

Safety Issue for Aerogel Upgrade

Contents:

- [1] Heat: (at PMT Base)
- [2] Fire: (from Material)
- [3] Electrical: (at HV connector)
- [4] Gas: Nitrogen
- [5] Handling (during assembling): Micro Dust (Aerogel)

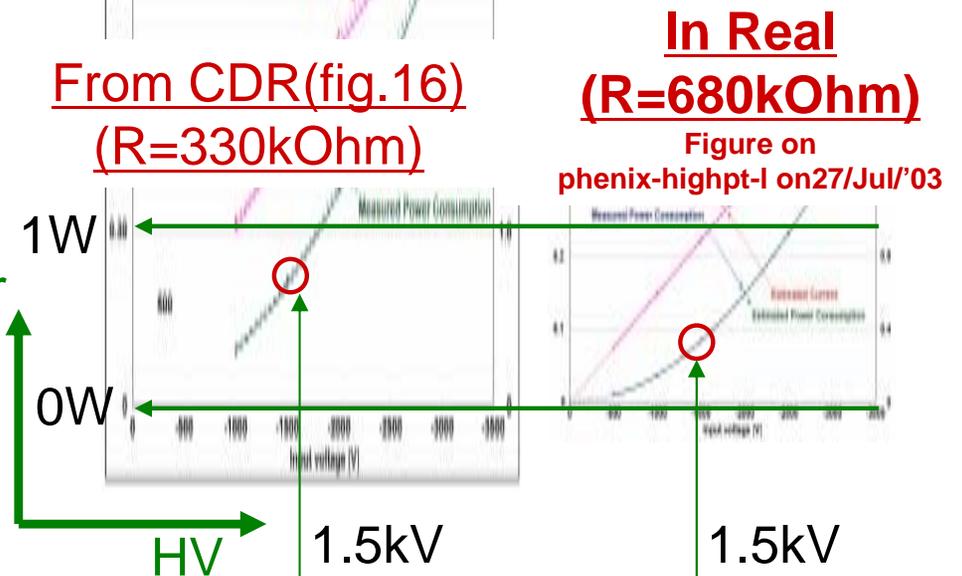
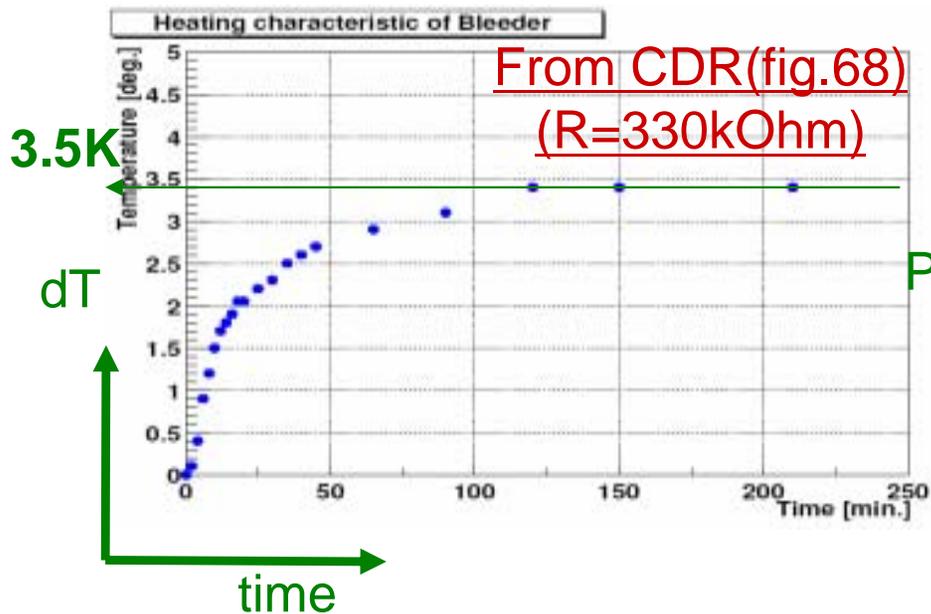
Susumu SATO

