

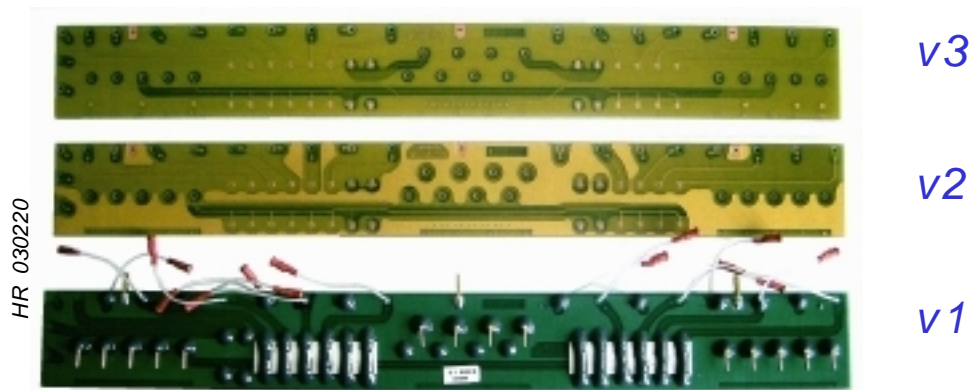


**CMS**  
**BARREL MUON**  
**DT CHAMBERS**

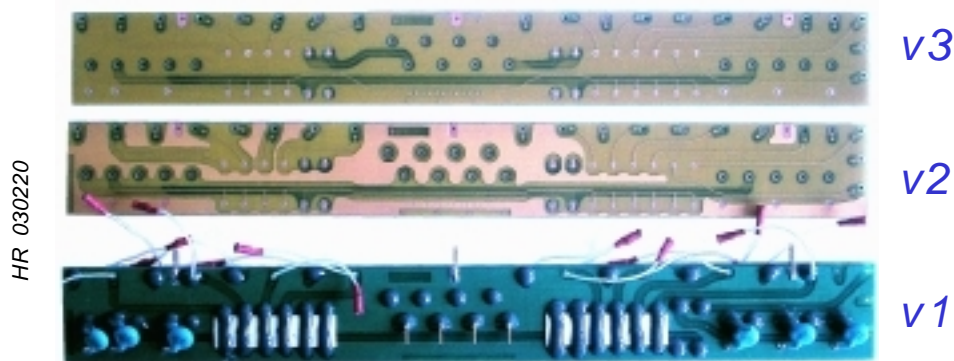
*HV Safety*  
*Improvements for*  
*HVB Board*  
*Remarks from G. Hilgers*

***“Maintenez vos distances...”***

*Hans Reithler*  
*020323*



*Front view of present HVB layouts. V2 and v3 are prototypes, designed to improve HV safety margin, especially on outer layers.*

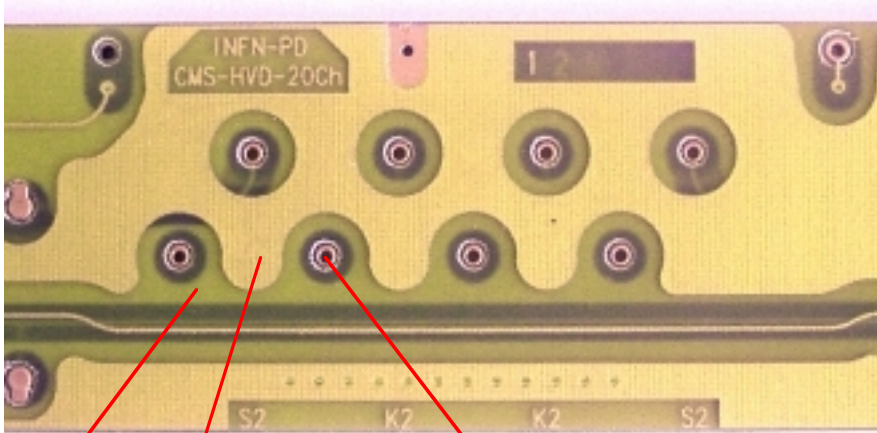


*Rear view of present HVB layouts*

*Diagnostics of long-term problems seen in v1 was current between GND and HV lines in outer layers.*

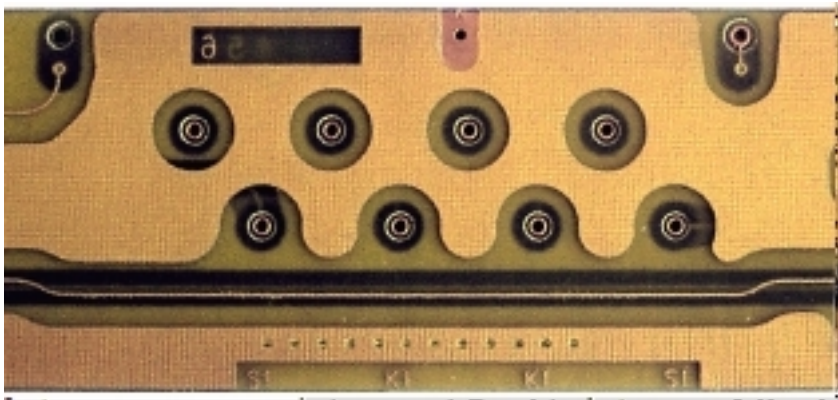
*Largest safety margin is then given by v3, with almost no GND in outer layers.*

