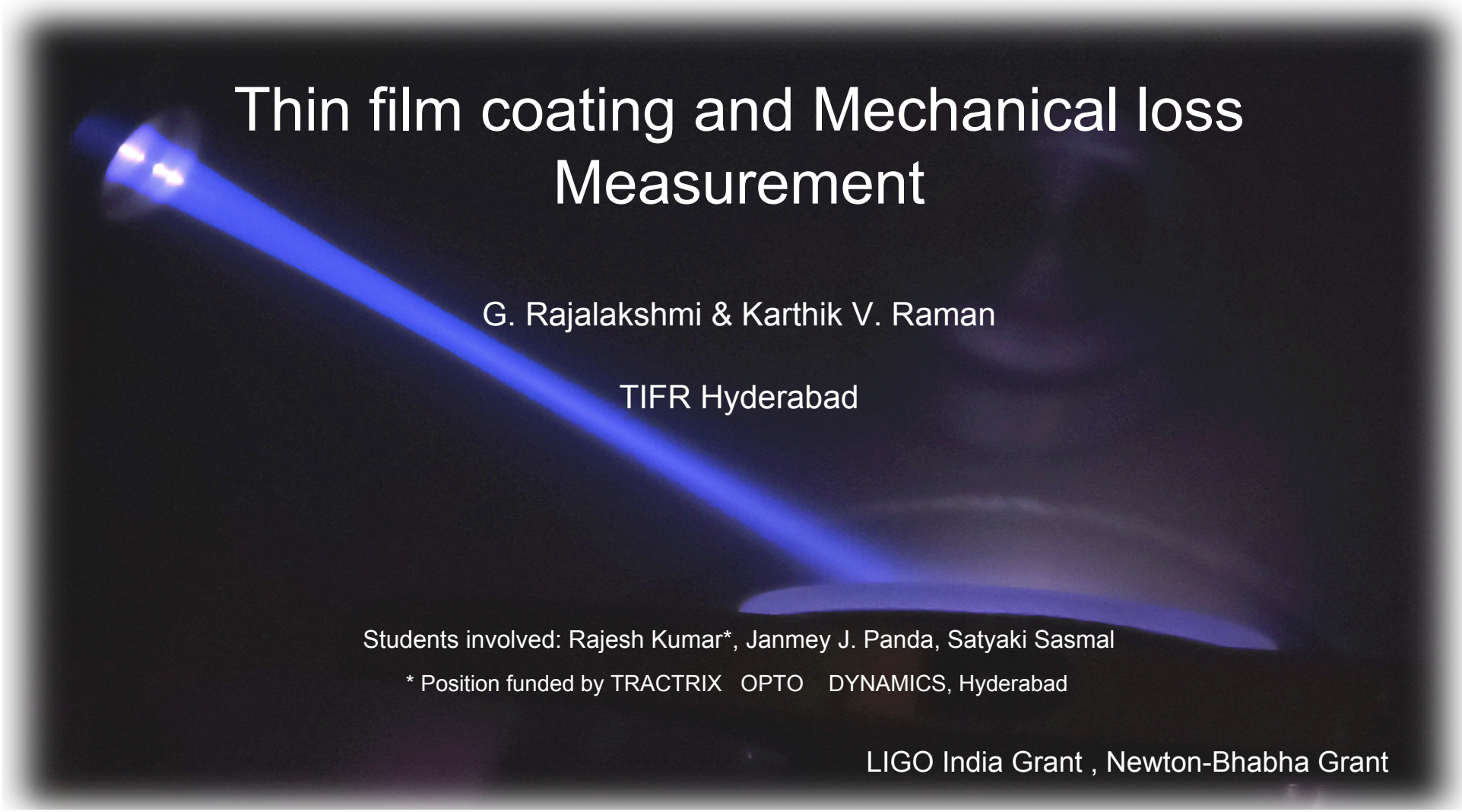


Thin film coating and Mechanical loss Measurement

G. Rajalakshmi & Karthik V. Raman

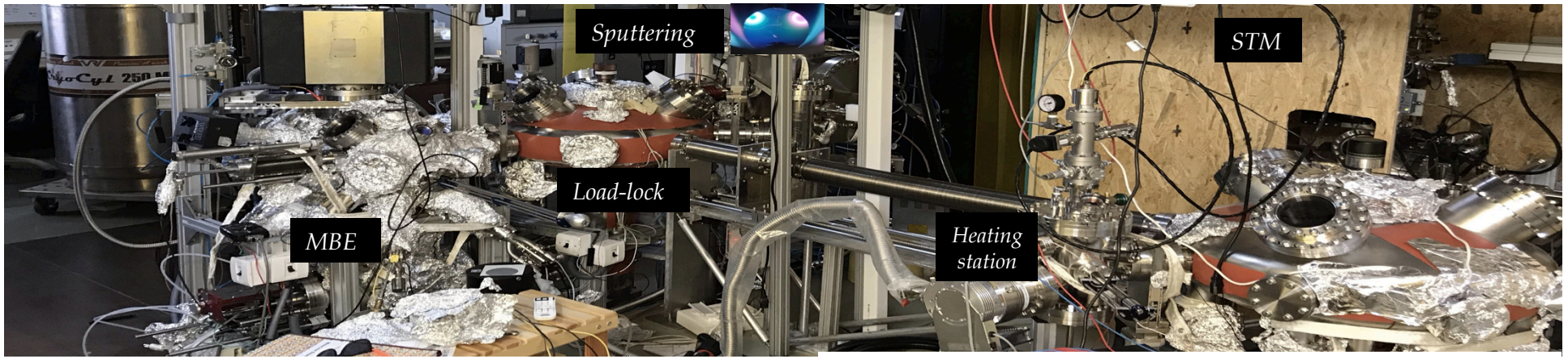
TIFR Hyderabad

Students involved: Rajesh Kumar*, Janmey J. Panda, Satyaki Sasmal

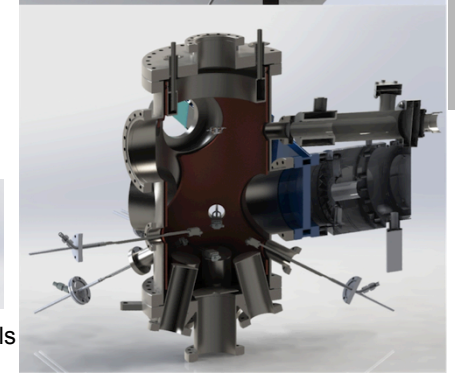
* Position funded by TRACTRIX OPTO DYNAMICS, Hyderabad

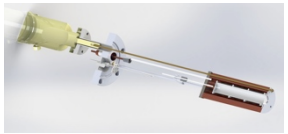
LIGO India Grant , Newton-Bhabha Grant

Condensed Matter Laboratory : Ultra High vacuum cluster line setup



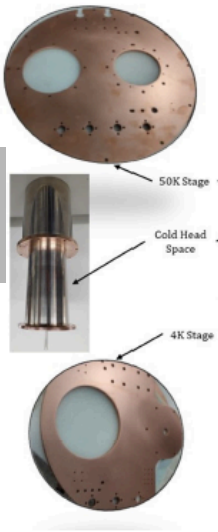
In-house assembly of MBE system
Operating at $5x10^{-10}$ mbar

