Jitter Analysis Software
MX210001A

Transmission Analysis Software
MX210002A
BERTWave MP2100B
To meet rapid increases in data volumes, data centers are introducing high-speed interconnects, such as Active Optical Cable (AOC) and Direct Attach Cable (DAC), with transmission speeds faster than 10 Gbit/s between servers.

The Jitter Analysis Software MX210001A has a new, high-speed, jitter-analysis function supporting all-in-one measurements, such as simultaneous jitter analysis, and eye pattern measurement and eye mask test.

Moreover, the high-speed sampling increases measurement efficiency by cutting measurement time.

Adding the Transmission Analysis Software MX210002A to the BERTWave supports Tx analyses (S₂₁ Gain, Phase), and waveform simulation (de-embedded) using linear equalizer, filter, and emphasis operations; simultaneous waveform sampling and simulation support simultaneous eye pattern measurement and eye mask test.

Furthermore, combined tracking with the MX210001A software permits simultaneous post-simulation waveform jitter analysis. These versatile functions provide the perfect environment for applications ranging from R&D to manufacturing of AOC and DAC.

### Target Applications
- Fibre Channel, InfiniBand, USB, SAS/SATA, 10 GbE, 40 GbE, 100 GbE
- Active Optical Cable (AOC), Direct Attach Cable (DAC), SFP+, QSFP+, CFP2, CX4
- Design Validation Test (DVT)

### Jitter Analysis
- Bathtub jitter analysis
- Classify Tj into Dj, Rj, J2, J9, DDJ, DDPWS, DCD, ISI, and PJ
- Measure any signal, including PRBS31*1

*1: Histogram mode only

### WDP Measurements
- WDP, TWDP, dWDP*2

*2: To compute the WDP, MATLAB R2010b by MathWorks purchase is required separately.

### Transmission Analysis
- Measures transmission path and device S₂₁ (Gain, Phase) characteristics*3
- Single-end and differential IF measurements*4

*3: MP2100B with PPG and sampling scope options
*4: MP2100B-001 with dual electrical interface option

### Waveform Simulation
- Linear equalizer and filter
- Emphasis (4 taps max.)

### High-speed Measurements
- High-speed bathtub BER value (1.0e-18)
- High-speed sampling
- High-speed DDJ using high-speed triggering

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### MATLAB® is a trademark of The MathWorks Inc.
Jitter Analysis Software MX210001A

The ideal jitter analysis solution matching the application can be selected from either the histogram mode for measuring basic jitter analysis or the pattern search mode for detailed jitter analysis.

**Histogram Mode**

This mode supports basic jitter analysis for any signal (including PRBS31). Results are displayed as either bathtub jitter or a histogram calculated by the Dual Dirac model from the eye pattern. In addition, tact times are cut by simultaneous 2-channel jitter analysis, eye pattern, and eye mask test measurements.

**Pattern Search Mode**

In addition to basic jitter components, this mode isolates more detailed jitter components for specific signals (up to PRBS15). Anritsu’s unique triggering method supports faster DDJ measurements than conventional analyzers.

**Analyses at both of Histogram and Pattern Search Mode**

- **TJ BER**: Total Jitter at 1.0e-12
- **Djdd**: Deterministic Jitter (Dual Dirac model)
- **Rjdd**: Random Jitter (Dual Dirac model)
- **Tj at sBER**: Total Jitter at specified BER
- **Eye Opening**: Horizontal Eye opening at specified BER
- **J2 BER**: Total Jitter at 2.5e-3
- **J9 BER**: Total Jitter at 2.5e-10

**Analyses at Pattern Search Mode**

- **DDJ**: Data Dependent Jitter vs. Bit
- **DDPWS**: Data Dependent Pulse Width Shrinking
- **PJ**: Periodic Jitter (support PJ frequency estimation)
- **DCD**: Duty Cycle Distortion
- **ISI**: Inter Symbol Interference

Transmission Analysis Software MX210002A

Waveform simulation with transmission analysis (S21 Gain, Phase) functions as well as linearity, filtering and emphasis calculation supports simultaneous waveform sampling and simulation. The eye pattern measurement and eye mask test functions can also be used simultaneously.

**Transmission Analysis S21 (Gain, Phase)**

BERTWave PPG and Eye/Pulse scope tracking supports measurement of transmission path and device S21 characteristics (Gain, Phase). S21 differentials are supported by the built-in differential interface.

**Waveform Simulation**

Waveform data can be sampled, linear-equalized, filtered, emphasized and displayed simultaneously. Various eye analyses, including eye pattern measurement (Tr/Tf, etc.), eye mask test, jitter analysis separation, etc., can be applied to the displayed eye waveform.

