IHEP RPC Bakelite Resistivity *in-Situ* Test Results and Strip Plane Considerations

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Why we need to know the resistivity of Bakelite electrode?

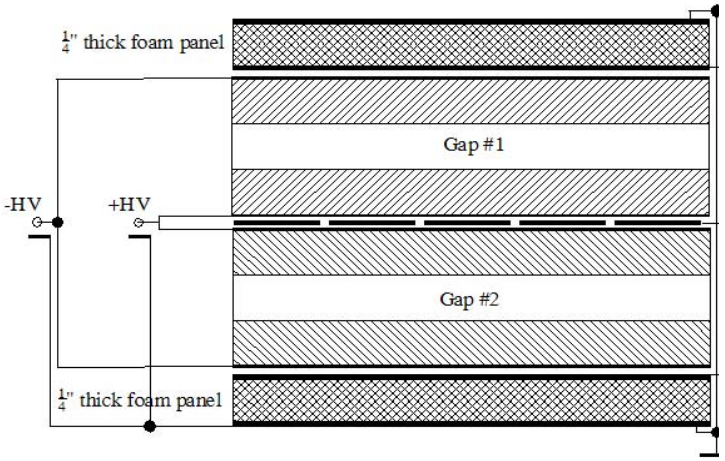
Bakelite resistivity is one of the most important parameter: it affects the rate capability, the leakage current. During the mass production this is one of the parameter needs to be controlled.

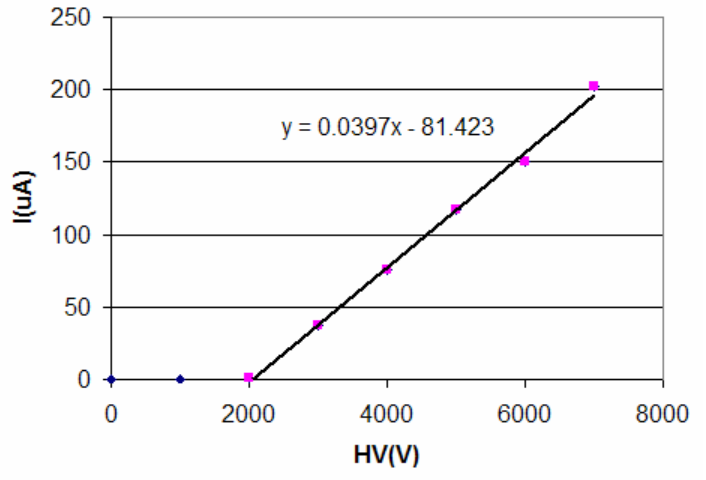
If we satisfy the performance of the prototype we have to record its Bakelite resistivity for mass production QC.

To measure the resistivity in situ, we deploy the following method:

Flow pure Ar gas through RPC chamber, purge all previous streamer gas, then apply HV step by step, record the dark current. Plot I_{dark} vs. HV, we'll see a straight line after HV pass ~2000V. Calculate the slop of this line we'll be able to derive the resistivity.

