

NumericalBox3D DLSSM

Part IV: Solver-01

Gao-Feng Zhao

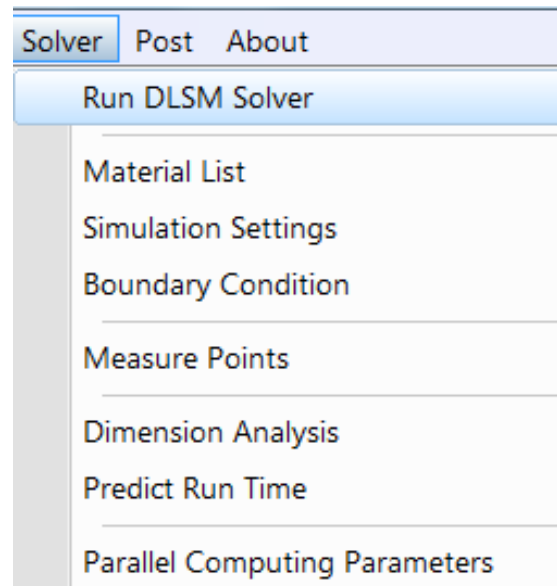
Tianjin University

2019-11-26

www.dembox.org

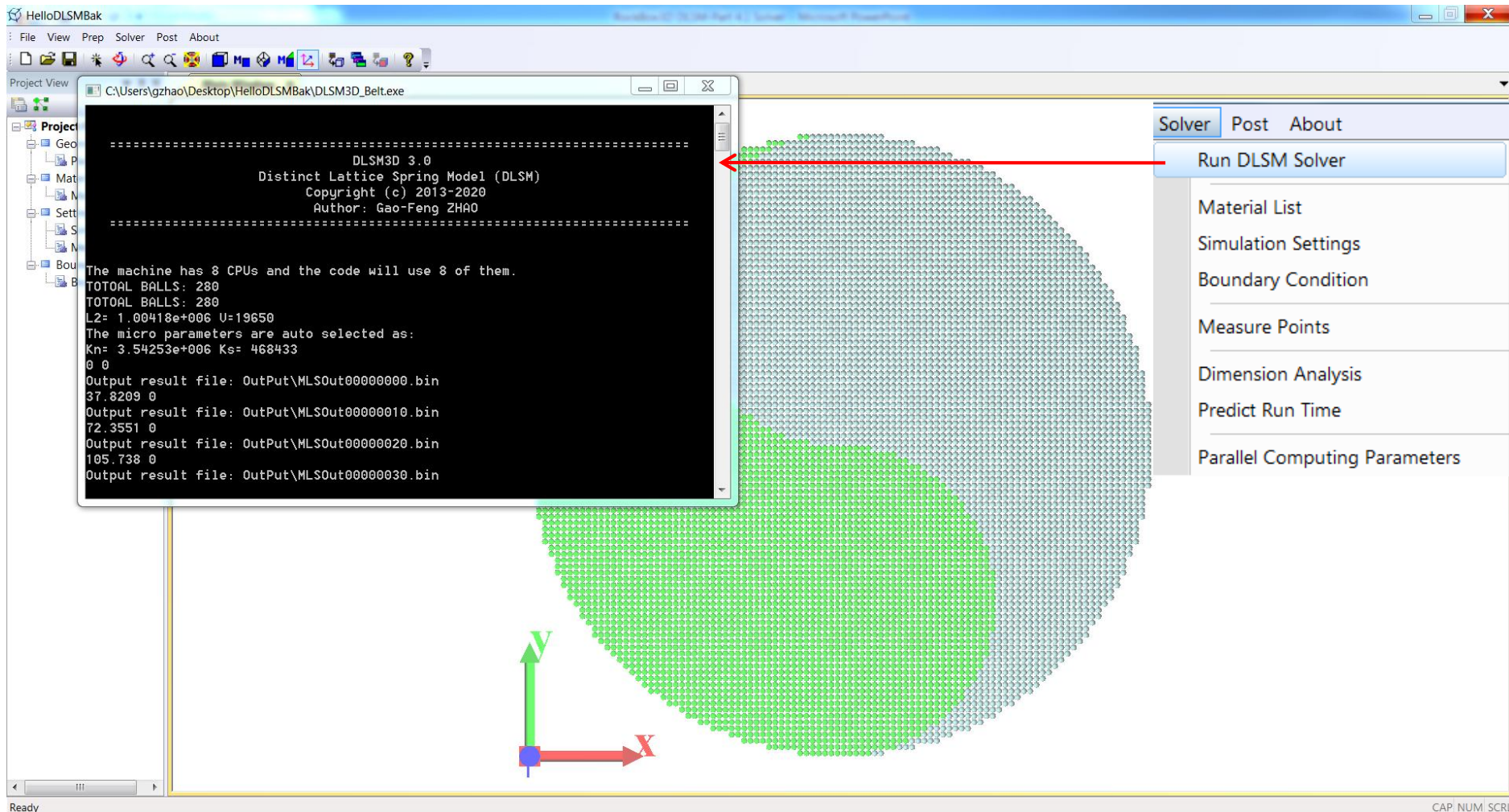
The Menu

Menu

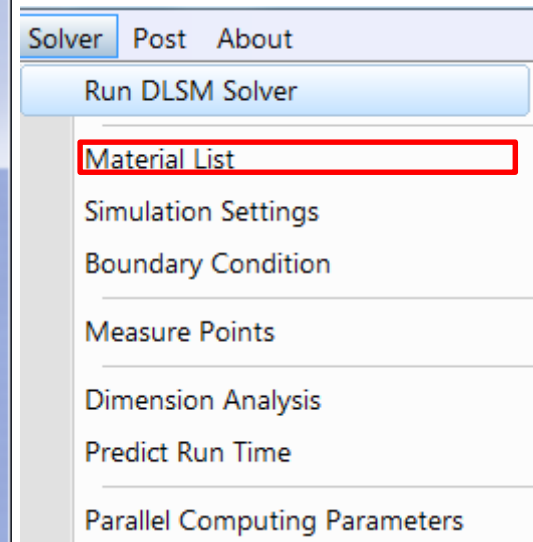
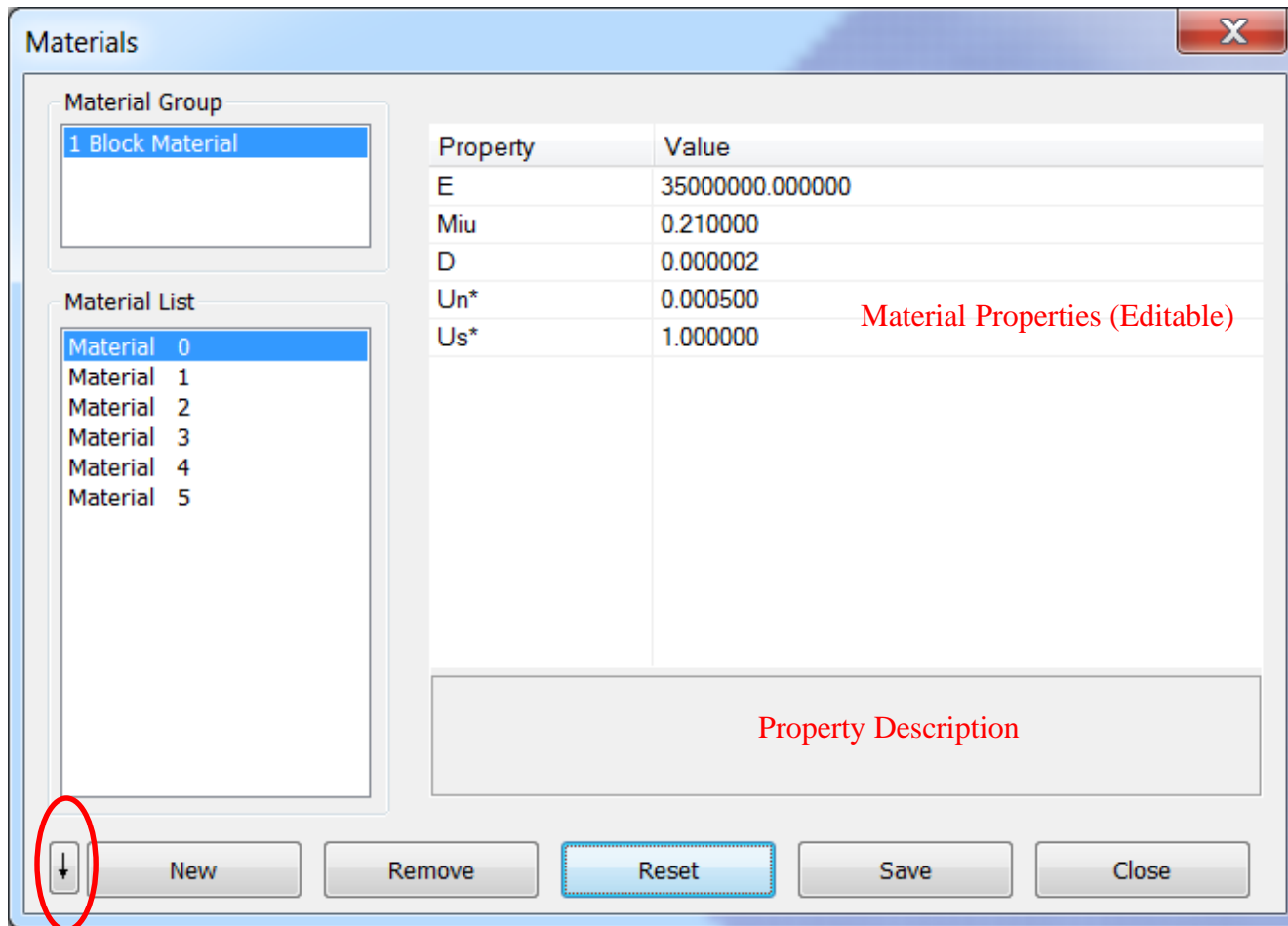


Solver

