Provide an on-line monitor for beam conditions and possibility to request beam-abort, injection inhibit or ramp down detector voltages

Provide an initial mapping of the radiation field to check accuracy of background simulations and identify leaks in the shielding

Provide a long-term monitoring of integrated radiation exposure to aid in post-mortem diagnosis in case of device failure and to aid in corrective measures for background mitigation

M. Huhtinen

CMS Radiation Monitoring Meeting: 15 May 2003

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We propose to study the use of small diamond detectors very close to the beam pipe at about z=1.5-2 m from the IP

# Have to discriminate beam-loss against normal background from pp

1 proton on TAS: 10<sup>-10</sup> Gy/p

Normal pp at 10<sup>34</sup>: 0.02 Gy/s

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# 100 ns sampling time gives sensitivity to loss of >20 protons on TAS

M. Huhtinen

#### Connect to LHC beam abort system to be able to send abort or injection inhibit request in case of major abnormalities Connect to CMS DCS in order to be able to ramp down detector voltages in case of minor abnormalities

Potentially useful for diagnostics during beam set-up of the machine

Continuous monitoring of beam and background conditions with short sampling time. A record of these data form the centerpiece of the CMS radiation monitoring system, which otherwise might be mostly based on passive monitors. Thus it might be only the BCM which gives data with (very) high time resolution.

M. Huhtinen

Need to establish relationship between BCM readings and radiation levels throughout CMS

Need active monitors in various parts:

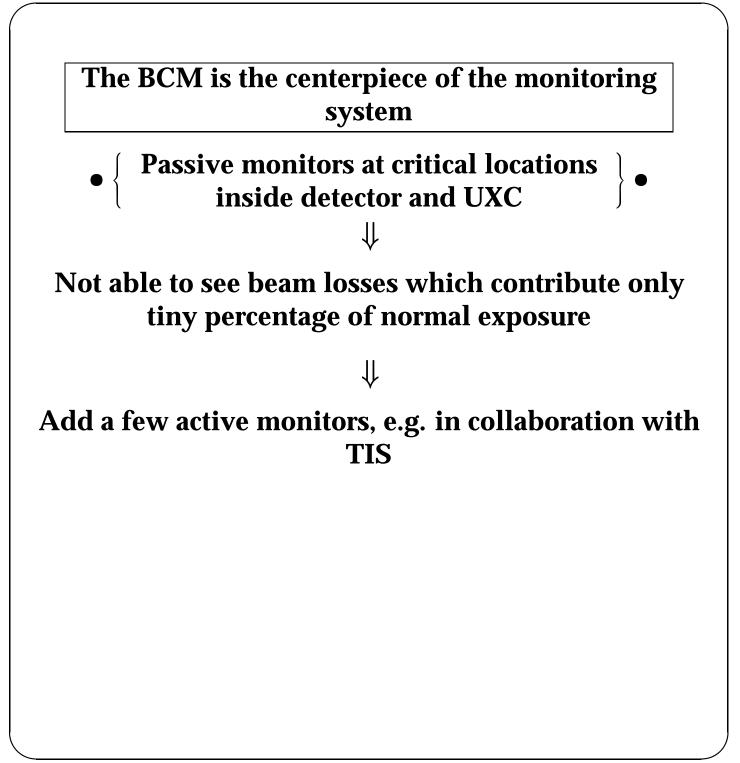
- dummy/real pixel sensors on pixel structure
- the Si-sensors of the silicon Tracker
- the muon chambers
- special monitors (counters) in the UXC

### Need to map the radiation field to inspect integrity of shielding and accuracy of simulations

# Same monitors as above + additional passive monitors collected at the end of the run for readout

M. Huhtinen

### Long-term monitoring



M. Huhtinen

### **Radiation levels**

Tracker:	1 kGy–1 MGy 0.02–20 kGy 10–10 <sup>4</sup> mGy/h	for 500 fb <sup><math>-1</math></sup> for 10 fb <sup><math>-1</math></sup> at L=10 <sup>33</sup>
ECAL:	100 Gy–100 kGy 2–2000 Gy 1–1000 mGy/h	for 500 fb <sup>-1</sup> for 10 fb <sup>-1</sup> at L=10 <sup>33</sup>
HCAL, MUON:	<100 Gy < 2 Gy < 1 mGy/h	for 500 fb <sup>-1</sup> for 10 fb <sup>-1</sup> at L=10 <sup>33</sup>
UXC:	<10 Gy < 200 mGy < 0.1 mGy/h	for 500 fb <sup>-1</sup> for 10 fb <sup>-1</sup> at L=10 <sup>33</sup>
rang	nonitors of TIS ha ge of 10 $\mu$ Gy/h–400 $\downarrow\downarrow$ uited as active mor	mGy/ĥ

M. Huhtinen

Diamond based BCM close to beam line is the centerpiece of the whole radiation monitoring system

Pixel and Tracker can do their own radiation mapping during pilot run, first physics run and even thereafter

Muon system might also be able to act as its own radiation mapping device (?)

**PMI monitors used by TIS have perfect dynamic range for UXC and around HF** 

Consider using  $\sim 20^{\circ}$  of these within the RAMSES network

Investigate cost effective and suitable passive monitors for initial mapping and long term monitoring

ECAL and HCAL RBX only outstanding issue: PMIs do not fit into the region – need smaller devices. Do we need active monitors here ?

M. Huhtinen