



19ECT302-TRANSMISSION LINES & ANTENNAS

UNIT 4-TOPIC – LOG PERIODIC ANTENNA



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LOG –PERIODIC ANTENNA

Introduction

- In telecommunication, a **log-periodic antenna** is a broadband, multi-element, directional, narrow-beam antenna that has impedance and radiation characteristics that are regularly repetitive as a logarithmic function of the excitation frequency.
- The individual components are often dipoles.
- The lengths and spacings of the elements of a log-periodic antenna increase logarithmically from one end to the other.

KEY POINTS:

- High bandwidth
- Moderate directivity



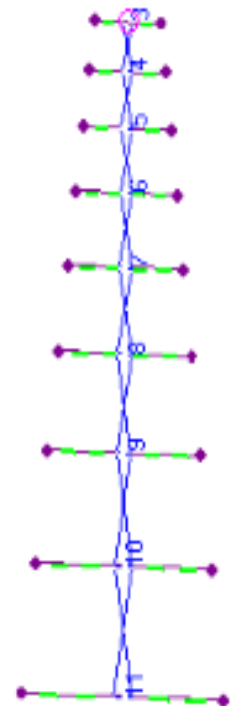
FREQUENCY RANGE

- The frequency range, in which the log-periodic antennas operate is around **30 MHz to 3GHz** which belong to the **VHF** and **UHF** bands.
- There are several type of log-periodic antennas such as the planar, trapezoidal, zig-zag, V-type, slot and the dipole. The mostly used one is log-periodic dipole array, in short, LPDA.



CONSTRUCTION

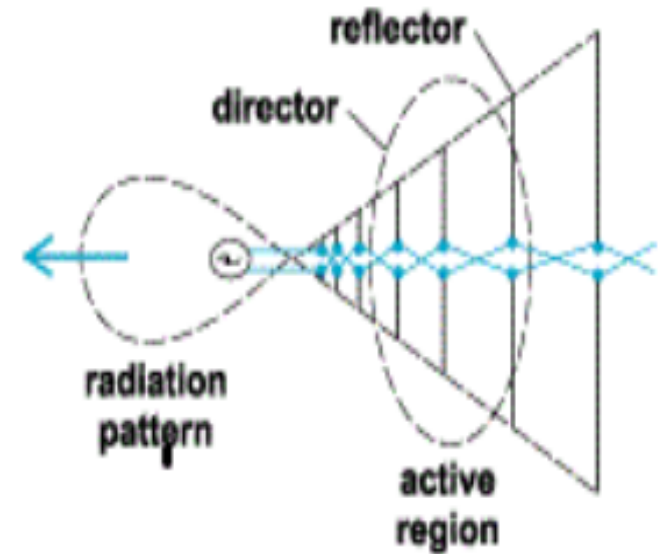
- Log periodic antenna has an array of dipole which has their length according to logarithmic scale.
- Log periodic antenna is basically a wideband antenna because it has many dipole elements which are of different length, radiating different frequency.
- The structure of log periodic antenna is shown on right side.
- In this the dipole array are cross connected to each other.





