



Publication Year	2016
Acceptance in OA	2020-05-15T09:05:58Z
Title	VizieR Online Data Catalog: The first Fermi LAT SNR catalog (1SC) (Acero+, 2016)
Authors	Acero, F., Ackermann, M., Ajello, M., Baldini, L., Ballet, J., Barbiellini, G., Bastieri, D., Bellazzini, R., Bissaldi, E., Blandford, R. D., Bloom, E. D., Razzano, M., Razzaque, S., Reimer, A., Reimer, O., Brandt, T. J., Renaud, M., Reposeur, T., Rousseau, R., Saz Parkinson, P. M., Schmid, J., de Palma, F., Schulz, A., Sgro, C., Siskind, E. J., Spada, F., Spandre, G., Bregeon, J., Spinelli, P., Strong, A. W., Suson, D. J., Tajima, H., Desiante, R., Takahashi, H., Tanaka, T., Thayer, J. B., Thompson, D. J., Tibaldo, L., Tibolla, O., Bruel, P., Torres, D. F., Tosti, G., Troja, E., Digel, S. W., Uchiyama, Y., Vianello, G., Wells, B., Wood, K. S., Wood, M., Yassine, M., Den Hartog P. R., Buehler, R., Zimmer, S., Buson, S., di Venere, L., Caliendo, G. A., Cameron, R. A., Caputo, R., Caragiulo, M., CARAVEO, PATRIZIA, Casandjian, J. M., Cavazzuti, E., Cecchi, C., Chekhtman, A., Chiang, J., Drell, P. S., Chiaro, G., Ciprini, S., Claus, R., Cohen, J. M., Cohen-Tanugi, J., Cominsky, L. R., Condon, B., Conrad, J., Cutini, S., D'AMMANDO, FILIPPO, Drlica-Wagner, A., de Angelis, A., Favuzzi, C., Ferrara, E. C., Franckowiak, A., Fukazawa, Y., Mazziotta, M. N., Funk, S., Fusco, P., Gargano, F., Gasparrini, D., Giglietto, N., Giommi, P., Giordano, F., GIROLETTI, MARCELLO, Glanzman, T., Godfrey, G., Michelson, P. F., Gomez-Vargas, G. A., Grenier, I. A., Grondin, M. -H., Guillemot, L., Guiriec, S., Gustafsson, M., Hadasch, D., Harding, A. K., Hayashida, M., Hays, E., Mitthumsiri, W., Hewitt, J. W., Hill, A. B., Horan, D., Hou, X., IAFRATE, Giulia, Jogler, T., Johannesson, G., Johnson, A. S., Ka, Mae T., Katagiri, H., Mizuno, T., Kataoka, J., Katsuta, J., Kerr, M., Knodlseder, J., Kocevski, D., Kuss, M., Laffon, H., Lande, J., Larsson, S., Latronico, L., Moiseev, A. A., Lemoine-Goumard, M., Li, J., Li, L., Longo, F., Loparco, F., Lovellette, M. N., Lubrano, P., Magill, J., Maldera, S., Marelli, M., Monzani, M. E., Mayer, M., Moretti, E., Morselli, A., Moskalenko, I. V., Murgia, S., Bonino, R., Nemmen, R., Nuss, E., Ohsugi, T., Omodei, N., Orienti, M., Orlando, E., Ormes, J. F., Paneque, D., Perkins, J. S., Pesce-Rollins, M., Bottacini, E., Petrosian, V., Piron, F., Pivato, G., Porter, T. A., Raino, S., Rando, R.
Handle	http://hdl.handle.net/20.500.12386/24856
Journal	VizieR Online Data Catalog

The first Fermi LAT supernova remnant catalog.

