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Measuring Optical Tx Characteristics on an Oscilloscope

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Introduction

Introduction

- This contribution walks through the steps required to measure some of the optical Tx characteristics as defined in IEEE 802.3dj draft 2.2.
- The waveforms used in this presentation are simulated signals meant to be as an example on setting up the measurements on a DCA sampling oscilloscope.
- All measurements shown in this presentation were performed using a FlexDCA beta FW (P08.30.73) that implements $TDECQ_{CER}$, JRMS and J4u03 as defined in IEEE 802.3dj draft 2.2.
- The use of the FlexDCA beta *P08.30.73* shall be restricted to further the development of measurement methodology within the IEEE 802.3 working group.

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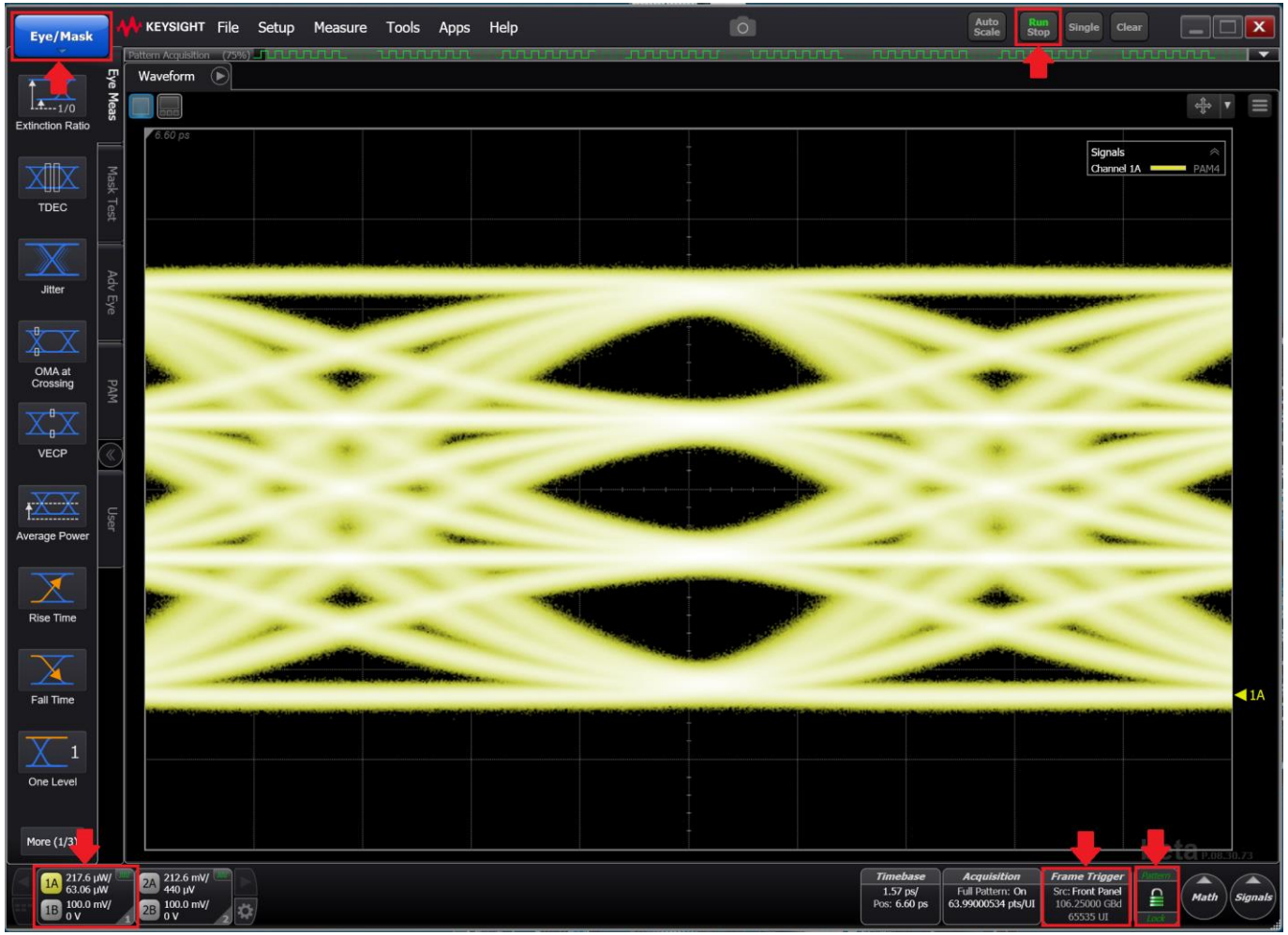
Acquiring Waveforms

Acquiring Waveforms

FlexDCA *beta P.08.30.73*

- Turn on the correct channel "1A"
- Go to "Eye/Mask" mode
- Click on "Run" to display waveform
- Enable "Pattern Lock"
- Verify the oscilloscope detects the correct baud rate and pattern length under "Frame Trigger"

