Dimensionality switching in electric conduction in FeS TOMO-HIRO TAKAYAMA, KOHSHI TAKENAKA, HIDENORI TAKAGI, RIKEN(The Institute of Physical and Chemical Research), also at University of Tokyo and CREST-JST — Orbital degree of freedom plays an essential role in the properties of strongly correlated systems, and will be a key function in the next generation. The orbital state, namely, shape of electron cloud, can affect some macroscopic properties such as transport properties. We have indeed observed a dimensionality change in electric conduction in stoichiometric iron sulfide, FeS, as a consequence of change in orbital states. FeS crystallizes in a NiAs-based troilite structure and is an antiferromagnetic semiconductor below $T_N = 600$ K. At $T_s \sim 400$ K, spin-axis transition, the rotation of antiferromagnetically ordered spins of iron atoms, occurs; the spins are directed along $c$-axis at low temperatures, and they rotate and lie in $c$-plane at $T_s$. This transition involves a change in orbital states of Fe$^{2+}$ ions. The outermost electron of Fe$^{2+}$ ions spreads in basal-plane below $T_s$, while it elongates in $c$-direction above $T_s$. This change strongly couples onto the electric conduction and induces its dimensionality change from two-dimensional below $T_s$ to three-dimensional above $T_s$. We will discuss this change in orbital states and its appearance in electric conduction.