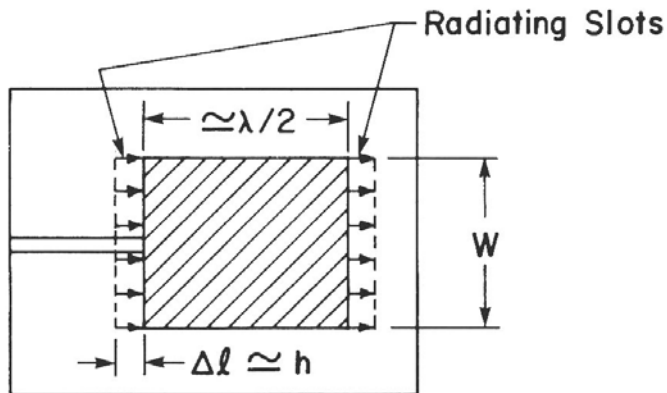
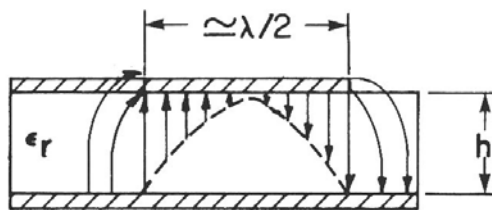
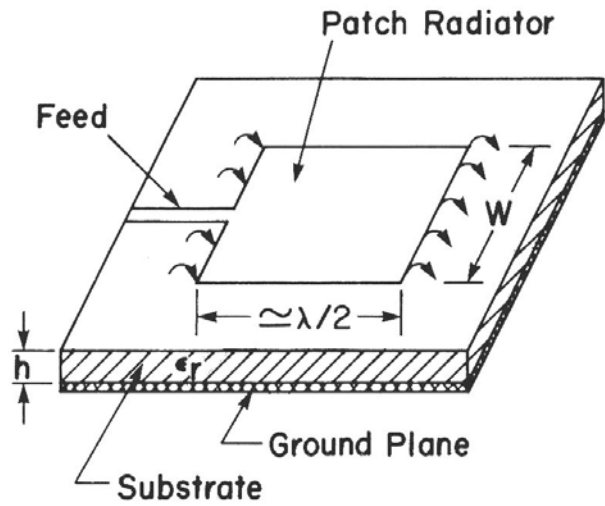
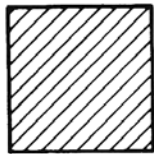


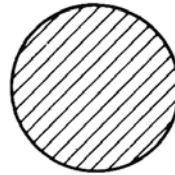
# Antenna patch rettangolare



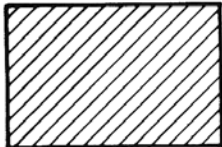
# Varie forme di antenne stampate



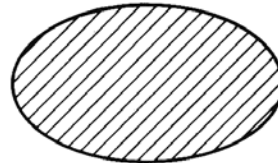
**Square**



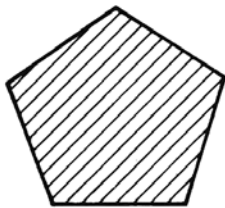
**Disk**



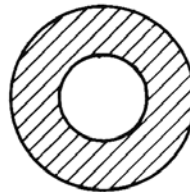
**Rectangular**



**Ellipse**



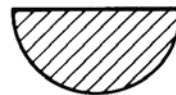
**Pentagon**



**Ring**



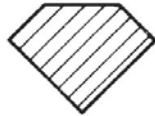
**Equilateral  
Triangle**



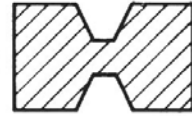
**Semi Disk**

# altre forme di antenne stampate

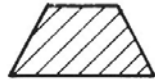
Truncated Square



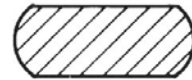
Rectangular with Trapezoidal Edges



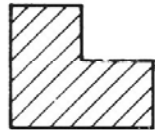
Trapezoidal



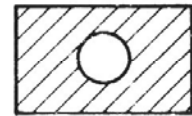
Truncated Circle



L-shape



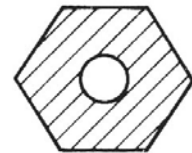
Rectangle with Inner Circle



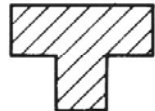
Cross-junction Shape



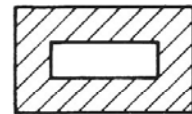
Hexagonal with Inner Circle



T-shape



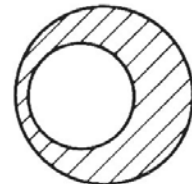
Rectangular Ring



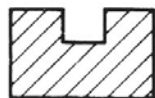
Meinke Shape



Eccentric Circular Ring



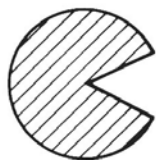
U-shape



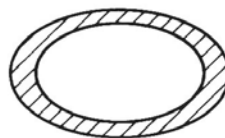
Star Shape



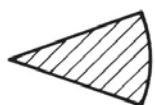
# altre forme di antenne stampate



Disk with Slot



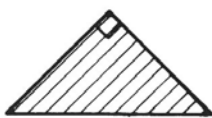
Elliptical Ring



Disk Sector



Semi Ring

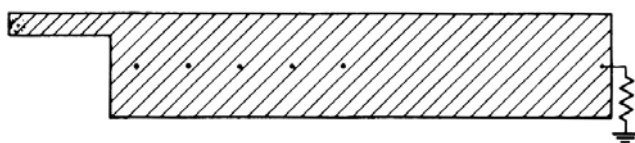
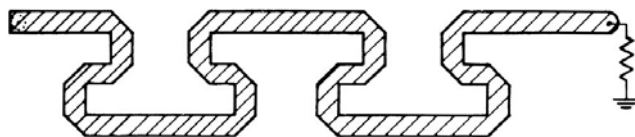
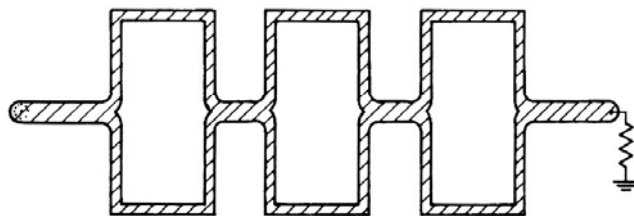
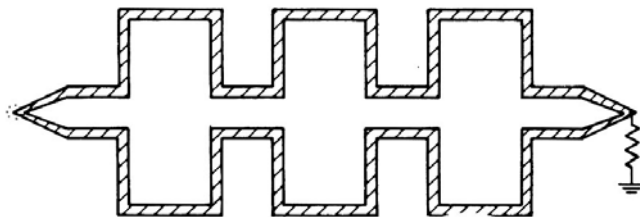
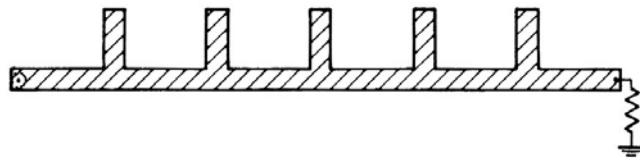


Right-Angled  
Isosceles Triangle

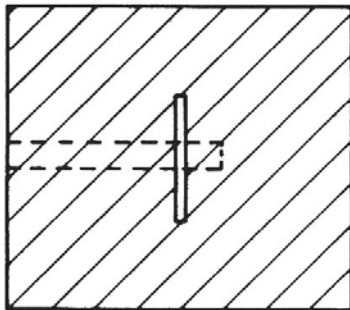


Ring Sector

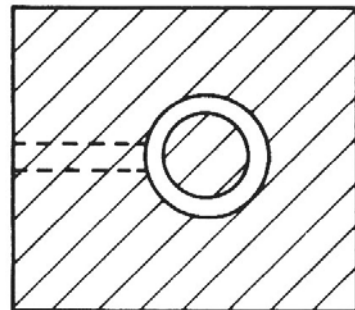
# antenne stampate ad onda viaggiante



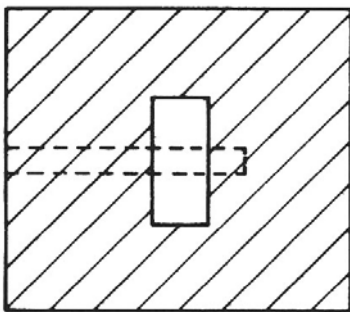
# antenne a fenditura



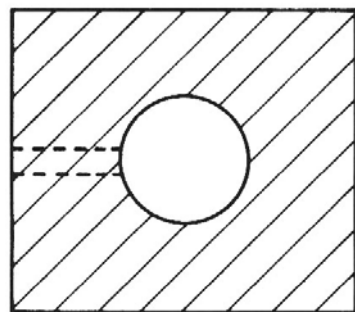
**Narrow Slot**



**Circular Ring Slot**



**Wide Slot**

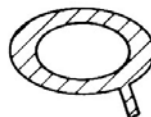
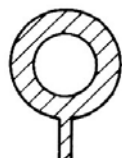
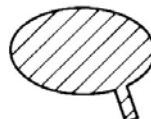
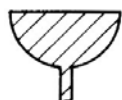
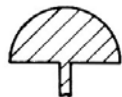
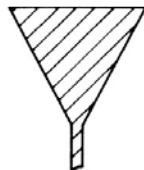
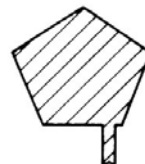
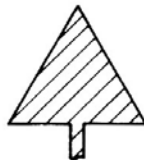
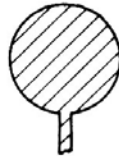
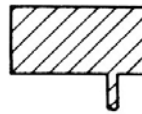
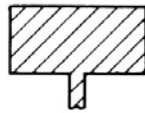


**Circular Patch Slot**

# Varie forme di antenne stampate con alimentazione in microstriscia

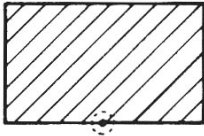
Center Fed  
Microstrip Antennas

Off-Center Fed  
Microstrip Antennas

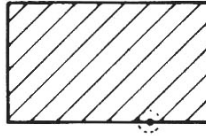


# Varie forme di antenne stampate con alimentazione in coassiale

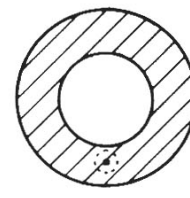
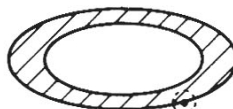
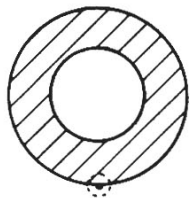
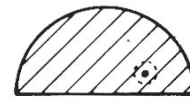
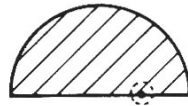
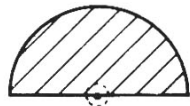
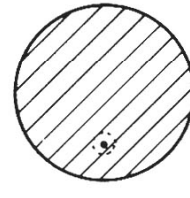
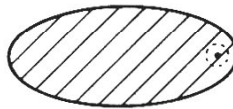
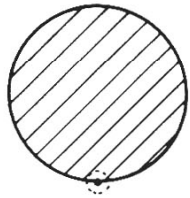
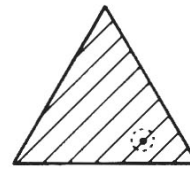
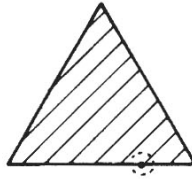
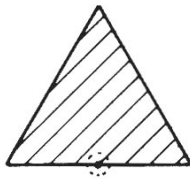
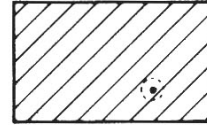
Center Fed  
Microstrip Antennas



