Correlations of 802.3dj measurements - pathfinding plugfest results

for the 802.3dj meeting in Hamburg

Pavel Zivny [Tektronix]

2024/09/09 zivny_3dj_01_2409

Supporters, contributors

Contributors

- John Calvin, Ahmad El-Chayeb [Keysight Technologies]
- Evan Smith [Tektronix]
- Ali Ghiasi [Ghiasi Quantum]
- Tim Brackett [Wilder Technologies]

Supporters

- TBD

Motivation

- The 802.3dj measurements are a challenge to the implementors, to the T&M and to the 802.3dj task force. Some of us agreed to join a pathfinding plugfest verifying the common ground.
- This was organized by Pavel Zivny (EA co-chair for High Speed Networking, abetted by Sam Johnson of intel (co-chair, on paternity leave), and with help from Chris Lyon in the EA leadership in particular) as an EA plugfest.
- Here is my report on the findings.

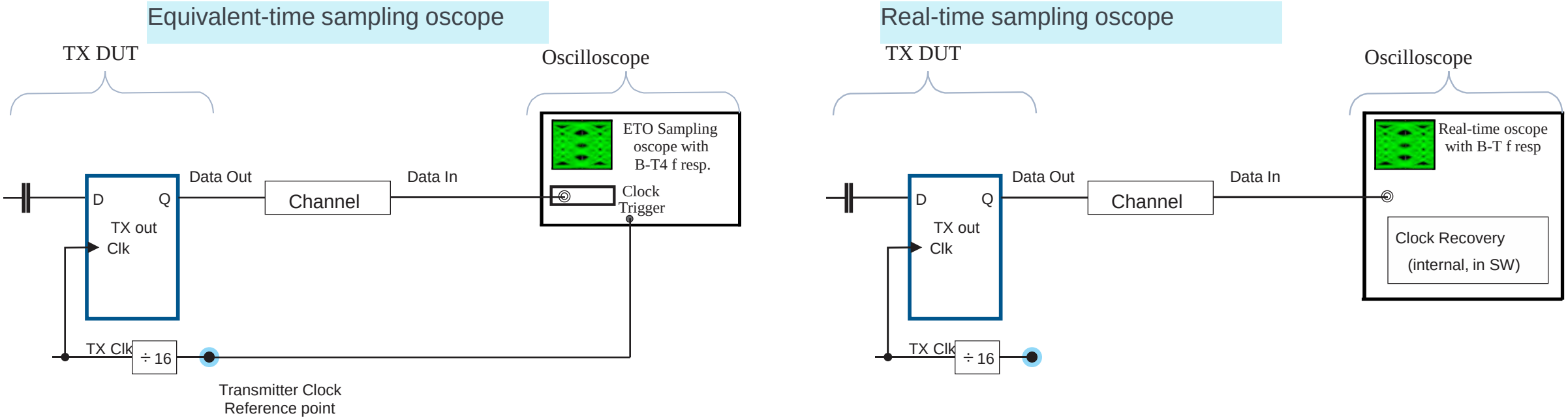
Participants

- Ali Ghiasi [Ghiasi Quantum]
  Tim Brackett [Wilder Technologies]
  John Calvin, Ahmad El-Chayeb, others [Keysight Technologies]
  Pavel Zivny, Evan Smith [Tektronix]
  and additional individuals and companies took part in some level or other.

  We encourage anyone interested in helping to get more data like this to reach out to us, e.g. to Pavel.Zivny@ieee.org or to any others among the contributors

