

Excitation of Alfvén eigenmodes by low energy beam ions in the DIII-D and JET tokamaks

R. Nazikian^{1,*}, N. N. Gorelenkov¹, B. Alper², H. L. Berk³, D. Borba⁴,
R. V. Budny¹, G. Y. Fu¹, W. W. Heidbrink⁵, G. J. Kramer¹,
M. A. Makowski⁶, S. D. Pinches², S. E. Sharapov², W. M. Solomon¹, E. J.
Strait⁷, R. B. White¹, M. A. Van Zeeland⁷, and JET-EFDA contributors⁸

¹*Princeton Plasma Physics Laboratory,
Princeton, New Jersey 08543, USA*

²*Euratom/UKAEA Fusion Association, Culham Science Centre,
Abingdon OX14 3DB, United Kingdom*

³*University of Texas at Austin, Austin, Texas 78712, USA*

⁴*Euratom/IST Fusion Association, Centro de Fusao Nuclear, Lisboa, Portugal*

⁵*University of California Irvine, Irvine, California 92697, USA*

⁶*Lawrence Livermore National Laboratory, Livermore, California 94550, USA*

⁷*General Atomics, San Diego, California 92186-5608, USA and*

⁸*See the Appendix of M.L. Watkins, et al.,
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Abstract

Core localized Alfvén eigenmodes in DIII-D [J.L. Luxon, Nucl. Fusion **42**, 614 (2002)] and Joint European Torus (JET) [P.H. Rebut and B.E. Keen, Fusion Technol. **11**, 13 (1987)] plasmas are driven by deuterium neutral beam ions traveling well below the Alfvén speed. Modes are observed in reverse magnetic shear discharges with deuterium ion velocities as low as 0.23 and 0.16 of the Alfvén speed parallel to the magnetic field in DIII-D and JET plasmas, respectively. Ellipticity-induced Alfvén eigenmodes in DIII-D and toroidicity-induced Alfvén eigenmodes (TAEs) in JET are excited by deuterium ions traveling well below the fundamental passing ion resonance condition, indicating the role of high order resonances in driving these modes. NOVA-K analysis reveals many high order resonances as contributing to the mode drive at high central safety factor due to the correspondingly large poloidal orbit width and precessional frequency of the passing ions.

*rnazikian@pppl.gov