

# Experiences in Fabrication and Testing the Prototype of the 4.90GHz Accelerating Sections for MAMI C

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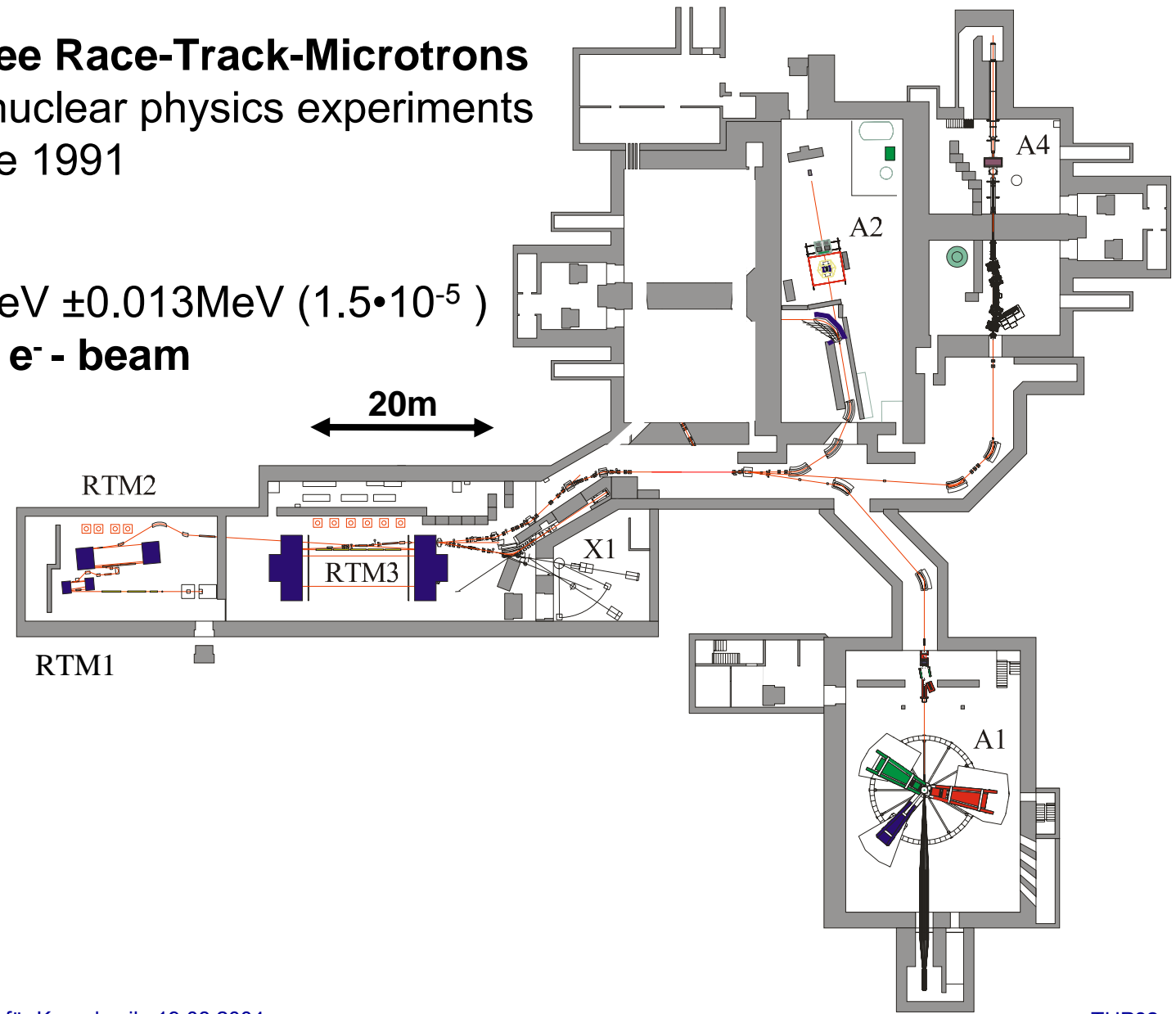
## THP82

