Installation

Background

The requirement involves the integration of various components to supply microwave power to the test device (DUT). In the demonstration schematic test (Figure 1), the DUT is replaced by a dummy load. Below are the key points:

- **Microwave Power Source**: A microwave generator serves as the primary source of microwave power, which is transmitted through several components to reach the DUT.
- **Circulator**: This device directs microwave power from the generator to a bi-directional coupler and ensures that any reflected power from the coupler is directed to the dummy load. This provides additional protection for the microwave generator.
- **Dual-directional coupler:** This component extracts a small amount of forward and reflected power from the main line while maintaining the integrity of the coupled and isolated ports. Instruments such as spectrum analyzer and power sensors connect to these ports to measure power levels and other characteristics. Power must be sufficiently attenuated using attenuators before being fed to these instruments to prevent overload. A power divider is employed to distribute the microwave signal to multiple instruments simultaneously.
- **Matching Network**: Since the impedance of the DUT is unknown, a matching network is implemented to optimize power transmission.
- **Protection Elements**: DC blocks and surge protectors are included to provide additional safety for the microwave generator.
- **Bias Tee**: This component adds a bias current alongside the microwave power supplied to the DUT.

Demonstration test

For the demonstration test circuit schematic shown in Figure 1, the party is required to demonstrate the following at the delivery location:

1. **Interfacing**: Demonstrate the interfacing between all components.
2. **Microwave Generator Performance**: Verify in the values of forward power (output) and frequency of the microwave generator up to 200W at operating frequencies of 2.4GHz and 2.5GHz using instruments (like spectrum analyser and power meter) in accordance with specifications mentioned.
3. **Power Handling Tests**: Test the circuit at a minimum of forward (output) power indicated in Table 1 from the microwave generator for a duration indicated in Table 1. Logging feature mentioned in subsequent section must be demonstrated during the tests. The forward power measured by power sensor during the duration of tests should be within 10% of initial nominal value. The reflected power measured by microwave generator during the duration of tests should be less than 10% of forward (output) power set at microwave generator.

Table 1: Details of Power Handling tests

Sl. No.	Power (in W)	Duration (continuous)
a)	200	5 min
b)	150	3 hours
c)	100	48 hours

4. **Reflected Power Management**: Show that the circulator can divert reflected power towards the dummy load to minimize reflected power to the microwave generator. This should be demonstrated by disconnecting the bi-directional coupler from the circuit (keeping the circulator output port open) and setting the microwave generator to 200W forward power for a short duration of 5 seconds. Reflected power reading in the microwave generator must be less than 20W during the test.

