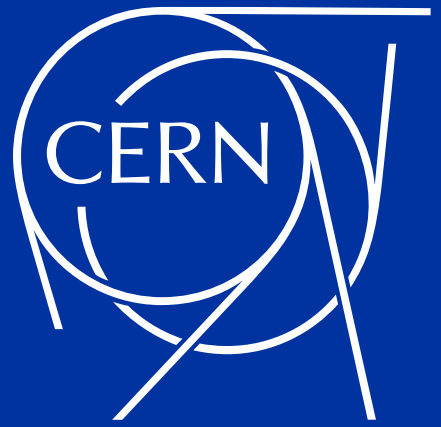


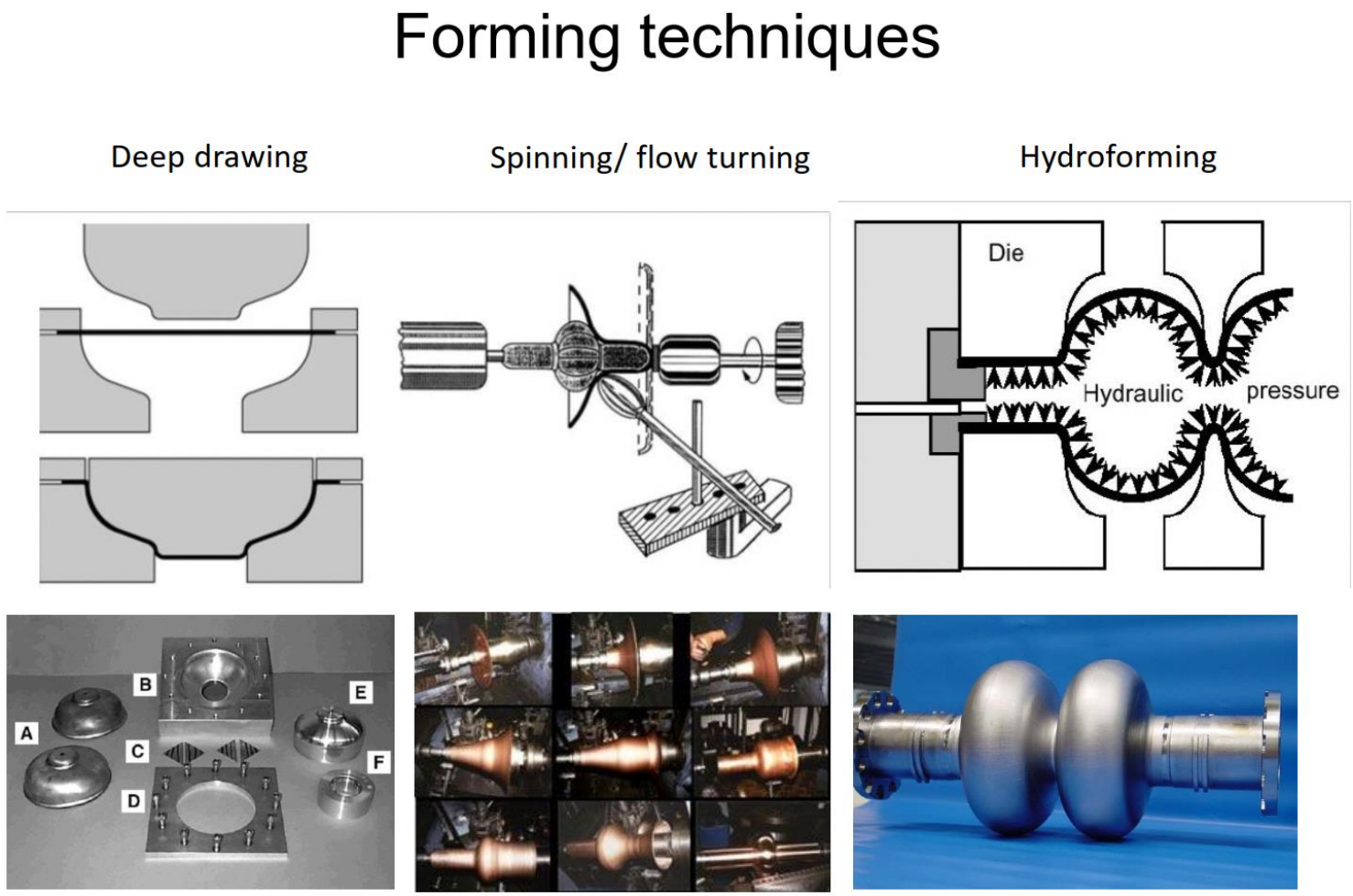
CERN Summer School 2022

Viesturs Lācis

20.09.2022.

