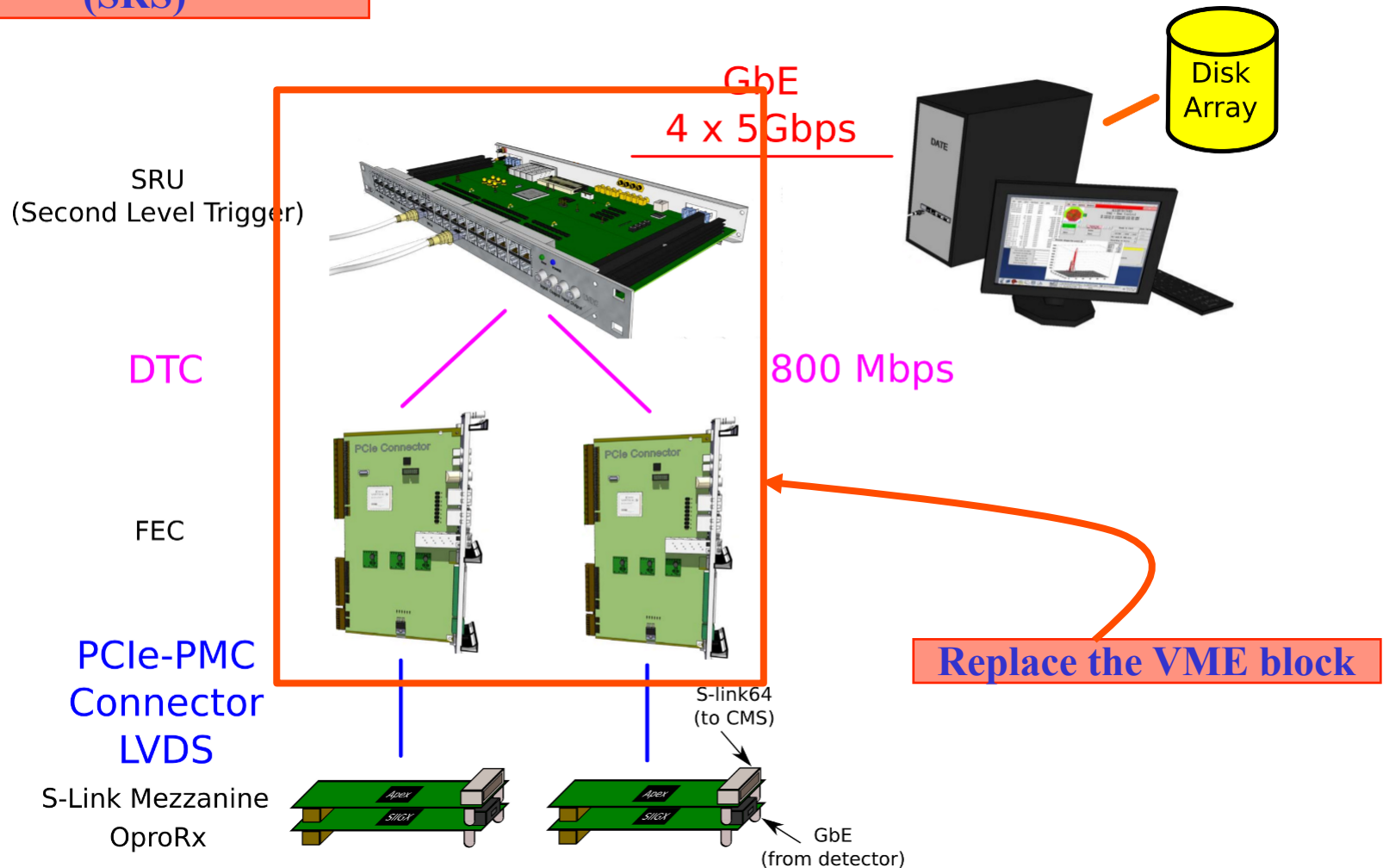


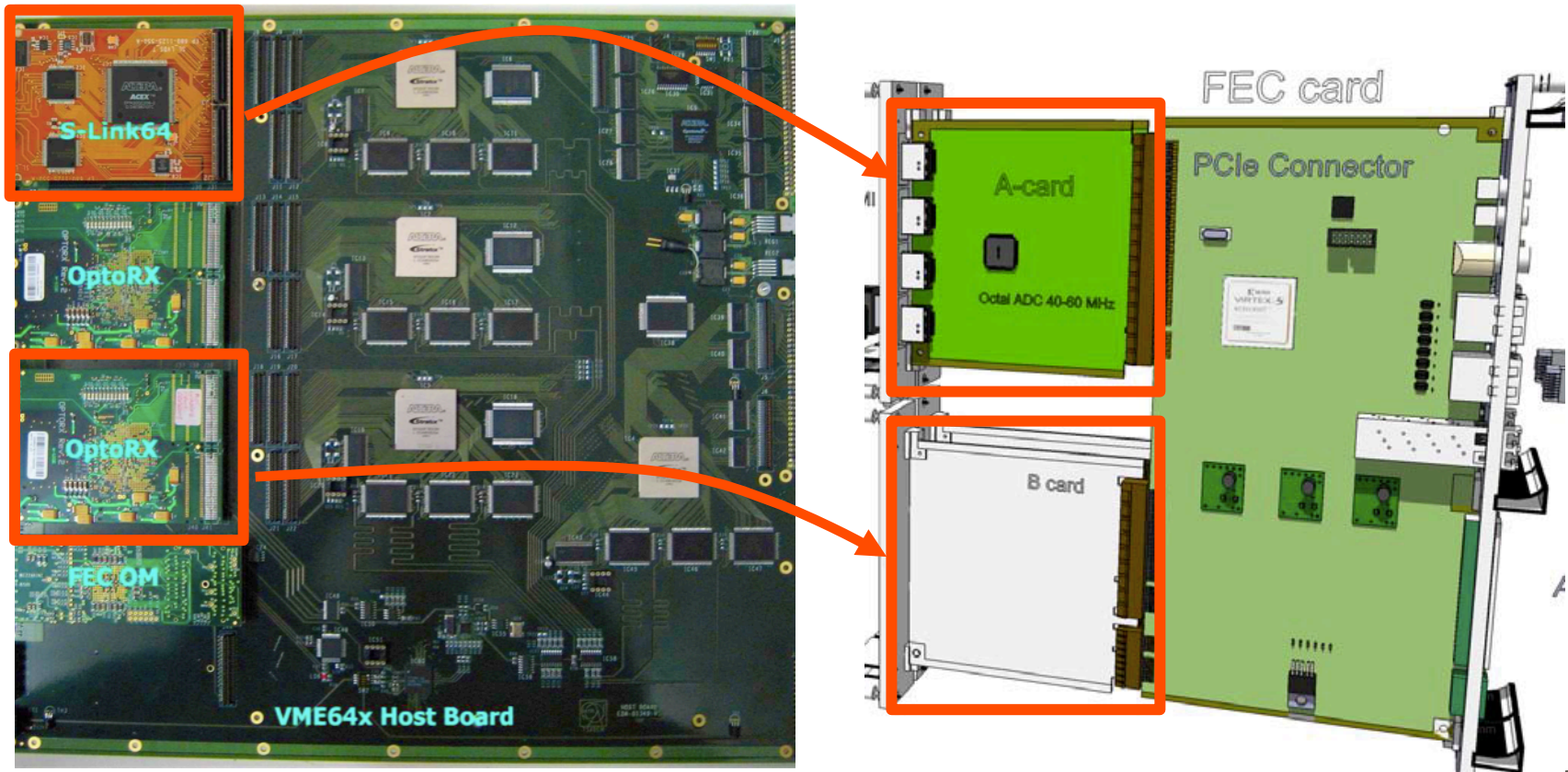
DAQ evolution: ... to here

Scalable Readout System (SRS)