Jul/28/2003

[1] Heat (Chap.2.1.3 & App.-A)

(1) Bench test (PMT in Al-Box) shows only **3.5K(@0.68W)** rise. even without air flow
- tested PMT base (0.68W/PMT @ 1.5kV)

(2) Moreover, **in real**, R modified to 680kOhm
→ **Half (0.34W)** of Power consumption (0.68W/PMT → **0.34W/PMT @ 1.5kV**)



Therefore, No need for cooling

[2a] Material (Connector, Cable)

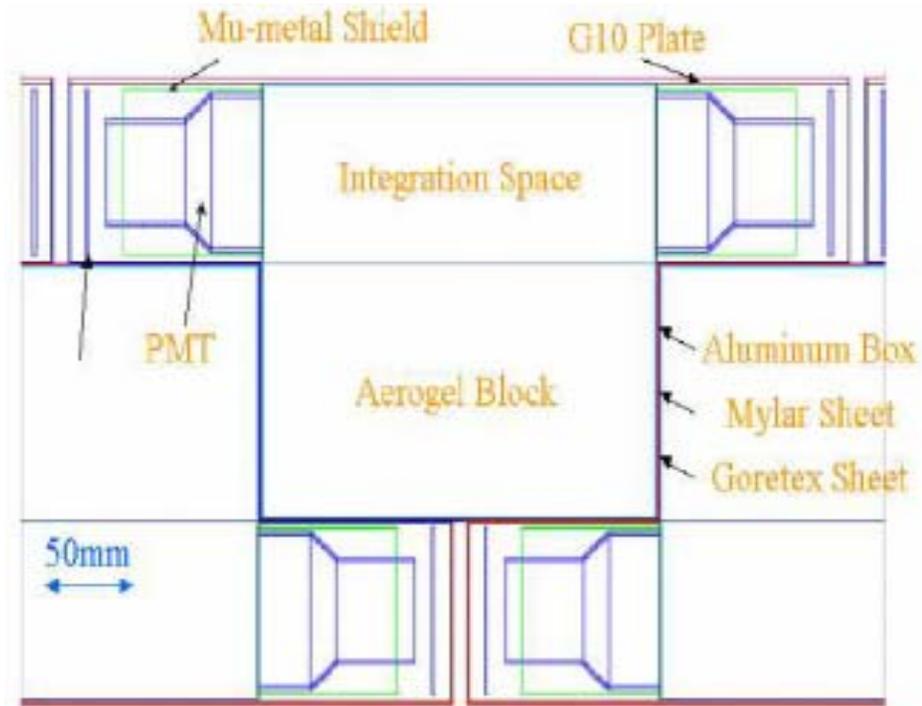
(Cf. Chaps. 2.1.7, 3.1.3, App.-B, C)

Item	Ever used in Phenix ?	Fire Rate	Electrical
01) Connector (HV)	Used in EMCaI (but ours are 3-pin)	UL94V-0	3 kV
02) Connector (Signal, at Preamp)	New	UL94V-0	300 V
03) Connector (Signal, at Box)	Used in EMCaI	UL91V-0 / UL94-0	3 kV
04) Connector (LED)	New	UL94V-0	600 V
05) Cable (HV)	Used in RICH [RG59/U]	Refer to RICH	-
06) Cable (Signal, PMT to Preamp)	Used in e.g. EMCaI [RG174/U]	Refer to EMCaI	-
07) Cable (Signal, Preamp to FEE)	New [UL8233 (Hitachi)]	UL V W-1	-
08) Cable (LED)	LAN cable (Category-5E)	UL-E108898	-
09) Cable (LV for Preamp)	Used in RICH	Refer to RICH	-

**All the parts are (I) Fire-Rate-Acquired, or/and
(II) Ever-Used in Phenix
→ Should be fire-safe.**

[2b] Material (Material inside Al-box) (cf.App.-C)

