Perfect Absorption by an Array of Lossy Dipoles Located Close to a Ground Plane

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***Abstract*— This paper presents a thin absorbing structure comprising an array of finitely conductive terminal-loaded dipoles spaced about half a wavelength apart and located above a ground plane. We show that if the antennas are terminated with proper load impedance, instead of a conjugate-matched one, a perfect absorption can be attained even when the array lies close to the ground plane. We also identify a threshold height below which the absorption efficiency rapidly drops and perfect absorption cannot be realized. The idea is illustrated via a concrete example of array of dipoles printed with conductive ink technology on a Kapton HN flexible film backed by a rigid Rogers 4350B substrate. The array is designed for perfect absorption at 3.45 GHz when it is located one-tenth of a wavelength above the ground plane. Good agreement between simulation and measurement results is demonstrated.**

***Index Terms*— Absorption efficiency, antenna arrays, dipole, electromagnetic wave absorption, silver ink.**

made of lossy material [10] to the case of an array of lossy dipoles above ground plane. In [10], it is shown that the optimal load that maximizes the total power absorbed (both by the load and the material of which the antenna is made) is different from the conjugate-matched load, which is required to maximize the load power alone. Likewise here, we show that the optimal load that maximizes the absorption efficiency of the infinite lossy array is different from the complex conjugate of the dipole's active impedance [11], [12] required to maximize the array load power. The maximum absorption efficiency can reach 100%, but, contrary to infinite array of lossless dipoles [3], not for all heights of the array above the ground. Specifically, below some threshold height, which depends on the periodicity, geometry, and finite conductivity of dipoles, the absorption efficiency drops rapidly. However, this threshold height can still be suffi-