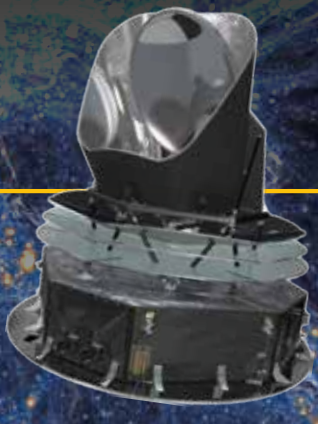
From Planck to the future of CMB



May 23-27, 2022

Ferrara, Italy

esa GRUBER esa Planck INFN Istituto Nazionale di Fisica Nucleare COMUNE DI FERRARA Università degli Studi di Ferrara

WORKSHOP VENUE

Aula Magna, Palazzo Trotti Mosti
Department of Law of the University of Ferrara
Corso Ercole I d'Este, 37 - Ferrara

POSTER SESSION

Palazzo Giordani
Department of Law of the University of Ferrara
Corso Ercole I d'Este, 44 - Ferrara

SOCIAL VENUE

WELCOME COCKTAIL, LUNCHES and COFFEE BREAKS

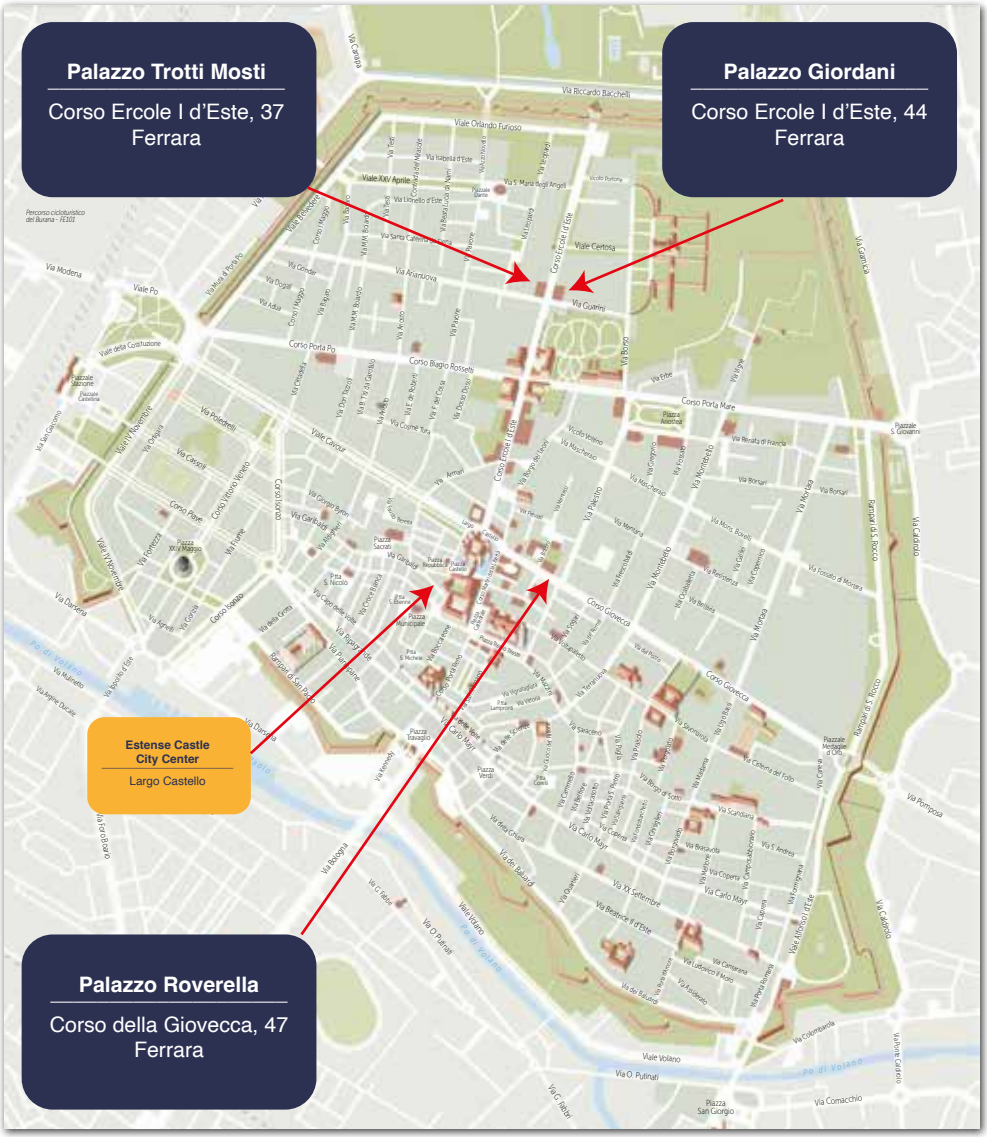
Palazzo Giordani

Department of Law of the University of Ferrara
Corso Ercole I d'Este, 44 - Ferrara

SOCIAL DINNER

Thursday 26 May

Palazzo Roverella
Corso della Giovecca, 47 - Ferrara


Palazzo Trotti Mosti
Corso Ercole I d'Este, 37
Ferrara
Palazzo Giordani
Corso Ercole I d'Este, 44
Ferrara
Estense Castle
City Center
Largo Castello
Palazzo Roverella
Corso della Giovecca, 47
Ferrara

SCIENTIFIC ORGANIZING COMMITTEE

- Belen Barreiro
- Marco Bersanelli
- Erminia Calabrese
- Tadayasu Dotani
- Masashi Hazumi
- Ludovic Montier (co-chair)
- Paolo Natoli
- Bruce Partridge
- Jan Tauber (co-chair)
- Matthieu Tristram

LOCAL ORGANIZING COMMITTEE

- Mario Ballardini
- Marco Bortolami
- Thejs Brinckmann
- Martina Gerbino
- Alessandro Gruppuso
- Massimiliano Lattanzi
- Margherita Lembo
- Paolo Natoli (chair)
- Luca Pagano

ORGANIZING SECRETARIAT

CFR
CONSORZIO FUTURO IN RICERCA

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GENERAL INFORMATION

SECRETARIAT DESK AND REGISTRATION

