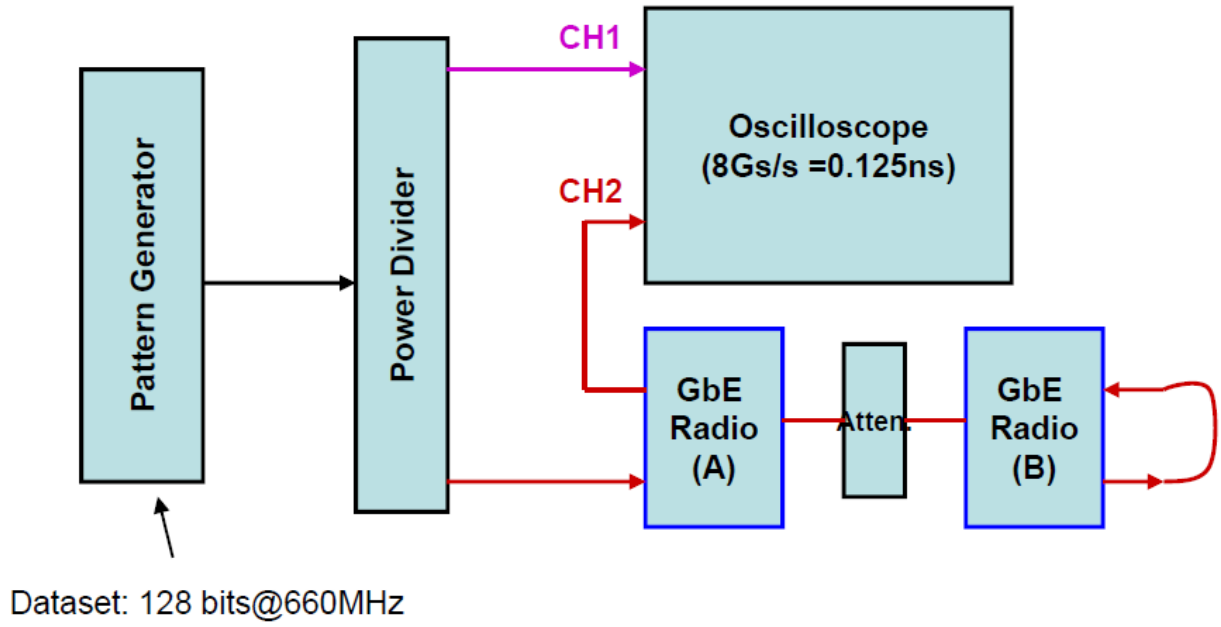
EB Series: Layer 1 Latency Measurement Report

Feb 24, 2012

The latency of the EB Series was measured in the following way:

- A pattern generator generates a pulse stream.
- A power divider is used to split the signal into two streams.
- One of the signal paths (CH1) is fed directly into an oscilloscope.
- The other signal path (CH2) traverses through the radio link and loops back through the link again before being fed into the same oscilloscope (CH2) for comparison.

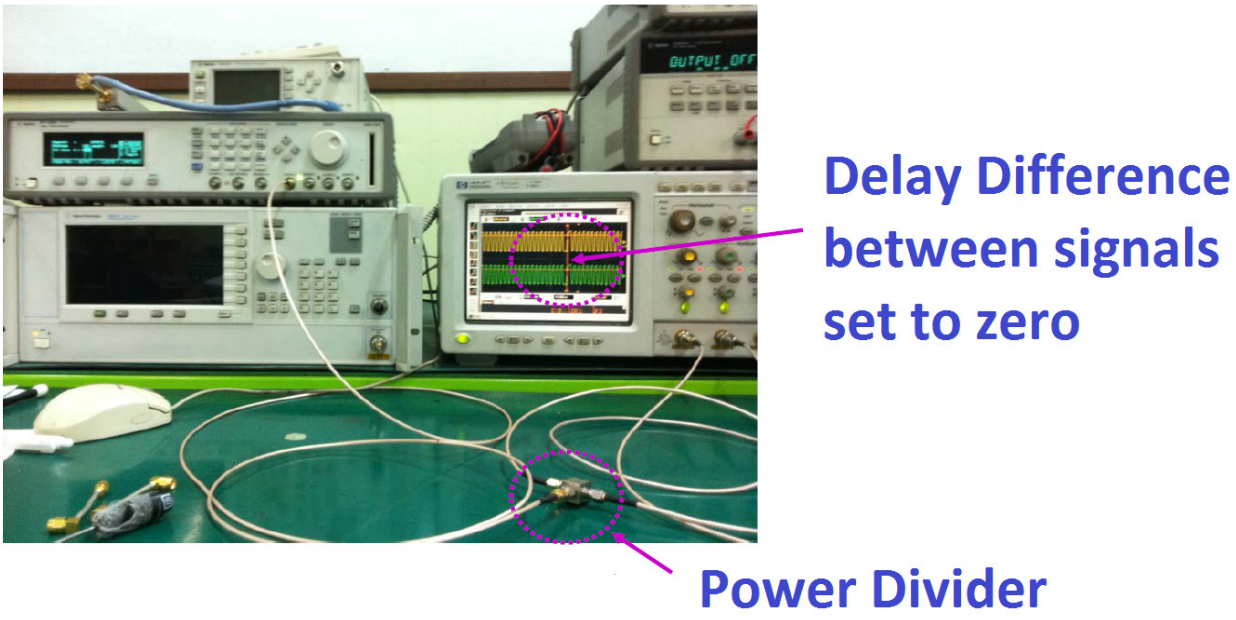
The setup is summarized in the following diagram.



