

MET Using Water Vapor Propellant

John E. Brandenburg PhD of Kepler Aerospace is the inventor and principal developer of the MET (Microwave Electro-Thermal) thruster for space, using water vapor as propellant [1]. (Patents John E Brandenburg, Michael Micci: Mar, 27 2001: US 6205769 2. John E Brandenburg: Sep, 28 1999: US 5956938.

The thruster system is now being flown in space by Momentus Corporation <https://www.businesswire.com/news/home/20230109005921/en/Momentus-Vigoride-5-Status-Update-1> after being launched by the SpaceX Transporter 6 vehicle on January 3. This is the third time it is being flown, after being successfully demonstrated in space on two previous flights. Dr. Brandenburg had earlier served as a consultant for Momentus on the MET project. The MET using water propellant is so robust it can be run at room air pressure on a table-top with water vapor propellant using 2.45 GHz microwaves and based on 1 kW microwave oven technology. It has also been demonstrated at 75kW using 915 MHz industrial microwaves.



(L to R) 1kW MET operating in vacuum on N₂, MET-H₂O at room pressure, 75kW MET operating on H₂O.

Its performance, when optimized leads to high efficiency ~ 80% and high I_{sp} of 900seconds. (see images). The MET is being used as the propulsion for a “space tug” to deploy satellites but has a much wider potential.

Kepler’s MET thruster is ideal for deorbiting or changing the orbits of satellites. It can be easily customized to work on any size satellites and because of it’s light weight and small size can be integrated into almost any space system.

[1] Brandenburg, J.E. Kline, J.F., and Sullivan D.F. (2005) “The Microwave Electro-Thermal (MET) Thruster Using Water As Propellant “IEEE Transactions On Plasma Science Vol. 33, No. 2. p776