EP Facilities Studies
&
related R&D

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ILC SRF meeting 11/05/06

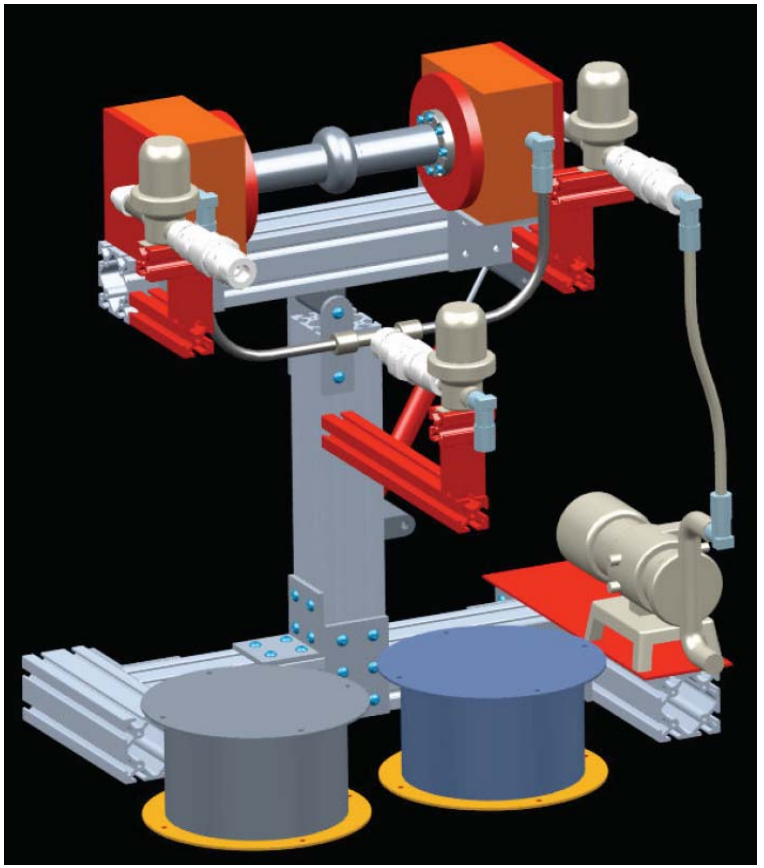
Layout

- 3.9 GHz monocell setup
- Related EP R&D
  - Tumbling
  - Process R&D
    - Fluorine monitoring
    - Time life improvement
  - Modeling

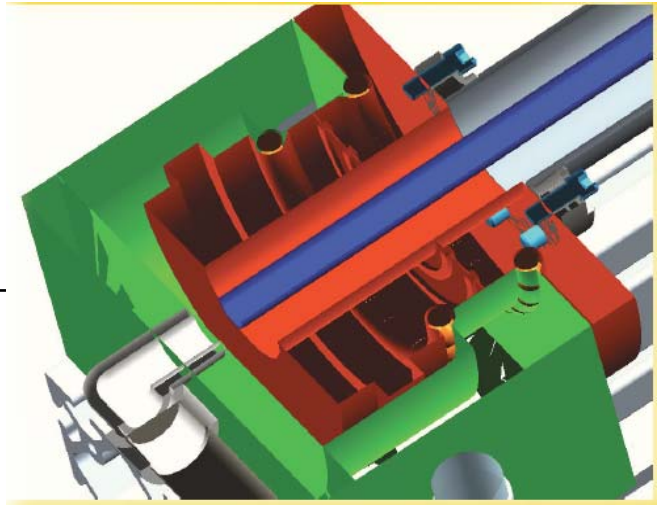
3.9 GHz facility

C. Boffo

- Small scale cavity set-up
- Allows to conduct R&D program with low volume of acids
  - Low cost
  - Safety
  - High turnover