Setup and test result





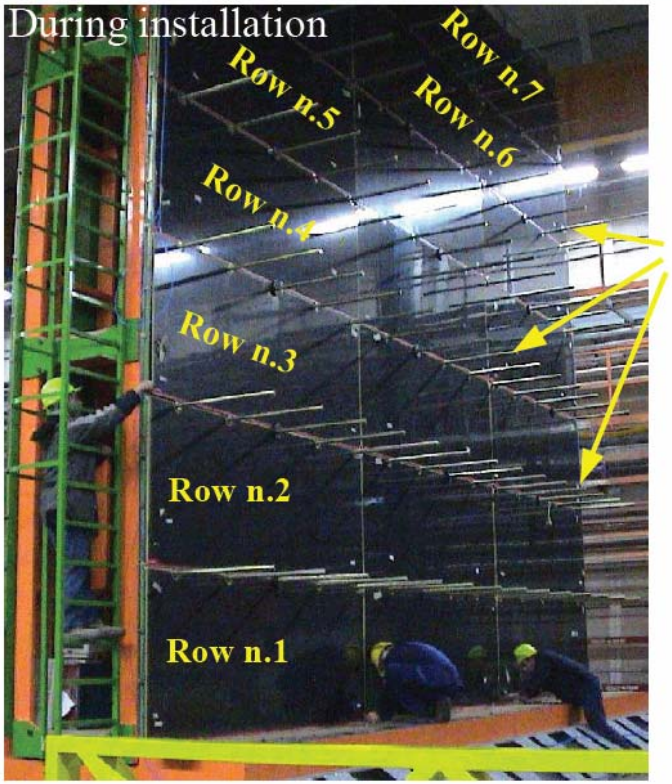
Total area: S = 2(RPCs)*2m*1m = 4m^2,

Total thickness: d = 2(electrodes)*0.2cm = 0.4cm,

HV below 2000V, dark current is very small, above 2000V Ar gas starts discharge, we can see the gap as being shorted, the measured leakage current is the DC current through the Bakelite electrodes. Slop = 0.0397 μA/V, $\Rightarrow$ resistance R = (1/0.0397)*10$^6\Omega$, ρ = R*S/d = 2.52·10$^{12}\Omega$cm. Compare to Belle glass RPC, ρ=5·10^{12} Ωcm. Italian Bakelite resistivity is about one order of magnitude less than this.

Strip plane consideration

The OPERA RPC system: layer



Bolts

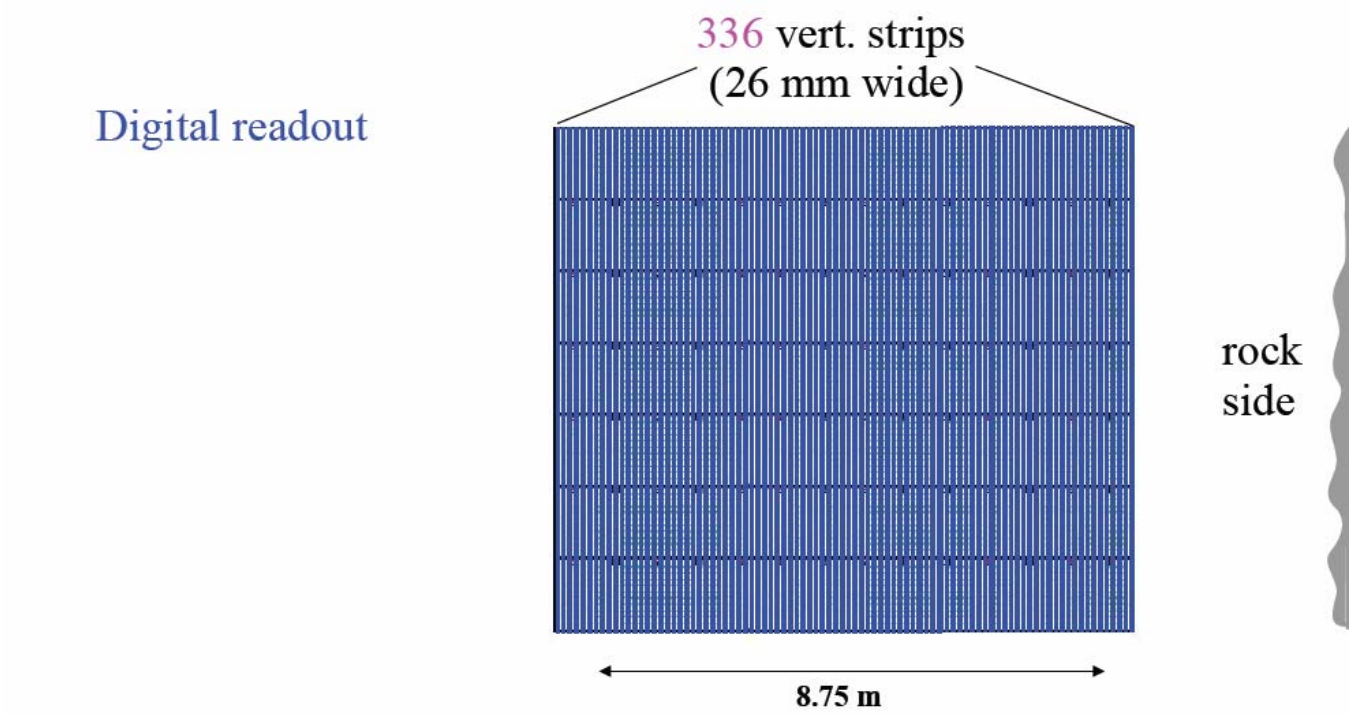
1 Layer
=
7×3 RPCs
(~70 m²)

