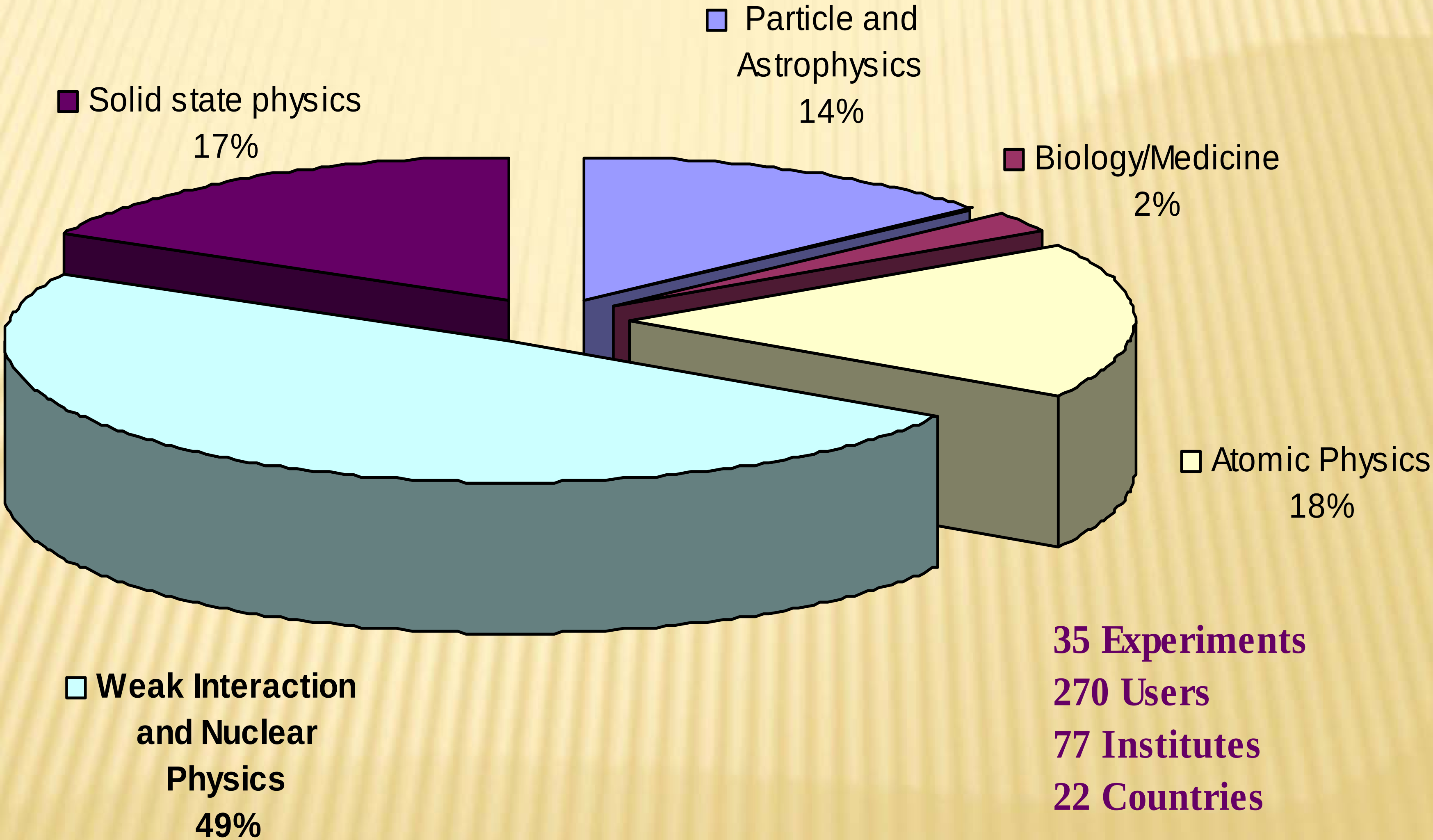
M. Pasini for the HIE-ISOLDE activity at CERN

