Special Test Request Form	STR Number 34R2

Part 1 – Test Definition Section

Test Title: **Investigation of trigger requests during dead time with a single CAL Module**	Test Requestor: **J. Eric Grove**

Test Purpose and Justification:

Analysis of muon data from STR33 has revealed that the excess counts in the GEM Discarded counter are the result of spurious trigger requests from CAL-LO and CAL-HI. These requests have a particular time signature. Comparison with data from SVAC runs during 2, 4, and 6 towers indicates that the rate of discarded events is increasing with increasing numbers of towers. Why the rate (or likelihood of occurrence) of these discarded events depends on the number of towers being tested remains a mystery.

The working hypothesis from the CAL group is that these discarded events are the result of pickup of readout noise in the CAL-TEM system. This pickup is independent of the trigger source. Module-level testing has shown that some GCFEs are more susceptible to retriggering than others, so we speculate that the discarded events are another tracer of varying susceptibility. Thus it is important to investigate individual Modules with a GASU (which was not available to the subsystems).

We propose to perform a test similar to STR33 on two individual CAL Modules, prior to integration into the LAT. We will use the GEM periodic trigger to stimulate readout, set CAL FLE and FHE thresholds to their flight values (as in STR33), and allow the CAL-LO and CAL-HI to open the trigger window. We will then vary trigger conditions, thresholds, and readout timing to attempt to characterize the performance of the Modules prior to integration.

We propose that FM117 be tested because it showed susceptibility to retriggering during hot soak in TVAC (see CAL ATDP pages). This test can be performed either before or after flight TEM/TPS installation, as convenient to I&T. We propose that this test also be performed on another CAL Module for comparison. Because the Module-level data provide no a priori reason to select one of the remaining Modules over another, we propose that this selection be based on the convenience to I&T.

Test Description:

Pre-test preparation:

1. Mate flight TEM/TPS per I&T procedure.

2. Execute CPT per I&T procedure.

3. Execute calibDAC per I&T procedure.

4. Execute calibGen per I&T procedure.

5. Execute muTrg per I&T procedure.

6. Analyze calibration data offline and generate DAC settings specified below.

Similar to the four runs of STR33, except trigger is GEM periodic trigger || CAL-LO || CAL-HI. Use 1 kHz period trigger. Steps 2-4 verify the excess trigger source. Steps 5-6 measure the sensitivity to threshold. Step 7 investigates the observed time structure of the discarded events, to test whether they depend on the detailed timing of GCFE readout.

1. Collect 5 minutes of 1-kHz-periodic-trigger data with CAL Module in flight configuration. This is similar to the SVAC End2End run with ID B-2, which was the baseline for the STR33 study.

2. Repeat #1, but do not allow CAL-LO to open the trigger window.

3. Repeat #1, but do not allow CAL-HI to open the trigger window.

4. Repeat #1, but do not allow either CAL-LO or CAL-HI to open the trigger window.

5. Repeat #1, but raise the FLE threshold to maximum (DAC=127) and the FHE threshold to 2 GeV.

6. Repeat #1, but lower the FLE and FHE thresholds to 50 MeV and 500 MeV, respectively, i.e. half their flight values.

7. Repeat #1, but set GCRC delays to maximum values (63, 63, 255), rather than their flight values (31, 53, 133). Note that this makes the CAL deadtime exceed the GEM deadtime.

8. Repeat #1, but lengthen GCRC delays by unique values (+20, +10, +40) to (51, 63, 173). These increments should keep CAL deadtime within existing GEM deadtime, but provide unique increments that may lead to an understanding of the time structure of the discarded events.

GSE Configuration:

EGSE: Current metrology bay test cart

MGSE: CAL shipping container, or metrology bay, or other suitable support stand.

LAT Configuration:

Single CAL Module (FM117, then another Module) with EM GASU. TEM/TPS should be flight.

Expected Results/Acceptance Criteria:

Offline results: Analysis of retriggering rate and time structure using s/w tools developed for STR33.

Acceptance criteria: Data taking completes.

Expected Duration:

24 hr (including analysis) for pre-test prep. Test duration: 4 hr including setup

Expected Analysis Duration:

1 day

Test Procedure:

Based on STR33.

Test Script:

Based on STR33.

Part 2 – Impact Assessment Section
Procedure development: Write down the steps in the work order; use existing procedures for tests.
Script development and checkout: Need schema for FM117 and the other calorimeter under test (we need this anyway for standard metrology bay tests). Need 7 new test configurations which will require new e2e csv files, timing delay schema, and discriminator threshold schema.
Impact to schedule: Metrology bay tests will take 10 hrs instead of 2 hrs for 2 CAL modules (FM117 and another one of I&T's choice).
Risk Assessment: No significant risk
Required Resources: • 2-hrs of Brian Grist to write the work order • 8-hrs of online person to create the csv files, discriminator threshold schema, validation, and installation. • 16-hrs of test conductor person for additional metrology bay test time • 4-hrs of test conductor/operator/QA for LAT test
Other Affected Parties: CAL team – offline analysis of metrology bay data (calibGenCal) to determine the discriminator settings at the requested energy thresholds, and also analysis of data for results and post-test report.

Part 3: Signature Approval:

Required Authorizations	Printed Name	Signature	Date
Quality	Joe Cullinan	(Signature on file)	9/7/05
I&T	Elliott Bloom	(Signature on file)	9/6/05
Program Office	Lowell Klaisner or Dick Horn	(Signature on file)	9/7/05
Systems Engineering	Pat Hascall	(Signature on file)	9/6/05
Affected S/S managers	N/A		
Instrument Scientist	Steve Ritz or Eduardo do Couto e Silva	(Signature on file)	9/6/05
Calorimeter	Neil Johnson or Eric Grove	(Signature on file)	9/6/05
DAQ	Mike Huffer	Verbal approval for Rev 2	9/6/05
Other	N/A		
Other	N/A		