POINT OF EXCITATION

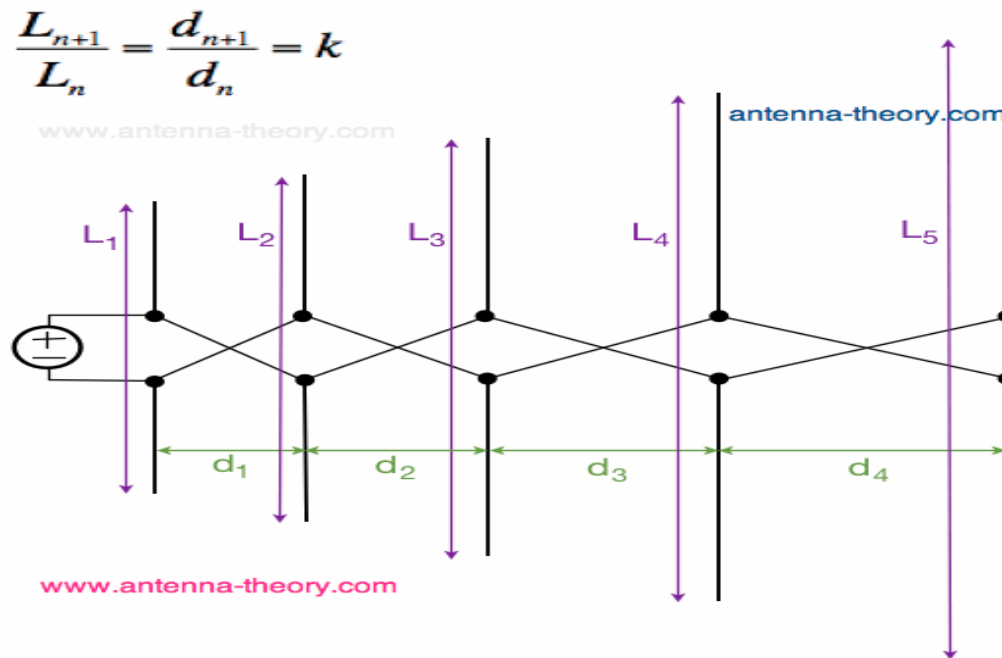
- The single element is provided excitation via these cross connection lines.
- Here only one element has provided excitation and other element has no separate excitation.
- By varying the point of excitation we can change the radiation pattern of log periodic antenna.





DESIGN PARAMETERS

- 5 element Log-Periodic Dipole Antenna Array.
- The dipole lengths and spacings are related as





CONTN

- The physical structure and electrical characteristics, when observed, are repetitive in nature. The array consists of dipoles of different lengths and spacing, which are fed from a two-wire transmission line. This line is transposed between each adjacent pair of dipoles.
- The dipole lengths and separations are related by the formula $-R_1/R_2=R_2/R_3=R_3/R_4=T=|l_1/l_2=l_2/l_3=l_3/l_4$

Where

- τ is the design ratio and $\tau < 1$
- R is the distance between the feed and the dipole
- l is the length of the dipole.