Off-Center Fed  
Microstrip Antennas

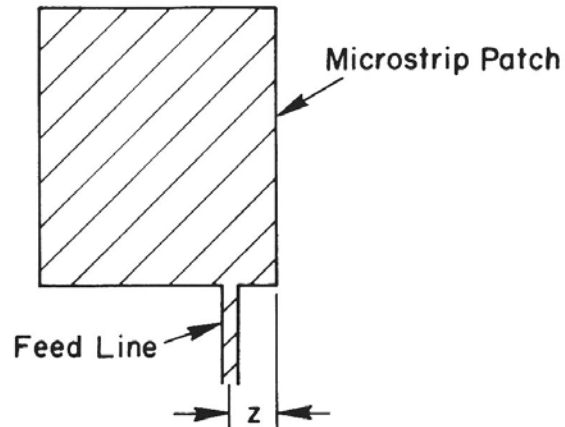
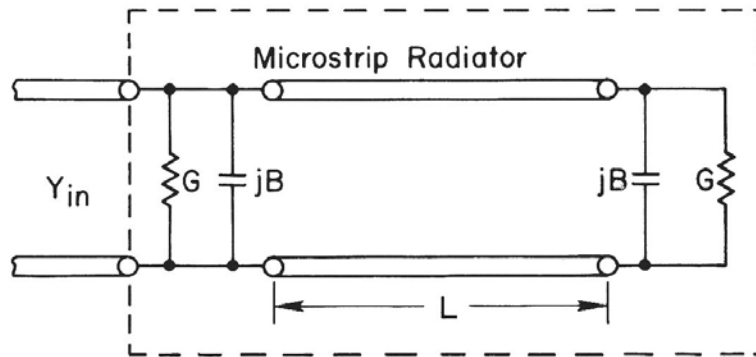


Arbitrary Fed  
Microstrip Antennas



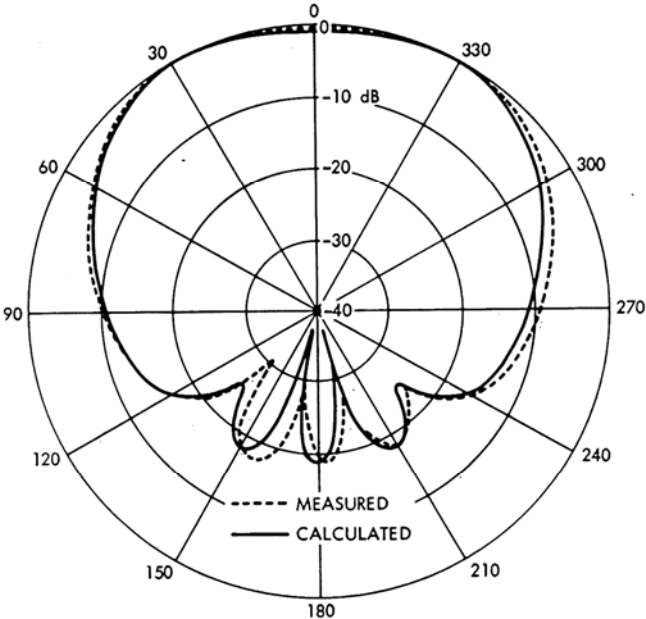


# Circuito equivalente di un radiatore patch rettangolare, alimentato in microstriscia

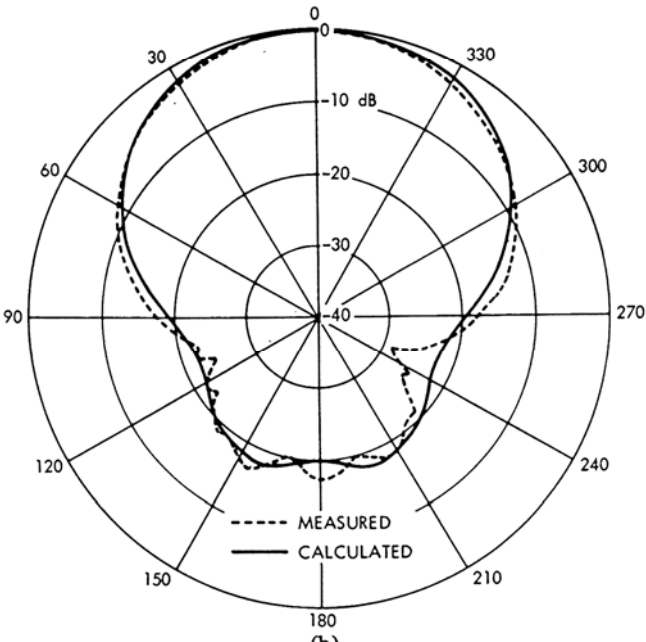


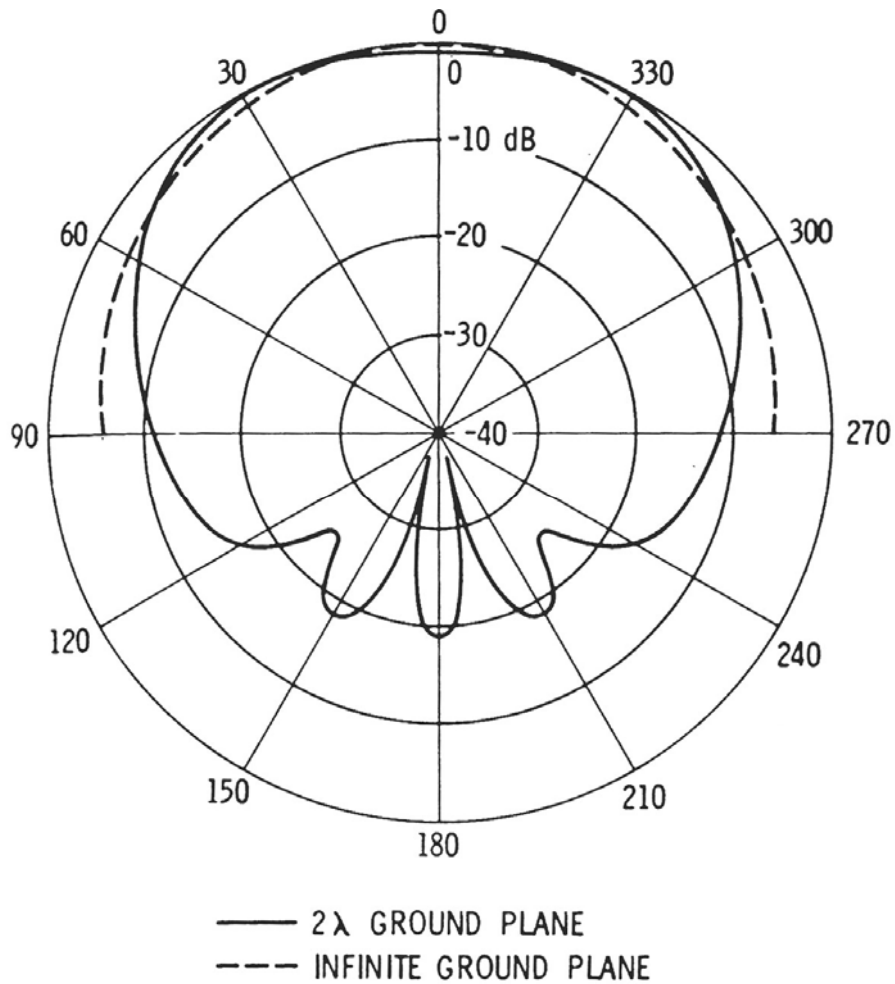
# diagramma di radiazione di un patch rettangolare

