

For WorkShop 2006.04

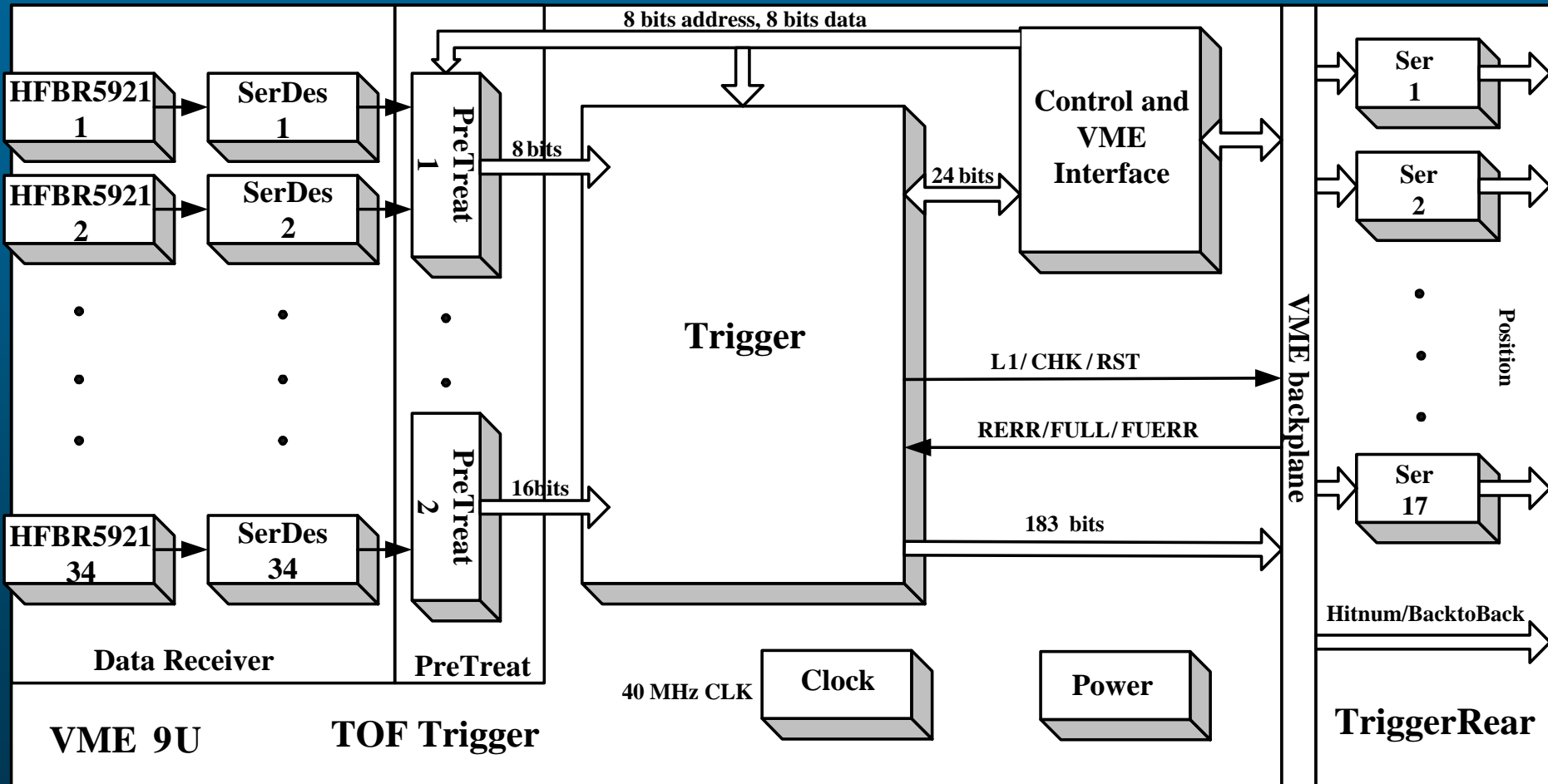
Test of TOF Trigger Electronics

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04/23/2006**

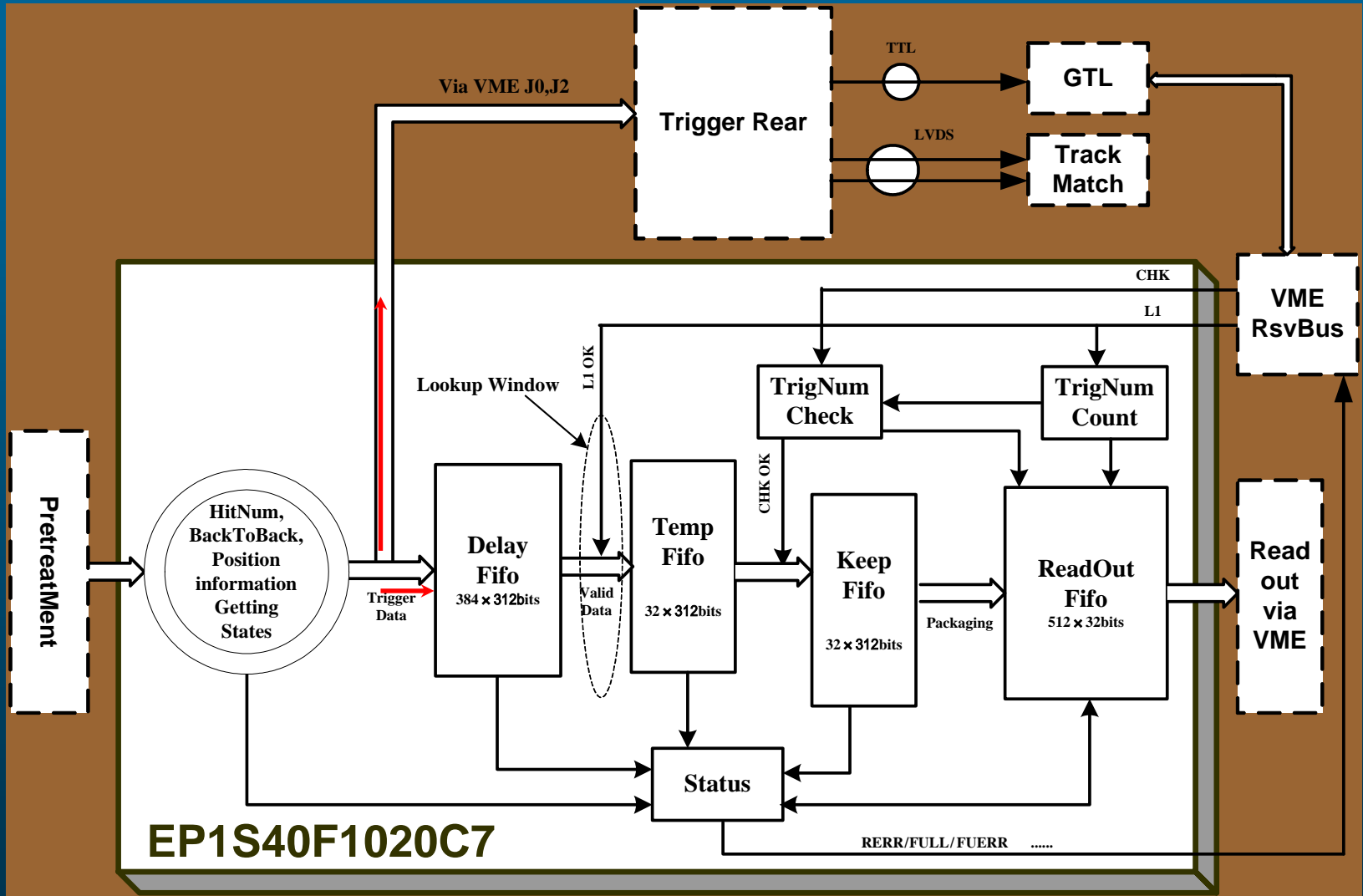
Design Progress of TOF Trigger

- **Summer of 2004:** The PCB layout was finished.
- **Summer of 2005:** TOF Trigger System has been tested successfully according to the primal requirements.
- **Workshop 2005.10:** New targets has been put forward. Lots of the logic of TOF trigger system needs redesigned.
- **January 2006:** Design of the New system was completed. Tests with the simulation data testified our logic.
- **This term till now:** Further tests have been carried out ...

