24 603 -19 Pass LTE10 Bandwidth Lower Band Edge -31.502 Pass Measurement 1 -19 Measurement 2 -27.707 -19 Pass Upper Band Edge -19 -19 Measurement 1 -30.955 Pass Measurement 2 -27.32 Pass 64QAM Modulation LTE5 Bandwidth Lower Band Edge Measurement 1 -28.262 Pass -19 Measurement 2 -26.222 -19 Pass Upper Band Edge -27.031 -24.62 -19 -19 Measurement 1 Pass Measurement 2 Pass LTE10 Bandwidth Lower Band Edge -19 -19 Measurement 1 -31.414 Pass Measurement 2 -27.829 Pass Upper Band Edge Measurement 1 -30.897 -19 Pass Measurement 2 -27.732 -19 Pass 256QAM Modulation LTE5 Bandwidth Lower Band Edge -19 -19 Measurement 1 -28.371 Pass Measurement 2 -25.52 Pass Upper Band Edge Measurement 1 -26.827 Pass -19 Measurement 2 -24 676 -19 Pass LTE10 Bandwidth Lower Band Edge Measurement 1 -31.493 -19 Pass Measurement 2 -28.24 -19 Pass Upper Band Edge

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-30 478

-27.635

-19

-19

Pass

Pass

Measurement 1

Measurement 2

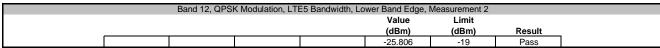


Band 12, QPSK Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-28.691 -19 Pass







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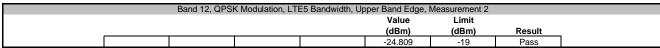


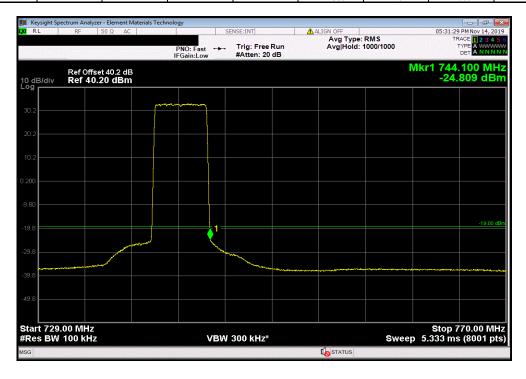
Band 12, QPSK Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-26.853 -19 Pass







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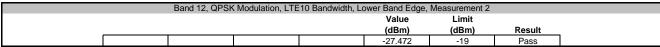


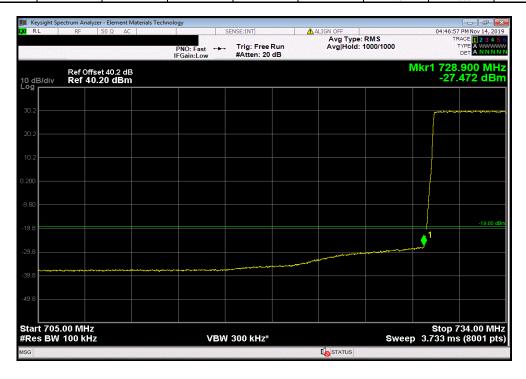
Band 12, QPSK Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-31.322 -19 Pass







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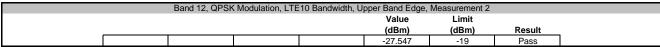


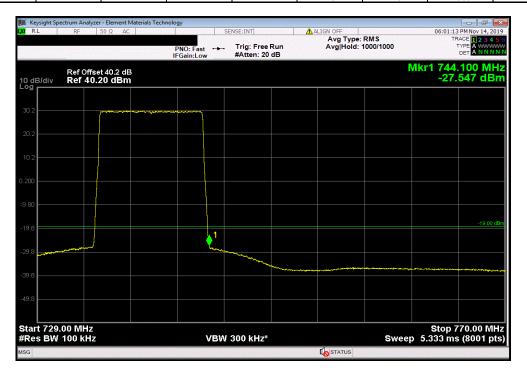
Band 12, QPSK Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value
Limit
(dBm) (dBm) Result

