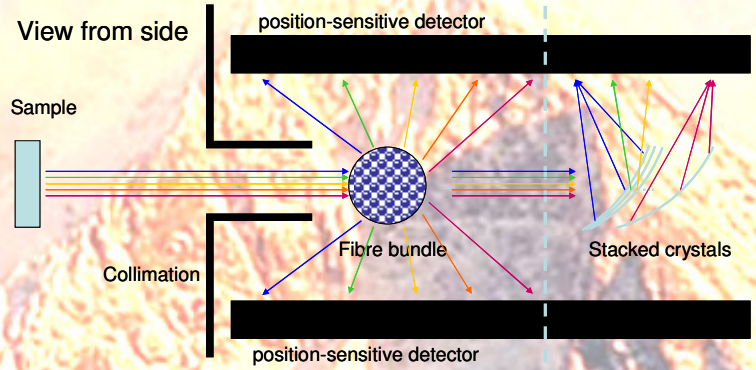
Wavelength-encoding by Bragg diffraction



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+ everybody interested

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Multiplexing

$$I = N\Phi_{incident} \frac{\partial^2 \sigma}{\partial\Omega \partial E_{final}} \Delta\Omega \, \Delta E_{final}$$

$$\text{Resolution} \propto \Delta\Omega \, \Delta E_{final}$$

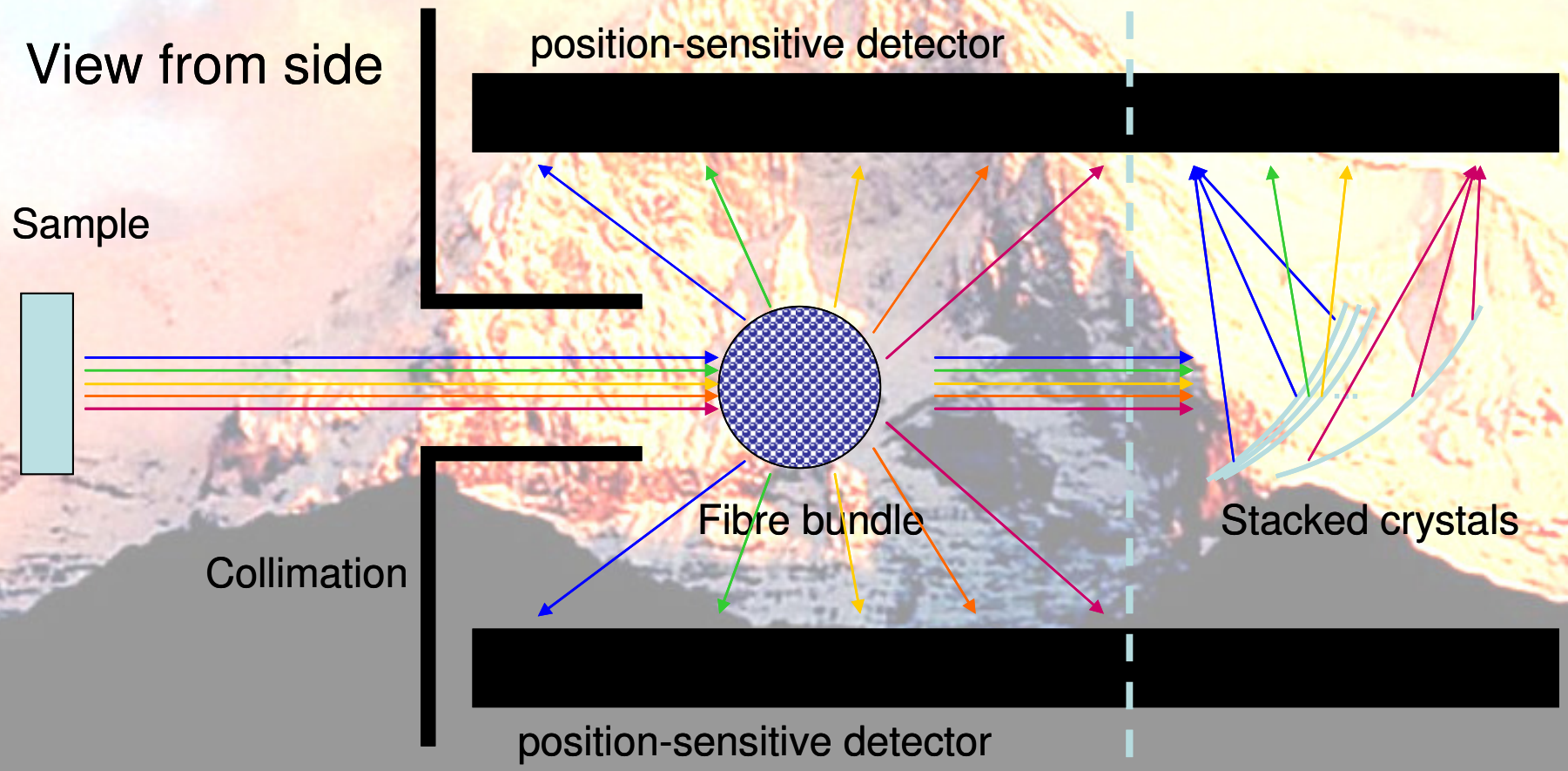
$$\text{Solution : measure several } I_{ij}(\Delta\Omega_i \, , \Delta E_j^{final})$$

