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ELECTROSTATIC INTERACTION BETWEEN NA POINT CHARGE AND A SINUSOIDAL CORRUGATED CYLINDER

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Resumo

Problems involving boundary conditions on corrugated surfaces are relevant to understand nature, since, even apparently smooth surfaces have corrugations, at some scale, that will affect their interactions. In this context, Clinton, Esrick and Sacks [Phys. Rev. B 31, 7540 (1985)] solved the Poisson's equation for a charge in the presence of a nonplanar conducting surface, by a perturbative analytical calculation of the corresponding Green's function. In the present work, we extend this perturbative analytical calculation to the case of a point charge in the presence of a grounded conducting corrugated cylinder. By considering sinusoidal corrugations on the cylinder, we show that an azimuthal force arises, and that this force always attracts the charge to the peaks of the corrugation. The knowledge of the Green's function corresponding to this problem can also be interesting for investigating the van der Waals interaction between a polarizable particle and the cylinder in question. Such investigation can be done by combining this approach with the description done by Eberlein and Zietal [Phys. Rev. A 75, 032516 (2007)] for the van der Waals interaction between a polarizable particle and an ideal conducting surface, which has been one of the focuses of recent investigations by the Casimir-Amazônia Group at UFPA.

Palavras chave: Electrostatic interaction, Green's function, Perturbative method.