PRESENT AND **FUTURE** TEST FACILITIES FOR HIGH-INTENSITY TARGETRY EXPERIMENTS @ CERN

Outline

- Present possibilities
- Test facilities in the near future
- Far future possibilities

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with input from **Jacques Lettry** & **Rende Steerenberg**

Targetry Workshop
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Present possibilities

1 ISOLDE target area

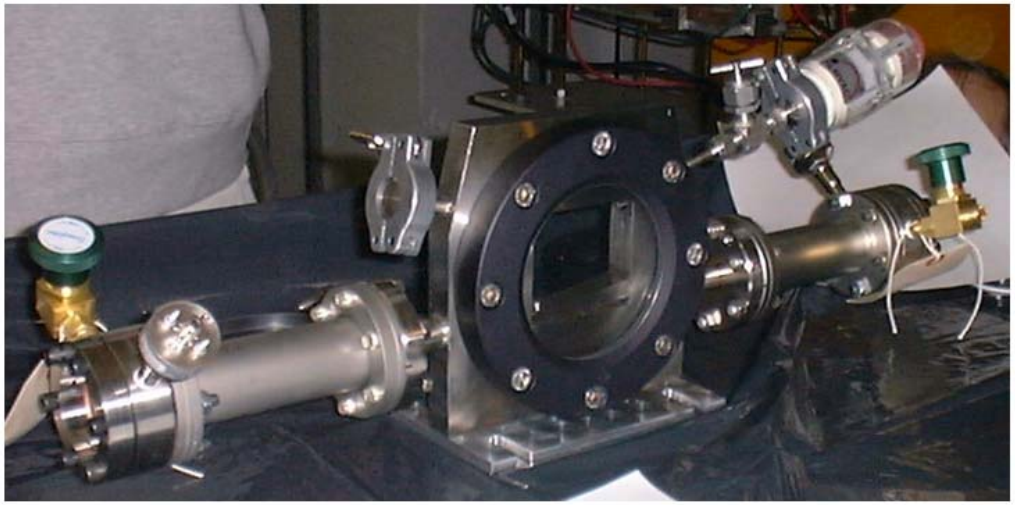
- Beam momentum: **1 ÷ 1.4GeV/c** ; from PSB
- Maximum intensity : **30×10^{12}** protons, **230ns** pulse length
- Experiments:
  - targetry experiments: THROUGH - THIMBLE, also using Hg
  - significant target development program each year for the ISOLDE users for RIB beams
- Future:
  - The facility is operational and always available
  - Tests should be coordinated with the ISOLDE physics program and must get the proper approval (committees, safety, etc.)
  - They should also respect the constraints of the existing system
    - weight, size, radioactive environment, etc.
  - **HIE-ISOLDE** is under design, with the development of several kW targets coupled to LINAC-4 and upgraded PSB operation
    - Could a test target station be envisaged somewhere in the new design for tests?
      - **Y. Kadi (CERN/ATB)** is the right person to contact…

Present possibilities

3 ISOLDE target area

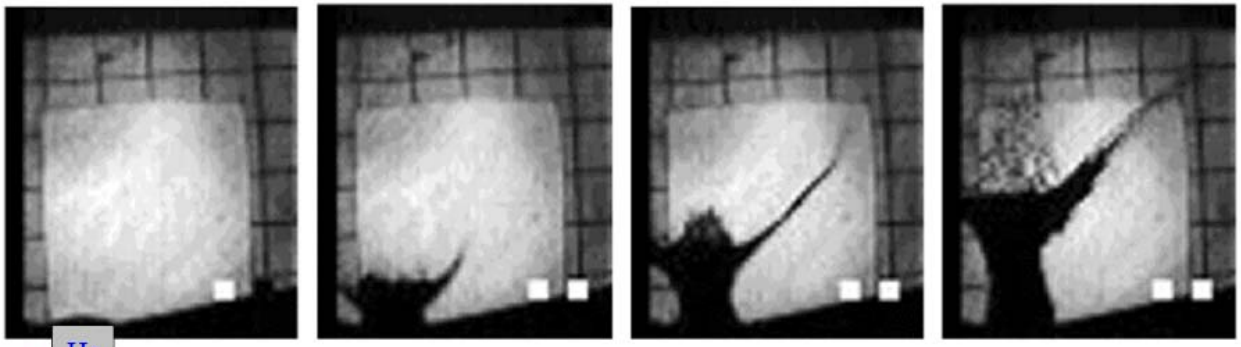
A. Fabich, J. Lettry, H. Kirk, K. Mc Donald, T. Tsang

