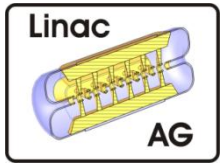
Front-End Linac Design and Beam Dynamics Simulations for MYRRHA



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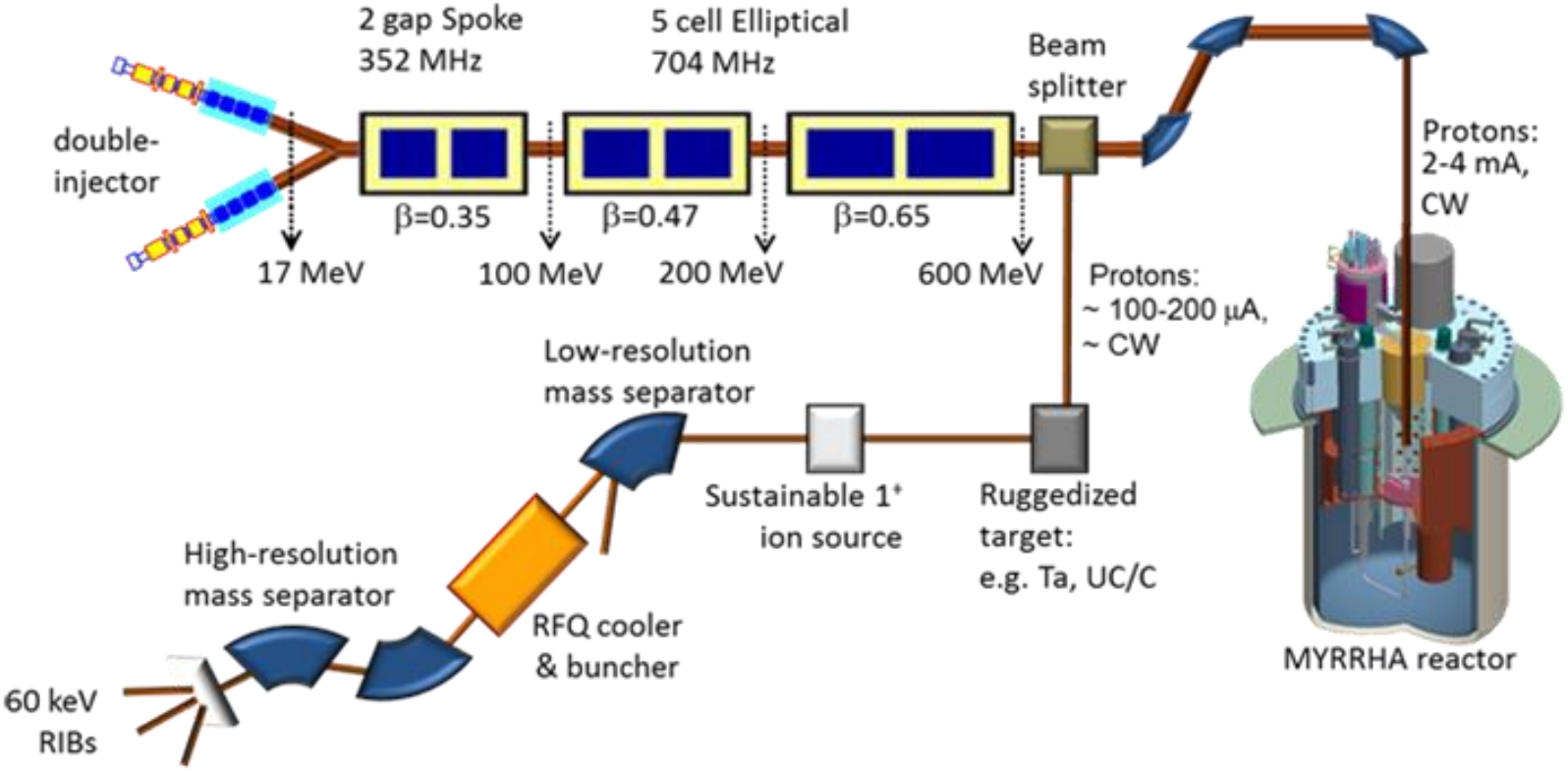
The MYRRHA Proton-Driver

