POPLAR FUTURE BEAMLINE

JOSIE MCGARRIGLE 24/02/2026 POPLAR COLLABORATION MEETING

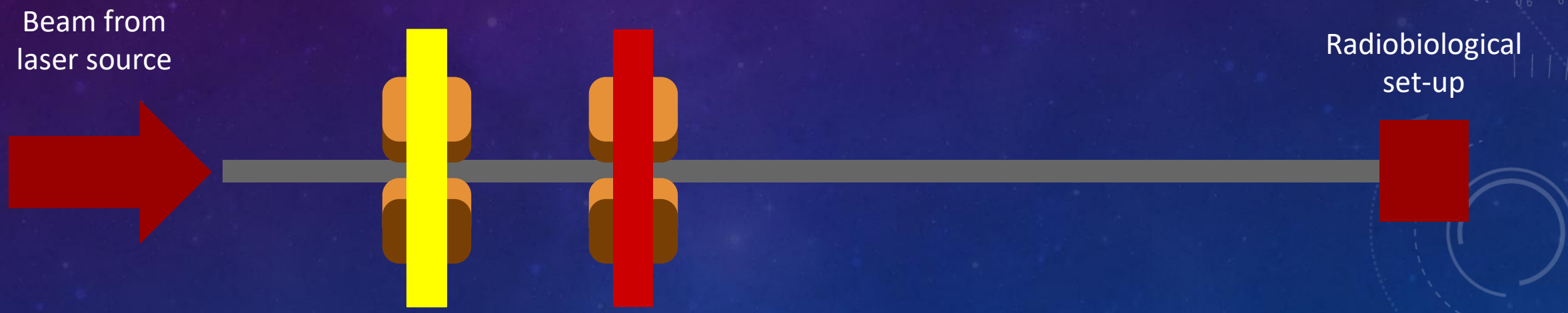
1

RESULTS SO FAR

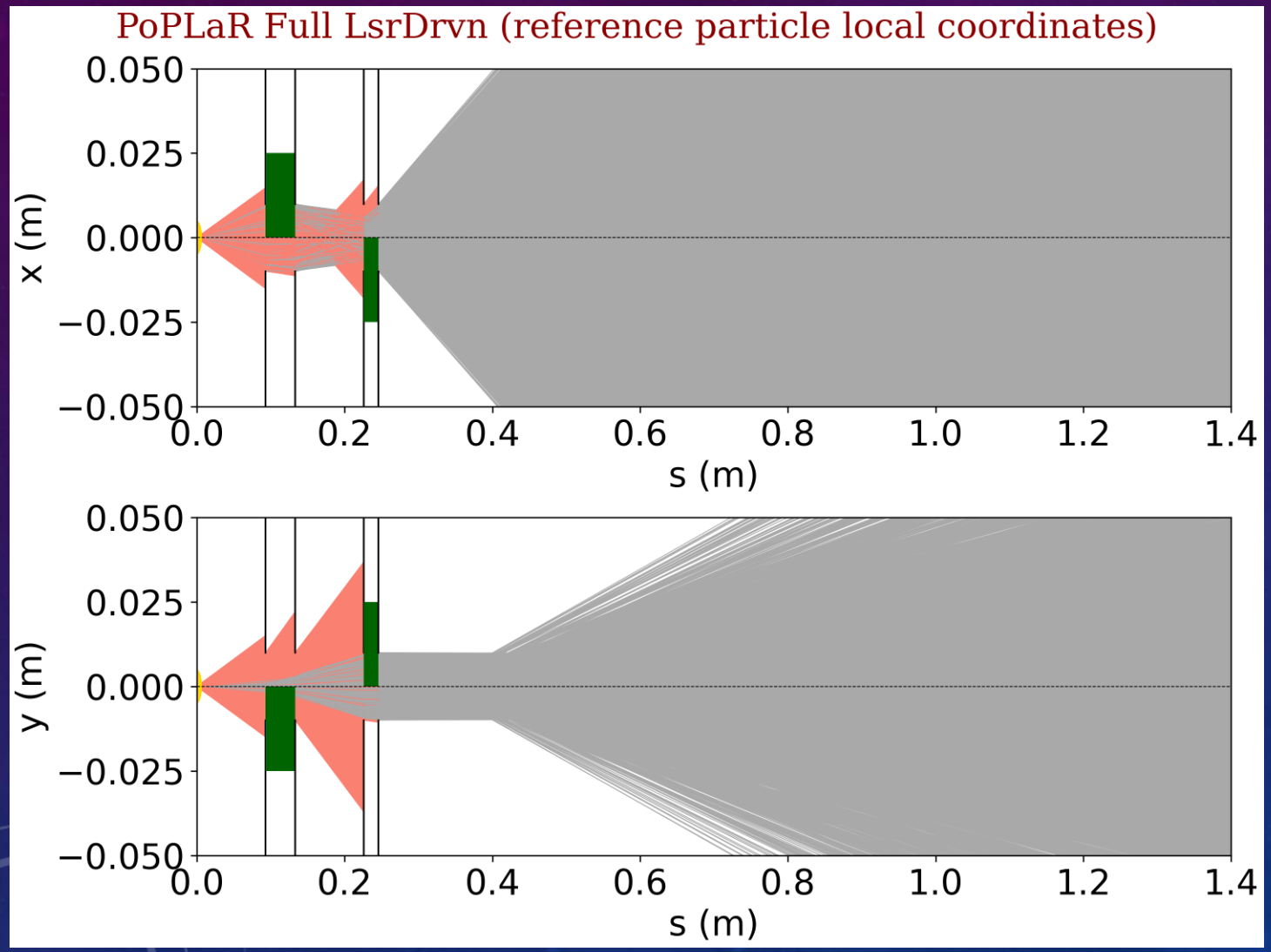
CURRENT SET UP- OPTIMISATION

- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

Key: Focus Quadrupole Defocus Quadrupole



CURRENT SET UP- VISUAL



- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

TRANSMISSION TO CELLS: 4.7 ±0.07 %

ADDITIONAL METRICS

Coefficient of Variation (CV)

