

Memory Consumption for the Tube Dual-Readout Calorimeter

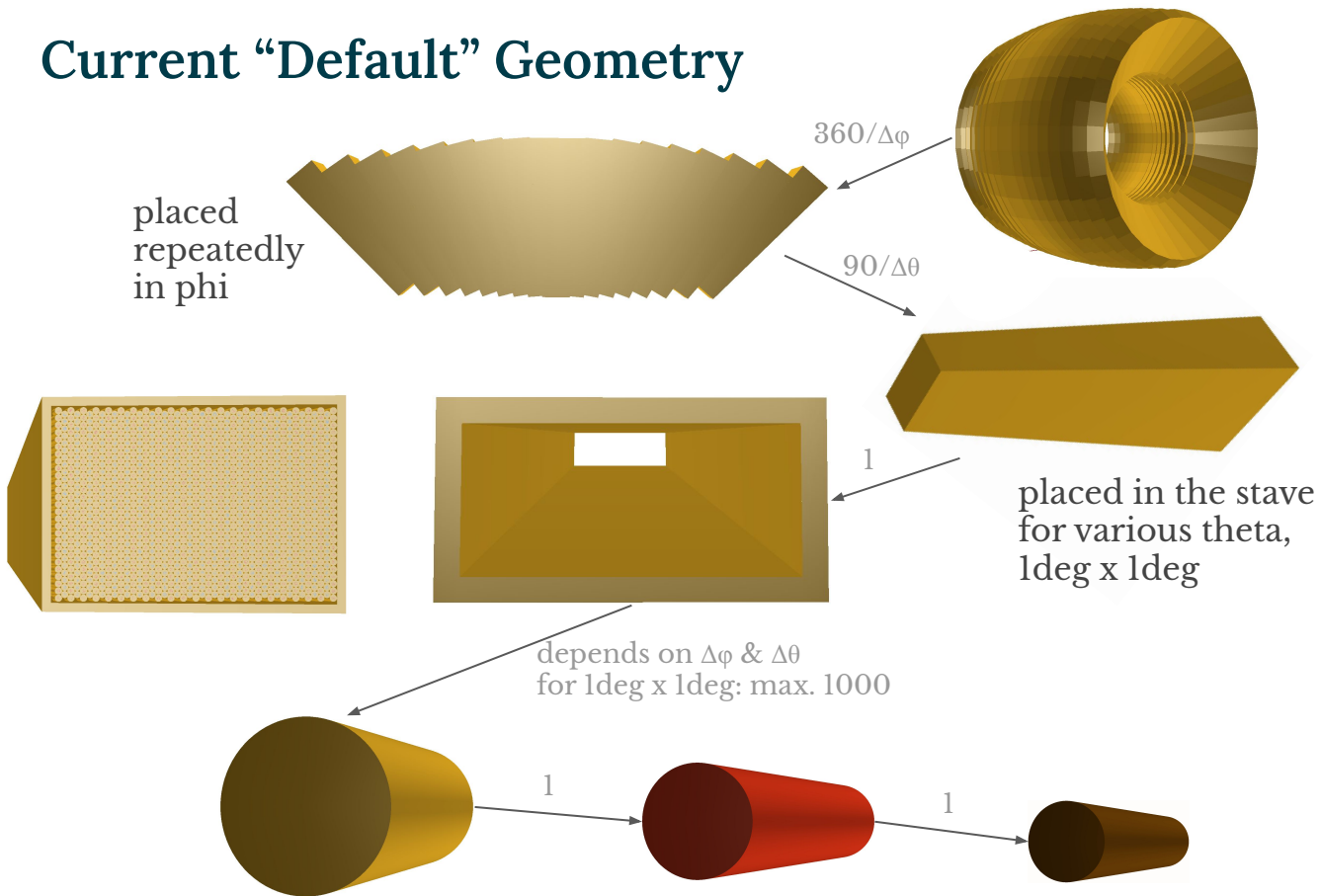
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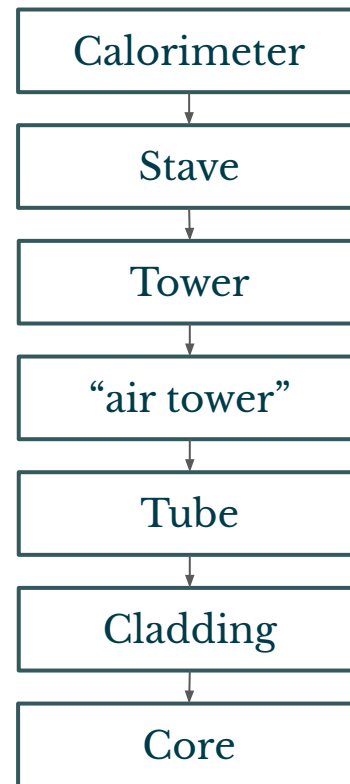


