

## STEM Extension v5.0

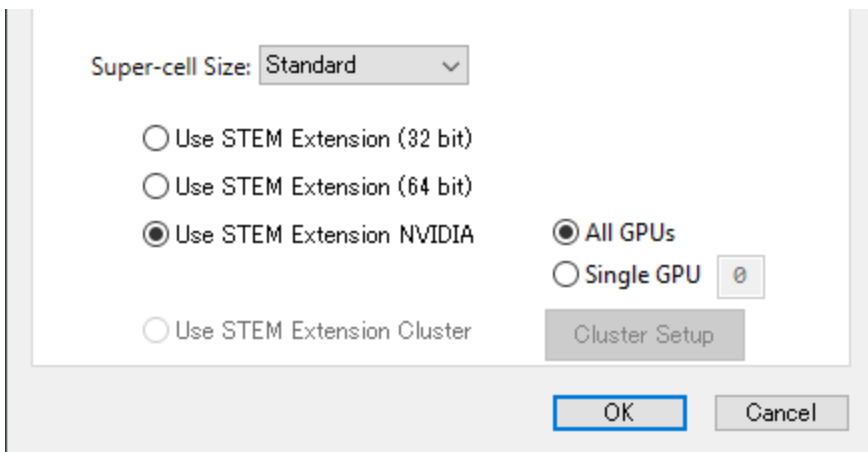
### Installation

Since this is a beta version, there is no installer. Simply unzip the STEM Extension v5.0.zip at the desktop. The STEM Extension v5.0 has the same folder structure as the xHREM.

### How to Use

Since this is the beta version, please launch the revised xMultiGUI and xSTEMImage in the Utilities folder, not from the Start menu. Owing to the same folder structure, the usage should be identical with other STEM simulations using the xHREM.

The way to calculate the STEM signal is identical except you have to select STEM Extension selection in the Option tab of the STEM dialog:



When you want to use your NVIDIA GPU(s), select “Use STEM Extension NVIDIA” and “All GPU.” If you want to use a specific single GPU, select “Single GPU” and specify the GPU number.

**NOTE:** All the NVIDIA GPU(s) found on your PC will be listed in the output window opened by MultiGUI. Here, you can check the name of GPU and its number used in the program. The following extract of the list output shows GPU information:

```
0 GPU INFORMATION
  Number of NVIDIA GPU: 2
  GPU 0: Quadro P620 / Memory 2048 MB
  GPU 1: Quadro K2200 / Memory 4096 MB
  GPU to be used: All
```

The following extract of the list output shows the progress of scan in the case of 100 x 100 scan points for a full unit cell. In order to optimize calculation a set of sixteen (16) scan points is grouped. When we use two GPUs, the first 16 points (1 to 16) are calculated by the GPU 0, and the next 16 points (17 to 32) are calculated by the GPU 1. Then, the GPU 0 calculates the third 16 points (33 to 48), and the GPU 1 the forth 16 points (49 to 64), and so on. If the number of the scan points at the end of the scan line is less than 16, some points of the next line will be combined into the group of the 16 points. After four lines (400 scan points), the first 16 points of the fifth line is calculated by GPU 1, and after eight lines (800 scan points), the first 16 points of the ninth line is calculated again by GPU 0 (800/32=25).

0	STEM PROBE LOOP FOR DEFOCUS:	50.000
Y	--> X	
0.0000	--> 1:0 17:1 33:0 49:1 65:0 81:1 97:0	
0.0101	--> 13:1 29:0 45:1 61:0 77:1 93:0	
0.0202	--> 9:1 25:0 41:1 57:0 73:1 89:0	
0.0303	--> 5:1 21:0 37:1 53:0 69:1 85:0	
0.0404	--> 1:1 17:0 33:1 49:0 65:1 81:0 97:1	
0.0505	--> 13:0 29:1 45:0 61:1 77:0 93:1	
0.0606	--> 9:0 25:1 41:0 57:1 73:0 89:1	
0.0707	--> 5:0 21:1 37:0 53:1 69:0 85:1	
0.0808	--> 1:0 17:1 33:0 49:1 65:0 81:1 97:0	
0.0909	--> 13:1 29:0 45:1 61:0 77:1 93:0	
0.1010	--> 9:1 25:0 41:1 57:0 73:1 89:0	
0.1111	--> 5:1 21:0 37:1 53:0 69:1 85:0	
0.1212	--> 1:1 17:0 33:1 49:0 65:1 81:0 97:1	
0.1313	--> 13:0 29:1 45:0 61:1 77:0 93:1	
0.1414	--> 9:0 25:1 41:0 57:1 73:0 89:1	

**NOTE:** In the above example the scan interval is  $1.0/99 = 0.01010\dots$ , since the full range (0.0 to 1.0) is calculated by 100 of points to simplify the explanation. If you use 101 points for a full unit (0.0 to 1.0), the scan interval becomes a simple fraction of  $1.0/100 = 0.01$ .