Record 1 of 50

By: Albert, F (Albert, Felicie); Couprie, ME (Couprie, M. E.); Debus, A (Debus, Alexander); Downer, MC (Downer, Mike C.); Faure, J (Faure, Jerome); Flacco, A (Flacco, Alessandro); Gizzi, LA (Gizzi, Leonida A.); Grismayer, T (Grismayer, Thomas); Huebl, A (Huebl, Axel); Joshi, C (Joshi, Chan); Labat, M (Labat, M.); Leemans, WP (Leemans, Wim P.); Maier, AR (Maier, Andreas R.); Mangles, SPD (Mangles, Stuart P. D.); Mason, P (Mason, Paul); Mathieu, F (Mathieu, Francois); Muggli, P (Muggli, Patric); Nishiuchi, M (Nishiuchi, Mamiko); Osterhoff, J (Osterhoff, Jens); Rajeev, PP (Rajeev, P. P.); Schramm, U (Schramm, Ulrich); Schreiber, J (Schreiber, Jorg); Thomas, AGR (Thomas, Alec G. R.); Vay, JL (Vay, Jean-Luc); Vranic, M (Vranic, Marija); Zeil, K (Zeil, Karl)

Title: 2020 roadmap on plasma accelerators

Source: NEW JOURNAL OF PHYSICS

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Article Number: 031101

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Published: MAR 2021

Abstract: Plasma-based accelerators use the strong electromagnetic fields that can be supported by plasmas to accelerate charged particles to high energies. Accelerating field structures in plasma can be generated by powerful laser pulses or charged particle beams. This research field has recently transitioned from involving a few small-scale efforts to the development of national and international networks of scientists supported by substantial investment in large-scale research infrastructure. In this New Journal of Physics 2020 Plasma Accelerator Roadmap, perspectives from experts in this field provide a summary overview of the field and insights into the research needs and developments for an international audience of scientists, including graduate students and researchers entering the field.

Accession Number: WOS:000629956800001

Record 2 of 50

By: Alexandridi, C (Alexandridi, Christina); Delen, X (Delen, Xavier); Druon, F (Druon, Frederic); Georges, P (Georges, Patrick); Martin, L (Martin, Luc); Mathieu, F (Mathieu, Francois); Papadopoulos, D (Papadopoulos, Dimitris)

Title: Generation of optically synchronized pump-signal beams for ultrafast OPCPA via the optical Kerr effect

Source: OPTICS LETTERS

Volume: 46

Issue: 9

Pages: 2035-2038

DOI: 10.1364/OL.425237

Document Type: Article

Published: MAY 1 2021

Abstract: In recent years, multi-petawatt laser installations have achieved unprecedented peak powers, opening new horizons to laser-matter interaction studies. Ultra-broadband and extreme temporal contrast pulse requirements make optical parametric chirped pulse amplification (OPCPA) in the few-picosecond regime the key technology in these systems. To guarantee high fidelity output, however, OPCPA requires excellent synchronization between pump and signal pulses. Here, we propose a new highly versatile architecture for the generation of optically synchronized pump-signal pairs based on the Kerr shutter effect. We obtained >550 mu J pump pulses of 12 ps duration at 532 nm optically synchronized with a typical ultrashort CPA source at 800 nm. As a proof-of-principle demonstration, our

system was also used for amplification of similar to 20 mu J ultra-broadband pulses based on an OPCPA setup. (C) 2021 Optical Society of America

Accession Number: WOS:000645860800010

PubMed ID: 33929412

Record 3 of 50

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 (Bruendermann, E.); Buscher, M (Buescher, 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 (vol 229, pg 3675, 2020)

Source: EUROPEAN PHYSICAL JOURNAL-SPECIAL TOPICS

Volume: 229

Issue: 1

Pages: 4285-4287

DOI: 10.1140/epjst/e2021-100018-5

Supplement: S

Document Type: Correction

Published: FEB 3 2021

Accession Number: WOS:000618354100001

Record 4 of 50

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

Title: Scattering of ultrashort laser pulses in Maxwellian plasmas: Transition scattering

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 10

Article Number: 102104

DOI: 10.1063/5.0065862

Document Type: Article

Published: OCT 2021

Abstract: In this paper, we presented a model, describing transition scattering of ultrashort laser pulses (USLPs) in Maxwellian plasmas in terms of the full spectral-angular probability during the entire time of pulse action. We demonstrated that in the case of the USLP, probability dependence on pulse duration (t-dependence) generally is a non-monotonic function. The main trends of the t-dependence were defined. For quasi-elastic transition scattering, we derived analytical formulas of the full spectral-angular probability that describes non-monotonic areas of the t-dependence with high accuracy. In the framework of the analytical approach, we established conditions, at which non-monotonic trends are realized, and assessed dynamics of local extremes at the variation of problem parameters. We compared t-dependence, angular dependence of transition, and Thomson scattering probability and assessed limits of analytical approximations. The crucial similarities and differences of these two types of scattering were described. Published under an exclusive license by AIP Publishing

Accession Number: WOS:000721697300004

Record 5 of 50

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

Title: Scattering of ultrashort laser pulses on plasmons in a Maxwellian plasma

Source: MATTER AND RADIATION AT EXTREMES

Volume: 6

Issue: 5

Article Number: 054404

DOI: 10.1063/5.0065835

Document Type: Article

Published: SEP 1 2021

Abstract: On the basis of equations obtained in the framework of second-order quantum-mechanical perturbation theory, the standard approach to the calculation of scattering radiation probability is extended to the case of ultrashort laser pulses. We investigate the mechanism of the appearance of plasmon peaks in the spectrum of the plasma form factor for different parameters of the problem. For the case in which scattering on plasmons dominates over scattering on electron density fluctuations caused by chaotic thermal motion, we derive analytical expressions describing the scattering probability of ultrashort laser pulses on plasmons. Together with this, we obtain a simple expression connecting the frequency of scattered radiation and the energy transmitted from the incident pulse to plasmon, and vice versa. In considering the scattering probability, our emphasis is on the dependence on the pulse duration. We assess in detail the trends of this dependence for various relations between pulse carrier frequency and plasmon energy. (c) 2021 Author(s). All article content, except where otherwise noted, is licensed under a Creative Commons Attribution (CC BY) license (http:// creativecommons.org/licenses/by/4.0/). https://doi-org.inp.bib.cnrs.fr /10.1063/5.0065835

Accession Number: WOS:000697143900001

Record 6 of 50

By: Astapenko, VA (Astapenko, V. A.); Rosmej, FB (Rosmej, F. B.); Sakhno, EV (Sakhno, E., V)

Title: Dynamics of Time Evolution of Quantum Oscillator Excitation by Electromagnetic Pulses

Source: JOURNAL OF EXPERIMENTAL AND THEORETICAL PHYSICS

Volume: 133

Issue: 2

Pages: 125-135

DOI: 10.1134/S1063776121070013

Document Type: Article

Published: AUG 2021

Abstract: The dynamics of time evolution of quantum oscillator excitation by electromagnetic pulses is investigated theoretically for an arbitrary field amplitude in a pulse. We consider a harmonic oscillator without damping and excitation between stationary states. The general formula for the excitation of quantum states as a function of time is derived in terms of instantaneous energy of an associated classical oscillator in the field of an electromagnetic pulse. The derived expression is used in detailed analysis of the time dependence of the quantum oscillator excitation probability beyond the range of perturbation theory for various pulse parameters including total excitation from the ground state, excitation from excited states, and excitation spectra.

Accession Number: WOS:000702394300001

Record 7 of 50

By: Bonfigli, F (Bonfigli, F.); Hartley, NJ (Hartley, N. J.); Inubushi, Y (Inubushi, Y.); Katagiri, K (Katagiri, K.); Koenig, M (Koenig, M.); Matsuoka, T (Matsuoka, T.); Makarov, S (Makarov, S.); Montereali, RM (Montereali, R. M.); Nichelatti, E (Nichelatti, E.); Ozaki, N (Ozaki, N.); Piccinini, M (Piccinini, M.); Pikuz, S (Pikuz, S.); Pikuz, T (Pikuz, T.); Sagae, D (Sagae, D.); Vincenti, MA (Vincenti, M. A.); Yabuuchi, T (Yabuuchi, T.)

Title: Photoluminescent radiation-induced color centers in lithium fluoride for detection of pulsed 10 keV XFEL beam

Source: NUOVO CIMENTO C-COLLOQUIA AND COMMUNICATIONS IN PHYSICS

Volume: 44

Issue: 4-5

Article Number: 146

DOI: 10.1393/ncc/i2021-21146-x

Document Type: Article

Published: JUL-OCT 2021

Abstract: Images of the Spring-8 Angstrom Compact free electron LAser (SACLA) 10 keV pulsed (10 fs) beam were recorded in a lithium fluoride (LiF) crystal by exploiting visible photoluminescence of radiation-induced color centers (CCs). Photoluminescent beam images stored in LiF, irradiated at several energies from 0.04 to 0.8 J, were acquired by a fluorescence optical microscope and processed with an algorithm developed in Matlab, allowing to reconstruct the transversal beam fluence distribution.

Accession Number: WOS:000728566200041

Record 8 of 50

By: Bonvalet, J (Bonvalet, J.); Loiseau, P (Loiseau, P.); Marques, JR (Marques, J-R); Atukpor, E (Atukpor, E.); D'Humieres, E (D'Humieres, E.); Domange, J (Domange, J.); Forestier-Colleoni, P (Forestier-Colleoni, P.); Hannachi, F (Hannachi, F.); Lancia, L (Lancia, L.); Raffestin, D (Raffestin, D.); Tarisien, M (Tarisien, M.); Tikhonchuk, V (Tikhonchuk, V); Nicolai, P (Nicolai, Ph)

Title: Laser-driven collisionless shock acceleration of protons from gas jets tailored by one or two nanosecond beams

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 11

Article Number: 113102

DOI: 10.1063/5.0062503

Document Type: Article

Published: NOV 2021

Abstract: It was proposed recently that laser-ion acceleration in gas jets may be significantly improved if each side of a gas jet target is tailored by an auxiliary nanosecond laser pulse [Marques et al., Phys. Plasmas 28, 023103 (2021)]. In the present study, the proton acceleration by electrostatic shock in these one- or two-side tailored plasmas is investigated using particle-in-cell simulations. It is demonstrated that the formation of a thin plasma layer with a steep density profile and a maximum density of the order of the critical density strongly improves the proton acceleration in the forward direction with a maximum ion energy of tens of MeV with mildly relativistic laser pulses. Proton acceleration up to tens of MeV is predicted using realistic plasma density profiles obtained from tailored gas jet targets compared to a few MeV reported in other publications.</p>

Accession Number: WOS:000715858600002

Record 9 of 50

By: Bott, AFA (Bott, A. F. A.); Chen, L (Chen, L.); Boutoux, G (Boutoux, G.); Caillaud, T (Caillaud, T.); Duval, A (Duval, A.); Koenig, M (Koenig, M.); Khiar, B (Khiar, B.); Lantuejoul, I (Lantuejoul, I); Le-Deroff, L (Le-Deroff, L.); Reville, B (Reville, B.); Rosch, R (Rosch, R.); Ryu, D (Ryu, D.); Spindloe, C (Spindloe, C.); Vauzour, B (Vauzour, B.); Villette, B (Villette, B.); Schekochihin, AA (Schekochihin, A. A.); Lamb, DQ (Lamb, D. Q.); Tzeferacos, P (Tzeferacos, P.); Gregori, G (Gregori, G.); Casner, A (Casner, A.)

