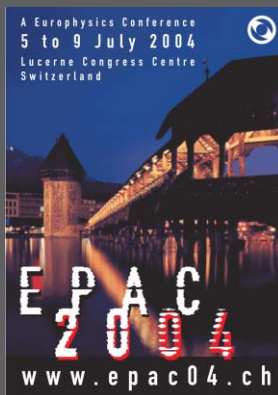


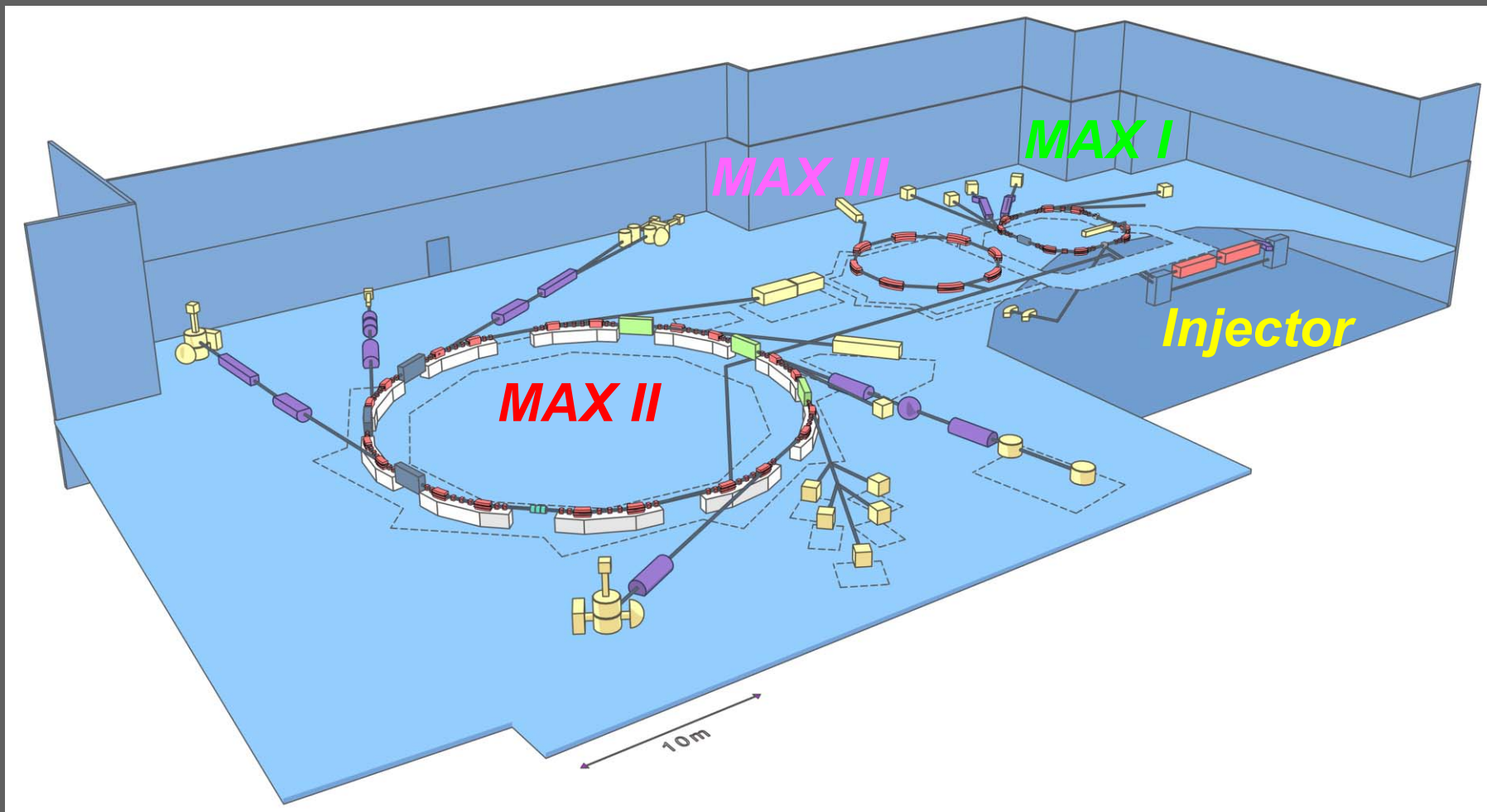
COMMISSIONING OF THE 500 MEV INJECTOR FOR MAX-LAB

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Why a new injector?

- 100 MeV RaceTrack Microtron old (25+ years)
- MAX I used as slow (0.03 Hz) booster
- Flexibility for injection into MAX III
- Increase energy to 250 MeV in Pulse stretcher mode for MAX I

Why a linac?

- Compact, easy to fit
- Compatible with FEL
- Needed anyway a pre injector
- Cost new RTM+booster v. Linac

What did we get?

