



# *Progress of Energy-sum Testing*

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# Energy-sum Testing: Hardware

Participants of tests at RAL Lab 12, 12-16 Jan 04:  
Bruce, Murrough, Steve, Norman, Cano, Uli, Stefan R., Ian,  
Weiming, Jürgen

Hardware overview:

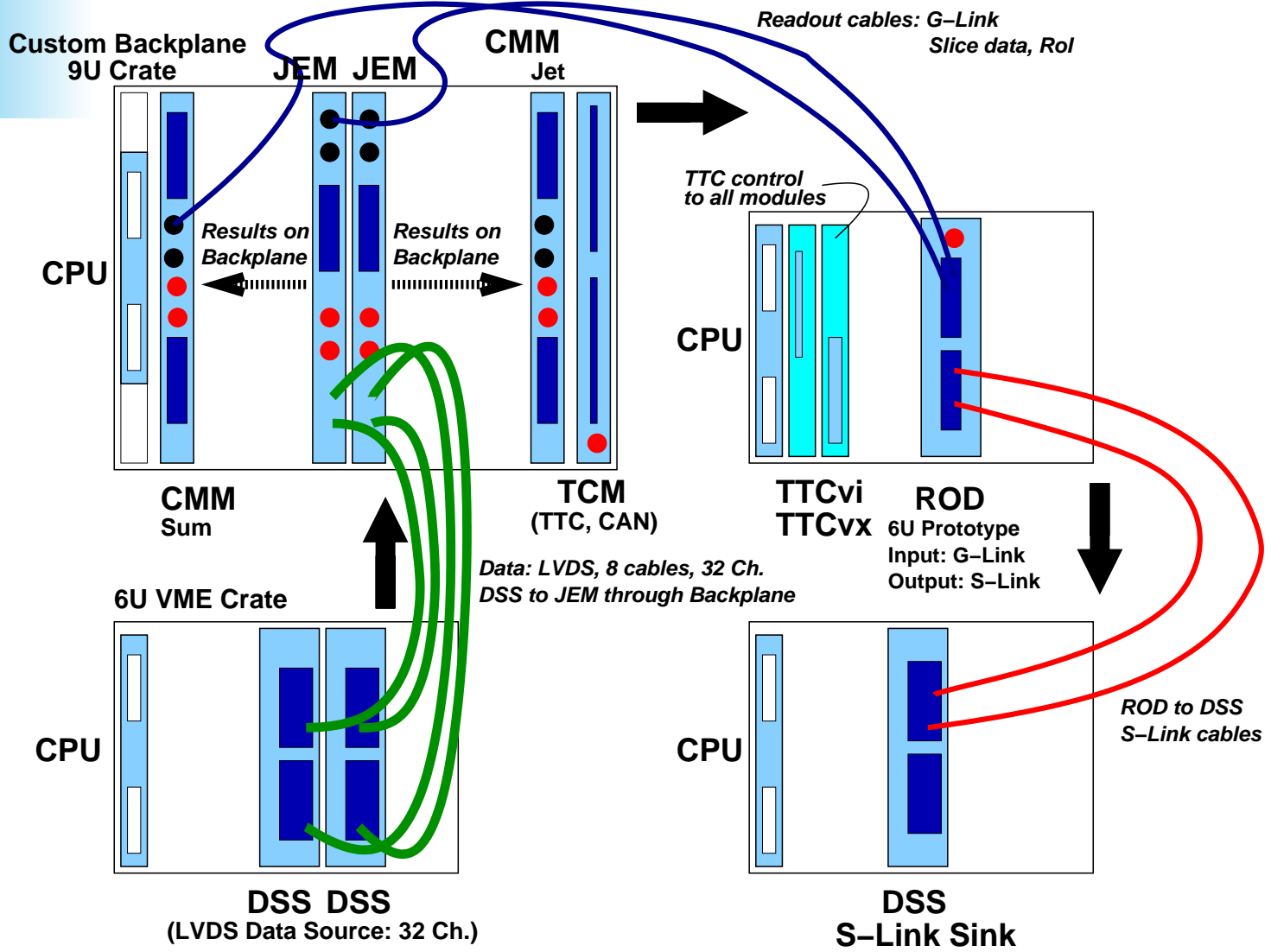
- **Hardware problem of JEM G-Links** fixed:  
Source and sink did not use same termination circuitry, both G-Link transmissions from JEM work.
- **Two JEMs tested: JEM 0.1 and JEM 0.2.** Updated firmware to prevent configuration problems (FPGA done pin actively driven).
- **Two CMMs tested** with Energy-sum firmware
- **32 LVDS source channels available** from two DSSs

# *Energy-sum Testing: Simulation*

## Simulation news:

- **Generators** to produce test vector inputs for playback memories of JEM and CMM, various pattern options (e.g. quad-linear encoded for CMM, special random patterns, useful ramps).
- Adapted slightly changed summation tree in JEM.
- No '**LVDS/DSS to JEM Generator**' used in test then, ready now.

