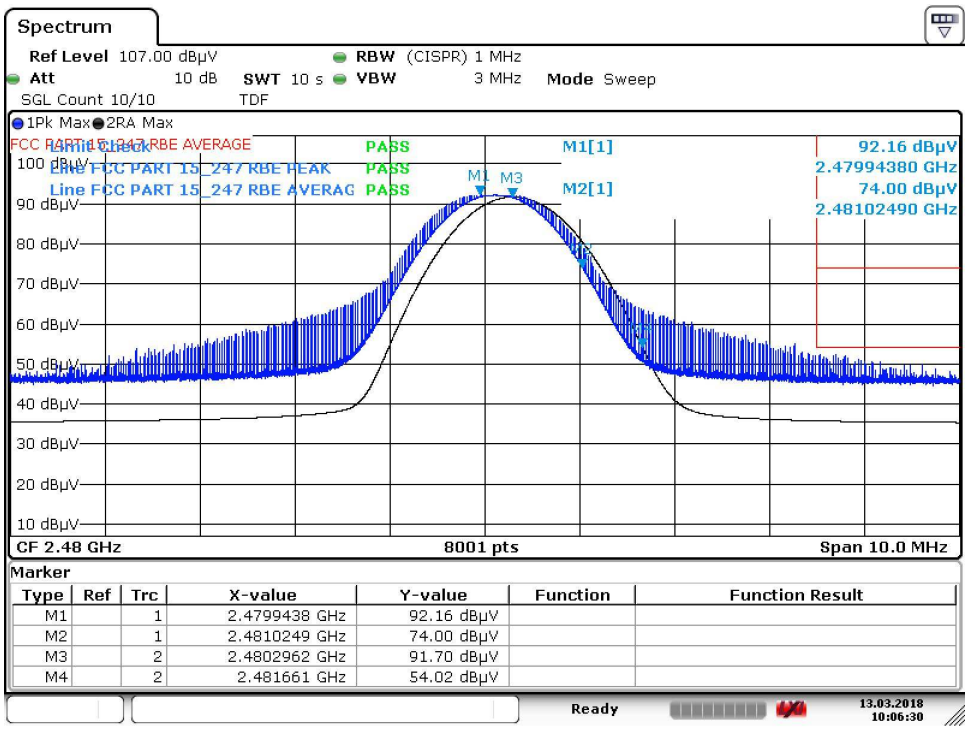
	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Radiated Emissions (Bandedge)	
DNB Job Number:	86088	Date: 13 Mar 2018	Specification
Customer:	Vutiliti		[X] 15.247 (c) [X] ANSI C63.10-2013
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		
	1 Mbps (Basic data rate)		

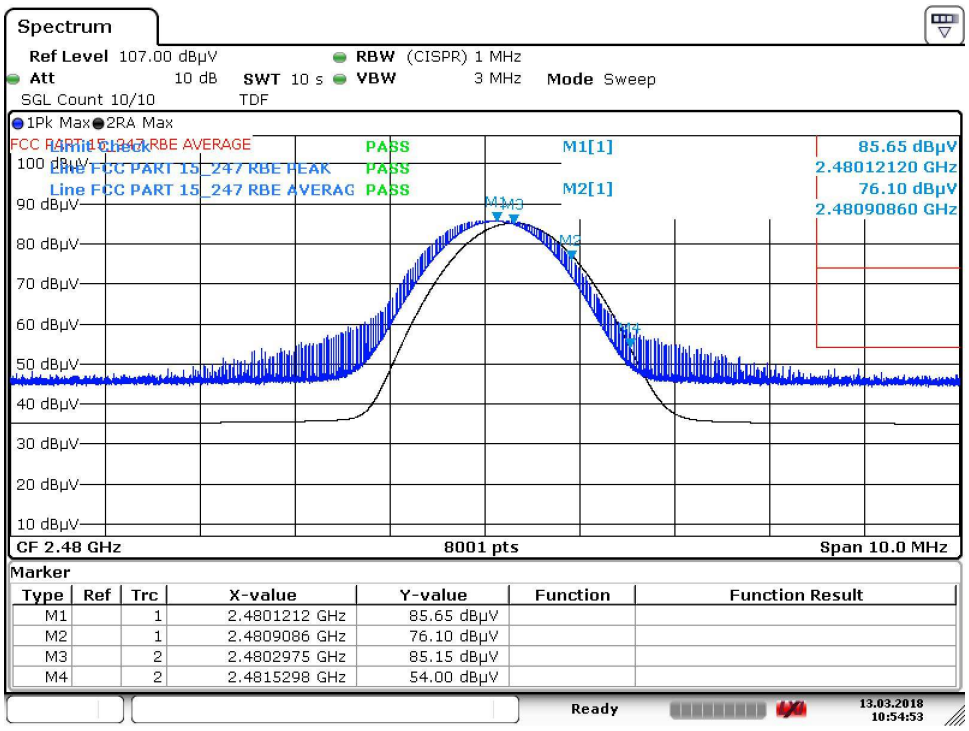
Radiated Corrected Band Edge - Upper Edge - X Axis - Horizontal



Date: 13.MAR.2018 10:06:30

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Radiated Emissions (Bandedge)	
DNB Job Number:	86088	Date: 13 Mar 2018	Specification
Customer:	Vutiliti		[X] 15.247 (c) [X] ANSI C63.10-2013
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		
	1 Mbps (Basic data rate)		

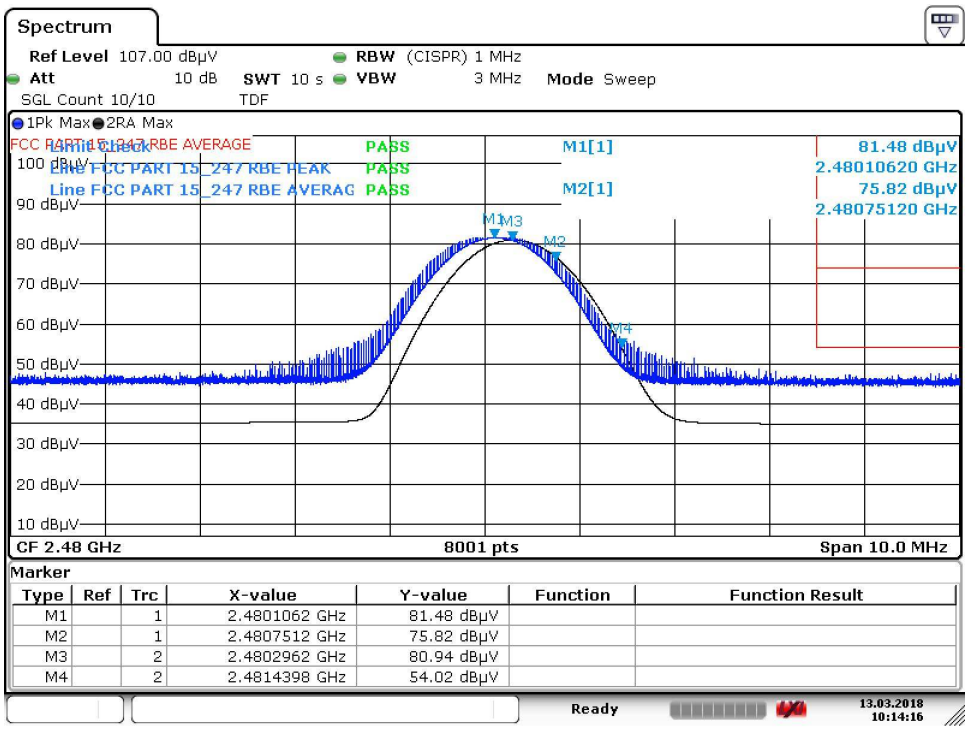
Radiated Corrected Band Edge - Upper Edge - X Axis - Vertical



Date: 13.MAR.2018 10:54:53

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Radiated Emissions (Bandedge)	
DNB Job Number:	86088	Date: 13 Mar 2018	Specification
Customer:	Vutiliti		[X] 15.247 (c) [X] ANSI C63.10-2013
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		
	1 Mbps (Basic data rate)		