Title: Inefficient Magnetic-Field Amplification in Supersonic Laser-Plasma Turbulence

Source: PHYSICAL REVIEW LETTERS

Volume: 127

Issue: 17

Article Number: 175002

DOI: 10.1103/PhysRevLett.127.175002

Document Type: Article

Published: OCT 21 2021

Abstract: We report a laser-plasma experiment that was carried out at the LMJ-PETAL facility and realized the first magnetized, turbulent, supersonic (Maturb 2.5) plasma with a large magnetic Reynolds number (Rm 45) in the laboratory. Initial seed magnetic fields were amplified, but only moderately so, and did not become dynamically significant. A notable absence of magnetic energy at scales smaller than the outer scale of the turbulent cascade was also observed. Our results support the notion that moderately supersonic, low-magnetic-Prandtl-number plasma turbulence is inefficient at amplifying magnetic fields compared to its subsonic, incompressible counterpart.

Accession Number: WOS:000711323900008

PubMed ID: 34739267

Record 10 of 50

By: Burdonov, K (Burdonov, K.); Fazzini, A (Fazzini, A.); Lelasseux, V (Lelasseux, V); Albrecht, J (Albrecht, J.); Antici, P (Antici, P.); Ayoul, Y (Ayoul, Y.); Beluze, A (Beluze, A.); Cavanna, D (Cavanna, D.); Ceccotti, T (Ceccotti, T.); Chabanis, M (Chabanis, M.); Chaleil, A (Chaleil, A.); Chen, SN (Chen, S. N.); Chen, Z (Chen, Z.); Consoli, F (Consoli, F.); Cuciuc, M (Cuciuc, M.); Davoine, X (Davoine, X.); Delaneau, JP (Delaneau, J. P.); d'Humieres, E

(d'Humieres, E.); Dubois, JL (Dubois, J-L); Evrard, C (Evrard, C.); Filippov, E (Filippov, E.); Freneaux, A (Freneaux, A.); Forestier-Colleoni, P (Forestier-Colleoni, P.); Gremillet, L (Gremillet, L.); Horny, V (Horny, V); Lancia, L (Lancia, L.); Lecherbourg, L (Lecherbourg, L.); Lebas, N (Lebas, N.); Leblanc, A (Leblanc, A.); Ma, W (Ma, W.); Martin, L (Martin, L.); Negoita, F (Negoita, F.); Paillard, JL (Paillard, J-L); Papadopoulos, D (Papadopoulos, D.); Perez, F (Perez, F.); Pikuz, S (Pikuz, S.); Qi, G (Qi, G.); Quere, F (Quere, F.); Ranc, L (Ranc, L.); Soderstrom, PA (Soderstrom, P-A); Sciscio, M (Sciscio, M.); Sun, S (Sun, S.); Vallieres, S (Vallieres, S.); Wang, P (Wang, P.); Yao, W (Yao, W.); Mathieu, F (Mathieu, F.); Audebert, P (Audebert, P.); Fuchs, J (Fuchs, J.)

Title: Characterization and performance of the Apollon short-focal-area facility following its commissioning at 1 PW level

Source: MATTER AND RADIATION AT EXTREMES

Volume: 6

Issue: 6

Article Number: 064402

DOI: 10.1063/5.0065138

Document Type: Article

Published: NOV 1 2021

Abstract: We present the results of the first commissioning phase of the short-focal-length area of the Apollon laser facility (located in Saclay, France), which was performed with the first available laser beam (F2), scaled to a nominal power of 1 PW. Under the conditions that were tested, this beam delivered on-target pulses of 10 J average energy and 24 fs duration. Several diagnostics were fielded to assess the performance of the facility. The on-target focal spot and its spatial stability, the temporal intensity profile prior to the main pulse, and the resulting density gradient formed at the irradiated side of solid targets have been thoroughly characterized, with the goal of helping users design future experiments. Emissions of energetic electrons, ions, and electromagnetic radiation were recorded, showing good laser-to-target coupling efficiency and an overall performance comparable to that of similar international facilities. This will be followed in 2022 by a further commissioning stage at the multi-petawatt level.</p>

Accession Number: WOS:000711170900002

Record 11 of 50

By: Burdonov, K (Burdonov, K.); Bonito, R (Bonito, R.); Giannini, T (Giannini, T.); Aidakina, N (Aidakina, N.); Argiroffi, C (Argiroffi, C.); Beard, J (Beard, J.); Chen, SN (Chen, S. N.); Ciardi, A (Ciardi, A.); Ginzburg, V (Ginzburg, V.); Gubskiy, K (Gubskiy, K.); Gundorin, V (Gundorin, V.); Gushchin, M (Gushchin, M.); Kochetkov, A (Kochetkov, A.); Korobkov, S (Korobkov, S.); Kuzmin, A (Kuzmin, A.); Kuznetsov, A (Kuznetsov, A.); Pikuz, S (Pikuz, S.); Revet, G (Revet, G.); Ryazantsev, S (Ryazantsev, S.); Shaykin, A (Shaykin, A.); Shaykin, I (Shaykin, I.); Soloviev, A (Soloviev, A.); Starodubtsev, M (Starodubtsev, M.); Strikovskiy, A (Strikovskiy, A.); Yao, W (Yao, W.); Yakovlev, I (Yakovlev, I.); Zemskov, R (Zemskov, R.); Zudin, I (Zudin, I.); Khazanov, E (Khazanov, E.); Orlando, S (Orlando, S.); Fuchs, J (Fuchs, J.)

Title: Inferring possible magnetic field strength of accreting inflows in EXor-type objects from scaled laboratory experiments

Source: ASTRONOMY & ASTROPHYSICS

Volume: 648

Article Number: A81

DOI: 10.1051/0004-6361/202040036

Document Type: Article

Published: APR 16 2021

Abstract: Aims. EXor-type objects are protostars that display powerful UV-optical outbursts caused by intermittent and powerful events of magnetospheric accretion. These objects are not yet well investigated and are quite difficult to characterize. Several parameters, such as plasma stream velocities, characteristic densities, and temperatures, can be retrieved from present observations. As of yet, however, there is no information about the magnetic field values and the exact underlying accretion scenario is also under discussion.Methods. We use laboratory plasmas, created by a high power laser impacting a solid target or by a plasma gun injector, and make these plasmas propagate perpendicularly to a strong external magnetic field. The propagating plasmas are found to be well scaled to the presently inferred parameters of EXor-type accretion event, thus allowing us to study the behaviour of such episodic accretion processes in scaled conditions.Results. We propose a scenario of additional matter accretion in the

equatorial plane, which claims to explain the increased accretion rates of the EXor objects, supported by the experimental demonstration of effective plasma propagation across the magnetic field. In particular, our laboratory investigation allows us to determine that the field strength in the accretion stream of EXor objects, in a position intermediate between the truncation radius and the stellar surface, should be of the order of 100 G. This, in turn, suggests a field strength of a few kilogausses on the stellar surface, which is similar to values inferred from observations of classical T Tauri stars.

Accession Number: WOS:000641799200001

Record 12 of 50

By: Chanteloup, JC (Chanteloup, Jean-Christophe); Bellanger, S (Bellanger, Severine); Daniault, L (Daniault, Louis); Fsaifes, I (Fsaifes, Ihsan); Veinhard, M (Veinhard, Matthieu); Bourderionnet, J (Bourderionnet, Jerome); Larat, C (Larat, Christian); Lallier, E (Lallier, Eric); Brignon, A (Brignon, Arnaud)

Edited by: Zervas, MN (Zervas, MN); Jauregul-Misas, C (Jauregul-Misas, C)

Title: 61 channels Coherent Beam Combining femtosecond Digital laser

Source: FIBER LASERS XVIII: TECHNOLOGY AND SYSTEMS

Book Series Title: Proceedings of SPIE

Volume: 11665

Article Number: 116651H

DOI: 10.1117/12.2576606

Document Type: Proceedings Paper

Published: 2021

Abstract: Tiled-aperture Coherent Beam Combination architecture opens the way to digital laser operating in high peak and average power regimes.

Conference Title: Conference on Fiber Lasers XVIII - Technology and Systems

Conference Date: MAR 06-11, 2021

Conference Location: ELECTR NETWORK

Sponsor(s): NKT Photon A S; Act Fiber Syst GmbH

Accession Number: WOS:000691545100037

Record 13 of 50

By: Denoeud, A (Denoeud, A.); Hernandez, JA (Hernandez, J-A); Vinci, T (Vinci, T.); Benuzzi-Mounaix, A (Benuzzi-Mounaix, A.); Brygoo, S (Brygoo, S.); Berlioux, A (Berlioux, A.); Lefevre, F (Lefevre, F.); Sollier, A (Sollier, A.); Videau, L (Videau, L.); Ravasio, A (Ravasio, A.); Guarguaglini, M (Guarguaglini, M.); Duthoit, L (Duthoit, L.); Loison, D (Loison, D.); Brambrink, E (Brambrink, E.)

Title: X-ray powder diffraction in reflection geometry on multi-beam kJ-type laser facilities

Source: REVIEW OF SCIENTIFIC INSTRUMENTS

Volume: 92

Issue: 1

Article Number: 013902

DOI: 10.1063/5.0020261

Document Type: Article

Published: JAN 1 2021

Abstract: An ultrafast x-ray powder diffraction setup for laser-driven dynamic compression has been developed at the LULI2000 laser facility. X-ray diffraction is performed in reflection geometry from a quasi-monochromatic laser-generated plasma x-ray source. In comparison to a transmission geometry setup, this configuration allows us to probe only a small portion of the compressed sample, as well as to shield the detectors against the x-rays generated by the laser-plasma interaction on the front side of the target. Thus, this new platform facilitates probing of spatially and temporarily uniform thermodynamic conditions and enables us to study samples of a large range of atomic numbers, thicknesses, and compression dynamics. As a proof-of-concept, we report direct structural measurements of the bcc-hcp transition both in shock and ramp-compressed polycrystalline iron with diffraction signals recorded between 2 theta similar to 30 degrees and similar to 150 degrees. In parallel, the pressure and temperature history of probed samples is measured by rear-side visible diagnostics (velocimetry and pyrometry).

