24 Sept 2025

Summary of GaNPA Design Team Selections

Of the white papers received, eleven design teams and twelve circuit concepts were selected for inclusion on the GaNPA MPW. Selected design teams are a mix of academic groups and small businesses. The academic groups are Michigan State University (MSU), Ohio State University (OSU), University of Illinois Urbana Champaign (UIUC), University of Texas - Dallas (UTD), and the University of Vermont (UVM). Smal businesses include DOES, Fresnel, NxBeam, ReconRF, and OSEMI.

Design concepts address a number of application areas including Ka-band, Q-band, and V-band power amplifiers for military electronic warfare (EW), Radar, and Comms along with FR2 and FR3 5G solutions. In addition to power amplifiers, multiplier and circulator designs were submitted. This variety of design concepts will effectively exercise the NGMC GaN15 process, CA DREAMS MOSIS 2.0, and MMEC's Design Hub.

- Michigan State University (MSU) - ***A V-Band Load Modulated Power Amplifier for space-based EW systems with superior MMIC performance***
    - The MSU circuit concept is targeting future satellite communications (SATCOM) and space-based electronic warfare (EW) applications. Specific performance objectives are an output power of 1 W with greater than 30% power added efficiency (PAE) from Psat to 6 dBm back-off across a bandwidth of 50 – 65 GHz.

- Ohio State University (OSU) - ***GaN-Based Modular Frequency Doubler and Quadrupler MMIC for Reconfigurable mmWave Signal Generation***
    - The OSU circuit concept is focused on demonstrating a GaN-based frequency-doubler and quadrupler. These multiplier circuits will directly upconvert amplitude- and phase-modulated waveforms at intermediate frequencies (8–20 GHz), to higher RF bands. This supports high-performance use cases such as frequency-agile transmitters, high-bandwidth radar, and secure communication systems that demand spectrally rich signals at 30–80 GHz and beyond.

- University of Illinois Urbana Champaign (UIUC) - ***Integrated GaN Circulators***
    - Strong self-interferences and hostile interferences are a challenge for Comm and EW systems. UIUC will develop an ultrawideband sequentially switched delay line (SSDL) on-chip circulator that provides greater than 20dB isolation for simultaneous Transmitting and Receiving (STAR) operations over an ultra-wide instantaneous bandwidth from 2GHz to 18GHz.

- University of Texas - Dallas (UTD) - ***Switched-Mode High-Efficiency 24 GHz GaN Power Amplifier for Pulsed Wireless Power Beaming Applications***
    - The UTD team is focused on developing a solution for wireless power beaming to enable continuous operation of untethered platforms such as persistent ISR drones, autonomous robotic swarms, and off-grid sensor nodes. The proposed amplifier will operate over 23-25 GHz with a minimum output power of 16 W in pulsed mode with

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power added efficiency (PAE) of 50%.

- University of Vermont (UVM) - ***28/39 GHz Dual-Band GaN Power Amplifier Design***
  - The team at UVM is looking to address Ka-band power amplification (PA) needs for 5G communications. This band (26.5-40 GHz) supports high data rate and low latency transmission in millimeter-wave (mmWave) networks. This effort will prototype a dual-band PA achieving greater than 1 W at both 28 GHz and 39 GHz with a power added efficiency (PAE) of 35%.

- DOES - ***Adaptive Wide-Band GaN15PWR Monolithic Power Amplifier (AWB-MPA) for 24–48 GHz SATCOM Uplinks, 5G-FR2 Tactical Mesh Radios & Mid-Band Electronic-Warfare Pods***
  - DOES is looking to prototype a single, broadband RF power-amplifier tile capable greater than 2 W (33 dBm) saturated power (Psat) with greater than 35% power added efficiency (PAE) across the 24-48 GHz bandwidth for 5G FR2 communication applications. DOES plans to integrate this PA with a transformer-based broadband combiner, sensor-assisted AI linearization, and a 3D-printed Cu-diamond heat-spreader to yield a lighter, cooler, software-defined PA tile that frees up to 15% of prime power, halves calibration complexity, and accelerates the fielding of next-gen SATCOM, EW, and 5G systems.

- Fresnel - ***Broadband Load-Modulated Amplifier Synthesized by AI Technology (BLAST)***
  - Fresnel has proposed a Pseudo-Doherty Load-Modulated Balanced Amplifier (PD-LMBA) design that combines the staged carrier/peaking efficiency boost of a Doherty PA with the broadband, mismatch-tolerant nature of balanced-hybrid designs to address the FR3 (7.125-24.25 GHz) 5G band targeting 2 W peak output power with 30% power added efficiency (PAE) average across the band. Fresnel plans to complete the PD-LMBA design using zapRF, their AI-driven RF synthesis automation tool.

- NxBeam - ***32-38 GHz 10 W 150nm GaN Power Amplifier MMIC***
  - NxBeam plans to develop a harmonically tuned, high-efficiency, Ka-band Power Amplifier (PA) wideband radar applications addressing the increasing demand for compact, high-power, broadband mmWave Pas for multifunction systems. Target performance metrics are 10 W of saturated power with greater than 25% power added efficiency (PAE) with an operational bandwidth of 32-38 GHz.

- ReconRF_1 - ***Q-Band AI-Accelerated GaN MMIC SSPA Design for Downlink SATCOM and Radar Systems***
  - ReconRF plans to utilize their proprietary artificial intelligence (AI) driven impedance matching network synthesis tool to develop a Q-band solid state power amplifier (SSPA) for SATCOM downlink applications in user terminals, gateway feeder links, and radar. Proposed metrics are greater than 10 W output power with 30% power added efficiency (PAE) with an operational bandwidth of 37.5-42.5 GHz.

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- ReconRF_2 - ***V-Band AI-Accelerated GaN MMIC SSPA Design for Gateway Uplinks and Airborne Communications***
  - In a second design, ReconRF will utilize their AI enabled design tool to develop a V-band solid state power amplifier (SSPA) for uplink applications in gateway uplinks, high-speed airborne communications, and radar. For this MMIC, greater than 10 W of out power is expected with 20-25% power added efficiency (PAE) over a frequency range of 47.2-51.4 GHz.

- OSEMI - ***Distributed GaN Power Amplifier for NAVSEA Critical Communication Applications***
  - OSEMI is looking to develop a broadband (30-80 GHz) power amplifier to enable secure, jam-resistant ship-to-shore communications for NAVSEA applications. Targeting several watts of power at mid-band (~65 GHz), the OSEMI team will attempt to identify and capitalize on transistor cells that possess a natural 50-ohm impedance which will greatly simplify the circuit design and potentially enhance linearity.

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