



IEEE ENERGY CONVERSION CONGRESS & EXPO **Nashville, TN | OCT.29-Nov.2**

Tutorial Title

Wide Bandgap Device based Power Electronics for Aerospace Applications

Instructor Team

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Abstract

Aerospace applications are not new but potentially the final frontiers for power electronics research and developments. On the aviation side, because of the need for fuel saving and greenhouse gas reduction, more electric aircraft (MEA), unmanned aerial vehicles (UAV), electric vertical take-off and landing (e-VTOL) aircraft, and future hybrid and turbo electric propulsion call for a new generation of power converters, motor drives, and solid-state circuit breakers with unprecedented power density, efficiency, and reliability. On the space side, lunar, Mars and deep space expeditions, will need light-weight and highly efficient power electronics systems to work reliably at places that no man has gone before, where space radiation and extreme operation conditions present more challenges to power devices and circuits. Wide bandgap (WBG) power devices, such as Silicon Carbide (SiC) Junction Barrier Schottky (JBS) diodes and power MOSFETs and Gallium Nitride (GaN) high electron mobility transistors (HEMTs) and Gate Injection Transistors (GITs), are regarded as natural candidates for aerospace applications. With great efforts from device manufacturers and system integrators, these devices are either already or close to being implemented in different power converters, actuator drives and circuit breakers for aerospace applications. The main remaining challenges for WBG devices and their circuits for aviation applications include radiation hardness, extreme operation temperature, high altitude, high voltage, high dv/dt, and high di/dt operation induced issues such as lower partial discharge inception voltage and higher EMI noises. The tutorial will start with an introduction of state-of-the-art of power electronics devices and circuits for aerospace applications, then dive into detailed discussions on the above mentioned challenges. Design examples for both electric propulsion and lunar surface power distribution will be introduced in detail. The tutorial caters to professionals at the intermediate level. Audience members should be aware of basic power electronics devices and circuits and be interested in more recent developments.



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Instructor Biography

Dr. Jin Wang (IEEE Fellow), is a Full Professor at The Ohio State University. Dr. Wang has over 200 peer-reviewed journal and conference publications and 9 patents. His research interests include wide bandgap power devices and their applications, high-voltage and high-power converter/inverters, electrification of transportation and integration of renewable energy sources.

Dr. Wang, initiated and served as the General Chair for the 1st IEEE Workshop on Wide Bandgap Power Devices and Applications in 2013. From 2020 to 2022, Dr. Wang serves as the Founding Chair for the Technical Committee on Aerospace Power at the IEEE Power Electronics Society, during which he initiated and served as the General Chair for the 1st IEEE Workshop on Power Electronics for Aerospace Applications (PEASA).