

# OPTISWORKS 3D TEXTURES

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## 議程：

- 為何開發3D textures ?
- 3D textures於 OptisWorks的應用概念
- 3D textures於 OptisWorks功能
- 比對SPEOS模擬結果
- BLU 結果
- Speos / OptisWorks效能比較
- Demo
- 相關訊息
- Q & A



## 為何開發 3D textures (1/3) ?

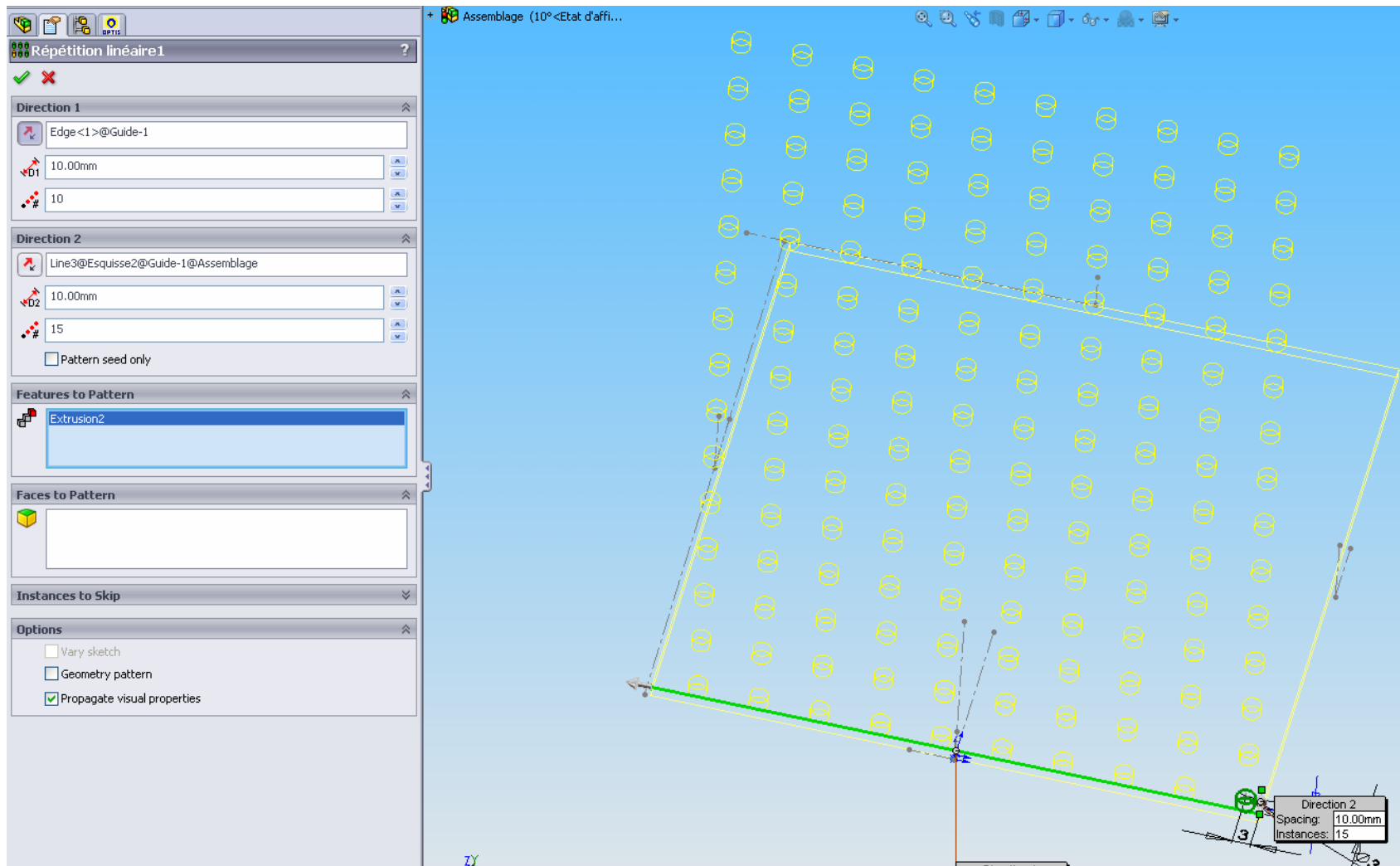
➤ 如何對千萬數量之微結構在**SLW**進行模擬?



Back Light Unit (BLU)  
LCD

# 為何開發 3D textures (2/3) ?

## ➤ 陣列複製於 SLW





## 為何開發 3D textures (3/3) ?

### ➤ **SLW** 進行為結構之限制

- Number of repetitions : just few hundreds
- Position and orientation of patterns : few possibilities
- Memory consuming
- Long simulation time

