

Title: Cosmic absorption of ultra high energy particles

Author(s): Ruffini, R (Ruffini, R.); Vereshchagin, GV (Vereshchagin, G. V.); Xue, SS (Xue, S. -S.)

Source: ASTROPHYSICS AND SPACE SCIENCE. Volume: 361. Issue: 2. Article Number: 82. DOI: 10.1007/s10509-016-2668-5. Published: FEB 2016

Abstract: This paper summarizes the limits on propagation of ultra high energy particles in the Universe, set up by their interactions with cosmic background of photons and neutrinos. By taking into account cosmic evolution of these backgrounds and considering appropriate interactions we derive the mean free path for ultra high energy photons, protons and neutrinos. For photons the relevant processes are the Breit-Wheeler process as well as the double pair production process. For protons the relevant reactions are the photopion production and the Bethe-Heitler process. We discuss the interplay between the energy loss length and mean free path for the Bethe-Heitler process. Neutrino opacity is determined by its scattering off the cosmic background neutrino. We compute for the first time the high energy neutrino horizon as a function of its energy.

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Record 2 of 23

Title: Neutron-Star-Black-Hole Binaries Produced by Binary-Driven Hypernovae

Author(s): Fryer, CL (Fryer, Chris L.); Oliveira, FG (Oliveira, F. G.); Rueda, JA (Rueda, J. A.); Ruffini, R (Ruffini, R.)

Source: PHYSICAL REVIEW LETTERS **Volume:** 115 **Issue:** 23 **Article Number:** 231102 **DOI:** 10.1103/PhysRevLett.115.231102 **Published:** DEC 4 2015

Abstract: Binary-driven hypernovae (BdHNe) within the induced gravitational collapse paradigm have been introduced to explain energetic (E-iso greater than or similar to 10^{52} erg), long gamma-ray bursts (GRBs) associated with type Ic supernovae (SNe). The progenitor is a tight binary composed of a carbon-oxygen (CO) core and a neutronstar (NS) companion, a subclass of the newly proposed "ultrastripped" binaries. The CO-NS short-period orbit causes the NS to accrete appreciable matter from the SN ejecta when the CO core collapses, ultimately causing it to collapse to a black hole (BH) and producing a GRB. These tight binaries evolve through the SN explosion very differently than compact binaries studied in population synthesis calculations. First, the hypercritical accretion onto the NS companion alters both the mass and the momentum of the binary. Second, because the explosion time scale is on par with the orbital period, the mass ejection cannot be assumed to be instantaneous. This dramatically affects the post-SN fate of the binary. Finally, the bow shock created as the accreting NS plows through the SN ejecta transfers angular momentum, braking the orbit. These systems remain bound even if a large fraction of the binary mass is lost in the explosion (well above the canonical 50% limit), and even large kicks are unlikely to unbind the system. Indeed, BdHNe produce a new family of NS-BH binaries unaccounted for in current population synthesis analyses and, although they may be rare, the fact that nearly 100% remain bound implies that they may play an important role in the compact merger rate, important for gravitational waves that, in turn, can produce a new class of ultrashort GRBs.

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Record 3 of 23

Title: An effective field theory for neutron stars with many-body forces, strong Sigma(-) repulsion, and K- and K-0 condensation

Author(s): Mesquita, A. (Mesquita, A.); Razeira, M (Razeira, M.); Ruffini, R (Ruffini, R.); Rueda, JA (Rueda, J. A.); Hadjimichef, D (Hadjimichef, D.); Gomes, RO (Gomes, R. O.); Vasconcellos, CAZ (Vasconcellos, C. A. Zen)

Source: ASTRONOMISCHE NACHRICHTEN Volume: 336 Issue: 8-9 Pages: 880-884 DOI: 10.1002/asna.201512242 Published: NOV 2015

Abstract: The role of many-body correlations (many-body forces) and K–K-0 condensation in ϵ -equilibrated hyperonic matter is investigated in order to shed some light in the hyperonization puzzle, ie that neutron star mass of $2M_{\text{max}}(R)$ cannot be obtained in the presence of exotic degree of freedoms. In this investigation, we use an effective relativistic QHD-model with parameterized couplings which represents an extended compilation of other effective models found in the literature. Our theoretical approach exhausts the whole fundamental baryon octet (n , p , Σ^+ , Σ^0 , Σ^- , Λ , Ξ^0 , Ξ^-) and simulates n -order corrections to the minimal Yukawa couplings by considering many-body nonlinear self-couplings and meson-meson interaction terms involving scalar-isoscalar (σ , σ^*), vector-isoscalar (ω , ϕ), vector-isovector (ρ), and scalar-isovector (δ) sectors. Following recent experimental results, we consider in our calculations the extreme case where the Σ^- experiences such a strong repulsion that its influence in the nuclear structure of a neutron star is excluded at all. We study the effects of this exclusion on the phase transition of conventional exotic hadronic matter to hadronic matter containing a condensate of kaons and anti-kaons. As a novelty in the treatment of kaon and anti-kaon condensation in high density nuclear matter, we consider a Lagrangian formulation which describes, in addition to the interaction involving baryons and mesons and the contribution of kaons and anti-kaons in free propagation, the presence of many-body forces involving kaon, anti-kaon and meson fields. To implement the corresponding phase transition we considered the Gibbs conditions combined with the mean-field approximation, giving rise to a mixed phase of coexistence between baryon matter and the condensed of kaons and anti-kaons. Our investigation show that even with kaon condensation, the nuclear equation of state satisfies both the maximum mass and the allowed ranges of mass and radius of neutron stars. (c) 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim)

