Fundamental Physics at 21 cm

Report of Contributions

https://indico.cern.ch/e/868271

Contribution ID: **1** Type: **not specified**

An Absorption Feature in Observations with EDGES Mid-Band

Monday 30 March 2020 14:00 (1h 15m)

I will present results from observations with the EDGES Mid-Band system. This instrument measured in 2018 the sky-averaged radio spectrum in the range ˜60-120 MHz. It used a blade antenna that is ˜30% smaller than the Low-Band antennas used for the measurements in Bowman et al. (2018). Despite the smaller antenna, in the Mid-Band spectrum we identify an absorption feature that is consistent with our Low-Band result. This consistency increases the confidence that this feature is not an instrumental artifact but instead a spectral property of the sky. In my talk I will describe the Mid-Band observations, instrument calibration, data modelling, and characteristics of the Mid-Band absorption signal.

Presenter: Prof. MONSALVE , Raul (Department of Physics and McGill Space Institute McGill University)

Contribution ID: **2** Type: **not specified**

TBA

Presenters: Prof. FIALKOV, Anastasia (Cambridge); TO BE CONFIRMED

Contribution ID: **3** Type: **not specified**

Dark Matter in Light of the 21cm EDGES Signal

Monday 30 March 2020 15:15 (1h 15m)

Presenter: Prof. ELY, Kovetz (Ben Gurion Univ.)

Contribution ID: **4** Type: **not specified**

Neutrinos at 21 cm

Tuesday 31 March 2020 09:30 (1h 15m)

Presenter: Prof. PASCOLI, Silvia (Durham University)

Contribution ID: **5** Type: **not specified**

TBA

Tuesday 31 March 2020 11:15 (1h 15m)

Presenter: Prof. ARCHIDIACONO, Maria (Bologna Univ.)

Contribution ID: **6** Type: **not specified**

Colloquium

Tuesday 31 March 2020 16:00 (1 hour)

Presenter: Prof. JULIEN, Lesgourgues (RWTH Aachen U.)

Contribution ID: **7** Type: **not specified**

TBA

Wednesday 1 April 2020 09:30 (1h 15m)

Presenter: Prof. ZAROUBI, Saleem (University of Groningen)

Contribution ID: **8** Type: **not specified**

Modeling the 21-cm signal from the Cosmic Dawn

Wednesday 1 April 2020 11:15 (1h 15m)

The birth of the first stars, black holes and galaxies heralded the end of the cosmic Dark Ages and the beginning of the Cosmic Dawn. The light from these objects heated and ionized almost every atom in existence, culminating in the Epoch of Reionization: the final major phase change of the Universe. This final frontier of astrophysical cosmology is undergoing a transition from an observationally-starved epoch to a "Big Data" field. This process is set to culminate with upcoming Square Kilometre Array interferometric observations of the redshifted 21-cm line: providing a 3D map of the first billion years of our Universe. With the SKA, we will be able to actually study the UV and X-ray properties of the first galaxies, as well as physical cosmology, which are encoded in the large-scale structure of the 21-cm signal.
I will review the current status of observations of the EoR and Cosmic Dawn, before discussing the main challenges in modeling the 21-cm signal: a huge range of relevant scales and a large parameter space of astrophysical uncertainties. I will review how simulations have adapted to address these challenges. Finally, I will introduce a Bayesian forward-modeling framework capable of on-the-fly sampling of 3D simulations, allowing us to simultaneously infer the properties of the unseen first galaxies and physical cosmology encoded in the 21-cm signal.

