

**CERN**, the European Organization for Nuclear Research, invites you to join us on **9th March 2018** for a **manufacturing and applications workshop** on

### **High-Frequency Radio Frequency Quadrupole (HF-RFQ) technology.**

#### **Purpose**

As part of its mission, CERN aims to disseminate its technologies for the benefit of society. The intention of this workshop is to provide companies with a chance to:

- Assess the feasibility of HF-RFQ technology for your business
- Learn from CERN experts on RFQ manufacturing processes
- Discuss the applications of this new technology, and collaboration opportunities, with CERN

We are inviting companies with manufacturing capability and/or an interest in being a distributor for HF-RFQ technology.

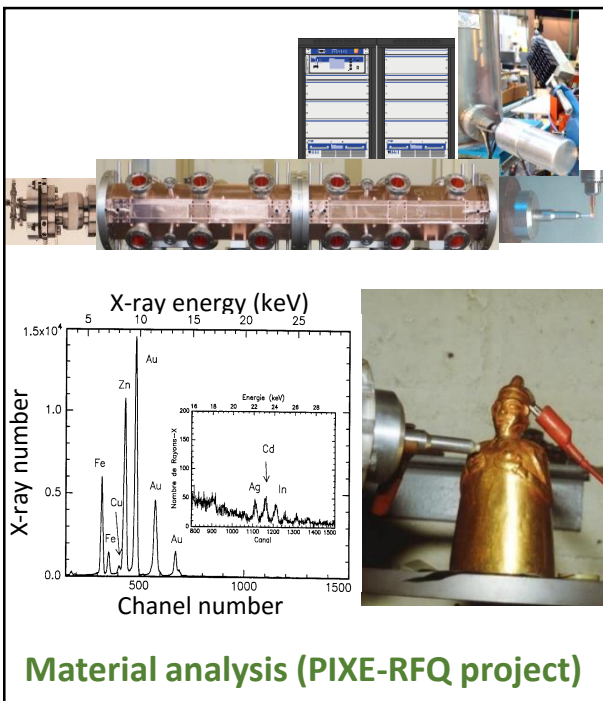
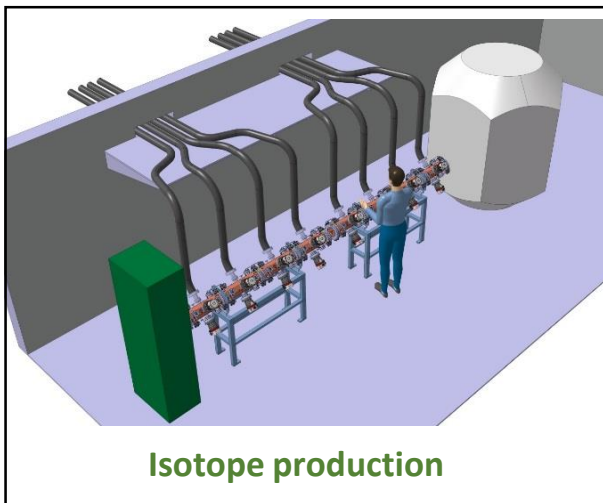
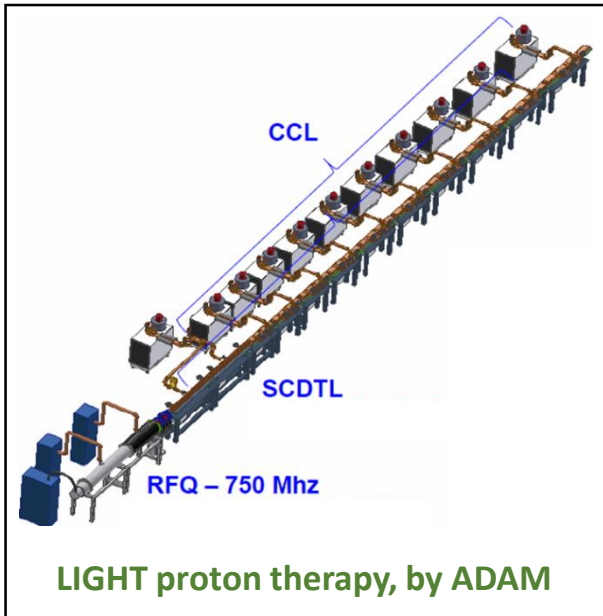
#### **Why a High-Frequency RFQ?**

