**Collaboration Meeting**
**MVD Subgroup**
**FZ Jülich, September 8, 2009**

Thomas Würschig

# Mass estimates and internal MVD routing

universitätbonn

# Mass estimates: Strip part

**UPPER LIMITS FOR MECHANICS ONLY !!**

| | |
|---|---|
| Sensor | 700 g |
| Frontend chips | 100 g |
| Cooling (pipe+water) | 350 g |
| Cooling connectors | 200 g |
| Global support | 1100 g * |
| Local support | 1300 g * |
| HD connectors | 550 g |
| Supply connectors | 270 g |
| HV connectors | 50 g |
| Bus cables | 870 g |
| HV+power cables | 120 g |
| **TOTAL** | **5600 g** |

* Full massive carbon fibre

# Mass estimates: Pixel part

**UPPER LIMITS FOR MECHANICS ONLY !!**

| | | |
|---|---|---|
| Sensor | 75 g | |
| Frontend chips | 85 g | |
| Cooling (pipe+water) | 200 g | |
| Cooling connectors | 140 g | |
| Global support | 600 g | * |
| Local support | 750 g | * |
| HD connectors | 450 g | ** |
| Supply connectors | 120 g | ** |
| HV connectors | 25 g | ** |
| Bus cables | 700 g | *** |
| HV+power cables | 65 g | *** |
| **TOTAL** | **3210 g** | |

* Full massive carbon fibre

** Based on strip estimate

*** Based on strip estimate, scaled to strip values

# Mass estimates: MVD

**UPPER LIMITS FOR MECHANICS ONLY !!**

| | | |
|---|---|---|
| **Strip part** | | **5.6 kg** |
| **Pixel part** | | **3.2 kg** |
| **Global MVD support** | **<** | **1.0 kg** |
| **TOTAL** | **<** | **10 kg** |

- Estimate based on updated info and more details
- Good agreement with specified number for the collaboration so far
  → MVD weight: 10 kg ... 15 kg

# Internal MVD routing

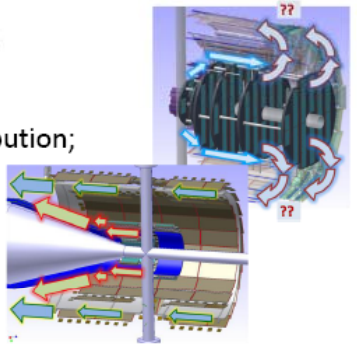
- Last MVD mechanics workshop:
  - First concepts
  - Space problems

... Dedicated internal meeting yesterday

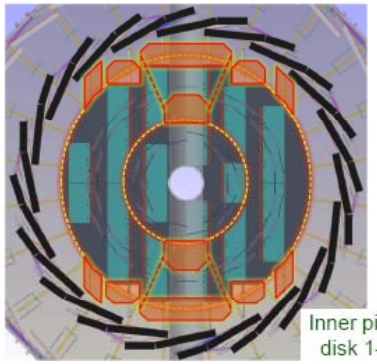
...

## Discussion

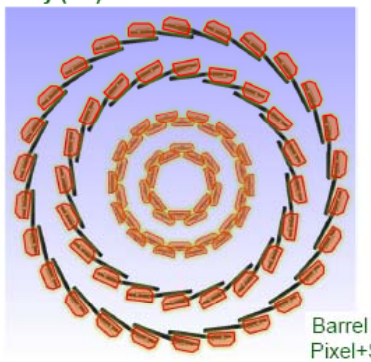
- Internal MVD routing
  - Inner pixel disks 1 - 5: Non uniform distribution;
    Routing concentrated at top and bottom
  - Inner barrel part (pixel+strip):
    Routing along beam pipe;
    Circular, more homogeneous distribution



Radial occupancy (XY)



