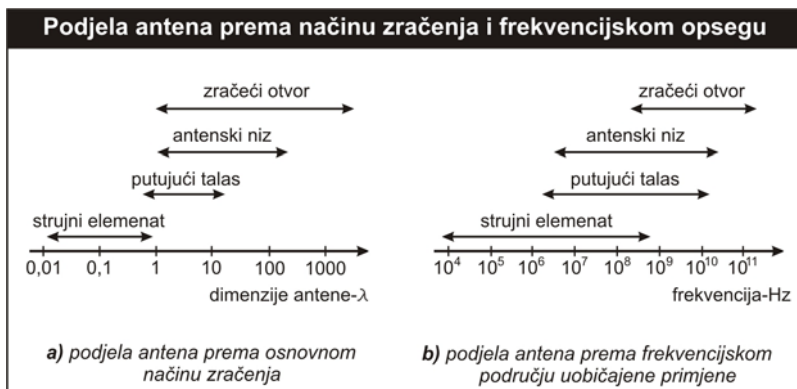


4.4. OSNOVNE VRSTE ANTENA

Ako se primjene dva primarna kriterijuma vezana za osnovne principe samog rada antena, one se mogu razvrstati prema: **osnovnom načinu zračenja** i **frekvencijskom području uobičajene primjene**, kao što je prikazano na *slici 4.9*.



Slika 4.9

Na primjer, **grupu antena u obliku zračećeg strujnog elementa** (*current elements*) sačinjavaju: dipol, monopol, petlja, prorez, bikonična, disk, mikrotrakasta i ostale antene.

Neke iz **grupe antena sa putujućim talasom** (*travelling-wave antennas*) su: duga žičana, romb, prorezani talasovod, spiralna, helikoidna, log-periodična, dielektrična i mikrotrakasta.

Antenski niz (*array antenna*) sadrži više pravilno raspoređenih elementarnih antena s takvom pobudom da ostvaruju zadati dijagram zračenja.

Grupu antena u obliku zračećeg otvora (*aperture antennas*) sačinjavaju reflektor, lijevak i sočiva. Iako postoje brojni izuzeci, navedene grupe se razlikuju po dimenzijama antene u odnosu na talasnu dužinu zračenog polja (*slika 4.9-a*). Naravno, to utiče na frekvencijsko područje uobičajene primjene (*slika 4.9-b*).

Na *slici 4.10*, prikazano je nekoliko osnovnih tipova antena sa karakteristikama.

U praksi, prilikom dolaska na sami izvor zračenja, ukoliko ne raspoložemo sa kompletnom tehničkom dokumentacijom o postavljenim emisionim antenama, poznavanje samih fabričkih konstruktivnih rješenja može nam biti od koristi da identifikujemo tip antene, a na osnovu toga možemo približno odrediti frekvencijski opseg emisionog uređaja, što mjernoj ekipi može biti od koristi prilikom prvih podešavanja mjernih instrumenata na terenu (*slike: 4.11 i 4.12*).

Prilikom mjerenja elektromagnetskih zračenja bilo da se radi o mjerenjima na samom izvoru zračenja ili o mjerenjima u objektu za rad ili stanovanje, posebno je važno izabrati odgovarajuću antenu za određenu vrstu mjerenja, kao i za određeni frekvencijski opseg (*slike: 4.13-a i 4.13-b*).










Osnovni tipovi antena sa karakteristikama		
Vrsta antene	Dijagram zračenja	Pojačanje
POLUTALASNI DIPOL 		Teoretski u odnosu na izotropni radijator: $dBi=0dB$ U odnosu na polutalasni dipol $dBd=2,14dB$
POVEZANA GRUPA DIPOLA n-broj dipola 		U zavisnosti od parnog broja dipola $6dB - 12dB$
YAGI ANTENA 		U zavisnosti od broja direktora $6dB - 12dB$
HELIKOIDNA ANTENA 		$6dB - 16dB$
PARABOLIČNA ANTENA 		U zavisnosti od površine i obrade paraboloida $24dB - 48dB$

KESAT COMMUNICATIONS

KEMO,02-08-4PI[®]

