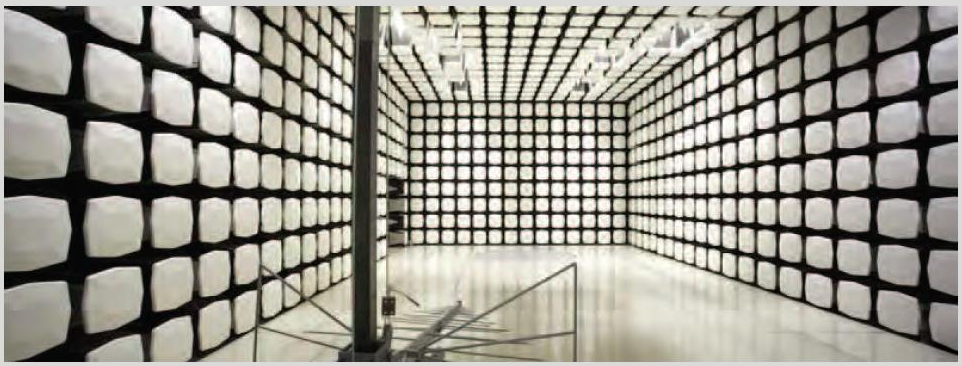
# Timecode Systems Limited

## UltraSync BLUE

## FCC 15.247:2018

## 902 – 928 MHz FHSS Transceiver

## Report # TMEC0002.2



NVLAP LAB CODE: 200630-0

# CERTIFICATE OF TEST

**Last Date of Test: September 7, 2018**
**Timecode Systems Limited**
**Model: UltraSync BLUE**

## Radio Equipment Testing

### Standards

| Specification | Method |
|---|---|
| FCC 15.247:2018 | ANSI C63.10:2013 |

### Results

| Method Clause | Test Description | Applied | Results | Comments |
|---|---|---|---|---|
| 6.2 | Powerline Conducted Emissions | No | N/A | Not required for a battery powered EUT. |
| 6.5, 6.6 | Spurious Radiated Emissions | Yes | Pass | |
| 7.5 | Duty Cycle | Yes | N/A | Characterization of radio operation. |
| 7.8.2 | Carrier Frequency Separation | Yes | Pass | |
| 7.8.3 | Number of Hopping Frequencies | Yes | Pass | |
| 7.8.4 | Dwell Time | Yes | Pass | |
| 7.8.5 | Output Power | Yes | Pass | |
| 7.8.6 | Band Edge Compliance | Yes | Pass | |
| 7.8.6 | Band Edge Compliance - Hopping Mode | Yes | Pass | |
| 7.8.7 | Occupied Bandwidth | Yes | Pass | |
| 7.8.8 | Spurious Conducted Emissions | Yes | Pass | |
| 11.10.2 | Power Spectral Density | No | N/A | Not required for FHSS devices. |

### Deviations From Test Standards

None

### Approved By:

*Kyle Holgate, Operations Manager*

***Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.***

# REVISION HISTORY

| Revision Number | Description | Date (yyyy-mm-dd) | Page Number |
|---|---|---|---|
| 00 | None | | |

# ACCREDITATIONS AND AUTHORIZATIONS

## United States

**FCC** - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

**A2LA** - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Element to certify transmitters to FCC and IC specifications.

**NVLAP** - Each laboratory is accredited by NVLAP to ISO 17025

## Canada

**ISED** - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

## European Union

**European Commission** – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

## Australia/New Zealand

**ACMA** - Recognized by ACMA as a CAB for the acceptance of test data.

## Korea

**MSIT / RRA** - Recognized by KCC's RRA as a CAB for the acceptance of test data.

## Japan

**VCCI** - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

## Taiwan

**BSMI** – Recognized by BSMI as a CAB for the acceptance of test data.

**NCC** - Recognized by NCC as a CAB for the acceptance of test data.

## Singapore

**IDA** – Recognized by IDA as a CAB for the acceptance of test data.

## Israel

**MOC** – Recognized by MOC as a CAB for the acceptance of test data.

## Hong Kong

**OFCA** – Recognized by OFCA as a CAB for the acceptance of test data.

## Vietnam

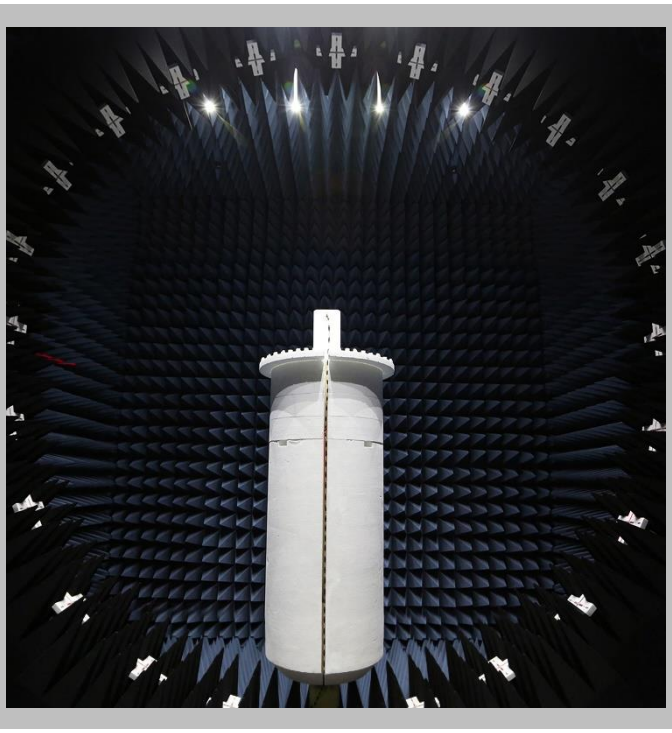
**MIC** – Recognized by MIC as a CAB for the acceptance of test data.

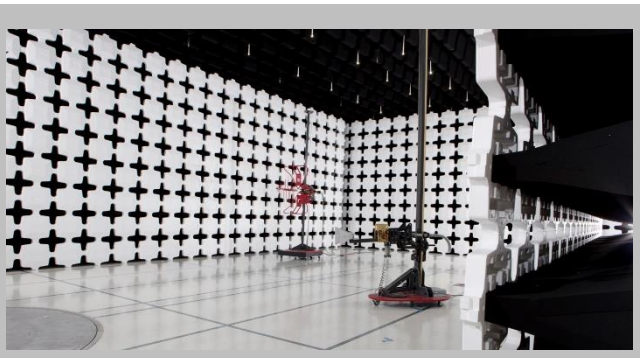
# SCOPE

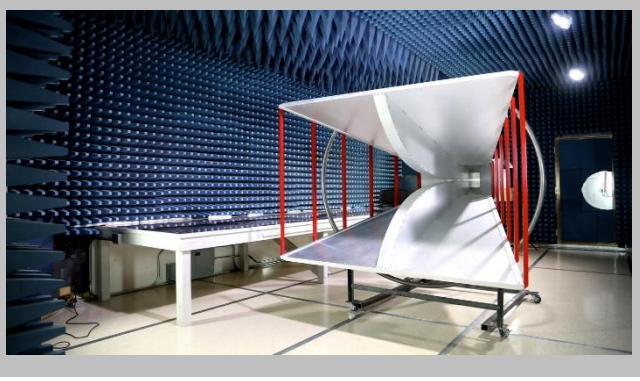
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

# FACILITIES

| California | Minnesota | New York | Oregon | Texas | Washington |
|---|---|---|---|---|---|
| Labs OC01-17<br>41 Tesla<br>Irvine, CA 92618<br>(949) 861-8918 | Labs MN01-10<br>9349 W Broadway Ave.<br>Brooklyn Park, MN 55445<br>(612)-638-5136 | Labs NY01-04<br>4939 Jordan Rd.<br>Elbridge, NY 13060<br>(315) 554-8214 | Labs EV01-12<br>6775 NE Evergreen Pkwy #400<br>Hillsboro, OR 97124<br>(503) 844-4066 | Labs TX01-09<br>3801 E Plano Pkwy<br>Plano, TX 75074<br>(469) 304-5255 | Labs NC01-05<br>19201 120th Ave NE<br>Bothell, WA 98011<br>(425)984-6600 |
| **NVLAP** | | | | | |
| NVLAP Lab Code: 200676-0 | NVLAP Lab Code: 200881-0 | NVLAP Lab Code: 200761-0 | NVLAP Lab Code: 200630-0 | NVLAP Lab Code:201049-0 | NVLAP Lab Code: 200629-0 |
| **Innovation, Science and Economic Development Canada** | | | | | |
| 2834B-1, 2834B-3 | 2834E-1, 2834E-3 | N/A | 2834D-1, 2834D-*2* | 2834G-1 | 2834F-1 |
| **BSMI** | | | | | |
| SL2-IN-E-1154R | SL2-IN-E-1152R | N/A | SL2-IN-E-1017 | SL2-IN-E-1158R | SL2-IN-E-1153R |
| **VCCI** | | | | | |
| A-0029 | A-0109 | N/A | A-0108 | A-0201 | A-0110 |
| **Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA** | | | | | |
| US0158 | US0175 | N/A | US0017 | US0191 | US0157 |







# MEASUREMENT UNCERTAINTY

element
TMU.2015.07.10

## Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

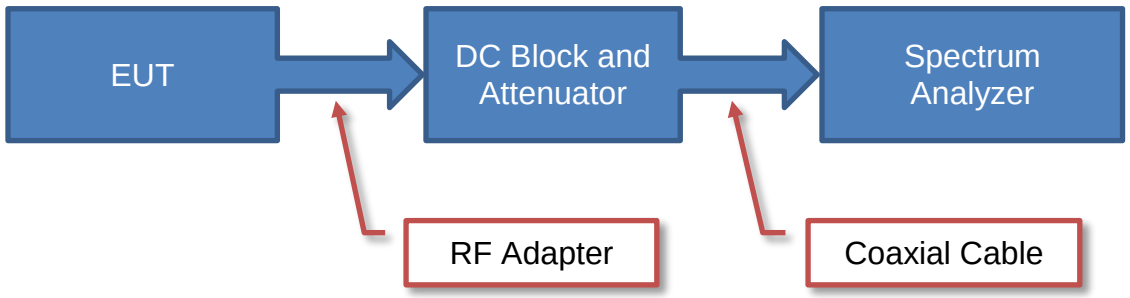
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

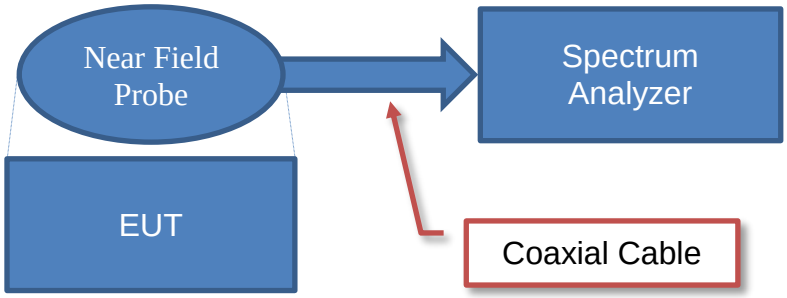
| Test | + MU | - MU |
|---|---|---|
| Frequency Accuracy (Hz) | 0.0007% | -0.0007% |
| Amplitude Accuracy (dB) | 1.2 dB | -1.2 dB |
| Conducted Power (dB) | 0.3 dB | -0.3 dB |
| Radiated Power via Substitution (dB) | 0.7 dB | -0.7 dB |
| Temperature (degrees C) | 0.7°C | -0.7°C |
| Humidity (% RH) | 2.5% RH | -2.5% RH |
| Voltage (AC) | 1.0% | -1.0% |
| Voltage (DC) | 0.7% | -0.7% |
| Field Strength (dB) | 5.2 dB | -5.2 dB |
| AC Powerline Conducted Emissions (dB) | 2.4 dB | -2.4 dB |

# Test Setup Block Diagrams

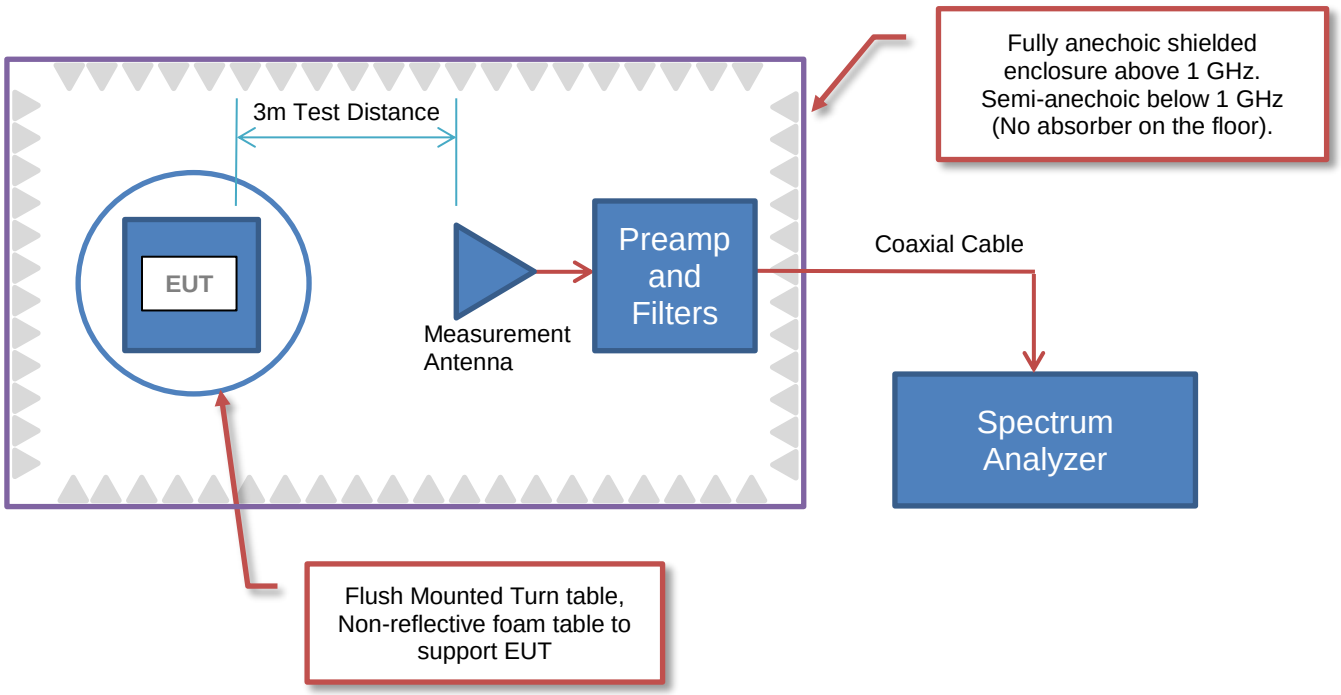
## Antenna Port Conducted Measurements




## Near Field Test Fixture Measurements




## Spurious Radiated Emissions



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

| | |
|---|---|
| **Company Name:** | Timecode Systems Limited |
| **Address:** | Unit 6 Elgar Business Centre Moseley Road |
| **City, State, Zip:** | Hallow, WR2 6NJ |
| **Test Requested By:** | Paul Scurrell |
| **Model:** | UltraSync BLUE |
| **First Date of Test:** | September 5, 2018 |
| **Last Date of Test:** | September 7, 2018 |
| **Receipt Date of Samples:** | September 4, 2018 |
| **Equipment Design Stage:** | Production |
| **Equipment Condition:** | No Damage |
| **Purchase Authorization:** | Verified |