- Measures spread of radial fluence distribution

$$\frac{\sigma_{\emptyset}}{\langle \emptyset \rangle} . 100\ \%$$

Where: $\sigma_{\emptyset}$ = sample std dev across populated bins

$\langle \emptyset \rangle$ = mean fluence across populated bins

Flatness

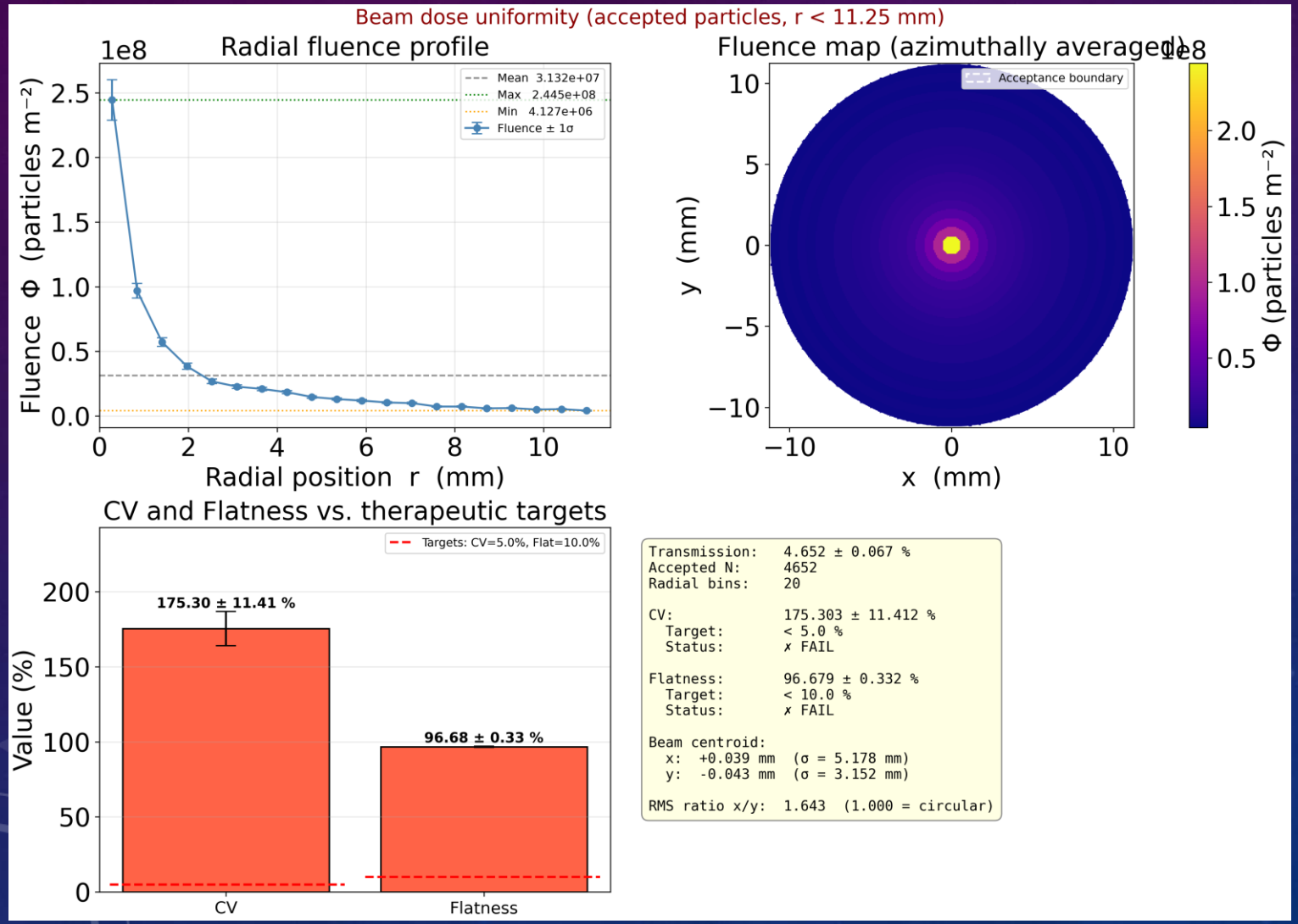
- Measures how flat the radial fluence profile is

$$\frac{\emptyset_{max} - \emptyset_{min}}{\emptyset_{max} + \emptyset_{min}} . 100\ \%$$