-30.92 -19 Pass







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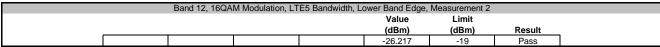


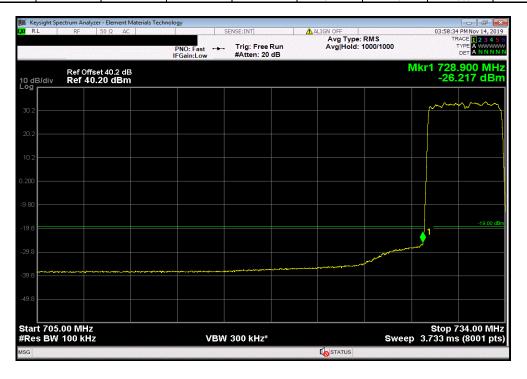
Band 12, 16QAM Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value
Limit
(dBm) (dBm) Result

-28.719 -19 Pass







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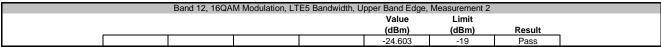


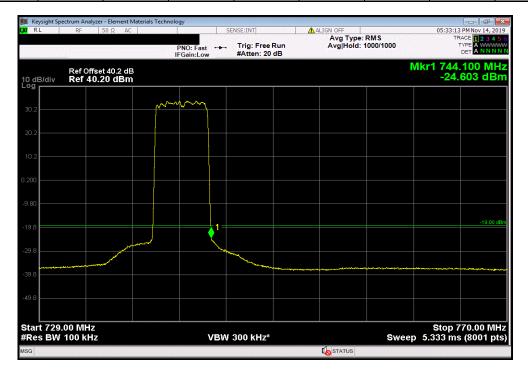
Band 12, 16QAM Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-27.263 -19 Pass







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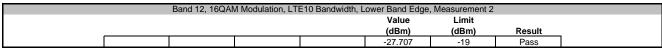


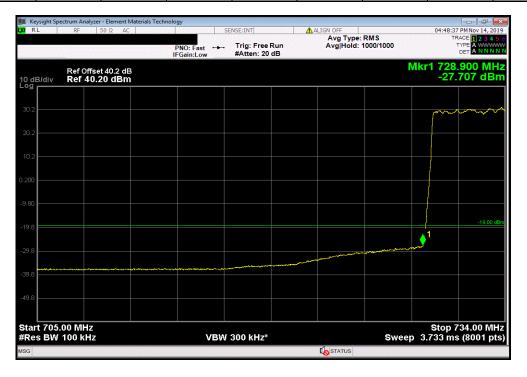
Band 12, 16QAM Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-31.502 -19 Pass







Report No. NOKI0004.1 204/574

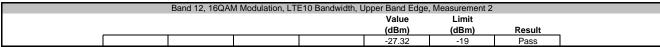


Band 12, 16QAM Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-30.955 -19 Pass







Report No. NOKI0004.1 205/574

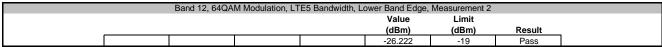


Band 12, 64QAM Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-28.262 -19 Pass







Report No. NOKI0004.1 206/574

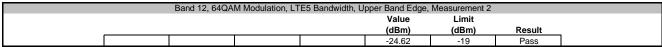


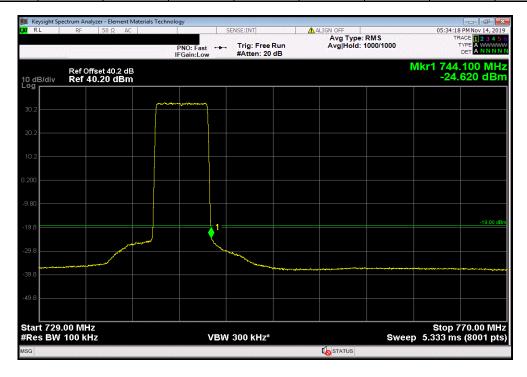
Band 12, 64QAM Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-27.031 -19 Pass







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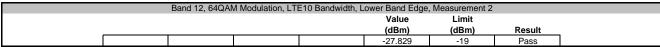


