E2E Test Sequence for first two tower tests (a proposal)

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Roadmap to Two-Tower CPT

The goal for this talk is to propose a list of tests for the first 2 towers based on the Event Data Handling Tests recommended by the E2E report

- **The E2E Report provided recommendation for the LAT tests**
  - **Power on Sequencing – was discussed in previous meetings**
  - **Subsystems Tests – were discussed in previous meetings**
  - **Integrated Trigger Tests – under development**
  - **Event Data Handling Tests**

This talk

1. **Baseline Cosmic Ray (BCR)**
2. **Condition Scan CR (CSCR)**
3. **Baseline CR Trigger (BCRT)**
4. **Nominal-Rate CR (NRCR)**
5. **Nominal-Rate Condition Scan CR (NRCSCR)**
6. **CAL Nominal-Rate CR (CALNCCR)**
7. **Baseline CR Data Volume (BCRDV)**
8. **Nominal-Rate CR Data Volume (NRCRDV)**
9. **VDG (VDG)**

Test Description (1)

- Test Assumptions
  - Nominal settings from the Integrated instrument are known (e.g, voltages, DAC settings, timing)
  - Data is taken from cosmic rays unless explicitly stated (e.g. VDG)
- Test Philosophy
  - For the data handling tests we will only vary one parameter at the time while keeping the others fixed at their nominal values

- Baseline Cosmic Ray (BCR) 1 hour
  - Reference data taking
    - nominal settings
    - CAL Zero suppression ON
    - CAL FOUR RANGE Readout OFF
- Condition Scan CR (CSCR) 4x1 = 4 hours
  - Vary thresholds
    - TKR hit threshold (2 settings: min, max)
    - CAL hit threshold (2 settings: min, max)
- Baseline CR Trigger (BCRT) 4x1 = 4 hours
  - Enable only one trigger at the time
    - Trigger inputs are TKR, CAL_LO, CAL_LO (4 MeV), CAL_HI

Test Description (2)

- Nominal Rate Cosmic Ray (NRCR) 6 x 4 x 1.5 = 32 hrs
  - Vary rates overlaying a Poisson distribution
    - Use solicited trigger condition to get rates (0.2, 0.5,1, 2, 10, 20 kHz)
      - Enable TKR trigger only
      - Enable CAL_LO trigger only
      - Enable CAL_HI trigger only
      - Enable ALL trigger inputs
- Nominal-Rate Condition Scan CR (NRCSCR) 2 x 2 x 1.5 = 6 hrs
  - Vary thresholds with ALL trigger inputs enabled
    - Use solicited triggers to overlay a Poisson distribution (5 kHz) – no ACD
      - TKR hit threshold (2 settings: min, max)
      - CAL hit threshold (2 settings: min, max)
- CAL Nominal-Rate CR (CALNCCR) 2 x 2 x 1.5 = 6 hours
  - Enable only TKR trigger and use solicited trigger condition
    - Use solicited triggers to overlay a Poisson distribution (5 kHz) – no ACD
      - CAL_LO threshold (2 settings: min, nom)
      - CAL_HI threshold (2 settings: min, nom)

Test Description (3)

- Baseline CR Data Volume (BCRDV) 1 hr
  - Same as reference test but with CAL zero suppression OFF
- Nominal-Rate CR Data Volume (NRCRDV) 4 x 4 x 1.5 = 24 hrs
  - Vary rates overlaying a Poisson distribution with CAL zero suppression OFF
    - Use solicited trigger condition to get rates (1, 2, 10, 20 kHz)
      - Enable TKR trigger only
      - Enable CAL_LO trigger only
      - Enable CAL_HI trigger only
      - Enable ALL trigger inputs
- Van de Graaff (VDG) 4 x 6 = 24 hrs
  - Tower is positioned horizontally use TKR Trigger with CAL_LO at 4 MeV
    - Nominal settings
    - overlaying a Poisson at 5 kHz with CAL zero suppression off
    - overlaying a Poisson at 5 kHz with CAL zero suppression on
    - High rate VDG (2h) + 4 CR background control samples of 1 h each
      - *Time estimates for VDG tests based on performance of VDG accelerator during EM operations*

- Total Time for Data Handling Tests for 2 Towers
  - 1 + 4 + 4 + 32 + 6 + 6 + 1 + 24 + 24 = 102 hours x 1.25 = 128 hours

25% overhead

Issues

- Can we afford the total time of 128 hours?
  - ~ 8 days for a 16-hour shift
  - ~ 5 days for a 24-hour shift
- Is it sufficient to do these only for the major hardware configurations?
  - 1 tower – because it is the first
  - 2 towers – first time with have a multiple tower system
  - 16 towers – before we put the ACD on
  - Do we want to add any other configuration in between?
    - For example when we add one of the ELX components (e.g. SIU)?
- For future discussion (NOT today), we list, just for the record, some implementation issues
  - If one piece fails at the end of the sequence (e.g. hour 120) do we have to repeat the entire sequence to meet the requirements?
  - For the high rate tests do we know what is the fraction of events to be prescaled because of EGSE limitations? (E2E report suggests 1% to 10%)
    - How does this affect the duration of the data taking?
  - Can we afford to wait a day or two of turnaround from tests that depend on SAS reconstruction?