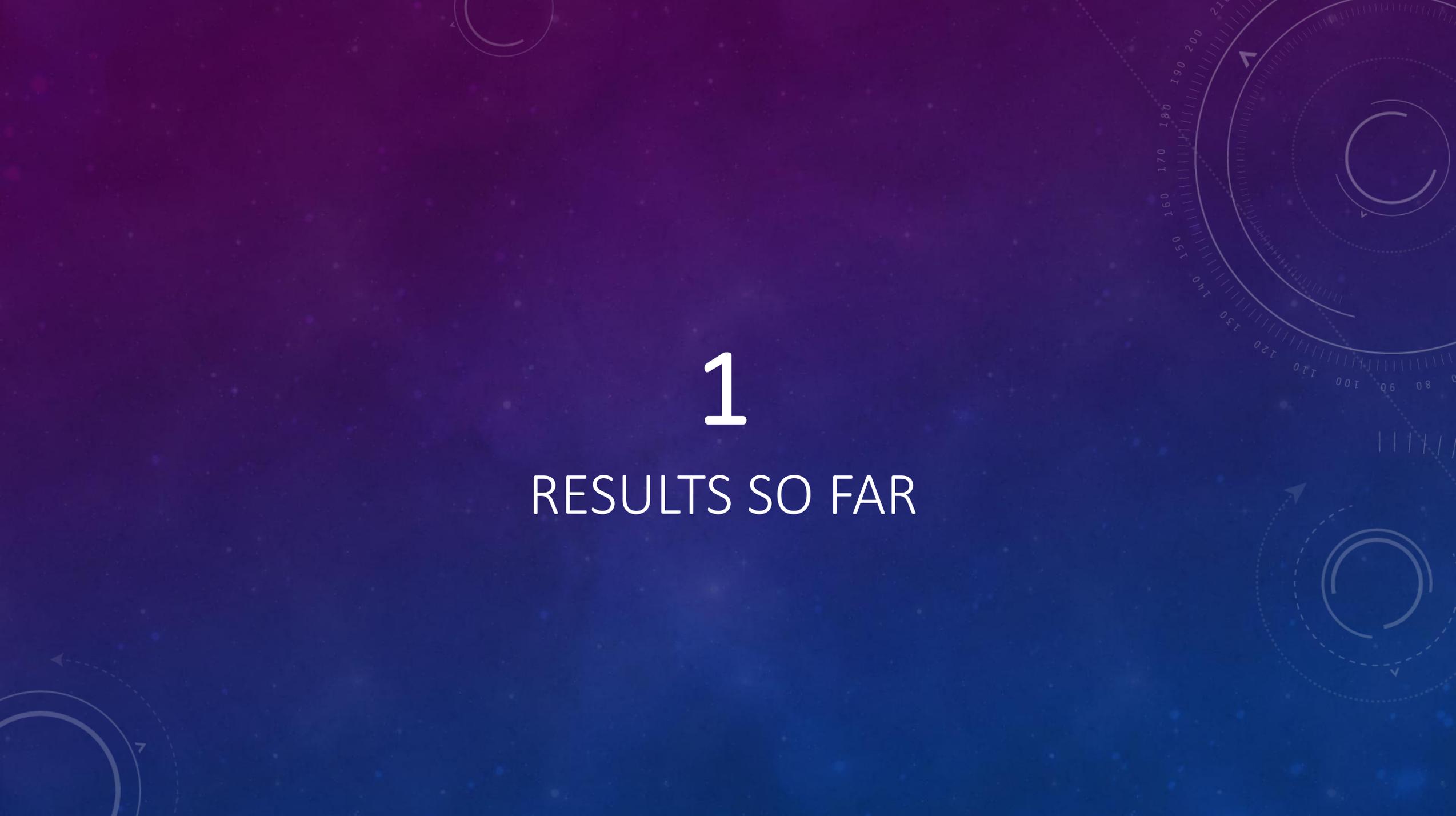
The background features a dark blue gradient with a starry pattern. On the left side, there are several overlapping circular elements. A prominent one is a large arc with a scale from 140 to 260, with major ticks every 10 units and minor ticks every 2 units. Other circles include dashed lines, solid lines, and arrows indicating direction. The overall aesthetic is technical and futuristic.

# POPLAR FUTURE BEAMLINE

JOSIE MCGARRIGLE

24/02/2026

POPLAR COLLABORATION MEETING

The background features a dark blue gradient with a subtle pattern of white stars and technical diagrams. On the right side, there are several circular diagrams with concentric lines and arrows, resembling a radar or a data visualization. One of these diagrams has numerical labels (100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 210) along its outer edge. In the bottom right corner, there is a circular diagram with a dashed outer ring and a solid inner ring, with an arrow pointing clockwise. In the bottom left corner, there is a circular diagram with a dashed outer ring and a solid inner ring, with an arrow pointing counter-clockwise. In the top left corner, there is a circular diagram with a dashed outer ring and a solid inner ring, with an arrow pointing counter-clockwise.