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Record 4 of 23

Title: Predicting supernova associated to gamma-ray burst 130427a

Author(s): Wang, Y (Wang, Y.); Ruffini, R (Ruffini, R.); Kovacevic, M (Kovacevic, M.); Bianco, CL (Bianco, C. L.); Enderli, M (Enderli, M.); Muccino, M (Muccino, M.); Penacchioni, AV (Penacchioni, A. V.); Pisani, GB (Pisani, G. B.); Rueda, JA (Rueda, J. A.)

Source: ASTRONOMY REPORTS Volume: 59 Issue: 7 Pages: 667-671 DOI: 10.1134/S1063772915070148 Published: JUL 2015

Abstract: Binary systems constituted by a neutron star and a massive star are not rare in the universe. The Induced Gravitational Gamma-ray Burst (IGC) paradigm interprets Gamma-ray bursts as the outcome of a neutron star that collapses into a black hole due to the accretion of the ejecta coming from its companion massive star that underwent a supernova event. GRB 130427A is one of the most luminous GRBs ever observed, of which isotropic energy exceeds $10(54)$ erg. And it is within one of the few GRBs obtained optical, X-ray and GeV spectra simultaneously for hundreds of seconds, which provides an unique opportunity so far to understand the multi-wavelength observation within the IGC paradigm, our data analysis found low Lorentz factor blackbody emission in the Episode 3 and its X-ray light curve overlaps typical IGC Golden Sample, which comply to the IGC mechanisms. We consider these findings as clues of GRB 130427A belonging to the IGC GRBs. We predicted on GCN the emergence of a supernova on May 2, 2013, which was later successfully detected on May 13, 2013.

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Record 5 of 23

Title: 1WHSP: An IR-based sample of similar to 1000 VHE gamma-ray blazar candidates

Author(s): Arsioli, B (Arsioli, B.); Fraga, B (Fraga, B.); Giommi, P (Giommi, P.); Padovani, P (Padovani, P.); Marrese, PM (Marrese, P. M.)

Source: ASTRONOMY & ASTROPHYSICS Volume: 579 Article Number: A34 DOI: 10.1051/0004-6361/201424148 Published: JUL 2015

Abstract: Context. Blazars are the dominant type of extragalactic sources at microwave and at-ray energies. In the most energetic part of the electromagnetic spectrum (E greater than or similar to 100 GeV) a high fraction of high Galactic latitude sources are blazars of the high synchrotron peaked (HSP) type, that is BL Lac objects with synchrotron power peaking in the UV or in the X-ray band. Building new large samples of HSP blazars is key to understand the properties of jets under extreme conditions, and to study the demographics and the peculiar cosmological evolution of these sources.

Aims. High synchrotron peaked blazars are remarkably rare, with only a few hundreds of them expected to be above the sensitivity limits of currently available surveys, some of which include hundreds of millions of sources. To find these very uncommon objects, we have devised a method that combines ALLWISE survey data with multi-frequency selection criteria.

Methods. The sample was defined starting from a primary list of infrared colour-colour selected sources from the ALLWISE all sky survey database, and applying further restrictions on IR-radio and IR-X-ray flux ratios. Using a polynomial fit to the multi-frequency data (radio to X-ray), we estimated synchrotron peak frequencies and fluxes of each object.

Results. We assembled a sample including 992 sources, which is currently the largest existing list of confirmed and candidates HSP blazars. All objects are expected to radiate up to the highest-ray photon energies. In fact, 299 of these are confirmed emitters of GeV gamma-ray photons (based on Fermi-LAT catalogues), and 36 have already been detected in the TeV band. The majority of sources in the sample are within reach of the upcoming Cherenkov Telescope Array (CTA), and many may be detectable even by the current generation of Cherenkov telescopes during flaring episodes. The sample includes 425 previously known blazars, 151 new identifications, and 416 HSP candidates (mostly faint sources) for which no optical spectra is available yet. The full 1WHSP catalogue is online at <http://www.asdc.asi.it/1whsp/>, providing a direct link to the SED building tool where multi-frequency data for each source can be easily visualised.

