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DESIGN, MANUFACTURING AND CHARACTERIZATION OF A 1 MILLINEWTON CLASS FEED
EMITTER**Abstract**

FEED thrusters are recognized to have unique performances among technologies for space propulsion. Among others, main advantages of the FEED technology are:

- high specific impulse, ranging between 5000 and 9000 s;
- low thrust noise, $0.1 \mu\text{N}/\sqrt{\text{Hz}}$ which is below the nano-balance detection threshold;
- short response time, ranging between 50 and 150 ms, depending on the thrust step and initial thrust level;
- thrust resolution below 100 nN;
- low nominal power at thruster level, about 6 W at 100 μN of thrust;
- high thrust accuracy.

As part of the development of the 150 μN class FEED thruster (FT-150 FEED Thruster), Alta performed the characterization of thruster performance as a function of a number of geometrical parameters of the emitter. This allowed the optimization of a set of key geometrical parameters of the emitter as well as the identification of the emitter manufacturing process.

Based on the lesson learnt from the FT-150 development, a 1 mN Class FEEP emitter was designed and manufactured totally in-house, implementing an optimized manufacturing process. The emitter was tested and its performance fully characterized. The emitter showed a very stable emission in the 100-1000 μN thrust range while confirming its peculiar characteristics of short time response and high specific impulse.

This article provides a description of the emitter and of its manufacturing process, presents main test results after a description of the dedicated set-up and of main characteristics of the thruster.