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Understanding silicon for optics

Most high energy lasers use single crystal silicon for the mirrors only, up to 460 mm diameter. McCarter has developed an all single crystal silicon telescope model that incorporates modular single crystal silicon mirrors with 39NiFe inserts for attachment, as well as single crystal silicon support structures to provide a system that is athermal. The telescope concept can scale up to meter class, as demonstrated for the SBL-IFX space based meter class laser. Single crystal silicon, a material that behaves isotropically; and McCarter processing methods are critical in providing 80-325 mm missile interceptor telescopes that will not blur, creep or jitter during thermal and/or mechanical loads. SiSi is the only material that can handle endo- and exothermal missions. After two decades of prototyping and third party testing McCarter has created a TRL-6 solution to overcome single crystal silicon size and complexity restraints. These manufacturing processes are comprised of single crystal silicon; glass frit bonding and metal insert attachment. McCarter silicon mirrors are successfully fielded in ABL, THEL, MTHEL, CRAM200, INSS and others. After building EKV mirrors during MDA SBIR B044-095-1205, “define and demonstrate a beryllium substitute material for GMD applications”, McCarter was contracted by WSMR to replace their cooled molybdenum mirrors with single crystal silicon mirrors incorporating our processing technology. Molybdenum is a heritage material that, like beryllium, is in-efficient and extremely expensive. The use of McCarter’s modular approach enabled a compact HEL system without the need for any coolers. This contract for WSMR, as well as another with MZA, Albuquerque NM with modular single crystal silicon helicopter HEL mirrors raised the technical readiness level to 6. In addition to detecting and deterring hostile missiles this same technology will mitigate space trash and protect against asteroids of all sizes.

Biography

Douglas R McCarter, Drhc, is the Technical Integrator of McCarter Machine & Technology Inc., founded in 1981. His patented and proprietary silicon processes achievements were documented by published technical papers and over 50 oral presentations. In turn, he has won many awards, mentioned in Forbes.com, Kiplinger Letter, Entrepreneur.com, NASA Tech Briefs, Missile Defense Briefs Open and Classified, and recognized as the current world expert in precision silicon components. He has served as member of Editorial Staff of Advanced Optical Technology, in Munich Germany since 2012. In 2016, Dr. Babin, Congressman District 37 and Leader of NASA Funding, endorsed him, and the staffers are working directly with backing of the development of McCarter Silicon Space Systems. In addition to over 3000 hours of Technical Schools, he has been directly mentored by the late Frank Anthony, Bell Labs and Roger Paquin Perk & Elmer, a retired Materials Expert.

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