

# Mad City Labs SPM-M Kit

Mad City Labs' SPM-M kit is suitable for both research and teaching environments. The assembled SPM is a high performance, closed loop scanning resonant probe microscope.

## SPM-M kit includes:

- MadPLL®
- Nano-SPM200 nanopositioning stage (XY)
- Nano-OP30 nanopositioning stage (Z)
- 3 axis closed loop Nano-Drive® controller
- OCL option (Z axis only)
- AFMView™ software
- AFMView™ tutorial
- Adapter plate between preamplifier and Nano-OP30
- Adapter plate to Thorlabs MT1 micropositioner
- Application note: "AFM kit with manual positioning" (includes BOM)
- Application note: "Tungsten tip etching station"

MadPLL® is an integrated solution that includes the digital phase lock loop (PLL) controller, software, sensor amplifier board and resonant probe mounting board. MadPLL includes five (5) each of the vertical, horizontal, Akiyama and blank probe boards. In addition each unit is shipped with 5 tuning forks. Additional probe boards and tuning forks can be purchased separately.

All Mad City Labs nanopositioning systems have low noise PicoQ® sensors and closed loop feedback control.

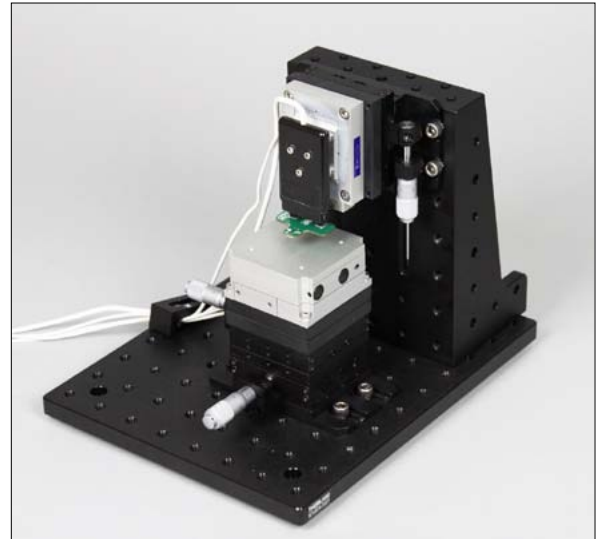
## Available options:

- 12" x 12" x 13" acrylic enclosure
- LED illuminator
- Motorized Z-axis approach

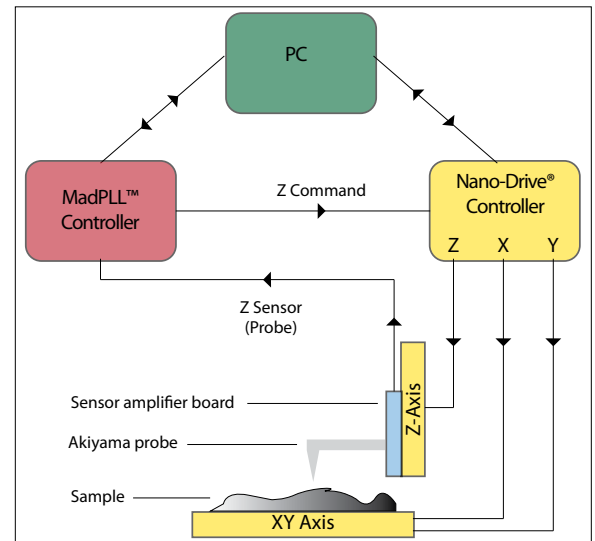
## Not included:

These items are described in the application note and are listed in the Bill of Materials (BOM).

- Manual micropositioning stages for XY, Z manipulation
- Breadboard
- L-Bracket
- Fasteners or clamps



AFM constructed from the SPM-M kit and additional components.

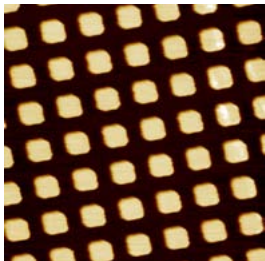


Schematic of a typical AFM instrument based on SPM-M kit.

## Examples

The images below were acquired using similar configurations to the SPM-M Kit.

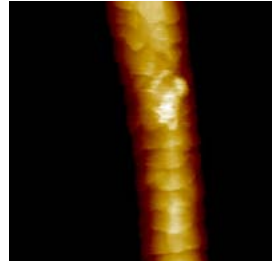
### Calibration grid (100nm tall, 10 μm pitch)



70 μm x 70 μm,  
Unidirectional scan  
PLL mode, constant  
probe signal  
Z force feedback:  
frequency

Data taken using MadPLL™ with Nano-OP30 nanopositioning system (Z-axis), Nano-OP100 nanopositioning system (XY axes)

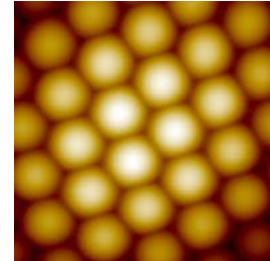
### Human Hair



100 μm x 100 μm  
Bidirectional scan  
Self oscillation  
mode, constant  
probe signal  
Z force feedback:  
frequency

Data taken using MadPLL™ with Nano-OP30 nanopositioning system (Z-axis), Nano-OP100 nanopositioning system (XY axes)

### Fly eye



100 μm x 100 μm  
Bidirectional scan  
PLL mode, constant  
probe signal  
Z force feedback:  
frequency

Data taken using MadPLL™ with Nano-OP30 nanopositioning system (Z-axis), Nano-OP100 nanopositioning system (XY axes)