$$(R_n/R_{n+1})=(l_n/l_{n+1})=\text{scale factor or periodicity factor}$$



ACTIVITY TIME-FIND THE SLOGAN OF THE COMPANIES



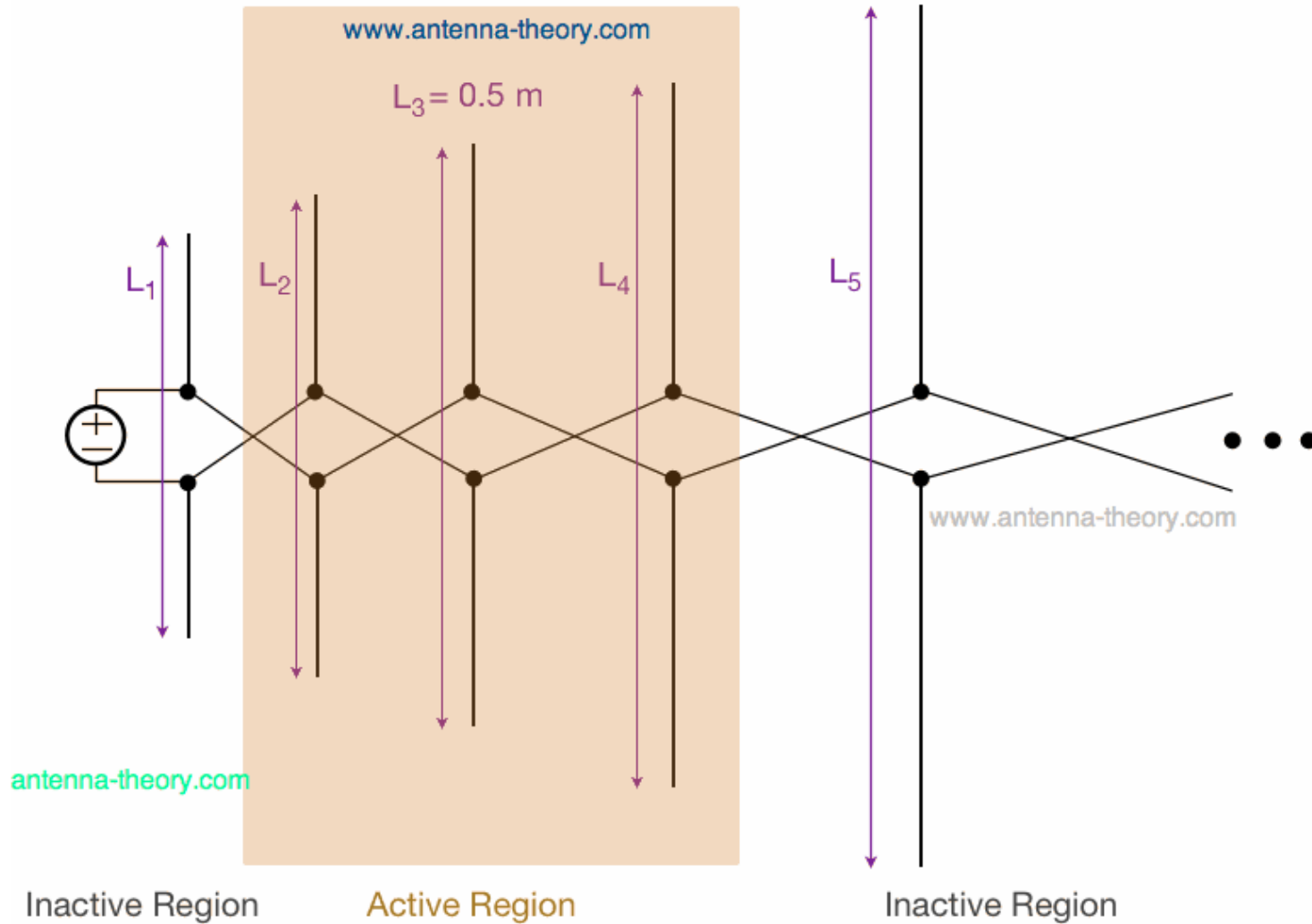


ACTIVITY TIME-answer





REGIONS OF OPERATION





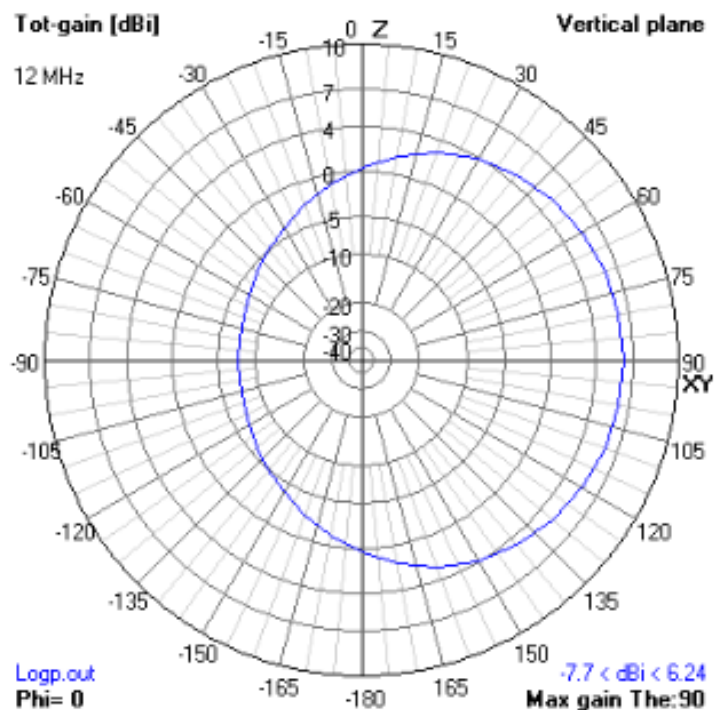
REGIONS OF OPERATION

- **Inactive region($L < \lambda/2$)-impedance-capacitive-**
Radiation-backwards
- **Active region($L = \lambda/2$) -impedance-resistive**
Radiation-strong radiation towards left in
backward and a little radiation towards right.
- **Reflective region/inactive region($L > \lambda/2$)-**
impedance-inductive



