OpenPICs WP3

Agenda - Part I (start 14:00)

1. **Last meeting's action points**
2. **Progress and issues to be raised per partner**
   a. **TU/e**
   b. **Smart Photonics**
   c. **Bright Photonics**
   d. **Effect Photonics**
   e. **Technobis**
3. **Summary**

Action points

Nr.	Description	Responsible
1.	**Planning WP3 design on MPW** Revision of chip allocation for WP3 on MPW runs	
2.	**Allocation for test structures** If space is available or urgent test of designs is important, 1 month before the tape-out, notice should be given to Smart to include said designs.	Ronald, Weiming
3.	**Mode mismatch issue Triplex-InP** Contact Lionix to work out solutions for the mode mismatch problem discussed between Smart MPW chips and Triplex chips.	Ronald
4	**Standardization of pad layout for both wafer and die tester** Assure the compatibility of test cells for wafer and die tester. Keep aligned with PixApp standards.	Rui, Weiming

Review Report

Open Innovation Photonic ICs

OpenPICs

Technical Summary Report

(09/2016 – 06/2017)

Europese Unie

Europees Fonds voor Regionale Ontwikkeling

OPZuid

Europees Innovatieprogramma Zuid-Nederland

JePPIX

Photonic Integration Technology Centre

PhotonDelta

Integrated Photonics Ecosystem

CO Confidential, only for members of the consortium CO

Table of Contents

TABLE OF CONTENTS 2
INTRODUCTION 3
WORK PACKAGE 1 - MARKET DEMANDS 4
Milestone Summary (WP1.M1): Linking Products to Building Blocks 5
Milestone Summary (WP1.M2): Survey of requirements and building blocks 6
Milestone Summary (WP1.M5): Training and Outreach 7
WORK PACKAGE 2 – PROCESS CHARACTERISATION 8
Milestone Summary (WP2.M0.1): WP2 Project Charter 9
Milestone Summary (WP2.1.M1.2): Generic MPW Planning & Update Q3'16 - Q2'17 Data 11
Milestone Summary (WP2.1.M1.1): List of Generic MPW parameters for data monitoring and improvement 12
Milestone Summary (WP2.1.M1.2): Generic MPW Parameters – Update Q2-2017 13
Milestone Summary (WP2.1.M1.1): Generic BB Improvements – Metallization Lift-off 14
Milestone Summary (WP2.2.M2.1): Generic BB Improvements: Threshold Current & Passivation - Dielectric Material Quality 15
Milestone Summary (WP2.2.M2.2): Generic BB Improvements Threshold Current & Passivation – Integration Improvement 16
WORK PACKAGE 3 – BUILDING BLOCK IMPROVEMENT 17
Milestone Summary (WP3.1.M0): Technology and Design Concept – Modulator 18
Milestone Summary (WP3.1.M0): Technology and Design Concept - RF Lines 19
Report Summary (WP3.1.R0): Analysis and Design - Modulator 20
Report Summary (WP3.1.R0): Analysis and Design – RF Line 21
Milestone Summary (WP3.1.M1): Mask Design Tape Out - Modulator 22
Milestone Summary (WP3.1.M1): Mask Design Tape Out – RF Line 23
Milestone Summary (WP3.2.M0): Report on the current state of the PDK and issues list 24
Milestone Summary (WP3.2.M1): Figure of Merit for the building blocks from MPW SMART PDK 25
Milestone Summary (WP3.2.M2): Definition of Composite BB Figure of Merits 26
Report Summary (WP3.2.R0): Definition of Measurement Procedures 27
Report Summary (WP3.3.R0): Design of Standard MPW Building Block Test Cell 28
Milestone Summary (WP3.4.PDA.M0): Development of PDAFlow Template 29
Report Summary (WP3.5.R0): 400G transmitter concept 30
Report Summary (WP3.5.R1): Demonstrator Sensing 31
WORK PACKAGE 4 – PROCESS IMPROVEMENT 32
Milestone Summary (WP4.M1.1): Specific tasks and milestones defined; WP started. (WP4.M1.2): Quantifiable criteria for each milestone defined 33
Milestone Summary (WP4.M3.1): Zn-diffusion time determined: ready for joint MPW validation 34
Milestone Summary (WP4-M5.1): DUV lithography introduced to MPW 35
PARTNERS 36