Run DLSTM Solver



Material List



Material List

Materials

Material Group

1 Block Material

Material List

Material 0
Material 1
Material 2
Material 3
Material 4
Material 5

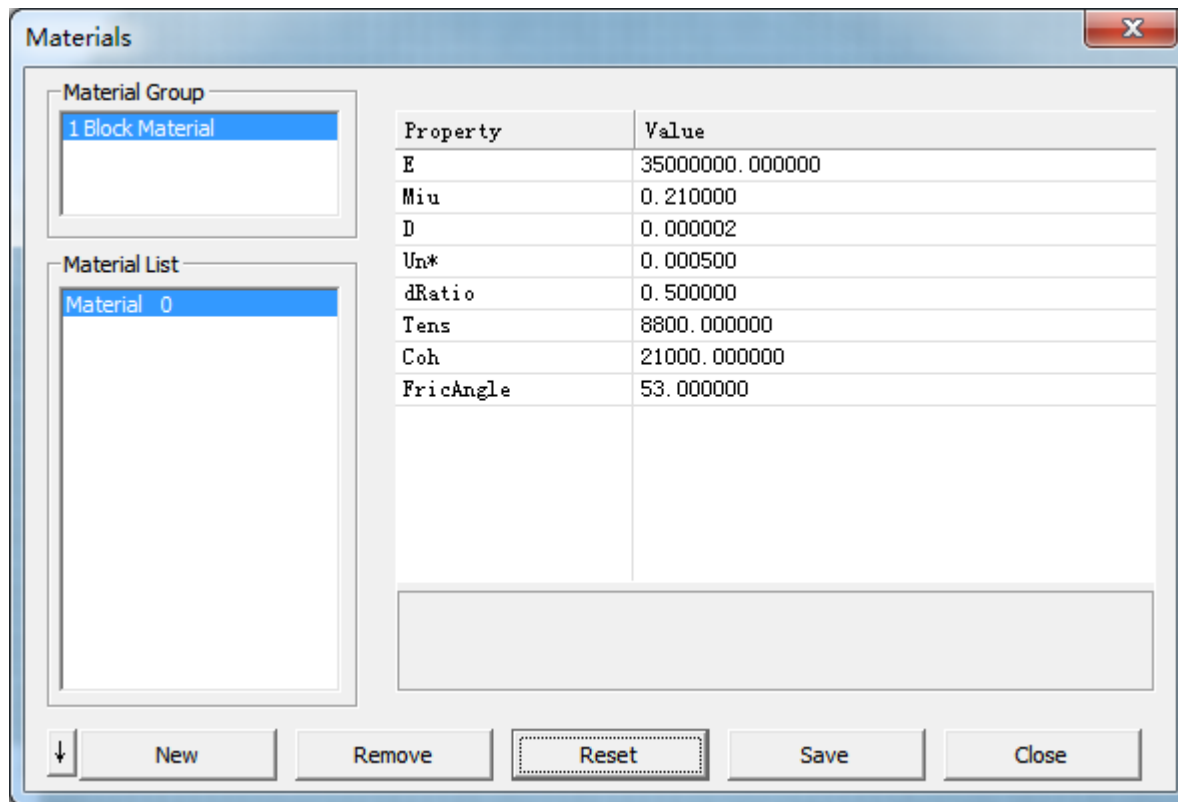
Property	Value
E	35000000.000000
Miu	0.210000
D	0.000002
Un*	0.000500
Us*	1.000000

