Title: Characterization of the Tissue Dielectric Constant of Skin Basal Cell Carcinoma

Objective: To characterize the tissue dielectric constant (TDC) of basal cell carcinoma (BCC).

Background: In vitro dielectric constant measures of cancerous-tumors have shown differences compared to non-cancerous tumors. But, TDC values of BCC in vivo has not been characterized.

Methods: In 30 patients, TDC of skin lesions to be biopsied was measured prior to biopsy at 300 MHz via the open ended coaxial line method to a depth of 0.5 mm. Lesion measurements were compared to values on non-affected skin. Patient age (mean ± SD) was 71.9±15.5 (35-95 years) with 19 males and 11 females included.

Results: Biopsy results showed BCC for all 30 lesions of which 2/3 were classified as nodular and 1/5 as infiltrative. TDC values measured on lesions were overall significantly less than measured on contralateral non-affected skin (22.1±15.7 vs. 37.4±14.3, p < 0.0001). However, in four cases TDC values were greater on the lesions. These tended to be lesions that were either ulcerated or edematous. However, initial preliminary comparisons of measurements on non-cancerous lesions (n=10) indicate that average percentage differences between lesions and control skin are about 40% for both cancerous and non-cancerous lesions.

Conclusions: Although significant differences in TDC values are found between BCC skin lesions and non-affected skin, the fact that there is so far, no clear separation between cancerous and non-cancerous differences, cautions that TDC measurements may have inadequate selectivity as a useful detection method. An increase in the number of non-cancerous lesion comparison measurements may provide further insight into this issue.