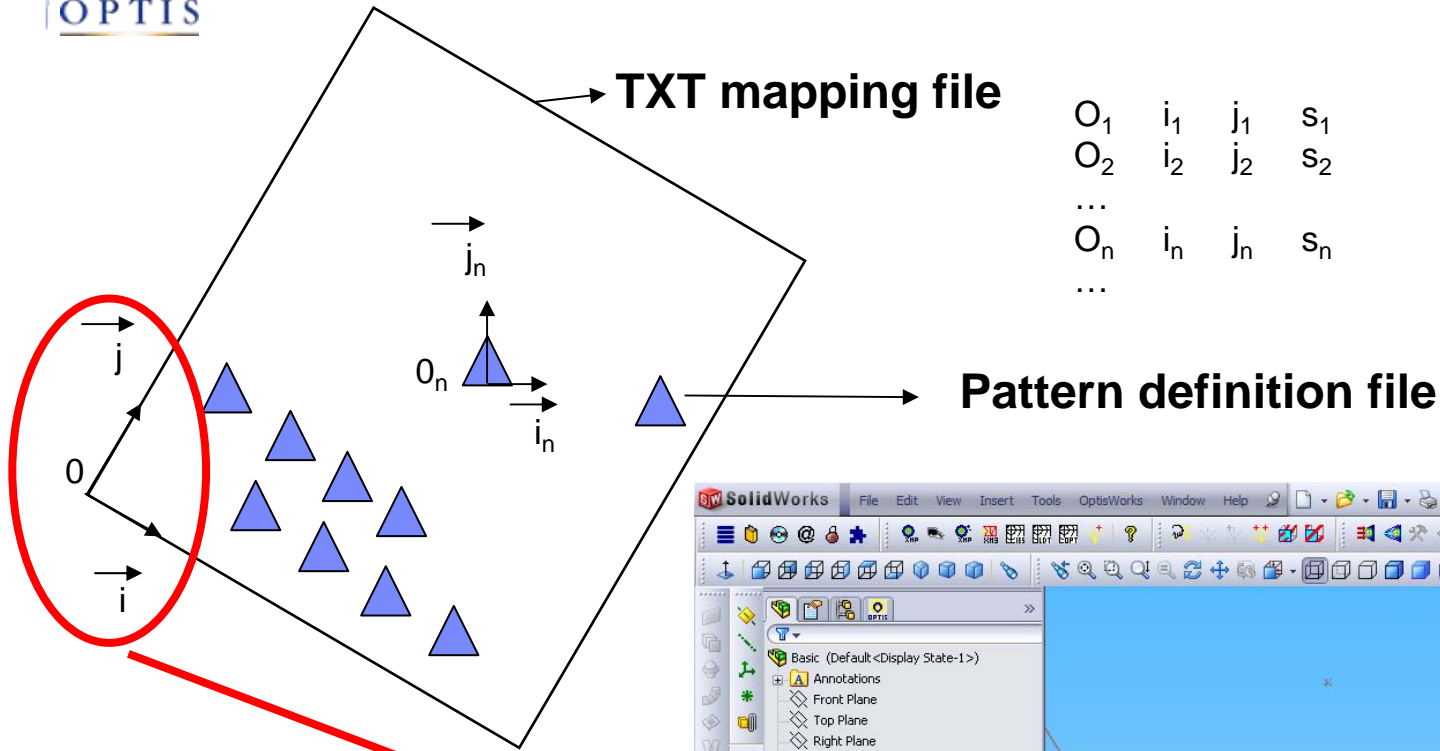
➤ **Conclusion: it is not possible to use SLW feature repetition to design and simulate millions of patterns**

### **Solution**

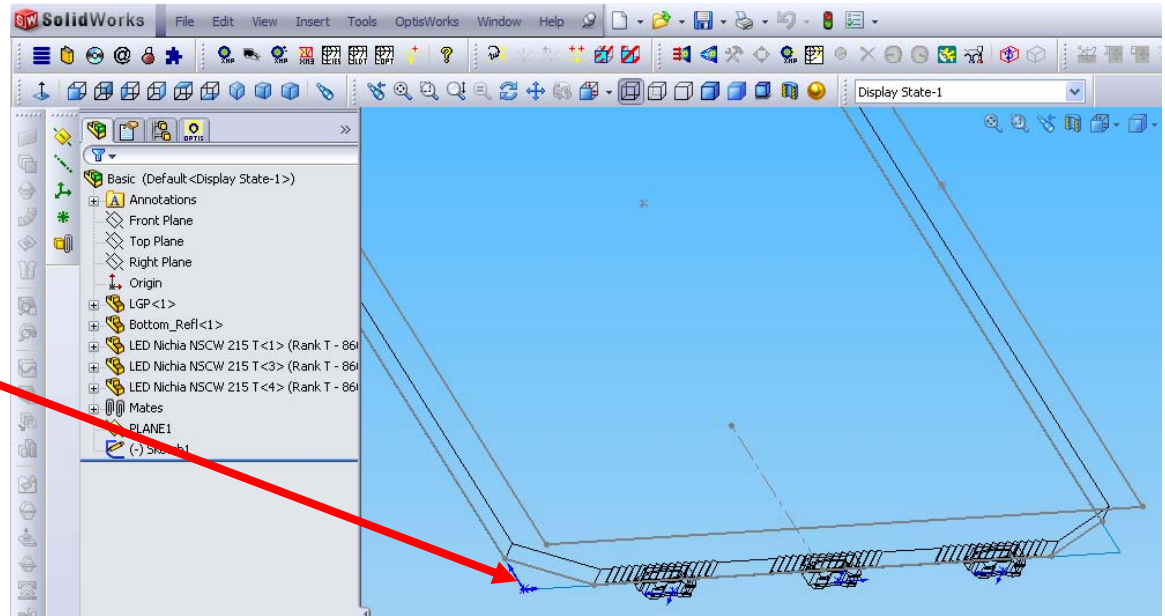
**OPTIS has developed the most powerful and fastest solution to simulate millions of mechanical patterns:  
3D Textures**



# 3D textures於OptisWorks之概念 (1/4)



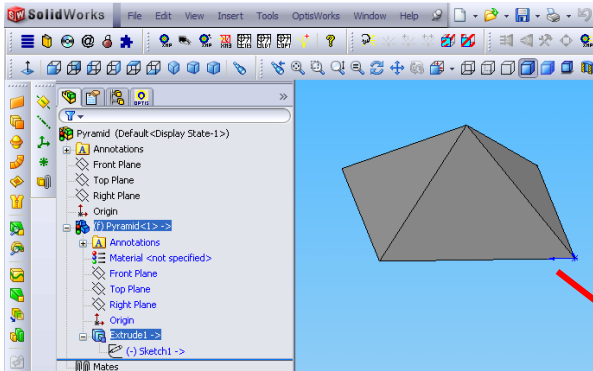
$O_1$	$i_1$	$j_1$	$s_1$
$O_2$	$i_2$	$j_2$	$s_2$
...			
$O_n$	$i_n$	$j_n$	$s_n$
...			





