Record 1 of 43

By: Albertazzi, B (Albertazzi, B.); Mabey, P (Mabey, P.); Michel, T (Michel, Th.); Rigon, G (Rigon, G.); Marques, JR (Marques, J. -R.); Pikuz, S (Pikuz, S.); Ryazantsev, S (Ryazantsev, S.); Falize, E (Falize, E.); Som, LV (Som, L. Van Box); Meinecke, J (Meinecke, J.); Ozaki, N (Ozaki, N.); Ciardi, A (Ciardi, A.); Gregori, G (Gregori, G.); Koenig, M (Koenig, M.)

Title: Experimental characterization of the interaction zone between counter-propagating Taylor Sedov blast waves

Source: PHYSICS OF PLASMAS

Volume: 27

Issue: 2

Article Number: 022111

DOI: 10.1063/1.5137795

Document Type: Article

Published: FEB 2020

Abstract: Astronomical observations reveal that the interaction between shock waves and/or blast waves with astrophysical objects (molecular clouds, stars, jet winds, etc.) is a common process which leads to a more intricate structure of the interstellar medium. In particular, when two isolated massive stars are relatively close and explode, the resulting Supernovae Remnants (SNRs) can interact. The impact zone presents fascinating complex hydrodynamic physics which depends on the age of the SNRs, their relative evolution stage, and the distance between the two stars. In this Letter, we investigate experimentally the interaction region (IR) formed when two blast waves (BWs) collide during their Taylor-Sedov expansion phase. The two BWs are produced by the laser irradiation (1 ns, similar to 500 J) of 300 mu m diameter carbon rods and propagate in different gases (Ar and N-2) at different pressures. The physical parameters, such as the density and temperature of the IR, are measured for the first time using a set of optical diagnostics (interferometry, schlieren, time-resolved optical spectroscopy, etc.). This allows us to determine precisely the thermodynamic conditions of the IR. A compression ratio of r similar to 1.75 is found and a 17-20% increase in temperature is measured compared to the shell of a single blast wave. Moreover, we observe the generation of vorticity, inducing strong electron density gradients, in the IR at long periods after the interaction. This could in principle generate magnetic fields through the Biermann Battery effect. Published under license by AIP Publishing.

Accession Number: WOS:000519632500002

Record 2 of 43

By: Aleksandrov, V (Aleksandrov, V); Bleotu, G (Bleotu, G.); Caratas, L (Caratas, L.); Dabu, R (Dabu, R.); Dancus, I (Dancus, I); Fabbri, R (Fabbri, R.); Iancu, V (Iancu, V); Ispas, B (Ispas, B.); Kiss, M (Kiss, M.); Lachapelle, A (Lachapelle, A.); Lazar, A (Lazar, A.); Masruri, M (Masruri, M.); Matei, D (Matei, D.); Merisanu, M (Merisanu, M.); Mohanan, V (Mohanan, V); Naziru, A (Naziru, A.); Nistor, D (Nistor, D.); Secareanu, R (Secareanu, R.); Talposi, M (Talposi, M.); Toader, A (Toader, A.); Toma, A (Toma, A.); Ursescu, D (Ursescu, D.)

Title: UPGRADING DESIGN OF A MULTI-TW FEMTOSECOND LASER

Source: ROMANIAN REPORTS IN PHYSICS

Volume: 72

Issue: 4

Article Number: 413

Document Type: Article

Published: 2020

Abstract: The configuration of a commercial TW-class femtosecond laser amplifier and measurement techniques used for laser pulse characterization are described. Designed laser modules and new laser system layout for upgrading this sub-TW femtosecond laser system to a multi-TW laser system are presented. A four-pass Ti:sapphire

amplifier was designed to amplify the chirped pulses from 15 mJ up to 220 mJ energy. A vacuum compressor, with two-diffraction gratings, was designed for amplified pulses temporal compression. Considering 30 nm bandwidth input pulses with ideal Fourier transform limit (FTL) duration of 31.4 fs, 1.05 times FTL pulses can be obtained by the compensation of the chirped pulse amplifier phase dispersion in the compressor. Some experiments based on the upgraded multi-TW Ti:sapphire laser are proposed, such as spectral broadening for post-compression, laser induced damage threshold measurements using femtosecond pulses, and coherent combination of ultrashort pulses.

Accession Number: WOS:000598999200006

Record 3 of 43

By: Assmann, RW (Assmann, R. W.); Weikum, MK (Weikum, M. K.); Akhter, T (Akhter, T.); Alesini, D (Alesini, D.); Alexandrova, AS (Alexandrova, A. S.); Anania, MP (Anania, M. P.); Andreev, NE (Andreev, N. E.); Andriyash, I (Andriyash, I.); Artioli, M (Artioli, M.); Aschikhin, A (Aschikhin, A.); Audet, T (Audet, T.); Bacci, A (Bacci, A.); Barna, IF (Barna, I. F.); Bartocci, S (Bartocci, S.); Bayramian, A (Bayramian, A.); Beaton, A (Beaton, A.); Beck, A (Beck, A.); Bellaveglia, M (Bellaveglia, M.); Beluze, A (Beluze, A.); Bernhard, A (Bernhard, A.); Biagioni, A (Biagioni, A.); Bielawski, S (Bielawski, S.); Bisesto, FG (Bisesto, F. G.); Bonatto, A (Bonatto, A.); Boulton, L (Boulton, L.); Brandi, F (Brandi, F.); Brinkmann, R (Brinkmann, R.); Briquez, F (Briquez, F.); Brottier, F (Brottier, F.); Brundermann, E (Brundermann, E.); Buscher, M (Buscher, M.); Buonomo, B (Buonomo, B.); Bussmann, MH (Bussmann, M. H.); Bussolino, G (Bussolino, G.); Campana, P (Campana, P.); Cantarella, S (Cantarella, S.); Cassou, K (Cassou, K.); Chance, A (Chance, A.); Chen, M (Chen, M.); Chiadroni, E (Chiadroni, E.); Cianchi, A (Cianchi, A.); Cioeta, F (Cioeta, F.); Clarke, JA (Clarke, J. A.); Cole, JM (Cole, J. M.); Costa, G (Costa, G.); Couprie, ME (Couprie, M. -E.); Cowley, J (Cowley, J.); Croia, M (Croia, M.); Cros, B (Cros, B.); Crump, PA (Crump, P. A.); D'Arcy, R (D'Arcy, R.); Dattoli, G (Dattoli, G.); Del Dotto, A (Del Dotto, A.); Delerue, N (Delerue, N.); Del Franco, M (Del Franco, M.); Delinikolas, P (Delinikolas, P.); De Nicola, S (De Nicola, S.); Dias, JM (Dias, J. M.); Di Giovenale, D (Di Giovenale, D.); Diomede, M (Diomede, M.); Di Pasquale, E (Di Pasquale, E.); Di Pirro, G (Di Pirro, G.); Di Raddo, G (Di Raddo, G.); Dorda, U (Dorda, U.); Erlandson, AC (Erlandson, A. C.); Ertel, K (Ertel, K.); Esposito, A (Esposito, A.); Falcoz, F (Falcoz, F.); Falone, A (Falone, A.); Fedele, R (Fedele, R.); Pousa, AF (Ferran Pousa, A.); Ferrario, M (Ferrario, M.); Filippi, F (Filippi, F.); Fils, J (Fils, J.); Fiore, G (Fiore, G.); Fiorito, R (Fiorito, R.); Fonseca, RA (Fonseca, R. A.); Franzini, G (Franzini, G.); Galimberti, M (Galimberti, M.); Gallo, A (Gallo, A.); Galvin, TC (Galvin, T. C.); Ghaith, A (Ghaith, A.); Ghigo, A (Ghigo, A.); Giove, D (Giove, D.); Giribono, A (Giribono, A.); Gizzi, LA (Gizzi, L. A.); Gruner, FJ (Gruener, F. J.); Habib, AF (Habib, A. F.); Haefner, C (Haefner, C.); Heinemann, T (Heinemann, T.); Helm, A (Helm, A.); Hidding, B (Hidding, B.); Holzer, BJ (Holzer, B. J.); Hooker, SM (Hooker, S. M.); Hosokai, T (Hosokai, T.); Hubner, M (Huebner, M.); Ibison, M (Ibison, M.); Incremona, S (Incremona, S.); Irman, A (Irman, A.); Iungo, F (Iungo, F.); Jafarinia, FJ (Jafarinia, F. J.); Jakobsson, O (Jakobsson, O.); Jaroszynski, DA (Jaroszynski, D. A.); Jaster-Merz, S (Jaster-Merz, S.); Joshi, C (Joshi, C.); Kaluza, M (Kaluza, M.); Kando, M (Kando, M.); Karger, OS (Karger, O. S.); Karsch, S (Karsch, S.); Khazanov, E (Khazanov, E.); Khikhlukha, D (Khikhlukha, D.); Kirchen, M (Kirchen, M.); Kirwan, G (Kirwan, G.); Kitegi, C (Kitegi, C.); Knetsch, A (Knetsch, A.); Kocon, D (Kocon, D.); Koester, P (Koester, P.); Kononenko, OS (Kononenko, O. S.); Korn, G (Korn, G.); Kostyukov, I (Kostyukov, I.); Kruchinin, KO (Kruchinin, K. O.); Labate, L (Labate, L.); Le Blanc, C (Le Blanc, C.); Lechner, C (Lechner, C.); Lee, P (Lee, P.); Leemans, W (Leemans, W.); Lehrach, A (Lehrach, A.); Li, X (Li, X.); Li, Y (Li, Y.); Libov, V (Libov, V.); Lifschitz, A (Lifschitz, A.); Lindstrom, CA (Lindstrom, C. A.); Litvinenko, V (Litvinenko, V.); Lu, W (Lu, W.); Lundh, O (Lundh, O.); Maier, AR (Maier, A. R.); Malka, V (Malka, V.); Manahan, GG (Manahan, G. G.); Mangles, SPD (Mangles, S. P. D.); Marcelli, A (Marcelli, A.); Marchetti, B (Marchetti, B.); Marcouille, O (Marcouille, O.); Marocchino, A (Marocchino, A.); Marteau, F (Marteau, F.); de la Ossa, AM (Martinez de la Ossa, A.); Martins, JL (Martins, J. L.); Mason, PD (Mason, P. D.); Massimo, F (Massimo, F.); Mathieu, F (Mathieu, F.); Maynard, G (Maynard, G.); Mazzotta, Z (Mazzotta, Z.); Mironov, S (Mironov, S.); Molodozhentsev, AY (Molodozhentsev, A. Y.); Morante, S (Morante, S.); Mosnier, A (Mosnier, A.); Mostacci, A (Mostacci, A.); Muller, AS (Mueller, A. -S.); Murphy, CD (Murphy, C. D.); Najmudin, Z (Najmudin, Z.); Nghiem, PAP (Nghiem, P. A. P.); Nguyen, F (Nguyen, F.); Niknejadi, P (Niknejadi, P.); Nutter, A (Nutter, A.); Osterhoff, J (Osterhoff, J.); Espinos, DO (Oumbarek Espinos, D.); Paillard, JL (Paillard, J. -L.); Papadopoulos, DN (Papadopoulos, D. N.); Patrizi, B (Patrizi, B.); Pattathil, R (Pattathil, R.); Pellegrino, L (Pellegrino, L.); Petralia, A (Petralia, A.); Petrillo, V (Petrillo, V.); Piersanti, L (Piersanti, L.); Pocsai, MA (Pocsai, M. A.); Poder, K (Poder, K.); Pompili, R (Pompili, R.); Pribyl, L (Pribyl, L.); Pugacheva, D (Pugacheva, D.); Reagan, BA (Reagan, B. A.); Resta-Lopez, J (Resta-Lopez, J.); Ricci, R (Ricci, R.); Romeo, S (Romeo, S.); Conti, MR (Rossetti Conti, M.); Rossi, AR (Rossi, A. R.); Rossmanith, R (Rossmanith, R.); Rotundo, U (Rotundo, U.); Roussel, E (Roussel, E.); Sabbatini, L (Sabbatini, L.); Santangelo, P (Santangelo, P.); Sarri, G (Sarri, G.); Schaper, L (Schaper, L.); Scherkl, P (Scherkl, P.); Schramm, U (Schramm, U.); Schroeder, CB (Schroeder, C. B.); Scifo, J (Scifo, J.); Serafini, L (Serafini, L.); Sharma, G (Sharma, G.); Sheng, ZM (Sheng, Z. M.); Shpakov, V (Shpakov, V.); Siders, CW (Siders, C. W.); Silva, LO (Silva, L. O.); Silva, T (Silva, T.); Simon, C (Simon, C.); Simon-Boisson, C

