

Astrophysical Big Bang Laboratory

長瀧天体ビッグバン研究室

PI: Shigehiro Nagataki (Ph.D of Science), Associate Chief Scientist

1. Abstract

Our laboratory, Astrophysical Big Bang Laboratory, was established on 1st Apr. 2013. Our group focuses on unveiling lots of mysteries surrounding astrophysical explosive phenomena such as supernovae (SNe) and gamma-ray bursts (GRBs). SNe and GRBs are the most powerful explosions in the universe, and yet very little are known about their explosion mechanisms. These astrophysical big bangs continue to fascinate us with their unknown physics and puzzling astronomical phenomena such as gravitational waves, r-process nucleosynthesis, particle acceleration, high-energy gamma-rays/neutrinos, ultra-high energy cosmic rays. Through our theoretical and computational approaches, we strive to reveal the complete pictures of these violent explosions and provide the-state-of-the-art physical interpretations for current, cutting-edge observations as well as useful predictions for future observations by the next-generation astronomical observatories. We are more than passionate to co-operate with researchers in RIKEN as well as all other interested groups in Japan and the world, and together we would like to establish a Utopia in RIKEN for scientists.

Toward our goal, communications & collaborations with Nishina Center are crucial. The state-of-the-art equation of state for dense matter and nuclear reaction data for various channels can be provided by Nishina Center groups, which are essential to unveil the phenomena of SNe and GRBs. Our group has joint meetings with Dr. Nakatsukasa's group continuously since FY2013. This year we invited more nuclear physicists to the joint meeting for further communications. Our group has joined one of the Pioneering Projects, "Extreme precisions to explore fundamental physics with exotic particles (Triple-E)" (GD: Dr. Yasunori Yamazaki). This project definitely helps our group to enhance communications and collaborations with Nishina Center, especially Dr. Uesaka's group. We also believe that our group can contribute especially to new science using RIBF facility as well as Nishina Center through this project. Also, deep understanding for mathematical and computational physics can be very important to solve fundamental, unsolved problems in astrophysics. Our group has joined one of the Pioneering Projects, "Interdisciplinary Theoretical Science Research Group

(iTHES)” (GD: Dr. Tetsuo Hatsuda) from FY2014 to discover new science by enhancing communications with researchers of nuclear physics, condensed matter, chemistry, and biology in RIKEN. This should be also helpful to increase our group’s activity for astrophysics. Shigehiro Nagataki, the PI of our group, has been a leader of Interdisciplinary Mathematical and Computational Collaboration Team of iTHES.

Super-computing is indispensable for unveiling the explosion mechanisms of SNe and GRBs. Full-understanding of them is still not achieved even by using K-computer. We are planning to achieve the complete understanding of the explosion mechanisms with the post-K computer. For the purpose, we are developing a new code that should fit the supercomputing by post-K computer. Dr. Tomoya Takiwaki who has done numerical simulations of SNe by K-computer supported by HPCI Strategic Program Field 5 “The origin of matter and the universe” has joined our group from 1st Aug. 2014. We believe we can accelerate our project to unveil the explosion mechanisms of SNe and GRBs together with him, and we will continue to encourage excellent researchers of this field to join our group from all over the world, so that our group in RIKEN will lead the world in this field.

As mentioned above, our group has already decided to lead the world in the field of astrophysical big bang, including the explosion mechanisms. For the purpose, we are seeking for top-ranked researchers in the world, encouraging them to join our group, and doing the-state-of-the-art researches in this field. We are succeeding to have an international laboratory composed of 6 Japanese including PI and 6 foreigners (two from Russia, and one from Italy, China, Hong-Kong, and Thailand), including Alumni who succeeded to get their next positions such as a faculty position at Yunnan Observatory in China, assistant professor position at Kyushu Univ., JAXA International Top Young Fellow, Marie Curie Fellow, and postdoc position at Kavli IPMU, the University of Tokyo. Among 6 foreign members, two joined us from Stanford Univ., and two from Max Planck Institute. We are sure that we can establish a top-ranked lab. in the world and achieve our goals & dreams in the near future leading the world.

2. Key Words

Supernova Explosions, Gamma-Ray Bursts, Neutron Stars, Black Holes, Supernova Remnants, gravitational waves, neutrinos, r-process/Explosive Nucleosynthesis, Radiation Transfer, Relativistic MHD Flow, Particle Acceleration, High-Energy Cosmic Rays, General Relativity, Equation of State for Dense Matter, High Performance Super-Computing.

