Prospects of new Science at ID03

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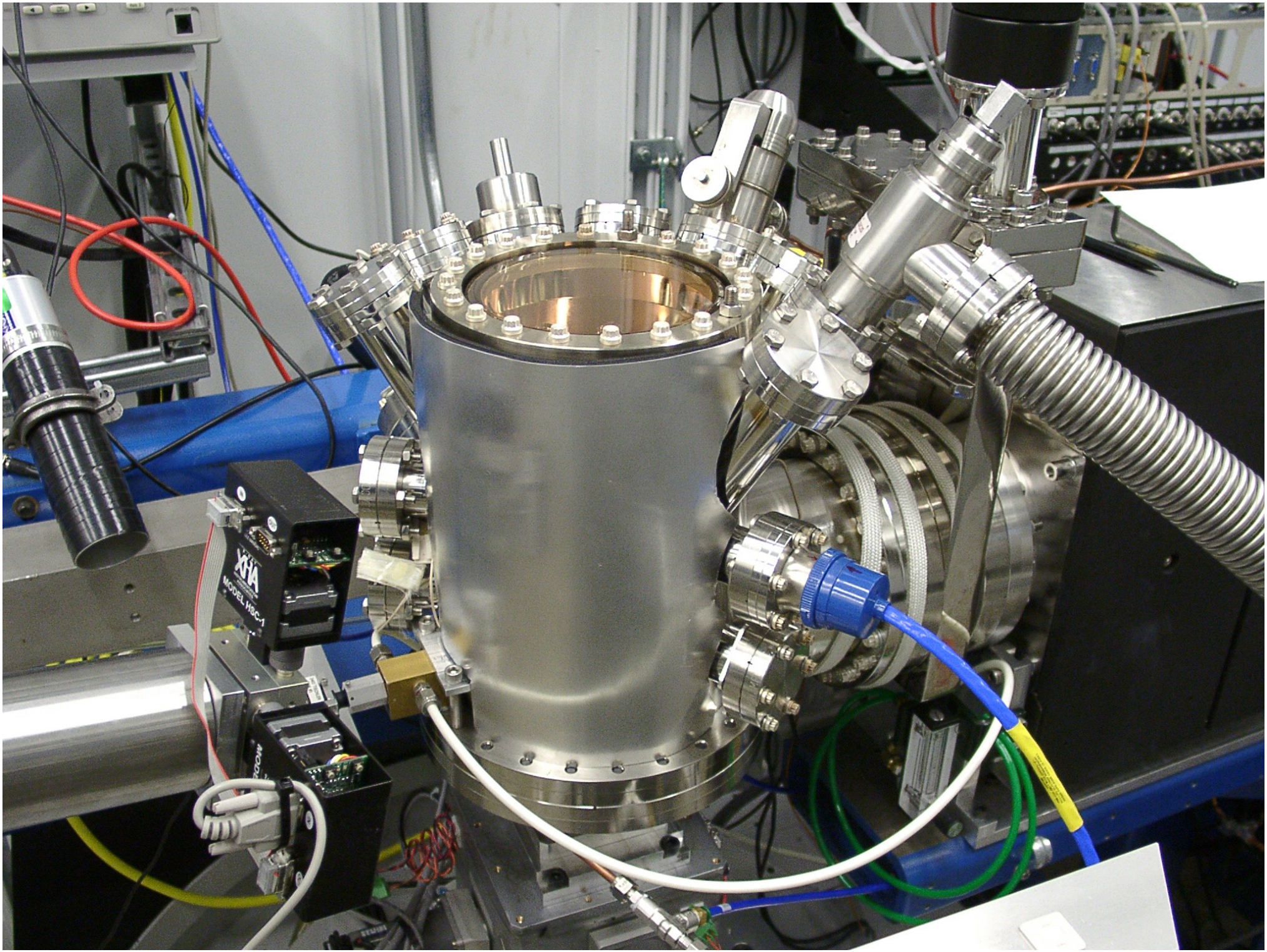
ID03 Status Workshop
Jan 13, 2006

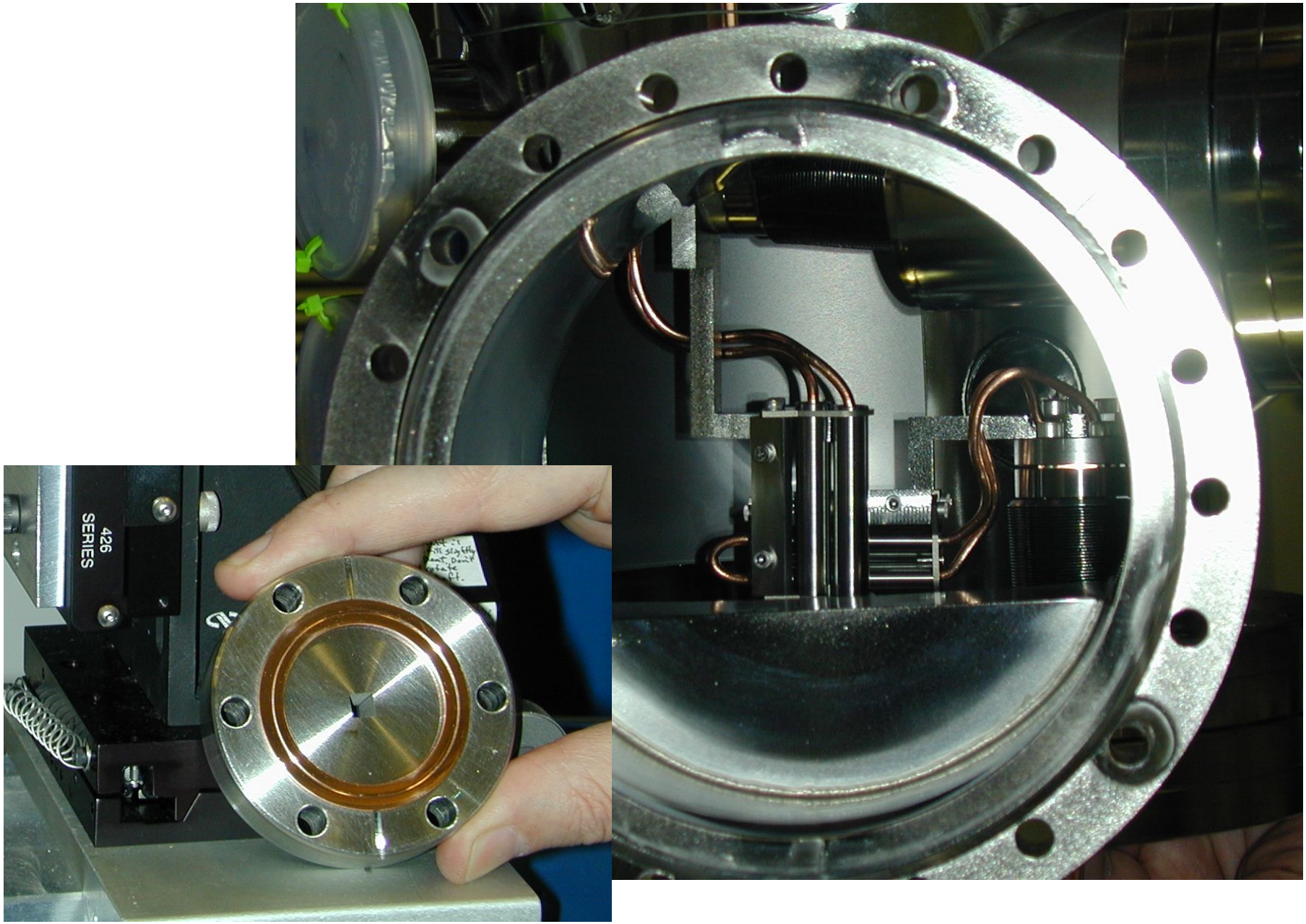
Opportunities for Surface X-ray Diffraction

- Definitive structure of surface/interface
- In situ growth, oxidation, catalysis
- Nanoscience with small beams
- Coherence
- GISAXS and CGISAXS
- Coherent “Yoneda” geometry

