Tektronix

Noise Measurements: more details re. ad-hoc on RINxOMA, others

802.3dj meeting in Montreal

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Agenda

- Noise measurements: measurement flat area selection
- [backup: Instrument noise compensation]

Motivation

- The measurement of noise on 100+ GBd waveform is needed in several places – SNDR, RINxOMA, etc.
- Using the RINxOMA example from ad-hoc's presentation
  "Noise measurement for RIN, re johnson_3dj_03a_2405" as an example, we show a practical noise measurement extraction
- This and other additional info are some of the information on what the instrumentation can do and what we can call "acceptable compensation" needs clarifying which this presentation will provide, see zivny_3dj_01a_2405 .

Noise measurement

- In the original example there is no significant slope in the ‘flat area’ – the noise measurement across 2UI with one histogram is not impacted by a zero slope

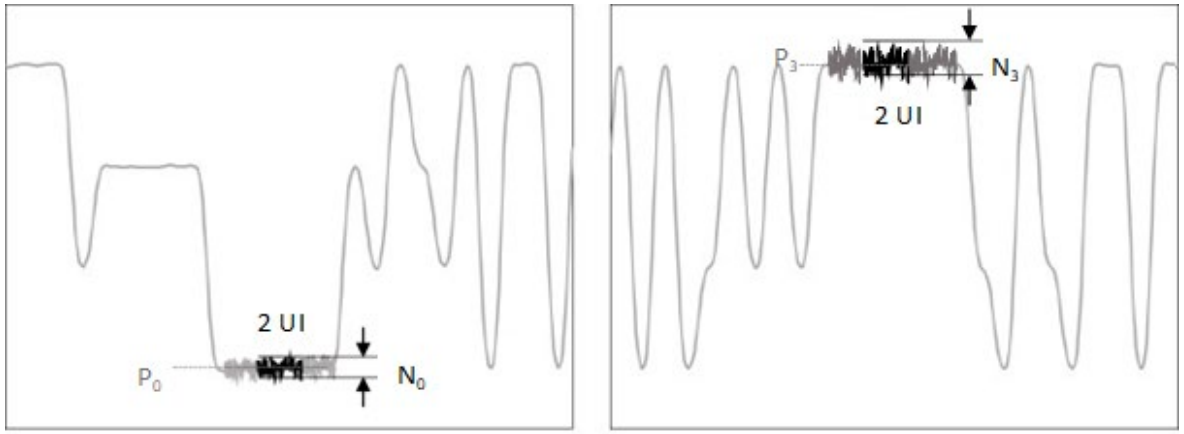


Figure 180—11—Example power levels Po and P3 from PRBS13Q test pattern

Noise measurement in presence of slope

- Compare the original (top right) to the picture on the right, where the signal exhibits slope over the flat areas: the sensitivity of the noise measurement to the slope of the ‘flat area’ is clearly visible; the measured ‘noise’ incorrectly appears higher

