

HIGH ENERGY GAMMA-RAY ASTRONOMY

2nd International Symposium on
High Energy Gamma-Ray Astronomy

Heidelberg, Germany 26–30 July 2004

γ 2004
Heidelberg

EDITORS

Felix A. Aharonian
Heinz J. Völk
Dieter Horns

*Max-Planck-Institut für Kernphysik
Heidelberg*

SPONSORING ORGANIZATIONS

Max-Planck Society
German Federal Ministry for Educational Research
Deutsche Forschungsgemeinschaft

CD-ROM INCLUDED

**AMERICAN
INSTITUTE
OF PHYSICS**

Melville, New York, 2005

AIP CONFERENCE PROCEEDINGS ■ VOLUME 745

CONTENTS

Preface.....	xiii
International Scientific Organizing Committee	xv

PART ONE—INVITED TALKS

High-Energy Neutrino Astronomy	3
F. Halzen	
Origin of Galactic Cosmic Rays.....	14
V. Ptuskin	
Observational Gamma-ray Cosmology	23
J. R. Primack, J. S. Bullock, and R. S. Somerville	
High-Energy Processes in Relativistic Flows.....	34
G. Pelletier, G. Henri, D. Gialis, and L. Saugé	
The Highest-Energy Cosmic Rays	48
A. V. Olinto	
Cosmic Rays and Gamma Radiation from Clusters of Galaxies.....	60
P. Blasi	
Magnetic Field Amplification in Strong Shocks	73
A. R. Bell	
High-Energy Processes in SNRs	80
E. G. Berezhko	
High-Energy Processes in Microquasars	93
J. M. Paredes	
High-Energy Gamma-ray Emissions from Pulsars, Pulsar Winds, and Plerions.....	105
A. K. Harding	
Interaction of Pulsar Winds with Interstellar Medium.....	117
S. Bogovalov, V. Chechetkin, A. Koldoba, and G. Ustyugova	
Gamma-ray Blazars: An Overview	129
L. Maraschi and F. Tavecchio	
What Gamma Rays Tell Us about Jets	140
G. V. Bicknell, V. Safouris, L. Saripalli, C. J. Saxton, R. Subrahmanyam, R. S. Sutherland, and S. J. Wagner	
Magnetic Collimation of the Relativistic Jet in M87.....	148
K. Tsinganos and S. Bogovalov	
Nonthermal X-ray Emission from Supernova Remnants	160
J. Vink	
Gamma-ray Line Astronomy.....	172
R. Diehl	
On the Origin of Unidentified EGRET Gamma-ray Sources.....	184
O. Reimer	
Future Hard X-ray Missions to Study Nonthermal Universe.....	199
T. Takahashi	

Future GeV γ-ray Missions and New Discovery Potential	210
T. Kamae	
Neutrino Telescopes	222
J. Carr	
HAWC: A Next Generation VHE All-Sky Telescope	234
G. Sinnis (<i>for the HAWC Collaboration</i>)	
Status of Ground-Based Gamma-ray Astronomy	246
W. Hofmann	

