

IAU Division I Working Group “Nomenclature for Fundamental Astronomy” (NFA)

NFA WG EXPLANATORY DOCUMENT (DRAFT 5, 18 March 2005)

PART B2): SUMMARY OF TERMS AND DEFINITIONS

Table I provides a categorized list of all terms excluding those on time, their abbreviations (acronyms) and most commonly used symbols. In some cases there is no abbreviation or symbol, while in others a suggestion has been given. Table II gives the acronyms listed in alphabetical order. This takes into account previous NFA documents, the answers to the NFA Questionnaire and the WG discussion.

Authors must always ensure that the symbols used in a particular document are defined adequately.

References

NFA Newsletter 1, Annex 6, *Draft of Nomenclature and Terminology for the IAU WG* (C. Hohenkerk), October 2003.

NFA Working Group e-mail discussion, October 2003-February 2005.

NFA Questionnaire A, Annex, January 2004.

NFA WG recommendations and guidelines on terminology, draft 5, December 2004.

IAU (2000): *Approved Resolutions*, Transactions of the International Astronomical Union, Vol. XXIVB; *Proceedings of the Twenty-Fourth General Assembly*; Manchester, Ed. H. Rickman, Astronomical Society of the Pacific, Provo, USA, 2001, pp. 34-58.

TABLE I – Terminology Listed in Categories

The Glossary in part B3 contains a fuller description of the definitions.

Symbol	Abbreviation	Short Description	Comment or definition	CIO / Equinox Based
1. General				
	CIO based	for procedures using the CIO		CIO
	Equinox based	for procedures using the equinox		equinox
2. Systems				
2.1 Celestial systems				
	BCRS	Barycentric Celestial Reference System		
	GCRS	Geocentric Celestial Reference System		
	ICRS	International Celestial Reference System		
	CIRS	Celestial Intermediate Reference System	The CIO and CIP of date	CIO
	ERS	true equinox & equator of date reference system		equinox
		mean equinox and equator of date		equinox
2.2 Terrestrial systems				
	GTRS	Geocentric Terrestrial Reference System		
	ITRS	International Terrestrial Reference System		
	TIRS	Terrestrial Intermediate Reference System		CIO

Symbol	Abbreviation	Short Description	Comment or definition	CIO / Equinox Based
3. Frames				
	ICRF	International Celestial Reference Frame		
	ITRF	International Terrestrial Reference Frame		
4. Origins				
		ICRS origin		
		J2000.0 origin		
	CIO	celestial intermediate origin		CIO
s		CIO walk		CIO
	TIO	terrestrial intermediate origin		CIO
s'		TIO walk		
		mean equinox		equinox
		true equinox		equinox
5. Poles				
X, Y		coordinates of the celestial intermediate pole with respect to the GCRS		
x_p, y_p		coordinates of the celestial intermediate pole with respect to the ITRS		
6. Meridians				
		ITRF meridian		
		TIO meridian		
		Greenwich meridian (low precision)		
		ephemeris meridian		
7. Coordinates				
α	RA	right ascension	generic term	
α_i	RA_i	intermediate right ascension, CIO right ascension	ERA-compatible	CIO
α_e	RA_e	equinox right ascension, right ascension with respect to the equinox	ST-compatible	equinox
	RA	apparent right ascension		equinox
α_{ICRS}	RA_{ICRS}	ICRS right ascension		
δ	Dec, DEC	declination		CIO & equinox
δ_{ICRS}	Dec_{ICRS}	declination measured from the ICRS equator		
λ	Long	longitude	generic term	
ϕ, ϕ'	Lat	latitude, geocentric latitude	generic term	

Symbol	Abbreviation	Short Description	Comment or definition	CIO / Equinox Based
8. Frame bias				
$\delta\psi_B, \delta\epsilon_B$		frame bias in longitude and obliquity		
$d\alpha_0$		frame bias in right ascension, equinox offset at J2000.0		
$\eta_0, \xi_0, d\alpha_0$		frame bias in rectangular coordinates		
9. Earth rotation relationships				
θ	ERA	Earth rotation angle		CIO
	GST	Greenwich (apparent) sidereal time (GAST)	GST = GAST GST = GMST + EE	equinox
	GMST	Greenwich mean sidereal time		equinox
GHA Aries	GHA Aries	Greenwich hour angle Aries	GAST	equinox
E_0	EO	equation of the origins	$EO = \theta - GST = \theta - GAST$	CIO & equinox
E_e	EE	equation of the equinoxes	$EE = GAST - GMST$	equinox
E_t	EqT	equation of time	apparent solar time minus mean time.	
10. Precession and Nutation Angles				
X, Y		the GCRS coordinates of the CIP that include frame bias, precession and nutation at date t		CIO
χ_A, ω_A, ψ_A		accumulated precession angles from epoch to date t		equinox
ϵ_0	Eps0	obliquity of ecliptic at J2000.0		
ϵ_A	Eps	obliquity of the ecliptic at date t		
$\Delta\psi, \Delta\epsilon$	Dpsi, Deps	nutation in longitude and obliquity at date t		equinox
11. Matrices				
$C, C(x, y, s)$	C2I	matrix that transforms from the celestial (GCRS) to the Celestial Intermediate Reference System (CIRS)	“C” stands for “celestial to”	CIO
$Q, Q(x, y, s)$	I2C	matrix from CIRS to the celestial (GCRS)	$Q = C^{-1}$ used by IERS.	CIO
B	C2J	frame bias matrix, GCRS to J2000.0		equinox
P	J2m	precession matrix, J2000.0 to mean equinox of date		equinox
N	m2t	nutation matrix, mean equinox of date to true equinox of date		equinox
NP	J2t	precession-nutation matrix, J2000.0 to true equinox of date		equinox

