ISO 19926-1:2019 (E)

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

Contents

Foreword

Introduction

1 Scope

2 Normative references

3 Terms and definitions

4 Abbreviated terms

5 Basics

5.1 Frequency bands
5.2 System configuration
5.2.1 Overview of radar system component units
5.2.2 Dual-polarization transmit modes
5.2.2.1 General
5.2.2.2 Simultaneous transmit and receive or hybrid mode
5.2.2.3 Alternate H/V mode
5.2.2.4 Linear depolarization ratio mode
5.2.3 Description of components
5.2.3.1 Antenna
5.2.3.2 Radome
5.2.3.3 Transmitter
5.2.3.3.1 General aspects
5.2.3.3.2 Transmitter duty cycle
5.2.3.3.3 System pulse width range
5.2.3.3.4 Pulse repetition frequency
5.2.3.4 Receiver
5.2.3.5 Signal processor
5.2.3.6 Data processor

6 System performance and measurement parameters

6.1 General aspects
6.2 Fundamental parameters
6.2.1 Sensitivity
6.2.1.1 Definition
6.2.1.2 Derivation from radar equation
6.2.1.3 Basic calculation
6.2.1.4 System loss and attenuation of radio wave
6.2.1.5 Pulse-compression gain
6.2.2 Spatial resolution
6.2.2.1 Definition
6.2.2.2 Beam resolution
6.2.2.3 Range resolution
6.2.3 Phase stability
6.2.4 Accuracy of dual-polarization measurement
6.2.4.1 Dual polarization
6.2.4.2 Cross polarization and port isolation
6.3 Other key parameters
6.3.1 Side lobe
6.3.2 Beam direction co-alignment
6.3.3 Beam width matching
6.3.4 Maximum rotation speed

6.3.5 Acceleration
6.3.6 Antenna pointing accuracy
6.3.7 Dynamic range
6.3.8 Unwanted emissions

7 Calibration, monitoring and maintenance

7.1 General aspects
7.2 Calibration
7.2.1 General
7.2.2 Types of calibration
7.2.3 Items, procedures and intervals of calibration
7.3 Monitoring
7.3.1 General
7.3.2 Stability of radar system
7.3.3 Monitoring receiver stability and electrical pointing using the sun
7.3.3.1 General remarks
7.3.3.2 Antenna pointing accuracy
7.3.3.3 Receiver stability
7.4 Maintenance
7.4.1 General aspects
7.4.2 Preventive maintenance
7.4.3 Corrective maintenance
7.4.4 Maintenance options
7.4.5 Maintenance items and intervals
7.5 Life-cycle management
7.5.1 Spare-parts strategy
7.5.2 System availability
7.5.3 Life-cycle costs

8 Staff, competencies and training

9 Siting and installation

9.1 General aspects
9.2 Selection and preparation of a radar site
9.3 Supporting infrastructure
9.4 Coverage
9.5 Visibility and interferences

Annex A (normative) System performance parameter measurement

A.1 General
A.2 Standard specification format
A.3 Fundamental parameter measurement
A.3.1 General
A.3.2 Transmit pulse half power width
A.3.2.1 Measurement diagram
A.3.2.2 Measurement device
A.3.2.3 Measurement method
A.3.3 Peak transmit power, Pt
A.3.3.1 Measurement diagram
A.3.3.2 Measurement device
A.3.3.3 Measurement method
A.3.3.3.1 General
A.3.3.3.2 Cable loss measurement
A.3.3.3.3 Measurement of Pt
A.3.4 Antenna gain, beam width
A.3.4.1 General
A.3.4.2 Measurement diagram
A.3.4.3 Measurement device
A.3.4.4 Measurement method
A.3.4.4.1 Antenna gain
A.3.4.4.2 Antenna beam width, θH/V
A.3.5 Cross-polarization isolation
A.3.5.1 Measurement diagram
A.3.5.2 Measurement device

