

# NEGs and the IP

2nd Visit to SLAC by SAES Getters on 3/1/07

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3/13/07



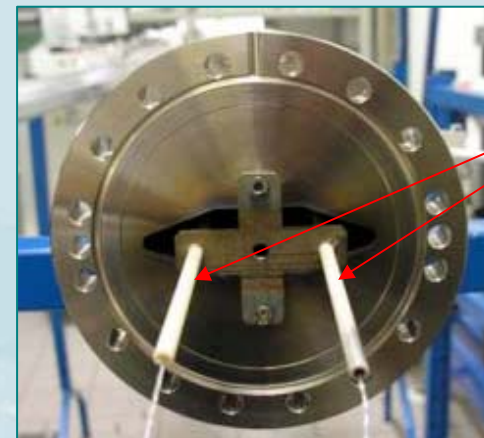
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# Coating IP chambers with NEG (TiZrV) film.

Typical chambers are fairly uniform in cross sectional dimensions along length.



Cathodes

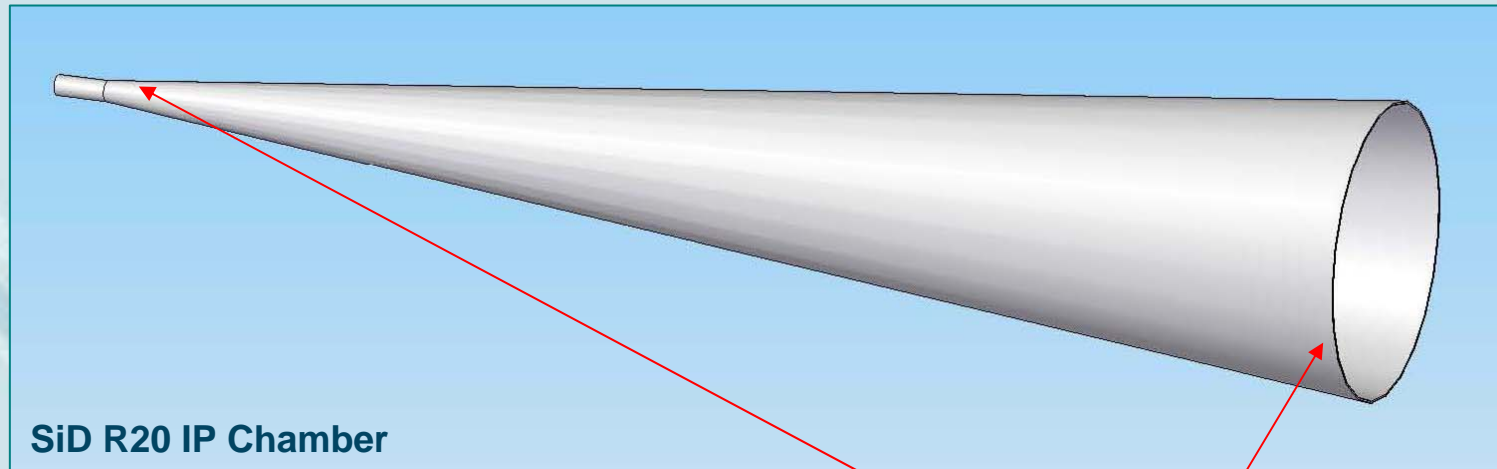


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# Coating IP chambers with NEG (TiZrV) film.



Conical IP chamber has diameter which grows ~2cm - .5m.

- May be difficult to achieve uniform coating thickness from end to end.
- May be difficult to achieve stable plasma for sputtering process.
- SAES Getters is investigating these issues.



