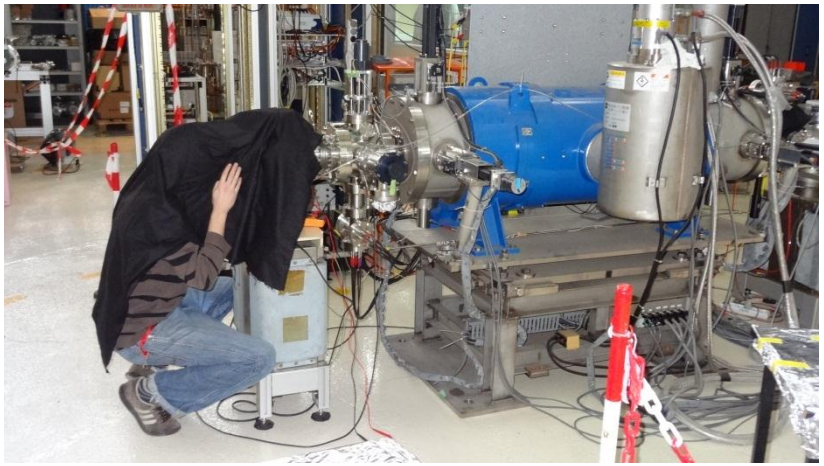
Status of e+ production and trapping at Saclay
GBAR collaboration meeting

Pierre Grandemange
CNRS/CSNSM
IRFU/SPP

Working at CEA Saclay for my PhD thesis on the positron trap from Riken



18 03 2012

Electron spot coming from the electron gun on a phosphor screen

Several improvements have been made on positron production and accumulation experiment at CEA Saclay

