

HYDROSTATIC AND IMPLOSION TESTS

**UAM-ARATZ "SPANISH"**  
STAINLESS STEEL COVER  
TESTING RESULTS

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# CONTEXT

Manufactured by:

**Talleres Aratz S.A.** in **Vitoria**

(Álava, Basque Country, Spain) with acrylic dome from **Kuraray** (Japan)

**Current design (30.7 kg)** is 2nd iteration

(see next slide) featuring improvements:

- **Single-piece, truncated-conical, welded "barrel"**
- **Strengthened welded bottom**
- Better force distribution through **wider connection washers**

Covers still developmental

**structural test articles**

with non-definitive components:

- **Handmade bottom** with **large** tolerances.
- Room for optimization in **hole distribution**
- Beefed-up **top ring flange**

Production cost **~€175/cover**

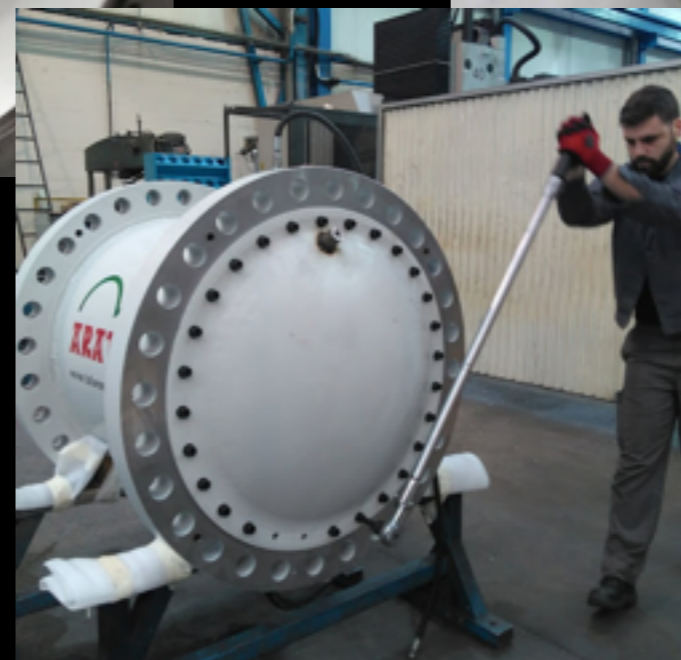
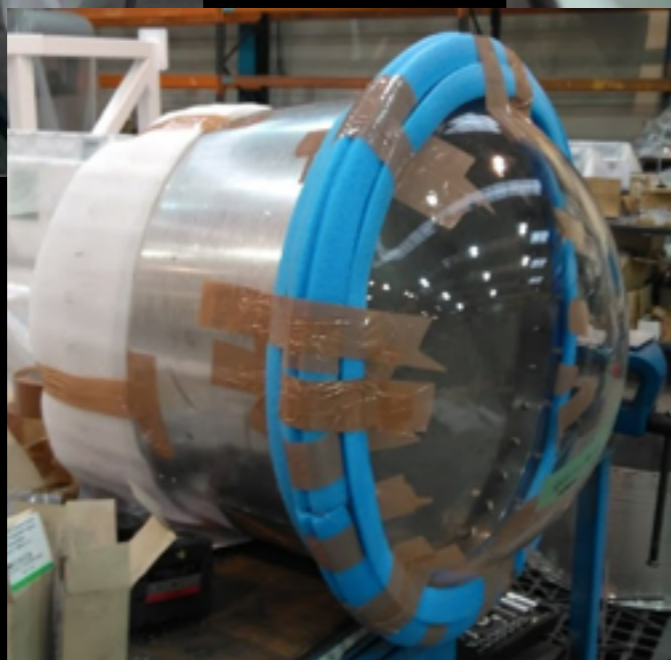
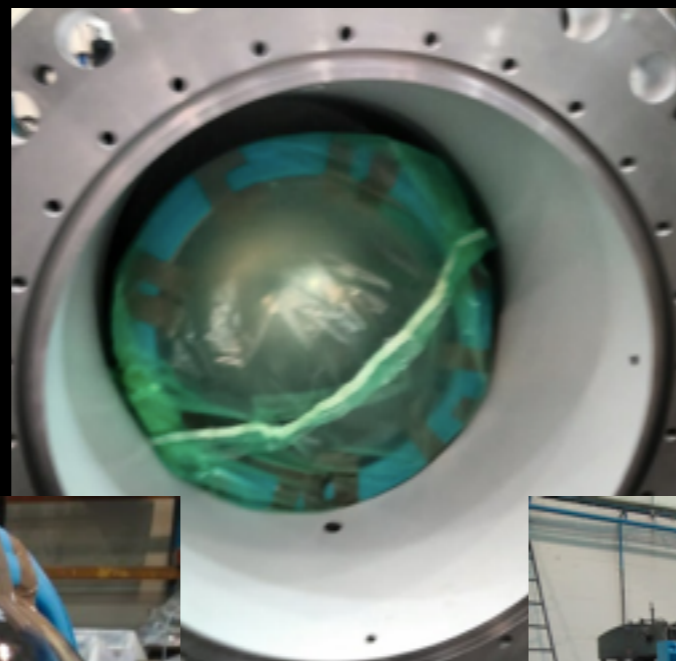
(+ one-time €150k overhead for molds and tooling)





