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Industrial wireless communication specification based on cellular networks - Part 4: Security requirements

基于蜂窝网络的工业无线通信规范 第4部分：安全要求

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part

1.Structure and Drafting Rules of Standardization Documents". Drafting. This document is Part 4 of GB/T 42126, "Industrial Wireless Communication Specifications Based on Cellular Networks". GB/T 42126 has been published. The following parts were included.

1.General Technical Requirements;

4.Safety Requirements;

5.Application Specifications;

6.Acceptance Specifications. Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents. This document was proposed by the China Machinery Industry Federation. This document is under the jurisdiction of the National Technical Committee on Standardization of Industrial Process Measurement, Control and Automation (SAC/TC124). This document was drafted by: the Institute of Comprehensive Technical and Economic Research on Instrumentation and Meter of the Machinery Industry, Southeast University, and Fujian Shunchang Hongrun Precision Instruments Co., Ltd. The company, Beijing Institute of Printing, Guoneng Zhishen Control Technology Co., Ltd., Guoneng Jilin Longhua Thermal Power Co., Ltd. Jilin Thermal Power Plant, State Grid Liaoning Ningxia Electric Power Research Institute, Nanjing Shenye Intelligent Technology Co., Ltd., Huawei Technologies Co., Ltd., and Xi'an Huayun Zhilianxin Information Technology Co., Ltd., Hangzhou Meiyi

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Cellular wireless communication technology (hereinafter referred to as cellular network) has been continuously evolving and has now reached its fifth generation. Industrial wireless communication based on cellular networks... Communication systems (referred to as industrial cellular networks) are gradually meeting the application requirements of low latency, high bandwidth, wide connectivity, and flexible networking in industrial scenarios. For example, manufacturers can connect assets such as manufacturing equipment sensors, controllers, tools, and materials through industrial cellular networks, and can also share information. The system connects with equipment, providing all relevant parties with richer, more operable, traceable, and location-based information, thus helping industry

move towards digitalization and informatization. And the transformation towards intelligence. With the continuous evolution of cellular network wireless communication technology, industrial cellular networks are facing challenges in bandwidth, latency, and availability. Continue to improve and empower more industrial application scenarios. GB/T 42126, "Industrial Wireless Communication Specification Based on Cellular Networks," is a fundamental standard guiding the application of cellular networks in industrial settings. To ensure that the industrial cellular network can adapt to the application needs of industrial scenarios, it is proposed to consist of 6 parts.

1.General Technical Requirements. The purpose is to establish general technical requirements applicable to various industrial sites.

2.Protocol Standards. The purpose is to establish communication protocol requirements applicable to industrial environments.

3.Test Specifications. The purpose is to establish industry-standard test specifications for communications.

4.Security Requirements. The purpose is to ensure the secure operation and management of cellular networks.

5.Application Requirements. The aim is to better apply cellular networks in industrial settings and facilitate widespread adoption by all stakeholders.

6.Acceptance Requirements. The purpose is to ensure that the cellular network, once established according to the requirements of GB/T 42126.1~GB/T 42126.5, meets the following standards. It meets the actual requirements of all relevant parties. Cellular network-based industrial wireless communication specifications Part

4 Safety Requirements

1.Scope This document specifies the security requirements for industrial wireless communication systems based on cellular networks, including security risk analysis and overall security design requirements. Requirements, security features, and deployment requirements. This document applies to industrial wireless communication systems based on cellular networks, especially 5G-related security planning, construction, operation management, and testing. Evaluate.

4.Abbreviations The following abbreviations apply to this document. AES. Advanced Encryption Standard AGV. Automated Guided Vehicle AKA. Authentication and Key Agreement AMF. Access and Mobility Management Function API. Application Programming Interface APP. Application AS. Access Layer AUSF. Authentication Server Function AUSF. Authentication Server Function CPE (Customer Premise Equipment) CPF. Control Plane Function DDoS. Distributed Denial of Service EMS. Energy Management System ERP. Enterprise Resource Planning FlexE. Flexible Ethernet gNB. Next Generation NodeB

GNSS. Global Navigation Satellite System GPS. Global Positioning System HMI. Human Machine Interface HTTP Hypertext Transfer Protocol IPsec. Internet Protocol Security LIMS (Laboratory Information Management System) MEC. Multi-access Edge Computing MEP. Multi-access Edge Security Platform MES. Manufacturing Execution System NAS. Non-Access Stratum NEF. Network Exposure Function NF. Network Function NRF. Network Repository Function NSSAI. Network Slice Selection Assistance Information PCF. Policy Control Function PDU. Protocol Data Unit PLC. Programmable Logic Controller QMS. Quality Management System QoS. Quality of Service RAN. Radio Access Network RB. Resource Block SCADA. Supervisory Control and Data Acquisition System SLA. Service Level Agreement SMF. Session Management Function TLS. Transport Layer Security UDM. Unified Data Management UE. User Equipment UPF. User-Plane Function VLAN. Virtual Local Area Network VPN. Virtual Private Network WMS. Warehouse Management System 3GPP. 3rd Generation Partnership Project 5G. The Fifth Generation Mobile Communication Technology

5 Security Risk Analysis

5.1 Security Risks of Cellular Network Access Cellular network access introduces new risks to existing security systems. Figure 1 illustrates the risk points of cellular network access in industrial sites. As shown. Figure

1.Schematic diagram of risk points in industrial sites for cellular network access. In Figure 1, risk points can be divided into three categories.

---Risk Point A. The access point is outside the industrial site security boundary, and existing protective measures (such as firewalls) are effective;

---Risk Point B. The access point is located within the application domain security boundary, where existing protective measures are partially ineffective or introduce internal security risks;

---Risk Point C. The access point is within the security boundary of the control domain, and some of the original protective measures have failed, posing a direct security risk to the production equipment.

5.2 Other Risk Analysis The introduction of cellular networks should be analyzed to assess the additional security risks it poses to the control and application domains of industrial sites, including operational, economic, and health risks. Health, environment, and other factors are considered. Assessment principles and methods are detailed in IEC 62443 and GB/T 30976.1.

6 General Safety Design Requirements

6.1 Integration Requirements Cellular networks should be integrated with industrial communication network security through security measures such as authentication, data