IEEE802.3aq Channel model ad-hoc

TP3 - ISI Generator Block for Stressed Sensitivity Test

Petre Popescu - Quake Technologies

popescu@quaketech.com

www.quaketech.com

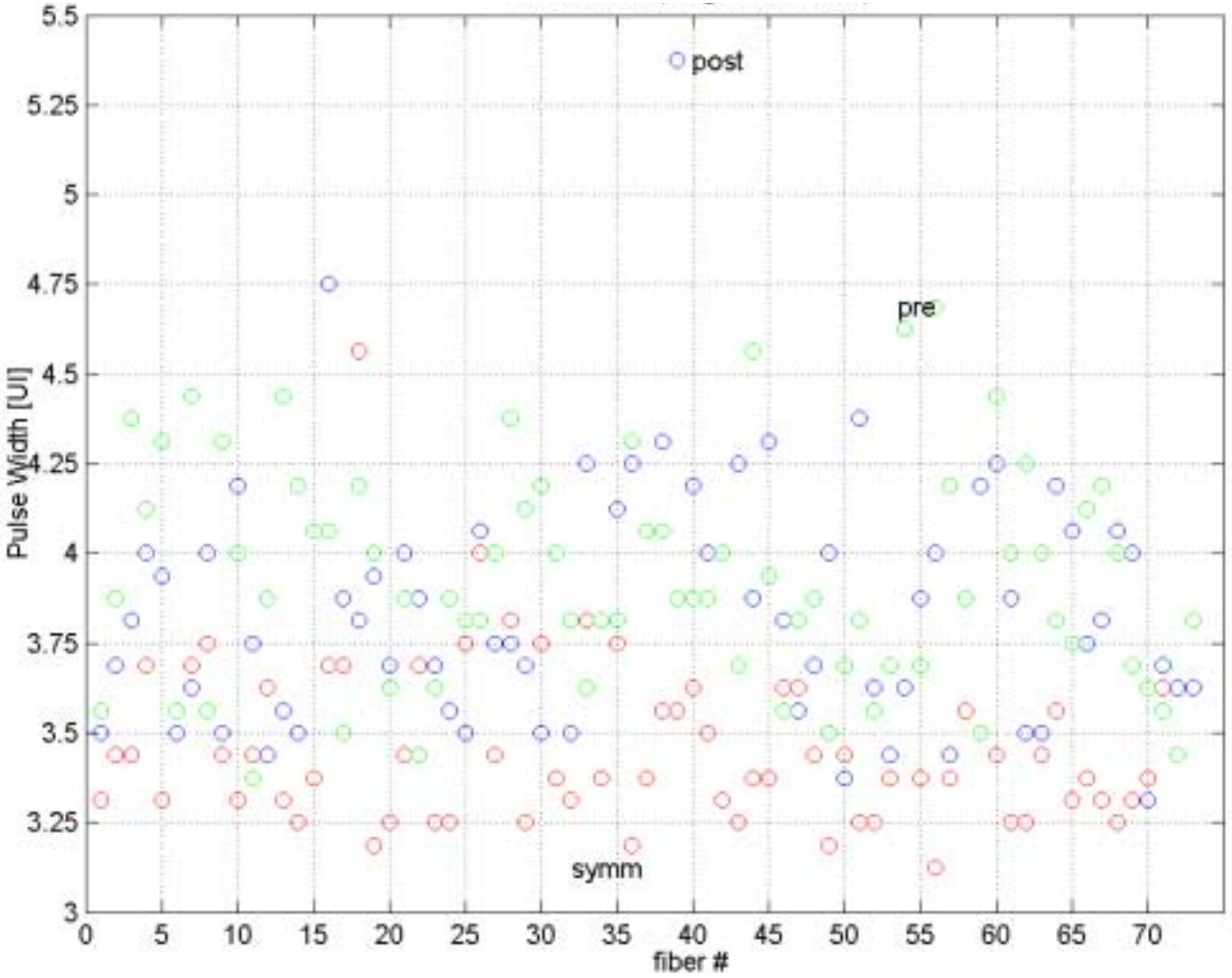
Contributors

- Sudeep Bhoja, Big Bear Networks

- Lew Aronson, Finisar

1. Selected Impulse Response Review

The pulse width was calculated for impulse response relative magnitude >=0.1 for the three types, pre-cursor, quasi-symmetrical, and post cursor.



