Laboratory Session: Antenna Measurements in Spherical range

Objectives:

1) Description of the measurement system set-up and alignment.
2) Measurement of a horn in far field: principal patterns and gain.
3) Measurement of the axial ratio with rotating linear source.
4) Fresnel zone measurement: principal planes and gain.

Procedure:

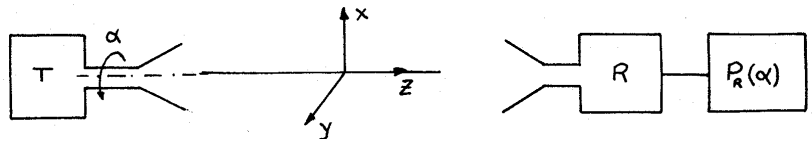
1. Description of the measurement system set-up and alignment

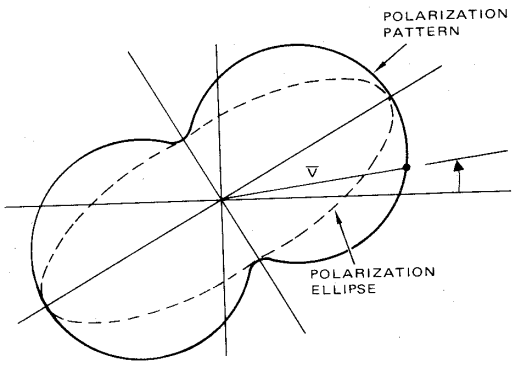
2. Measurement of a horn in far field

- Description of the measurement system set-up
- Axes configuration and alignment explanation
- E-plane radiation pattern measurement: amplitude and phase plot.
- Software PROCENCA: rectangular horn characterization: radiation patterns. (E-plane, H-plane and ϕ=45º co polar and ϕ=45º cross polar patterns). Estimation of the directivity. Calculation of the phase centre in the 3 planes.
- Radiation patterns plotting
- Multifrequency measurement
- Gain measurement: substitution technique.

3. Measurement of the axial ratio with rotating linear source

- Mounting of the circular polarization antenna (corrugated circular horn + septum polarizer)
- Adjustment of reference ϕ and positioner controller offset
- Axial Ratio measurement with rotating linear source (polar and cartesian plot)