Accelerator Driven System

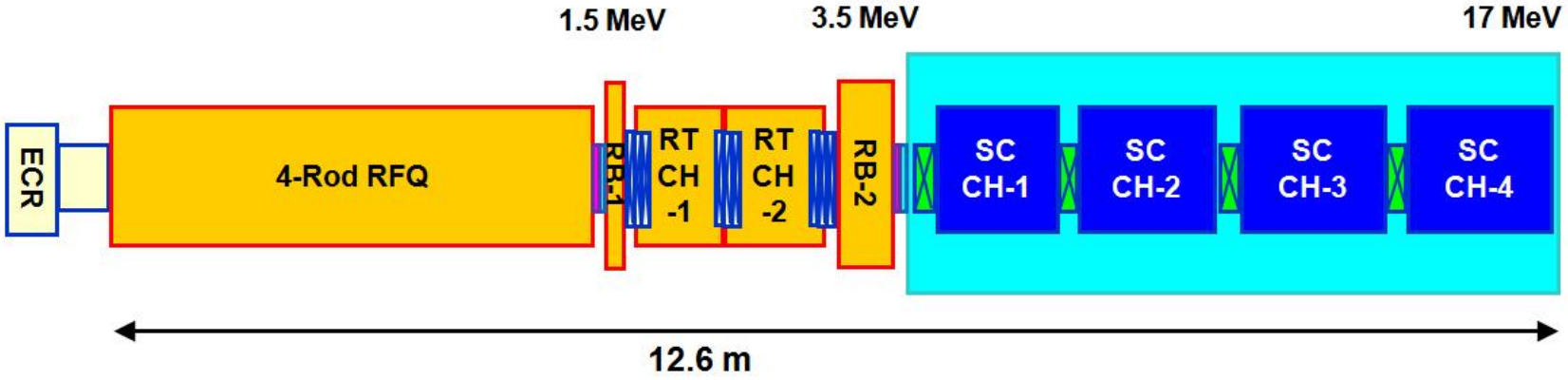
4 mA beam/600 MeV → 2.4 MW Beam power, cw operated

Requirements

Low Beam losses + very high reliability



Scheme of the MYRRHA Injector



Design Philosophy

Minimum number of components

Conservative design

Double injector for parallel redundancy

RFQ

Parameter	Value	Unit
RF Structure	4-Rod	---
Frequency	176	MHz
Beam current	4	mA
Duty factor	100	%
E_{out}	1.5	MeV
R_p	>67	kΩm
Specific power	25	kW/m
Voltage	40	kV
Length	4	m

