FRANÇAIS ENGLISH

ModulED

PATENT 1 PATENT

A new generation of 100kW+ electric powertrains for electric and hybrid vehicles

What is ModulED?

CEA-Leti introduces a new generation of 100kW+ electric powertrains to support the performance and reliability needs of hybrid and electric vehicles, as part of their large-scale deployment. The ModulED *(Modular Electric Drive)* simultaneously offers high power density, leveraging a compact powertrain that is fully built into the engine block:

- Energy efficiency is twice as high, and over a wide range of functions.
- Kinetic energy is directly regenerated into electric energy—engine braking—in the battery, using the powertrain's bidirectional.

Applications

- Electric vehicle
- Hybrid vehicle

What's new?

To develop ModulED, CEA-Leti researchers relied on:

- gallium nitride (GaN) wide-bandgap semiconductors with a much higher efficiency performance than traditional silicon components;
- a high-speed synchronous motor in the range of 22,500 rpm (compared to 12,000 rpm currently, or BMW i3), resulting in a smaller size and improved weight/power ratio;
- a rotor with an optimized arrangement of magnets injected directly into it, reducing the amount of rare earth that is used;
- next generation transmission for reduced high-speed synchronous electric motors;
- resiliency, thanks to a six-phase structure.

Trends

With powers ranging from several hundred watts to hundreds of kW, wide-bandgap technologies (GaN) are adapted to numerous applications, such as electric vehicles, aeronautics, space, converters, multiple chargers, or uninterruptible power supply (UPS, data centers). GaN allows a frequency increase, and consequently, lowers the volume/weight of power converters.

The spread of electric vehicles is driving exponential volumes, leading to lower costs and to larger-scale deployments of wide-band gaps technologies across all industry and consumer sectors.

CEA-Leti offers optimal component implementations with customized architectures, leading to several patents.

Interested in this technology?

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