*Shielding anyway mainly from GND in neighbour layer (closer to HV lines).*



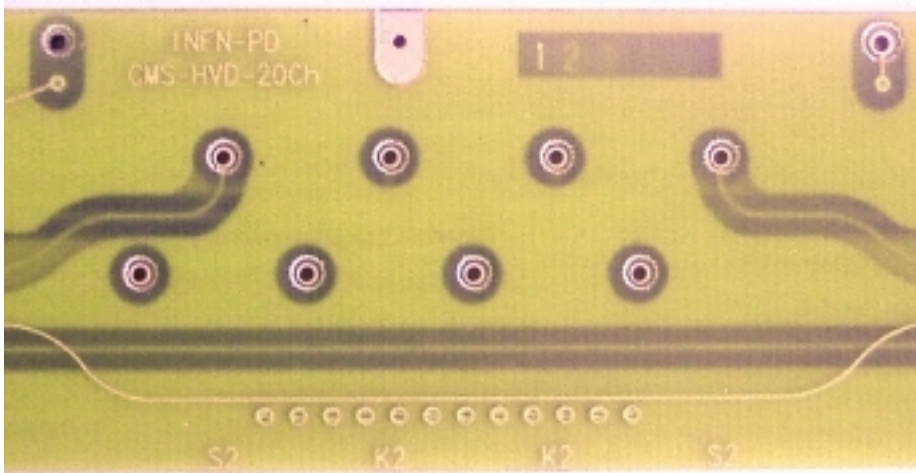
*Detail of v2, front view*

*HV contact feedthrough  
GND on outer layer at increased distance  
GND on inner layer much closer to HV feedthrough*

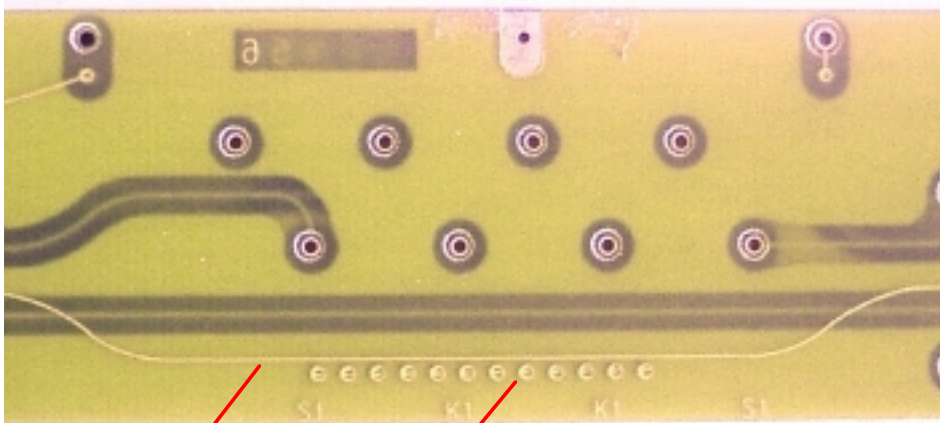


*Detail of v2, rear view*

*Improved distance between GND and HV lines - only in outer layers. Inner layers still represent a long-term risk.*



*Detail of v3, front view*



*Detail of v3, rear view*

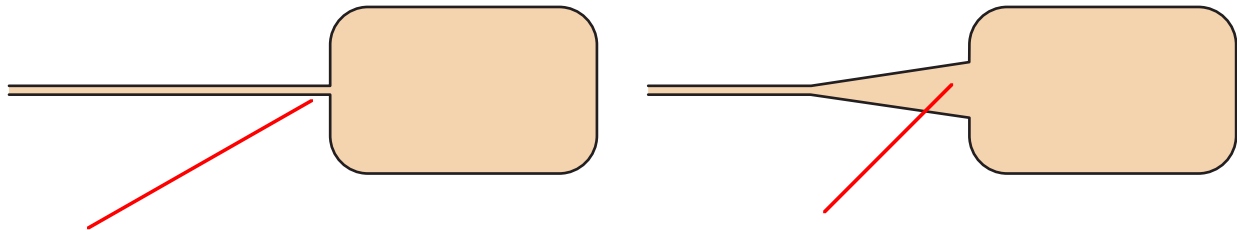
*GND contact feedthroughs?  
HV line on outer layer, moved close to them,  
then represents a severely increased risk*

*Almost no GND on outer layers - v3 safest.*

*Inner layers as in v1, v2.*

*Accidentally reduced distance between GND feedthroughs and HV lines in outer layers?*

*Soldering pads vs. thin lines:*



*Thin line at soldering pad: risk of rupture (mech. stress, mainly from thermal stress).*

*A wider transition is safer.*

*Mechanical safety is increased by having a wider and smoother transition between thin lines and pads for soldering.*



# *Conclusion*

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*Still potential for simple and effective improvements of long-term HV safety margin and robustness of HVB boards.*

*Since a large fraction of the HVBs is being remade to improve the long-term HV safety margin, these improvements could and should be included.*

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