

OTMB Upgrade Considerations for MEx/1 and GE2/1

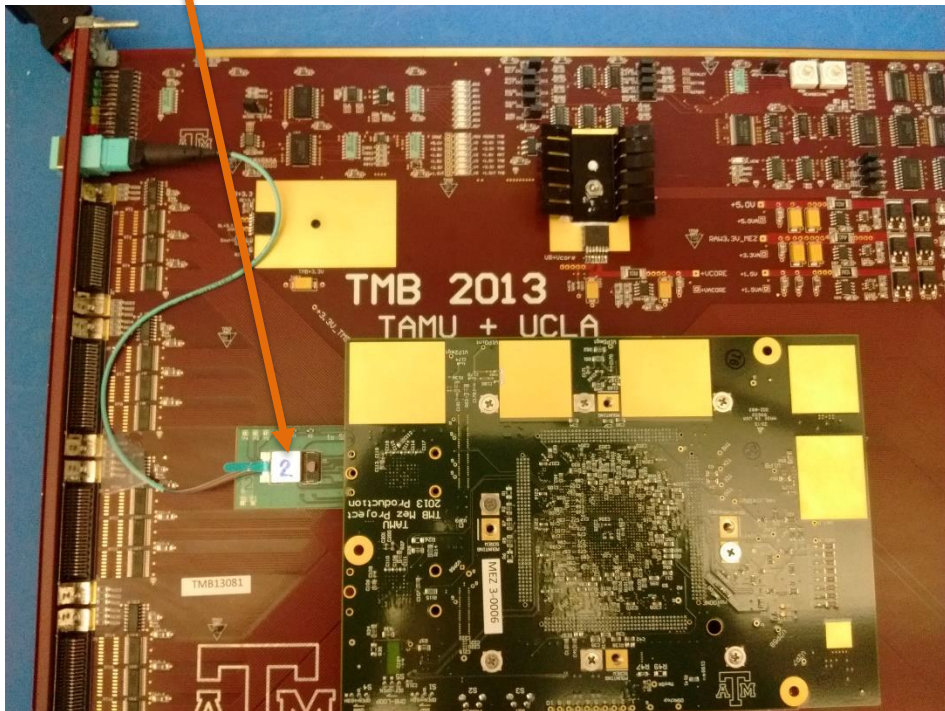
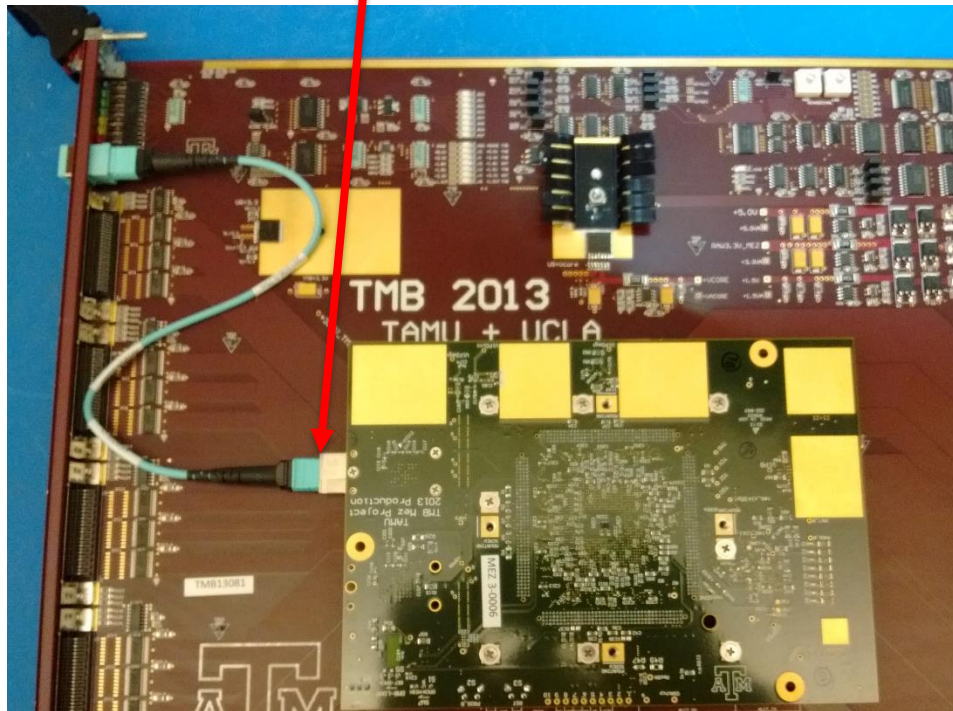
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OTMB Upgrade Requirements for MEx/1

