

Introduzione alle Antenne

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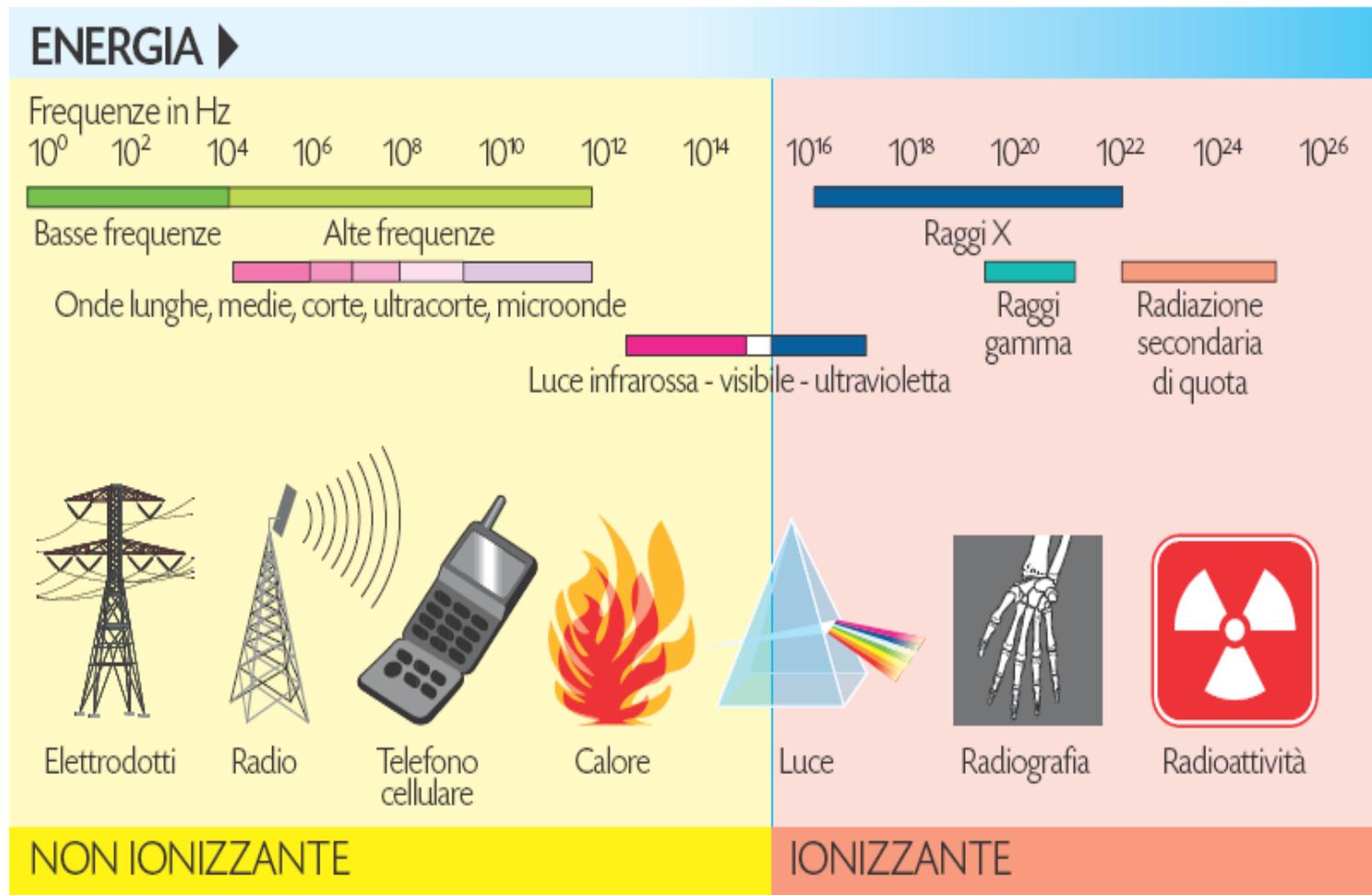
Testi consigliati

- F. T. Ulaby, “Fundamentals of Applied Electromagnetics”, 2001 Media Edition.
- F.T. Ulaby, “Fondamenti di campi elettromagnetici”, McGraw-Hill.
- Kraus, “Electromagnetics with Applications”, McGraw-Hill International Ed.
- Kraus, “Antennas”, International Ed.
- C. A. Balanis, “Antenna Theory”, John Wiley and Sons Ed.
- V. Rizzoli, “Lezioni di Campi Elettromagnetici”, Progetto Leonardo, Editrice Esulapio.

