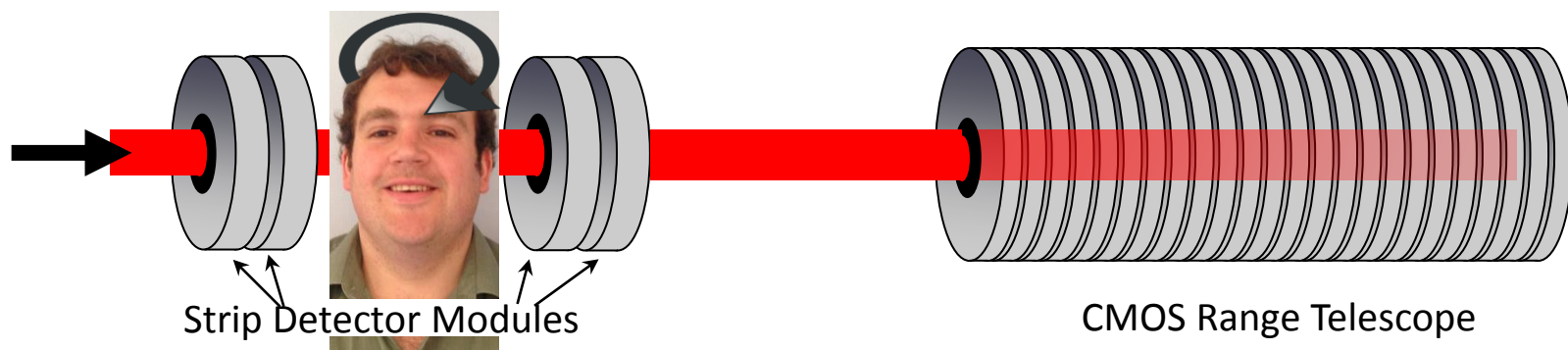


PRaVDA: Towards Clinical Quality Proton CT

T. Price, University of Birmingham (on behalf of PRaVDA)

Proton radiotherapy utilises the proton Bragg Peak to deposit a larger dose to a target volume with low dose to healthy tissue. Proton CT will allow a direct measure of body tissue stopping powers and greatly reduce the uncertainty on the proton range during proton radiotherapy. This will improve the treatment of cancers using proton beams and reduce the dose to critical structures.

In order to acquire a proton CT we need information on every single proton before and after the patient. HEP helps us with this. Silicon strip trackers will measure proton trajectory and a stack of large scale CMOS APS will measure the residual range at a rate of 1M protons / s. This will yield a pCT image in a clinically feasible time.



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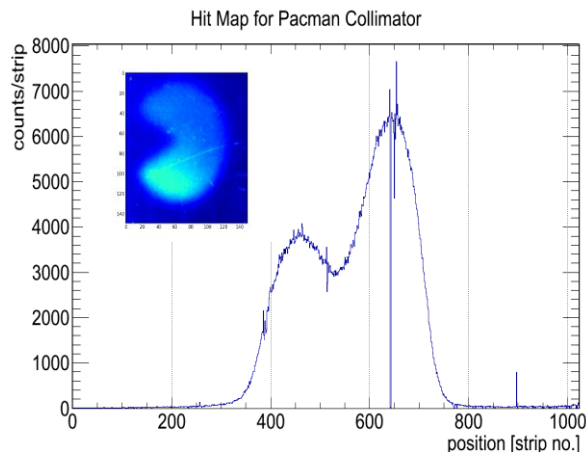
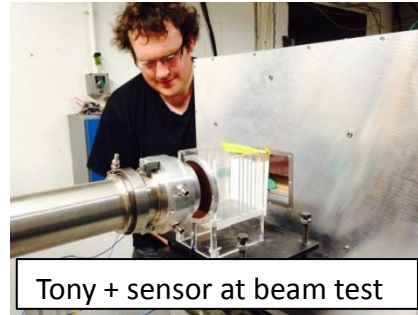
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Strip Tracking System

- 3 strips rotated at 60° yield x-u-v coordinate reduces ambiguities at high beam currents
- Strips developed by University of Liverpool HEP group
- Manufactured by Micron Semiconductor Ltd with high yield
- 150 μm thick
- $93 \times 96 \text{ mm}^2$ area
- 90.8 μm pitch



Single strip hit map through Pacman collimator

CMOS Range Telescope

- Stack of CMOS sensors stops protons
- The final range translates to its energy
- Pixelated detectors allow tracking of thousands of protons simultaneously
- Full CMOS capability with high charge collection due to deep-wells
- Active area of $50 \times 100 \text{ mm}^2$
- Pixel pitch of $194 \times 194 \mu\text{m}^2$
- 3 side buttable
- Rolling shutter readout $> 1000 \text{ fps}$
- $S/N > 25$ @ 29 MeV proton