piano E



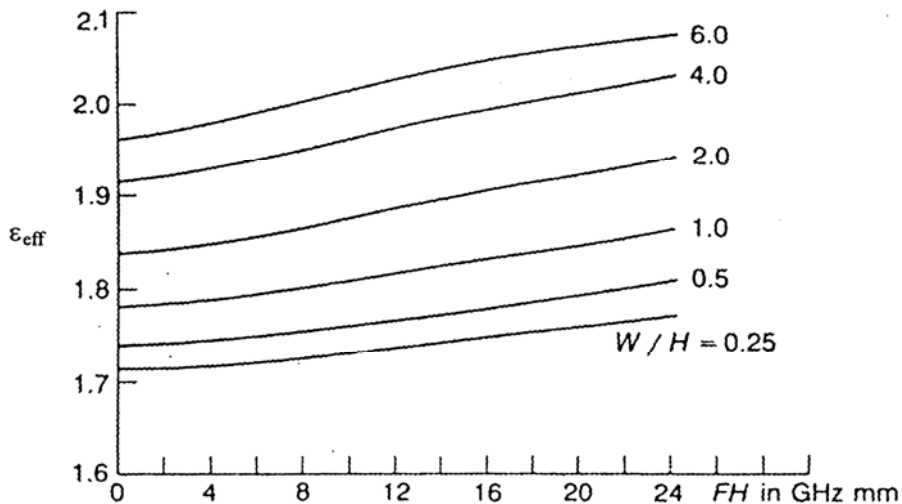
piano H



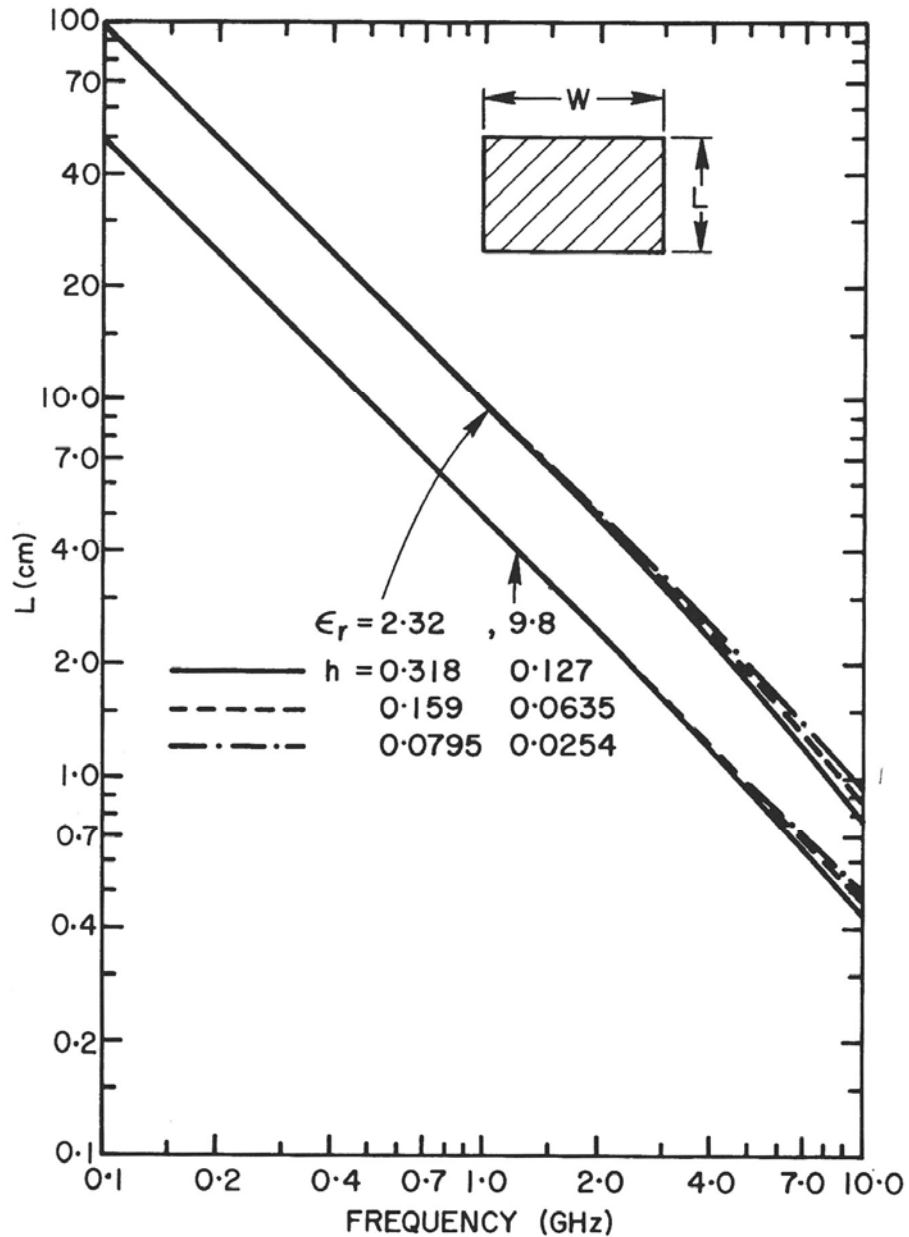


confronto tra i diagrammi di radiazione sul piano E (calcolati),  
relativi a patch rettangolari su piano di massa di dimensione  $2\lambda$   
e piano di massa infinito

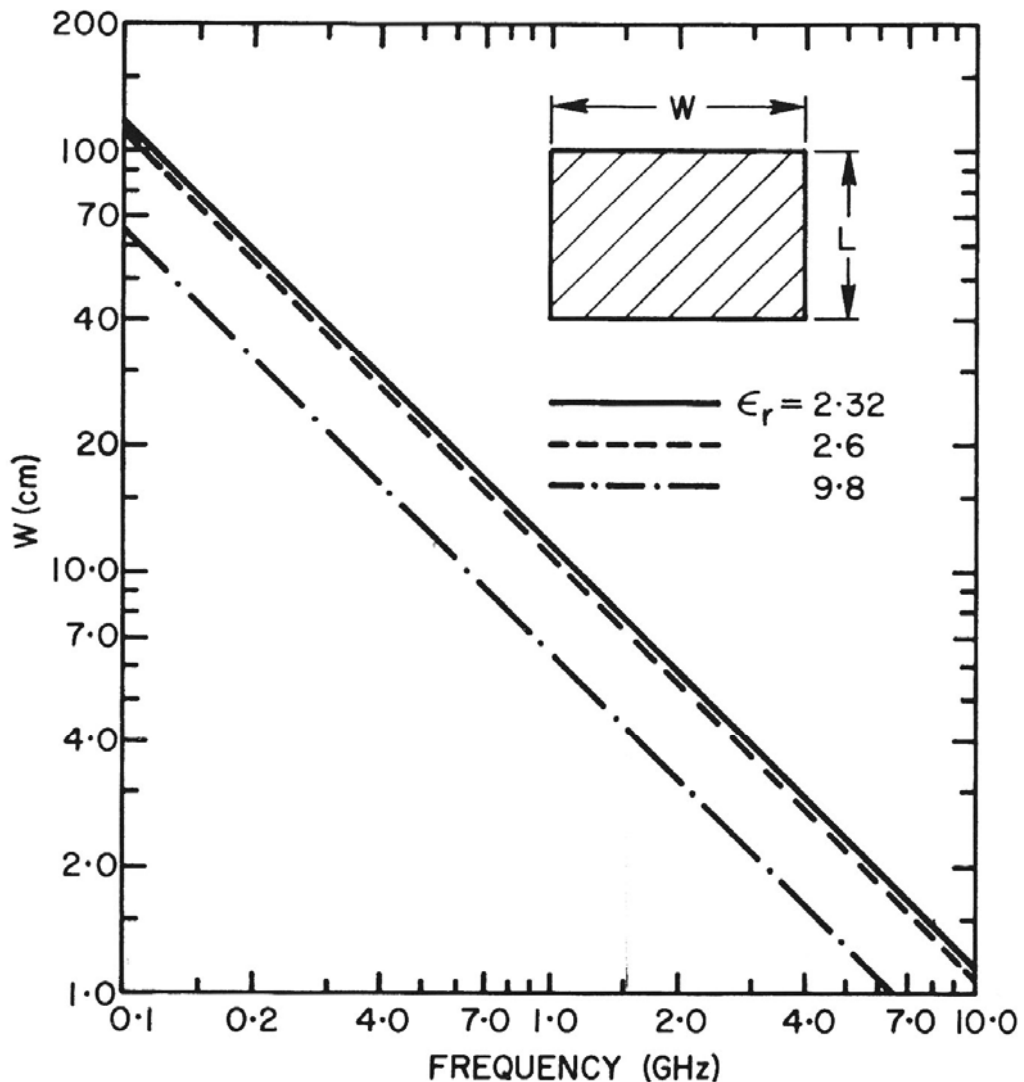
variazione della costante dielettrica efficace per substrato a base di PTFE con microfibre di vetro ( $\epsilon_r = 2.26$ ) in funzione del prodotto frequenza spessore del substrato



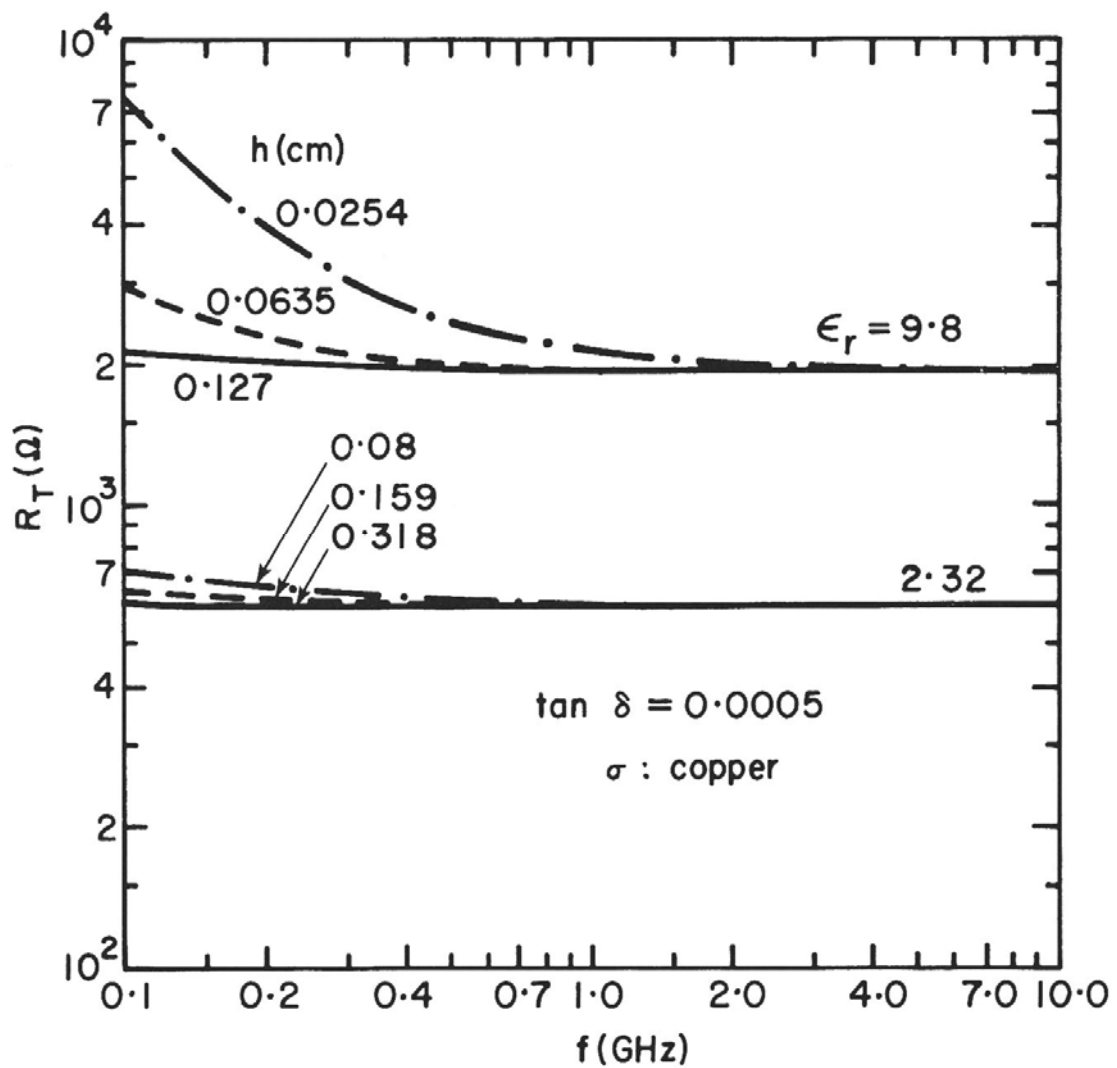
lunghezza di un patch rettangolare risonante, in funzione della frequenza e per diversi substrati dielettrici