Thermionic RF-gun 2 MeV

Energy filter (120 deg)

2 x Linac 5.2 m, SLED, 125 MeV

2 x Recirculator magnets

Overall size ~ 2 m high, 15 m long



$E = 4 \times 125 \text{ MeV} = 500 \text{ MeV}$

$I = 100 \text{ mA}$

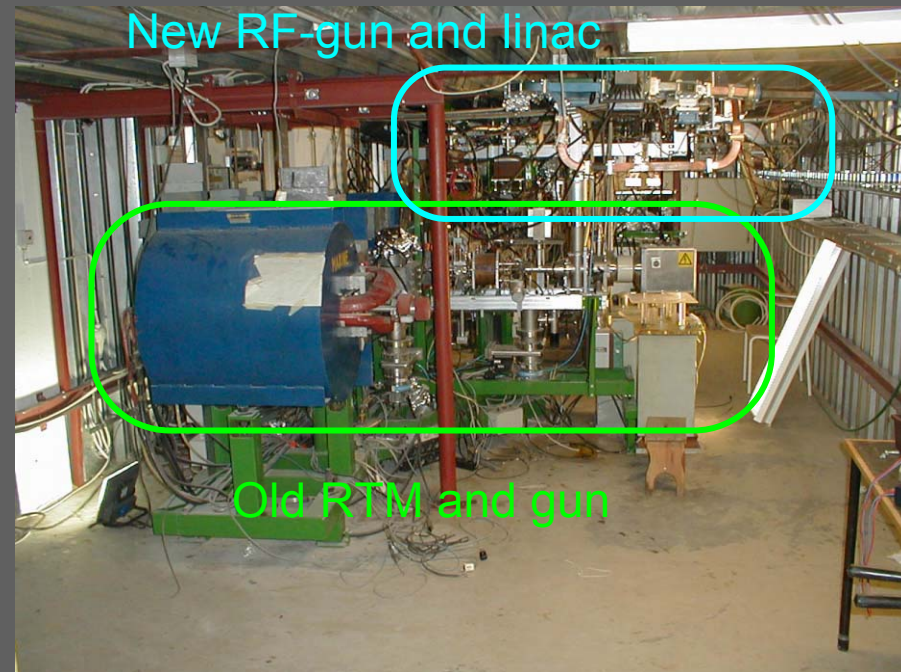
$T_{\text{pulse}} = 60 - 100 \text{ ns pulses}$