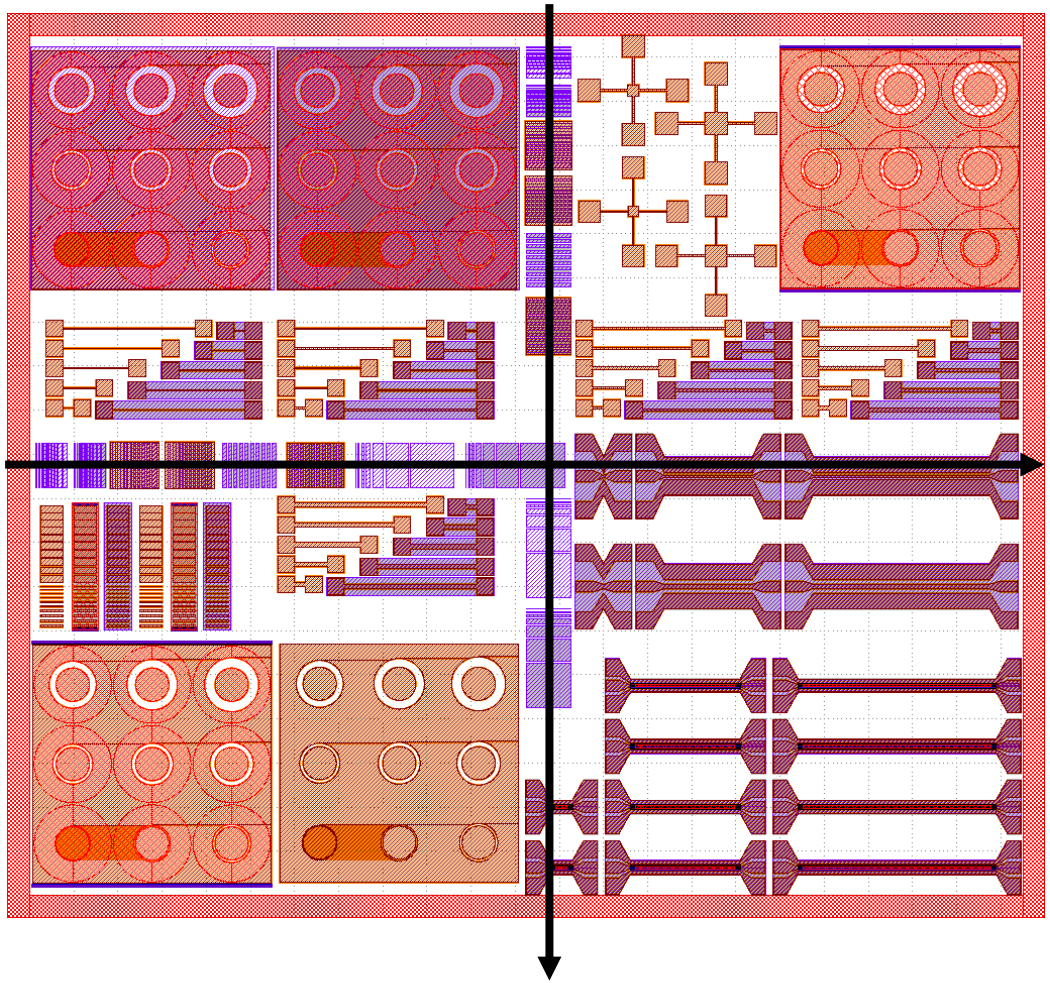
- 3 MS in WP1
- 7 MS in WP2
- 14 Items in WP3
- 3 MS in WP4