A.3.5.3 Measurement method
A.3.6 Minimum detectable signal, Smin
A.3.6.1 Theoretical estimation
A.3.6.2 Non-pulse-compression radar
A.3.6.2.1 Band width measurement
A.3.6.2.1.1 Measurement diagram
A.3.6.2.1.2 Measurement device
A.3.6.2.1.3 Measurement method
A.3.6.2.2 Noise-figure measurement
A.3.6.3 Pulse-compression radar
A.3.6.3.1 Bandwidth measurement
A.3.6.3.1.1 Measurement diagram
A.3.6.3.1.2 Measurement device
A.3.6.3.1.3 Measurement method
A.3.6.3.2 Noise-figure measurement
A.3.7 Pulse-compression gain
A.3.7.1 General
A.3.7.2 Measurement diagram
A.3.7.3 Measurement device
A.3.7.4 Measurement method
A.3.8 Range resolution
A.3.8.1 Non-pulse-compression radar
A.3.8.2 Transmit pulse half power width
A.3.8.2.1 General
A.3.8.2.2 Sampling interval of received signal
A.3.8.2.2.1 General
A.3.8.2.2.2 Measurement diagram
A.3.8.2.2.3 Measurement method
A.3.8.2.3 Bandwidth of receiver
A.3.8.3 Pulse-compression radar
A.3.8.3.1 Measurement diagram
A.3.8.3.2 Measurement device
A.3.8.3.3 Measurement method
A.3.9 System loss, F
A.3.9.1 General
A.3.9.2 Measurement of radome transmission loss, Frd
A.3.9.2.1 General
A.3.9.2.2 Measurement diagram
A.3.9.2.3 Measurement device
A.3.9.2.4 Measurement method
A.3.9.3 Measurement of loss of transmit receive paths
A.3.9.3.1 General
A.3.9.3.2 Measurement diagram
A.3.9.3.3 Measurement device
A.3.9.3.4 Measurement method
A.3.9.4 Measurement of matched filter losses
A.3.9.4.1 General
A.3.9.4.2 Measurement diagram
A.3.9.4.3 Measurement method
A.3.10 Phase stability
A.3.10.1 General aspects
A.3.10.2 Measurement for klystron and solid-state radar
A.3.10.2.1 Measurement diagram
A.3.10.2.2 Measurement device
A.3.10.2.3 Measurement method
A.3.10.3 Measurement for magnetron, klystron and solid-state radar
A.3.10.3.1 Measurement diagram
A.3.10.3.2 Measurement device
A.3.10.3.3 Measurement method
A.4 Other key parameters
A.4.1 General
A.4.2 Unwanted emissions
A.4.2.1 Measurement diagram
A.4.2.2 Measurement device

A.4.2.3 Measurement method
A.4.3 Antenna side lobe
A.4.3.1 Measurement diagram
A.4.3.2 Measurement device
A.4.3.3 Measurement method
A.4.4 Beam direction co-alignment
A.4.4.1 Measurement diagram
A.4.4.2 Measurement device
A.4.4.3 Measurement method
A.4.5 Beam width matching
A.4.5.1 Measurement diagram
A.4.5.2 Measurement device
A.4.5.3 Measurement method
A.4.6 Maximum rotation speed
A.4.6.1 Measurement diagram
A.4.6.2 Measurement device
A.4.6.3 Measurement method
A.4.7 Acceleration
A.4.7.1 Measurement diagram
A.4.7.2 Measurement device
A.4.7.3 Measurement method
A.4.8 Antenna pointing accuracy
A.4.8.1 Measurement diagram
A.4.8.2 Measurement device
A.4.8.3 Measurement method
A.4.9 Dynamic range
A.4.9.1 Measurement diagram
A.4.9.2 Measurement device
A.4.9.3 Measurement method
A.4.10 Range side lobe
A.4.10.1 Measurement method
A.4.10.2 Measurement device

Annex B (informative) Sample radar specifications

Annex C (informative) Recording of measurement results

Annex D (informative) Recommended maintenance and calibration actions

Annex E (informative) Radar data exchange

Annex F (informative) Other radar systems

F.1 Phased-array weather radar
F.2 Micro rain radar
F.3 Terminal Doppler weather radar
F.4 Terminal Doppler lidar
F.5 Cloud radar
F.6 Small-size radar system

Page count: 93