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Record 6 of 23

Title: An international conference in honour of the centennial of the birth of Ya.B. Zeldovich, "Subatomic Particles, Nucleons, Atoms, the Universe: Processes and Structure"
Author(s): Kilin, SY (Kilin, S. Ya.); Ruffini, R (Ruffini, R.); Vereshchagin, G (Vereshchagin, G.)

Source: ASTRONOMY REPORTS **Volume:** 59 **Issue:** 6 **Pages:** 415-417 **DOI:** 10.1134/S1063772915060153 **Published:** JUN 2015

Abstract: An international conference in honour of the centennial of the birth of Ya.B. Zeldovich, "Subatomic Particles, Nucleons, Atoms, the Universe: Processes and Structure" was held in Minsk, Belarus on March 10-14, 2014. Scientific papers based on plenary presentations made at this conference are being published in Volumes 6 and 7, 2015 of "Astronomy Reports".

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Record 7 of 23

Title: Did gamma ray burst induce Cambrian explosion?

Author(s): Chen, PS (Chen, Pisin); Ruffini, R (Ruffini, R.)

Source: ASTRONOMY REPORTS **Volume:** 59 **Issue:** 6 **Pages:** 469-473 **DOI:** 10.1134/S1063772915060098 **Published:** JUN 2015

Abstract: One longstanding mystery in bio-evolution since Darwin's time is the origin of the Cambrian explosion that happened around 540 million years ago (Mya), where an extremely rapid increase of species occurred. Here we suggest that a nearby GRB event 500 parsecs away, which should occur about once per 5 Gy, might have triggered the Cambrian explosion. Due to a relatively lower cross section and the conservation of photon number in Compton scattering, a substantial fraction of the GRB photons can reach the sea level and would induce DNA mutations in organisms protected by a shallow layer of water or soil, thus expediting the bio-diversification. This possibility of inducing genetic mutations is unique among all candidate sources for major incidents in the history of bio-evolution. A possible evidence would be the anomalous abundance of certain nuclear isotopes with long half-lives transmuted by the GRB photons in geological records from the Cambrian period. Our notion also imposes constraints on the evolution of exoplanet organisms and the migration of panspermia.

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ISSN: 1063-7729

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Record 8 of 23

Title: RADIAL STABILITY IN STRATIFIED STARS

Author(s): Pereira, JP (Pereira, Jonas P.); Rueda, JA (Rueda, Jorge A.)

Source: ASTROPHYSICAL JOURNAL **Volume:** 801 **Issue:** 1 **Article Number:** 19 **DOI:** 10.1088/0004-637X/801/1/19 **Published:** MAR 1 2015

Abstract: We formulate within a generalized distributional approach the treatment of the stability against radial perturbations for both neutral and charged stratified stars in Newtonian and Einstein's gravity. We obtain from this approach the boundary conditions connecting any two phases within a star and underline its relevance for realistic models of compact stars with phase transitions, owing to the modification of the star's set of eigenmodes with respect to the continuous case.

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Record 9 of 23

Title: Detecting New gamma-ray Sources Based on Multi-frequency Data The Case of 1WHSPJ031423.9+061956

Author(s): Arsioli, B (Arsioli, Bruno); Chang, YL (Chang, Yu Ling)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICARANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 060004 **DOI:** 10.1063/1.4937209 **Published:** 2015

Abstract: We use the Fermi Science Tools in an attempt to unveil faint gamma-ray blazars that may be above the threshold for detectability with Fermi-LAT and are not identified by automated methods. Our search for new sources in the 100MeV-300GeV band is mainly driven by the 1/2WHSP catalogs, which list high synchrotron peaked blazars expected to be emitters of VHE photons. Here we present the gamma-ray detection of 1WHSP J031423.9+061956, modelling its high energy spectrum as a power law. We describe an example where multi-frequency selection, performed at much lower energies (from radio to X-ray), helps to pin-point a high energy source. The 1/2WHSP catalogs are built with the aim of providing a list of TeV targets for the VHE arrays of Cherenkov telescopes. Moreover, these catalogs provide useful seeds for identifying new high energy sources within the raw-data from Fermi. With the aid of multi-frequency data, we can explore the very high energy domain in greater details, improving the description of the gamma-ray sky.

