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Utilizing Off-the-Shelf Parts for the Next Generation of Space Exploration

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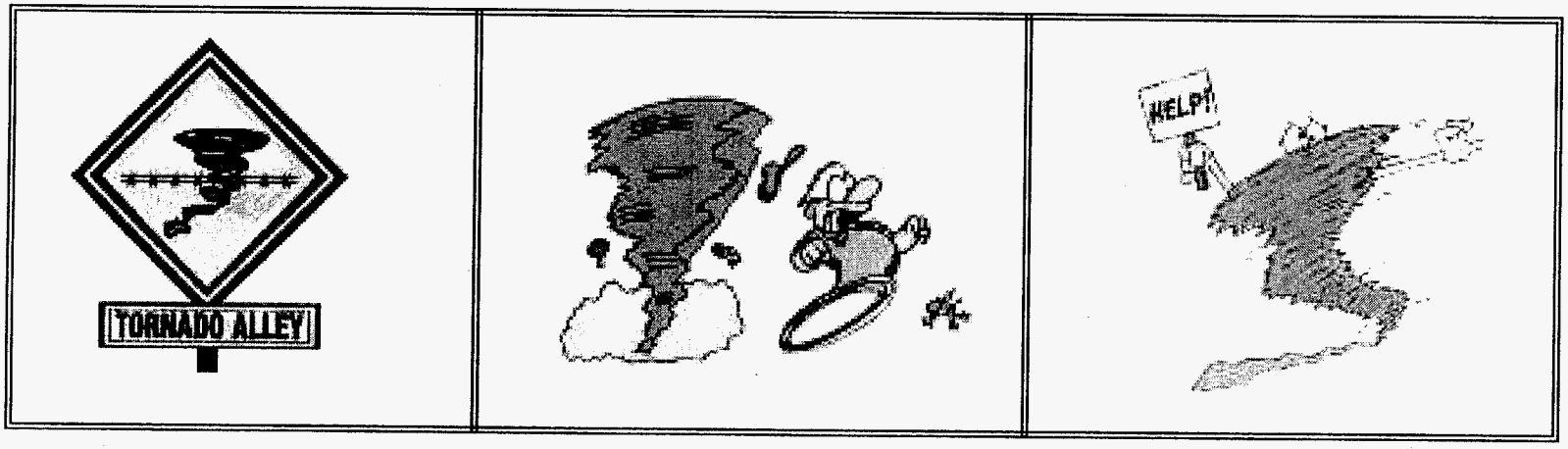
Why is Predicting the Weather Important?

- Early warning can potentially save lives and property



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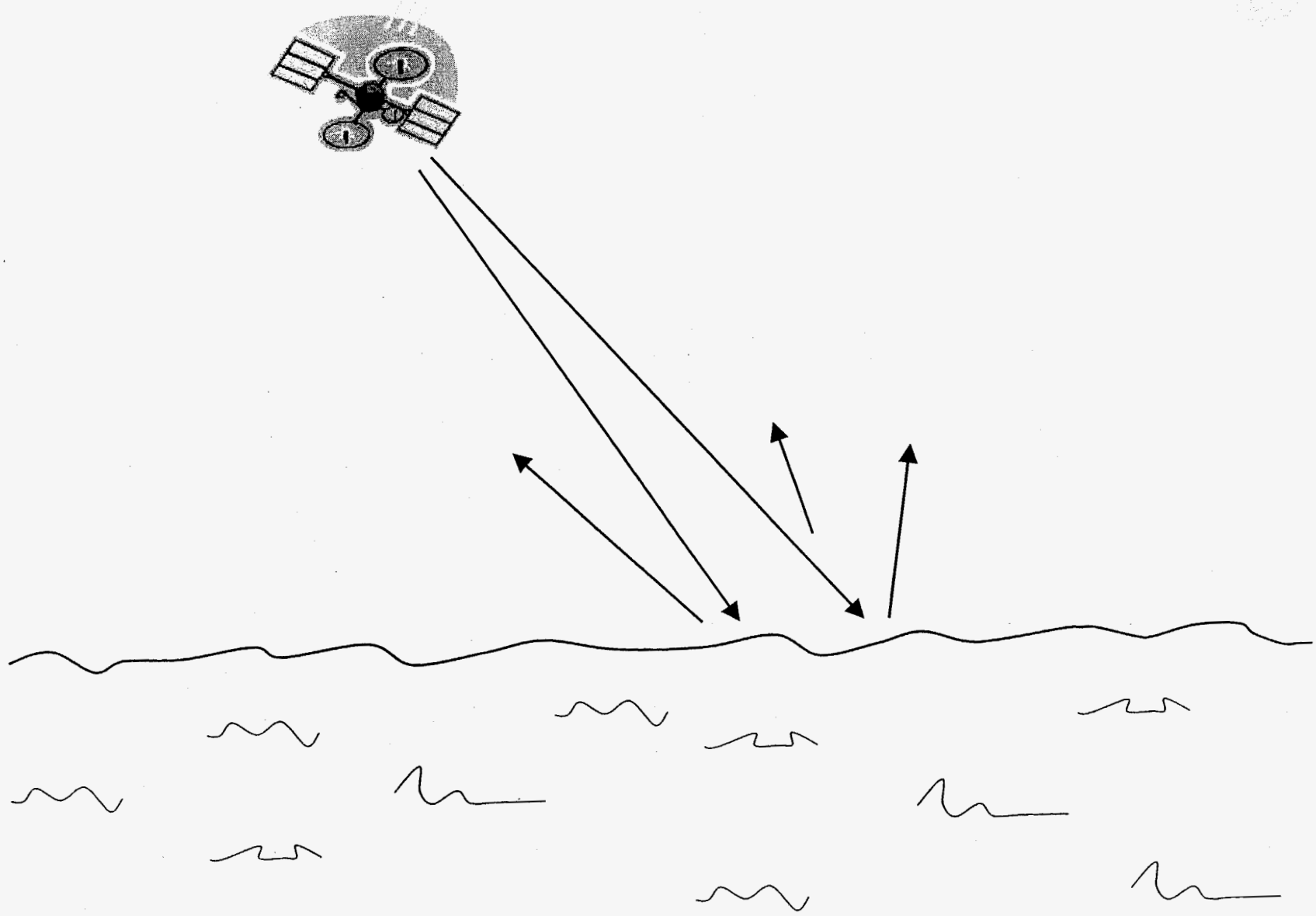
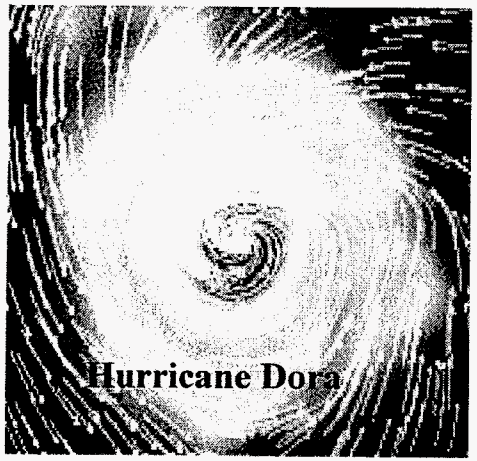
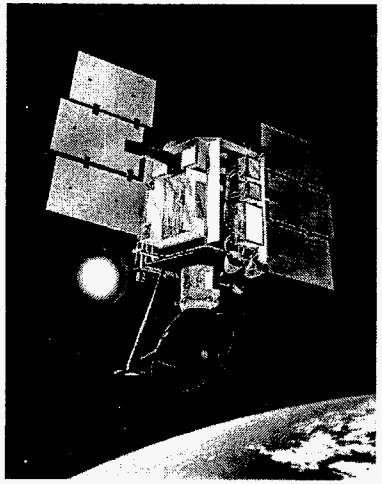
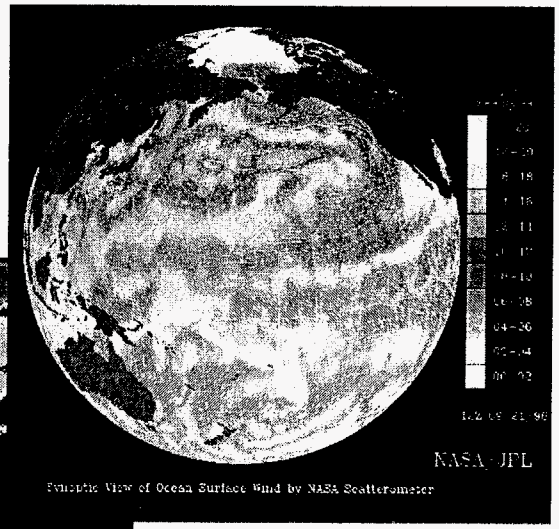