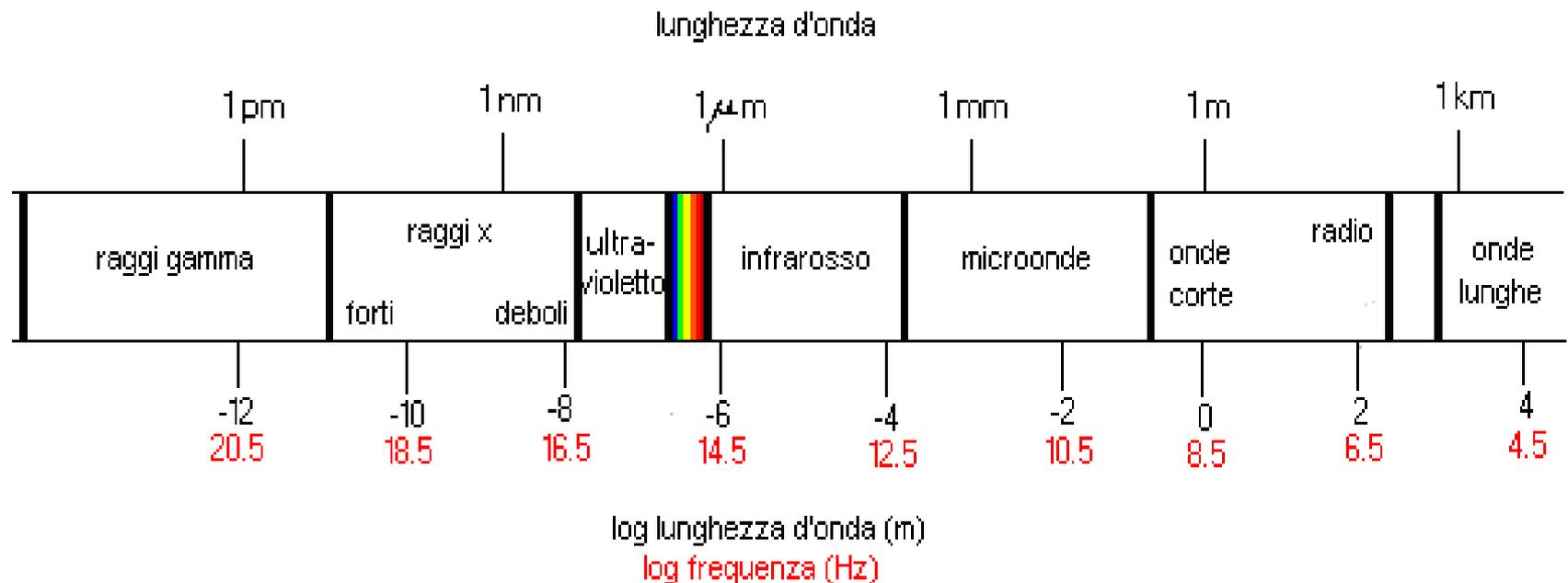
Onde Elettromagnetiche

- Quando un'onda elettromagnetica incontra un ostacolo penetra nella materia e cede la propria energia producendo una serie di effetti diversi a seconda della sua frequenza.
- Sulla base di questo, lo spettro elettromagnetico viene suddiviso in una sezione IONIZZANTE, comprendente raggi X e raggi gamma, aventi frequenza molto alta (> 3000 THz) e dotati di energia sufficiente per ionizzare direttamente atomi e molecole, ed una NON IONIZZANTE (NIR), le cui radiazioni non trasportano un quantitativo di energia sufficiente a produrre la rottura dei legami chimici e produrre ionizzazione.
- Le onde e.m. oggetto della nostra attenzione sono quelle Non ionizzanti (NIR) aventi frequenze che vanno da 30 kHz a 300 GHz.

Radiazioni ionizzanti e non ionizzanti



Spettro Elettromagnetico

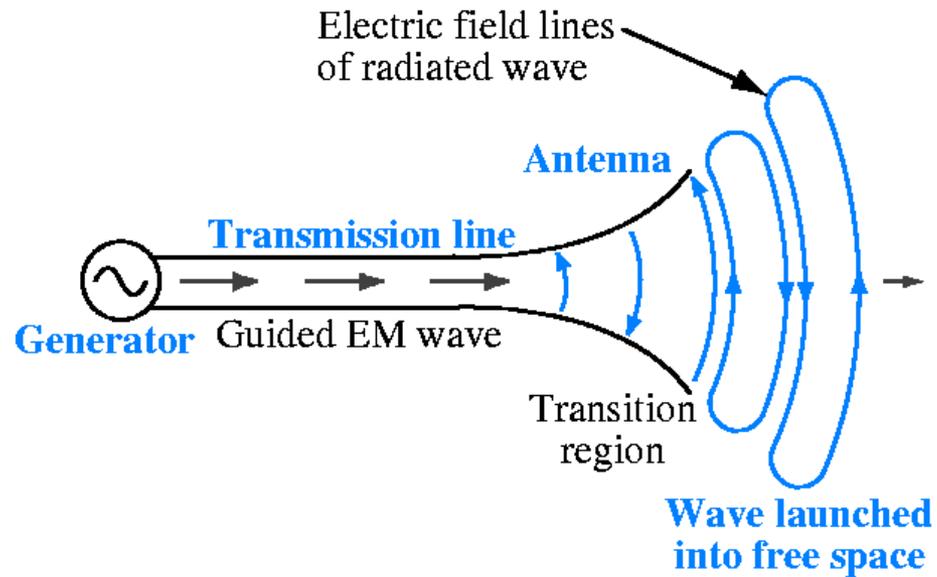


nome e sigla della banda ed esempi di applicazioni	frequenza	lunghezza d'onda
Extremely Low Frequency (ELF) frequenze estremamente basse comunicazioni con i sottomarini	< 3 kHz	> 100 km
Very Low Frequency (VLF) frequenze molto basse segnali per la navigazione marittima	3 ÷ 30 kHz	10 ÷ 100 km
Low Frequency (LF) frequenze basse loran-C e altri sistemi di navigazione	30 ÷ 300 kHz	1 ÷ 10 km
Medium Frequency (MF) frequenze medie radio Am e radio marittima	300 kHz ÷ 3 MHz	100 m ÷ 1km
High Frequency (HF) alte frequenze radio a onde corte e radiotelefono	3 ÷ 30 MHz	10 ÷ 100 m
Very High Frequency (VHF) frequenze molto alte televisione VHF e radio FM	30 ÷ 300 MHz	1 ÷ 10 m
Ultra-High Frequency (UHF) frequenze ultra-elevate televisione UHF, telefoni cellulari, sistemi di localizz. GPS	300MHz ÷ 3 GHz	10 cm ÷ 1m
Super-High frequency (SHF) frequenze super-elevate comunicazione satellitare e spaziale, sistemi a microonde	3 ÷ 30 GHz	1 ÷ 10 cm
Extremely High frequency (EHF) frequenze estremamente elevate radioastronomia, sistemi a guida radar per l'aeronautica	30 ÷ 300 GHz	1mm ÷ 1cm

