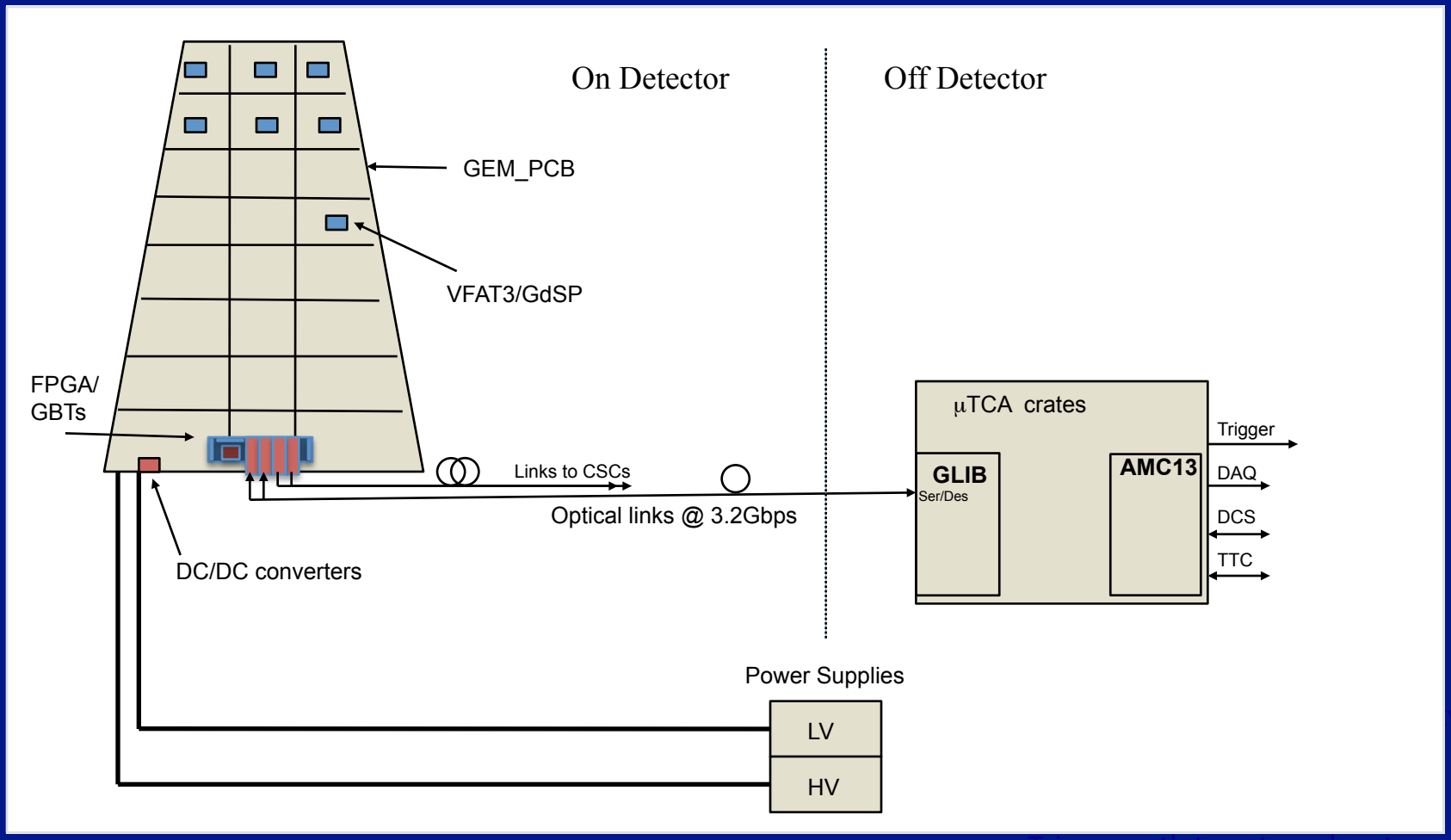
The CMS GEM project : Global Requirements on Electronics

Provide Trigger & Tracking data from all GE1/1 GEM Chambers

(for the one day workshop Jan 2013)

- GEM detectors
  - Design optimised for gas, and in particular GEM detectors
- Triggering
  - Provide "Fast OR" trigger information with granularity of 2 channels to send locally to CSC TMB.
  - Timing resolution <8ns.
- Tracking
  - Provide full granularity tracking data on receipt of a LV1A.
  - Be compatible with CMS trigger upgrade possibilities
    - LV1A latency < 20us
    - LV1A rate < 1MHz Poisson

