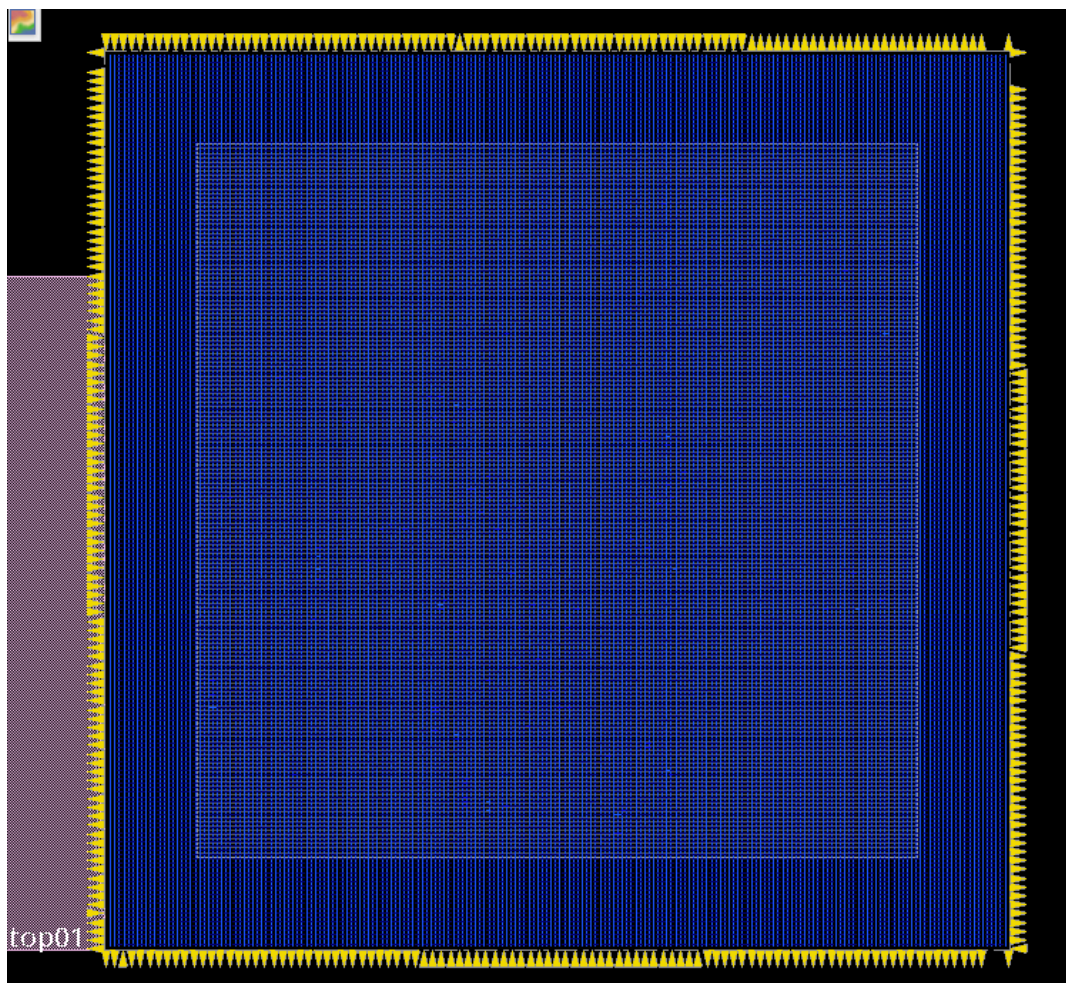## CS5120 Homework Assignment #5

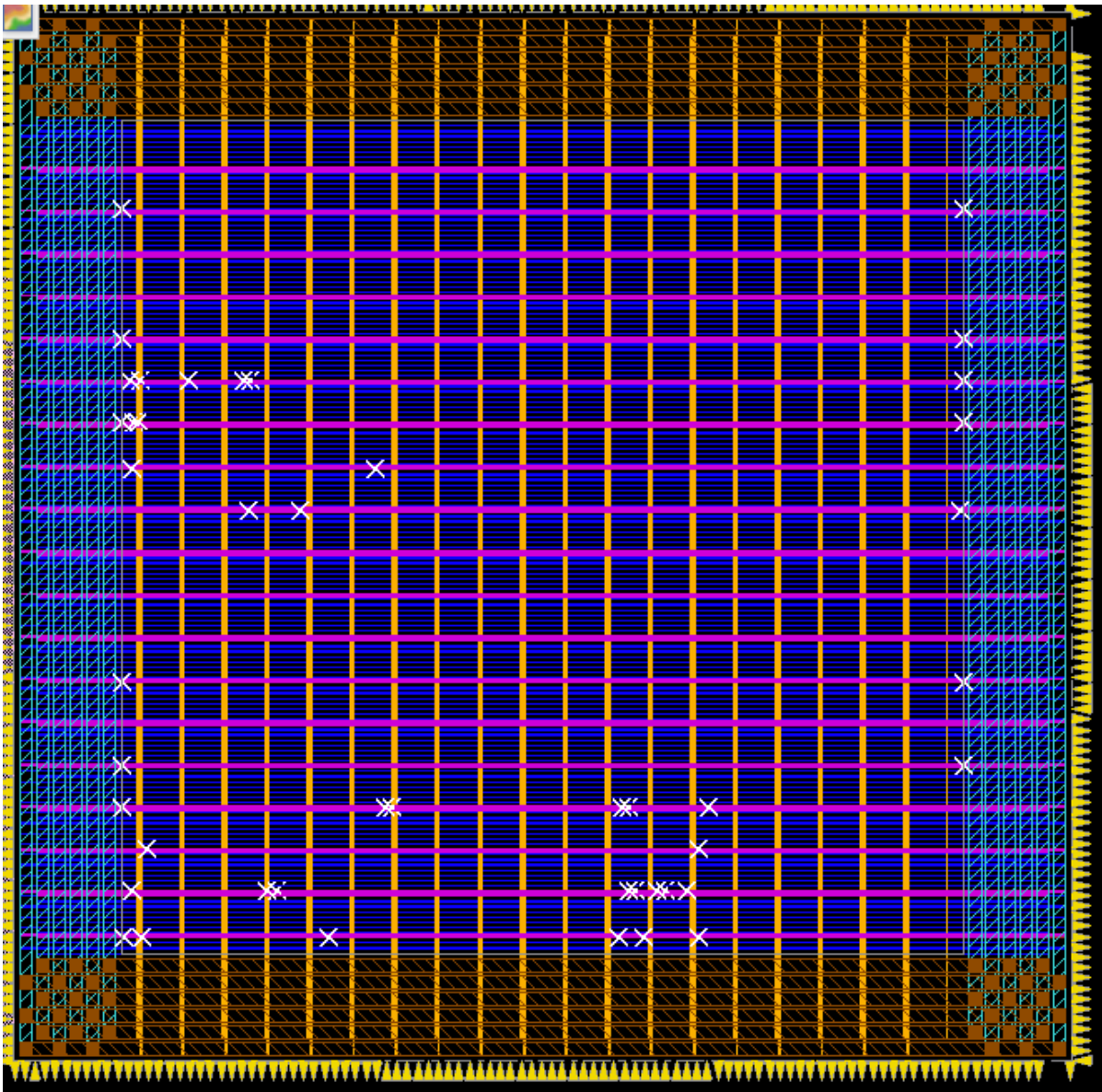Name: 