# First results from ITEP Molded Tiles with Dimple

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Calorimeter for ILC

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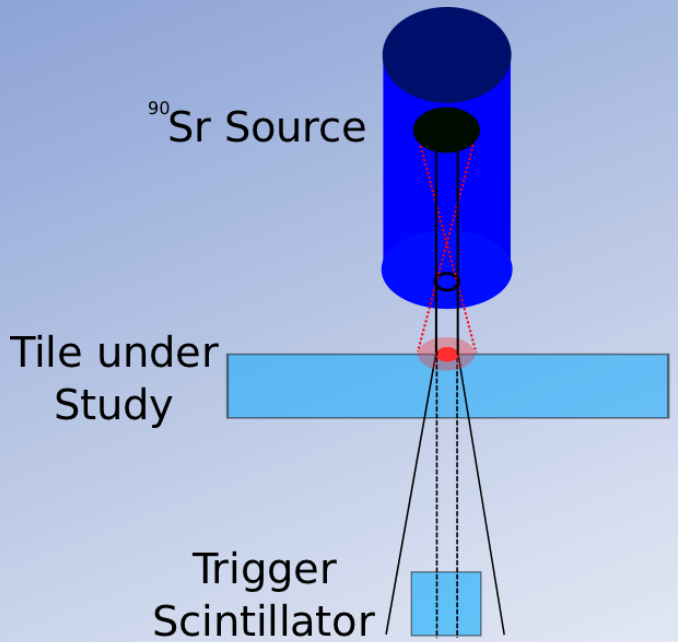
# Outline

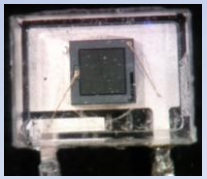
- The scanning setup
- The dimpled DESY tile
- The injection molded ITEP tile
- Summary and Outlook

# The Scanning Setup

## The Scanning Setup:

- Sr90 Source with end point energy of 2.27MeV
- Coincidence trigger to ensure penetration of tile under study
- Air conditioning to ensure temperature stability
- Use T3B DAQ to acquire Sr90 Data and T3B calibration chain:
  - Scan: 500 Events at 65x65 positions

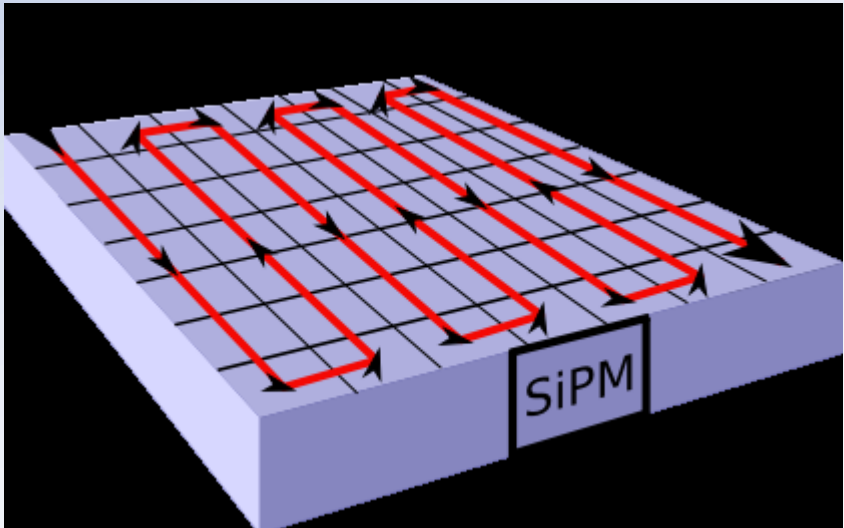


## The Cells:

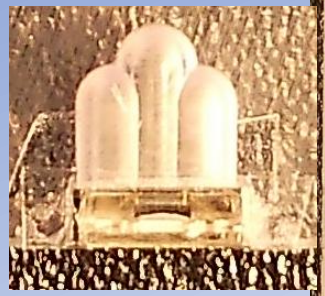
- Tile dimensions: 3x3x0.3 $cm^3$
- Directly couple (air gap) MPPC-50P with translucent casing to tile
- Overvoltage adjusted to 1pe peak @ 5mV

