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

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

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

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Introduction

This
Engineering layout of the beamline

The.
The dimensions of the focusing crystals

The

The dimensions of the crystals and gaps
The case.

IN20 configuration of crystals
The out.

IN22 configuration of crystals
The required.
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

<table>
<thead>
<tr>
<th>Layout up to G4</th>
<th>As in engineering layout</th>
</tr>
</thead>
<tbody>
<tr>
<td>G4</td>
<td>Length = 1.2m (ends 0.3m inside drum shield), m=3 on all surfaces, guides is straight 150mm tall x 40mm wide</td>
</tr>
<tr>
<td>Guide coatings</td>
<td>All m=3 including inner surface of curved guide</td>
</tr>
<tr>
<td>T2 chopper frequency</td>
<td>180Hz</td>
</tr>
<tr>
<td>Focusing crystals</td>
<td>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</td>
</tr>
</tbody>
</table>
Figure 4: Spatial (left) and divergence (right) distributions after the curved guide G2 for case 6.
$E = 3.6\text{meV}$

$E = 5.0\text{meV}$

$E = 15\text{meV}$
Figure 5: Spatial (left) and divergence (right) distributions after the straight guide G4 for case 6.
$E = 3.6 \text{meV}$

$E = 5.0 \text{meV}$

$E = 15 \text{meV}$
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.
Effect of guide tapering
The required.

Guide coating on curved section
The case.

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

E = 5.0 meV

E = 15 meV
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 $R_0=0.8$. 
Figure 14: Spatial (left) and divergence (right) distributions at the sample for case 18.

- E = 30meV
- E = 60meV
- E = 90meV
Mosaic spread and reflectivities

The required.

Fig. 2. Calculated and observed value of $R^\text{max}$ at $\lambda = 1.20$ Å. The lower abscissa applies to (002) of a sample having parameters $t_0 = 0.37$ cm and $\beta = 1.13^\circ$. 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

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

The shield.