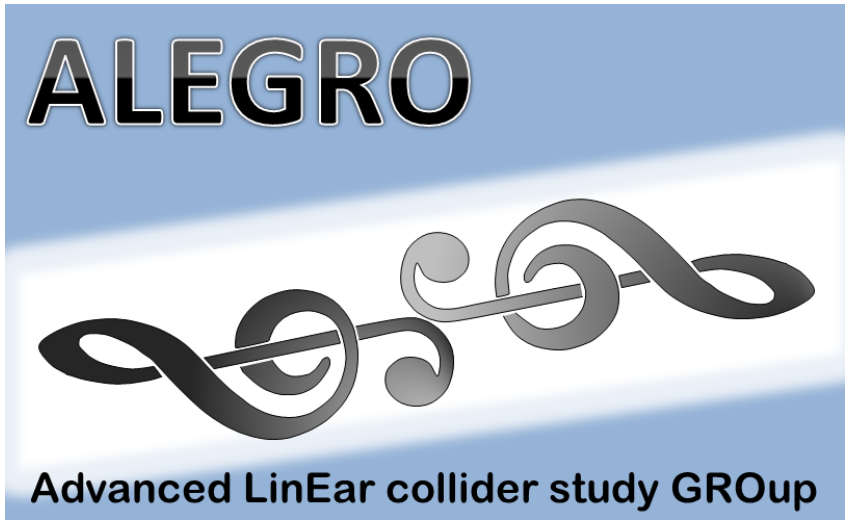
Warm welcome to the

2019

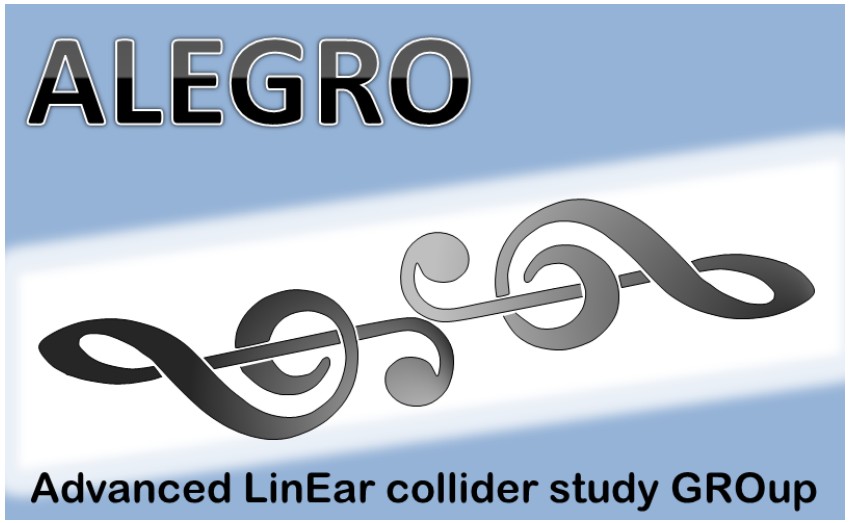


Workshop

Welcome remark by:
Dr. Eckhard Elsen
Director of Research and Computing, CERN

Warm welcome to the

2019



Workshop

Patric Muggli, Max Planck Institute for Physics

Organizing committee: Brigitte Cros (CNRS)
Edda Gschwendtner (CERN)
Patric Muggli (Max Planck Institute)
Daniel Schulte (CERN)

Support: Angélique Foussat (CERN)

How Did We Get Here?

https://indico.cern.ch/event/569406/

ANAR2017: Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017

ALEGRO

Advanced LinEar collider study GROup

… is one of the major outcome of the ANAR 2017 workshop!