Accession Number: WOS:000609450900001
PubMed ID: 33514214

Record 14 of 50

By: Dwivedi, A (Dwivedi, A.); Petitgirard, S (Petitgirard, S.); Appel, K (Appel, K.); Brambrink, E (Brambrink, E.); Konopkova, Z (Konopkova, Z.); Millot, M (Millot, M.); Preston, T (Preston, T.); Ravasio, A (Ravasio, A.); Strohm, C (Strohm, C.); Zastrau, U (Zastrau, U.); Cerantola, V (Cerantola, V.)

Title: Towards higher densities of matter: ultra- high pre-compression in shock dynamic experiments

Source: ACTA CRYSTALLOGRAPHICA A-FOUNDATION AND ADVANCES

Volume: 77

Pages: C457-C457

Meeting Abstract: MS-70-7

Supplement: S

Document Type: Meeting Abstract

Published: AUG 2021

Accession Number: WOS:000761714400446

Record 15 of 50

By: Filippov, ED (Filippov, Evgeny D.); Makarov, SS (Makarov, Sergey S.); Burdonov, KF (Burdonov, Konstantin F.); Yao, WP (Yao, Weipeng); Revet, G (Revet, Guilhem); Beard, J (Beard, Jerome); Bolanos, S (Bolanos, Simon); Chen, SN (Chen, Sophia N.); Guediche, A (Guediche, Amira); Hare, J (Hare, Jack); Romanovsky, D (Romanovsky, Denis); Skobelev, IY (Skobelev, Igor Yu); Starodubtsev, M (Starodubtsev, Mikhail); Ciardi, A (Ciardi, Andrea); Pikuz, SA (Pikuz, Sergey A.); Fuchs, J (Fuchs, Julien)

Title: Enhanced X-ray emission arising from laser-plasma confinement by a strong transverse magnetic field

Source: SCIENTIFIC REPORTS

Volume: 11

Issue: 1

Article Number: 8180

DOI: 10.1038/s41598-021-87651-8

Document Type: Article

Published: APR 14 2021

Abstract: We analyze, using experiments and 3D MHD numerical simulations, the dynamic and radiative properties of a plasma ablated by a laser (1 ns, 1012-1013 W/cm2) from a solid target as it expands into a homogeneous, strong magnetic field (up to 30 T) that is transverse to its main expansion axis. We find that as early as 2 ns after the start of the expansion, the plasma becomes constrained by the magnetic field. As the magnetic field strength is increased, more plasma is confined close to the target and is heated by magnetic compression. We also observe that after similar to 8 ns, the plasma is being overall shaped in a slab, with the plasma being compressed perpendicularly to the magnetic field, and being extended along the magnetic field direction. This dense slab rapidly expands into vacuum; however, it contains only similar to 2% of the total plasma. As a result of the higher density and increased heating of the plasma confined against the laser-irradiated solid target, there is a net enhancement of the total X-ray emissivity induced by the magnetization.

Accession Number: WOS:000640601800014
PubMed ID: 33854146

Record 16 of 50

By: Guarguaglini, M (Guarguaglini, M.); Soubiran, F (Soubiran, F.); Hernandez, JA (Hernandez, J-A); Benuzzi-Mounaix, A (Benuzzi-Mounaix, A.); Bolis, R (Bolis, R.); Brambrink, E (Brambrink, E.); Vinci, T (Vinci, T.); Ravasio, A (Ravasio, A.)

Title: Electrical conductivity of warm dense silica from double-shock experiments

Source: NATURE COMMUNICATIONS

Volume: 12

Issue: 1

Article Number: 840

DOI: 10.1038/s41467-021-21046-1

Document Type: Article

Published: FEB 5 2021

Abstract: Understanding materials behaviour under extreme thermodynamic conditions is fundamental in many branches of science, including High-Energy-Density physics, fusion research, material and planetary science. Silica (SiO2) is of primary importance as a key component of rocky planets' mantles. Dynamic compression is the most promising approach to explore molten silicates under extreme conditions. Although most experimental studies are restricted to the Hugoniot curve, a wider range of conditions must be reached to distill temperature and pressure effects. Here we present direct measurements of equation of state and two-colour reflectivity of double-shocked alpha -quartz on a large ensemble of thermodynamic conditions, which were until now unexplored. Combining experimental reflectivity data with numerical simulations we determine the electrical conductivity. The latter is almost constant with pressure while highly dependent on temperature, which is consistent with simulations results. Based on our findings, we conclude that dynamo processes are likely in Super-Earths' mantles. Warm dense silica is a key component in rocky planets' mantles, but reproducing the relevant conditions in experiments is challenging. Here the authors use a double-shock technique to achieve such conditions and measure the reflectivity in situ, providing insight into the conductivity and its possible impact on dynamo processes in super-Earths' mantles.

Accession Number: WOS:000617500200012

PubMed ID: 33547308

Record 17 of 50

By: Horny, V (Horny, Vojtech); Veisz, L (Veisz, Laszlo)

Title: Generation of single attosecond relativistic electron bunch from intense laser interaction with a nanosphere

Source: PLASMA PHYSICS AND CONTROLLED FUSION

Volume: 63

Issue: 12

Article Number: 125025

DOI: 10.1088/1361-6587/ac2996

Document Type: Article

Published: DEC 2021

Abstract: Ultrahigh-intensity laser-plasma physics provides unique light and particle beams as well as novel physical phenomena. A recently available regime is based on the interaction between a relativistic intensity few-cycle laser pulse and a sub-wavelength-sized mass-limited plasma target. Here, we investigate the generation of electron bunches under these extreme conditions by means of particle-in-cell simulations. In a first step, up to all electrons are expelled from the nanodroplet and gain relativistic energy from time-dependent local field enhancement at the surface. After this ejection, the electrons are further accelerated as they copropagate with the laser pulse. As a result, a few, or under specific conditions isolated, pC-class relativistic attosecond electron bunches are generated with laser pulse parameters feasible at state-of-the-art laser facilities. This is particularly interesting for some applications, such as generation of attosecond x-ray pulses via Thomson backscattering.

Accession Number: WOS:000718048600001

Record 18 of 50

By: Katagiri, K (Katagiri, K.); Ozaki, N (Ozaki, N.); Ohmura, S (Ohmura, S.); Albertazzi, B (Albertazzi, B.); Hironaka, Y (Hironaka, Y.); Inubushi, Y (Inubushi, Y.); Ishida, K (Ishida, K.); Koenig, M (Koenig, M.); Miyanishi, K (Miyanishi, K.); Nakamura, H (Nakamura, H.); Nishikino, M (Nishikino, M.); Okuchi, T (Okuchi, T.); Sato, T (Sato, T.); Seto, Y (Seto, Y.); Shigemori, K (Shigemori, K.); Sueda, K (Sueda, K.); Tange, Y (Tange, Y.); Togashi, T (Togashi, T.); Umeda, Y (Umeda, Y.); Yabashi, M (Yabashi, M.); Yabuuchi, T (Yabuuchi, T.); Kodama, R (Kodama, R.)

Title: Liquid Structure of Tantalum under Internal Negative Pressure

Source: PHYSICAL REVIEW LETTERS

Volume: 126

Issue: 17

Article Number: 175503

DOI: 10.1103/PhysRevLett.126.175503

Document Type: Article

Published: APR 28 2021

Abstract: In situ femtosecond x-ray diffraction measurements and ab initio molecular dynamics simulations were performed to study the liquid structure of tantalum shock released from several hundred gigapascals (GPa) on the nanosecond timescale. The results show that the internal negative pressure applied to the liquid tantalum reached -5.6 (0.8) GPa, suggesting the existence of a liquid-gas mixing state due to cavitation. This is the first direct evidence to prove the classical nucleation theory which predicts that liquids with high surface tension can support GPa regime tensile stress.

Accession Number: WOS:000652836500009

PubMed ID: 33988455

Record 19 of 50

By: Koenig, M (Koenig, Michel); Crandall, D (Crandall, David); Mao, HK (Mao, Ho-Kwang); Lan, K (Lan, Ke); Hoffmann, DHH (Hoffmann, Dieter H. H.); Zhang, WY (Zhang, Weiyan)

Title: Matter and radiation at extremes: Prospects and impacts

Source: MATTER AND RADIATION AT EXTREMES

Volume: 6

Issue: 1

Article Number: 013002

DOI: 10.1063/5.0041011

Document Type: Editorial Material

Published: JAN 1 2021

Accession Number: WOS:000608150400001

Record 20 of 50

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

Title: Bremsstrahlung cannon design for shock ignition relevant regime

Source: REVIEW OF SCIENTIFIC INSTRUMENTS

Volume: 92

Issue: 1

Article Number: 013501

DOI: 10.1063/5.0022030

Document Type: Article

Published: JAN 1 2021

Abstract: We report on the optimization of a BremsStrahlung Cannon (BSC) design for the investigation of laser-driven fast electron populations in a shock ignition relevant experimental campaign at the Laser Megajoule-PETawatt Aquitaine Laser facility. In this regime with laser intensities of 10(15) W/cm(2)-10(16) W/cm(2), fast electrons with energies <= 100 keV are expected to be generated through Stimulated Raman Scattering (SRS) and Two Plasmon Decay (TPD) instabilities. The main purpose of the BSC in our experiment is to identify the contribution to x-ray emission from bremsstrahlung of fast electrons originating from SRS and TPD, with expected temperatures of 40 keV and 95 keV, respectively. Data analysis and reconstruction of the distributions of x-ray photons incident on the BSC are described.

Accession Number: WOS:000607201300001

PubMed ID: 33514221

Record 21 of 50

By: Kritcher, AL (Kritcher, A. L.); Zylstra, AB (Zylstra, A. B.); Callahan, DA (Callahan, D. A.); Hurricane, OA (Hurricane, O. A.); Weber, C (Weber, C.); Ralph, J (Ralph, J.); Casey, DT (Casey, D. T.); Pak, A (Pak, A.); Baker, K (Baker, K.); Bachmann, B (Bachmann, B.); Bhandarkar, S (Bhandarkar, S.); Biener, J (Biener, J.); Bionta, R (Bionta, R.); Braun, T (Braun, T.); Bruhn, M (Bruhn, M.); Choate, C (Choate, C.); Clark, D (Clark, D.); Di Nicola, JM (Di Nicola, J. M.); Divol, L (Divol, L.); Doeppner, T (Doeppner, T.); Geppert-Kleinrath, V (Geppert-Kleinrath, V.); Haan, S (Haan, S.); Heebner, J (Heebner, J.); Hernandez, V (Hernandez, V.); Hinkel, D (Hinkel, D.); Hohenberger, M (Hohenberger, M.); Huang, H (Huang, H.); Kong, C (Kong, C.); Le Pape, S (Le Pape, S.); Mariscal, D (Mariscal, D.); Marley, E (Marley, E.); Masse, L (Masse, L.); Meaney, KD (Meaney, K. D.); Millot, M (Millot, M.); Moore, A (Moore, A.); Newman, K (Newman, K.); Nikroo, A (Nikroo, A.); Patel, P (Patel, P.); Pelz, L (Pelz, L.); Rice, N (Rice, N.); Robey, H (Robey, H.); Ross, JS (Ross, J. S.); Rubery, M (Rubery, M.); Salmonson, J (Salmonson, J.); Schlossberg, D (Schlossberg, D.); Sepke, S (Sepke, S.); Sequoia, K (Sequoia, K.); Stadermann, M (Stadermann, M.); Strozzi, D (Strozzi, D.); Tommasini, R (Tommasini, R.); Volegov, P (Volegov, P.); Wild, C (Wild, C.); Yang, S (Yang, S.); Young, C (Young, C.); Edwards, MJ (Edwards, M. J.); Landen, O (Landen, O.); Town, R (Town, R.); Herrmann, M (Herrmann, M.)

