EUROPEAN SCHOOL OF ANTENNAS 2005

ANTENNA CENTER OF EXCELLENCE (ACE)

MICROWAVE AND MILLIMETER-WAVE ANTENNA DESIGN

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Place: IETR, University of Rennes 1, RENNES, FRANCE

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Theory (12 h)

J.M. Laheurte

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Experimental lab (4 h)
M. Grzeskowiak

2nd Part : Design of Millimeter Wave Antennas

Course organiser : Mohamed HIMDI, Professor

IETR (Université de Rennes 1 and INSA de Rennes, France)

Theory (9h)

M. Himdi, O. Lafond, R. Sauleau, M. Drissi, S. Chainon, J.M Floch, K. Mahdjoubi

Introduction

1- Millimeter wave frequency ranges
2- Constraints (losses, dielectric information at MM, realisation,…)
3- Advantages (small size, light weight,…)
4- Main features and applications

Characterisation Of Antennas Transmission Media In Millimeter Wave Domain

1- Dielectric characterisation techniques
2- Dielectric constant
3- Dielectric losses

Effect Of Transmission Media On Performance Of Printed Antennas

1- Dielectric losses
2- Metallic losses
3- Surface waves losses
4- Efficiency
5- Limitation of gain
6- Effect on radiation pattern (co and cross polarisation)
7- Effect on reflection coefficient (scan blindness angle)

Millimeter Wave Specific Antennas Realisation Technology

1- Technology of printed antennas
  1-1 2D technology
  1-2 Multilayer technology
2- 3D technology
  2-1 Micro-machined technology
  2-2 Integrated and monolithic technology
  2-3 Metallised foam technology
  2-4 Conformal technology

Specific Millimeter Wave Antennas Metrology

1- Vector Network Analyser
2- Anechoic chamber
3- Probe station
4- Test fixture
5- Connectors and transitions (coaxial/waveguide, microstrip/waveguide, waveguide/NRD...)

Millimeter Wave Antennas Examples

1- Printed antennas array
2- Integrated antenna
3- MEMS antenna
4- Slotted waveguide array
5- Leaky-wave antenna
6- Tapered dielectric rod antenna
7- Dielectric resonator antenna
8- Quasi-optical structure (PBG, GBA,…)
9- Reflector antenna
10- Reflect-array
11- Lens antenna
12- Horn antenna
13- Multi-beam antenna
14- Phased array

Main Millimeter Wave Antennas Applications

1- Civilian applications
2- Military applications
3- Space applications
4- Automotive applications
5- Medical applications

Experimental lab (7h)

L. Le Coq, S. Chainon, S. Collardey

1- Characterisation of soft substrate (Network Analyser)
2- Measurement of antenna input impedance (Network Analyser, probe station)
3- Radiation pattern measurement of different patches antenna
   3-1 Connector effect
   3-2 Substrate effect
   3-3 Environment effect
4- Radiation pattern measurement of patches array
5- Rapid antenna gain measurement