

Bulk and Surface Resistivity .

Bulk or Volume Resistivity.

This is a parameter used to define the conductive characteristics through the material in the case of RPCs it is Bakelite, HPL (high pressure laminate), or glass or other poorly conducting material.

By placing electrodes on each side (top and bottom) of the sheet an electric field is created through the material that produces a current flow. This allows the resistance to be calculated.

This current is through a specified cross-sectional area and through the thickness of the material.

The formula to calculate this is;

	$\rho \text{ (Vol.)}$	=	$R \times A/t \text{ [Ohm.cm]}$
Where	R	=	Resistance
	t	=	the thickness between the
electrodes	A	=	electrode cross sectional area

Diagram Fig 19

Apparatus used ; Fig 20

Result	Resistance	= $14 \times 10^9 \text{ [Ohm]}$
	Resistivity	= $R \times A/t \text{ [Ohm.cm]}$
		= $1.4 \times 10^{12} \text{ [Ohm.cm]}$

This parameter influences the rate capability which will increase with lower resistivity as the charge can be evacuated from the gap and through the gap electrodes more easily.

Surface Resistivity

This characteristic is used to define the conductive layer applied to the electrode material that composes the gap that is made from HPL or glass etc. This layer is necessary for the uniform distribution of the high voltage and corresponding OV layers on the outside of the gap.

By applying an electric field along the surface of the electrode material or substrate between two metallic electrodes on the same surface a current will flow between these electrodes. In this basic geometry the current will flow preferentially through the surface layer rather than the glass or HPL as the conductive layer is less resistive than the bulk material, HPL or glass.

The length of the electrodes that are parallel to each other and the distance between them define the length “L” and the width “L” of the passage for the current. This gives a square between the electrodes. The thickness of the layer is taken as a constant as it is a function of the chosen product used and the application method.

$$\text{Rho (Surf.)} = \text{R/square [Ohms/square]}$$

Diagram Fig. 21

Apparatus Fig. 22

Results	Resistance	129, 43.7, 3.3 and 43.6 MOhm
	Surface resistivity	129, 43.7, 3.3 and 43.6 MOhm/square.

This parameter Rho (Surf.) influences the signal strength and the rate capability.

Since the signal generated in the gap must reach the pickup strips that are outside the gap and its conductive layers these layers must be “transparent” to this signal.

The signal strength is higher when the conductive layer is more resistive as it acts less like a faraday cage.

The rate capability is higher when the conductive layer is more conductive as the charge depleted by the passage of a charged particle through the gap will be replaced more quickly by the easier movement of charge from the HV power supply.

A compromise between these two antagonistic parameters must be made.