Inner pixel disk 1-5



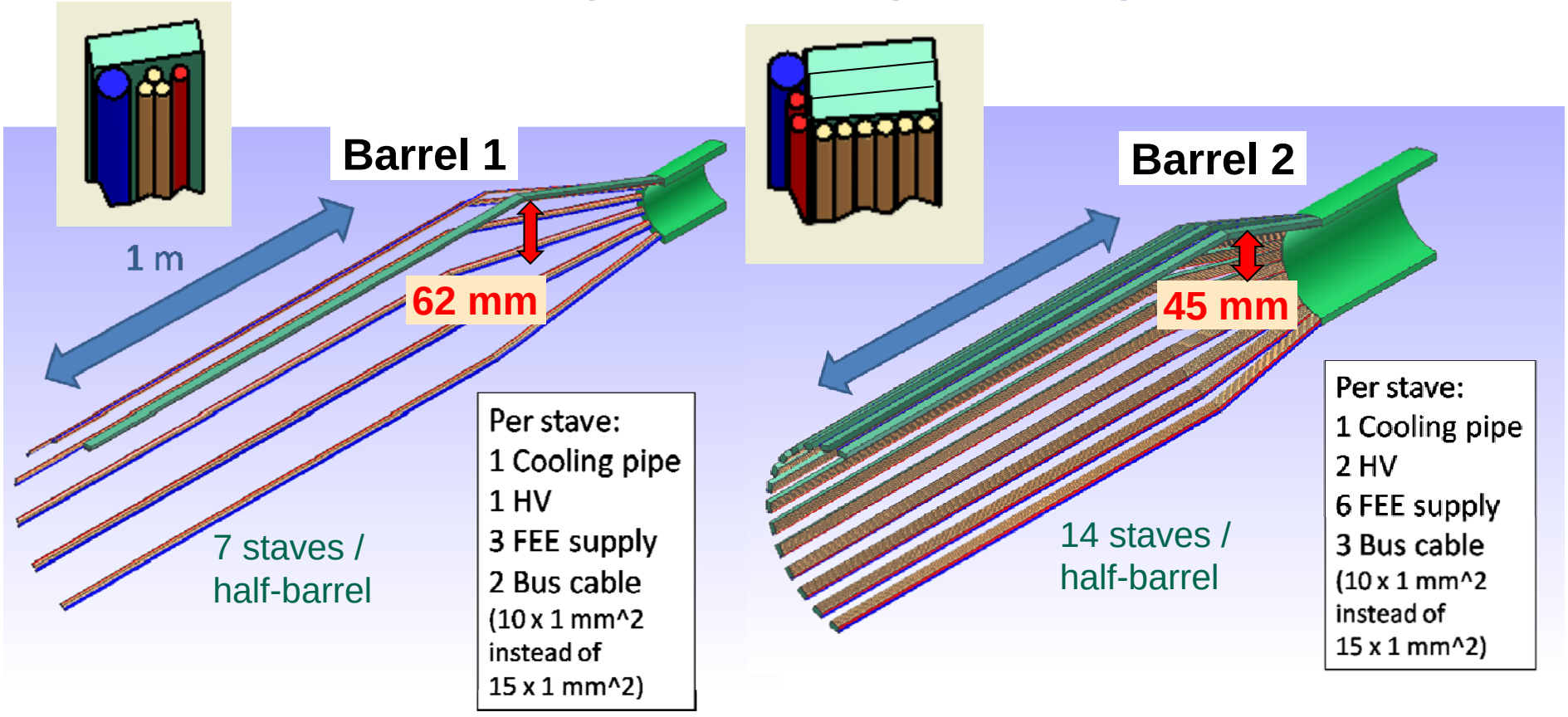
Barrel part Pixel+Strip

## Conclusions and results

- Severe problems occurred for the internal MVD routing
  - Global MVD support mostly blinds outer radius from 142 mm to 150 mm
  - Any routing outside r = 150 mm not accepted ! (not even r = 150.1 mm)
    - ✓ Routing of (parts of) forward disks **inside** global support

# MVD routing: barrel

- Implementation: Simplified routing scheme based on former assumptions for space req's ...



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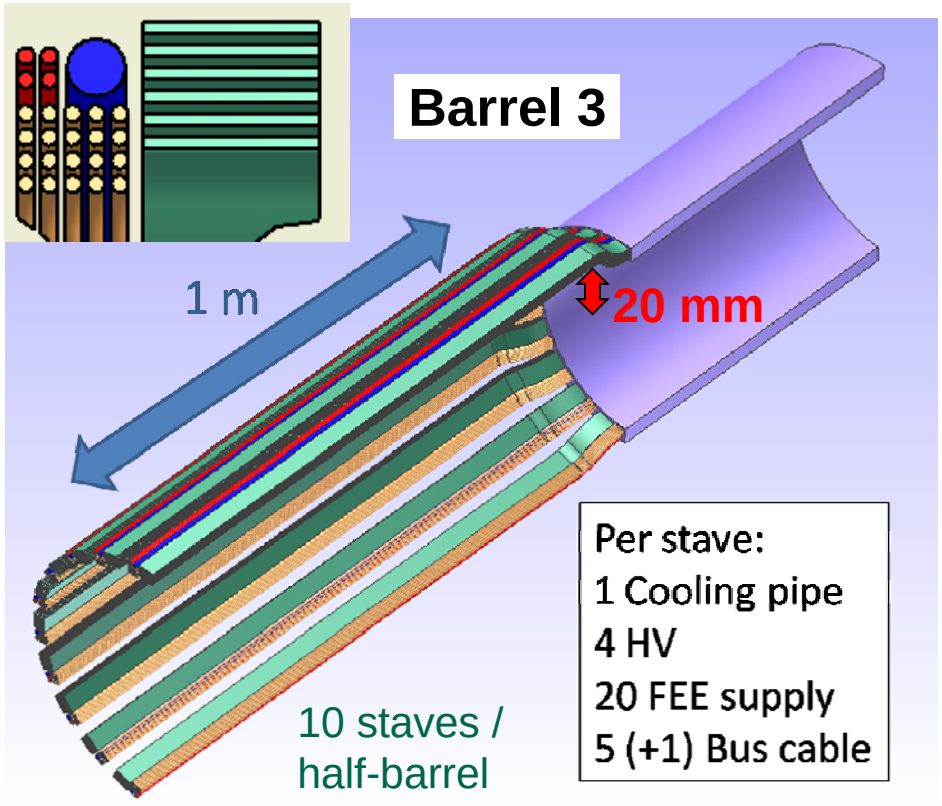