Title: Achieving record hot spot energies with large HDC implosions on NIF in HYBRID-E

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 7

Article Number: 072706

DOI: 10.1063/5.0047841

Document Type: Article

Published: JUL 2021

Abstract: HYBRID-E is an inertial confinement fusion implosion design that increases energy coupled to the hot spot by increasing the capsule scale in cylindrical hohlraums while operating within the current experimental limits of the National Ignition Facility. HYBRID-E reduces the hohlraum scale at a fixed capsule size compared to previous HYBRID designs, thereby increasing the hohlraum efficiency and energy coupled to the capsule, and uses the cross-beam energy transfer (CBET) to control the implosion symmetry by operating the inner (23 degrees and 30 degrees) and outer (44 degrees and 50 degrees) laser beams at different wavelengths (Delta lambda > 0). Small case to capsule ratio designs can suffer from insufficient drive at the waist of the hohlraum. We show that only a small amount of wavelength separation between the inner and outer beams (Delta lambda 1-2 angstrom) is required to control the symmetry in low-gas-filled hohlraums (0.3mg/cm(3) He) with enough drive at the waist of the hohlraum to symmetrically drive capsules 1180 mu m in outer radius. This campaign is the first to use the CBET to control the symmetry in 0.3mg/cm(3) He-filled hohlraums, the lowest gas fill density yet fielded with Delta lambda > 0. We find a stronger sensitivity of hot spot P2 in mu m per Angstrom (40-50 mu m/angstrom wavelength separation) than observed in high-gas-filled hohlraums and previous longer pulse designs that used a hohlraum gas fill density of 0.6mg/cm(3). There is currently no indication of transfer roll-off with increasing Delta lambda, indicating that even longer pulses or larger capsules could be driven using the CBET in cylindrical hohlraums. We show that the radiation flux symmetry is well controlled during the foot of the pulse, and that the entire implosion can be tuned symmetrically in the presence of the CBET in this system, with low levels of laser backscatter out of the hohlraum and low levels of hot electron production from intense laser-plasma interactions. Radiation hydrodynamic simulations can accurately represent the early shock symmetry and be used as a design tool, but cannot predict the late-time radiation flux symmetry during the peak of the pulse, and semi-empirical models are used to design the experiments. Deuterium-tritium (DT)-layered tests of 1100 mu m inner radius implosions showed performance close to expectations from simulations at velocities up to similar to 360km/s, and record yields at this velocity, when increasing the DT fuel layer thickness to mitigate hydrodynamic mixing of the ablator into the hot spot as a result of defects in the ablator. However, when the implosion velocity was increased, mixing due to these defects impacted performance. The ratio of measured to simulated yield for these experiments was directly correlated with the level of observed mixing. These simulations suggest that reducing the mixing, e.g., by improving the capsule defects, could result in higher performance. In addition, future experiments are planned to reduce the coast time at this scale, delay between the peak compression and the end of the laser, to increase the hot spot Published under an exclusive license by AIP Publishing.convergence and pressure. To reduce the coast time by several hundred ps compared to the 1100 mu m inner radius implosions, HYBRID-E has also fielded 1050 mu m inner radius capsules, which resulted in higher hot spot pressure and a fusion energy yield of similar to 170 kJ.

Accession Number: WOS:000691880900001

By: Le Garrec, B (Le Garrec, B.)

Edited by: Mazuray, L (Mazuray, L); Fuchs, U (Fuchs, U); Babington, J (Babington, J)

Title: Design of a telescopic zoom system for electron acceleration with lasers

Source: OPTICAL DESIGN AND ENGINEERING VIII

Book Series Title: Proceedings of SPIE

Volume: 11871

Article Number: 118710R

DOI: 10.1117/12.2597176

Document Type: Proceedings Paper

Published: 2021

Abstract: A telescopic zoom system made of three spherical mirrors has been designed for the purpose of electron acceleration with lasers at LULI's Apollon facility. This system is based on a telescope with 3 or 4 mirrors, the distances of which can be varied continuously. We are constrained by laser damage considerations which prevents us from reducing the dimension of the incident laser beam and we will show that the 3-mirror solution can be made of a first convex mirror, a second concave mirror and a third convex mirror. It is possible to get a continuous range of focal lengths when translating the second mirror such that the final focal length will vary from 1 to 4 (zoom ratio 4x) and that the final focal spot will not move. When dealing with on-axis mirrors, we will get a central obscuration and the next step will be to go off-axis such that no obscuration will occult the beam propagation. Moreover our laser beams are fairly well collimated with a residual divergence much less than 100 mu rad which means that we are not considering any field of view like it is for astronomical systems. The purpose of this paper is to describe the step-by-step method leading to the final compact zoom system that allows the focal length to be varied continuously. A mock-up of the system at a reduced scale is being built, first as a proof-of-principle and second to work on the alignment of the 3-mirror zoom.

Conference Title: Conference on Optical Design and Engineering VIII

Conference Date: SEP 13-18, 2021

Conference Location: IFEMA, Madrid, SPAIN

Conference Host: IFEMA

Accession Number: WOS:000828789100019

Record 23 of 50

By: Le Garrec, B (Le Garrec, B.); Chabanis, M (Chabanis, M.); Tinker, F (Tinker, F.); Uwakwe, M (Uwakwe, M.)

Edited by: Geyl, R (Geyl, R); Otaduy, D (Otaduy, D); Volkel, R (Volkel, R)

Title: A simple collimator design for measuring focal spots with high dynamical range

Source: OPTICAL FABRICATION, TESTING, AND METROLOGY VII

Book Series Title: Proceedings of SPIE

Volume: 11873

DOI: 10.1117/12.2599953

Document Type: Proceedings Paper

Published: 2021

Abstract: High intensity lasers in the 10-PW range require large optics (up to 600 mm diameter) with very high surface quality. In our case we have been facing troubles coming from very small wavefront defects at high spatial frequencies; defects that were not visible when checking with a Fizeau-type interferometer that was providing a PSD record. These very small defects were creating high-contrast Talbot fringes when propagating our laser beam. We decided to check carefully how the focal spot of our laser beam was affected and this was the reason why we decided to build collimators. Our collimator is a classical Newton-type telescope that can be used either off-axis or on- axis with a low central occultation (< 12%). The beam comes from a collimated laser source that is focused through a 30-mu m pinhole by a microscope objective (x 20) in order to obtain a "clean" spatial distribution. In the collimated part, optical densities calibrated at the operating wavelength(s) are inserted in order to control the intensity in the focal spot. An operating range of 10 orders of magnitude is obtained with a source emitting 5 mW. The measurement is made in the focal plane of the component to be tested with a CCD camera. In cooperation with Aperture Optical Sciences Inc., the collimator was tested with known components and results compared with other available systems. Finally, we are able to identify and to measure periodic defects as low as lambda/2500 and to connect them with their PSD value.

Conference Title: Conference on Optical Fabrication, Testing, and Metrology VII
Conference Date: SEP 13-17, 2021
Conference Location: ELECTR NETWORK
Sponsor(s): SPIE
Accession Number: WOS:000828789300008

Record 24 of 50

By: Lelasseux, V (Lelasseux, V); Soderstrom, PA (Soderstrom, P-A); Aogaki, S (Aogaki, S.); Burdonov, K (Burdonov, K.); Cerchez, M (Cerchez, M.); Chen, SN (Chen, S. N.); Dorard, S (Dorard, S.); Fazzini, A (Fazzini, A.); Gugiu, M (Gugiu, M.); Pikuz, S (Pikuz, S.); Rotaru, F (Rotaru, F.); Willi, O (Willi, O.); Negoita, F (Negoita, F.); Fuchs, J (Fuchs, J.)

Title: Design and commissioning of a neutron counter adapted to high-intensity laser matter interactions

Source: REVIEW OF SCIENTIFIC INSTRUMENTS

Volume: 92

Issue: 11

Article Number: 113303

DOI: 10.1063/5.0057828

Document Type: Article

Published: NOV 1 2021

Abstract: The advent of multi-PW laser facilities world-wide opens new opportunities for nuclear physics. With this perspective, we developed a neutron counter taking into account the specifics of a high-intensity laser environment. Using GEANT4 simulations and prototype testings, we report on the design of a modular neutron counter based on boron-10 enriched scintillators and a high-density polyethylene moderator. This detector has been calibrated using a plutonium-beryllium neutron source and commissioned during an actual neutron-producing laser experiment at the LULI2000 facility (France). An overall efficiency of 4.37(59)% has been demonstrated during calibration with a recovery time of a few hundred microseconds after laser-plasma interaction.

Accession Number: WOS:000716720400004

PubMed ID: 34852516

Record 25 of 50

By: Leslie, J (Leslie, Jack); Robinson, SM (Robinson, Stuart M.); Oakley, F (Oakley, Fiona); Luli, S (Luli, Saimir)

Title: Non-invasive synchronous monitoring of neutrophil migration using whole body near-infrared fluorescence-based imaging

Source: SCIENTIFIC REPORTS

Volume: 11

Issue: 1

Article Number: 1415

DOI: 10.1038/s41598-021-81097-8

Document Type: Article

Published: JAN 14 2021

Abstract: Advances in fluorescence imaging coupled with the generation of near infrared probes have significantly improved the capabilities of non-invasive, real-time imaging in whole animals. In this study we were able to overcome a limitation of in vivo fluorescence imaging and have established a dual cell tracking method where two different cell types can be monitored according to the spectral signature of the cell labelling fluorophore. Using a mouse model of acute liver injury, we have characterised the in vivo migration patterns of wild type and transgenic neutrophils with impaired chemotaxis. Here, we were able to demonstrate that IVIS provides a sensitive multiplexing technology to differentiate two different cell populations based on the spectral signature of the cell labelling fluorophores. This spectral unmixing methodology has the potential to uncover multidimensional cellular interactions involved in many diseases such as fibrosis and cancer. In vivo spectral un-mixing provides a useful tool for monitoring multiple biological process in real-time in the same animal.