王領崧   Student ID: 107062107

1 Congestion Map

因為大部分 overflow values 都是 negative，因此沒有明顯的 congestion 在這次的 design
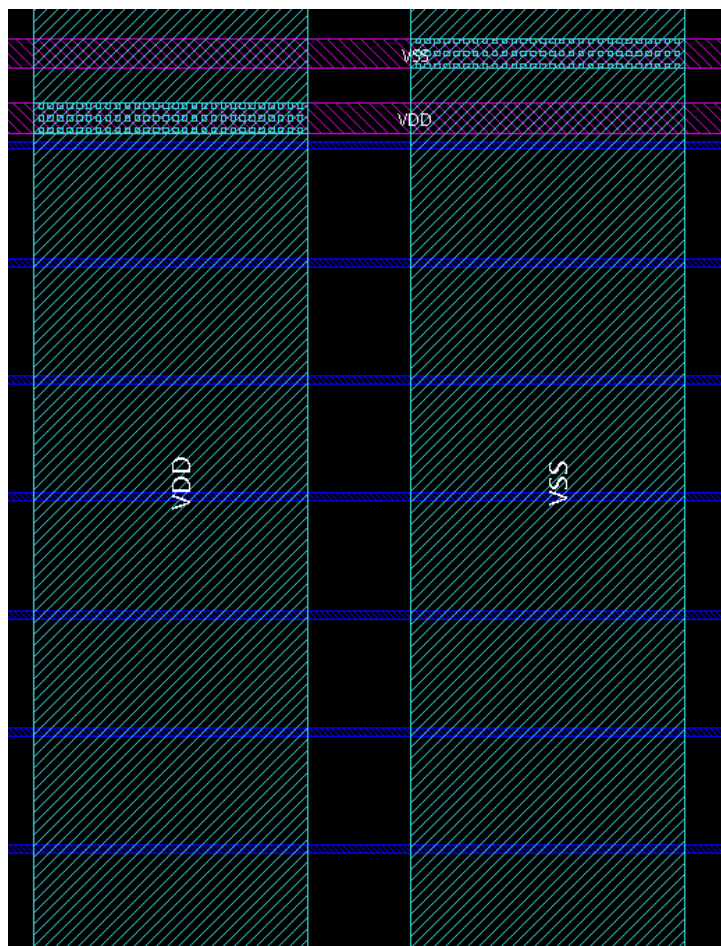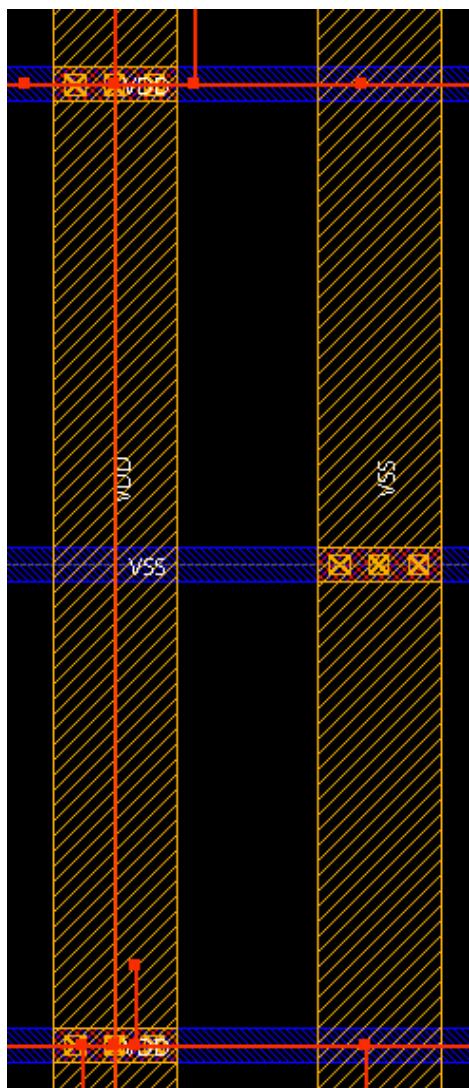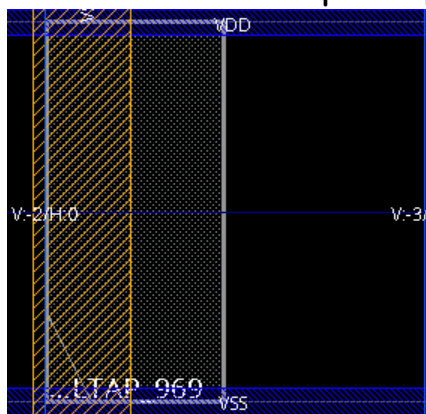
2 Power Rails

