How to define STA with ETD/ETDS
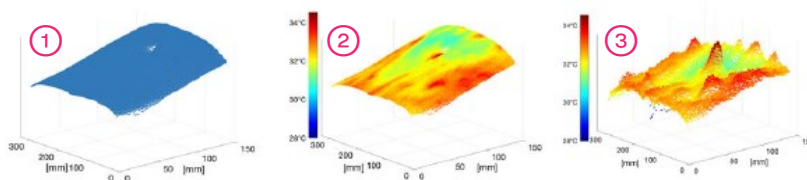
Surface Tracking Area (STA) definition

ℹ Surface and thermal tracking

ETD and ETDS project structured light in a pseudo-random pattern onto the patient surface to acquire 3D imaging. Thermal information gives an additional dimension, or virtual topography, enhancing tracking accuracy. The 3D surface ① is combined with 2D thermal data by projecting the 3D information over the thermal image plane, using the perspective-n-point algorithm ② to calculate a 3D-to-thermal matrix that enriches every 3D point (x, y, z) with its thermal information T:

$$P_i = (x_i, y_i, z_i) \rightarrow P_{\alpha i} = (x_i, y_i, z_i, \alpha T_i)$$

The weighting factor α ensures the comparability between geometric and thermal data and allows it to be utilized while matching the reference data P_i and the live surface ③:

Surface Tracking Area

- To track the surface patient movement, select a STA on the patient, which **averages all points** within its defined area(s). One or more separated areas can be defined, but they will all be treated as a single and rigid STA.
- ETD/ETDS uses a **smart tracking area concept,** which excludes from the tracking all irrelevant parts located outside of a predefined box centered at the isocenter and marked in gray (picture below).
- Although the thermal information improves the tracking reliability, enough 3D information in the STA is necessary to guarantee precise surface tracking results (ETD will not allow to proceed if information is insufficient). Always consider the overall "landscape" of the area of interest: a varied topography (e.g., facial hills and valleys) improves surface tracking quality more than a large, flat surface area.
- If needed, it is possible to redefine the STA for subsequent beams (requires x-rays).
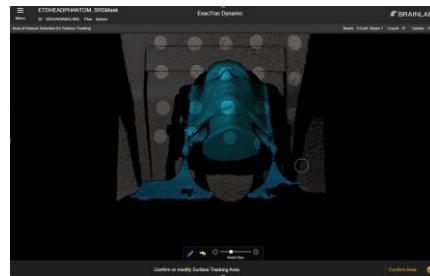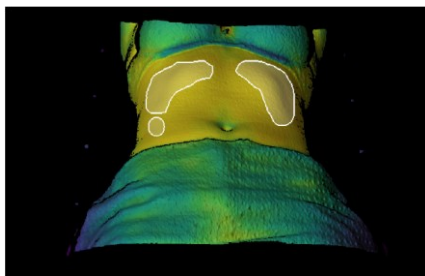
General recommendations

- STA should reflect the PTV movement.
- Avoid overly large (lacks precision) or too small (too sensitive) areas.
- Include irregular topographic areas; avoid rounded or flat ones.
- STA should not be blocked or covered by any immobilization.
- For Elekta users, STA should not include part of the iGUIDE Reference Frame.
- Heated or heating blankets should not be used with ETD/ETDS to prevent incorrect temperature shifts.

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Rev.1.1 – This instructional document is based on software version 2.0 and does not replace the user guides. Make sure you are using the latest document revision. For further assistance, please contact Brainlab support.

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How to define STA with ETD/ETDS
Clinical examples

1 Cranial

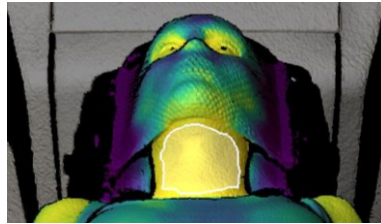- Close face mask: include mask around treated region
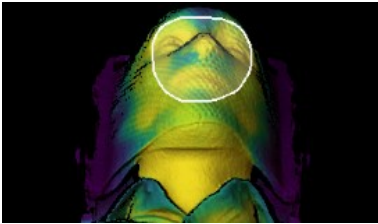
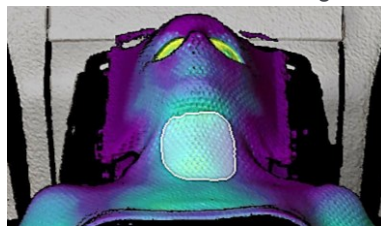- Open face mask: include face of the patient

2 Head & Neck

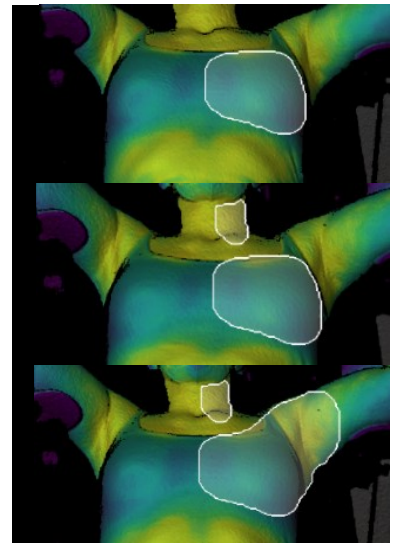- Close face mask: include neck, mandible, sternum

- Extended mask: include mask around treated region
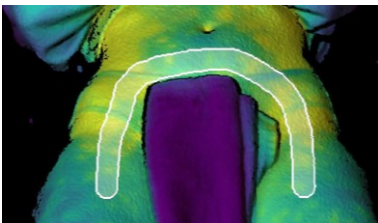

3 Breast
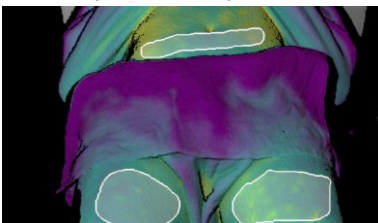
Include breast and auxillary area (e.g. armpit, neck etc.)

4 Pelvis

Based on the patient, use one or multiple disconnected areas.
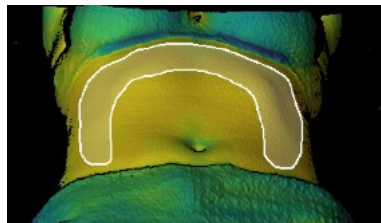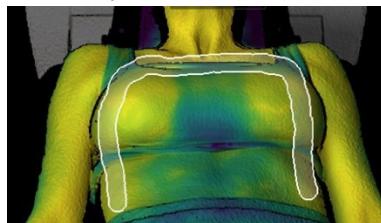- Example 1: single area

- Example 2: multiple area

5 Spine & Thorax

Reversed U excluding abdomen to minimize breathing motion.
- Example 1: spine

- Example 2: thorax

6 Extremities

Include only treated region(s)

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