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Current “Default” Geometry

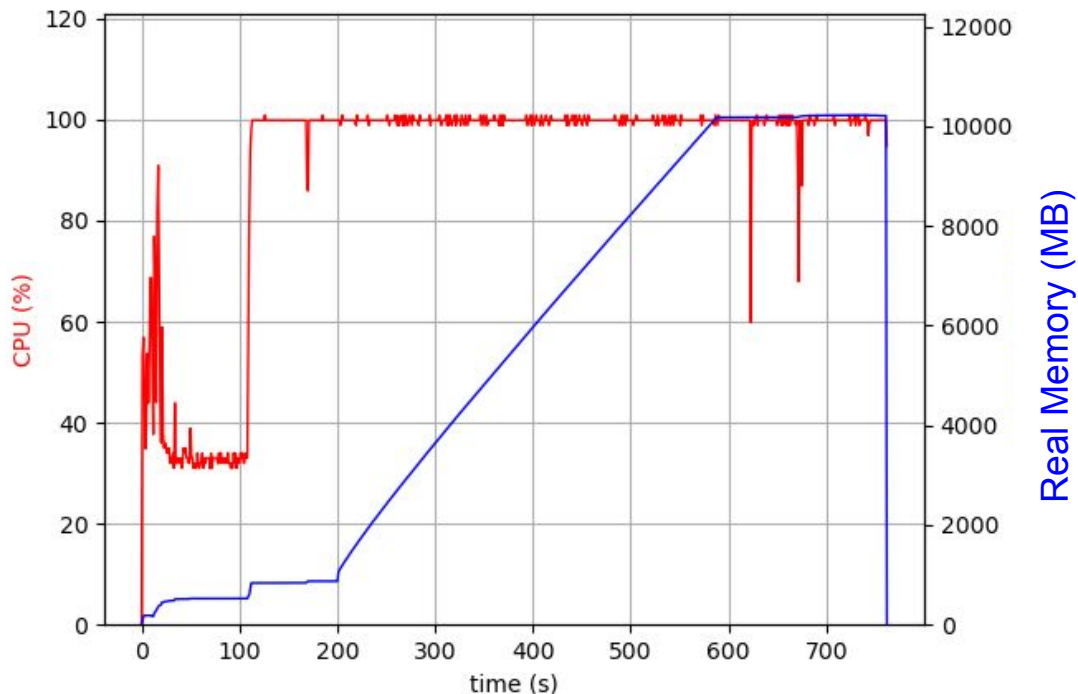


Volume Hierarchy



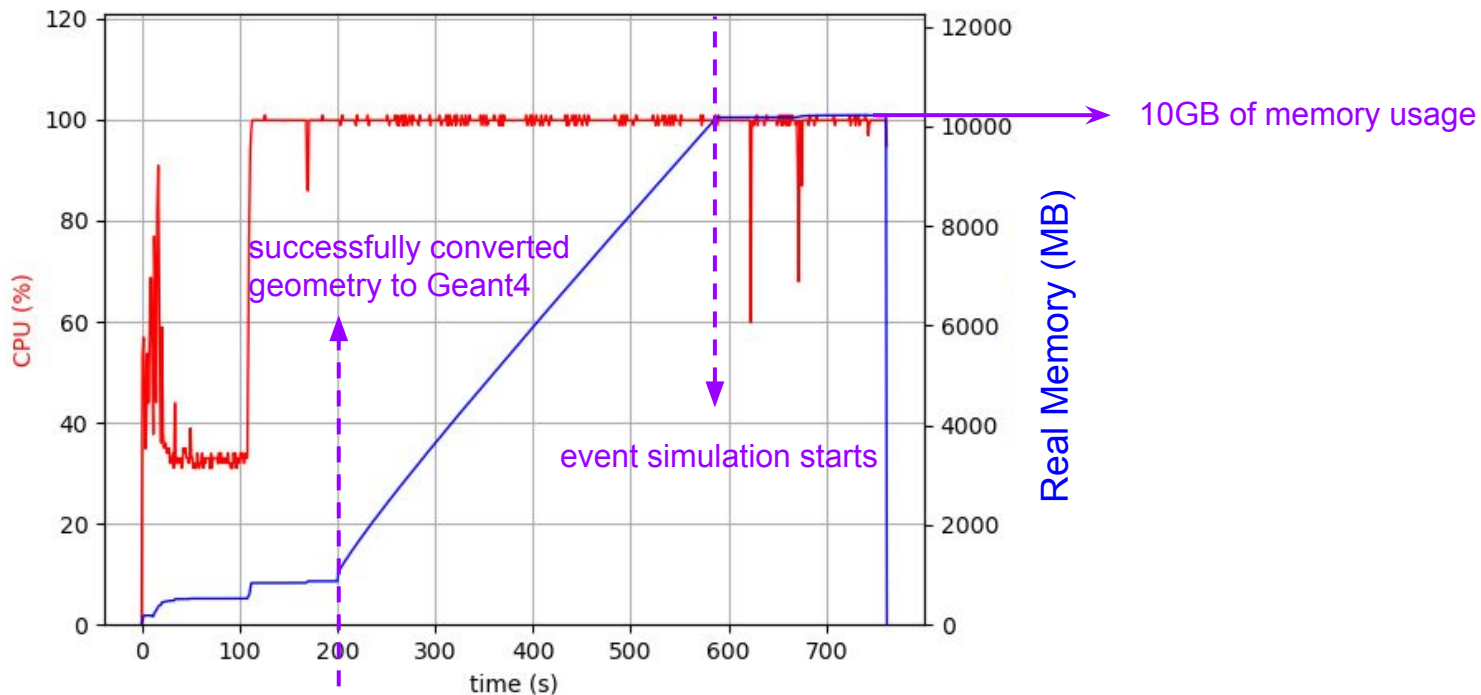
Memory Consumption *ddsim* in Default Geometry

