Circularly Polarized Microstrip Antennas

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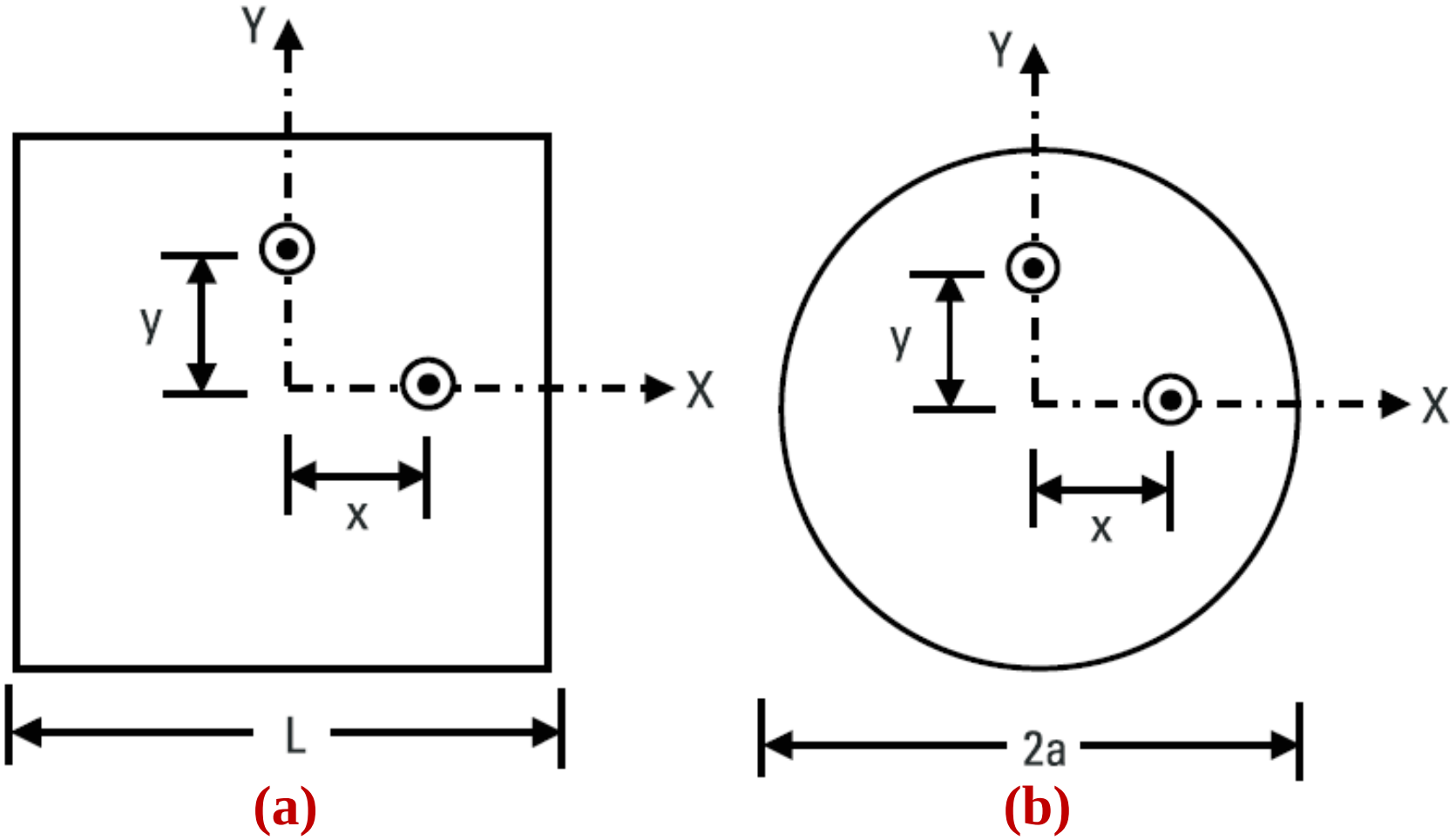
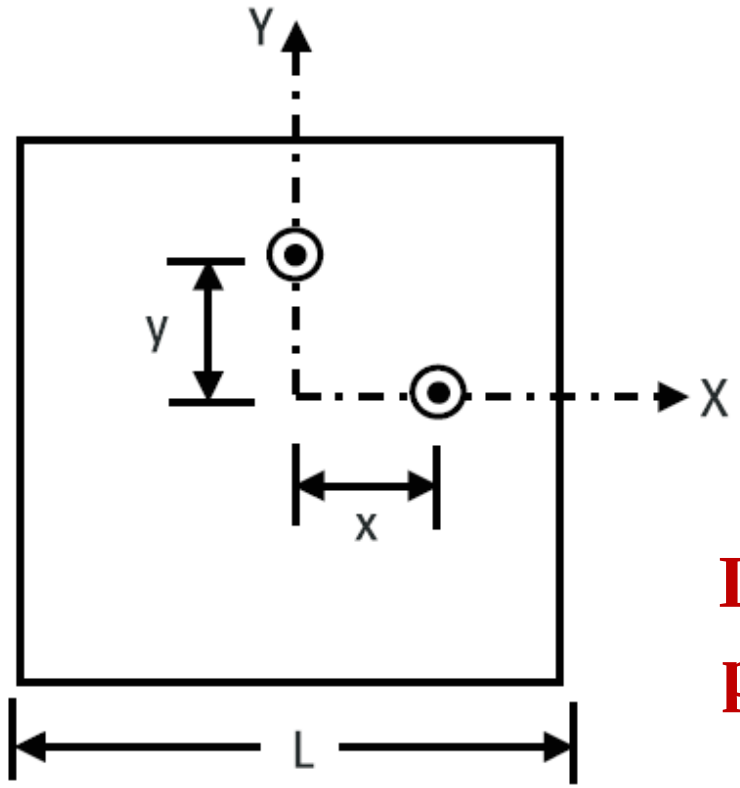
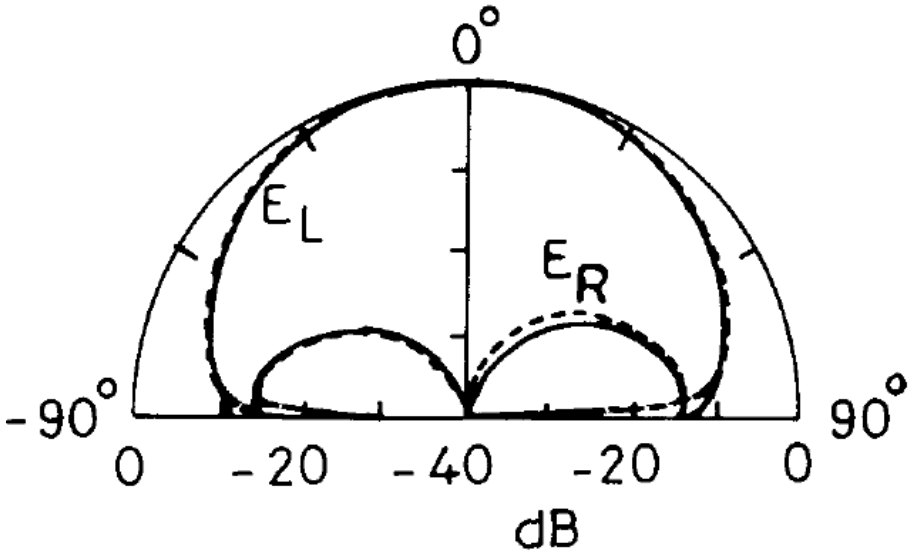
Circularly Polarized (CP) Dual Feed MSA



Dual-feed (a) SMSA and (b) CMSA

Square MSA with Dual Feed



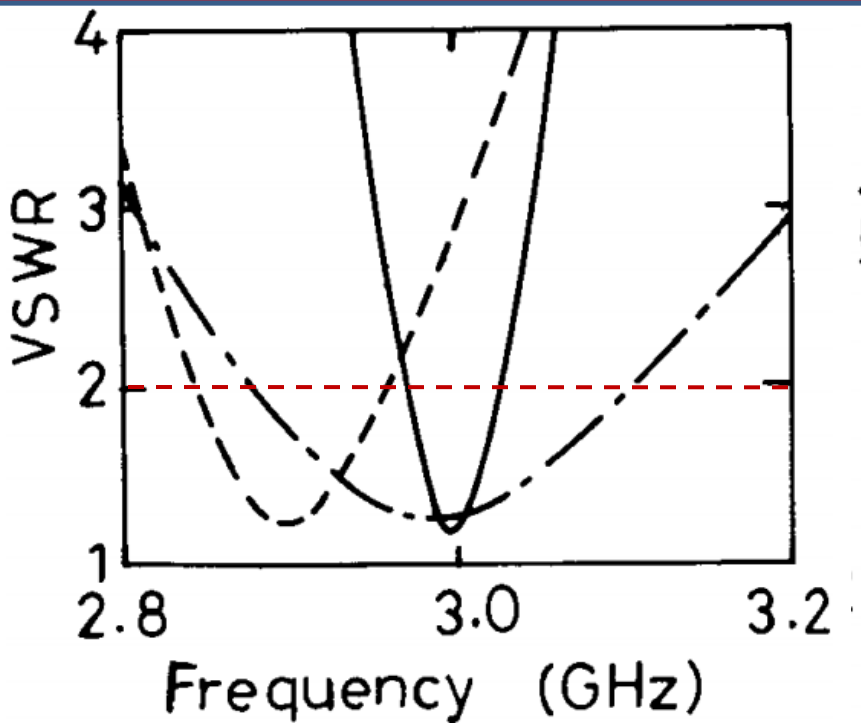


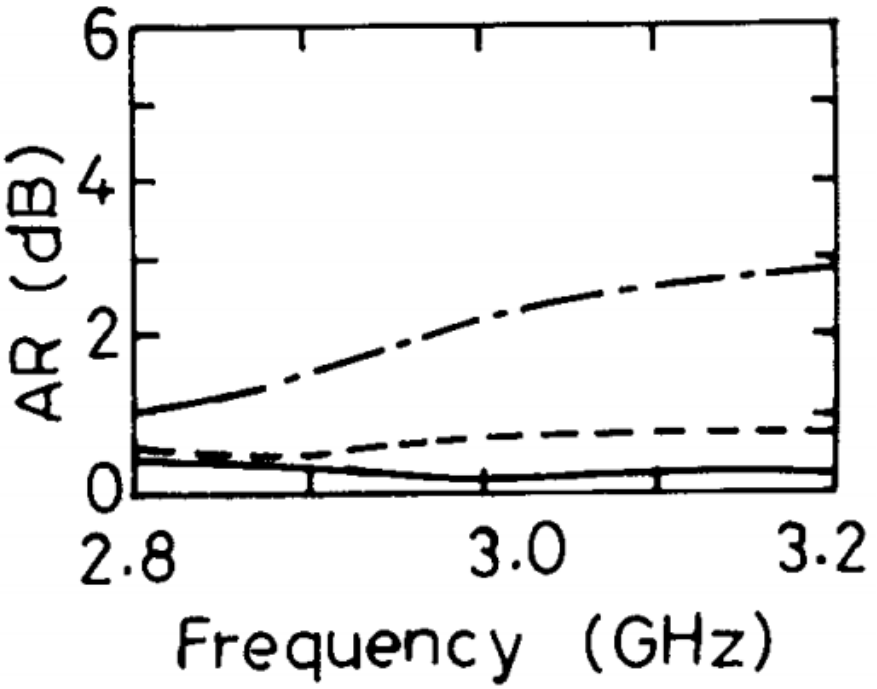
Left- and right-hand circularly polarized field components (E_L and E_R) in the φ = 0° and 90° planes at 3.0 GHz

