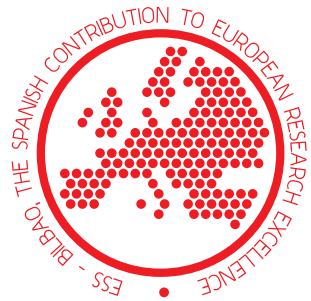


ESS bilbao

MIRACLES. Technical description

Scope Setting Meeting

Consorcio ESS-BILBAO

October 20, 2016

Presentation index

General Overview

MIRACLES

General overview

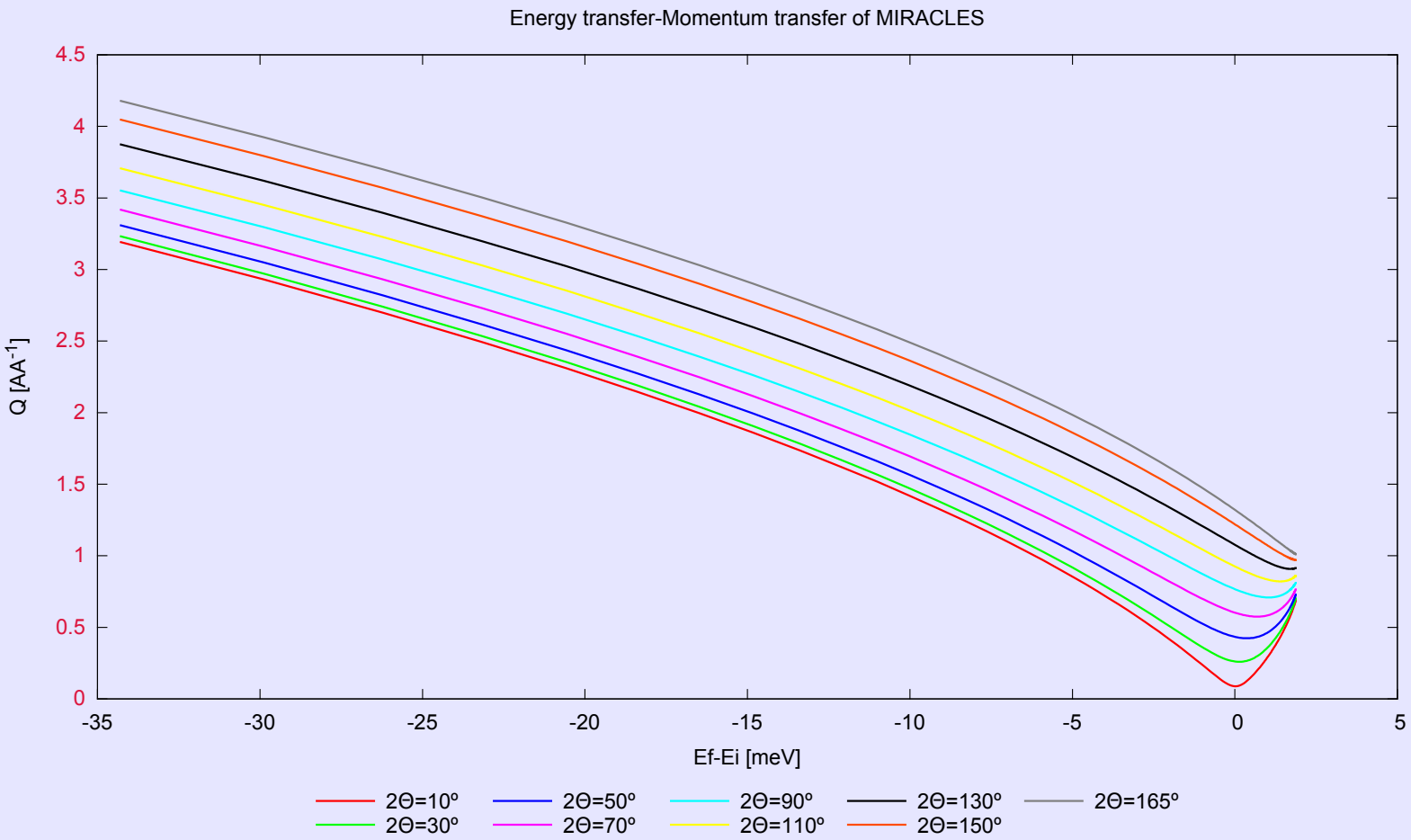
- Located in W5 (between MAGIG and BIFROST).
- Proposal concept updated to adapt to the butterfly moderator. The 3 cm height butterfly is considered for the redesign.

Instrument concept and performance

- The guide starts at 2.0 m from the moderator, and transports the beam to the sample, placed at 162.5 m.
- Chopper cascade
  - PWD pair to adapt flux-resolution (cutting the long pulse of ESS to improve the spectral resolution).
  - PS pair to select a single frame per source period.
  - WBD/FO choppers to select the wavelength band for each experiment, and prevent the frame overlap.
- Analyser: spherical, radius 2.5 m. Used to select E_f: Si 111 (λ_f=6,27Å), Si333 (λ_f=2,08Å), and Si311 as an update (λ_f=3,27Å).

