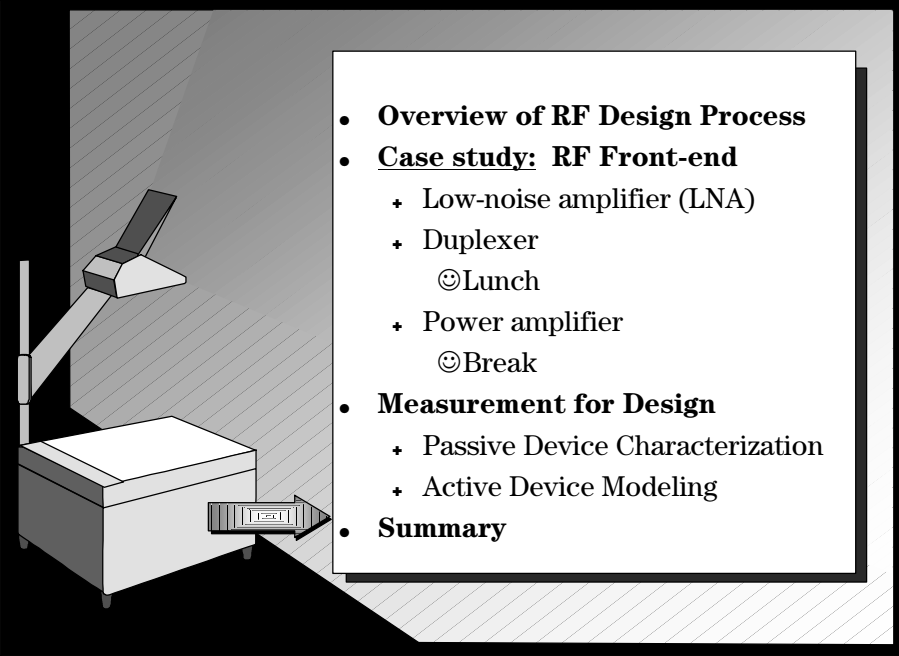RF Design and Measurement Seminar
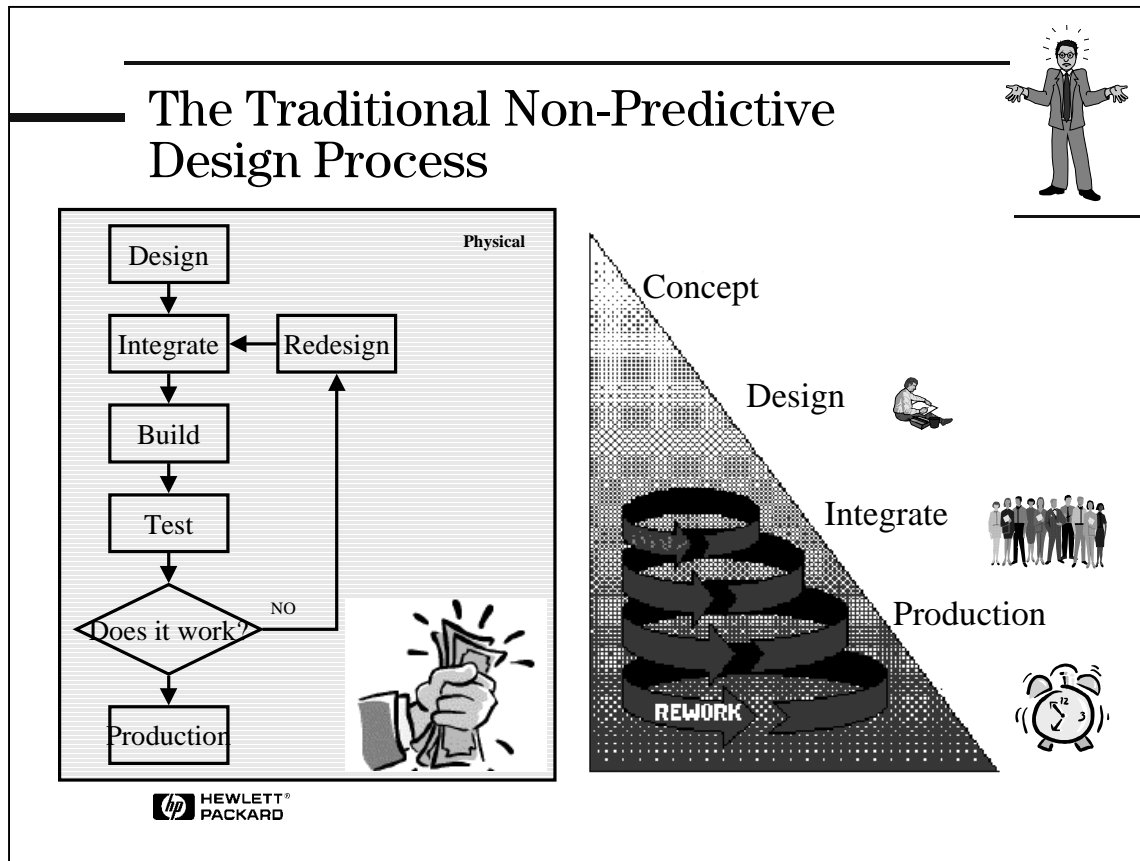
Slide #163

