Test of XRSTECH diced Si(555) analyzer

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Method

<u>Four contributions to energy resolution</u>

- Incident photon (ΔE_i)
  1. monochromator
     symmetric channel cut Si(660)
     ΔE_i = 31.5 meV

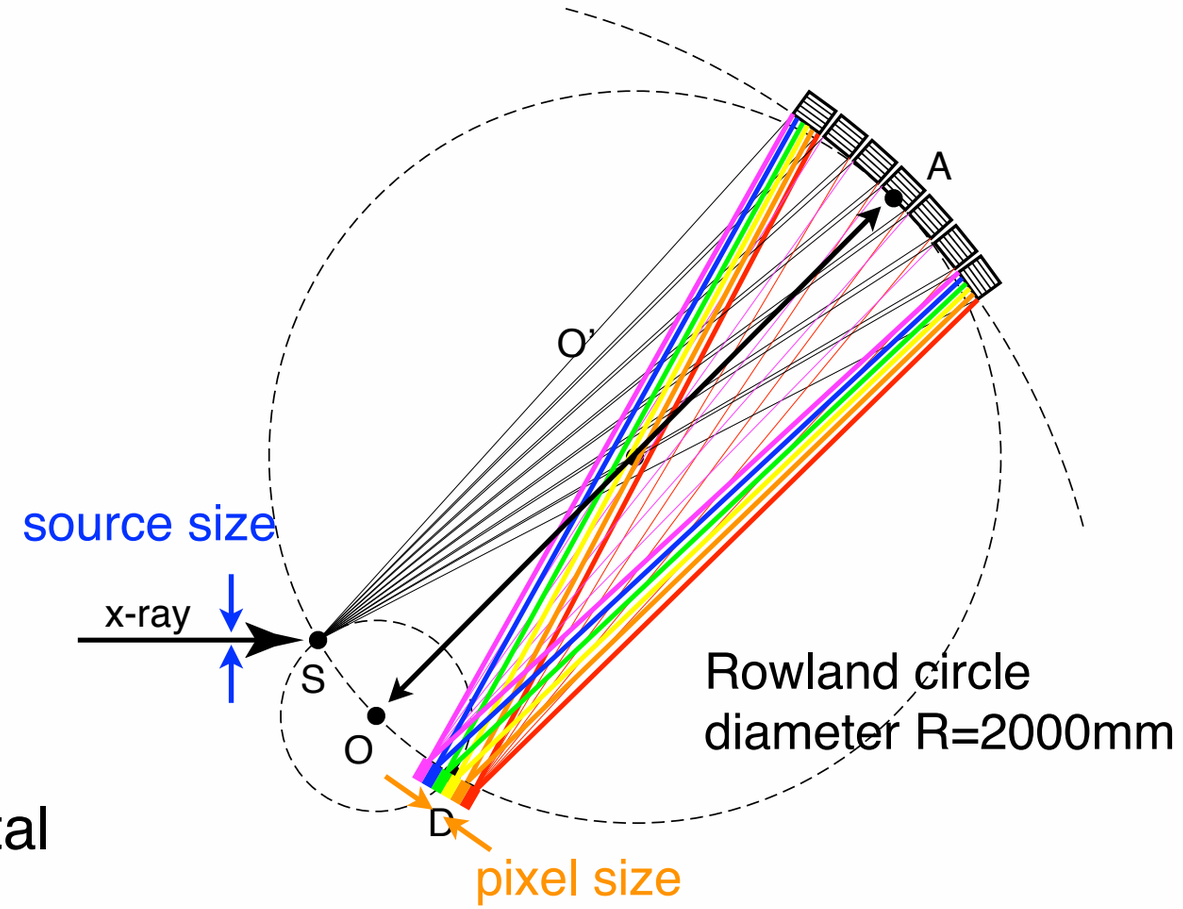
- Scattered photon (ΔE_f)
  2. beam size on the sample (s)
     s = 0.04 mm

