

Using the SSPRQ pattern for the transit time measurement

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comment r03-44*



Draft 3.3 now includes a transmitter transition time measurement:

138.8.7 Transmitter transition time

The transmitter transition time of each lane shall be within the limits given in Table 138–8 if measured using the test pattern specified for transmitter transition time in Table 138–12.

Transmitter transition time is defined as the slower of the time interval of the transition from 20% of OMA_{outer} to 80% of OMA_{outer} , or from 80% of OMA_{outer} to 20% of OMA_{outer} , for the rising and falling edges respectively, as measured through an optical to electrical converter (O/E) and oscilloscope with a combined frequency response of a fourth-order Bessel-Thomson filter response with a bandwidth of approximately 13.28125 GHz. Compensation may be made for any deviation from an ideal fourth-order Bessel-Thomson response.

The 0% level and the 100% level are P_0 and P_3 as defined by the OMA_{outer} measurement procedure (see 138.8.4), with the exception that the square wave test pattern is used.

- Key points:
- Square wave test pattern
- Same scope channel response as used for TDECQ
- Edge defined at 20% and 80% amplitude thresholds with 0% and 100% amplitudes defined by the OMA_{outer} measurement (adapted to a square wave pattern)

SSPRQ (pattern 6) used for primary measurements expected for manufacturing compliance test