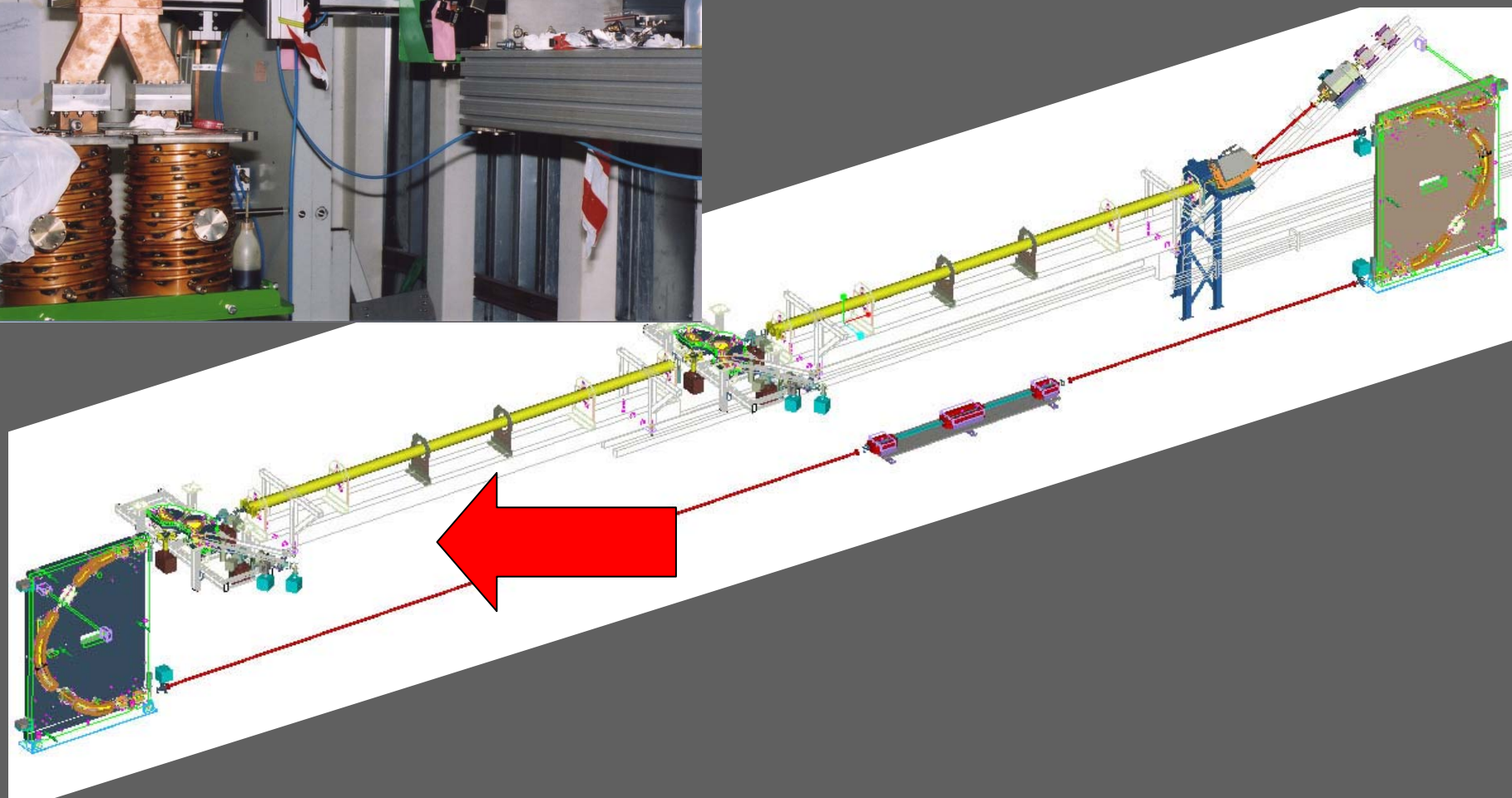
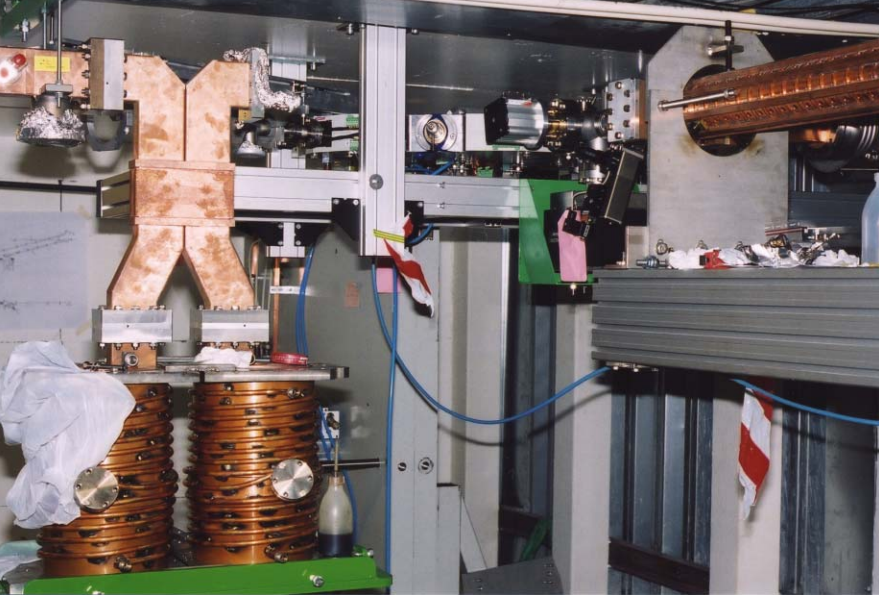
$\epsilon_n = 15 \text{ mm mRad}$

