Spin correlation and dynamics of the spin-liquid material $\text{EtMe}_3\text{Sb[Pd(dmit)]}_2$ revealed by in-plane ESR measurements

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The anion radical salts $X\text{[Pd(dmit)]}_2$, where $X$ is a monovalent cation, are Mott insulators which consist of a $S=1/2$ triangular lattice. These salts have attracted attention over the years since the geometrical spin-frustration can be controlled by substituting the cation $X$. While most of them show a Néel order, the $\text{EtMe}_3\text{Sb[Pd(dmit)]}_2$ shows no long-range order down to 30 mK. Although many studies suggest the title compound as a candidate material for the quantum spin-liquid state, the triangular lattice is strongly distorted and the nature of the ground state remains unclear. Therefore, the electronic states of $\text{EtMe}_3\text{Sb[Pd(dmit)]}_2$ have been investigated by ESR measurements. As shown in the ‘in-plane’ angular dependence of the g-value (see Fig. 1), we have observed the splitting of two ESR absorptions coming from two independent anion layers in which the dimer stacking directions are different. This observation suggests the interlayer exchange interaction is infinitesimal, estimated ca. 0.37 mK, which is in a good agreement with the absence of long-range order in this salt. Moreover, the in-plane angular dependence of the ESR linewidth shows some features reflecting the non-equivalent triangular exchange interactions. Linewidth minima are observed when the magnetic field is applied along the strongest and second-strongest triangular exchange path, and a maximum is observed for the weakest triangular exchange path. Interestingly, the former ESR lineshape profile is a Lorentzian, while the latter is a Gaussian which might be due to the competition of two frustrating spin-chains. The characteristic ESR behavior of this salt will be presented in contrast with other salts that have different ground state, and its low temperature electronic state will be discussed.

![Figure 1: In-plane angular dependence of the g-value at 4.7 K](image_url)