BNL-CERN thimble test



1st P-bunch
1.8×10^12 ppb
dt: 100 ns

24GeV p+



Timing : 0.0, 0.5, 1.6, 3.4 ms, shutter 25 µs

V_{splash} ~20-40 m/s

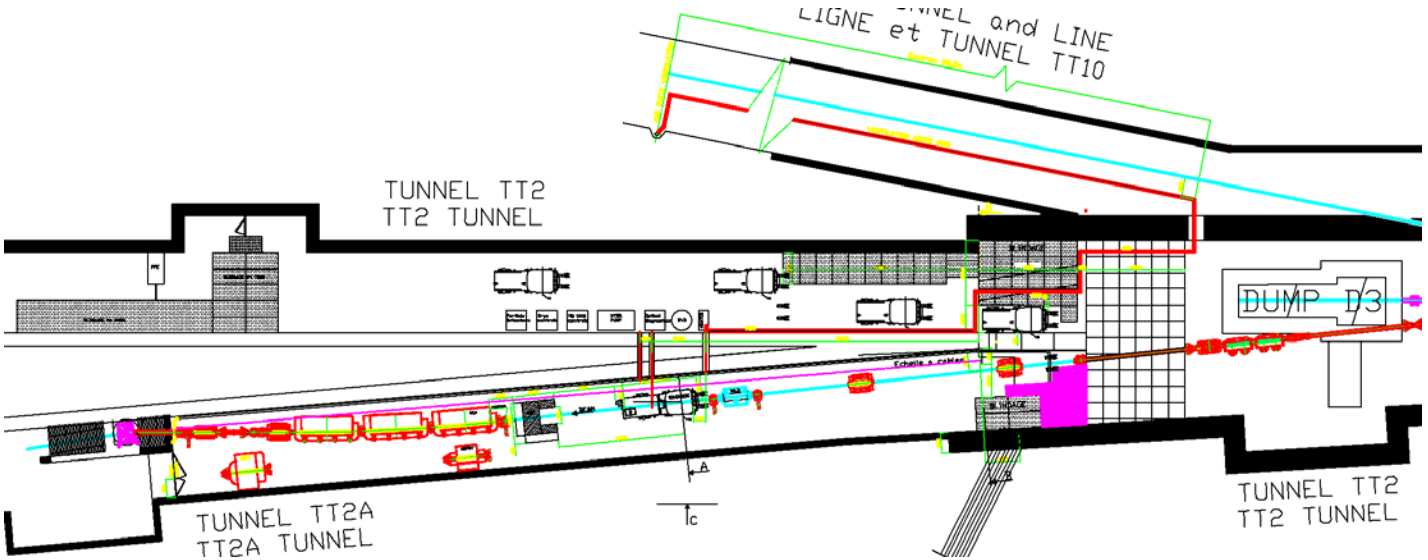
13th February 20 8 kHz camera J. Lettry

Courtesy : J. Lettry, CERN

Present possibilities

FTN/n-TOF line

- Beam momentum: 14÷ 24 GeV/c, from PS
- Maximum Intensity : **30×10^{12}** protons, variable pulse length and bunch spacing
- Experiments :
  - MERIT; installed and completed in 2007
- Future :
  - Unavailable due to nTOF operation



Present possibilities

Other?

- **PS – East Area**
  - There is a semi-fast extraction to an IRRADIATION facility
    - 1-4-8 bunches @ 14 GeV/c for a total intensity $<5\times10^{11}$ p
- Re-use some of the **old tunnels attached to PS**
  - **TT7 tunnel**: old neutrino target area
  - **AD-loop** : anti-proton ring
  - In both cases a complete rebuilt of the line is required
    - Magnets (available?), power supplies, instrumentation
  - Needs detailed evaluation study (I.E + R. Steerenberg)
  - Would also need some “political” support from the management

