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Report on the McStas simulations of the HYSPEC guides and focusing crystals

June 2006

SING SNS Instruments – Next Generation

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REPORT ON THE MCSTAS SIMULATIONS OF THE HYSPEC GUIDES AND FOCUSING CRYSTALS

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1?th June 2006

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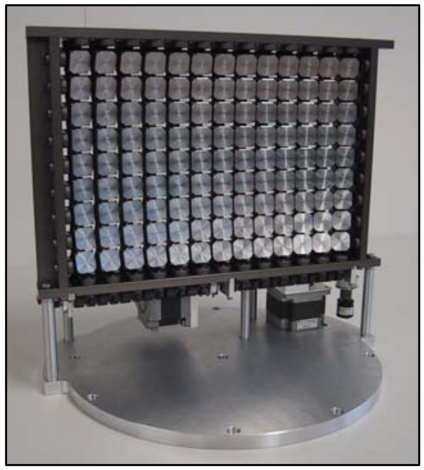


Figure 1: The SwissNeutronics double focusing monochromator constructed for E? at HMI.

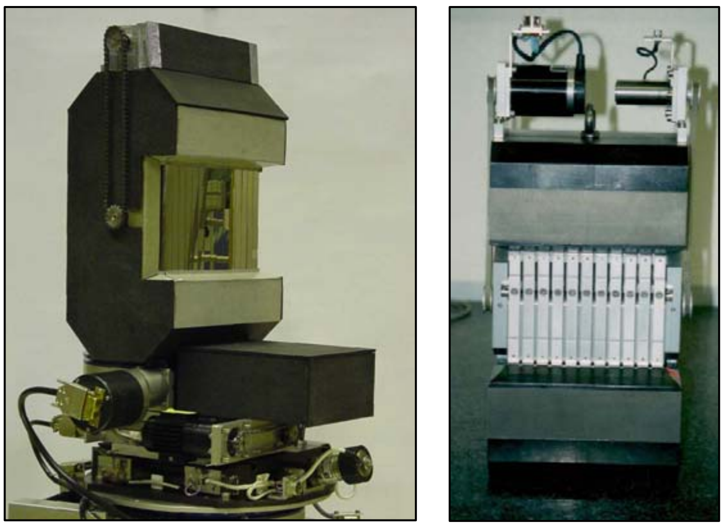


Figure 2: The IN20 style Heusler monochromator with vertically oriented Heusler crystals

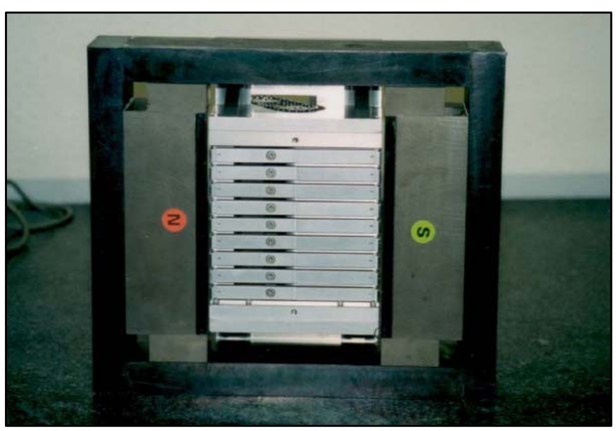
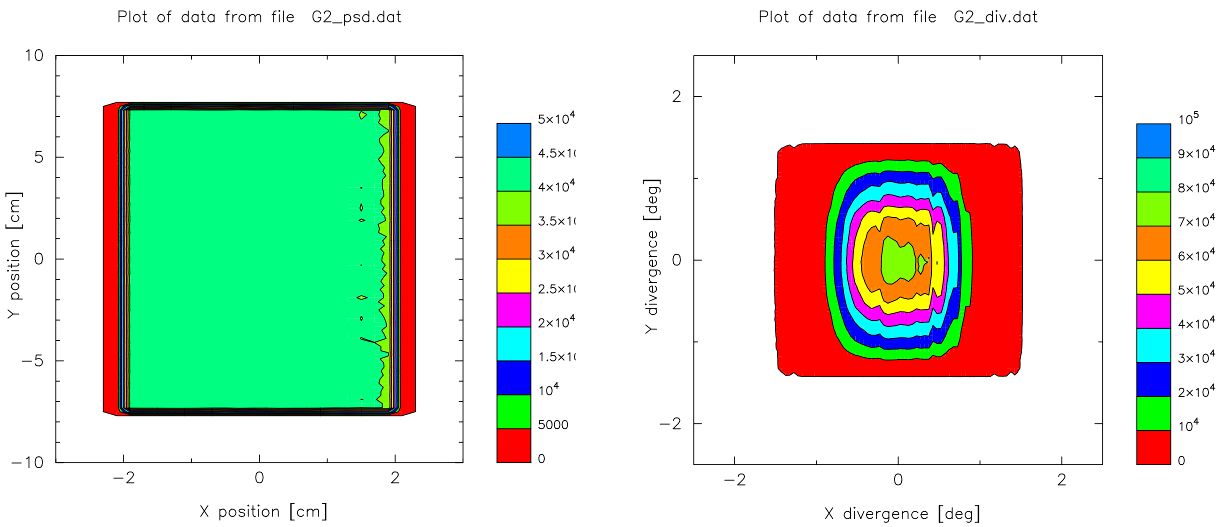


Figure 3: The IN22 style Heusler monochromator with horizontally oriented Heusler crystals.

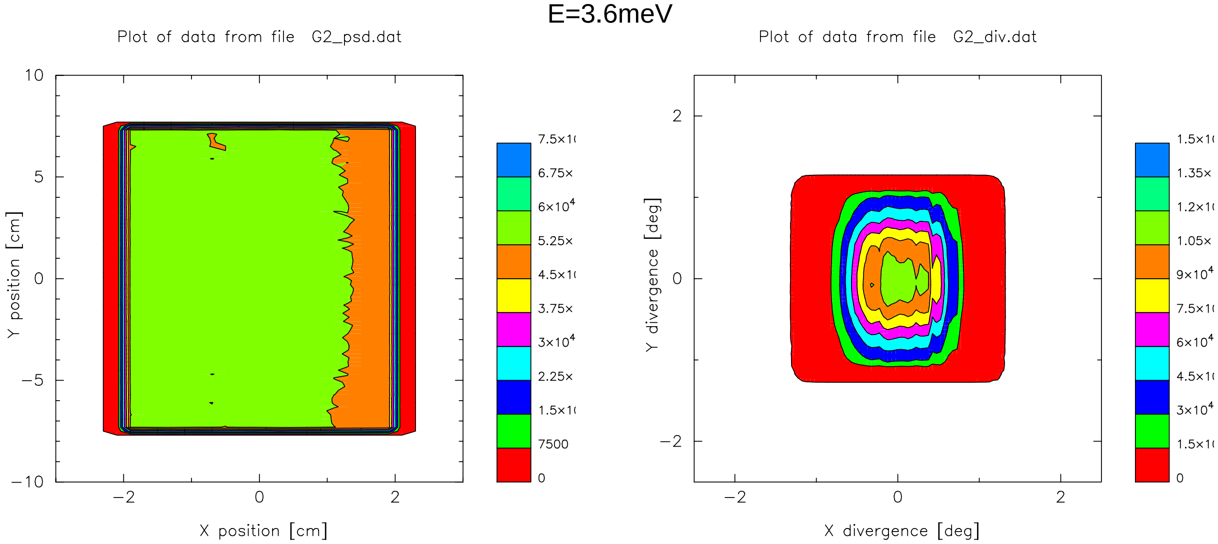
Case 6

The first model examined

Layout up to G4	As in engineering layout
G4	Length = 1.?m (ends 0.3m inside drum shield), m=3 on all surfaces, guides is straight 150mm tall x 40mm wide
Guide coatings	All m=3 including inner surface of curved guide
T2 chopper frequency	180Hz
Focusing crystals	HOPG – ZYB (48') 13 x 13 array of strips 19mm wide x 12mm tall with 1mm gap between strips. Total width = 260mm, height = 168mm. Vertically focused on sample LMM=Infinity, LMS=1.4m



E=3.6meV



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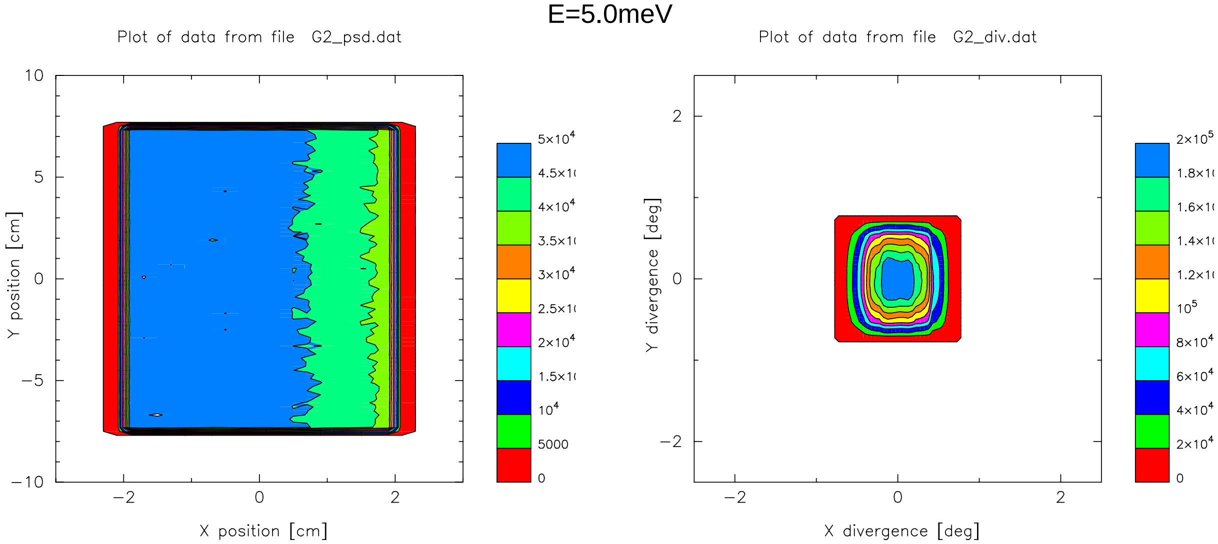
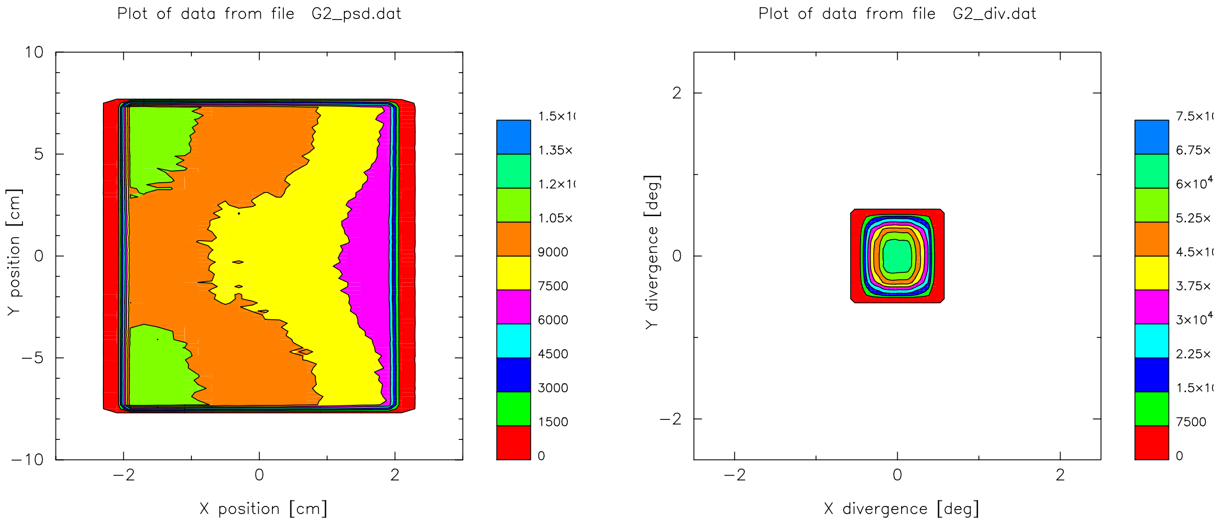


