The Semiconductor Guidestar Laser: A Novel, Affordable, Low SWaP Sodium Guide Star Laser for Adaptive Optics Tracking of Space Objects

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The Australian National University (ANU) is leading the development of a new type of sodium (589nm) guidestar laser that promises to revolutionise Laser Guide Star Adaptive Optics (LGS AO) use in space surveillance, astronomy and laser communication applications. Based on novel, affordable, and low SWaP semiconductor technology, a full-scale prototype of the Semiconductor Guidestar Laser is being built by US laser manufacturer Areté Associates in partnership with ANU, EOS Space Systems, Lockheed Martin Space Systems and other Australian and US academic and industry partners. The laser, to be delivered in early 2019, will be initially installed on the EOS satellite and debris tracking station 1.8m telescope at Mount Stromlo Observatory where it will be thoroughly tested, on sky and in real operation conditions.

In the context of the Space Environment Research Centre (SERC), ANU is also installing two LGS AO systems on the EOS 1.8m telescope. These will enable LEO object imaging, significantly improve GEO object tracking accuracy, and make it possible to demonstrate manoeuvring of LEO debris by photon pressure using an AO-compensated EOS/Lockheed 10-20kW infra-red (IR) laser. The Semiconductor Guidestar Laser will be co-mounted, co-aligned, and propagated either separately or together with the fiber-based sodium guidestar laser being developed by EOS for SERC operations. If all goes according to plan, 2019 will see the first Laser Guide Star ever created in Australian skies, and the first experimental, on-sky demonstration of a space debris manoeuvre by photon pressure from a sodium LGS AO-corrected ground-based IR laser.