

Definition of Polarization Discrimination in Satellite Communications

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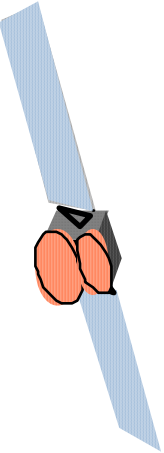
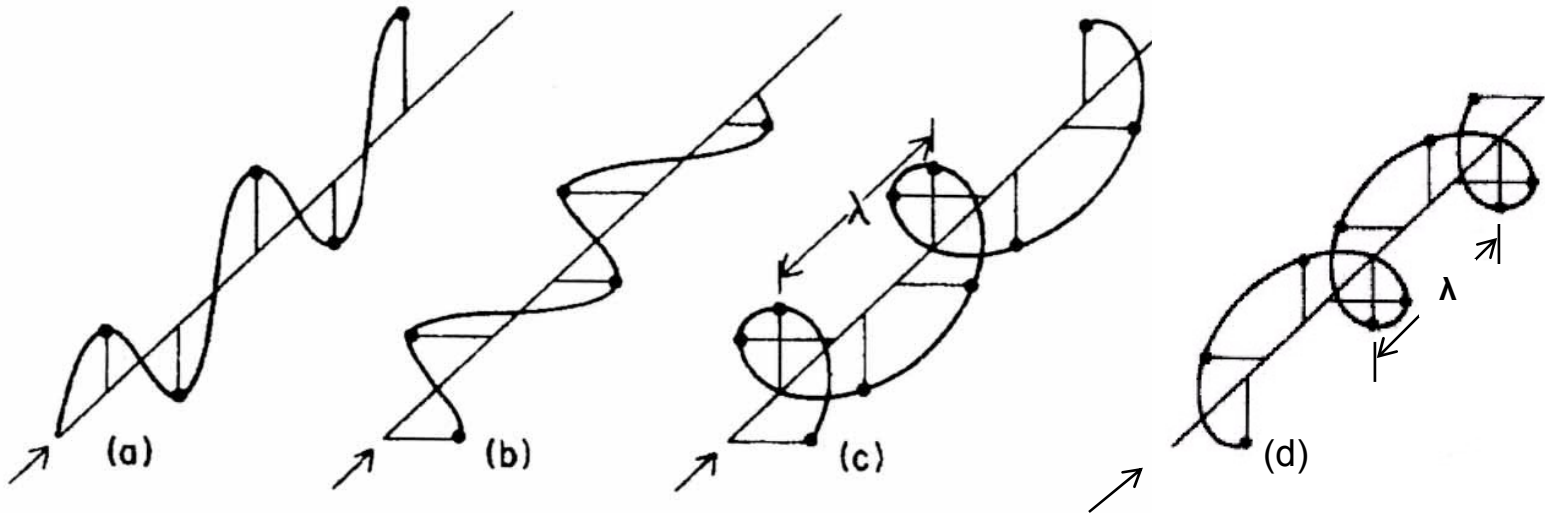
Polarization of the EM Wave

Linear polarization:

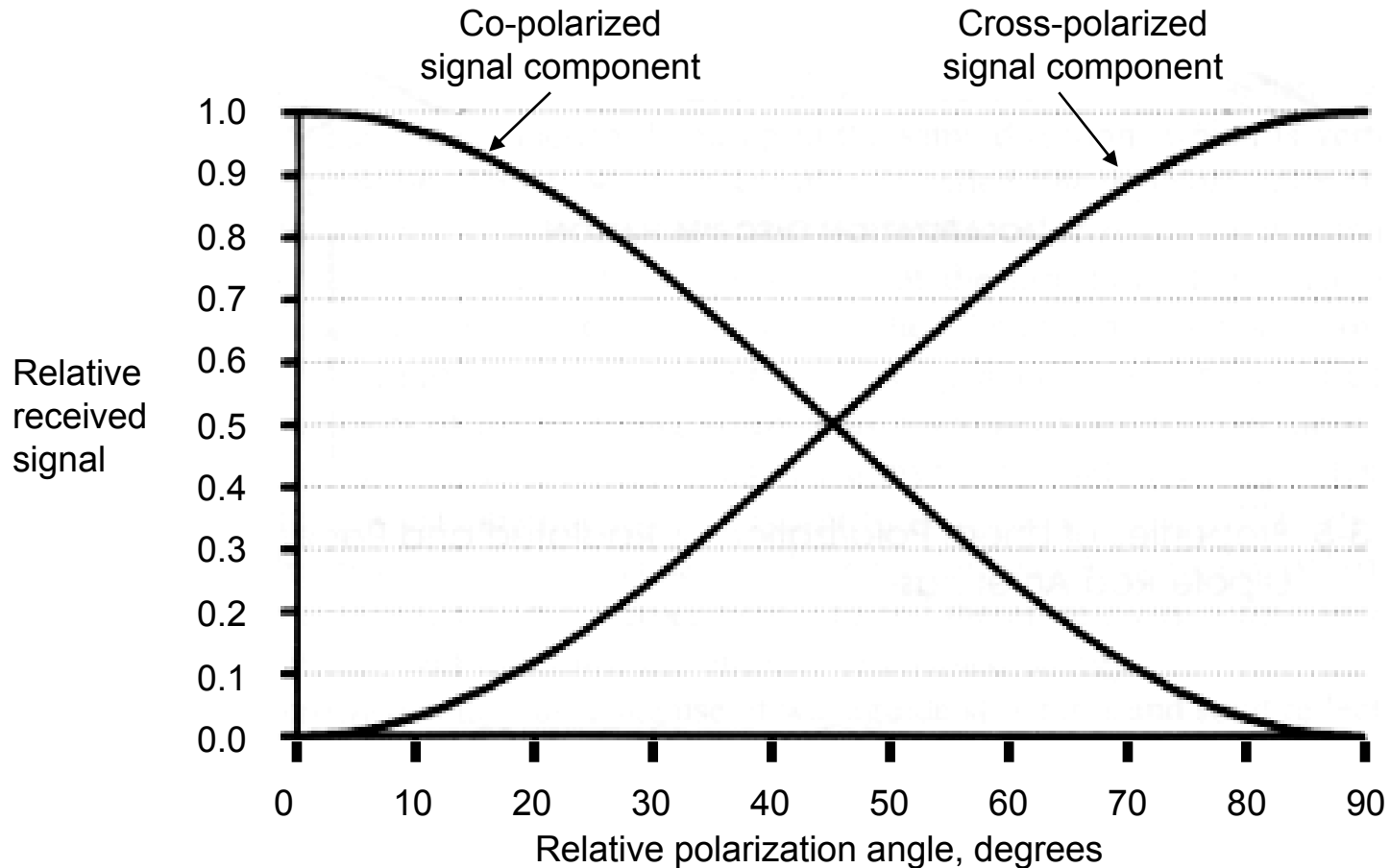
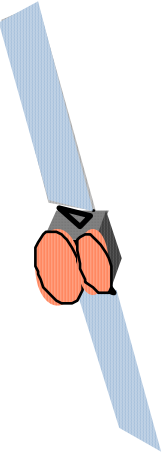
- (a) vertical
- (b) horizontal