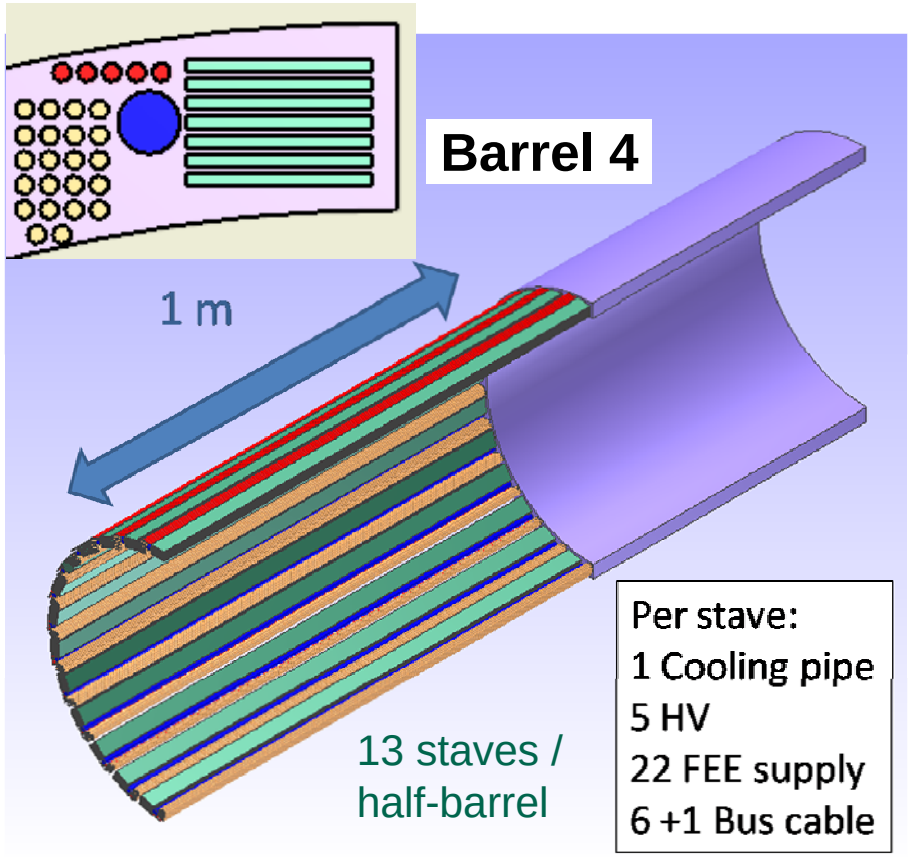

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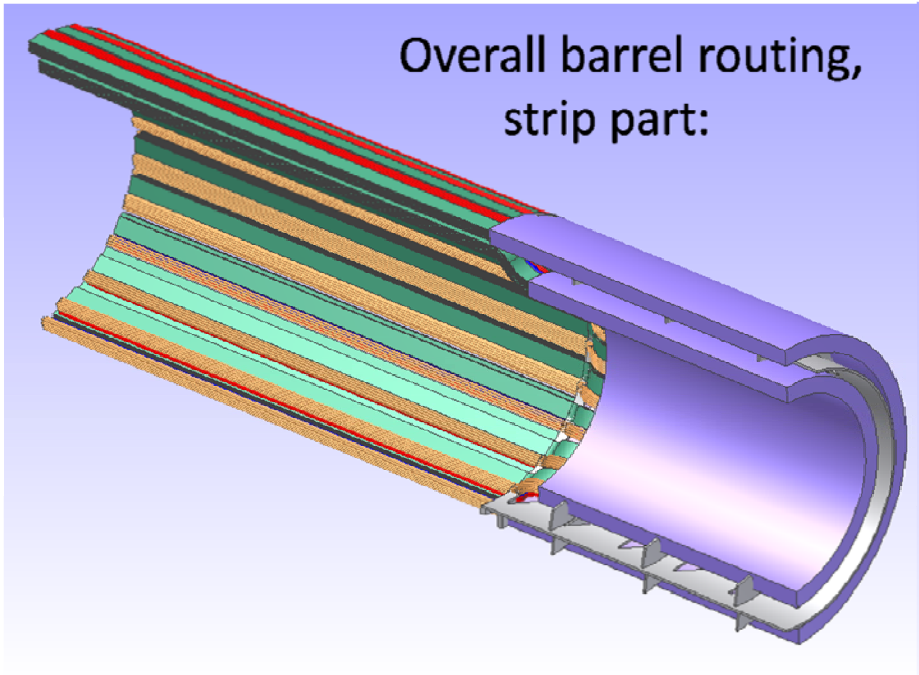


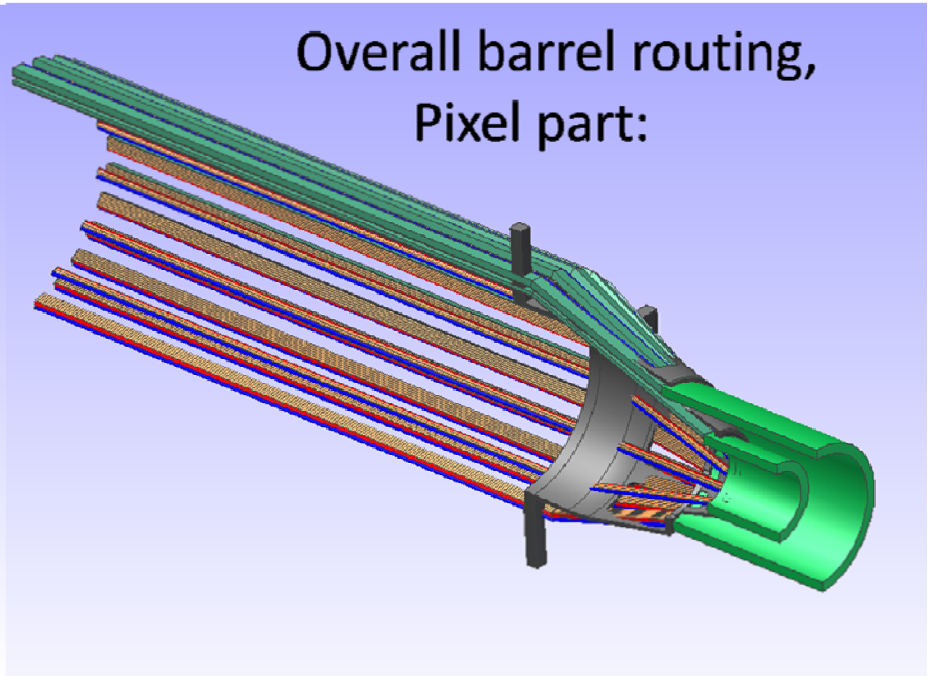

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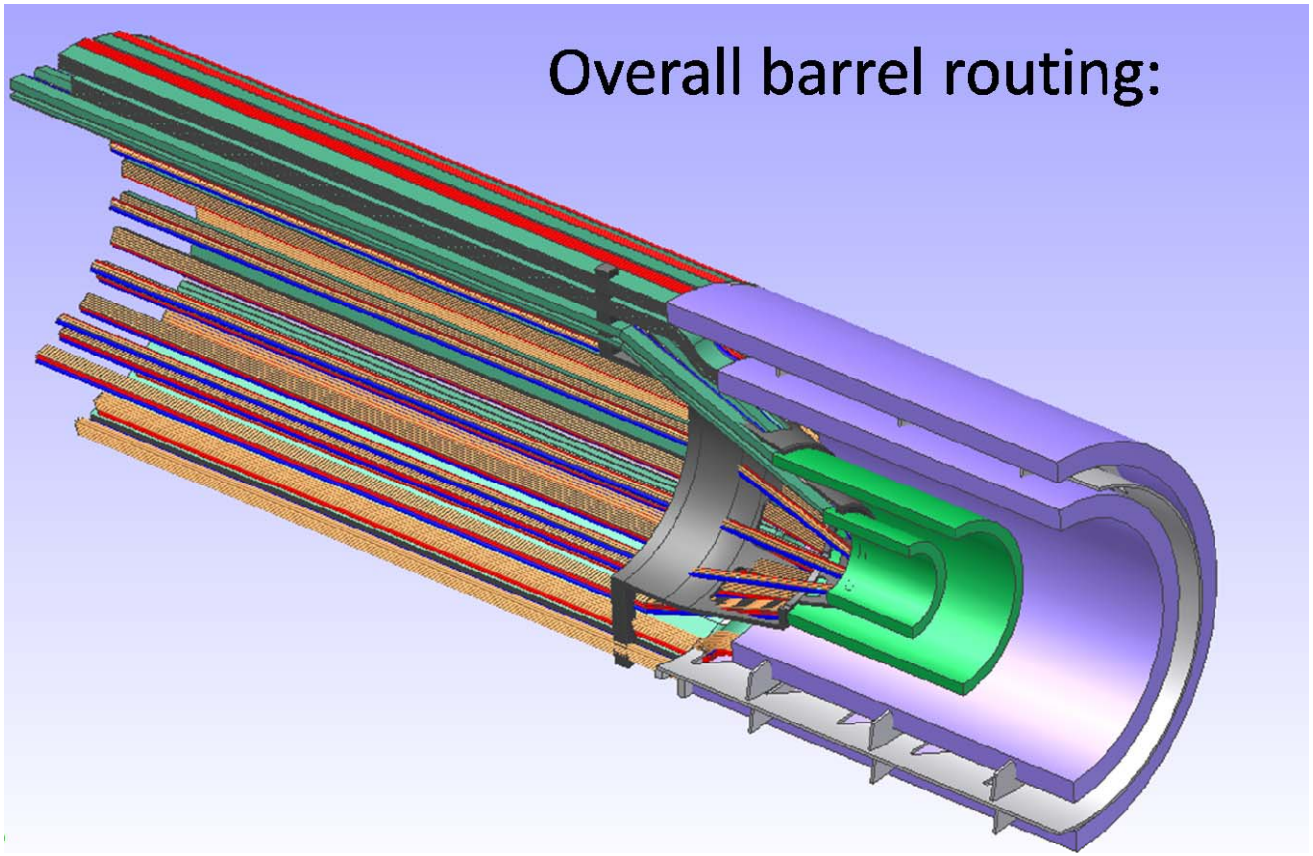