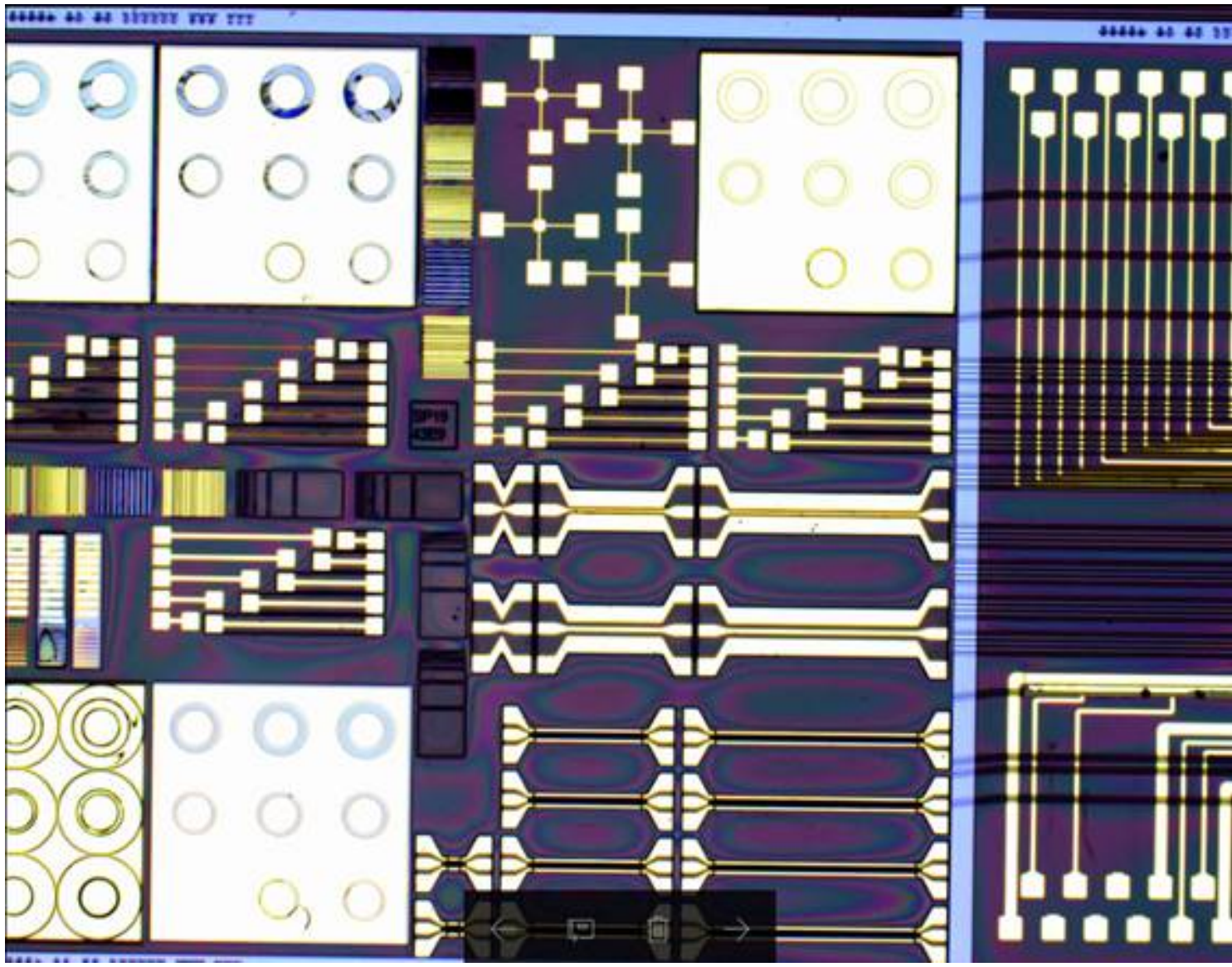
- 36 page report

Review Meeting

- the face-to-face meeting for the OpenPICs project will be on **August 29, 2017, from 9:00 to 13:00.**
- FLX 9.181
- Nicole Derksen from Stimulus will attend

