Radar Systems

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Outline

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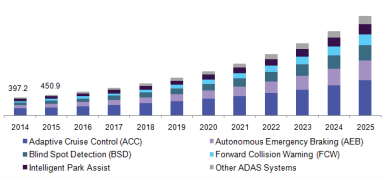
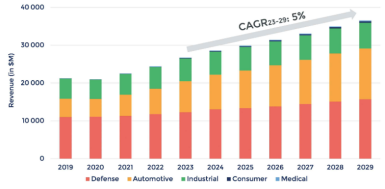
Motivation

Market forecast



U.S. automotive radar market, by application, in million USD. Source: Grand View Research

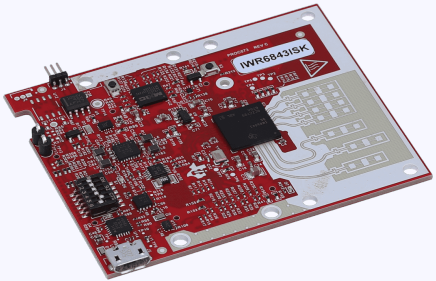


Radar system market forecast. Source: Yole

Motivation

Drivers

- Integration
- Reference designs
- Price drop



Source: Texas Instruments

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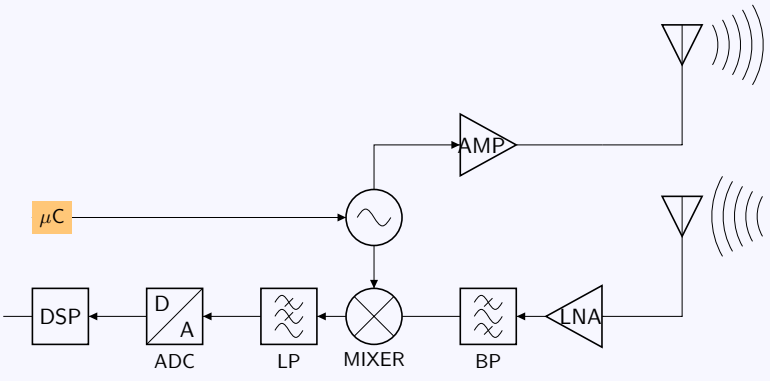
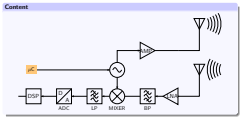
General remarks

Content



General remarks



Content

- Wave propagation and antennas
- Block diagram
- Modulation
- Spectral analysis
- Point cloud processing
- Current trends in radar signal processing
- Applications

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Literature

Literature

- Stergiopoulos, Advanced Signal Processing, CRC Press, 2009
- Kay, S.; Fundamentals of Statistical Signal Processing, Vol. I: Estimation Theory, Prentice Hall,1993
- Mahafza, Radar Signal Analysis and Processing using Matlab, CRC Press, 2016
- Winner, Handbuch Fahrerassistenzsysteme, Springer, 2015

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Preliminary outline

Preliminary outline

Week	Unit	Topic
41	1	Introduction, wave propagation
42	2	Block diagram
43	na	vacation
44	3	Spectral Analysis
45	4	Spectral Analysis
46	5	Angle finding
47	na	Block week
48	6	Angle finding
49 – 51	7 – 9	State Estimation and Tracking
2 – 4	10 – 12	Current trends & joint implementations

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Exam

Exam

Assessment of the course: Written Exam (60 min, planned for TBA) at the end of the course (50%) and homework (50%) with demonstration/presentation. Homework deals with aspects of signal processing for uses cases in automotive or robotics. Homework is teamwork and can be based upon demonstration boards and/or Matlab/Python and public dataset.

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Wave propagation

Introduction

Content

- Basics of related electromagnetic wave theory
- Basics of antennas

Study goals

- Understand basic wave propagation phenomena
- Understand basic antenna properties