

How Do I...

Check quality of SDSS photometry for an object (photo flags)

You can check the quality of SDSS photometry for a single object using the Object Explorer, or you can check the quality of your search results. The key to both is to examine photometric *flags*. Flags are yes/no values that check whether certain features are present in the object's image. A list of flags is at the end of this guide.

To check flags for a single object:

1. Follow the directions in How To guide #1, "How do I get an image and spectrum for my favorite object?" You will end up at an Object Explorer entry for a single object.

SDSS J000007.81-000226.0
GALAXY ra=0.03258, dec=-0.040575, ObjId = 587731186203951236

mode	PRIMARY
status	TARGET PRIMARY OK_STRIPE OK_SCANLINE PSEQUENT RESOLVED OK_RUN GOOD SET
flags	BINNED1 INTERP COSMIC_RAY CHILD
PrimTarget	TARGET_GALAXY
SecTarget	

run	rerun	camcol	field	obj	rowc	colc
2662	40	3	283	132	242.4	1607.9
u	g	r	i	z		
16.87	15.67	15.13	14.87	14.80		
fiberMag_r	petroMag_r	devMag_r	expMag_r	psfMag_r	modelMag_r	
17.41	15.06	14.79	15.13	17.87	15.13	
extinction_r	petroRad_r	parentId	nChild			
0.09	8.768	587731186203951235	0			

SpecObjID = 109153257443557376

plate	mjd	fiberId	z	zErr	zConf	specClass	ra	dec	fiberMag_r	objId
387	51791	192	0.024	0.00019	0.994	GALAXY	0.03260	-0.04057	17.37	587731186203951236

zStatus	XCORR_EMLINE
zWarning	
PrimTarget	TARGET_GALAXY
SecTarget	
eClass	0.029

2. Look at **Flags**, the third row of data just below the object's coordinates. You will see the object's flags listed, one after the other with one space in between. See the list of flags at the end of this document for what they mean.

To return flags as a part of an SQL search result:

You can view flags as part of your SQL searches. You can then examine the list of flags for each object the search returned, just as you would examine the list of flags in the Object Explorer.

1. Go to the SQL Search form. From the main page, click **SQL Search**.
2. To return flags, add the following to the **SELECT** block of your query:

```
SELECT dbo.fPhotoFlagsN(flags) as flags
```

3. This is what a sample query returning flags might look like:

```
SELECT top 10 objid,ra,dec,modelmag_g,dbo.fPhotoFlagsN(flags) as flags
FROM PhotoTag
WHERE
    type=6
AND modelmag_g BETWEEN 15 and 19
```

Here are the results the query returns:

objid	ra	dec	g	flags
587724197469028467	7.009404	13.912121	18.42	BINNED1
587724197469028539	7.134311	13.926089	18.711	BINNED1
587724197469028526	7.105818	13.909984	18.751	BINNED1 MANYPETRO
587724197469028421	7.107197	13.816814	17.507	BINNED1 MANYPETRO
587724197469028534	7.127633	13.940174	18.194	BINNED1 MANYPETRO
587724197469028356	7.00777	13.749406	16.973	BINNED1 INTERP
587724197469028377	7.059184	13.858853	17.783	BINNED1 INTERP
587724197469028419	7.106311	13.831121	16.002	BINNED1 INTERP
587724197469028436	7.130802	13.894924	15.79	BINNED1 INTERP
587724197469028403	7.095329	13.876649	16.016	BINNED1 INTERP CHILD

To search flags as part of an Imaging Query search result:

You can search through flags as part of your searches, either with the Imaging Query Form. You can request that the tool return only objects that possess one or more flags, such as searching for moving objects by looking for the MOVED flag. Or you can search

for only those objects that do not possess certain flags, such as searching for unsaturated objects by checking that the SATURATED flag is off.

