

Beam Propagation for bKAGRA Phase 1 with flat ETMs

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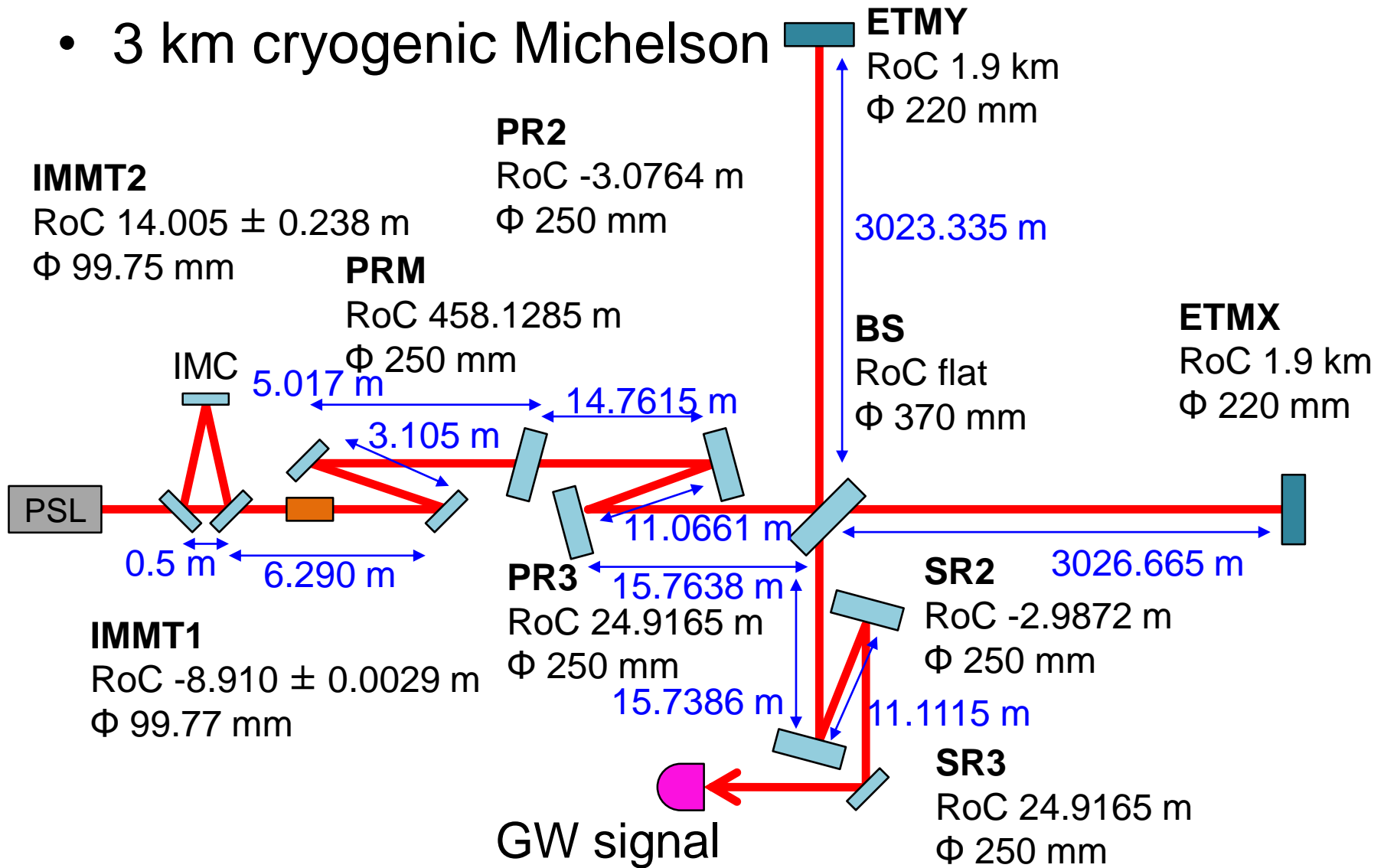
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Summary

