Helsinki Scenario

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Summary of open topics

- Types of detector inserts
- Detectors in secondary vacuum
- Preferably a thin window to reduce showering
- Alignment of detector stations to each other and the BPMs
- Detector station supports
- Detector cooling
- Detector retraction in emergencies

Design considerations

- Definitely go for perpendicular detector inserts with thin (200 μm or less) steel windows – minimum interference with beam shield – we need appropriate RF simulation
- Try to use window designs investigated and tested by TOTEM Roman Pots or the window proposed by Andrew
- Moving the other beam pipe away is really worth considering for secondary vacuum access to detectors
- Adapt TOTEM or ATLAS RP detector cooling solution for fp420 stations – we have similar thermal loads
- Radhard stepper motors should be picked from appropriate LHC hardware baseline design report
- Pneumatic or vacuum operated failsafe mechanism to eliminate beam dump requests from risk analysis matrix. Beam dump requirement remains in case beam hits detector
- Four separate stations provide redundancy

Alignment

- The problem is nothing is rigid and fixed if we want to achieve 10 μm positioning accuracy of detector blocks over the length of 10 m
- Perpendicular detector inserts have better geometry for alignment measurements – detector inserts can be calibrated separately from chambers
- Detector plane position co-ordinates needed for “garage” position and “data taking” position plus any variations during data taking – we would prefer optical dynamic position monitoring to ensure accurate tracks
- Detector positioning should rely on BPM data during Closed Orbit beam stage. Beam Loss Monitors should be monitored as well. Where are the BLM locations near 420 m???
- “our” BPM cost is lower since we can use four warm “Button Feedthrough Pickups” mounted on a 6-way cross
- Laser alignment should provide monitoring in X,Y plane from the BPM location on the beampipe to determine relative positions of different detector blocks to each other and the BPM
- Accurate relative positions of assembled detector chambers can be measured by using pulsed wire and dummy pickup electrodes mounted in dummy detector windows together with optical calibration. Separately calibrated detector blocks can then be inserted after bakeout without compromising the optical position monitoring system

That's all for now

- Simulation data is needed before new drawings can be made, especially the RF environment around the beam
- We may have solved the relative alignment/positioning problem, but further research is needed before demonstration. The system provides continuous monitoring of X,Y co-ordinates of all stations and the BPM with 3-5 micron accuracy over the 25 mm travel range
- Quartic needs a different chamber/window which means the last station is probably a hybrid SiQuartic station