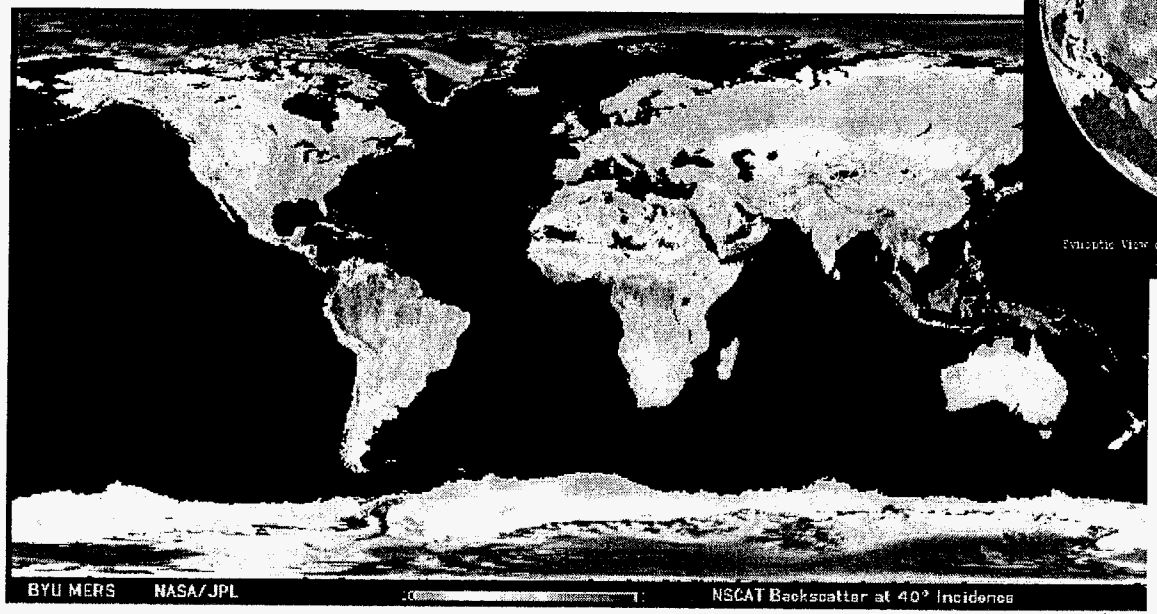
SeaWinds Scatterometer



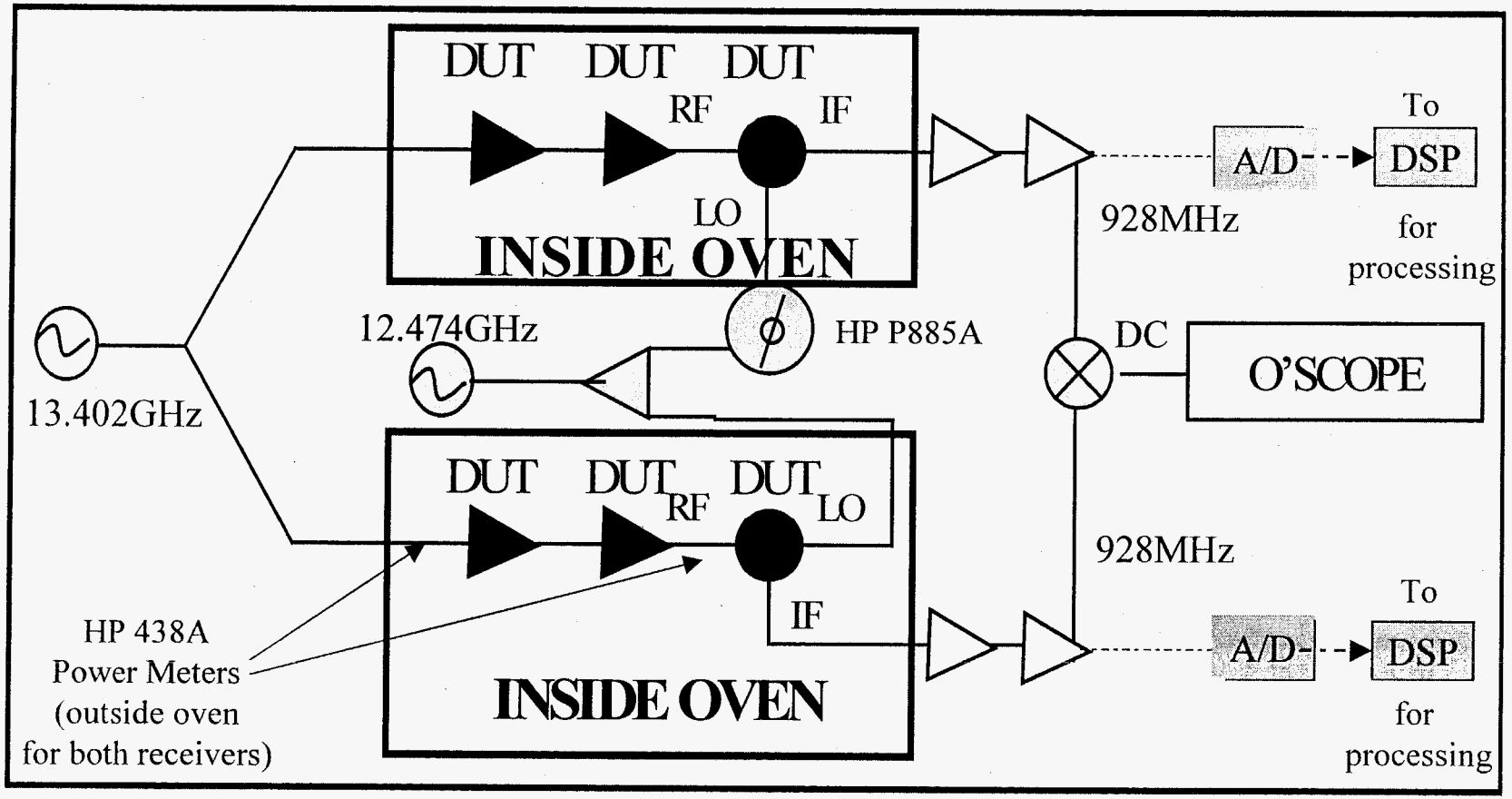
13.402 GHz
1.5 ms pulses
375 kHz chirp
110 Watts
803km orbit







Block Diagram of RF Front-End Test



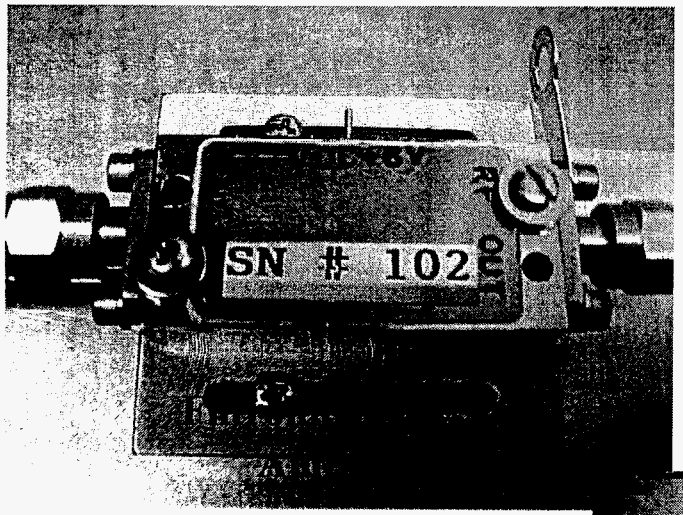
Requirements Vs Results

