

Development of UHV Compatible Carbon Attenuator Coating on APBN Support Rods for a Helix TWT

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IVS-2012, Kolkata
February 15-17

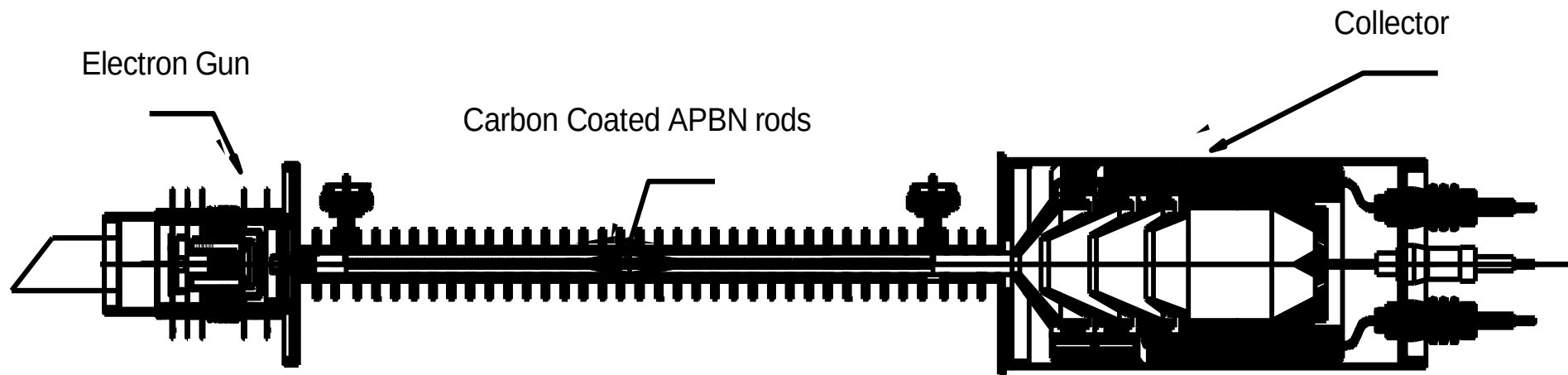


Outline

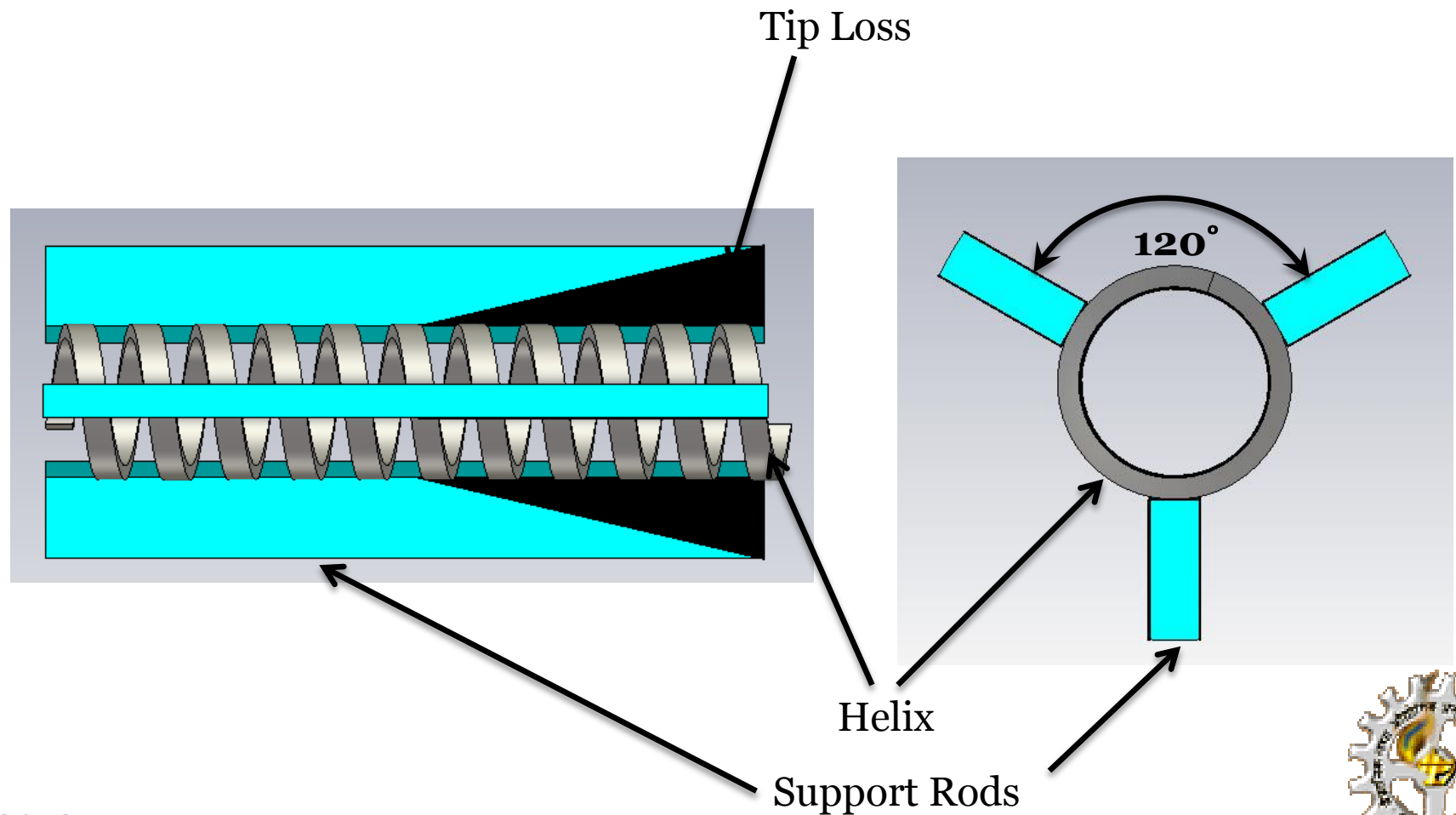
- Introduction
- SWS with support rods
- Common attenuator coating profiles
- Various coating methods
- Attenuator coating system
- RF loss measurement setup
- Advantages of Pyrolytic coating
- Conclusion



Travelling Wave Tube



SWS with support rods



Common attenuator coating profiles used in Helix TWTs

- **Tip loss:** used for multi-section tubes
- **Centre loss:** used for single-section tubes
- Coating length and value are design parameters

Coating on APBN support rods is done in vacuum by cracking of hydro-carbon, namely, Heptane



Types of coating profiles

Tip loss



Centre loss



Various coating methods

- **Pyrolytic deposition of hydro carbon**
- RF Sputtering
- Thin film deposition (by evaporation)



Attenuator Coating System



Vacuum chamber

Heater coil

Heptane

Bell jar Control switches



Pyrolytic cracking method

- Pyrolytic hydrocarbon cracking is commonly used
- Typically, heptane (C_7H_{16}) is used
- Desired profile is obtained by adjusting the pitch of the heating coil
- During coating process, rod is rotated by means of a shaft for uniform coating

