HOMER Analyzer ISM 2.45 GHz, WR-340 Waveguide

General Description

The HOMER-Series STH 2.45-GHz Analyzer (Fig. 1) is an automatic impedance and power measurement system based on WR-340 (R-26) waveguide. The system works under the full-power operating conditions of magnetron-based microwave generators and measures both magnitude and phase of reflection coefficient as well as incident, reflected and absorbed powers and frequency. The system is designed for CW, high-ripple (Rectified) and Pulsed sampling modes. STH can be:

- Used autonomously without external controller.
- Controlled from a personal computer or another controller via RS232 or CAN Bus interface.
- Integrated into a LabVIEW environment.

The peak working power is fixed at the manufacture time as specified in the customer's order[1].

The system comes with its own software (Server) and documentation.

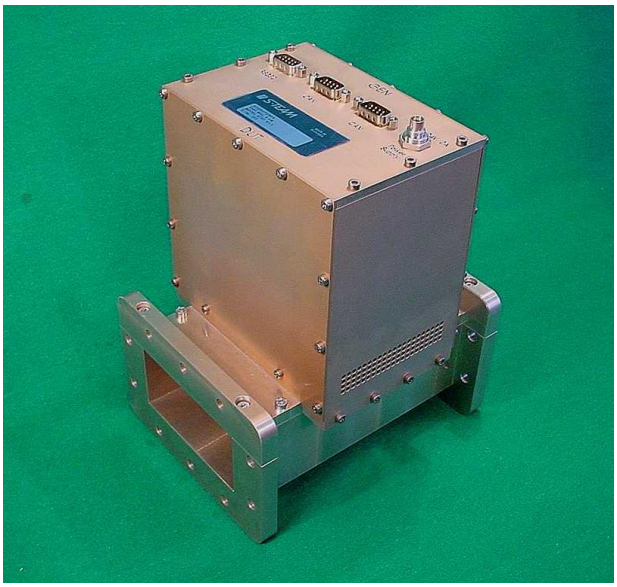

Fig. 1. HOMER STH Analyzer (2.45 GHz, WR-340 waveguide).

Principle of Operation

The HOMER Analyzer is based on the six-port reflectometer (SPR) principle. SPR is capable of measuring complex reflection coefficient of the load as well as the incident, reflected and absorbed powers. A frequency counter is also integrated with the system. The conceptual simplicity of SPR facilitates its stable and temperature-independent operation 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 connected in place of load. It is recommended for the best performance that the recalibration be performed each two years.

Reflectometers of this type are especially suitable for industrial applications where on-line monitoring and control under full working power is required.

Modes of Sampling

HOMER supports three modes of signal sampling, named *CW*, *Rectified*, and *Pulsed*.

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

Rectified mode is designed for slowly pulsing microwave signals (up to several kHz repetition rate). Such signals are typical for magnetrons powered by low-cost power supplies which incorporate simple half-wave or full-wave rectifiers. The Rectified mode provides instantaneous and mean values of the reflection coefficient and powers.

Pulsed mode (optional) is intended primarily for sampling fast square pulse-modulated microwave signals with pulse widths down to 100 μs. The Pulsed mode provides instantaneous and mean values *in pulse* of the reflection coefficient and powers.

[1] See Specifications for the available range. Changing the peak working power requires hardware modification and partial unit recalibration.

Office: S-TEAM Lab, Budova FEI STU B212, Ilkovicova 3, SK-84104 Bratislava, Slovak Republic
Tel./fax: +421-2-6542 7968 **E-mail**: support@s-team.sk http://www.s-team.sk

HomSoft Windows Control, Visualization and Data Logging Software

The *HomSoft* control, visualization and data logging software (Fig. 2) significantly expands 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
  - Return Loss
  - VSWR
  - Polar Display
  - Smith Charts (Z and Y)
  - Oven diagram (Rieke-type chart)
  - Frequency
- Measurement of incident, reflected, and absorbed powers and their 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 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 tailored to particular tasks.
- DDE Server option enables other Windows applications to share measurement results.
- Extensive on-line help.