Where: $\emptyset_{max}$ = maximum annular fluence

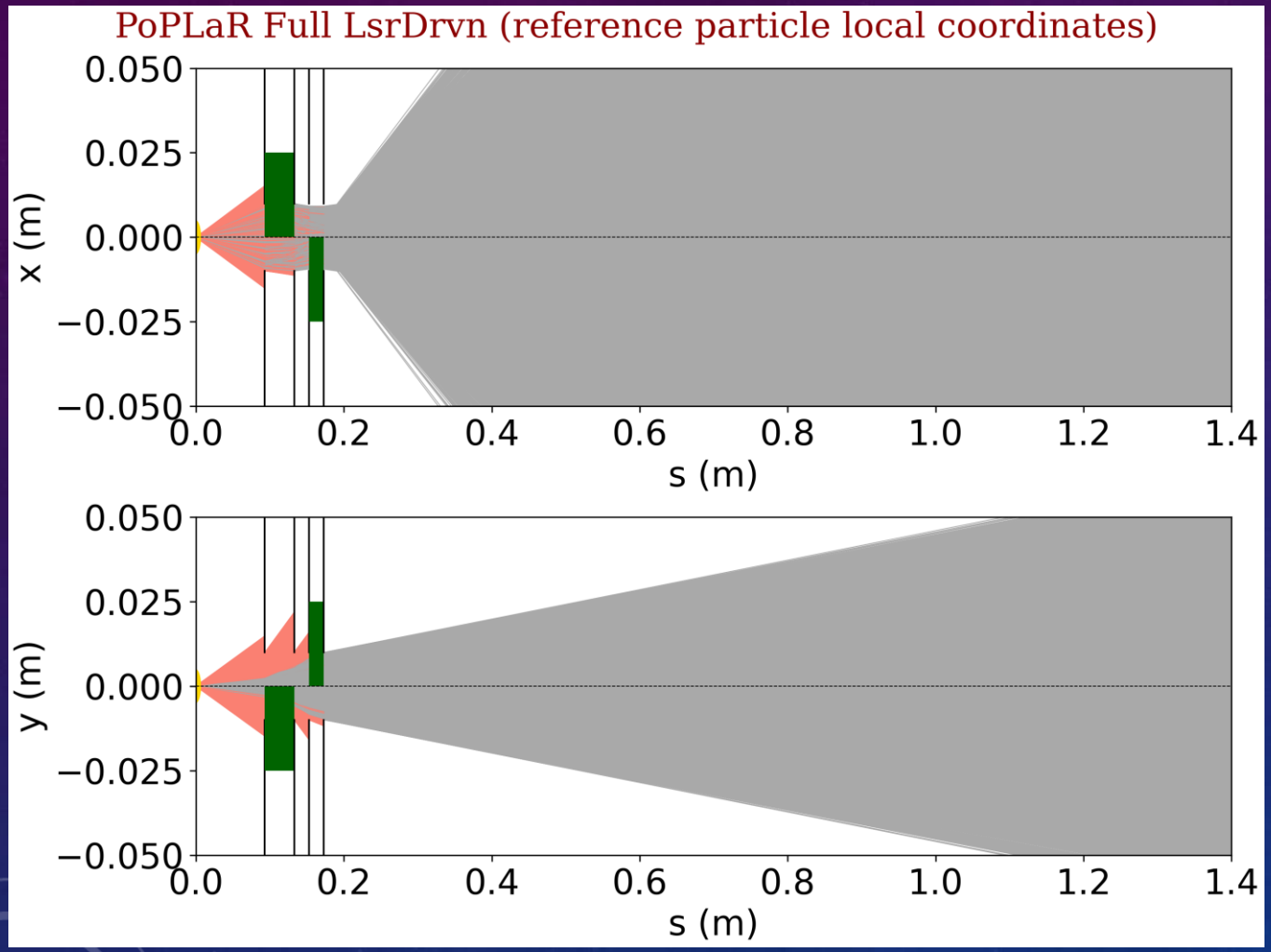
$\emptyset_{min}$ = minimum annular fluence