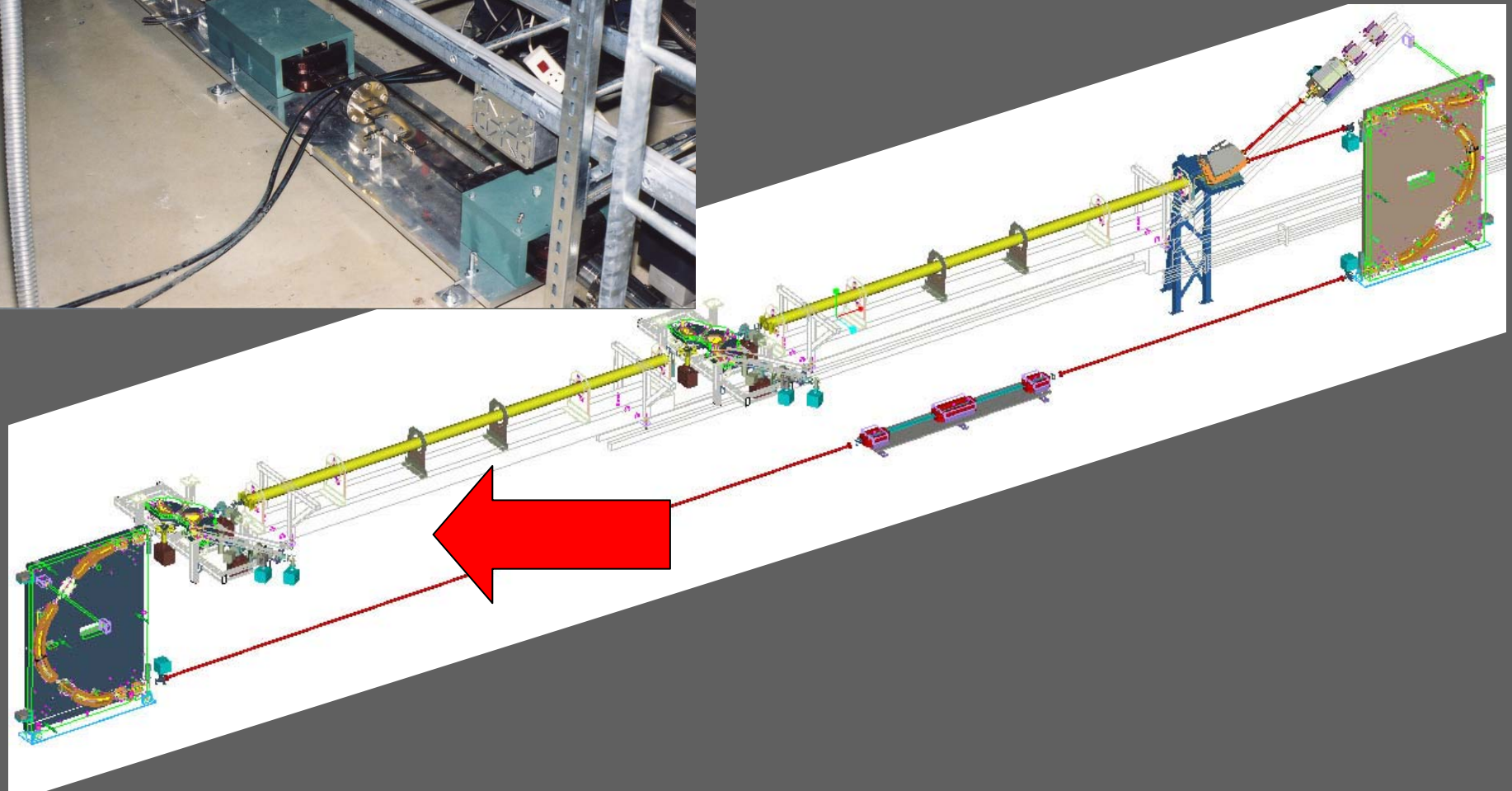
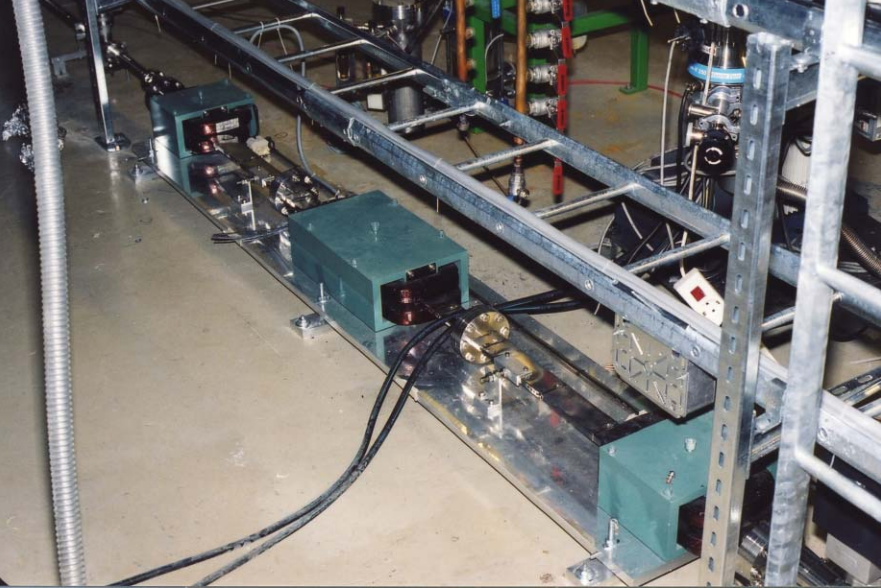
How?

