



SonixGPS Specifications Sheet

Precision Ultrasound Guidance for Biopsies and Line Placements

SonixGPS
Guidance Positioning System

A. Introduction

The SonixGPS is a revolutionary guidance procedure developed by Ultrasonix. **Figure 1** shows how SonixGPS is used to guide the biopsy needle approaching the target. The spatial position of the needle with respect to the ultrasound image is updated in real-time. Users can now inject the needle outside the ultrasound imaging plane.

They can also plan the needle route before it actually enters the body. SonixGPS can speed up the biopsy procedure while offering high accuracy and flexibility. In addition, it can reduce the pain suffered by patients caused by multiple needle entries when trying to find the best biopsy route inside the body.

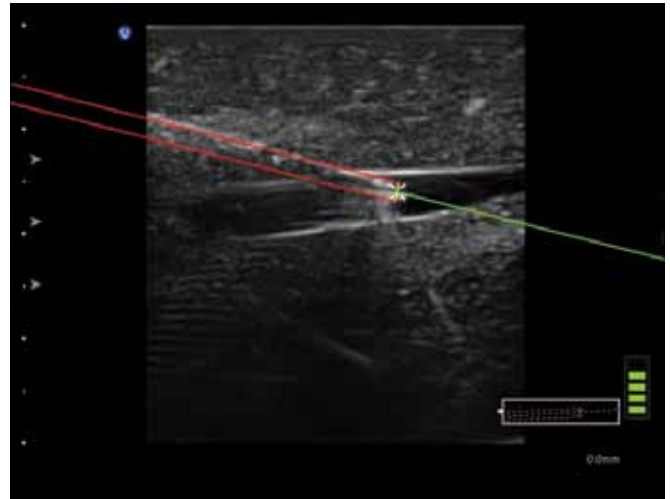


Figure 1 - Shows how SonixGPS can be used to guide a needle to its target.

B. Background

Ultrasound imaging has been widely used in many clinical applications such as image-guided diagnosis and therapy. By visualizing both the tissue and diagnostic tool such as a biopsy needle, ultrasound imaging can help doctors find the relative position between the region-of-interest and the needle.

However, typical ultrasound images are in 2D while the actual operating region is in 3D, This results in difficulties when trying to localize the needle position accurately. With the introduction of the new SonixGPS technology, the relative positions between the needle and the ultrasound image can be accurately located. Therefore, the needle can easily be positioned in the region-of-interest.

TRACKING

A typical motion tracking system contains a transmitter and one or more motion sensors. Motion sensors track their position (X, Y, and Z coordinates) and orientation (azimuth, elevation, and rotation angles) relative to the transmitter. One sensor is embedded inside the ultrasound transducer, which provides the position and orientation of the ultrasound image with respect to the transmitter.

Another sensor is attached to or inside the needle, which provides the same information for the needle. The relative position and orientation between the needle tip and the ultrasound image can be set up through a calibration process.

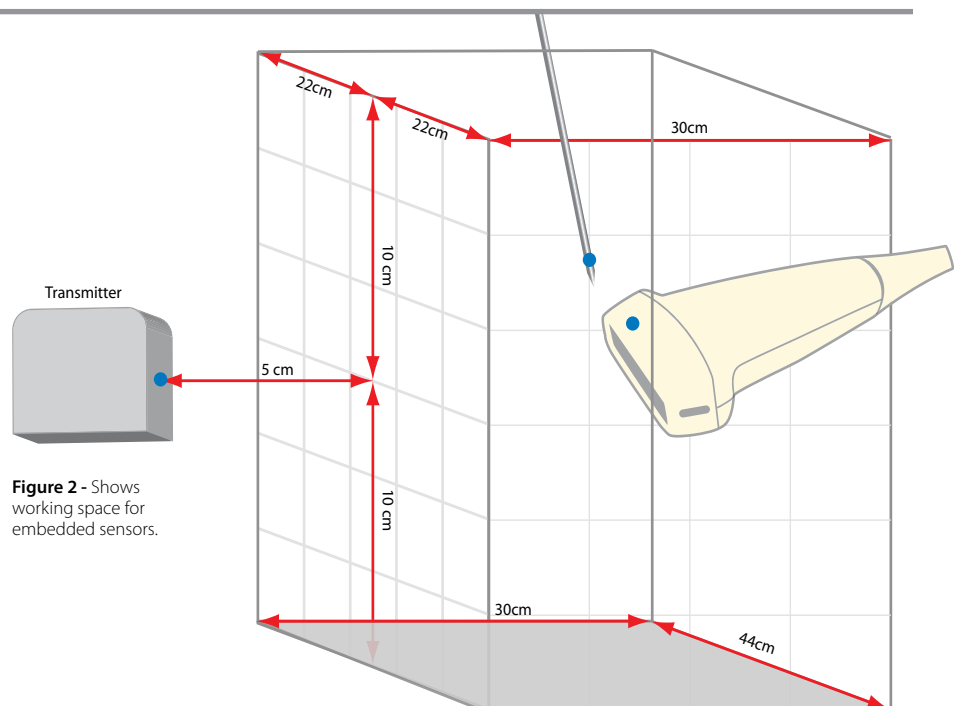


Figure 2 - Shows working space for embedded sensors.