Multiple Energy Analysis

- Time-of-flight:
  - Requires pulsed monochromatic incident beam
  - Continuous source: must chop the beam
  - Pulsed source: must monochromatize the beam
- Bragg-diffraction:
  - E.g. triple-axis spectrometers
  - scatters one energy – the rest continue
  - Idea: have consecutive crystals, scatter different energies

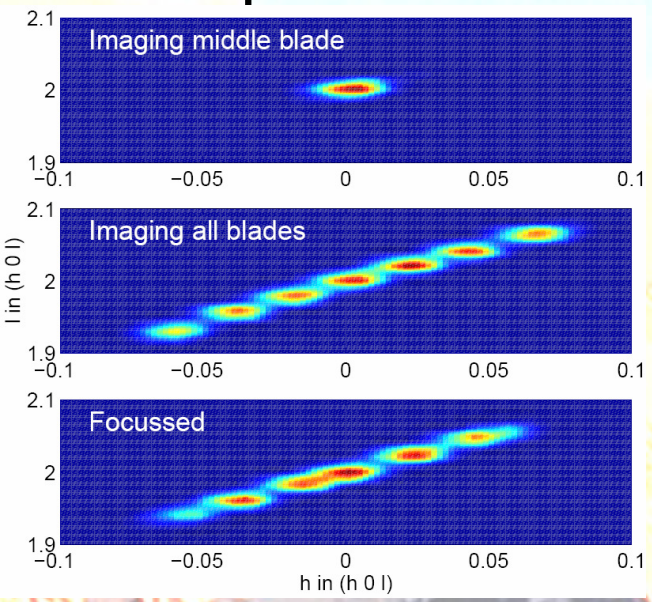
Two approaches

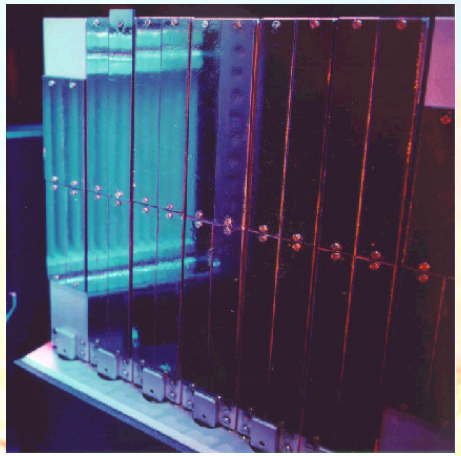
- Crystal-fibre bundles
- Consecutive stack of crystals blades

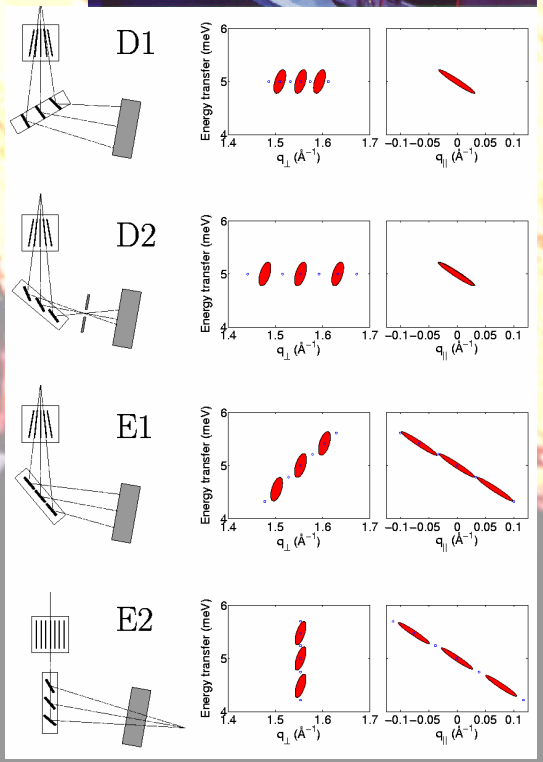


The RITA-concept

- Divide TAS analyser in multiple blades
  - SPINS
  - UFO
  - IN8-IMPS
  - PUMA-project