New Capabilities for ID03

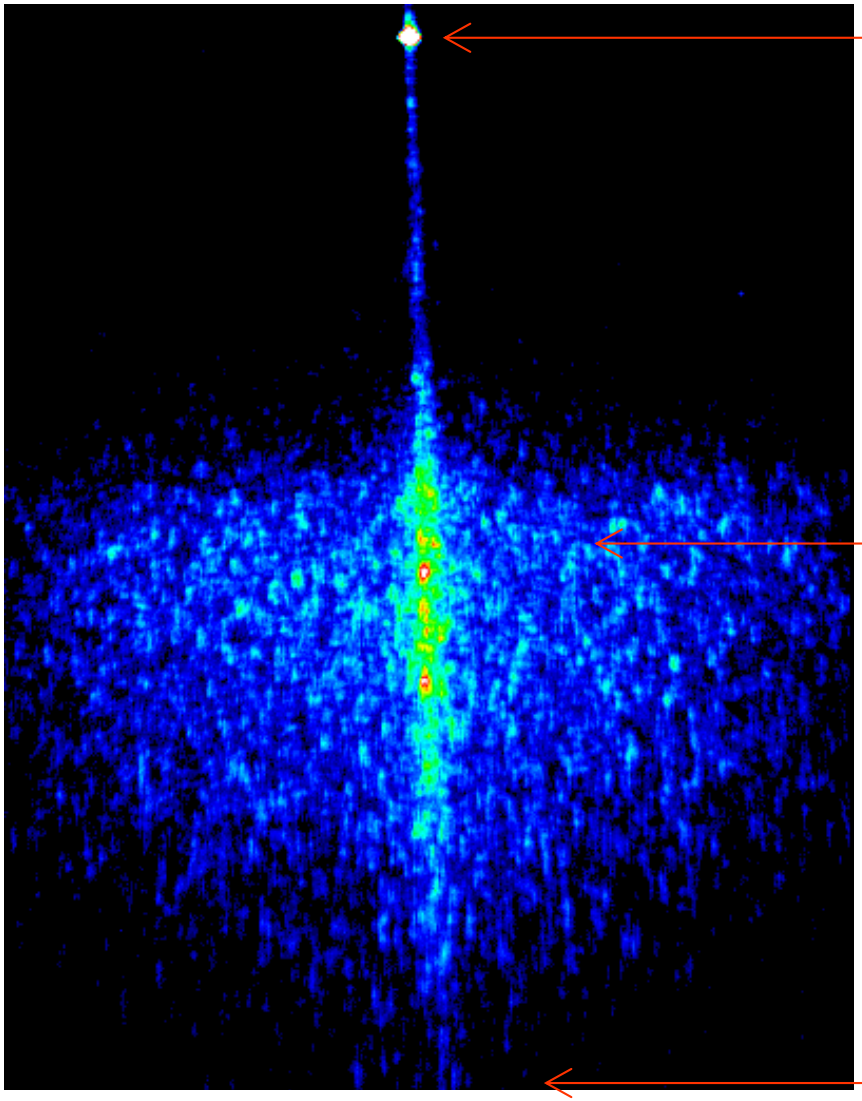
- KB optics for micron focus in UHV
- Space for GISAXS detectors
- Stable optics for long measurements
- High speed, intelligent data collection
- Scanable monochromator
  - overcomes sphere of confusion


MODEL HSC-1


426
SERIES

Structure in "Yoneda" Peak

Grazing-exit diffraction from a 1000A Au polycrystalline film

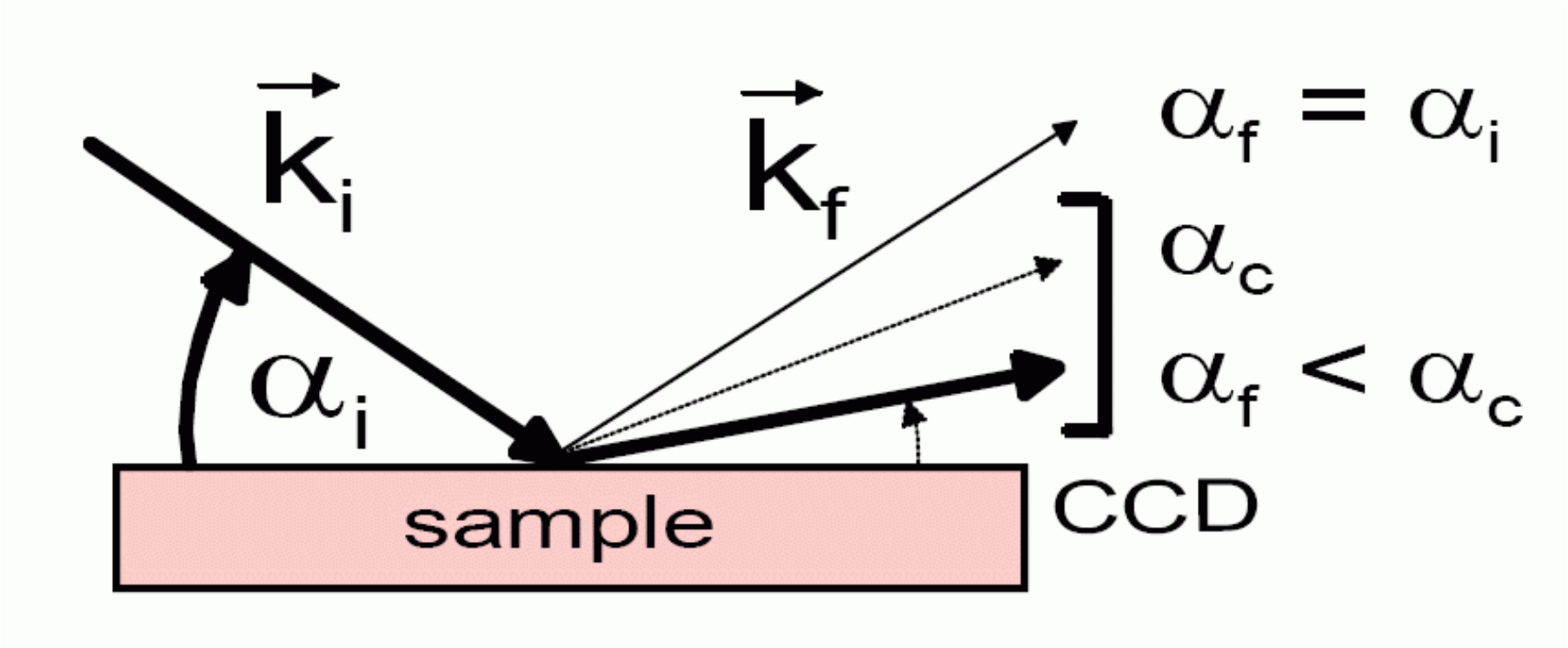


Specular ($\alpha_f \sim \alpha_i$)

