Comments on the Development of the Rayleigh-Jeans Law

The Rayleigh-Jeans Law was an important step in our understanding of the equilibrium radiation from a hot object, even though it turned out not to be an accurate description of nature. The careful work in developing the Rayleigh-Jeans law laid the foundation for the quantum understanding expressed in the Planck radiation formula. In outline form, here are the steps which led to the Rayleigh-Jeans law.

Equilibrium standing wave electromagnetic radiation in a cubical cavity of dimension L must meet the condition:	$n_1^2 + n_2^2 + n_3^2 = \frac{4L^2}{\lambda^2}$	Show
The number of modes in the cavity is:	$N = \frac{8\pi L^3}{3\lambda^3}$	Show
The number of modes per unit wavelength is:	$-\frac{dN}{d\lambda} = \frac{8\pi L^3}{\lambda^4}$	Show
The energy per unit volume per unit wavelength is:	$\frac{du}{d\lambda} = \frac{8\pi kT}{\lambda^4}$	Show
The average radiated energy per unit wavelength is:	$\frac{dR}{d\lambda} = \frac{2\pi ckT}{\lambda^4}$	Show
Which when expressed in terms of frequency is:	$\frac{dR}{d\nu} = \frac{2\pi\nu^2 kT}{c^2}$	Show

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