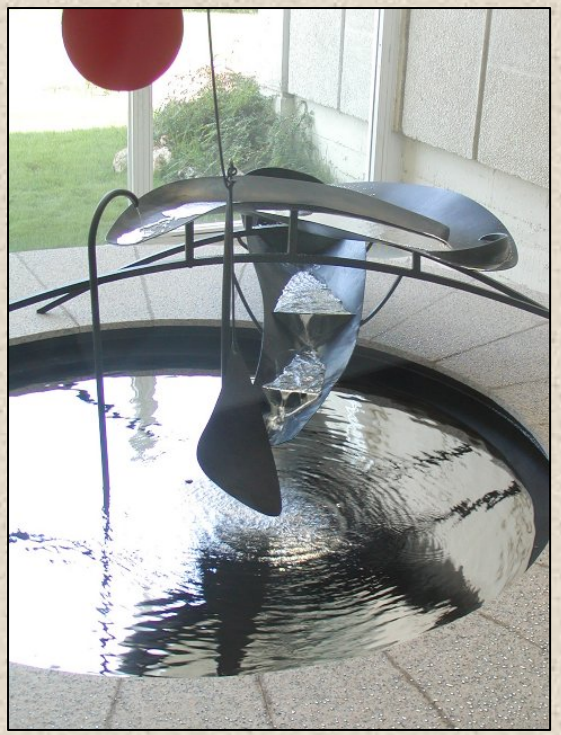
MERcury Intense Target (MERIT) Experiment – *or nTOF-11*



Mercury fountain, Funtació Juan Miró, Barcelona - Spain

Solenoid and Cryogenics Safety Review

Ilias Efthymiopoulos

Adrian Fabich

Solenoid and Cryogenics Safety Review
CERN – February 3, 2006

Solenoid & Cryogenics Review

Review Panel

Cryogenics experts:

- Goran Perinic (AT/ECR)
- Vladislav Benda (AT/ACR)

Cryogenics safety:

- Karl Gunnar Lindell (SC/GS)

Mechanical safety:

- Benoit Delille (SC/GS)
- Andrea Astone (SC/GS)

General Safety:

- Bruno Pichler (SC/GS)
- Paolo Cennini (AB/DSO)

Thanks a lot for accepting the invitation

Solenoid & Cryogenics Review

Agenda

http://indico.cern.ch/conferenceDisplay.py?confId=673

Friday 03 February 2006 top

09:00->*09:30* Introduction

09:00	Introduction (20') (Slides)	Ilias Efthymiopoulos (*CERN*) , Adrian Fabich (*CERN*)
09:20	Discussion (10')	

09:30->*10:40* Solenoid

09:30	Solenoid description (40')	Peter Titus (*MIT*)
10:10	Discussion (30')	all
10:45	break	

11:00->*12:10* Cryogenics system

11:00	Description (40') (Slides)	Friedrich Haug (*CERN*)
11:40	Discussion (30')	all
12:10	lunch (..)	

13:15->*14:15* Closed/open session

13:15	discussion (1h00')	reviewers

14:30->*15:30* feedback session

14:30	feedback (1h00')	reviewers, all

Solenoid & Cryogenics Review

Scope

- Review the **Solenoid** and the associated **Cryogenics**
  1. Overall design & operation foreseen at CERN
  2. Mechanical construction
  3. Production & safety tests at production
  4. Tests foreseen before and after delivery at CERN
- What is **NOT included**:
  - the MERIT experiment, mercury loop, radiation, access, …

Goal

- Produce a summary report with comments or recommendations to be followed up
  - Committed to final approval of the installation at CERN
  - Subject to final inspection in situ
- Deadline : Wednesday February 8, 2006

The MERIT Experiment

Introduction

few words about the experiment….

The MERIT Experiment (1/3)