E=15meV



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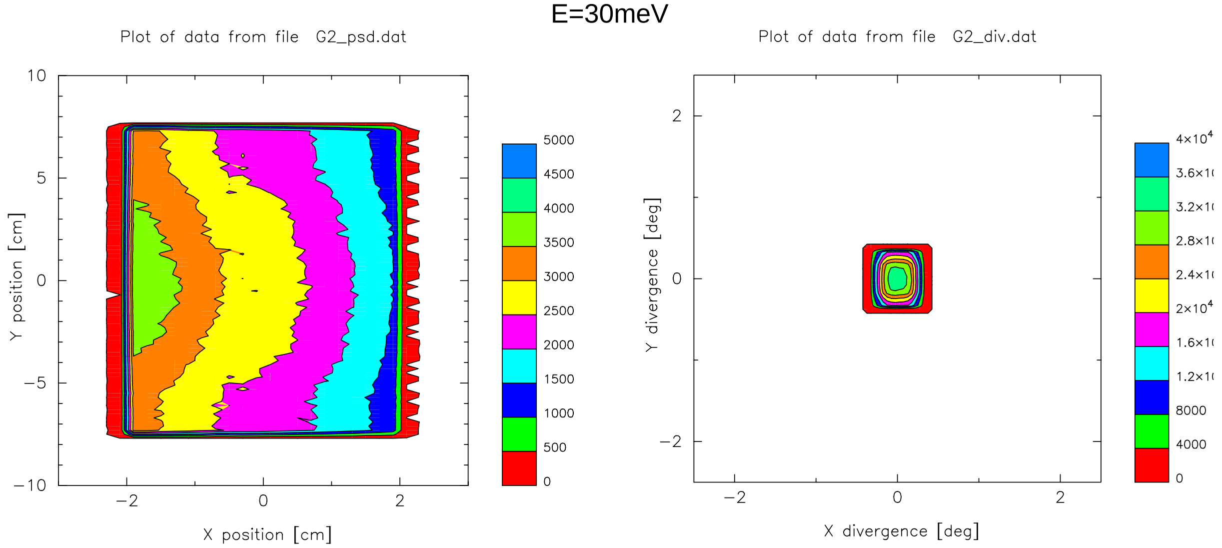

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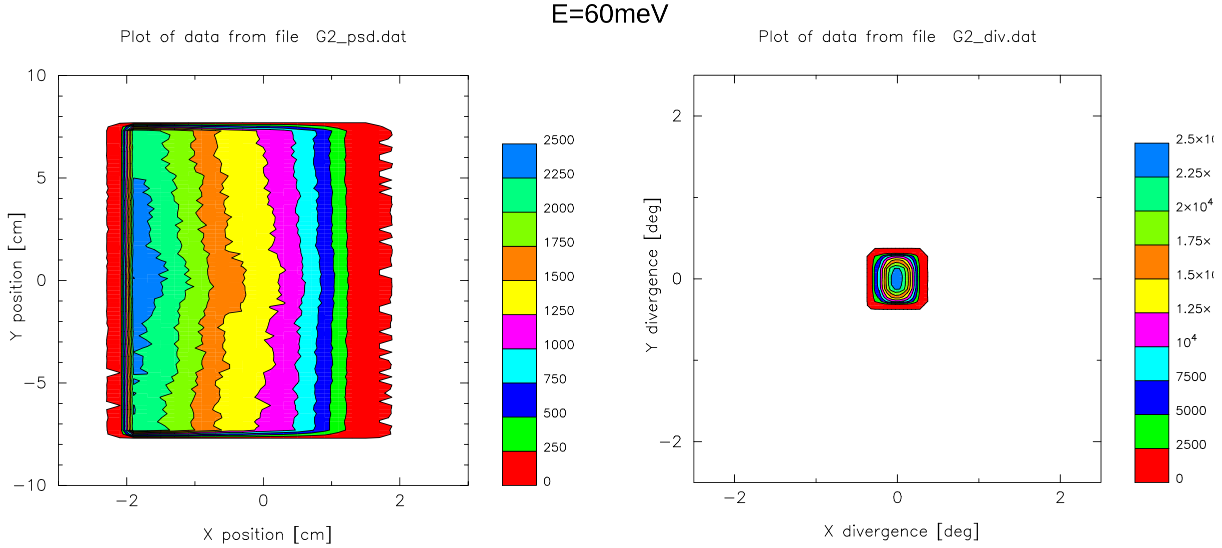
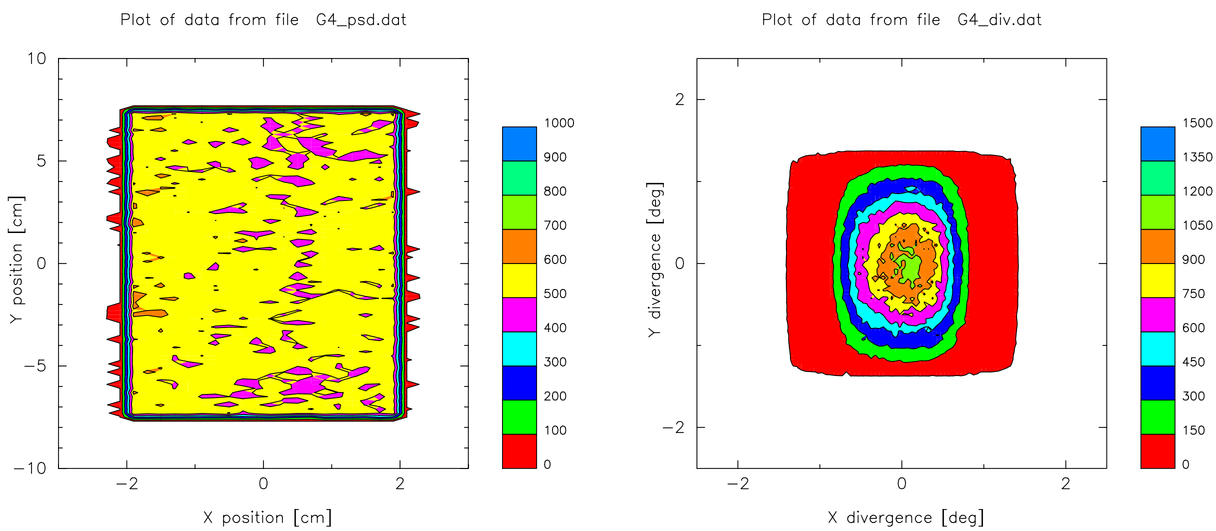


E=90meV

Figure 4: Spatial (left) and divergence (right) distributions after the curved guide G2 for case 6.



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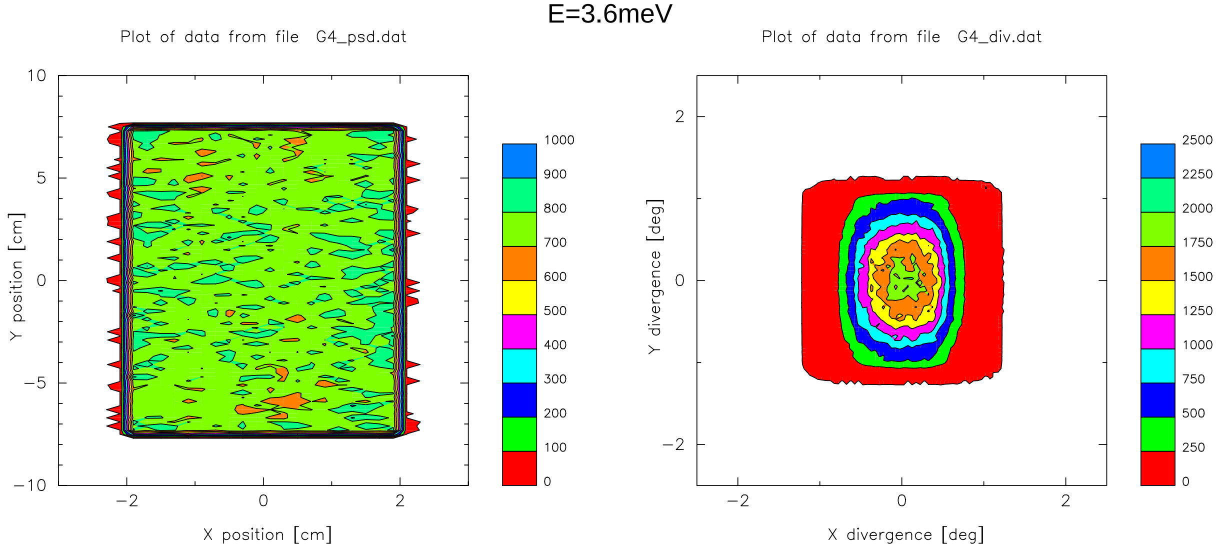
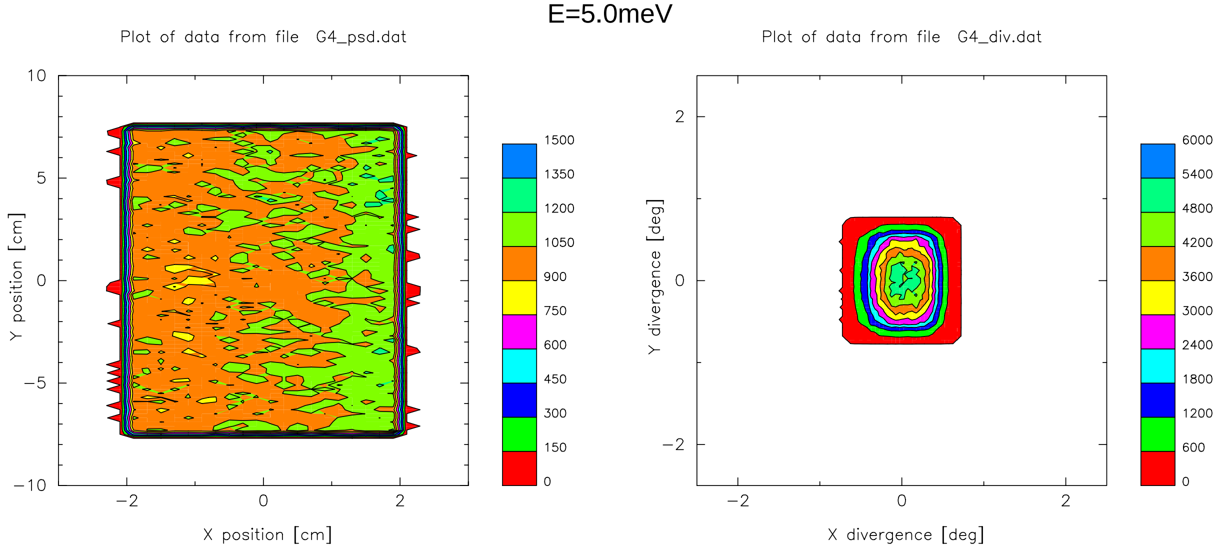