(Simon-Boisson, C.); Sinha, U (Sinha, U.); Sistrunk, E (Sistrunk, E.); Specka, A (Specka, A.); Spinka, TM (Spinka, T. M.); Stecchi, A (Stecchi, A.); Stella, A (Stella, A.); Stellato, F (Stellato, F.); Streeter, MJV (Streeter, M. J. V.); Sutherland, A (Sutherland, A.); Svystun, EN (Svystun, E. N.); Symes, D (Symes, D.); Szwaj, C (Szwaj, C.); Tauscher, GE (Tauscher, G. E.); Terzani, D (Terzani, D.); Toci, G (Toci, G.); Tomassini, P (Tomassini, P.); Torres, R (Torres, R.); Ullmann, D (Ullmann, D.); Vaccarezza, C (Vaccarezza, C.); Valleau, M (Valleau, M.); Vannini, M (Vannini, M.); Vannozzi, A (Vannozzi, A.); Vescovi, S (Vescovi, S.); Vieira, JM (Vieira, J. M.); Villa, F (Villa, F.); Wahlstrom, CG (Wahlstrom, C. -G.); Walczak, R (Walczak, R.); Walker, PA (Walker, P. A.); Wang, K (Wang, K.); Welsch, A (Welsch, A.); Welsch, CP (Welsch, C. P.); Weng, SM (Weng, S. M.); Wiggins, SM (Wiggins, S. M.); Wolfenden, J (Wolfenden, J.); Xia, G (Xia, G.); Yabashi, M (Yabashi, M.); Zhang, H (Zhang, H.); Zhao, Y (Zhao, Y.); Zhu, J (Zhu, J.); Zigler, A (Zigler, A.)

Title: EuPRAXIA Conceptual Design Report

Source: EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS

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Issue: 24

Special Issue: SI

Pages: 3675-4284

DOI: 10.1140/epjst/e2020-000127-8

Document Type: Review

Published: DEC 2020

Abstract: This report presents the conceptual design of a new European research infrastructure EuPRAXIA. The concept has been established over the last four years in a unique collaboration of 41 laboratories within a Horizon 2020 design study funded by the European Union. EuPRAXIA is the first European project that develops a dedicated particle accelerator research infrastructure based on novel plasma acceleration concepts and laser technology. It focuses on the development of electron accelerators and underlying technologies, their user communities, and the exploitation of existing accelerator infrastructures in Europe. EuPRAXIA has involved, amongst others, the international laser community and industry to build links and bridges with accelerator science - through realising synergies, identifying disruptive ideas, innovating, and fostering knowledge exchange. The Eu-PRAXIA project aims at the construction of an innovative electron accelerator using laser- and electron-beam-driven plasma wakefield acceleration that offers a significant reduction in size and possible savings in cost over current state-of-the-art radiofrequency-based accelerators. The foreseen electron energy range of one to five gigaelectronvolts (GeV) and its performance goals will enable versatile applications in various domains, e.g. as a compact free-electron laser (FEL), compact sources for medical imaging and positron generation, table-top test beams for particle detectors, as well as deeply penetrating X-ray and gamma-ray sources for material testing. EuPRAXIA is designed to be the required stepping stone to possible future plasma-based facilities, such as linear colliders at the high-energy physics (HEP) energy frontier. Consistent with a high-confidence approach, the project includes measures to retire risk by establishing scaled technology demonstrators. This report includes preliminary models for project implementation, cost and schedule that would allow operation of the full Eu-PRAXIA facility within 8-10 years.

Accession Number: WOS:000602891800001

Record 4 of 43

By: Astapenko, VA (Astapenko, V. A.); Rosmej, FB (Rosmej, F. B.); Lisitsa, VS (Lisitsa, V. S.); Khramov, ES (Khramov, E. S.)

Title: Thomson scattering in plasmas: Theory generalization for ultrashort laser pulse effects

Source: PHYSICS OF PLASMAS

Volume: 27

Issue: 8

Article Number: 083301

DOI: 10.1063/5.0016064

Document Type: Article

Published: AUG 2020

Abstract: The standard approach to calculate the Thomson scattering probability is reconsidered for the case of ultrashort incident laser pulses (USLPs). We established a new model for the interaction of USLP with plasmas that is based on Fermi's equivalent photon conception to calculate the spectral-angular differential Thomson scattering probability. The simulations demonstrate that the scattering probability for USLP is a non-monotonic function of

pulse duration in contrast to the standard long-pulse model showing linear dependence. An analytical approach is developed to study the nonlinear behavior of the scattering probability as a function of pulse duration and other parameters.

Accession Number: WOS:000559322600001

Record 5 of 43

By: Astapenko, VA (Astapenko, Valeriy Alexandrovich); Rosmej, FB (Rosmej, Frank Bernhard); Khramov, ES (Khramov, Egor Sergeevich)

Title: Time Dependence of Ultra-Short Laser Pulses Scattering by Atom in High Frequency Limit

Source: ATOMS

Volume: 8

Issue: 3

Article Number: 41

DOI: 10.3390/atoms8030041

Document Type: Article

Published: SEP 2020

Abstract: We investigated theoretically the time dependence of ultra-short laser pulse scattering by an atom at the high-frequency limit for the spectral and total probability of the process using new expression which we derived in this paper. We established that the time dependence of spectral scattering is presented by the curve with the maximum for sufficiently large detuning of scattering frequency from the carrier frequency of the pulse, while the total scattering probability is always the monotonically increasing function of time. We also studied the dependence of scattering probability on pulse duration at the long-time limit. It was shown that, at the long-pulse limit, the scattering probability is a linear function of pulse duration, while in the opposite case, it is a function with maximum. The position of this maximum is determined by the detuning of the scattering frequency from the carrier frequency of the pulse.

Accession Number: WOS:000578217400001

Record 6 of 43

By: Bardon, M (Bardon, M.); Moreau, JG (Moreau, J. G.); Romagnani, L (Romagnani, L.); Rousseaux, C (Rousseaux, C.); Ferri, M (Ferri, M.); Lefevre, F (Lefevre, F.); Lantuejoul, I (Lantuejoul, I); Etchessahar, B (Etchessahar, B.); Bazzoli, S (Bazzoli, S.); Farcage, D (Farcage, D.); Maskrot, H (Maskrot, H.); Serres, F (Serres, F.); Chevrot, M (Chevrot, M.); Loyez, E (Loyez, E.); Veuillot, E (Veuillot, E.); Cayzac, W (Cayzac, W.); Vauzour, B (Vauzour, B.); Boutoux, G (Boutoux, G.); Sary, G (Sary, G.); La Fontaine, AC (La Fontaine, A. Compant); Gremillet, L (Gremillet, L.); Poye, A (Poye, A.); Humieres, ED (Humieres, E. D.); Tikhonchuk, VT (Tikhonchuk, V. T.)

Title: Physics of chromatic focusing, post-acceleration and bunching of laser-driven proton beams in helical coil targets

Source: PLASMA PHYSICS AND CONTROLLED FUSION

Volume: 62

Issue: 12

Article Number: 125019

DOI: 10.1088/1361-6587/abbe35

Document Type: Article

Published: DEC 2020

Abstract: To increase the fluence and maximum energy of laser-driven proton beams in view of potential applications such as isochoric heating of dense material or isotope production, it has been proposed to attach a helical coil normally to the rear side of the irradiated target. By driving the target discharge current pulse through the coil, this scheme allows a fraction of the proton beam to be selected in energy and to be focused and further accelerated. The previously published results are extended to higher laser pulse energies and longer coils. This leads to an increased number of guided protons and the generation of several proton bunches. Large scale particle-in-cell simulations with realistic boundary conditions reproduce well the experimental results. A detailed analysis of the numerical simulations and an analytical model demonstrate that the current propagation along a helical wire differs from the one of a linear or folded wire. In a helical wire, the current pulse is subject to velocity dispersion, which results in progressive modification of its spatial profile, and so in proton bunch trapping and focusing.

Accession Number: WOS:000584946500001

Record 7 of 43

By: Baton, SD (Baton, S. D.); Colaitis, A (Colaitis, A.); Rousseaux, C (Rousseaux, C.); Boutoux, G (Boutoux, G.); Brygoo, S (Brygoo, S.); Jacquet, L (Jacquet, L.); Koenig, M (Koenig, M.); Batani, D (Batani, D.); Casner, A (Casner, A.); Le Bel, E (Le Bel, E.); Raffestin, D (Raffestin, D.); Tentori, A (Tentori, A.); Tikhonchuk, V (Tikhonchuk, V); Trela, J (Trela, J.); Reverdin, C (Reverdin, C.); Le-Deroff, L (Le-Deroff, L.); Theobald, W (Theobald, W.); Cristoforetti, G (Cristoforetti, G.); Gizzi, LA (Gizzi, L. A.); Koester, P (Koester, P.); Labate, L (Labate, L.); Shigemori, K (Shigemori, K.)

Title: Preliminary results from the LMJ-PETAL experiment on hot electrons characterization in the context of shock ignition

Source: HIGH ENERGY DENSITY PHYSICS

Volume: 36

Article Number: 100796

DOI: 10.1016/j.hedp.2020.100796

Document Type: Article; Proceedings Paper

Published: AUG 2020

Abstract: In the Shock Ignition scheme, the spike pulse intensity is well above the threshold of parametric instabilities, which produce a considerable amount of hot electrons that could be beneficial or detrimental to the ignition. To study their impact, an experiment has been carried out on the LMJ-PETAL facility with a goal to generate a strong shock inside a plastic layer under plasma conditions relevant to full-scale shock ignition targets. To evaluate the effect of hot electrons on the shock characteristics, laser temporal smoothing was either switched on or off, which in turns varies the quantity of hot electrons being generated. In this paper, we present preliminary results obtained during the experiment dedicated to the hot electron characterization. We present also calculations for the second part of the experiment, scheduled in 2020 and focused on the shock characterization.