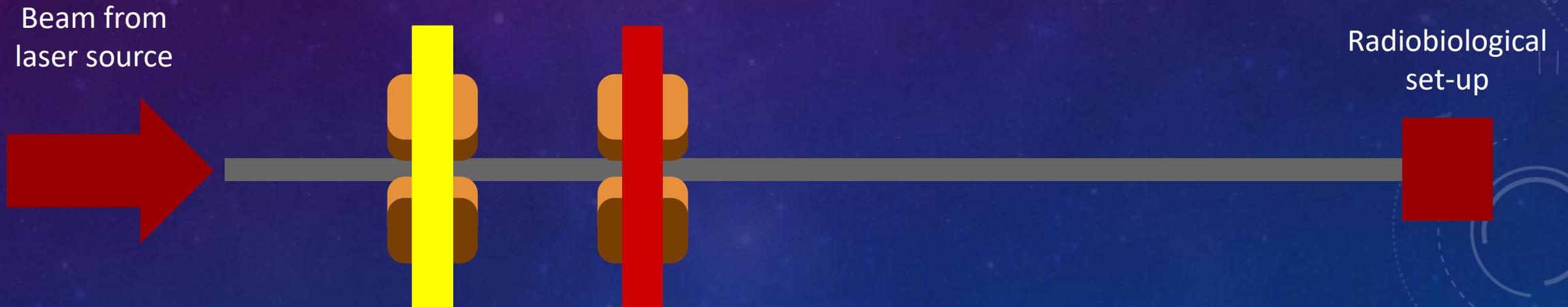
1

RESULTS SO FAR

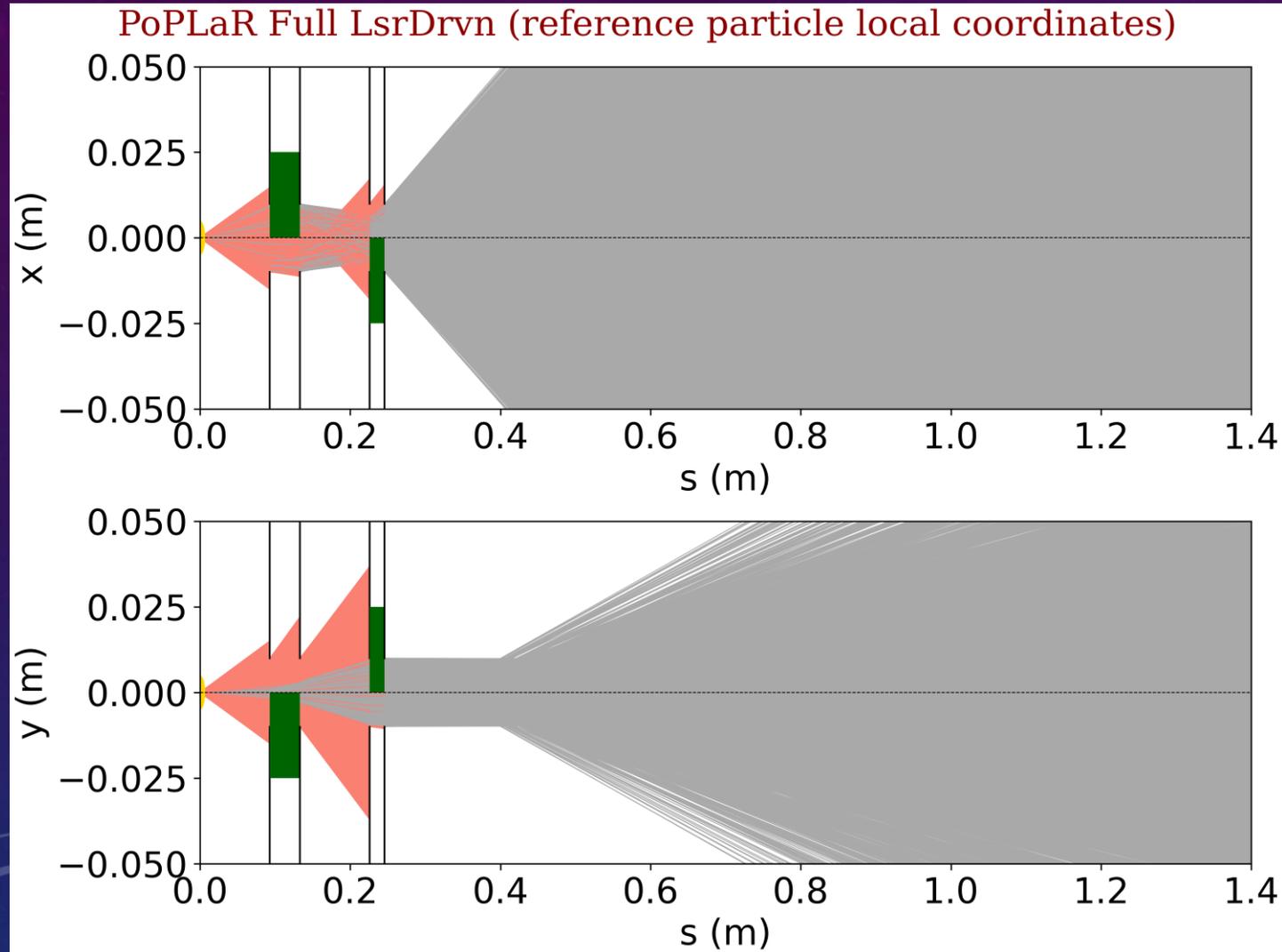
# CURRENT SET UP- OPTIMISATION



- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission



# CURRENT SET UP- VISUAL



- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

TRANSMISSION TO CELLS:  $4.7 \pm 0.07 \%$

# ADDITIONAL METRICS

## Coefficient of Variation (CV)

- Measures spread of radial fluence distribution

$$\frac{\sigma_{\phi}}{\langle \phi \rangle} \cdot 100 \%$$

Where:  $\sigma_{\phi}$  = sample std dev across populated bins  
 $\langle \phi \rangle$  = mean fluence across populated bins

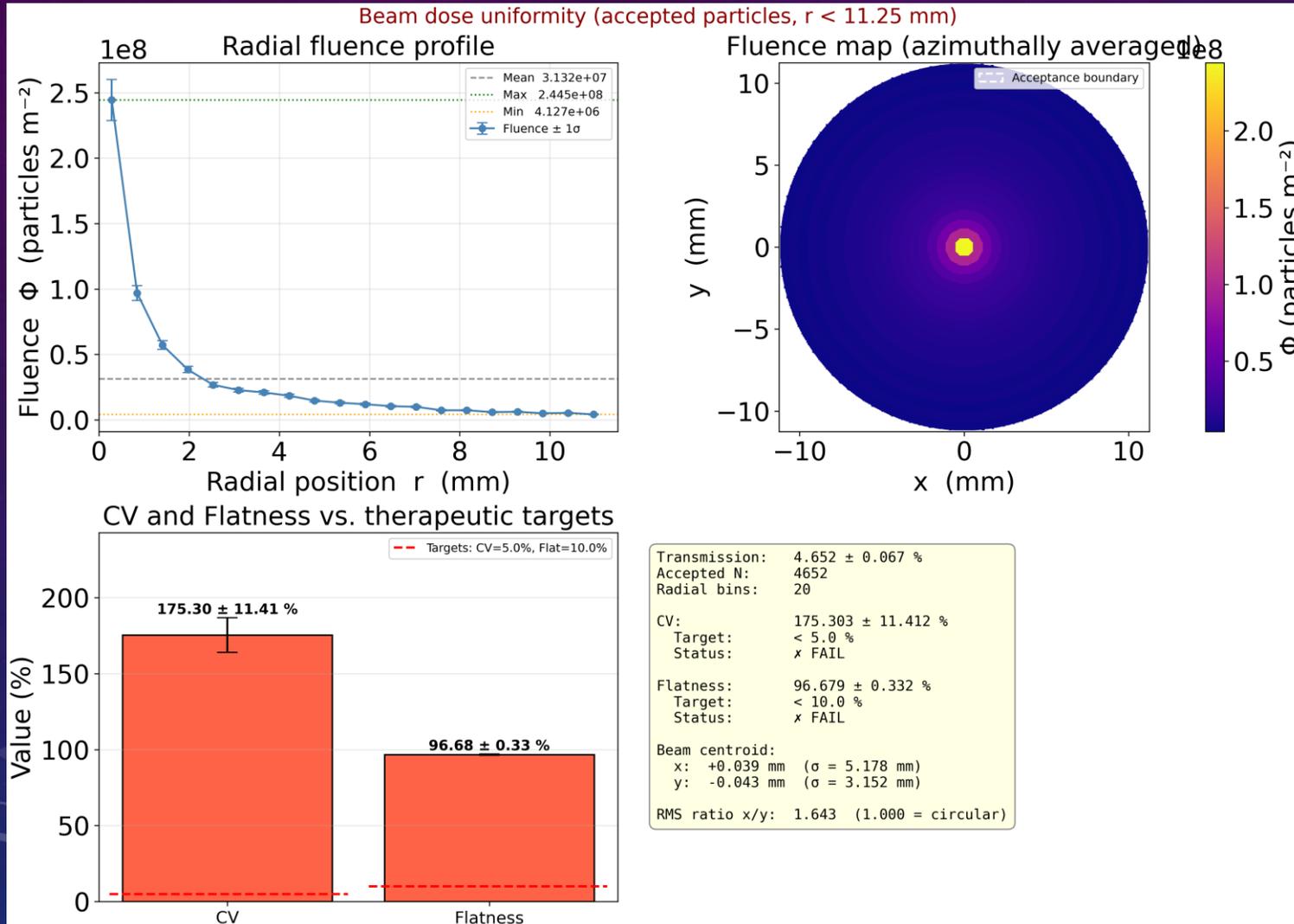
## Flatness

- Measures how flat the radial fluence profile is

$$\frac{\phi_{max} - \phi_{min}}{\phi_{max} + \phi_{min}} \cdot 100 \%$$

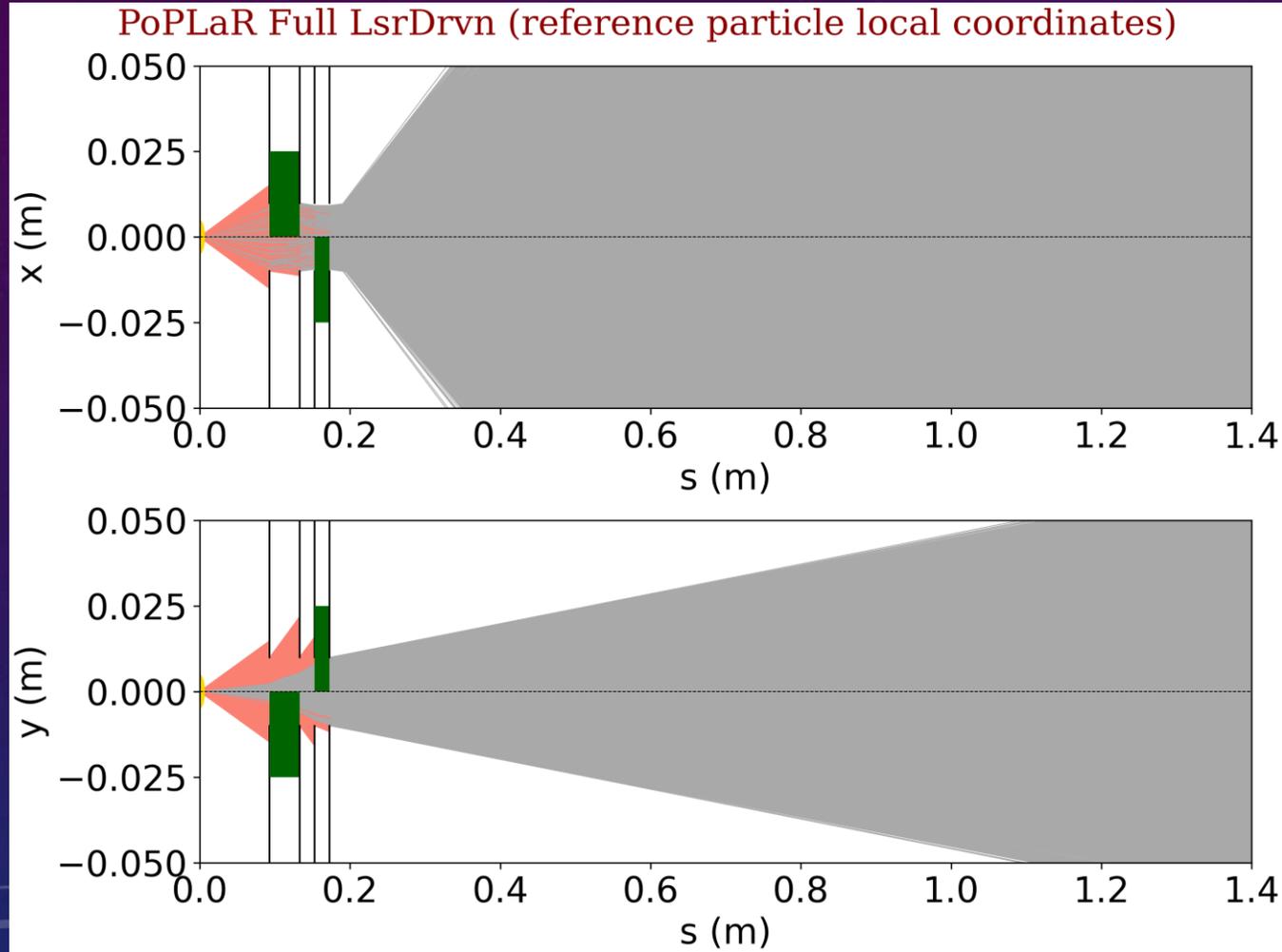
Where:  $\phi_{max}$  = maximum annular fluence  
 $\phi_{min}$  = minimum annular fluence