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Conference Title: 2nd ICRA Net Cesar Lattes Meeting - Supernovae, Neutron Stars and Black Holes

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Conference Sponsors: Cent Brasileiro Pesquisas Fisicas, Coordenacao Aperfeicoamento Pessoal Nivel Super, European Union, Educ Audiovisual & Culture Execut Agcy, Espaco Ciencia Recife, Estacao Ciencias Auditorium Joao Pessoa, Fundacao Carlos Chagas Filho Amparo Pesquisa Estado Rio De Janeiro, Fundacao Planetario Cidade Rio De Janeiro, Inst Fed Educacao Ciencia Tecnologia Ceara, Int Ctr Relativist Astrophys Network, Univ Fed Paraiba, Univ Fed Pernambuco, Univ Fed Fluminense, ICTP, Ceara, ITA, IHEP, UNS, Univ Sapienza Rome, UNAM, INPE, UIS, Univ Nice Sophia Antipolis, State Comm Sci RA, NAS Armenia, FAPERJ, Consortium GARR, BSU, IHES, NASB, ASI, UNIFEI, Al Farabi Kazhak Natl Univ, Univ Fed Rio Grande Sul, Inst Fisica, Univ Estado Rio De Janeiro, UFF, UAM, CNR, UFSC, UFPE, INFN, IFCE, LeCosPA, UnB

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Record 10 of 23

Title: Black Holes, Neutron Stars and Supernovae within the Induced Gravitational Collapse Paradigm for GRBs

Author(s): Becerra, L (Becerra, Laura); Bianco, CL (Bianco, Carlo Luciano); Cipolletta, F (Cipolletta, Federico); Enderli, M (Enderli, Maxime); Fryer, CL (Fryer, Chris L.); Izzo, L (Izzo, Luca); Kovacevic, M (Kovacevic, Milos); de Lima, RCR (de Lima, Rafael Camargo Rodrigues); Muccino, M (Muccino, Marco); de Oliveira, FG (de Oliveira, Fernanda Gomes); Penacchioni, AV (Penacchioni, Ana Virginia); Pisani, GB (Pisani, Giovanni Battista); Rueda, JA (Rueda, Jorge Armando); Ruffini, R (Ruffini, Remo);

Wang, Y (Wang, Yu); Zaninoni, E (Zaninoni, Elena)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICRANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 020002 **DOI:** 10.1063/1.4937180 **Published:** 2015

Abstract: Recent progress in understanding of the Gamma-Ray Bursts, Supernovae and Black Holes is presented.

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Record 11 of 23

Title: Physics and Astrophysics of Neutron Stars

Author(s): Belvedere, R (Belvedere, R.); Cipolletta, F (Cipolletta, F.); Cherubini, C (Cherubini, C.); de Carvalho, SM (de Carvalho, S. M.); Filippi, S (Filippi, S.); Negreiros, R (Negreiros, R.); Pereira, JP (Pereira, Jonas P.); Rueda, JA (Rueda, Jorge A.); Ruffini, R (Ruffini, R.)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICRANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 030001 **DOI:** 10.1063/1.4937184 **Published:** 2015

Abstract: We summarize the recent results on the physics and astrophysics of neutron stars presented in the Second ICRANet Cesar Lattes Meeting in 2015.

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Record 12 of 23

Title: A Sample of Swift/SDSS Faint Blazars

Author(s): Fraga, B (Fraga, Bernardo); Giommi, P (Giommi, Paolo); Turriziani, S (Turriziani, Sara)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICRANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 050007 **DOI:** 10.1063/1.4937200 **Published:** 2015

Abstract: We aim here to provide a complete sample of faint ($f(r)$ greater than or similar to 1 mJy, $f(x)$ greater than or similar to $10^{(-15)}$ erg cm $^{(-2)}$ s $^{(-1)}$) blazars and blazar candidates serendipitously discovered in deep Swift images centered on Gamma-ray bursts (GRBs). By stacking all available images, we obtain exposures ranging from 10(4) to more than a million seconds. Since GRBs are thought to explode randomly across the sky, this set of deep fields can be considered as an unbiased survey of approximate to 12 square degrees of extragalactic sky, with sensitivities reaching a few $10^{(-15)}$ erg cm $^{(-2)}$ s $^{(-1)}$ in the 0.5-2 keV band. We then derive the x-ray Log N Log S and show that, considering that our sample may be contaminated by sources other than blazars, we are in agreement with previous estimations based on data and simulations.

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Record 13 of 23

Title: Multi-Frequency, Multi-Messenger Astrophysics with Blazars at ASDC and BSDC

Author(s): Giommi, P (Giommi, Paolo)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICRANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 060001 **DOI:** 10.1063/1.4937206 **Published:** 2015

Abstract: In this contribution I discuss the impact that blazars are having on today's multi-frequency and time-domain astrophysics, as well as how they are contributing to the opening of the era of multi-messenger astronomy. In this context I report some preliminary results from a systematic spectral and timing analysis carried out at ASDC on a very large number of X-ray observations of blazars. I also describe some of the on-going activities dedicated to the set up a new research oriented data center within ICRANet, called the Brazilian Science Data Center or BSDC, capitalising on the extensive experience on scientific data management of the ASDC, on the theoretical astrophysics background of ICRANet, and on local specific expertise. Both the ASDC and BSDC are actively accumulating "science ready" data products on blazars, which will be made available through the ASDC "SED builder" tool (<https://tools.asdc.asi.it/SED>) and by means of interactive tables reachable at the web sites of both centers.

