# Review of EVP Quality Flags

- ***QF 120*** **(dataset representation version 1)**
  - **Incorrect EHORA**
  - **Can be fixed by running through EVPSLC**
- ***QF 130*** **(dataset representation version 2)**
  - **Includes ToF-I and PSD-I corrections.**
- ***QF 131*** **(dataset representation version 3)**
  - **Includes ToF-II and PSD-I corrections.**
  - **ToF of earlier data (rep v1 and v2) corrected in EVP DAL layer (PEVPSR/PEVPRR).**
  - **Generated using EVPRNN v12/13.**
  - **First data generated at MPE with EVPRNN v12 on 04-OCT-1993 (~MPE-EVP-20433).**
  - **Also generated by EVPRNO (copy of EVPRNN v13).**
  - **First data generated at MPE with EVPRNO v1 on 07-JUL-1998 (~MPE-EVP-41506).**
- ***QF 134*** **(dataset representation version 3)**
  - **Includes ToF-VI and PSD-II corrections.**
  - **These data generated by EVPRNN v14/15.**
  - **First data generated at MPE with EVPRNN v14 on 16-FEB-1998 (~MPE-EVP-39162).**

# History of ToF Corrections

**ToF-0**
Raw ToF data with no corrections applied.

**ToF-I**
Incorporated differences between minitelescopes and the dependence on D1 energy. Differences in the average separation of the D1 and D2 modules for each minitelescope, along with differences in cable lengths for each minitelescope, resulted in shifts of up to 20 channels. In addition, there is an observed dependence on both D1 and D2 energy. This first-order correction resulted in a forward peak at channel 120 and a backward peak at channel 80.

**ToF-II**
Even after applying the ToF-I corrections, there were observed to be significant variations in the forward peak position as a function of both D1 and D2 energy deposits. The ToF-II corrections incorporated these dependencies. The correction scheme to generate ToF-II data (developed by Boer and van Dijk) was incorporated into a routine known as TOFCOR.

**ToF-III**
Completely evised the ToF corrections. These corrections are based on the PMT pulseheights, rather than the derived D1 and D2 energy deposits. *Hence, these corrections require the use of REM data.* In addition, corrections were included to account for temperature variations of the detectors and the FCC, the pathlength differences between minitelescopes (and the module-specific electronics), the D2 hardware threshold, pathlength corrections based on interaction locations in D1 and D2, and the variations of the rise time of the signal as function of interaction location in D1. This particular version of ToF corrections is designed to align the *forward* ToF peaks of each minitelescope. (This scheme developed by van Dijk.)

**ToF-VI**
This scheme starts with the ToF-III data and imposes an additional correction based on location in D2. Empirical correction factors were derived using data in several *localization bins* within each D2 module. The correction factors are contained in the COMPASS dataset type TCC. These corrections are not applied to events that are located in excluded regions of D2 modules with dead PMTs. At the present time (Jan, 1998), these corrections cannot be applied to about 5-10 percent of the data. The latest EVPRNN code assigns events which have these correction a CPL value (REFLAG) of 11. Events for which no valid ToF-VI correction could be applied have a CPL value (REFLAG) of 10. (The correction algorithm developed by Weidenspointner, COM-RP-MPE-DRG-174.)

# History of PSD Corrections

**PSD-0**
Raw PSD data with no corrections applied.

**PSD-I**
Corrects the raw PSD values based in the D1 energy-dependence of the PSD distribution for each D1 module. The goal of these corrections is to provide separation between photons and neutrons at PSD channel 100.

**PSD-II**
Improved the PSD correction scheme to reduce the D1 energy-dependence of the PSD-I corrections. (This scheme introduced by Weidenspointner, COM-RP-MPE-DRG-174.)

# EVP Current Processing Level (CPL)

During the course of processing an event in EVPRNN, the software assigns a processing level to each event. Within the EVPRNN code, this is referred to as the Current Processing Level (CPL). Eventually, this parameter becomes part of the EVP event message, at which point it is referred to as a rejection flag and denoted by REFLAG. The REFLAG value is therefore indicator of how far a particular event made it through the sequence of processing steps. It also is used to flag any errors that arise. If an error is encountered by EVPRNN in the course of processing an event, the final REFLAG value will be negative, with a vlaue that is related to type of error that was encountered. Below are listed the possible REFLAG values. Note that some of the various processing combinations used to define a particular CPL value may be relevant for singles events rather than good telescope events.

1 = Raw event. No processing completed.

2 = D1 pulseheight to energy conversion completed.

3 = D2 pulseheight to energy conversion completed.

