Space Simulation Chamber (SSC) for space instrumentation testing in Tromsø.

Åshild Fredriksen, Ove Havnes
Department of Physics and Technology (DPT),
UiT The Arctic University of Norway
DPT has moved into new building in main campus in Tromsø

Technology building, main campus

Auroral Observatory near Prestvann
New building – new lab

Moving the plasma laboratory into a new location
New horizons – new development
- the Space Simulation Chamber (SSC)

Formerly at Norwegian Defense Research Establishment (NDRE) – now at Aurolab

Purpose:
To serve as development and vacuum test facility for rocket and satellite payloads and instrumentation

To simulate plasma environment for space vehicles and plasma propulsion development
Some features

- Easy access through large doors
- Dimensions:
  - Length 2.0 m
  - Diameter 0.9 meter
- Refurbished and equipped with
  - 2x (HiPace 800, 790 l/s turbopumps and Pfeiffer Penta 35 backing pump) → Fast pumpdown time (Estimated to $10^{-5}$ mbar: 50 min
  - Kaufman plasma source → ‘Space’ plasma flow around instrumentation
The vacuum system with gauges

Pressure gauges:
- Capacitance manometer
  1x10^{-1} til 1x10^{-5} mbar
- HV combined
  Cold cathode / Pirani
- Pirani fine vacuum
- Fine / coarse vacuum
  Pirani / Piezo

P1  Coarse vacuum during pumpdown from 1 atm.
    Control S1, when V1 and V4 closed.
P2  Monitoring forevacuum for turbo
    Control S2, when V2, V3 and V4 closed.
P3  Capacitance vacuum gauge
P4  Combined pirani/cold cathode
    (entire pressure range)
Present status of vacuum system

* Vacuum chamber cleaned and assembled
* Pumps, valves, and vacuum gauge systems delivered. Modified big ports delivered by end of June.
* Pumpdown by backing pumps only tested. Pressure of $10^{-2}$ mbar reached in 1 hour
* Early August: Vacuum system with turbo pumps mounted and tested.
New plasma source was assembled at NDRE but never used. To be mounted and tested next semester.
First instrument being tested (Havnes): a rocket born mass spectrometer (ICON)

Question: What is the origin of dust particles forming condensation nucleii of ice crystals in the mesospheric noctilucent clouds?

“Earlier” model for icy dust.

Havnes’ model, from previous studies:

Water ice, fluffy?
Meteoric (metallic) smoke particles?

Building rocket-born mass spectrometer probe:
- Fragmentation
- Evaporation chamber
- RGA
- Ion pump

ICON
Future possibilities with SSC

- Offer payload testing for rocket experiments launched from Andøya (ICI, Canorock, MaxiDusty...)
- Collaboration on instrument development for rocket and small satellite payloads, e.g. Cube-sat.
- Development of small plasma thrusters for ‘mikro’-satellites and accurate thrust measurements. SSC unique regarding size an access to be able to test thrust from propulsion sources inside vacuum and ‘space’ plasma.
Thanks to NDRE, Technology building funds for scientific equipment and NFR project funds allowing this project to ‘fly’!

...and thanks to the audience!