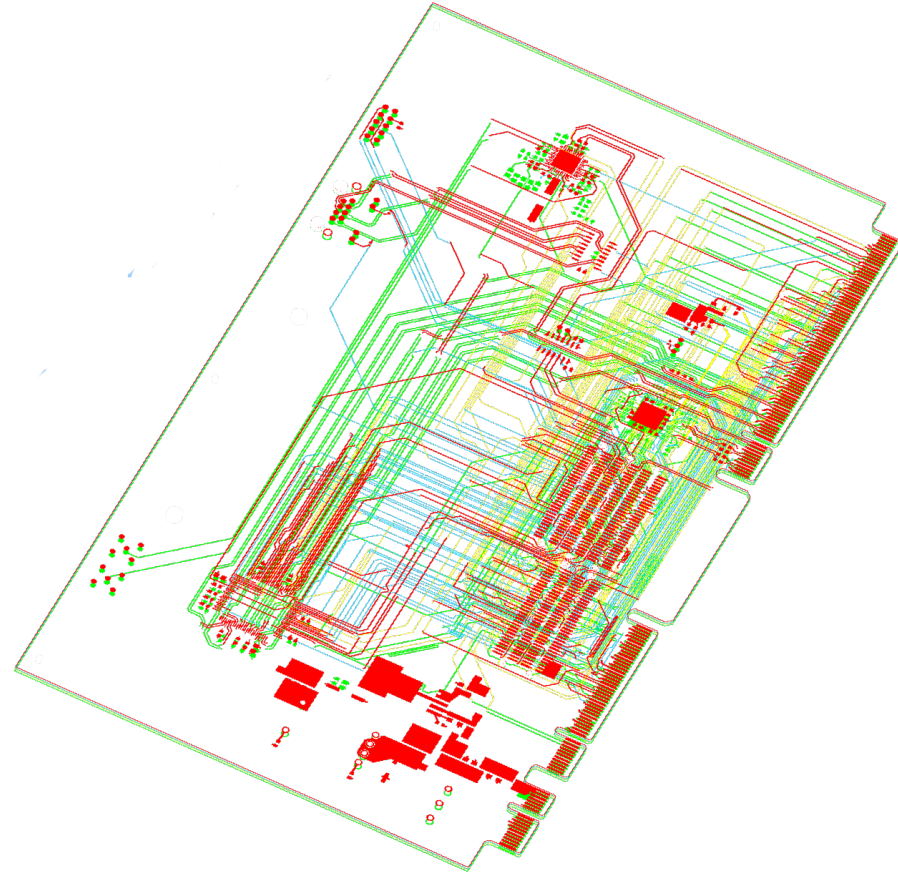
DAQ evolution: ... to here

- We would like to leverage as much as possible the actual resources: OptoRX + S-Link.
- An interface has been designed and is under construction to adapt the OptoRX to the RD51-FEC.



RD51-FEC OptoRX interface

- La scheda è stata disegnata e prodotta a Bari da A. Fiergolski con l'aiuto del servizio CAD di sezione.
- 4 PCB sono stati prodotti ed uno completamente montato ed in test.
- In attesa della FEC è stato completamente provato al banco ed attrezzato con una OptoRX.
- Prove di acquisizione sono state fatte usando una link S-Link/PCI e sia VFAT reali che simulati in firmware.
- Il comportamento della card e le sue caratteristiche elettriche, sono state completamente provate in laboratorio.



