

6<sup>th</sup> URSI Austria National Committee Meeting

# Some Current Aspects of Wave Propagation Research

Karl-Franzens-Universität Graz, Institut für Physik, Univ.-Platz 5, 2. Stock, 8010 Graz, 11. Jänner 2018

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**6<sup>th</sup> URSI Austria National Committee Meeting**

## **URSI Commission F**

# **Some Current Aspects of Wave Propagation Research**

**(Einige aktuelle Aspekte der Wellenausbreitungsforschung)**

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**JOANNEUM RESEARCH  
Space and Communication Technology**

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## Towards new frontiers with W-Band satellite channel investigations (1/2)

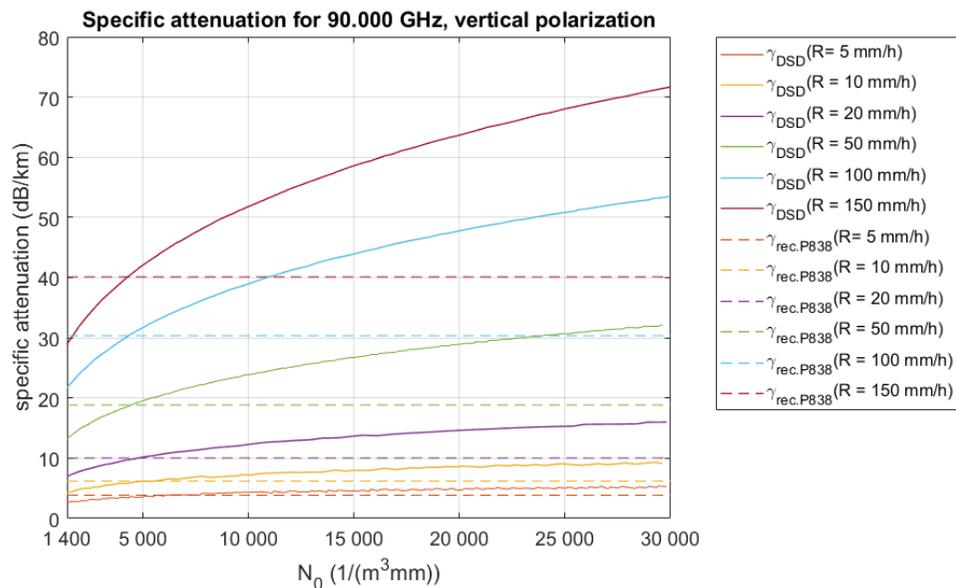
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- Ka-band is in operational use, though many aspects still subject of research activities
- Q- / V-Band not yet in operational use (as to the author's knowledge), however is adopted much faster than expected. E.g. the satellite operator Eutelsat in March 2016 launched the spacecraft 65W carrying a Q / V Band demonstration payload
- Recently W-band activities were started by ESA, with a LEO satellite to carry a research payload

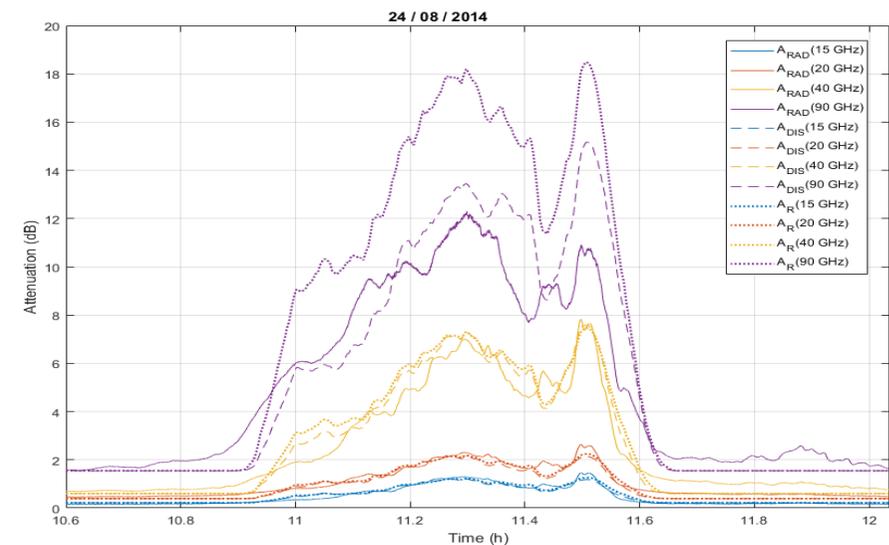
## Towards new frontiers with W-Band satellite channel investigations (2/2)

