Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

**Diagnostic Development for the Lockheed Martin Compact Fusion Reactor Project** BRADLEY SOMMERS, JAMES DUFF, ZACHARY HARALSON, CHRISTOPHER LOHFF, TOM MCGUIRE, NICOLO MONTECALVO, PATRICK NOYES, GAREN ORDOYAN, ARTAN QERUSHI, PATRICK ROSS, AARON SCHINDER, ELIZABETH STRANDBERG, ALEX WHITE, Lockheed Martin - Palmdale, CA — The T4B experiment is a linear, encapsulated ring cusp confinement device, designed to develop a physics and technology basis for a follow-on high beta machine as part of the compact fusion reactor program. Three non-invasive laser diagnostics have been developed to investigate confinement, neutral beam heating, and source behavior on the T4B device, including (1) a Thomson scattering system employing a 532 nm Nd:YAG laser to measure electron density and temperature, (2) a dispersion interferometer utilizing a continuous-wave CO2 laser (10.6 $\mu$m) to measure time resolved, line-integrated electron density and (3) a dispersion interferometer utilizing a continuous-wave, 532 nm Nd:YAG laser to measure time resolved, line-integrated electron density. An overview of laser systems, detection schemes, and data analysis techniques is presented, including up to date results obtained from the T4B experimental campaign. We also present a suite of non-invasive diagnostics for the T4B experiment looking at several aspects of the plasma performance including plasma emissions (bolometry, spectroscopy), stability, and magnetic field perturbations. 

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Date submitted: 10 Jul 2019 Electronic form version 1.4