

Static & Dynamic Wireless Charging of Electric Buses

ASSOCIATED PROJECT

A real-world demonstration in the City of Málaga (Spain): the VICTORIA project

Overview

The possibility of charging electric vehicles at bus stops and/or traffic lights without driver intervention (static or stationary charging) or even charging while the vehicle is moving (dynamic charging), could greatly increase its autonomy. The project was carried out in the city of Málaga (Spain) and consists in designing and installing a dedicated bus lane with inductive charge, to test static, stationary and dynamic charge.

Objectives

- Demonstrate static, stationary and dynamic charge.
- Optimal design of a 50-kW wireless power transfer system.
- Demonstrate advantages of SP-S resonant topology for dynamic charging (designed and patented by CIRCE).
- Provide a solution for good electromagnetic shielding.
- Collaboration with FABRIC to share technical and economic data.

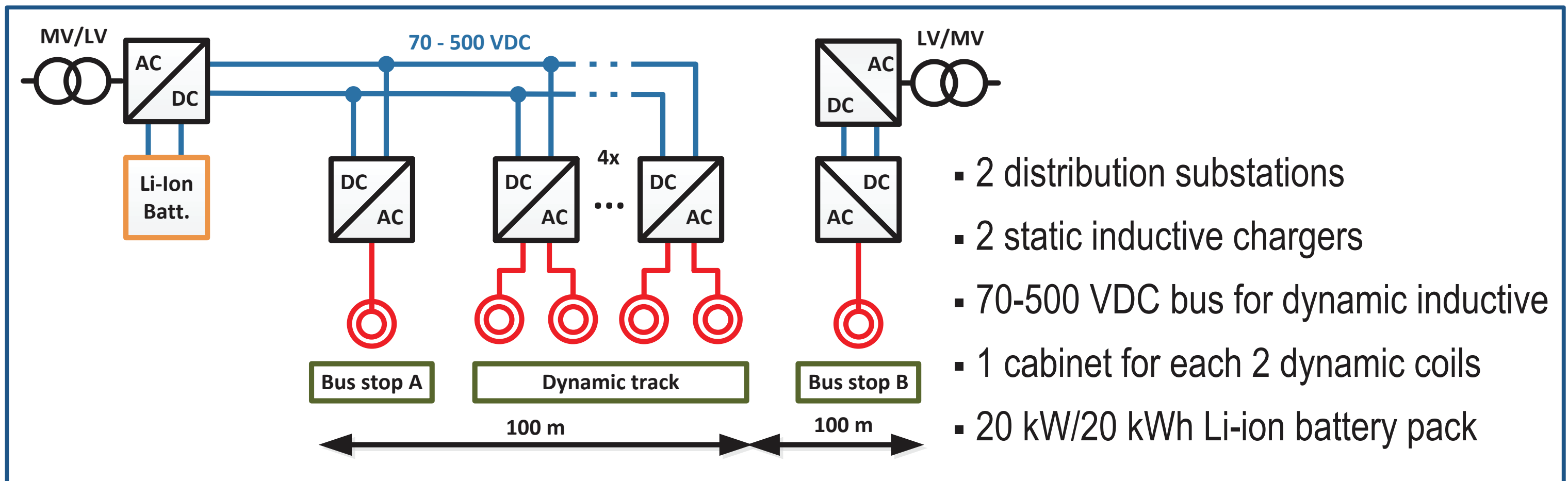
Partners involved



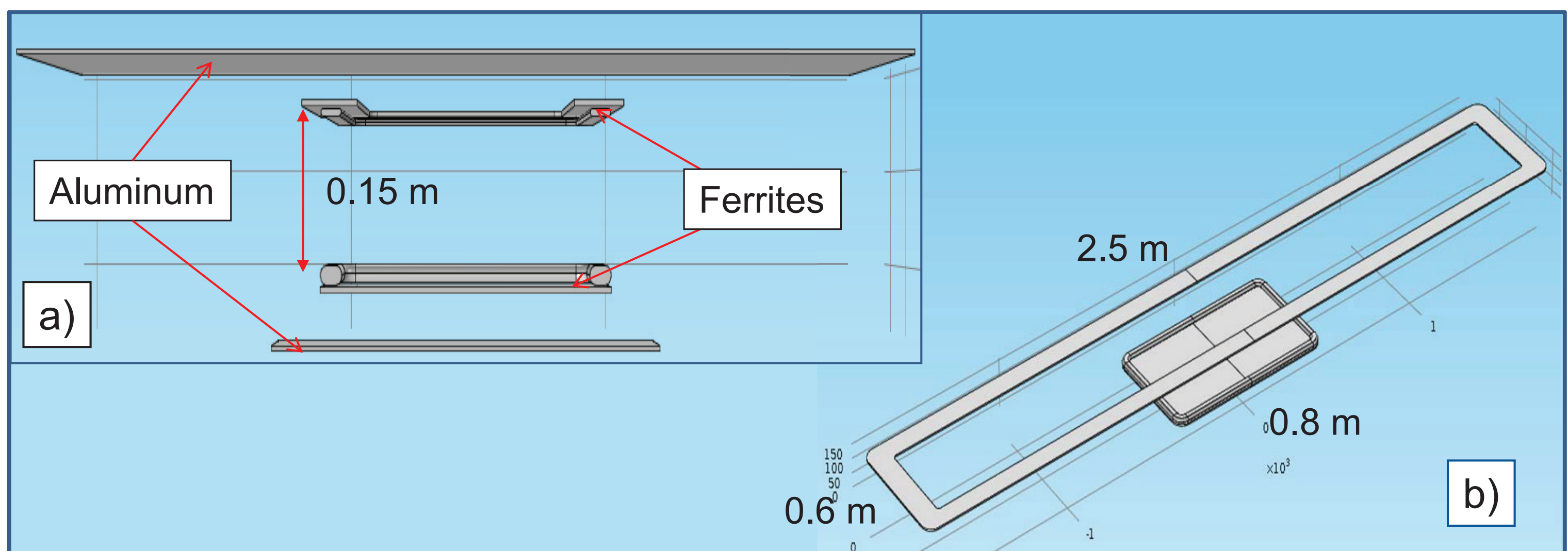
Gulliver U520 electric bus

Developments

CIRCE developed the wireless power transfer (WPT) system (Fig. 2). Good shielding is obtained with large coils on board and short coils in the road (Fig. 3). Core of this development is the Serial Parallel-Serial (SP-S) topology (see Fig. 4), which allows high misalignment between coils (up to 30% of coil surface).



