# PMSM MODEL AND SIMULATION

## Objectives

The main objective of this lab is to model and simulate a PMSM in a EV application.

In this lab, you will have to modify the model of the EV already implemented and substitute the DC motor by a PMSM. Then, the system will have to be simulated in different conditions.

## Questions

The EMRAX motor 188, low voltage (<https://emrax.com/wp-content/uploads/2020/03/manual_for_emrax_motors_version_5.4.pdf>) is supposed to be used for this application.

Motor parameters:

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Rs | 0,8 m |
| Ld | 5,4 H |
| Lq | 6,0 H |
| Lambdam | 0,072 Vs/rad |
| Pole pairs | 10 |

Modify the model of the vehicle for a PMSM. Remember that you have also to modify the controller and the inverter.

1. Paste a picture of the implementation of the model of the PMSM, electric part, and electromechanical conversion part.
2. Paste an image of the implementation of the controller.
3. Paste an image of the implementation of the modulator and the inverter..
4. Explain and compute the tuning of the controller.

For the required performance,

|  |  |
| --- | --- |
| **Performance target** | **Target value** |
| 0 to 100 km/h | 7 s |
| Maximum speed | 120 km/h, at 0% grade |
| Grade at 80 km/h | 7,2 % |
| Maximum grade | 33 %, at 5 km/h |
| NEDC cycle | - |

1. Paste plots of voltage/current/vehicle speed showing that it can be fulfilled and explain why.

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