HOMER V1.6 Hot Measurement System

Basic Description

The *HOMER*™ Hot Measurement System is high power vector impedance analyzer serving for effective and easy monitoring and controlling process parameters in semiconductor/FDP fabrication and other industrial applications, including plasma. It is designed for CW, high-ripple ("Rectified") and pulsed operation modes. Under the full-power operating conditions of magnetron-based microwave generators, *HOMER* measures both magnitude and phase of reflection coefficient as well as incident, reflected and absorbed power and frequency. It can help reduce equipment manufacturing costs controlling the quality of a fabrication process. *HOMER* comes with its own software and documentation. It can be controlled from a personal computer via RS232 or CAN interface.

Principle of Operation

HOMER is based on the six-port reflectometer (SPR) principle. The microwave hardware of a SPR creates four different combinations of the waves incident on and reflected from load. Powers of these combined waves are sensed by four amplitude detectors. Using the detector outputs and signal frequency, SPR can compute the complex reflection coefficient of the load as well as the incident power. This conceptual simplicity of SPR facilitates its stable and temperature-independent operation of over long periods of time. The system parameters required for the computations are obtained in the process of factory-made calibration where a collection of impedance standards is used in place of load. It is recommended that the recalibration be performed once a year. For accurate measurement it is also essential to know the signal frequency. Unlike laboratory generators, magnetron frequency is not known in advance but may vary as a function of working conditions, most importantly the applied high voltage and load impedance. A frequency counter is therefore integrated with the system. Reflectometers of this type are especially suitable for industrial applications where on-line monitoring and control under full working power is required.

Modes of Operation

HOMER supports three modes of operation, named CW, Rectified, and Pulsed.

CW mode is applicable to unmodulated microwave signals with output power ripple not exceeding 15% of peak value.

Rectified mode is designed for slowly pulsing microwave signals (up to 400 Hz repetition rate). Such signals are typical for magnetrons powered by low-cost power supplies which incorporate simple half-wave or full-wave rectifiers.

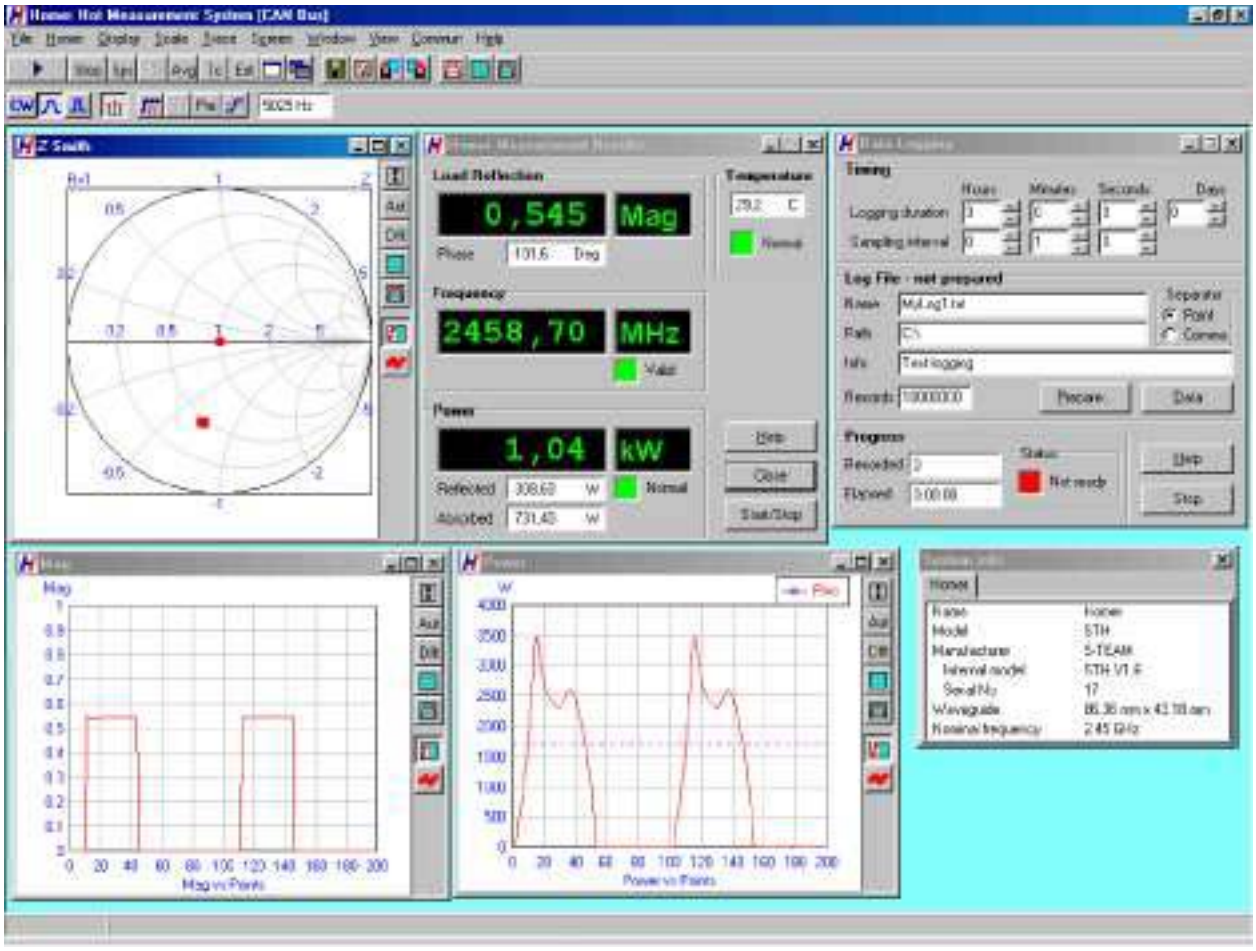
Pulsed mode option is intended for sampling fast pulse-modulated microwave signals with pulse widths down to 100 *xs* and repetition period up to 100 ms.