L = 3 cm, ε_r = 2.55, h = 0.159 cm and tanδ = 0.001

Two Feeds at x = 0.5 cm with $1/\underline{0}^0$ and at y = 0.5 cm with $1/\underline{90}^0$ for LHCP

Square MSA with Dual Feed for Different Substrate Parameters



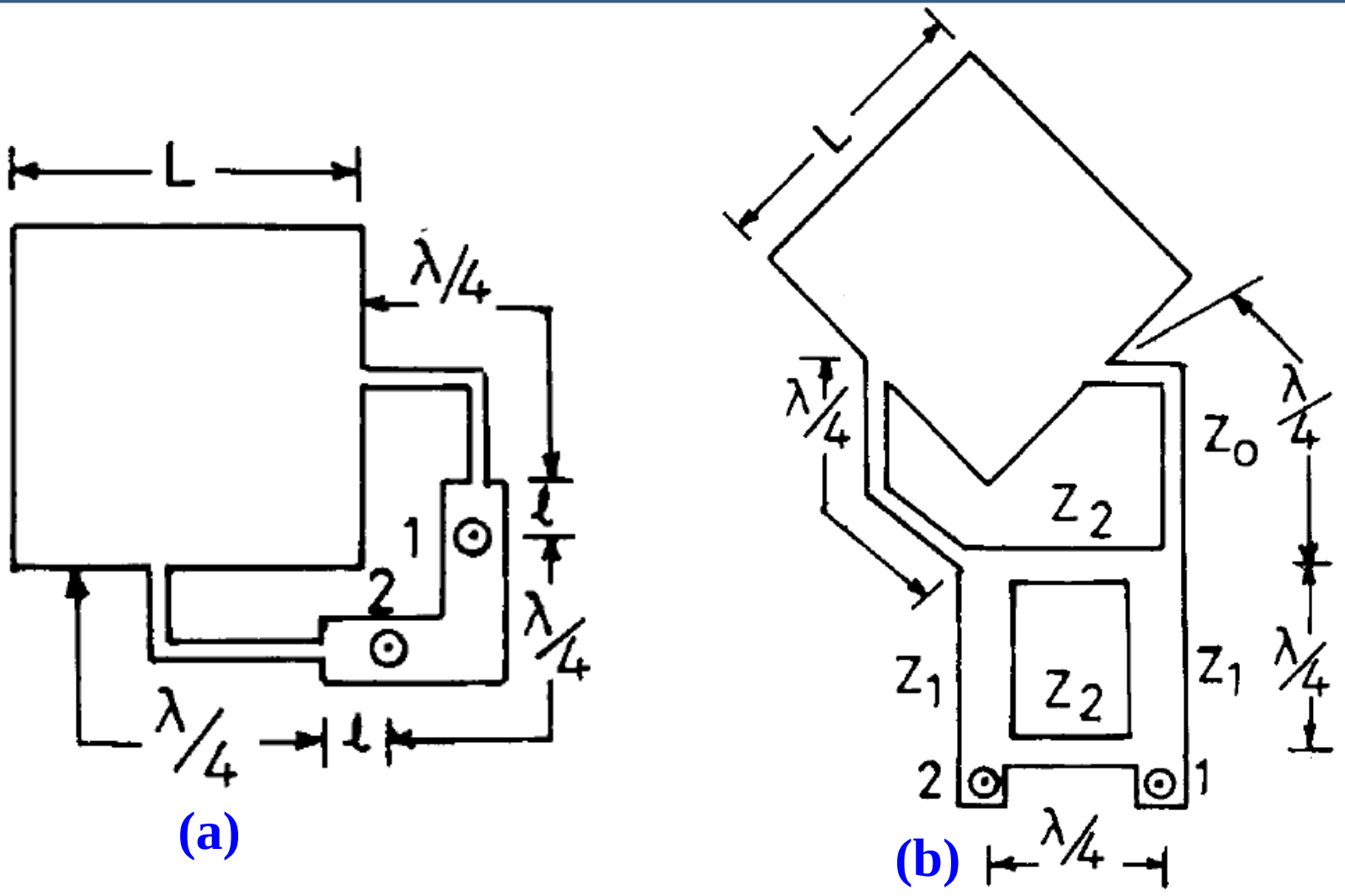


(——) ε_r = 2.55 and h = 0.159 cm, L = 3cm, x = y = 0.5cm

(- - -) ε_r = 2.55 and h = 0.318 cm, L = 3cm, x = y = 0.6cm

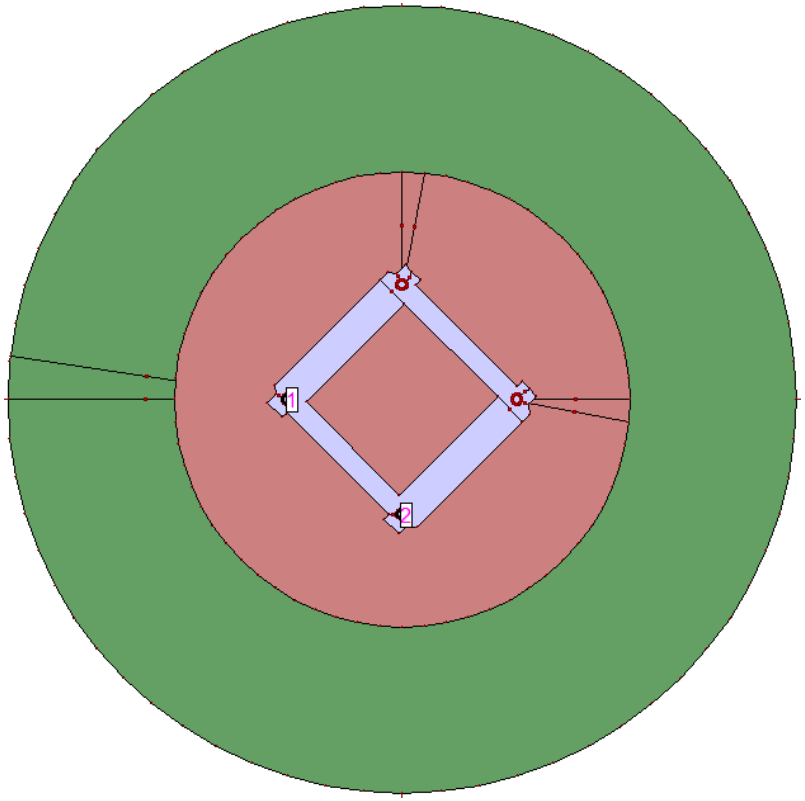
(– . –) ε_r =1 and h = 0.5 cm, L = 4.5cm, x = y = 1.4cm

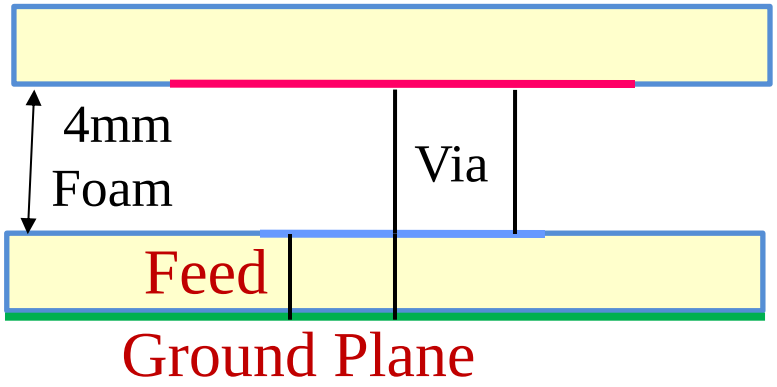
SMSA Integrated with Dual Feed



SMSA with (a) offset feed and (b) 3-dB 2-branch line coupler

CP Suspended CMSA with Dual Feed





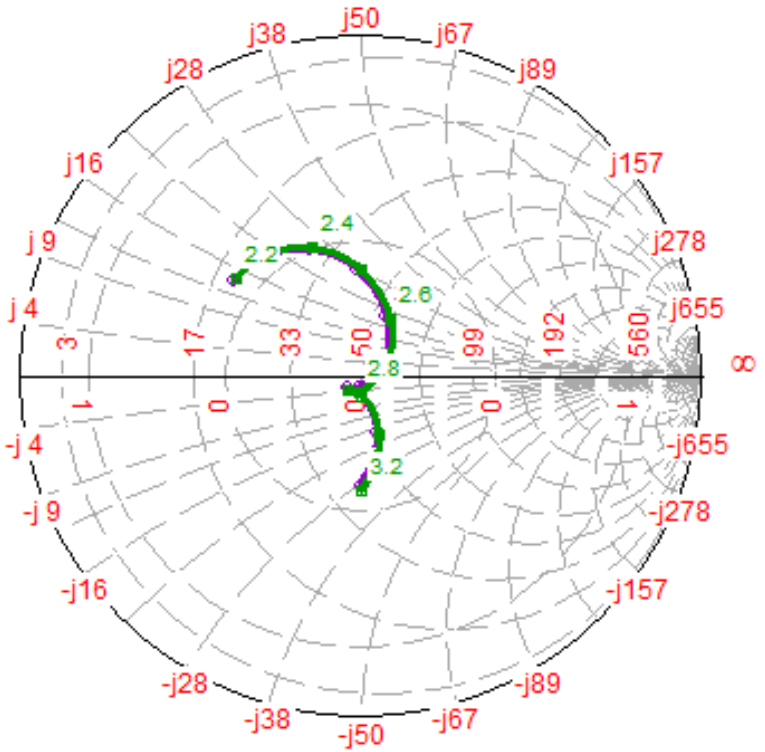
Frequency Range: 2.7-2.9GHz (7%)