Short RFQ section constructed

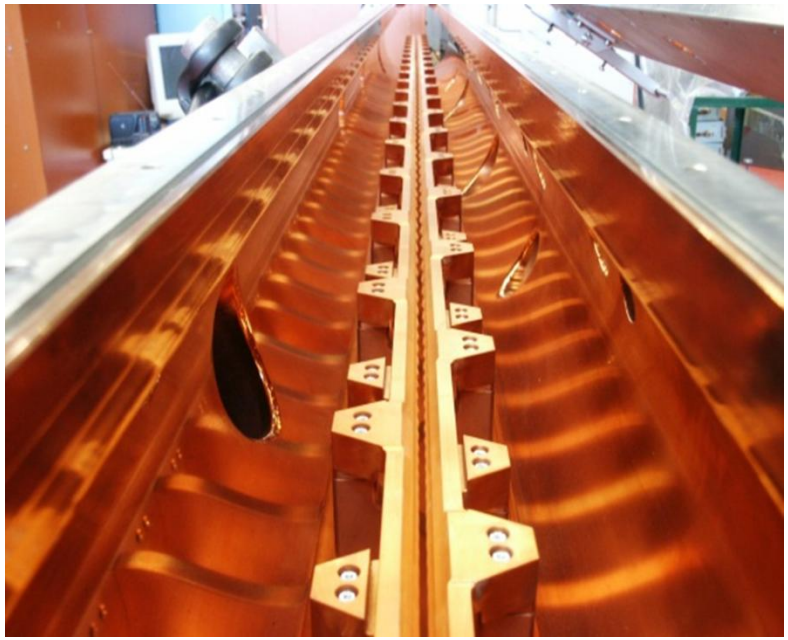
RF test with up to 40 kW/m

Vossberg et al: THPB047

Relativley low voltage

Reduced thermal load

Optimized cooling



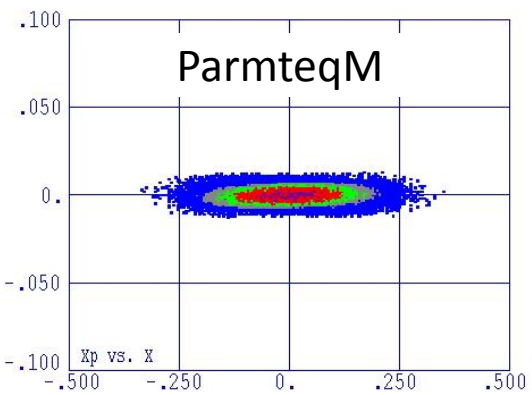
A. Bechtold, NTG

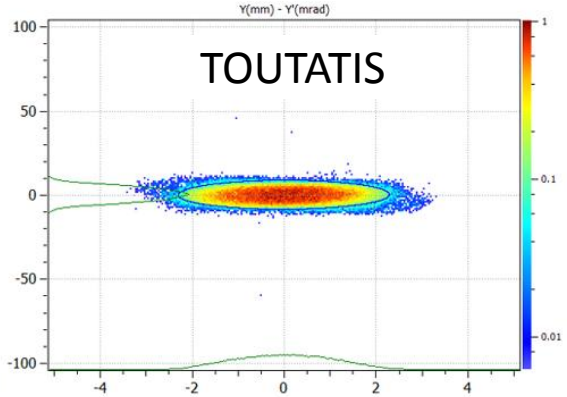
RFQ Beam Dynamics

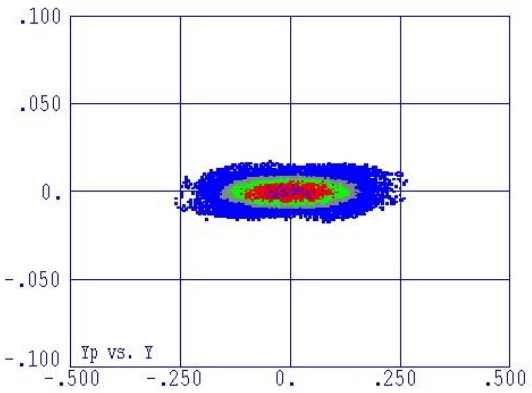
Code benchmarking

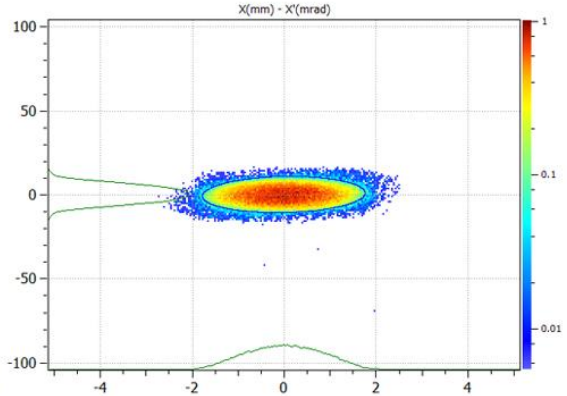
ParmteqM – TOUTATIS

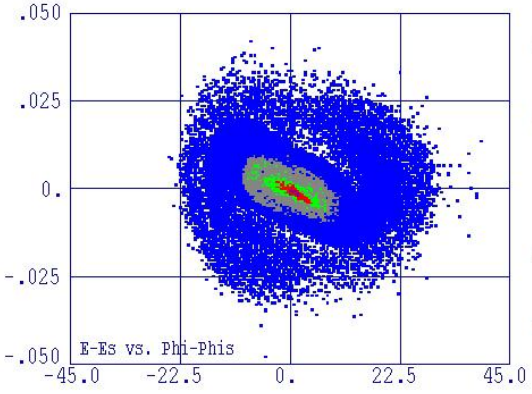
Excellent agreement
Very small emittance growth

