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Title : **Modeling, Analysis and Control of the Phase-Shifted Carrier Modulation based Modular Multilevel Converters**

Abstract:

This talk presents a comprehensive analysis of the phase-shifted carrier (PSC) modulation based modular multilevel converter (MMC) systems, considering multiple control objectives. Based on the analysis, advanced modulation and control methods are further investigated. For the underlying modulation stage, this work fully reveal the benefits of using different carrier arrangements between different phase legs. Two optimal working modes are proposed for harmonic minimization of the line-to-line voltage or common mode voltage. Furthermore, flexible tradeoffs between them can also be achieved by solving the proposed optimization problem. For the upper-level control stage, a new dual harmonic injection (DHI) method is developed, which can effectively reduce the peak value of arm current with minimally increased cost in capacitor voltage ripples. By lowering the peak arm current, the proposed method can allow MMCs to handle larger output currents using the same current-rated switches, enhancing the system's overall power-handling capability. Experiment results verify the effectiveness of the proposed modulation and control methods.