A-type (upper row)

B-type (lower rows)

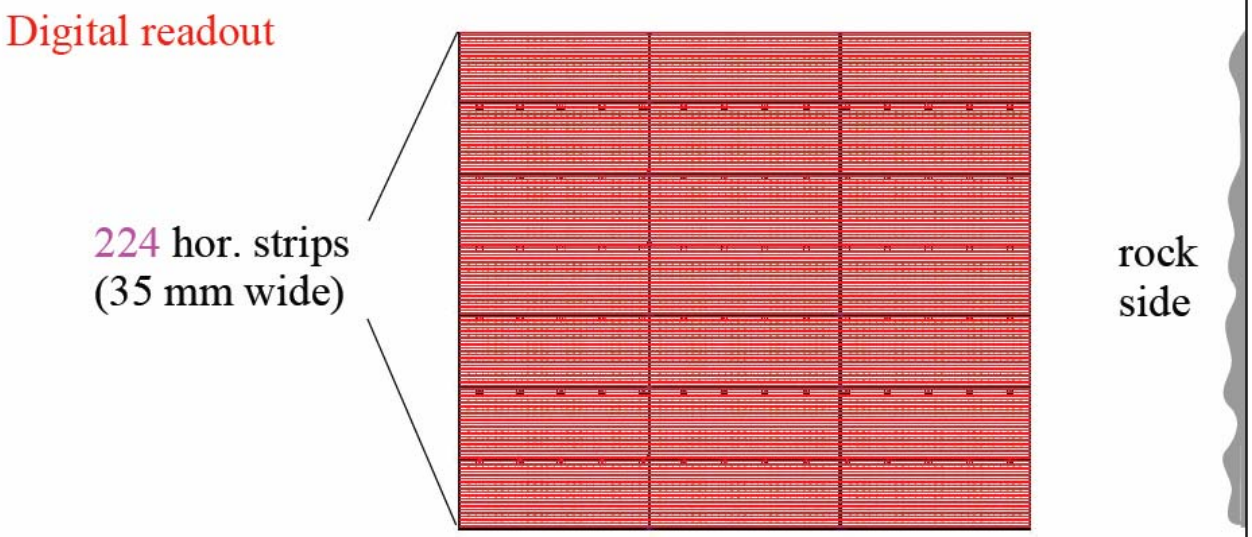
OPERA RPC strip plane

The OPERA RPC system: layer



OPERA RPC strip plane

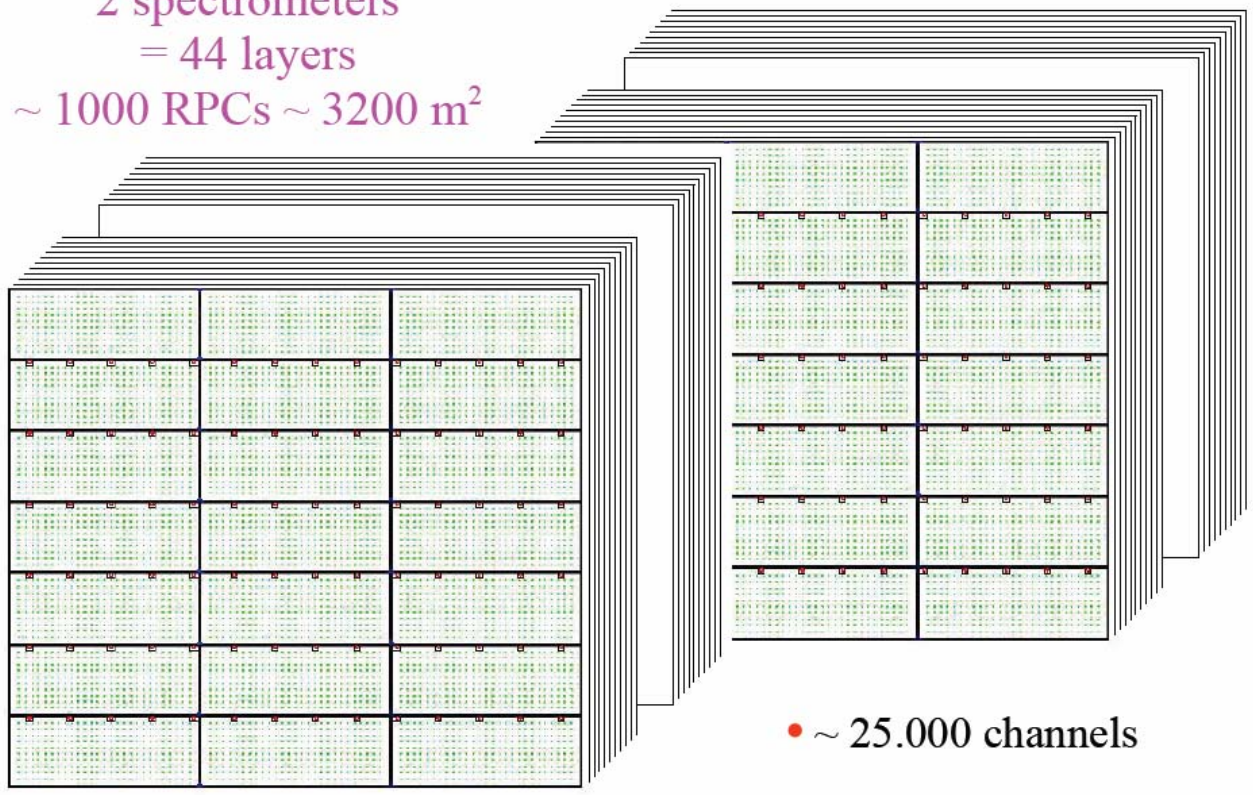