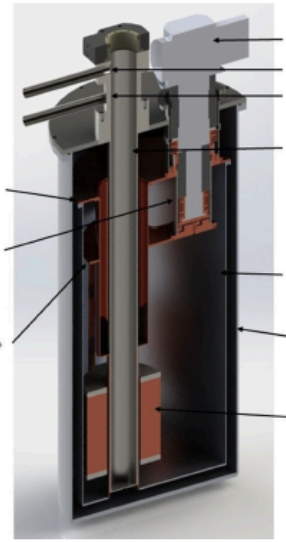


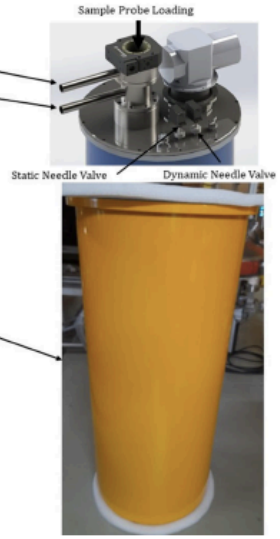


Build our own Knudsen cells

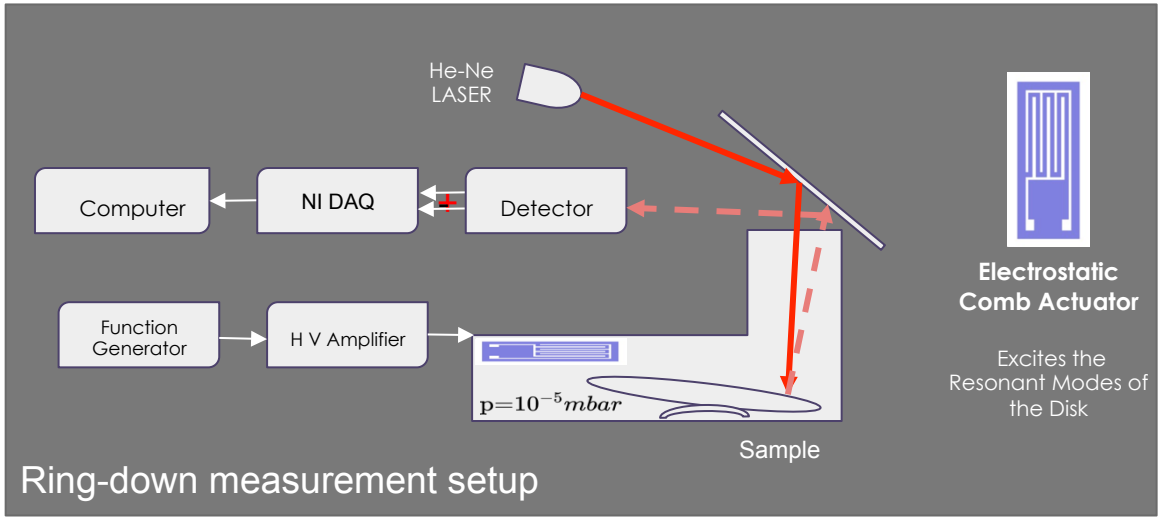
In-house development of cryogenics







Mechanical Loss measurement setup



2019 Received from Stuart's group (Paul Hill)

Working of the Actuator setup

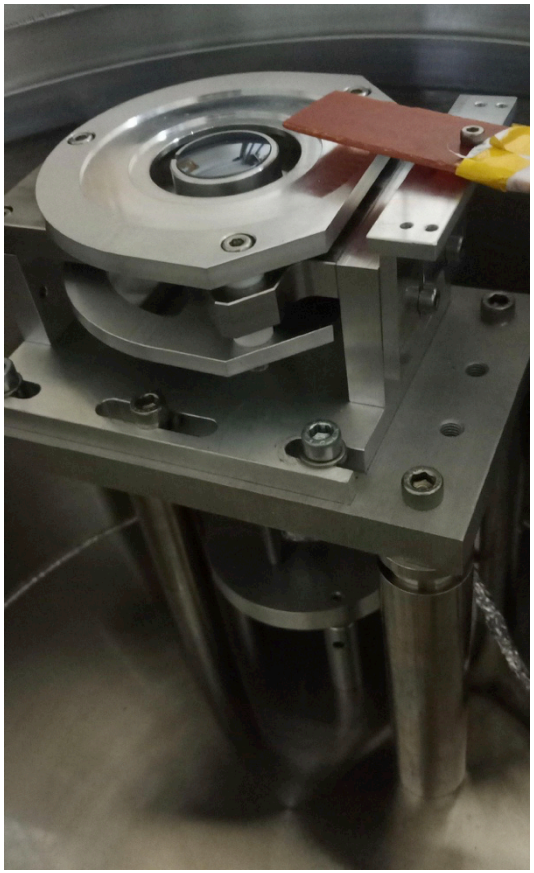
When the Chamber is being pumped

Electrostatic comb actuator

Wafer suspended

After the Chamber is pumped

Top View of sample stage with actuator



Testing of monocrystalline AlGaAs/GaAs DBR mirrors from ***RRCAT,Indore***
Geetanjali et al

Films epitaxially grown on (001) oriented GaAs substrate by metal organic vapour phase technique (MOVPE)

