Installed Performance of Antennas on aeroStructures

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Installed Performance of Antennas on aeroStructures

10 Partners from France (3), Germany (2), Netherlands (1), Spain (2) and UK (2)

BAE SYSTEMS (UK) - Largest European defence company - Land, Sea and Air

ASTRIUM (De) - Industry Leader in Design and Manufacture of Satellites

ATR (Fr) - World Leader in the Regional Turboprop market

Vector fields (UK) - Provider of Software for Electromagnetic Design

DLR (De) - The German Aerospace Centre and Germany's Space Agency

EADS (Fr) - A global leader in aerospace, defence and related services

NLR (NL) - Dutch knowledge Centre for Aviation and Space Technology

ONERA (Fr) - The French National Aerospace Research Establishment

GRIDSYSTEMS (Sp) - European leader in the Grid Technology market

CIMNE (Sp) - International Centre for Numerical methods in Engineering

Antennas for aircraft systems

• Antennas provide the interface between the systems inside an airframe and the outside world

• The performance of an antenna is influenced by the platform on which it is installed

• The antenna of each system is required to provide the optimum spatial coverage (uniform relative gain - smooth polar plots) at the correct frequency, as well as provide adequate Absolute gain to attain the correct range for its system

Current Antenna Siting Process

To install an antenna on an airframe requires several months and costs up to 2 MEuros.

- Usually computation is undertaken and Scaled model measurements used to bridge frequency gap and verify computations. These take several weeks & are costly
- Interference among on-board systems is discovered very late when the time schedule is critical.
- Corrective action often involves
  - the re-positioning of the antennas,
  - installation of unanticipated filters or equipment modification,

  These cause delay and also result in unforeseen costs.
- Re-siting of an antenna has a "knock-on" effect on the entire antenna layout as well as on the equipment within the airframe.

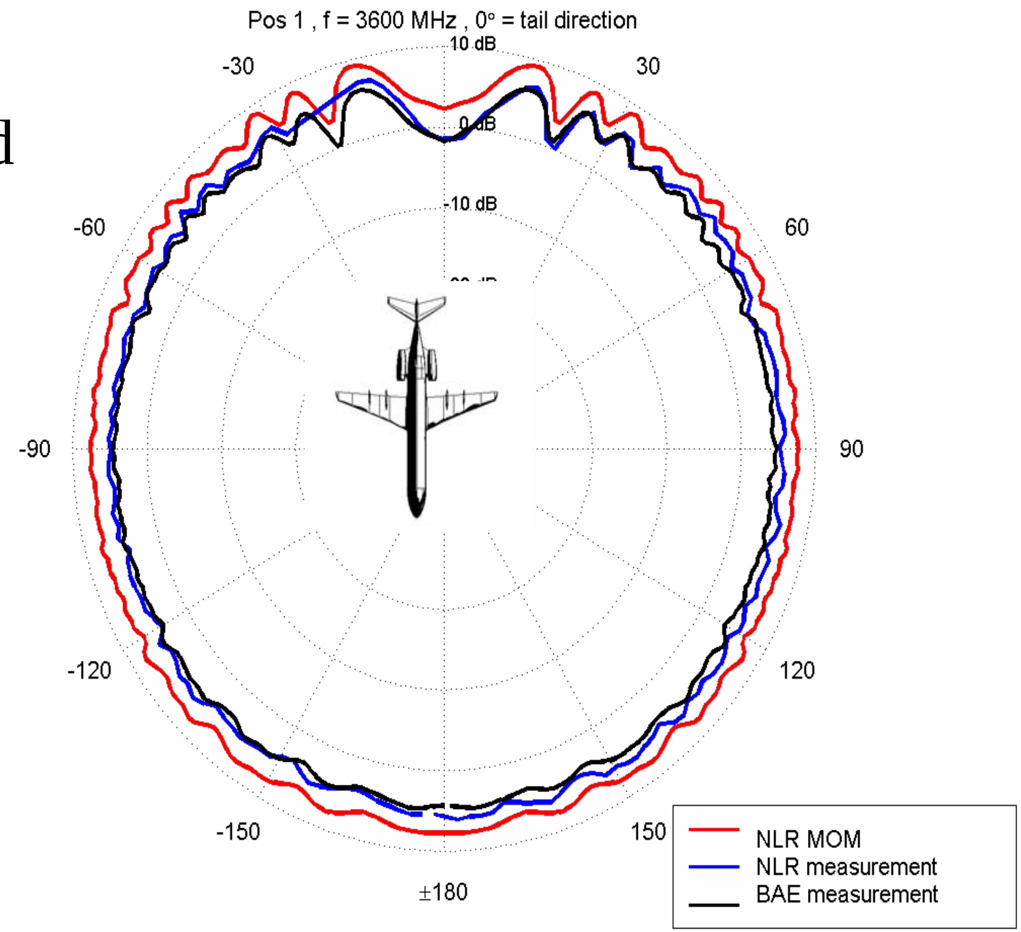
IPAS

The main objectives of IPAS are to

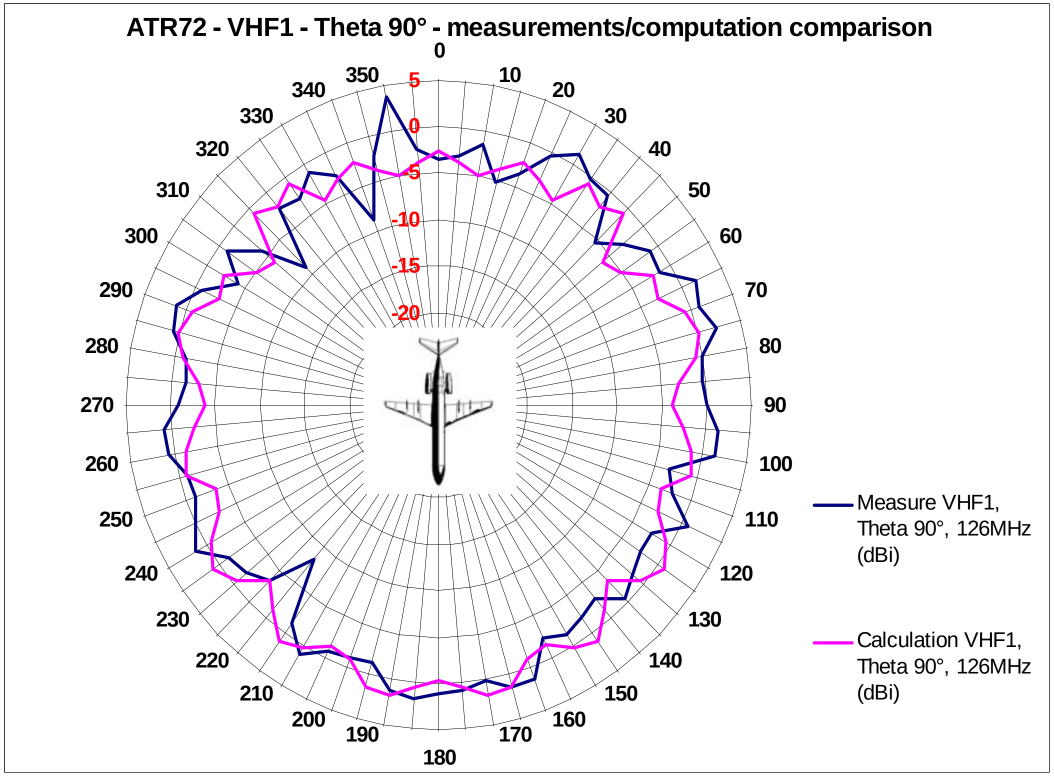
- obtain verified predictions of antenna performance and bridge the frequency gap. Thus obviate the need for scaled model measurements
- compute more accurate predictions and incorporate dielectrics and laminates like GLARE (used on Airbus 380)
- calculate more accurately the coupling between antenna pairs - aids interoperability assessment
- perform full scale measurements in situ - feasibility of using a novel Airborne Near Field Test Facility (ANTF) - obviate the need for in-flight measurements for antennas on top surface of airframe
- develop Codes of Practice for siting antennas on aircraft

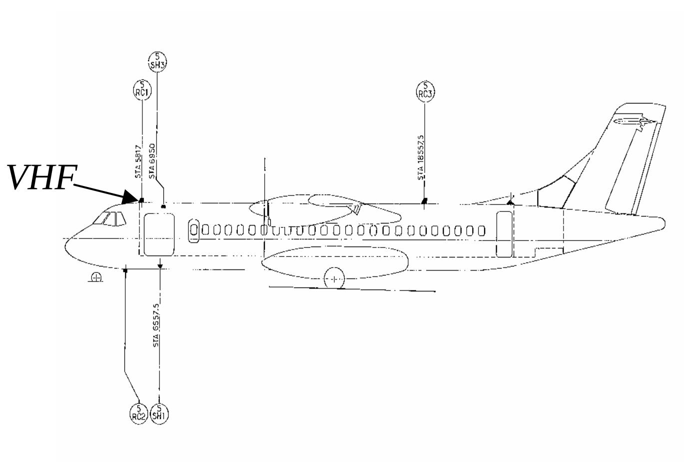
Correlation between measurements and computation on a scaled model

One example of the very good correlation obtained between the same 1/15th scaled model of a Fokker 100 measured at two different test sites and computation



Correlation between measurements and computation on a real aircraft





The antenna is on the forward fuselage of an ATR72 on the ground, and the computations were undertaken using EMC2000

The antenna on the aircraft is in transmit mode and the heights of the transmit and receive antennas are 3.4m.

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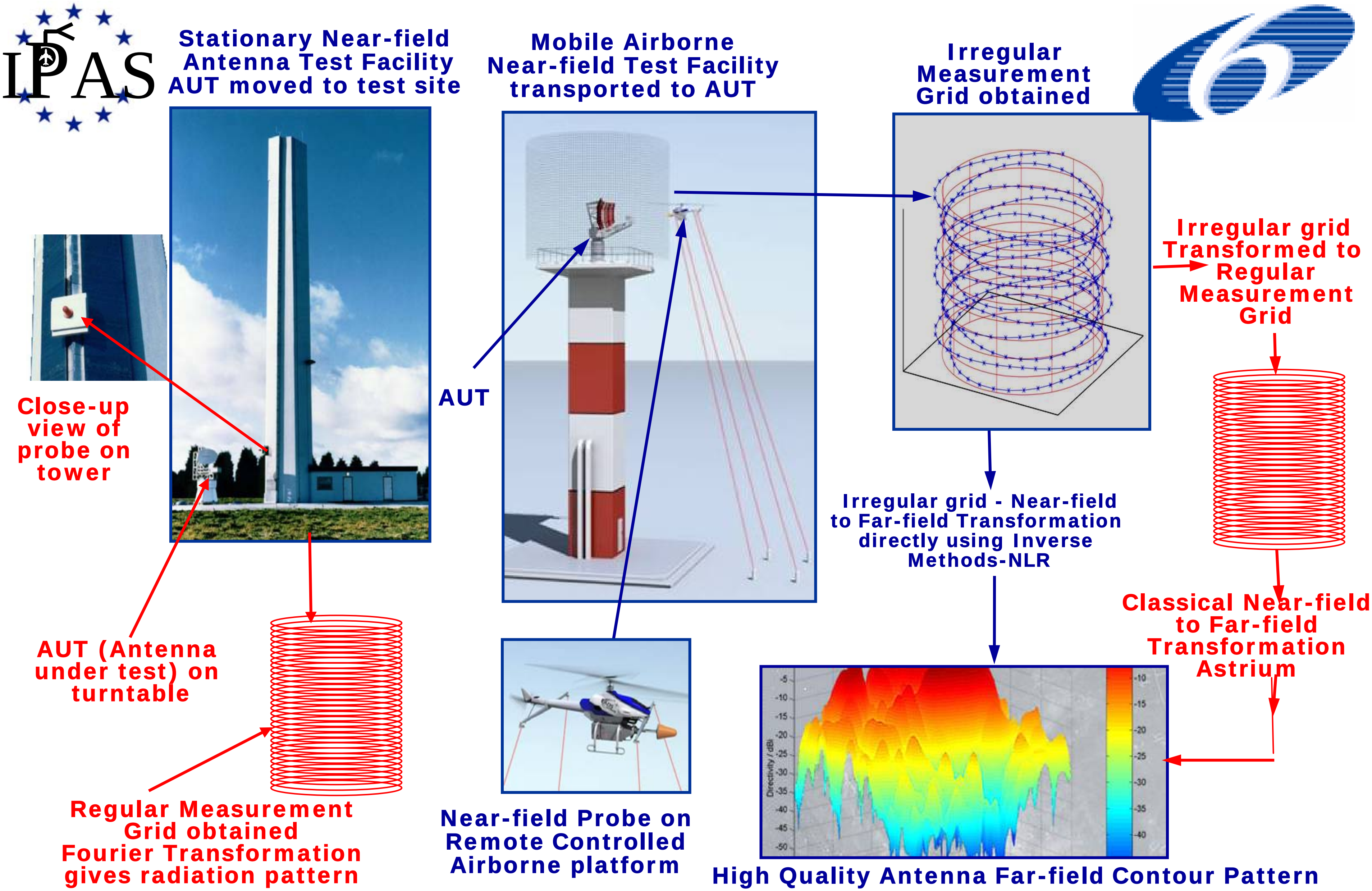

