Abstract Submitted
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**In-Situ Additive Manufacturing Platform for Neutron, X-ray and Proton Beamlines**[1] JASON C. COOLEY, Sigma Division, Los Alamos National Laboratory, DONALD B. BROWN, MST-8, Los Alamos National Laboratory, JOHN S. CARPENTER, Sigma, Division, Los Alamos National Laboratory, BJORN CLAUSEN, MST-8, Los Alamos National Laboratory, CARL E. CROSS, THOMAS J. LIENERT, Sigma Division, Los Alamos National Laboratory, JOHN E. BERNAL, Sigma Division Los Alamos National Laboratory, ADRIAN S. LOSKO, MST-8, Los Alamos National Laboratory — Advanced manufacturing offers the promise to make high value components with complex shapes without complex machining or significant material waste on short notice. There are however significant technical barriers to overcome with focused research and development. In the case of metallic parts made by melting and depositing wire or powder, additive manufacturing results in repetitive heating and cooling of the deposited material. The thermal gradients imposed are significantly higher than typically encountered during casting. These gradients produce residual stresses we cannot currently predict and can cause the formation of undesirable secondary phases. Efforts to accurately predict the final state of materials manufactured additively will require an understanding of the time evolution of the microstructure which includes intertwined residual stresses, texture, and chemical inhomogeneity. The best way to understand these linked effects is to measure their evolution in-situ during the deposition process. In order to do this a prototype device for making quasi 1-D features while making real time beamline measurements (radiography and diffraction) has been built and recently tested.

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