

LHCb Geometry in DD4hep

- **Re-engineered class diagrams**
hate to show them, but still...
- **Two migration use cases**
- **Tests**
- **Detector Elements**

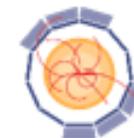
Markus Frank PH/LBC

Feb 28th 2019 DD4hep Developers Meeting

DD4hep

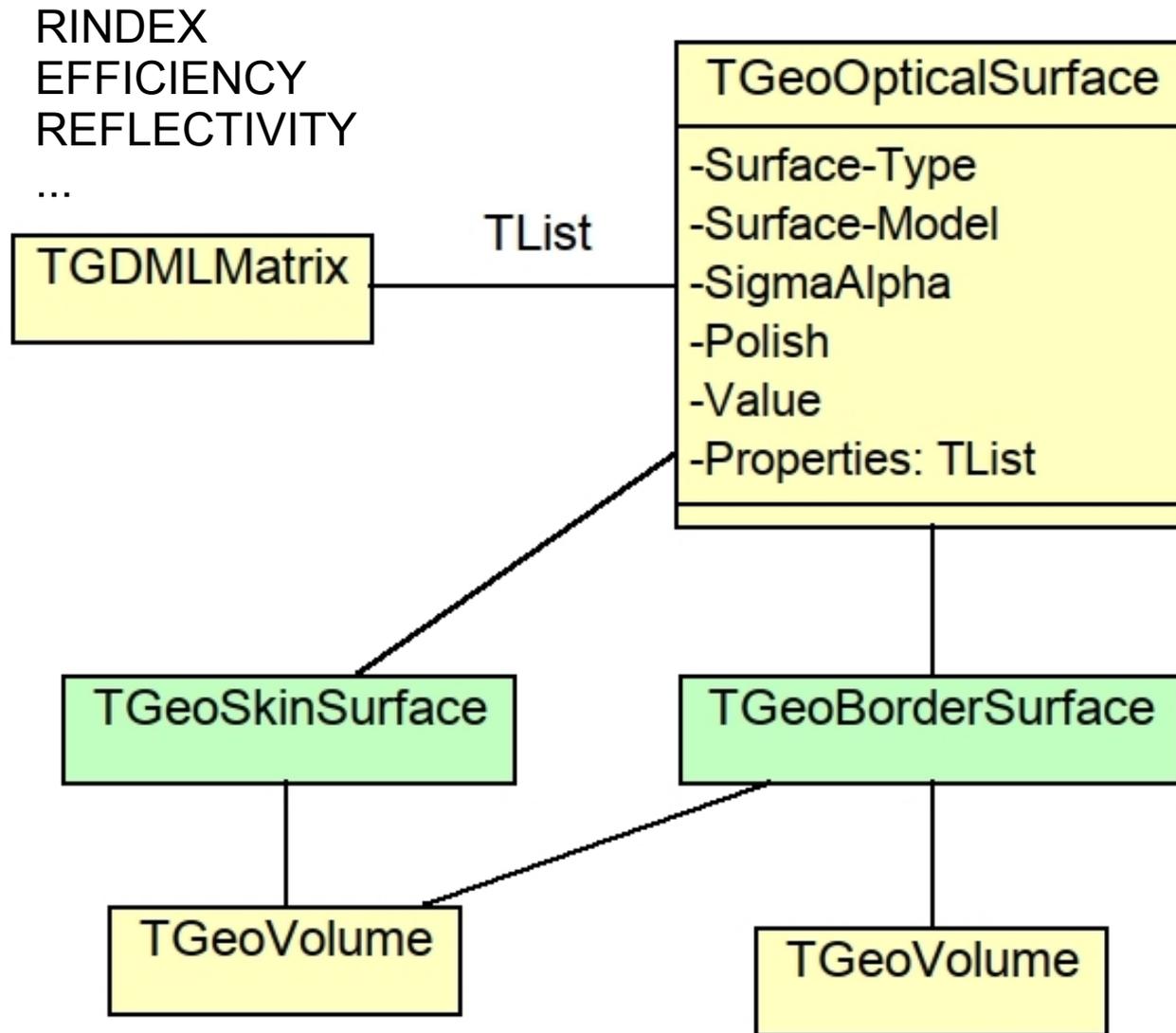


This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement no. 654168.