HIE-ISOLDE PROJECT
Nb SPUTTERING AT CERN

OUTLOOK

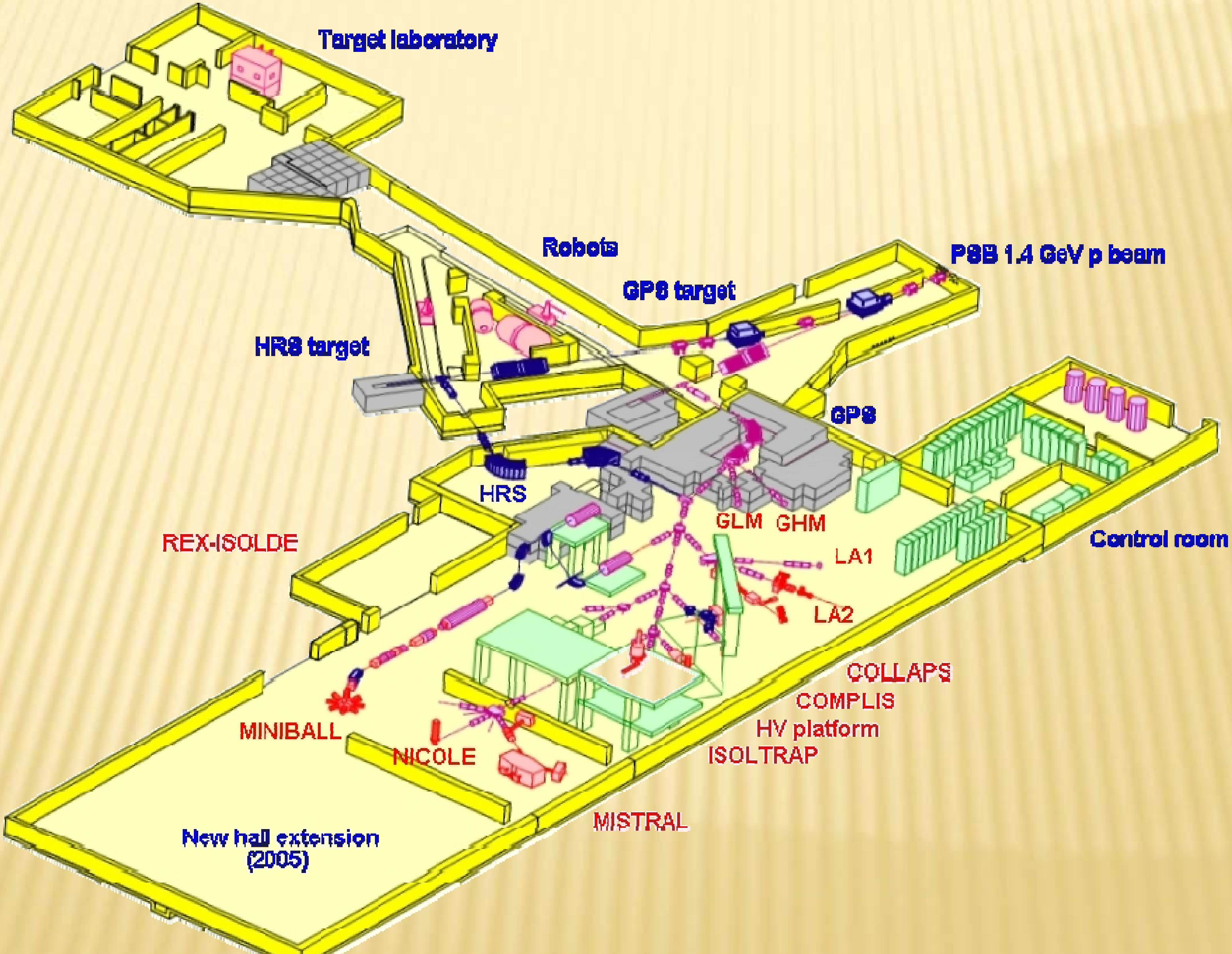
- ISOLDE at CERN
- HIE-ISOLDE activity
- SC linac (HIE-LINAC)
- Nb sputtering QWR development
- Summary