# CURRENT SET UP- CV & FLATNESS ESTIMATIONS



- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

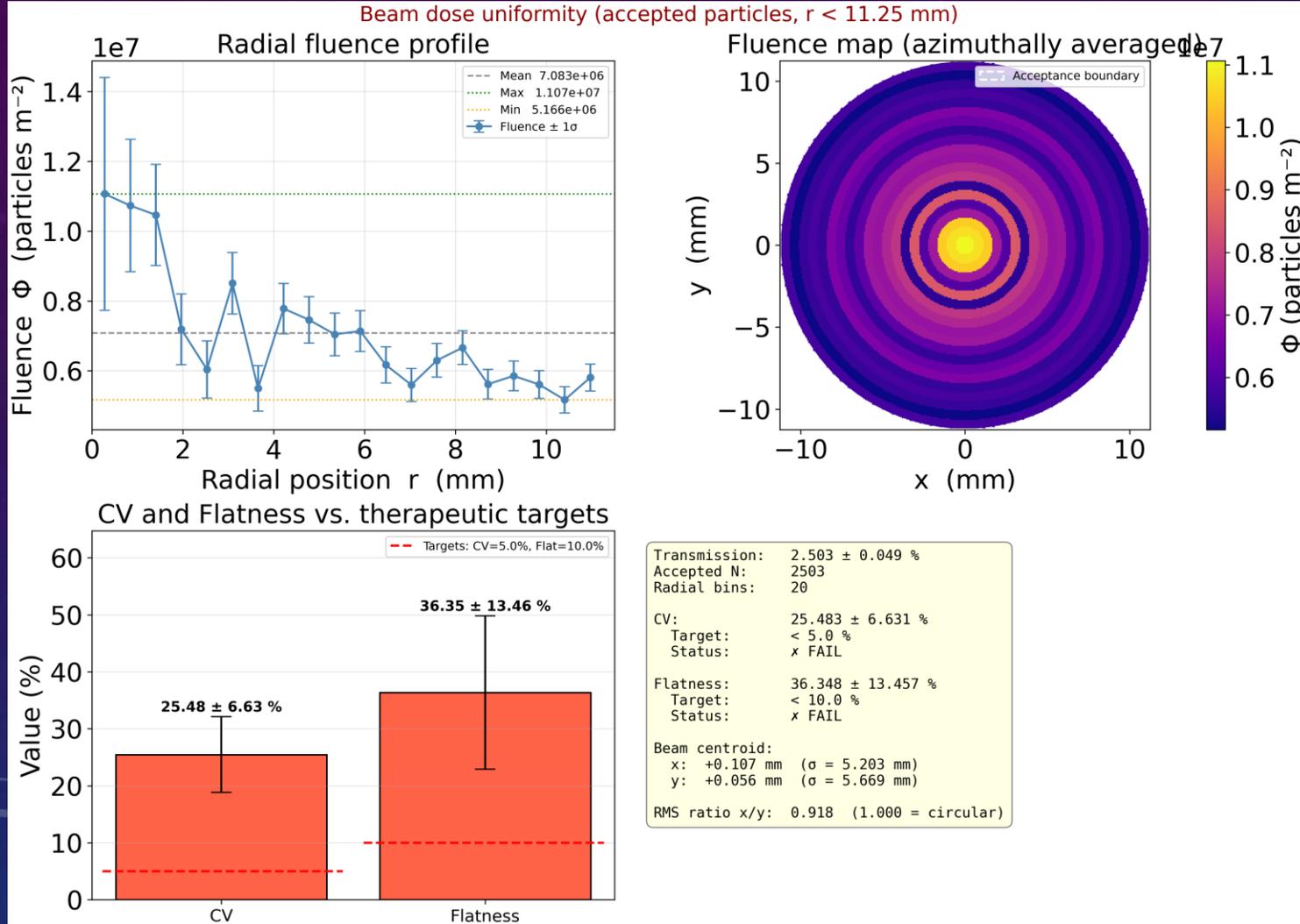
# 2 QUAD- IF CAN CLOSE Q2 DISTANCE- VISUAL



- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

TRANSMISSION TO CELLS:  $2.50 \pm 0.05 \%$

# 2 QUAD- IF CAN CLOSE Q2 DISTANCE- CV & FLATNESS ESTIMATIONS

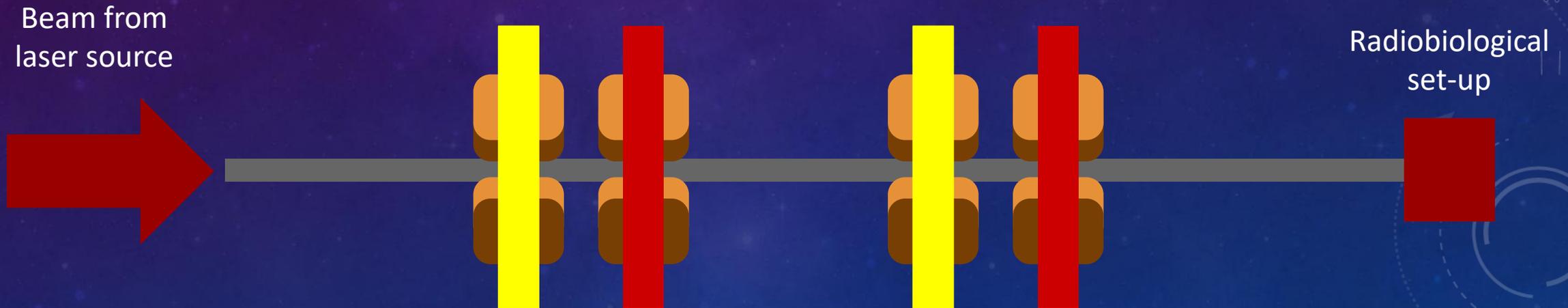


- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

# 4 QUAD SET UP- OPTIMISATION

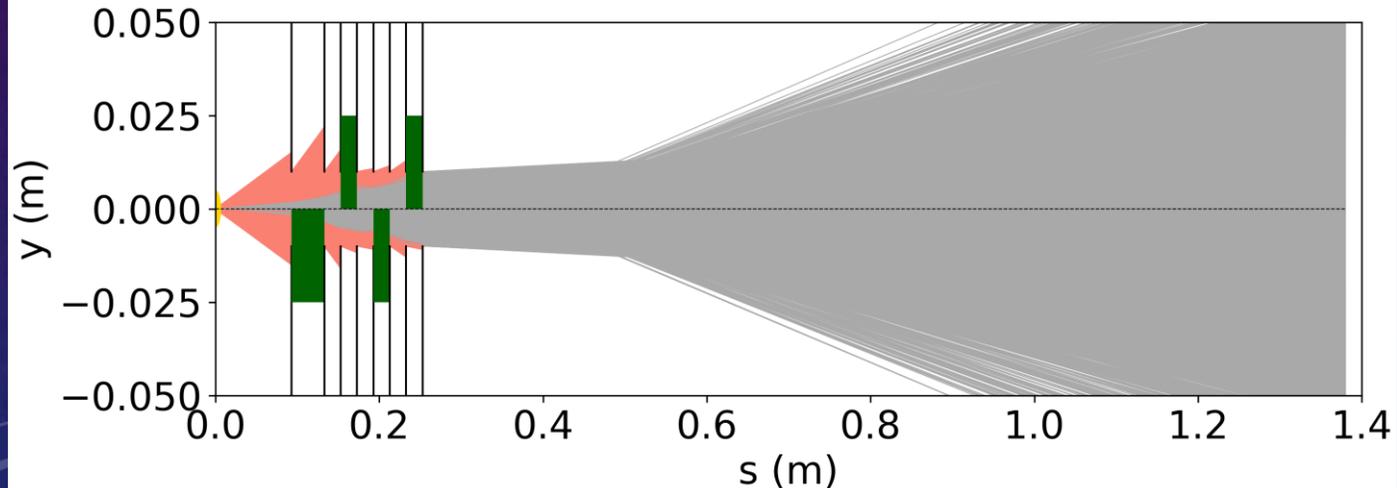
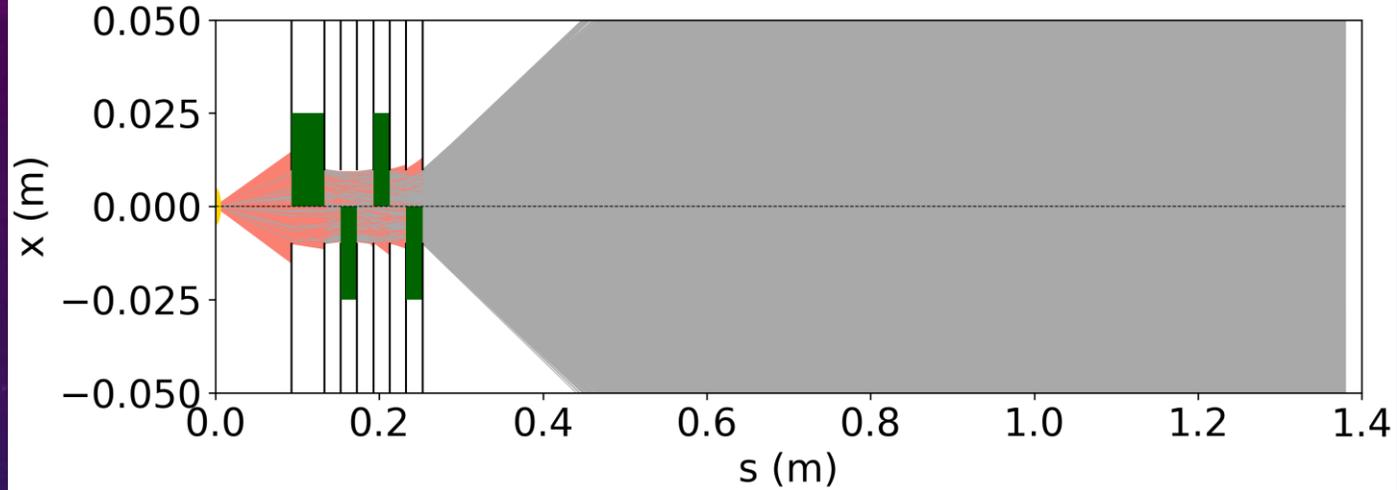


- 4 Quadrupoles
- FDFD 2 Quadrupole pairs
- Optimised by transmission
  - First pass: trials all quad options
  - Second pass: optimises for best quad combo



# 4 QUAD SET UP- VISUAL

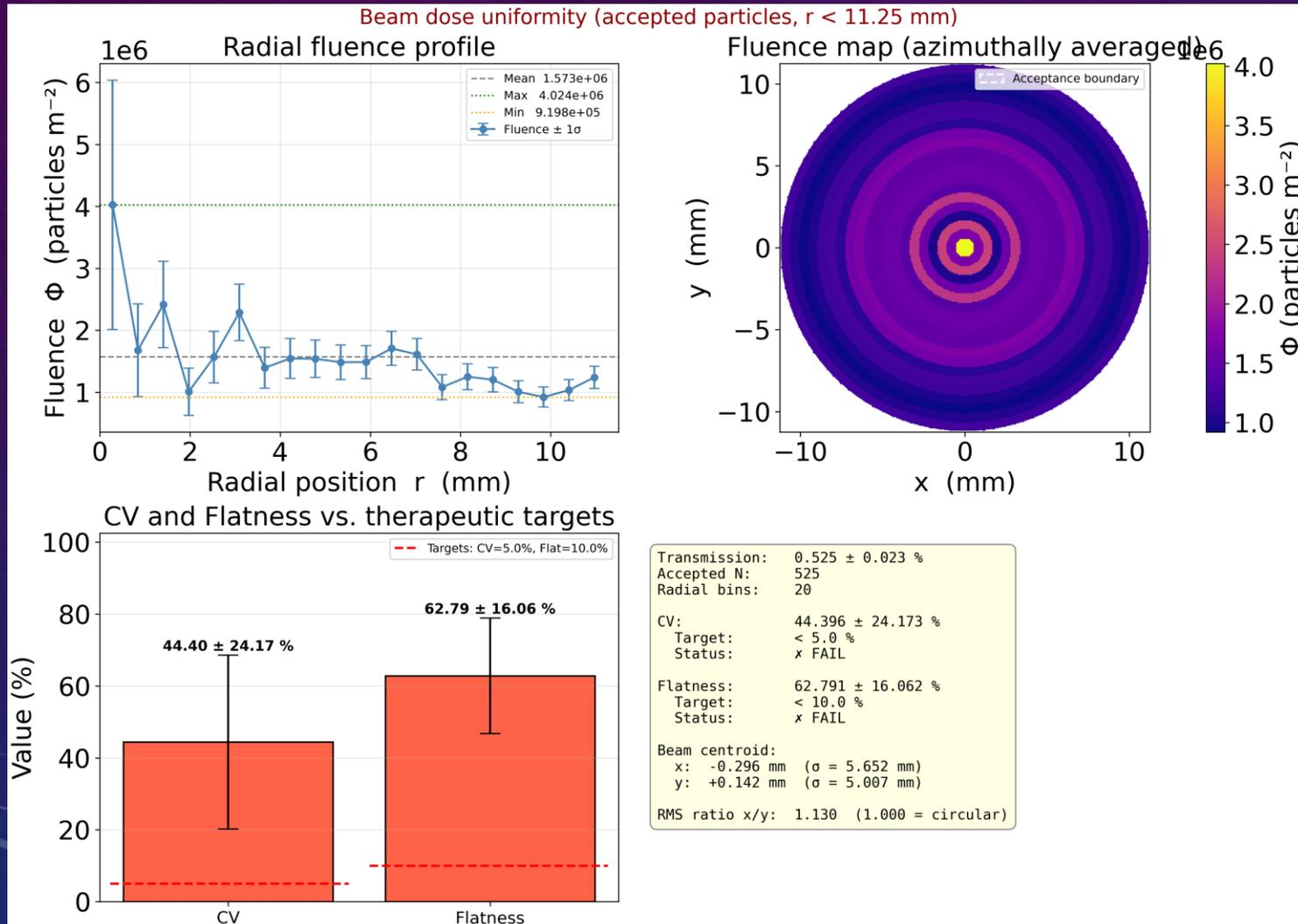
PoPLaR Full LsrDrvn (reference particle local coordinates)