Summer school lectures

- 70 % - mindblowing
- 10 % - interesting
- 20 % - useful

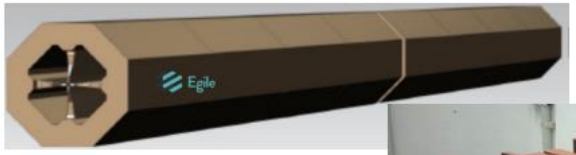


Summer School lectures

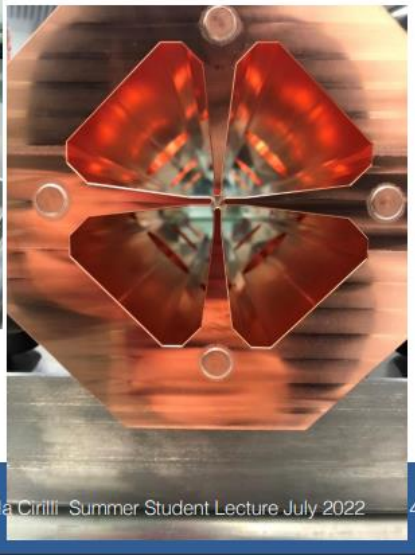
Introduction to RFQ

in linear accelerator

The RFQ for C^{6+} LINAC option



First (of 4 sections) completed



Collaboration CERN-CIEMAT-CDTI-Spanish industry
2.0 m long
750 MHz
Will deliver Carbon (or Helium) at 5 MeV (total energy)
Designed at CERN built in Spanish Industry

Main project – laser polishing of AM-built RFQ

- **Surface treatment of AM-built RFQ**
  - Reduce roughness
  - Reduce porosity

- **Laser polishing of AM-built copper parts – no evidence found, focus on Aluminium**

Main project – laser polishing of AM-built RFQ

Extract the laser parameters used for laser polishing AM-built aluminium parts

Experiment	No. 1		No. 2		No. 3	No. 4	
Laser mode	PW	CW	PW	CW	PW	PW	CW
Laser wavelength, nm	1030		1030		1030	1030	
Laser power, W	1700	1000	1700	1400	1712	1700	1400
Diameter of laser spot, um	1298	1298	1298	1298	1298	1056	1056
Power density, W/mm^2	1284,72	755,72	1300	1057	1293,79	1940	1600
Energy density, J/mm^2			76,5	42	83,2	76,5	33,6
Pulse duration, ms	0,3	n/a	0,3	n/a	0,41	0,3	n/a
Pulse frequency, Hz	1000	n/a	1000	n/a	2000	1000	n/a
Toolpath overlap, %	95	93,7	94,9	93,7	93,6	93,7	92,1
Scanning velocity, mm/min	8177,4	6000	12000	48000	24000	12000	60000
Feedrate, mm/min	100	100	40	200	100	40	250