Conference Title: 11th International Conference on Inertial Fusion Science and Applications (IFSA)

Conference Date: SEP 22-27, 2019

Conference Location: Osaka, JAPAN

Accession Number: WOS:000577443700014

Record 8 of 43

By: Burdonov, K (Burdonov, K.); Revet, G (Revet, G.); Bonito, R (Bonito, R.); Argiroffi, C (Argiroffi, C.); Beard, J (Beard, J.); Bolanos, S (Bolanos, S.); Cerchez, M (Cerchez, M.); Chen, SN (Chen, S. N.); Ciardi, A (Ciardi, A.); Espinosa, G (Espinosa, G.); Filippov, E (Filippov, E.); Pikuz, S (Pikuz, S.); Rodriguez, R (Rodriguez, R.); Smid, M (Smid, M.); Starodubtsev, M (Starodubtsev, M.); Willi, O (Willi, O.); Orlando, S (Orlando, S.); Fuchs, J (Fuchs, J.)

Title: Laboratory evidence for an asymmetric accretion structure upon slanted matter impact in young stars

Source: ASTRONOMY & ASTROPHYSICS

Volume: 642

Article Number: A38

DOI: 10.1051/0004-6361/202038189

Document Type: Article

Published: OCT 7 2020

Abstract: Aims. Investigating the process of matter accretion onto forming stars through scaled experiments in the laboratory is important in order to better understand star and planetary system formation and evolution. Such experiments can indeed complement observations by providing access to the processes with spatial and temporal resolution. A previous investigation revealed the existence of a two-component stream: a hot shell surrounding a cooler inner stream. The shell was formed by matter laterally ejected upon impact and refocused by the local magnetic field. That laboratory investigation was limited to normal incidence impacts. However, in young stellar objects, the complex structure of magnetic fields causes variability of the incident angles of the accretion columns. This led us to undertake an investigation, using laboratory plasmas, of the consequence of having a slanted accretion impacting a young star.Methods. Here, we used high power laser interactions and strong magnetic field generation in the laboratory, complemented by numerical simulations, to study the asymmetry induced upon accretion structures when columns of matter impact the surface of young stars with an oblique angle.Results. Compared to the scenario

where matter accretes perpendicularly to the star surface, we observe a strongly asymmetric plasma structure, strong lateral ejecta of matter, poor confinement of the accreted material, and reduced heating compared to the normal incidence case. Thus, slanted accretion is a configuration that seems to be capable of inducing perturbations of the chromosphere and hence possibly influencing the level of activity of the corona.

Accession Number: WOS:000581809400001

Record 9 of 43

By: Courtois, C (Courtois, C.); La Fontaine, AC (La Fontaine, A. Compant); Bonnet, T (Bonnet, T.); Gobet, F (Gobet, F.); Hannachi, F (Hannachi, F.); Marques, JR (Marques, J. R.); Tarisien, M (Tarisien, M.); Versteegen, M (Versteegen, M.); Vinci, T (Vinci, T.)

Title: Effect of plasma hydrodynamics on laser-produced bremsstrahlung MeV photon dose

Source: PHYSICS OF PLASMAS

Volume: 27

Issue: 11

Article Number: 113108

DOI: 10.1063/5.0019816

Document Type: Article

Published: NOV 2020

Abstract: We detail a laser plasma experiment aimed at enhancing laser to MeV electron energy coupling and then the x-ray dose produced when a short pulse laser propagates through a long preformed plasma. This study can be of interest not only for radiography of high areal mass objects requiring large doses but also for radiation safety of large scale laser facilities such as LMJ or NIF able to produce long preformed plasmas through which a short pulse laser can propagate. A low-intensity (similar to 10(14) W/cm(2)) ns beam explodes a thin foil deposited on a high-Z solid target to generate an underdense plasma. An intense (>10(18) W/cm(2)) and short (<1 ps) laser pulse then (with an adjustable delay <delta>t) interacts with this plasma and produces multi-MeV electrons. These high-energy electrons are converted into a bremsstrahlung emission of MeV x-ray photons in the high-Z target. In a second target design, a vacuum gap between the foil and the conversion target is also tested to let the plasma expand on both sides of the foil, increasing the interaction length even more. Results show how the vaporization of the foil produces an underdense plasma over several hundreds of micrometers which significantly enhances x-ray doses, with harder x-ray spectra obtained at an optimum delay, delta t, until the short pulse laser is affected by refraction. Increasing the interaction length with gap targets is at the origin of a much more complex plasma hydrodynamics involving on-axis plasma stagnation which delays the optimum time for the maximum x-ray dose production.

Accession Number: WOS:000595728700001

Record 10 of 43

By: de Resseguier, T (de Resseguier, T.); Prudhomme, G (Prudhomme, G.); Roland, C (Roland, C.); Sollier, A (Sollier, A.); Lescoute, E (Lescoute, E.); Loison, D (Loison, D.); Brambrink, E (Brambrink, E.)

Edited by: Lane, JMD (Lane, JMD); Germann, TC (Germann, TC); Armstrong, MR (Armstrong, MR); Wixom, R (Wixom, R); Damm, D (Damm, D); Zaug, J (Zaug, J)

Title: Material Ejection from Surface Defects in Laser Shock-Loaded Metallic Foils

Source: SHOCK COMPRESSION OF CONDENSED MATTER - 2019

Book Series Title: AIP Conference Proceedings

Volume: 2272

Article Number: 120023

DOI: 10.1063/12.0000817

Document Type: Proceedings Paper

Published: 2020

Abstract: Ejecta production upon the breakout of a shock wave at a rough surface has been the subject of extensive research work for about six decades. For a few years, we have investigated how laser-driven shocks could provide original, complementary data on this issue, over specific ranges of very high loading pressures, very short pulse durations (ns-order), small dimensions (tens of mu m) and extremely high strain rates. Here, selected results are presented in two metals (Cu and Sn), with either single triangular grooves of controlled depths and sharp angles or periodic, quasi-sinusoidal perturbations of different amplitudes. Experimental data combine measurements of jet

velocities, using both optical shadowgraphy and Photonic Doppler Velocimetry, with ultra-fast laser based X-ray radiography to estimate mass ejection. Results are briefly compared with the predictions of analytical models and data obtained by other teams from explosive-based experiments, at lower pressure and over much larger temporal and spatial scales. Thus, both interest and limitations of laser shocks for this particular field of shock physics are illustrated and discussed.

Conference Title: 21st Biennial American-Physical-Society -Topical-Group Conference on Shock Compression of Condensed Matter (SCCM)

Conference Date: JUN 16-21, 2019

Conference Location: Portland, OR

Sponsor(s): Amer Phys Soc Top Grp

Accession Number: WOS:000616190800037

Record 11 of 43

By: Depierreux, S (Depierreux, S.); Neuville, C (Neuville, C.); Tassin, V (Tassin, V); Monteil, MC (Monteil, M-C); Masson-Laborde, PE (Masson-Laborde, P-E); Baccou, C (Baccou, C.); Fremerye, P (Fremerye, P.); Philippe, F (Philippe, F.); Seytor, P (Seytor, P.); Teychenne, D (Teychenne, D.); Katz, J (Katz, J.); Bahr, R (Bahr, R.); Casanova, M (Casanova, M.); Borisenko, N (Borisenko, N.); Borisenko, L (Borisenko, L.); Orekhov, A (Orekhov, A.); Colaitis, A (Colaitis, A.); Debayle, A (Debayle, A.); Duchateau, G (Duchateau, G.); Heron, A (Heron, A.); Huller, S (Huller, S.); Loiseau, P (Loiseau, P.); Nicolai, P (Nicolai, P.); Riconda, C (Riconda, C.); Tran, G (Tran, G.); Stoeckl, C (Stoeckl, C.); Seka, W (Seka, W.); Tikhonchuk, V (Tikhonchuk, V); Pesme, D (Pesme, D.); Labaune, C (Labaune, C.)

Title: Experimental investigation of the collective stimulated Brillouin and Raman scattering of multiple laser beams in inertial confinement fusion experiments

Source: PLASMA PHYSICS AND CONTROLLED FUSION

Volume: 62

Issue: 1

Article Number: 014024

DOI: 10.1088/1361-6587/ab5acd

Document Type: Article

Published: JAN 2020

Abstract: The direct and indirect drive schemes for inertial confinement fusion (ICF) make use of a large number of laser beams arranged in a symmetric angular distribution. The preferential decay geometry of the three waves resonant couplings, mainly responsible for backscattered light in single beam experiments, may then be deeply modified in the region of crossing beams where collective laser plasma instabilities could develop. Such instabilities can occur for laser beams having a common symmetry axis along which they drive a common daughter wave. The collective coupling results in an increase of the growth gain with the increase of the number of interacting beams and produce energy losses in new backward directions. We have taken advantage of the multiple beams of the Omega laser facility and of its large battery of diagnostics to study the physics related to this multiple beams interaction in the regimes of high temperature plasmas relevant of the direct and indirect drive schemes to ICF. Experiments performed in a planar open geometry have evidenced the large amplification of stimulated Raman scattering (SRS) electromagnetic waves almost transverse to the density gradient as theoretically predicted 40 years ago. This was achieved in long scale-length high-temperature plasmas in which two beams couple to the same scattered electromagnetic wave further demonstrating this multiple-beams collective SRS interaction. The collective nature of the coupling and the amplification at large angles from the density gradient increase the global SRS losses and produce light scattered in novel directions out of the planes of incidence of the beams. Indirect drive experiments were performed in rugby ball shaped Hohlraum irradiated by 40 beams. Large instantaneous (peak reflectivity >30%) Brillouin sidescattering was evidenced to originate from the collective Brillouin amplification of a shared ion acoustic wave driven along the Hohlraum axis by a cone of 10 beams. In this paper, the scattering geometry is detailed for the two types of collective instabilities showing that they produce light scattered in novel very precise directions located far from the original aperture of the beams where the diagnostics are usually set-up. This scattered light could be measured on Omega thanks to the flexibility of the facility. Key features of the light scattered by collective instabilities are identified that would allow to recognize their signatures in more complex, less diagnosed experiments.

Accession Number: WOS:000542645100006

Record 12 of 43

By: Deschaud, B (Deschaud, B.); Peyrusse, O (Peyrusse, O.); Rosmej, FB (Rosmej, F. B.)

Title: Simulation of XFEL induced fluorescence spectra of hollow ions and studies of dense plasma effects

Source: PHYSICS OF PLASMAS

Volume: 27

Issue: 6

Article Number: 063303

DOI: 10.1063/5.0011193

Document Type: Article

Published: JUN 2020

Abstract: X-ray free electron laser (XFEL) interaction with solids has been simulated to resolve simultaneously variable XFEL photon energy and x-ray spectral distribution of the target emission (2D-maps). It is discovered that the highly transient charge state distribution exhibits a characteristic target response due to the action of the sharply rising radiation field. Finally, we identify advantageous features for studies of dense plasma effects of two K-shell vacancy hollow ion x-ray emission excited via resonance excitation. These features and characteristics permit the global study of dense plasma effects via the simulation of the time-integrated joint distribution of pumped and fluorescence energies. It is shown that the simulation of these specific 2D-maps offers a global vision of the complex interplay between different processes or phenomena such as photoionization, resonance excitation, or ionization potential depression.

