

Insulation qualms on EHT Probe

Thank you for your article on the EHT Probe (SILICON CHIP, April 2010). I was in the process of designing my own and now it seems I may not have to. However, in your design I'm a little concerned about the electrical stress on the PC board (depending on material type) in the gaps between the 10M Ω resistors in the line down each side of the board.

When measuring 25kV, the voltage across these 8mm gaps between conductors would be $7 \times 313V$, or 2.191kV. I would have thought, where an uncoated board is concerned, that a space of more than 11mm between conductors would have been more appropriate at 2.191kV although I'm willing to admit that my expertise in this area is woefully out of date.

I seem to recall that *Spacing (mm) = (V_{peak} x 0.005) + 0.6* was a useful rule-of-thumb formula. Coating the PC board after scrupulous cleaning reduces the spacing requirement to about half although I don't believe heatshrink tubing could be considered to constitute "coating".

I would be grateful for your assurance that 8mm spaces between conductors in these gaps will not lead to tracking difficulties on an uncoated PC board or on the inside surface of the reduced heatshrink tube. (R. C., Ocean Grove, Vic).

● You are quite correct in stating that the voltage drops across the 8mm gaps down each side of the PC board when measuring an input of 25kV would be almost 2.2kV. However, this shouldn't cause a problem within the board material itself, as the specified dielectric strength of modern FR-4 epoxy fibre-glass and FR-2 SRBP board materials is over 20kV/mm.

The air surrounding the board should not be much of a problem either, assuming it is dry air of course. The current figure for the dielectric strength of dry air seems to be around 9kV/mm, especially between rounded conductors as we have here. One of the reasons for suggesting that readers fit the assembled board with a heatshrink sleeve is to ensure that any air trapped inside remains relatively dry.

If there is a problem, it would be caused by any dirt, moisture or other impurities on the surface of the board, before the heatshrink sleeve is fitted.

Our testing suggested that a freshly manufactured board would be clean enough to avoid any risk of flashover

but if you want to be 'extra careful' you could coat the assembled board with a "conformal coating" of epoxy resin or polyurethane – allowing it to dry thoroughly before the heatshrink sleeving is applied.