**J/ApJS/218/23** Fermi LAT third source catalog (3FGL) (Acero+, 2015)

Fermi Large Area Telescope third source catalog.

Acero F., Ackermann M., Ajello M., Albert A., Atwood W.B., Axelsson M., Baldini L., Ballet J., Barbiellini G., Bastieri D., Belfiore A., Bellazzini R., Bissaldi E., Blandford R.D., Bloom E.D., Bogart J.R., Bonino R., Bottacini E., Bregeon J., Britto R.J., Bruel P., Buehler R., Burnett T.H., Buson S., Caliandro G.A., Cameron R.A., Caputo R., Caragiulo M., Caraveo P.A., Casandjian J.M., Cavazzuti E., Charles E., Chaves R.C.G., Chekhtman A., Cheung C.C., Chiang J., Chiaro G., Ciprini S., Claus R., Cohen-Tanugi J., Cominsky L.R., Conrad J., Cutini S., D'Ammando F., de Angelis A., Deklotz M., de Palma F., Desiante R., Digel S.W., Di Venere L., Drell P.S., Dubois R., Dumora D., Favuzzi C., Fegan S.J., Ferrara E.C., Finke J., Franckowiak A., Fukazawa Y., Funk S., Fusco P., Gargano F., Gasparrini D., Giebels B., Giglietto N., Giommi P., Giordano F., Giroletti M., Glanzman T., Godfrey G., Grenier I.A., Grondin M.-H., Grove J.E., Guillemot L., Guiriec S., Hadasch D., Harding A.K., Hays E., Hewitt J.W., Hill A.B., Horan D., Iafrate G., Jogler T., Johannesson G., Johnson R.P., Johnson A.S., Johnson T.J., Johnson W.N., Kamae T., Kataoka J., Katsuta J., Kuss M., La Mura G., Landriu D., Larsson S., Latronico L., Lemoine-Goumard M., Li J., Li L., Longo F., Loparco F., Lott B., Lovellette M.N., Lubrano P., Madejski G.M., Massaro F., Mayer M., Mazziotta M.N., Mcenery J.E., Michelson P.F., Mirabal N., Mizuno T., Moiseev A.A., Mongelli M., Monzani M.E., Morselli A., Moskalenko I.V., Murgia S., Nuss E., Ohno M., Ohsugi T., Omodei N., Orienti M., Orlando E., Ormes J.F., Paneque D., Panetta J.H., Perkins J.S., Pesce-Rollins M., Piron F., Pivato G., Porter T.A., Racusin J.L., Rando R., Razzano M., Razzaque S., Reimer A., Reimer O., Reposeur T., Rochester L.S., Romani R.W., Salvetti D., Sanchez-Conde M., Saz Parkinson P.M., Schulz A., Siskind E.J., Smith D.A., Spada F., Spandre G., Spinelli P., Stephens T.E., Strong A.W., Suson D.J., Takahashi H., Takahashi T., Tanaka Y., Thayer J.G., Thayer J.B., Thompson D.J., Tibaldo L., Tibolla O., Torres D.F., Torresi E., Tosti G., Troja E., Van Klaveren B., Vianello G., Winer B.L., Wood K.S., Wood M., Zimmer S.

<Astrophys. J. Suppl. Ser., 218, 23 (2015)>
=2015ApJS..218...23A

**ADC_Keywords:** Active gal. nuclei ; Gamma rays ; Pulsars ; BL Lac objects ; Surveys
**Mission_Name:** Fermi

**Keywords:** catalogs; gamma rays: general

**Abstract:**
We present the third Fermi Large Area Telescope (LAT) source catalog (3FGL) of sources in the 100MeV-300GeV range. Based on the first 4yr of science data from the Fermi Gamma-ray Space Telescope mission, it is the deepest yet in this energy range. Relative to the Second Fermi LAT catalog, the 3FGL catalog incorporates twice as much data, as well as a number of analysis improvements, including improved calibrations at the event reconstruction level, an updated model for Galactic diffuse γ-ray emission, a refined procedure for source detection, and improved methods for associating LAT sources with potential counterparts at other wavelengths. The 3FGL catalog includes 3033 sources above 4σ significance, with source location regions, spectral properties, and monthly light curves for each. Of these, 78 are flagged as potentially being due to imperfections in the model for Galactic diffuse emission. Twenty-five sources are modeled explicitly as spatially extended, and overall 238 sources are considered as identified based on angular extent or correlated variability (periodic or otherwise) observed at other wavelengths. For 1010 sources we have not found plausible counterparts at other wavelengths. More than 1100 of the identified or associated sources are active galaxies of the blazar class; several other classes of non-blazar active galaxies are also represented in the 3FGL. Pulsars represent the largest Galactic source class. From source counts of Galactic sources we estimate that the contribution of unresolved sources to the Galactic diffuse emission is ~3% at 1GeV.

