

# GALEX Release 1 (GR1) Column descriptions for

## -xg-gsp.fits.htm

\*xg-gsp.fits: -Tab Jan'04 / Dec'04

Binary FITS table column descriptions for \*-xg-gsp.fits files:  
(Total number of fields: 58. Total number of bytes: 17280.)

ggoid : TTYPE1 (2J) : Global ID of spectral source

Joining these two integers yields a 64 bit integer uniquely identifying this source including the tile number, band, product number, reduction try (path), etc. The bits from most significant to least are:

- 3 bits: vsn : Version number (of the pipeline)
- 16 bits: tile : Tile or field or target number
- 2 bits: type : Observ. type (00=single,01=AIS(multi))
- 2 bits: ow : optics wheel(01=drct,10=grsm,11=opaq,00=undef)
- 4 bits: prod : product number(\_visits,\_best,etc.)
- 12 bits: img : visit/sub-visit number  
(when type=01: 5 bit subvis + 7 bit visit)
- 3 bits: try : try number (processing number)
- 2 bits: band : Band (01=nuv,10=fuv,11=both,00=undefined)
- 20 bits: xid : Extraction ID

The extraction ID is the same as the extraction ID in the \*-xd-mcat.fits file used for this spectral reduction.

ggoid\_D : TTYPE2 (2J) : Global ID of direct image source

This is the GGID for the corresponding source in the direct image catalog (the \*-xd-mcat.fits file).

band : TTYPE3 (1J) : 1=nuv only, 2=fuv only, 3=both

From the GGID.

id : TTYPE4 (1J) : Spectral source ID

Extraction ID from the GGID.

alpha\_j2000 : TTYPE5 (1D) : Right Ascension J2000 (deg)

delta\_j2000 : TTYPE6 (1D) : Declination J2000 (deg)

Merged position from the merged catalog file (-xd-mcat.fits).

numpt : TTYPE7 (1J) : Number of points in spectra

The actual number of real data points in the spectral arrays obj,objerr,etc. Note that this may be smaller than the number of allocated values.

objwidth : TTYPE8 (1E) : 'arcsec' : Object extraction width (arcsec)

The object extraction window width in arcseconds. This is the region of the spatial profile centered on the expected center of the source used to accumulate the flux at each point along the spectrum. Note that this is the total size of extraction aperture (i.e. a diameter, not a radius).

bckwidth : TTYPE9 (1E) : Background extraction width (arcsec)

This is the width in the spatial direction used for the background estimate. The background excludes the object window and also regions immediately adjacent to the object (see objbcksep).

The background width is equal to the number of rows in the spectral image strip, minus one row used to accumulate the spectral response deviations (currently not used).

objbcksep : TTYPE10 (1E) : Object-Background separation (arcsec)

The separation between the object window and the background windows which bracket each side of the object window.

bckcolrad : TTYPE11 (1J) : Radius for averaging background columns (pix)

Number of columns to average on either side of a given column to compute the background level at each point along the spectrum.

A value of 0 means only use the column at each point to determine the background. A value of 1 means include 1 column on either side of the primary column to compute the background at each spectrum point.

truthid : TTYPE12 (1J) : Truth catalog ID (matched)

Not used.

objtype : TTYPE13 (1J) : Object Type(0=galex,1=star)

A guess at the object type based on the direct image colors.

temperature : TTYPE14 (1E) : Estimated effective temper.(K)

From a blackbody fit to the spectrum.

redshift : TTYPE15 (1E) : Estimated redshift

Not used.

slope : TTYPE16 (1E) : Estimated spectral slope

A power-law fit to the spectrum, this is alpha in equation:

$f_{\nu}$  (proportional to)  $\nu^{\alpha}$ . Or, in our case, photons per sec. per  $\text{cm}^2$  per Ang. proportional to  $\lambda^{\alpha}$ .

qa : TTYPE17 (1E) : Quality Analysis value

Not currently used.

flag : TTYPE18 (1J) : Miscellaneous flag (not used)

Not currently used.

weight : TTYPE19 (2E) : Average weight (each band)

Average response in effective seconds for the unmasked pixels in the spectral image strip. (NUV is the first element.)

This includes flat field response and neighbor masking.

background : TTYPE20 (2E) : Average background (each band)

Average background in photons per (effective) second per pixel for the unmasked pixels within the background limits. The pixel size in the image strips is nominally 1 square arcsecond.