The OPERA RPC system: layer



OPERA RPC strip plane

The OPERA RPC system

2 spectrometers
= 44 layers
~ 1000 RPCs ~ 3200 m^2



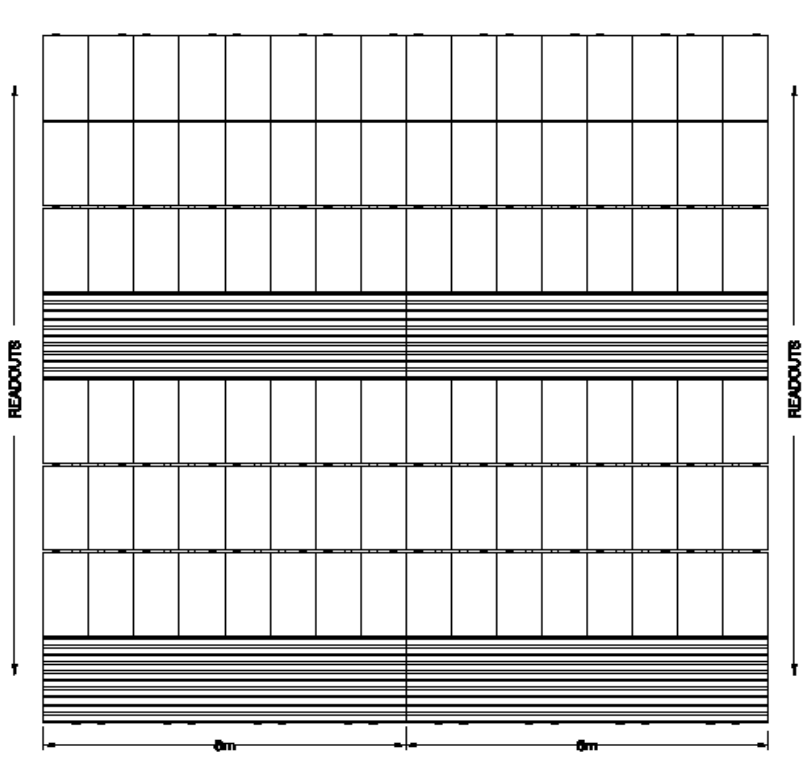
