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|  | ***Department of Electronics and Telecommunication Engineering***  ***(NBA ACCREDIATED)***  ***Antenna and Radio Wave Propagation Laboratory***  ***Academic Year 2020-2021***  ***Odd Semester*** |

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| **Course Code** | ECC603 |
| **Subject Professor In-charge** | Prof. Santosh Jagtap |
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| **Roll Number** | 18104B0024 |
| **Class** | TE EXTC |
| **Division** | B |
| **Date of Performance** | 28th April 2021 |
| **Date of Submission** |  |

**EXPERIMENT NO.7**

**Design Broadside and Endfire array and plot its radiation pattern.**

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| **Total**  **(10 Marks)** | **Sign** |
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**EXPERIMENT No.7**

**Title:** Design Broadside and Endfire array and plot its radiation pattern.

**Estimated time to complete this experiment:** 02 hours

**Objective:** Understand array types as per their radiation properties

**CO to be achieved:** CO1, CO2.

**Expected Outcome of Experiment:** Generation of Broadside and Endfire pattern

**Pre Lab/ Prior Concepts:** Wire antennas, Half dipole, radiation pattern

**Theory (2 Marks)**

Definition, Condition for Broadside and Endfire pattern.

Broadside pattern:

* Arrays in which the antenna elements are fed in phase are broadside arrays; the main lobe is emitted perpendicular to the plane of the elements.
* A *broadside array* is a one or two dimensional array in which the direction of radiation (main lobe) of the radio waves is perpendicular to the plane of the antennas. To radiate perpendicularly, the antennas must be fed in phase.
* Examples: Collinear arrays, Planar arrays.

Endfire pattern:

* An *endfire array* is a linear array in which the direction of radiation is along the line of the antennas. The antennas must be fed with a phase difference equal to the separation of adjacent antennas.
* Examples: Log periodic dipole array, Yagi-Uda antenna

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| **Array Design** |
| **Design Specification:**   1. **Frequency (f) :** 300 MHz 2. **Wavelength (λ)=** 1 meter 3. **Length of Wire (l) :** 0.5λ   Antenna & Wave Propagation     |  | | --- | | **λ =c/f=1 m l=0.5\* λ=0.5 m** |     Where,  c=Speed of light  L= Length of dipole  **Diameter of Wire (d):**  **d= λ/100** |

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| **Array Geometry**      **Parameter Setting** |

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| **Results** |
| 1. **Broadside Radiation Pattern (d=0.5 λ)** |
| **HBPW=40 degree Gain=5.99 dB**     1. **Endfire Radiation Pattern (d=0.5 λ)** |
| **HPBW= 120, Gain= 4.48 dB** |
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| **Results** |
| 1. **Broadside Radiation Pattern (d= λ)** |
| **HBPW=30 degree Gain= 4.93 dB**     1. **Endfire Radiation Pattern (d= λ)** |
| **HPBW= 120, Gain= 4.48 dB** |
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| **Observations:**   |  |  |  |  | | --- | --- | --- | --- | | **Sr.No** | **Parameter** | **Broadside Array** | **Endfire Array** | | 1 | HBPW | 40 degree | 60 degree | | 2 | Gain | 5.99 dB | 4.48 dB | |

**Conclusion:**

* For an array of two isotropic sources with equal magnitude and in phase, we get maximum radiation normal to the axis of the array.

This is known as the broadside pattern.

* For an array of two isotropic sources with equal magnitude and out of phase, we get maximum radiation along the axis of the array.

This is known as the endfire pattern.