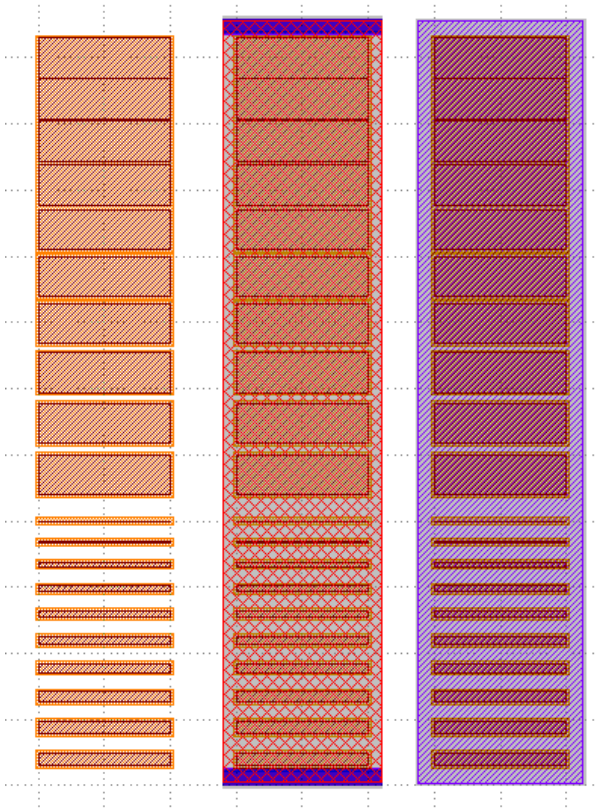
SP 19



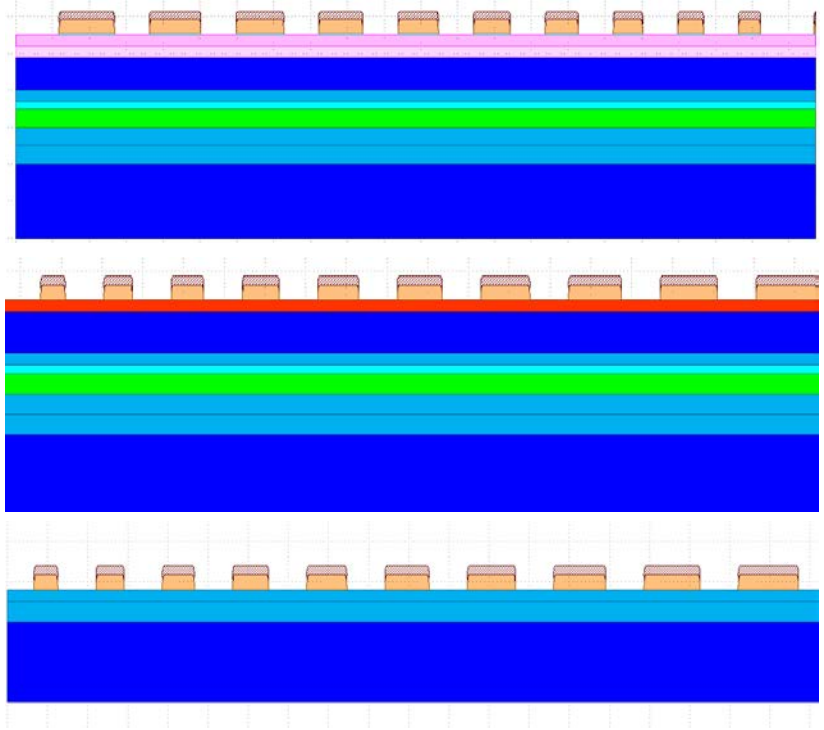


WP 3.3 BB Characterization – metal, recess resolutions

Metal definition



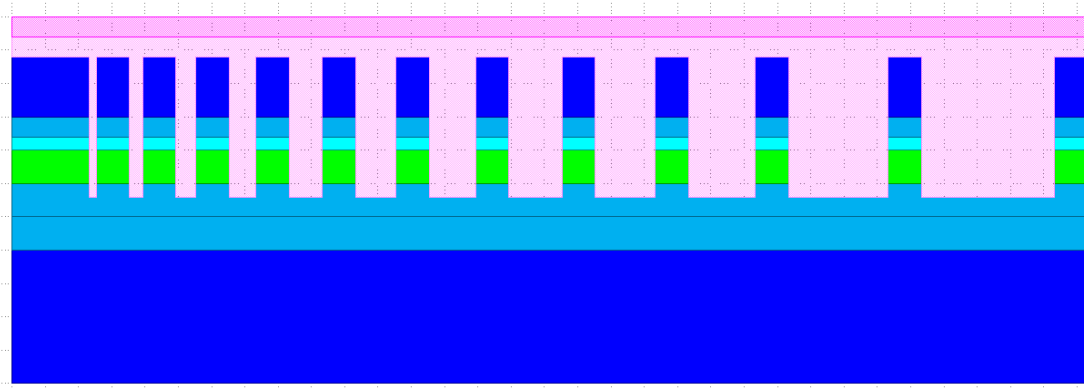
1 µm – 2 µm --… 12 µm



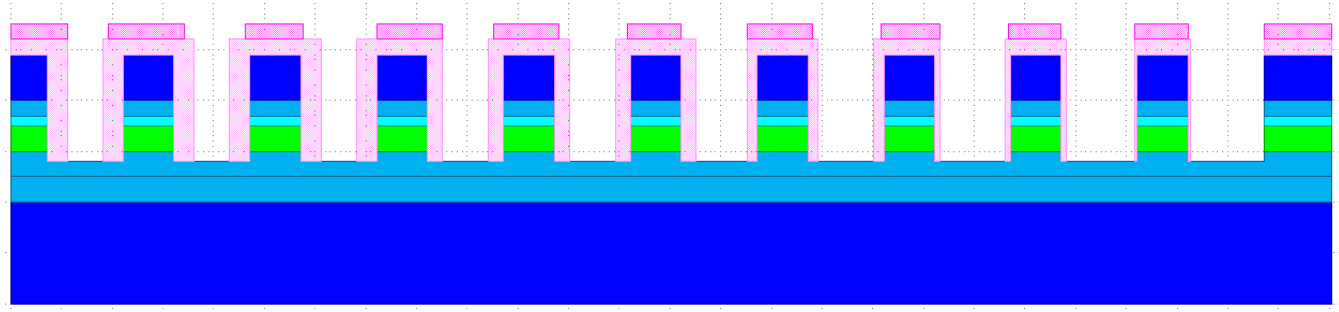
- Microscope in CR
- SEM ?

SEM or other means?