Building on its experience with the LINAC4 injector (the first stage in the LHC accelerator chain), the HF-RFQ was constructed with the goal of providing a compact, light-weight, low beam-loss injector for a proton therapy Linac. The 750MHz HF-RFQ can reach an output energy up to 5 MeV in only 2 metres, making it suitable for:

- **High energy hadron Linac injector systems**
- **Linac for radioisotope production**
- **Transportable Linac for high-sensitivity Ion Beam analysis (e.g. PIXE, PIGE)**
- **Other applications benefiting from a low output current ion beam.**

During this workshop, we will be sharing information regarding the potential applications of the HF-RFQ and the detailed CERN manufacturing procedures (machining, tooling, metrology, heat treatment and vacuum brazing) including general manufacturing guidance for RFQs.

## Applications



## Agenda

- 09:00 Welcome refreshments
- 09:30 Introduction to CERN
- 10:00 Applications and business opportunities for the HF-RFQ
- 10:45 Manufacturing approach (including processes for machining, tooling, metrology, heat treatment and vacuum brazing)
- 12:00 Lunch
- 13:30 Visit to CERN manufacturing workshop facilities
- 15:00 Coffee break
- 15:30 Q&A with technical staff

Throughout the visit there will be opportunities to converse with CERN engineering staff in order to understand the manufacturing feasibility of the HF-RFQ, and to benefit from their experience.

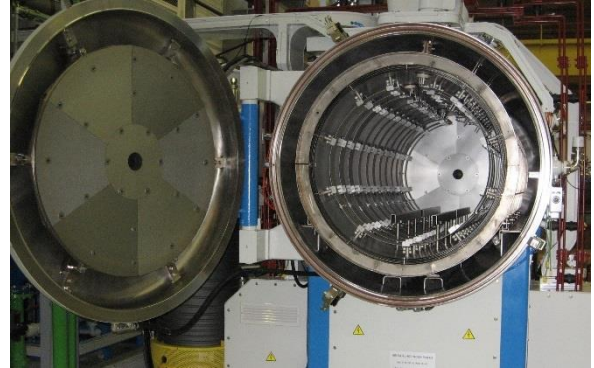
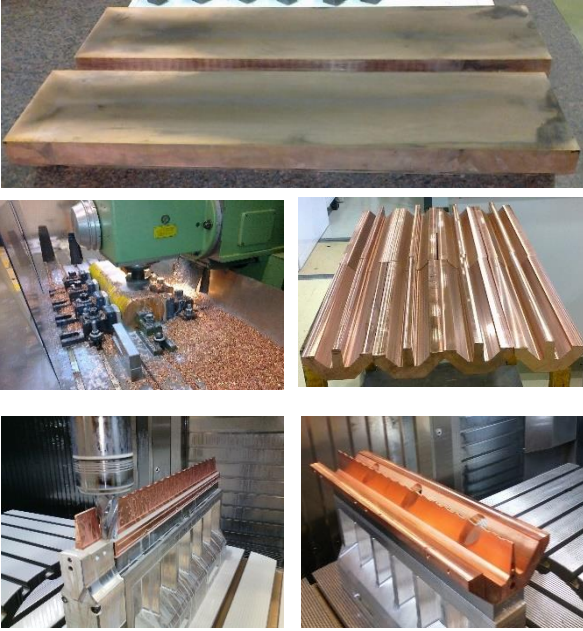
We invite you to join us on **9th March 2018** at **CERN - European Organization for Nuclear Research, Meyrin, CH-1211 Geneva 23, Switzerland**

