IMU Triggers and Physics Motivations

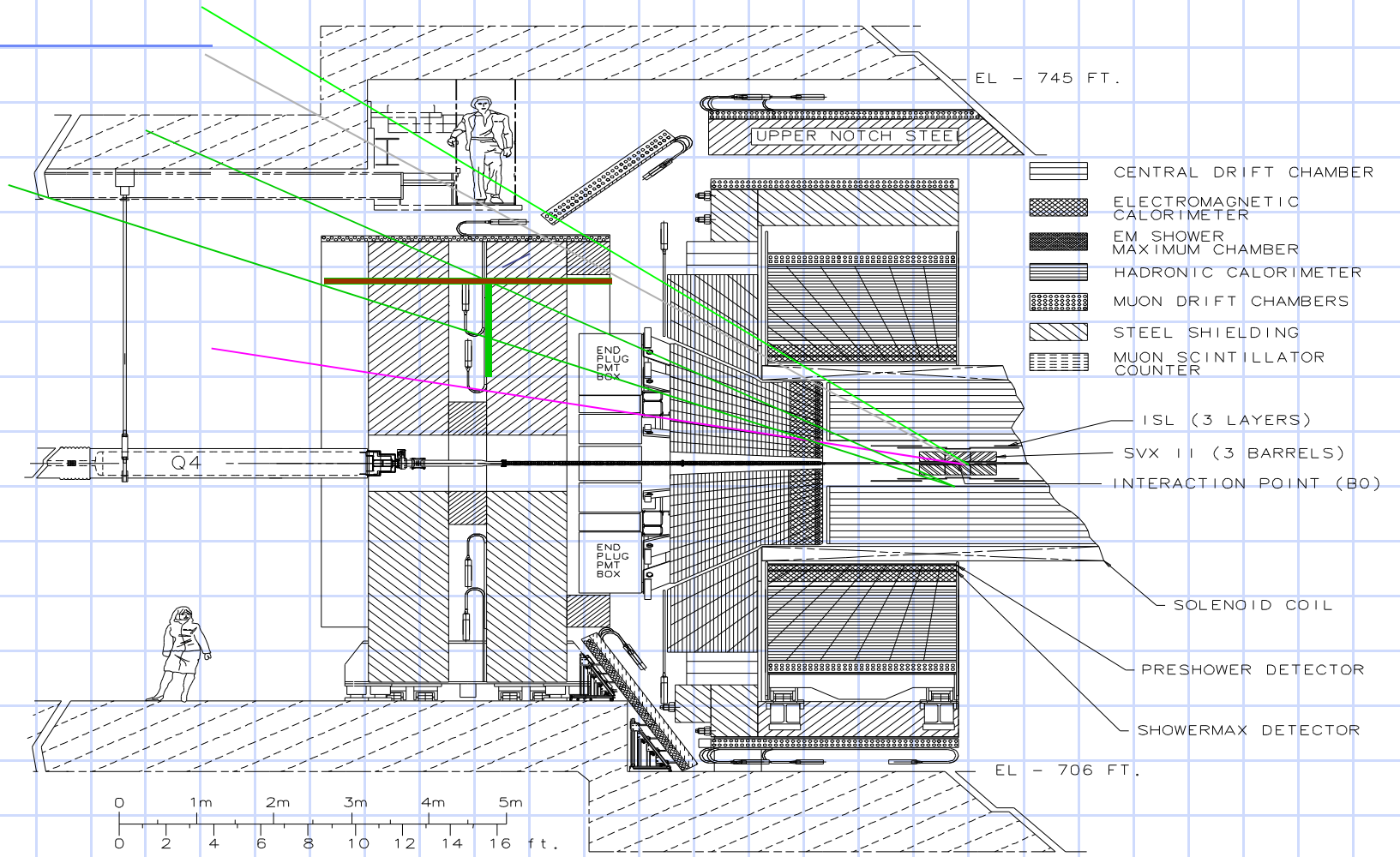
Woo-Hyun Chung

University of Wisconsin

Outline

- Introduction (IMU System)
- IMU Triggers (Past & Present)
- Physics from IMU Triggers
- Trigger Improvements for IMU
- IMU Trigger Rates
- Conclusions

IMU(Intermediate Muon) System
= BMU+BSU+TSU



IMU Triggers

- Table: PHYSICS_3_07 (until Jan 11th 2006)

  L1: L1_BMU10_BSU_PT8
  L1_BMU10_BSUR_TSUO_&_CLC

  L2: L2_CJET15_&_BMU10_PT11_L1_BMU10_BSU_PT8
  L2_CJET15_L1_BMU10_BSUR_TSUO

  L3: MUON_BMU9_L2_BMU10_BSU_PT15_DPS
  MUON_CENTRAL_JET20_L1_BMU10_BSUR
  MUON_CENTRAL_JET20_L1_BMU10_PT8

  **IMU Front trigger dropped in PHYSICS_4_00 (Feb 2006)

IMU Triggers (2)

- History:

Date	Run N	Trigger Table	Changes
May 15 2003	162989	PHYSICS_1_04_v-9	Stream B First Stable version after bug fixes and With CJET15 added in L2 Production Dataset MUON_CALIB
Aug 26 2003	168087	PHYSICS_1_05_v-8	Added L3 Pt>9 GeV Loose track-stub matching (< 30 cm)
Jan 8 2004	177486	PHYSICS_2_01_v-1	IMUF L3 cuts made standard IMUR inclusive trigger dropped Production Dataset MUON_BMU
May 3 2004	182336	PHYSICS_2_04_v-2	Hadron timing added to all L1
Feb 11 2006	211538	PHYSICS_4_00	IMUF dropped in all Level