# 3D textures於OptisWorks之概念(2/4)

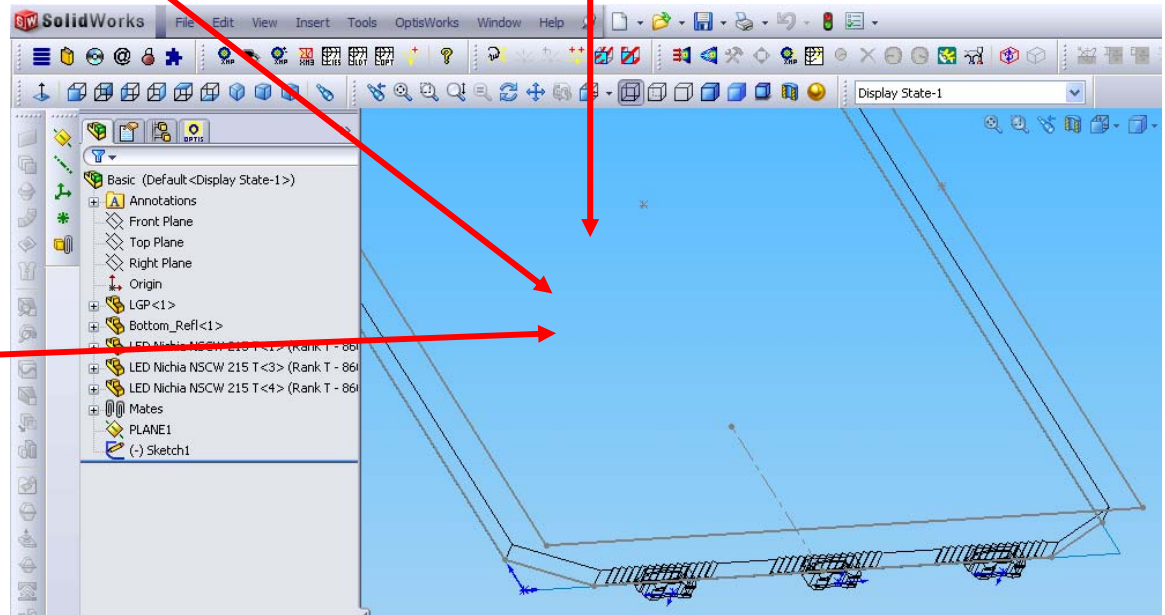
Give additional parameters : surface quality, Material, Boolean operation, axis system...



Design the pattern in SLW/OW

```
Texture.txt - Notepad
File Edit Format View Help
1132499
17.15 2.06995 0 -1 1 0 0 1 0 1
17.1113 2.10492 0 -1 1 0 0 1 0 1
17.0747 2.06995 0 -1 1 0 0 1 0 1
17.038 2.10492 0 -1 1 0 0 1 0 1
17.0013 2.06995 0 -1 1 0 0 1 0 1
16.9647 2.10492 0 -1 1 0 0 1 0 1
16.928 2.06995 0 -1 1 0 0 1 0 1
16.8913 2.10492 0 -1 1 0 0 1 0 1
16.8546 2.06995 0 -1 1 0 0 1 0 1
16.818 2.10492 0 -1 1 0 0 1 0 1
16.7813 2.06995 0 -1 1 0 0 1 0 1
16.7446 2.10492 0 -1 1 0 0 1 0 1
16.708 2.06995 0 -1 1 0 0 1 0 1
16.6713 2.10492 0 -1 1 0 0 1 0 1
16.6346 2.06995 0 -1 1 0 0 1 0 1
16.5979 2.10492 0 -1 1 0 0 1 0 1
16.5613 2.06995 0 -1 1 0 0 1 0 1
16.5246 2.10492 0 -1 1 0 0 1 0 1
16.4879 2.06995 0 -1 1 0 0 1 0 1
16.4512 2.10492 0 -1 1 0 0 1 0 1
16.4146 2.06995 0 -1 1 0 0 1 0 1
16.3779 2.10492 0 -1 1 0 0 1 0 1
16.3412 2.06995 0 -1 1 0 0 1 0 1
16.3045 2.10492 0 -1 1 0 0 1 0 1
16.2679 2.06995 0 -1 1 0 0 1 0 1
16.2312 2.10492 0 -1 1 0 0 1 0 1
Ln 1, Col 1
```

Give positions, orientation and scale for each pattern



Design the BLU in SLW/OW



# 3D textures於OptisWorks之概念(3/4)

**3D texture** ?

✓ ✗

**3D texture name**

Is-Soft1

**Apply on surfaces**

Face<1>@LGP-1

**Axis system definition**

Origin  
Point2@Sketch1

Direction of the X axis  
Edge<1>@LGP-1

Direction of the Y axis  
Edge<2>@LGP-1

**Pattern definition**

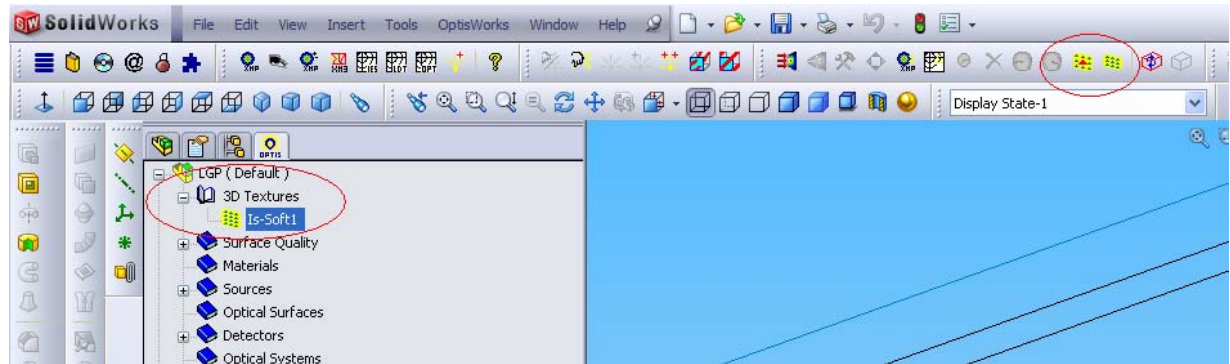
C:\WORKING\TEXTURES 3D\ISSOFT-1\PYRAMID.TXT

