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High vacuum measurements at a linear inductive accelerator module

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We are going to present recent high vacuum pressure measurements recorded at new Prototype Accelerator Module (PAM) of the Advance Sources and Detectors (ASD) –Scorpius project [1]. To avoid the ion-hose instability [2] in our linear inductive accelerator with 2 kA, 20 MeV electron multi-pulse beams during radiographic scans, an advance high vacuum system and accelerator components were being developed. The Scorpius PAM vacuum chamber consists of three induction voltage adder beam lines, vacuum plenums with three different vacuum pumps: turbo-molecular pump (TMP; 1000 l/s), NEG pump (2100 l/s for H₂) and ion pump (500 l/s). An ultimate vacuum pressure of 4.0 to 5.0 1e-8 Torr along single PAM vacuum chamber was achieved. Dominant residual gases (H₂, H₂O, O₂, N₂, CO, Ar, CO₂) were recorded to understand different vacuum pumping speed configurations (NEG-ION configuration or production setup, NEG-ION-TMP pumps ON for vacuum roughing from atmosphere to high vacuum pressure, influences of each pump on different residual gas species in PAM, etc.). Measured results will be discussed and compared with the vacuum pressure simulations.

Footnotes

[1] M. Crawford, and J. Barraza, “Scorpius: The Development of a New Multi-Pulse Radiographic Systems”, IEEE 21st International Conference on Pulsed Power, Brighton, UK 18-22 June 2017, IAN 17563191.

[2] C. Ekdahl, “The Ion-Hose Instability in a High-Current Multi-Pulse Linear Induction Accelerator”IEEE Transactions on Plasma Sciences, Vol 47, No 1, January 2019, page 300-306.

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