### Challenges in the LEO W-Band experiment:

- tropospheric W-Band attenuation shows high complexity for modelling



DSD-derived (solid) and rainrate-derived specific attenuation (dashed, as per ITU-R P838) at 90.000 GHz for certain rainrates

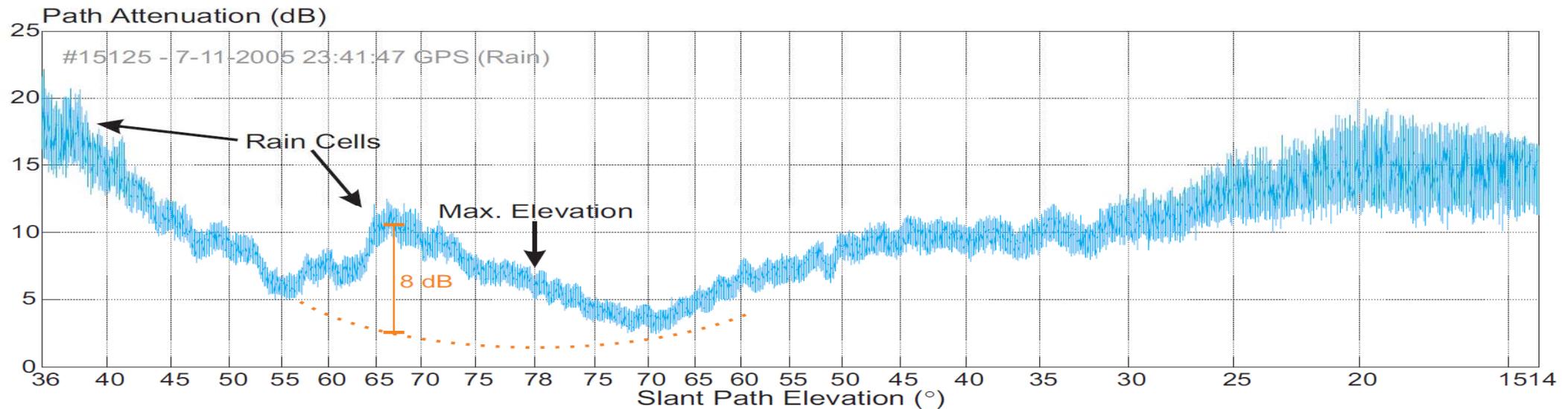


Radiometer-derived (solid), DSD-derived (dashed) and rainrate-derived (dotted) attenuations for 90 GHz slantpath from Graz towards Alphaset, August 24, 2014.

## Towards new frontiers with W-Band satellite channel investigations (2/2)

Challenges in the LEO W-Band experiment:

- the LEO configuration results in a combination of many effects:  
variable LoS distance, antenna pointing effects, elevation dependent gaseous and rain attenuation, multipath (ground clutter) effects, scintillations, depolarization



Sample overpass of LEO propagation measurements; Figure by Kostulski, T "Ka Band Propagation Experiments on the Australian Low Earth Orbit Microsatellite 'FedSat'", PhD Thesis (Engineering), Univ. of Technology, Sydney. 2008.