Table 138–12—Test-pattern definitions and related subclauses

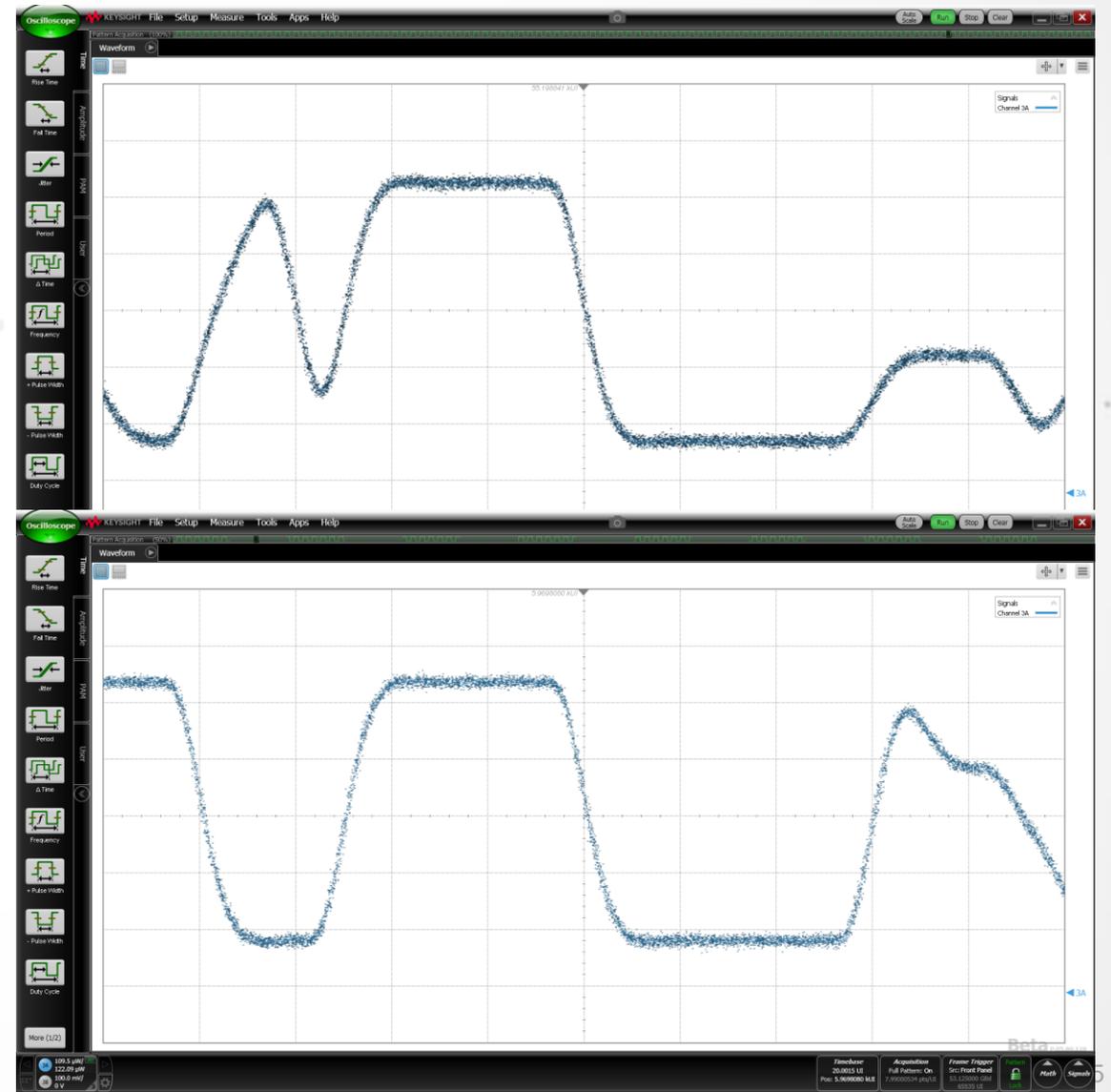
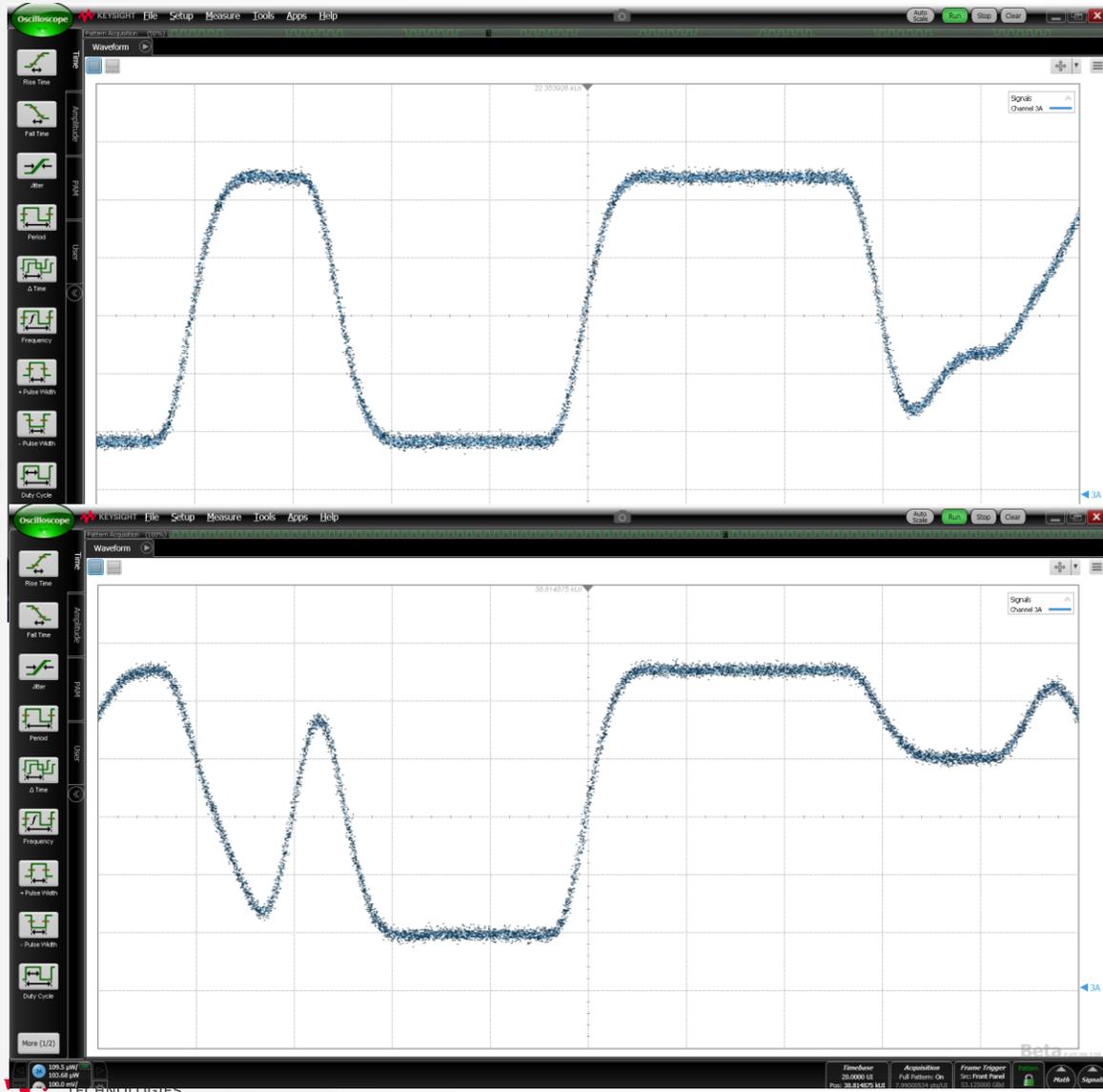
Parameter	Pattern	Related subclause
Wavelength, spectral width	3, 4, 5, 6, or valid 50GBASE-SR, 100GBASE-SR2, or 200GBASE-SR4 signal	138.8.2
Average optical power	3, 4, 5, 6, or valid 50GBASE-SR, 100GBASE-SR2, or 200GBASE-SR4 signal	138.8.3
Outer Optical Modulation Amplitude (OMA_{outer})	4 or 6	138.8.4
Transmitter and dispersion eye closure for PAM4 (TDECQ)	6	138.8.5
Extinction ratio	4 or 6	138.8.6
Transmitter transition time	Square wave	138.8.7
RIN_{12OMA}	Square wave	138.8.8
Stressed receiver sensitivity	3, 5, or valid 50GBASE-SR, 100GBASE-SR2, or 200GBASE-SR4 signal	138.8.10
Stressed eye closure (SEC), calibration	6	138.8.10