• ~ 25.000 channels

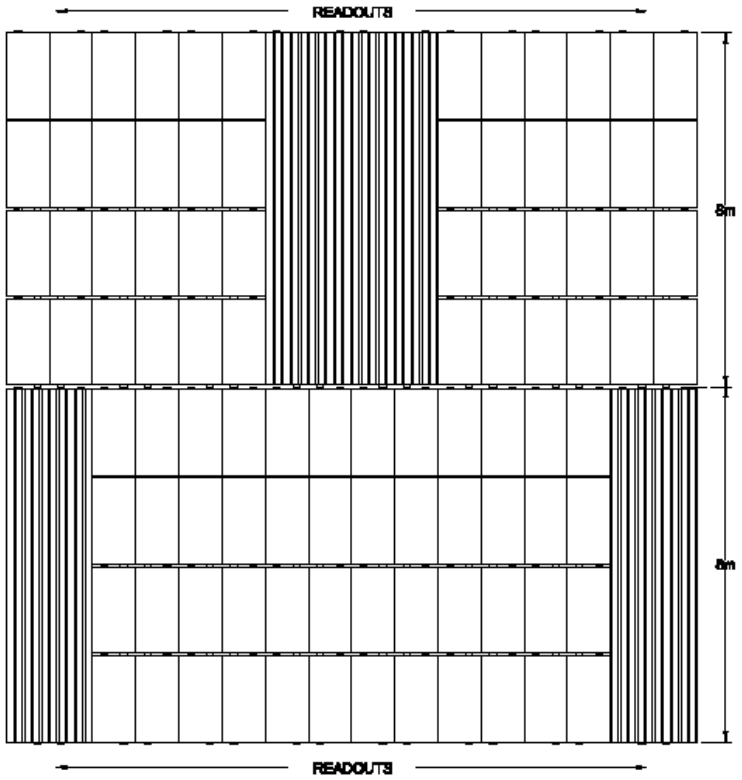
A. Longhin, INFN & Padova University OPERA RPC: installation and underground test results RPC2005, Oct 10-12 Seoul