3. Members

Principal Investigator

Shigehiro Nagataki
Associate Chief Scientist

Core Members

Hiroataka Ito
Postdoctoral Researcher

Jin Matsumoto
Postdoctoral Researcher

Yuto Teraki
Special Postdoctoral Researcher

Tomoya Takiwaki
Research Scientist

Maxim Barkov
Research Scientist

Annop Wongwathanarat
Foreign Postdoctoral Researcher

Maria Giovanna Dainotti
Visiting Researcher (JSPS Fellow)
From Feb. 2015, Marie Curie Fellow at
Stanford Univ.

Past Core Members

Masaomi Ono
Assistant Professor, Kyushu Univ.

Alexey Tolstov
Postdoctoral Researcher, Kavli IPMU,
Univ. of Tokyo

Jirong Mao
Visiting Researcher, Kyushu Univ.
From Apr. 2015, Faculty at Yunnan
Observatory

Shiu-Hang Lee
JAXA International Top Young Fellow.
Visiting Scientist of RIKEN

Long Term Visitors

Haoning He (from UCLA)
Andrea Boria (from Jagellonian Univ.)

Short Term Visitors

Ryosuke Hirai (Waseda)
Yu Yamamoto (Waseda)
Shun Furusawa (Waseda)
Shigeo Kimura (Osaka Univ.)
Nobuya Nishimura (Keele Univ.)
Keitaro Takahashi (Kumamoto Univ.)
Tomoya Kinugawa (Kyoto Univ.)
Sergei Blinnikov (ITEP/IPMU)
Donald Warren (NCSU)
Kenichi Nishikawa (Alabama Univ.)
Alexei Pozanenko (Space Research
Institute)
Alexander Kusenko (UCLA/IPMU)
Luca Baiotti (Osaka Univ.)
Patrick Slane (Harvard-Smithsonian)
Daniel Patnaude (Harvard-Smithsonian)
Donald Ellison (NCSU)

Assistant

Sachiko Dohi

4. Achievements

(1) Book & Reviews (refereed)

寺木悠人 “放射スペクトルと乱流電磁場の深い関係” 天文月報, 108,1,41-50, 2014/12/20

滝脇知也 固武慶 “重力崩壊型超新星の爆発メカニズム” 日本物理学会誌, vol 70, 2015/03/05

(2) Papers in Journals (Refereed)

Barkov Maxim, Bosch-Ramon Valenti “Formation of large-scale magnetic structures associated with the Fermi bubbles” *Astronomy and Astrophysics*, Volume 565, 5 pp, 2014/5/1

Hiroataka Ito, Shigehiro Nagataki, Jin Matsumoto, Lee Shiu-Hang, Tolstov Alexey, Mao Jirong, Dainotti Maria, Akira Mizuta “Spectral and Polarization Properties of Photospheric Emission from Stratified Jets” *The Astrophysical Journal* Vol. 789, Issue 2, p19-37, 2014/7/1

Rouillé d'Orfeuil, B., Allard, D.; Lachaud, C.; Parizot, E.; Blaksley, C.; Nagataki, S., “Anisotropy expectations for ultra-high-energy cosmic rays with future high-statistics experiments”, *Astronomy & Astrophysics*, Volume 567, id.A81, 26 pp., 2014/07/01

Lee, Shiu-Hang, Patnaude, Daniel J.; Ellison, Donald C.; Nagataki, S.; Slane,

Patrick O., “Reverse and Forward Shock X-Ray Emission in an Evolutionary Model of Supernova Remnants Undergoing Efficient Diffusive Shock Acceleration”, *The Astrophysical Journal*, Volume 791, Issue 2, article id. 97, 18 pp., 2014/08/20

Nakamura, Ko, Kuroda, Takami; Takiwaki, Tomoya; Kotake, Kei, “Impacts of Rotation on Three-dimensional Hydrodynamics of Core-collapse Supernovae”, *The Astrophysical Journal*, Volume, 793, Issue 1, article id. 45, 14 pp. (2014), 09/2014

Horiuchi S., Nakamura, K.; Takiwaki, T.; Kotake, K.; Tanaka, M., “The red supergiant and supernova rate problems: implications for core-collapse supernova physics”, *Monthly Notices of the Royal Astronomical Society: Letters*, Volume 445, Issue 1, p.L99-L103, 11/2014

Rowlinson, A, Gompertz, B. P.; Dainotti, M.; O'Brien, P. T.; Wijers, R. A. M. J.; van der Horst, A. J. “Constraining properties of GRB magnetar central engines using the observed plateau luminosity and duration correlation” *Monthly Notice Royal Astronomical Society* Volume 443, Issue 2, p.1779-1787 (2014)

