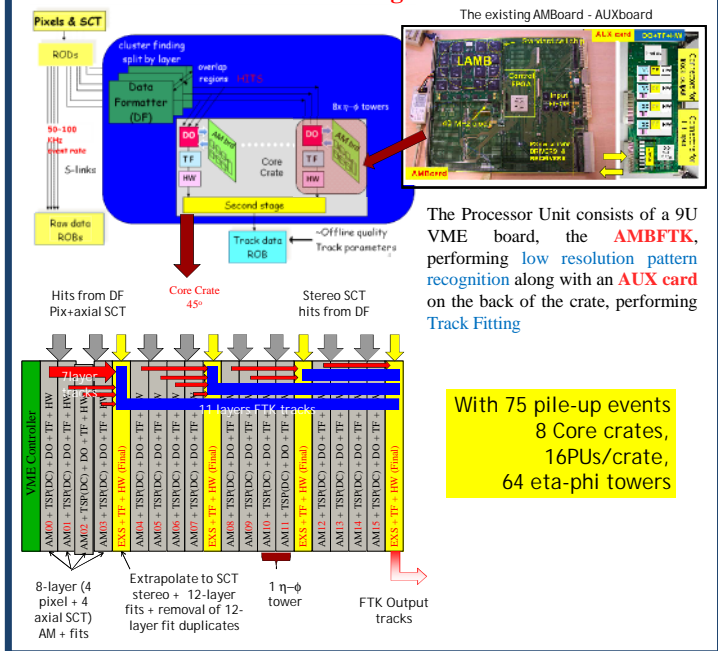


The First Prototype for the FastTracker Processing Unit

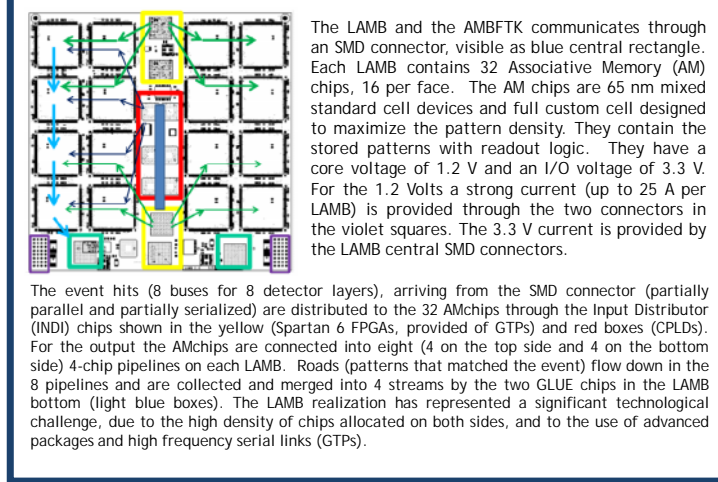
A. Andreani, A. Annovi, M. Beretta, M. Bogdan, M. Citterio, F. Alberti, P. Giannetti, A. Lanza, D. Magalotti, M. Piendibene, M. Shochet, A. Stabile, J. Tang, L. Tompkins
on behalf of the ATLAS TDAQ Collaboration



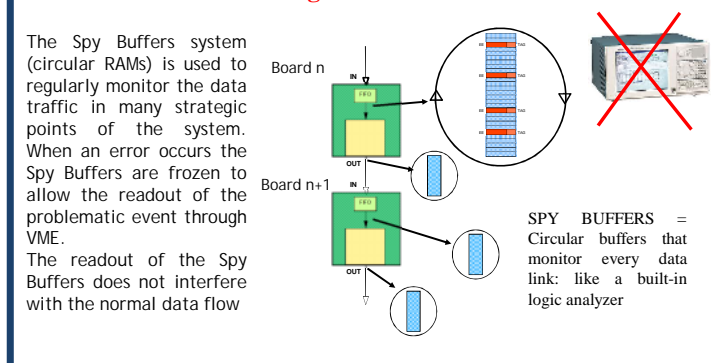
FTK Functional Diagram & Architecture



The LAMB



Monitoring the data flux



The Processing Unit

The Processing unit is composed by the AM board (equipped with 4 Lambs) and the AUX board. The AUX board provides hits of 8 detector layers on 8 buses for a total of 12 Gbits/sec to the AM board through 12 high frequency serial links (red arrows) and will sink the found roads through other 16 high frequency serial links (24 Gbits/sec, blue arrows).

AMB board Serial links AUX board

Proto AMBoard Proto AUX

Backplane VME

Custom shape for good contact at P3

A special P3 connector allows the communication between the front and rear boards placed on the same VME slot. A custom board profile has been studied and simulated in the CAD to guarantee a perfect board-to-board closure of the P3 connector without a backplane support in that region

The AM board

A network of high speed serial (red) and parallel (green) links characterize the bus distribution on the AMBFTK. A huge amount of detector clusters ("hits") must be distributed (input chips in the central red box) at high rate with very large fan-out to all patterns (10 Millions of patterns will be located on 128 chips placed on a single board) and a huge amount of roads must be collected (output chips in the blue box near the P3) and sent back to the FTK post-pattern-recognition functions on the AUX rear board.

The AUX board

The AUX card will contain multiple high-level functions: Data Organizer (DO), Track Fitting (TF) and Hit Warrior (HW). All these functions will be implemented in powerful FPGAs. The AUXboard (mounted on the back of the VME backplane) communicates with the AMboard through the P2 connector (slow control). A high speed P3 connector is used to transfer data from/to AMboard. A prototype of AUXboard is ready for testing high speed serial links (GTPs) with the AMboard

AUX board prototype

A 2 kg board needing 100 A at 1,2 V

The AMboard needs a lot of power! Each LAMB equipped with 32 Amchips needs up to 25A of current @1,2V!

This strong current is generated from 4 DC-DC converters (red boxes in the picture), one per Lamb, that convert 48V in 1.2V.

A custom VME backplane (with 4 pin at 48V) is necessary to bring enough current @48V to power the DC-DC converters.