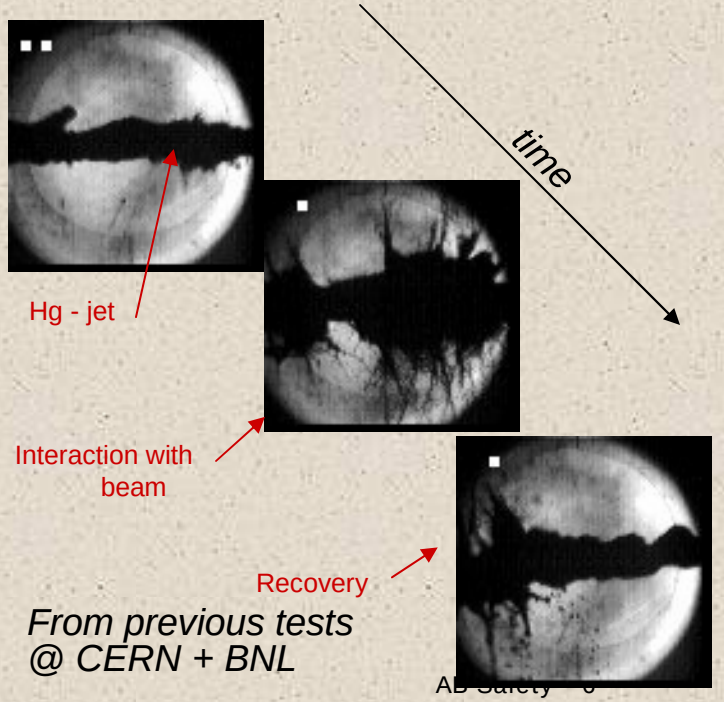
*We propose to perform a **proof-of-principle test of a target station** suitable for a Neutrino Factory or Muon Collider source using a 24-GeV proton beam incident on a target consisting of a **free mercury jet** that is inside a **15-T capture solenoid magnet**.*