Slika 4.10

Konstruktivna rješenja emisionih VHF, FM i UHF antena

																										
<p>VHF-BIDIRECTIONAL</p>	<p>VHF-OMNIDIRECTIONAL BASE STATION</p>	<p>VHF-YAGI</p>																								
<table border="1"> <tr><td>frequency range</td><td>78MHz...88MHz</td></tr> <tr><td>gain</td><td>5 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>70⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>60⁰</td></tr> </table>	frequency range	78MHz...88MHz	gain	5 dBi	E-field (beamwidth)	70 ⁰	H-field (beamwidth)	60 ⁰	<table border="1"> <tr><td>frequency range</td><td>146MHz...174MHz</td></tr> <tr><td>gain</td><td>2 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>60⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>360⁰</td></tr> </table>	frequency range	146MHz...174MHz	gain	2 dBi	E-field (beamwidth)	60 ⁰	H-field (beamwidth)	360 ⁰	<table border="1"> <tr><td>frequency range</td><td>275MHz...285MHz</td></tr> <tr><td>gain</td><td>8 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>60⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>80⁰</td></tr> </table>	frequency range	275MHz...285MHz	gain	8 dBi	E-field (beamwidth)	60 ⁰	H-field (beamwidth)	80 ⁰
frequency range	78MHz...88MHz																									
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E-field (beamwidth)	60 ⁰																									
H-field (beamwidth)	80 ⁰																									
																										
<p>FM-YAGI</p>	<p>FM-TRANSMITTER</p>	<p>FM-TRANSMITTER</p>																								
<table border="1"> <tr><td>frequency range</td><td>(88MHz...108MHz)</td></tr> <tr><td>gain</td><td>6 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>70⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>125⁰</td></tr> </table>	frequency range	(88MHz...108MHz)	gain	6 dBi	E-field (beamwidth)	70 ⁰	H-field (beamwidth)	125 ⁰	<table border="1"> <tr><td>frequency range</td><td>(88MHz...108MHz)</td></tr> <tr><td>gain</td><td>0..2 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>360⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>90⁰</td></tr> </table>	frequency range	(88MHz...108MHz)	gain	0..2 dBi	E-field (beamwidth)	360 ⁰	H-field (beamwidth)	90 ⁰	<table border="1"> <tr><td>frequency range</td><td>(88MHz...108MHz)</td></tr> <tr><td>gain</td><td>2 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>50⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>360⁰</td></tr> </table>	frequency range	(88MHz...108MHz)	gain	2 dBi	E-field (beamwidth)	50 ⁰	H-field (beamwidth)	360 ⁰
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H-field (beamwidth)	360 ⁰																									
																										
<p>UHF-DERCTIONAL</p>	<p>UHF-DERCTIONAL</p>	<p>UHF-DERCTIONAL</p>																								
<table border="1"> <tr><td>frequency range</td><td>(410MHz...470MHz)</td></tr> <tr><td>gain</td><td>8 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>33⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>155⁰</td></tr> </table>	frequency range	(410MHz...470MHz)	gain	8 dBi	E-field (beamwidth)	33 ⁰	H-field (beamwidth)	155 ⁰	<table border="1"> <tr><td>frequency range</td><td>(350MHz...470MHz)</td></tr> <tr><td>gain</td><td>10 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>30⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>120⁰</td></tr> </table>	frequency range	(350MHz...470MHz)	gain	10 dBi	E-field (beamwidth)	30 ⁰	H-field (beamwidth)	120 ⁰	<table border="1"> <tr><td>frequency range</td><td>(330MHz...470MHz)</td></tr> <tr><td>gain</td><td>9,5 dBi</td></tr> <tr><td>E-field (beamwidth)</td><td>47⁰</td></tr> <tr><td>H-field (beamwidth)</td><td>50⁰</td></tr> </table>	frequency range	(330MHz...470MHz)	gain	9,5 dBi	E-field (beamwidth)	47 ⁰	H-field (beamwidth)	50 ⁰
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E-field (beamwidth)	47 ⁰																									
H-field (beamwidth)	50 ⁰																									