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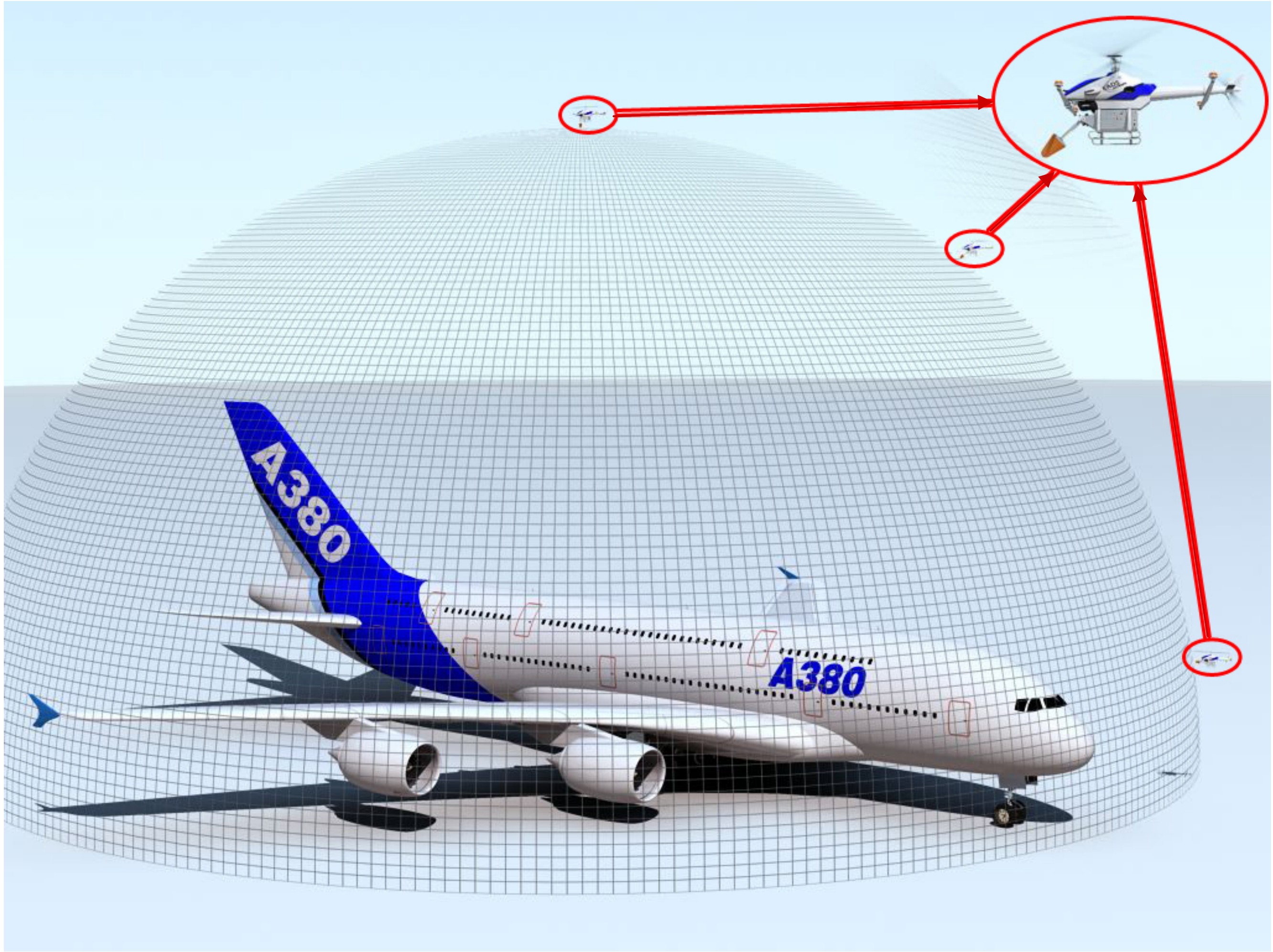
ANTF Measurements of Installed Performance of Aircraft Antennas



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