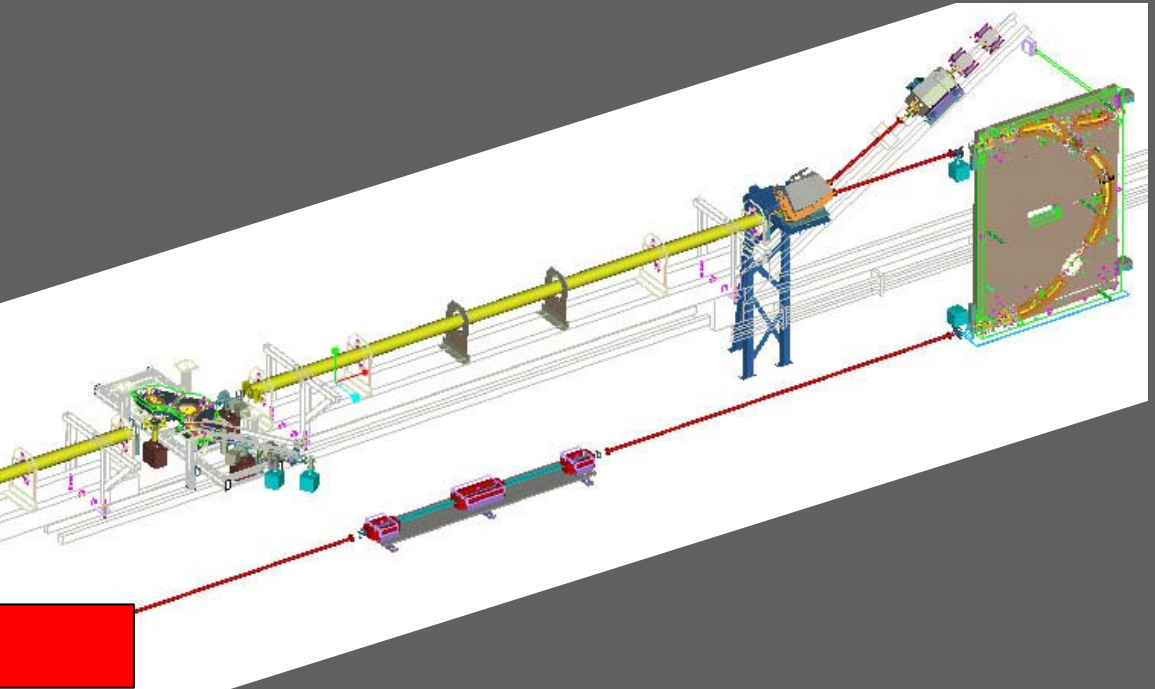
Installed 1 gun + 1 linac (110 MeV)
during operation and then removed the
RTM

