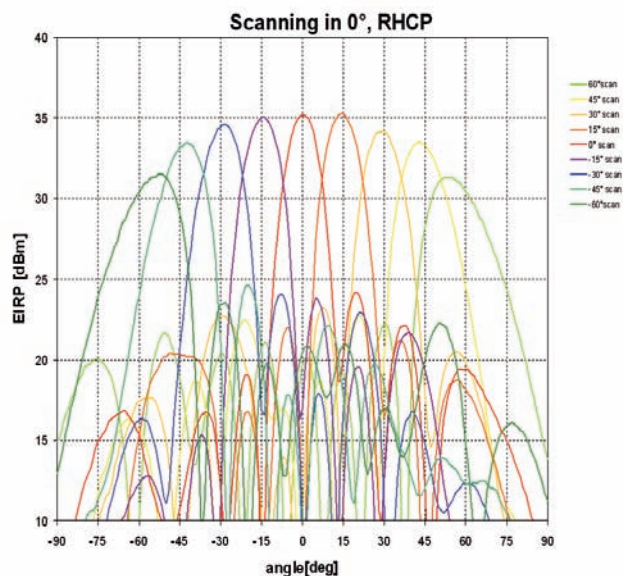


Summary

Within the SANTANA projects, highly integrated transmit/receive modules are developed to demonstrate the technology of Ka-band multimedia terminals employing digital beamforming.

A complete medium-size DBF system has been realised (64 antenna elements each for the transmitting / receiving terminal). This system has been successfully demonstrated by establishing communication links between the DBF terminal and moving platforms (car or aeroplane).



Tx 6x6 array scanned from
-60° to 60°

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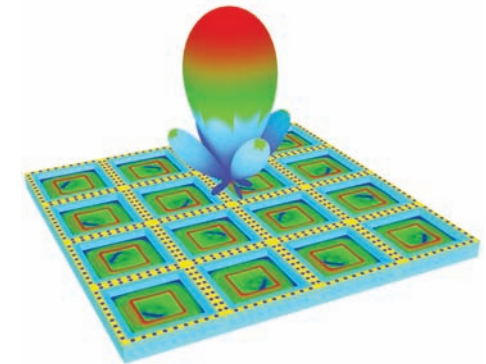
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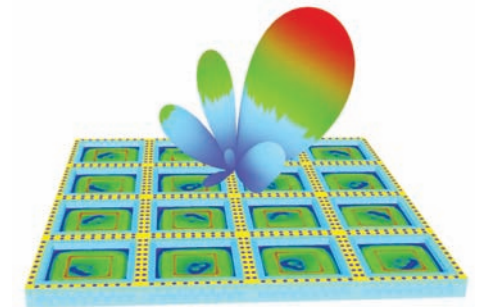
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SANTANA „Smart Antenna Terminal“



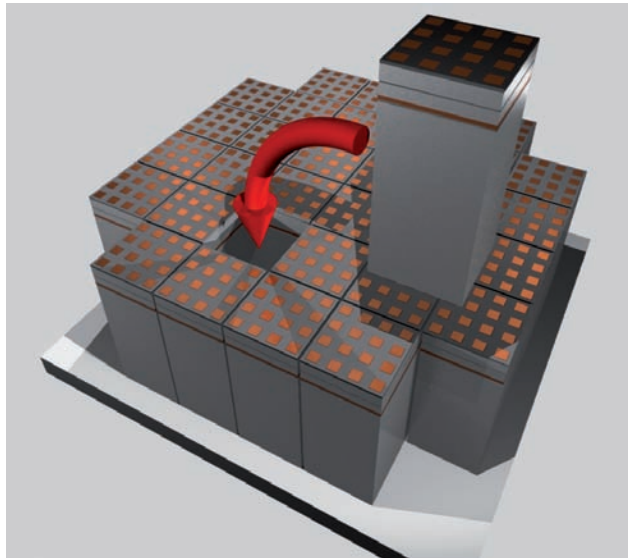
Ka-Band Antenna Terminal using Digital Beamforming for Broadband Applications



Scope

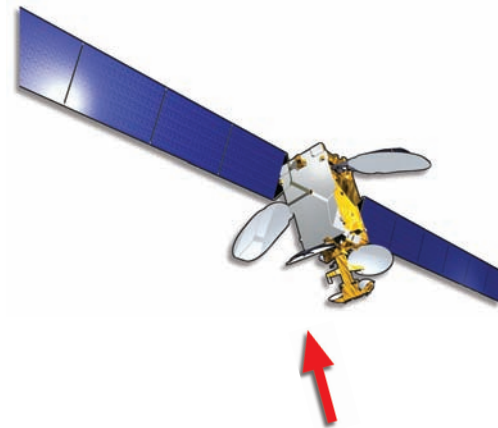
Future broadband satellite communication systems are highly interesting for mobile access to fast data services. Among the preferred applications the in-flight data exchange between aircraft and satellite for real-time internet access is a most promising one, especially for frequencies up to Ka-band.

For such applications, antennas employing Digital Beamforming (DBF) are well suited, since they offer fast and flexible beam reconfigurability. The SANTANA antenna concept is based on 4x4 element arrays (transmit resp. receive modules), which can be used to build high-gain DBF antenna arrays for multimedia applications.



Modular concept of the SANTANA antenna

Applications



Mobile Multimedia Terminals

- Uplink: 30 GHz, downlink: 20 GHz
- Scan range down to 60° from boresight
- Data rate: > 10 Mbit/s (downlink)
- GEO satellites, circular polarisation
- Digital beamforming

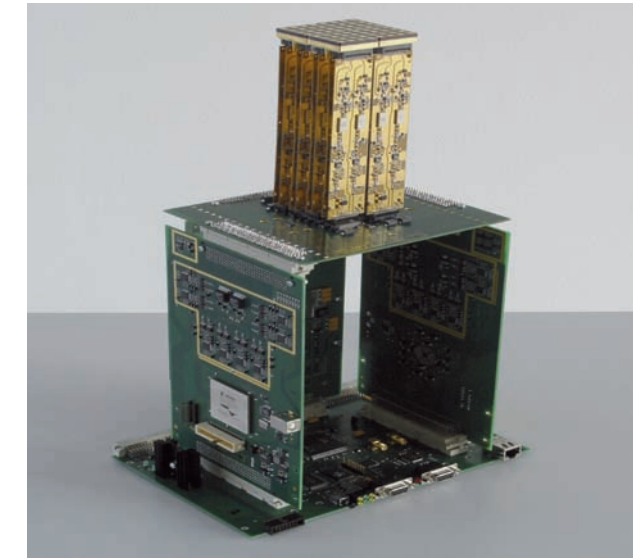


Mobile broadband communication

Architecture

The antenna transmit & receive modules consist of 16 (4 x 4) patches each, arranged spatially according to the sequential rotation principle. Phase and amplitude shifts are applied at baseband level using a direct up- or down-conversion of the signal transmitted/received by each patch.

Therefore, each antenna element is equipped with a complete RF front-end, IF circuits, DA-resp. AD-converters, and dedicated digital logic. In conjunction with fast algorithms for beamforming and beamsteering this defines a very flexible and versatile system for broadband mobile communication.



Rx DBF antenna system incl. RF, IF and baseband circuits