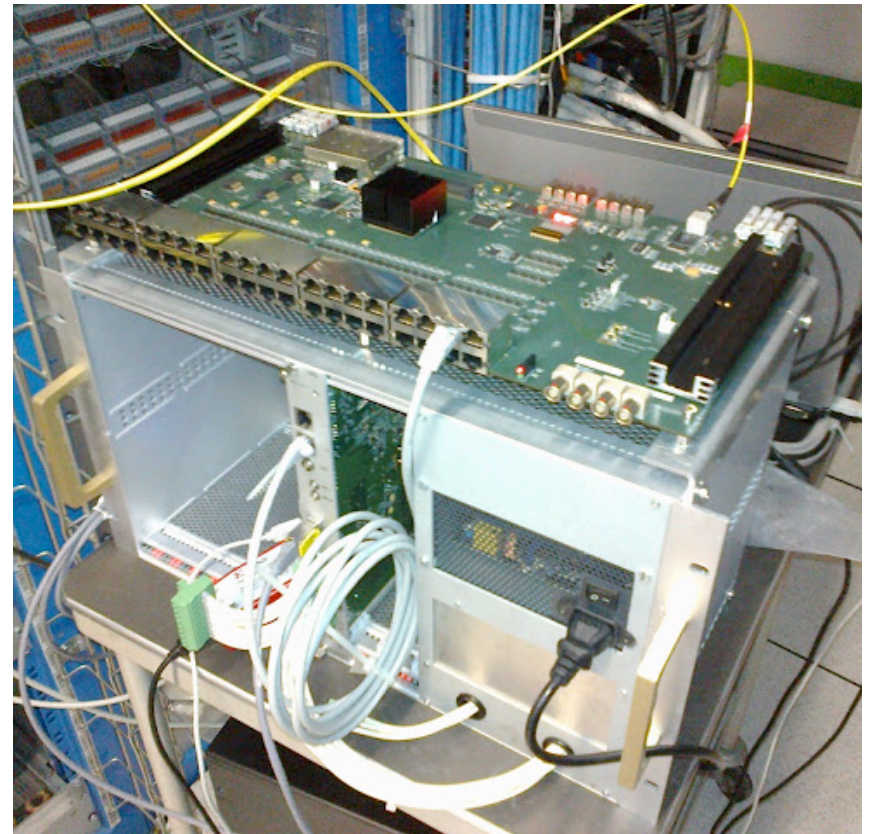
Novita`

- Ricevuti una SRS-FEC e un modulo SRU (concentratore) e relativi accessori
- Integrata la scheda di interfaccia opto-fec con Opto-RX
- Integrati TTC (trigger and timing) e sistema di backpressure (busy)
- Sono stati fatti test in laboratorio e a IP5
- Presa dati di 3 RP (1/2 station), osservato fino a 10x le performances attuali (limite in questo test: HD del computer di readout). **Consideriamo che il field-test sia positivo.**
- Ci concentriamo ora sull'ottimizzazione del sistema e sulla definizione dei dettagli dell'architettura.
- La collaborazione RD51 sta aggiornando il disegno della FEC (FPGA piu` potente, vari suggerimenti dalla comunita`) e la sezione di Bari sta contribuendo con il layout.
- Si prevede di semplificare il disegno dell'interfaccia FEC-OptoRX per cui si chiederà un impegno del servizio di progettazione elettronica.
- **Servizi: progettazione.**
 - la collaborazione RD51 ha in programma l'aggiornamento della SRU e potrebbero chiederci un contributo sul layout (~ 1m.u.)
 - Non e` esclusa una evoluzione della scheda di interfaccia FEC/Opto-RX (~1m.u.)