  3. Intrinsic (Darwin) width of analyzer crystal
     $\Delta\omega$ = 23.5 μrad

  4. pixel size of detector (p)
     p = 0.172 mm for PILATUS
     p = 0.050 mm for MYTHEN

$$\Delta E_f = E \cdot \cot\theta_B \cdot [(s/R)^2+(\Delta\omega)^2+(p/2R)^2]^{1/2}$$

Bragg angle of Si(555) at E = 9900 eV
θ_B = 86.3903°

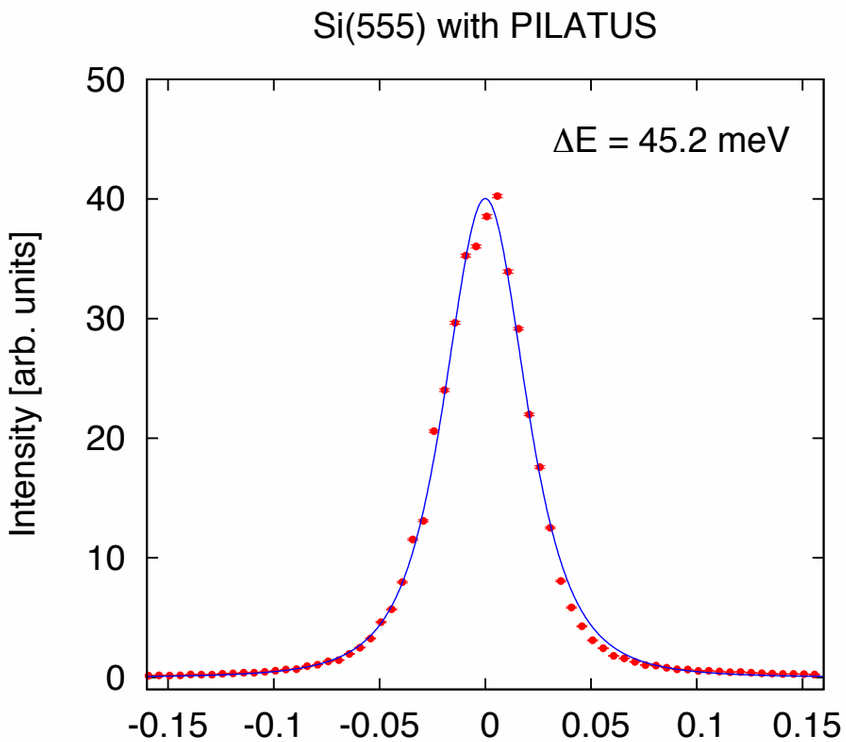


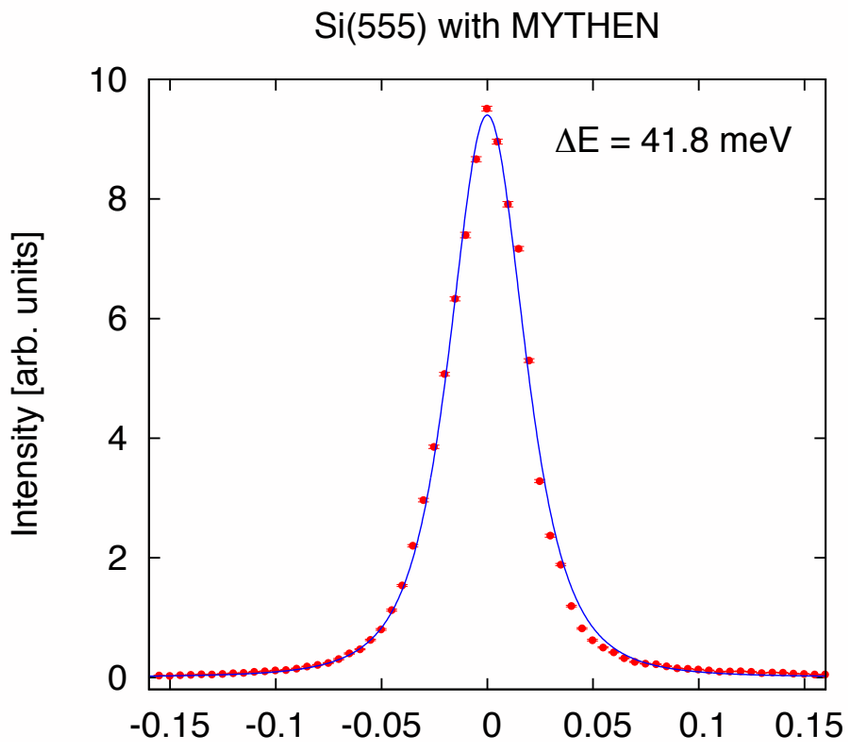
<u>Experimental conditions</u>

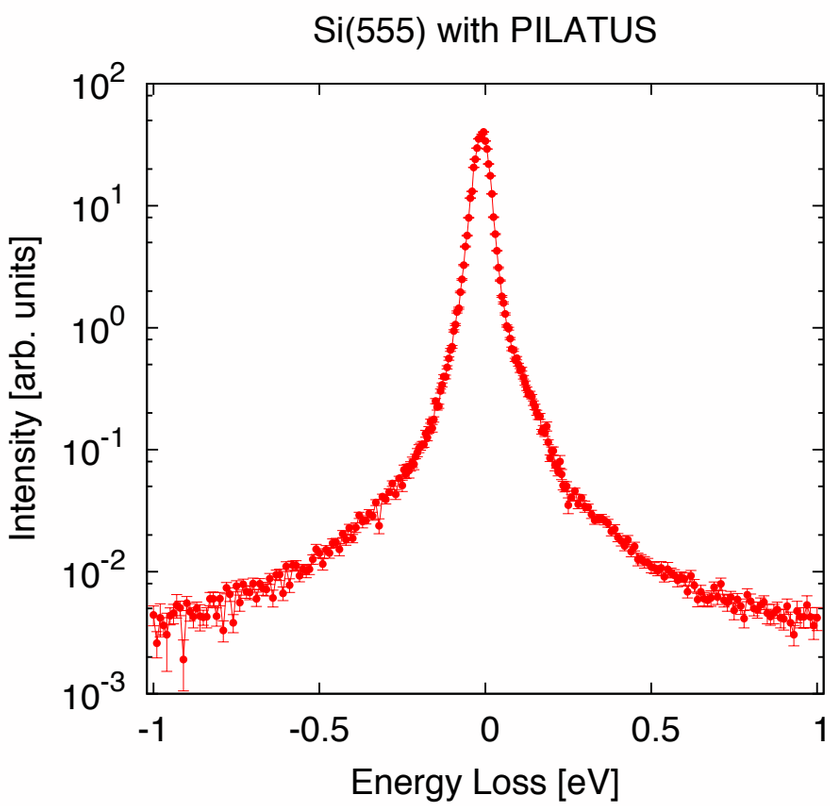
- sample
  Kapton tape

- scattering angle
  2θ = 30°

Experimental results







red circles:
experimental data
blue lines:
fitting result using Lorentzian squared
+ constant background

Comparison with expected values

photon energy (E)	9900 eV	
Miller index of analyzer and Bragg angle (θ_B)	Si(555), 86.3903°	
Incident beam resolution (E_i)	31.5 meV	
beam size at sample (s)	12.50 meV	
analyzer Darwin width ($\Delta\omega$)	14.68 meV	
pixel size of detector (p)	PILATUS 26.87 meV	MYTHEN 7.81 meV
expected total resolution	45.67 meV	37.75 meV
experimental resolution	45.2 meV	41.8 meV

Experimental resolutions are comparable to the expected values!