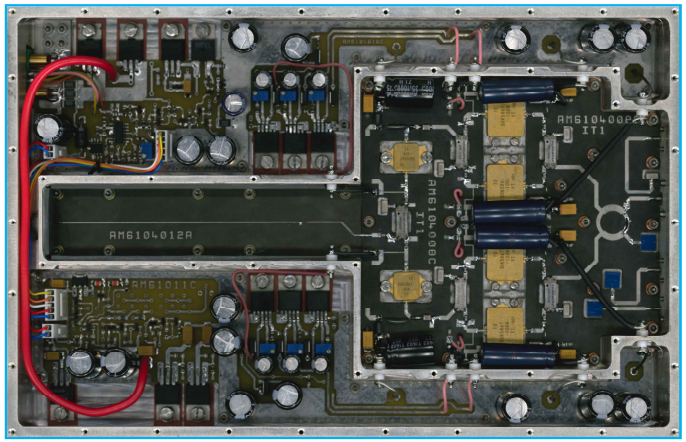
Introduction to Microwave Amps Ltd.

AM61 1.2kW X-Band Pulsed SSPA

Company Profile

- Solid State Power Amplifier Manufacturer
- Products Cover Applications 1MHz to 20GHz
- Founded in 1989
- Turnover £2-3m / Year
- UK Limited Company
- ISO9001 2015
- Factory in Ashton, Bristol, UK
- Full In-house Design, Production & Test
- 25 Employees



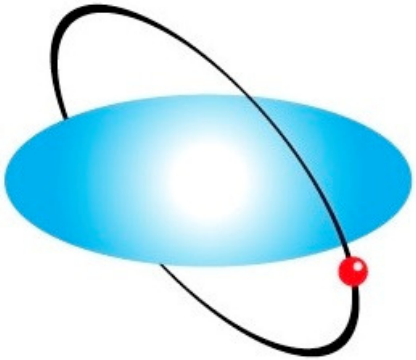
AM61 400W C-Band Pulsed SSPA

Typical Amplifier Applications

Jamming/ ECM

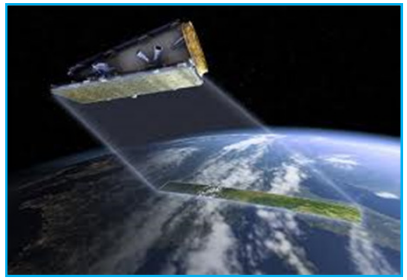
Video/ Data Links

Mobile Comms



RADAR

Space



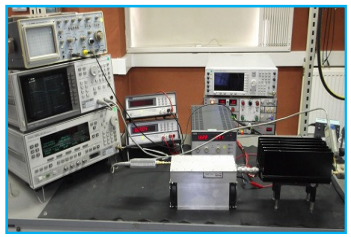
Medical

High Energy Physics

Full In House Production

Design

Test



Circuit Boards

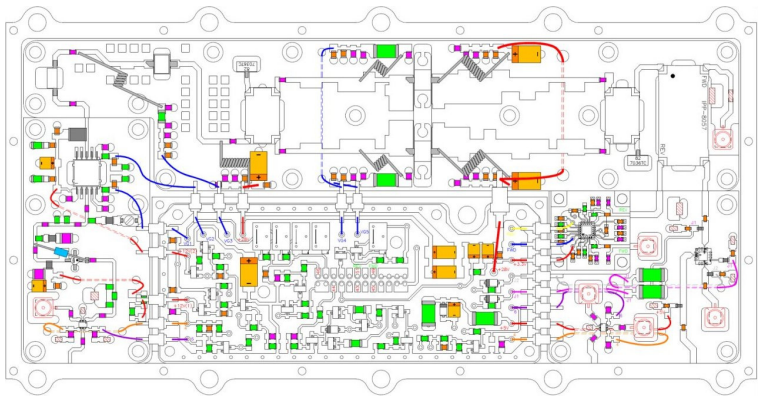
In-house Manufacturing
From Design
Through to Test

Assembly

Metal Work

Design Procedure

- Over 25 Years of Designing Solid State High Power Amplifiers
- Our Knowledge is Founded on High Frequency Gallium Arsenide
- Over 15 Years Experience with LDMOS and Gallium Nitride
- Designed using the Latest Microwave Office Software
- Layouts with AutoCAD and 3D SolidWorks



