

# **A PILOT STUDY ON INTERPRETATION MARKS OF SUPER LOW FREQUENCY ELECTROMAGNETIC SPECTRUM CURVES OF GOAVES IN MINE\***

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## **ABSTRACT**

Defined by international telecommunications union (ITU), the spectrum in the band between 30 and 300 Hz are named as super low frequency (SLF). In this band, the electromagnetic waves are rarely shielded by strata of lower resistivity and can spread strongly. Therefore, it can be used on the earth's surface to detect goaves underground. The equipment, which use the natural SLF electromagnetic signals to obtain information of targets, is called as passive SLF explorer. In this paper, we introduce the study that uses the passive SLF explorer to detect goaves.

The explorer receives the SLF electromagnetic signals on the ground, and the signals are the synthesis of resistivity, density, magnetism, depth and other characteristics of the rocks underground. After signal processing, the apparent resistivity of different depth of rocks can be work out from that and form a spectrum curve varied with depth change. According the curve, we can find if there is gob existing underground.

After a great many experiments at different goaf site in different mine, we collected about a thousand spectrum curves in total and then made analysis on the characteristics of the filling in goaf and set up the interpretation marks to obtain the information of goaf and terrane from these curves.

From the investigation on goaves, we found that the goaves appears several types, after a period of time, according to its filling. Those are classed as four types, goaf of no filling, goaf of water seeping or saturation, the cap of goaf falling down and goaf filled with fallen cap and water. Compared the investigation with the SLF electromagnetic curves, we find the curve's characteristics those correspond to goaf of different type and class the SLF curves in four type correspondingly.

According to the representative differences of amplitude and shape of different curves, we set up the interpretation marks of SLF electromagnetic curves of goaves. The interpretation marks can help interpreter to identify the filling type and status of goaves, and can improve the accuracy and

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objectivity in the interpretation work.

The interpretation marks of SLF electromagnetic curves represent the relationship between apparent resistivity and filling types, which is listed below: high resistivity is identified correspondingly to no filling, low resistivity to water seeps or saturation, uneven resistivity to the cap of goaf falling down but high resistivity to unfilled part of goaf, complicated resistivity characteristics to goaf filled with fallen cap and water. The different lithology of cap and floor of coal bed also represent different characteristics of resistivity, that is, fine sandstone shows serration amplitude on SLF electromagnetic curves, medium sandstone shows a variation with a certain direction and a higher amplitude.

**Key words:** SLF electromagnetic wave ; spectrum curve ; interpretation marks ; goaves in mine.