

## ASTR1001 “Astrophysics” Assignment 3.

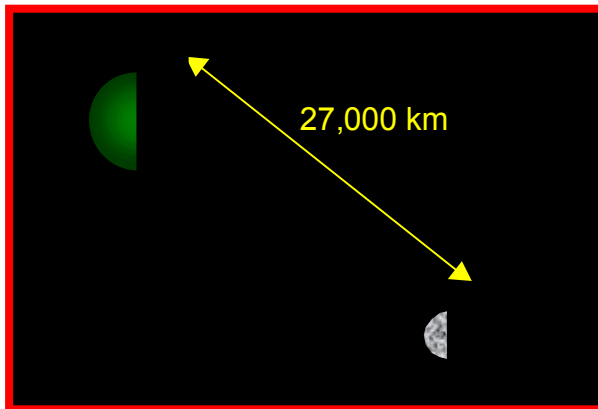
# Third Data Release

### ***The Story So Far***

Due to persistent nagging from the science team, Captain Chubb eventually relented and sent a stealthy robot probe in close to take pictures. The probe got to 500 AU out, and took one close up picture of the dot. Communications were then abruptly broken off – all contact with the probe has been lost. No further data were taken. This could have been a technical failure, but it got Captain Chubb very worried, so she quickly retreated to ten light-years away.

### ***The Picture***

The single picture taken before communication was lost was taken while the radio signal was at its maximum frequency, 1420.024 MHz, ie. just before one of the long cut-offs started. HD666123 was to the left of the field imaged.



The dot actually consists of two objects, a large one (component A) and a small one (component B). They are 27,000 km apart. The radius of component A is 9,207 km, while component B has a radius of 5,413 km.

The luminosity of the two components could be measured from the image at three wavelengths. These numbers are the total power put out by each component, summed over all directions, not just the flux that you detect.

Filter	Wavelength	Luminosity of component A (W/nm)	Luminosity of component B (W/nm)
B	440nm	$2.32 \times 10^{13}$	$8.00 \times 10^{12}$
K	2,100nm	$3.02 \times 10^{13}$	$3.84 \times 10^{10}$
L	10,000nm	$2.98 \times 10^{14}$	$1.71 \times 10^{12}$

### ***The Assignment.***

This is the last of three assignments based on the “mystery planet”. For this assignment, you should deduce as much as possible, using the data that I’ve provided here, plus the data from the first and second assignments.

This assignment is worth 5% of the marks for ASTR1001.

If you wish, you may once again work in teams. If you do so, you need only submit one write-up for the whole team, and you will all be given the same mark. Team submissions will be marked in exactly the same way as individual submissions.

**Deadline: Monday 13<sup>th</sup> May, 11am.** Assignments should be submitted electronically via WebCT. A special link will be provided.

Your write-up should once again be at most 300 words long, summarising what you have deduced about the mystery planet. It should be written in the style of an ‘Executive Briefing’ for Captain Chubb. You should concentrate on facts that might be important to this mission, and on the physical reasoning that led you to these conclusions.