Electromagnetic Radiation Monitoring and Rescue Equipment Based on Communication

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Abstract. In case of electromagnetic radiation pollution caused by an accident, it is necessary to monitor the accident site to facilitate rescue personnel to carry out rescue operations in time according to the site conditions. The technical problem to be solved in this paper is to overcome the defects of the existing technology and provide an electromagnetic radiation monitoring and rescue equipment based on communication. We connect the control host with the remote to observe the rescue area remotely. When an abnormality is found, a reminder will be sent to ensure the life safety of rescue personnel. When an injured person is found, the on-site rescue workers can be notified to facilitate the rescue work.

Keywords: Electromagnetic radiation equipment, detection, Communication.

1. Introduction

Electromagnetic radiation monitoring is to systematically measure the amount of electromagnetic radiation in a specific environment (area), then explain it according to the measurement purpose and corresponding standards to control electromagnetic radiation pollution and protect the environment and public safety. The measurement of electromagnetic pollution monitoring is the measurement of electromagnetic radiation intensity, including the measurement of near-field strength, far-field strength, and microwave energy leakage. According to the measurement site, it can be divided into operation environment monitoring, specific public exposure environment monitoring (such as the environment near the radiation source) and public exposure environment monitoring. According to the measured parameters, it is divided into the monitoring of electric field intensity, magnetic field intensity, electromagnetic field rate and flux density. In case of electromagnetic radiation pollution caused by an accident, it is necessary to always monitor the accident site to facilitate rescue personnel to carry out rescue operations in time according to the site conditions. However, the current electromagnetic radiation monitoring and rescue equipment is usually fixed and supported by a tripod, which is not only inconvenient to carry, but also can’t effectively maintain stability when the ground is uneven, affecting normal use, and there are deficiencies.

The technical problem to be solved in this paper is to overcome the defects of the existing technology and provide a communication based electromagnetic radiation monitoring and rescue equipment.

2. Basic Characteristics of Electromagnetic Radiation Field

Electromagnetic radiation field is generally divided into far field and near field. The spatial range with the field source as the center and the radius less than one wavelength is usually called the near field or the induced field. The near field generally has the following characteristics: there is no clear proportional relationship between electric field intensity and magnetic field intensity. Generally, for

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high voltage and low current field sources (such as transmitting antenna, feeder, etc.), the electric field is much stronger than the magnetic field. On the contrary, for the field source with low voltage and high current, the magnetic field is much stronger than the electric field. The electromagnetic field intensity in the near field is much greater than that in the far field, and changes rapidly with distance.

The space with the field source as the center and the radius of more than one wavelength is called far field, which can also be called radiation field. The characteristics of far-field mainly include: all electromagnetic energy is radiated in the form of electromagnetic wave, and the attenuation of radiation intensity is much slower than that of induced field; The action directions of electric field and magnetic field are perpendicular to each other, and both are perpendicular to the propagation of electromagnetic wave. Direction: the electromagnetic field intensity in the far field is less than that in the near field.

For the radiation source that can produce a certain intensity of electromagnetic radiation, the electromagnetic intensity in the near field is greater than that in the far field. There are three main frequency ranges of electromagnetic field sources that human body may contact:

1) 0 ~ 300Hz electrostatic field and extremely low frequency electromagnetic field. It mainly comes from high-voltage transmission lines, indoor power wiring, nuclear magnetic resonance and various equipment using DC power supply.

2) Medium frequency electromagnetic field of 300Hz ~ 10MHz. It mainly includes computer display, industrial induction heater, anti-theft system and remote-control system, etc.

3) RF range: 10 MHz ~ 300 GHz. It mainly includes radar, radio broadcasting, television, and communication [1-3].

3. Hazard Mechanism of Microwave Radiation
The harm mechanism of microwave radiation to human body mainly includes heat generating effect, non-heat generating effect and cumulative effect:

1) Thermogenic effect [4]. It refers to the rise of body temperature caused by microwave radiation with a certain frequency and power. When the temperature rise exceeds the temperature regulation capacity of the tissue, or the energy absorbed by the irradiated tissue is much greater than the metabolic capacity of the human body, the heat transfer capacity of the tissue will be confused, resulting in damage and even tissue death.

2) Non thermogenic effect [5]. There are weak electromagnetic fields in human organs and tissues, which are stable and orderly. Once disturbed by external electromagnetic fields, the weak electromagnetic field in equilibrium will be destroyed and cause harm to human body. Non thermal effects mainly refer to the biological effects produced in electromagnetic places of various frequencies, especially in human bodies with low electromagnetic energy density, with less heat and no temperature rise. Obvious impact on human body.

3) Cumulative effect [6-8] After the human body is affected by heat generating effect and non-heat generating effect, if the damage is not repaired in time and is radiated by electromagnetic wave again, the degree of damage will accumulate, and it will become a permanent disease and life-threatening for a long time. If the human body is radiated by electromagnetic wave for a long time, even if the power is very small and the frequency is very low, unexpected lesions may be induced.

