

# Update on the Gd loaded acrylic

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**On behalf of the Veto group**



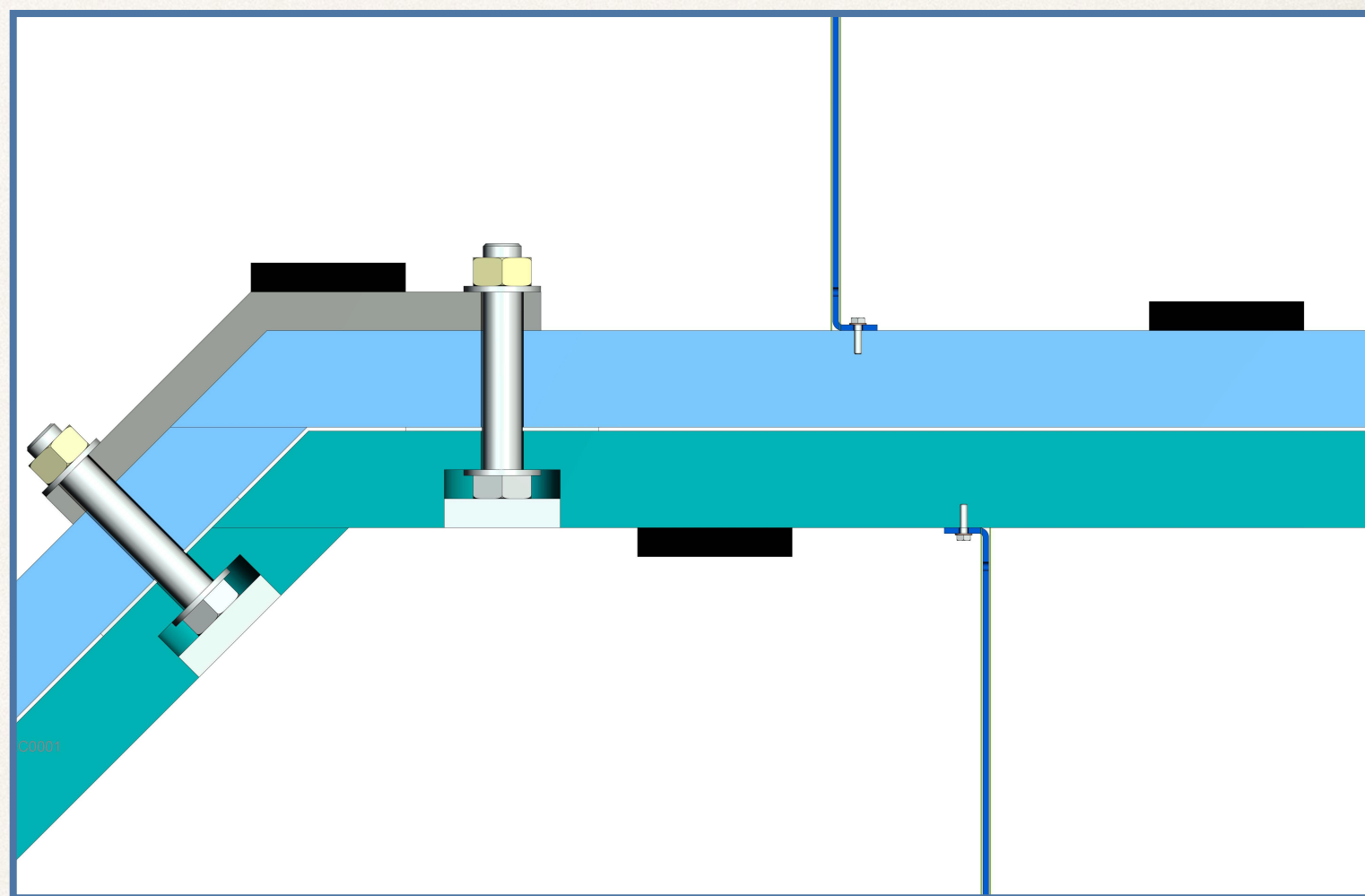
# Recap : Acrylic + Gadolinium

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Veto bulk structure: two 5 cm thick panels made by acrylic mixed with gadolinium.

Acrylic will be produced in the DonChamp Chinese company.

The acrylic for the veto will come from the so-called "line 4" and it will be mixed with Gd during the fabrication process.