# The Mainz Microtron, MAMI B

- a cascade of **three Race-Track-Microtrons**
- mainly used for nuclear physics experiments
- in operation since 1991

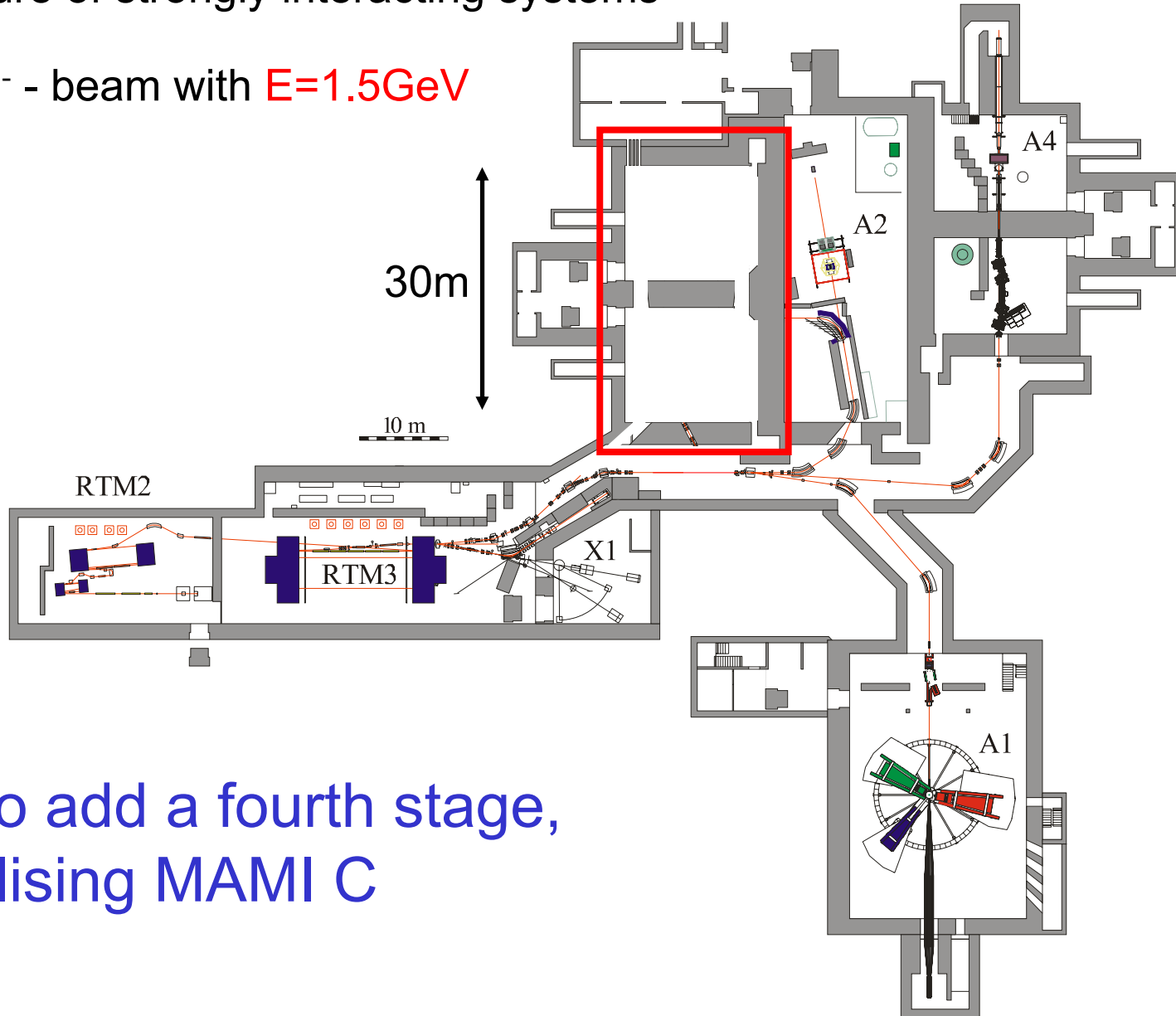
Parameter:

180MeV - 882MeV  $\pm 0.013\text{MeV}$  ( $1.5 \cdot 10^{-5}$ )  
**max. 100 $\mu\text{A}$  cw e<sup>-</sup> - beam**

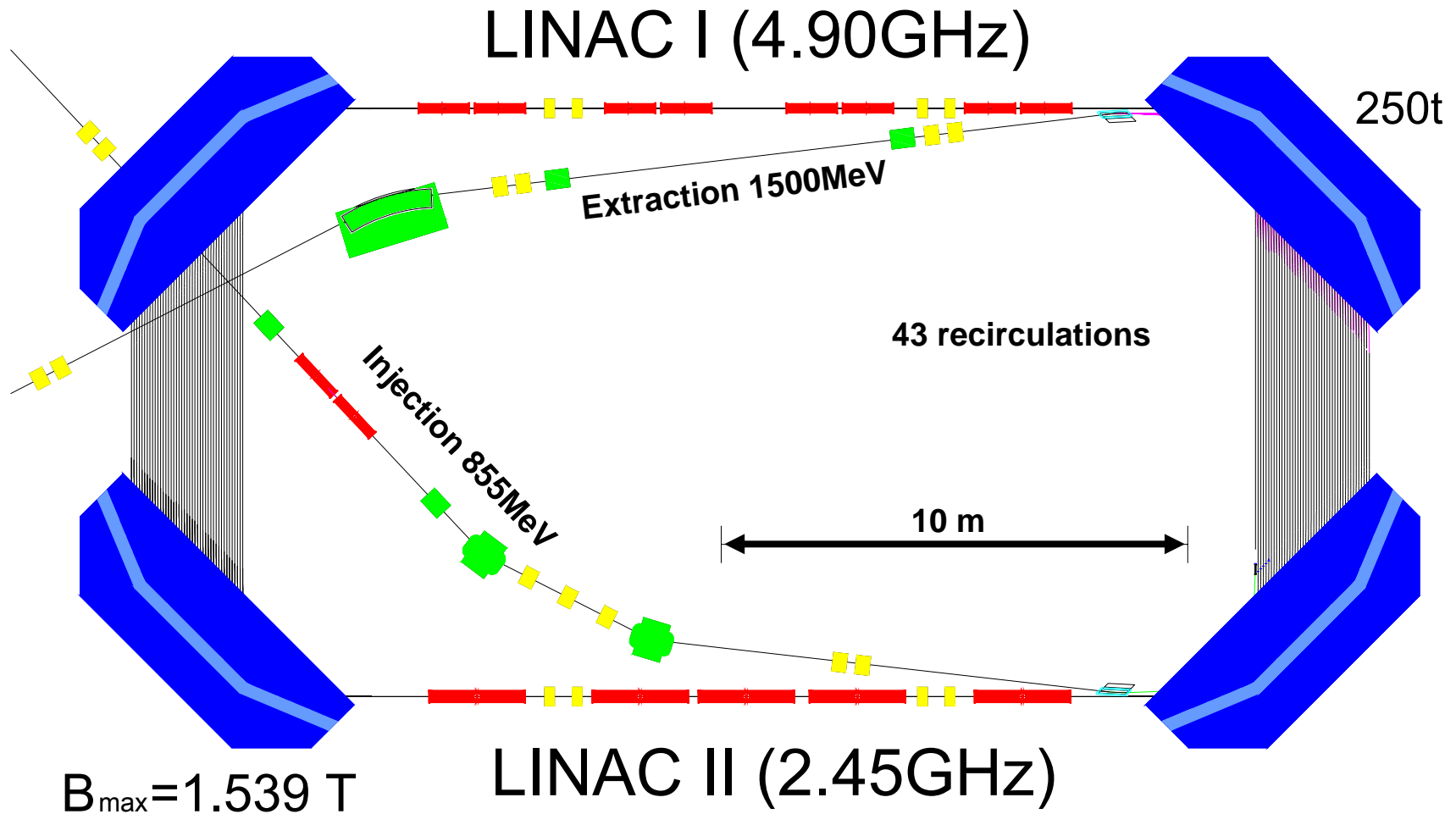


Since 1999 new collaborative research centre CRC443:  
“Many body structure of strongly interacting systems”

need for cw e<sup>-</sup> - beam with **E=1.5GeV**



