Recently, we have studied the magnetotransport phenomena in high-Tc cuprates and in π-BEDT-TTF organic superconductors on the basis of the Fermi liquid theory \[1\]. Based on the ‘exact’ expressions for the Hall coefficient \(R_H\) \[3\] and for magnetoresistance (MR) \[4\], we studied their behavior in nearly antiferromagnetic (AF) Fermi liquid state. We take care to satisfy the Ward identity \[5\] in order not to violate the conserving laws and several rigorous relations in the Fermi liquid. In this article, we explain the essence of our works and point out the mistakes in the comment by O. Narikiyo \[6\].

(i) **Yamada-Yosida theory**: Based on the Fermi liquid theory, Yamada and Yosida proved exactly that the resistance becomes ‘zero’ even at finite temperatures, if there are no Umklapp processes \[7\]. This rigorous result is reproduced within the fluctuation-exchange (FLEX) approximation with all the vertex corrections required by the Ward identity; one Maki-Thompson (MT) term and two Aslamazov-Larkin (AL) terms as shown in Fig.1. It is proved in Appendix D of Ref. \[7\] by using the fact that the Bethe-Salpeter equation in the FLEX approximation is equal to the exact one, eq. (6-13) or (6-17) of Ref. \[7\], except for the kernel function; \(\Delta_0(k,k';q,k - q)\). This fact means that the analysis of the conductivity with Umklapp processes in Ref. \[7\] is also reproduced by the FLEX. In conclusion, the related criticism in Ref. \[6\] is false as stated above.

(ii) **\(T_{22}^{(a)}\) in the FLEX**: According to Eliashberg \[8\], \(T_{22}^{(a)}(p,p')\) is given by the difference across the branch cuts, so it is ‘pure imaginary’. As is known, the imaginary part of a four-point vertex at finite energies should contain (at least) two \(\rho_k(0)\)'s in it \[3\]. This fact is overlooked in Ref. \[6\]. As for the MT-term, \(T_{22}^{(a)}(p,p + q)\) in the FLEX approximation is proportional to \((U^2T^2)\mathrm{Im}\chi_q(\omega)/\omega|_{\omega=0}\) if charge fluctuations are negligible \[1\]. \(\chi_q(\omega) = \chi_q^0(\omega)/(1 - U\chi_q^0(\omega))\) is the spin susceptibility, and \(\chi_q^0(\omega) = -T\sum_{\epsilon,k} G_k(\epsilon)G_{k+q}(\epsilon + \omega)\). We can show that

\[\text{Im}\chi_q(\omega)/\omega|_{\omega=0} = (1 + U\chi_q(0))^2 \cdot \text{Im}\chi_q^0(\omega)/\omega|_{\omega=0}\]

Thus, \(T_{22}^{(a)}\) coming from the MT-term (\(T^{(a)}\) in Fig.1) is shown in the r.h.s of Fig.2 which is compatible with the Fermi liquid theory because \(\rho_k(0)\) represents the ‘coherent part’. Thus, the criticism against the MT-term of the FLEX approximation in Ref. \[6\] is incorrect. This term together with \(T^{(b,c)}\) in Fig.1 form the three diagrams in Fig.5 of Ref. \[7\], so Yamada-Yosida theory is satisfied exactly in the FLEX as explained in (i).

When the AF fluctuations are strong due to nesting like in high-Tc cuprates, which is beyond the scope of the analysis by Yamada-Yosida, \(T_{22}^{(a)}\) gives the additional temperature dependence on both \(R_H\) and MR. The mechanism, which is the main conclusion of Ref. \[1\], \[2\], \[3\] is based on the established Fermi liquid theory.

In summary, the criticisms by Ref. \[6\] are misunderstandings. The famous ‘seemingly’ non-Fermi liquid behavior of the magnetotransport phenomena in high-Tc and in π-BEDT-TTF is naturally understood from the standpoint of the nearly AF Fermi liquid.

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\[9\] A.A. Abrikosov, L.P. Gor’kov and I.E. Dzyaloshinskii: Methods of Quantum Field Theory in Statistical Physics (Pergamon Press, Oxford).