1051-81-37　　　　　**Indranil Sen Gupta*** (`sengupta@math.tamu.edu`), Department of Mathematics, Texas A&M University, College Station, TX 77843-3368. *Spectral analysis of the three dimensional Dicke Superradiance problem.*

Superradiance has been attracted the attention of many physicists and chemists since the pioneering work of Dicke (Phys. Rev., 93 , 99 , 1954) on spontaneous radiations. This problem is reduced to finding all the eigenfunctions of some integral equation. Slepian, Landau and Pollak (Prolate Spheroidal Wave Functions, Fourier Analysis and Uncertainity- I - V , Bell System technical journal) considered an integral equation related to the one-dimensional superradiance problem in a different context of communication theory and obtained prolate spheroidal functions as the eigenfunctions. In our work we will consider 3-dimensional superradiance problem and find a differential operator that commutes with the integral operator related to the problem. We find all the eigenfunctions of the differential operator and obtain a complete set of eigensolutions for the 3-dimensional superradiance problem. (Received August 26, 2009)