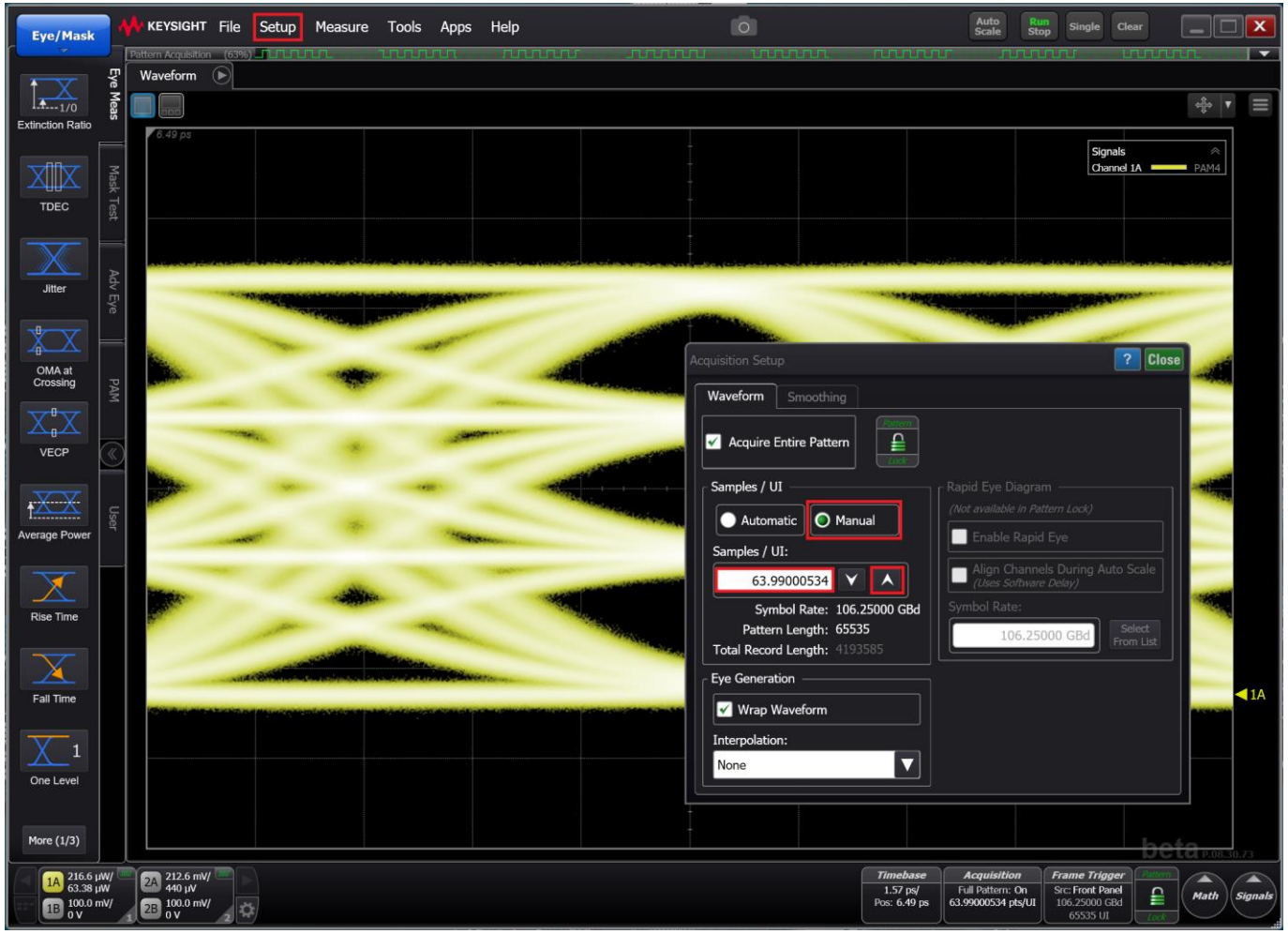


Acquiring Waveforms

FlexDCA *beta P.08.30.73*

- Change the number of samples/UI for acquisition
- Go to "**Setup > Acquisition Setup**"
- Select "**Manual**" samples / UI
- Use the up arrow "▲" to change the value to 63.99000534

P.S. The minimum required samples/UI for CER TDECQ is 32 to make sure we have at least one sample / level / histogram.