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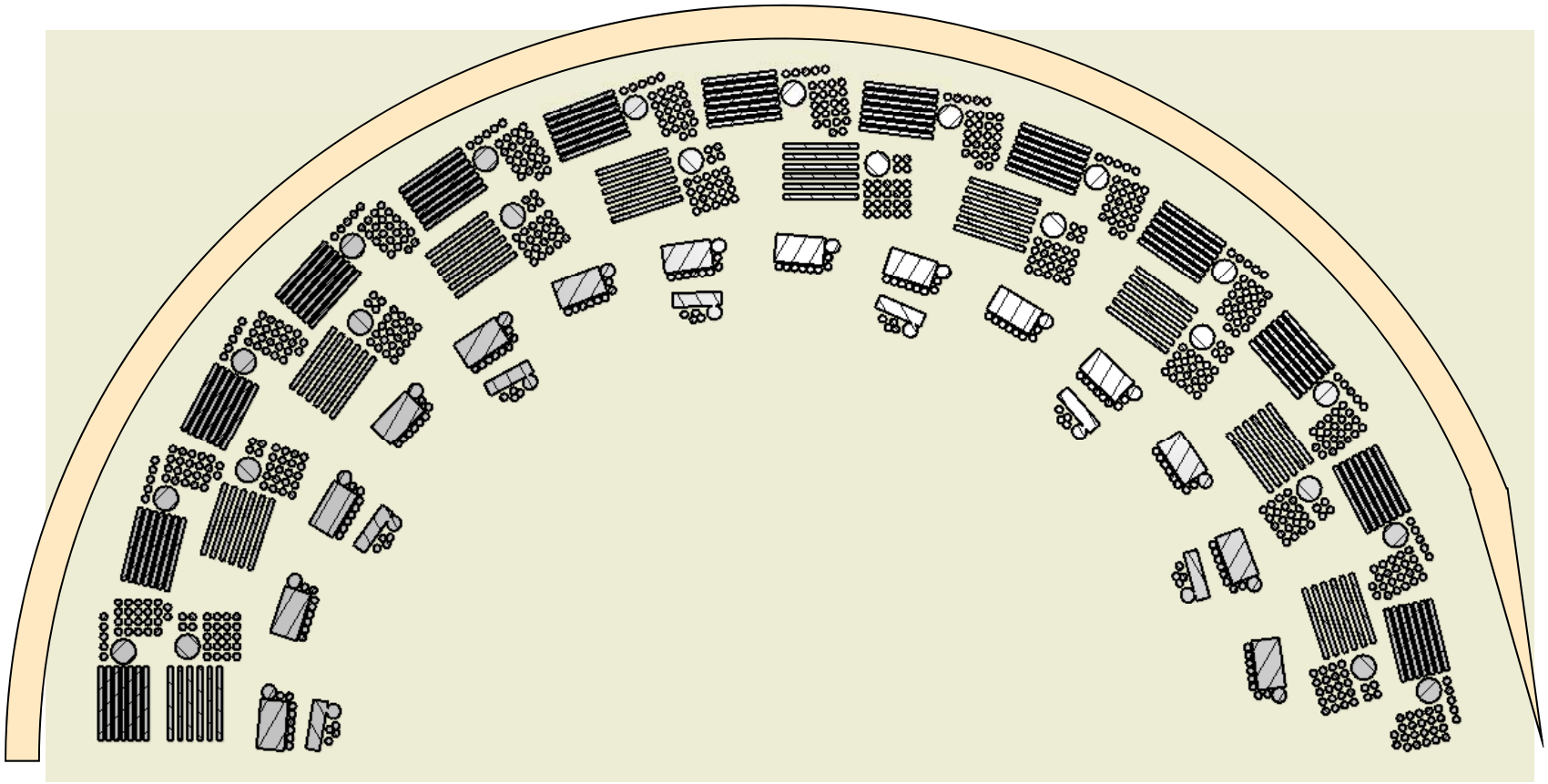
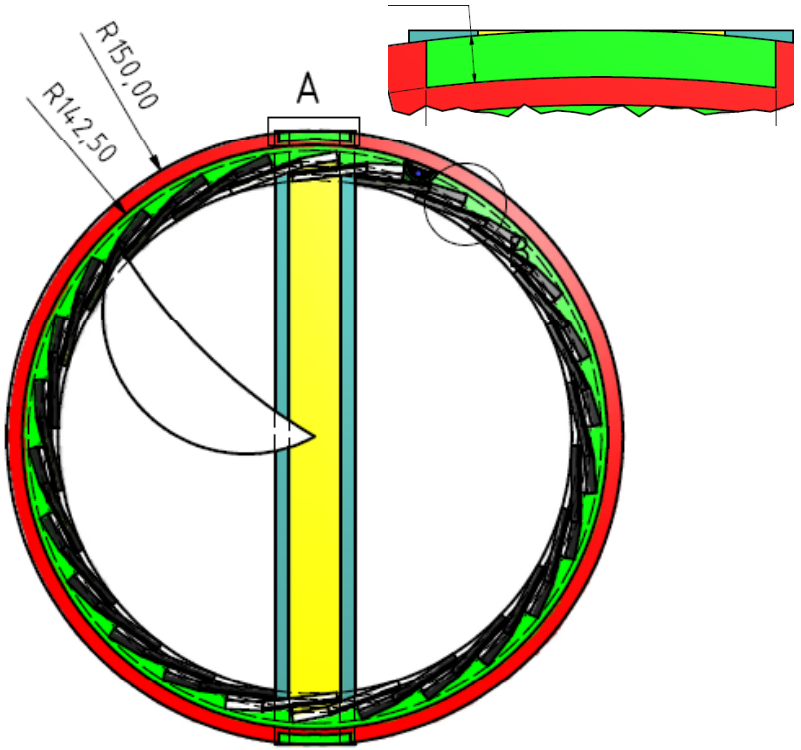