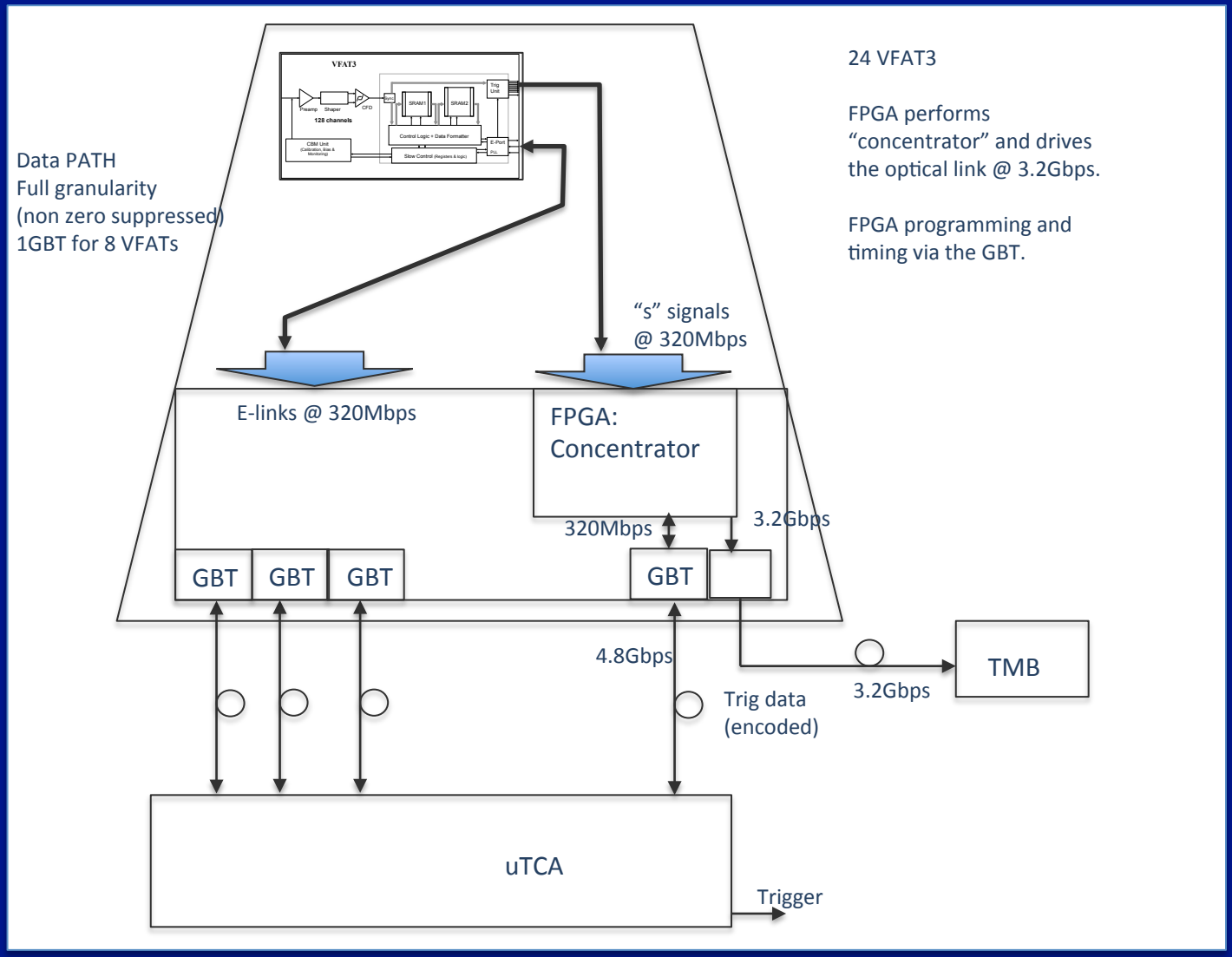
CMS GEM Electronics System



ween

- Trigger path to external systems at uTCA level.

