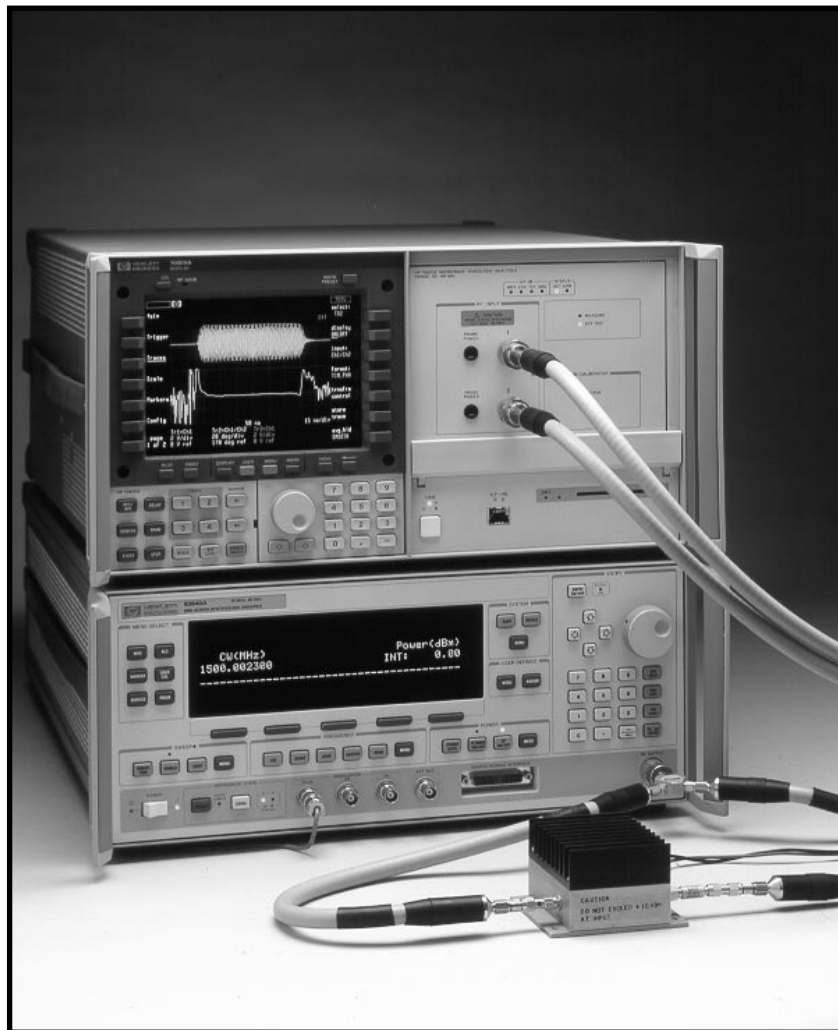


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# HP 71500A

## Microwave Transition Analyzer



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**Non-linear component testing**  
dc to 40 GHz  
Two channels

***Measurements***

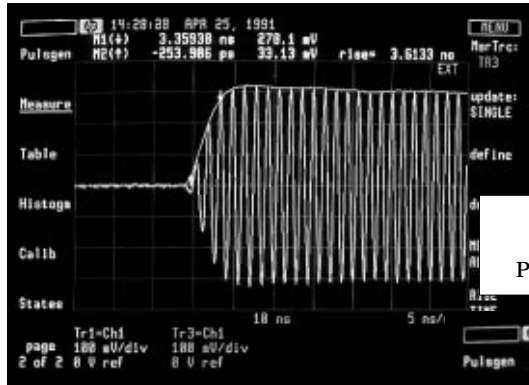
Phase settling  
Rise/fall times  
On/off ratios  
Delay  
Switching time  
Peak/average power  
Group delay

***Performance***

1 ps  $\Delta t$  accuracy  
Trigger to 40 GHz  
10 ps rise time

*The HP 72500A combines the HP 70820A microwave transition analyzer module and the HP 70004A color display and mainframe. Performance is optimized using a synthesized source.*

# Measure Magnitude and Phase of Microwave Components in the Time Domain



## View microwave pulses in four formats:

- Real -- RF displayed similar to an oscilloscope
- Magnitude -- RF envelope shown with linear scaling
- Log magnitude -- RF envelope show with log scaling
- Phase -- RF phase displayed versus time in the pulse