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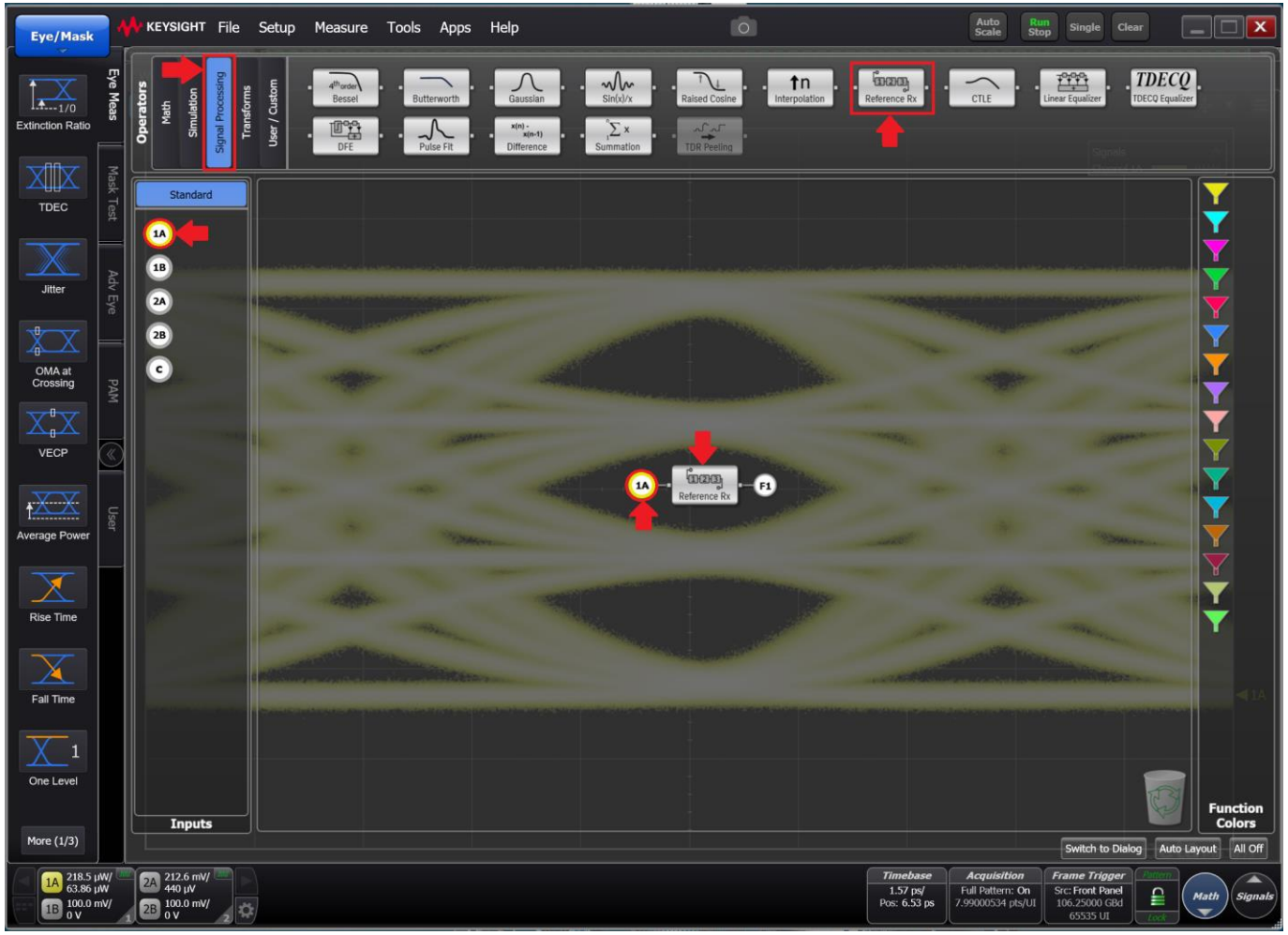
Setting-up “FFE + DFE” Reference Equalizer

