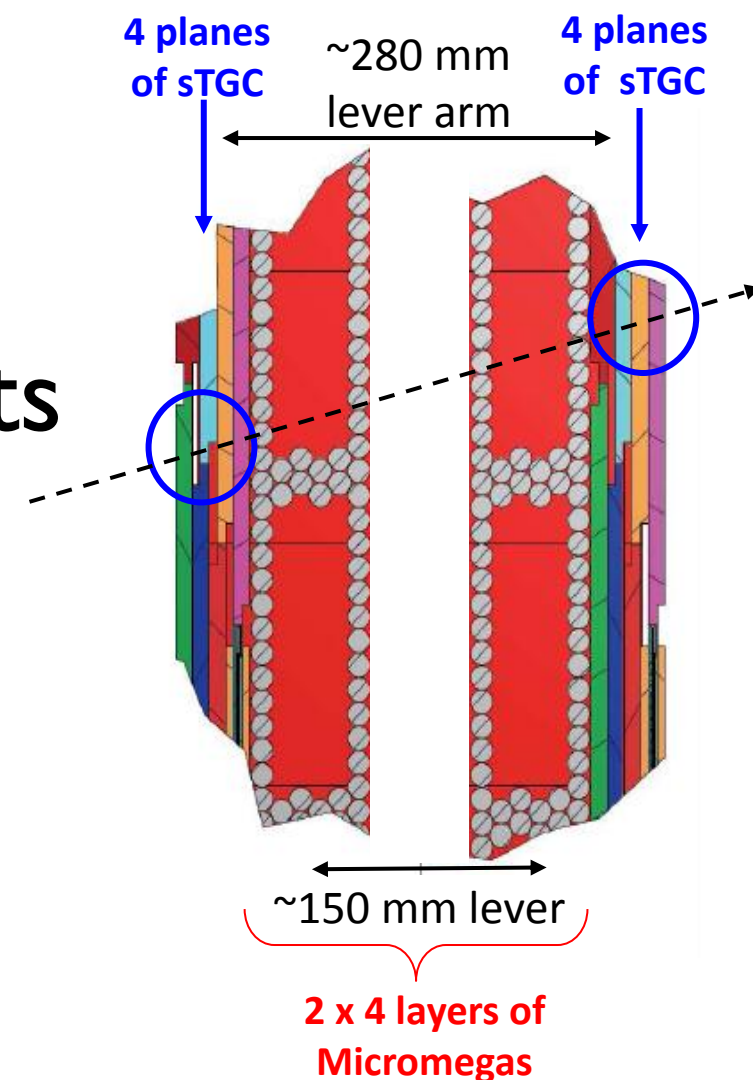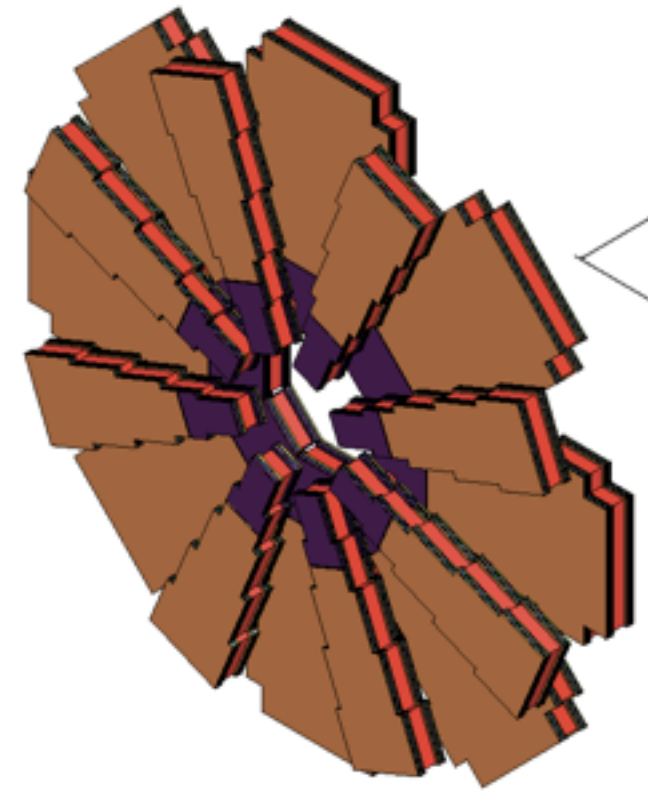# NSW trigger