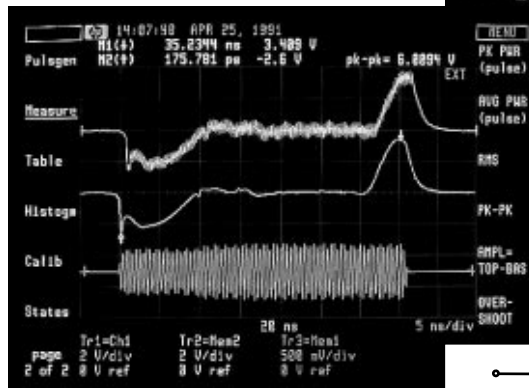


Pulsed Amps

Traces shown with real and magnitude formats vs. time.

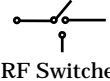


TWT's



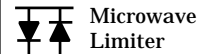
Traces shown are RF plus video feedthrough, video feedthrough only, and RF only (rescaled).

RF Switches



## Remove and separate video feedthrough without external filters

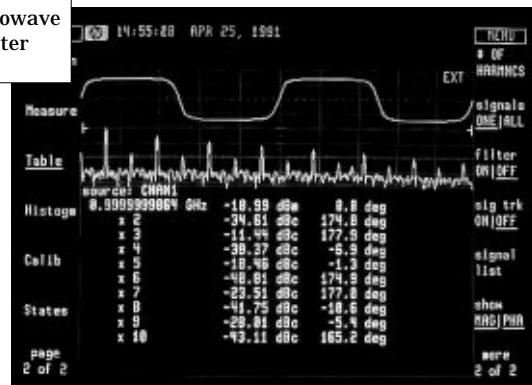
- Measure video feedthrough directly
- Measure RF carrier directly



Microwave Limiter

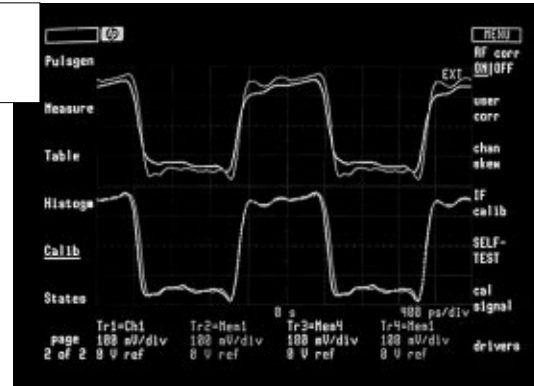
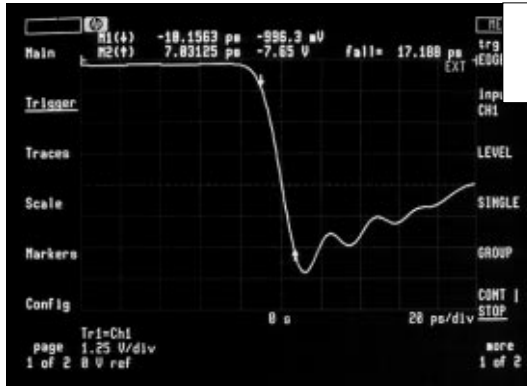
**FFT:** Provides the bridge from the time domain to the frequency domain

- Display frequency, magnitude, and phase simultaneously
- Display fundamental and harmonics to 40 GHz (repetitive) -- results in waveform and tabular formats
- Compare to CAE simulations



Traces shown are magnitude vs. time, FFT display, and harmonic table (includes phase).

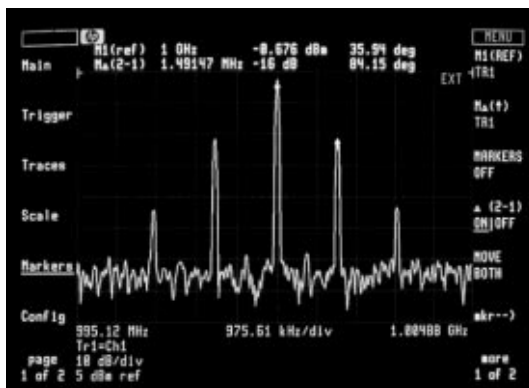
# Measure Semiconductor Devices



Measure a 17 ps fall time.