The Electronics System



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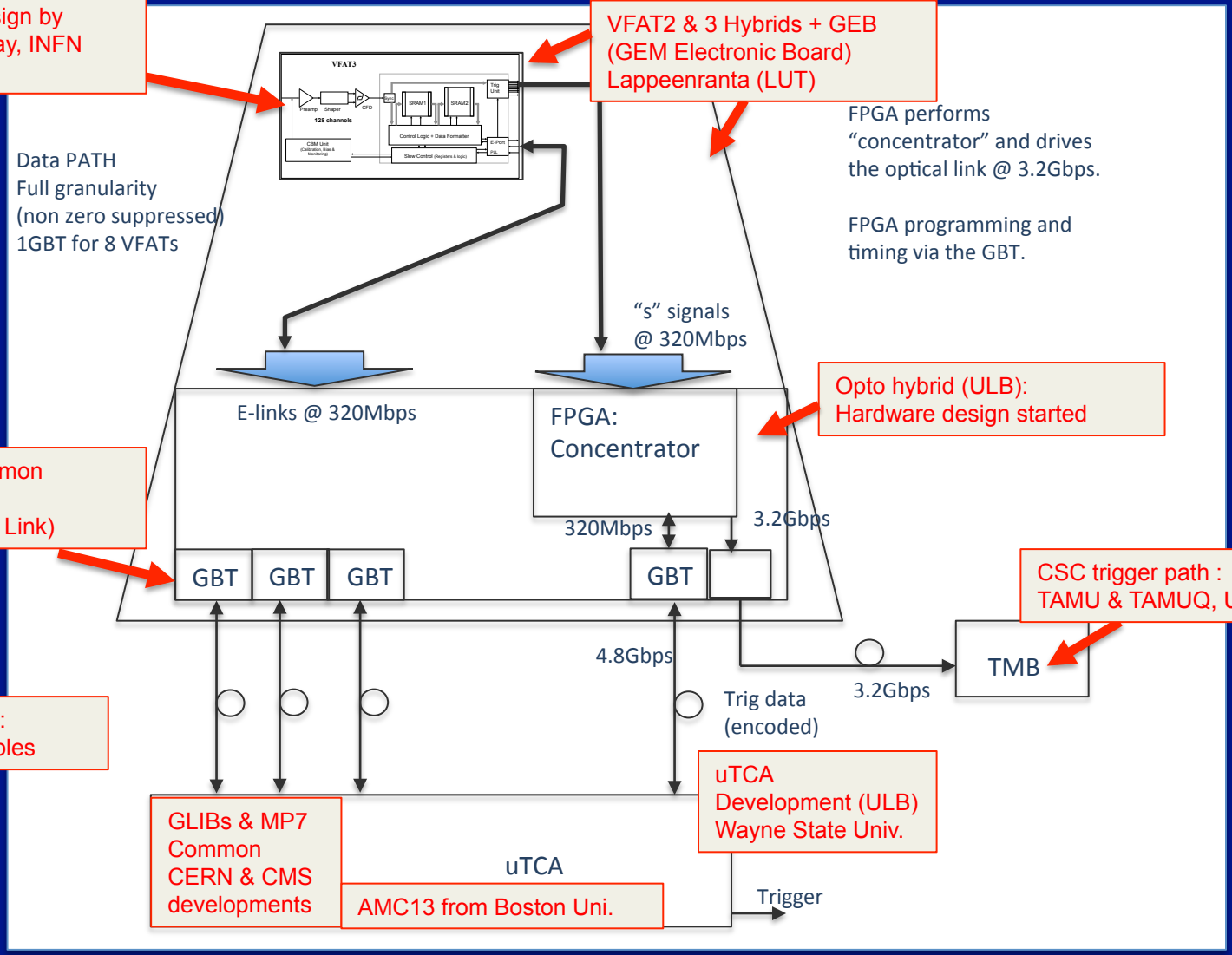