Presenter: Prof. MESINGER, Andrei (Scuola Normale Superiore)

Contribution ID: **9** Type: **not specified**

TBA

Presenter: Dr LIU, Hongwan (Princeton-NYU)

Contribution ID: **10** Type: **not specified**

Modeling the 21-cm signal from the Cosmic Dawn

The birth of the first stars, black holes and galaxies heralded the end of the cosmic Dark Ages and the beginning of the Cosmic Dawn. The light from these objects heated and ionized almost every atom in existence, culminating in the Epoch of Reionization: the final major phase change of the Universe. This final frontier of astrophysical cosmology is undergoing a transition from an observationally-starved epoch to a "Big Data" field. This process is set to culminate with upcoming Square Kilometre Array interferometric observations of the redshifted 21-cm line: providing a 3D map of the first billion years of our Universe. With the SKA, we will be able to actually study the UV and X-ray properties of the first galaxies, as well as physical cosmology, which are encoded in the large-scale structure of the 21-cm signal.
I will review the current status of observations of the EoR and Cosmic Dawn, before discussing the main challenges in modeling the 21-cm signal: a huge range of relevant scales and a large parameter space of astrophysical uncertainties. I will review how simulations have adapted to address these challenges. Finally, I will introduce a Bayesian forward-modeling framework capable of on-the-fly sampling of 3D simulations, allowing us to simultaneously infer the properties of the unseen first galaxies and physical cosmology encoded in the 21-cm signal.

Presenter: Prof. MESINGER, Andrei (Scuola Normale Superiore)

Contribution ID: **11** Type: **not specified**

TBA

Presenter: Dr ARCHIDIACONO, Maria (INFN-Bologna)

Contribution ID: **12** Type: **not specified**

Complementarity of CMB and 21cm for the study of dark matter properties and exotic reionization

Monday 30 March 2020 17:00 (1h 15m)

In this talk, I will review how the CMB and 21cm can be used to study dark matter (DM) properties, as well as sources of exotic (early) reionization. I will first discuss how the CMB can provide strong constraints on scattering between DM and baryons, and probe the parameter space suggested by the EDGES anomaly. I will then introduce models that could reconcile the EDGES anomaly while being consistent with CMB observations. Secondly, I will explain how the CMB can be used to probe the existence of extra sources of ionization and heating, and compare existing constraints to what future 21cm experiment could do. I will also discuss the status in the Planck 2018 data of a hint for early exotic reionization originally suggested in earlier Planck release.

Presenter: Prof. POULIN, Vivian (Montpellier Univ.)

Contribution ID: **13** Type: **not specified**

TBA

Tuesday 31 March 2020 14:00 (30 minutes)

Presenter: Prof. LOPEZ-HONOREZ, Laura (Brussels Univ)

Session Classification: BSM Pitching Session

Contribution ID: **14** Type: **not specified**

TBA

Tuesday 31 March 2020 14:30 (30 minutes)

Presenter: Dr WITTE, Sam (Valencia Univ.)

Session Classification: BSM Pitching Session

Contribution ID: **15** Type: **not specified**

TBA

Presenter: Prof. BERNARDI, Gianni (INAF)

Session Classification: BSM Pitching Session

Contribution ID: **16** Type: **not specified**

TBA

Presenter: Dr SPINELLI , Marta (INAF)

Session Classification: BSM Pitching Session

Contribution ID: **17** Type: **not specified**

Discussion session

Session Classification: BSM Pitching Session

Contribution ID: **18** Type: **not specified**

TBA

Wednesday 1 April 2020 14:00 (30 minutes)

Presenter: Prof. BERNARDI, Gianni (INAF)

Session Classification: Experimental Challenges at 21 cm

Contribution ID: **19** Type: **not specified**

TBA

Wednesday 1 April 2020 14:30 (30 minutes)

Presenter: Dr SPINELLI, Marta (INAF)

Session Classification: Experimental Challenges at 21 cm

Contribution ID: **20** Type: **not specified**

TBA

Thursday 2 April 2020 09:30 (30 minutes)

Presenter: Dr LIU, Hongwan (NYU-Princeton)

Session Classification: BSM Pitching Session

Contribution ID: **21** Type: **not specified**

TBA

Thursday 2 April 2020 11:15 (30 minutes)

Presenter: Dr SOKOLENKO, Anastasia (Vienna Univ.)

Session Classification: BSM Pitching Session