Agenda

- **Overview of RF Design Process**
- **Case study: RF Front-end**
  - Low-noise amplifier (LNA)
  - Duplexer
    - ☺Lunch
  - Power amplifier
    - ☺Break
- **Measurement for Design**
  - Passive Device Characterization
  - Active Device Modeling
- **Summary**

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Slide #164

The Traditional Non-Predictive Design Process

Physical

Design → Integrate ← Redesign → Build → Test → Does it work? → Production

NO

Concept

Design

Integrate

Production

REWORK
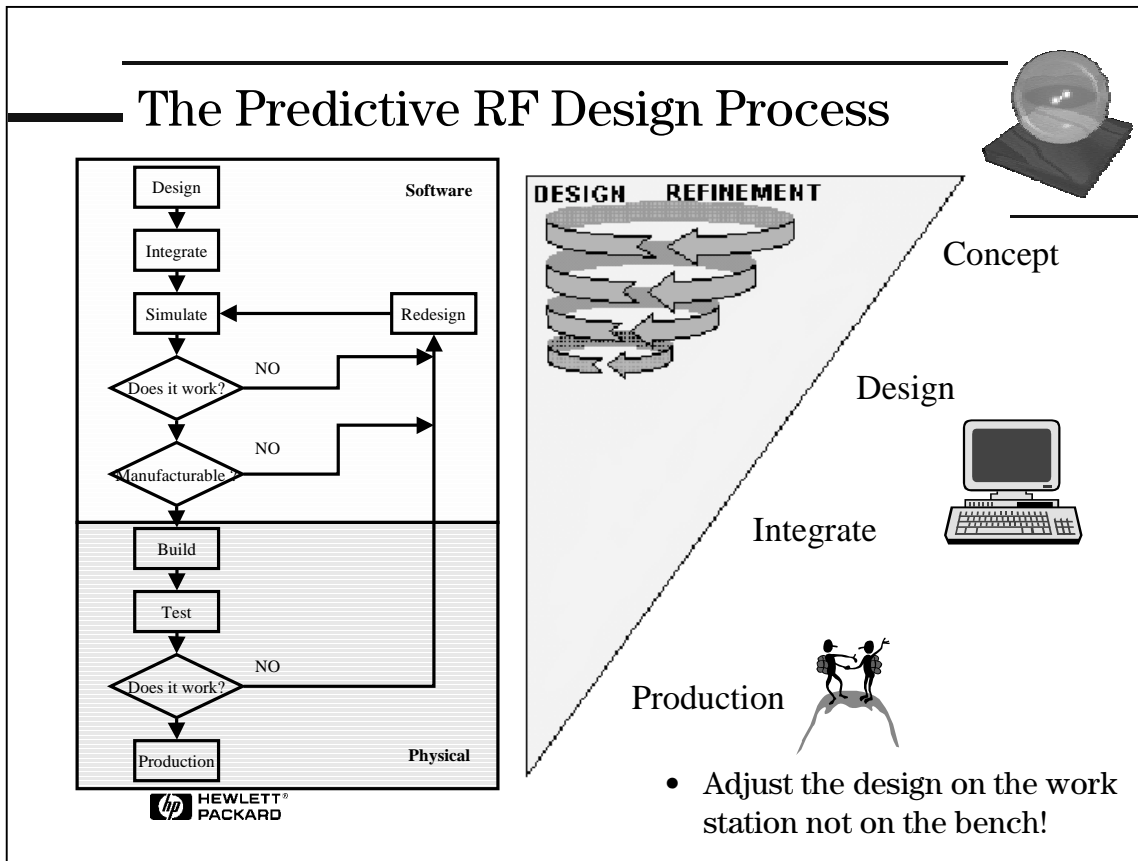
We started the day discussing the traditional design process. The problem is that this process is non-predictive. You hope that your design works, but in case it doesn't you run multiple physical prototype boards varying some of the components hoping that one works.

