

# Microwave Controls Update

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# Controls Overview

**Position to frequency mapping and calculation.**

**Integration of EIP frequency read back into microwave controls GUI.**

**Calibration and homing procedure.**

**Remove manual slope(intercept) calculation and propagation through controls to automated version.**

**Automated polarization optimization.**

# Controls GUI

The screenshot displays a comprehensive GUI for a motor control system, organized into several functional panels:

- Communication setup:** Includes a COM Port dropdown (COM9), a "STOP COMMUNICATION" button, a warning message, and a "Debug mode" toggle.
- Manual motor control:** Features input fields for Step size (rev), Step size (GHz), Velocity (rev/sec), and Frequency to seek (GHz), along with "Move up", "Move down", and "Goto" buttons.
- Motor information:** Displays Motor time (sec), Motor position (rev), and Frequency (calculated, GHz).
- Motor alarm (error):** Shows Alarm code (0x00) and a troubleshooting instruction.
- Frequency calibration:** Contains fields for Frequency 1, Position 1, Frequency 2, and Position 2, with "Read position", "Calculate fit parameters", and "Refine fit parameters" buttons.
- Automatic control:** Includes "Automatic mode on/off", "Advanced Config", and "Seek positive polarization" buttons, along with a table of parameters (Samples taken, Eventnum, Polarization, Rate) and a "Data input file" field.
- Configuration backup/restore:** Provides "Save configuration to file" and "Restore configuration from file" buttons, with a descriptive text block.
- Calibration and Home/Mapping:** A red-bordered section containing "Calibrate", "Home", and "Configure Map" buttons, along with "Home Status" and "Map Status" indicators.
- Graph:** A plot of Amplitude vs. Frequency (MHz) showing a step-like signal.
- Status and Error:** Includes "error out" and "Calibrate Error" status indicators, and fields for "Calculated Frequency" and "EIP Readback".
- Power and Width:** Displays "Microwave power (mW)", "New power (mW)", and "Width (GHz)" with associated input fields and an "Add power reading" button.

# Controls GUI

The screenshot displays a comprehensive control interface for a motor system. It is organized into several functional panels:

- Communication setup:** Includes a COM Port dropdown (COM9), a "STOP COMMUNICATION" button, a warning message, and a "Debug mode" toggle.
- Manual motor control:** Features input fields for Step size (rev), Step size (GHz), Velocity (rev/sec), and Frequency to seek (GHz), along with "Move up", "Move down", and "Goto" buttons.
- Motor information:** Displays real-time data for Motor time (sec), Motor position (rev), and Frequency (calculated, GHz).
- Motor alarm (error):** Shows the Alarm code and provides a link to the manual for troubleshooting.
- Frequency calibration:** Contains fields for Frequency 1/2 and Position 1/2, with buttons for "Read position", "Calculate fit parameters", and "Refine fit parameters".
- Automatic control:** Includes mode selection (Automatic mode on/off, Advanced Config, Seek positive polarization), a data table, and a file path for data input.
- Configuration backup/restore:** Provides buttons for saving and restoring settings.
- Calibration and Home:** Includes a "Calibrate" button and a "Home" button with status indicators.
- Map Status:** Shows "Moving ..." and a "Configure Map" button.
- Power and Frequency Settings:** Includes fields for Seek Freq (MHz), Microwave power (mW), New power (mW), and Width (GHz), with an "Add power reading" button.
- Graph:** A plot of Amplitude vs. Frequency (MHz) showing a stepped response. A red box highlights the graph and the "Calculated Frequency" and "EIP Readback" values below it.
- Calibration Error:** Two panels showing status and code for calibration errors.

