The effect of gas bulk rotation in the morphology of the Lyα line.

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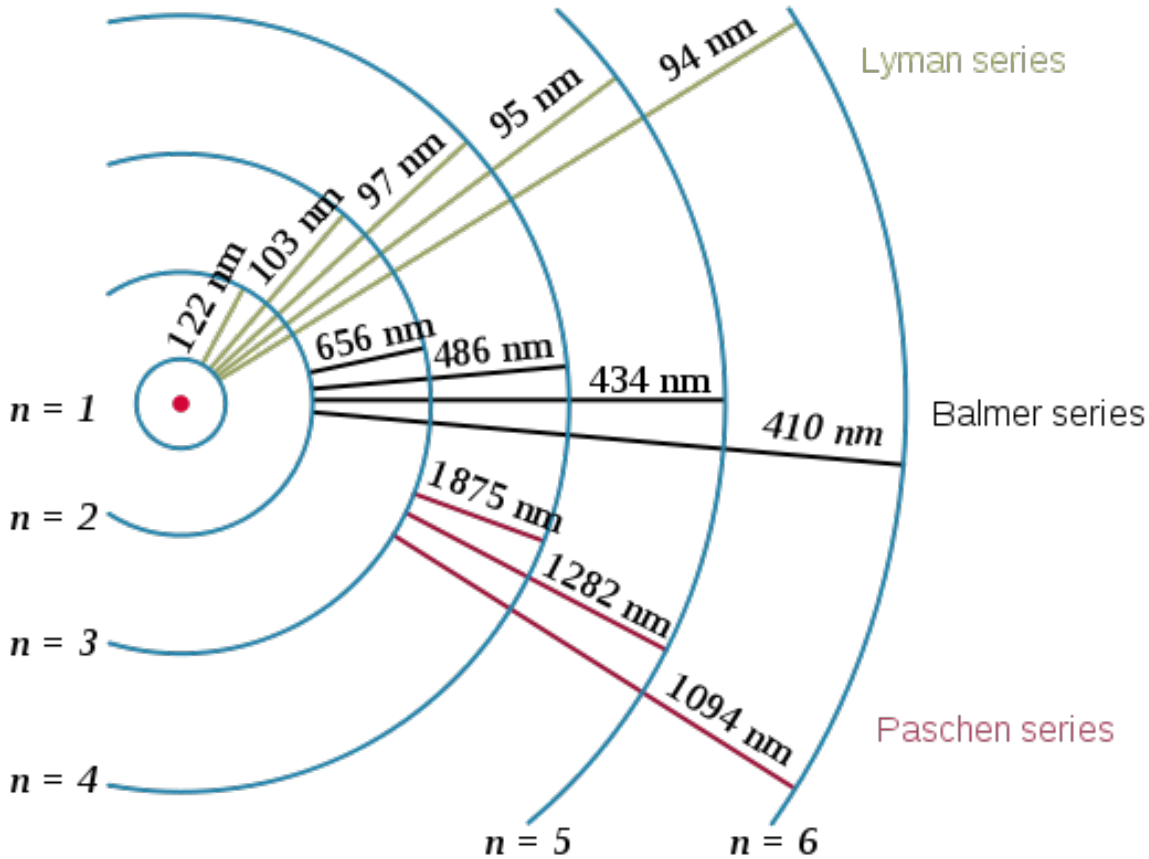
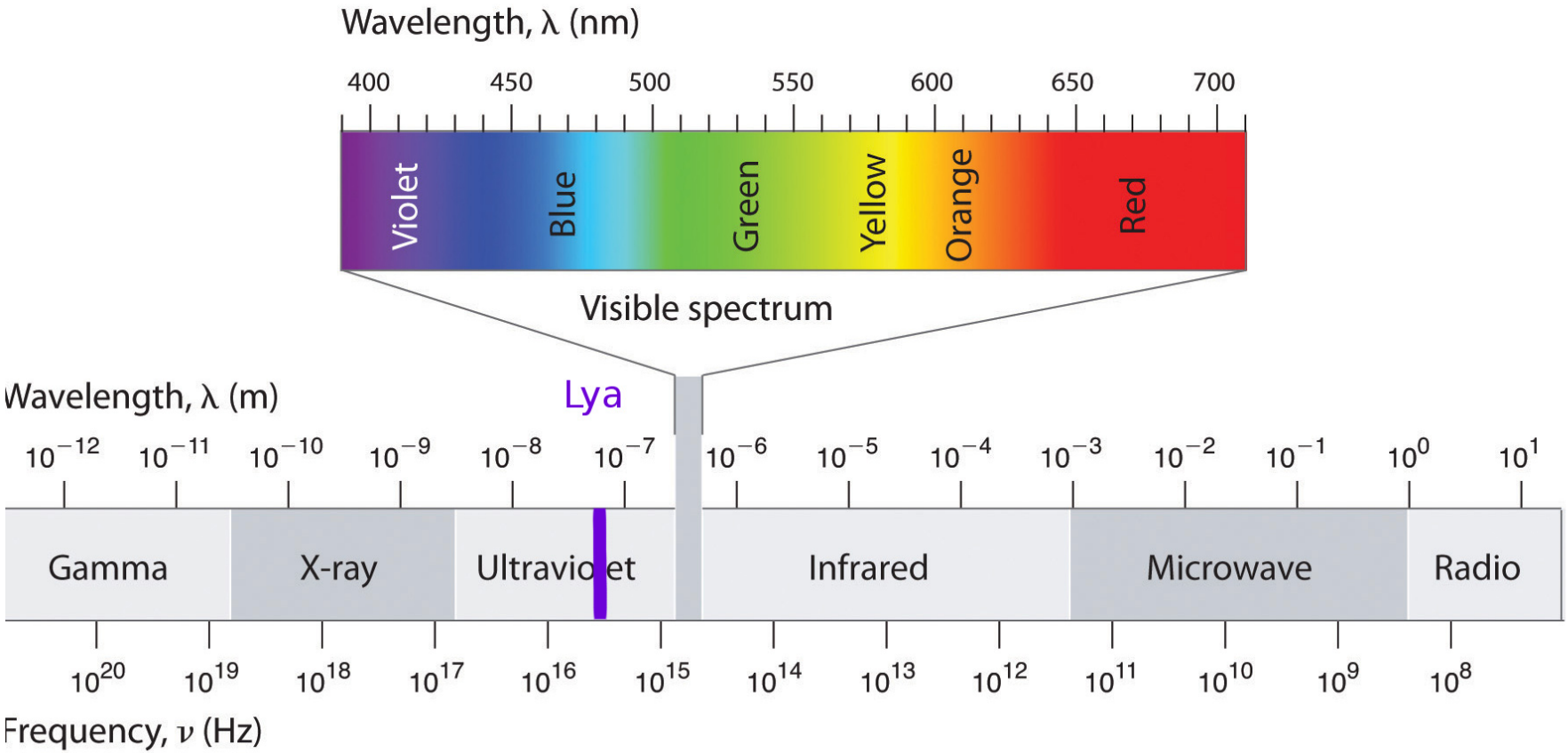
Lyman α emission line

