**Communicating with the Phase-O-Matic through Matlab**

*Dylan Jervis, Graham Edge, Dec 2010*

**Abstract**

This document provides an overview of how to communicate to the Phase-O-Matic over TCP/IP using Matlab, along with some brief comments on the code that was used in testing. This is the way the Phase-O-matic is controlled in Joseph’s Lattice experiment in MP025.

**Requirements**

1. Matlab
2. Working Phase-O-Matic (i.e. the Rabbit processor has already been programmed to talk with the DDS)
3. TCP/IP connection between Matlab and Phase-O-matic
4. Matlab “Instrumentation Control Toolbox”

**Overview**

Matlab can send information from one IP address (the computer running Matlab) to another IP address (the Phase-O-Matic) using the Instrumentation Control Toolbox – available for download from the [MathWorks store](http://www.mathworks.com/products/instrument/) ($30 for student version). The information that Matlab sends are commands that tell the Phase-O-Matic to “set the DDS frequency” or “ramp the DDS frequency” or “wait for trigger”, etc.. The code that corresponds to these commands can be found [here](http://www.physics.utoronto.ca/~astummer/pub/mirror/Projects/Archives/PhaseOMatic/Docs/All%20About%20MicroMatic%20&%20PhaseOMatic.doc), in a document called “All about MicroMatic & PhaseOMatic” (as a note: these commands are written in hex in the document. However, they have to be converted to [unicode](http://en.wikipedia.org/wiki/Unicode) in order for Matlab to send them and the Phase-O-Matic to process them. Where this is done should be obvious in the Matlab code – just look for the “native2unicode” function).

**Test Code**

There are four Matlab files that were used to test communication with the Phase-O-Matic:

1. calc\_DDS\_freq.m

This calculates a 6-byte Frequency Tuning Word (FTW) in unicode, given a desired frequency.

1. set\_DDS\_freq.m

When sent to the Phase-O-Matic, this function sets the DDS output to some fixed frequency. Uses calc\_DDS\_freq.m.

1. ramp\_DDS\_freq.m

When sent to the Phase-O-Matic, this function ramps the DDS output from start\_freq to end\_freq in some time tt. Uses calc\_DDS\_freq.m and set\_DDS\_freq.m.

1. DDS\_tcpip\_test.m.

This is the function that sends the desired commands to the Phase-O-Matic, the function within which the Instrumentation Control Toolbox is required. This code was modified from some downloaded example code. It is well commented, so should be easy to follow.

**Comments**

* We found [WireShark](http://www.wireshark.org/) (a network protocol analyzer, available for free) to be very helpful when troubleshooting the code. Easy to use and highly recommended.
* For those working in MP025, we do not call the function DDS\_tcpip\_test.m when we run the DDS in the experiment. Instead, this code is integrated into the calc\_sequence.m function. However, calc\_DDs\_freq.m, set\_DDS\_freq.m, and ramp\_DDS\_freq.m are all used as is (Dec 2010).