circstats = plotEntrainedUnitsCA1(data, myunits, ADBitVolts, Datablock\_thetaphase, tvector)

This is the function to use to test and plot the entrainment of units to the LFP of the channel of maximum spike height for each unit. For example, if cluster 4 has a maximum spike height on channel 8, then this function will plot the entrainment of the spikes to the phase of the lfp you give it on channel 8.

You need these things as input variables:

1. data – this is the output of the function processKwikSpikes and contains all of the information about each cluster/unit
2. myunits – this is a 2 dimensional matrix indicating which units within the dv struct you want to test and plot for entrainment. Each desired unit is a row in the matrix. The first column is the number of the dv (usually 1 as I split raw data based on the dv), the second column is the unit number (as indexed in the struct dv, or number of raws that have spikes/clusters). For example if myunits =
   1. 1 5
   2. 1 7
   3. 1 3
   4. this will test and plot entrainment of dv(1).unit(5), dv(1).unit(7) and dv(1).unit(3)
3. ADBitVolts – this is the conversion factor to get uV for spike amplitudes, which comes directly from the header of the CSC files. Set to 1 if you don’t need accurate spike amplitude numbers.
4. Fullphase – this is the most time consuming variable to create. It is the calculated phase angle for the entire cscblock. The easiest wasy to create this is from the .dat file used for spike sorting. If you have loaded in the .dat file already into a datablock (see help file for processKwikSpikes), then you can follow these steps.
   1. The first thing you need to do is filter the data in the frequency band to which you would like to test entrainment. For example:
      1. Datablock\_theta = CSCBandPass(datablock, [4 12], 32000, 2);
   2. The next thing you need to do is calculate the phase angle. This can take a long time in computing. One way to do this is to use the Hilbert transform and then extract the angle component:
      1. Datablock\_thetaphase = angle(hilbert(datablock\_theta));
5. tvector – this is the standard tvector that contains the absolute timestamps for the recording session for each sample. You can create one my loading 1 CSC from the recording using LoadCSCs\_pfk

You can then run the function:

* 1. Circstats = plotEntrainedUnitsCA1(dv, myunits, ADBitVolts, datablock\_thetaphase, tvector);

This will plot everything.

It will also return the variable circstats. This is an N x 6 matrix where N is the number of units tested. Each of the 6 columns has a different statistic:

% circstats returns the following statistics:

% 1: mean angle 2: upper conf interval 3: lower conf interval

% 4: p value of Rayleigh test 5: z statistic of Rayleigh test

% 6: magnitude of mean vector

I’ve been using a Rayleigh statistic p value of less than 0.05 to count a unit as significantly entrained. I’ve been using the mean vector magnitude as a measure of *how* entrained the unit is.