- 4 Quadrupoles
- FDFD 2 Quadrupole pairs
- Optimised by Transmission

TRANSMISSION TO CELLS:  $4.40 \pm 0.01 \%$

# 4 QUAD SET UP- CV & FLATNESS ESTIMATIONS

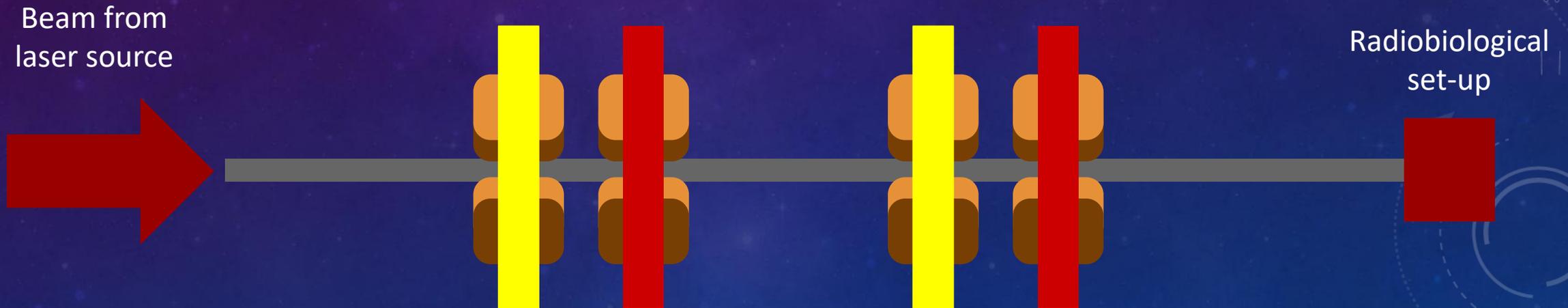


- 4 Quadrupoles
- FDFD 2 Quadrupole pairs
- Optimised by transmission

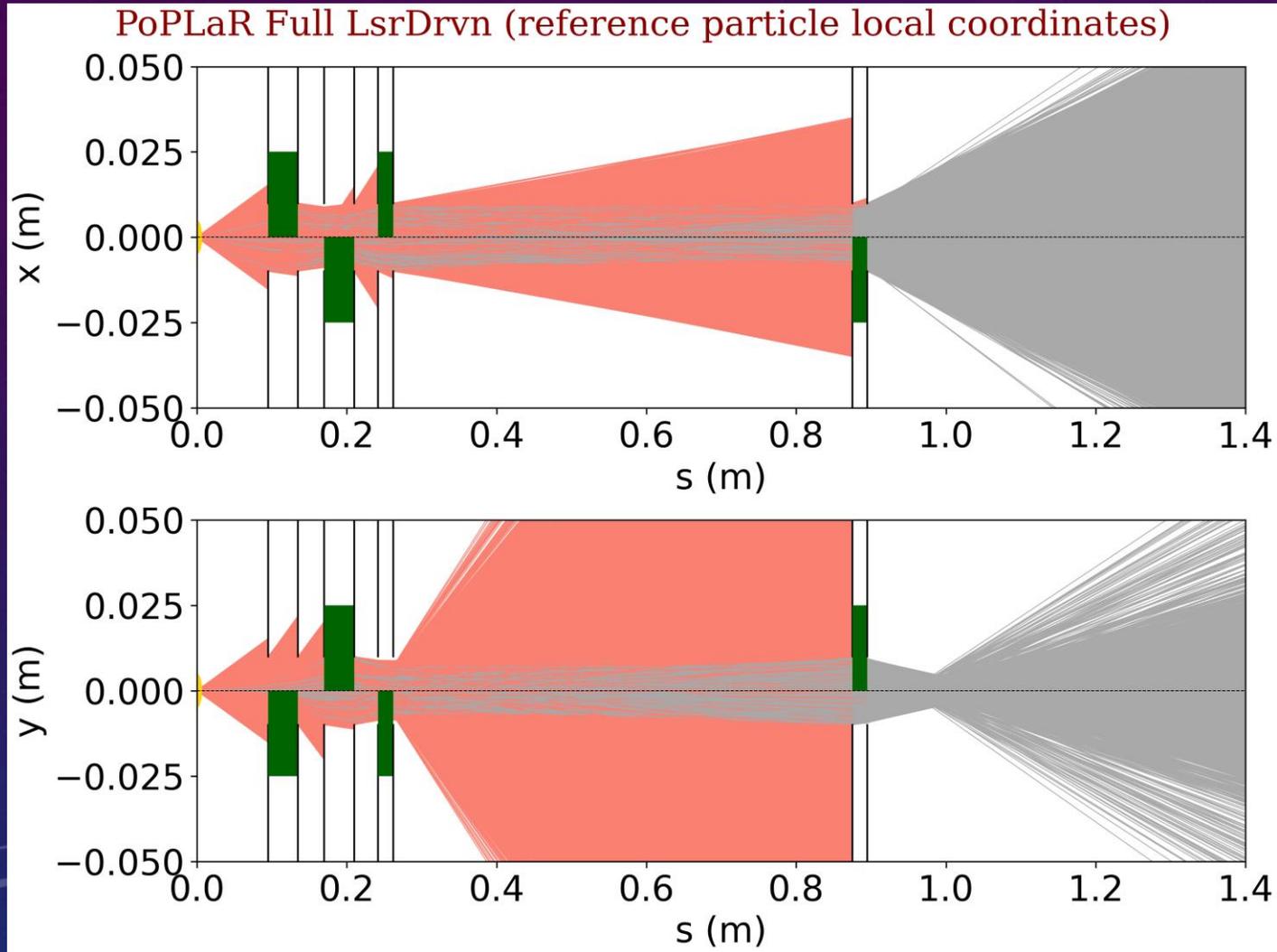
# 4 QUAD SET UP- OPTIMISATION



- 4 Quadrupoles
- FDFD 2 Quadrupole pairs
- Optimised by CV
  - First pass: trials all quad options
  - Second pass: optimises for best quad combo