- Running simulation of 10 events (80 GeV electrons)
- Using [psrecord](#) to monitor memory consumption



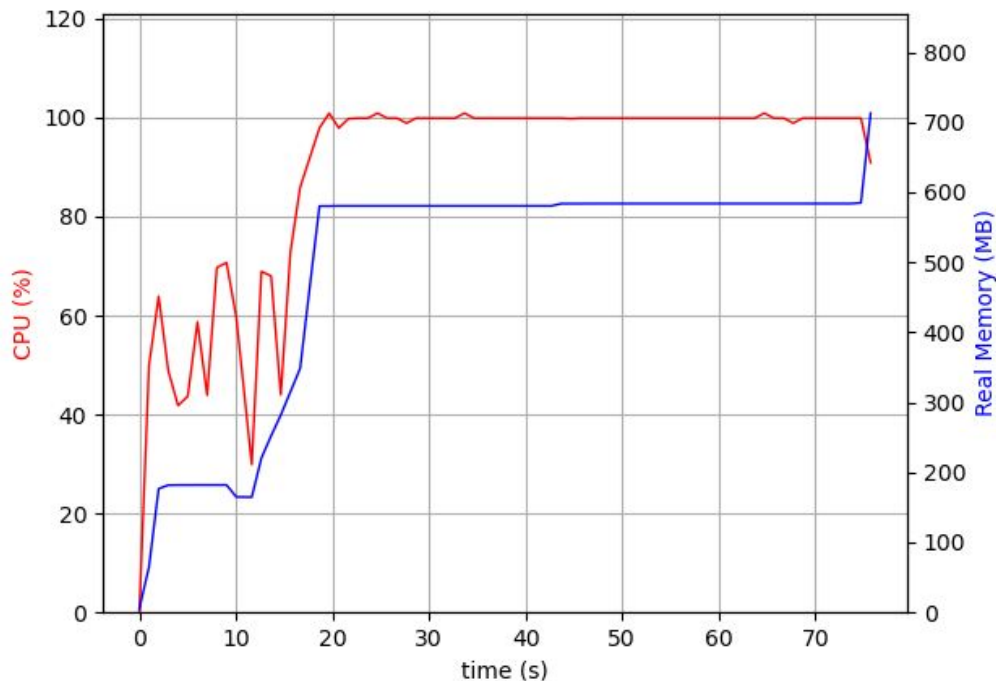
Memory Consumption *ddsim* in Default Geometry

- Running simulation of 10 events (80 GeV electrons)
- Using [psrecord](#) to monitor memory consumption



Memory Consumption *dd4hep2root*

- Using [psrecord](#) to monitor memory consumption
- Max memory around 600MB (instead of 10GB)

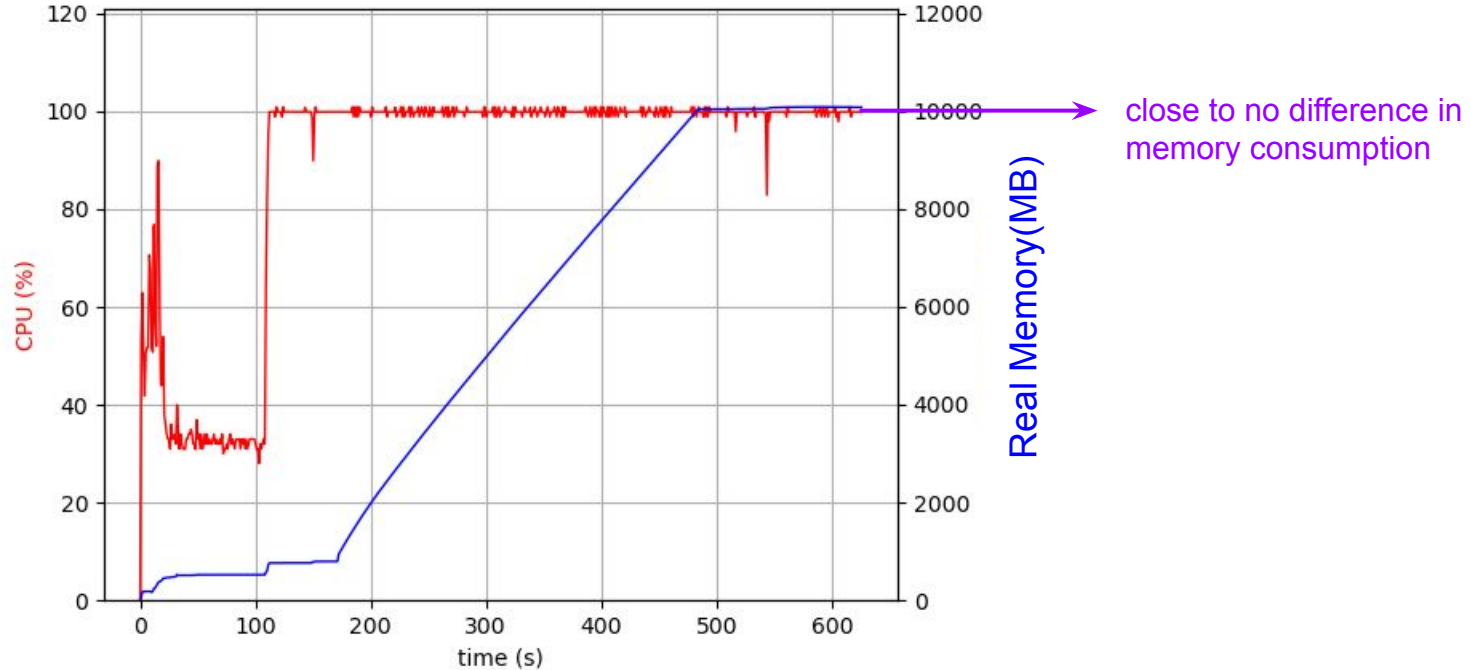


Removing Cladding Volume to see effect on Memory

- Cladding around fibres to ensure total internal reflection
- removes close to 1/3 of volumes