CURRENT SET UP- CV & FLATNESS ESTIMATIONS



- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

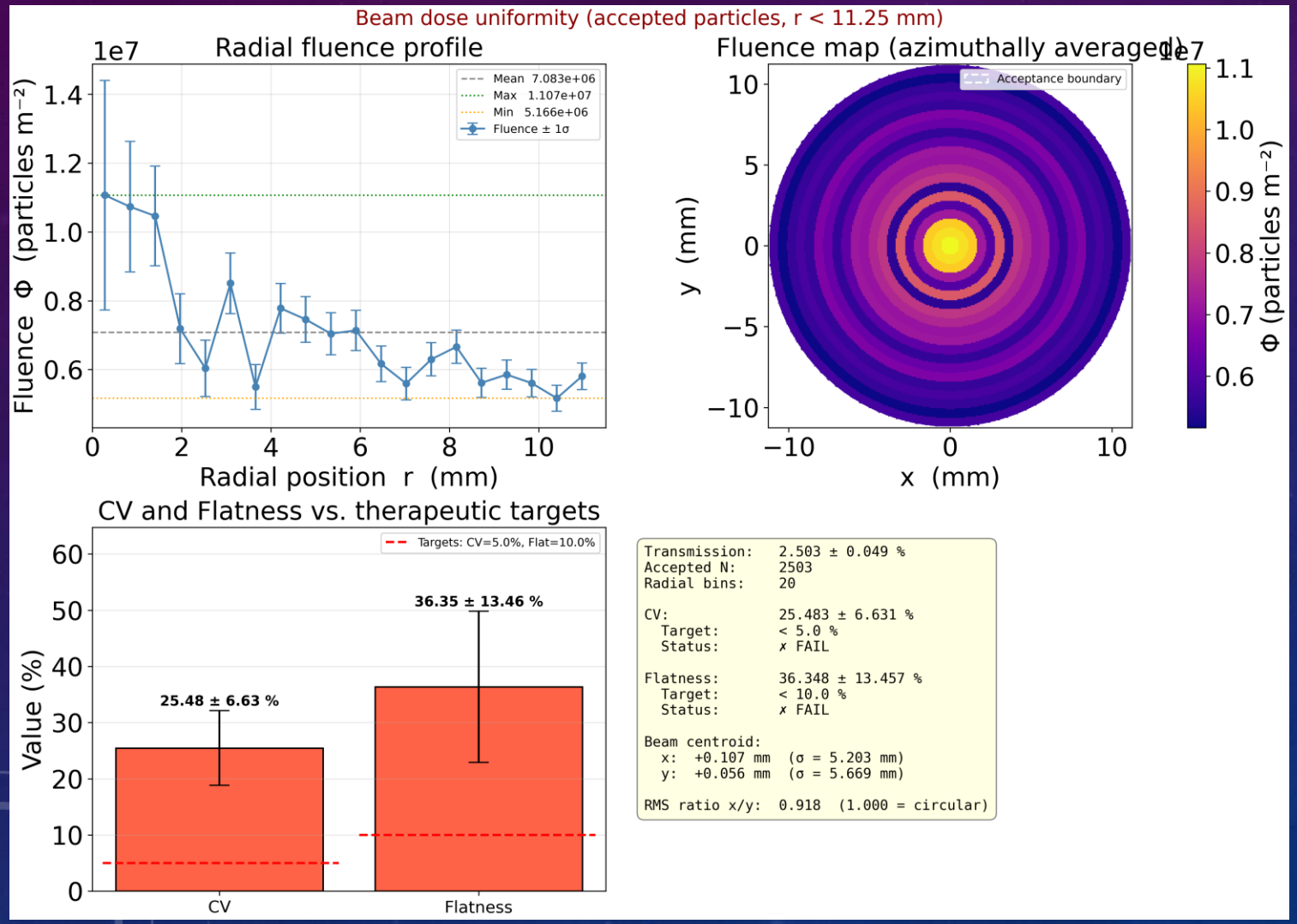
2 QUAD- IF CAN CLOSE Q2 DISTANCE- VISUAL



- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

TRANSMISSION TO CELLS: 2.50 ±0.05 %

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

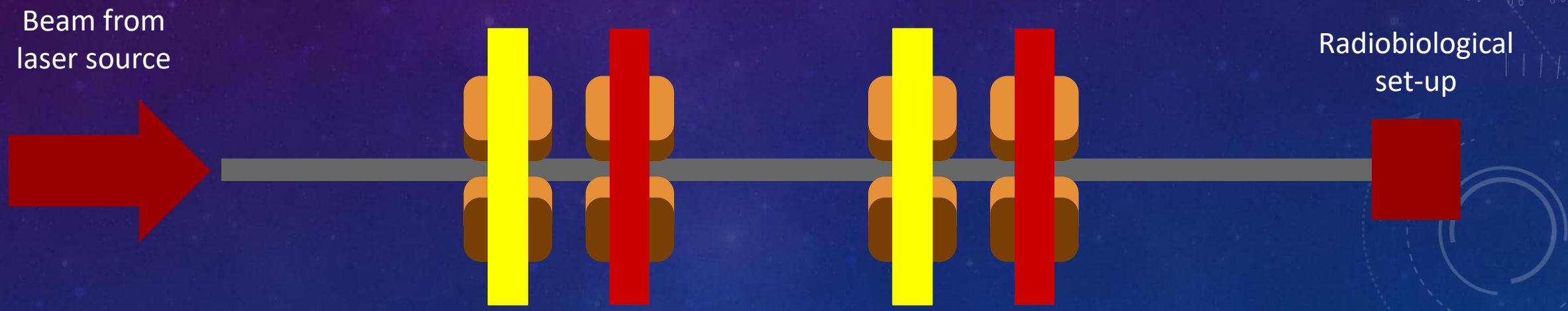


- 2 Quadrupoles
- FD Quadrupole pair
- Optimised by transmission

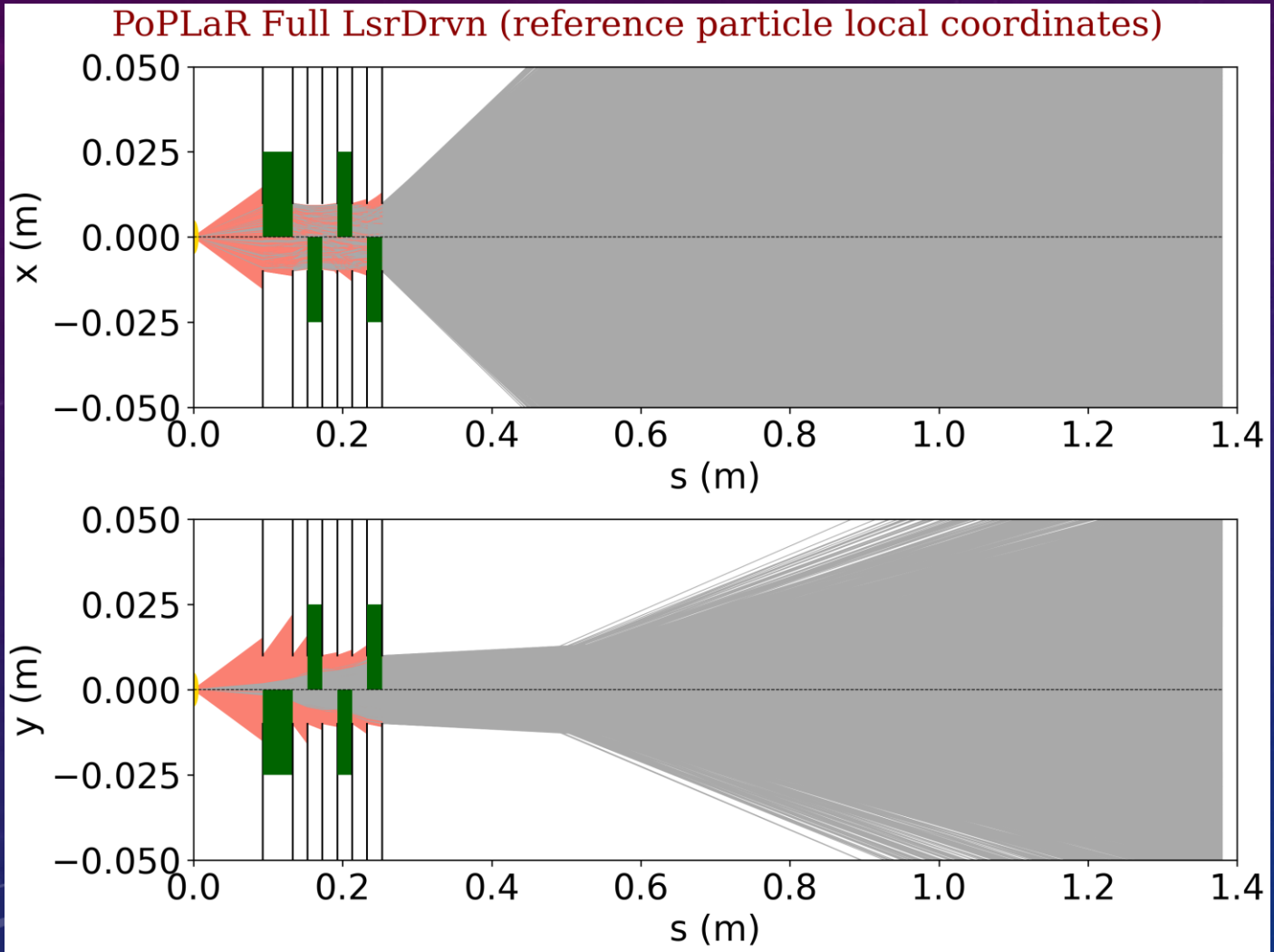
4 QUAD SET UP- OPTIMISATION

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

