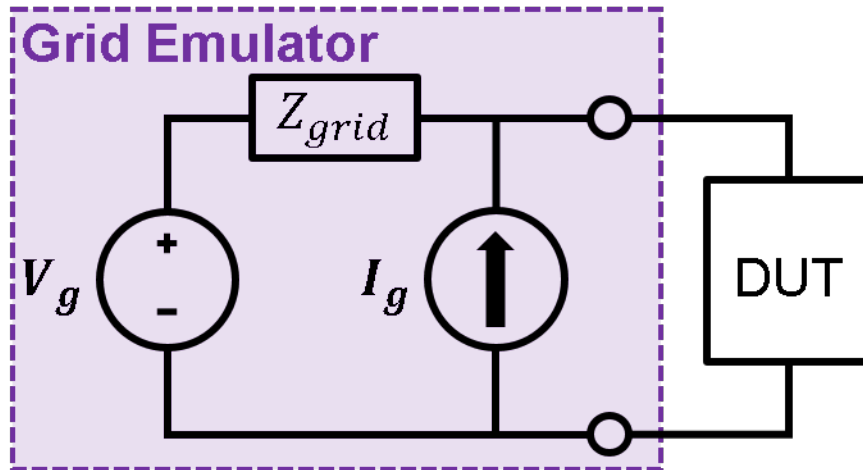


RWTH Technology

Grid Emulator with Wideband-frequency Impedance based Grid Impedance Modelling for Testing and Validation of Power System Components



Challenge

The connection of power electronics driven energy sources to modern electrical grids is calling for special requirements, since more and more renewable energy sources are integrated in modern grids. Apart from that, the operation of power electronics based industrial electronics components, electrical vehicles or aerospace-related applications must be verified against various national and international standards to ensure safe and “grid friendly” operation of on-grid products. It’s critical for manufacturers to conduct these tests to prove compliance and to relieve product liability concerns. Furthermore, during the research and development phase of new products assessing the component’s behavior in an electrical grid is of high importance.

Compliance tests nowadays are performed by using classical grid emulators, which act as an ideal voltage source to emulate the grid’s behavior in different scenarios. By doing so, the grid’s impedance is completely neglected, implying the assumption of a strong grid, which does not hold for today’s and future grids anymore.

Solution

Our solution enables a realistic compliance and product verification testing of power system components to be connected to today’s and future electrical AC and DC grids. This is enabled by a novel way to represent a grid’s behavior by using wideband-frequency impedance (WFZ) models of grids and allows the investigation of effects, which are fully neglected by classical grid emulators. Those are undesired effects such as (inter-) harmonics, resonances or other interactions of filtering devices and inverters in a local grid. Such effects will never emerge as a problem when using classical grid emulators but can be a major source of problems in power system operation.

The required WFZ grid models, which go beyond simple resistive-inductive models, are obtained by measurements using a novel non-invasive grid impedance measurement device (see Technology Offer No. 2240) or based on off-line simulations. Furthermore, a database of typical WFZs representing grids with different characteristics and in different regions of

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Fields of application

Development and validation of power system components

Keywords

Compliance tests
Electrical grid emulation
Electrical grid impedance

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the world could be provided to users of such a novel grid emulator. The database enables them to conduct grid compliance tests of components under a variety of conditions without requiring deep knowledge about the underlying grid configurations.

Advantages

- Enables realistic compliance testing and product verification of power system components
- Going far beyond classical grid emulators by enabling investigation of otherwise neglected effects and interactions between components and the electrical grid
- Required grid models obtained by non-invasive measurement device or simulations

Status

- An international patent application is filed
- The concept has been proven in simulations and a prototype is currently under construction.

RWTH Aachen University is looking for partners for patent exploitation and for research partners for joint development or contract research.