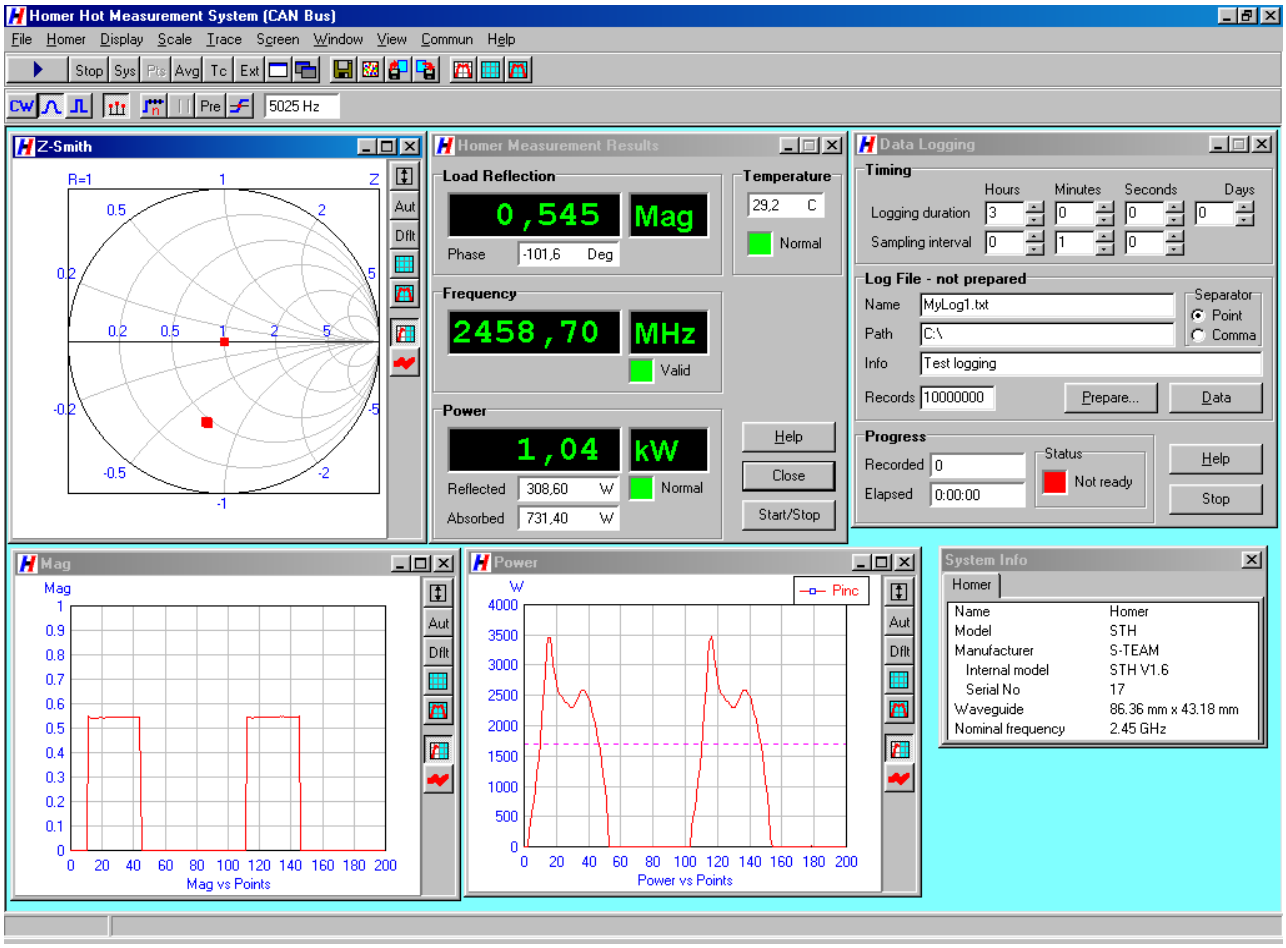

Fig. 2. Example of *HomSoft* graphical user interface.