PART TWO—ORAL TALKS AND POSTERS

GALACTIC SOURCES

Observations of SNR RX J1713.7-3946 with H.E.S.S.	263
D. Berge, S. Funk, J. Hinton, M. Lemoine-Goumard, M. de Naurois, and L. Rolland (<i>for the H.E.S.S. Collaboration</i>)	
Discovery of Diffuse TeV Gamma-ray Emission from the Galactic Plane Using Milagro Detector	269
R. Fleysher (<i>for the Milagro Collaboration</i>)	
Recent Observations of IC443 with the Whipple 10m Telescope	275
J. Holder (<i>for the VERITAS Collaboration</i>)	
Gamma-ray Models for SN 1006 Using Different Astronomical Parameters	281
L. T. Ksenofontov, E. G. Berezhko, and H. J. Völk	
Superbubbles: A Laboratory for High-Energy Astrophysics and Cosmic-ray Physics	287
A. Marcowith, E. Parizot, A. van der Swaluw, A. Bykov, V. Tatischeff, and G. Ferrand	
Gamma-ray Spectra due to Cosmic-ray Interactions with Dense Gas Clouds	293
M. Ohishi, M. Mori, and M. Walker	
Preliminary Results from a Search for TeV γ-ray Emission from SN1987A and the Surrounding Field with H.E.S.S.	299
G. Rowell, J. Hinton, and W. Benbow (<i>for the H.E.S.S. Collaboration</i>)	
Nonthermal X-radiation Emission of SNR RX J1713.7-3946: The Relations to a Nearby Molecular Cloud	305
Y. Uchiyama, F. A. Aharonian, T. Takahashi, J. S. Hiraga, Y. Moriguchi, and Y. Fukui	
The Gamma-ray Emitting Microquasar LS I +61 303	311
M. Massi, M. Ribó, J. M. Paredes, S. T. Garrington, M. Peracaula, and J. Martí	
Broad-Band Electromagnetic Radiation from Microquasars Interacting with ISM	317
V. Bosch-Ramon, F. A. Aharonian, and J. M. Paredes	
γ-ray Generation in Microquasars: The Link with AGN	323
I. J. Latham, K.-M. Aye, A. M. Brown, P. M. Chadwick, C. N. Hadjichristidis, R. Le Gallou, T. J. L. McComb, S. J. Nolan,	

K. J. Orford, J. L. Osborne, A. Noutsos, and S. M. Rayner	
Gamma Rays from the Pulsar Wind Nebulae	329
W. Bednarek and M. Bartosik	
Search for TeV Emission from the Direction of the Vela and PSR	
B1706-44 Pulsars with the H.E.S.S. Experiment	335
B. Khélifi, N. Komin, T. Lohse, C. Masterson, S. Schlenker, F. Schmidt,	
U. Schwanke, and C. Stegmann (<i>for the H.E.S.S. Collaboration</i>)	
Discovery of the Binary Pulsar PSR B1259-63 in VHE Gamma Rays	341
S. Schlenker, M. Beilicke, B. Khélifi, C. Masterson, M. de Naurois,	
and L. Rolland (<i>for the H.E.S.S. Collaboration</i>)	
Discovery of an Unidentified TeV Source in the Field of View of PSR	
B1259-63 with H.E.S.S.	347
M. Beilicke, B. Khélifi, C. Masterson, M. de Naurois, M. Raue, L. Rolland,	
and S. Schlenker (<i>for the H.E.S.S. Collaboration</i>)	
High-Energy Emissions from the PSR1259-63/SS2883 Binary System	353
A. Kawachi, T. Naito, and S. Nagataki	
On the Formation of Energy Spectra of Synchrotron X-rays	
and Inverse Compton γ-rays in Binary Systems with Luminous	
Optical Stars	359
D. Khangulyan and F. Aharonian	
Gamma-ray and Neutrino Emission by Fast Spinning Magnetars	365
Q. Luo	
Pulsar Bow-Shocks	371
A. Pellizzoni, F. Mattana, A. De Luca, S. Mereghetti, P. Caraveo, M. Conti,	
and M. Tavani	
Search for Pulsed TeV Gamma-ray Emission from Young Pulsars	
with H.E.S.S.	377
F. Schmidt, F. Breitling, S. Gillessen, A. Konopelko, T. Lohse,	
S. Schlenker, U. Schwanke, and C. Stegmann (<i>for the H.E.S.S.</i>	
<i>Collaboration</i>)	
Nonlinear Electromagnetic Wave Propagation in the Termination	
Shock of a Pulsed Wind.	382
O. Skjæraasen, A. Melatos, and A. Spitkovsky	
Bright FIR Emission from the Circumstellar Torus in the	
Crab Nebula	388
R. J. Tuffs, C. C. Popescu, and D. A. Green	
 GALACTIC CENTER	
 Model-Based Analysis of the Galactic Centre with H.E.S.S. during	
Summer 2003.	397
L. Rolland (<i>for the H.E.S.S. Collaboration</i>)	
Detection of Sub-TeV Gamma Rays from the Galactic Center with	
the CANGAROO-II Telescope	403
K. Tsuchiya (<i>for the CANGAROO Collaboration</i>)	
TeV Gamma Rays from Sgr A*	409
A. Neronov and F. Aharonian	

