



20th International Conference on Renewable Energies and Power Quality (ICREPQ'22) Vigo (Spain), 27 th to 29th July
2022 Renewable Energy and Power Quality Journal (RE&PQJ) ISSN 2172-038 X, Volume No.20, September 2022



A PHOTOVOLTAIC LIGHT ELECTRIC VEHICLE FOR PROJECT-BASED EDUCATION IN ENGINEERING



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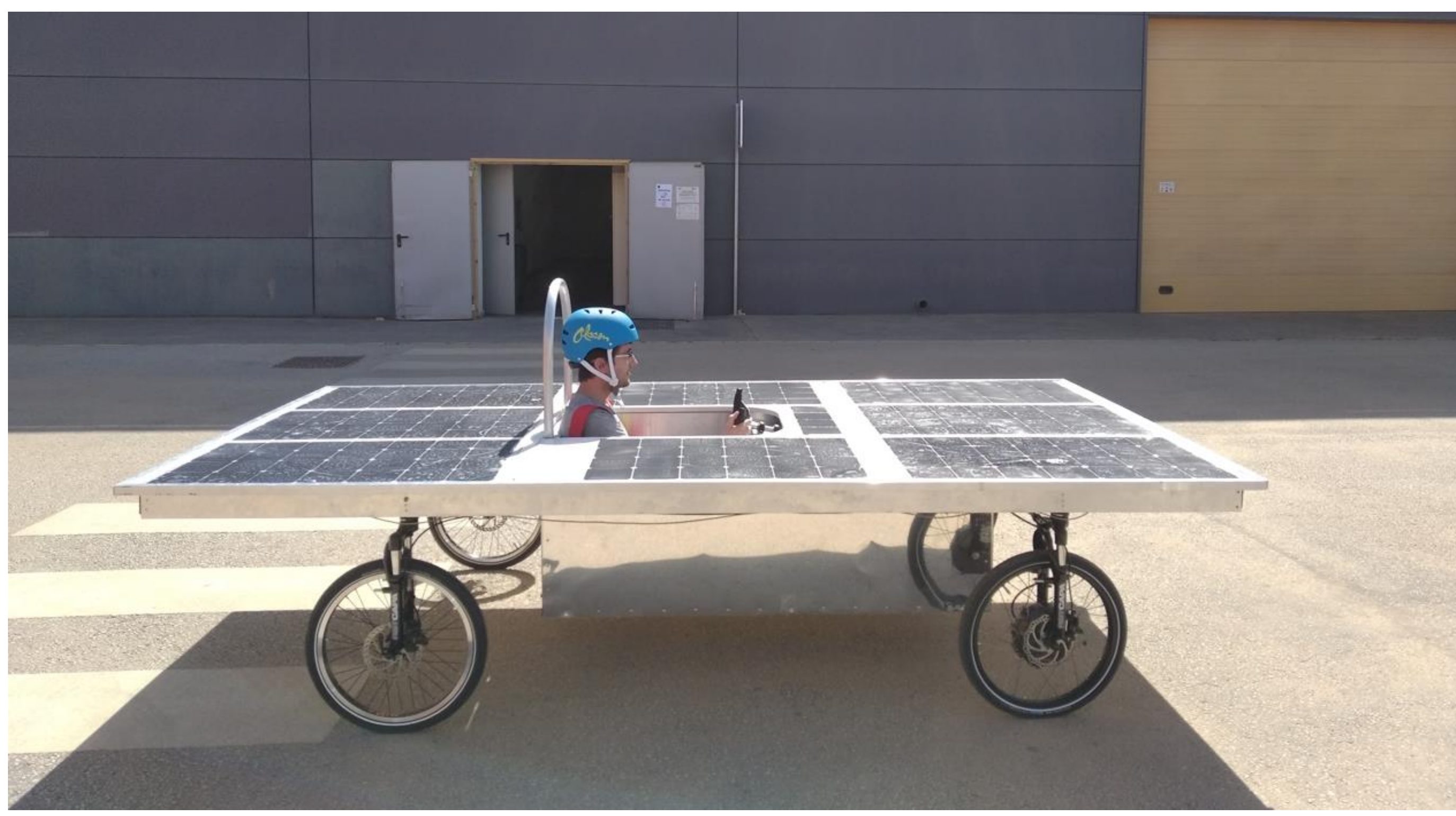
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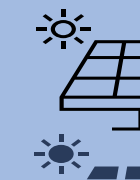
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CONCLUSIONS

In this work, it has been shown how a project-based teaching program for students of different Engineering degrees with very little practical experience has allowed the design and manufacture of an experimental photovoltaic vehicle prototype suitable for use in a new type of energy efficiency races for students.