左圖為 connection between power ring & power strip

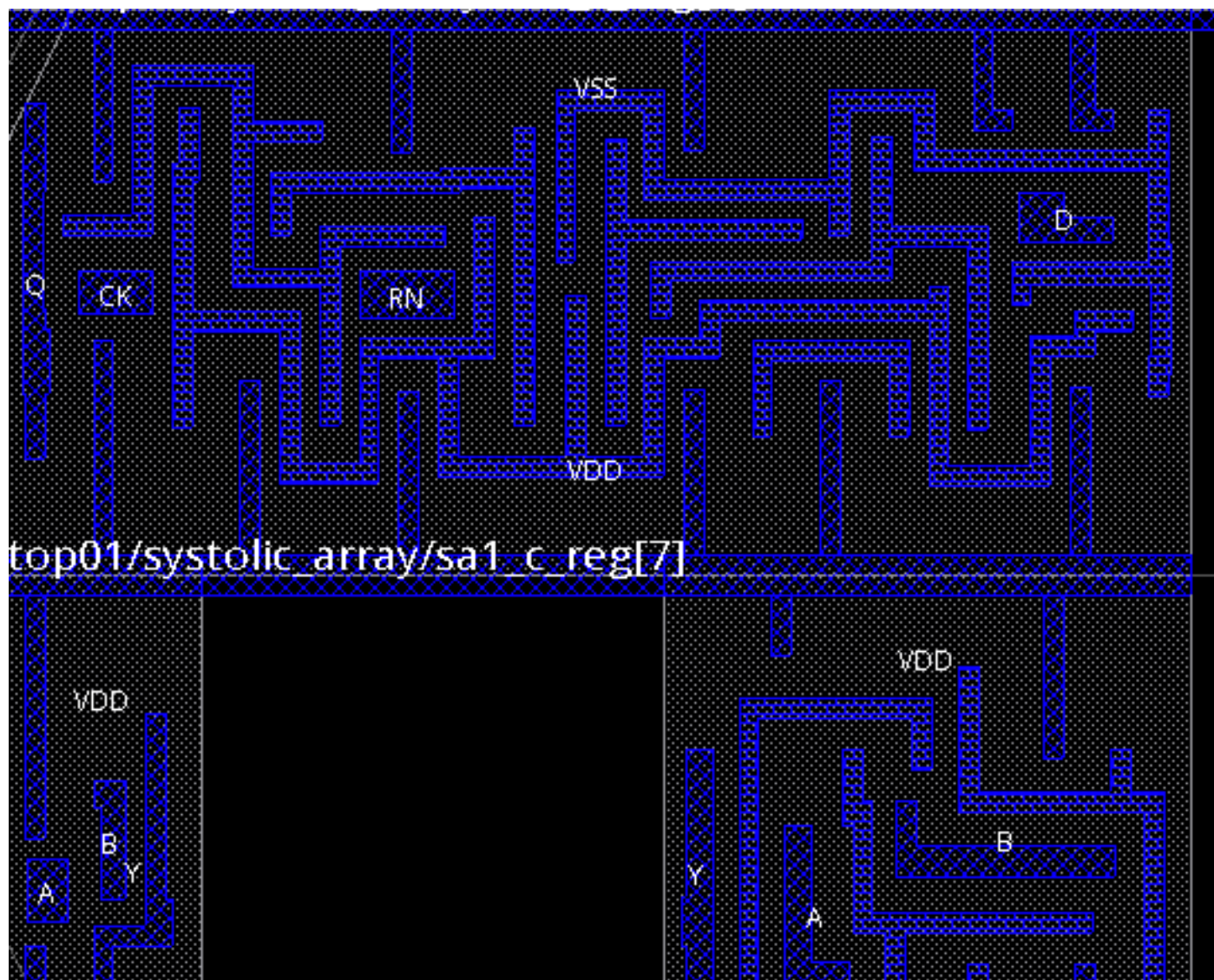右圖為 connection between power ring & core ring