New Remove Reset Save Close

	Density (kg/m ³)	Elastic Modulus (GPa)	Poisson's Ratio	Tensile Strength (MPa)	UCS (MPa)
Steel	8000	200	0.3	400	250
Sandstone	2000	1-20	0.21-0.38	4-25	20-170
Shale	2500	1-70	0.2-0.4	2-10	5-100
Granite	2700	10-70	0.1-0.3	7-25	100-250

Material parameters of
DLSM/4D-LSM

Material List



Material parameters of
Multi-body 4D-LSM

Simulation Settings

Simulation Setting

Property	Value
Lx	50.000000
Ly	50.000000
Lz	10.000000
CellSize	2.000000
dGap	0.500000
dT	5e-008
T	0.0002
dURatio	0.000100
nOutLoops	10.000000
Gx	0.000000
Gy	0.000000
Gz	0.000000
Dp	0.100000

Lx
Length of the cell search box in x direction

Save Reset
Default Value Close

Solver Post About

Run DSLM Solver

Material List

Simulation Settings

Boundary Condition

Measure Points

Dimension Analysis

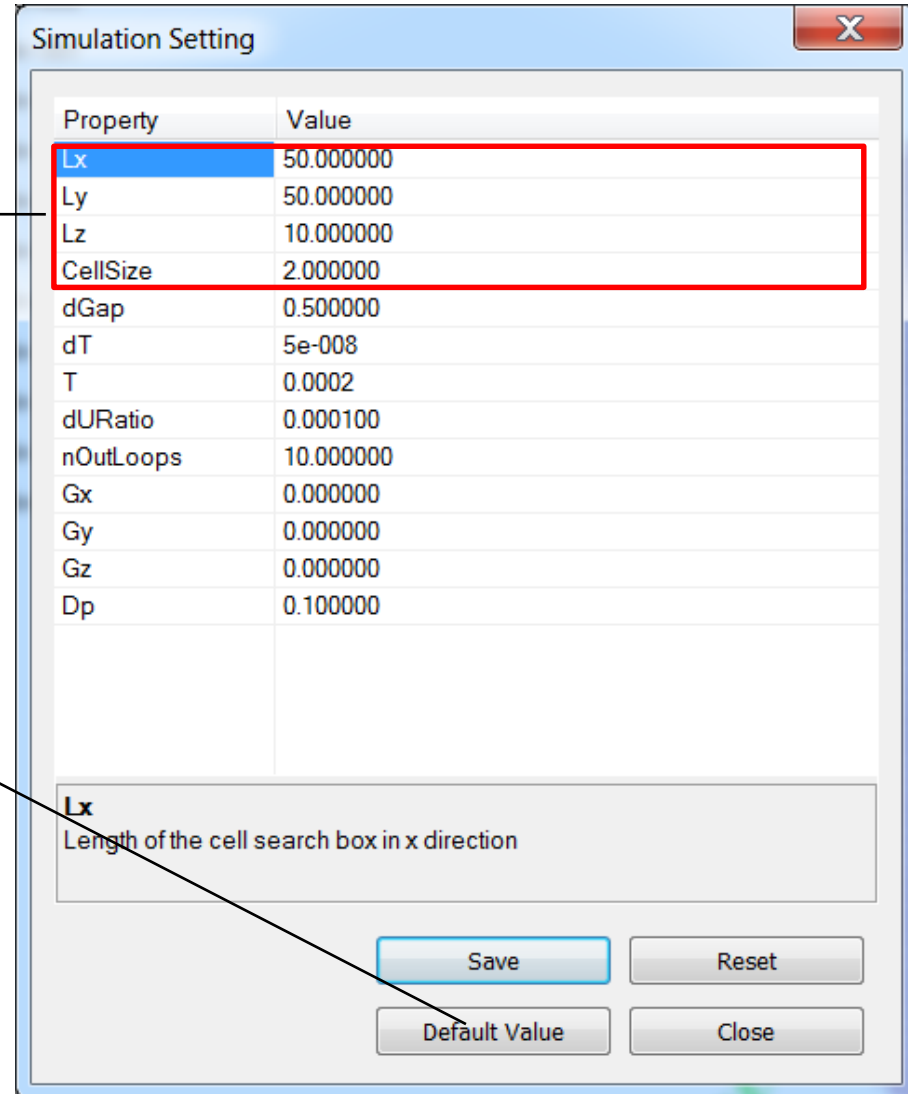
Predict Run Time

Parallel Computing Parameters

Simulation Settings

Contact detection parameters.

Automatically get default values that calculated by the software.



The image shows a 'Simulation Setting' dialog box with a table of properties and values. A red rectangle highlights the first four rows (Lx, Ly, Lz, CellSize). An arrow points from the text 'Contact detection parameters.' to this red box. Another arrow points from the text 'Automatically get default values that calculated by the software.' to the 'Default Value' button at the bottom. Below the table, there is a section for 'Lx' with a description: 'Length of the cell search box in x direction'. At the bottom right, there are four buttons: 'Save', 'Reset', 'Default Value', and 'Close'.

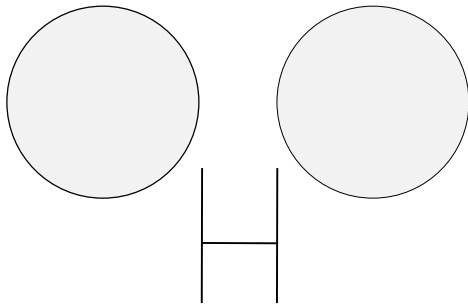
Property	Value
Lx	50.000000
Ly	50.000000
Lz	10.000000
CellSize	2.000000
dGap	0.500000
dT	5e-008
T	0.0002
dURatio	0.000100
nOutLoops	10.000000
Gx	0.000000
Gy	0.000000
Gz	0.000000
Dp	0.100000

Lx
Length of the cell search box in x direction

Save Reset
Default Value Close

Simulation Settings

Contact search domain size, and cell element size (cell based contact detection method).



Condition for two particles to form a bond spring pair.

