

Re: Pioneer anomaly

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- *From:* Gerard Westendorp <westy31@xxxxxxxxxx>
 - *Date:* Tue, 27 Sep 2005 19:37:40 +0000 (UTC)
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Esa A E Peuha wrote:

> Gerard Westendorp <westy31@xxxxxxxxxx> writes:
>
>
>>Similarly, if the Pioneer were to become electrostatically charged, by
>>picking up charges from particles it picks up underway, then charged
>>particles would not only get deflected by it through mechanical
>>collision, but be deflected by electric fields. The momentum changes in
>>any particles that are deflected in this way will get transferred to the
>>Pioneer, causing net deceleration.
>>
>
> That would only be possible if interplanetary matter had a nonzero
> charge density. However, if there were enough net charge around the
> Pioneer to decelerate it as much as we've seen, the charge would block
> any radio signals between us and the Pioneer, so we wouldn't even know
> it's decelerating...
>
>

If you look at plane wave solutions of the Maxwell equations in a space with charge density (c) and mass density (m), you get the dispersion relation:

$$\omega^2 + k^2 + c/m = 0$$

So if you had a sufficiently large charge density, you would get a big distortion of radio waves, especially low frequency ones, like you say. But if for example the mass of the particles were large, than we would see a smaller effect.

In the case of the earth's ionosphere, we do get quite an effect on low frequency radio, and a lot less on higher frequencies such as light. But these charge densities would be huge compared to the ones near Pioneer. So I am not so convinced.

We would have to put in some numbers. Maybe people have already done this.

Gerard

- ***Follow-Ups:***
 - ◆ ***Re: Pioneer anomaly***
 - ◇ *From:* Esa A E Peuha

- ***References:***
 - ◆ ***Re: Pioneer anomaly***
 - ◇ *From:* Charles Cagle
 - ◆ ***Re: Pioneer anomaly***
 - ◇ *From:* Charles Francis
 - ◆ ***Re: Pioneer anomaly***
 - ◇ *From:* Gerard Westendorp
 - ◆ ***Re: Pioneer anomaly***
 - ◇ *From:* Esa A E Peuha

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