Internship in Satellite System Ground Segments Division

Internship title: New EUMETSAT GEO Ranging System Feasibility and Performance Analysis

The need to accurately determine a spacecraft's position relative to its supporting ground station and its intended target is fundamental to space navigation. In its basic form, the range measurement begins with a known ranging signal modulated onto an uplink, retransmitted by the spacecraft, and then detected on the downlink. The round-trip light time associated with this cycle yields a measurement of the range.

In non-regenerative ranging techniques, such as tone ranging for example, the on-board transponder performs phase demodulation and re-modulation of the carrier only. When the ranging signal is turned around or retransmitted by the spacecraft, the uplink noise is also modulated onto the downlink carrier, incurring a path loss thereby degrading the ranging measurement precision.

The Consultative Committee for Space Data Systems (CCSDS) has addressed this issue by providing recommendations for two cases of regenerative ranging, one where ranging accuracy is a priority, and the other where acquisition time is of primary concern. However, this internship will be more focused on the CCSDS recommendation for transparent (nonregenerative) ranging. These recommendations were selected based on evaluating performance in several key metrics, including: range measurement accuracy, acquisition time, interference to telecommand/telemetry, and hardware implementation.

The purpose of this internship is to study and analyse through simulations and ad-hoc software tools the potential performance of the recommended CCSDS PSEUDO-NOISE (PN) Ranging Systems when applied to EUMETSAT's GEO spacecraft fleet. The new S/W simulation tools (mainly MatLab and/or C++) shall be developed or tailored to allow parameterisation of the different scenarios, including extreme degraded cases.

This internship will provide students with the possibility to put in practice several different signal processing techniques learnt at university.

Duties

As an intern you will:

- Develop a practical and accurate understanding of the space to ground and ground to space communication links within the different EUMETSAT programmes (MSG and MTG);
- Acquire valuable experience in the understanding and assessment of EUMETSAT Ground Station technical documentation and CCSDS standards;
- Familiarise with satellite communications simulation and test tools.
- In addition, the intern will support relevant day-to-day activities within the team.

Skills and Experience

- Have the ability to work effectively in English;
- Be computer literate;
- Be intrinsically motivated and curious about the internship subject;
- Be able to work independently and collaboratively;
- Have the ability to take the initiative in researching ideas;
- Have the ability to collect, collate, conceptualize and present information clearly.

Additional specific requirements:

- Good understanding of modern signal processing techniques;
- Good understanding of space telecommunications systems;
- Practical experience in either C, C++ or MatLab;
- Practical experience in reading and assessing technical documentation.

Employment Conditions

Length of internship: **3 months**
Anticipated start date: **Anytime in 2024**

The internship will require a non-disclosure agreement and potentially a basic background check for the intern, due to the sensitivity of the provided information.

No salary is paid to interns who are still in studies, however a daily allowance and contribution to travel / accommodation costs may be provided. The conditions will be established taking into account the requirements and policy of the intern's educational institution.

Interns are responsible for providing their own health and accident insurance and for finding their

own accommodation in Darmstadt.

EUMETSAT is committed to providing an equal opportunities work environment for men and women.
Please note that only nationals of EUMETSAT Member States may apply. The EUMETSAT Convention requires that Staff shall be recruited on the basis of their qualifications, account being taken of the international character of EUMETSAT.

About EUMETSAT

EUMETSAT is Europe's meteorological satellite agency. Its role is to establish and operate meteorological satellites to monitor the weather and climate from space - 24 hours a day, 365 days a year. This information is supplied to the National Meteorological Services of the organisation's Member States in Europe, as well as other users worldwide.

EUMETSAT also operates several Copernicus missions on behalf of the European Union and provide data services to the Copernicus marine and atmospheric services and their users.

As an intergovernmental European Organisation, EUMETSAT has 30 Member States (Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, The Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.)

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