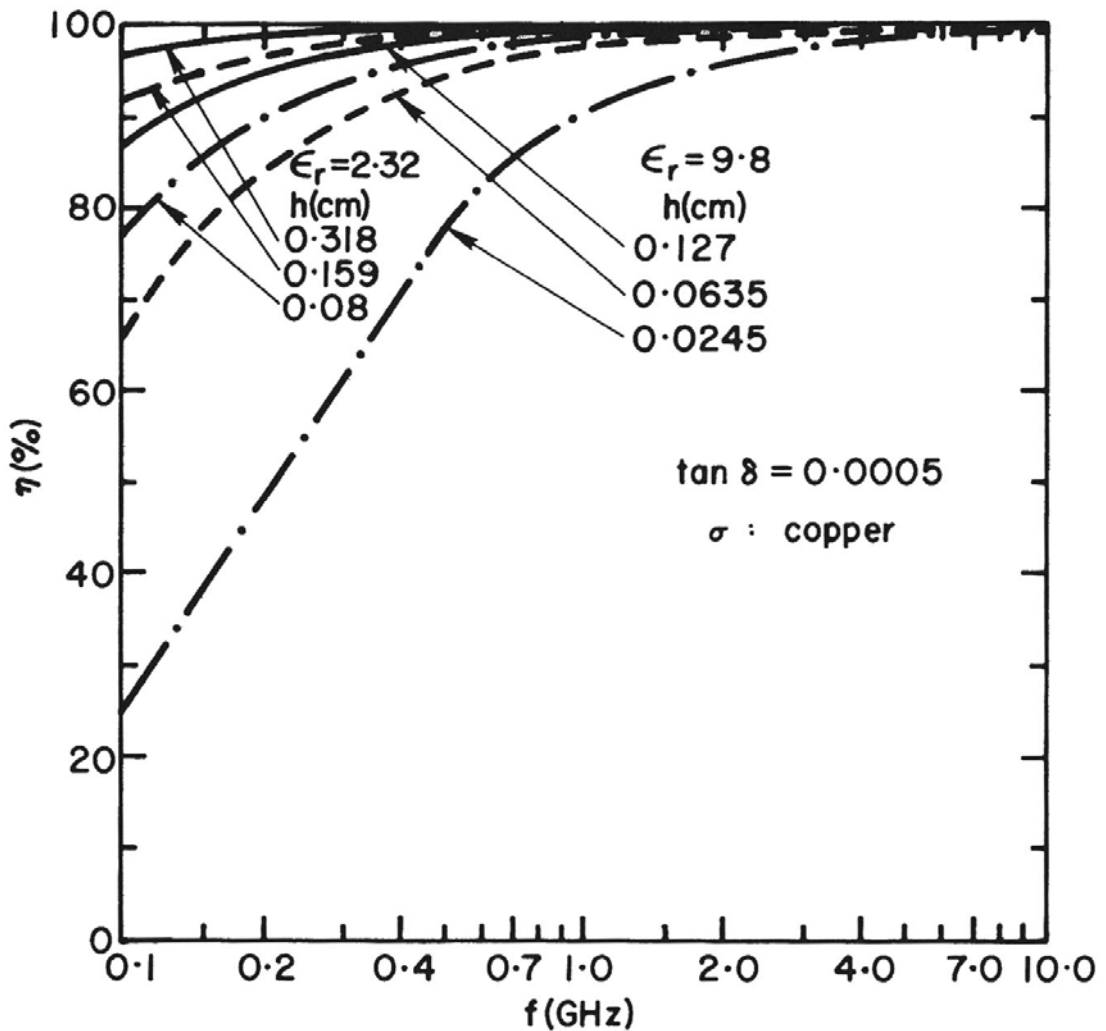
larghezza del patch rettangolare che realizza l'adattamento dell'antenna alla microstriscia a  $50 \Omega$ , in funzione della frequenza e per diversi substrati dielettrici



resistenza di radiazione di un patch rettangolare  
 in funzione della frequenza e per diversi  
 substrati dielettrici

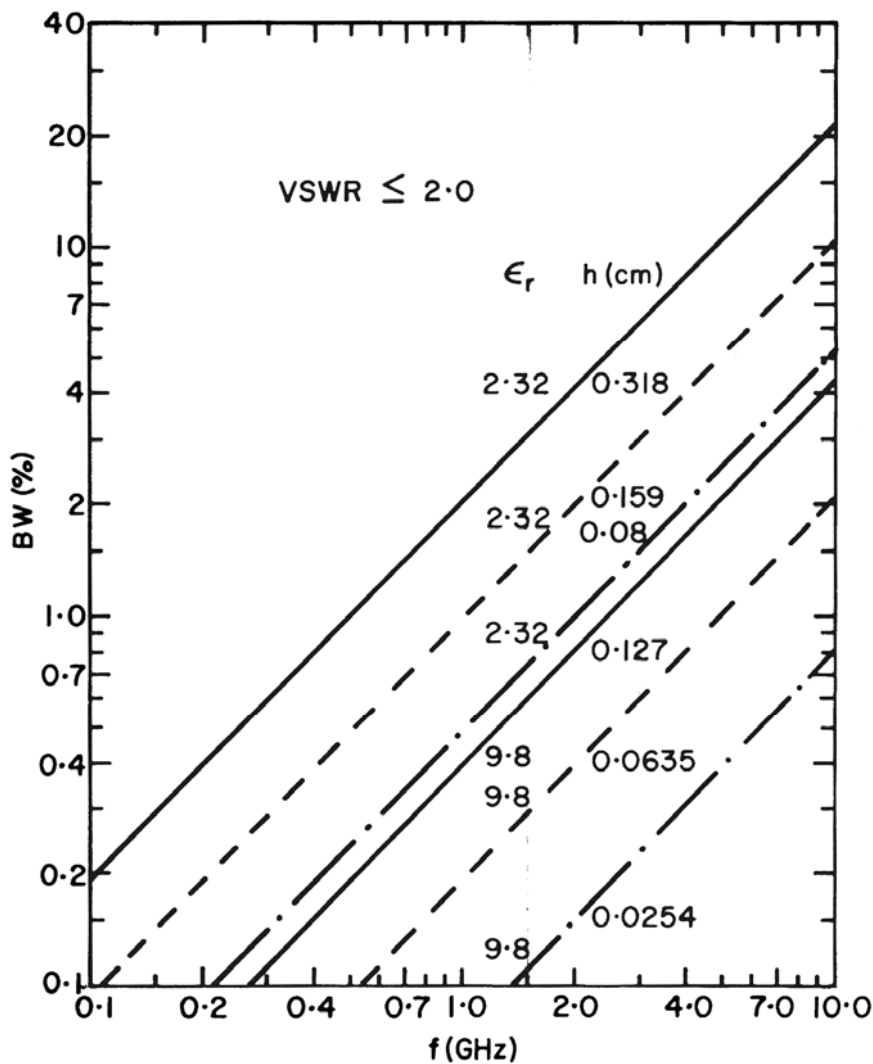


efficienza di radiazione di un'antenna patch rettangolare in funzione della frequenza e per diversi substrati dielettrici

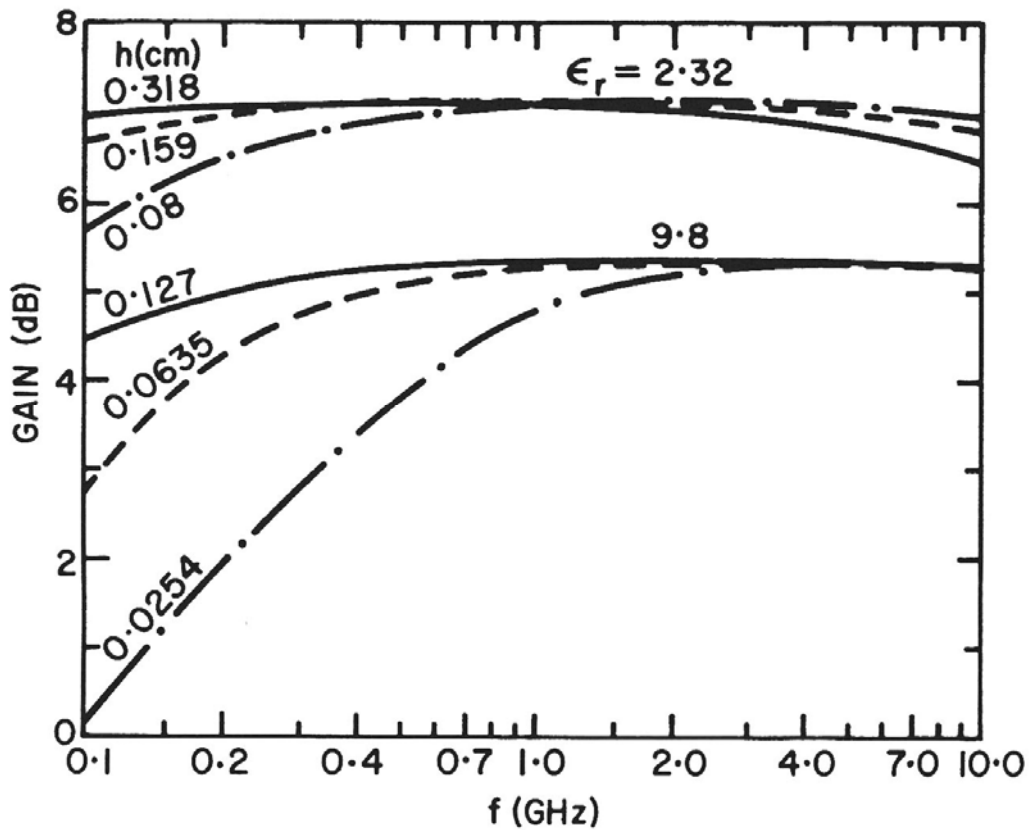




larghezza di banda di un'antenna patch rettangolare in funzione della frequenza e per diversi substrati dielettrici

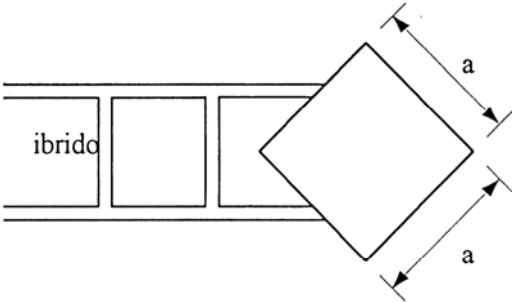


guadagno di un'antenna patch rettangolare in funzione della frequenza e per diversi substrati dielettrici

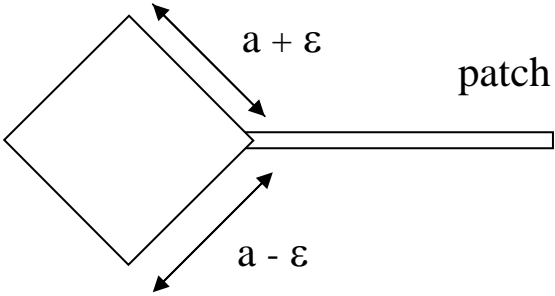
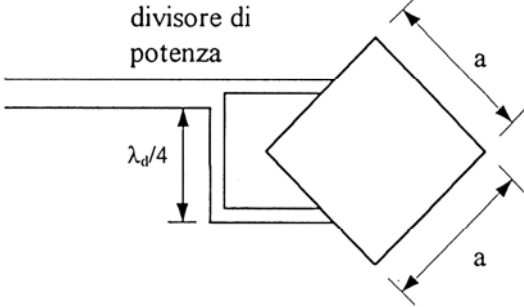


