

超宽带时域近距离高分辨ISAR成像

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UWB Time Domain Near Field High Resolution ISAR Imaging

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摘要

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摘要 近距离目标超高分辨率微波成像技术在安全检测、非破坏性控制、生物医学等领域中有着非常重要的应用价值和广阔的应用前景。该文利用基于窄脉冲形式的超宽带时域雷达系统研究近距离目标的高分辨率ISAR成像,给出了仿真和实测结果。利用转台旋转目标,基于超宽带脉冲源和超宽带收发天线以及高性能取样示波器,配以同步触发脉冲和自行研发的数据采集软件,搭建了该时域雷达实验系统,提出了准确获取目标回波信息的实验条件,和实现回波延时精确校正的误差补偿方法。并针对采样时间窗内的杂波干扰,讨论了时域后向投影算法(Back Projection, BP)与背景对消技术相结合的成像算法,实现了分辨率为8 mm的近距离目标的成像,准确地反映了目标的位置、形状和大小等信息。

关键词: 超宽带雷达 时域 后向投影 背景对消 脉冲重复频率

Abstract: The high resolution imaging of near field targets are interesting for security, non-destructive control and biomedical application. In this paper, high resolution near field ISAR imaging is implemented using Ultra Wide Band (UWB) time domain radar system. Simulation and experiment are both conducted. The target is rotated by turntable. The system is built based on the UWB pulse source, UWB antennas, high performance sampling oscillograph, synchronous trigger pulse and proper motion study data acquisition software. Experiment condition and delay errors compensation method are presented to obtain accurate echo information of the target. And Back Projection (BP) combined with background cancel algorithm is discussed considering the clutter interference in time window. High resolution (8 mm) image is obtained, which exactly represents the position, shape and size of target.

Keywords: Ultra Wide Band (UWB) radar Time domain Back Projection (BP) Background cancel Pulse Repetition Frequency (PRF)

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