

Midterm Exam AST 714

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Good luck. Due March 27th. You may use as a reference book or other materials, but should work individually on the problems.

1. Consider a point source which is observed both directly and the light from this source is observed from a small cloud. If the source is observed to be unpolarized and the scattering is from Thomson Scattering from free electrons and the geometry is such that the line from the source to the small cloud makes an angle of 45° to the line from the object to the observer. Then what would be the polarization of scattered light from the cloud. Draw a diagram showing the polarizations.
2. An object has a measured emission at 100 MHz of $F = 5 \times 10^{-17} \text{ erg cm}^{-2} \text{ s}^{-1} \text{ Hz}^{-1}$ at a telescope with a resolution of 9 arc minutes.
 - (a) Assuming it is unresolved and radiating as a blackbody, what can you say about the temperature of the object?
 - (b) Assuming it is just resolved and radiating as a blackbody and is as large as can be and not be resolved what can you say about the temperature?
 - (c) What can you say about the temperature of the material doing the emission?
3. Do problem 4.7 from Rybicki and Lightman.
4. Consider the ejecta of a supernova, if we approximate this as a sphere of radius, R, of 10 solar mass of fully ionized hydrogen at temperature $T=10^6$ K, then:
 - (a) What would be the emission from this sphere if we treated it as a black body?
 - (b) What would be the emission from this sphere if we treated it as optically thin Bremsstrahlung?
 - (c) At what radius are they equal?