Overview

I. DFS GBAS Activities Frankfurt (W. Dunkel)

- DFS GBAS Ground Station History (SLS-3000)
- GNSS Monitoring (MDES, IGM)
- GNSS Interference Monitoring (GIMOS, GIMOS II)

II. GBAS Bremen (H. Hoffmann)

- Goals
- Timeline
- Current Activities

III. Summary

DGPS Ground Station Experience of DFS

D910, Munich
1995

D920, Frankfurt
1998

SLS-3000, Frankfurt
2000

DFS Deutsche Flugsicherung GmbH
Washington, December 2004

Seite 4

DFS Deutsche Flugsicherung

DFS GBAS Activities

GBAS Installation Frankfurt (SLS-3000)

Marker Runway 07R

SLS - 3000

GNSS Chokering Antenna

RSMU 1 und 2

RSMU 3

Honeywell BetaLAAS SLS-3000

Status

- Prototype GBAS CAT I Ground Station
- Installed at Frankfurt Airport in the year 2000
- Updated, VDB format now compliant to RTCA/DO-246B

Outstanding Issues

- SCAT-I receiver and antennas used, operating with 1Hz
- Not all the necessary GBAS monitors implemented (SARPs changes)
- VDB not fully compliant to the tightened emission requirements
- No tool available to convert MT4 FAS data for the SLS-3000
- Documentation is incomplete
- Safety assessment missing
- Software design assurance according to ED-119/DO-278 missing
- Future support, future development

DFS GBAS Activities

Measurement Data Rec. & Data Evaluation System

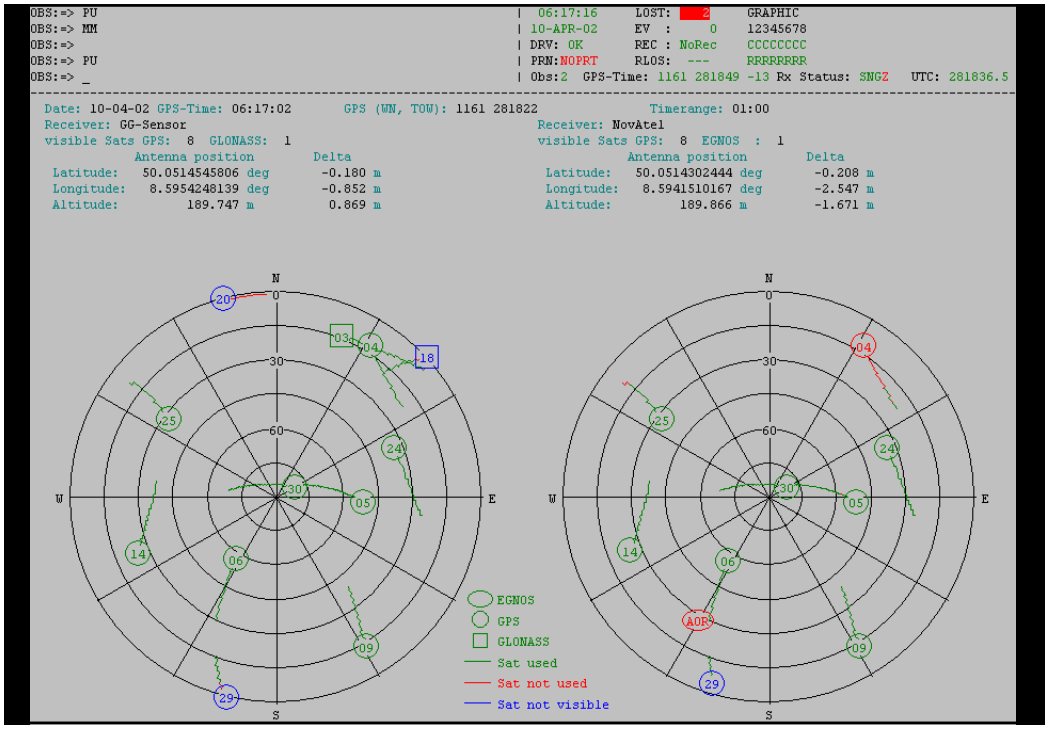
Antenna installation

MDES

MDES Features

- **data recording on tape (24h/day) and hard disk**
  - **GNSS data** — Digital Linear Tape 35/70 GB (≈ 2 months, 2 Hz)
    PC: DLT → SAPPHIRE format (csv format)
  - **orbital data** — almanac (YUMA), ephemeris (RINEX2)
  - **statistics** — receiver table, statistic data table
  - **error protocol** — in EXCEL readable ASCII format
- **online data evaluation**
  - **plots** — polar plots, MODAMS build in plot capabilities
  - **statistics** — accuracy, UDRE, DOP, No. Satellites, DL errors
  - **error protocols** — SLS, MDES, GPS, GLONASS (EXCEL readable)
  - **monitoring pages** — MDES, GNSS, SLS, each receiver, each satellite
- **automated services**
  - **observations** — parameter, events
  - **warnings** — send email to a group of users (instruction)
  - **orbital data, ...** — send files via ftp (regular or if data changes)

