Polarimetry concepts for the EDM precursor experiment at COSY

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Outline

Motivation

Detector concept

Detector

Summary & Outlook

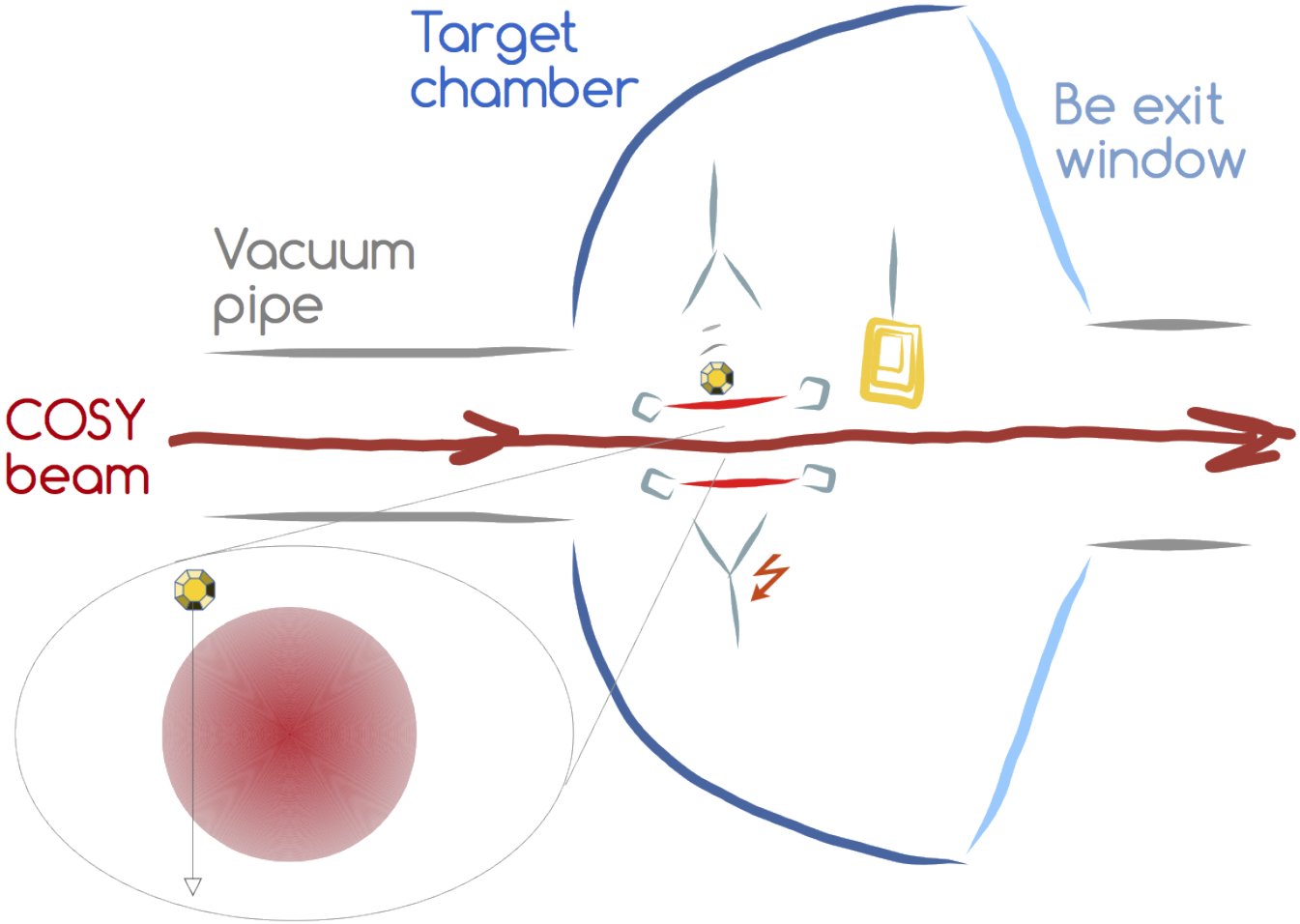
Design goals for an EDM polarimeter

- Current candidate method for EDM search implicates a linear buildup of polarization with time.
- Design goals for polarimeter:
  - High σ_{el},A_y
  - Minimal influence on beam
  - Low sensitivity to systematic effects