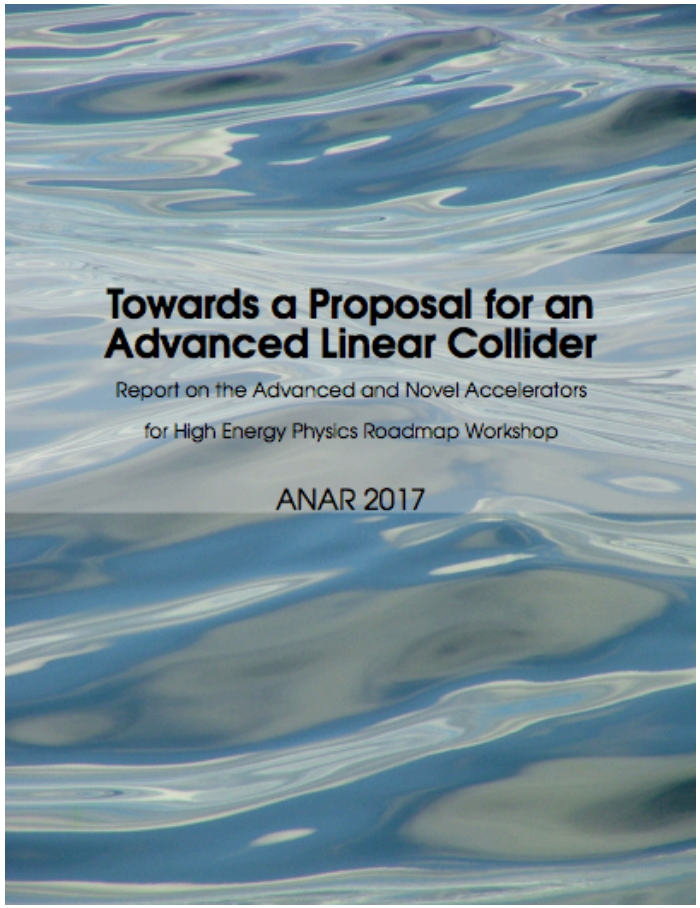
(Advanced LinEar collider study GROup) is a study group towards Advanced Linear Colliders.
ALEGRO's general charge is to coordinate the preparation of a proposal for an advanced linear collider in the multi-TeV energy range.

How Did We Get Here?

ALEGRO
Advanced LinEar collider study GROup

ICFA ANA

ANAR2017: Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017



Document broadly distributed to laboratories management and funding or deciding agencies…
to demonstrate the existence of a community and of a plan for ANA* applications to high-energy physics

*Advanced and Novel Accelerators

… is another major outcome of the ANAR 2017 workshop!

How Did We Get Here?

ANAR2017: Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017

Decided to prepare a document for the 2020 European Strategy for Particle Physics

First concrete action European Strategy, but input from the world-wide community (ANA, ALEGRO)

Created the ALEGRO Workshop series …

Chose: Advanced LInear Collider, ALIC

… other major outcome of the ANAR 2017 workshop!

How Did We Get Here?

ALEGRO
Advanced LinEar collider study GROup

ICFA ANA

ANAR2017: Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017

How Did We Get Here?

ALEGRO
Advanced LinEar collider study GROup

WG8 - Advanced and novel accelerators for High Energy Physics

Topics addressed:

- Examine key challenges
- Discuss suitable concepts and identify topics for future R&D or innovation including electron and positron sources, optics between stages, acceleration of positrons, luminosity, final focus, damping ring and efficiency

Co-Leader: Brigitte Cros
Co-Leader: Patric Muggli
Co-Leader: Carl Schroeder
Co-Leader: Chuanxiang Tang

Nuclear Inst. and Methods in Physics Research, A 909 (2018) 460–462

Contents lists available at ScienceDirect

Nuclear Inst. and Methods in Physics Research, A

journal homepage: www.elsevier.com/locate/nima

Summary of Working Group 8: Advanced and Novel Accelerators for High Energy Physics

B. Cros [a,*], P. Muggli [b,c], C.B. Schroeder [d], C. Tang [e]

[a] LPGP CNRS, Université Paris-Sud, Université Paris Saclay, Orsay, France
[b] Max Planck Institute for Physics, München, Germany
[c] CERN, Geneva, Switzerland
[d] Lawrence Berkeley National Laboratory, Berkeley, CA, USA
[e] Tsinghua University, Beijing, China

How Did We Get Here?

