

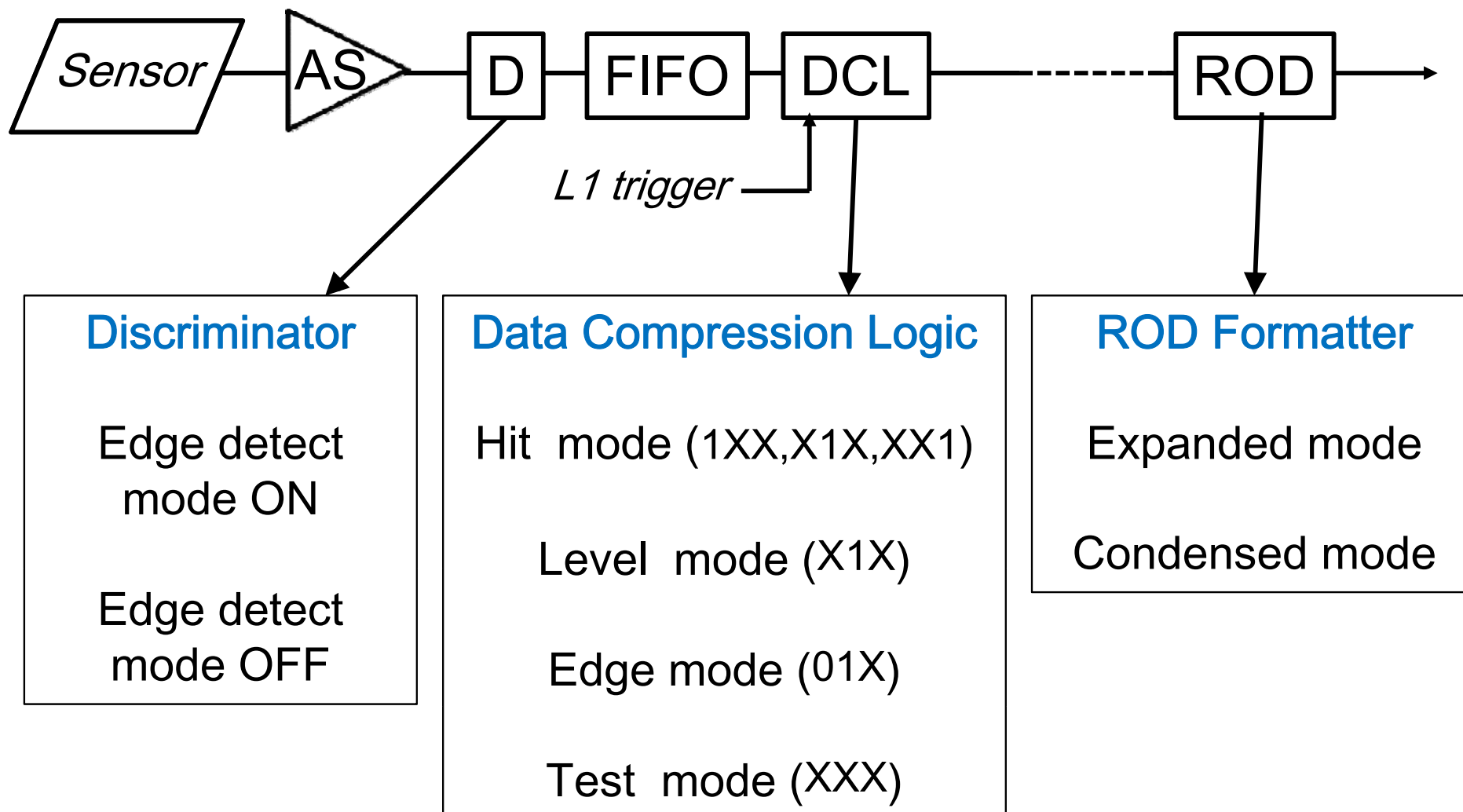
Timing treatment in the SCT

Sep. 7, 2010

SCT Digitization TF meeting

Taka Kondo (KEK)

Three operations on timing in DAQ



ABCD chip design

3.2.3.2 Edge Detection Circuitry [1]

The function of this block is to detect a high to low transition in the data entering the pipeline, and for each of such transition found **the circuit generates a pulse of duration 1 clock cycle irrespective of the length of the incoming pulse.** The effect of this block is that only a single '1' is written into the pipeline for every hit detected regardless of the response time of the discriminator. This circuitry can be turned on or off by setting the appropriate bit in the configuration register.

[1] ABCD3T ASIC Specification Version: V1.2

ABCD chip design [1,2]

3.2.6 Data compression logic

.....Each group of 3 bits is compared against one of 4 selectable criteria.

If the pattern meets the criteria, then the hit pattern from that channel is sent to the readout circuitry for transmission, if not, no data is sent.

Mode (1:0)	Selection Criteria	Hit Pattern (Oldest data bit 1st)	Usage
00	Hit	1XX or X1X or XX1	Detector alignment
01	Level	X1X	Normal Data Taking
10	Edge	01X	Normal Data Taking
11	Test	XXX	Test Mode

(N.B. X = Don't care state.)