$\alpha_f \sim \alpha_c$

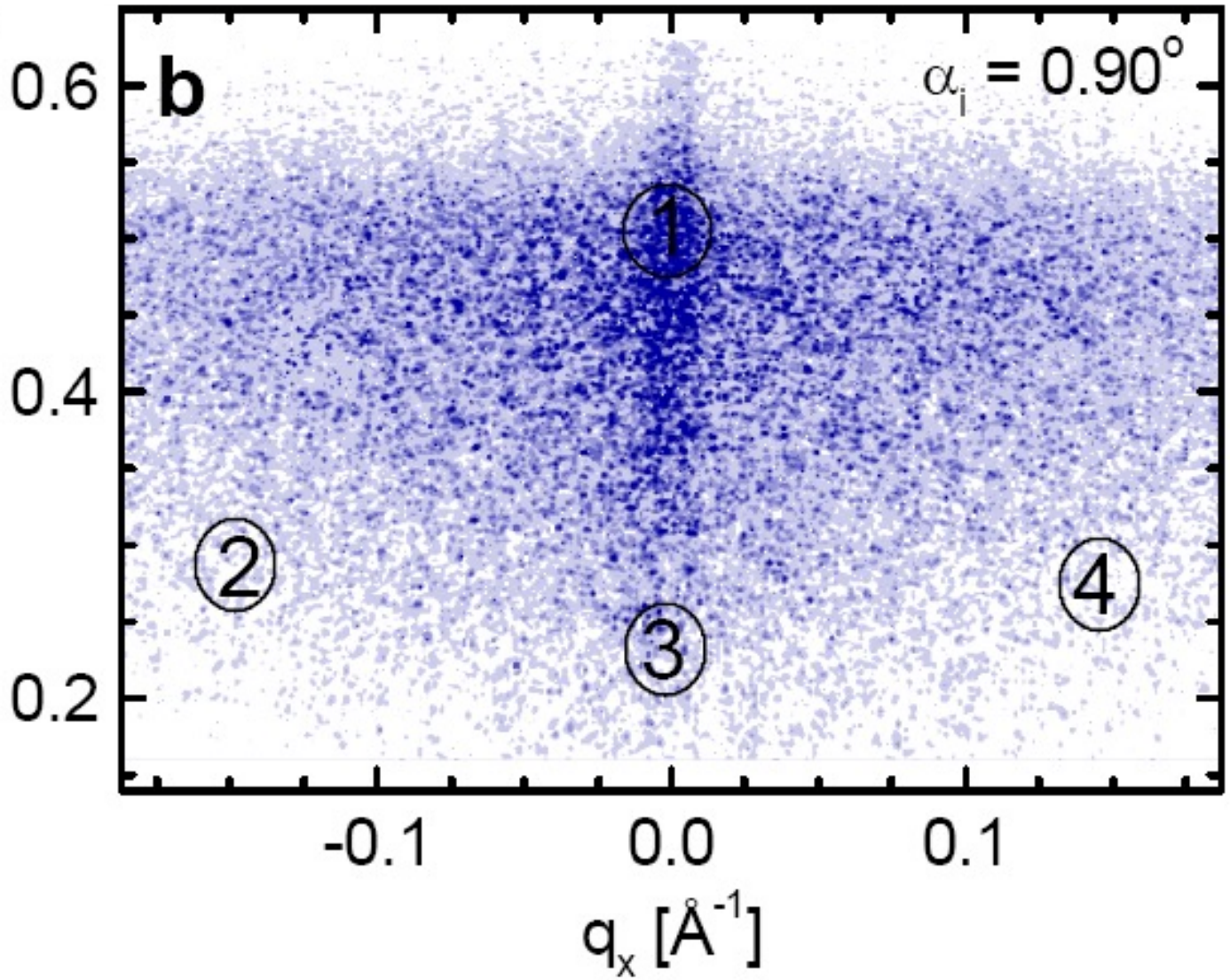
$\alpha_f \sim 0$

Coherent "Yoneda" sample geometry

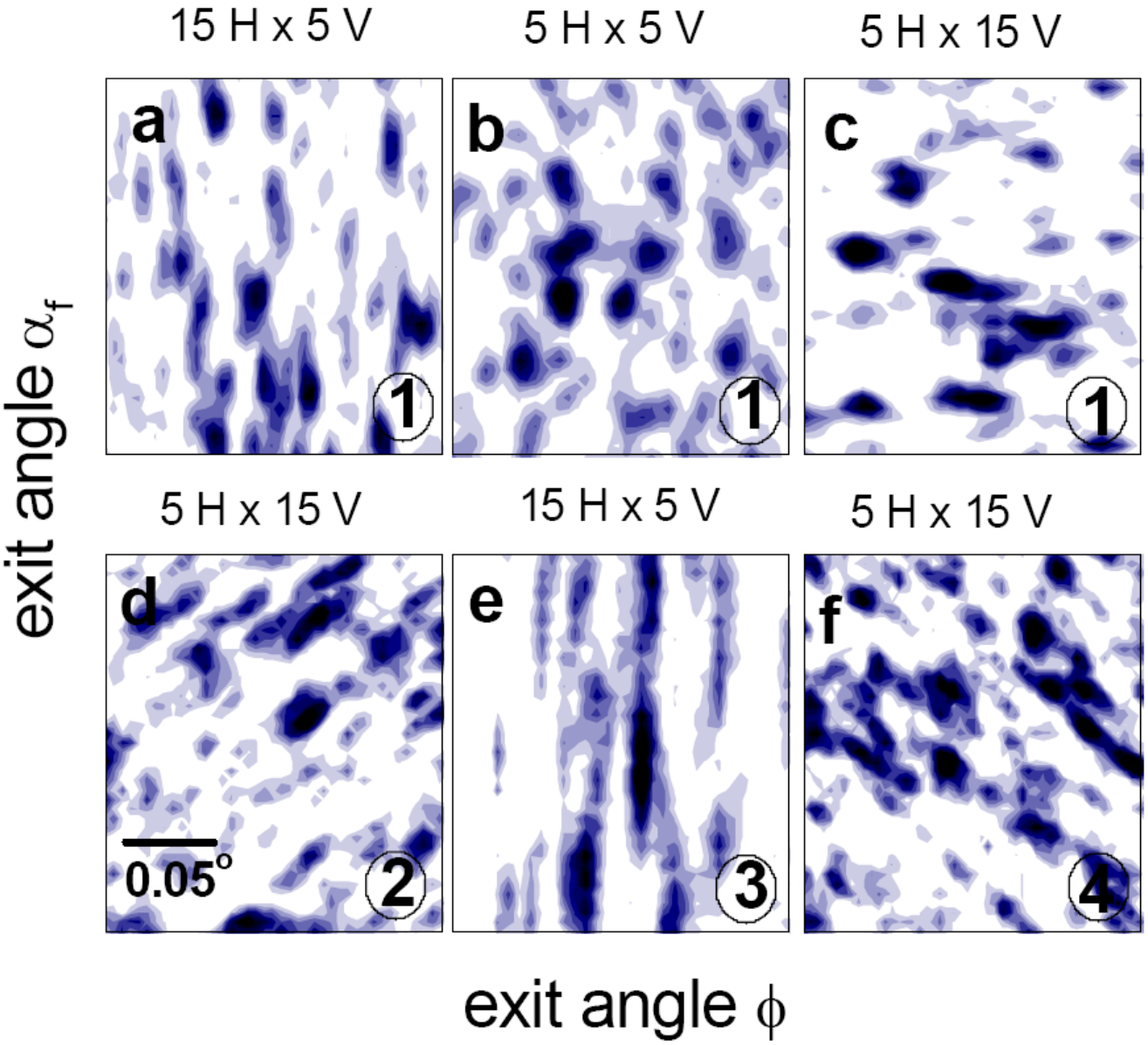


F. Pfeiffer, W. Zhang and I. K. Robinson,
Applied Physics Letters 84 1847 (2004)

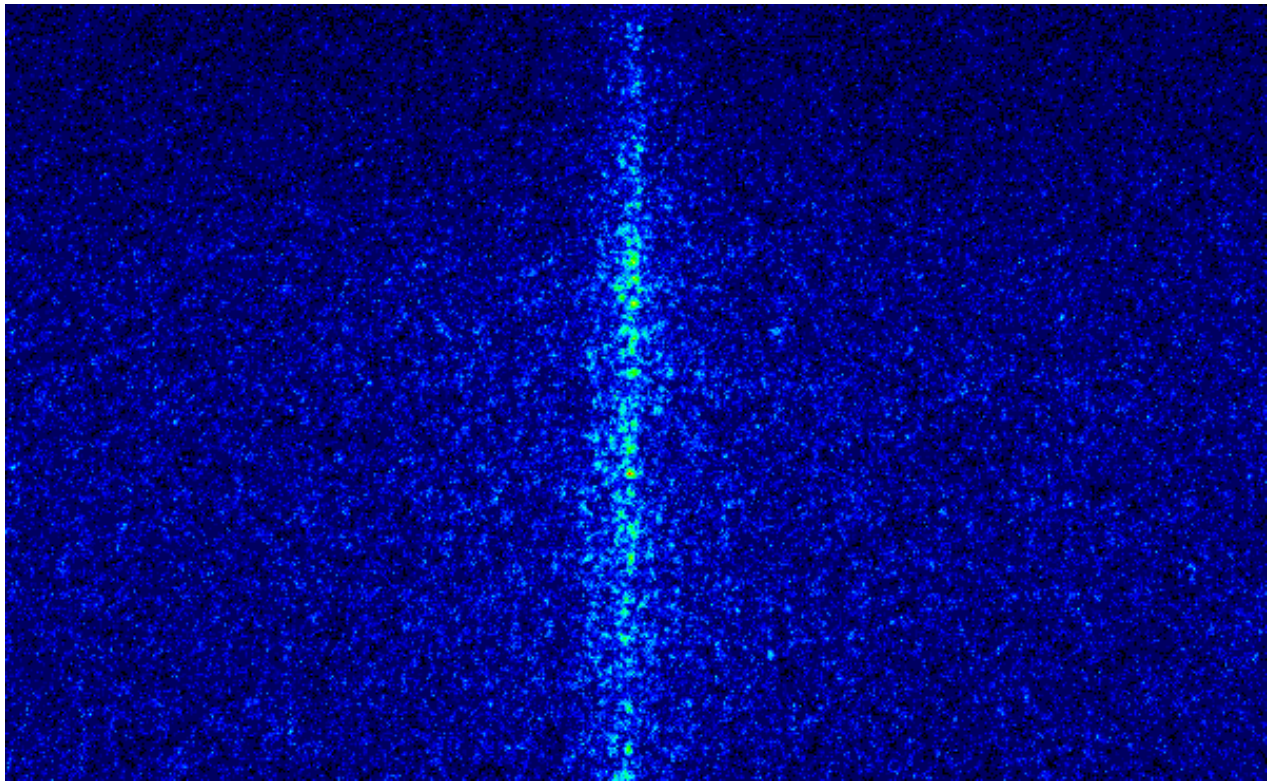
Anisotropy of speckles



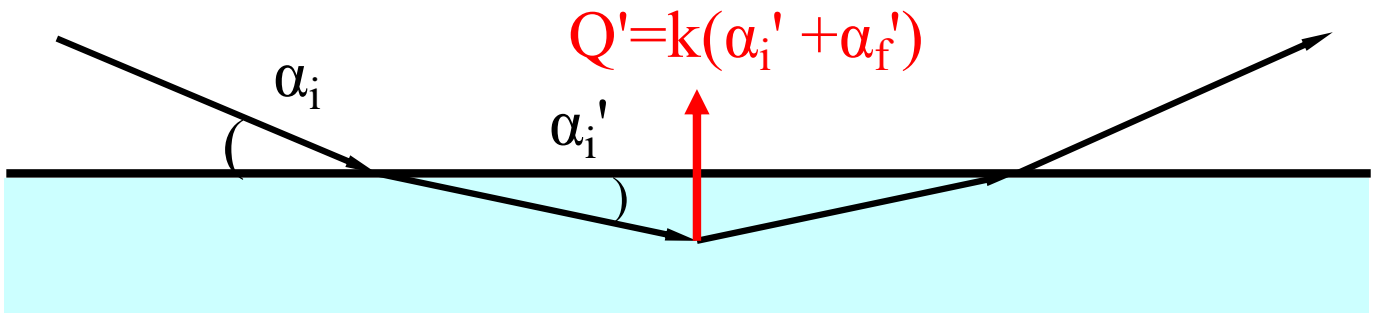
Variation with entrance slit (microns)