Browse

**Mapping definition**

C:\WORKING\TEXTURES 3D\ISSOFT-1\ISSOFT-1.TXT

Browse



**Pattern material**

C:\PROGRAM FILES (X86)\OPTIS\LIBRARY\MATERIAL\

Browse

**Pattern surface quality**

C:\PROGRAM FILES (X86)\OPTIS\LIBRARY\SURFACE\

Browse

**Boolean operation**

Add on

**Preview**

First pattern to display  
0

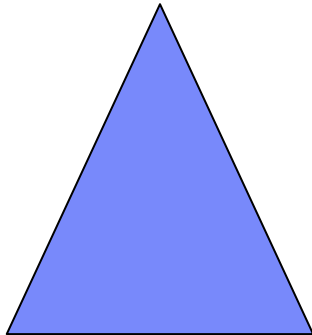
Number of pattern to display  
500

Preview

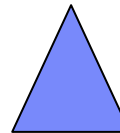


# 3D textures於OptisWorks之概念(4/4)

**SolidWorks (0.01 mm limitation)**



**OptisWorks 3D Texture**



**$S_n$  : scale factor**



## 3D textures於OptisWorks之概念(1/3)

### ➤ Main capabilities

- Pattern: any CAD shape (no problem with CAD precision)
- Applied on: any CAD surfaces (flat or curved, rectangular or not)
- Surface quality of Pattern could be different than the support surfaces
- Material quality of Pattern could be different than the support surfaces (ink jet)
- Position and orientation could be different for each pattern (constant or variable mapping)
- Pattern size could be different for each pattern



# 3D textures in OptisWorks 效能提升

## ➤ 主要功能

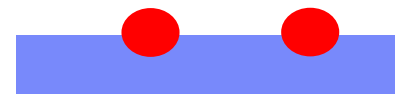
- 是用多種形式之布林運算應用



Remove



Add on with a different material



Insert with a different material



Add on with the same material



Add in with a different material



Insert with a different material

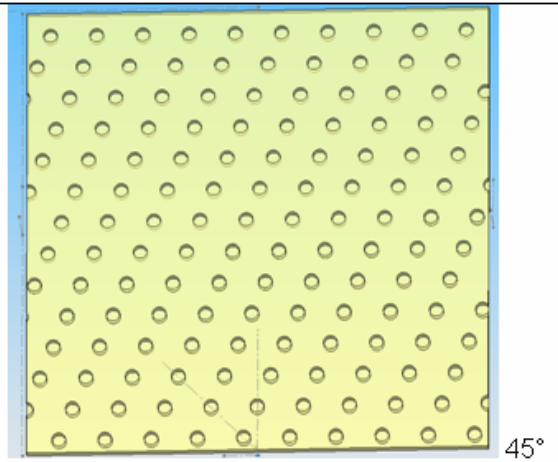
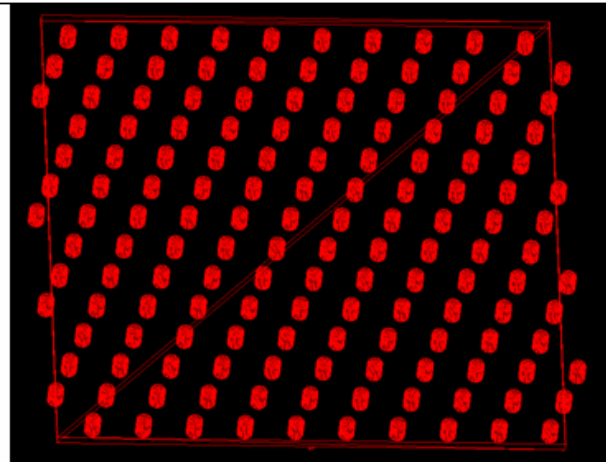
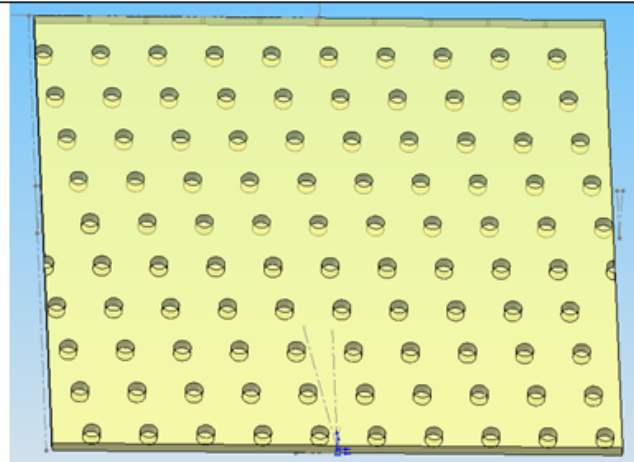
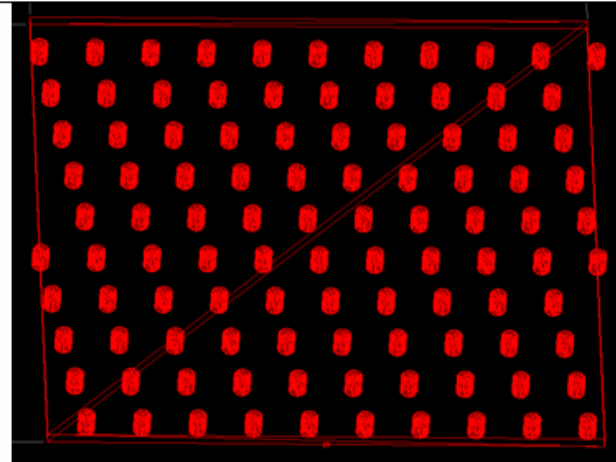


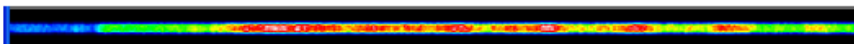
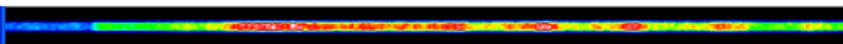