Accession Number: WOS:000542597100001

Record 13 of 43

By: Druon, F (Druon, Frederic); Genevrier, K (Genevrier, Kevin); Georges, P (Georges, Patrick); Papadopoulos, DN (Papadopoulos, Dimitris N.)

Title: Comparison of multi-pass and regenerative strategies for energetic high-gain amplifiers based on Yb:CaF2

Source: OPTICS LETTERS

Volume: 45

Issue: 16

Pages: 4408-4411

DOI: 10.1364/OL.398612

Document Type: Article

Published: AUG 15 2020

Abstract: Yb-doped materials, due to their high saturation fluence and consequently their low gain, represent a challenging choice for high-energy amplifiers. In this Letter, we study two original amplifier designs adapted to a large number of passes capable of operating in the 100 mJ energy range at repetition rates up to 100 Hz using Yb:CaF2 crystals as active media. Amplification geometries based on double-head active-mirror configurations are presented. We confront two alternative strategies suitable for amplification of large beams: regenerative and geometrical multi-pass amplifiers. This Letter consists of finding the pivot point, allowing us to discriminate the specific interest of each strategy. We present compensation methods of the thermal lens adapted to each amplifier configuration with and without cavity, and we demonstrate that despite similar laser heads and pumping conditions, the thermal lens impacts differently the optimal performance for multi-pass or regenerative strategy. We perform amplification up to 66 mJ pulses at 10 Hz with the regenerative amplifier and 52 mJ at 100 Hz with the multi-pass amplifier. (C) 2020 Optical Society of America

Accession Number: WOS:000564903500011

PubMed ID: 32796970

Record 14 of 43

By: Filippov, ED (Filippov, E. D.); Skobelev, IY (Skobelev, I. Yu); Revet, G (Revet, G.); Chen, SN (Chen, S. N.); Fuchs, J (Fuchs, J.); Pikuz, SA (Pikuz, S. A.)

Book Group Author(s): IOP

Title: Analyzing x-ray emission of target impurities to determine the parameters of recombining laser plasma

Source: XXXIV INTERNATIONAL CONFERENCE ON INTERACTION OF INTENSE ENERGY FLUXES WITH MATTER

Book Series Title: Journal of Physics Conference Series

Volume: 1556

Article Number: 012006

DOI: 10.1088/1742-6596/1556/1/012006

Document Type: Proceedings Paper

Published: 2020

Abstract: In this work, the possibility of the implementation of impurities in the compositions of solid thick targets irradiated by intense lasers is discussed in order to solve problems of optically-thick plasma diagnostics. Calculations were conducted for relative intensities of oxygen resonance lines (H-like-3p-1s, 4p-1s, 5p-1s, 6p-1s, 7p-1s transitions) in a recombination quasi-stationary model to obtain plasma parameters. In the experiment with 0.6 ns, 40 J laser pulses focused to 600 mu m focal spot at solid polyvinylidene chloride target the parameters of plasma jet stopped by solid oxidized Teflon obstacle were studied by means of spatially-resolved x-ray spectroscopy.

Conference Title: 34th International Conference on Interaction of Intense Energy Fluxes with Matter (ELBRUS)

Conference Date: MAR 01-06, 2019

Conference Location: Terskol, RUSSIA

Sponsor(s): Russian Acad Sci

Accession Number: WOS:000619216000007

Record 15 of 43

By: Hernandez, JA (Hernandez, J-A); Morard, G (Morard, G.); Guarguaglini, M (Guarguaglini, M.); Alonso-Mori, R (Alonso-Mori, R.); Benuzzi-Mounaix, A (Benuzzi-Mounaix, A.); Bolis, R (Bolis, R.); Fiquet, G (Fiquet, G.); Galtier, E (Galtier, E.); Gleason, AE (Gleason, A. E.); Glenzer, S (Glenzer, S.); Guyot, F (Guyot, F.); Ko, B (Ko, B.); Lee, HJ (Lee, H. J.); Mao, WL (Mao, W. L.); Nagler, B (Nagler, B.); Ozaki, N (Ozaki, N.); Schuster, AK (Schuster, A. K.); Shim, SH (Shim, S. H.); Vinci, T (Vinci, T.); Ravasio, A (Ravasio, A.)

Title: Direct Observation of Shock-Induced Disordering of Enstatite Below the Melting Temperature

Source: GEOPHYSICAL RESEARCH LETTERS

Volume: 47

Issue: 15

Article Number: e2020GL088887

DOI: 10.1029/2020GL088887

Document Type: Article

Published: AUG 16 2020

Abstract: We report in situ structural measurements of shock-compressed single crystal orthoenstatite up to 337 55 GPa on the Hugoniot, obtained by coupling ultrafast X-ray diffraction to laser-driven shock compression. Shock compression induces a disordering of the crystalline structure evidenced by the appearance of a diffuse X-ray diffraction signal at nanosecond timescales at 80 13 GPa on the Hugoniot, well below the equilibrium melting pressure (>170 GPa). The formation of bridgmanite and post-perovskite have been indirectly reported in microsecond-scale plate-impact experiments. Therefore, we interpret the high-pressure disordered state we observed at nanosecond scale as an intermediate structure from which bridgmanite and post-perovskite crystallize at longer timescales. This evidence of a disordered structure of MgSiO3 on the Hugoniot indicates that the degree of polymerization of silicates is a key parameter to constrain the actual thermodynamics of shocks in natural environments.

Plain Language Summary The study of silicate materials at extreme pressures and temperatures provides insight on the evolution of planetary bodies evolution during solar system formation. During their accretion, rocky bodies have undergone several collisions and possibly planetary impacts that have transformed their minerals. The microscopic processes occurring during such events are not fully understood. In this study, we used high-power lasers to generate shock waves into MgSiO3 enstatite crystals, creating conditions comparable to the deepest part of the early Earth mantle and large planetary impacts. During the shock wave transit, within few nanoseconds, we probed the structure of shocked enstatite between 14 3 and 337 55 GPa using intense X-ray pulses from Linac Coherent Light Source X-ray free electron laser facility. We found that, when shocked between 80 +/- 13 GPa and the conditions of equilibrium melting (above 170 GPa), enstatite transforms into a disordered structure instead of forming bridgmanite

or post-perovskite-the expected equilibrium phases. This disordered structure is similar to MgSiO3 glass or liquid and is observed up to 337 +/- 55 GPa. This study provides the first direct measurement of shocked enstatite structure and suggests that the observed disordered state is an intermediate phase on the transformation pathway of bridgmanite in natural impacts.

Accession Number: WOS:000560376100069

Record 16 of 43

By: Hinkel, DE (Hinkel, D. E.); Doppner, T (Doeppner, T.); Masse, LP (Masse, L. P.); Widmann, K (Widmann, K.); Divol, L (Divol, L.); Bachmann, B (Bachmann, B.); Hopkins, LFB (Hopkins, L. F. Berzak); LePape, S (LePape, S.); Weber, CR (Weber, C. R.); MacLaren, SA (MacLaren, S. A.); Zylstra, AB (Zylstra, A. B.); Ralph, JE (Ralph, J. E.); Benedetti, LR (Benedetti, L. R.); Moore, AS (Moore, A. S.); Thomas, CA (Thomas, C. A.); Casey, DT (Casey, D. T.); Smalyuk, VA (Smalyuk, V. A.); Robey, HF (Robey, H. F.); Celliers, PM (Celliers, P. M.); MacDonald, MJ (MacDonald, M. J.); Krauland, CM (Krauland, C. M.); Thorn, DB (Thorn, D. B.); Rosen, MD (Rosen, M. D.); Patel, PK (Patel, P. K.); MacGowan, BJ (MacGowan, B. J.); Schneider, MB (Schneider, M. B.); Clark, DS (Clark, D. S.); Pak, AE (Pak, A. E.); Edwards, MJ (Edwards, M. J.); Landen, OL (Landen, O. L.); Callahan, DA (Callahan, D. A.); Hurricane, OA (Hurricane, O. A.)

Title: Optimization of capsule dopant levels to improve fuel areal density

Source: HIGH ENERGY DENSITY PHYSICS

Volume: 37

Article Number: 100884

DOI: 10.1016/j.hedp.2020.100884

Document Type: Article

Published: NOV 2020

Abstract: Fuel areal density (rho R) of all recent indirectly driven, cryogenically-layered DT implosions at the National Ignition Facility (NIF) show a deficit when compared to simulations. Across all designs, experimental rho R is lower than in 1D simulations without alpha energy or momentum deposition. A series of layered implosions were fielded at NIF to assess the impact of fuel-ablator instability, as caused by M-band preheat, on lower-than expected fuel areal density. The stability of the fuel-ablator interface is modified by varying the Atwood number through a series of experiments where capsules were fielded with different ablator dopant levels. A key finding of this campaign is that optimization of 1D physics (shock timing) dominates stabilization of the fuel-ablator interface.

Accession Number: WOS:000596566500001

Record 17 of 43

By: Le Pape, S (Le Pape, S.); Divol, L (Divol, L.); Huser, G (Huser, G.); Katz, J (Katz, J.); Kemp, A (Kemp, A.); Ross, JS (Ross, J. S.); Wallace, R (Wallace, R.); Wilks, S (Wilks, S.)

Title: Plasma Collision in a Gas Atmosphere

Source: PHYSICAL REVIEW LETTERS

Volume: 124

Issue: 2

Article Number: 025003

DOI: 10.1103/PhysRevLett.124.025003

Document Type: Article

Published: JAN 15 2020

Abstract: We present a study on the impact of a gas atmosphere on the collision of two counterpropagating plasmas (gold and carbon). Imaging optical Thomson scattering data of the plasma collision with and without helium in between have been obtained at the Omega laser facility. Without gas, we observed large scale mixing of colliding gold and carbon ions. Once ambient helium is added, the two plasmas remain separated. The difference in ionic temperature is consistent with a reduction of the maximum Mach number of the flow from M = 7 to M = 4. It results in a reduction of a factor similar to 10 of the counterstreaming ion-ion mean free path. By adding a low-density ambient gas, it is possible to control the collision of two high-velocity counterstreaming plasma, transitioning from an interpenetrating regime to a regime in agreement with a hydrodynamic description.

Accession Number: WOS:000507541700002

PubMed ID: 32004037

Record 18 of 43

By: Lei, Z (Lei, Z.); Zhao, ZH (Zhao, Z. H.); Yao, WP (Yao, W. P.); Xie, Y (Xie, Y.); Jiao, JL (Jiao, J. L.); Zhou, CT (Zhou, C. T.); Zhu, SP (Zhu, S. P.); He, XT (He, X. T.); Qiao, B (Qiao, B.)

Title: Numerical study of the knot structure in scaled protostellar jets by laboratory laser-driven plasmas

Source: PLASMA PHYSICS AND CONTROLLED FUSION

Volume: 62

Issue: 9

Article Number: 095020

DOI: 10.1088/1361-6587/aba4be

Document Type: Article

Published: SEP 2020

Abstract: Knot structures exist ubiquitously in young stellar object (YSO) jets, which are a key tracer in astronomical observation to estimate the jet properties and eventually the YSO's parameters (age, size, mass and so on). Using 2D and 3D radiation magnetohydrodynamic simulations of the laser-produced plasma jets in external poloidal magnetic fields, we present a systematic analysis on the formation mechanism and characteristics of knot structures in collimated jets. The simulations demonstrate that the multi-knot pattern in jets can be formed by the oblique internal shocks in only single ejection. It is found that the distance L between different knots in jet is determined by the ratio of its thermal pressure to magnetic pressure beta as L alpha D beta(1/2), where D is the jet transverse diameter. There is a factor about 0.4-0.6 between the knot and jet velocities. And radiation cooling effect can alleviate the intensity of the external magnetic field required for collimating jets. These findings are scaled to the conditions of YSO jets, and can be applied to explore some characteristics of the astrophysical jets.

