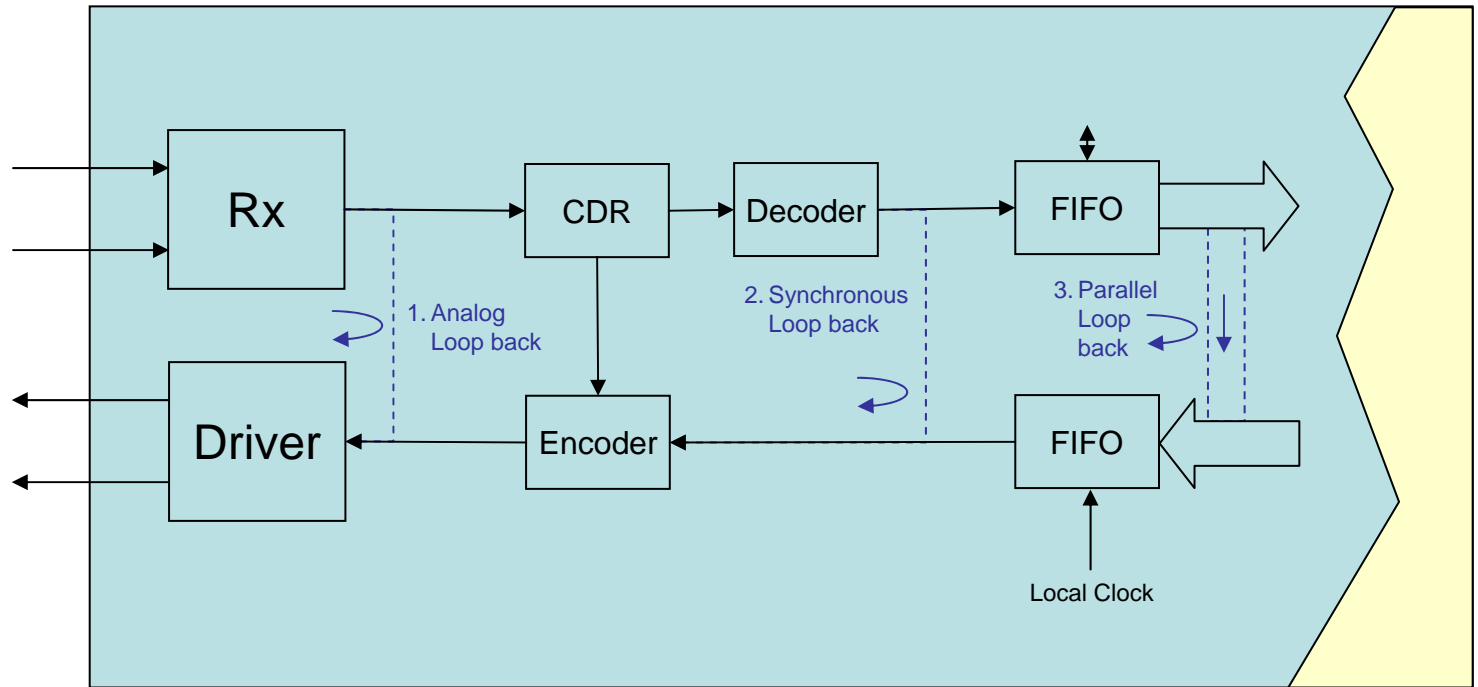


# SAS-2 Loop Back Test

- The only way (other than access to internal device registers) to test receivers.
- Receiver performance is an essential part of interoperability and system budgets.

