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Component Outgassing Results & Getter Pumping in the Large Area Fast Photo-detector

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Outgassing Results and Estimate of Getter Area

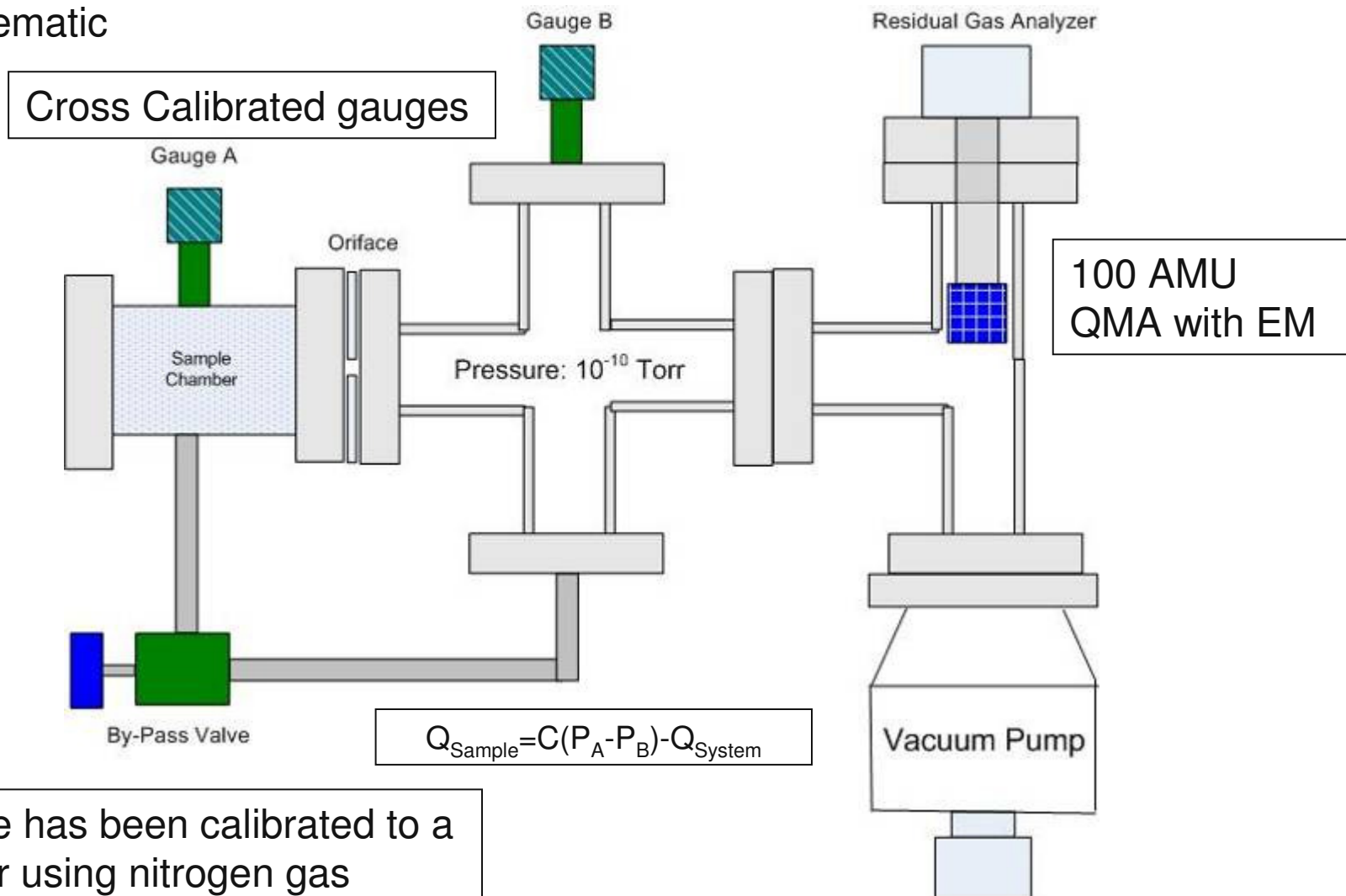
- This talk contains the test results of two components of the Photo-detector assembly.
- Two 33 mm MCP's with ALD coating were tested.
- A sample of the silver anode paste also underwent testing.
 - The results contain both the room temperature outgassing rate and a residual gas spectrum.
- The size of the getter pump strip can be partially estimated as more materials need testing.