RADIATION PATTERN

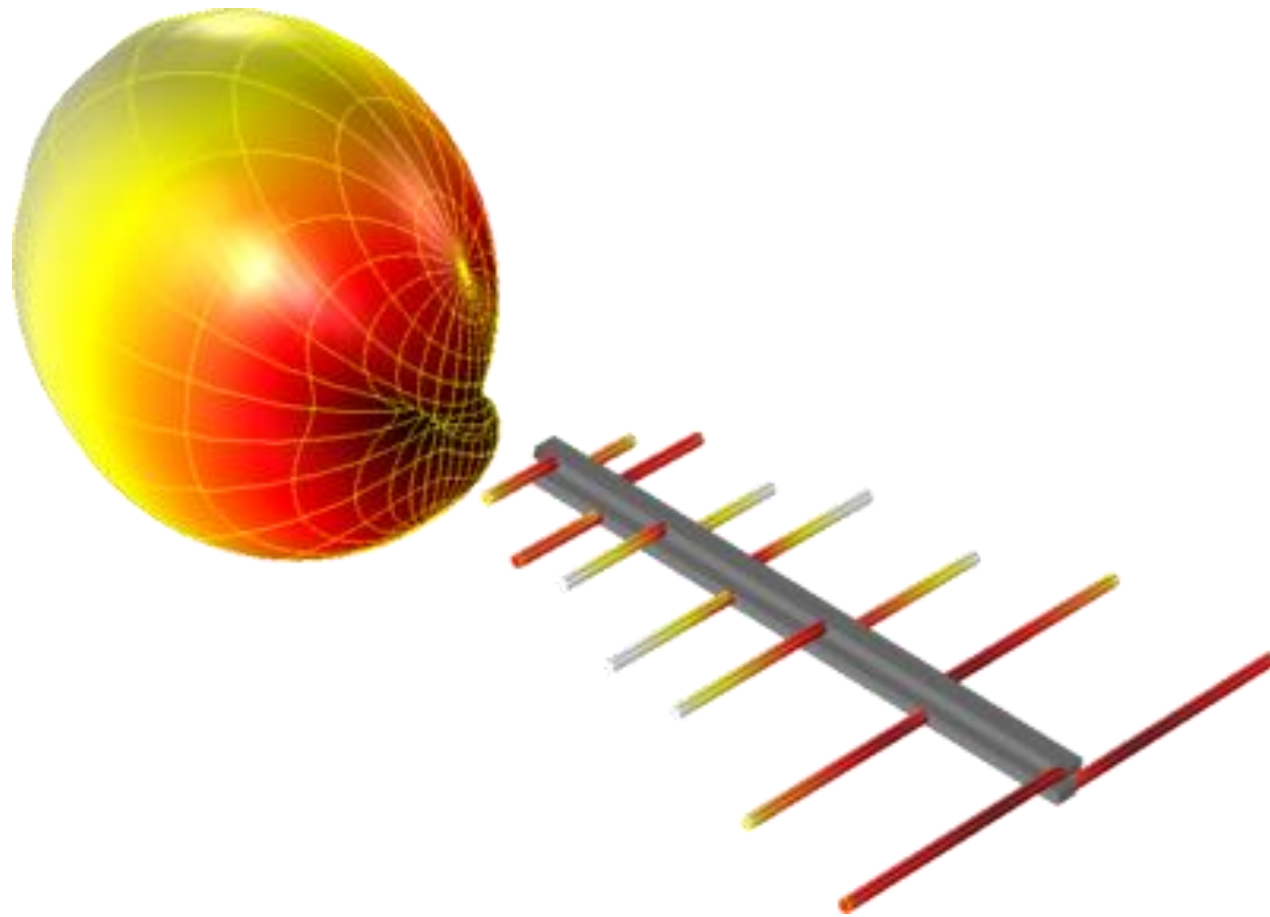
- The directive gains obtained are low to moderate. The radiation patterns may be Unidirectional or Bi-directional.



- The radiation pattern of log periodic antenna is shown here.
- From the pattern we can say that it has less directivity than other antennas like Yagi-uda.
- But we can obtain wide frequency response than any other antenna'.
- Here the radiation pattern is shown at 12MHz frequency.



FAR FIELD PATTERN





Advantages & Disadvantages

Advantages

- The antenna design is compact.
- Gain and radiation pattern are varied according to the requirements.

Disadvantages

- External mount.
- Installation cost is high.

Applications

- Used for HF communications.
- Used for particular sort of TV receptions.
- Used for all round monitoring in higher frequency bands.



THANKYOU!