Laminate/Substrate	Dielectric Constant (X-Band)	Loss Tangent (X-Band)	Dimensional Stability	Chemical Resistance	Temperature Range °C	Relative Cost
PTFE Unreinforced	2.1	0.0004	Poor	Excellent	-27 to +260	High
PTFE Glass Woven Web	2.17 to 2.55	0.0009 to 0.0022	Excellent	Excellent	-27 to +260	Medium
PTFE Glass Random Fiber	2.17 to 2.35	0.0009 to 0.0015	Fair	Excellent	-27 to +260	Medium to High
PTFE Quartz Reinforced	2.47	0.0006	Excellent	Excellent	-27 to +260	High
Ceramic PTFE Composite	10.2	0.002	Excellent	Good	-15 to +170	High
Cross Linked Polystyrene	2.54	0.0005	Good	Good	-27 to +110	Medium
Cross Linked Polystyrene/ Glass Reinforced	2.62	0.001	Good	Good	-27 to +110	Low
Cross Linked Polystyrene/ Quartz Material	2.6	0.0005	Good	Good	-27 to +110	Medium to High
Cross Linked Polystyrene/ Woven Quartz	2.65	0.0005	Good	Good	-27 to +110	Medium to High
Cross Linked Polystyrene/ Ceramic Powder-Filled	3 to 15	0.0005 to 0.0015	Fair to Good	Fair	-27 to +110	Medium to High
Teflon/Unreinforced (unclad)	2.1	0.0004	Poor	Excellent	-27 to +260	Medium
Teflon/Glass Reinforced	2.55	0.0015	Good	Excellent	-27 to +260	Medium
Teflon/Ceramic Reinforced	2.3	0.001	Fair to Good	Excellent	-27 to +260	Medium to High
Teflon/Quartz Reinforced	2.47	0.0006	Good	Excellent	-27 to +260	High
Teflon/Ceramic Filled	10.3	0.002	Good	Excellent	-27 to +260	Low
Polyphenylene Oxide (PPO)	2.55	0.0016	Good	Poor	-27 to +193	Medium
Irradiated Polyolefin	2.32	0.0005	Poor	Excellent	-27 to +100	Low
Irradiated Polyolefin/ Glass Reinforced	2.42	0.001	Fair	Excellent	-27 to +100	Medium
Polyolefin/Ceramic Powder-Filled	3 to 10	0.001	Poor	Excellent	-27 to +100	High
Glass Bonded Mica	7.5	0.002	Excellent	Excellent	-27 to +593 Unclad	Medium to High
Silicone Resin/Ceramic Powder-Filled	3 to 25	0.0005 to 0.004	Fair to Good	Good	-27 to +268	High
Polyester/Ceramic-Powder Filled Glass Reinforced	6	0.017	Excellent	Excellent	-27 to +205	Medium
Sapphire	9	0.0004	Excellent	Excellent	-24 to +371	Very High
Ceramics (Typical)	6.5	0.0006	Excellent	Excellent	to +1650	Medium to High
Alumina	9.8	0.0004	Excellent	Excellent	to +1600	Medium to High
Beryllia (BeO)	6.8	0.0003	Excellent	Excellent	to +1250	Medium to High

# Metodi per ottenere polarizzazione circolare

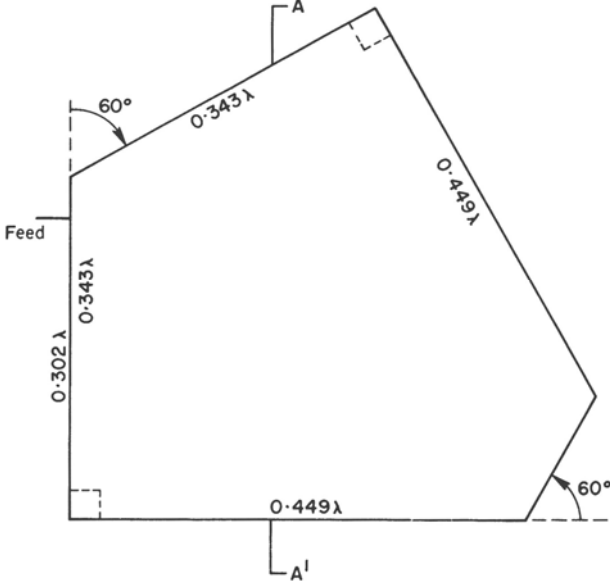


patch quadrato



patch quasi quadrato

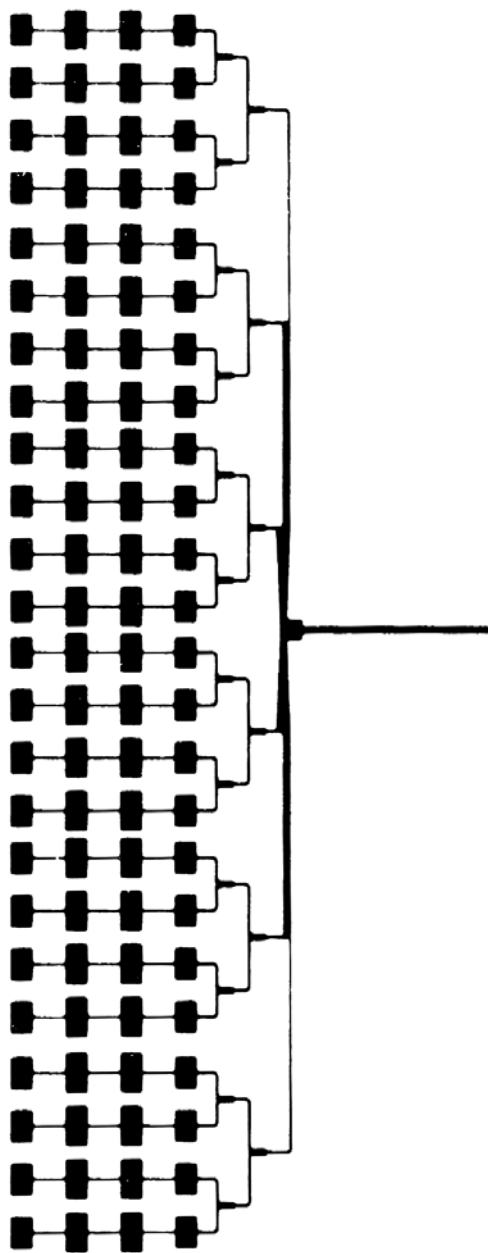
patch pentagonale



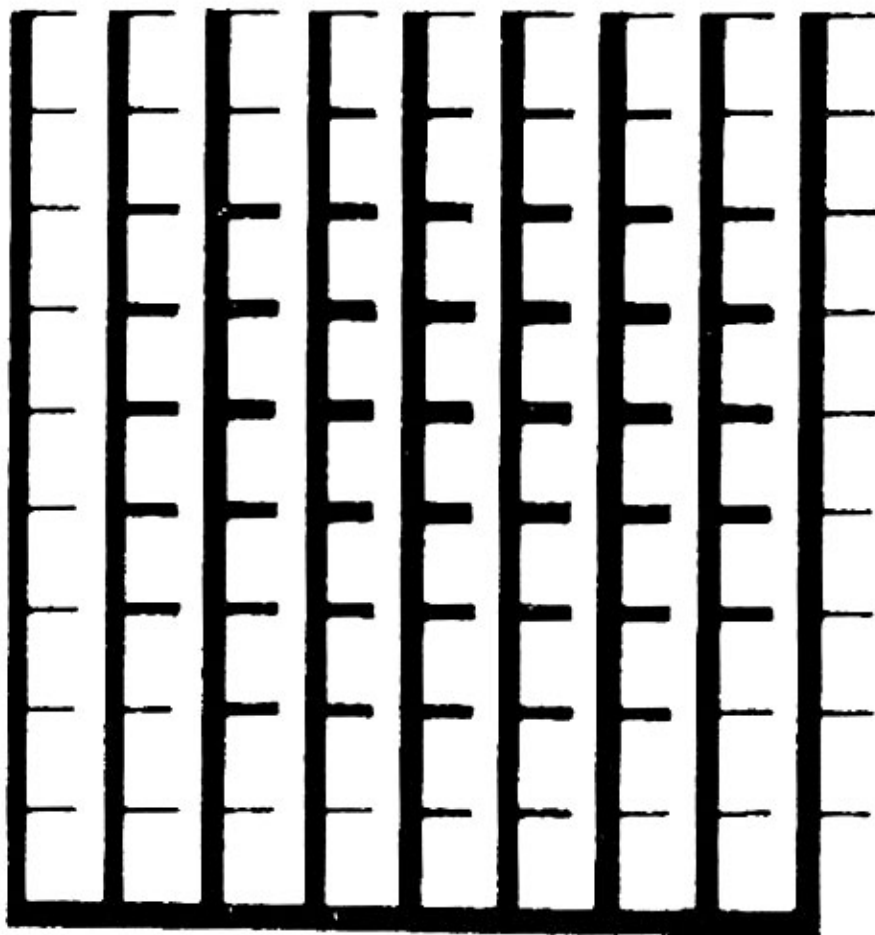
## Scelta ottimale dei parametri elettrici e geometrici per antenne in microstriscia

<b>CARATTERISTICHE</b>	<b>COSTANTE DIELETTRICA</b>	<b>TIPO DI SUBSTRATO</b>
BASSA RADIAZIONE DELL'ALIMENTAZIONE	ALTA	SOTTILE
SCARSA ECCITAZIONE ONDE SUPERFICIALI	BASSA	SOTTILE
BUON CONTROLLO DELLE TOLLERANZE	BASSA	SOTTILE
SCARSO ACCOPPIAMENTO MUTUO	BASSA	SOTTILE
SCARSE PERDITE DI ARRAY	ALTA	SOTTILE
LARGHEZZA DI BANDA ELEVATA	BASSA	SPESSO

antenna a schiera di patch rettangolari in  
microstriscia (AEG-Telefunken)

