


# US420

FP420 is a combination of ATLAS, CMS, TOTEM people developing plans for p-detectors at 420m from ATLAS & CMS collisions.

It is an international effort.

US420 is being formed as a “consortium” of US groups who want to participate in FP420, following the example of the UK420 consortium asking for UK funding. All US420 activities should be fully coordinated with other FP420 groups. US420 will ask for funding for R&D and eventual share of construction.

# First meeting March 3<sup>rd</sup>



## US 420m Proton Detection

[ last update: Thursday 10 March 2005 ]

**Date/Time:** from Thursday 03 March 2005 (22:30) to Friday 04 March 2005 (00:30)  
**Location:** Fermilab  
**Chairperson:** [Albrow, M.G.](#)

**Thursday 03 March 2005**

1.	<b>Introduction</b> (20) ( <a href="#">more information</a> )	<a href="#">Mike Albrow</a> (Fermilab)
2.	<b>BTeV Silicon?</b> (15) ( <a href="#">transparencies</a> )	<a href="#">Simon Kwan</a> (Fermilab)
3.	<b>3D Silicon?</b> (15) ( <a href="#">more information</a> )	<a href="#">Sherwood Parker</a> (SLAC)
4.	<b>Diamond detector?</b> (15) ( <a href="#">transparencies</a> )	<a href="#">Steve Schnetzer</a> (Rutgers Univ.)
5.	<b>Fermilab test beam</b> (15) ( <a href="#">more information</a> )	<a href="#">Erik Ramberg</a> (Fermilab)
6.	<b>Modeling Radiation Load to Forward Detectors</b> (05) ( <a href="#">more information</a> )	<a href="#">Igor Rakhno</a> (Fermilab)

Second meeting March 24<sup>th</sup> : Report from CMS/TOTEM Mtg CERN 18<sup>th</sup> Mar

Now → **FP420 Meeting at FNAL Tue April 26th**

## People who have expressed interest so far (Enough to be on distribution list)

### Already in CMS, ATLAS or TOTEM

Mike	Albrow	Fermilab
Andrew	Brandt	U.Texas Austin
Nikolai	Mokhov	Fermilab
Jeff	Spalding	Fermilab
Bob	Webber	Fermilab
Steve	Schnetzer	Rutgers
Reiner	Wallny	UCLA
Sasha	Drozhdin	Fermilab
Igor	Rakhno	Fermilab
Ian	Shipsey	Purdue
Jim	Pinfold	Alberta
Peter	Schlein	UCLA
Simon	Kwan	Fermilab
Chris	Kenney	SLAC
Alberto	Santoro	CBPF Brazil
Sherwood	Parker	U.Hawaii
Greg	Snow	U.Nebraska
Cyrus	Taylor	CWRU
Harry	Cheung	Fermilab
Erik	Gottschalk	Fermilab
Michael	Rijssenbeek	SUNY SB
Monika	Grothe	Wisconsin, Madisor
Jim	Rohlf	Boston U.
Samim	Erhan	UCLA

