

## Release Notes for the SPHEREx Target List of Ice Sources (SPLICES)

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### ABSTRACT

Version 7.1 of the SPHEREx Target List of Ice Sources (SPLICES) is fully described in Ashby, Hora, Lakshminpathaiah et al. (2023). This document describes subsequent updates to SPLICES, of which the latest is version 7.3. SPLICES version 7.3 currently contains  $8.9 \times 10^6$  targets thought likely to present infrared absorption features due to water ice and other volatile species in the solid (ice) phase.

### 1. VERSION 7.2

The two main color-based target selection criteria used to compile SPLICES rely on the relatively shallow 2MASS PSC. This means they have a built-in shortcoming, in that they will tend to be biased against  $JHK_s$ -faint sources. In other words, both of the two main target selections might miss the most deeply embedded objects, as well as sources situated behind the thickest screens of obscuring dust, because emission from such objects, even if detected by *WISE*, might be too attenuated to appear in the 2MASS PSC. To mitigate this bias we supplemented SPLICES with a *WISE*-only selection intended to identify more highly obscured objects. The selection criteria are quantified below.

*WISE*-only targets were required to be well-detected in both short-wavelength *WISE* bands in order to be included. Specifically, they had to be brighter than  $W1 = 14.7$  and  $W2 = 13.3$  mag. The AllWISE photometric quality flags for both  $W1$  and  $W2$  were required to be “A”. Furthermore, to select for obscured sources, the colors were required to be red, such that  $W1 - W2 > 0.1$ .

To ensure spectral purity in the eventual SPHEREx spectra, sources satisfying the above brightness and color criteria were rejected if the AllWISE flag `n2MASS` was anything other than 0 or 1 (to reject sources with multiple close neighbors). Sources were also rejected if they had more than one 2MASS PSC source within  $6''2$ . At this stage, duplications of prior SPLICES targets were also rejected.

As an additional check, the spatial distribution of sources satisfying the above constraints which were also detected in 2MASS was then examined. Those with near-IR colors  $(J - K) < 0.45(H - W2) + 1.2$  and  $(J - K) > 2.5(H - W2) + 0.1$  were removed from the list, because they seemed to be distributed uniformly over the sky, whereas objects not satisfying these two criteria were associated with dark clouds.

A final step was performed ‘by hand’ to remove spurious objects around bright *WISE* sources. This was necessary because the  $W1 - W2 > 0.1$  color criterion selects spurious peaks in the *WISE* diffraction spikes. We therefore removed sources that were flagged as possible diffraction pattern objects in the *WISE* catalog. We also performed a visual search for other spurious objects by inspecting the nearby fields around bright *WISE* sources ( $W1 < 4$  mag) and removing artifacts forming obvious large-scale cross or circle patterns.

The roughly 278,000 objects satisfying all the *WISE*-only selection criteria described above are flagged as `W1mW2` in column 40 (`SEL_TYPE`) of SPLICES.

### 2. VERSION 7.3

To make SPLICES version 7.3, a small number of duplicate sources (those found to have the same “designation” keyword) were identified and removed from SPLICES version 7.2. Also, a small number of spurious AllWISE-only detected sources that had been added to SPLICES version 7.2 were removed by hand, because these were found to correspond to the diffraction spikes around bright stars.