
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
!
!  $c1 = 2 \cdot h \cdot c^2$ 
!
!  $= 1.191042722(93)e-16$ 
! -----
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
!
!  $h \cdot c$ 
!  $c2 = \frac{h \cdot c}{k}$ 
!
!  $= 1.4387752(25)e-02$ 
! -----
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	$7.2973525698 \times 10^{-3}$
c	Speed of light in a vacuum	299792458 m/s
e	Euler's number	2.7182818284590452
ev	elementary charge e, 1 electron volt	$1.602176565 \times 10^{-19}$ C
eps0	electric vacuum permittivity	$8.854187817 \times 10^{-12}$ F/m
F	Faraday constant NAe	96485.3365 C/mol
G	Gravitation constant	6.67384×10^{-11} m ³ /kg/s ²
gn	Earth standard gravity	9.80665 m/s ²
h	Planck constant	$6.62606957 \times 10^{-34}$ J s
hbar	$\hbar/(2\pi)$	$1.054571726 \times 10^{-34}$ J s
k	Boltzmann constant R/NA	$1.3806488 \times 10^{-23}$ J/K
me	electron mass	$9.10938291 \times 10^{-31}$ kg
mn	neutron mass	$1.674927351 \times 10^{-27}$ kg
mp	proton mass	$1.672621777 \times 10^{-27}$ kg
mu0	magnetic vacuum permeability	$12.566370614 \times 10^{-7}$ N/A ²
Na	Avogadro constant NA	$6.02214129 \times 10^{23}$ 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	$2.8179403267 \times 10^{-15}$ m
rydberg	Rydberg constant Rinf	10973731.568539 m ⁻¹
sigma	Stefan-Boltzmann constant	5.670373×10^{-8} W/m ² /K ⁴
u	unified atomic mass unit	$1.660538921 \times 10^{-27}$ 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.