ALEGRO
Advanced LinEar collider study GROup

ICFA ANA

ANAR2017: Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017

3rd European Advanced Accelerator Concepts Workshop
http://agenda.infn.it/event/EAAC2017
Supported by EU/ARIES via EuroNNAc3
24-30 September 2017, La Biodola - Isola d'Elba – Italy
Laser technology for advanced accelerators
Dielectric structures and other novel technologies
Advanced and novel accelerators for high energy physics
High gradient and multibunch acceleration in metallic structures
(C-X-band and beyond) with innovative power generation schemes
Plasma accelerators driven by: modern lasers, electron beams, proton beams
Computations for accelerator physics advanced beam diagnostics for beams and plasma
Novel schemes using advanced technologies (table-top FEL, medical imaging ...)
EAAC 2017

UNIVERSITY OF OXFORD
JAI John Adams Institute for Accelerator Science
Somerville College

ALEGRO 2018 workshop at Oxford

26 March - 29 March 2018, Oxford, UK

How Did We Get Here?

ALEGRO
Advanced LinEar collider study GROup

ICFA ANA

ANAR2017: Advanced and Novel Accelerators for High Energy Physics Roadmap Workshop 2017

3rd European Advanced Accelerator Concepts Workshop
http://agenda.infn.it/event/EAAC2017
Supported by EU/ARIES via EuroNNAc3
24-30 September 2017, La Biodola - Isola d'Elba – Italy
Laser technology for advanced accelerators
Dielectric structures and other novel technologies
Advanced and novel accelerators for high energy physics
High gradient and multibunch acceleration in metallic structures
(C-X-band and beyond) with innovative power generation schemes
Plasma accelerators driven by: modern lasers, electron beams, proton beams
Computations for accelerator physics advanced beam diagnostics for beams and plasma
Novel schemes using advanced technologies (table-top FEL, medical imaging ...)
EAAC 2017

UNIVERSITY OF OXFORD
JAI John Adams Institute for Accelerator Science
Somerville College

ALEGRO 2018 workshop at Oxford

26 March - 29 March 2018, Oxford, UK

AAC
ADVANCED ACCELERATOR CONCEPTS

Breckenridge
COLORADO
AUG 12-17, 2018
BEAVER RUN RESORT AND CONFERENCE CENTER

ESPP INPUT

ALEGRO input for the 2020 update of the European Strategy for Particle Physics: comprehensive overview

Contacts: B. Cros[1], P. Muggli[2]
on behalf of ALEGRO collaboration,
member list at http://www.lpgp.u-psud.fr/icfaana/alegro/alegro-members

[1] LPGP, CNRS, Université Paris Sud, Orsay France, email: brigitte.cros@u-psud.fr
[2]Max Planck Institute for Physics, Munich, Germany, email: muggli@mpp.mpg.de

arXiv:1901.08436

Advanced and Novel Accelerators (ANAs) can provide acceleration gradients orders of magnitude greater than conventional accelerator technologies, and hence they have the potential to provide a new generation of more compact, high-energy machines. Four technologies are of particular interest, all of which rely on the generation of a wakefield which contains intense electric fields suitable for particle acceleration. In the laser wakefield accelerator (LWFA) and plasma wakefield accelerator (PWFA) the wakefields are driven in a plasma by intense laser or particle beams, respectively; in the structure wakefield accelerator (SWFA), the wake is excited by a particle bunch propagating through a structured tube; and in the dielectric laser accelerator (DLA), a laser pulse directly drives an accelerating mode in a dielectric structure.

In view of the great promise of ANAs, and the substantial effort worldwide to develop them, the Advanced LinEar collider study GROup, ALEGRO, was formed at the initiative of the ICFA ANA panel. ALEGRO aims to foster studies on accelerators based on ANAs for applications to high-energy physics, with the ambition of proposing a machine that would address the future goals of particle physics. This document summarizes the current view of the international community on this topic. It proposes a list of priorities that the community would like to invest effort in over the next five to ten years.

We propose as a long-term goal the design of an e^+/e^-/gamma collider with up to 30 TeV in the center of mass - the Advanced Linear International Collider (ALIC). On the path to this collider, a number of stepping stones have to be established. These will lead to spin-offs at lower energy that will benefit ultrafast X-ray science, medicine, and industrial applications. **The major goal for our community over the next five to ten years is the construction of dedicated ANA facilities that can reliably deliver high-quality, multi-GeV electron beams from a small number of stages.** The successful demonstration of robust stages of this type would provide a platform for ANAs with large number of stages generating high-quality beams in the TeV range.

The document also discusses other challenges that must be met for the complete ALIC concept. These include the design of appropriate particle sources, the development of high-power lasers needed for LWFAs and DLAs, the achievement of required tolerances, and the need for additional tools such as the development of novel diagnostics for the ultra-fast bunches generated by ANAs, and fast simulation methods.