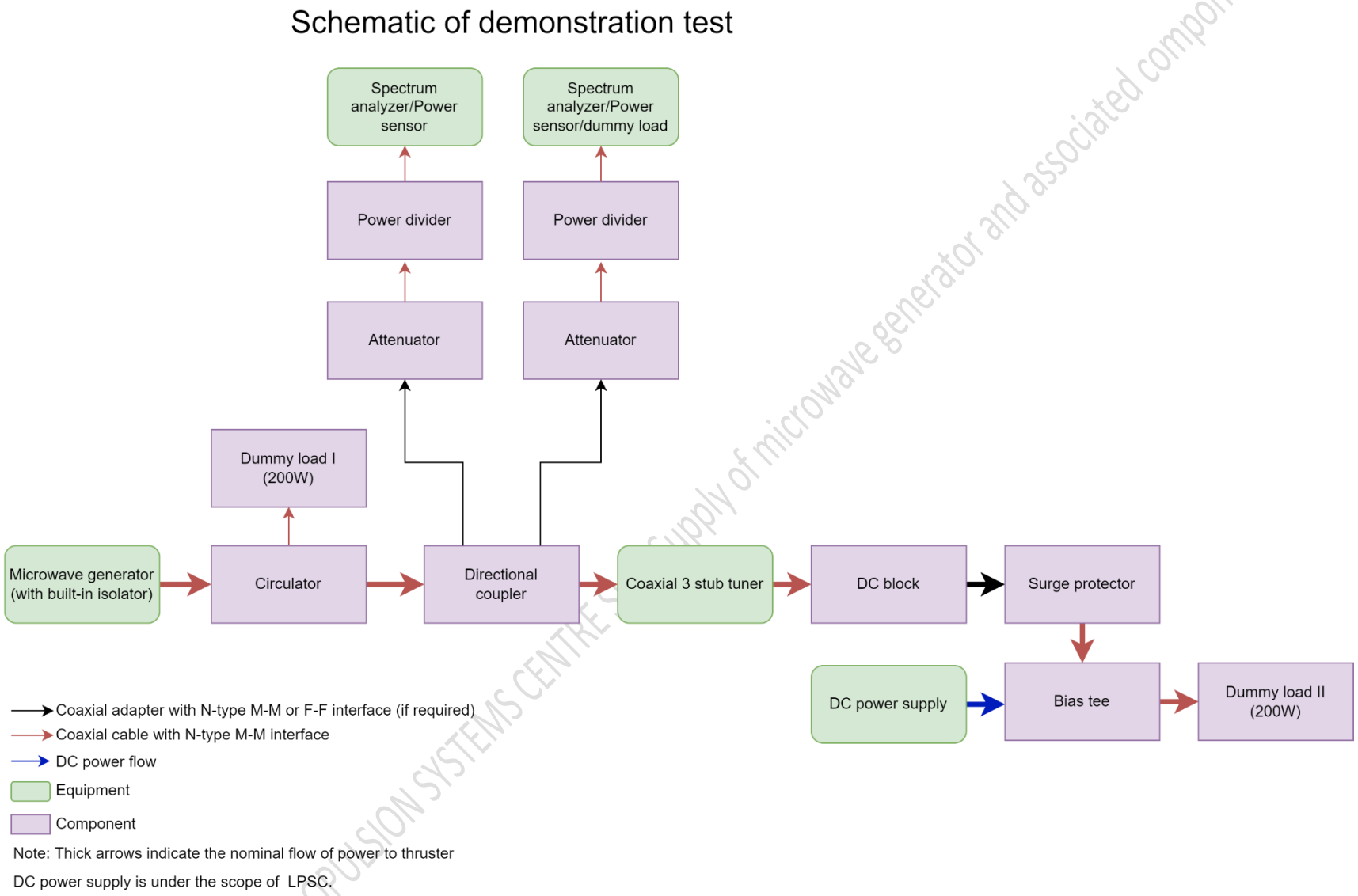

Figure 1 : Schematic of demonstration test

Remote operation

Remote operation of the following equipment must be demonstrated at the delivery location:

- Microwave generator
- Spectrum analyzer
- Power sensor

Industrial PC and accessories for connection should be used for all the interfacing and demonstration. In this context all the necessary software and codes must be present in the PC.

Common logging platform

A software needs to be developed for the logging with following features:

1. Logs all the essential parameters from microwave generator, power sensor and spectrum analyzer at a user predefined time interval through remote communication. The parameters required but not limited to are shown in Table-2.

Table 2: Parameters required for logging

Equipment	**Parameter**
Microwave generator	Set frequency
	Output frequency
	Set power
	Output forward power
	Reflected power
	Health status/alarms
Power sensor (Qty: 2)	Power
Spectrum analyzer	Spectrum data

2. All log data except from spectrum analyzer should be in single file (preferably csv) with appropriate heading and time stamp. The spectrum data from spectrum analyzer should be dumped at user predefined time interval into separate files.
3. The averaging/acquiring/reading options for power sensor and spectrum analyzer should be user predefined.
4. The source code for the software should be provided.

Rack mounting

Following items should be mounted in the rack:

- Microwave generator
- Spectrum analyser
- Industrial PC