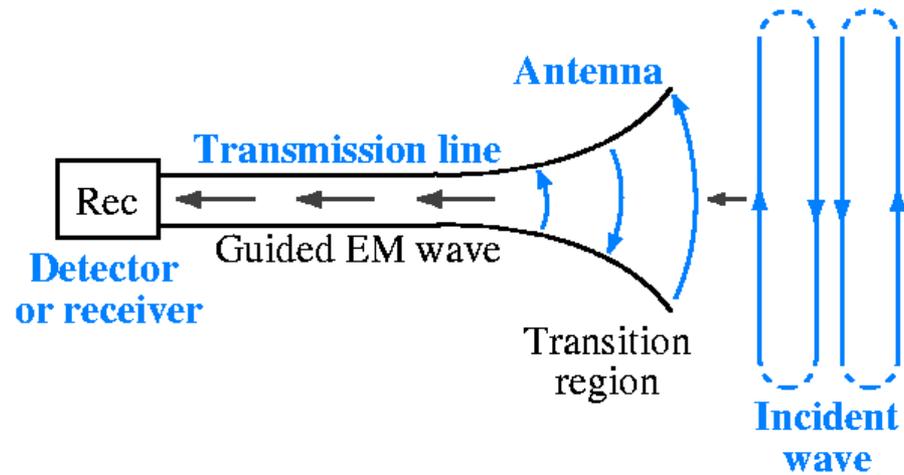
Che cosa è un' Antenna ?

- Un mezzo per irradiare o ricevere le onde radio [IEEE].
- La struttura di transizione tra lo spazio libero e un dispositivo guidante [Balanis].
- Un trasduttore tra un'onda guidata che si propaga in una linea di trasmissione e un'onda elettromagnetica che si propaga nello spazio libero (e viceversa). [Ulaby].
- Le antenne sono l'elemento di transizione tra lo spazio e la circuiteria. Esse convertono i fotoni in elettroni e viceversa. [Kraus].

Antenne trasmittenti e riceventi

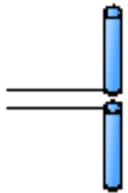


(a) Transmission mode

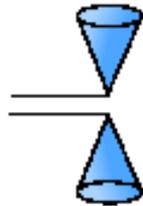


(b) Reception mode

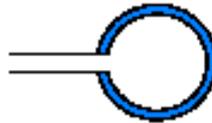
Vari tipi di Antenne



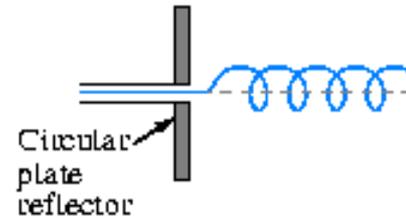
(a) Thin dipole



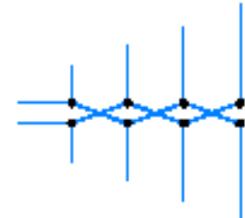
(b) Biconical dipole



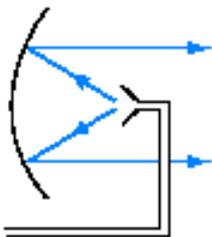
(c) Loop



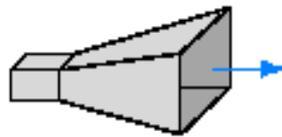
(d) Helix



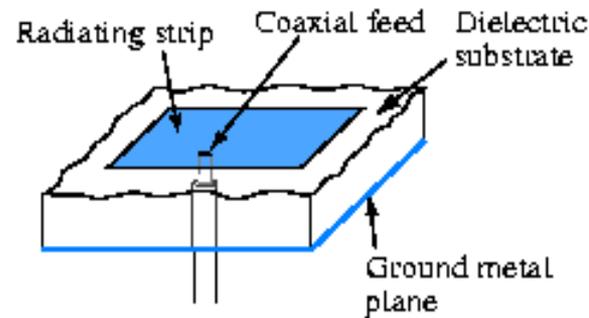
(e) Log-periodic



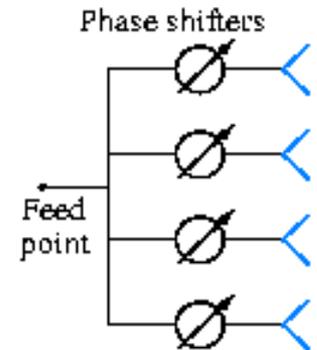
(f) Parabolic dish reflector



(g) Horn



(h) Microstrip



(i) Antenna array

Classificazione

- Antenne a filo
- Antenne d'apertura
- Antenne a microstriscia
- Antenne a riflettore
- Antenne a lente
- Antenne a schiera.

Antenne a filo

- Antenne a dipolo;
- Antenne a loop;
- Antenne a elica.

Antenne a dipolo: FM 87.5 - 108 MHz

SPECIFICATIONS

- **Frequency range:** 87,5 - 108 MHz
- **Max. power:** 2 kW
- **Impedance:** 50 Ohm
- **Gain:** 2,5 dB
- **Weight:** 7 Kg.
- **Dimensions (WxDxH):** 134x95x25
- **Max wind speed:** 200 Km/h
- **Material:** steel



Antenne a dipolo di precisione (1/2)

Overview

Precision Dipole Antennas are half-wave, fixed length precision dipoles designed to generate traceable calibrated fields or to measure electric fields at their respective frequency. The DP-series antennas are typically used as a reference or standard gain antenna.

Applications

- Calibration
- Communications testing
- Antenna pattern measurements

Dipole Test Sets

The DP-Series Dipole Antennas are designed with operating frequencies matched the operating frequencies of common mobile radio devices, and are available in sets that correspond to communication systems used in Europe, North America, and Asia, including GSM, TDMA, PCS, Bluetooth, and others. Custom frequencies are available.