- New OTMB design nearly unchanged from LS1 board
 - Consider removing unused SkewClear connectors on front panel
 - Replacements for obsolete parts on Mezzanines
 - MIC49500WU by Micrel → MIC49500WR from Microchip
 - Snap12 by Reflex Photonics (\$540) → Firefly from Samtec (\$260)

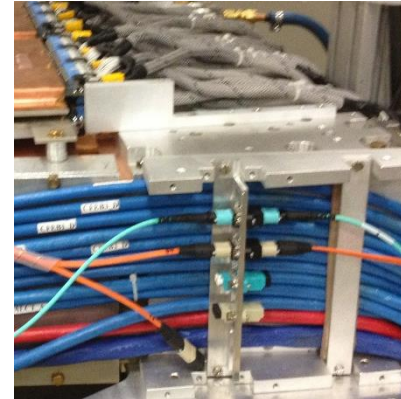


OTMB Hardware Development Plan

- We propose to build 125 new boards with basically the 2013 design
 - MEx/1 requires 108 new OTMBs (baseboard + mezzanine), add 17 spares
 - Recall that 2013 production was 87 boards (72 + 15 spares)
- Staying with the XCF128X Xilinx Proms for OTMB
 - Fastest-FPGA-programming solution using a single PROM chip
 - Radiation durability is good for the P. Crate region
 - Allows us to keep new and old OTMB designs compatible
 - Easier for software support and maintenance
 - Old and new OTMBs can be interchangeable, with one common pool
 - We already bought 160 of them 2 months ago
 - Use 125 for production and a few for prototypes: and 25% spares
 - Can be used for repairs on new OTMBs and also old 2013 OTMBs
- Now consider options to connect GE2/1 fiber with OTMB

Fiber Considerations: GE2/1 → ME2/1 OTMB

- The routing from GE2/1 on YE1 to the YE2 disc is planned, but the connection to ME2/1 OTMB needs to be defined
- Recall the GE1/1 → ME1/1 interface
 - GEM trigger fibers ~1m long connect from OH board to a patch panel at the ME1/1 CSC, where GEM fibers are naturally linked into the available CSC fanout & trunk lines



- Analogy for GE2/1 → ME2/1, on separate discs
 - GEM trigger fibers ~40m long connect from OH board to an “adapter” located near the ME2/1 CSC, where GEM fibers are naturally linked into the available CSC fanout & trunk lines
 - Cost is small, just additional length of fiber: likely \$50 per OTMB
 - This inexpensive, naïve plan should work, but a few concerns...
 - The latency going all the way to ME2/1 is a few BX longer than taking a more direct route to OTMB at the P.Crate
 - The routing of a few fibers all the way to ME2/1 will take some space

