

CWM 18.03.2004

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Surface Resistance on
collimator jaw material

Overview

- Materials
- Surface treatments
- Measurements
- Results
- Conclusions

Materials

- CFC materials
- Graphite
- Coating

	Company	Grade
Graphite	SGL	R 4550
		R8650
		R8710
		R8710Cu
		Sigrasic
	Poco	ZEE
		PLS
		FM
		DFP
CFC	Tatsuno	AC100
		AC200
		AC150
	SGL	1001Z
		1501Z
	Snecma	N11
		NB31

Surface treatment

- Coating after heat treatment 1000°C / 2h
- Side A : half CO₂ cleaning, half no cleaning
Followed by 1 μm Copper coating
- Side B : half CO₂ cleaning, half no cleaning
Followed by Ti flash and 1 μm
Copper coating

Thickness of coating measured by:
step profiler, x-ray fluorescence or weight.
Average thickness

Measurements 1

Resistivity on a large sample:

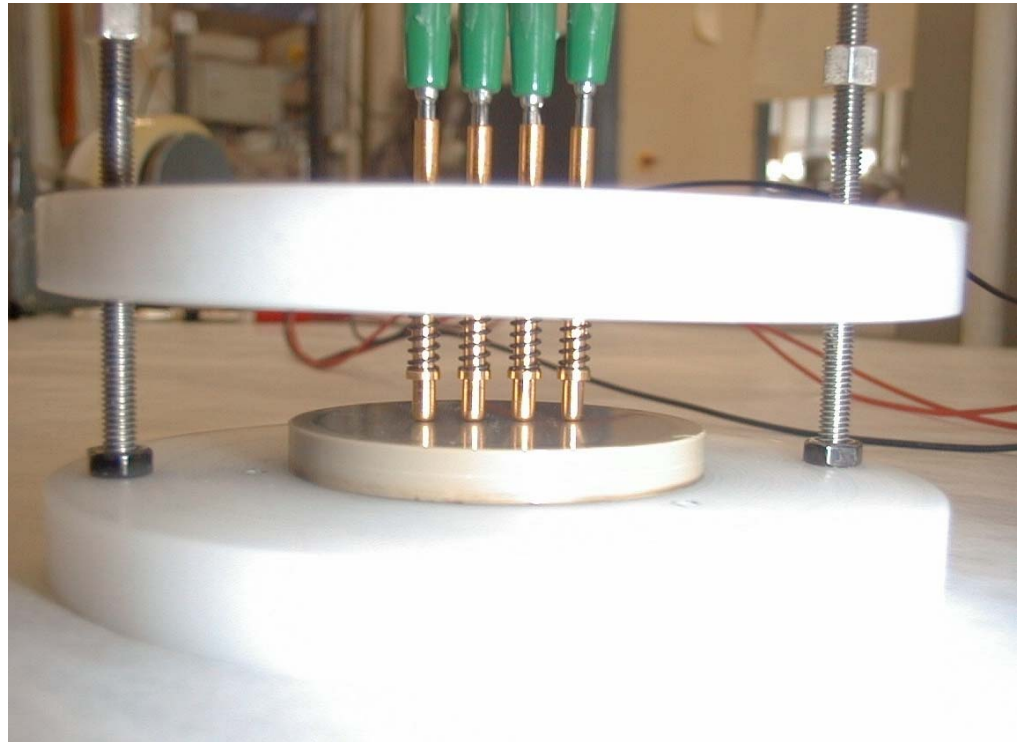
$$\rho = V/I \ 2\pi s$$

ρ : resistivity

s : point spacing

V : potential between inner probes

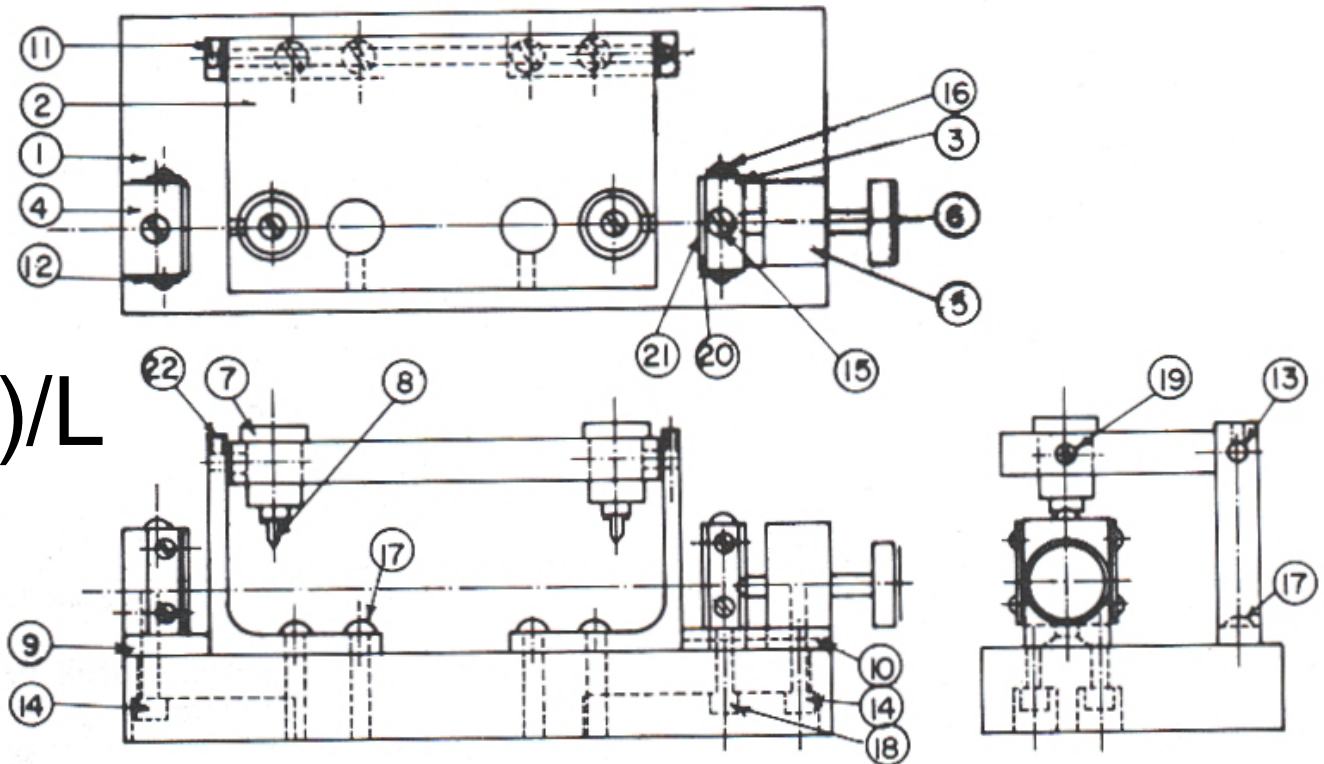
I : current through the outer pairs of probes