Antenne a dipolo di precisione (2/2)

Mechanical Specifications

Dimensions: Dependent on operating frequency; approx. one-half wavelength

Weight: Varies by model

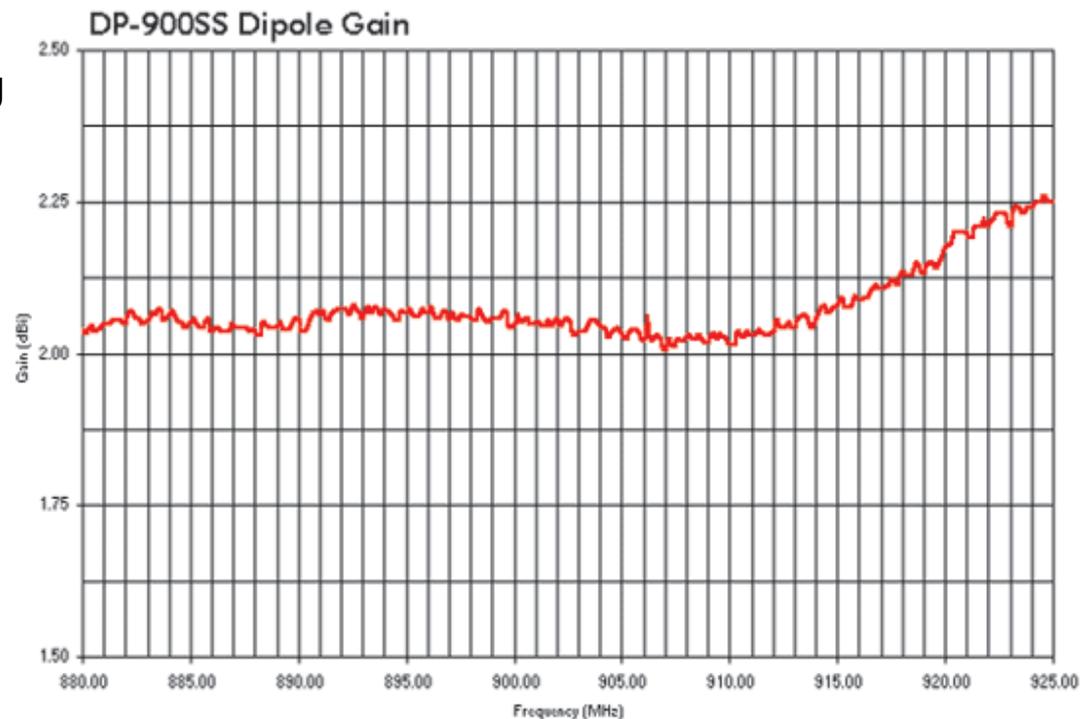
Construction: Available in aluminum, stainless steel or brass

RF Connector: SMA (female)

Electrical Specifications

Gain: See data graph

Impedance: 50 ohms



Antenna a elica

- Gain 15 dBi
- Length 52 cm
- BW 2350 - 2550 MHz
- Max Power 10 W
- Impedance 50 ohm
- Beam width 3 dB of 50°
- Polarization RHCP
- Dia.Mast. 50 mm
- Equipped with splash proof radome



CPMelettronica E16-CA

Picture of the antenna without radome

Antenne d'apertura

- Tromba piramidale:
- Tromba conica;
- Guida d'onda rettangolare.



Antenna a tromba

Antenna Features

- Operating frequency of 1 GHz to 18 GHz
- High gain
- Robust mechanical design

Applications

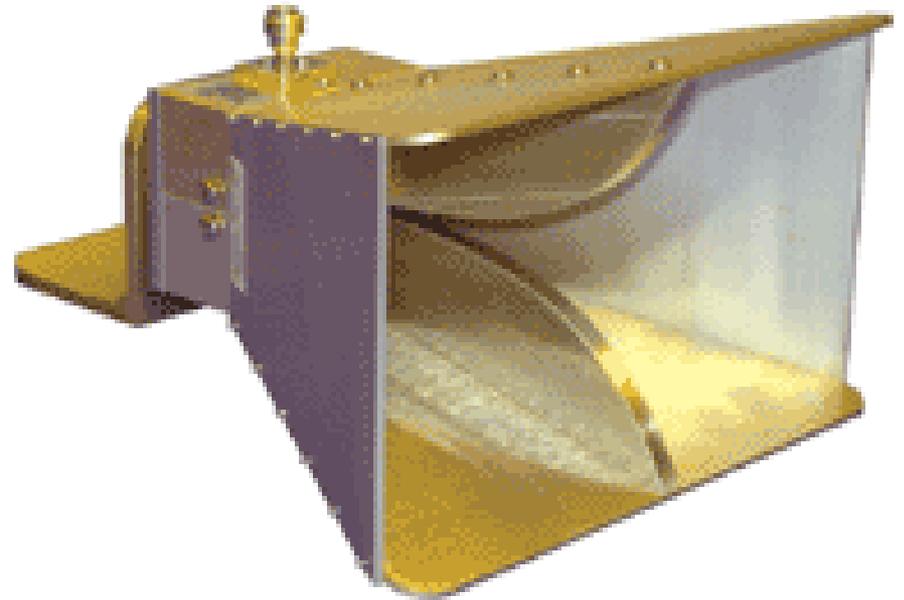
- Immunity testing
- Emissions testing
- Probe calibration

Mechanical Specifications

- Overall Size:
- Width: 25 cm
- Depth: 21 cm
- Height: 15 cm
- Weight: 1.8 kg
- Construction: Aluminum with a gold chromate finish

Electrical Specifications

- Power Handling: 300W
- Feedpoint Impedance: 50 ohms (nominal)



