

Communication on the Earth

Ground Station

It is planned to set up an LRT ground station within the BayernSat project. Within the framework of the research and teaching assignment of the Institute of Astronautics the construction of an LRT ground station started this year in summer. On the grounds of good communication with prestigious companies and institutes around Munich, the feasibility of a commanding and monitoring ground station was strengthened. The observatory Feuerstein near Nürnberg supported us with its experience in building ground stations, and made available an unused antenna turntable for conversion; thus in just a few months we managed to mechanically convert the turntable to be used as a TMT ground station for LEO satellites. The turntable with its 2m parabolic reflector will be installed on the roof of the Institute to achieve the best possible visibility to the satellites.

Figure 2-1 Antenna in the past and present shows the turntable before and after its readjustment in summer this year.

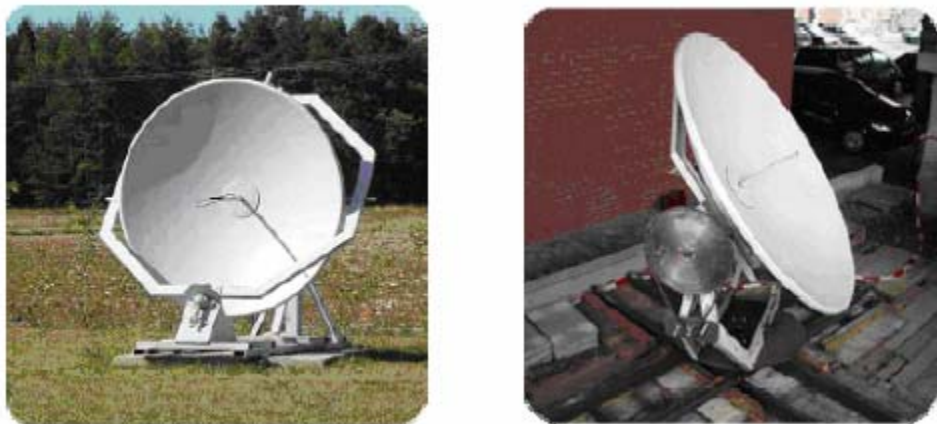


Figure 2.1: Antenna in the past and present

Project Plan Ground Station:

The ground station as a teaching and research object, which will be used by students to write their semester and diploma theses on the one hand, and on the other hand will be used to generate scientific research work in the field of space communication, is well received by both sides. As students are to participate actively, it is necessary to draw up a specific project plan for the construction of the ground station to be able to consider the framework conditions of the university course such as exam schedules.

Figure 2 2: Ground station – schedule shows an overview of the current project plan and time schedule of the ground station. One very important moment will be in the third third of 2005, when the first overall tests of the ground station are to take place. The final installation on the roof of the Institute is planned in spring 2006 for weather reasons. This completion date is well in line

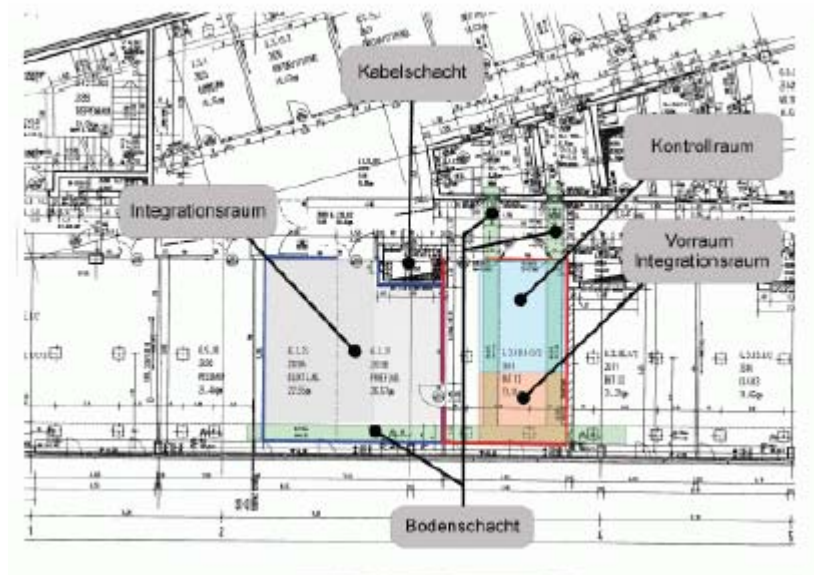


Figure 2.3: General plan - ground segment

Calibration Unit

A separate transmitter unit is very helpful for the first test and calibration measurements of the ground station. To this end, the Meteorological Institute of the Ludwig Maximilian University makes available a place at the research weather tower. A smaller transmitter unit is to be installed at an altitude of 35 m. Pregenerated satellite telemetric data can be sent via this unit, thus making it possible to verify the whole communication distance just as it will be in the later scenario.

Figure 2 6:General plan – campus Garching shows an aerial view of the TU campus Garching and the position of the ground station and the calibration transmitter. The visibility between ground station and test emitter with a linear distance of approx. 500 m is not hampered .



Figure 2.4: General plan – campus Garching

Antennas – Hardware

The control hardware for antenna tracking is an important element when implementing an antenna turntable. Another sign of the excellent cooperation with the observatory Feuerstein is that they made available the control boards for the drive end. The control unit is composed of a Rabbit 2000 board in combination with a PIC. This board is used for control as well as regulation, data processing and data management between turntable and control room.

The goal is to integrate the whole control unit with the control terminal and visual display in a 19" plug-in unit and operate it in a weatherproof 19" rack on the roof.

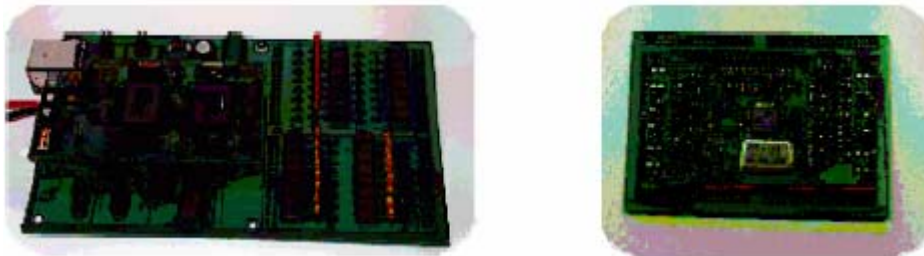


Figure 2.5: Control boards: left: Rabbit 2000, right: PIC

The position of the antenna will be detected with incremental transmitters, and the adequate device electronic will be displayed either directly or via computer interface on the display of the control room. The resolution of the transmitters is 0.2° , which is sufficient for the given requirements. The transmitters and the electronic are by courtesy of the German Aerospace Centre / Moraba.



Figure 2.6: Incremental evaluation electronics

We received further hardware devices, a PCM decoder and two 19" racks, as permanent loans by courtesy of DomoTV company from Freising. The decoder will be used for the first test experiments and signal analyses.



Figure 2.7: PCM decoder



Figure 2.8: 19"-Racks