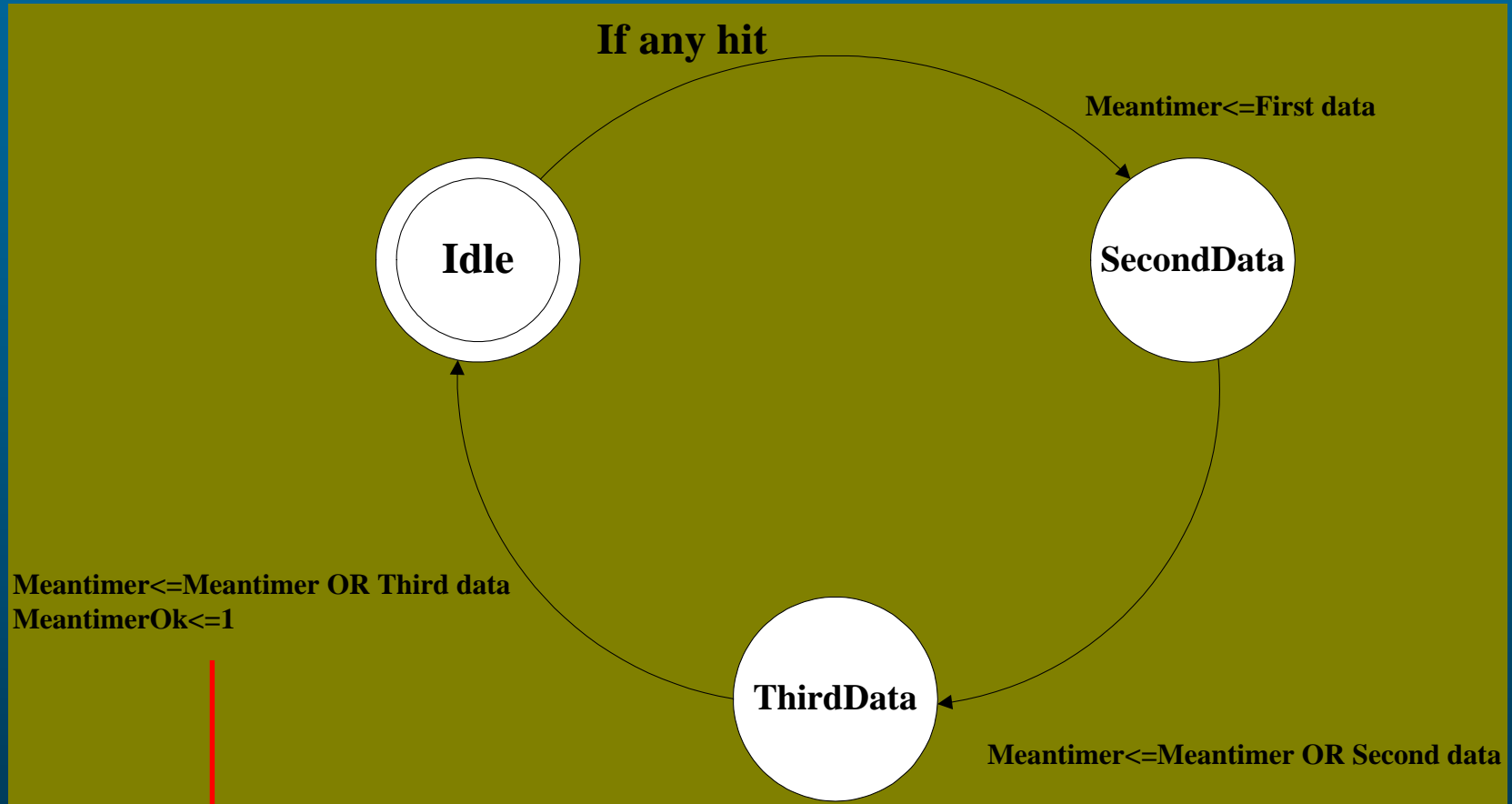
Description of the TOF Trigger



Performance of the Trigger logic



How to get Hitnum/BacktoBack/Position



There still needs 2 clocks to generate the Hitnum/BacktoBack/Position information...

One trigger deal example:

Use the barrel for example, 1 means there is a hit:

| Clk \ Num | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------|---|---|---|---|---|---|---|---|---|
| 41 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| 42 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 168 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 169 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Hitnum of barrel: ≥ 2
Backtoback of barrel: 1
If only inner layer, then
Hitnum of barrel: 1
Backtoback of barrel: 0

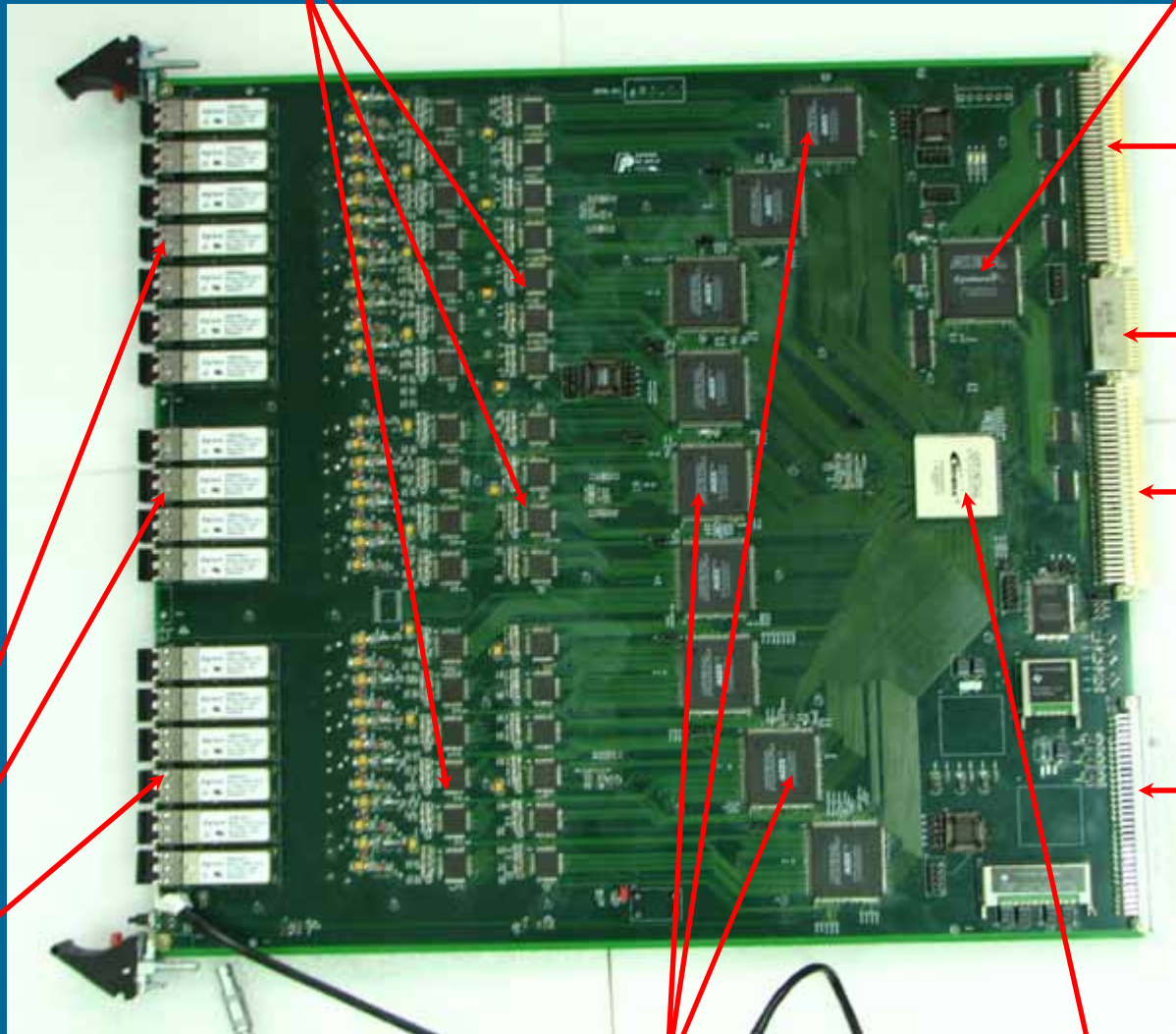
Hitnum of barrel: =1
Backtoback of barrel: 0
If only inner layer, then
Hitnum of barrel: 0
Backtoback of barrel: 0