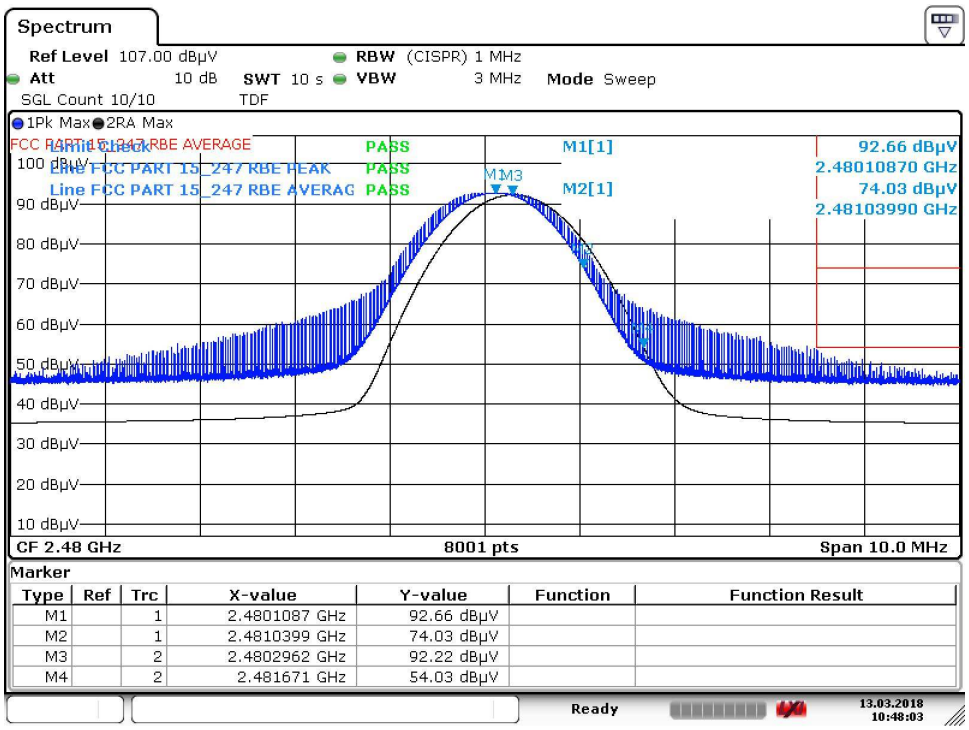
Radiated Corrected Band Edge - Upper Edge - Y Axis - Horizontal



Date: 13.MAR.2018 10:14:16

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Radiated Emissions (Bandedge)	
DNB Job Number:	86088	Date: 13 Mar 2018	Specification
Customer:	Vutiliti		[X] 15.247 (c) [X] ANSI C63.10-2013
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		
	1 Mbps (Basic data rate)		

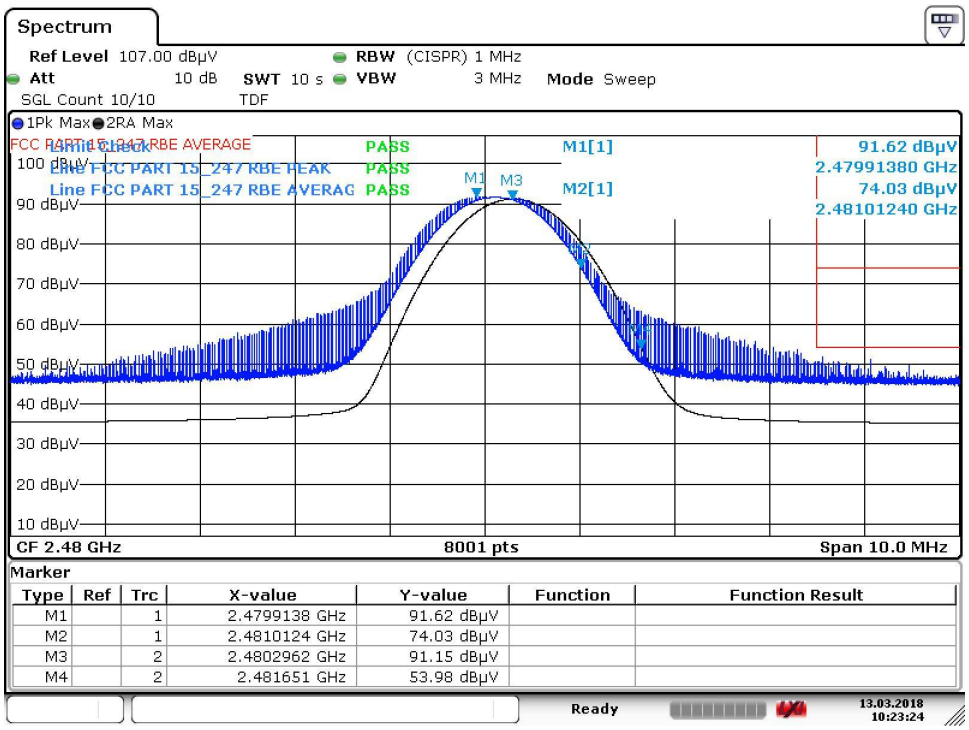
Radiated Corrected Band Edge - Upper Edge - Y Axis - Vertical



Date: 13.MAR.2018 10:48:03

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Radiated Emissions (Bandedge)	
DNB Job Number:	86088	Date: 13 Mar 2018	Specification
Customer:	Vutiliti		[X] 15.247 (c) [X] ANSI C63.10-2013
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		
	1 Mbps (Basic data rate)		

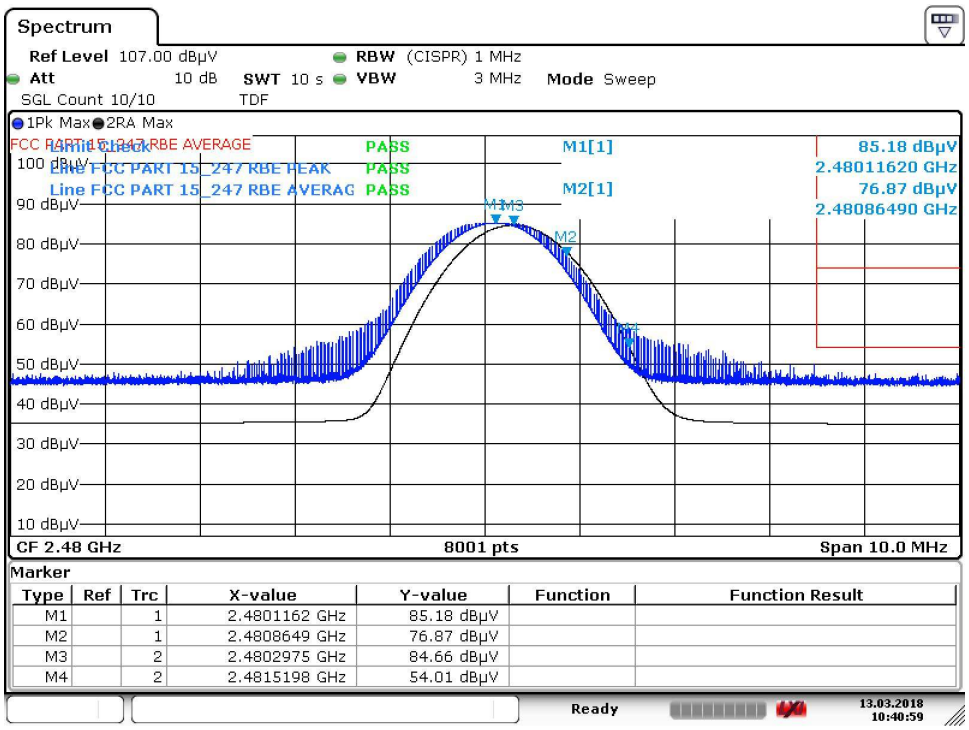
Radiated Corrected Band Edge - Upper Edge - Z Axis - Horizontal



Date: 13.MAR.2018 10:23:23

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Radiated Emissions (Bandedge)	
DNB Job Number:	86088	Date: 13 Mar 2018	Specification
Customer:	Vutiliti		[X] 15.247 (c) [X] ANSI C63.10-2013
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		
	1 Mbps (Basic data rate)		

Radiated Corrected Band Edge - Upper Edge - Z Axis - Vertical



Date: 13.MAR.2018 10:40:59

15.247 (a,2) 6 dB Bandwidth

Test Procedure: ANSI C63.10-2013

6 dB Bandwidth

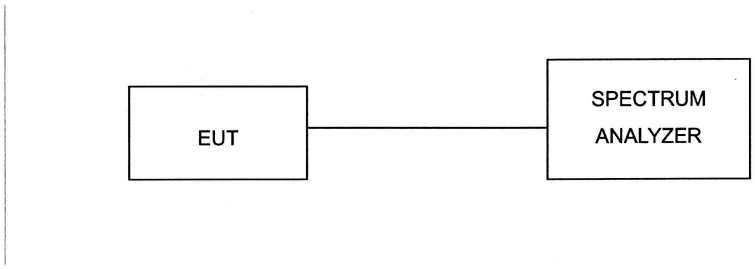
Use the following spectrum analyzer settings:
Span = approximately 2 to 3 times the 6 dB bandwidth, centered on a hopping channel
RBW ≥ 1% of the 6 dB bandwidth
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 6 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 6 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

