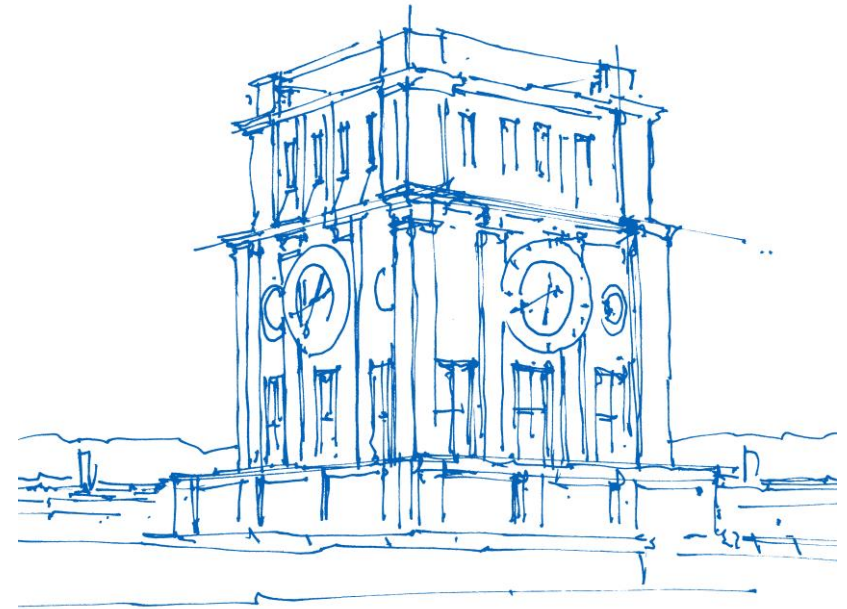


iFTDC for CEDAR

Igor Konorov

COMPASS TB Meeting

CERN Geneva September 3-d



Uhrenturm der TUM

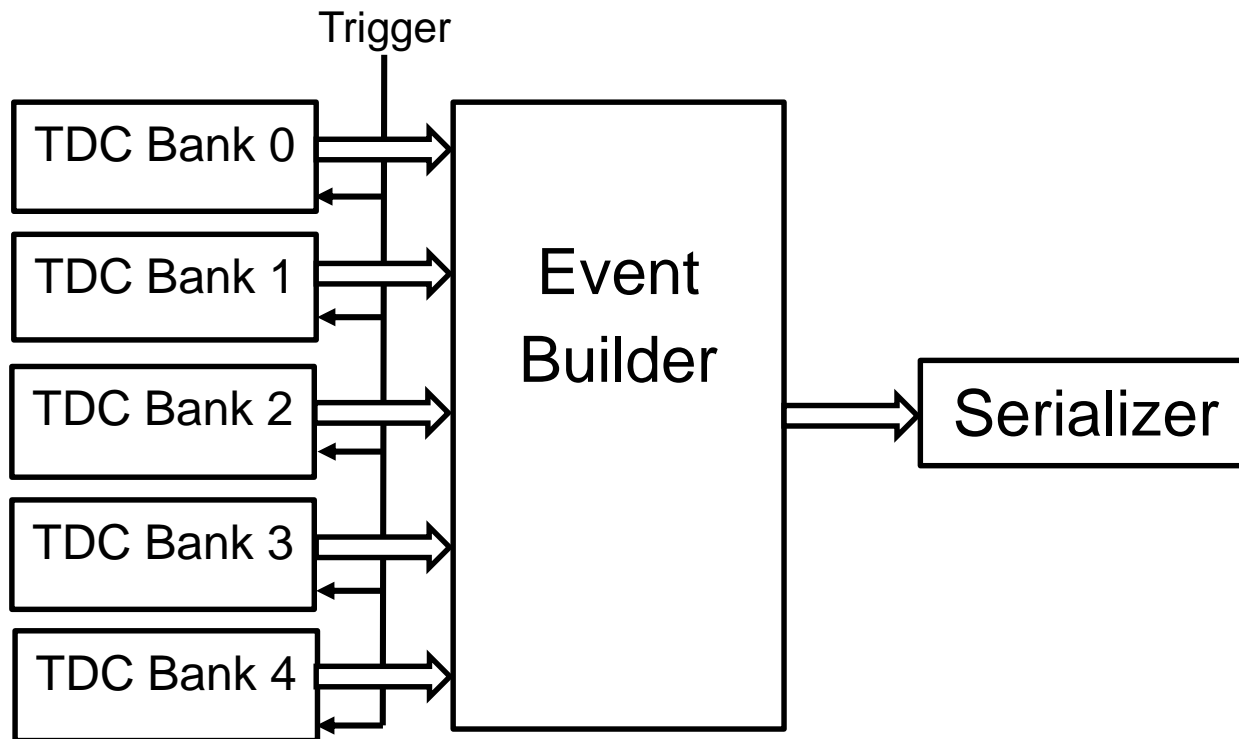
iFTDC firmware for CEDAR

Changes of iFTDC firmware for CEDAR:

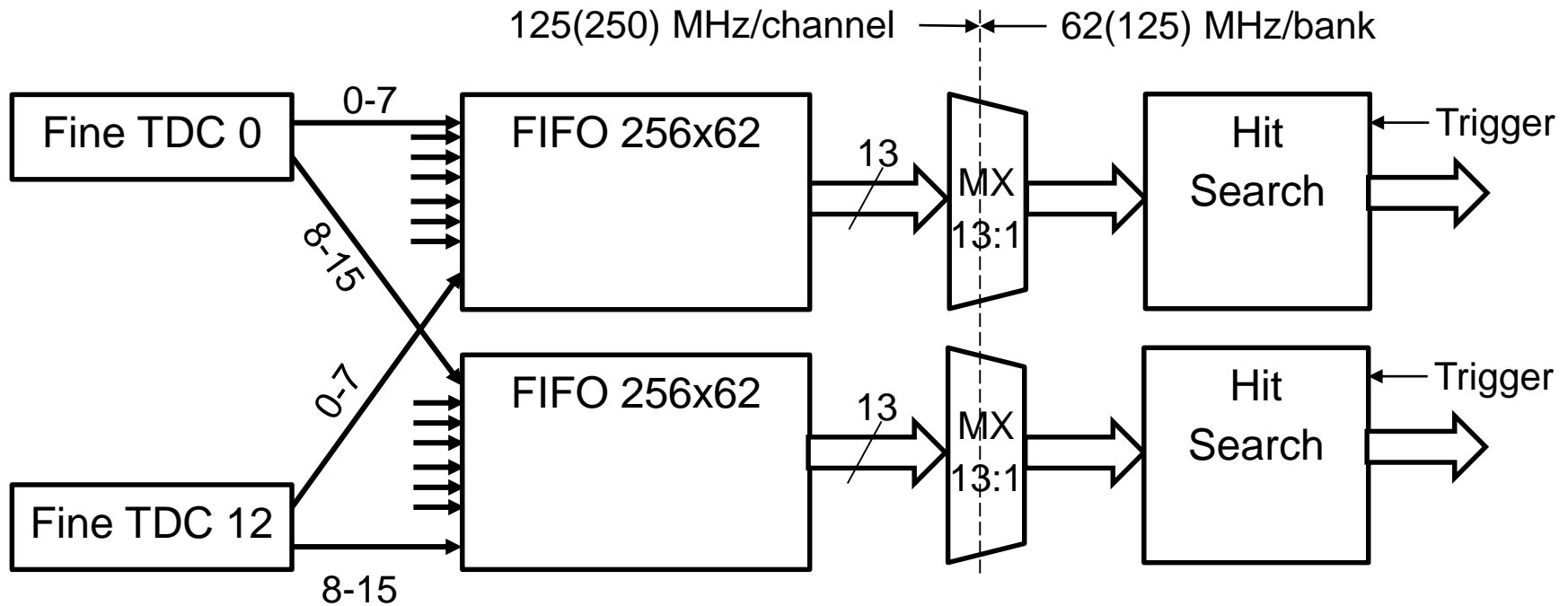
- 16 channels instead of 64 to increase hit rate capability
- **1 ns bin size version**
 - 10% differential non linearity
 - 8 ns minimum time interval between hits
- **0.5 ns bin size version**
 - 20% differential non linearity
 - 4 ns minimum time interval between hits
- Programmable signal edge : rising, falling and both

The preparation has been done by TUM master student Korbinian Urban

iFTDC Architecture



iFTDC Bank Architecture



Hit rate performance examples

- 13 channels/bank => 5(10) MHz/channel
- 4 channels/bank => 15(30) MHz/channel
- 1 channel/bank => 62(125) MHz/channel

Firmware Limitations

- 15 MHz per channel maximum hit rate capability
- Maximum 100 hits per event otherwise TDC stops sending data to MUX till next spill
- No built-in monitoring such as hit rate measurement per channel, hit loss monitoring

Observed Problems

Thanks to Vladimir Frolov for data analysis

Unfortunately still important information is missing : hit rate per channel, cross talk, efficiency.