SRS-FEC con scheda opto-fec e Opto-RX



Il sistema completo a IP5



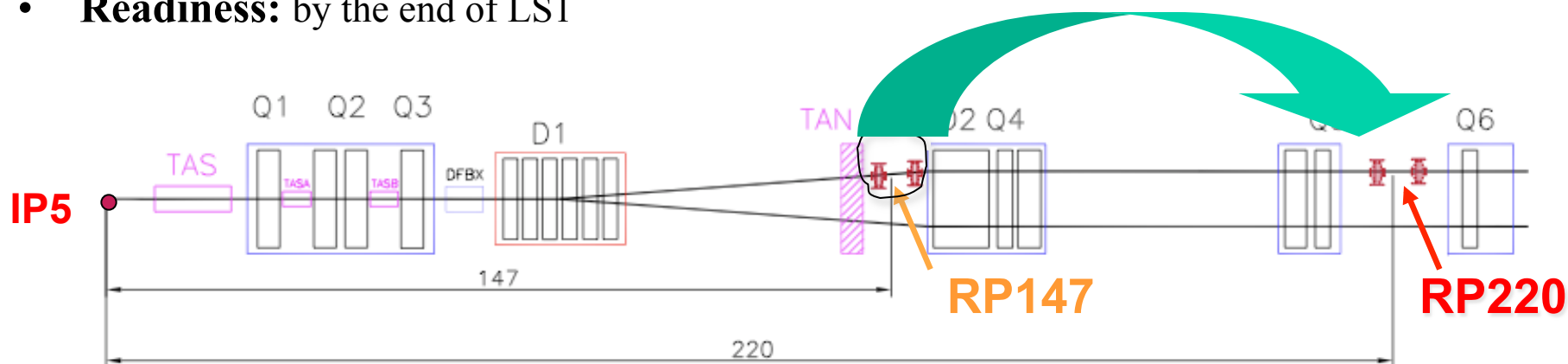


Incremental Upgrade Program

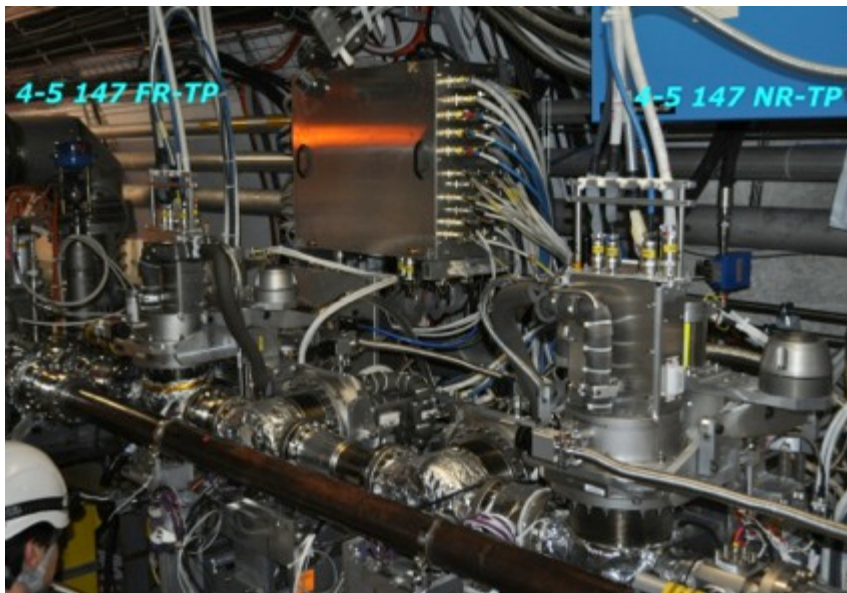
5 Marzo 2013
Angelo Scribano

- **Physics**
 - Elastic, Inelastic, Total cross-sections at 14 TeV
 - Diffractive processs (soft+), Mx forw+central with CMS
- **LHC**
 - β^* 90 m as now
 - Low β^* optics special runs at low luminosity
- **Detectors**
 - RP 220 (horizontal+vertical)
 - T2 consolidation (11th-card, HV, ...) and T1 maintenance
 - SRS for DAQ
- **Readiness:** during LS1 (to take data on 1st run, if needed)

- **Physics:**
 - Sensitivity to 10 pb cross-sections in diffractive processes
 - Mx forw+central and diffraction (soft+hard) with CMS
- **LHC: high lumi with special train of low-lumi bunches**
 - $\beta^* 90$ m with crossing-angle and 1000 bunches
 - Standard optics runs at high luminosity triggering on train of small bunches (and TCL6 installed)
- **Detectors: limited data taking to avoid radiation damage**
 - RP 147 (vertical+horizontal) relocated near 220 (eventually tilted to allow multi-tracks reconstruction)
 - Impedance protection (e.g. Faraday cage) and ferrite treatment to sustain high luminosity/heat environment
- **Readiness:** by the end of LS1