Setting-up “FFE + DFE” Reference Equalizer

FlexDCA *beta P.08.30.73*

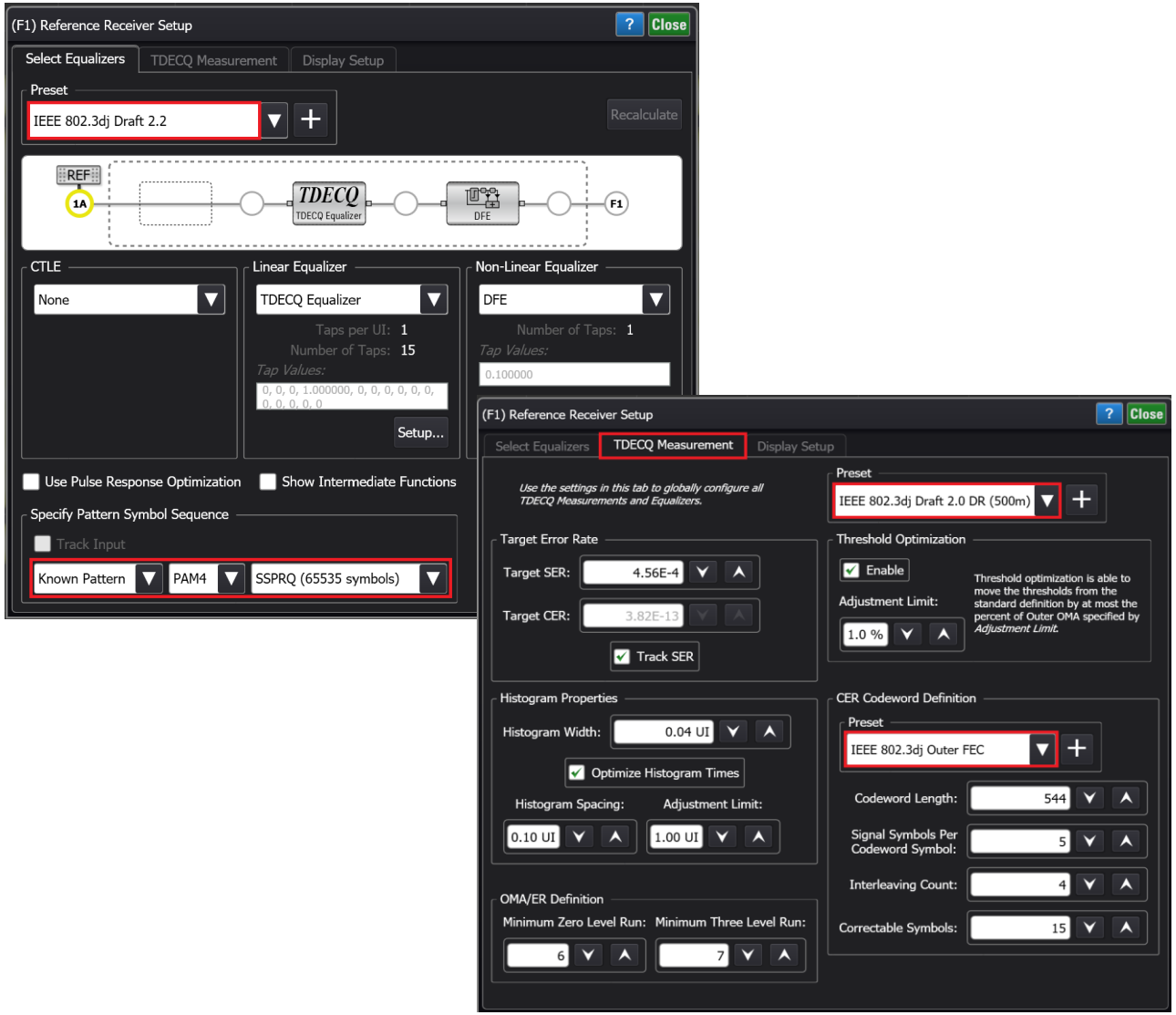
- Click on “Math”
- Go to “Signal Processing” mode
- Drag and drop “Reference Rx” operator
- Drag “1A” to the input of “Reference Rx”
- Click on “Reference Rx” Operator to open dialog box



Setting-up “FFE + DFE” Reference Equalizer

FlexDCA *beta P.08.30.73*

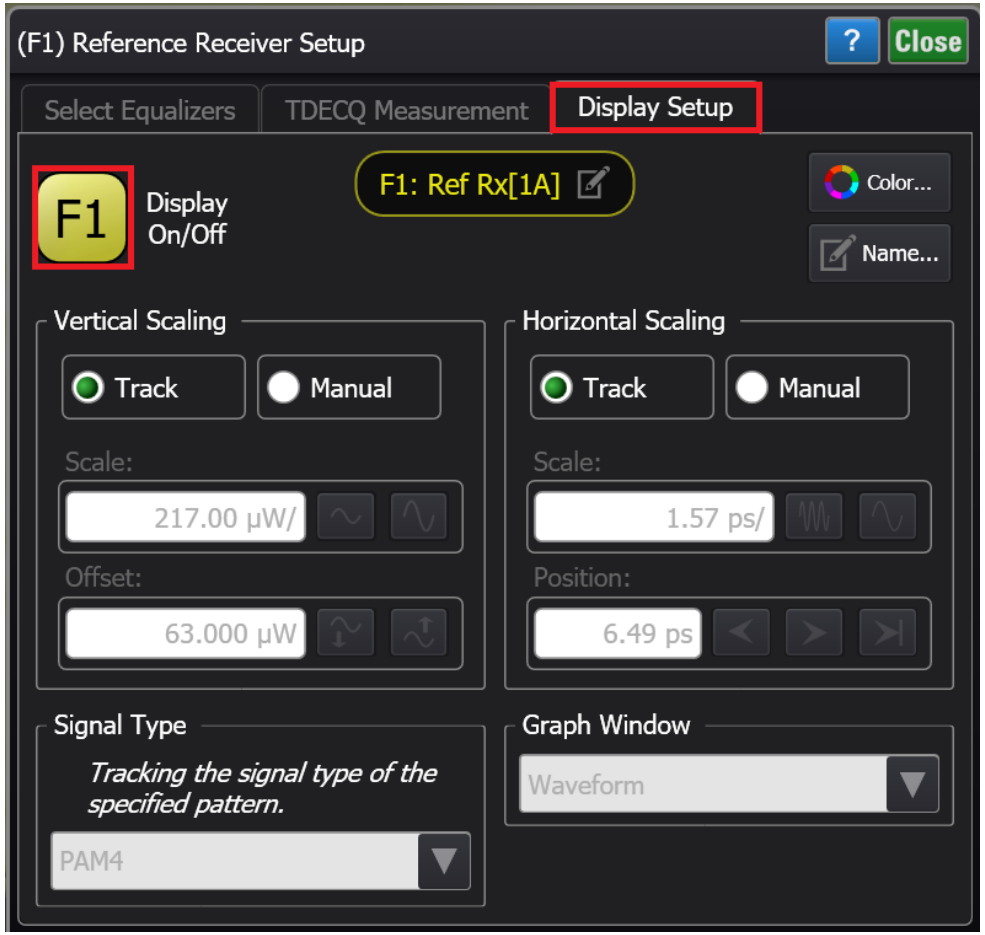
- Select “IEEE 802.3dj Draft 2.2” preset
- Change the “Pattern Symbol Sequence” to “Known Pattern” and select “PAM4” & “SSPRQ”
- Go to the “TDECQ Measurement” Tap
- Select the correct “Preset” for your PMD
  - example “IEEE 802.3dj Draft 2.0 DR (500m)”
- Select the correct “CER Codeword Definition”
  - example “IEEE 802.3dj Outer FEC”



