Re: Bill Bryson and the big bang

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From: Bjoern Feuerbacher (*feuerbac_at_thphys.uni−heidelberg.de*)
Date: 07/02/04

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vonroach wrote:
> On Thu, 01 Jul 2004 17:57:22 +0200, Bjoern Feuerbacher
> <feuerbac@thphys.uni−heidelberg.de> wrote:
>
>
>>vonroach wrote:
>>

[snip]

>>>Just a question or two: which is more important − the energy
>>>of a photon or the energy density of the whole wave (whatever
>>>precisely the latter expression means)?
>>
>>"Important" in what sense? For what?
>>
>>The energy of a radio wave would e.g. determine in what distance from
>>the emitter it still can be heard. The energy in an infrared wave would
>>e.g. determine by how much its absorber is heated. Is that important
>>enough for you?
>
>
> Not really, both are limited to their own range.

Sorry, I don't understand what you mean here.

> Can't important
> amplitude get a radiowave to mimic an x−ray or gamma ray.

Again, depends on the effect. If you want to "mimic" the total
energy which is deposited, this is possible. If you want to "mimic"
effects caused by the energy of individual photons, then it isn't.

> All three
> have different frequency ranges that have important characteristics of
> the radiation.

Right.

>>>And a practical application:
>>>can a wave of infrared, visible, or ultraviolet light polarized or
>>>modified in any other way be given enough amplitude to cause its
>>>effect to mimic that of x−rays? gamma rays? cosmic waves?
>>
>>Depends on the effect. Some effects depend on the energy in the wave
>>(see e.g. the examples above), some others on the energy of the
>>individual photons (see e.g. the examples like skin damage you brought
>>up, or the photoelectric effect).
>
>
> Photoelectric effect?

Don't you know what that is?

> I presume a reference to lasers or UVL radiation.

What is UVL radiation? Did you mean UV radiation?

And no, for the photoelectric effect, neither lasers nor UV light
is needed. It works just as well with visible light − at least for
some materials.

> Such waves of low amplitude will have little or no effect;
> however, x−ray and gamma radiations have the effect even at very low
> amplitude.

Again, depends on what effect you are talking about.

[snip]

>>And why are you interesting in designing weapons?
>
> Because if your belief in amplitude is correct it would be possible.

So what? Just because it is possible to design a weapon is IMO no
reason to be interested how one could do that.

>>>An answer indicating that any of these different areas of the spectrum
>>>can be made more effective by increasing the amplitude will avoid the
>>>issue.
>>
>>What do you mean by "effective" here?
>
> Produce the effects of X−rays or gamma rays with comparable exposures.

WHICH effects?

[snip

>>>No mathematical consideration is requested, I'm discussing practical
>>>use.
>>
>>If you haven't noticed, in order to know beforehand (i.e. before
>>actually constructing and testing an apparat) what is required for
*>>a desired practical use, one *has* to make mathematical considerations*
>>in general.
>
> It probably helps with sophistication, but I suspect was little use
> with early clubs or cannons.

But it was of lots of use in designing radios, and X−ray tubes.

> Trial and error is an alternative based
> on a belief that it might be possible.

Yes − but trial and error is not only the hard way to arrive at the
desired result, it also often does not give the best possible result.

[snip]

>>>Ok, if `time' slows does radioactive decay slow?
>>
>>Yes. Ever heard of the measurement of time dilation with muons which
>>were produced in the atmosphere? Muon decay is very similar to the
>>radioactive decay of nuclei.
>
> Earth atmosphere remains in a high mass milieu.

I have no clue what this is supposed to mean.

>>>If so, I assume than a `time
>>>standard' sent far into massless (?) space would beam inaccurate
>>>earthtime back to us.
>
> In massless `space' or absence of much mass, `space' would contract?

No. Why should it???

> time would `slow'? but would the radioactive standard produced on
> earth `recognize' these changes and still send the correct earthtime
> in messages back to the distant earth cradled in a space craft and
> unaware that the craft was in motion relative to earth, or would it
> demonstrate effects of motion?.

Atomic clocks which are in motion wrt earth, and above it (hence in
another gravitational potential) give other time measurements than
atomic clocks on earth. This is nicely shown by the GPS satellites.

> (Muons do decay, but I don't know if
> anybody uses it for a time standard) Atomic clocks are used based on

> the natural decay of their standard.

Err, no. Atomic clocks have nothing to do with radioactive decays.
They use a hyperfine transition in the atoms.

>>How did you arrive at that conclusion?
>
> An interrogatory is not a `conclusion'. An answer may be.

Looked like a conclusion to me. Sorry for the misunderstanding.

[snip]

Bye,
Bjoern