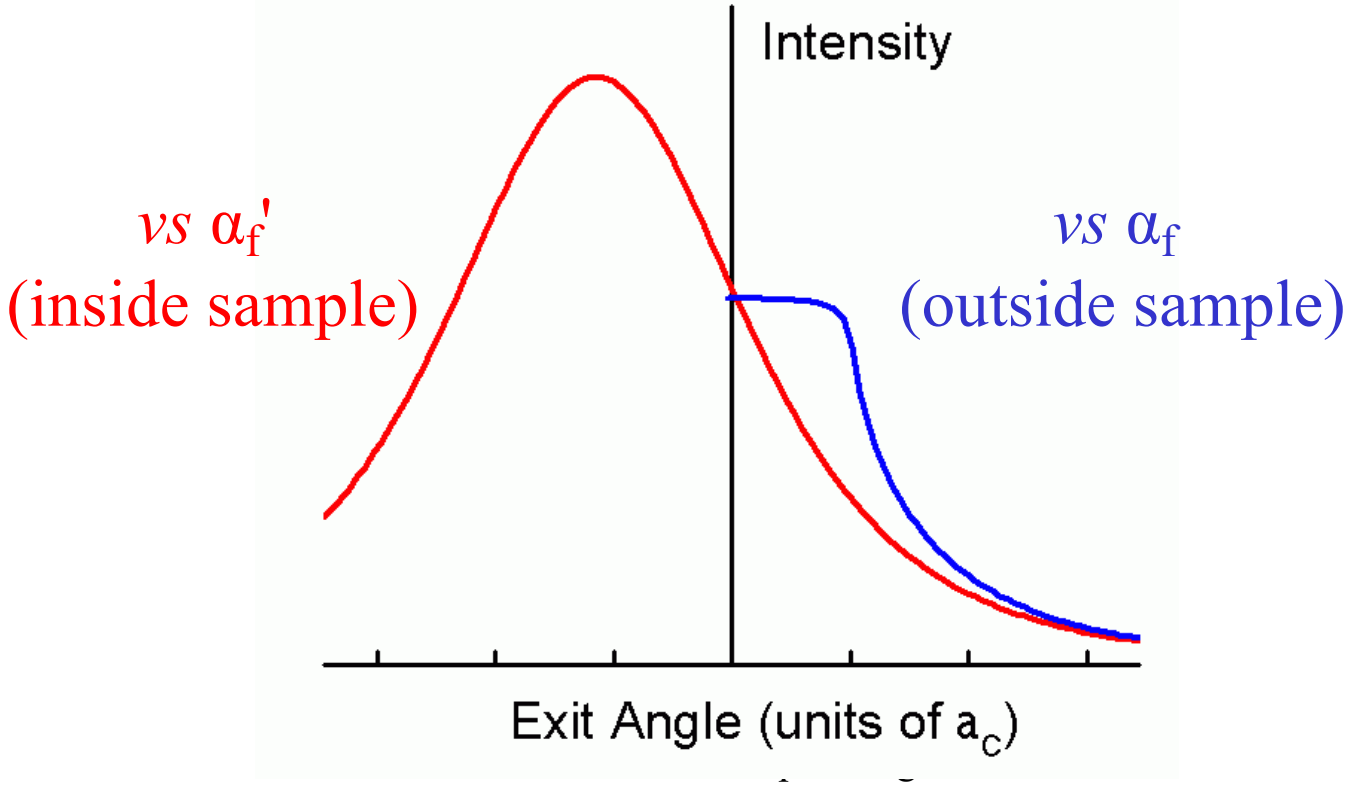


Angle series, 0.01° steps

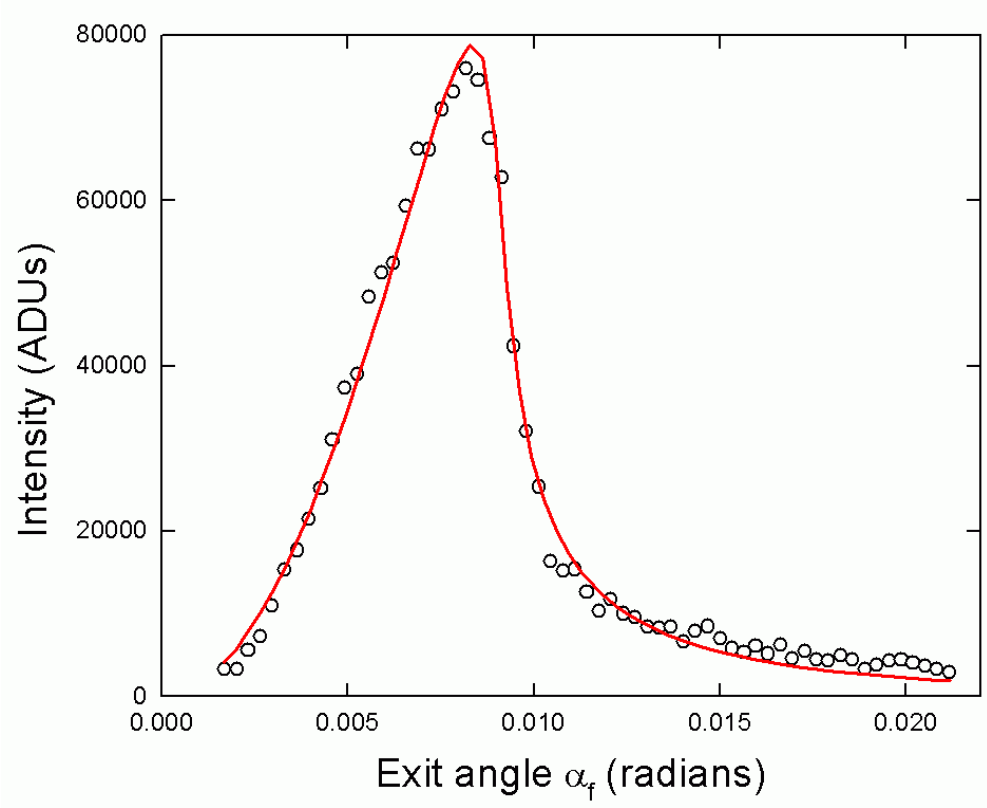


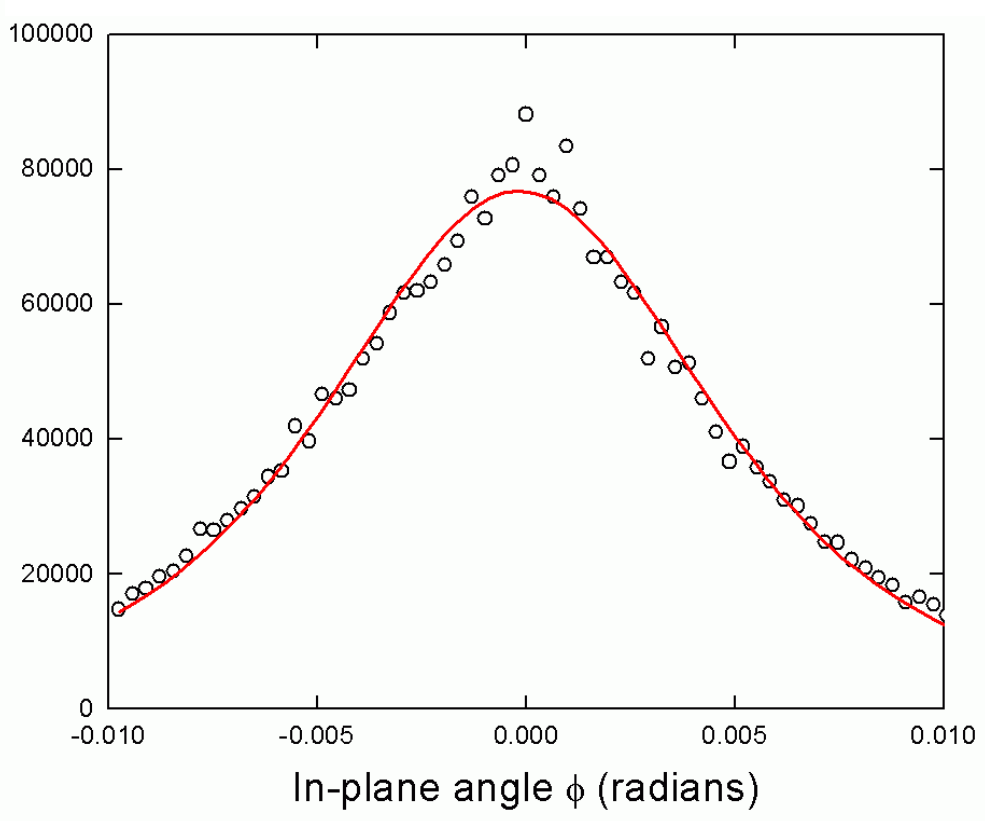