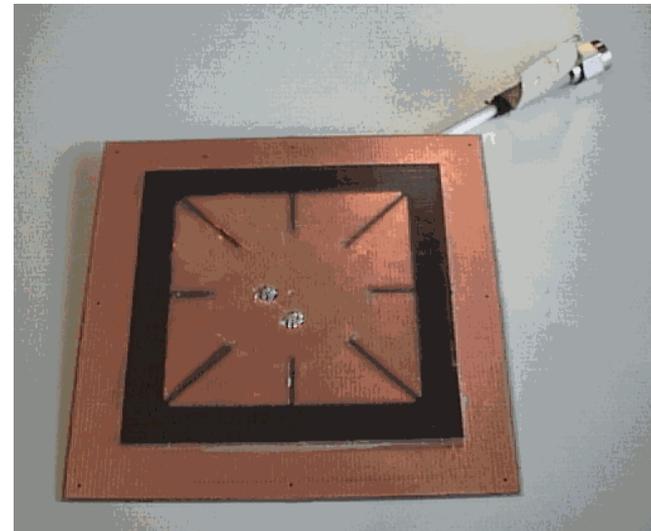
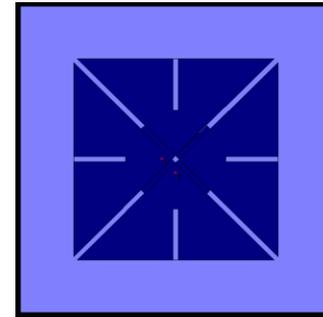
Antenne a microstriscia

- Antenna a microstriscia (patch) rettangolare.
- Antenne a microstriscia (patch) circolare.
- Antenne a microstriscia con patch di varia forma.



Microstrip Patch Antenna for GPS application

- *Low profile and low cost patch antenna for GPS application*
- *The radiating structure is composed of a square patch with 8 slits introduced on each middle side and on the corners in order to reduce the dimensions*
- *Patch dimensions are 36x36 cm and ground dimensions are 60x60cm*

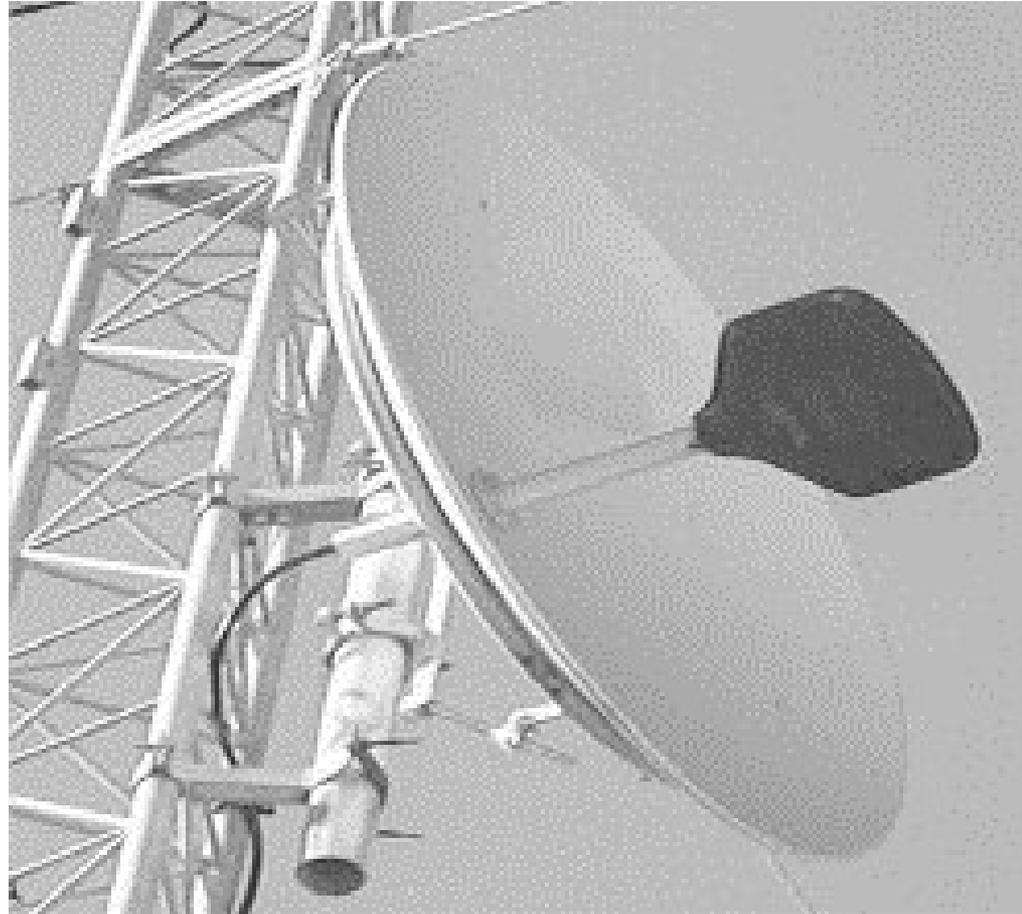


Antenne a riflettore

- Riflettore parabolico.
- Riflettore ad angolo.