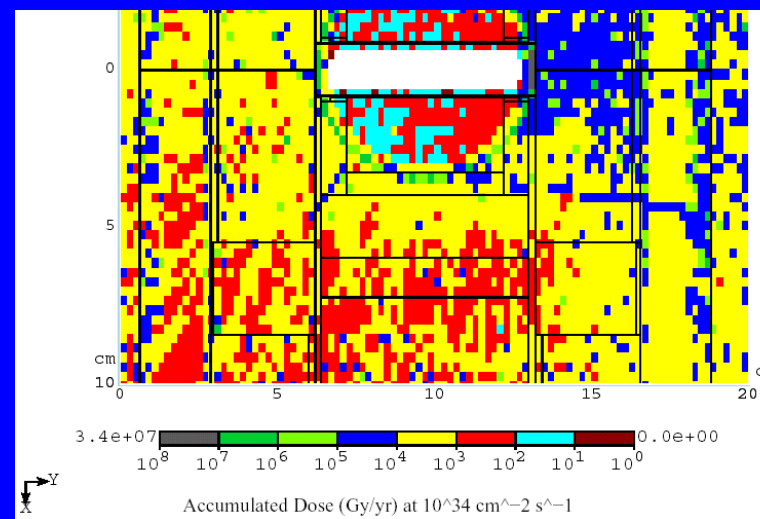
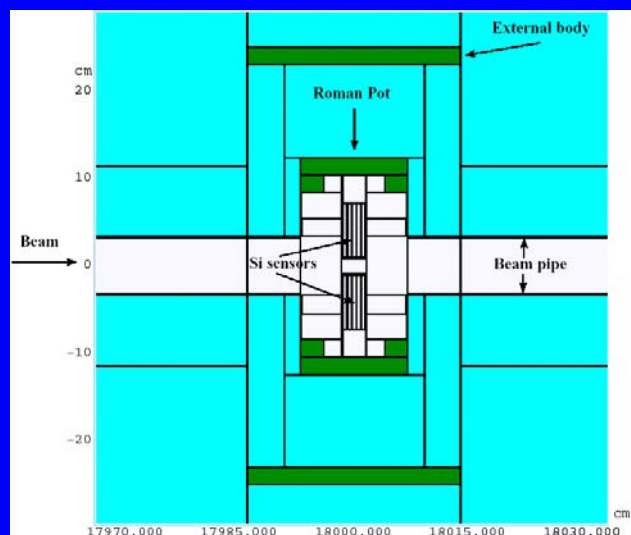
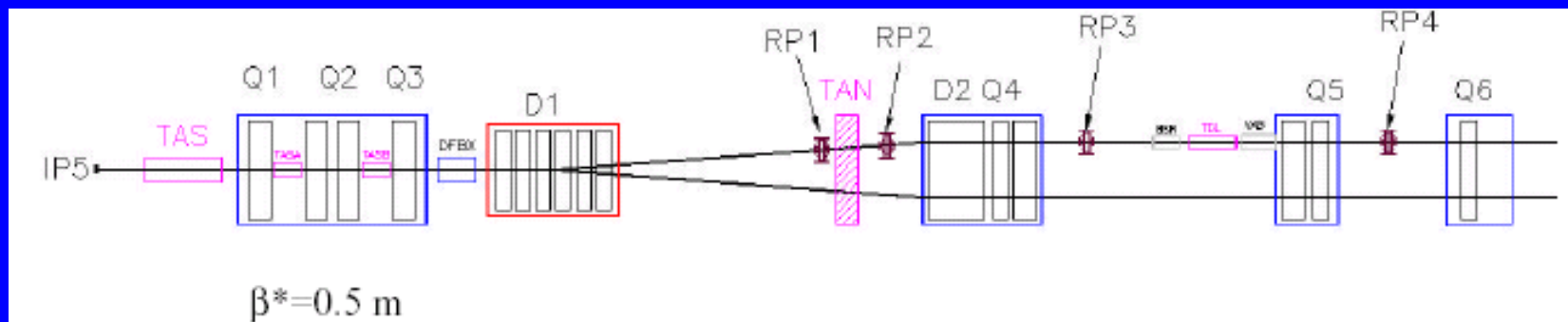
### Not (yet) in CAT ?

Dino	Goulianos	Rockefeller
Doug	Wright	Lawrence Livermore
Jeff	Gronberg	Lawrence Livermore
David	Lange	Lawrence Livermore
Erik	Ramberg	Fermilab
Munir	Islam	Connecticut
Sebastian	White	BNL
Wlodek	Guryn	BNL
Michele	Gallinaro	Rockefeller
Mary	Convery	Rockefeller
Koji	Terashi	Rockefeller
Christina	Mesropian	Rockefeller
Ken	Hatekayama	Rockefeller
Andre	Boccia	Rockefeller
Duncan	Brown	Fermilab

# Accelerator -Related Calculations

Nikolai Mokhov, Sasha Drozhdin and Igor Rakhno (talk)  
(Accelerator Division)

Flux calculations for TOTEM ... will be extended to 420 m (Igor)



Example of dose plot (at TOTEM detectors)

Studies that can be performed by Igor, Nikolai et al.:  
(Previously performed for Tevatron (GTeV)  
and some studies for CMS/TOTEM) ... for 420m

- 1) Acceptances  $(\xi, t, \phi); (M_X, y_X)$  & size, shape of detectors
- 2) Resolutions  $\sigma_{\bar{p}}; \sigma_M$  for tracking, missing mass
- 3) **Doses to detectors**
- 4) **Hit rates in detectors**
- 5) **Radiation environment** to cables, DAQ etc
- 6) Calibration techniques (with BPMs, Elastic?, etc.)

