# PS1 Aperture photometry of point sources

Aperture photometry here refers to the measurement of the total count rate - or equivalently instrumental magnitude - for a point source based on integration over an aperture *plus* an extrapolation to total based on the integral of the PSF model outside the aperture.

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## Definition

Aperture photometry here refers to the measurement of the total count rate - or equivalently instrumental magnitude - for a point source based on integration over an aperture plus an extrapolation involving the PSF. This photometry should **not** be used for extended sources, and **should not be confused with the fixed aperture measurements provided on the stacks**.

It is usually computed using one of a number of predefined routines, typically designed to account for partial pixels via some form of interpolation. Characteristically, there appears to be little information on the specifics of the aperture photometry definitions adopted in PanSTARRS1 PSPS processing. The total count rate is typically corrected for the "sky", or local background. The local background can be estimated, e.g., from a robust mean or median carried out on a formally empty region of the image, and then multiplied by the area of the aperture and subtracted from the count rate included in that aperture. The total count rate can then be corrected, both for variations in sensitivity (e.g., air mass) and for the specifics of the aperture used (e.g., by applying an aperture correction based on the PSF at that position). Aperture magnitudes are typically more robust than PSF magnitudes to variations in seing, but are more subject to variations in crowded fields. Determining what is a source and the correct background level is also challenging in highly crowded areas.

In PS1, an 'optimal' aperture radius is determined based on the local PSF (this radius is stored in the Detection and StackObjectAttributes tables). The wings of the same analytic PSF are then used to extrapolate the flux measured inside this aperture to a 'total' flux.

If you want true fixed-aperture measurements then these are available in the StackApFlx, StackApFlxExGalUnc, StackApFlxExGalCon6 or StackApFlxExGalCon8 tables.

## Parameters in PS1 MeanObject table fields

| Name | Unit | Data Type | Size | Default Value | |
|---|---|---|---|---|---|
| **gMeanApMag** | AB magnitudes | REAL | 4 | -999 | Mean aperture magnitude from g filter detections. |
| **gMeanApMagErr** | AB magnitudes | REAL | 4 | -999 | Error in mean aperture magnitude from g filter detections. |
| **gMeanApMagStd** | AB magnitudes | REAL | 4 | -999 | Standard deviation of aperture magnitudes from g filter detections. |
| **gMeanApMagNpt** | dimensionless | SMALLINT | 2 | -999 | Number of measurements included in mean aperture magnitude from g filter detections. |

and similar entries for the rizy filters.

## Parameters in PS1 StackObjectThin table fields

| Name | Unit | Data Type | Size | Default Value | |
|---|---|---|---|---|---|
| **gApMag** | AB magnitudes | REAL | 4 | -999 | Aperture magnitude from g filter stack detection. |

| | | | | | |
|---|---|---|---|---|---|
| **gApMag Err** | AB magnitudes | REAL | 4 | -999 | Error in aperture magnitude from g filter stack detection. |

and similar entries for the rizy filters.

# Parameters in PS1 Detection table fields Table

| Name | Unit | Data Type | Size | Default Value | |
|---|---|---|---|---|---|
| **apFlux** | Janskys | REAL | 4 | -999 | Flux in seeing-dependent aperture. |
| **apFluxErr** | Janskys | REAL | 4 | -999 | Error on flux in seeing-dependent aperture. |
| **apFillF** | dimensionless | REAL | 4 | -999 | Aperture fill factor. |
| **apRadius** | arcsec | REAL | 4 | -999 | Aperture radius. |

The equivalent stack measurements are found in **PS1 StackObjectAttributes table fields**.