Slide #165

The Predictive RF Design Process

Design — Software

Integrate

Simulate ← Redesign

Does it work? — NO

Manufacturable? — NO

Build

Test

Does it work? — NO

Production — Physical

DESIGN   REFINEMENT

Concept

Design

Integrate

Production

- Adjust the design on the work station not on the bench!
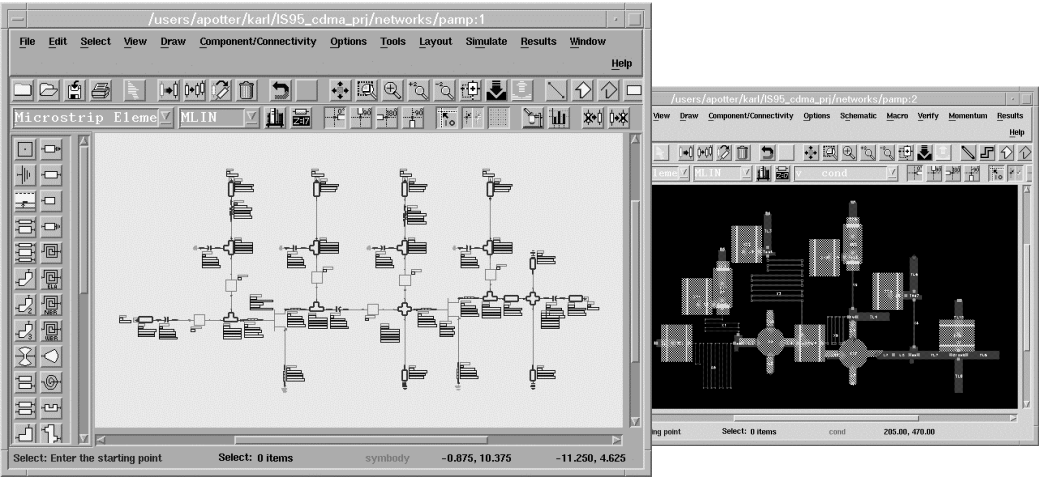
Next we introduced a new process that uses EDA software to refine the design early in the development process.

Slide #166

Modern Predictive RF Design is made possible with the HP Advanced Design System. System level, circuit level, simulation and layout are all provided in an integrated environment and much more.

Slide #167

Concept: System-Level Design
(Simple PCS-band transceiver front end)

Power Amp

Freq. = 1880 MHz +/- 50 MHz min.
Pout (1 dB) = +27 dBm min
Psat = +30 dBm min
Gain = 25 dB min

1.9 GHz

Duplexer

Freq. lower band = 1880 MHz +/- 30 MHz
Freq. upper band = 1960 MHz +/- 30 MHz

LNA

Freq. = 1960 MHz +/- 50 MHz min.
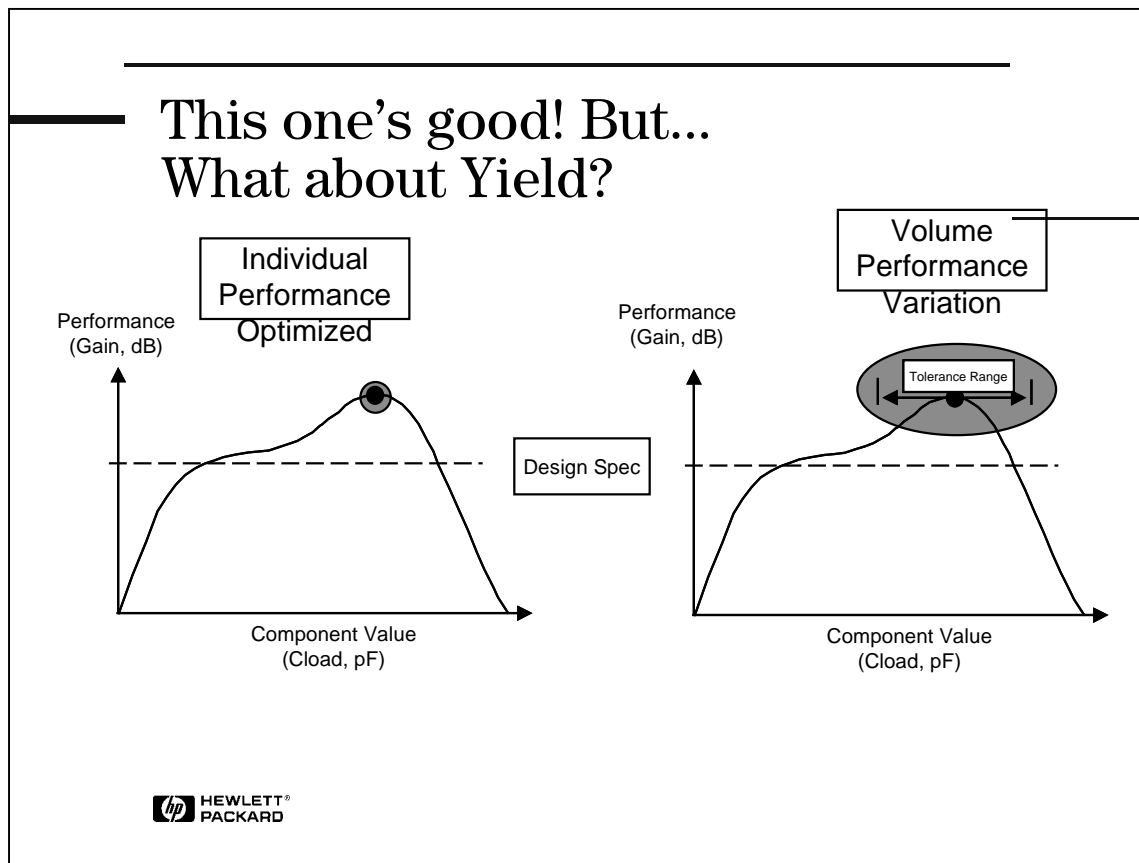Gain = 25 dB min
NF < 3 dB

