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Fukushima Daiichi Muon Imaging

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Japanese government announced cold-shutdown condition of the reactors at Fukushima Daiichi by the end of 2011, and mid- and long-term roadmap towards decommissioning has been drawn. However, little is known for the conditions of the cores because access to the reactors has been limited by the high radiation environment. The debris removal from the Unit 1 - 3 is planned to start as early as 2020, but the dismantlement is not easy without any realistic information of the damage to the cores, and the locations and amounts of the fuel debris. Soon after the disaster of Fukushima Daiichi, several teams in the US and Japan proposed to apply muon transmission or scattering imagings to provide information of the Fukushima Daiichi reactors without accessing inside the reactor building. GEANT4 modeling studies of Fukushima Daiichi Unit 1 and 2 showed clear superiority of the muon scattering method over conventional transmission method. The scattering method was demonstrated with a research reactor, Toshiba Nuclear Critical Assembly (NCA), where a fuel assembly was imaged with 3-cm resolution. The muon scattering imaging of Fukushima Daiichi was approved as a national project and is aiming at installing muon trackers to Unit 2. A proposed plan includes installation of muon trackers on the 2nd floor (operation floor) of turbine building, and in front of the reactor building. Two 7mx7m detectors were assembled at Toshiba and tested.