

Notes on repairing arcing on a microchannel plate

Paul Houston:

We've done this several times. The problem is to make the torrseal more viscous by heating a little up for a while. You want it not to be runny, but not to leave long ribbons when you try to pull away. Then just put a drop on both sides of the defective plate (it may affect both plates). You'll have a dead spot there, but you can usually work around this.

Dadong Xu:

We run across the same problem some time ago. You may want to try to reverse the potential on the MCP to see what will happen. For example, if you are working with the front plate grounded, try to put negative voltage on the front and ground the back plate. But notice that in this configuration, the HV on the phosphor screen should not exceed 3000V. Always apply the voltage slowly. In our case the discharge near the edge eventually disappeared for reasons unknown.

Peter Harland:

Having just lost a set of MCP's to the very same bright spot I felt that I ought to reply to your quest for information. Our MCP's developed the discharge without warning. One day OK, the next day we have a flare at the edge. They had been in use for 2 years and had probably clocked up over 1000 hours. We did not try Torr Seal but we did clean the surface of the MCP's with spectroscopic acetone and a cotton bud which led to an improvement in gain that allowed us to operate at a lower voltage. However, the problem came back and continued to get worse until one day there was a brilliant flash and that was that. The MCP had what looked like a drunken snail track across the surface from the damaged edge to the middle. On touching the surface gently with a cotton bud it literally disintegrated. So, we gained a little time while the replacements were shipped but that was about it.

David Chandler:

I have heard of others doing this sort of thing but I have no personal experience. I think it would work if there are not sharp edges to create a corona discharge. We found that pulsing our mcps minimized this effect when we did get a bad spot.

Arthur Suits:

It's interesting that you are dealing with this; we have been trying to refurbish our detectors lately (since Burle has fallen way behind on promised delivery of a new one). I'll be interested to hear what others tell you. I'll tell you what we've done. Our detector had a large weak area on it, and when we took it apart it turned out to be the phosphor, not the MCP (a clear yellowed area just where the weak spot was). We tried cleaning and reassembling it, then got some arcing (they didn't wait long enough before trying it) that resulted in burns on the edges

much as you describe. I decided to try the plates in a non-chevron configuration so that the burns on the two plates would not line up. (We first sonicated them in methanol for a few hours then put them in a vacuum oven overnight.) This seemed to solve the arcing problem and the plates worked OK. For our experiments the genuine "chevron" configuration doesn't seem to matter. In fact, it doesn't matter much which side of the plates face out. They just have slightly different layers of nichrome on them that give slightly different efficiency and pulse height distributions. Our problem now is the phosphor. I found a company that would sell us P-47 phosphor powder, but wouldn't tell us how to apply it. We managed to coat a thin layer of a suspension in methanol, and it actually worked and we got nice images with it. But it didn't have a binder in it (the company was even ambiguous on this point) so that after a day of running the phosphor started coming off the detector (But only in areas where the ions were hitting.) We since found a company at Ga. Tech that promised to recoat it immediately (and cheaply) and that's where things stand now. We expect it back in a week. They have since told me they use an acrylic binder, so I think we could really do it ourselves now. I will experiment more later and let you know. I do want to learn to do as much of this as possible in-house, especially since I now begin to think it is the phosphor that is the weakest link.

Wim van der Zande:

In earlier days, I have removed spots by simply drilling the affected place away (it was done by someone in the workshop experienced in working with ceramics). This procedure has prolonged the lifetime of plates in a test set-up.

Rajesh K. Vatsa:

I am writing to you as I have some experience with the MCP. We had a somewhat similar problem. The MCP which was working all right started arcing tripping the high voltage supply. We found that progressively the threshold voltage for arcing kept on decreasing and it became difficult to operate. Then I opened the detector which has two plates and rotated the first one by about 180 degrees with respect to second plate. Subsequently there was no problem. I feel that some channels find a low resistance path on both the plates (I guess you are using a CHEVRON configuration). The normal resistance is about 150 Mega ohms or more from one end to the other of the MCP plate. This low resistance path gets shortcircuited when the high voltage is applied. If we separate the channels on the two plates, the problem could be rectified. Please note that this may decrease the gain somewhat. If you

are using only one plate still rotation may help.