Slika 4.11

Konstruktivna rješenja RX/TX GSM & UMTS antena																										
 <p>OMNIDIRECTIONAL-900</p> <table border="1"> <tr> <td>frequency range</td> <td>{890MHz...960MHz}</td> </tr> <tr> <td>gain</td> <td>6 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>20°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>_°</td> </tr> </table>	frequency range	{890MHz...960MHz}	gain	6 dBi	E-field (beamwidth)	20°	H-field (beamwidth)	_°	 <p>HIGH GAIN BASE STATION-900</p> <table border="1"> <tr> <td>frequency range</td> <td>{870MHz...960MHz}</td> </tr> <tr> <td>gain</td> <td>21 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>7,5°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>30°</td> </tr> </table>	frequency range	{870MHz...960MHz}	gain	21 dBi	E-field (beamwidth)	7,5°	H-field (beamwidth)	30°	 <p>SUPER GAIN-900</p> <table border="1"> <tr> <td>frequency range</td> <td>{870MHz...960MHz}</td> </tr> <tr> <td>gain</td> <td>20 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>60°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>6°</td> </tr> </table>	frequency range	{870MHz...960MHz}	gain	20 dBi	E-field (beamwidth)	60°	H-field (beamwidth)	6°
frequency range	{890MHz...960MHz}																									
gain	6 dBi																									
E-field (beamwidth)	20°																									
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E-field (beamwidth)	60°																									
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 <p>BASE STATION SERIES-1800</p> <table border="1"> <tr> <td>frequency range</td> <td>{1710MHz...1900MHz}</td> </tr> <tr> <td>gain</td> <td>13 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>28°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>62°</td> </tr> </table>	frequency range	{1710MHz...1900MHz}	gain	13 dBi	E-field (beamwidth)	28°	H-field (beamwidth)	62°	 <p>SHORT BACKFIRE-1800</p> <table border="1"> <tr> <td>frequency range</td> <td>{1735MHz...1840MHz}</td> </tr> <tr> <td>gain</td> <td>18 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>19°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>19°</td> </tr> </table>	frequency range	{1735MHz...1840MHz}	gain	18 dBi	E-field (beamwidth)	19°	H-field (beamwidth)	19°	 <p>BASE STATION SERIES-1800</p> <table border="1"> <tr> <td>frequency range</td> <td>{1710MHz...1900MHz}</td> </tr> <tr> <td>gain</td> <td>11,5 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>30°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>90°</td> </tr> </table>	frequency range	{1710MHz...1900MHz}	gain	11,5 dBi	E-field (beamwidth)	30°	H-field (beamwidth)	90°
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 <p>BASE STATION SERIES-UMTS</p> <table border="1"> <tr> <td>frequency range</td> <td>{1920MHz...1980MHz} {2110MHz...2170MHz}</td> </tr> <tr> <td>gain</td> <td>5 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>30°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>360°</td> </tr> </table>	frequency range	{1920MHz...1980MHz} {2110MHz...2170MHz}	gain	5 dBi	E-field (beamwidth)	30°	H-field (beamwidth)	360°	 <p>BASE STATION SERIES-UMTS</p> <table border="1"> <tr> <td>frequency range</td> <td>{1920MHz...1980MHz} {2110MHz...2170MHz}</td> </tr> <tr> <td>gain</td> <td>12 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>15°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>60°</td> </tr> </table>	frequency range	{1920MHz...1980MHz} {2110MHz...2170MHz}	gain	12 dBi	E-field (beamwidth)	15°	H-field (beamwidth)	60°	 <p>BASE STATION SERIES-UMTS</p> <table border="1"> <tr> <td>frequency range</td> <td>{1710MHz...1880MHz} {1920MHz...1980MHz} {2110MHz...2170MHz}</td> </tr> <tr> <td>gain</td> <td>10 dBi</td> </tr> <tr> <td>E-field (beamwidth)</td> <td>14°</td> </tr> <tr> <td>H-field (beamwidth)</td> <td>115°</td> </tr> </table>	frequency range	{1710MHz...1880MHz} {1920MHz...1980MHz} {2110MHz...2170MHz}	gain	10 dBi	E-field (beamwidth)	14°	H-field (beamwidth)	115°
frequency range	{1920MHz...1980MHz} {2110MHz...2170MHz}																									
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gain	10 dBi																									
E-field (beamwidth)	14°																									
H-field (beamwidth)	115°																									

