Universität Stuttgart
Institut für Robuste Leistungshalbleitersysteme

Laura Manoliu, Benjamin Schoch, Janis Wörmann, Ingmar Kallfass
laura.manoliu@ilh.uni-stuttgart.de
ingmar.kallfass@ilh.uni-stuttgart.de
Institut für Robuste Leistungshalbleitersysteme
Pfaffenwaldring 47, D-70569 Stuttgart

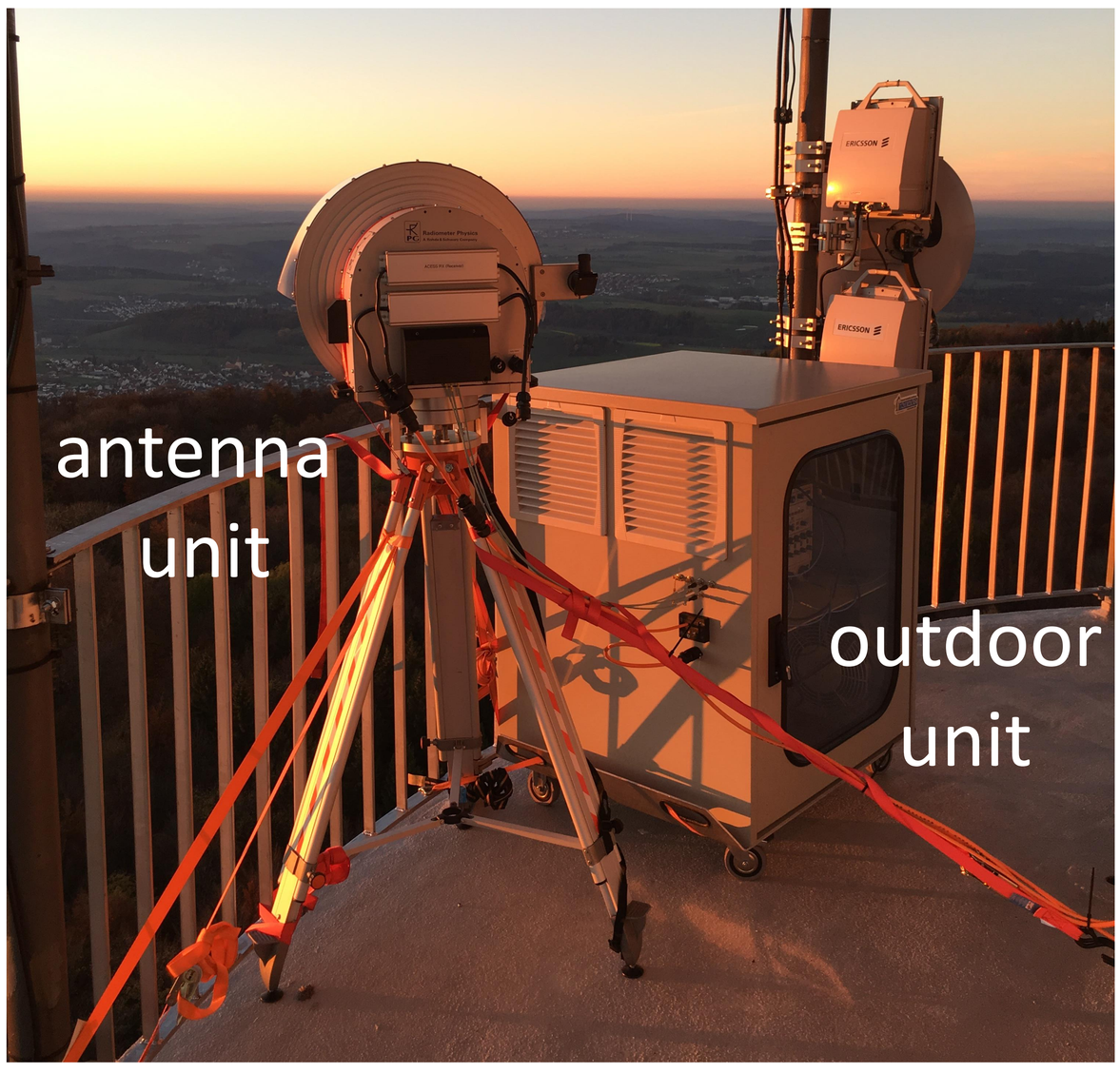
Exploratory In-Orbit Verification of an E/W-band Satellite Communication Link - Terrestrial Mission

Goals

- Measure, model and characterize the atmospheric and weather effects on a communication E/W-band link (71-76 GHz & 81-86 GHz) with different elevation angles;
- Demonstrate wireless radio broadband internet in remote areas;
- Characterize the E/W-band front-end modules and payload computer for later use in ILH EIVE satellite mission;
- Achieve a record in terrestrial radio data transmission with the highest data rate demonstrated so far (40 Gbit/s) and transmission distance (60 km).