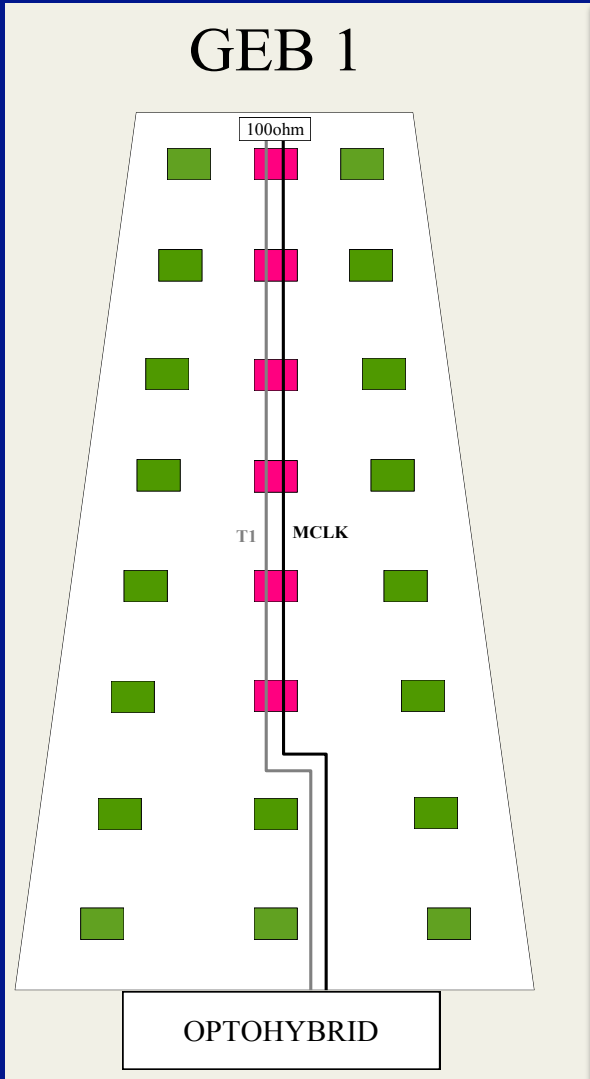
Electronics : Full size prototype hardware steps

Prototype 1 :
VFAT2
Compatible with VFAT2 CMS Hybrid or Totem hybrids
GEB v1
OptoHybrid V1
Readout & Programming via UART or Optically to uTCA
Applications of Prototype 1 : Electrical tests – initial firmware and software development

Prototype 2 : (At first 8 eta divisions, then sub versions for extended eta options)
VFAT2
VFAT2 CMS Hybrid
GEB v2
OptoHybrid V2
Readout & Programming optically from/to uTCA
Applications of Prototype 2 : CERN Cosmic Stand – Test beam – Slice Test

Prototype 3 :
VFAT3 (or VFAT3 emulator to start)
VFAT3 Hybrid Vx….
GEB v3
OptoHybrid V3
Readout & Programming optically via GBT from/to uTCA
Applications of Prototype 3 : CERN Cosmic Stand - Final system

Prototype 1 :



Prototype 1 : VFAT2, GEB1 + OptohybridV1 + DAQ
Readout of 6 VFAT2 chips via OHv1

The main goals for GEB1 are checking:

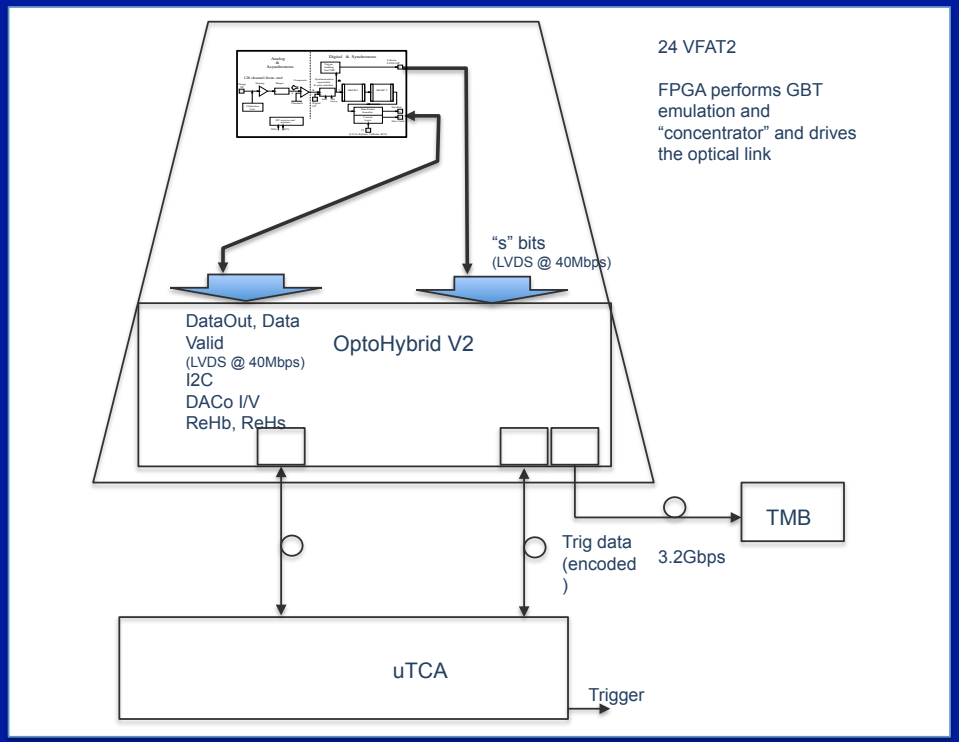
- Electrical design and routing issues.
- Manufacturability
- Electrical tests, signal integrity over a large board
- CMS VFAT2 Hybrid V2 verification
- Noise studies
- Optohybrid1 verification
- Enable DAQ hardware and software development to start.