Removing Cladding Volume to see effect on Memory

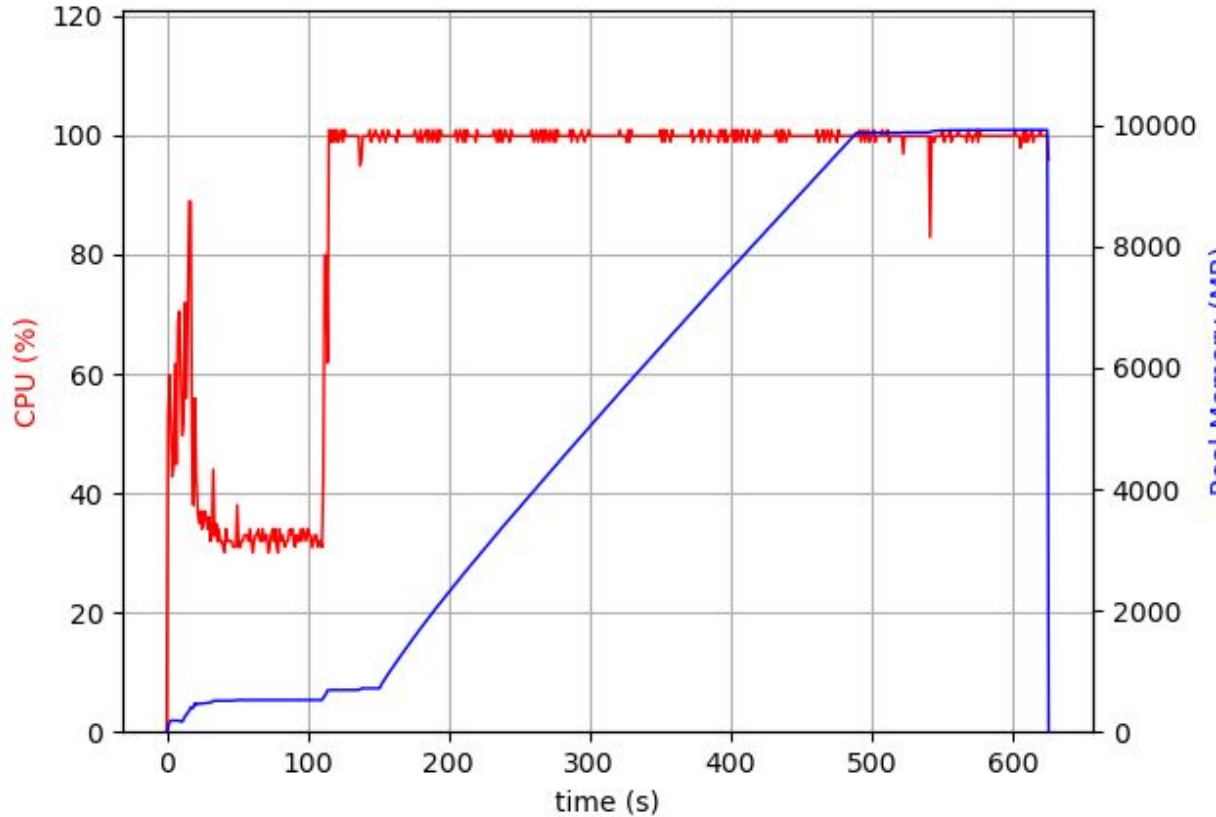
- Cladding around fibres to ensure total internal reflection
- removes close to 1/3 of volumes



Volume Map

- In current implementation volumes and solids are initialised and placed for each tube individually in a loop for each tower
 - regardless of whether the volume can be reused for another tube of same length
- Idea: create volumes once and store in a map (length of tube as key, volume as value)
 - Length rounded to some ‘tolerance’
 - Making better (re-)use of tubes of similar length

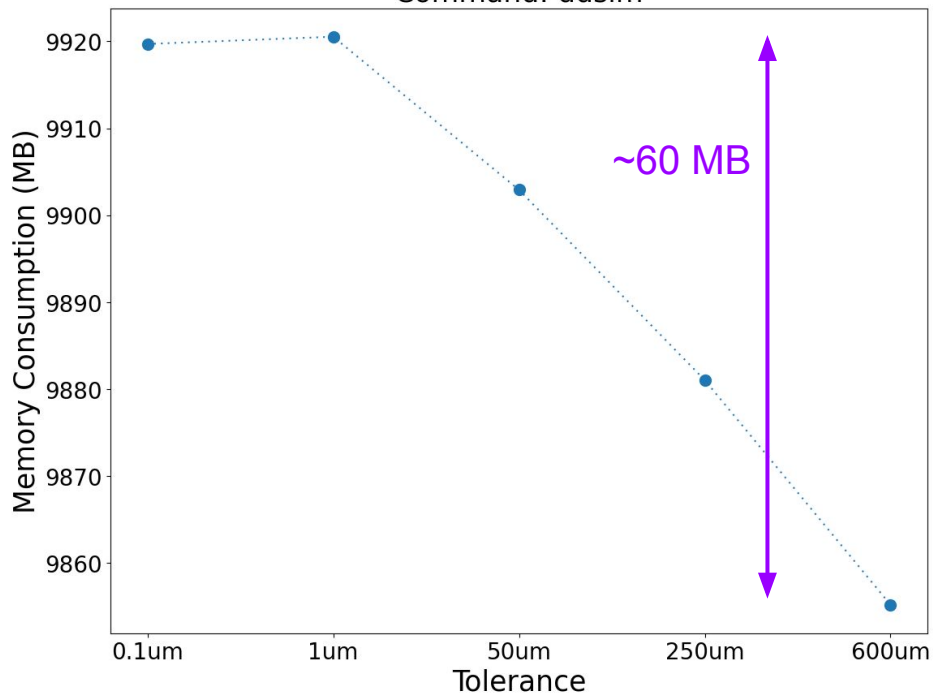
Volume Map: 50um Tolerance



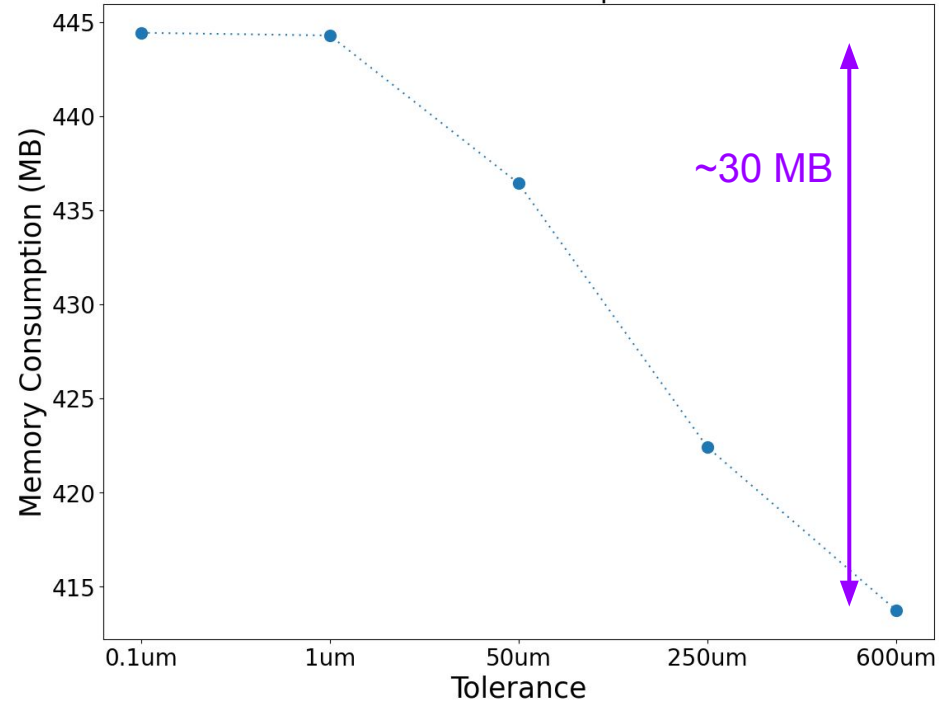
- still very little improvement
- can try different tolerances