Modes of trigger logic

- ❖ Normal working mode
- ❖ Online check mode
- Normal processing mode
- Test processing mode
- ✓ Both layers mode
- ✓ Only Inner layer mode
- Normal L1 mode
- Self generated L1 mode
- Normal read mode
- Self control read mode

TOF Trigger module

TOP:



Ser/des

Control/VME interface

VME P1

VME P0

VME P2

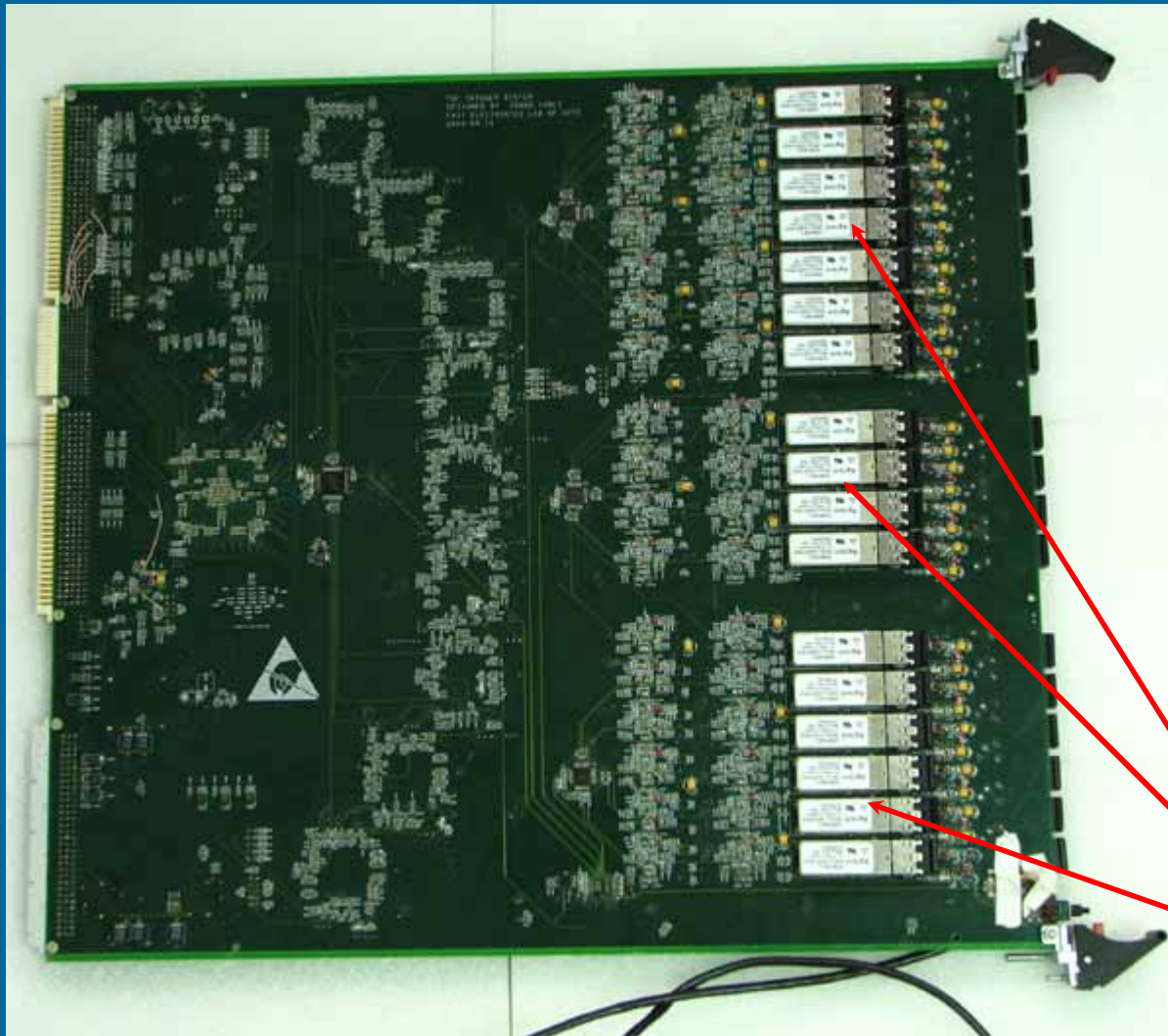
VME P3

Fiber interface

Pretreatment

TriggerLogic

Bottom:



Fiber interface

Tests of this term

Tests with the FEE Rear module;

Tests of the online-check mode working;

Tests with the Trigger Rear module;

Tests with the fast control module, clock fanout module and Trigger Rear module.

Tests with the FEE Rear module

VME P0

VME P2

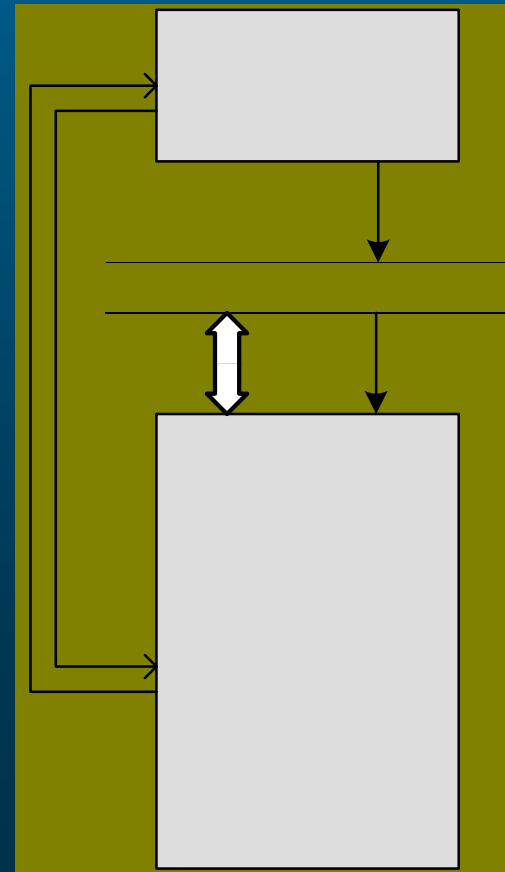


Fiber Interface

Tests with the FEE Rear module

- TOFFEE Rear module is inserted into the the same slot behind TOF Trigger module;
- TOFFEE Rear module gives out the Meantimer through a 20m fiber.
- The Meantimer data is preset at the TOFFEE Rear module. A state machine controls the discontinuous data transfer.
- L1 is supplied by the TOFFEE Rear module, as is specified.

- ❖ Data transfer is OK;
- ❖ PretreatMent is OK;
- ❖ Hitnum/Position information is OK;
- ❖ CBLT is OK;

