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Bi-spectral Extraction Systems for Feeders

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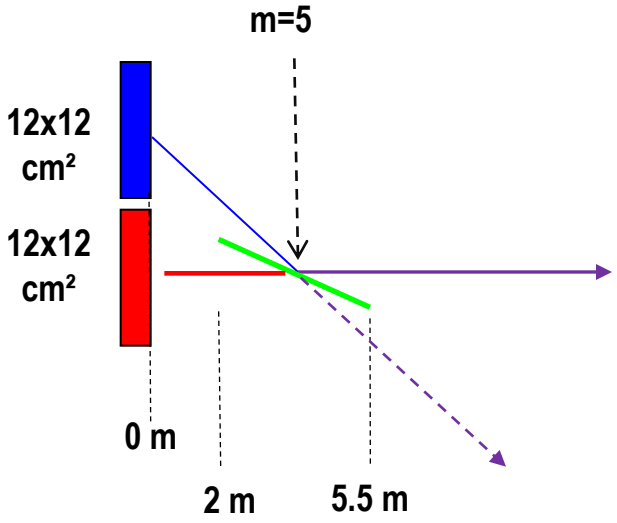
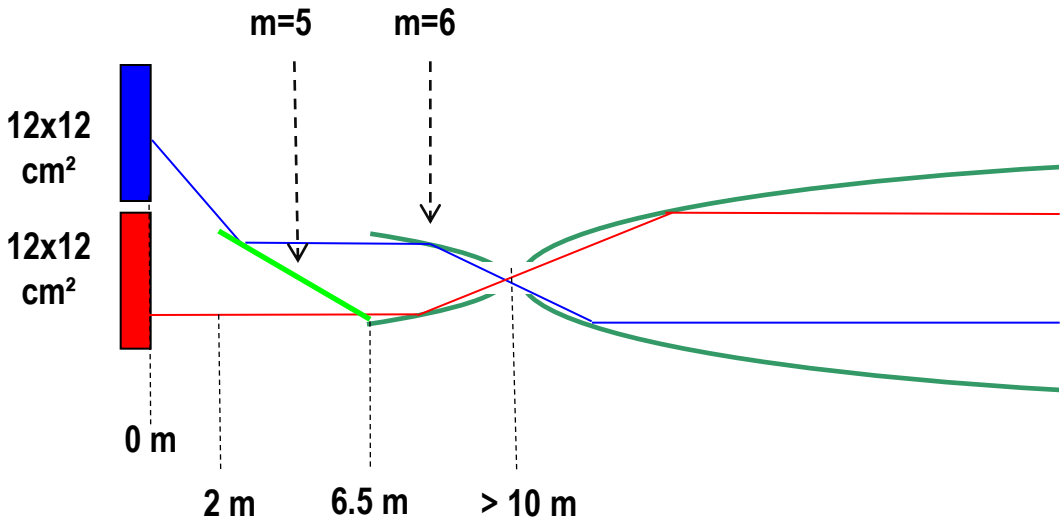
ITESS