Samples taken	Eventnum	Polarization	Rate
2	1554416215	0.611	0.000272727

Frequency 1	Position 1	Frequency 2	Position 2
140.000	0	140.400	0

Seek Freq (MHz)	Microwave power (mW)	New power (mW)	Width (GHz)
140.8	1.000	1.000	0.050

# Controls GUI

The screenshot displays a comprehensive control interface for a motor system. It is organized into several functional panels:

- Communication setup:** Includes a COM Port dropdown set to 'COM9', a 'STOP COMMUNICATION' button, a warning message, and a 'Debug mode' toggle.
- Manual motor control:** Features input fields for Step size (rev), Step size (GHz), Velocity (rev/sec), and Frequency to seek (GHz), along with 'Move up', 'Move down', and 'Goto' buttons.
- Motor information:** Displays real-time data for Motor time (sec), Motor position (rev), and Frequency (calculated, GHz).
- Motor alarm (error):** Shows the Alarm code and provides a link to the motor manual for troubleshooting.
- Frequency calibration (highlighted in red):** Contains fields for Frequency 1, Position 1, Frequency 2, and Position 2, along with 'Read position', 'Calculate fit parameters', and 'Refine fit parameters' buttons.
- Automatic control:** Includes mode selection (Automatic mode on/off, Advanced Config, Seek positive polarization), a data table, a file path for data input, and a 'Launch simulation' button.
- Configuration backup/restore:** Provides buttons for saving and restoring configuration files, with a detailed note about what settings are backed up.
- Calibration and Home/Mapping:** Includes 'Calibrate', 'Home', and 'Configure Map' buttons, along with status indicators for Home and Mapping.
- Graph:** A plot of Amplitude versus time, showing a step-like signal.
- Calculated Frequency and EIP Readback:** Displays numerical values for Home (MHz), Seek Freq (MHz), Microwave power (mW), New power (mW), and Width (GHz).
- error out and Calibrate Error:** Sections for monitoring error status and codes.

Samples taken	Eventnum	Polarization	Rate
2	1554416215	0.611	0.000272727

Negative seek bounds	Positive seek bounds	Home frequency
Minimum: 140.350	Minimum: 140.100	Positive: 140.180
Maximum: 140.650	Maximum: 140.300	Negative: 140.450

Home (MHz)	Seek Freq (MHz)	Microwave power (mW)	New power (mW)	Width (GHz)
139.80	140.8	1.000	1.000	0.050

# Simulations & Automated Polarization

**Data output file:** C:\Users\...\Slow-Controls\Motor controller\sim\_out.csv

**Current time (simulated):** 18:16:11 April 04, 2019

**Polarization:** 0.597476

**Beam on:**  **Paused:**

**RESET SIMULATION** **STOP SIMULATION**

**Seconds until next data:** 4

**# Sweeps:** 250

**Time per second (s):** 1

**Polarization vs time** (Plot 0)

Time (min)	Polarization
18:11:03	0.55
18:12:03	0.56
18:13:03	0.57
18:14:03	0.58
18:15:03	0.59
18:16:03	0.60