TA Collaboration (including Shigehiro Nagataki & Hiroataka Ito) “Indications of

Intermediate-scale Anisotropy of Cosmic Rays with Energy Greater Than 57 EeV in the Northern Sky Measured with the Surface Detector of the Telescope Array Experiment” The Astrophysical Journal Letters, Volume 790, p. 21-25, 2014/7/14

TA Collaboration (including Shigehiro Nagataki & Hirotaka Ito) “Searches for Large-scale Anisotropy in the Arrival Directions of Cosmic Rays Detected above Energy of 1019 eV at the Pierre Auger Observatory and the Telescope Array” The Astrophysical Journal, Volume 794, p. 172-186 2014/10/7

Dainotti Maria Giovanna, Del Vecchio Roberta, Nagataki Shigehiro, Capozziello Salvatore, “Selection Effects in Gamma-Ray Burst Correlations: Consequences on the Ratio between Gamma-Ray Burst and Star Formation Rates” Astrophysical Journal Volume 800, Issue 1, article id. 31, pages 12 (2015)

Sumiyoshi, K, Takiwaki, T.; Matsufuru, H.; Yamada, S., “Multi-dimensional Features of Neutrino Transfer in Core-collapse Supernovae”, The Astrophysical Journal, Volume 216, Issue 1, article id. 5, 37 pp. (2015). 01/2015

Masada Youhei, Takiwaki, Tomoya; Kotake, Kei, “Magnetohydrodynamic

Turbulence Powered by Magnetorotational Instability in Nascent Protoneutron Stars”, The Astrophysical Journal Letter, Volume 798, Issue 1, article id. L22, 7 pp. (2015), 01/2015

Bosch-Ramon Valenti, Barkov Maxim, Perucho Manel “Orbital evolution of colliding star and pulsar winds in 2D and 3D; effects of: dimensionality, EoS, resolution, and grid size” Astronomy and Astrophysics, accepted (2015)

TA Collaboration (including Shigehiro Nagataki & Hirotaka Ito) “Energy spectrum of ultra-high energy cosmic rays observed with the Telescope Array using a hybrid technique” Astroparticle Physics, Volume 61, p. 93-101, 2015/2

TA Collaboration (including Shigehiro Nagataki & Hirotaka Ito) “Study of Ultra-High Energy Cosmic Ray composition using Telescope Array's Middle Drum detector and surface array in hybrid model” Astroparticle Physics, Volume 64, p. 49-62, 2015/4

(3) Oral Presentations at International Meetings (Invited Talks)

Shigehiro Nagataki, “Supernova Explosions: From Engine to Remnant”, HEDLA 2014: 10th International Conference on High Energy Density Laboratory Astrophysics, Bordeaux, France, 2014/05/12

Shigehiro Nagataki, “R-Process Nucleosynthesis in Astrophysical Big Bang”, Nuclear Physics and Astrophysics of Neutron-Star Mergers and Supernovae, and the Origin of R-Process Elements, Trento, Italy, 2014/09/08

Tomoya Takiwaki, “Explosion Mechanism of Core-Collapse Supernovae”, Nuclear Physics and Astrophysics of Neutron-Star Mergers and Supernovae, and the Origin of R-Process Elements, Trento, Italy, 2014/09/09

Shigehiro Nagataki, “Astrophysical Big Bang: From Engine to Remnant”, PACIFIC2014, Moorea, French Polynesia, 2014/09/16

Shigehiro Nagataki, “R-Process and Nucleosynthesis in Astrophysical Big Bang”, Recent progress on r-process and nucleosynthesis, RIKEN, Saitama, 2014/11/25

Maria Dainotti, “An intrinsic luminosity-time correlation in X-ray afterglows: study of selection effects, implications for cosmology and theoretical models”, Ioffe Workshop on GRBs and other transient sources, Saint Petersburg, Russia 2014/09/23

Barkov Maxim “Simulations of stellar/pulsar-wind interaction along one

full orbit”, ACCRETION AND OUTFLOWS THROUGHOUT THE SCALES: FROM YOUNG STELLAR OBJECTS TO AGNS, Lyon, France, 2014/10/3

Tomoya Takiwaki “Impact of electron capture rate and equation of state on supernovae explosions”, International Workshop on Study of Neutron Stars and Core-Collapse Supernovae, RIKEN, Saitama, 2014/12/18