E=5.0meV



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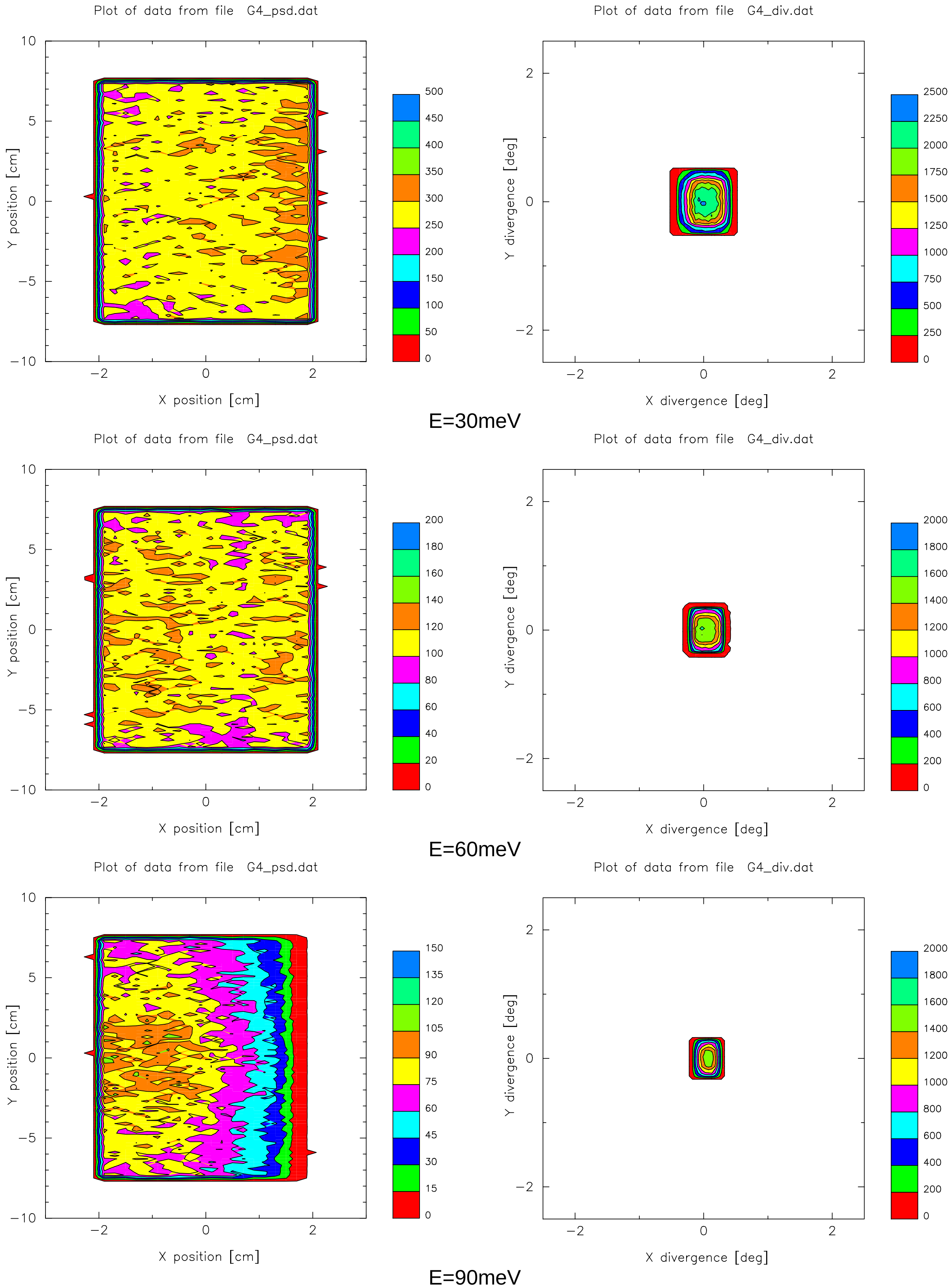
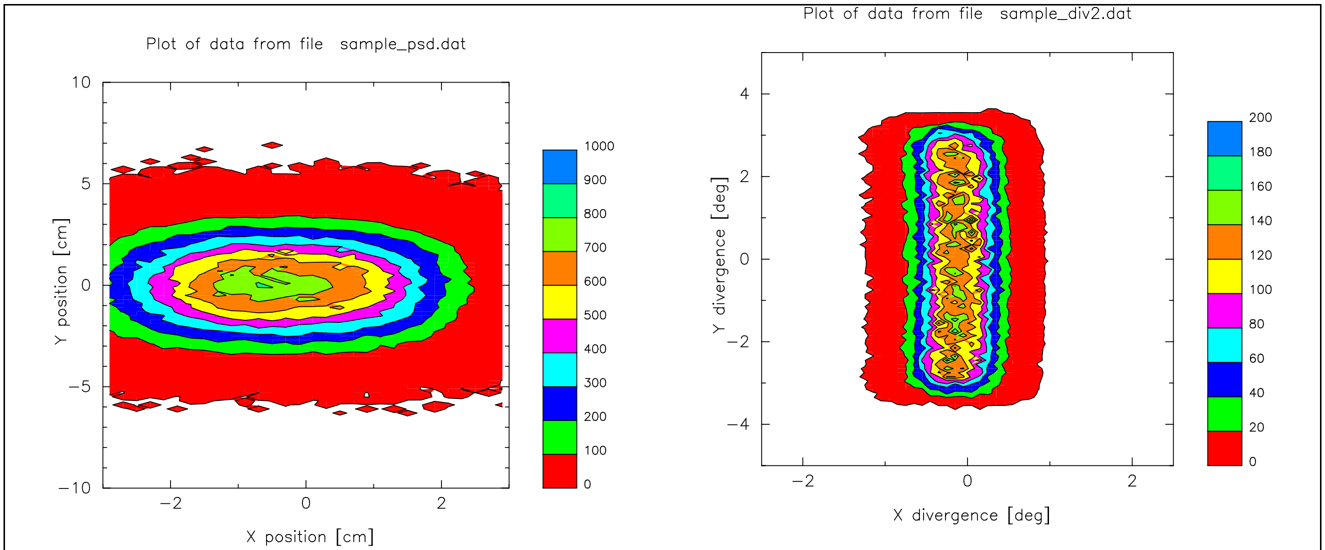


Figure 5: Spatial (left) and divergence (right) distributions after the straight guide G4 for case 6.



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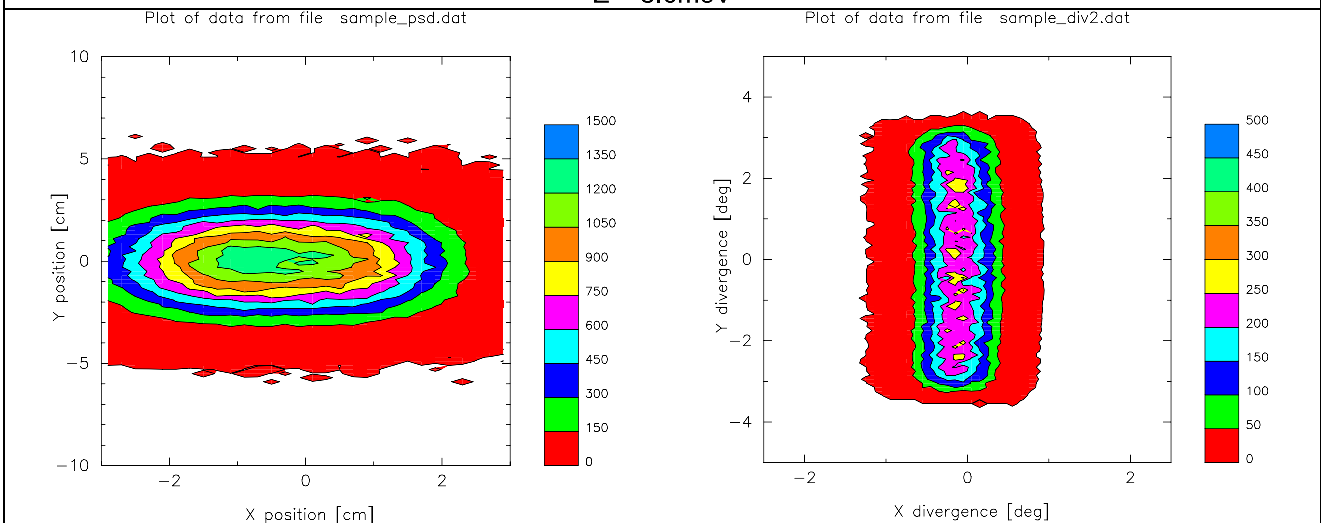

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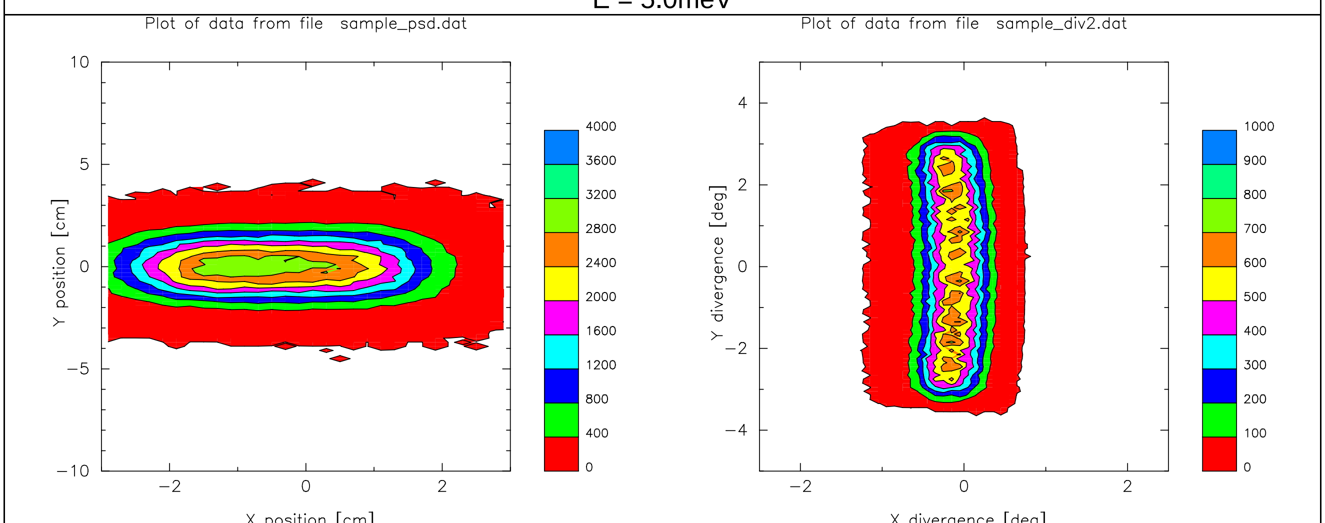