Setting-up “FFE + DFE” Reference Equalizer

FlexDCA *beta P.08.30.73*

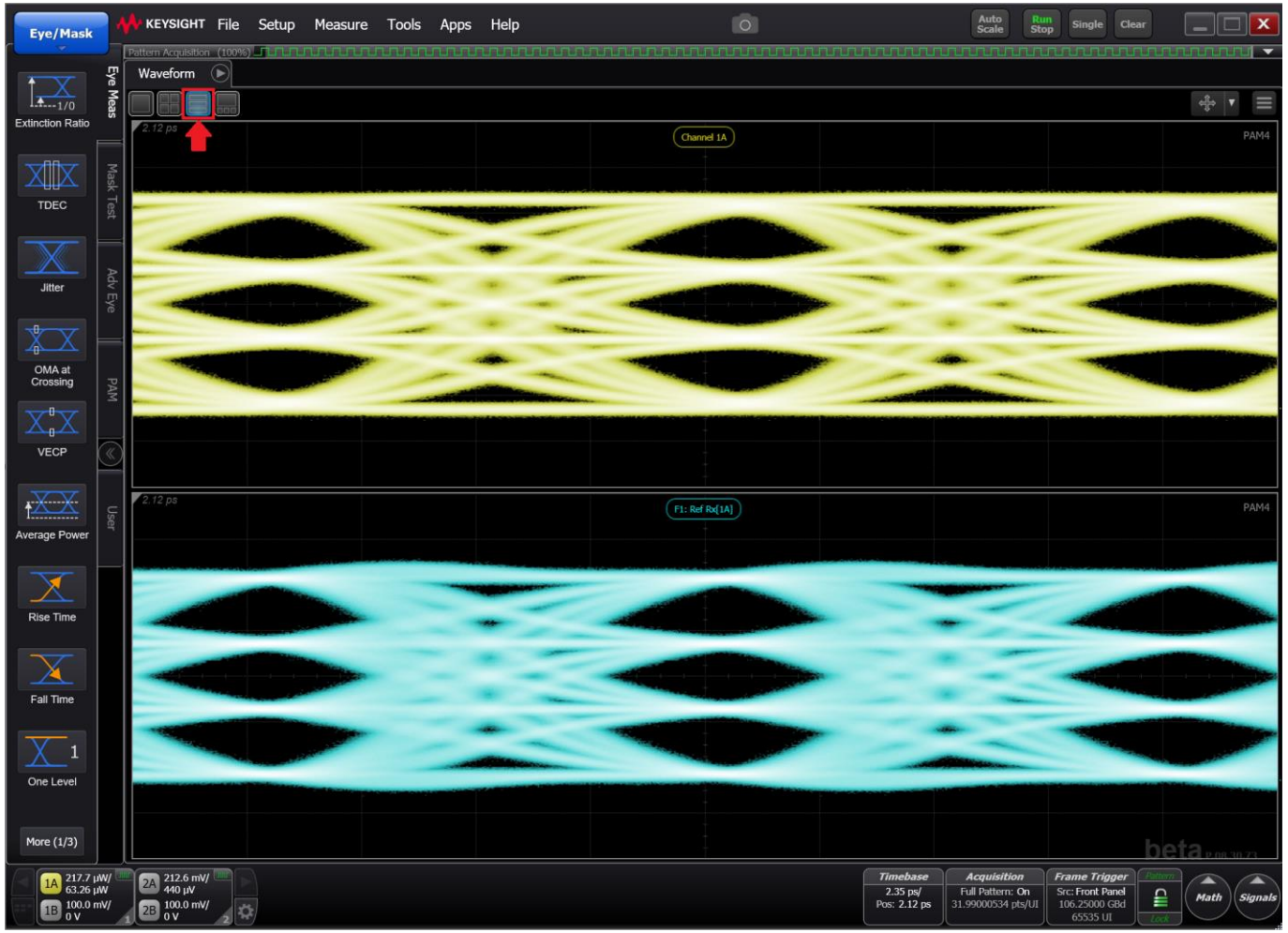
- Go to “Display Setup” tap
- Turn on display for “F1”
- Close the “Reference Receiver Setup” dialog box
- Minimize the “Math” panel