Outgassing Test

- MCP
 - Two samples were provided by the ALD Group for test
 - Each sample was 33 mm in diameter.
 - Since this sample had been baked at 400 C it did not require any additional cleaning.
- Silver Paste
 - The sample was prepared by Ferro using SP 1965 paste.
 - The sample size is 3.2 cm x 5.1 cm that was fired at 1200 F (649 C).
 - The sample was cleaned in a citric acid detergent, rinsed in DI water and dried in nitrogen gas.
- The samples were placed in the system for a single 400 deg C bake for 20 hours
- Upon cooling the outgassing rate was measured.
- The spectrum of residual gases was also recorded.

Outgassing System

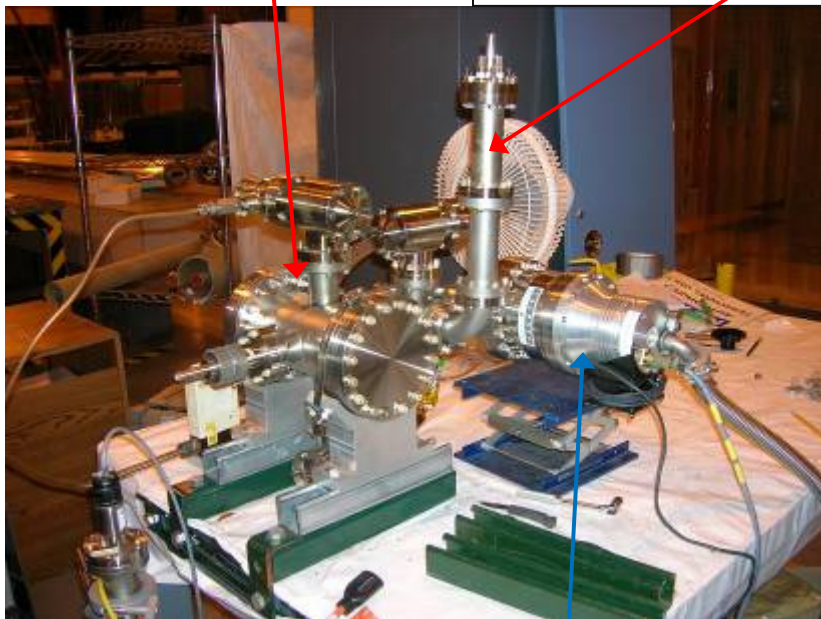
■ Schematic



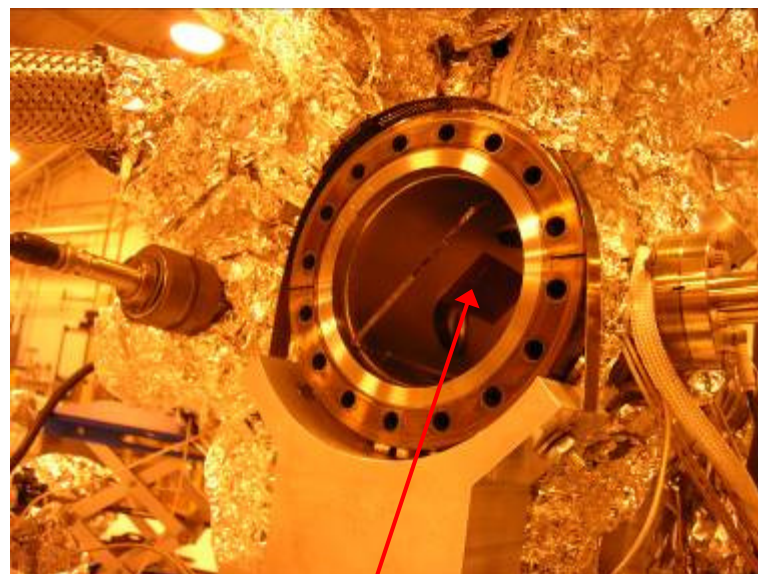
Test Setup

Sample Chamber

Residual Gas Analyzer



Vacuum Pump



Silver paste sample
cut to fit system

Outgassing Results

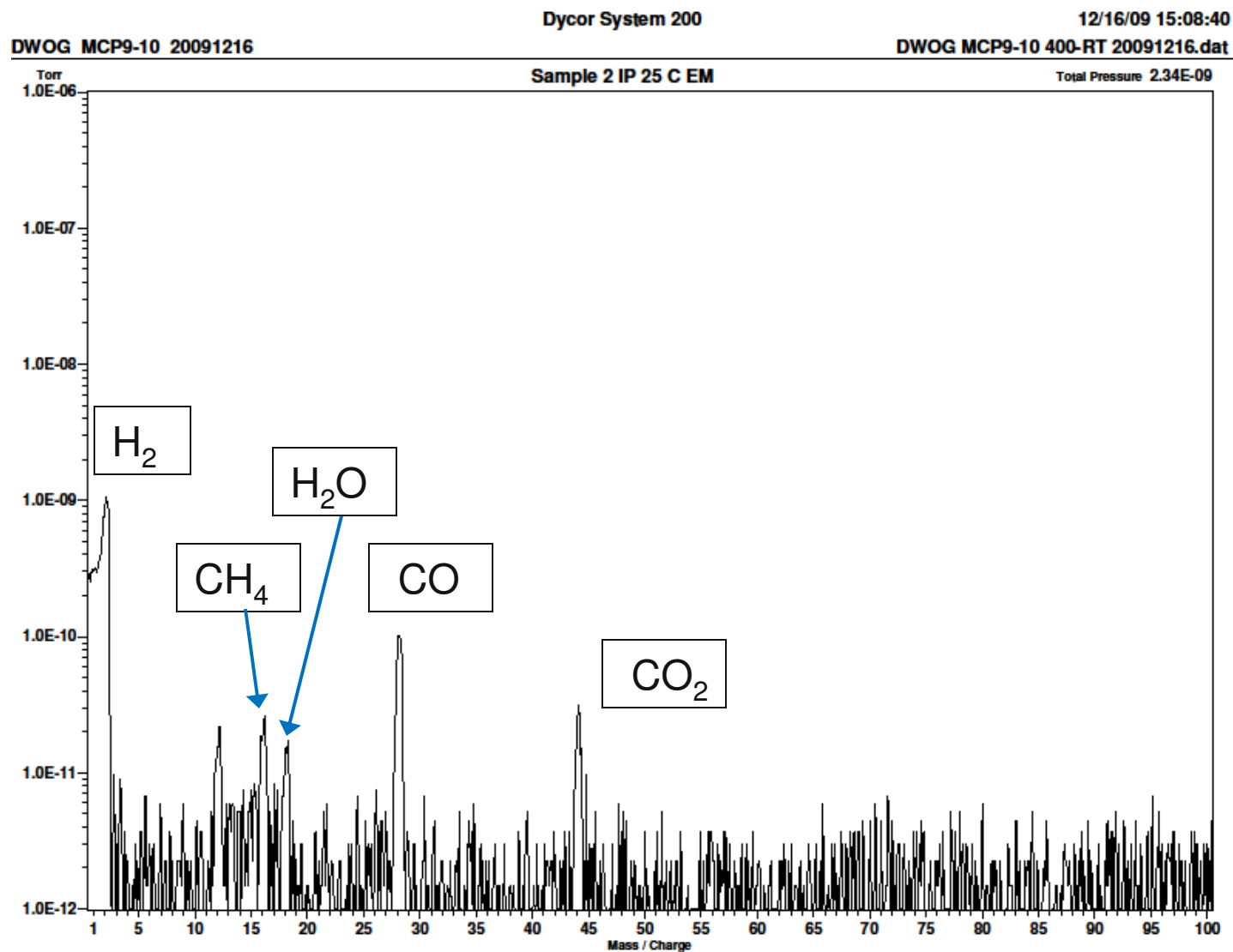
■ MCP

- The outgassing rate for the two parts are 2.5×10^{-10} torr*lit/sec
- The outgassing rate for (2) 8" x 8" MCP's is 1.4×10^{-8} torr*lit/sec
- Assuming that the MCP's are the only source of outgassing, then the photo detector will need ~10 lit/sec of pumping speed. For a pressure of 1.4×10^{-9} torr.