Placement

Where are the Tap cell placed ?   在 VDD & VSS 間
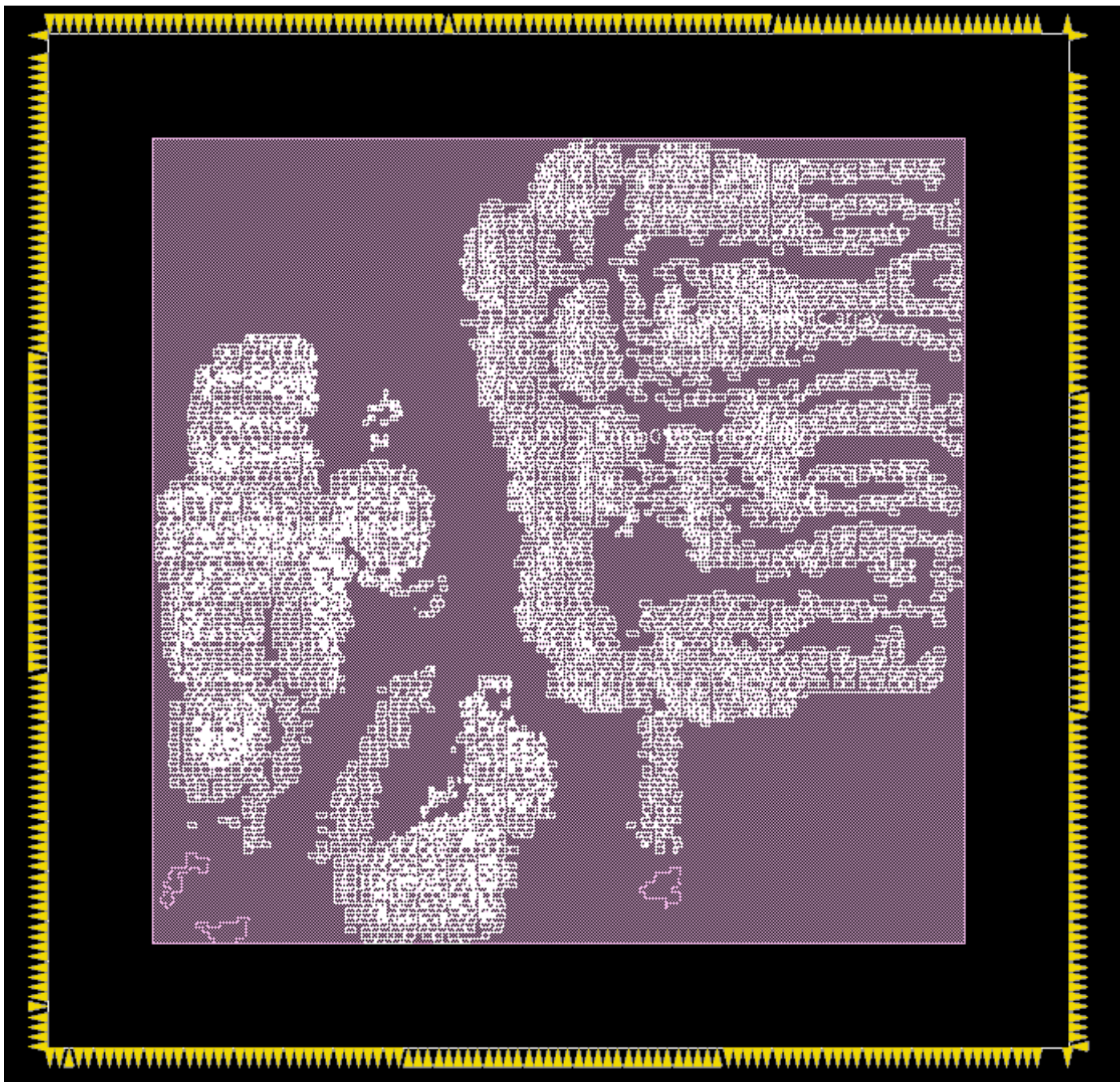
3 Power Ground Connect

