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New formula of Debye length in solid metallic hydrogen KAZUNORI SHIBATA, RYOSUKE KODAMA, Graduate School of Engineering, Osaka University — In arbitrary quasineutral states, ionic potential is somewhat screened by electrons. The degree of the screening is represented by Debye screening length. The Debye length varies proportional to square root of the temperature in plasma state. When the temperature drops to the Fermi temperature, electrons undergo Fermi degenerate and the Debye length becomes independent of the temperature. Such situation also appears in solid states. We have researched in solid metallic hydrogen because it is said to be a high temperature superconductor and is an ideal matter to treat the Debye screening by the lack of orbital electrons. By taking into account the changes in electronic quantum statistical state, the formula of the Debye length in the superconductive state was derived. The Debye length in the superconductive state again depends on the temperature by bosonization of the electrons. As a one application, we also have calculated the penetration probability by using the WKB approximation. The probability at $n = 10^{31}\mathrm{m}^{-3}$ and T=10K is comparative that of a particle of about 7.5 eV penetrates bare Coulomb potential.

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