Parameters of an Bi-spectral Extraction System



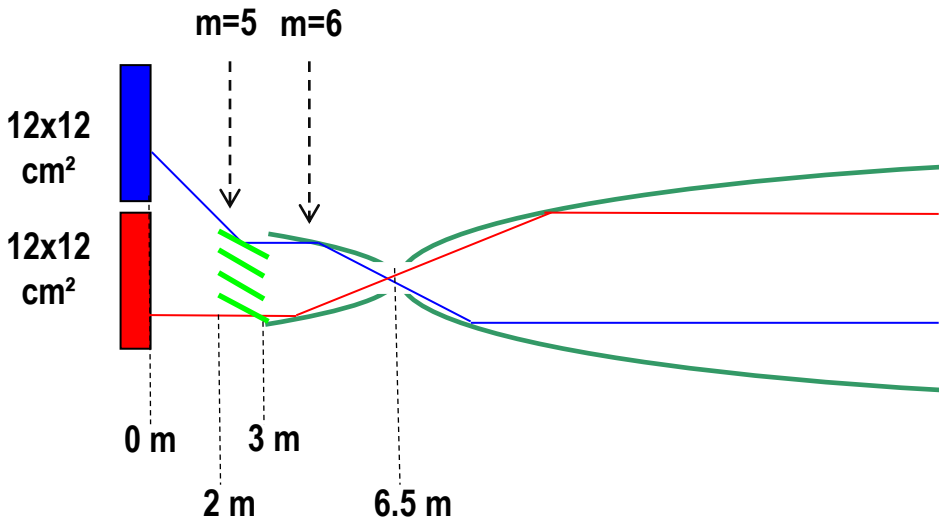
- Basic Idea
  - Transparent mirror in front of the thermal moderator that lets short wavelength neutrons pass and reflects long wavelength neutrons
- Only 2 free parameter
  - Mirror coating and cross-over wavelength determines inclination angle (1° for m=5 and 2 Ang cross-over wavelength)
  - => distance to center of cold source determines center position
  - => minimal distance fixes mirror size

Combination of Extraction System and Feeder



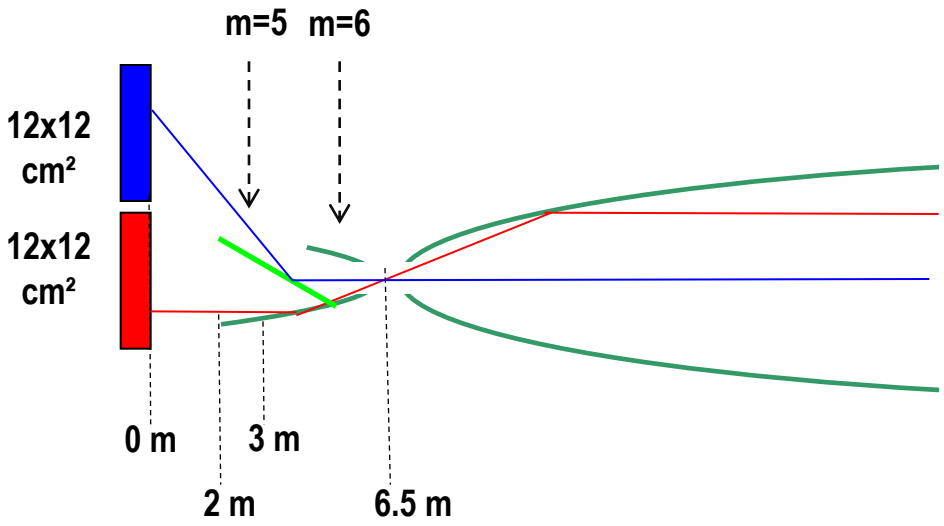
- Problem
  - Focal point too far from the source