Roman Pot at 147m & 220m

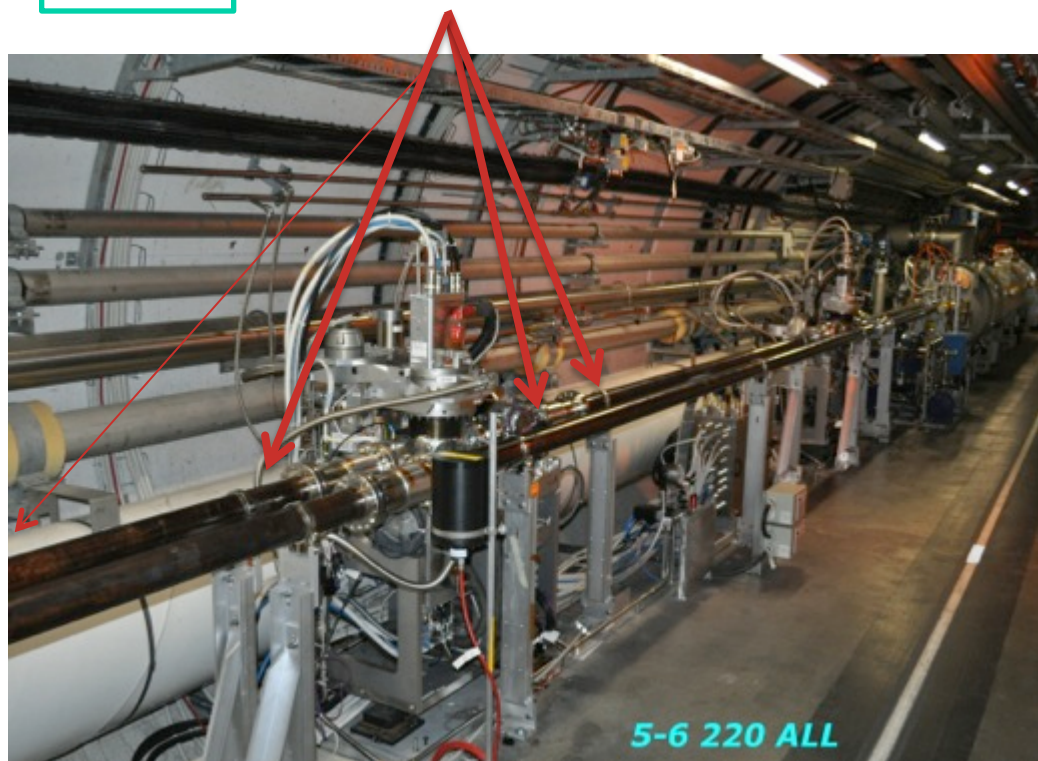


patch
panel

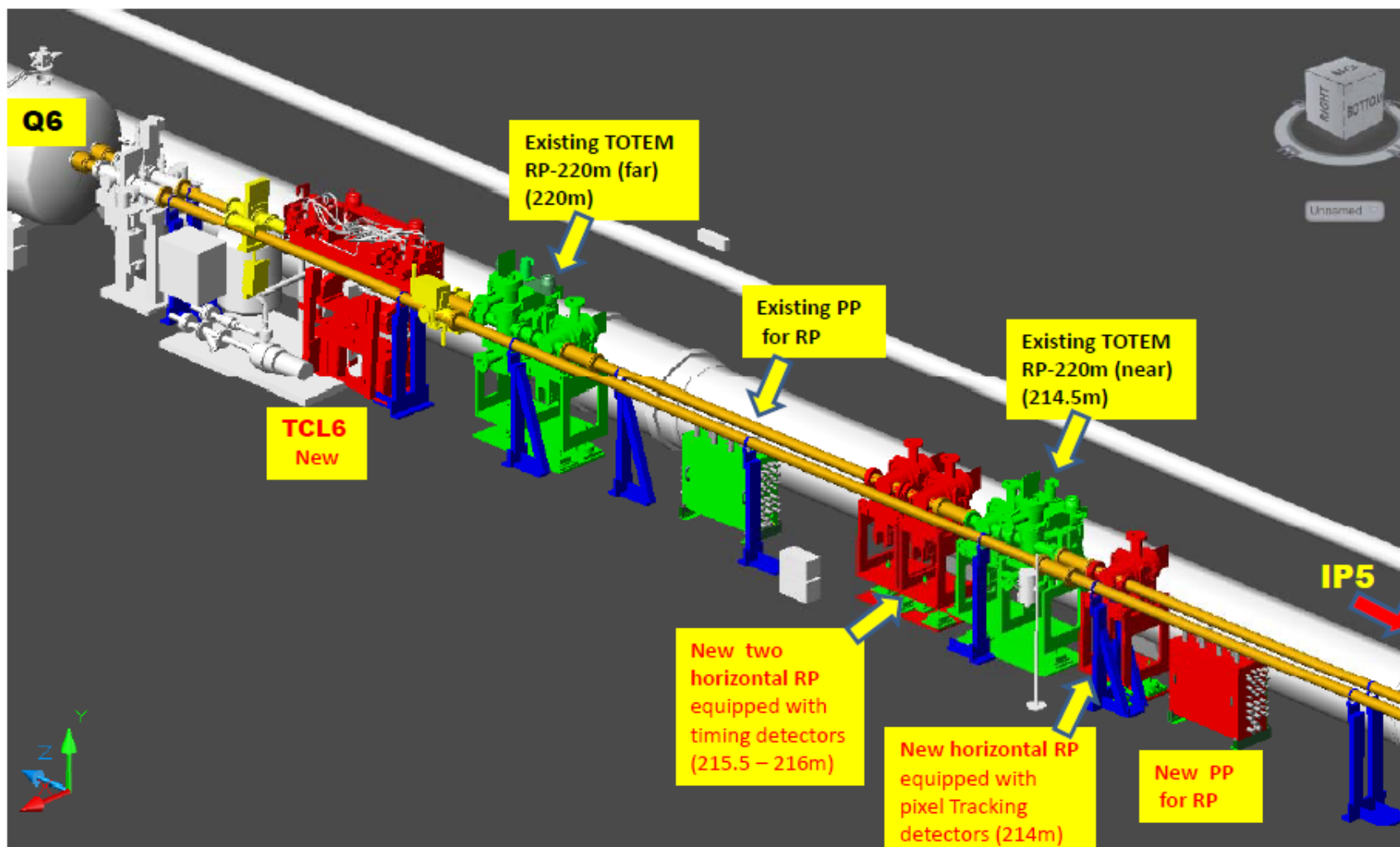
Position of new RPs

Relocation of RPs &
patch panel from
147m to 200m

patch panel
(relocated from 147m)



Integration study of TCL6 and Roman Pots



- TOTEM proposes to install additional horizontal RPs in region of $\pm 220\text{m}$ of ip5 during LS1
- These new horizontal RP detectors will allow tracking & timing at low β^* and high luminosity

- **Physics:**
 - Sensitivity to < 10 pb cross-sections in diffractive processes
 - Mx forw+central and diffraction (soft+hard) with CMS
- **LHC: high lumi with special train of low-lumi bunches**
 - $\beta^* 90$ m with crossing-angle and 1000 bunches
 - Permanent standard optics at high luminosity triggering on train of small bunches (and TCL6 installed)
- **Detectors: extended running → gradually implement rad-hard detectors**
 - RP 220 edgeless radiation-hard pixel detectors (multi-tracks) with CMS chip + trigger from RP strip detectors
 - New cylindrical shape to minimize thin window material in longitudinal direction and minimum impedance for high luminosity
- **Readiness:** after end of LS1 anytime in between LHC runs

- **Physics:**
 - Sensitivity to low cross-sections requiring events pile-up
 - Mx forw+central and diffraction (hard) with CMS
- **LHC: full lumi without special bunches**
 - $\beta^* 90$ m with crossing-angle and 1000 bunches
 - Permanent standard optics at high luminosity triggering on standard bunches (and TCL6 installed)
- **Detectors: as 2nd order + vertex tagging in multi-event bx**
 - RP 220 edgeless radiation-hard pixel detectors (multi-tracks) with CMS chip + trigger from RP strip detectors
 - Timing detectors downstream of tracking RPs; Ckov, Si, or diamond technologies to give 10 ps resolution
- **Readiness:** between LS1 and LS2
- → troppo presto per noi quantificare in questo momento le richieste per servizi negli anni > 2014
 - Possiamo assumere che **non saranno identicamente nulle**, ma data la dimensione ed estensione dei rivelatori ci aspettiamo che siano meno impegnative di quelle di esperimenti piu` grandi.