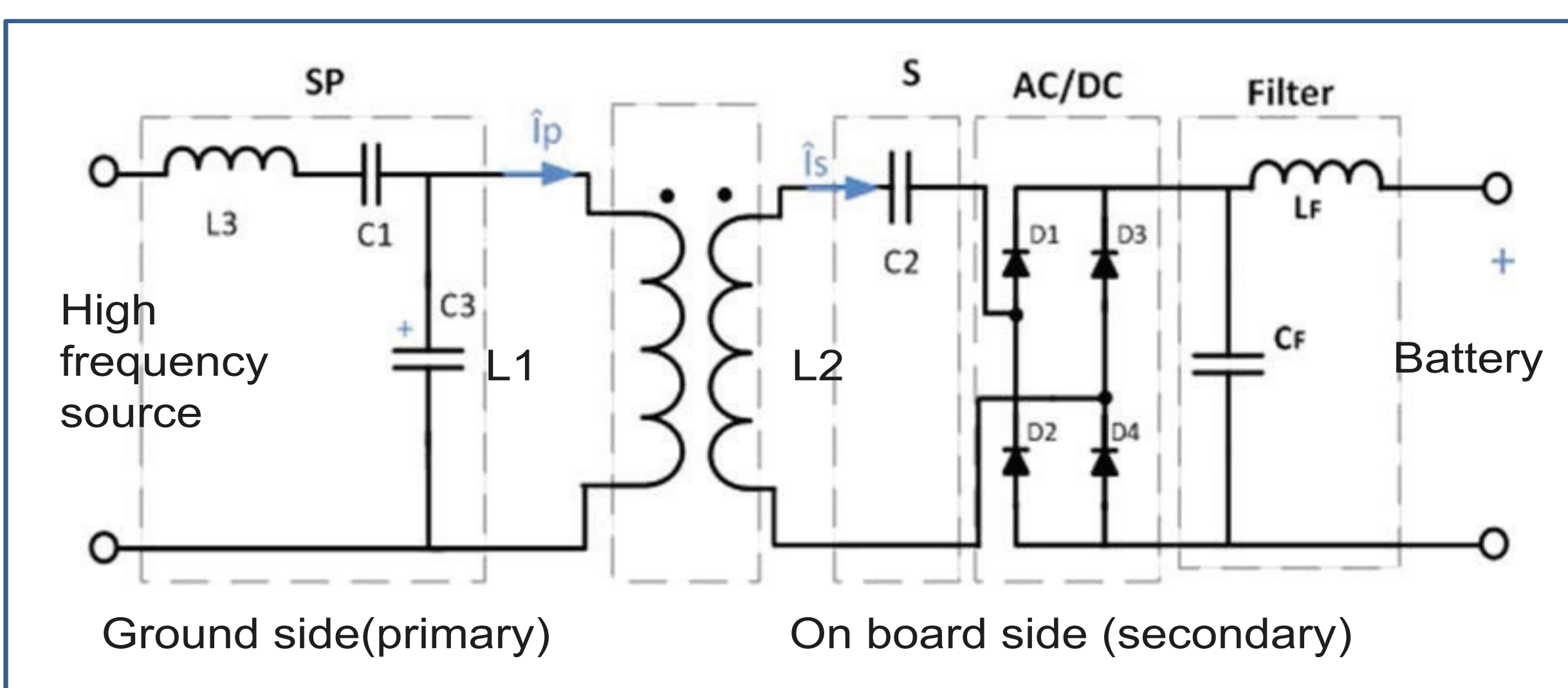
Charging lane arrangement for static charge and dynamic charge.



Coil arrangement and electric parameters a) Front view; b) Perspective view.

Airgap :	0.15 m
DC bus Voltage:	650 V
Battery current:	150 A
Battery voltage:	285 - 400 V
Charging Power:	50 kW
WPT Frequency:	23.8 kHz
Emitter coil:	0.6 x 0.8 m
Receiver coil:	0.6 x 2.5 m

