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INVESTIGATION OF THE MELTING PROCESS OF TITANIUM ALLOY AND SAC305 IN A
SOUNDING ROCKET USING A LASER DIODE**Abstract**

The main purpose of the following research is to study the structure of the titanium alloy, Ti6Al4V and SAC305 melted and welded on board REXUS 16 sounding rocket, using only a 25W LASER diode. The experiment will fly from Kiruna, Sweden in May 2014, as part of the REXUS/BEXUS programme, which is realised under a bilateral agreement between the German Aerospace Center (DLR) and the Swedish National Space Board (SNSB). EuroLaunch is a cooperation between the Esrange Space Center of SSC and the Mobile Rocket Base (MORABA) of DLR and ZARM and it is responsible for the campaign management and operations of the launch vehicles. The experiment setup contains a multimode 25W LASER diode (975 nm wavelength), Ti6Al4V and SAC305 samples, temperature and pressure sensors and a gyroscope. The processes are recorded with a GoPro Camera. The materials are going to be shifted during the expected 120s of microgravity, so the LASER beam will be able to melt and weld the materials. The paper is focused on the modifications of the internal structure of the samples, during the sub-orbital flight, expecting a change in the dendrites growth and in solidification process in comparison with Earth-based measurements and computer simulations. The results are presented in antithesis between laboratory conditions and the sounding rocket conditions. Along the gravity, there are also other parameters, as very low pressure and slow spinning movement of the rocket at the apogee, which are taken into consideration in the comparison in this paper. In conclusion, melting Titanium alloys and acid core solder can advance

some important applications because of their reliance in space industry manufacturing, thus making our research a significant breakthrough with an eye to future in-situ space welding.