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The authors present the numerical validation of a dual layer reflectarray antenna with innovative radiating elements for use in the base station of the WISPERS Project (co-funded by Regione Piemonte), which deals with emergency info-mobility services based on an innovative unmanned ultra-light aircraft platform (UAV) for emergency radio services. This innovative antenna with reduced volume and weight has been proposed in order to fulfill the requirements of the link between the UAV and the ground station (P. Pirinoli, M. Mussetta, P.T. Cong, M. Orefice, "Prototype of a dual band reflectarray antenna for UAVs tracking", *IEEE AP-S 2009*).

The reflecting elements consist in two concentric, narrow-strip square rings, and they have been selected among different possible configurations since they exhibit a good frequency behavior. The cell size is about 0.45λ at the band central frequency. In the solution proposed, the reflecting elements can be located on different layers, for different frequency bands.

This geometry presents several advantages: first, it shows more independent degrees of freedom which can be used to enhance the bandwidth, since a RA is intrinsically a narrow band structure; moreover, the square ring has a resonant size lower than that of a square patch and even of a circular ring.

From previously presented analyses, several interesting features came out: the considered variation of the size of the square rings yield to a phase variation of more than 600°, and this variation is almost linear in a 400° range; moreover, the curves computed at the different frequencies are almost parallel. Similar curves have been obtained in different frequency bands by considering the rings embedded in an infinite periodic structure and adopting a full wave approach.

The design of the entire planar reflector can be conveniently carried out using an indirect synthesis procedure, based on an optimization algorithm. The advantage of using global optimizers is that they are able to handle a large number of degrees of freedom and to provide a configuration satisfying at the best the different constraints on the antenna.

In order to validate the basic concepts of the design and optimization of the proposed planar reflector, a full-wave analysis of a reduced prototype is firstly carried out and then the antenna will be manufactured and measured.