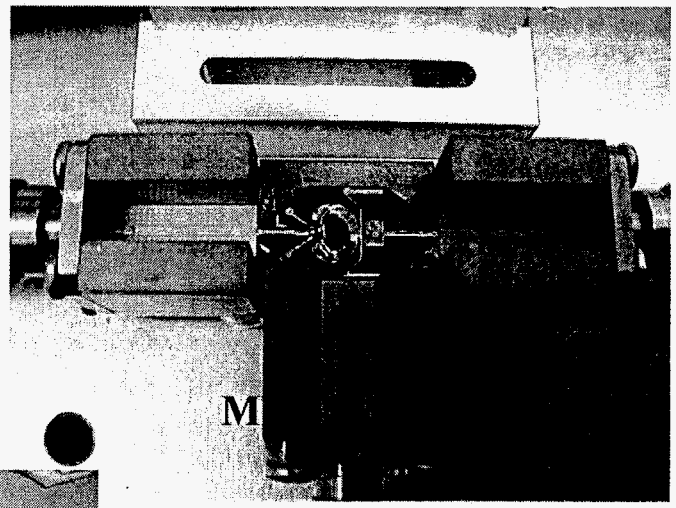
	System Requirements	Experimental Results
Frequency	13.402GHz	13.402GHz
▲ **Phase**	10 degrees	<4 degrees
▲ **Gain**	4dB	< 0.25dB
Power	40dB	30dB
Noise Figure	< 3dB	2.7dB

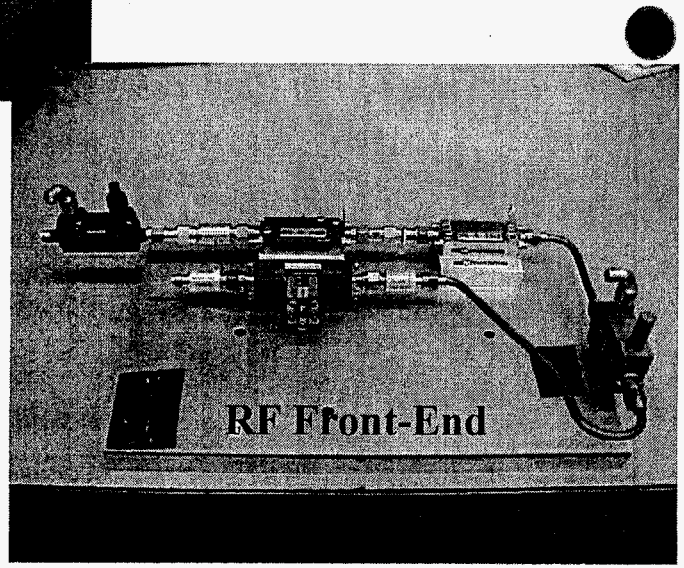
▲ = Difference between the two receiver strings.