Measurements 2

Resistivity measurement (ASTM C 611 - 84):

ASTM C 611



$$\rho = (R \cdot A) / L$$

Measurements 3

- Contact Resistance influenced by
 - Geometry
 - Material and combination
 - Microstructure
 - Contact forces
 - Temperature

Results (bulk)

<i>Graphite</i>		<i>Size</i>	<i>Orientation</i>	<i>Resistivity [$\mu\Omega m$]</i>	<i>known values</i>
<i>bakeout (1000°C for 2 h)</i>					
before					
SGL	R 4550	Prim.	iso	15	13
		Sec.	iso		
	R8650	Prim.	iso	15	14
	R8710	sample	iso	16	14
	R8710Cu	sample	iso	6	3
Sigrasic					
Poco	ZEE		iso	44	
	PLS		iso		12.2
	FM		iso		12.4
	DFP		iso		15
CFC					
Tatsuno	AC100	Prim.	x-y	11-12.5	
	AC200	Prim.	x	13.5-18	
		Sec.	x-y	14	
	AC150		x-y		
SGL	1001Z	sample	x-y		6
	1501Z	sample	x-y		6
Snecma	N11	"Prim."	x-y	6	
	NB31	samples	x-y-z	9	

Conclusions

- Bulk resistivity measurement correspond to literature (4 points)
- “surface”/bulk compared to beam effect?
- Contact resistance in case of coating and for RF-contacts / clamping structure?