Solid State Technology

We use Three main Semiconductor Technologies in our Amplifiers. Each has its Strengths and Weaknesses, and we use our Experience to match the Technology to the Application. An Overview is Below:

GaAs FET

High Frequency - to 15GHz	Low Voltage, High Current
Excellent Linearity	Low Power Density
Established Technology	Future Obsolescence

GaN HEMT

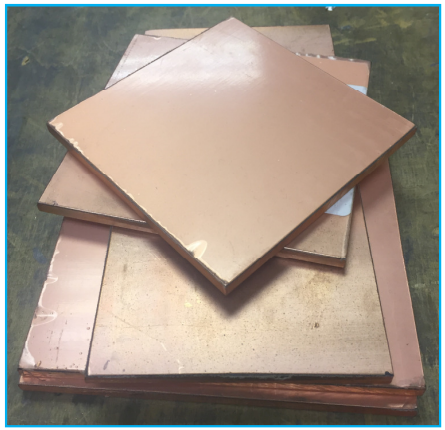
High Voltage, Low Current	Poorer Linearity
High Efficiency	Higher Cost
High Power Density	Limited Duty
Development Scope	Limited Availability

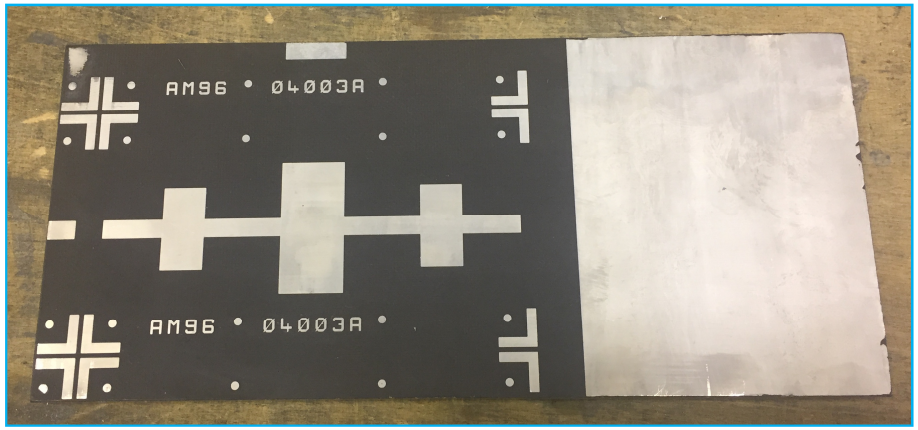
LDMOS

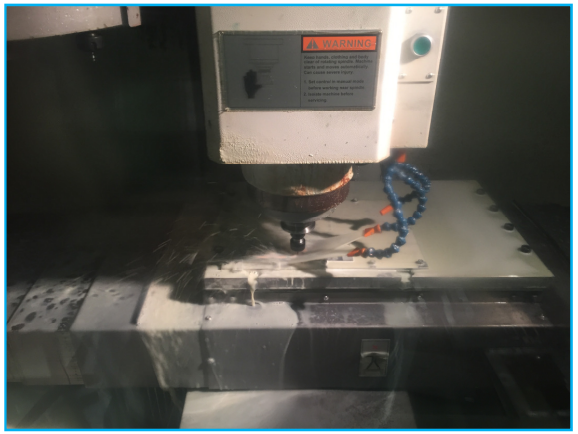
High Voltage, Low Current	< 3.5GHz Operation
Highest Power Density	Limited Duty
Low Cost	Pulse Distortion

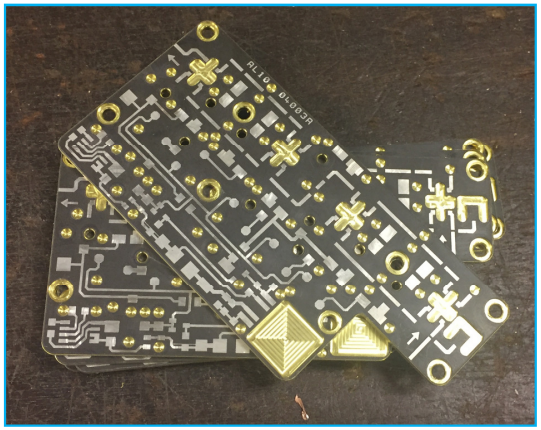
Circuit Board Process

- Starting with a Rogers Thick Copper Backed Duroid
- Photo Lithography to Develop the Required Pattern
- Wet Etch Process to Remove the unwanted Copper
- A High Speed Milling Cycle to Create Fixing Holes Component Wells, Grounding Points, etc.