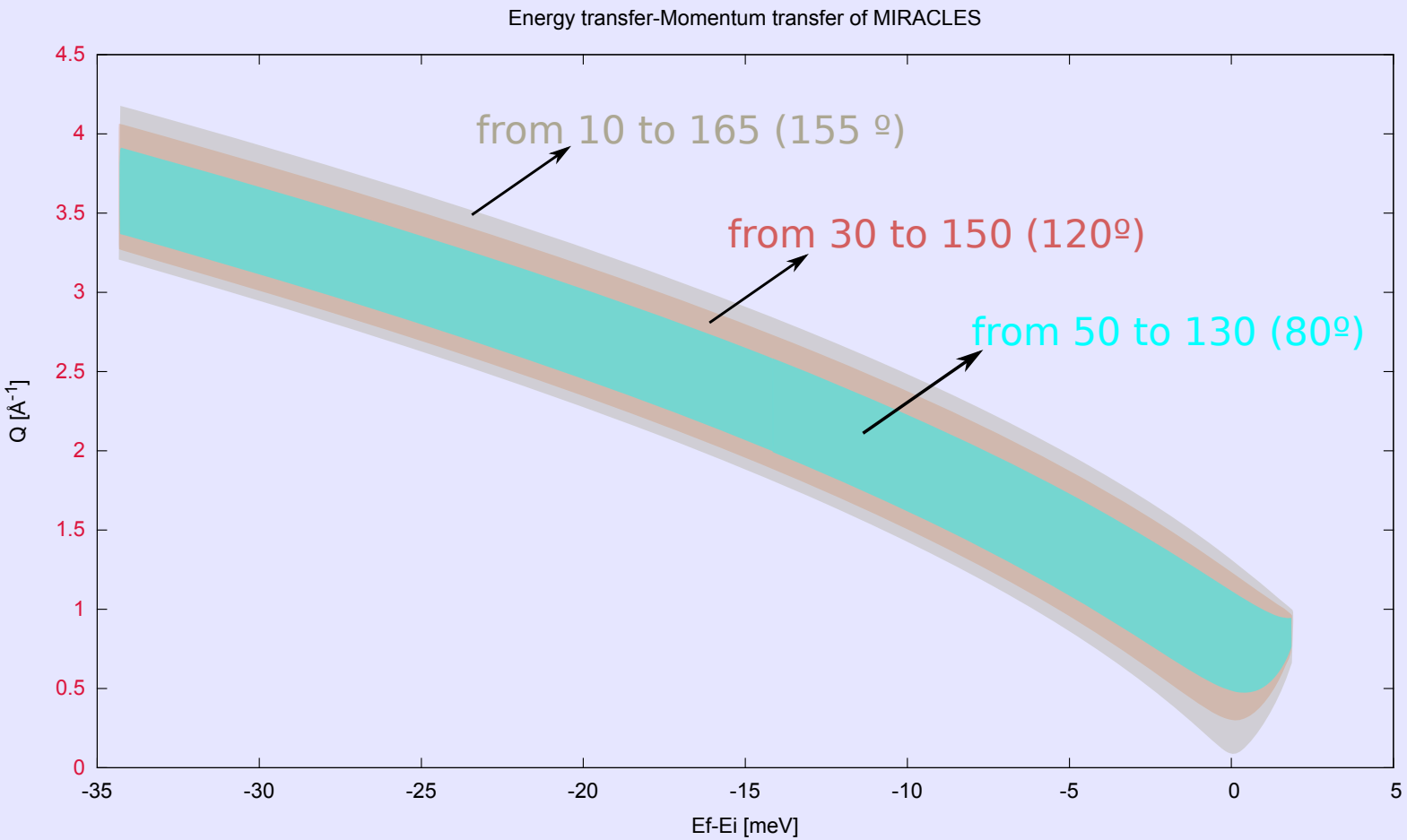
General overview

Energy and momentum transfer range. Si 111



General overview

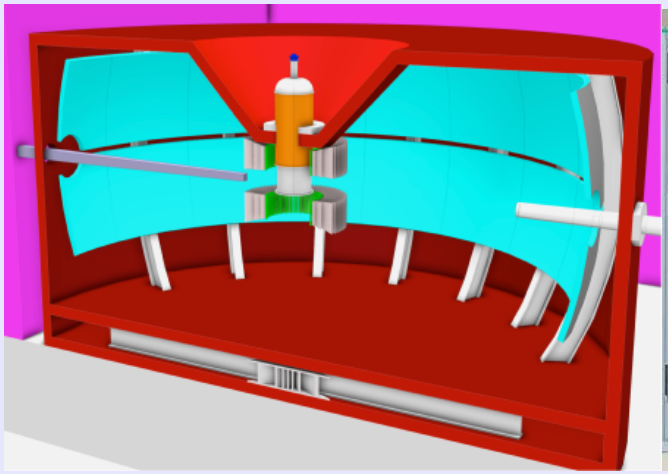
Energy and momentum transfer range. Si 111

