



UNIVERSITÀ
DI PARMA

PhD programme in Civil Engineering and Architecture
36° Cycle (2020-2023)

Design and performances evaluations of a resilient «green» pavement

A new approach for eco-sustainable transport:

a functional infrastructure for vehicles operating with wireless electric charging

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Enviromental Global Outlook



Goals

Reduction of gas emissions caused by the increased level of traffic

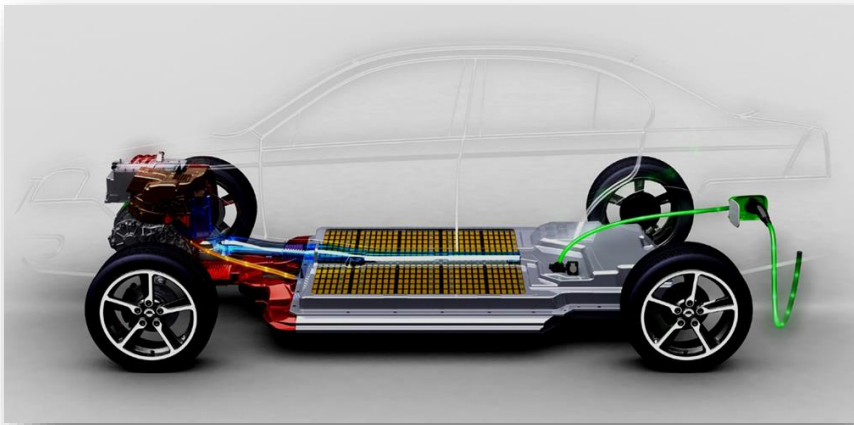
Conversion of road transport systems from combustion engines to electric technology

Resilient and durable road pavements

Approach

Development of a wireless charging system

Evaluation of the optimal mix design of asphalt mixtures to guarantee high mechanical performances, low paving temperatures and extreme workability



Project variables

Electrical
Quest

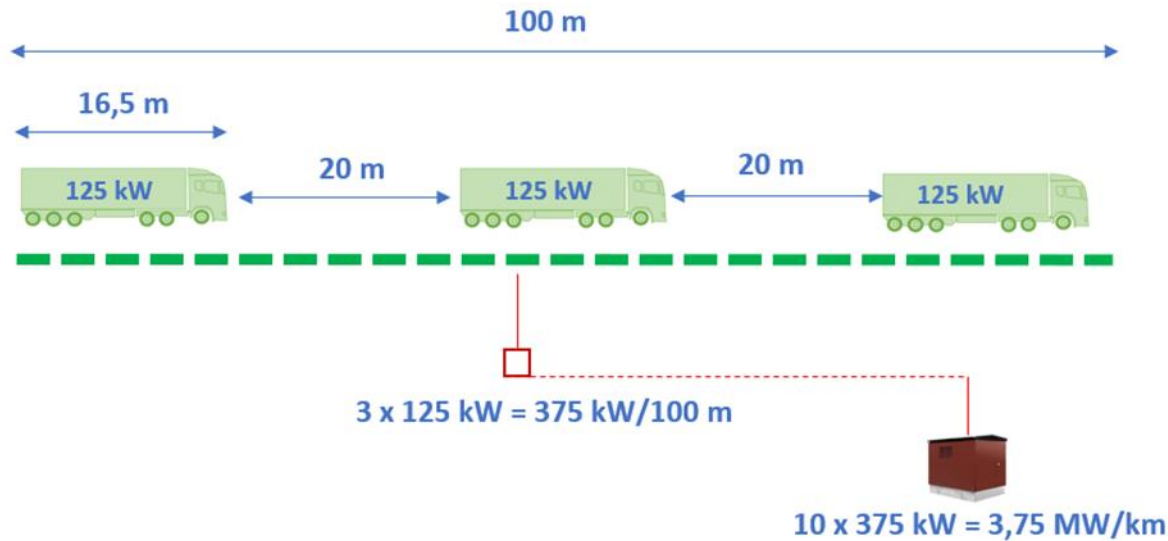
Energy
transmission by
means of
electromagnetic
resonance
systems

Behavior of the
asphalt mixtures
subjected to
electromagnetic
field

Structural
Mechanical
Quest



How the wireless electric charging system works



The coils transfer the energy to a receiver which can be mounted on any type of electric vehicle such as trucks, buses and cars.



The DWPT system (Dynamic Wireless Power Transfer) allows charging while driving, reducing the need for large batteries which, in addition to increasing the weight of vehicles, also increase their accessibility to purchase on the market.