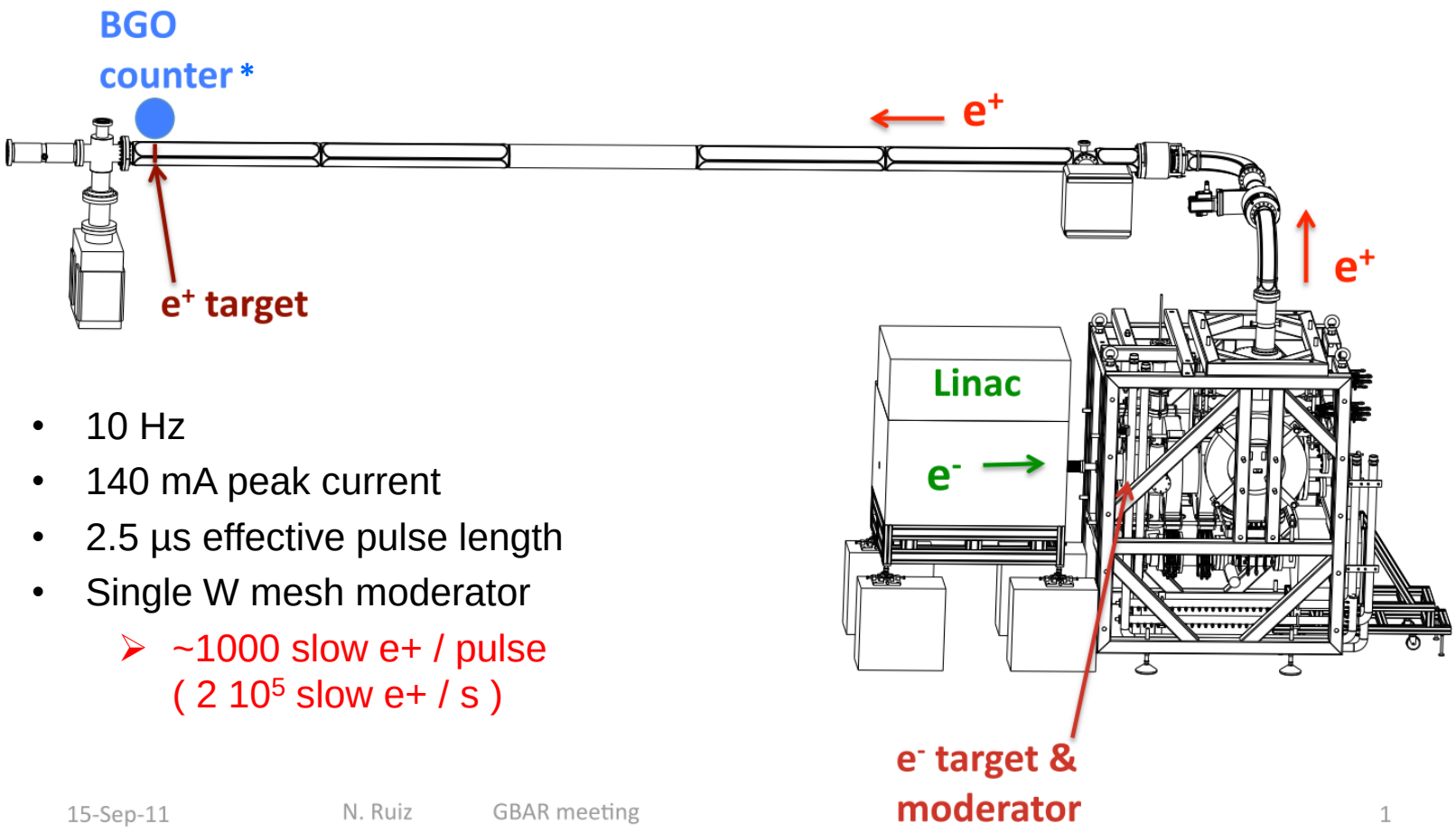
Plan

1. e+ production status

2. The improvements on the slow positron beamline

3. The RIKEN penning trap status

Status at the last collaboration meeting

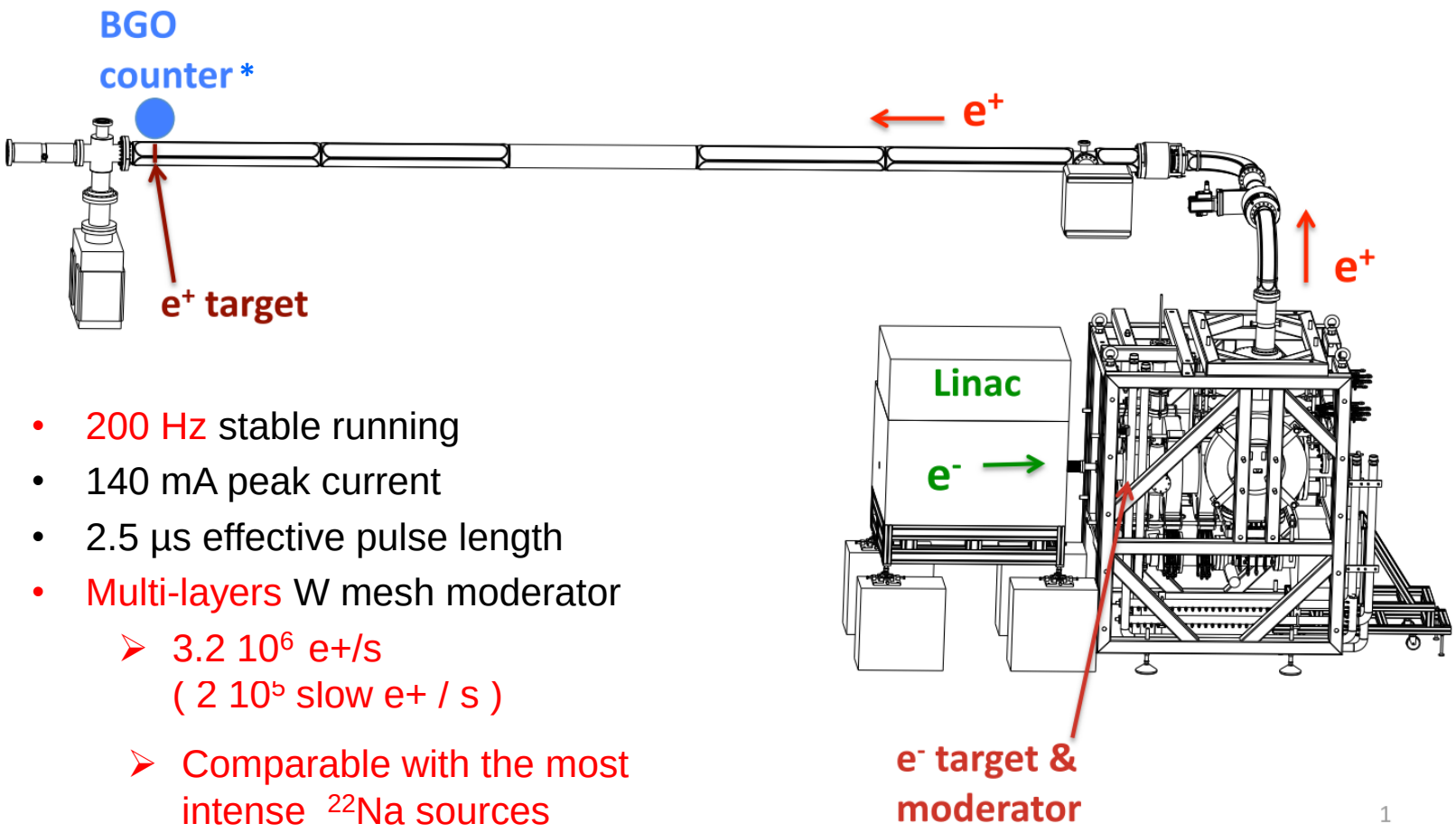


- 10 Hz
- 140 mA peak current
- 2.5 µs effective pulse length
- Single W mesh moderator
  - ➢ ~1000 slow e+ / pulse
    (2 10^5 slow e+ / s)