Interpretation of the Gamma-ray Signal from the Galactic Center	416
D. Horns	
Search for Dark Matter with GLAST	422
A. Morselli	
TeV γ-rays from Neutralino Annihilation in the Milky Way and in Extragalactic Objects	428
L. Pieri, N. Fornengo, and S. Scopel	
Neutralino Annihilation in the Large Magellanic Cloud.	434
A. Tasitsiomi	
EXTRAGALACTIC SOURCES	
AGN Observations with H.E.S.S.	443
A. Lemi��re (<i>for the H.E.S.S. Collaboration</i>)	
On the Intrinsic Spectrum of PKS 2155-304 from H.E.S.S. 2003 Data	449
L. Costamante, W. Benbow, D. Horns, A. Reimer, and O. Reimer (<i>for the H.E.S.S. Collaboration</i>)	
News from a Multi-wavelength Monitoring Campaign on Mrk 421.....	455
W. Cui (<i>for the VERITAS Collaboration</i>), M. Bla��jowski, M. Aller, H. Aller, H. Ter��sranta, B. Mochejska, P. Boltwood, A. Sadun, M. B��ttcher, and A. Reimer	
The Very High Energy Gamma-ray Spectra of 1ES 1959+650 and Mrk 421 as Measured with the Whipple 10m Telescope.	462
M. K. Daniel (<i>for the VERITAS Collaboration</i>)	
Large Zenith Angle Observations of Flares from Mkn 421 in 2004 with H.E.S.S.	468
D. Horns, M. Beilicke, W. Benbow, A. Lemi��re, M. de Naurois, L. Rolland, and G. P. Rowell (<i>for the H.E.S.S. Collaboration</i>)	
X-ray Variability Studies of TeV Blazars	475
D. Emmanoulopoulos, G. P��hlhofer, and S. Wagner	
Recent AGN Observations by the Solar Tower Atmospheric Cherenkov Effect Experiment.....	481
J. Kildea, A. Alabiso, D. A. Bramel, J. Carson, C. E. Covault, D. Driscoll, P. Fortin, D. M. Gingrich, D. S. Hanna, A. Jarvis, T. Lindner, R. Mukherjee, C. Mueller, R. A. Ong, K. Ragan, R. A. Scalzo, D. A. Williams, and J. Zwaan	
Periodic Variability and Binary Black Hole Systems in Blazars	487
F. M. Rieger	
The Duty-Cycle of Gamma-ray Blazars: A New Approach, New Results	493
S. Vercellone, S. Soldi, A. W. Chen, and M. Tavani	
Studies of Nearby Blazars with Milagro	499
D. Williams (<i>for the Milagro Collaboration</i>)	
Centaurus A: The Nearest Blazar?	505
Z. Abraham, U. Barres de Almeida, T. P. Dominici, and A. Caproni	
High-Energy Emission from Off-Axis Relativistic Jets	510
E. V. Derishev, F. A. Aharonian, and V. V. Kocharyan	