Part Selection

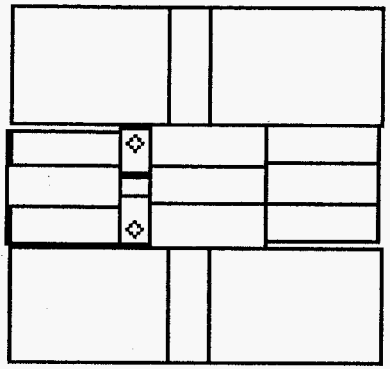
Size
Frequency
Gain
Noise Figure
Ease-of-Use
Power Consumption
Reliability

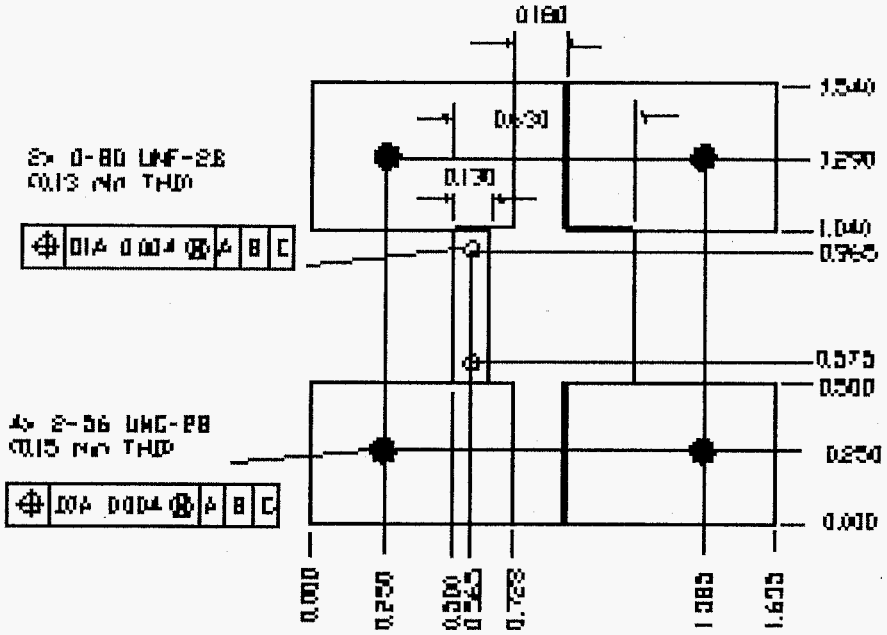