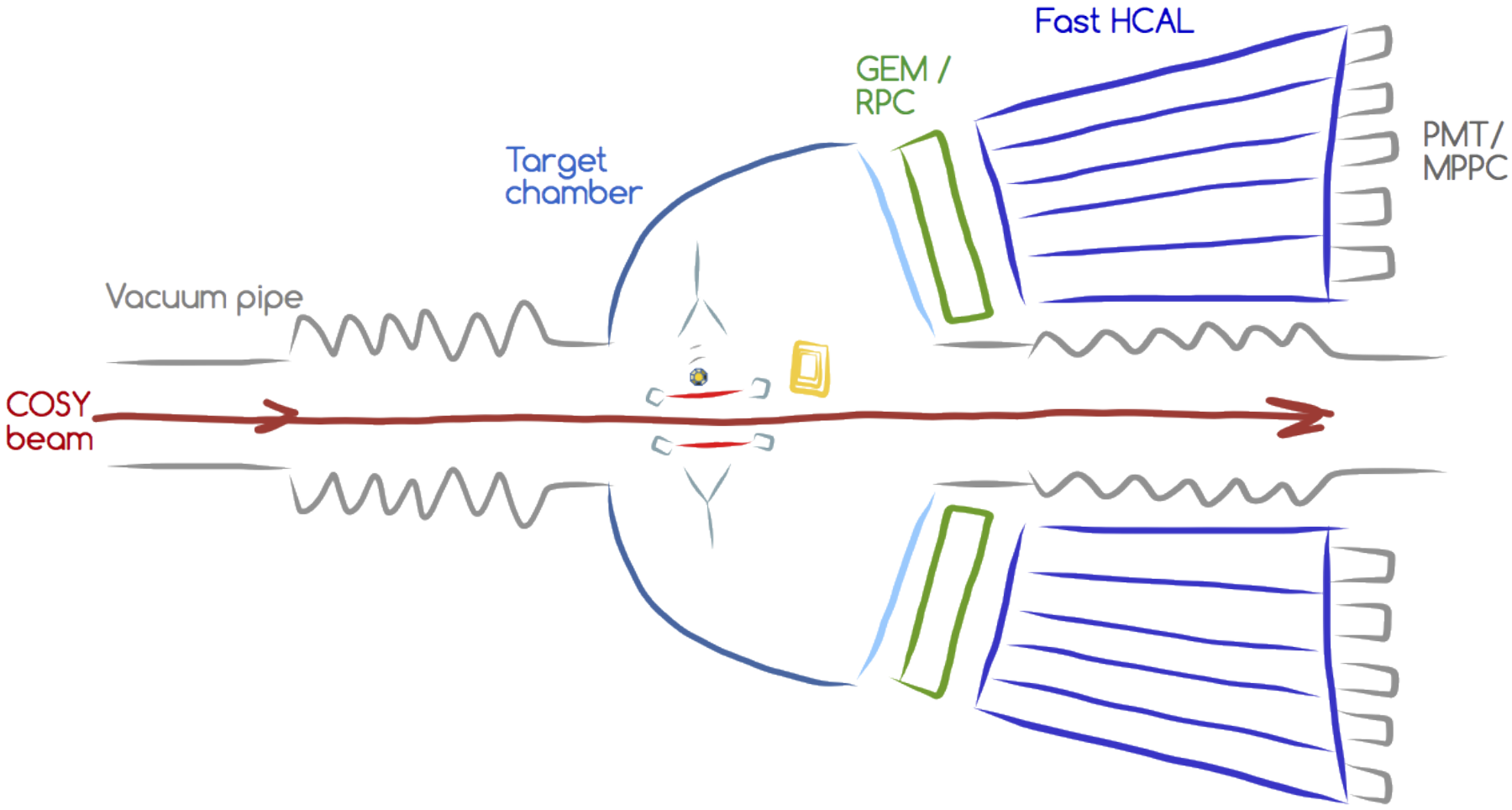
Target choice

- Carbon was chosen as best overall target choice
- Big cross section and analysing power, easy to handle
- XSec, Ay, FOM 50, 250 MeV

