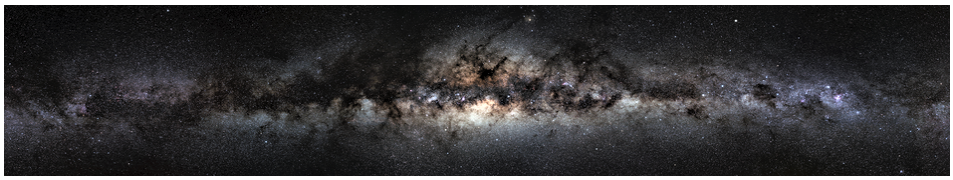

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Axion and Dark Photon Experiments, a Translators Dictionary for the Perplexed

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The dark photon is a massive hypothetical particle that interacts with the Standard Model by kinetically mixing with the visible photon. Due to the similarity with the electromagnetic signals generated by axions, many putative bounds on dark photon signals are simply reinterpretations of historical bounds set by axion haloscopes. However, the dark photon has a property that the axion does not: an intrinsic polarization. Due to the rotation of the Earth, accurately incorporating this polarization into dark photon analyses is nontrivial, and highly experiment-dependent. Several well-known searches for axions employ techniques for testing signals that preclude their ability to set exclusion limits on dark photons, and hence should not be reinterpreted as such. Most experiments do not have a straight forward reinterpritation for polarized dark photons. On the other hand, we find that if one does account for the dark photon's polarization, and the rotation of the Earth, an experiment's discovery reach can be improved by an order of magnitude. Here, we detail the strategies that would need to be taken to properly optimise a dark photon search. These include a judiciously choosing the orientation of the experiment, as well as strategically timing any repeated measurements and splitting measurements into multiple parts. Such strategies have significant impact on limits without additional time or cost.

Primary author: MILLAR, Alexander (Stockholm University)

Presenter: MILLAR, Alexander (Stockholm University)

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