- Real ETM mirrors might not be available on time coating was to start in February, but will start in April at best case
- We might have to use flat ETMs
- If flat ETMs are used, beam radius at BS/PR3/SR3 will be **~171 mm**, which is
 - ~31% loss** at BS ($\phi 370\text{mm}$, 45 deg)
 - ~44% loss** at PR3/SR3 ($\phi 220\text{mm}$, 0.686 deg)also, note that GVs in arms have $\phi 100\text{mm}$ or $\phi 150\text{ mm}$
for comparison, in iKAGRA, returning beam at BS ($\phi 74\text{ mm CA}$) had 76 mm radius, which is ~ 62% loss
- Beam radius at AS port will be **~ 8 mm**
we will need 3 inch in-vac mirror for steering AS beam to in-air optical table

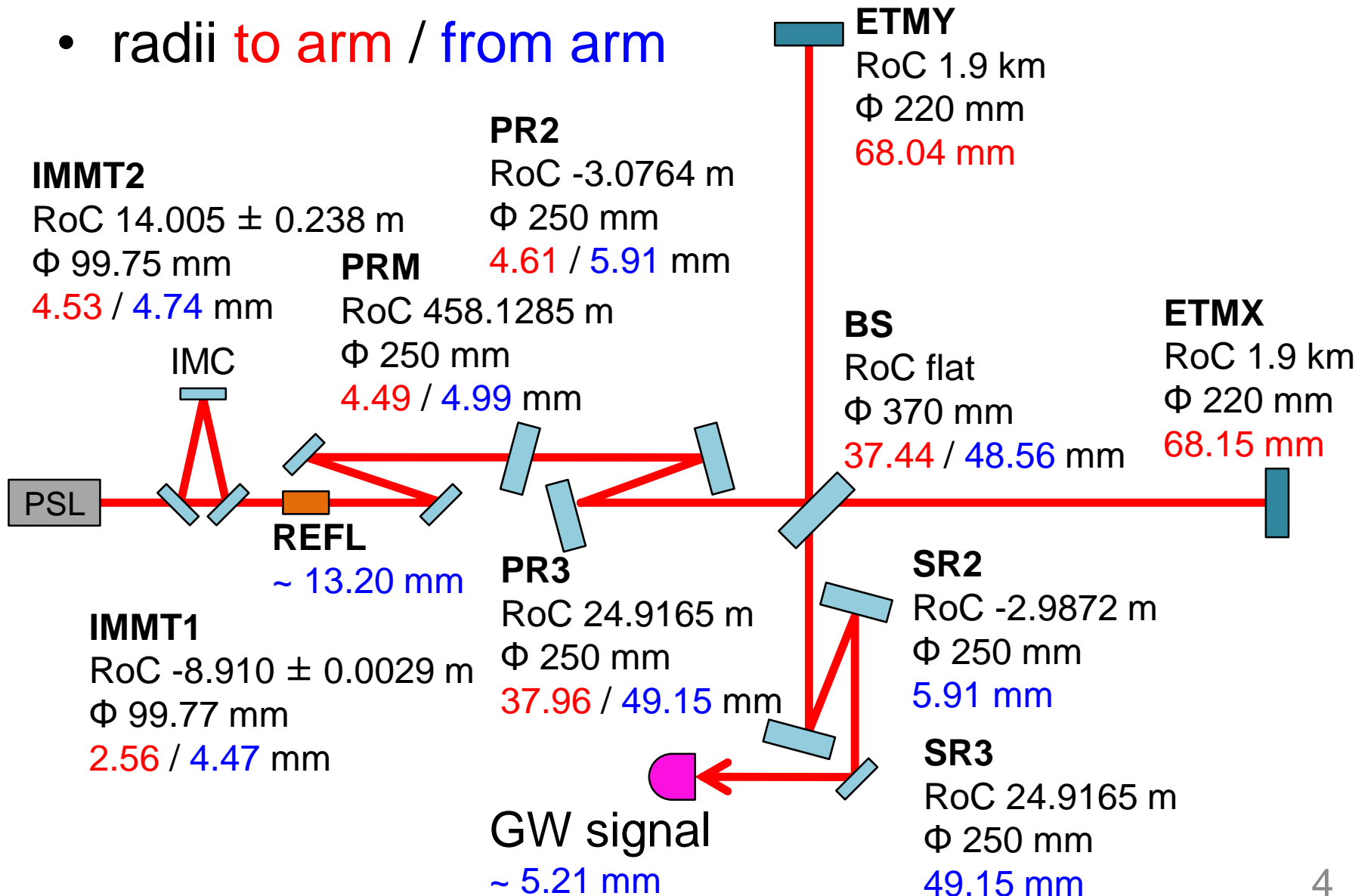
bKAGRA Phase1 Layout

- 3 km cryogenic Michelson



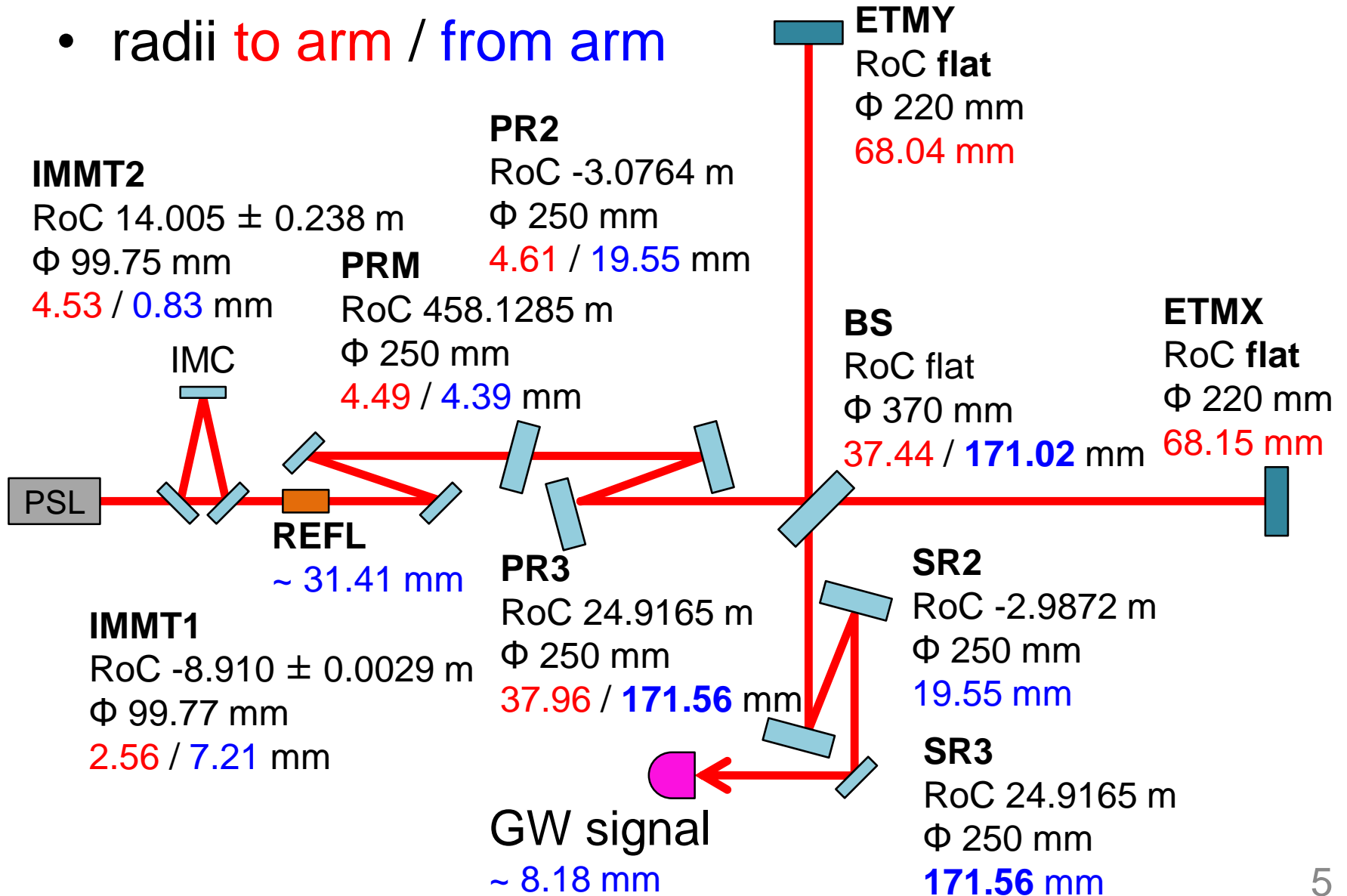