Riccardo Vari - INFN Roma

sTGC

- Strips, pads, wire groups

- ~385,000 channels

- 3.2mm strips

- 16 sectors per wheel

- each wheel: 8 layers, in two quadruplets

- wire groups (not used in trigger, but read out on L1A)

- R = 3.64m, Δz = 30cm

4 planes of sTGC ~280 mm lever arm **4 planes of sTGC**

~150 mm lever

2 x 4 layers of Micromegas

NSW trigger general concept

- Integrate the NSW with the current end-cap level1 muon trigger system

- Use of both sTGC and MM

- At each BC, find pointing local tracks to confirm Big Wheel coincidences

- Pointing required precision: < 1mrad

New detectors of SW + TGC of BW's
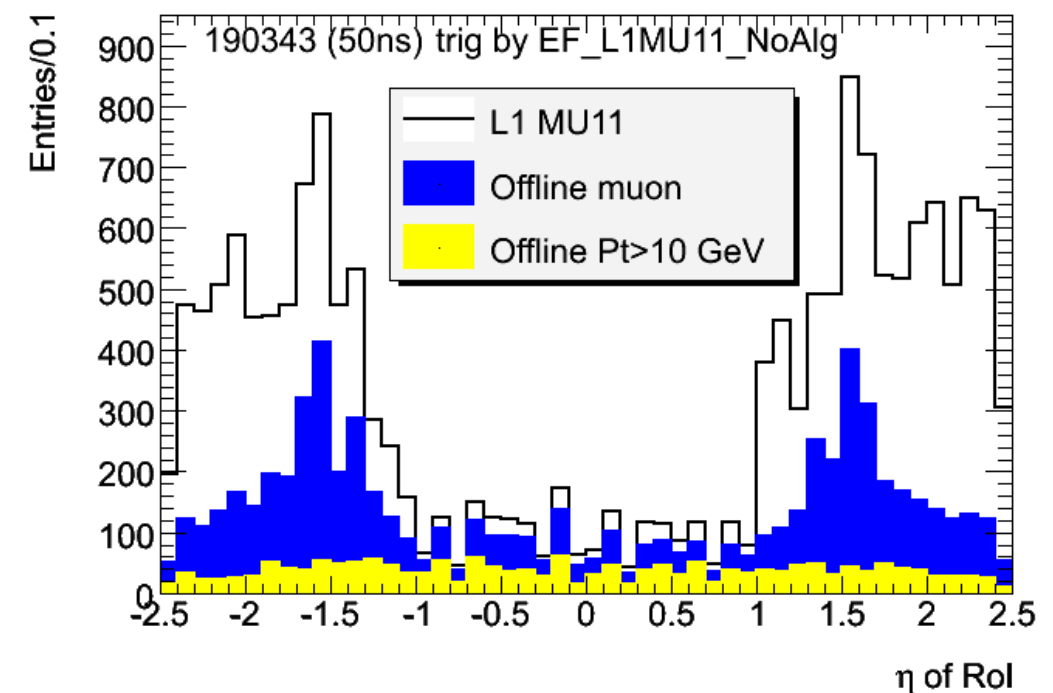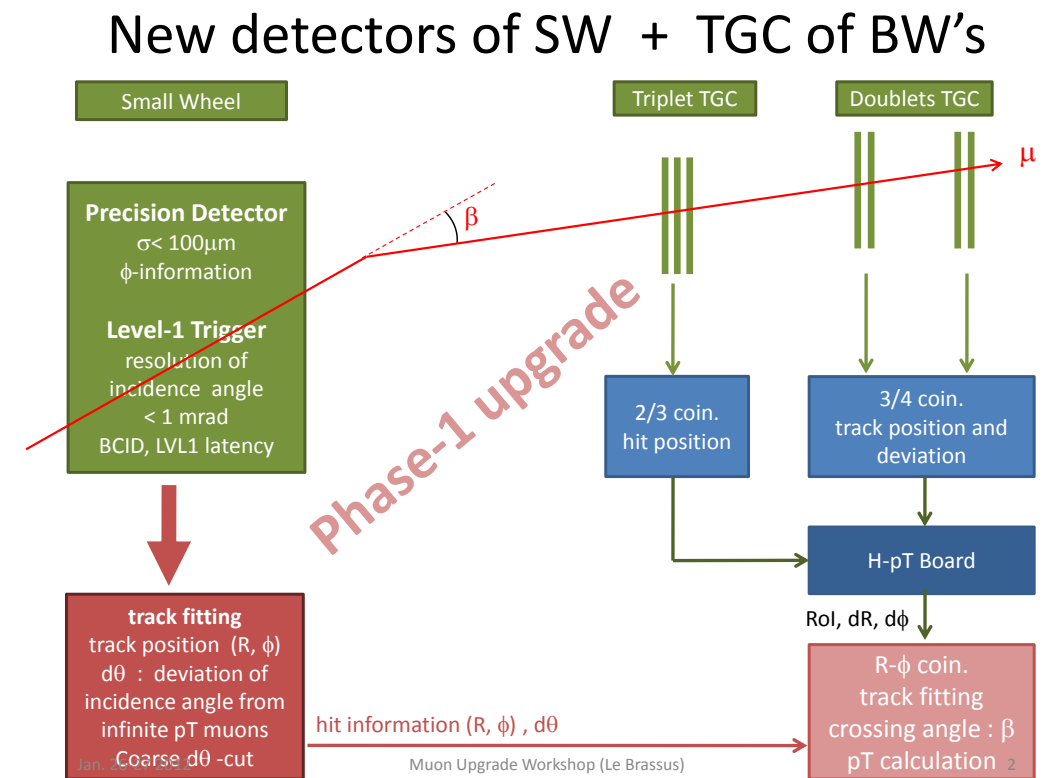
Gruppi italiani