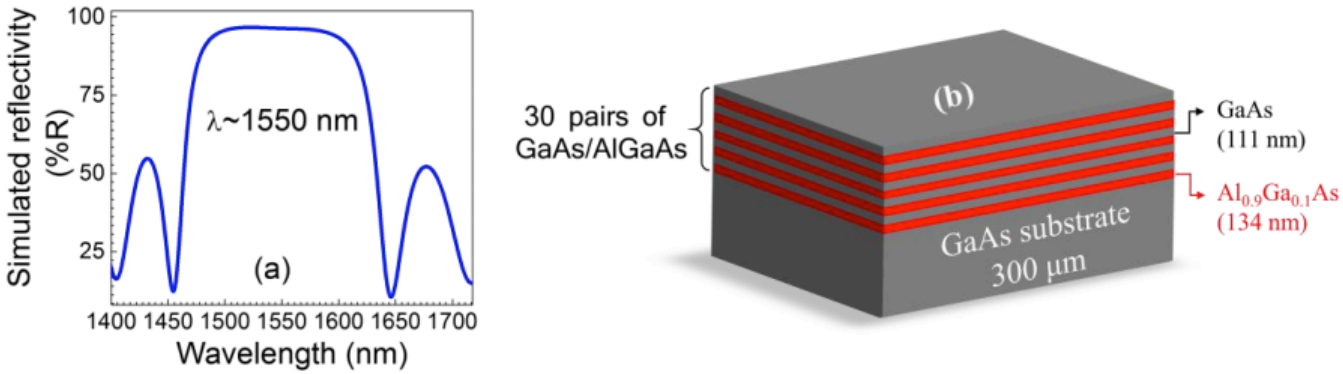
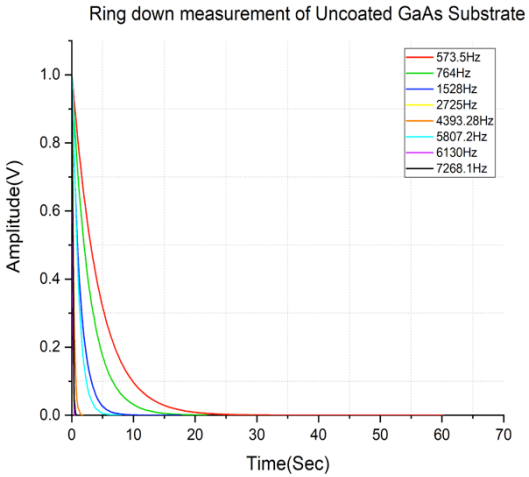
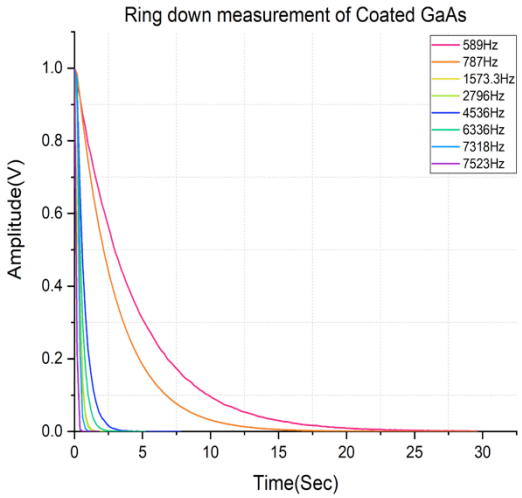
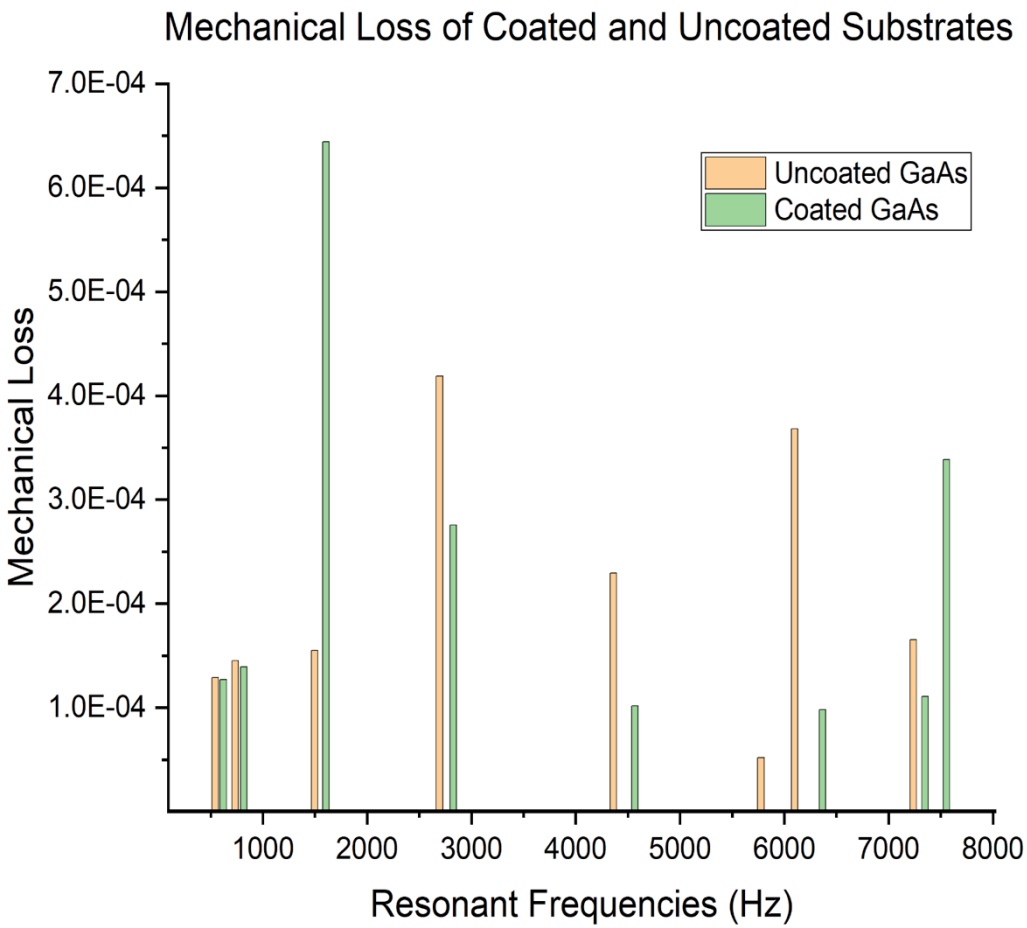