Accession Number: WOS:000626775600015

PubMed ID: 33446811

Record 26 of 50

By: Lutgert, J (Luetgert, J.); Vorberger, J (Vorberger, J.); Hartley, NJ (Hartley, N. J.); Voigt, K (Voigt, K.); Rodel, M (Roedel, M.); Schuster, AK (Schuster, A. K.); Benuzzi-Mounaix, A (Benuzzi-Mounaix, A.); Brown, S (Brown, S.); Cowan, TE (Cowan, T. E.); Cunningham, E (Cunningham, E.); Doppner, T (Doeppner, T.); Falcone, RW (Falcone, R. W.); Fletcher, LB (Fletcher, L. B.); Galtier, E (Galtier, E.); Glenzer, SH (Glenzer, S. H.); Laso Garcia, A (Laso Garcia, A.); Gericke, DO (Gericke, D. O.); Heimann, PA (Heimann, P. A.); Lee, HJ (Lee, H. J.); McBride, EE (McBride, E. E.); Pelka, A (Pelka, A.); Prencipe, I (Prencipe, I.); Saunders, AM (Saunders, A. M.); Scholmerich, M (Schoelmerich, M.); Schorner, M (Schoerner, M.); Sun, P (Sun, P.); Vinci, T (Vinci, T.); Ravasio, A (Ravasio, A.); Kraus, D (Kraus, D.)

Title: Measuring the structure and equation of state of polyethylene terephthalate at megabar pressures

Source: SCIENTIFIC REPORTS

Volume: 11

Issue: 1

Article Number: 12883

DOI: 10.1038/s41598-021-91769-0

Document Type: Article

Published: JUN 18 2021

Abstract: We present structure and equation of state (EOS) measurements of biaxially orientated polyethylene terephthalate (PET, (C10H8O4)n, also called mylar) shock-compressed to (155 +/- 20) GPa and (6000 +/- 1000) K using in situ X-ray diffraction, Doppler velocimetry, and optical pyrometry. Comparing to density functional theory molecular dynamics (DFT-MD) simulations, we find a highly correlated liquid at conditions differing from predictions by some equations of state tables, which underlines the influence of complex chemical interactions in this regime. EOS calculations from ab initio DFT-MD simulations and shock Hugoniot measurements of density, pressure and temperature confirm the discrepancy to these tables and present an experimentally benchmarked correction to the description of PET as an exemplary material to represent the mixture of light elements at planetary interior conditions.

Accession Number: WOS:000665062100004

PubMed ID: 34145307

Record 27 of 50

By: Manuel, MJE (Manuel, M. J. -E.); Khiar, B (Khiar, B.); Rigon, G (Rigon, G.); Albertazzi, B (Albertazzi, B.); Klein, SR (Klein, S. R.); Kroll, F (Kroll, F.); Brack, FE (Brack, F. -E.); Michel, T (Michel, T.); Mabey, P (Mabey, P.); Pikuz, S (Pikuz, S.); Williams, JC (Williams, J. C.); Koenig, M (Koenig, M.); Casner, A (Casner, A.); Kuranz, CC (Kuranz, C. C.)

Title: On the study of hydrodynamic instabilities in the presence of background magnetic fields in high-energy-density plasmas

Source: MATTER AND RADIATION AT EXTREMES

Volume: 6

Issue: 2

Article Number: 026904

DOI: 10.1063/5.0025374

Document Type: Article

Published: MAR 1 2021

Abstract: Blast-wave-driven hydrodynamic instabilities are studied in the presence of a background B-field through experiments and simulations in the high-energy-density (HED) physics regime. In experiments conducted at the Laboratoire pour l'utilisation des lasers intenses (LULI), a laser-driven shock-tube platform was used to generate a hydrodynamically unstable interface with a prescribed sinusoidal surface perturbation, and short-pulse x-ray radiography was used to characterize the instability growth with and without a 10-T B-field. The LULI experiments were modeled in FLASH using resistive and ideal magnetohydrodynamics (MHD), and comparing the experiments and simulations suggests that the Spitzer model implemented in FLASH is necessary and sufficient for modeling these planar systems. These results suggest insufficient amplification of the seed B-field, due to resistive diffusion, to alter the hydrodynamic behavior. Although the ideal-MHD simulations did not represent the experiments accurately, they suggest that similar HED systems with dynamic plasma-beta (=2 mu(0)rho v(2)/B-2) values of less than similar

to 100 can reduce the growth of blast-wave-driven Rayleigh-Taylor instabilities. These findings validate the resistive-MHD FLASH modeling that is being used to design future experiments for studying B-field effects in HED plasmas. (C) 2021 Author(s).

Accession Number: WOS:000630134400001

Record 28 of 50

By: Marini, S (Marini, S.); Kleij, PS (Kleij, P. S.); Amiranoff, F (Amiranoff, F.); Grech, M (Grech, M.); Riconda, C (Riconda, C.); Raynaud, M (Raynaud, M.)

Title: Key parameters for surface plasma wave excitation in the ultra-high intensity regime

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 7

Article Number: 073104

DOI: 10.1063/5.0052599

Document Type: Article

Published: JUL 2021

Abstract: Ultra-short high-power lasers can deliver extreme light intensities (>= 10(20)W/cm(2) and <= 30 fs) and drive large amplitude Surface Plasma Wave (SPW) at over-dense plasma surface. The resulting current of energetic electron has great interest for applications, potentially scaling with the laser amplitude, provided that the laser-plasma transfer to the accelerated particles mediated by SPW is still efficient at ultra-high intensity. By means of particle-in-cell simulations, we identify the best condition for SPW excitation and show a strong correlation between the optimum surface plasma wave excitation angle and the laser's angle of incidence that optimize the electron acceleration along the plasma surface. We also discuss how plasma density and plasma surface shape can be adjusted in order to push to higher laser intensity the limit of surface plasma wave excitation. Our results open the way to new experiments on forthcoming multi-petawatt laser systems. Published under an exclusive license by AIP Publishing.

Accession Number: WOS:000691882300003

Record 29 of 50

By: Marini, S (Marini, S.); Kleij, PS (Kleij, P. S.); Pisani, F (Pisani, F.); Amiranoff, F (Amiranoff, F.); Grech, M (Grech, M.); Macchi, A (Macchi, A.); Raynaud, M (Raynaud, M.); Riconda, C (Riconda, C.)

Title: Ultrashort high energy electron bunches from tunable surface plasma waves driven with laser wavefront rotation

Source: PHYSICAL REVIEW E

Volume: 103

Issue: 2

Article Number: L021201

DOI: 10.1103/PhysRevE.103.L021201

Document Type: Article

Published: FEB 15 2021

Abstract: We propose to use ultrahigh intensity laser pulses with wave-front rotation (WFR) to produce short, ultraintense surface plasma waves (SPW) on grating targets for electron acceleration. Combining a smart grating design with optimal WFR conditions identified through simple analytical modeling and particle-in-cell simulation allows us to decrease the SPW duration (down to a few optical cycles) and increase its peak amplitude. In the relativistic regime, for I lambda(2)(0) = 3.4 x 10(19) W/cm(2) mu m(2), such SPW are found to accelerate high charge (few 10 s of pC), high energy (up to 70 MeV), and ultrashort (few fs) electron bunches.

Accession Number: WOS:000618082300014

PubMed ID: 33735997

Record 30 of 50

By: Marques, JR (Marques, J. -R.); Loiseau, P (Loiseau, P.); Bonvalet, J (Bonvalet, J.); Tarisien, M (Tarisien, M.); d'Humieres, E (d'Humieres, E.); Domange, J (Domange, J.); Hannachi, F (Hannachi, F.); Lancia, L (Lancia, L.); Larroche, O (Larroche, O.); Nicolai, P (Nicolai, P.); Puyuelo-Valdes, P (Puyuelo-Valdes, P.); Romagnani, L

(Romagnani, L.); Santos, JJ (Santos, J. J.); Tikhonchuk, V (Tikhonchuk, V.)

Title: Over-critical sharp-gradient plasma slab produced by the collision of laser-induced blast-waves in a gas jet: Application to high-energy proton acceleration

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 2

Article Number: 023103

DOI: 10.1063/5.0031313

Document Type: Article

Published: FEB 2021

Abstract: Generating thin and high density plasma slabs at a high repetition rate is a key issue for ultra-high intensity laser applications, such as plasma photonics, electron acceleration by few laser-cycle pulses, or collisionless shock acceleration of protons to high energies. In this paper, we present a scheme to generate such plasma slabs. It is based on the propagation and collision in a gas jet of two counter-propagating blast waves (BWs). Each BW is launched by a sudden and local heating induced by a nanosecond laser beam that propagates along the side of the jet. The resulting cylindrical BW expands perpendicular to the beam. The shock front, which is bent by the gas jet density gradient, pushes and compresses the plasma toward the jet center. By using two parallel ns laser beams, one on each side of the gas jet, this scheme enables us to tailor independently two opposite sides of the jet, while avoiding the damage risks associated with counterpropagating laser beams. A parametric study is performed using two and three dimensional hydrodynamic (single fluid), as well as kinetic (Fokker-Planck), simulations. This study shows that the BW bending combined with the collision in a stagnation regime increases the density by more than ten times and generates a very thin (down to few micrometers), near to over-critical plasma slab with a high density contrast (>100) and a lifetime of a few hundred picoseconds. Two dimensional particle-in-cell simulations are, then, used to study the influence of the plasma tailoring on proton acceleration by a high-intensity sub-picosecond laser pulse. It is shown that tailoring the plasma, not only at the entrance but also at the exit side of the picosecond-pulse, enhances the proton beam collimation and increases significantly the number of high energy protons, and their maximum energy.

Accession Number: WOS:000629780900003

Record 31 of 50

By: Marret, A (Marret, A.); Ciardi, A (Ciardi, A.); Smets, R (Smets, R.); Fuchs, J (Fuchs, J.)

Title: On the growth of the thermally modified non-resonant streaming instability

Source: MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY

Volume: 500

Issue: 2

Pages: 2302-2315

DOI: 10.1093/mnras/staa3465

Document Type: Article

Published: JAN 2021

Abstract: The cosmic rays non-resonant streaming instability is believed to be the source of substantial magnetic field amplification. In this work, we investigate the effects of the ambient plasma temperature on the instability and derive analytical expressions of its growth rate in the hot, demagnetized regime of interaction. To study its non-linear evolution, we perform hybrid-PIC simulations for a wide range of temperatures. We find that in the cold limit, about two-thirds of the cosmic rays drift kinetic energy is converted into magnetic energy. Increasing the temperature of the ambient plasma can substantially reduce the growth rate and the magnitude of the saturated magnetic field.