- Three primary measurements expected for manufacturing test are TDECQ, Extinction ratio, and OMA_{outer} , which can all be measured on the SSPRQ pattern (pattern 6)
- All three parameters are extracted from a single waveform acquisition
- Current definition of transition time will require switching to the square wave pattern and a second waveform acquisition

Assuming transition time will be tested in manufacturing, consider use of SSPRQ pattern for transition time test

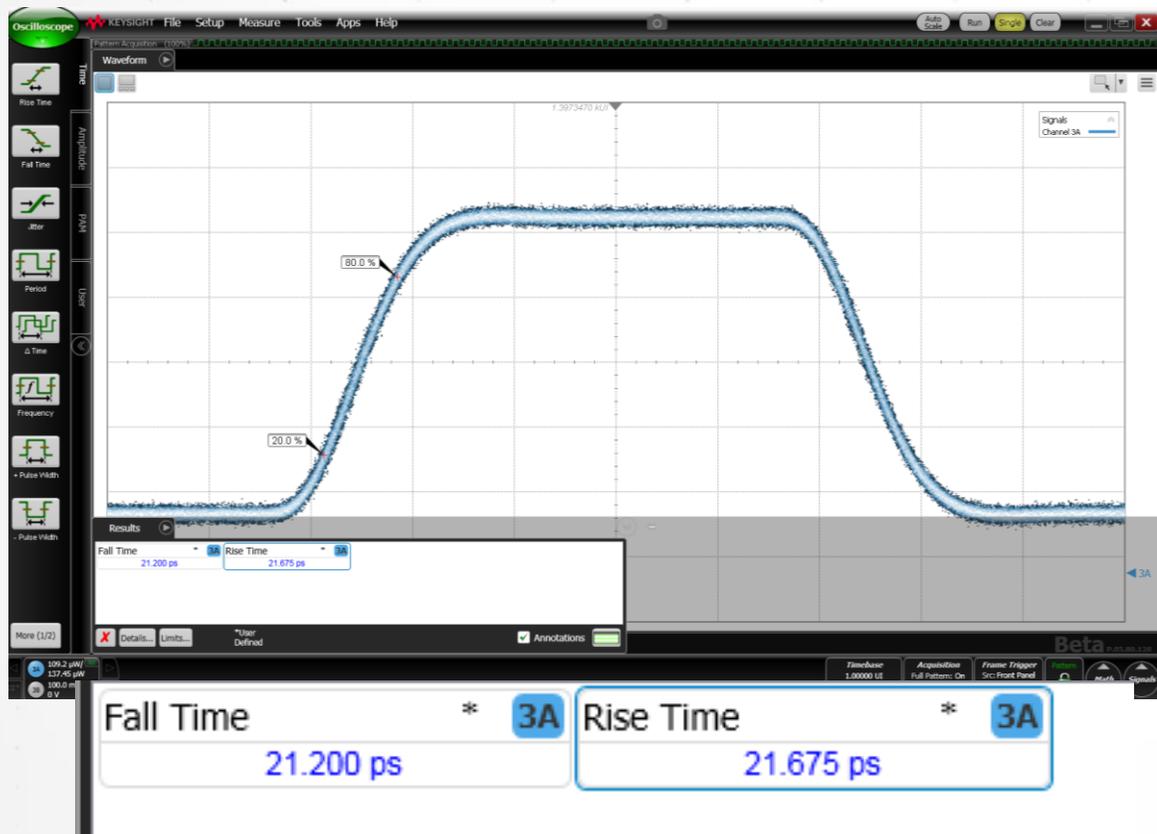
- The SSPRQ pattern has :
 - Two runs of 0000033333
 - Two runs of 3333300000
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- Both sequences yield a good 'edge'
 - 0000033333 could be used for a risetime measurement
 - 3333300000 could be used for a falltime measurement
 - This measurement is possibly more representative of actual transmitter transition time than the simple square wave pattern based measurement (defer judgement to the transceiver experts)

