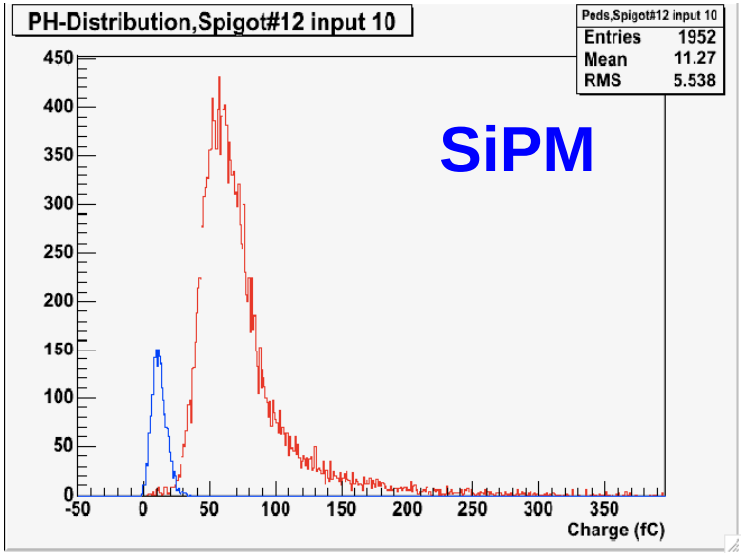
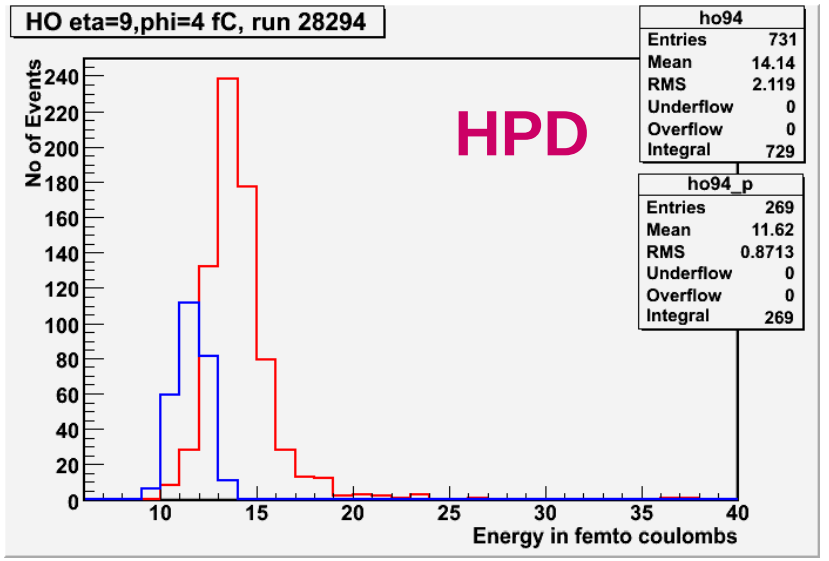
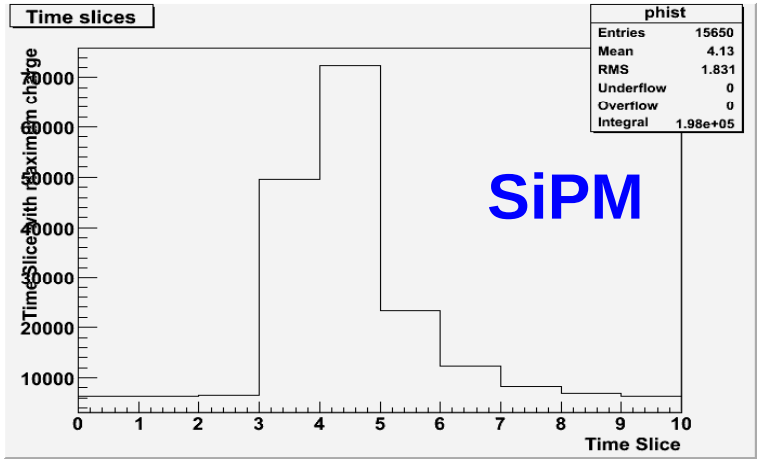
HO Strawman Proposal