Proposal submitted to INTC – May 2004

Experiment approved as nTOF-11 → **MERIT**

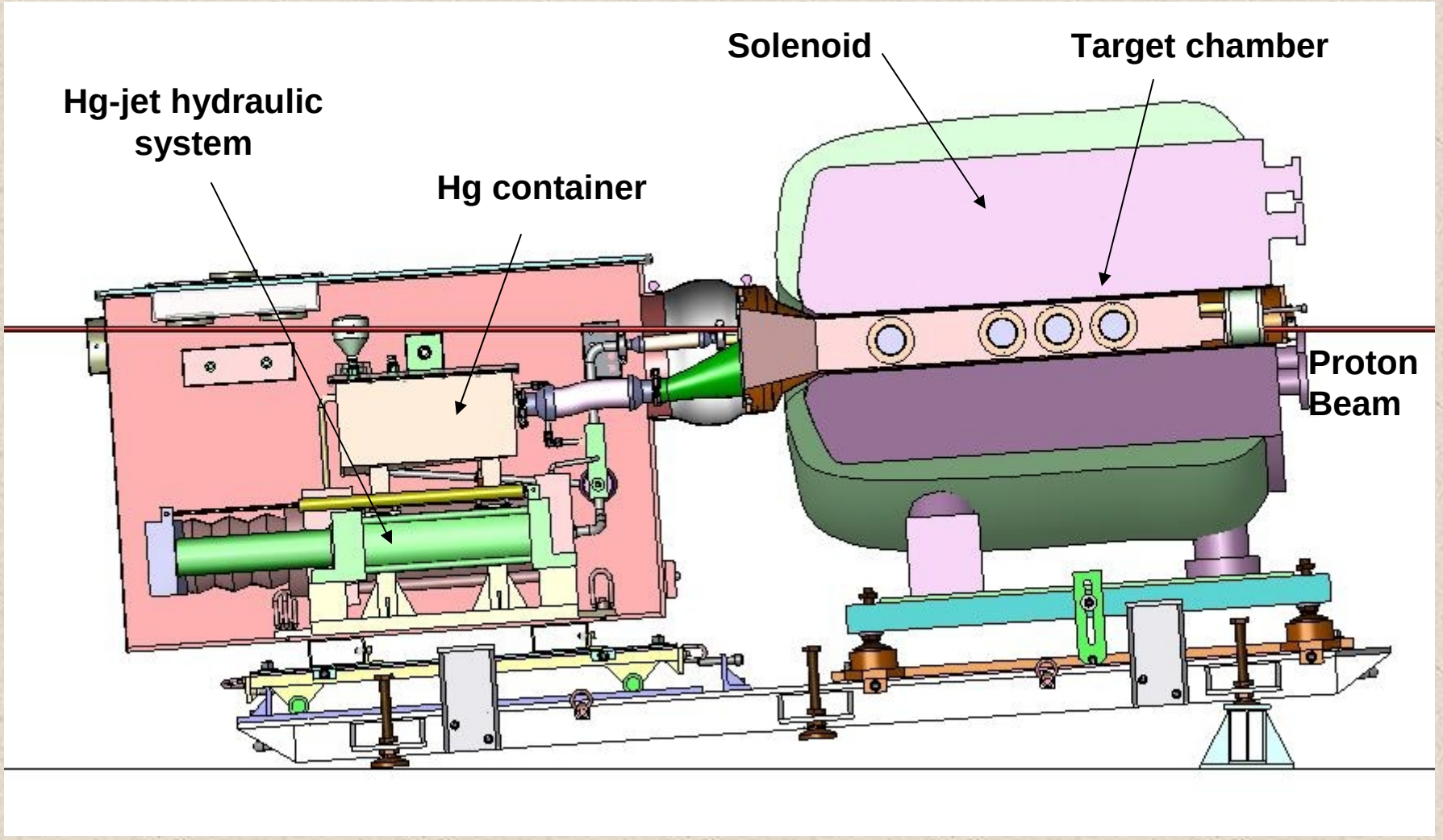
Target

- 1-cm diameter Hg jet, v ≅ 20m/s
- PS Proton beam: 24 GeV/c
  - Max. 3×10^{13} protons/pulse,
  - Pulse length 0.5÷2 μsec
  - ~100 (HI) pulses in total
  - Total limit: 3×10^{15} protons on target
- Meson collection using a 15-T solenoid