The minimum time spacing (better resolution) for four tap ISI generator is Δt=0.7UI (pulse_width~3*Δt+2, the pulse_width of the two filters impulse response is ~2UI).

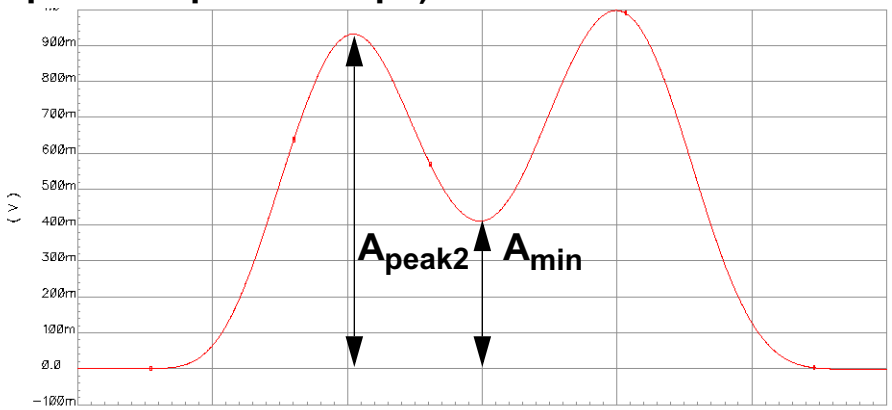
2. ISI Generator Block for Stressed Sensitivity Test

Evaluation methodology

- use four fixed delay taps for ISI generator block.
- select a number of impulse responses with best fit from each of the three categories (post-cursor, quasi-symmetrical, pre-cursor, see presentation bhoja_1_0105.pdf).
- I will define an impulse response as split-pulse, if the relative magnitude of the second peak is minimum 0.7 and the minimum value is lower than the second peak by minimum 0.3 (number chosen based on impulse response shape).