Acero F., Ackermann M., Ajello M., Baldini L., Ballet J., Barbiellini G., Bastieri D., Bellazzini R., Bissaldi E., Blandford R.D., Bloom E.D., Bonino R., Bottacini E., Brandt T.J., Bregeon J., Bruel P., Buehler R., Buson S., Caliendo G.A., Cameron R.A., Caputo R., Caragiulo M., Caraveo P.A., Casandjian J.M., Cavazzuti E., Cecchi C., Chekhtman A., Chiang J., Chiaro G., Ciprini S., Claus R., Cohen J.M., Cohen-Tanugi J., Cominsky L.R., Condon B., Conrad J., Cutini S., D'Ammando F., de Angelis A., de Palma F., Desiante R., Digel S.W., Di Venere L., Drell P.S., Drlica-Wagner A., Favuzzi C., Ferrara E.C., Franckowiak A., Fukazawa Y., Funk S., Fusco P., Gargano F., Gasparrini D., Giglietto N., Giommi P., Giordano F., Giroletti M., Glanzman T., Godfrey G., Gomez-Vargas G.A., Grenier I.A., Grondin M.-H., Guillemot L., Guiriec S., Gustafsson M., Hadasch D., Harding A.K., Hayashida M., Hays E., Hewitt J.W., Hill A.B., Horan D., Hou X., Iafrate G., Jogler T., Johannesson G., Johnson A.S., Kamae T., Katagiri H., Kataoka J., Katsuta J., Kerr M., Knodlseder J., Kocevski D., Kuss M., Laffon H., Lande J., Larsson S., Latronico L., Lemoine-Goumard M., Li J., Li L., Longo F., Loparco F., Lovellette M.N., Lubrano P., Magill J., Maldera S., Marelli M., Mayer M., Mazziotta M.N., Michelson P.F., Mitthumsiri W., Mizuno T., Moiseev A.A., Monzani M.E., Moretti E., Morselli A., Moskalenko I.V., Murgia S., Nemmen R., Nuss E., Ohsugi T., Omodei N., Orienti M., Orlando E., Ormes J.F., Paneque D., Perkins J.S., Pesce-Rollins M., Petrosian V., Piron F., Pivato G., Porter T.A., Raino S., Rando R., Razzano M., Razzaque S., Reimer A., Reimer O., Renaud M., Reposeur T., Rousseau R., Saz Parkinson P.M., Schmid J., Schulz A., Sgro C., Siskind E.J., Spada F., Spandre G., Spinelli P., Strong A.W., Suson D.J., Tajima H., Takahashi H., Tanaka T., Thayer J.B., Thompson D.J., Tibaldo L., Tibolla O., Torres D.F., Tosti G., Troja E., Uchiyama Y., Vianello G., Wells B., Wood K.S., Wood M., Yassine M., den Hartog P.R., Zimmer S.

<Astrophys. J. Suppl. Ser., 224, 8 (2016)>
=2016ApJS..224....8A (SIMBAD/NED BibCode)

ADC_Keywords: Supernova remnants ; Gamma rays ; Surveys ; Stars, distances

Keywords: acceleration of particles; catalogs; cosmic rays; gamma-rays: ISM; ISM: supernova remnants; radiation mechanisms: nonthermal

Abstract:

To uniformly determine the properties of supernova remnants (SNRs) at high energies, we have developed the first systematic survey at energies from 1 to 100GeV using data from the Fermi Large Area Telescope (LAT). Based on the spatial overlap of sources detected at GeV energies with SNRs known from radio surveys, we classify 30 sources as likely GeV SNRs. We also report 14 marginal associations and 245 flux upper limits. A mock catalog in which the positions of known remnants are scrambled in Galactic longitude allows us to determine an upper limit of 22% on the number of GeV candidates falsely identified as SNRs. We have also developed a method to estimate spectral and spatial systematic errors arising from the diffuse interstellar emission model, a key component of all Galactic Fermi LAT analyses. By studying remnants uniformly in aggregate, we measure the GeV properties common to these objects and provide a crucial context for the detailed modeling of individual SNRs. Combining our GeV results with multiwavelength (MW) data, including radio, X-ray, and TeV, we demonstrate the need for improvements to previously sufficient, simple models describing the GeV and radio emission from these objects. We model the GeV and MW emission from SNRs in aggregate to constrain their maximal contribution to observed Galactic cosmic rays.

Description:

We have systematically characterized the Fermi/LAT 1-100GeV emission from 36 months (from 2008 August 4 to 2011 August 4) in 279 regions containing known radio SNRs, identifying sources emitting in the regions and then determining the likelihood that the source nearest the SNR is associated with it. We found 102 candidates, 30 of which have sufficient spatial overlap and significance with the alternative IEMs to suggest they are the GeV counterparts to their corresponding radio SNRs and an additional 14 candidates which may also be related to the SNRs.