4 = Both D1 and D2 pulseheight to energy conversion completed.

5 = D1 pulseheight to energy conversion and D1 location completed.

6 = D2 pulseheight to energy conversion and D1 location completed.

7 = D1 pulseheight to energy conversion, D1 location and D2 pulseheight to energy conversion completed.

8 = D2 pulseheight to energy conversion, D2 location and D1 pulseheight to energy conversion completed.

9 = Both D1 and D2 location completed. (This implies that both D1 and D2 pulseheight to energy conversion is also completed, since pulseheight to energy conversion is required for location.)

**10 = PSD-II and ToF-III corrections applied.**

**11 = PSD-II and ToF-VI corrections applied.**

# EVP Processing Errors

**Three types of errors are defined by EVP processing (as listed in the EVPRNN log file) :**

***Random Errors***

- **Inconsistent Bit Pattern**
- **D1 Location Error**
- **D2 Location Error**
- **D1 MHT Lookup Failure***
- **D2 MHT Lookup Failure***
- **Phibar Calculation Error**
- **Any other random error**

***Time-Dependent Errors (TDE)***

- **Bad CP1 Status***
- **Bad PSD Status**
- **Bad CP2 Status***
- **Bad TOF Status**
- **Bad CR1 Status**
- **Bad CR2 Status**
- **Missing OA Data**

***Parameter-Dependent Errors (PDE)***

- **Digital D1 Sum is Zero or Negative**
- **Digital D2 Sum is Zero or Negative***
- **Any D1 PMT Energy is Negative**
- **Any D2 PMT Energy is Negative**
- **PSD Interpolation Failure***
- **TOF Correction Error**

# Special Modes

***Proton Mode***

**Designed to study through-going muons.**

- **Veto rejection overide on.**
- **All events go to gamma-2.**
- **Thresholds set to high levels for both D1 and D2.**
- **Generates large number of CP errors.**
  **(C-RAP 268 : No D2 Cal-2 events during proton mode. Related to AE handling of high rates?)**

***Albedo Mode***

**Designed to study atmospheric neutrons.**

- **Sliding time window moved way up.**
- **ToF window covers only forward peak and neutrons.**
- **All events go to gamma-2.**
- **Noticeable reduction in number of processed gamma-1 events.**

# Summary of EVP Processing

***PHASE 1 (TJD 8392 - 8492)***

- **QF 120/130/131 gamma-1**
- **QF 120/130/131 gamma-2**
- **QF 134 gamma-1 (not yet processed)**
- **QF 134 can only be processed from TJD 8655 (middle of VP 19)**

***PHASE 2 (TJD 8943 - 9236)***

- **QF 130/131 gamma-1**
- **QF 130/131 gamma-2**
- **QF 134 gamma-1 (not yet processed)**

***PHASE 3 (TJD 9216 - 9628)***

- **QF 130/131 gamma-1**
- **QF 130/131 gamma-2**
- **QF 134 gamma-1**

***PHASE 4 (TJD 9629 - 9992)***

- **QF 131 gamma-1**
- **QF 131 gamma-2**
- **QF 134 gamma-1 (not yet completed)**

***PHASE 5 (TJD 9993 - 10398)***

- **QF 131 gamma-1**
- **QF 131 gamma-2**
- **QF 134 gamma-1**

***PHASE 6 (TJD 10371 - 10762)***

- **QF 131 gamma-1**
- **QF 131 gamma-2**
- **QF 134 gamma-1 (not yet completed)**

# Summary of EVP Processing

***PHASE 7 (TJD 10763 - 11147)***

- **QF 131 gamma-1**
- **QF 131 gamma-2**
- **QF 134 gamma-1**

***PHASE 8 (TJD 11148 - 11519)***

- **QF 131 gamma-1**
- **QF 131 gamma-2**
- **QF 134 gamma-1**

***PHASE 9 (TJD 11521 - 11690)***

- **QF 131 gamma-1**
- **QF 131 gamma-2**
- **QF 134 gamma-1**

# Open Issues

- ***Need a review of all QF 200 data.***

  **Are they all at data rep v3 (QF 131)?**

- ***Compare ITOG summaries versus TIM datasets*.**

  **Are instrument anomalies properly included?**

- ***Compare ITOG summaries versus module status table*.**

  **Are changes in HV properly included?**

  **Are PMT noise problems properly included?**

- ***Update COMPASS Users web page.***

  **http://wwwgro.unh.edu/comptel/compass/compass_users.html**

  **Serves as documenation.**

- ***Processing of Pre-Flight Neutron Data?***

  **Useful for studying atmospheric neutrons.**