# Loop Back Test Options

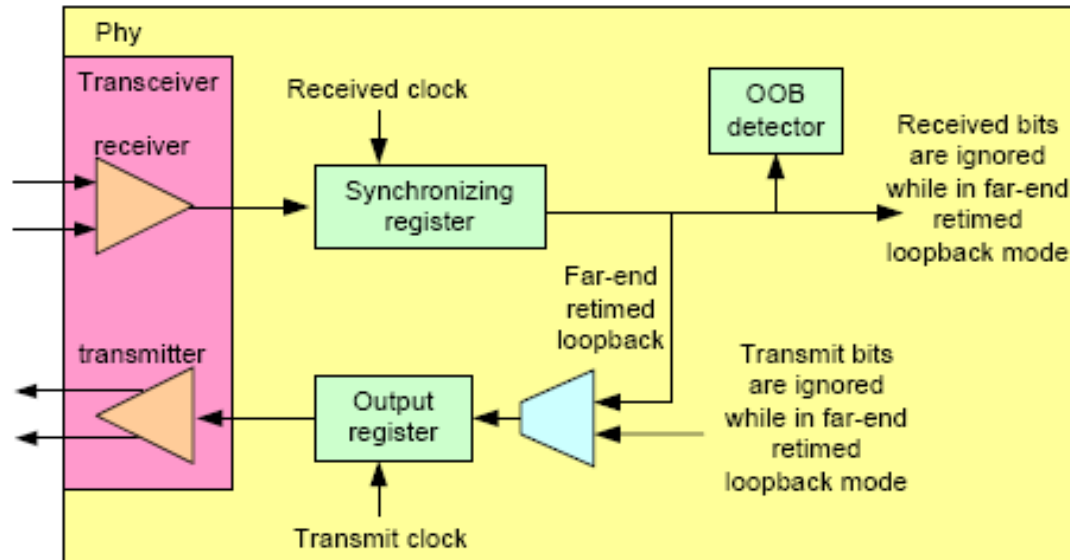
Phy. Portion



Loop Back Test Configurations:

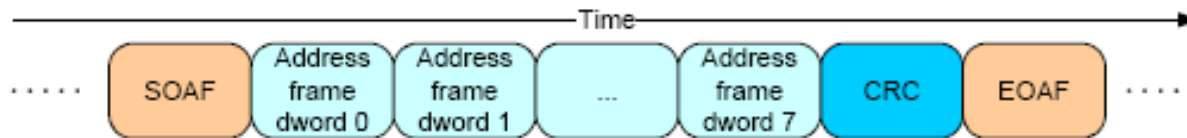
- 1. Analog Loop Back:** Most chips have this. Does not allow testing of receiver as the data sampling (decision) point is not included (also does not execute transmitter pre-emphasis, so parametric signal from transmitter is not representative of real signal).
- 2. Synchronous Loop Back:** Proprietary, not all chips have this.
- 3. Far-end Retimed Loop Back:** Most chips have this. This will also allow testing of the receiver and transmitter, data coming into the tx path FIFO is however clocked by the local clock, and any mismatches between this clock and the rx recovered clock are resolved by insertion of pairs of primitives etc. This means the outgoing pattern differs from the incoming pattern, the patterns are however repeatable in time.