[1] ABCD3T ASIC Specification Version: V1.2

[2] F. Campabadal et al., NIMA 552 (2005) 292

Bilge's thesis [1] p.73

Rod Formatter:

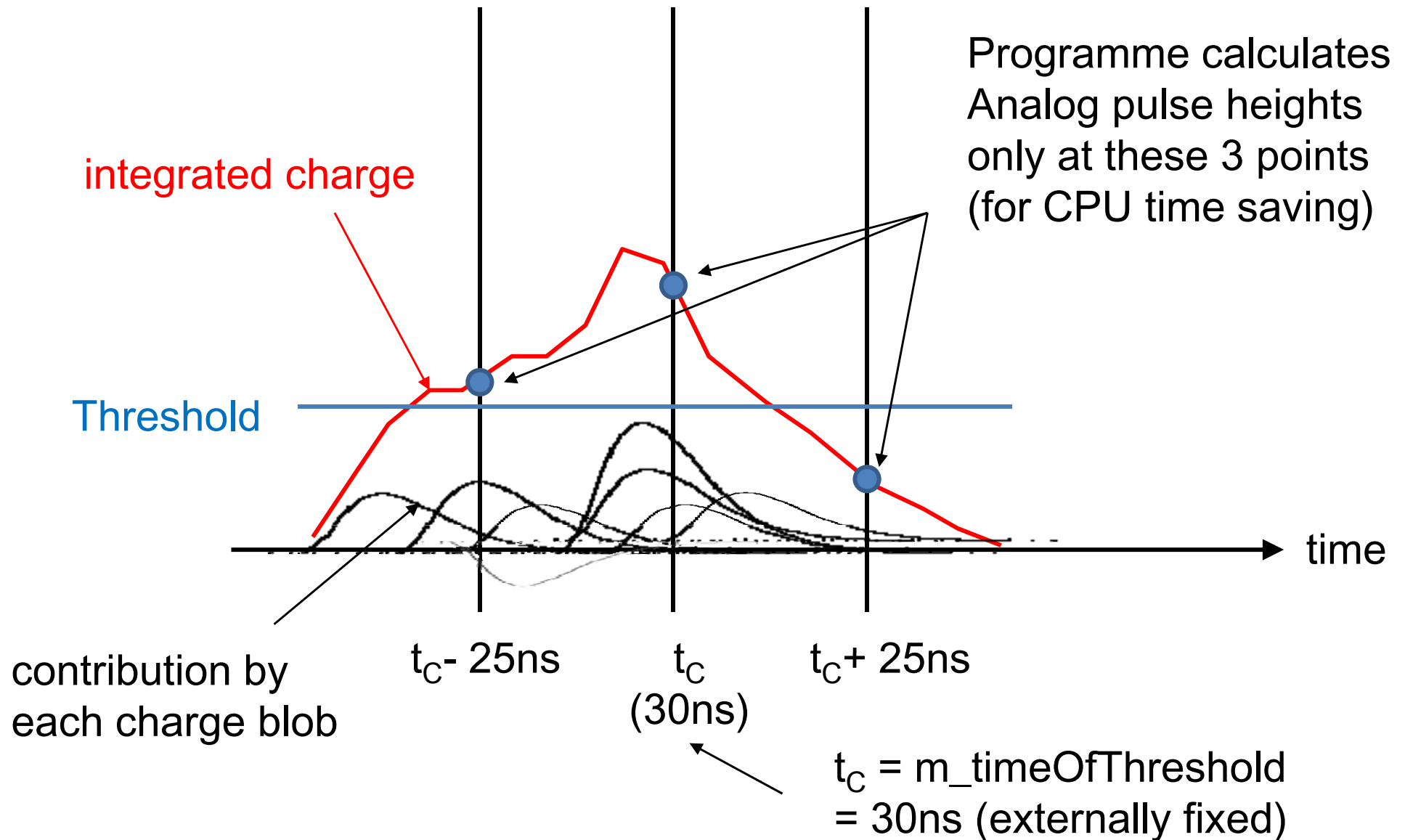
.....The formatter has two modes: expanded and compressed. The data received from the module always contains 3 time-bins worth of information. This information is kept in the **expanded** mode, while in the **compressed** mode, only the 01x pattern is tagged as a hit and the time-bin information is discarded, reducing data size significantly.....

There are two errors (consultation with Dave Robinson):

- (1) compressed → condensed
- (2) “only the 01x pattern is tagged as a hit” must be omitted.

[1] Thesis by Bilge Melahat Demirköz at Balliol College

tbin in the current SCT digitization model (15.8.0)



tbin in the current SCT digitization model (15.8.0)

Data Compression mode	Condition for getting a “hit”	tbin is set to
1	$\text{Analog}(t_C) > \text{Threshold}$	010
2	$\text{Analog}(t_C - 25\text{ns}) < \text{Threshold}$ and $\text{Analog}(t_C) > \text{Threshold}$	010
3	At least one of $\text{Analog}(t_C - 25\text{ns})$, $\text{Analog}(t_C)$, $\text{Analog}(t_C + 25\text{ns})$ is $> \text{Threshold}$	100,010,001,11 0,101,011,111

Online DAQ : SctGUI > Options > Run Options

Following commands are available in the SctGUI menu:

- Set Expanded Mode
- Set Condensed Mode
- Set Edge Detect Mode ON, OFF
- Set Level Mode (X1X)
- Set Any Hit Mode (1XX | X1X | XX1)
- Set Edge Compression (01X) Mode

So far, a combination of **Expanded Mode + Any Hit Mode** has been used for most of data taking.

Possible operation modes in future

Type	Edge detection	Data Compression logic	ROD
A	OFF	Hit(1XX,X1X,XX1)	Expanded or Condensed
B		Level(X1X)	
C		Edge(01X)	
D	ON	Hit(100,010,001,101)	
E		Level(010)	
F		Edge(010)	

New SCT Digitization model should be capable for all cases.