



CERN Colloquium

SPEAKER: Rashid Sunyaev

TITLE: **Hot gas in clusters of galaxies, cosmic microwave background radiation and cosmology**

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ABSTRACT

Presence of the hot ($kT_e \sim 3 - 10$ KeV) rarefied gas in the clusters of galaxies (most massive gravitationally bound objects in the Universe) leads to the appearance of "shadows" in the angular distribution of the Cosmic Microwave Background (CMB) Radiation and permits to measure the peculiar velocities of these clusters relative to the unique coordinate frame where CMB is isotropic. I plan to describe the physics leading to these observational effects. Planck spacecraft, ground based South Pole and Atacama Cosmology Telescopes discovered recently more than two thousand of unknown before Clusters of Galaxies at high redshifts detecting these "shadows" and traces of kinematic effect, demonstrating the correlation of the hot gas velocities with mass concentrations on large scales. Giant ALMA interferometer in Atacama desert resolved recently strong shocks between merging clusters of galaxies. Newly discovered clusters of galaxies permit to study the rate of growth of the large scale structure of the Universe and open an independent way to measure key cosmological parameters of our Universe. I plan to mention Russian - German Spectrum-X/eRosita space mission under preparation for the launch in the March of 2019. This mission will be able to detect all (hundred thousand !) rich clusters of galaxies in the observable Universe and up to 3 millions of accreting supermassive black holes (in Active Galactic Nuclei) during 4 year long X-Ray sky survey. S3 and S4 ground based CMB research programs promise to reach similar or even higher sensitivities and detect up to a million of clusters and groups of galaxies containing hot gas. This will open an era of synergy and competition between X-Ray and microwave astronomy in the search for the hot (0.3 KeV $< kT_e < 30$ KeV) plasma clouds in the Universe.