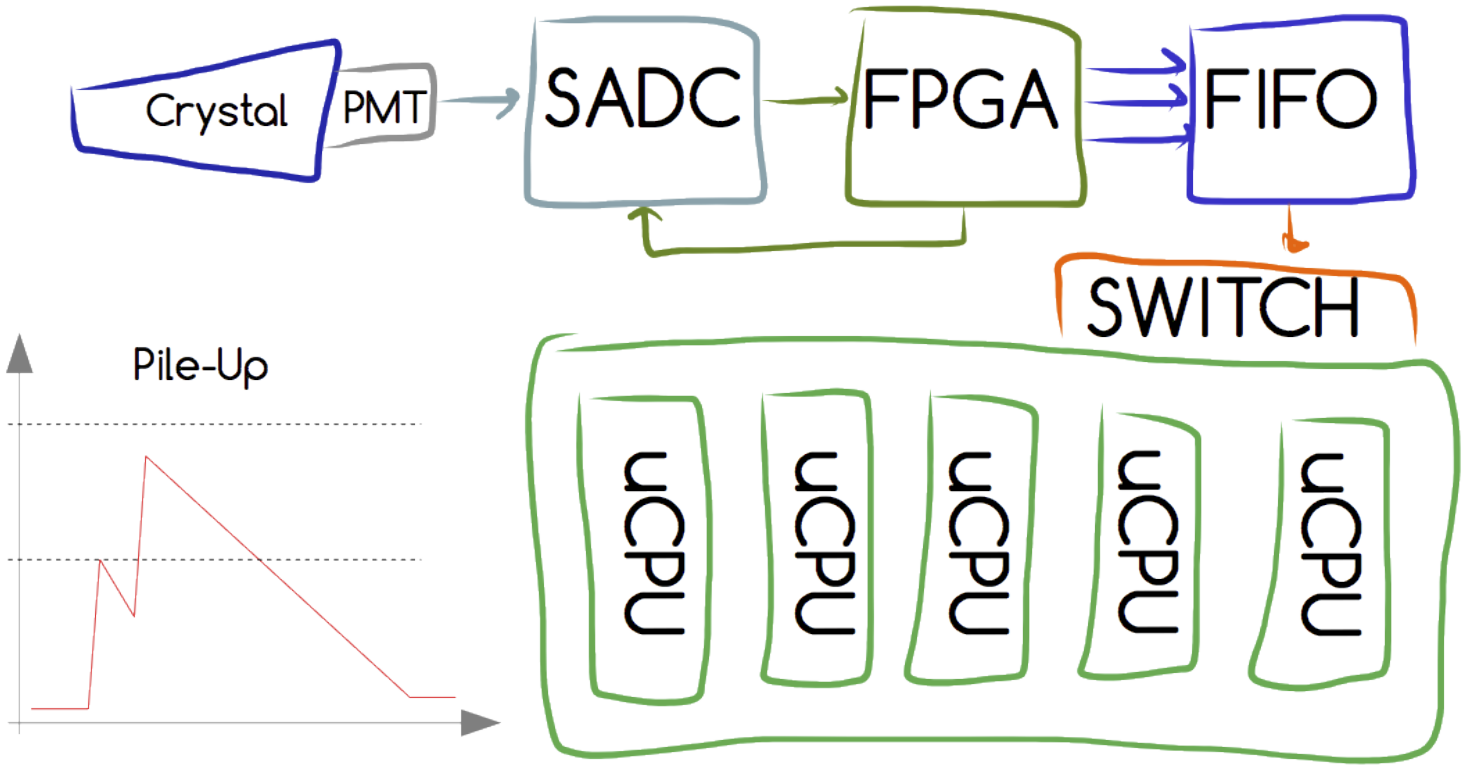
Target concept



Detector concept



Readout Concept



- Triggerless readout: Use waveform digitizers and read out every turn.
- Use FPGA-based online analysis

Readout Concept (cont'd)

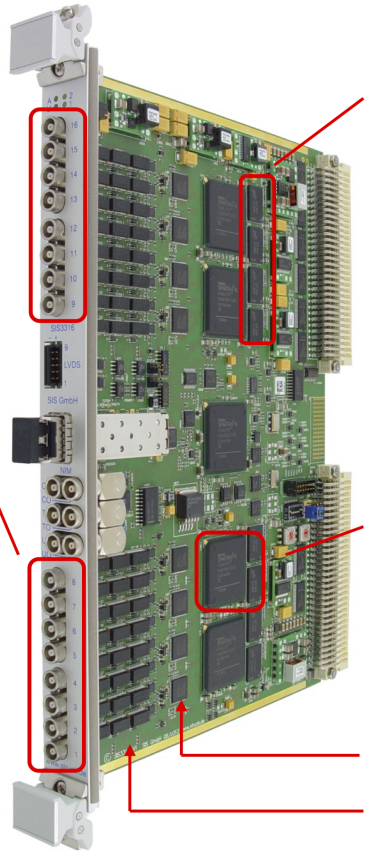
SIS3316 16 channel VME FADC

16 Analog Input Connectors

- Programmable Input Termination
• 50 Ohm
• High Impedance

- Programmable Input Range
• 5V
• 2V

- Programmable Analog Offset (DAC)
-> variable Input Range from +5V/0V to 0V/-5V
-> variable Input Range from +2V/0V to 0V/-2V



