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Tailored density profile of heterogeneous underdense medium of a multi-foil assembly for multi-keV x-ray sources optimization MICHEL PRIMOUT, DANIELE BABONNEAU, LAURENT VIDEAU, LAURENT JACQUET, CEA, CEA, DAM, DIF TEAM — We studied multi-keV x-ray source made of titanium foils assembly. The purpose of this heterogeneous structure is to create a medium with the same hydroradiative properties as an efficient -but yet non existing- pure metallic-like underdense homogeneous medium. We can mimic the multi-keV x-ray emission of an equivalent underdense medium of any density between 5 and 40 mg/cc. For both cases, the highest multi-keV x-ray conversion efficiency has been found at density around 20 mg/cc. This optimum is best realized by assembly of a set of 0.1 μm titanium foils separated by 20 μm of vacuum. Note that the concept can be easily extended to higher Z materials like iron, copper or germanium at higher x-ray emission energy. This approach allows us to build any non uniform homogeneous underdense medium with tailored density profiles : increasing or decreasing ones, both longitudinally and transversally to the laser incident direction. This is a very promising method provided that we can design any foils assembly with thickness as low as 0.1 μm, what has been proved feasible in recent studies of the reference [Shao-yong Tu et al in PoP, 21, 043107, 2014]. Each configuration has been simulated by the 2D rad-hydro code FCI2 with Arbitrary Eulerian-Lagrangian rezoning option.

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