GENERATING DISPLAY

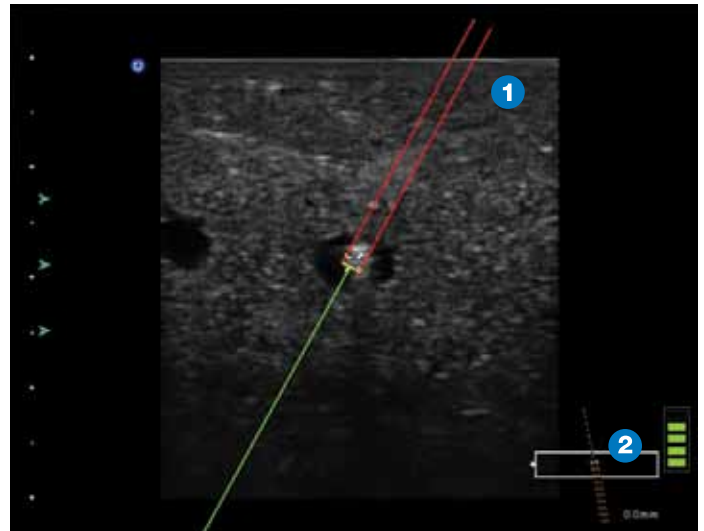
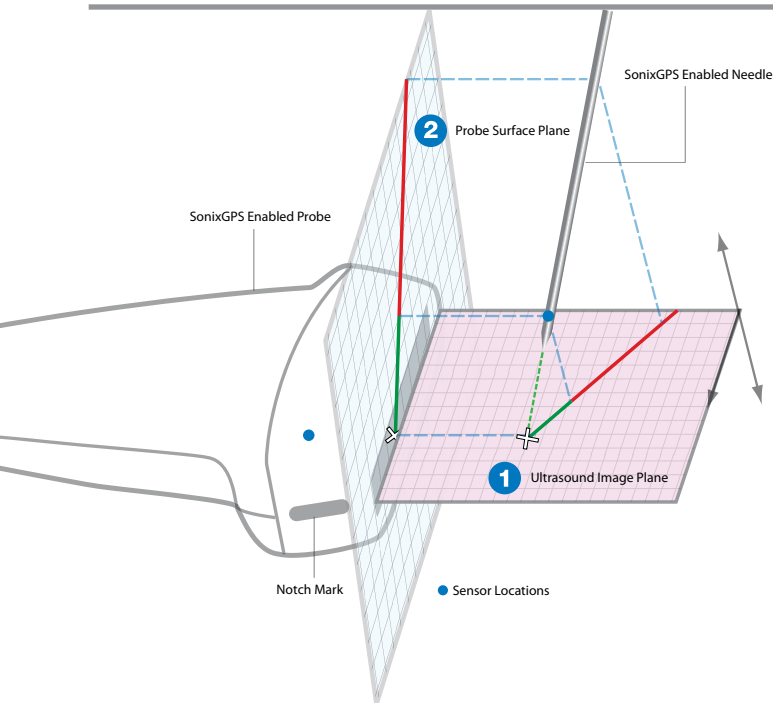


Figure 3 (left) - Illustrate how two views are generated using the SonixGPS technology.
Figure 4 (above) - Display of screen generated by SonixGPS.

To display the 3D position of the needle relative to the 2D ultrasound image, the needle is projected into two orthogonal 2D planes: **1** the ultrasound image plane, and **2** the probe surface plane. The needle is represented as red-dotted lines and its center projection line is shown in green.

The intersection point between the ultrasound image and needle or its projection line is shown as a white cross mark. Thus, the cross mark should always be pointing to the target. The distance between the actual needle tip with the intersection point is shown at the bottom right of the image, with units displayed in millimeters.

C. SonixGPS for Biopsies

For some special needles used in breast biopsy, a yellow box (usually close to the needle tip) will show the region where the tissue sample will be cut. The spatial position of the needle with respect to the ultrasound image is updated in real-time. Users can now inject the needle outside the ultrasound imaging plane.

SonixGPS can accelerate up the biopsy procedure while offering high accuracy and flexibility. In addition, it can reduce the pain suffered by patients when positioning the needle for the best biopsy route.

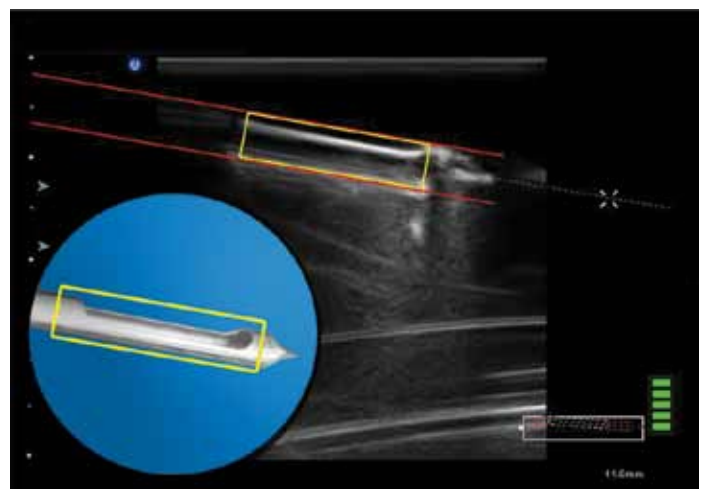


Figure 5 - The yellow box indicates the location of the aperture on the biopsy needle in relationship to the ultrasound image.

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