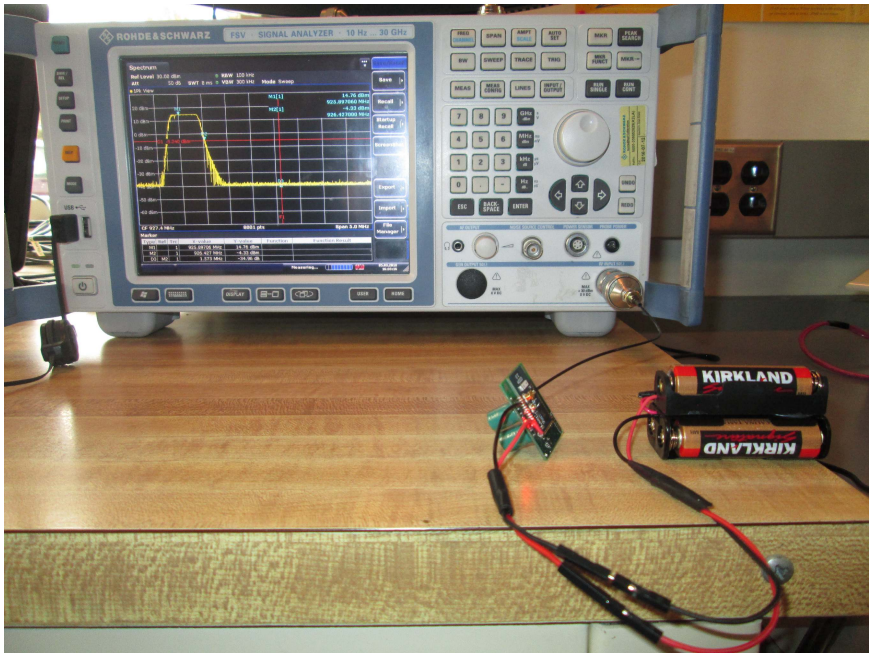
EUT operating conditions:

The software provided by the client to enable the EUT to transmit continuously.

Test Set Up: (Note following set up was used for allantenna conducted measurements)



	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Measurement Test Set Up	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247
Antenna Conducted Measurement Set Up			



	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	6 dB Single Channel Bandwidth	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(a,2)
	Test Procedure		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No *J Payne*

6 dB Bandwidth

ANSI C63.10-2013 Clause 11.8.1

The steps are as follows:

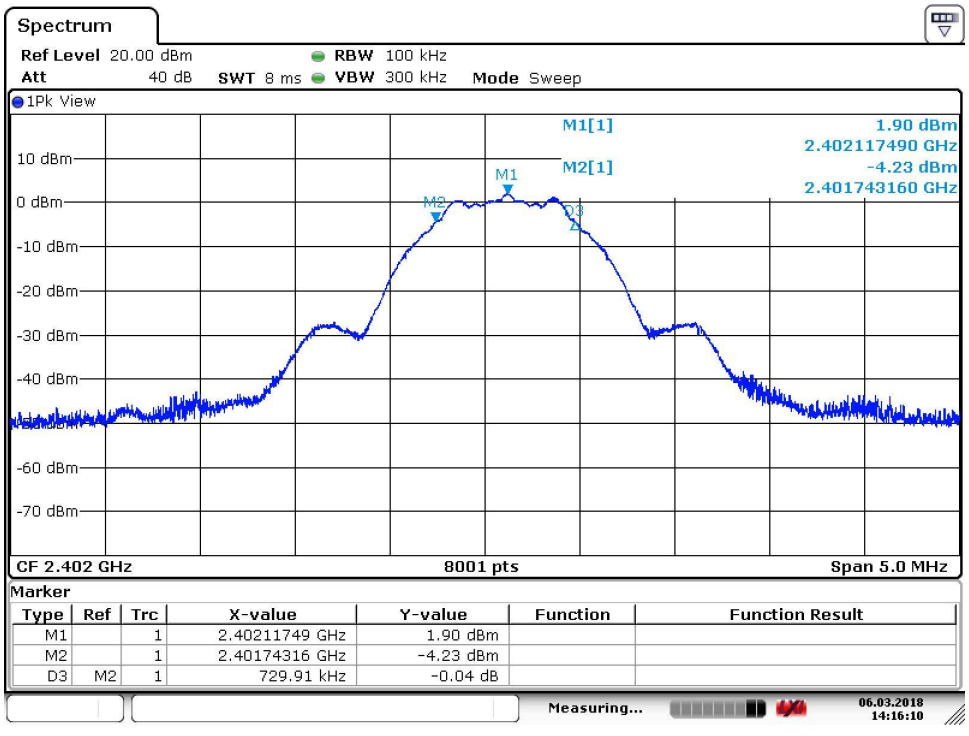
a) Set RBW = 100 kHz
b) Set the VBW ≥ [3 x RBW]
* per ANSI C63.10-2013 clause 6.9.2 Set the span to 2 to 5 times the OBW
c) Detector = peak
d) Trace mode = max hold
e) Sweep = auto couple
f) Allow trace to stabilize
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.
h) Submit this plot(s).

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	6 dB Single Channel Bandwidth	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter 1 Mbps (Basic data rate)		Clause 15.247(a,2)

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No *J Payne*

Channel	Chl Freq (MHz)	6dB BW (kHz)	Limit	Pass/Fail
Low	2402	729.910	> 500 kHz	Pass



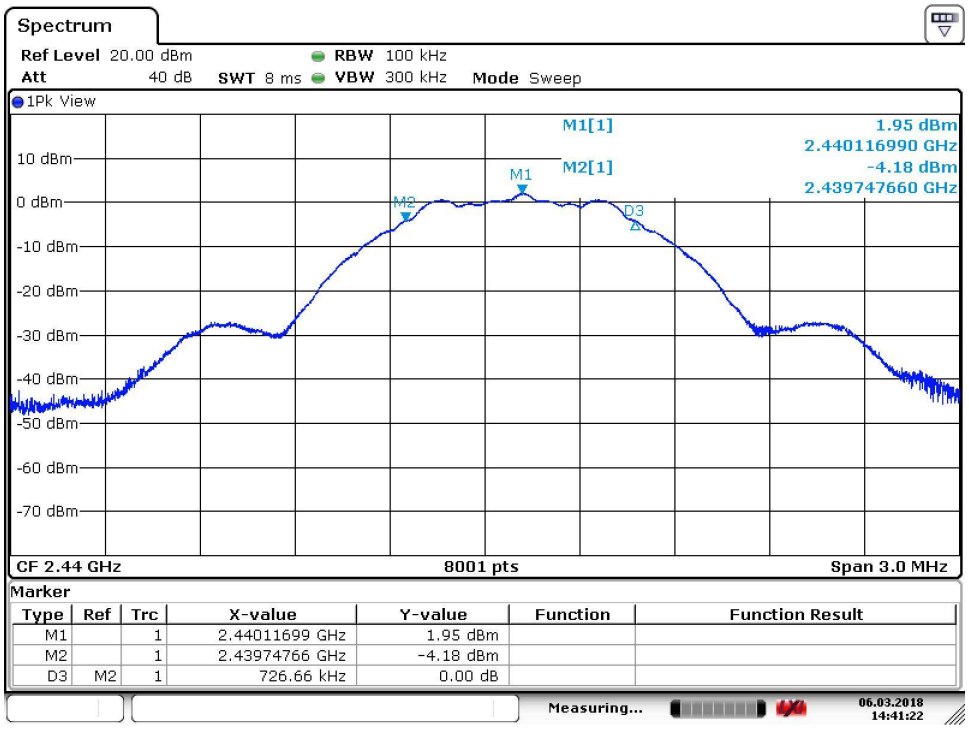
Date: 6.MAR.2018 14:16:10

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	6 dB Single Channel Bandwidth	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter 1 Mbps (Basic data rate)		Clause 15.247(a,2)

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No *J Payne*

Channel	Chl Freq (MHz)	6dB BW (kHz)	Limit	Pass/Fail
Middle	2440	726.660	> 500 kHz	Pass