Hydrodynamics of Internal Shocks in Relativistic Outflows	516
M. Kino, A. Mizuta, A. Celotti, and S. Yamada	
Unifying X-ray Emission Properties of Large-Scale Jets, Hotspots, and Lobes in AGN	522
J. Kataoka and Ł. Stawarz	
Astroparticle Transport and Yield in Extragalactic Jets and Hot Spots.....	528
A. Marcowith and F. Casse	
Relativistic Shocks: Particle Acceleration, Magnetic Field Generation, and Emission	534
K.-I. Nishikawa, P. Hardee, C. B. Hedden, G. Richardson, R. Preece, H. Sol, and G. J. Fishman	
Substructure of the X-ray Hotspots in Cygnus A	540
M. Bałucińska-Church, M. Ostrowski, Ł. Stawarz, and M. J. Church	
Kiloparsec-Scale Jets in Nearby Galaxies as Possible Sources of High-Energy γ-ray Emission.....	545
Ł. Stawarz, M. Ostrowski, M. Sikora, and A. Siemiginowska	
Particle Acceleration Efficiencies in Astrophysical Shear Flows	549
F. M. Rieger and P. Duffy	
A Relativistic Outflow Model: Analytical Solutions.....	555
C. Schuster and R. Schlickeiser	
Nonlinear Shock Acceleration and High-Energy Gamma Rays from Clusters of Galaxies	561
S. Gabici and P. Blasi	
Gamma Rays from Large-Scale Structure Formation and the Warm-Hot Intergalactic Medium: Cosmic Baryometry with Gamma Rays	567
S. Inoue and M. Nagashima	
Gamma-ray Absorptions in the SED of QSO.....	573
A. F. Iyudin, V. Burwitz, J. Greiner, A. Reimer, and O. Reimer	
BL Lac Contribution to the Extragalactic Gamma-ray Background	578
T. M. Kneiske and K. Mannheim	
A New Determination of the Diffuse Galactic and Extragalactic Gamma-ray Emission.....	585
A. W. Strong, I. V. Moskalenko, and O. Reimer	
Very High Energy Observations of Gamma-ray Bursts with the Whipple/VERITAS Telescopes	591
D. Horan (<i>for the VERITAS Collaboration</i>)	
Search for VHE Emission from GRB with Milagro	597
P. M. Saz Parkinson (<i>for the Milagro Collaboration</i>)	
Follow-up Observations of Gamma-ray Bursts with STACEE	603
D. A. Williams, A. Alabiso, L. M. Boone, D. Bramel, J. Carson, C. E. Covault, P. Fortin, D. M. Gingrich, D. Hanna, A. Jarvis, J. Kildea, T. Lindner, C. Mueller, R. Mukherjee, R. A. Ong, K. Ragan, R. A. Scalzo, and J. Zwaerink	

EXPERIMENTS AND METHODS

The Status and Performance of H.E.S.S.	611
W. Benbow (<i>for the H.E.S.S. Collaboration</i>)	
Observations of the Crab Nebula with H.E.S.S.	617
C. Masterson, W. Benbow, S. Funk, and S. Gillessen (<i>for the H.E.S.S. Collaboration</i>)	
The MAGIC Telescope: Status and Future Plans	622
E. Lorenz (<i>for the MAGIC Collaboration</i>)	
Recent Results from the MAGIC Telescope	628
R. K. Bock (<i>for the MAGIC Collaboration</i>)	
The VERITAS Prototype and the Upcoming VERITAS Array	633
A. D. Falcone (<i>for the VERITAS Collaboration</i>)	
Recent Results from CANGAROO-II&III	639
M. Mori (<i>for the CANGAROO-III Team</i>)	
Gamma-ray Astronomy above 30 GeV with the CELESTE Experiment (1996–2004)	645
H. Manseri (<i>for the CELESTE Collaboration</i>)	
CELESTE Energy Scale and Blazar Observations	651
E. Brion and H. Manseri (<i>for the CELESTE Collaboration</i>)	
Astrophysics with Milagro	657
A. J. Smith (<i>for the Milagro Collaboration</i>)	
Status of the ARGO-YBJ Experiment	663
G. Di Sciascio (<i>for the ARGO-YBJ Collaboration</i>)	
Gamma-ray Astronomy with a Large Muon Detector in the ARGO-YBJ Experiment	669
G. Di Sciascio, T. Di Girolamo, K. Fratini, R. Megna, and L. Saggese	
A Northern Sky Survey for both Steady TeV Gamma-ray Point Source and Large-Scale Anisotropy of Cosmic-ray Intensity Using the Tibet Air Shower Array	675
H. R. Wu (<i>for the ASγ Collaboration</i>)	
Measuring the Variability of Gamma-ray Sources with AGILE	681
A. W. Chen, S. Vercellone, A. Pellizzoni, and M. Tavani	
Search for Relic Neutralinos with Milagro	685
L. Fleysher (<i>for the Milagro Collaboration</i>)	
Evidence for New Unidentified TeV γ-ray Sources from Recent TeV Sky Surveys	691
D. Kieda, G. Walker, and R. Atkins	
Selection and 3D-Reconstruction of Gamma-ray-Induced Air Showers with H.E.S.S.	697
M. Lemoine-Goumard and B. Degrange (<i>for the H.E.S.S. Collaboration</i>)	
Advanced Analysis Methods in the H.E.S.S Experiment	703
M. Lemoine-Goumard and M. de Naurois (<i>for the H.E.S.S. Collaboration</i>)	
The Earth's Gamma-ray Albedo as Observed by EGRET	709
D. Petry	