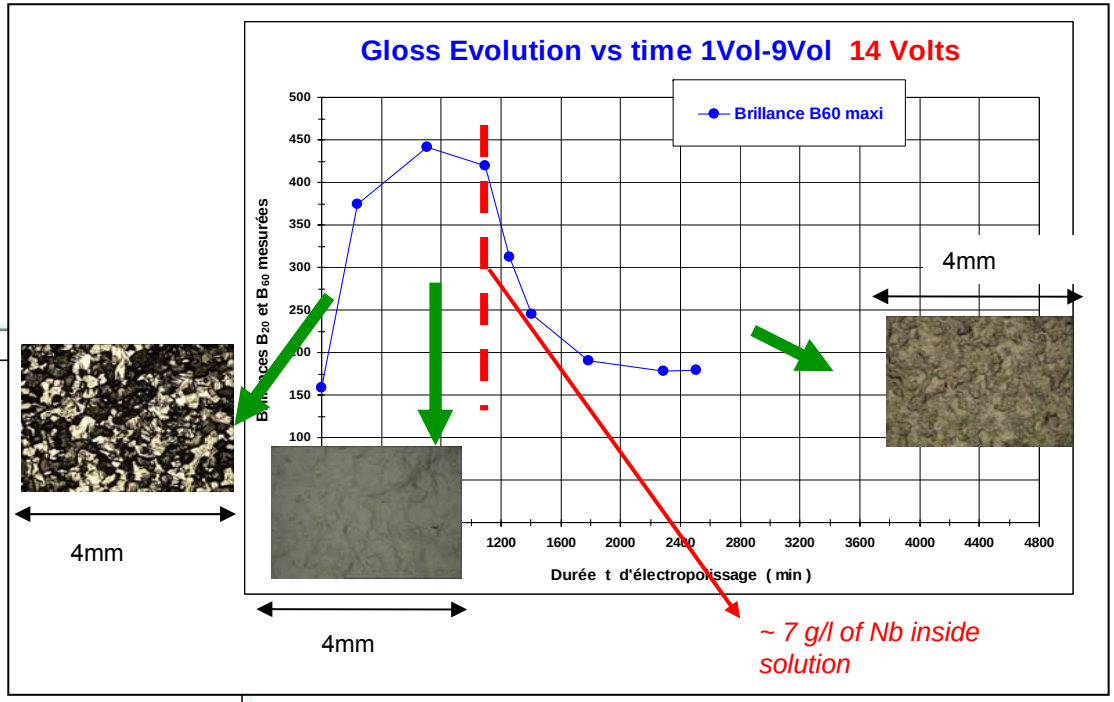
3.9 GHz facility

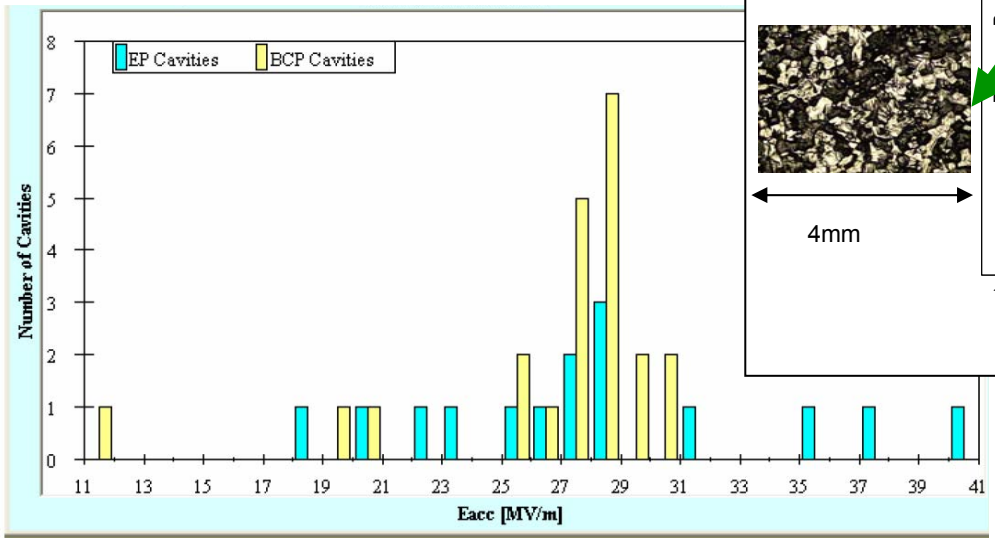


- **Total projected cost ~28k$**
- The components of the hydraulic system IN HOUSE(7k$)
- The support frame (8/20) IN HOUSE (500$)
- The pneumatic system IN HOUSE (1K$)
- Control system PLC based (LE is in charge 5K$) UNDER DEVELOPMENT
- Finalizing rotary connections to the cavity, will order next week (KE)
- Assembly started this week in IB3 (1 tech)