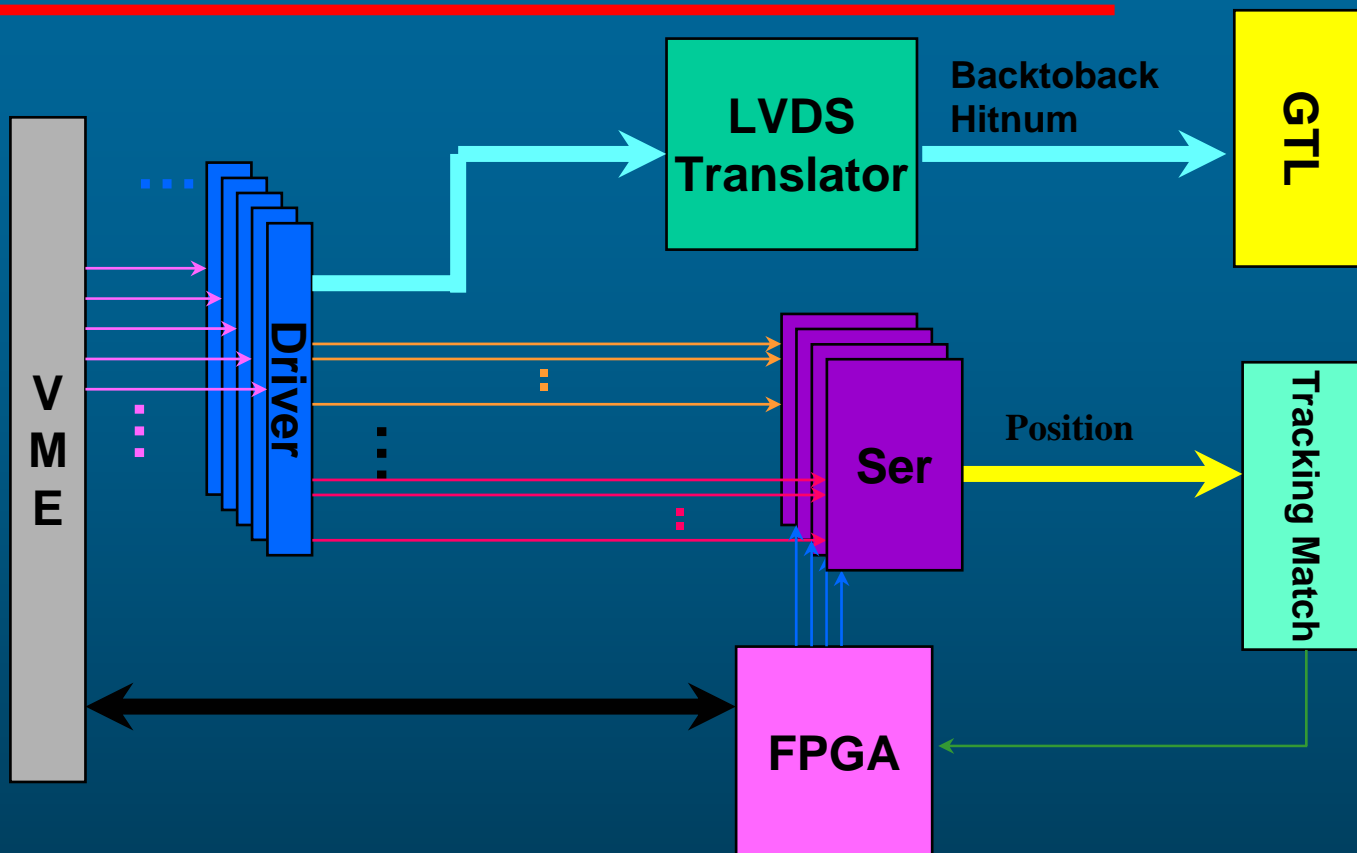


Tests of the online-check mode working

- Preset Meantimer data is written by VME at one time.
11 barrel channels;
6 endcap channels;
- L1 is self-generated by TriggerLogic;
- For the moment the preset Meantimer data is fixed once it is set; For further design, the preset data should also be dynamic, which will present the real process much better.

- ❖ PretreatMent is OK;
- ❖ Hitnum/BacktoBack/Position information is OK;
- ❖ CBLT is OK;

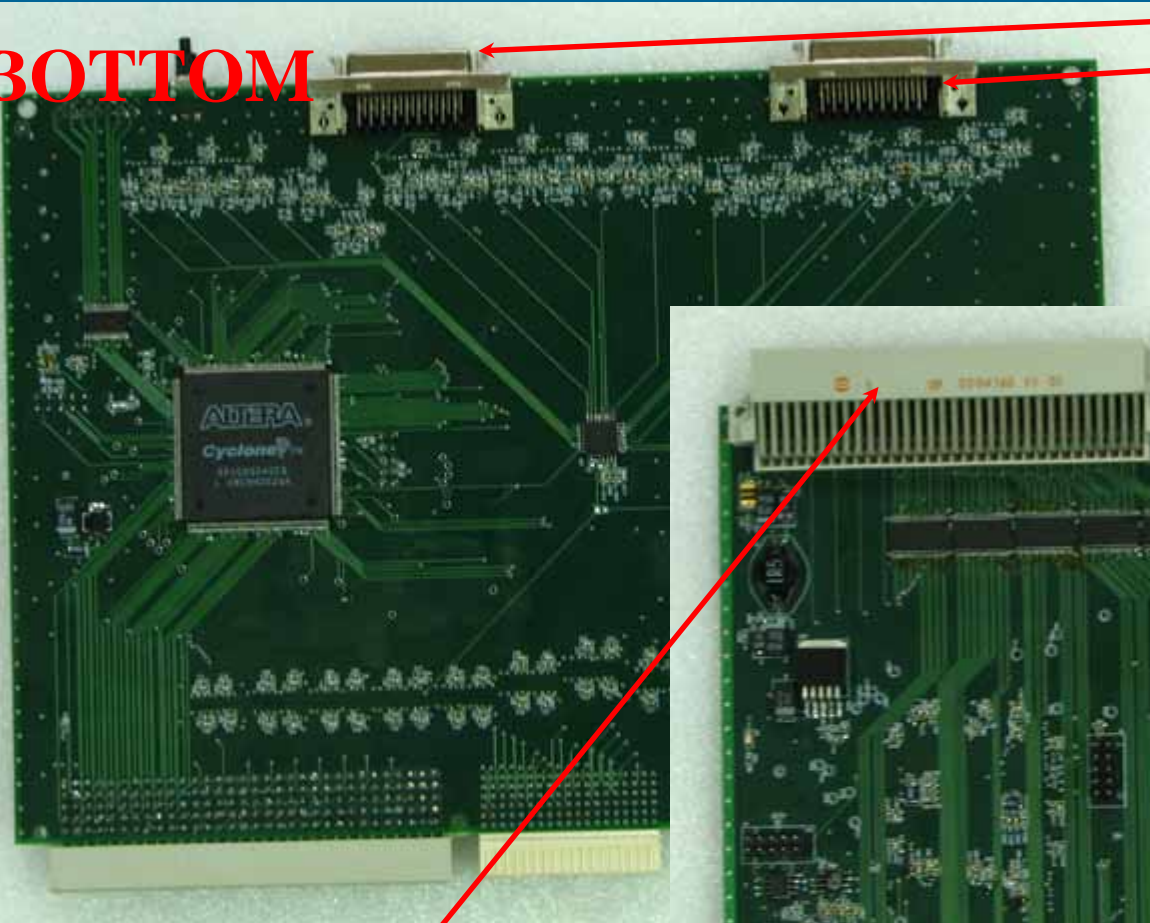
About the Trigger Rear module



- Get the position/hitnum/backtoback information from TOF Trigger via **VME J0 and J2**.
- Signals will be sent to GTL : **4bits hitnum & 3bits back-to-back information**;
Use the standard 0.1 inch space connector for flat cable.
- Signals will be sent to tracking match : **136bits position information**;
Use SN65LV1023A for LVDS serializing, uses the 3M™ Mini D Ribbon (MDR) 050 Board mount Thru-Hole Right Angle Receptacle-Shielded Connectors and 3M™ Mini D Ribbon (MDR) Cable for data transfer.