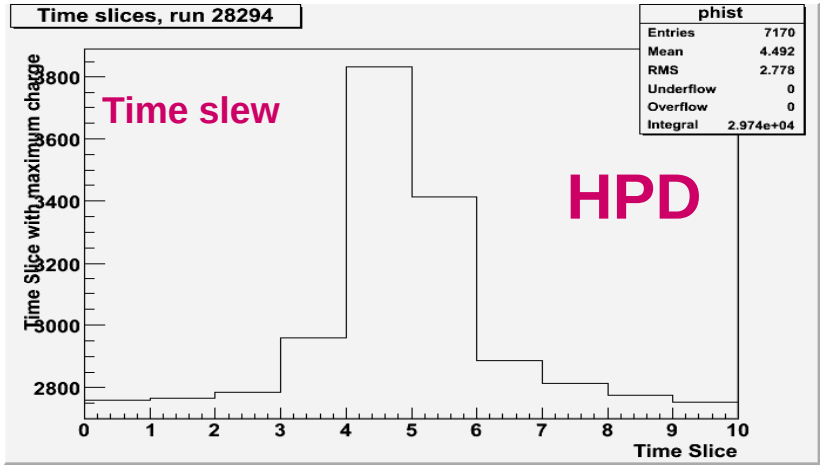
- Propose to replace HPDs in R1 and R2 with SIPMs, ASAP
- R0 OK, leave alone.
- SIPM benefits
  - Work in B field
  - Better QE
  - Better signal-to-noise (higher gain)
- QIE/HTR/DCC will remain unchanged
- Upgrade will remain in place for life of CMS (OK for MTT)