**Description:**
The data for the 3FGL catalog were taken during the period from 2008 August 4 (15:43 UTC) to 2012 July 31 (22:46 UTC), to covering close to 4yr. The LAT detects γ-rays in the energy range from 20MeV to more than 300GeV.

**File Summary:**

| FileName | Lrecl | Records | Explanations |
|---|---|---|---|
| ReadMe | 80 | . | This file |
| table4.dat | 173 | 4984 | LAT 4-year catalog (3034 unique 3FGL sources) |
| table8.dat | 132 | 3034 | LAT 4-year catalog: spectral information |
| table3.dat | 350 | 12 | Definitions of the analysis flags |
| lcs/* | 0 | 3034 | ASCII files of the light curves |

**See also:**
B/ocl : Optically visible open clusters and Candidates (Dias+ 2002-2014)
VII/258 : Quasars and Active Galactic Nuclei (13th Ed.) (Veron+ 2010)
VII/253 : A Catalogue of Galactic Supernova Remnants (Green, 2009)
VIII/81 : Sydney University Molonglo Sky Survey (SUMSS V2.1) (Mauch+ 2008)
IX/29 : ROSAT All-Sky Survey Faint Source Catalog (Voges+ 2000)
IX/10 : ROSAT All-Sky Bright Source Catalogue (1RXS) (Voges+ 1999)
VIII/65 : 1.4GHz NRAO VLA Sky Survey (NVSS) (Condon+ 1998)
VII/202 : Globular Clusters in the Milky Way (Harris, 1997)
VIII/27 : Parkes-MIT-NRAO (PMN) Surveys (Griffith+ 1994)
VII/161 : Nearby Galaxies (Schmidt+ 1993)
J/ApJS/215/14 : WISE cand. γ-ray blazar radio sources (D'Abrusco+, 2014)
J/ApJS/209/34 : The first Fermi-LAT >10GeV catalog (1FHL) (Ackermann+, 2013)
J/ApJS/208/17 : 2nd Fermi LAT cat. of gamma-ray pulsars (2PC) (Abdo+, 2013)
J/MNRAS/432/1294 : Fermi unassociated sources ATCA observations (Petrov+, 2013)
J/ApJ/753/83 : Associations to 1FGL sources (Ackermann+, 2012)
J/ApJS/199/31 : Fermi LAT second source catalog (2FGL) (Nolan+, 2012)
J/ApJ/743/171 : The 2LAC catalog (Ackermann+, 2011)
J/ApJS/188/405 : Fermi-LAT first source catalog (1FGL) (Abdo+, 2010)
J/MNRAS/402/2403 : Australia Telescope 20GHz Survey Catalog (Murphy+, 2010)
J/ApJS/186/1 : 4th IBIS/ISGRI soft gamma-ray survey catalog (Bird+, 2010)
J/A+A/506/1563 : First AGILE catalog of gamma-ray sources (Pittori+, 2009)
J/ApJS/183/46 : Fermi/LAT bright gamma-ray source list (0FGL) (Abdo+, 2009)
J/A+A/495/691 : Multifrequency cat. of blazars, Roma-BZCAT (Massaro+, 2009)
J/A+A/489/849 : Revised cat. of EGRET gamma-ray sources (Casandjian+, 2008)
J/ApJS/175/97 : CGRaBS: γ-ray blazar candidates (Healey+, 2008)
J/ApJS/171/61 : Flat-Spectrum Radio Sources all-sky survey (Healey+, 2007)
J/A+A/469/807 : Catalogue of Galactic low-mass X-ray binaries (Liu+, 2007)
J/MNRAS/372/777 : Parkes Multibeam Pulsar Survey. VI. (Lorimer+, 2006)
J/A+A/455/1165 : Catalogue of Galactic high-mass X-ray binaries (Liu+, 2006)
J/AJ/126/1607 : IRAS Revised Bright Galaxy Sample (Sanders+, 2003)
J/PASP/113/10 : Sub-mJy radio sources complete sample (Masci+, 2001)
J/ApJS/123/79 : Third EGRET catalog (3EG) (Hartman+, 1999)
http://www.atnf.csiro.au/research/pulsar/psrcat/ : ATNF pulsar catalog
http://www.physics.umanitoba.ca/snr/SNRcat/ : SNRcat home page
http://tevcat.uchicago.edu/ : TeVCat (online gamma-ray catalog) home page
http://fermi.gsfc.nasa.gov/ssc : The Fermi Science Support Center