Band 12, 64QAM Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-31.414 -19 Pass







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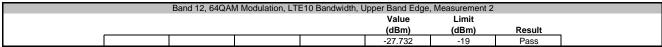


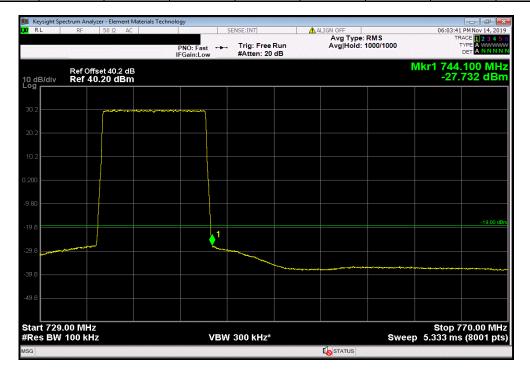
Band 12, 64QAM Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-30.897 -19 Pass







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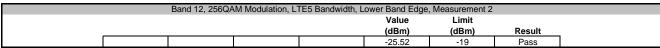


Band 12, 256QAM Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-28.371 -19 Pass







Report No. NOKI0004.1 210/574

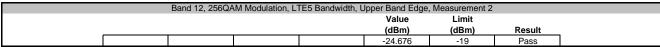


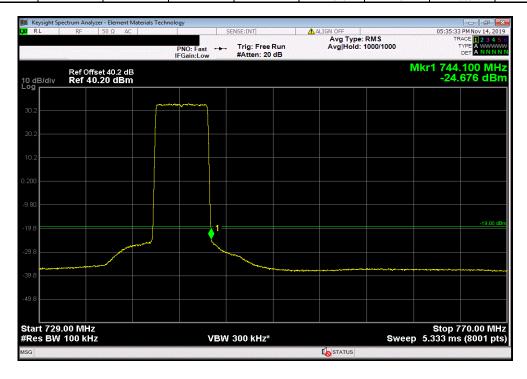
Band 12, 256QAM Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-26.827 -19 Pass







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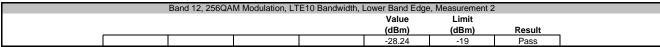


Band 12, 256QAM Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-31.493 -19 Pass







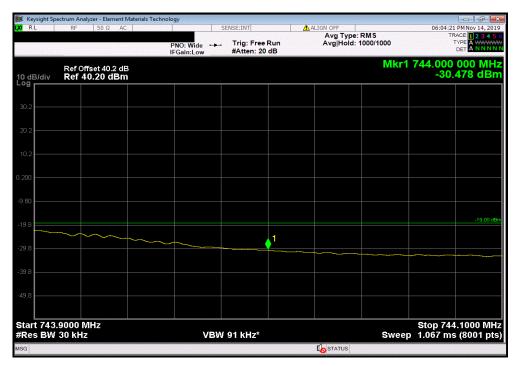
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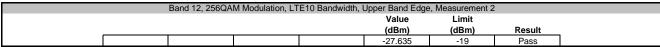


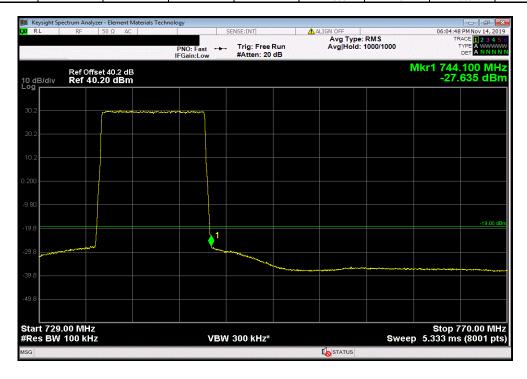
Band 12, 256QAM Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-30.478 -19 Pass







Report No. NOKI0004.1 213/574



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Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in the available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet. For Multiband operation, measurements were taken at the lower band edge of the lower band and the upper band edge of the upper band.

The spectrum was scanned below the lower band edge and above the higher band edge.

All limits were adjusted by a factor of [-10*log((N)] to account for the device operation as a N port MIMO transmitter, as per FCC KDB 622911.

