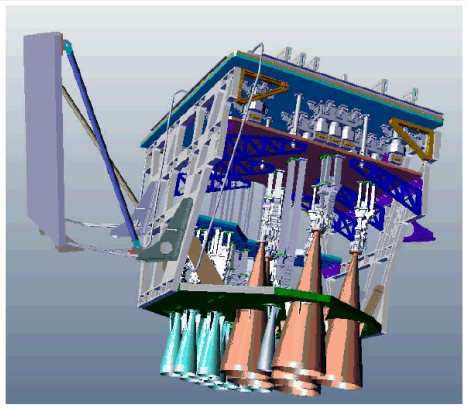
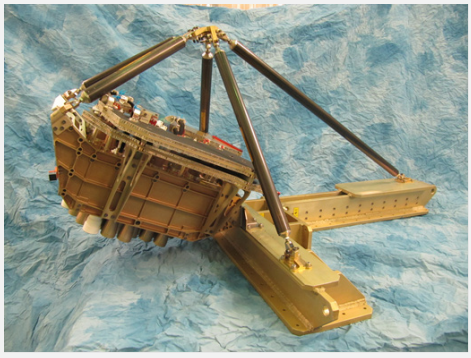
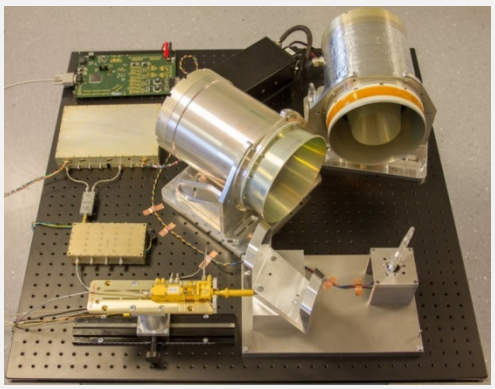
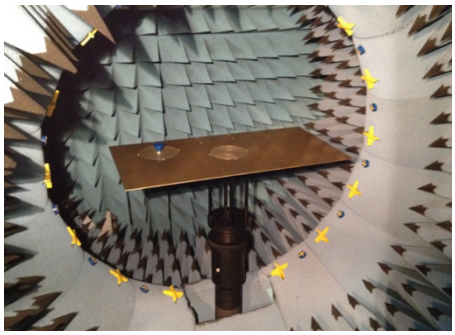
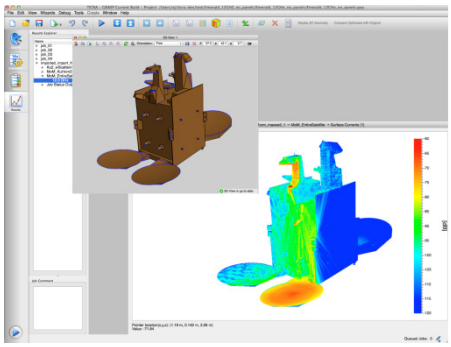
Final Presentation Day – 18 February 2015 (Einstein Aj033)

Recent Antenna Developments and Related Modelling Tools

9:30	**Introduction**
9:45	**Ka-Band Integrated Active Feed for Multiple Beam Antennas (ARTES 5.1, 600 k€)** *Thales Alenia Space - France (FR)*
	 This study enabled the design a new Ka - Band Integrated Active Feed system solution allowing to improve the G/T performance and to reduce the hardware implemented into the communication module. The main challenge of the study has been to perform an architecture trade-off taking into account the RF performance improvements while securing industrialisation aspects. The design implements a new approach based on the use of a receive Waveguide Feeding Network (WFN) supporting a ring redundancy, LNA and thermal control. An EM model has been built to validate the RF performance predictions. The selected feed architecture, in addition to improve by more than 1 dB the G/T performance, makes available more space on the earth panel to accommodate down-converters and output redundancy ring. Having the LNA within the feed assembly enables using coaxial cables connexion between the LNA and the down-converters saving mass, cost and AIT time w.r.t a solution implementing waveguides. The selected Ka-Band Integrated Active Feed configuration brings a major step for future Ka Multibeam mission.
10:45	**Development of a Single Feed Per Beam Antenna Product (ARTES 3/4, 850 k€ ESA - 1.7 M€ total)** Airbus Defence and Space (DE/GB)
	 The objective of the project was to design and manufacture an Engineering Qualification Model (EQM) of a Feed Block Assembly (FBA) for future Ka Band Single Feed Per Beam (SFPB) antenna programmes. The project included the development of generic designs of feed chain for user/gateway and RF sensing applications, and a modular design approach for the Feed Cluster Housing Module (FCHM), which together achieved a step improvement in cost effectiveness relative to the previous state of the art. The project used the knowledge gained from earlier ARTES funded feasibility study phase to manufacture and test the chosen design concept, and provide full qualification heritage for future projects. The project ran from late 2010 to mid 2014. The design, analysis, manufacture and test of the generic feed chain products was carried out by the Airbus Defence and Space Antenna Group in Ottobrunn, Germany. The feed chains were qualified at unit level, for an environment which should envelope the needs of future commercial projects. The qualified feed chains were then built into the FCHM EQM, designed by the Airbus Defence and Space Antenna Group in Stevenage, UK. The combined FBA product was then qualified by testing in a representative MFSA configuration.
11:45	**Coffee break**