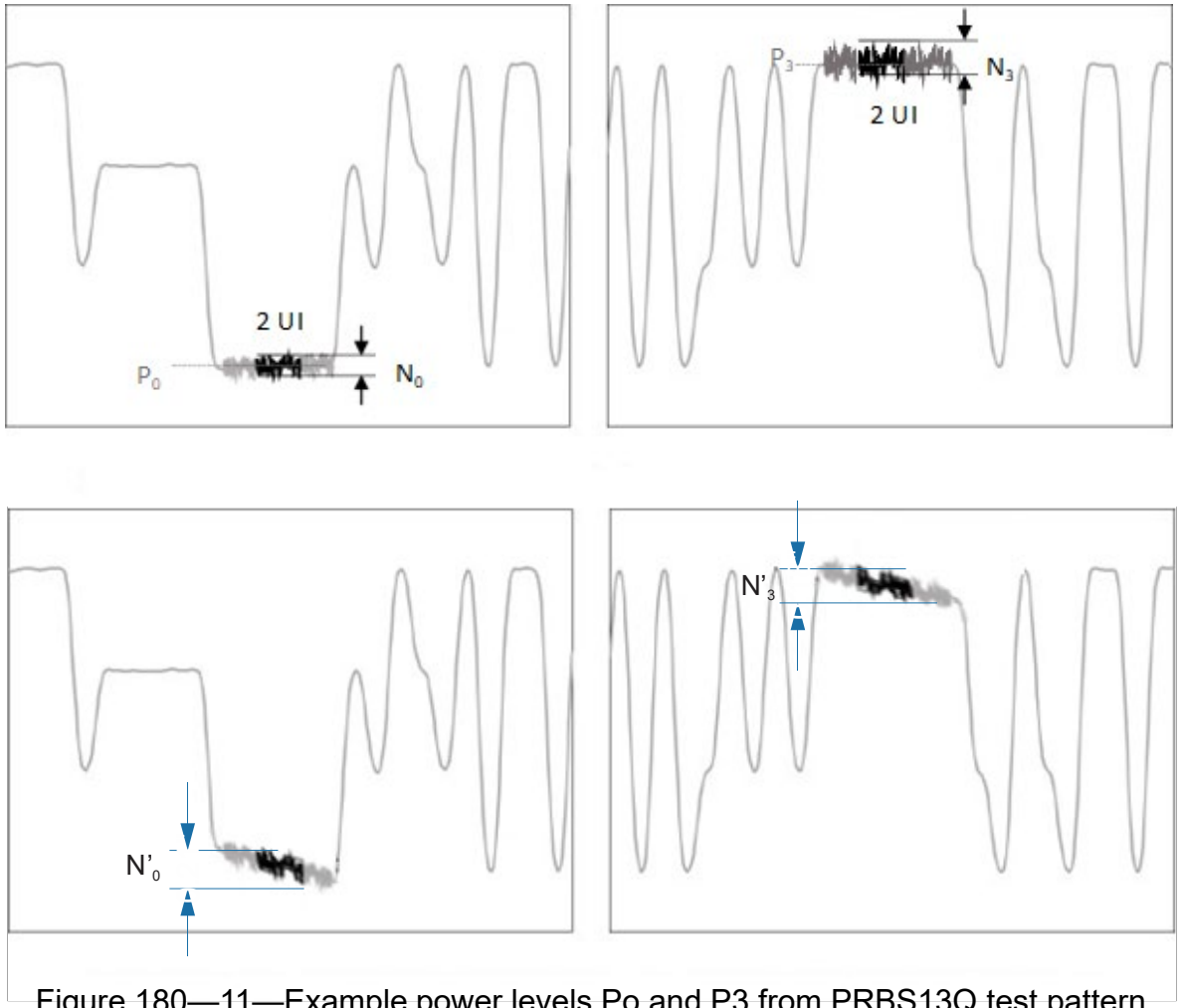
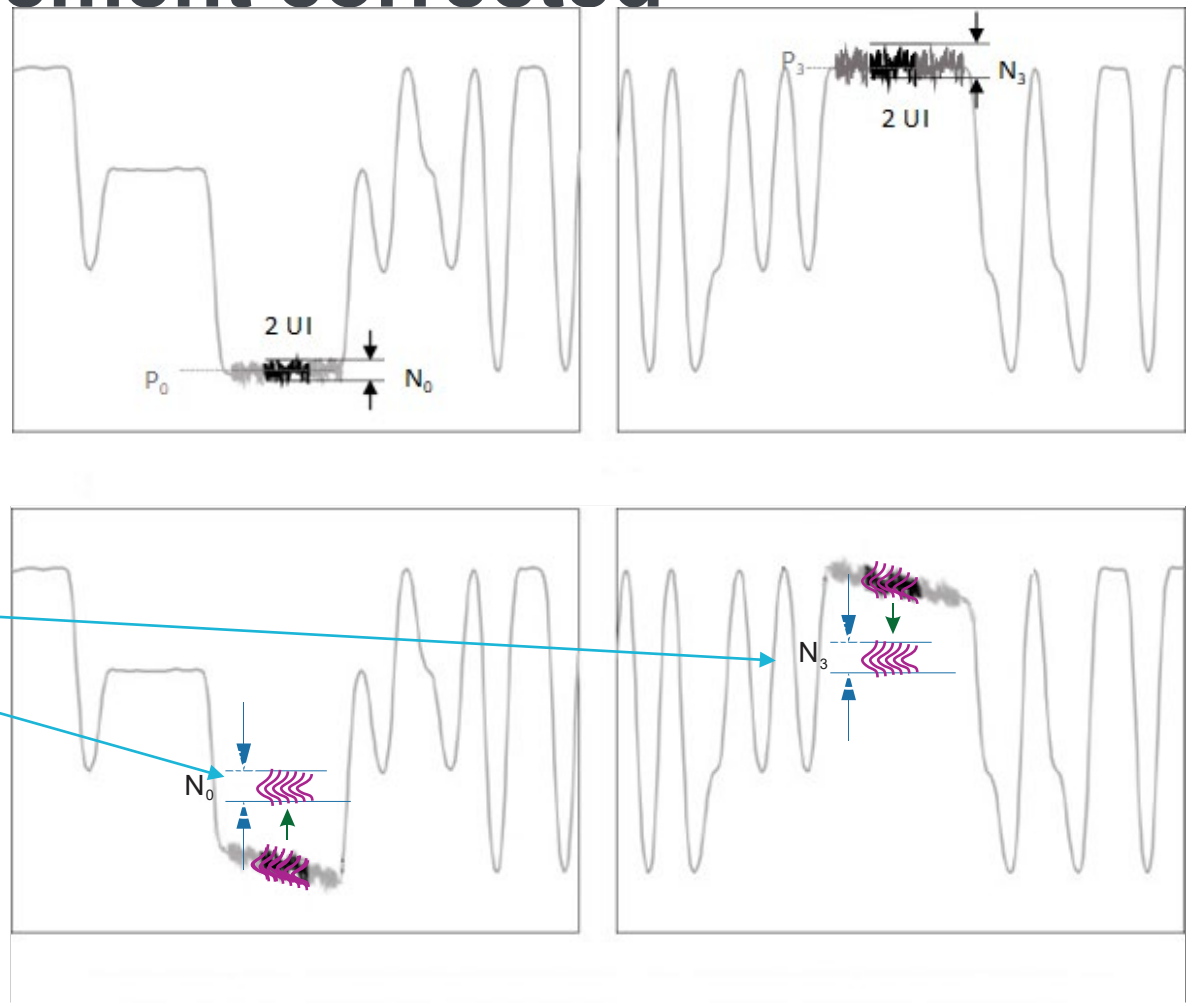