A Secretariat desk will be present at first floor of Palazzo Trotti Mosti from 8:30 a.m. for all days of the Workshop.
Before accessing the Scientific Session all participants are asked to register at the Secretariat desk to collect the badge and the conference kit. Everybody is kindly asked to wear this badge at all sessions and social events.
For administrative matters, before and after the Conference, please contact the Conference Secretariat (Conference and Training Office I e-mail: convegni@unife.it).
Please note that NO on-site registration will be allowed during the Conference.

POSTERS

Posters will be on permanent display in Palazzo Giordani, close to the coffee break and lunch area. The poster session is scheduled on Tuesday, May 24, at 18:10, during the welcome *aperitivo*.

WIRELESS NETWORK

Internet / WiFi Wireless connection will be available in all conference areas.
Participants may ask for WIFI credentials at the Secretariat desk, ID card or passport is strictly required.
The EDUROAM network SSID will be available (no need of ID/passport in this case)

FOR ANY INFORMATION

Conference Secretariat
Consorzio Futuro in Ricerca
Ufficio Convegni e Attività Formative
convegni@unife.it

Local Organizing Committee
loc_p2fcmb@fe.infn.it

Scientific Organizing Committee
soc_p2fcmb@fe.infn.it

8:30 Registration opens

9:30 - 11:30 *Open coffee – Palazzo Giordani*

10:00 - 10:30 Welcome and foreword from
Rector of University of Ferrara - **Laura Ramaciotti**
Director of Department of Physics and Earth Sciences, UniFe - **Vincenzo Guidi**
Director of INFN Ferrara - **Roberto Calabrese**

Objectives of the workshop - **Ludovic Montier** and **Jan Tauber**
Logistic information - **Paolo Natoli**
Setting the context - **Reno Mandolesi** and **Jean-Loup Puget**

SCIENCE CHALLENGES

10:45 Key future science goals from the CMB
invited talk **Jo Dunkley** (Princeton University)

11:25 Scientific challenges expected from future space experiments
invited talk **Tomotake Matsumura** (Kavli IPMU Tokyo)

11:55 Scientific challenges expected from future ground experiments
invited talk **Suzanne Staggs** (Princeton University)

12:25 Scientific challenges expected from future balloon experiments
invited talk **Paolo de Bernardis** (Rome Sapienza University)

13:00 - 14:00 *Lunch and Poster viewing - Palazzo Giordani*

CMB, CROSS-CORRELATION AND GALACTIC SCIENCE SESSION

14:00 CMB probes of cosmological inflation: current status and future prospects - invited talk **Anthony Challinor** (Cambridge University)

Day 1
Monday, May 23, 2022

DETECTORS AND BEAMS

14:40 Knowing your beams - invited talk
Jon Gudmundsson (Stockholm University)

15:20 Beam calibration campaign requirements to control temperature-to-polarisation leakage for CMB-Stage 4
Clara Vergès (Harvard CfA)

15:40 Study of beam side-lobes systematics and calibration for the LiteBIRD mission
Clément Leloup (APC Paris)

16:00 Map-making and Beams for the Atacama Cosmology Telescope
Emilie Storer (Princeton University)

16:20 - 16:40 *Coffee Break - Palazzo Giordani*

DETECTORS AND BEAMS

16:40 The shape of CMB focal planes to come - invited talk
Hannes Hubmayr (NIST Bolder)

17:20 Optimization of a microwave polarimeter for astronomy with optical correlation and detection
Guillermo Pascual Cisneros (IFCA Santander)

17:40 Optical calibration simulations for the Simons Observatory
Nadia Dachlythra (Oskar Klein Stockholm)

18:00 - 18:30 *Discussion*

Day 1
Monday, May 23, 2022

DATA CALIBRATION AND CHARACTERIZATION

9:00 Lessons from Planck Calibration for Future CMB Experiments invited talk **Charles R. Lawrence** (NASA/JPL)

9:20 The Characterization and Calibration of the Simons Observatory Small Aperture Telescope: Status and future plans **Nicholas Galitzki** (UCSD)

9:40 Calibration and Systematics for the CMB-S4 Inflation Survey Small Aperture Telescopes **Kirit Karkare** (Chicago University)

10:20 Polarization angle requirements for CMB B-mode experiments. Application to the LiteBIRD satellite **Enrique Martínez-González** (IFCA Santander)

10:40 - 11:00 *Coffee break – Palazzo Giordani*

11:00 PROTOCALC: Design and Simulation of a Calibration Source for mm Telescopes **Gabriele Coppi** (INFN Milan)

11:20 *Discussion*

CMB, CROSS-CORRELATION AND GALACTIC SCIENCE SESSION

11:50 The history of reionisation: peering through the dark ages with the CMB - invited talk **Stephan Ilic** (IJCLab Paris)

12:30 - 14:00 *Lunch and Poster viewing - Palazzo Giordani*

14:00 Particle and energy composition of the Universe: Neutrinos, Light relics and Dark Matter - invited talk **Massimiliano Lattanzi** (INFN Ferrara)

Day 2

Tuesday, May 24, 2022

SYSTEMATICS IMPACT ON LARGE ANGULAR SCALE SCIENCE

14:40 Lessons learned from Planck for cosmology from large angle polarization - invited talk **Loris Colombo** (Milan University)

15:20 Cosmological inference from large-angular scale CMB data **Roger de Belsunce** (Cambridge University)

15:40 Cosmological constraints and instrumental systematics studies using line-of-sight distortion fields with BICEP/Keck and beyond **Dominic Beck** (Stanford University)

16:00 High Resolution analysis of the South Pole Atmosphere for CMB observations **Sofia Fatigoni** (UBC)

16:20 - 16:40 *Coffee break – Palazzo Giordani*

16:40 Challenges for high precision lensing reconstruction **Giulio Fabbian** (CCA Flatiron Institute)

17:00 Novel method for joint systematic correction and foreground cleaning and its application to the estimation of cosmic birefringence in Simons Observatory **Baptiste Jost** (APC Paris)

17:20 Simultaneous determination of miscalibrated polarization angles and cosmic birefringence from Planck PR4 **Patricia Diego-Palazuelos** (IFCA Santander)

17:40 *Discussion*

18:10 *Poster Session and Welcome Cocktail – Palazzo Giordani*

Day 2

Tuesday, May 24, 2022

CMB, CROSS-CORRELATION AND GALACTIC SCIENCE

1. Theoretical and numerical aspects of CMB spectral distortions from non-thermal electromagnetic energy injections at high redshifts - **Sandeep Kumar Acharya**
2. Iterative CMB delensing in the era of CMB-S4 and beyond - **Sebastian Belkner**
3. The Simons Observatory: a new open-source power spectrum pipeline applied to the Planck legacy data - Hidde Jense
4. How to measure CMB lensing with deep polarisation surveys - **Louis Legrand**
5. A cross-correlation analysis of CMB lensing and radio galaxy maps - **Giulia Piccirilli**
6. New CMB Lensing Measurements with the Atacama Cosmology Telescope: Opportunities and Challenges - **Jiatianfu Qu**
7. Towards precision cluster cosmology with the Simons Observatory - **Iñigo Zubeldia**

7a. Cosmic Birefrigence: Cross-Spectra and Cross-Bispectra with CMB Anisotropies - **Alessandro Greco**

DATA ANALYSIS INTERDEPENDENCIES

8. Constraining decaying dark matter with spectral distortions of the CMB - **Boris Bolliet**
9. Fundamental physics with the thermal and kinetic Sunyaev Zeldovich effects and their correlations with large scale structure tracers - **Boris Bolliet**
10. Retrieving cosmological information from clusters and hot diffuse gas in CMB small scales - **Marian Douspis**
11. The dark twilight and the light of dawn joined to reconstruct the reionization history - **Daniela Paoletti**
12. On the interplay of systematics and foregrounds with BeyondPlanck – **Trygve Leithe Svalheim**

DATA CALIBRATION AND CHARACTERIZATION

13. The Atacama Cosmology Telescope: Map-Based Noise Models - **Zachary Atkins**
14. Hover-Cal: A drone-based polarized mm-wave calibration system - **Felipe Carrero**
15. Calibration Satellites for Ultra-Sensitive CMB Polarization Experiments - **Francisco Javier Casas** (presented by **Enrique Martinez-Gonzalez**)
16. Antenna control software integration and implementation for the Simons Observatory - **Lauren Saunders**

DETECTORS AND BEAMS

17. A tale of two Half Wave Plates: characterising, comparison and future prospects of Pancharatnam and embedded metal mesh WPs - **Charlotte Braithwaite**
18. Kinetic Inductance Detectors readout for COSMO - **Giulia Conenna**

EXPERIMENTAL RESULTS

19. The Planck Legacy Archive, present and future - **Marcòs Lopez-Caniego** (presented by **Jan Tauber**)

SYSTEMATICS IMPACT ON LARGE ANGULAR SCALE SCIENCE

20. Systematic effects induced by the HWP rotational instabilities - **Susanna Azzoni**

FOREGROUNDS

21. A hybrid component separation method for CMB B-mode searches - **Susanna Azzoni**
22. Multi-Clustering Needlet-ILC in view of the LiteBIRD satellite - **Alessandro Carones**
23. CENN: a fully convolutional neural network for CMB recovery in realistic microwave sky simulations - **José Manuel Casas González**
24. High resolution component separated maps with ACT and Planck over 35% of the sky - **William Coulton**
25. New constraints on polarized synchrotron and dust emissions frequency spectrum with the Simons Observatory - **Valentina Fanfani**
26. AME spatial variations along the Galactic Plane - **Mateo Fernández-Torreiro**
27. Cleaning and Modelling Polarized Foregrounds - **Andrei Frolov**
28. New constrains on the AME polarisation with QUIJOTE in bright Galactic molecular complexes - **Raul Gonzalez Gonzalez**
29. Polarised synchrotron spectral index variation from Planck - **Steven Gratton**
30. The Haze as seen by QUIJOTE - **Federica Guidi**
31. Study of the polarized synchrotron foreground in CMB observations - **Felice Antonio Martire**
32. Radio sources in the QUIJOTE-MFI wide survey maps - **Diego Herranz Muños** (presented by **Patricia Diego Palazuelos**)

FUTURE PLANS

33. MISTRAL: MIllimeter Sardinia radio Telescope Receiver based on Array of Lumped elements kids - **Elia Stefano Battistelli**
34. Status and expected performance of the LSPE-SWIPE experiment - **Luca Lamagna** (presented by **Paolo De Bernardis**)
35. CMB Spectral Distortions from Antarctica with COSMO - **Lorenzo Mele**
36. Detection of the Rees-Sciama effect with future surveys - **Elena Pierpaoli**
37. Detection of the moving lens effect with current and future data - **Elena Pierpaoli**

SCIENCE CHALLENGES

38. Delensing upcoming, large-scale B-mode polarization data: prospects and challenges - **Anton Baleato Lizancos**
39. Primordial Standard Clocks in the CMB - **Matteo Braglia**
40. Understanding the origin of primordial gravitational waves: constraining SU(2) gauge field inflation with LiteBIRD - **Paolo Campeti**

POSTER SESSION

FOREGROUNDS

9:00 Characterization of Foreground emission for CMB experiments: current status and future prospective - invited talk **Nicoletta Krachmalnicoff** (SISSA)

9:30 Next steps in component separation for new CMB observables invited talk **Mathieu Remazeilles** (IFCA Santander)

10:00 Single frequency CMB B-mode inference with realistic foregrounds from a single training image **Niall Jeffrey** (UCL)

10:20 Diffuse polarized foregrounds from component separation with QUIJOTE-MFI **Elena de la Hoz** (IFCA Santander)

10:40 - 11:00 *Coffee break – Palazzo Giordani*

11:00 Component separation for the Simons Observatory Large Aperture Telescope **Benjamin Beringue** (Cardiff University)

11:20 First low latitudes reconstruction of the dust polarization spectral energy distribution variation **Alessia Ritacco** (INAF OAC)

11:40 Foreground Removal for B-Modes Detection with Clustering Methods **Giuseppe Puglisi** (Tor Vergata University)

12:00 Beyond Foregrounds: Galactic Science in the 2020s **Brandon Hensley** (Princeton University)

12:20 - 12:50 *Discussion*

Free or Excursion to Museo Ferrari

Day 3

Wednesday, May 25, 2022

DATA ANALYSIS INTERDEPENDENCIES

9:00 Integrated data analysis and end-to-end simulations - invited talk
Reijo Keskitalo (LBNL)

9:40 BeyondPlanck – Bayesian end-to-end Analysis of Planck LFI
Mathew Galloway (Oslo University)

10:00 SO Likelihood Codes for CMB Combined Probes
Ian Harrison (Cardiff University)

10:20 CMB power spectra and cosmological parameters from Planck PR4 (NPIPE) with CamSpec
Erik Rosenberg (Cambridge University)

10:40 - 11:00 *Coffee break – Palazzo Giordani*

11:00 The integrated angular bispectrum of the CMB
Gabriel Jung (Padova University)

11:20 The Atacama Cosmology Telescope: science and analysis pipeline
Adriaan Duivenvoorden (Princeton University)

11:40 Building an accurate analytical power spectrum covariance matrix on a small survey area **Etienne Camphuis** (IAP Paris)

12:00 *Discussion*

12:30 - 14:00 *Lunch and Poster viewing – Palazzo Giordani*

CMB, CROSS-CORRELATION AND GALACTIC SCIENCE

14:00 Simulating correlated CMB and large-scale structure observables invited talk **Jia Liu** (Kavli IPMU Tokyo)

14:40 Cosmology with CMB Lensing: ACT, SO and beyond
Mathew Madhavacheril (Perimeter Waterloo)

Day 4
Thursday, May 26, 2022

15:00 Galaxy clusters in the mm wavelengths: cosmological analysis and future perspectives **Laura Salvati** (IAS Orsay)

15:20 Cosmology from SPT-3G **Federica Guidi** (IAP Paris)

15:40 Pasiphae: Goal and overview of current status
Vincent Pelgrims (Crete University)

16:00 - 16:20 *Coffee break – Palazzo Giordani*

16:20 Spectral distortion science and measurement challenges
invited speaker **Aditya Rotti** (Manchester University)

EXPERIMENTAL RESULTS

17:00 The C-Band All-Sky Survey: Northern sky-survey results
Angela Taylor (Oxford University)

17:20 The BICEP/Keck program: latest results and progress update on the upcoming BICEP Array receiver deployments
Kirit Karkare (Chicago University)

17:40 The QUIJOTE MFI wide survey: A northern sky survey in intensity and polarization at 10–20GHz
Jose Alberto Rubino-Martin (IAC Tenerife)

18:00 Limits on Cosmological B-mode Polarization in the CMB from Spider
Elle Shaw (UIUC)

Day 4
Thursday, May 26, 2022

FUTURE PLANS

9:00 Introduction to future experiments - invited talk
François R. Bouchet (IAP Paris)

9:30 LiteBIRD - invited talk
Masashi Hazumi (KEK Tsukuba)

9:50 Ongoing and planned CMB spectrometers and what we still need to make this happen - invited talk
Jens Chluba (Manchester University)

10:10 From Stage 3 to Stage 4 - South Pole Observatory, Simons Observatory and CMB-S4 - invited talk
Julian Borrill (LBNL)

10:30 - 10:50 *Coffee break – Palazzo Giordani*

10:50 All the Way from Earth to Space. How Earth-based, sub-orbital and space missions are complimenting each other with precision measurements of the millimeter sky – invited speaker
Mark Devlin (UPenn)

11:10 - 12:10 *Discussion EOM*

Day 5

Friday, May 27, 2022

INVITED SPEAKERS

Julian Borrill (LBNL)
François R. Bouchet (IAP Paris)
Anthony Challinor (Cambridge University)
Jens Chluba (Manchester University)
Loris Colombo (Milan University)
Paolo de Bernardis (Rome Sapienza University)
Mark Devlin (UPenn)
Jo Dunkley (Princeton University)
Jon Gudmundsson (Stockholm University)
Masashi Hazumi (KEK Tsukuba)
Hannes Hubmayr (NIST Bolder)
Stephan Ilic (IJCLab Paris)
Reijo Keskitalo (LBNL)
Nicoletta Krachmalnicoff (SISSA)
Massimiliano Lattanzi (INFN Ferrara)
Charles R. Lawrence (NASA/JPL)
Jia Liu (Kavli IPMU Tokyo)
Reno Mandolesi (Ferrara University)
Tomotake Matsumura (Kavli IPMU Tokyo)
Jean-Loup Puget (ENS Paris)
Mathieu Remazeilles (IFCA Santander)
Aditya Rotti (Manchester University)
Suzanne Staggs (Princeton University)