Simulation Setting

Property	Value
Lx	50.000000
Ly	50.000000
Lz	10.000000
CellSize	2.000000
dGap	0.500000
dT	5e-008
T	0.0002
dURatio	0.000100
nOutLoops	10.000000
Gx	0.000000
Gy	0.000000
Gz	0.000000
Dp	0.100000

Lx
Length of the cell search box in x direction

Save Reset

Default Value Close

Boundary Condition

Boundary Condition

Load List

- 1 Load
- 2 Load

Property	Value
X1	0.000000
X2	50.000000
Y1	0.000000
Y2	0.500000
Z1	0.000000
Z2	10.000000
Type	Velocity
Direction	Y
Operation	

Z1
The low value of the range for the boundary condition in z direction

☐ Display Load

Remove All Reset Save

Add Load Default Loads Close

Solver Post About

Run DLSM Solver

Material List

Simulation Settings

Boundary Condition

Measure Points

Dimension Analysis

Predict Run Time

Parallel Computing Parameters

Boundary Condition

Boundary Condition

Load List

- 1 Load
- 2 Load

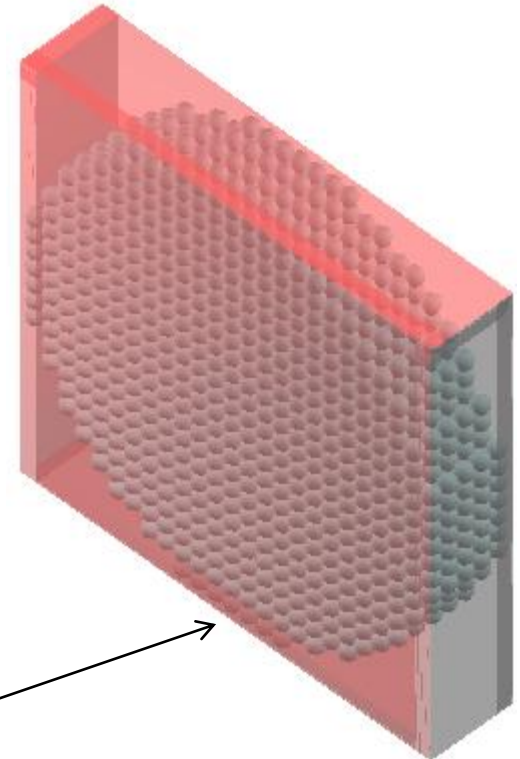
Property	Value
X1	0.000000
X2	50.000000
Y1	0.000000
Y2	0.500000
Z1	0.000000
Z2	10.000000
Type	Velocity
Direction	Y
Operation	

Z1
The low value of the range for the boundary condition in z direction

☐ Display Load

Remove All Reset Save

Add Load Default Loads Close



Boundary Condition

Boundary Condition

Load List

- 1 Load
- 2 Load

Property	Value
X1	0.000000
X2	50.000000
Y1	0.000000
Y2	0.500000
Z1	0.000000
Z2	10.000000
Type	Velocity
Direction	Y
Operation	

Remove
New
Edit Load Data

Operation
Remove the load, New load, or Edit the load data

☐ Display Load

Remove All Reset Save

Add Load Default Loads Close

Solver Post About

Run DLSM Solver

Material List

Simulation Settings

Boundary Condition

Measure Points

Dimension Analysis

Predict Run Time

Parallel Computing Parameters

Boundary Condition

Boundary Condition

Load List

1 Load

2 Load

Property	Value
X1	0.000000
X2	50.000000
Y1	0.000000
Y2	0.500000
Z1	0.000000
Z2	10.000000
Type	Velocity
Direction	Y
Operation	

Remove

New

Edit Load Data

Operation

Remove the load, New load, or Edit the load

☐ Display Load

Remove All

Add Load

Reset

Default

Load Data

LOADING HISTORY

0.1

VALUE

0

0

5

10

TIME

View Load Data As File

Read From File

Generate Curves

Type:

[1] Constant

[1] Constant

[2] Linear

[3] Triangle

[4] Sin

[5] Trapezoid

Amplitude:

End Time:

Number of Records:

4

Zero Value Time:

0.00015

Peak Time:

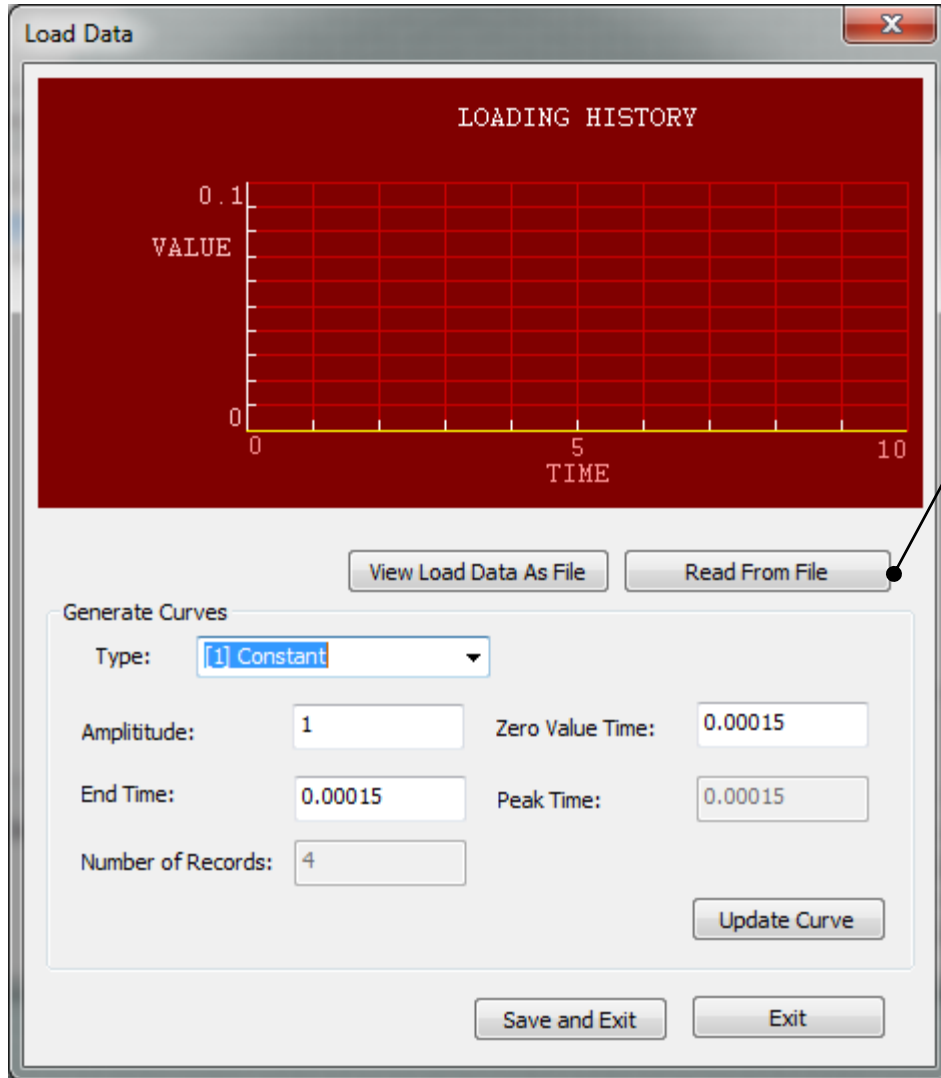
0.00015

Update Curve

Save and Exit

Exit

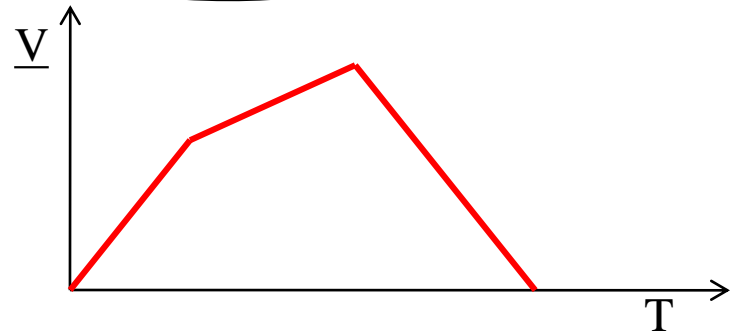
Boundary Condition



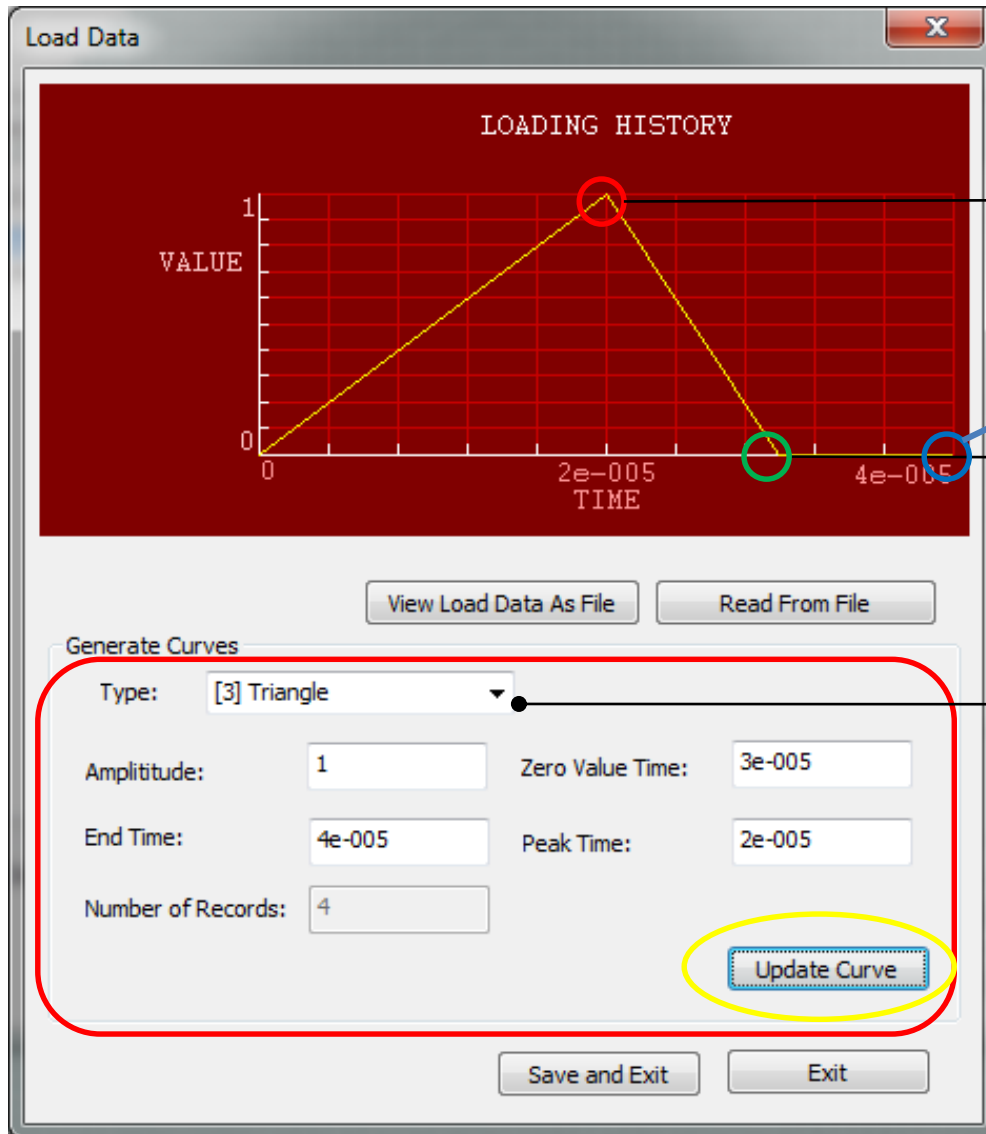
Line1: Number of record points
Line 2: Time1, Value1
Line 3: Time2, Value2
....

