Alternative Specification to OCL Inductance to Control 100BASE-TX Baseline Wander

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OCL and “Killer Packet” Response

- The ANSI 263-1995 OCL requirement of paragraph 9.1.7 implies that transmit droop is only a function of line transformer inductance when actually transmit droop is a function of the overall transmitter high-pass response

- Transmitter droop effects the “Killer Packet” response time in 100Base-TX systems:
  - Simulated “Killer Packet” voltage offsets remain fairly constant for OCLs ranging from 40 uH to 350 uH
  - Simulated “Killer Packet” response times, defined as the settling time for the received “killer packet” waveform, vary from about 1 usec to 10 usec for OCLs ranging from 40 uH to 350 uH
  - Longer response times are more easily tracked by receiver baseline wander compensation circuits

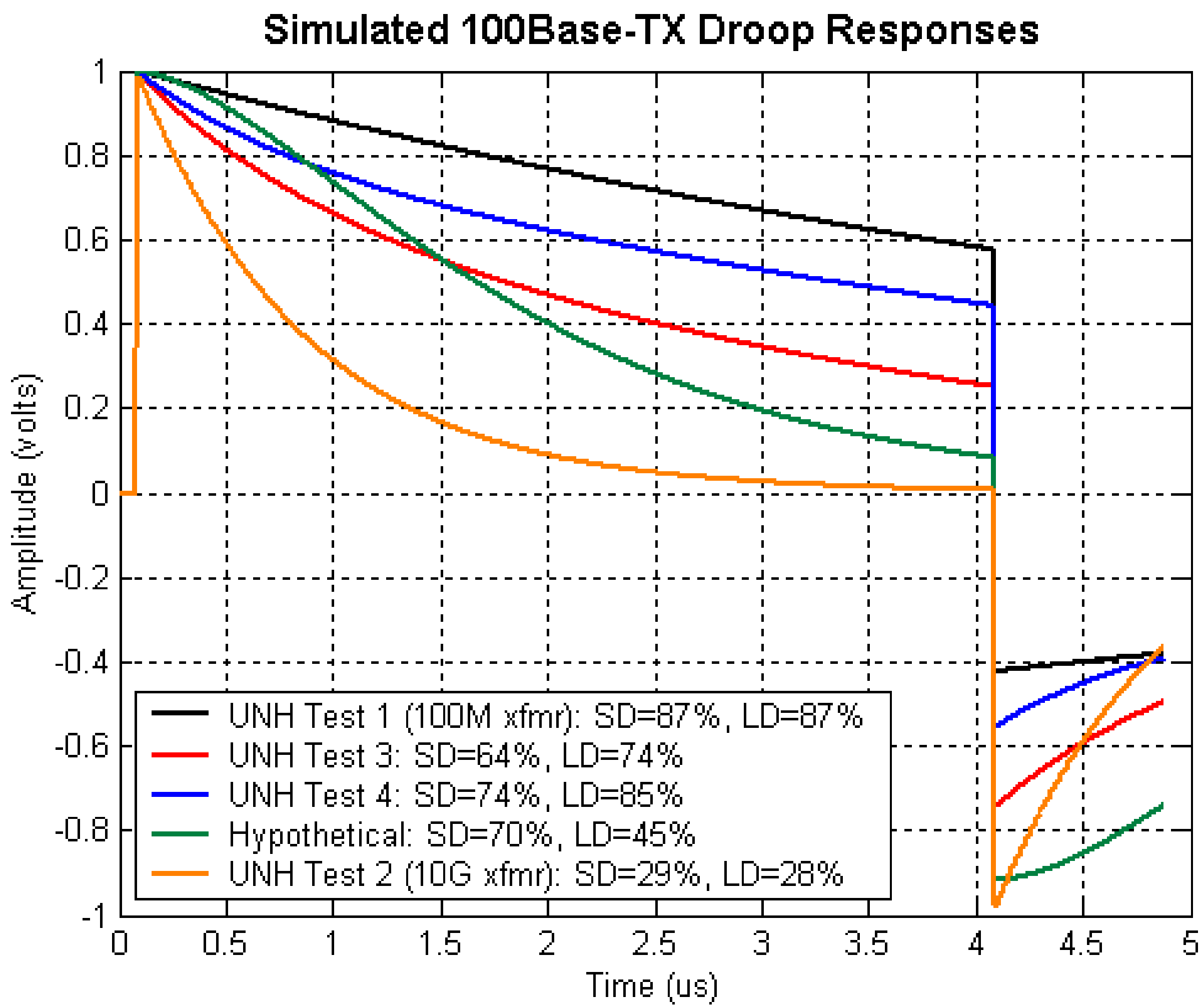
Simulated “Killer Packet” Responses

- Simulations indicate that “Killer Packet” response time is closely correlated with “Long-Term” transmitter droop:
  - Short-Term Droop (SD)

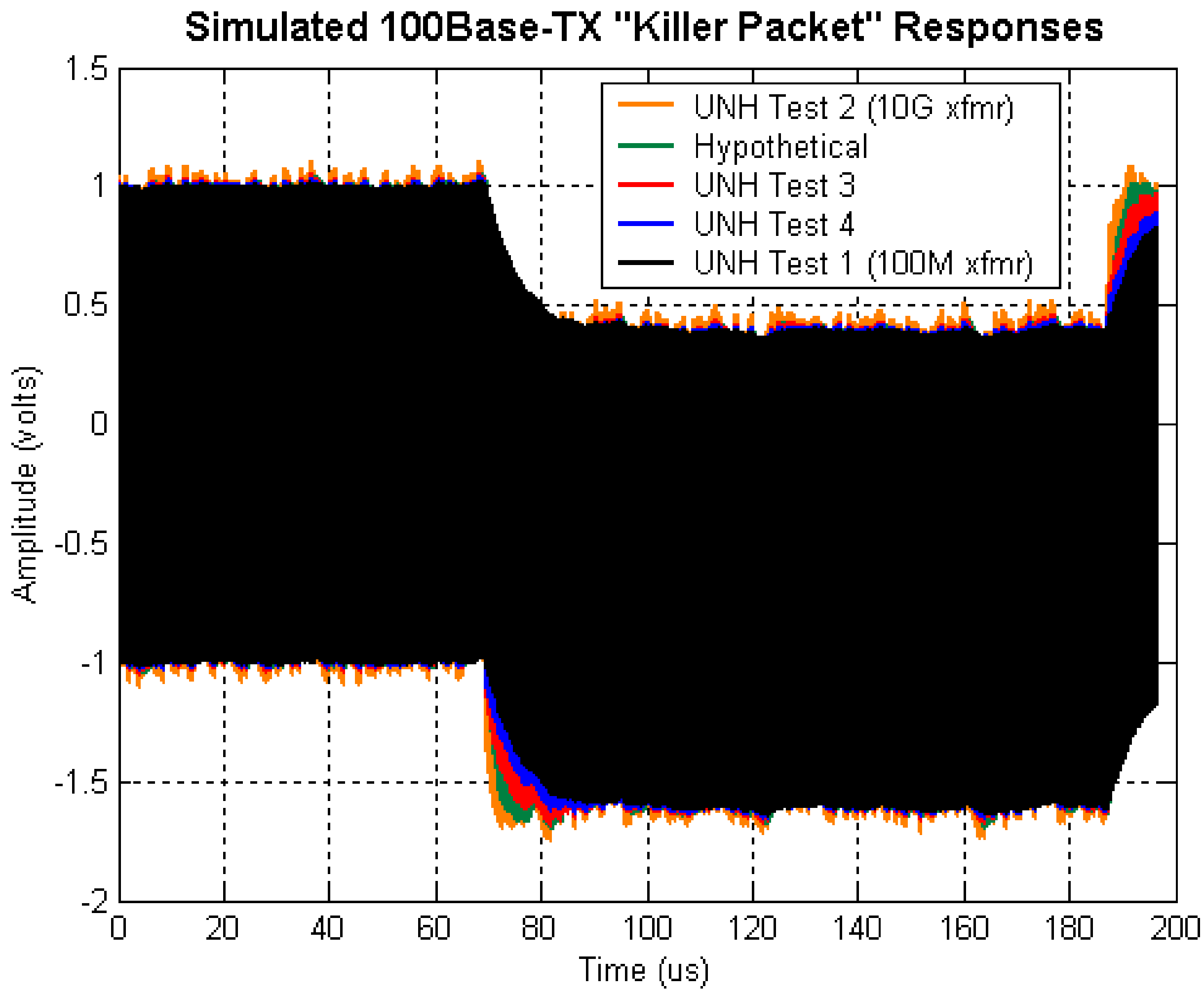
    Assuming a positive pulse, droop is the percentage voltage decay from the peak point after a rising edge transition (t0) to a specified point at some later time (t1)
  - Long-Term Droop (LD)