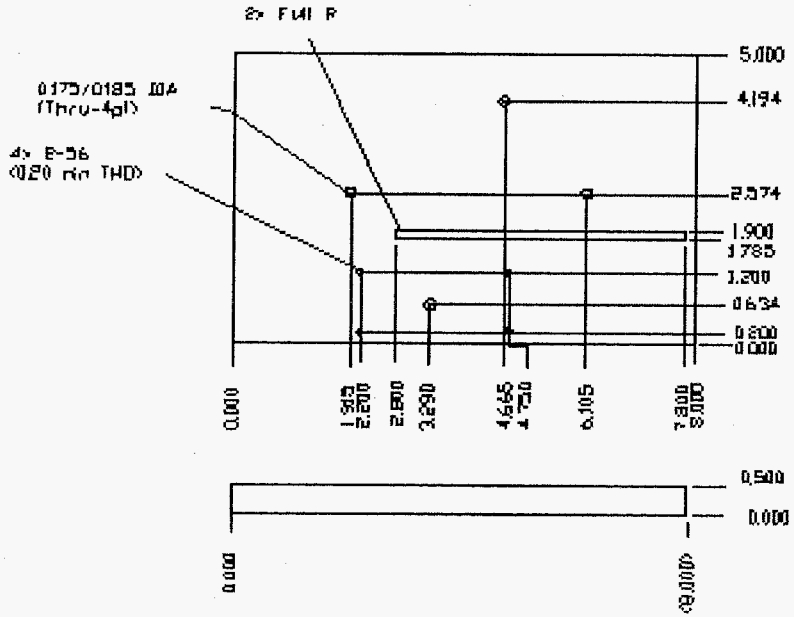




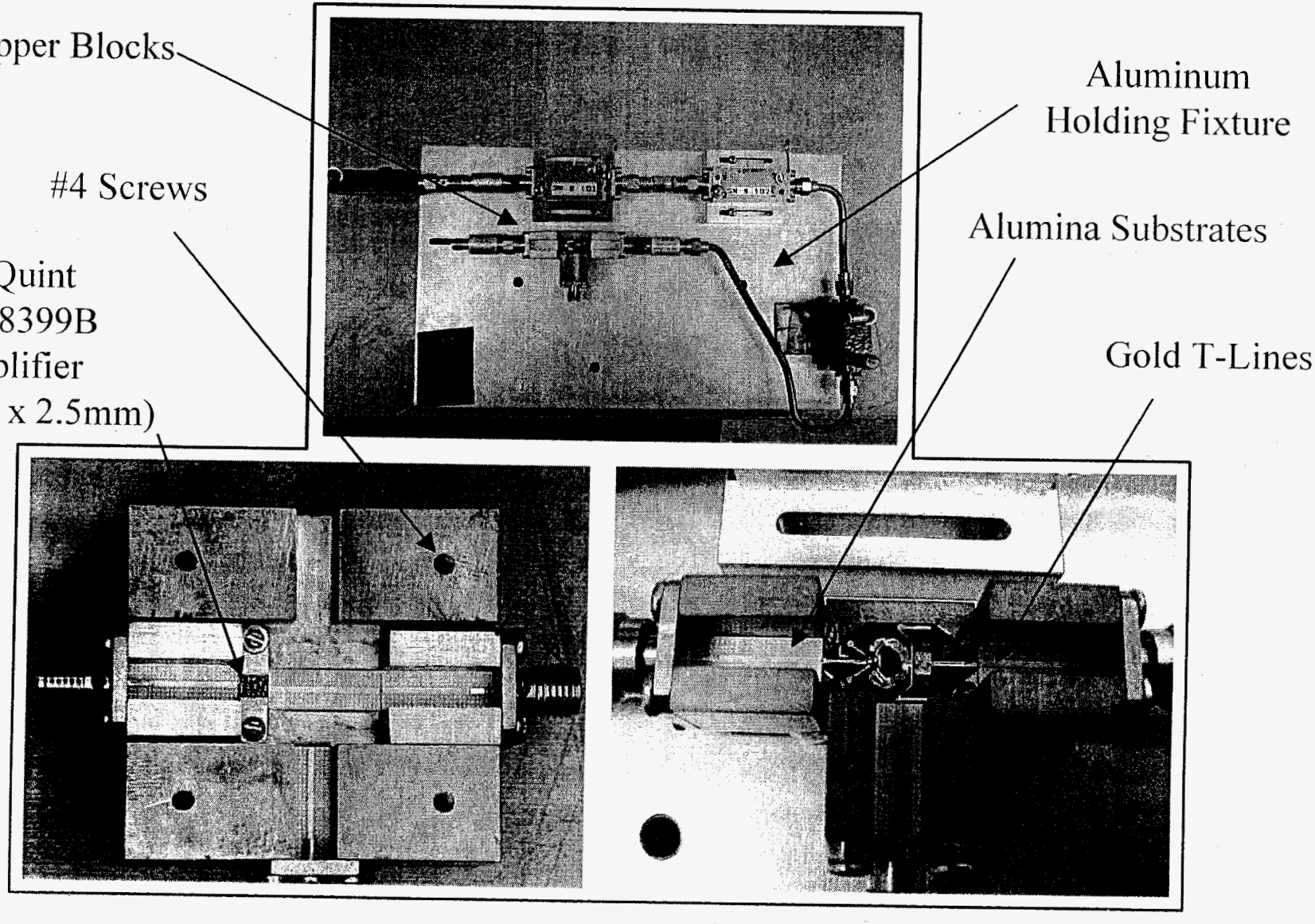
Test Fixture Design



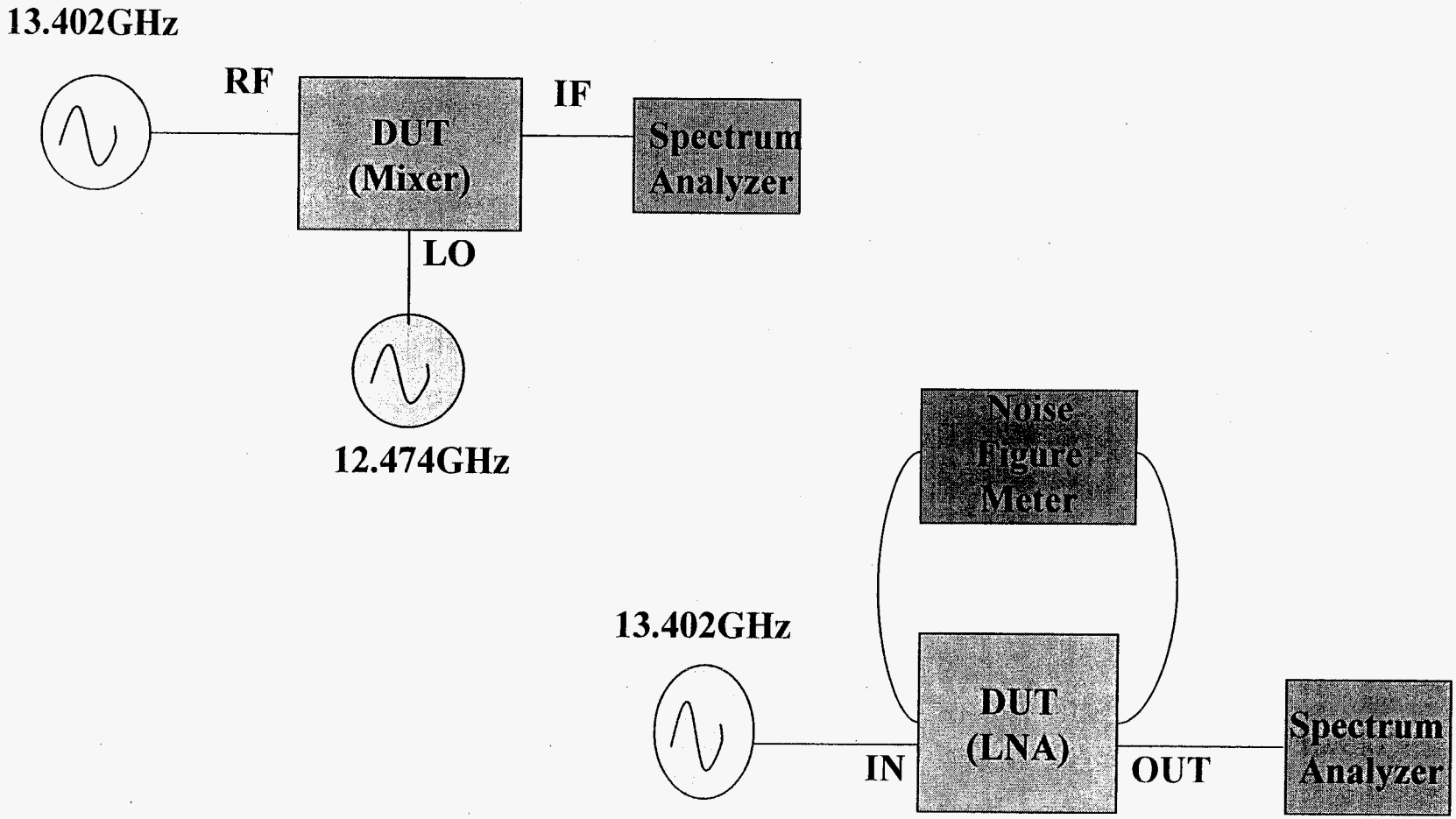