E = 15meV

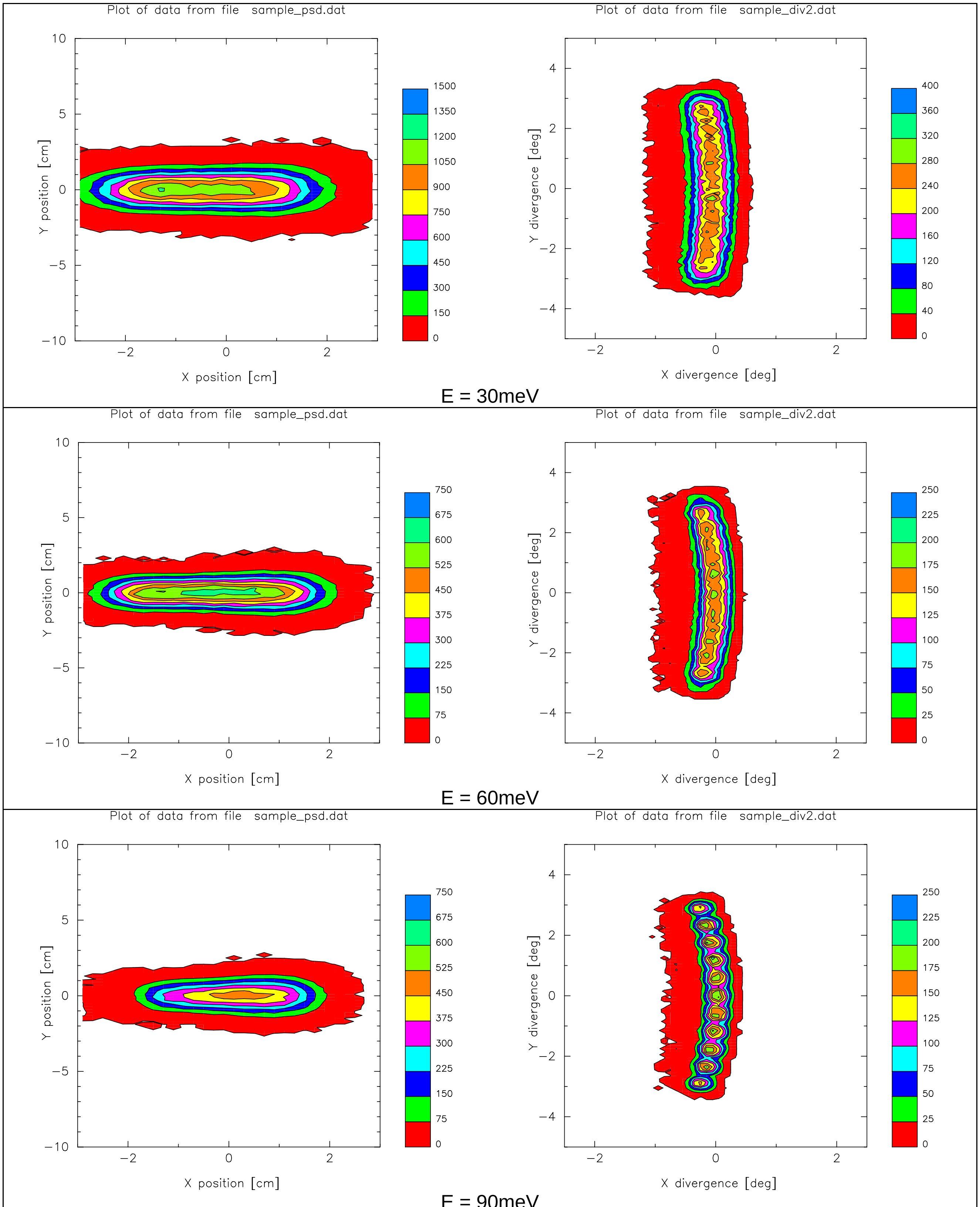


Figure 6: Spatial (left) and divergence (right) distributions at the sample position for case 6.

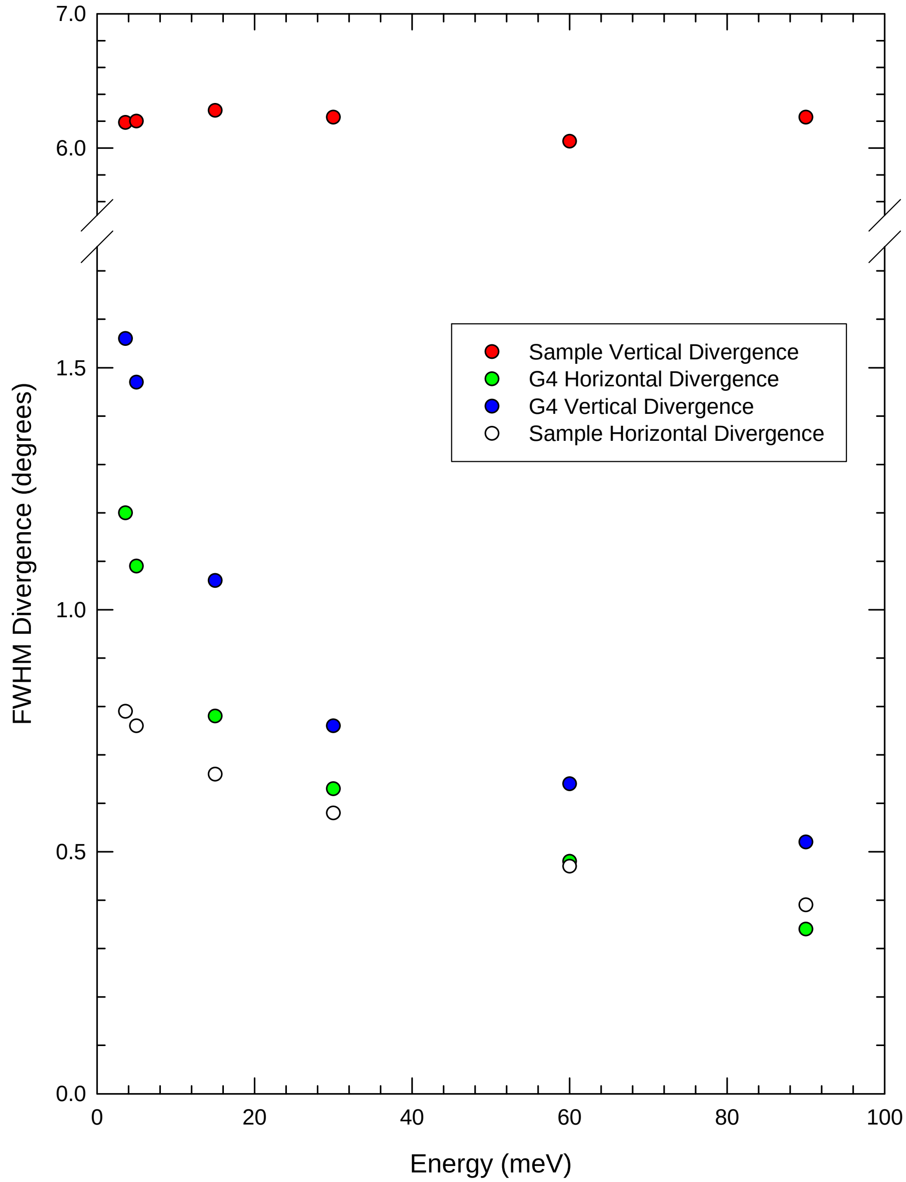


Figure 7: Divergences for case 6

Horizontal focusing

The out.

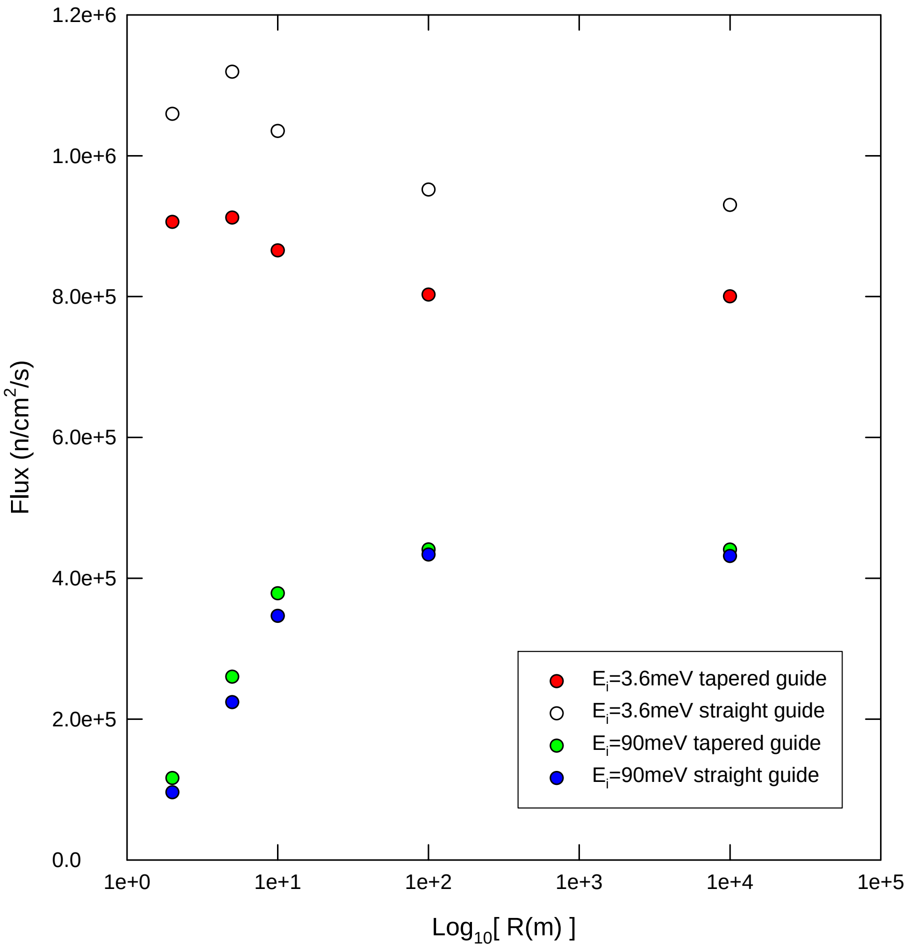


Figure 8: Finding the optimum radius of curvature for horizontal focusing at 3.6 and 90 meV for case ?.

