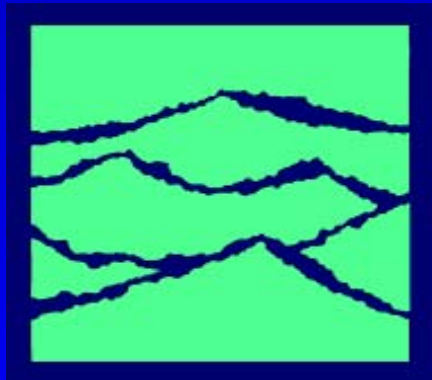


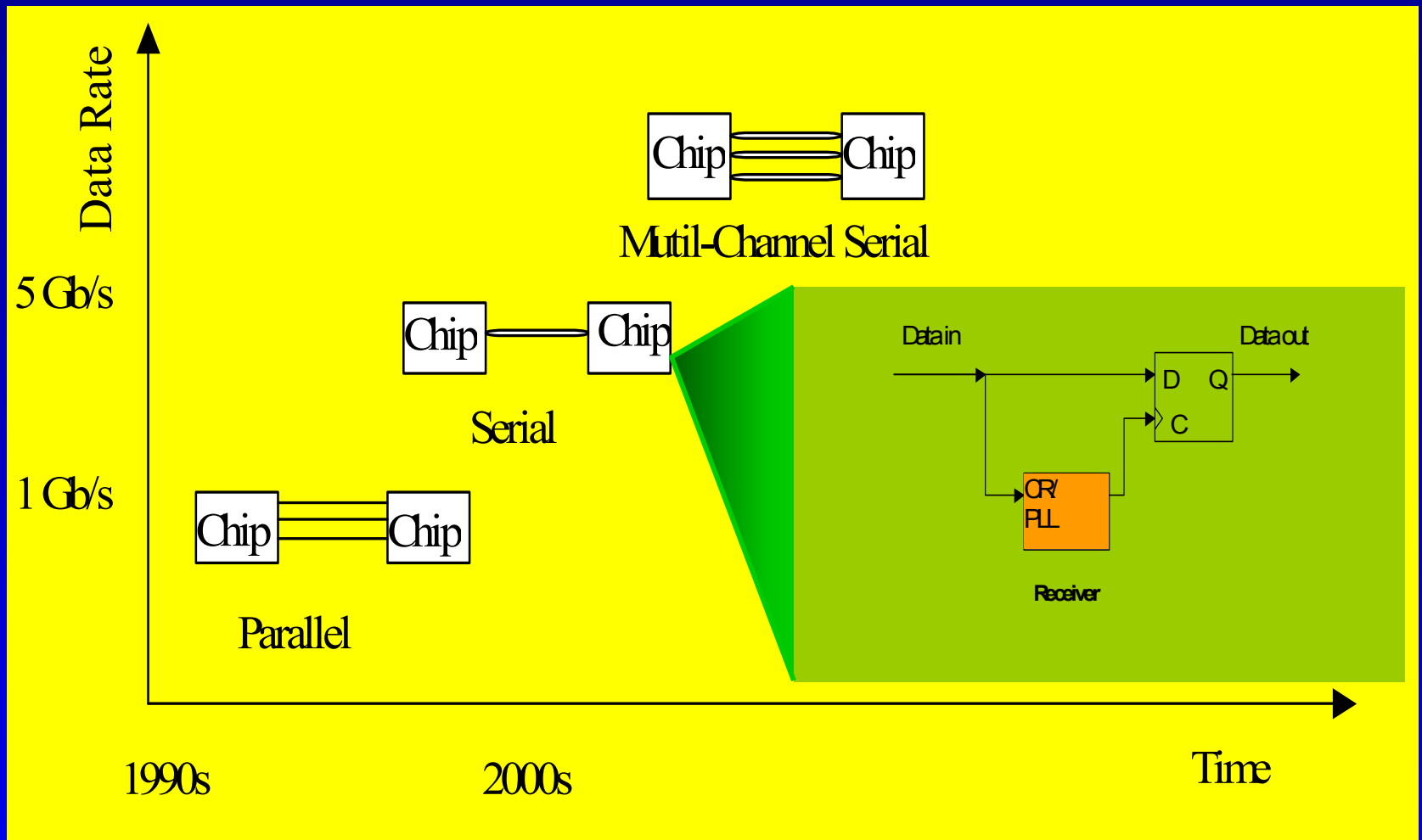
ITC 2003

Requirements, Challenges, And Solutions For Testing Multiple GB/s ICs In Production

