

# Dark Matter, UV-Mapped from Interstellar Space

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## Abstract

If simple proven ultraviolet spectrometers are aboard Interstellar Probe we believe that they can be used to map the distribution of the dark matter in the universe.

## 1. Introduction

The nature of the dark matter in the universe is perhaps the most profound, but experimentally accessible, mystery in all of physics today. But despite a huge number of searches, the nature of the dark matter, known to exist only because of its strong and clear gravitational effects, has not been identified.

It was just 378,000 years after the Big Bang that the entire universe recombined. Subsequently, almost all of the universe's hydrogen has been reionized: but the source of the required ionizing photons is unknown. And furthermore, that which has until now been regarded as the most likely source of those reionizing photons, small galaxies in the early universe, has now been strongly ruled out [1].

We have suggested [2] that the reionization, which certainly occurred, was in actuality caused by the slow decay of a component of the dark matter into pairs of photons having a spectrum that extends shortward of 911.8 Å, and so can ionize hydrogen.

## 2. Ionizing Ultraviolet Radiation

We made that radical suggestion because our analysis [3] of the *Galaxy Evolution Explorer* far-ultraviolet cosmic background radiation clearly indicates the existence of a second component to the far ultraviolet background (the primary component being simply dust-scattered starlight). Whatever the source of that

second component, there is no reason to expect it not to extend shortward of the 911.8 Å hydrogen absorption edge, and hence be capable of performing the required reionization of the universe.

## 3. What Is To Be Done

The New Horizons mission to, and beyond, Pluto, carried an ultraviolet spectrometer having 9 Å resolution and hence having the capability of distinguishing dust-scattered starlight (Lyman series absorption lines must be present) from the mysterious second component which we have suggested is what reionized the universe.

We have used engineering data from New Horizons [4] as a proof-of-concept for the use of similar spectrometers aboard Interstellar Probe to map the distribution of the dark matter in our galaxy. Ideal for Interstellar Probe would be spectrometers aboard two missions, one up-stream and one down-stream, with observations being made in the anti-solar hemisphere. The reason vast distance from the Sun is required, is to avoid the incredibly strong 1216 Å hydrogen radiation from the Sun, which would scatter to all wavelengths and make detection of the putative dark matter radiation impossible: and of course that is why Interstellar Probe is the natural host for our proposed investigation.

## Acknowledgements

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## References

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