→ Compare DesyTile with ITEPs new injection molded tiles

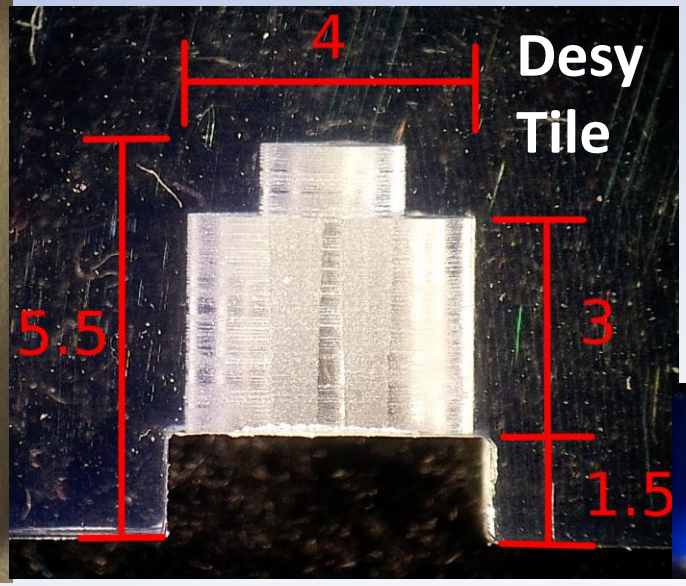


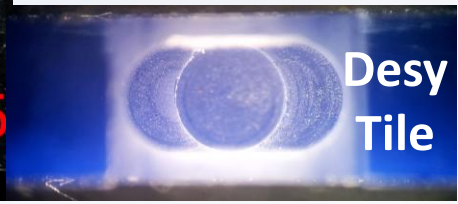
# The MPI DESY Tile

- Uniformity optimization:
  → Dimple of special shape drilled into the tile
  (unsuitable for mass production)
- completely enclosed by 3M mirror foil
- Scintillator material: Bicron-SCSN38







# The MPI DESY Tile

**Left:**

Mean signal height plotted vs. the XY-Position

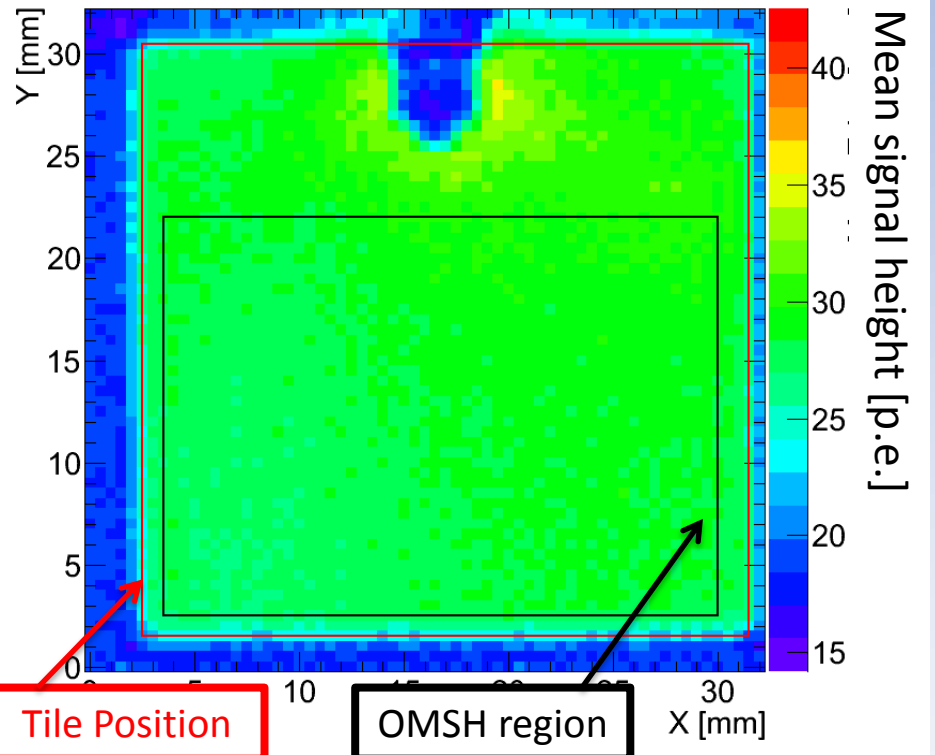
Z-range +-50% of the overall mean signal height for a fair comparability to other tiles