**Others are doing 1,2,6**

**We concentrate on 3,4,5 ... but it all needs integration/coordination**

## From Igor Rahkno's earlier talk

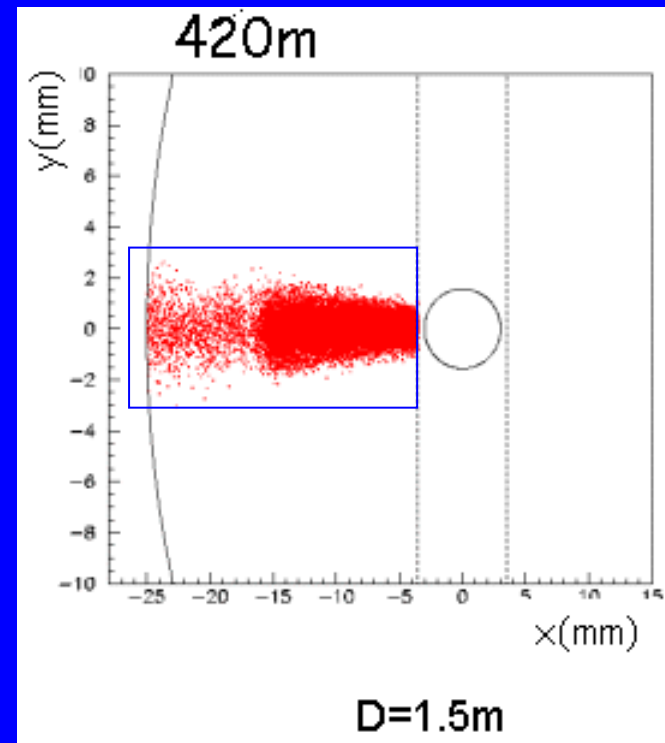
### Summary

1. Detailed models for the LHC regions and a forward detector were developed.
2. The models can be updated to comply with current needs.
3. Detailed data on particle fluxes, accumulated dose *etc* was calculated back in fall 2002 for Roman Pots 1 thru 4(5), 140-215 m downstream of IP5.
4. Detailed data on distributions over a single Si plate can be provided as well.
5. Such studies can be performed in the region up to 420 m.

(He talks today)

Protons (all  $x$ ,  $x_i$  that get there, generated flat in  $\ln x$ ,  $\ln x_i$ ) in  $x, y$ .  
Normal low-beta operation.