Effect of guide tapering

The required.

Guide coating on curved section

The case.

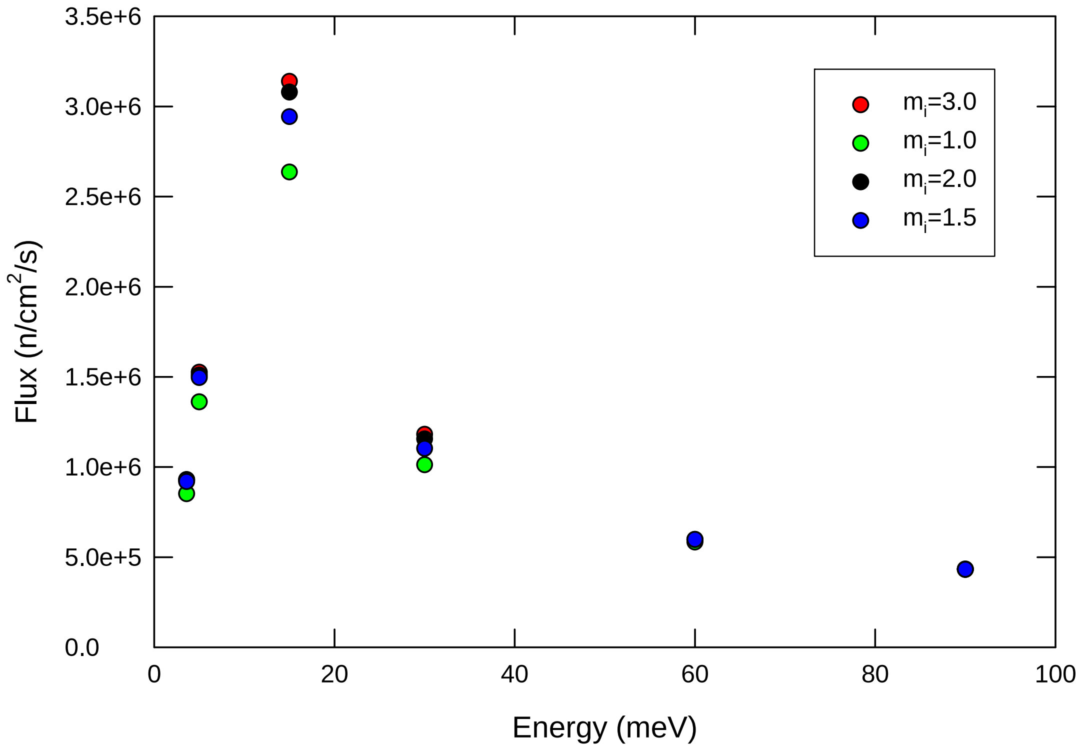


Figure 9: Comparison of flux at sample for different inner curved guide coatings.

Length of final guide section

The out.

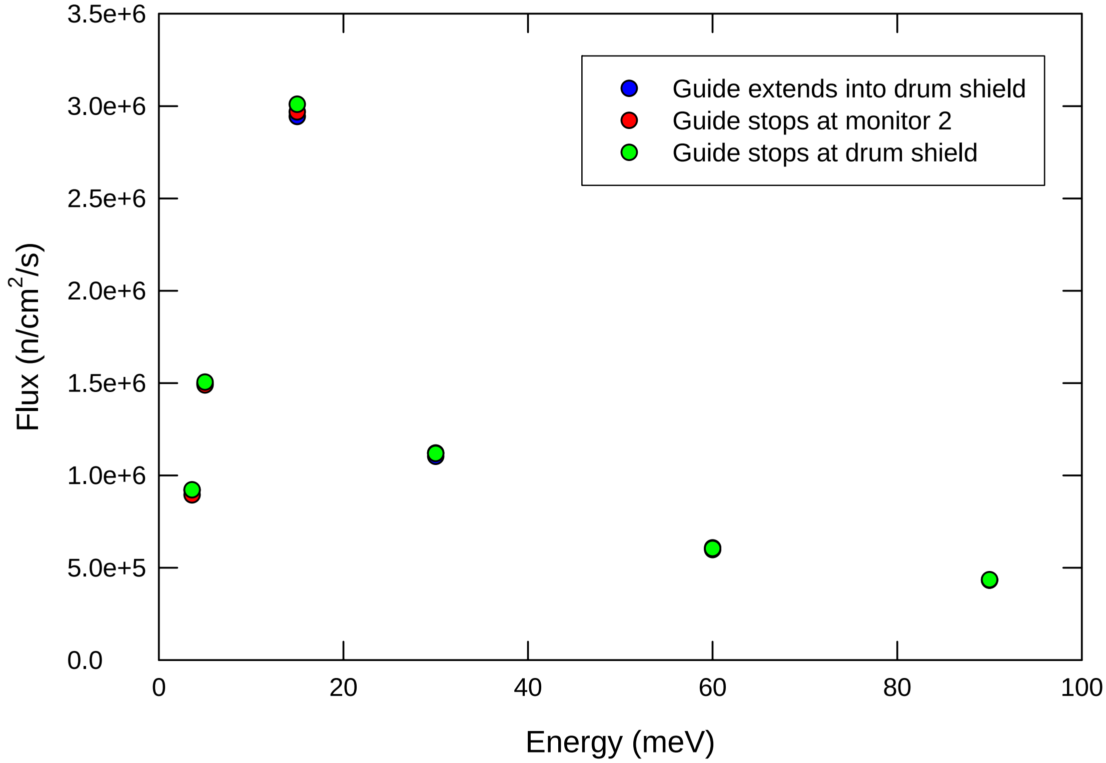


Figure 10: Comparison of flux at sample for different lengths of the final piece of guide.

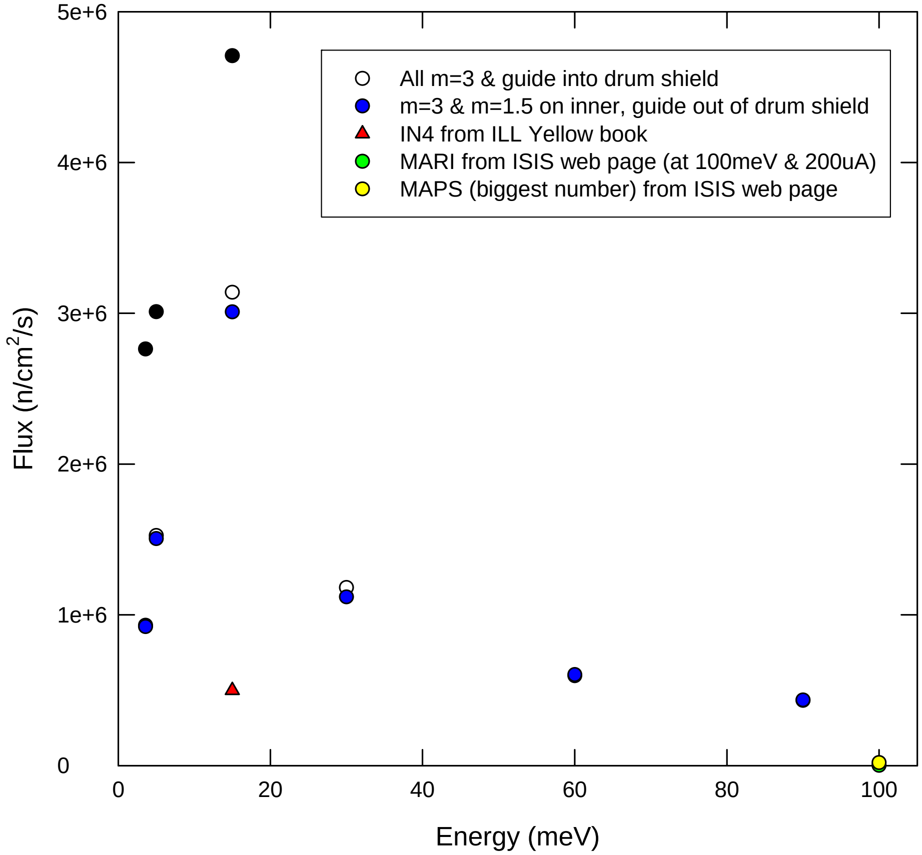
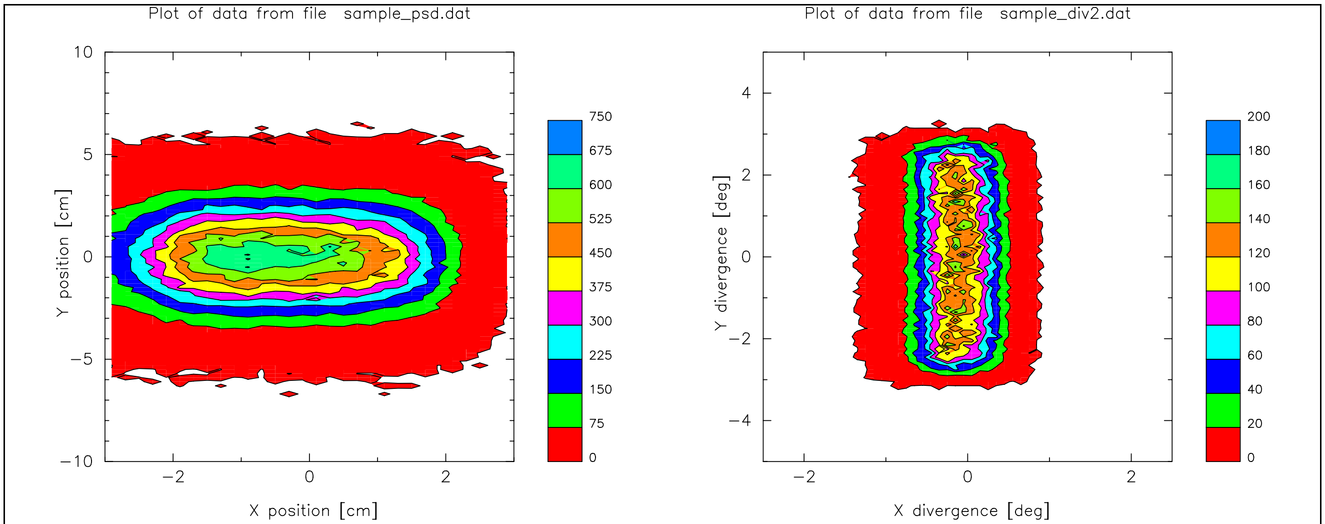
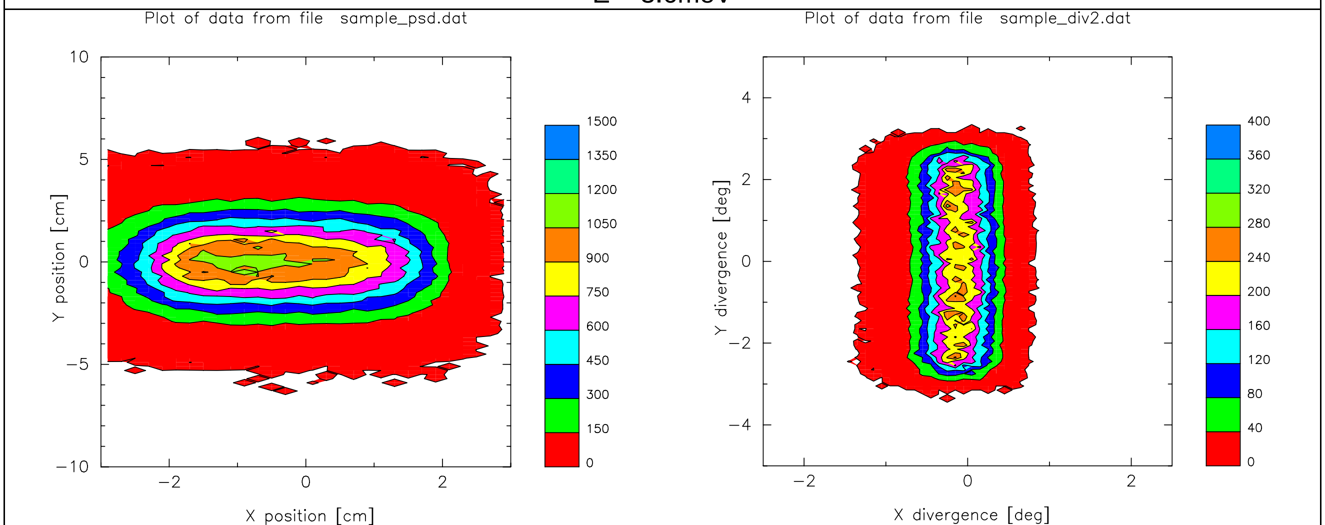