# MVD routing: disks

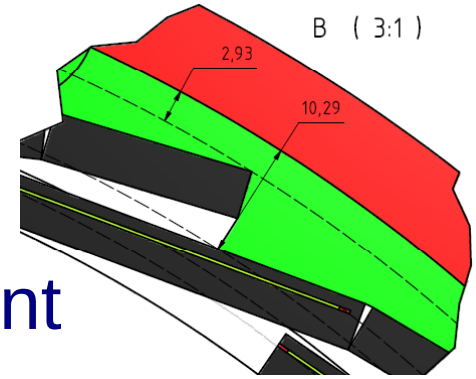
- Total area cross section

| | |
|---|---|
| Strip part | 2300 mm$^2$ |
| Add. layers: | factor 2 |
| Pixel part | 3500 mm$^2$ |
| Total: | **8100 mm$^2$** |
| (no safety factor) | |




- Current version:

  Not sufficient space !




Entire free space:
(a) Keep out at top and bottom:
2 x 166.5 mm^2
(b) Space between Barrel 4 and inner support radius:
5,693 mm^2

TOTAL 6,026 mm^2

# MVD routing: disks

- Problems so far ... ☹
  - Not sufficient space, even with thinner global support
  - Required routing inside global MVD support

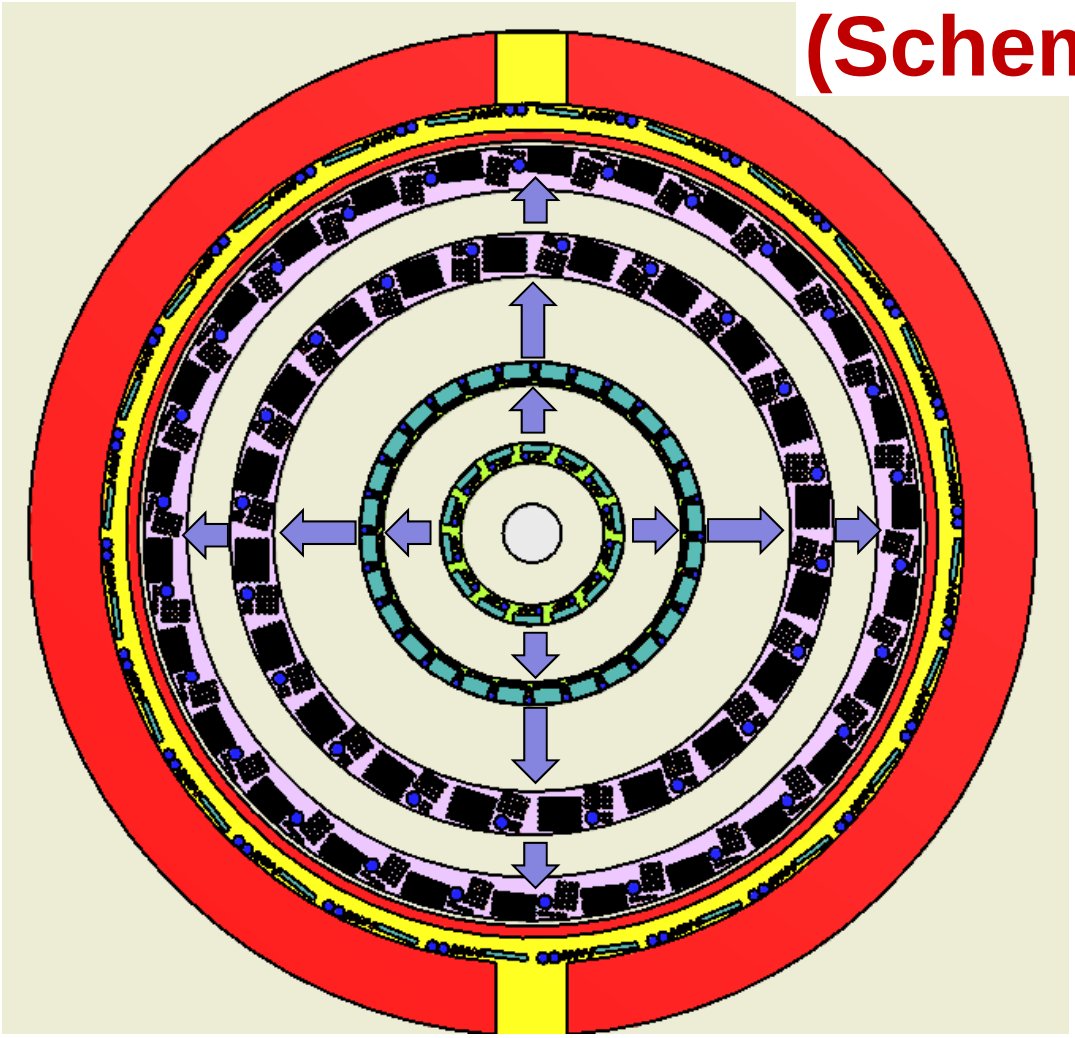
- Solution ... ☺ ... (!?)
  - Decrease outer radius of barrel layer 4 and strip disks
  - Global MVD support shifted inside
    - ✓ Smallest impact of overall concepts in strip part
    - ✓ Sufficient space created in between global MVD support and maximum outer radius of 150 mm