Original Idea: Short Parallel Mirrors



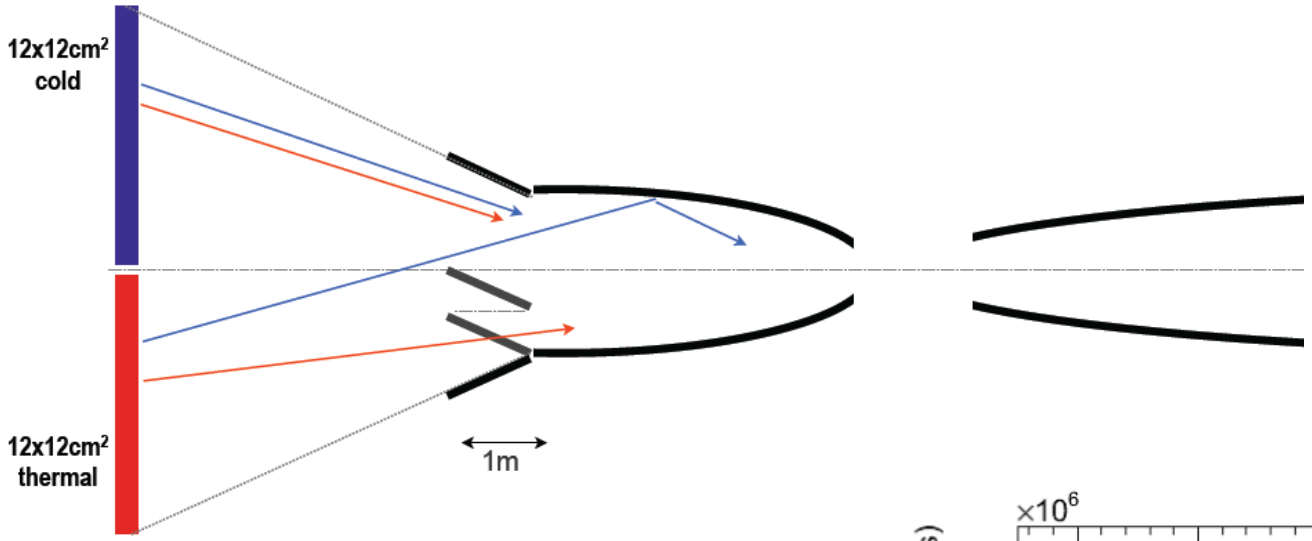
- Performance
  - Efficiency 65 - 80 %
  - Symmetric divergence distribution
- Attempts to improve the system
  - Mirror inside the extraction system
  - Shift towards cold moderator
  - Variation of mirror inclination angle
  - Even shorter or longer mirrors
  - Bending of the mirrors

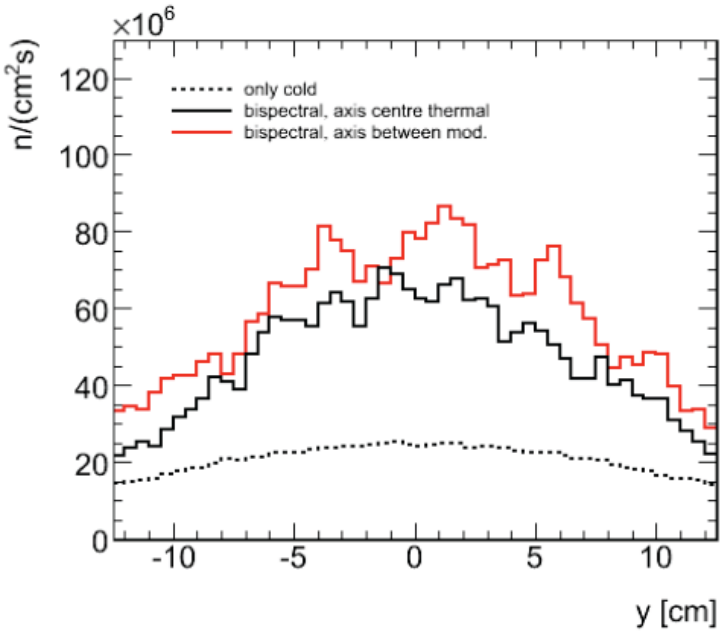
Alternative Idea: Mirror inside Feeder



- Disadvantage
  - Part of the feeder has to be removed
- Performance
  - Efficiency worse
  - Asymmetric divergence distribution

