
Meteorology — Weather radar —
Part 1:
System performance and
operation

Météorologie — Radars météorologiques —

Partie 1: Performance et fonctionnement des systèmes

iTech Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 19926-1:2019

<https://standards.iteh.ai/catalog/standards/iso/8f05adb8-551c-4b0b-b587-939b031b599f/iso-19926-1-2019>



iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 19926-1:2019

<https://standards.iteh.ai/catalog/standards/iso/8f05adb8-551c-4b0b-b587-939b031b599f/iso-19926-1-2019>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction	vi
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	1
5 Basics	2
5.1 Frequency bands	2
5.2 System configuration	3
5.2.1 Overview of radar system component units	3
5.2.2 Dual-polarization transmit modes	6
5.2.3 Description of components	7
6 System performance and measurement parameters	10
6.1 General aspects	10
6.2 Fundamental parameters	12
6.2.1 Sensitivity	12
6.2.2 Spatial resolution	16
6.2.3 Phase stability	21
6.2.4 Accuracy of dual-polarization measurement	22
6.3 Other key parameters	22
6.3.1 Side lobe	22
6.3.2 Beam direction co-alignment	22
6.3.3 Beam width matching	22
6.3.4 Maximum rotation speed	23
6.3.5 Acceleration	23
6.3.6 Antenna pointing accuracy	23
6.3.7 Dynamic range	23
6.3.8 Unwanted emissions	24
7 Calibration, monitoring and maintenance	24
7.1 General aspects	24
7.2 Calibration	25
7.2.1 General	25
7.2.2 Types of calibration	25
7.2.3 Items, procedures and intervals of calibration	26
7.3 Monitoring	26
7.3.1 General	26
7.3.2 Stability of radar system	26
7.3.3 Monitoring receiver stability and electrical pointing using the sun	27
7.4 Maintenance	28
7.4.1 General aspects	28
7.4.2 Preventive maintenance	28
7.4.3 Corrective maintenance	28
7.4.4 Maintenance options	29
7.4.5 Maintenance items and intervals	29
7.5 Life-cycle management	30
7.5.1 Spare-parts strategy	30
7.5.2 System availability	30
7.5.3 Life-cycle costs	31
8 Staff, competencies and training	31
9 Siting and installation	34
9.1 General aspects	34

9.2	Selection and preparation of a radar site	34
9.3	Supporting infrastructure	35
9.4	Coverage	36
9.5	Visibility and interferences	37
Annex A (normative) System performance parameter measurement.....		38
Annex B (informative) Sample radar specifications.....		79
Annex C (informative) Recording of measurement results.....		81
Annex D (informative) Recommended maintenance and calibration actions.....		85
Annex E (informative) Radar data exchange.....		88
Annex F (informative) Other radar systems.....		89
Bibliography		92

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 19926-1:2019

<https://standards.iteh.ai/catalog/standards/iso/8f05adb8-551c-4b0b-b587-939b031b599f/iso-19926-1-2019>

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 5, *Meteorology*, and by the World Meteorological Organization (WMO) as a common ISO/WMO Standard under the Agreement on Working Arrangements signed between the WMO and ISO in 2008.

A list of all parts in the ISO 19926 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The rapid development of weather radar occurred just before and during the Second World War. Initially, radar was demonstrated at long (10 m to 50 m) wavelengths, but quickly moved to shorter wavelengths (3 cm and 10 cm) with the requirement for, and development of, compact and high-power transmitters. C-band (5 cm) wavelengths were available in the late 1950s. The first operational Doppler radars appeared in the mid-1980s, with demonstration of the technology's application in operations and the availability of high-speed, affordable processors and efficient software codes. The adoption of dual-polarization capability for operational radars followed in the mid to late 1990s.

Radars provide localized, highly detailed, timely and three-dimensional sensing and observing capability that no other meteorological monitoring system can provide. They are able to measure variations in precipitation rates at a resolution of a few square kilometres or better and at time cycles of the order of a few minutes. They provide the capability to monitor rapidly evolving weather events, which is critical for the provision of early warnings of severe and hazardous weather. This includes heavy rain, hail, strong winds (e.g. tornadoes and tropical cyclones) and wind shear; the conditions that have the highest impact on society of all the weather elements. Doppler and dual-polarization radars are able to resolve the high variability of wind and precipitation types, and even see insects or clear air turbulence used to predict the onset of thunderstorms and for measuring vertical wind profiles. Dual polarization is also used for quality assurance and to improve precipitation estimates.

With high speed telecommunications and data processing, radar systems are now networked to better monitor large-scale weather phenomena, such as tropical cyclones and major extra-tropical storms (both in summer and winter). The data derived from the networking of radars can provide longer lead times (from 60 min to 90 min to several hours) for early warnings. Numerical weather prediction systems have also now advanced and the assimilation of continental-scale radar-derived precipitation data into global models can significantly improve the 4-day to 5-day precipitation forecasts of neighbouring areas and continents.

The provision of homogeneous, high-quality data starts with the installation and use of appropriate radar technology for the local weather environment and conditions. The wavelength of the radar, the beam width of the antenna, the type and power of the transmitter, the sensitivity of the receiver and the waveform all have significant impacts on the resolution and quality of radar data. Weather radars have traditionally been specified and configured to meet local requirements for weather monitoring and surveillance and to cater for local geography and other factors, leading to globally diversity in technology and in sampling strategies. These all impact on different data quality metrics, such as availability, timeliness and accuracy. These metrics also rely on the operation and maintenance of the radar systems through adherence to prescribed and standardized procedures and practices. This requires the establishment of standards, technical specification best practices and guidelines for network design, site selection, calibration, system and equipment maintenance, sampling and data processing, and distribution.

The purpose of this document is wide and addresses organizations in all countries using weather radar, with particular emphasis on countries that do not have a long tradition of weather radar operation and usage. It provides:

- support to manufacturers to maintain a comparable and high level of competitive weather radar systems;
- aid for tendering authorities to take into account state of the art of system performance as well as merely component definitions in their documents and, thus, to help to compare different incoming bids;
- provision of a valid documentation on the potential and limitations of weather radar systems, thus supporting capacity building worldwide;
- advice on the general requirements for siting, operation, maintenance and calibration tasks to keep radar systems on a high level of data quality and availability;

- a description of the required range of tasks for operating and maintaining weather radar systems in order to let managers allocate enough financial resources and staff capacity for this purpose.

Further information, such as the fundamentals of weather radar measurement, can be found in Reference [1].

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

ISO 19926-1:2019

<https://standards.iteh.ai/catalog/standards/iso/8f05adb8-551c-4b0b-b587-939b031b599f/iso-19926-1-2019>