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## Sunyaev-Zeldovich effect as tool to probe fundamental physics and modified gravity

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We used the data on the Cosmic Microwave Background (CMB) temperature anisotropies measured by the Planck satellite and a sample of X-ray selected clusters with spectroscopically measured redshifts to probe the standard cosmological model and the underlying theory of gravity. To avoid antenna beam effects, we brought all the maps to the same resolution. We used a CMB template to subtract the cosmological signal while preserving the Thermal Sunyaev-Zeldovich (TSZ) anisotropies; next, we removed galactic foreground emissions around each cluster and we masked out all known point sources. Once the cleaning procedure is completed, we measured the TSZ effect on discs of aperture  $\theta_{500}$  and centered at the position of each galaxy cluster in our sample. Then, we extracted the value of the CMB temperature at galaxy cluster location. With these data we constrained the deviation of adiabatic evolution of the Universe and the spatial variation of the fine structure constant. Next, we measured the TSZ profile of COMA cluster and used it to constrain modified gravity models that, in their weak field limit, modify the Newtonian potential. (Up to 250 words).

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