Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Calculation of the $3C/3D$ line intensity ratio in Fe XVII[1] CHARLES CHEUNG, University of Delaware, MIKHAIL KOZLOV, Petersburg Nuclear Physics Institute of NRC "Kurchatov Institute", SERGEY PORSEV, MARIANNA SAFRONOVA, University of Delaware — Some of the brightest X-ray lines in the spectra of many hot astrophysical objects arise from Fe XVII spectra around 15 Å: the resonance line $3C$ ($[(2p^5)_{1/2}3d_{3/2}]_{J=1} \rightarrow [2p^6]_{J=0}$) and the intercombination line 3D ($[(2p^5)_{3/2}3d_{5/2}]_{J=1} \rightarrow [2p^6]_{J=0}$). These lines are crucial for plasma diagnostics of electron temperatures, elemental abundances, ionization conditions, velocity turbulences, and opacities [1]. However, for the past four decades, their observed intensity ratios persistently disagree with advanced plasma models. We have carried out very large-scale relativistic configuration interaction (CI) calculations of the $3C/3D$ line intensity ratio, correlating all ten electrons, including Breit and quantum electrodynamical (QED) corrections, for Fe XVII [1]. Using a new parallel version of our CI code, we were able to increase the number of configurations to over 230,000, saturating the computation for all possible numerical parameters. Our theoretical 3C-3D energy difference of 13.44 eV is in agreement with the experiment [1] to 0.3%. The computational advances highlighted in this work are widely applicable and can be used on most elements in the periodic table.
Steffen Kühn et al., arXiv:1911.09707.

[1]This work was supported in part by U.S. NSF Grant No. PHY-1620687, Office of Naval Research, award number N00014-17-1-2252, and RFBR grants No. 17-02-00216 and No. 18-03-01220.

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Date submitted: 31 Jan 2020 Electronic form version 1.4