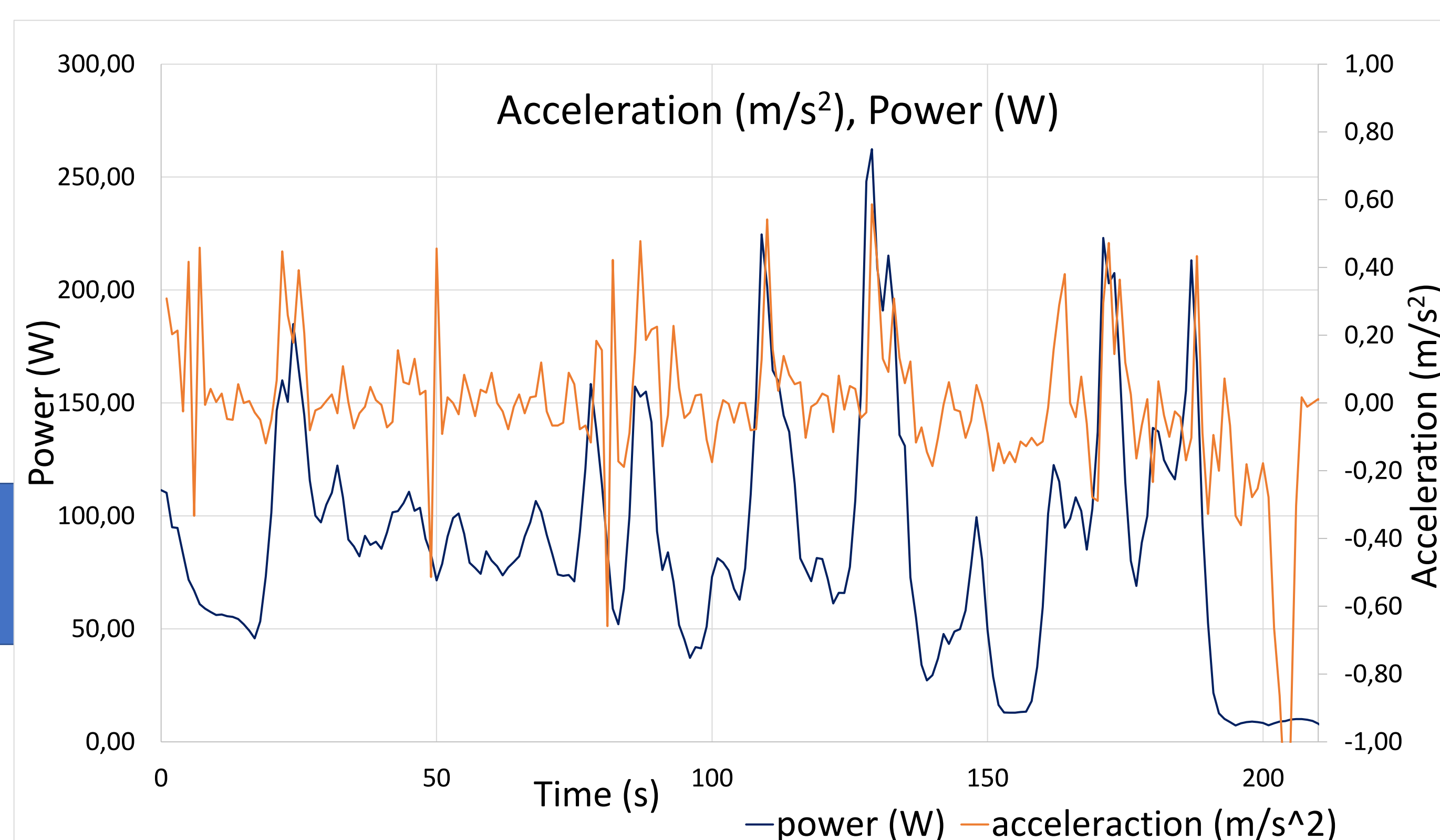
WORK METHODOLOGY

-  Theoretical-practical sessions
-  Basic training
-  Design task
-  Manufacture
-  Evaluation



RESULTS

It can be verified that the consumption at constant speed is quite low, producing power peaks when the vehicle accelerates. Analyzing the data recorded in the different tests, it is concluded that in sections at a constant average speed of 10 km/h, 15 km/h and 20 km/h, the vehicle requires an average power of 65.10 W, 95.68 W and 109 W, respectively. Finally, another series of tests have been carried out with the vehicle to check its behavior against sections with unfavorable slopes. In this sense, the vehicle has overcome without much difficulty, a section with an unfavorable slope of 7% with an average speed of 11.97 km/h and an average power of 238.88 W. All these power values are less than the maximum value that the photovoltaic generator can supply.

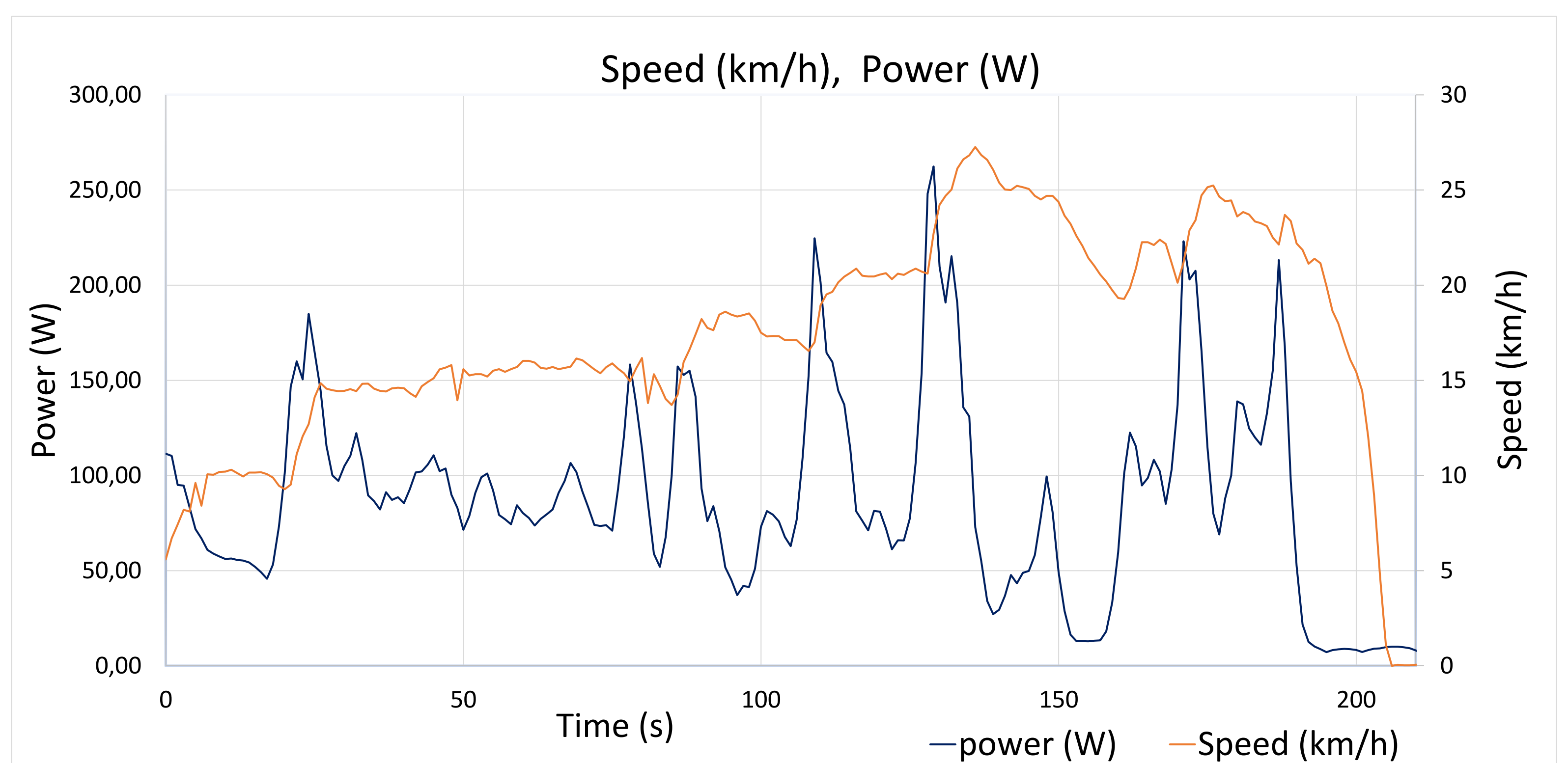
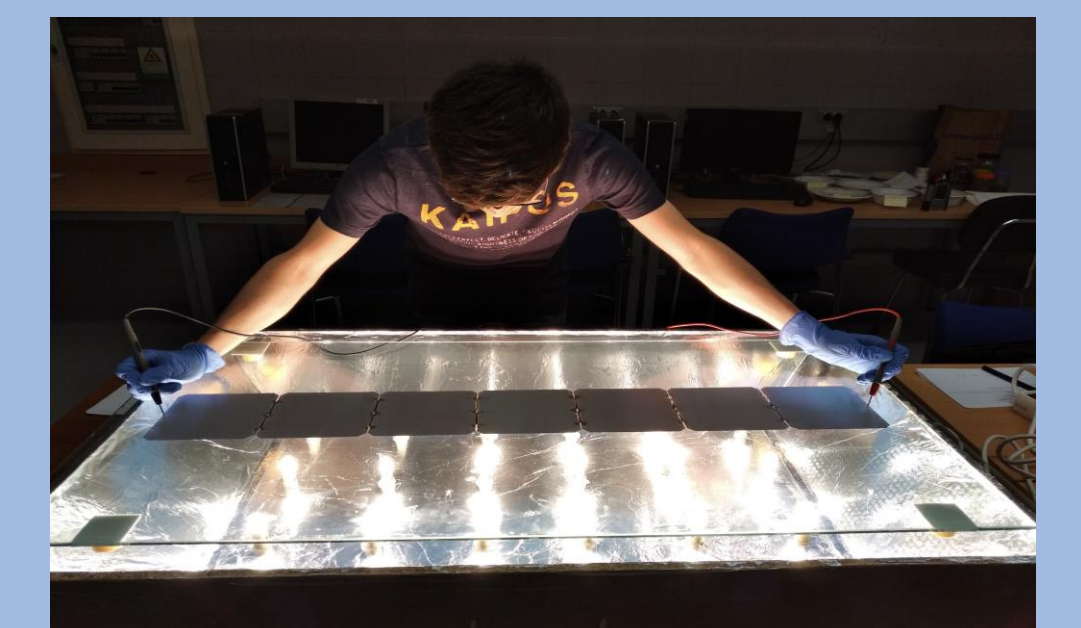
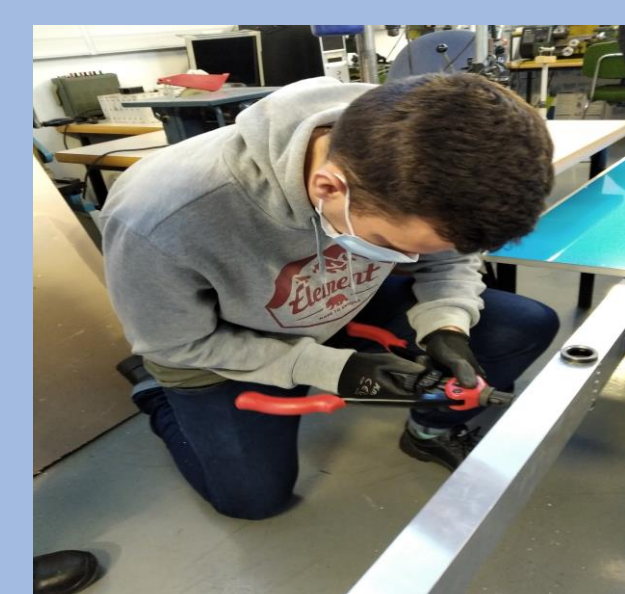


