From FABRIC TO INCIT-EV

IEA Task 45 E Roads Webinar

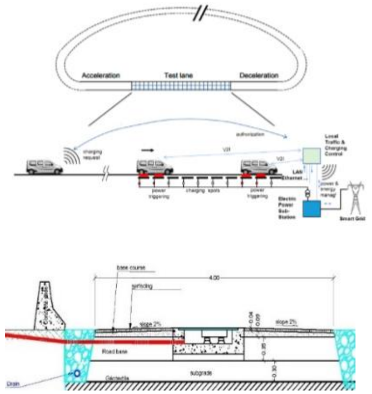
S.Laporte VEDECOM

version 08/10/2020

FABRIC

Feasibility analysis and development of on-road charging solutions for future electric vehicles

Versailles-Satory (FRA – VEDECOM)





Suza (ITA- POLITO)




Project facts

Duration 52 M (01/01/2014 – 30/06/2018)

DG / Unit Research and Innovation

Budget 9 M€ | **Funding** 6.5 M€

Key Objective

Assess Feasibility of Dynamic Wireless Power Transfer (in real driving conditions)

- **2 demonstration sites**
- **85 kHz rated DWPT systems**
- **20 kW target max power**
- **Speed from 0 to 100 km/h**

- **http://www.fabric-project.eu**

Supported by:

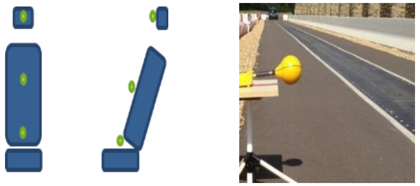
This project has received funding from the EU's FP7 for research, technological development & demonstration under GA no 605405

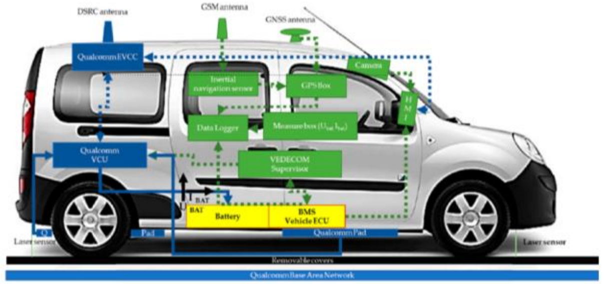
THE FABRIC PROJECT

Versailles – Satory Demonstrations and Conclusions

The charging integrated infrastructure and the two car prototypes have been fully operational since April 2017 and operable for more than a year with some maintenance; It has demonstrated many times the original targets, i.e.

- **Charging up to 20 kW**
- **Charging 1 or 2 cars (LDV Kangoo)**
- **Charging from 0 to 100 km/h**





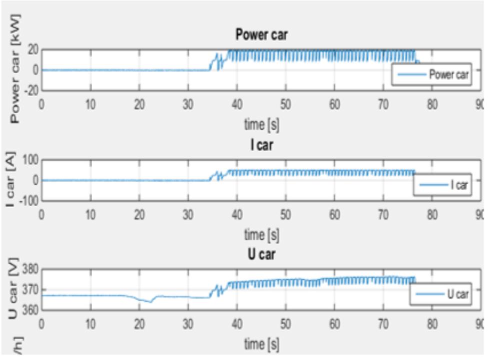


Figure 7 Example of on-board electric measurement showing ripple induced by primary coils subsections separations (test at 10 km/h, 20 kW)

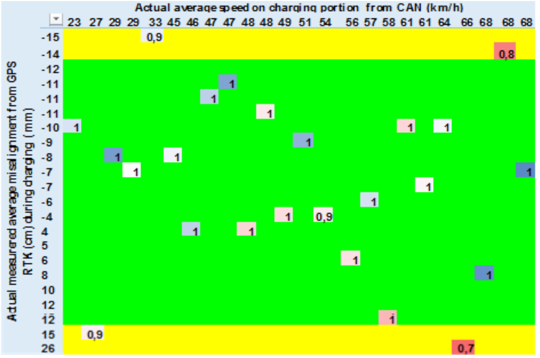


Figure 8 Efficiency indicator values as a function of average speed (horizontal) and average misalignment (vertical). This indicator is calculated as the ratio between the actual efficiency for a test run over the maximum recorded efficiency value

Experimental track concept

The civil engineered VEDECOM experimental track concept has proven to be a crucial tool for such specific early prototypes tune-up, validation and demonstration. (Easy access to power electronics components).

Energy efficiency

Total energy efficiency on the tested Qualcomm prototype, the total efficiency measured, grid to battery, reached around 70% using methodology elaborated within the FABRIC project for the two test sites.

Charging current shapes

The ripple on the output current and voltage signals could be further reduced.

