Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Application of Laser Ablation Inductively Coupled Plasma Mass Spectrometry and Enriched Tungsten Isotopes to Nuclear Fusion Impurity Transport Research[1] JONAH DURAN, JACK NOWATARSKI, DAVID DONOVAN, Univ of Tennessee, Knoxville, EZEKIEL UNTERBERG , MIKE ZACH, Oak Ridge National Laboratory — During the DIII-D Metal Rings Campaign of 2016, one divertor tile-array was coated in natural tungsten (W) (26.5% W-182) and the other array was coated with 93.5% isotopically enriched W-182. The unique isotopic fingerprint of the enriched W-182 coating enabled the eroded W to act as tracer particles. Graphite collector probes (CPs) were inserted into the plasma scrape-off-layer (SOL) at the outboard midplane during operations to sample W escaping the divertor region. The use of W tracer particles and isotopic analysis of the CPs provides unique information on how various plasma operating configurations affect impurity production from the divertor and transport within the SOL. Laser Ablation Mass Spectrometry (LA-MS) is used in order to measure isotopic ratios of the W deposited on the CPs. Initial tests have revealed enrichment on the probes up to nearly 93% which corresponds with sourcing of impurities from the enriched W-182 tile-array. Additional empirical evidence is provided for understanding divertor high-Z sourcing and transport through trace plasma material interaction studies with low-Z walls. With the Stable Isotopic Mixing Model, relative contribution from each W source is also provided.

[1]Work supported by US DOE under DE-SC0016318 (UTK), DE-AC05-00OR22725 (ORNL) and DIII-D contract DE-FC02-04ER54698.

Jonah Duran
Univ of Tennessee, Knoxville

Date submitted: 12 Jul 2017 Electronic form version 1.4