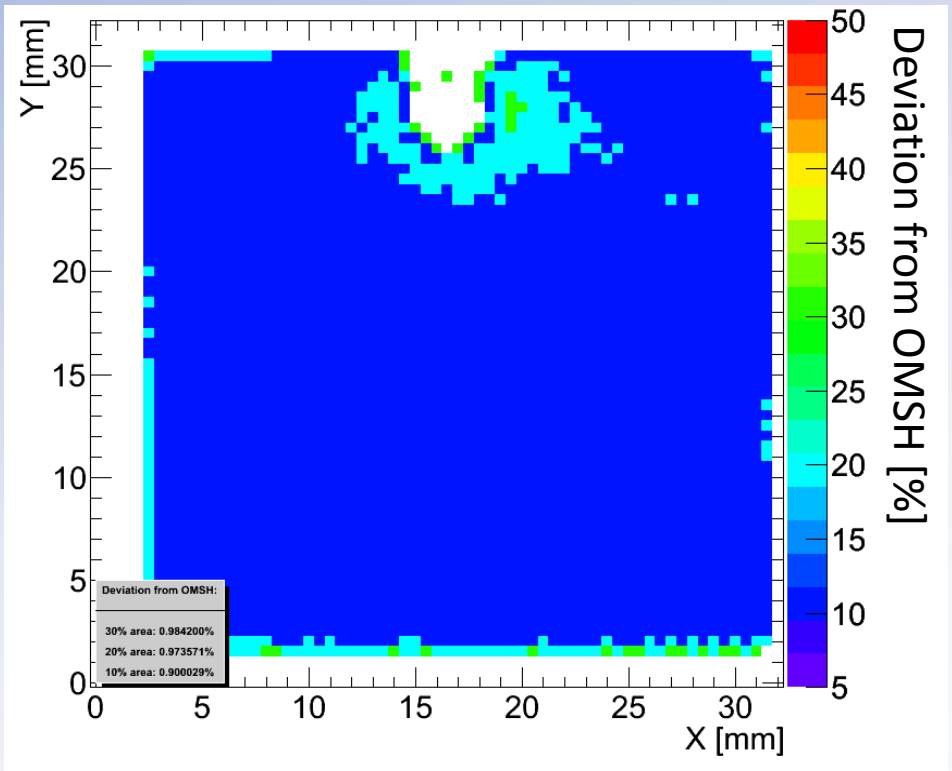
**Right:**

Deviation from OMSH vs. the XY-Position

**Overall mean signal height: 28.4 p.e.**

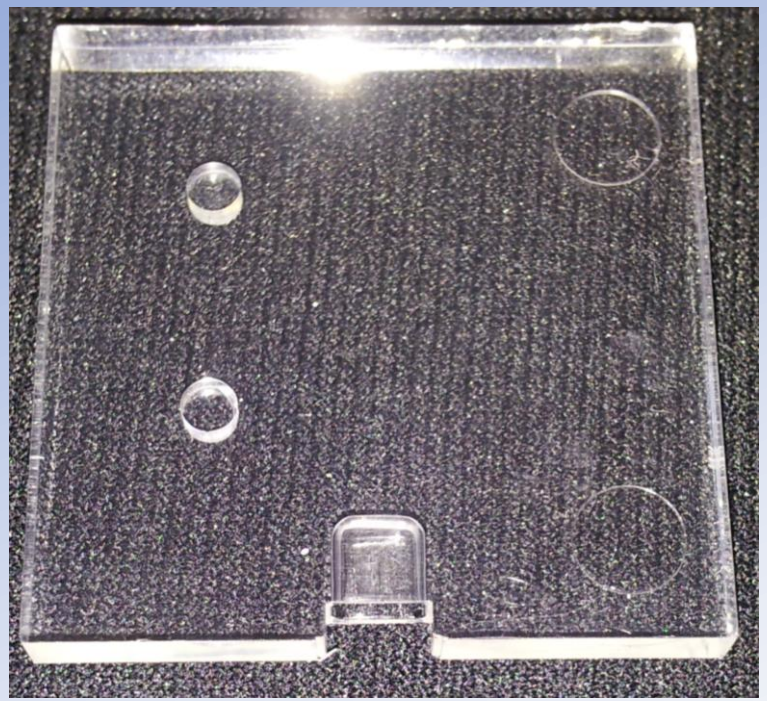
| Deviation from OMSH | Tile area within this deviation |
|---|---|
| **30** % | 98.4 % |
| **20** % | 97.4 % |
| **10** % | 90 % |



# The MPI ITEP Tile

- Special machine allows tile fabrication through injection molding
  - → Spacer inserted during freeze out
  - → Allows (in principle) automized fabrication with special shaped dimple that optimizes tile uniformity and with lego alignment pins
- In contrast to drilling: Dimple is very translucent
- Test Tile 1: completely enclosed by 3M mirror foil