Example:

```
3
0 0
1 2
2 3
4 0
```



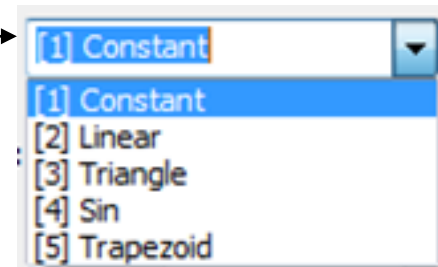
Boundary Condition



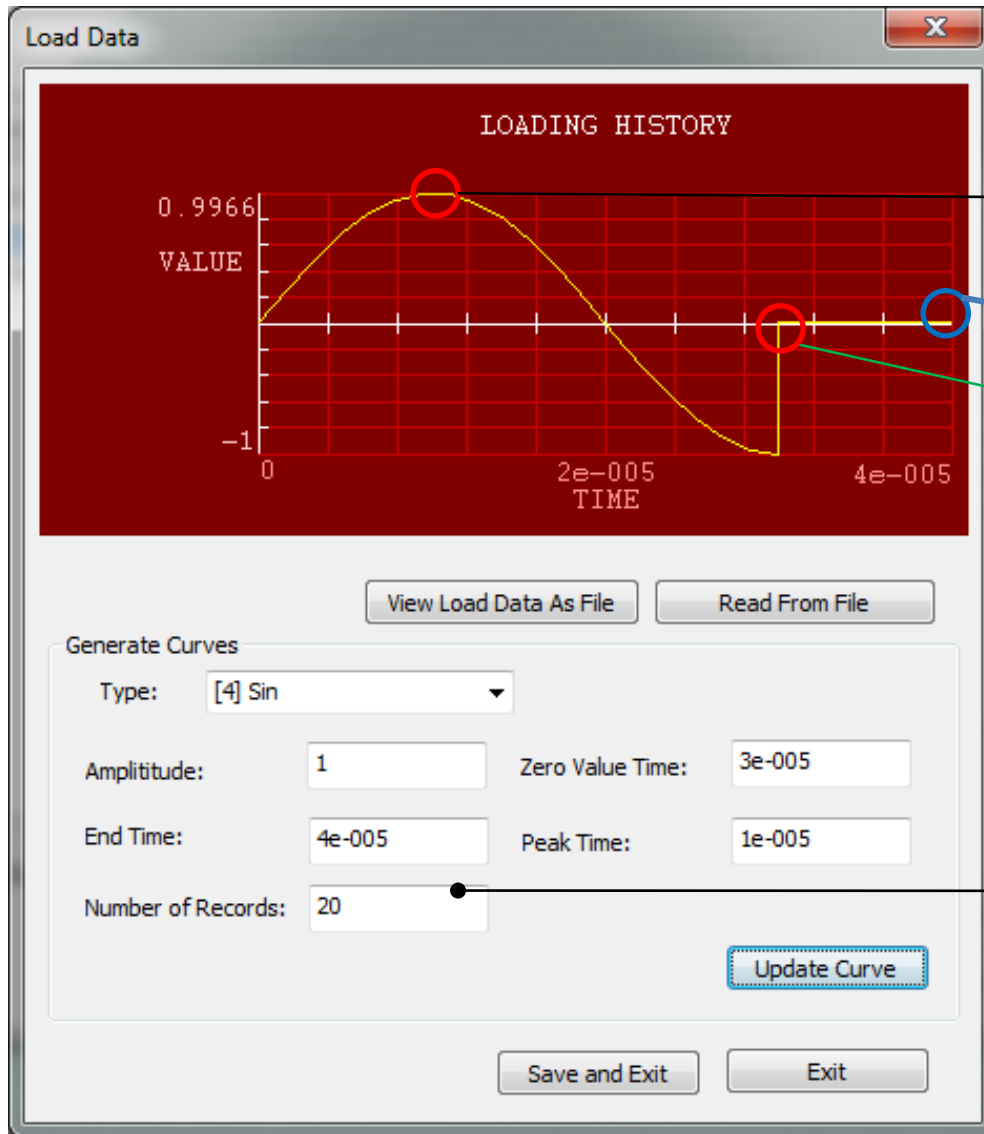
→ Peak point (Peak time, Amplitude)

→ End time.

→ Zero time.



Boundary Condition



→ Peak point (Peak time, Amplitude)

→ End time.

→ Zero time.

→ Number of points to represent the curve.

Measure Points

Measure Points

Option

Sampling Frequency (Loops per record):
3

Default Type for new points:
[01] UX

Color of the measure points:

New Point
Read ID List From File
Write ID List To File
From Path
Color Measure Points
Remove All
Reset Data
Save
Close

Property	Value
[-] Measure Point 001	
ID	0
[X,Y,Z]	0.250000, 21.750000, 0.250000
Type	UX
Operation	
[-] Measure Point 002	
ID	0
[X,Y,Z]	0.250000, 21.750000, 0.250000
Type	UY
Operation	
[-] Measure Point 003	
ID	0
[X,Y,Z]	0.250000, 21.750000, 0.250000
Type	UZ
Operation	