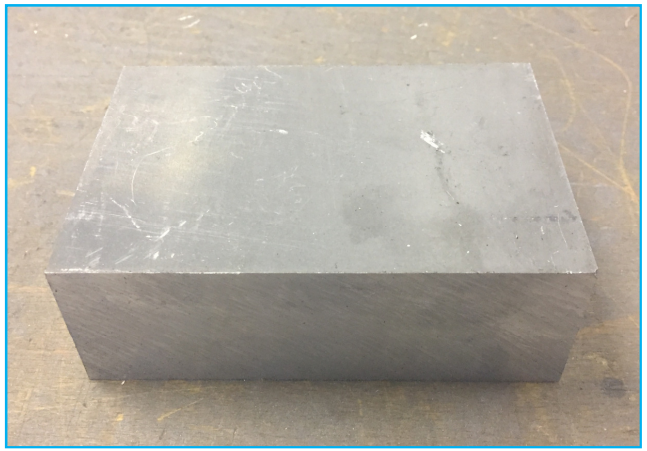


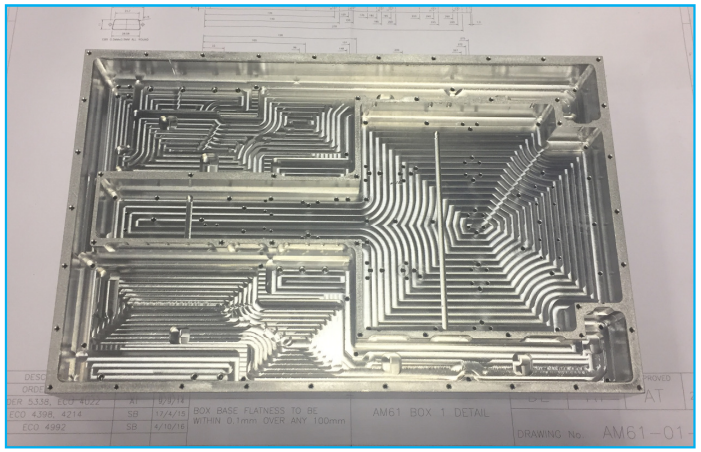




Metal Work Manufacture

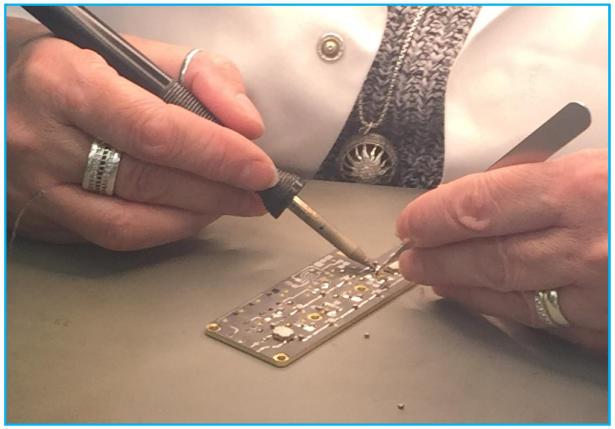
- We Start with an Aluminium Rolled Blank
- The Required Pattern is loaded into our High Speed Milling Machines
- This is then Milled in 3 Dimensions
- Enclosures, Fixing Holes, Heat Sinks, Threaded Holes can be Created