CMS-TOTEM proton spectrometer

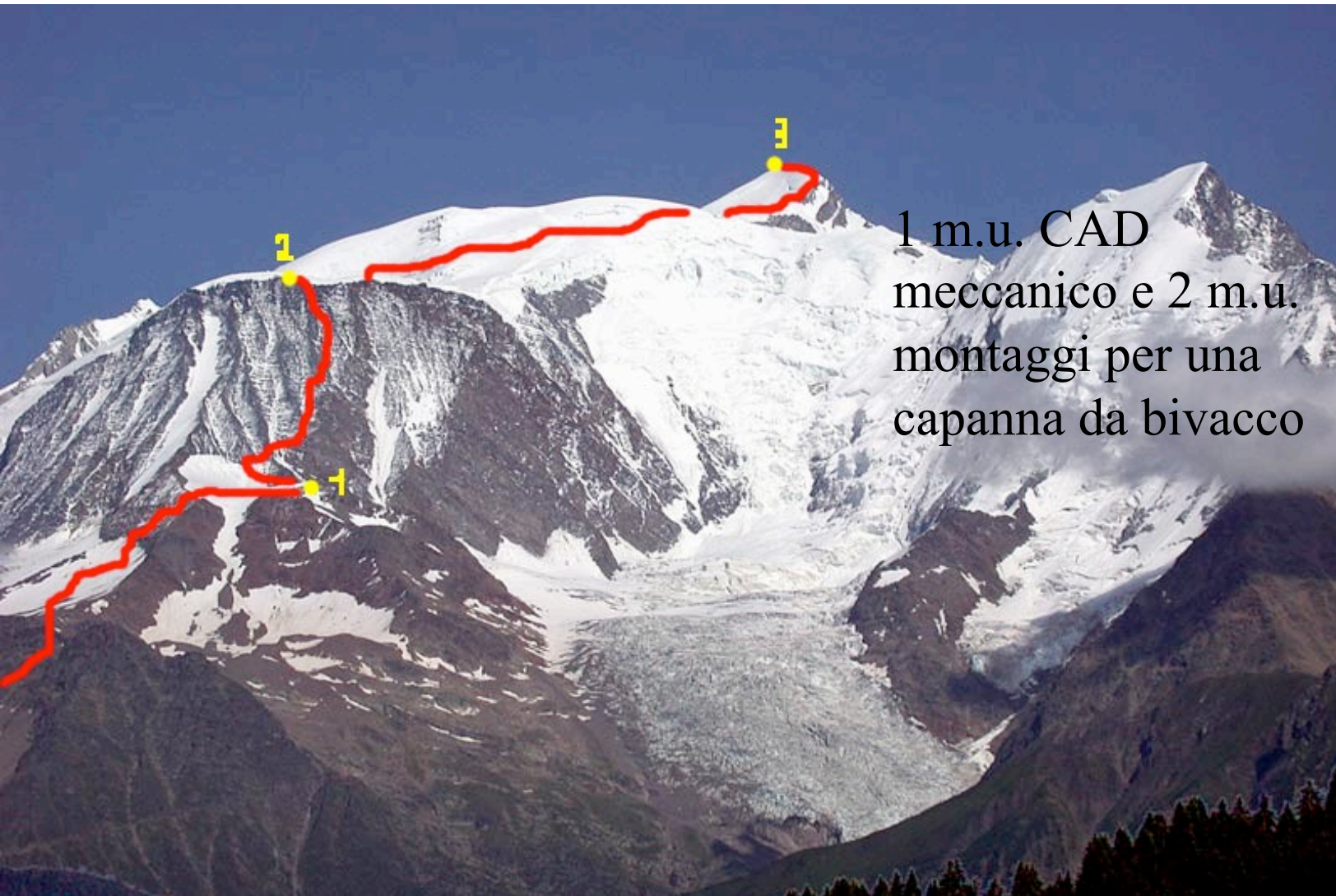
Abstract

We demonstrate the feasibility to use the Roman Pots made available by the TOTEM collaboration in the 200-220 m region downstream of the CMS interaction point to house the HPS tracking and timing detectors. This solution makes it possible to have a spectrometer ready for physics immediately after LS1; it has the full support of the TOTEM Collaboration, which would participate in the installation and commissioning, as well as in the data-taking and data analysis efforts. We would therefore be able to profit from their expertise in operating a near-beam detector at LHC.

LS3 upgrades



3 m.u. officina
meccanica per
costruzione sdraio
e ombrelloni



1 m.u. CAD
meccanico e 2 m.u.
montaggi per una
capanna da bivacco



1 m.u. officina meccanica per un
nuovo sistema di distribuzione del
gas



1 m.u. progettazione
elettronica per una
scheda di
acquisizione GPS

2 m.u. montaggi
meccanici per la
manutenzione dei winch