Shigehiro Nagataki, “Astrophysical Big Bang and Neutrinos”, International Workshop on Neutrino Physics and Astrophysics, Istanbul, Turkey, 2015/03/17

(4) Oral Presentations at International Meetings (Contributed Talks):

Hiroataka Ito, “Effects of jet structure on the photospheric emission in gamma-ray bursts”, Ioffe Workshop on GRBs and other transient sources, Saint Petersburg, Russia 2014/09/22

Barkov Maxim “Rapid TeV and GeV Variability in AGNs as Result of Jet-Star Interaction”, Fifth International Fermi Symposium, Nagoya, Japan, 2014/10/23

Barkov Maxim “Orbital evolution of colliding star and pulsar winds in 2D and 3D”, High Energy Astrophysics 2014, Moscow, Russia, 2014/12/23

(5) Oral Presentations at Domestic Meetings (Invited/Keynote Talks)

長瀧重博, “Astrophysical Big Bang: From Engine to Remnant”, 超新星残骸研究会, 名古屋大学, 2014/06/12

Maxim Barkov, “GRB Engine and Relativistic Flow”, RIKEN-IPMU-RESCEU Joint Meeting 2014, RIKEN, Saitama, Japan, 2014/07/07

Maria Dainotti, “GRB cosmology”, RIKEN-IPMU-RESCEU Joint Meeting 2014, RIKEN, Saitama, Japan, 2014/07/07

Jin Matsumoto, “Relativistic HD/MHD Flow for GRB Jets”, RIKEN-IPMU-RESCEU Joint Meeting 2014, RIKEN, Saitama, Japan, 2014/07/07

Hiroataka Ito, “Photospheric Emission in GRBs”, RIKEN-IPMU-RESCEU Joint Meeting 2014, RIKEN, Saitama, Japan, 2014/07/08

Yuto Teraki, “WIGGLER RADIATION IN LANGMUIR TURBULENCE - A possible emission mechanism of GEB-”, RIKEN-IPMU-RESCEU Joint Meeting 2014, RIKEN, Saitama, Japan, 2014/07/08

Wongwathanarat Annap, “Core-Collapse

Supernovae: A Day after the Explosion” SN-GRB Workshop 2014, RIKEN, Saitama, Japan, 2014/8/25

Tomoya Takiwaki, “Explosion Mechanism of Core-collapse Supernovae”, SN-GRB Workshop 2014, RIKEN, Saitama, Japan, 2014/8/25

Jin Matsumoto “Numerical Experiments of GRB Jets”, SN-GRB Workshop 2014, RIKEN, Saitama, Japan, 2014/8/26

Maxim Barkov “GRB Engine”, SN-GRB Workshop 2014, RIKEN, Saitama, Japan, 2014/8/26

Yuto Teraki “Particle acceleration & radiation in the plasma waves”, SN-GRB Workshop 2014, RIKEN, Saitama, Japan, 2014/8/26

Maria Dainotti, “Afterglow/GRB Cosmology”, SN-GRB Workshop 2014,, RIKEN, Saitama, Japan, 2014/8/27

Hiroataka Ito “Photospheric Emission in GRBs”, SN-GRB Workshop 2014,, RIKEN, Saitama, Japan, 2014/8/27

寺木悠人, “強い超光速電磁波中を運動する相対論的電子”, HEAP2014, KEK、茨城、2014/10/14

滝脇知也, “超新星のニュートリノ爆発と磁気爆発”, 第二回 DTA シンポジウム,

国立天文台, 東京, 2014/10/28

伊藤裕貴 “構造を持った相対論的ジェットからの光球面放射”, 理論天文学研究会 2014, 千葉, 2014/11/10

Wongwathanarat Annop “Core-Collapse Supernovae: From Shock Revival to Break-out”, SNR Workshop, Rikkyo University, Tokyo, Japan, 2014/11/10

滝脇知也, “京で解くニュートリノ放射輸送問題と超新星爆発”, プラズマシンポジウム, 新潟, 2014/11/18

Wongwathanarat Annop “3D Core-Collapse Supernova Simulations: From Shock Revival to Shock Break-out” HPCI-iTHES International Workshop on Study of Neutron Stars and Core-Collapse Supernovae, RIKEN, Saitama, Japan, 2014/12/17

長瀧重博, “星の回転と超新星爆発・ガンマ線バースト”, 「大質量星の進化・活動現象と星の回転」研究会, 北海道大学, 札幌, 2015/02/19

Annop Wongwathanarat, “3D long-time core-collapse supernova simulations”, RIKEN-RESCEU-IPMU Joint Meeting, Univ. of Tokyo, Tokyo, 2015/3/3