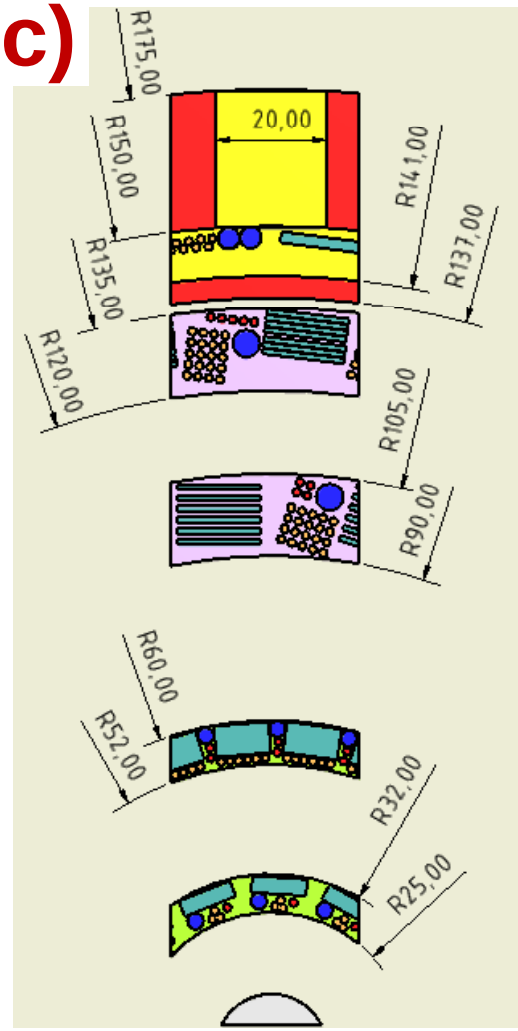
# MVD routing: disks

- Solution ... ☺ ... (!?)
  - Decrease of outer radius barrel layer 4:
    $r_{max}$ = 140 mm **– 5 mm** → $r_{max}$ = 135 mm
  - Global MVD support:
    r = 137 mm ... 141 mm → **Space: 8,228 mm²**
    Remark:
    Additional space at radii > 150 mm along CF
    for cooling pipes : 20 mm (width) up to min. r = 175 mm
    → **Additional space outside r = 150 mm: > 1,400 mm²**
- Check:
  - Effects for strip disks
  - Coverage tests