Accession Number: WOS:000561503200001

Record 19 of 43

By: Lelasseux, V (Lelasseux, V.); Fuchs, J (Fuchs, J.)

Title: Erratum: Modelling energy deposition in TR image plate detectors for various ion types (vol 15, P04002, 2020)

Source: JOURNAL OF INSTRUMENTATION

Volume: 15

Issue: 11

Article Number: E11002

Document Type: Correction

Published: NOV 2020

Accession Number: WOS:000595652200001

Record 20 of 43

By: Lelasseux, V (Lelasseux, V.); Fuchs, J (Fuchs, J.)

Title: Modelling energy deposition in TR image plate detectors for various ion types

Source: JOURNAL OF INSTRUMENTATION

Volume: 15

Issue: 4

Article Number: P04002

DOI: 10.1088/1748-0221/15/04/P04002

Document Type: Article

Published: APR 2020

Abstract: This paper presents an empirical model for the response of Fuji BAS-TR image plate (IP) for various type of energetic ions. This model has been obtained using the works of Bonnet et al. [Rev. Sci. Instrum. 84 (2013) 103510] and Birks [Proc. Phys. Soc. A 64 (1951) 874] and has been confronted to several experimental sets of data, showing its validity and its limits for high Z ions.

Accession Number: WOS:000534740000002

Record 21 of 43

By: Li, LZ (Li, Ling-Zhi); Yue, LH (Yue, Li-Hui); Zhang, ZM (Zhang, Zhi-Min); Zhao, J (Zhao, Jing); Ren, LM (Ren, Lei-Ming); Wang, HJ (Wang, Hong-Jie); Li, L (Li, Lu)

Title: Comparison of mRNA Expression of P2X Receptor Subtypes in Different Arterial Tissues of Rats

Source: BIOCHEMICAL GENETICS

Volume: 58

Issue: 5

Pages: 677-690

DOI: 10.1007/s10528-020-09968-9

Early Access Date: MAY 2020

Document Type: Article

Published: OCT 2020

Abstract: This study aims to compare the expression of P2X receptor subtype mRNA in different arterial tissues of rats. After the rats were sacrificed, the internal carotid, pulmonary, thoracic aorta, mesenteric and caudal arteries were dissected out. Then, the P2X receptor mRNA expression in different blood vessels was detected by reverse transcription-polymerase chain reaction (RT-PCR) and real-time quantitative polymerase chain reaction. The P2X1, P2X4 and P2X7 receptor mRNA amplification products revealed specific bands of the same size as the amplified target fragment in their respective lanes, while the P2X2, P2X3, P2X5 and P2X6 receptor mRNA amplification products did not reveal significant specific bands in their respective lanes by RT-PCR. Based on the P2X1 receptor mRNA expression of the mesenteric artery, there were no significant differences in the internal carotid, pulmonary and thoracic aorta (0.64 +/- 0.07, 0.17 +/- 0.11 and 1.49 +/- 0.65, respectively). However, the P2X1 receptor mRNA expression level in the caudal artery significantly increased (11.06 +/- 1.99, $P < 0.01$). Furthermore, there was no difference in P2X4 receptor mRNA expression among these five blood vessels ($P > 0.05$). The P2X7 receptor mRNA expression level was significantly different: pulmonary artery < tail artery = thoracic aorta < internal carotid artery < mesenteric artery. The relative P2X1 receptor mRNA expression in the caudal artery was observed to be elevated when compared to that of the internal carotid, pulmonary and thoracic aorta as well as the mesenteric arteries. The P2X7 receptor mRNA expression level is pulmonary artery < caudal artery = thoracic aorta < internal carotid artery < mesenteric artery. P2X4 receptor mRNA expression was not significantly different among these five blood vessels.

Accession Number: WOS:000531112900001

PubMed ID: 32385670

Record 22 of 43

By: Li, X (Li, X.); Rosmej, FB (Rosmej, F. B.)

Title: Analytical approach to level delocalization and line shifts in finite temperature dense plasmas

Source: PHYSICS LETTERS A

Volume: 384

Issue: 25

Article Number: 126478

DOI: 10.1016/j.physleta.2020.126478

Document Type: Article

Published: SEP 7 2020

Abstract: X-ray line shifts and delocalization of levels of He-like ions are studied within the framework of the self-consistent multi-configuration relativistic finite temperature ion sphere model. A set of analytical equations for an N-electron bound atomic system to determine X-ray line shifts and level delocalization is proposed that provides very good agreement with numerical calculations, newly high precision line shift measurements of the 1s3p P-1(1) - 1s(2) S-1(0) He-beta transition in Cl15+ and the 1s3p P-1(1)-level delocalization in Al11+. We re-analyzed the recently claimed discrepancy between the predictions from the ion sphere model, analytical approaches and the data. The analytical b-potential approach that imitates lattice effects via a perturbation of the free electron distribution in the in sphere is developed and contrasted with currently unexplained line shift measurements of the 1s2p P-1(1) - 1s(2) S-1(0) He-alpha transition in Al11+.

Accession Number: WOS:000551342500010

Record 23 of 43

By: Mabey, P (Mabey, P.); Albertazzi, B (Albertazzi, B.); Rigon, G (Rigon, G.); Marques, JR (Marques, J. -R.); Palmer, CAJ (Palmer, C. A. J.); Topp-Mugglestone, J (Topp-Mugglestone, J.); Perez-Martin, P (Perez-Martin, P.); Kroll, F (Kroll, F.); Brack, FE (Brack, F. -E.); Cowan, TE (Cowan, T. E.); Schramm, U (Schramm, U.); Falk, K (Falk, K.); Gregori, G (Gregori, G.); Falize, E (Falize, E.); Koenig, M (Koenig, M.)

Title: Laboratory Study of Bilateral Supernova Remnants and Continuous MHD Shocks

Source: ASTROPHYSICAL JOURNAL

Volume: 896

Issue: 2

Article Number: 167

DOI: 10.3847/1538-4357/ab92a4

Document Type: Article

Published: JUN 2020

Abstract: Many supernova remnants (SNRs), such as G296.5+10.0, exhibit an axisymmetric or barrel shape. Such morphologies have previously been linked to the direction of the Galactic magnetic field, although this remains uncertain. These SNRs generate magnetohydrodynamic shocks in the interstellar medium, modifying its physical and chemical properties. The ability to study these shocks through observations is difficult due to the small spatial scales involved. In order to answer these questions, we perform a scaled laboratory experiment in which a laser-generated blast wave expands under the influence of a uniform magnetic field. The blast wave exhibits a spheroidal shape, whose major axis is aligned with the magnetic field, in addition to a more continuous shock front. The implications of our results are discussed in the context of astrophysical systems.

Accession Number: WOS:000545711900001

Record 24 of 43

By: Mabey, P (Mabey, Paul); Michel, T (Michel, Thibault); Albertazzi, B (Albertazzi, Bruno); Falize, E (Falize, Emeric); Charpentier, N (Charpentier, Nicolas); Koenig, M (Koenig, Michel)

Title: Calculating the temperature of strongly radiative shocks

Source: PHYSICS OF PLASMAS

Volume: 27

Issue: 8

Article Number: 083302

DOI: 10.1063/5.0008301

Document Type: Article

Published: AUG 2020

Abstract: A new method of calculating the temperature of strongly radiative shocks (Mihalas number of order unity or lower) is proposed. By including ionization, radiative energy, and radiative flux terms in the Rankine-Hugoniot jump conditions across the shock front, a new, self-consistent method of calculating the temperature of radiative shocks is developed. The method is compared to those used to calculate temperature in previous studies using similar methods, including those which partially included radiative and/or ionization effects. The method is also compared to experimental data, taken from the literature, as well as the SESAME equation of state tables and radiative hydrodynamics simulations. The results show the importance of including all radiative terms for the case of strongly radiative shocks. This result has important implications for the design and interpretation of future laboratory experiments where even faster radiative shocks may be generated. Previously unseen phenomena could be accessible when the radiative energy plays a significant role in the system.

Accession Number: WOS:000556769400001

Record 25 of 43

By: Marques, JR (Marques, J-R); Briand, C (Briand, C.); Amiranoff, F (Amiranoff, F.); Depierreux, S (Depierreux, S.); Grech, M (Grech, M.); Lancia, L (Lancia, L.); Perez, F (Perez, F.); Sgattoni, A (Sgattoni, A.); Vinci, T (Vinci, T.); Riconda, C (Riconda, C.)

Title: Laser-Plasma Interaction Experiment for Solar Burst Studies

Source: PHYSICAL REVIEW LETTERS

Volume: 124

Issue: 13

Article Number: 135001

DOI: 10.1103/PhysRevLett.124.135001

Document Type: Article

Published: APR 2 2020

Abstract: A new experimental platform based on laser-plasma interaction is proposed to explore the fundamental processes of wave coupling at the origin of interplanetary radio emissions. It is applied to the study of electromagnetic (EM) emission at twice the plasma frequency (2 omega(p)) observed during solar bursts and thought to result from the coalescence of two Langmuir waves (LWs). In the interplanetary medium, the first LW is excited by electron beams, while the second is generated by electrostatic decay of Langmuir waves. In the present experiment, instead of an electron beam, an energetic laser propagating through a plasma excites the primary LW, with characteristics close to those at near-Earth orbit. The EM radiation at 2 omega(p) is observed at different angles. Its intensity, spectral evolution, and polarization confirm the LW-coalescence scenario.

Accession Number: WOS:000523406400003

PubMed ID: 32302165

Record 26 of 43

By: McGuffey, C (McGuffey, C.); Kim, J (Kim, J.); Wei, MS (Wei, M. S.); Nilson, PM (Nilson, P. M.); Chen, SN (Chen, S. N.); Fuchs, J (Fuchs, J.); Fitzsimmons, P (Fitzsimmons, P.); Foord, ME (Foord, M. E.); Mariscal, D (Mariscal, D.); McLean, HS (McLean, H. S.); Patel, PK (Patel, P. K.); Stephens, RB (Stephens, R. B.); Beg, FN (Beg, F. N.)

Title: Focussing Protons from a Kilojoule Laser for Intense Beam Heating using Proximal Target Structures

Source: SCIENTIFIC REPORTS

Volume: 10

Issue: 1

Article Number: 9415

DOI: 10.1038/s41598-020-65554-4

Document Type: Article

Published: JUN 10 2020

Abstract: Proton beams driven by chirped pulse amplified lasers have multi-picosecond duration and can isochorically and volumetrically heat material samples, potentially providing an approach for creating samples of warm dense matter with conditions not present on Earth. Envisioned on a larger scale, they could heat fusion fuel to achieve ignition. We have shown in an experiment that a kilojoule-class, multi-picosecond short pulse laser is particularly effective for heating materials. The proton beam can be focussed via target design to achieve exceptionally high flux, important for the applications mentioned. The laser irradiated spherically curved diamond-like-carbon targets with intensity 4x10(18)W/cm(2), producing proton beams with 3MeV slope temperature. A Cu witness foil was positioned behind the curved target, and the gap between was either empty or spanned with a structure. With a structured target, the total emission of Cu K alpha fluorescence was increased 18 fold and the emission profile was consistent with a tightly focussed beam. Transverse proton radiography probed the target with ps order temporal and 10 mu m spatial resolution, revealing the fast-acting focussing electric field. Complementary particle-in-cell simulations show how the structures funnel protons to the tight focus. The beam of protons and neutralizing electrons induce the bright K alpha emission observed and heat the Cu to 100eV.