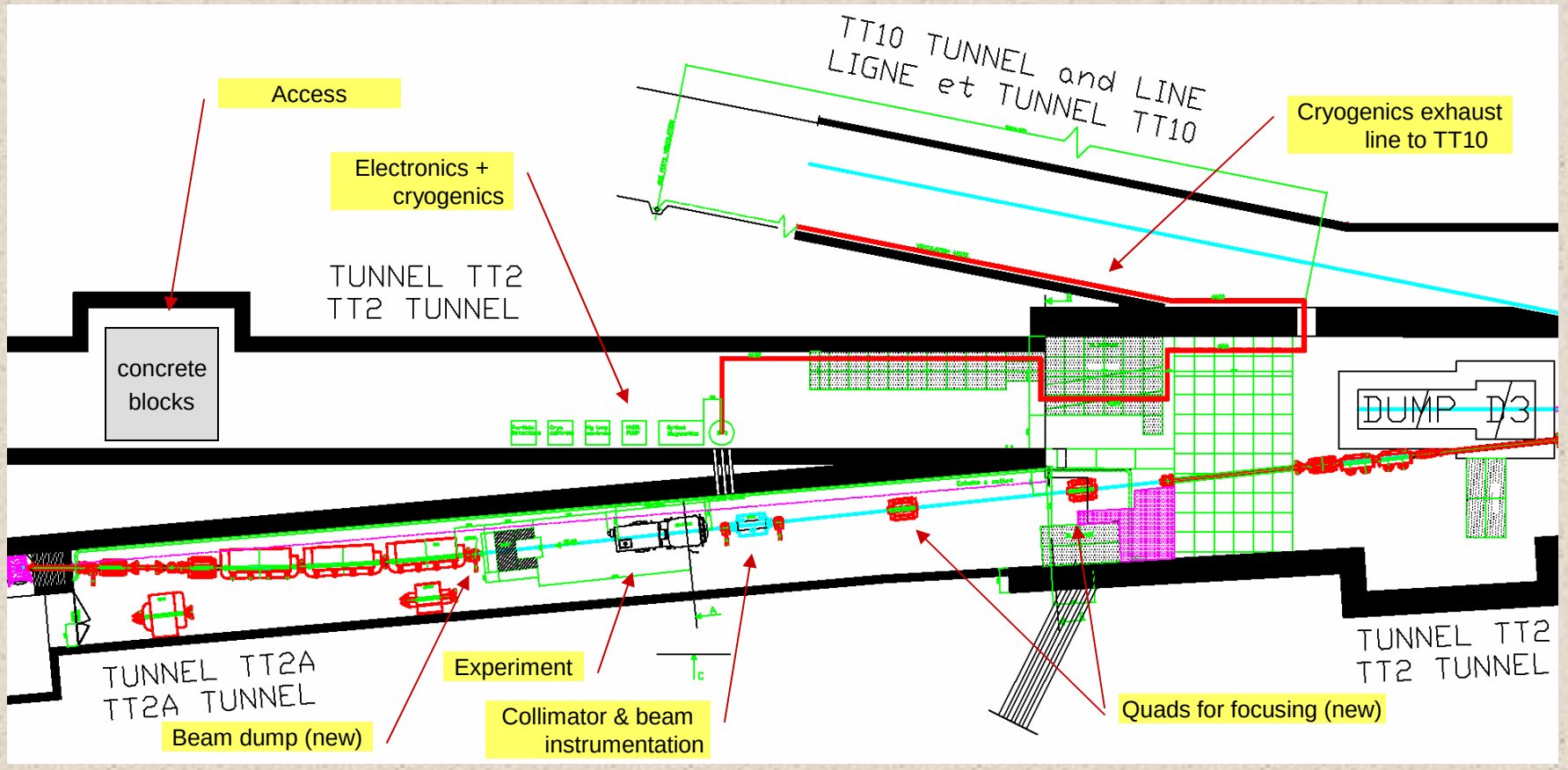
From previous tests @ CERN + BNL

The MERIT Experiment (2/3)



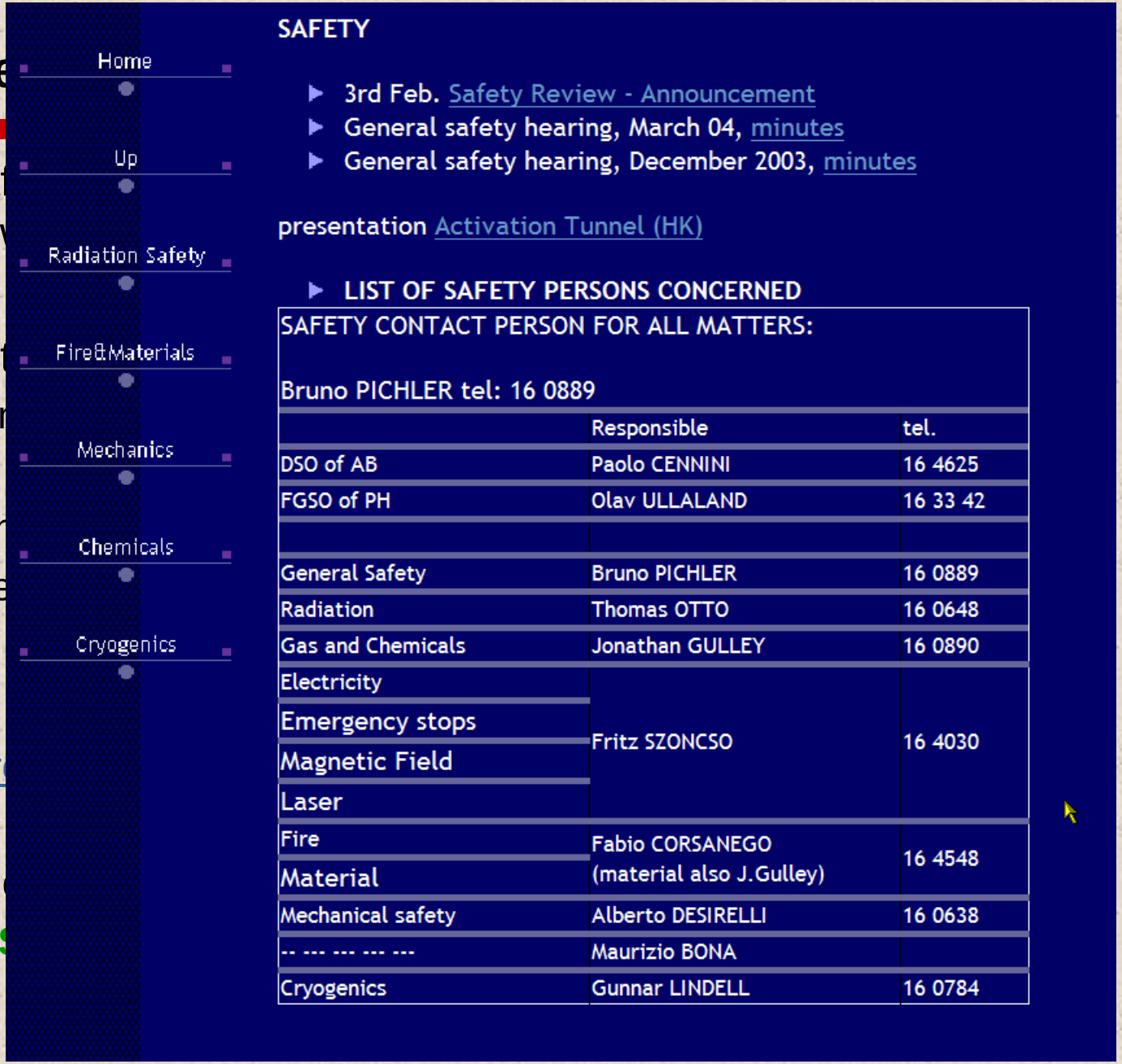
The MERIT Experiment (3/3)

