

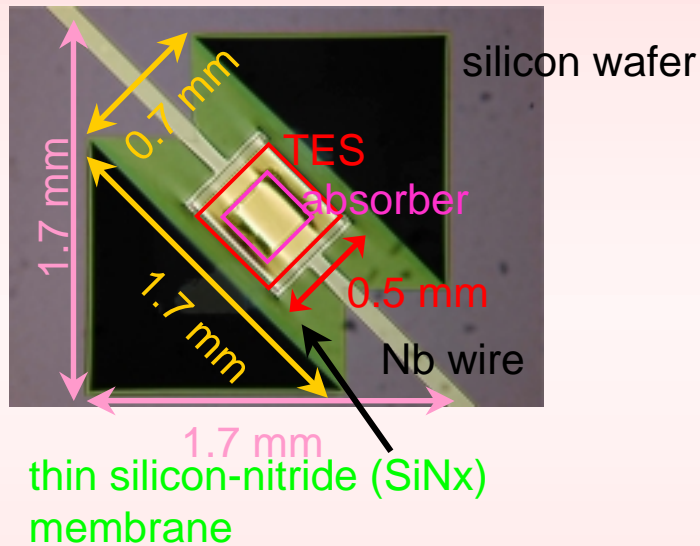
Analyses on the Operating Point Dependence of the Energy Resolution with a Ti/Au TES Microcalorimeter

Umeyo Morita, Y.Ishisaki, T.Koga, T.Ohashi (TMU), S.F.Terracol, T.Miyazaki, S.Friedrich (LLNL), K.Mitsuda (ISAS), K.Tanaka (SII)



Device

Bridge type TES calorimeter



TES

Ti/Au bilayer
Ti/Au = 40/110 nm thickness

Au absorber

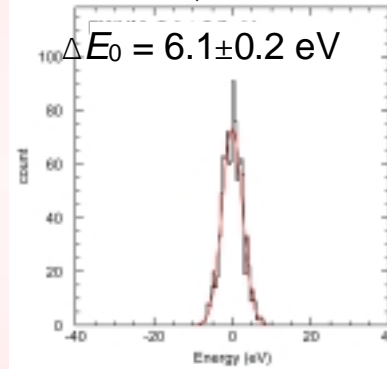
0.3×0.3 mm,
300 nm thickness

0.2 mm ϕ sapphire collimator attached on the absorber.

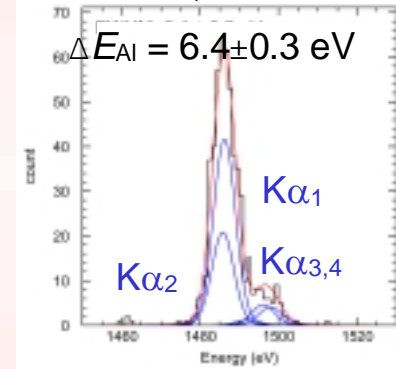
Energy spectrum

- corrected with the forth order polynomial
- using a multiline fit (considering the natural widths)