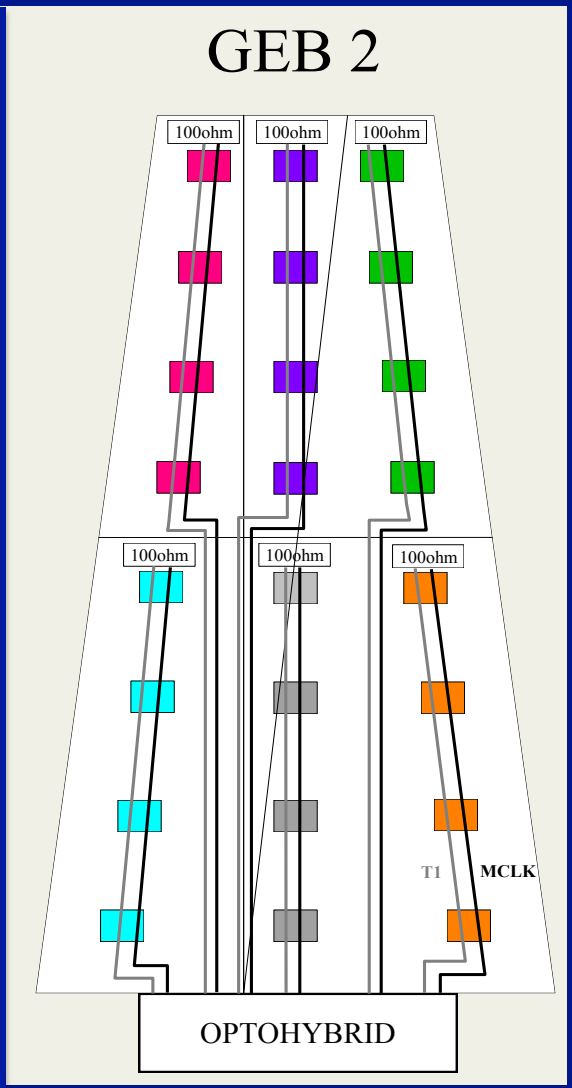
Prototype 2 :

