
Day 2 (Wednesday, 26 October) 11:15 - 12:45, Hall A

Technical Session 4 Radio Propagation Analysis

T4-1-A

Air-Ground SWIM Demonstration over Extended AeroMACS - Tracking, antenna placement and handover evaluations -

Kazuyuki Morioka, Xiaodong Lu, Junichi Naganawa, Naoki Kanada, Norihiko Miyazaki, Noriaki Hiraga, Naruto Yonemoto, Akiko Kohmura (Electronic Navigation Research Institute, MPAT)

The System Wide Information Management (SWIM) provides a digital data-sharing infrastructure that includes the standardization of the data format and exchange protocol internationally so that the required information can be shared among related civil aviation stakeholders efficiently and safely. In our project, we study availability of the Aeronautical Mobile Airport Communications System (AeroMACS) as a wireless media to achieve Aircraft Access to SWIM (AATS) around the airport. We carried out flight experiments by AeroMACS prototype and SWIM test bed over Sen-dai City to confirm the possibility of expanding of AeroMACS coverage. In this report, we focus on tracking, antenna placement and handover evaluations. First, the results of tracking tests show that our system can track the aircraft by using only ADS-B position report and keep the communication link between the base station and the aircraft. Second, the results of antenna placement tests show that both the main and sub antennas for large aircraft should be mounted at the bottom of the aircraft body to obtain higher combined gain. On the other hand, the main and sub antennas for small aircraft should be mounted at the bottom and top of the aircraft respectively to obtain diversity gain during the aircraft turn. Third, the results of handover tests show that our system needs parameter optimization regarding handover in the air. Finally, we demonstrate SWIM-based information sharing over extended AeroMACS coverage.

T4-2-A

On the Imaging of Large Antenna Array Navigation Systems

Robert Geise, Björn Neubauer, Alexander Weiß, Altan Akar (Technische Universität Braunschweig)

This contribution discusses the imaging of large antenna array navigation systems by means of nearfield measurements. Examples for such navigation systems are the instrument landing system (ILS) and the Doppler VHF omnidirectional radio range (DVOR). In this context imaging means the determination of individual array's antenna's amplitudes and phases with nearfield measurements and a corresponding prediction of the far field radiation characteristic according to required specifications of flight inspections. Nearfield measurement results of a large ILS antenna array are presented, and fundamentals are explained with numerical simulations. In particular, a simple simulation scheme allows the investigation of basic measurement requirements and errors that are essential for the later application. This work is part of the NAVANT-NG (navaid antenna characterization - next generation) project dealing with nearfield inspection techniques by means of unmanned aerial vehicle. From the academic point of view this contribution summarizes the fundamental issues and probable approaches for solutions of such imaging techniques, which are a mathematical ill-conditioned problem, that exceeds the current state of the art of nearfield inspection of single antennas.

T4-3-A

Investigating the Impact of Dynamic Scatterers on Transmission Channels - A Case Study of the Propeller Aircraft Airbus A400M in the context of the Instrument Landing System

Altan Akar, Björn Neubauer (Technische Universität Braunschweig)

Multipath propagation can lead to signal disturbances and cause risks in the operation of critical applications such as flight navigation systems [1]. Hence, in addition to an effective system design, an important task is to ensure a sufficient level of system integrity. This in turn requires to identify possible sources of interference. The presented work investigates the impact of non-static scatterers on transmission channels. In particular, the focus is on periodic interferences caused by fast rotating propellers of the military aircraft Airbus A400M on the localizer of the instrument landing system (ILS). Measurement results are presented for a generic triangular setup and a realistic ILS scenario with aircrafts on various positions around the runway.