Signal Analyzers

Microwave Transition Analyzer — HP 71500A

DC–40 GHz with two channels

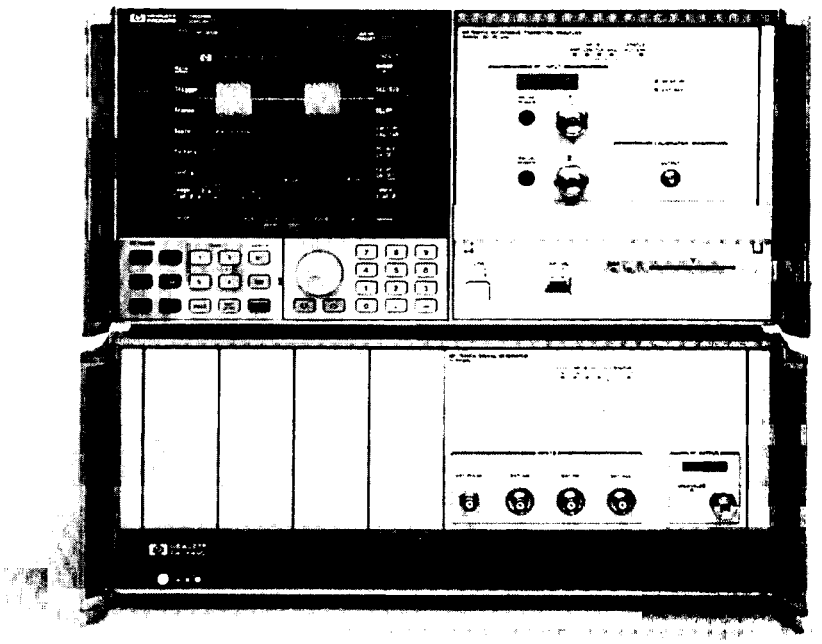
Time domain measurements with FFTs

Up to 1 ps delta time accuracy

Magnitude and phase measurements on pulsed-RF signals to 100 ps pulse widths and 25 ps edges

Analysis of AM, FM, and PM on RF carriers

Stepped frequency and power sweeps, magnitude, and phase



The HP 71500A microwave transition analyzer is a two-channel, sampler-based time-domain instrument for measurements from dc to 40 GHz. It consists of the HP 70820A microwave transition analyzer module and an HP 70004A color display/mainframe.

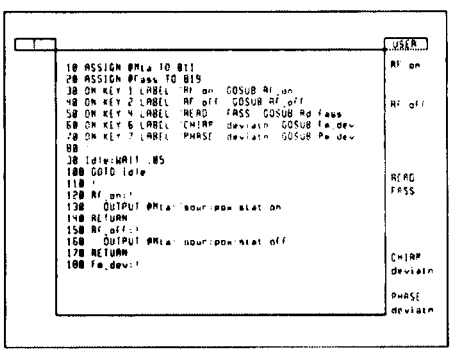
The instrument makes continuous-wave and pulsed RF measurements, specializing in measuring fast magnitude and phase transitions. Performance specifications include 1 ps delta time accuracy, 10 ps rise and fall time (25 ps for pulsed RF), and internal triggering to 40 GHz. You can measure magnitude and phase settling times, rise and fall times, time delay, peak and average power, group delay, AM to PM conversion, and more.

The HP 71500A incorporates measurement functions from many instruments: oscilloscope, vector network analyzer, vector voltmeter, spectrum analyzer, modulation domain analyzer, frequency counter, and peak power meter. Compact MMS format makes the HP 71500A ideal for use in ATE systems or anywhere that downsizing and measurement versatility are required. Optimal performance requires use of a synthesized source, which you order separately.

Generate custom solutions with IBASIC

The HP 71500A allows you to generate custom, application-specific interfaces through the internal execution of HP Instrument BASIC programs. IBASIC eliminates the need for an external controller by bringing the computer inside the analyzer. Programs can be generated and edited by attaching a standard HP-HIL keyboard to the front of the mainframe. Key logging provides a quick and easy way to generate remote command equivalents of front panel key presses. Also incorporated into the HP 70004A mainframe is a memory card interface that can be used as a disk drive for the system. External disk drives are also supported over the HP-IB interface.

The HP 71500A provides extensive trace processing, including arithmetic and calculus math operations, complex formats, digital demodulation, FFTs, and more. This capability, combined with IBASIC's ability to generate custom user interfaces, multi-step procedures, and programmable control of other instruments, allows for completely customized measurements.



IBASIC programs allow generation of custom user interfaces.