DFS GBAS Activities



MDES Status

Status

- System for GNSS data recording and GNSS monitoring
- Permanent recording of all data from SLS-3000, Ashtech Z-Sensor, GG-Sensor, NovAtel Millenium WAAS
- Installed at Frankfurt Airport in the year 1998
- Last update in 2004 to adapt to the new RTCA/DO-246B VDB format and to implement new VDB output data format (EUROCONTROL PEGASUS ICD)
- Direct access via network connection

Shortcomings

- Based on FIS hard- and software -> robust but expensive
- Limited computer power and memory after major update in 2000 (data rate of the ground station and SBAS receiver 1 Hz -> 2 Hz)

⇒ Will be replaced by the Independent GBAS Monitor (IGM)

Independent GBAS Monitor (IGM)

Idea

- Permanent observer
- Independent of the GS, not part of the GBAS architecture
- For introduction & commissioning
- Online functions
  - Phase I (2005):Data collection, data recording (HD)
  - Phase II (2006): Data evaluation, status monitoring
  - Phase III (2007): add certified GBAS receiver

Concept

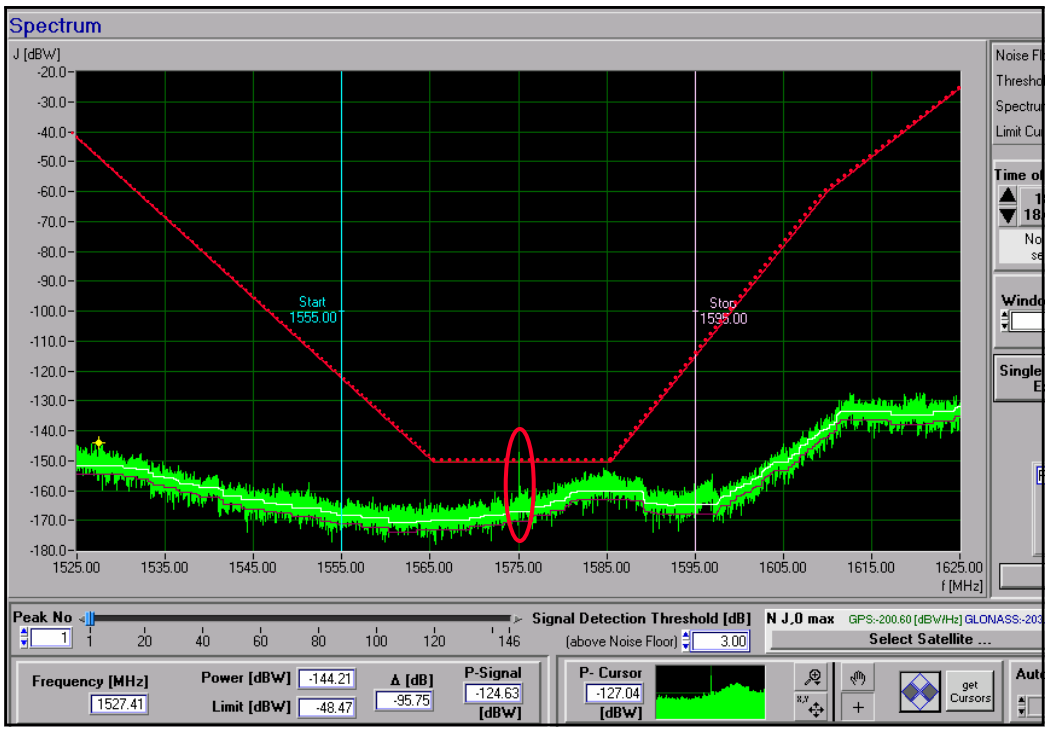
- Based on MDES experience
- PC server hardware (simple, flexible, robust)
- Operating system LINUX
- Application software modular
- Remote control and remote maintenance via network
- Low cost operation