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Record 14 of 23

Title: The Role of the Dark Matter Distribution in the Structure Formation

Author(s): Gomez, LG (Gomez, L. Gabriel); Rueda, JA (Rueda, Jorge A.)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICRANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 060003 **DOI:** 10.1063/1.4937208 **Published:** 2015

Abstract: We review the most important ingredients that compose the halo model of structure formation, emphasizing on the role played by the density profile of dark matter (DM). The theoretical predictions of the so-called warm DM (WDM) and cold DM (CDM) cosmologies at small scales are discussed in terms of recent numerical simulations and current observational data coming from rotation curves of galaxies. We elaborate on the recently introduced Ruffini-Arguelles-Rueda (RAR) DM profile, which is obtained from the configuration of equilibrium of a self-gravitating system of massive fermions, hereafter "inos", and show that it can be a good candidate for WDM. A significant insight for this model might be inferred based on the analytical approach of the halo model, pointing out that there might have signals of quantum cores of galaxies on the non-linear matter power spectrum at small scales, which are however unfortunately inaccessible today with the current observational instruments. Upcoming surveys could test in the future the quantum features of galactic cores.

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Record 15 of 23

Title: Cosmic Matrix in the Jubilee of Relativistic Astrophysics

Author(s): Ruffini, R (Ruffini, R.); Aimuratov, Y (Aimuratov, Y.); Belinski, V (Belinski, V.); Bianco, CL (Bianco, C. L.); Enderli, M (Enderli, M.); Izzo, L (Izzo, L.); Kovacevic, M (Kovacevic, M.); Mathews, GJ (Mathews, G. J.); Moradi, R (Moradi, R.); Muccino, M (Muccino, M.); Penacchioni, AV (Penacchioni, A. V.); Pisani, GB (Pisani, G. B.); Rueda, JA (Rueda, J. A.); Vereshchagin, GV (Vereshchagin, G. V.); Wang, Y (Wang, Y.); Xue, SS (Xue, S. -S.)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICRANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 020001 **DOI:** 10.1063/1.4937179 **Published:** 2015

Abstract: Following the classical works on Neutron Stars, Black Holes and Cosmology, I outline some recent results obtained in the IRAP-PhD program of ICRANet on the "Cosmic Matrix": a new astrophysical phenomenon recorded by the X-and Gamma-Ray satellites and by the largest ground based optical telescopes all over our planet. In 3 minutes it has been recorded the occurrence of a "Supernova", the "Induced-Gravitational-Collapse" on a Neutron Star binary, the formation of a "Black Hole", and the creation of a "Newly Born Neutron Star". This presentation is based on a document describing activities of ICRANet and recent developments of the paradigm of the Cosmic Matrix in the comprehension of Gamma Ray Bursts (GRBs) presented on the occasion of the Fourteenth Marcel Grossmann Meeting on Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theory. A Portuguese version of this document can be downloaded at: http://www.icranet.org/documents/brochure_icranet_pt.pdf.

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Conference Title: 2nd ICRANet Cesar Lattes Meeting - Supernovae, Neutron Stars and Black Holes

Conference Date: APR 13-22, 2015

Conference Location: Rio De Janeiro, BRAZIL

Conference Sponsors: Cent Brasileiro Pesquisas Fisicas, Coordenacao Aperfeicoamento Pessoal Nivel Super, European Union, Educ Audiovisual & Culture Execut Agcy, Espaco Ciencia Recife, Estacao Ciencias Auditorium Joao Pessoa, Fundacao Carlos Chagas Filho Amparo Pesquisa Estado Rio De Janeiro, Fundacao Planetario Cidade Rio De Janeiro, Inst Fed Educacao Ciencia Tecnologia Ceara, Int Ctr Relativist Astrophys Network, Univ Fed Paraiba, Univ Fed Pernambuco, Univ Fed Fluminense, ICTP, Ceara, ITA, IHEP, UNS, Univ Sapienza Rome, UNAM, INPE, UIS, Univ Nice Sophia Antipolis, State Comm Sci RA, NAS Armenia, FAPERJ, Consortium GARR, BSU, IHES, NASB, ASI, UNIFEI, Al Farabi Kazhak Natl Univ, Univ Fed Rio Grande Sul, Inst Fisica, Univ Estado Rio De Janeiro, UFF, UAM, CNR, UFSC, UFPE, INFN, IFCE, LeCosPA, UnB

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Record 16 of 23

Title: Ten Years of Swift: a Universal Scaling for Short and Long Gamma-Ray Bursts (E-X,E-iso - E-gamma,E-iso - E-pk)