Slika 4.12

Profesionalne mjerne antene
Nr.01

Klasifikacija mjernih antena prema frekvencijskom području		
Test	Frequency	Antenna
Magnetic field	9 kHz – 30 MHz	Loop
Electric field	30 MHz – 800 MHz	Dipol
	30 MHz – 300 MHz	Biconical
	300 MHz – 2 GHz	Log Periodic
	30 MHz – 2 GHz	BiLogic
	600 MHz – 40 GHz	Horn



LOOP ANTENNA





DIPOL ANTENNA

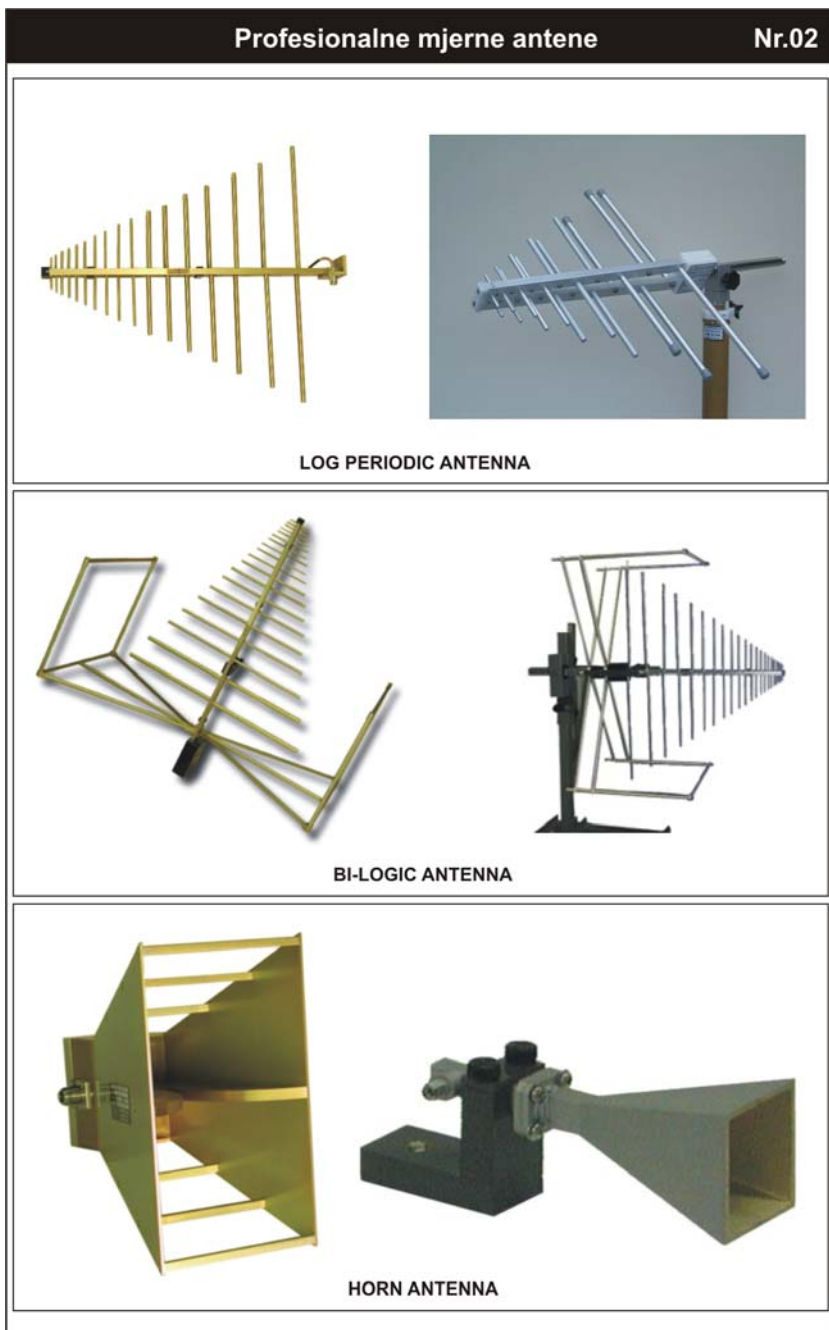




BICONICAL ANTENNA



Slika 4.13-a



Slika 4.13-b