Accession Number: WOS:000605983000060

Record 32 of 50

By: McIlvenny, A (McIlvenny, A.); Doria, D (Doria, D.); Romagnani, L (Romagnani, L.); Ahmed, H (Ahmed, H.); Booth, N (Booth, N.); Ditter, EJ (Ditter, E. J.); Ettlinger, OC (Ettlinger, O. C.); Hicks, GS (Hicks, G. S.); Martin, P (Martin, P.); Scott, GG (Scott, G. G.); Williamson, SDR (Williamson, S. D. R.); Macchi, A (Macchi, A.); McKenna, P (McKenna, P.); Najmudin, Z (Najmudin, Z.); Neely, D (Neely, D.); Kar, S (Kar, S.); Borghesi, M (Borghesi, M.)

Title: Selective Ion Acceleration by Intense Radiation Pressure

Source: PHYSICAL REVIEW LETTERS

Volume: 127

Issue: 19

Article Number: 194801

DOI: 10.1103/PhysRevLett.127.194801

Document Type: Article

Published: NOV 5 2021

Abstract: We report on the selective acceleration of carbon ions during the interaction of ultrashort, circularly polarized and contrast-enhanced laser pulses, at a peak intensity of 5.5 x 10(20) W/cm(2), with ultrathin carbon foils. Under optimized conditions, energies per nucleon of the bulk carbon ions reached significantly higher values than the energies of contaminant protons (33 MeV/nucleon vs 18 MeV), unlike what is typically observed in laser-foil acceleration experiments. Experimental data, and supporting simulations, emphasize different dominant acceleration mechanisms for the two ion species and highlight an (intensity dependent) optimum thickness for radiation pressure acceleration; it is suggested that the preceding laser energy reaching the target before the main pulse arrives plays a key role in a preferential acceleration of the heavier ion species.

Accession Number: WOS:000714982900005

PubMed ID: 34797126

Record 33 of 50

By: Mercuri-Baron, A (Mercuri-Baron, A.); Grech, M (Grech, M.); Niel, F (Niel, F.); Grassi, A (Grassi, A.); Lobet, M (Lobet, M.); Di Piazza, A (Di Piazza, A.); Riconda, C (Riconda, C.)

Title: Impact of the laser spatio-temporal shape on Breit-Wheeler pair production

Source: NEW JOURNAL OF PHYSICS

Volume: 23

Issue: 8

Article Number: 085006

DOI: 10.1088/1367-2630/ac1975

Document Type: Article

Published: AUG 2021

Abstract: The forthcoming generation of multi-petawatt lasers opens the way to abundant pair production by the nonlinear Breit-Wheeler process, i.e. the decay of a photon into an electron-positron pair inside an intense laser field. In this paper we explore the optimal conditions for Breit-Wheeler pair production in the head-on collision of a laser pulse with gamma photons. The role of the laser peak intensity versus the focal spot size and shape is examined keeping a constant laser energy to match experimental constraints. A simple model for the soft-shower case, where most pairs originate from the decay of the initial gamma photons, is derived. This approach provides us with a semi-analytical model for more complex situations involving either Gaussian or Laguerre-Gauss (LG) laser beams. We then explore the influence of the order of the LG beams on pair creation. Finally we obtain the result that, above a given threshold, a larger spot size (or a higher order in the case of LG laser beams) is more favorable than a higher peak intensity. Our results match very well with three-dimensional particle-in-cell simulations and can be used to guide upcoming experimental campaigns.

Accession Number: WOS:000685898100001

Record 34 of 50

By: Mu, XW (Mu, Xiaowei); Cai, S (Cai, Shuang); Fu, R (Fu, Rong); Qian, YM (Qian, Yumeng); Pan, ZY (Pan, Ziye); Li, L (Li, Lu)

Title: Efficient full-spectrum driven ammonia synthesis over heterostructured TiO2 nanosheet arrays

Source: CHEMICAL COMMUNICATIONS

Volume: 58

Issue: 2

Pages: 278-281

DOI: 10.1039/d1cc06489d

Early Access Date: NOV 2021

Document Type: Article

Published: DEC 23 2021

Abstract: Here, we report that efficient photocatalytic ammonia synthesis was realized across the entire solar spectrum by using Ru modified anatase/TiO2(B) heterostructured nanosheet arrays. The superior NH3 production rates of 2004 mu g h(-1) g(-1) and 521 mu g h(-1) g(-1) were achieved under visible light (400 nm) and near-infrared-light (1550 nm) irradiation, respectively.

Accession Number: WOS:000728079800001

PubMed ID: 34878464

Record 35 of 50

By: Oh, JAS (Oh, Jin An Sam); Wang, YM (Wang, Yumei); Zeng, QB (Zeng, Qibin); Sun, JG (Sun, Jianguo); Sun, QM (Sun, Qiaomei); Goh, M (Goh, Minhao); Chua, B (Chua, Bengwah); Zeng, KY (Zeng, Kaiyang); Lu, L (Lu, Li)

Title: Intrinsic low sodium/NASICON interfacial resistance paving the way for room temperature sodium-metal battery

Source: JOURNAL OF COLLOID AND INTERFACE SCIENCE

Volume: 601

Pages: 418-426

DOI: 10.1016/j.jcis.2021.05.123

Early Access Date: JUN 2021

Document Type: Article

Published: NOV 2021

Abstract: Sodium-metal batteries have strong potential to be utilized as stationary high energy density storage devices. Owing to its high ionic conductivity, low electronic conductivity and relatively easy fabrication, NASICON-structure electrolyte (Na3Zr2Si2PO12) is one of the potential candidates to be considered in the solid-state sodium-metal batteries at room temperature. However, the large interfacial resistance between the solid-state electrolyte and the metallic sodium is known to limit the critical current density (CCD) of the cell. In this study, a simple and cost-effective annealing process is introduced to the electrolyte preparation to improves its interface with metallic sodium. X-ray photoelectron spectroscopy and scanning probe microscopy show that Si forms bonds with the surface functional groups when exposed to the ambient condition. With the removal of surface contamination as well as a partially reduced electrolyte surface, the annealed electrolyte shows an extremely small interfacial resistance of 11 Omega cm(2) and a high CCD of 0.9 mA cm(-2). This study provides an insight on the electrolyte surface preparation and its significant in a sodium-metal solid-state battery.

Accession Number: WOS:000684996900003

PubMed ID: 34087600

Record 36 of 50

By: Okuchi, T (Okuchi, Takuo); Seto, Y (Seto, Yusuke); Tomioka, N (Tomioka, Naotaka); Matsuoka, T (Matsuoka, Takeshi); Albertazzi, B (Albertazzi, Bruno); Hartley, NJ (Hartley, Nicholas J.); Inubushi, Y (Inubushi, Yuichi); Katagiri, K (Katagiri, Kento); Kodama, R (Kodama, Ryosuke); Pikuz, TA (Pikuz, Tatiana A.); Purevjav, N (Purevjav, Narangoo); Miyanishi, K (Miyanishi, Kohei); Sato, T (Sato, Tomoko); Sekine, T (Sekine, Toshimori); Sueda, K (Sueda, Keiichi); Tanaka, KA (Tanaka, Kazuo A.); Tange, Y (Tange, Yoshinori); Togashi, T (Togashi, Tadashi); Umeda, Y (Umeda, Yuhei); Yabuuchi, T (Yabuuchi, Toshinori); Yabashi, M (Yabashi, Makina); Ozaki, N (Ozaki, Norimasa)

Title: Ultrafast olivine-ringwoodite transformation during shock compression

Source: NATURE COMMUNICATIONS

Volume: 12

Issue: 1

Article Number: 4305

DOI: 10.1038/s41467-021-24633-4

Document Type: Article

Published: JUL 14 2021

Abstract: Meteorites from interplanetary space often include high-pressure polymorphs of their constituent minerals, which provide records of past hypervelocity collisions. These collisions were expected to occur between kilometre-sized asteroids, generating transient high-pressure states lasting for several seconds to facilitate mineral transformations across the relevant phase boundaries. However, their mechanisms in such a short timescale were never experimentally evaluated and remained speculative. Here, we show a nanosecond transformation mechanism yielding ringwoodite, which is the most typical high-pressure mineral in meteorites. An olivine crystal was shock-compressed by a focused high-power laser pulse, and the transformation was time-resolved by femtosecond diffractometry using an X-ray free electron laser. Our results show the formation of ringwoodite through a faster, diffusionless process, suggesting that ringwoodite can form from collisions between much smaller bodies, such as metre to submetre-sized asteroids, at common relative velocities. Even nominally unshocked meteorites could therefore contain signatures of high-pressure states from past collisions. Meteorites from space often include denser polymorphs of their minerals, providing records of past hypervelocity collisions. An olivine mineral crystal was shock-compressed by a high-power laser, and its transformation into denser ringwoodite was time-resolved using an X-ray free electron laser.

Accession Number: WOS:000675628800010

PubMed ID: 34262045

Record 37 of 50

By: Peng, H (Peng, H.); Riconda, C (Riconda, C.); Weber, S (Weber, S.); Zhou, CT (Zhou, C. T.); Ruan, SC (Ruan, S. C.)

Title: Frequency Conversion of Lasers in a Dynamic Plasma Grating

Source: PHYSICAL REVIEW APPLIED

Volume: 15

Issue: 5

Article Number: 054053

DOI: 10.1103/PhysRevApplied.15.054053

Document Type: Article

Published: MAY 24 2021

Abstract: When a dynamic medium in which the laser propagates changes its refractive index in time, the laser changes its frequency while keeping its wavevector unchanged to fullfil the dispersion relation. This is usually applied to upshift the laser frequency with ionizing plasma. We propose an alternative technique to modify light frequency. A transient plasma grating can be generated by two identical counterpropagating laser pulses via strongly coupled stimulated Brillouin scattering (SC SBS). The rapid evolution of the plasma grating affects the wave-dispersion relation and a band gap develops around the laser frequency, dependent on the grating amplitude. As a result, the lasers convert their frequency downward to the low edge of the band gap, while a free-traveling laser converts its frequency to both the upper and lower edge of the band gap. Depending on the considered setup, practical applications of this technique include either laser-frequency downshift or spectral splitting can be exploited. The former can be used for Raman amplification in plasma and the latter for dual-color x-ray generation by Thomson and/or Compton scattering.