ESPP INPUT

ALEGRO
Advanced LinEar collider study GROup

ALEGRO input for the 2020 update of the European Strategy for Particle Physics: ADDENDUM

ALEGRO collaboration

Abstract
This document provides additional information to support the ALEGRO proposal for R&D relevant to an Advanced Linear International Collider, ALIC, based on high gradient acceleration concepts.

Keywords
Advanced and Novel Accelerators, multi-TeV electron- positron linear collider

ALEGRO collaboration members as of September 2018 : Erik Adli[1], Weiming An[2], Nikolay Andreev[3], Oznur Apsimon[4], Ralph Assmann[5], Jean-luc Babigeon[6], Robert Bingham[7], Tom Blackburn[8], Christopher Brady[9], Michael Bussmann[10], Bruce Carlsten[11], James Chappell[12], Jian Bin Ben Chen[13], Sebastien Corde[14], Laura Corner[15], Benjamin Cowan[16], Brigitte Cros[17], Joel England[18], Eric Esarey[19], Ricardo Fonseca[20] , Brian Foster[5,21], Spencer Gessner[13], Leonida A Gizzi[22], Daniel Gordon[23] , Edda Gschwendtner[13], Anthony Hartin[5], Bernhard Hidding[24], Mark Hogan[18], Simon Hooker[21], T. Hughes [25], Alexei Kanareykin[26], Stefan Karsch[27], Valentin Khoze[28], Pawan Kumar[29], Wim Leemans[19], Francois Lemery[5], Ang Li[30], R. Li[18], Vladyslav Libov[5], Emily Sistrunk Link[31], Michael Litos[32], Gregor Loisch[5], Nelson Lopes[20,33], Olle Lundh[34], Alexey Lyapin[35], Edu Marin[13], Mattias Marklund[8], Timon Mehrling[19], Patric Muggli[13,27], Pietro Musumeci[2], Zulfikar Najmudin[33], Uwe Niedermayer[36], Jens Osterhoff[5], Marc Palmer[41], Rajeev Pattathil[7], Michael Peskin[18], Philippe Piot[38], John Power[39], Alexander Pukhov[40], Heather Ratcliffe[41], Marc Riembau [42], Veronica Sanz[43], Gianluca Sarri[44] , Yuri Saveliev[7], Levi Schachter[45], Lucas Schaper[5], Norbert Schoenenberger[30] , Carl Schroeder[19], Sarah Schroeder[5], Daniel Schulte[13], Andrei Seryi[46], Sergey Shchelkunov [XX], Craig Siders[31], Evgenya Simakov [11], Christophe Simon-Boisson[47], Michael Spannowsky[28], Christina Swinson[37], Andrzej Szczepkowicz[48], Roxana Tarkeshian[5], Johannes Thomas[40], Junping Tian[49], J.V. Tilborg[19], Paolo Tomassini[22], Vasili Tsakanov[50], Jean-Luc Vay[19], Jorge Vieira[20], Henri Vincenti[51], Roman Walczak[21], Dan Wang[52], Stephen Webb [53], Glen White [18] Guoxing Xia[4], Hitoshi Yamamoto[54], Tevong You[55], Igor Zagorodnov[5]

[1] Univ Norway, Oslo, Norway
[2] UCLA, Los Angeles, California, USA
[3] IHED, Moscow, Russia
[4] Univ. Manchester, UK
[5] DESY, Hamburg, Germany
[6] LAL, Orsay, France
[7] STFC, UK
[8] Chalmers, Sweden
[9] Warwick, UK
[10] HZDR, Germany
[11] LANL, Los Alamos, New Mexico, USA
[12] University College London, UK
[13] CERN, Geneva, Switzerland
[14] Ecole Polytechnique, Palaiseau, France
[15] Univ. Liverpool, UK
[16] Tech-X Corporation, Boulder, Colorado, USA
[17] CNRS LPGP, Orsay, France
[18] SLAC, Stanford, USA
[19] LBNL, Berkeley, USA
[20] IST, Lisbon, Portugal
[21] JAI and Dept of Physics, Univ. Oxford, Oxford, UK
[22] INO, Pisa, Italy
[23] NRL, USA
[24] Univ Strathclyde, Glasgow, UK
[25] Stanford Univ., Stanford, California, USA
[26] Euclid Tech labs, USA
[27] Max Planck Institute for Physics, Munich, Germany
[28] Univ. Durham, UK
[29] Raj Kumar Goel Institute of Technology, Ghaziabad, India
[30] FAU, Germany
[31] LLNL, Livermore, California, USA
[32] Univ. of Colorado, Boulder, Colorado USA
[33] Imperial College London, UK
[34] University of Lund, Sweden
[35] RHUL, UK
[36] Tech Univ. Darmstadt,Darmstadt, Germany
[37] Brookhaven National Lab, USA
[38] North Illinois Univ. and Fermi National Accelerator Laboratory, USA
[39] ANL, USA
[40] Univ. Duesseldorf, Germany
[41] Warwick Univ, UK
[42] Université de Genève, Switzerland
[43] Sussex Univ., UK
[44] Queen Univ. Belfast, UK
[45] Technion Israel Institute of Technology, Haifa, Israel
[46] JLAB, Newport news, VA, USA
[47] THALES LAS, France
[48] University of Wroclaw, Poland
[49] Univ. Tokyo, Japan
[50] CANDLE SRI, am
[51] CEA Saclay , France
[52] Tsinghua University, China
[53] Radiasoft, Boulder, CO, USA
[54] Tohoku University , japan
[55] DAMTP, Univ. Cambridge, UK

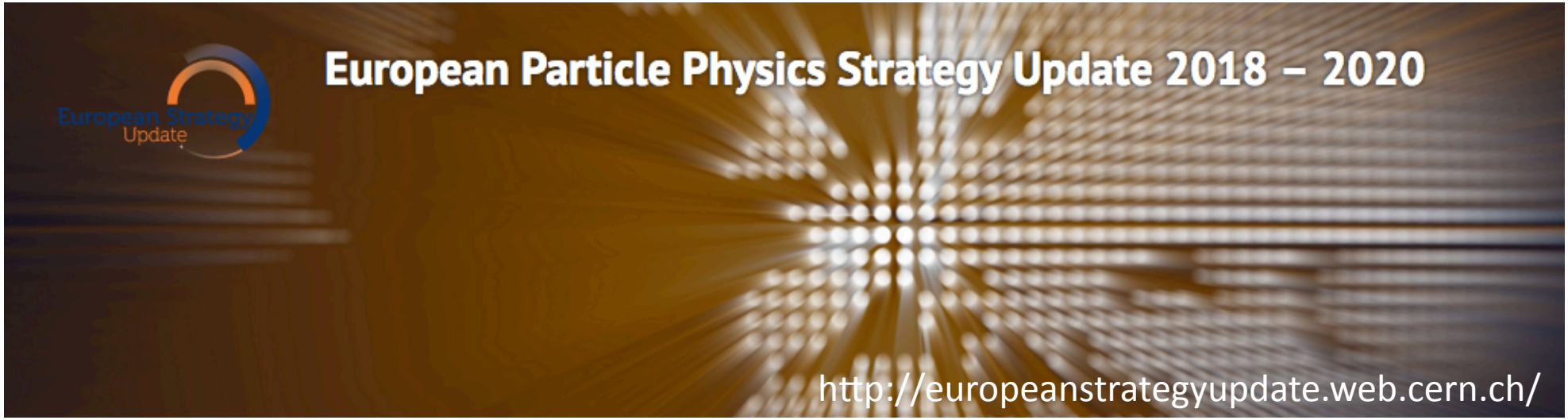
arXiv:1901.10370v2

✧First community-wide (and beyond) document!!!