**To register your attendance** and for all enquiries about local transportation and accommodation please go to the following link: <https://indico.cern.ch/event/686876/>

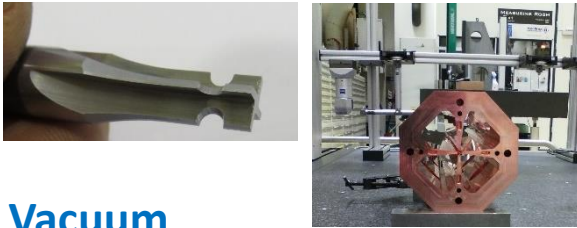
To ask any questions about the purpose, agenda, or technical nature of the visit, please contact: **Amy Bilton**, Business Development, at [amy.bilton@cern.ch](mailto:amy.bilton@cern.ch)

**Note:** the HF-RFQ is a patent pending technology (WO2016023597). Attendance of the workshop does not imply grant of a licence for use of the technology – which must be negotiated on a commercial basis.

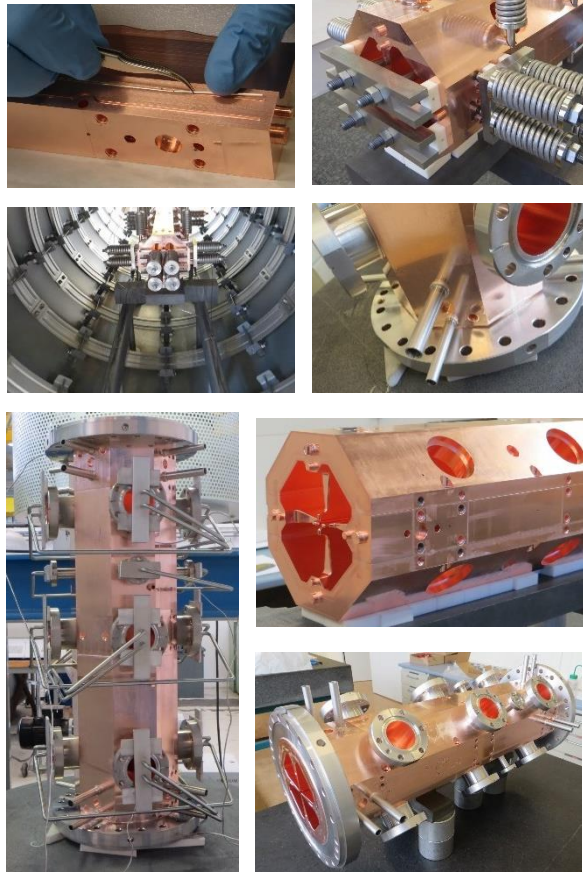
## Machining steps



## Tooling & Metrology



## Vacuum brazing



## HF-RFQ parameters

	5 MeV HF-RFQ	PIXE-RFQ
RF Frequency (MHz)	750	750
Length (mm)	1964	1000
Input Energy (MeV)	0.04	0.02
Output Energy (MeV)	5	2
Average Current (nA)	1500 max.	100
Peak Current ( $\mu$ A)	30	1
Repetition Rate (Hz)	200	200
Pulse Duration ( $\mu$ s)	20	500
Duty Cycle (%)	0.4 / 5 max.	10
Vane Voltage (kV)	68	35
Min Aperture (mm)	0.9	0.7
Max Modulation	2.8	2.0
Ro (mm)	2.0	1.4
Rho (mm)	1.5	1.4
Rhol (mm)	1.9	1.7
Transmission (%)	30	30
Output Beam Size (mm)	$\pm 0.5$	$\pm 0.1$
Acceptance ( $\pi$ mrad mm) (Total norm.)	0.3	0.15
Output Energy Spread (keV)	20	10
RF Peak Power (kW)	400	50
RF Efficiency (%)	35	35
Coupler number (#)	4	1
Plug Power (Total) (KVA)	57.1	14.3