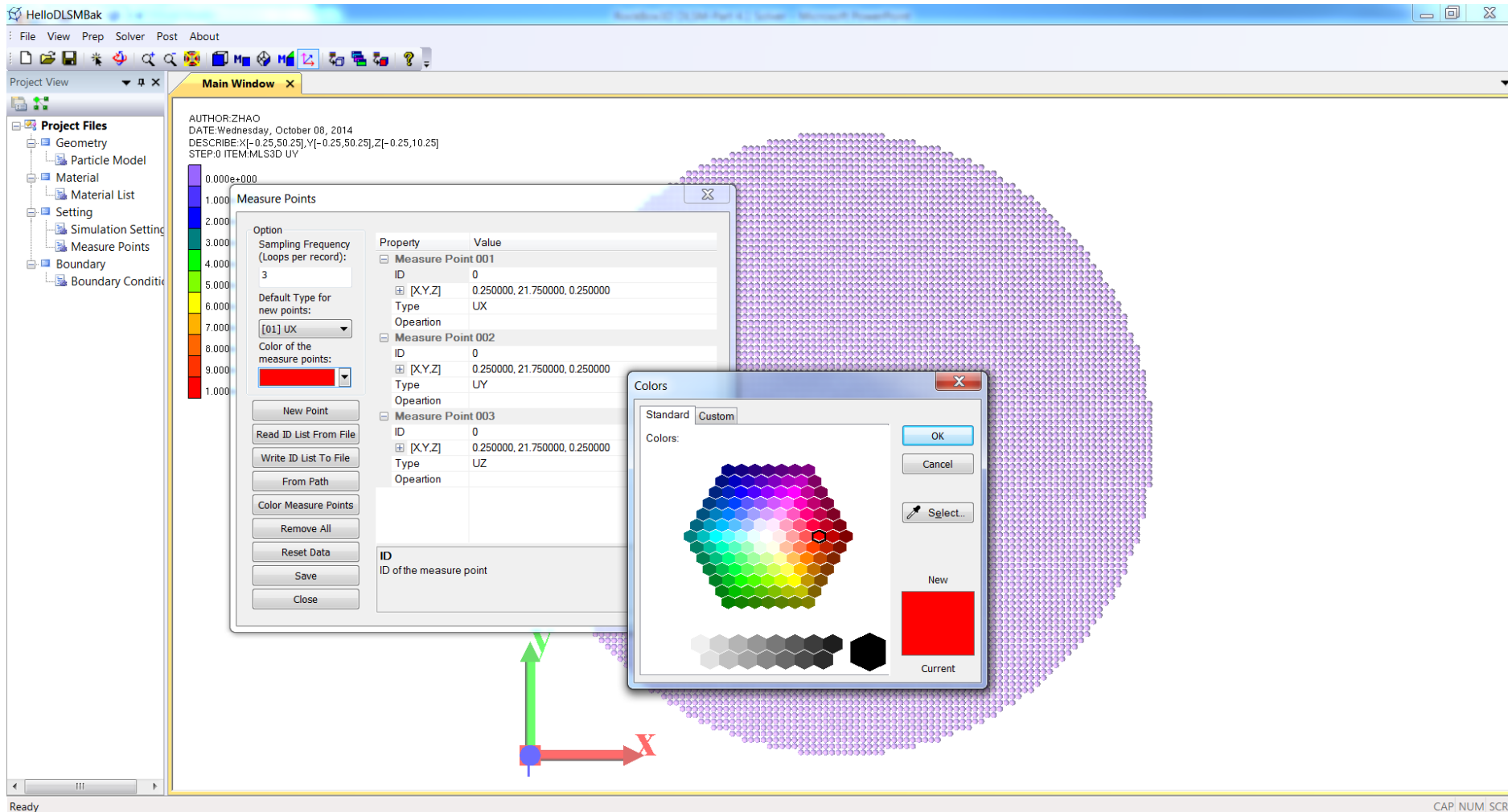
ID
ID of the measure point

Solver Post About

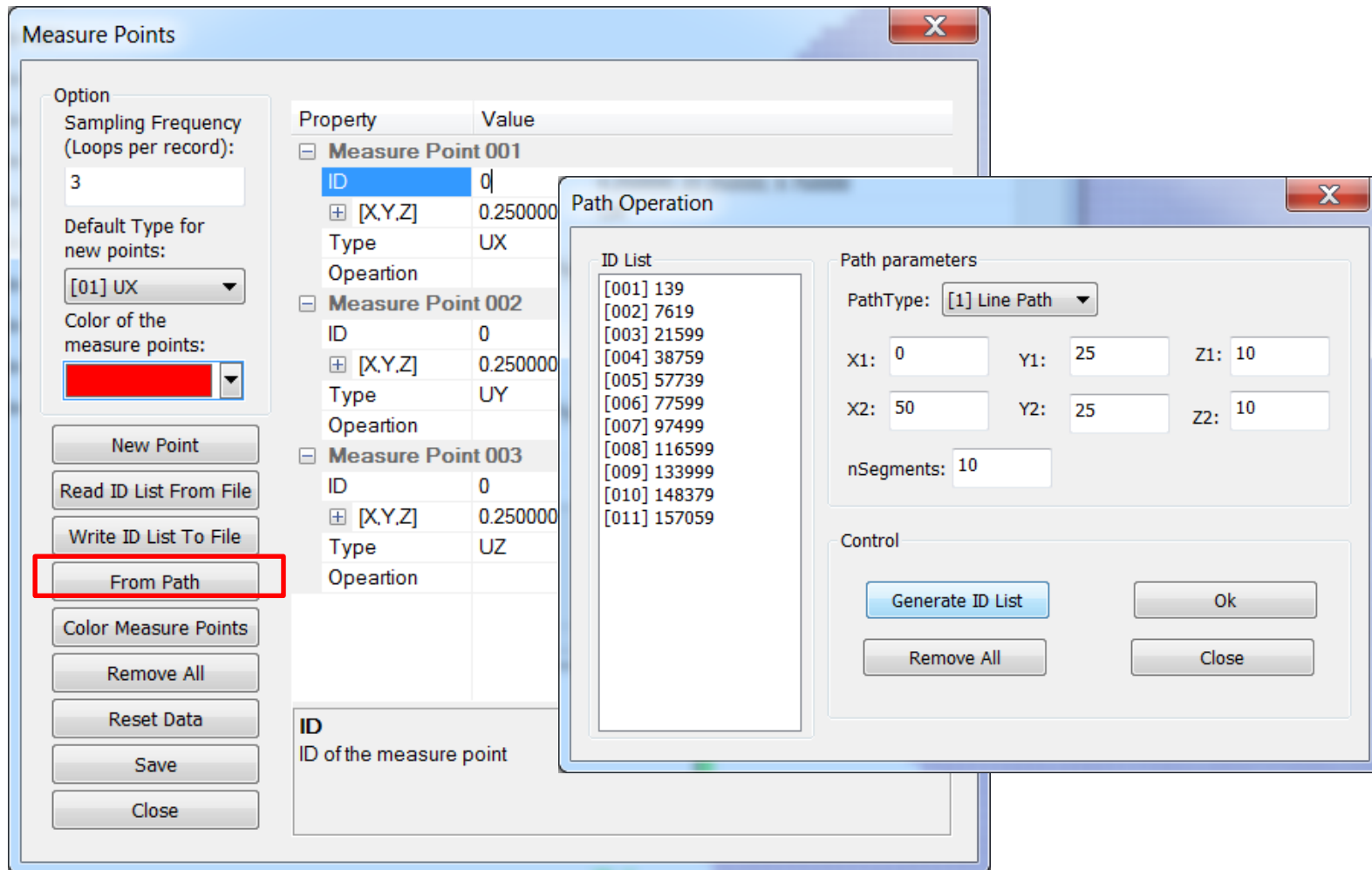
Run DSLM Solver

Material List
Simulation Settings
Boundary Condition
Measure Points
Dimension Analysis
Predict Run Time
Parallel Computing Parameters

