

Scientific Monitoring And Reliable Telecommunications (SMART) Cable Systems: Integration of Sensors into Telecommunications Repeaters

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Abstract—Integration of geophysical sensors into commercial submarine telecommunications cable systems has been proposed as a means to provide early warning of earthquake and tsunami events and expand our understanding of the ocean’s role in Earth’s climate. Submarine telecommunications systems are optimized for high capacity data transmission over long distances and routinely achieve operating lives of 15 to 25 years without experiencing internal faults or failures. The systems consist of pressure housings, incorporated into the cable at intervals of 60 to 150 km, house optical fiber amplifiers, simple power supply circuits, and little else. Modification of these “repeater” housings to incorporate temperature, pressure, and acceleration sensors and deliver communication and power to those sensors with negligible impact on the repeaters’ primary telecommunications functions, however, does present certain engineering challenges. Several possible methods of providing a communications channel, isolating the sensors from the repeaters’ power supply, and mounting the sensors to the cable or repeater housing are proposed. The impact of each on the performance and reliability of the system are considered. This preliminary analysis shows that the necessary modifications are feasible and identifies several areas for more detailed development.

Keywords: *SMART Cables, telecommunications, repeater, ocean temperature, bottom pressure recorder, accelerometer, tsunami, early warning, marine hazards, climate variability and change, ocean observing technology*

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