Finally installed the rest of the system

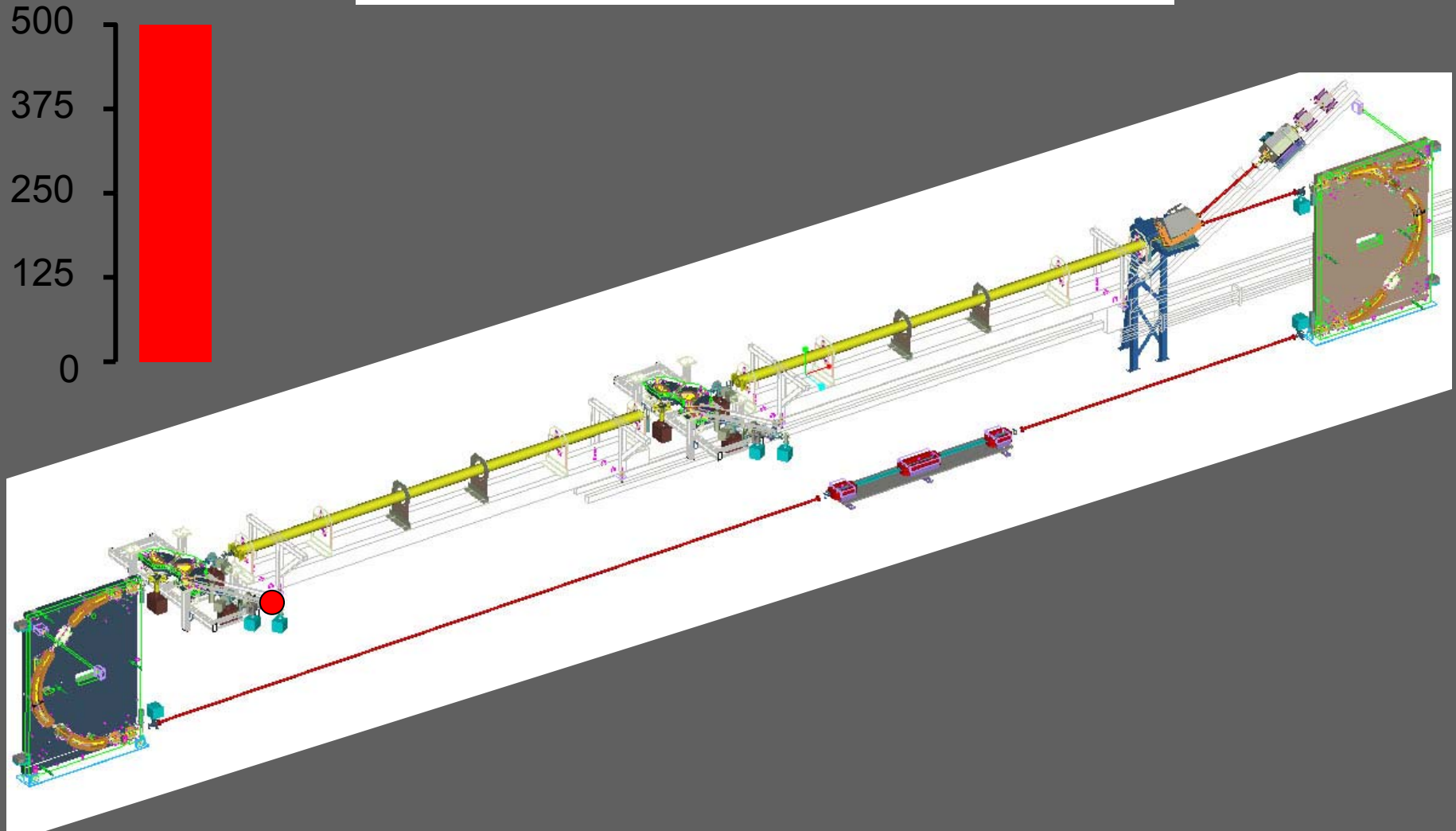




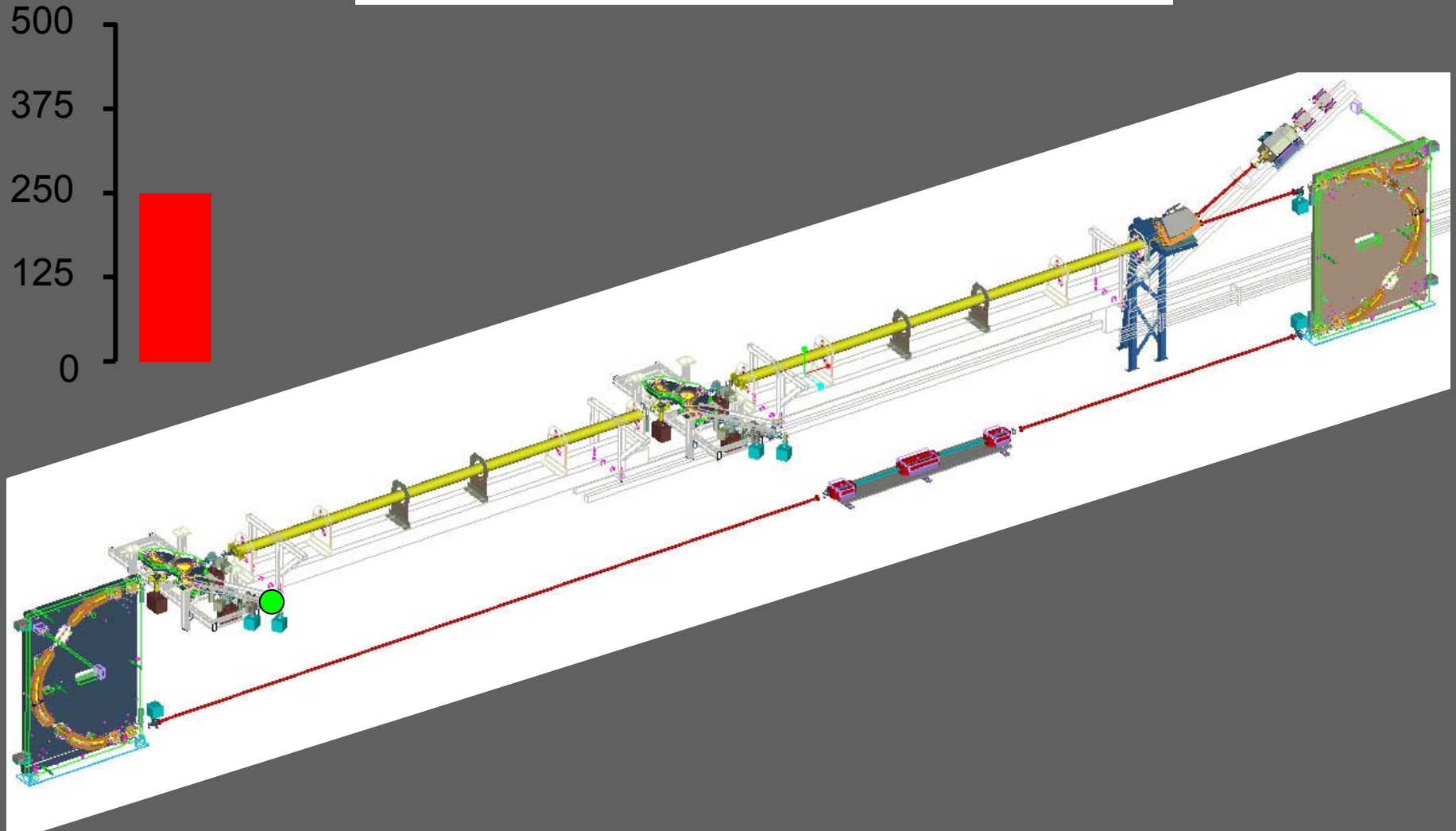