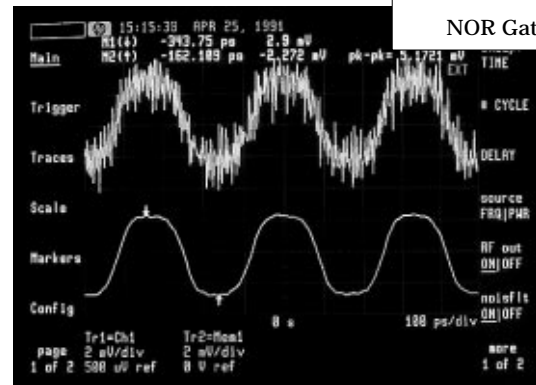
## Time domain features for high-frequency design

- 1 ps  $\Delta t$  accuracy
- Noise filtering, faster than averaging
- 10 ps rise time
- Negative time without delay lines
- Trigger to 40 GHz without external hardware
- Phase triggering for low-level signals



Measure phase of sidebands;  
determine whether AM or FM.

Correct for cable losses: Top trace compares to reference without corrections; bottom trace shows corrections.

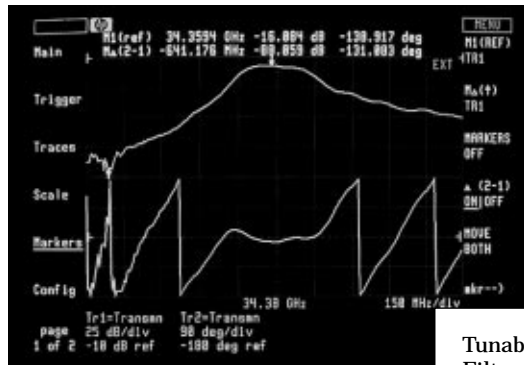


Noise filter removes noise signals faster than averaging.

## FFT: provides phase information for narrowband modulation analysis

- 10 MHz frequency spans
- 10 MHz single-shot bandwidth
- Unpreselected

# Measure Magnitude and Phase of Microwave Components in the Frequency Domain



Traces shown are 34 GHz filter transmission measurement, magnitude and phase vs. frequency.

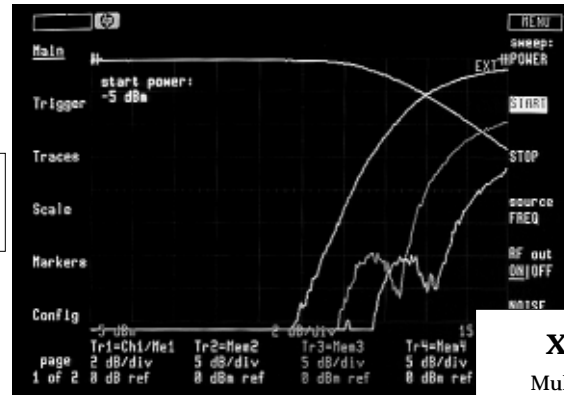
Tunable Filter

## Swept harmonic responses of multiplier

- View n harmonics to 40 GHz
- Normalized gain compression
- AM to PM conversion in TWT's

## CW or pulsed network analysis

- 100 ps wide pulses
- Resolution: 0.1 dB and 1 degree at 8 GHz

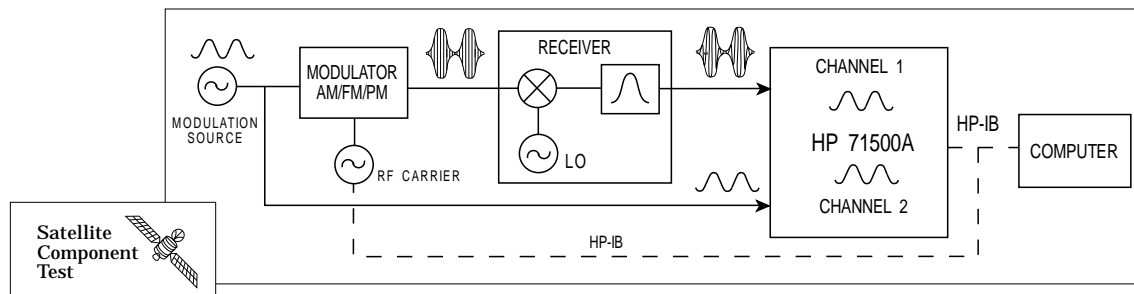


$\times N$   
Multiplier

$P_{out}$  vs.  $P_{in}$  display. Traces show are normalized gain compression of fundamental and 3rd, 5th, and 7th harmonics.