(NUV is the first element (value), FUV is the second value.)

median\_s/n : TTYPE21 (2E) : Median Signal/Noise (each band)

Median S/N per spectral pixel (wavelength point) in the flux calibrated spectra. Each spectral pixel is nominally 3.5 Angstroms in size. For NUV the range used for this computation is 1755 to 3000 Angstroms. For FUV the range is 1300 to 1745 Angstroms.

(NUV is the first element (value), FUV is the second value.)

centroid : TTYPE22 (2E) : Relative position(spatial)(each)

Centroid of the profile relative to the expected object position.

The expected object position is the given by the number of rows in the image strip (-pri.fits or -prc.fits):

$(\text{object center}) = (\text{number of rows in image strip} - 2) / 2$ .

This assumes the center of a pixel in the first row is 0.0.

Note that the last row of an image strip is for the spectral response variation (currently 1.0). The centroid value is relative to the expected object center, so a perfectly aligned object would have a centroid value of 0.0.

(NUV is the first element (value), FUV is the second value.)

specfwhm : TTYPE23 (2E) : Estim. Spatial FWHM (each band)

This is an approximate estimate of the FWHM (in arcseconds) of the spatial profile. Assuming a gaussian, it uses the formula:

$\text{FWHM} = 0.93944 \times (\text{area of profile}) / (\text{peak pixel value})$

(NUV is the first element (value), FUV is the second value.)

effexp : TTYPE24 (2E) : Effective exposure time in spectral image strip

For each band (NUV and FUV, respectively), the effective exposure time in seconds for the entire spectral image strip (object and background regions) for a given source. This value takes into account the varying response of the flat field and corrections for dead spots. It does not include masking of neighboring sources by spectral extraction programs.

effmask : TTYPE25 (2E) : Effective masking fraction in spectral image

For each band, the effective masking fraction over the entire spectral image strip. This includes masking of neighboring sources. No masking would be 0., masking of 10% of the image strip would be 0.10. Multiplying "effexp" and "1.0 - effmask" gives you approximately the "weight" value.

nuv\_numpro : TTYPE26 (1J) : Number of points in NUV profile

Number of points in the NUV profile array. This is one less than the number of rows in the spectral image strip, since the last row in the image strip is the spectral response variation.

fuv\_numpro : TTYPE27 (1J) : Number of points in FUV profile

Number of points in the FUV profile array.

nuv\_profile : TTYPE28 (198E) : NUV profile (spatial)

NUV profile array. Values are in photons/second/pixel (a pixel is nominally 1 square arcsecond). The column range used to compute the average profile is offsets +50 to +275 arcseconds for NUV (offset=0 is the undeviated wavelength position on the image strip). This is roughly the NUV first order portion of the spectrum. Masked pixels are ignored. See the description of the "centroid" column for the definition of the "object center row".

fuv\_profile : TTYPE29 (198E) : FUV profile (spatial)

FUV profile array. Values are in photons/second/pixel (a pixel is nominally 1 square arcsecond). The column range used to compute the average profile is offsets +175 to +375 arcseconds for FUV. This is roughly the FUV second order portion of the spectrum. Masked pixels are ignored.

nuv : TTYPE30 (1E) : Direct image flux rate (NUV)

NUV flux in photons per (effective) second from direct image source extraction. This is the "nuv\_flux" column in the bandmerged direct image source catalog (-xd-mcat.fits), but converted to photons per second rather than micro Janskys.

nuve : TTYPE31 (1E) : Error in direct image flux rate

One sigma error in "nuv" column value.

fuv : TTYPE32 (1E) : Direct image flux rate (FUV)

FUV flux in photons per (effective) second from direct image source extraction.

fuve : TTYPE33 (1E) : Error in direct image flux rate

One sigma error in "fuv" column value.

nuvs : TTYPE34 (1E) : Spectral flux scaled to direct

NUV flux derived from the extracted spectrum. This is computed by summing the products of the flux in each pixel of the flux calibrated spectrum by the direct image effective area and the dispersion. The wavelength range used in the NUV is 1800 to 2800 Angstroms. Since this does not include the edges of the bandpass, a correction factor (guess) of 1.0254 is applied to the sum. Some discrepancy will remain between the direct and grism results, but this value is useful for quality analysis.

nuvs0 : TTYPE35 (1E) : Error in nuvs

One sigma error in "nuvs" column value.