Physics from IMU Triggers

- Inclusive Forward Muon Study from IMU:
  - W Asymmetry (Dan Cyr)
  - W/Z Cross Section
- Forward Muon can be used to improve sensitivity for statistically limited analyses
  - Single Top:
    - Overall ~14% gain over CMUP+CMX (Jason Slaunwhite)
  - Higgs Analyses:
    - gg->H->W+W→lvlv
    - ZH->l+l-bb : 17% gain (Beate and Ben)
    - WH->lvbb : 15% gain (Anyes)
    - WH->WWW
    - H->tautau

**Newly reported IMU trigger efficiency is ~63% (w/ 3L XFT's)

Trigger Improvements for IMU

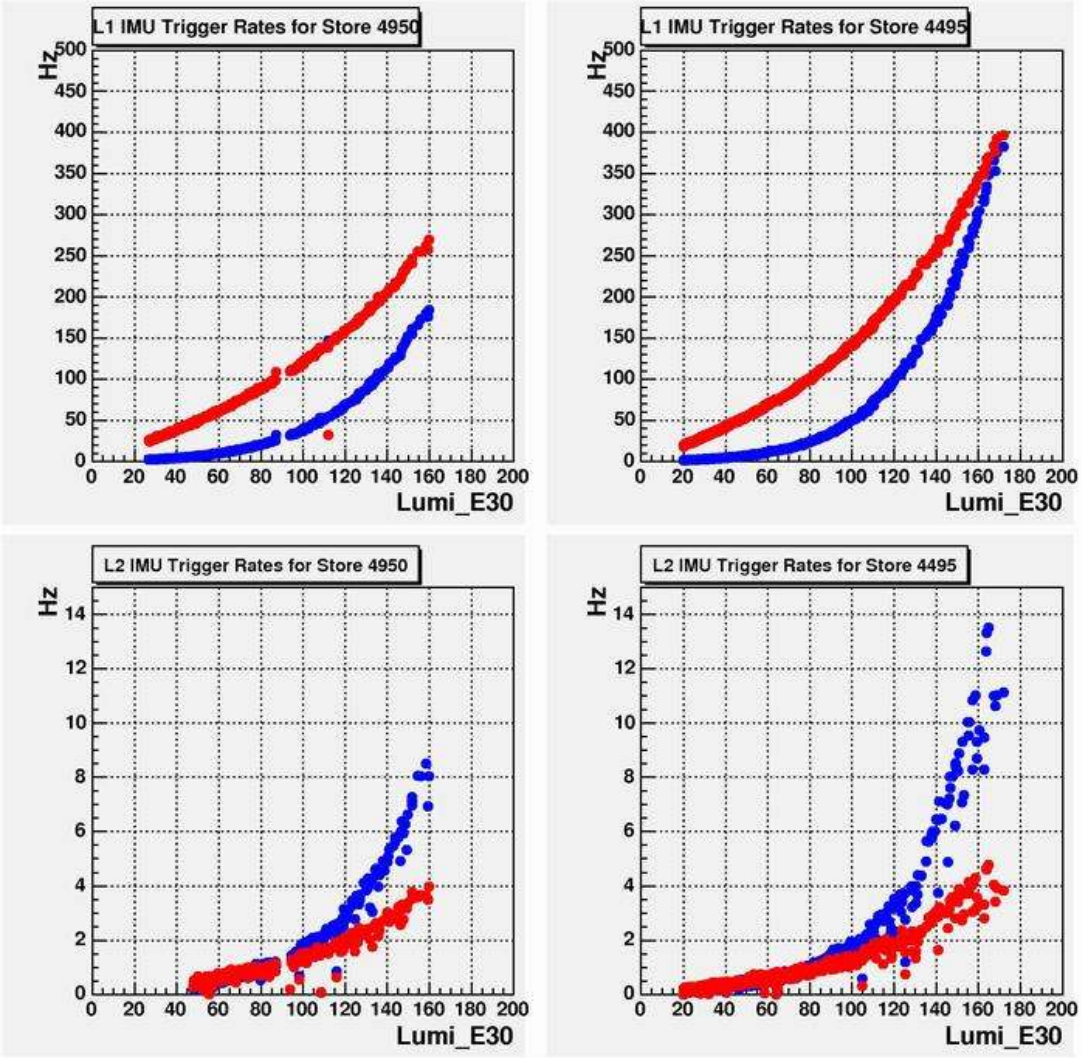
- Revival of 3L XFT in L1 to resurrect IMU Front Trigger (Ben Kilminster)
- Upgraded SVT tracks with IMU Trigger in L2 (Paola Giannetti)
  - L1 rate should be reasonable
- Other possibilities:
  - Mezzanine card upgrade to use 4 hit BMU stubs to reduce trigger rates
    - efficiency suffers, but shrink L1 rate ~4 times – James Bellinger
  - How about DiMuon Trigger with central muons?
    - Could be done easily in Muon Match Box
  - Using Jet information in L1?
  - Lepton + track trigger?

IMU Trigger Rates (Recent)

IMU Front Trigger
IMU Rear Trigger

- IMUF rate increases slowly below 100E30, but catches up very quickly after
- L2 IMUF(+cjet) shoots up even more
- Special test run 192061 at Lum ~25E30 shows IMUF is
  ~5 times more than IMUR (without 3L XFT)
  More points necessary at high luminosity

Store 4495 :
PHYSICS_HIGHLUM_3_06
PHYSICS_3_07
Store 4590 :
PHYSICS_3_09



Conclusions

- IMU provides extended lepton (good quality – as good as CMX in every sense) coverage for rare Physics analyses, especially Higgs and Single Top
- Contributions of IMU Front Trigger to low statistics analyses could be significant
- Many options to reduce trigger rates at very high luminosity for specific Physics analysis