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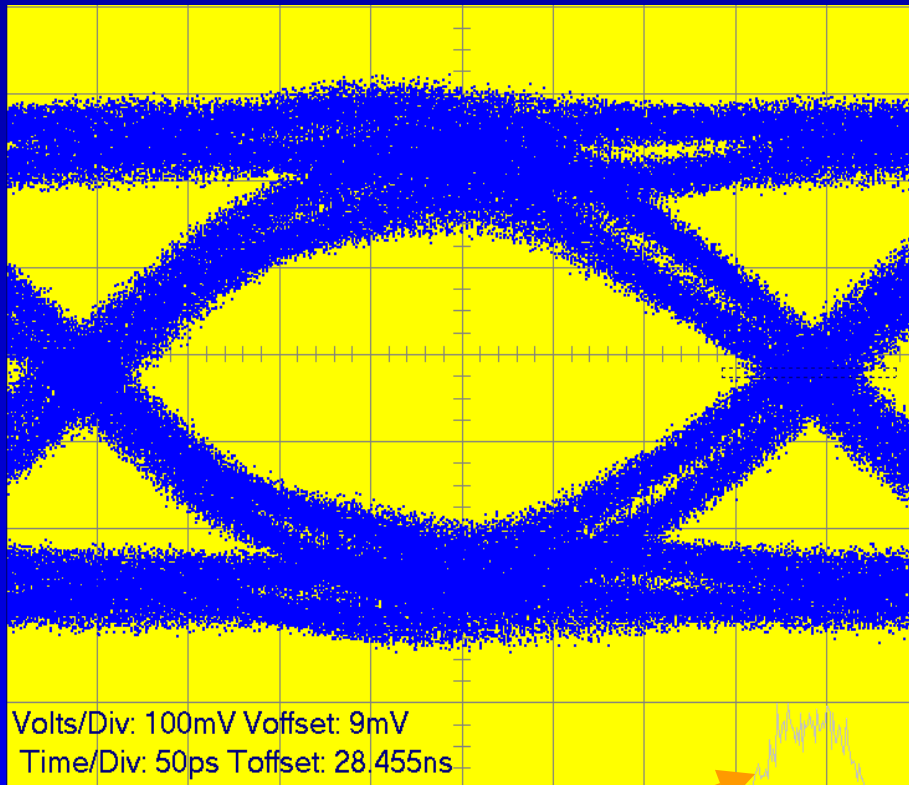


Short-Haul (~ m) Link Technology Trend

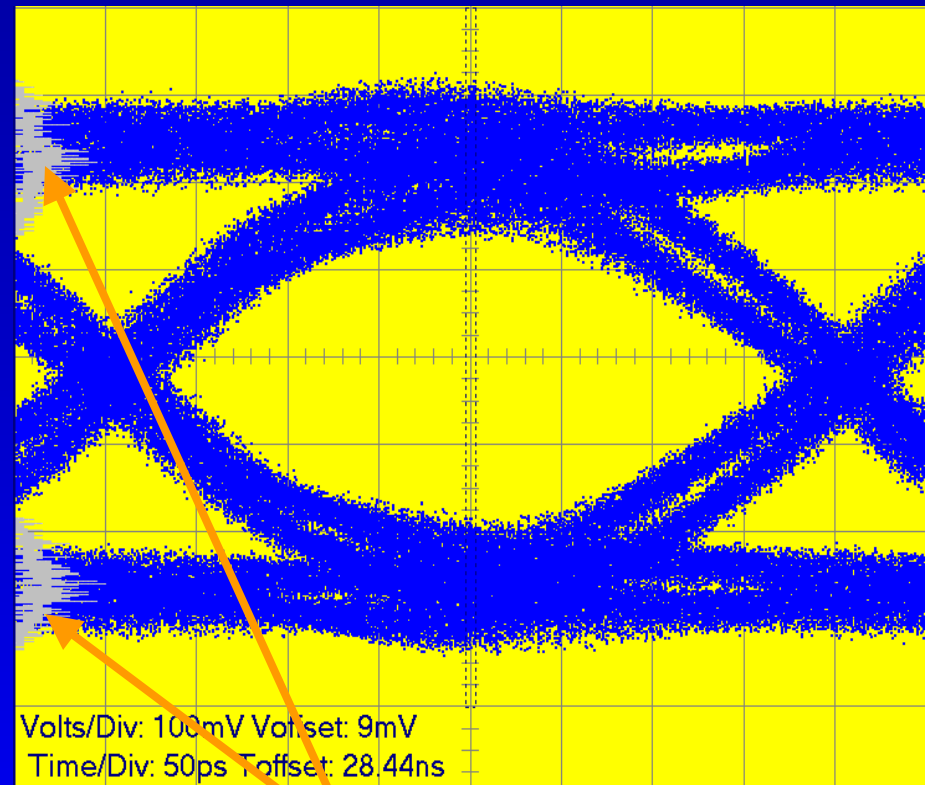


What Needs To Be Tested?