Present possibilities

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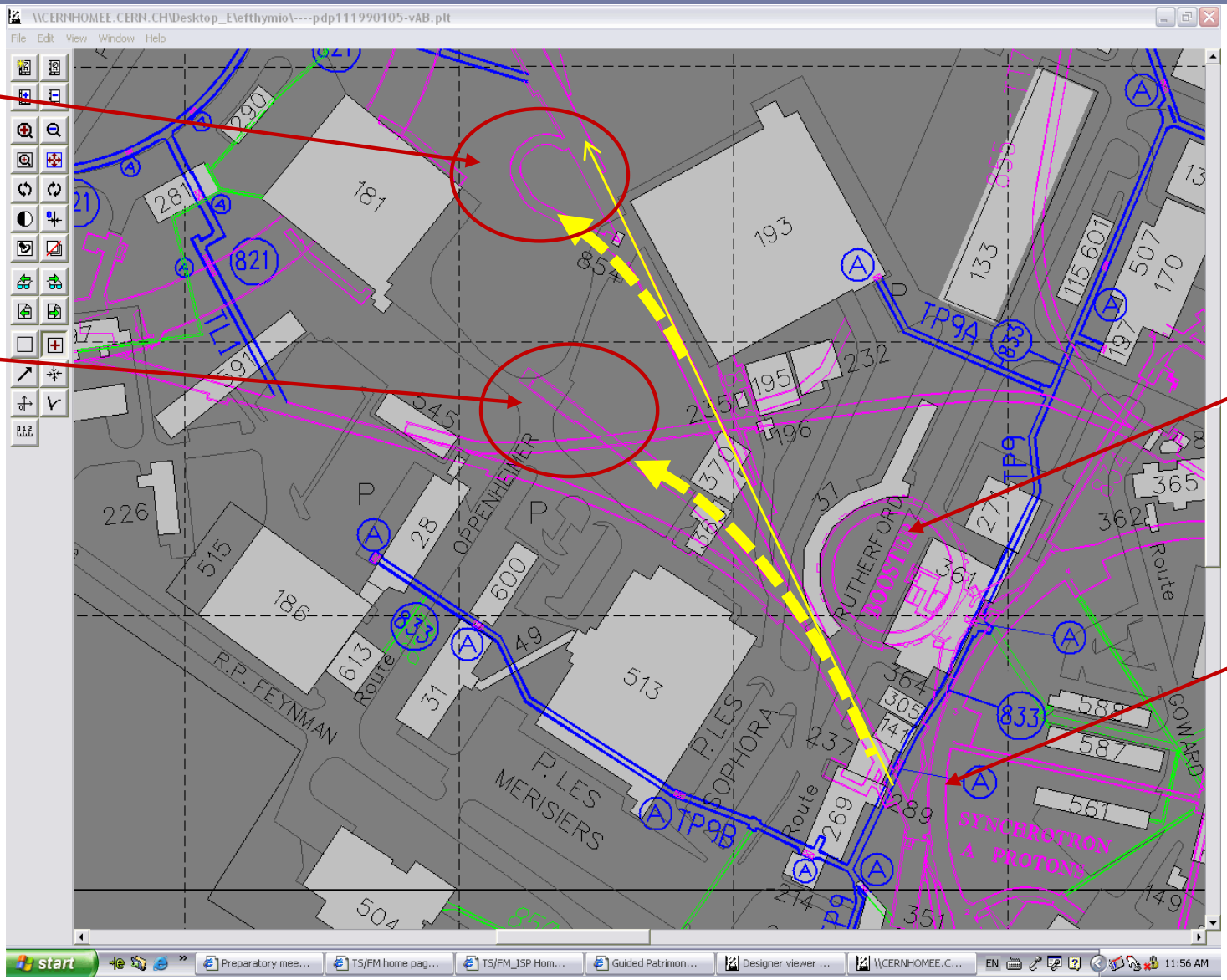
TT7 & Anti-Proton Loop tunnels