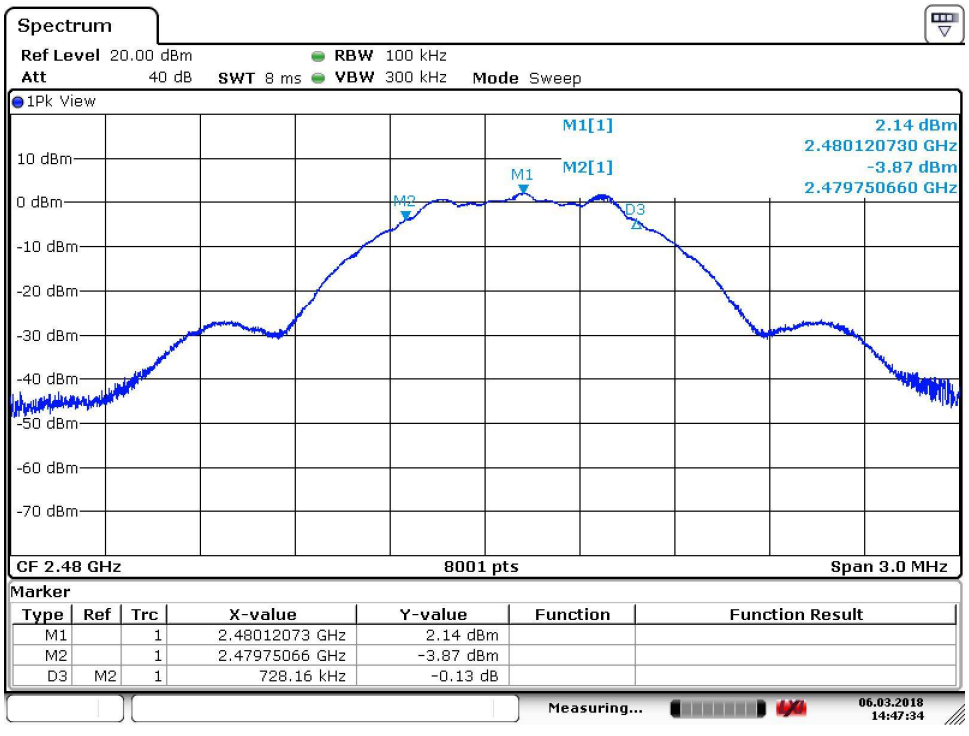


	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	6 dB Single Channel Bandwidth	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter 1 Mbps (Basic data rate)		Clause 15.247(a,2)

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No *J Payne*

Channel	Chl Freq (MHz)	6dB BW (kHz)	Limit	Pass/Fail
High	2480	728.160	> 500 kHz	Pass

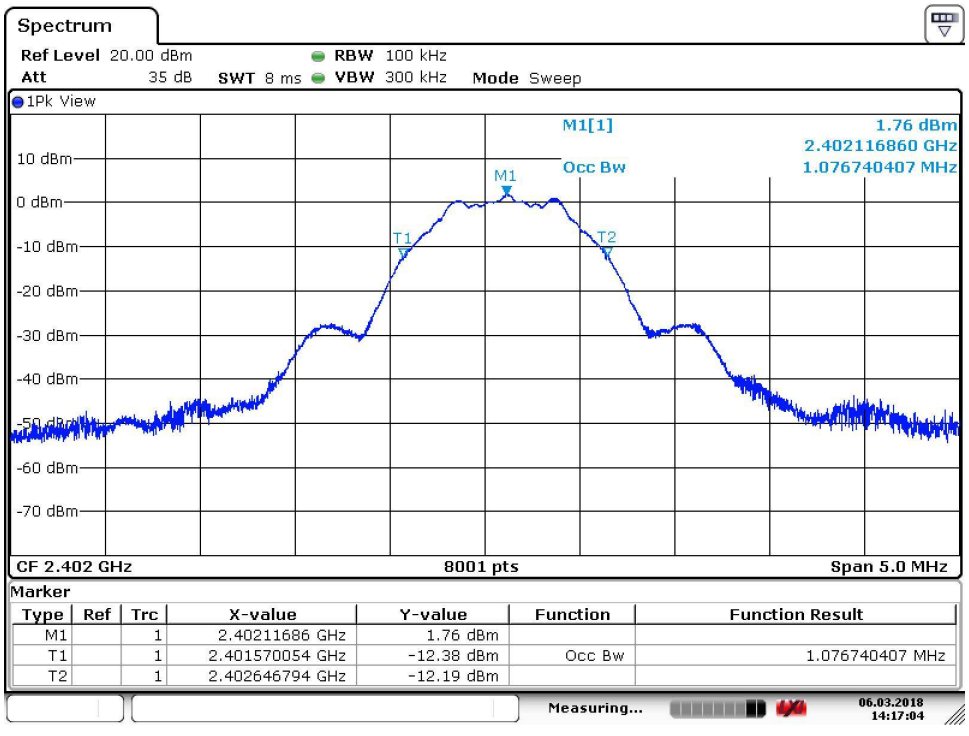


	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	99% Occupied Bandwidth	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard RSS-Gen
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause Section 6.6
	1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No *J Payne*

Channel	Chl Freq (MHz)	99% BW (MHz)
Low	2402	1.076740407



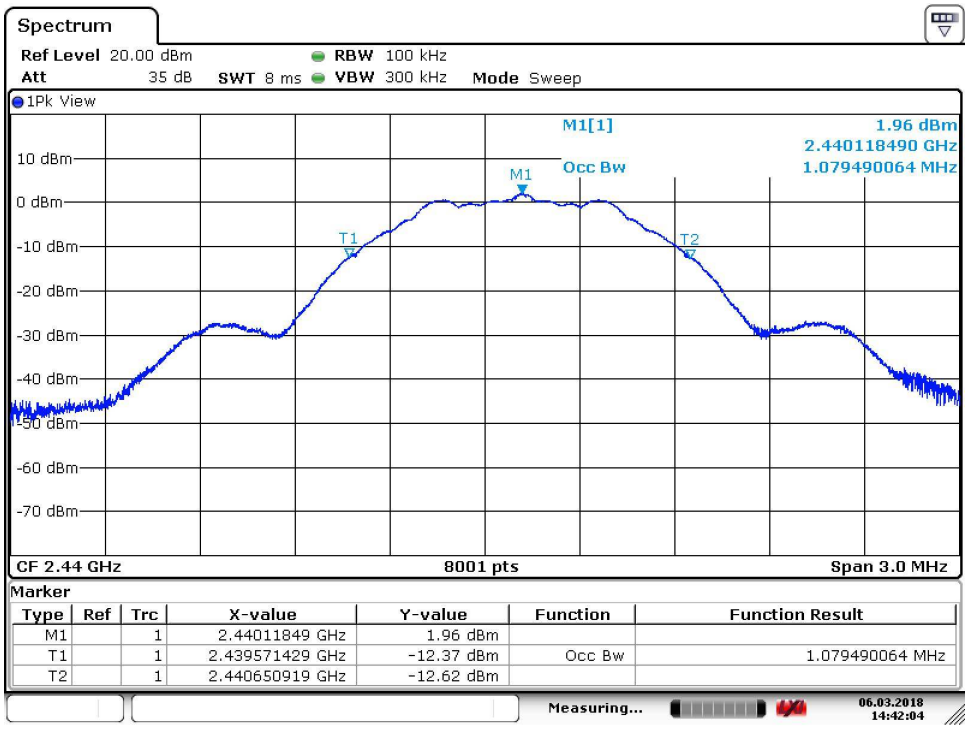
Date: 6.MAR.2018 14:17:05

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	99% Occupied Bandwidth	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard
Customer:	Vutiliti		RSS-Gen
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause Section 6.6
	1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No *J Payne*

