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An Experiment to Detect Lunar Horizon Glow with the Lunar Orbit Laser Altimeter Laser Ranging Telescope

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Lunar horizon glow (LHG) was an observation by the Apollo astronauts of a brightening of the horizon around the time of sunrise. The effect has yet to be fully explained or confirmed by instruments on lunar orbiting spacecraft despite several attempts. The Lunar Reconnaissance Orbiter (LRO) spacecraft carries the laser altimeter (LOLA) instrument which has a 2.5 cm aperture telescope for Earth-based laser ranging (LR) mounted and bore-sighted with the high gain antenna (HGA). The LR telescope is connected to LOLA by a fiber-glass cable to one of its 5 detectors. For the LGH experiments the LR telescope is pointed toward the horizon shortly before lunar sunrise with the intent of observing any forward scattering of sunlight due to the presence of dust or particles in the field of view. Initially, the LR telescope is pointed at the dark lunar surface, which provides a measure of the dark count, and moves toward the lunar limb so as to measure the brightness of the sky just above the lunar limb immediately prior to lunar sunrise. At no time does the sun shine directly into the LR telescope, although the LR telescope is pointed as close to the sun as the 1.75-degree field of view permits. Experiments show that the LHG signal seen by the astronauts can be detected with a four-second integration of the noise counts.