Followup

- Alternative derivations for Black Body:
  - Harwit: *Astrophysical Concepts (ISBN 0-471-35820-7)*
  - Bradt*: Astrophysical Processes (ISBN 9780521846561)*
- For resistor noise:
  http://www.claysturner.com/dsp/Johnson-Nyquist%20Noise.pdf
- There is a spreadsheet to plot blackbody formulae at
  http://galileo.phys.virginia.edu/classes/252/bbr.xls

Lecture 6 - examples

- When do we need to worry about hν/kT ?
  - h=6.6E-34 Js
  - k=1.38E-23J/K

$$\nu \ll \frac{kT}{h}$$

  - if T=3K, 100K, 1000K

    (note: peak frequency is at hν/kT~ 3)

Rayleigh-Jeans

$$S = \frac{2\mathrm{k}T_b \Omega \nu^2}{c^2}$$

alternatively

$$T_b = \frac{S c^2}{2\mathrm{k} \Omega \nu^2}$$

- In radio astronomer units(!)

$$T_b = 1.3 \times 10^6 \frac{(S/Jy)}{(\nu/GHz)^2 (\theta/arcsec)^2}$$

The Moon

- Consider the moon
  - At radio wavelengths little variation with phase (we see a little below the surface)
  - If temperature is about 220K. size 0.5deg what surface brightness will we see? (if beam is small)
  - If beam width is 1.5 deg?
  - How many Jy at 10GHz?
  - How many Jy at 20GHz?

Mars?

- This weekend 4.5 arcseconds in diameter
- Temperature about 211K
- How many Jy at 10GHz?

Venus

- This weekend about 9.5 arcseconds diameter
- Temperature about 600K
- How many Jy at 10GHz?

Brightness temperatures

- Very Long Baseline Interferometry
  - suppose a source has a flux density of 0.2Jy at 2.4GHz and 0.5Jy at 8GHz and has a size of 2 milliarcseconds ...
- Suppose we have a patch of galaxy radiating at 400K at 151MHz ; how many Jy would we receiver in a radio telescope beam of 2º

Hot star

- temperature 10000K, frequency 30GHz
  - is $h\upsilon/kT$ important?
  - how many W m^{-2} Hz^{-1} sr^{-1}