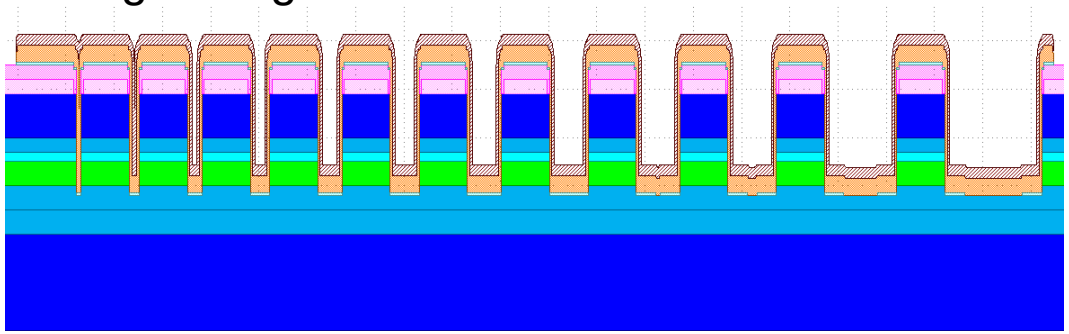
Deep and shallow trenches

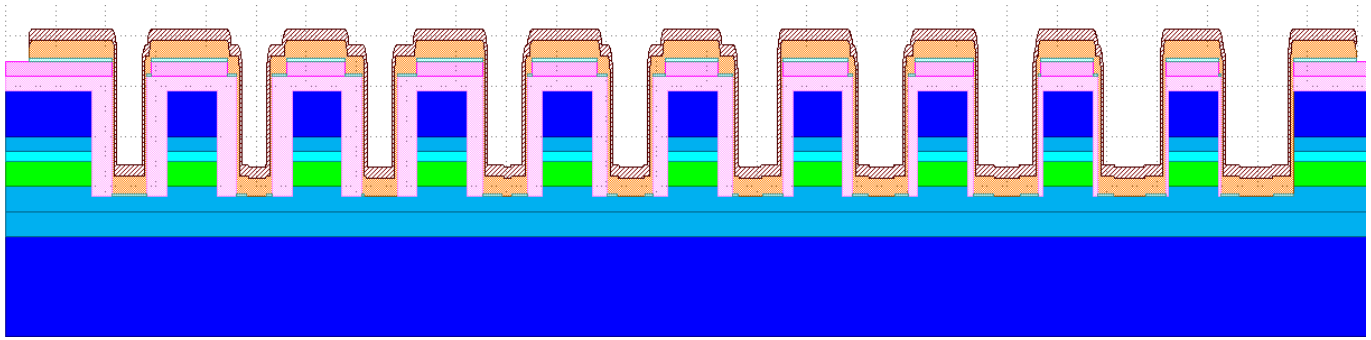


Varying apertures for polyopen + plating test



Plating through trenches

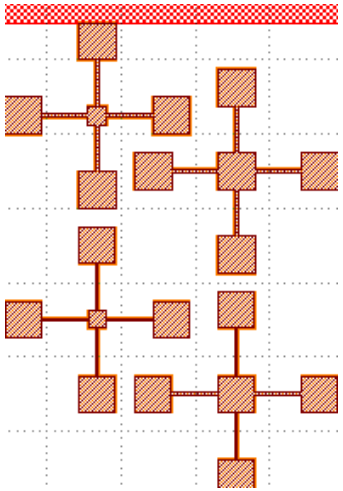




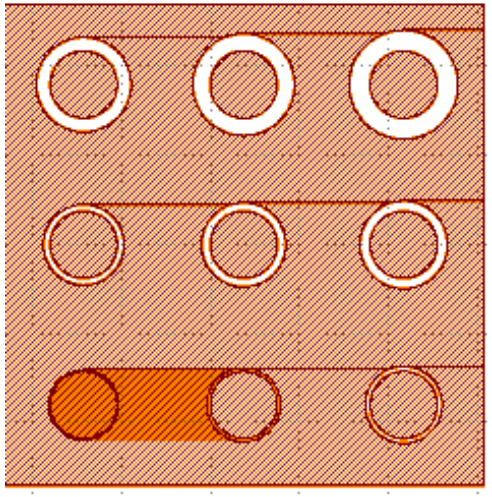
Standard SEM settings

Series resistance