Hiroataka Ito, “Photospheric emission from structured relativistic jet in gamma-ray bursts”,

RIKEN-RESCEU-IPMU Joint Meeting, Univ. of Tokyo, Tokyo, 2015/3/3

Jin Matsumoto, “Growth of Rayleigh-Taylor and Richtmyer-Meshkov instabilities at the relativistic jet interface”, RIKEN-RESCEU-IPMU Joint Meeting, Univ. of Tokyo, Tokyo, 2015/3/3

Barkov Maxim, “Orbital evolution of colliding star and pulsar winds in 2D and 3D” RIKEN-RESCEU-IPMU Joint Meeting, Univ. of Tokyo, Tokyo, 2015/3/4

滝脇知也, “超新星爆発 3次元シミュレーション”, 日本物理学会, 早稲田大学, 東京, 2014/03/24

(6) Oral Presentations at Domestic Meetings (Contributed Talks)

寺木悠人, “ラングミュア乱流中を運動する相対論的電子からの放射スペクトル”, 日本地球惑星科学連合大会 2014, 神奈川, 2014/4/30

Maxim Barkov, “Close binary progenitors of gamma-ray bursts and hypernovae”, iTHES Mini-workshop on "Strong-Field Physics", RIKEN, Wako, 2014/5/29

伊藤裕貴, “三次元相対論的流体シミュレーションから探る相対論的ジェットからの光球面放射”, 日本天文学会 2014 年秋季年会, 山形大学, 山形, 2014/9/11

寺木悠人, “強い超光速電磁波中の相対論

的電子からの放射”，日本天文学会 2014 年秋季年会，山形大学，山形，2014/9/13

寺木悠人，“強い超光速電磁波中の電子の加速と放射”，高エネルギー宇宙物理研究会 2014，九州大学，福岡県，2014/11/25

Shigehiro Nagataki, “Theoretical Study for Unveiling the Origins of VHE-Neutrinos in the Near Future”, 新学術領域研究「ニュートリノフロンティア」研究会 2014，富士吉田市，2014/12/22

伊藤裕貴 “構造を持った相対論的ジェットからの光球面放射” コンパクト連星合体からの重力波・電磁波放射とその周辺領域，京都大学，京都，2015/2/13

伊藤裕貴，“相対論的ジェットの伝搬ダイナミクスが与える光球面放射への影響”，日本天文学会 2015 年春季年会，大阪大学，大阪，2015/3/18

(7) Outreach

長瀧重博，“星は生きてるよ。ぼくらは星から生まれたよ。”，理化学研究所和光キャンパス一般公開，埼玉，2014/04/19

長瀧重博，“星は生きてるよ。僕等は星から生まれたよ。”，さいたま市立大宮北高等学校見学会，理化学研究所，埼玉，2014/07/24

長瀧重博，“サマースクール宇宙課題 超新星 1987A”，HPCI Summer School，京都大学，2014/07/25

長瀧重博，“星は生きてるよ。ぼくらは星から生まれたよ。”，竹園西児童館 夏休み講演，つくば市、茨城，2014/07/26

滝脇知也，“ 計算機内で再現する超新星爆発 ～パソコンと京コンピュータの違い～”，全国七タシンポジウム，つくば市、茨城、2014/8/7

長瀧重博，“星は生きてるよ。僕等は星から生まれたよ。”，水戸啓明高等学校見学会，理化学研究所，埼玉，2014/07/24

長瀧重博，“宇宙の不思議についてお話ししよう”，8 月小中学生向け和光地区見学ツアー，理化学研究所，埼玉，2014/08/20

Shigehiro Nagataki, “Supernova and Nucleosynthesis 1”, The 13th CNS International Summer School, RIKEN, Saitama, 2014/08/22

Shigehiro Nagataki, “Supernova and Nucleosynthesis 1”, The 13th CNS International Summer School, RIKEN, Saitama, 2014/08/23

滝脇知也，“ 宇宙 最大の爆発「超新星」を 京で再現する ”，未来をひらくスーパーコンピュータ ～「京」からその先へ限りなき挑戦～，東京千代田区，2014/8/23

長瀧重博，“Why Astrophysical Big Bang?”，素核宇宙融合レクチャーシリー

ズ 第 13 回, 理化学研究所, 埼玉,
2014/11/27-28

Shigehiro Nagataki, “Why Astrophysical
Big Bang?”, Noyori Winter School 2014,
Kanagawa, 2014/12/02

