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Application of High Harmonic Fast Waves to Off-Axis Current Drive in DIII-D,* R. Prater, R.I. Pinsker, C.P. Moeller, *GA*; M. Porkolab, *MIT*; V.L. Vdovin, *Kuchatov Institute* – High harmonic fast waves, also called “whistlers” or “helicons,” may be an effective means of driving current off-axis in high performance discharges in DIII-D. Modeling using the GENRAY ray tracing code APP shows that fast waves launched with frequency 500 MHz tend to spiral around the magnetic axis. If the electron beta is above 1.7%, the waves are damped around $\rho=0.5$ for a broad range of conditions. The fast wave current drive in the test discharge is 2 to 4 times larger per MW than that from the electron cyclotron heating or neutral beam injection systems on DIII-D. Interestingly, the current drive location and magnitude are nearly independent of the launched $n_{||}$ over the range 2 to 4. Use of a moderately large value, $n_{||}=3$, reduces the possibility of mode conversion to the slow wave. A traveling wave antenna is expected to be effective at launching the wave with a narrow spectrum of $n_{||}$, which also helps avoid mode conversion. A test of the physics of high harmonic fast wave current drive is planned for DIII-D.

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