# On the Design of a Inductively Coupled Telemetry Coils for a Retinal Prosthesis

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Recent advances in ophthalmologic research has shown that blind patients affected by incurable retinal degeneration affecting photoreceptor cells, such as Retinitis Pigmentosa (RP) or Age-Related Macular Degeneration (AMD), can partially regain some form of vision by means of a retinal prosthetic device. This device, implanted in the human eye, directly stimulates surviving neural cells in the retina (ganglion and bipolar cells) thus performing the functions of the damaged photoreceptor layer.

Currently considered prototypes of a retinal prosthesis system are composed of two units: external and implanted. The implanted unit receives power and data through a wireless telemetry link that employs inductively coupled coils.

In this paper we will describe the use of quasi-static methods, such as the partial inductance method, used to optimize the design of both external and internal coils in terms of coupling coefficient, accounting for the size limitations imposed by the system, range of motion of the eye, curvature of the implanted coil needed to fit on the human eye, and coil thickness.

Advantages and disadvantages of various design configurations will be discussed, including coupling variations as a function of the size and relative position of the coils, total resistance of the coils, capacitive effects and their estimations and finally, implications of each design on the Specific Absorption Rate of power (or SAR) for electromagnetic safety assessment within IEEE & ICNIRP guidelines.

Numerical and experimental results will be presented and preliminary utilization of an experimental system for the verification of the computed SAR will be discussed.