



Performances of the modules for the upgrade

Discussion

Calorimeter upgrade meeting
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- Dominated by 4 effects
 - Radiation effects
 - PMT gain degradation
 - Pile-up effects
 - Removal of the SPD/PRS and particle identification

Today, only look at 2 first effects
- Quantify the problem
 - Origin of the problem
 - Fibre,
 - Scintillator
 - Amplitude of the effect wrt the accumulated dose
 - Irradiation in the tunnel
 - Not the proper incidence
 - Good particle content but slow (x5 wrt cavern)
 - High flux irradiation
 - Fast, but is it reliable (pessimistics) ?
 - Measurement on the detector itself
 - Can be used for a cross-check only – Some technical problems (source)

- Methods to (partially) cure the problem
 - Replacement of some modules (inner region) (→ when should we decide ?)
 - Would replace 48 modules – no spare left (see Bruno's slides)
 - This requires the present spare is checked (+ fixed - do we need fib, scint, mix)
 - Can we apply methods to recover ?
 - After removing the modules (in case a second replacement is necessary)
 - Could it be done in situ ?
 - Techniques foreseen :
 - Flashing modules with UV
 - Heating modules
 - Need to test on irradiated modules
 - Can we use one of the modules irradiated in the tunnel / at PS
 - Should we leave a single module in the tunnel from now on ?
 - ECAL and HCAL are not on the same footing
 - Replacement envisaged only for ECAL
 - LHCb physics does not rely so much on HCAL...
- PMT degradation → ~400 spares, a fraction is used during LS1
 - Can we imagine buying a new set to compensate for any future degradation
 - Cost issue – Those PMT should be tested before installation – etc...
 - Contact Hamamatsu