Accession Number: WOS:000657692000004

Record 38 of 50

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

Title: Numerical study of Langmuir wave coalescence in laser-plasma interaction (vol 28, 043102, 2021)

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 5

Article Number: 059902

DOI: 10.1063/5.0054645

Document Type: Correction

Published: MAY 2021

Accession Number: WOS:000678723100002

Record 39 of 50

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

Title: Numerical study of Langmuir wave coalescence in laser-plasma interaction

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 4

Article Number: 043102

DOI: 10.1063/5.0037028

Document Type: Article

Published: APR 2021

Abstract: Type-III-burst radio signals can be mimicked in the laboratory via laser-plasma interaction. Instead of an electron beam generating Langmuir waves (LWs) in the interplanetary medium, the LWs are created by a laser interacting with a millimeter-sized plasma through the stimulated Raman instability. In both cases, the LWs feed the Langmuir decay instability which scatters them in several directions. The resulting LWs may couple to form electromagnetic emission at twice the plasma frequency, which has been detected in the interplanetary medium, and recently in a laboratory laser experiment [Marques et al., Phys. Rev. Lett. 124, 135001 (2020)]. This article presents the first numerical analysis of this laser configuration using particle-in-cell simulations, providing details on the wave spectra that are too difficult to measure in experiments. The role of some parameters is addressed, with a focus on laser intensity, in order to illustrate the behavior of the electromagnetic emission's angular distribution and polarization.

Accession Number: WOS:000636766900001

Record 40 of 50

By: Poujade, O (Poujade, O.); Barrios, MA (Barrios, M. A.); Baton, S (Baton, S.); Blancard, C (Blancard, C.); Devriendt, R (Devriendt, R.); Primout, M (Primout, M.)

Title: Rayleigh-Taylor mixing may account for the position anomaly in NIF microdot spectroscopy experiments

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 4

Article Number: 042704

DOI: 10.1063/5.0040583

Document Type: Article

Published: APR 2021

Abstract: The "microdot spectroscopy" experiment [Barrios et al., "Electron temperature measurements inside the ablating plasma of gas-filled Hohlraums at the National Ignition Facility," Phys. Plasmas 23, 056307 (2016); Barrios et al., "Developing an experimental basis for understanding transport in NIF Hohlraum plasmas," Phys. Rev. Lett. 121, 095002 (2018).] allows for a simultaneous measurement of the electron temperature (T-e) and position of a patch of Mn and Co inside a Hohlraum, as described by Barrios et al. ["Electron temperature measurements inside the ablating plasma of gas-filled Hohlraums at the National Ignition Facility," Phys. Plasmas 23, 056307 (2016).] HYDRA simulations systematically predicted a dot location further away from its starting location than observed in the experiment. In the article, integrated radiation hydrodynamics simulations with TROLL have led to the same trend as HYDRA. A new ad hoc treatment of laser absorption, through what we have called absorption multipliers, has been implemented in TROLL in order to mimic the effect of absorption mechanisms other than inverse-bremsstrahlung. It led to the instrumental conclusion that whatever physical phenomenon was responsible for the position anomaly must have occurred in the early stage. More precise simulations of the dot region, from early to late time, show that the position discrepancy can be explained by a Rayleigh-Taylor mixing of the dot into the ablator as it expands in the Hohlraum. This mixing tends to shift the simulated dot closer to the location measured in the experiment. However, the mixing also changes the interpretation of the electron temperature from the spectral line ratios.

Accession Number: WOS:000638225200001

Record 41 of 50

By: Ravasio, A (Ravasio, A.); Bethkenhagen, M (Bethkenhagen, M.); Hernandez, JA (Hernandez, J-A); Benuzzi-Mounaix, A (Benuzzi-Mounaix, A.); Datchi, F (Datchi, F.); French, M (French, M.); Guarguaglini, M (Guarguaglini, M.); Lefevre, F (Lefevre, F.); Ninet, S (Ninet, S.); Redmer, R (Redmer, R.); Vinci, T (Vinci, T.)

Title: Metallization of Shock-Compressed Liquid Ammonia

Source: PHYSICAL REVIEW LETTERS

Volume: 126

Issue: 2

Article Number: 025003

DOI: 10.1103/PhysRevLett.126.025003

Document Type: Article

Published: JAN 13 2021

Abstract: Ammonia is predicted to be one of the major components in the depths of the ice giant planets Uranus and Neptune. Their dynamics, evolution, and interior structure are insufficiently understood and models rely imperatively on data for equation of state and transport properties. Despite its great significance, the experimentally accessed region of the ammonia phase diagram today is still very limited in pressure and temperature. Here we push the probed regime to unprecedented conditions, up to similar to 350 GPa and similar to 40 000 K. Along the Hugoniot, the temperature measured as a function of pressure shows a subtle change in slope at similar to 7000 K and similar to 90 GPa, in agreement with ab initio simulations we have performed. This feature coincides with the gradual transition from a molecular liquid to a plasma state. Additionally, we performed reflectivity measurements, providing the first experimental evidence of electronic conduction in high-pressure ammonia. Shock reflectance continuously rises with pressure above 50 GPa and reaches saturation values above 120 GPa. Corresponding electrical conductivity values are up to 1 order of magnitude higher than in water in the 100 GPa regime, with possible significant contributions of the predicted ammonia-rich layers to the generation of magnetic dynamos in ice giant interiors.

Accession Number: WOS:000607525700011

PubMed ID: 33512205

Record 42 of 50

By: Revet, G (Revet, G.); Khiar, B (Khiar, B.); Filippov, E (Filippov, E.); Argiroffi, C (Argiroffi, C.); Beard, J (Beard, J.); Bonito, R (Bonito, R.); Cerchez, M (Cerchez, M.); Chen, SN (Chen, S. N.); Gangolf, T (Gangolf, T.); Higginson, DP (Higginson, D. P.); Mignone, A (Mignone, A.); Olmi, B (Olmi, B.); Ouill, M (Ouill, M.); Ryazantsev, SN (Ryazantsev, S. N.); Skobelev, IY (Skobelev, I. Yu); Safronova, MI (Safronova, M., I); Starodubtsev, M (Starodubtsev, M.); Vinci, T (Vinci, T.); Willi, O (Willi, O.); Pikuz, S (Pikuz, S.); Orlando, S (Orlando, S.); Ciardi, A (Ciardi, A.); Fuchs, J (Fuchs, J.)

Title: Laboratory disruption of scaled astrophysical outflows by a misaligned magnetic field

Source: NATURE COMMUNICATIONS

Volume: 12

Issue: 1

Article Number: 762

DOI: 10.1038/s41467-021-20917-x

Document Type: Article

Published: FEB 3 2021

Abstract: The shaping of astrophysical outflows into bright, dense, and collimated jets due to magnetic pressure is here investigated using laboratory experiments. Here we look at the impact on jet collimation of a misalignment between the outflow, as it stems from the source, and the magnetic field. For small misalignments, a magnetic nozzle forms and redirects the outflow in a collimated jet. For growing misalignments, this nozzle becomes increasingly asymmetric, disrupting jet formation. Our results thus suggest outflow/magnetic field misalignment to be a plausible key process regulating jet collimation in a variety of objects from our Sun's outflows to extragalatic jets. Furthermore, they provide a possible interpretation for the observed structuring of astrophysical jets. Jet modulation could be interpreted as the signature of changes over time in the outflow/ambient field angle, and the change in the

direction of the jet could be the signature of changes in the direction of the ambient field. Mass outflow is a common process in astrophysical objects. Here the authors investigate in which conditions an astrophysically-scaled laser-produced plasma flow can be collimated and evolves in the presence of a misaligned external magnetic field.

Accession Number: WOS:000617330000006

PubMed ID: 33536408

Record 43 of 50

By: Rigon, G (Rigon, G.); Albertazzi, B (Albertazzi, B.); Mabey, P (Mabey, P.); Michel, T (Michel, Th); Falize, E (Falize, E.); Bouffetier, V (Bouffetier, V); Ceurvorst, L (Ceurvorst, L.); Masse, L (Masse, L.); Koenig, M (Koenig, M.); Casner, A (Casner, A.)

Title: Exploring the Atwood-number dependence of the highly nonlinear Rayleigh-Taylor instability regime in high-energy-density conditions

Source: PHYSICAL REVIEW E

Volume: 104

Issue: 4

Article Number: 045213

DOI: 10.1103/PhysRevE.104.045213

Document Type: Article

Published: OCT 27 2021

Abstract: We experimentally study the late-time, highly nonlinear regime of the Rayleigh-Taylor instability in a decelerating phase. A series of laser-driven experiments is performed on the LULI2000 laser, in which the initial Atwood number is varied by adjusting the decelerating medium density. The high-power laser is used in a direct drive configuration to put into motion a solid target. Its rear side, which initially possesses a two-dimensional machined sinusoidal perturbations, expands and decelerates into a foam leading to a Rayleigh-Taylor unstable situation. The interface position and morphology are measured by time-resolved x-ray radiography. We develop a simple Atwood-dependent model describing the motion of the decelerating interface, from which its acceleration history is obtained. The measured amplitude of the instability, or mixing zone width, is then compared with late-time acceleration-dependent Rayleigh-Taylor instability models. The shortcomings of this classical model, when applied to high-energy-density conditions, are shown. This calls into question their uses for systems, where a shock wave is present, such as those found in laboratory astrophysics or in inertial confinement fusion.

Accession Number: WOS:000712423700003

PubMed ID: 34781551

Record 44 of 50

By: Rigon, G (Rigon, G.); Albertazzi, B (Albertazzi, B.); Pikuz, T (Pikuz, T.); Mabey, P (Mabey, P.); Bouffetier, V (Bouffetier, V); Ozaki, N (Ozaki, N.); Vinci, T (Vinci, T.); Barbato, F (Barbato, F.); Falize, E (Falize, E.); Inubushi, Y (Inubushi, Y.); Kamimura, N (Kamimura, N.); Katagiri, K (Katagiri, K.); Makarov, S (Makarov, S.); Manuel, MJE (Manuel, M. J-E); Miyanishi, K (Miyanishi, K.); Pikuz, S (Pikuz, S.); Poujade, O (Poujade, O.); Sueda, K (Sueda, K.); Togashi, T (Togashi, T.); Umeda, Y (Umeda, Y.); Yabashi, M (Yabashi, M.); Yabuuchi, T (Yabuuchi, T.); Gregori, G (Gregori, G.); Kodama, R (Kodama, R.); Casner, A (Casner, A.); Koenig, M (Koenig, M.)

Title: Micron-scale phenomena observed in a turbulent laser-produced plasma

Source: NATURE COMMUNICATIONS

Volume: 12

Issue: 1

Article Number: 2679

DOI: 10.1038/s41467-021-22891-w

Document Type: Article

Published: MAY 11 2021

Abstract: Turbulence is ubiquitous in the universe and in fluid dynamics. It influences a wide range of high energy density systems, from inertial confinement fusion to astrophysical-object evolution. Understanding this phenomenon is crucial, however, due to limitations in experimental and numerical methods in plasma systems, a complete description of the turbulent spectrum is still lacking. Here, we present the measurement of a turbulent spectrum down to micron scale in a laser-plasma experiment. We use an experimental platform, which couples a high power optical

laser, an x-ray free-electron laser and a lithium fluoride crystal, to study the dynamics of a plasma flow with micrometric resolution (similar to 1 mu m) over a large field of view (>1 mm(2)). After the evolution of a Rayleigh-Taylor unstable system, we obtain spectra, which are overall consistent with existing turbulent theory, but present unexpected features. This work paves the way towards a better understanding of numerous systems, as it allows the direct comparison of experimental results, theory and numerical simulations.