Volume Map Tolerance Comparison

Command: ddsim

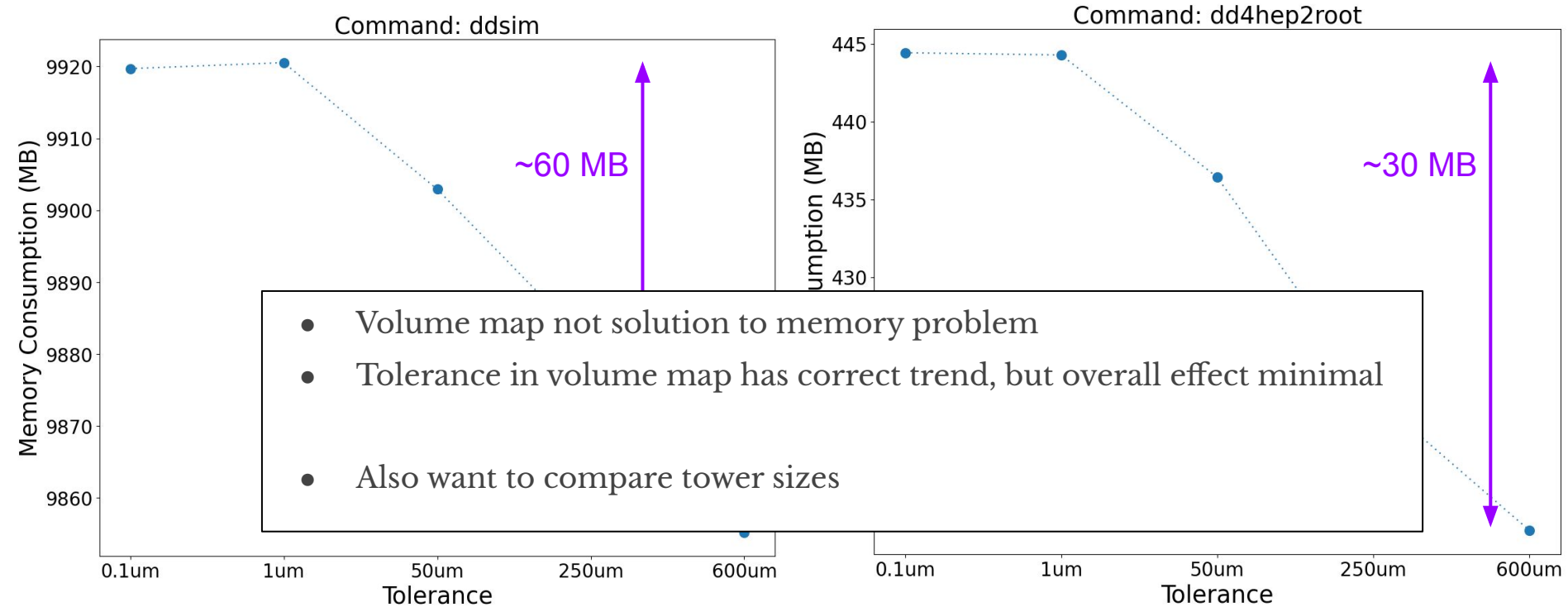


Command: dd4hep2root



To keep in mind: x-axis not to scale (not linear relation)

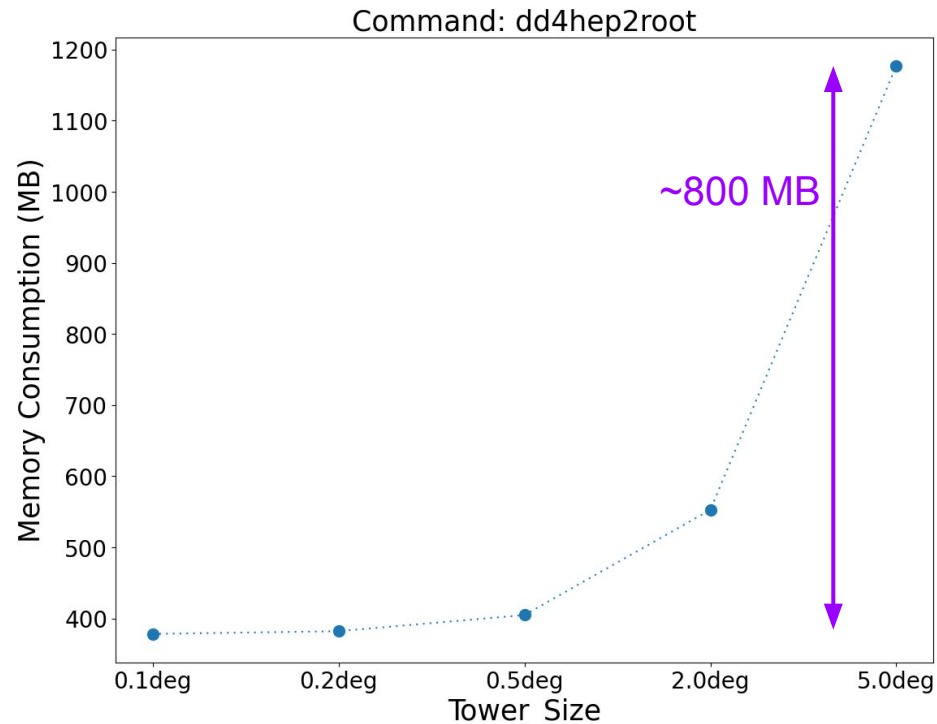
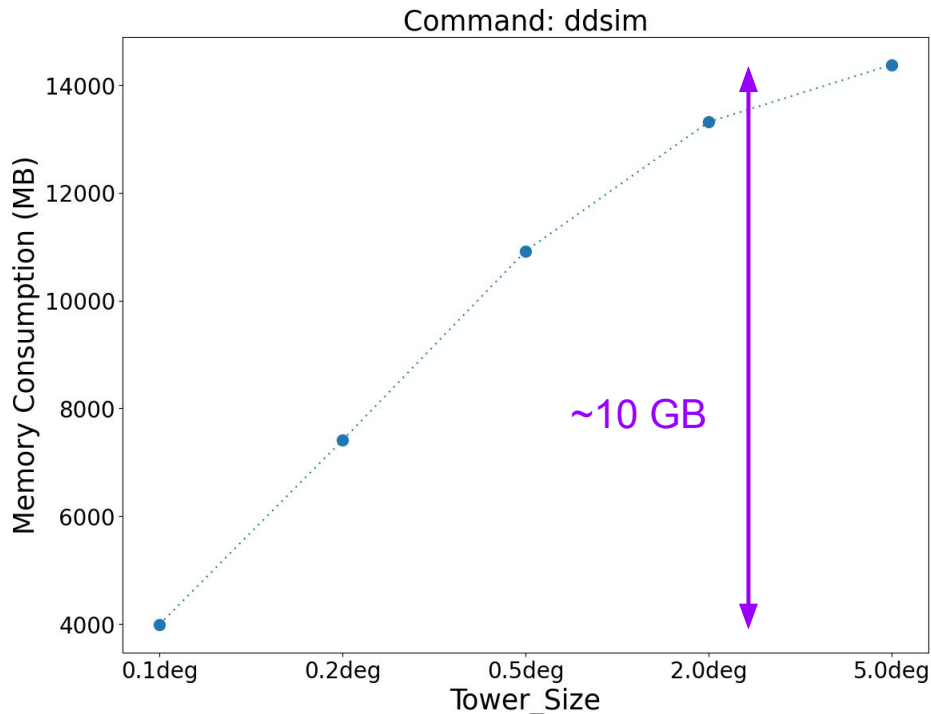
Volume Map Tolerance Comparison