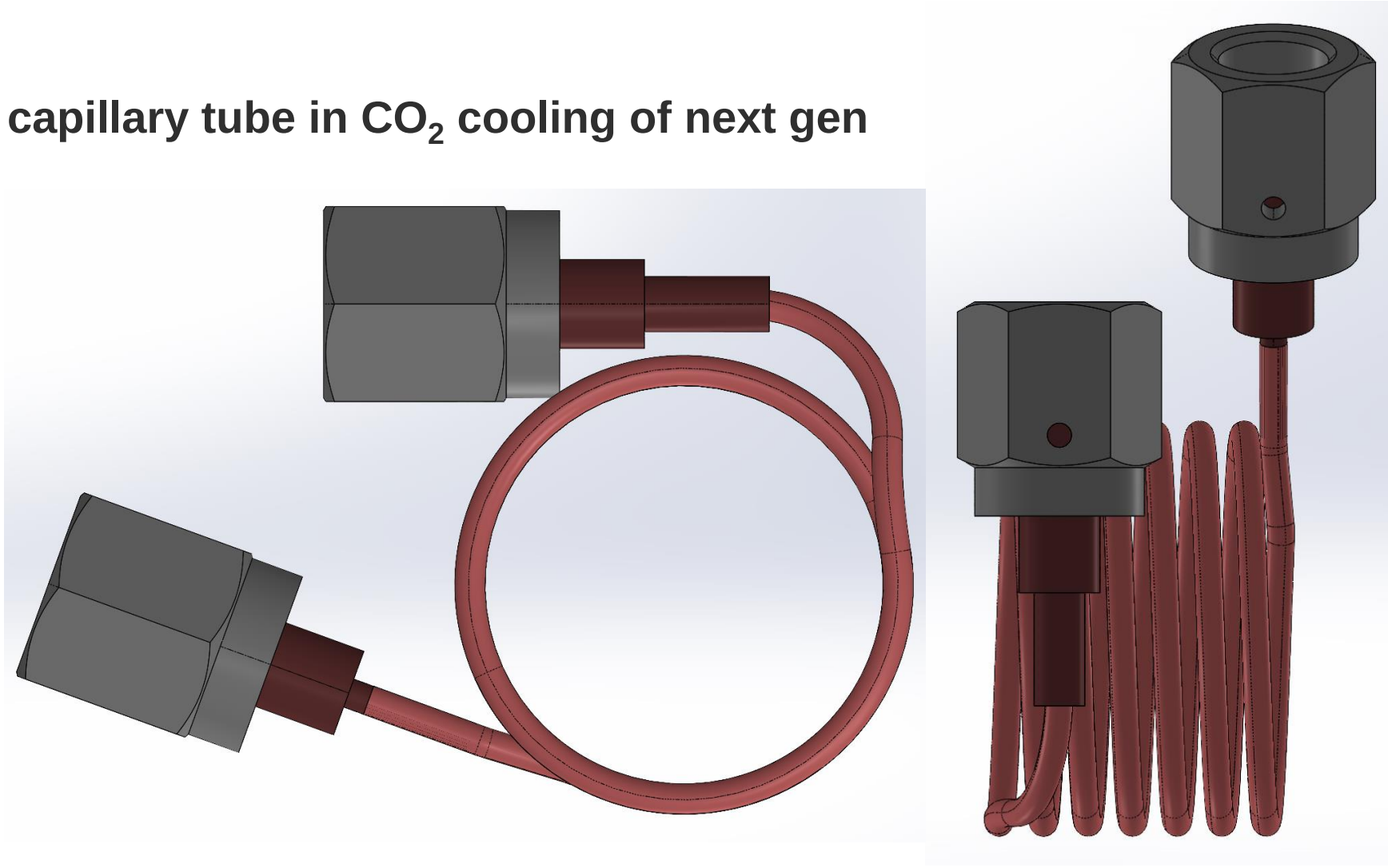
Main project – laser polishing of AM-built RFQ

Adjusted laser parameters for different absorption and laser power

	Initial parameters, adjusted for difference of laser absorption		Parameters adjusted for DU	Parameters adjusted for 3D printer
Laser mode	PW	CW	CW	CW
Laser wavelength, nm	1060		1060	1060
Laser power, W	1700	1400	1000	250
Diameter of laser spot, um	1300	1300	1300	1300
Pulse duration, ms	0,4	n/a	n/a	n/a
Pulse frequency, Hz	2000	n/a	n/a	n/a
Toolpath overlap, %	94	94	94	94
Scaning speed, mm/min	6000	12000	7059	1765

