

**Comments on Adaptive Filtering
for Ultra320 SCSI**

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**SCSI Physical Working Group Meeting
28 March 2000
Milpitas, CA**

- An adaptive filter provides compensation for variations in environment, such as operating temperature and voltage.
- An adaptive filter provides compensation for variations in manufacturing process.
- When used with a training pattern, an adaptive filter provides for an inherent closed loop to adjust signal quality for different cable plants and environmental conditions.
- An adaptive filter provides for better margin than a system using a fixed filter at the receiver and precompensation at the transmitter over the range of allowable cable plant configurations.
- There has been no disagreement that an adaptive filter will be required for Ultra640.

- An adaptive filter is implemented using "internal chip design rules", instead of "5 volt tolerant I/O circuit design rules". Thus, the circuitry gets smaller with each succeeding CMOS process generation used to implement Ultra320.
- I/O pad circuitry area remains nearly constant from generation to generation because of the high voltage transistor requirements.
- Adaptive filter area is away from the pads, and adds no capacitance to the SCSI device capacitance.
- Transmitter precomp adds area and capacitance to the I/O cell and necessarily adds junction and gate capacitance measurable at the SCSI connector.
- Mandated transmit precomp at any significant percentage adds to the overhead of legacy requirements for future SCSI generations.
- Transmit precomp using a "cutback" approach lowers signal amplitude, reducing tolerance to noise. Today's systems use 450 mV minimum amplitude; reducing to 310 mV has significant risks.

- An adaptive filter could be easier to implement, since adaption allows for increased process tolerance.
- The "adaptive" portion of Quantum's adaptive filter design for Ultra320 is only about 10% of the total silicon area required by the filter.
- The adaptive filter's ability to compensate for process tolerance might even make its implementation smaller than a fixed filter.
- An adaptive filter allows use of existing drivers; a fixed filter at the receiver and and precompensation at the transmitter requires design changes to both drivers and receivers.