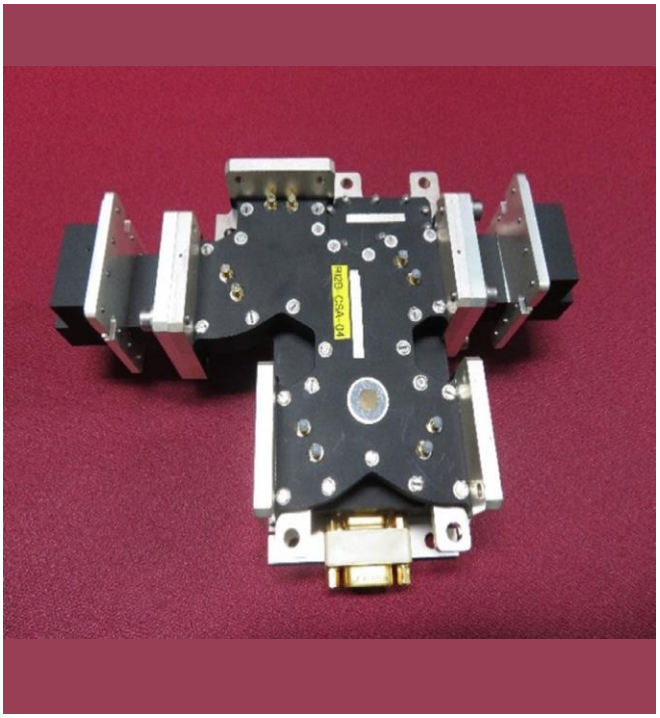
High Power Circulator-Switch Assembly

The X-Band circulator-switch assembly is a 3 port system for signal duplexing between the payload transmitter and receiver systems in SAR payloads where a single antenna is used for both transmission and reception of signals. It protects the receiver during transmit window and isolates the transmitter during receive window. It consists of 01 ferrite circulator and 02 ferrite switches inside each unit. It has switching time of under 2.5us and is capable of handling up to 2kW peak power and 440W average power in space. The switches are commanded by a 5V TTL input from the payload controller which synchronizes the CSA with the transmit and receive timings of the payload.



Specifications:

- Very fast switching speed of under 2.5 us
- Isolation of 60dB between transmitter and receiver during transmit window.
- Transmit loss of 0.25dB and receive loss of 0.85dB over 600 MHz at operating temperature range
- Capable of high RF power handing. Tested for power handling and multipaction up to 500W average and 6kW peak RF power at thermo-vacuum conditions.
- In-built driver for generating magnetic flux based on external TTL input.
- The unit has undergone thorough space qualification including
  - S-parameter characterization from -150C to 550C at vacuum
  - Qualification level vibration & mechanical shock.
  - Multipactor & vacuum power handling testing at 6kW peak and 440W average power respectively

Applications

IThe Circulator-Switch Assembly is the crucial front-end element of high power microwave remote sensing payloads where a common antenna is shared by the high power transmitter and the low power receiver. It protects the receiver by providing more than 60dB of isolation during the transmit window. With switching speed as low as 2.5us, it is also the duplexing mechanism between transmit and receive signals of the payload. The CSA is subject to the full payload output power and hence tested up to 6kW of peak power and 440W average power. Typical transmit loss of the unit is better than 0.25 and receive path loss better than 0.85dB over 600 MHz bandwidth at 9.6 GHz center frequency.

Specifications for 8 X 8 Butler Matrix	
Parameter	Specifications
Frequency	9.3 – 9.9 GHz
Transmit path Loss (over 600 MHz)(from -15^{0}C to 55^{0}C)	0.25 dB (max)
Receive path Loss (over 600 MHz) (from -15^{0}C to 55^{0}C)	0.85 dB (max)
Return Loss (600 MHz)	16 dB(min)
Peak Power Handling	2 KW
Average Power Handling	440W
Full power operating temperature (base-plate)	-10^{0}C to 50^{0}C
Switching Speed	2.5us (max)
Interface	WR90 waveguide
Mass	0.7 kg (max)

Technology Transfer from ISRO

ISRO is willing to offer the knowhow of this technology to suitable entrepreneurs / industries in India. Capable manufacturing industries interested in acquiring this knowhow may write with details of their present activities, requirements and plans for implementation, infrastructure and technical expertise available with them, their own market assessment, if any, and plans for diversification to the address given below: