SINIGARDI STEFANO

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MARCH, 27TH 1985

Education

- from 01/2011 to 12/2013 — "Alma Mater Studiorum" – University of Bologna and INFN Bologna
  PhD in Physics, within the group of Prof. Turchetti
  Thesis: "Laser driven proton acceleration and beam shaping"
  http://stefano.sinigardi.it/PhD_thesis.pdf

- from 01/2008 to 12/2010 — "Alma Mater Studiorum" – University of Bologna
  MS in Nuclear and Subnuclear Physics (2 years)
  Graduated on 17/12/2010, final grade: full marks (110/110)
  Thesis in Analytical Mechanics: "Dynamical aspects of optical acceleration and transport of protons". This work has been cited in subsequent theses from this group.
  http://stefano.sinigardi.it/published/MS_Sinigardi_thesis.pdf

- from 09/2004 to 12/2007 — "Alma Mater Studiorum" – University of Bologna
  BS in Physics (3 years)
  Graduated on 14/12/2007, final grade: full marks with honours (110/110 e lode)
  Thesis in Subnuclear Physics: "Studio di fattibilità per la ricerca di eventi $H \rightarrow b\bar{b}$ accompagnati da un fotone ad alto p_T col rivelatore CMS ad LHC" (Feasibility study in searching $H \rightarrow b\bar{b}$ events accompanied with a high p_T photon in the CMS detector at LHC). This work has been cited in subsequent theses from this group.
  http://stefano.sinigardi.it/published/BS_Sinigardi_thesis.pdf

Other Schools

- April 14-16, 2014 — Programming paradigms for new hybrid architectures (CINECA – Italy)
- September 3 – 6, 2013 — The 6-th Asian Summer School and Symposium on Laser-Plasma Acceleration and Radiation (Kyoto – Japan)
- November 12 – 16, 2012 — International Momiji School for Young Scientists High Field Science – Kyoto
- October 10 – 14, 2011 — 20th Summer School of Parallel Computing (CINECA – Italy)
- July 4 – 15, 2011 — 7th Advanced School of Parallel Computing (CINECA – Italy)
- June 20 – 25, 2011 — Course CLXXIX Laser-Plasma Acceleration (SIF – Italy)

Research Experience

- since 12/2009 — INFN Bologna – Group V
  I'm working mainly with Prof. Giorgio Turchetti and Dr. Pasquale Londrillo, studying laser acceleration of protons and computer simulations of these events

(coding a "Particle-In-Cell" software). I'm also working on the problem of transporting those laser accelerated bunches along a beamline.

- since 08/2014 — UniBO –Physics of Complex Systems group
  I'm working in the group, lead by Prof. Armando Bazzani and Prof. Sandro Rambaldi, implementing fundamental algorithms in embedded systems in order to record inertial and geopositioning data to reconstruct vehicular dynamics. The work is made in synergy with R&D laboratories located inside board OEMs. Part of the work is also devoted to device quality testing and quality improvements.

- from 01/2014 to 04/2014 — CNR/INO – Pisa
  Working with Prof. A. Macchi and Dr. Andrea Sgattoni on laser acceleration of protons and numerical simulations of these regimes. The collaboration is still going on

- from 05/2013 to 09/2013 — JAEA/KPSI Kizugawa (JP) – QuBS Advanced Beam Technology Division
  Under the supervision of Prof. P. R. Bolton, I worked on the problem of simulating the 2011 *Ogura's* experiment during which protons with a record energy were obtained using the J-KAREN laser at KPSI. Different models have been analysed and included in our simulation tools.

- from 10/2012 to 12/2012 — JAEA/KPSI Kizugawa (JP) – Advanced Beam Technology Division
  Under the supervision of Prof. K. Kondo and Prof. P. R. Bolton, I worked on some laser-produced proton problems related to injection in a post-accelerating cavity.

- from 09/2012 to 10/2012 — "European Organization for Nuclear Research" CERN – Genève.
  During this month I worked in the group BE/ABP with Prof. A. Lombardi on some beam dynamics problems that could relate their experience with the design of Linac4 and our experience in the transport of a laser generated bunch.

- from 06/2012 to 07/2012 — "Gesellschaft für Schwerionenforschung GmbH" – Darmstadt.
  During this month I worked with Prof. I. Hofmann on the effect of a stripping foil inside the transport line, in order to remove electrons from the initial neutral bunch produced by a laser-plasma accelerator for ions.

