

# WG 5.2.1 Meeting Simulation - Phase-I

November 10th 2022

Marco Leite (USP)

# WG 5.2.1 Simulation Phase-I

Minutes from Nov. 3rd. 2022 meeting



Attendance : M. Leite, G. Saito, R. Buhler, R. Giacomini

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## Introduction (M. Leite)

- Minutes from previous meeting: no comments
- Described the open issues, the severity and the effort needed to work on each one

## TCAD Simulation (R. Buhler)

- R. Buhler presented some plots from TCAD example from UCSC. More results to come
- Can it be presented to general meeting ?

## Geant4 Simulation (M. Morales)

- Discuss further implementations towards a first stable version (by email)

## Action Items (for next meeting Oct. 13th)

- TCAD Simulation (R. Buhler)
  - Prepare presentation with TCAD results (2D and 3D) to discuss with UCSC
- Geant4 Simulation (M. Morales)
  - Follow up by email

M. Leite, 03/11/2022

🕒 10/11/2022, 10:23 👤 Marco Lisboa Leite

# WG 5.2.1 Simulation Phase-I - Gitlab Issues

Project issues in Gitlab as of Today (27/10/2022)

The image shows four vertical panels, each representing a different project in Gitlab. Each panel displays a list of issues with their titles, effort, priority, and status. The projects are: Geant4 (purple header), TCAD (orange header), KDetSim (grey header), and Garfield++ (yellow header). Issues include titles like 'Validate advanced G4ML Geometry construction', 'Explore the AC-LGAD first example in Sentaurus (UCSC)', 'Understand the input files needed to simulate a LGAD', 'Commit working example of UFSD', 'Threshold for photons in physics processes', 'Generate electrical field for the AC-LGAD structures from Taylor's example', and 'Transfer the build directory examples to documentation'.

The screenshot shows the Gitlab Issues page for the 'Simulation' project. At the top, there are filters for 'Open' (7), 'Closed' (10), and 'All' (17). Below the filters is a search bar and a 'Created date' dropdown. The main content is a list of open issues, each with a title, a brief description, and various tags for effort, priority, and status. Two red arrows point to the first two issues: 'Transfer the build directory examples to documentation' and 'Threshold for photons in physics processes'. A large red vertical text 'OPEN' is positioned to the left of the issue list.

Issue Title	Effort	Priority	Status	Created	Updated
Transfer the build directory examples to documentation	Medium	Medium	Feature Fix	Nov 30, 2022	4 days ago
Threshold for photons in physics processes	Low	Low	Priority Low	Nov 10, 2022	6 days ago
Understand the input files needed to simulate a LGAD	Medium	High	Priority High	Oct 31, 2022	1 week ago
Commit working example of UFSD	Low	Medium	Priority Medium	Nov 11, 2022	1 week ago
Generate electrical field for the AC-LGAD structures from Taylor's example	Medium	Blocking	Priority Blocking	Oct 24, 2022	2 weeks ago
Validate advanced G4ML Geometry construction	Medium	Medium	Priority Medium	Nov 30, 2022	2 weeks ago
Explore the AC-LGAD first example in Sentaurus (UCSC)	Medium	Medium	Priority Medium	Oct 24, 2022	2 weeks ago

# WG 5.2.1 Simulation Phase-I - Beam Information

Added Beam information to ntuple (filled in LGAD\_02SensitiveDetector.cc)

```
109 ////////////////////////////////////////////////////////////////////
110 // Get the address of the ROOT TTree branches //
111 ////////////////////////////////////////////////////////////////////
112 G4int *beam_particle          = HistMan->GetBeamParticle();
113 std::vector<G4double>* beam_origin = HistMan->GetBeamOrigin();
114 std::vector<G4double>* beam_p4   = HistMan->GetBeamP4();
115
116 ////////////////////////////////////////////////////////////////////
117 // Persist the information //
118 ////////////////////////////////////////////////////////////////////
119 *beam_particle = beam_PDG ;
120 *beam_origin = {pos.x(), pos.y(), pos.z()};
121 *beam_p4     = {mom.x(), mom.y(), mom.z(), beam_energy} ;
122
123 En->emplace_back(Energy);
124 HistMan->FillNtuple();
125     Energy = 0.0;
126 }
127
```

# WG 5.2.1 Simulation Phase-I - Charge Transport

- Would be important to have the E field calculated by TCAD to import to Garfield++ and other ad-hoc simulators
- Can I have a file to test with Garfield++ ?

## 4.2.2. Synopsys TCAD

Electric fields calculated using the device simulation program Synopsys Sentaurus [46] can be imported with the classes `ComponentTcad2d` and `ComponentTcad3d` (derived from the base class `ComponentTcadBase`).

The function to import the field map is

---

```
bool Initialise(const std::string& gridfilename,  
               const std::string& datafilename);
```

---

**gridfilename** name of the mesh file, the extension is typically `.grd`

**datafilename** name of the file containing the nodal solution; the filename typically ends with `_des.dat`

Both files have to be exported in DF-ISE format, files in the default TDR format cannot be read. To convert a TDR file to `_des.dat` and `.grd` files, the Sentaurus tool `tdx` can be used

---

```
tdx -dd fieldToConvert.tdr
```

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