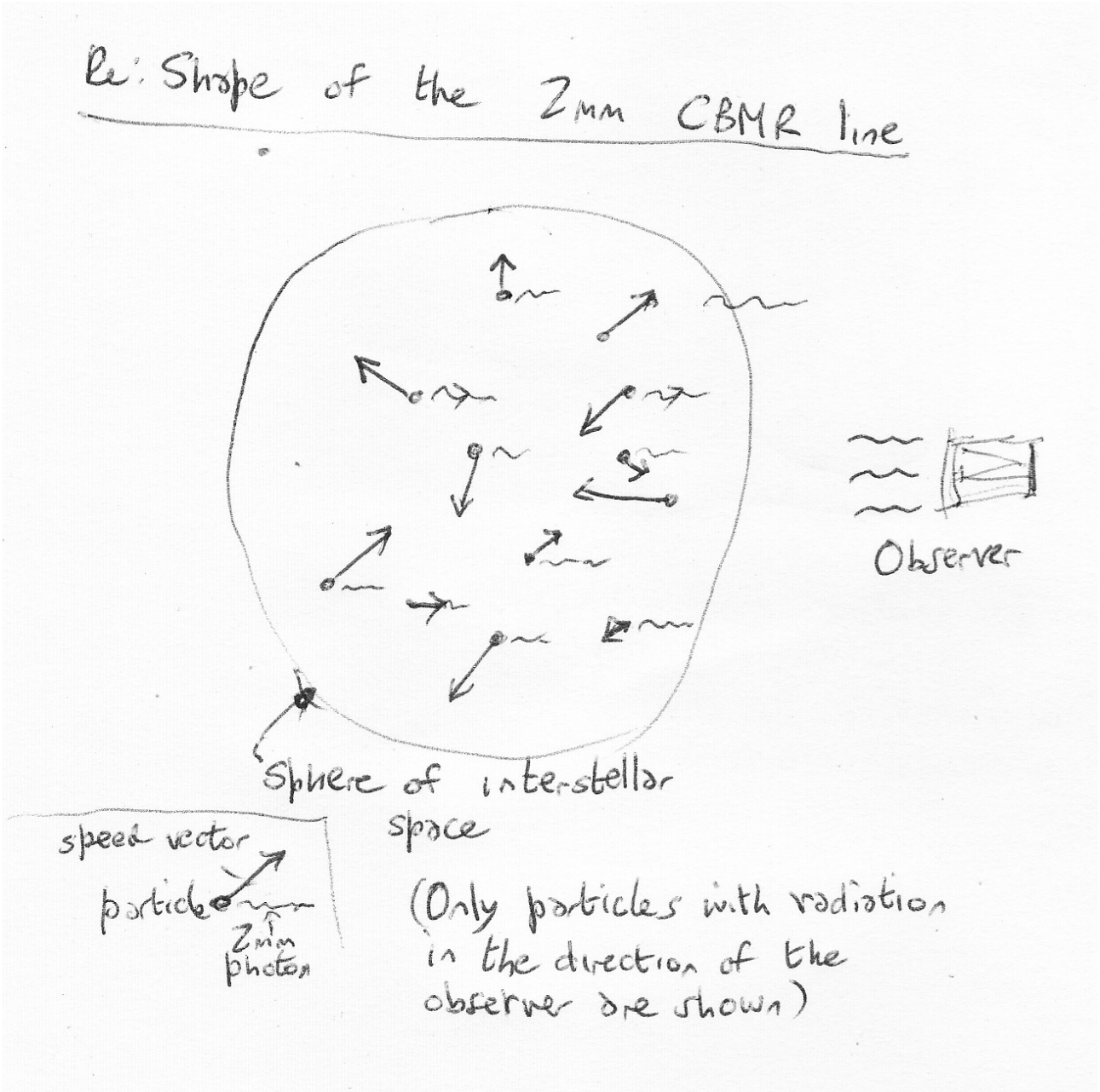
ZBL142X.pdf

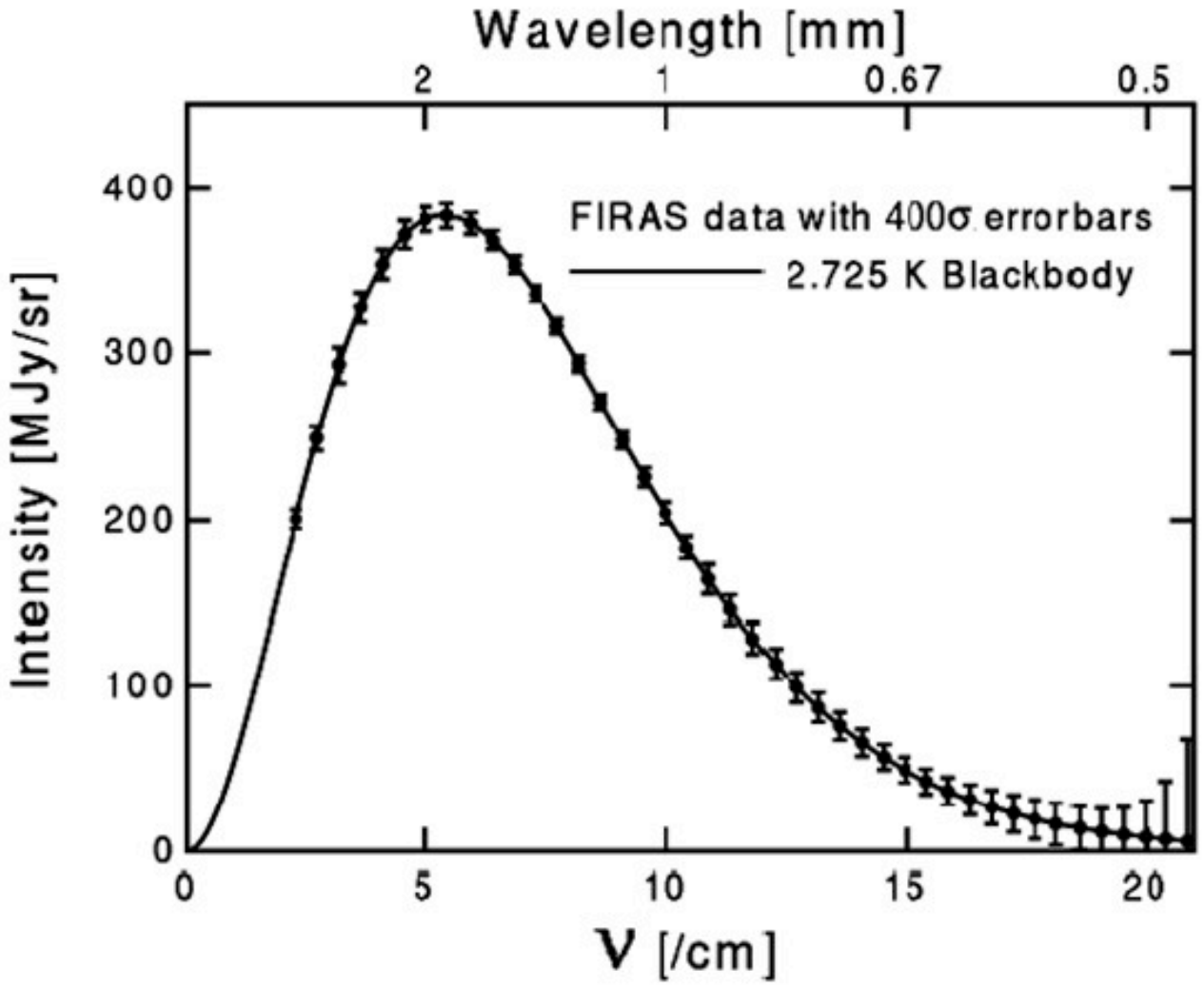
The second illustration below shows observed data for the CMBR line, an astronomical spectral line in microwave radiation observed from all points of the sky. It is called the Cosmic Microwave Background Radiation, and has a peak wavelength just below 2mm.

Calculations are wanted for the shape of this line assuming it is derived from particles in interstellar/intergalactic space which are moving at a range of velocities, similar to particles of gas in an enclosed vessel. It is to be assumed that some of these particles emit microwave photons as they travel, at a particular peak quantum frequency, and that these photons are red-shifted or blue-shifted according to their vector velocity relative to the observer, as standard Doppler shifts. It is to be assumed that these photons are emitted in random directions by the particles (not linked with their intrinsic velocities), and that a distant observer sees only those photons which happen to be directed toward the observer (or that part of the radiation which is in line of sight).



The first sketch represents a sphere of space with emitting particles travelling at a range of velocities. Within this sphere, the most popular velocity vector appears to be in the plane at right angles to the observer, and these particles should show zero Doppler shift.

Other particles within the sphere may be travelling at higher or lower speed relative to the observer, leading to their photons being red-shifted or blue-shifted to various extents, according to whether their vector velocities are away from or towards the observer, and according to the size of these vector velocities.



If the particle velocities followed a Normal distribution, their mean (root-square) velocity would presumably be at the point of inflexion of the curve. The velocity distribution cannot actually be according to a Normal curve, as individual theoretical velocities can be as high as may be above the mean on one side, but cannot be below zero on the low side.

If the desired derived curve is similar to that above, presumably it will give the mean root-square velocity of the particles. Caution: all the above may be questionable, the catcher should make their own analysis.