
Subject: Re: Physical constants in IDL with !CONST
Posted by [Paul Van Delst\[1\]](#) on Tue, 18 Dec 2012 23:13:37 GMT
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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.