Influence of speed, alignment and air gap.

From a series of 54 tests, when aligned to an average +/- 12 cm, there is no noticeable reduction in the performance of the system with speed in the tested range

EMC and EMF

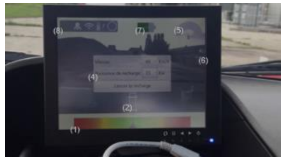
The prototype system meets applicable requirements inside and outside the vehicle.

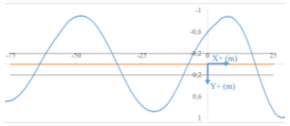
ICT technologies

The LKA integrated in the HMI for Satory site solution was a good asset to ensure maximal charge performance. Further developments should investigate fully automated trajectory control.

Main paper reference

https://www.mdpi.com/2032-6653/10/4/84





THE FABRIC PROJECT

Suza Demonstrations and Conclusions

The charging integrated infrastructure and the van prototype were fully operational only at the end of 2017 and were operable for 6 months with some maintenance . Main demonstrations:

- **low power (6 kW)**
- **from stationary to mid speed (50 km/h)**
- **and with one van**

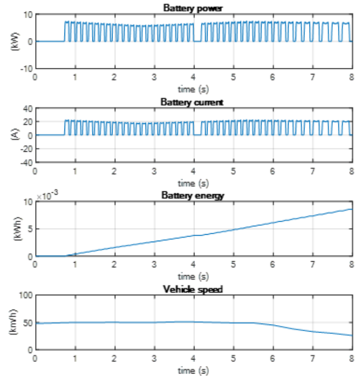


Figure 11 Example of on-board electric measurement showing ripple induced by primary coils subsections separations (test at 50 km/h, 7kW)

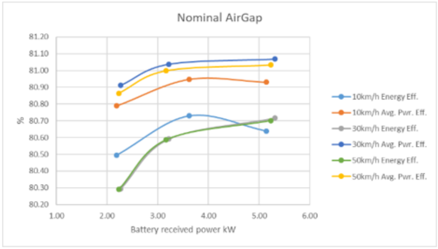


Figure 12 Efficiency values as a function of average speed and battery power.

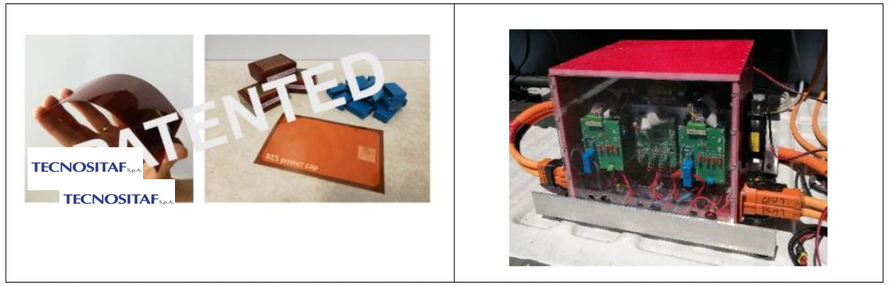


Figure 45. Capacitor shape for the low-current (S2) solution (left) and on-board DC/DC converter for vehicle self-power regulation (right).

Direct embedment concept

The POLITO-SAET main goal was to try a complete and realistic implementation in a road. The main aspects identified within the two solutions were the ground coupling for a realistic embedment.

Energy efficiency

The global efficiency af the system was measured at the power level showing a good result being 92% grid to battery at the lab tests, above 80 % in dynamic conditions.

Charging current shapes

The ripple on the output current and voltage levels at the battery side was dramatically high (in motion). The reason was the placement of the coils far enough not to interact one with the other.

Influence of speed, alignment and air gap.

From a series of tests a precise alignment evaluation was not easy to be implemented. An autonomous driving system could be a solution to optimize the WPT power and efficiency.

The speed was not an influencing element till the reached level (50km/h).

EMC and EMF

The prototype system meets applicable requirements inside and outside the vehicle. No EMC impact on car components was assessed during more than one year of monitored exploitation.

ICT technologies

A no communication power control approach has been tried and successfully implemented so to avoid massive adoption ultrahigh speed communication instruments (5G) for identification and feedback control

Paper Reference

URL: http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8288672&isnumber=8365919