In short, microwave radiation may cause damage to human central nervous system, reproductive system, cardiovascular system, immune system, and visual system.

4. Design of Communication Based Electromagnetic Radiation Monitoring and Rescue Equipment
This paper discloses a communication based electromagnetic radiation monitoring and rescue equipment, including placing a bottom plate and a support column, the top of the support column is sleeved with a tensile support rod, one side of the connecting block is connected with a first cross rod, the end of the first cross rod is provided with a positioning groove, a positioning support plate is placed inside the positioning groove, and an electric PTZ is installed on the top surface of the
positioning support plate. An infrared camera is installed on the rotary table of the electric pan tilt, a limited fence is installed on the top surface of the second cross bar, a plurality of limit locking screws are arranged on the periphery of the limit fence, the limit locking screws penetrate into the inner cavity of the limit fence, and an electromagnetic radiation monitor is placed inside the limit fence. In this paper, the bottom plate is hinged on the outside of the support column, so that the bottom plate can be adjusted according to the slope of the ground. After the tension angle is locked by the telescopic sleeve rod, the positioning inserting rod is inserted into the ground for fixation, to make the overall placement more stable and avoid shaking due to external force in outdoor use.

![Figure 1. The overall structure diagram.](image)

In the figure 1: 1. Place the bottom plate; 2. Support column; 3. Connector; 4. Grooves; 5. Baffle; 6. T-shaped chute; 7. Positioning plate; 8. Inserting rod groove; 9. Positioning inserting rod; 10. Through hole; 11. Tension strut; 12. Connecting block; 13. The first cross bar; 14. Positioning groove; 15. Positioning support plate; 16. Electric PTZ; 17. Infrared camera; 18. The second cross bar; 19. Limit fence; 20-21. Electromagnetic radiation monitor; 22. Control the host; 23. Rotating support; 24. Telescopic sleeve rod; 101. Iron sheet; 102. Magnet; 103. Bandage; 121. Connecting seat; 122. Connecting sleeve; 123. Inclined strut; 231. Mounting plate; 232. Threaded rod; 233. Annular sleeve; 234. Connector; 235. Locking sleeve.
The control host is equipped with storage battery, loudspeaker, 5g communication module, data transmission module, control module and memory. The control host is electrically connected with electric pan tilt, infrared camera, and electromagnetic radiation monitor. Power is supplied through storage battery, 5g communication module relates to remote control, and voice can be broadcast through loudspeaker. The data of infrared camera and electromagnetic radiation monitor are transmitted by data transmission module, the control module controls the electric PTZ, and the memory records the content.

When in use, place the electromagnetic radiation monitor in the limit fence, then lock the electromagnetic radiation monitor with the limit locking screw, connect the control host with the remote-control end, and receive the pictures taken by the infrared camera and the values monitored by the electromagnetic radiation monitor. When the electromagnetic radiation values in the monitoring area of the electromagnetic radiation monitor are abnormal, the electric pan tilt can be controlled remotely by controlling the host, to adjust the shooting angle of the infrared camera, find the target in the area faster, and remind the on-site rescue workers by controlling the speaker in the host. When there are people in need of rescue in the area, the speaker in the host plays a notice to assist the injured in self rescue, At the same time, dispatch the rescue workers to improve the rescue speed; After use, the placing bottom plate is folded, the iron sheet is absorbed with the magnet, and the strap is bound at the same time, so that the placing bottom plate is folded on the outside of the support column. At the same time, the connecting sleeve on the connecting block can be separated from the tensile support rod, so that the first cross rod and the second cross rod can be removed and placed vertically. After separation, the overall occupied area is greatly reduced, which is convenient for carrying, more convenient to use.

In this paper, the bottom plate is hinged on the outside of the support column, so that the bottom plate can be adjusted according to the slope of the ground. After the tension angle is locked by the telescopic sleeve rod, the positioning inserting rod is inserted into the ground for fixation, so as to make the overall placement more stable and avoid shaking due to external force in outdoor use; At the same time, the bottom plate can be folded and bound with the support column, and the cross bar at the top can be separated through the connecting block, so as to reduce the occupied area and facilitate the overall carrying; At the same time, the control host is connected with the remote, which can observe the rescue area remotely, send a reminder in case of abnormality, so as to ensure the life safety of rescuers, and notify the on-site rescue workers when an

5. Conclusion
This paper presents a communication-based electromagnetic radiation monitoring and rescue equipment. We connect the control host to the remote, and can observe the rescue area remotely, and send out reminders when abnormalities are found to protect the lives of rescuers. When the injured are found, the rescue workers on the spot can be notified for convenience. Carry out rescue work. Its advantage lies in the accurate measurement of electromagnetic radiation data and timely communication and alarm, while the stability is stronger, and it is convenient to carry.

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