15-Sep-11 N. Ruiz GBAR meeting 1

*BGO counter lent by ETH Zurich laboratory

Status today collaboration meeting

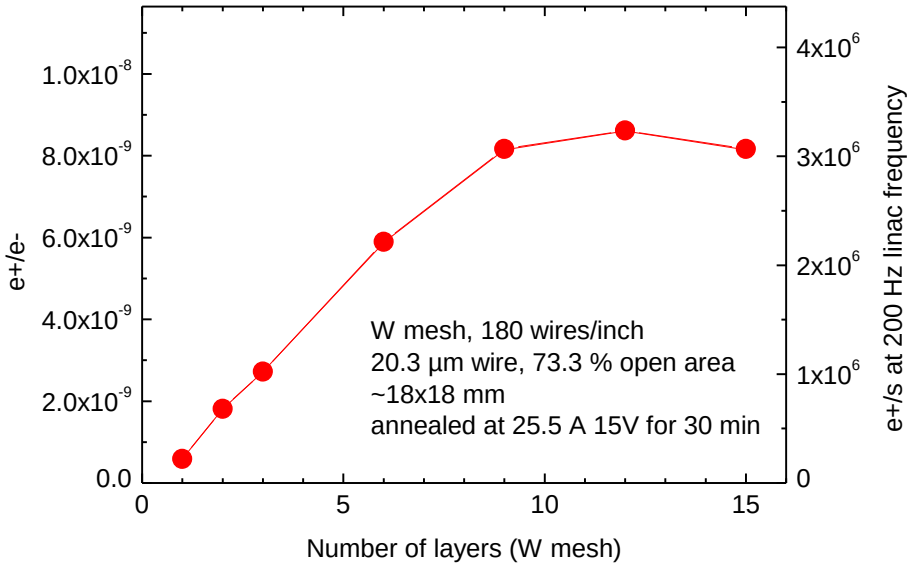


- 200 Hz stable running
- 140 mA peak current
- 2.5 µs effective pulse length
- Multi-layers W mesh moderator
  - ➢ 3.2 10^6 e+/s
    (2 10^5 slow e+ / s)
  - ➢ Comparable with the most intense ^{22}Na sources

1

*BGO counter lent by ETH Zurich laboratory

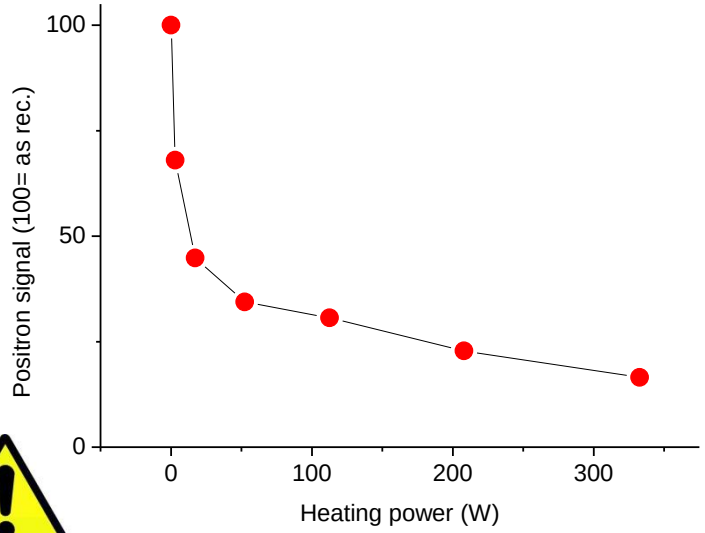
e+ production



- Investigation of several developments
  - Chemical etching
  - Geometry
  - …

Present slow e^+ rate	$3.2\ 10^6\ s^{-1}$
Extrap. to 10 MeV linac	$4.3\ 10^7\ s^{-1}$
target value	$2.8\ 10^8\ s^{-1}$

- Moderator (single 20 µm grid) was heated *in situ* by electrical current
- Slow positron yield monitored at the target