Muon response for YB1

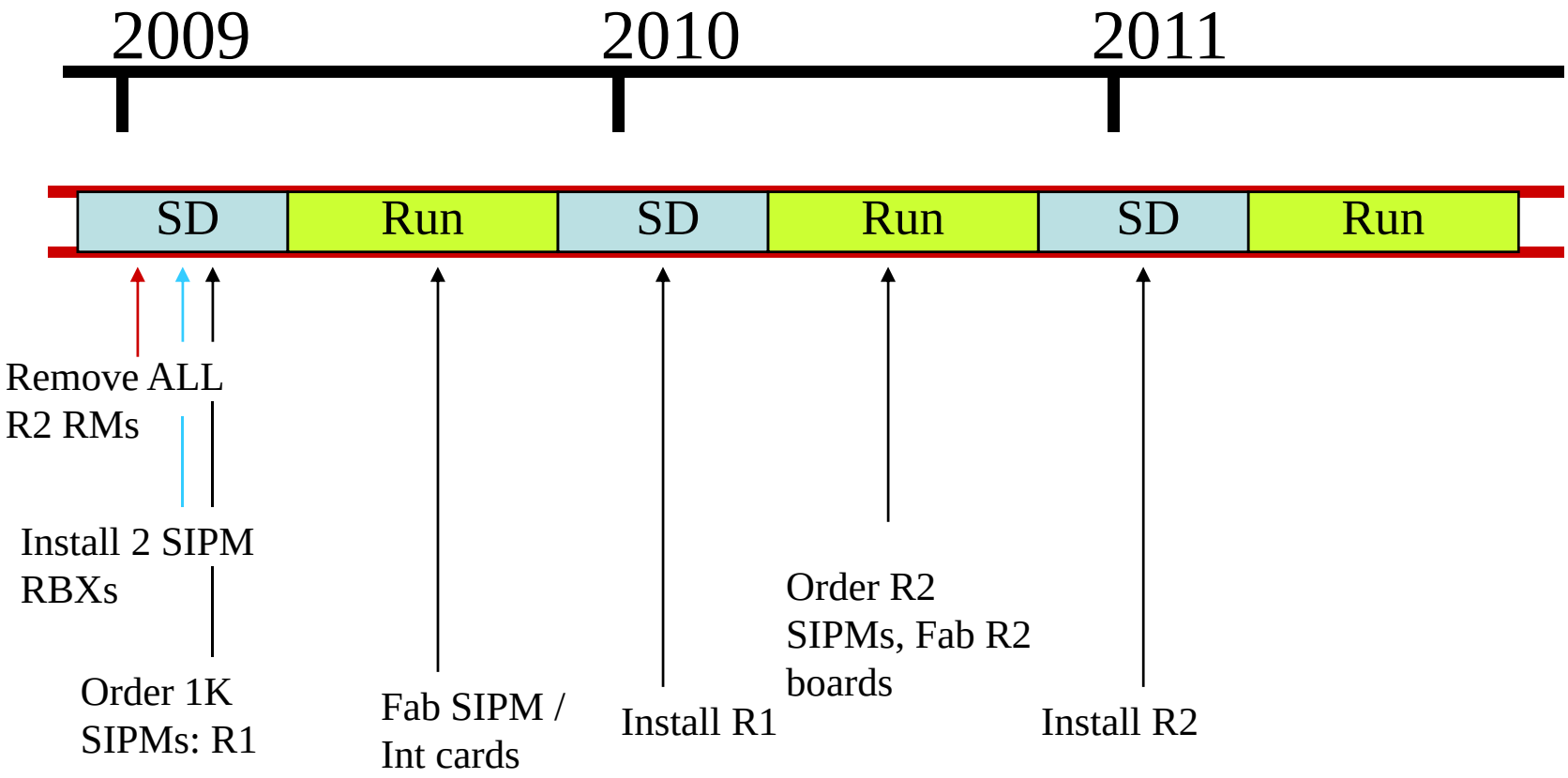








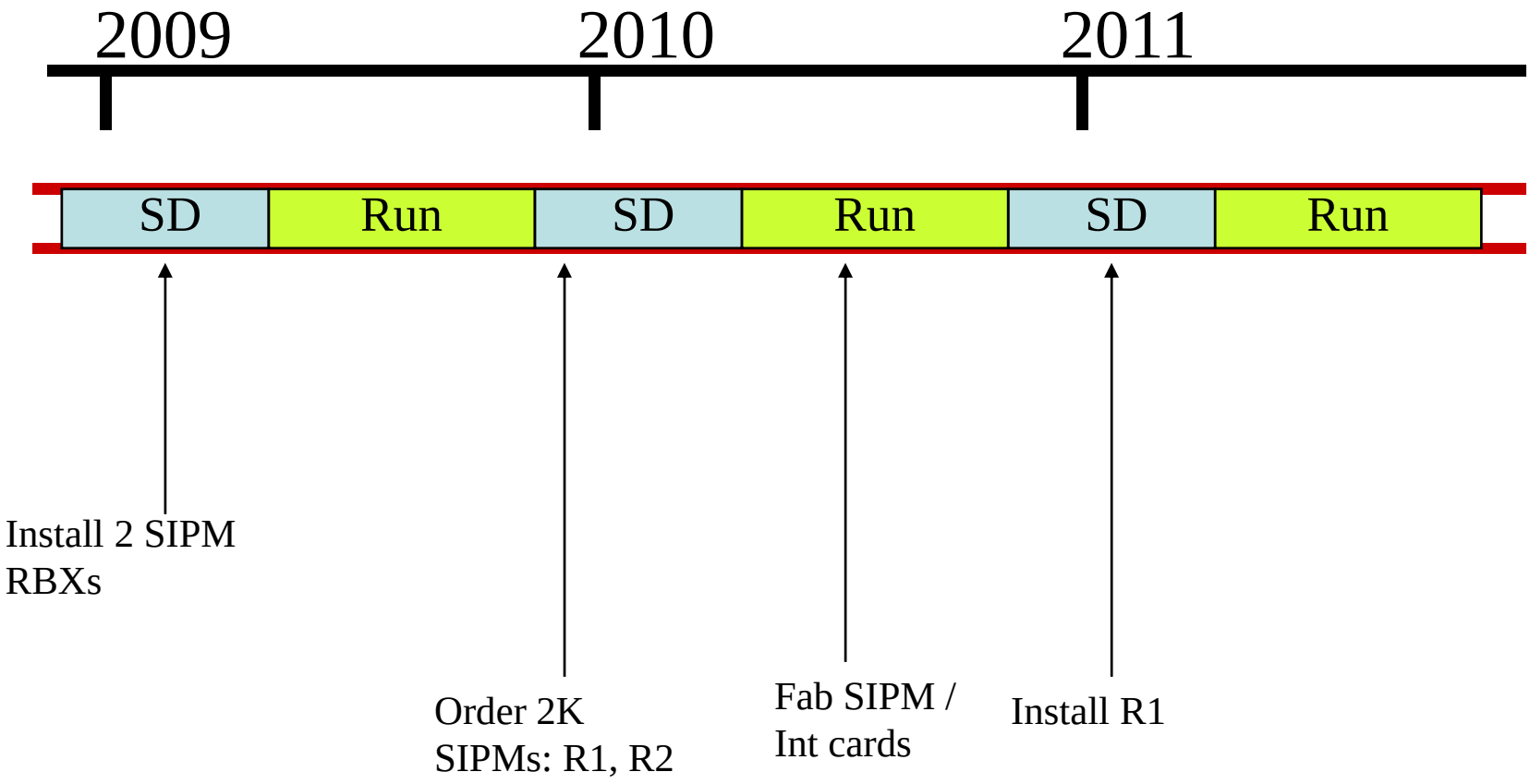
Fast Path Timeline



Fast Path Decisions

- Decide not to operate R2 (now)
  - Not needed for early physics
  - Need HPDs for R1 replacements, spares
  - Get jump start on upgrade by removing RMs
- Evaluate Hamamatsu, FBK diodes on bench (now – March)
  - Performance (done!)
  - Lifetime
- Install 2 RBXs of SIPMs (Hama, FBK) (Feb-Mar)
  - Develop utilities needed for DCS, …
- Order SIPM for HO upgrade of R1, R2 (Mar 09)
- Build Cards (Mar – Oct) Build tested RMs with R2
