ASIC bugs and features

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M.J. LeVine, ed.

This document describes details of the STAR cluster-finder ASIC which are bugs or undocumented features. They have been uncovered by Markus Schulz and Tonko Ljubicic.

Interface issues

The following discrepancies have been observed between the documentation and actual behavior of timing and polarity for hardware interface signals to the ASIC:

1. DATA_ACK is active LOW, contrary to Fig. 5A in the specification (The text in the specification is correct.)

2. The time 'tdvdata' from V_ACK to valid V_DATA is specified to be 5 ns (max). It is actually 10 nsec.

3. The ADC data are presented as **pairs** to the sequential port. The signal V_REQ is not asserted by the ASIC until the second of the pair has been processed. [No serious consequence.]

4. As a side effect of (3), the first datum vanishes from the output of the sequential port after approximately 26 nsec, if V_ACK is asserted longer than this. At this time, the second datum appears at the port. The second datum seems to remain at the output port until V_ACK is deasserted, but it should not be assumed that it will still be there when the next ADC datum has been processed (another 150 nsec).

Application issues

The following undocumented functional behaviors have been observed:

1. Use of the value N_SEQ_LO=15 causes the ASIC to fail to find clusters. [***Workaround***: do not use N_SEQ_LO=15]

2. For clusters which terminate on MAX_TIMEBIN-1, ASIC reports the END pointer as MAX_TIMEBIN. [***Workaround***: check sequences which have MAX_TIMEBIN as an upper limit, or accept occasional sequences which include an extra ADC value.]

3. A cluster beginning and ending on MAX_TIMEBIN is reported with a meaningless END pointer. [***Workaround***: do not accept clusters starting on MAX_TIMEBIN.]

4. In SVT mode, the eighth CPP may have the INVALID bit set on the BEGIN, but not the END pointer. [***No effect*** - test the BEGIN pointer's INVALID bit.]

5. In SVT mode, the eighth CPP may be valid, but the INVALID bit may be set for the END pointer only. [***Workaround***: test INVALID bits on BEGIN pointer, mask END pointer value to clear INVALID bits.]