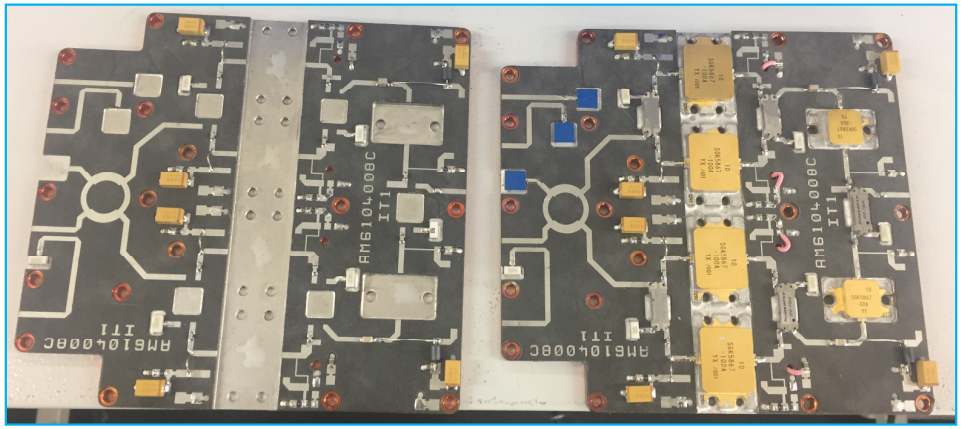




Assembly

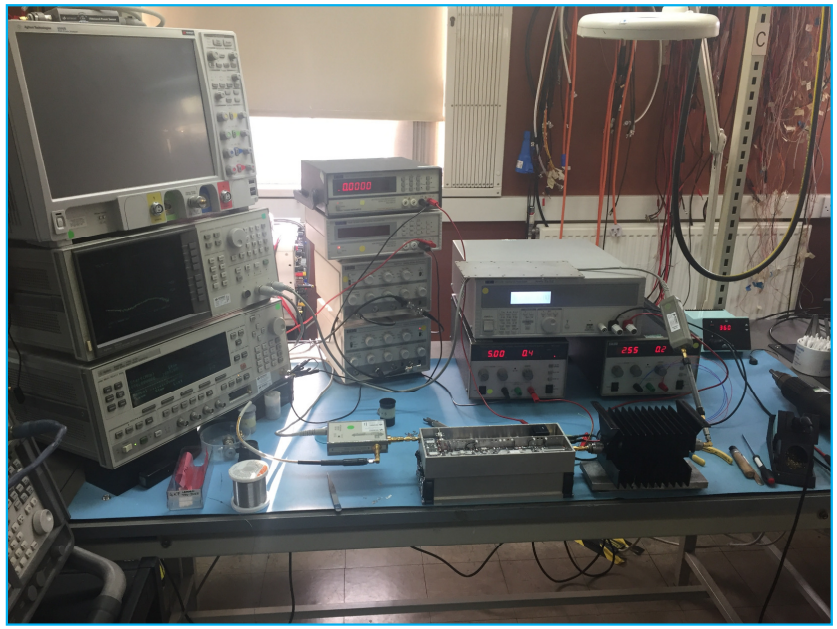
- All Assembly done by Hand
- Assembly Team have Space Grade Soldering Qualifications
- Two Stage Solder Process