# Internal routing concept

## (Schematic)





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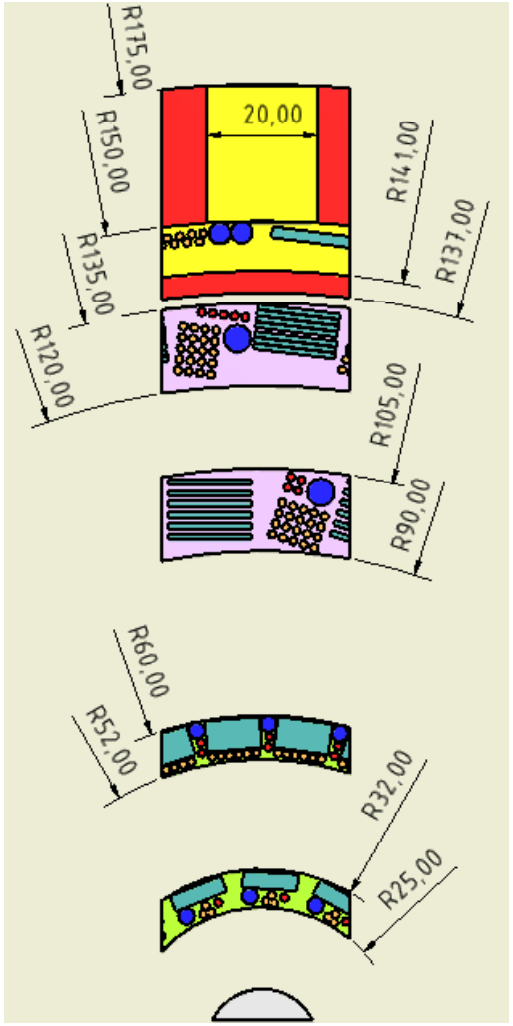
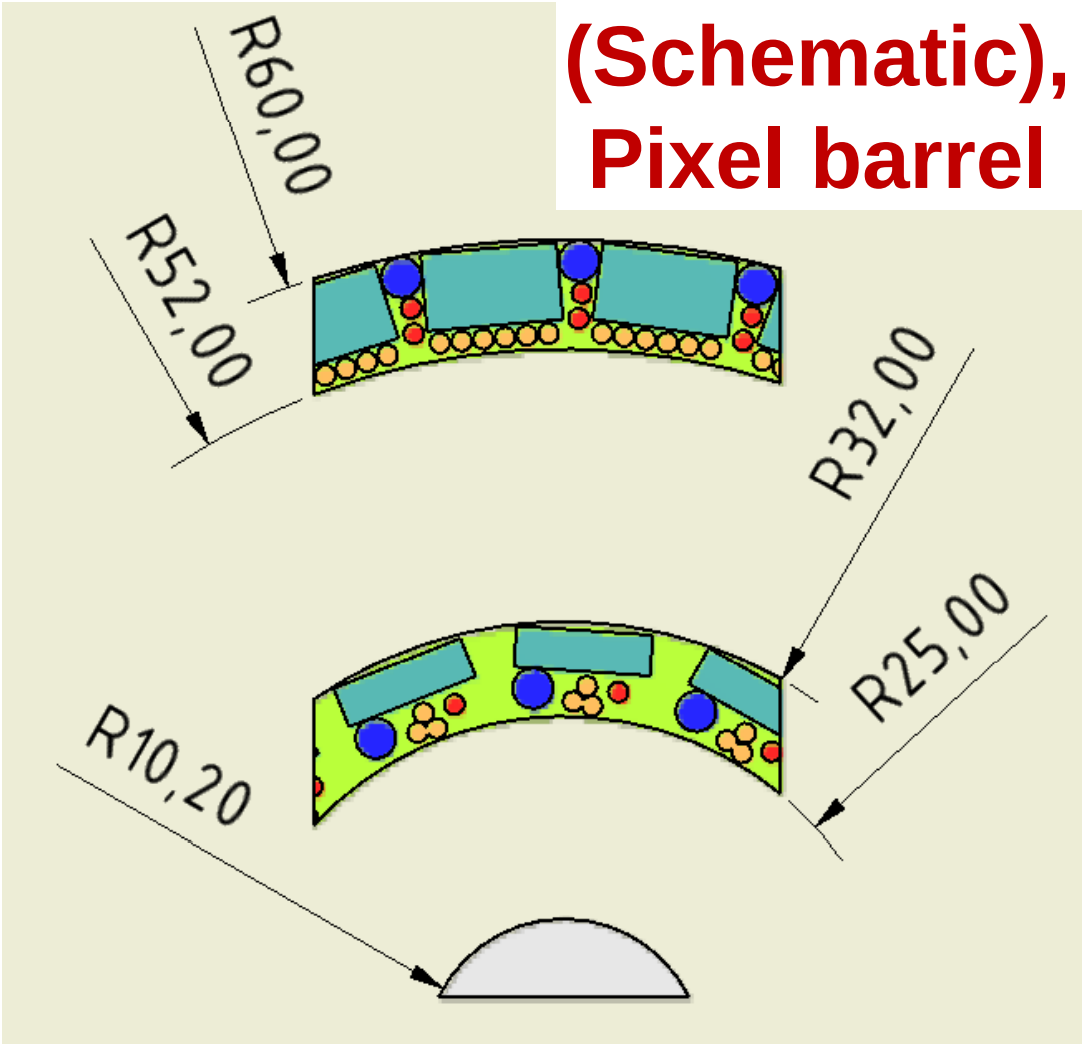
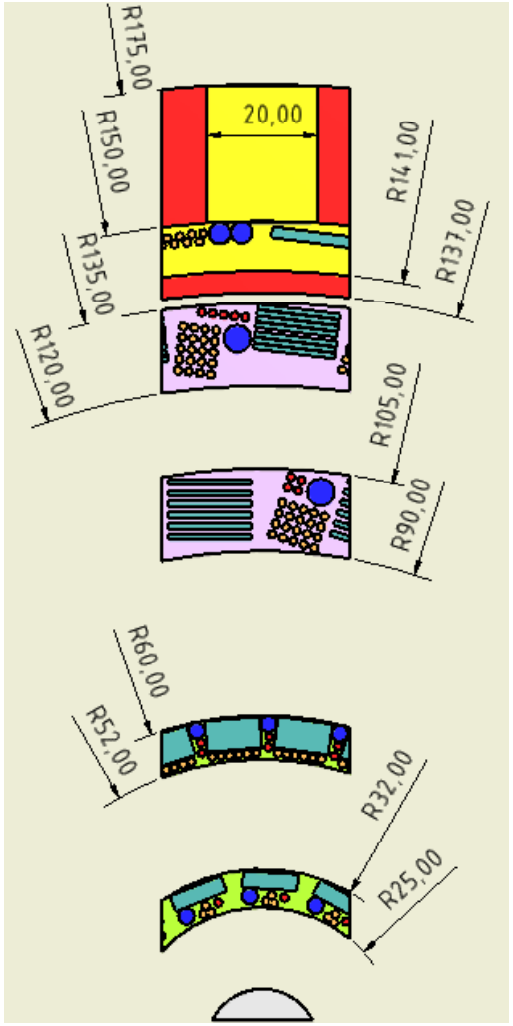
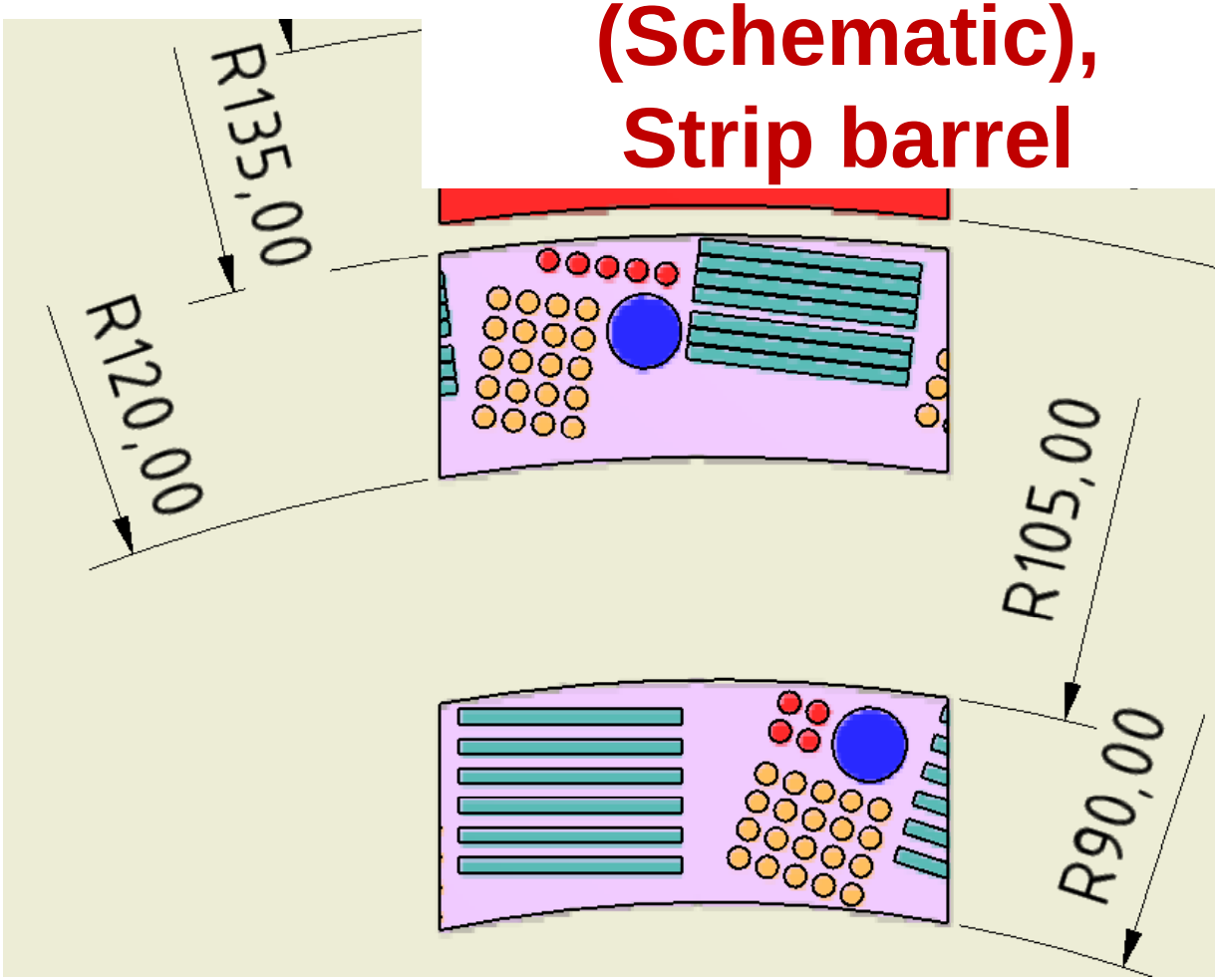