ISOLDE AT CERN – THE PHYSICS



35 Experiments
270 Users
77 Institutes
22 Countries

ISOLDE AT CERN – THE FACILITY

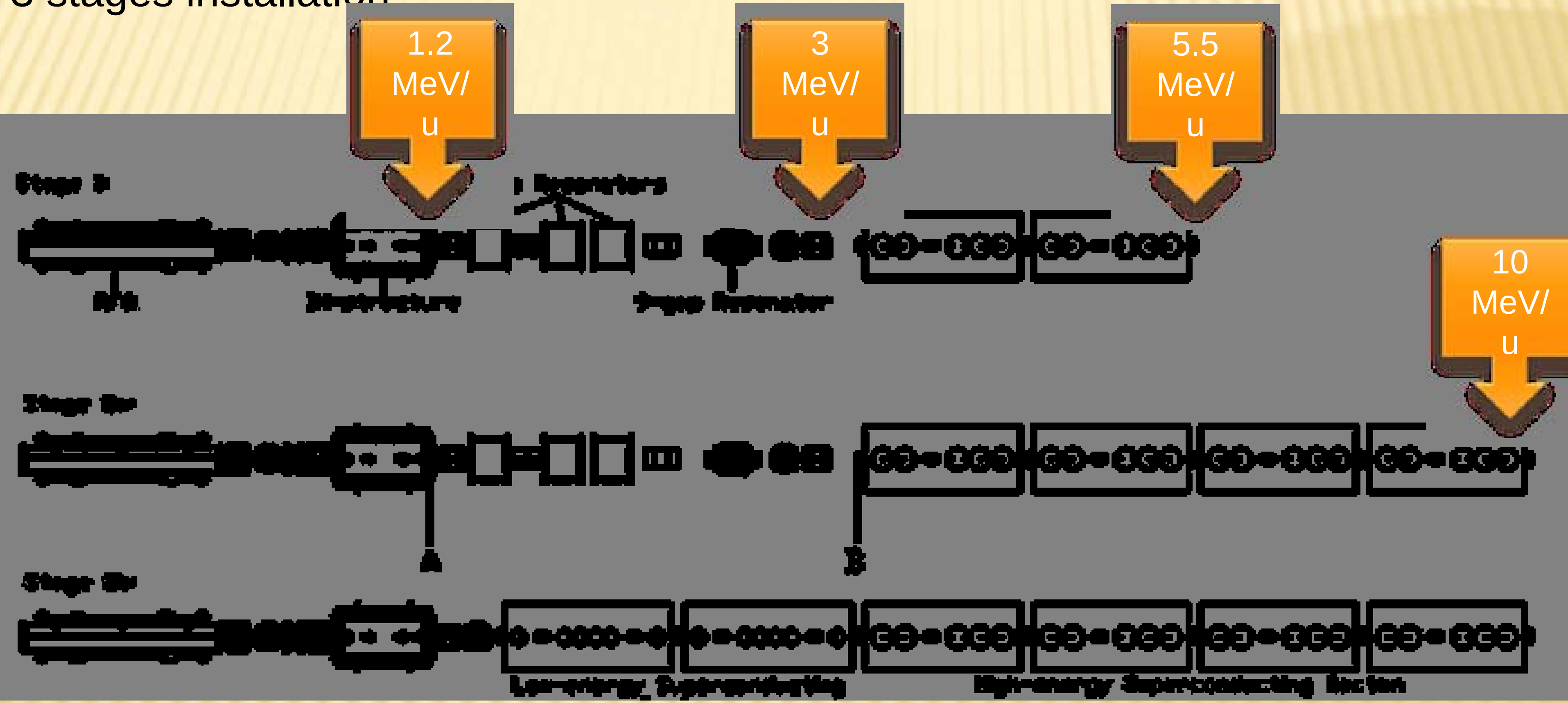


HIE-ISOLDE ACTIVITY

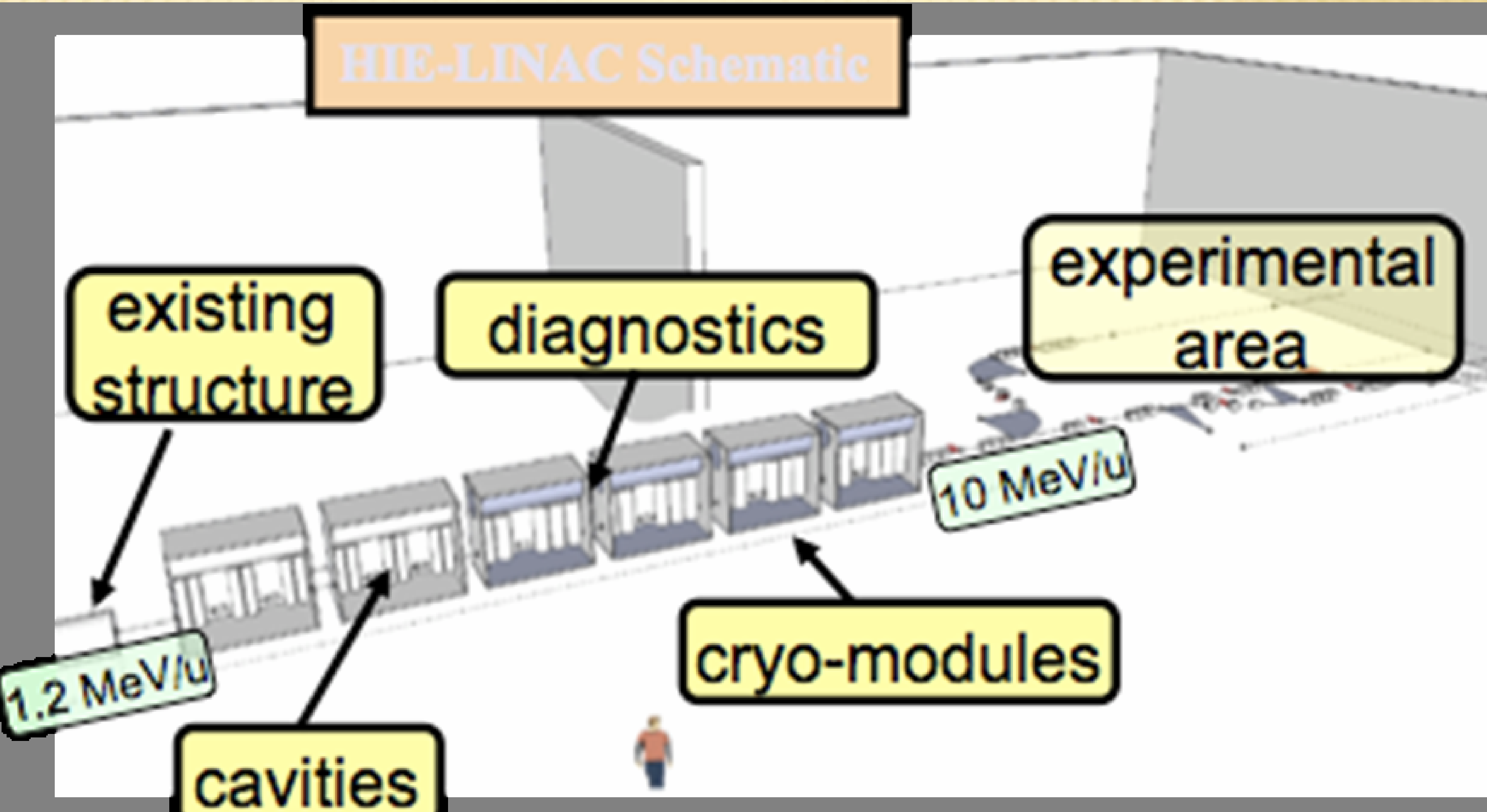
- REX energy upgrade and increase of current capacity
  - Energy upgrade in 3 stages: 5.5 MeV and 10 MeV/u and lower energy capacity
  - REX trap and charge breeder upgrade
- ISOLDE proton driver beam intensity upgrade - strongly linked to PS Booster improvements including linac4
  - Faster cycling of the booster
  - New target stations for ISOLDE
  - New targets
  - New target handling system
- ISOLDE radioactive ion beam quality – more than half already financed through the ISOLDE collaboration
  - Smaller longitudinal and transverse emittance
  - Higher charge state for selected users
  - Better mass resolution
  - Target and ion source development e.g. RILIS

HIE-LINAC

3 stages installation



HIE-LINAC



HIE-LINAC Schematic
existing structure
diagnostics
experimental area
10 MeV/u
1.2 MeV/u
cryo-modules
cavities