Setting-up “FFE + DFE” Reference Equalizer

FlexDCA *beta P.08.30.73*

- Switch to “Stacked Mode” to split the waveforms into separate grids
- The yellow waveform in this example is the raw waveform
- The bleu waveform in this example is the equalized waveform



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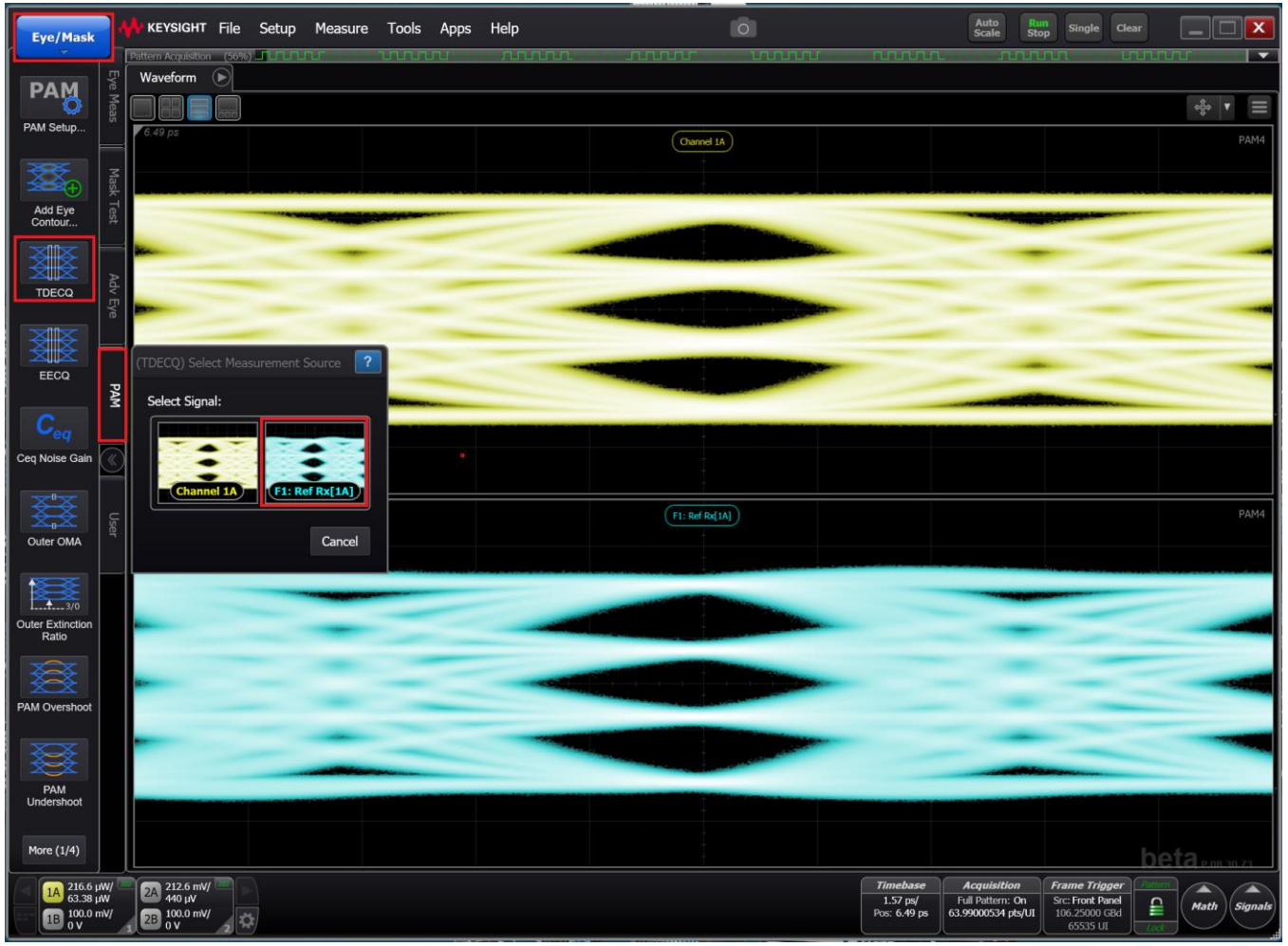
Measuring TDECQ on Equalized Waveform

Measuring TDECQ on Equalized Waveform

FlexDCA *beta P.08.30.73*

- In "**Eye/Mask**" Mode, go to "**PAM**" measurements
- Click on "**TDECQ**" and the select the equalized signal "**F1: Ref Rx [1A]**"
- The measured TDECQ will be reported in the measurement pane.