fuvs : TTYPE36 (1E) : Spectral flux scaled to direct

FUV flux derived from the extracted spectrum. This is computed by summing the products of the flux in each pixel of the flux calibrated spectrum by the direct image effective area and the dispersion. The wavelength range used in the FUV is 1350 to 1700 Angstroms. Since this does not include the edges of the bandpass, a correction factor (guess) of 1.1071 is applied to the sum. Some discrepancy will remain between the direct and grism results, but this value is useful for quality analysis.

fuvs0 : TTYPE37 (1E) : Error in fuvs

One sigma error in "fuvs" column value.

nuv0s : TTYPE38 (1E) : NUV Zeroth order flux rate

NUV flux derived from only the 0th order spectrum. The wavelength range is 2000 to 2300 Angstroms and no correction is applied. Although smaller than the value "nuvs", each of the values of nuv0s,nuv1s,nuv2s should be the same and can be used for quality analysis.

nuv0se : TTYPE39 (1E) : Error in NUV Zeroth order flux rate

One sigma error in "nuv0s" column value.

nuv1s : TTYPE40 (1E) : NUV First order flux rate

NUV flux derived from only the 1st order spectrum. The wavelength range is 2000 to 2300 Angstroms and no correction is applied.

nuv1se : TTYPE41 (1E) : Error in NUV First order flux rate

One sigma error in "nuv1s" column value.

nuv2s : TTYPE42 (1E) : NUV Second order flux rate

NUV flux derived from only the 2nd order spectrum. The wavelength range is 2000 to 2300 Angstroms and no correction is applied.

nuv2se : TTYPE43 (1E) : Error in NUV Second order flux rate

One sigma error in "nuv2s" column value.

fuvs1s : TTYPE44 (1E) : FUV First order flux rate

FUV flux derived from only the 1st order spectrum. The wavelength range is 1350 to 1600 Angstroms and no correction is applied. Although smaller than the value "fuvs", each of the values of fuvs1s,fuvs2s,fuvs3s should be the same and can be used for quality analysis.

fuvs1se : TTYPE45 (1E) : Error in FUV First order flux rate

One sigma error in "fuvs1s" column value.

fuvs2s : TTYPE46 (1E) : FUV Second order flux rate

FUV flux derived from only the 2nd order spectrum. The wavelength range is 1350 to 1600 Angstroms and no correction is applied.

fuvs2se : TTYPE47 (1E) : Error in FUV Second order flux rate

One sigma error in "fuvs2s" column value.

fuvs3s : TTYPE48 (1E) : FUV Third order flux rate

FUV flux derived from only the 3rd order spectrum. The wavelength range is 1350 to 1600 Angstroms and no correction is applied.

fuvs3se : TTYPE49 (1E) : Error in FUV Third order flux rate

One sigma error in "fuvs3s" column value.

zero : TTYPE50 (1E) : Wavelength of first pixel (Ang.)

Zero point for the wavelength scale in Angstroms. The true wavelength is given by: wavelength = zero + (pixel#) \* disp, where the first pixel is pixel# 0.

disp : TTYPE51 (1E) : Angstroms per pixel

Dispersion for the wavelength scale in Angstroms per pixel. The true wavelength is given by: wavelength = zero + (pixel#) \* disp, where the first pixel is pixel# 0.

obj : TTYPE52 (552E) : Flux (pho/sec/cm^2/Ang) (standard)

Spectrum array in photons per second per  $\text{cm}^2$  per Angstrom. This is the standard reduction which means a simple sum of the pixels in the object region (given by "objwidth", see -gsax.fits file) after dividing by the response image and subtracting an average background level at each wavelength point (or column). Only NUV 1st order and FUV 2nd order are used to compute this spectrum.

objerr : TTYPE53 (552E) : Error on obj

One sigma error for obj[i] array.

opx : TTYPE54 (552E) : Flux (pho/sec/cm^2/Ang) (optimal)

Intended for optimal extraction spectrum, currently not used.

opxerr : TTYPE55 (552E) : Error on opx

Not used.

obj3s : TTYPE56 (552E) : Flux (pho/sec/cm^2/Ang) (FUV 3rd + NUV 2nd)

Secondary spectrum-- this is similar to "obj" but only the NUV 2nd order and FUV 3rd order are used to extract the spectrum (instead of only NUV 1st and FUV 2nd). This is expected to have a much lower S/N but will have a higher spectral resolution than "obj".

obj3err : TTYPE57 (552E) : Error on obj3s

One sigma error for obj3s[i] array.

objjdn : TTYPE58 (552E) : Flux spectrum using median image strip.

Spectrum extracted from the median image strip files (-prm.fits).

Only used for co-added or visit-combined data. This array is not used for individual visits.