**Note: A detector 6mm(y) x 24mm (x) covers distribution.**

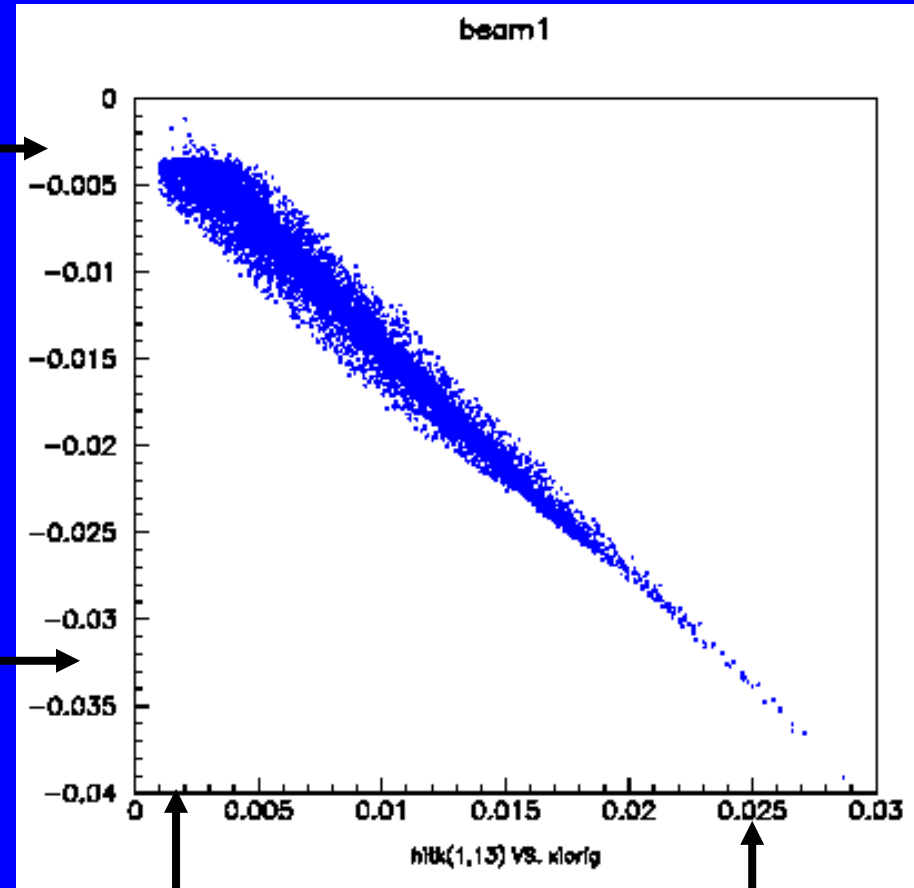


Valentina Avati

# From Valentina Avati, 420m low beta x-xi relation

~ 3mm + edge detector

limit of 30mm detector



30 GeV Mx  
(symmetric case)

350 GeV Mx (sym)

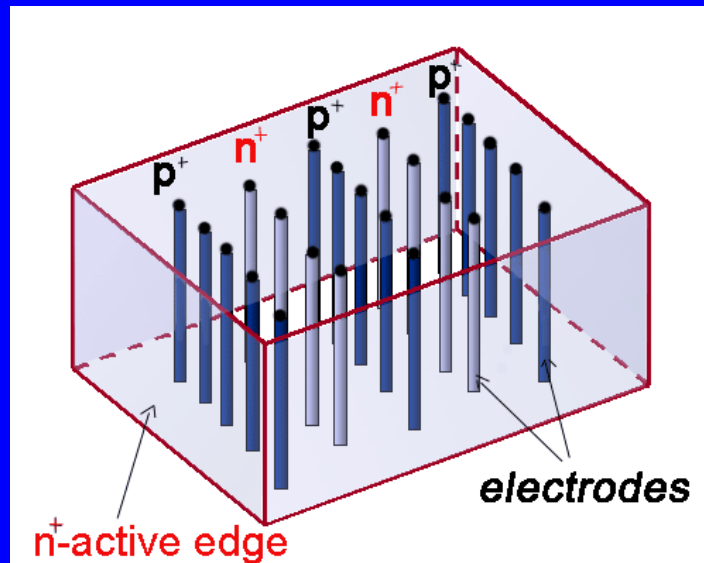
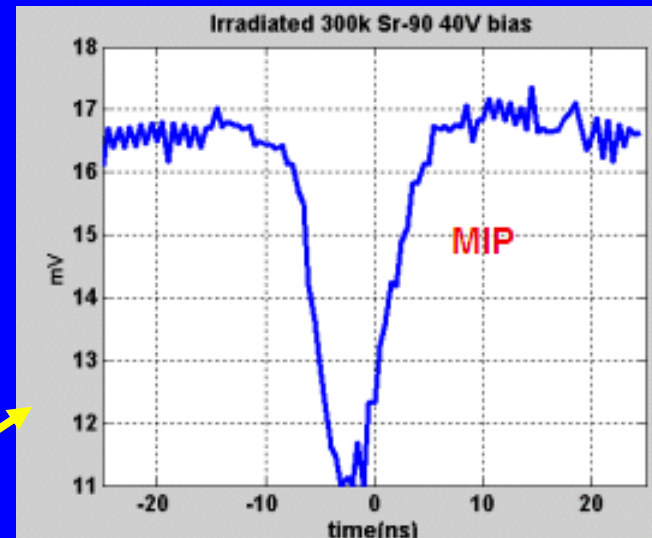


# Detectors

Main Issues:

- Resolution
- Radiation hardness
- (Efficiency)
- Edgelessness
- Timescale
- (Cost)
- People who want to do it!