For Bands 12 and 14, the adjustment factor is $-10*\log(4) = -6$ dB. The Bands 12 and 14 adjusted limit is -19 dBm. For Band 29, the adjustment factor is $-10*\log(2) = -3$ dB. The Band 29 adjusted limit is -16 dBm.

Per FCC section 27.53(g), the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm. The limit is adjusted to -19 dBm [-13 dBm -10 log (4)] per FCC KDB 662911D01 v02r01 because the RRH may operate as a 4 port MIMO transmitter for Band 12.

FCC 27.53(g) requires a >100 kHz measurement bandwidth for emissions 100 kHz outside of the RRH operating frequency range. FCC 27.53(g) requires a >30 kHz measurement bandwidth for emissions between 100 kHz outside of the RRH operating frequency range and band edge of the operating frequency range.

Report No. NOKI0004.1



EUT: AHLBBA RRH
Serial Number: K9193514835
Customer: Nokia Solutions and Networks Work Order: NOKI0004
Date: 18-Nov-19
Temperature: 22.7 °C Humidity: 29.9% RH Barometric Pres.: 1019 mbar Project: None
Tested by: Jonathan Kiefer
TEST SPECIFICATIONS Power: 54VDC Test Method Job Site: TX09 ANSI C63.26:2015 COMMENTS Band 12 band edge measurements. Tested on highest power antenna port (Port 2). EUT is operated at 100% duty cycle. DEVIATIONS FROM TEST STANDARD Jonathan Kiefer Configuration # 2 Signature Value (dBm) Limit (dBm) Result QPSK Modulation LTE5 Bandwidth Lower Band Edge Measurement 1 -24.359 Pass Measurement 2 -23.858 -19 Pass Upper Band Edge Pass Pass Measurement 1 -23.398 Measurement 2 LTE10 Bandwidth Lower Band Edge Measurement 1 Measurement 2 -19 -19 -27.013 Pass Pass -25.04 Upper Band Edge Measurement 1 -26.755 -19 -19 Pass Measurement 2 -24.841 Pass 16QAM Modulation LTE5 Bandwidth Lower Band Edge Measurement 1 Measurement 2 -24.013 -24.228 -19 -19 Pass Pass Upper Band Edge Measurement 1 -24.643 Pass -19 Measurement 2 -26 013 -19 Pass LTE10 Bandwidth Lower Band Edge -27.316 Pass Measurement 1 -19 Measurement 2 -25.323 -19 Pass Upper Band Edge -19 -19 Measurement 1 -26 965 Pass Measurement 2 -24.948 Pass 64QAM Modulation LTE5 Bandwidth Lower Band Edge Measurement 1 -24.365 Pass -19 Measurement 2 -24.496 -19 Pass Upper Band Edge -19 -19 Measurement 1 -24.291 Pass Measurement 2 Pass LTE10 Bandwidth Lower Band Edge -19 -19 Measurement 1 -26.804 Pass Measurement 2 -24.967 Pass Upper Band Edge -26.589 Measurement 1 -19 Pass Measurement 2 -24.723 -19 Pass 256QAM Modulation LTE5 Bandwidth Lower Band Edge -19 -19 Measurement 1 -23.831 Pass Measurement 2 -24.15 Pass Upper Band Edge Measurement 1 -23.167 Pass -19 Measurement 2 -25 269 -19 Pass LTE10 Bandwidth Lower Band Edge Measurement 1 -26.776 -19 Pass Measurement 2 -25.409 -19 Pass Upper Band Edge Measurement 1 -26.702 -19 Pass

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-25.15

-19

Pass

Measurement 2

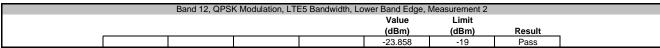


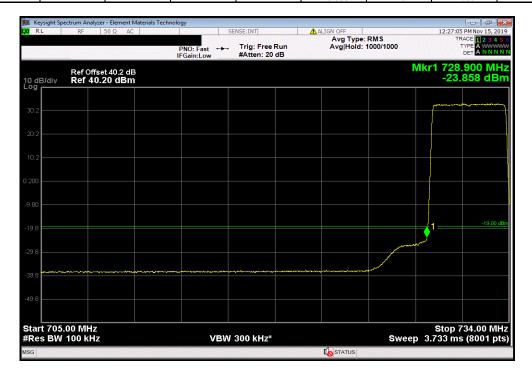
Band 12, QPSK Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-24.359 -19 Pass