- Bologna (2 FTE)

- Napoli (1 FTE)

- Roma (2 FTE)

- Roma Tre (1 FTE)

- ...

Possible contributions

- Simulation (detector optimization/segmentation, trigger system algorithm/segmentation)

- On detector trigger electronics

- Off detector electronics

- Radiation tolerance tests/certification

- Trigger control software

- Calibration/Monitoring

- DAQ development

Richieste per il 2013

CONSUMO	Xilinx Kintex-7 FPGA Evaluation Kit	4 x 2.5 k€
MISSIONI ESTERE	Test beam *@ DESY/Fermilab/...* *4 settimane*	6 M.U.
	Test irraggiamento fotoni/neutroni *@ Israele/Saclay/...* *4 settimane*	3 M.U.
	Meeting & upgrade weeks *@ CERN, ...*	4 M.U.

Backup

sTGC trigger geometry

sTGC quadruplet

Physical pads, each layer staggered by ½ pad in both directions

Logical pad-tower defined by projection from 4 layers of staggered pad boundaries

Pad trigger selects a band of strips under row of logical pads

Pad-tower coincidence = 3-out-of-4 overlapping pads

μ

4 planes of sTGC

4 planes of sTGC

~280 mm

~150 mm

2 x 6 layers of sMDT tubes
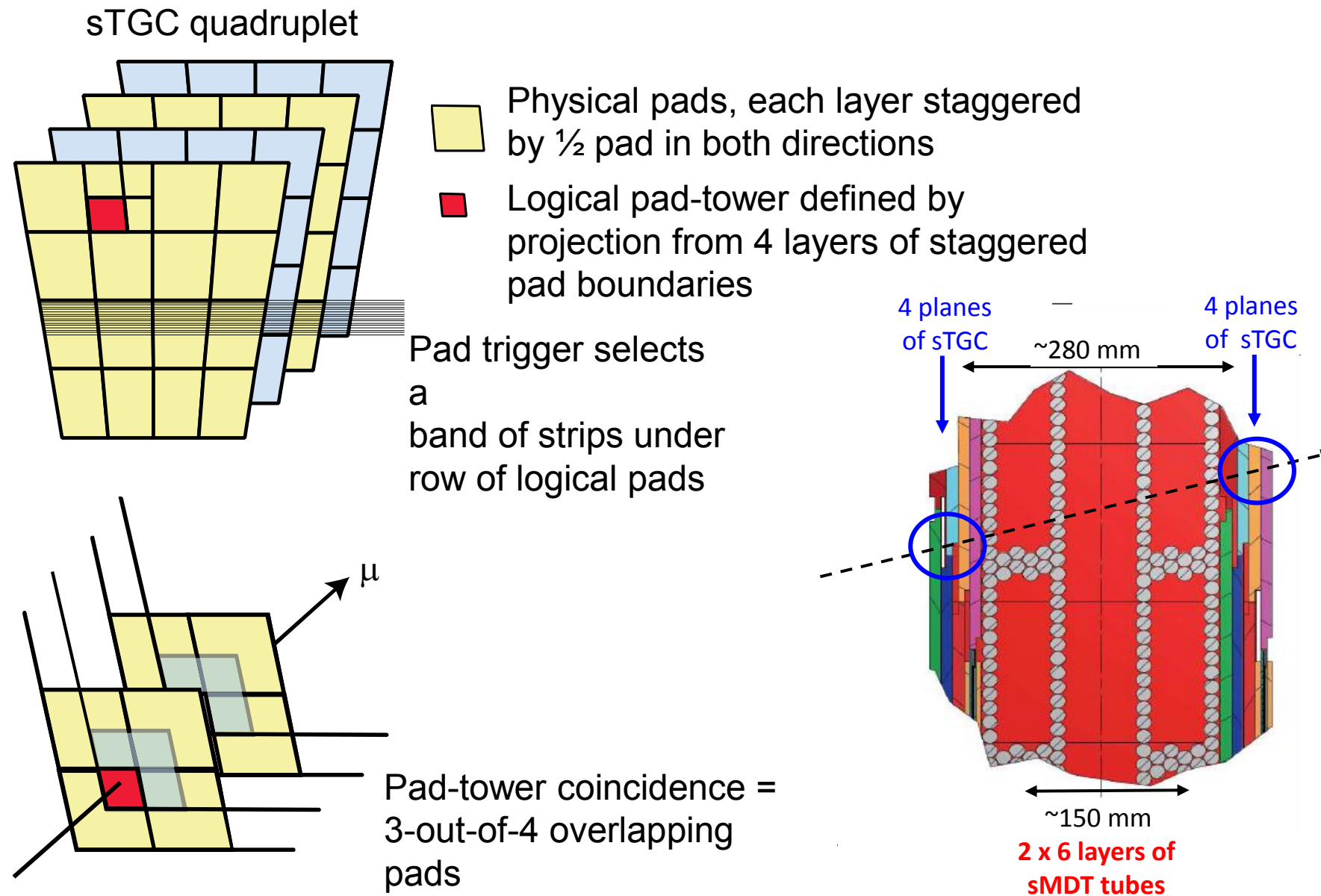
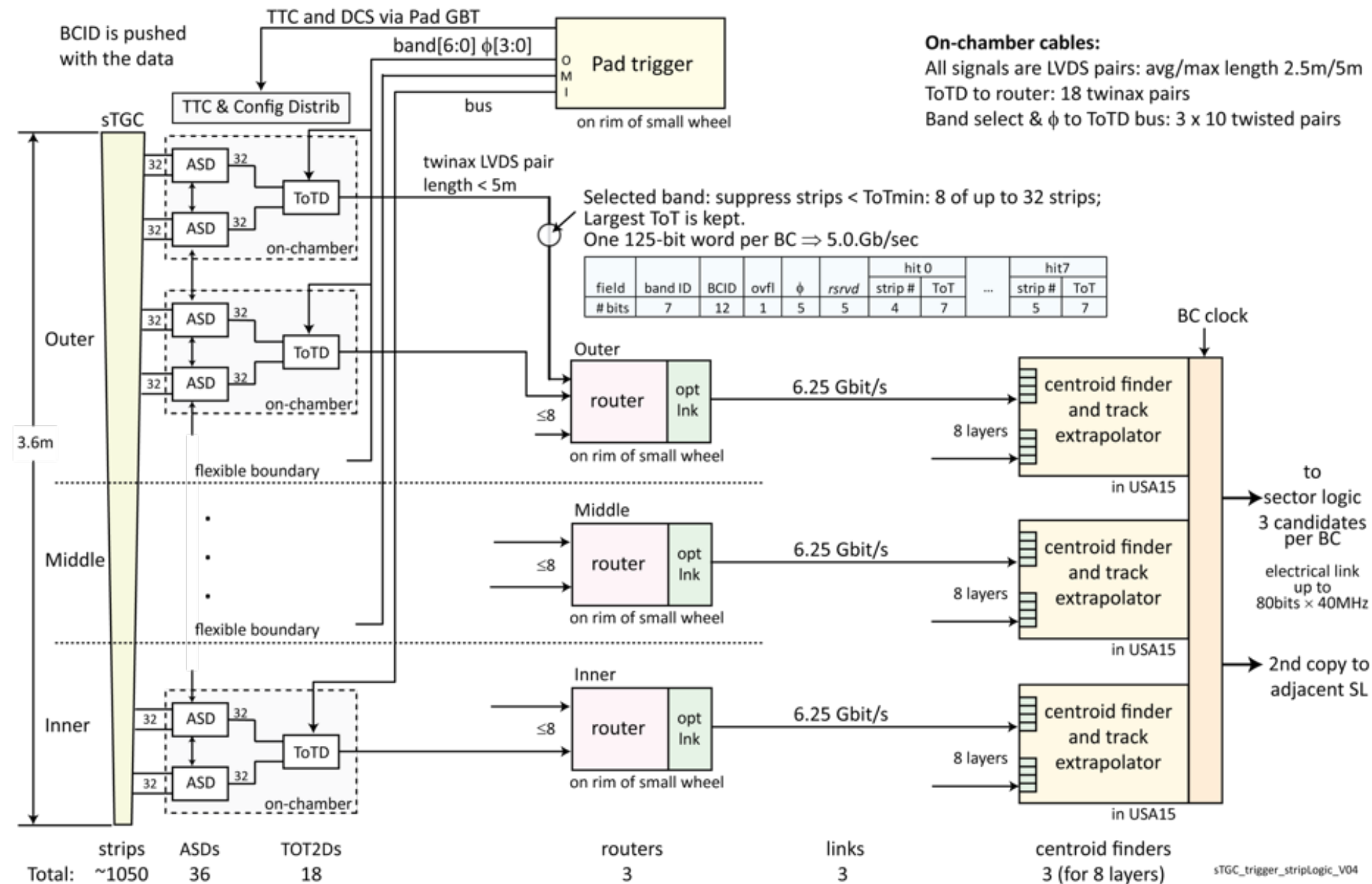# sTGC trigger scheme

