Intraoperative tumor resection currently relies on the ability of a surgeon to visually detect and/or palpate the tumor and tumor margins. Small tumor nodules can be missed or tumor margins may be inadequately removed, resulting in the need for secondary treatment. Intraoperative fluorescence imaging can help improve the initial resection and, therefore, both improve outcomes and reduce cost. Unconjugated fluorescent dyes have been previously used for this type of study to identify tumors in first-in-human studies. However, dyes conjugated to a targeting moiety have better specificity for the tumor itself and provide better guidance for the surgeon to locate the tumor and remove margins.

The new Solaris imaging system is an open air fluorescence imaging instrument designed specifically for intraoperative imaging in small to large animals. The system supports 4 different fluorochromes (channel) including fluorescein isothiocyanate (FITC), rhodamine red, Alexa™ 750, and rhodamine 6G (R6G). A fiber optic based delivery system for LED illumination that passes through an excitation filter. Light emitted by the fluorochrome is collected through an emission filter and sent to the camera for image capture. The imaging head is equipped with an adjustable arm so that it can be positioned 75 cm above the patient, allowing for an unobstructed view of the surgical site.

**Instrument Features Include:**
- Tallest based control
- Adjustable imaging arm & head
- Fixed focal length optics to position the system outside of the sterile field
- Movable cart and lockable foot pedal
- Tablet based control
- Fixed focal length optics to position the system outside of the sterile field
- Surgical grade white light LED based illumination
- Four channels to support visible and near infrared (NIR) dyes
- Two sCMOS cameras for simultaneous fluorescence and color image capture
- B. Imaging in an ambient light environment

**Instrument Design & Ambient Light Rejection**

**A. System Design**

**B. Imaging in an ambient light environment**

Imaging has been designed for use in a normal operating environment with ambient lighting (photograph at left). Because the white light illumination spectrally overlaps with the 470 and 660 channels, a custom designed notch filter was placed in front of the white light LED (photograph at right). This removes any leakage and further reduces the effects of ambient lighting, alternating red and blue lasers are acquired to enable subtraction of the background frame from the foreground frame.

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