Fraunhofer ISE

Press Release

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Electronics for Power Engineering

Fraunhofer ISE Follows New Paths with High Voltage Silicon Carbide Power Devices

Thanks to new components, power electronic converters for power engineering applications are becoming even more efficient. Researchers at the Fraunhofer Institute for Solar Energy Systems ISE have now successfully implemented silicon carbide (SiC) devices with a blocking voltage of 10 kV in a DC-DC converter for medium-voltage applications. This demonstrator can be used in renewable power plants which are gaining significance for the energy grid of the future.

Silicon carbide (SiC) devices enable the construction of extremely efficient and compact power electronic systems. For some time, SiC devices with blocking voltages of up to 1700 V have been commercially available. Now research is focusing on SiC semiconductors with even higher voltages and lower switching losses. First prototype devices have already been developed. "In the past we have experienced significant success in the implementation of SiC semiconductors in power electronic systems for the low-voltage range. The logical step for us was to use these 10 kV devices for medium voltage applications," says Dirk Kranzer, group leader of "Advanced Devices and Technologies" at Fraunhofer ISE. "With this step, entirely new power electronic system structures become conceivable, supporting renewable power generation in large plants and power transmission in the next-generation energy grid."

Fraunhofer ISE developed the first demonstrator with SiC semiconductors for the medium-voltage range within the "Supergrid" project of the Fraunhofer-Gesellschaft. The 30 kW DC voltage converter with 3.5 kV input voltage and

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8.5 kV output voltage reached an efficiency of 98.5%. The switching frequency was 15 times higher than the value possible for conventional silicon devices within the same voltage range. The SiC semiconductors used in the circuit of the Fraunhofer DC-DC converter were developed by CREE, one of the leading companies for SiC semiconductor devices.

The new high voltage devices not only enable better efficiencies and compacter designs with fewer components but also facilitate totally new applications in power engineering or the rail industry. "We have a long road ahead until we are able to build converters with these silicon carbide devices which are ready for series production. With the new high voltage devices and circuit design challenges, we encounter limits related to the insulation and construction techniques. This is especially evident with the even higher blocking voltages foreseen for SiC semiconductors in the future," says Jürgen Thoma, development engineer at Fraunhofer ISE. "Despite this, the time is now right to get a move on near-industry research using these promising new devices in power electronic applications for the power engineering of the future."

The Fraunhofer ISE is presenting its development at the Intersolar Munich from June 4-6 in Hall C3.320.

Information Material

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Text of the press release can be downloaded from our website: www.ise.fraunhofer.de

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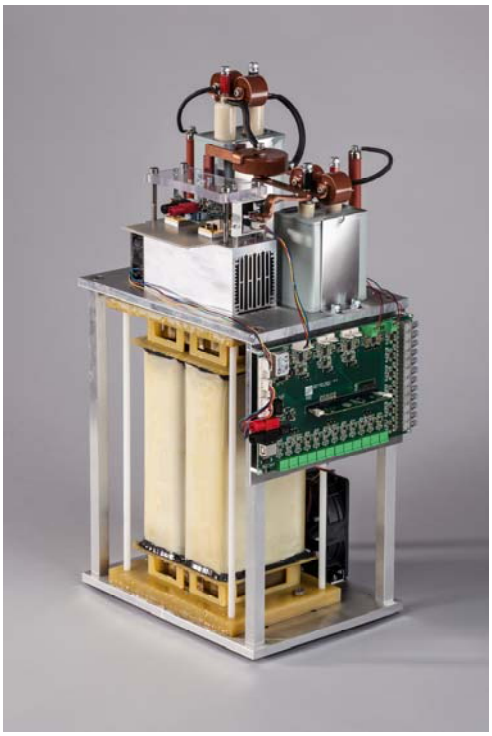

30 kW medium-voltage DC-DC converter, developed at Fraunhofer ISE, contains 10 kV devices made of silicon carbide (SiC). ©Fraunhofer ISE

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