About the Trigger Rear module

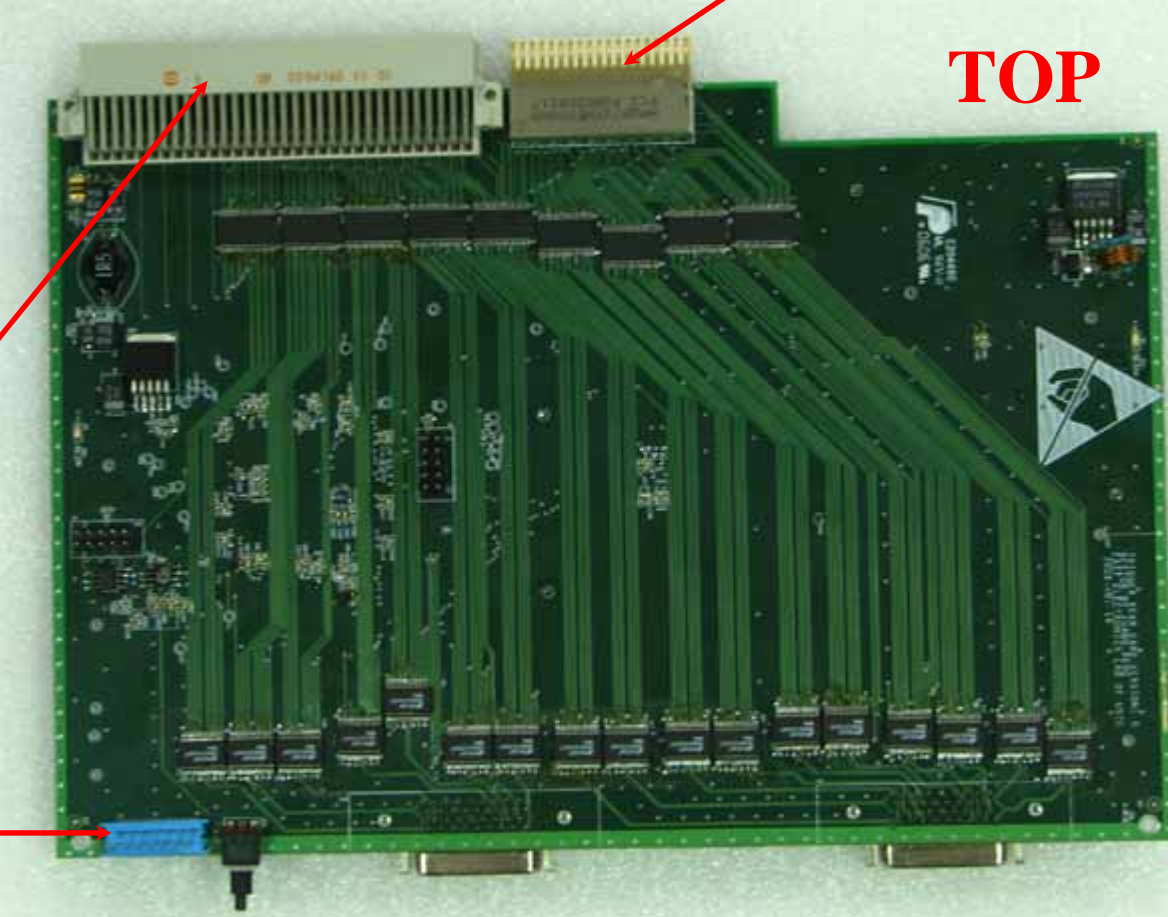
BOTTOM



**To Track Match
136bits**

VME P0

TOP



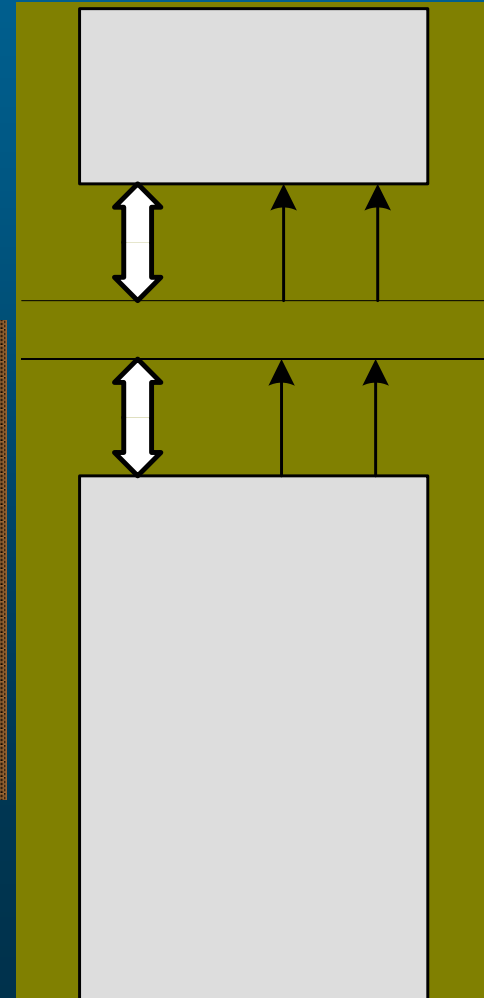
VME P2

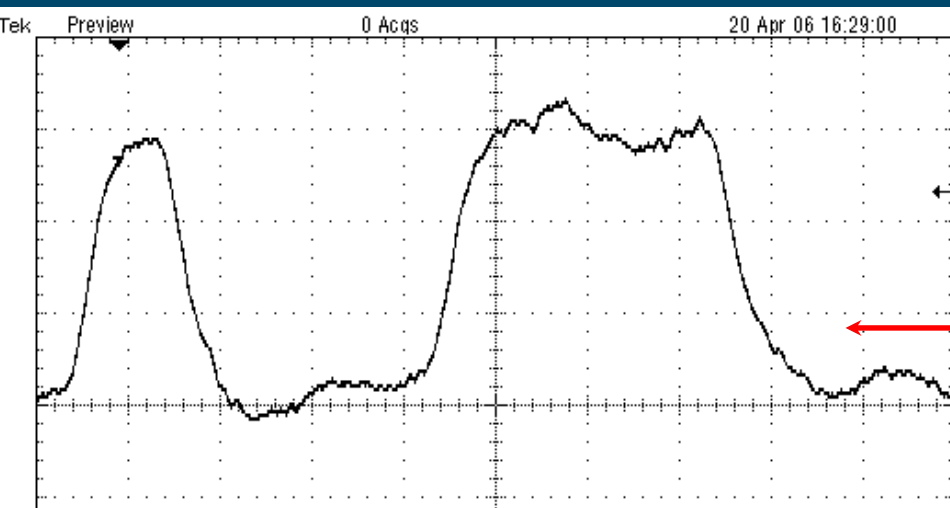
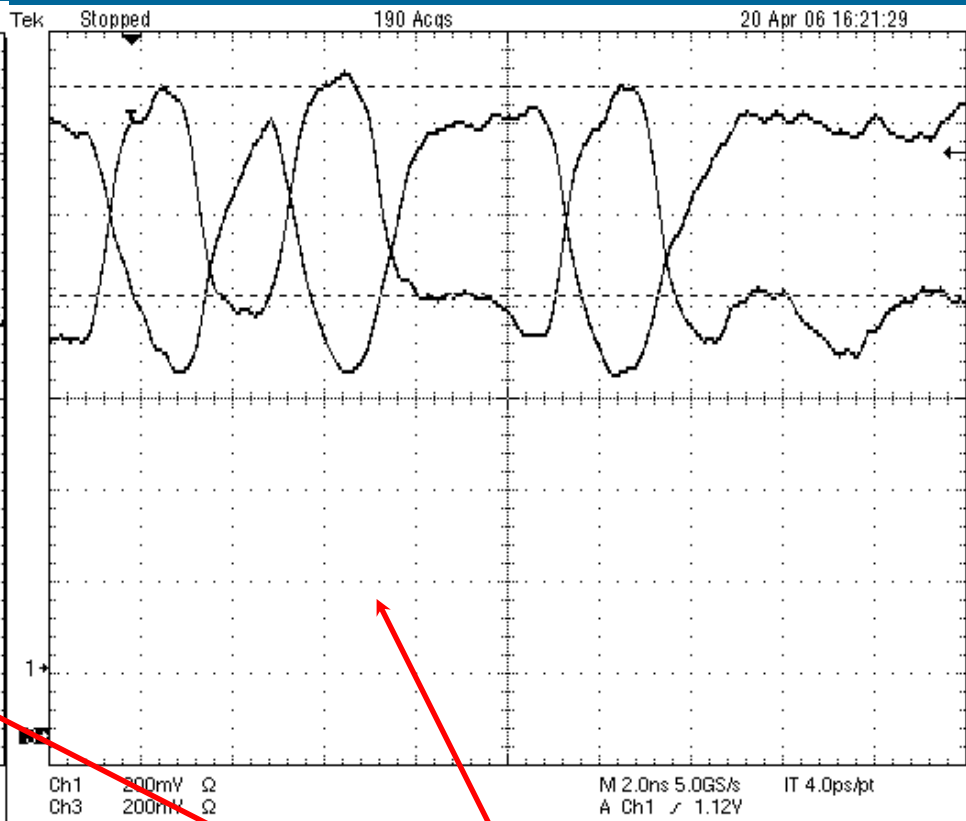
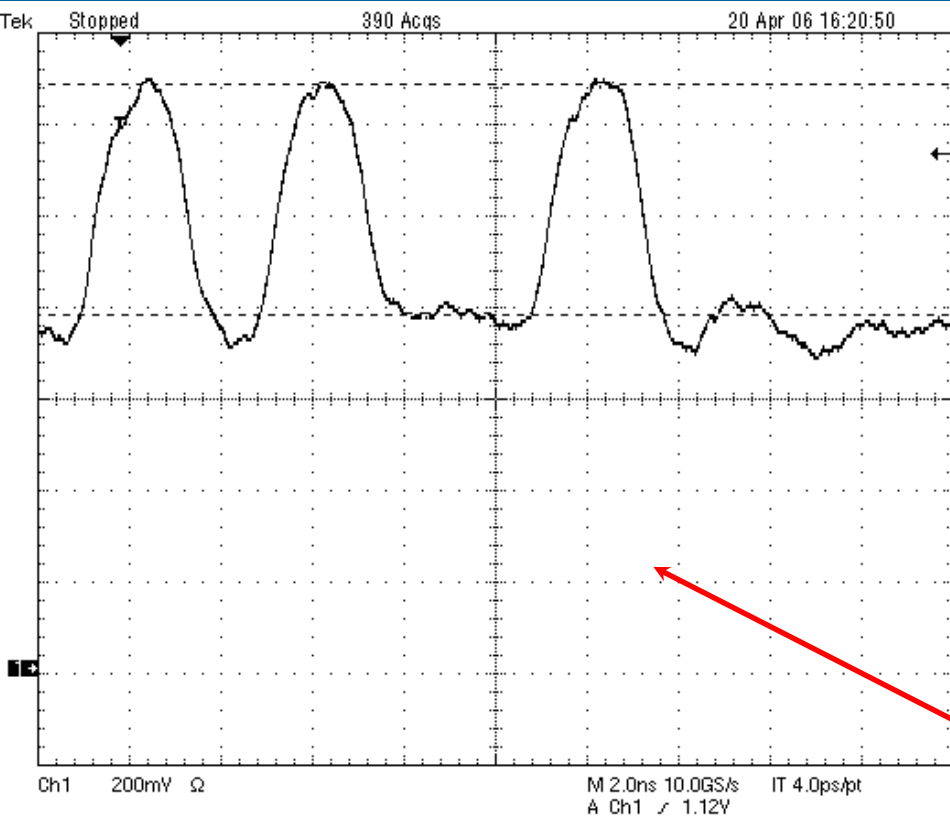
To GTL