*: Data length equivalent to PRBS15

WDP Measurements

Combining the MX210001A with MATLAB supports WDP, TWDP and dWDP measurements for evaluating the waveform dispersion of specific signals.

Note: To compute the WDP, MATLAB R2010b by MathWorks purchase is required separately.
Active Optical Cable (AOC) Measurements

The MX210001A supports simultaneous jitter analysis, eye pattern measurement, and eye mask tests required by high-speed and multi-lane Active Optical Cables (AOC). Moreover, high-speed triggering supports fast DDJ measurements, reducing measurement times by 80%.

Simultaneous Eye pattern measurement, Eye mask test and Jitter analysis

Typical values when capturing $10^6$ samples at 10.3125 Gbit/s bit rate with PRBS15 test pattern at single-lane and back-to-back measurements
Direct Attach Cable (DAC) Measurements

The eye opening of passive cables like Direct Attach Cables (DAC) used for short connections between server racks, etc., can be assured using the equalizer built into the equipment Rx section. The MX210002A can be used to measure $S_{21}$ (Gain, Phase) characteristics of these devices. Moreover, since waveforms with optimized equalizer, filter, and emphasis values can be predicted from these transmission characteristics, eye pattern measurement and eye mask test of simulated waveforms can be performed. In addition, combination with the MX210001A supports tests required for DAC manufacturing, such as eye pattern measurement and jitter analysis, in one unit.

Emphasis Effect Simulation

The same 4-tap emphasis as the 4 Tap Emphasis MP1825B can be set. The type of eye pattern resulting from equalization and emphasis correction of a waveform with an eye pattern degraded by transmission path loss, or analysis using on-the-spot waveform simulation to determine the required equalization or emphasis can be fed back into the emphasis design.
<table>
<thead>
<tr>
<th>Measurement Item</th>
<th>BERTWave MP2100B</th>
<th>Jitter Analysis Software MX210001A</th>
<th>Transmission Analysis Software MX210002A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MP2100B-021</td>
<td>MP2100B-023</td>
<td></td>
</tr>
<tr>
<td>Electrical Differential Measurement</td>
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<tr>
<td>Single-ended Electrical Measurement</td>
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<td>Optical Signal Measurement</td>
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<tr>
<td>Integrity of Signals Tests</td>
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<tr>
<td>- Time and Amplitude Tests</td>
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<td>- Histogram Test</td>
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<tr>
<td>- Eye Mask Test/Mask Margin Test</td>
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<tr>
<td>Jitter Analysis</td>
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<tr>
<td>WDP Measurement</td>
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<tr>
<td>Transmission Analysis (S21 Gain, Phase)*2</td>
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<tr>
<td>Waveform Simulation</td>
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<tr>
<td>- Linear Equalizer/Filter, Emphasis Arithmetic</td>
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<tr>
<td>Waveform Simulation + jitter Analysis</td>
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</tbody>
</table>

*1: MX210001A and MX210002A operates on MP2100B-021 or MP2100B-023.
*2: Transmission analysis (S21 Gain, Phase) operates on MP2100B-011/012/014 and MP2100B-021/023.
### Jitter Analysis Software MX210001A

**Operating Conditions**
- Operates only when installed in MP2100B with correct license information
- The installer runs with V3.00.00 or later
- Other use conditions comply with MP2100B
- The WDP runs under MATLAB R2010b SP1

**Measurement Algorithm**
- Histogram mode, Pattern Search mode

**Histogram Mode**
- **Measurement Targets**: Channel A, Channel B, Channel A&B, Differential signals (MP2100B-021)
- **Measurement Items**: TJ (1.0E-12), TJ (user defined)*, RJ (d-d), DJ (d-d), J2 jitter, J9 jitter, Eye opening*
- **Measurement Graphs**: TJ Histogram CHA, TJ Histogram CHB, Bathtub CHA, Bathtub CHB

**Pattern Search Mode**
- **Pattern Length**: 2 to 32768
- **Measurement Targets**: Channel A, Channel B, Differential signal (MP2100B-021)
- **Measurement Items**: TJ (1.0E-12), TJ (user defined)*, RJ (d-d), RJ (rms), DJ (d-d), PJ (p-p), DDJ (p-p), DCD, ISI (p-p), Eye opening*, J2 jitter, J9 jitter, DDPWS, PJ Frequency
- **Measurement Graphs**: TJ Histogram, RJ/PJ Histogram, DDJ Histogram, Composite histogram, DDJ vs. Bit, Bathtub, PJ vs. Frequency

