# Fermi Surface and Its Temperature Dependence in $Sr_2RuO_4$ by High-resolution Compton Scattering Experiments

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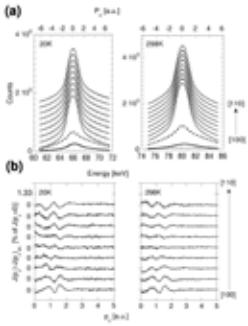
**Electron occupation number densities (ONDs) projected on the (110) plane in momentum space have been obtained using high-resolution Compton scattering experiments to elucidate Fermi surface signatures in the derivative images of the densities. The OND measured at 20 K shows an image that represents the well-known Fermi surfaces of $Sr_2RuO_4$ consisting of α, β, and γ Fermi surfaces (FSs), while that measured at room temperature shows an image in which the β and γ FSs are significantly suppressed. This temperature dependence is not explained only by the band structure predicted by the LAD-based band theory, suggesting the importance of including mass enhancement factors for the reduction of the band width.**

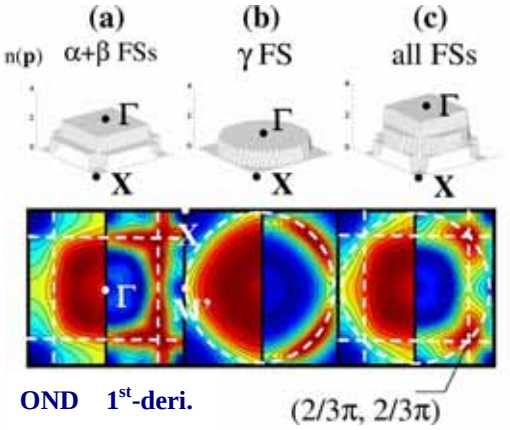
**The experiments were carried out at ID15B, ESRF and BL08W, SPring-8. The data at 20 K were obtained at ID15B and the data at room temperature (298 K) were at BL08W.**



(a) Raw spectra (thin lines), core-electron contributions (thick lines), and multiple- scattering contributions (broken lines).
(b) Anisotropies of directional Compton profiles

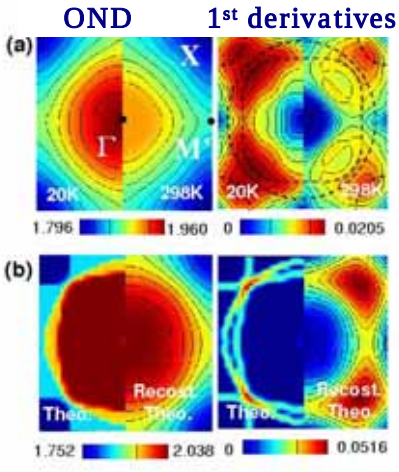
## Simulations of Model Fermi Surfaces

**The electron occupation number densities (ONDs) and their 1st derivatives are shown for three models of Fermi surface (FS): (a) α + β FSs, (b) γ FS, (c) α + β + γ FSs. Compton profiles were computed along the same directions to the experiments, and then the ONDs were obtained by following the same procedures to the data-processing of the experimental results.**




**The OND of the 20 K data reflects the α, β, and γ FSs geometry, while that of 298 K shows only the signature of α FS. These findings are not understood within the LDA band theory. The rescaling of the band widths due to mass enhancement could explain the difference: the β and γ FSs show larger enhancement factors than the α FS [1].**

**[1] A. P. Mackenzie et al, PRB 54(1996) 7425.**




(a) Experimental ONDs and their 1st derivatives at 20 K and 298 K
(b) Theoretical ONDs and their derivatives. The left sides are as-calculated OND, and the right sides are reconstructed OND from the theoretical Compton profiles.