Specifications

Electrical	
Waveguide type	WR-340 (R-26)
Flange type	IEC
Frequency range	2425 – 2475 MHz
Maximum working power[2] [3]	100 W – 30 kW
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 V ±10% DC
Current consumption	0.7 A
Interface	RS232 or RS422, optionally CAN Bus
Modes of signal sampling	CW, Rectified, Pulsed
Max acceptable ripple in CW mode	15 % of peak value
Max repetition rate of signal envelope in Rectified mode[4]	10 kHz
Min pulse width in Pulsed mode	100 μs
Mechanical	
Mass	3 kg
Length	174 mm (6.85 in)
Width	138 mm (5.43 in)
Height	226 mm (8.90 in)
Surface finish	E-CLPS 4600
Environmental	
Operating temperature range	+5 to +55 °C
Storage temperature range	-10 to +125 °C

[2] Actual maximum working power is hardware-fixed according to customer's demand (must be within the Specifications limits). The actual minimum working power is 20 dB (= dynamic range) below the actual maximum working power.

[3] In Rectified and Pulsed modes, maximum power means ***peak*** power (not its mean value).

[4] Signal envelope repetition rate (ripple frequency) f_e is determined by power line frequency f_p and rectification method. Examples: One-phase half-wave rectification $f_e=f_p$; one-phase full-wave rectification $f_e=2f_p$; three-phase half-wave rectification $f_e=3f_p$; three-phase full-wave rectification $f_e=6f_p$; three-phase Y+Δ half-wave rectification $f_e=6f_p$; three-phase Y+Δ full-wave rectification $f_e=12f_p$.

Configurations

Basic Configuration

- STH Basic Unit
- Internal firmware (Server)
- Calibration in 2425 to 2475 MHz band
- RS232 or RS422 serial interface
- CW and Rectified modes of operation
- Operating handbook (pdf)
- Communication protocol manual (pdf)
- Set of standard cables[5]

Options

- *HomSoft* Windows visualization and control software
- Pulsed mode of sampling
- CAN Bus communication interface (includes CAN Bus cable)
- CAN-USB Adapter (to connect a PC to CAN Bus network)
- LabVIEW HOMER Virtual Instruments Library
- Dynamic Data Exchange (DDE) server in *HomSoft* Windows SW
- Technical support in hours (four hours are complimentary)

Optional Power Supplies

- Traco Power TBL 150-124, 24V/6.25A, DIN rail mountable
- Electro-Automatik EA-PS-524-11T, 24V/10.5A, input 90-264 V, benchtop

[5] Set of standard cables includes DC power supply cable, RS232/RS422 cable, and (in case of CAN Bus) CAN Bus cable.

Miscellaneous

CAN-USB Adapter. To connect your PC with a CAN Bus network (or with the STHT alone), the *Sontheim CAN USB Light Dongle* adapter is needed. You can order it as an option. Another possibility is to buy the dongle yourself from the manufacturer (visit http://www.s-i-e.de).

LabVIEW HOMER Virtual Instruments Library enables HOMER monitoring and control from within the National Instruments' LabVIEW environment. The library consists of a number of virtual instruments (Fig. 3) and is accompanied by several useful examples. The library enables users to integrate HOMER into their own applications with much less effort than trying to start from scratch by studying HOMER communication protocol and programming the communication themselves.

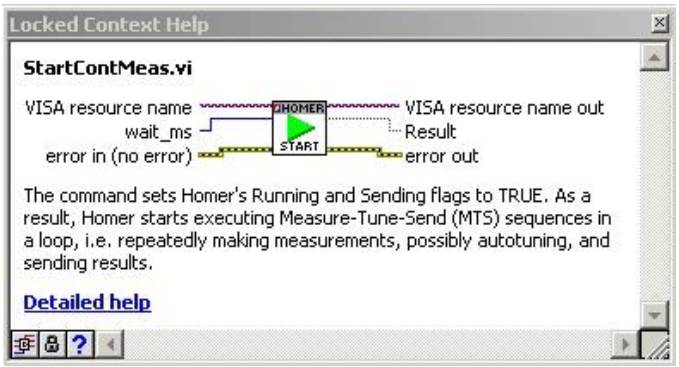

Fig. 3. Example of a LabVIEW virtual instrument block.