Circular polarization

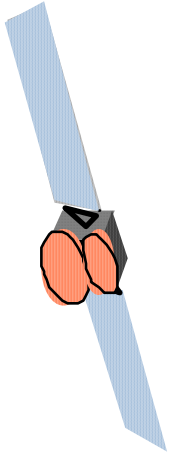
- (c) Left hand
- (d) Right hand



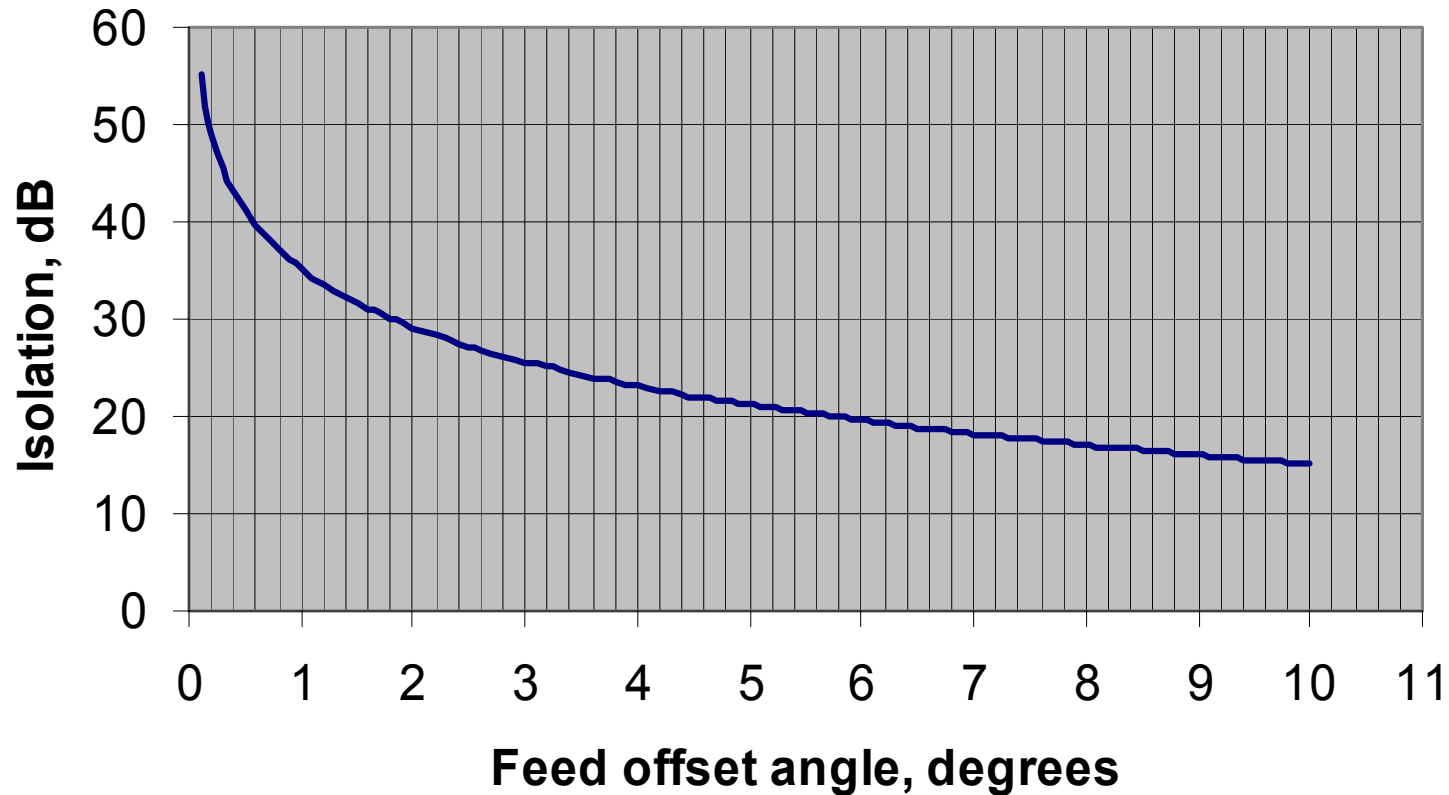
Linear Co- and Cross-Polarization



Linear Cross-Polarization Isolation

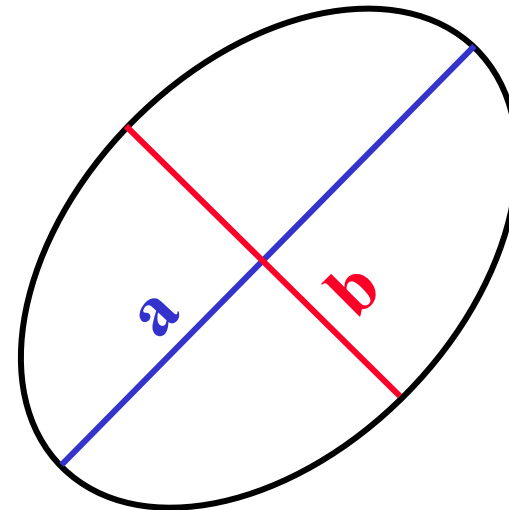


Cross-Polarization Isolation

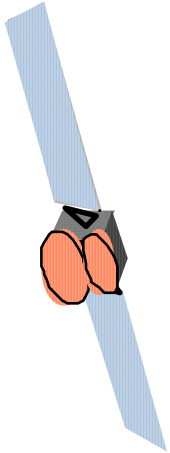


Properties of Circular Polarization

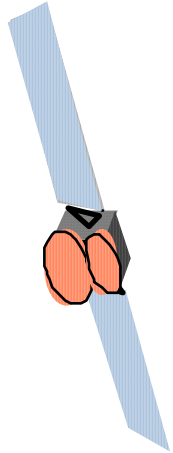
- **Special case of elliptical polarization**
- **Polarization sense established within the transmit feed system**
- **Little or no impact from the ionosphere**
- **Isolation properties generally inferior to linear**