AIDA²⁰²⁰

TGeo: Optical Surfaces



Geant4: Optical Surfaces

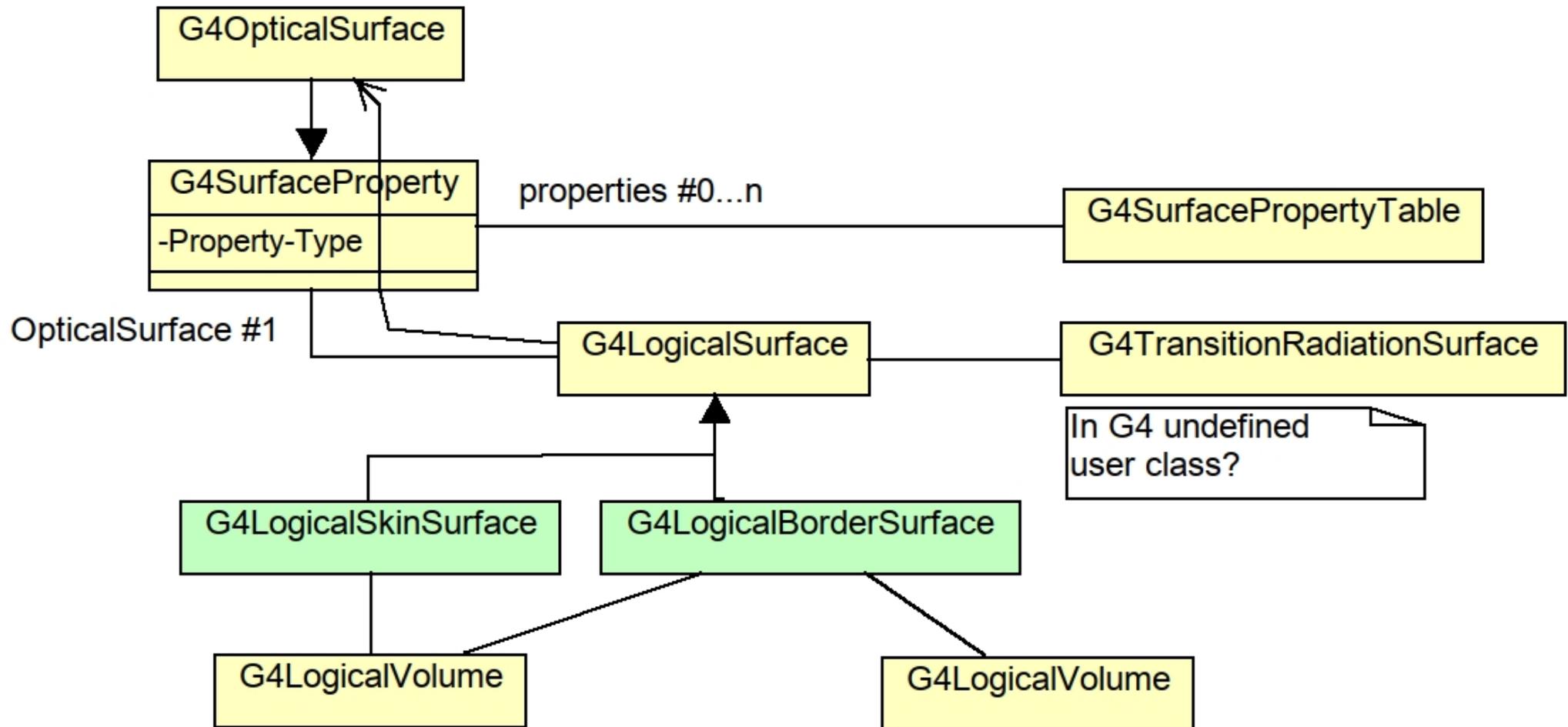


Diagram Conclusions

- **Class diagrams are similar (what else?)**
- **Central objects containing *data* are**
 - **TGeo: TGeoOpticalSurface**
 - **G4: G4OpticalSurface**
 - **Data are:**
refractive index, reflection, etc.
as function of photon energy (2 x n matrices)
- **Association objects are**
 - **TGeo: TGeoBorderSurface, TGeoSkinSurface**
 - **G4: G4LogicalBorderSurface, G4LogicalSkinSurface**

