UNIVERSITÄT STUTTGART
INSTITUTE OF SPACE SYSTEMS

Pfaffenwaldring 29 · 70569 Stuttgart · Phone +49 (0) 711 685-62375 · Fax: +49 (0) 711 685-63596 · www.irs.uni-stuttgart.de

Bachelor Thesis Work

of Choose titleName, Surname

Erstellen eines parametrischen Skalierungsmodells für Kommunikationssysteme von Satelliten

Development of a parametric scaling model for satellite communications systems

Motivation:

In the earliest design stages of a satellite project, trade studies are often done using parametric scaling models. These enable the evaluation of many different possibilities to fulfil the mission objectives, which allow for an optimization of the satellite design.

Within the IRAS (Integrated Research platform for Affordable Satellites) project funded by the Ministry of Economics, Labor and Housing of Baden-Württemberg, solutions for lowering satellite costs are under examination. This includes new technologies for electronics, structures and propulsion systems, but also a new development platform called DCEP (Digital Concurrent Engineering Platform). One purpose of this platform is to connect software tools for automation of individual design tasks, which will allow an automated multi-dimensional optimization of the entire mission. Currently, two tools are being developed at the IRS for use with the DCEP: the Evolutionary Satellite Design Converger (ESDC), and a constellation design tool.

Within the scope of this thesis, a scaling model for communications systems should be developed. The model should allow estimation of power and mass of a communication system with respect to several parameters (e.g. frequency, output RF power, half-power beam width, data rate), as they change with altitude or other orbit or constellation parameters, and should provide relevant output data for other spacecraft systems, i.e. power and attitude control requirements. It should be applicable for both communications payloads, as well as for telemetry & telecommand or data downlink subsystems of the satellite bus. The model should be based on a hardware database, which should allow updating the scaling model with future developments.

Please contact Martin Fugmann: fugmann@irs.uni-stuttgart.de

Task:

- Literature research on state-of-the-art satellite communications systems and components
- Identification of necessary input and output parameters
- Set-up of an extendable database including the required data
- Implementation of a tool to automatically generate scaling laws based on the database
- Documentation

Supervisor: Martin Fugmann, Manfred Ehresmann

Starting date: Click for date

Submission until: Click for date

Acknowledgement of receipt:
I hereby confirm that I read and understood the task of the bachelor thesis, the juridical regulations as well as the study- and exam regulations.

_____
Prof. Dr.-Ing. Sabine Klinkner
(Responsible Professor)

_____
Signature of the student

UNIVERSITÄT STUTTGART
INSTITUTE OF SPACE SYSTEMS

Pfaffenwaldring 29 · 70569 Stuttgart · Phone +49 (0) 711 685-62375 · Fax: +49 (0) 711 685-63596 · www.irs.uni-stuttgart.de

Declaration

I, ***Name***,***Firstname*** hereby certify that I have written this please select a topic independently with the support of the supervisor, and I did not use any resources apart from those specified. The thesis, or substantial components of it, has not been submitted as part of graded course work at this or any other educational institution.

I also declare that during the preparation of this thesis I have followed the appropriate regulations regarding copyright for the use of external content, according to the rules of good scientific and academic practice[1]. I have included unambiguous references for any external content (such as images, drawings, text passages etc.), and in cases for which approval is required for the use of this material, I have obtained the approval of the owner for the use of this content in my thesis. I am aware that I am responsible in the case of conscious negligence of these responsibilities.

.....

Place, Date, Sign

I hereby agree that my please select a topic with the following title:

Enter title

is archived and publicly available in the library of the Institute of Space Systems of the University of Stuttgart please select a topic and that the thesis is available on the website of the institute as well as in the online catalogue of the library of the University of Stuttgart. The latter means that bibliographic data of the thesis (title, author, year of publication, etc.) is permanently and worldwide available.

After finishing the work I will, for this purpose, deliver a further copy of the thesis along with the examination copy, as well as a digital version.

I transfer the proprietary of these additional copies to the University of Stuttgart. I concede that the thesis and the results generated within the scope of this work can be used free of cost and of temporal and geographical restrictions for the purpose of research and teaching to the institute of Space Systems. If there exist utilisation right agreements related to the thesis from the institute or third parties, then these agreements also apply for the results developed in the scope of this thesis.

.....

Place, Date, Sign

[1] Stated in the DFG recommendations for „Assurance of Good Scientific Practice“ or in the statute of the University of Stuttgart for „Ensuring the Integrity of Scientific Practice and the Handling of Misconduct in Science“