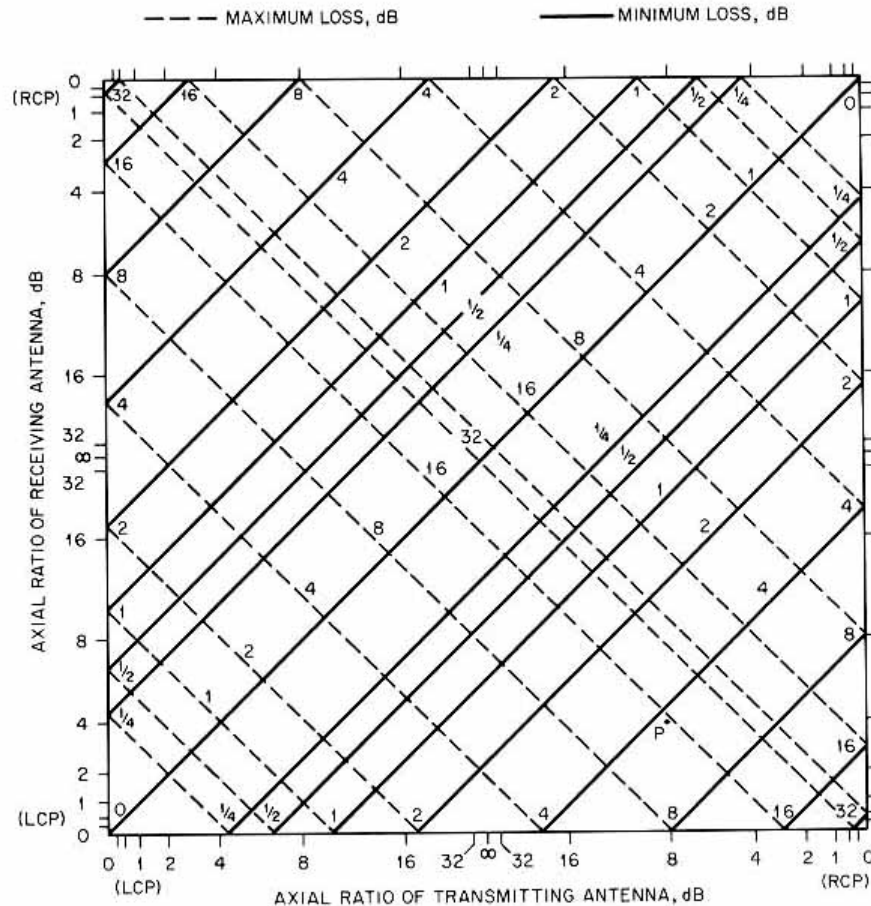
$$\text{Axial ratio} = 20 \log (a/b)$$



Polarization Coupling



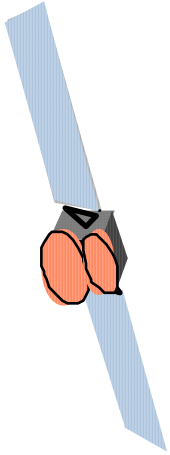
Polarization type	Linear	Circular
Linear	$-10 \log [\cos^2 \Theta] \text{ dB}$	-3 dB
Circular (elliptical)	-3 dB	Graph



Ref: Johnson, Antenna Engineering Handbook, FIG 23-7, p 23-9

Use of Linear Polarization

- **Frequencies above S-band**
- **High rain attenuation regions**
- **Simple microwave components**
- **Use of polarization as measurement tool**



User of Circular Polarization

- **Frequencies below C-band**
- **Simplify antenna alignment (no polarization adjustment required)**
- **No correction for day/night variation due to Faraday Effect**

See www.applicationstrategy.com for more resources