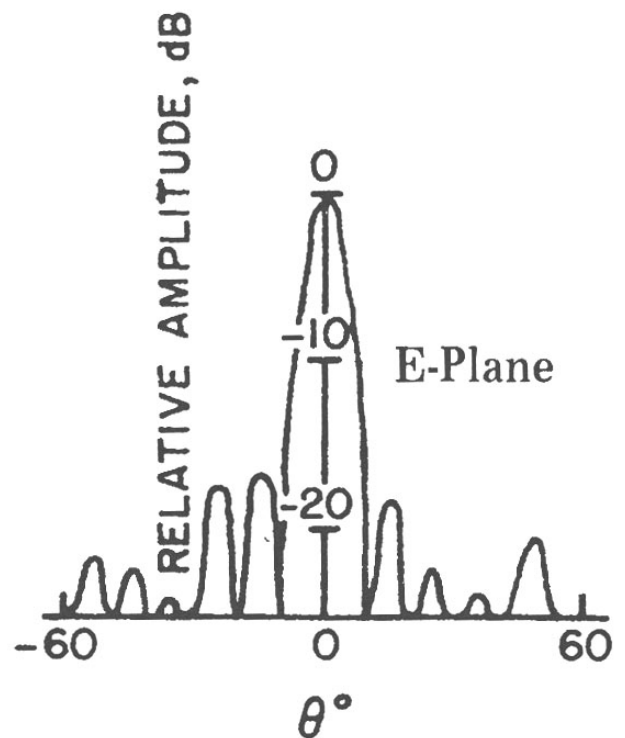
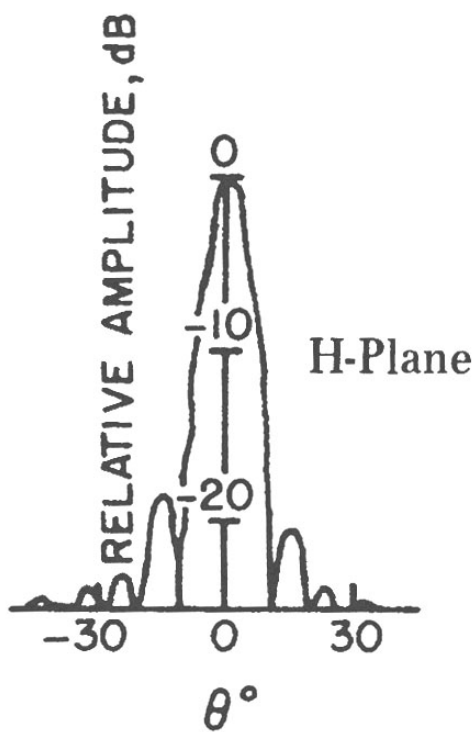


schiera piana di 9 schiere lineari di 9 stub radianti



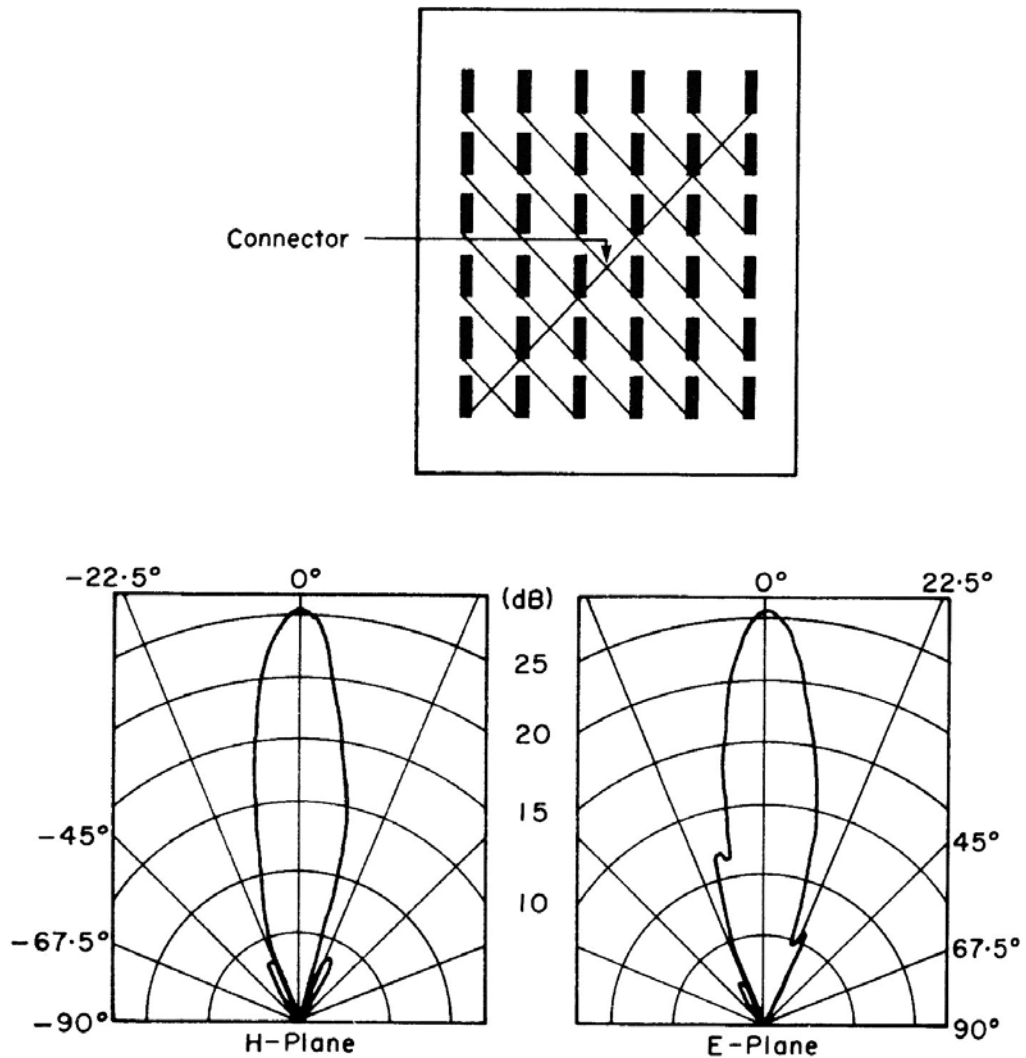
frequenza di lavoro 17.196 GHz,  
guadagno 20 dB.

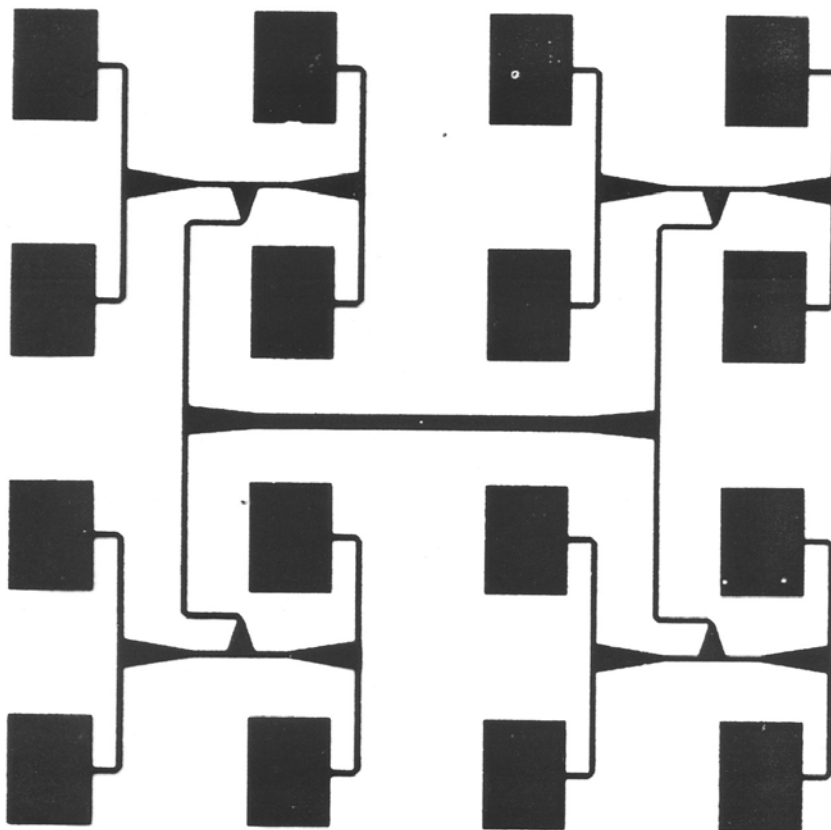
diagrammi di radiazione sul piano H e sul piano E dell'antenna a schiera piana di 9 schiere lineari di 9 stub radianti





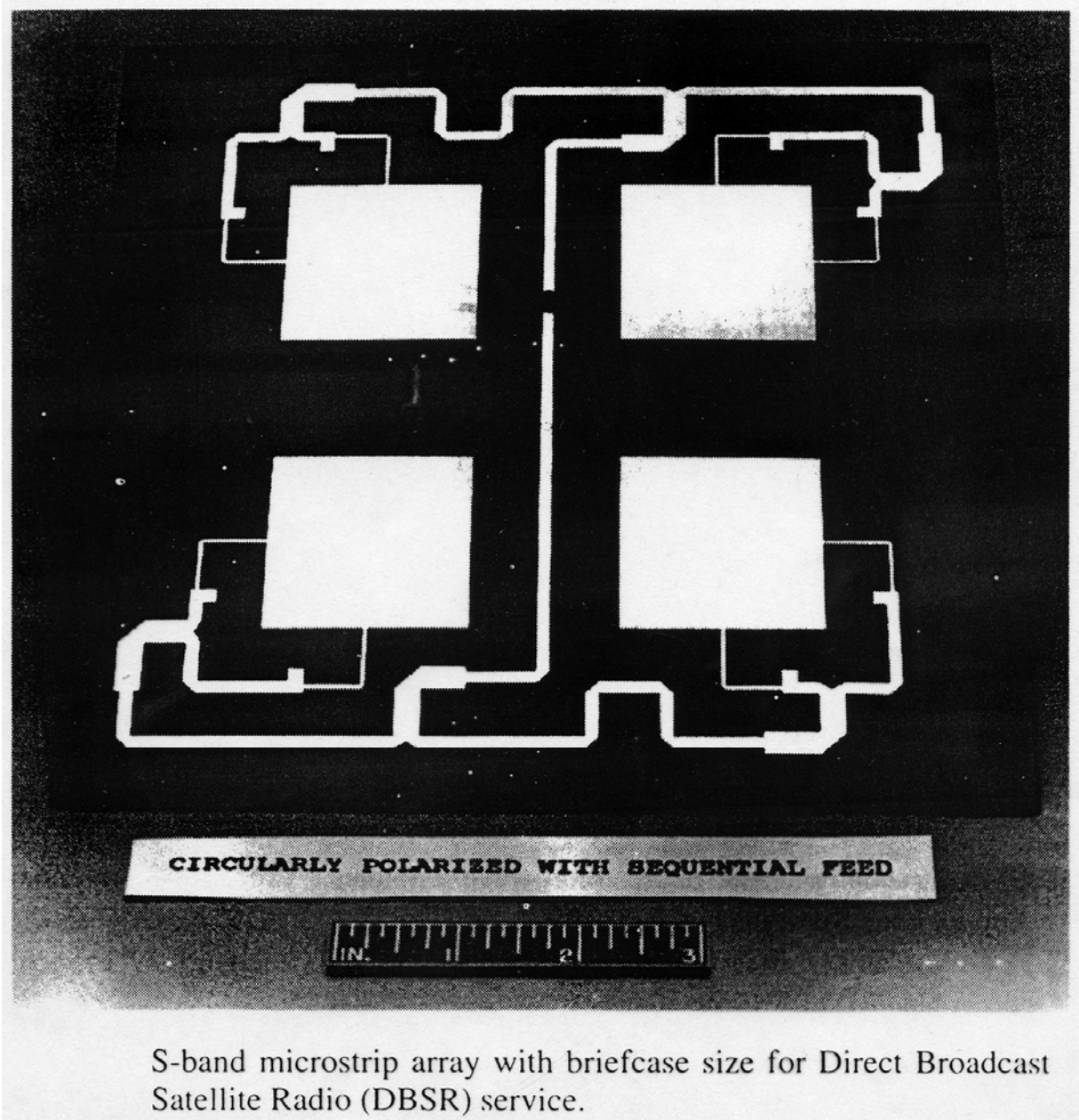
schiera di i  $6 \times 6$  patch con alimentazione incrociata e relativi diagrammi di radiazione sul piano H e sul piano E alla frequenza di 9.3 GHz.