# The MPI ITEP Tile

**Left:**

Mean signal height plotted vs. the XY-Position

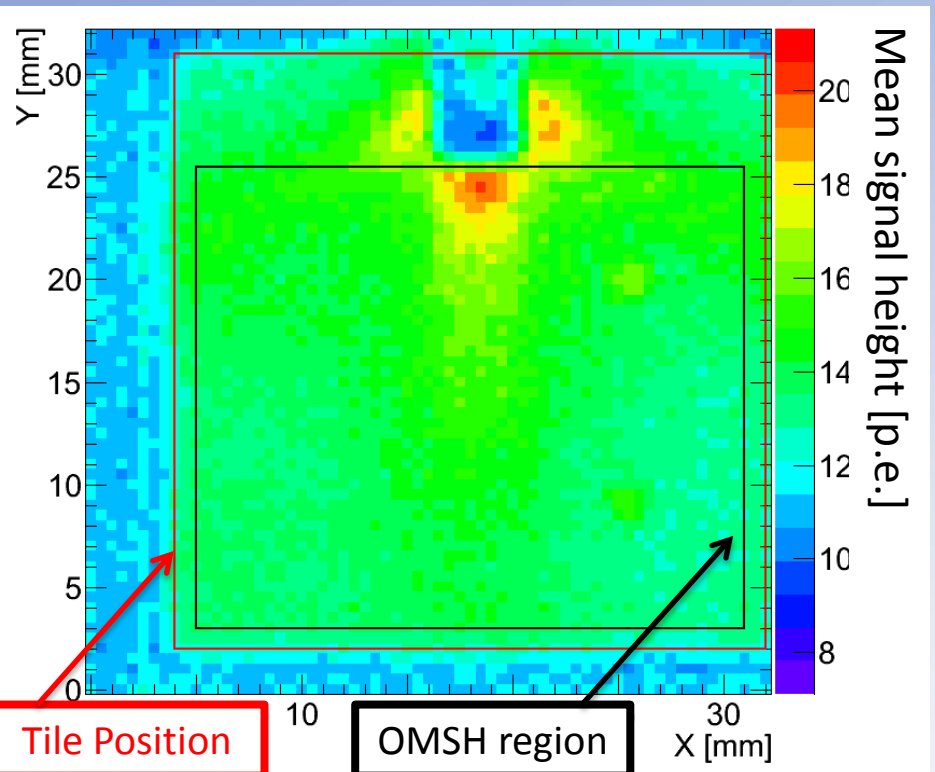
Z-range +-50% of the overall mean signal height for a fair comparability to other tiles