Channel	Chl Freq (MHz)	99% BW (MHz)
Middle	2440	1.079490064



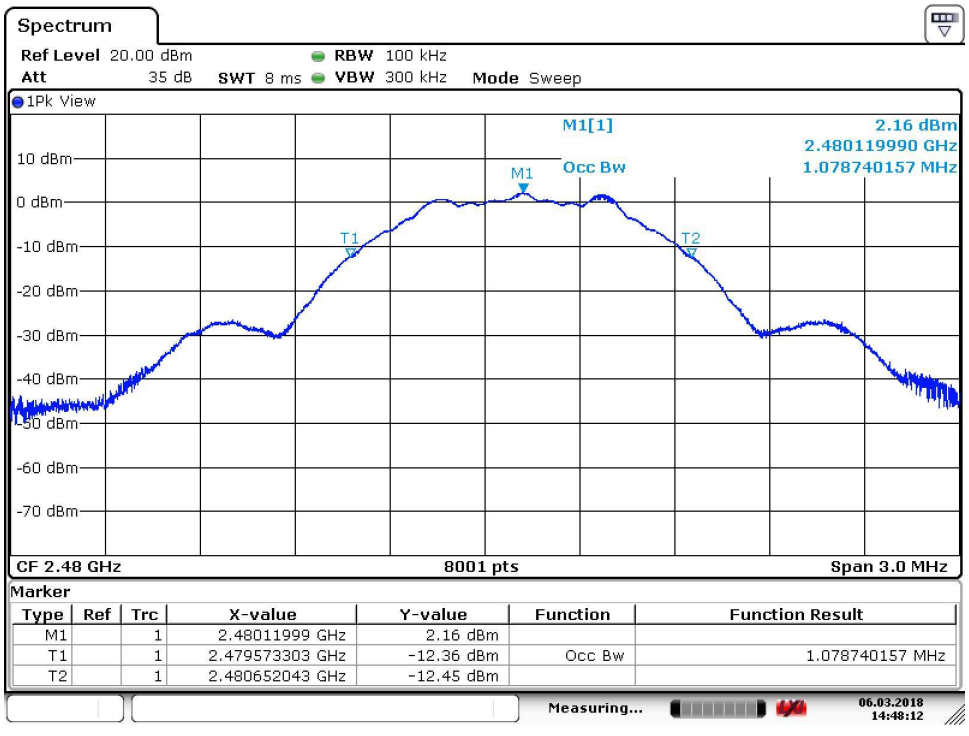
Date: 6.MAR.2018 14:42:05

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	99% Occupied Bandwidth	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard RSS-Gen
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter 1 Mbps (Basic data rate)		Clause Section 6.6

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No *J Payne*

Channel	Chl Freq (MHz)	99% BW (MHz)
High	2480	1.078740157



Date: 6.MAR.2018 14:48:13

15.247 (a,2,b3) Maximum Peak Output Power (Conducted)

Test Procedure: ANSI C63.10-2013

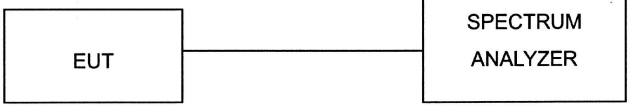
Peak Output Power

Per clause 11.9.1.1 RBW ≥ DTS Bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement.

a) Set the RBW ≥ DTS bandwidth
b) Set the VBW ≥ [3 x RBW]
c) Set span ≥ [3 x RBW]
d) Sweep time = auto couple
e) Detector = peak
f) Trace mode = max hold
g) Allow trace to fully stabilize
h) Use peak marker function to determine the peak amplitude
i) Submit plots

Test Set Up:



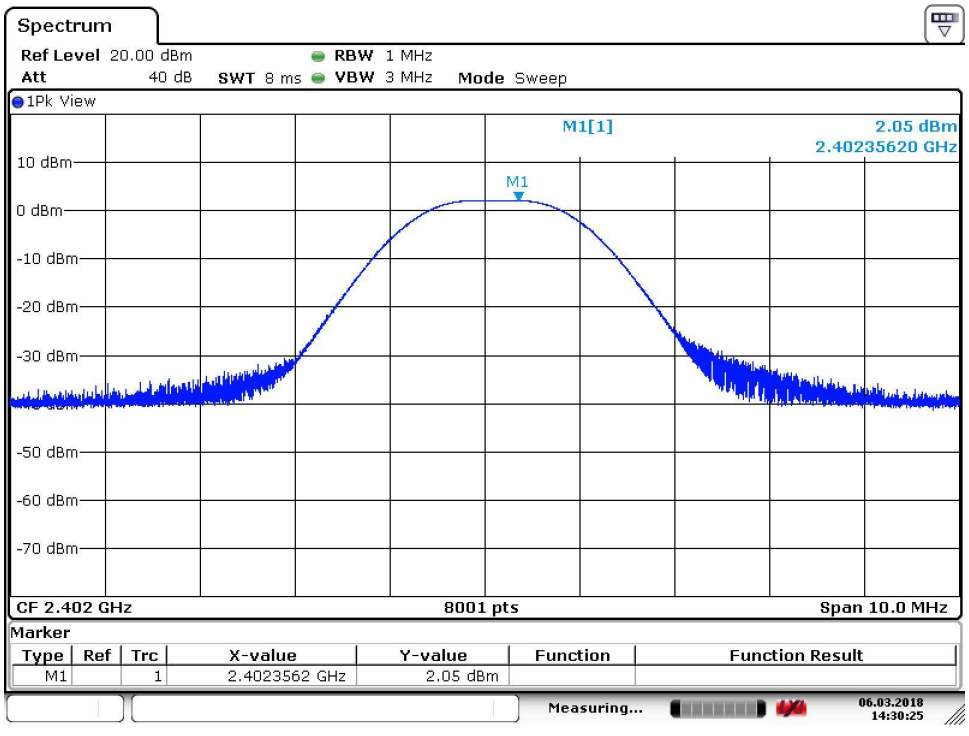
	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Peak Output Power (Cond)	

DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard
Customer:	Vutiliti		FCC Part 15
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(b)
	Low Channel - 1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Freq MHz	Meas Peak Pwr (dBm)	Limit (dBm)	Delta (dBm)	Meas Peak Pwr (mW)	Limit (mW)	Delta (mW)	Pass/Fail
2402	2.05	30.00	-27.95	1.603	1000	-998.397	Pass



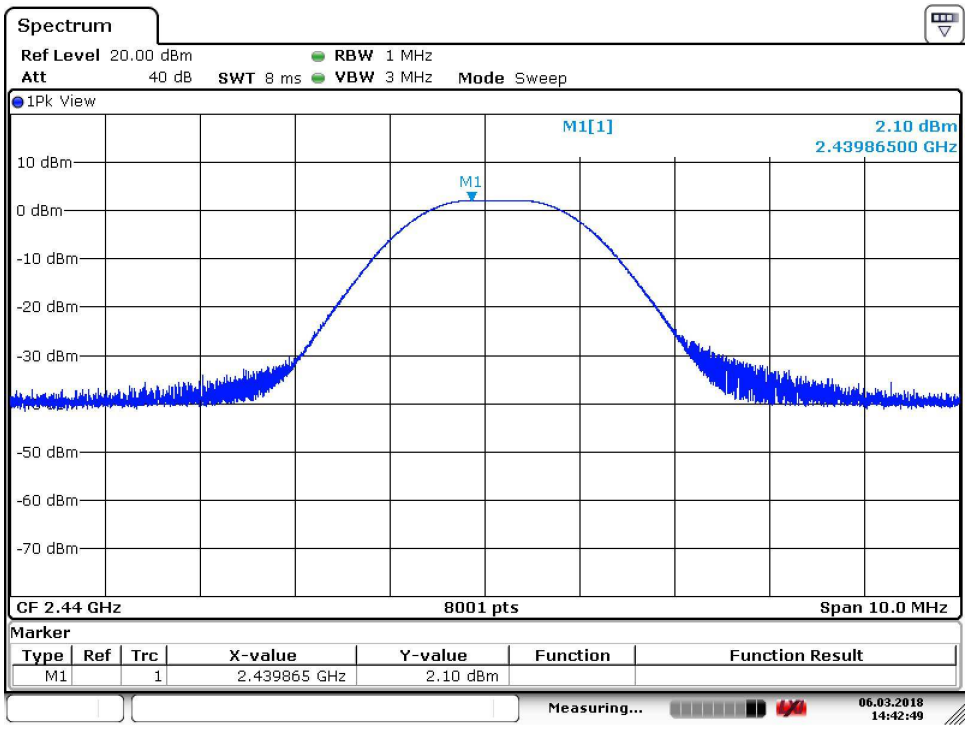
Date: 6.MAR.2018 14:30:26

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Peak Output Power (Cond)	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(b)
	Middle Channel - 1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Freq MHz	Meas Peak Pwr (dBm)	Limit (dBm)	Delta (dBm)	Meas Peak Pwr (mW)	Limit (mW)	Delta (mW)	Pass/Fail
2440	2.10	30.00	-27.9	1.622	1000	-998.378	Pass