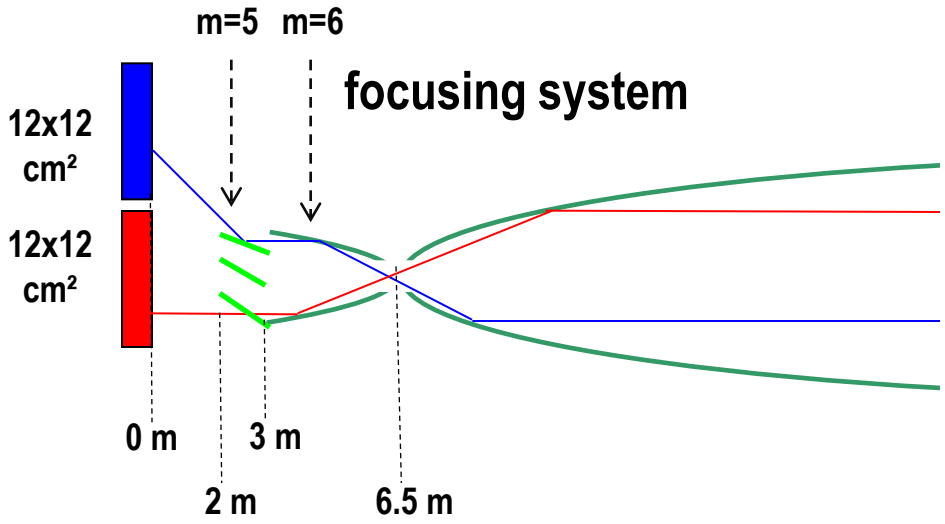
Centered System





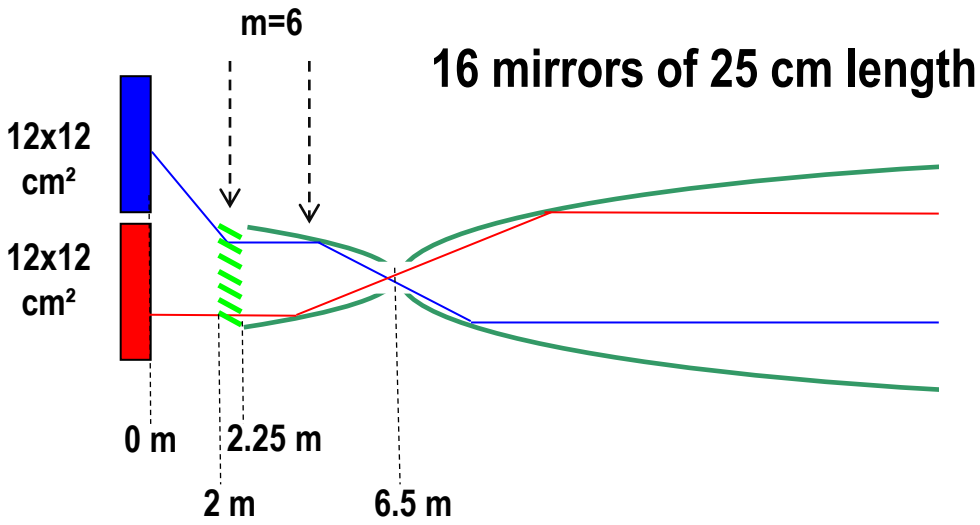
- Performance
  - Good efficiency (90 %)
  - Poor divergence distribution

Approach – Variation of the Inclination Angle



- ‘Focusing’ system:
  - Efficiency lower (65 %)
- ‘Defocusing’ system
  - Efficiency not higher (80%)