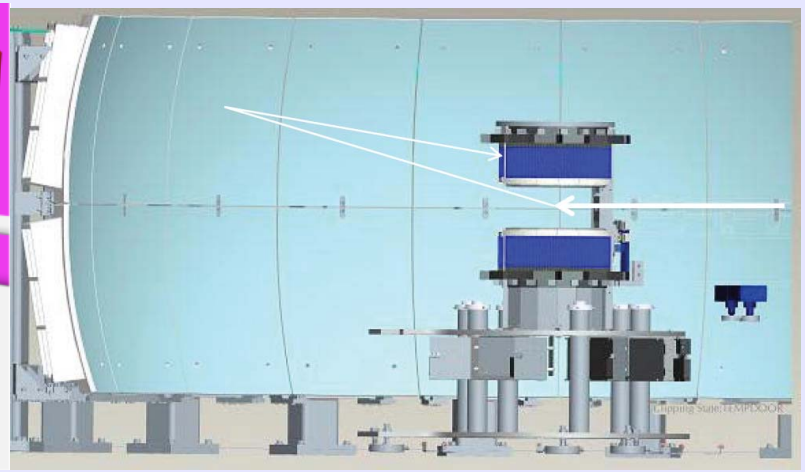


General overview

Secondary spectrometer

- Spherical analyser with R=2.5m. Near backscattering geometry ($\theta_B \approx 88^o$).
- Scattering angle covered by the analyser $\approx 155\ ^o$. Vertical viewing window of $\pm\ 22\ ^o$.
- Beryllium filter to avoid Si_{333} ($2.08\AA$) while selecting $\lambda_f = 6.27\AA$ with the Si_{111}. Not decided yet, as in the case of the radial collimator.
- 2 cylindrical arrays with at least 80 He^3 detectors each, covering a scattering angle between 10 and 165 ^{o}. 2 ^{o} separation between detectors.



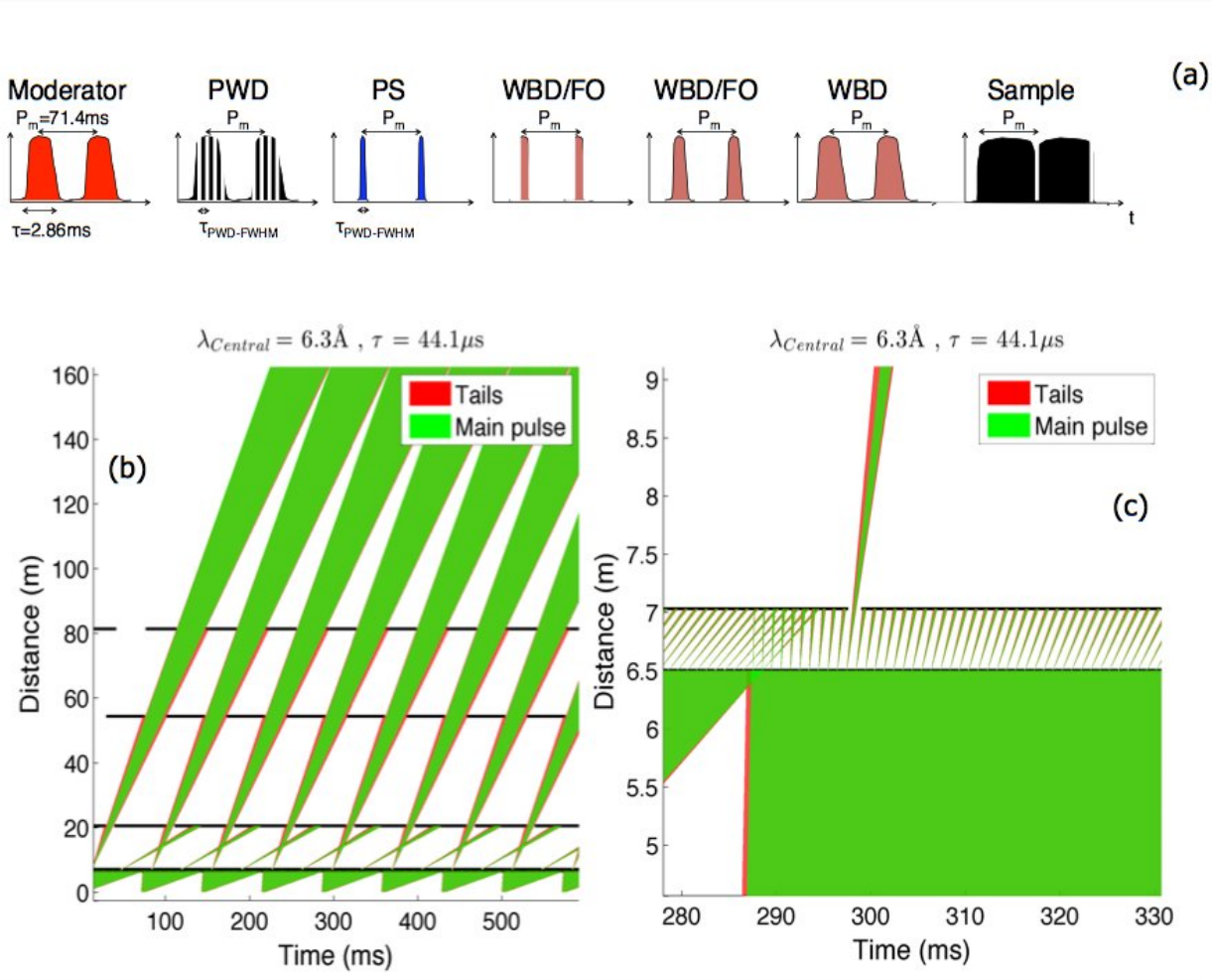


Source: N. Tsapatsaris et al Review of Scientific Instruments 87, 085118 (2016); doi: 10.1063/1.4961569
E.Mamontov. A time-of-flight backscattering spectrometer at the SNS, BASIS