- Install as possible, 2009 shutdown, 2010 shutdown

Relaxed Path Timeline



Requirements Document for HO SIPMs

Requirements for HO SIPMs (Complete lifetime of CMS including 10 years 1035)**
(Draft Nov 11, 2008)

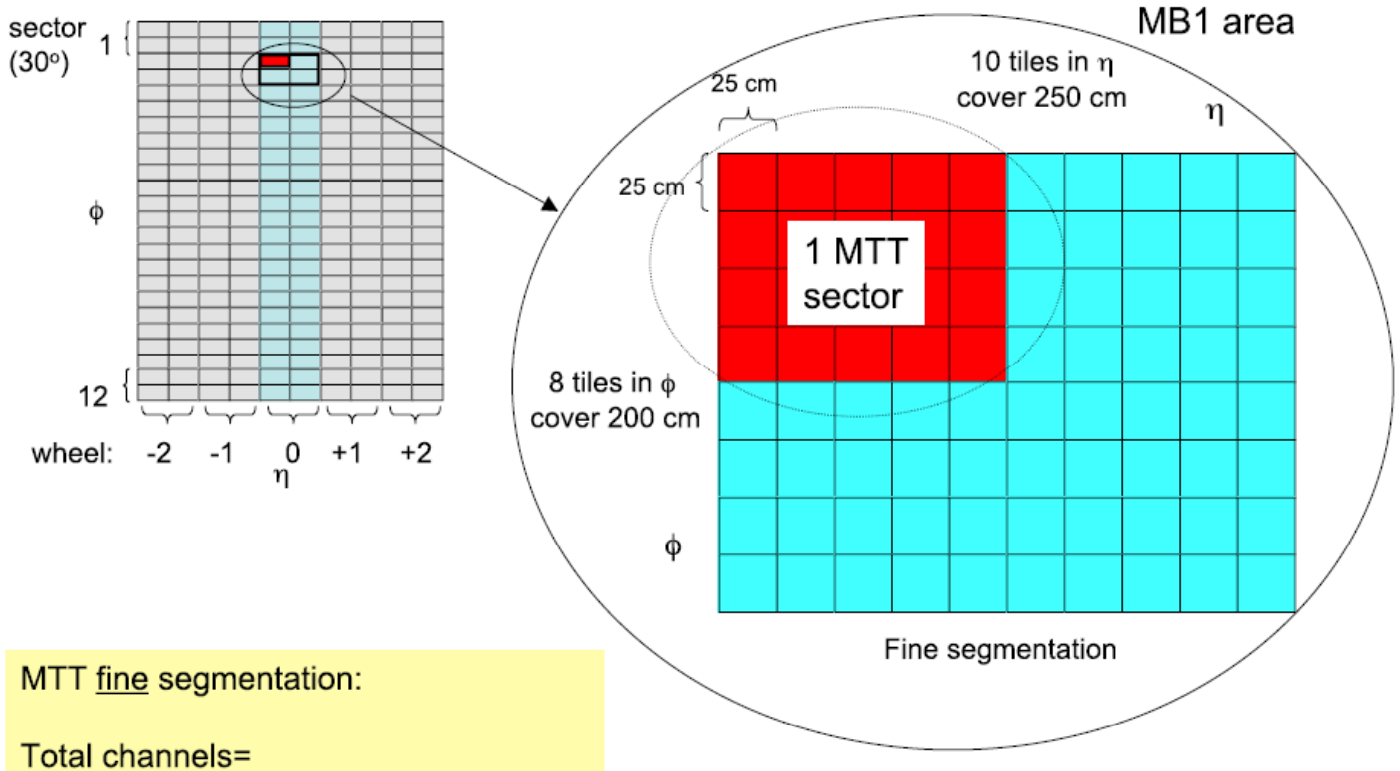
In this note we specify the requirements for an SIPM replacement for the HO HPDs. We anticipate that this replacement will last the remaining life of CMS so we set our specifications accordingly. We will study the suitability for FBK 2.8mm diameter, and Hamamatsu 3X3mm square SIPMs.