Preferred set-up

- Transmitter situated on the Zugspitze mountain;
- Line-of-Sight from Zugspitze to Hochschule Kempten, Oberstdorf and Eibsee;
- Receiver and measurement equipment situated on Hochschule Kempten, Oberstdorf and Eibsee;
- Parabolic dish antenna: 55 cm diameter on a stable, precise positioner+ a weather-proof cabinet.



Experimental Setup in collaboration with SWR.
A similar setup is planned in EIVE-T.

Motivation

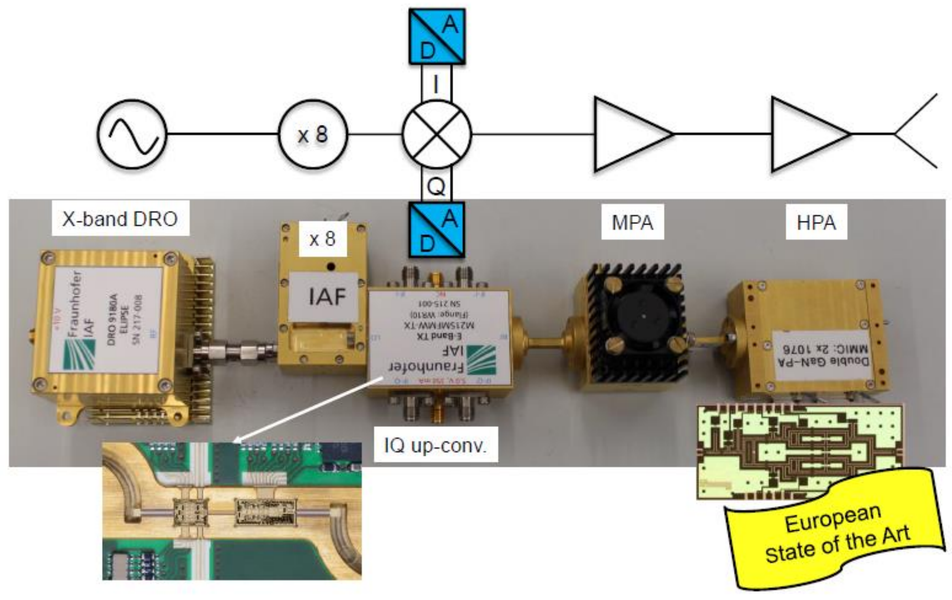
- Precise modeling of the atmospheric effects and creating a statistical data base of the atmospheric attenuation in the E-Band;
- Measure the atmospheric attenuation and compare it with the ITU theoretical models;
- Extend the ITU models for different elevations;
- Transmit wirelessly live 4k video & image data

Requirements

- AC power supply access
- Internet access (not mandatory)

Duration

- About 8 months (June 2021-Feb 2022), including installation, de-installation and check-ups.
- In accordance to the transmission allowance from German & Austrian authorities (BNetzA).
- Experiments will not run continuously, but they will be remotely (via Internet) switched on/off.
- Duration of an experiments: 5-10 minutes. Multiple experiments per day.



E-Band high-frequency modules, enclosed in the antenna unit.

FPGA MSoC KIT enclosed in the outdoor unit.

Bundesministerium für Wirtschaft und Energie
DLR
Radiometer Physics A Rohde & Schwarz Company
TESAT
Fraunhofer IAF
Institute of Space Systems University of Stuttgart
Institut für Robuste Leistungshalbleitersysteme