Author(s): Zaninoni, E (Zaninoni, Elena); Bernardini, MG (Bernardini, Maria Grazia); Margutti, R (Margutti, Raffaella); Amati, L (Amati, Lorenzo)

Edited by: DeAlmeida UB; Chardonnet P; Negreiros RP; Rueda J; Ruffini R; Vereshchagin G; Vasconcellos CZ

Source: SECOND ICRANET CESAR LATTES MEETING: SUPERNOVAE, NEUTRON STARS AND BLACK HOLES **Book Series:** AIP Conference Proceedings **Volume:** 1693 **Article Number:** 050008 **DOI:** 10.1063/1.4937201 **Published:** 2015

Abstract: From the comprehensive statistical analysis of Swift X-ray light-curves collected from the launch of the Swift satellite until the end of 2010, we found a three-parameter correlation between the isotropic energy emitted in the rest frame 1-10(4) keV energy band during the prompt emission (E-gamma,E-iso), the rest frame peak of the prompt emission energy spectrum (E-pk), and the X-ray energy emitted in the rest frame 0.3-30 keV observed energy band (E-X,E-iso), computed excluding the contribution of the flares. The importance of this scaling law is that it is followed by both long and short GRBs, and, at the same time, involves prompt and afterglow emission quantities. Therefore there are some properties which are shared by long and short GRBs as a whole. We updated this correlation considering all GRBs observed until June 2014, confirming the existence of this scaling law, and examining some particular GRBs, as 090426 and 100816A. We also discuss the physics that is driving this correlation.

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Conference Title: 2nd ICRANet Cesar Lattes Meeting - Supernovae, Neutron Stars and Black Holes

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Record 17 of 23

Title: A simplified view of blazars: the very high energy gamma-ray vision
Author(s): Padovani, P (Padovani, P); Giommi, P (Giommi, P.)
Source: MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY **Volume:** 446 **Issue:** 1 **Pages:** L41-L45 **DOI:** 10.1093/mnras/slu164 **Published:** JAN 1 2015
Abstract: We have recently proposed a simplified scenario for blazars in which these sources are classified as flat-spectrum radio quasars or BL Lacs according to the prescriptions of unified schemes, and to a varying combination of Doppler-boosted radiation from the jet, emission from the accretion disc, the broad-line region, and light from the host galaxy. This scenario has been thoroughly tested through detailed Monte Carlo simulations and reproduces all the main features of existing radio, X-ray, and gamma-ray surveys. In this paper, we consider the case of very high energy emission ($E > 100$ GeV) extrapolating from the expectations for the GeV band, which are in full accordance with the Fermi-LAT survey results, and make detailed predictions for current and future Cherenkov facilities, including the Cherenkov Telescope Array. Our results imply that greater than or similar to 100 new blazars can be detected now at very high energy and up to z similar to 1, consistently with the very recent MAGIC detection of S4 0218+35 at $z = 0.944$.
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Record 18 of 23

Title: Thermal evolution of neutron stars with global and local neutrality
Author(s): de Carvalho, SM (de Carvalho, S. M.); Negreiros, R (Negreiros, R.); Rueda, JA (Rueda, Jorge A.); Ruffini, R (Ruffini, Remo)
Source: PHYSICAL REVIEW C **Volume:** 90 **Issue:** 5 **Article Number:** 055804 **DOI:** 10.1103/PhysRevC.90.055804 **Published:** NOV 21 2014
Abstract: Globally neutral neutron stars, obtained from the solution of the called Einstein-Maxwell-Thomas-Fermi equations that account for all the fundamental interactions, have been recently introduced. These configurations have a more general character than the ones obtained with the traditional Tolman-Oppenheimer-Volkoff equations, which impose the condition of local charge neutrality. The resulting configurations have a less massive and thinner crust, leading to a new mass-radius relation. Signatures of this new structure of the neutron star on the thermal evolution might be a potential test for this theory. We compute the cooling curves by integrating numerically the energy balance and transport equations in general relativity, for globally neutral neutron stars with crusts of different masses and sizes, according to this theory for different core-crust transition interfaces. We compare and contrast our study with known results for local charge neutrality. We found a new behavior for the relaxation time, depending upon the density at the base of the crust, $\rho(\text{crust})$. In particular, we find that the traditional increase of the relaxation time with the crust thickness holds only for configurations whose density of the base of the crust is greater than approximate to $5 \times 10(13)$ g cm^{-3} . The reason for this is that neutron star crusts with very thin or absent inner crust have some neutrino emission processes blocked, which keeps the crust hotter for longer times. Therefore, accurate observations of the thermal relaxation phase of neutron stars might give crucial information on the core-crust transition which may aid us in probing the inner composition and structure of these objects.
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Negreiros, Rodrigo	L-3108-2016	

