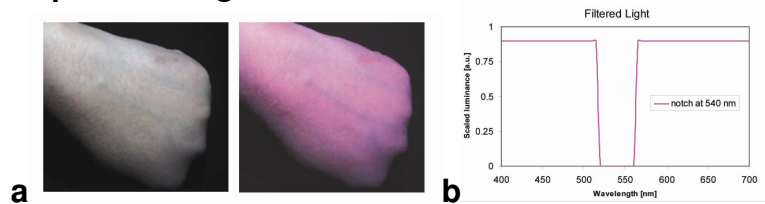


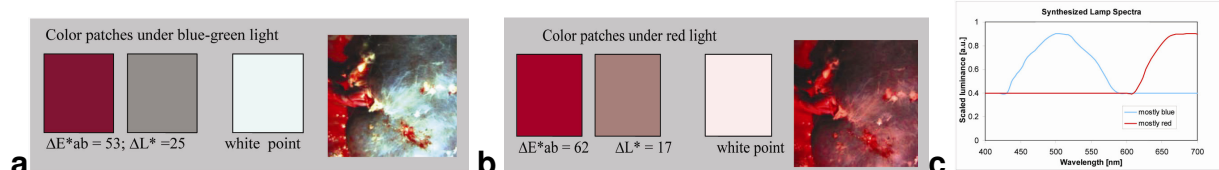
## Customer Application: Quantitative Color of tissue for clinical decisions

**Sample Type:** Human Skin /Kidney tissue

**Captured Images/Data:**



**Enhanced vein contrast. (a)** Hand under white light vs. **(b)** tuned OneLight notch



**Enhanced kidney tissue contrast. (a)** Highlighting kidney tissue by blue shaped spectral distribution **(b)** highlighting blood vessel and perfusion in kidney by red shaped spectral distribution **(c)** synthesized "lamp" spectral distributions using OneLight (blue versus red)

### Technique/Settings of application use:

Customer is using a spectrally shaped illumination source (OneLight) to optimize the contrast between features with subtle color differences commonly encountered in a biomedical setting. For the hand images, the OneLight SPLE was programmed with a green notch from 515-565nm. The kidney images were processed from previous hyperspectral images using an LCTF with CCD, and then convolved with a desired simulated light spectral distribution (easily reproduced by OneLight). Computational images were generated by a model for each selective band imaging of either red and blue spectra illumination and calculating magnitude of color difference and light-dark contrast for the two object colors shown in each image.

### Improvement over Conventional Systems

Conventional biomedical illumination (surgical lamps, LED surgical lamps) is not spectrally programmable, hence limited in improving contrast for tissue visualization, cannot adaptively adjust for various contrast "recipes" for different tissues and limited in creating a wide range of datasets to build a library of standardized tissue imaging with quantitative color measures. Characterization of color of tissues using lamps and a LCTF filter at the camera has problems of limited blue light from surgical lamps compounded by poor CCD responsivity in the blue, which can result in incorrect color analysis. Many types of tissues will only require boosting certain spectral bands. The OneLight implementation is ideal for both better color characterization having a wide range and relative blue boost and flexible ability for illumination spectral shaping for various tissue contrast.

### Utility of OneLight to Customer

OneLight illumination validated the predicted contrast from the illuminant model. Further characterization best implemented by OneLight – specifically hyperspectral reflectance data of representative tissue samples, and maximizing contrast for various tissue types.

### Significance of the technique to Life Sciences:

Extensible as broadly flexible clinical diagnostic visualization tool customizable for wide range of tissue contrast, for human viewing diagnostic decisions – potentially could generate multiple medical devices for specific tissue analysis.

## **Customer Application: Quantitative Color of tissue for clinical decisions**

### **References for All Images**

*Citation* :Mehrnoush Khojasteh and Calum MacAulay, "Selective excitation light fluorescence (SELF) imaging", Proc. SPIE 7568, 75680F (2010); doi:10.1117/12.843739

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