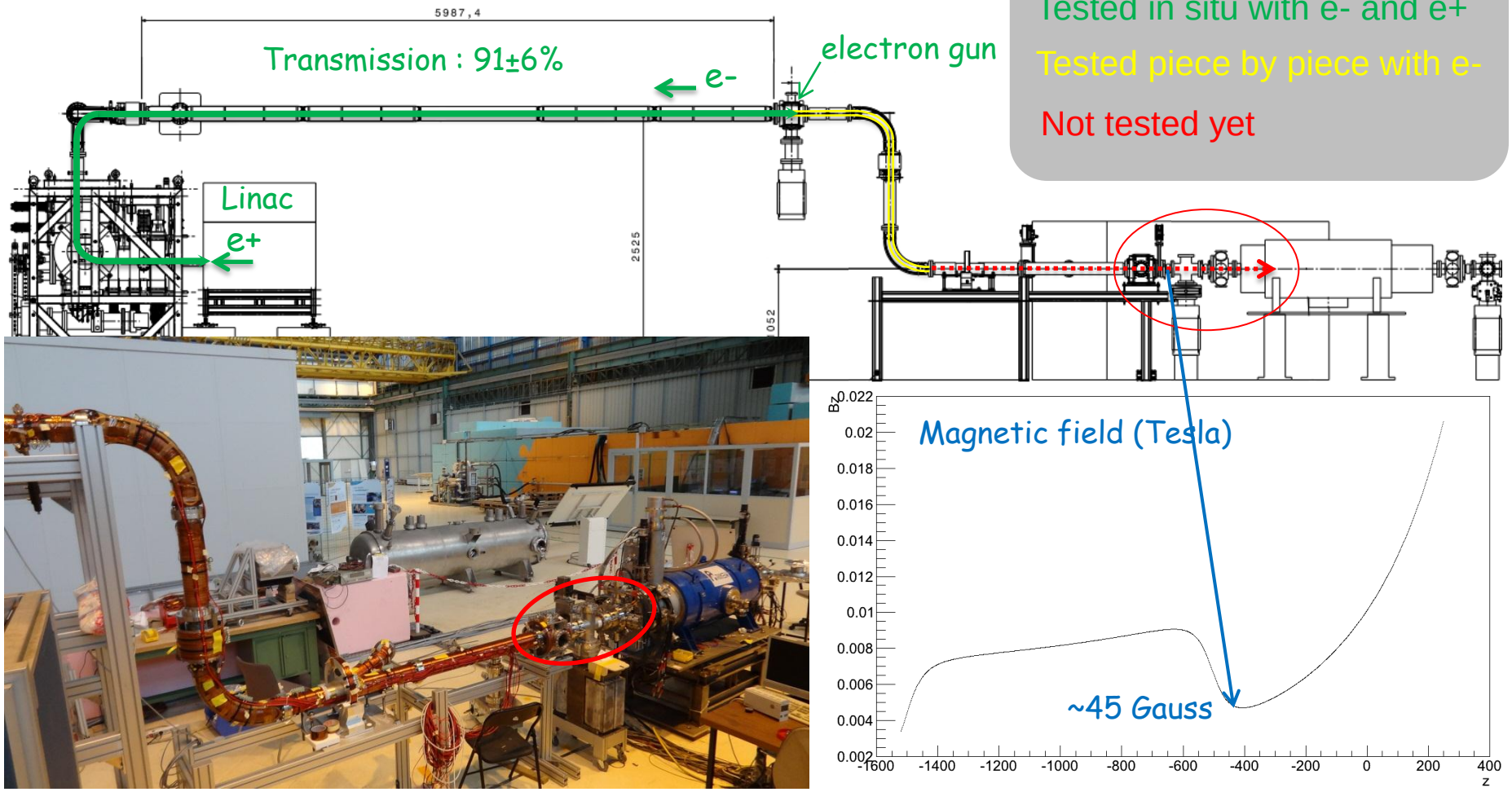


- Moderation efficiency decreases with temperature
- 30 minutes at 200 Hz : moderation efficiency reduced by 30% (Reversible)
- Still investigating long term effects

- 11-13 April : The Polish NCBJ Team has installed a new AFC - *Automatic Frequency Control* - for the tuning of the Magnetron
  - Stability increased
- The linac is stable enough for moderation development
- The linac is stable enough to accumulate positrons in the trap
- The linac energy will be monitored with the spectrometer installed by the NCBJ team