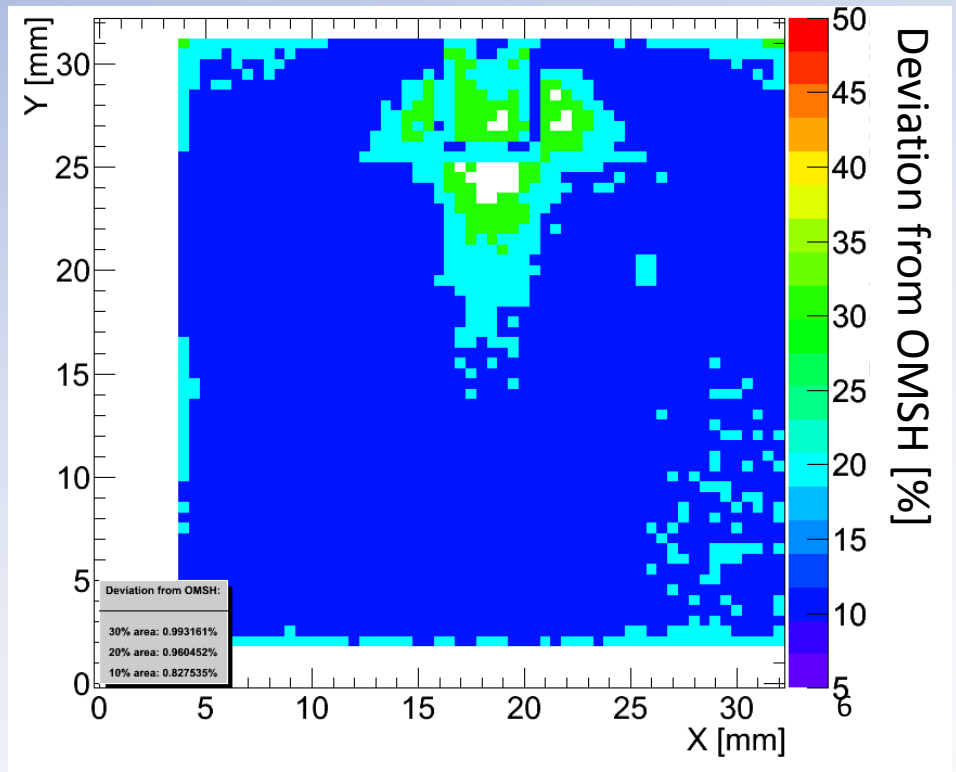
**Right:**

Deviation from OMSH vs. the XY-Position

**Overall mean signal height: 14.2 p.e.**

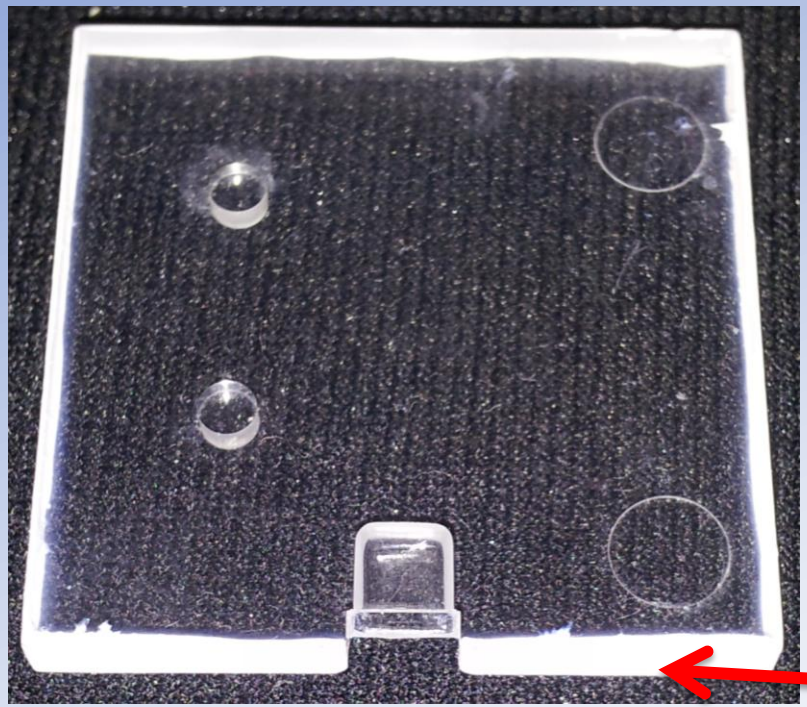
| Deviation from OMSH | Tile area within this deviation |
|---|---|
| **30** % | 99.3 % |
| **20** % | 96.0 % |
| **10** % | 82.8 % |



# The MPI ITEP Tile

Test Tile 2: Faces enclosed by 3M mirror foil, sides chemically matted



Sides chemically matted

# The MPI ITEP Tile

**Left:**

Mean signal height plotted vs. the XY-Position

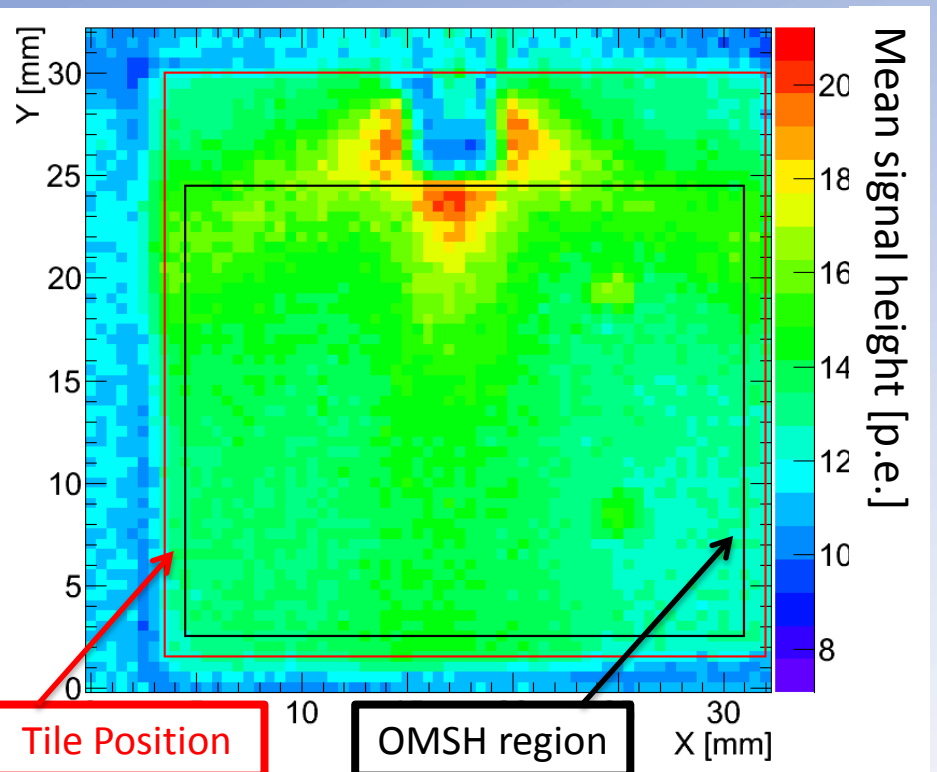
Z-range +-50% of the overall mean signal height for a fair comparability to other tiles

