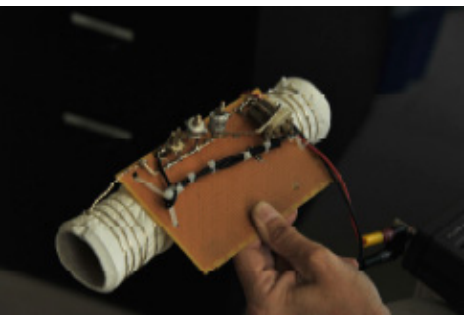

EVATRANS

Wireless transfer of electromagnetic power by tuned resonant evanescent fields

Project Summary

It was recently shown elsewhere that strongly coupled oscillating electrical circuits at resonance having high Q factors, are able of exchanging electromagnetic power in ways which are markedly different from more common coupled circuits, such as primary and secondary circuits in a transformer or even close emitter-receptor antennae pairs. In particular such coupled circuits were shown to be capable of functioning as wireless devices for power transfer at large distances. This was also our main goal, together with the idea of reducing the role played by the electric component of the electromagnetic fields, which requires to work at low frequency regimes, at wavelengths much larger that the device's dimensions. What distinguishes power exchanges in traditional devices from those in the new ones relates to the way in which the power flux organizes itself geometrically between the source/emitter and the target/receiver regions. This particular organisation is a result of the interplay between the wave character of the field and the conditions of near-perfect wave absorption which are met at the receptor level at resonance and at high-Q (quality factor).

We developed a complete analytical model under the assumption of large electromagnetic wavelengths, compared to the set-up characteristic dimensions. On the modelling and simulation side, we used a symbolic-calculus software to setup the analytical model, to visualise the fields and the fluxes in 3D, to compute the iterative solutions to the mixed induction-law equations and to interactively explore the space of parameters available in the this type of physics problem, which was very helpful in understanding the physical subtleties involved. The concrete realization of the experimental setup constituted a major challenge due to the very large values required for the quality factors Q of the oscillating circuits. The results obtained were finally met with success since we managed to transfer power almost over 7 meters, with high efficiency and using small coils (see figure above).

Valorisation

First steps to protect the intellectual property (IP) are being undertaken regarding the innovative setup model, design and electronics. Further steps will be taken once the work is extended and validated at very high-Q. A project (Hyper-Q) has been submitted for that purpose.

Publications of EvaTrans are suspended, waiting for the IP issues to be cleared.

Contact / Mr José Alberty (jose.alberty@hesge.ch)
Authors / Mr José Alberty and Patrick Favre

This project has been carried out by hepia (HES-SO//Geneva) and IICT (HEIG-VD)