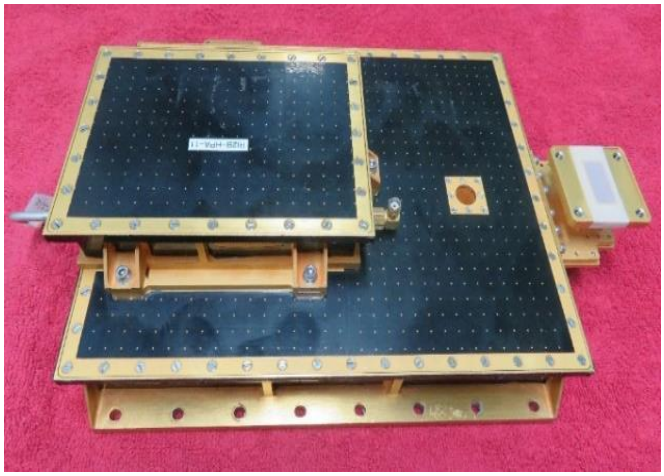

X-BAND 250W PULSED SOLID STATE POWER AMPLIFIER

The X-Band 250W Pulsed SSPA is the highest power FM SSPA developed in ISRO at X-Band. This was a pivotal technology for microwave remote sensing SAR and is an indispensable sub-system in multiple SAR payloads. This SSPA delivers an output power of 250W with DC efficiency of 22% with gain of more than 55dB over 600MHz at 9.6GHz.

The subsystem has been bifurcated into two trays for better performance as well as better thermal management and size optimization. A total of 06 GaN devices and 02 packaged GaAs MMICs have been used for obtaining required RF power and gain. It also consists of pulse modulator card integrated within the RF package for better performance. In order to ensure low-loss interfacing with other subsystems in the transmit section of the payload, a low-loss microstrip to waveguide transition has been designed and implemented at the output of SSPA. The unit also houses a digital phase shifter in order to control output phase of the amplified signal. SSPA EPC is designed for 325W average output power having four outputs with input raw bus voltage varying from 35V to 42V (DC). SSPA RF unit weighs approx. 1.5kg and is housed in 2 trays with overall dimension of approx. 300mm x 200mm x 100mm. SSPA EPC dimension is approx. 220mm x 75mm x 135mm and it weighs around 1.8 Kg.

Salient Features

- Highest power X-band FM SSPA designed and developed in SAC, ISRO.
- A total of 5 stage amplification process and 08 discreet devices (02 GaAs and 06 GaN) were used in each SSPA.
- In-house designed low-loss micro-strip to WR-90 transition.
- In-house designed Digital Phase Shifter MMIC.
- Integrated Pulse Modulator Card and DPS driver card in single sub-system.
- Efficient mechanical design for better thermal management.
- DC bias voltages to SSPA is provided by inhouse developed EPC.
- It has undergone thorough space qualification including burn-in test at 55°C and thermo-vacuum characterization from -15°C to 55°C at full output power.

Application

The SSPA is the primary unit of X-Band transmitter in high power light weight SARs. It amplifies the signal coming from FG and provides input to the high power combiner of the payload. It is capable of delivering upto 250W power with 22% DC efficiency and >55dB gain. It has been tested at upto 22% duty cycle over 600MHz bandwidth at 9.6 GHz. It also houses a digital phase shifter (DPS) in order to control output phase of the amplified signal, which enables polarimetric capability in SAR as per its design and requirements and also suffices electronic beam steering capability in the payload.

SAC Technologies

Specifications of X-Band 250W Pulsed SSPA

Parameter	Specifications
Frequency	9.3 – 9.9 GHz
Output Power (nominal)	53.6 dBm
Large signal gain	54dB (min)
OP flatness at ambient	± 1dB
Operating temperature range (base-plate)	-10^0C to 50^0C
Gain variation over operating temperature range	± 0.75dB w.r.t. ambient
Out of band spurious	< -50dBc
Pulse Width	5µs to 40µs
Duty Cycle	22% (max)
Phase control	Range 360^0, Step 5.625^0
RF Interface	SMA input, WR90 output
Mass (with EPC)	3.3 kg

Technology Transfer

SAC/ISRO offers to transfer this technology of the **X-band 250W Pulsed Solid State Power Amplifier** developed by SAC to industries in India with adequate experience and facilities. Enterprises interested in obtaining knowhow may register and submit their proposal to IN-SPACe, Ahmedabad at www.inspace.gov.in

SAC Technologies

For more details, Contact:

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