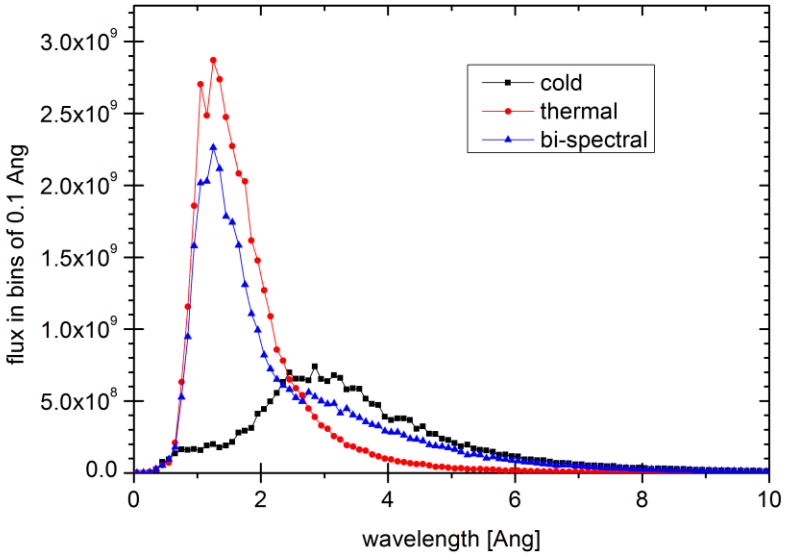
Compact System by Very Short Mirrors

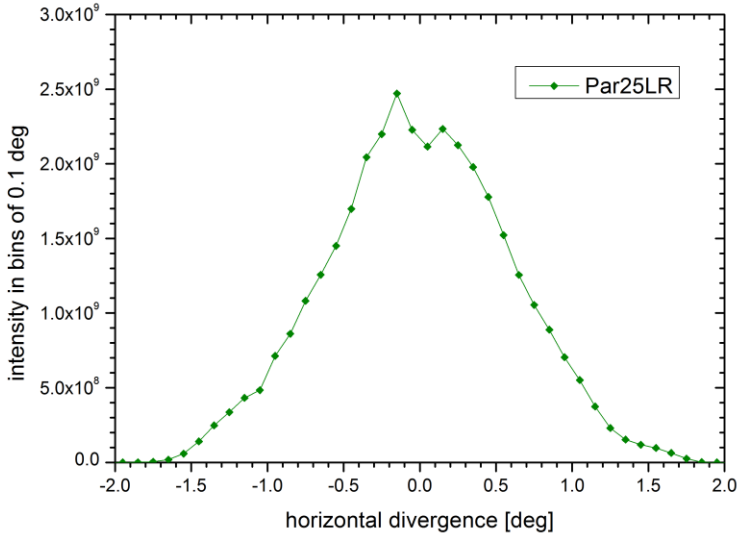


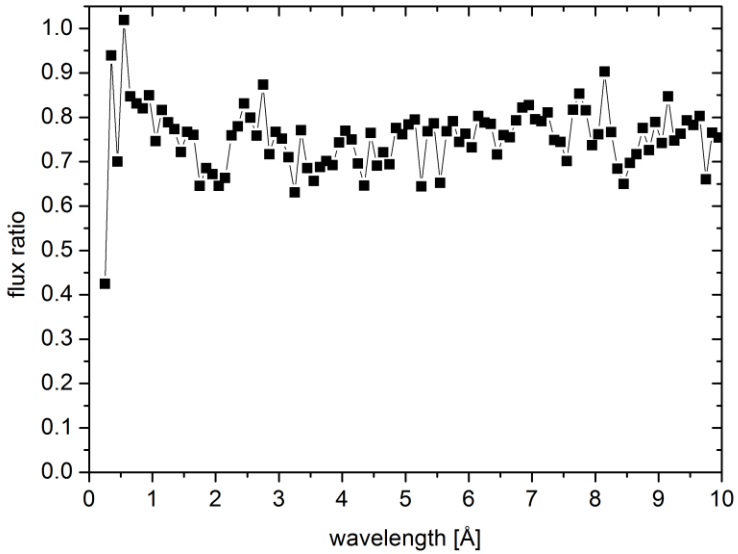
- Features
  - 25 cm long parallel m=6 mirrors
  - Center of the beamline shifted by 1.5 cm from the center of the thermal moderator
- Advantages:
  - Feeder system is hardly influenced
  - Possibility to remove extraction system for some of the measurements
  - Easy to build, to align and to exchange

Results: Compact Extraction System

- Performance
  - Acceptable efficiency (> 75 %)
  - Good divergence distribution
- Variations
  - Longer mirrors (50 cm) yield same results
  - Focusing arrangement of the mirrors give lower intensity from cold moderator







Additional Results

- Variation of the length of parallel mirrors gave an optimal length of 1 m, if the feeder is cut
- Reduction of the distance between the beamline and the center of the moderators showed increasing intensity, but also increasing asymmetry in the divergence distribution
- Optimization of the feeder lead to maximal efficiency of more up to 90 %
- Studies still ongoing …..

Acknowledgement

Thank you for your attention

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