
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
>
> !
>
> !  $c_1 = 2.h.c^2$ 
>
> !
>
> !  $= 1.191042722(93)e-16$ 
>
> ! -----
>
> 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
>
> !
>
> !  $h.c$ 
>
> !  $c_2 = -----$ 
>
> !  $k$ 
>
> !
>
> !  $= 1.4387752(25)e-02$ 
>
> !
>
> ! -----
>
> 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.
