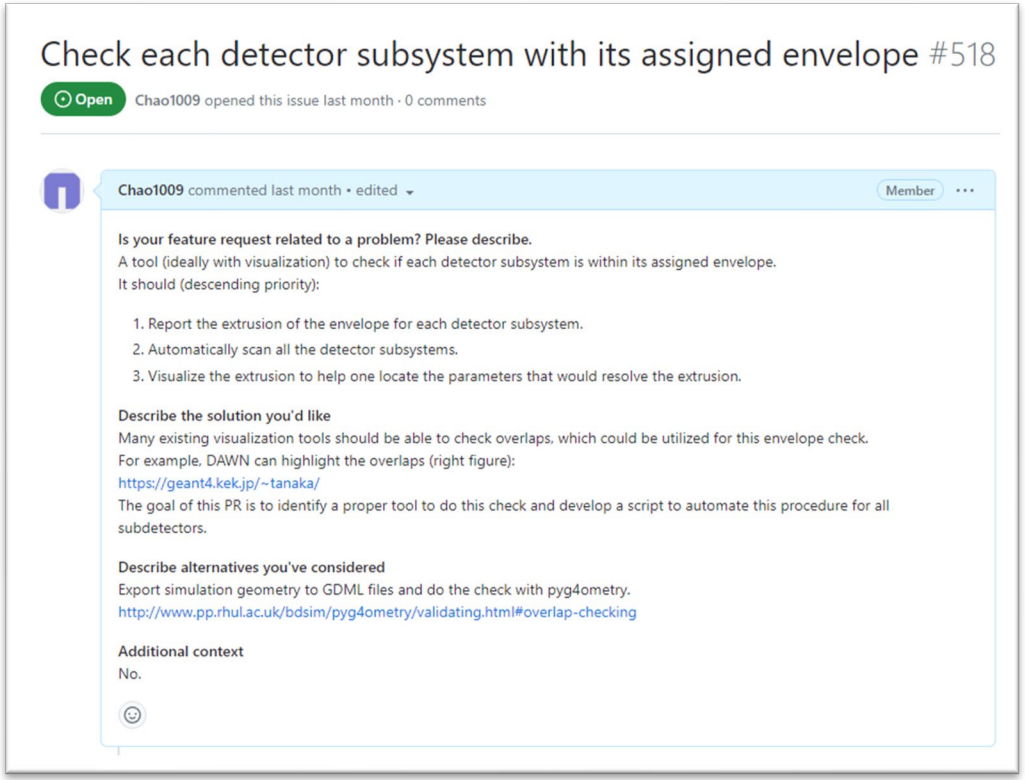
General tests for individual sub-detectors

- Develop a set of scripts/tools to provide useful information for each detector subsystem
  - Visualization (DAWN views)
  - Material scan (g4MaterialScan script)
  - Overlaps
  - Envelope check (detector parameter table check)

- Automated benchmarks for each release of epic
  - Figures
  - Material table
  - Warnings if checks failed

Related Issues/PRs

- Related issues/PRs



Check each detector subsystem with its assigned envelope #518

Open · Chao1009 opened this issue last month · 0 comments

Chao1009 commented last month • edited — Member

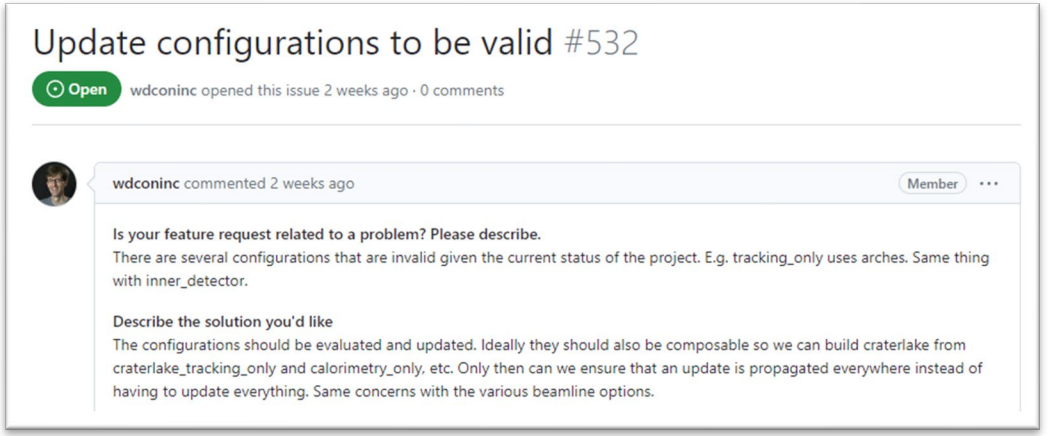
Is your feature request related to a problem? Please describe.
A tool (ideally with visualization) to check if each detector subsystem is within its assigned envelope.
It should (descending priority):

1. Report the extrusion of the envelope for each detector subsystem.
2. Automatically scan all the detector subsystems.
3. Visualize the extrusion to help one locate the parameters that would resolve the extrusion.