Tomoya Takiwaki, “Numerical recipes for
modeling core-collapse supernovae in
K-computer”, Google seminar, Roppongi,
Tokyo, 2015/02/16

(8) Seminar Talks (International)

Shigehiro Nagataki, “Astrophysical Big
Bang: From Engine to Remnant”, HEAD
Lunch Seminar at CfA, Harvard Univ.,
Boston, USA, 2014/05/28

Maria Dainotti “Selection effects on the
Luminosity time correlation and GRBs
as cosmological tools”, University of
Federico II, Naples, Italy, 2014/07/10

Maria Dainotti “Application of the
Luminosity time correlation as
cosmological tool”, Jagiellonian
University, Krakow, Poland, 2014/07/14

Barkov Maxim “Close Binary
Progenitors Of Gamma Ray Bursts And
Hypernovae”, Heoretical groupe seminar,
INR RAS, Moscow, Russia, 2014/12/22

(9) Seminar Talks (Domestic)

Maria Dainotti, “An intrinsic
luminosity-time correlation in X-ray

afterglows: implications for cosmological
models”, Aoyama Gakuin Univ.,
2015/05/16

Shigehiro Nagataki, “Astrophysical Big
Bang: From Engine to Remnants”,
Seminar at Department of Physics, Osaka
Univ., Osaka, 2014/05/21

Maria Dainotti “Introduction to Gamma
Ray Bursts”, JSPS Science dialogue,
Shizuoka-Kita High School, 2014/05/28

長瀧重博, “天体ビッグバン: 爆発機構か
ら残骸まで”, 立教大学物理セミナー,
立教大学, 東京, 2014/06/26

滝脇知也, “重力波、ニュートリノ、光で
迫る. 超新星の爆発メカニズム”, 国立天
文台 談話会, 国立天文台, 東京,
2014/09/19

Maria Dainotti “An intrinsic
luminosity-time correlation in X-ray
afterglows: study of selection effects,
implications for cosmology and
theoretical models” JAXA, Sagami-hara,
2014/10/16

Dainotti Maria Giovanna, “Study of
selection effects, implications for
cosmology and theoretical models in the
Gamma Ray Bursts”, Waseda University,
Shinjyuku, 2014/11/9

Barkov Maxim “Orbital evolution of
colliding star and pulsar winds in 2D and

3D”, Astrophysical seminar in Rikkyo University, Tokyo, Japan, 2014/12/18

寺木悠人 “パルサー星雲の終端衝撃波近傍の粒子加速”, 釧路高専第4回理・工学セミナー, 釧路高専, 北海道, 2014/12/20

長瀧重博, “Why Astrophysical Big Bang?”, 国立天文台談話会, 国立天文台, 東京, 2015/02/13

(10) Poster Presentations at International Meetings

Yuto Teraki, “Radiation spectra from relativistic electrons moving in a Langmuir turbulence”, COSPAR2014, Mowcow, Russia, 2014/8/3

Hiroataka Ito, “Study of photospheric emission from GRB jet based on 3D hydrodynamical simulation”, International school of gravitational wave physics, Kyoto 2015, Kyoto Univ., Kyoto, 2015/3/25

(11) Poster Presentations at Domestic Meetings

寺木悠人, “強い波の中での電子の加速と放射”, 宇宙プラズマ理論研究会, 東北

大学, 山形, 2014/8/13

松本仁, “Rayleigh-Taylor 不安定性と Richtmyer-Meshkov 不安定性が相対論ジェットに与える影響”, 第27回理論懇シンポジウム、国立天文台、東京、2014/12/24-26

寺木悠人, “強い超光速電磁波乱流中の粒子加速と放射”, 第27回理論懇シンポジウム、国立天文台、東京、2014/12/24-26

伊藤裕貴, “三次元流体ミュレーションから探る相対論的ジェットからの光球面放射”, 平成26年度天文シミュレーションプロジェクトユーザーズミーティング, 国立天文台、東京、2015/1/19

松本仁, “相対論的MHDジェットのダイナミクス”, 平成26年度天文シミュレーションプロジェクトユーザーズミーティング, 国立天文台、東京、2015/1/20

(12) Meetings organized by our group.

RIKEN-IPMU-RESCEU Joint Meeting 2014, RIKEN, Saitama, 2014/07/07-08

SN-GRB Workshop 2014, RIKEN, Saitama, 2014/08/25-27