- Bit Error Rate (BER)
- Timing jitter and amplitude noise



Timing jitter pdf



Amplitude noise pdf

Requirements For Testing BER, Jitter, and Noise: (I) Methodology

- Parametric-based **deterministic** methods are no longer sufficient (e.g., pk-pk, rms only)
- Distribution function based **statistical** methods are needed (e.g., jitter pdf, BER cdf)

◆ Challenge # 1:

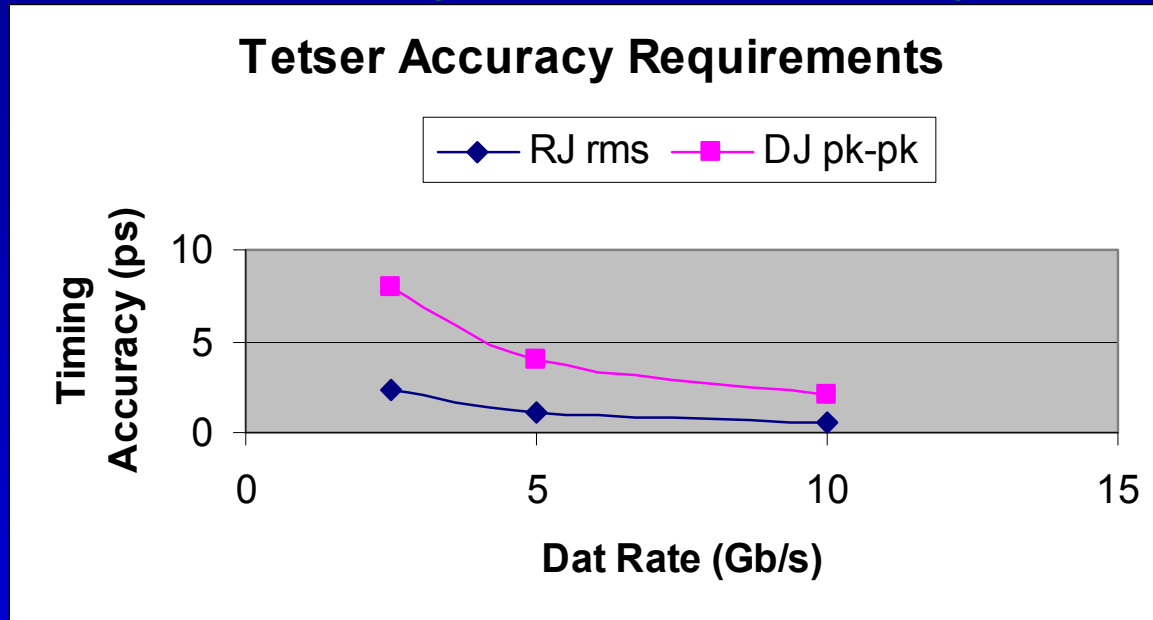
Most of the ATE systems *do not* offer statistical based jitter/BER testing methods

II: System Emulation

- Rx needs to recover the clock from the received bit stream
- Jitter transfer function is complementary to the transfer function of the clock recovery
- Jitter transfer function *must* be included in the BER, jitter/noise determination
- ◆ Challenge # 2:
Most ATE systems *do not* have the jitter transfer function (e.g., CDR) built-in for testing serial Tx/Rx

III: Tester Hardware Accuracy

- Assuming a 10% TJ for the tester at $BER=10^{-12}$, 2% DJ (a “double delta”) and 8% is RJ (a Gaussian)



◆ Challenge # 3:

For a typical ATE system with ~50 ps EPA, achieving DJ < 10 ps and RJ < 2.5 ps requirements are *not trivial*

IV: Tester Throughput

- To measure 1 bit error at BER= 10^{-12} , for a 1 GB/s data, it will take 20 *minutes*
- To measure an eye-diagram down to BER= 10^{-12} , it will take an oscilloscope with 50 ks/s rate many *days*

◆ Challenge # 4:

ATE systems with a BERT or a scope to measure BER, jitter/noise *will not* have the throughput performance for production

Possible Solutions

Some Facts:

- Statistical based BER/jitter analysis methods already **exist**
- High-performance jitter measurement hardware (accuracy \sim pps and clock recovery are **available** for lab measurements
- Open architecture **enables** the correlative and uniform integration
- **Re-inventing the wheel is not cost effective** to the end user

Solutions:

- Short term: low-level integration of existing and proven technology into the ATE (addressing time-to-market)
- Long term: high-level integration of existing and proven technology into the ATE (addressing cost reduction)