Accession Number: WOS:000560478900031

PubMed ID: 32523004

Record 27 of 43

By: McIlvenny, A (McIlvenny, A.); Ahmed, H (Ahmed, H.); Scullion, C (Scullion, C.); Doria, D (Doria, D.); Romagnani, L (Romagnani, L.); Martin, P (Martin, P.); Naughton, K (Naughton, K.); Sgattoni, A (Sgattoni, A.); Symes, DR (Symes, D. R.); Macchi, A (Macchi, A.); McKenna, P (McKenna, P.); Zepf, M (Zepf, M.); Kar, S (Kar, S.); Borghesi, M (Borghesi, M.)

Title: Characteristics of ion beams generated in the interaction of ultra-short laser pulses with ultra-thin foils

Source: PLASMA PHYSICS AND CONTROLLED FUSION

Volume: 62

Issue: 5

Article Number: 054001

DOI: 10.1088/1361-6587/ab7d26

Document Type: Article

Published: MAY 2020

Abstract: Experiments investigating ion acceleration from laser-irradiated ultra-thin foils on the GEMINI laser facility at the Rutherford appleton laboratory indicate a transition to 'light sail' radiation pressure acceleration when using circularly polarised, high contrast laser pulses. This paper complements previously published results with additional data and modelling which provide information on the multispecies dynamics taking place during the acceleration, and provides an indication on expected scaling of these processes at higher laser intensities.

Accession Number: WOS:000523604100001

Record 28 of 43

By: Michel, T (Michel, Th); Albertazzi, B (Albertazzi, B.); Mabey, P (Mabey, P.); Rigon, G (Rigon, G.); Lefevre, F (Lefevre, F.); Some, LV (Some, L. Van Box); Barroso, P (Barroso, P.); Egashira, S (Egashira, S.); Kumar, R (Kumar, R.); Michaut, C (Michaut, C.); Ota, M (Ota, M.); Ozaki, N (Ozaki, N.); Sakawa, Y (Sakawa, Y.); Sano, T (Sano, T.); Falize, E (Falize, E.); Koenig, M (Koenig, M.)

Title: Laboratory Observation of Radiative Shock Deceleration and Application to SN 1987A

Source: ASTROPHYSICAL JOURNAL

Volume: 888

Issue: 1

Article Number: 25

DOI: 10.3847/1538-4357/ab5956

Document Type: Article

Published: JAN 1 2020

Abstract: The first laboratory evidence of a radiative shock (RS) decelerating during its free expansion phase in an optically thick medium is presented. A shock is generated in a multilayer solid target under the irradiation of a high-power laser at the GEKKO XII laser facility. The rear surface of the target is connected to a gas cell filled with Xe. Upon breakout, an RS, characterized by low Boltzmann number Bo MUCH LESS-THAN 1 and Mihalas number R 10, is generated. Experimental results reveal that radiative losses through the radiative precursor cause the shock to lose energy and decelerate. A model is developed that describes the shock propagation as a function of time. The model is in agreement with both numerical simulations and experimental results. These results have tremendous consequences for astrophysical systems, such as SN 1987A, where radiative deceleration may play a role in the formation of the observed hotspots in the circumstellar ring.

Accession Number: WOS:000504987100001

Record 29 of 43

By: Morard, G (Morard, Guillaume); Hernandez, JA (Hernandez, Jean-Alexis); Guarguaglini, M (Guarguaglini, Marco); Bolis, R (Bolis, Riccardo); Benuzzi-Mounaix, A (Benuzzi-Mounaix, Alessandra); Vinci, T (Vinci, Tommaso); Fiquet, G (Fiquet, Guillaume); Baron, MA (Baron, Marzena A.); Shim, SH (Shim, Sang Heon); Ko, B (Ko, Byeongkwan); Gleason, AE (Gleason, Arianna E.); Mao, WL (Mao, Wendy L.); Alonso-Mori, R (Alonso-Mori, Roberto); Lee, HJ (Lee, Hae Ja); Nagler, B (Nagler, Bob); Galtier, E (Galtier, Eric); Sokaras, D (Sokaras, Dimosthenis); Glenzer, SH (Glenzer, Siegfried H.); Andrault, D (Andrault, Denis); Garbarino, G (Garbarino, Gaston); Mezouar, M (Mezouar, Mohamed); Schuster, AK (Schuster, Anja K.); Ravasio, A (Ravasio, Alessandra)

Title: In situ X-ray diffraction of silicate liquids and glasses under dynamic and static compression to megabar pressures

Source: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA

Volume: 117

Issue: 22

Pages: 11981-11986

DOI: 10.1073/pnas.1920470117

Document Type: Article

Published: JUN 2 2020

Abstract: Properties of liquid silicates under high-pressure and high-temperature conditions are critical for modeling the dynamics and solidification mechanisms of the magma ocean in the early Earth, as well as for constraining entrainment of melts in the mantle and in the present-day core-mantle boundary. Here we present in situ structural measurements by X-ray diffraction of selected amorphous silicates compressed statically in diamond anvil cells (up to 157 GPa at room temperature) or dynamically by laser-generated shock compression (up to 130 GPa and 6,000 K along the MgSiO3 glass Hugoniot). The X-ray diffraction patterns of silicate glasses and liquids reveal similar characteristics over a wide pressure and temperature range. Beyond the increase in Si coordination observed at 20 GPa, we find no evidence for major structural changes occurring in the silicate melts studied up to pressures and temperatures exceeding Earth's core mantle boundary conditions. This result is supported by molecular dynamics calculations. Our findings reinforce the widely used assumption that the silicate glasses studies are appropriate structural analogs for understanding the atomic arrangement of silicate liquids at these high pressures.

Accession Number: WOS:000538147800024

PubMed ID: 32414927

Record 30 of 43

By: Pasley, J (Pasley, John); Andrianaki, G (Andrianaki, Georgia); Baroutsos, A (Baroutsos, Andreas); Batani, D (Batani, Dimitri); Benis, EP (Benis, Emmanouil P.); Ciardi, A (Ciardi, Andrea); Cook, D (Cook, Donna); Dimitriou, V (Dimitriou, Vasilios); Dromey, B (Dromey, Brendan); Fitilis, I (Fitilis, Ioannis); Gatti, G (Gatti, Giancarlo); Grigoriadis, A (Grigoriadis, Anastasios); Huault, M (Huault, Marine); Hernandez, JAP (Perez Hernandez, Jose Antonio); Kaselouris, E (Kaselouris, Evaggelos); Klimo, O (Klimo, Ondrej); Koenig, M (Koenig, Michel); Koundourakis, G (Koundourakis, George); Kucharik, M (Kucharik, Milan); Limpouch, J (Limpouch, Jiri); Liska, R (Liska, Richard); Lopez, CS (Lopez, Carlos Salgado); Malko, S (Malko, Sophia); Olmos-Miguelanez, S (Olmos-Miguelanez, Susana); Orphanos, Y (Orphanos, Yannis); Ospina, V (Ospina, Valeria); Papadogiannis, NA (Papadogiannis, Nektarios A.); Petrakis, S (Petrakis, Stelios); Psikal, J (Psikal, Jan); Rivetta, MS (Serena Rivetta, Maria); Rodriguez-Conde, MJ (Rodriguez-Conde, Maria-Jose); Santos, JJ (Jorge Santos, Joao); Sinor, M (Sinor, Milan); Skoulakis, A (Skoulakis, Alexandros); Tazes, I (Tazes, Ioannis); Pascual, LT (Pascual, Laura Tejada); Tsitou, C (Tsitou, Calliope); Vachal, P (Vachal, Pavel); Volpe, L (Volpe, Luca); Vyskocil, J (Vyskocil, Jiri); White, S (White, Steven); Yeung, M (Yeung, Mark); Zerouli, G (Zerouli, Ghassan); Tatarakis, M (Tatarakis, Michael)

Title: Innovative education and training in high power laser plasmas (PowerLaPs) for plasma physics, high power laser matter interactions and high energy density physics: experimental diagnostics and simulations

Source: HIGH POWER LASER SCIENCE AND ENGINEERING

Volume: 8

Article Number: e5

DOI: 10.1017/hpl.2020.4

Document Type: Editorial Material

Published: 2020

Abstract: The second and final year of the Erasmus Plus programme 'Innovative Education and Training in high power laser plasmas', otherwise known as PowerLaPs, is described. The PowerLaPs programme employs an innovative paradigm in that it is a multi-centre programme, where teaching takes place in five separate institutes with a range of different aims and styles of delivery. The 'in-class' time is limited to 4 weeks a year, and the programme spans 2 years. PowerLaPs aims to train students from across Europe in theoretical, applied and laboratory skills relevant to the pursuit of research in laser plasma interaction physics and inertial confinement fusion. Lectures are intermingled with laboratory sessions and continuous assessment activities. The programme, which is led by workers from the Hellenic Mediterranean University and supported by co-workers from the Queen's University Belfast, the University of Bordeaux, the Czech Technical University in Prague, Ecole Polytechnique, the University of Ioannina, the University of Salamanca and the University of York, has just finished its second and final year. Six Learning Teaching Training activities have been held at the Queen's University Belfast, the University of Bordeaux, the Czech Technical University, the University of Salamanca and the Institute of Plasma Physics and Lasers of the Hellenic Mediterranean University. The last of these institutes hosted two 2-week-long Intensive Programmes, while the activities at the other four universities were each 5 days in length. In addition, a 'Multiplier Event' was held at the University of Ioannina, which will be briefly described. In this second year, the work has concentrated on training in both experimental diagnostics and simulation techniques appropriate to the study of plasma physics, high power laser matter interactions and high energy density physics. The nature of the programme will be described in detail, and

some metrics relating to the activities carried out will be presented. In particular, this paper will focus on the overall assessment of the programme.