Patch diameter = 52mm

Ground plane diameter = 90mm

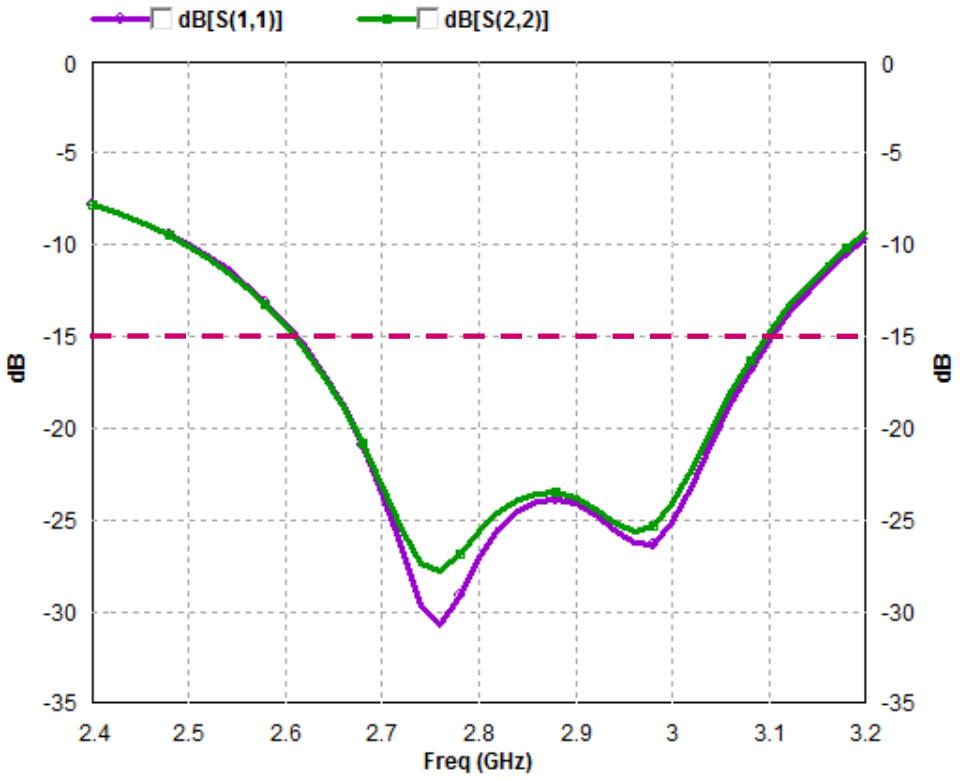
Substrate - RT Duroid 5870

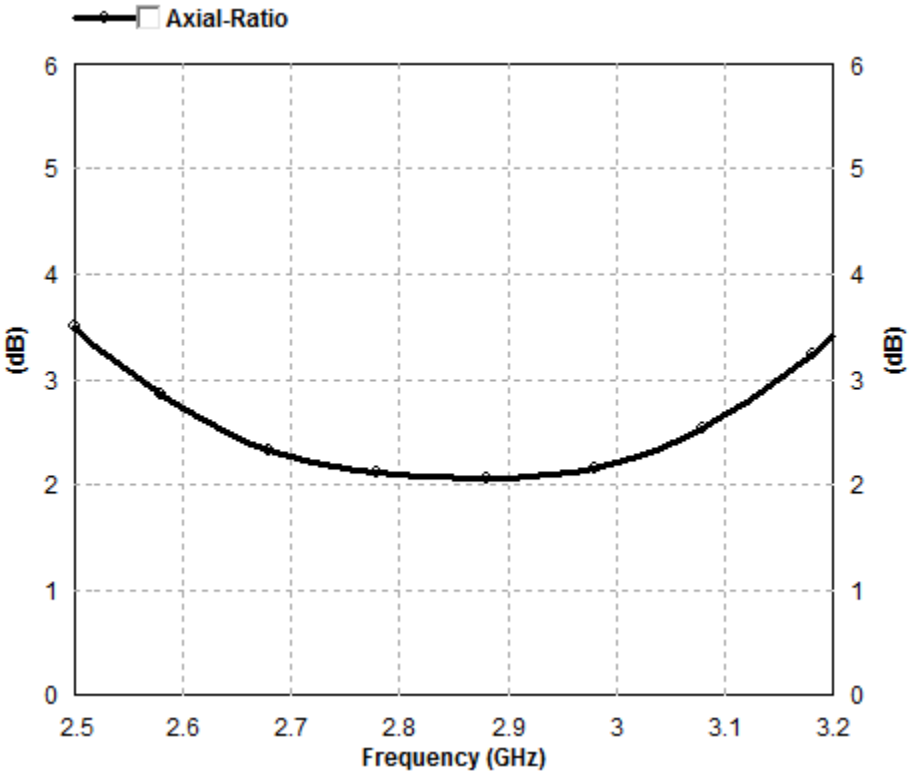
(ε_r = 2.33, h = 0.8 mm, tanδ= 0.0012)



Smith-Chart Display

CP Suspended CMSA – S_{11} and AR

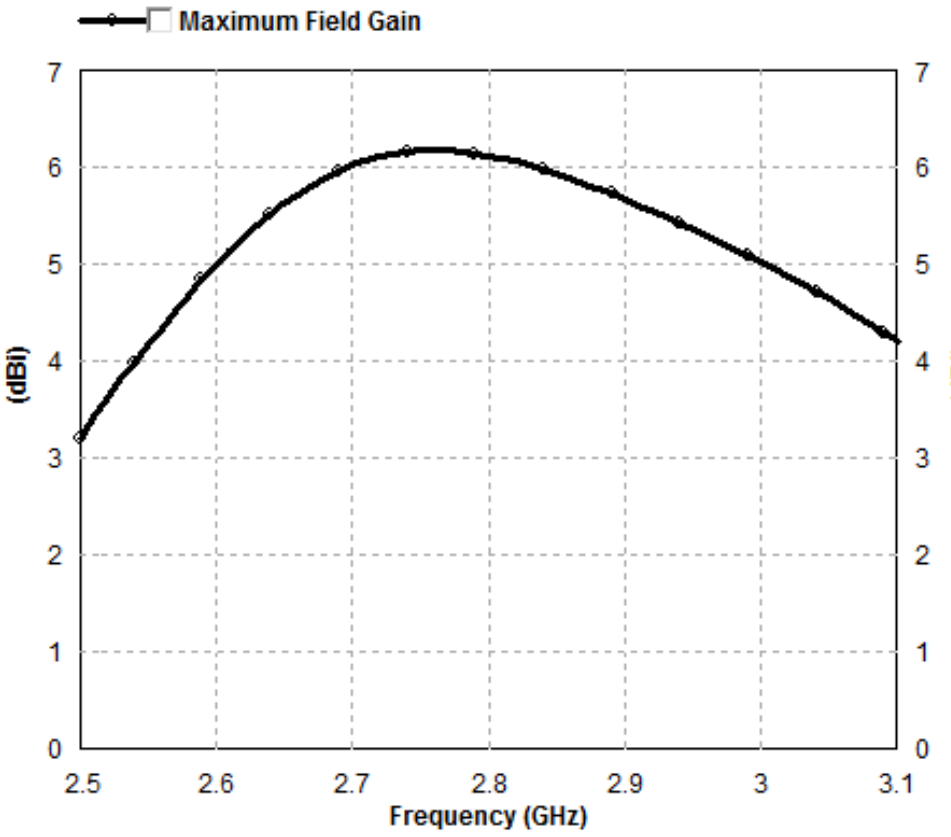




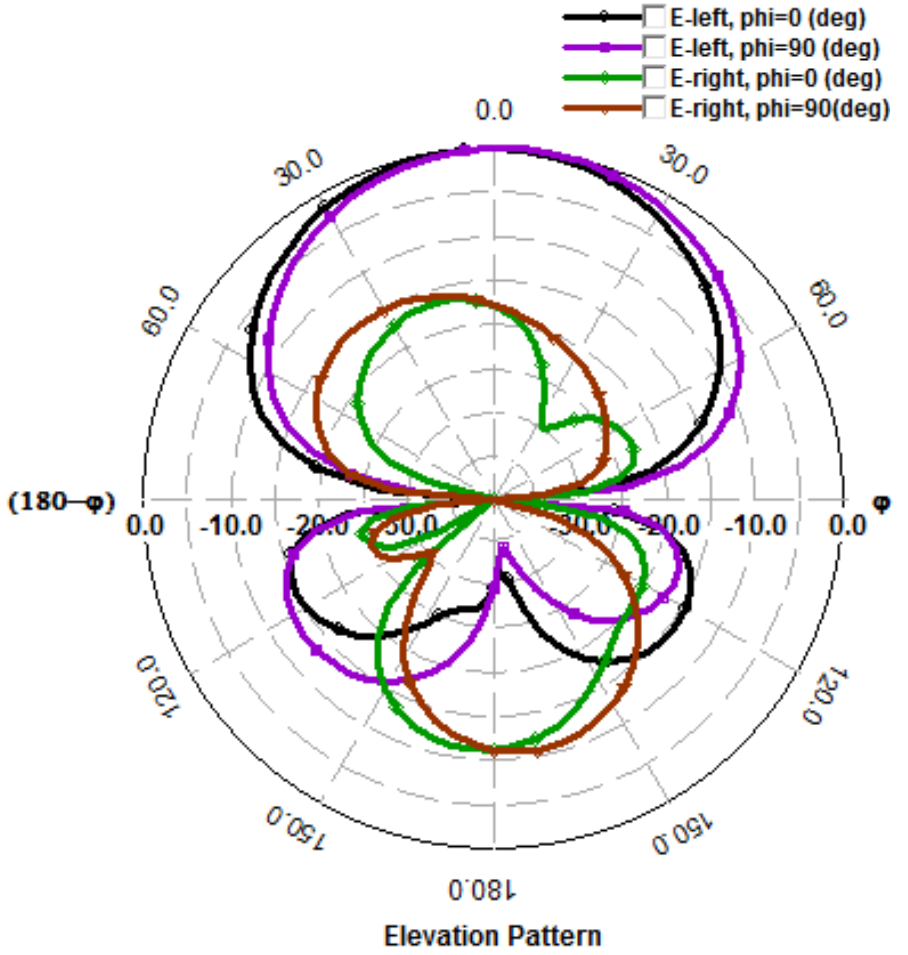
BW for $|S_{11}| \leq -15$dB
= 2.62 - 3.10GHz (17%)