To keep in mind: x-axis not to scale (not linear relation)

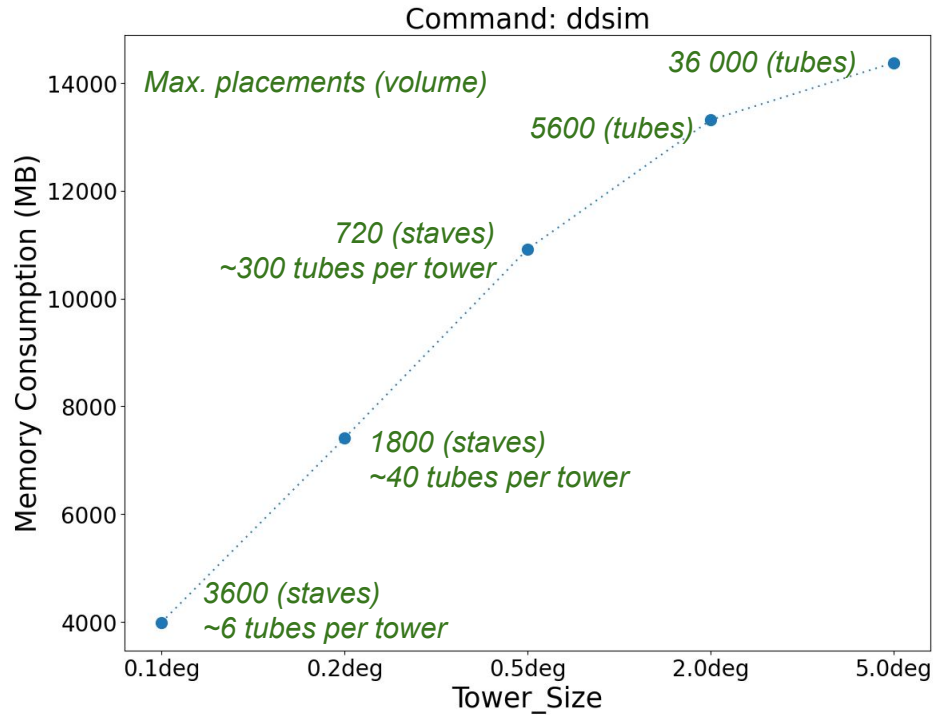
Tower Size Comparison

Note: had to change wall thickness for comparison with small towers



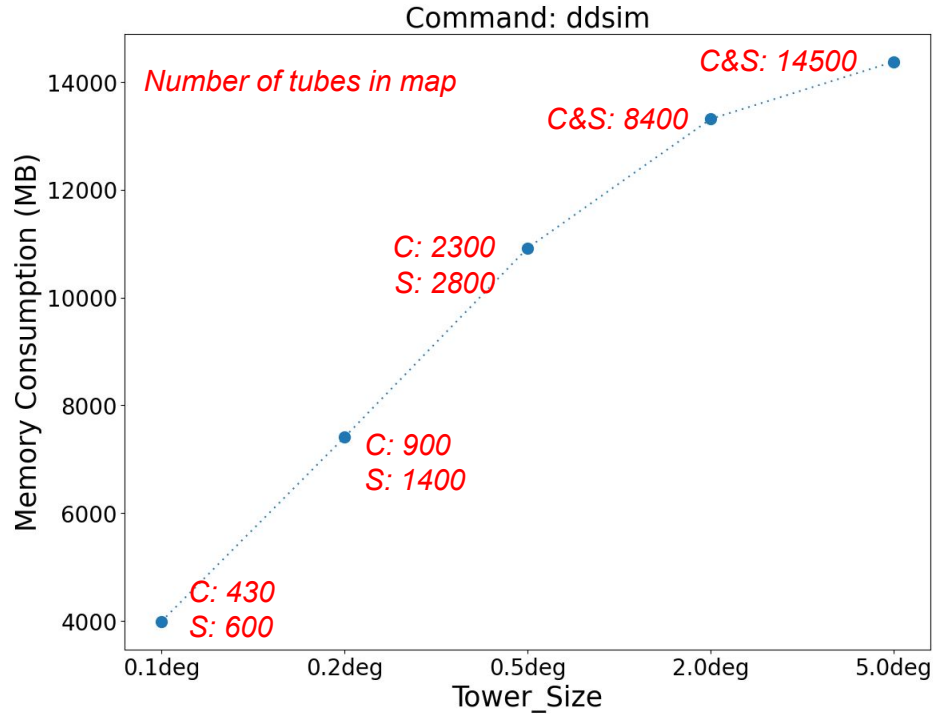
To keep in mind: x-axis not to scale (not linear relation)