Decision to add a fourth stage,  
realising MAMI C



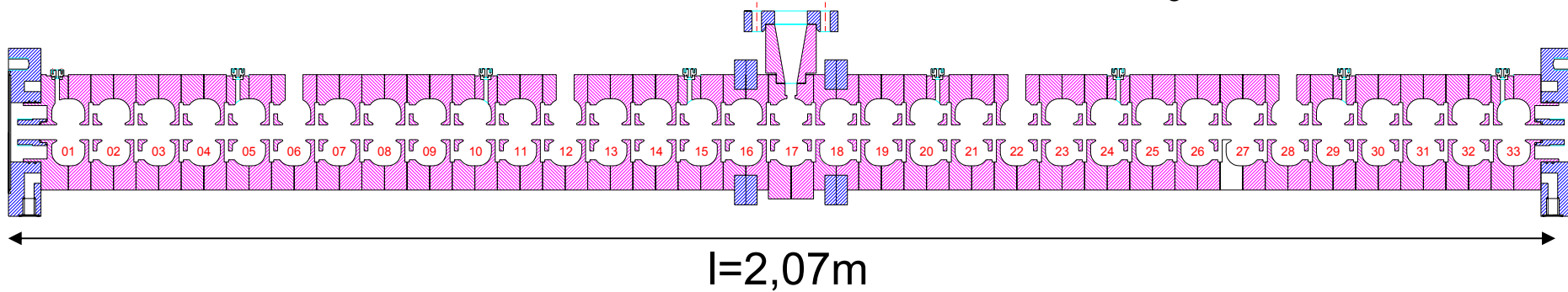
**4.90GHz:** necessary for moderate energy gain per turn  
to fit machine in existing hall

**2.45GHz:** for a more relaxed longitudinal beam dynamic

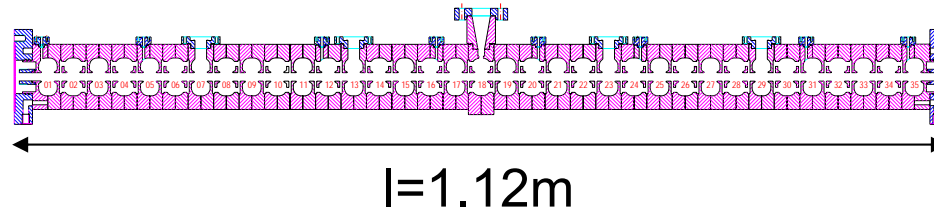
# Need to develop 4.90GHz cw linac section:

starting point: 2.45GHz MAMI C section

bi-periodic, on axis coupled,  $\pi/2$ -mode, 33 AC,  $r_s=67M\Omega/m$



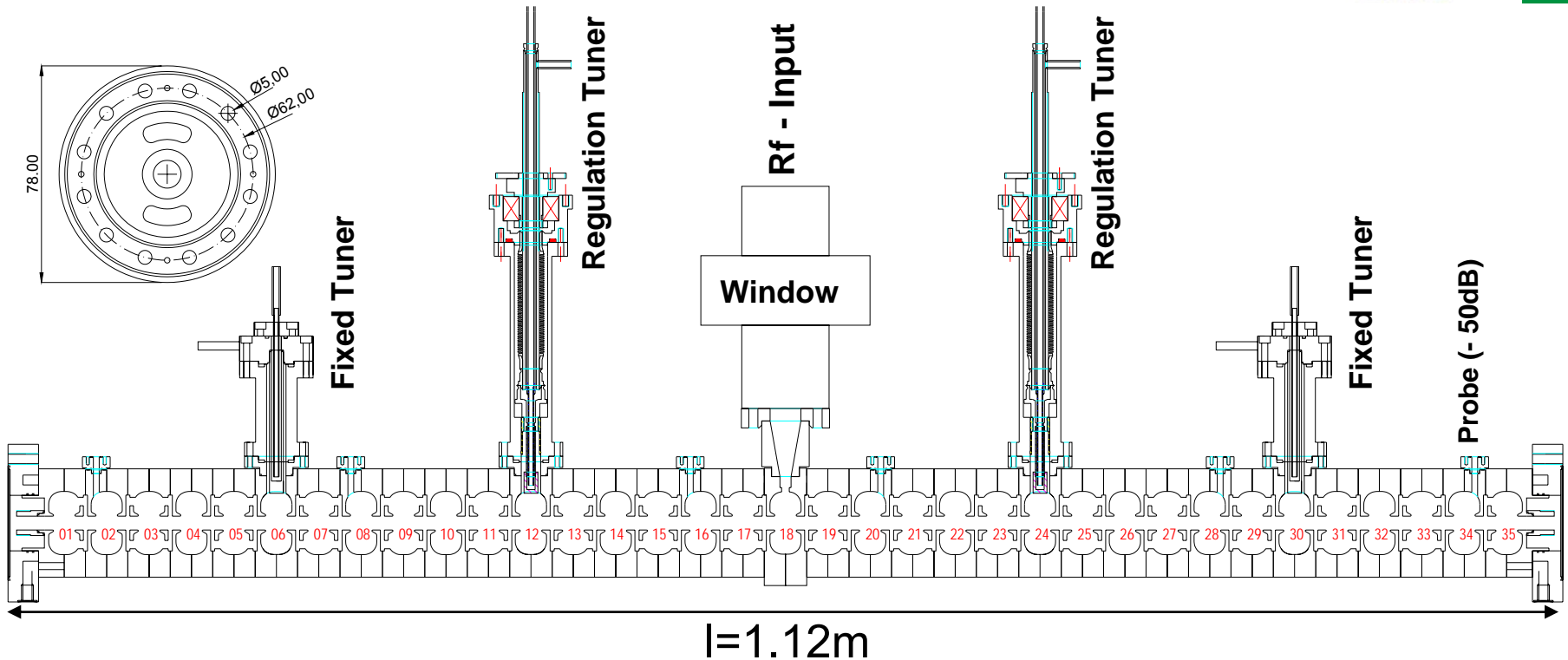
scaling by:  $v \rightarrow \alpha \cdot v \quad l \rightarrow \frac{1}{\alpha} \cdot l \quad \text{with } \alpha=2$



with modifications:

- 35AC
- increased beam hole for loss free beam transmission ( $\varnothing=7mm \rightarrow 10mm$ )
- coupling increased from 4%  $\rightarrow$  8.8% (stability, manufacturing tolerances)

# The final design of the 4.90GHz prototype section



design-parameters  
(MAFIA, URMEL, Al-test-cavities):

$$r_s = 78 \text{ M}\Omega/\text{m} \text{ (-18\%)}$$

$$k = -8.7\%$$

$$Q \geq 10000$$

$$k_{cc} = -0.66\%$$

measured at the brazed  
prototype section:

$$r_s = 82 \text{ M}\Omega/\text{m}$$

$$k = -8.8\%$$

$$Q = 10600$$

$$k_{cc} = -0.68\%$$



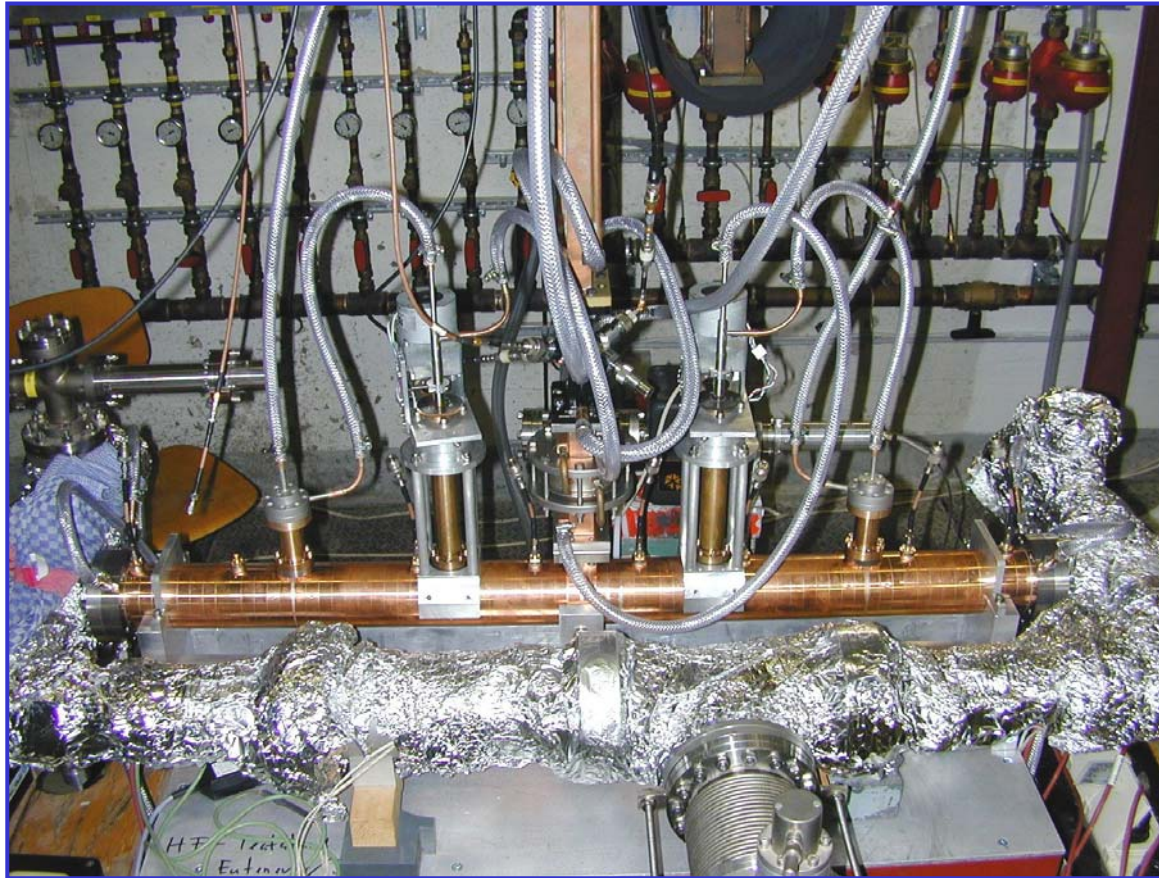
Prototype manufactured fully in House and successfully tested in 2003