BW for AR ≤ 3dB
= 2.56 - 3.15GHz (21%)

CP CMSA – Gain and Radiation Pattern

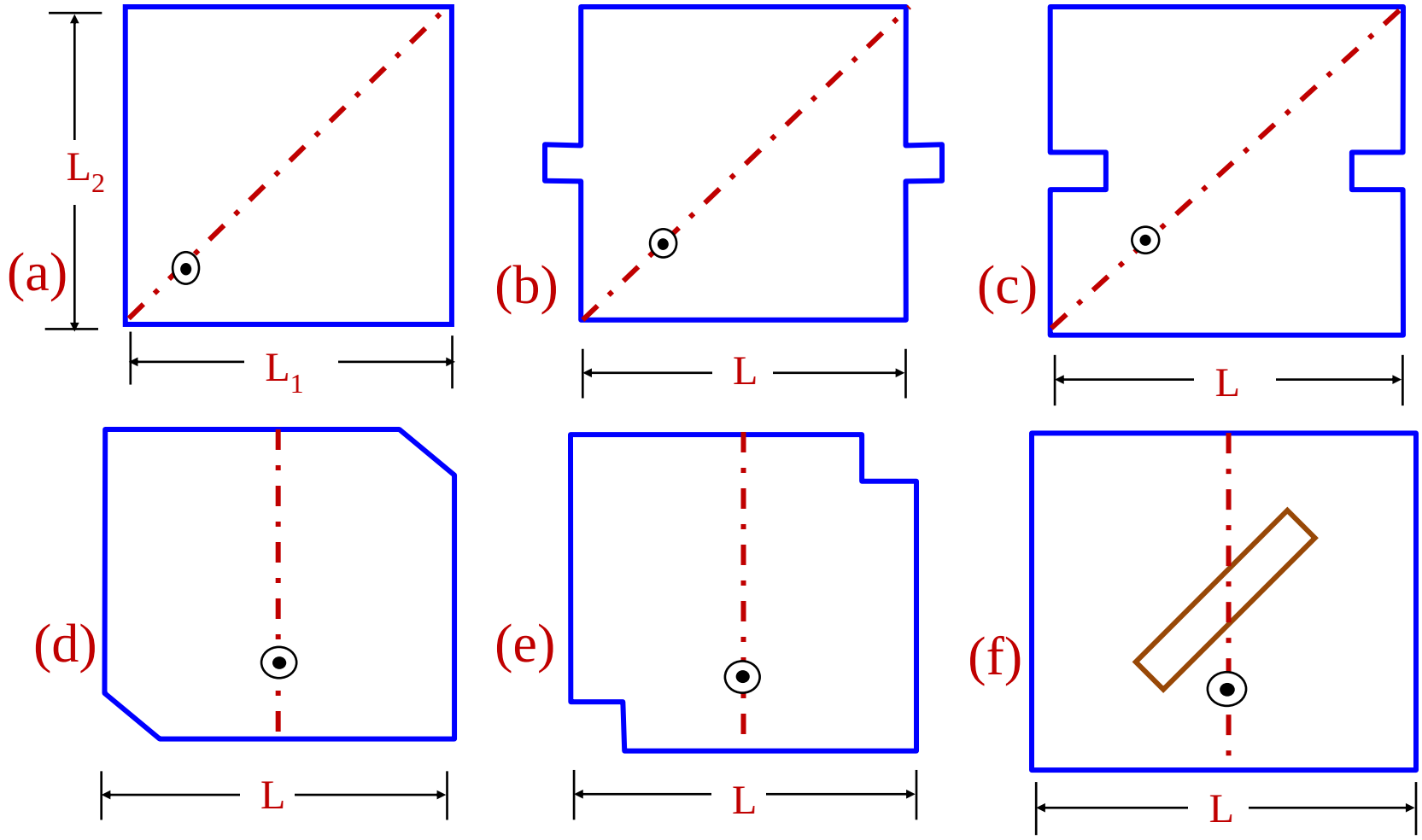


Max Gain = 6.2dBi



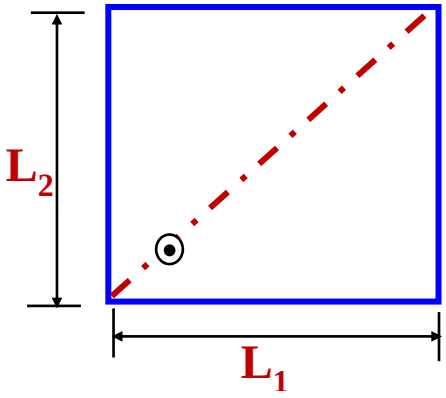
LHCP Radiation Pattern at 2.8GHz

Various Single Feed CP MSAs



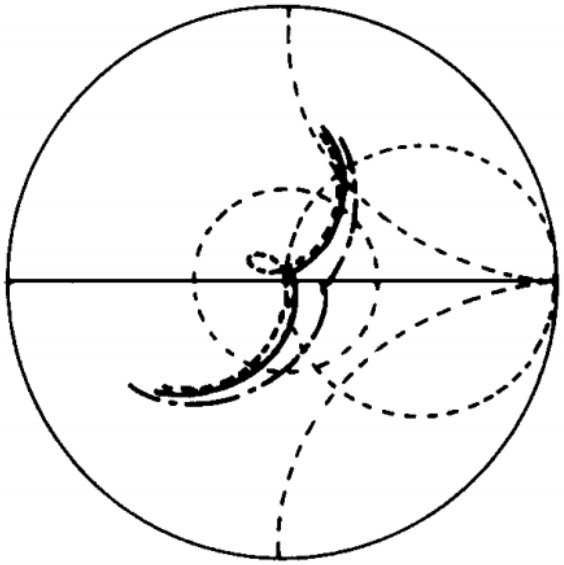
(a) Diagonal fed nearly square. Square with (b) two stubs, (c) two notches, (d) two corners chopped, (e) square notches at two corners, and (f) diagonal slot.

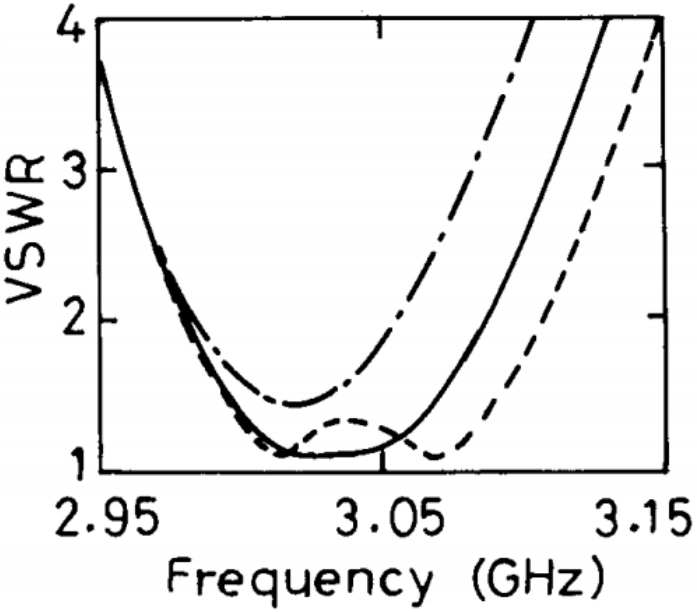
Diagonal Fed Nearly Square MSA

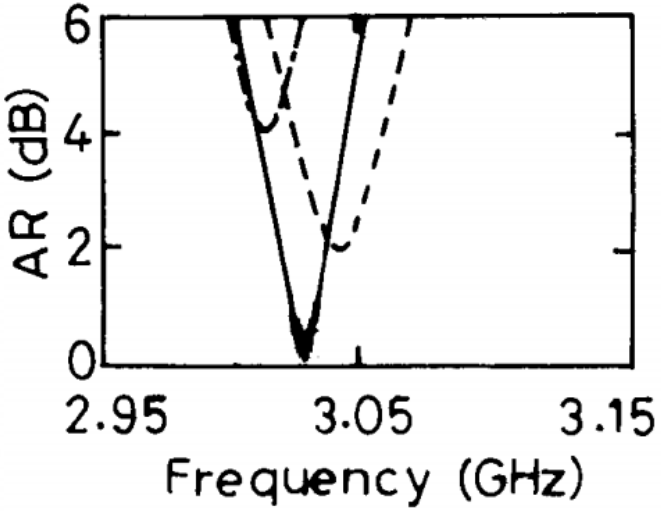


L_1 = 3cm, Feed position = (0.15 L_1, 0.15 L_2)