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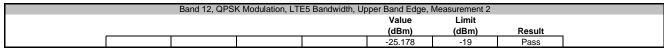


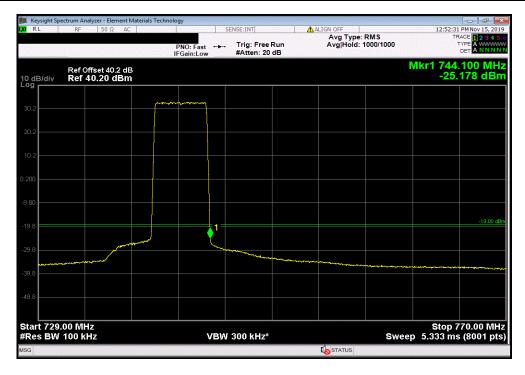
Band 12, QPSK Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-23.398 -19 Pass







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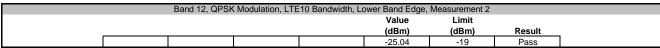
Band 12, QPSK Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

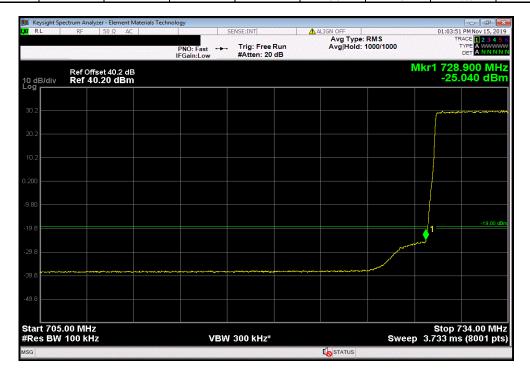
Value

(dBm) (dBm) Result

-27.013 -19 Pass







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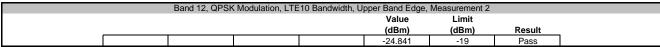


Band 12, QPSK Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value
Limit
(dBm) (dBm) Result

-26.755 -19 Pass







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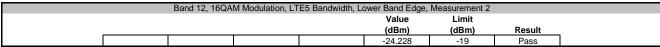


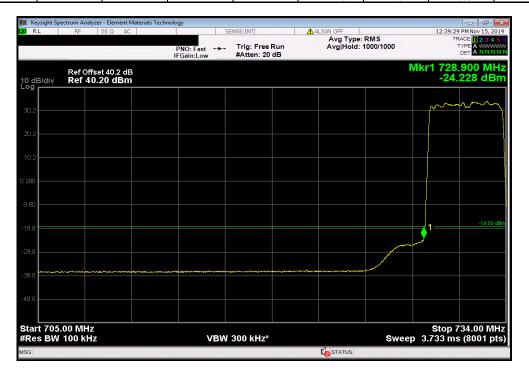
Band 12, 16QAM Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-24.013 -19 Pass







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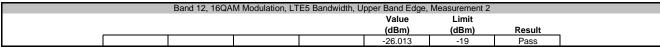


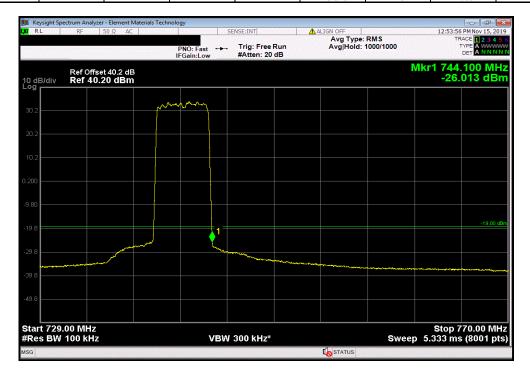
Band 12, 16QAM Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-24.643 -19 Pass







