

Abstract Submitted
for the DNP16 Meeting of
The American Physical Society

Static and dynamic screening effect on the resonant alpha-alpha scattering in a QED plasma¹ XIAOJUN YAO, THOMAS MEHEN, BERNDT MUELLER, Duke Univ — The plasma screening effect on the low-energy $\alpha - \alpha$ (${}^4\text{He} - {}^4\text{He}$) scattering is studied by using the pionless effective field theory and thermal field theory. It is known that in vacuum a resonance lies at the center-of-mass energy 91.84 keV with a width 5.57 eV, identified as the ground state of ${}^8\text{Be}$. It is found that the static (Debye) screening decreases the resonance energy and width. A bound state starts to form when $m_D > 0.3$ MeV. However, when the dynamic screening effect is included, which results in an imaginary potential (damping rate), both the resonance energy and width increase with the plasma temperature. Then the screening effect on the thermal nuclear scattering rate is studied and found to suppress the rate by more than 800 times when the temperature is 10 keV around. These screening effects may have implications on the rates of nuclear reactions with a resonance in the thermal domain, many of which are of great interest in cosmology and astrophysics.

¹DE-FG02-05ER41367; DE-FG02-05ER41368

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Date submitted: 27 Jun 2016

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