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Measuring $TDECQ_{CER}$ on Equalized Waveform

Measuring $TDECQ_{CER}$ on Equalized Waveform

FlexDCA *beta P.08.30.73*

- In "**Eye/Mask**" Mode, go to "**PAM**" measurements and click on "**More**"
- Click on "**CER TDECQ**" and the select the equalized signal "**F1: Ref Rx [1A]**"
- The measured CER TDECQ will be reported in the measurement pane.

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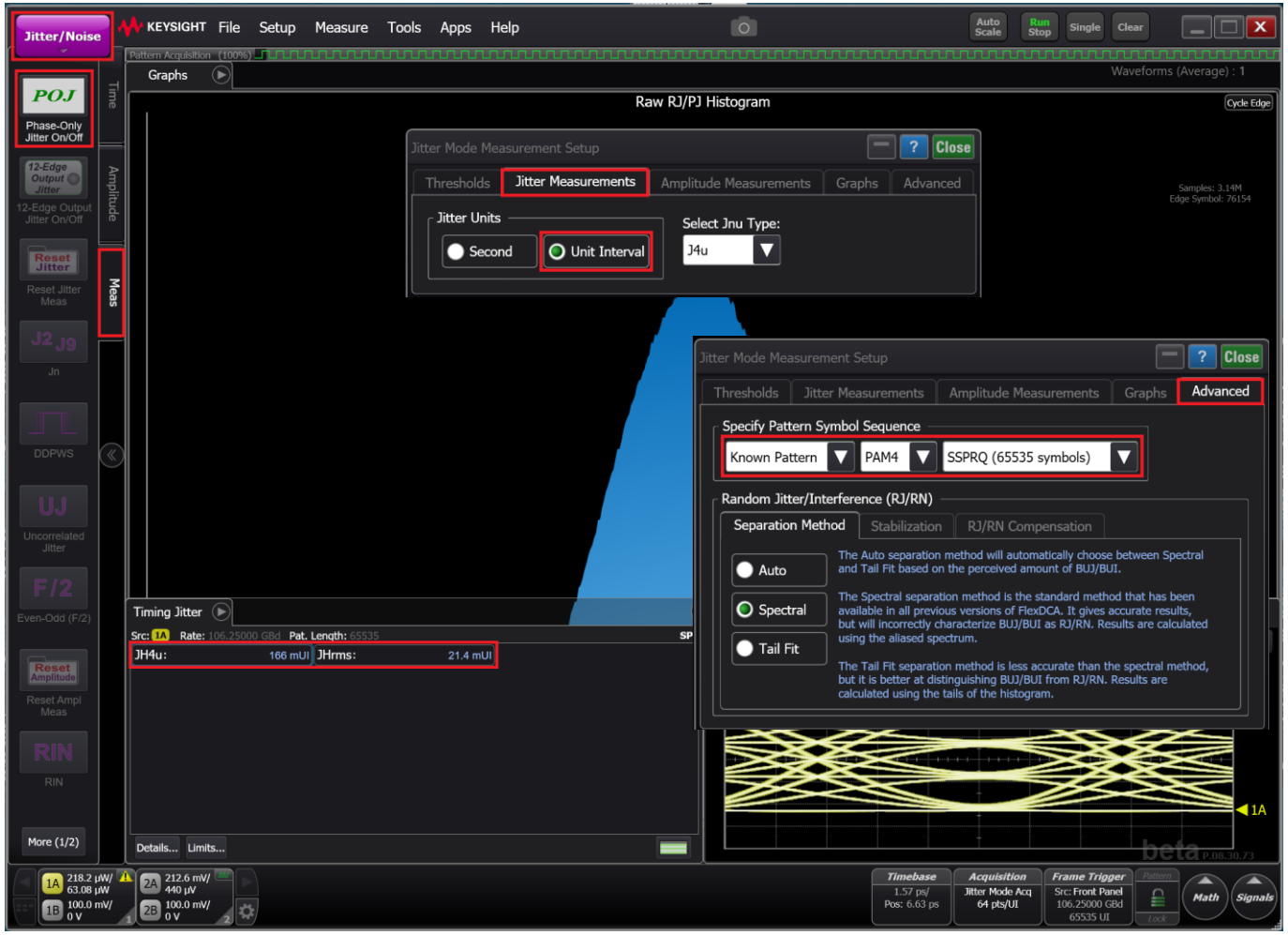
Measuring JRMS and J4u03

Measuring JRMS and J4u03

FlexDCA *beta P.08.30.73*

- Switch to "Jitter/Noise" Mode
- Go to the "Meas" tap
- Click on "POJ"
- Right click on "JH4u" or "JHrms"
- In the "Jitter Measurements" tap, change "Jitter units" to "Unit Interval"
- In the "Advanced" tap, change the pattern symbol sequence to "Known Pattern" and select the correct pattern.



