Direct observation of asymmetric band structure of bilayer graphene through quantum capacitance measurements KAORU KANAYAMA, KOSUKE NAGASHIO, TOMONORI NISHIMURA, AKIRA TORIUMI, The University of Tokyo — Although upper conduction and valence sub-bands in bilayer graphene are known to be asymmetric, a detailed analysis based on the electrical measurements is very limited due to the infirm quality of gate insulator. In this study, the electrical quality of the top-gate Y$_2$O$_3$ insulator is drastically improved by the high-pressure O$_2$ post-deposition annealing at 100 atm and the carrier density of $\sim 8 \times 10^{13}$ cm$^{-2}$ is achieved. In quantum capacitance measurements, the drastic increase of the density of states is observed in addition to the van Hove singularity, suggesting that the Fermi energy reaches upper sub-band. At the same carrier density, the sudden reduction of the conductivity is observed, indicating that the inter-band scattering occurs. The estimated carrier density required to fill the upper sub-bands is different between electron and hole sides, i.e., asymmetric band structure between upper conduction and valence bands is revealed by the electrical measurements.