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Record 19 of 23

Title: Two short bursts originating from different astrophysical systems: The genuine short GRB 090227B and the disguised short GRB 090510 by excess
Author(s): Muccino, M (Muccino, Marco); Bianco, CL (Bianco, Carlo Luciano); Izzo, L (Izzo, Luca); Wang, Y (Wang, Yu); Enderli, M (Enderli, Maxime); Pisani, GB (Pisani, Giovanni Battista); Penacchioni, AV (Penacchioni, Ana Virginia); Ruffini, R (Ruffini, Remo)
Source: JOURNAL OF THE KOREAN PHYSICAL SOCIETY **Volume:** 65 **Issue:** 6 **Special Issue:** SI **Pages:** 865-870 **DOI:** 10.3938/jkps.65.865 **Published:** SEP 2014
Abstract: GRB 090227B and GRB 090510 are two gamma-ray bursts (GRBs) traditionally classified as short bursts. The major outcome of our analysis is that they indeed originate from different systems. In the case of GRB 090227B, from the inferred values of the total energy of the e^+e^- plasma, erg, the engulfed baryonic mass $M(B)$, expressed as, and the circumburst medium (CBM) average density, $aOE(c)n(CBM) > = (1.90 \pm 0.20) \times 10^{-5} \text{ cm}^{-3}$, we have assumed the progenitor of this burst to be a symmetric neutron star (NS) merger with masses $m = 1.34 M_{\text{aS}}(TM)$, radii $R = 12.24$ km, and crustal thicknesses of similar to 0.47 km. In the case of GRB 090510, we have derived the total plasma energy, erg, the Baryon load, $B = (1.45 \pm 0.28) \times 10^{-3}$, and the Lorentz factor at transparency, $\Gamma' = (6.7 \pm 1.7) \times 10(2)$, which are characteristic of the long GRB class, as well as a very high CBM density, $aOE(c)n(CBM) > = (1.85 \pm 0.14) \times 10(3) \text{ cm}^{-3}$. The joint effect of the high values of G and $aOE(c)n(CBM) >$ compresses in time and "inflates" in intensity the extended afterglow, making GRB 090510 appear to be a short burst, which we here define as a "disguised short GRB by excess", occurring in an overdense region with $10(3) \text{ cm}^{-3}$.
Accession Number: WOS:000343902700013
Conference Title: 13th Italian-Korean Symposium on Relativistic Astrophysics
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Record 20 of 23

Title: Static and rotating neutron stars fulfilling all fundamental interactions
Author(s): Belvedere, R (Belvedere, Riccardo); Rueda, JA (Rueda, Jorge A.); Ruffini, R (Ruffini, Remo)
Source: JOURNAL OF THE KOREAN PHYSICAL SOCIETY **Volume:** 65 **Issue:** 6 **Special Issue:** SI **Pages:** 897-902 **DOI:** 10.3938/jkps.65.897 **Published:** SEP 2014
Abstract: We summarize the key ingredients of a new neutron star model fulfilling global, but not local, charge neutrality. The model is described by what we have called the Einstein-Maxwell-Thomas-Fermi equations, which account for the strong, weak, electromagnetic, and gravitational interactions, as well as thermodynamical equilibrium, within the framework of general relativity and relativistic nuclear mean field theory. We show the results for both static and uniformly-rotating neutron stars and discuss some astrophysical implications.
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Record 21 of 23

Title: Effective field theory for neutron stars with strong Sigma(-)-hyperon repulsion

Author(s): Razeira, M (Razeira, M.); Mesquita, A (Mesquita, A.); Vasconcellos, CAZ (Vasconcellos, C. A. Z.); Ruffini, R (Ruffini, R.); Rueda, JA (Rueda, J. A.); Gomes, RO (Gomes, R. O.)

Source: ASTRONOMISCHE NACHRICHTEN **Volume:** 335 **Issue:** 6-7 **Special Issue:** SI **Pages:** 733-738 **DOI:** 10.1002/asna.201412101 **Published:** AUG 2014

Abstract: We investigate the role of many-body correlations in the maximum mass of neutron stars using the effective relativistic QHD-model with parameterized couplings which represents an extended compilation of other effective models found in the literature. Our model exhausts the whole fundamental baryon octet (n, p, Sigma(-), Sigma(0), Sigma(+), Lambda, Xi(-), Xi(0)) and simulates corrections to the minimal Yukawa couplings by considering many-body nonlinear self-couplings and meson-meson interaction terms involving scalar-isoscalar (sigma, sigma*), vector-isoscalar (omega, phi), vector-isovector (delta) and scalar-isovector (d). Following recent experimental results, we consider in our calculations the extreme case where the Sigma(-) experiences such a strong repulsion that it does not appear at all in nuclear matter. (C) 2014 WILEY-VCH Verlag GmbH&Co.KGAA, Weinheim

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Record 22 of 23

Title: Strangeness content of neutron stars with strong Sigma(-) -hyperon repulsion

Author(s): Razeira, M (Razeira, M.); Mesquita, A (Mesquita, A.); Vasconcellos, CAZ (Vasconcellos, C. A. Z.); Ruffini, R (Ruffini, R.); Rueda, JA (Rueda, J. A.); Gomes, RO (Gomes, R. O.)