## Information Provided by the Party Requesting the Test

| **Functional Description of the EUT:** |
|---|
| Time code synchronization system |

| **Testing Objective:** |
|---|
| Seeking to demonstrate compliance under FCC 15.247:2018 for operation in the 902 - 928 MHz Band. |

# CONFIGURATIONS

## Configuration TMEC0002- 1

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| USBI3 | 2.9 |

| EUT | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| Time code synchronization system | Timecode Systems Limited | UltraSync BLUE | 111836-000001 |

## Configuration TMEC0002- 2

| Software/Firmware Running during test | |
|---|---|
| **Description** | **Version** |
| USBI3 | 2.9 |

| EUT | | | |
|---|---|---|---|
| **Description** | **Manufacturer** | **Model/Part Number** | **Serial Number** |
| Time code synchronization system | Timecode Systems Limited | UltraSync BLUE | 111836-000003 |

| Cables | | | | | |
|---|---|---|---|---|---|
| **Cable Type** | **Shield** | **Length (m)** | **Ferrite** | **Connection 1** | **Connection 2** |
| USB Cable | Yes | 1.0 m | No | Time code synchronization system | Unterminated |

# MODIFICATIONS

## Equipment Modifications

| Item | Date | Test | Modification | Note | Disposition of EUT |
|---|---|---|---|---|---|
| 1 | 2018-09-05 | Occupied Bandwidth | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 2 | 2018-09-05 | Output Power | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 3 | 2018-09-05 | Band Edge Compliance | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 4 | 2018-09-05 | Spurious Conducted Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 5 | 2018-09-05 | Carrier Frequency Separation | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 6 | 2018-09-05 | Number of Hopping Frequencies | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 7 | 2018-09-05 | Dwell Time | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 8 | 2018-09-05 | Band Edge Compliance – Hopping Mode | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | EUT remained at Element following the test. |
| 9 | 2018-09-07 | Spurious Radiated Emissions | Tested as delivered to Test Station. | No EMI suppression devices were added or modified during this test. | Scheduled testing was completed. |

# SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2018.05.04

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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

**MODES OF OPERATION**

Continuous Tx, Low Data Ch = 915.8 MHz, High Data Ch = 922.2 MHz, Low Landing Ch = 915.05 MHz, High Landing Ch = 914.65 MHz

**POWER SETTINGS INVESTIGATED**

Battery

**CONFIGURATIONS INVESTIGATED**

TMEC0002 - 2

**FREQUENCY RANGE INVESTIGATED**

| Start Frequency | 30 MHz | Stop Frequency | 12400 MHz |
|---|---|---|---|

**SAMPLE CALCULATIONS**

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

**TEST EQUIPMENT**

| Description | Manufacturer | Model | ID | Last Cal. | Interval |
|---|---|---|---|---|---|
| Cable | None | Standard Gain Horns Cable | EVF | 30-Nov-2017 | 12 mo |
| Amplifier - Pre-Amplifier | L-3 Narda-MITEQ | AMF-6F-08001200-30-10P | PAO | 30-Nov-2017 | 12 mo |
| Antenna - Standard Gain | ETS Lindgren | 3160-07 | AHU | NCR | 0 mo |
| Filter - High Pass | Micro-Tronics | HPM50108 | HFV | 1-Feb-2018 | 12 mo |
| Cable | N/A | Double Ridge Horn Cables | EVB | 29-Nov-2017 | 12 mo |
| Amplifier - Pre-Amplifier | Miteq | AMF-3D-00100800-32-13P | PAG | 29-Nov-2017 | 12 mo |
| Antenna - Double Ridge | ETS Lindgren | 3115 | AIZ | 7-Feb-2018 | 24 mo |
| Filter - Band Pass/Notch | K&L Microwave | 3TNF-500/1000-N/N | HFT | 5-Dec-2017 | 12 mo |
| Filter - Low Pass | Micro-Tronics | LPM50003 | LFB | 28-Feb-2018 | 12 mo |
| Attenuator | Coaxicom | 3910-10 | AWX | 28-Feb-2018 | 12 mo |
| Attenuator | Coaxicom | 3910-20 | AXZ | 28-Feb-2018 | 12 mo |
| Cable | N/A | Bilog Cables | EVA | 25-Jul-2018 | 12 mo |
| Amplifier - Pre-Amplifier | Miteq | AM-1616-1000 | AOL | 30-Nov-2017 | 12 mo |
| Antenna - Biconilog | EMCO | 3142 | AXA | 24-Oct-2016 | 24 mo |
| Antenna - Biconilog | EMCO | 3141 | AXG | 17-Jul-2017 | 24 mo |
| Analyzer - Spectrum Analyzer | Agilent | E4446A | AAQ | 18-Mar-2018 | 12 mo |

**TEST DESCRIPTION**

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

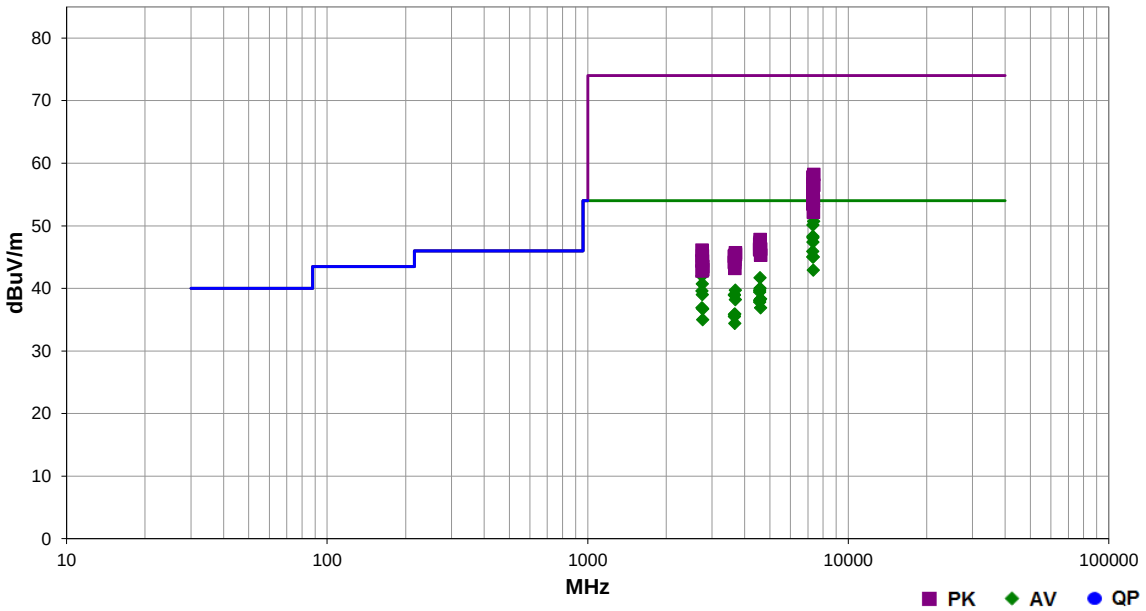
# SPURIOUS RADIATED EMISSIONS

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

| | | | | | |
|---|---|---|---|---|---|
| **Work Order:** | TMEC0002 | **Date:** | 7-Sep-2018 | | |
| **Project:** | None | **Temperature:** | 22.4 °C | | |
| **Job Site:** | EV01 | **Humidity:** | 40.6% RH | | |
| **Serial Number:** | 111836-000003 | **Barometric Pres.:** | 1022 mbar | **Tested by:** | Jeff Alcoke |
| **EUT:** | UltraSync BLUE | | | | |
| **Configuration:** | 2 | | | | |
| **Customer:** | Timecode Systems Limited | | | | |
| **Attendees:** | Paul Bannister | | | | |
| **EUT Power:** | Battery | | | | |
| **Operating Mode:** | Continuous Tx, Low Data Ch = 915.8 MHz, High Data Ch = 922.2 MHz, Low Landing Ch = 915.05 MHz, High Landing Ch = 914.65 MHz | | | | |
| **Deviations:** | None | | | | |
| **Comments:** | Software power setting = 80. See comments below for Channel and EUT orientation. | | | | |

| **Test Specifications** | **Test Method** |
|---|---|
| FCC 15.247:2018 | ANSI C63.10:2013 |

| **Run #** | 33 | **Test Distance (m)** | 3 | **Antenna Height(s)** | 1 to 4(m) | **Results** | Pass |
|---|---|---|---|---|---|---|---|




| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/ Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7326.400 | 41.1 | 12.3 | 1.3 | 357.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 53.4 | 54.0 | -0.6 | Low Data Ch, EUT on Side |
| 7377.625 | 40.5 | 12.9 | 2.6 | 338.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 53.4 | 54.0 | -0.6 | High Data Ch, EUT on Side |
| 7326.417 | 40.5 | 12.3 | 1.0 | 9.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 52.8 | 54.0 | -1.2 | Low Data Ch, EUT Vert |
| 7377.608 | 37.8 | 12.9 | 1.0 | 10.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 50.7 | 54.0 | -3.3 | High Data Ch, EUT Vert |
| 7326.400 | 37.8 | 12.3 | 3.1 | 294.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 50.1 | 54.0 | -3.9 | Low Data Ch, EUT Vert |
| 7326.417 | 36.0 | 12.3 | 1.0 | 255.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 48.3 | 54.0 | -5.7 | Low Data Ch, EUT Horz |
| 7326.400 | 35.8 | 12.3 | 3.8 | 317.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 48.1 | 54.0 | -5.9 | Low Data Ch, EUT Horz |
| 7326.433 | 35.1 | 12.3 | 1.0 | 258.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 47.4 | 54.0 | -6.6 | Low Data Ch, EUT on Side |
| 7320.417 | 33.7 | 12.2 | 1.1 | 349.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 45.9 | 54.0 | -8.1 | Low Landing Ch, EUT on Side |
| 7349.217 | 32.5 | 12.5 | 1.2 | 348.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 45.0 | 54.0 | -9.0 | High Landing Ch, EUT on Side |
| 7320.417 | 32.8 | 12.2 | 1.1 | 357.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 45.0 | 54.0 | -9.0 | Low Landing Ch, EUT Vert |
| 7349.208 | 30.4 | 12.5 | 3.2 | 353.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 42.9 | 54.0 | -11.1 | High Landing Ch, EUT Vert |
| 2745.158 | 45.0 | -3.0 | 1.0 | 65.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 42.0 | 54.0 | -12.0 | Low Landing Ch, EUT Vert |
| 4593.250 | 37.3 | 4.4 | 1.0 | 85.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 41.7 | 54.0 | -12.3 | High Landing Ch, EUT on Side |
| 2755.967 | 43.6 | -2.9 | 1.0 | 54.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 40.7 | 54.0 | -13.3 | High Landing Ch, EUT Vert |
| 4593.242 | 35.6 | 4.4 | 1.0 | 351.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 40.0 | 54.0 | -14.0 | High Landing Ch, EUT Vert |
| 3688.817 | 37.5 | 2.2 | 1.0 | 313.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 39.7 | 54.0 | -14.3 | High Data Ch, EUT on Side |
| 4575.267 | 35.4 | 4.3 | 1.0 | 85.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 39.7 | 54.0 | -14.3 | Low Landing Ch, EUT on Side |
| 2745.158 | 42.6 | -3.0 | 1.0 | 8.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 39.6 | 54.0 | -14.4 | Low Landing Ch, EUT on Side |
| 4575.233 | 35.1 | 4.3 | 2.0 | 353.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 39.4 | 54.0 | -14.6 | Low Landing Ch, EUT Vert |
| 3663.200 | 37.0 | 2.0 | 1.0 | 315.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 39.0 | 54.0 | -15.0 | Low Data Ch, EUT on Side |
| 2755.958 | 41.9 | -2.9 | 1.0 | 9.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 39.0 | 54.0 | -15.0 | High Landing Ch, EUT on Side |