Material	Parts
Al	Box, Lid
Black Paper	Light tighten'er [Note: Fully sandwiched by Al-lid and G10]
G10	(1)Lid strengthen'er, (2)PMT base
MC901-Nylon (See backup slide)	(1)PMT mechanical holder, (2)Spacer btw PMT & mu-metal
Mylar	Inner box
PTFE	Reflector (Goretex)
Silica aerogel	Aerogel
Metal, SiO ₂	PMT
Mu-metal	B-shield



CDR (Fig.82)

**All the parts are under: (I) Enclosed environment, and
(II) N₂ gas flow
→ to be fire-safe.**

[3] Electrical safety concern (HV)

(cf.Chap2.1.7)

+ HV connector

*In spec.,

600V_{Max} (5kV if mA) per gap.

*In real, ~ 0.2mA, 1.5kV.

Moreover, among 3 pins use only 1st and 3rd pin,

But there are bare pins for a few mm at the lid connection. then put HV connector cover

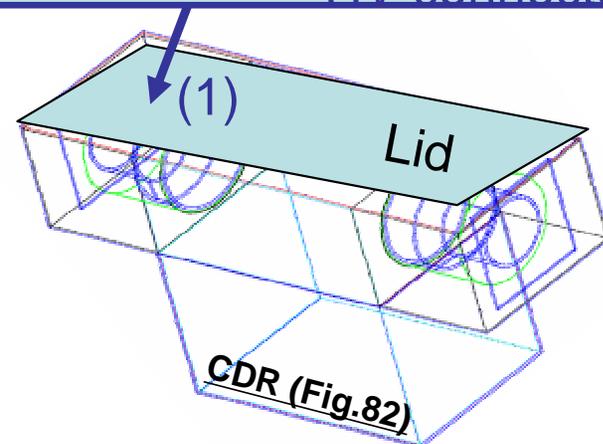
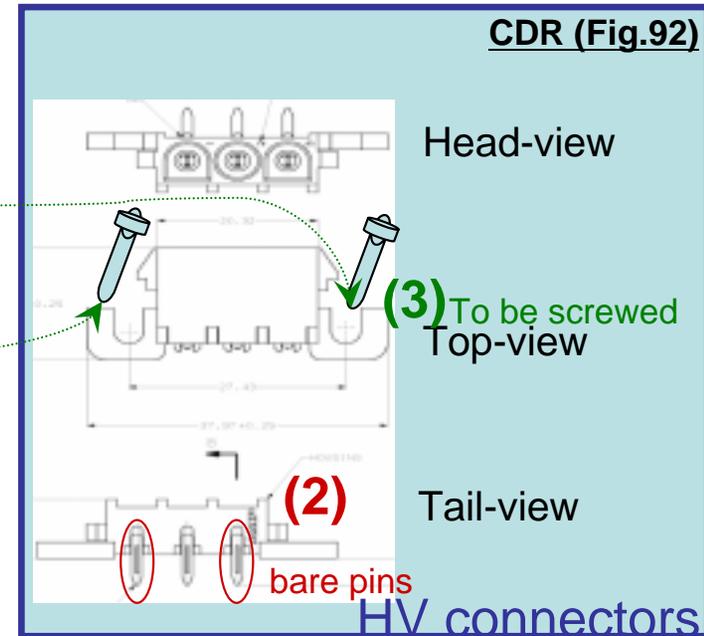


*Made of **Mylar** (~0.1 mm thickness for easy bending, otherwise too much complicated).

to be made by hand-bending



- (1) When connector is screwed on Lid
- (2) **bare HV pins need to be covered**
- (3) Therefore both Mylar cover and HV Connector will be screwed down on the Al-Lid of the box.



[4] Gas (Chap.2.1.9)

- Nitrogen flow
 - For **Purging** (~800 liters per hour)
 - of any outgas from chemicals inside the Al-box
 - Also for Non-flammability inside the box.
 - (As already discussed,) not the issue for cooling.

Note: Requirements

– Clean & Dry N₂

→ Otherwise, irreversible results on Aerogel transmutation characteristics.

Note that we have ~15 p.e., which we do not like to lose at all.