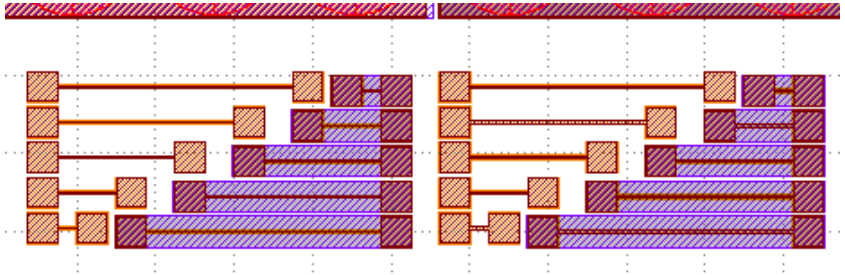
4 point Van de Pauw



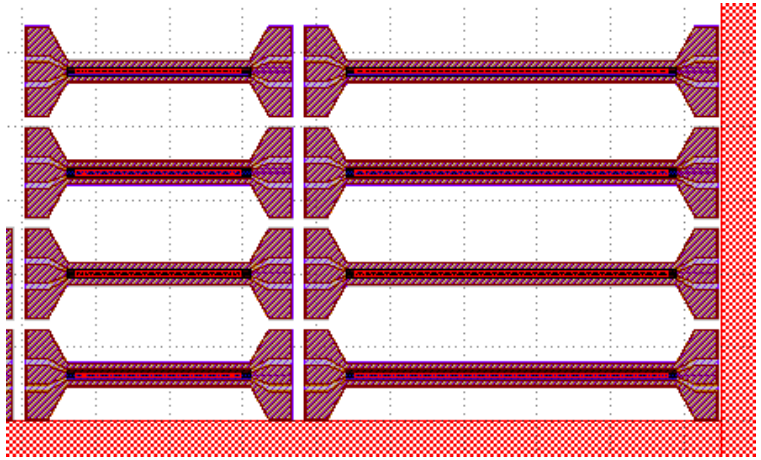
Contact resistance + sheet



DC series resistance

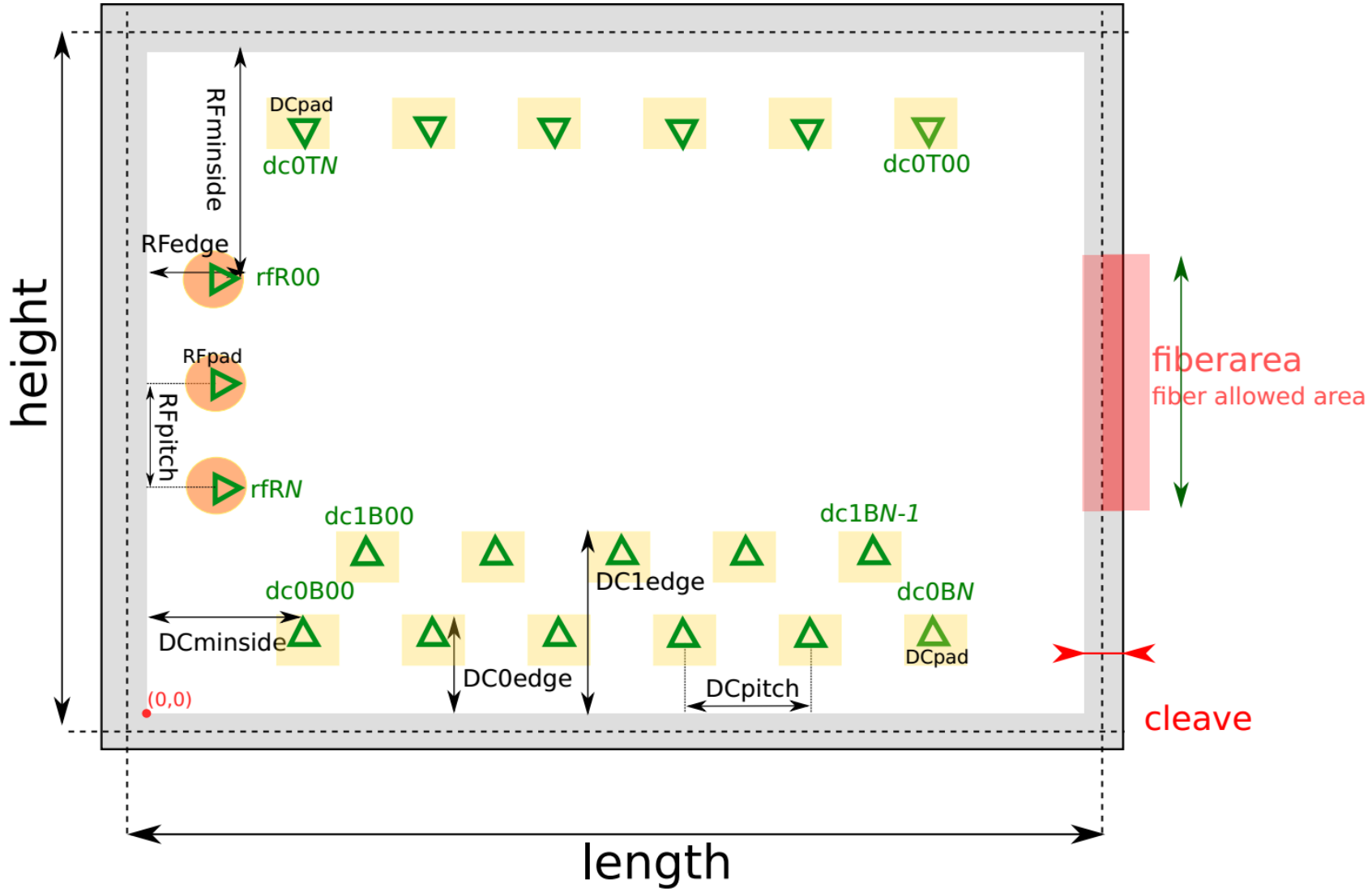


RF frequencies

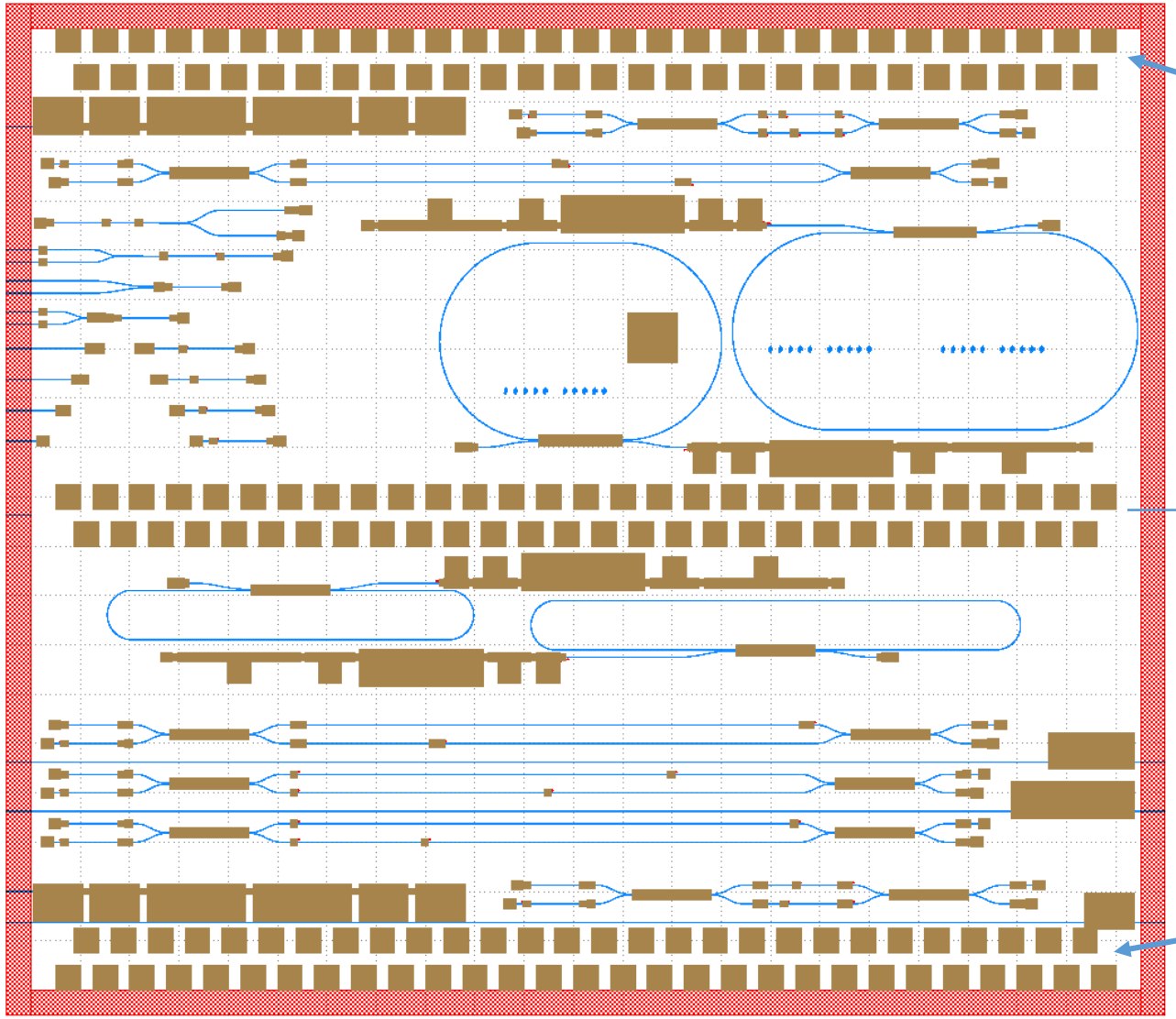


- VNA measurements

PixApp Standard Naming Convention