Accession Number: WOS:000515586900001

Record 31 of 43

By: Pasley, J (Pasley, John); Andrianaki, G (Andrianaki, Georgia); Apinaniz, JI (Apinaniz, Jon Imanol); Baroutsos, A (Baroutsos, Andreas); Batani, D (Batani, Dimitri); Benis, EP (Benis, Emmanouil P.); Ciardi, A (Ciardi, Andrea); Cook, D (Cook, Donna); de Marco, M (de Marco, Massimo); Dimitriou, V (Dimitriou, Vasilios); Dromey, B (Dromey, Brendan); Fitilis, I (Fitilis, Ioannis); Gatti, G (Gatti, Giancarlo); Grigoriadis, A (Grigoriadis, Anastasios); Huault, M (Huault, Marine); Hernandez, JAP (Hernandez, Jose Antonio); Kaselouris, E (Kaselouris, Evaggelos); Klimo, O (Klimo, Ondrej); Koenig, M (Koenig, Michel); Koundourakis, G (Koundourakis, George); Kucharik, M (Kucharik, Milan); Limpouch, J (Limpouch, Jiri); Liska, R (Liska, Richard); Lopez, CS (Lopez, Carlos Salgado); Malko, S (Malko, Sophia); Olmos-Miguelanez, S (Olmos-Miguelanez, Susana); Orphanos, Y (Orphanos, Yannis); Ospina, V (Ospina, Valeria); Papadogiannis, NA (Papadogiannis, Nektarios A.); Petrakis, S (Petrakis, Stelios); Psikal, J (Psikal, Jan); Rico, M (Rico, Mauricio); Rivetta, MS (Rivetta, Maria); Rodriguez-Conde, MJ (Rodriguez-Conde, Maria-Jose); Santos, JJ (Santos, Joao); Sinor, M (Sinor, Milan); Skoulakis, A (Skoulakis, Alexandros); Tazes, I (Tazes, Ioannis); Pascual, LT (Pascual, Laura Tejada); Touati, M (Touati, Michael); Tsitou, C (Tsitou, Calliope); Vachal, P (Vachal, Pavel); Volpe, L (Volpe, Luca); Vyskocil, J (Vyskocil, Jiri); White, S (White, Steven); Yeung, M (Yeung, Mark); Zeraouli, G (Zeraouli, Ghassan); Tatarakis, M (Tatarakis, Michael)

Title: Innovative education and training in high power laser plasmas (PowerLaPs) for plasma physics, high power laser matter interactions and high energy density physics: experimental diagnostics and simulations (vol 8, e5, 2020)

Source: HIGH POWER LASER SCIENCE AND ENGINEERING

Volume: 8

Article Number: e9

DOI: 10.1017/hpl.2020.12

Document Type: Correction

Published: 2020

Accession Number: WOS:000526439000001

Record 32 of 43

By: Patel, PK (Patel, P. K.); Springer, PT (Springer, P. T.); Weber, CR (Weber, C. R.); Jarrott, LC (Jarrott, L. C.); Hurricane, A (Hurricane, A.); Bachmann, B (Bachmann, B.); Baker, KL (Baker, K. L.); Hopkins, LFB (Hopkins, L. F. Berzak); Callahan, DA (Callahan, D. A.); Casey, DT (Casey, D. T.); Cerjan, CJ (Cerjan, C. J.); Clark, DS (Clark, D. S.); Dewald, EL (Dewald, E. L.); Divol, L (Divol, L.); Doppner, T (Doppner, T.); Field, JE (Field, J. E.); Fittinghoff, D (Fittinghoff, D.); Gaffney, J (Gaffney, J.); Geppert-Kleinrath, V (Geppert-Kleinrath, V); Grim, GP (Grim, G. P.); Hartouni, EP (Hartouni, E. P.); Hatarik, P (Hatarik, P.); Hinkel, DE (Hinkel, D. E.); Hohenberger, M (Hohenberger, M.); Humbird, K (Humbird, K.); Lzumi, N (Lzumi, N.); Jones, S (Jones, S.); Khan, SF (Khan, S. F.); Kritcher, AL (Kritcher, A. L.); Kruse, M (Kruse, M.); Landen, L (Landen, L.); Pape, SL (Pape, S. Le); Ma, T (Ma, T.); MacLaren, SA (MacLaren, S. A.); MacPhee, AG (MacPhee, A. G.); Masse, LP (Masse, L. P.); Meezan, NB (Meezan, N. B.); Milovich, JL (Milovich, J. L.); Nora, R (Nora, R.); Pak, A (Pak, A.); Peterson, JL (Peterson, J. L.); Ralph, J (Ralph, J.); Robey, HF (Robey, H. F.); Salmonson, JD (Salmonson, J. D.); Smalyuk, VA (Smalyuk, V. A.); Spears, BK (Spears, B. K.); Thomas, CA (Thomas, C. A.); Volegov, PL (Volegov, P. L.); Zylstra, A (Zylstra, A.); Edwards, MJ (Edwards, M. J.)

Title: Hotspot conditions achieved in inertial confinement fusion experiments on the National Ignition Facility

Source: PHYSICS OF PLASMAS

Volume: 27

Issue: 5

DOI: 10.1063/5.0003298

Document Type: Article

Published: MAY 2020

Abstract: We describe the overall performance of the major indirect-drive inertial confinement fusion campaigns executed at the National Ignition Facility. With respect to the proximity to ignition, we can describe the performance of current experiments both in terms of no-burn ignition metrics (metrics based on the hydrodynamic performance of targets in the absence of alpha-particle heating) and in terms of the thermodynamic properties of the hotspot and

dense fuel at stagnation-in particular, the hotspot pressure, temperature, and areal density. We describe a simple 1D isobaric model to derive these quantities from experimental observables and examine where current experiments lie with respect to the conditions required for ignition.

Accession Number: WOS:000537059200001

Record 33 of 43

By: Peng, H (Peng, H.); Riconda, C (Riconda, C.); Grech, M (Grech, M.); Zhou, CT (Zhou, C-T); Weber, S (Weber, S.)

Title: Dynamical aspects of plasma gratings driven by a static ponderomotive potential

Source: PLASMA PHYSICS AND CONTROLLED FUSION

Volume: 62

Issue: 11

Article Number: 115015

DOI: 10.1088/1361-6587/abb3aa

Document Type: Article

Published: NOV 2020

Abstract: In this work, a quasi-neutral plasma grating is considered, generated by two counter-propagating identical laser beams. Typical time scales associated with such gratings are given by t(unit) = root m(i)/2Zm(e)(kv(0))(-1), where v(0) is the electron quiver in the laser field of wavevector k. In most situations, the behavior of the grating can be characterized by a single parameter, mu, which is proportional to the ratio of background electron temperature to the square of the electron quiver velocity. Indeed, even for quasi-neutral gratings, electron pressure might play an important role, via adiabatic electron heating. The influence on grating formation and lifetime of other parameters involving the inclusion of dissipative effects or kinetic effects is also examined in detail. Finally, an approximated analytical solution to the fluid model is found and shows good agreement with first-principle simulations.

Accession Number: WOS:000576418100001

Record 34 of 43

By: Pepin, CM (Pepin, C. M.); Torchio, R (Torchio, R.); Occelli, F (Occelli, F.); Lescoute, E (Lescoute, E.); Mathon, O (Mathon, O.); Recoules, V (Recoules, V); Bouchet, J (Bouchet, J.); Videau, L (Videau, L.); Benuzzi-Mounaix, A (Benuzzi-Mounaix, A.); Vinci, T (Vinci, T.); Briggs, R (Briggs, R.); Pascarelli, S (Pascarelli, S.); Gaal, R (Gaal, R.); Loubeyre, P (Loubeyre, P.); Sollier, A (Sollier, A.)

Title: White-line evolution in shocked solid Ta evidenced by synchrotron x-ray absorption spectroscopy

Source: PHYSICAL REVIEW B

Volume: 102

Issue: 14

Article Number: 144102

DOI: 10.1103/PhysRevB.102.144102

Document Type: Article

Published: OCT 9 2020

Abstract: Time-resolved x-ray absorption experiments have been performed on shocked tantalum. Using a single 100 ps synchrotron x-ray pulse, nanosecond-lived equilibrium states of shocked solid Ta have been measured by L-3-edge absorption spectroscopy. The energy shift and intensity change of the white line were measured up to 130 GPa and 2000 K. The experimental results are discussed in light of density functional theory calculations and FEFF simulations. The absence of occurrence of the hcp-omega phase is suggested from the analysis of the shape of the white line.

Accession Number: WOS:000576600200002

Record 35 of 43

By: Prudhomme, G (Prudhomme, G.); de Resseguier, T (de Resseguier, T.); Roland, C (Roland, C.); Sollier, A (Sollier, A.); Lescoute, E (Lescoute, E.); Loison, D (Loison, D.); Brambrink, E (Brambrink, E.)

Title: Velocity and mass density of the ejecta produced from sinusoidal grooves in laser shock-loaded tin

Source: JOURNAL OF APPLIED PHYSICS

Volume: 128
Issue: 15
Article Number: 155903
DOI: 10.1063/5.0022940
Document Type: Article
Published: OCT 21 2020
Abstract: When a shock wave of several tens of GPa breaks out at a free surface, a material is ejected ahead of this surface. The amount and velocity of such ejecta depend on the breakout pressure, state of the released material (solid, liquid, or mixed), whether the shockwave is supported or unsupported, and the initial geometrical perturbation (or roughness) of the free surface. If surface defects consist of small grooves, pits, or scratches, material ejection occurs in the form of jets breaking up into tiny particles (so-called microjetting), with jet tip velocities up to several times higher than the free surface velocity. The laser-based experiments presented in this paper focus on microjetting in shock-melted tin with periodic surface perturbations. Several complementary diagnostics are combined to measure the velocity and mass of ejecta during the early stages of the jetting process. One relevant advancement is the use of ps-laser x-ray radiography to probe the density of the ejecta in distinct jets a few tens of mu m-wide. The effects of the depth and wavelength of the initial perturbation are investigated in both linear and near-linear growth regimes. The results are compared with predictions derived from the Richtmyer-Meshkov Instability theory.
Accession Number: WOS:000585807800001

Record 36 of 43

By: Ranc, L (Ranc, Lucas); Le Blanc, C (Le Blanc, Catherine); Lebas, N (Lebas, Nathalie); Martin, L (Martin, Luc); Zou, JP (Zou, Ji-Ping); Mathieu, F (Mathieu, Francois); Radier, C (Radier, Christophe); Ricaud, S (Ricaud, Sandrine); Druon, F (Druon, Frederic); Papadopoulos, D (Papadopoulos, Dimitris)
Title: Improvement in the temporal contrast in the tens of ps range of the multi-PW Apollon laser front-end
Source: OPTICS LETTERS
Volume: 45
Issue: 16
Pages: 4599-4602
DOI: 10.1364/OL.401272
Document Type: Article
Published: AUG 15 2020
Abstract: We demonstrate the impact of the optics roughness in Offner stretchers used in chirped pulse amplification laser chains and how it is possible to improve the temporal contrast ratio in the temporal range of 10-100 ps by adequately choosing the optical quality of the key components. Experimental demonstration has been realized in the front-end source of the multi-petawatt (PW) laser facility Apollon, resulting in an enhancement of the contrast ratio by two to three orders of magnitude. (C) 2020 Optical Society of America
Accession Number: WOS:000564903500060
PubMed ID: 32797019

Record 37 of 43

By: Riconda, C (Riconda, Caterina); Dendy, R (Dendy, Richard)
Title: Editorial for The 46th European physical society conference
Source: PLASMA PHYSICS AND CONTROLLED FUSION
Volume: 62
Issue: 1
Article Number: 010201
DOI: 10.1088/1361-6587/ab54bf
Document Type: Editorial Material
Published: JAN 2020
Accession Number: WOS:000499376000001

Record 38 of 43

By: Rosmej, FB (Rosmej, F. B.); Vainshtein, LA (Vainshtein, L. A.); Astapenko, VA (Astapenko, V. A.); Lisitsa, VS (Lisitsa, V. S.)

