Appendix A

(http://igscb.jpl.nasa.gov/igscb/data/format/rinex211.txt)

RINEX VERSION 2.11 FORMAT DEFINITIONS AND EXAMPLES

TABLE A1

GNSS OBSERVATION DATA FILE - HEADER SECTION DESCRIPTION

	HEADER LABEL (Columns 61-80)	DESCRIPTION	FORMAT
	RINEX VERSION / TYPE	- Format version (2.11) - File type ('O' for Observation Data) - Satellite System: blank or 'G': GPS 'R': GLONASS 'S': Geostationary signal payload 'E': Galileo 'M': Mixed	F9.2,11X, A1,19X, A1,19X
	PGM / RUN BY / DATE	- Name of program creating current file - Name of agency creating current file - Date of file creation	A20, A20, A20
*	COMMENT	Comment line(s)	A60
	MARKER NAME	Name of antenna marker	A60
*	MARKER NUMBER	Number of antenna marker	A20
	OBSERVER / AGENCY	Name of observer / agency	A20,A40
	REC # / TYPE / VERS	Receiver number, type, and version (Version: e.g. Internal Software Version)	3A20
	ANT # / TYPE	Antenna number and type	2A20
	APPROX POSITION XYZ	Approximate marker position (WGS84)	3F14.4
	ANTENNA: DELTA H/E/N	- Antenna height: Height of bottom surface of antenna above marker - Eccentricities of antenna center relative to marker to the east and north (all units in meters)	3F14.4
*	WAVELENGTH FACT L1/2	- Default wavelength factors for L1 and L2 (GPS only) 1: Full cycle ambiguities 2: Half cycle ambiguities (squaring) 0 (in L2): Single frequency instrument - zero or blank The wavelength factor record is optional for GPS and obsolete for other systems. Wavelength factors default to 1.	2I6, I6

	If the record exists it must precede any satellite-specific records (see below).		
*|WAVELENGTH FACT L1/2	- Wavelength factors for L1 and L2 (GPS) 1: Full cycle ambiguities 2: Half cycle ambiguities (squaring) 0 (in L2): Single frequency instrument	2I6,	*
	- Number of satellites to follow in list for which these factors are valid.	I6,	
	- List of PRNs (satellite numbers with system identifier)	7(3X,A1,I2)	
	These optional satellite specific lines may follow, if they identify a state different from the default values. Repeat record if necessary.		
# / TYPES OF OBSERV	- Number of different observation types stored in the file	I6,	
	- Observation types		
	- Observation code	9(4X,A1,	
	- Frequency code	A1)	
	If more than 9 observation types: Use continuation line(s) (including the header label in cols. 61-80!)	6X,9(4X,2A1)	
	The following observation types are defined in RINEX Version 2.11: Observation code (use uppercase only): C: Pseudorange GPS: C/A, L2C Glonass: C/A Galileo: All P: Pseudorange GPS and Glonass: P code L: Carrier phase D: Doppler frequency S: Raw signal strengths or SNR values as given by the receiver for the respective phase observations		
	Frequency code		
	GPS Glonass Galileo SBAS 1: L1 G1 E2-L1-E1 L1 2: L2 G2 -- -- 5: L5 -- E5a L5 6: -- -- E6 -- 7: -- -- E5b -- 8: -- -- E5a+b --		
	Observations collected under Antispoofing are converted to "L2" or "P2" and flagged with bit 2 of loss of lock indicator (see Table A2). Units : Phase : full cycles Pseudorange : meters		

		Doppler : Hz SNR etc : receiver-dependent	
		The sequence of the types in this record has to correspond to the sequence of the observations in the observation records	
*	INTERVAL	Observation interval in seconds	F10.3
	TIME OF FIRST OBS	- Time of first observation record (4-digit-year, month,day,hour,min,sec) - Time system: GPS (=GPS time system) GLO (=UTC time system) GAL (=Galileo System Time) Compulsory in mixed GPS/GLONASS files Defaults: GPS for pure GPS files GLO for pure GLONASS files GAL for pure Galileo files	5I6,F13.7, 5X,A3
*	TIME OF LAST OBS	- Time of last observation record (4-digit-year, month,day,hour,min,sec) - Time system: Same value as in TIME OF FIRST OBS record	5I6,F13.7, 5X,A3
*	RCV CLOCK OFFS APPL	Epoch, code, and phase are corrected by applying the realtime-derived receiver clock offset: 1=yes, 0=no; default: 0=no Record required if clock offsets are reported in the EPOCH/SAT records	I6
*	LEAP SECONDS	Number of leap seconds since 6-Jan-1980 Recommended for mixed files	I6
*	# OF SATELLITES	Number of satellites, for which observations are stored in the file	I6
*	PRN / # OF OBS	PRN (sat.number), number of observations for each observation type indicated in the "# / TYPES OF OBSERV" - record. If more than 9 observation types: Use continuation line(s) including the header label in cols. 61-80! This record is (these records are) repeated for each satellite present in the data file	3X,A1,I2,9I6 6X,9I6
	END OF HEADER	Last record in the header section.	60X

