Mott criticality in the quasi-two-dimensional organic conductor κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl: NMR and transport studies

F. Kagawa,[1] K. Miyagawa,[1,2] and K. Kanoda[1,2]

[1]*Department of Applied Physics, University of Tokyo, Hongo 7-3-1, Bunkyo-ku Tokyo 113-0033, Japan.*
[2]*CREST, Japan Science and Technology Corporation, Kawaguchi 332-0012, Japan*

The quasi-two-dimensional organic conductor κ–(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl is a prototypical Mott insulator with an effectively half-filled band and undergoes the bandwidth-controlled Mott transition under soft pressure (~ 30 MPa). As shown in Fig. 1, the Mott transition is a first-order transition with a finite-temperature critical endpoint. At the critical point, the Mott transition occurs continuously and thus the critical phenomena of Mott transition (i.e. the Mott criticality) develop around the critical endpoint. We investigated magnetic and transport properties of the Mott criticality using NMR and conductance measurements.

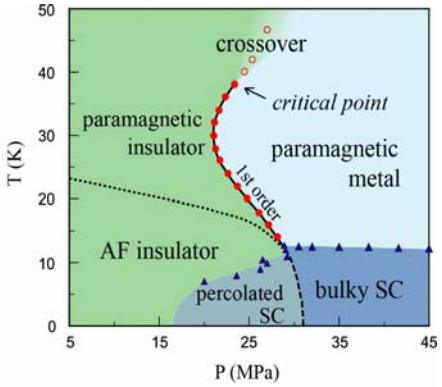

Fig. 1: Pressure-temperature phase diagram of κ–(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl [1].

From the NMR measurements, we found that the spin-lattice relaxation rate $1/T_1$ show no divergent behavior at the endpoint. From the conductance measurements, we found the unconventional critical exponents (δ, β, γ) ~ (2, 1, 1) [2], which is significantly different from the reported values for the three-dimensional system, Cr-doped V_2O_3 [3].

[1] F. Kagawa *et al*., Phys. Rev. B **69**, 064511 (2004); Phys. Rev. Lett. **93**, 127001 (2004). [2] F. Kagawa *et al*., Nature **436**, 534 (2005). [3] P. Limelette *et al*., Science **302**, 89 (2003).