$A_{peak2} - A_{mim} > 0.3$

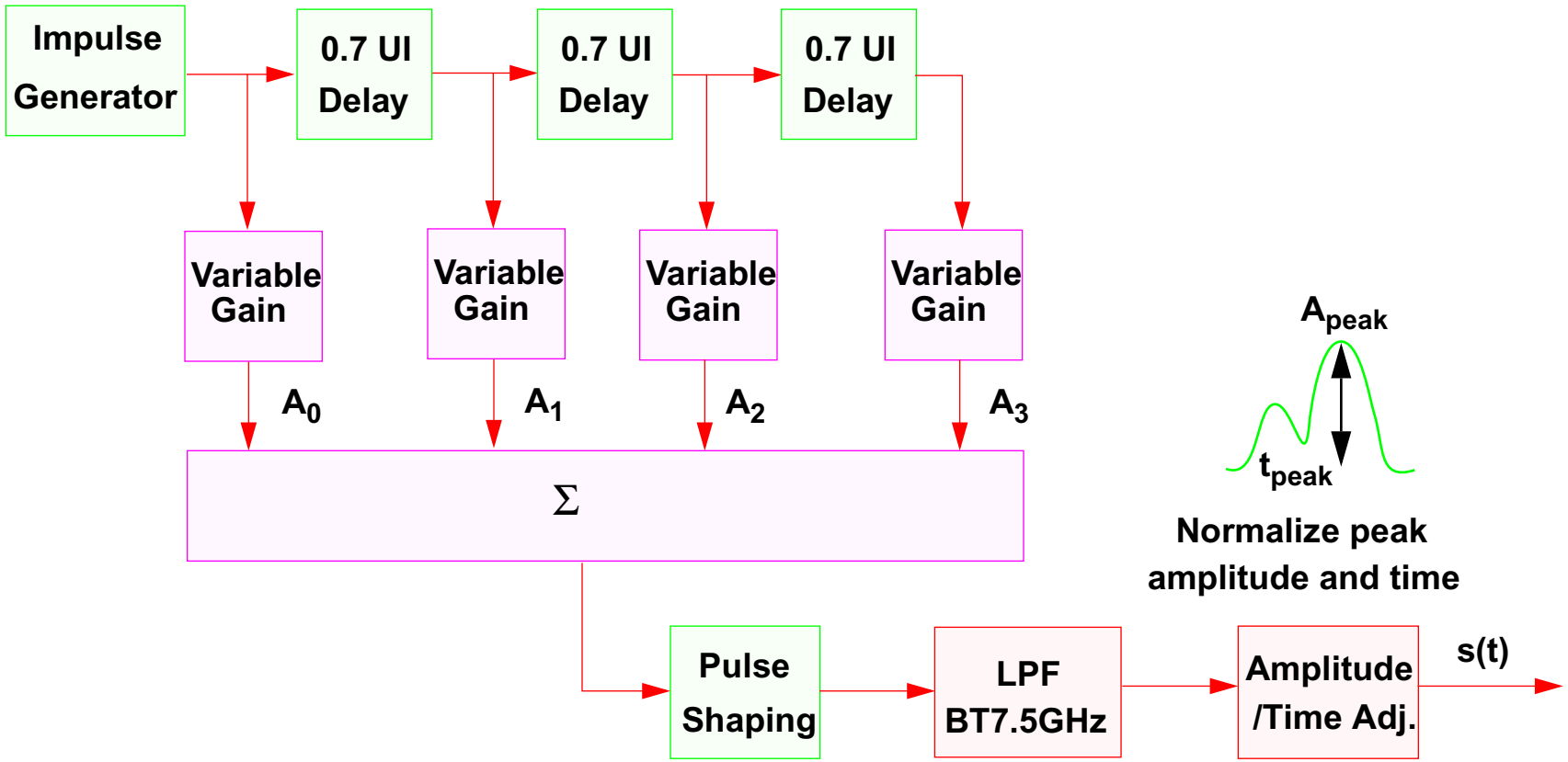
$A_{peak2} >= 0.7$



- use a Gaussian low-pass filter (47ps rise and fall times) for pulse shaping and a fourth order BT7.5GHz low-pass filter for receiver bandwidth.
- optimize the amplitude of the four pulses (A_0, A_1, A_2, and A_3) for minimum square error (MSE), with reasonable resolution (2 or 3 digits).
- the optimization will be based on minimizing the peak error (errpk) and the relative error signal area (PSR, fore more details see popescu_1_0904).
- for a given set of amplitudes, calculate the effective PSR and PIE_D.

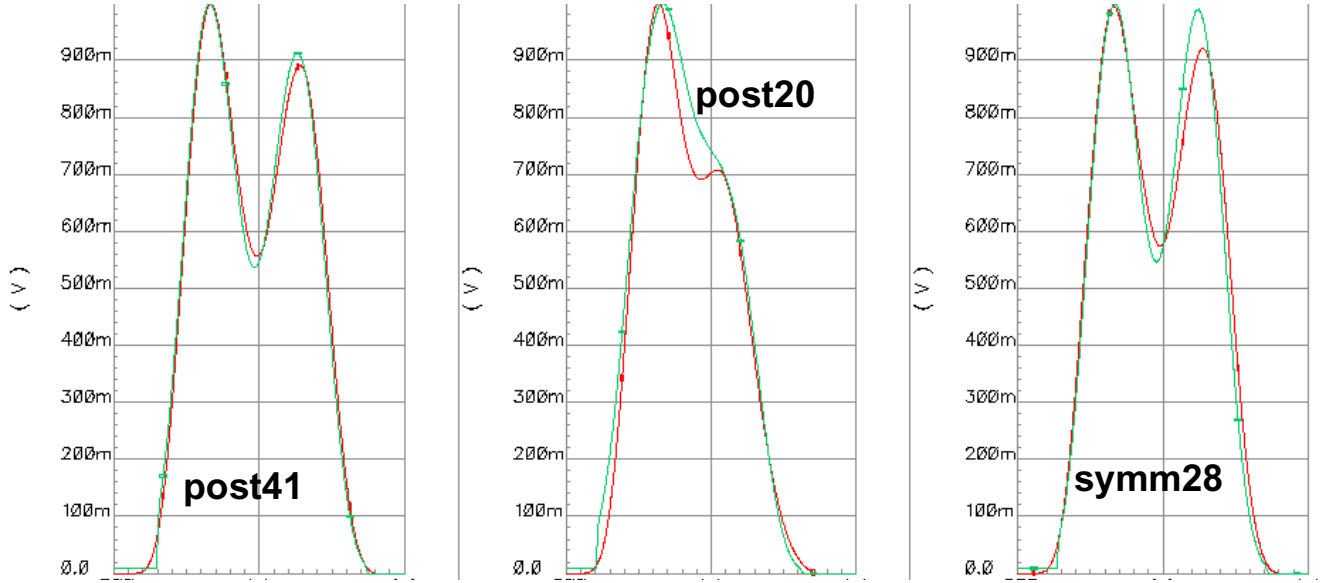
3. ISI Generator Block for Stressed Sensitivity Test