1. Active area. HO R1 and R2 have 5 0.9mm fibers close-packed into a circular bundle. The diameter of this bundle is 2.6mm. Thus the diode should be of order > 2.8mm diameter or 3X3mm square. The maximum size of the package is constrained to fit inside an array corresponding to the placement of the 18 pixels in an HPD.

2. Signal to Noise. The HPD has a signal-to-noise of about 3 to 1 for a MIP. The SIPM should at least match this performance.

MTT Concept (Phase II)

Layout with scintillator tiles



MTT fine segmentation:

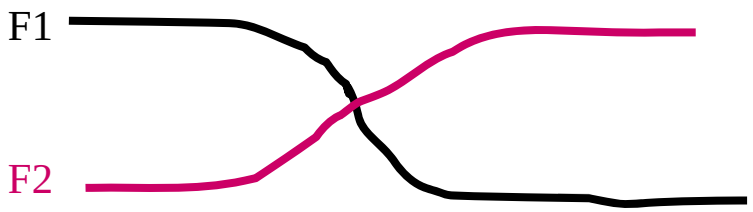
Total channels=
(8 in ϕ **x** 10 in η) x 60 MB sectors=**4800**

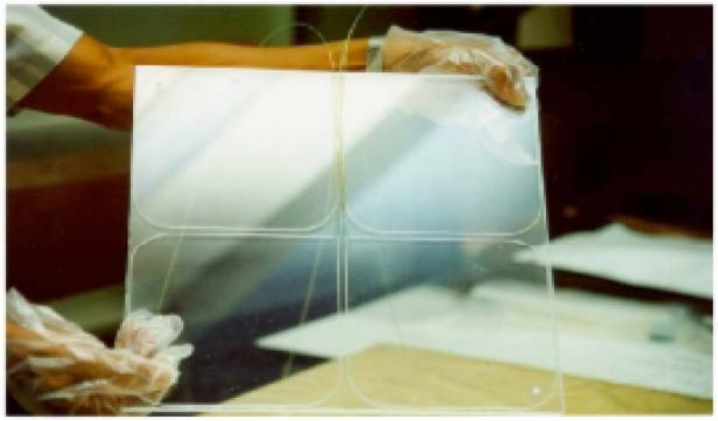
Total area: 2.0 x 2.5 x 60=**300 m²**

Fast tag + ghost rejection

Using HO for MTT?

- Existing HO ~ ½ segmentation of desired MTT. OK like this? If not →
- Replace SIPMs with EDUs. Read out each of the 4 fibers per tile, analog info gives improved position resolution.





- New QIE/back end electronics

Fine MTT Scenario

- Don’t install 3X3 SIPMs
- Rather develop EDUs
- Install EDUs 2011 with old electronics
- At some point in the future (2015?) upgrade to new electronics using same EDUs