    Assuming a positive pulse, droop is the percentage voltage decay from the point just preceding a falling edge transition (t1) to a specified point at some earlier time (t0)
- Short-Term Droop is used in 1000Base-T and 10GBase-T standards
- Simulations show it is possible to construct hypothetical transmit droop responses that exhibit good short-term droop behavior but poor “Killer Packet” responses

SIMULATED DROOP RESPONSES



SIMULATED "KILLER PACKET" RESPONSES



UNH Baseline Wander Test Results

- Baseline Wander tests conducted by the UNH IOL indicate that the droop waveforms labeled “Test 1”, “Test 3”, and “Test 4” produce acceptable baseline wander performance on both legacy and modern 100Base-TX PHYs
  - Test 1: waveform based on ~350 uH OCL (100Base-RX requirement)
  - Test 3: waveform equivalent to ~170 uH OCL based on Long-Term droop
  - Test 4: waveform equivalent to ~310 uH OCL based on Long-Term droop
- The droop waveform labeled “Test 2” produces unacceptable baseline wander performance in the same UNH IOL tests
  - Test 2: waveform based on ~40 uH OCL (10GBase-T requirement)
- UNH IOL tests use AWG to produce “Killer Packet” waveforms that ping the DUT at total of 20,000 times
- DUT responses are monitored to establish an effective packet loss rate for “Killer Packet” events

PROPOSED DROOP SPECIFICATION

- Add Maximum Output Droop specification to 100Base-TX to ensure next generation Fast Ethernet PHYs comply with baseline wander capabilities of legacy 100Base-TX PHYs with respect to "Killer Packet" response
- Droop specification is similar to existing requirements for 1000Base-T and 10GBase-T PHYs
- Requires simple test waveform consisting of less than 1K samples that can be generated using integer divider on F_{BAUD} clock (125 MHz)
- Uses same test equipment and test fixtures required for verifying compliance with existing rise time, fall time, pulse symmetry, and "transmit eye template" requirements
- Alleviates potential manufacturing and performance issues related to existing 350 uH OCL requirement

PROPOSED DROOP SPECIFICATION

- Wording is based on 1000Base-T droop requirement (40.6.1.2.2)

- Maximum Output Droop

  A PHY that does not meet the OCL requirement of paragraph 9.1.7 of ANSI 263-1995 shall meet the following maximum output droop requirement. The magnitude of the positive voltage of the transmit droop test waveform at point B, as defined in Figure X–X, shall be greater than 70% of the magnitude of the positive voltage of the waveform at point A. These measurements are to be made while transmitting the droop test pattern and observing the differential signal output at the MDI. Point A is defined as the point exactly 1 us before point B. Point B is defined as the point just prior to where the waveform undergoes a negative transition in voltage as indicated in Figure X–X.

PROPOSED DROOP SPECIFICATION

- Droop Test Waveform

  When the 100Base-TX transmit droop test pattern is enabled, the PHY shall transmit the following sequence of data symbols:

  {{250 -1 symbols}, {500 +1 symbols}, {250 -1 symbols}}

- Droop Test Waveform is produces a 125 kHz square wave that can be generated from F_{BAUD} using a divide-by-1000 frequency counter

PROPOSED DROOP SPECIFICATION