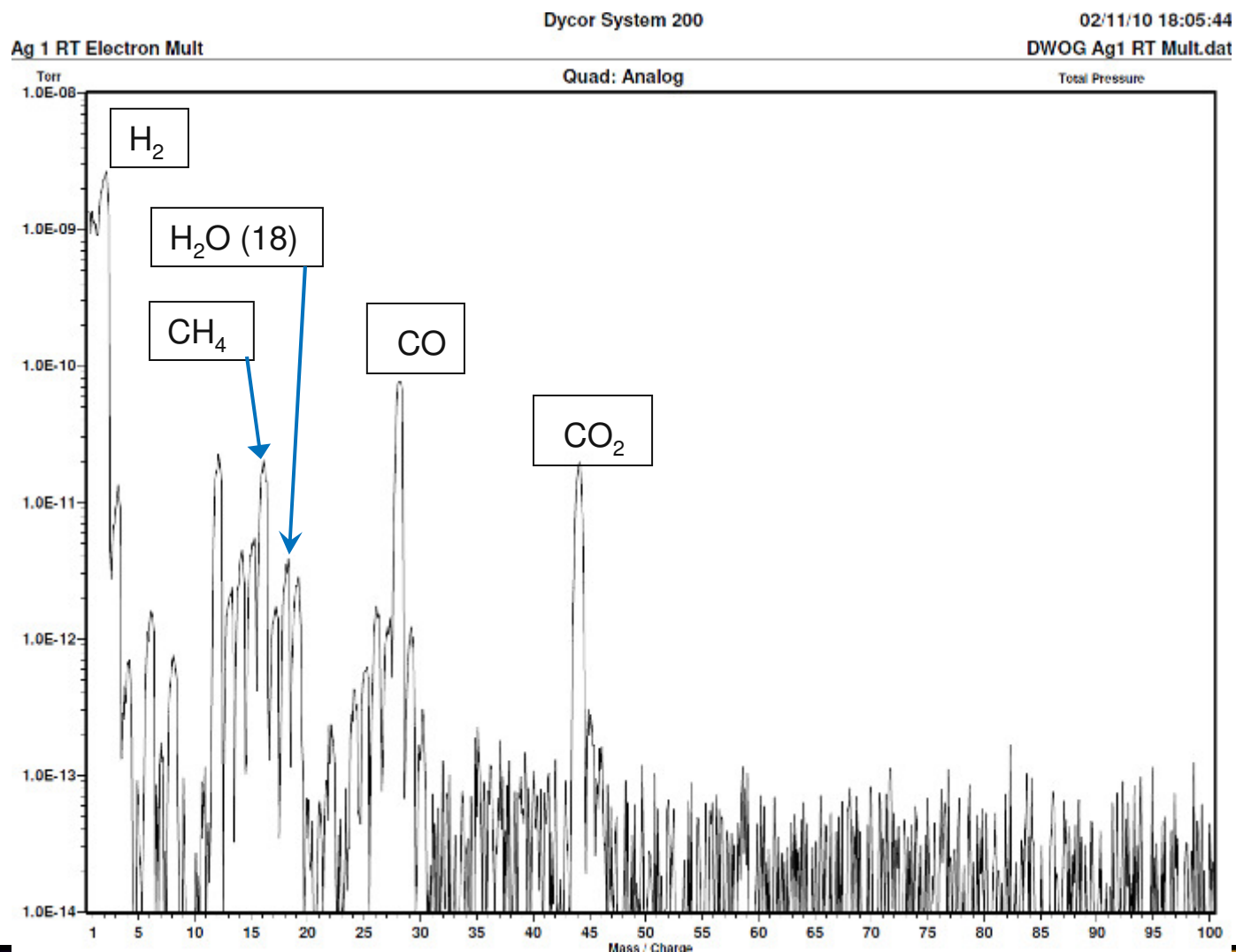
■ Silver Paste

- The outgassing rate for the part is 7×10^{-11} torr*lit/sec (2.5 sq in)
- The outgassing rate for a 8.26" x 8.26" Anode base plate with 74% silver paste coverage is 1.4×10^{-9} torr*lit/sec
- Assuming that the anode base plate is the only source of outgassing, then the photo detector will need ~1 lit/sec of pumping speed. For a pressure of 1.4×10^{-9} torr.

