Subject: Re: Physical constants in IDL with !CONST
Posted by lecacheux.alain on Fri, 21 Dec 2012 09:57:56 GMT
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Le mercredi 19 décembre 2012 00:13:37 UTC+1, Paul van Delst a écrit :
> Cool.
>
>
>
> From my "Fundamental_Constants" module (still stuck at the 2006 CODATA
>
> numbers. Yoicks!):
>
>
>
>
>
>
> ! Standard atmosphere
>
> ! Symbol:P0, Units:Pa, Rel.Uncert.(ppm): exact
>
> ! ---
>
> REAL(fp), PARAMETER :: STANDARD_ATMOSPHERE = 101325.0_fp
>
>
>
> ! Standard temperature
>
> ! (ice point of water, NOT triple point)
>
> ! Symbol:T0, Units:Kelvin, Rel.Uncert.(ppm): exact
>
> ! --
>
> REAL(fp), PARAMETER :: STANDARD_TEMPERATURE = 273.15_fp
>
>
>
>
>
>
> The others I would add are derivatives (as are some in your main list),
>
> but what the hell:
>
>
>
>

```
>
>    ! First Planck function constant
>
>    ! Symbol:c1,  Units:W.m^2.sr^-1,  Rel.Uncert.(ppm): 0.078
>
>    !
>
>    !   c1 = 2.h.c^2
>
>    !
>
>    !      = 1.191042722(93)e-16
>
>    ! ------------------------------------------------------
>
>    REAL(fp), PARAMETER :: C_1 = &
>
>      TWO * PLANCK_CONSTANT * SPEED_OF_LIGHT**2
>
>
>
>
>
>    ! Second Planck function constant
>
>    ! Symbol:c2,  Units:K.m,  Rel.Uncert.(ppm): 1.7
>
>    !
>
>    !         h.c
>
>    !   c2 = -----
>
>    !          k
>
>    !
>
>    !      = 1.4387752(25)e-02
>
>    !
>
>    ! -------------------------------------------
>
>    REAL(fp), PARAMETER :: C_2 = &
>
>      PLANCK_CONSTANT * SPEED_OF_LIGHT / BOLTZMANN_CONSTANT
>
>
```

```
>
>
>
>    ! Molar volume of an ideal gas at standard
>
>    ! temperature and pressure
>
>    ! Symbol:Vm,  Units:m^3/mol,  Rel.Uncert.(ppm): 1.7
>
>    !
>
>    !        R.T0
>
>    !   Vm = ------
>
>    !         P0
>
>    !
>
>    !      = 2.2413996(39)e-02
>
>    ! ------------------------------------------------
>
>    REAL(fp), PARAMETER :: STP_MOLAR_VOLUME = &
>
>      MOLAR_GAS_CONSTANT * STANDARD_TEMPERATURE / STANDARD_ATMOSPHERE
>
>
>
>
>
>    ! Loschmidt constant: The number density of one mole
>
>    ! of an ideal gas at standard temperature and pressure
>
>    ! Symbol:n0,  Units:m^-3,  Rel.Uncert.(ppm): 1.7
>
>    !
>
>    !        N(A).P0
>
>    !   n0 = ---------
>
>    !         R.T0
>
>    !
>
>    !        N(A)
```

>
>   !   = ------   .....(1)
>
>   !   Vm
>
>   !
>
>   !   = 2.6867775(47)e+25
>
>   !
>
>   ! --
>
>   REAL(fp), PARAMETER :: LOSCHMIDT_CONSTANT = &
>
>   AVOGADRO_CONSTANT / STP_MOLAR_VOLUME
>
>
>
>
>
> I use these daily in my conversions of the various units of
>
> concentrations of gases in the atmosphere.
>
>
>
> Well, except for the first and second Planck constants - those are for
>
> computing Planck radiances.
>
>
>
>
>
> cheers,
>
>
>
> paulv
>
>
>
> On 12/18/12 17:34, Chris Torrence wrote:
>
>> Hi all,
>
>>

>
>> I'm adding a new system variable to IDL, called !CONST. So far, it's
>
> an IDL structure containing the following physical constants, in MKS
>
> units. All of these values (except for !const.pi, .e, .phi, and
>
> .R_earth) are taken from the "2010 CODATA Recommended Values," from NIST.
>
>>
>
>> Name Description Value
>
>> alpha Fine structure constant 7.2973525698 x 10-3
>
>> c Speed of light in a vacuum 299792458 m/s
>
>> e Euler's number 2.7182818284590452
>
>> ev elementary charge e, 1 electron volt 1.602176565 x 10-19 C
>
>> eps0 electric vacuum permittivity 8.854187817 x 10-12 F/m
>
>> F Faraday constant NAe 96485.3365 C/mol
>
>> G Gravitation constant 6.67384 x 10-11 m3/kg/s2
>
>> gn Earth standard gravity 9.80665 m/s2
>
>> h Planck constant 6.62606957 x 10-34 J s
>
>> hbar h/(2pi) 1.054571726 x 10-34 J s
>
>> k Boltzmann constant R/NA 1.3806488 x 10-23 J/K
>
>> me electron mass 9.10938291 x 10-31 kg
>
>> mn neutron mass 1.674927351 x 10-27 kg
>
>> mp proton mass 1.672621777 x 10-27 kg
>
>> mu0 magnetic vacuum permeability 12.566370614 x 10-7 N/A2
>
>> Na Avogadro constant NA 6.02214129e23 mol-1
>
>> phi golden ratio 1.6180339887498948
>
>> pi Pi 3.1415926535897932

>
>> R molar gas constant 8.3144621 J/mol/K
>
>> R_earth Earth radius (spherical) 6370997.0 m
>
>> re classical electron radius 2.8179403267 x 10-15 m
>
>> rydberg Rydberg constant Rinf 10973731.568539 m-1
>
>> sigma Stefan-Boltzmann constant 5.670373 x 10-8 W/m2/K4
>
>> u unified atomic mass unit 1.660538921 x 10-27 kg
>
>>
>
>> Here's my question: What am I missing? Are there any physical
>
>> constants that most people would find useful for their day-to-day
>
>> work. The key is "most" people - nothing too esoteric, or limited to
>
>> a single scientific discipline, etc.
>
>>
>
>> Thanks!
>
>>
>
>> -Chris
>
>> ExelisVis
>
>
>
>> p.s. please limit your comments to !CONST. Our new
>
>> widget system team is currently hard at work in a secret underground
>
>> bunker, and cannot be disturbed.

Why not, simply, change the existing !Radeg and !Dtor constants to double ?
That should not imply any important loss of compatibility.

For the rest, the !CONST initiative looks pretty useful to me. Please only not to be too specific to a particular scientific discipline!

alain.