101.28 MHZ Nb SPUTTERED QW CAVITIES

Low β **High β**

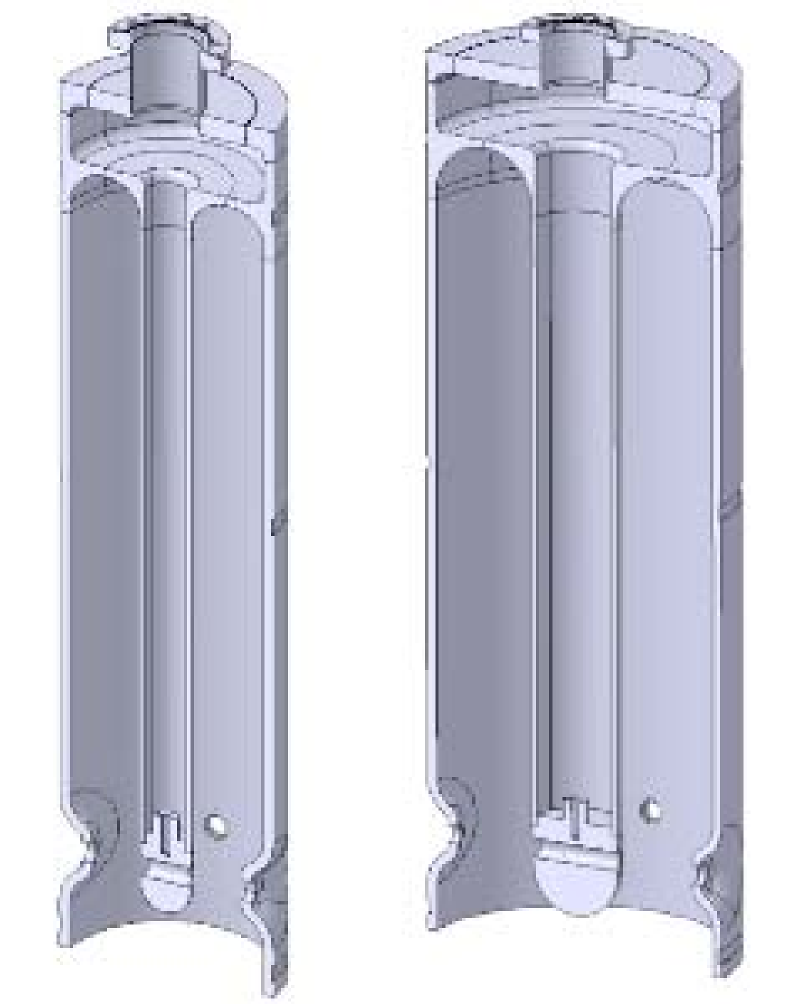
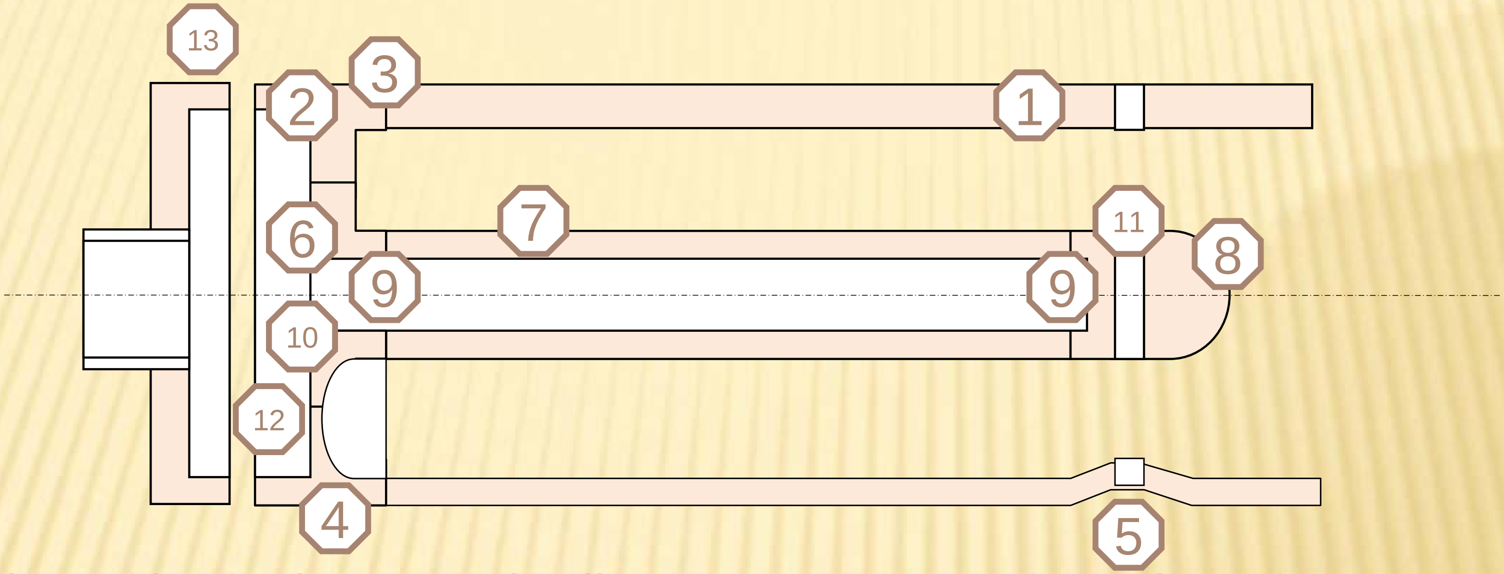