***Figure 1**: (a) Simulated reflectivity curve for of 23 period $Al_{0.9}Ga_{0.1}As$/GaAs DBR stack with 134/111 nm thickness (b) Schematic of 30 period AlGaAs/GaAs DBR structure for the photonic stopband around 1550 nm.*

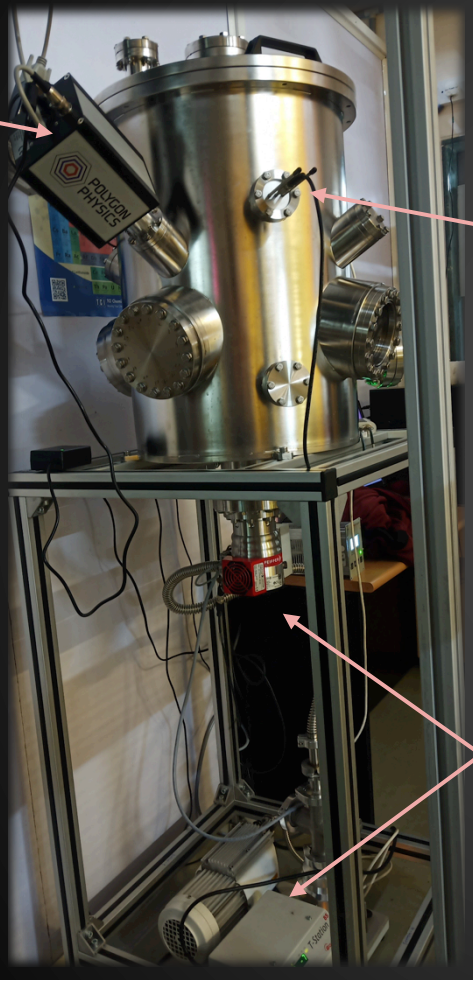

Ring down measurement of Uncoated GaAs Substrate
573.5Hz
764Hz
1528Hz
2725Hz
4393.28Hz
5807.2Hz
6130Hz
7268.1Hz
Amplitude(V)
Time(Sec)

