APPLICATIONS

MMC MODELLING WITH THE RTDS® SIMULATOR

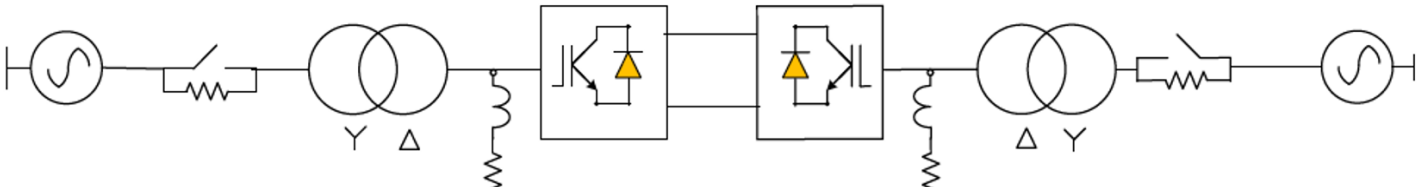
Modular Multilevel Converters (MMCs) are widely used in HVDC and FACTS applications. The RTDS Simulator's MMC models are well-established and have been used for the factory testing and replica control testing of many installed MMC schemes. Due to their complex topology and control, MMCs can be computationally intensive to model with electromagnetic transient (EMT) simulation techniques – especially in real time. It's important to understand the different MMC modelling options for the RTDS Simulator and apply the model best for your project based on your phenomena of interest and available simulation hardware.

PROCESSOR-BASED MODELS

These models run on the RTDS Simulator's central processing hardware in both the Mainstep and Substep environments. All basic RTDS Simulator configurations in the NovaCor series are capable of running these models.

- **MMC5:** The MMC5 model includes internal automatic capacitor voltage balancing control (average value) and is well-suited for testing higher-level controls. MMC5 supports up to 1,280 submodules per valve leg. Half-bridge, full-bridge, and mixed configurations are supported. A built-in battery across each SM is also supported.

- **CHAINV5:** The CHAINV5 model supports individual submodule firing pulse input and can be used to test low-level firing pulse controls via the GTDI card or Aurora link. CHAINV5 supports up to 56 submodules per valve leg. Half- and full-bridge configurations are supported. This model does not support internal faults.



With the relatively lightweight MMC5 component, it's possible to simulate this 2-terminal, point-to-point symmetric monopole system using one NovaCor 2.0 chassis with 2 licensed cores.

GTSOC V2-BASED MODELS

These valve models run on the GTSOC V2 – FPGA-based auxiliary hardware for the RTDS Simulator. They support the testing of MMC control systems including the low-level firing pulse controls. The models are connected to the main simulation, typically containing the cable/line, AC system, and controls, on the central processing hardware via fibre cable.

150 Innovation Drive, Winnipeg, Canada R3T 2E1 • + 1 204-989-9700
Contact Us

Our new embedded models have no interface transmission line between the valve model running on the GTSOC V2 and the network simulation running on the central processing hardware. They can be placed in either the Substep or Mainstep environment.

- **GM/GMMX:** The Generic Model (GM) is our most detailed model available. The GM or GMMX allows for up to 768 submodules per half-phase / valve arm. Half-bridge, full-bridge, and mixed configurations are supported. It supports individual IGBT firing, internal faults external parameter setting feature and the inclusion of a damping submodule or battery across each SM. **With the GMMX, up to 2 valve arms can be modelled on one GTSOC V2 unit. That means 3 units are required to represent one HVDC monopole terminal.**

- **GMMX6VLV:** The GMMX6VLV is a variation of the GMMX. It supports a maximum of 128 submodules per half-phase / valve arm with the ability to **model up to 6 valve arms per GTSOC V2.** This model is ideal for STATCOM applications where two 3-phase STATCOM MMC converters can be modelled on one unit.

- **U5:** The U5 model allows for up to 512 submodules per half-phase / valve arm. Half- and full-bridge configurations are supported. Only normal firing states are considered and individual IGBT faults cannot be represented. **With U5, up to 6 valve arms can be modelled on one GTSOC V2 unit. That means one unit is required to represent one HVDC monopole terminal.**

- **Controller model:** Optionally, a model for representing low-level firing controls is also available. The model provides firing pulses to the valve models via the Aurora protocol (fibre cable). **The controls for up to 3 valve arms (or 6 valve arms in the case of GMMX) can be modelled on one GTSOC V2 unit.**

The GTSOC V2 is a multi-function, FPGA-based auxiliary hardware that can be used to represent MMC valves and controls.

LEARN MORE ABOUT HVDC & FACTS AT

RTDS.COM/APPLICATIONS/HVDC-AND-FACTS

150 Innovation Drive, Winnipeg, Canada R3T 2E1 • + 1 204-989-9700
Contact Us

YOUR WORLD IN REAL TIME.
RTDS.COM