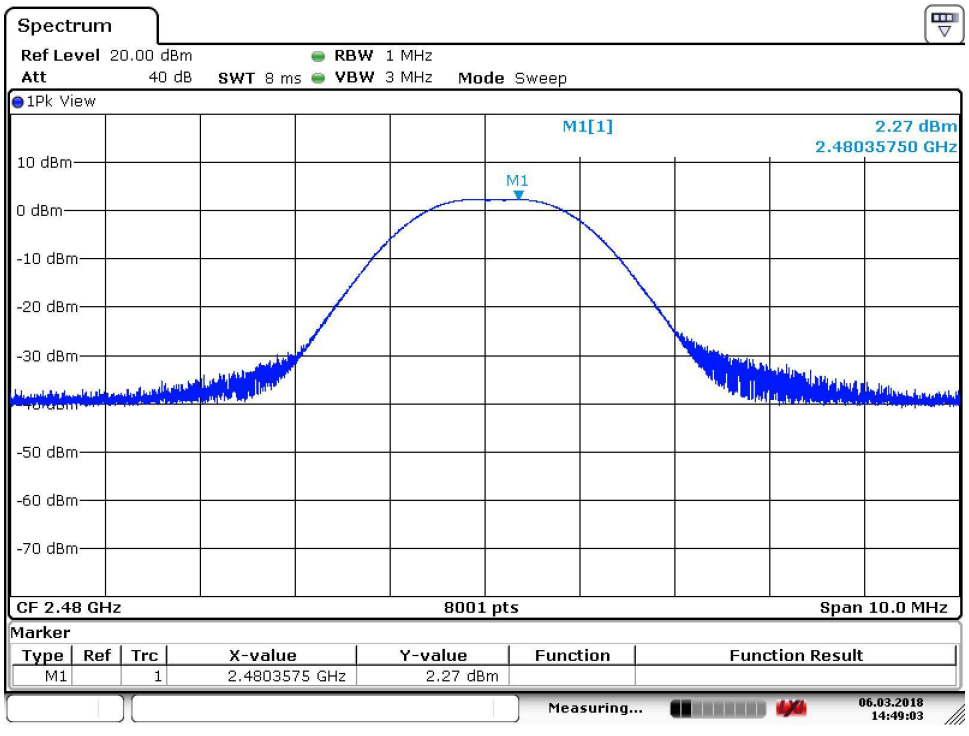
Date: 6.MAR.2018 14:42:50

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Peak Output Power (Cond)	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(b)
	High Channel - 1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Freq MHz	Meas Peak Pwr (dBm)	Limit (dBm)	Delta (dBm)	Meas Peak Pwr (mW)	Limit (mW)	Delta (mW)	Pass/Fail
2480	2.27	30.00	-27.73	1.687	1000	-998.313	Pass



Date: 6.MAR.2018 14:49:03

15.247 (a,2,d) Conducted Band Edge and Out of Band Emissions

Test Procedure: ANSI C63.10-2013

Band-edge Compliance of RF Conducted Emissions

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation
RBW ≥ 1% of the span
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section. Submit this plot.

Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit. Submit this plot.

Test Set Up: Same as 15.247 (a,2) 6dB Emission Bandwidth

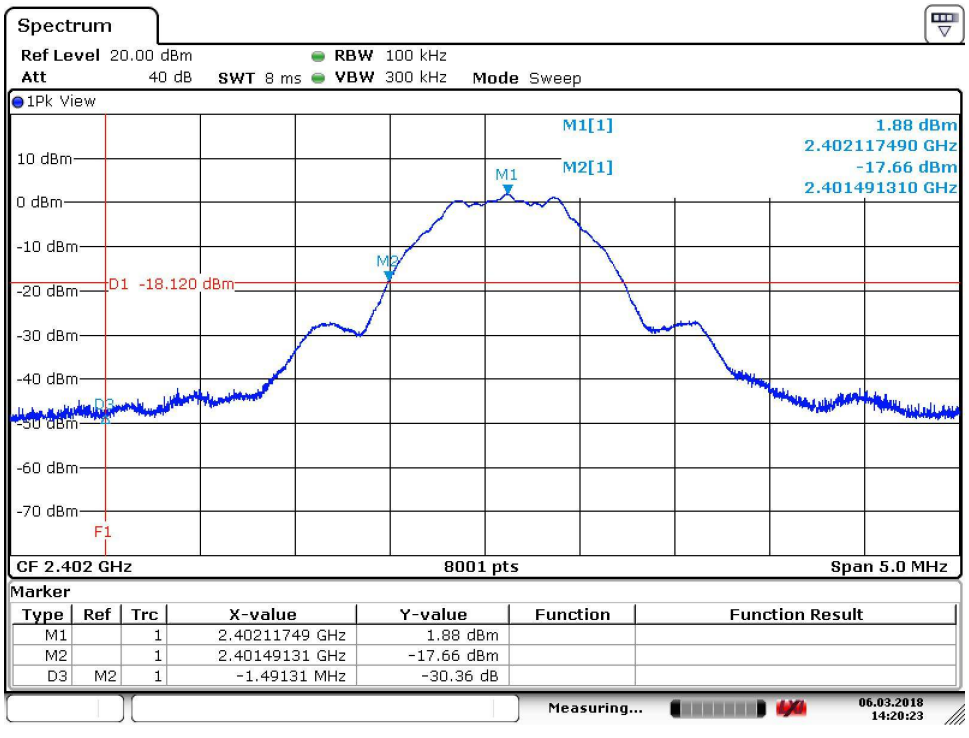
	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Band Edge Measurements	

DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard
Customer:	Vutiliti		FCC Part 15
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(a,2,d)
	1 Mbps (Basic data rate)		

Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Conducted Band Edge Measurement			Freq Delta (MHz)	Pass/Fail
Limit	Lower (MHz)	Upper (MHz)		
2400	2401.491310		1.491	Pass



Date: 6.MAR.2018 14:20:24

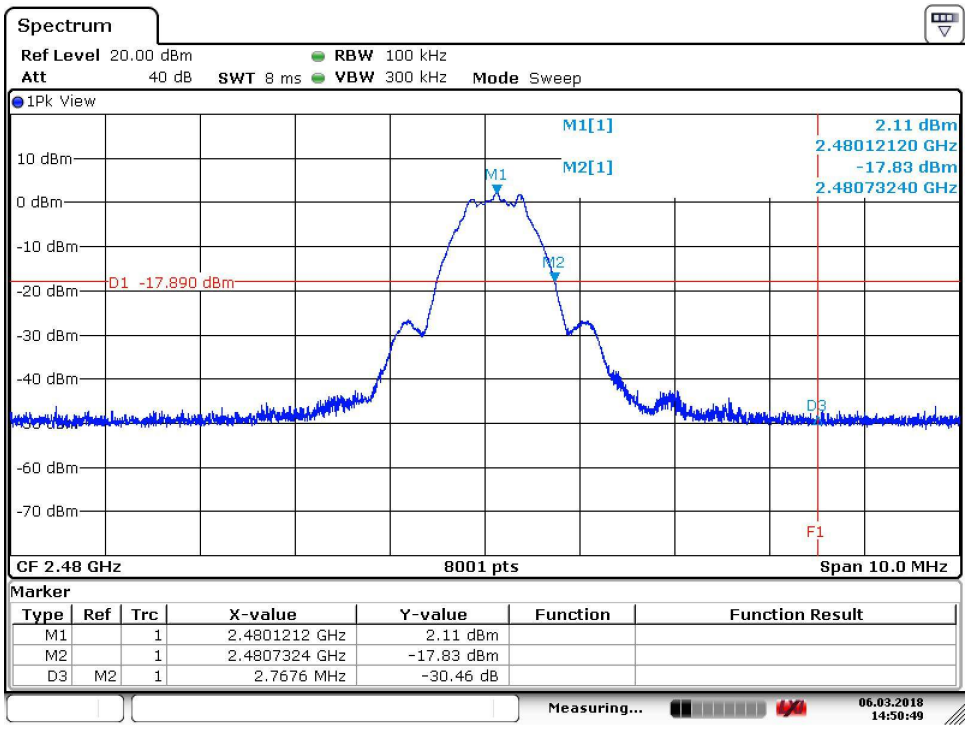
	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Band Edge Measurements	

DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard
Customer:	Vutiliti		FCC Part 15
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(a,2,d)
	1 Mbps (Basic data rate)		

Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Conducted Band Edge Measurement			Freq Delta (MHz)	Pass/Fail
Limit	Lower (MHz)	Upper (MHz)		
2483.5		2480.732400	2.768	Pass



	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Conducted Spurious	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(a,2,d)
	Test Procedure		

Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Test Procedure: ANSI C63.10-2013

15.247 (a,2,d) Spurious RF Conducted Emissions

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.
RBW = 100 kHz
VBW ≥ RBW
Sweep = auto
Detector function = peak
Trace = max hold