Power / ground signals 會跟相同 row 的 cell 一起共享

4 Amoeba View

屬於同一個 module 中的 cell 會被 partition 在一起

power analysis result

Total internal power (mW)	1.0334
Total switching power (mW)	0.3928
Total leakage power (mW)	0.0048
Total power (mW)	1.43110

```
Total Power
----------------------------------------------------------------------------
Total Internal Power:        1.03347712            72.2153%
Total Switching Power:       0.39282668            27.4492%
Total Leakage Power:         0.00480180             0.3355%
Total Power:                 1.43110559
----------------------------------------------------------------------------
Ended Static Power Report Generation: (cpu=0:00:00, real=0:00:00,
mem(process/total/peak)=1290.96MB/2848.89MB/1407.18MB)
```
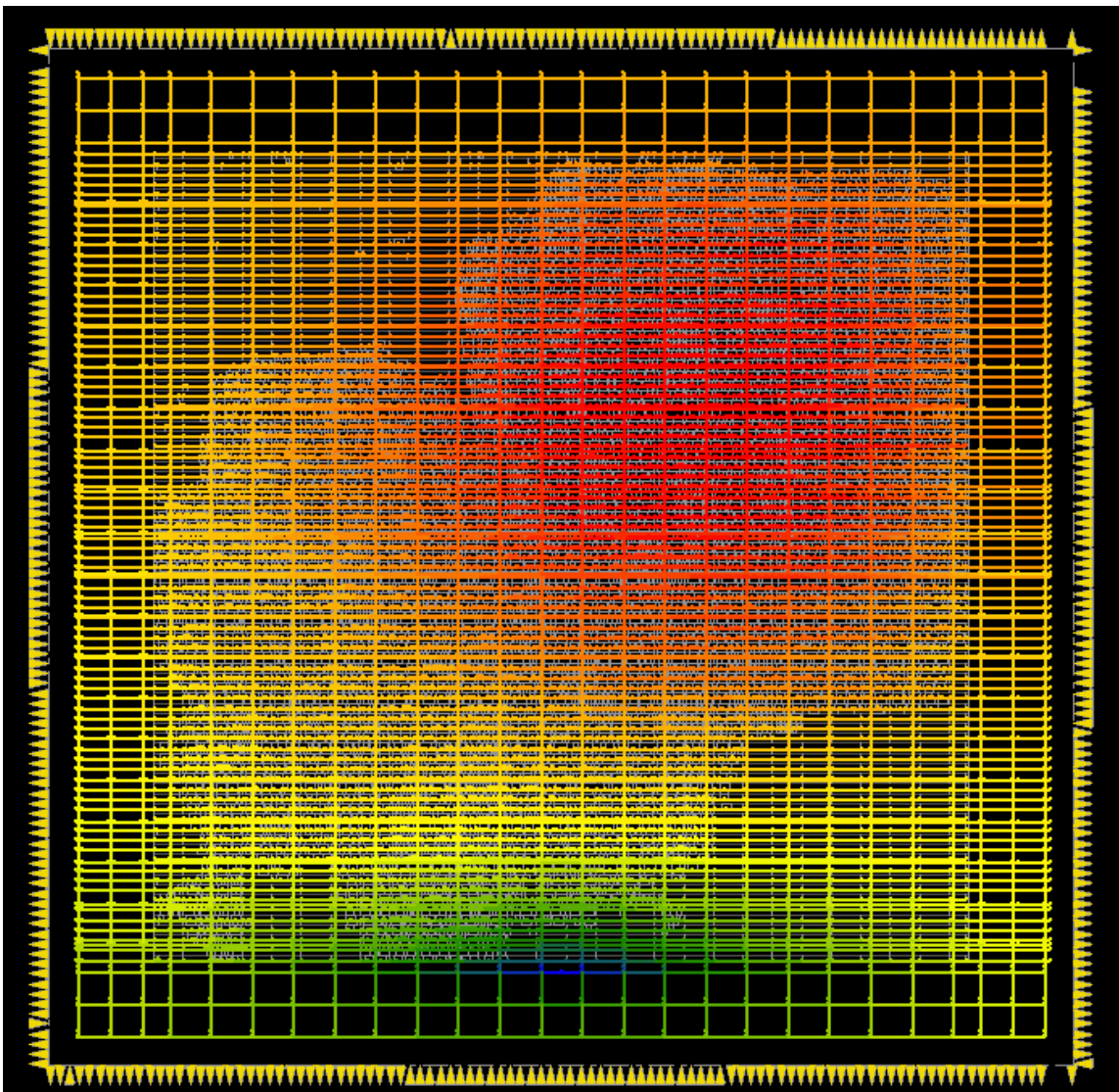
5 IR Drop