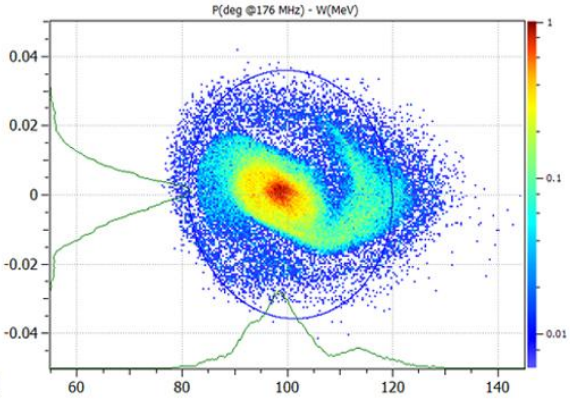






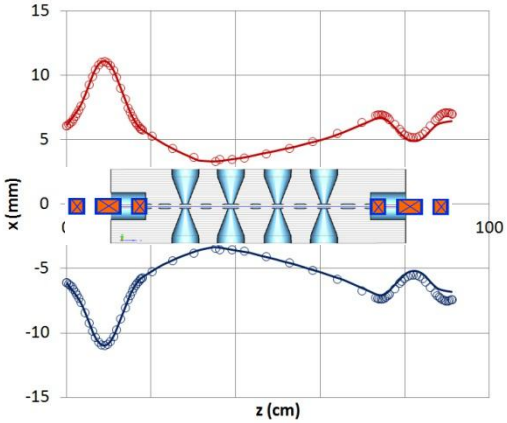


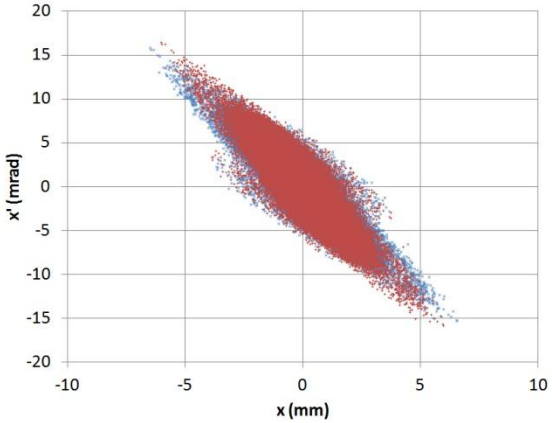


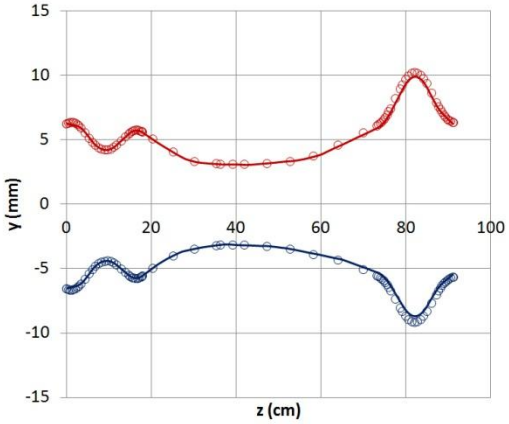


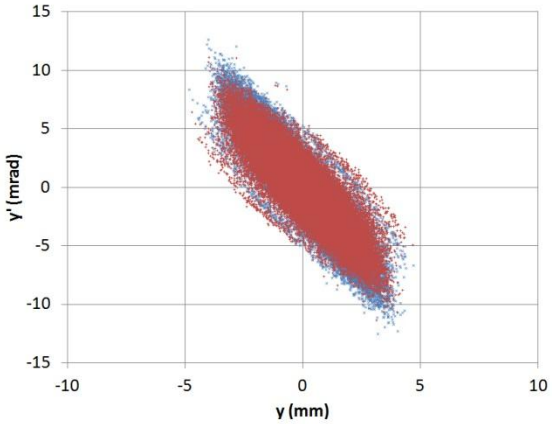
Code Benchmarking

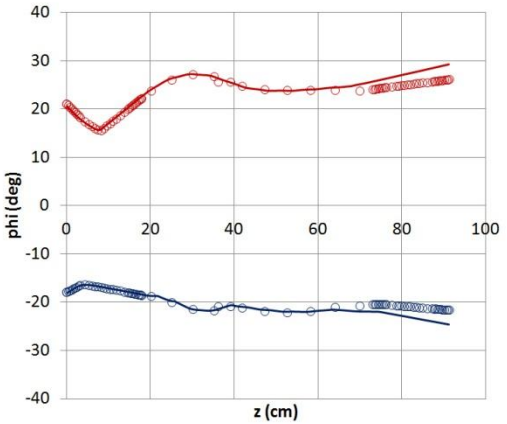