## Ongoing Propagation-related Projects in JOANNEUM RESEARCH

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- Measurement and Assessment Of 2nd Order Statistics Of Ka Band Satcom Systems in Tropical Regions (ESA Contract 4000106180/12/NL/NR)
- Propagation & Communications Experiment, Experiment Campaign for GS Graz on Alphasat TDP#5 (ESA Contract 4000102639/10/NL/CLP)
- Study of Optical Communications with a Hybridised Optical/RF Payload Data Transmitter (ESA Contract No. 4000115256/15/NL/FE)
- Mobile Ka-band Multimedia Receiver for Vehicles (ESA Contract No. 4000114811/15/NL/ND)
- Ground Station for the Alphasat Q/V Band Communications Experiment (ESA Contract No. 4000114582/15/NL/Nde)
- Reference procedure for adoption of software tools and digital products as ITU-R recommendations (ESA Contract No. 4000115277/16/UK/AD)
- Short Term Satellite Channel Characteristics Forecast (FFG Projekt 844368) - completed

## JOANNEUM RESEARCH contributions to conferences in 2017

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**Cuervo F.**, H. Y. Lam, J. B. Din, J. R. Castro, **M. Schmidt** and **M. Schönhuber**, "The JOANNEUM RESEARCH SatCom Ka and Q band campaigns in Europe and Malaysia," *2017 11th European Conference on Antennas and Propagation (EUCAP)*, Paris, 2017, pp. 1476-1480. doi: 10.23919/EuCAP.2017.7928869

**Cuervo F.**, **M. Schönhuber**, J. Rivera Castro, **V. Mitterauer**, A. Martellucci, "Radiometer-derived slant path attenuations and frequency scaling at Alphasat and W-band frequencies" Proceedings of the 23rd Ka and Broadband Communications Conference, Trieste, Italy, October 16 - 19, 2017.

**Ebert J.**, **H. Schlemmer**, **E. Tuerkyilmaz**, J. Rivera-Castro, S. Cioni and W. Gappmair, "An efficient receiver architecture for burst reception at very low SNR," *2017 14th International Conference on Telecommunications (ConTEL)*, Zagreb, 2017, pp. 47-54. doi: 10.23919/ConTEL.2017.8000038

European Space Agency and **Austria**, „Submission of Data for Table IV-12 – Statistics of Rain Drop Size Distribution“, ITU-R SG3 Input Document 3J/124-E resp. Document 3M/219-E, received August 05, 2017

**Schmidt M.**, L. Csurgai-Horvath, P. Horvath, B. Horvath, A. Martellucci, J. Rivera Castro "Architectural Design of the Q/V Band site diversity experiment between Austria and Hungary", Proceedings of the 9th EAI International Conference on Wireless and Satellite Systems, September 14–15, 2017, Oxford, Great Britain (proceedings in preparation)

**Schmidt M.**, **J. Ebert**, **E. Greschitz**, J.R. Castro, "Operational Results of Up-Link Power Control for Q/V Band Satellite Ground Station" Proceedings of the 23rd Ka and Broadband Communications Conference, Trieste, Italy, October 16 - 19, 2017.

**Schönhuber M.**, **J. P. Mateos** and **K. Plimon**, "About seasonal variations of specific attenuations derived from DSD measurements," *2017 11th European Conference on Antennas and Propagation (EUCAP)*, Paris, 2017, pp. 1782-1783. doi: 10.23919/EuCAP.2017.7928812

**Schönhuber M.**, **F. Cuervo**, **S. Rošker**, **M. Schwinzerl**, "Averaging aspects in short term forecasts of tropospheric attenuation", Proceedings of the 23<sup>rd</sup> URSI General Assembly and Scientific Symposium, August 19 – 26<sup>th</sup>, 2017, Montreal, Canada

**JOANNEUM RESEARCH and Colorado State University organize a convened session „Propagation Aspects in Remote Sensing“ at EuCAP 2016 (Davos), EuCAP 2017 (Paris) and EuCAP 2018 (London)**

## The EurAAP Working Group on Propagation

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- EuRAAP, the European Association on Antennas and Propagation ( <http://www.euraap.org> )
- Existing Memorandum of Understanding (MoU) between URSI and EuRAAP
- EuRAAP Working Group on Propagation lists Propagation Experts:  
( as given on <http://radiokom.eti.pg.gda.pl/MPE/experts.php> , as per January 10, 2018)

Mobile	Satellite	Radio Astronomy, Radar, Remote Sensing	Navigation	Free Space Optics	Other (Terrestrial Propagation, Ionosphere, etc.)
TU Wien	JR Graz	JR Graz	JR Graz	TU Wien	SpaceTec Partners Spielberg
TU Graz				TU Graz	
JKU Linz				JR Graz	
JR Graz					