A Lyα photon is emitted with a $\lambda = 1215.67\mathring{A}$.

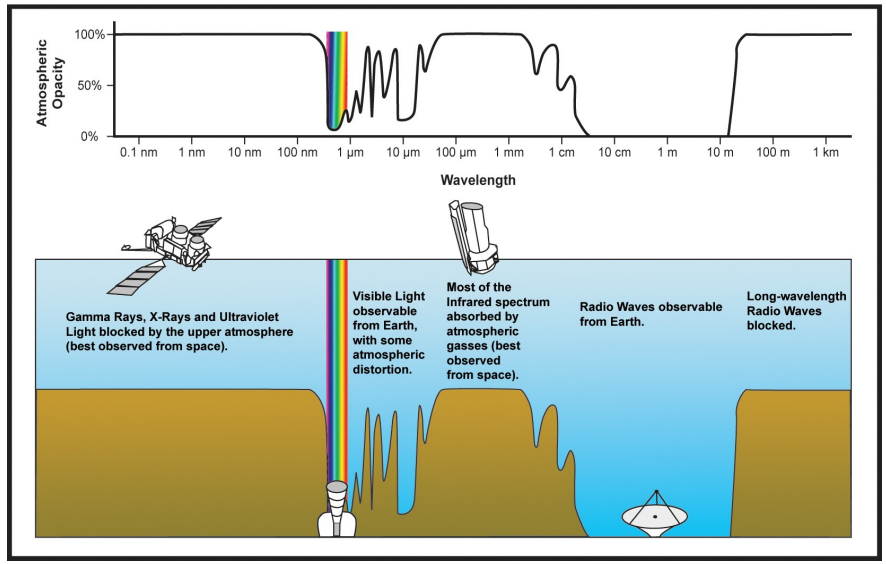


Lya line characteristics

Lyα is in the vacuum UV part of the EM spectrum



Cosmological Redshift


Atmospheric Opacity
100%
50%
0%
0.1 nm
1 nm
10 nm
100 nm
1 μm
10 μm
100 μm
1 mm
1 cm
10 cm
1 m
10 m
100 m
1 km
Wavelength
Gamma Rays, X-Rays and Ultraviolet Light blocked by the upper atmosphere (best observed from space).
Visible Light observable from Earth, with some atmospheric distortion.
Most of the Infrared spectrum absorbed by atmospheric gasses (best observed from space).
Radio Waves observable from Earth.
Long-wavelength Radio Waves blocked.

Assuming that galaxies emmit Lyα radiation we should be able to observe this radiation from the earliest (farther) galaxies in the Universe.

In order to radiate Lyα photons we need:

- Hydrogen
- Sources

UV radiation sources in the Universe

ARE YOUNG GALAXIES VISIBLE?

R. B. Partridge and P. J. E. Peebles
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Received August 5, 1966; revised September 8, 1966

ABSTRACT

The purpose of this paper is to assess the general possibility of observing distant, newly formed galaxies. To this end a simple model of galaxy formation is introduced. According to the model galaxies should go through a phase of high luminosity in early stages of their evolution. The estimated luminosity for a galaxy resembling our own is $\sim 3 \times 10^{46}$ ergs/sec, roughly 700 times higher than the present luminosity. The bright phase would occur at an epoch of about 1.5×10^{8} years, corresponding to a redshift between 10 and 30, depending on the cosmological model assumed.

The possibility of detecting individual young galaxies against the background of the night sky is discussed. Although the young galaxies would be numerous and would have sufficiently large angular diameters to be easily resolved, most of the radiation from the young galaxies would arrive at wavelengths of 1–3 μ where detection is difficult. However, it seems possible that the Lyman-α line might be detected if it is a strong feature of the spectra of young galaxies.

It is also shown how such an experiment might help us to distinguish between various cosmological models.

25 years later ...