Describe the solution you'd like
Many existing visualization tools should be able to check overlaps, which could be utilized for this envelope check.
For example, DAWN can highlight the overlaps (right figure):
https://geant4.kek.jp/~tanaka/
The goal of this PR is to identify a proper tool to do this check and develop a script to automate this procedure for all subdetectors.

Describe alternatives you've considered
Export simulation geometry to GDML files and do the check with pyg4ometry.
http://www.pp.rhul.ac.uk/bdsim/pyg4ometry/validating.html#overlap-checking

Additional context
No.



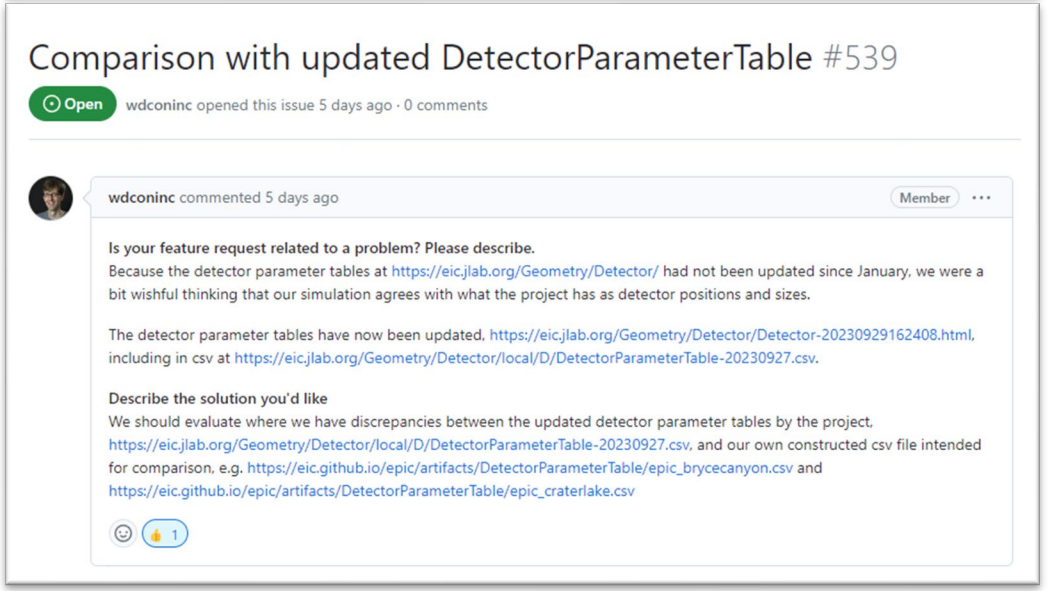
Update configurations to be valid #532

Open · wdconinc opened this issue 2 weeks ago · 0 comments

wdconinc commented 2 weeks ago — Member

Is your feature request related to a problem? Please describe.
There are several configurations that are invalid given the current status of the project. E.g. tracking_only uses arches. Same thing with inner_detector.

Describe the solution you'd like
The configurations should be evaluated and updated. Ideally they should also be composable so we can build craterlake from craterlake_tracking_only and calorimetry_only, etc. Only then can we ensure that an update is propagated everywhere instead of having to update everything. Same concerns with the various beamline options.



Comparison with updated DetectorParameterTable #539

Open · wdconinc opened this issue 5 days ago · 0 comments

wdconinc commented 5 days ago — Member

Is your feature request related to a problem? Please describe.
Because the detector parameter tables at https://eic.jlab.org/Geometry/Detector/ had not been updated since January, we were a bit wishful thinking that our simulation agrees with what the project has as detector positions and sizes.

The detector parameter tables have now been updated, https://eic.jlab.org/Geometry/Detector/Detector-20230929162408.html, including in csv at https://eic.jlab.org/Geometry/Detector/local/D/DetectorParameterTable-20230927.csv.