Figure 11: Flux at sample against energy comparison.



E = 3.6meV



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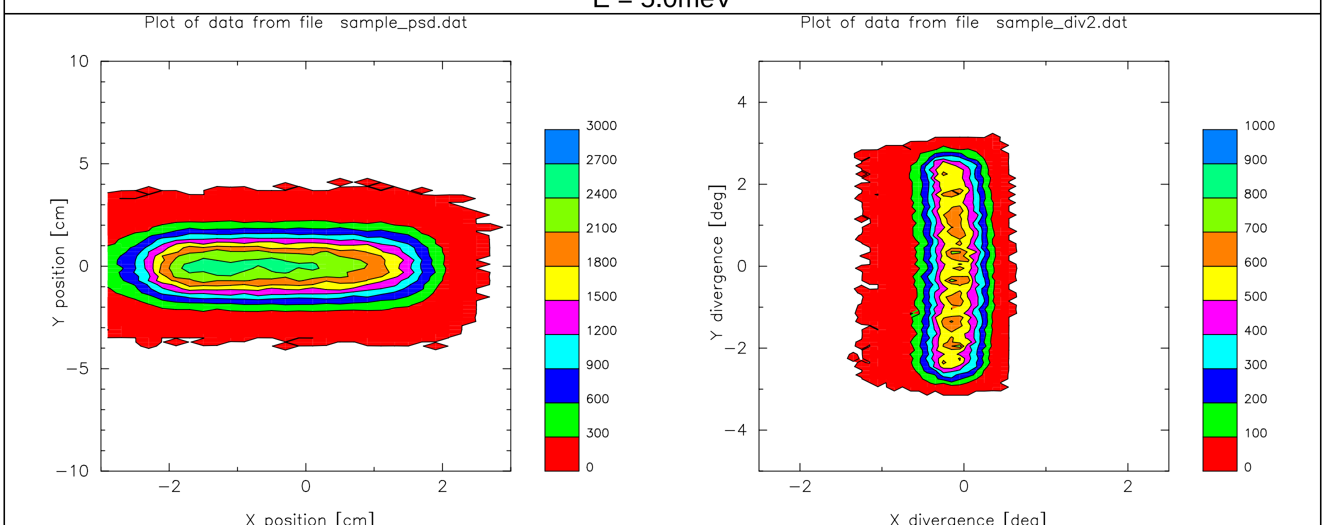


E = 15meV

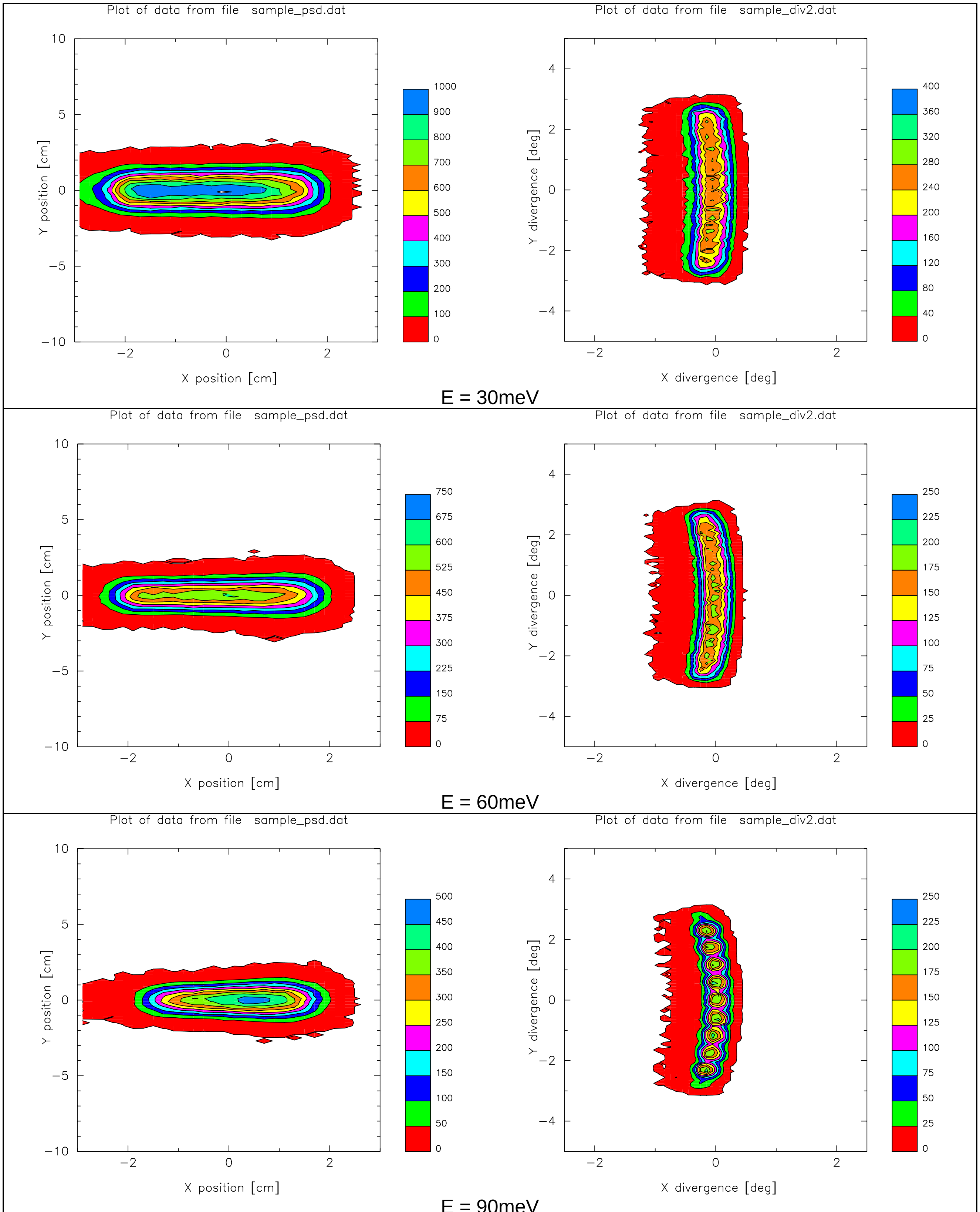


Figure 12: Spatial (left) and divergence (right) distributions at the sample for case 17.