Applied to SP20

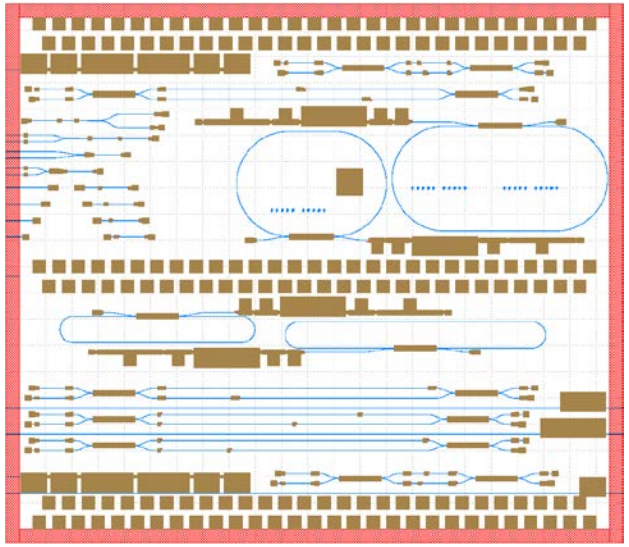


dc0T29 … dc0T00
dc1T28 … dc1T00

Non-conform
dc0M00
dc1M00

dc1B00 … dc1B28
dc0B00 … dc0B29

Idea of CDF and MDF



Chip Description File

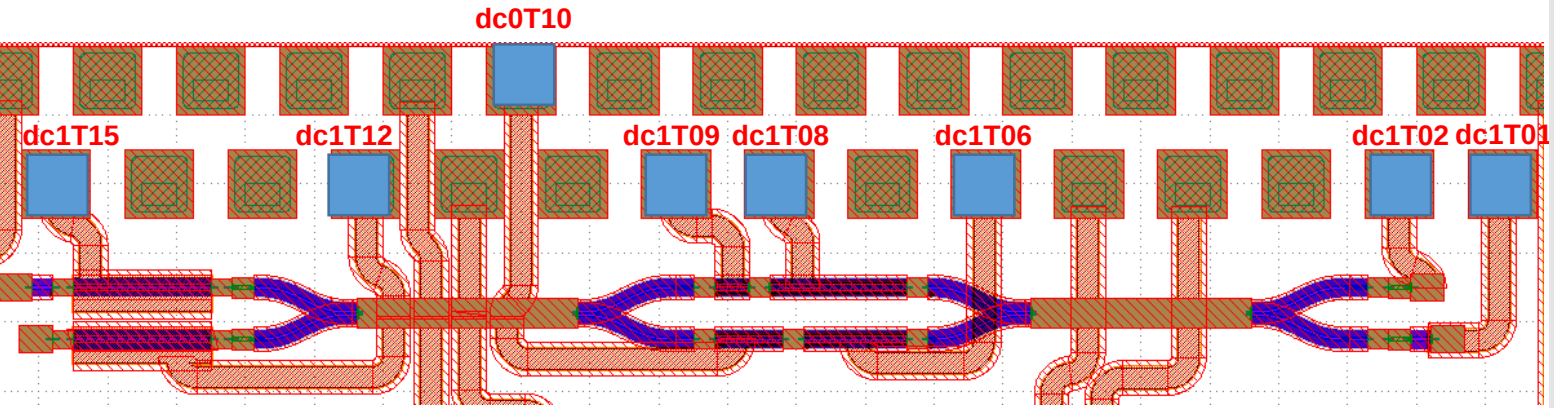
Chip Measurement File

Yet Another Markup Language (YAML)