The first part of the case study will focus on the LNA

The first case study focused on an LNA design.

Slide #168

This one's good! But...
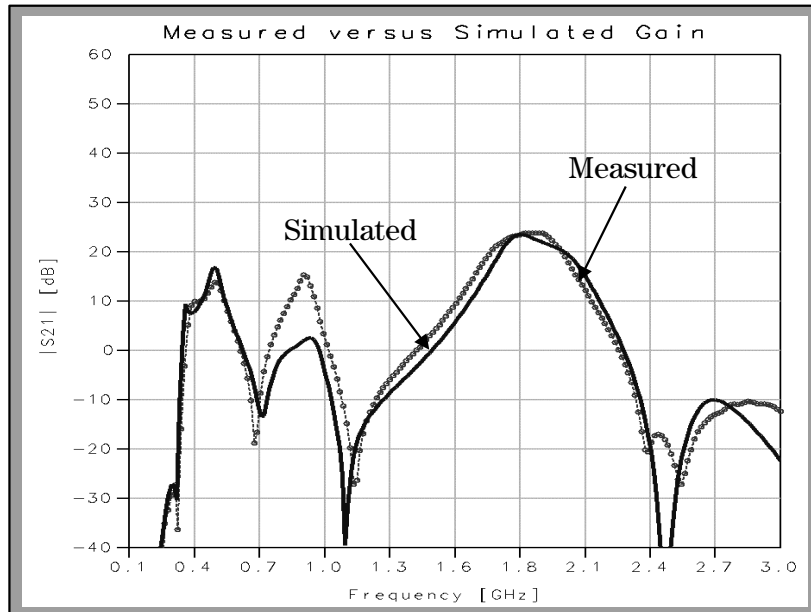What about Yield?

We then looked at the effects of component tolerances.

RF Design and Measurement Seminar

Slide #169

Working Power Amplifier !!!

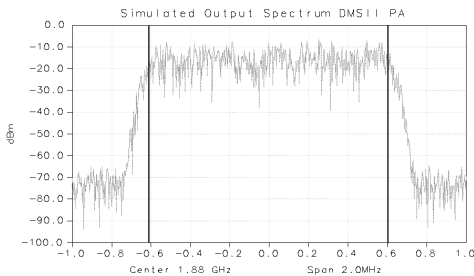The second case study covered the design of a power amplifier.