Comparison of ZYB and ZYA

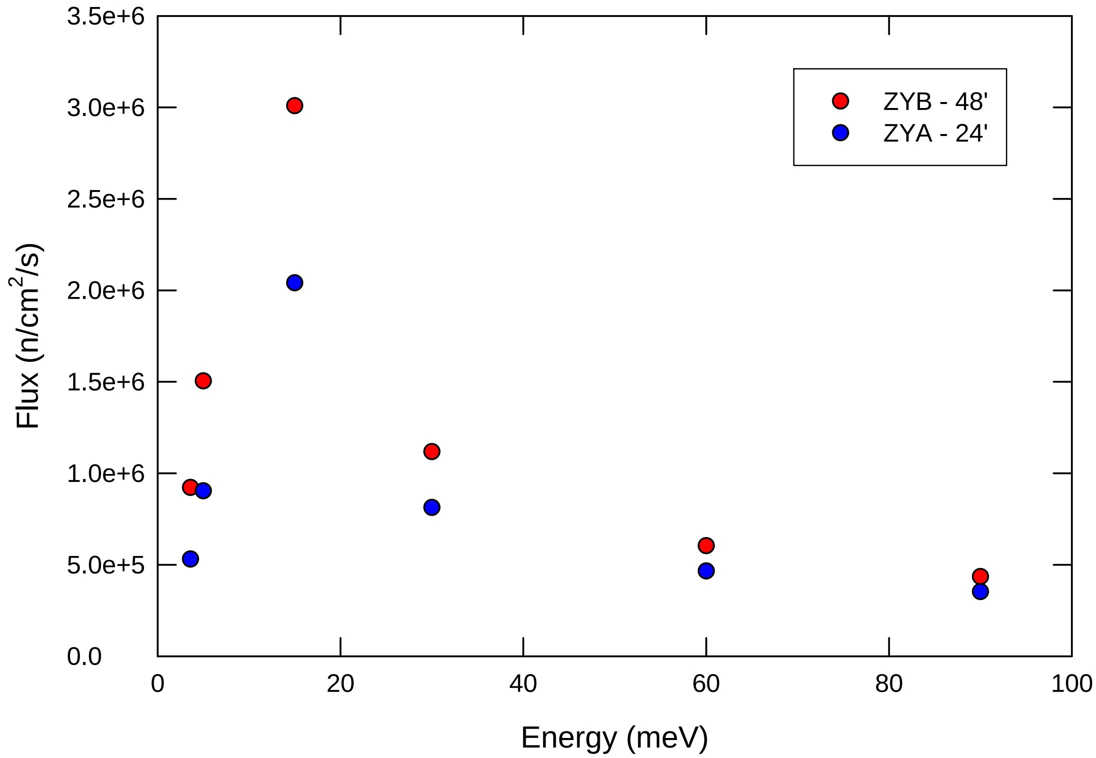
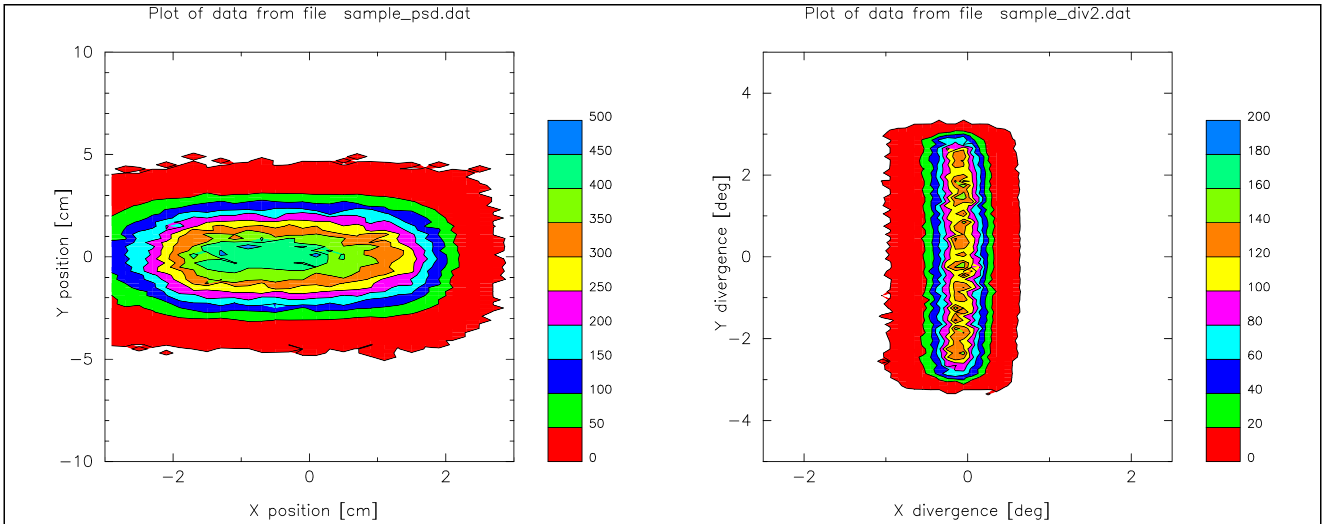
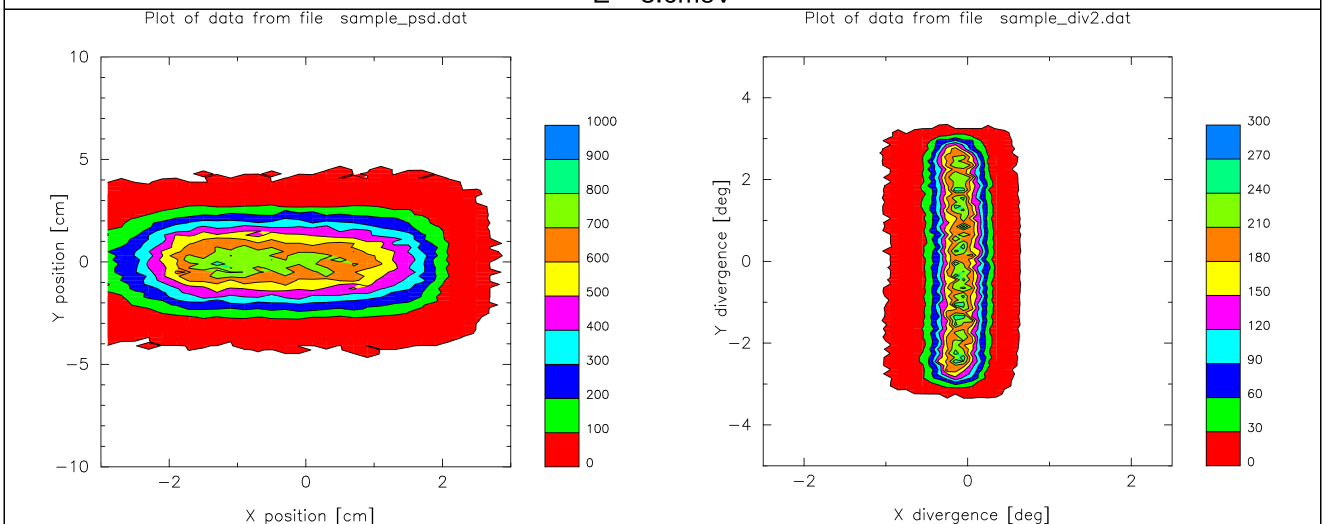


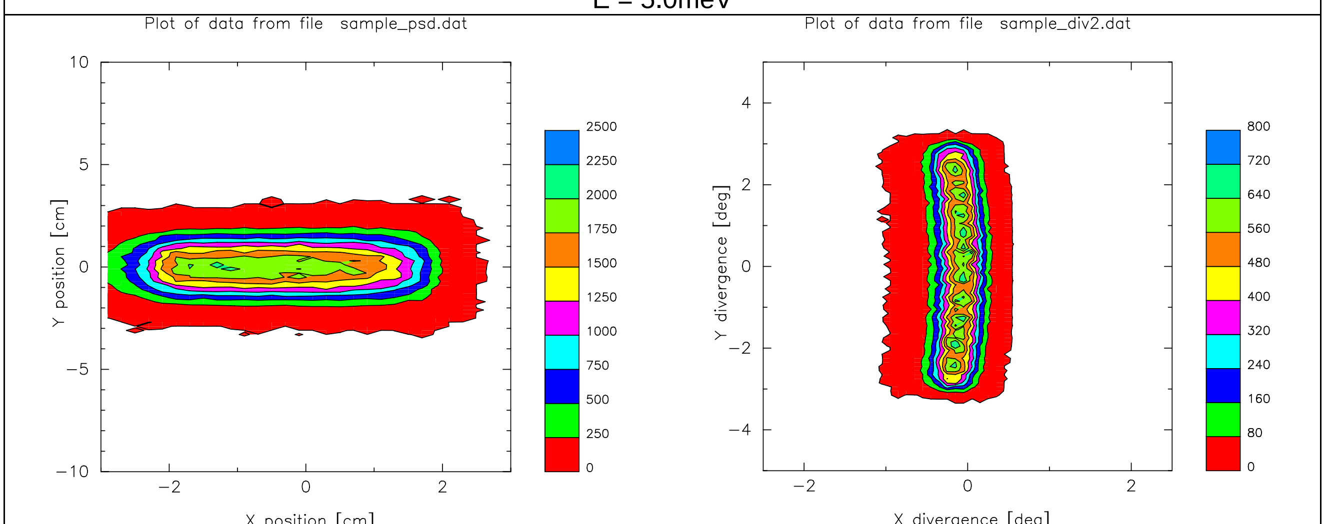
Figure 13: Comparison of flux at sample for ZYB and ZYA with the same peak reflectivity of R_0=0.8.



E = 3.6meV



E = 5.0meV



E = 15meV

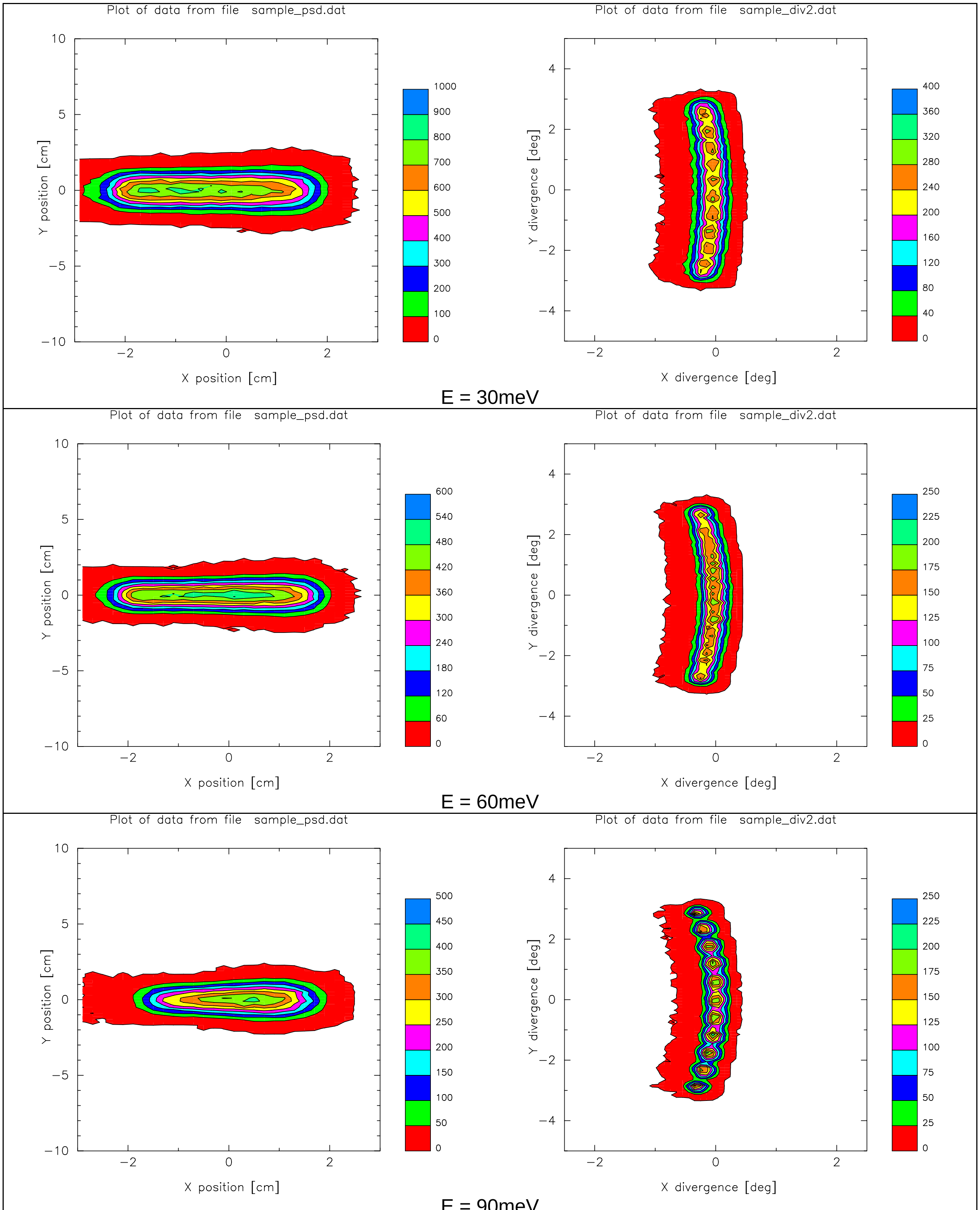
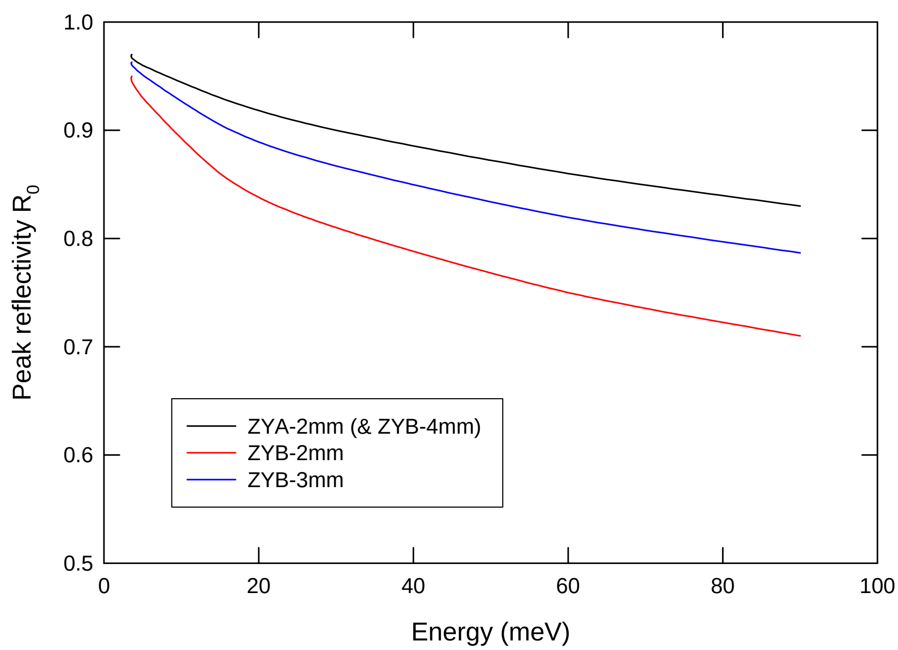


Figure 14: Spatial (left) and divergence (right) distributions at the sample for case 18.