DDR3 Memory

4 x 2 x 256 MByte = 2GByte

• 512 MByte / 4-channel group
• 128 MByte / channel

• 64 MSample / channel

ADC FPGA: Xilinx Spartan 6
XC6SLX75T-3
-compatible options:
* XC6SLX100T
* XC6SLX150T

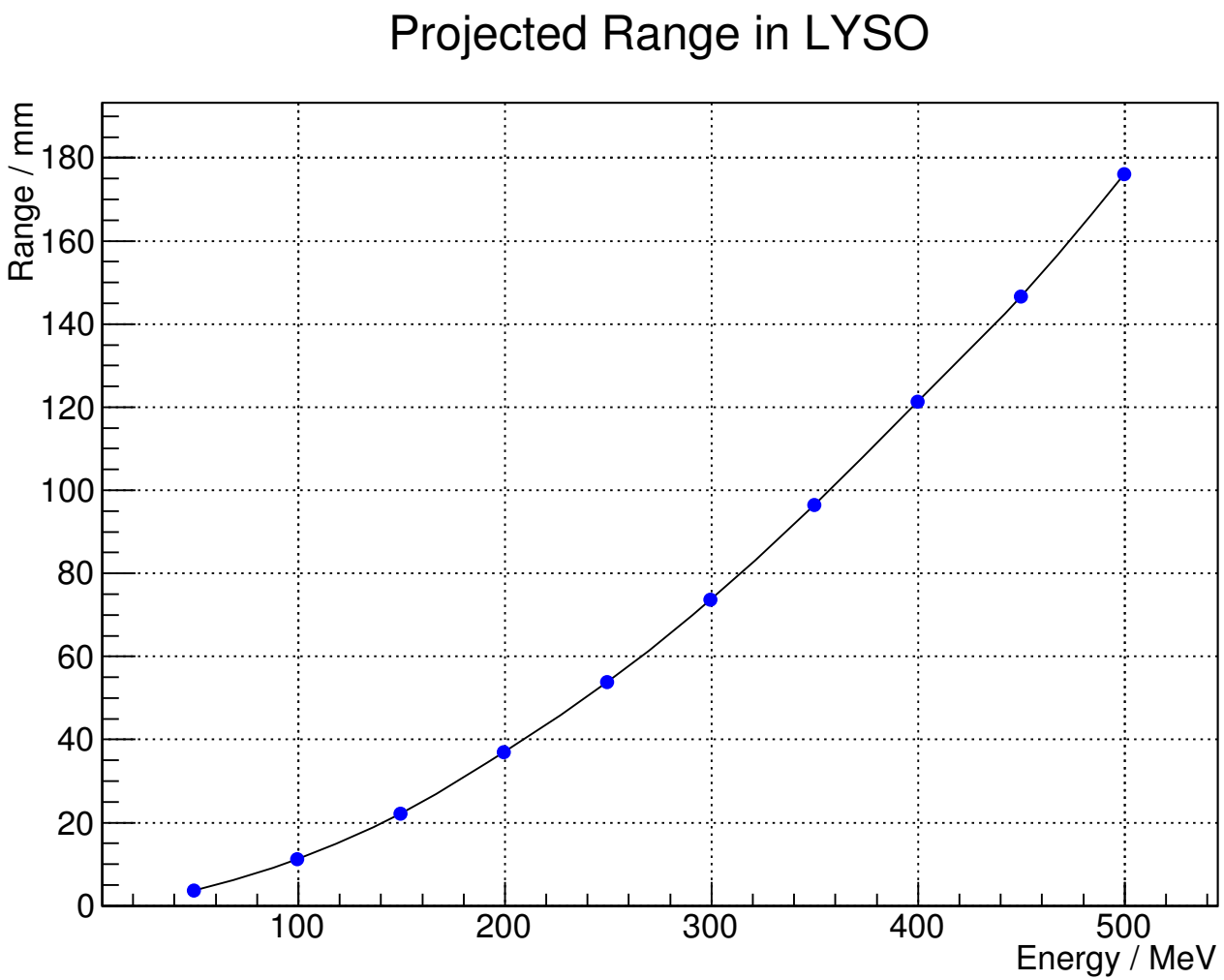
Application Firmware

250 MSPS 14-bit ADC or
125 MSPS 16-bit ADC

Impedance/Range Relays
and Offsets (DACs)

Candidate Layout

Simulation studies



Simulation studies (cont'd)

- Lyso vs Plastic+Degrader vs Sandwich

Summary & Outlook

- Have a candidate layout for JEDI polarimeter
- Crystals have been ordered for hardware tests.
- Will explore gain from tracking capabilities.
- New student will begin work on target end of year.