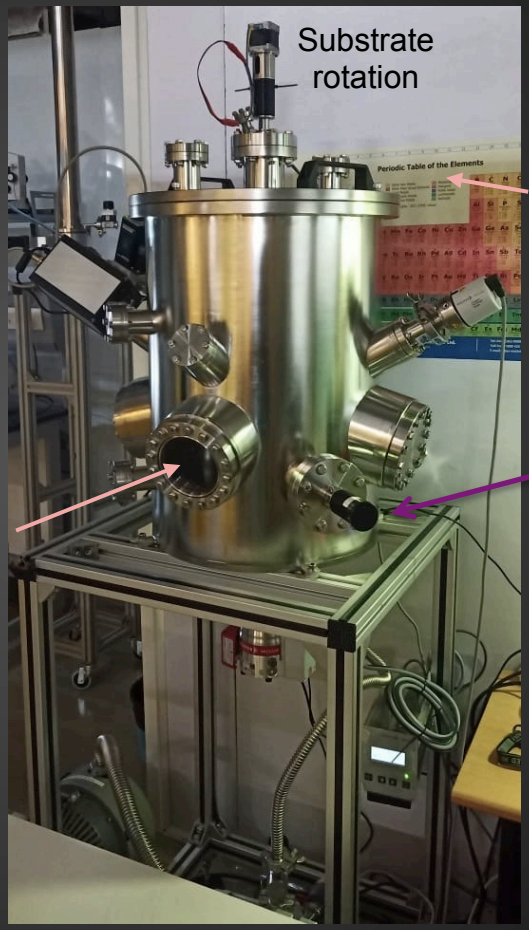

Ring down measurement of Coated GaAs
589Hz
787Hz
1573.3Hz
2796Hz
4536Hz
6336Hz
7318Hz
7523Hz
Amplitude(V)
Time(Sec)


Mechanical Loss of Coated and Uncoated Substrates
Uncoated GaAs
Coated GaAs
Mechanical Loss
Resonant Frequencies (Hz)

Installation of the Vacuum chamber with **ECR gun**

Birney et al., PRL 2018





Four targets on a radial turret

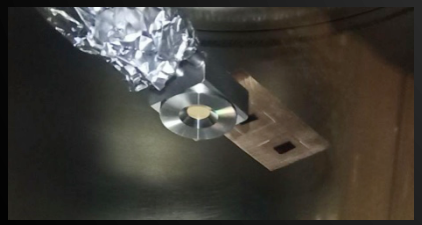
Funded by Newton-Bhabha, LIGO India & TIFRH