- from 06/2010 to 07/2010 — "Johann Wolfgang Goethe" – University of Frankfurt (Thesis work)
  I spent six weeks in Frankfurt working with Prof. U. Ratzinger's group, comparing our simulations with their results, improving our code, creating a particle bunch generator and learning many topics about simulations, in particular about solenoids.

- from 03/2007 to 12/2007 — INFN Bologna – CMS Collaboration
  I worked mainly with Dr. Andrea Perrotta, studying a way to keep under control the background noise when looking for $H \rightarrow b\bar{b}$ events accompanied with a high p_T photon. I wrote an analyser that, using input parameters, running on simulated events, determines how many irreducible background events we were keeping and so how much noise was going to disturb signal analysis.

Work experience

- since 04/2014 — Università di Bologna, Dipartimento di Fisica
  Assegno di ricerca Protocollo num. 1436 del 15/11/2013, titolo "Modelli per accelerazione laser di protoni e generazione di raggi X Thomson", tutor Prof. Armando Bazzani
- from 01/2014 to 04/2014 — Consiglio Nazionale delle Ricerche, Istituto Nazionale di Ottica
  Contratto di prestazione d'opera in regime di lavoro autonomo occasionale

- from 03/2012 to 05/2012 — University of Bologna
  Teaching assistant for Prof. Graziano Servizi (INFN/UniBO)
  Course: Computer Science and Computer Programming Lab

- from 12/2011 to 05/2012 — University of Bologna
  Teaching assistant for Prof. Tommaso Ruggeri (CIRAM/UniBO)
  Course: Analytical Mechanics

- during 02/2011 — Arte e Scienza in Piazza – Mostra Estremo
  Guide for the exhibition, that was centred around the description of many different physics experiment around the world

Publications

- "Towards robust algorithms for current deposition and dynamic load-balancing in a GPU particle in cell code", by F. Rossi, P. Londrillo, A. Sgattoni, S. Sinigardi and G. Turchetti, AIP Conf. Proc. 1507, pp. 184-192 (2012) (doi:10.1063/1.4773692)
- "The LILIA experiment: Energy selection and post-acceleration of laser generated protons", by G. Turchetti, S. Sinigardi, P. Londrillo, F. Rossi, M. Sumini, D. Giove and C. De Martinis, AIP Conf. Proc. 1507, pp. 820-824 (2012) (doi:10.1063/1.4773804)
- "Protons Acceleration by CO2 Laser Pulses and Perspectives for Medical Applications", by P. Londrillo, G. Servizi, A. Sgattoni, S. Sinigardi, M. Sumini and G. Turchetti, chapter in the "CO2 Laser - Optimisation and Application" book by Dan C. Dumitras, 2012 (ISBN 978-953-51-0351-6) (doi:10.5772/38882)
- "Transport and energy selection of laser generated protons and post-acceleration with a compact linac", by S. Sinigardi, G. Turchetti, P. Londrillo, F. Rossi, D. Giove, C. De Martinis, M. Sumini, Physical Review Special Topics-Accelerators and Beams 16 (3), 031301 (2013) (doi: 10.1103/PhysRevSTAB.16.031301)
- "Advanced strategies for ion acceleration using high power lasers", by A. Macchi, A. Sgattoni, S. Sinigardi, M. Borghesi, M. Passoni, Plasma Phys. Control. Fusion 55 124020 (2013) (doi:10.1088/0741-3335/55/12/124020)
- "Post-acceleration of laser driven protons with a compact high field linac", by S. Sinigardi, P. Londrillo, F. Rossi, G. Turchetti, P. R. Bolton, Proc. SPIE 8779, Laser Acceleration of Electrons, Protons, and Ions II; and Medical Applications of Laser-Generated Beams of Particles II; and Harnessing Relativistic Plasma Waves III, 87791J (May 9, 2013) (doi:10.1117/12.2017235)
- "High Energy Gain and Transverse Instability in Three-Dimensional Simulations of Light Sail Acceleration", by A. Sgattoni, S. Sinigardi, Andrea Macchi, Applied Physics Letters 105, 8 (2014) (doi: 10.1063/1.4894092)
- "High quality proton beams from hybrid integrated laser-driven ion acceleration systems", by S. Sinigardi, G. Turchetti, F. Rossi, P. Londrillo, D. Giove, C. De Martinis, P. R. Bolton, Nucl. Instr. Meth. A, Vol. 740, Pages 99-104 (2014) (doi:10.1016/j.nima.2013.10.080)
- "The LILIA (Laser Induced Light Ions Acceleration) experiment at LNF", by S. Agosteo, M. P. Anania, M. Caresana, G. A. P. Cirrone, C. De Martinis, D. Delle Side, A. Fazzi, G. Gatti, D. Giove, D. Giulietti, L. A. Gizzi, L. Labate, P. Londrillo, M. Maggiore, V. Nassisi, S. Sinigardi, A. Tramontana, F. Schillaci, V. Scuderi, G. Turchetti, V. Varoli, L. Velardi, Nucl. Instr. Meth. B, Vol. 331, Pages 15-19 (2014) (doi:10.1016/j.nimb.2013.12.035)
- "Case studies in space charge and plasma acceleration of charged beams", A. Bazzani, M. Giovannozzi, P. Londrillo, S. Sinigardi, G. Turchetti, Comptes Rendus Mecanique 342, 10-11 (2014) (doi: 10.1016/j.crme.2014.07.004)
- "Maxwell-Vlasov equations for laboratory plasmas: conservation laws and approximation schemes", G. Turchetti, S. Sinigardi, P. Londrillo, Eur. Phys. Jour. D 68, 12 (2014) (doi:10.1140/epjd/e2014-50228-x)
- "Optimizing PICCANTE – an Oper Source Particle-In-Cell Code for Advanced Simulations on Tier-0 Systems", A. Sgattoni, L. Fedeli, S. Sinigardi, A. Marocchino, A. Macchi, V. Weinberg, A. Karmakar, PRACE report (2015) (arXiv:1503.02464)
- "Laser-driven Rayleigh-Taylor instability: Plasmonic effects and three-dimensional structures", A. Sgattoni, S. Sinigardi, L. Fedeli, F. Pegoraro, A. Macchi, Phys. Rev. E, 91, 1 (2015) (doi:10.1103/PhysRevE.91.013106)
- "Errors, Correlations and Fidelity for noisy Hamilton flows. Theory and numerical examples", G. Turchetti, F. Panichi, S. Sinigardi, S. Vaienti, submitted to J. Phys. A: Math. Gen. (2015) (arXiv:1509.07738)