Report No. NOKI0004.1 221/574

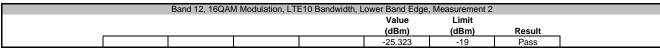


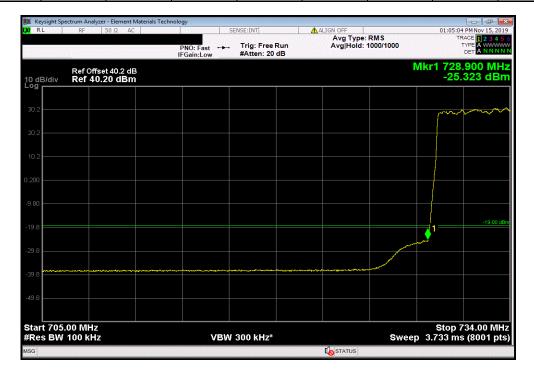
Band 12, 16QAM Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-27.316 -19 Pass







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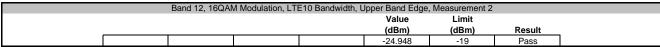


Band 12, 16QAM Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-26.965 -19 Pass







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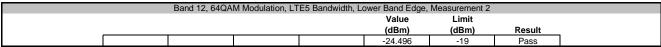


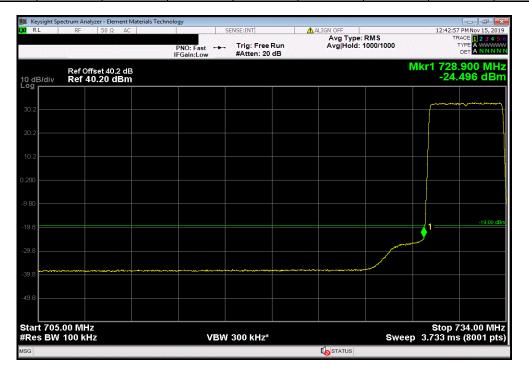
Band 12, 64QAM Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-24.365 -19 Pass







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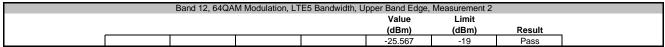


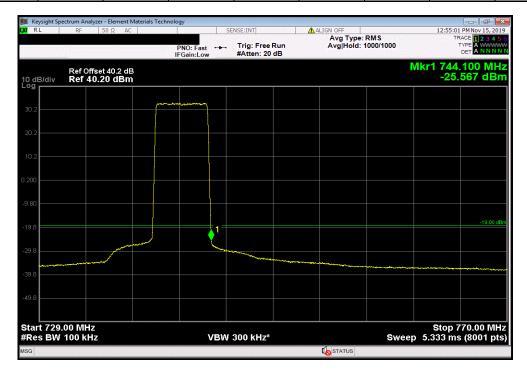
Band 12, 64QAM Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-24.291 -19 Pass







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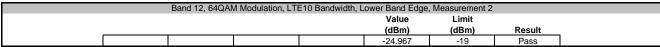


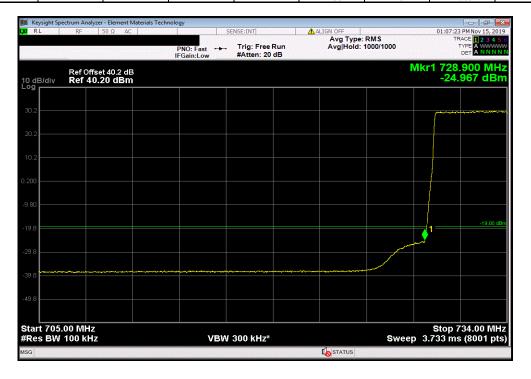
Band 12, 64QAM Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-26.804 -19 Pass







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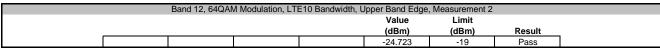


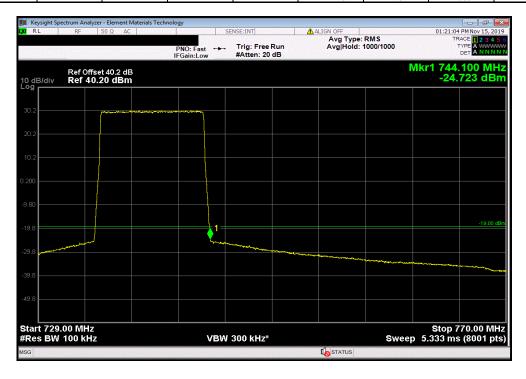
Band 12, 64QAM Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-26.589 -19 Pass