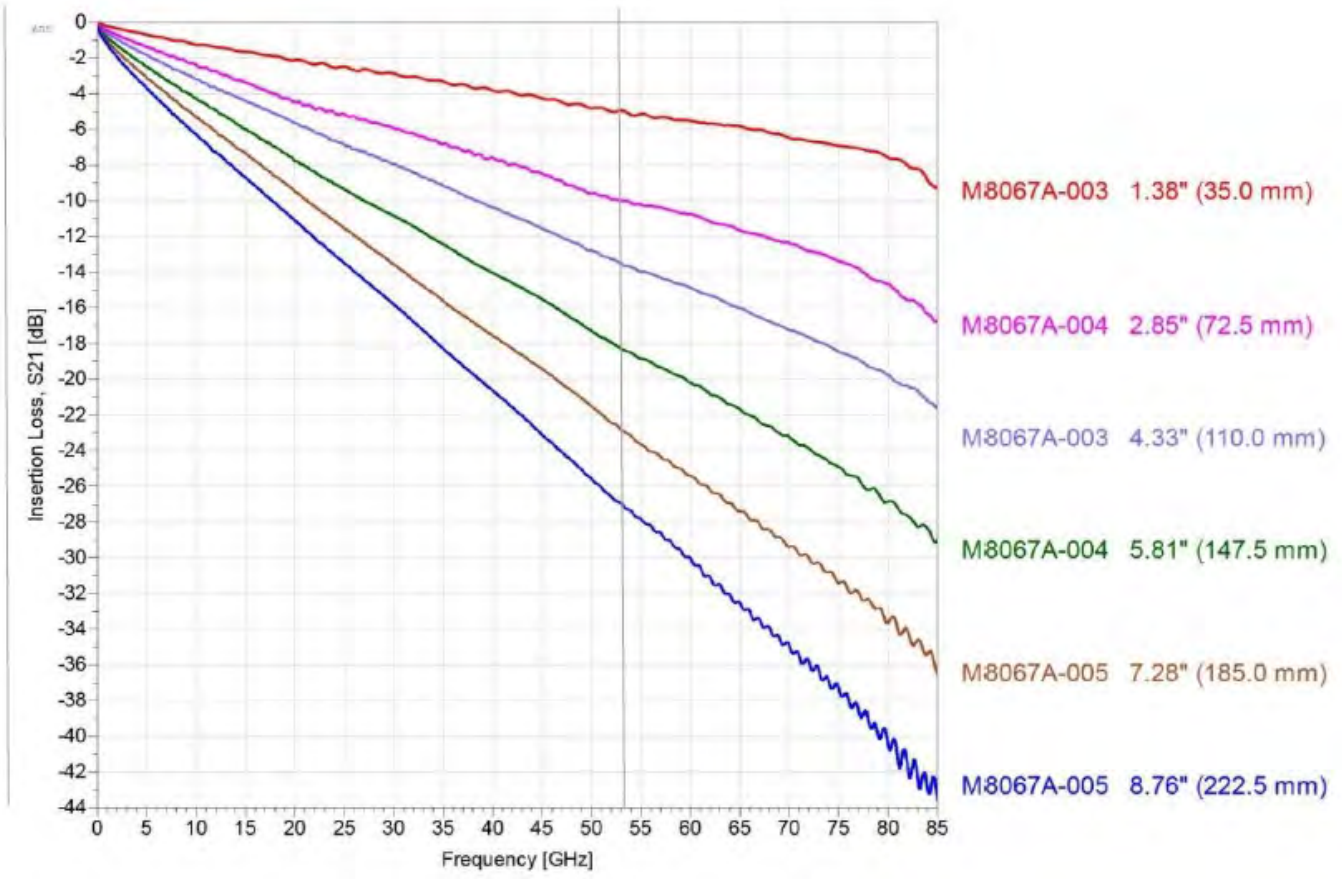
Experiment setup

- The signal source (BERT was connected to the oscilloscopes via ISI board with different length / loss traces. Reference used a direct connection.
- V-connectors; Bessel-Thomson set to 60 GHz; no crosstalk; no intentional impairments beyond the visible Channel; instruments set to best known setup; sampling trigger is a direct clock (no CRU).



Channel - detail

- An ISI board was used as the channel
- “no board” →”0 dB”; plus the purple “10 dB”
  green “20 dB”
  blue “30 dB”
- There is a small amount of interconnect cable loss involved that is not shown; ca. 3 dB



The correlation of selected measurements $J3U_{03}$, SNDR in particular. No Eye opening methodology.

loss: ~	0	dB		
measurements	oscope1	oscope2	oscope3	oscope4 rms only
Jrms	✓	✓	✓	✓
J3u				
J3u03	✓	✓	✓	
EOJ	✓	✓	✓	
SNDR	✓	✓	✓	
Pmax	✓	✓	✓	
Vf	✓	✓	✓	

loss: ~	10	dB		
measurements	oscope1	oscope2	oscope3	oscope4 rms only
Jrms	✓	✓	✓	✓
J3u				
J3u03	✓	✓	✓	
EOJ	✓	✓	✓	
SNDR	✓	✓	✓	
Pmax	✓	✓	✓	
Vf	✓	✓	✓	

loss: ~	20	dB		
measurements	oscope1	oscope2	oscope3	oscope4 rms only
Jrms	✓	✓	✓	✓
J3u			·	
J3u03	✓	✓		
EOJ	✓	✓	·	
SNDR	✓	✓	·	
Pmax	✓	✓	·	
Vf	✓	✓	·	

loss: ~	32	dB		
measurements	oscope1	oscope2	oscope3	oscope4 rms only
Jrms	✓	✓	·	·
J3u			·	
J3u03	✓	✓		
EOJ	✓	✓	·	
SNDR	✓	✓	·	
Pmax	✓	✓	·	
Vf	✓	✓	·	

The blue arrow mark progress made in the measurements over last few months.

Check-marks signify good correlation

The dots mark measurements currently under development for improvements in the near future

Direction of further development

- Currently the jitter measurements and the SNDR measurements are progressing and we moved from a situation where different measurement solutions had disparate measurement results,
  to now improved situation where we have:
  - Good correlation at low loss and at 10 dB channel on $jitter_{03}$, SNDR, EOJ across 3 oscilloscopes from two vendors
  - 20 dB and higher channel loss introduces loss or results on at least one measurement solution and poor results on jitter across minor transition (e.g. 01, 10) and even on some on 2-level transition

Conclusion

- The basic SNDR and Jitter measurements are improving in correlation over the last few months
- There is a good hope that we will see correlations of multiple source measurement tools for basic jitter and SNDR measuremens
- Eye opening metrology and jitter on minor transitions do not yield for higher loss channels so far.
- The results are limited in number of DUT sources and other details; ➔all 802.3dj members, please consider contributing your DUTs into future activities to enhance the data set (confidentially is fine). Contact me for more info, thank you, Pavel

Further events

- As the 802.3dj measurements are developing we encourage everyone to get in touch about getting more data so the DUTs results can help guide the 802.3dj work.
- All information will be fully confidential except as what you agree to be released; and you can pull out all of your info any time.

Pavel.Zivny@ieee.org