Google scholar profile: http://scholar.google.com/citations?user=Pogp61AAAAAJ

Projects

During my research activities I have been involved in many computing projects, both Italian (ISCRA – CINECA) and European (PRACE). In particular I have been Principal Investigator in these projects:

- IscrC_ALaDyn (2014): 1M hours, IBM BGQ (Fermi).
- IscrB_PICforX (2015): 5M hours, IBM BGQ (Fermi)

while I have collaborated also in these others:

- Pra05_0994: 10M hours, IBM BGQ (Fermi)
- Ppp17_2458: 500k hours, IBM BGQ (250k Fermi + 250k Juqueen)
- IscrA_PICPBA: 1.5M hours, IBM Power6 (SP6)
- IscrC_FOAMT: 250k hours, IBM Power6 (SP6)
- IscrC_jasmine: 250k hours, IBM iDataPlex (PLX), GPU
- IscrC_JABonBGQ: 2M hours, IBM BGQ (Fermi)
- IscrC_PWFAEIB: 250k hours, IBM iDataPlex (PLX), GPU
- IscrC_jaznano: 250k hours, IBM iDataPlex (PLX), GPU

Code development

- Author of the code "Propaga", a beam dynamics code based on the integration of the equations of motion for beam transport. Fully parallelized, used in our group to deal with laser produced bunch propagation in beamlines. Interfaced with many other scientific tools like Astra, Fluka, Path/Travel, gnuplot and our PIC codes (ALaDyn, piccante and Jasmine).
- Co-developer and maintainer of "ALaDyn" and the related visualization tools.
- Co-developer and maintainer of "piccante" and the related visualization
- Co-developer and maintainer of many json, kml and similar geo-positioning converter tools
- GitHub profile: https://github.com/cenit
- GitHub organizations: https://github.com/physycom, https://github.com/ALaDyn

Posters

- 2013 – Posters to present my work related to post-acceleration of laser driven protons
  "High quality proton beams from hybrid integrated laser-driven ion acceleration systems", poster by S. Sinigardi, G. Turchetti, P. Londrillo, F. Rossi, D. Giove, C. De Martinis, P. R. Bolton presented at the ASSS-6 (JP)
  "The LILIA (Laser Induced Light Ions Acceleration) experiment al LNF", poster by S. Agosteo, M.P. Anania, M. Caresana, G. Cirrone, C. De Martinis, D. Delle Side, A. Fazzi, G. Gatti, D. Giove, D. Giulietti, L. Gizzi, L. Labate, P. Londrillo, M. Maggiore, V. Nassisi, S. Sinigardi, A. Tramontana, F. Schillaci, V. Scuderi, G. Turchetti, V. Varoli, L. Velardi