OPERA RPC strip plane

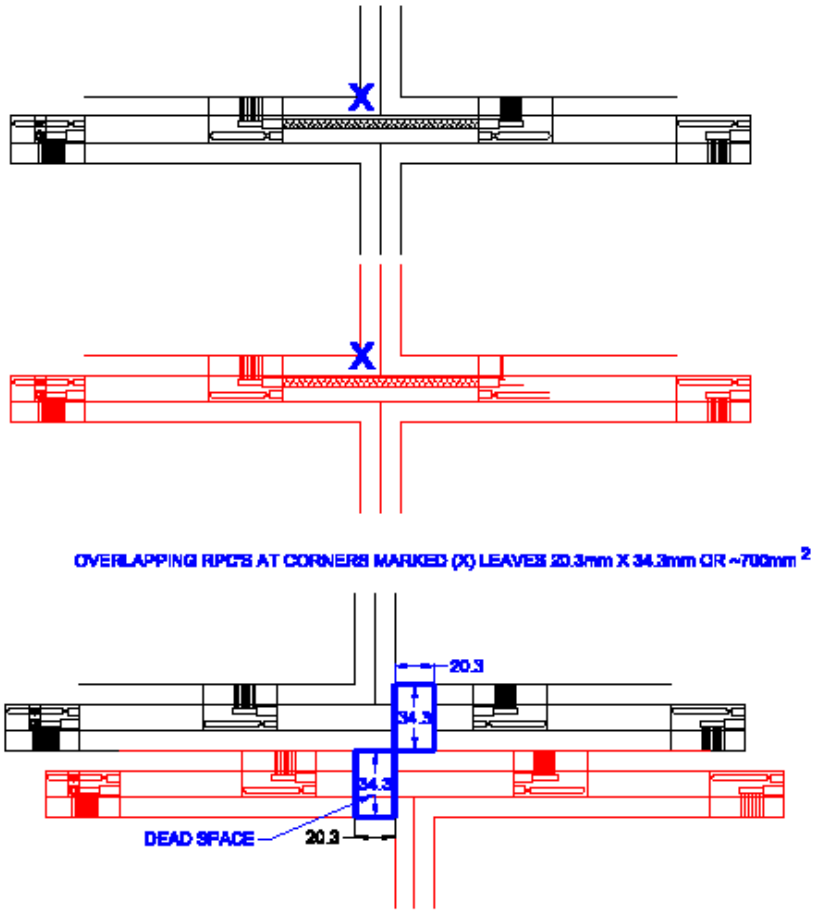
Installation phases (I)

Strip plane – B. Sand

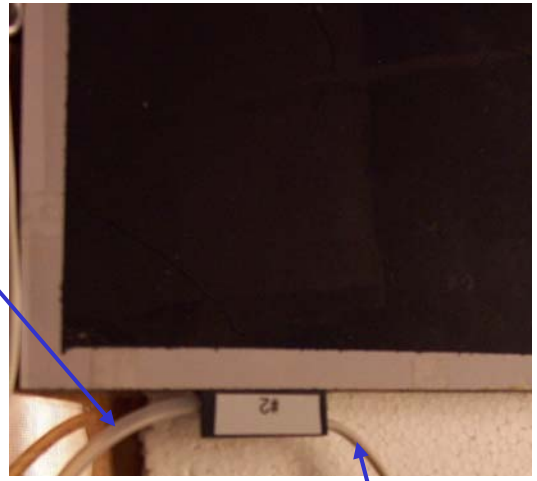


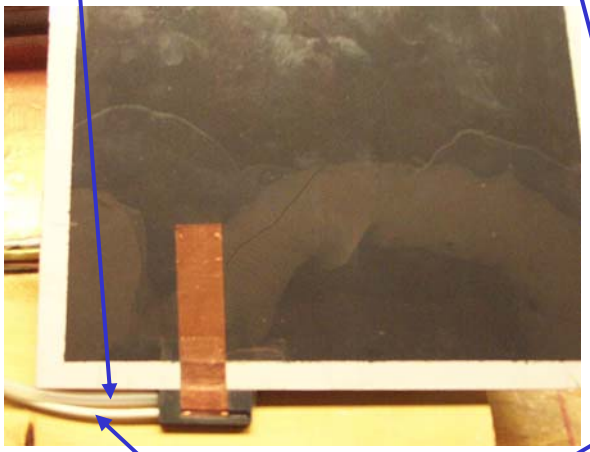


Strip plane – B. Sands



Gas tubing





HV cable

Strip plane – B. Sands