

Implementation of QT Algorithm for MTD and PP2PP

qt32b_10_v5_2.mcs

Chris Perkins

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Description:

This algorithm outputs a bitmap indicating “good” hits in each of 16 pairs of ADC/TAC channels. A “good” hit is defined as one where the ADC value is greater than some threshold and the corresponding TAC value is greater than TAC_MIN and less than TAC_MAX. The channel mask register can be used but note that ADC and TAC channels must each be masked individually.

Inputs:

QT8A: 4 PMT ADC, 4 PMT TAC
QT8B: 4 PMT ADC, 4 PMT TAC
QT8C: 4 PMT ADC, 4 PMT TAC
QT8D: 4 PMT ADC, 4 PMT TAC

Registers (1 Set Per Daughter Card):

Alg. Reg. 0 (Reg 13): ADC_Threshold
Alg. Reg. 1 (Reg 14): TAC_MIN
Alg. Reg. 2 (Reg 15): TAC_MAX
Reg. 11: Channel Mask

LUT:

Timing adjustments/pedestal subtraction for each PMT

Action (21x RHIC Clock):

1st: Mask channels and Latch inputs
If mask bit = 1, channel data = 0

2nd: For each PMT (4 per daughter board):

ADC above threshold: $ADC > PMT_ADC_Thresh \rightarrow Good_ADC$

TAC above threshold: $TAC > TAC_MIN \rightarrow Good_TAC_MIN$

TAC below threshold: $TAC < TAC_MAX \rightarrow Good_TAC_MAX$

3rd: Make good_hits(0-3):

$good_hit(i) = Good_ADC(i) \ \&\& \ Good_TAC_MIN(i) \ \&\& \ Good_TAC_MAX(i)$

Latch Output Bits to next daughter or L0 FPGA:

Board A: good_hits(0-3) or sum_in(0-3)

Board B: good_hits(0-3) or sum_in(4-7)

Board C: good_hits(0-3) or sum_in(8-11)

Board D: good_hits(0-3) or sum_in(12-15)

Algorithm Latch: 6

L0 Output to DSM:

- (0) good hit: ADC Ch 0, TAC ch 4
- (1) good hit: ADC Ch 1, TAC ch 5
- (2) good hit: ADC Ch 2, TAC ch 6
- (3) good hit: ADC Ch 3, TAC ch 7
- (4) good hit: ADC Ch 8, TAC ch 12
- (5) good hit: ADC Ch 9, TAC ch 13
- (6) good hit: ADC Ch 10, TAC ch 14
- (7) good hit: ADC Ch 11, TAC ch 15
- (8) good hit: ADC Ch 16, TAC ch 20
- (9) good hit: ADC Ch 17, TAC ch 21
- (10) good hit: ADC Ch 18, TAC ch 22
- (11) good hit: ADC Ch 19, TAC ch 23
- (12) good hit: ADC Ch 24, TAC ch 28
- (13) good hit: ADC Ch 25, TAC ch 29
- (14) good hit: ADC Ch 26, TAC ch 30
- (15) good hit: ADC Ch 27, TAC ch 31
- (16-31) '0'