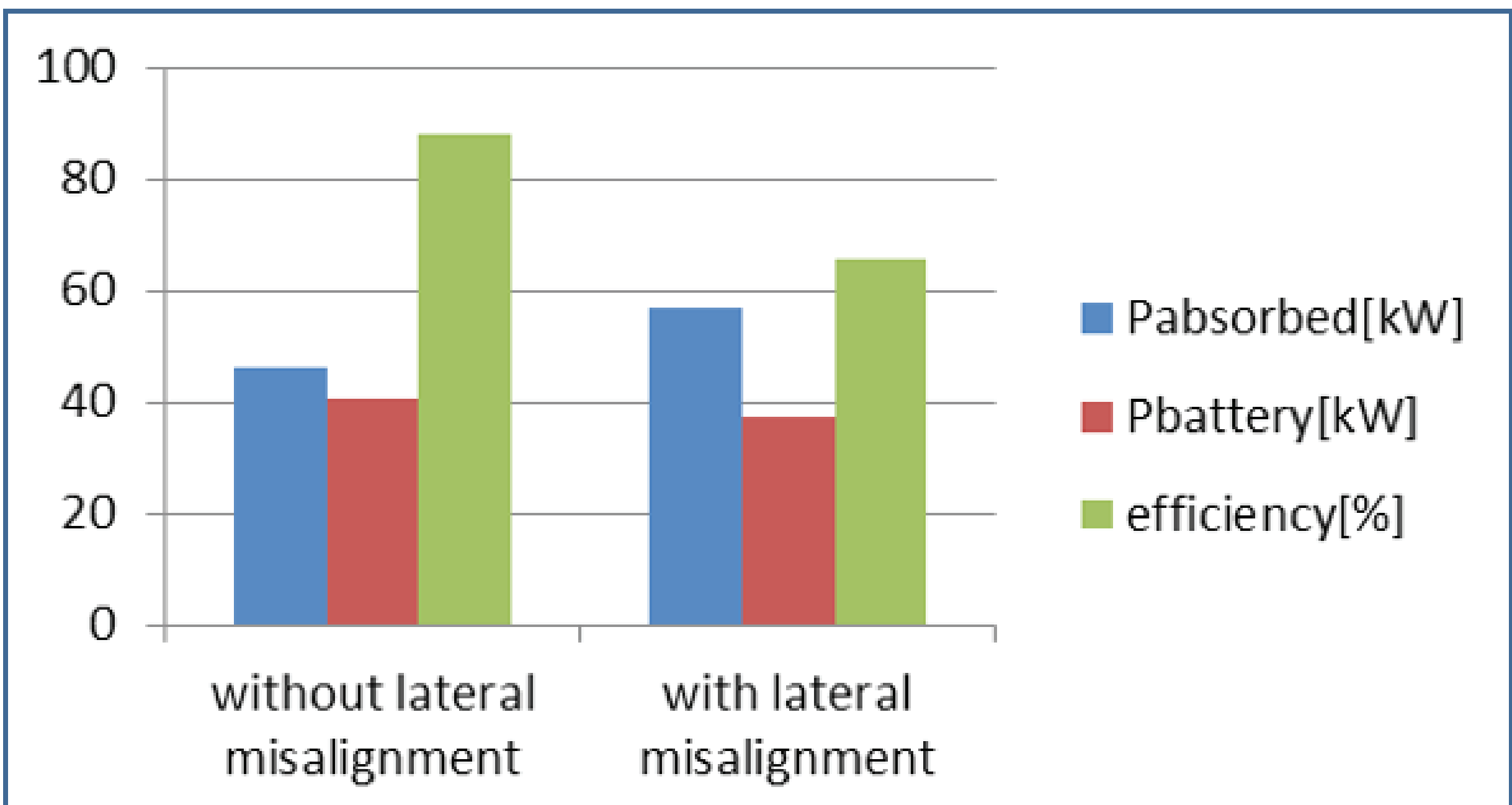
Design parameters.



Employed SP-S resonant topology.

Achievements

- Solution with high power transfer capability (50 kW)
- Improved power quality → THD less than 1%
- Total efficiency over 80%
- IPT efficiency over 91 %
- Fewer EMC certification problems due to reduced noise
- Small filters → Reduction of cost and size
- Integrated Li-ion static storage and ready to integrate solar PV
- Valuable showcase for FABRIC DWPT viability analysis



IPT efficiency with and without lateral misalignment.

Final Event & Demonstration | 21-22 June 2018 Italy

Contact

Hans Bludszweit, CIRCE, Spain
Email: hblud@fcirce.es

Coordinator

Jorge Sánchez Cifuentes, Endesa, Spain
Email: jorge.sanchezc@enel.com

Funding

3.7 M€

This project has received funding from FEDER Innterconecta Anadalucia 2013 Technology Fund (jointly financed by the EU through European Regional Development Funds), by the CDTI and by the Governing Board of Andalusia.



Centro para el Desarrollo Tecnológico Industrial



FEDER – ININTERCONECTA

“Una manera de hacer Europa”