Tests with the Trigger Rear module

- Trigger Rear module is inserted into the the same slot behind TOF Trigger module;
- The clock and reset signals of rear module are supplied by TOF Trigger.
- Use SignalTap II Logic Analyzer to verify the data transfer. Use Tektronix TDS7104 to observe the signal.

- ❖ Data transfer via VME J0 and J2 is OK;
- ❖ Logic of Trigger Rear is OK;
- ❖ Serializers and drivers on the Rear module function well;





0100100000

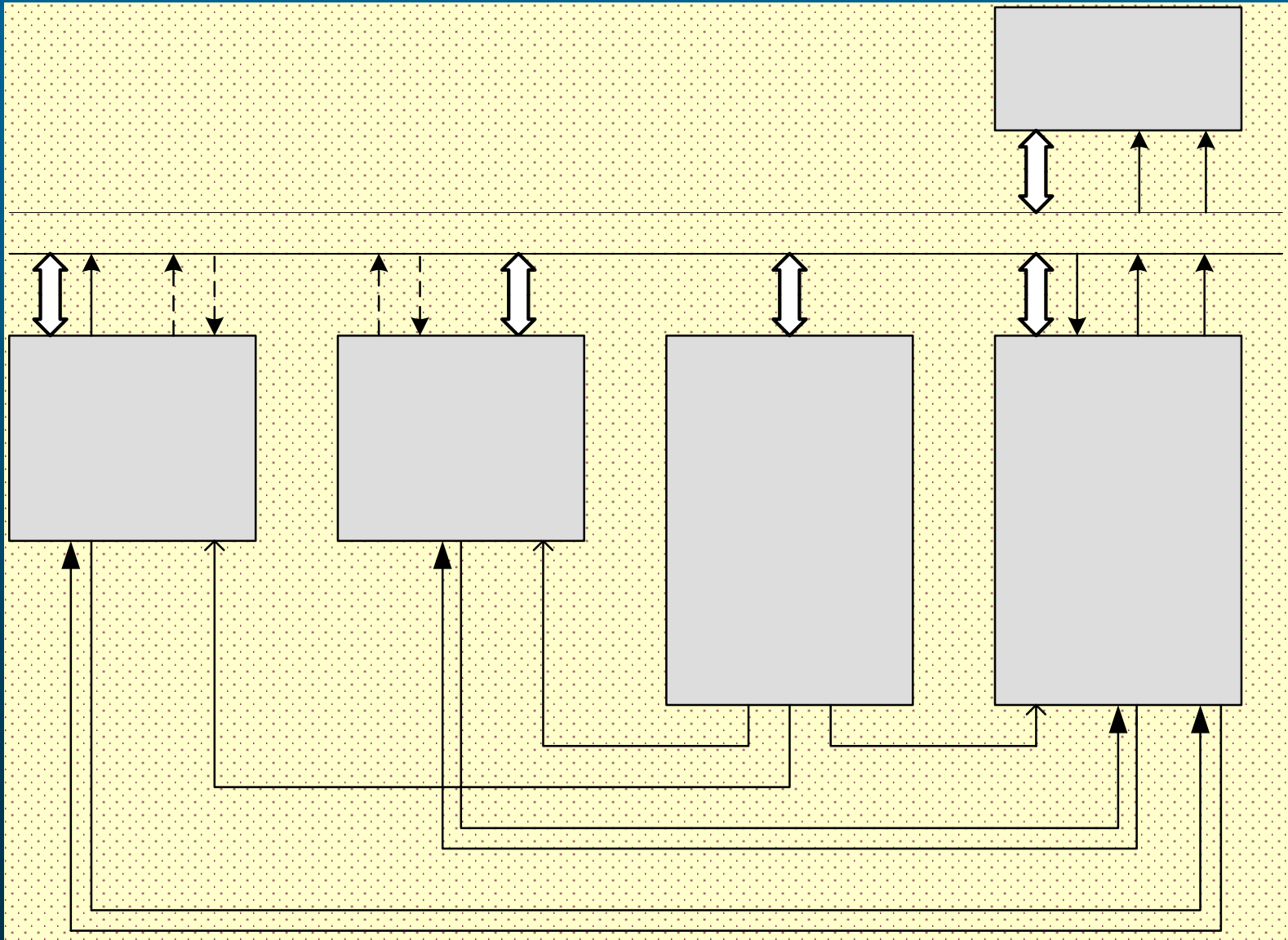
0001110000

Outputs of LV1023

The newest tests

- Together with the fast control module, clock fanout module and Trigger Rear module in one VME backplane, TOF Trigger system has performed a system-level test.
- Two fast control modules are used to supply Meantimer so as to get the back-to-back information. Meantimer datas of the two modules are preset and can be changed any time. Every time they will be sent at the same time.
- Clock of the whole system is provided by the clock fanout module which is designed by Song Jian.
- L1 is generated by fast control Module 1#. ReserveBus of VME backplane is used to transfer L1, as is specified.