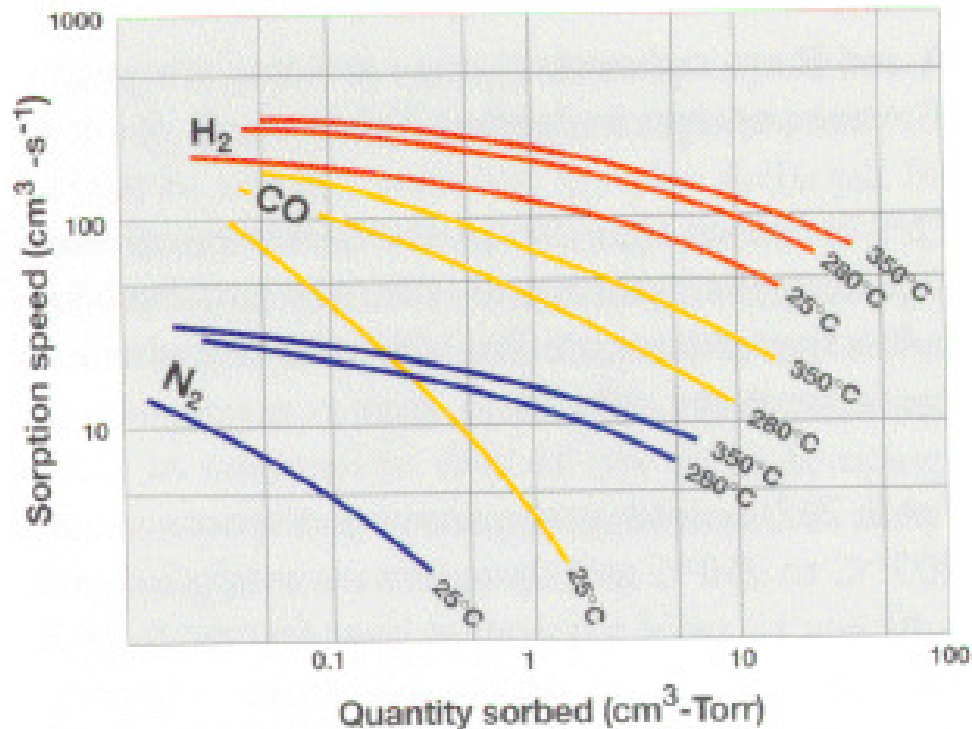
Residual Gas Analysis MCP



Residual Gas Analysis Silver Paste



Saes ST-707 Getter Strips



- Data is for 50 sq mm
- This material can be activated at 350 C (2 hrs).
- From this the area of the getter is 8.8 sq inches