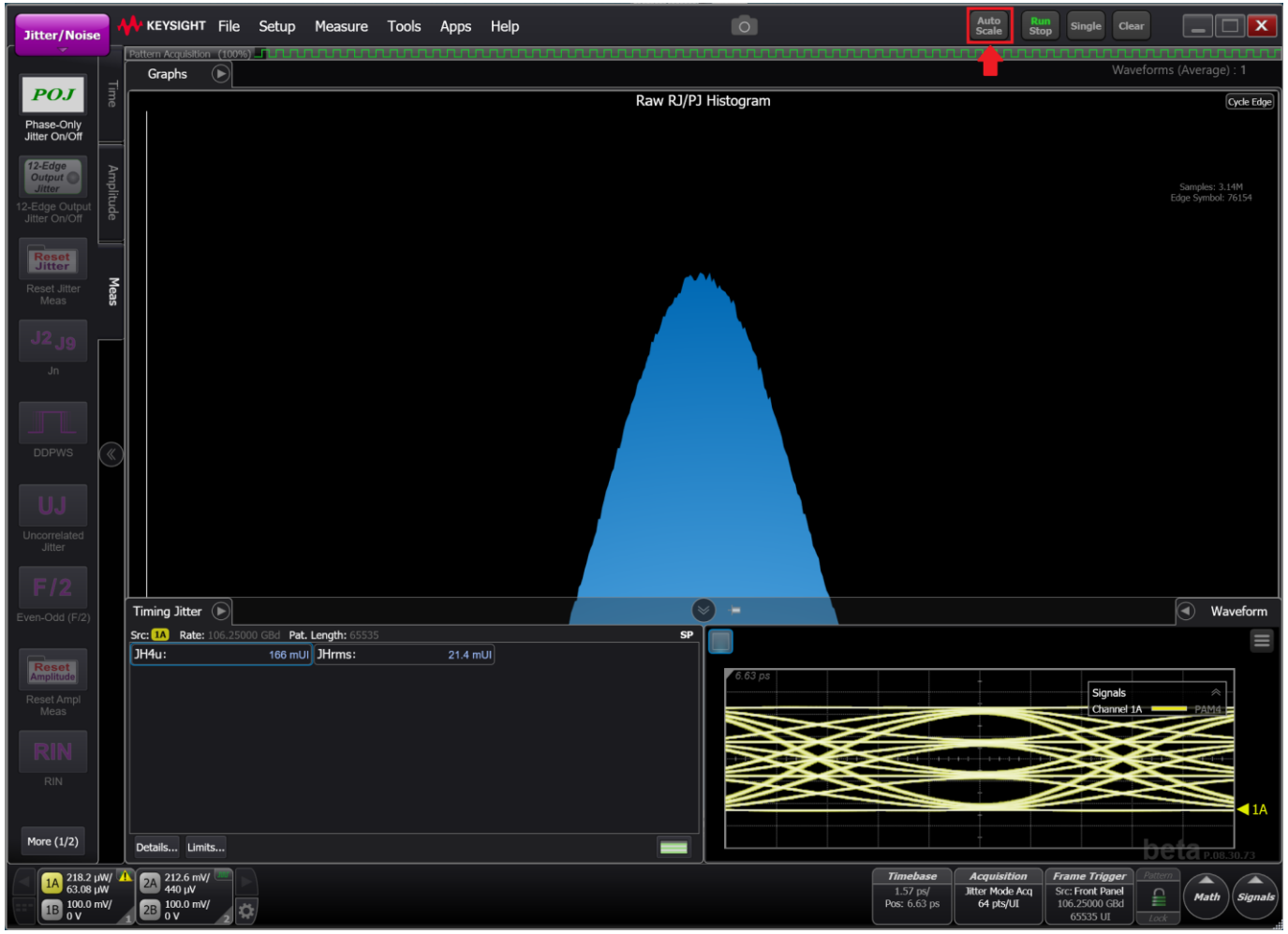
Measuring JRMS and J4u03

FlexDCA *beta P.08.30.73*

- Close "Jitte Mode Measurement Setup"
- "Autoscale" the signal
- "JH4u" and "JHrms" will be reported in the measurement pane.

POJ measurements is still work in progress and is not fully implemented in this FlexDCA beta FW.

This beta FW does not implement EOJ, and therefore, the reported JH4u and JHrms are considered optimistic.



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Thank you