*Silhouette of corporately fed patch array for linear polarisation  
with uniform aperture distribution*

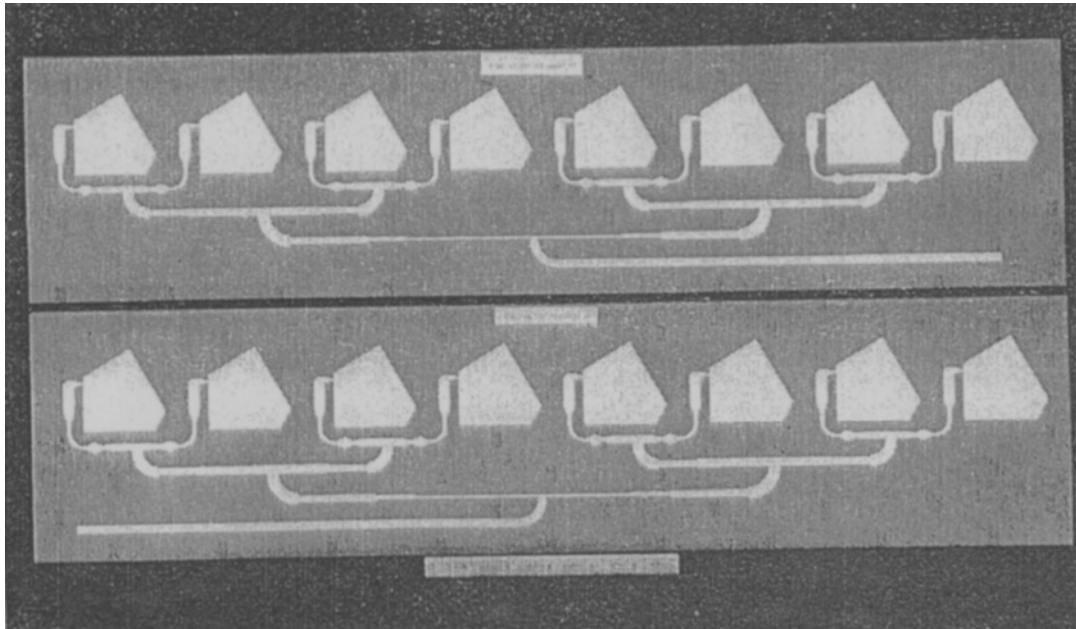
$\epsilon_r = 2.32$ ;  $h = 1.59$  mm;  $h/\lambda_0 = 0.06$ ; frequency = 12.0 GHz;  $d/\lambda_0 = 0.7$



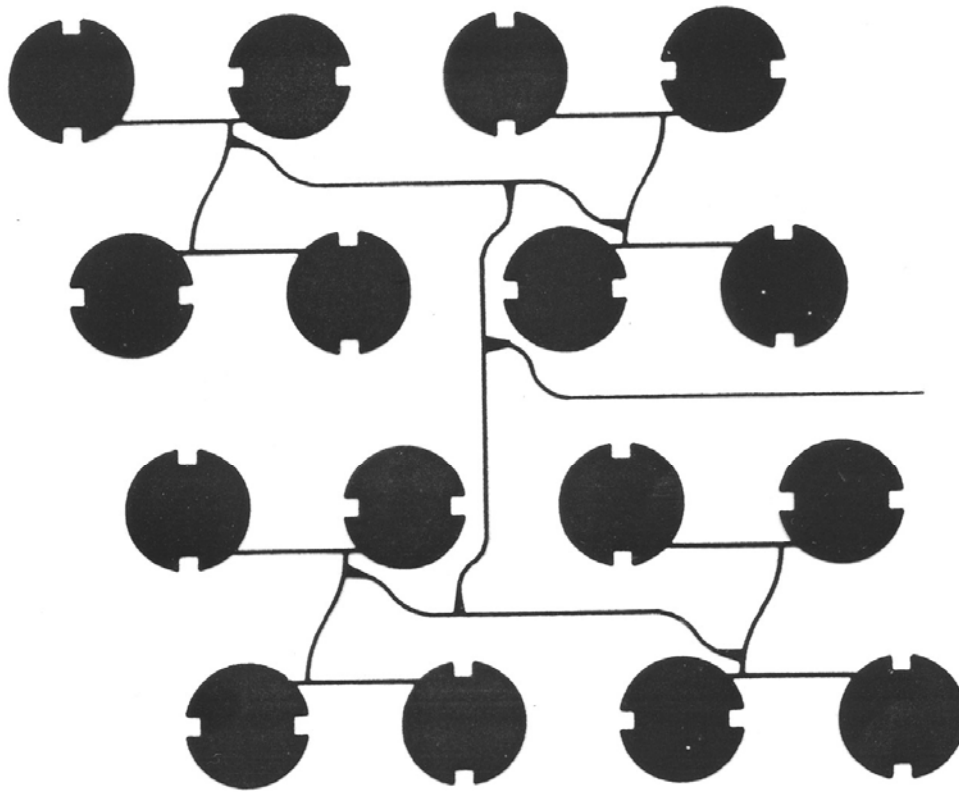
**CIRCULARLY POLARIZED WITH SEQUENTIAL FEED**



S-band microstrip array with briefcase size for Direct Broadcast Satellite Radio (DBSR) service.

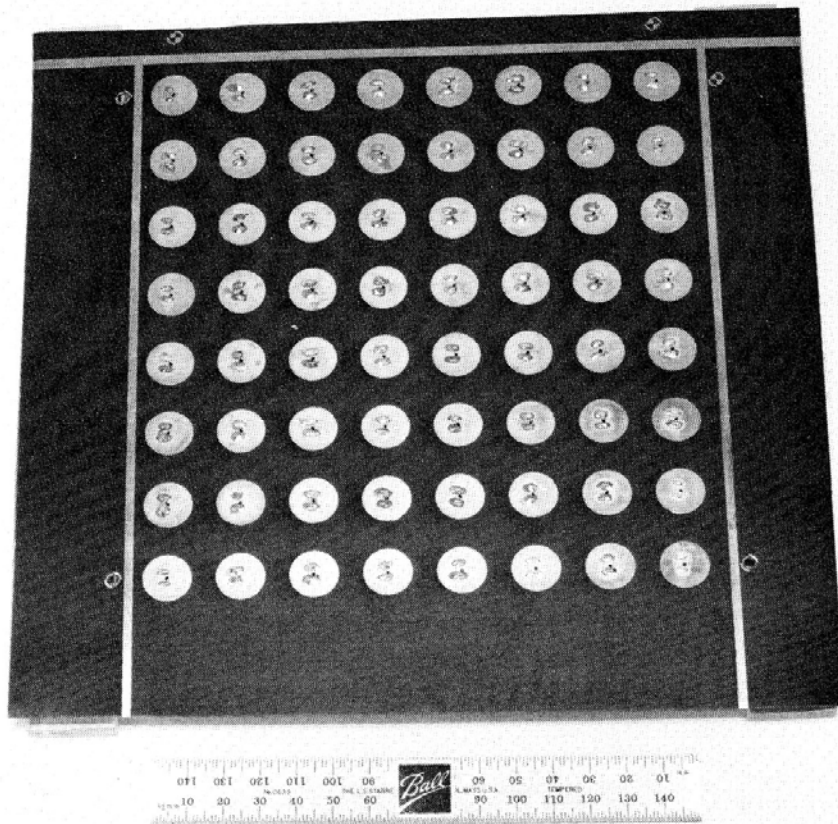


antenna a schiera di radiatori in microstriscia funzionante in banda S con polarizzazione circolare e circuito di formazione del fascio di tipo gerarchico reattivo.



*Silhouette of disc array for circular polarisation using sequentially rotated feeding*

schiera di  $8 \times 8$  patch in microstriscia a scansione elettronica del fascio per SHF SATCOM. La scansione del fascio è controllata da microprocessore e realizzata con sfasatori digitali a 3 bit implementati con diodi PIN.

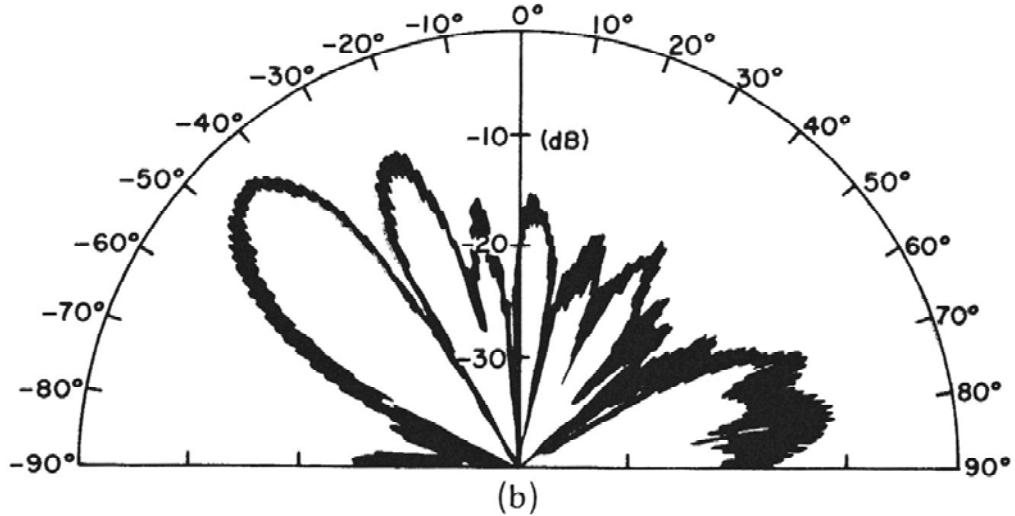
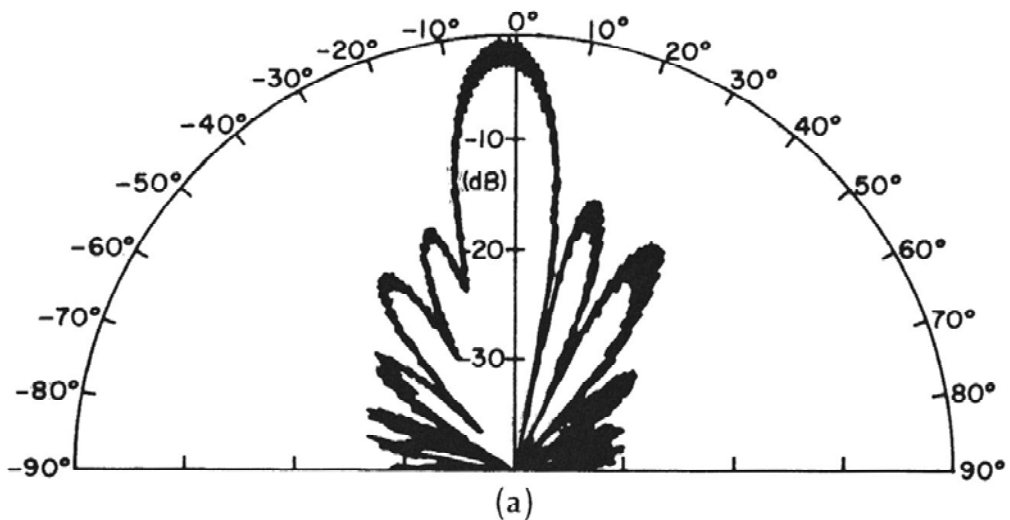


frequenza di lavoro 7.5 GHz,  
guadagno 19.8 dB,  
larghezza di banda 500 MHz,  
polarizzazione circolare sinistrorsa,

