Resonant Cavity Design Using the Finite Element Method, C.R.I. EMSON, <u>D. WALSH</u>, Vector Fields Ltd - This paper presents a finite element method for calculating resonant frequencies for an arbitrary three dimensional cavity. Firstly, we consider the difficulties introduced by modelling high frequency fields, notably the failure of traditional nodal element formulations to treat the inherent singularities associated with re-entrant corners. Unless the singularities are taken into consideration, the eigenvalues cannot be obtained with any degree of accuracy. We then detail the edge element method, and explain its advantages for modelling singularities, and preventing the occurrence of spurious solutions. By virtue of being a finite element method this approach is flexible and efficient, allowing complex geometries to be represented accurately and with minimum number of variables. The method also provides the complete field profile in the cavity interior for each mode, allowing detailed investigation of the characteristics of the device. The strength of this approach will be demonstrated by solving realistic examples, showing how additional relevant design parameters such as Q factors and wall heating may easily be determined.