

# Identifying HII Regions

Once you have a list of objects you think might be HII regions, use the [Navigation Tool](#) or the [Object Explorer](#) to see which ones really are. Look also at their spectra to see which ones have the hydrogen emission lines characteristic of HII regions.

HII regions are generally found in the arms of spiral galaxies. For nearby galaxies that appear large, spiral arms are easy to identify. You will probably find the cores of active galaxies also turn up in your data. These may be due to massive black holes eating gas and dust near the galaxy core, rather than star formation. These cores are *not* HII regions.

One clue to whether you are seeing a galaxy core or a real HII region might be to check if the source was also seen in the x-ray ROSAT survey, since active galactic nuclei frequently give off x-rays as well. If ROSAT saw the sources, chances are it is a galactic nucleus and not an HII region. ROSAT data are available online at the [ROSAT Archive](#). Another clue is to look at the object's spectrum for the characteristic strong hydrogen emission lines that mark HII regions.

If the galaxy is small, use the Zoom bar of the Navigation Tool to zoom in on it. SkyServer is somewhat limited in its zoom ability, however. If you need to zoom in further still, download FITS images with the [Object Explorer](#) and use an image processing program such as Iris (see the [Image Processing](#) project) to zoom in on the object to see if it might be an HII region.

Even with your best efforts, it may be difficult to tell if an object is really HII region. If you are unsure, simply mark the object as uncertain. SDSS astronomers frequently carry out follow-up observations with other telescopes on objects they are unsure of.

There is no single sure way to identify HII regions. Sometimes visual inspection is enough. For other candidates, you may need to look at the spectrum, zoom in on the region, or look at the object in other wavelengths. Even if you do all these things, you may still find some objects that you cannot be certain are HII regions.

**Challenge.** Are you ready for the challenge? Create a catalog of HII regions in SDSS data. Write a query (or series of queries) to find objects classified as galaxies that are actually HII regions. Use the colors of galaxies to narrow the list of potential HII candidates down to a manageable level. Inspect each candidate in various ways to determine if it really is an HII region.

Each entry in your catalog should include the object ID, ra, dec, and the magnitudes through each of the five filters. You also should include a short essay on how your data were collected (for example: We searched for galaxies for which SDSS has obtained spectra. We looked for objects where  $u - z < x$ .) This information is important so other researchers can know where your data came from, and can judge whether or not your data

suit their needs.

[Send us](#) your HII region catalogs. We'll look at all the catalogs we receive. If yours is one of the best, we'll post it here, and we'll pass it on to SDSS scientists to use!