Chopper cascade

Chopper cascade

TOF evolution along the primary spectrometer. 2 pulses



Source: N. Tsapatsaris et al Review of Scientific Instruments 87, 085118 (2016); doi: 10.1063/1.4961569

Chopper cascade

Updated concept of the chopper cascade

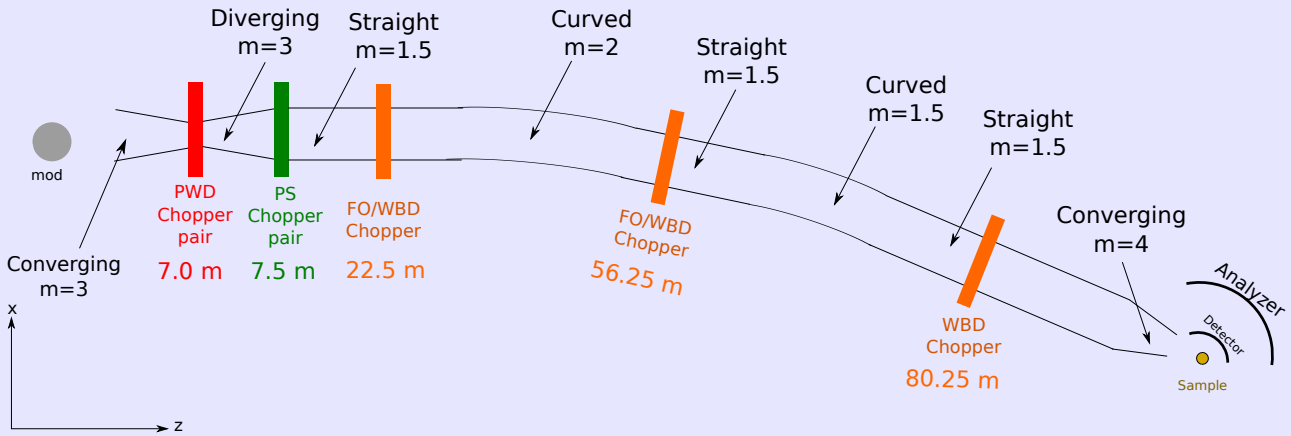
Chopper Id	Position	Updated parameters. Values are in meters, degrees and Hertz
Ch1	7.0	R=0.35; Freq=252; slit opening= 7.95 (x2) and 40 (x2), window height=0.124
Ch2	7.01	R=0.35; Freq=-252; slit opening= 7.95 (x2) and 40 (x2), window height=0.124
Ch3	7.5	R=0.35; Freq=28→56; slit opening= 14.3, window height=0.124
Ch4	7.51	R=0.35; Freq=-28→-56; slit opening= 14.3, window height=0.124
Ch5	22.5	R=0.35; Freq=14→56; slit opening= 55, window height=0.124
Ch6	56.25	R=0.35; Freq=14→56; slit opening= 125, window height=0.124
Ch7	80.5	R=0.35; Freq=14→56; slit opening= 167, window height=0.124

Guide system

Guide system

General overview

- Maximize brilliance transfer to a 3cm x 3xm sample, within a solid angle of $7.62 \cdot 10^{-3}$ sr.
- The first part of the guide is a double trumpet (converging-diverging guide).
- The last part of the guide is converging.
- Curved section to avoid direct view of sight and avoid neutrons below 1.5 $\AA$.



