

FMfl2023 Program

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| Name | Mark McGuinness |
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| Title | Real Time Moisture Measurement using Microwaves |
| Abstract | <p>An important factor when delivering bauxite ore to an alumina factory is the moisture content in the shipment. A microwave analyzer can be mounted across a conveyor belt to measure phase shift, attenuation, and ore depth to infer moisture content in real time using a linear calibration.</p> <p>The moisture content is a important because it affects the weight of the ore, with direct impact on the true value of the ore. Accurate and reliable continuous moisture measurement is important to both buyer and seller.</p> <p>Our study is informed by data provided to a European Study Group with Industry that was collected from a number of shipments to a factory in Ireland. We use Maxwell's differential equations to develop a four-layer model of microwave propagation that captures the effects of reflections at multiple interfaces between ore and air. These reflections cause interference effects in phase shifts and attenuation as the ore depth varies on the conveyor belt.</p> <p>Our model explains the strongly nonlinear dependence of attenuation data on ore depth, and improves understanding of and confidence in the real-time measurement of ore moisture content using microwaves.</p> |