**Byte-by-byte Description of file:** table4.dat

| Bytes | Format | Units | Label | Explanations |
|---|---|---|---|---|
| 1- 13 | A13 | --- | 3FGL | The 3FGL name (1) |
| 15- 21 | F7.3 | deg | RAdeg | Right Ascension in decimal degrees (J2000) |
| 23- 29 | F7.3 | deg | DEdeg | Declination in decimal degrees (J2000) |
| 31- 37 | F7.3 | deg | GLON | Galactic longitude |
| 39- 45 | F7.3 | deg | GLAT | Galactic latitude |
| 47- 51 | F5.3 | deg | amaj | [0.005/1.1]? 95% confidence error ellipse semimajor axis |
| 53- 57 | F5.3 | deg | amin | [0.005/0.6]? 95% confidence error ellipse semiminor axis |
| 59- 61 | I3 | deg | phi | [-90/90]? Position angle ϕ of error ellipse (East of North) |
| 63- 68 | F6.1 | --- | Sig | [4/1049]? Significance (2) |
| 70- 75 | F6.1 | 10-5/m2/s | F35 | [0/1298] Photon flux summed over 3 bands 1-100GeV ($10^{-9}$ph/cm$^2$/s) |
| 77- 79 | F3.1 | 10-5/m2/s | e_F35 | [0/3]? The 1σ uncertainty in F35 |
| 81- 86 | F6.1 | fW/m2 | S25 | [1.7/8932] Energy flux for 100MeV-100GeV from power-law fit ($10^{-12}$erg/s/cm$^2$) |
| 88- 91 | F4.1 | fW/m2 | e_S25 | [0.4/26]? The 1σ uncertainty in S25 |
| 93- 96 | F4.2 | --- | Gamma | [1.1/5.8] Photon power-law index Γ for 100MeV-100GeV |
| 98-101 | F4.2 | --- | e_Gamma | [0.01/1.1]? 1σ uncertainty in Gamma |
| 103-104 | A2 | --- | Mod | Spectral model used to fit the energy spectrum (PL, EC or LP) (3) |
| 106 | A1 | --- | Var | [T] Variability flag, T=true (4) |
| 108-119 | A12 | --- | Flag | Analysis flag(s); see Table 3 |
| 121-138 | A18 | --- | Assoc | The γ-ray association (5) |
| 140 | A1 | --- | TeV | [EP] Extended or Point-like source (6) |
| 142-146 | A5 | --- | Class | Astrophysical class of source (7) |
| 148-173 | A26 | --- | ID | Designator of identified or associated source (8) |

**Note (1):** 3FGL JHHMM.m+DDMM[c/e/i/s], constructed according to
"IAU Specifications for Nomenclature": m is decimal minutes of RA;
in the name RA and DE are truncated at 0.1min and 1', respectively;
* "c" indicates that based on the region of the sky the source is
is considered to be potentially confused with Galactic diffuse emission;
* "e" indicates a source that was modeled as spatially extended (Sec.3.4);
* the two spectral components of the Crab PWN are designated "i" and "s".
**Note (2):** Derived from likelihood Test Statistic for 100MeV-300GeV analysis.

**Note (3):** Spectra model used:
PL = power-law;
EC = power-law with exponential cutoff;
LP = log parabolic.

**Note (4):**
T = <1% chance of being a steady source; see note in text.
**Note (5):** Positional associations with 0FGL, 1FGL, 2FGL, 3EG, EGR, or 1AGL.
Sources with multiple γ-ray associations are edited on multiple lines.
**Note (6):** Flag from association with a TeVCat source:
P = unresolved angular size;
E = extended.
**Note (7):** Like "ID" in 3EG catalog (Hartman+, 1999, J/ApJS/123/79), but with
more detail as described in Table 6 (1010 sources are unassociated).
Capital letters indicate firm identifications (238 sources);
lower-case letters indicate associations (1785 sources).
Table 6: LAT 3GL source classes as follows:

```
PSR   = Pulsar, identified by pulsations (143 sources)
psr   = Pulsar, no pulsations seen in LAT yet (24 sources)
PWN   = Pulsar wind nebula (9 sources; and 2 "pwn")
SNR   = Supernova remnant (12 sources; and 11 "snr")
spp   = Supernova remnant/pulsar wind nebula (49 sources)
glc   = Globular cluster (15 sources)
HMB   = High-mass binary (3 sources)
BIN   = Binary (1 source)
NOV   = Nova (1 source)
SFR   = Star-forming region (1 source)
css   = Compact steep spectrum quasar (1 source)
BLL   = BL Lac type of blazar (18 sources; and 642 "bll")
FSRQ  = FSRQ type of blazar (38 sources; 446 "fsrq")
agn   = Non-blazar active galaxy (3 sources)
RDG   = Radio galaxy (3 sources; and 12 "rdg")
sey   = Seyfert galaxy (1 source)
BCU   = Blazar candidate of uncertain type (5 sources; and 568 "bcu")
GAL   = Normal galaxy (or part) (2 sources; and 1 "gal")
sbg   = Starburst galaxy (4 sources)
NLSY1 = Narrow-line Seyfert 1 (2 sources; and 3 "nlsy1")
ssrq  = Soft-spectrum radio quasar (3 sources)
```