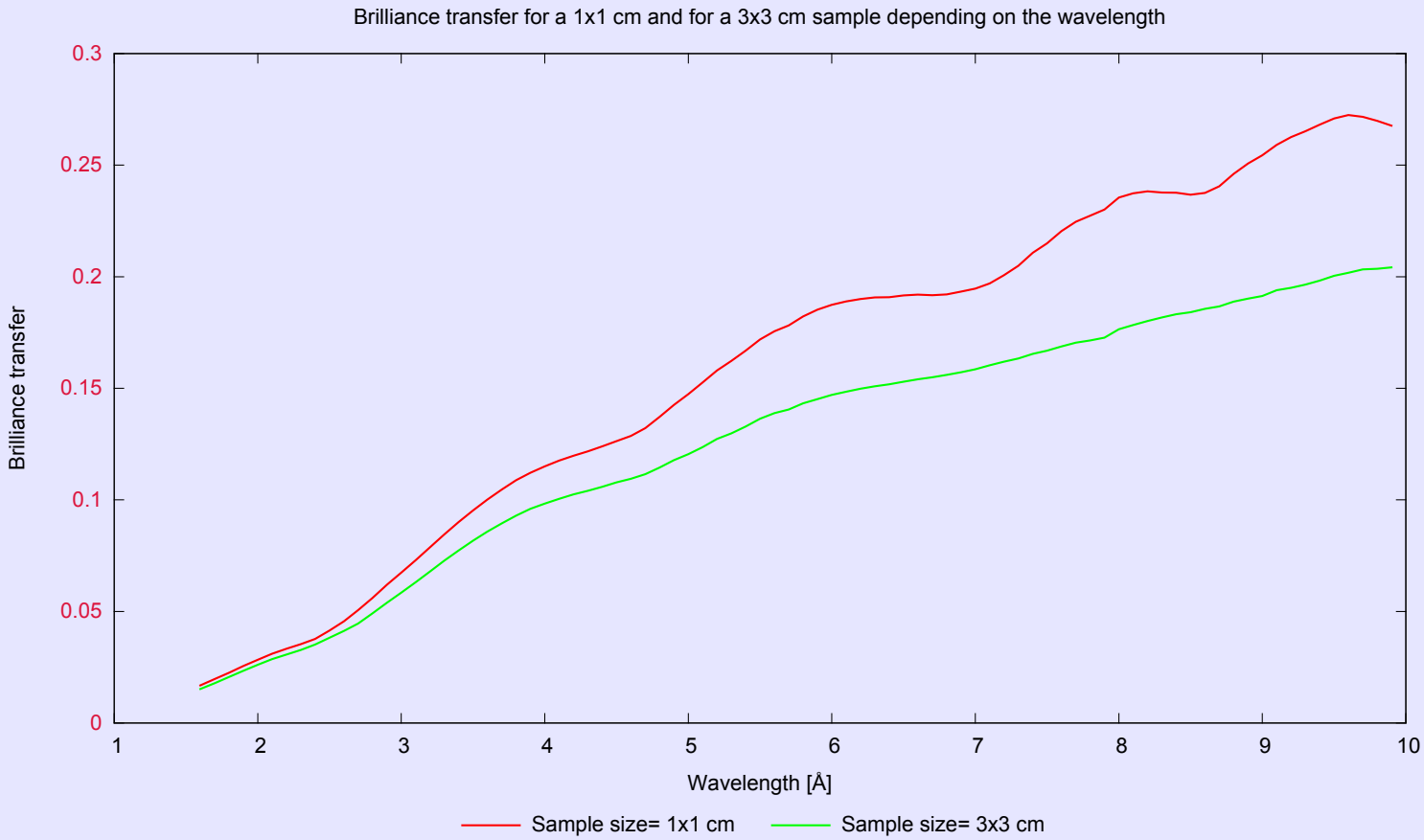
Guide system

New guide configuration

ID	Description	Values
G1	Guide	w_1=0.06; h_1=0.076;w_2=0.04; h_2=0.12; m=3; L=4.99
G2	Guide	w_1=0.04; h_1=0.12; w_2=0.043; h_2=0.12; m=3; L=0.47
G3	Guide	w_1=0.043; h_1=0.12; w_2=0.11; h_2=0.12; m=3; L=9.04
G4	Guide	w_1=0.11; h_1=0.12; w_2=0.11; h_2=0.12; m=1.5; L=5.94
G5	Guide	w_1=0.11; h_1=0.12; w_2=0.11; h_2=0.12; Radius=5000; m=2; L=32.5
G6	Guide	w_1=0.11; h_1=0.12; w_2=0.11; h_2=0.12; m=1.5; L=1.15
G7	Guide	w_1=0.11; h_1=0.12; w_2=0.11; h_2=0.12;Radius=5000;m=2; L=22.5
G7 exit	Guide	w_1=0.11; h_1=0.12; w_2=0.11; h_2=0.12; m=1.5; L=1.5
G8	Guide	w_1=0.11; h_1=0.12; w_2=0.11; h_2=0.12; m=1.5; L=75.0
G9	Guide	w_1=0.11; h_1=0.12; w_2=0.032; h_2=0.032; m=4; L=6.98

