

# MECHATRONICS

# BOOK SERIES

SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 2

---

**Editors**

**Md. Raisuddin Khan**

**Md. Mozasser Rahman**

**Muhammad Mahbubur Rashid**

**Shahrul Na'im Sidek**



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## CHAPTER 15

### DETERMINATION OF TARGET SPEED FROM THE FMCW RADAR DATA

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#### 15.1 Introduction

Frequency Modulated Continuous Wave (FMCW) radar is a short range measuring radar system. During normal operation of a FMCW radar, the frequency of transmitted signal is changed gradually over a certain period of time [1,2]. For a sawtooth shaped radar signal the transmitter frequency is increased linearly within the sweep time (Fig. 15.1). A sawtooth wave ramps upward and then sharply drops. In this kind of frequency modulation the frequency of the transmitted signal is linearly increased about  $\Delta F$  within the sweep time  $t_s$ .

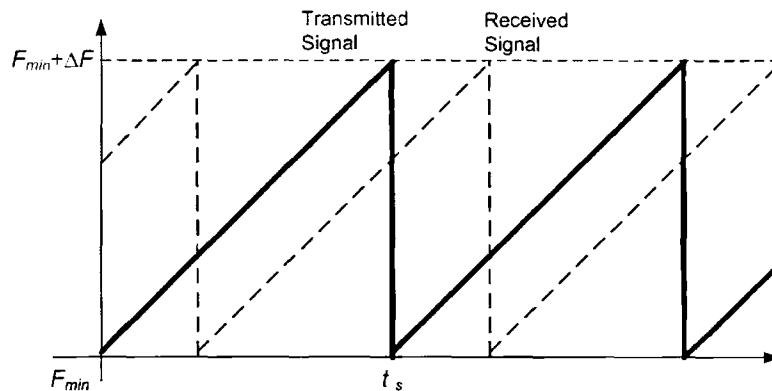


Fig. 15.1: Sawtooth shaped FMCW radar signal.

Like any radar, the FMCW radar antenna will illuminates the target with a microwave signal, which is then reflected and picked up by a receiving device [1,2]. If there is an object of target at the distance  $R$ , the receiver antenna will obtain a beat signal of frequency  $f_R$

$$f_R = \frac{2F_m}{c} R, \quad (15.1)$$

with the rate of frequency modulation  $F_m$