1. Go to the Imaging Query Form. From the main page, click **Imaging Query**. See the Imaging Query guide for more information.
2. Select any parameters you like on the form.
3. Look at the **Obj Flags** drop-down menus at bottom of the form:

The screenshot shows the 'Imaging Constraints' section of the SkyServer DR5 Imaging Query form. It includes a 'Submit Request' button and a 'Reset Form' button. The 'Magnitude and Color Type' section has radio buttons for 'Petro', 'Model', and 'PSF', with 'Model' selected. Below this are two rows of input fields for 'Magnitudes' (min and max) and 'Colors' (min and max) for filters u, g, r, i, z. The 'Obj Type' section has checkboxes for 'Extended Sources (e.g., Galaxies)', 'Point Sources (e.g., Stars)', 'Sky', and 'Unknown', with the first two checked. Below this is a note: '(Shift-mouse to select multiple contiguous entries, Ctrl-mouse to select non-contiguous entries)'. The 'Obj Flags' section has two dropdown menus: 'At least one of these flags ON' and 'All of these flags OFF'. Both dropdowns currently show 'ignore', 'CANONICAL_CENTER', 'BRIGHT', 'EDGE', and 'BLENDED'. There are 'Submit Request' and 'Reset Form' buttons at the bottom of the form.

4. To guarantee that your results will possess a certain flag, select the flag from the *At least one of these flags ON* menu. To select more than one flag to check, hold down the CTRL key while selecting.
5. To guarantee that your results will not possess a certain flag, select the flag from the *All of these flags OFF* menu. To select more than one flag to check, hold down the CTRL key while selecting.
6. Click **Submit Request** to send your query to the database.
7. The flags will not show up in the search results unless you specifically request them in the **Imaging** menu of the *Parameters to Return* section above. But they

will be checked, and the search will return only objects that meet your flag criteria.

To search flags as part of an SQL query:

You can search through flags as part of your searches using SQL. You can request that the tool return only objects that possess one or more flags, such as searching for moving objects by looking for the MOVED flag. Or you can search for only those objects that do not possess certain flags, such as searching for unsaturated objects by checking that the SATURATED flag is off.

1. Go to the SQL Search form. From the main page, click **SQL Search**.
2. To constrain your search based on flags, add the following to the **WHERE** block of your query:
 - a. To find only objects for which a certain flag is present:

```
AND (p.flags & dbo.fPhotoFlags('flag')) > 0
```

For example, this query will find IDs and positions of objects that have been flagged as having moved:

```
SELECT objid, ra, dec  
FROM photoTag  
WHERE (flags & dbo.fPhotoFlags('MOVED')) > 0
```

- b. To find only objects for which a certain flag is absent:

```
AND (p.flags & dbo.fPhotoFlags(flag)) = 0
```

For example, this query will screen out IDs and positions of objects that have been flagged as saturated:

```
SELECT objid, ra, dec  
FROM photoTag  
WHERE (flags & dbo.fPhotoFlags('SATURATED')) = 0
```

To find only objects with clean photometry:

By using several flags together, you can limit your searches to return only objects that have clean photometry, thereby ensuring that you have a good sample. The flags you use differ depending on whether you are looking at stars or extended objects.

The queries below run slowly. These are test versions that use “TOP 10” to return only the first 10 results. To return all results, remove the top 10 and use the **CasJobs** batch query system. Also, note that lines that start with -- are comments that are not executed as SQL statements.

For stars, use the following query to return IDs, positions, colors, and flags:

```
SELECT TOP 10 objid, ra, dec, u, g, r, i, z, dbo.fPhotoFlagsN(flags) as
  flags
FROM star
WHERE
  ((flags & 0x10000000) != 0)
  -- detected in BINNED1

  AND ((flags & 0x8100000c00a4) = 0)
  -- not EDGE, NOPROFILE, PEAKCENTER, NOTCHECKED,
  -- PSF_FLUX_INTERP, SATURATED, or BAD_COUNTS_ERROR

  AND (((flags & 0x400000000000) = 0) or (psfmagerr_g <= 0.2))
  -- not DEBLEND_NOPEAK or small PSF error
  -- (substitute psfmagerr in other band as appropriate)

  AND (((flags & 0x100000000000) = 0) or (flags & 0x1000) = 0)
```

