NMR study of the Tomonaga-Luttinger liquid state in the carbon nanotubes

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Carbon nanotubes (CNT) are perfect candidates to realize 1D electronic systems, such as described by the Tomonaga-Luttinger Liquid theory. Although the TLL behavior in the electronic transport was reported for metallic CNT, conductivity measurements can be spoiled by contact effects such as Coulomb blocade. On the other hand, NMR provides a non invasive probe of the electronic properties of a bulk system such as CNT bundles. I will present 13C NMR studies of the single and double wall nanotubes. Namely, in the single wall species (SWCNT) the nuclear relaxation study reveals that spin excitations are gapless down to at least 6K and the characteristic power law dependence of 1/(T1T) could be followed over two decades in temperature. The observed exponent is smaller than expected in the two-band model used to describe the metallic CNT. The field dependence of the relaxation rate indicates a frequency dependence of the correlation function, however its origin remains unclear.