Size ~ 6 mm (v) x 24 mm (h)

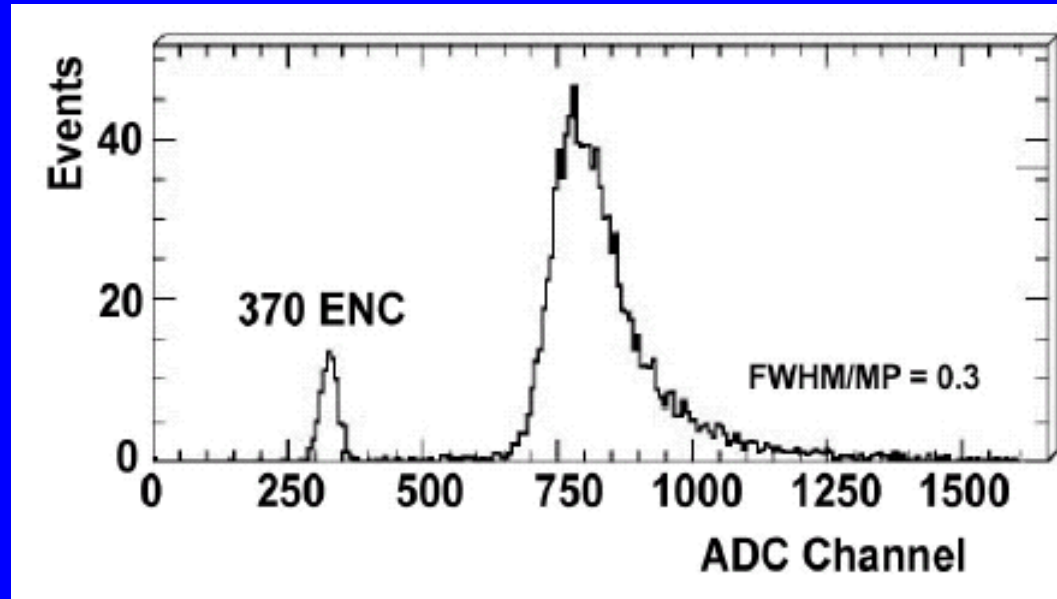


Front runners seem to be:  
**3D Silicon**

**Diamond (?) timescale?**

# Diamond

Talk: Steve Schnetzer, Rutgers



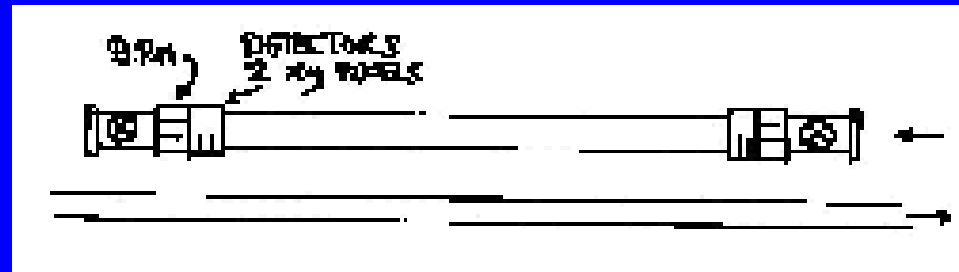
Rad hard, few  $10^{15}/\text{cm}^2$

Recent pieces 8mm x 8mm

In quantity by end year (expected) ...  $\rightarrow$  12 x 12 later?

This year could have  $>\sim 4$  layers in test beam, also radiation tests

# Vacuum Mechanics



Vac Valves  
BPMs  
Pumps

Roman Pots?