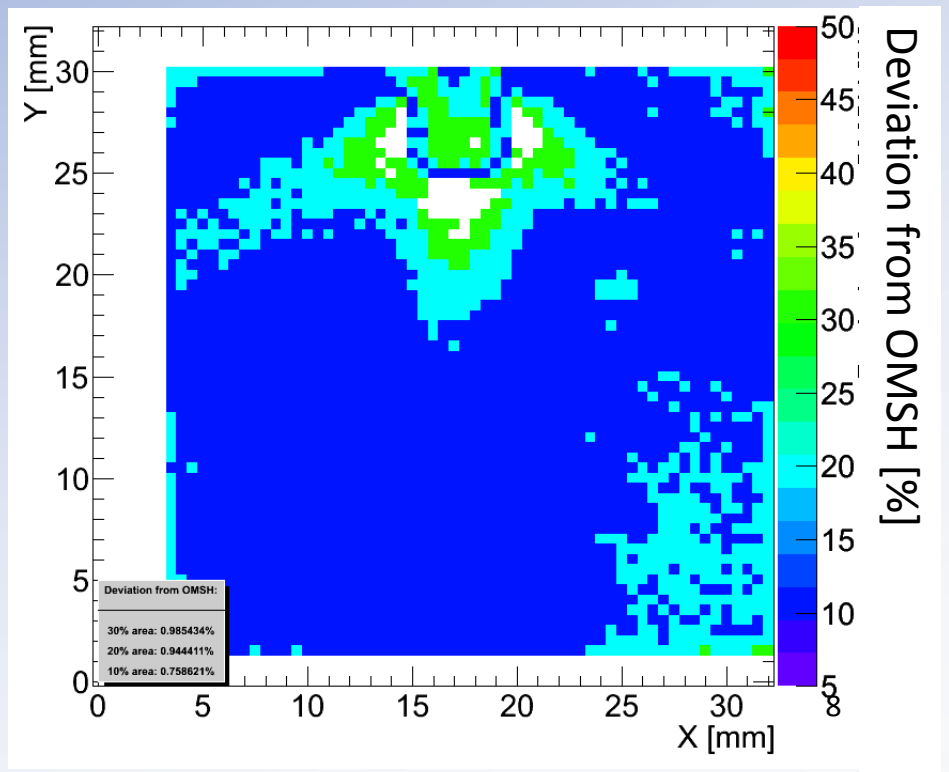
**Right:**

Deviation from OMSH vs. the XY-Position

**Overall mean signal height: 14.1 p.e.**

| Deviation from OMSH | Tile area within this deviation |
|---|---|
| **30** % | 98.5 % |
| **20** % | 94.4 % |
| **10** % | 75.9 % |



# Summary

| Deviation from OMSH | Desy Tile | Itep Tile (fully 3M) | Itep Tile (matted sides) |
|---|---|---|---|
| **30** % | 98.4 % | 99.3 % | 98.5 % |
| **20** % | 97.4 % | 96.0 % | 94.4 % |
| **10** % | 90 % | 82.8 % | 75.9 % |
| **OMSH** | 28.4 p.e. | 14.2 p.e. | 14.1 p.e. |

**Light yield:** Desy tile has twice the light yield due to different scintillator material

→ Depends on what LY we aim for (dynamic range…)

**Uniformity:**

- Very good for Desy tile
- Slightly decreased for Itep tiles (especially in +-10% region)

→ Going from a rectangular to a more rounded shape at the front of the dimple will probably improve that

Altogether the injection molding can be called a success!