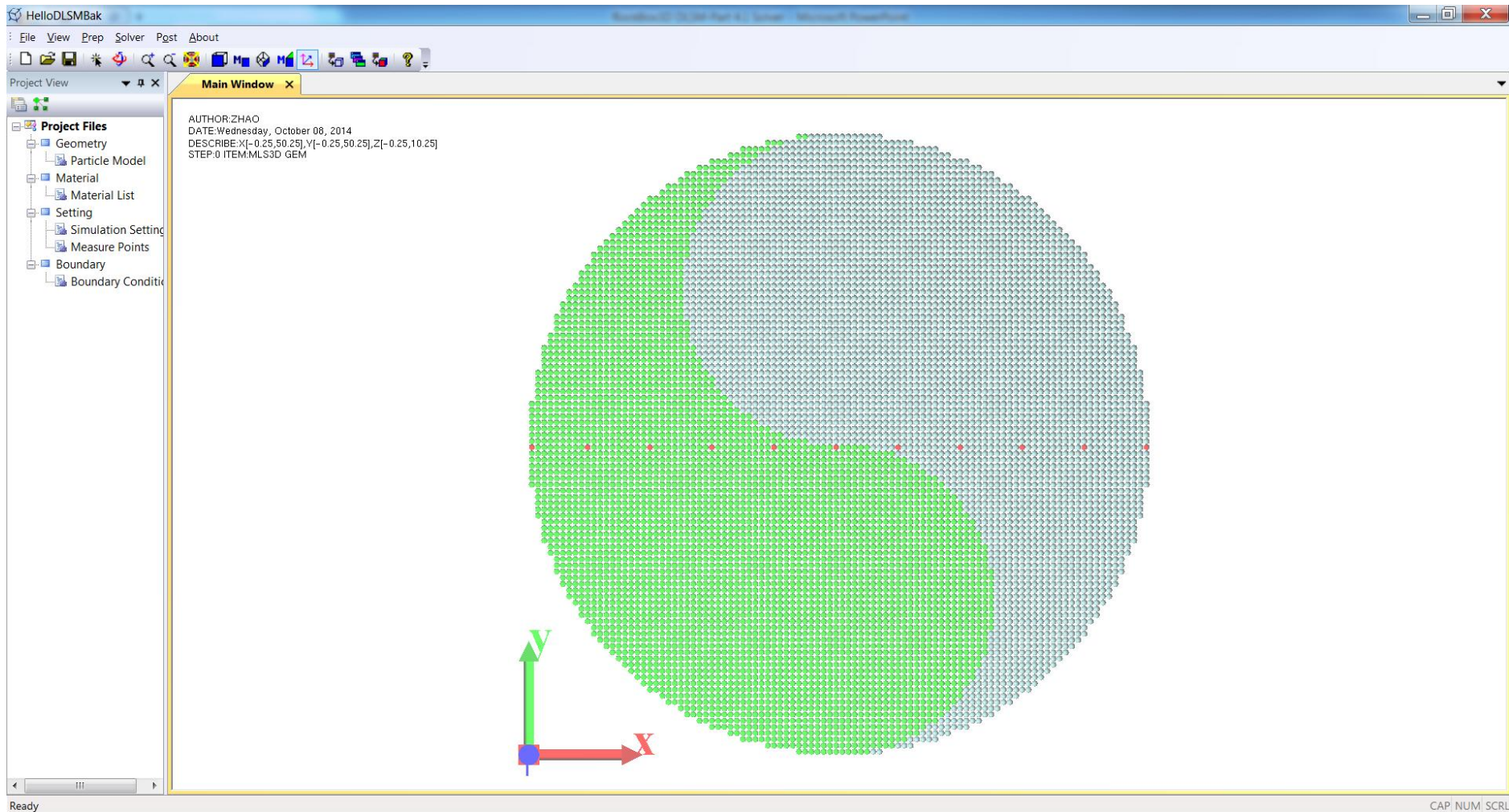
Measure Points



Measure Points



Measure Points



Dimension Analysis

Dimension Analysis

Orders Caculation

Time: [5]1.00E+000 Second

Mass: [4]1.00E+000 Kilogram

Space: [3]1.00E-003 Meter

[Time : t]

[Mass : m]

[Space : s]

Acceleration : s/t^2

Stress : N/s^2

Density : m/s^3

Force : $N = ma = m \cdot s/t^2$

Energy : ms^2/t^2

Therm : K

Velocity : s/t

Out Put

Force: 1.00E-003

Acceler: 1.00E-003

Density: 1.00E+009

Velocity: 1.00E-003

Stress: 1.00E+003

Energy: 1.00E-006

Volume: 1.00E-009

Area: 1.00E-006

W: 1.00E-006

Specific Heat (J/kg/K): 1.00E+000

Thermal conductivity (W/m/K): 1.00E+003

[Note:] What you see=Value* Rate, while what you input should be

Execute

Close

Solver Post About

Run DLSM Solver

Material List

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Measure Points

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Predict Run Time

Parallel Computing Parameters

Predict Computational Time

Run Time Predictor

Computation Information

Item 001 Item 002	Run Time (s):	1.52
	Number of Particles:	2445
	Caculation Cycles:	400

Predict

Close

Save Get Cur Info

Add RemoveAll

Reset Remove

Solver Post About

Run DLSM Solver

Material List

Simulation Settings

Boundary Condition

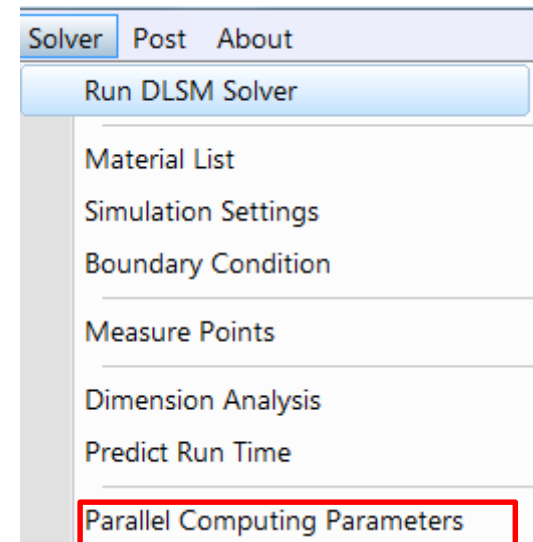
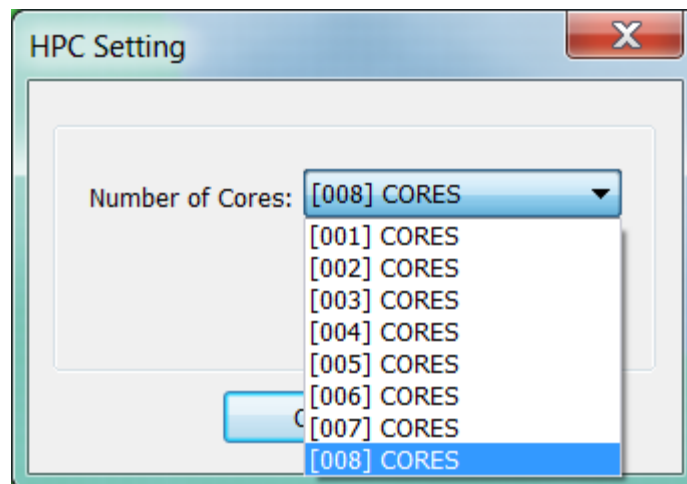
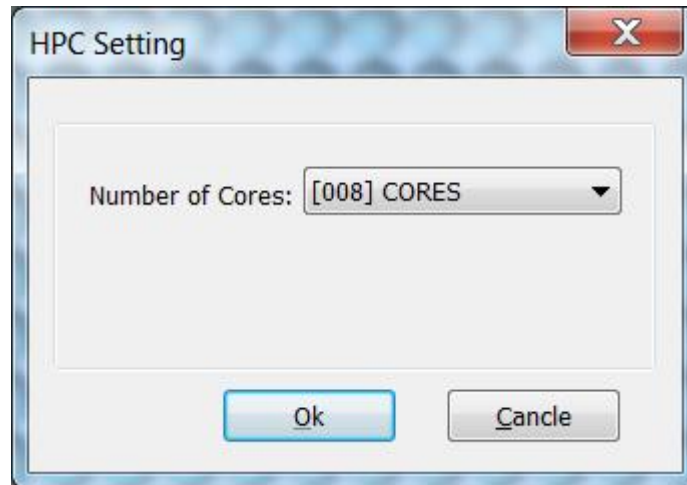
Measure Points

Dimension Analysis

Predict Run Time

Parallel Computing Parameters

Parallel Computing





If you can't explain it simply,
you don't understand it well enough.-Albert Einstein

TO BE CONTINUED...