Contribution ID: **601** Type: **not specified**

P2.028 Mechanical design of the high powered helicon antenna and strip line feed in the DIII-D tokamak*

Tuesday, 18 September 2018 11:00 (2 hours)

A high-powered "comb-line" helicon antenna for use within the DIII-D Tokamak is currently in design and fabrication at General Atomics. The antenna will drive current in high beta discharges using electromagnetic helicon waves. The high powered helicon antenna (HPHA) is expected to couple up to one MW of power into DIII-D plasmas at a frequency of 476 MHz. The antenna design includes 30 individual, inductively coupled modules fastened to six internally water-cooled Inconel back-plates. The end modules have special design features to provide RF stripline feed attachment points. Each back-plate is mounted to a pedestal, which is secured to the vessel wall via a combination of studs and welded brackets.

The mechanical design includes features to minimize and survive disruption forces, thermal loading from RF losses, vacuum vessel bake (350C), and installation considerations. Thermal stress design challenges include plasma heat loads, thermal ratcheting, and bake-out cycles that result in thermal growth differences between the strip line and the vessel. Splitting the back-plate into six sections each with a central pedestal support significantly reduces the disruption loads. A single strip line folded in half, fed near the fold provides a 180° phase shift between the strip line module connections for driving the two module straps. This looped mono RF coaxial stripline design was chosen for optimal properties in space limitations, ease of attachment, installation, structural rigidity and RF tuning ability. The strip lines are supported by a quarter-wavelength "stub", mid span, for support during thermal cycling and plasma disruption events. Multiphysics FEA analyses are performed to optimize the geometric shapes to meet the aforementioned design challenges.

A description of the mechanical design, fabrication, installation, and analyses of the HPHA and stripline feeds will be presented.

- Work supported in part by the US Department of Energy under DE-FC02-04ER54698 and DE-AC02-09CH11466.

Presenter: FISHLER, Benjamin (Fusion Group General Atomics)

Session Classification: P2