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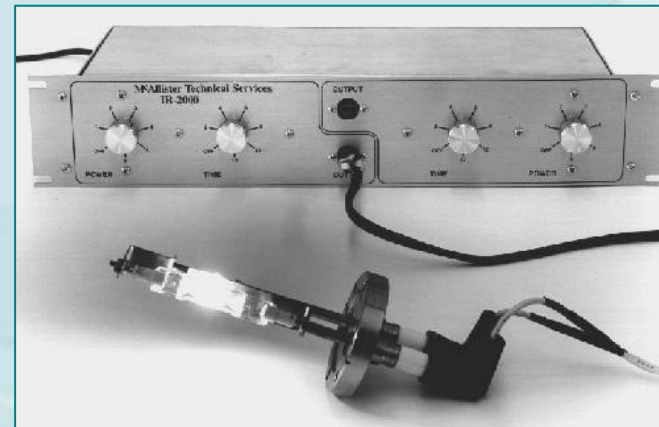
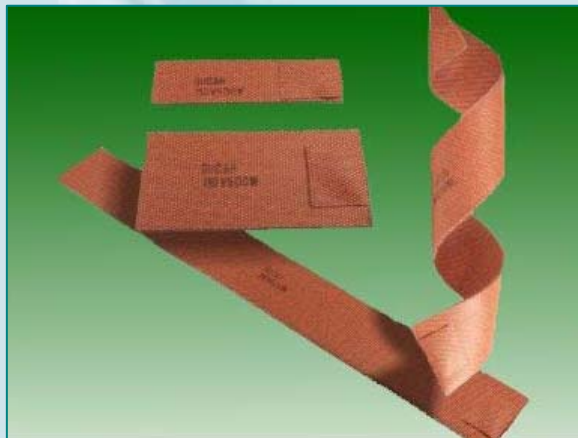
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# NEGs on IP Chamber – Activation?

To activate - heat chamber to minimum 180° C for 24 hours

## Options for Heating

- Heating channels/coils on chamber – adds high Z material to IP.
- Resistive heating – requires electrical isolation.
- Quartz lamps – requires many vacuum ports.
- Heat tapes/blankets – ideal solution, low profile.



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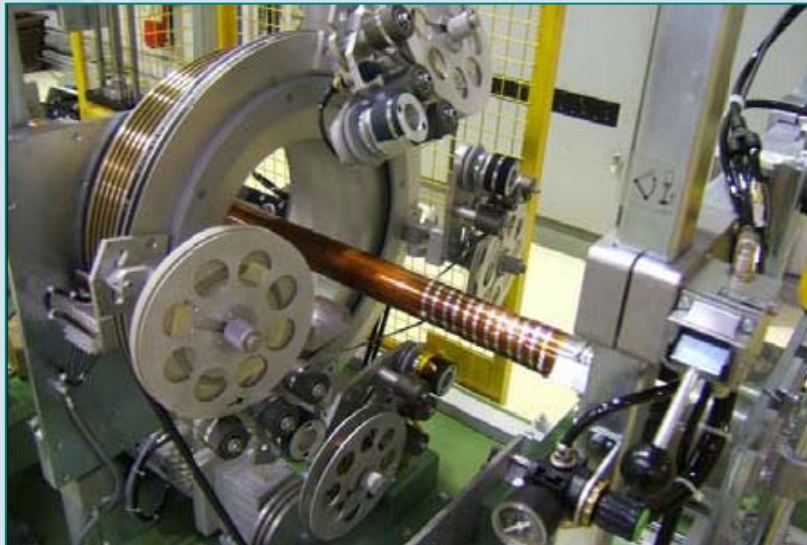


# Ultra-Thin Heater for NEG Activation

Typical silicon rubber heat tape is ~2mm thick

Ultra-thin heat tape developed at CERN is ~.3mm thick

- Polyimide Stainless Steel (PI-SS)
- Applied directly to chamber by wrapping layers – excellent thermal contact



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# Ultra-Thin Heater for NEG Activation

## Operational Issues for Ultra-Thin Heaters

- Heaters are polymerized to bond to chamber and prevent de-lamination.
- **Once bonded only effective way to remove them is sandblasting.**
- Heaters can fail due to hot spots resulting from voids or TC failure.
- Failed heater will require full replacement of chamber resulting in a significant downtime.



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# Still Unknown.....

## Impedance of NEG films and Resistive Wall Effects

- Anomalous increase of impedance seen at ELETTRA associated with NEG coated chamber installation. Confirmed with second chamber installation.
- Preliminary study at SOLEIL in collaboration with ELETTRA.  
<http://www.esrf.eu/files/Machine/Conferences/ESLS/RNagaoka1.pdf>
- Further complicated by non-uniform NEG thickness.
- Needs more studies to determine if this is an issue for ILC.



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# Questions to Answer....

## **Expected frequency of normal (N<sub>2</sub>) venting of IP chambers.**

- Long activation time (24hrs) may be operationally undesirable.
- Permanently installed heaters or apply when needed.

## **Total pumping capacity required for lifespan of IP.**

- Determines required NEG film thickness – impedance consequences.
- NEGs have finite capacity after which activation is no longer effective.

## **Possibility of accidental vent to atmosphere or slow vacuum leak.**

- Could affect total pumping capacity, gas load not accounted for in normal operation.



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