This method relies on a simple scheme based on comparative measurement with an oscilloscope with a sub nanosecond resolution. The comparison between the two signals is direct and transparent.

Test Setup

A pulse data set is generated from a pulse/pattern generator and split into two separate signal paths using a power divider. In order to make sure the two paths are calibrated, the delay differences are first set to zero by comparing the two cable path using a scope. See the picture below for this setup.

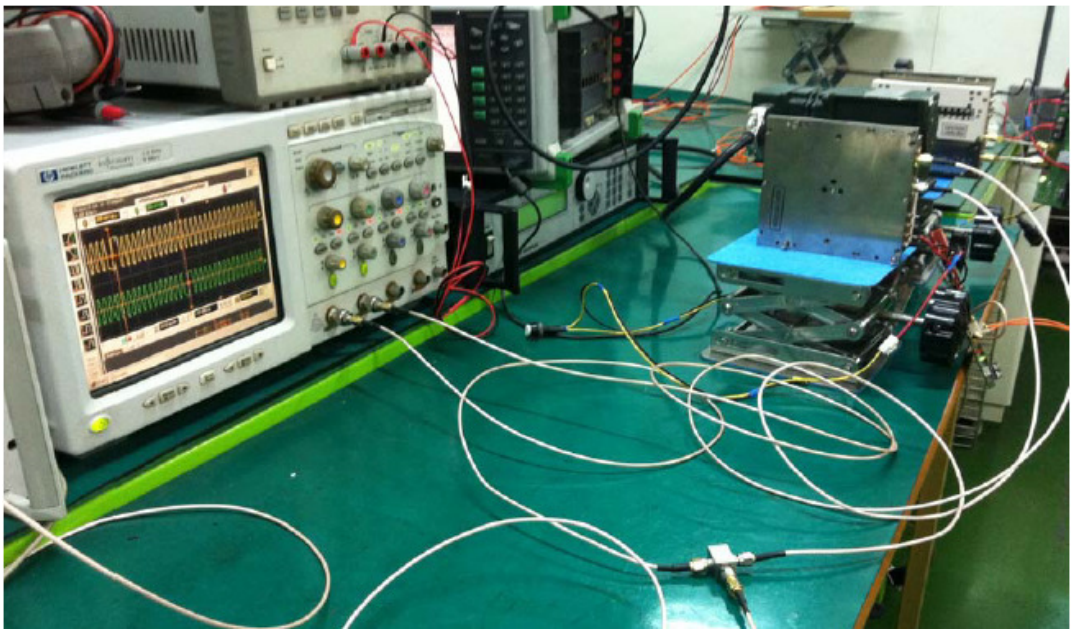


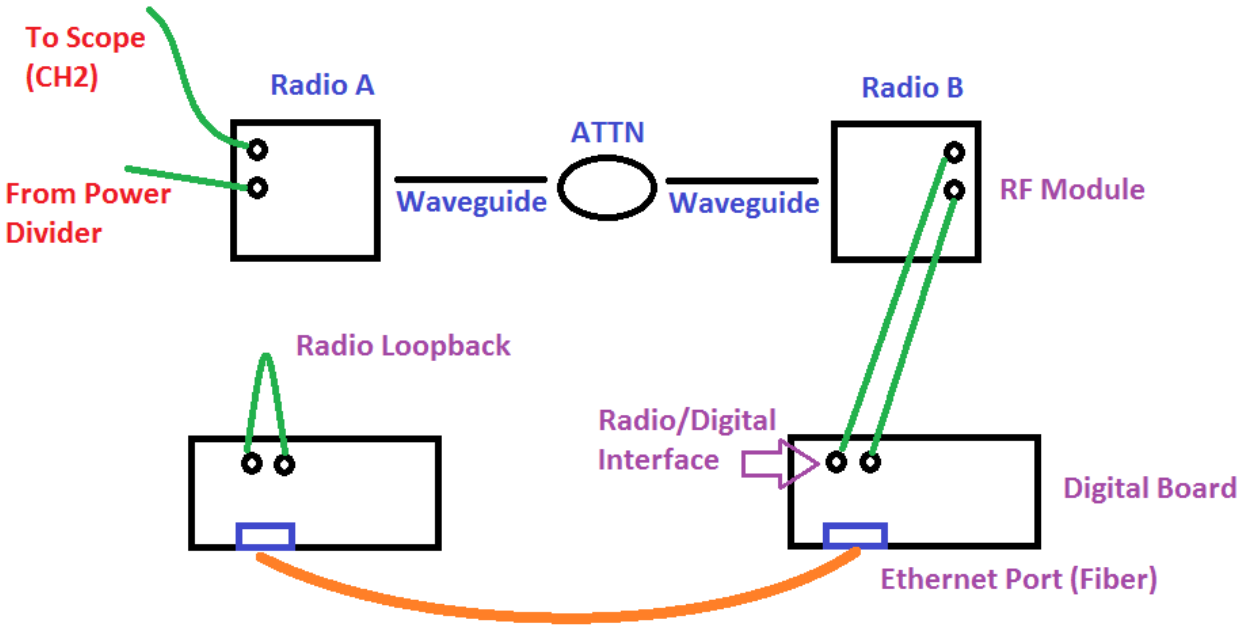
Then, one signal path goes to the scope directly and the other signal path goes to the radio. Please note that the setup has a different loopback structure from that normally seen with network loopback using Ethernet interfaces. As detailed in the diagram below, the method uses a radio loopback. This way, a direct comparison of signal delays at the scope is utilized, as opposed to more complicated Ethernet frames.