Antenna Parabolica

- o 1.5 m diametro
- o Guadagno: 19-43 dB
- o Frequenza: 875MHz – 14.6 GHz



Antenna Parabolica 2.4 GHz

CPMelettronica **PAR60C-A / PAR90C-A**

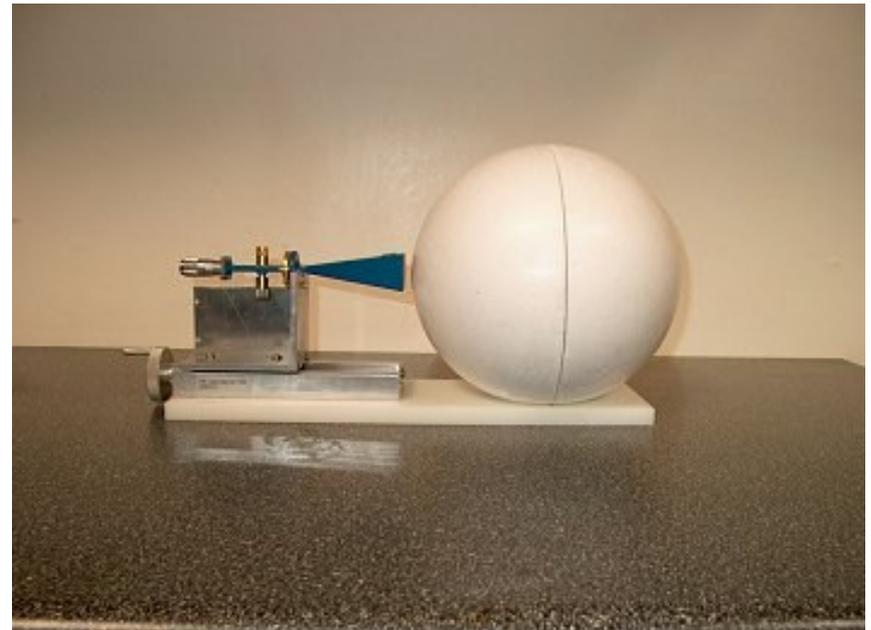
- **Dish size** 60cm. or 90cm
- **Gain** 23dB or 27dB
- **Feeder** 2 turns helix,
- Equipped with radome
- **Beam width** 3 dB of 18°
- **B.W.** 2350 - 2550 MHz
- **Max Power** 10 W
- **Impedance** 50 Ohm

Splash proof
radome of the
feed helix



Antenne a lente

- Convessa-convessa;
- Piana-convessa;
- Convessa-concava;
- Concava-piana;
- Concava-concava;
- Concava-convessa.



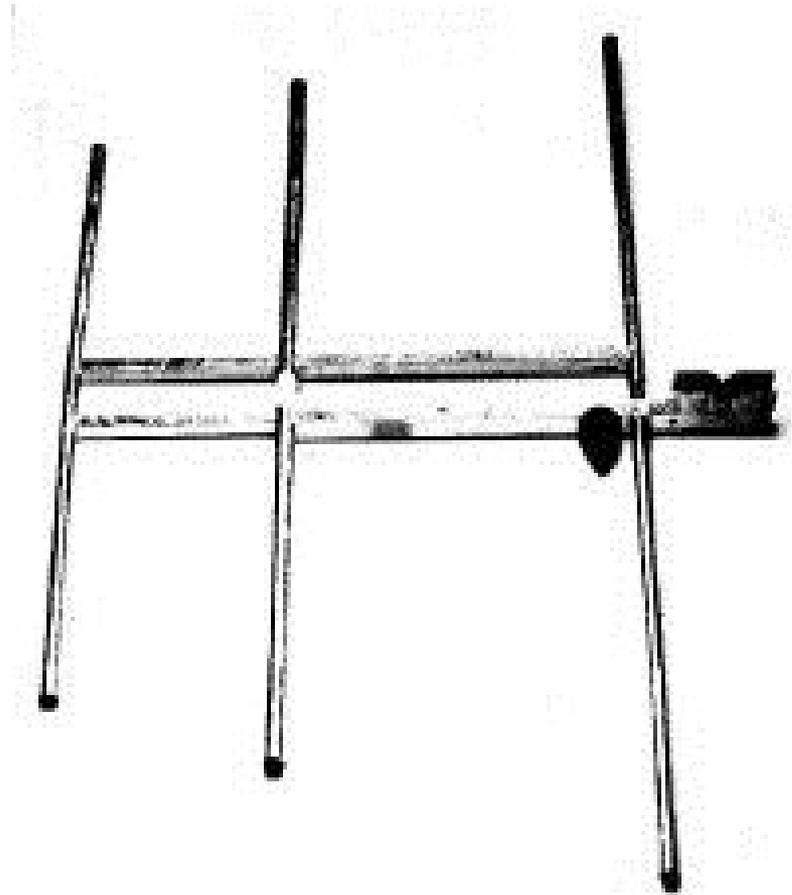
Antenne a schiera

- Yagi-Uda.
- Log-Array.
- Array di antenne di apertura.
- Array di antenne a patch.

Antenna Yagi-Uda a 3 elementi TV VHF

SPECIFICATIONS

- **Frequency range:**172 - 210 MHz or 210 - 230 MHz
- **Max. power:**400 W
- **Impedance:**50 Ohm
- **Gain:**4,5 dB
- **Weight:**6 Kg.
- **Dimensions (WxDxH):**89x75x4
- **Max wind speed:**180 Km/h



Antenna a Log-Periodic (80MHz-1GHz)

Features

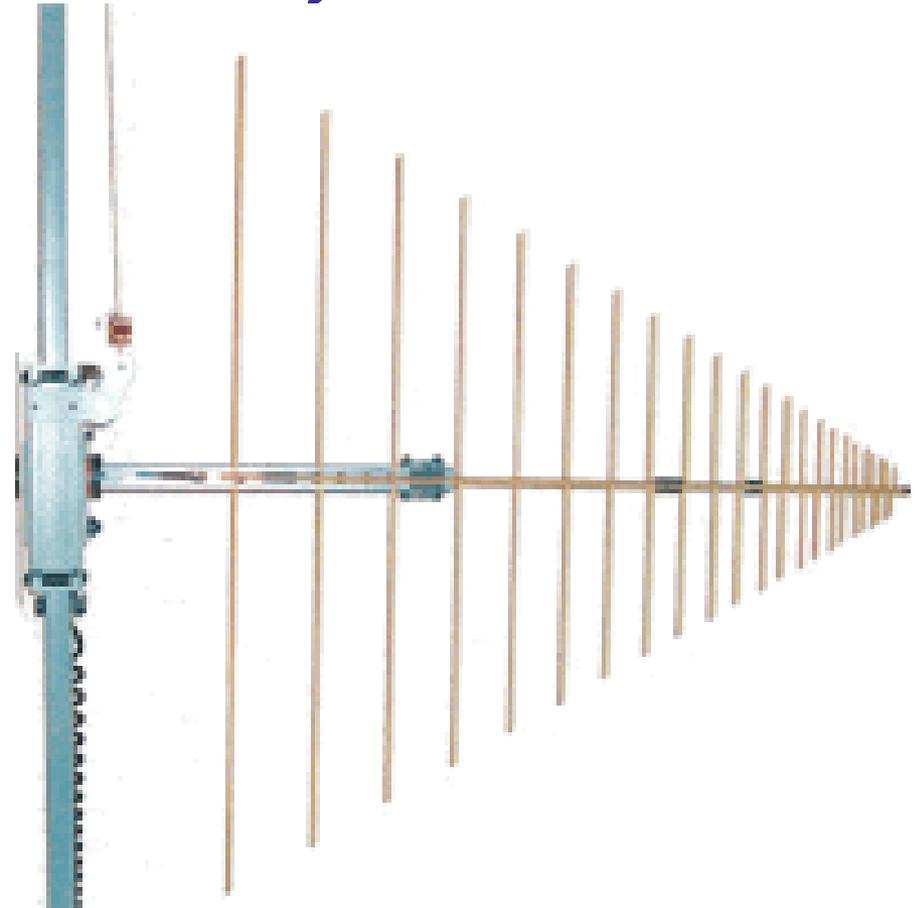
- Wide frequency range of 80 MHz to 1 GHz
- High power handling (2.5 kW)
- High efficiency and low loss
- Robust mechanical design