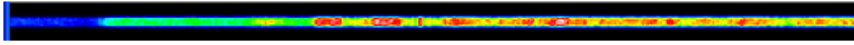
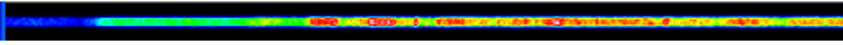
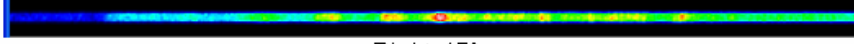
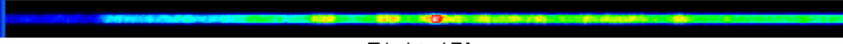
## 3D textures in OptisWorks 之效能(3/3)


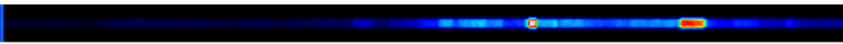
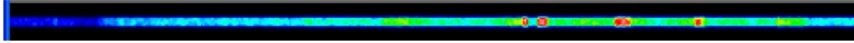
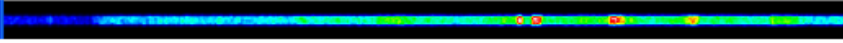




### ➤ Main capabilities

- Number of patterns : NN millions
- Memory usage : low (around 150 Mb for 1 million patterns)
- Loading time : very fast (2 seconds for 1 million patterns)
- Simulation time : very fast (10 millions rays : 16 minutes for 4 millions patterns) and not linear with the number of patterns
- Multithread : optimized
- 32 bits and 64 bits versions of OptisWorks
- Optimization : using VBScript

# 對比 (1/3)

SYSTEM	
SLW repetition feature	3D Texture
 <p>45°</p>	 <p>45°</p>
 <p>10°</p>	 <p>10°</p>

RESULTS 45°	
SLW repetition feature	3D Texture
 Front 45°	 Front 45°
 Back 45°	 Back 45°
 Left 45°	 Left 45°
 Right 45°	 Right 45°

RESULTS 10°	
SLW repetition feature	3D Texture
 Front 10°	 Front 10°
 Back 10°	 Back 10°
 Left 10°	 Left 10°
 Right 10°	 Right 10°