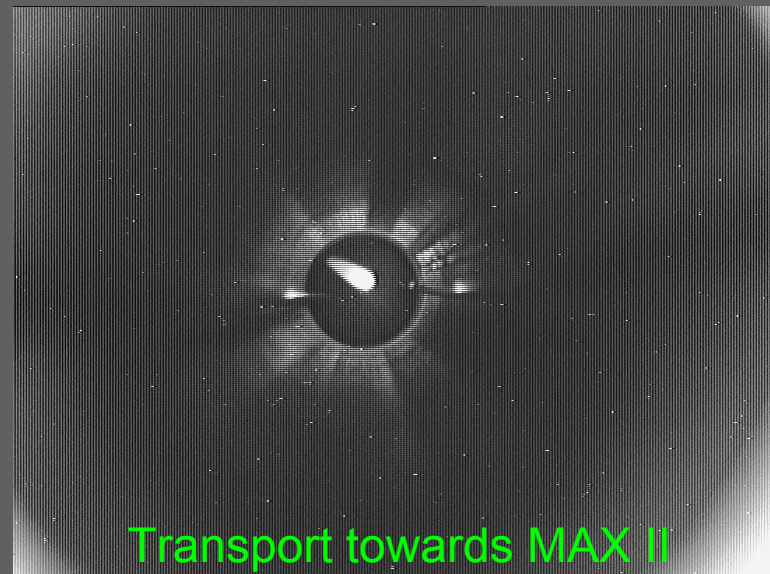
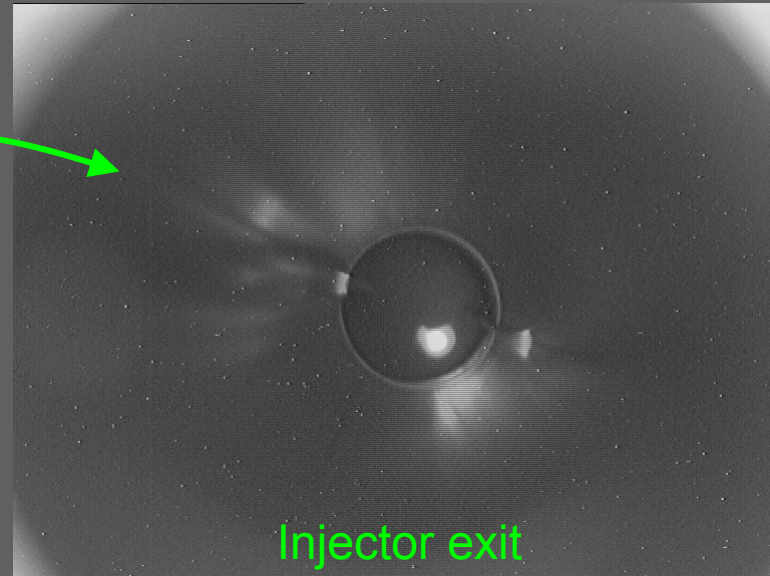
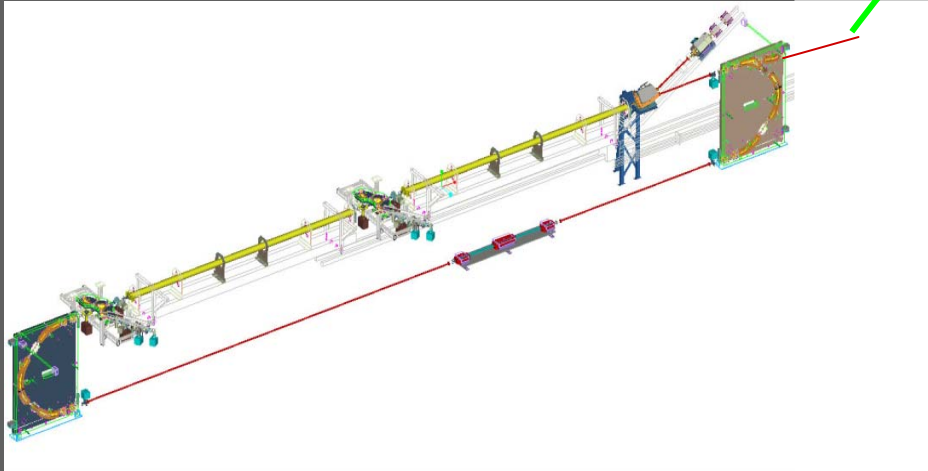
500 MeV for MAX II, III and FEL