Accession Number: WOS:000658723900027

PubMed ID: 33976145

Record 45 of 50

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

Title: XFEL and HHG interaction with matter: Effects of ultrashort pulses and random spikes

Source: MATTER AND RADIATION AT EXTREMES

Volume: 6

Issue: 3

Article Number: 034001

DOI: 10.1063/5.0046040

Document Type: Article

Published: MAY 1 2021

Abstract: The theory of photoionization describing the interaction of x-ray free-electron laser (XFEL) pulses and high-harmonic-generated (HHG) radiation is generalized to ultrashort laser pulses, where the concept of the standard ionization probability per unit time in Fermi's golden rule and in Einstein's theory breaks down. Numerical calculations carried out in terms of a generalized photoionization probability for the total duration of pulses in the near-threshold regime demonstrate essentially nonlinear behavior, while absolute values may change by orders of magnitude for typical XFEL and HHG pulses. XFEL self-amplified spontaneous emission pulses are analyzed to reveal general features of photoionization for random and regular spikes: the dependences of the nonlinear photoionization probability on carrier frequency and spike duration are very similar, allowing an analytical expectation value approach that is valid even when there is only limited knowledge of random and regular parameters. Numerical simulations carried out for typical parameters demonstrate excellent agreement. (C) 2021 Author(s).

Accession Number: WOS:000634447000001

Record 46 of 50

By: Rouze, B (Rouze, Bastien); Bellanger, S (Bellanger, Severine); Fsaifes, I (Fsaifes, Ihsan); Bellanger, C (Bellanger, Cindy); Veinhard, M (Veinhard, Matthieu); Chanteloup, JC (Chanteloup, Jean-Christophe); Primot, J (Primot, Jerome)

Book Group Author(s): IEEE

Title: PISTIL interferometry diagnosis on a 61 channels coherent beam combining digital laser

Source: 2021 CONFERENCE ON LASERS AND ELECTRO-OPTICS EUROPE & EUROPEAN QUANTUM ELECTRONICS CONFERENCE (CLEO/EUROPE-EQEC)

DOI: 10.1109/CLEO/Europe-EQEC52157.2021.9542514

Document Type: Proceedings Paper

Published: 2021

Conference Title: Conference on Lasers and Electro-Optics Europe / European Quantum Electronics Conference (CLEO/Europe-EQEC)

Conference Date: JUN 21-25, 2021

Conference Location: ELECTR NETWORK

Accession Number: WOS:000728078300858

Record 47 of 50

By: Ruyer, C (Ruyer, C.); Debayle, A (Debayle, A.); Loiseau, P (Loiseau, P.); Masson-Laborde, PE (Masson-Laborde, P. E.); Fuchs, J (Fuchs, J.); Casanova, M (Casanova, M.); Marques, JR (Marques, J. R.); Romagnani, L (Romagnani, L.); Antici, P (Antici, P.); Bourgeois, N (Bourgeois, N.); Nakatsutsumi, M (Nakatsutsumi, M.);

Safronova, M (Safronova, M.); Starodubtsev, M (Starodubtsev, M.); Lin, T (Lin, T.)

Title: Forward scattering and filamentation of a spatially smoothed laser pulse in the hydrodynamic and kinetic frameworks

Source: PHYSICS OF PLASMAS

Volume: 28

Issue: 5

Article Number: 052701

DOI: 10.1063/5.0043931

Document Type: Article

Published: MAY 2021

Abstract: We address the scattering of a high energy laser pulse on a large wavelength acoustic turbulence of relevance for Laser M'egajoule or National Ignition Facility-class experiments. Both kinetic and hydrodynamic frameworks are adopted and combined with a linearized description of the laser propagation. The resulting dispersion relations display important kinetic contributions to the growth of the forward Brillouin instability. Moreover, proof is made that the spatial incoherence often used in high energy laser facilities is, for cold enough plasmas or in the multi-ion species case, not enough to reach full control of the laser filamentation. Comparisons with experimental results and dedicated hydrodynamic simulations confirm our results. The derived dispersion relations present new tools for assessing the propagation quality and energy deposition region of high energy laser pulses. They also underline the importance of accounting for kinetic effects, even in the millimeter and nanosecond scale of many inertial confinement fusion or high-energy-density experiments.

Accession Number: WOS:000678719000001

Record 48 of 50

By: Sano, T (Sano, Takayoshi); Tamatani, S (Tamatani, Shohei); Matsuo, K (Matsuo, Kazuki); Law, KFF (Law, King Fai Farley); Morita, T (Morita, Taichi); Egashira, S (Egashira, Shunsuke); Ota, M (Ota, Masato); Kumar, R (Kumar, Rajesh); Shimogawara, H (Shimogawara, Hiroshi); Hara, Y (Hara, Yukiko); Lee, SH (Lee, Seungho); Sakata, S (Sakata, Shohei); Rigon, G (Rigon, Gabriel); Michel, T (Michel, Thibault); Mabey, P (Mabey, Paul); Albertazzi, B (Albertazzi, Bruno); Koenig, M (Koenig, Michel); Casner, A (Casner, Alexis); Shigemori, K (Shigemori, Keisuke); Fujioka, S (Fujioka, Shinsuke); Murakami, M (Murakami, Masakatsu); Sakawa, Y (Sakawa, Youichi)

Title: Laser astrophysics experiment on the amplification of magnetic fields by shock-induced interfacial instabilities

Source: PHYSICAL REVIEW E

Volume: 104

Issue: 3

Article Number: 035206

DOI: 10.1103/PhysRevE.104.035206

Document Type: Article

Published: SEP 17 2021

Abstract: Laser experiments are becoming established as tools for astronomical research that complement observations and theoretical modeling. Localized strong magnetic fields have been observed at a shock front of supernova explosions. Experimental confirmation and identification of the physical mechanism for this observation are of great importance in understanding the evolution of the interstellar medium. However, it has been challenging to treat the interaction between hydrodynamic instabilities and an ambient magnetic field in the laboratory. Here, we developed an experimental platform to examine magnetized Richtmyer-Meshkov instability (RMI). The measured growth velocity was consistent with the linear theory, and the magnetic-field amplification was correlated with RMI growth. Our experiment validated the turbulent amplification of magnetic fields associated with the shock-induced interfacial instability in astrophysical conditions. Experimental elucidation of fundamental processes in magnetized plasmas is generally essential in various situations such as fusion plasmas and planetary sciences.

Accession Number: WOS:000702529000003

PubMed ID: 34654211

Record 49 of 50

By: Singh, S (Singh, Sushil); Armstrong, CD (Armstrong, Chris D.); Kang, N (Kang, Ning); Ren, L (Ren, Lei); Liu, HY (Liu, Huiya); Hua, N (Hua, Neng); Rusby, DR (Rusby, Dean R.); Klimo, O (Klimo, Ondrej); Versaci, R (Versaci, Roberto); Zhang, Y (Zhang, Yan); Sun, MY (Sun, Mingying); Zhu, BQ (Zhu, Baoqiang); Lei, AL (Lei, Anle); Ouyang, XP (Ouyang, Xiaoping); Lancia, L (Lancia, Livia); Garcia, AL (Garcia, Alejandro Laso); Wagner, A (Wagner, Andreas); Cowan, T (Cowan, Thomas); Zhu, JQ (Zhu, Jianqiang); Schlegel, T (Schlegel, Theodor); Weber, S (Weber, Stefan); McKenna, P (McKenna, Paul); Neely, D (Neely, David); Tikhonchuk, V (Tikhonchuk, Vladimir); Kumar, D (Kumar, Deepak)

Title: Bremsstrahlung emission and plasma characterization driven by moderately relativistic laser-plasma interactions

Source: PLASMA PHYSICS AND CONTROLLED FUSION

Volume: 63

Issue: 3

Article Number: 035004

DOI: 10.1088/1361-6587/abcf7e

Document Type: Article

Published: MAR 2021

Abstract: Relativistic electrons generated by the interaction of petawatt-class short laser pulses with solid targets can be used to generate bright x-rays via bremsstrahlung. The efficiency of laser energy transfer into these electrons depends on multiple parameters including the focused intensity and pre-plasma level. This paper reports experimental results from the interaction of a high intensity petawatt-class glass laser pulses with solid targets at a maximum intensity of 10(19) W cm(-2). In-situ measurements of specularly reflected light are used to provide an upper bound of laser absorption and to characterize focused laser intensity, the pre-plasma level and the generation mechanism of second harmonic light. The measured spectrum of electrons and bremsstrahlung radiation provide information about the efficiency of laser energy transfer.

Accession Number: WOS:000617561100001

Record 50 of 50

By: Soloviev, AA (Soloviev, A. A.); Burdonov, KF (Burdonov, K. F.); Kotov, AV (Kotov, A., V); Perevalov, SE (Perevalov, S. E.); Zemskov, RS (Zemskov, R. S.); Ginzburg, VN (Ginzburg, V. N.); Kochetkov, AA (Kochetkov, A. A.); Kuzmin, AA (Kuzmin, A. A.); Shaikin, AA (Shaikin, A. A.); Shaikin, IA (Shaikin, I. A.); Khazanov, EA (Khazanov, E. A.); Yakovlev, IV (Yakovlev, I., V); Luchinin, AG (Luchinin, A. G.); Morozkin, MV (Morozkin, M., V); Proyavin, MD (Proyavin, M. D.); Glyavin, MY (Glyavin, M. Yu); Fuchs, J (Fuchs, J.); Starodubtsev, MV (Starodubtsev, M., V)

Title: Experimental Study of the Interaction of a Laser Plasma Flow with a Transverse Magnetic Field

Source: RADIOPHYSICS AND QUANTUM ELECTRONICS

Volume: 63

Issue: 11

Pages: 876-886

DOI: 10.1007/s11141-021-10101-y

Early Access Date: OCT 2021

Document Type: Article

Published: APR 2021

Abstract: We present the results of studying experimentally the expansion of laser plasma in a strong external magnetic field (with a magnetic flux density of 13.5 T) at various sizes of the region of plasma formation on the surface of a solid-state target. It is shown that when the size of the plasma formation region is smaller than the classical plasma braking radius, a nearly identical topology of plasma flows is observed, which is characterized by the formation of a thin plasma sheet directed along the external magnetic field. If the width of the plasma formation region is comparable with the classical plasma braking radius, an additional plasma sheet starts to be formed.

Accession Number: WOS:000702188600002

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