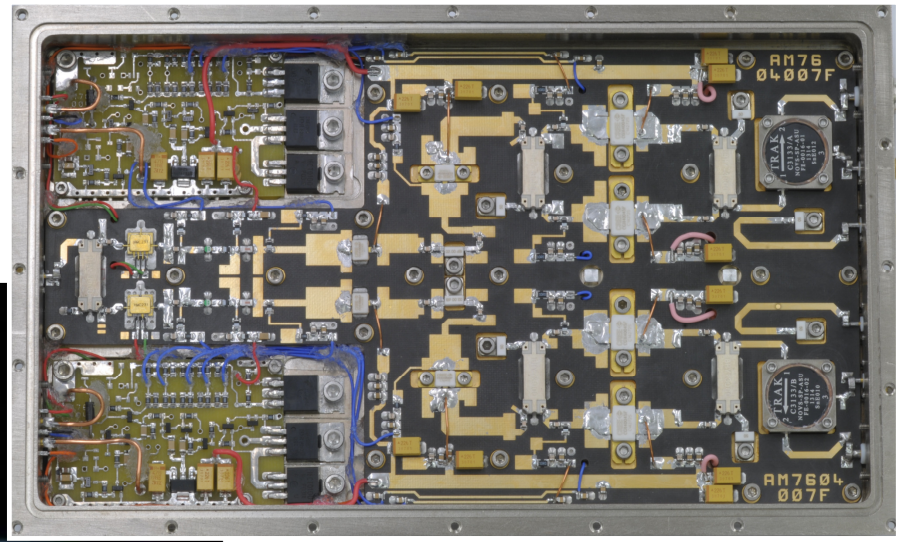
Testing

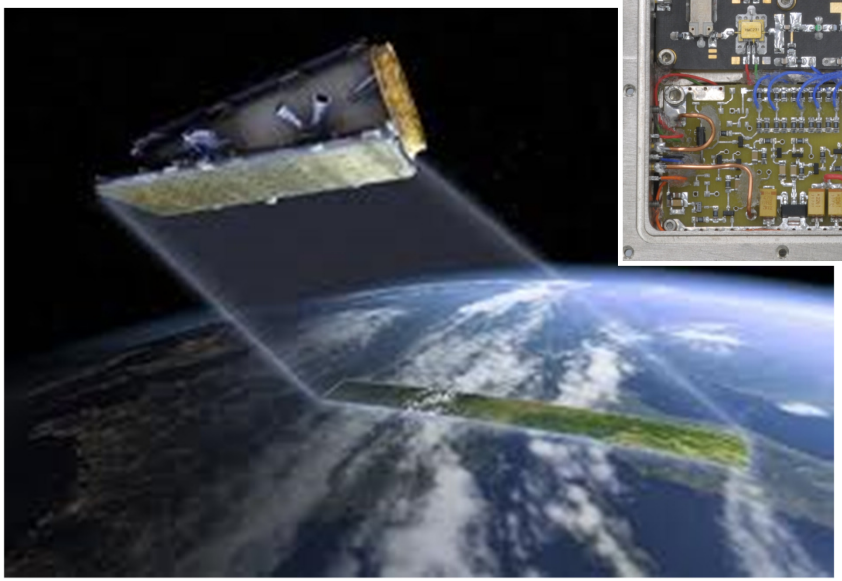
- All Units 100% Tested before Shipping
- Test Power Levels up to 24kW Pulsed, & 20kW CW



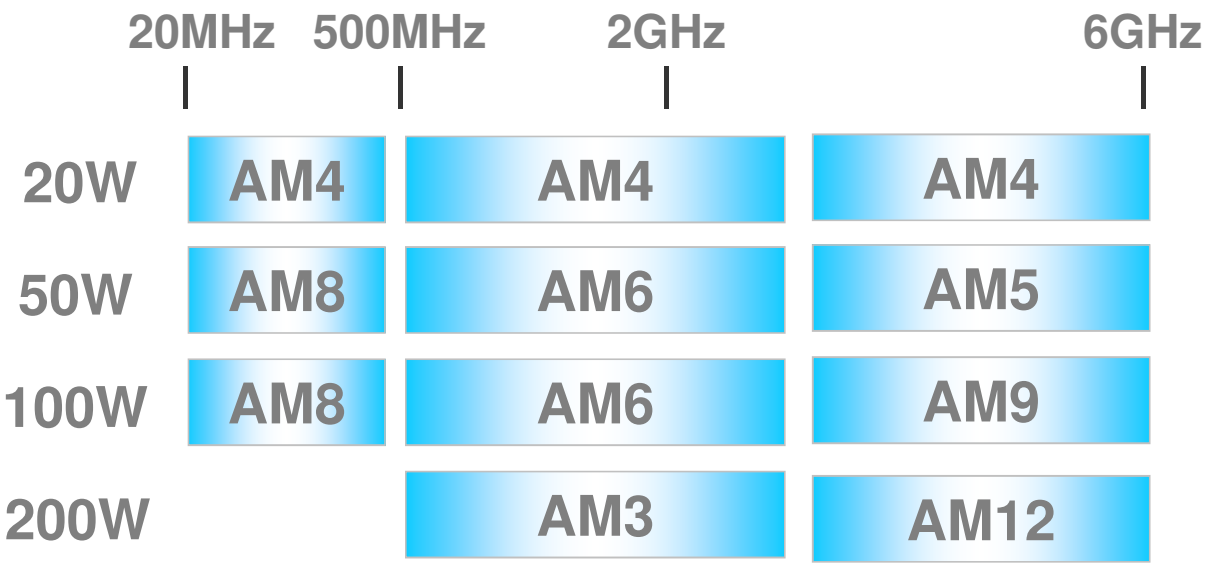
AM76 Space Amplifier

The AM76 is a GaN SSPA which will fly in the NovaSAR-S Spacecraft. This is an S-Band, 100W Amplifier with Dual Output.





