



Fig. 1. Automatic Network Analyzer for measuring complex impedances, gain, loss, and phase shift from 0.11 to 12.4 GHz consists of (l. to r.), Model 8411A Harmonic Frequency Converter, Model 8410A Main Frame, and a plug-in display module (either Model 8413A Phase-Gain Indicator or Model 8414A Polar Display). Network Analyzer makes swept or single-frequency measurements. See Fig. 8 for other system components.

An Advanced New Network Analyzer for Sweep-Measuring Amplitude and Phase from 0.1 to 12.4 GHz

The information obtainable with a new network analyzer greatly improves microwave design practices, especially where phase information is important.

A NEW MICROWAVE NETWORK ANALYZER developed in the -hp- microwave laboratory promises to be of major importance in many electronic fields, especially those concerned with the phase properties of microwave systems and components. The new instrument sweep-measures the magnitude and phase of reflection and transmission coefficients over the range from 110 MHz to 12.4 GHz. This makes it possible for the analyzer to completely characterize active and passive devices, since nearly every parameter of interest for high-frequency devices can be measured including gain, attenuation, phase, impedance, admittance and others.

The new analyzer represents a major step in the continuing trend to automation in microwave measurements, a trend recognized in several articles in this publication and elsewhere*. Systems that are especially aided by the kinds of automated measurements the analyzer makes are the modern systems that emphasize phase properties, such as electronically-scanned radar and monopulse and doppler radar. Similarly, optimum use of the new high-frequency solid-state devices that make systems such as phased-array radars economically practical is dependent on sophisticated measurements. The reason for this de-

* See references on page 9.

-hp- Journal readers:

We believe you who work with frequencies above 100 MHz will be especially interested in this issue because it discusses an important new system that measures gain, phase, impedance, admittance and attenuation on a swept basis from 110 MHz to 12.4 GHz. In other words the system will measure all network parameters not only of passive networks and devices but also of transistors and even of negative real impedances. Readout is on a meter or on a scope which presents measured performance over a whole frequency band at a glance.

The new system leads to wider use of the familiar quantities we usually call reflection and transmission coefficients. These coefficients are also known as 'scattering parameters', and using them in combination with the new system leads to more sophisticated design techniques including computerized design. An informative article about scattering parameters begins on p. 13.

Obviously, the new system is a powerful tool for the engineer. In addition, it has important implications for the whole microwave engineering field in the future. This is also discussed in this issue (p. 11) by Paul Ely, engineering manager of our microwave laboratory.

I invite your attention to what we believe is unusually important microwave information.

Sincerely, Editor