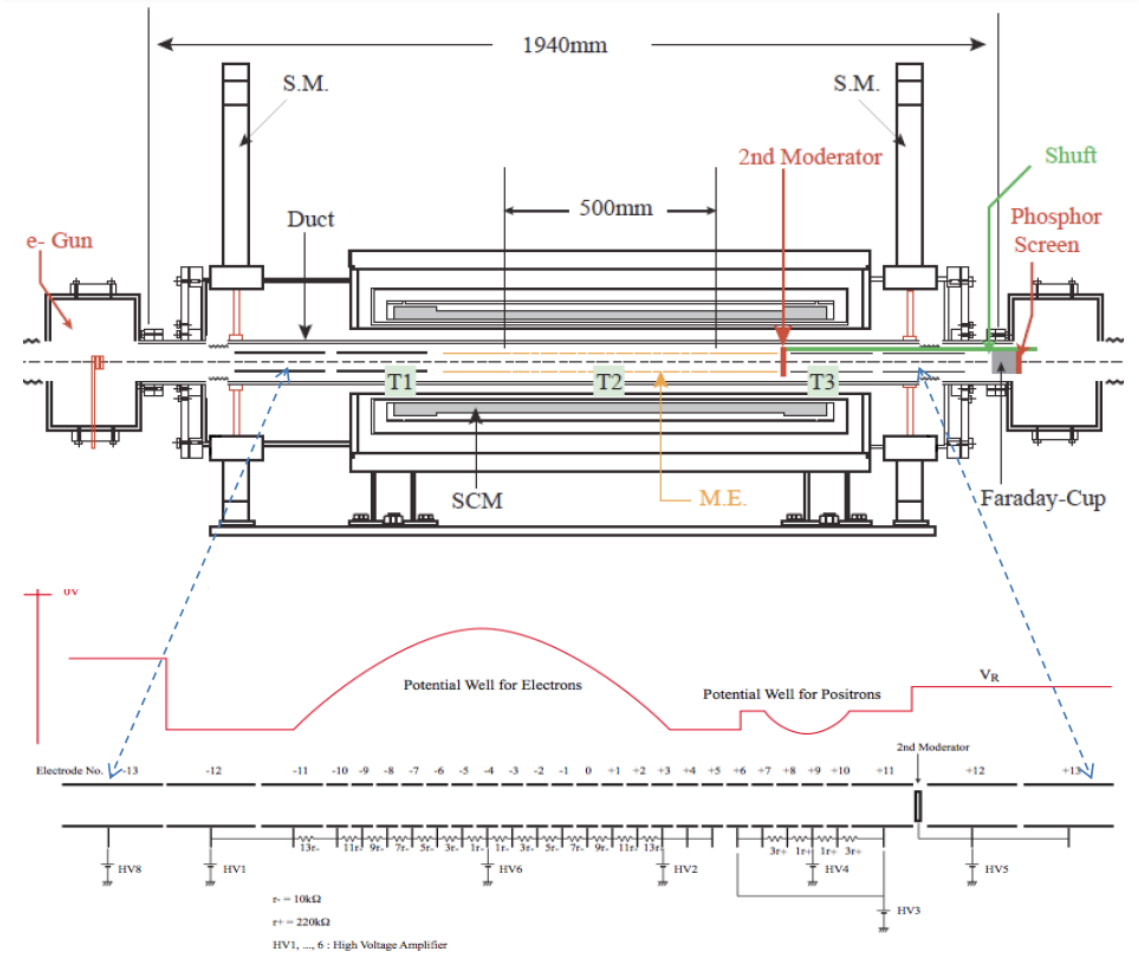
The improvements on the slow positron beamline