Project time Line

1st YEAR

Study and modelling
of the variables

2nd YEAR

Laboratory activities:
specimen preparation
techniques and tests

3rd YEAR

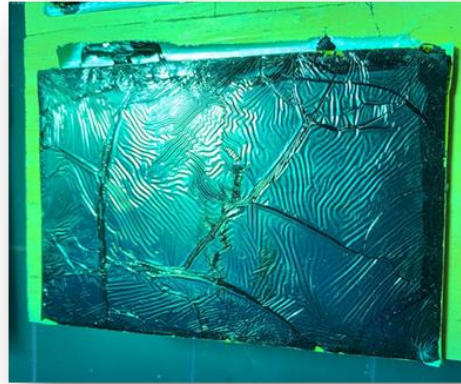
Reproducibility from the
laboratory to reality: large-
scale test field



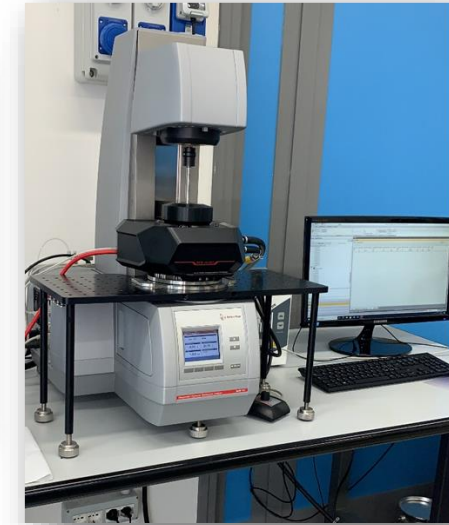
Study of Bituminous Materials

Bitumen

- Treating procedures of asphalt binders using innovative additives able to avoid ageing effects due to the electromagnetic field
- Differences between several ageing procedures (PAV, RTFOT, and UV) will be teste using the DSR



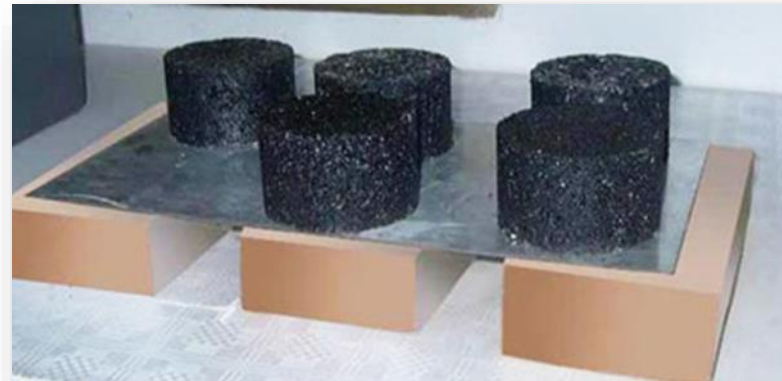
UV radiation aging



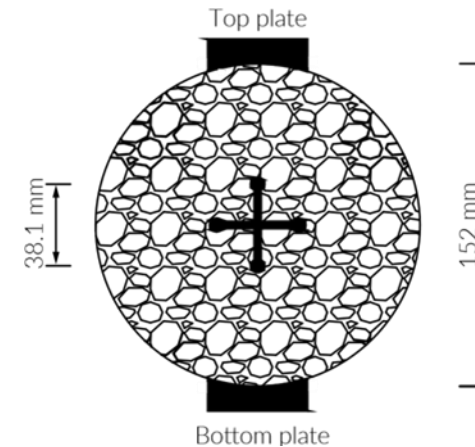
Dynamic Shear Rheometer

Asphalt Mixtures

- Mechanical characterization of asphalt mixtures to select the proper mix design procedure



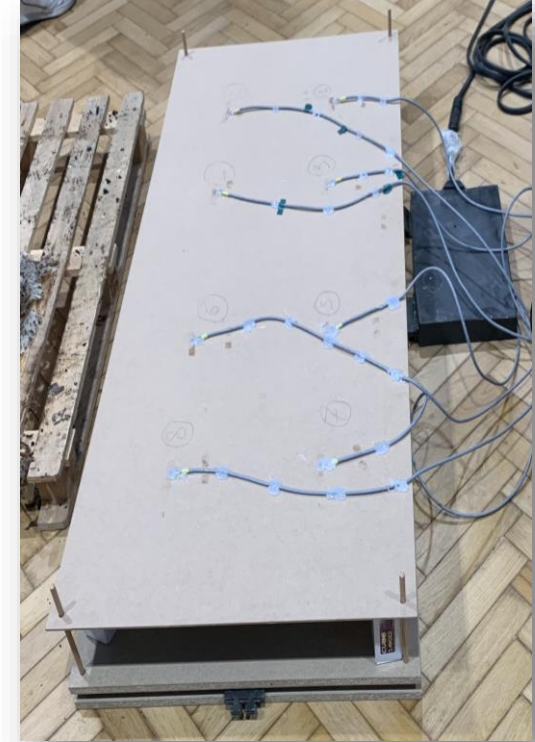
Asphalt mixtures specimens



Assembly of Variables

Overlapping system of elements

- Positioning of the electromagnetic coils
- Electromagnetic coils are overlapped by asphalt mixtures slabs
- The use of appropriate sensors for evaluating the electromagnetic resistance of the whole system



On Field Testing