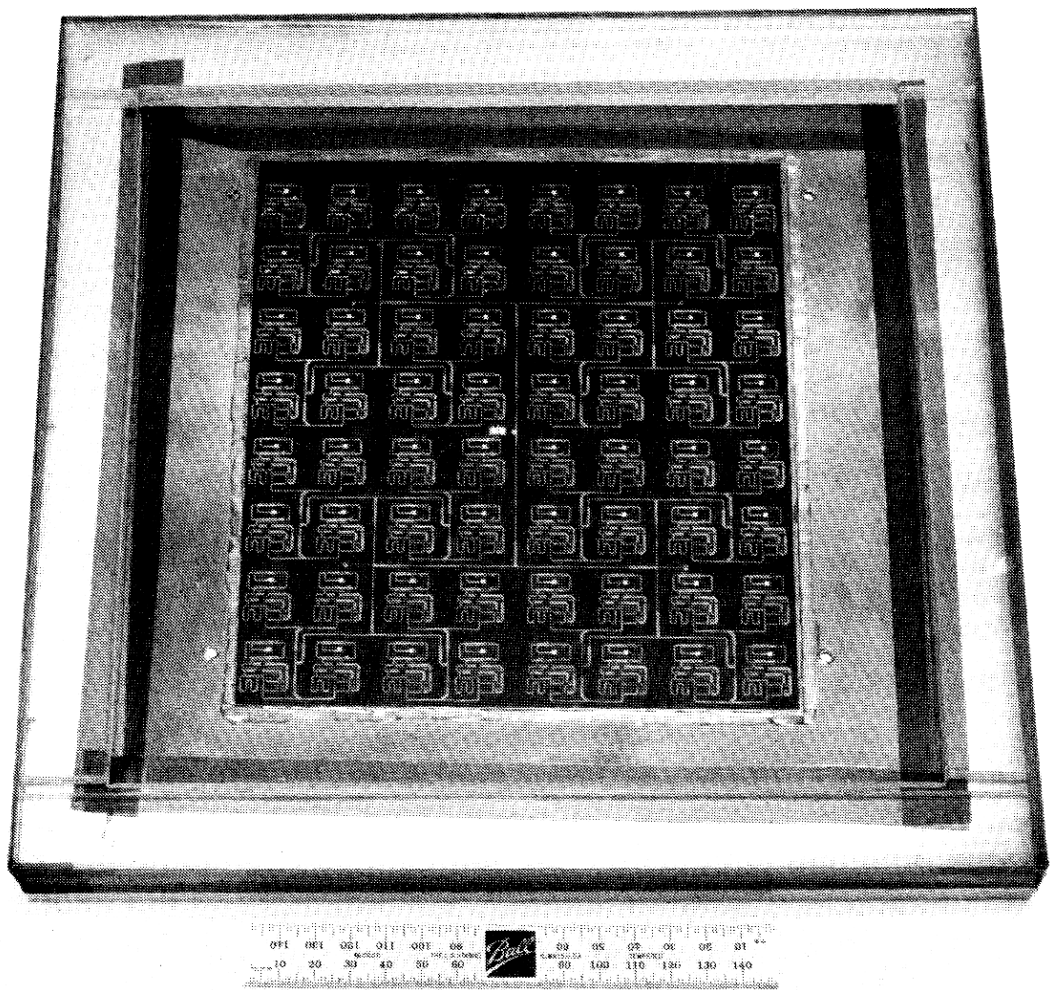
diagrammi di radiazione dell'antenna a schiera  
per SHF SATCOM :

a) fascio in posizione broadside,

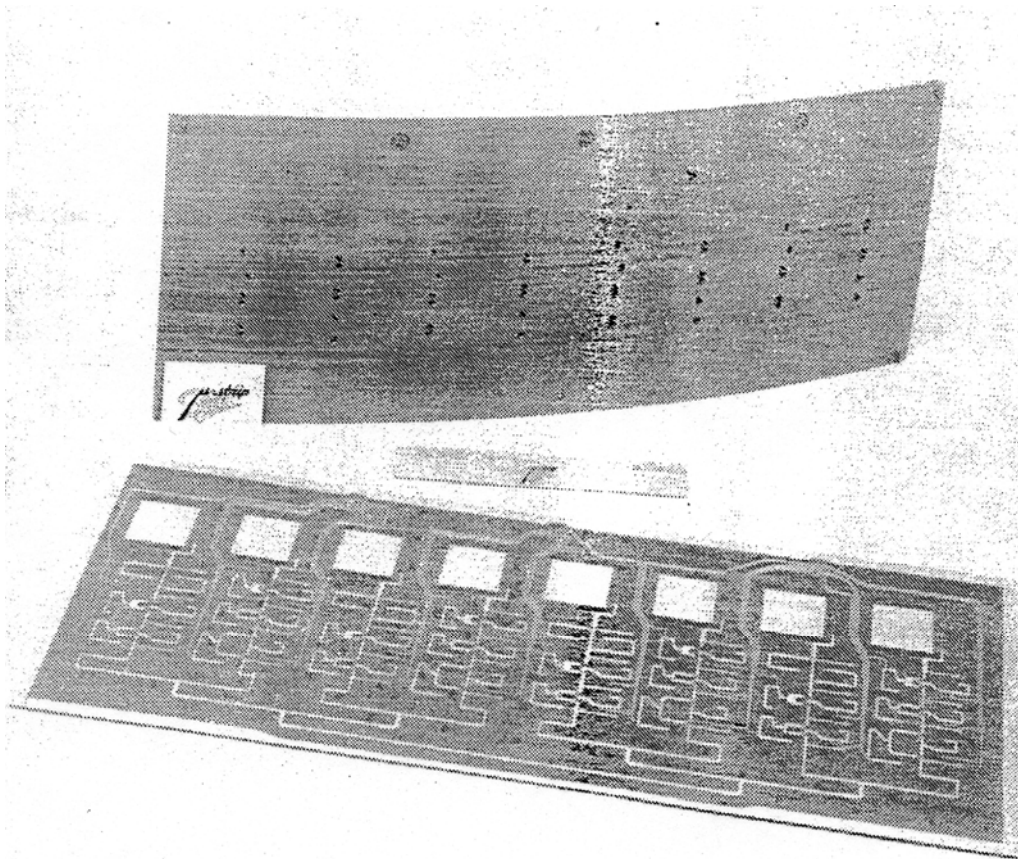
b) fascio a  $45^\circ$



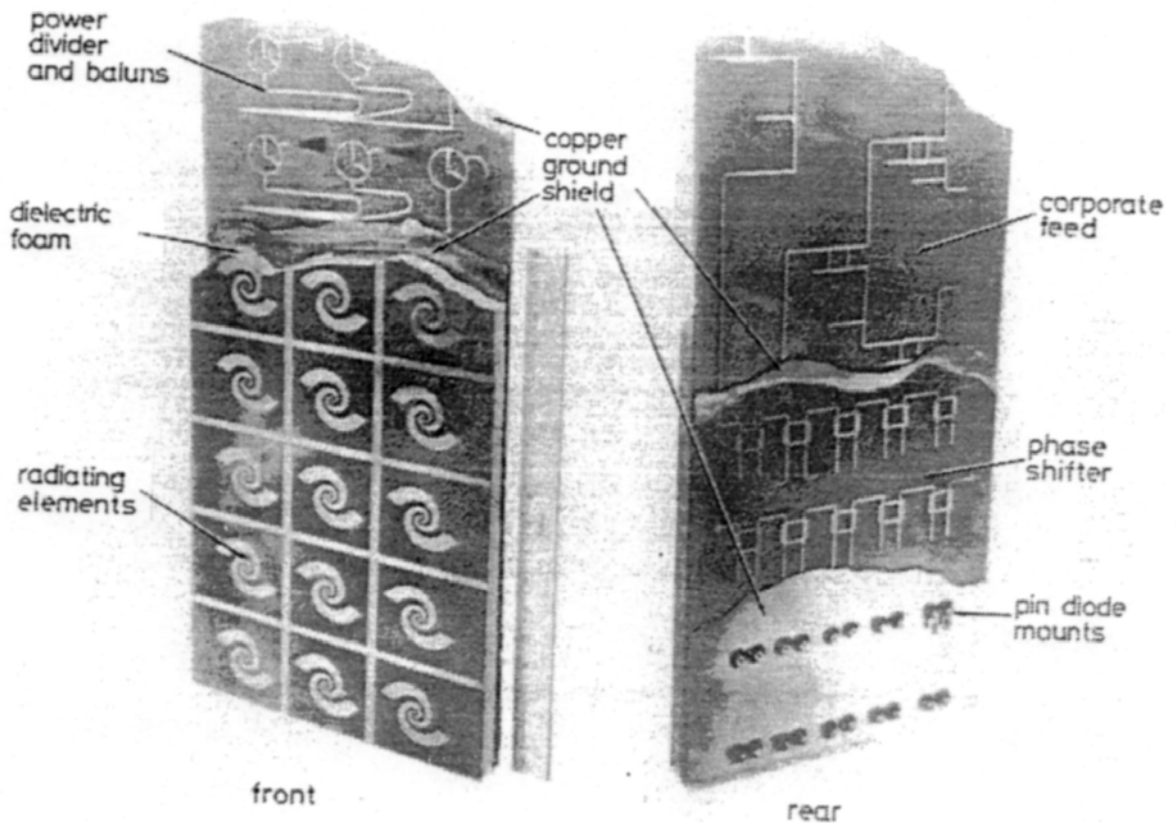
particolare dell'alimentazione gerarchica e degli sfasatori dell'antenna a schiera per SHF SATCOM







antenna a schiera di radiatori in microstriscia per comunicazioni velivolo-satellite. La schiera non è piana, ma adattata alla struttura del veicolo, è composta da 8 di patch quadrati funzionanti in banda S in polarizzazione circolare. Si nota il circuito di formazione del fascio comprendente gli sfasatori.



schiera di spirali stampate. Nei diversi strati componenti il substrato sono inclusi i baloons, i divisori di potenza e gli sfasatori a diodi pin; l'alimentazione è di tipo gerarchico.