Anti-proton loop

TT7 tunnel

- may not be fully compatible with LINAC4/SPL layout



Future test facilities for High-intensity Targetry Experiments @ CERN

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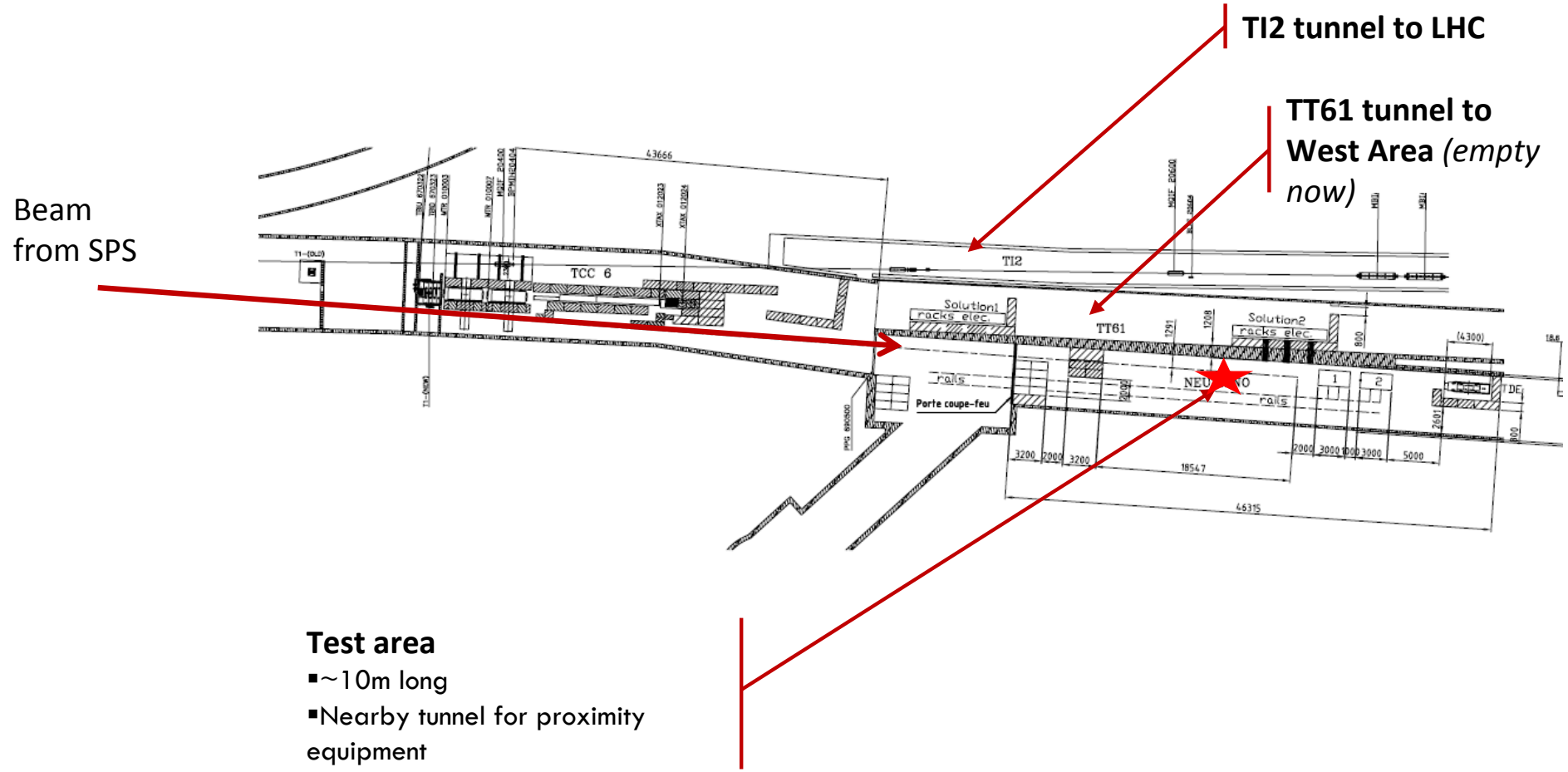
Test facilities in the near future

HIRADMAT

- A test facility under study for material irradiation (collimators) under LHC beam conditions
- Attached to SPS
  - TI2 extraction line ; old WANF target area
- Beam parameters:
  - Beam momentum: **450 GeV/c**
    - could it go down to SPS injection energy (~30 GeV/c???)
  - Bunch intensity: **$5.0\times10^{9} \div 1.15\times10^{11}$** ; 1 ÷ 288 bunches, 25ns apart
  - Pulse energy 2.4MJ; length ~7us;
  - 1mm^2 beam size at the target
- Design ongoing; expected to be available for "external" users by **November 2010**
  - Part of EU funded program for "open access"

Test facilities in the near future

- Test facility (under study) in old WANF tunnel



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Far future possibilities

PS2 experimental areas

- Experimental areas for the new PS2 machine (> 2016?)
  - Underground caverns:
    1. high-intensity fixed target or rare decay experiment
    2. High-intensity irradiation + {targetry + ν-front-end} facility

Preliminary

- Beam parameters:

Parameter	unit	PS2	PS
Injection energy kinetic	GeV	4.0	1.4
Extraction energy kinetic	GeV	~ 50	13/25
Max. intensity LHC (25ns)	ppb	4.0×10^{11}	1.7×10^{11}
Max. intensity FT	ppp	1.2×10^{14}	3.3×10^{13}
Max. stored energy	kJ	1000	70
Linear ramp rate	T/s	1.5	2.2
Repetition time (50 GeV)	s	~ 2.5	1.2/2.4
Max. effective beam power	kW	400	60

Far future possibilities

PS2 machine layout

PS2 machine
•~surface exp. areas

SPS ring

PS2 machine
•Underground exp. areas

PS2 machine

LHC ring