## Measure group delay of receivers

- Similar to microwave link analyzer
- Measure delay from baseband modulation (AM, FM, PM) waveform



## Display intrapulse parameters in the time domain

- Amplitude, phase, and frequency vs. time
- Modulation rates to > 1 GHz
- Max. frequency deviation

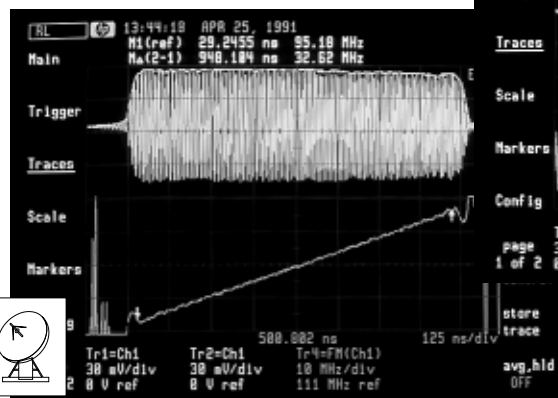
$$= \frac{500}{\text{time span(sec)}}$$

- Ideal for verifying signal simulators and synthesized radar systems

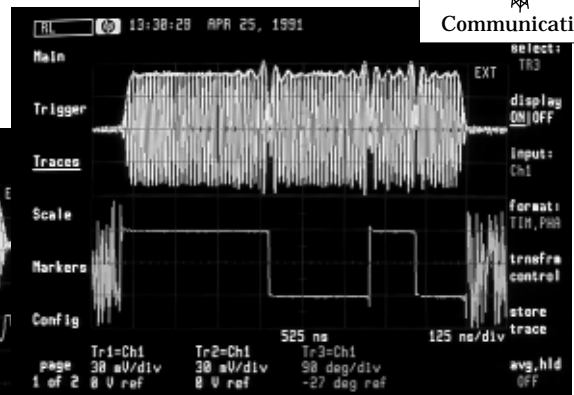
Radar Component Test



Linear chirp (frequency vs. time).



Phase modulation (phase vs. time).



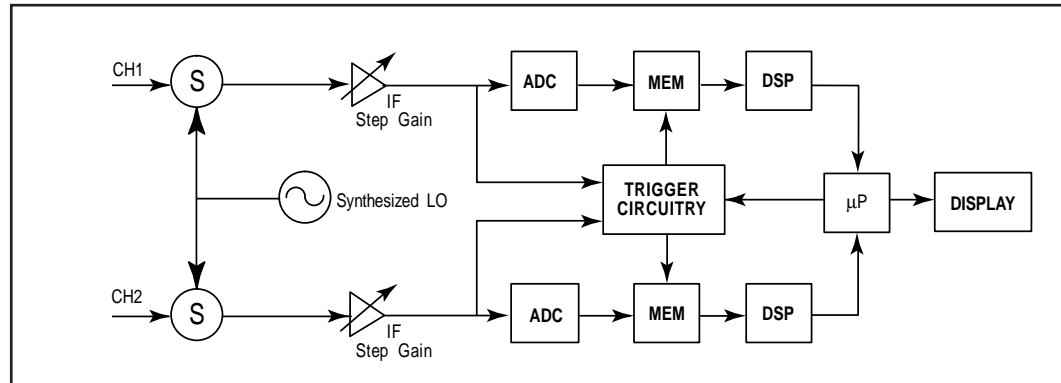
Communications

## The HP 71500A Measures...

### Fast magnitude and phase transitions.

The HP 71500A microwave transition analyzer is a two-channel, dc to 40 GHz, sampler-based instrument that makes CW and pulsed-RF measurements, specializing in fast transitions.

One digital signal processing (DSP) chip per channel demodulates the signal and performs extensive waveform math.