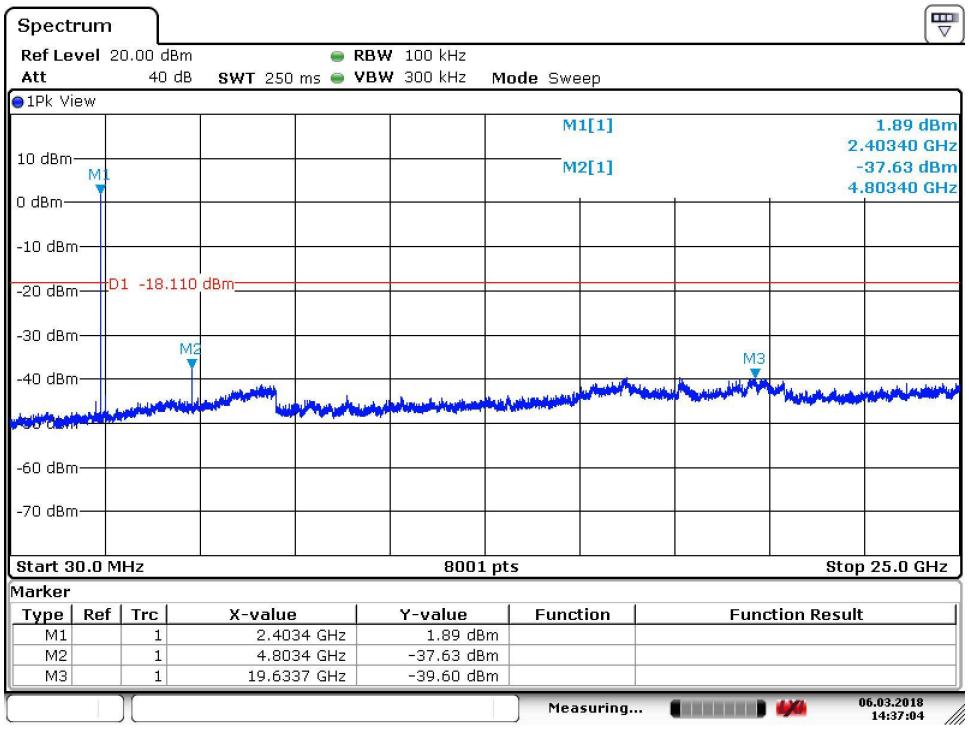
Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this Section. Submit these plots.

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Conducted Spurious	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter Low Channel - 1 Mbps (Basic data rate)		Clause 15.247(a,2,d)

Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Peak Output Power	Reading (dBm)	-20dBc (dBm)	Pass/Fall
2.05 dBm	1.89	-18.11	Pass

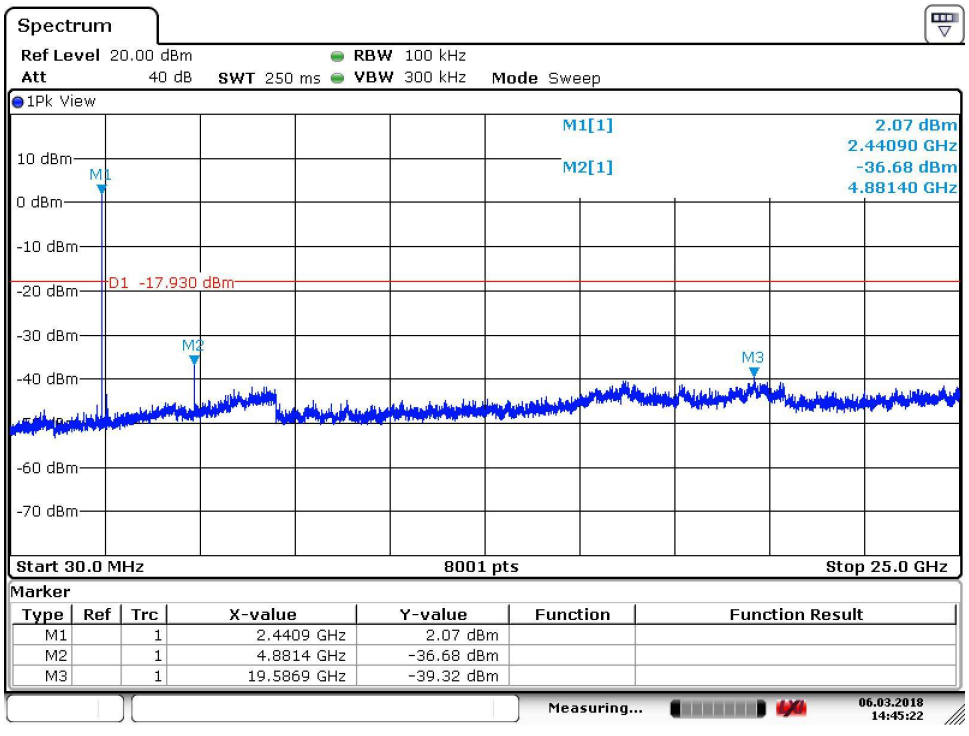


	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Conducted Spurious	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter Middle Channel - 1 Mbps (Basic data rate)		Clause 15.247(a,2,d)

Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Peak Output Power	Reading (dBm)	-20dBc (dBm)	Pass/Fall
2.10 dBm	2.07	-17.93	Pass



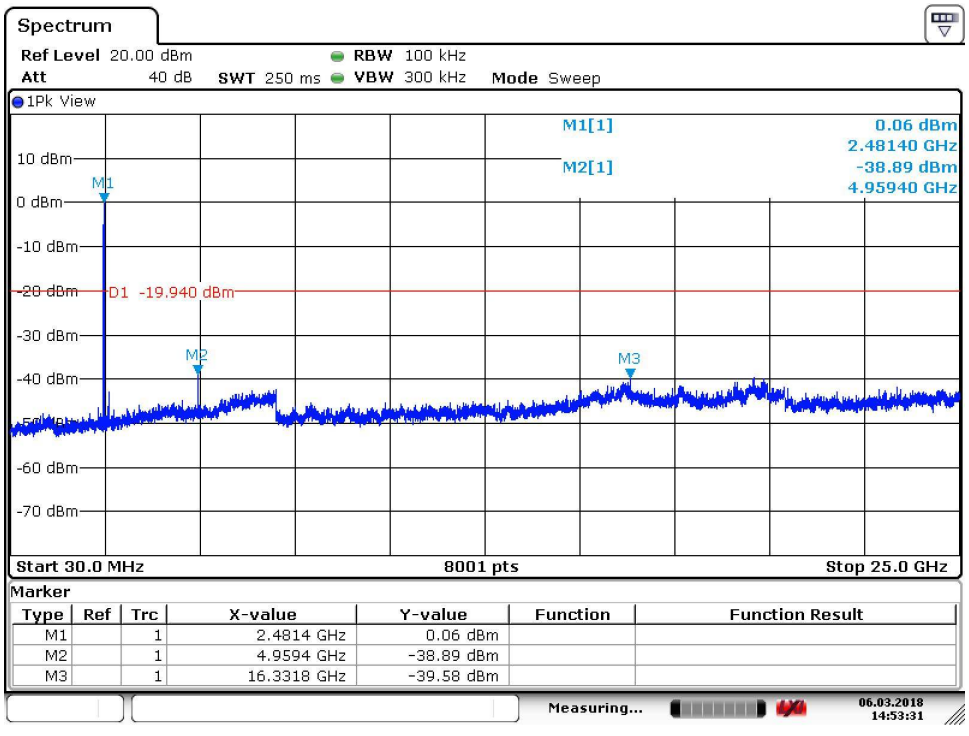
Date: 6.MAR.2018 14:45:23

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Conducted Spurious	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(a,2,d)
	High Channel - 1 Mbps (Basic data rate)		

Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Peak Output Power	Reading (dBm)	-20dBc (dBm)	Pass/Fall
2.27 dBm	0.06	-19.94	Pass



Date: 6.MAR.2018 14:53:32

15.247(a,2,e): Power spectral density(PSD).

