ADAMAS 2014

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Content:

1. Neutrons
2. Spectroscopy
3. Emittance
4. Timing
5. XBPM
Pavel Kavrigin
TU Wien
TRIGA - nuclear reactor

Thermal neutrons

Huge gamma background
Li - conversion

Gamma background

\(^3\text{He} = 3 \text{ MeV}\)

\(\alpha = 2 \text{ MeV}\)

LiF foil
Pulse shapes

Alpha particles:

![Alpha particles pulse shape](image1)

Figure 2. Rectangular pulse shape: ideal (blue), theoretical (green), measured (red).

Photons:

![Photons pulse shape](image2)

Figure 3. Triangular pulse shape: ideal (blue), theoretical (green), measured (red).
Pulse shape analysis
ROSY®

Real time processing

4 channels, 5 GS/s, FPGA, embedded server
Matevz Cerv
CERN ATLAS
Ion spectroscopy

Bragg curve

Counts

α-particle 5.5 MeV
σ = ±2.45 keV

Energy [keV]

Energy resolution [keV]

Statistical limit

Resolution [electrons]

5.5 MeV alpha, 2.45 keV, 180 electrons

σ/E [%]

Energy [MeV]

Statistical limit
Spectroscopic Amplifier

Detector

2 m cable

Cx-L amplifier
CERN n_TOF

Counts

Deposited Energy [MeV]

\( E_{\text{ion}} \) for the calibration = 12 eV

\( ^{148}\text{Gd} \quad ^{239}\text{Pu} \quad ^{241}\text{Am} \quad ^{244}\text{Cm} \)
Reference: A. Zimbal, PTB
Thomas Hofmann
CERN LINAC4
Emittance Meter

H⁻ beam
LINAC4

Laser
Magnet
H⁰ particles

CIVIDEC Instrumentation
Signal

Laser pulses

Background

Amplitude (Diamond [mV])

t [μs]
Emittance

Simulation

Measurement
Nicola Minafra
CERN Totem
Time resolution

MIP protons

Time-of-flight measurement

Noise = 1000 electrons

FWHM = 10 ns
130 MeV pions

\[ \sigma = 173 \text{ ps} \]
Diamond XBPM
In cooperation with Diamond Light Source
XBPM

- **4Q-Diamond Detector**
  - 50 um sCVD diamond
  - 3 mm aperture
  - 4 pads, 100 nm titanium metallization
  - Gap: 1 um

- **CIVIDEC LCA - Low-Current Amplifier**
  - 1 – 1000 nA
  - Offset current <1 pA
The 4Q-Diode
Chris Bloomer, Diamond Light Source
Installation of XBPM
Installation of XBPM
XBPM at the Diamond Light Source
XBPM
Low-current amplifier
Detector response

- Interaction probability vs. Energy [keV]
- Generated charge [fC] vs. Energy [keV]
- Conversion yield [fC] vs. Energy [keV]
- Current [nA] vs. Beam intensity [photons/s]

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Erich Griesmayer
Detector response

33 nA measured
36 nA predicted

0.32 uW
1.5e10 s⁻¹
13 keV

0.03 nA
0.4 nA
2 nA
9 nA
Position resolution

Signals seen from Quadrants A and D during vertical stepper scan

\[ dl = \frac{\text{noise}}{\text{amplitude}} \cdot (\text{beam} \otimes \text{gap}) \]

Aim: < 100 nm
Philip Bambade
IN2P3/CNRS et Université Paris Sud
Accelarator Test Facility (ATF) @ KEK

low energy (1.3GeV) prototype of the final focus system for **ILC** and **CLIC**

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**Goals of ATF2**

- **goal 1**—achieving the 37 nm design vertical beam size at the IP;
- **goal 2**—stabilizing the beam at that point at the nanometer level;

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βp/p₀ = 0.0008

**Scan beam halo transverse distribution** → investigate & control ATF2 beam halo

**Probe Compton recoil electron**→ investigate the higher order contributions to the Compton process
The first Diamond Sensor is installed horizontally at ATF2. The main purpose is to measure the beam halo distribution.

Initial Waveform:
- Total Beam intensity: $1.2 \times 10^9$
- Voltage on DS: -40V

Beam Core Scan:
- Total Beam intensity: $1.2 \times 10^9$
- Voltage on DS: -40V

Beam Halo Scan:
- Total Beam intensity: $5.2 \times 10^9$
- Voltage on DS: -400V

Installed at ATF2 in Nov. 2014
Thank you for your attention!