- Contain wafer ID, chip ID
- Contain positions of measurement pads
- Additional information

```
Power Measurement: My measurement results
chip_name: SMART test chip
measurement_points:
- {UL: 0, UR: 4700.01, VL: 100, VR: 100, file_string: parameter1, id: 1, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 125, VR: 125, file_string: parameter1, id: 2, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 150, VR: 150, file_string: parameter1, id: 3, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 200, VR: 200, file_string: parameter1, id: 4, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 350, VR: 350, file_string: parameter1, id: 5, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 400, VR: 400, file_string: parameter1, id: 6, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 450, VR: 450, file_string: parameter1, id: 7, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 500, VR: 500, file_string: parameter1, id: 8, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 1100, VR: 1100, file_string: parameter1, id: 9, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 1150, VR: 1150, file_string: parameter1, id: 10, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 1200, VR: 1200, file_string: parameter1, id: 11, measurement_type: powermeasurement}
- {UL: 0, UR: 4700.01, VL: 1250, VR: 1250, file_string: parameter1, id: 12, measurement_type: powermeasurement}
reference_points:
- {UL: 0, UR: 4700.01, VL: 0, VR: 0}
- {UL: 0, UR: 4700.01, VL: 1275, VR: 1275}
units: um
```

Measurement Procedure



- SOA in forward bias
- Detector in reverse
- Sweep phase voltage/current
- Measure photocurrent

```
Structure: DpEOPMEfficiency
chip_name: SMART test chip
num_pads: 8
num_meas: 8
measurement_runs:
    Run1:
        Source:
        - {type: sweep, pad: dc1T09, stimulus: voltage, range: -5 to 0}
        - {type: fix, pad: dc1T15, stimulus: current, range: 50}
        - {type: fix, pad: dc1T12, stimulus: current, range: 0}
        - {type: fix, pad: dc1T08, stimulus: voltage, range: 0}
        - {type: fix, pad: dc1T06, stimulus: voltage, range: 0}
        - {type: fix, pad: dc1T02, stimulus: voltage, range: -2}
        - {type: fix, pad: dc1T01, stimulus: voltage, range: -2}
        - {type: fix, pad: dc0T10, stimulus: voltage, range: 0}
        Measure:
        - {pad: dc1T15, meas: voltage}
        - {pad: dc1T12, meas: voltage}
        - {pad: dc1T09, meas: current}
        - {pad: dc1T08, meas: current}
        - {pad: dc1T06, meas: current}
        - {pad: dc0T10, meas: current}
        - {pad: dc1T02, meas: current}
        - {pad: dc1T01, meas: current}
        .
        .
        .
max_ratings:
- {pad: dc1T15, voltage: 20, current: 50}
.
.
.
unitsA: mA
unitsB: V
```

Agenda - Part II (start 15:00)

1. **Last meeting's action points**
2. **Progress and issues to be raised per partner**
   a. **TU/e**
   c. **Bright Photonics**
   d. **Phoenix**
3. **Summary**

Action Points

Nr.	Description	Responsible
1.	**Measurement Template** Draft measurement template for capturing meta data using mark-up language such as Jasen. This will be useful for both efficient storing and exchange of measurement data.	Weiming
2.	**Library management** JePPIX should have an overview of library components with information that it can offer during the MPW ordering procedure.	

Measurement Template

Use YAML
Yet another markup language

Measurement

- Environment
  - Temperature
  - Operator
  - Time stamp
- Chip under Test
  - Run ID
  - Wafer ID
  - Die ID
  - ← Designer, Simulation data etc, Additional info
- Device under Test
  - Device structure
  - Measurement type
  - Input output range
  - ← Designer, Simulation data etc, Additional info
- Setup
  - Setup ID
  - Timestamp
  - Calibration ID
  - ← State of equipment, Parts used, Calibraiton data
- Raw Data
  - Format
  - Storage

Example of JSON and YAML

JSON

Example Response

```
Status: 200 OK

{
  "groups": [
    {
      "name":       "DJs",
      "created_at": "2009-05-13T00:07:08Z",
      "updated_at": "2011-07-22T00:11:12Z",
      "id":         211
    },
    {
      "name":       "MCs",
      "created_at": "2009-08-26T00:07:08Z",
      "updated_at": "2010-05-13T00:07:08Z",
      "id":         122
    }
  ]
}
```

YAML

```yaml
---
key: value
map:
    key1: "foo:bar"
    key2: value2
list:
  - element1
  - element2
# This is a comment
listOfMaps:
  - key1: value1a
    key2: value1b
  - key1: value2a
    key2: value2b
---
```