

Title: Impact facility based upon high frequency two-stage light-gas gun

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Abstract

An impact facility based upon a two-stage high-frequency light-gas gun has been developed to allow fast and low-cost hypervelocity tests. The mechanical configuration and the managing electronic system are presented.

The unit is powered only by means of high-pressure gas: no explosive powder is used. The system is managed by a dedicated computer system, which acquires signals from pressure transducers and operates nine electron valves. To improve the gun reliability, the control system has been designed to carry out an automatic diagnostic procedure after each shot. To improve the gun performance and the safety, an active piston-damping procedure has been developed.

In this configuration a high shot frequency has been reached (10 shots/h). Projectiles with mass between 100–300 mg have been launched up to 3–4 km/s depending on the mass.

This work can also be seen as a feasibility study for a new class of high-performance, high-frequency and low-cost two-stage light-gas guns, useful for the Italian Hypervelocity Laboratory, proposed to be built at the Italian Center for Aerospace Research (CIRA).