Applications

- Immunity Testing and Emissions Testing

Electrical Characteristics

- Gain: 5 - 6 dBi
- Polarization: Linear
- Power Handling: 2.5 kW (continuous)
- Impedance: 50 Ohms nominal
- **Mechanical Specifications**
- Dimensions: 142 cm L x 170 cm W x 5 cm H (14 cm with mount)
- Weight: 4 kg
- Construction: Aluminum with gold chromate finish



Antenna a Log-Periodic (80MHz-3GHz)

Features

- Wide frequency range of 80 MHz to 3 GHz
- Moderate power handling (500W)
- Robust mechanical and feed design

Applications

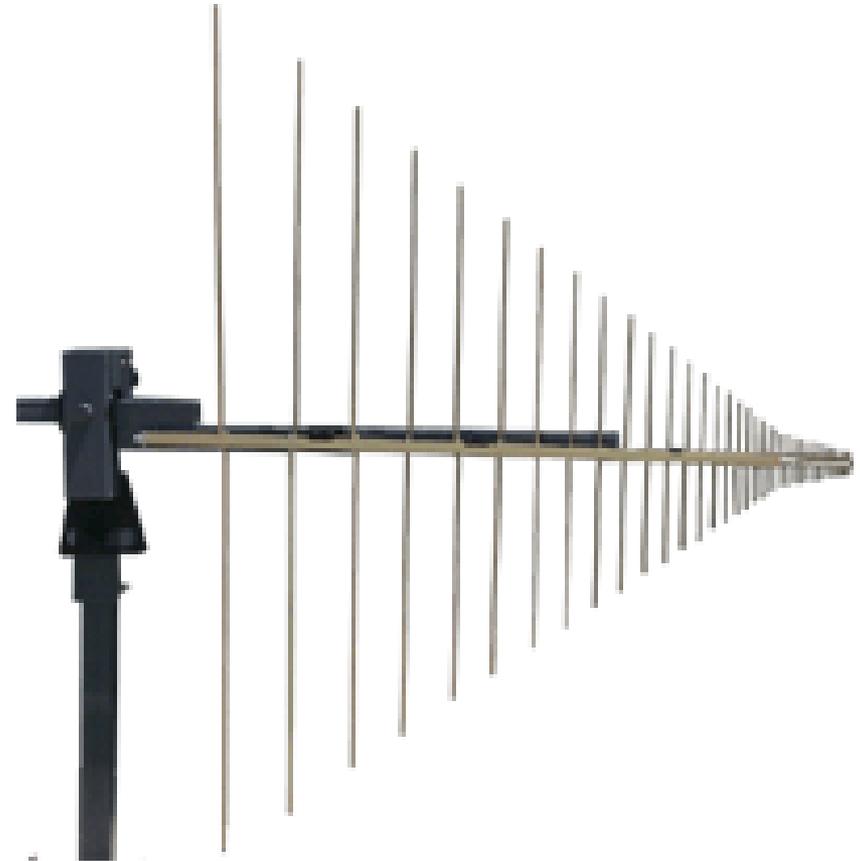
- Immunity Testing and Emissions Testing

Electrical Characteristics

- Frequency Range: 80 MHz to 3 GHz
- Gain: 6 – 8 dBi
- Polarization: Linear
- Power Handling: 500W CW
- Feedpoint Impedance: 50 ohm nominal

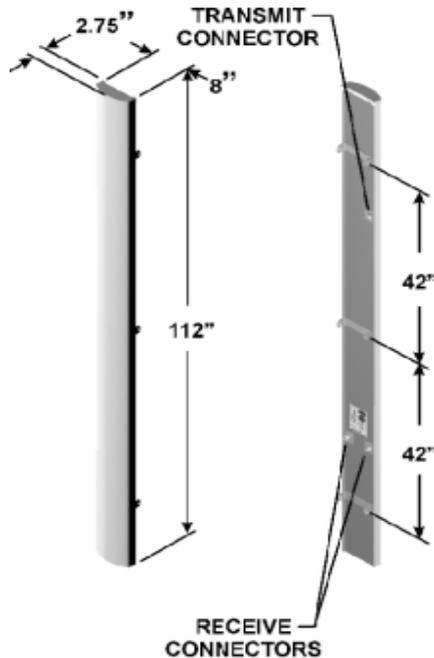
Mechanical Specifications

- Size: 155 cm x 170 cm (L x W)
- Weight: 4 kg
- Construction: Aluminum with gold chromate finish



Antenna per GSM- dual band

- 806 MHz - 1990 MHz
- HPBW piano orizz. 65°
- Gain 11.8 dBd (13.9 dBi)



