

## **Arges: a microgravity experiment on helical instabilities in discharge lamps**

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“Arges” is the name of an experiment which is to be carried out by the Dutch astronaut André Kuipers, who will fly to the International Space Station in spring 2004. It deals with several aspects of metal halide lamps. These HID lamps (High-Intensity Discharge) are gaining ground in the lighting industry because of their very high energy efficiency (up to 40%). In the lamps, which are operated in the arc regime and which are contained in a ceramic balloon, filled with xenon, mercury, and salts of various metals and iodine), de-mixing occurs. This de-mixing is driven by electrophoretic effects. Furthermore, helical instabilities might occur in the lamp, which are believed to be driven by the self-generated magnetic field. Both phenomena are severely modified under 1 G conditions: convection will bend a horizontally burning arc channel upwards, and a vertically burning arc channel will exhibit convective cells. This makes it impossible to study these phenomena on the ground. If a proper understanding of these phenomena is to be gained, experiments under microgravity are necessary.

The main objectives of the experiment are: (1) to determine the critical factors for the onset of helical instabilities; (2) to characterise radial de-mixing by radially resolved high-resolution emission spectroscopy; and (3) to determine radial profiles of atomic densities by laser diode absorption spectroscopy.

To this end a special, extremely compact, high-resolution spectrometer has been developed, as well as a parallel detection optical system for the diode laser absorption. The hardware will be tested in parabolic flight campaigns in april 2003.

In the talk, the details of the especially developed diagnostics will be presented. Some preliminary test measurements will also be discussed.