[5] Handling of Aerogel (Micro dust)

- Aerogel can be micro dust when fully broken.
 - Fragile, because $n=1.0114$ (density = $0.04 \text{ [g/cm}^3\text{)]}$)
- Assembling of Aerogel at 510-Highbay
 - (1)Person: Better with Mask, Gloves, After-Washing-of-Hands
 - (2)Trash-can: Better to have Enclosed-can for broken-Aerogel

Material Safety Data Sheet

Company : Matsushita Electric Works, Ltd.

【 Protective measures, storage and handling 】

* in case of crushed pieces or powder

• Technical protective :

When handling larger quantities without extraction plant,
breathing and eye protection required

• Personal protective equipment :

Avoid inhalation of dust

【 Information of toxicity 】

- | | | |
|-----------------------|----------------------------------|--|
| • Acute oral toxicity | <u>lethal dose</u> > 2,000 mg/kg | {2.5 liter (~1 box) of Aerogel} / {Person(50kg)}
(tested in mice) |
| • Skin irritation | : non-irritant | (tested on rabbits) |
| • Eye irritation | : non-irritant | (tested on rabbits) |

Backup Slide

Material Safety Data Sheet

Company: Matsushita Electric Works, Ltd.
Address : 1048, Kadoma, Osaka 571-8686, Japan
Section : Coating Business Promotion Department
Telephone Number: 06-6906-2018, Japan
Facsimile Number : 06-6904-4457, Japan

【 Product Name 】 Silica Aerogel SP-12

【 Characteristics 】

- Chemical nature: silicon dioxide (SiO₂ : 90%)
- Form : block
- Color : transparent
- Odor : none

【 Physical data 】

- | | | |
|------------------------------------|-----------|-------------------|
| • Density | 0.04 | g/cm ³ |
| • Boiling point | — | |
| • Vapor pressure | — | |
| • Viscosity | — | |
| • Solubility in water | insoluble | |
| • Flash point | — | |
| • Ignition point | — | |
| • Explosion limits | — | |
| • Thermal decomposition | — | |
| • Hazardous decomposition products | — | |
| • Hazardous reactions | — | |

【 Measures in case of accidents and fires 】

- First aid : Wash affected skin with soap and water .
Wash affected eyes thoroughly under running water with eyelid open .
- Extinguish media : Water spray, foam, dry powder
- After crush and spillage : Take up with a dust-binding medium and dispose of .

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|-----------------------|-----------------------------|---------------------|
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| • Skin irritation | : non-irritant | (tested on rabbits) |
| • Eye irritation | : non-irritant | (tested on rabbits) |

* The product is confirmed as non hazardous substance by the tests based on the OECD Guideline for Testing Chemicals (1987).

【 Information on ecological effects 】

- Eliminability : Because of its poor solubility in water, the product is virtually separated from water mechanically in biological effluent treatment plants .

【 Further information 】

About MC901

Copied from: <http://www.bayplastics.co.uk/data%20sheets/dsm/dsmprinting/nylatron%20MC901.htm>

PRODUCT DATA SHEETS

NYLATRON® MC 901 (PA 6) (blue)

NYLATRON MC901 (produced by a similar process to that of Nylatron GSM) is a highly versatile general engineering plastics due to its excellent combination of properties.

- High stiffness / strength
- Continuous working temperature 105°C (max 80°C)
- Good impact strength
- Good chemical resistance (pH 5-11)
- Good wear resistance
- Low weight (1/6 vs steel)
- Good dynamic bearing material
- UL 94 V-0 rating at 12.7mm thick only
- Blue colour

Application : Gears, bearings, rollers, wheels, cams, nuts, valve seats, pulleys, gaskets etc.

The data are typical values and are not intended to represent specifications. Their aim is to guide the user towards a material choice. All statements, technical information and recommendations in this product data sheet are presented in good faith, based upon test believed to be reliable and practical field experience. However, Bay Plastics Ltd cannot guarantee the accuracy or completeness of this information, and, it is the customer's responsibility to determine the suitability of products in any given application.

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