sTGC trigger: strip logic: one layer of one 1/16th

~65 overlapping bands of strips per layer
Typically 20, but up to 32, strips in a band
A band may bridge two ToTDs.
Gaps in ASD allowed due to chamber boundaries

On-chamber cables:
All signals are LVDS pairs: avg/max length 2.5m/5m
ToTD to router: 18 twinax pairs
Band select & ϕ to ToTD bus: 3 x 10 twisted pairs

TTC and DCS via Pad GBT
band[6:0] ϕ[3:0]
BCID is pushed with the data
TTC & Config Distrib
bus
Pad trigger
on rim of small wheel

sTGC
3.6m
Outer
Middle
Inner

32 ASD 32
32 ASD 32
ToTD
on-chamber

twinax LVDS pair length < 5m

Selected band: suppress strips < ToTmin: 8 of up to 32 strips;
Largest ToT is kept.
One 125-bit word per BC $\Rightarrow$ 5.0 Gb/sec

field	band ID	BCID	ovfl	ϕ	rsrvd	hit 0 strip #	ToT	...	hit7 strip #	ToT
# bits	7	12	1	5	5	4	7		5	7

flexible boundary

Outer
router opt lnk
≤8
on rim of small wheel
6.25 Gbit/s
centroid finder and track extrapolator
8 layers
in USA15

BC clock

Middle
router opt lnk
≤8
on rim of small wheel
6.25 Gbit/s
centroid finder and track extrapolator
8 layers
in USA15

Inner
router opt lnk
≤8
on rim of small wheel
6.25 Gbit/s
centroid finder and track extrapolator
8 layers
in USA15

to sector logic
3 candidates per BC

electrical link up to 80bits × 40MHz

2nd copy to adjacent SL

	strips	ASDs	TOT2Ds		routers	links	centroid finders	
Total:	~1050	36	18		3	3	3 (for 8 layers)	sTGC_trigger_stripLogic_V04

MM trigger scheme