



The 14th International Conference on Quality, Reliability, Risk, Maintenance, and Safety Engineering (QR2MSE2024)

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Special Session on:

Challenge of Extreme Environmental Reliability, from Electronic Components to System

Human never stops our exploration, and the fields of industrial involvement continue to expand. More and more application areas are posing new challenges to reliability assessment theories and methods: “Voyager II” in the universe has entered the Kuiper Belt. The “Trieste” at the bottom of the Mariana Trench has been visiting for years. New tokamak devices are exploring the mysteries of nuclear fusion, new energy systems established in desert and sea. All of these are leading the expansion of research in applied extreme environments. For which the uncertainty, credibility, accelerated degradation of the basic theory and simulation analysis methods of potential risks are of particular concern. For example, the uncertainty of the operating state of motors in extreme environments is aggravating, the stability of power electronic control circuits in high temperature and high humidity and other operating environments is declining, dynamic characters of electrical appliances in high radiation environments are becoming more difficult and the degradation of mechanical structures is becoming more severe. In the last decade, with a tending scope of exploration brought about by the progress of human science and technology, research of reliability in these new areas have become a hot spot of concern in industry.

However, there is still a lack of systematic fundamental theories, experimental methods or physical models in the field of reliability research. Data-driven diagnosis and prediction for extreme environments in the direction of reliability assessment are facing great challenges due to high uncertainty.

This special session addresses the reliability theory and application under extreme environment. It is designed to demonstrate and discuss the reliability of components, motors, circuits, and even systems in extreme environmental applications. The key element of focus is on uncertainty theory, simulation and modelling techniques, Accelerated Degradation theories and test methods, and whole life PHM, including but not limited to electrical equipment in aerospace, power, nuclear, marine, wind, photovoltaic, and deep earth environments. Hope to provide a platform for sharing of innovative theories and ideas in the field of reliability to demonstrate the latest applications of advanced techniques in our fields.



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