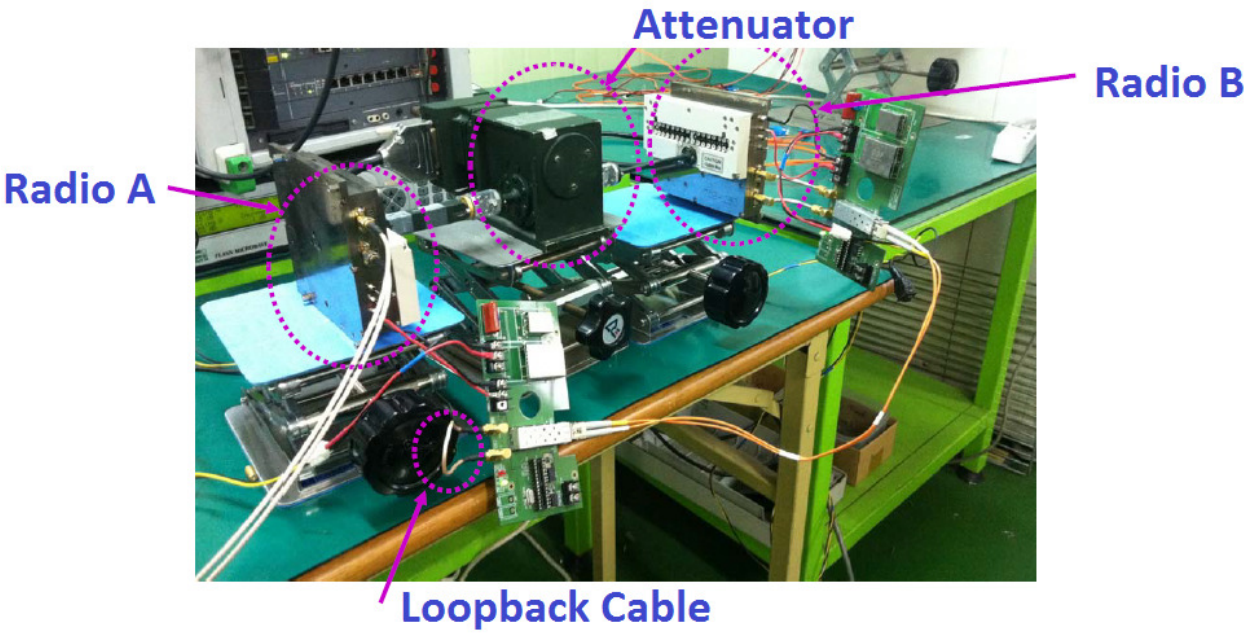
The signal through the radio link back to CH2 at the scope is following:

- The signal first goes to the radio/digital interface port of Radio A.
- The signal then goes through the RF module of Radio A, waveguides, and attenuator to the other link.
- The signal then goes through Radio B.

- Ethernet ports of Radios A and B are connected directly using a short fiber cable.
- The signal goes through the digital board of Radio A and looped back at the radio/digital interface of Radio A.
- The signal then effectively traverses the radio link twice before arriving at CH2 of the scope.






Attenuator
Radio B
Radio A
Loopback Cable

Test Results

The following picture shows the scope screen where the path delay between CH1 and CH2 is shown. The delay measured this way shows 38 ns. Because the signal passes the radio link twice in this measurement, the end-to-end radio link latency then is estimated to be 19ns.