2nd successful Endurance Test on a LPM motor in vacuum conditions

R. LeLetty - CEDRAT RECHERCHE.

We are delighted in announcing the successful test of our **LPM20** linear piezoelectric motor, carried out in June this year at the CNES (French Agency Space), Toulouse in vacuum conditions.
Developed for positioning applications, the piezoelectric motor has proved to be a very interesting solution thanks to its high massive force, its zero consumption at rest and its high precision. For space applications, it is a question of obtaining an identical behaviour in ambient and in vacuum conditions. However, the friction drive that is the key to the functioning of the piezoelectric motor, limits the lifespan and poses tribology problems.

After a first successful endurance test run pushing the motor to 260.000 actuations (forward and back) under a 10 N force, the **LPM20** motor then carried out 260.000 actuations under 20 N, without any change to the performances. This is a terrific achievement, the fruit of months of research work, financed by both CEDRAT RECHERCHE and the CNES, in collaboration with the Laboratoire de Mécanique des Contacts de l'INSA in Lyon. The presentation of the PhD by M.F Six is previewed for October 99 at INSA in Lyon.

Ronan Le Letty -
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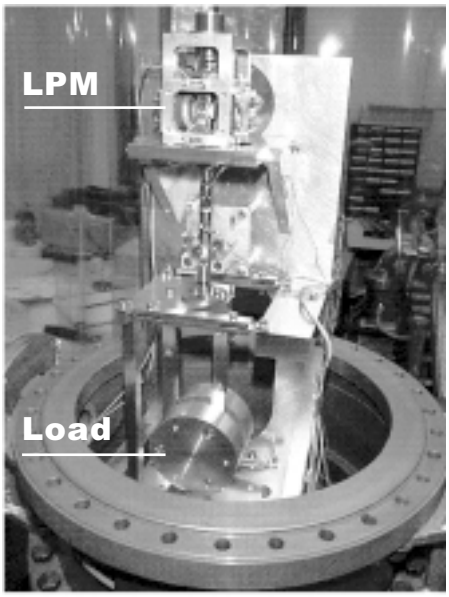
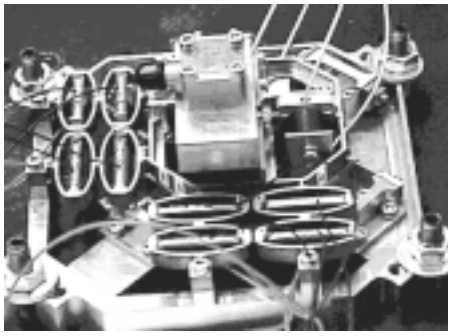


View of the motor installed on the test plate in the vacuum chamber.

Design and Functional Tests of an XY Stage for ROSETTA / MIDAS.

For future instruments for planetary explorations, extremely fine mechanism able to produce displacement accuracy in the sub-micrometer range with a limited mass budget, are required. The only technology which can meet this specification is the piezoelectric actuator associated to capacitive displacement sensors, which displays several advantages : solid state design, which means no friction, noise limited by the driving electronic, ...
An XY stage able to produce a stroke of 100*100 µm has been developed for the European Space Agency (ESA). It will perform the scanning function of an Atomic Force Microscope in Rosetta/ Midas space experimentation. The required stroke is too high to be achieved directly by the active material. In addition, the mass budget for this mechanism was limited to 400gr. Therefore, the amplifying technique used in the Amplified Piezo Actuator produced by CEDRAT RECHERCHE has been preferred to other techniques such as mechanisms using hertzian pivots. The development includes also the guiding functions, especially needed to reduce the other parasitic degrees of freedom. An extensive use of Finite Element Analysis has been carried out.



View of the piezoelectric XY stage based on APA50S actuators.

The Engineering Model includes 8 APA50S actuators and two capacitive displacement sensors ; the functional performances were successfully tested, being closed to the predicted ones. The strokes and the parasitic degrees of freedom were measured using a laser interferometer.
The stage has been tested over a temperature range (-20 +50°C), submitted to random vibration tests and lifetime tests (more than one million of strokes). The effects of these tests and other parameters such as piezoelectric drift effect, gravity, ...) on the functional performances are discussed.

François Barillot -
CEDRAT RECHERCHE

Products

We are delighted in announcing the presentation, at the week of Electronics and Physics, of our range of magnetic measurement and magnetisation material (Fluxmeters, Gaussmeters, Helmholtz coils, Magnetisers,...).

Rendez-vous at our stand HJ27, Physics Seminar, Hall 7/1.

For any further information, contact Mister Lionel GRAND - CEDRAT - lionel.grand@cedrat.com

Gaussmeter type DG500 - Laboratorio Elettrofisico.