File Summary:

FileName	Lrec1	Records	Explanations
ReadMe	80	.	This file
catalog.dat	272	102	First Fermi LAT catalog of SNRs (SNR_CATALOG); spatial and spectral results (tables 1 and 2)
limits.dat	57	245	SNR upper limits (SNR_UPPERLIMITS) (table 3)
mwinfo.dat	429	279	Multiwavelength data (MW_INFO) (tables 4-7)

Description of file: Also available on FTP, the fixed FITS file for the catalog:

1SC_{catalog}v02fixed.fits (sent by the author) containing the three bintable
 SNR_CATALOG, SNR_{UPPERLIMITS} and MW_INFO -- this file should also be updated
 on http://fermi.gsfc.nasa.gov/ssc/data/access/lat/1st_SNR_catalog/

See also:

[VTI/272](#) : A catalogue of Galactic supernova remnants (Green, 2014)
[J/ApJS/218/23](#) : Fermi LAT third source catalog (3FGL) (Acero+, 2015)
[J/ApJS/217/4](#) : 2FGL sources observed between 5-9GHz (Schinzel+, 2015)
[J/ApJS/208/17](#) : 2nd Fermi LAT cat. of gamma-ray pulsars (2PC) (Abdo+, 2013)
[J/ApJ/771/57](#) : FAVA/Fermi-LAT flaring gamma-ray sources (Ackermann+, 2013)
[J/other/Sci/340.45](#) : Fast shocks around SN 1006 (Nikolic+, 2013)
[J/ApJ/753/83](#) : Associations to 1FGL sources (Ackermann+, 2012)
[J/ApJS/199/31](#) : Fermi LAT second source catalog (2FGL) (Nolan+, 2012)
[J/MNRAS/372/777](#) : Parkes Multibeam Pulsar Survey. VI. (Lorimer+, 2006)
[J/ApJS/73/781](#) : X-ray observations of galactic SNRs (Seward, 1990)
<http://tevcat.uchicago.edu/> : TeVcat online gamma-ray catalog
http://fermi.gsfc.nasa.gov/ssc/data/access/lat/1st_SNR_catalog/ : Fermi LAT
 SNR catalog home page

Byte-by-byte Description of file: [catalog.dat](#)

Bytes	Format	Units	Label	Explanations
1- 3	A3	---	---	[SNR]
4- 13	A10	---	SNR	SNR identifier (LLL.l+BB.B)
15- 35	A21	---	Class	Classification ("Classified" (30 sources), "Marginally classified" or "Not an SNR")
37- 44	F8.4	deg	RAdeg	Right ascension in decimal degrees (J2000)
46- 53	F8.4	deg	DEdeg	Declination in decimal degrees (J2000)
55- 60	F6.4	deg	e_RAdeg	[0.002/0.2] 1 σ statistical error in best fit on RAdeg
62- 67	F6.4	deg	e_DEdeg	[0.002/0.3] 1 σ statistical error in best fit on DEdeg
69- 74	F6.4	deg	s_RAdeg	[0/2.2] 1 σ systematic error from alternative IEMs in best fit on RAdeg
76- 81	F6.4	deg	s_DEdeg	[0/1.9] 1 σ systematic error from alternative IEMs in best fit on DEdeg
83- 89	F7.3	deg	GLON	Candidate SNR position in Galactic longitude
91- 96	F6.3	deg	GLAT	Candidate SNR position in Galactic latitude
98-102	F5.3	deg	amaj	[0/0.2]? Long radius of error ellipse at 68% confidence
104-108	F5.3	deg	bmin	[0/0.07]? Short radius of error ellipse at 68% confidence
110-115	F6.2	deg	PA	[-82.1/86.1]? Position angle of the 68% long axis from celestial North, positive toward increasing R.A. (eastward)
117-123	F7.2	---	TS	[25.3/5806.8] Source test statistic (TS)
125-131	F7.2	---	TSe	[-17.7/5806.6] TS _{ext} of the best fit extended hypothesis over a point source
133-137	F5.3	deg	Rad	[0.1/3]? Best fit radius of extended disk
139-143	F5.3	deg	e_Rad	[0.009/0.2]? 1 σ statistical error on Rad
145-149	F5.3	deg	S_Rad	[0/2.1]? 1 σ positive systematic error on Rad from the alternative IEMs
151-155	F5.3	deg	s_Rad	[0/1.1]? 1 σ negative systematic error on Rad from the alternative IEMs
157	I1	---	F1	[0/8] Number of alternate IEMs for which a candidates TS became less than 9
159	I1	---	F2	[0/8] Number of alternate IEMs for which the best extension hypothesis changed, between extended and point
161	I1	---	F3	[0/9] Number of alternate IEMs which had problems with during fitting
163-168	F6.4	---	Loc	[0/1] Fractional overlap in the GeV candidates position with respect to Greens catalog radio SNR
170-175	F6.4	---	Ext	[0/1] Fractional overlap in the GeV candidates extension with respect to Greens catalog radio SNR
177-180	A4	---	Sp	Spectral form: PL (power law) or logP
182-189	E8.3	ph/cm2/s	F1000	Photon flux for 1GeV-100GeV
191-198	E8.3	ph/cm2/s	e_F1000	1 σ statistical uncertainty on F1000
200-207	E8.3	ph/cm2/s	S_F1000	1 σ positive systematic uncertainty for F1000
209-216	E8.3	ph/cm2/s	s_F1000	1 σ negative systematic uncertainty for F1000
218-221	F4.2	---	Index	[0/5] Photon index for PL model; alpha for logP model
223-226	F4.2	---	e_Index	[0/0.8] 1 σ statistical uncertainty on Index
228-231	F4.2	---	S_Index	[0/1.6] 1 σ positive systematic uncertainty on Index
233-236	F4.2	---	s_Index	[0/1.6] 1 σ negative systematic uncertainty on Index
238-243	F6.2	---	TSc	[-13.4/548.1] TS of logP model over simple PL
245-248	F4.2	---	beta	[0/1.8] logP beta
250-253	F4.2	---	e_beta	[0/0.7] 1 σ statistical uncertainty on beta
255-258	F4.2	---	S_beta	[0/0.6] 1 σ positive systematic