Source: ASTRONOMISCHE NACHRICHTEN **Volume:** 335 **Issue:** 6-7 **Special Issue:** SI **Pages:** 739-744 **DOI:** 10.1002/asna.201412102 **Published:** AUG 2014

Abstract: A new constraint on the equation of state and composition of the matter on neutron stars has been provided by the measurement of the mass $2.01 \pm 0.04 M_{\odot}$ for PSR J0348 + 0432. In this contribution we investigate the role of many-body correlations in the maximum mass of neutron stars using the effective relativistic QHD-model with parameterized couplings. The complete expression of our QHD interaction Lagrangian exhausts the whole fundamental baryon octet (n, p, Sigma(-), Sigma(0), Sigma(+), Lambda, Xi(-), Xi(0)) and includes many-body forces simulated by nonlinear self-couplings and meson-meson interaction terms involving scalar-isoscalar (sigma, sigma*), vector-isoscalar (omega, phi), vector-isovector (rho), and scalar-isovector (delta). We study the behavior of the asymmetry parameter, which describes the relative neutron excess in the system as well as the behavior of the strangeness asymmetry parameter, which specifies the strangeness content in the system and is strictly connected with the appearance of a particular hyperon species in the extreme case where the Sigma(-) experiences such a strong repulsion that it does not appear at all in nuclear matter. (C) 2014 WILEY-VCH Verlag GmbH& Co. KGAA, Weinheim

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Record 23 of 23

Title: On binary-driven hypernovae and their nested late X-ray emission

Author(s): Ruffini, R (Ruffini, R.); Muccino, M (Muccino, M.); Bianco, CL (Bianco, C. L.); Enderli, M (Enderli, M.); Izzo, L (Izzo, L.); Kovacevic, M (Kovacevic, M.); Penacchioni, AV (Penacchioni, A. V.); Pisani, GB (Pisani, G. B.); Rueda, JA (Rueda, J. A.); Wang, Y (Wang, Y.)

Source: ASTRONOMY & ASTROPHYSICS **Volume:** 565 **Article Number:** L10 **DOI:** 10.1051/0004-6361/201423812 **Published:** MAY 2014

Abstract: Context. The induced gravitational collapse (IGC) paradigm addresses the very energetic (10(52)-10(54) erg) long gamma-ray bursts (GRBs) associated to supernovae (SNe). Unlike the traditional "collapsar" model, an evolved FeCO core with a companion neutron star (NS) in a tight binary system is considered as the progenitor. This special class of sources, here named "binary-driven hypernovae" (BdHNe), presents a composite sequence composed of four different episodes with precise spectral and luminosity features.

Aims. We first compare and contrast the steep decay, the plateau, and the power-law decay of the X-ray luminosities of three selected BdHNe (GRB 060729, GRB 061121, and GRB 130427A). Second, to explain the different sizes and Lorentz factors of the emitting regions of the four episodes, for definiteness, we use the most complete set of data of GRB 090618. Finally, we show the possible role of r-process, which originates in the binary system of the progenitor.

Methods. We compare and contrast the late X-ray luminosity of the above three BdHNe. We examine correlations between the time at the starting point of the constant late power-law decay $t(a)^*$, the average prompt luminosity $<L_{\text{iso}}>$, and the luminosity at the end of the plateau L_{a} . We analyze a thermal emission (similar to 0.97-0.29 keV), observed during the X-ray steep decay phase of GRB 090618.

Results. The late X-ray luminosities of the three BdHNe, in the rest-frame energy band 0.3-10 keV, show a precisely constrained "nested" structure. In a space-time diagram, we illustrate the different sizes and Lorentz factors of the emitting regions of the three episodes. For GRB 090618, we infer an initial dimension of the thermal emitter of similar to 7×10^{12} cm, expanding at Gamma approximate to 2. We find tighter correlations than the Daiotti-Willingale ones.

Conclusions. We confirm a constant slope power-law behavior for the late X-ray luminosity in the source rest frame, which may lead to a new distance indicator for BdHNe. These results, as well as the emitter size and Lorentz factor, appear to be inconsistent with the traditional afterglow model based on synchrotron emission from an ultra-relativistic (Gamma similar to 10(2)-10(3)) collimated jet outflow. We argue, instead, for the possible role of r-process, originating in the binary system, to power the mildly relativistic X-ray source.

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