20 UI spans at 53.125 Gbaud, with 0000033333 and 3333300000 centered at transition time edge

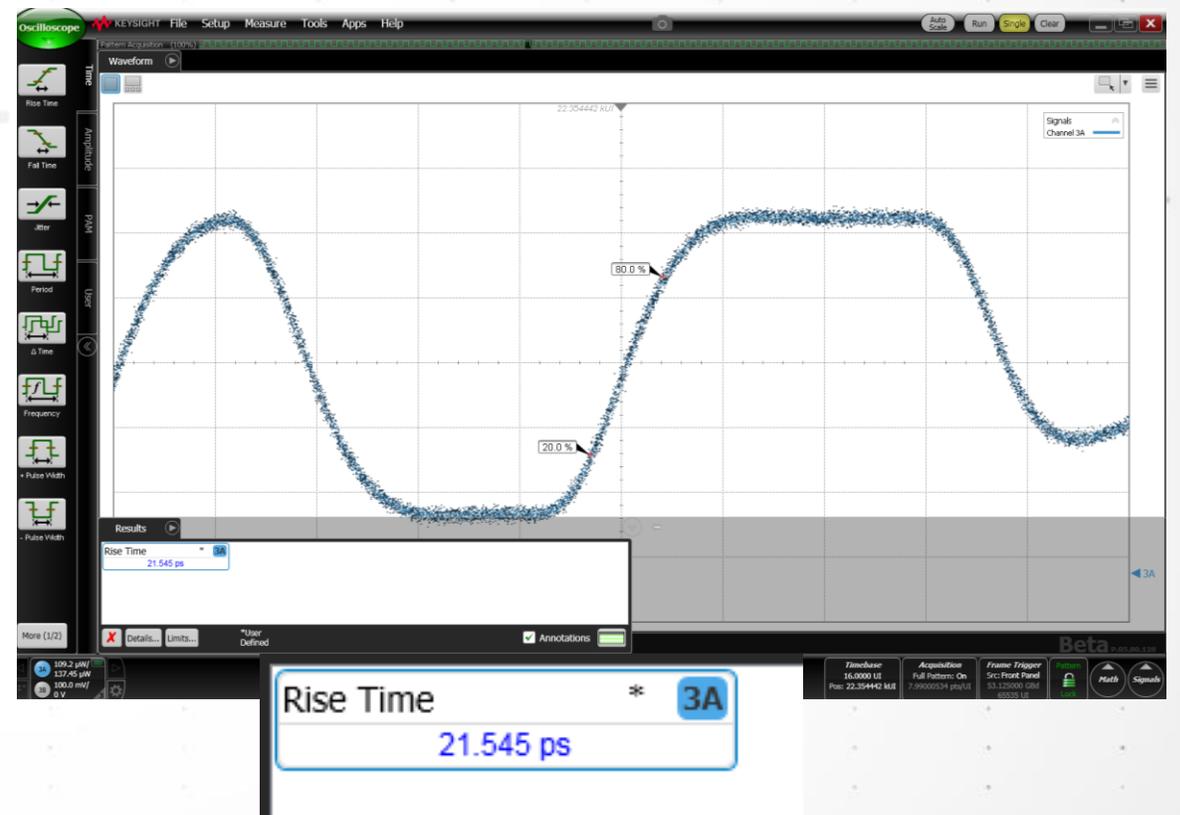


Comparing measurement setup for square wave and SSPRQ

- Transition time from the square wave

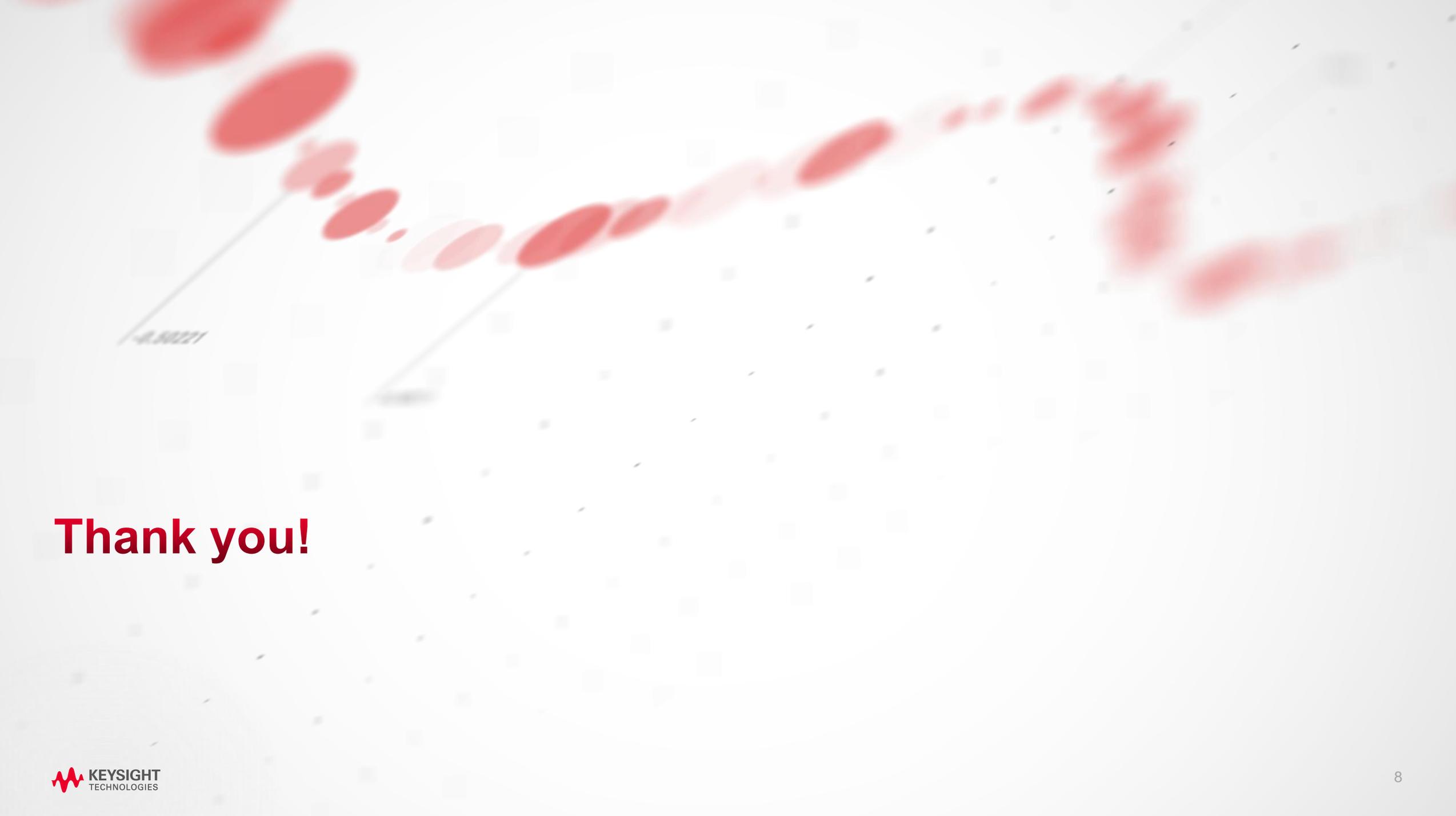


- Transition time from the 00000333333 sequence



Defining OMA and the 0% and 100% reference levels

- In comment r03-44, in addition to requesting that SSPRQ be a valid pattern for transition time, it was also proposed that the OMA values used to define the 0% and 100% values and subsequent 20% and 80% thresholds could be derived from the middle of the 00000 and 33333 runs
- Since the normative OMA_{outer} value is easily derived from the SSPRQ pattern (7 threes and 6 zeros, see 138.8.4 and 121.8.4) this would be a preferred method over using OMA values derived from the 00000 and 33333 sequences
 - Revise comment:
 - **Original comment:** Change 138.8.7 line 25 from “.....using the test pattern.....” to “.....using a test pattern.....” And line 36 from “.....square wave test pattern is used.” to “.....square wave test pattern is used. When the SSPRQ pattern is used, P0 is measured over the central 2UI of the run of 5 zeroes and P3 is measured over the central 2UI of the run of 5 threes in the 0000033333 or 3333300000 sequences.
 - **Revision:** Change 138.8.7 line 25 from “.....using the test pattern.....” to “.....using a test pattern.....” And line 36 from “.....square wave test pattern is used.” to “.....square wave test pattern is used. When the SSPRQ pattern is used, P0 and P3 are measured according to 121.8.4



Thank you!