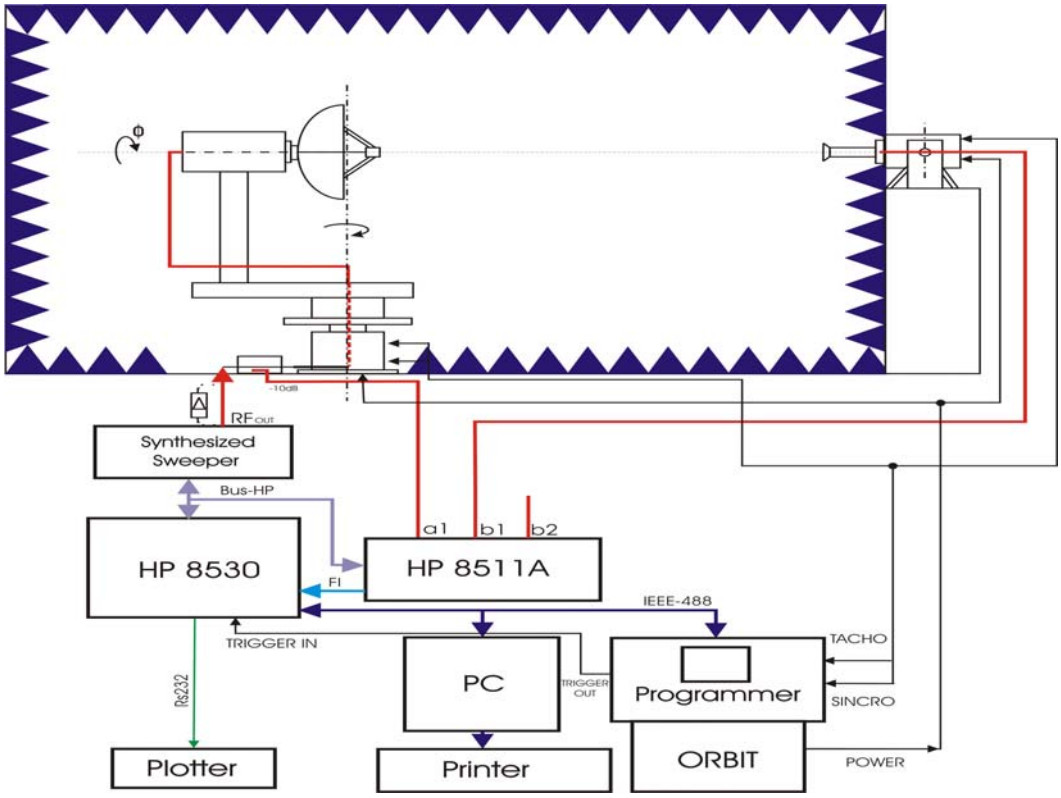




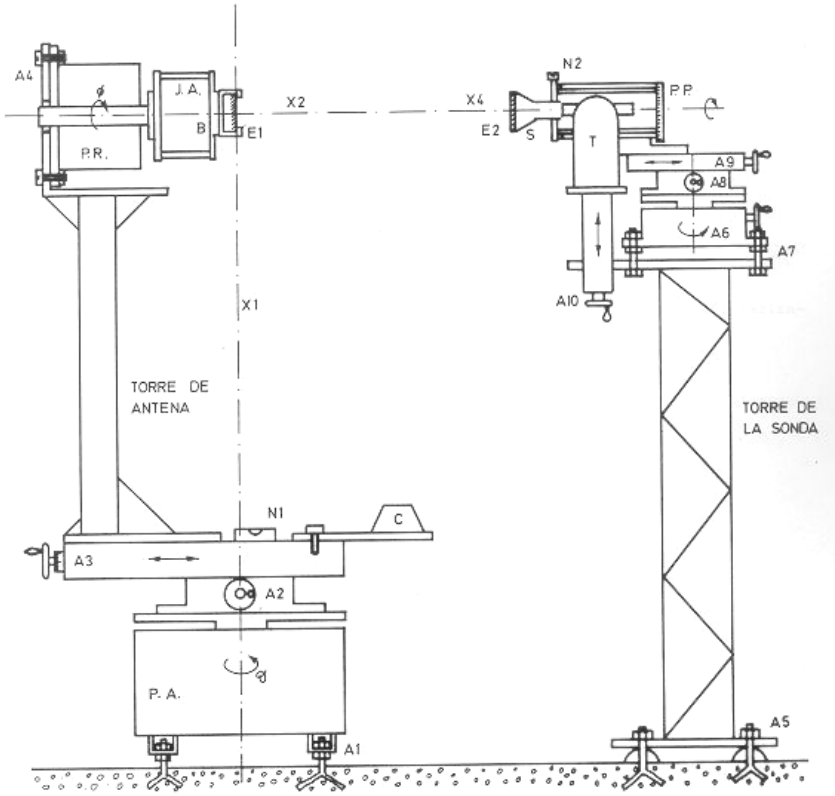
- Measurement of the axial Ratio vs. frequency, with $\Delta\alpha \approx 10^o$
- E-theta and E-phi acquisition and transformation to E-lhc and E-rhc, using PROCENCA

4. Fresnel zone measurement: principal planes and gain

- RF equipment: vector network analyzer, synthesizer, test-set
- Positioner controller: ORBIT System



- Axes configuration and alignment explanation



- Install probe and AUT and offset adjustment.
- E-plane radiation pattern acquisition of a rectangular horn (standard gain horn)
- Measurement of the received power transmitting with the standard gain, and vector network analyzer gain calibration.
- Replacement of standard gain horn by AUT (GSM1800-UMTS sectorial antenna).
- Alignment and positioner controller offset adjustment.
- Measurement of the received power in Fresnel zone transmitting with AUT (for gain comparison)
- Radiation pattern in Fresnel zone of AUT
- Fresnel zone principal planes acquisition using software PROCENCA
- Fresnel zone (principal planes) to far field (principal planes) using software SFIFT: configuration and execution.
- Plotting results and gain calculation, including a near field to far field correction factor.

$$G_{AUT}(dB) = G_{stnd}(dB) + 10\log\left(\frac{P_{R-AUT}}{P_{R-stnd}}\right) + W(0,0)/w(0,0)$$

- Comparison of results before and after transforming to far field.