Effect of refraction on lineshape





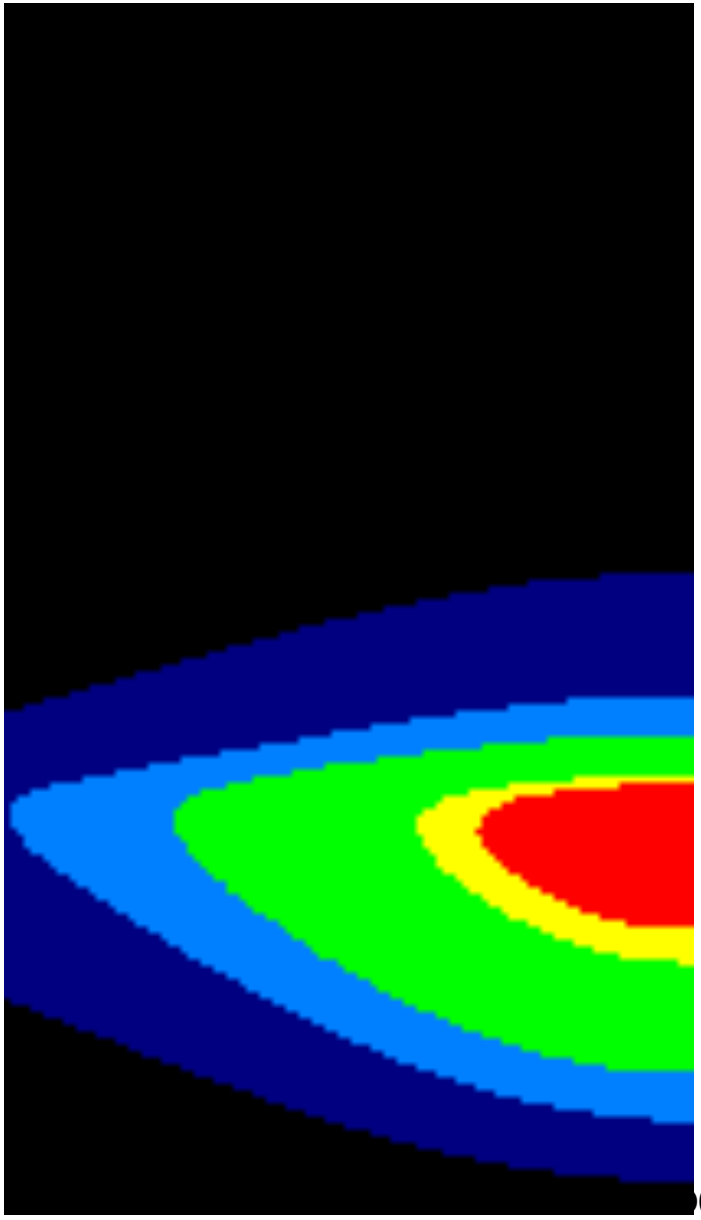
Fits to (Lorentzian)^2 Profiles

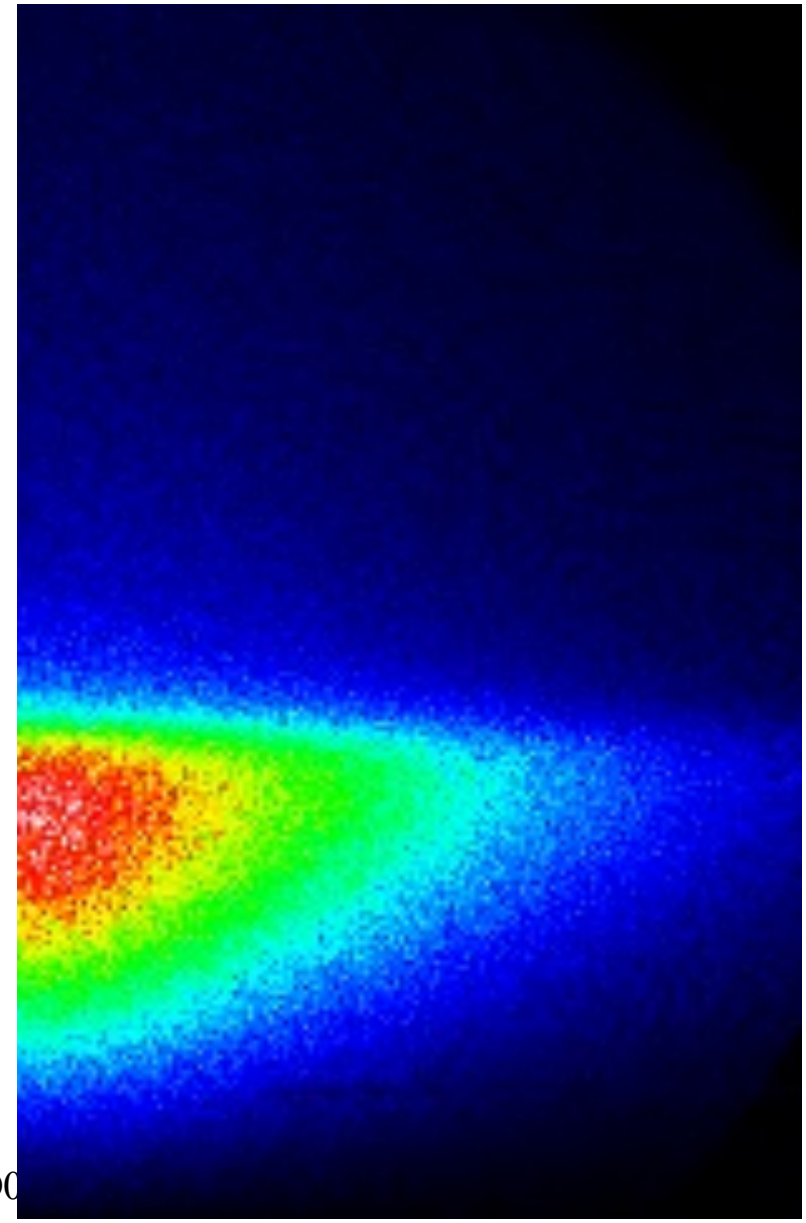


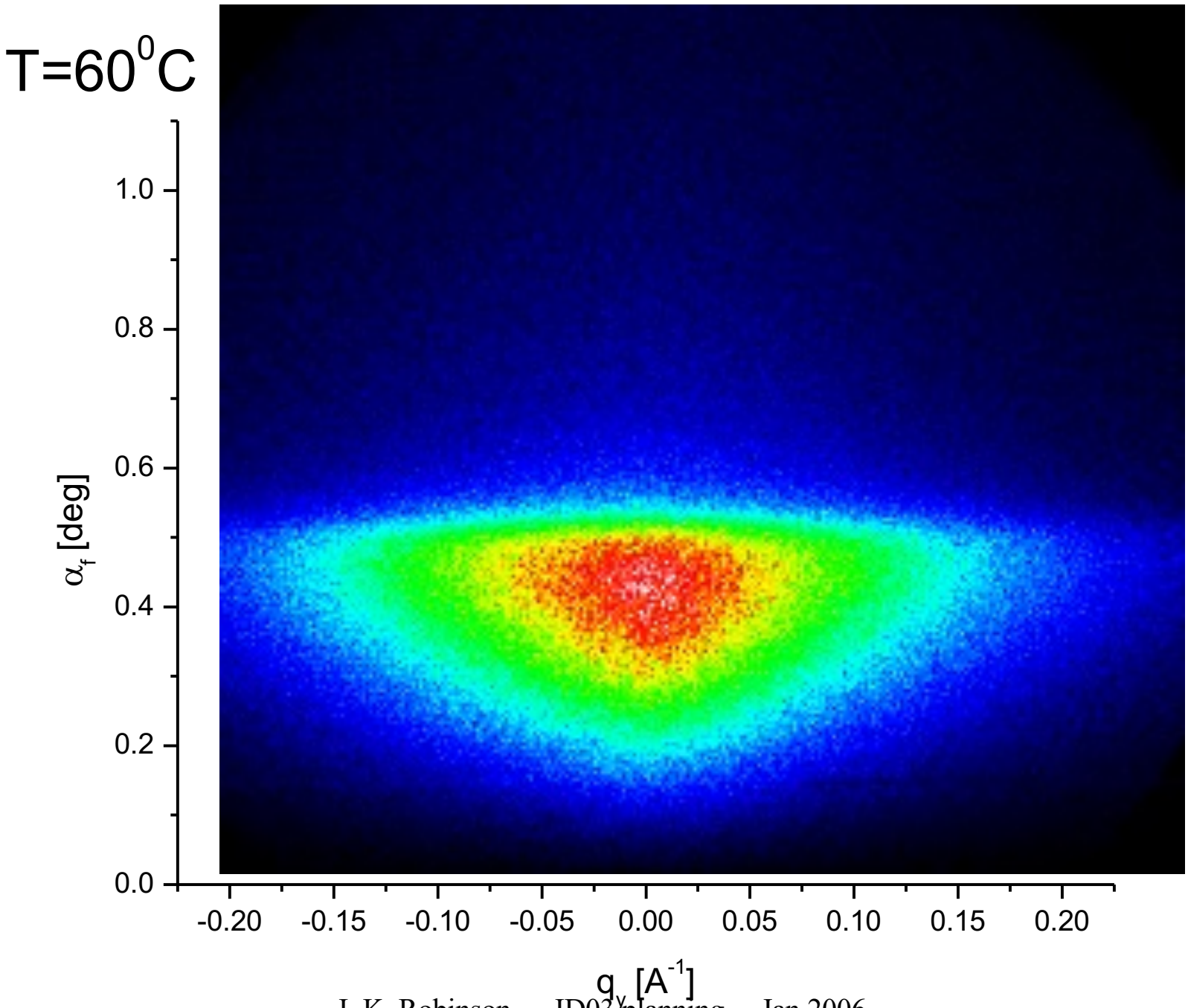