Test Fixtures



Basic Functionality Tests



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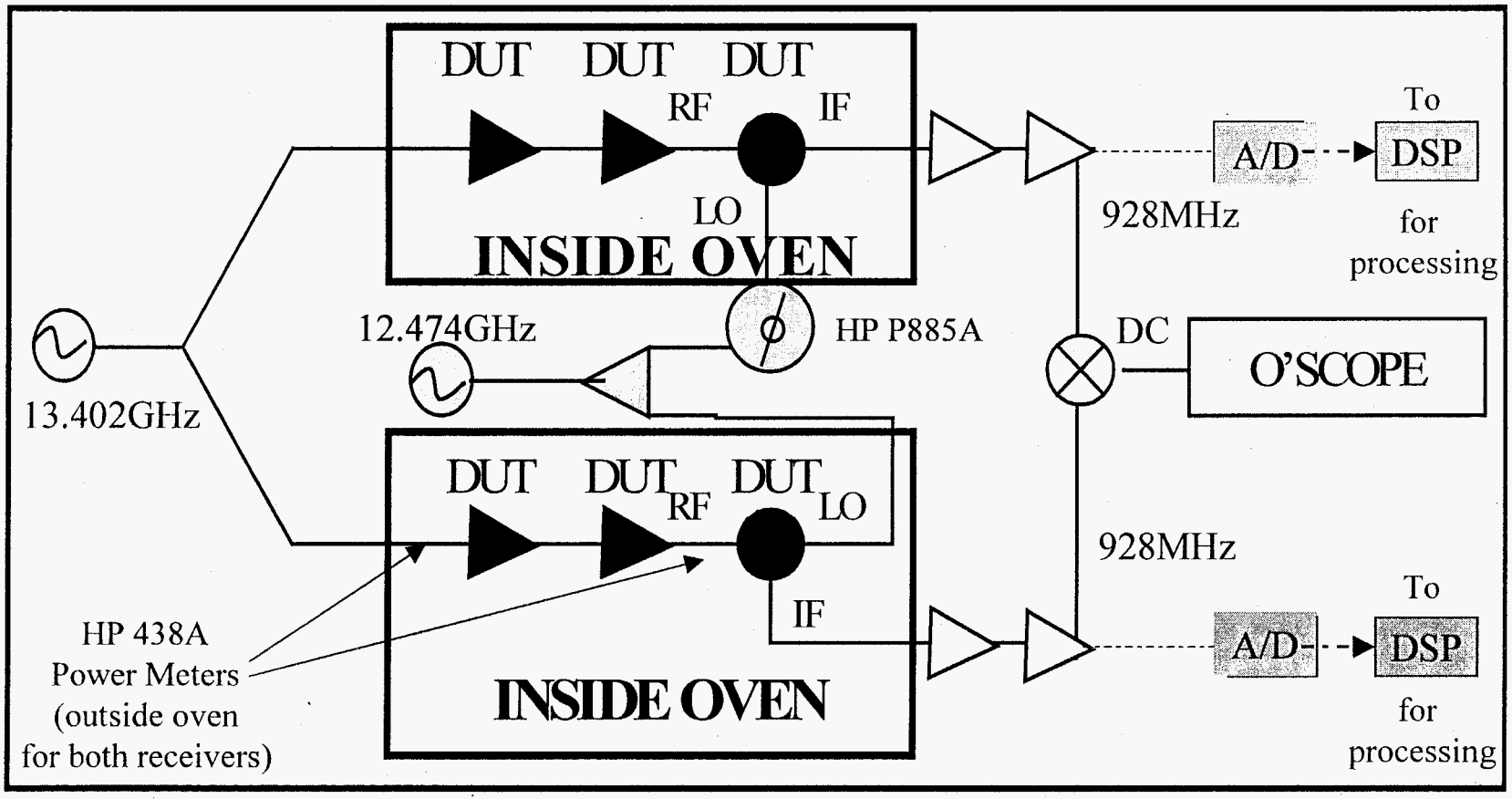