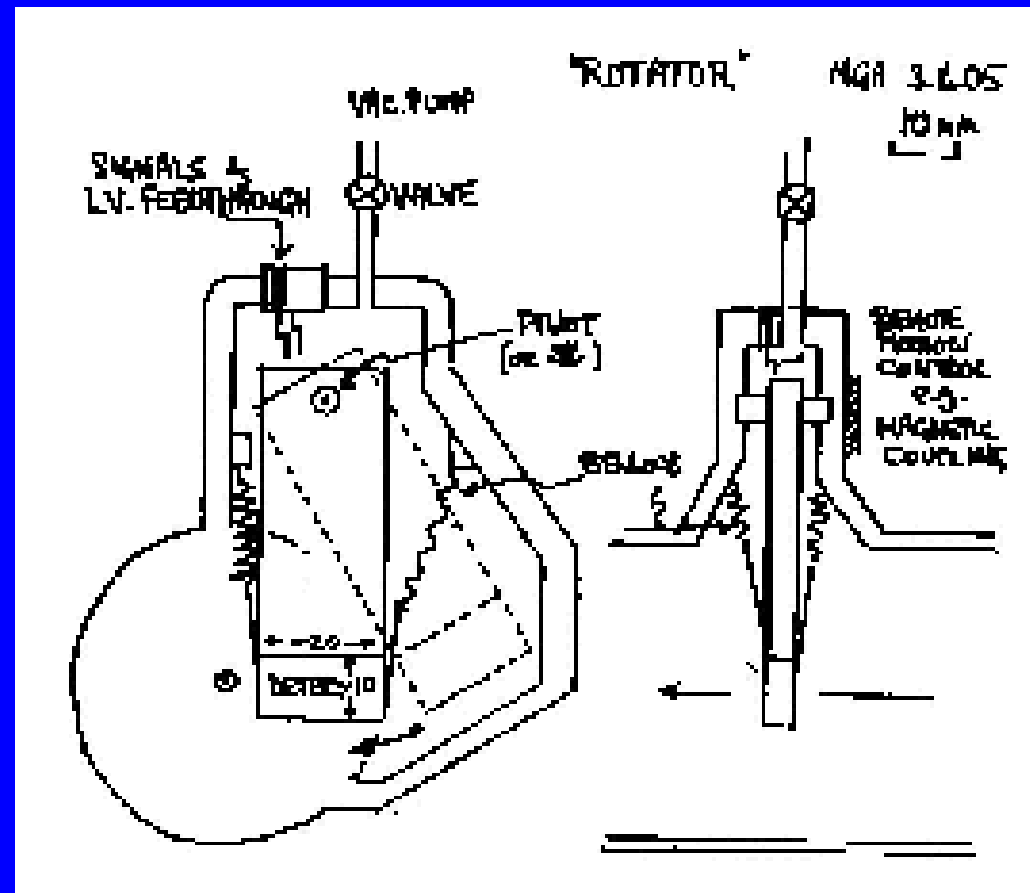
Helsinki Microstations?

Moving Pipe?

**PIVOT**



Now preliminary design  
by Carl Lindenmayer  
MGA talk later ...



# Fermilab Test Beam

(Erik Ramberg, co-ordinator)

BEAM

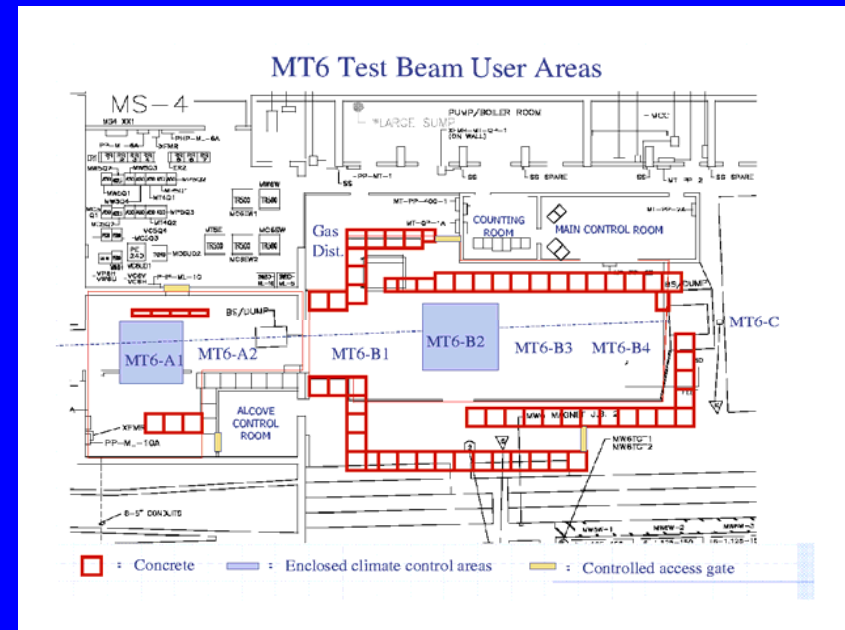


120 GeV protons, slow spill ~ 5 sec/2 mins  
(TeV & MINOS dictate proton economics)  
~ 200K per spill, in ~ 4mm x 4mm

In beam: 3 MWPC 1mm pitch → Accelerator Div.  
4 x-y layers of Silicon

Climate controlled stations, electronics rooms, signal + HV cables

2005 users: CMS Pixels; BTeV pixels, straws, Ecal; ILC calo.