ESPP Input

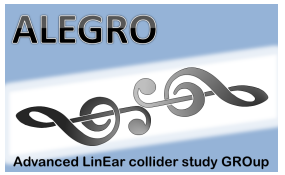
Today: opening talk by Brigitte …

Represent ALEGRO at ESPP (B. Cros, P. Muggli) …



https://cafpe.ugr.es/eppsu2019/

EAAC 2019



4th European Advanced Accelerator Concepts Workshop

15-21 September 2019
Hotel Hermitage, La Biodola Bay, Isola d'Elba, Italy
Europe/Rome timezone

- WG8 focuses on developments relevant to advanced linear collider challenges. Progress towards collider components for electrons/positrons will be discussed including:
  - Electron or positron injectors
  - High-gradient accelerator modules (plasma, or evacuated media);
  - Beam Delivery systems (beam transport, synchronization, tolerance)
  - Staging experiments
  - Simulations aspects specific to complex systems
  - Detector and physics case

ALEGRO PROGESS

- An advance linear collider is a major goal of the ANA community (long term)
- It includes intermediate steps: FEL applications (short to mid-term), fixed targets, …
- Gathering a broadened community (ANA+…) around a common project: ALIC
- Gave the community and our work visibility …

  Report from Bruce Carlsten, chair of ICFA-ANA panel, about 2019 ICFA meeting:

  "The ICFA committee is interested in ANA technologies and, importantly, approved ICFA endorsement of all our proposed 2018 workshops and conferences."

  "ICFA recognizes the extraordinary impact of ANA technologies and we had a quick discussion about showcasing ANA technologies at next year's ICFA seminar."

- Input document to the ESPP
- Three workshops organized …
- Dedicated working group at EAAC 2017, 19, …
- Community publications …

We Are Here

GOALS OF THIS WORKSHOP

- Take stock of progress towards ALIC
  - Speakers instructed to focus on ALIC-relevant topics
  - How do we address ALIC issues?
- Include all aspects of ALIC, collider
- Focus on ALIC first stage

- Program strongly reflects that … (DLA: ACHIP week)

- Write a summary/progress document, to be published: arxiv + journal (Rev. Mod. Phys.?)
  - each speaker would write a paragraph or two on his/her presentation, ALIC-specific
  - compiled and submitted as a community document
- To be discussed …

- Determine organizer and location for ALEGRO 2020 … CERN or other, Europe or other …

GOALS OF THIS WORKSHOP

- Take stock of progress towards ALIC
  - Speakers instructed to focus on ALIC-relevant topics
  - How do we address ALIC issues?
- Include all aspects of ALIC, collider
- Focus on ALIC first stage

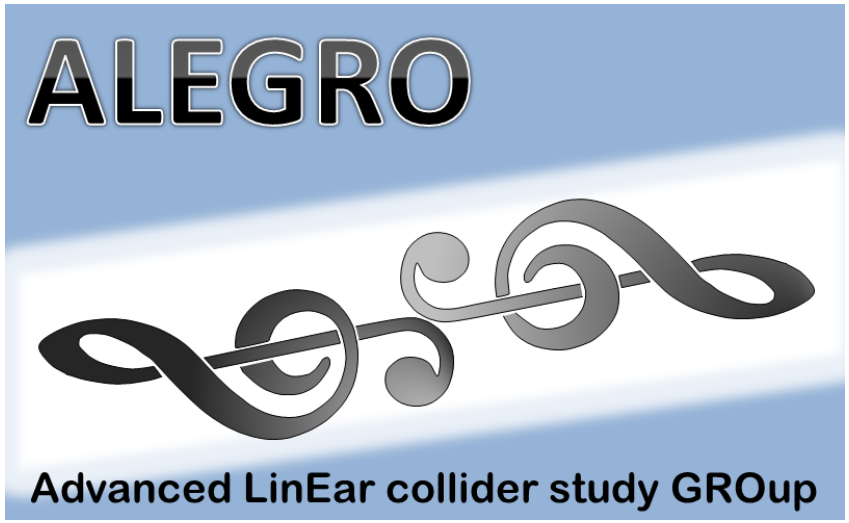
- Program strongly reflects that … (DLA: ACHIP week)

- Write a summary/progress document, to be published: arxiv + journal (Rev. Mod. Phys.?)
  - each speaker would write a paragraph or two on his/her presentation, ALIC-specific
  - compiled and submitted as a community document
- To be discussed …

- Determine organizer and location for ALEGRO 2020 … CERN or other, Europe or other …

Warm welcome to the

2019



Workshop

Thank you in advance for your participation and contributions!

