Online LTP Seminar
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Aneutronic Fusion as a Driver for Technology Innovation

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TAE Technologies, Inc. (TAE) is a privately funded company pursuing a novel approach to magnetic confinement fusion, which relies on Field-Reversed Configuration (FRC) plasmas composed of mostly energetic and stable particles. This advanced FRC-based system simplifies the reactor design and could offer a path forward to clean, safe, and economical aneutronic p-B11 fusion.

To validate the science behind the FRC-based approach to fusion, an active experimental program is underway at TAE's state-of-the-art plasma research facility in Orange County, California. The core of the facility is the world's largest FRC device named Norman. In Norman, tangential injection of variable energy neutral beams (15 – 40 keV hydrogen, up to 20 MW total), coupled with plasma edge biasing, active plasma control, and advanced surface conditioning, led to production of steady-state, hot FRC plasmas dominated by fast ion pressure. High-performance, advanced beam-driven FRCs were produced, characterized by macroscopic stability, steady-state plasma sustainment, and dramatically reduced transport rates [1,2].

Our quest towards a practical FRC-based fusion reactor has stimulated innovation across a wide range of technologies. In particular, TAE, together with its collaborators at the Budker Institute (Russia), has successfully developed and operated several state-of-the-art accelerator systems. Numerous breakthrough innovations in negative ion beams and high-energy accelerator technology, which were originally introduced to serve current and future fusion experiments, have been combined to create an advanced commercial accelerator for targeted cancer radiation therapy. Similarly, power delivery systems developed for Norman are finding commercial applications in electric vehicles, as well as in residential, industrial, and utility-scale electrical grid applications.

References

[1] H. Gota et al., Nucl. Fusion 59, 112009 (2019)

[2] M. Binderbauer et al., Phys Plasmas 22, 056110 (2015)

Short Bio

Dr. Artem Smirnov is an expert on charged particle beams, plasma sources, diagnostics, innovative confinement concepts, and electric propulsion. He joined TAE Technologies in 2006 to lead the development of neutral beam technology, fast ion diagnostics, and plasma stabilization techniques. As a Chief Technology Officer, he is presently leading TAE's team of 200+ scientists and engineers pursuing disruptive R&D and technology commercialization projects in fusion energy, cancer therapy, power management, and data science. He holds several technology patents and has co-authored more than 50 peer-reviewed publications. Dr. Smirnov holds a Ph.D. in plasma physics from Princeton University and an M.B.A. from the UCLA Anderson School of Management.