More effort for data analysis has to be done.

- No Data from one or more TDCs. Problem occurred very often at the beginning.
 - Caused by event size exceeding

- Wrong hit timing
 - Source is unknown, problem solved by reloading firmware (radiation ?)

- Two hits with the same timing
 - Error in timing encoding.

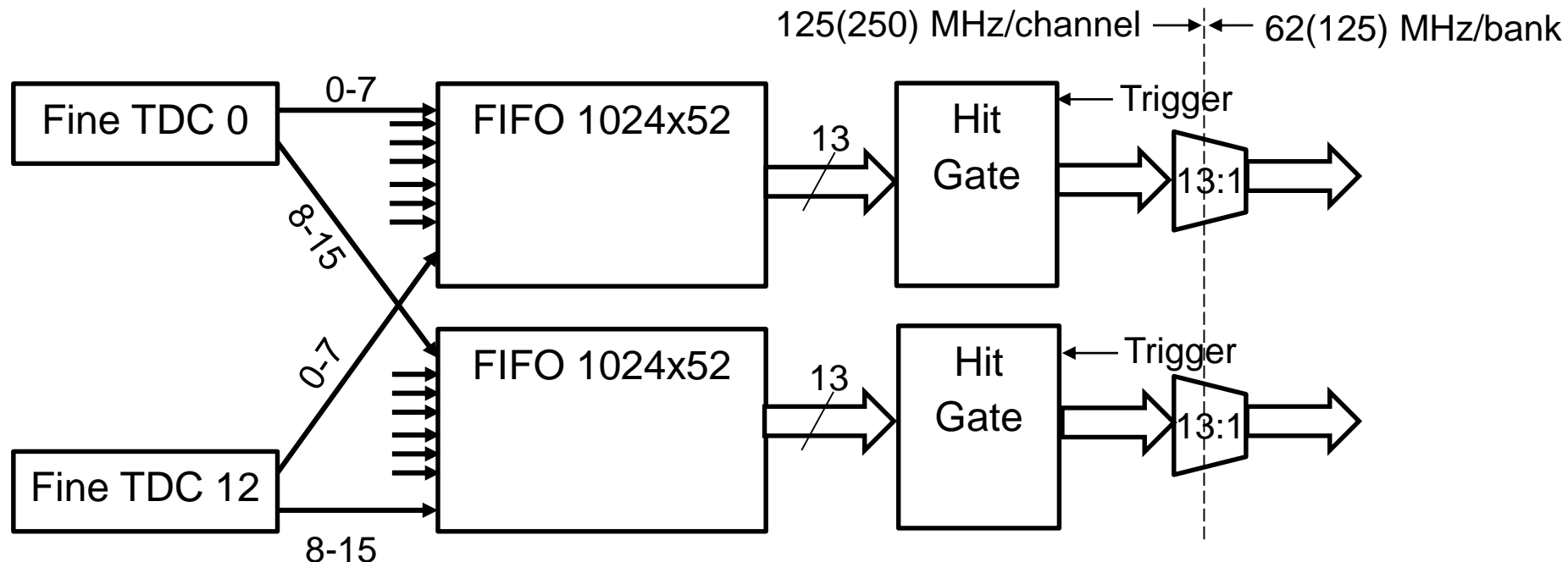
Improvement of iFTDC Firmware

Main cause of problems is limited hit rate capability due to hit multiplexing

We improved performance without changing architecture but it was not enough

Change of firmware are currently been implemented:

- Delay of all hits until trigger decision for 3-4 us
- No sharing hits between consecutive events
- Start hit multiplexing after hits are accepted by trigger



Improvement of iFTDC Firmware

Unfortunately student who was preparing firmware decided to do master thesis in astrophysics.

I'm working on implementing changes

Status of firmware :

- firmware changes have been implemented
- Simulation is in progress
- I will try to deploy the new firmware this week

THANK YOU