PBO GPS Station Phase RMS File Naming Convention and Format Description

This document describes the naming convention and internal format for PBO GPS station phase RMS files.

1 Background

PBO has two GPS Analysis Centers (ACs) that process raw GPS data and produce position solutions for all stations in the PBO and PBO Nucleus networks as well as selected other stations One AC is operated by the Geodesy Laboratory at Central Washington University and the other by the Berkeley Seismological Laboratory at the University of California, Berkeley. These ACs produce GPS station position solutions on a daily basis using rapid orbit products ("rapid" solutions), as well as with about 14 days latency using the final orbit products ("final" solutions). The ACs send both the rapid and final solutions to the PBO Analysis Center Coordinator (ACC) at MIT. The rapid and final products are available separately from the PBO GPS Archives with latencies of about 24 hours and 14 days, respectively.

The ACC first rotates each of the individual AC products into a single common reference frame. The ACC then combines these intermediate rotated products to produce a single best-estimate PBO combined solution for station position and velocity. The intermediate and final combined products are also available from the PBO GPS Archives with latencies of about 24 hours and 14 days (rapid and final).

From these products, the ACC generates an estimate of the phase RMS for each day for each station. These are stored separately and also available from the PBO GPS Archives.

For further details of the GPS processing and products, please see the PBO GPS Processing Plan and the Preliminary Design Review document for PBO data management, both of which are available on the PBO web site.

2 File Name Convention

Each GPS station phase RMS file generated by the GPS Analysis Center Coordinator is identified with a unique file name, with the structure

`<AC_ID><GPSWK><GPSDAY>.<PROD_ID>.rms`

where

- `<AC_ID>`
  A string that identifies the PBO Analysis Center from whose work the velocity field is derived. Values are one of `CWU` (Central Washington University), `BSL` (Berkeley Seismological Laboratory), or `PBO` (Combined solution from MIT).
- `<GPSWK><GPSDAY>`
  A string that gives the GPS week and day of week for which the RMS values are valid. `<GPSWK>` is a 4-digit number and `<GPSDAY>` is a 1-digit number from 0 to 6, where 0 represents Sunday and 6 represents Saturday.

- <PROD_ID>
  A string that identifies the product type. Values are
  rapid_loose: Rapid product from a given AC, in the loose reference frame used by that AC.
  final_loose: Final product from a given AC, in the loose reference frame used by that AC.
  rerun_loose: Rerun product from a given AC, in the loose reference frame used by that AC.
  rapid_frame: Rapid product from a given AC, rotated into a common reference frame.
  final_frame: Final product from a given AC, rotated into a common reference frame.
  rerun_frame: Rerun product from a given AC, rotated into a common reference frame.

For example, the GPS station phase RMS file derived from final combined solutions generated by the Analysis Center Coordinator for 22 July 2005 (GPS week and day are 1332 and 5, respectively) would be named pbo13325.final_frame.rms.

Please see the PBO web pages for a link to converters from GPS week and day to other common date references.

3 PBO GPS Station Phase RMS File Format

PBO GPS Station Phase RMS files are made available in ASCII format. The file begins with a set of header lines:

```
* RMS File from  ../BSL_snx/bsl12996.20041204.b.rms
* Created 20050929072528
```

where RMS File from gives the original source file and Created gives the creation date for the RMS file in YYYYMMDDhhmmss format, where YYYY is the 4-digit year, MM is the 2-digit month, DD is the 2-digit day of month, hh is the 2-digit hour, mm is the 2-digit minute, and ss is the 2-digit second of file generation.

Following the header are a series of lines giving phase RMS estimates for each station for the given day. These lines have the structure

```
*Site  COM #    RMS    CWU #    RMS     BSL #    RMS      A      B
*               mm              mm              mm      mm     mm
```

The entries are described in Table 1 below.

Table 1: PBO GPS Station Phase RMS File Format

Entry	Definition
`Site`	4-character PBO Dot Number for a given station
`Com #`	Average number of phase observations for the solutions from the two Analysis Centers, weighted by the processing frequency of the two groups. CWU uses five-minute sampling in their processing, while BSL uses 30-second sampling. Thus the CWU phase observations are multiplied by 10 in the averaging process. If only one Analysis Center has provided values, `Com #` is the value for that center.
`RMS`	Average phase RMS for the two solutions, again weighted by the processing frequency as in `Com #`.
`CWU #`	Number of phase observations reported by CWU, scaled from five-minute to 30-second sampling.
`RMS`	Phase RMS for CWU solutions
`BSL #`	Number of phase observations reported by BSL
`RMS`	Phase RMS for CWU solutions
`A, B`	Parameters for the elevation angle-dependent RMS model used by PBO. PBO uses $R^2(\theta) = A^2 + B^2/\sin(\theta^2)$, where R is the phase RMS and θ is the elevation angle from zero to 90 degrees (horizon to zenith).

An example file would have the following internal structure

```
* RMS File from  ../BSL_snx/bsl12996.20041204.b.rms
* Created 20050929072528
*Site  COM #    RMS    CWU #    RMS     BSL #    RMS      A      B
*              mm              mm              mm      mm     mm
 AB07  24780    8.1        -     -      24780    8.1     2.7    3.2
 AB37  26860    6.0        -     -      26860    6.0     0.4    2.3
 AC59  24982    7.3        -     -      24982    7.3     2.3    2.9
 AC62  26713    7.1        -     -      26713    7.1     1.7    2.7
 AC63  26620    5.4        -     -      26620    5.4     1.3    2.1
 AC64  19950    9.5        -     -      19950    9.5     5.7    3.3
 AC65  23876    9.1        -     -      23876    9.1     5.0    3.0
```

and so on.

This file was named `pbo12996.final_frame.rms`, indicating it was produced from the combined solution produced by the Analysis Center Coordinator for GPS week 1299, day 6, and in the final PBO reference frame. Information from the CWU solution was lacking for this day, giving the `-` for each CWU entry.

Station `AC59` had 24982 phase RMS observations in the BSL solution, and since there was no CWU information, it also had 24982 phase RMS observations in the combined solution. The overall phase RMS for `AC59` on this day was 7.3 mm, and the elevation angle-dependent model for this day would be

$$R^2(\theta) = 2.3^2 + 2.9^2/\sin(\theta) \tag{1}$$

or

$$R^2(\theta) = 5.29 + 8.41/\sin(\theta)\,. \tag{2}$$