DDE Server. DDE Server is a functionality within the *HomSoft* Windows visualization and control SW, and hence it needs the *HomSoft* option, too. The DDE Server enables another (customer's) Windows program, e.g. Microsoft Excel, to extract measurement results from running *HomSoft*.

Technical support. It often happens that new users, especially in the initial phase, need counsel about issues that are not directly the matter of HOMER itself but of their particular application, or about topics that are in detail described in the accompanying documentation. Four hours of such support are provided free of charge; additional support should be ordered.

Dimensional Drawing

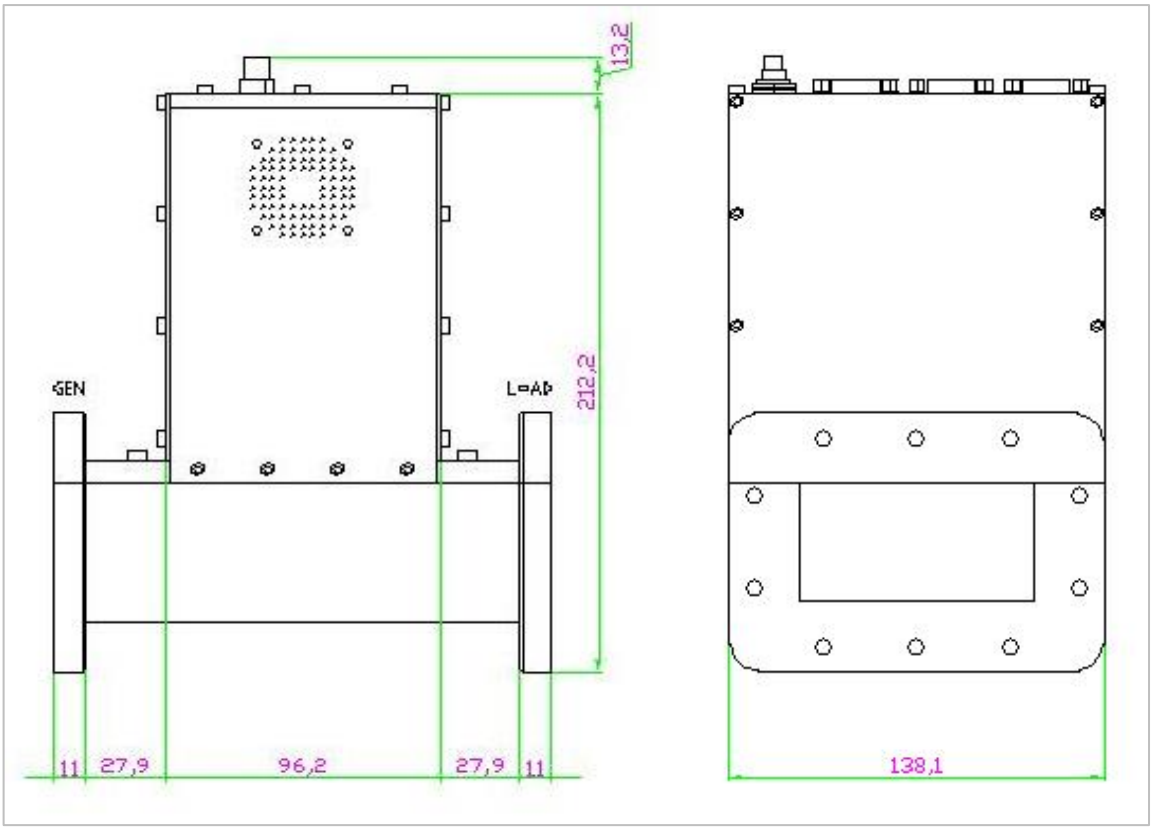

Fig. 4. Basic HOMER Analyzer dimensions. All dimensions are in millimeters.