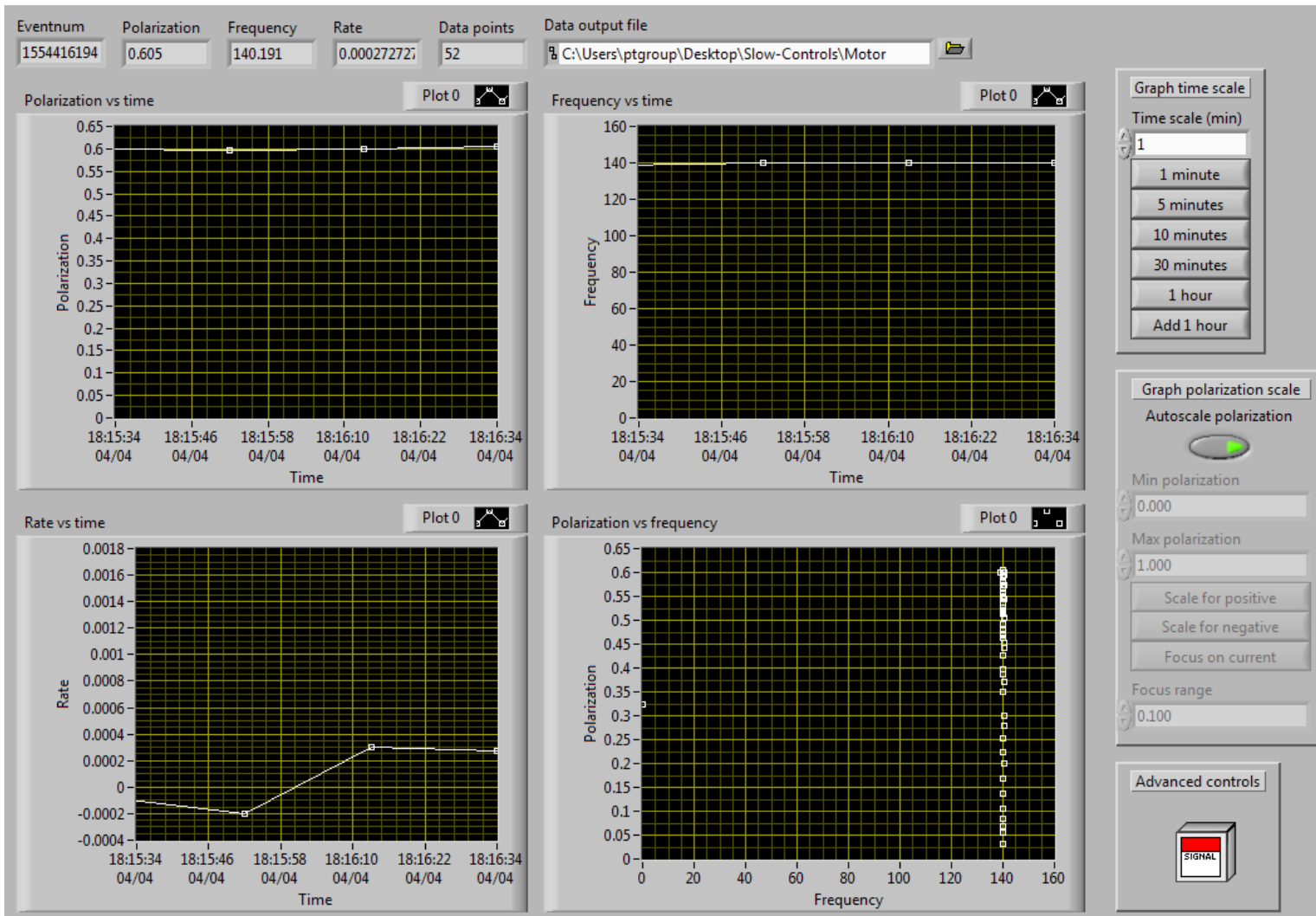
**Advanced data and controls**

Internal parameters	System parameters	Pn (noisy)
Pe: -0.745881	Frequency (GHz): 140.251	0.596485
Pn: 0.600396	System temperature (K): 1	Polarization (unfuzzed): 0.596934
Alpha: 0.053115	Beam current (nA): 100	Thermal fluctuations: 0.01
Beta: 2.50731	Fit parameters	Sweep error: 0.01
C: 0.000136073	A: 0.572086	Precision: 100
Phi: 0	S: 0.0835606	Physical constants
Pe0: -0.964028	M1: 140.286	T1e (s): 0.03
Dose: 0	M2: 140.486	T1n (s): 1500
Temperature: 1	Start time: 5:56:11.649 PM 4/4/2019	Elapsed time (s): 1199.75

**Launch fit parameters chooser**

Time scale (min): 5 | 5 minutes | 15 minutes | 30 minutes | Add 30 minutes

# Simulations & Automated Polarization



# Future Work

**Everything needs to be cleaned up and idiot checked.**

**Potentially (certainly) need a new rotational stepper motor.**

**Software limit checking.**

**Drift studies.**

**Make mapping an appended process instead of a replacement.**