Table 1: Cavity design parameters

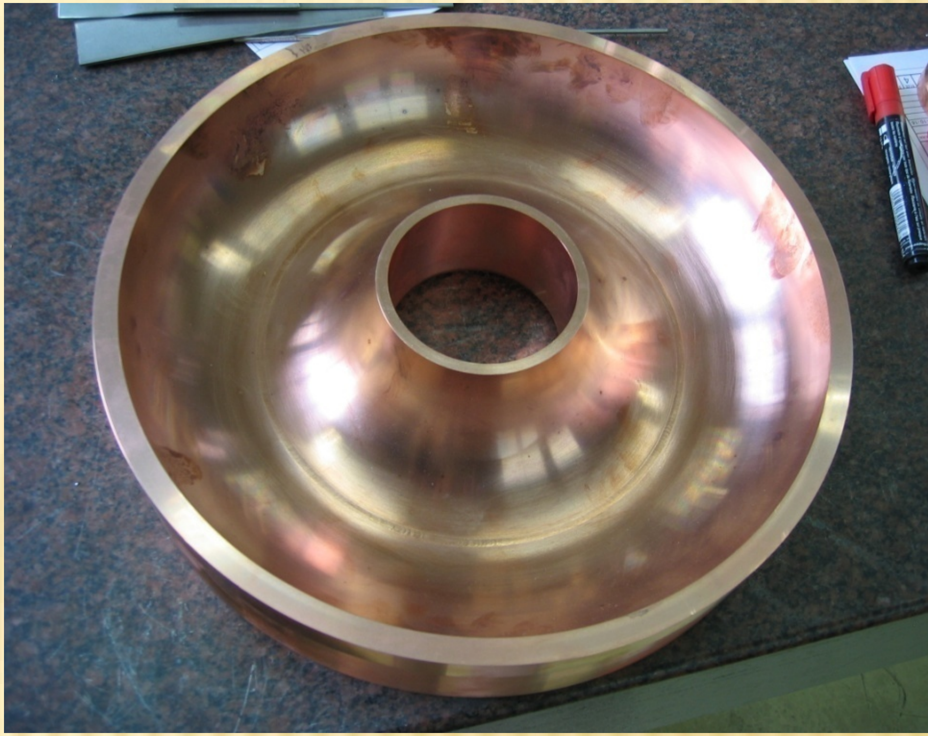
Cavity	Low β	highβ
No. of Cells	2	2
f (MHz)	101.28	101.28
β_0 (%)	6.3	10.3
Design gradient E_{acc}(MV/m)	6	6
Active length (mm)	195	300
Inner conductor diameter (mm)	50	90
Mechanical length (mm)	215	320
Gap length (mm)	50	85
Beam aperture diameter (mm)	20	20
$U/E_{acc}{}^2$ (mJ/(MV/m)^2	73	207
E_{pk}/E_{acc}	5.4	5.6
H_{pk}/E_{acc} (Oe/MV/m)	80	100.7
R_{sh}/Q (Ω)	564	548
$\Gamma = R_s \cdot Q_0$	23	30.6
Q_0 for 6MV/m at 7W	$3.2 \cdot 10^8$	$5 \cdot 10^8$
TTF max	0.85	0.9
No. of cavities	12	20