GE2/1 → ME2/1 OTMB, Fiber Option #2

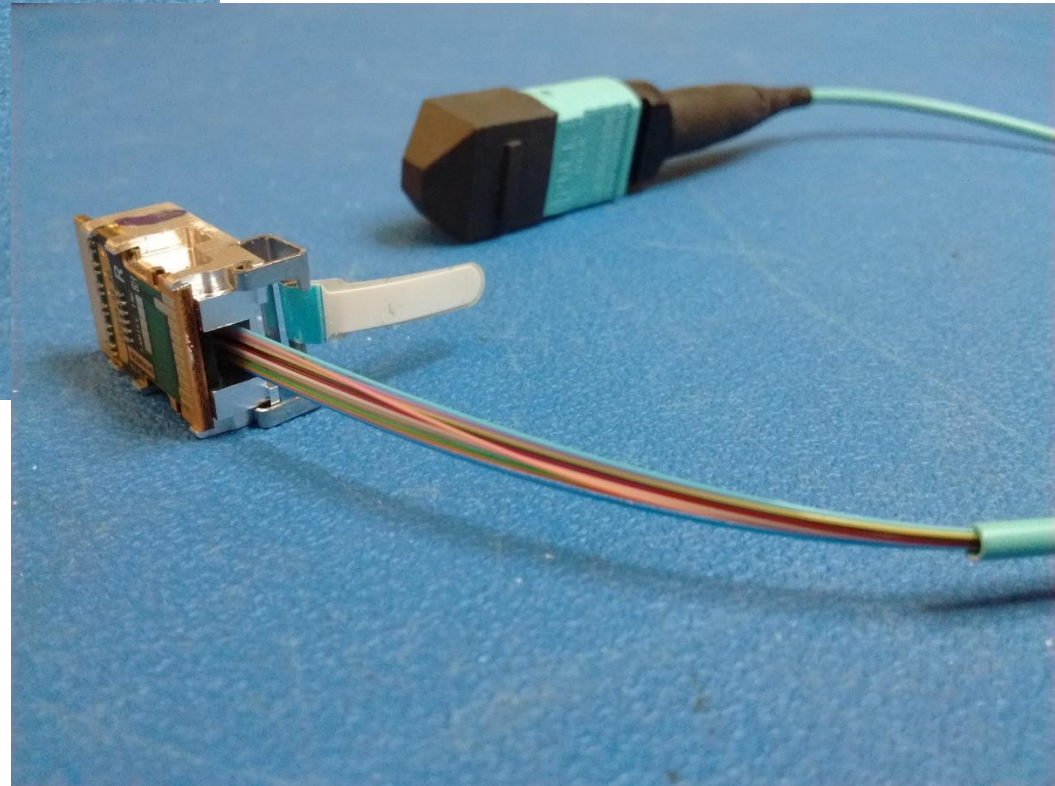
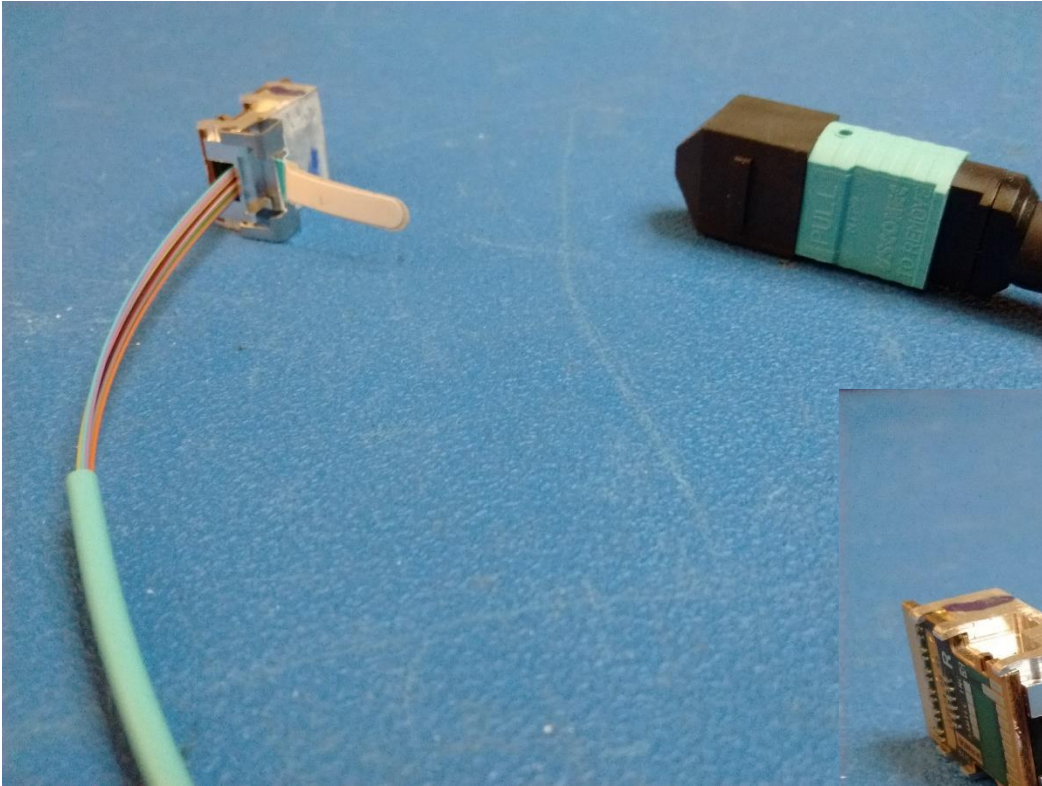
- We can consider an option to connect the GE2/1 fibers to the OTMB near the P.Crate, without modifications to the OTMB
 - Requires a custom “Y” patch fiber with MTP terminations, plus adapters to link CSC and GE2/1 fiber bundles into it
 - Cost: \$200 per OTMB est.
 - Assumes GEM MTP termination, possibly cheaper with LC
 - These fiber bundle assemblies must somehow hang in front of the P.Crate OTMBs
 - One branch for CSC links
 - Another for GEM links
- Mechanically awkward
 - How to do this safely?
 - Strain relief, etc
- Guidance required...
 - CSC ops expertise
 - GEM route plan from YE1
- Adds a CSC fiber interface
 - Slight light loss for CSC