For extended objects, use the following query to return IDs, positions, colors, and flags:

```
SELECT TOP 10 objid, ra, dec, u, g, r, i, z, dbo.fPhotoFlagsN(flags) as flags
FROM galaxy
WHERE
  ((flags & 0x10000000) != 0)
  -- detected in BINNED1
  AND ((flags & 0x8100000c00a0) = 0)
  -- not NOPROFILE, PEAKCENTER, NOTCHECKED, PSF_FLUX_INTERP, SATURATED, or
  -- BAD_COUNTS_ERROR
  -- if you want to accept objects with interpolation problems for PSF mags,
  -- change this to: AND ((flags & 0x800a0) = 0)

  AND (((flags & 0x400000000000) = 0) or (psfmagerr_g <= 0.2))
  -- not DEBLEND_NOPEAK or small PSF error
  -- (substitute psfmagerr in other band as appropriate)

  AND (((flags & 0x100000000000) = 0) or (flags & 0x1000) = 0)
  -- not INTERP_CENTER or not COSMIC_RAY - omit this AND clause if you want to
  -- accept objects with interpolation problems for PSF mags.
```

Complete List of Flags (current for DR5 as of 5/18/07):

Name	Value	Description
CANONICAL_CENTER	0x0000000000000001	Measurements used the center in r^* , rather than the locally determined center.
BRIGHT	0x0000000000000002	Object detected in first, bright object-finding; generally $r^* < 17.5$
EDGE	0x0000000000000004	Object is too close to edge of frame
BLENDED	0x0000000000000008	Object had multiple peaks detected within it; was thus a candidate to be a deblending parent.
CHILD	0x0000000000000010	Object is the product of an attempt to deblend a BLENDED object.
PEAKCENTER	0x0000000000000020	Given center is position of peak pixel, rather than based on the maximum-likelihood estimator.
NODEBLEND	0x0000000000000040	No deblending was attempted on this object, even though it is BLENDED.
NOPROFILE	0x0000000000000080	Object was too small or too close to the edge to estimate a radial profile.
NOPETRO	0x0000000000000100	No valid Petrosian radius was found for this object.
MANYPETRO	0x0000000000000200	More than one Petrosian radius was found.
NOPETRO_BIG	0x0000000000000400	Petrosian radius is beyond the last point in the radial profile.
DEBLEND_TOO_MANY_PEAKS	0x0000000000000800	There were more than 25 peaks in this object to deblend; deblended brightest 25.
COSMIC_RAY	0x0000000000001000	Contains a pixel interpreted to be part of a cosmic ray.
MANYR50	0x0000000000002000	Object has more than one 50% light radius.
MANYR90	0x0000000000004000	Object has more than one 90% light radius.
BAD_RADIAL	0x0000000000008000	Some of the points in the given radial profile have negative signal-to-noise ratio. Not a significant parameter.
INCOMPLETE_PROFILE	0x000000000010000	Petrosian radius intersects the edge of the frame.
INTERP	0x000000000020000	Object contains one or more pixels whose values were determined by interpolation.
SATURATED	0x000000000040000	Object contains one or more saturated pixels
NOTCHECKED	0x000000000080000	There are pixels in the object which were not checked to see if they included a local peak, such as cores of saturated stars.
SUBTRACTED	0x000000000100000	This BRIGHT object had its wings subtracted from the frame
NOSTOKES	0x000000000200000	Object has no measured Stokes params
BADSKY	0x000000000400000	The sky level is so bad that the highest pixel in the object is very negative; far more so than a mere non-detection. No further analysis is attempted.
PETROFAINT	0x000000000800000	At least one possible Petrosian radius was rejected as the surface brightness at r_P was too low. If NOPETRO is not set, a different, acceptable Petrosian radius was found.
TOO_LARGE	0x000000001000000	The object is too large for us to measure its profile (it extends beyond a radius of approximately 260), or at least one child is larger than half a frame.
DEBLENDED_AS_PSF	0x000000002000000	Deblender treated obj as PSF
DEBLEND_PRUNED	0x000000004000000	At least one child was removed because its image was too similar to a supposedly different child.
ELLIPFAINT	0x000000008000000	Object center is fainter than the isophote whose shape is desired, so the isophote properties are not measured. Also flagged if profile is incomplete.
BINNED1	0x000000001000000	Object was detected in 1x1 binned image
BINNED2	0x000000002000000	Object was detected in 2x2 binned image, after unbinned detections are replaced by background.
BINNED4	0x000000004000000	Object was detected in 4x4 binned image
MOVED	0x000000008000000	The deblender identified this object as possibly moving.
DEBLENDED_AS_MOVING	0x000000010000000	A MOVED object that the deblender treated as moving.
NODEBLEND_MOVING	0x000000020000000	A MOVED object that the deblender did not treat as moving.
TOO_FEW_DETECTIONS	0x000000040000000	A child of this object was not detected in enough bands to reliably deblend as moving.