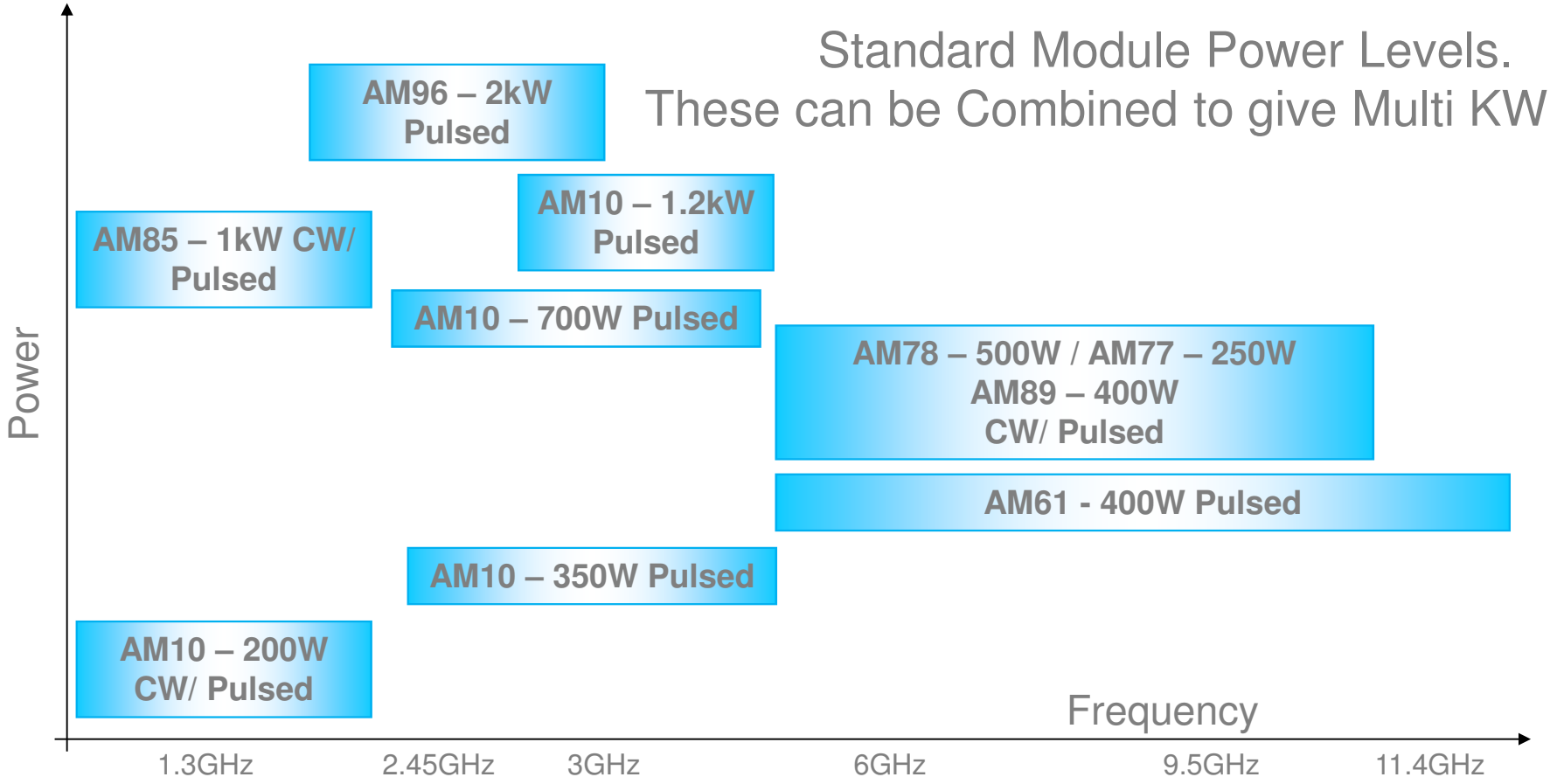
Wideband GaN Module Capability



- Solid State GaN & LDMOS Designs
- Instantaneous Full Bandwidth
- TTL Control
- Reverse Polarity Protection
- Open & Short Circuit Operation & Alarm
- RF Output Status Monitor
- Over Temperature Protection
- DC Current Monitor

RF Power Module Capability

Standard Module Power Levels.
These can be Combined to give Multi KW Units.

