



TLU v0.2



Outline

- Test-beam experience of TLU v0.1
- TLU v0.2 hardware
- Hardware status
- Plans.
- Conclusions.



Test-beam Experience

- TLU used at JRA1 beam-test at CERN
- Concept “works”
- Bugs to fix in firmware
 - Trigger number readout broken in fixed-latency version.
- Enhancements
 - Pre-veto trigger counters (Bonn “fix” ported back to repository)



TLU v0.2 Hardware

- Four sets of “Lemo” I/O connectors for DUT
(increased from two)
 - Two sets NIM level I/O
 - Two sets TTL I/O
- BUSY inputs can be switched between Lemo and RJ45 under s/ware control (was solder-bridge)
- All outputs can be turned on/off under s/ware

control

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TLU v0.2 Hardware

- Connector added for future daughterboard to provide clock and control signals to Calice clock-and-control module
- I2C buses added for slow I/O – easily expandable.
- More LEDs for diagnostics
- Connectors added for switches and LCD display
 - Stand-alone operation would need modifications to FPGA board.
 - Would need substantially more firmware.



Hardware Status

- Three modules manufactured.
 - Minor bugs: Correctable by-hand but time-consuming
- Bug fixed version going for manufacture soon (O(days))
 - Switchable termination and thresholds on Lemo I/O removed to reduce cost.
- Firmware ready
 - ... but has same bugs as v0.1
- Software modifications needed for I2C



Future Hardware Updates

- Interface to Calice clock and control (C&C) unit
 - Implemented as daughter-board.
 - Could be added to existing TLU v0.2 (needs new front-panel)
 - Work won't start until requested by other groups.



Future Hardware Updates

- Possible replacement of existing 15V supply for photo-multipliers.
 - Include adjustable control voltage and ADC monitor
 - Interface by I2C.
 - Easy to upgrade existing TLU v0.2



Future Hardware Updates

- Make RJ45 <--> Lemo interface boxes
 - Similar units – Lemo as well as TTL
 - Could then use all six DUT interfaces with Lemo.
 - Will also include DUT_CLK line.



Firmware Updates

- Option for DUT to initiate “busy” by raising DUT_CLK line (outside a trigger/busy handshake sequence).
 - “compile-time option”
 - Removes race condition where DUT raising BUSY and then thinks it has suspended triggers and *simultaneously* TLU sends trigger and thinks that BUSY is raised in response.



Firmware Updates

- Option to switch DUT from “trigger/busy handshake” mode to “receive triggers only” mode.
 - Useful for debugging.
 - Not yet implemented, but minor change.
- Improve documentation.



Future Firmware Updates

- Code needs a substantial tidy up
 - Code for interface hardware (EZ-USB chip) completely mixed with TLU specific code.
 - Factorize to make it easier to add new modules.
 - Make it easier to run simulations of TLU specific code – fewer bugs before release (probably!)



Conclusion

- TLU is still being developed.
- Has potential to interface to Calorimeter.
 - daughterboard to support this would be low cost/effort.
 - Need to check if any combination of Calorimeter and beam-telescope / TPC / actually want to run jointly.....
- First priority is to manufacture more TLU v0.2 and fix firmware bugs.