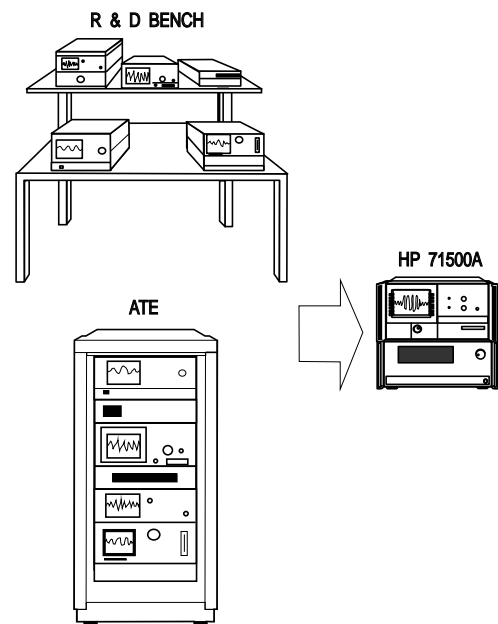


Block diagram of HP 71500A

### Downsized solution for R&D and ATE

HP took the compact format of the modular measurement system (MMS) and integrated the measurement functionality from many instruments, including the oscilloscope, vector network analyzer, peak power meter, spectrum analyzer, and more. By incorporating many functions of dedicated test equipment, the HP 71500A provides a one-box solution — increasing the space on your R&D bench, as well as meeting today's requirements for downsized ATE stations.

The HP 71500A won't replace these instruments all the time. You may still require the 12-term error correction, Smith chart, speed, and s-parameter test set of a vector network analyzer; the four channels of an oscilloscope; or the preselection, wide-span, and dynamic range of a spectrum analyzer. But day to day, the HP 71500A provides unique capabilities along with traditional measurements that you'll want to evaluate.



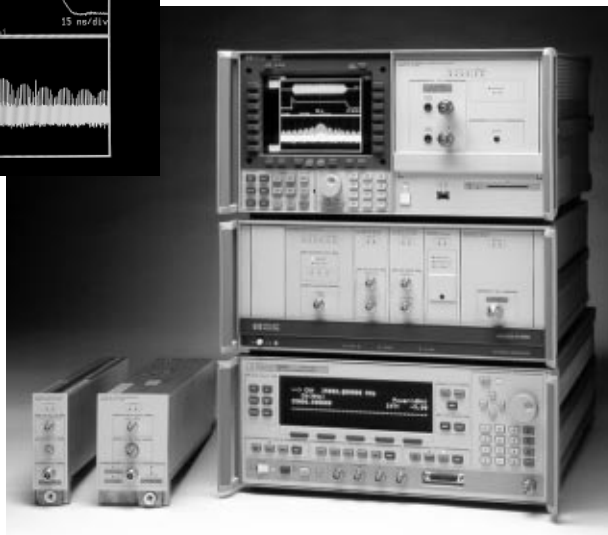
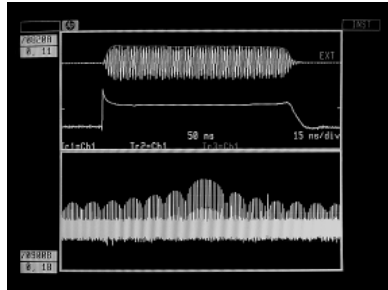
Capability for the bench; versatility for ATE systems.

## Combine the HP 71500A with Other Modular Products



When your measurements require multiple instruments, you save rack and bench space by sharing common functions such as displays, cooling, and power supplies in the HP 70000 modular measurement system.

Shown here is an MMS system with HP 71500A traces in the upper display window and a microwave spectrum analyzer trace in the lower window.



**For more information about Hewlett-Packard test and measurement products, applications, services, and for a current sales office listing, visit our web site, <http://www.hp.com/go/tmdir>. You can also contact one of the following centers and ask for a test and measurement sales representative.**

### United States:

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Test and Measurement Call Center  
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Englewood, CO 80155-4026  
1 800 452 4844

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Measurement Assistance Center  
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Hong Kong  
Tel: (852) 2599 7777  
Fax: (852) 2506 9285

## Related Literature:

### Technical Data Sheet

Specifications and ordering information

Lit# 5091-0792E

### MMS Catalog

Modular Measurement System Catalog

Details on the complete HP 70000 product line

Lit# 5965-2818E

**Data Subject to Change**

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