DBP3G 18-65/C/2
DUAL BAND GSM 1800/UMTS
DUAL POLARIZATION ANTENNA
2 x 17.5 dBi GSM - 2 x 18.5 dBi UMTS

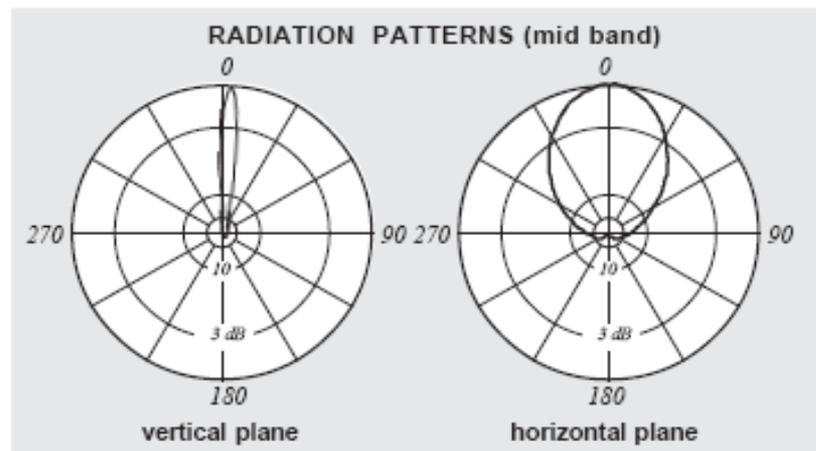


ELECTRICAL DATA

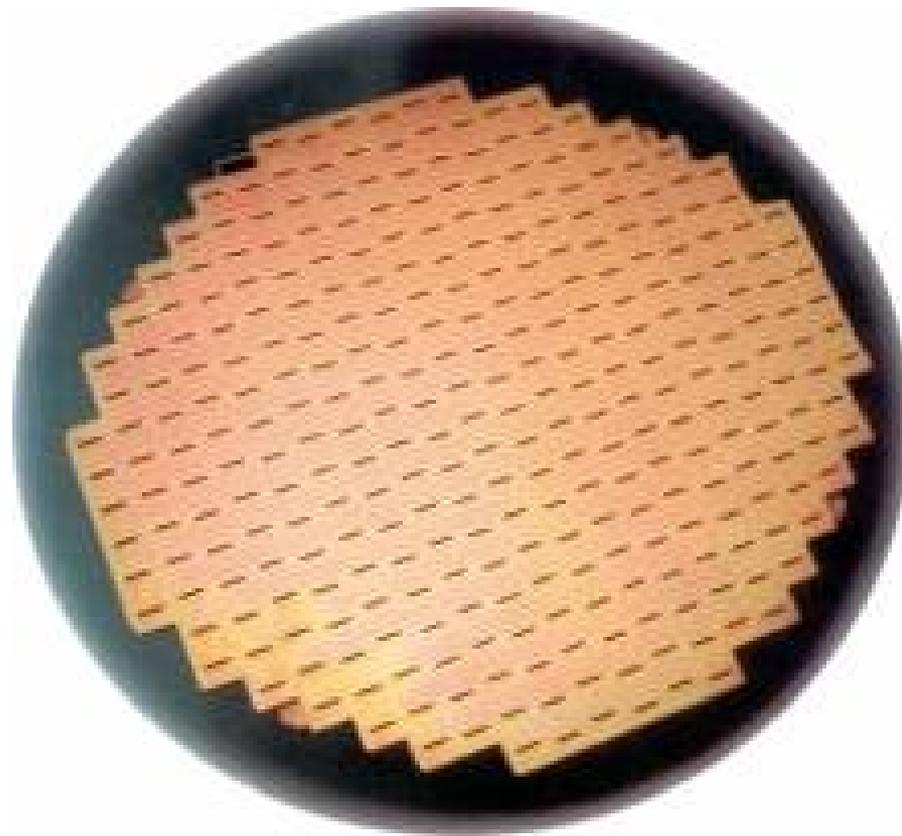
ANTENNA TYPE	DBP3G 18-65/C/2	
FREQUENCY RANGE	1710 + 1880 MHz	1920 + 2170 MHz
IMPEDANCE	50 ohm	
CONNECTOR	2 x 7/16-T	
MAX. POWER	2 x 300 W	
VSWR	≤ 1.35	
POLARIZATION	±45°	
GAIN	2 x 17.5 dBi	2 x 18.5 dBi
HALFPOWER BEAMWIDTH		
Vertical plane	7°	6.5°
Horizontal plane	67°	63°
FRONT TO BACK RATIO	≥ 30 dB (Copolari)	
SIDELobe SUPPRESSION	≥ 14 dB	
<small>(per lobe outside above to 1000)</small>		
ISOLATION	≥ 30 dB	
ELECTRICAL DOWN TILT	2°	
LIGHTNING PROTECTION	All metal parts DC grounded	
INTERMODULATION	c -150 dBc (2 x 40 dBm carrier)	

MECHANICAL DATA

DIMENSIONS	1302 x 155 x 89 mm	
WEIGHT	6 Kg	
WIND SURFACE	Front	0.20 m ²
	Side	0.09 m ²
WIND LOAD	Front	130 N
<small>(wind speed 150km/h)</small>	Side	110 N
ICING PROTECTION	Full radome	
RADOME COLOUR	Grey (std.) others on request	
MOUNTING	On the wall or on pole	
PACKING	1404 x 172 x 82 mm	



Flat plate slot arrays for military applications



High Power Biconical Antenna

Applications

- Immunity testing, and emissions measurements

Features

- Improved balun provides superior patterns and balance

Electrical Characteristics

- Frequency Range: 20 MHz to 300 MHz
- Power Handling: 3500 W continuous
- Feedpoint Impedance: 50 ohms nominal

Mechanical Specifications

- Size: 138 cm x 56 cm x 56 cm (W x D x H)
- Weight: 4 kg
- Construction: Aluminum



Onde piane e onde sferiche: perchè studiarle ?

