

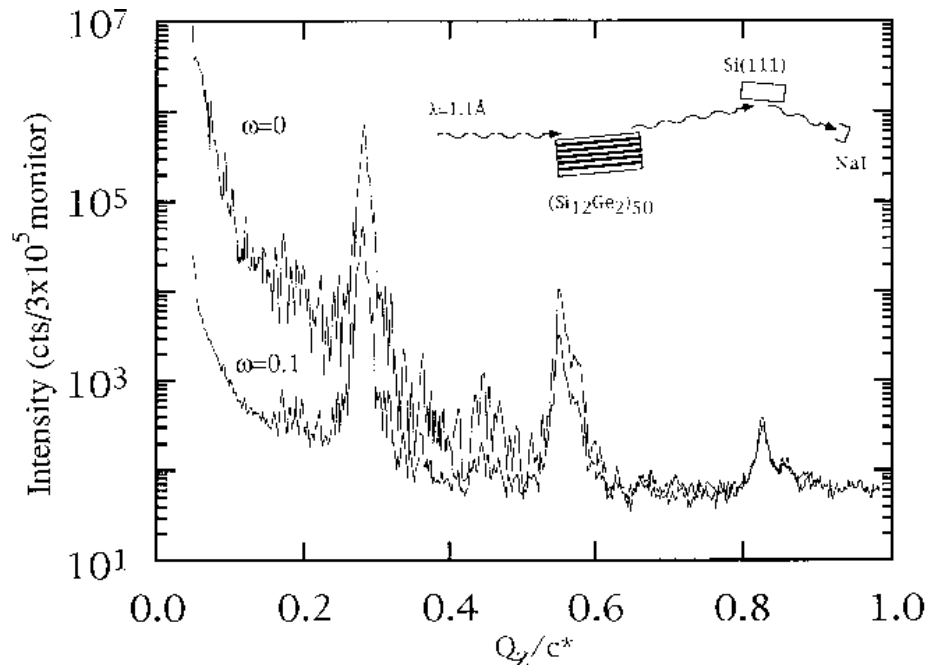
# High resolution diffraction facility at F3

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The F3 station is a relatively new experimental station providing focussed monochromatic beam to a semi-permanently installed high resolution spectrometer. The station is optimal for a number of experiments such as general purpose diffraction, low angle scattering, and anomalous scattering with NaI scintillation counters or position-sensitive detectors. The philosophy is to provide a facility for a wide range of experiments using a standard configuration in order to minimize setup time.

Focussing is achieved by a bent, slotted Si(111) crystal monochromator producing  $>10^{11}$  ph/sec for typical experimental geometries. The table below shows the performance of F3 and other comparable stations at CHESS (comparable mean 2-3eV energy resolution at 10-13keV):

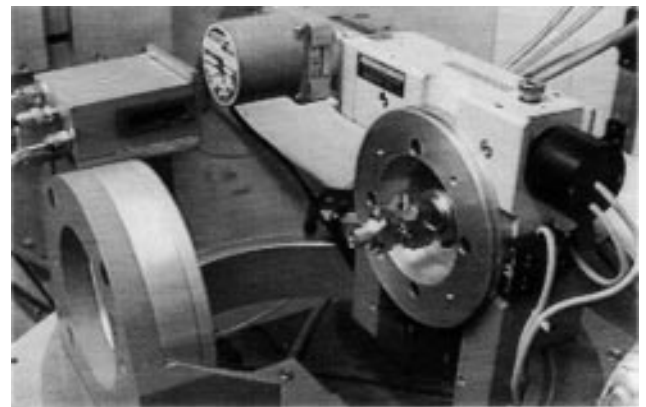
The F3 spectrometer is a Huber 424 two-circle goniometer with a Huber 511.1 Eulerian cradle, also known as a small Huber 4-circle. A motorized analyzer assembly has been added for a 6-circle configura-



tion. This spectrometer with analyzer has been used for a number of applications including: to separate closely spaced features in diffracted beams, to reject Compton scattering from diffracted beams, and to reject the incident beam for low-angle scattering experiments.

The figure above shows an example of data that was obtained recently at F3 from a  $(\text{Si}_{12}\text{Ge}_{2})_{50}$  superlattice. Scans with different settings of the analyzer crystal were used to separate the true specular reflected beam ( $\omega=0^\circ$ ) from diffuse scattering caused by roughness ( $\omega=0.1^\circ$ ). The  $\omega=0^\circ$  curve is a q-2q scan showing three orders of superlattice Bragg reflections. The period of the superlattice is 14 monolay-

ers giving rise to the Bragg peaks at  $L=4/14, 8/14,$  and  $12/14$  for the first three orders. The  $\omega=0.1^\circ$  curve is an "offset" q-2q scan of the diffuse scattering. Resonant features, when  $Q_z$  matches the reciprocal superlattice spacing, and closely spaced satellites in the diffuse scattering match the satellites in the specular scattering. This data has been used to determine



CHESS sagittal focussing summary

station	source (W=wiggler)	magnification	energy range (keV)	brightness @10keV (ph/s/100mA/mm <sup>2</sup> )
A2	W	0.59	5-25	$1 \times 10^{11}$
C2	HB	0.27	5-12	$2 \times 10^{11}$
D1	HB	0.32	5-15	$1.5 \times 10^{11}$
F2	W	0.32	5-22	$6 \times 10^{11}$
F3	HB	0.33	5-20	$1.5 \times 10^{11}$

the structure of roughness at the interfaces of the superlattice.

The F3 station is available for feasibility studies, express mode proposals, and also for regular (long term) projects. For more information call Randy Headrick, (607-255-0919)