Off-Axis Performance of Semi-analytical Model Analysis with the H.E.S.S. Experiment.....	715
L. Rolland and M. de Naurois (<i>for the H.E.S.S. Collaboration</i>)	
Recent Results on the Magnetic Fields of the Galaxy.....	721
R. Wielebinski	
Atmospheric Sensing for the H.E.S.S. Array	724
K.-M. Aye, A. M. Brown, P. M. Chadwick, C. Hadjichristidis, I. J. Latham,	
R. Le Gallou, T. J. L. Mc Comb, S. J. Nolan, A. Noutsos, K. J. Orford,	
J. L. Osborne, and S. M. Rayner (<i>for the H.E.S.S. Collaboration</i>)	
MAGIC—Roadmap to a Standard Analysis.....	730
T. Bretz (<i>for the MAGIC Collaboration</i>)	
Point Spread Function and Long-Term Stability of the H.E.S.S. Reflectors	736
R. Cornils, S. Gillessen, I. Jung, W. Hofmann, and G. Heinzelmann (<i>for the H.E.S.S. Collaboration</i>)	
Performance Study of a Wide-Angle Camera for Atmospheric Cerenkov Telescopes.....	742
I. de la Calle and S. D. Biller	
STAR: Very Large Aperture Telescope Array Using Many Small IACTs	748
A. D. Falcone, H. Krawczynski, J. Buckley, S. B. Hughes, and I. Jung	
The Central Trigger System of the H.E.S.S. Telescope Array	753
S. Funk, J. Hinton, G. Hermann, D. Berge, K. Bernlöhr, W. Hofmann, P. Nayman, F. Toussenel, and P. Vincent	
Locating the TeV-Excess from the Galactic Centre Region	758
S. Gillessen, J. Hinton, and S. Funk (<i>for the H.E.S.S. Collaboration</i>)	
The Potential of a Čerenkov Array for Supersymmetry and Cosmology	764
G. Vasileiadis, A. Falvard, E. Giraud, J. Lavalle, and S. Sajjad	
The LOIS Project and Astrophysics.....	770
A. W. Guthmann and B. Thidé	
Analysis of Muon Events Recorded with the MAGIC Telescope.....	774
M. Meyer and K. Mase (<i>for the MAGIC Collaboration</i>)	
Detection of Cherenkov Light from Low-Energy γ-Showers by Extra Large Diameter IACT	779
V. Sahakian and A. Akhperjanian	
Studies for a Level 2 Trigger for H.E.S.S. Phase 2	785
M. Tluczykont (<i>for the H.E.S.S. Collaboration</i>)	
A New Camera for the HESS Phase II Experiment	791
P. Vincent, A. R. Bazer-Bachi, L.-M. Chouinet, P. Corona, Y. Degerly, B. Degrange, E. Delagnes, F. Feinstein, G. Fontaine, P. Goret, J.-F. Huppert, A. Karar, P. Manigot, P. Nayman, M. de Naurois, M. Ouchrif, S. Pita, M. Punch, J. Raux, J.-P. Tavernet, M. Tluczykont, F. Toussenel, and F. Voisin	
Rise Time of the Simulated VERITAS 12 m Davies-Cotton Reflector	797
R. J. White	
Author Index.....	803