

IEEE Recommended Practice for Radar Cross-Section Test Procedures

IEEE Antennas and Propagation Society

Developed by the
Antennas and Propagation Standards Committee

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Approved 24 September 2020

IEEE SA Standards Board

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Abstract: The process of the measurement of the radar cross section of objects using a test range is described in this recommended practice. The term *radar cross section* (RCS) is defined, and the characteristics of different types of test ranges are given. The responsibilities of the test range operators are shown to involve test and calibration of the measurement range systems and to take the measurements accurately. Techniques are described for each stage of this process.

Keywords: compact range, dynamic test range, elevated range, error, ground-plane range, IEEE 1502™, inverted-V range, near-field non-anechoic range, radar cross section (RCS), radar test range, RCS measurement, spherical-wave anechoic chamber, tapered chamber, uncertainty

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Introduction

This introduction is not part of IEEE Std 1502-2020, IEEE Recommended Practice for Radar Cross-Section Test Procedures.

The measurement of radar cross section began to be a very important science in the 1960s and 1970s. Many test ranges were designed and built during that time. In the 1980s and 1990s, radar cross-section test ranges and the procedures to test, calibrate, and use them remained individualized. The operators of each test range used practices developed by the scientists and engineers that designed the test ranges. This recommended practice for radar cross-section test procedures is an attempt to provide a standard of practice across this community. It is developed for the test-range operator, the test-range manager, and users of test-range data.

The IEEE Standards Board first approved this recommended practice as a new project on 20 March 1997. The original standard was first updated in 2007, and the current revision is the second update.

Contents

1. Overview	11
1.1 Scope	11
1.2 Purpose	11
1.3 Word usage	11
2. Normative references	12
3. Definitions, acronyms, and abbreviations	12
3.1 Definitions	12
3.2 Acronyms and abbreviations	13
4. Radar cross-section measurement process	14
4.1 Introduction	14
4.2 Radar cross-section measurement background	15
4.3 Standardized test procedures	17
5. Measurement techniques	18
5.1 General	18
5.2 Outdoor ranges	18
5.3 Indoor ranges	24
5.4 Test-zone plane-wave characterization	28
5.5 Techniques for clutter and noise reduction	29
5.6 Target support concepts	34
5.7 Precision RCS calibration	37
5.8 Drift	39
5.9 I/Q balance	39
5.10 Linearity	41
5.11 Waveforms	42
5.12 Spatial and frequency averaging	45
6. RCS imaging concepts	46
6.1 General	46
6.2 Image quality	47
6.3 Noise	49
6.4 Selection of measurement parameters	49
6.5 Range ambiguities	49
6.6 Cross-range ambiguities	50
6.7 Windowing and discretization	50
6.8 Experimental design for a two-dimensional imaging measurement task	51
7. Organizing RCS range documentation	52
7.1 Introduction	52
7.2 Background	53
7.3 Introduction to ANSI/NCSL Z540.3-2006	53
7.4 ANSI/NCSL Z540.3-2006: a brief overview of Part I by clause	54
7.5 Supplementary documentation sections	56
7.6 Organizing the RCS <i>range book</i> to comply with ANSI/NCSL Z540.3-2006	57
7.7 Self-registration and third-party certification review of the range book	58
7.8 Summary	58

8. RCS uncertainty analysis.....	59
8.1 Uncertainty and error.....	59
8.2 Reasonable and uniform analysis	59
8.3 Uncertainty analysis	62
8.4 Overall uncertainty	67
9. Test planning	68
9.1 General	68
9.2 Overview	69
9.3 Reasons for a test plan	69
9.4 Test plan process	69
9.5 Conclusions	71
10. Summary	71
Annex A (informative) Bibliography	73

IEEE Recommended Practice for Radar Cross-Section Test Procedures

1. Overview

1.1 Scope

This recommended practice establishes processes for the measurement of the electromagnetic scattering from objects. It is written for the personnel responsible for the operation of test ranges and not for the design of such ranges. It recommends procedures for testing and documenting the quality of the measurement system, for calibrating the measurement system, for carrying out the radar scattering measurements, and for delivering the measurement data in a useful format to the end user.

The document defines radar cross section (RCS), describes different types of test ranges, and reviews methods of characterizing and operating radar scattering measurement ranges. Issues related to test-object support systems, types of test ranges, instrumentation, signal polarization, calibration, data analysis, and range uncertainty are also discussed.

1.2 Purpose

Although many RCS measurement ranges are built for specific localized purposes (for example, airplane measurements) and methods of characterizing the ranges and performing the measurements are developed for the specific needs of each particular test range, many other objects are measured nowadays, and the corresponding ranges are probably not dedicated to a specific class of objects. Consequently, this recommended practice is intended to establish guidelines so that operators and users of RCS ranges can provide results that are useful across a larger community of users

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (shall equals is required to).^{1,2}

¹ The use of the word *must* is deprecated and cannot be used when stating mandatory requirements, *must* is used only to describe unavoidable situations.

² The use of *will* is deprecated and cannot be used when stating mandatory requirements, *will* is only used in statements of fact.