Describe the solution you'd like
We should evaluate where we have discrepancies between the updated detector parameter tables by the project, https://eic.jlab.org/Geometry/Detector/local/D/DetectorParameterTable-20230927.csv, and our own constructed csv file intended for comparison, e.g. https://eic.github.io/epic/artifacts/DetectorParameterTable/epic_brycecanyon.csv and https://eic.github.io/epic/artifacts/DetectorParameterTable/epic_craterlake.csv

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Configurations Update

- Configurations for regions/systems
  - Barrel/Endcap
  - Far forward/backward
  - Tracking
  - Calorimeters
  - For studying the integration of several subsystems
    - Clustering for calorimeters at the acceptance edge
    - Tracking

- Configurations for each individual detector subsystem
  - For generating material table, doing envelope/parameter checks

Parameters/envelope Check

- Latest update in last week
- Simulation parameter table available https://github.com/eic/epic/blob/main/templates/DetectorParameterTable.csv.jinja2
  - A script to compare two csv tables
  - Component-by-component
  - Report inconsistent parameters
  - Report missing component/column
- An automated benchmark

EIC GEOMETRY — FRI, 29 SEP 2023 16:24:08

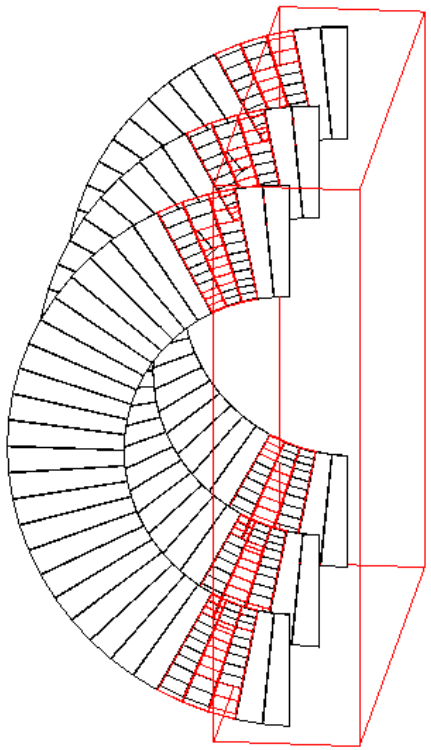
EIC DETECTOR GEOMETRY

INTERACTION POINT 6

Region	Component	Sub-Component	WBS	Length (cm)	Inner Radius (cm)	Outer Radius (cm)	Offset from Center (cm)	Physical Start (cm)	Physical End (cm)	Volume (m^3)	Weight (kg)	Technology	Notes
HADRON DIRECTION END CAP	HD Flux Return (Collar)			170	269	324	414.6	329.6	499.6	17.42	136,685	Iron	Offset: measured from center. Weight estimated as 100% iron.
	Hadron Calorimeter		6.10.06	140	17.5	267	359.6	359.6	499.6	31.22	199,896	FeSc, WSc last segment	Tower size: 5cm x 5cm x 140cm including 10cm readout Offset: measured from face nearest to interaction point Weight: estimated as 79% iron and 21% plastic
	HD Flux Return (Oculus)			22.2	195	267	340.7	329.6	351.8	2.32	18,205	Iron	Offset: measured from center. Weight estimated as 100% iron.
	Electromagnetic Calorimeter		6.10.05	30	14.0	195	329.6	329.6	359.6	3.57	23,048	Pb/Sc	Tower size: 2.5 cm x 2.5 cm x 30 cm including readout 10cm Offset: measured from face nearest to interaction point Weight: estimated as 85% lead glass and 15% steel
	Service Gap			13.6			316	316	329.6				Offset: measured from location nearest to interaction point
	Dual RICH		6.10.04	120	14.0	180	320	200	320	10.47	1,946	Aerogel/Gas	Offset: measured from face farthest from the interaction point Volume: calculated as sum of the sub-sections Weight: based on parametric estimate from CLAS LTCC
		Detector Section		*94*	*14.0*	*180*	*226*	*226*	*320*	*9.51*			*Offset: measured from face nearest to interaction point*
		Aerogel Section		*26*	*14.0*	*109.413*	*200*	*200*	*226*	*0.96*			*Offset: measured from face nearest to interaction point*
	HD Time of Flight/Tracker		6.10.03	15	8	60	180	180	195	0.17	33	AC/LGAD	Offset: measured from face nearest to interaction point Weight: based on parametric estimate from SBS Gem
	Barrel Flux Return			632	269	324	0	-316	316	64.76	330,295	Iron	Offset: measured from center. Weight estimated as 65% iron.
	Barrel Hadron Calorimeter		6.10.06	570	180.0	267	0	-285	285	65.20	417,449	FeSc	Offset: measured from center. Volume: calculated as sum of the sub-sections Weight: estimated as 79% iron and 21% plastic
		HD Section		*170*	*194.0*	*267*	*200*	*115*	*285*	*17.97*			*Offset: measured from face nearest to interaction point*
		Central Section		*300*	*180.0*	*267*	*-35*	*-185*	*115*	*36.65*			*Offset: measured from center of detector*
		LD Section		*100*	*194.0*	*267*	*-235*	*-285*	*-185*	*10.57*			*Offset: measured from face nearest to interaction point*
	Solenoid Magnet		6.10.07	384	142	177	-10	-202	182	13.47	45,956	Solenoid	Weight: based on parametric estimate from CLEO II
	Barrel HD EMCal Support			26.67	115.8	194	200	186.665	213.335	2.03	7,399	Steel	Offset: measured from center. Weight estimated as 100% steel.
		Exterior Plate		*26.67*	*185.4*	*194*	*200*	*186.665*	*213.335*	*0.27*	*2,146*	*Steel*	*Offset: measured from center. Weight estimated as 100% steel.*
		Support Ring		*10.16*	*115.8*	*185.4*	*200*	*194.92*	*205.08*	*0.67*	*5,253*	*Steel*	*Offset: measured from center. Weight estimated as 100% steel.*
	Barrel EMCal		6.10.05	470	81.0	116	-38.75	-273.75	196.25	9.54	32,719		
		Exterior Cover		*460.0*	*114*	*116*	*-38.75*	*-268.75*	*191.25*	*0.66*			*Material needs to be specified for weight calculation*
		Imaging Part		*440*	*81.0*	*96*	*-38.75*	*-258.75*	*181.25*	*3.67*	*12,875*	*Pb+Sc+Si*	*Weight: based on parametric estimate from CMS EMCal*
		Sampling Part		*440*	*96.0*	*114*	*-38.75*	*-258.75*	*181.25*	*5.23*	*18,330*	*PB+Sc*	*Weight: based on parametric estimate from CMS EMCal*
		LD Readout Electronics		*15*	*81.0*	*116*	*-258.75*	*-273.75*	*-258.75*	*0.32*	*757*		*Offset: measured from face nearest to interaction point. Weight calculated as silicon.*
		HD Readout Electronics		*15*	*81.0*	*116*	*181.25*	*181.25*	*196.25*	*0.32*	*757*		*Offset: measured from face nearest to interaction point. Weight calculated as silicon.*
				26.67	115.8	194	-222.25	-235.585	-208.915	2.03	7,399	Steel	Offset: measured from center. Weight estimated as 100% steel.

