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On Proton Radiography of the Nonideal Plasma of Noble Gases

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In the present report possibilities of the proton radiography for equation of state measurements of shock compressed nonideal plasma of noble gases are discussed. We will analyze experiments with the shock-induced strongly coupled plasma of argon and xenon, which were conducted at the TWAC-ITEP proton radiography facility in 2010. The shock pressure P in argon tests was from 100 to 1000 bars, temperature T was 8-20 kK with non-ideality parameter Γ of about 1. In similar tests with xenon the values of P=4-6.5 kbar, T= 20-25 kK and Γ=1-2.5 were reached. The existence of shock waves in argon was registered by proton radiography. However the observed density gradient in these waves is of the same order as the sensitivity of the technique, so the accuracy of the experiment proved to be low. Considerably better situation is observed in xenon, where the formation and development of a shock wave and a plasma plug behind its front is firmly registered. Further processing of these proton radiography data on xenon allow to determine with sufficient accuracy the density of the developed strongly coupled plasma of xenon.

Primary author: Prof. MINTSEV, Victor (IPCP RAS)

Presenter: Prof. MINTSEV, Victor (IPCP RAS)

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