GNSS Interference Monitoring System, GIMOS

GIMOS antennas on a van

GIMOS racks

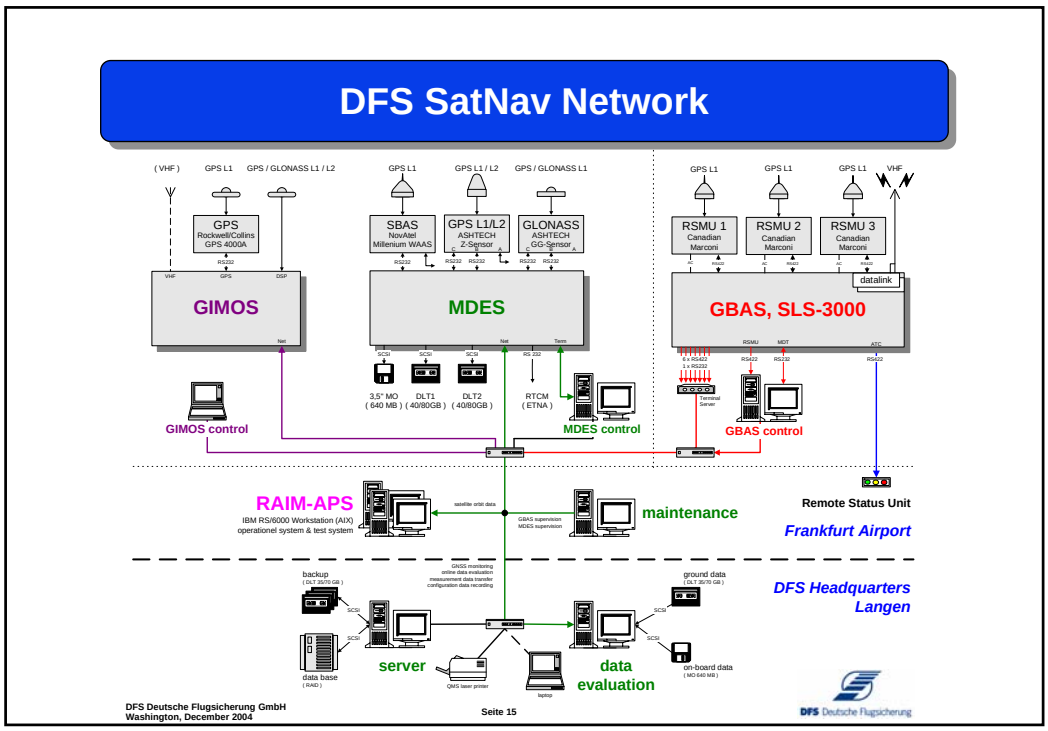
DFS GBAS Activities

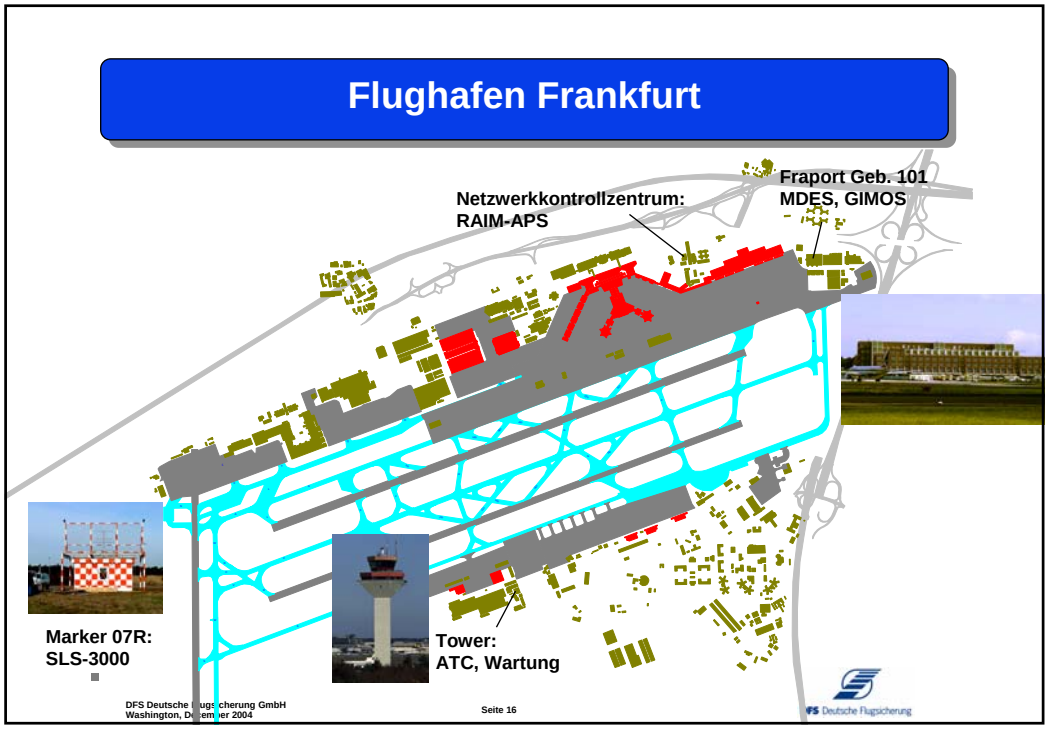


Second Generation, GIMOS II

GIMOS II rack and GNSS antennas

DFS GBAS Activities





II. GBAS Bremen
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