

## Mixed-Signal Doherty Power Amplifier (#7496)

*A mixed-signal doherty power amplifier created to achieve high linearity, high efficiency, and well-controlled power cells to enable the next generation wireless communication systems*

To address this challenge, inventors Hua Wang, Song Hu, and Fei Wang have developed a mixed-signal Doherty PA composed of one or more auxiliary branches, each containing multiple amplifiers. The PA's digitally controlled analog branches may be turned on based on the amplitude of the input modulation signal, ensuring linear power gain synthesis and increasing linearity. Furthermore, these branches are much more relaxed than conventional digital PA, since the branches use bit number requirements. The main PA's analog branch ensures that small amplitude signals can be accurately amplified, thus leading to a large dynamic range. Additionally, the turning point of the auxiliary PA can be precisely controlled to achieve ideal Doherty load modulation, which substantially increases the efficiency. Lastly, sampling images are substantially suppressed due to this mixed signal Doherty operation, compared to the conventional digital PA.

### Benefits/Advantages

- Achieves high peak efficiency, back-off efficiency, and linearity
- Supports complex modulations with large bandwidths (> GHz)
- Compatible with many process technologies, including CMOS, SiGe, GaAs, and GaN

### Potential Commercial Applications

- Power amplifiers and transmitters
- 5G/5G MIMO systems
- Internet-of-Things (IoT)

### Background/Context for This Invention

With the explosive growth of mobile traffic demand, the fifth generation (5G) of wireless networks faces the contradiction between capacity requirements and spectrum. A popular solution is to incorporate the millimeter wave (mmWave) band into 5G networks. While the huge bandwidth in the mmWave allows more mobile traffic, fundamental differences between current systems introduce problems such as high propagation loss, directivity, sensitivity to blockage, and issues of mobility with mmWave communications. The power amplifier (PA) is often considered one of the most critical building blocks in a wireless network, but there is a need for a new PA architecture to achieve high linearity, high efficiency, and well-controlled PA power cells to enable the next generation wireless communication systems.

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**More Information****Publications**

**For more information about this technology, please visit:**

<https://licensing.research.gatech.edu/technology/mixed-signal-doherty-power-amplifier>

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