**ANALYSIS FRONT 45°**

**Surface / Section**

Shape:  Rectangle

Center: X: 0 mm, Y: 0 mm

Dimension: Width: 120 mm, Height: 4 mm

Maximum Value: 3.992e+006 lx

Minimum Value: 0.000e+000 lx

Average: 6.076e+005 lx

Flux: 2.916e+002 lm

Barycentre X: -9.920e-001 mm

Barycentre Y: -2.103e-004 mm

Sigma X: 3.014e+001 mm

Sigma Y: 3.096e-001 mm

Sigma: 1.022e+006 lx

Contrast: 1.0000

RMS contrast: 1.6828

**Surface / Section**

Shape:  Rectangle

Center: X: 0 mm, Y: 0 mm

Dimension: Width: 120 mm, Height: 4 mm

Maximum Value: 3.911e+006 lx

Minimum Value: 0.000e+000 lx

Average: 6.047e+005 lx

Flux: 2.903e+002 lm

Barycentre X: -8.373e-001 mm

Barycentre Y: -3.573e-004 mm

Sigma X: 3.008e+001 mm

Sigma Y: 3.099e-001 mm

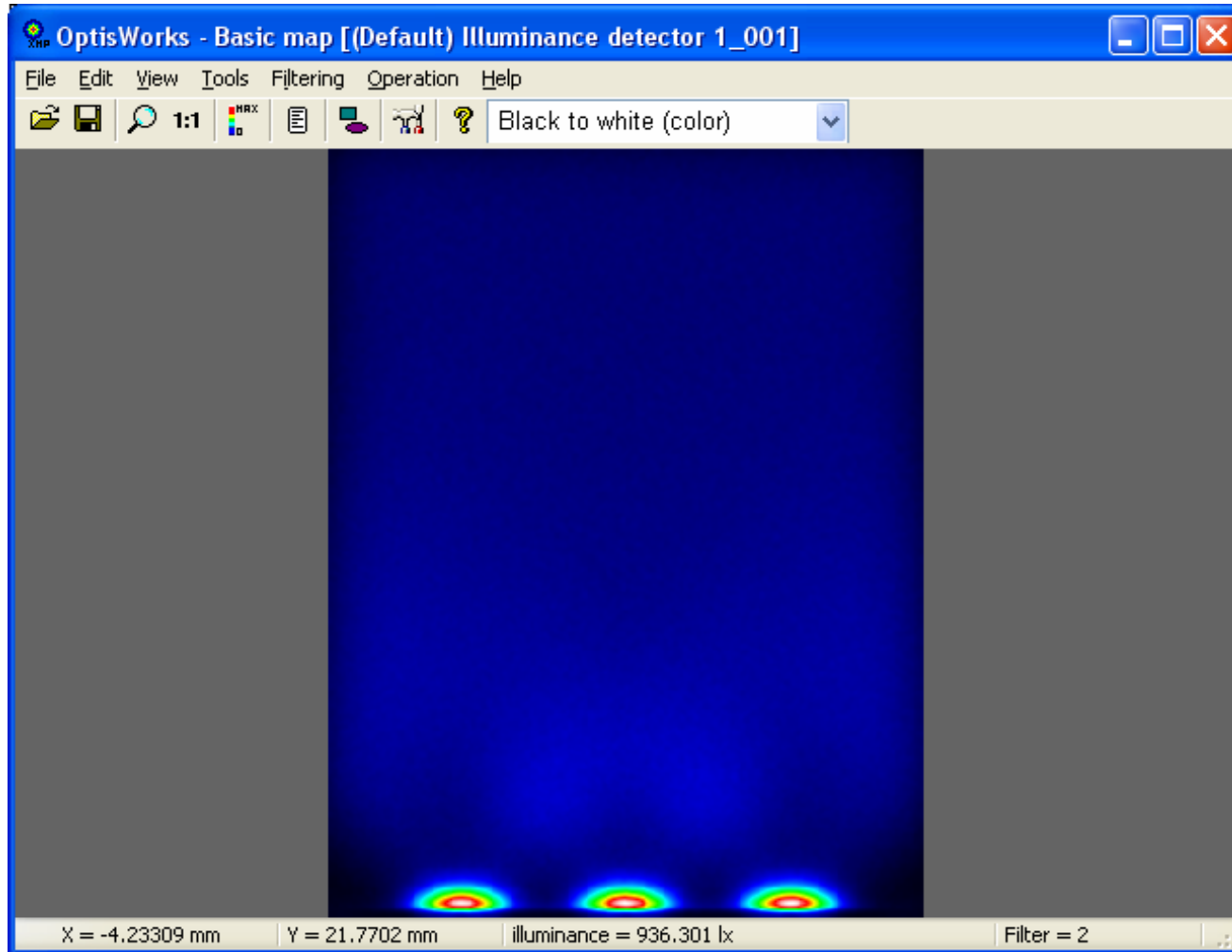
Sigma: 1.017e+006 lx

Contrast: 1.0000

RMS contrast: 1.6824

X =      Y =      illuminance =      Filter = 2

# BLU 結果



**1.1 millions of pyramids**

**50 millions rays**

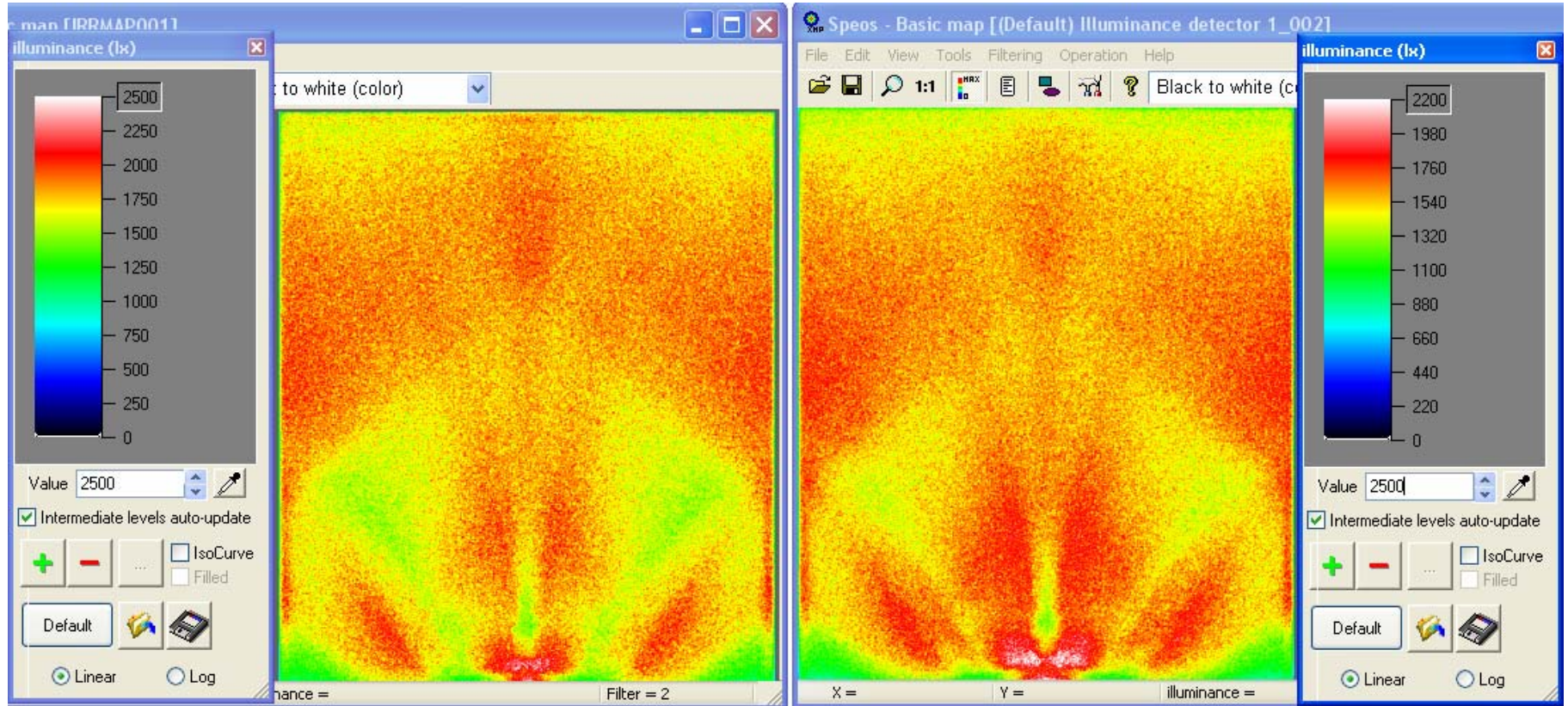
**8 hours (2 Xeon 3.2 GHz hyperthreading – 4 threads)**



# Speos / OptisWorks效能比對 (1/3)

Capabilities	Speos	OptisWorks
Pattern shape	Basic	Any CAD shape
Applied on	Flat surface	Any CAD surface
Surface quality (pattern / support)	Could be different	Could be different
Material (pattern / support)	Must be the same	Could be different
Position and orientation of patterns	Could be different for each pattern	Could be different for each pattern
Size of patterns	Could be different for each pattern	Could be different for each pattern
Boolean operation	Yes with the same material	All types
Number of patterns	N millions	NN millions
Memory usage	High	Low
Loading time	Long	Very fast
Simulation time	Normal	Very fast (up to 50 time faster)
Multithread	Not fully optimized	Optimized
64 bits version	No	Yes