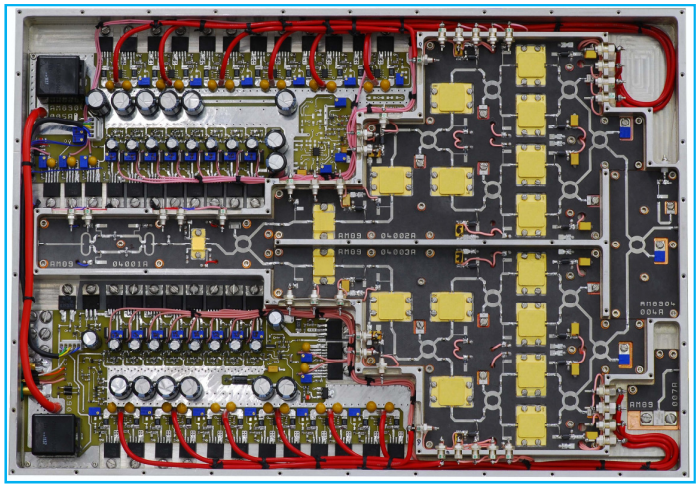


microwave amps

High Energy Physics Amplifier Portfolio

Klystron & IOT Drivers, Buncher & Stochastic Cooling PAs. Solid State LDMOS, GaN & GaAs FET Power Amplifiers

Series	From	To	< 250	< 500	< 1000	< 2000	< 3000	< 5000	< 10000	< 20000
AM10/1.3S-53-53---CW/Pulsed-Power	1.28	1.32	—							
AM10/S-Band--180W	2.85	3.00	—							
AM10/2.85S-55-55---Pulsed-Power	2.85	2.87		—						
AM10/S-Band-350W	2.85	3.00		—						
AM10/3S-55-55---Pulsed-Power	2.99	3.01		—						
AM89/C-Band-400W-CW/Pulsed	5.68	5.72		—						
AM61/C-Band-400W-	5.70	5.72		—						
AM61/X-Band-(9.5GHz)-400W	9.00	9.50		—						
AM61/X-Band-(11.4GHz & 12GHz) -400W	11.40	12.00		—						
AM85/L-Band-1000W	1.28	1.32			—					
AM10/2.85S-58-58---Pulsed-Power	2.85	2.87			—					
AM10/S-Band-700W	2.85	3.00			—					
AM10/3S-58-58---Pulsed-Power	2.99	3.01			—					
AM96/L-Band-2kW	1.28	1.32				—				
AM10/S-Band-1200W	2.85	3.00				—				
AM61/X-Band-(11.4GHz & 12GHz) -1200W	11.40	12.00				—				
AM96/20kW-Pulsed-Power-Systems	1.20	1.40								—
AM97/2.1GHz 14kW CW Tower System	2.08	2.12								—



An AM89 400W C-Band Pulsed SSPA

AM96 Tower of Power

The AM96 is a Modular Solid State Power Amplifier, offering CW or pulsed operation in a single rack. This topology allows maximum flexibility in design and increased resilience in operation due to the redundancy built into the RF and DC circuits.

Features:

- Frequency: 10MHz to 4GHz in Bands
- Power: CW or Pulsed up to 20kW
- TTL Gating Control
- High Linearity
- Excellent Amplitude and Phase Stability
- Fast Response Time
- Soft Degradation
- PSU Redundancy
- Modular Construction
- Full Remote Control & Monitoring
- GaN, LDMOS, GaAs SSPA