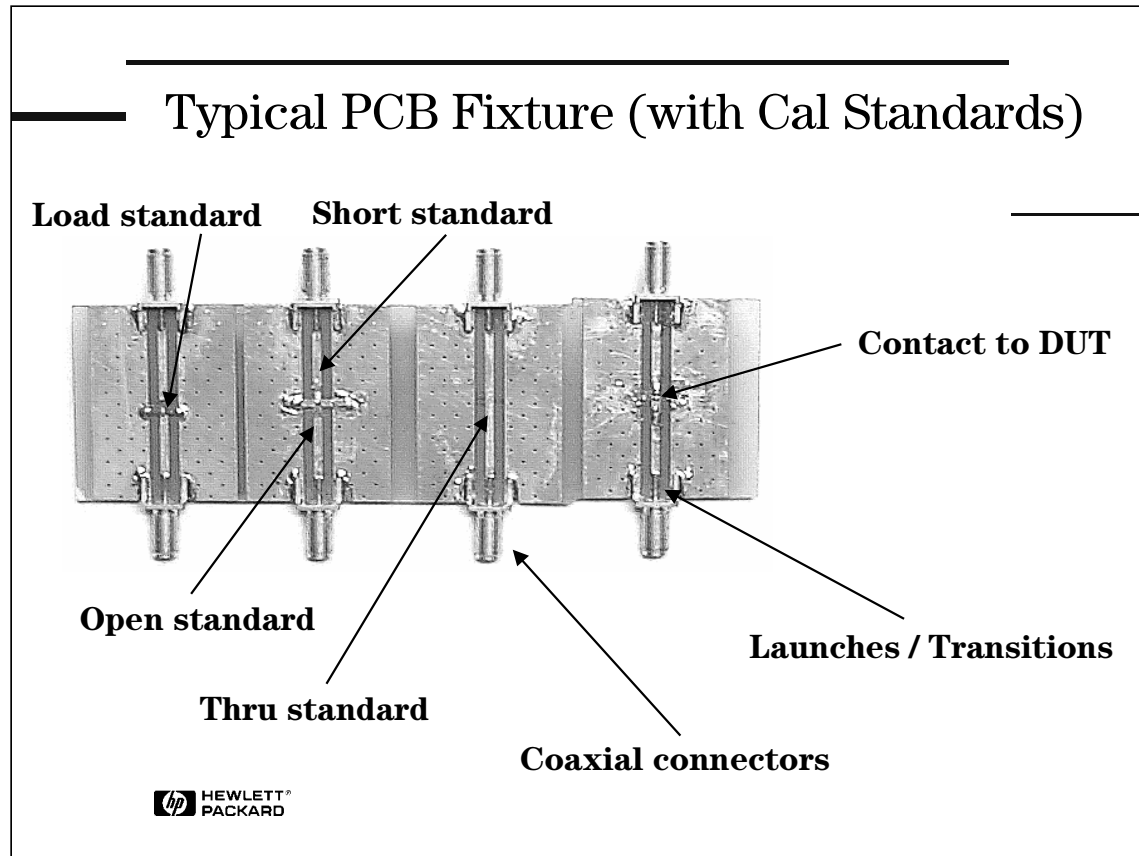**Slide #170**
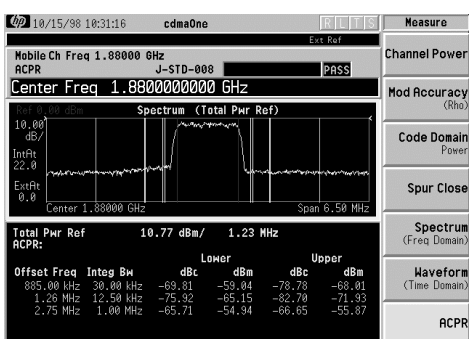
We simulated and measured the amplifier performance using digital modulation.

RF Design and Measurement Seminar

Slide #171

Typical PCB Fixture (with Cal Standards)

Load standard   Short standard

Contact to DUT

Open standard

Launches / Transitions
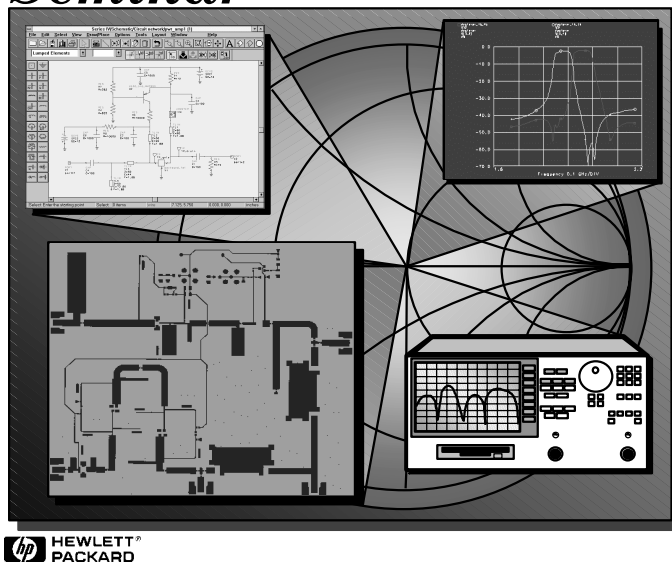
Thru standard

Coaxial connectors

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The final section covered fixturing and calibration issues which arise when characterizing devices.

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Slide #172

Thank You for Attending - HP RF Design and Measurement Seminar

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