- Located in the **TT2A tunnel** upstream of the nTOF target
- **Data taking**: two-weeks at the PS startup in 2007 – second slot later as reserve



Safety issue

- Several sa
  discussed
- No show-st
  - Decisio
- Access co
  - No acce
- Memos on
  - http://pr
- Safety stru
  - GLIMO



Safety issues (2/2)

EDMS # 383772

CERN — European Organization for Nuclear Research

I S I E C

INITIAL SAFETY INFORMATION ON EXPERIMENTS AT CERN

DATE:	January 2006	**EXPERIMENT:**	MERIT (ntof11)
INSTALLATION START:	February 2006	**AREA/BEAM:**	TT2A (FTN), TT2, TT10, ISR
SPOKESMAN:	Harold G. Kirk (BNL), Kirk McDonald (Princeton University)		
GLIMOS :	Adrian Fabich	**TEL:**	160345
FILLED IN BY:	Adrian Fabich	**TEL:**	160345

(1) TEST BEAMS : FTN line

LABS AT CERN (BLDG/ROOM): TT2A (FTN), TT2, TT10, ISR

(2) GASES, LIQUIDS, CRYOLIQUIDS

(used in detectors or kept in nearby containers)

Device Type	Fluid 1 + % Fluid 2 etc.	Volume	Abs. Press.	Max Flow
cryogenics	LN2	6000 liter	15 bar	200 g/s
hydr. fluid	not flammable	~30 liter	206 bar	~30 m/s
Hg loop	mercury	25 liter	100 bar	200 g/s

(3) OTHER CHEMICALS

Toxic/Corrosive/Flammable metals, solvents, additives etc:

see above,
no flammable gases/liquids present

(4) ELECTRICITY

	Magnet type	Power	Field	Gap Vol.	Max.water press.
MAGNETS:	BNL solenoid	5 MW	15 T pulsed	15 cm bore, 1m	80 K cryogenic, 15 bar

	Detector Type	Voltage	Current	Stored Energy	No of HV Channels	Remote Shut-off?
High Voltage (> 1 KV)	scintillator	???	???	???		
	not yet known	???	???	???		

SHORT-CIRCUIT current > 5 mA for >50 V possible anywhere? NO

POWER dissipated by all electronics a) on detectors: negligible

b) off detectors: negligible

SPECIAL GROUNDING REQUIREMENTS? n.a.

1/2

EDMS # 383772

(5) LIFTING AND HANDLING

Weight of heaviest single piece to install ? BNL solenoid with baseplate, ~5.5 tons

Specially designed handling equipment? CERN standards: 170 ton crane, turtle, jacks

For which max. weight? see above

(6) VACUUM TANK, PRESSURE TANK, CRYO TANK

Tank	Abs. pressure	Volume	Weakest part(s) of wall
LN2 dewar	2 bar	6000 liter	standard equipement
cryostat	15 bar	120 liter	(with supply lines)
Hg loop	200 bar	open system	beam windows

(7) IONIZING RADIATION

Beam intensity, radioact. Sources, depleted uranium, etc.

PS proton beam, 24 GeV/c, 4*10^13 protons/pulse, see also EDMS 626963

(8) NON-IONIZING RADIATION

	DETAILS (e.g. class of laser, origin of UV light, average power of microwaves or RF, pulsed or CW, ...)
LASER 1	class4, 808 nm, 30 W peak, 150 ns pulse, 1 MHz (2 systems)
LASER 2	class4, 850 nm, 1 W peak, micro-sec pulse at kHz (2 systems)
UV LIGHT	not applicable
microwaves, RF	not applicable

(9) OTHER HAZARDS (or remarks):

ODH, fire, access, interlocks ...

see memos at EDMS 626963, 697850, 697857, 697860

(10) RISK ANALYSIS

ODH not yet done, see also above

PLEASE RETURN THIS FORM TO THE DSO OF THE PH DEPARTMENT

2/2