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Emcore Corporation, Group4 Labs, and Air Force Research Laboratory Demonstrate GaN-on-Diamond Transistor

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August 2, 2006... Emcore Corporation located in Somerset, New Jersey USA, announced that a team from Emcore's EMD division, Group4 Labs and engineers at the U.S. Air Force Research Laboratory (AFRL) have successfully demonstrated a gallium nitride (GaN)-on-diamond high electron mobility transistor (HEMT). According to Emcore, the aluminum gallium nitride (AlGaN) on GaN transistor layers were grown using metal-organic chemical vapor deposition (MOCVD). The MOCVD process was completed at Emcore, and then Group4 Labs attached their CVD-produced diamond substrate using their patented technology. Finally, the AFRL fabricated the transistors.

Emcore said, that demonstration proved the feasibility of making GaN-based radio frequency (RF) devices thermally coupled to diamond substrates for maximum heat extraction. The team expects to be able to pack more devices in less space due to better heat dissipation. Additionally the improved heat dissipation will allow more devices to be placed close to the active device area. The team expects that the novel packaging and foundry process could be used for high performance GaN-based RF devices, high brightness LEDs and Laser Diodes. *"We are excited by the promise of this technology combining the most robust semiconductor material with the best heat spreader,"* commented Dr. Ivan Eliashevich, Director of R&D at Emcore Corporation's EMD division. [Emcore News Release](#).

This demonstration was the result of years of work during the compound semiconductor industry's on-again/off-again love affair with diamond substrates. While diamond substrates have been made before, it took the advances of Group4 Labs to allow successful thermal coupling of GaN-on-diamond. It took the perseverance of the military to continue researching a technology many had given up on. The advance also required the MOCVD innovation of Emcore. The demonstration, while impressive, is still far from the commercial success some diamond substrate pioneers hoped for. If diamond substrates are ever a commercial success, it will take many more breakthroughs and the right market conditions for the team and especially the military to be vindicated for their choice of continuing research on diamond substrates. –Scott Mc

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