12:00	**Development of an Array Radiometer Core Demonstrator (STRIN, 800 k€)** *Omnisys Instruments AB (SE)*
	 The Array Radiometer Core Demonstrator, ARCD, project is the development of receiver electronics for four 12 GHz spectrometer channels at 340GHz Cf. The development included LO multiplier chain, mixer, horn, IF system, BE and test set-up. The target instrument for the radiometer core is the STEAMR instrument (Stratosphere Troposphere Exchange And Climate Monitor Radiometer). The system basically consists of an array of 14 heterodyne receivers based on broad band sub-harmonically pumped planar Schottky diode mixers operating in the 320-360 GHz spectral range. The signal originating from both sidebands is down-converted to an intermediate frequency (IF) in the range 3.6-15.6 GHz. The IF signal is filtered, amplified and spectrally resolved using autocorrelation spectrometers that provide a maximum instantaneous bandwidth of 12 GHz with a baseline spectral resolution of 25 MHz. The tests show that the ARCD is a fully functional 512 channel spectral radiometer. The design allow for four receivers simultaneously to operate and to forward data to the control system, in this case a PC. System noise temperature is below 1000 K for the low (3.6-9.6 GHz) and below 2000K for the high (9.6-15.6 GHz) IF frequency band. System stability by means of Allan variance is approximately 10s.
13:00	**Lunch break**
14:00	**MBSE-A refinement with EAML maintenance - 7 (CCN, 130 k€)** *MVI (IT)*
	 The European Antenna Modelling Library development is an on-going work initiated by ESA in 2004 to support the implementation of extra capabilities in antenna engineering tools to provide better support to the three key processes in space antenna design: synthesis, analysis and optimisation, for the most relevant antenna classes. In the last slice (number 7) a number of improvements have been implemented involving: parallelisation of PO for Graphics cards; the improvement of MoM algorithms for multi-core architectures; the evolution of model-based interpolation schemes to blend computationally expensive high-accuracy simulations and low-accuracy computationally lean simulations; the upgrade of the EDX implementation covering the current-to-field mapping and the implementation of a binary file option to support the exchange of large data sets; the further consolidation of the EDX Fields data dictionary and further dissemination activities.
15:00	**Integrated Tool for Reflector Antenna Design, Antenna Farm Scattering, and Interference Prediction (ARTES 5.2, 600 k€)** *TICRA (DK)*
	 Telecommunication satellite reflector antennas are typically designed using the reflector antenna design tool, GRASP, which provides an accurate analysis of the isolated reflector antenna performance. The analysis of the antenna performance in presence of the spacecraft platform and assessment of interference and coupling effects can in GRASP only be performed using a simplistic model of the platform, and consequently the antenna designer is forced to perform the detailed platform scattering analysis in other tools. In this activity, we have developed an add-on to GRASP with multiple novel analysis techniques, that will allow the antenna designer to model the influence of the satellite platform as an inherent part of the antenna design in GRASP. The new analysis techniques include high-frequency asymptotic methods as well as a fast and robust full-wave solver, which is ideally suited for accurate solution of electrically large and complex scattering problems. In addition, substantially improved facilities for creating geometrically complex models have been developed, including the ability to import and analyse CAD models directly in GRASP.
16:00	**Closure**