# Leads to Rob Elliott's Diagram



# Keys to successful Re-timed Loop Back Testing:

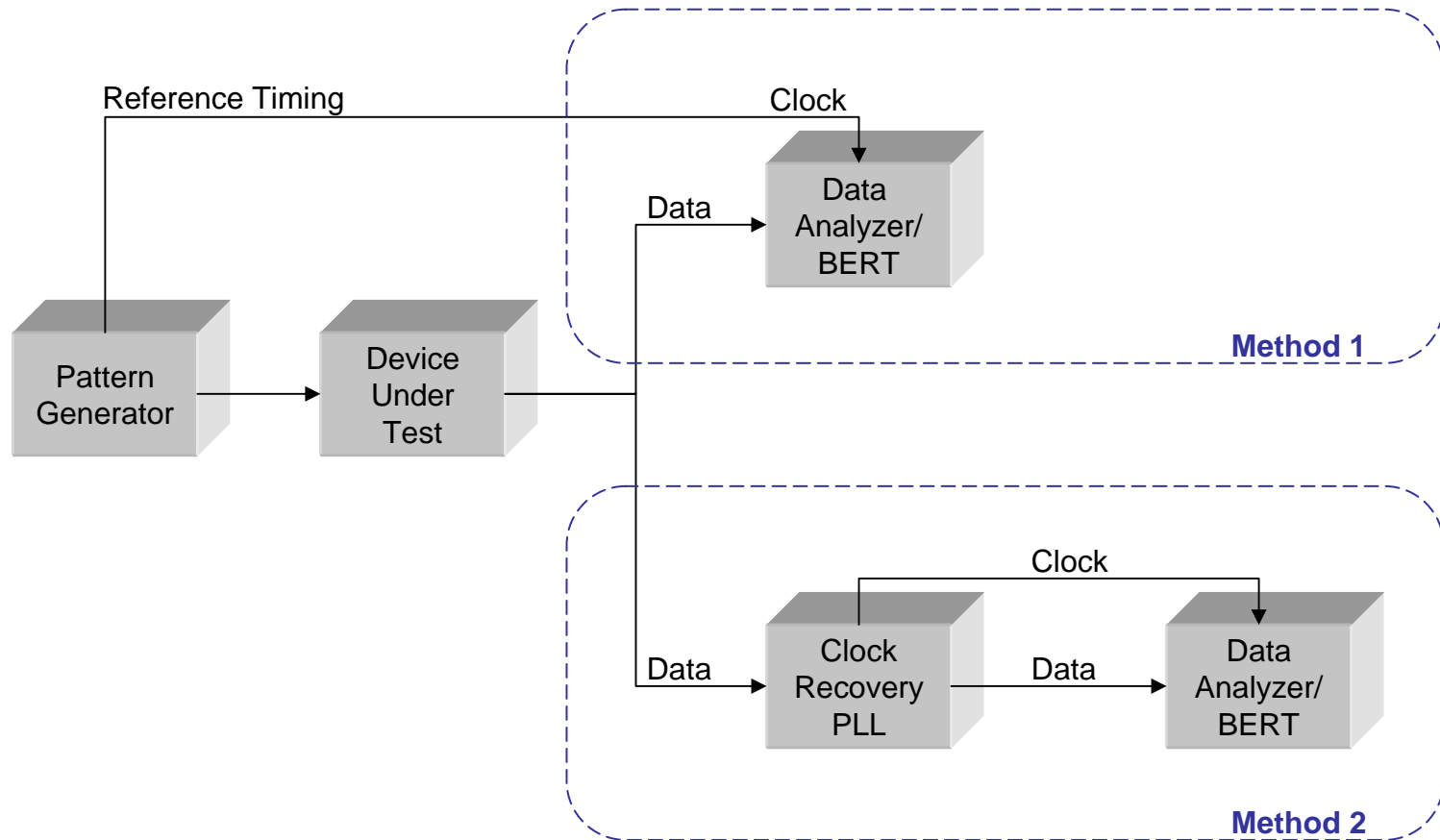
- Framed Test Patterns allow use of multiple types of error detection test equipment; i.e. BERTs; Logic and Protocol Analyzers etc.



- Remember that with a repeatable input the output will also be repeatable in time.
- Allow test equipment to either delete or ignore deletable primitives.
- Remember that any error in returned data counts.