Simulation Environment

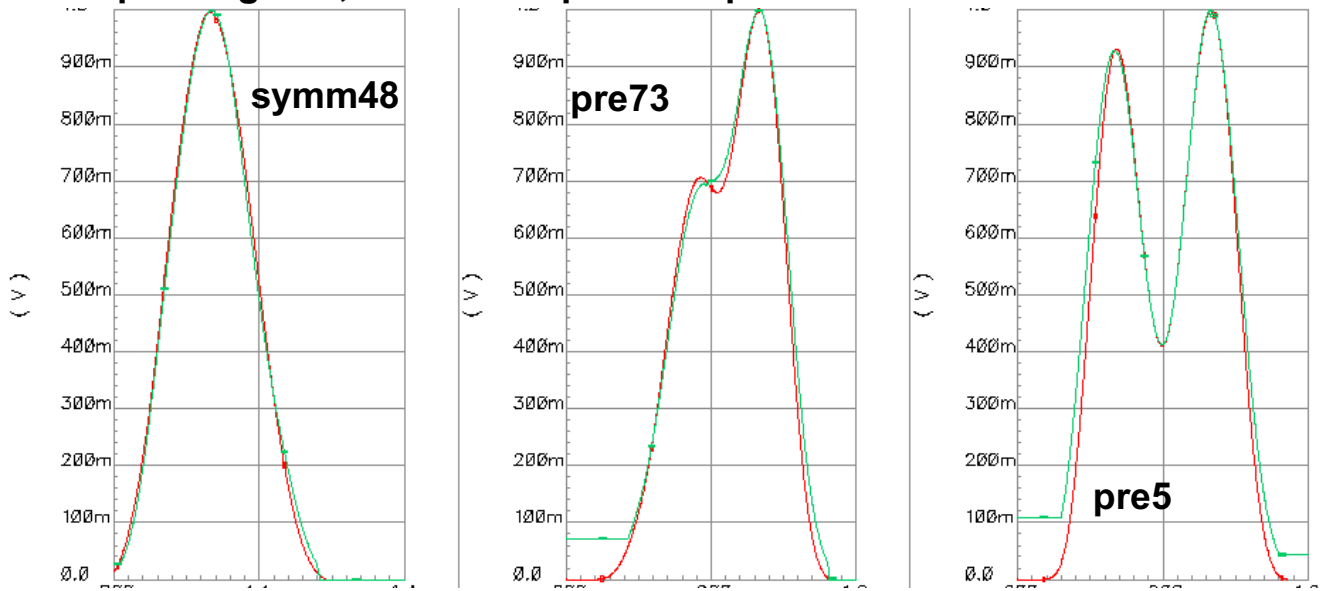


- The analysis will include four tap, 0.7 UI spaced, stressor generation.
- Minimum square error will be used for optimization.
- The pulse shaping circuit is a Gaussian filter, forcing rise and fall times (20% to 80%) to be ~47 ps.
- The receiver is substituted by a fourth order low-pass filter, BT7.5GHz.

4. Optimization Results (1)



fiber impulse response green, stressor impulse response red



5. Optimization Results (2)

Table 1: Four taps stressor results

Fiber	type	A_0 $\Delta t=0$	A_1 $\Delta t=0.7$ UI	A_2 $\Delta t=1.4$UI	A_3 $\Delta t=2.1$ UI	PSR [dB]	PIE_D [dBo]
post20	post-cursor	0.935	0.27	0.575	0.2	21.9	4.15
post41	post-cursor (split)	0.925	0.3	0.325	0.8	28.2	4.25
pre73	pre-cursor	0.2	0.575	0.27	0.935	25.6	4.2
pre5	pre-cursor (split)	0.925	0.125	0.3	0.925	21.4	4.1
symm48	symmetrical	0.35	0.7	0.6	0.225	29.7	4.63
symm28	symmetrical (split)	0.9	0.335	0.3	0.85	22.5	4.3

Note 1: The PIE_D values are lower than I expected. I will review the calculations.

Note 2: A five tap (0.6 UI spaced) ISI generator will give better approximation for fiber impulse response.