ε_r = 2.55, h = 0.159cm and tanδ = 0.001

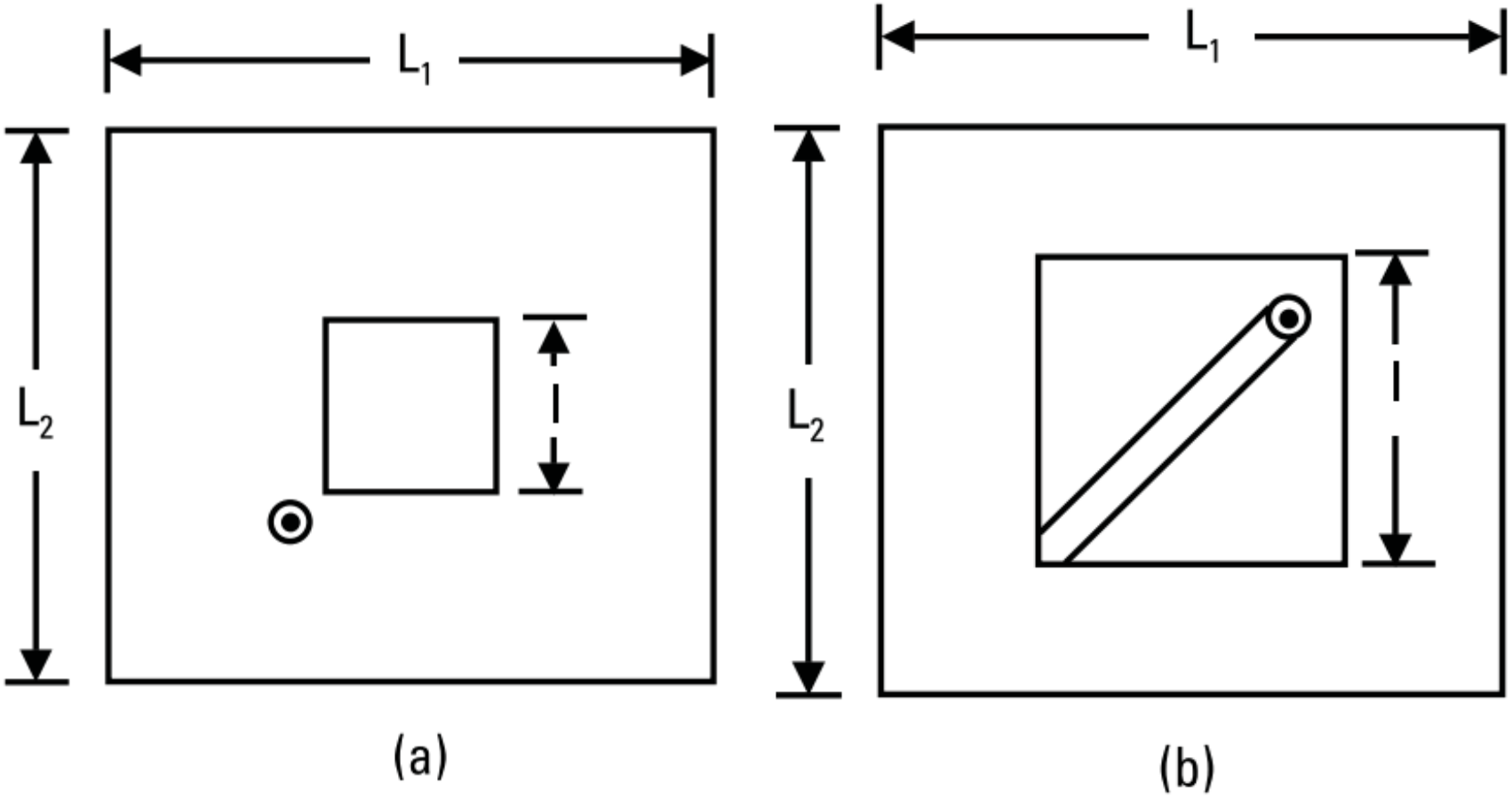






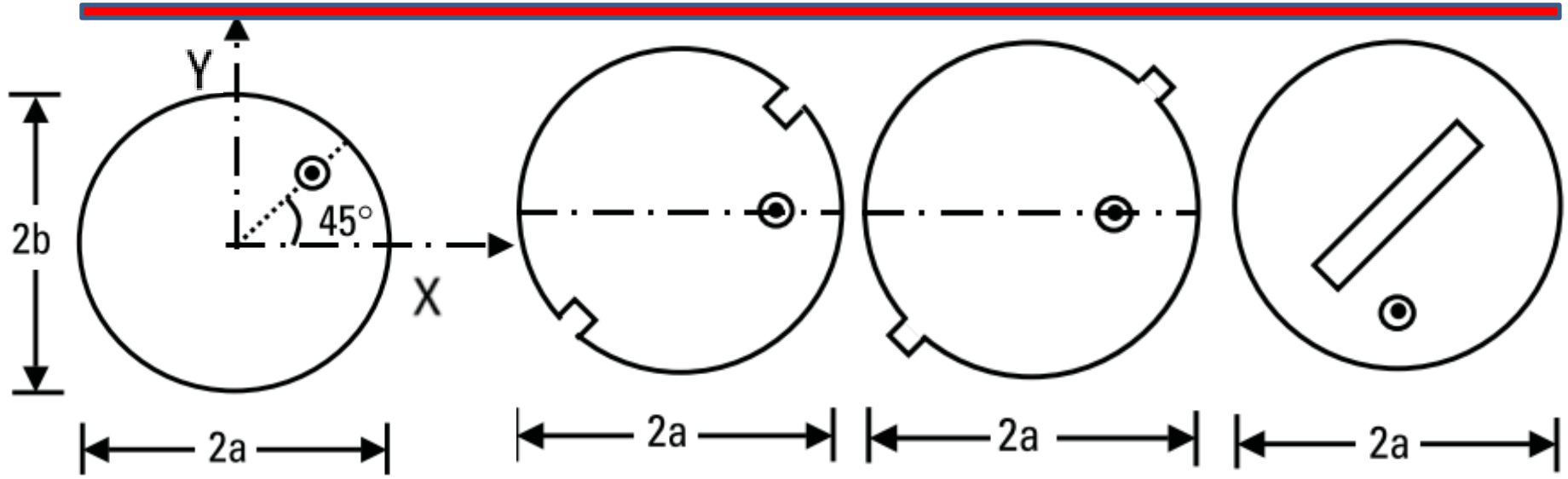
Input impedance, VSWR and AR plots for three values of L_2: (- - -) 2.9, (——) 2.92, and (– - –) 2.95 cm - LHCP

Nearly Square Ring MSA

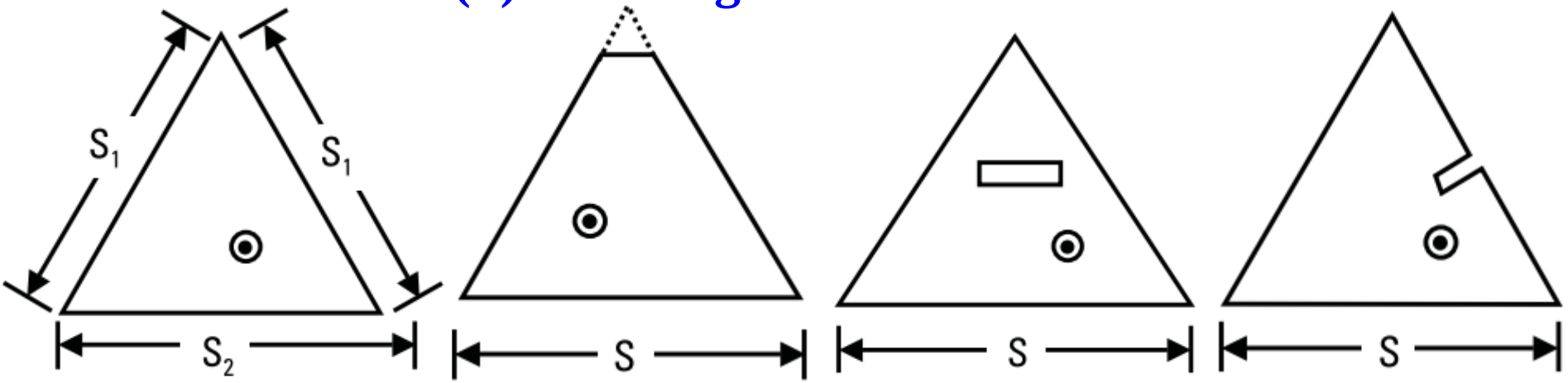


Nearly square ring MSA with (a) coaxial feed and (b) quarter-wave transformer.

Variations of CMSAs and ETMSAs

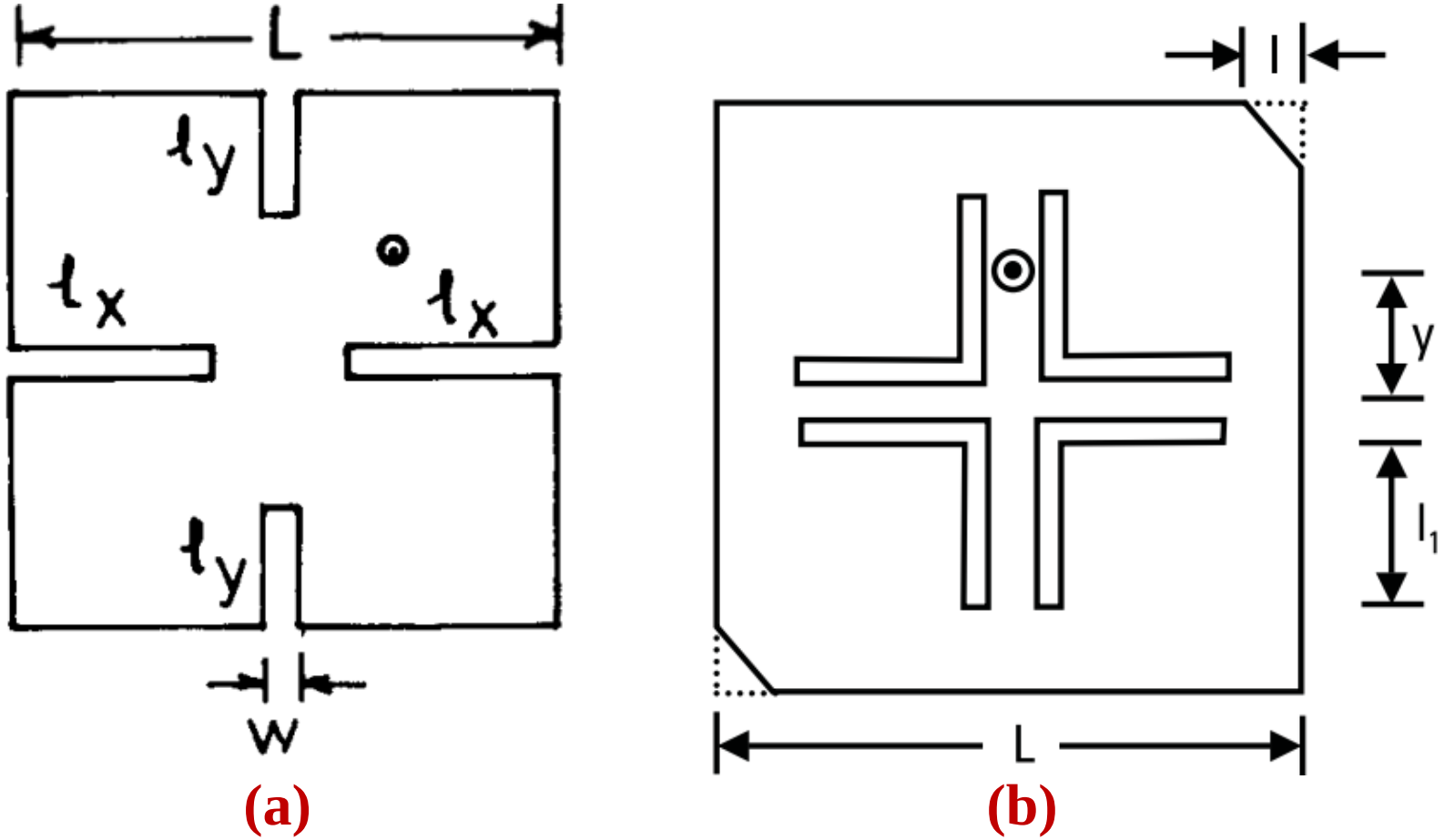


(a) Elliptical MSA and CMSA with (b) two notches, (c) two stubs, and (d) a rectangular slot in the centre.