Key: Focus Quadrupole Defocus Quadrupole



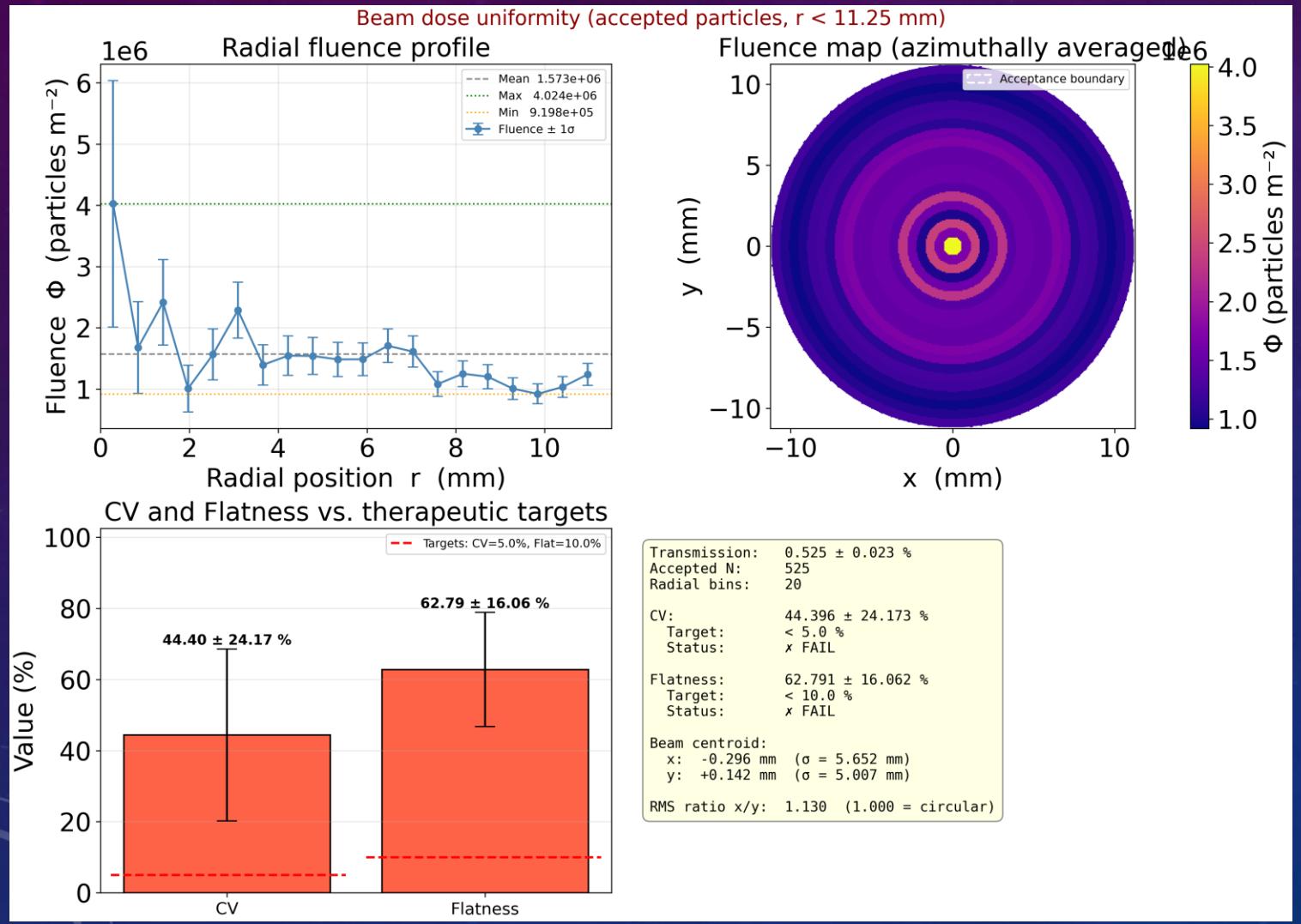
4 QUAD SET UP- VISUAL



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

TRANSMISSION TO CELLS: 4.40 ±0.01 %

4 QUAD SET UP- CV & FLATNESS ESTIMATIONS

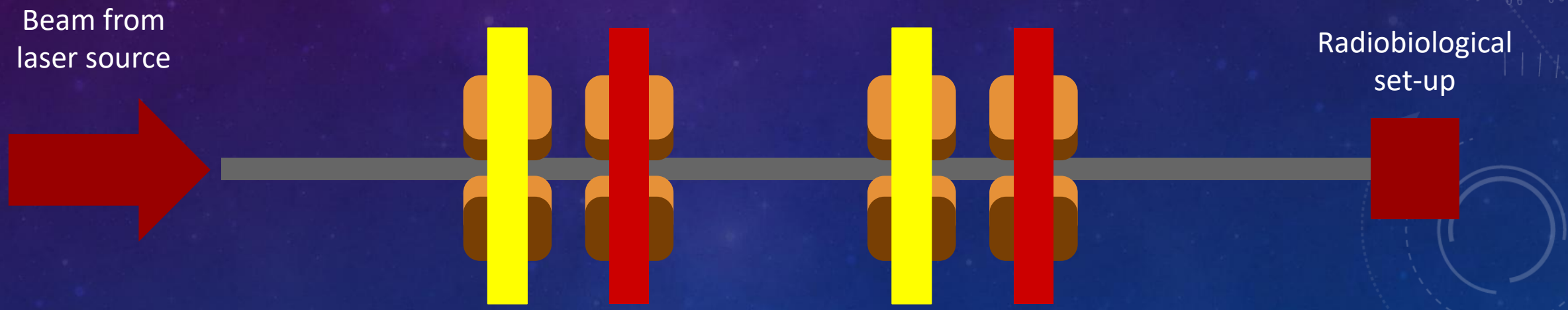


- 4 Quadrupoles
- FDFD 2 Quadrupole pairs
- Optimised by transmission

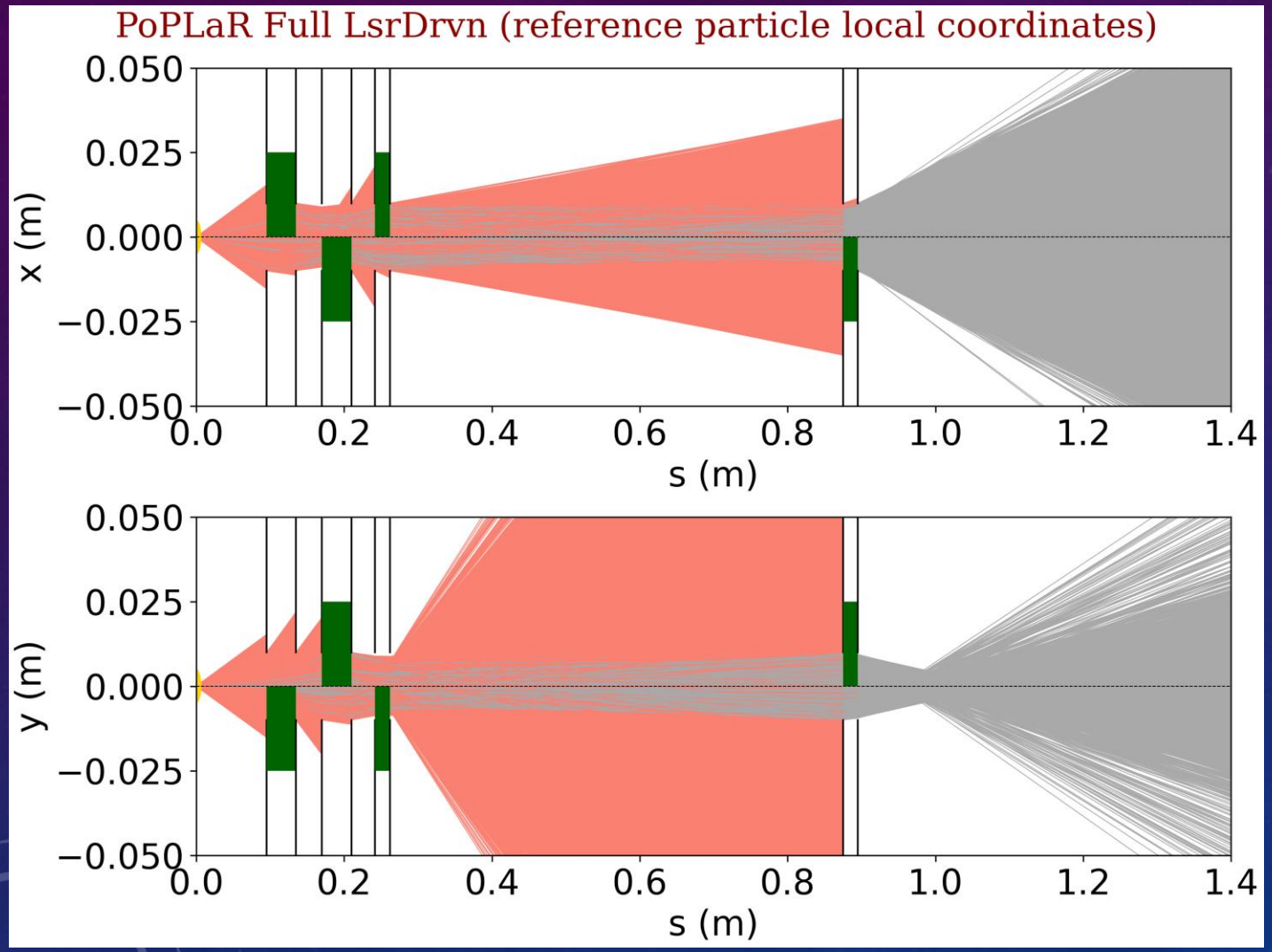
