Research on laser in-sky safety early warning method for high power debris laser ranging system

Xue Dong, Hongyu Long, Zhipeng Liang, Xingwei Han, Jian Gao, Qingli Song, Guohai Zhao, Haitao Zhang
Changchun Observatory of National Astronomical Observatories, Chinese Academy of Sciences, Changchun, China

A method for judging the in-sky safety of the laser beam pointing for high-power debris laser ranging (DLR) system is proposed. It realized the real-time safety area judgment and early warning of the laser beam intersection with the transiting aircraft. We build the laser beam pointing safety warning system at Changchun Station to validate the method. Results showed the intersection time between the transiting aircraft and the laser beam accounts for 0.86% of the observation time, which does not affect the regular operation of the laser ranging system; the energy density of the aircraft outside the intersection area is between 10-14 ~ 10-25 J/cm2, which is much smaller than the laser safety threshold corresponding to the ANSI Z136 standard. Result shows the effectiveness of the laser in-sky safety warning method on the high-power debris laser ranging system.