Symbol	Abbreviation	Short Description	Comment or definition	CIO / Equinox Based
NPB	C2t	combined bias, precession, nutation matrix, GCRS to true equinox and equator of date		equinox
$\mathbf{W}(x_p, y_p, s')$	T2T	polar motion matrix, matrix from the terrestrial system to the ITRS		CIO & equinox
12. Computation of Hour Angle: CIO & Equinox Based Methods				
θ	ERA	Earth rotation angle		CIO
	LERA	local Earth rotation angle	$LERA = \theta + \lambda$	CIO
H	GHA	Greenwich hour angle (measured from zero longitude)	$H = \theta - \alpha_i = GAST - \alpha_e$	CIO & equinox
h	LHA	local hour angle	$h = \theta + \lambda - \alpha_i = LAST - \alpha_e$	CIO & equinox
	GST (GAST)	Greenwich sidereal time (Greenwich apparent sidereal time)	GST = GAST GST = GMST + EE	equinox
	GMST	Greenwich mean sidereal time		equinox
	LMST	local mean sidereal time	LMST = GMST + λ	equinox
	LAST	local apparent sidereal time	LAST = GAST + λ	equinox
	LHA Aries	local hour angle Aries	LAST	equinox

TABLE II – Acronyms and Symbols – Listed in Alphabetical Order

Table II lists all the acronyms and abbreviations from Table I in alphabetic order, those without abbreviations appear at the start of the list.

Abbreviation	Symbol	Term
	$\delta\psi_B, \delta\varepsilon_B$	frame bias in longitude and obliquity between GCRS and J2000.0
	$d\alpha_0$	frame bias in RA, equinox offset at J2000.0
	$\eta_0, \xi_0, d\alpha_0$	frame bias in rectangular coordinates
	s	positioning of the CIO on the equator of the CIP (CIO walk)
	s'	positioning of the TIO on the equator of the CIP (TIO walk)
	X, Y	coordinates of the CIP in the GCRS
	x_p, y_p or x, y	coordinates of the CIP in the ITRS
	χ_A, ω_A, ψ_A	accumulated precession angles
	B	frame bias matrix, GCRS to J2000.0
	C	matrix that transforms from the celestial to the CIRS
	N	nutation matrix, mean to true equinox of date
	NP	precession-nutation matrix, J2000.0 to true equinox of date
	NPB	combined bias, precession, nutation matrix, GCRS to EES
	P	precession matrix, J2000.0 to mean equinox of date
	Q	matrix from CIRS to GCRS
	W	polar motion matrix, terrestrial to ITRS
A		<i>none</i>
B		
BCRS		Barycentric Celestial Reference System
C		
CIO		celestial intermediate origin
CIP	X, Y	coordinates of the CIP with respect to the GCRS
CIRS		Celestial Intermediate Reference System
D		
Dec, DEC	δ	declination
Dec _{ICRS}	δ_{ICRS}	declination measured from the ICRS equator
Dpsi, Deps	$\Delta\psi, \Delta\varepsilon$	nutation in longitude and obliquity
E		
EE	E_e	equation of the equinoxes
EO	E_o	equation of the origins
Eps	ε_A	obliquity of the ecliptic
Eps0	ε_0	obliquity of ecliptic at J2000.0
EqT	E_t	equation of time
ERA	θ	Earth rotation angle
ERS		true equinox and equator of date reference system
F		<i>none</i>

Abbreviation	Symbol	Term
G		
GAST		Greenwich apparent sidereal time (GST)
GCRS		Geocentric Celestial Reference System
GHA	H	Greenwich hour angle
GHA Aries	GHA Aries	Greenwich hour angle Aries
GMST		Greenwich mean sidereal time
GST		Greenwich sidereal time (GAST)
H		
		<i>none</i>
I		
ICRF		International Celestial Reference Frame
ICRS		International Celestial Reference System
IERS		International Earth Rotation and Reference Systems Service
ITRF		International Terrestrial Reference Frame
ITRS		International Terrestrial Reference System
J-K		
		<i>none</i>
L		
LAST		local apparent sidereal time
Lat	ϕ, ϕ'	latitude, geocentric latitude
LERA		local Earth rotation angle
LHA	h	local hour angle
LHA Aries		local hour angle Aries
LMST		local mean sidereal time
Long	λ	longitude
M-Q		
		<i>none</i>
R		
RA	α	right ascension (generic)
RA _e , RA _i	α_e	equinox right ascension, intermediate right ascension
RA _{ICRS}	α_{ICRS}	ICRS right ascension
S		
		<i>none</i>
T		
TIO		terrestrial intermediate origin
TIRS		Terrestrial Intermediate Reference System
U-Z		
		<i>none</i>