Mosaic spread and reflectivities

The required.



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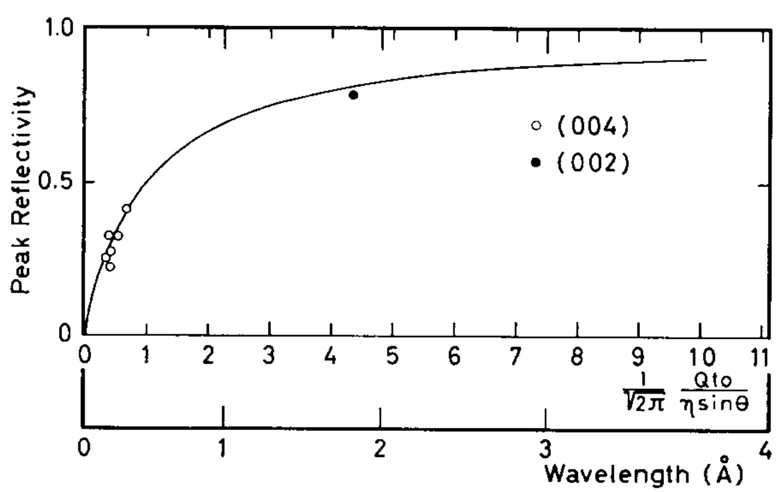


Fig. 2. Calculated and observed value of R^{max} at $\lambda = 1.20$ Å. The lower abscissa applies to (002) of a sample having parameters $t_0 = 0.37$ cm and $\beta = 1.13°$. One data point for this sample at $\lambda = 1.86$ Å is included.

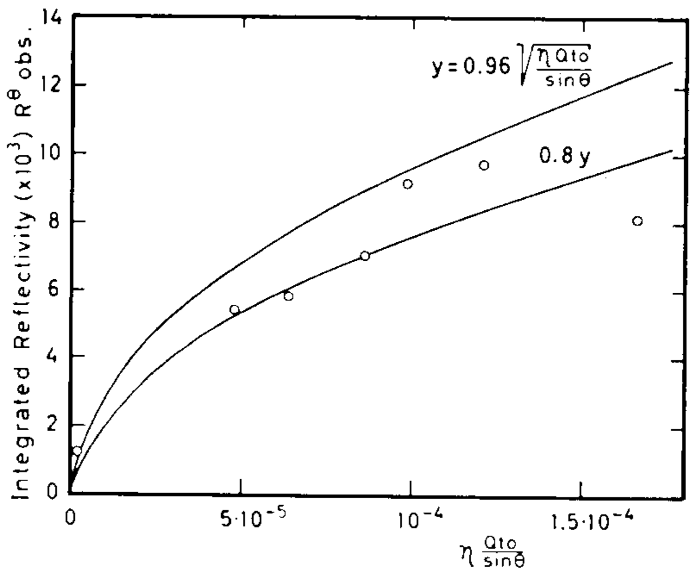


Fig. 3. $R\theta$ for a rotated sample at $\lambda = 1.20$ Å, (004) reflections. The upper curve is calculated for an ideally imperfect, non-absorbing crystal. For the lower curve an empirical attenuation factor of 0.8 is included.

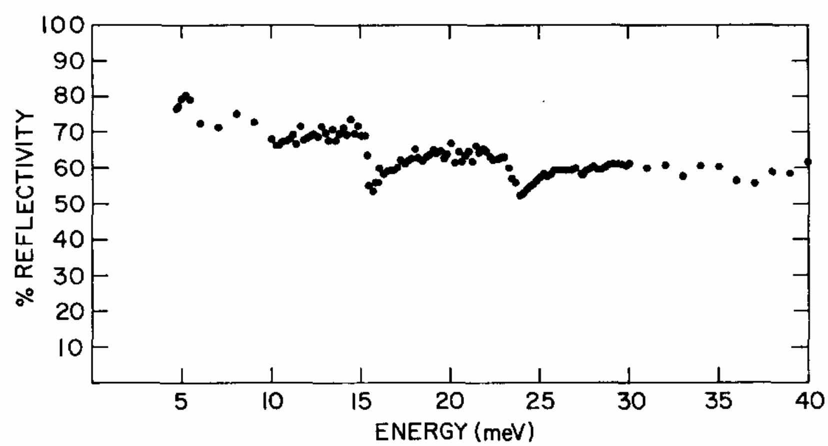


Fig. 1. Energy dependence of pyrolytic graphite (002) reflectivity measured using a chromium sample.

The configuration of the Heusler focusing crystals

The

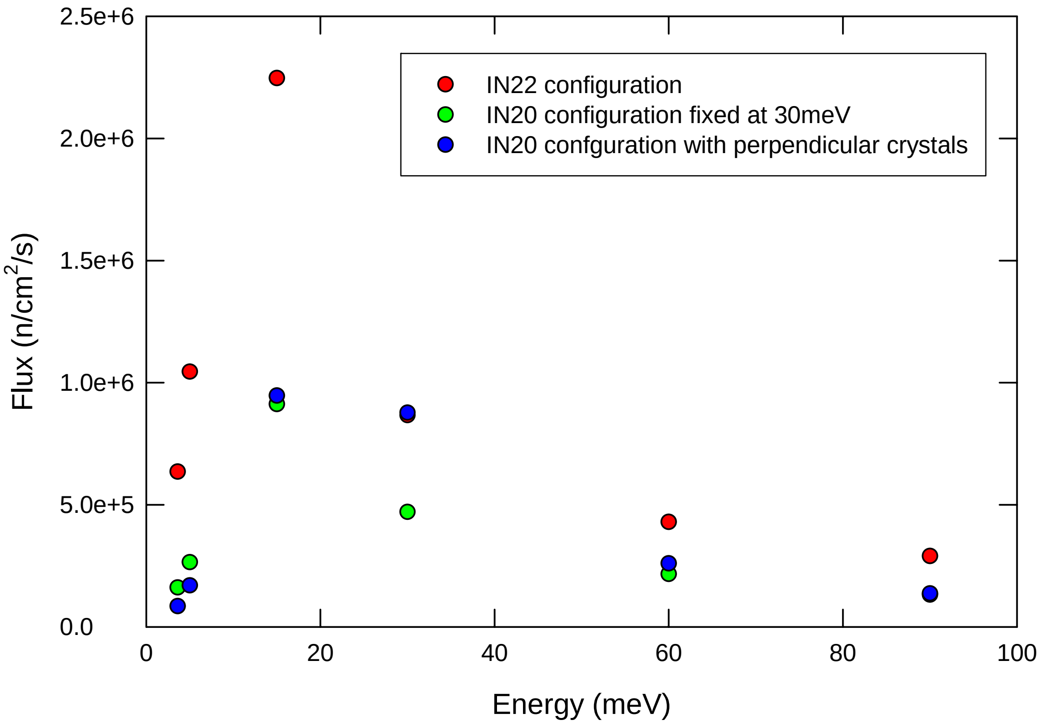
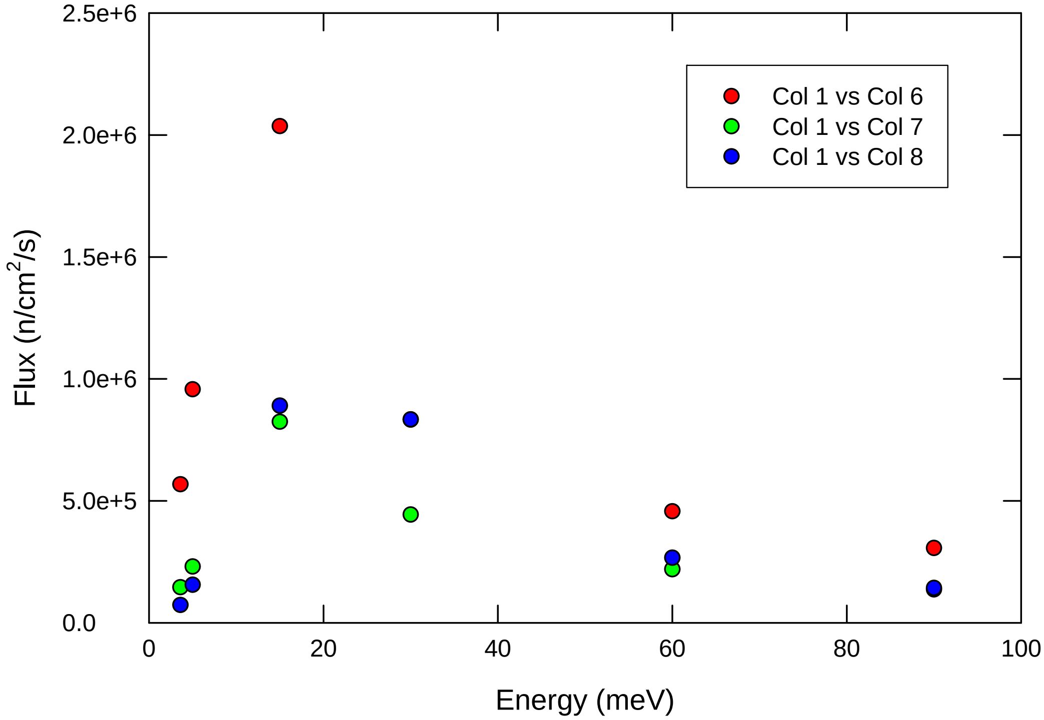


Figure 15: A comparison of the IN22 and IN20 configurations.


Col 1 vs Col 6
Col 1 vs Col 7
Col 1 vs Col 8
Flux (n/cm²/s)
0.0
5.0e+5
1.0e+6
1.5e+6
2.0e+6
2.5e+6
0
20
40
60
80
100
Energy (meV)

Conclusions

The shield.