Dirichlet to Neumann operator for the high frequency wave equation for elliptic cylinders coated with dielectric absorbing material: a complete analysis of the symbol

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It is known that, for elliptic cylinders (including the easier case of a elliptic section which is a disk), we can use separation of variables. The cotangent bundle of the boundary is characterized by a discrete Fourier mode n for the angular variable and a continuous Fourier mode k_z for the z-variable. After partial Fourier transform in z, variable of the axis of the cylinder, the eigenfunctions on the boundary (circle of radius R or ellipse) are either the usual trigonometric functions or the Mathieu functions, labeled through a quantization condition.
Using precise asymptotic expansions of the Bessel and Hankel functions for the disk, and of the modified Mathieu functions for the cylinder, we are able to identify the leading order term in ω as a function of k_z, n (of order 1) and the next order term (of order 0) of this symbol where k_z AND n grow in ω when $\omega \to +\infty$. In particular, we show that there is a explicit correction for the next order term generally used of the form $\frac{1}{2R}$ through $\frac{1}{2R}\frac{\epsilon\mu\omega^2-k_z^2}{\epsilon\mu\omega^2-k_z^2-\frac{n^2}{R^2}}$, where ϵ, μ are the dielectric constants of the layer and R is the radius of the cylinder. An analogous expression is found for the elliptic cylinder, making use of the radius of curvature at each point of the boundary.

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