250 MeV for MAX I

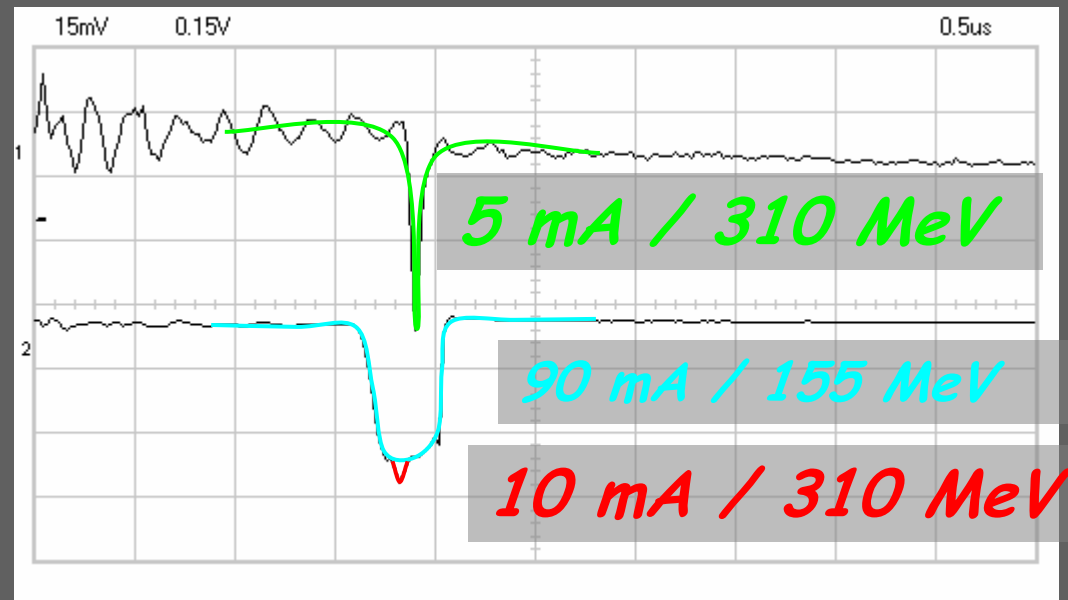
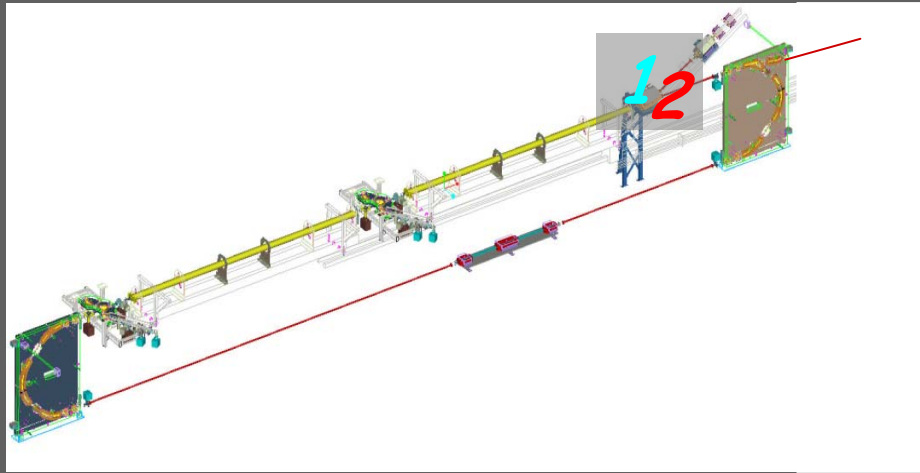


Proof of beam



June 22, 2004

Current pulse



June 22, 2004

Results

- Current extracted 15 mA
- Energy in beam 310 MeV
- Macro pulse length 60 – 100 ns
- Emittance 15 mm mRad (norm)
- All-in-one block magnets with 8 mm vacuum chamber work fine
- Injection to be shown
- Conditioning some remains

Problems / experience

- Sensitive optics
- Energy tails
- Beam loading
- Discharges

Future

- Injection into MAX II with the new system
- Injection into MAX III
- 250 MeV for MAX I in pulse stretcher mode
- Adapt the thermionic gun to a photo cathode gun using a long pulse (5 ns) laser system. Matching one bunch injection into the 100 MHz RF systems of MAX II and MAX III and reducing beam loading.
- Install a low emittance photo cathode gun for HG-FEL tests within the EURFEL proposal.
- Bunch compression in the recirculator system

Posters on related topics

- WEPLT137 Higher Order Modes in the New 100 and 500 MHz Cavities at MAX-lab
- THPKF057 Testruns of the 100 MHz RF System for MAX-II
- THPKF058 Experimental Experience with a Thermionic RF-gun
- THPKF059 Adaption of an RF-gun from Thermionic to Photo Cathode



Thank you!