A) General Information

Main-scientific field: Energy Transfer
Specific-Discipline: Wireless Energy Transfer
Acronym: WOLEVET - ID20120630- 08
Title of the User-Project:
Wireless On-Line Electric Vehicle Energy Exchange
TA Call: 7th call
Host Research Infrastructure: TU Sofia R&DS
Starting Date: 24th June 2013
End Date: 5th July 2013
Lead User : Stanimir Valtchev, Auxiliary Professor
Organization: Universidade NOVA de Lisboa (UNL),
Faculdade de Ciencias e Tecnologia (FCT)
Additional Users: Rui Medeiros - Ph.D. Student

B) Summary of the User-Project

The aim of this project is to apply the accumulated knowledge in the area of wireless energy transfer for a further development of practical applications and implementations. The project is focused on the design of the transmitters and testing of their electrical parameters, varying the working frequency in the kHz range. The intended application is related to the possibility to make more acceptable the use of the electric vehicles by including a most efficient wireless charging of different batteries from the grid. The contribution of the project we see in a possible "system" point of view, in order to help the future generations to live in a greener world. The optimization models and techniques are discussed as a future development of scientific, technical and technology problems. Starting from a smaller size model, not sufficiently optimized, other transmitter sizes and configurations were experimented with realistic modeling proposed for transmitters capable to transfer 1- 2 or more kW active power in the kHz range of frequency.

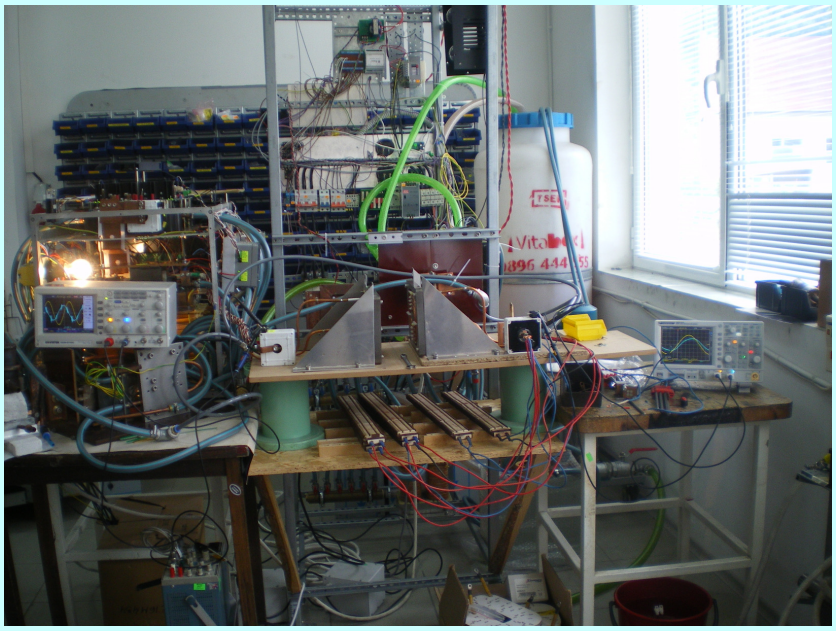
Auto-oscillating MOSFET inverter f= 200-300 kHz-**Fig.1 Demo transmitter**

- $N_1=N_2=5$ L=3,04 µH
- Ferrites Siemens P68/21, N27
- $C_1= C_2 =18.8$nF
- H.F. rectifier diodes Motorola MBR 10/100
- Battery GIPI 1272 Pb – 12V, 7.2 Ah
- LED lighting
- Connection in parallel to the inductor
- Resonant frequency f=256kHz
- Distance D = 7 to 21 mm
- P=150W

C) Main Achievements (or Expected Results)

H.F. Generator with
Transmitter №1 - **Fig 2**

- Ferrites EE6527 from CF139 in a set
- C=6800 pF
- $N_1=N_2=5$, L=10,8 μH, no cooling
- Connection in parallel to inductor
- Frequency **f = 538 kHz**
- Distance D = 120 to 240mm
- Efficiency η = 50-.70%
- P = 800 W



MOSFET inverter, phase shift regulated, full bridge F = 100 to 200 kHz-**Fig.3**
Transmitter №1

- Ferrites EE6527, grade CF139
- L=10,8 μH, air cooled
- C=0,2 μF
- Frequency **f=130 kHz**
- D=100 to 250mm
- P=1300W, η =45-.60%

Transmitter №2

- Ferrites FLUXTROL50
- L=4,7μH, water cooling
- C=0,2 μF
- Frequency **f = 184 kHz**
- Distance D = 100 to 150mm
- P = 2000W, η =70-.80%

The expected outcome of the project is: 1.Experimental results from testing of different size and shapes of transmitters for different power in the kHz range of the frequency 2. Analysis of the requirements to the control systems for wireless charging of different batteries for electric vehicles and rationalized use of energy transfer; 3. Implementation of the tested versions of energy transfer into the energy management in industry and for micro grids.

D) Dissemination of the Results (Planned)

Technical articles for 2013 -2014 conferences: the first planned is the INTELEC 2013 in Hamburg, Germany. Further plans include technical paper for international conferences/symposia organized by IEEE, such as SmartGridComm, CDC, ISIE, INDIN, and IFAC.

E) Use of the Resources

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Nr. of Users involved: 2 users
Access Days: 9 days
Stay Days: 12 days