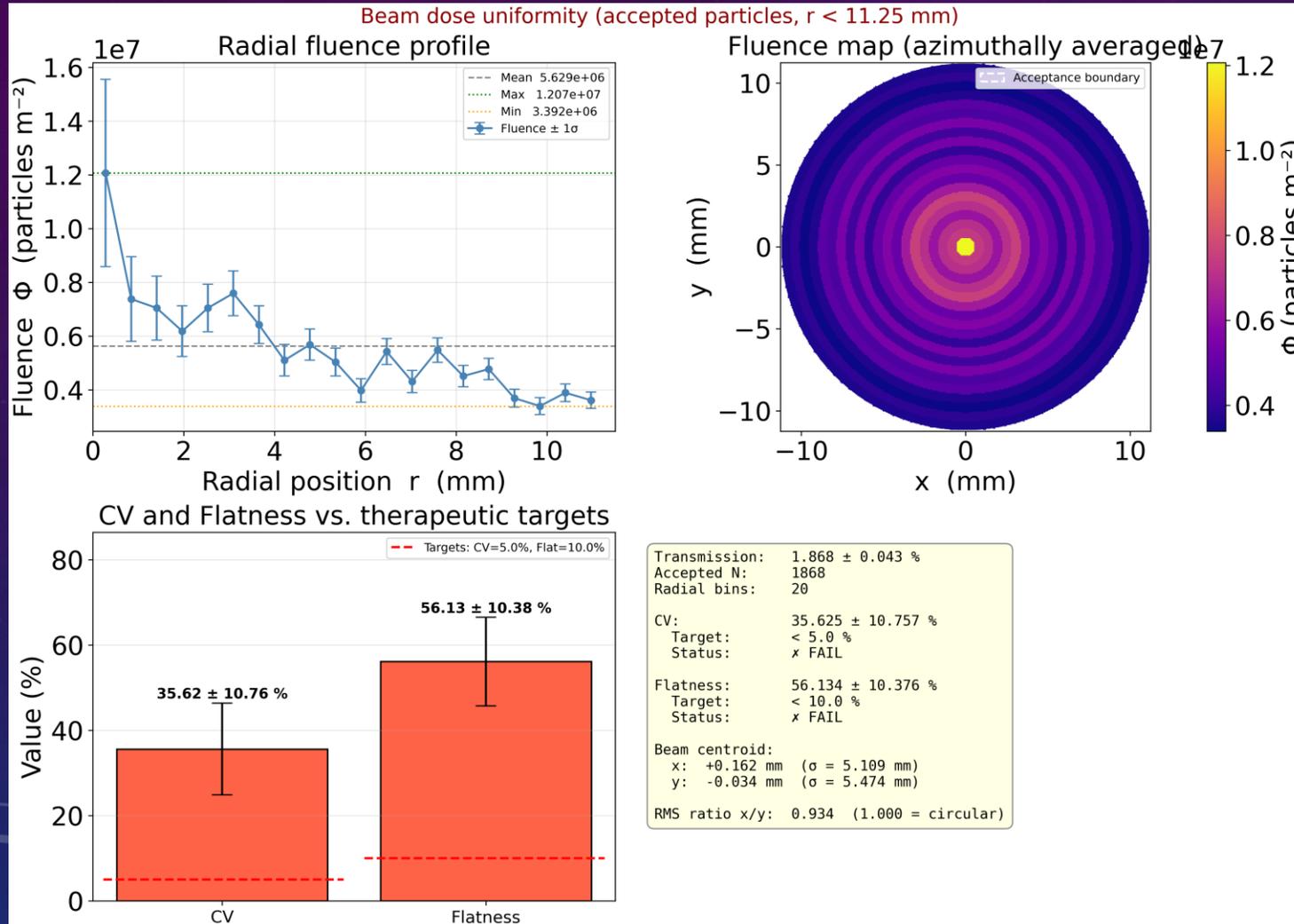
# 4 QUAD SET UP- VISUAL



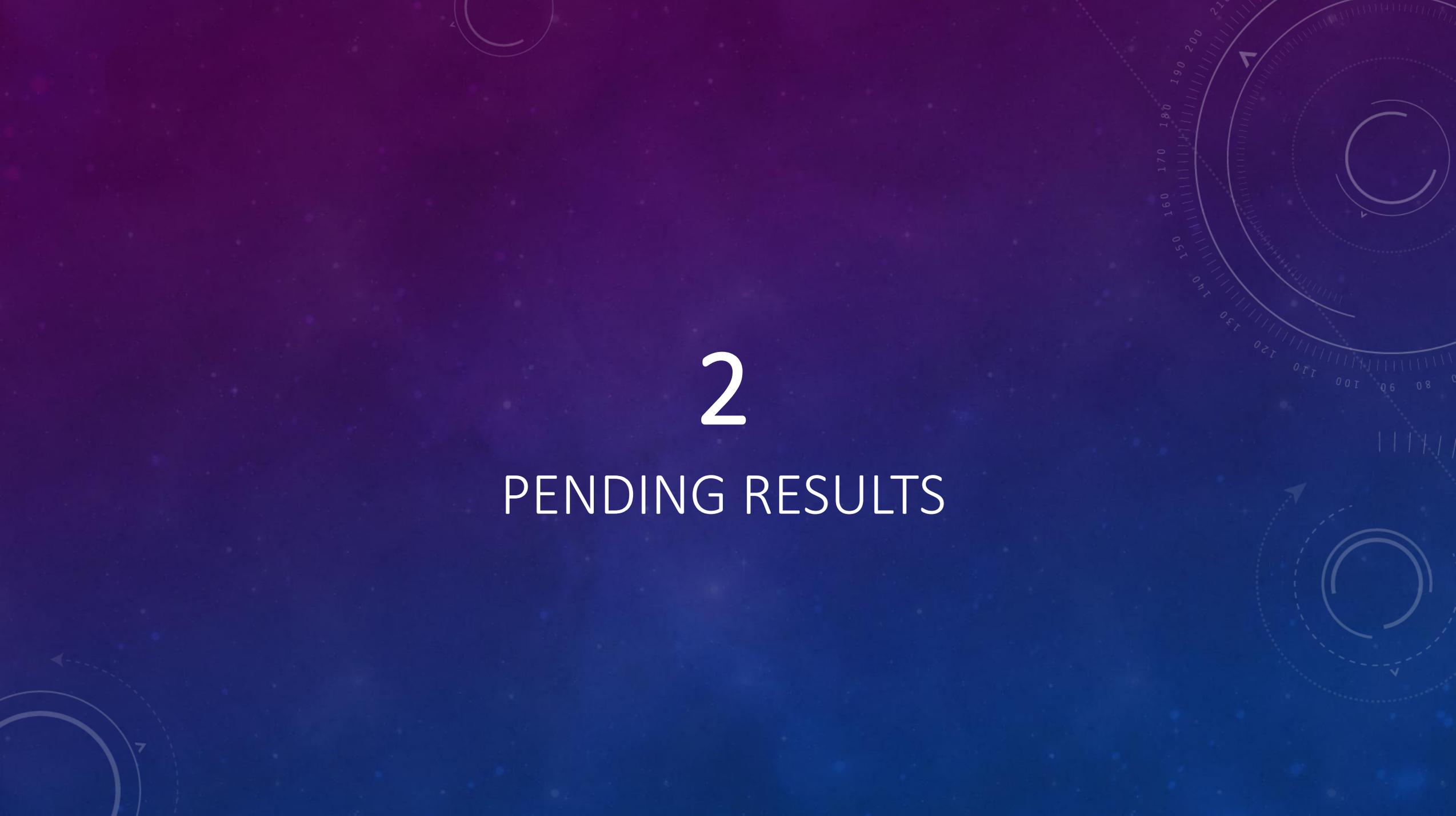
- 4 Quadrupoles
- FDFD 2 Quadrupole pairs
- Optimised by CV
- Low transmission penalty in cost function