Figure 180—11—Example power levels Po and P3 from PRBS13Q test pattern

Example of the noise measurement corrected for the slope of the ‘flat area’

- Example of the corrected measurement:
  the distributions are collected in a sample-interval wide histograms;
- Then aligned by mean…
- … then measured (or measured separately, then combined; etc.)



Acquisition method comment

- The ‘aligned means’ of narrow distribution can be additionally beneficial to sampling oscilloscopes, which might acquire the distribution area separately
- Although sampling oscilloscopes can acquire 0 width columns, in order to avoid local distribution minima it’s desirable to acquire in several places or across a wider area

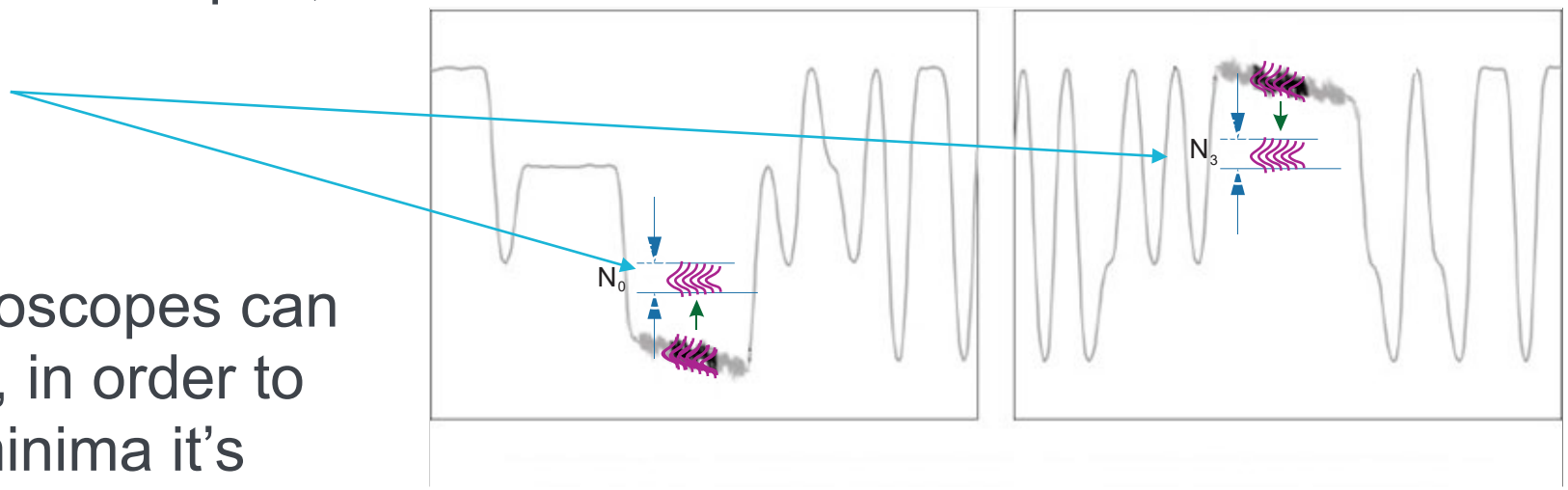


Figure 180—11—Example power levels Po and P3 from PRBS13Q test pattern

Conclusion

- Example is given of a simple method for removing the impact of slope from the measurement of noise with histogram/histograms.
- Methods might differ between oscilloscope types slightly

- Thank you

-end.

Oscilloscope random noise de-embedding

- The oscilloscope noise is included in the result
- If both noises are gaussian then the oscilloscope noise could be removed (from the sum-of-the-squares)
- Typically this is difficult as
  - The oscilloscope noise is somewhat position dependent, and
  - The noise on the signal is rarely gaussian
- This is for further study