

IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (1) (5)

Author: Mr. Claude-Martin Brito
SAFRAN, France, claude-martin.brito@safrangroup.com

Mr. Valentin Quesnel
SAFRAN, France, valentin.quesnel@safrangroup.com

Dr. Vanessa Vial
SAFRAN, France, vanessa.vial@safrangroup.com

PPSX00 HALL THRUSTER: ON THE FINAL PATH TOWARDS THE QUALIFICATION OF A
SUBKILOWATT-CLASS THRUSTER**Abstract**

The PPSX00 is the subkilowatt-class Hall Thruster of the Safran portfolio designed to match the propulsive needs of LEO/MEO small satellite. Its development program aims at maturing technologies leading to a compact and highly cost efficient product massively marketable within 2024. The need for low-cost propulsion systems to equip hundreds of platforms is very challenging, be it from the technical, budgetary or production aspects: (1) Ability of operating for thousands of hours and cycles with state-of-the-art performance level at few hundreds Watts; (2) Design approach to be relied, when feasible, on COTS components; and (3) Production rates about 10 to 100 times higher than those typically met for comsats. Following the ultimate objective of obtaining a low-cost efficient solution in very stringent time-to-market constraints, Safran applied a risk-managed development plan by considering the whole internal architecture of the cathode as a critical technology itself, by multiplying specimens and tests earlier in the development, and by focusing the anode block development on the maturation of technological bricks. The PPSX00 has successfully passed the PDR in October 2020, validating the technical, cost and production-ability aspects. The technical maturity (TRL 6+), the necessary justifications, the mitigation of risks associated to critical technologies, the conformity with both technical and market requirements, and the industrial prerequisite (such as the consolidation of the whole manufacturing chain) are available. Results obtained so far on the prototype thruster, the EM thruster and lately the DM thruster confirm that the performances with Xenon and Krypton are in line with the state-of-the-art of thrusters in this range. Several functional demonstrations have been cumulated so far: Xenon endurance test of 2500 hours at (1000 [W] @ 300 [V]) (500 [kN.s]) on the EM thruster ; 2500 cycles test campaign of an EM cathode in diode mode operating with Xenon; 7000 cycles test campaign of an DM cathode operating with Xenon; Krypton endurance test of 1000 hours of an EM cathode coupled with the DM anode block. In addition, dedicated mechanical test campaigns on both, anode and cathode blocks have been performed in order to (1) confirm that the DM models withstand the qualification environment levels and (2) test some technological bricks that could be integrated in the PPS@X00 development as backup bricks. Dedicated partial life tests with two DM models are ongoing and will complete the whole set of needed justification for the upcoming Critical Design Review.