**Note (8):** For sources located within the angular extents of extended LAT
sources, this column has the name of the extended source followed by "field".

---

**Byte-by-byte Description of file:** table8.dat

| Bytes | Format | Units | Label | Explanations |
|---|---|---|---|---|
| 1- 13 | A13 | --- | 3FGL | The 3FGL name |
| 15- 20 | F6.2 | 10-4/m2/s | F1 | [0/538] Integrated 100-300MeV band photon flux (in $10^{-8}$ph/cm$^2$/s) |
| 22- 25 | F4.2 | 10-4/m2/s | E_F1 | ? Upper limit uncertainty in F1 (1) |
| 27- 30 | F4.2 | 10-4/m2/s | e_F1 | ? Lower limit uncertainty in F1 (1) |
| 32- 36 | F5.1 | --- | TS1 | [0/216]? Square root of 100-300MeV band test statistic |
| 38- 43 | F6.2 | 10-4/m2/s | F2 | [0/322] Integrated 300-1000MeV band photon flux (in $10^{-8}$ph/cm$^2$/s) |
| 45- 48 | F4.2 | 10-4/m2/s | E_F2 | ? Upper limit uncertainty in F2 (1) |
| 50- 53 | F4.2 | 10-4/m2/s | e_F2 | ? Lower limit uncertainty in F2 (1) |
| 55- 59 | F5.1 | --- | TS2 | [0/569]? Square root of 300-1000MeV band test statistic |
| 61- 67 | F7.2 | 10-5/m2/s | F3 | [0/1071] Integrated 1-3GeV band photon flux (in $10^{-9}$ph/cm$^2$/s) |
| 69- 72 | F4.2 | 10-5/m2/s | E_F3 | ? Upper limit uncertainty in F3 (1) |
| 74- 77 | F4.2 | 10-5/m2/s | e_F3 | ? Lower limit uncertainty in F3 (1) |
| 79- 83 | F5.1 | --- | TS3 | [0/712]? Square root of 1-3GeV band test statistic |
| 85- 91 | F7.2 | 10-6/m2/s | F4 | [0/2162] Integrated 3-10GeV band photon flux (in $10^{-10}$ph/cm$^2$/s) |
| 93- 97 | F5.2 | 10-6/m2/s | E_F4 | ? Upper limit uncertainty in F4 (1) |
| 99-103 | F5.2 | 10-6/m2/s | e_F4 | ? Lower limit uncertainty in F4 (1) |
| 105-109 | F5.1 | --- | TS4 | [0/466]? Square root of 3-10GeV band test statistic |
| 111-116 | F6.2 | 10-6/m2/s | F5 | [0/114] Integrated 10-100GeV band photon flux |
| 118-121 | F4.2 | 10-6/m2/s | E_F5 | ? Upper limit uncertainty in F5 (1) |
| 123-126 | F4.2 | 10-6/m2/s | e_F5 | ? Lower limit uncertainty in F5 (1) |
| 128-132 | F5.1 | --- | TS5 | [0/112]? Square root of 10-100GeV band test statistic |

---

**Note (1):** A blank uncertainty limit indicates an infinite value.

---

**Byte-by-byte Description of file:** table3.dat

| Bytes | Format | Units | Label | Explanations |
|---|---|---|---|---|
| 1- 2 | I2 | --- | Flag | [1/12] Flag code |
| 4-350 | A347 | --- | Note | Explanation text of the flag code |

```
History:
    From electronic version of the journal
    27-Sep-2015: Insert into VizieR
    05-Jul-2019: LCs in ASCII format downloaded from:
    http://fermi.gsfc.nasa.gov/ssc/data/access/lat/4yr_catalog/ap_lcs.php
    And 3FGL names in Table 8 updated (all "c" components are omitted
     in the original MRT file).
```

---

```
(End)               Greg Schwarz [AAS], Emmanuelle Perret [CDS]    07-Aug-2015
```

*The document above follows the rules of the Standard Description for Astronomical Catalogues; from this documentation it is possible to generate **f77** program to load files into arrays or line by line*