# Speos / OptisWorks效能比對(2/3)

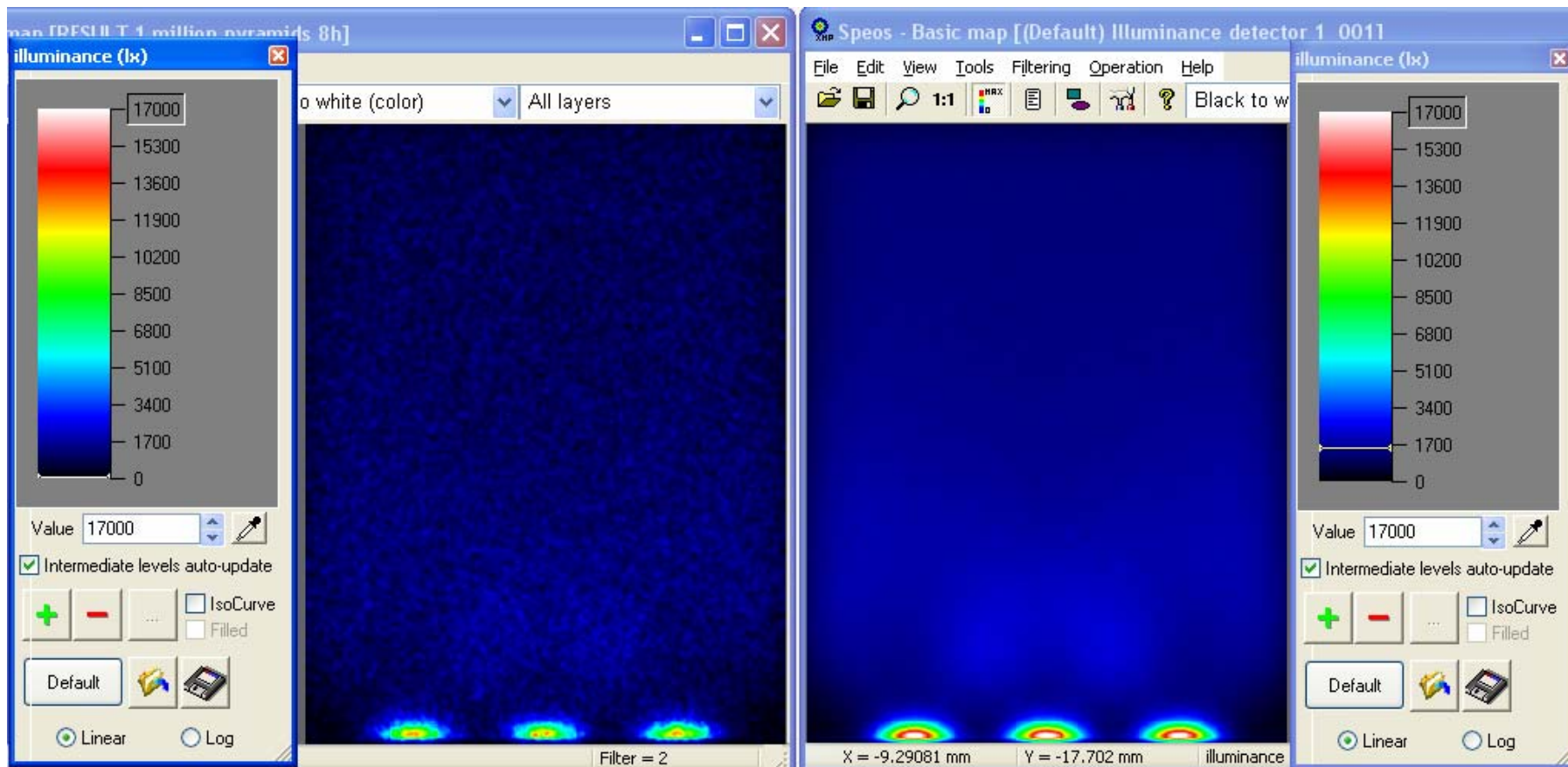


**Speos**  
**140 millions rays**  
**4 days 13 hours**

**OptisWorks**  
**140 millions rays**  
**2 days**

**2 Xeon 3.2 GHz hyperthreading – 4 threads**

# Speos / OptisWorks效能比對(3/3)



**Speos**  
**1 millions rays**  
**8 hours**

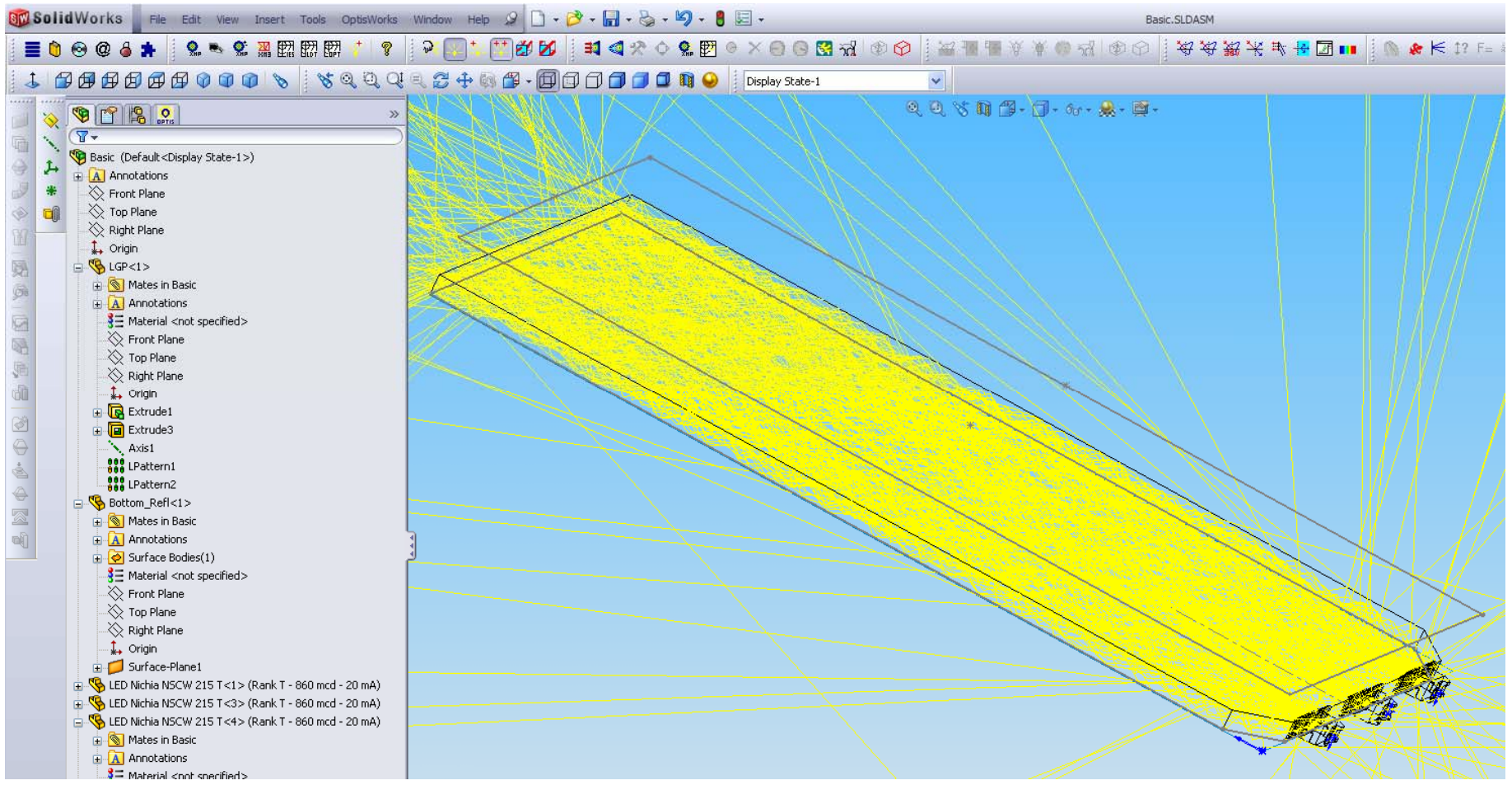
**OptisWorks**  
**50 millions rays**  
**8 hours**