maximum ir drop is 0.00042901.

```
METAL_9: 0.00035844 [0 - 0.00035844]
METAL_8: 0.00034035 [1.8118e-05 - 0.00035847]
METAL_7: 0.00042901 [2.5834e-05 - 0.00045484]
METAL_6: 0.00042311 [3.316e-05 - 0.00045627]
METAL_5: 0.00036707 [9.2161e-05 - 0.00045924]
METAL_4: 0.00036762 [9.4784e-05 - 0.00046241]
METAL_3: 0.00036818 [9.7407e-05 - 0.00046558]
METAL_2: 0.00036873 [0.00010003 - 0.00046876]
METAL_1: 0.00037281 [0.00010265 - 0.00047546]
```

6 Core Utilization

Final utilization : 53.517

```
Reporting Utilizations.....

Core utilization  = 53.517263
Effective Utilizations
Average module density = 0.515.
Density for the design = 0.515.
      = stdcell_area 109027 sites (37287 um^2) / alloc_area 211884 sites (72464 um^2).
Pin Density = 0.2111.
          = total # of pins 46722 / total area 221280.
*** Message Summary: 0 warning(s), 0 error(s)
```

7 Post-layout Simulation

```
80: -2016
81: 11665
82: 7611
83: -479


The hardware time usage: 715

Cycle counter ........14868506
Instruction counter .. 2264678
CPI: 6.56
Status:DONE
```

8 LEC Result

```
0 unmapped points reported
// Command: usage
CPU time      : 1.95    seconds
Memory usage : 219.79  M bytes
// Command: report compare data -nonequivalent
0 Non-equivalent point(s) reported
0 compared point(s) reported
===========================================================================
Compared points      PO      DFF        Total
---------------------------------------------------------------------------
Equivalent           231     1869       2100
===========================================================================
// Command: exit -force
```

9 Pre-layout Power Analysis

'pre layout power report.rpt'

10 Post-layout Power Analysis With Post-sim Waveform

'post sim power report.rpt''

11 Post-layout Power Analysis With Pre-sim Waveform

'pre_sim_power_report.rpt'

12 Average Post-layout Power Analysis With Post-sim Waveform

'conv averaged power report.rpt'