# 3 mm sheet

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## Gadolinium Oxide - $Gd_2O_3$

Laboratory mixing  
3 mm thick acrylic planes  
1% in mass of Gd sulfate

**Nano particles** with grain diameter  
between 80 nm and 100 nm have  
been used.

**Very good uniformity** in the xy  
horizontal plane, and **also in the z**  
**direction.**

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: Thanks to Cong Guo for all the info! :  
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# 5 cm sheet

**PMMA + Gd<sub>2</sub>O<sub>3</sub>**

25 cm x 25 cm

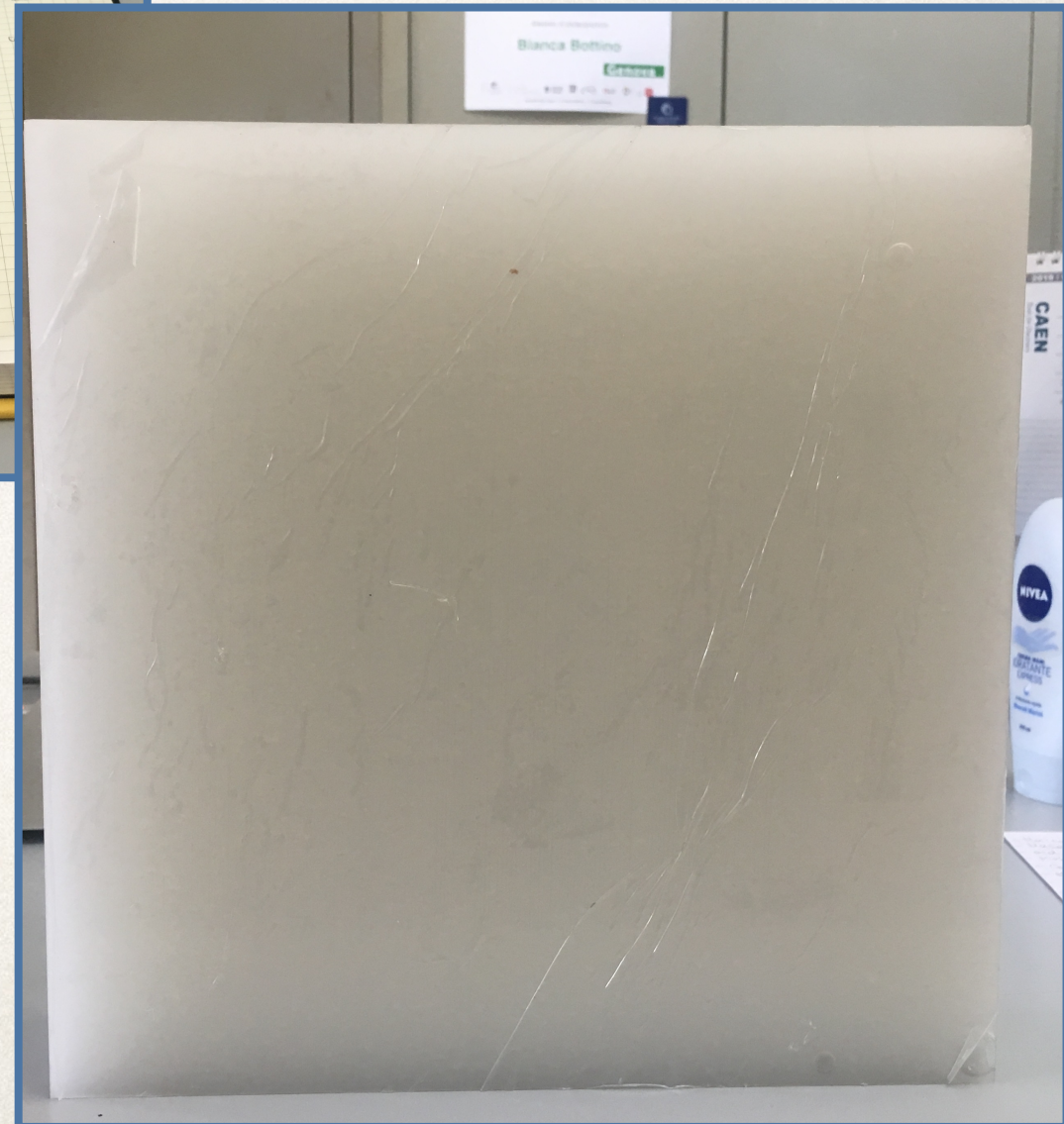
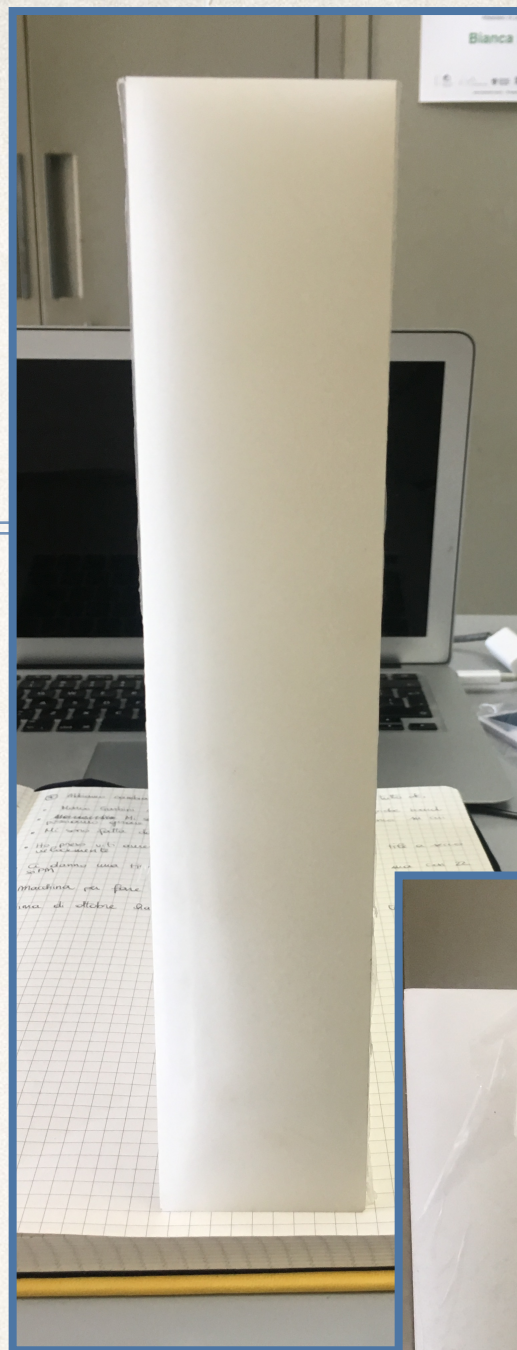
5 cm thick