#### PDF Standard

<table>
<thead>
<tr>
<th>PDJ Standard</th>
<th>PDJ Filter</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM-0</td>
<td>HP0</td>
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<tr>
<td>STM-1</td>
<td>HP1</td>
</tr>
<tr>
<td>STM-4</td>
<td>HP1'</td>
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<tr>
<td>STM-16</td>
<td>HP2</td>
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<td>STM-64</td>
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<td>STM-256</td>
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<td>STM-0</td>
<td>LP</td>
</tr>
<tr>
<td>STM-1</td>
<td>LP'</td>
</tr>
</tbody>
</table>

**Operating Conditions**
- Operates only when installed in MP2100B with correct license information
- The installer runs with V3.00.00 or later
- Other use conditions comply with MP2100B

**Transmission Analysis Software MX210002A**

**Operating Conditions**
- Operates only when installed in MP2100B with correct license information
- The installer runs with V3.00.00 or later
- Other use conditions comply with MP2100B

**Measurement Mode**
- Transmission analysis, Waveform estimation

**Transmission Analysis**
- **Measurement Items**: Gain graph, Phase graph, Group delay graph (Phase graph and Group delay graph switching display)
- **Gain Graph**: Displays amplitude characteristics of transmission frequency characteristics
- **Frequency Range**: 0.0 Hz to 25 GHz, 0.025-GHz steps
- **Frequency Scale**: 0.5 GHz to 5.0 GHz/division, 0.1-GHz steps (max. frequency <25 GHz)
- **Frequency Offset**: 0.0 Hz to 20.0 GHz, 0.5-GHz steps (max. frequency <25 GHz)
- **Gain Scale**: 0.5 to 20.0 dB/division, 0.5-dB steps
- **Gain Offset**: -80.0 to +80.0 dB, 0.5-dB steps
- **Phase Graph**: Displays phase characteristics of transmission frequency characteristics
- **Phase Scale**: Degree: -180 to +180°
  Radian: -3.14 to +3.14
- **Group Delay Graph**: Displays group delay characteristic of transmission frequency characteristics. Group delay characteristic is set by relative delay.
- **Group Delay Scale**: 1 to 1000 ps/division, 1-ps steps
- **Group Delay Offset**: -500 to +500 ps/division, 1-ps steps
- **Phase Graph Unit**: Degree, Radian
- **Read Out Marker**: Read Out Marker function
- **Average**: Displays average result/measurement (1 to 99 times, 1-time steps)
- **Smoothing**: Calculates moving average of measurement value (Enable, Disable switching display)
- **Smoothing Factor**: 0.0 to 10.0%, 0.1% steps
- **Calibration**: Sets calibration information for basic transmission characteristics

**Waveform Estimation**
- **Equalizer Setting**: Selects reflector, non-reflector at calculation
- **Equalizer Type**: Analog, Digital
- **Emphasis Format**: 2Post/1Pre, 3Post, 1Post/1Pre, 2Post, 1Post
- **Emphasis Tap**: -10.0 to +10.0 dB, 0.1-dB steps
- **Device Character**: Reads S2P File
- **Jitter Analysis**: Displays estimated waveform calculation results at MX210001A (when MX210001A installed in MP2100B)

*: BER specified as TJ Measurement BER in setting items

*: Operates on MP2100B-021 or MP2100B-023
### Ordering Information

**Jitter Analysis Software MX210001A/Transmission Analysis Software MX210002A**

Please specify the model/order number, name and quantity when ordering.

The names listed in the chart below are Order Names. The actual name of the item may differ from the Order Name.

<table>
<thead>
<tr>
<th>Model/Order No</th>
<th>Name</th>
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<tbody>
<tr>
<td>MP2100B</td>
<td>Main frame</td>
</tr>
<tr>
<td>MP2100B-021</td>
<td>Dual Electrical Receiver</td>
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<tr>
<td>MP2100B-023</td>
<td>Optical/Single-ended Electrical Receiver</td>
</tr>
<tr>
<td>MX210001A</td>
<td>Jitter Analysis Software</td>
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<td>MX210002A</td>
<td>Transmission Analysis Software</td>
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<tr>
<td>W3569AE</td>
<td>MX210001A Operation Manual</td>
</tr>
<tr>
<td>W3571AE</td>
<td>MX210002A Operation Manual</td>
</tr>
</tbody>
</table>

Note: To compute the WDP, MATLAB R2010b by MathWorks purchase is required separately.

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**Specifications are subject to change without notice.**

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**Anritsu enVision: ensure**

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