4 QUAD SET UP- OPTIMISATION

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

Key: Focus Quadrupole Defocus Quadrupole



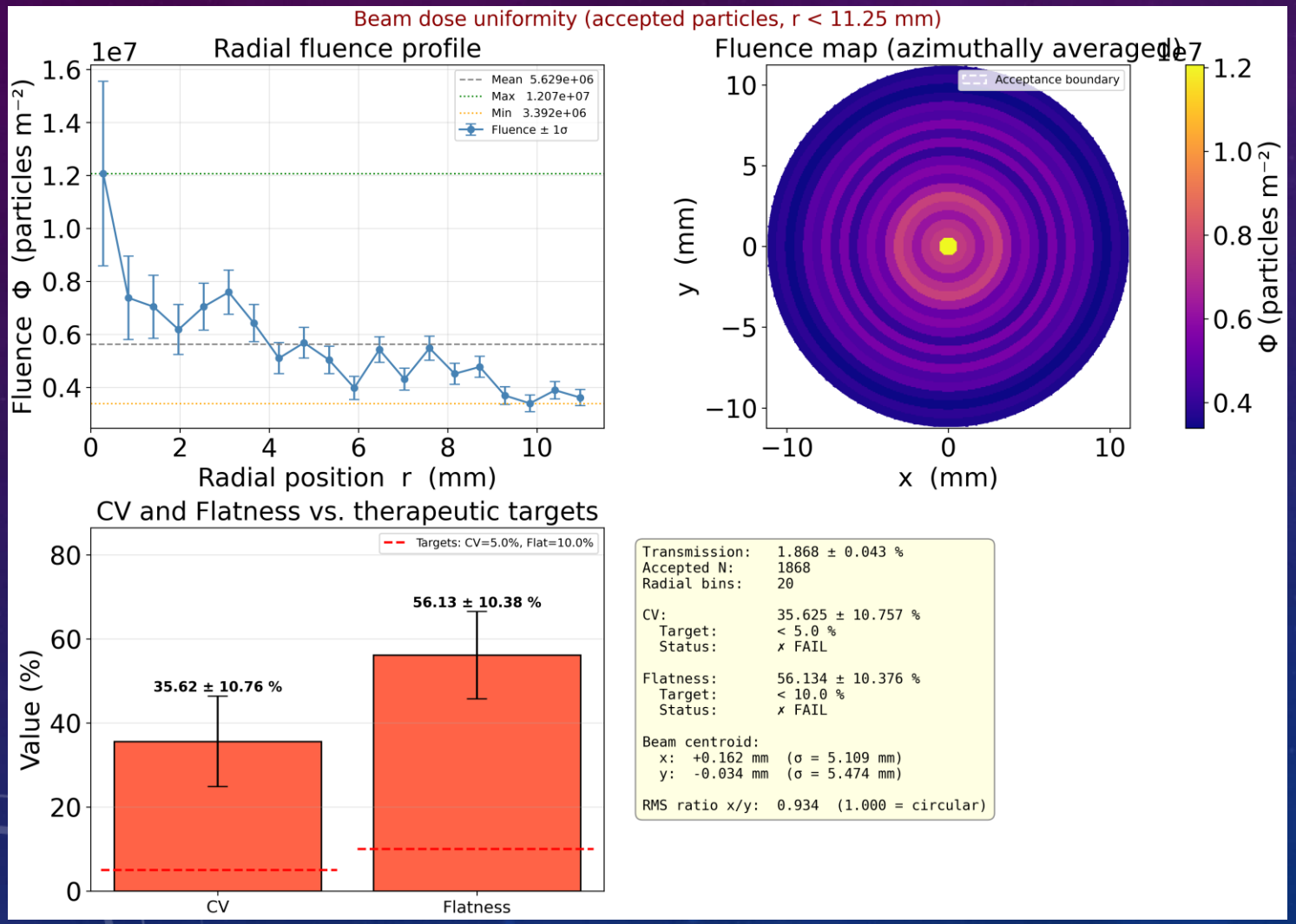
4 QUAD SET UP- VISUAL



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

TRANSMISSION TO CELLS: 1.87 ±0.04 %

4 QUAD SET UP- CV & FLATNESS ESTIMATIONS



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

