In this paper, we present our latest study of skin characterization, i.e. dry skin, hydrated skin, sweating, and damaged skin. Previous studies showed it can be used for solvent penetration measurements \[4\], skin damage assessments \[5\], and so on. With calibrated Epsilon imaging systems, we can measure the absolute dielectric permittivity of the sample, in a 6-bit grey-scale capacitance resolution per pixel (0–255). See Figure 1.

**Apparatus**

The Epsilon Permittivity Imaging System is based on Fujistu fingerprint sensor (Fujistu Ltd), which has 256x300 pixels with Fujistu optical resolution. Each pixel is equivalent of a capacitive sensor, which measures the absolute dielectric permittivity of the sample. It has a 6-bit grey-scale capacitance resolution per pixel (0–255). See Figure 1.

**Epsilon Calibration**

The Epsilon differs from other such systems in its calibrated, linear response to near-surface dielectric permittivity, see Figure 2. The linear response is important because it enables variability to be related to permittivity. The calibration allows consistency from instrument to instrument and from time to time. With calibrated Epsilon imaging systems we can measure the absolute dielectric permittivity of the material.

**Results and Discussion**

Several image processing techniques have been implemented to enhance the measurements. The first is RoI (region of interest) selection. By selecting RoI, we can study the area of interest, and avoid other interferes such as hair. Figure 3 shows the effects of RoI in Burst mode, i.e. the sensor is in contact with skin over a period of time, and several images are captured. The next step is to work out the skin image from the whole image. Figure 4 shows the effects of RoI in SnapShot mode, i.e. only one skin image is captured. Again, the histogram of the image is clearly different from that of the whole image.

**Conclusion**

Capacitive contact imaging can provide useful information for skin characterizations. Through image processing, we can reduce the measurement errors. Though calibration, we can get a linear absolute, electric permittivity measurement, and through absolute permittivity we can also get absolute water content, as well as solvent concentration in skin. By using the co-processing technique, we can analyze exactly the same skin region in each skin image.

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**References**

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