Diffraction of a creeping wave by the edge of a strongly-elongated spheroid truncated by a plane perpendicular to its axis.

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The theory of creeping waves propagating along the generatrixes of a strongly elongated body of revolution, has been developed by Andronov and Bouche (*Annales des Télécom*., **49**, 1994, pp. 206-210) who obtained instead of the Airy equation verified by the Fourier transform of the amplitude of the creeping waves in the classical boundary layer method, a biconfluent Heun equation. Applied to an elongated spheroid, this theory predicted an enhancement of the amplitude of the magnetic creeping wave which has been confirmed qualitatively by a numerical approach. In a previous paper, we applied this theory to the diffraction of a creeping wave on a strongly elongated perfectly conducting or coated object by a sharp edge (F. Molinet, *Proceedings of ICEAA*, 2009, Torino). More recently, important improvements to the theory have been made by Andronov, Bouche et al (*IEEE ANP*, Nov. 2012, p. 5286). They refined the theory by applying the asymptotic approach to the Maxwell's equations written in spheroidal coordinates, and found instead of the Heun equation a Whittaker equation. With this new asymptotic approach they obtained a perfect agreement between the theoretical and numerical approaches.

In this paper, we present new formulas for the diffraction of a creeping wave on a strongly elongated object by an edge type singularity , expressed in terms of Fock type integrals of Whittaker functions. The technique used is an extension of Michaeli's procedure. In a first step the Whittaker functions appearing in the expression of the creeping wave field are expanded in the boundary layer close to the surface, in Taylor series of the distance to the surface, which is supposed small. Then, in a second step, by using Whittaker's equation, it is shown that the first terms are identical to the first terms of the series expansion of sine and cosine functions. Hence, as in the classical asymptotics, the field in the boundary layer can be written in the form of a spectral representation of inhomogeneous incident and reflected plane waves. In a third step, the field diffracted by the edge is derived by applying the Spectral Theory of Diffraction.

A list of new hybrid diffraction coefficients for the diffraction of creeping waves by an edge on a strongly elongated object will be presented comprising the diffraction of a creeping wave into a space wave and vice versa, and the diffraction of a creeping wave into another creeping wave with the observation of the field on the surface and at large distance from it.