Fit params: center (x,y), amplitude, width=0.0084, α_i=0.011

Simulations of CCD data







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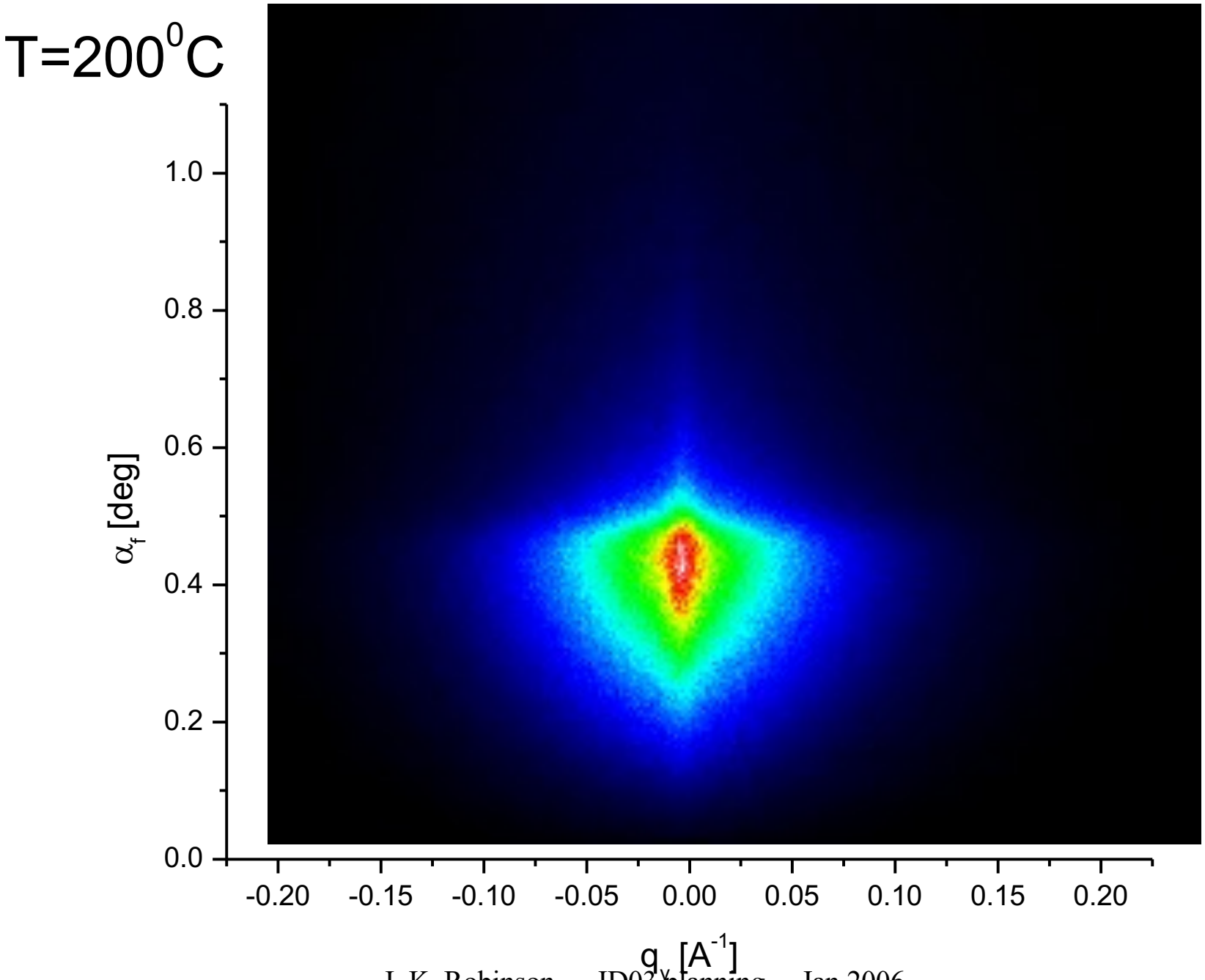
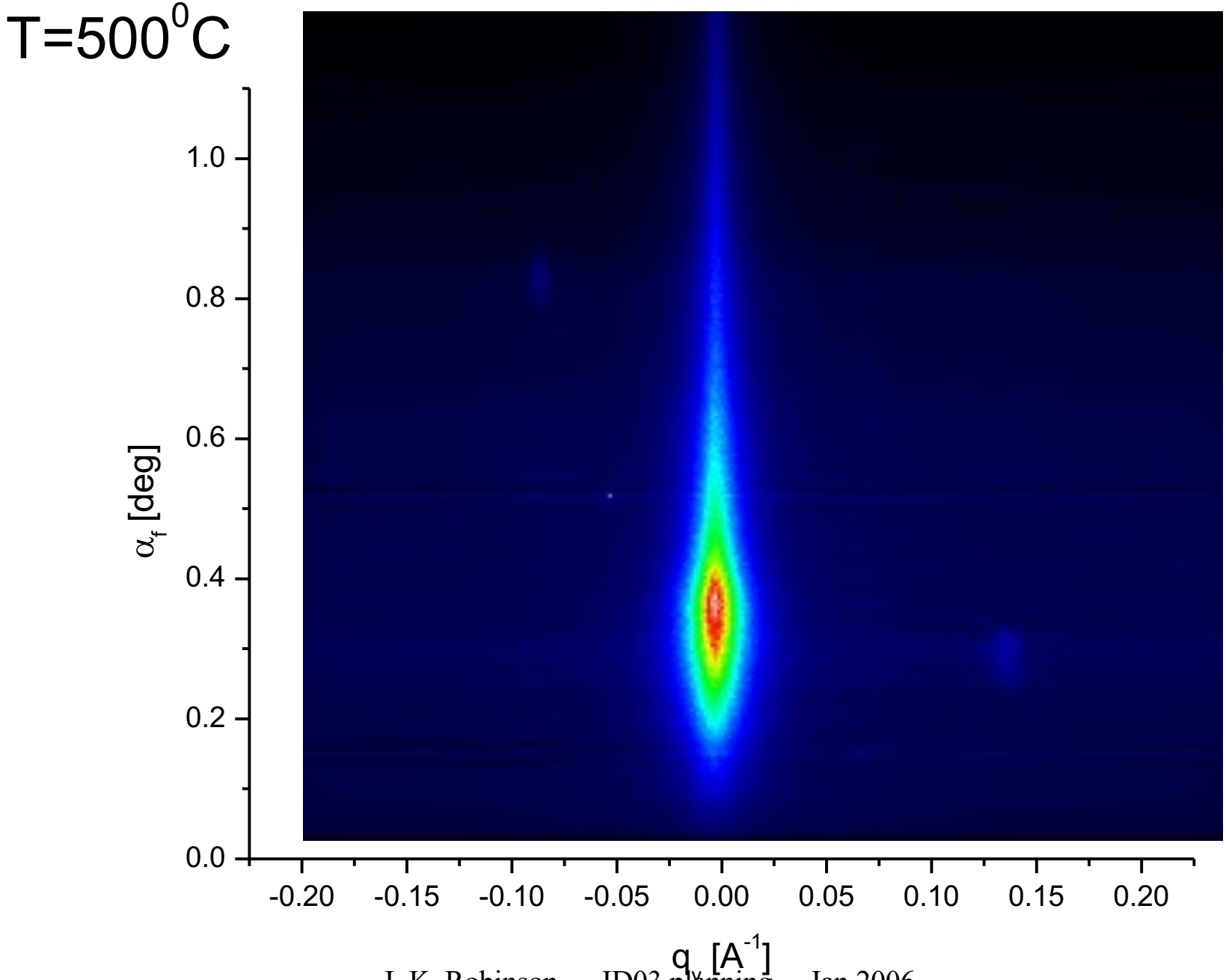
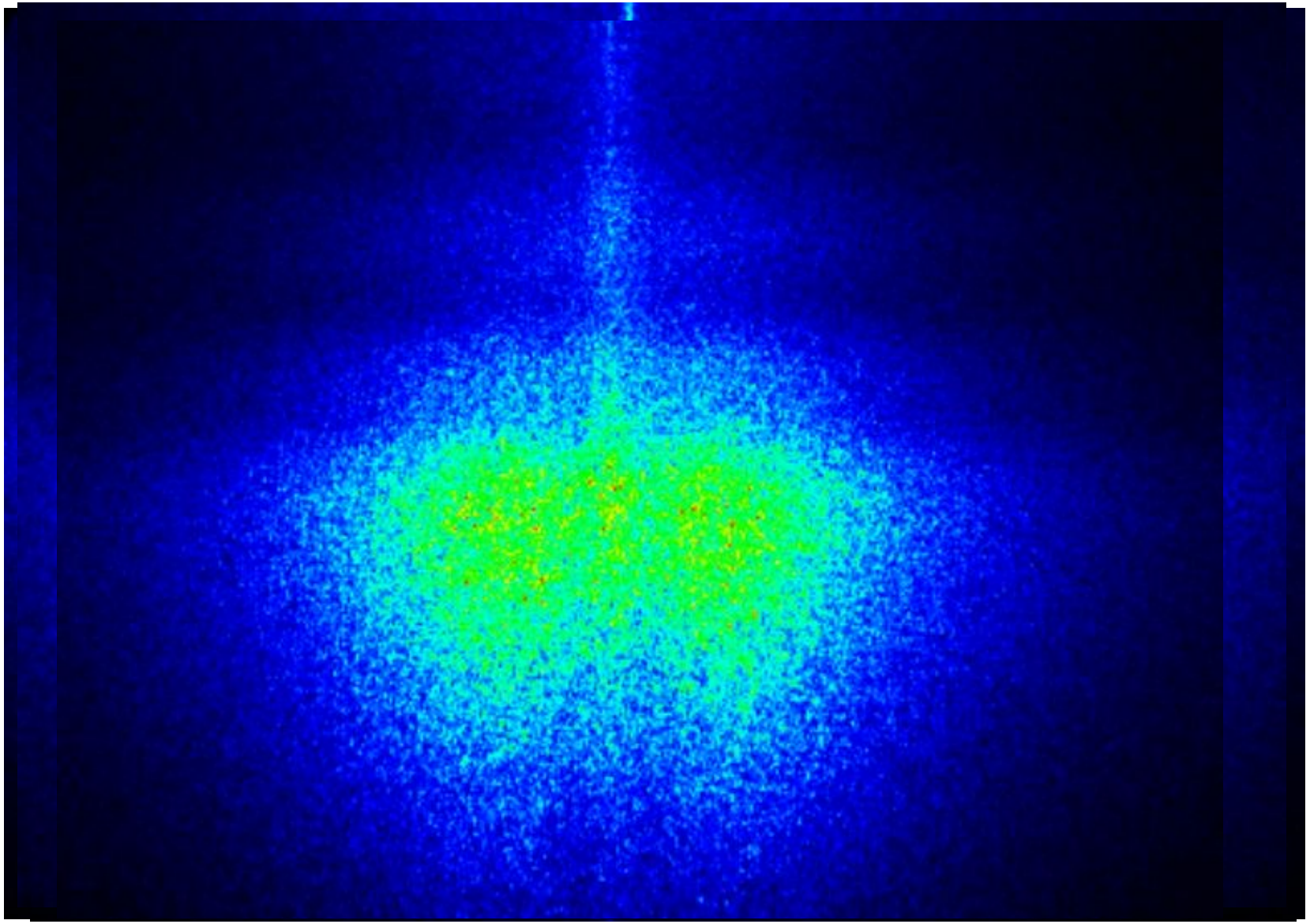
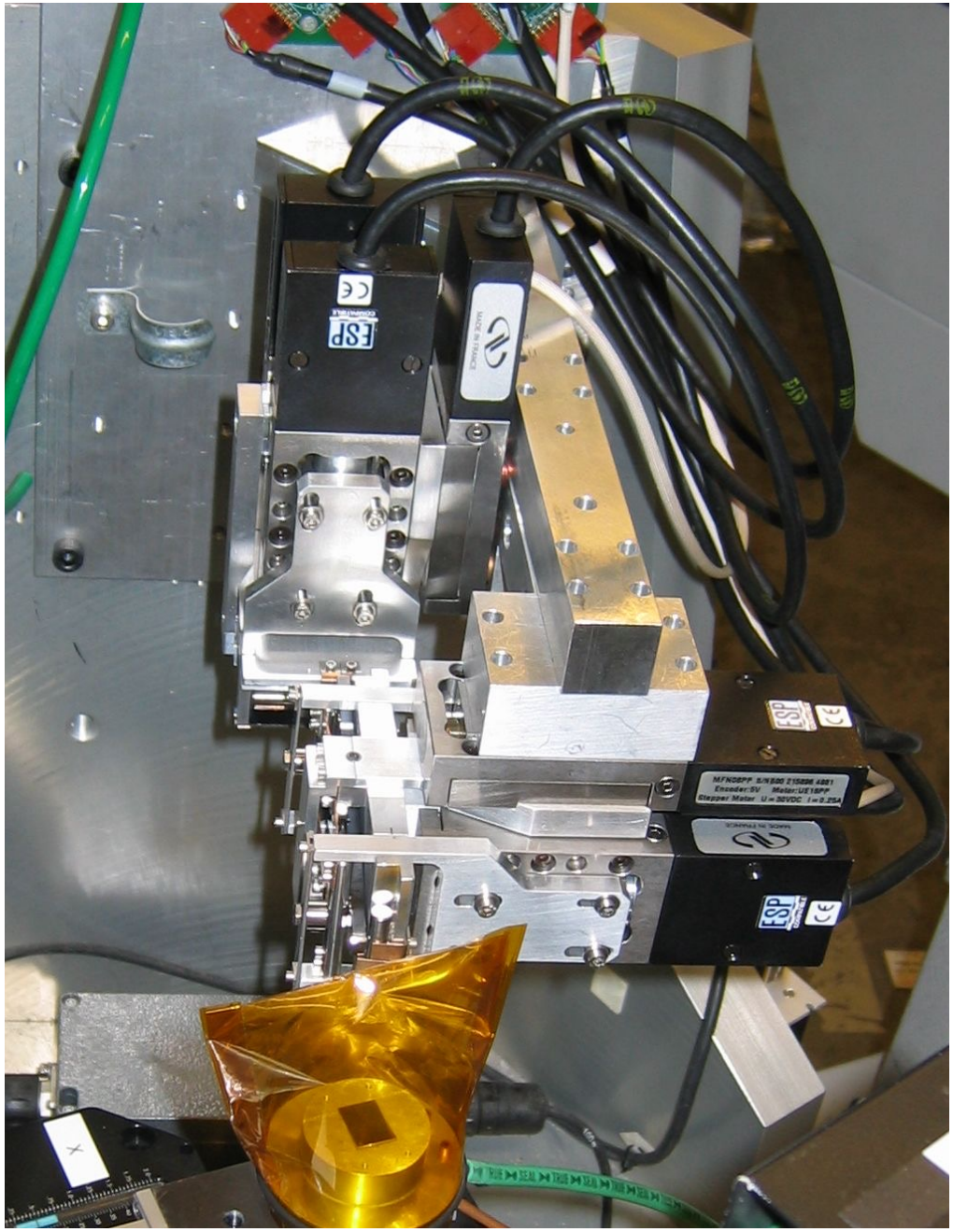