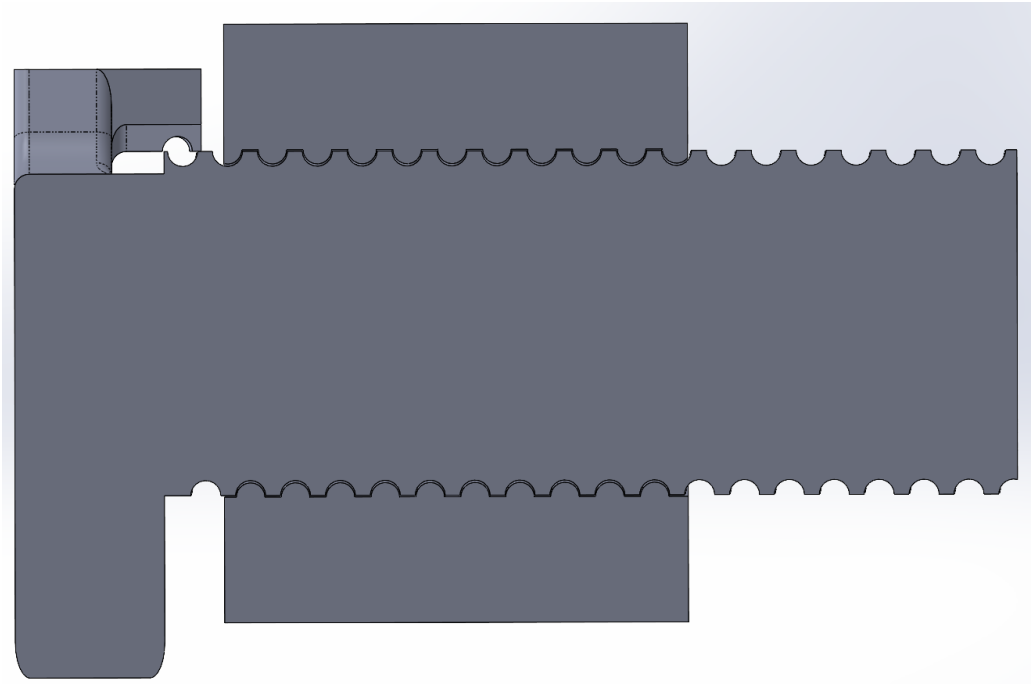
Secondary project – designing a tool

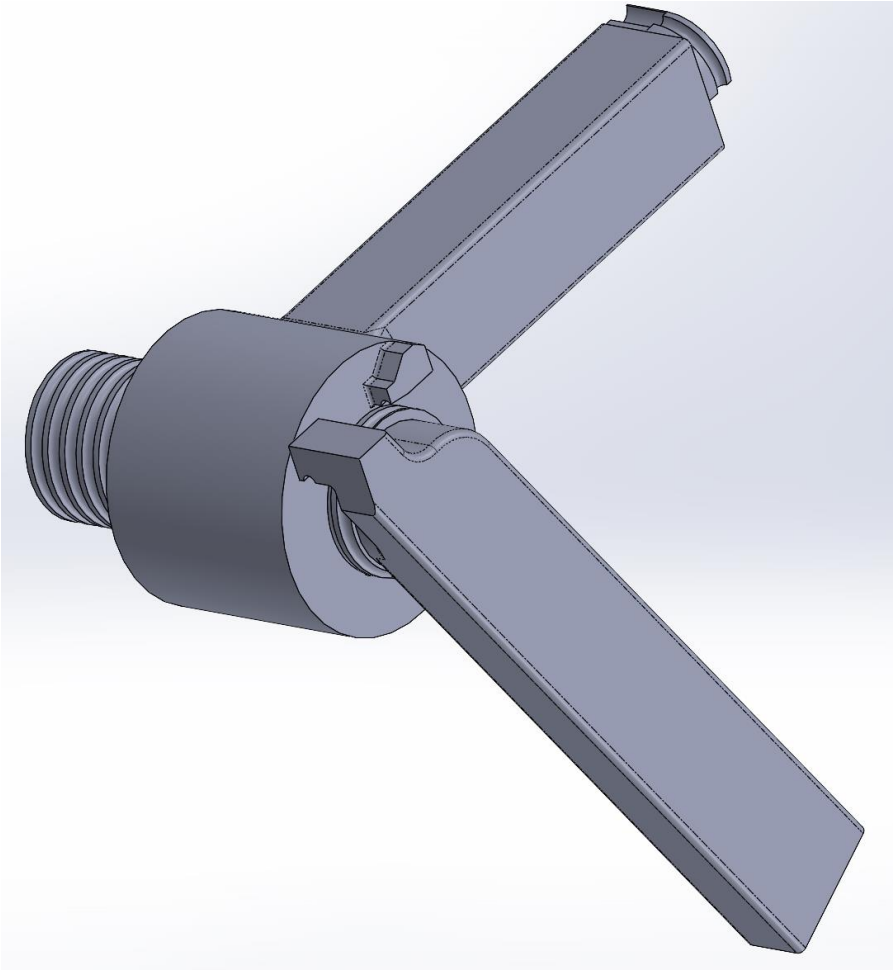
Tool for coiling capillary tube in CO_2 cooling of next gen CMS detector

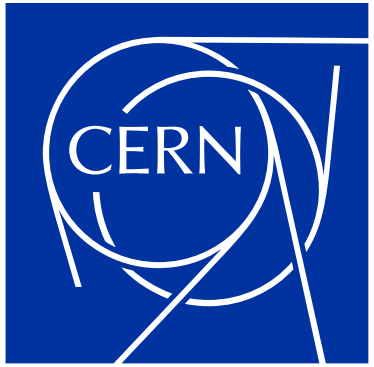


Secondary project – tool for coiling capillary tube

Successfuly tested on wire from straightened staple







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