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Pulsed-RF component test
For time domain measurements on components such as high power solid-state and traveling wave tube amplifiers and active RF switches, the microwave transition analyzer offers four ways of viewing pulsed-RF signals:

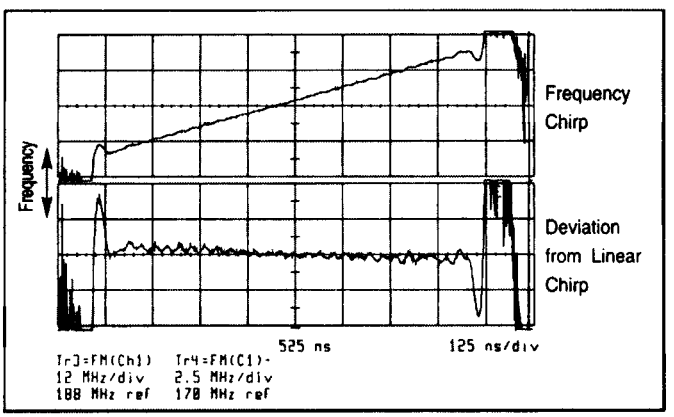
- Real format, an RF waveform display similar to that of an oscilloscope
- Magnitude format, an RF envelope display with linear scaling
- Log magnitude format, an RF envelope display with log scaling
- Phase format, a display of RF phase versus time within the pulse

The analyzer measures signals with pulse widths to 100 ps. Triggering on the pulse envelope stabilizes waveforms for making rise and fall time measurements. You can directly measure video feedthrough or the RF carrier, because the microwave transition analyzer can separate and remove the video feedthrough without external filters.

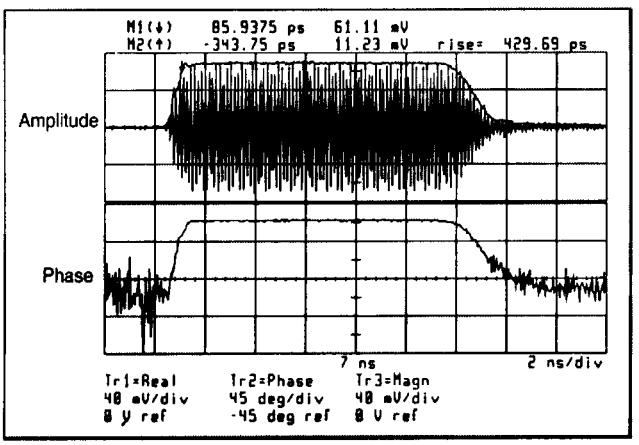
The HP 71500A's ability to control a synthesizer allows for stepped frequency and power sweeps. This allows measurements of gain, phase, group delay, and AM to PM conversion.

The HP 71500A also has the ability to tune to a frequency that is offset from or is a harmonic of the input frequency. This allows for measurement using frequency-translating devices, and for harmonic power sweeps.

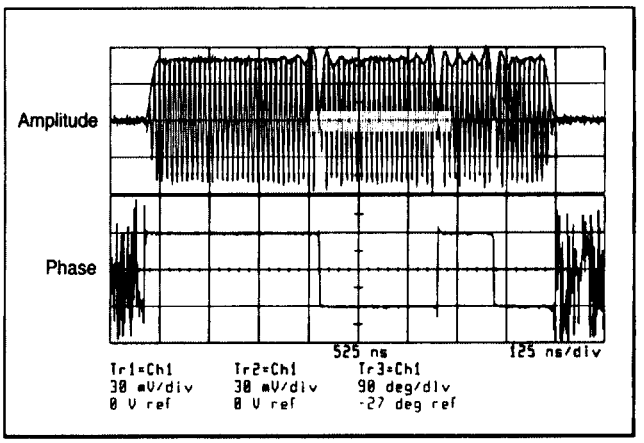
Radar test
You can test synthesized radar systems with measurements such as deviation from linear chirp and Barker code timing. The HP 71500A displays amplitude, phase, and frequency-versus-time for modulation rates to greater than 1 GHz. Maximum frequency deviation is equal to 500 divided by the time span in seconds.



Verify system chirp performance: **The lower trace uses math functions to show deviation from linear chirp. Deviation from parabolic chirp could also be defined and displayed.**



Measure fast pulses: **Magnitude and phase versus time of a 12 ns wide pulse of RF. A log magnitude display is also possible.**



Check Barker-code response: **Phase demodulation allows measurement of phase encoding within a pulse of RF. A Barker code is shown here.**