Beam Radii with RoC 1.9 km ETMs

- radii to arm / from arm

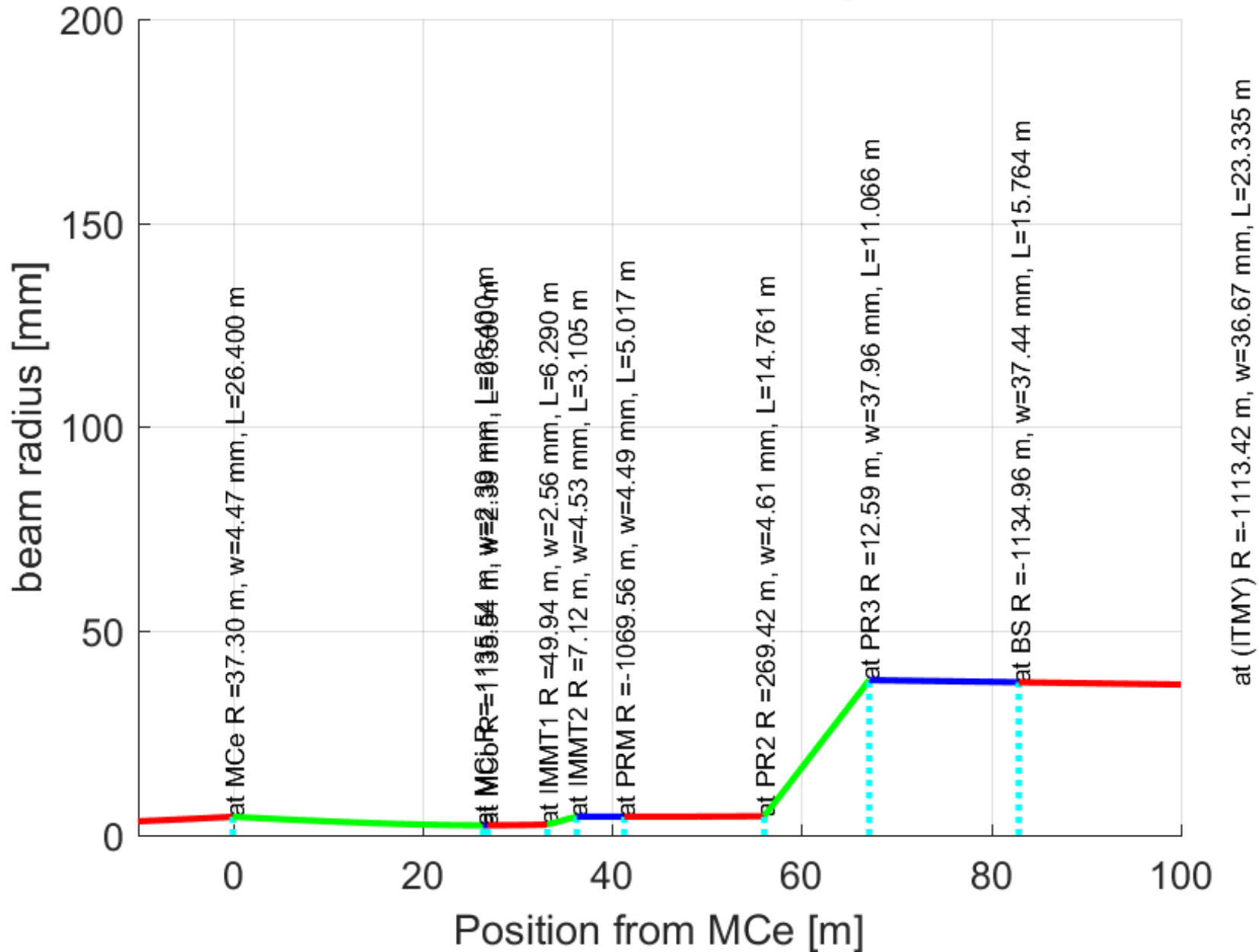


Beam Radii with Flat ETMs

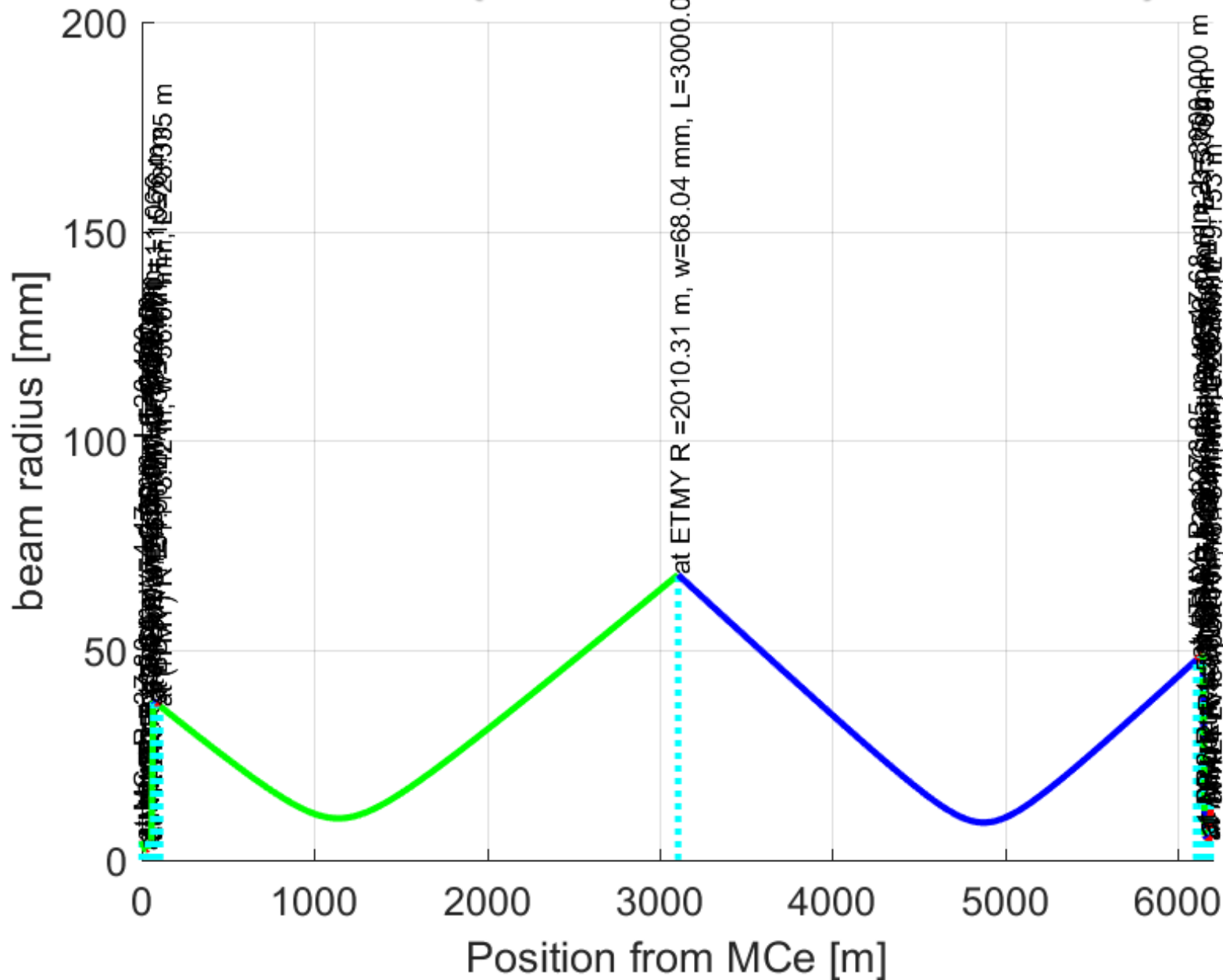
- radii to arm / from arm