Object Management and Access

- **Manage Optical Surfaces – string map (s)**
 - **TGeo: TGeoManager => accessible for reconstruction**
Named object lists containing surfaces and properties
 - **TGDMLMatrix** **<matrix/>**
 - **TGeoOpticalSurface** **<opticalsurface/>**
 - **TGeoSkinSurface** **<skinsurface/>**
 - **TGeoBorderSurface** **<bordersurface/>**

What is Required

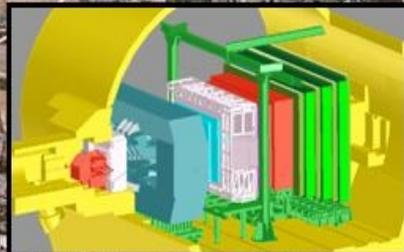
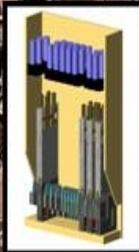
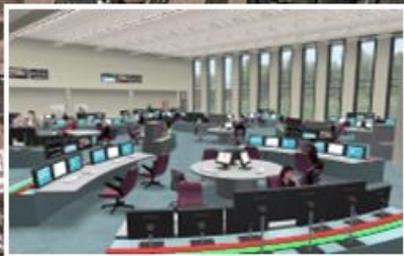
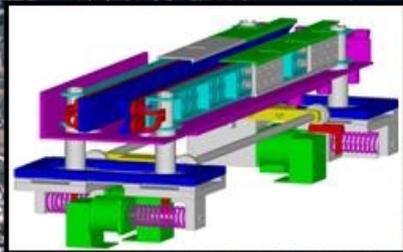
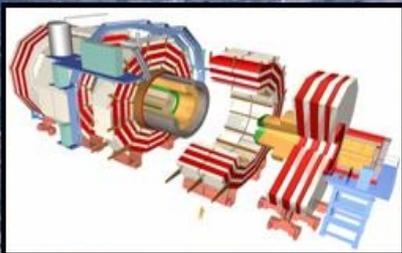
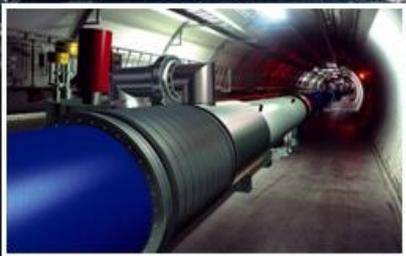
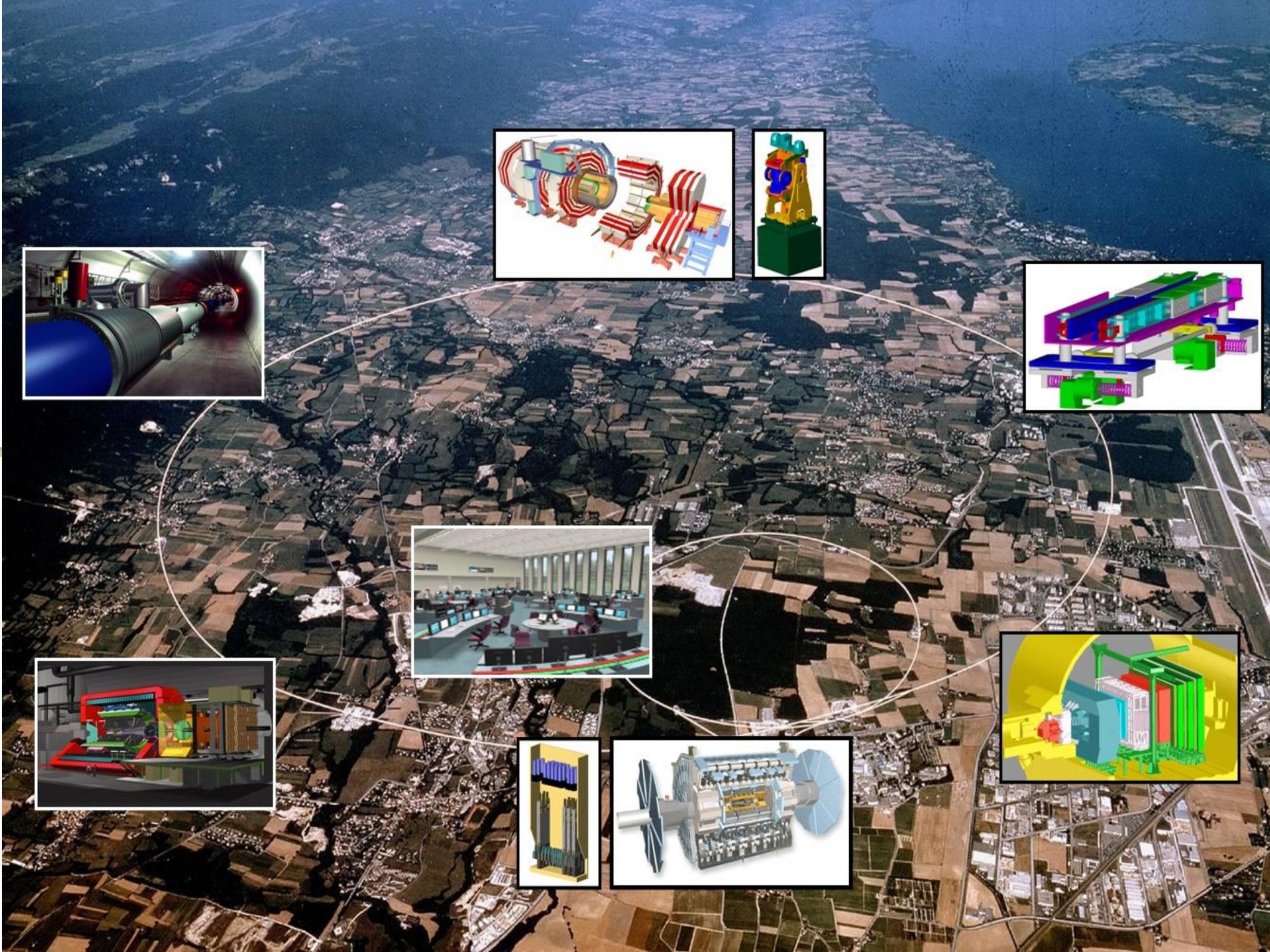
- **Need to parse surface property tables in compact**
 - Tuples: (energy, value)
 - Adopt GDML conventions
- **Unclear (at least to me) if the provided user interface fits the needs**
- **Need a user friendly way to access the data from the surfaces**
 - From *Detector* instance with forwarding to the TGeoManager instance
 - Handle facade to specialize accessing details
 - !! User input is needed here !!**
 - !! Need use cases !!**