| Freq (MHz) | Amplitude (dBuV) | Factor (dB) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/ Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3663.208 | 36.9 | 2.0 | 1.0 | 127.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 38.9 | 54.0 | -15.1 | Low Data Ch, EUT Vert |
| 4611.000 | 34.0 | 4.3 | 1.0 | 77.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 38.3 | 54.0 | -15.7 | High Data Ch, EUT on Side |
| 7377.392 | 45.3 | 12.9 | 2.6 | 338.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 58.2 | 74.0 | -15.8 | High Data Ch, EUT on Side |
| 3688.817 | 36.0 | 2.2 | 1.0 | 128.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 38.2 | 54.0 | -15.8 | High Data Ch, EUT Vert |
| 4579.008 | 33.8 | 4.3 | 1.0 | 94.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 38.1 | 54.0 | -15.9 | Low Data Ch, EUT on Side |
| 7326.075 | 45.5 | 12.3 | 1.3 | 357.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 57.8 | 74.0 | -16.2 | Low Data Ch, EUT on Side |
| 4578.992 | 33.5 | 4.3 | 1.0 | 331.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 37.8 | 54.0 | -16.2 | Low Data Ch, EUT Vert |
| 7325.967 | 45.4 | 12.3 | 1.0 | 9.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 57.7 | 74.0 | -16.3 | Low Data Ch, EUT Vert |
| 2747.408 | 39.9 | -3.0 | 1.0 | 313.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 36.9 | 54.0 | -17.1 | Low Data Ch, EUT Vert |
| 4611.025 | 32.6 | 4.3 | 1.0 | 0.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 36.9 | 54.0 | -17.1 | High Data Ch, EUT Vert |
| 7326.375 | 44.4 | 12.3 | 3.1 | 294.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 56.7 | 74.0 | -17.3 | Low Data Ch, EUT Vert |
| 2766.608 | 39.5 | -2.8 | 1.0 | 158.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 36.7 | 54.0 | -17.3 | High Data Ch, EUT on Side |
| 7377.617 | 43.6 | 12.9 | 1.0 | 10.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 56.5 | 74.0 | -17.5 | High Data Ch, EUT Vert |
| 7326.300 | 43.8 | 12.3 | 1.0 | 255.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 56.1 | 74.0 | -17.9 | Low Data Ch, EUT Horz |
| 3674.625 | 33.8 | 2.1 | 1.8 | 360.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 35.9 | 54.0 | -18.1 | High Landing Ch, EUT on Side |
| 3660.200 | 33.7 | 2.1 | 1.0 | 1.0 | 3.0 | 0.0 | Horz | AV | 0.0 | 35.8 | 54.0 | -18.2 | Low Landing Ch, EUT on Side |
| 7326.558 | 43.2 | 12.3 | 3.8 | 317.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 55.5 | 74.0 | -18.5 | Low Data Ch, EUT Horz |
| 3660.200 | 33.4 | 2.1 | 1.0 | 345.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 35.5 | 54.0 | -18.5 | Low Landing Ch, EUT Vert |
| 2766.625 | 37.8 | -2.8 | 1.0 | 34.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 35.0 | 54.0 | -19.0 | High Data Ch, EUT Vert |
| 7320.492 | 42.8 | 12.2 | 1.1 | 349.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 55.0 | 74.0 | -19.0 | Low Landing Ch, EUT on Side |
| 7326.542 | 42.3 | 12.3 | 1.0 | 258.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 54.6 | 74.0 | -19.4 | Low Data Ch, EUT on Side |
| 3674.600 | 32.3 | 2.1 | 1.3 | 22.0 | 3.0 | 0.0 | Vert | AV | 0.0 | 34.4 | 54.0 | -19.6 | High Landing Ch, EUT Vert |
| 7349.492 | 41.5 | 12.5 | 1.2 | 348.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 54.0 | 74.0 | -20.0 | High Landing Ch, EUT on Side |
| 7320.200 | 41.3 | 12.2 | 1.1 | 357.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 53.5 | 74.0 | -20.5 | Low Landing Ch, EUT Vert |
| 7348.933 | 39.7 | 12.5 | 3.2 | 353.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 52.2 | 74.0 | -21.8 | High Landing Ch, EUT Vert |
| 4593.108 | 43.4 | 4.4 | 1.0 | 85.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 47.8 | 74.0 | -26.2 | High Landing Ch, EUT on Side |
| 4593.733 | 43.0 | 4.4 | 1.0 | 351.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 47.4 | 74.0 | -26.6 | High Landing Ch, EUT Vert |
| 4574.983 | 42.9 | 4.2 | 1.0 | 85.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 47.1 | 74.0 | -26.9 | Low Landing Ch, EUT on Side |
| 4575.242 | 42.1 | 4.3 | 2.0 | 353.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 46.4 | 74.0 | -27.6 | Low Landing Ch, EUT Vert |
| 4610.875 | 42.0 | 4.3 | 1.0 | 77.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 46.3 | 74.0 | -27.7 | High Data Ch, EUT on Side |
| 4579.042 | 41.9 | 4.3 | 1.0 | 331.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 46.2 | 74.0 | -27.8 | Low Data Ch, EUT Vert |
| 4578.717 | 41.9 | 4.3 | 1.0 | 94.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 46.2 | 74.0 | -27.8 | Low Data Ch, EUT on Side |
| 2745.125 | 49.1 | -3.0 | 1.0 | 65.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 46.1 | 74.0 | -27.9 | Low Landing Ch, EUT Vert |
| 3688.417 | 43.5 | 2.2 | 1.0 | 313.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 45.7 | 74.0 | -28.3 | High Data Ch, EUT on Side |
| 3688.667 | 43.2 | 2.2 | 1.0 | 128.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 45.4 | 74.0 | -28.6 | High Data Ch, EUT Vert |
| 4610.867 | 41.0 | 4.3 | 1.0 | 0.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 45.3 | 74.0 | -28.7 | High Data Ch, EUT Vert |
| 3663.167 | 43.2 | 2.0 | 1.0 | 315.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 45.2 | 74.0 | -28.8 | Low Data Ch, EUT on Side |
| 2755.825 | 48.1 | -2.9 | 1.0 | 54.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 45.2 | 74.0 | -28.8 | High Landing Ch, EUT Vert |
| 3663.333 | 43.1 | 2.0 | 1.0 | 128.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 45.1 | 74.0 | -28.9 | Low Data Ch, EUT Vert |
| 3674.733 | 42.5 | 2.1 | 1.8 | 360.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 44.6 | 74.0 | -29.4 | High Landing Ch, EUT on Side |
| 2755.925 | 47.3 | -2.9 | 1.0 | 9.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 44.4 | 74.0 | -29.6 | High Landing Ch, EUT on Side |
| 2745.250 | 47.4 | -3.0 | 1.0 | 8.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 44.4 | 74.0 | -29.6 | Low Landing Ch, EUT on Side |
| 3660.192 | 42.1 | 2.1 | 1.0 | 1.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 44.2 | 74.0 | -29.8 | Low Landing Ch, EUT on Side |
| 3660.408 | 42.0 | 2.1 | 1.0 | 345.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 44.1 | 74.0 | -29.9 | Low Landing Ch, EUT Vert |
| 2766.608 | 46.3 | -2.8 | 1.0 | 158.0 | 3.0 | 0.0 | Horz | PK | 0.0 | 43.5 | 74.0 | -30.5 | High Data Ch, EUT on Side |
| 3674.467 | 41.1 | 2.1 | 1.3 | 22.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 43.2 | 74.0 | -30.8 | High Landing Ch, EUT Vert |
| 2766.500 | 45.8 | -2.8 | 1.0 | 34.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 43.0 | 74.0 | -31.0 | High Data Ch, EUT Vert |
| 2747.333 | 45.8 | -3.0 | 1.0 | 304.0 | 3.0 | 0.0 | Vert | PK | 0.0 | 42.8 | 74.0 | -31.2 | Low Data Ch, EUT Vert |

# DUTY CYCLE

**TEST DESCRIPTION**

The Duty Cycle (x) were measured for each of the EUT operating modes. The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

The EUT operates at 100% Duty Cycle.

# CARRIER FREQUENCY SEPARATION

XMit 2017.12.13

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 |
|---|---|---|---|---|---|
| Power Supply - DC | Topward | TPS-2000 | TPD | NCR | NCR |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Generator - Signal | Keysight | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. Frequency hopping systems shall have hopping channel carrier frequencies seperated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

# CARRIER FREQUENCY SEPARATION

element

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.4 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.5% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**EUT set to Internal Master Tx, Landing channel 1, 29.97 fps dropframe. Software power setting = 80. From occupied bandwdith measurments, the largest 20 dB OBW = 93.2 kHz.**

**DEVIATIONS FROM TEST STANDARD**

**None**

| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | **Value** | **Limit (≥)** | **Results** |
|---|---|---|---|
| 902 MHz - 928 MHz Band | | | |
| Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe) | | | |
| Mid Data Channel, 919 MHz | 100 kHz | 93.2 kHz | Pass |

# CARRIER FREQUENCY SEPARATION

TbtTx 2017.12.14 XMit 2017.12.13

| 902 MHz - 928 MHz Band, Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe), Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value | Limit (≥) | Results |
| | | | | 100 kHz | 93.2 kHz | Pass |

# NUMBER OF HOPPING FREQUENCIES

XMit 2017.12.13

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 |
|---|---|---|---|---|---|
| Power Supply - DC | Topward | TPS-2000 | TPD | NCR | NCR |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Generator - Signal | Keysight | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

# NUMBER OF HOPPING FREQUENCIES

element

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.5 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.4% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**Software power setting = 80.**

**DEVIATIONS FROM TEST STANDARD**

**None**

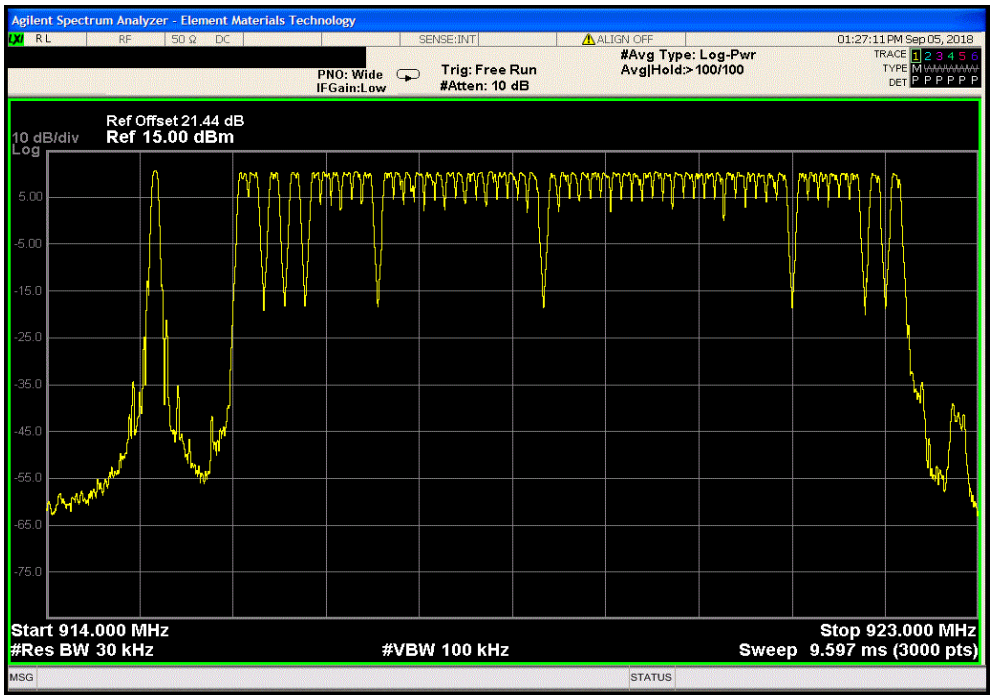
| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | **Number of Channels** | **Limit (≥)** | **Results** |
|---|---|---|---|
| 902 MHz - 928 MHz Band | | | |
| Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe) | | | |
| Mid Data Channel, 919 MHz | 57 | 50 | Pass |

# NUMBER OF HOPPING FREQUENCIES



| 902 MHz - 928 MHz Band, Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe), Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Number of Channels | Limit (≥) | Results |
| | | | | 57 | 50 | Pass |



# DWELL TIME

XMit 2017.12.13

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 | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Thermometer | Omegaette | HH311 | DTY | 5-Jan-18 | 5-Jan-21 |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The hopping function of the EUT was enabled.

On Time During 30 Sec = Pulse Width * Average Number of Pulses * Scale Factor

- Average Number of Pulses is based on 4 samples.
- Scale Factor = 20 Sec / Screen Capture Sweep Time = 20 Sec / 5 Sec = 4

# DWELL TIME

element

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.4 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.6% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**Software power setting = 80.**

**DEVIATIONS FROM TEST STANDARD**

**None**

| **Configuration #** | **1** | *Signature* |
|---|---|---|

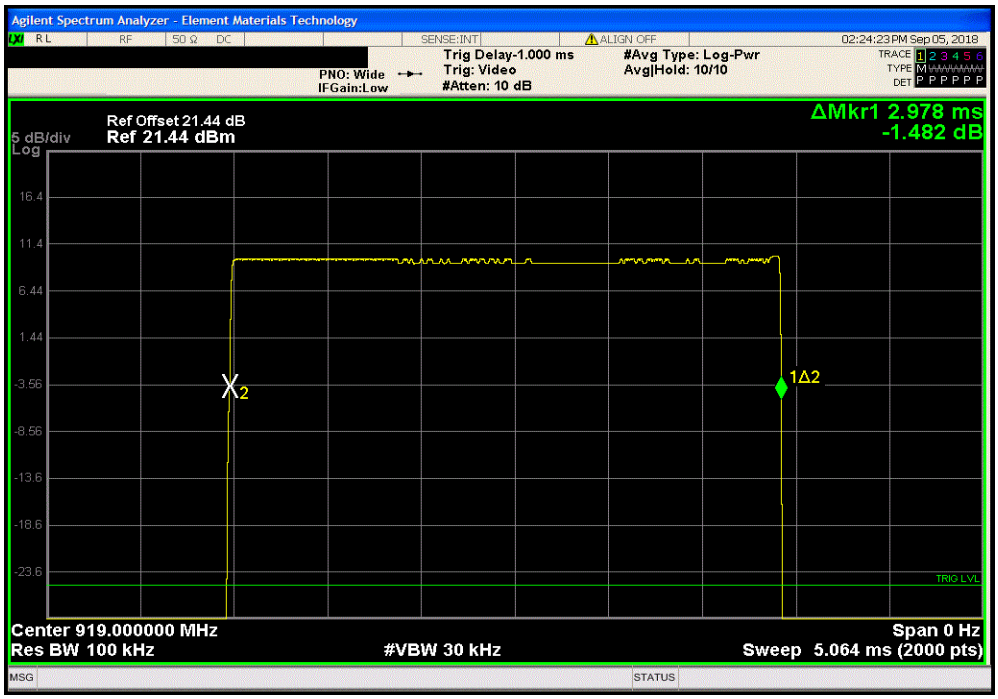
| | Pulse Width (ms) | Number of Pulses | Average No. of Pulses | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
|---|---|---|---|---|---|---|---|
| 902 MHz - 928 MHz Band | | | | | | | |
| Hopping Mode | | | | | | | |
| Mid Data Channel, 919 MHz | 2.978 | N/A | N/A | N/A | N/A | N/A | N/A |
| Mid Data Channel, 919 MHz | N/A | 3 | N/A | N/A | N/A | N/A | N/A |
| Mid Data Channel, 919 MHz | N/A | 3 | N/A | N/A | N/A | N/A | N/A |
| Mid Data Channel, 919 MHz | N/A | 3 | N/A | N/A | N/A | N/A | N/A |
| Mid Data Channel, 919 MHz | N/A | 2 | N/A | N/A | N/A | N/A | N/A |
| Mid Data Channel, 919 MHz | 2.978 | N/A | 2.75 | 4 | 32.758 | 400 | Pass |

