



## Power Generation and Storage

# High Power Solid State Power Amplifier System

**NASA Marshall Space Flight Center (MSFC)** has developed a High Power Solid State Power Amplifier System that combines 1KW modules (16 amps total) to generate up to 16KW of radio frequency (RF) power from 2–30 MHz. The NASA device is a first step toward increasing the power of solid state power amp devices so that they might replace the more cumbersome vacuum tube amps for some applications. Also, when vacuum tube amps fail, a total power failure occurs. Since the NASA device, however, is a system of amplifiers, it enables graceful failure, meaning one or more stages can fail and the system will continue to operate, although at reduced power.

## BENEFITS

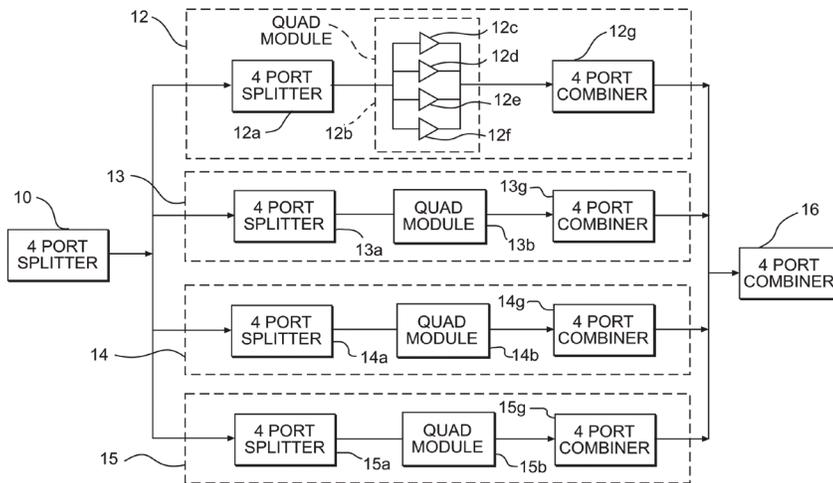
- **Reliability:** Allows graceful failure. In the event of a failure of one or more stages of the system, it continues to operate, albeit at a reduced power level.
- **Scalability to allow variable power:** 1, 2, 3, 4, 6, 8, 9, 12, and 16KW units are possible.
- **Lower Cost:** \$1/Watt (so \$16,000 for a 16KW unit)
- **Lower Weight:** 1 Watt of output power for every 0.1 to 1.0 pound of weight (compared to vacuum tube amps that generate 1W for every 1 to 5 pounds of weight)

technology solution



## THE TECHNOLOGY

The NASA device offers a higher power solid state power amp device that might replace the vacuum tube amps for some applications. Existing state-of-the-art power amplification at high powers has been almost exclusively provided by vacuum tube amplifiers. The power levels of current solid state power amplifiers are quite low (1–5KW) compared to the power levels of current vacuum tube amplifiers (10s of MW). However, the enormous size and weight of the vacuum tube amplifiers can be problematic. The system includes a receiver, splitters, a set of solid state amplifier units, multiport combiners, and a level control protection circuit.



## APPLICATIONS

The technology has several potential applications:

- RF induction (or dielectric) heating: for joining parts and producing hardened tempered coatings for hardware, including:
  - Metal chains
  - Locks
  - High-performance bearings for auto racing
  - Saw blades
  - Ceramics
- High Power Transmitters: for the broadcasting industry, communications systems
- Plasma generation: for cleaning ultrahigh vacuum parts

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