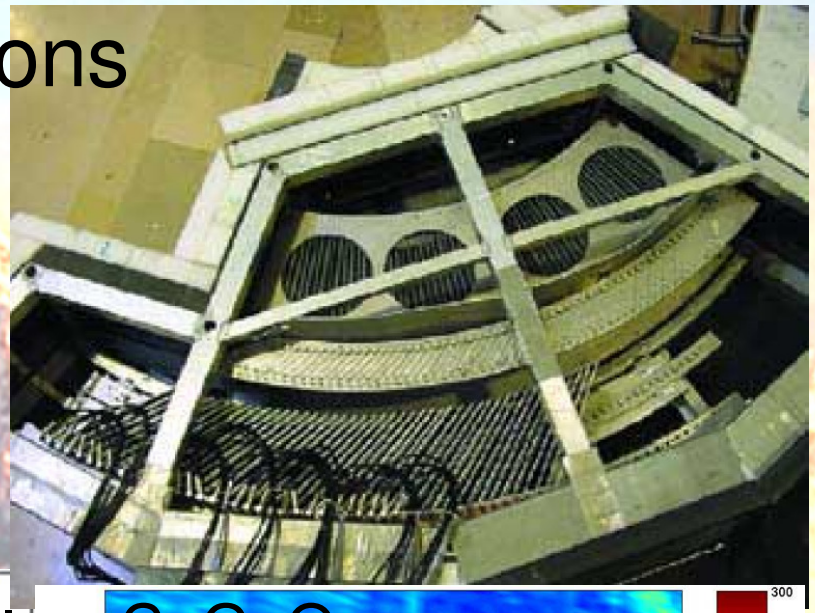
- Limitation:

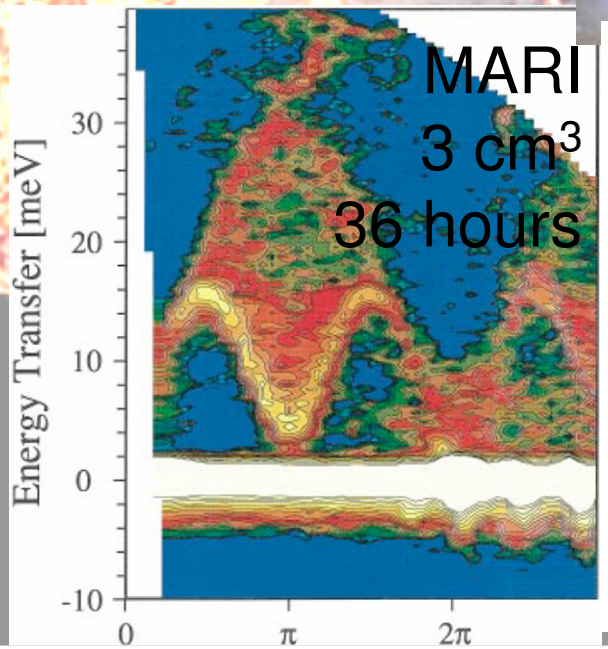
  #neutrons = total analyser area

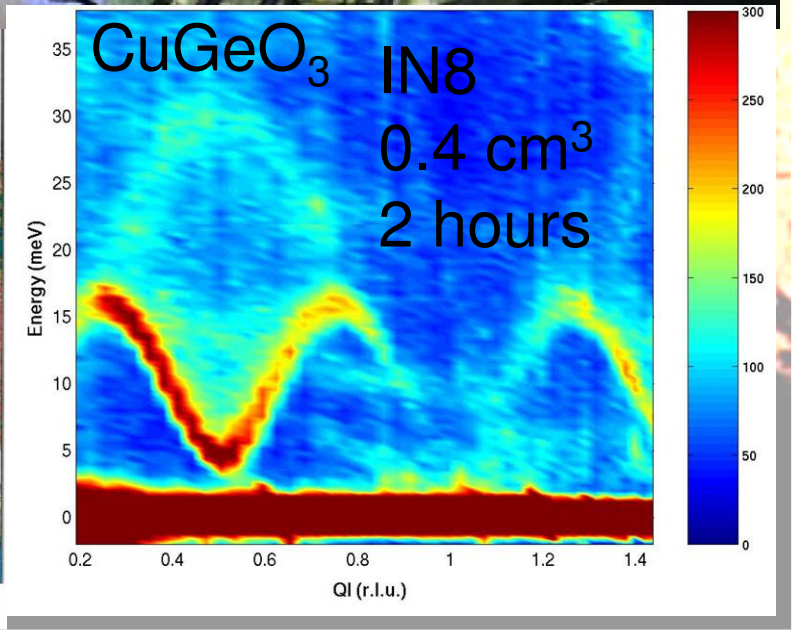
  Difficult to get more than 3-4 x TAS

Multiple angles

- Neutrons scatter in ‘all’ directions
- Collect more angles
  - MAD-box
  - Flat-cone
  - MACS
  - …
- Beats TOF for:
  - small samples
  - Field/pressure



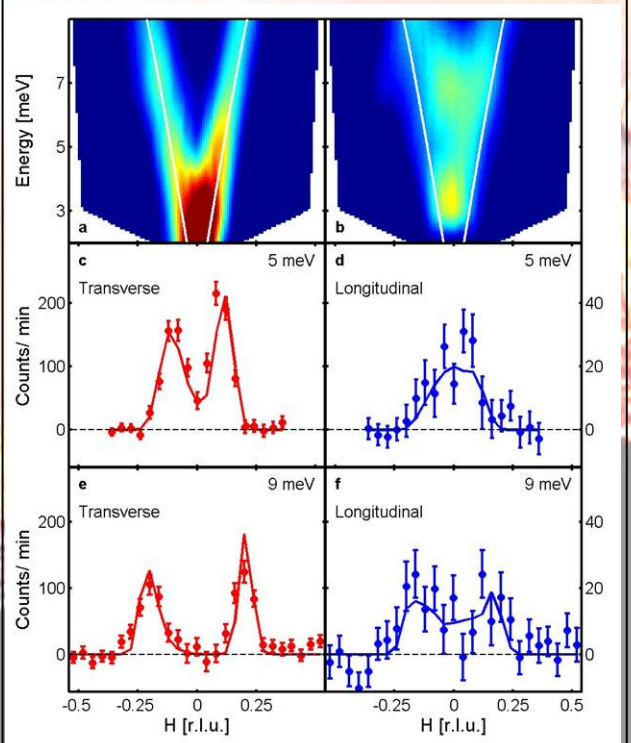




TAS v.s. TOF ⇒ Multi-TAS

TAS

- Focus on one Point
- Flexible
- Already “optimal” (IN8, IN20..)

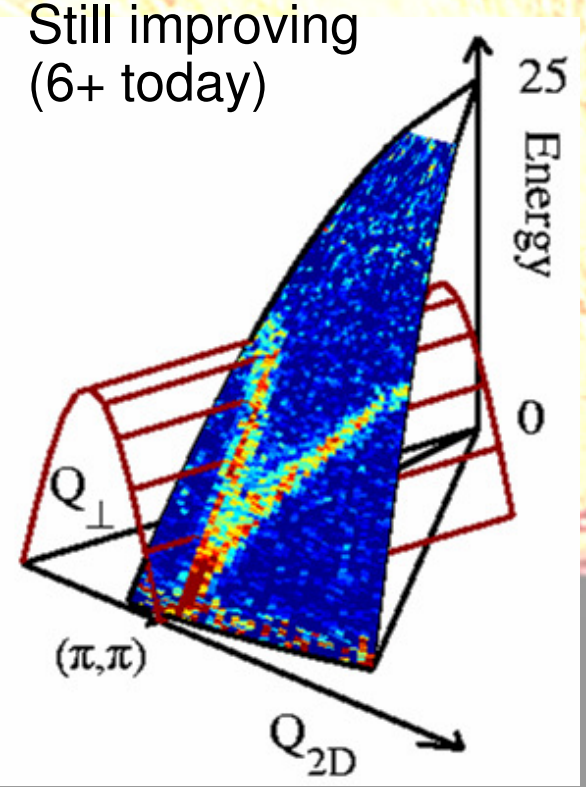


Multi-TAS

- a line in momentum-energy-space
- More Neutrons recorded than TAS
- More flexible than TOF
- Parametric studies