Rectified and Pulsed modes provide both instantaneous and average values of reflection coefficient and power.

Windows Control, Visualization and Data Logging Software

The control, visualization and data logging software significantly expands the the system capabilities. The basic features include:

- Microsoft Windows® environment
- Accurate measurement of complex reflection coefficient and its displaying in various formats, including
  - Magnitude
  - Phase angle
  - Return Loss
  - VSWR
  - Polar Display
  - Smith Charts (Z and Y)
  - Rieke-Type Chart
- Measurement of incident, reflected, and absorbed power and its displaying in various formats, including watts, decibels, percentage of incident power
- Numerical readout of signal frequency, load reflection coefficient and power in various formats
- Arbitrary shifting of the measurement plane
- Saving measured data as tables (text files) or pictures (BMP, GIF, JPG)
- Periodic data logging of all or some of the measured quantities
- Multiple windows enabling simultaneous observation of various quantities in different formats
- Wide selection of appearances of displayed curves
- Storing and retrieving of complete system settings matched to particulartasks
- Extensive on-line help



Specifications

Electrical	
Waveguide type	R-26 (WR-340 IEC, WG-9A)
Flange type	IEC
Frequency range	2425 to 2475 MHz
Maximum working power[1)2)]	30 kW
Minimum working power	1 W
Dynamic range of working power	20 dB
Reflection coefficient measurement error (uncertainty circle radius)	0.05
Incident power measurement error (matched load)	±5 %
Power supply voltage	24 10% DC
Power consumption	15W
Interface	RS232, CAN
Modes of operation	CW, Rectified, Pulsed
Max ripple in CW mode	15 % of peak value
Max repetition rate of signal envelope in Rectified mode[3)]	400 Hz
Min pulse width in Pulsed mode	100 |js
Max pulse repetition period Pulsed in mode	100 ms
Mechanical	
Mass	3 kg
Length	174 mm (6.85 in)
Width	138 mm (5.43 in)
Height	226 mm (8.90 in)
Environmental	
Operating temperature range	+5 to +55 Celsius
Storage temperature range	-10 to +125 Celsius

1) Actual maximum operating power is fixed according to customer's demand (must not exceed 30 kW). The actual minimum operating power is 20 dB (=dynamic range) below the actual maximum operating power or 1 W, whichever is greater.

2) In Rectified and Pulsed modes, maximum power means peak power (not its mean value)

3) Signal envelope repetition rate f_e is determined by power line frequency f_p and the rectification method. Examples: Half-wave-rectified signal $f_e=f_p$; full-wave-rectified signal $f_e=2f_p$; 3-phase ripple period $f_e=3f_p$.

Configurations

Basic Configuration

HOMER
RS232 or CAN Bus interface (one, according to customer's demand)
CW and Rectified mode of operation
Help for Homer (electronic handbook)

Options

Windows Software
Additional interface (CAN Bus or RS232)
Pulsed mode of operation