Power Diode Bridge

PEEC Technical Example Summary

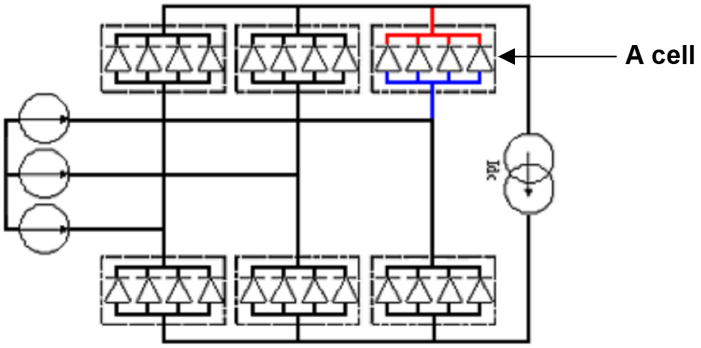
Introduction

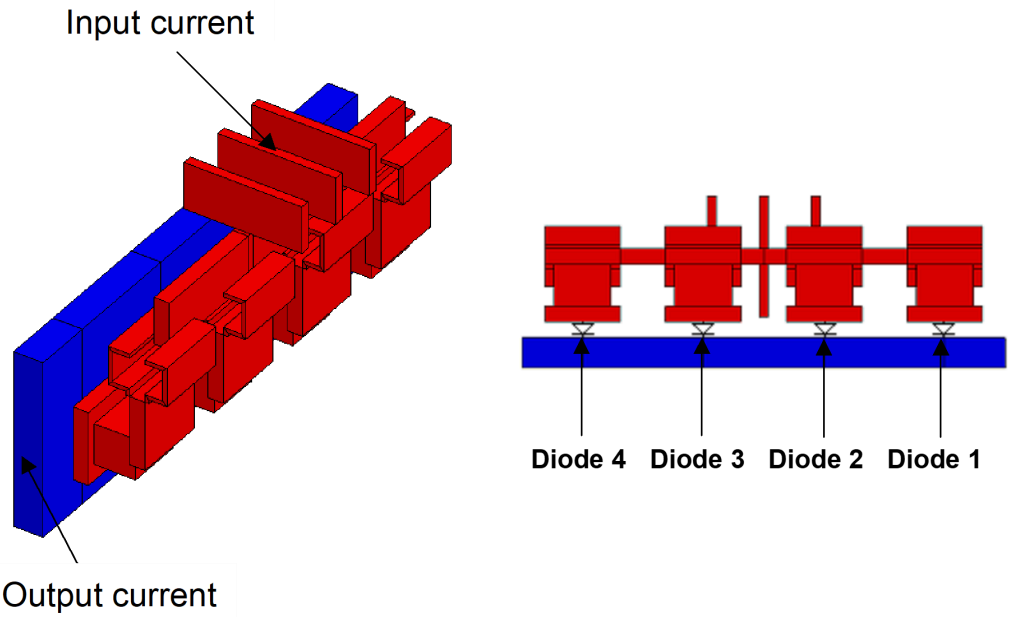
This technical example explains all steps to model the connection inside a power diode cell using the Flux PEEC software and to export it into the Portunus circuit simulation software.

Studied device

The considered power diode bridge (50 kA nominal current) is composed of six cells with four parallel diodes each. Electrical interconnections of one cell are modeled with Flux PEEC and imported six times into Portunus to build the full power diode bridge schematic.

The geometry of a cell is represented in the figure below.





Studied cases

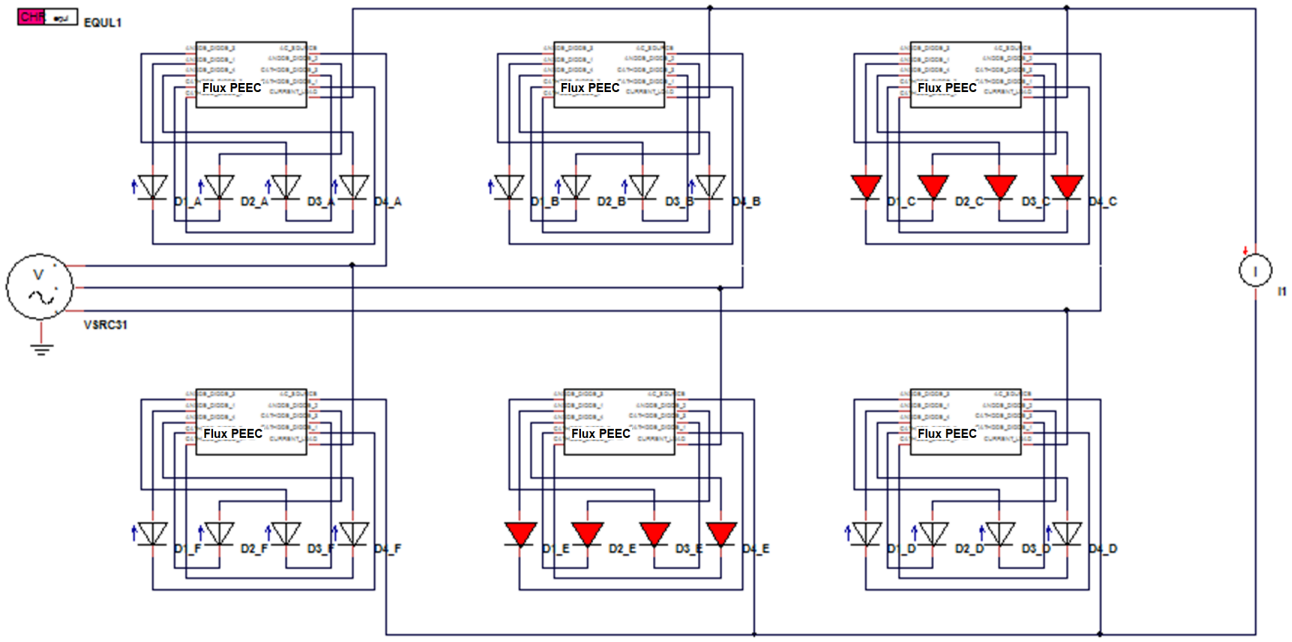
With Flux PEEC software, which is based on the PEEC (Partial Element Equivalent Circuit) method, a resistive and inductive model of the studied cell is generated. It contains partial resistances, partial inductances and mutual couplings, whose values depend from the material resistivity and the geometric characteristics of the conductors that constitute the device.

The aim of this tutorial is to study the influence of the position of the input bars on the RMS value of the current that flows inside the four diodes. Three geometries are considered using a parametric simulation: results are then exported into the simulation circuit software Portunus to analyze which location of the input bars is the most optimized one. Manual and automatic methods are used for the creation and the positioning of the impedance probes.

Description of the full Portunus model

Six Flux PEEC coupling elements are used to realize six "switching functions"; each of them is composed of four diodes in parallel.

The diode bridge is supplied by a sinusoidal voltage source and the load is represented by an equivalent model made of a DC current generator.



Temporal results

Unbalanced currents are shown on the waveforms below.