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How to detect and produce dark matter from (dark) Freeze-in, the kinetic mixing portal example

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Dark matter may belong to a hidden sector that is only feebly interacting with the Standard Model and may have never been in thermal equilibrium in the Early Universe. In this case, the observed abundance of dark matter particles could have been produced through a slow process. This applies to scenarios where Standard Model and Hidden Sector communicate through light mediator of mass less than a few MeV. In this talk, I will present two results about FIMPs using the well known kinetic mixing model as a test-model. I will first show that, for the first time, direct detection experiments are constraining the parameter space of this dark matter production mechanism. I will then show that in a certain region of the parameter space, FIMPs can be frozen-in from mediator annihilations, making the dark matter even feebler interacting.

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