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**Additive Manufacturing, Laser and Electron Beam Welding of GRCop-84 for a High Field Side LHCD Launcher for DIII-D** ANDREW SELTZMAN, STEPHEN WUKITCH, Massachusetts Institute of Technology — Recent advances in selective laser melting (SLM) 3D printing technology allow additive manufacture of RF launchers from a new material, Glenn Research Copper 84 GRCop-84, a $Cr_2Nb$ (8 at. % Cr and 4 at. % Nb) dispersion hardened alloy, in configurations otherwise unachievable with conventional machining processes. We present the design and construction techniques of an additively manufactured high field side (HFS) LHCD launcher for installation on DIII-D. We present studies of the metallurgical and mechanical properties of SLM printed GRCop-84 and techniques for brazing, laser and electron beam welding GRCop-84 to itself, oxygen free copper, and titanium-zirconium-molybdenum (TZM) alloy. Welds are analyzed with scanning electron microscopy and focused ion beam milling to verify distribution of $Cr_2Nb$ nano-crystals within the copper matrix. Additive manufacturing allows the integration of a novel impedance matching structure into the aperture of the launcher module for a reduction in electric fields in the vacuum section of the launcher and reduction in power reflection from the plasma surface when operating near the cut-off density. Work supported by the USDOE, OFES, using User facility DIII-D, under Award Number DE-FC02-04ER54698.

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