EP R&D

- EP gives very high E_{acc} but large spreading of results
- EP recipe very effective for short etching
- Lifetime issues

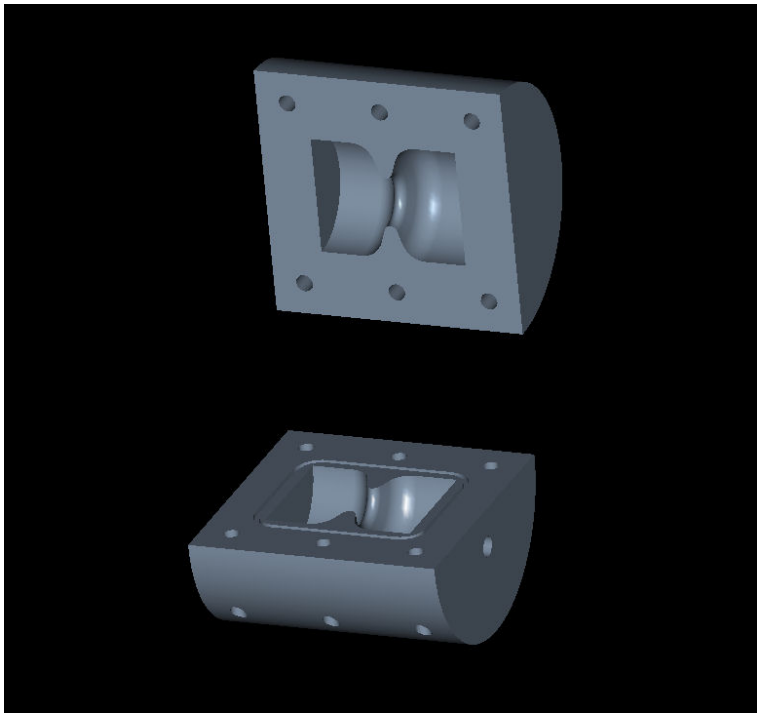




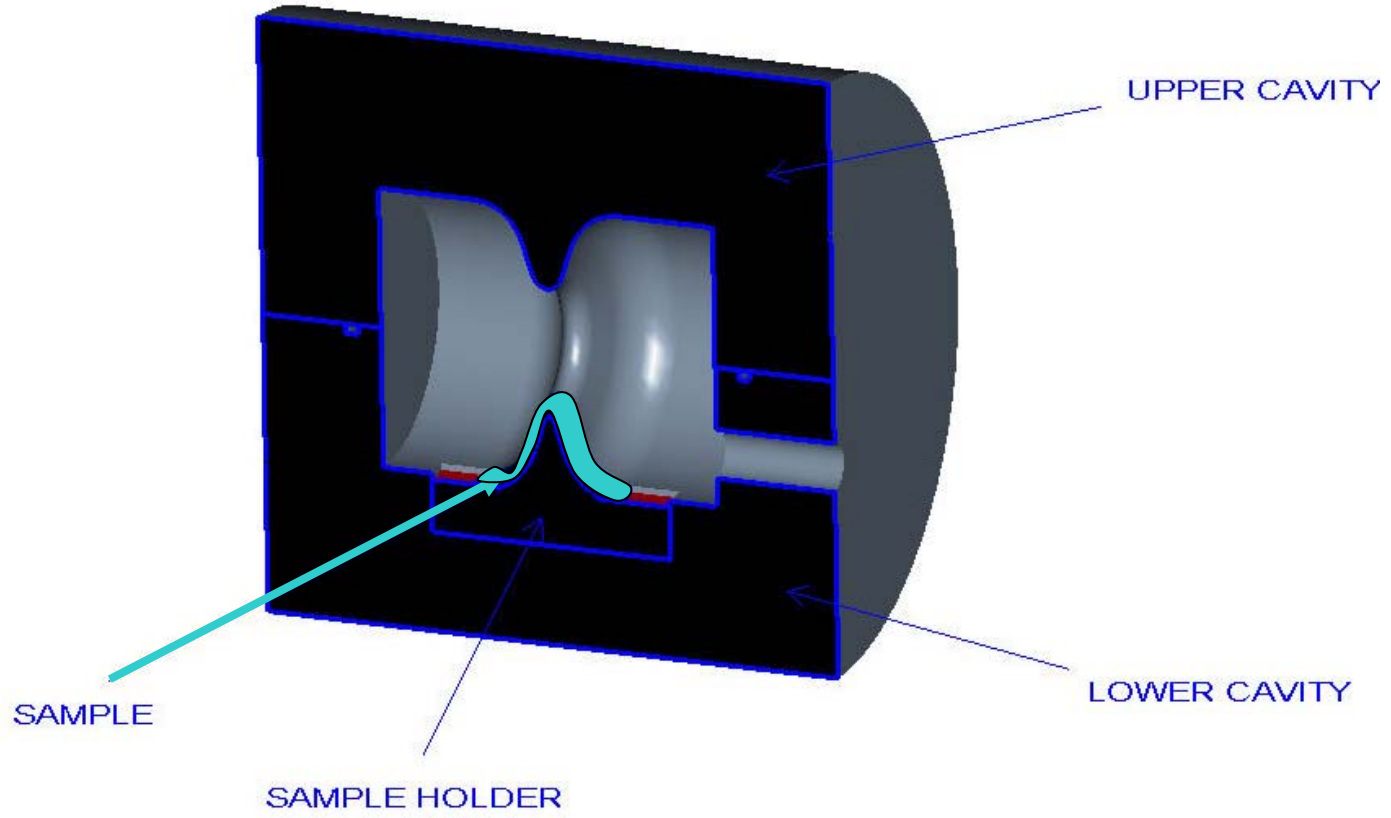
Tumbling

C. Cooper, K. Ewald

- Mechanical “pre”-polishing => saves EP etching
- Inexpensive, ± automated
- Issues
  - Iris/equator etching rate
  - H free process
  - Time consuming



Tumbling : sample set up



Sample set-up : save material, facilitate sample analysis…

EP Mechanism issues

- Find out the proper V condition =>viscous layer
- Find out the Fluorine role
  - Is it the limiting species ? (porous film => no !)
  - Does it improve Nb^{5+} solubility ?
- Find out a way to maintain fluorine content
  - NaF, low temperature…
- Find out a way to monitor F^-
  - Chromatography *(diluted samples, all ions)*
  - NMR *(samples, no dilution, only F- or H+)*
  - Abs Spectroscopy UV/Vis *(effective on HF + H_2SO_4 , but bubbles issues)*
  - Resistivity measurement *(expensive, but effective on HF + H_2SO_4 , bubbles issues)*
  - ISE *(dilution or works only with free F^-)*
  - …?

What can be done quickly w/ samples

- Correlate degradation and actual [F-]
- Add Nb^{5+} in the 1-9 EP soln
  - If I ↓ => limitation = $[Nb]_{sat}$
- Add F^- Salt (NaF)
  - viscosity/plateau
  - lifetime
- Other viscous buffer
- ≠ temperature
- Impedance measurements (Saclay)