				uncertainty on beta
260-263	F4.2	---	s_beta	[0/0.6] 1σ negative systematic uncertainty on
265-272	A8	---	Best	Best hypothesis from the final gtlike fit: "Disk", "Neardisk" or "Point"

Byte-by-byte Description of file: [limits.dat](#)

Bytes	Format	Units	Label	Explanations
1-	3	A3	---	[SNR]
4-	13	A10	---	SNR
15-	24	E10.5	ph/cm2/s UL95_I20	Supernova remnant name (LLL.l+BB.B) 95% confidence level upper limit assuming an index of 2.0
26-	35	E10.5	ph/cm2/s UL99_I20	99% confidence level upper limit assuming an index of 2.0
37-	46	E10.5	ph/cm2/s UL95_I25	95% confidence level upper limit assuming an index of 2.5
48-	57	E10.5	ph/cm2/s UL99_I25	99% confidence level upper limit assuming an index of 2.5

Byte-by-byte Description of file: [mwinfo.dat](#)

Bytes	Format	Units	Label	Explanations
1-	3	A3	---	[SNR]
4-	13	A10	---	SNR
16-	23	F8.4	deg RAJ2000	Supernova remnant name (LLL.l+BB.B) Right Ascension (J2000)
25-	32	F8.4	deg DEJ2000	Declination (J2000)
34-	37	F4.2	deg Rad	[0.01/2.3] Radio Radius
39-	44	F6.2	deg GLON	Galactic longitude
46-	50	F5.2	deg GLAT	Galactic latitude
52-	56	A5	---	Is SNR X-ray synchrotron emitting? ("False", "True" or "?")
58-116	A59	---	r_Xs?	Bibcode(s) for X-ray synchrotron reference
118-121	A4	---	Int?	[True] Is SNR interacting with molecular clouds?
123-130	A8	---	n_Int?	SNR interacting evidence(s) (Interacting_Evidence)
132-231	A100	---	r_Int?	Bibcode(s) for Interacting reference
233-237	F5.2	kpc	Dist	[0.2/17.4]? Distance to SNR
239-243	F5.2	kpc	e_Dist	[0/11.1]? Nearby Distance uncertainty (NearUnc_Distance)
245-249	F5.2	kpc	E_Dist	? Far Distance uncertainty (FarUnc_Distance)
251-258	A8	---	n_Dist	Method used for distance determination
260-338	A79	---	r_Dist	Reference(s) for distance measurement
340-344	F5.2	---	Index	[-2.1/3.1]? TeV index
346-349	F4.2	---	e_Index	[0/0.6]? TeV index uncertainty
351-429	A79	---	r_Index	Reference(s) for TeV index

History:
Downloaded at: http://fermi.gsfc.nasa.gov/ssc/data/access/lat/1st_SNR_catalog/
(tar archive file with 1SC_catalog.v02)

Acknowledgments:
Francesco de Palma [Istituto Nazionale di Fisica Nucleare]
(F1000 values fixed in 1SC_catalog -- were always =0)

(End) Emmanuel Perret [CDS] 27-Jun-2016

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](#)