ABSTRACT

This article presents a project for the design, manufacture and evaluation of a light electric vehicle prototype whose only source of energy comes from a photovoltaic generator integrated in it, that is, it does not have batteries for energy storage. In its approach and development, a project-based learning model (PBL) has been followed, for which a group of students from different degrees of the Escuela de Ingenierías Industriales of the Universidad de Málaga has been formed, who have developed all the tasks involved in the realization of the prototype. The purpose of this prototype is to serve as a model for defining a new concept of student races on energy efficiency in mobility. To evaluate the performance of the prototype, tests have been carried out to characterize the energy consumption in different drive cycles and irradiance conditions and to obtain characteristics as limits of speed, acceleration and rising slope.

TECHNICAL CHARACTERISTICS

- Quadricycle (135 cm track and 180 cm wheelbase).
- Total weight: 101.9 kg
- Chassis (aluminium tubes assembled with rivets and "sandwich" panels).
- Ackermann geometry.
- Hydraulic braking system.
- Front-wheel drive (Crystalyte G40).
- Electric differential configuration.
- Photovoltaic generator made with 224 highefficiency Sunpower C60 cells distributed in two parallel arrays. Its power in standard conditions is 715 Wp.



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ACKNOWLEDGEMENT

This work is part of a project-based education experience financed by the Universidad de Málaga within its "K-Project" program of the Vicerrectorado de Innovación Social y Emprendimiento of the UMA. (<http://www.link.uma.es/k-project/>)



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