LG July 9, 2008

This document is intended as a follow up to the discussions held on the topic of Ultimate sensor production testing during the phone conference held on June 25, 2008 between IPHC and LBNL. A web page giving the documents presented at that meeting and a meeting summary can be found here
http://rnc.lbl.gov/hft/hardware/docs/iphc_index_06_2008.html.
At this meeting, LBNL proposed a special dedicated testing mode for probe testing and production testing that involved a full data path test via automated column and row masking. IPHC proposed to do production testing based on the system functional testing points that has been proposed and partially developed for the sensor design validation and performance evaluation testing.
As an aid to developing a simple and reliable production testing plan, we propose that we develop an agreed set of requirements for the production testing. As a basis for that discussion, we propose that the following be considered as possible production testing requirements;

1. Production testing of sensors shall occur with all parts of the sensor operating and clocked as used in the operating condition.
2. Frame and pixel integration times shall be as per operating condition.
3. The production testing shall test the whole readout path. (preferably all at once)
4. A reasonable time shall be established for the time needed to test one sensor of less than or equal to 3 minutes. (If we assume 80% yield and 4 full detectors we need to test ~2K sensors which corresponds to ~100 hours of probe testing and an equal length of time for ladder testing)
5. No RDO or configuration lines other than what is needed for normal operation shall be required for the production testing.

It would be in the best interests of all to iterate on these proposed requirements. It is possible that relaxation of some of the proposed requirements would still give a high reliability test of the sensor operation. We welcome this discussion.

We have examined the individual tests described in the design validation and performance evaluation section of the presentation by CH at the phone conference. Based on the descriptions of the testing functionality, we have constructed the following diagram which we hope describes the proposed testing interfaces in a schematic way.
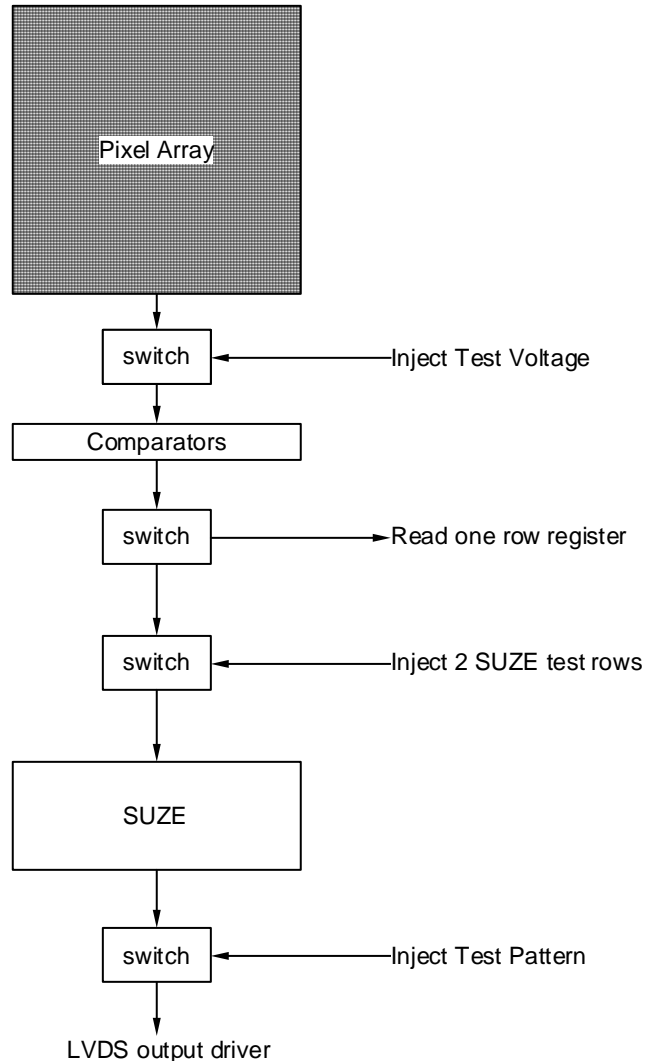
Figure 1: LBNL interpretation of Ultimate sensor testing functionality

Based on the descriptions of the production testing we have generated the following questions for the IPHC proposed production testing;

1. Is the diagram valid for what is being proposed?
2. Will all of the normal operation parts of the sensor be operating and clocked for the proposed two steps of the production testing?
3. Do you propose bringing all data out on the existing LVDS outputs for both tests (post-comparator and post SUZE)?
4. Will the frame and pixel integration time be as per the nominal operating condition for the sensor?
5. What are the proposed timing and data formats for the test data delivered over the output LVDS links?

As a question, would the implementation of individually controllable switches on the output of the comparators present a large design problem? If these switches were

controllable from a JTAG loaded register and equipped with an auto increment functional logic to allow for moving patterns of enabled comparators, this would be a usable method for meeting all of the proposed requirements. In particular this would allow for the testing of the full data path with one test.