Tower Size Comparison



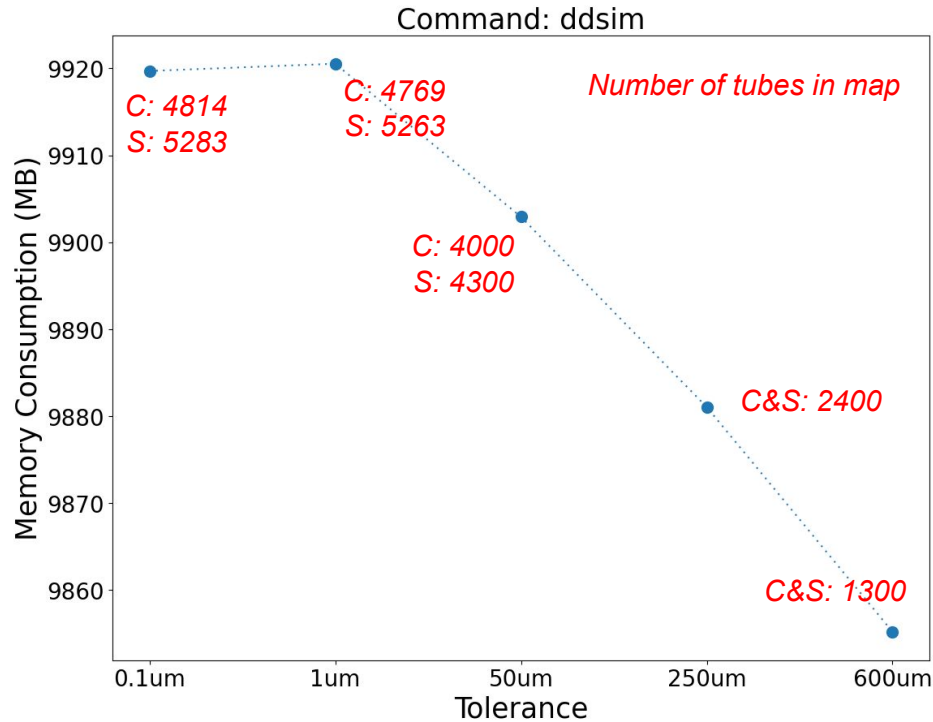
- Tower size clearly limiting factor
- Smaller towers less memory consumption despite max. placements not necessarily being smaller
 - small towers: identical volumes (stave) being placed repeatedly

Tower Size Comparison



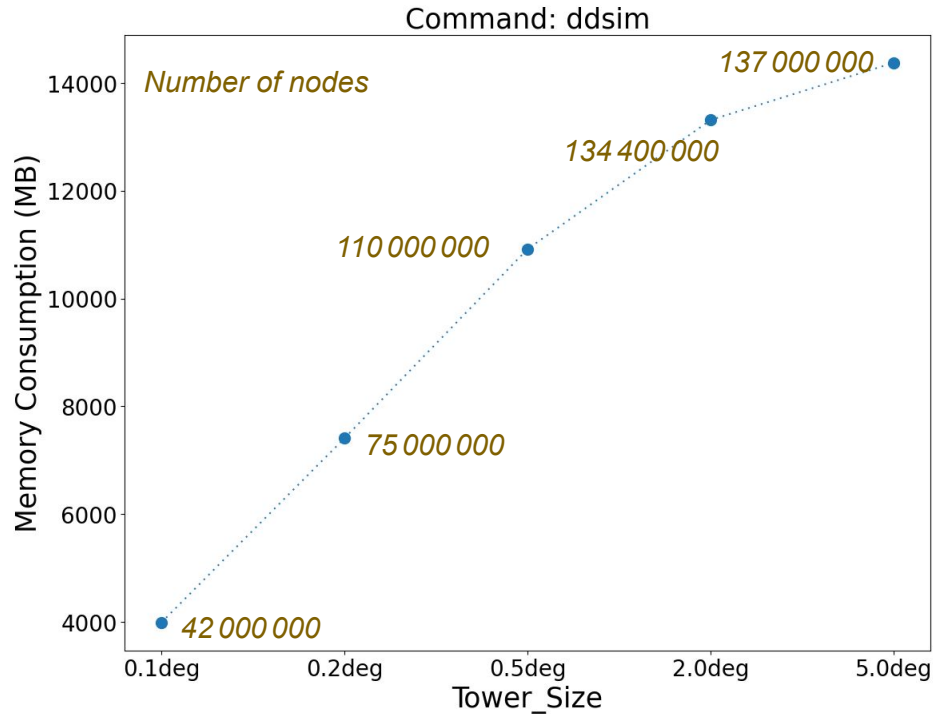
- Tower size clearly limiting factor
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 - small towers: identical volumes (stave) being placed repeatedly
- Memory consumption more directly related to number of created volumes
 - But in tolerance we saw little effect?

Volume Map Tolerance Comparison (1deg towers)



- Tower size clearly limiting factor
- Smaller towers less memory consumption despite max. placements not necessarily being smaller
 - small towers: identical volumes (stave) being placed repeatedly
- Memory consumption more directly related to number of created volumes
 - But in tolerance we saw little effect?
- Follows same trend but effect much smaller
 - 60MB vs 10GB

Tower Size Comparison (Number of nodes)



- As tower size decreases, more overall percentage of calorimeter becomes ‘support structure’
 - less number of volumes
- How compares to number of unique volumes?
- *Question: What exactly are nodes?*

Conclusion

- Memory Consumption clearly depends on combination of Number of unique Volumes created and how they are placed
 - Knew this already before, but the exact extent to which this applies to the dual-readout calorimeter was not clear
 - To be honest, still not completely clear
- In any case, need to find another way to reduce memory consumption
 - Exploitation of symmetries in tower & stave
 - More on this hopefully soon