

## ABSTRACT

A collective uniform geometrical theory of diffraction (UTD) ray solution is developed for describing the fields radiated by large array apertures that are conformal to a doubly curved, smooth convex PEC surface. Such conformal array apertures may either be physical array apertures formed by simple antenna elements located directly on a convex PEC surface, or be equivalent apertures defined by more complex flush mounted radome-covered antenna arrays whose elements are slightly recessed in a cavity structure just below the skin line of a convex PEC boundary. The present UTD solution describes all at once the radiation from the whole array aperture in terms of just a few rays which are launched from specific critical points in the interior and on the array aperture boundary. Hence, it is relatively highly efficient as compared to the conventional element-by-element field summation approach. More importantly, it provides useful physical insights into the array radiation mechanisms. In most practical applications, the large array is situated conformally on an even larger platform, e.g. an aircraft, a spacecraft, or a naval ship, etc. In these realistic cases, the very large platform part can be modeled efficiently by the high-frequency UTD method, while the large array part can be modeled locally by numerical methods (FEM, FE-BI, etc.). The coupling of the array fields to the external platform is then achieved by the present collective UTD solution which launches the collective ray fields from the array aperture or window to then interact with the rest of the platform. Such a

hybrid numerical-collective UTD method provides a useful, tractable and relatively efficient analysis of large arrays on a very large platform. Numerical results are presented to demonstrate the accuracy and efficiency of the present collective UTD ray solution for describing the fields radiated by large conformal antenna phased arrays on a smooth convex PEC surface.