Report No. NOKI0004.1 227/574

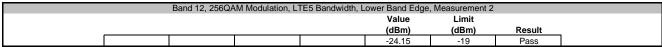


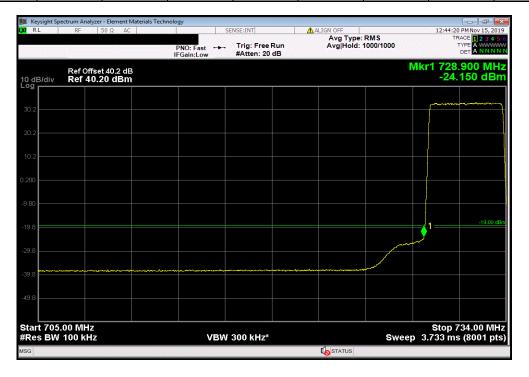
Band 12, 256QAM Modulation, LTE5 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-23.831 -19 Pass







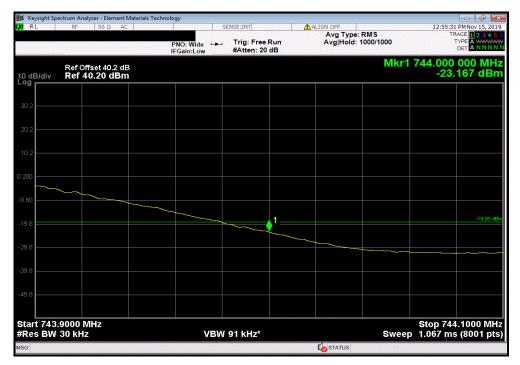
Report No. NOKI0004.1 228/574

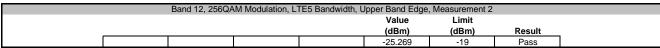


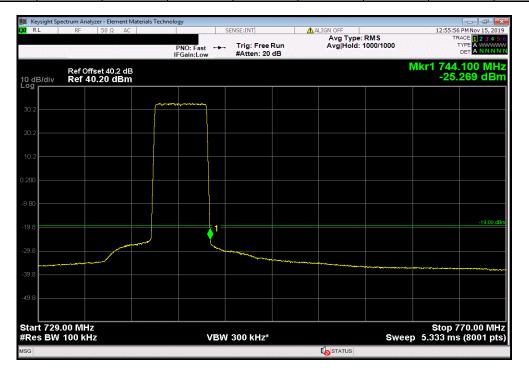
Band 12, 256QAM Modulation, LTE5 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-23.167 -19 Pass







Report No. NOKI0004.1 229/574

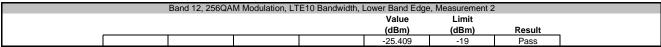


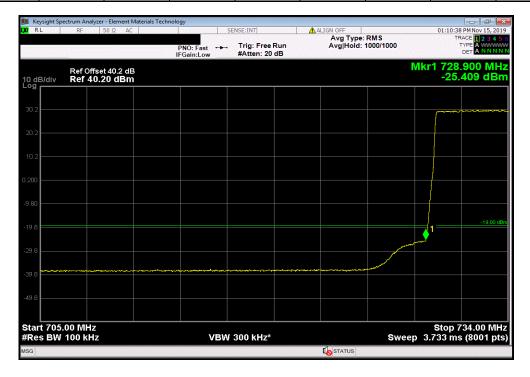
Band 12, 256QAM Modulation, LTE10 Bandwidth, Lower Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-26.776 -19 Pass







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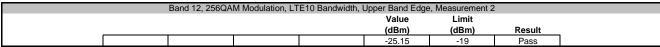


Band 12, 256QAM Modulation, LTE10 Bandwidth, Upper Band Edge, Measurement 1

Value Limit
(dBm) (dBm) Result

-26.702 -19 Pass







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