1% in mass of Gd oxide

**Nano particles** with grain diameter between 80 nm and 100 nm have been used.

Made in DonChamp company in their production line number 1.

**Two samples** one in Genova one in CERN, that is being sent to Genova also.





# 5 cm sheet

## PMMA + Gd<sub>2</sub>O<sub>3</sub>

Bottom part completely opaque, thin layer of white material (the oxide), due to the deposition of the nano grains during the polymerisation process.

Top part more transparent, with some small bubbles.





# 5 cm sheet

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## PMMA + Gd<sub>2</sub>O<sub>3</sub>

Also from a visual inspection of the lateral faces we could see a gradient in the concentration of gadolinium oxide.





# Tests

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- ❖ Measure precisely the **dimensions**, the **planarity** and the **weight** at room temperature, in order to obtain also an estimate of the  $\text{Gd}_2\text{O}_3$  concentration that should be between 1% and 2% in mass.
- ❖ Cool down one of the two samples to check the **behaviour in liquid nitrogen**.
- ❖ Measure again dimensions, planarity and weight to verify if there is any change due to the thermal cycle.
- ❖ Measure the **concentration of  $\text{Gd}_2\text{O}_3$  as a function of z coordinate**. **How can we do this?**
  - TGA- thermogravimetric analysis, but could not be sensitive enough
  - SEM - Scanning Electron Microscope
  - AAS - Atomic absorption spectroscopy

We are in contact with the Chemistry department here in Genova.



# First sample

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**Dimensions - measured in our mechanical work shop with a Control measuring machine (CCM)**

Height =  $49.960 \pm 0.005$  mm

Length =  $250.552 \pm 0.006$  mm

Width =  $250.510 \pm 0.006$  mm

**Weight**

~ 3.710 kg to be checked

Thanks to Cecilia!



# Radiopurity

At the moment we measured only one sample of  $\text{Gd}_2\text{O}_3$

	Ge (Susana)	ICPMS (Marina)	Super K ref.*
$^{232}\text{Th}$	On going	144 mBq/kg (35.52 ppb)	< 1.4 mBq/kg
$^{238}\text{U}$	On going	2005 mBq/kg (162.38 ppb)	< 38 mBq/kg

We are buying new samples from Japanese companies that should be much cleaner. In parallel we are investigating the possibility to purify nano grains.

\*Line 17 table 6.2 on SuperK PhD thesis from Perez