

**Master project, 2018-2019**

**— Full Bridge Modular Multilevel Converters : Control and behavior in normal operation and DC fault**

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**Context**

With the possible integration of marine renewable energy like offshore wind turbine or hydro-turbine, the concept of High Voltage Direct Current (HVDC) grids begin to emerge. The L2EP has worked on this subject for 8 years in close cooperation with RTE and EDF for instance. 6 PhD thesis has been defended; 3 PhD students, 2 post-doctorates are in progress on this topic. The interest of this work has allowed the emergence of this theme as transversal theme of L2EP. A demonstrator of Multi-terminal DC grid has been developed. This demonstrator has been presented as part of a European project name Twenties (<http://www.twenties-project.eu/node/148>). To connect the DC grid to the AC transmission grid, High voltage AC to DC converter are required. A structure has been proposed by SIEMENS in 2007 and has emerged as a reference. This AC/DC converter is called Modular Multilevel Converter (MMC) and it is shown in fig. 1 and 2. One small scales HVDC/HVAC converter has been developed in the L2ep in 2016.

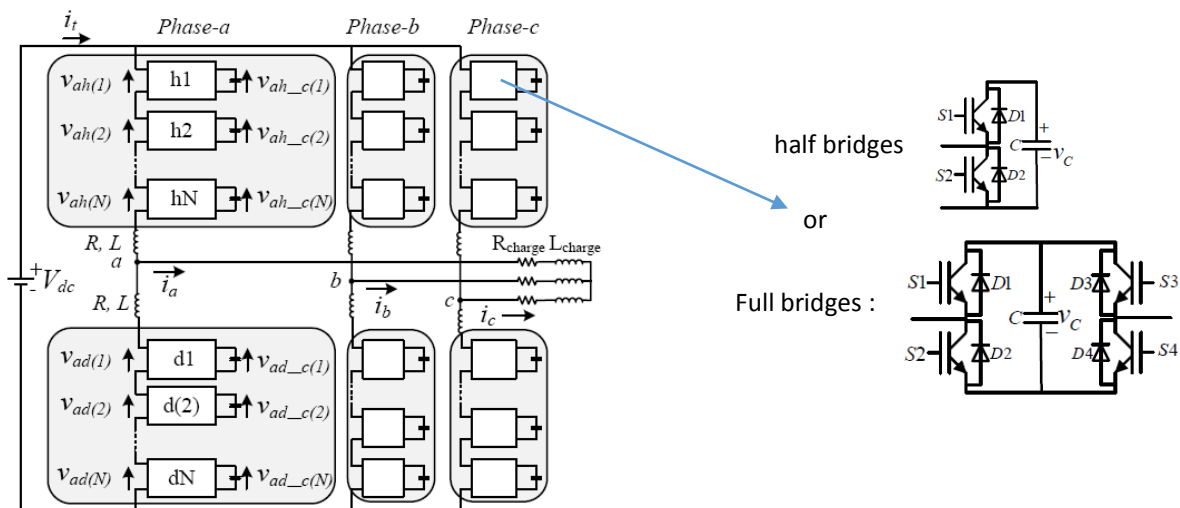


Figure 1 : MMC Scheme

Previous L2EP studies were focused on half bridges MMC due to its relative low losses compare to the full bridge one. However, the full bridge MMC have inherently the DC fault capability. A Full bridge MMC prototype (based on the Half bridge one) will be developed in 2019.

**Objective**

The objectives of this training are to understand and to develop the model and control of the MMC with full bridge sub-modules.

**Work steps**

The proposed work consists of:

- Bibliography study on the subject
- Modeling the Full Bridge MMC.
- Developing its control in normal operation
- Implement it in Matlab-Simulink simulation
- test its control in DC fault operation
- if we have time, Implement it in HIL
- Report writing

## Key word

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Modular Multilevel converter; MMC; High Voltage Direct current; HVDC link; HVDC converter.

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