# Large Composite Fermion Effective Mass at Filling Factor 5/2

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The growth of ultra-high mobility GaAs/Al-GaAs two dimensional electron gas systems (2DEG) has opened a path for the exploration of a plethora of exotic quantum states. Notably, the fractional quantum Hall (FQH) effect arises when such a material is cooled to cryogenic temperatures below a few hundreds of mK and subjected to high magnetic fields above a few Teslas. Among the sequence of composite fermion FQH states in the second Laudau level, the 5/2 state [1] emerges as a favorite for fundamental research and applications. Indeed, it is expected to host anyonic quasi-particles that obey non-Abelian quantum statistics [2], *i.e.* under an exchange of particles, the quasi-particle ground state wave-function undergoes a non-trivial transformation within the quasi-particles Hilbert's space. Along with being of fundamental importance for our understanding of quantum mechanics, this property is one of the building blocks of topologically protected (fault-tolerant) quantum computations [3].

An experimental demonstration of the non-Abelian nature of the 5/2 state is still lacking mostly because of the state's fragility since it requires temperatures below 500 mK and exquisite sample purity. Additionally, previous works [4] aiming to study the non-Abelian properties of the 5/2 state relied on the conventional Hall bar geometry for transport measurements, which unavoidably included edge states detrimental to the accuracy of bulk properties. Conversely, in this work [5], enabled by Corbino geometry samples, the "true bulk" thermodynamic properties are probed using a time resolved measurement scheme. The thermal conductance and the thermal relaxation time are measured as a function of temperature in order to infer the temperature dependence of the specific heat at filling factor 5/2. As such, the specific heat data at electron temperatures ranging from 20 mK to 200 mK reported in this work allows the extraction of key properties of the 5/2 state. For instance, the effective mass of 5/2 composite fermions in the Fermi liquid phase is linked to the specific heat [7] and yields a large effective mass ranging from 2 to 4 times the bare electron mass $m_e$. As shown in Fig. 1, our effective mass estimation in the Fermi liquid phase of the 5/2 state is unambiguously larger than previously reported values in the 1/2 state and consistent with thermopower measurements [4]. Finally, the bulk thermal conductance data acquired in this work can also give insights on the bulk behavior of the 5/2 state [9].

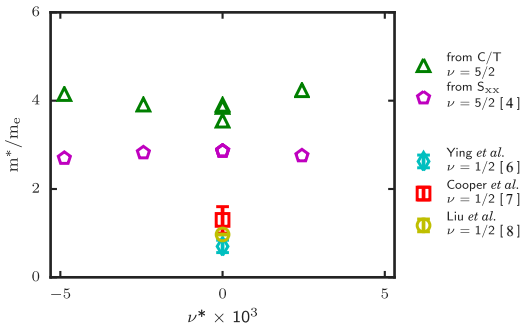


Fig. 1. Effective mass measured in [5] at filling factor 5/2 compared to other results at 5/2 and 1/2.

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