THE INCIT-EV PROJECT
Overview

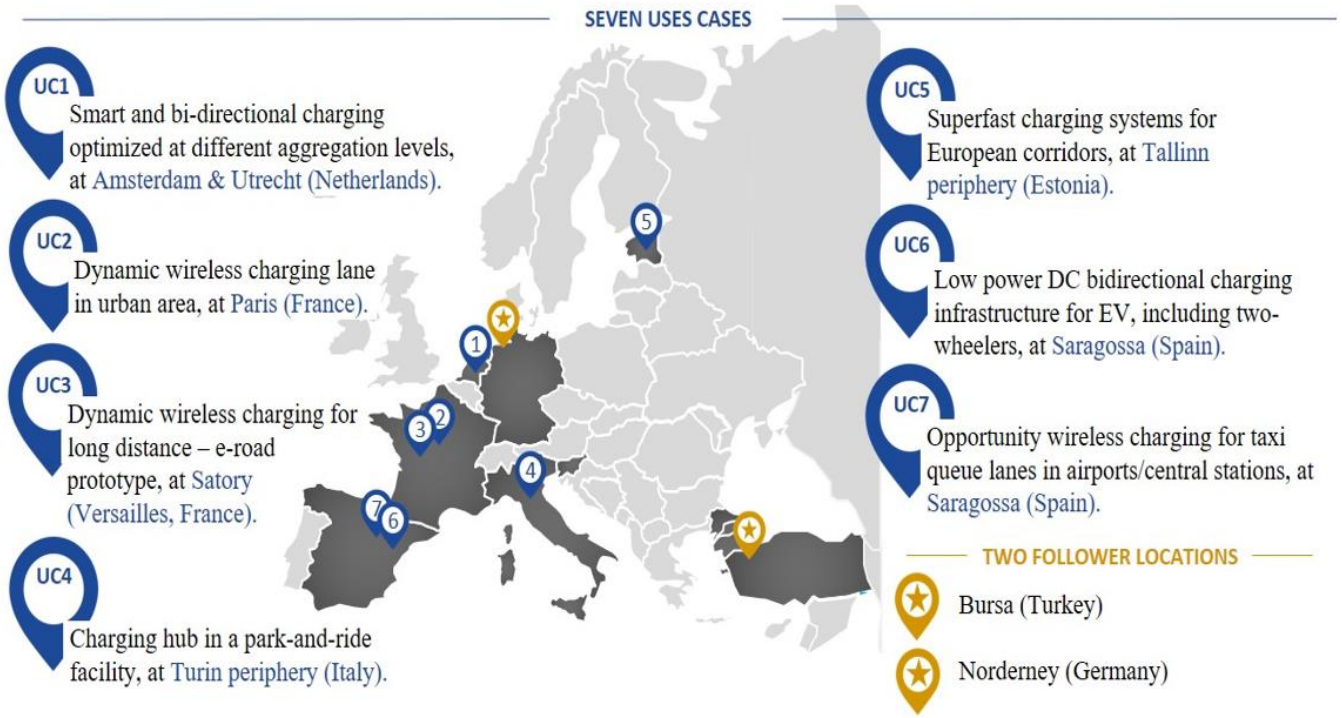
INSTITUT VEDECOM

THE INCIT-EV PROJECT

7 innovative user centric charging infrastructure demonstrations

Project Overview :

INCIT-EV aims to demonstrate, at five demonstration environments including TENT-T corridors, an innovative set of **charging infrastructures**, **technologies and its associated business models**, ready to **improve the EV users experience** by considering both their conscious and unconscious preferences in their design, with the ultimate goal of **fostering the EV market share** in the EU.



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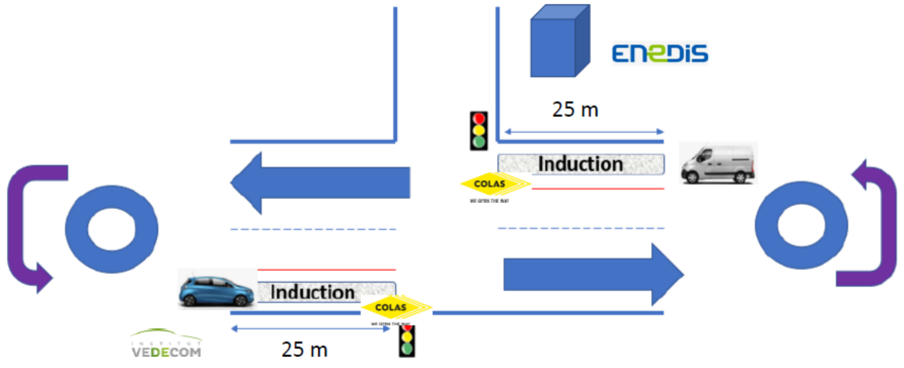
Two different use cases for DWPT (urban, extra urban). Demo start: Mid 2022.

E-road Paris demo



- To simulate urban usage of dynamic wireless power transfer
- To address real city infrastructure integration

E-road Satory demo

- To simulate long range and high speed usage of dynamic wireless power transfer
- To address interoperability of systems and vehicles
- To study the synergy between dynamic charging and guidance for AD

https://www.incit-ev.eu/