https://www.ilh.uni-stuttgart.de/forschung/mmw/EIVE/

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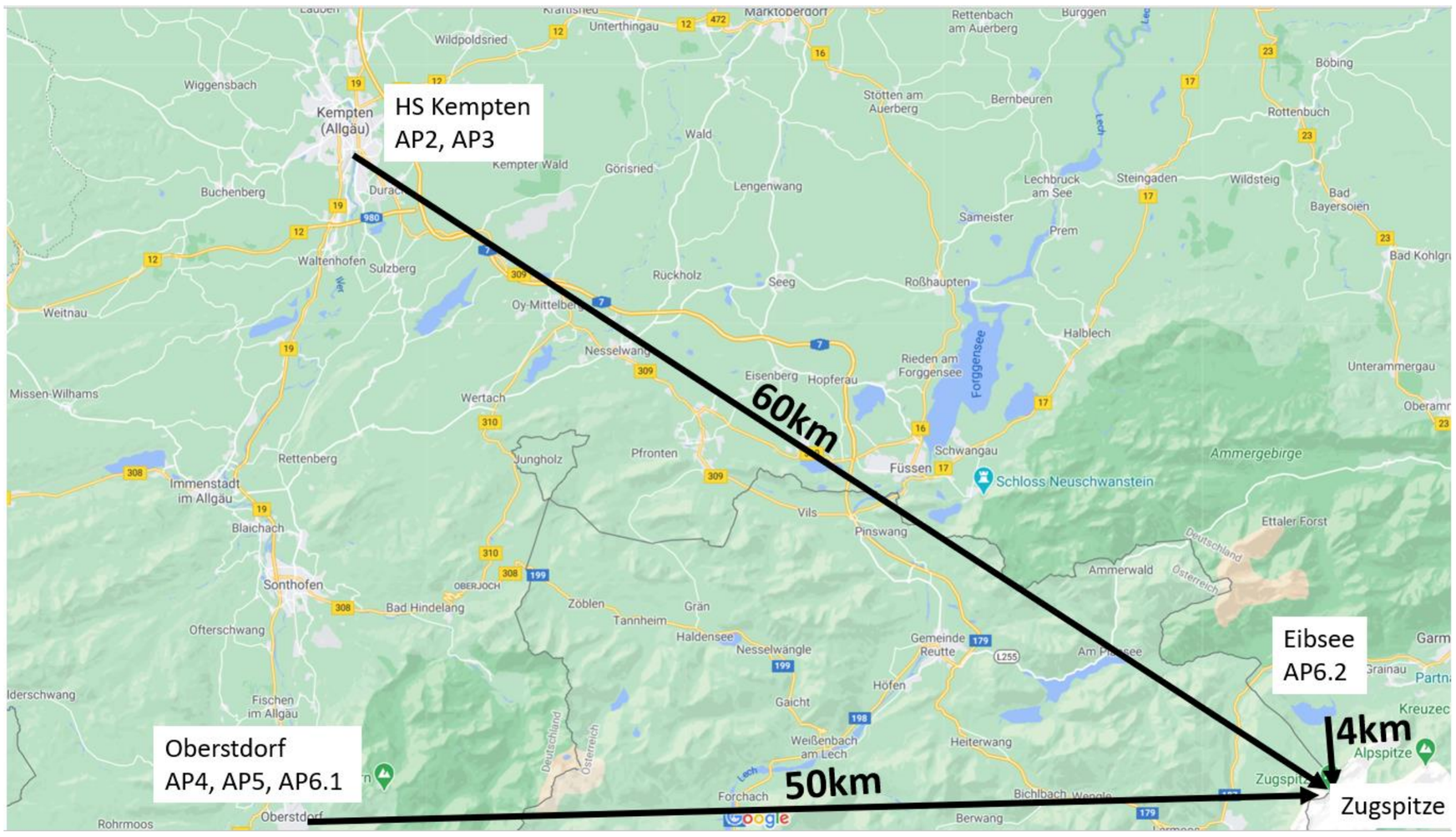
Stations



Nummer	Titel	Dauer	Ort
AP1	Transceiver-Integration und Test	4 Monate (T0 + 4)	ILH (Stuttgart)
AP2	Installation und Inbetriebnahme	1 Monat (T0 + 5)	Stuttgart, Kempten, Zugspitze
AP3	Rekordübertragung mit Polarisationsmultiplex	1 Monat (T0 + 6)	Kempten - Zugspitze (60 km)
AP4	Simplex-Übertragung zum Test der EIVE Nutzlast	1 Monat (T0 + 7)	Oberstdorf - Zugspitze (50 km)
AP5	Duplex-Übertragung Versorgung mit Breitbandinternet	1 Monat (T0 + 8)	Oberstdorf - Zugspitze (50 km)
AP6	Langzeitmessung atmosphärische Effekte	4 Monate (T0 + 12)	
AP6.1	kleiner Elevationswinkel	2 Monate (T0 + 10)	Oberstdorf - Zugspitze (50 km)
AP6.2	großer Elevationswinkel, im Anschluss Abbau	2 Monate (T0 + 12)	Eibsee – Zugspitze (6 km)
AP7	Projektkoordination und Dissemination	12 Monate (T0 + 12)	ILH (Stuttgart)

Timeline

- **Project Start: March 2021**
- **Project End: February 2022**

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