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A novel quench detection method using radio frequency wave technology

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The co-wound voltage tap sensor is considered suitable to pulse operation superconducting coil quench detection but it has a fatal weak point. There is no way to repair it in case of sensor failure, since the co-wound sensor will be embedded inside the coil. A novel quench detection method is presented in this paper to detect a quench using radio frequency wave technology. The RF detection relies only on external instrumentations, which means good maintenance. The first step is to balance the inductive component to be measured superconducting coil by using the balancing device (Balun) and then connect with steady-state RF power source through professional isolation component. The reflected power and phase of carrier signal will be changed if normal zone appeared even less than 2 milliohm which means a quench occurred. However, the high performance multistage cancellation systems are necessary in order to discriminate the large scale of unchanged components in the carrier signal. The simulation results have shown that radio frequency detection technology is applicable to the pulse superconducting coils as a backup method and this method has gained national patent. This paper introduces the principle, the conception design and simulation results. The preliminary test is under way in recent days.

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