Status at the last collaboration meeting



The RIKEN penning-malmberg trap status

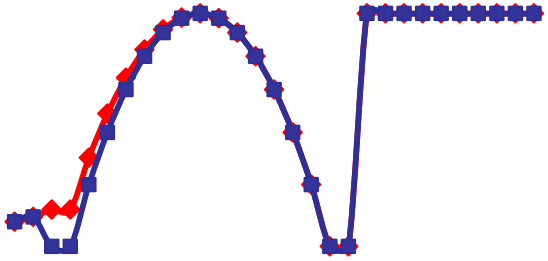
Apparatus



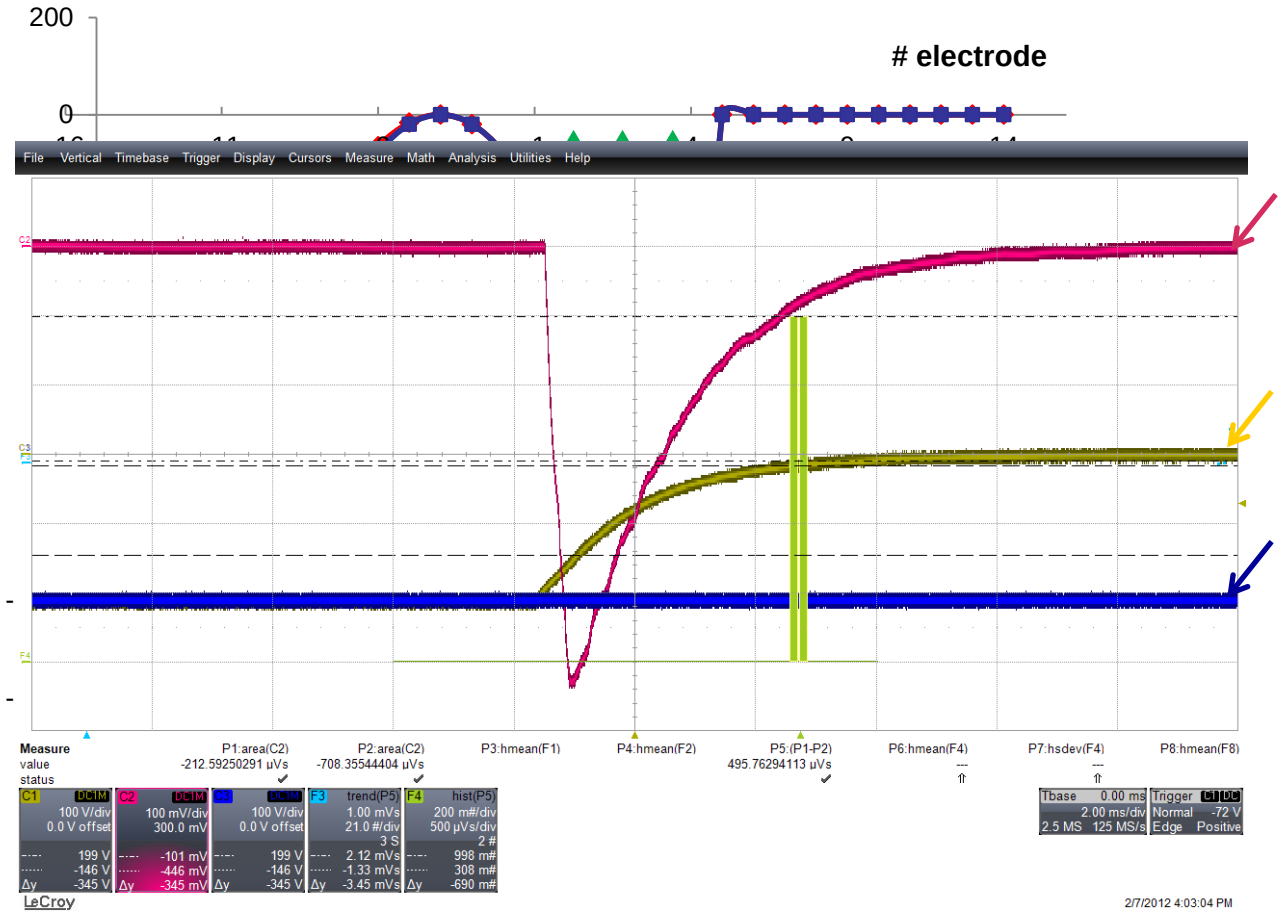
Magnetic field B = 5Tesla

Potential well V = 1 kVolt

Electron well length = 30 cm



The RIKEN Penning-Malmberg trap status

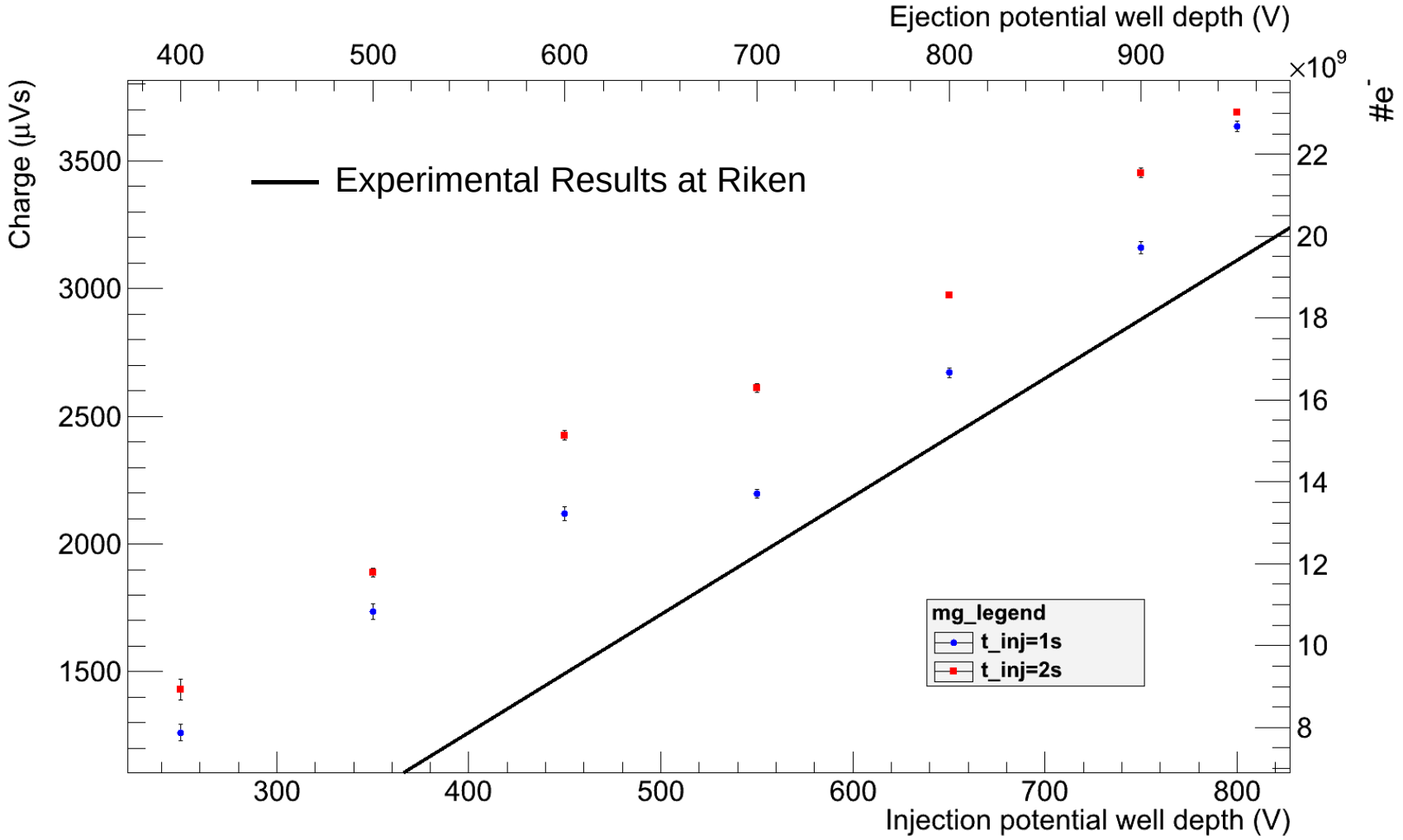


Signal on target