(a) Nearly ETMSA, (b) tip-truncated ETMSA, (c)ETMSA with a rectangular slot, and (d) ETMSA with a notch.

Compact CP Square MSA with Slits



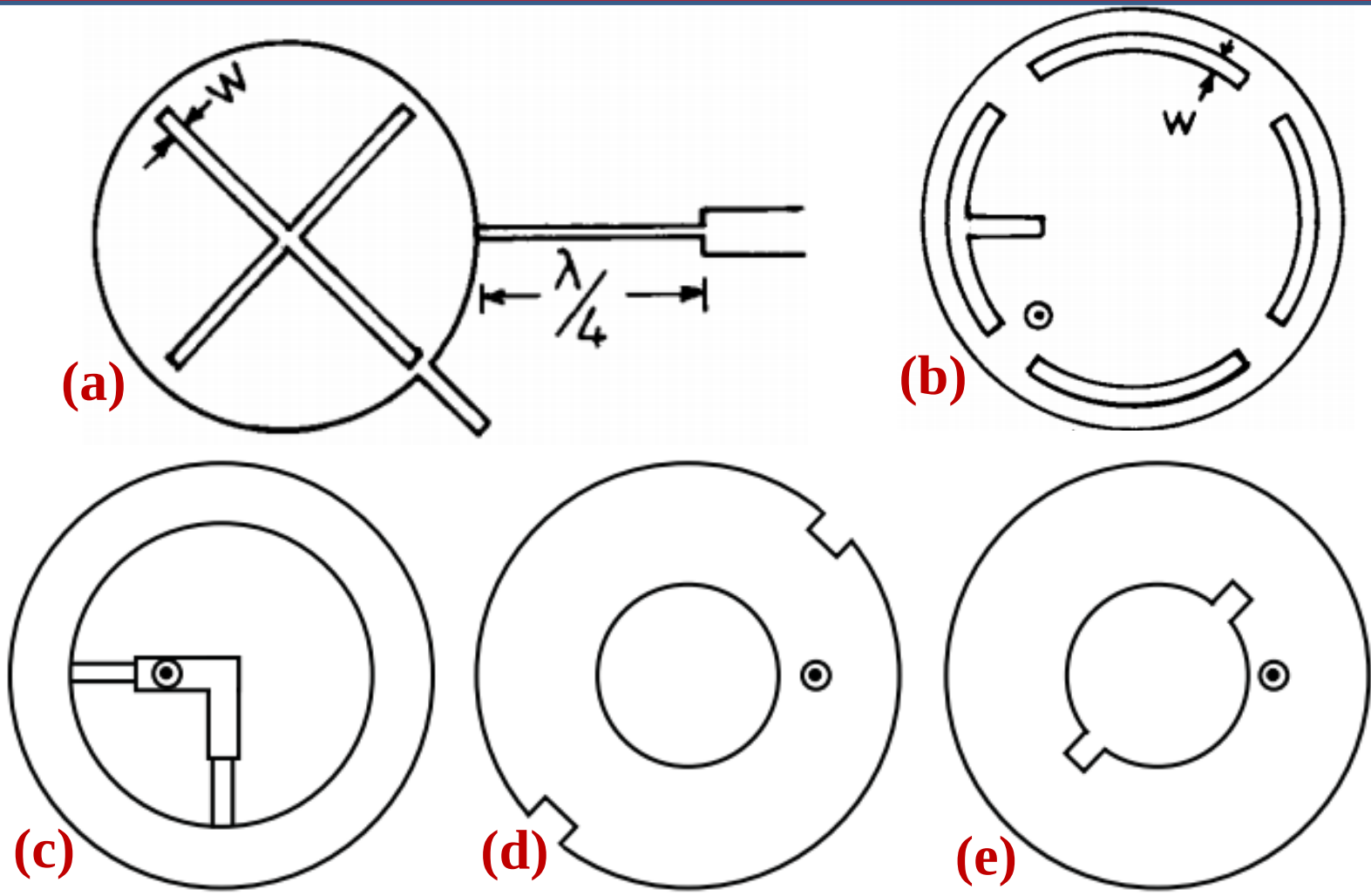
(a) (b)

(a) SMSA with two pairs of unequal slits and

(b) SMSA with corners chopped and four bent slits

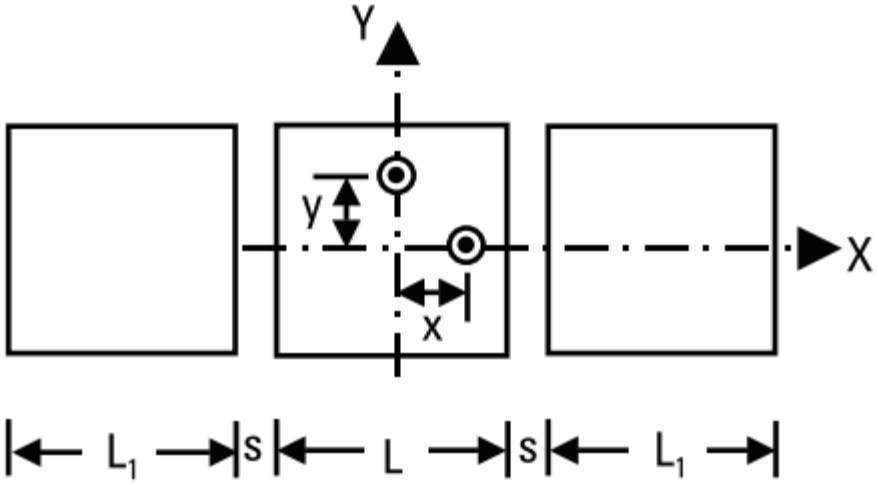
Application – GPS (1575 ± 10 MHz) antenna, RHCP

Compact CP CMSA with Slits

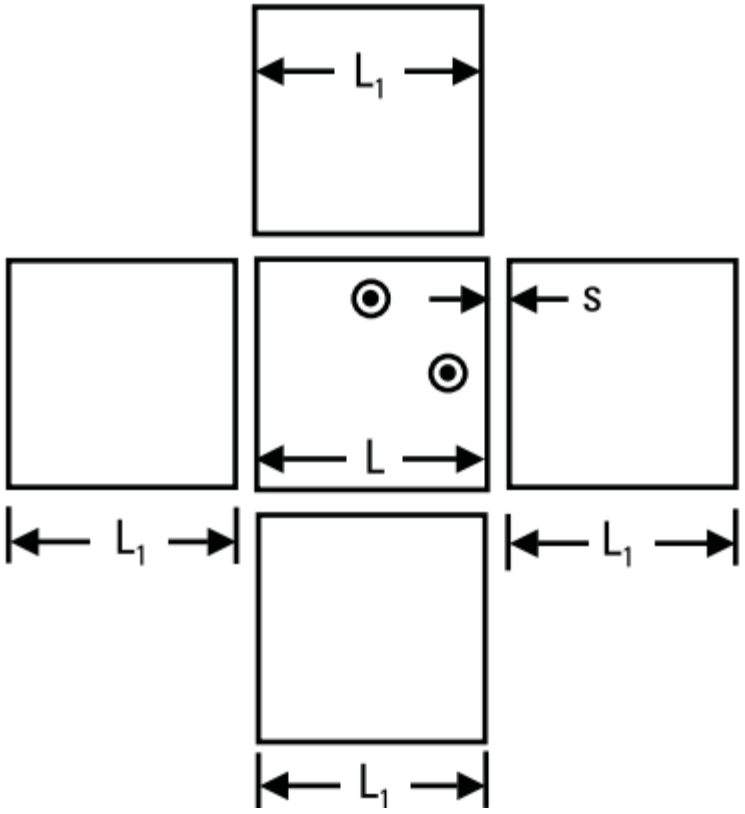


Compact CMSA with (a) cross slot and (b) curved slot with tuning stub. Annular ring MSA with (c) an internal offset polarizer and slits in the (d) outer and (e) inner circles

Gap-Coupled Broadband CP MSA



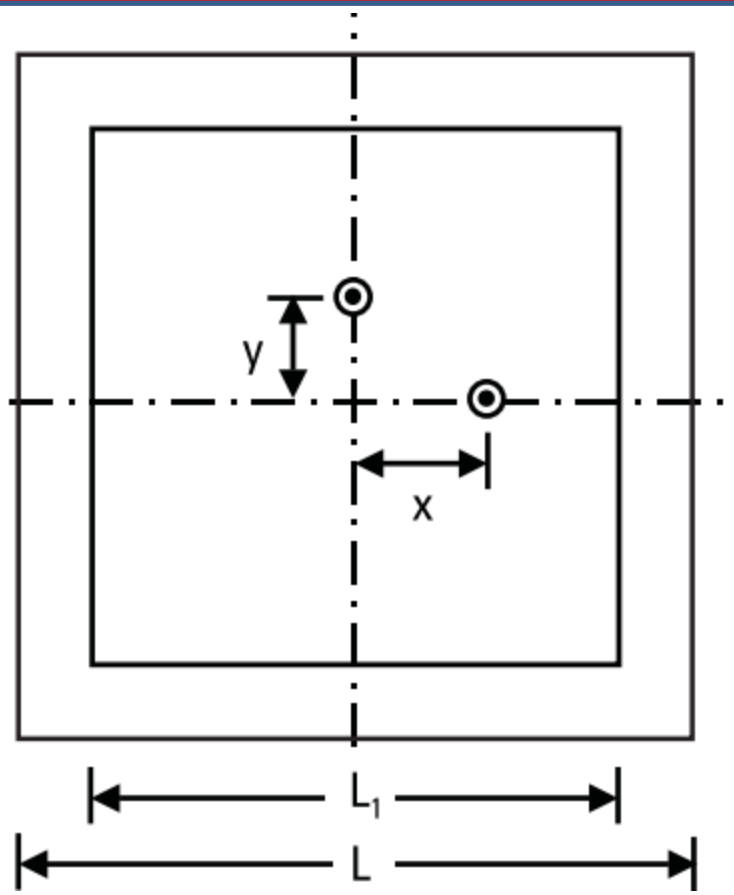
(a)