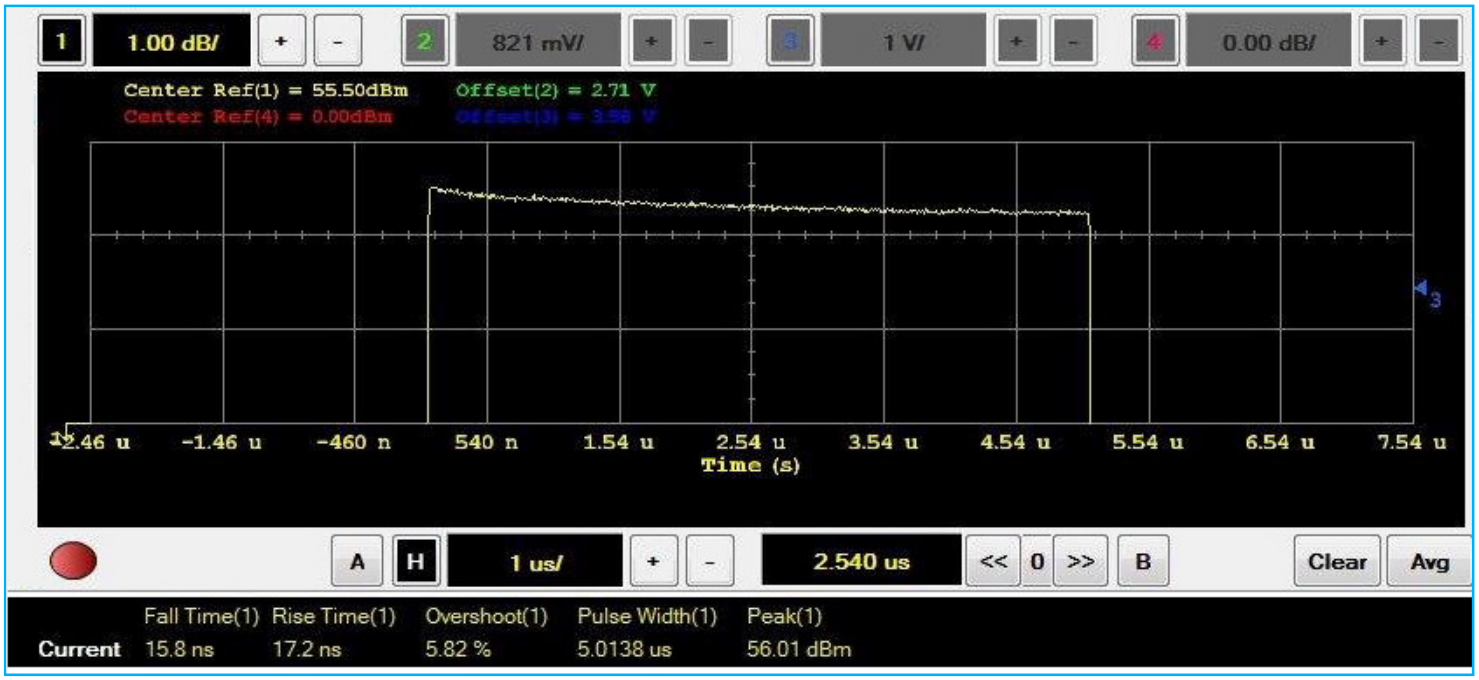
Applications:

- TWT Replacement
- Klystron & IOT Driver
- Materials Research
- NMR

20kW, 1.3GHz Pulsed System

Pulsed Power Characteristics

User demands vary greatly with application requirements. In some cases a high power pulse of low precision is needed, and in others a high fidelity pulse of exactness is essential. The technologies we use are selected to ensure that the correct pulse characteristic is achieved from the design.



12GHz 400W 5uS pulse measured on Agilent 8990B peak power analyser

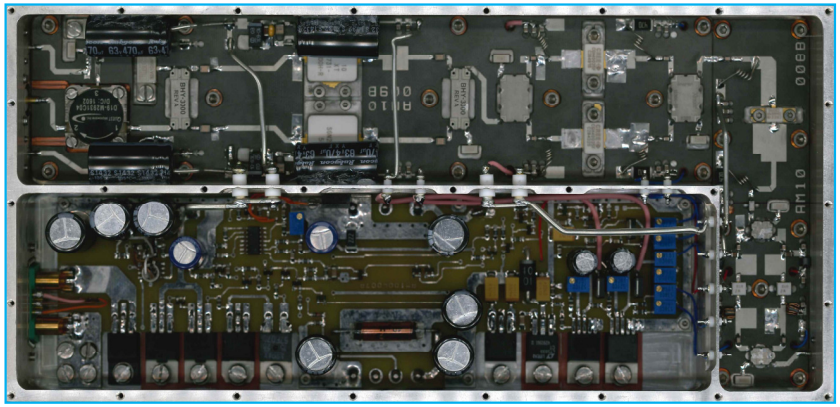
Typical Amplifier Features

Standard

- Modular or 19” Rack Mount
- Unconditional Stability
- Full Reverse Power Protection
- Fast Rise & Fall Response
- Low Pulse Distortion
- Control & Monitor Interface

Options

- Forward & Reverse Power Meters
- Class A, B, & AB
- Gated Operation
- Safety Interlocks
- Power Control
- Custom Remote Interface



AM10 S-Band 1.3kW Pulsed SSPA

Global High Energy Physics Customers

The End or the Start?