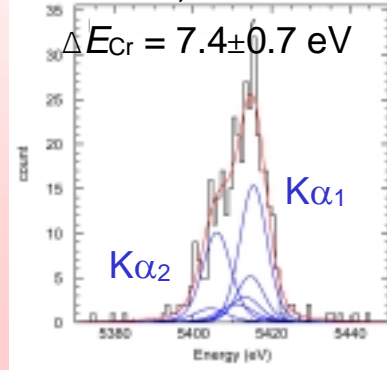
Baseline, $R = 48 \text{ m}\Omega$



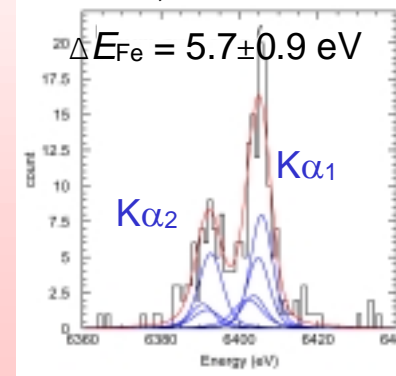
Al-K α , $R = 44 \text{ m}\Omega$



Cr-K α , $R = 36 \text{ m}\Omega$



Fe-K α , $R = 32 \text{ m}\Omega$

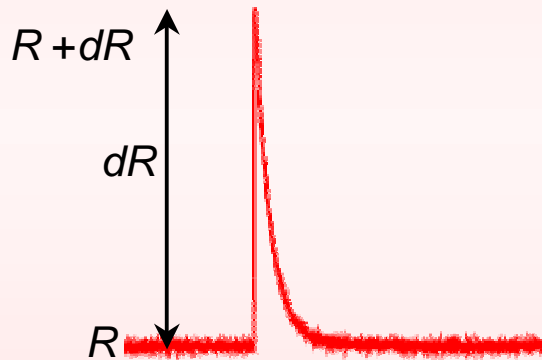


The operating points giving the best resolution are different for the X-ray lines.

Operating point dependence

R [m Ω]	ΔE_0 [eV]	ΔE_{Al} [eV]	ΔE_{Cr} [eV]	ΔE_{Fe} [eV]
48	6.1	7.1	10.3	19.0
44	6.4	6.4	9.9	12.8
36	6.4	8.7	7.4	8.9
32	6.5	8.2	9.4	5.7

including the resistance shift dR at the pulse peak for each energy,

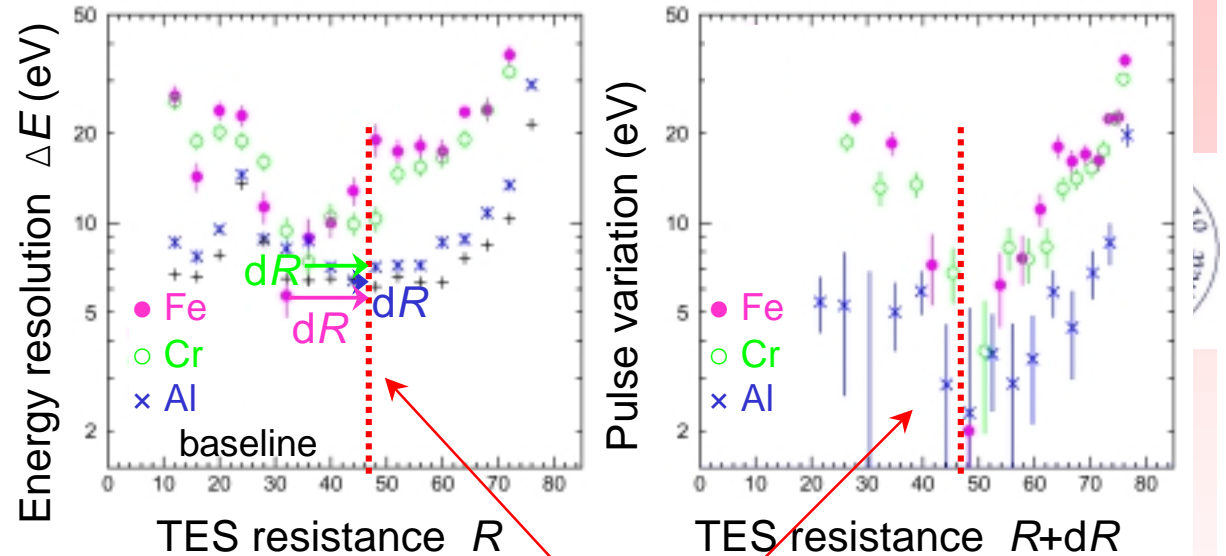


- the best resolution
- the minimum pulse variation ($= \sqrt{\Delta E^2 + \Delta E_0^2}$)
- the small gradient of α

is seen at $R+dR \sim 48 \text{ m}\Omega$

Estimation of the energy resolution

- In the case that the pulse variation is negligible,
- the noise spectrum should also be evaluated at the pulse peak, i. e. $NS(f; R+dR)$.



48 m Ω