GE2/1 → ME2/1 OTMB, Fiber Option #3

- Somewhat similar to Option #2, but install “Y” branch on OTMB Firefly ribbon, behind the front panel
 - Requires mechanical mods on the OTMB, to install another MTP front panel adapter
 - 5 fibers routed to one trigger port, 7 fibers to the other
 - May still maintain compatibility with ME1/1 OTMBs from 2013
 - But no obvious way to fit an extra adapter on front panel ☹
 - Idea 1: remove some LEDs: not recommended
 - Idea 2: remove all the SkewClear cable connectors
 - This could OK, since motivation for old TMB compatibility is gone
 - Frees up 75% of the OTMB front panel area
 - » New OTMBs would be obviously different
 - » Possibly still swappable with older OTMBs
- Requires a customized version of the Samtec Firefly
 - They can probably split the ribbon into two MTP connectors
 - 5 fibers to one MTP and 7 fibers to the other
 - Cost: extra \$100 per OTMB est.

Firefly Ribbon Detail



OTMB Mezzanine, a Small Redesign for LS2

The FPGA: XC6VLX240T-1FFG1156C

Virtex-6 FPGA + PROM

Cern QPLL

GE2/1 → ME2/1 OTMB,
Fiber Option #4

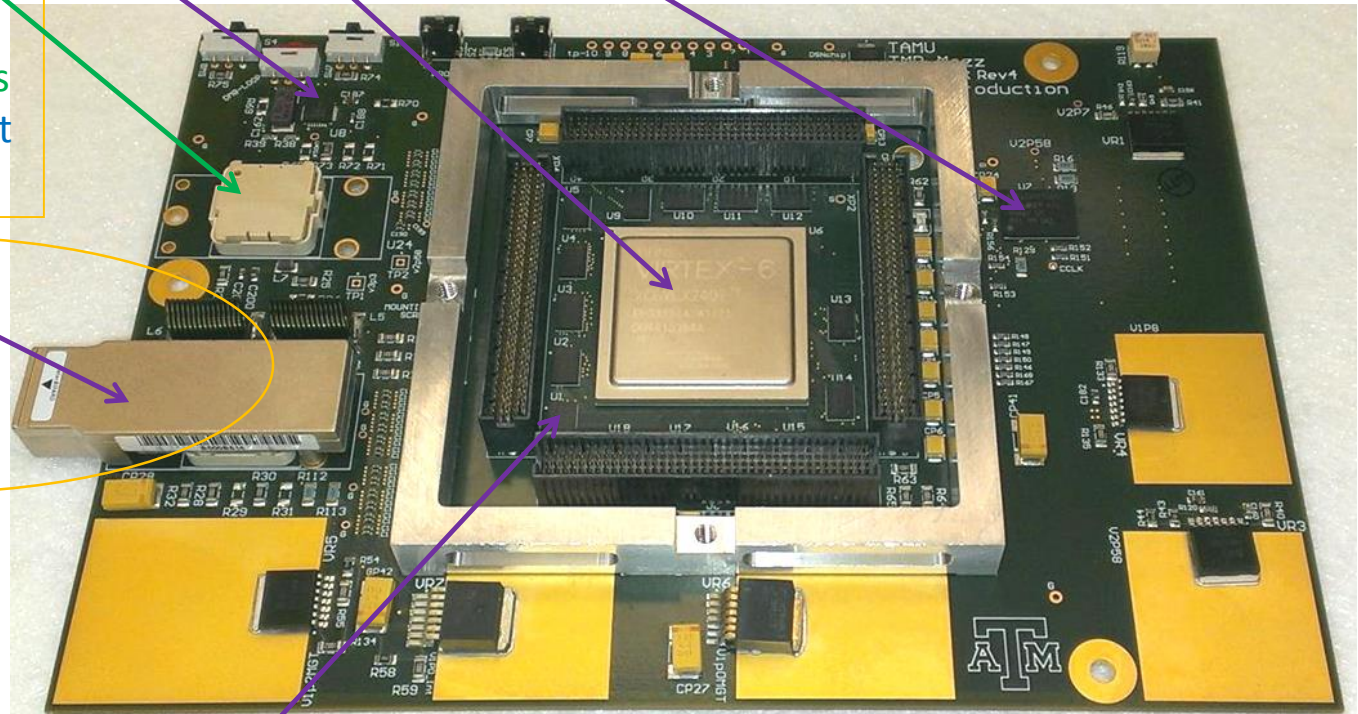
- Replace this Tx with Rx
- Gain ~10 extra receivers
- Requires extra MTP port on OTMB front panel

Snap12 Fiber Receiver
- 12 fibers from CFEBs,
GEM, rated at 3.5 gbps

Obsolete part,
replace with Samtec
FireFly Rx

I/O Voltage-level shifters, 3.3 V to 2.5 V

PCB Dimensions: 7.5" long by 5.25" wide
11 mm clearance from TMB base board



GE2/1 → ME2/1 OTMB, Fiber Option #5

- A rough idea in the early stage...
- Somewhat like a combination of Options #2 and #3
 - Use just one 12-fiber cable from DCFEBs for ODMB and OTMB links
 - 5 fibers for ODMB, 7 fibers for OTMB
 - Terminate these at P.Crate with a “Y” branched fiber into 2 MTP connectors
 - The DCFEB signals here effectively branch “out” rather than in
 - The ODMB branch plugs into MTP port on ODMB
 - The OTMB branch plugs into to one MTP port on OTMB
 - Note that the GE2/1 branch plugs into the other MTP port on OTMB
- This concept should maintain compatibility with ME1/1 OTMBs from 2013

A Few Words on OTMB Schedule

- A brief outline, as I understand it...
- Later this year: build new OTMB prototype
 - Baseboard and Mez, 2 each?
 - Testing completed November-December
 - ESR?
- Next year: OTMB production during spring 2019
 - Production testing to follow
- Deliveries to CERN begin summer 2019
 - Final shipments to Cern in August 2019
 - Fully tested + retested OTMBs at Cern
 - Ready for installation October 2019