→  
**Klystron:**

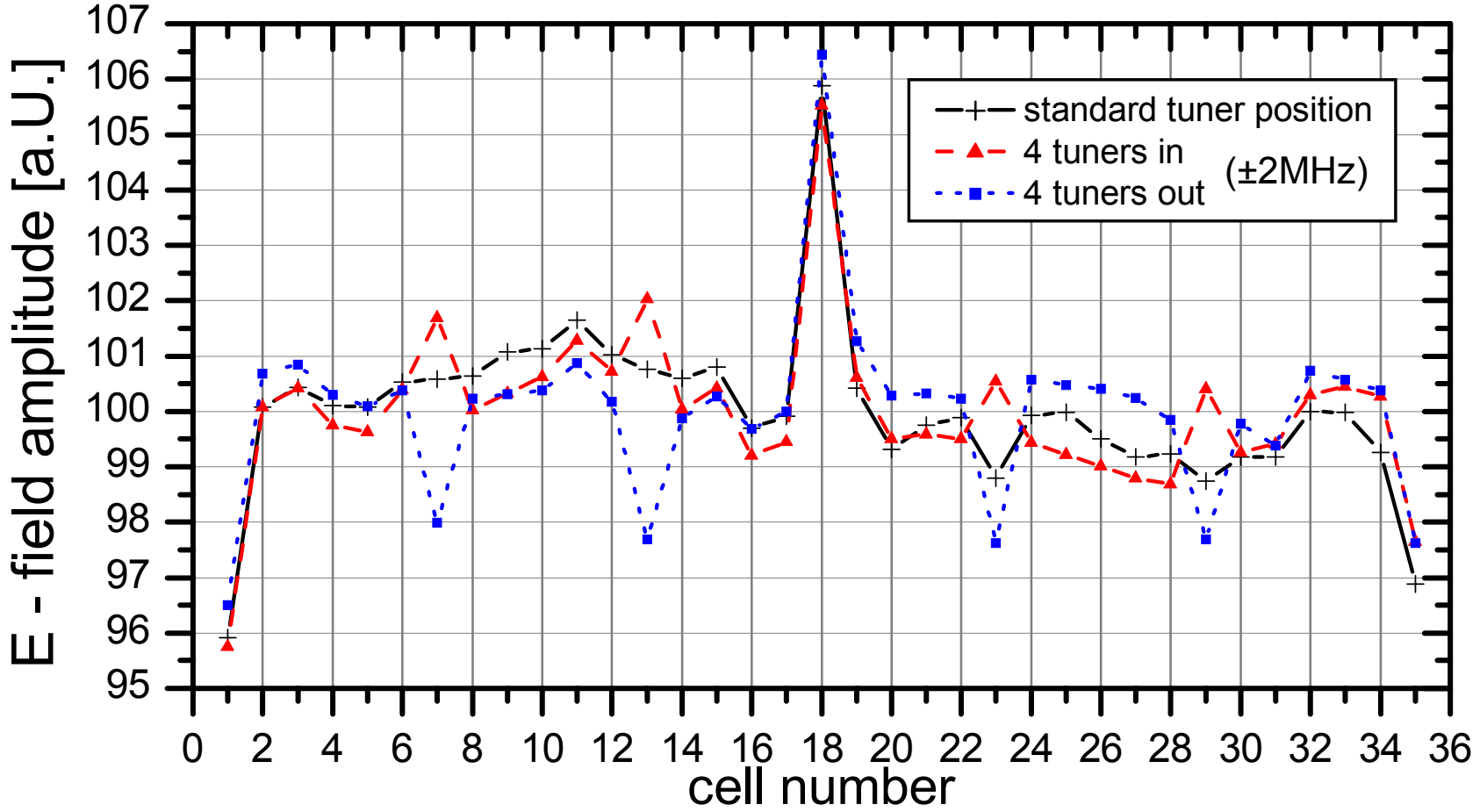
THALES

TH2166

4.90GHz, 55kW



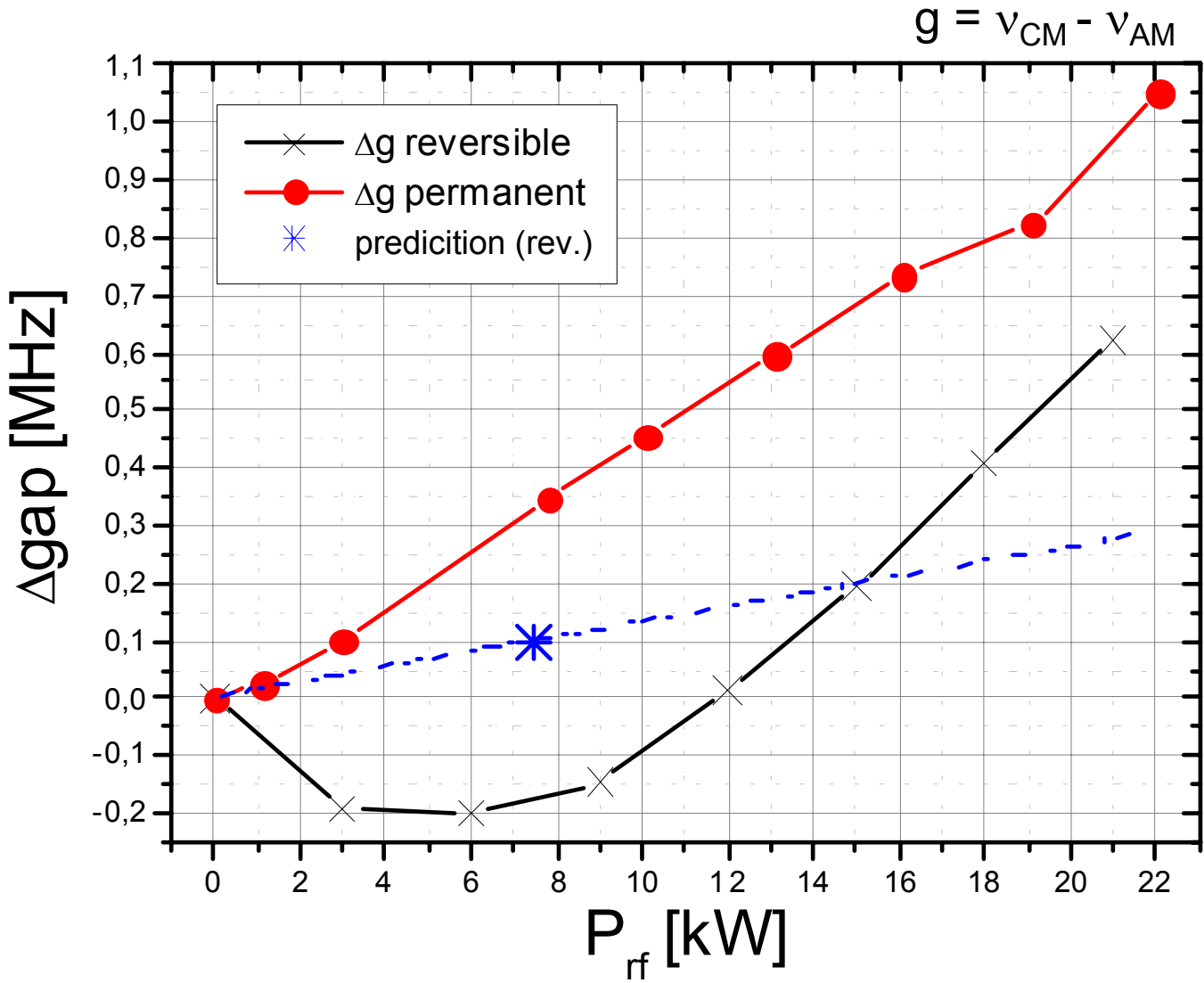
- up to max. 22kW cw rf-power (+50%) = 1.39MV / section
- all presets for resonance frequency and passband-gap under power well confirmed



thanks to the high coupling  $k=-8.8\%$



Some results: development of passband gap  $g$  with power



For MAMI C ten 4.90GHz sections are needed.

Manufacturing at two companies,

**ACCEL Instruments**, Bergisch-Gladbach, Germany  
and

**PMB**, Buc / Paris, France

started.

First sections expected to be delivered till 10/2004.

# Hope to see you at THP82 !