**2 Xeon 3.2 GHz hyperthreading – 4 threads**



# Demo (1/2)

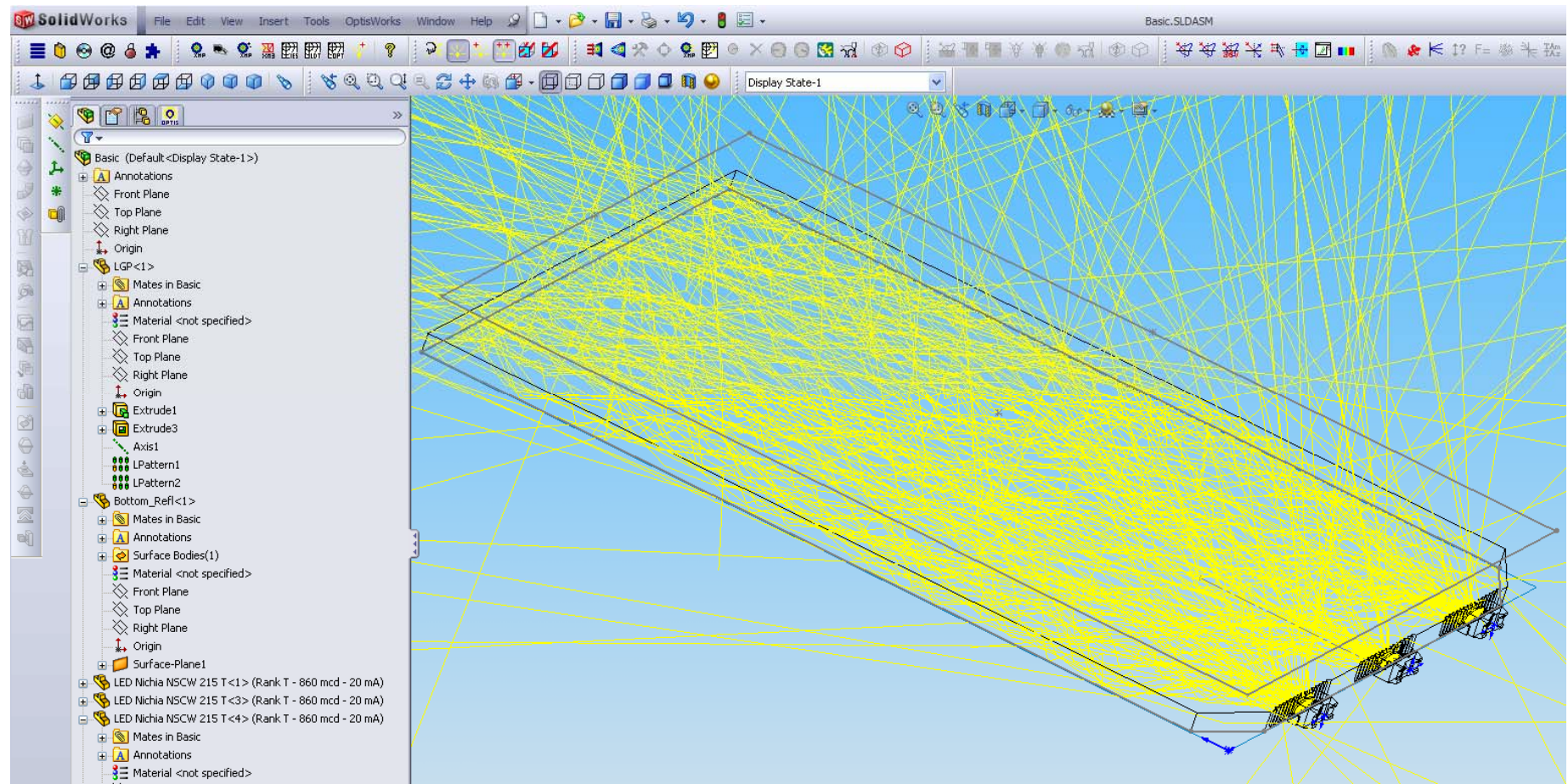
## ➤ 3D textures 結構未啓動





# Demo (2/2)

➤ 3D textures 結構已啟動





# 曲面微結構建構