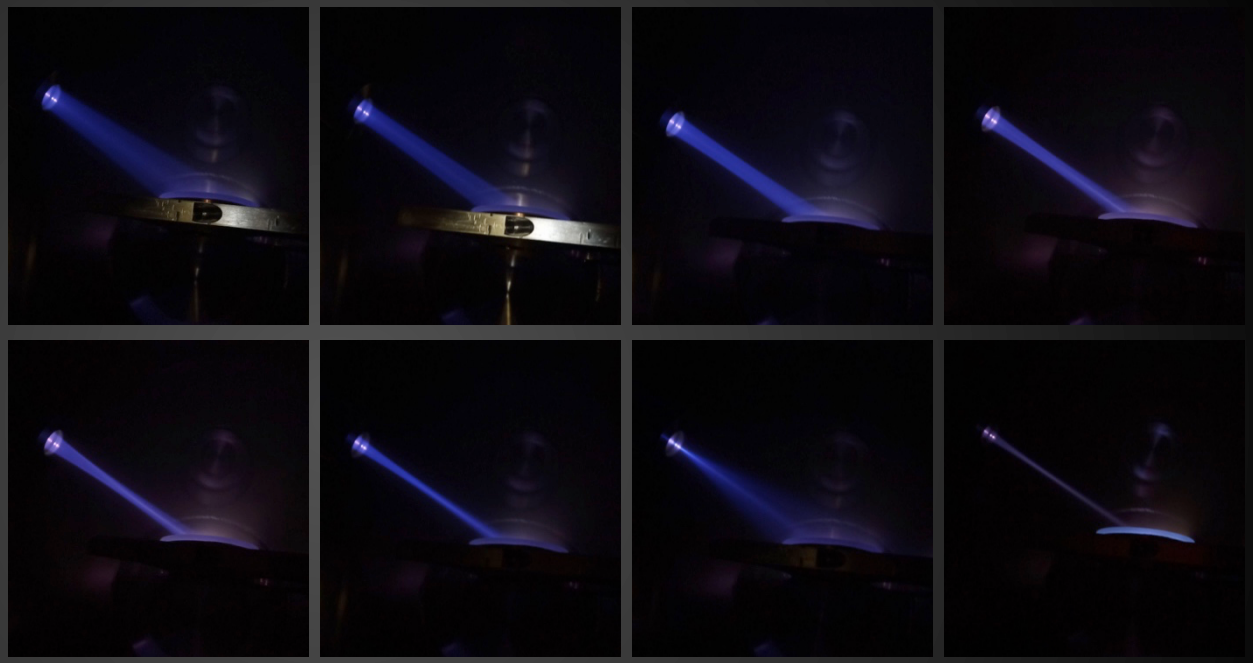
ECR Gun : under operation

Operating pressure:
1 x 10^{-4} mbar to 5 x 10^{-5} mbar

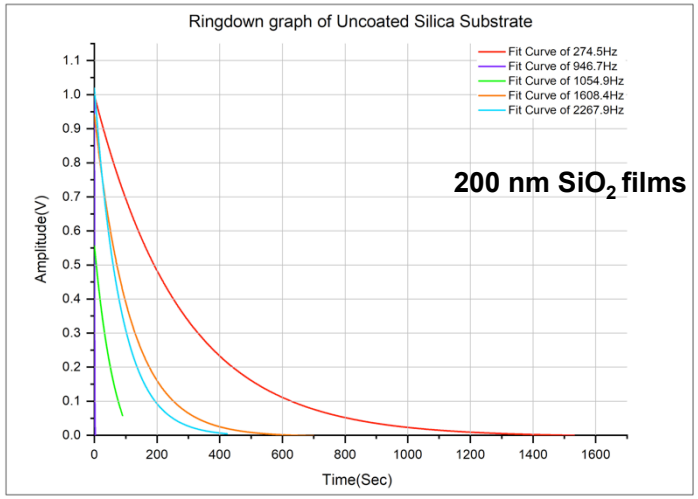
First beam focusing on the Silica target

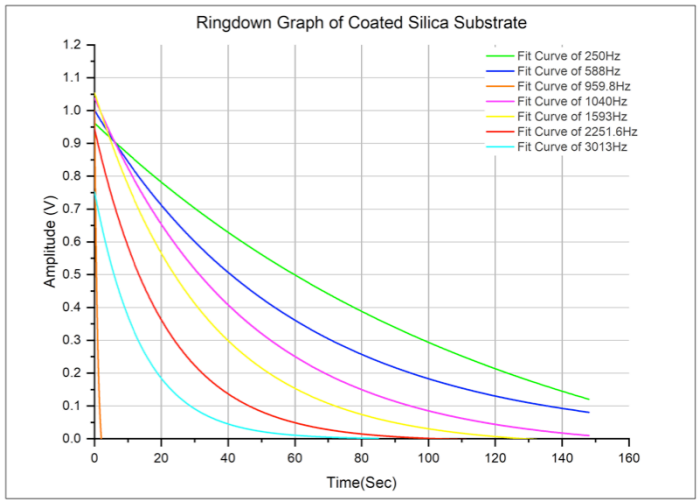
Thickness calibrated using QCM

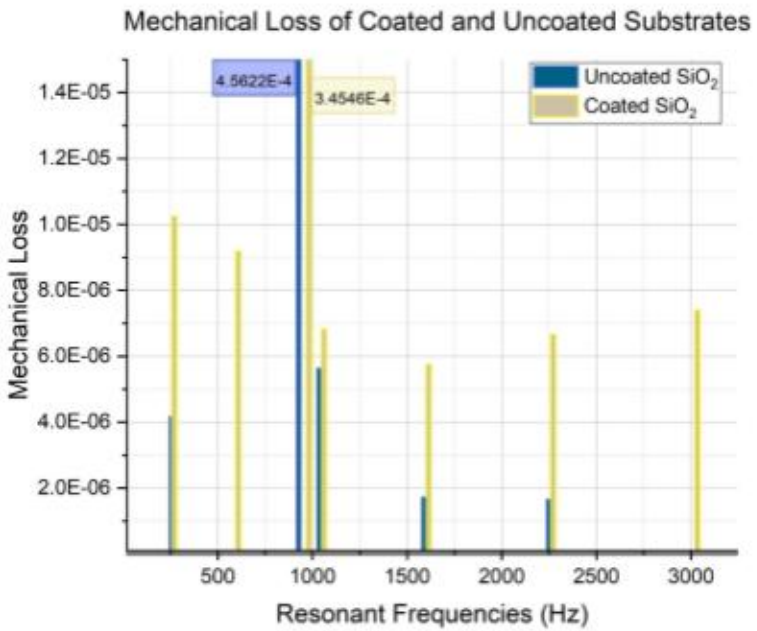




Shaping the beam by controlling Einzel Voltage







Work under progress:

- Installation of the Annealing station facility
- Structural and optical analysis of the films using spectrophotometer and XRD

Expansion of the Coating Center at TIFR Hyderabad