Prototype 2 : VFAT2, GEB1 + OptohybridV2 + DAQ

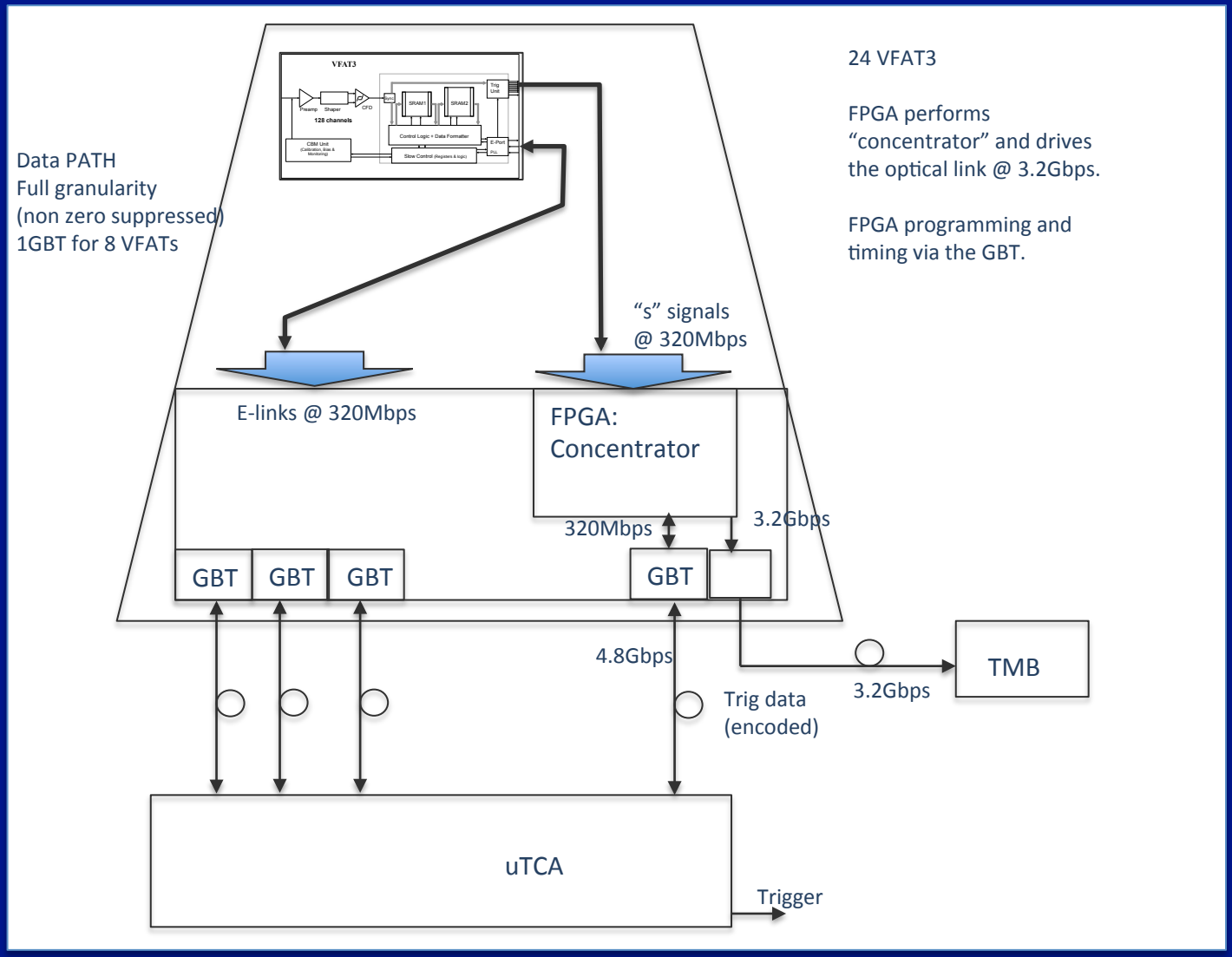
The main goals for GEB1 are checking:

- Electrical design and routing issues.
- Provide an “on detector” hardware platform for full size DAQ firmware and software development.
- Provide and full size hardware and DAQ platform for the development of application based prototypes.





