Development of an ultra thin monitor for charged particle beams

Proton therapy
- Maximum dose near end of proton track \( \rightarrow \) Bragg peak
- Low lateral scattering in the tissue \( \rightarrow \) beam stays focused on the tumor
- Bragg peak position adjustable by beam energy \( \rightarrow \) Spread Out Bragg Peak (SOBP)
- Therapeutic energy range : 70 – 230 MeV
- Beam current \( \equiv \) nA
- Application : resistant, inoperable (skull) or pediatric cancers

Pencil Beam Scanning Technique

Test of a detector prototype
- One dimension sampling (polymer + gold) and experiment with SiN membrane

Secondary Electron Emission (SEE)
- Surface process
- Only electrons close to the surface escape
- Low energy (few eV) \( \rightarrow \) vacuum mandatory
- Yield \( \equiv \) dI/dx \( \rightarrow \) Strong signal \( \equiv \) High Z

Detector principle
- Beam sampling with thin SEE emissive pattern deposited on thin dielectric substrate layer
- (X-ray) sampling using SEE currents from strips
- Signal readout from the emission side \( \rightarrow \) unaffected by EM fields in the beamline
- No filling gas \( \rightarrow \) no mechanical constraint \( \rightarrow \) thin materials usable

Future studies

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