## “Analysis masks” from FTV processing:Breast-MRI-NACT-PilotI-SPY 1 / ACRIN\_6657 I-SPY 2 / ACRIN\_6698Collections

These mask files give information useful for segmenting the DCE series used for the primary aim analysis metric functional tumor volume (FTV). The masks are INVERSE masks, in that a mask value of 0 indicates that a voxel was included in the measured FTV.

4 or 5 separate masking steps were used in the segmentation of each DCE acquisition:

Manual VOI A rectangular volume of interest encompassing the enhancing tumor region was drawn on 3 orthogonal MIP images

Background Background noise areas and saturated fat regions were eliminated using an intensity threshold applied to the pre-contrast DCE image. The threshold was set to a percentage of the 95th percentile of the intensity histogram from the VOI. The percentage used was set empirically for each imaging site in I-SPY1.

PE Threshold Normal non-enhancing breast tissue was masked with a percent enhancement (PE) threshold on the early PE map. The threshold used was set empirically for each imaging site in I-SPY1.

Connectivity A 3D minimum neighbor count (MNC) filter was applied to the mask resulting from the background and PE thresholds. Voxels were masked out which did not have at least the MNC of immediate neighbors in the mask. The MNC used was set empirically for each imaging site in I-SPY1.

OMIT regions Where deemed necessary by a trained observer, manual regions of interested were drawn to omit from the analysis regions non-tumor enhancing regions that were not eliminated by the other masking steps.

The analysis masks provided are bit-encoded to indicate which masking step(s) were applicable to each voxel in the image. Values used for each of the masking steps are:

1 PE Threshold

2 MNC Filter

8 Background mask

32 Manual VOI

64 OMIT Regions

### Mask Storage Formats

#### I-SPY 1 / ACRIN-6657 and Breast-MRI-NACT-Pilot

The masks are stored as a series of 2D DICOM MRI objects, image type DERIVED, and should be readable by any DICOM reader that can handle the DCE image files. The header meta-data is matched to the DCE acquisition so the masks can be directly applied to those images on a voxel-by-voxel level. The mask series is identified by the Series Number (0020,0011) equal to <n>1900 where <n> is the original DCE series ID, and by the Series Description (0008,103e) of “Volume SER analysis mask”.

The masks will be available on TCIA as part of the respective collections, most likely sometime in August 2016 depending on the TCIA curation time.

2018-03-05 Update: Mask files have not been uploaded to TCIA at this time.

The masks are currently available as compressed “tar” files on the UCSF “Box” site . Use the following link to access and download them:

<https://ucsf.box.com/s/d09xetaatzgnz2p9bxlqh50rrzilgcoj>

“Box” File list as of 7/22/2016:

I-SPY 1 / ACRIN 6657: ispy1\_PrimaryAim\_FTV\_masks.tar ~200MB

Breast-MRI-NACT-Pilot: pilot\_amasks\_ctp\_20160715.tar ~50MB

Files in the UCSF collections are stored in the GEMS standard directory structure:

<patient ID>/E<exam number>/<series number>/E<exam>S<series>I<image>.DCM

e.g.

*ISPY1\_1001/T1/E011541/41900/E011541S41900I0.DCM*

[Note: Image numbers start at 0 rather than the standard 1]

#### I-SPY 2 / ACRIN-6668

Masks are stored as 3D DICOM SEG objects and are included in the ACRIN-6698 and I‑SPY 2 collections on TCIA. These series will be included with any download of a full collection or of a manifest including the derived DCE objects.

Please direct any comments or discrepancies to: ispyimaging@ucsf.edu