Integrated Schottky Receiver for Small Satellite Deployment

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Abstract—The terahertz portion of the electromagnetic spectrum is of intense interest to astrophysics. In this wavelength regime, we find the spectral signatures of both water vapor and molecular oxygen. Specifically, water lines at 557 GHz and the 1100-1200 GHz band are excellent diagnostics of water vapor in the interstellar medium, the Earth's atmosphere and the atmospheres of other planetary bodies. Recent advances in small satellite technology now allow us to consider their use for remote sensing these lines in ways that were before impossible.

Here we will be presenting the preliminary results of a low-mass, low-power, highly integrated Schottky diode based coherent receiver system suitable for deployment on cubesat or other small satellite platforms. Currently, coherent Schottky receivers are far too large to be considered for deployment on any smaller forms of space-based satellites. Using an already existing design for a modular 520-600 GHz receiver designed at JPL, we have used novel packaging methods to condense this receiver into an integrated system. This integrated receiver has shown to have a volume and power consumption significantly smaller than the current state of the art. We further present the designs of a similar integrated receiver for the first excited state of water vapor operating at the 1040-1200 GHz range. Further research will be spent exploring whether we can use passively cooling technologies to better enhance the performance of these Schottky receivers.