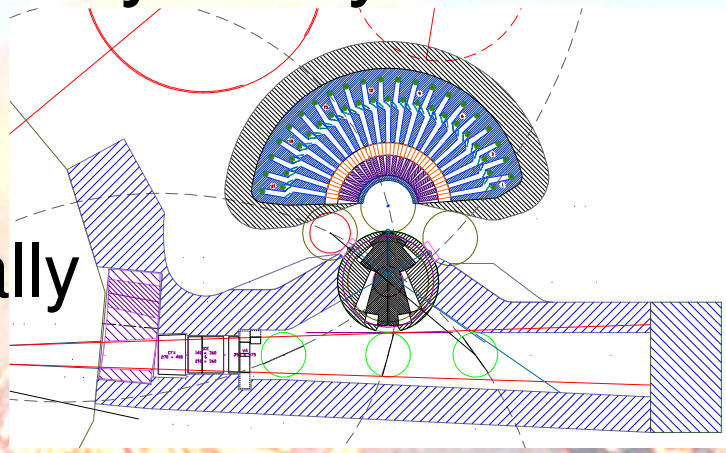
TOF

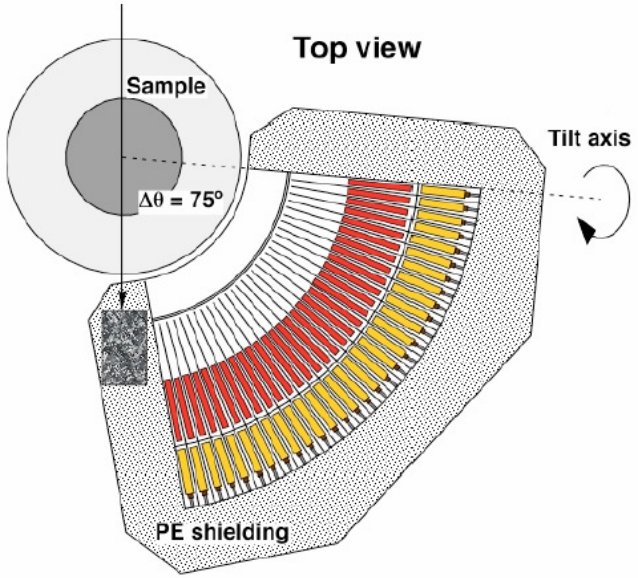
- 2-3D manifold
- Overwiew – sees “everything”
- Less flexible
- Still improving (6+ today)

