Block Name: Xe_pulse_dsm

Two independent charge injection networks that mimic the TRT Straw signal.

Size: Area = 280 X 202um

Power Requirement: 2.5 +/- .2V 2-5mW Inputs:

Digital -

- bxpulse Digital Pulse (LOW/HIGH/LOW)input longer than 100ns. Initiates delay pulse signal through delay chain.
- enable_even High to enable output from "even" Charge Injector
- enable_odd High to enable output from "odd" Charge Injector
- tp_spy_enable must be tied LOW to disable.
- Sel<0:4> Five data lines to select 32 element delay

Analog –

- tpdeven A/D input 0-250uA compliance 1.25V
- tpdodd A/D input 0-250uA compliance 1.25V

Outputs: (Range of intended use 0 - 50fC for 8 channels of ASDBLR)

- tp_even Analog calibration line to ASDBLR "even" channels
- tp_odd Analog calibration line to ASDBLR "odd" channels

Functionality:

The Xenon Pulser mimics the time development of the straw anode signal when the tube is filled with an Xeon CO2 CF4 mixture. The shaping is not complete and depends on a final (external) pole formed by a 7K resistor in series with a 3.5pF capacitor to a fixed supply. This pole is provided on the ASDBLR in order to avoid coupling to the digital substrate.

One instance of **Xe_pulse_dsm** is used per chip. It consists of t wo charge injectors controlled by separate 6 bit on chip DACs (Max Current = 250μ A) and one 32 element delay chain that allows the output pulse to be translated with respect to the input trigger, "bxpulse". The elements have a nominal delay of 1.6ns. One delay chain is used for both pulser outputs.

Xe_pulse_dsm Top level Schematic



DSM DTMROC Analog Block Description ATLAS TRT

Xenon Pulser Delay Chain



Delay element Schematic



Analog Block Description

'Xe' Like Charge Injector Schematic

A positive going pulse into 'Xpls' switches both differential pairs resulting in current being pulled from the 'Xenon_O' output. Switching of the differential pair on the right is controlled by a C-R network and is only momentary. This mimics the "electron" part of the signal. The pair on the left is switched for the duration of the time that 'Xpls' is high providing a constant DC current that works in conjunction with R-C integration networks to mimic the time development of the TRT straw signal. Xenon_O goes off chip to the ASDBLR input where additional shaping is added and a 200fF capacitor differentiates the signal and couples it into "even" or "odd channels on two ASDBLR chips.



SPICE Simulations

Even and Odd Xenon Pulser outputs programmed with 50 and 100uA. Two sets of traces from two different triggers show relative delay. A Delay input settings of 10000 and 11111 are used. A difference of 30 delays. Note that a single delay chain is used to trigger both "even" and "odd" pulsers.



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Measurements of a DSM Prototype (June, 01)

The two traces displayed show the two Xe pulser outputs from a prototype fabricated in June 2001. A programming current of 50μ A and 100μ A were used. The shape is qualitatively correct and the amplitude is reasonable for the load conditions



Xe_pulse_dsm Layout: 5:32 Selector, Delay Chain, Trigger and Enable network, and two Xenon like Charge injectors