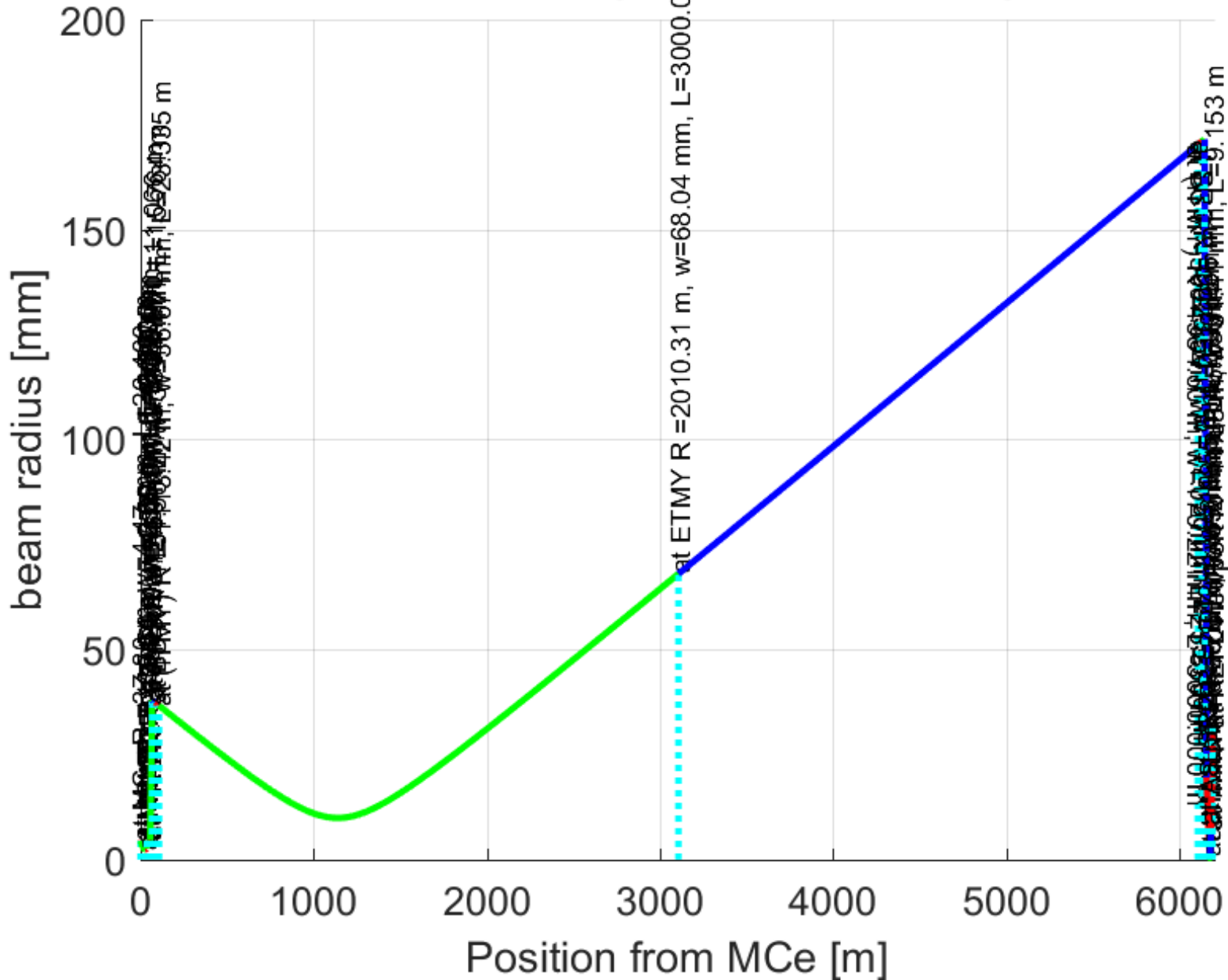
Input Stage



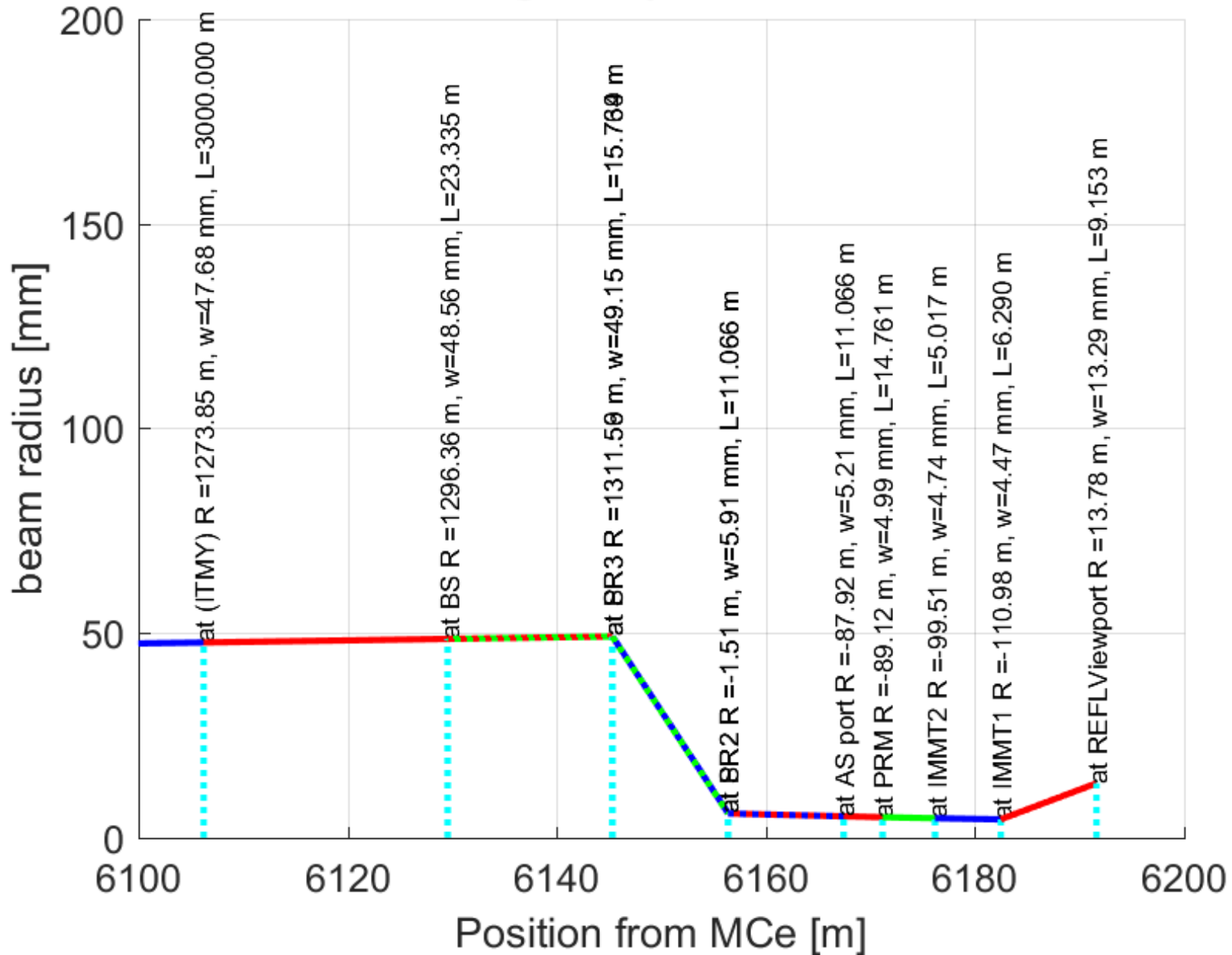
Arm (RoC 1.9km ETM)



Arm (Flat ETM)



Output Stage (RoC1.9km ETM)



Output Stage (Flat ETM)