Guide system

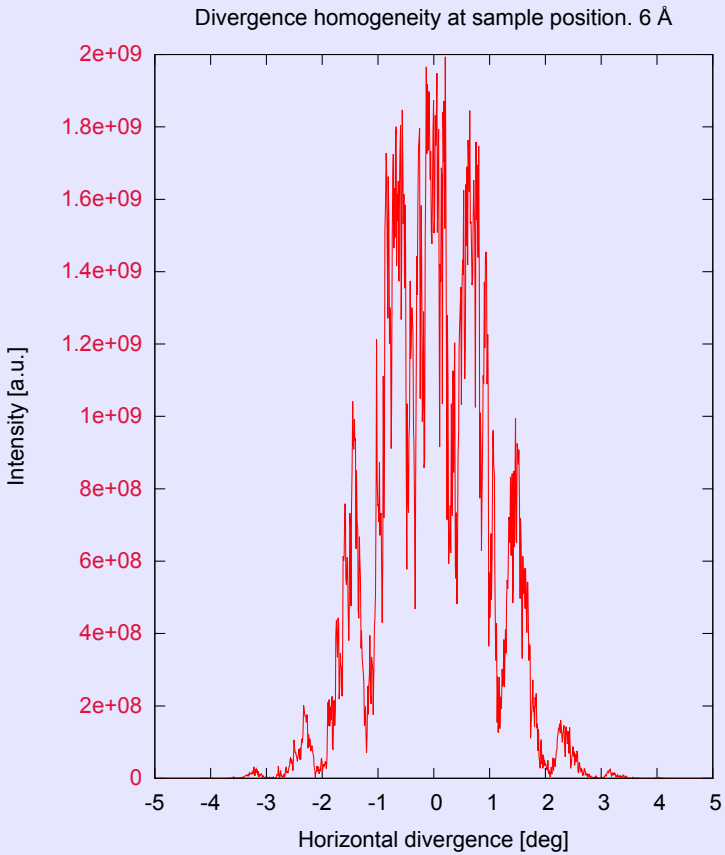
Results

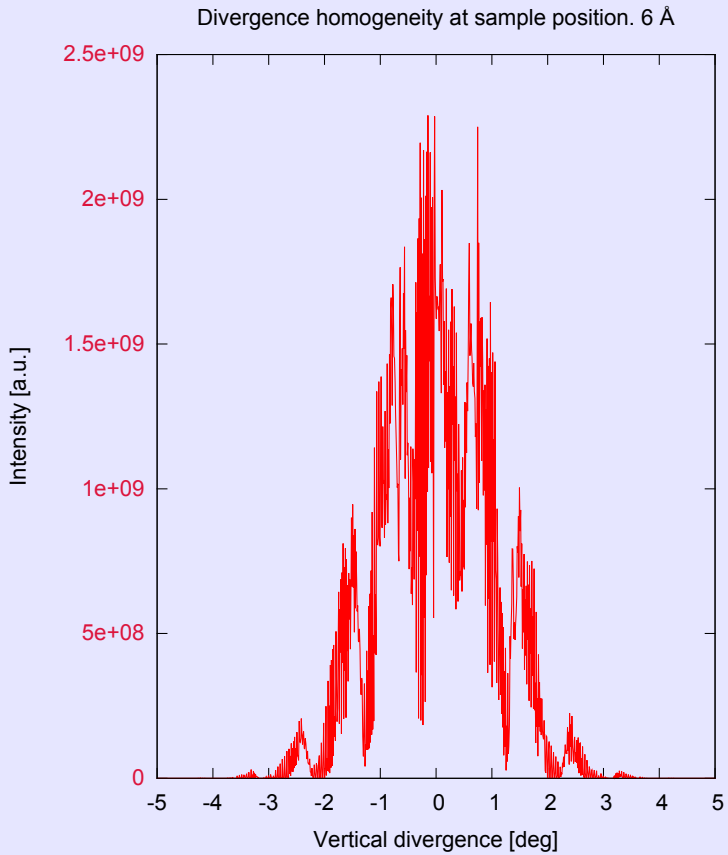


At 6 $\AA$ with 3x3cm sample, we obtain BT=0.142, that is the value predicted by Ken.