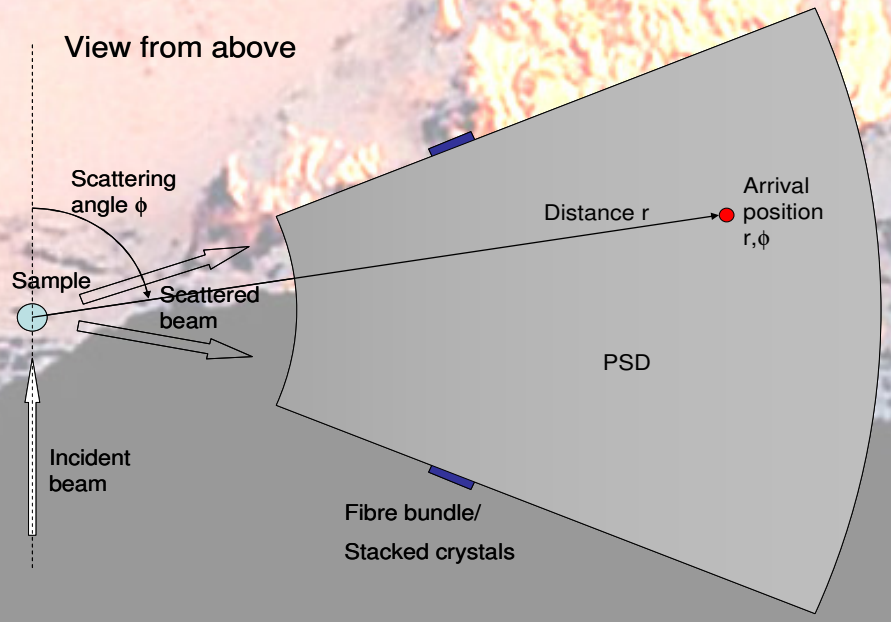


Continuous angles

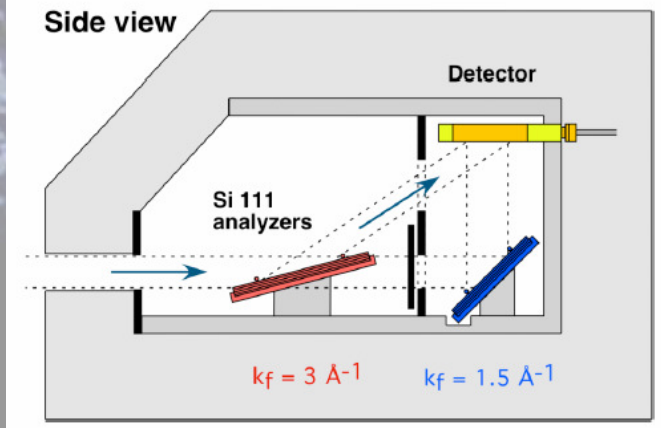
- Geometry of many analysers and detectors?
  - Dead angles
  - Solution: scatter vertically