Modeling issues

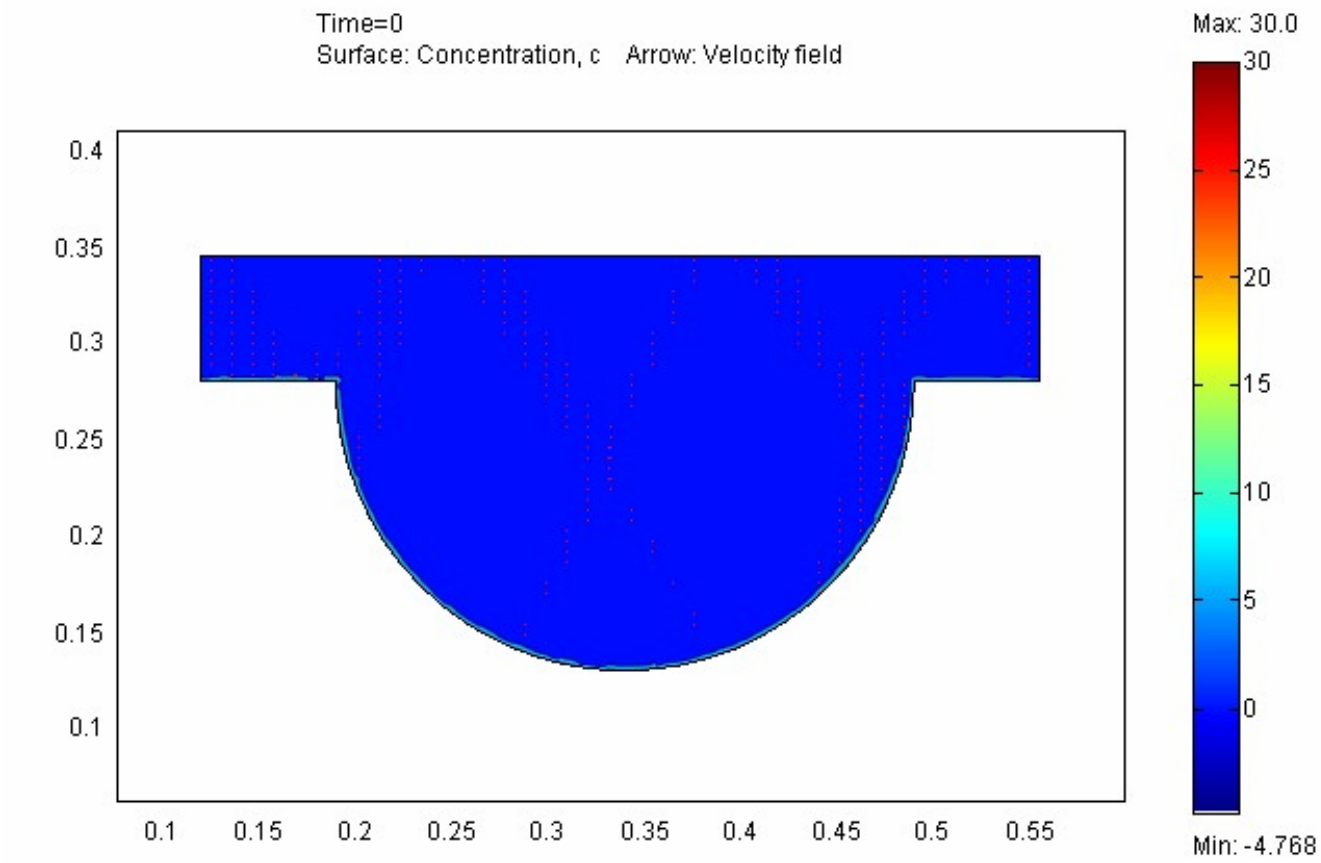
- => find out what conditions favor viscous layer
- => find out what disturbs viscous layer
- => play with parameters like viscosity, composition, EXm reactions
- => getting into more complex situation : geometry, motion, hydrodynamics

=> Intuitions !

- Eventually : correlate with experimental facts

Cavity geometry + gravity …

work done @ Saclay/ F. Eozenou



If you want to get a uniform viscous layer

-Density must remain low
-Viscosity must be high

N.B.: be careful with physics…

Conclusion

- R&D on EP is necessary !
- It can be done with relatively low cost on small samples/set-ups.
- It will save a lot of time and money compare to the same experiments conducted on a 9 cell facility…