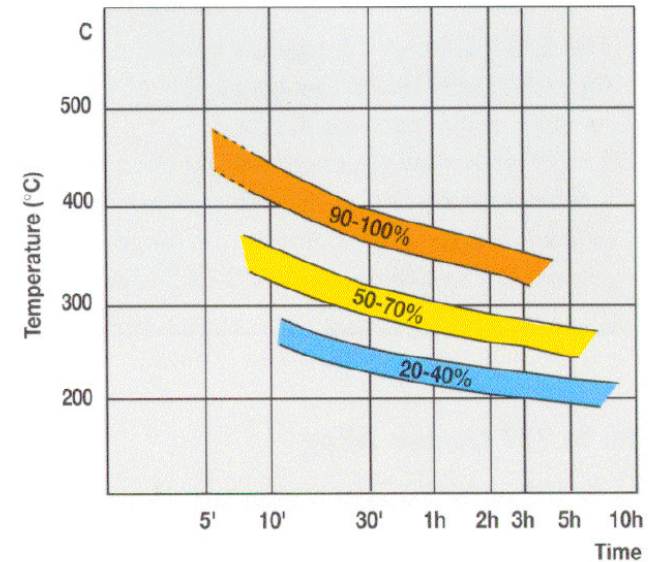
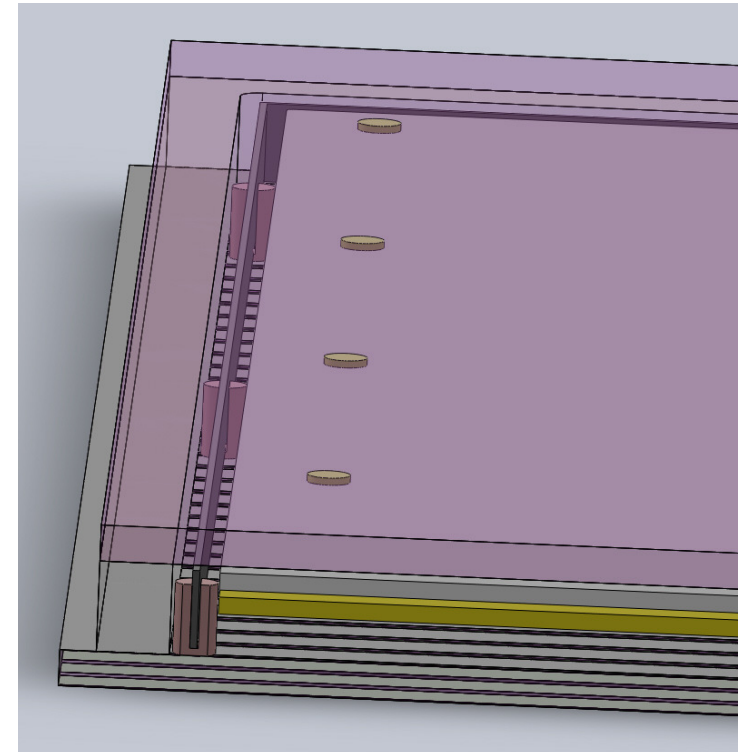
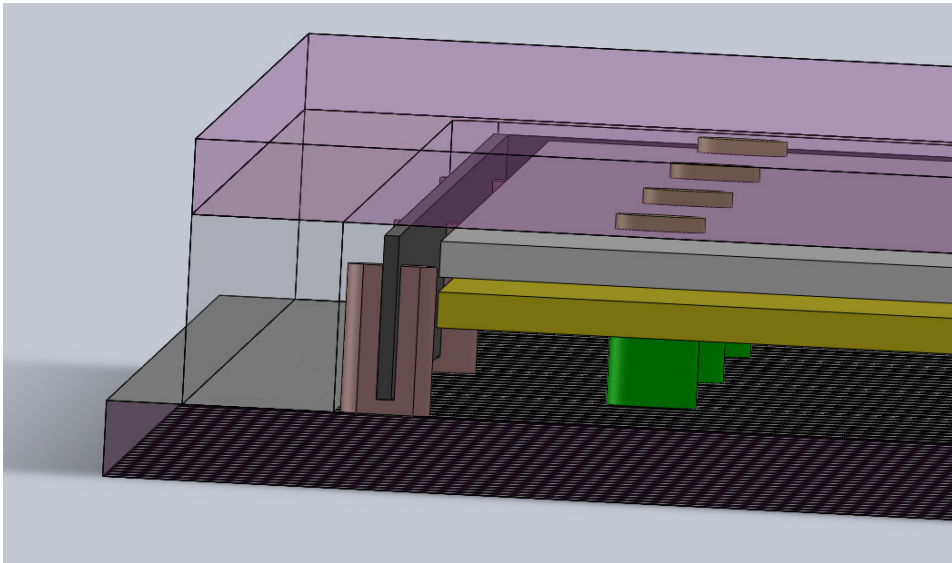
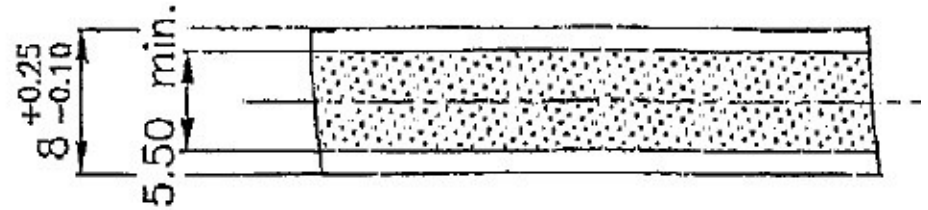


Fig. I. Activation conditions and gettering efficiency of St 707

NEG Pump Design

- From discussions with the manufacturer, the smallest strip that is made is 8 mm wide. This can be cut down to 5.5 mm.
- The space between the inside wall and the MCP provides for approximately 14 sq in's of getter area where the getter will be on all four sides.
- This area provides for 9 lit/sec of total pumping speed.



Conclusions

- MCP
 - The MCP's are very clean with a low outgassing rate.
 - The carbon monoxide and the methane can be pumped by a ST-707 getter.
- Silver Paste
 - The silver paste has a low outgassing rate.
 - The trace of fluorine is going to be confirmed in later testing.
- Getter Sizing
 - The sizing of the getter is based on the results of the two materials tested so far which adds up to a total of 8.8 square inches
 - The space available in the box is 14 square inches, so there is room for more material if some of the other materials require it.

Future Tests

- Testing of the B-33 Glass alone will be done to provide a baseline of the glass.
- The glass frit material needs to be tested.
- Testing will continue on the indium seal material, the alloy for this is in the process of being selected.
- A second test of the current silver paste will be run to determine trace gases.