PRACTICALS

- Please, please, please upload your slides on indico … (remove sensitive material)
- https://indico.cern.ch/event/732810/ or email us the slides … we'll upload'em

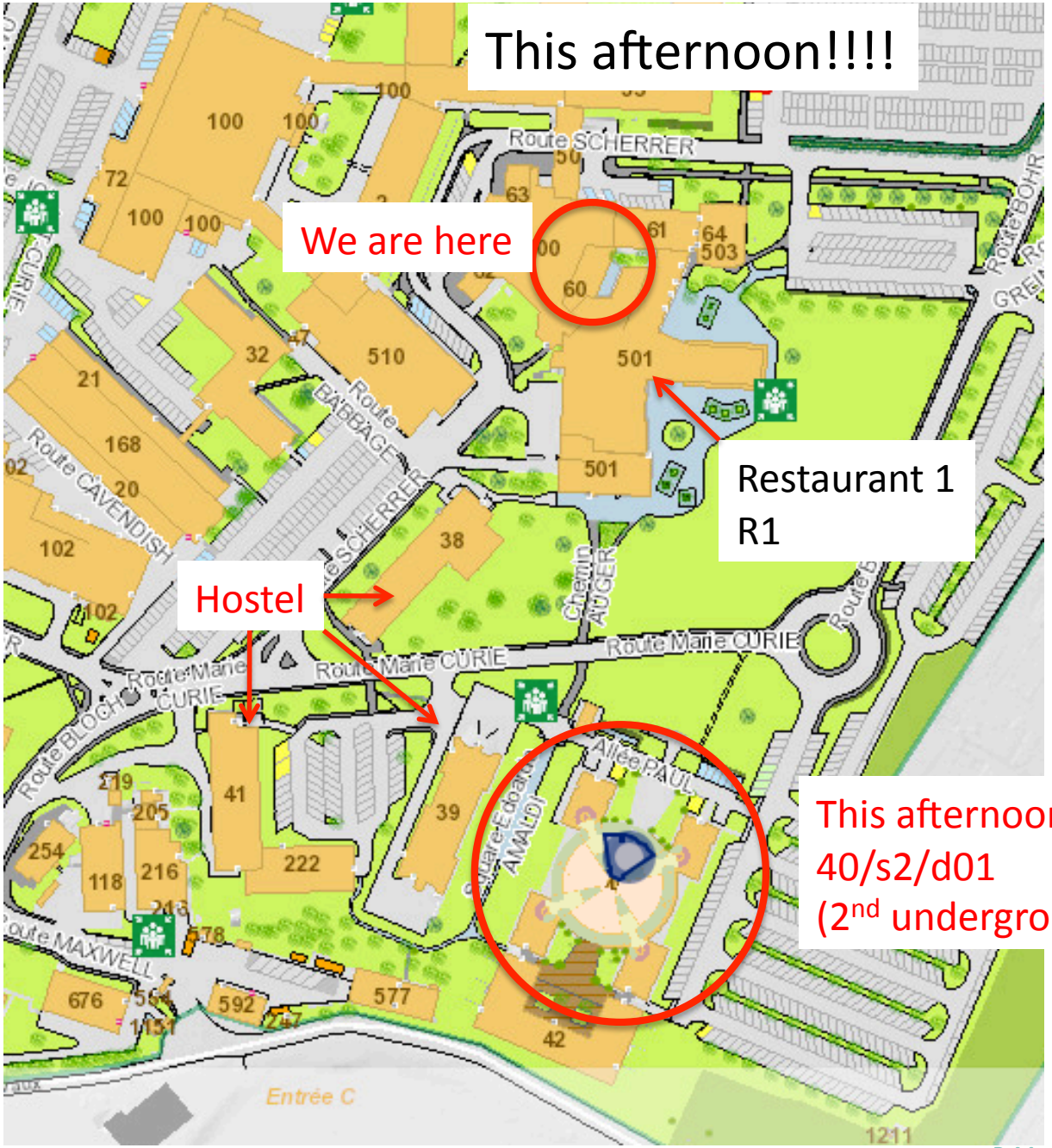
- This afternoon, Salle Dirac 40/s2/d01 (see next slide)

- Offer workshop cup washing service between breaks, ALEGRO goes green …

- Angélique is here this morning, then talk to us …

- Dinner: TONIGHT …. (see next-next slide)

PRACTICALS



PRACTICALS

Tram 18

Direction Bachet to go: stop Bel-Air

CERN to come back

Ticket: “Tout Genève”, 3CHF each way, valid 1hour, ~20min. ride