Records marked with * are optional

RINEX VERSION 2.10 FORMAT DEFINITIONS AND EXAMPLES

GPS OBSERVATION DATA FILE - HEADER SECTION DESCRIPTION

HEADER LABEL (Columns 61-80)	DESCRIPTION	FORMAT
RINEX VERSION / TYPE	- Format version (2.10)	F9.2,11X,
	- File type ('O' for Observation Data)	A1,19X,
	- Satellite System: blank or 'G': GPS	A1,19X
	'R': GLONASS	
	'S': Geostationary signal payload	
	'T': NNSS Transit	
	'M': Mixed	
PGM / RUN BY / DATE	- Name of program creating current file	A20,
	- Name of agency creating current file	A20,
	- Date of file creation	A20
* COMMENT	Comment line(s)	A60 *
MARKER NAME	Name of antenna marker	A60
* MARKER NUMBER	Number of antenna marker	A20 *
OBSERVER / AGENCY	Name of observer / agency	A20,A40
REC # / TYPE / VERS	Receiver number, type, and version (Version: e.g. Internal Software Version)	3A20
ANT # / TYPE	Antenna number and type	2A20
APPROX POSITION XYZ	Approximate marker position (WGS84)	3F14.4
ANTENNA: DELTA H/E/N	- Antenna height: Height of bottom surface of antenna above marker	3F14.4
	- Eccentricities of antenna center relative to marker to the east and north (all units in meters)	
WAVELENGTH FACT L1/2	- Default wavelength factors for L1 and L2	2I6
	1: Full cycle ambiguities	
	2: Half cycle ambiguities (squaring)	
	0 (in L2): Single frequency instrument	
	- zero or blank	I6
	The default wavelength factor line is required and must preceed satellite-specific lines.	
* WAVELENGTH FACT L1/2	- Wavelength factors for L1 and L2 1: Full cycle ambiguities 2: Half cycle ambiguities (squaring) 0 (in L2): Single frequency instrument	2I6, *
	- Number of satellites to follow in list for which these factors are valid.	I6,
	- List of PRNs (satellite numbers with system identifier)	(3X,A1,I2)

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   |                    | These opional satellite specific lines  |          |
   |                    | may follow, if they identify a state    |          |
   |                    | different from the default values.      |          |
   |                    |                                         |          |
   |                    | Repeat record if necessary.             |          |
   +--------------------+-----------------------------------  --+----------+
   |# / TYPES OF OBSERV | - Number of different observation types |  I6,     |
   |                    |   stored in the file                    |          |
   |                    | - Observation types                     |9(4X,A2)  |
   |                    |                                         |          |
   |                    |   If more than 9 observation types:     |          |
   |                    |     Use continuation line(s)            |6X,9(4X,A2)|
   |                    |                                         |          |
   |                    | The following observation types are     |          |
   |                    | defined in RINEX Version 2.10:          |          |
   |                    |                                         |          |
   |                    | L1, L2: Phase measurements on L1 and L2 |          |
   |                    | C1    : Pseudorange using C/A-Code on L1|          |
   |                    | P1, P2: Pseudorange using P-Code on L1,L2|         |
   |                    | D1, D2: Doppler frequency on L1 and L2  |          |
   |                    | T1, T2: Transit Integrated Doppler on   |          |
   |                    |         150 (T1) and 400 MHz (T2)       |          |
   |                    | S1, S2: Raw signal strengths or SNR     |          |
   |                    |         values as given by the receiver |          |
   |                    |         for the L1,L2 phase observations|          |
   |                    |                                         |          |
   |                    | Observations collected under Antispoofing|         |
   |                    | are converted to "L2" or "P2" and flagged|         |
   |                    | with bit 2 of loss of lock indicator    |          |
   |                    | (see Table A2).                         |          |
   |                    |                                         |          |
   |                    | Units : Phase       : full cycles       |          |
   |                    |         Pseudorange : meters            |          |
   |                    |         Doppler     : Hz                |          |
   |                    |         Transit     : cycles            |          |
   |                    |         SNR etc     : receiver-dependent|          |
   |                    | The sequence of the types in this record|          |
   |                    | has to correspond to the sequence of the|          |
   |                    | observations in the observation records |          |
   +--------------------+-----------------------------------------+----------+
*  |INTERVAL            | Observation interval in seconds         |   F10.3  |*
   +--------------------+-----------------------------------------+----------+
   |TIME OF FIRST OBS   | - Time of first observation record      |5I6,F13.7|
   |                    |   (4-digit-year, month,day,hour,min,sec)|          |
   |                    | - Time system: GPS (=GPS time system)   |5X,A3     |
   |                    |                GLO (=UTC time system)   |          |
   |                    |   Compulsory in mixed GPS/GLONASS files |          |
   |                    |   Defaults: GPS for pure GPS files      |          |
   |                    |             GLO for pure GLONASS files  |          |
   +--------------------+-----------------------------------------+----------+
*  |TIME OF LAST OBS    | - Time of last  observation record      |5I6,F13.7|*
   |                    |   (4-digit-year, month,day,hour,min,sec)|          |
   |                    | - Time system: Same value as in         |5X,A3     |
   |                    |                TIME OF FIRST OBS record |          |
   +--------------------+-----------------------------------------+----------+
*  |RCV CLOCK OFFS APPL | Epoch, code, and phase are corrected by |  I6      |*
   |                    | applying the realtime-derived receiver  |          |
   |                    | clock offset: 1=yes, 0=no; default: 0=no|          |
   |                    | Record required if clock offsets are    |          |
   |                    | reported in the EPOCH/SAT records       |          |
   +--------------------+-----------------------------------------+----------+
*  |LEAP SECONDS        | Number of leap seconds since 6-Jan-1980 |   I6     |*
   |                    | Recommended for mixed GPS/GLONASS files |          |
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# OF SATELLITES	Number of satellites, for which observations are stored in the file	I6
PRN / # OF OBS	PRN (sat.number), number of observations for each observation type indicated in the "# / TYPES OF OBSERV" - record. If more than 9 observation types: Use continuation line(s) This record is (these records are) repeated for each satellite present in the data file	I2,9I6 6X,9I6
END OF HEADER	Last record in the header section.	60X