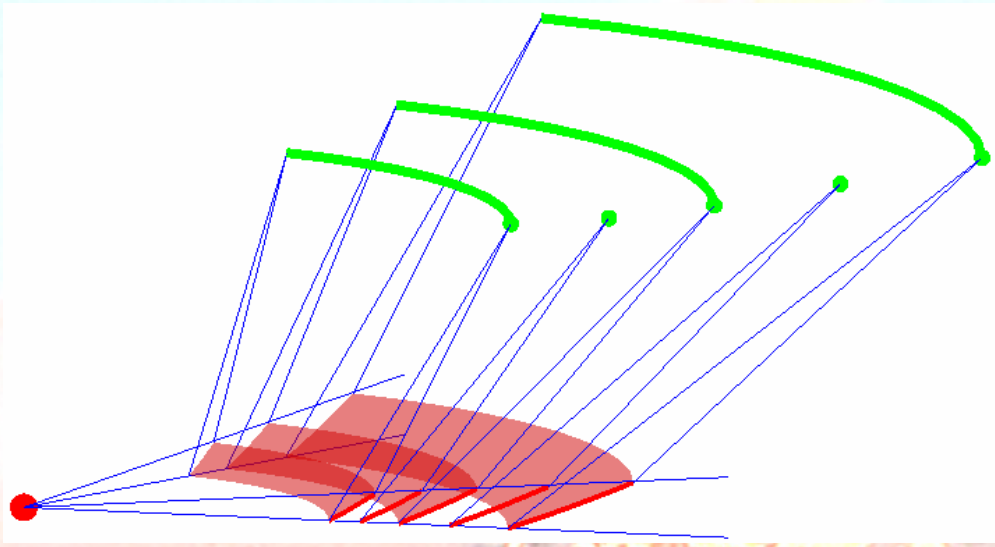


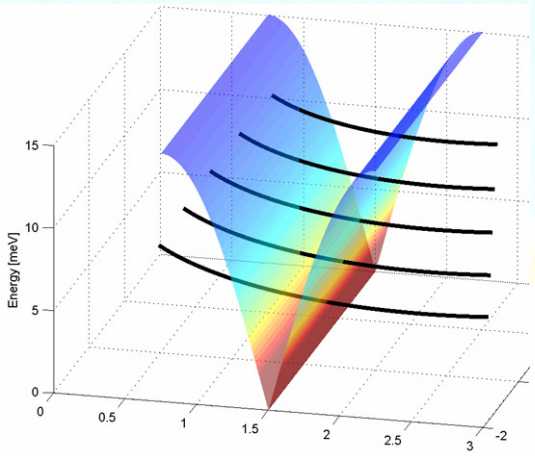


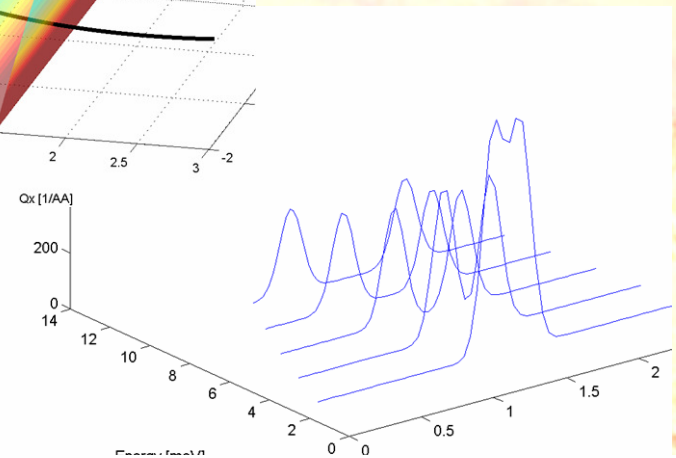
ILL flat-cone

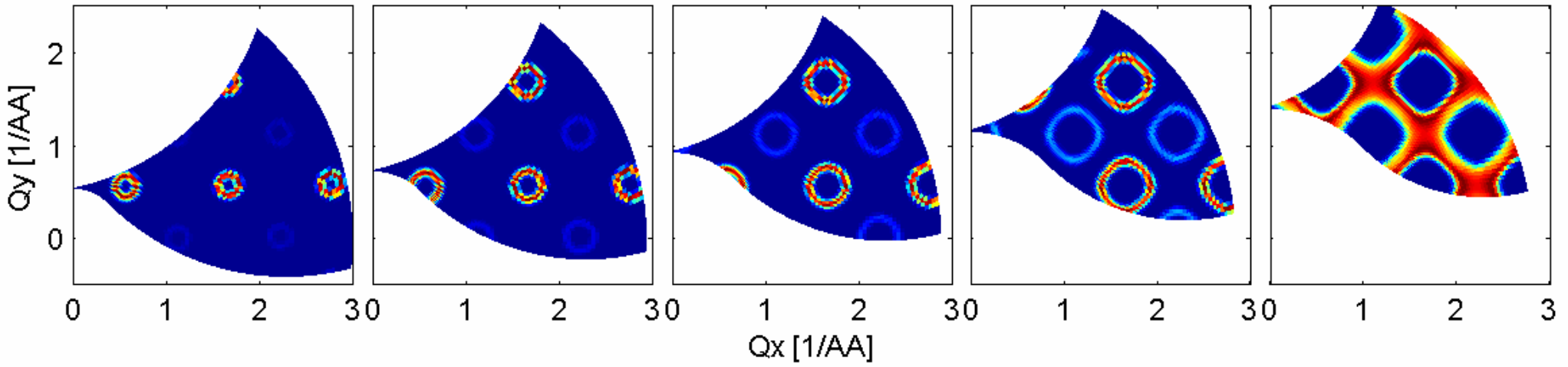


Continuous Angle + Multiple Energy Analysis

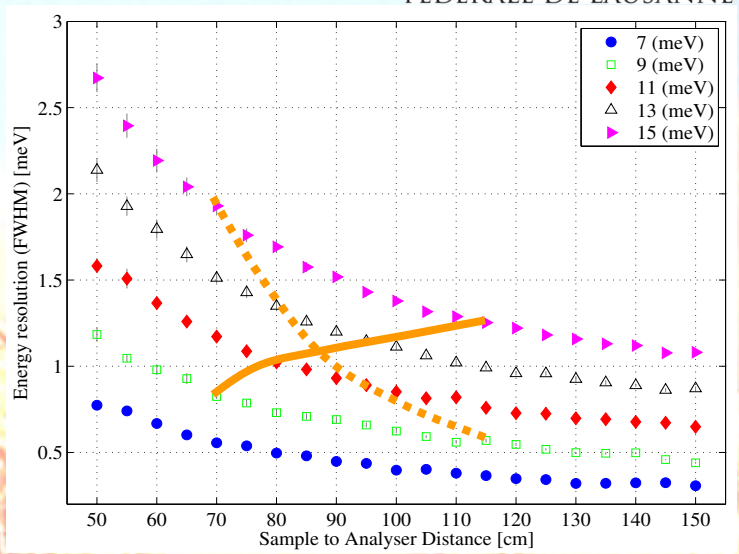








Work-plan



- Invite more interessants
- Material choices:
  - Crystal fibres
  - Stacked crystals: PG or Si/Ge?
- Geometries:
  - Compromises: coverage, resolution, bck, size & price: Monte Carlo
- Prototyping:
  - Reflectivities, absorption, background
- Adaptation of design to specific instrument characteristics
- Data-analysis / experiment planning tools