Deadtime Analysis Progress

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Trigger Setup

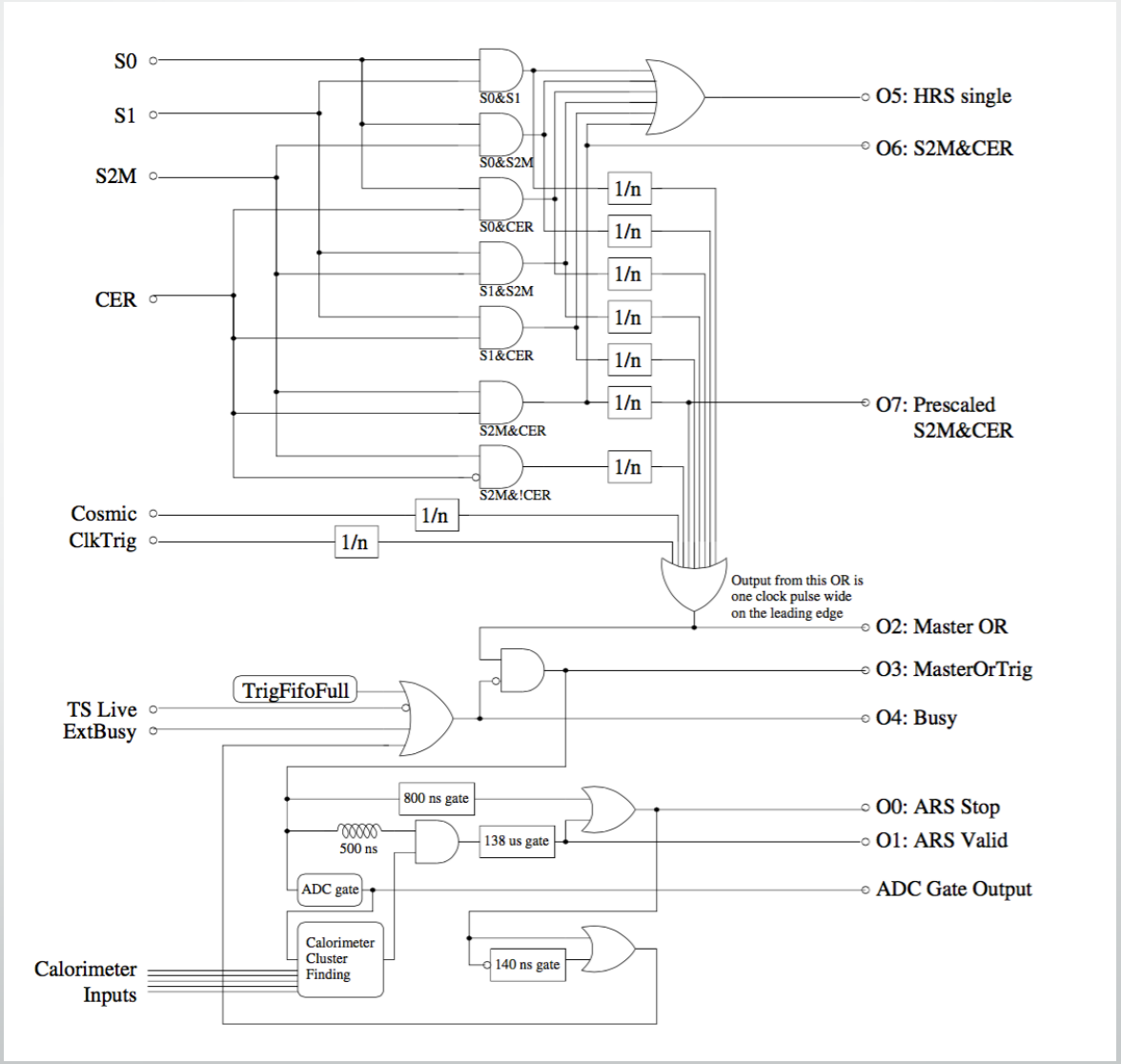
Left High Resolution Spectrometer (LHRS)

S2M&&CER

Analog Ring Sampler (ARS)

if ARS: valid

Master OR (scaler/counter)