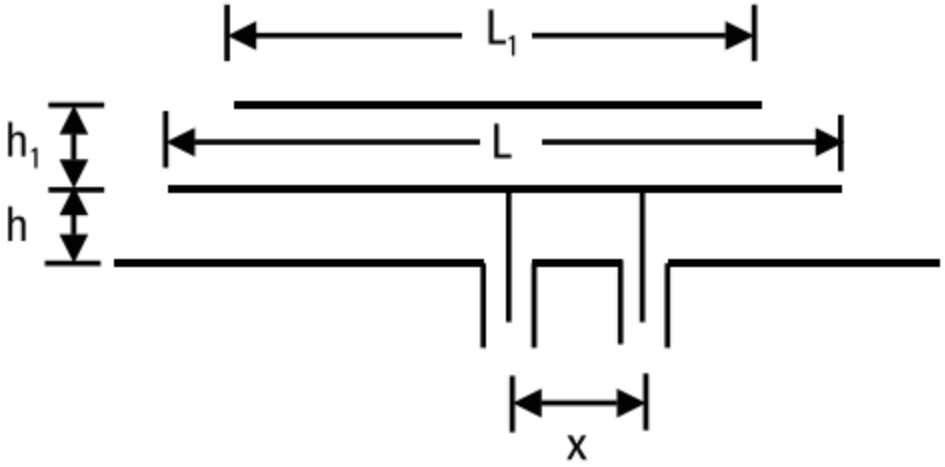
(b)

(a) Three gap-coupled and (b) five gap-coupled square patches with orthogonal feeds for CP

Stacked Broadband CP SMSA



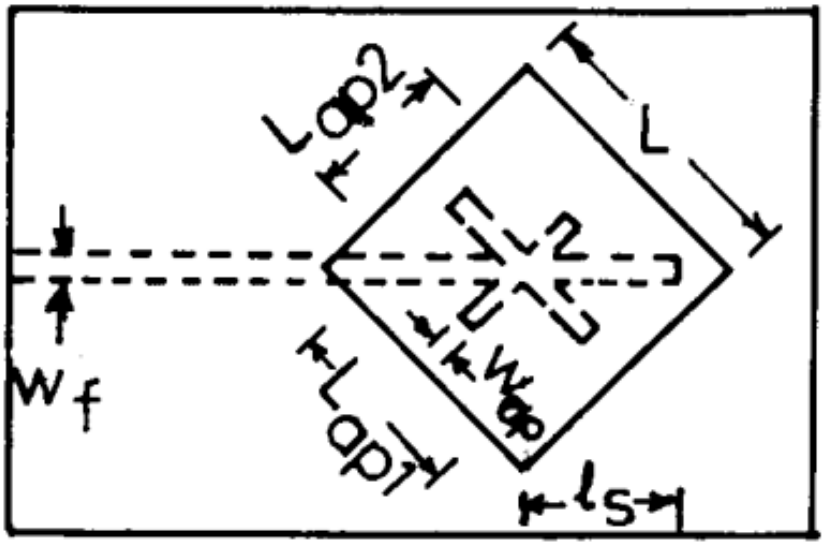
(a)



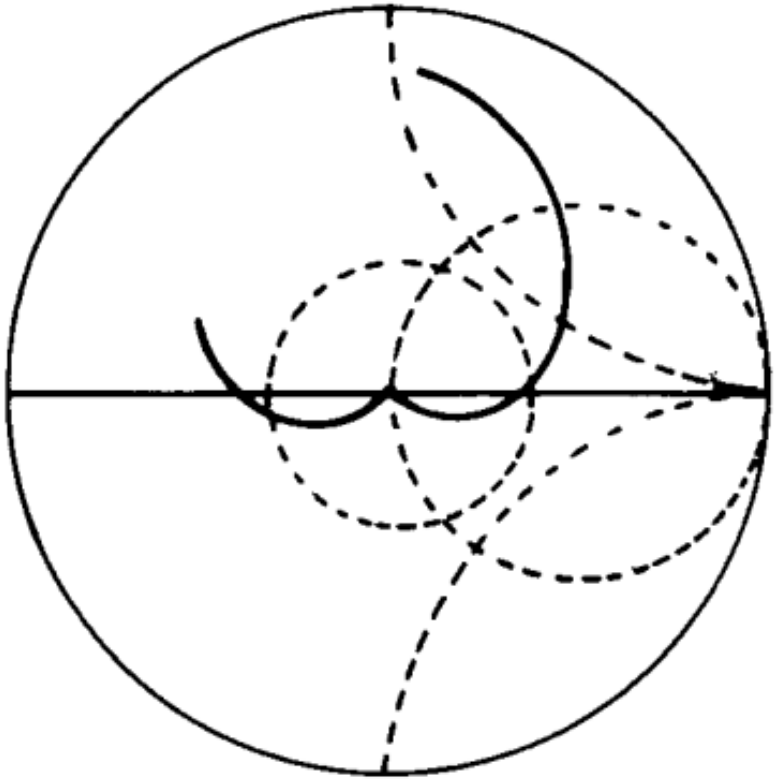
(b)

(a) Top and (b) side views of two stacked square patches

Aperture- Coupled Broadband CP MSA



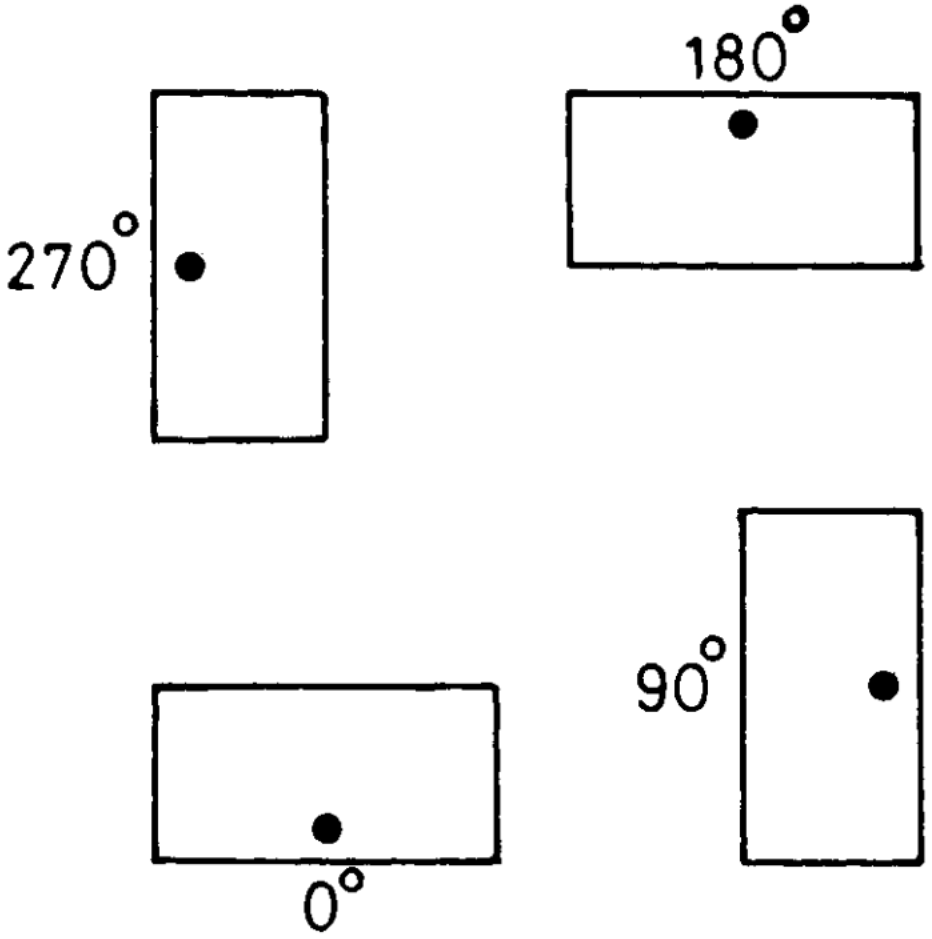
(a)



(b)

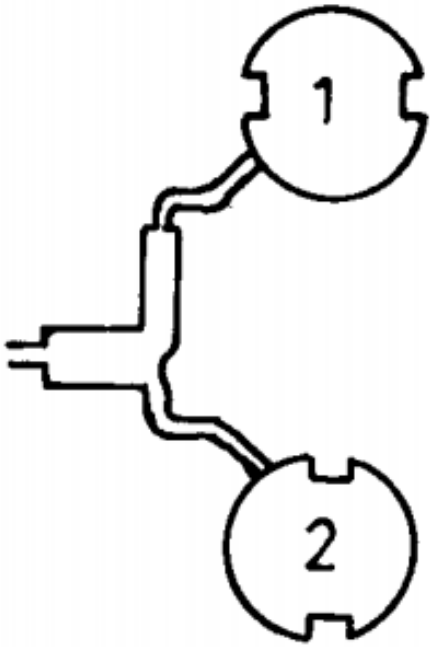
(a) Square patch with two orthogonal cross slots of unequal lengths and (b) its measured input impedance plot.