TRANSMISSION TO CELLS:  $1.87 \pm 0.04 \%$

# 4 QUAD SET UP- CV & FLATNESS ESTIMATIONS



- 4 Quadrupoles
- FDFD 2 Quadrupole pairs
- Optimised by CV
- Low transmission penalty in cost function

The background is a dark blue gradient with a field of small white stars. Overlaid on this are several faint, light blue technical diagrams. On the right side, there is a large circular gauge with a scale from 0 to 210 and a needle pointing towards 180. Below it is another circular diagram with concentric circles and arrows. In the bottom left, there are more circular diagrams with arrows. The overall aesthetic is clean, modern, and technical.

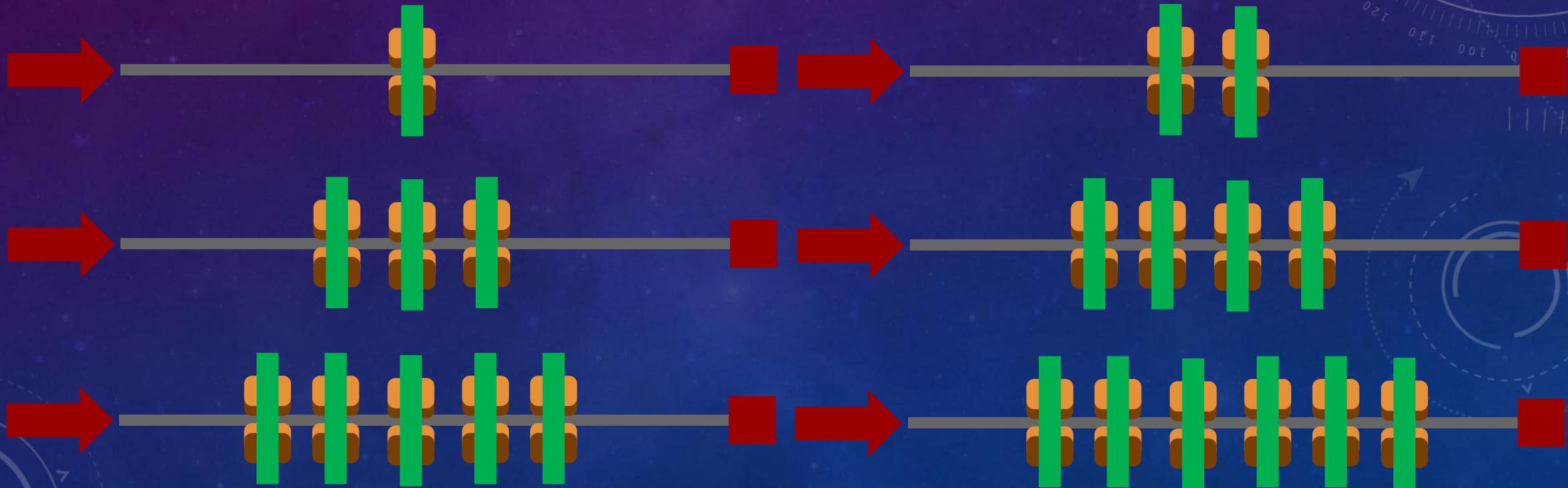
2

PENDING RESULTS

# ANY QUAD SET UP- OPTIMISATION

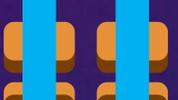
Key:  F or D Quadrupole

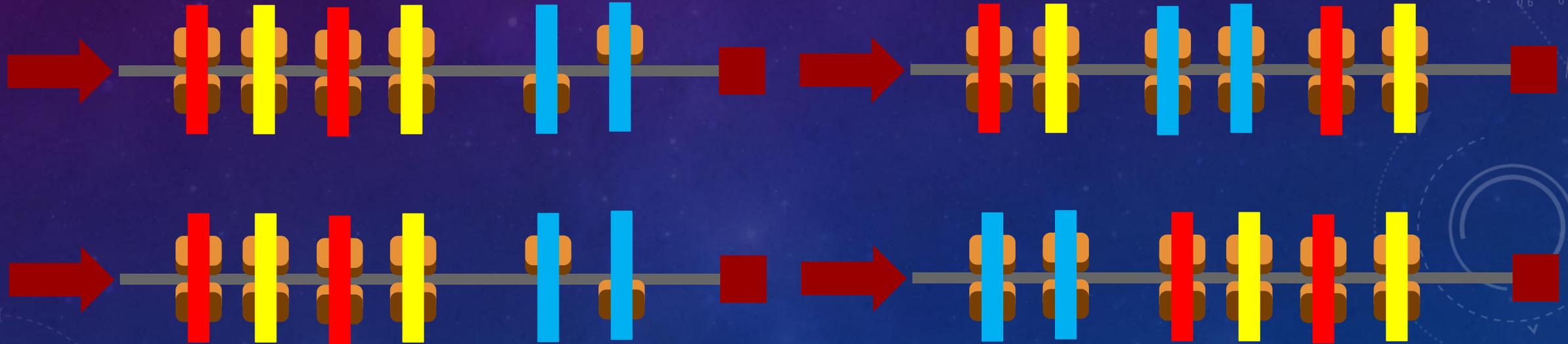
- Can have between 1 and 6 Quadrupoles
- All FD orders investigated
- Optimised by Transmission
- Optimised by CV



# 4 QUAD 2 DIPOLE SET UP- VISUAL

Key:  Focus Quadrupole  Defocus Quadrupole

 -/+ dipole pair  
 +/- dipole pair  
 Non-specific dipole pair



The background is a dark blue gradient with a subtle pattern of white stars. Overlaid on this are several faint, light blue technical diagrams. On the right side, there is a large circular diagram with concentric circles and radial lines, resembling a scale or a gauge, with numerical markings from 80 to 210. Below it is another circular diagram with dashed lines and arrows. On the left side, there are smaller circular diagrams, some with arrows indicating rotation or movement.

3

SLIGHTLY UNHINGED OPTION

# ANY QUAD & DIPOLE SET UP- OPTIMISATION

- Can have 1-6 Quadrupoles and dipole pair
- All FD orders investigated
- Optimised by Transmission
- Optimised by CV