- Borrowed from https://hallaweb.jlab.org/wiki/index.php/Trigger

Deadtime Computations

- Looking at scaler rates: live and raw

$$Raw\ rate = Live\ rate \cdot \frac{1}{1 - Deadtime}$$

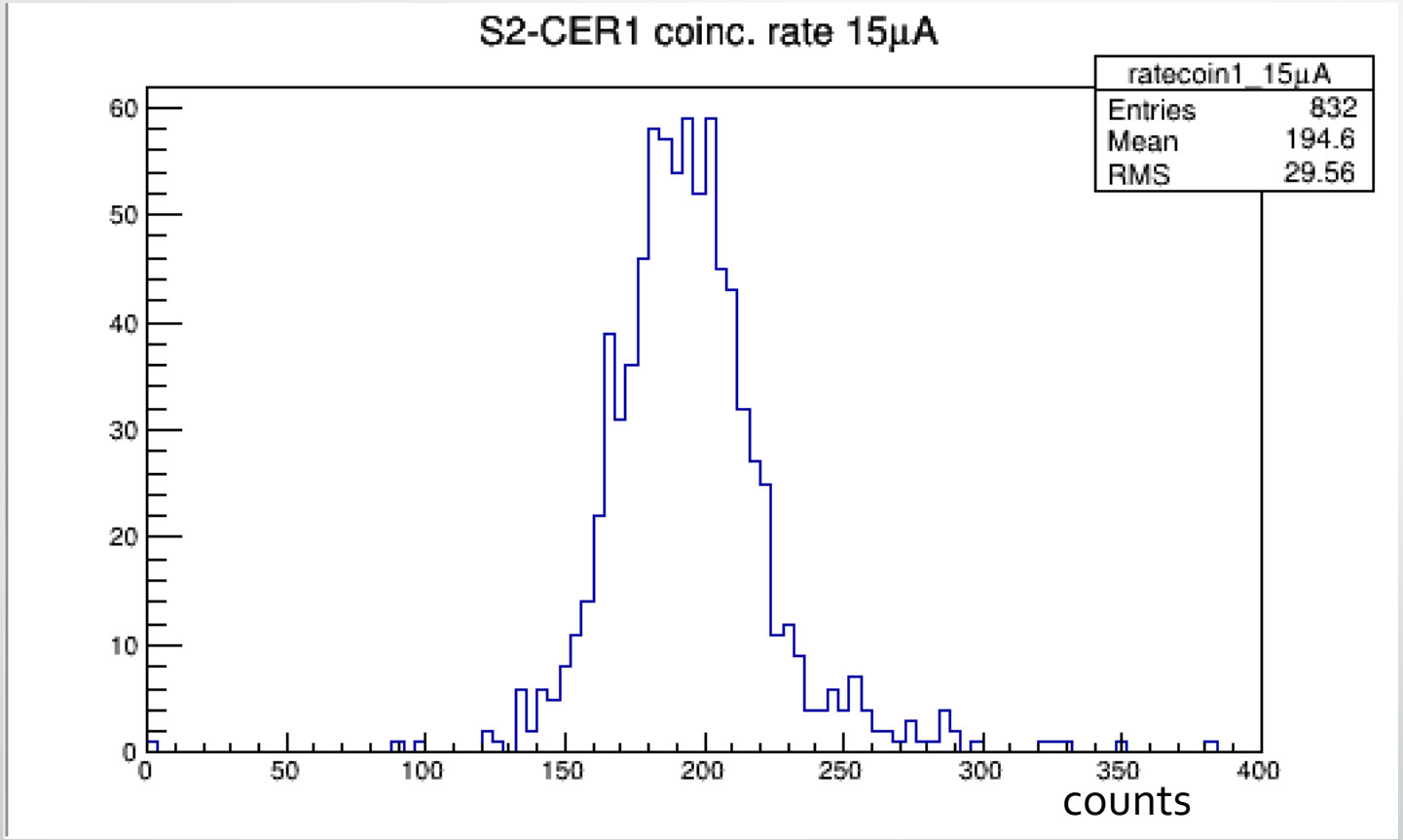
- Livetime and deadtime:

$$Livetime = \frac{Live\ Scaler\ Rate}{Raw\ Scaler\ Rate}$$

$$Deadtime = 1 - Livetime$$

Run#: 13418 (2016)

- Example of a scaler histogram:



- Run 13418 was taken at 3 different currents, 10, 15, 20 μA
- Took mean of each histogram to get live/raw rates

Live and Scaler rates

- Livetime Computations:

I (uA)	S2M LT	So LT	S2M&&Cer LT	Master OR LT
10.61	0.985	0.984	0.983	0.983
15.32	0.976	0.975	0.973	0.972
20.53	0.965	0.963	0.963	0.963

  - Observations: Increasing deadtime with increasing current: current dependence?

- Found current normalized raw rates..and current dependence still present in S2m&&CER, Master OR.

I(uA)	S2m raw norm (Hz/uA)	so norm raw (Hz/uA)	s2m&&cer raw norm (Hz/uA)	Master OR raw norm (Hz/uA)
0	212 Hz	101.8 Hz	13.9 Hz	23.4 Hz
10.61	592	186	11.6	11.5
15.32	591	187	12.1	12.4
20.53	591	186	12.6	12.9

  - First row is pedestal rate which is not normalized, and every other rate is pedestal subtracted.

CODA-based event rates

- Current normalized rates still current dependent, so looking at CODA events now.

I (uA)	S2M &Cer LT	CODA event rate: no cuts(Hz/uA)	Master OR Raw norm (Hz/uA)
0	0.997	16.26 Hz	23.4 Hz
10.61	0.985	9.27	11.5
15.32	0.976	10.26	12.4
20.53	0.965	11.26	12.9

Should be the same!!

- An explanation for this may be the randomly-counting scalers.

Random-counting scalers

- Example of a scan of a scaler, "S2M&Cer live" randomly counting from run 13418.
- Currently looking at more live scalers to see if problem persists.

```
root [6] T->Scan("cptS2M_CER_Live")
************************
*    Row    * cptS2M_CE *
************************
*        0 *          0 *
*        1 *          1 *
*        2 *          3 *
*        3 *          4 *
*        4 *          6 *
*        5 *          7 *
*        6 *          8 *
*        7 *         10 *
*        8 *         11 *
*        9 *         12 *
*       10 *         13 *
*       11 *         14 *
*       12 *         14 *
*       13 *         15 *
*       14 *         16 *
*       15 *         17 *
*       16 *         18 *
*       17 *         19 *
*       18 *         20 *
*       19 *         22 *
*       20 *         23 *
*       21 *         24 *
*       22 *         25 *
*       23 *         26 *
*       24 *         28 *
Type <CR> to continue or q to quit ==>
*       25 *         29 *
*       26 *         29 *
*       27 *         30 *
*       28 *         31 *
*       29 *         32 *
*       30 *         34 *
*       31 *         36 *
*       32 *         37 *
*       33 *         38 *
*       34 *         39 *
*       35 *         40 *
*       36 *         41 *
*       37 *         42 *
*       38 *         43 *
```