III. Operation of onboard experiments

Many experiments that are performed on sounding rockets are in great need of fast and reliable communication, both for down link of data and video and up link of commands. This is especially relevant for microgravity fluid science experiments when a fluid shall be manipulated in real time by observing the fluid via a high resolution video link. The manipulation can be such actions as changing temperature, pressure, inject more or another experiment liquid into experiment chamber etc. The SOURCE-2 experiment module on the sounding rocket MASER 12 is an example of this. Another example is today's microgravity material science experiments that are using x-ray on board the sounding rockets for in real time observe the processing of the material samples. In this case as an example the solidification process can be observed and manipulated during the flight by sending commands for changing the temperature gradient in the sample. The XRMON-GF experiment module developed by SSC on MASER 12 is an example of this. The module comprises one **Gradient Furnace** for directional solidification of AlCu alloys with *in situ* X-ray observation under microgravity. The experiment is defined by the "Self-organised Growth Microstructures" of IM2NP – Aix Marseille University (Marseille France).

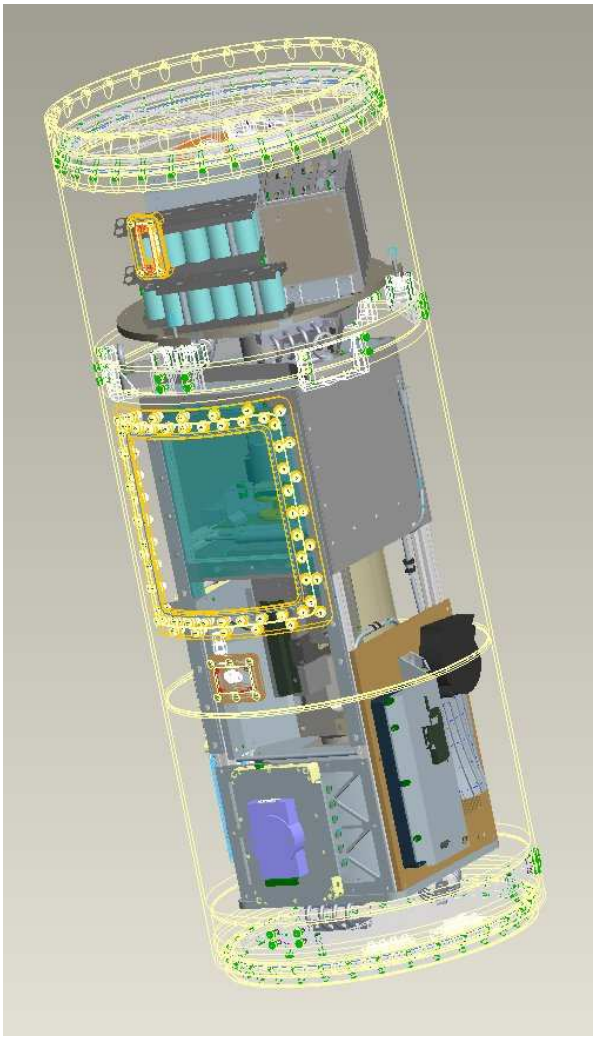

Figure III-2 XRMON-GF Experiment module

Figure III-1 X-ray image of sample in XRMON-GF experiment module

IV. Summary

The development of the communication systems in the sounding rockets such as the SSC run MASER program with the MASM service module that can provide high speed (4x5 Mbits/s) down links for data and video streams and uplinks for commands have increased the possibilities to perform advanced real time experiments in microgravity to a relative low cost compared to manned space flights. These possibilities have been utilized by a number of different scientific groups to perform very successful experiments in many different scientific fields.