Guide system

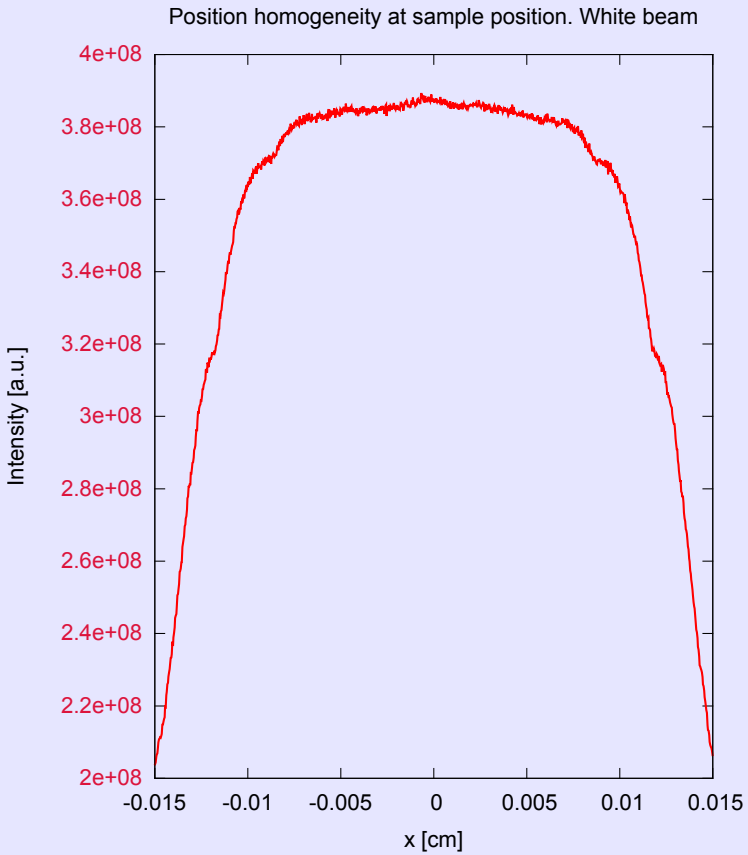
Results

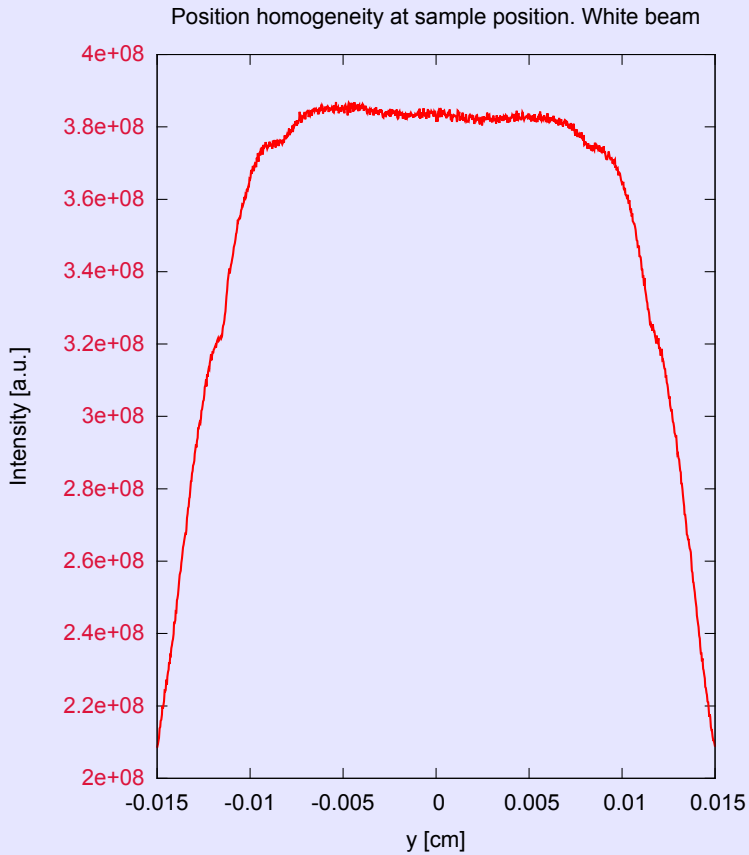




Guide system

Results

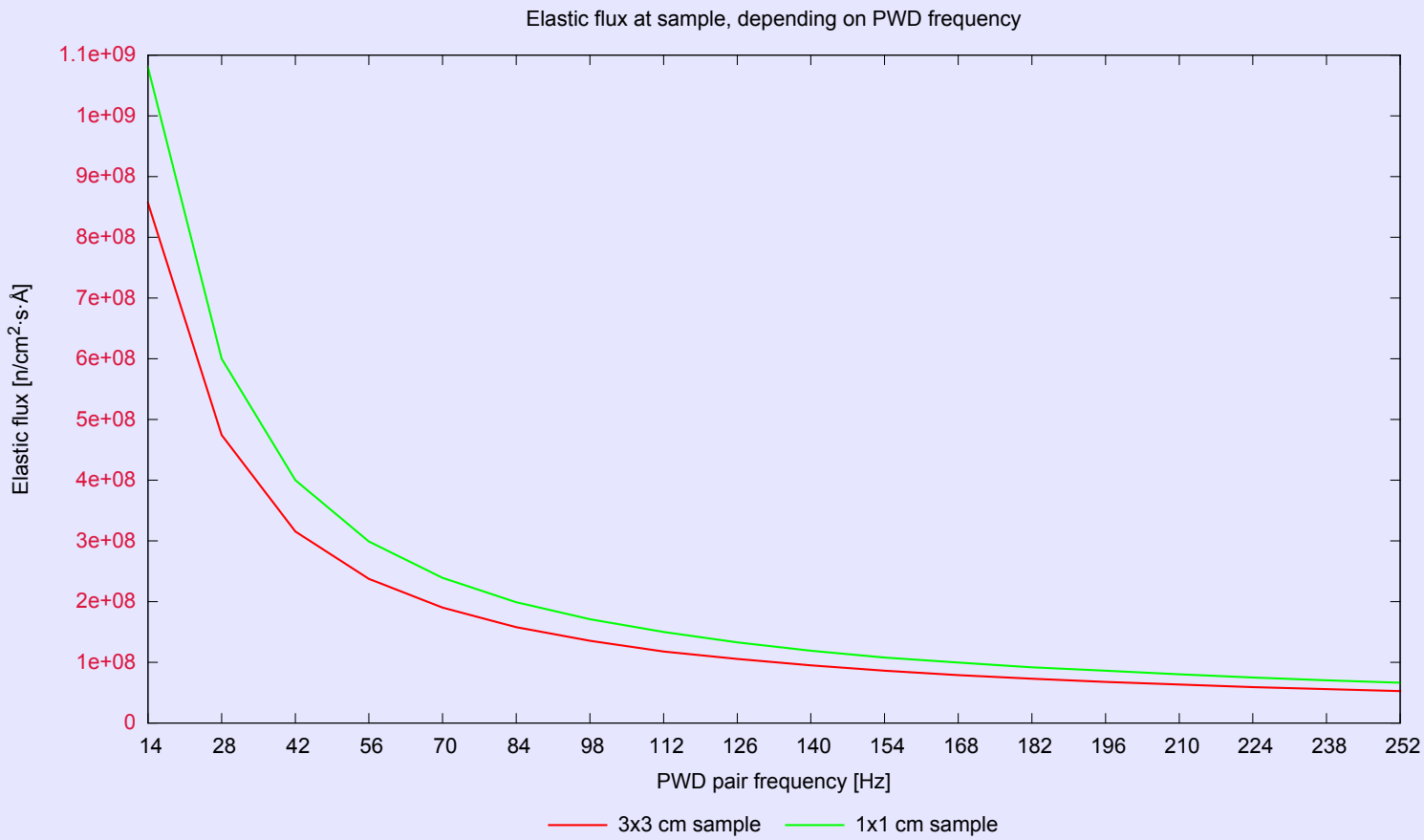




Expected Performance

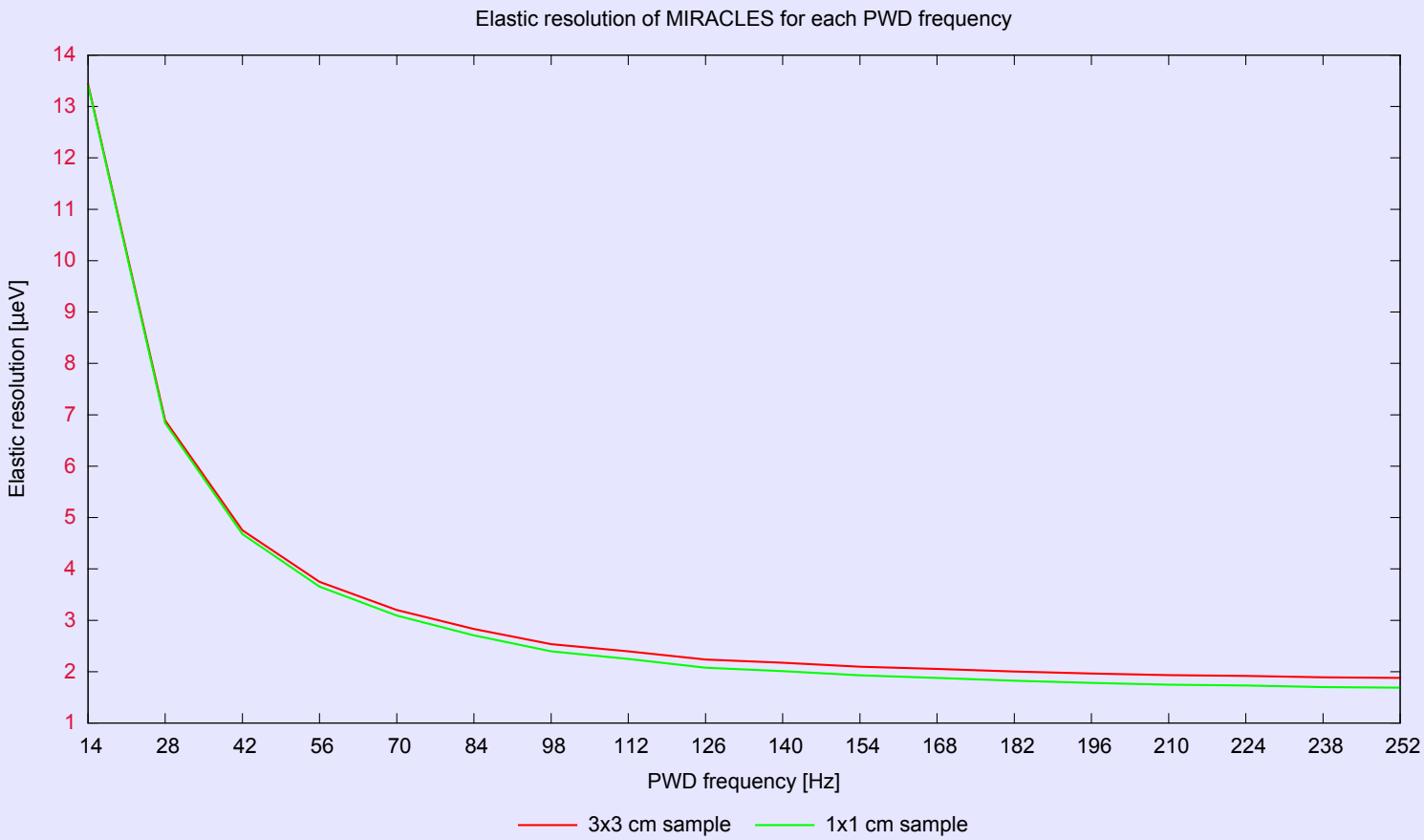
Expected Performance

Results with the updated primary spectrometer



Expected Performance

Results with the updated primary spectrometer



Expected Performance

Results with the updated primary spectrometer