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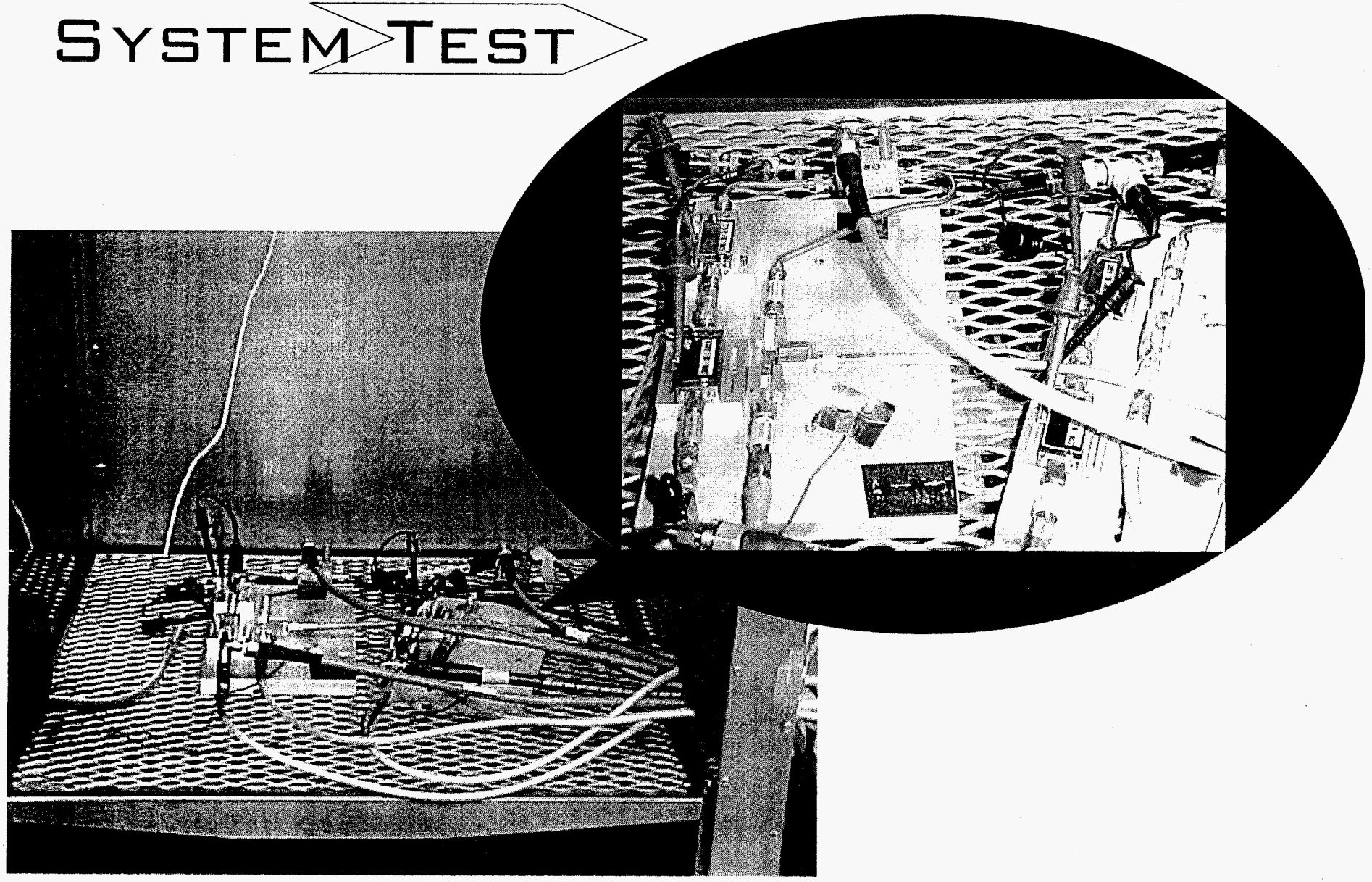
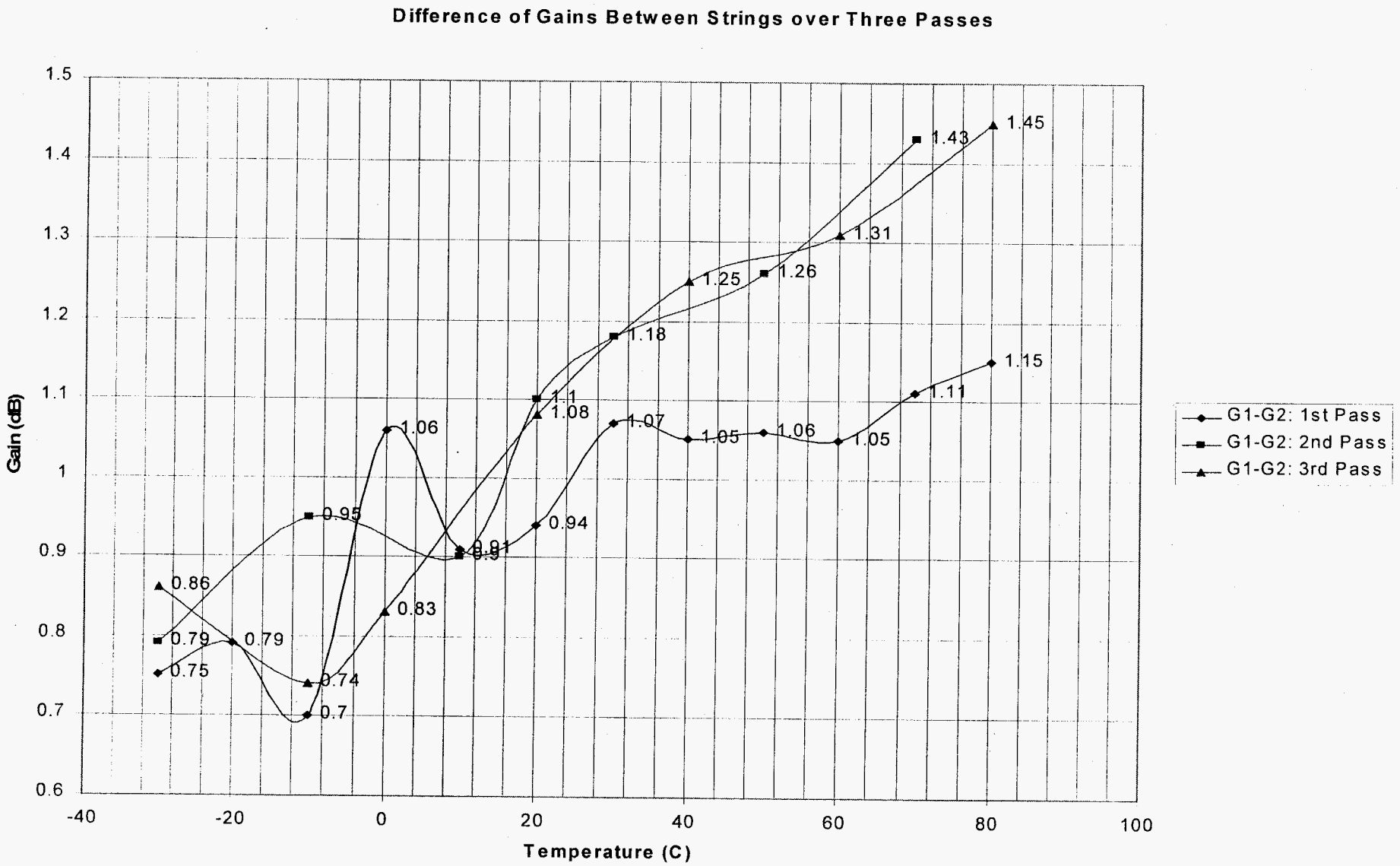
System Test