Implementation Constraints

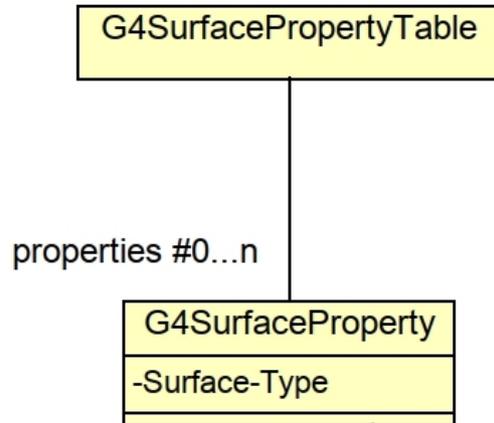
- **Optical surface objects must present *before* detector constructors are called**
 - **Skin- and Border-surface constructors can then be called in the detector constructors**
 - **Alternatively using plugins (like DDRec surfaces)**
- **The whole machinery must be properly translated to Geant4**
 - **Does G4 require specialized sensitive detector ?**
- **Surfaces are named lists in global namespace**
 - **Need some naming strategy about naming to duplicates by construction**

Conclusions

- **Work list is relatively clear**
 - **Optical Surface objects**
 - **Concrete surface creation in the detector constructors**
- **Facade implementation can help to simplify the usage**
 - **But needs user input**



Geant4: Optical Properties



```
enum G4SurfaceType {
    dielectric_metal, // dielectric-metal interface
    dielectric_dielectric, // dielectric-dielectric interface
    dielectric_LUT, // dielectric-Look-Up-Table interface
    dielectric_LUTDAVIS, // dielectric-Look-Up-Table DAVIS interface
    dielectric_dichroic, // dichroic filter interface
    firsov, // for Firsov Process
    x_ray // for x-ray mirror process
};
```

TGeo: Optical Properties in Materials

TGeoMaterial
-density
-radlen
-intlen
-pressure
-temperature
-state
-Cerenkov extension
-User extension

These may be useful -- if surface properties are connected to the material