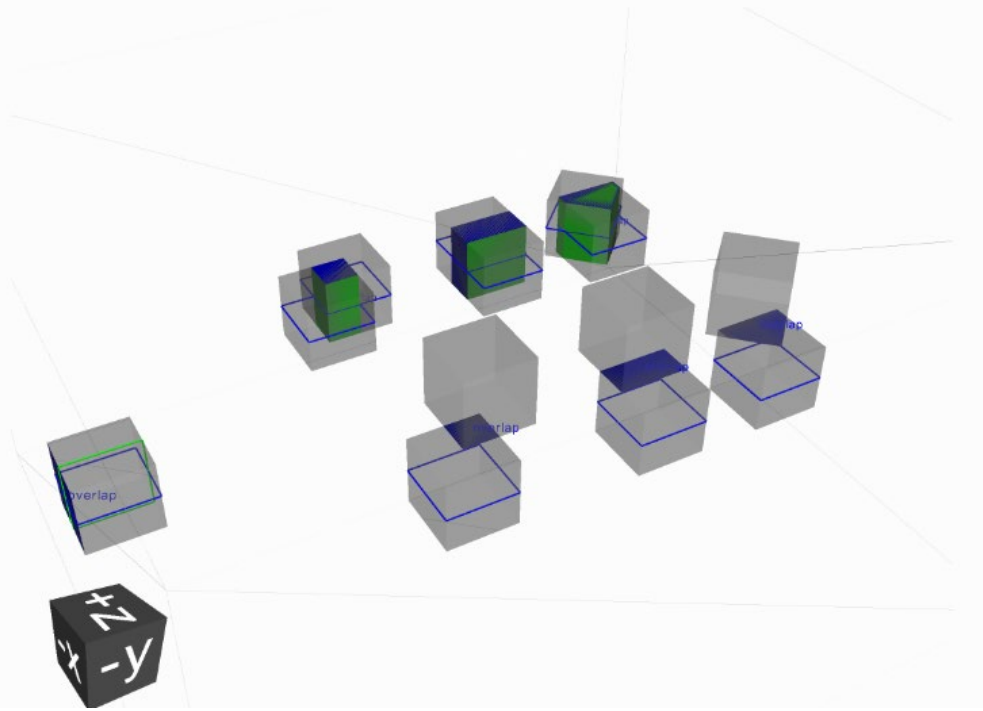
Envelope Checks

- Visualization is important



DAWN (DAVID)

```
# cd pyg4ometry/test/pythonGeant4
import pyg4ometry
r  = pyg4ometry.freecad.Reader("./T103_overlap_copl.gdml")
l = r.getRegistry().getWorldVolume()
l.checkOverlaps(recursive=False,coplanar=True,debugIO=False)
v = pyg4ometry.visualisation.VtkViewer()
v.addLogicalVolume(l)
v.view()
```



Pyg4metry