SEARCHES FOR PRIMEVAL GALAXIES

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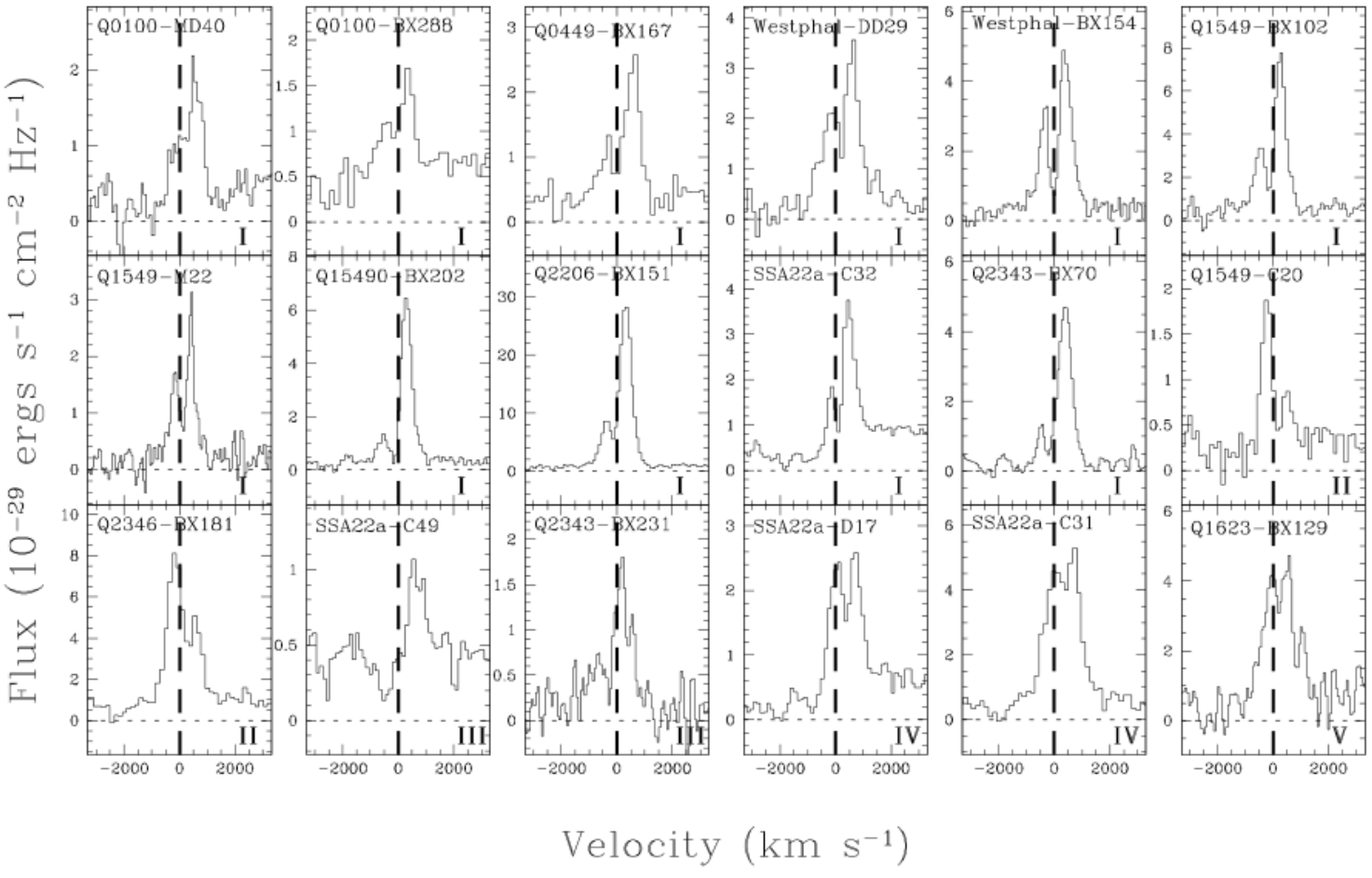
ABSTRACT. We review primeval galaxy searches based on the Lyα line emission. Simple arguments are given which suggest that primeval galaxies (interpreted here as ellipticals and bulges undergoing their first major bursts of star formation) should be detectable with present-day technology. Many active objects are now known at large redshifts, which may be plausibly interpreted as young galaxies, but there is so far no convincing detection of a field population of forming normal galaxies. This suggests that either primeval galaxies were obscured, and/or are to be found at higher redshifts, $z_{gf} > 5$.