Measured Gain



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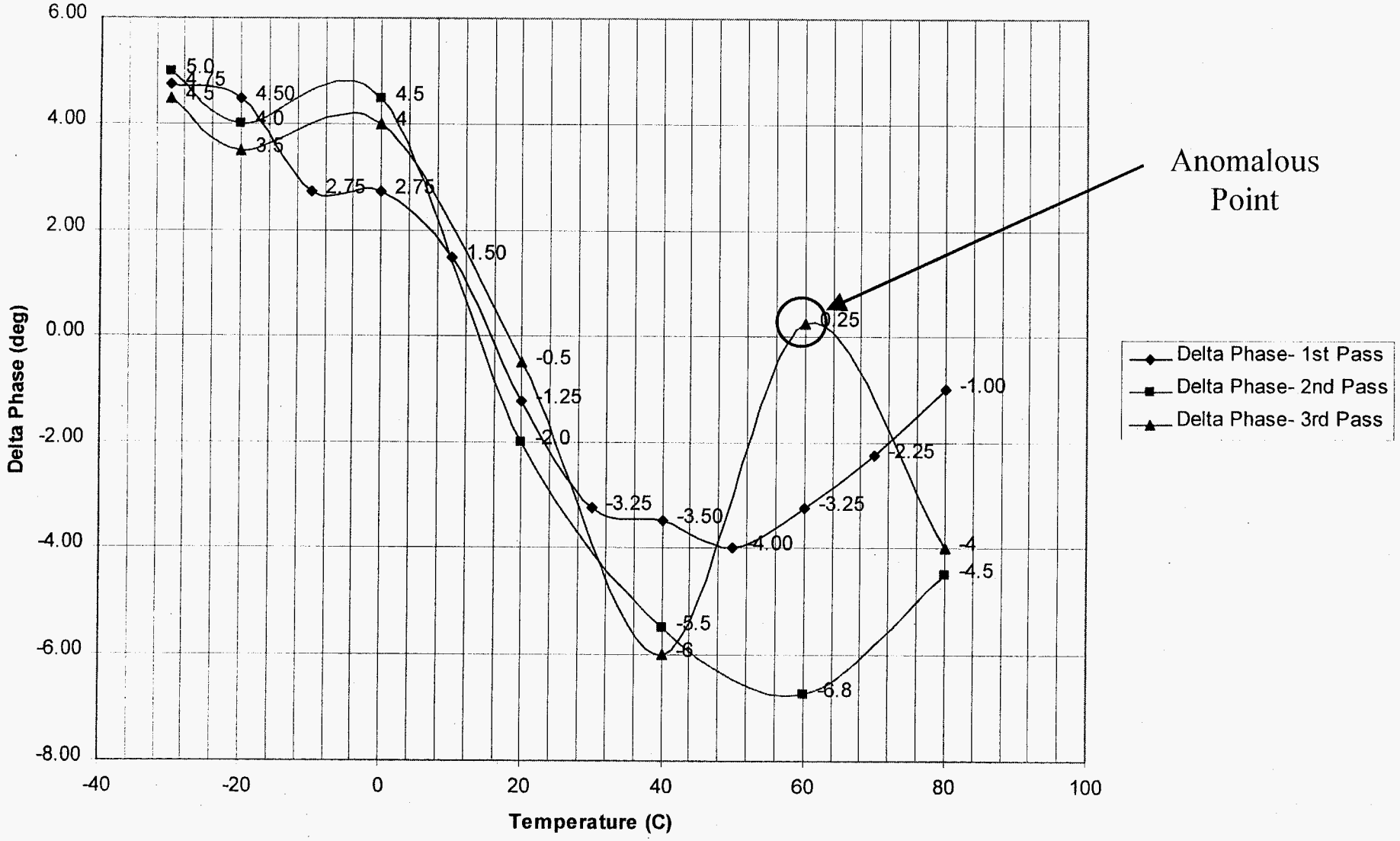
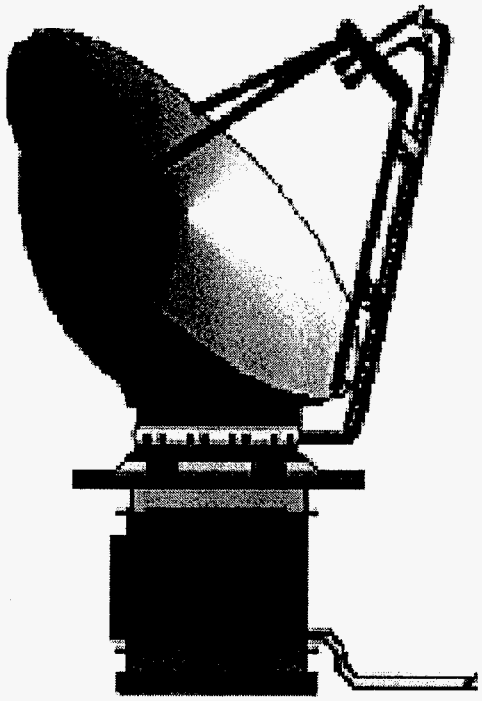
Measured Phase

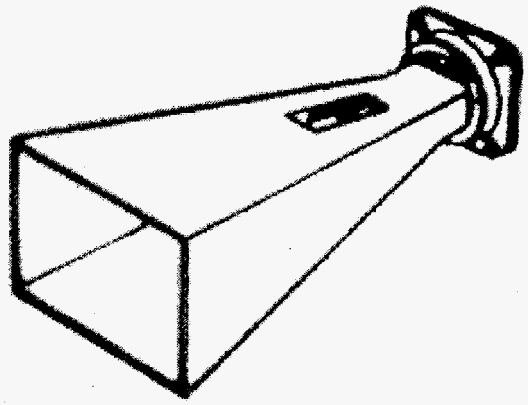
Comparison of Change in Phase Between Strings over Three Passes (Filtronic)



Antenna Subsystem

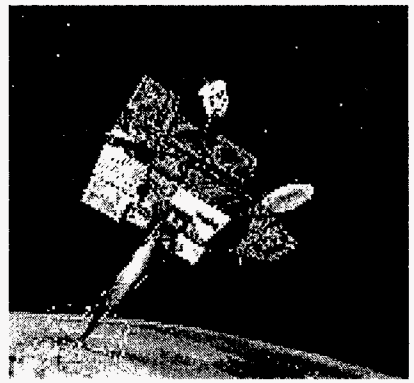


Dish Antenna



WR62 Horn Antenna

Link Gain
(Test Setup)



R = -173dB (loss in air)

h = 800km

$L_c \approx 4dB$

G = 35dB
EIRP = 81dBm

100W
(SeaWinds)

50

WR62 Horn
G = 17dB
P = -75dBm

$L_c \approx 4dB$

RF Front
End

NF = 2.7dB

P ≈ -79dB

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Conclusions

Advantages to Using Off-the-Shelf Parts include:

- Readily Available
- Less Expensive
- Increasingly More Reliable

Will Eventually be Used:

- Over the Ocean to Collect Wind Data

Studying/Tracking the Weather Will Help:

- Storm Detection
- Safely Route Ships
- Aid Oil Production
- Harvest Food
- Etc.

Cost Comparison

COTS	Custom

• Parts
• Labor
• Test
	• Parts (Wafer)
	• Labor
	• NRE
	  • Design
	  • Build
	• Test

$150K	$850K