CP Array using Linearly Polarized Elements

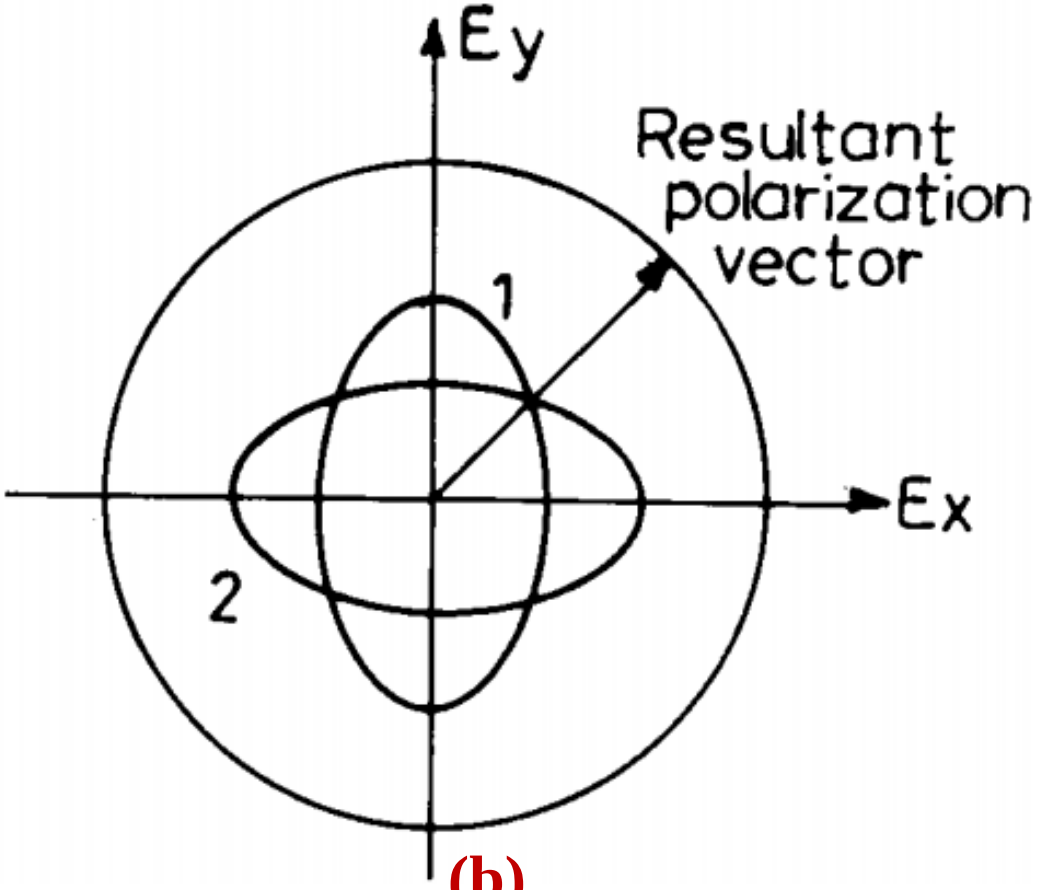


Two linearly polarized rectangular patches with 90° rotation and phase difference of 0°, 90°, 180°, and 270°

2-Elements Sequentially Rotated Array using CP MSAs



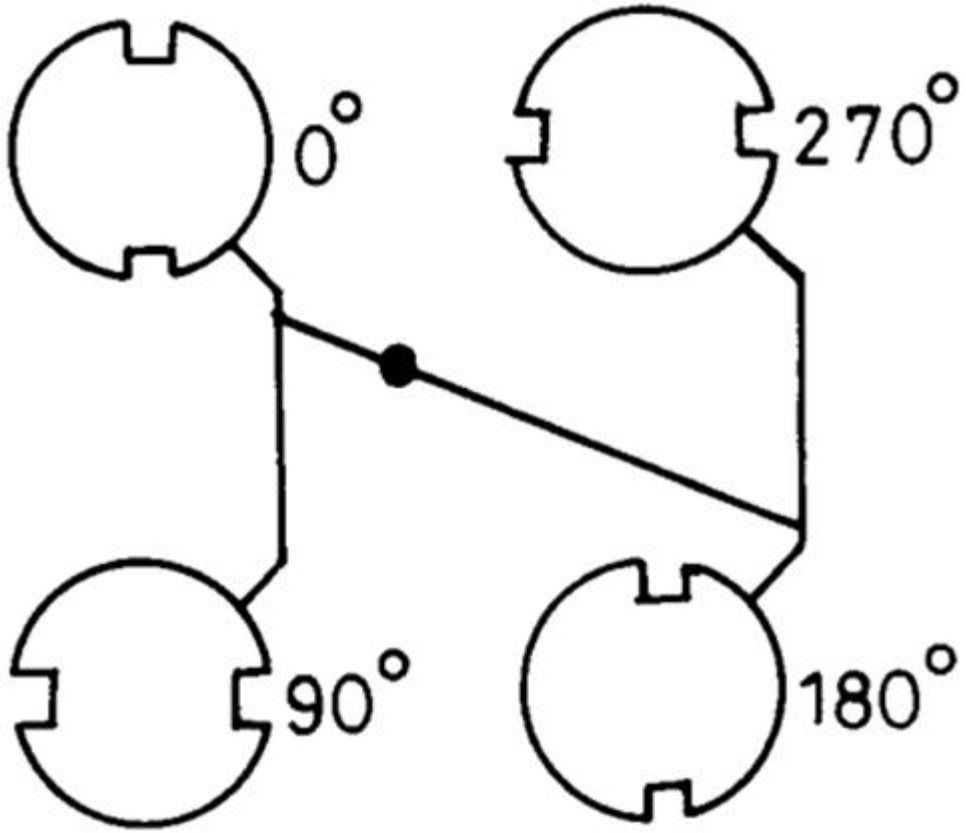
(a)



(b)

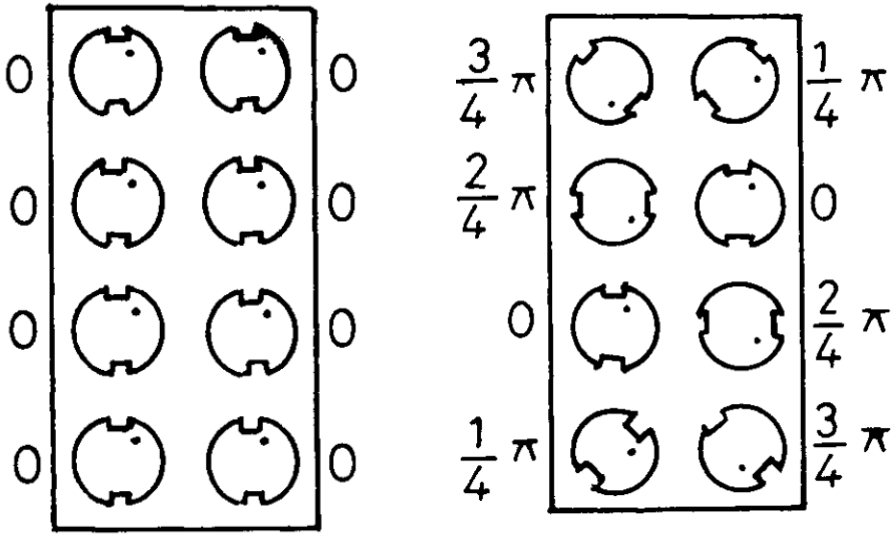
(a) Sequentially rotated array of two CP circular elements and (b) superimposed CP response of the two elements

4-Elements Sequentially Rotated Array using CP MSAs

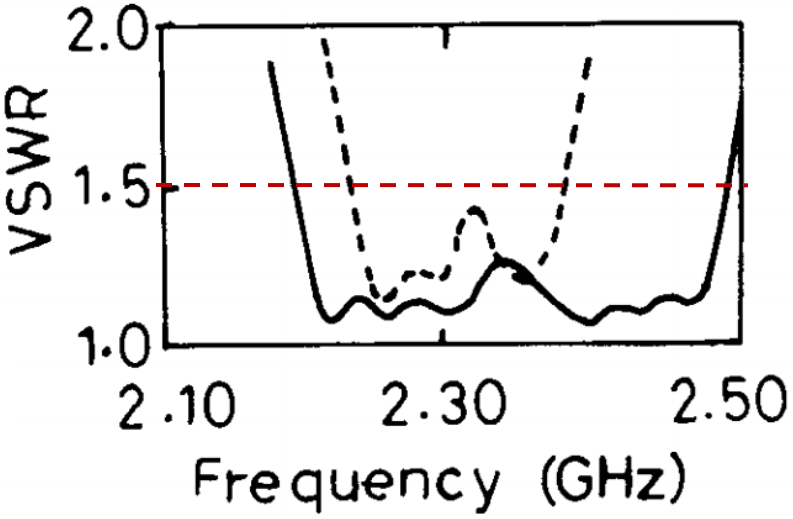


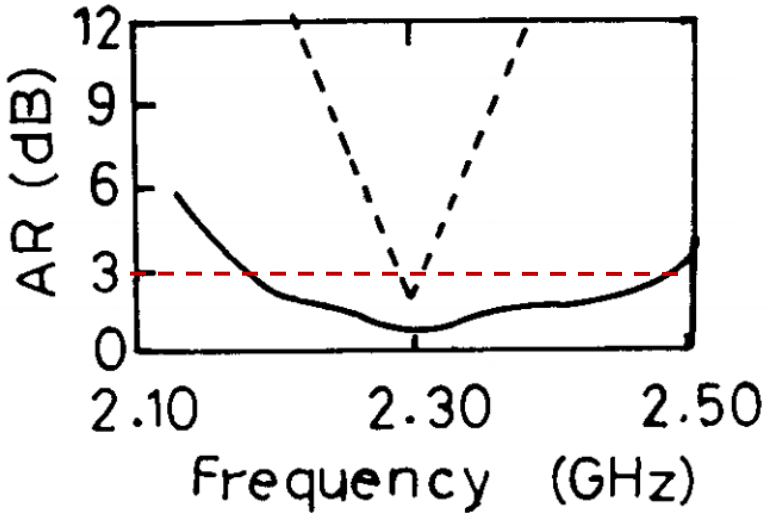
Sequential array of four CP elements with 90° rotation and phase difference of 0°, 90°, 180°, and 270°.

CP Array using CP Elements – VSWR and AR



2 × 4 arrays of circular patches with two notches: conventional and sequentially rotated.





Measured VSWR and AR plots

(- - -) conventional and (——) sequentially rotated.