

## **Generating Shape Images (May 2009 - A. Herman)**

### **1) Using Output Files from LOPC Post Pro**

*ie. FILENAME Output (example): LOPC\_8\_1\_Shape.csv*

This file is generated by LOPC\_PostPro.exe. To generate shape profiles – you must check ‘Yes’ in the box ‘Generate Shape Profiles’. The program simply reads the data – specifically the MEPs (or M-lines) – assesses the elements detected and the length of time spent blocking the photodiode element. The program –in basic form -generates 4’s & 5’s based on the attenuated intensity and positions the data (in the x-axis) using commas. If you read the csv file with Excel – it will conveniently separate the commas for you and position the elements accordingly. Once read into Excel – perform the following steps;

- click on corner tile to highlight all cells
- on Menu
  - select Format – Row – Height – type in ‘2.1’
  - select Format - Column – Width – type in ‘0.19’
  
- on Menu- select Conditional Formatting
  - Format – Patterns select black for color
  - Option #1 – in Condition 1 – Cell Value is between 1 and 7
  - Option #2 – in Condition 1 – Cell Value is between 4 and 5

The shapes should the appear in spreadsheet. Option #1 – shows the raw data representing the photodiode data directly. Option#2 rounds off the corners (inside & outside) in an attempt to better represent the shape – by excluding 1’s and including 7’s.

If the File is large and has many MEPs – then EXCEL cannot load the file completely and will only load the lines 1-65,000. If you wish to look at the remaining data – you may have to split the text file ‘LOPdata\_8.dat’ into 2 or more and reprocess.

### **2) User Processing of MEP Data**

The following is an example of raw MEP data consisting of a copepod occupying 4-elements of the LOPC;

```
M 26 43648 40 33221
M 25 43605 128 3668
M 24 43612 122 3740
M 23 43629 86 1506
```

And

```
M 27 2249 22 32888
M 26 2080 205 406
M 25 2158 52 276
M 24 2174 13 119
```

The first data of the M-line signifies the elements #'s indicating that elements 23-26 (or 24-27 in 2<sup>nd</sup> example) were occluded and therefore signifies the width of the copepod was somewhere between 3-4 mm. The 2<sup>nd</sup> data number corresponds to the start time, ie. the time at which that body segment of the copepod caused the detection threshold to surpass a set value. The 3<sup>rd</sup> data number corresponds to the time-of-flight (tof), that is, the time at which the body segment enters the beam (& rises above the detection threshold) and subsequently exits the beam (falls below the detection threshold). For a known flow speed, therefore, The 'tof' signifies the length of the copepod body segment. The 4<sup>th</sup> data number indicates the 'digital size' of the amount of light signal that was attenuated, the maximum being ~3800. The first line of every MEP set is marked with a value of 32768 which has been added to the digital size (DS) – and must be subtracted before calculations.

### Some Guidelines:

The mean flow speed is required to calculate length for the tof. Mean speed is obtained from the L5 line (refer to <http://www.alexherman.com> website for equations). In the cases cited above, the mean tow speed of the net was about ~0.7m/sec corresponding to a tof~30.

#### Case 1:

if tof > mean speed then one uses tof to calculate 'length' - & one can assume that the particle is longer than 1mm - but note that one must subtract 1mm from the total length calculated from the tof.

(Note that the front of the particle starts the time counter when it enters the 1mm diode zone - but it is the back of the particle that stops the counter as it exits the 1mm diode zone. So the tof is the sum of the particle length plus the diode length(1mm).

Also we assume the 'width' of the particle is 1mm provided it is an inside element.)

#### Case 2:

if the tof < mean speed (ie. 2<sup>nd</sup> data example above – elements 24 & 27)- than we can assume it was small and the attenuated signal wasn't able to 'rise' far above the threshold -so one has to reset tof =mean speed and revert back to a size estimate(described below).

#### Size estimating:

Example 1: if it was an inside element (ie as opposed to the end elements)- then one can assume the segment was 1mm in width. To calculate length - use the digital size - plug into formula (on website- for calculating esd from DS) to generate esd - calculate the area - and assume a rectangle with width =1mm. One has a large error when the digital size is small - so I set a minimum limit to the 'length' measurement at 100um - the lowest detection capability of the LOPC.

Example 2: - if it is an outside or end element - then one has no idea of shape - so estimate a square -with sides calculated from area - where area was calculated from esd - & esd calculated from formula (website) using digital size DS.