BAD_MOVING_FIT	0x0000000800000000	Moving fit too poor to be believable.
STATIONARY	0x0000001000000000	This object was consistent with being stationary.
PEAKS_TOO_CLOSE	0x0000002000000000	At least some peaks within this object were too close to be deblended, thus they were merged into a single peak.
MEDIAN_CENTER	0x0000004000000000	Center given is of median-smoothed image.
LOCAL_EDGE	0x0000008000000000	Center in at least one band is too close to an edge.
BAD_COUNTS_ERROR	0x0000010000000000	An object containing interpolated pixels had too few good pixels to form a reliable estimate of its error; the quoted error may be underestimated.
BAD_MOVING_FIT_CHILD	0x0000020000000000	A possible moving child's velocity fit was too poor, so it was discarded and the parent was not deblended as moving.
DEBLEND_UNASSIGNED_FLUX	0x0000040000000000	After deblending, a significant fraction of flux was not assigned to any children.
SATUR_CENTER	0x0000080000000000	Object center is close to at least one saturated pixel.
INTERP_CENTER	0x0000100000000000	Object center is close to at least one interpolated pixel.
DEBLENDED_AT_EDGE	0x0000200000000000	An object close enough to the edge of the frame normally not deblended, is deblended anyway. Only set for objects large enough to be EDGE in all fields/strips.
DEBLEND_NOPEAK	0x0000400000000000	There was no detected peak within this child in at least one band.
PSF_FLUX_INTERP	0x0000800000000000	Greater than 20% of the PSF flux is from interpolated pixels.
TOO_FEW_GOOD_DETECTIONS	0x0001000000000000	A child of this object had too few good detections to be deblended as moving.
CENTER_OFF_AIMAGE	0x0002000000000000	At least one peak's center lay off of the atlas image. This can happen when the object is deblended as moving, or if the astrometry is bad.
DEBLEND_DEGENERATE	0x0004000000000000	Two or more candidate children were essentially identical; one one was retained.
BRIGHTEST_GALAXY_CHILD	0x0008000000000000	This child is the brightest family member (in this band) that is classified as a galaxy.
CANONICAL_BAND	0x0010000000000000	This is the 'canonical' band; r unless the object is undetected in the r filter.
AMOMENT_FAINT	0x0020000000000000	Object was too faint to measure weighted moments such as mE1_g; unweighted values are reported.
AMOMENT_SHIFT	0x0040000000000000	Centroid shift too large when measuring adaptive moments. Row/Column shifts are reported in mE1, mE2.
AMOMENT_MAXITER	0x0080000000000000	Maximum number of iterations exceeded measuring e.g. mE2_g; unweighted values are reported.
MAYBE_CR	0x0100000000000000	There is reasonable suspicion that this object is actually a cosmic ray.
MAYBE_EGHOST	0x0200000000000000	There is reasonable suspicion that this object is actually a ghost produced by the CCD electronics.
NOTCHECKED_CENTER	0x0400000000000000	The center of this object lies in a region that was not searched for objects.
OBJECT2_HAS_SATUR_DN	0x0800000000000000	The electrons in this saturated object's bleed trails have been included in its estimated flux.
OBJECT2_DEBLEND_PEEPHOLE	0x1000000000000000	Deblend was modified by the deblender's peephole optimiser.
GROWN_MERGED	0x2000000000000000	Growing led to a merger
HAS_CENTER	0x4000000000000000	Object has a canonical center
RESERVED	0x8000000000000000	Not used