MICROWAVE MOISTURE SENSING OF SEEDCOTTON: PART 1: SEEDCOTTON MICROWAVE MATERIAL PROPERTIES

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Abstract

Moisture content at harvest is a key parameter that impacts quality and how well the cotton crop can be stored without degrading before processing. It is also a key parameter of interest for harvest time field trials as it can directly influence the quality of the harvested crop as well as alter the results of in-field yield and quality assessments. Microwave sensing of moisture has several unique advantages over lower frequency sensing approaches. The first is that microwaves are insensitive to variations in conductivity, due to presence of salts or minerals. The second advantage is that microwaves can peer deep inside large bulk packaging to assess the internal moisture content without performing a destructive tear down of the package. To help facilitate the development of a microwave moisture sensor for seedcotton; research was performed to determine the basic microwave properties of seedcotton. The research was performed on 110 kg micro-modules, which are of direct interest to research teams for use in on-going field based research projects. It should also prove useful for the enhancement of existing and future yield monitor and cotton ginning moisture sensor designs. Experimental data was gathered on the basic relations between microwave material properties and seedcotton over the range from 1.0 to 2.5 GHz and is reported on here-in. This research is part one of a two part series that reports on the fundamental microwave properties of seedcotton as moisture and density vary naturally during the course of typical harvesting operations; a full report on this research is available at Pelletier et al., 2016. Part two will utilize this data to formulate a prediction algorithm to form the basis for a prototype microwave moisture sensor and will examine the potential for new previously unexplored density independent algorithms.

References

Pelletier, M.G., Wanjura, J.D. and Holt, G.A. 2016. Microwave Moisture Sensing of Seedcotton: Part 1: Seedcotton Microwave Material Properties. *Sensors*, 16(11), 1843; doi: 10.3390/s16111843.