# 2018 HYDROSTATIC TESTS RESULTS

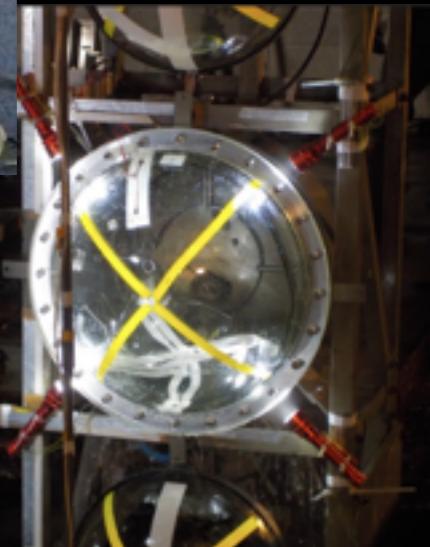
- Tests performed in Aratz facilities in Vitoria **12-21 Feb**, in a **dedicated pressure chamber** derived from water reservoir high-pressure turbine injectors that the company is producing
- Tested **complete pieces** of v.2 covers with 15mm-thick acrylic
- Water-tight **bagged**, protected by **foam** and **sealed**
- **Successful** test at 7 bar, minor deformations at 8 bar in an article.





# IMPLOSION TESTS

- Tested together with Japanese SUS and re-cover designs in **Kami-Sunagawa's** (Hokkaido) ex-Japan Microgravity Center (**JAMIC**) facility (700m-deep pit flooded with  $\sim 12^{\circ}\text{C}$  groundwater)
- Assembled in-situ and paired with newly-made Kuraray **20mm** acrylic flanged dome
- Cover was instrumented with **6 pressure gauges**, tested at 60 m depth with 4 bare PMTs around it
- All PMTs survived a nominal shockwave **No deformation or damages** to cover or acrylic dome



# CONCLUSIONS AND FUTURE

- Positive progression toward a working low-cost design for HK PD covers:
  - **v1.0** had problems at low P in hydrostatic test
  - **v2.0** damaged at medium P in hydrostatic test because of manufacturing
  - **v2.1** withstood high P with low damage in hydrostatic tests
  - **v2.2** withstood high P with no damage in hydrostatic tests  
& passed an implosion test at 60m
- Results from pressure gauges show good shockwave attenuation
- Road open for further **v2.x** testing and **v.3** development