Design and Integration of Antipodal Vivaldi Antennas for High Power Microwave Applications in Mobile Systems

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In mobile vehicles, e. g. cars, aircrafts, antennas are integrated in the body in order to reduce for example aerodynamic resistance. These antennas are therefore not clearly visible. Ultra wideband antennas for high power microwave applications like TEM horns or IRAs offer sizes which are not useful for the above requirements. At least one dimension of the cartesian coordinates (height, width or depth) should be minimised. Planar ultra wideband antennas, for example antipodal Vivaldi antenna, planar and wire log-periodic antenna, spiral antenna and bow-tie antenna (C. A. Balanis, Antenna Theory, John Wiley & Sons, 1997), are the preferred alternatives. The most directed and maximum electrical fieldstrength radiating antenna of the above is the antipodal Vivaldi which is chosen for further investigation. This antenna is designed, simulated, optimised for the UHF band. After building up and characterising one prototype, further four antennas are produced and qualified.

For integration into cars, the behaviour of a Vivaldi near a metallic plane is investigated. A metallic case which simulates an engine bonnet, a roof or a mudguard is built up for measurements and MoM simulation. Input matching and antenna pattern are yielded for variable distances from the horizontal placed Vivaldi to the metal plane. At 20 cm distance coupling effects can be neglected, at 8 cm the input matching is moderate but the main beam differs from the freespace case.