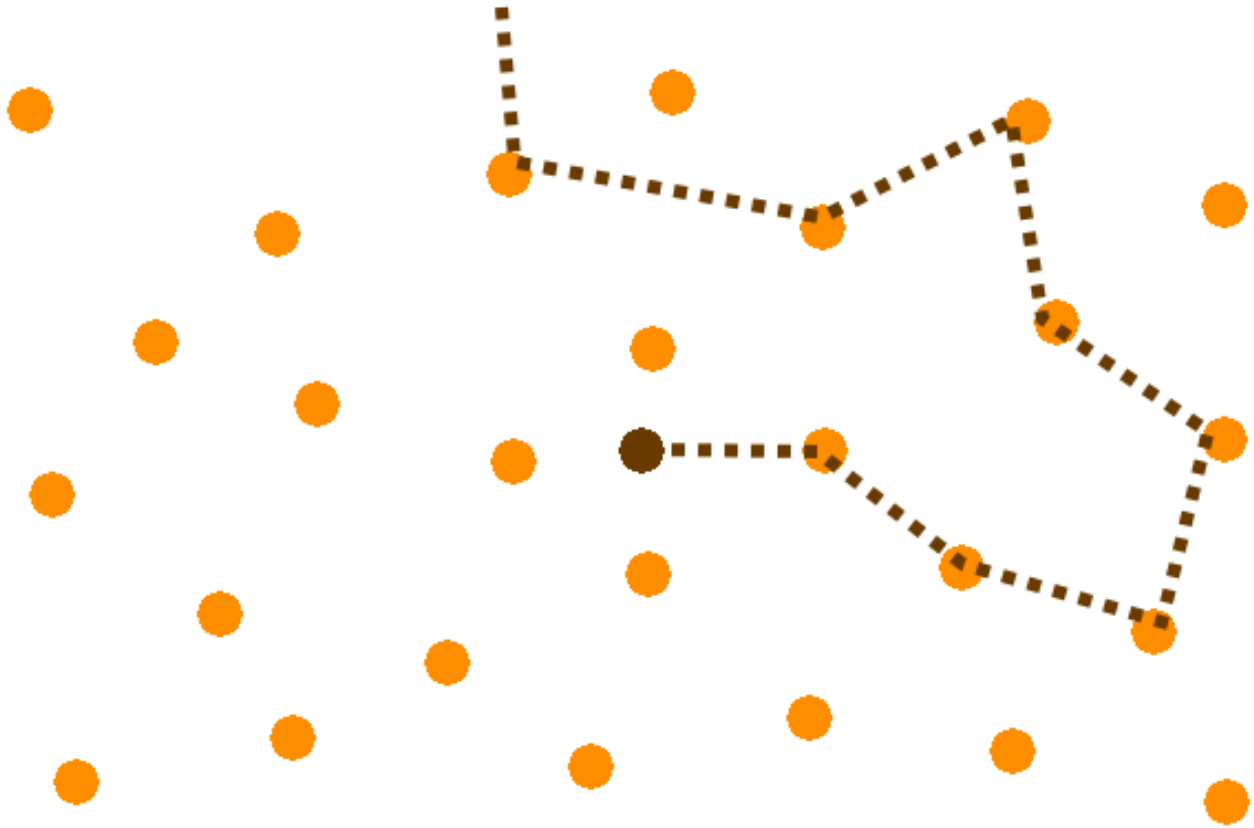
Units convention:

$$V = \frac{\nu_{obs} - \nu_{\alpha}}{c} \tag{1}$$

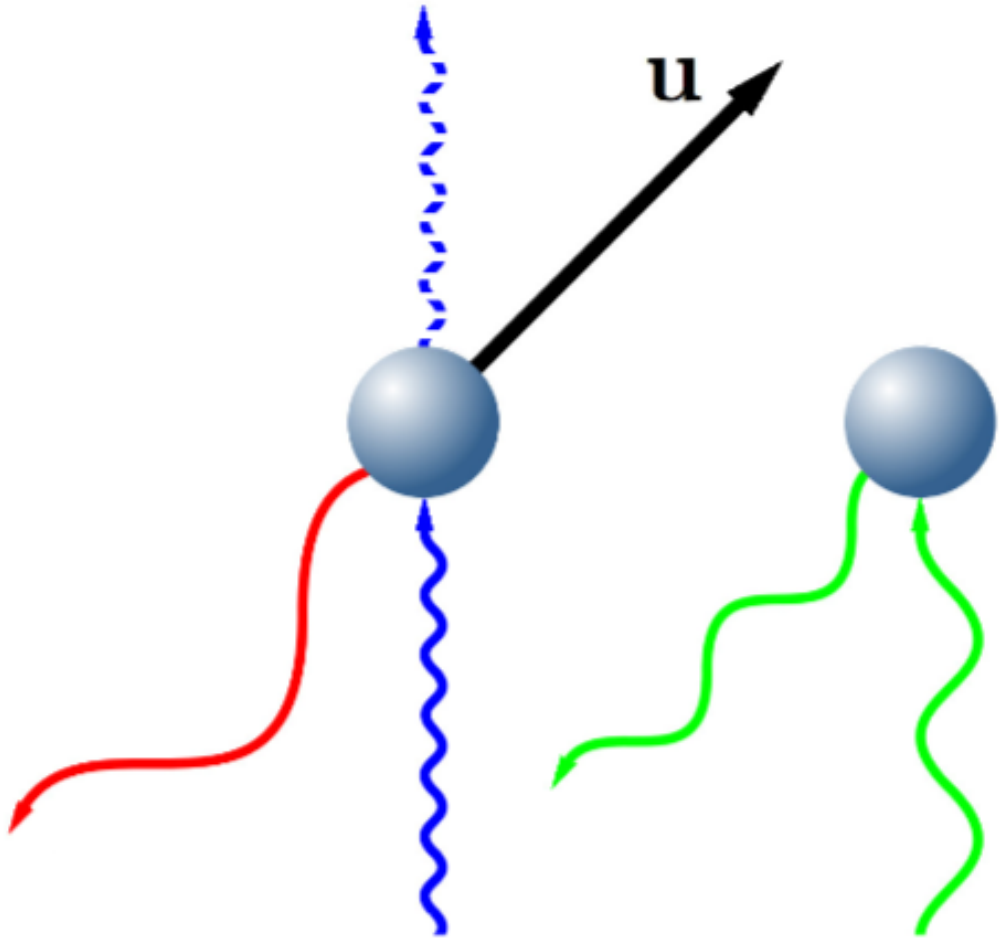
LAEs spectra