T=200^{0}C
1.0
0.8
0.6
0.4
0.2
0.0
α_f [deg]
-0.20
-0.15
-0.10
-0.05
0.00
0.05
0.10
0.15
0.20
q_y [A^{-1}]


T=500^{0}C
1.0
0.8
0.6
0.4
0.2
0.0
α_f [deg]
-0.20
-0.15
-0.10
-0.05
0.00
0.05
0.10
0.15
0.20
q_y [A^{-1}]

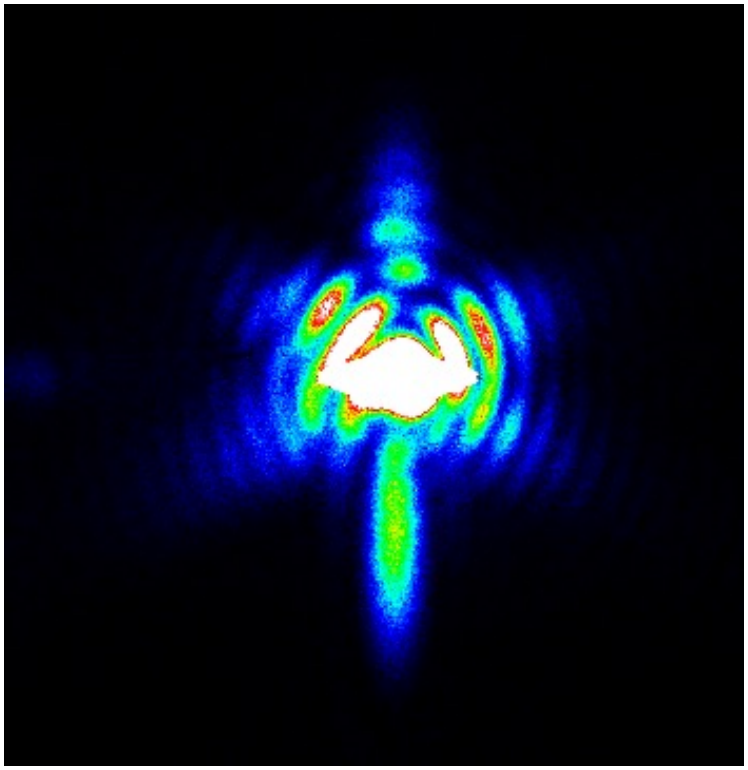
Annealing evolution for in-situ Fe



KB mirrors at 34-ID-C



Vary vertical aperture before KB



10 micron steps from 10 to 100 microns

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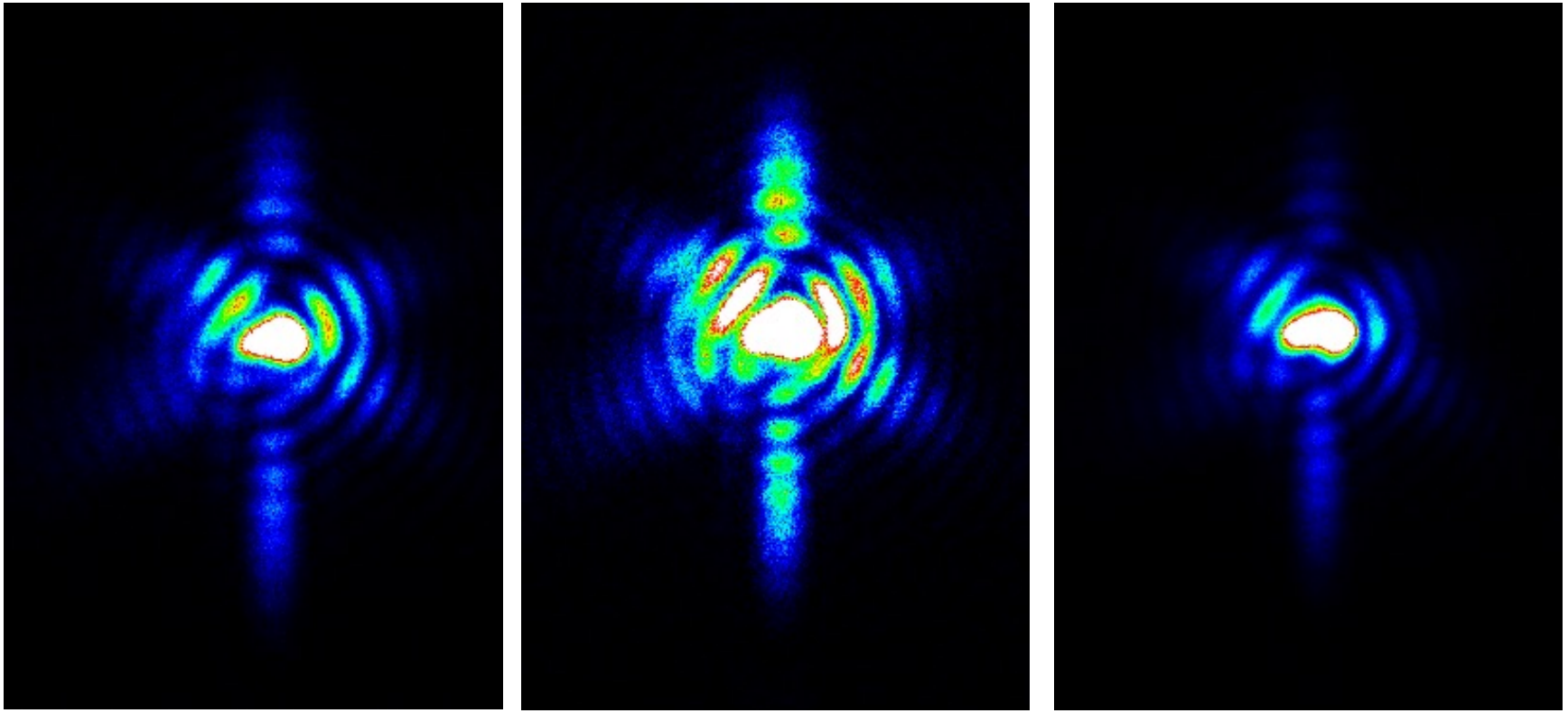
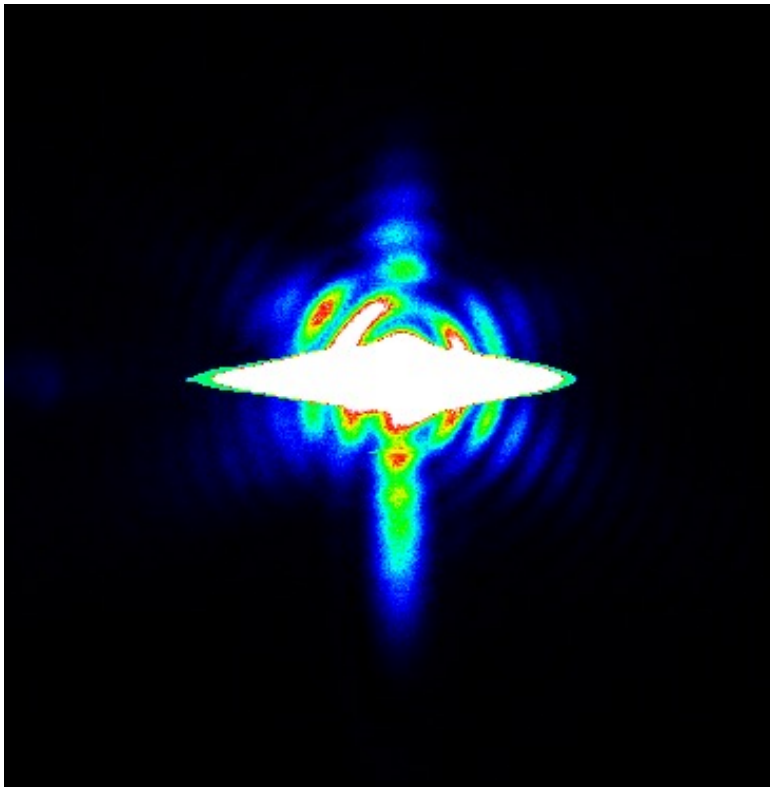
Insert diffuser before sample

all with 50 micron entrance slit



-138, none -140, 50mm -141, 15mm

Diffuser added 15mm before sample



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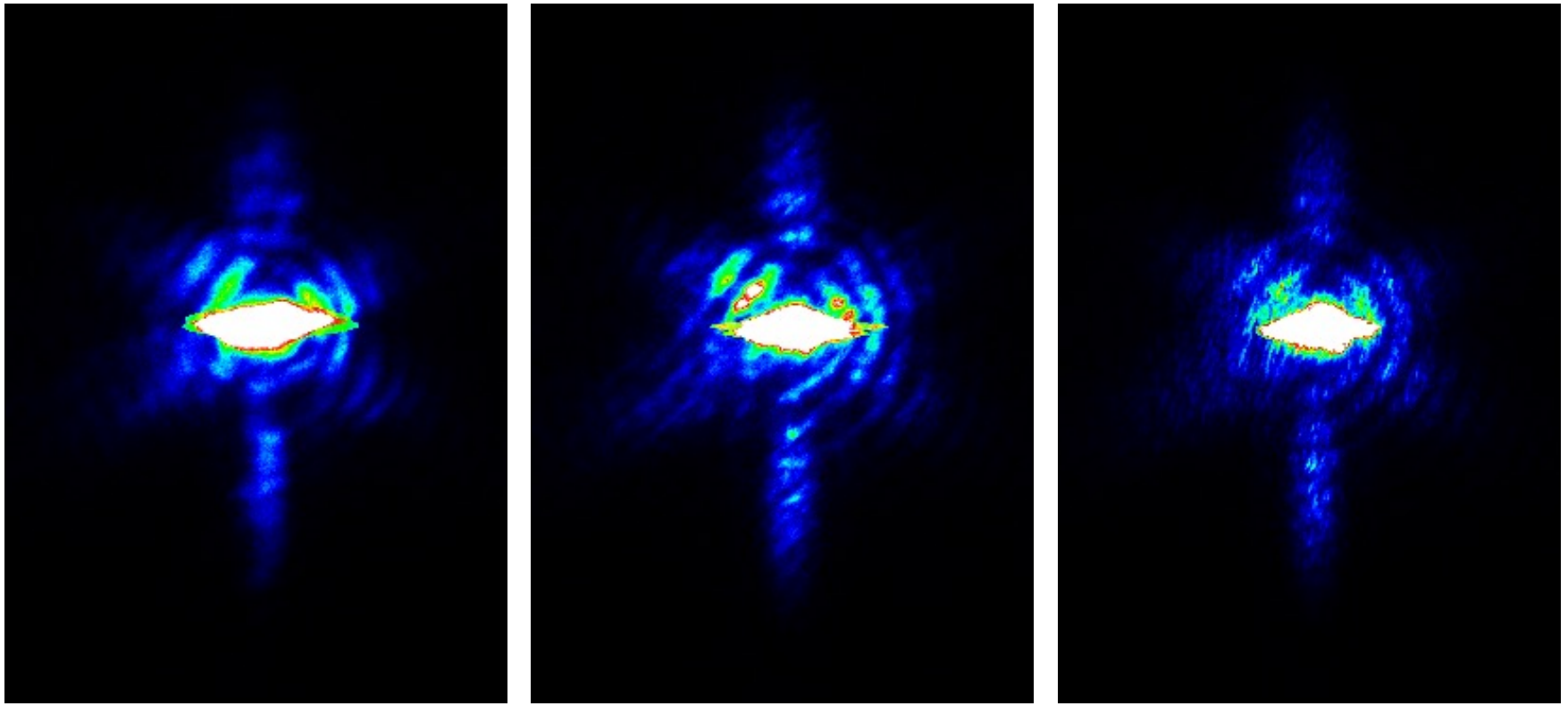
Add diffuser after sample

all with 50 micron entrance slit



-142, 10mm -143, 37mm -144, 250mm

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