



Contribution ID: 102

Type: **not specified**

Constraining the lifetime of Dark Matter

Thursday 10 September 2015 17:30 (20 minutes)

The existence of Dark Matter has been confirmed by many different cosmological probes including observations of the Cosmic Microwave Background (CMB) and the Large Scale Structure (LSS) of the Universe. But what else can we learn about the nature of Dark Matter from CMB and LSS data? One parameter of interest is the decay rate of Dark Matter. Even though Dark Matter must be stable on cosmological time scales, it may not be absolutely stable.

If we know the decay channels of the Dark Matter particle we can derive bounds on the decay rate by looking for visible decay products. But any such bound will of course depend on the assumed particle physics model. However, we can derive a model-independent bound if we assume the 'worst-case' scenario that Dark Matter only decay into invisible relativistic particles. To be truly model-independent we also extend the cosmological model by parameters, which could be degenerate with the Dark Matter decay rate.

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Session Classification: Dark Matter