Prototype 3 : Final System



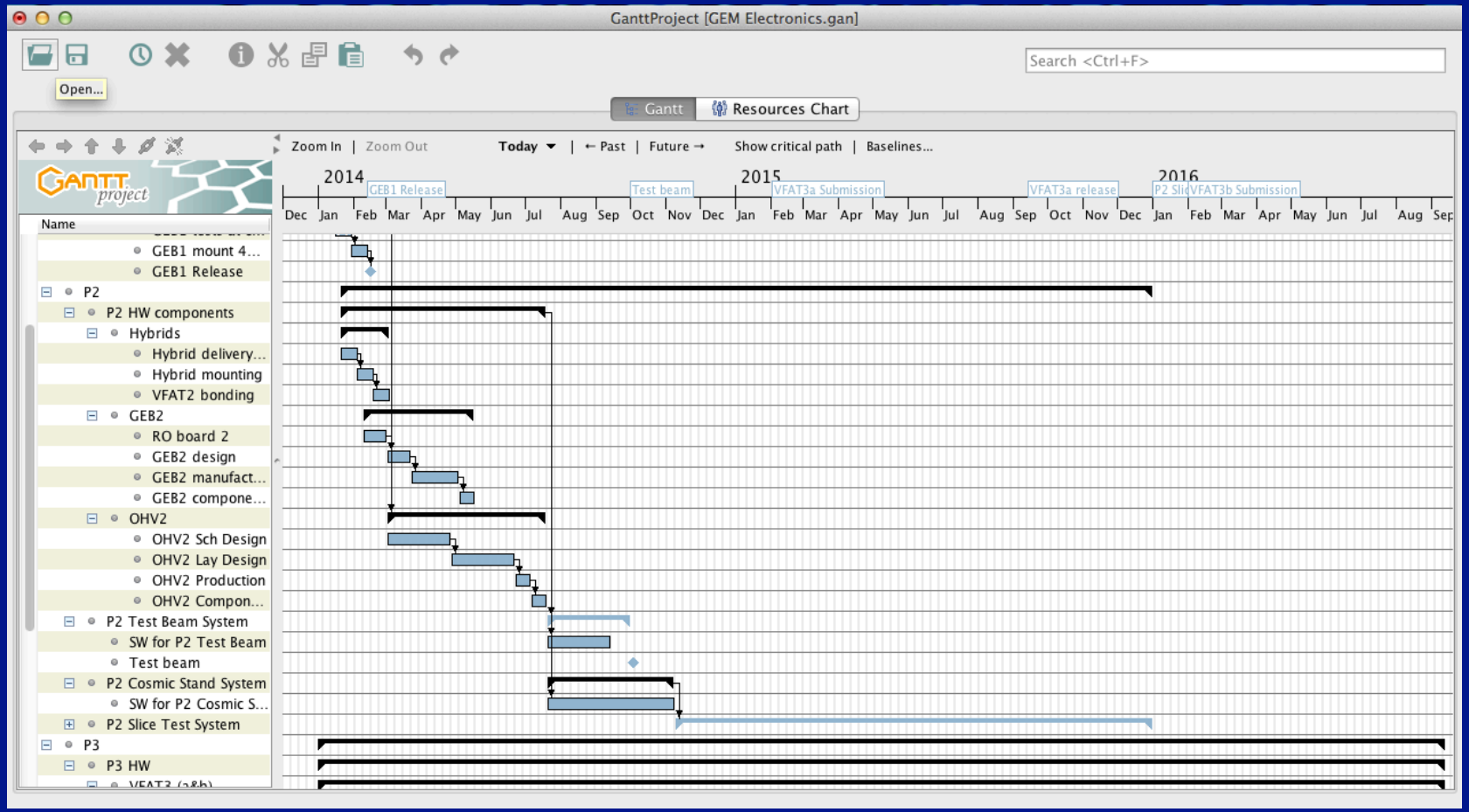
Modules & Application Systems

Components / modules		Applications					
Name	responsibility	P1	P2 CERN Cosmic Stand Syst. dev. 2014 onwards	P2 Test beam ? End of 2014	P2 Slice Test 2016	P3 Cosmic Stand Development 2016 onwards	P3 Final System LS2
			System Development Team @ CERN Leader coordinating SW, FW & construction			System Development Team @ CERN Leader coord. SW, FW & construction	
VFAT2	CERN	■	■	■	■		
VFAT2 Hybrid	LUT	■	■	■	■		
GEB V1	LUT	■					
GEB V2	LUT	■	■	■	■		
GEB V3	LUT ?					■	■
OH V1	ULB	■					
OH V2	ULB / TAMU		■	■	■		
OH V3						■	■
VFAT3	CERN / Bari					■	■
Links			■	■	■	■	■
GLIB			■	■	■		
MP7 (or similar)						■	■
uTCA (system)			■	■	■	■	■

■ Component required for this application

Workshop goal : Complete the left hand side of the table with components / modules including suggested institute responsibility. These then feed into the Application columns.

Project Planning



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Hardware Jan/Feb 2014

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VFAT2 CMS Hybrid
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Readout & Programming optically from/to uTCA
Applications of Prototype 2 : Test Beam - CERN Cosmic Stand – Slice Test

Hybrids & GEB2 ~ June 2014,
OH V2 ~ August 2014
System development for TB, CS & ST

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VFAT3 Hybrid Vx….
GEB v3
OptoHybrid V3
Readout & Programming optically via GBT from/to uTCA
Applications of Prototype 3 : CERN Cosmic Stand - Final system

VFAT3 (a) ~ Q4 2015
Initial hardware Q2-3 2015 ?
System development for CS & FS continuous up until LS2