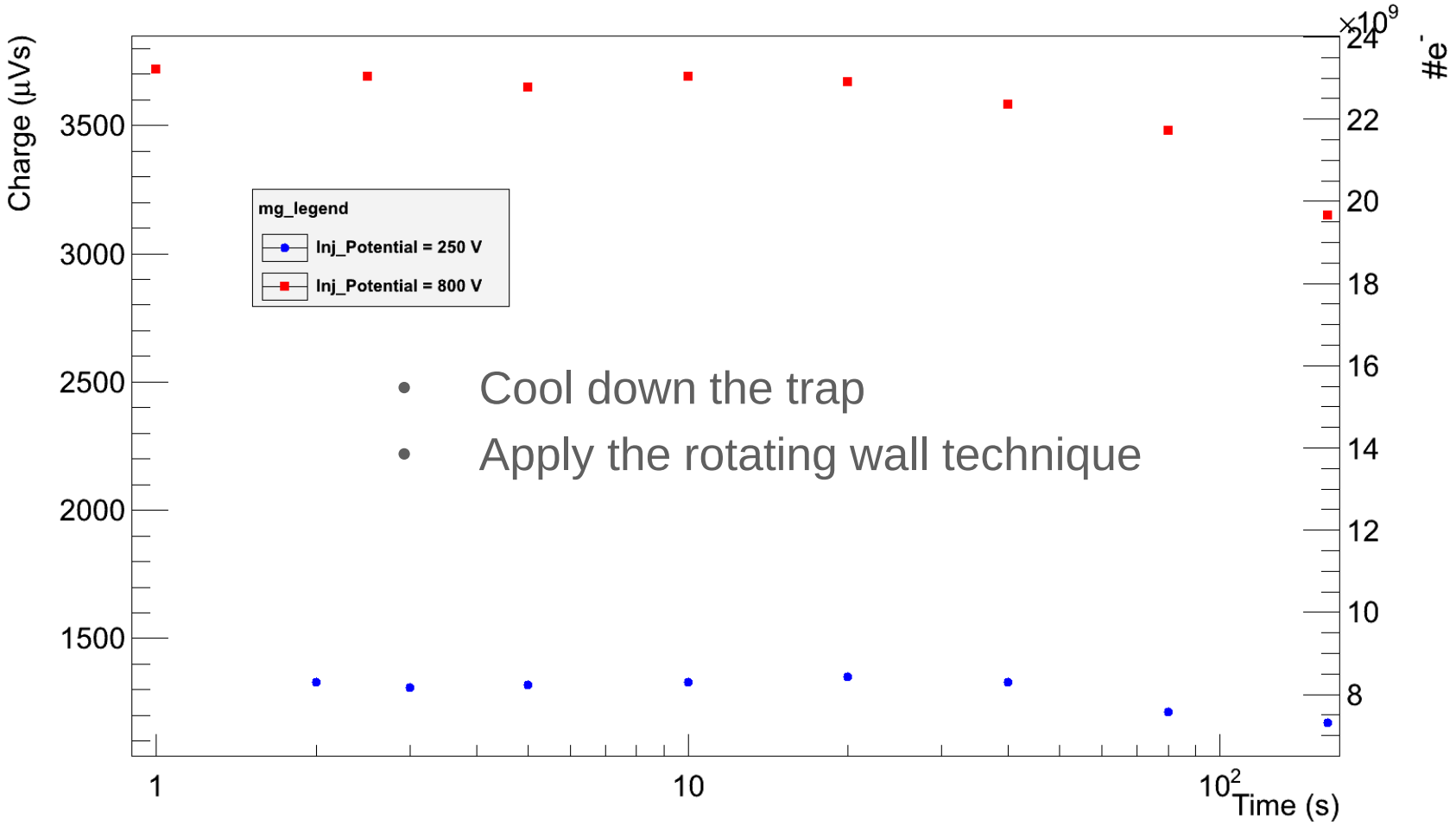
Extraction electrode

Injection electrode

Results with electrons



Results with electrons



2.10^{10} e- trapping easily reproducible

Trap is now ready for positron trapping tests

Fast High Voltage switch in development

Thank you for your attention

Swansea University
School of Physical Sciences

CSNSM

