ICEBERG Run

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Questions

1. Can individual channel linearity (INL) be measured using pulser data?
2. How precisely can individual channel gain (LArASIC+ColdADC; e-/LSB) be determined using pulser data?
3. What is the optimal gain setting? 14 mV/fC or 7.8 mV/fC?
4. How important is cross talk?
5. What are the optimal ColdADC Vref settings?
6. How can the TPC + Electronics response be calibrated absolutely (MeV/LSB-tick)?
    1. MIP dE/dX
    2. Michel electrons
    3. Ar-39

Pulser Calibration (addresses Q1-5)

- So far, the only type of pulser calibration that has been used extensively uses the LArASIC DACs.
  - This has the advantage that it can be done quickly (with all channels being pulsed at the same time) and allows dead or broken channels to be identified quickly…
  - But the chip to chip variation of response to this type of pulser calibration is large, probably primarily because the DACs vary chip to chip.
- Early in the run, we should try using the 16-bit DAC in the WIBs together with COLDATA switch control to pulse the LArASICs
  - Tests should be done with 1 channel per LArASIC active, 2 channels, …
- We should also try using an external function generator input through the WIB front panel to provide the “DAC” level.
  - This will allow us to indirectly compare the WIB DACs to one another.
- Either the WIB DAC or the external function generator should then be used to:
  - Measure channel gain and noise using (~1000 pulses?) ~8 DAC settings (pulsing all channels in parallel) for all LArASIC settings:
  - 4 gain settings x 4 shaping time settings x 2 output modes (SE or Differential)

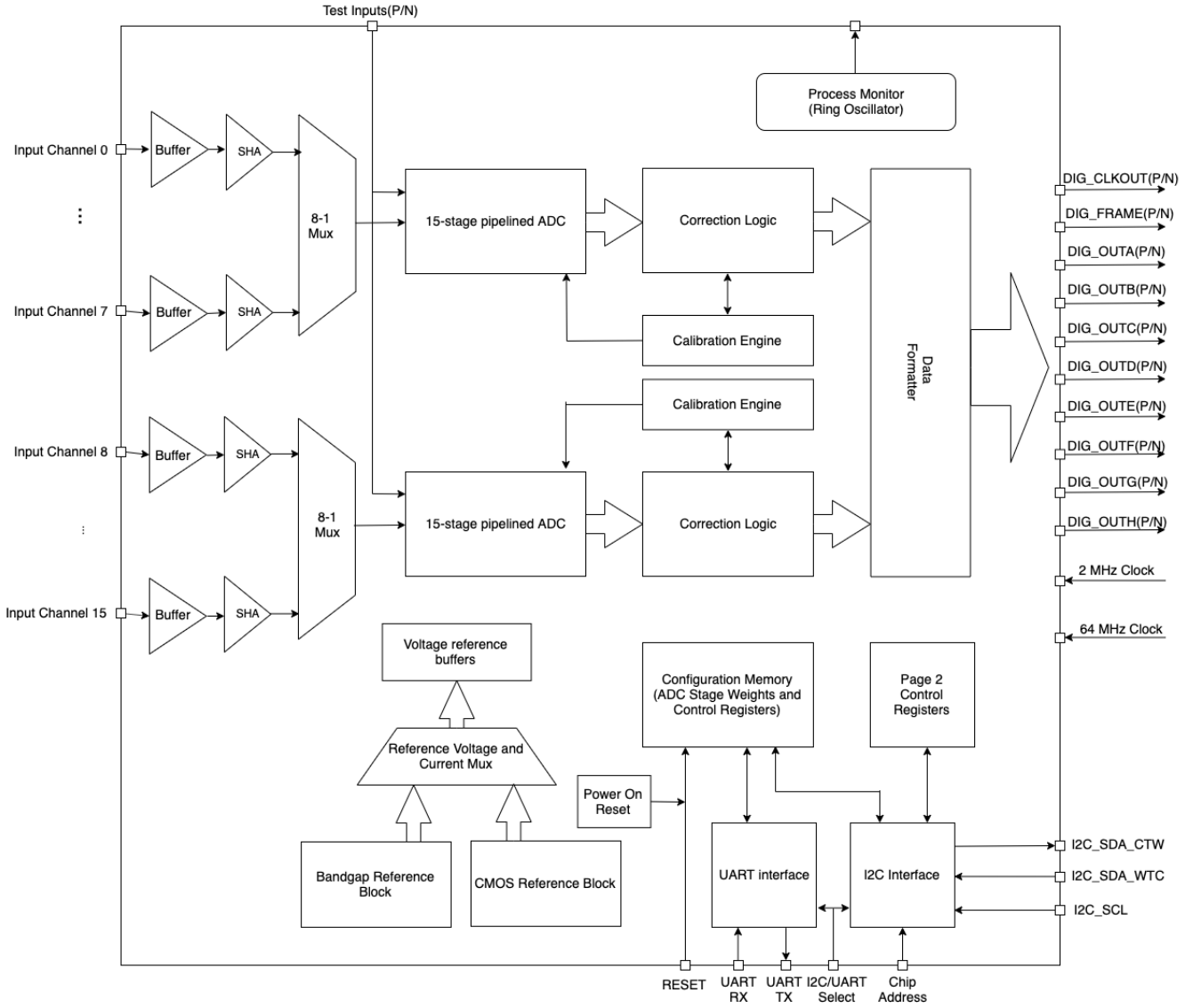
Pulser Calibration (continued)

- Either the WIB DAC or the external function generator should then be used to collect data in an attempt to measure INL
  - 1 Channel per LArASIC at a time (to monitor cross talk); 100-1000 pulses per DAC setting, ~100 DAC settings
  - At least the following configurations:
    - SE, 14 mV/fC; Differential 14 mV/fC; SE, 7.8 mV/fC; Differential 7.8 mV/fC
  - All channels in parallel (to see how much result is affected by cross talk)
- Vref settings should then be adjusted to:
  - Put the collection wire pedestal into a more linear section of the ADC &/or
  - Match ADC range to LArASIC dynamic range (or to linear range)

ColdADC reminder

- Two pipeline ADCs (0-7 & 8-15)
- Input buffers are not used
- Primary control is through 4 reference voltages:
- Vcmi = input common mode voltage
  in SE mode, output of SHA = Vin-Vcmi
- Vcmo = ADC common mode (mid range)
- Vrefp = ADC max voltage
- Vrefn = ADC min voltage

- Default values:
  - Vcmi = 0.9V
  - Vcmo = 1.2V
  - Vrefp = 1.95V
  - Vrefn = .45V
  - Dynamic range of ADC = Vrefp-Vrefn
    default value = 1.5V



ColdADC goals

- Every time ColdADC is reset (or power cycled):
  - Self-calibrate & record W0s & W1s (verify stability over run)
  - I expect these will change if dynamic range (Vrefp-Vrefn) is changed.

- Determine LArASIC dynamic range & linear range
- Consider adjusting reference voltages so that collection view pedestal values are closer to 2000 ADC counts (worst linearity is at the extremes = close to 0 & close to 16383)
- Adjust reference voltages so that the full LArASIC dynamic range is covered, and almost all ADC values are used.

TPC Data

- Horizontal Cosmic Ray Trigger (Scintillators on both sides)
  - Selected tracks can be used to determine response to MIPs
- Stopping Cosmic Ray Trigger? (coincidence of two scintillators on one side??)
  - Is this the best way to try to isolate Michel electrons?
- No trigger
  - Can we implement an online track trigger in the readout server? Cluster trigger?
  - How much data can we write to disk & how quickly can we scan through the data for tracks and/or other activity?