Radiate transfer through a static medium:



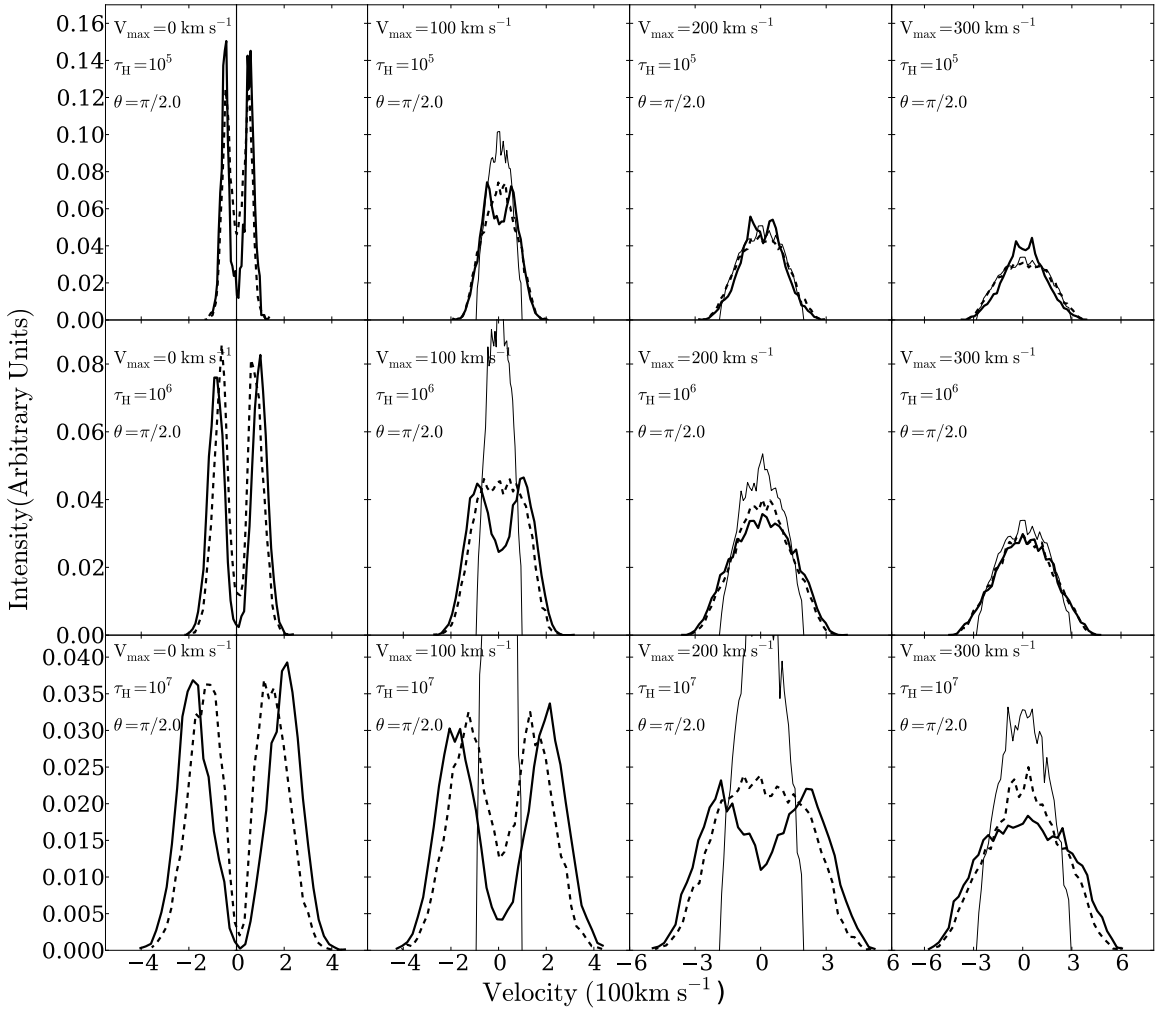
Radiate transfer through a non-static medium:



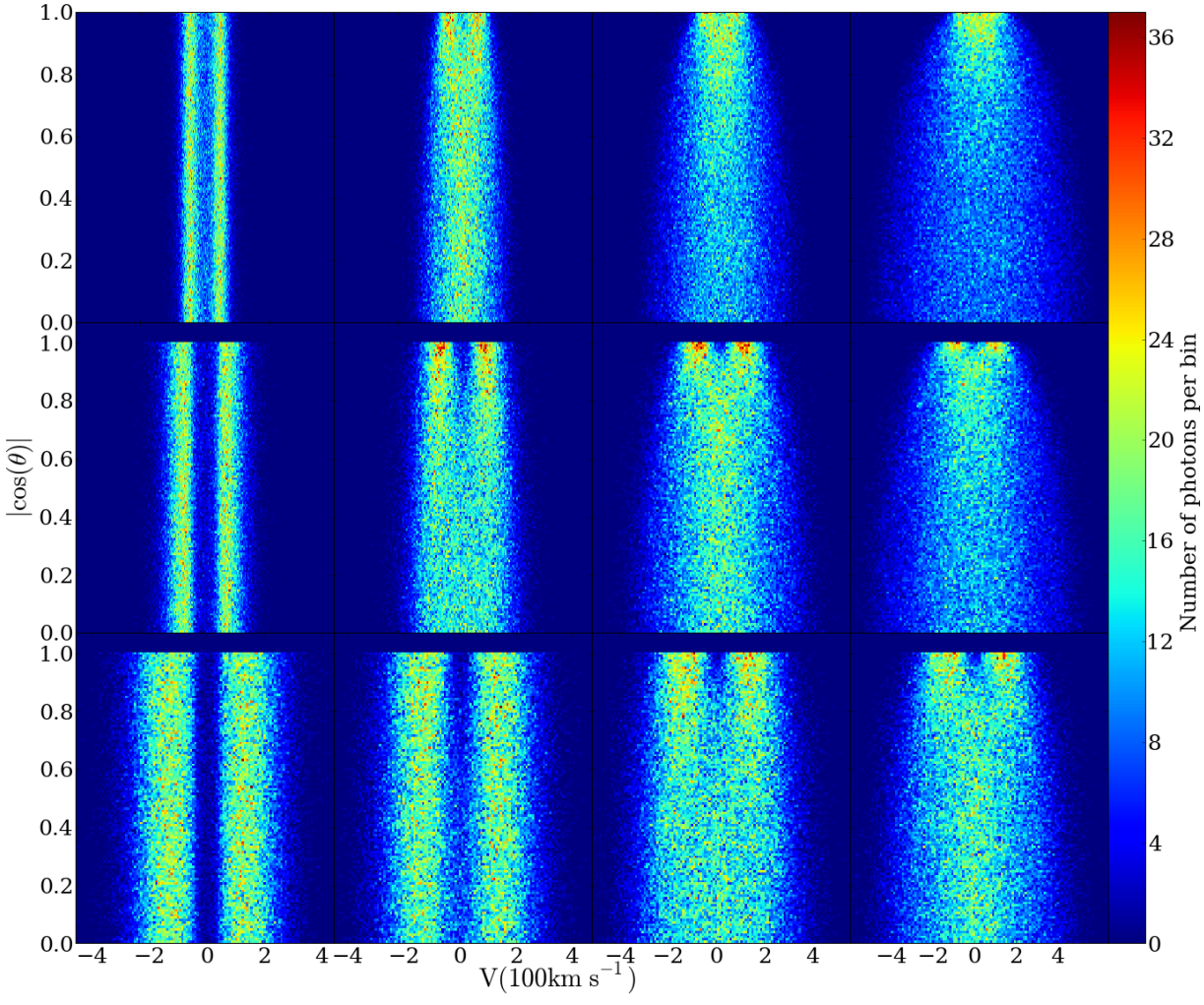
Radiative Transfer via Monte-Carlo methods:

Dust:

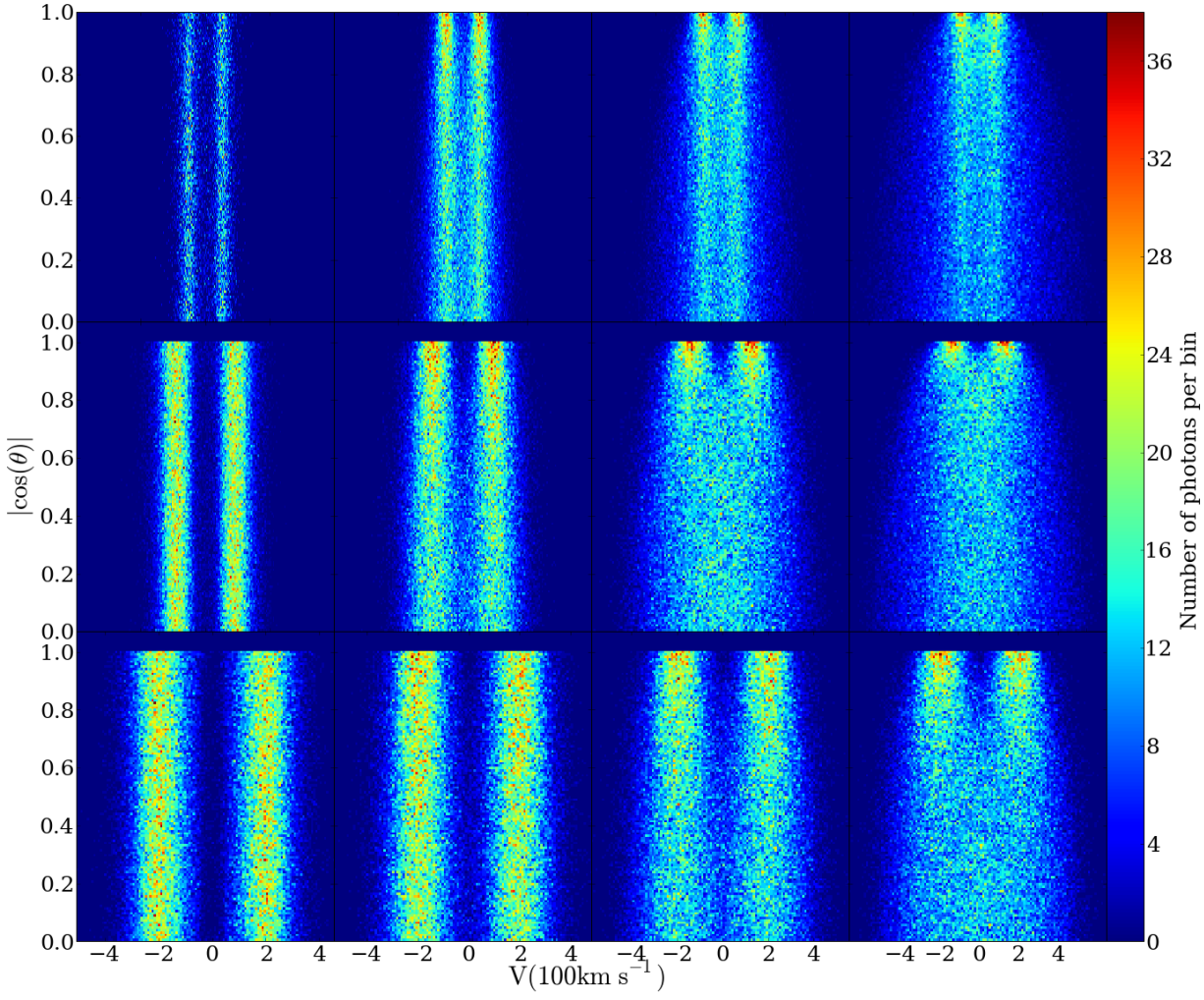
Simulated spectra



Simulated spectra



Simulated spectra



Simulated spectra