Progressing TWDP Follow-on from London

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Goals for 6/23 call

- This work requires a very focused group of volunteers…
- Agree on list of required decisions
- Agree on work required for completion
- Brainstorm options, questions, tasks
  - Is there any consensus?
- Assignments
  - … to report back with findings and recommendations

Progressing TWDP - decisions required

1. Finite EQ length
   - One length or multiple?
   - Length value(s)?
2. SNR-based link closure metric
   - Should it be based on scaled/normalized power?
     - If so, to what?
     - If so, should it be automated?
   - Can SNR or distortion/penalty be traded with power?
3. Separate equalizability metric?
   - Do we need one? Can it predict implementation penalty or a cliff?
   - What should it be?
4. Data sequence
   - Sequence for “system” test?

TWDP brainstorming & work required

- For each decision required:
  - Brainstorm options
  - Identify questions
  - Identify specific steps (what work, who, by when, etc.) to answer questions and make choices
    - Analysis, measurements & presentations
    - ….debate, opinions…
    - Test/validate

- Completion
  - Determine specific limits for the standard
  - Determine impact to mask, etc.
  - Write detailed resolutions/changes to code, text, figures, etc.

- Status and options -

ClariPhy recommendations or preferences shown in blue

EQ length

- Currently very long (infinite), but straw poll in London recommended use of finite length
- Options
  - Finite 14,6 (same as Ewen max)
  - Others…
- Questions
  - How well can use of finite length help predict implementation penalties for other non-ideal receiver characteristics?
  - Does performance at one length correlate with other lengths?
- Tasks…

SNR-based metric (link closure)

- Currently
  - Fixed min power limit (OMA_min), and
  - Max TWDP; OMA is scaled to OMA_min
- Options
  - Unscaled SNR (+ min power), or
  - Max TWDP + min power
  - Also
    - Min power fixed *or* function of SNR or TWDP
    - Power and TWDP based on OMA *or* OMSD
- Questions
  - Would use of SNR have to scale signal-borne noise?
  - If needed, can accurate power measurement be automated?
- Tasks…

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"Equalizability"

- Currently using only TWDP
- Options
  - Use finite length equalizer
    - Separate metric beyond link closure not required
  - Gamma
    - Scaled power? If so, to what?
  - Difference/rate of penalties vs. EQ length
  - Introduce threshold and/or timing offset(s)
  - Others?
- Questions
  - How well do these predict implementation penalty or a cliff?
- Tasks…

Data sequence for system test

- Currently using AnAi subpattern
- Options
  - Alternative subpatterns from AnAi or BnBi
- Questions
  - Does AnAi subpattern produce similar performance metrics as prbs9?
- Tasks…

Annex

Background

Issues with Reference Equalizer of Infinite Length

- Infinite length equalizer can be overly optimistic
  - Not practical or realizable
  - No problem with precursor channels
  - No problem with *very* long impulse response in channel
    - For example, an electrical reflection resulting in echo many bit periods after current bit
  - No problem equalizing nonlinear functions of pseudo-random sequences
    - These appear as delayed scaled versions of the original waveform
- While the infinite length equalizer can equalize these impairments, a reasonable finite length equalizer can have problems
  - This can be manifested as large implementation penalty

SNR, TWDP and OMA

- In addition to SNR-loss, many believe TWDP (and PIE-D) measure how difficult a signal is to equalize for practical DFEs
  - But is this true?
- In aronson_1_0105, pre-emphasis significantly reduced TWDP scores
  - Further analysis shows that decrease is caused in part by increased transmitted signal energy relative to normalized OMA (negative TFL in Swenson_05_05)
    - Given the same peak-peak power, a waveform with lower penalty can result in a lower slicer SNR
  - Decrease may also reflect reduction in ISI at equalizer input
    - Reduction of gamma in Swenson_05_05.pdf
- High OMA signal should perform better, but TWDP does not reflect that due to OMA normalization
- Since waveform is normalized to reference OMA, accurate measurement of OMA is required
  - "Challenged" by presence of normal distortions