# DWELL TIME

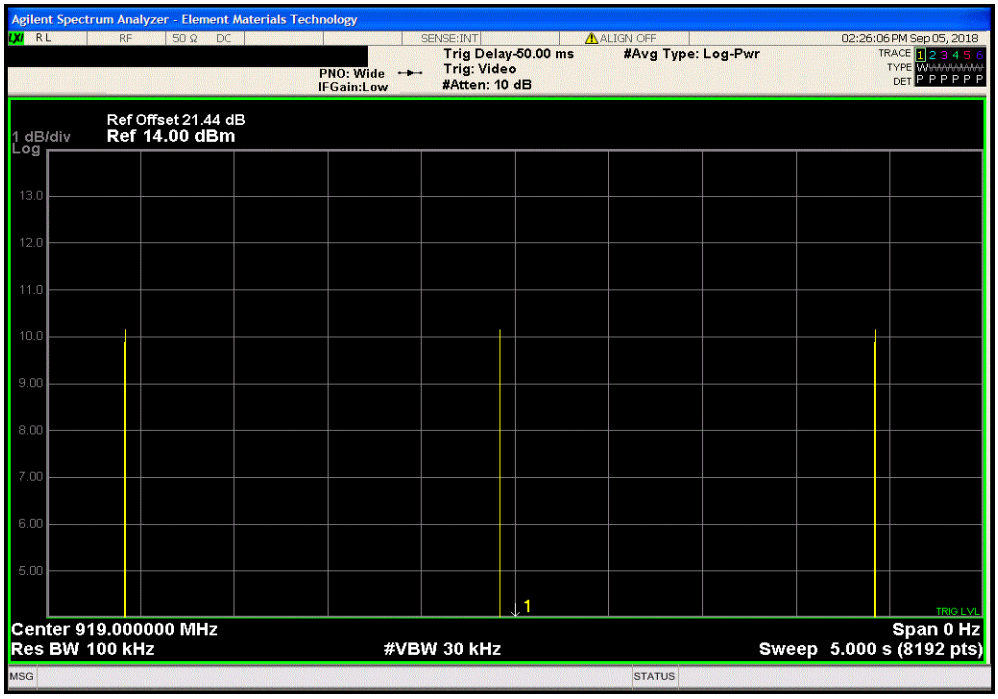
element

TbtTx 2017.12.14 XMit 2017.12.13

| 902 MHz - 928 MHz Band, Hopping Mode, Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Pulse Width (ms) | Number of Pulses | Average No. of Pulses | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| 2.978 | N/A | N/A | N/A | N/A | N/A | N/A |




| 902 MHz - 928 MHz Band, Hopping Mode, Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Pulse Width (ms) | Number of Pulses | Average No. of Pulses | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| N/A | 3 | N/A | N/A | N/A | N/A | N/A |

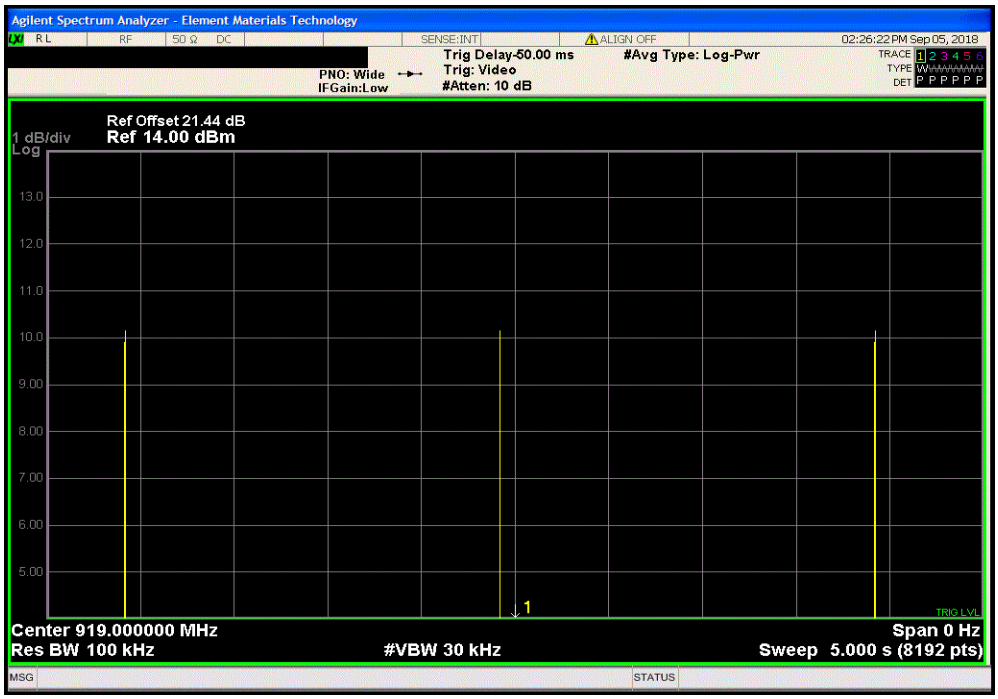


# DWELL TIME

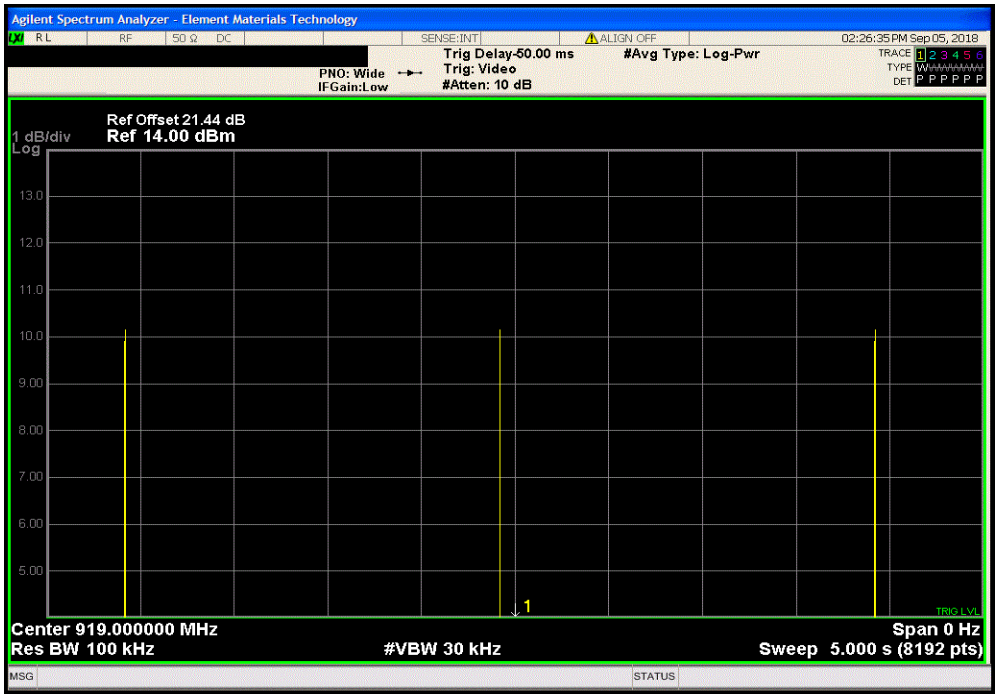
element

TbtTx 2017.12.14 XMit 2017.12.13

| 902 MHz - 928 MHz Band, Hopping Mode, Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Pulse Width (ms) | Number of Pulses | Average No. of Pulses | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| N/A | 3 | N/A | N/A | N/A | N/A | N/A |



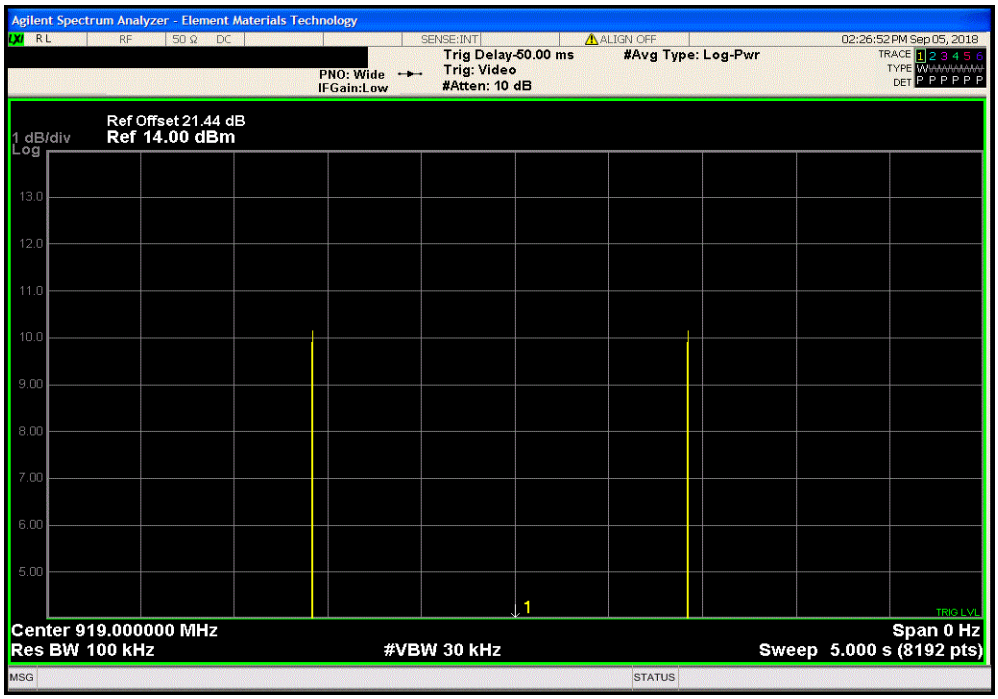

| 902 MHz - 928 MHz Band, Hopping Mode, Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Pulse Width (ms) | Number of Pulses | Average No. of Pulses | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| N/A | 3 | N/A | N/A | N/A | N/A | N/A |



# DWELL TIME



| 902 MHz - 928 MHz Band, Hopping Mode, Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Pulse Width (ms) | Number of Pulses | Average No. of Pulses | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| N/A | 2 | N/A | N/A | N/A | N/A | N/A |




| 902 MHz - 928 MHz Band, Hopping Mode, Mid Data Channel, 919 MHz | | | | | | |
|---|---|---|---|---|---|---|
| Pulse Width (ms) | Number of Pulses | Average No. of Pulses | Scale Factor | On Time (ms) During 20 s | Limit (ms) | Results |
| 2.978 | N/A | 2.75 | 4 | 32.758 | 400 | Pass |

**Calculation Only**

**No Screen Capture Required**

# OUTPUT POWER

XMit 2017.12.13

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 |
|---|---|---|---|---|---|
| Power Supply - DC | Topward | TPS-2000 | TPD | NCR | NCR |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Generator - Signal | Keysight | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The peak output power was measured with the EUT set to low and high transmit frequencies. The EUT was transmitting in a no hop mode at the data rate(s) listed in the datasheet.

The method found in ANSI C63.10:2013 Section 7.8.5 was used for a FHSS radio.

**De Facto EIRP Limit:** The EUT meets the de facto EIRP limit of +36 dBm.

# OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.5 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.5% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**Software power setting = 80.**

**DEVIATIONS FROM TEST STANDARD**

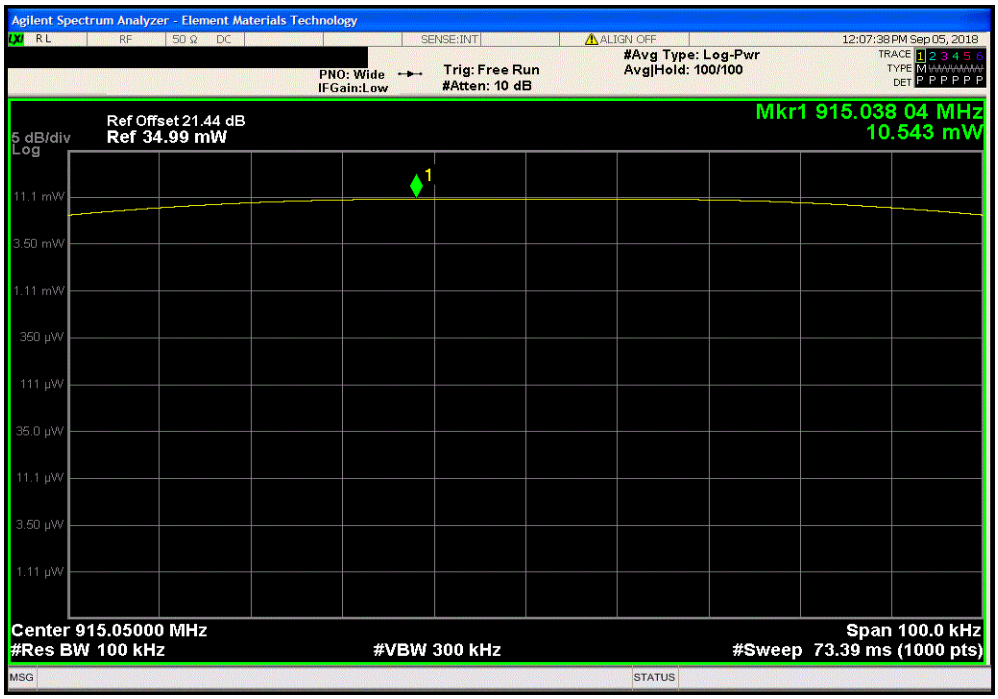
**None**

| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | **Value** | **Limit (<)** | **Result** |
|---|---|---|---|
| 902 MHz - 928 MHz Band | | | |
| Single Channel Mode | | | |
| Low Landing Channel, 915.05 MHz | 10.543 mW | 1 W | Pass |
| High Landing Channel, 918.65 MHz | 10.205 mW | 1 W | Pass |
| Low Data Channel, 915.80 MHz | 10.439 mW | 1 W | Pass |
| High Data Channel, 922.2 MHz | 9.974 mW | 1 W | Pass |

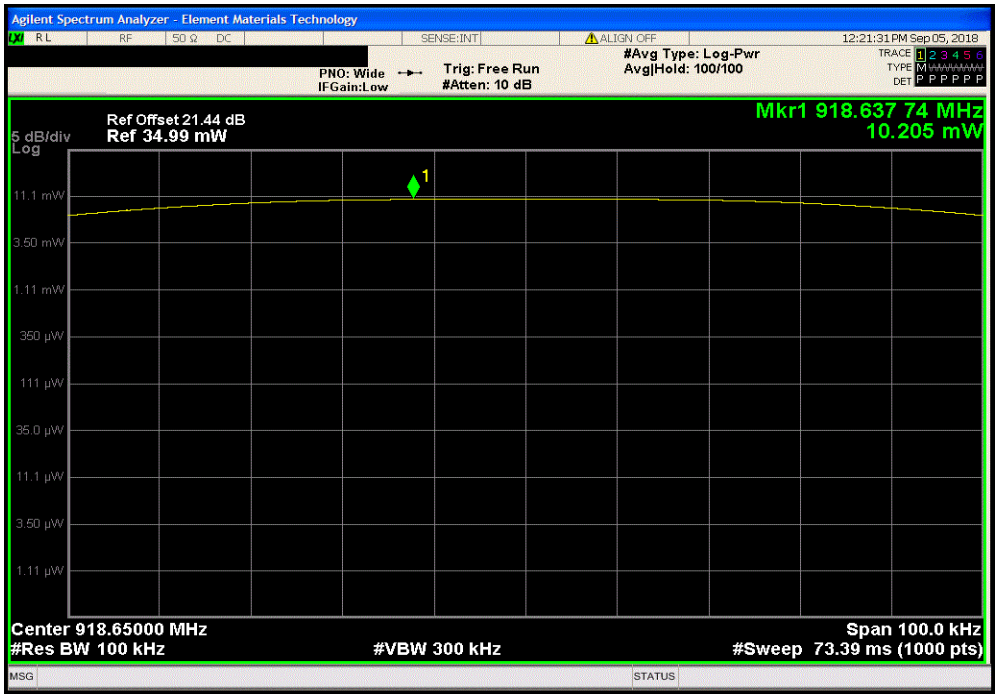
902 MHz - 928 MHz Band, Single Channel Mode, Low Landing Channel, 915.05 MHz

| | | | | Value | Limit (<) | Result |
|---|---|---|---|---|---|---|
| | | | | 10.543 mW | 1 W | Pass |