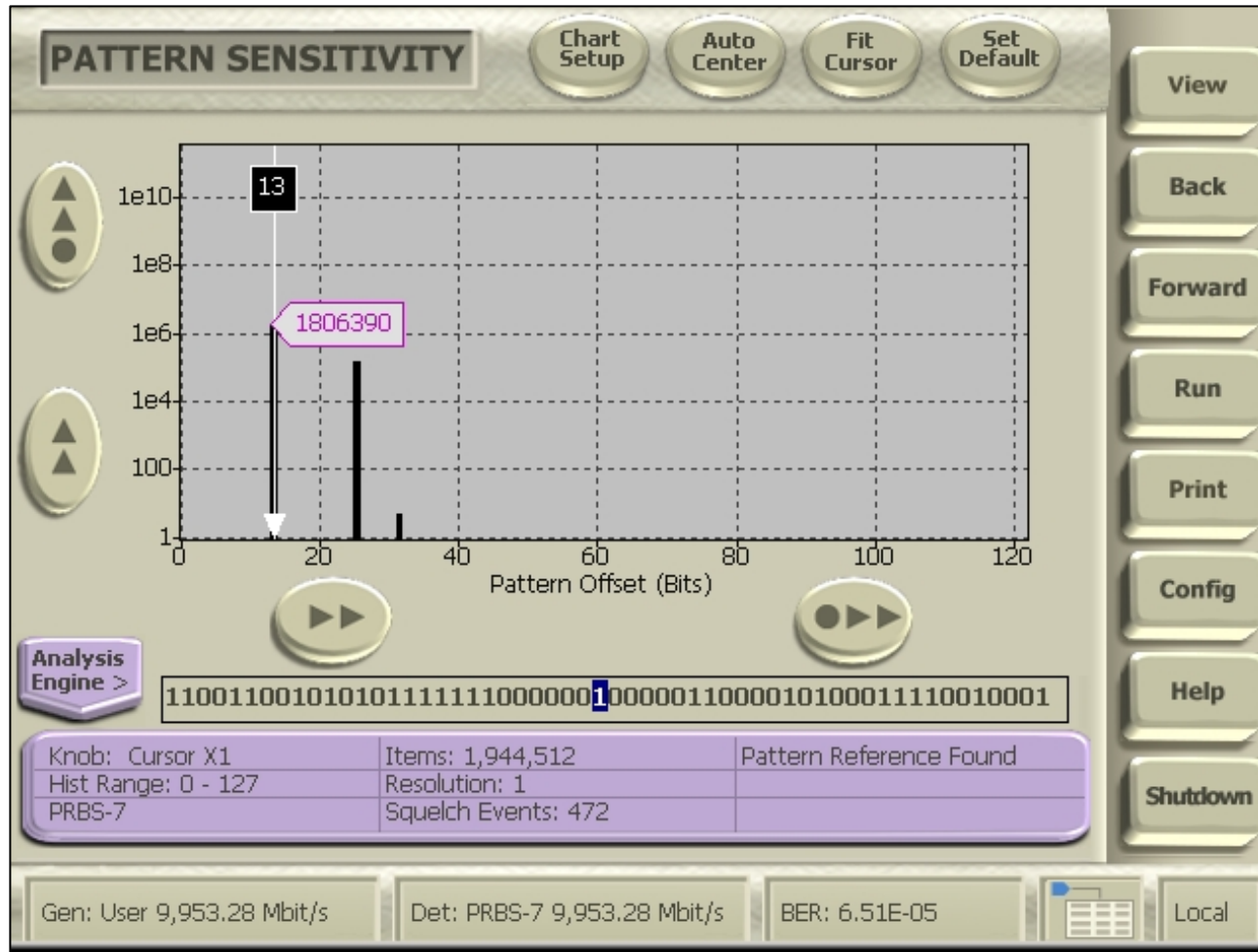
# Possible Measurement Methods

Some of many Methods for Measuring Re-timed Data



Note: Watch out for proprietary and/or patents when selecting methods

# Pattern Sensitivity Analysis



Note: Example of proprietary or patented method requiring additional software license.

# Need of changes to Rob's Proposal

While performing the far-end retimed loopback phy test function, the phy:

- a) shall perform clock recovery and perform dword synchronization;
- b) should delete a deletable primitive that it receives to prevent overflows (i.e., whenever it receives dwords at a higher rate than it transmits);
- c) shall retransmit each dword that is not a deletable primitive;
- d) shall transmit a deletable primitive to prevent underflows (i.e., whenever the transmitter is ready to transmit a dword but the receiver has not provided another dword to transmit); and
- e) shall transmit dwords using valid disparity based on the transmitted dword stream.

NOTE 1 - Only valid 8b10b characters are looped back.