

Optimum design of a microstrip ring resonator sensor for determination the moisture content in oil palm fruits and seeds

ABSTRACT

Oil palm fresh fruit bunch (OPFFB) is the main export product of the oil palm industry. A good oil palm is between 17 to 18 weeks of age with full fruitless maturity. An automated detection system should be implemented to determine the OPFFB's maturity and expedite the harvesting process. Various automated detection methods have been proposed for conventional method replacement. In a preliminary study, a new oil palm fruit sensor was proposed for detecting the maturity of OPFFB, and a microstrip ring resonator was designed for determining the moisture content in oil palm fruit. The coaxial feeder of the microstrip ring was a Sub-Miniature A (SMA) stub contact panel with outer and inner conductors of 4.1 mm and 1.3 mm, respectively. The measurement system consisted of a sensor and a PC controlled network analyzer. This system was tested successfully on seeds and fruits of oil palm with various degrees of maturity. The microstrip ring resonator operated between 2.2 and 3 GHz and required low frequency that enabled the electromagnetic field in the first half of the ring resonator to be transferred to the second half and subsequently cause the collinearity of the maximum field points in the feed lines and resonator.

Keyword: Oil palm; Microstrip ring; Microwave; Network analyzer; Moisture content