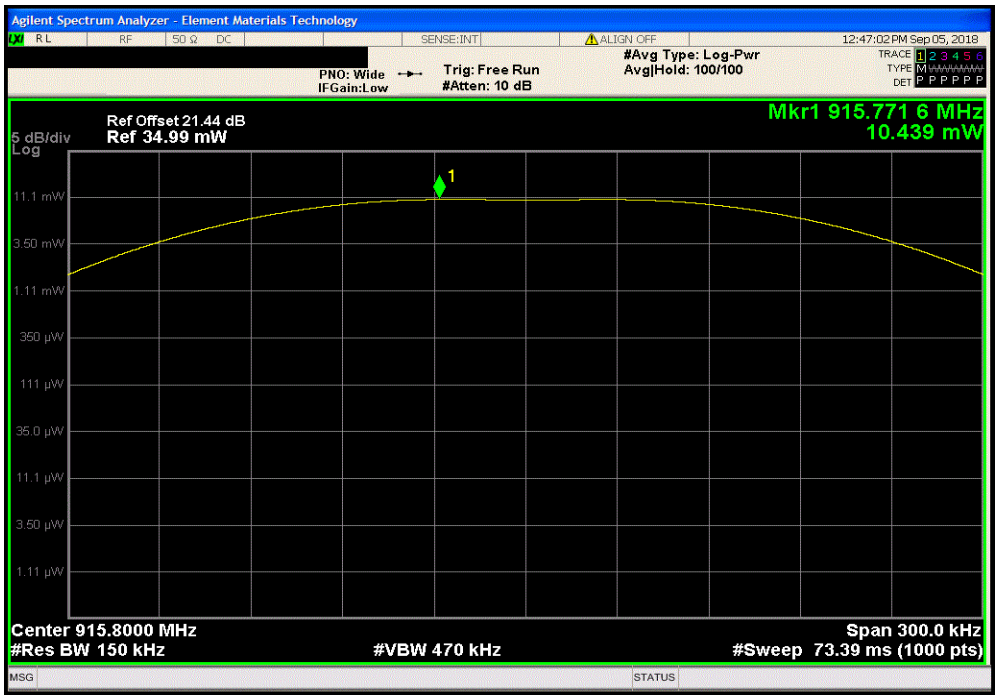



902 MHz - 928 MHz Band, Single Channel Mode, High Landing Channel, 918.65 MHz

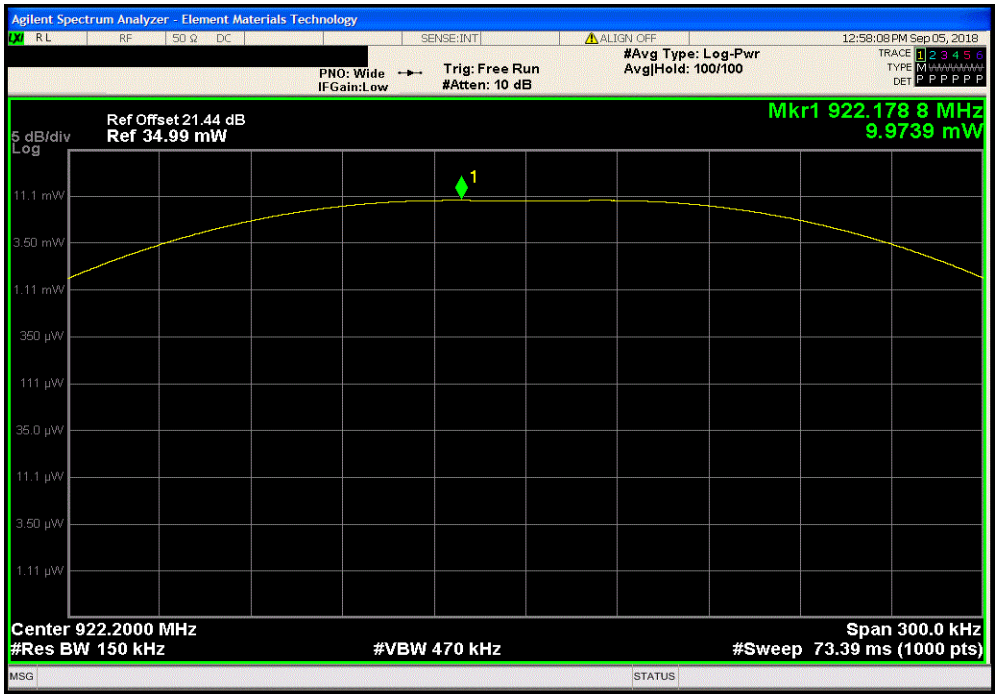
| | | | | Value | Limit (<) | Result |
|---|---|---|---|---|---|---|
| | | | | 10.205 mW | 1 W | Pass |



| 902 MHz - 928 MHz Band, Single Channel Mode, Low Data Channel, 915.80 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value | Limit (<) | Result |
| | | | | 10.439 mW | 1 W | Pass |




| 902 MHz - 928 MHz Band, Single Channel Mode, High Data Channel, 922.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value | Limit (<) | Result |
| | | | | 9.974 mW | 1 W | Pass |



# BAND EDGE COMPLIANCE

XMit 2017.12.13

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 | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Power Supply - DC | Topward | TPS-2000 | TPD | NCR | NCR |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**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 band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

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

# BAND EDGE COMPLIANCE

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.4 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.6% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**Software power setting = 80.**

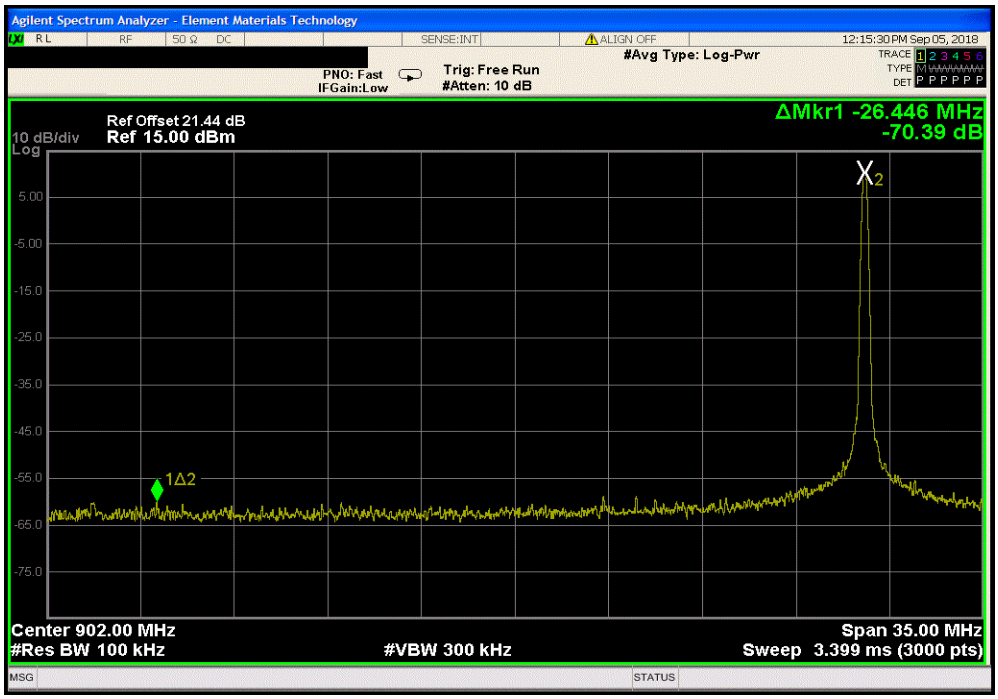
**DEVIATIONS FROM TEST STANDARD**

**None**

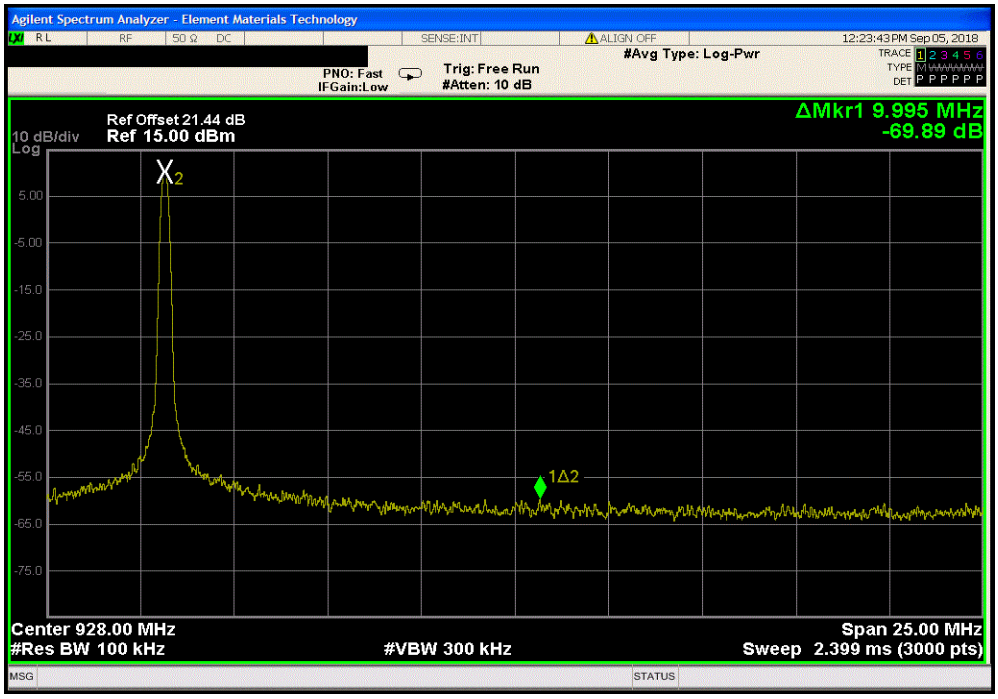
| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | **Value (dBc)** | **Limit ≤ (dBc)** | **Result** |
|---|---|---|---|
| 902 MHz - 928 MHz Band | | | |
| Single Channel Mode | | | |
| Low Landing Channel, 915.05 MHz | -70.39 | -20 | Pass |
| High Landing Channel, 918.65 MHz | -69.89 | -20 | Pass |
| Low Data Channel, 915.80 MHz | -70.09 | -20 | Pass |
| High Data Channel, 922.2 MHz | -70.05 | -20 | Pass |

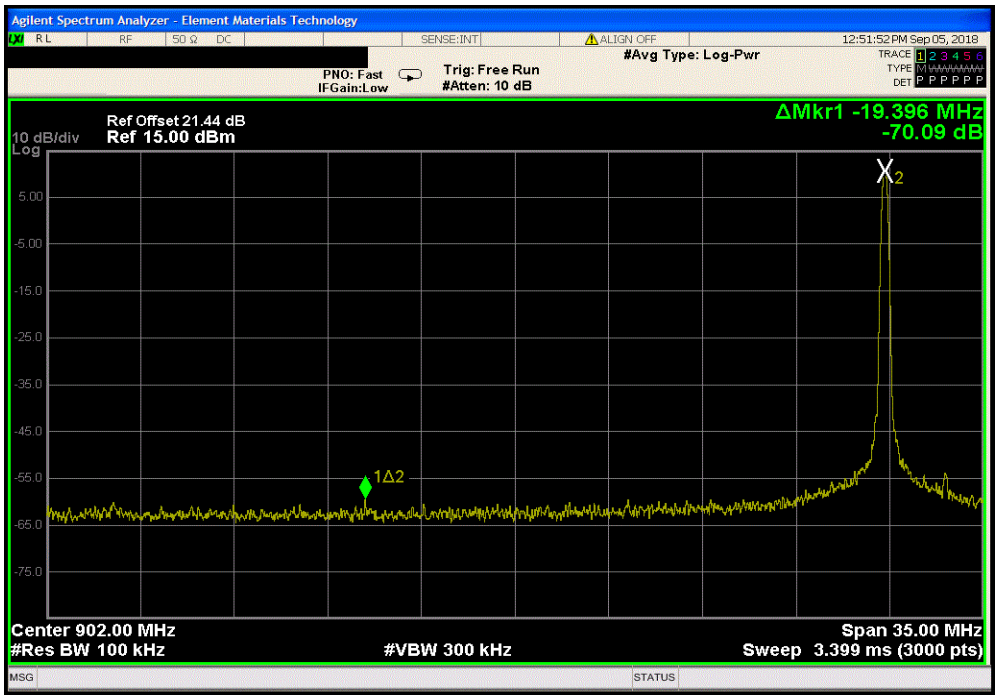
| 902 MHz - 928 MHz Band, Single Channel Mode, Low Landing Channel, 915.05 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
| | | | | -70.39 | -20 | Pass |