# Readout Test: Setup



# Readout Test of JEM: Results

- Synchronisation of JEM's spy memories to readout chain not possible: Needs TTC 'short command', those are not seen on JEM (old TTCrx ?). Therefore use **LVDS from DSS** as source.
- Readout test of **slice data only**. Energy-sums copied in place of jet algorithm results.
- Simulation matches output stream, also for multislice.
- Overnight test running 2 slices and 210 ticks between slices accumulated **300.000 events** before failure (cause unknown, ROD ?)
- Minimum time between L1As: 106 ticks (JEM: 89, ROD: 16 - see *Weiming's talk*). Scan performed for all numbers of slices foreseen (up to 5).

Setup working reliably

Long overnight test of readout chain performed for the first time.

# Tests of JEM with CMM/Energy-sum: Setup

- **CMMs on both sides of crate:** right one set to Energy-sum crate merger mode, left one set to Energy-sum system merger mode (forced geographical addressing, overriding automatic firmware selection)
- JEMs send energy-sums to **both sides** , so there are four JEMs in the system effectively.
- Small program to **dump all spy memories** from CMM/Energy-sum, CMM simulation output added in same format. Simulation did not use two-complement representation of negative values, quick patch made for tests, now properly done.

# Tests of JEM with CMM/Energy-sum: Results

- Simple pattern (binary counter ramping up to 15) from JEM generator used to fill the two JEMs' playback memories.
- Spy memories are **very sensitive** to clock adjustment, e.g. Crate Input spy memory: Total Ex and Ey are shown as expected, but not ET. Was Firmware problem, now identified.
- When JEMs are put into slots in different quadrant, **Sum-Ex and Sum-Ey add up to zero** as expected.
- Sum-ET thresholds can not be set. Problem not found in firmware ! Software ?
- Final CTP bits not properly checked yet. Initial ET-miss values sensible. Firmware still sends encoded CTP bits, now to be send unencoded.

# JEM Simulation: Generator for 'Nice Jets'

- Mode option for JEM input playback memory generator.
- Two 3D gaussian-distributed energy depositions in core region.
- Maximum ramped up to range limit (Mode '9') → Ramping through jet thresholds.
- Electromagn. deposition half of hadronic deposition (dummy energy sharing).

Input FPGA		eta 1	2	3	4		
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	3	31	3	0	0
7	0	0	31	241	31	0	0
6	0	0	3	31	3	0	0
5	0	0	0	0	0	0	0
4	0	0	3	31	3	0	0
3	0	0	31	241	31	0	0
2	0	0	3	31	3	0	0
1	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0



# *Next Tests: Week of 9-13 February*

- **Main issue: match jet algorithm with simulation** with help from Sam and Attila. Use 'nice jets' generator and ttbar physics test vector. Setup already tried yesterday.
- When simulation matches: Test **Slice Readout** again with real jet multiplicities, then try **Rol Readout** . Rol stream contains explicit location information (direction issue), need to check with offline algorithm.
- **CTP bits from CMM/Energy-sum** not yet properly tested.
- **Integration** using new 'LVDS/DSS to JEM generator' and neutral ROD format firmware for CMM with simulation to test full chain. (LVDS → JEM → CMM → ROD)

- **Physics test vectors:** Replacement for old Atlfast-Fortran runs: Dump Jet Elements and Trigger Towers from `TrigT1Calo` interfacing `Atlfast-Athena`. Started with help from Alan.
  - Generator option to read file into JEM playback memories now available, therefore format fixed
  - Prefer fast simulation to set PYTHIA kinematic settings very high to achieve high occupancy of high energetic jets. For development, standard fully simulated tt-files can be used.
- **Saturation:** Scheme withing Energy-sum Merger not yet properly implemented.
- **Database settings:** Interface all settings from database (general thresholds, eta/phi masks and FIO masks).