## Monte Carlo studies at Wisconsin, status:

### Available at U Wisconsin

- 100k H (120) EDDE, no pile-up
- 20k H(120) Exhume beta-version, no pile-up
- 500k full pile-up events
- 1 M QCD background events, pythia, no pile-up

### In production at U Wisconsin:

- 100k each:  
H (120) EDDE for  $1 \times 10^{33}$ ,  $2 \times 10^{33}$ ,  $1 \times 10^{34}$  with full pile-up
- 1 M each:  
QCD background events, pythia,  
for  $1 \times 10^{33}$ ,  $2 \times 10^{33}$ ,  $1 \times 10^{34}$  with full pile-up

### Coming soon:

- 100k H (120) Exhume 1.0.0,  
for no pile-up and for  $1 \times 10^{33}$ ,  $2 \times 10^{33}$ ,  $1 \times 10^{34}$  with full pile-up

## Beam Halo background in FP detectors:

Estimates available (M. Deile) for  
 $L = 0.5 \times 10^{33}$ ,  $1.2 \times 10^{33}$  and  $2 \times 10^{33}$

Example: Beam halo at  $L = 2 \times 10^{33}$   
Estimates valid for RPs at 220 m and 420 m

- a) 2808 bunches with  $0.52 \times 10^{11}$  p/bunch
  - single-arm rate: 0.7 MHz = 0.02/bunch
  - double-arm coincidence: 16 kHz = 0.0005/BX
  
- b) 936 bunches with  $0.90 \times 10^{11}$  p/bunch
  - single-arm rate: 0.4 MHz = 0.04/bunch
  - double-arm coincidence: 18kHz = 0.0018/BX

# CMS/TOTEM Meeting (CERN) March 15<sup>th</sup> 2005

**CMS/TOTEM Physics Diffraction** (14:00->18:00)

**Chairperson:** Albert De Roeck

**Location:** VRVS VENUS

**Room:** [40-2-A01](#)

14:00	Update on CASTOR (15) ( <a href="#">transparencies</a> )	A Panagiotou.
14:15	Update on the ZDC (15) ( <a href="#">transparencies</a> )	M. Murray
14:30	New ideas using chrystals for increasing the acceptance (15) ( <a href="#">transparencies</a> )	K. Eggert
14:45	Updates on the trigger studies (15) ( <a href="#">transparencies</a> )	M. Grothe
15:00	Pile-up in Pythia (15) ( <a href="#">more information</a> )	M. Ruspa
15:15	Acceptance paramterizations and new optics (15) ( <a href="#">more information</a> <a href="#">transparencies</a> )	V. Avati
15:30	Fast Forward proton simulation (15) ( <a href="#">transparencies</a> )	X. Rouby
15:45	POMWIG/CASTOR studies (15) ( <a href="#">more information</a> )	L. Sarycheva
16:00	Air shower physics models study (& CASTOR status in OSCAR) (15) ( <a href="#">transparencies</a> )	V. Popov
16:15	Diffraction W production (15) ( <a href="#">more information</a> )	A Loginov
16:30	Diffraction ttbar production (15) ( <a href="#">more information</a> )	A. Vilela
16:45	Diffraction J/Psi and Upsilon production (15) ( <a href="#">transparencies</a> )	D.J. Damiao
17:00	DY production and acceptance in CASTOR (15) ( <a href="#">transparencies</a> )	E. Sarkisyan
17:15	Diffraction Higgs Production (15) ( <a href="#">more information</a> )	M. Tasevsky
17:30	Exclusive Di-electrons in CMS (15) ( <a href="#">transparencies</a> )	Y Liu
17:45	The US420 project (15) ( <a href="#">more information</a> )	M. Albrow
18:00	LOI updates (15)	All

US groups work on:

**Diamond detectors**

**3D Silicon detectors**

**Test beams**

**Beam calculations: doses and trajectories**

**Monte Carlo simulations**

**Mechanical design ... PIVOT design, prototype (?)**

Plan to develop an R&D proposal for financial support.

Next US420 Meeting ~ May 26<sup>th</sup> /June 2<sup>nd</sup> ?