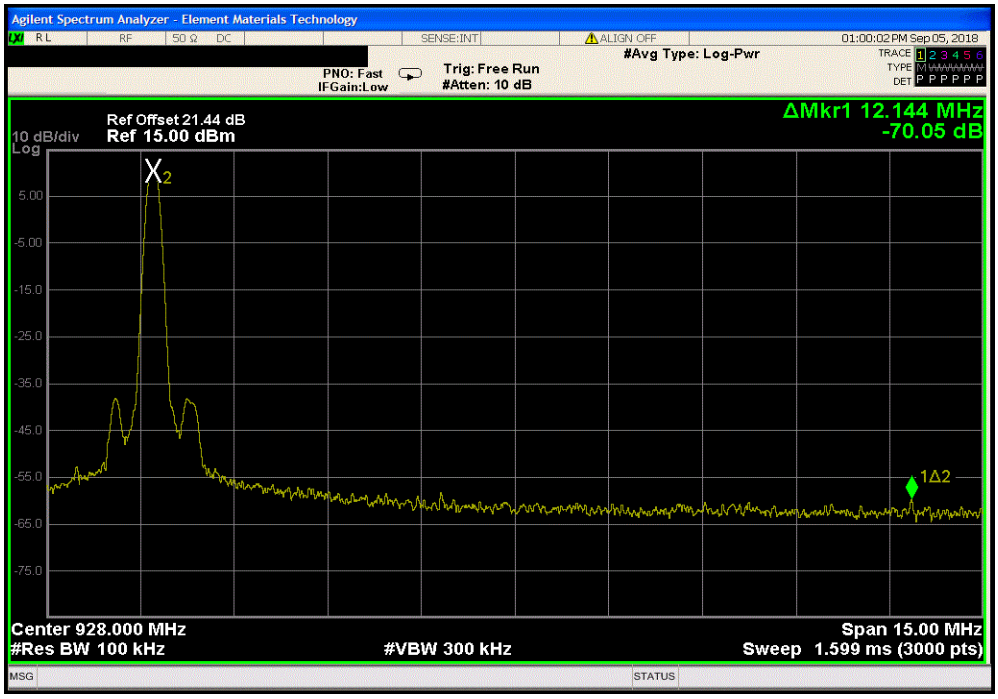

| 902 MHz - 928 MHz Band, Single Channel Mode, High Landing Channel, 918.65 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
| | | | | -69.89 | -20 | Pass |



| 902 MHz - 928 MHz Band, Single Channel Mode, Low Data Channel, 915.80 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
| | | | | -70.09 | -20 | Pass |




| 902 MHz - 928 MHz Band, Single Channel Mode, High Data Channel, 922.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
| | | | | -70.05 | -20 | Pass |



# BAND EDGE COMPLIANCE

XMit 2017.12.13

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 |
|---|---|---|---|---|---|
| Power Supply - DC | Topward | TPS-2000 | TPD | NCR | NCR |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Generator - Signal | Keysight | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**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 band were measured with the EUT set to its normal pseudo-random hopping sequence. The EUT was transmitting at the data rate(s) listed in the datasheet.

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

# BAND EDGE COMPLIANCE

element

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.4 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.7% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**Software power setting = 80.**

**DEVIATIONS FROM TEST STANDARD**

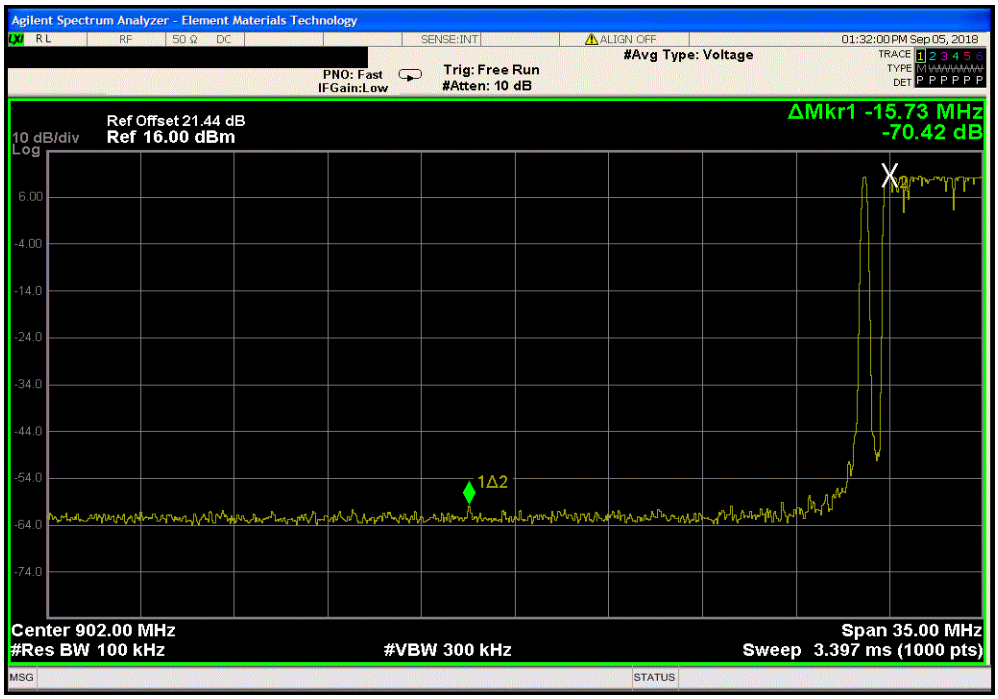
**None**

| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | **Value (dBc)** | **Limit ≤ (dBc)** | **Result** |
|---|---|---|---|
| 902 MHz - 928 MHz Band | | | |
| Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe) | | | |
| Low Landing Channel, 915.05 MHz | -70.42 | -20 | Pass |
| High Landing Channel, 918.65 MHz | -70 | -20 | Pass |
| Low Data Channel, 915.80 MHz | -70.18 | -20 | Pass |
| High Data Channel, 922.2 MHz | -71.17 | -20 | Pass |

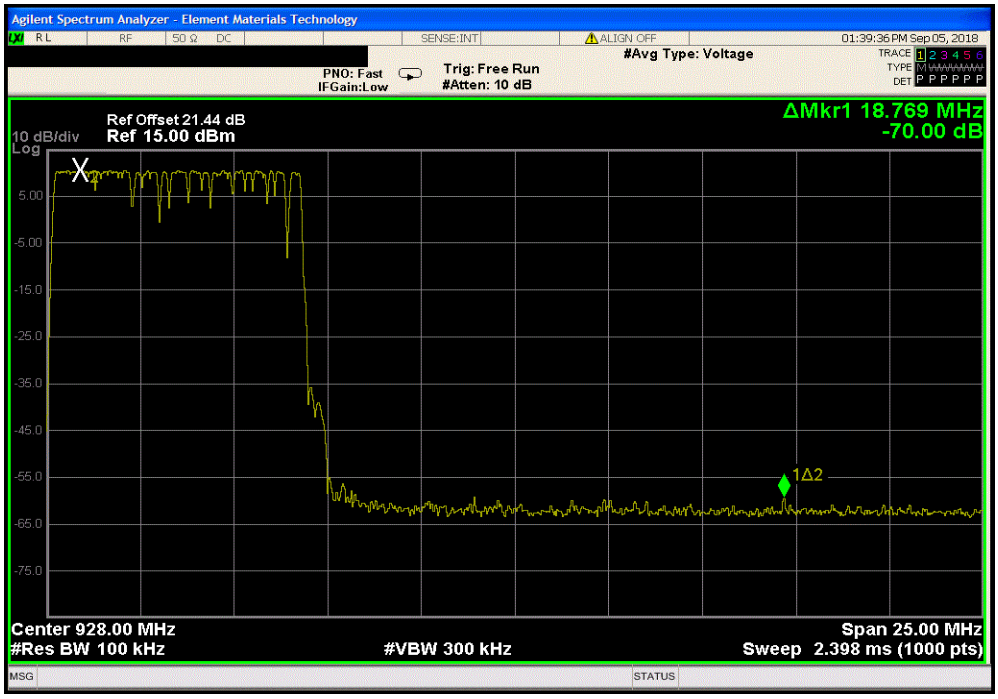
902 MHz - 928 MHz Band, Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe), Low Landing Channel, 915.05 MHz

| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
|---|---|---|---|---|---|---|
| | | | | -70.42 | -20 | Pass |

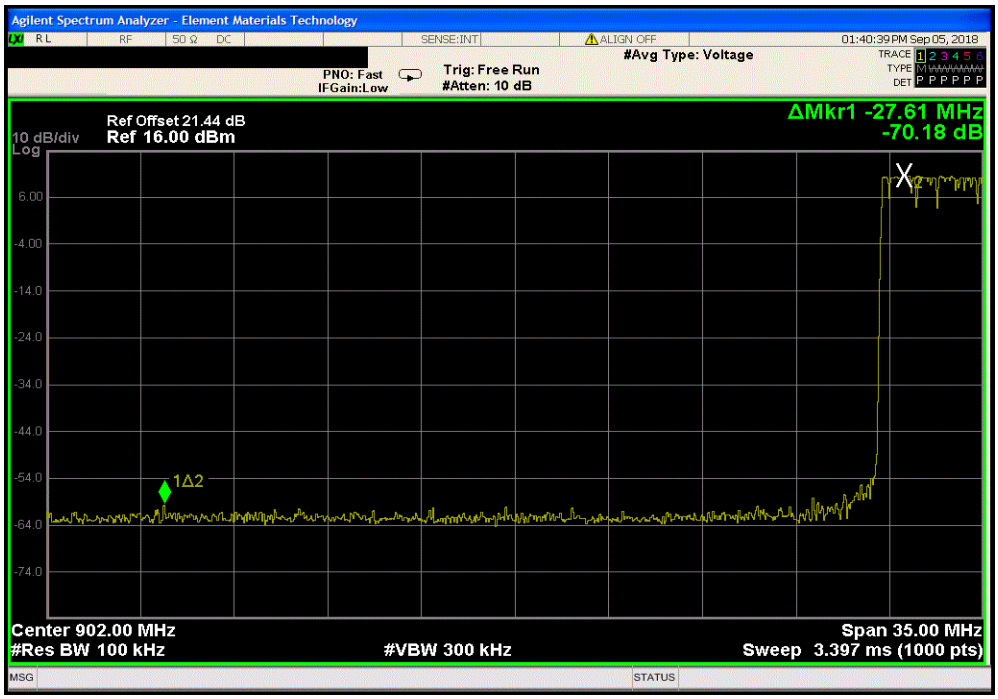



902 MHz - 928 MHz Band, Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe), High Landing Channel, 918.65 MHz

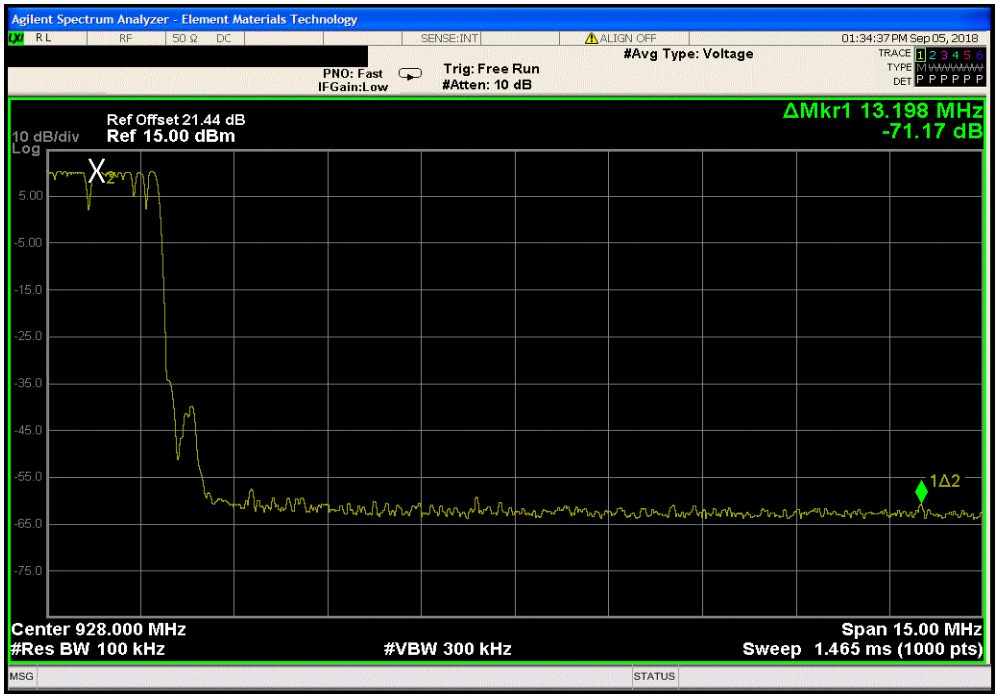
| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
|---|---|---|---|---|---|---|
| | | | | -70 | -20 | Pass |



| 902 MHz - 928 MHz Band, Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe), Low Data Channel, 915.80 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
| | | | | -70.18 | -20 | Pass |




| 902 MHz - 928 MHz Band, Hopping Mode (Internal Master Tx, Landing channel 1, 29.97 fps dropframe), High Data Channel, 922.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value (dBc) | Limit ≤ (dBc) | Result |
| | | | | -71.17 | -20 | Pass |



# OCCUPIED BANDWIDTH

XMit 2017.12.13

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 | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Power Supply - DC | Topward | TPS-2000 | TPD | NCR | NCR |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**TEST DESCRIPTION**

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The 20 dB occupied bandwidth was measured with the EUT set to low and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.

# OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.6 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.4% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**Software power setting = 80.**

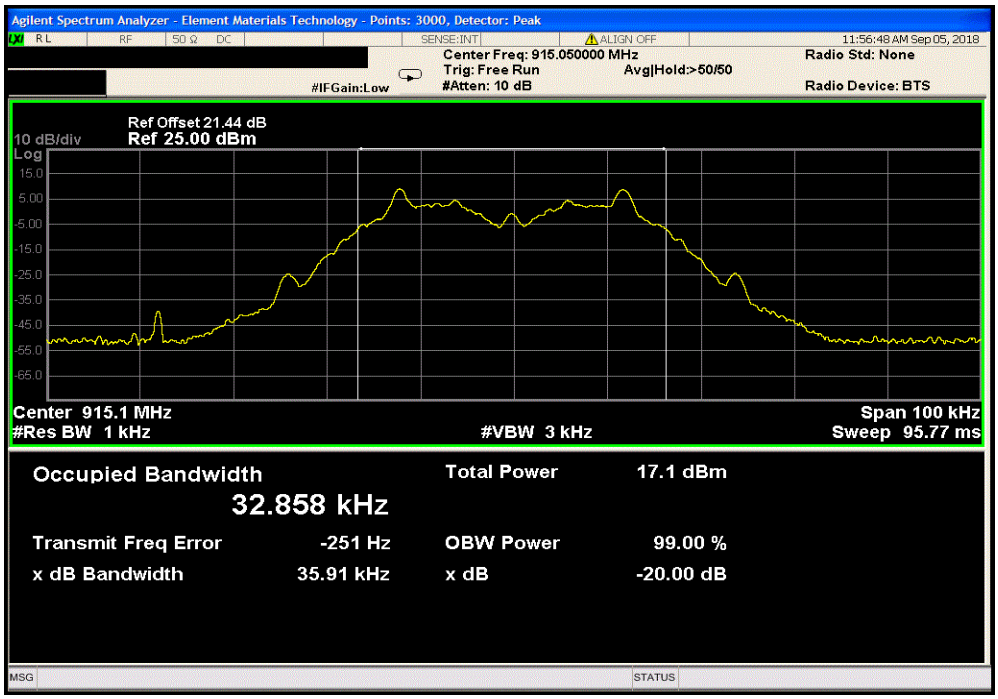
**DEVIATIONS FROM TEST STANDARD**

**None**

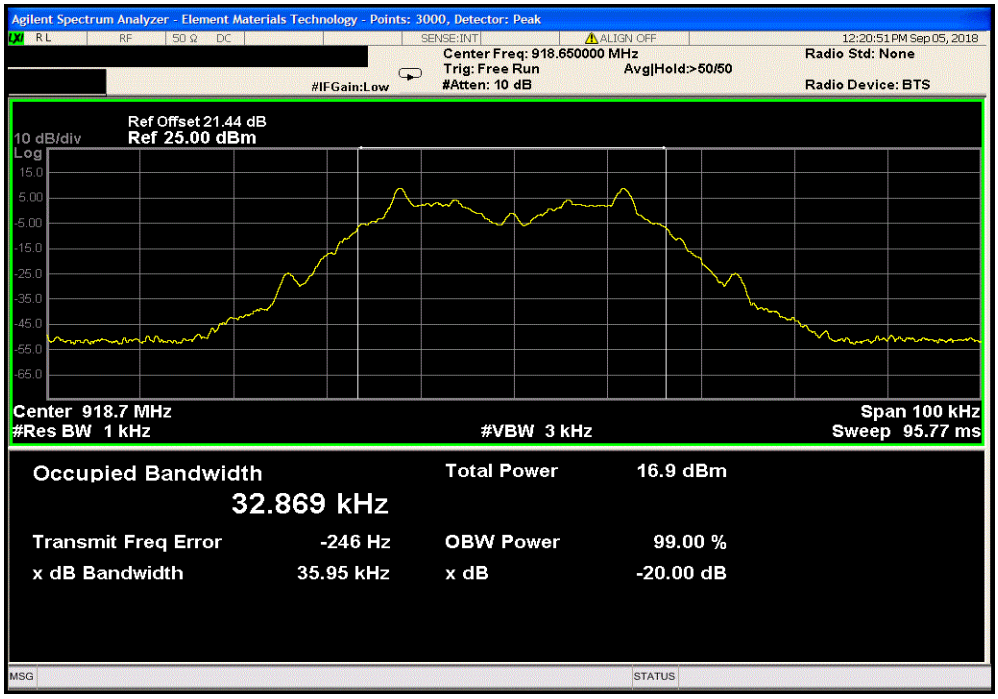
| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | **Value** | **Limit (≤)** | **Result** |
|---|---|---|---|
| 902 MHz - 928 MHz Band | | | |
| Single Channel Mode | | | |
| Low Landing Channel, 915.05 MHz | 35.91 kHz | 500 kHz | Pass |
| High Landing Channel, 918.65 MHz | 35.952 kHz | 500 kHz | Pass |
| Low Data Channel, 915.80 MHz | 92.128 kHz | 500 kHz | Pass |
| High Data Channel, 922.2 MHz | 93.227 kHz | 500 kHz | Pass |

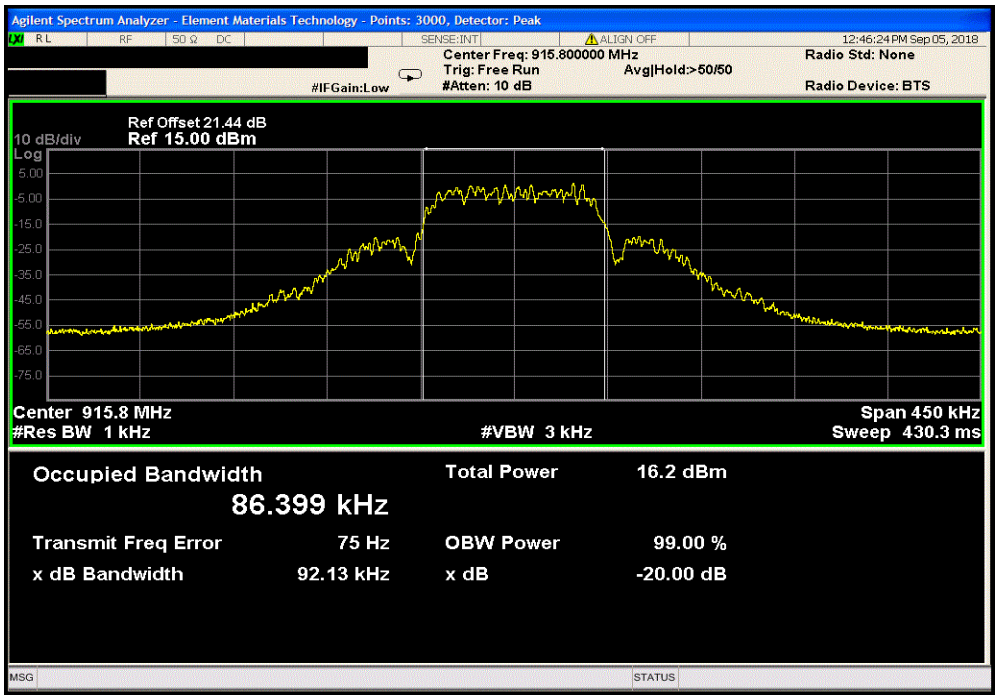
| 902 MHz - 928 MHz Band, Single Channel Mode, Low Landing Channel, 915.05 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value | Limit (≤) | Result |
| | | | | 35.91 kHz | 500 kHz | Pass |



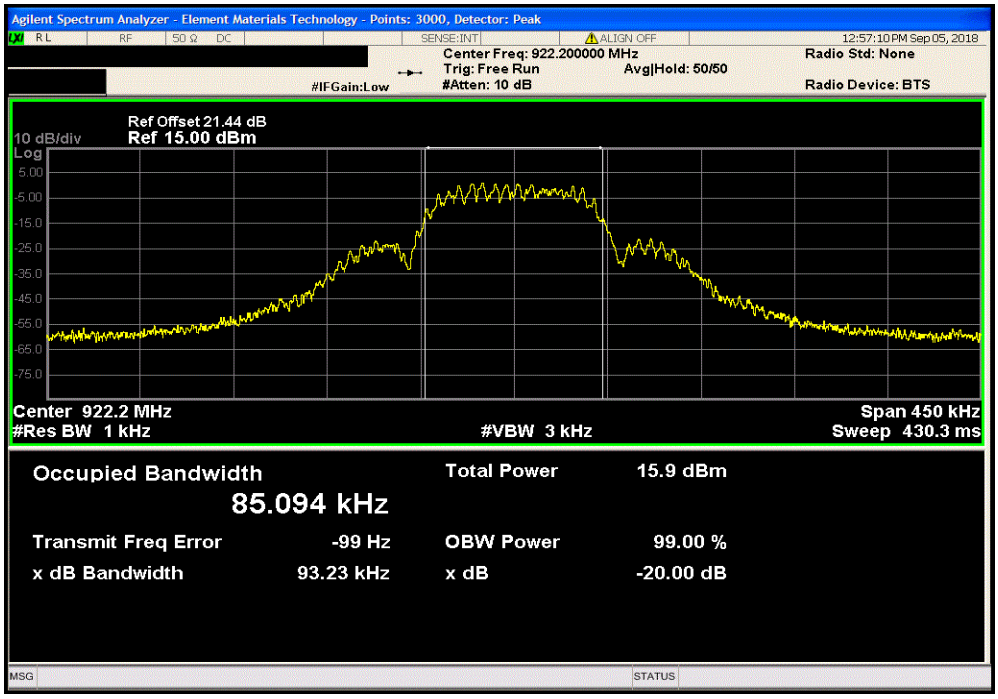

| 902 MHz - 928 MHz Band, Single Channel Mode, High Landing Channel, 918.65 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value | Limit (≤) | Result |
| | | | | 35.952 kHz | 500 kHz | Pass |



| 902 MHz - 928 MHz Band, Single Channel Mode, Low Data Channel, 915.80 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value | Limit (≤) | Result |
| | | | | 92.128 kHz | 500 kHz | Pass |




| 902 MHz - 928 MHz Band, Single Channel Mode, High Data Channel, 922.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Value | Limit (≤) | Result |
| | | | | 93.227 kHz | 500 kHz | Pass |



# SPURIOUS CONDUCTED EMISSIONS

XMit 2017.12.13

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 |
|---|---|---|---|---|---|
| Power Supply - DC | Topward | TPS-2000 | TPD | NCR | NCR |
| Meter - Multimeter | Tektronix | DMM912 | MMH | 17-Feb-16 | 17-Feb-19 |
| Generator - Signal | Keysight | N5182B | TFU | 27-Oct-15 | 27-Oct-18 |
| Cable | Micro-Coax | UFD150A-1-0720-200200 | EVH | 23-Apr-18 | 23-Apr-19 |
| Attenuator | S.M. Electronics | SA26B-20 | AUY | 16-Apr-18 | 16-Apr-19 |
| Block - DC | Fairview Microwave | SD3379 | AMW | 23-Apr-18 | 23-Apr-19 |
| Analyzer - Spectrum Analyzer | Agilent | N9010A | AFI | 12-Jan-18 | 12-Jan-19 |

**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 were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

# SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.12.14 XMit 2017.12.13

| | | | | | |
|---|---|---|---|---|---|
| **EUT:** | **UltraSync BLUE** | | | **Work Order:** | **TMEC0002** |
| **Serial Number:** | **1836000001** | | | **Date:** | **5-Sep-18** |
| **Customer:** | **Timecode Systems Limited** | | | **Temperature:** | **23.4 °C** |
| **Attendees:** | **Paul Bannister** | | | **Humidity:** | **40.6% RH** |
| **Project:** | **None** | | | **Barometric Pres.:** | **1015 mbar** |
| **Tested by:** | **Jeff Alcoke** | **Power:** | **Battery** | **Job Site:** | **EV06** |

| **TEST SPECIFICATIONS** | **Test Method** |
|---|---|
| **FCC 15.247:2018** | ANSI C63.10:2013 |
| | |

**COMMENTS**

**Software power setting = 80.**

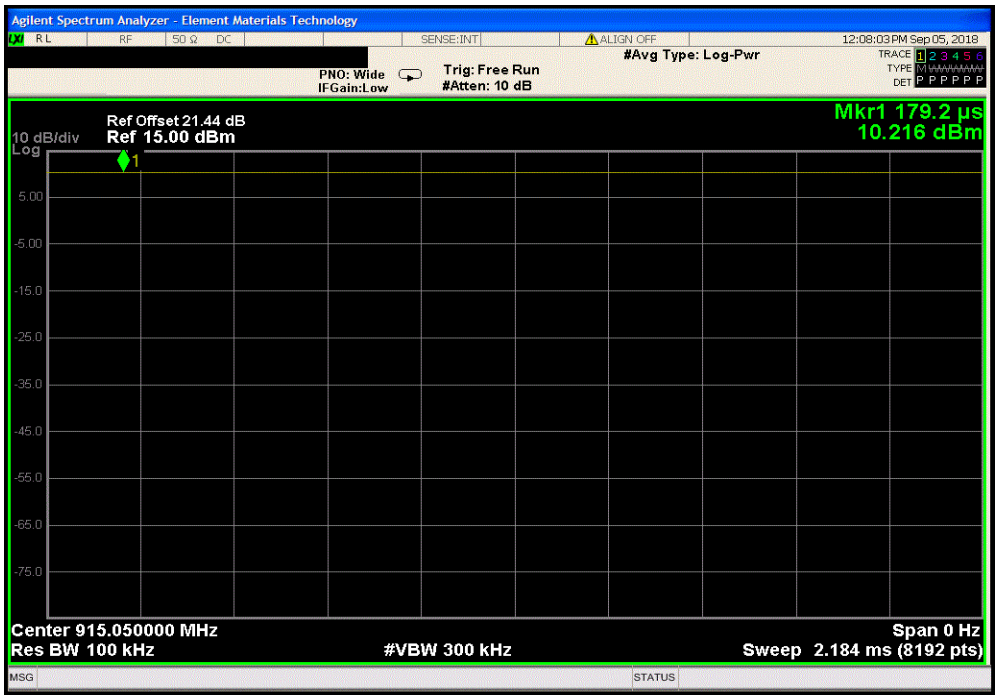
**DEVIATIONS FROM TEST STANDARD**

**None**

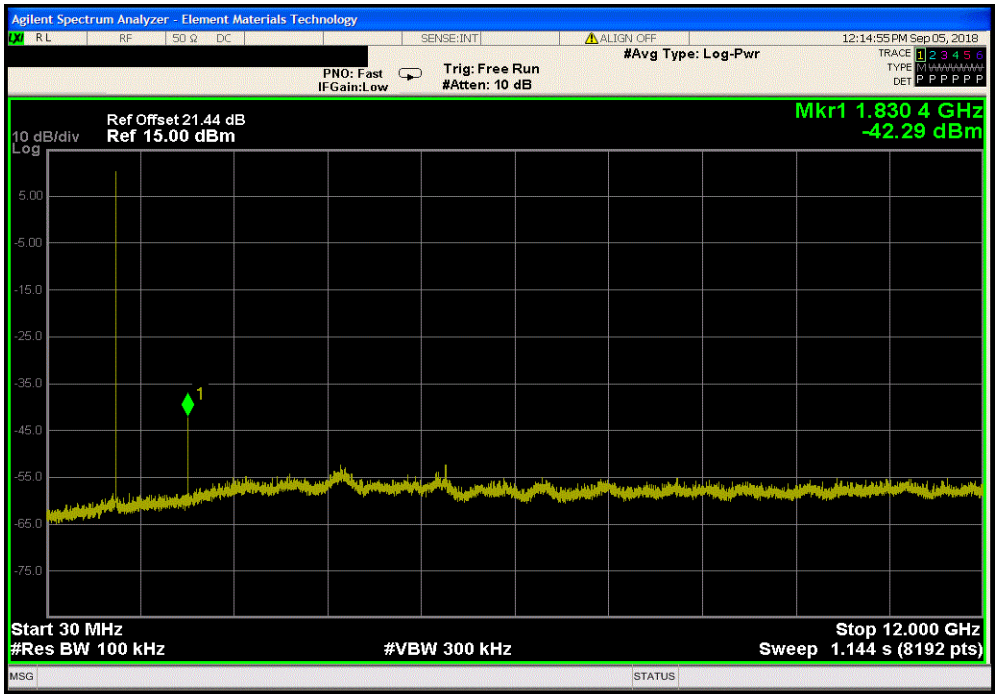
| **Configuration #** | **1** | *Signature* |
|---|---|---|

| | | **Frequency Range** | **Max Value (dBc)** | **Limit ≤ (dBc)** | **Result** |
|---|---|---|---|---|---|
| 902 MHz - 928 MHz Band | | | | | |
| | Single Channel Mode | | | | |
| | Low Landing Channel, 915.05 MHz | Fundamental | N/A | N/A | N/A |
| | Low Landing Channel, 915.05 MHz | 30 MHz - 12 GHz | -52.51 | -20 | Pass |
| | High Landing Channel, 918.65 MHz | Fundamental | N/A | N/A | N/A |
| | High Landing Channel, 918.65 MHz | 30 MHz - 12 GHz | -53.21 | -20 | Pass |
| | Low Data Channel, 915.80 MHz | Fundamental | N/A | N/A | N/A |
| | Low Data Channel, 915.80 MHz | 30 MHz - 12 GHz | -52.57 | -20 | Pass |
| | High Data Channel, 922.2 MHz | Fundamental | N/A | N/A | N/A |
| | High Data Channel, 922.2 MHz | 30 MHz - 12 GHz | -53.72 | -20 | Pass |