MANUFACTURING SEQUENCE



1. Rolling of half tubes, longitudinal welding, rough machining
2. Machining of end piece
3. E-beam welding
4. Fine machining of inner surface
5. “Bossage” and machining of beam ports
6. Manufacturing of baseplate of inner conductor
7. Manufacturing of central tube
8. Manufacturing of head
9. E-beam welding of the 3 parts of inner conductor
10. Fine machining of inner conductor
11. Drilling of beam line
12. Final long-distance e-beam welding

WELDING TEST: 1000 MM DISTANCE E-BEAM

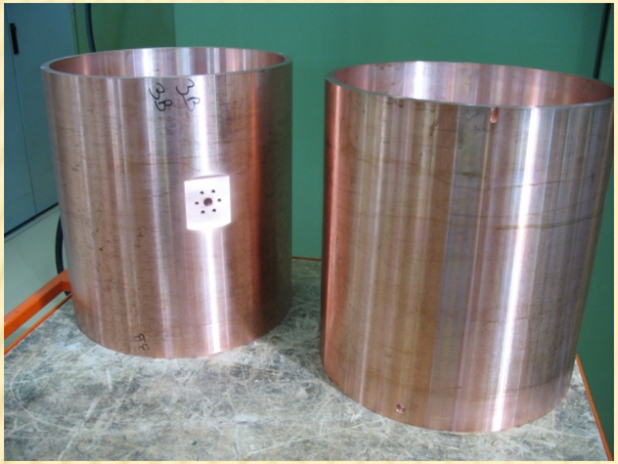


Roughness test performed after SUBU chemical polishing, 20 µm removed
Achieved Ra ≤ 0.8 µm, target value

MANUFACTURING OF BEAM PORTS: FLAT TEST

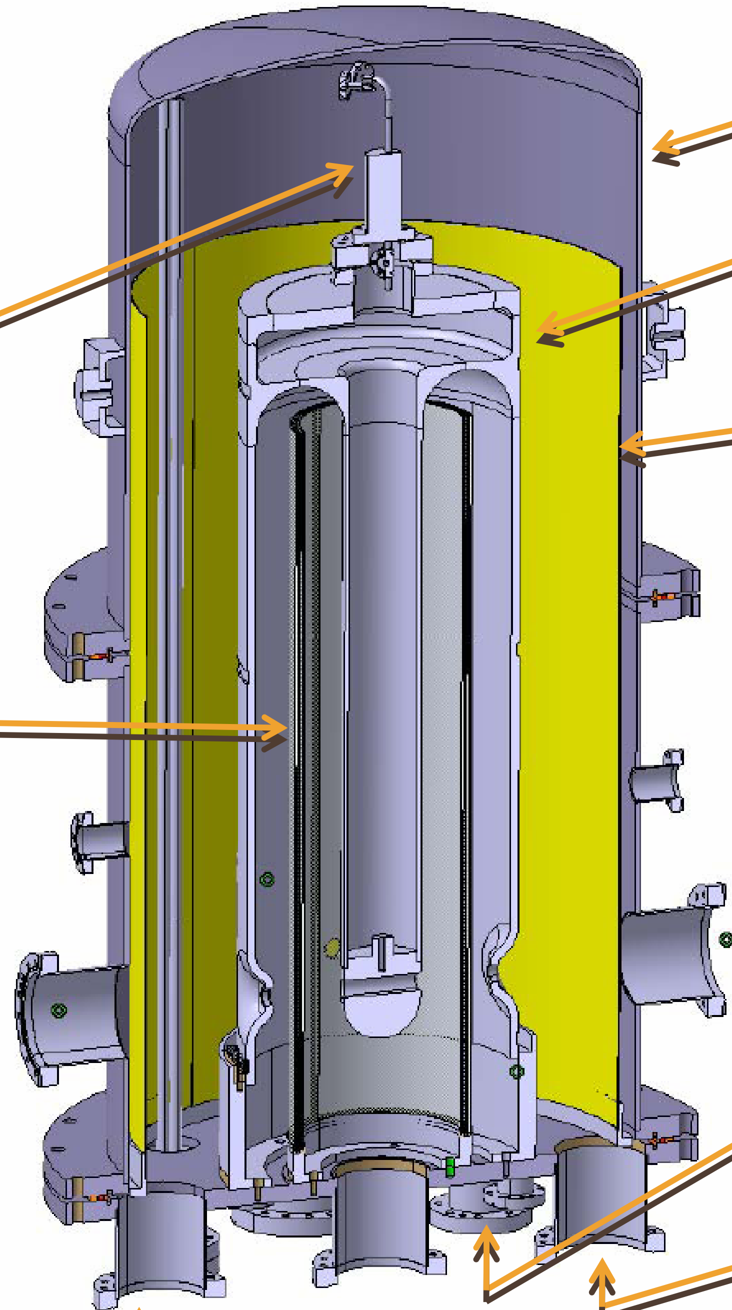
Starting thickness 10 mm
Residual thickness > 8 mm