Test Procedure: ANSI C63.10-2013

Clause 11.10.2 Method PKPSD (peak PSD)

The following procedure shall be used if the maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

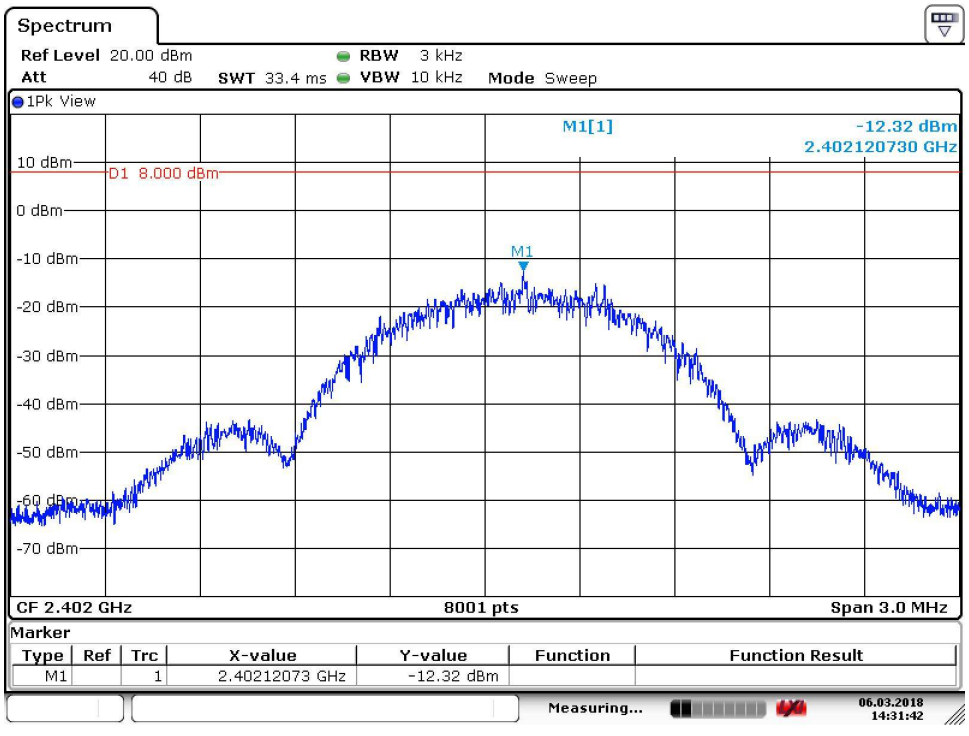
a) Set analyzer center frequency to DTS channel center frequency
b) Set the span to 1.5 times the DTS bandwidth
c) Set the RBW to 3 kHz $\leq$ RBW $\leq$ 100 kHz
d) Set the VBW $\geq$ [3 x RBW]
e) Detector = peak
f) Sweep time = auto couple
g) Trace mode = max hold
h) Allow trace to fully stabilize
i) Use the peak marker function to determine the maximum amplitude level within the RBW
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat
k) Submit plots

	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Power Spectral Density	
DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard FCC Part 15
Customer:	Vutiliti		
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(d)
	Low Channel - 1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Channel	Freq MHz	Meas PSD (dBm)	Limit (dBm)	Delta (dBm)	Pass/Fail
Low	2402	-12.32	8.0	-20.32	Pass



Date: 6.MAR.2018 14:31:43

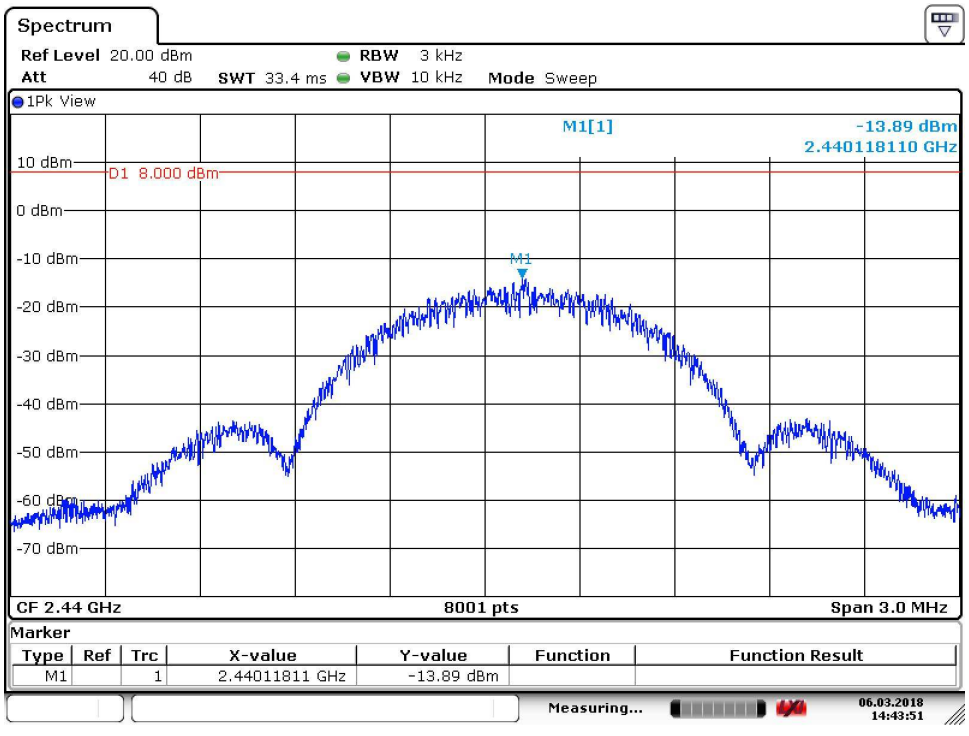
	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Power Spectral Density	

DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard
Customer:	Vutiliti		FCC Part 15
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(d)
	Middle Channel - 1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Channel	Freq MHz	Meas PSD (dBm)	Limit (dBm)	Delta (dBm)	Pass/Fail
Middle	2440	-13.89	8.0	-21.89	Pass



Date: 6.MAR.2018 14:43:52

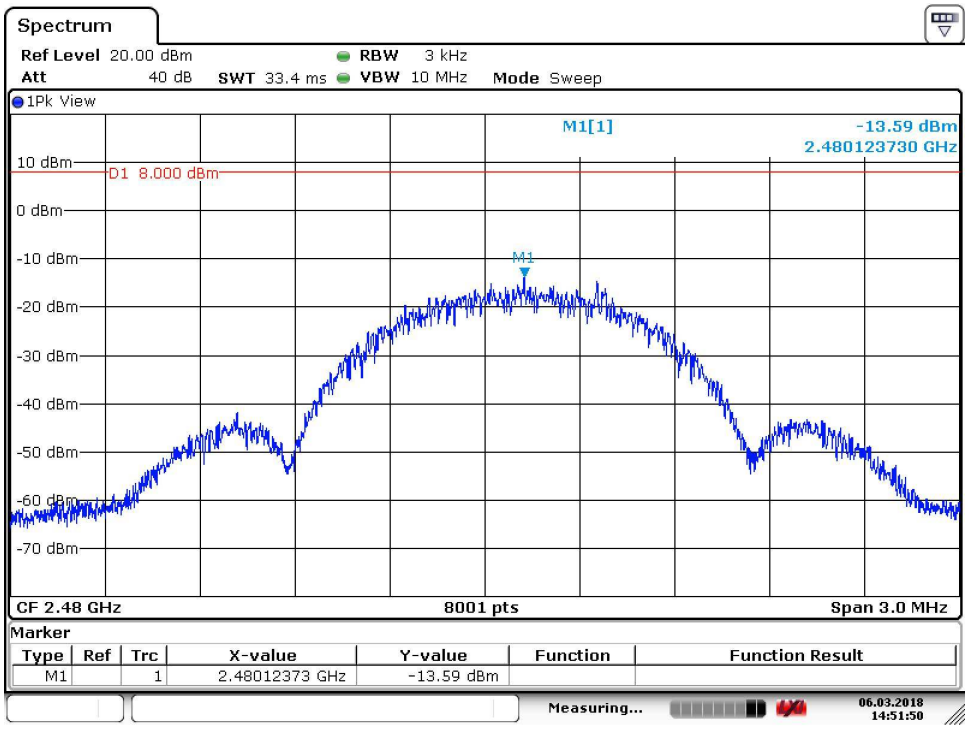
	1100 E Chalk Creek Road Coalville, UT 84017 (435) 336-4433 FAX (435) 336-4436	Power Spectral Density	

DNB Job Number:	86088	Date: 6 Mar 2018	Conformance Standard
Customer:	Vutiliti		FCC Part 15
Model Number:	VUHDRF1		
Description:	BLE Modular Transmitter		Clause 15.247(d)
	High Channel - 1 Mbps (Basic data rate)		

Environmental Conditions		
Ambient Temperature	Relative Humidity	Barometric Pressure
26 °C	30 %	101.35 kPa

EUT performed within the requirements of the applicable standard [X] Yes [ ] No J Payne

Channel	Freq MHz	Meas PSD (dBm)	Limit (dBm)	Delta (dBm)	Pass/Fail
High	2480	-13.59	8.0	-21.59	Pass



Date: 6.MAR.2018 14:51:51

2.1033 (b) (7) Equipment Photographs

Supplied separately for confidentiality

End of Report UT86088A-003