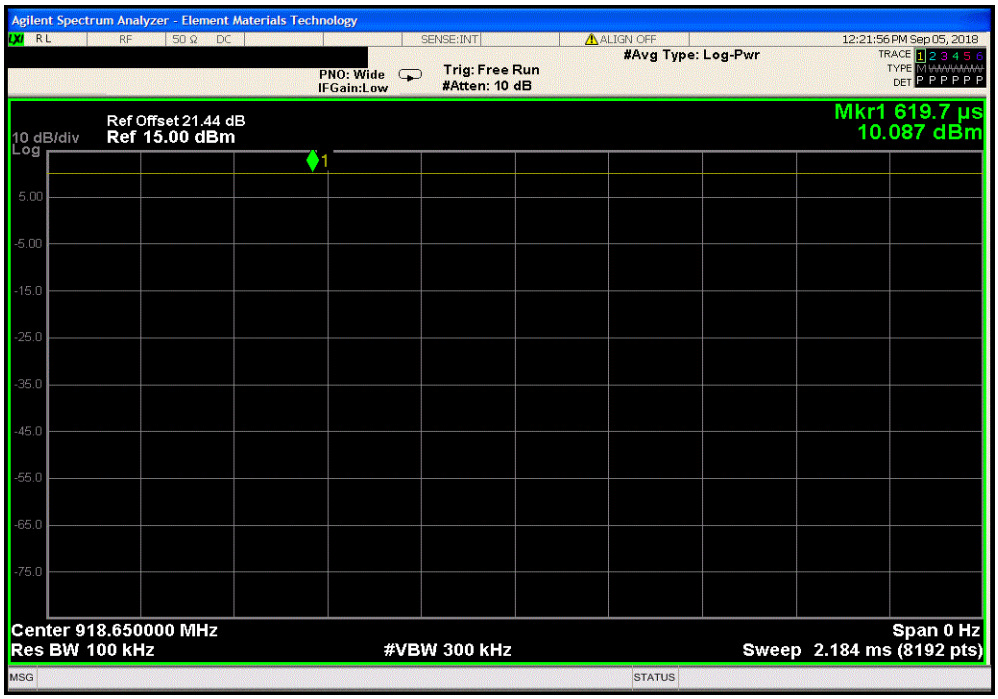
| 902 MHz - 928 MHz Band, Single Channel Mode, Low Landing Channel, 915.05 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Frequency Range | | | Max Value (dBc) | Limit ≤ (dBc) | Result |
| | Fundamental | | | N/A | N/A | N/A |



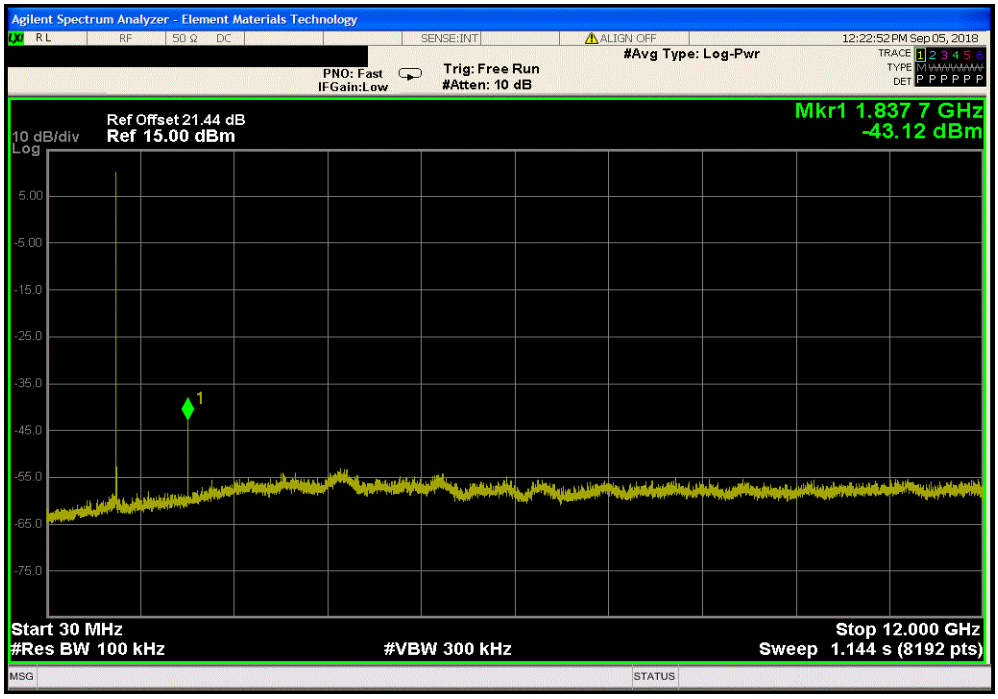

| 902 MHz - 928 MHz Band, Single Channel Mode, Low Landing Channel, 915.05 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency Range | | | Max Value (dBc) | Limit ≤ (dBc) | Result |
| 30 MHz - 12 GHz | | | -52.51 | -20 | Pass |



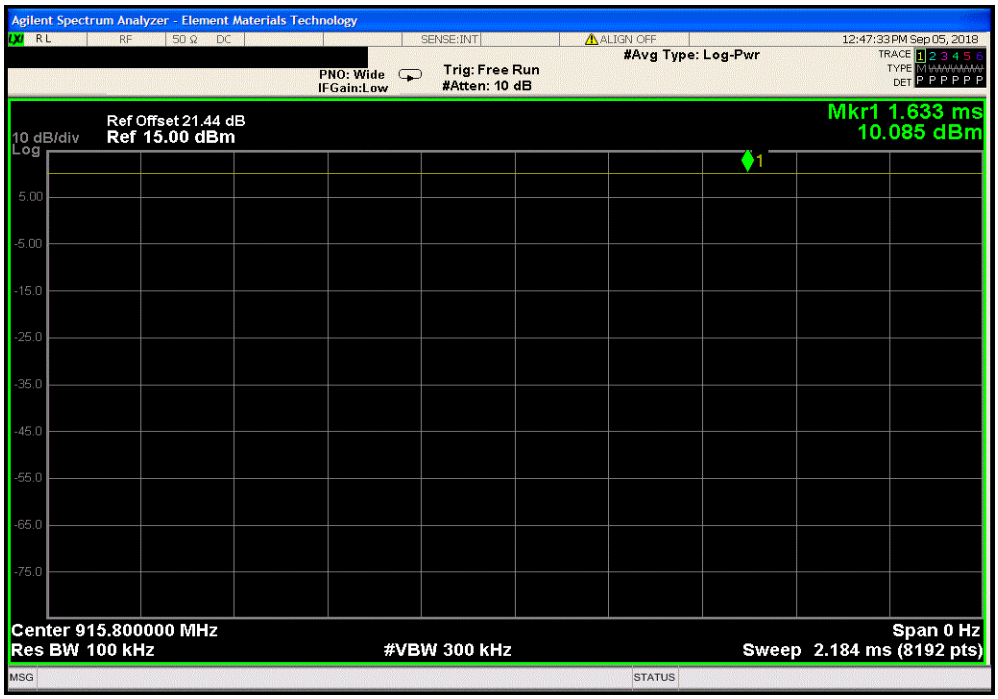
| 902 MHz - 928 MHz Band, Single Channel Mode, High Landing Channel, 918.65 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | **Frequency Range** | | | **Max Value (dBc)** | **Limit ≤ (dBc)** | **Result** |
| | Fundamental | | | N/A | N/A | N/A |



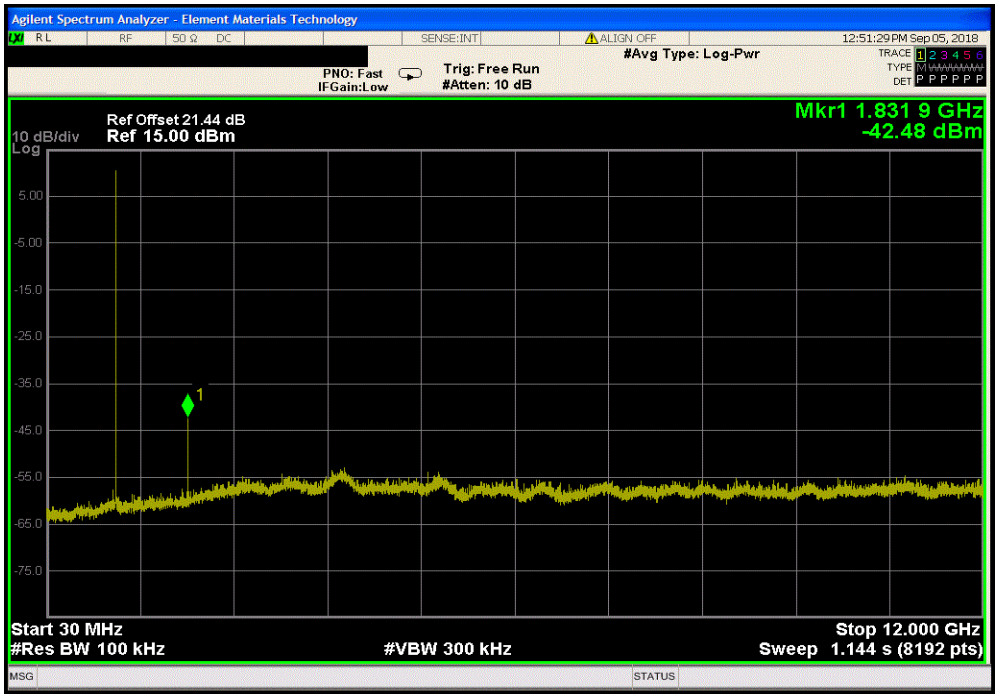

| 902 MHz - 928 MHz Band, Single Channel Mode, High Landing Channel, 918.65 MHz | | | | | |
|---|---|---|---|---|---|
| **Frequency Range** | | | **Max Value (dBc)** | **Limit ≤ (dBc)** | **Result** |
| 30 MHz - 12 GHz | | | -53.21 | -20 | Pass |



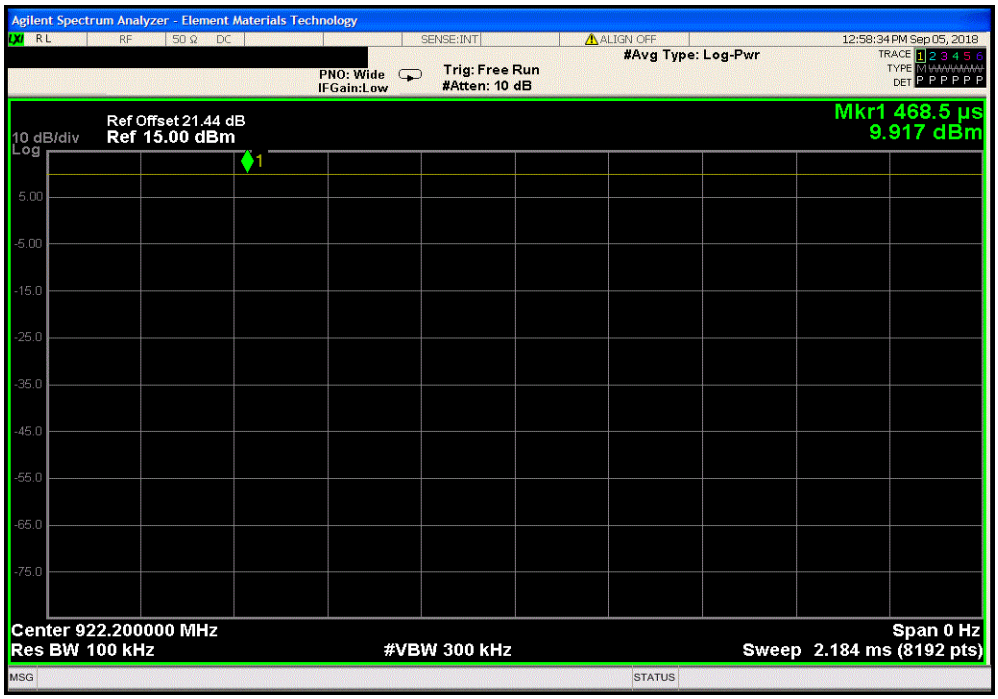
| 902 MHz - 928 MHz Band, Single Channel Mode, Low Data Channel, 915.80 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Frequency Range | | | Max Value (dBc) | Limit ≤ (dBc) | Result |
| | Fundamental | | | N/A | N/A | N/A |




| 902 MHz - 928 MHz Band, Single Channel Mode, Low Data Channel, 915.80 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency Range | | | Max Value (dBc) | Limit ≤ (dBc) | Result |
| 30 MHz - 12 GHz | | | -52.57 | -20 | Pass |



| 902 MHz - 928 MHz Band, Single Channel Mode, High Data Channel, 922.2 MHz | | | | | | |
|---|---|---|---|---|---|---|
| | Frequency Range | | | Max Value (dBc) | Limit ≤ (dBc) | Result |
| | Fundamental | | | N/A | N/A | N/A |




| 902 MHz - 928 MHz Band, Single Channel Mode, High Data Channel, 922.2 MHz | | | | | |
|---|---|---|---|---|---|
| Frequency Range | | | Max Value (dBc) | Limit ≤ (dBc) | Result |
| 30 MHz - 12 GHz | | | -53.72 | -20 | Pass |