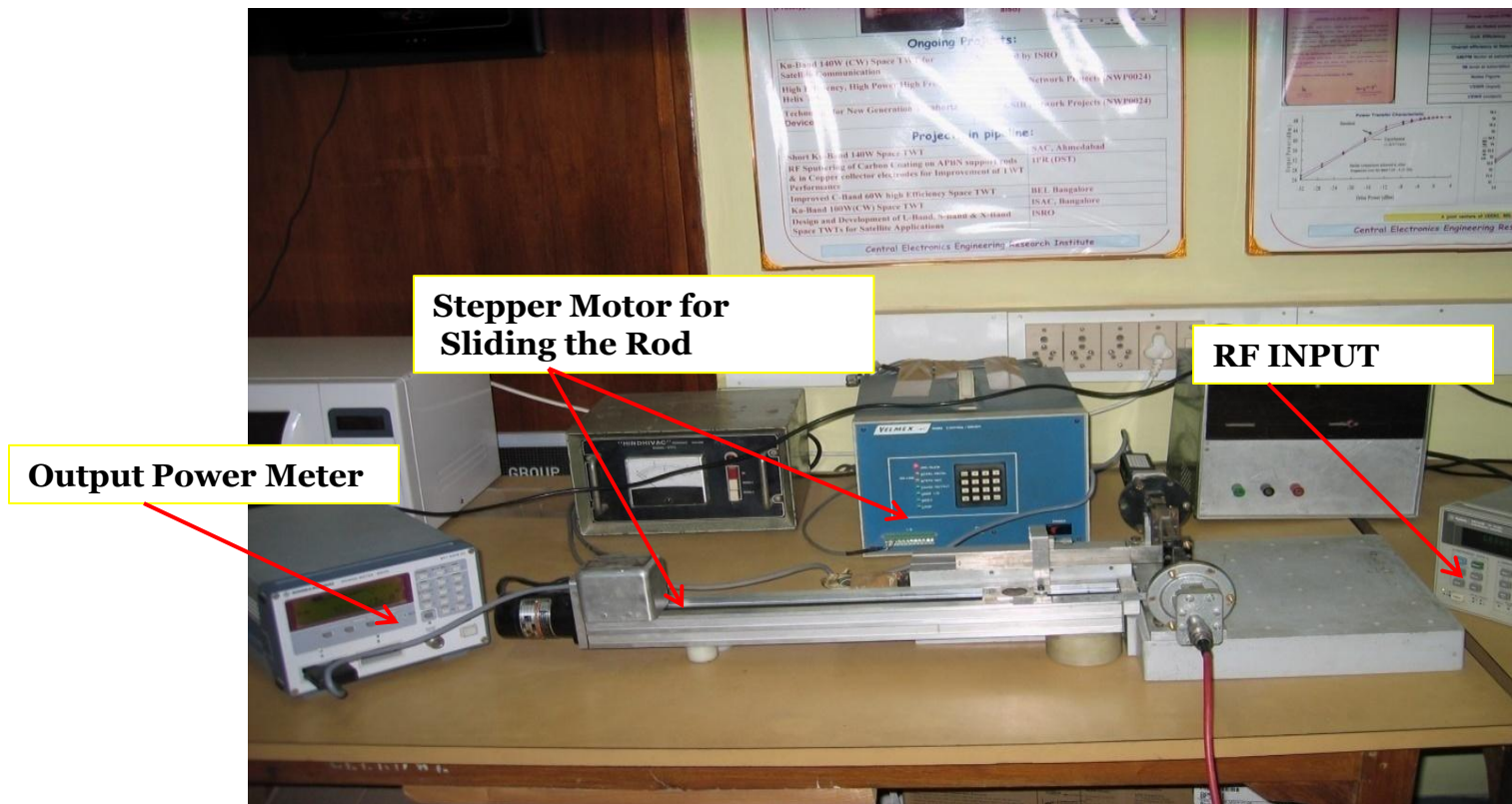


Working specifications

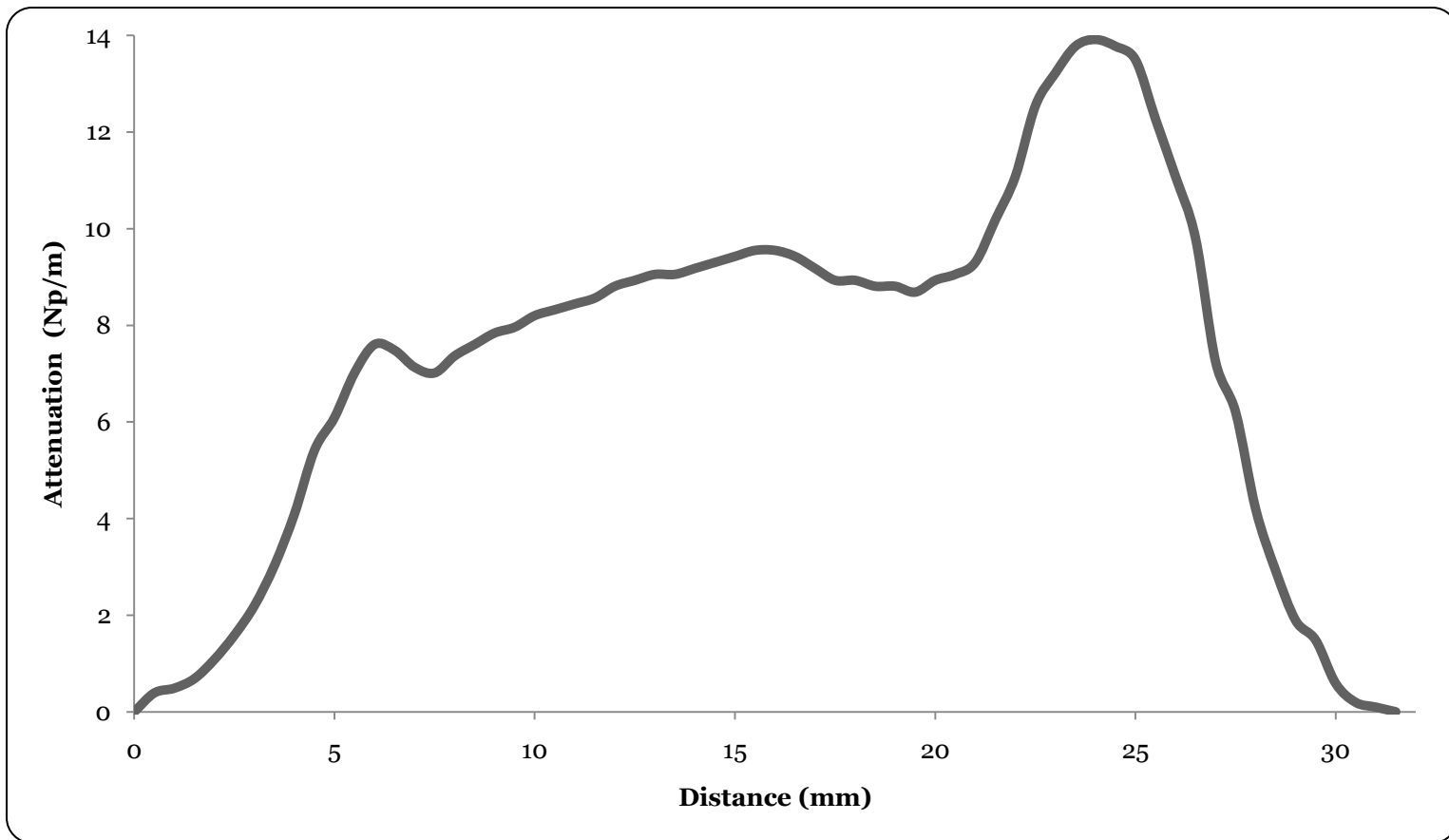
- Pressure: 10^{-1} mbar
- Liquid used: heptane (C_7H_{16})
- Voltage applied: 40V
- Temp: $\sim 1200^\circ$ C
- Time: 5 min



RF Loss Measurement Setup



Measured loss profile at 6.0 GHz



Advantages of Pyrolytic hydrocarbon coating

- Less time consuming
- Better loss profile
- UHV compatible
- Good adherence

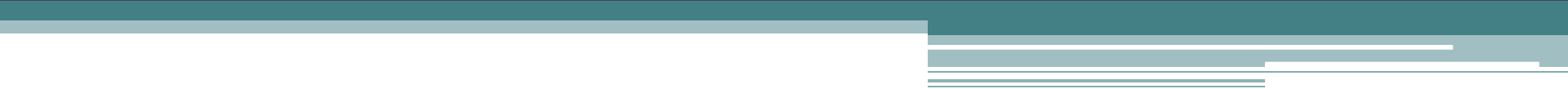


Conclusion

- Desired loss profile on APBN rods is obtained.
- Several trial have been made to optimize the process and coil pitch profile to achieve required loss profile.
- Development of UHV compatible carbon coating on APBN support rods for a helix travelling wave tube has been done.



Thank you

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