**(Schematic), Pixel barrel**

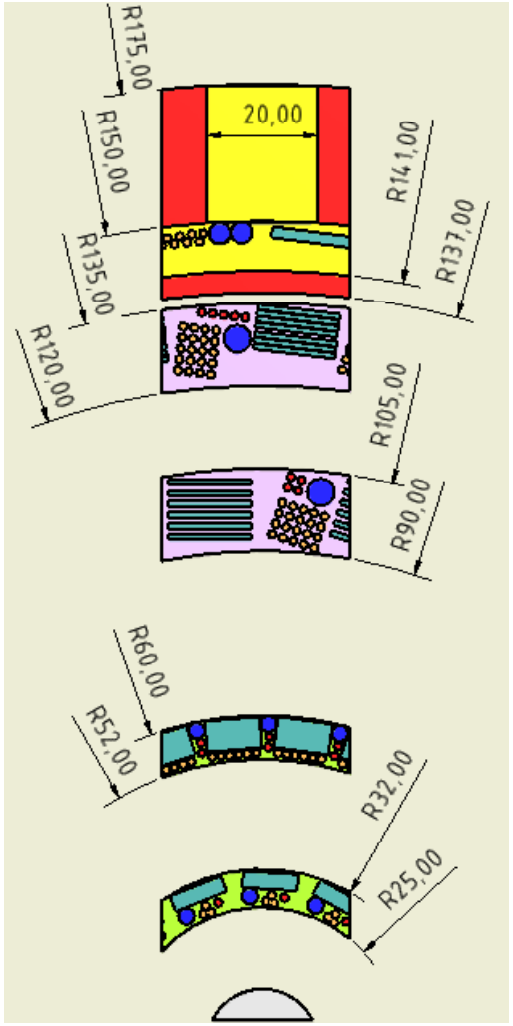
# Internal routing concept



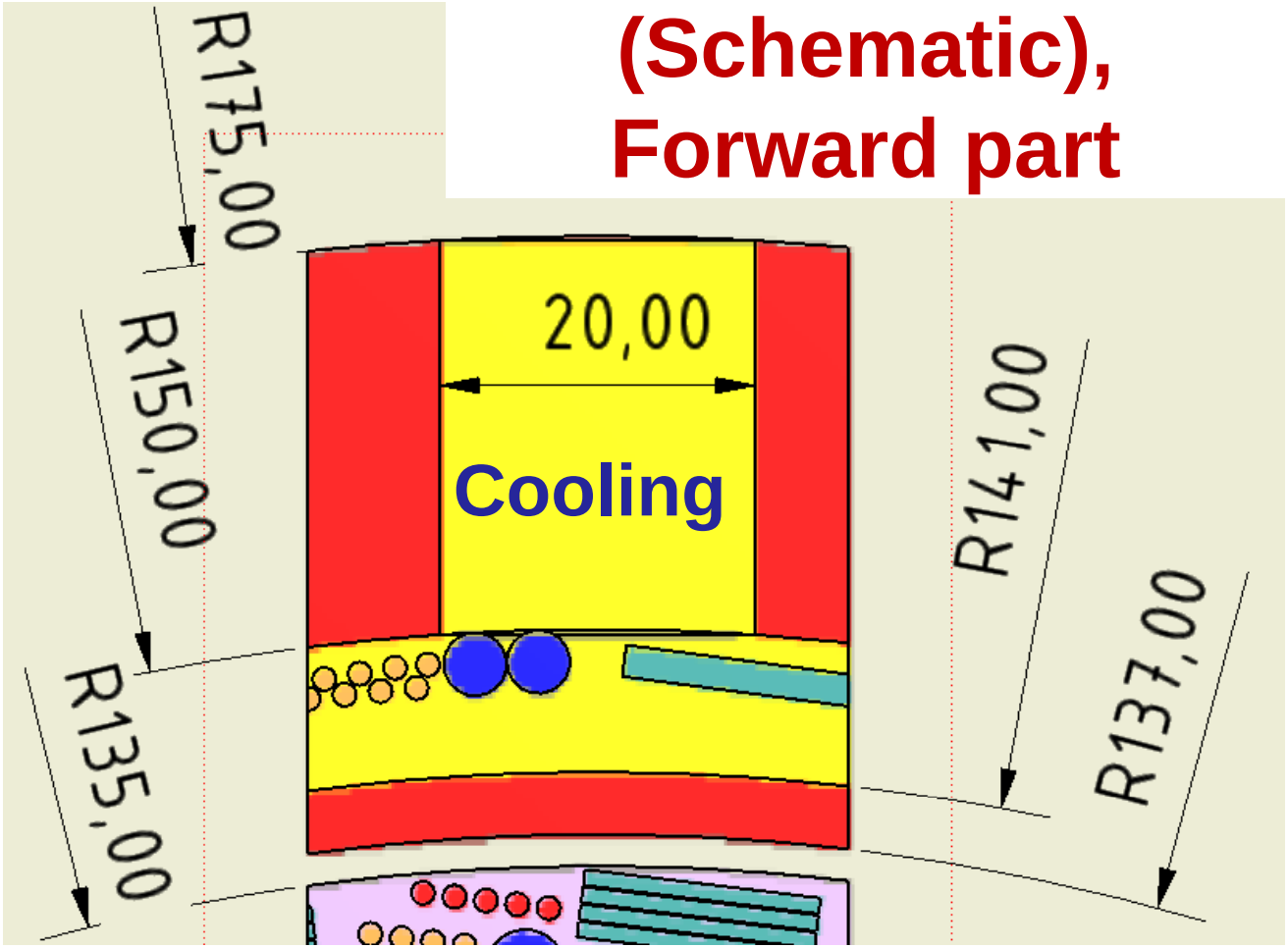




**(Schematic), Strip barrel**

# Internal routing concept




## (Schematic), Forward part



# Conclusion

- Updated mass estimates (for mechanics input!) in agreement with former specifiaction
- First concept for MVD barrel routing
- Solution for internal routing of forward part

  → To be checked

  → *Question:*
  Alternative routing of additional disks

  - What about routing into forward part (e.g. GEM system) ?