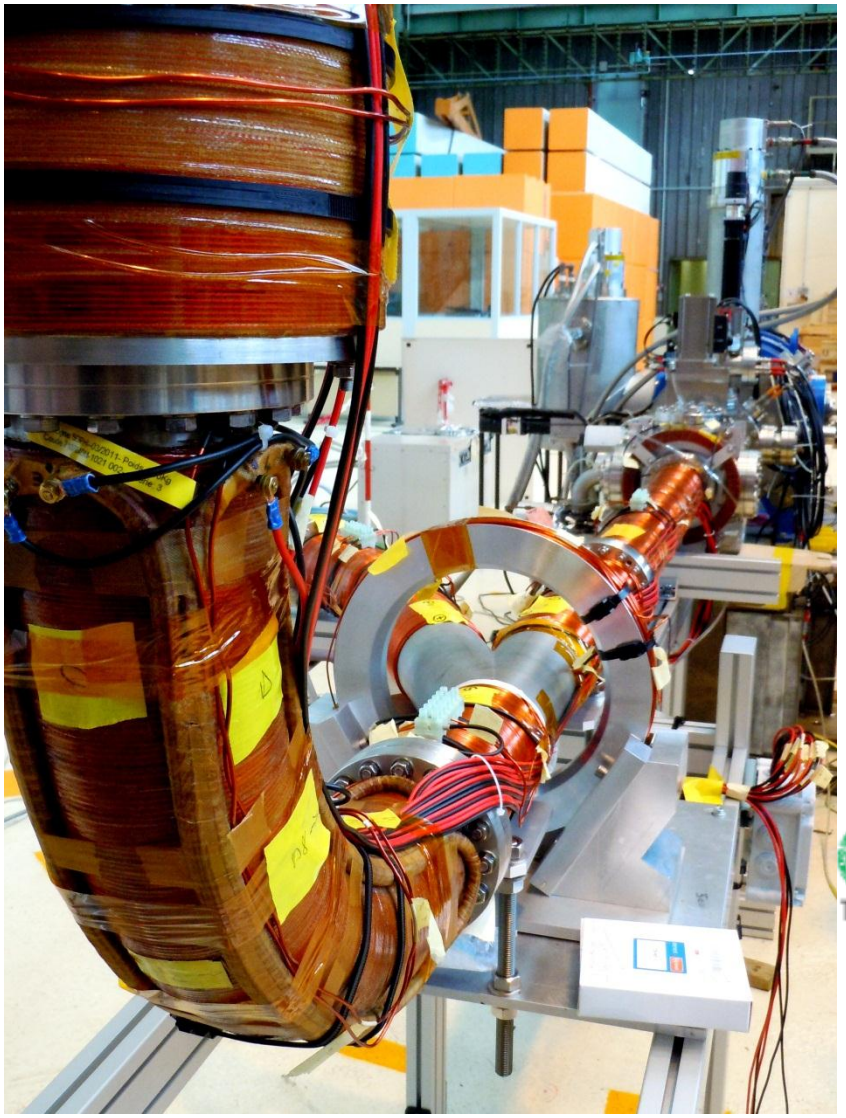
東京大学
THE UNIVERSITY OF TOKYO

IPCMS

NEUTRONS FOR SCIENCE
Institut Laue-Langevin

UPPSALA UNIVERSITET

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



Irfu

P.N.Lebedev Physical Institute of the Russian Academy of Science

JG|U
JOHANNES GUTENBERG UNIVERSITÄT MAINZ

東京理科大学
Tokyo University of Science

RIKEN