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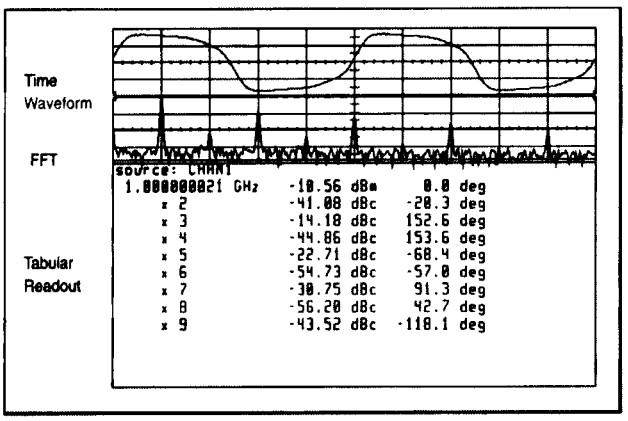
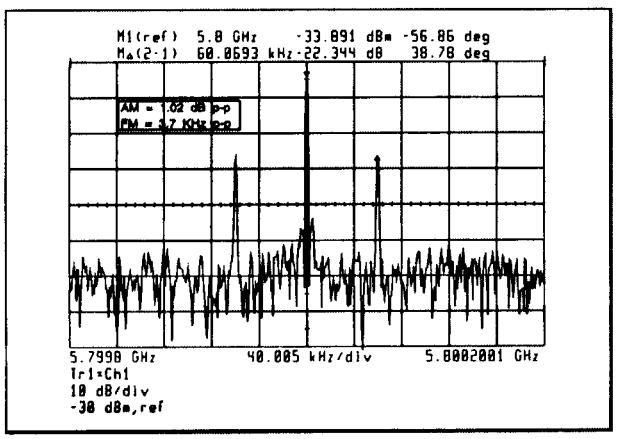
Satellite test
On frequency-translating devices such as satellite transponders, the HP 71500A can make several measurements, including group delay, AM to PM conversion, and gain/phase linearity versus drive level. No external mixers are needed, as would be required with a network analyzer.

Non-linear microwave analysis
Characterizing the non-linear behavior of high power devices and amplifiers is easy with the HP 71500A. With 40 GHz internal triggering, you can directly view non-linear effects in the time domain. A fast Fourier transform (FFT) display can simultaneously show the signal and its harmonics in the frequency domain. To aid in the development and verification of models for high power devices, the instrument can display results in tabular (numerical) format with both magnitude and phase of the harmonics. These results can then be used for or compared with CAE simulations.

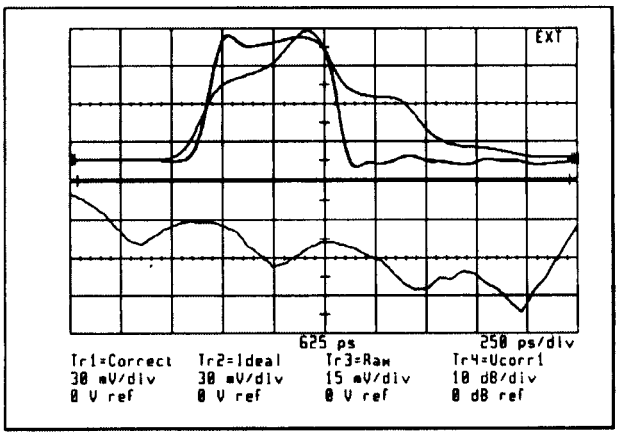
The HP 71500A also allows the user to enter corrections in the form of magnitude and phase versus frequency. This information can then be applied in the time domain, to correct for cable or fixture losses, for example.



Simultaneously display time and FFT: **Time and frequency domains fully characterize RF and microwave signal distortion. Tabular format allows easy comparison of results to CAE simulations.**



Measure AM, FM and PM: **Markers read amplitude and phase of modulation sidebands, allowing for computation of AM, FM, and PM components.**



Correct for cable losses: **Top half shows reference and corrected traces, which are virtually indistinguishable, as well as the wider, uncorrected pulse. Bottom trace shows the user corrections in the frequency domain.**

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Ordering Information

HP 71500A microwave transition analyzer system
Includes
- **HP 70004A** color display and mainframe
- **HP 70820A** microwave transition analyzer module, dc–40 GHz
- Adapter and cable accessories
- External power pack
- 1 meter HP-IB cable accessories (HP P/N 8120-3445)
- User manual sets for the HP 70004A and the HP 70820A

Synthesized source must be ordered separately.

Options available for the HP 71500A

001 delete adapter and cable accessories
002 delete external power pack (HP P/N 70310-60016)
External power pack supplies power to the HP 70820A's frequency reference oven when MMS mainframe power is turned off
003 add tutorial kit
Includes tutorial and demonstration parts for a self-paced class on the operation and capabilities of the HP 71500A/HP 70820A
810 add rackmount slide kit (HP P/N 5062-7086)
908 add rack flange kit
For mounting mainframes without handles (HP P/N 5062-3979)
910 add extra set of user manuals
913 add rack flange kit
For mounting mainframes with handles attached (HP P/N 5062-4073)
915 add service manuals
Includes assembly level service manual and component level information for the HP 70820A and HP 70004A

HP 70820A microwave transition analyzer module
Includes
- **HP 70820A** module
- Adapter and cable accessories
- **HP 70820A** user manual set
- **Option W30** two additional years of return-to-HP warranty (3 years total)
- **Option W50** Five year customer return repair coverage

Additional information
Color brochure, part number 5091-0791E

Product notes
A Versatile Measurement Set for Bench and Test (70820-1), product number 5952-2543E
Measure 25 ps Transitions in Switched and Pulsed Microwave Component Testing (70820-2), part number 5952-2546E
Picosecond Delta Time Accuracy (70820-3), part number 5952-2545E

Technical data sheet
Specifications and complete ordering information, part number 5091-0792E