Diagram of the system test



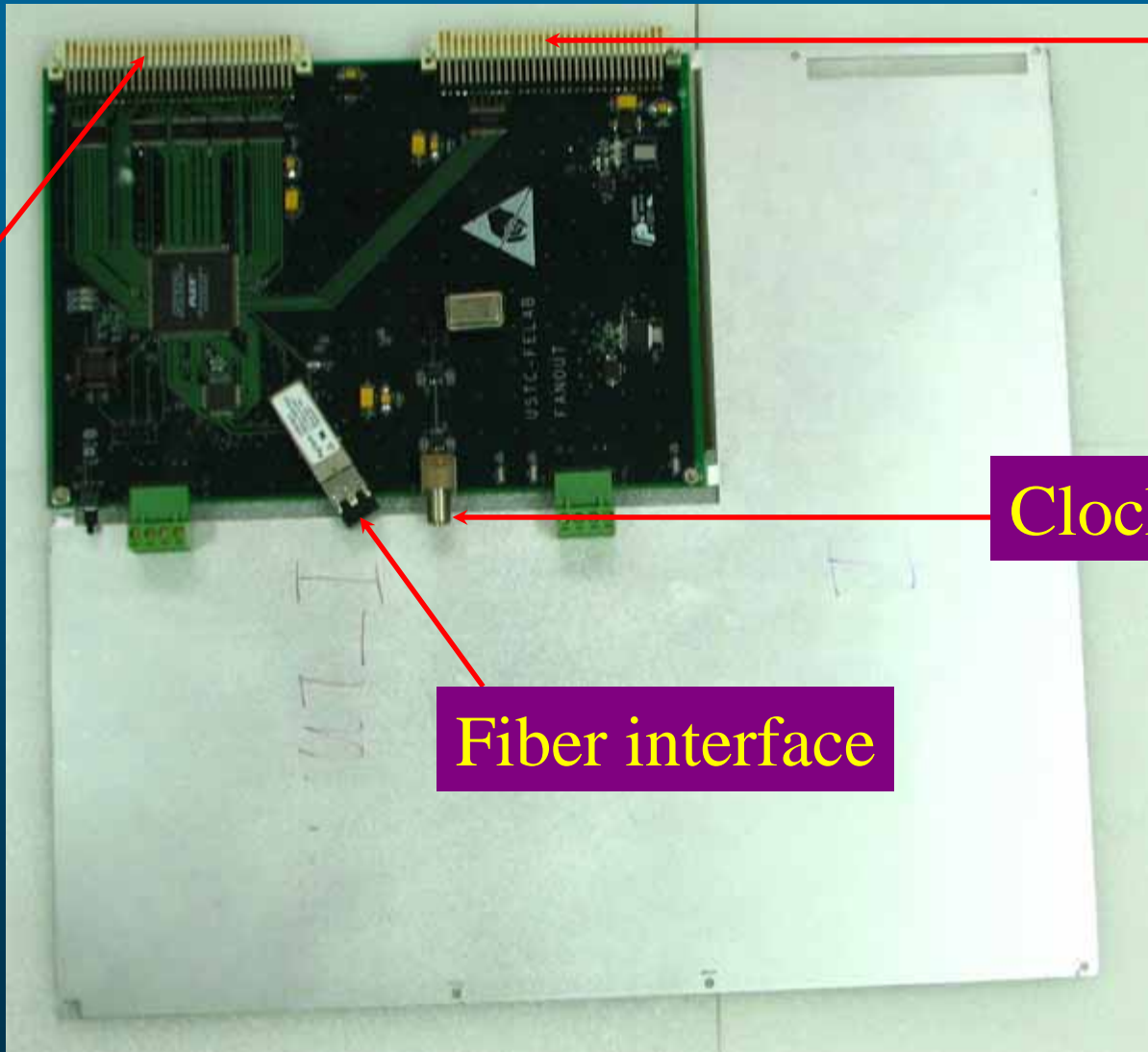
Fast control module

VME P1

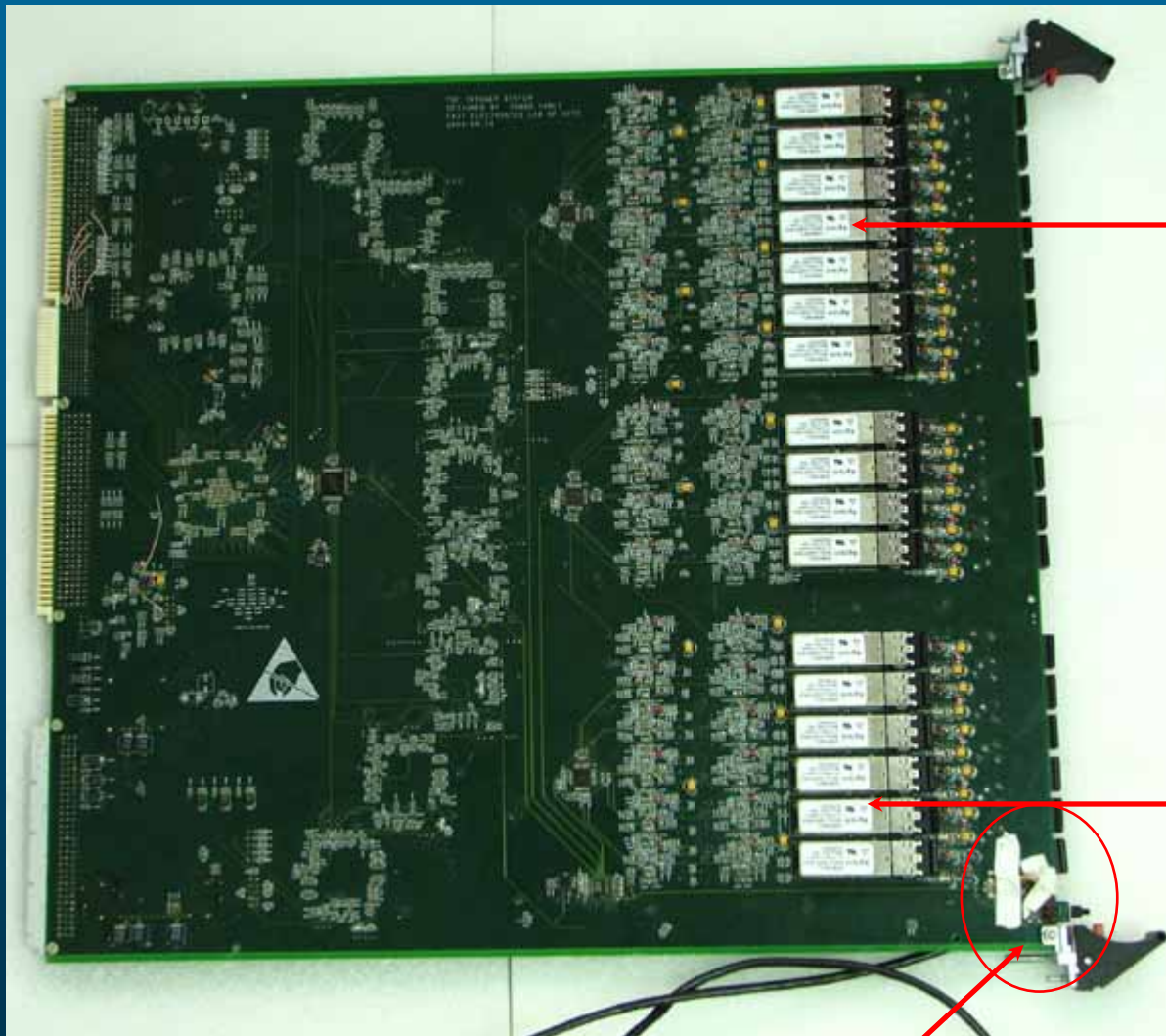
VME P2

Clock input

Fiber interface



TOF Trigger module



CH10

CH33

Clock input

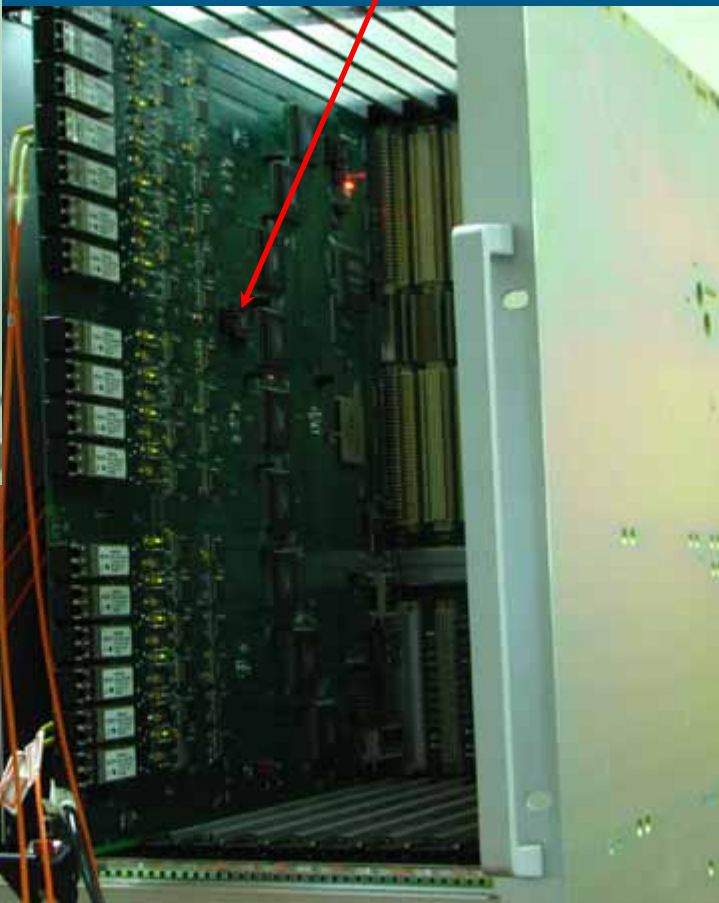
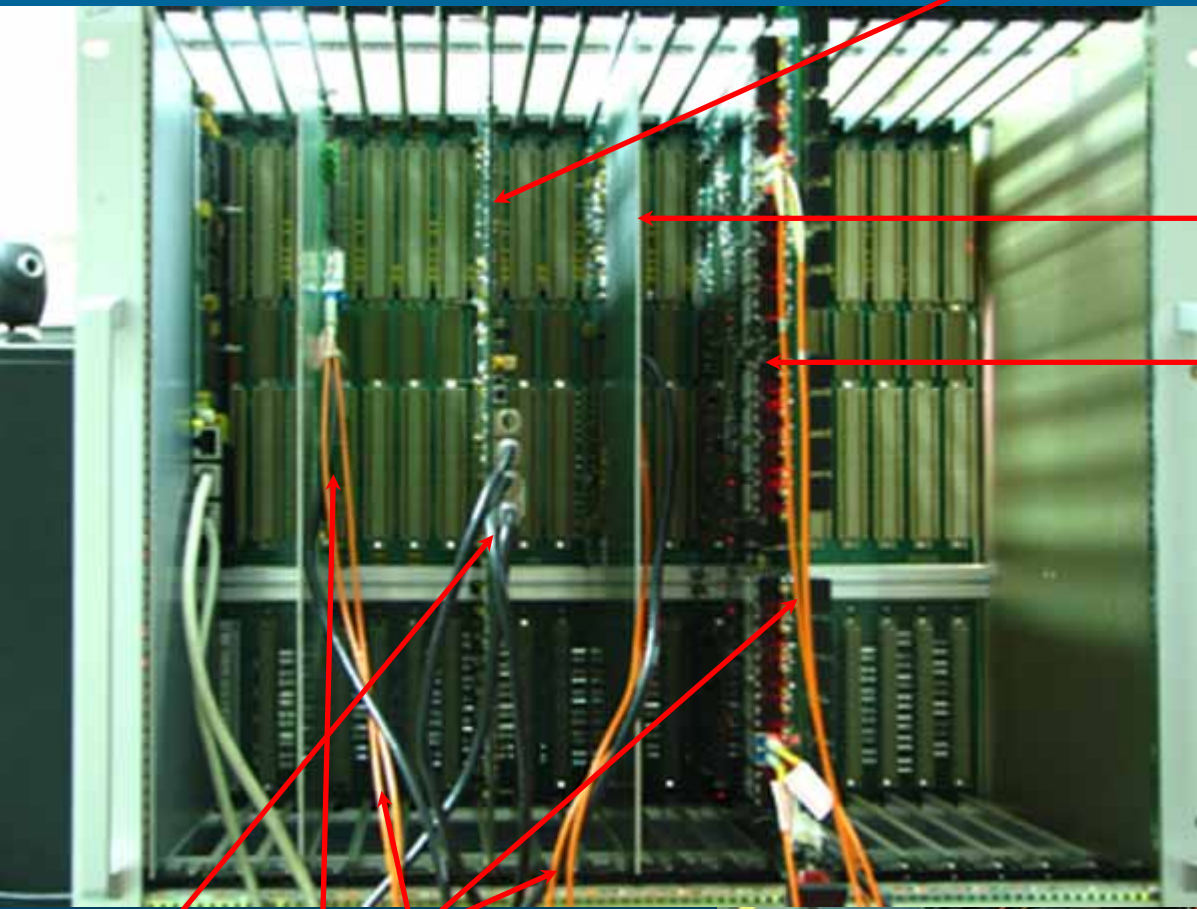
Bottom:

Pictures of the test

Clock fanout module

Fast control Module 2#

TOF trigger module

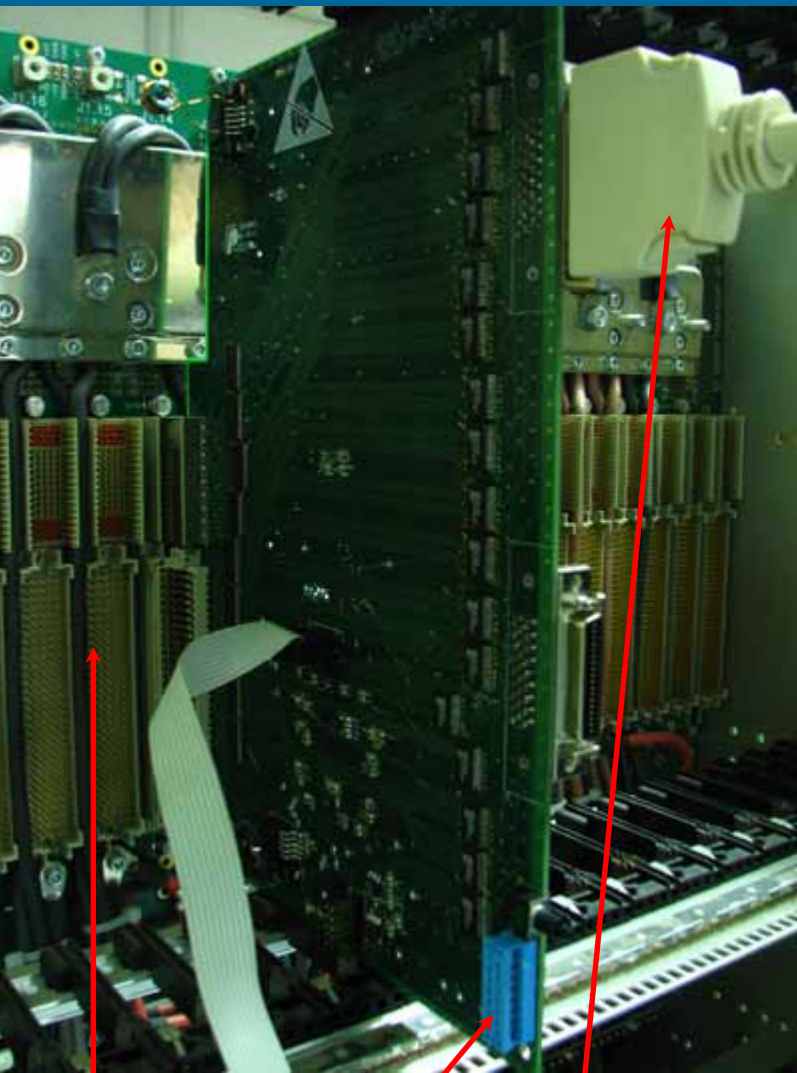


Fiber

Clock cable

Fast control Module 1#





Rear of VME backplane

5m Differential cable

To GTL

Tests have proved:

- ❖ Fiber transfer is OK;
- ❖ Pretreatment is OK;
- ❖ Hitnum/BacktoBack/Position information is OK;
- ❖ CBLT is OK;
- ❖ Data transfer via VME J0 and J2 is OK;
- ❖ Logic of Trigger Rear is OK;
- ❖ Serializers and drivers on the Rear module function well;

Further consideration:

- **Add more considerations to the online check mode process.**
- **Redesign the TOF Trigger module to 340mm 9U standard;**
- **Improve or change the logic if needed;**
- **Looking forward to run tests with GTL and tracking match system.**

Thanks!