- 2012 – Curriculum counselling for students after their Master Degree in Physics
  "Accelerazione Laser-Plasma", poster by S. Sinigardi, A. Sgattoni, F. Rossi, P. Londrillo and G. Turchetti
  "Trasporto e Post-Accelerazione di un fascio di protoni ottenuto da accelerazione laser", poster by S. Sinigardi and G. Turchetti

Conferences and Workshops

- September 13-19, 2015 — 2nd European Advanced Accelerator Concepts (La Biodola/Elba – Italy)
  Talk: "Proton energy enhancement by controlled preplasma formation"

- October 2-4, 2013 — Plasma Physics by Laser and Applications 2013 (Lecce)
  Talk: "Laser acceleration and transport lines for collimated and monochromatic proton beams"

- April 15-18, 2013 — SPIE Optics+Optoelectronics 2013
  Invited talk for the 8779B group: "Medical Applications of Laser-Generated Beams of Particles II - Review of Progress Made in Recent Years"

- November 4-5, 2011 — Coulomb '11 International Workshop – ORGANIZER
  Istituto Storico Parri, Bologna – Italy
  "Optical Acceleration of Ions and Perspective for Biomedicine"

Scholarships, Awards and Acknowledgments

- May 11, 2015 — "Premio Ricerca Scientifica e Innovazione Tecnologica – Claudio Bonivento"
  Bologna's Lions Club award for the best PhD thesis of the year in Physics

- Academic year 2005 – 2006
  Academic year 2004 – 2005 — Based on academic merit, I got scholarships for tuition expenses for two consecutive years

Skills

LANGUAGES

ITALIAN (MOTHER TONGUE)
ENGLISH (C2)
JAPANESE (A2)

COMPUTER

SCIENTIFIC SOFTWARE: WOLFRAM MATHEMATICA, MATLAB, FLUKA, ROOT, ASTRA, PATH/TRAVEL, IDL
OPERATING SYSTEMS: WINDOWS SERVER, WINDOWS, LINUX REDHAT BASED (CENTOS) AND DEBIAN BASED (UBUNTU), MAC OS X
EMBEDDED HW: RASPBERRY PI, BEAGLEBONE, ARDUINO
EMBEDDED SW: WINDOWS 10 IOT, RASPBIAN, FREERTOS, PROCESSING
VIRTUALIZATION TECHNOLOGIES: VMWARE SERVER, VMWARE WORKSTATION, VMWARE PLAYER, MICROSOFT HYPER-V, ORACLE VIRTUALBOX
PROGRAMMING AND SCRIPTING LANGUAGES, WITH MOST COMMON LIBRARIES: C / C++, FORTRAN, PYTHON, MPI, OPENMP, OPENCL, CUDA, GNU COMPILER COLLECTION & GDB, LLVM/CLANG, INTEL COMPILER & IDB, BASH, TCSH, POWERSHELL, LATEX WITH METAPOST AND TIKZ, GNUPLOT, HTML
EDITOR USED: VISUAL STUDIO PROFESSIONAL 2015, IAR EMBEDDED WORKBENCH, EMACS, VIM, SUBLIMETEXT, ECLIPSE
SOURCE CODE MANAGEMENT: GIT, MERCURIAL, SVN
HPC AND REMOTE COMPUTING TECHNOLOGIES: OPENSSH MANAGEMENT, LINUX NETWORK STACKS, WINDOWS NETWORK STACK, INFINIBAND TECHNOLOGIES, GLUSTERFS, GPFS, NFS, LSB/PBS/LLQ LOAD LEVELERS
OTHER TOOLS: MICROSOFT OFFICE 2016, LIBREOFFICE 5, GIMP, INKSCAPE
I'm at ease with maintaining computer systems both from hardware point of view and from the sys-admin management perspective. I collaborated with CNAF installing the HPC system in 2014 and, previously, I managed the small computing facility we had in our research group.

Other

- Invited member of the Italian Physical Society (SIF) since 2009
- Member of the European Physical Society (EPS) since 2009
- Assistant supervisor to four bachelor degree thesis in Physics and one master degree thesis in Nuclear Engineering