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Investigation of dielectric constant variations for Malaysians soil species towards its natural background dose

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Abstract. The correlation of natural background gamma radiation and real part of the complex relative permittivity (dielectric constant) for various species Malaysian soils was investigated in this research. The sampling sites were chosen randomly according to soils groups that consist of sedentary, alluvial and miscellaneous soil which covered the area of Batu Pahat, Kluang and Johor Bahru, Johor state of Malaysia. There are 11 types of Malaysian soil species that have been studied; namely Peat, Linau-Sedu, Selangor-Kangkong, Kranji, Telemong-Akob-Local Alluvium, Holyrood-Lunas, Batu Anam-Melaka- Tavy, Harimau Tampoi, Kulai-Yong Peng, Rengam-Jerangau, and Steepland soils. In-situ exposure rates of each soil species were measured by using portable gamma survey meter and ex-situ analysis of real part of relative permittivity was performed by using DAK (Dielectric Assessment Kit assist by network analyser). Results revealed that the highest and the lowest background dose rate were 94 ±26.28 μR hr^{-1} and 7 ±0.67 μR hr^{-1} contributed by Rengam Jerangau and Peat soil species respectively. Meanwhile, dielectric constant measurement, it was performed in the range of frequency between 100 MHz to 3 GHz. The measurements of each soils species dielectric constant are in the range of 1 to 3. At the lower frequencies in the range of 100 MHz to 600 MHz, it was observed that the dielectric constant for each soil species fluctuated and inconsistent. But it remained consistent in plateau form of signal at higher frequency at range above 600 MHz. From the comparison of dielectric properties of each soil at above 600 MHz of frequency, it was found that Rengam-Jerangau soil species give the highest reading and followed by Selangor-Kangkong species. The average dielectric measurement for both Selangor-Kangkong and Rengam-Jerangau soil species are 2.34 and 2.35 respectively. Meanwhile, peat soil species exhibits the lowest dielectric measurement of 1.83. It can be