Vertical Planar Near-field Beam Pattern Measuring System

General description

The Millimeter Wave Laboratory of Universidad de Chile has developed an automated near-field measuring system up to 50 GHz. The system's most important elements are an anechoic chamber, an inverted "T" planar beam scanner with a probe antenna, the scanner controller, a PNA Microwave network analyzer and a workstation with the control program.

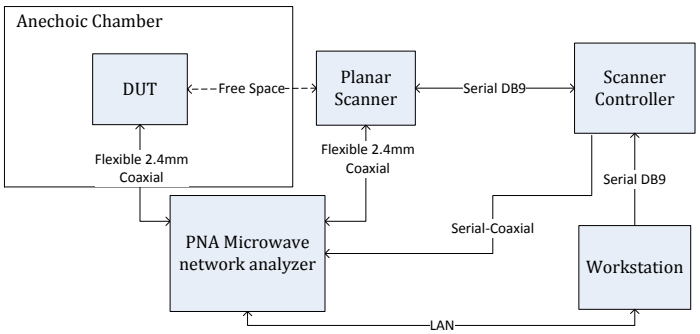

Figure 1: Block diagram of the Near-field Beam Pattern Measuring System.

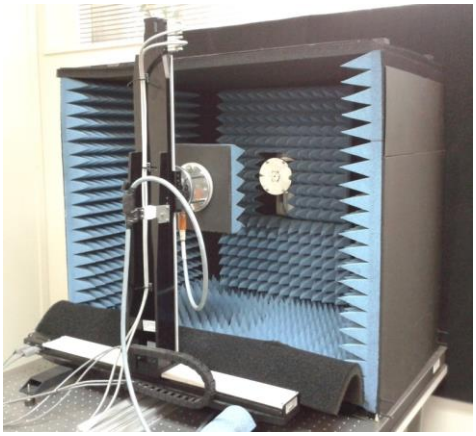

Figure 2: Planar Near-Field Beam Pattern measuring System.

Specifications

Anechoic Chamber

Absorber Manufacturer	Eccosorb
Model N°	VHP-NRL
Reflectibity@45GHz	~-40dB

Planar Scanner

Manufacturer	Newmark Systems
Model N°	STG-24-C
Resolution	1 μm
Planarity	<0.15 mm
Scan Speed (Max)	1 in/s
Scan Area	60 cm X 60 cm
Probe Carriage Capacity	6.8 Kg

Probe Antenna

Manufacturer	MI Technologies
Model	MI-6970-WR22

Scanner Controller

Manufacturer	Newmark Systems
Model N°	NCS-M2

PNA Microwave network analyzer

Manufacturer	Agilent
Model N°	E8364C
Frequency Range	10MHz to 50 GHz
Power Range	
@10 to 20 GHz	-24 to +3 dBm
@20 to 30 GHz	-23 to 0 dBm
@30 to 40 GHz	-23 to -4 dBm
@40 to 45 GHz	-25 to -5 dBm
@45 to 50 GHz	-25 to -10 dBm
Noise Floor	
10 Hz IF bandwidth	
@10 to 20 GHz	<-120 dBm
@20 to 40 GHz	<-114 dBm
@40 to 50 GHz	<-114 dBm
1 KHz IF bandwidth	
@10 to 20 GHz	<-100 dBm
@20 to 40 GHz	<-94 dBm
@40 to 50 GHz	<-94 dBm

ALMA Band 1 Test Setup Specifications

Test Frequencies	35, 42.5 and 50 GHz
DUT to Probe Distance (D)	179 mm
DUT Aperture Diameter(A)	31.68 mm
Sampling Distance (S)	0.48 λ
Maximum Far-Field Angle (α)	40°
Total N° of Points (N)	
@35GHz	6724
@42.5GHz	10000
@50GHz	13689
Scan Linear Length (L)	
@35GHz	0.333027 m
@42.5GHz	0.335203 m
@50GHz	0.333849 m

Typical Test Power

@35GHz	-5dBm
@42.5GHz	-5dBm
@50GHz	-10dBm

$$N = \left(\left\lceil \frac{2 \cdot D \cdot \tan(\alpha) + A}{S \cdot \lambda} \right\rceil + 1 \right)^2$$

$$L = S \cdot \lambda \cdot \left(\sqrt{N} - 1 \right)$$

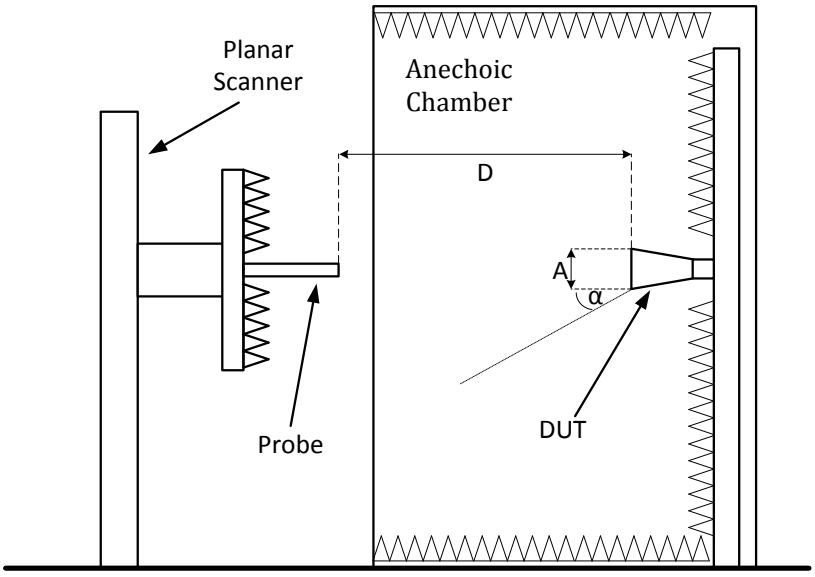

Figure 3: Diagram indicating the variables needed for ALMA Band 1 test setup.