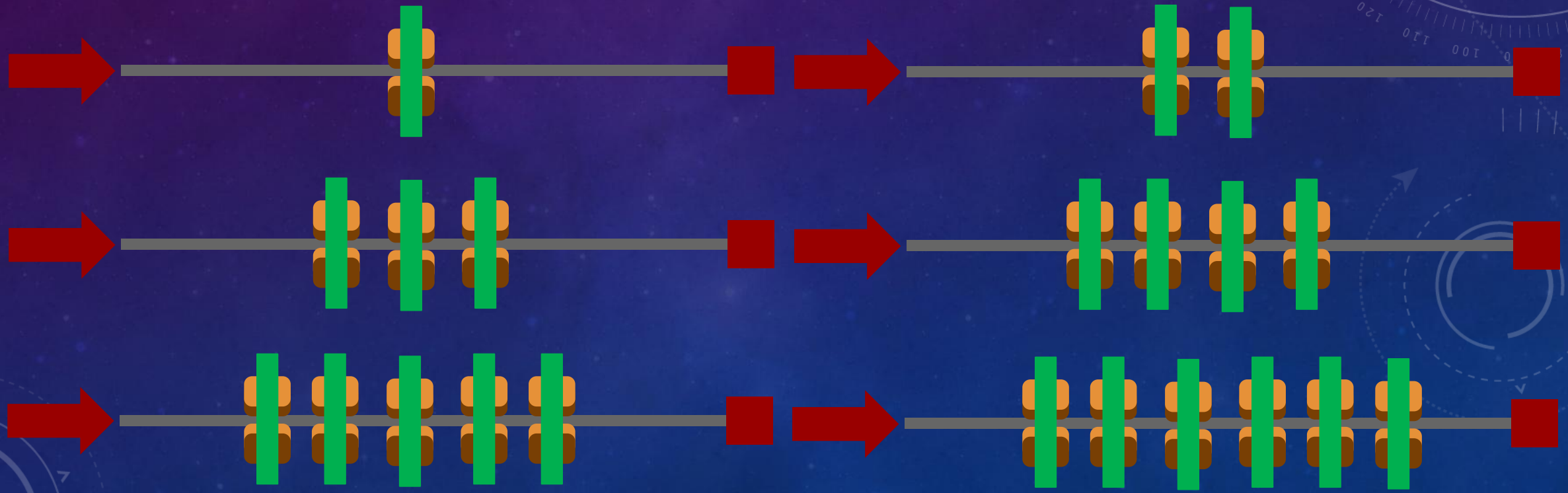
2

PENDING RESULTS

ANY QUAD SET UP- OPTIMISATION

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

Key: F or D Quadrupole



4 QUAD 2 DIPOLE SET UP- VISUAL

Key:

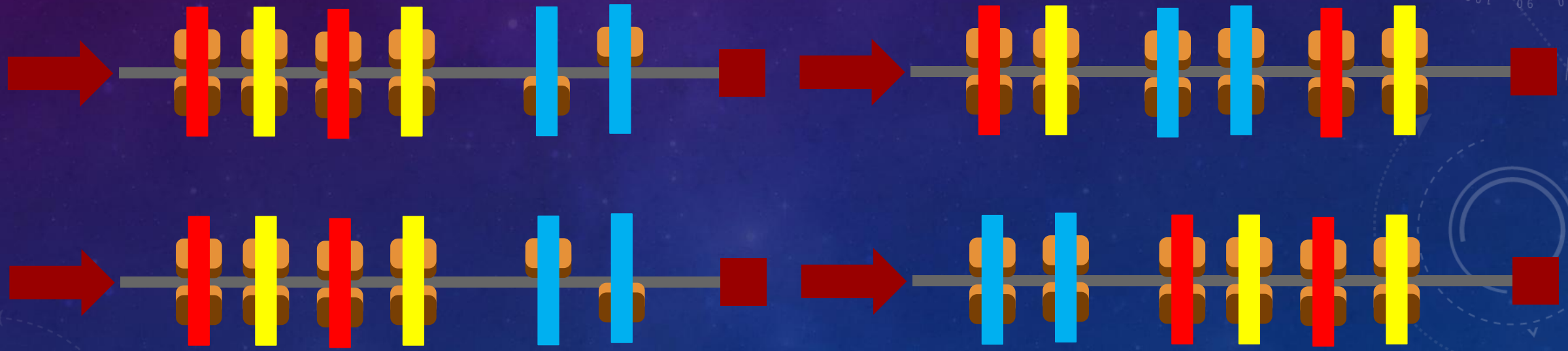
Focus Quadrupole

Defocus Quadrupole

-/+ dipole pair

+/- dipole pair

Non-specific dipole pair



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