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Dear Dr Reid,

I am responding to an email that you wrote on 31 July to Leonid Vitushkin at the BIPM, about units for gravity gradient, that was copied to me as President of the CCU. I apologize for having taken so long to react on this.

I understand that your problem is that the order of magnitude of gravity gradients that you are concerned with is around 10^{-9} s^{-2} , and you would like an SI unit, or at least a unit that is not too remote from the SI, in which to express these gravity gradients.

You should *not* talk about nano-second to the power minus 2. When multiple or sub-multiple prefixes are used within the SI, and the compound unit is then raised to a power, the whole compound unit is raised to the power concerned. Thus for example for an electric field $1 \text{ V/cm} = 100 \text{ V/m}$, because $1 \text{ V/cm} = 1 \text{ V cm}^{-1} = 1 \text{ V} (10^{-2} \text{ m})^{-1} = 10^{+2} \text{ V m}^{-1}$. In your example, $1 \text{ ns}^{-2} = 1 (10^{-9} \text{ s})^{-2} = 10^{+18} \text{ s}^{-2}$.

There is no way of expressing 10^{-9} s^{-2} as an SI unit by using a prefix, I am sorry to say. You could use the prefixes to write 10^{-6} s^{-2} in the form ks^{-2} ; or you could write 10^{-12} s^{-2} in the form Ms^{-2} (where M is the prefix for mega, i.e. 10^{+6}). However neither satisfies your need. You could use the correct SI unit 10^{-9} s^{-2} , awkward as it is to say and to write. Or you can invent your own non-SI unit of a magnitude that suits your need, and use it, specifying clearly once in each paper the meaning of your unit. I would be tempted to do the latter, and that is what you already seem to be doing if I understand your letter.

You are calling 10^{-9} s^{-2} an eotvos unit. That seems reasonable. None of the four symbols that you mention, E or Eo or Eot or EU, is entirely satisfactory, because E is one of the SI multiple prefixes, standing for exa-, 10^{+18} . However it should not be too confusing, since there is no unit whose symbol is o or ot or U. My advice is therefore to continue to use the unit eotvos unit for 10^{-9} s^{-2} , and to use the symbol Eot for this unit, and to explicitly define your unit once in each paper. As you will observe I am fairly tolerant of the use of non-SI units, when there is a good reason. Many of my purist colleagues would say you should use the SI unit 10^{-9} s^{-2} , and put up with the inconvenience.

Note that the symbol should begin with a capital E, but the name should be written with a lower case e (as for example with joule, symbol J; watt, symbol W; hertz, symbol Hz; etc.). The reason for this rule is to distinguish the name of the unit from the name of the man it commemorates.

With my best wishes,

Ian Mills

(I shall email this as an attachment, so that you get the formatting for exponents.)