Title: Statistical and quantum photoionization cross sections in plasmas: Analytical approaches for any configurations including inner shells

Source: MATTER AND RADIATION AT EXTREMES

Volume: 5

Issue: 6

Article Number: 064202

DOI: 10.1063/5.0022751

Document Type: Review

Published: NOV 1 2020

Abstract: Statistical models combined with the local plasma frequency approach applied to the atomic electron density are employed to study the photoionization cross-section for complex atoms. It is demonstrated that the Thomas-Fermi atom provides surprisingly good overall agreement even for complex outer-shell configurations, where quantum mechanical approaches that include electron correlations are exceedingly difficult. Quantum mechanical photoionization calculations are studied with respect to energy and nl quantum number for hydrogen-like and non-hydrogen-like atoms and ions. A generalized scaled photoionization model (GSPM) based on the simultaneous introduction of effective charges for non-H-like energies and scaling charges for the reduced energy scale allows the development of analytical formulas for all states nl. Explicit expressions for nl = 1s, 2s, 2p, 3s, 3p, 3d, 4s, 4p, 4d, 4f, and 5s are obtained. Application to H-like and non-H-like atoms and ions and to neutral atoms demonstrates the universality of the scaled analytical approach including inner-shell photoionization. Likewise, GSPM describes the near-threshold behavior and high-energy asymptotes well. Finally, we discuss the various models and the correspondence principle along with experimental data and with respect to a good compromise between generality and precision. The results are also relevant to large-scale integrated light-matter interaction simulations, e.g., X-ray free-electron laser interactions with matter or photoionization driven by a broadband radiation field such as Planckian radiation. (c) 2020 Author(s).

Accession Number: WOS:000585171000001

Record 39 of 43

By: Rosmej, FB (Rosmej, F. B.); Astapenko, VA (Astapenko, V. A.); Lisitsa, VS (Lisitsa, V. S.); Vainshtein, LA (Vainshtein, L. A.)

Title: Dielectronic recombination in non-LTE plasmas

Source: MATTER AND RADIATION AT EXTREMES

Volume: 5

Issue: 6

Article Number: 064201

DOI: 10.1063/5.0014158

Document Type: Review

Published: NOV 1 2020

Abstract: Novel phenomena and methods related to dielectronic capture and dielectronic recombination are studied for non-local thermodynamic equilibrium (LTE) plasmas and for applications to non-LTE ionization balance. It is demonstrated that multichannel autoionization and radiative decay strongly suppress higher-order contributions to the total dielectronic recombination rates, which are overestimated by standard approaches by orders of magnitude. Excited-state coupling of dielectronic capture is shown to be much more important than ground-state contributions, and electron collisional excitation is also identified as a mechanism driving effective dielectronic recombination. A theoretical description of the effect of angular-momentum-changing collisions on dielectronic recombination is developed from an atomic kinetic point of view and is visualized with a simple analytical model. The perturbation of the autoionizing states due to electric fields is discussed with respect to ionization potential depression and perturbation of symmetry properties of autoionization matrix elements. The first steps in the development of statistical methods are presented and are realized in the framework of a local plasma frequency approach. Finally, the impact of collisional-radiative processes and atomic population kinetics on dielectronic recombination is critically discussed, and simple analytical formulas are presented. (C) 2020 Author(s).

Accession Number: WOS:000575122600001

Record 40 of 43

By: Ruyer, C (Ruyer, C.); Bolanos, S (Bolanos, S.); Albertazzi, B (Albertazzi, B.); Chen, SN (Chen, S. N.); Antici, P (Antici, P.); Boker, J (Boker, J.); Dervieux, V (Dervieux, V); Lancia, L (Lancia, L.); Nakatsutsumi, M (Nakatsutsumi, M.); Romagnani, L (Romagnani, L.); Shepherd, R (Shepherd, R.); Swantusch, M (Swantusch, M.); Borghesi, M (Borghesi, M.); Willi, O (Willi, O.); Pepin, H (Pepin, H.); Starodubtsev, M (Starodubtsev, M.); Grech, M (Grech, M.); Riconda, C (Riconda, C.); Gremillet, L (Gremillet, L.); Fuchs, J (Fuchs, J.)

Title: Growth of concomitant laser-driven collisionless and resistive electron filamentation instabilities over large spatiotemporal scales

Source: NATURE PHYSICS

Volume: 16

Issue: 9

Pages: 983-+

DOI: 10.1038/s41567-020-0913-x

Early Access Date: JUN 2020

Document Type: Article

Published: SEP 2020

Abstract: In the interaction of ultraintense, short laser pulses with solid targets, the collisionless Weibel instability is observed. For a sufficiently high resistivity of the target, an additional resistive instability appears.
Collective processes in plasmas often induce microinstabilities that play an important role in many space or laboratory plasma environments. Particularly notable is the Weibel-type current filamentation instability, which is believed to drive the creation of collisionless shocks in weakly magnetized astrophysical plasmas. Here, this instability class is studied through interactions of ultraintense and short laser pulses with solid foils, leading to localized generation of megaelectronvolt electrons. Proton radiographic measurements of both low- and high-resistivity targets show two distinct, superimposed electromagnetic field patterns arising from the interpenetration of the megaelectronvolt electrons and the background plasma. Particle-in-cell simulations and theoretical estimates suggest that the collisionless Weibel instability building up in the dilute expanding plasmas formed at the target surfaces causes the observed azimuthally symmetric electromagnetic filaments. For a sufficiently high resistivity of the target foil, an additional resistive instability is triggered in the bulk target, giving rise to radially elongated filaments. The data reveal the growth of both filamentation instabilities over large temporal (tens of picoseconds) and spatial (hundreds of micrometres) scales.

Accession Number: WOS:000537039500001

Record 41 of 43

By: Scuderi, V (Scuderi, V); Milluzzo, G (Milluzzo, G.); Doria, D (Doria, D.); Alejo, A (Alejo, A.); Amico, AG (Amico, A. G.); Booth, N (Booth, N.); Cuttone, G (Cuttone, G.); Green, JS (Green, J. S.); Kar, S (Kar, S.); Korn, G (Korn, G.); Larosa, G (Larosa, G.); Leanza, R (Leanza, R.); Martin, P (Martin, P.); McKenna, P (McKenna, P.); Padda, H (Padda, H.); Petringa, G (Petringa, G.); Pipek, J (Pipek, J.); Romagnani, L (Romagnani, L.); Romano, F (Romano, F.); Russo, A (Russo, A.); Schillaci, F (Schillaci, F.); Cirrone, GAP (Cirrone, G. A. P.); Margarone, D (Margarone, D.); Borghesi, M (Borghesi, M.)

Title: TOF diagnosis of laser accelerated, high-energy protons

Source: NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION A-ACCELERATORS SPECTROMETERS DETECTORS AND ASSOCIATED EQUIPMENT

Volume: 978

Article Number: 164364

DOI: 10.1016/j.nima.2020.164364

Document Type: Article

Published: OCT 21 2020

Abstract: Significant challenges in the detection of laser-accelerated ions result from the high flux (10(10)-10(12) ions/pulse) and the short bunch duration which are intrinsic to laser-driven sources. The development of diagnostic techniques able to operate in real-time and on a high-rep basis is a key step towards multidisciplinary applications of such non-conventional beams. Real time diagnosis of the main beam parameters for high-energy protons accelerated

by the Vulcan Petawatt (VULCAN-PW) laser system has been performed using an on line diagnostics based on the Time of Flight (TOF) technique and the use of diamond detectors. Proton energy spectra have been measured for energies exceeding 30 MeV. The results show that the TOF method employing state-of-the-art detectors is a robust real-time diagnostics, able to operate efficiently under the harsh conditions occurring with kJ-class, PW laser systems, and offering the possibility to monitor on a shot-by-shot basis the main beam parameters of high intensity proton bunches for energies up to the 100 MeV level.

Accession Number: WOS:000564678100003

Record 42 of 43

By: Vanthieghem, A (Vanthieghem, Arno); Lemoine, M (Lemoine, Martin); Plotnikov, I (Plotnikov, Illya); Grassi, A (Grassi, Anna); Grech, M (Grech, Mickael); Gremillet, L (Gremillet, Laurent); Pelletier, G (Pelletier, Guy)

Title: Physics and Phenomenology of Weakly Magnetized, Relativistic Astrophysical Shock Waves

Source: GALAXIES

Volume: 8

Issue: 2

Article Number: 33

DOI: 10.3390/galaxies8020033

Document Type: Review

Published: JUN 2020

Abstract: Weakly magnetized, relativistic collisionless shock waves are not only the natural offsprings of relativistic jets in high-energy astrophysical sources, they are also associated with some of the most outstanding displays of energy dissipation through particle acceleration and radiation. Perhaps their most peculiar and exciting feature is that the magnetized turbulence that sustains the acceleration process, and (possibly) the secondary radiation itself, is self-excited by the accelerated particles themselves, so that the phenomenology of these shock waves hinges strongly on the microphysics of the shock. In this review, we draw a status report of this microphysics, benchmarking analytical arguments with particle-in-cell simulations, and extract consequences of direct interest to the phenomenology, regarding, in particular, the so-called microphysical parameters used in phenomenological studies.

Accession Number: WOS:000551227500016

Record 43 of 43

By: Weber, CR (Weber, C. R.); Clark, DS (Clark, D. S.); Pak, A (Pak, A.); Alfonso, N (Alfonso, N.); Bachmann, B (Bachmann, B.); Hopkins, LFB (Hopkins, L. F. Berzak); Bunn, T (Bunn, T.); Crippen, J (Crippen, J.); Divol, L (Divol, L.); Dittrich, T (Dittrich, T.); Kritcher, AL (Kritcher, A. L.); Landen, OL (Landen, O. L.); Le Pape, S (Le Pape, S.); MacPhee, AG (MacPhee, A. G.); Marley, E (Marley, E.); Masse, LP (Masse, L. P.); Milovich, JL (Milovich, J. L.); Nikroo, A (Nikroo, A.); Patel, PK (Patel, P. K.); Pickworth, LA (Pickworth, L. A.); Rice, N (Rice, N.); Smalyuk, VA (Smalyuk, V. A.); Stadermann, M (Stadermann, M.)

Title: Mixing in ICF implosions on the National Ignition Facility caused by the fill-tube

Source: PHYSICS OF PLASMAS

Volume: 27

Issue: 3

Article Number: 032703

DOI: 10.1063/1.5125599

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Abstract: The micrometer-scale tube that fills capsules with thermonuclear fuel in inertial confinement fusion experiments at the National Ignition Facility is also one of the implosion's main degradation sources. It seeds a perturbation that injects the ablator material into the center, radiating away some of the hot-spot energy. This paper discusses how the perturbation arises in experiments using high-density carbon ablators and how the ablator mix interacts once it enters the hot-spot. Both modeling and experiments show an in-flight areal-density perturbation and localized x-ray emission at stagnation from the fill-tube. Simulations suggest that the fill-tube is degrading an otherwise 1D implosion by similar to 2x, but when other degradation sources are present, the yield reduction is closer to 20%. Characteristics of the fill-tube assembly, such as the through-hole size and the glue mass, alter the dynamics and magnitude of the degradation. These aspects point the way toward improvements in the design, some of which

(smaller diameter fill-tube) have already shown improvements. Published under license by AIP Publishing.
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