An overview of the LIDAR observations of asteroid 25143 Itokawa

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The LIght Detection And Ranging instrument (LIDAR) on the Hayabusa spacecraft of the Japanese asteroid sample return mission has been operated since September 9(UT), 2005 near the near-Earth asteroid 25143 Itokawa (S-type asteroid). A total operation time of LIDAR, mostly in the Home Position along the Itokawa-S/C-Earth line at about 7 km altitude, was 1140 hours until November 25(UT), whereas the available data of reflected signal from the asteroid surface were reduced to about 40% of total LIDAR shots due to worse spacecraft pointing caused by reaction wheel failures. Although a planned systematic survey on the whole surface of Itokawa by LIDAR footprint of 5x12m from a 7km altitude was cancelled by this worse pointing, LIDAR could perform the observations to derive the whole shape of target asteroid, its surface local topographic profiles and the internal structure resulting from the gravity measurements. We present here the overview of our LIDAR observations, and show that asteroid Itokawa is the small asteroid with the mass of 3.58 +- 0.18 x 10^{10} kg, and the resulting low bulk density of 1.95 +- 0.14 g/cm^3 implies the presence of unusually high porosity of 39% in S-type asteroid.