MANUFACTURING OF MAIN COMPONENTS



MANUFACTURING OF BEAM PORTS:
CILINDRICAL TEST

DESIGN OF BIAS SPUTTER COATING SYSTEM AT CERN



MANUFACTURING OF SPUTTERING SYSTEM

All elements needed for manufacturing (flanges, tubes, etc.) have been procured

Components for UHV vacuum system have been procured (UHV gate valve, pressure reducer)

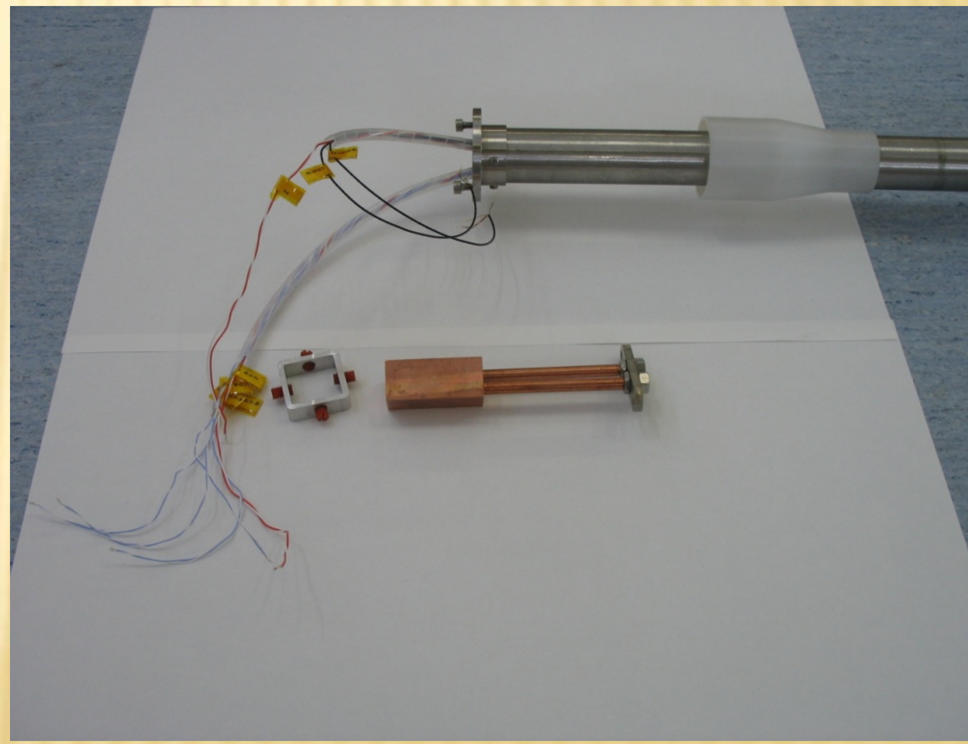
First test will show if we need other components (heaters, gauges, etc)

SURFACE TREATMENTS

- All components ordered
- Performed the check of chemical vapours aspiration (safety issue)
- Lab set-up is starting

RRR MEASUREMENT

- Cryostat insert built
- DVM and current source purchased
- DAQ program being prepared



ITEMS PRESENTLY BEING DESIGNED

- Support structure for the coating system
- Ultra-pure water rinsing system (cavity support + water rinsing nozzles)
- Handling tooling for surface treatments, water rinsing, clean room handling

- Items that need testing: niobium sputter cathodes, grids, feedthroughs

BIAS ELECTRODE BY WATER JET CUTTING

SUMMARY

- A high β cavity prototype is in construction, first Nb sputtering foreseen by end of this year.
- Cold test expected by Jan – Feb 2009
- Development of magnetron sputtering for QWR geometry foreseen in the next European program with LNL-INFN