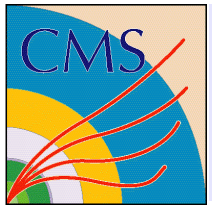


# CMS-LHC Signal Exchange

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**Presentation to Ad-Hoc Working Group on LHC Machine Parameters and Signal Exchange**

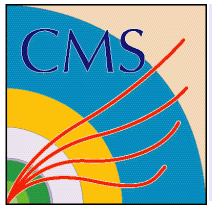
**March 26, 2002**

## Outline:

- CMS runtime feedback to LHC
- LHC Beam Abort Requests
- Timing adjustments
- CMS use of LHC RF pickups

**The pdf file of this talk is available at:**

**http://cmsdoc.cern.ch/~wsmith/LHCWG_0302.pdf**



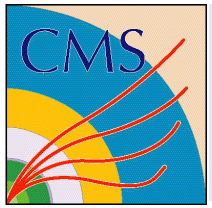

# CMS runtime feedback to LHC - I

## Information from Tracker

- **Z distribution & X,Y position**
  - Monitor pixel detector hit rate & silicon tracker every 10 msec
  - HLT analysis of pixel detect. provides vertex in x/y/z with good accuracy
  - Possibility of eventual info. on x/y width of luminous region
- **Luminosity**
  - Vertex counting/event reported every sec from pixel detector
- **Every 100 sec for transmission of summary information**

## Information from Muon System:

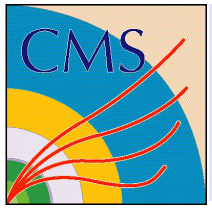
- **Muon halo, size & distribution of neutron background**
  - Needs further analysis as to character & frequency




# CMS runtime feedback to LHC - II

## Information from HCAL

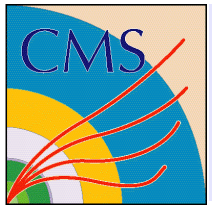
- **Octant/Quadrant Occupancies**
  - Reported normalized to 1 for “quiet” conditions, ranging btw. 0 - 5
  - Background “imbalance”
- **X,Y position using azimuthal energy flow**
  - Possible Z information from forward/backward rate asymmetry
- **Luminosity**
  - Information from forward rates
    - **Issue of backgrounds from halo muons, beam-gas, etc.**
- **Every minute**




# LHC Beam Abort Requests

## Abort on observing "odd behavior" in monitors

- **Level & Time Development**
  - Different responses for Injection, Ramping, Coasting
    - **Injection inhibit vs. Beam abort**
- **Use dedicated radiation detectors**
  - Diamond detectors on beam-pipe at z = 190 cm?
    - **Last point with minimum radius before becoming conical**
    - **Independent of Pixel system operation**
- **Response time on order of machine response time**
  - About 2 orbits, i.e. ~ 200 msec
- **Needs discussion with Machine Group:**
  - Design of detectors by CMS experimenters
  - Model of radiation levels at injection & ramping from M.G.



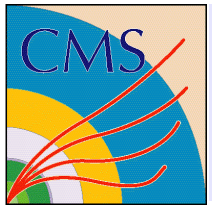

# Timing adjustments

**Do not anticipate frequent adjustments of the clock**

**Depends on actual machine & clock performance**

- **Information from Machine Group is needed**
  - Expected changes: How much? How often?
- **Need actual running experience.**

**CMS not affected by changes < 0.5 ns.**




# CMS use of LHC RF pickups

## Very Useful

- Use readout of all 4 quadrants separately
- Correlate with online (Higher Level Trigger) processing on average vertex position
- Use for systematic studies and for “fast” information

## Request to Machine Group to provide the 4 quadrant signals from each RF pickup

- Query to M.G. as to estimated statistical & systematic error (if known) when extrapolating to CMS Vertex position
- Request for liaison btw. M.G. and CMS concerning detailed development of pickup detectors, amplifiers and signal use.