LORASR-TraceWin

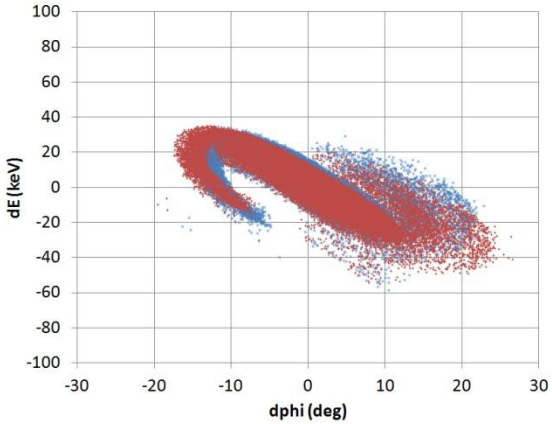












Extraordinary agreement between the two codes

Left: 100% envelopes
100000 particles

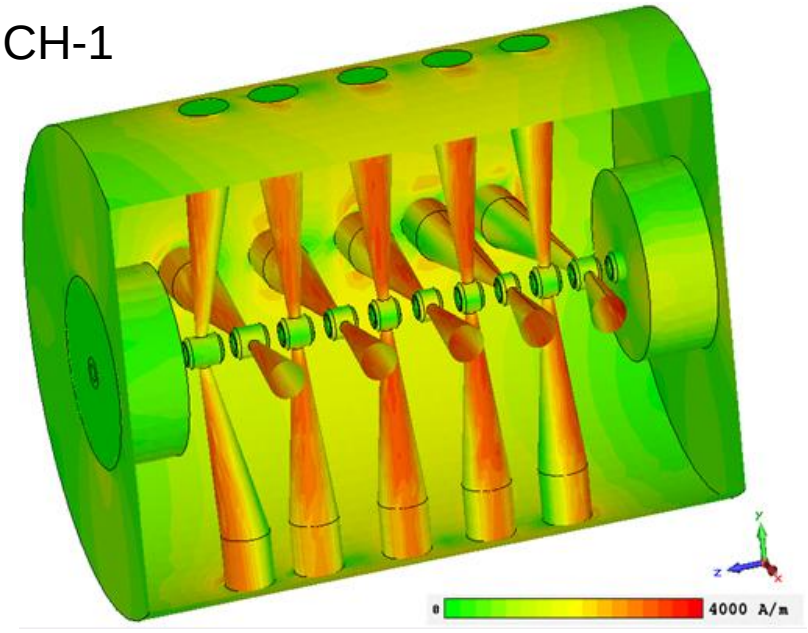
Solid line: TraceWin
Dots: LORASR

TraceWin

LORASR

Room Temperature CH-Cavities

CH-1

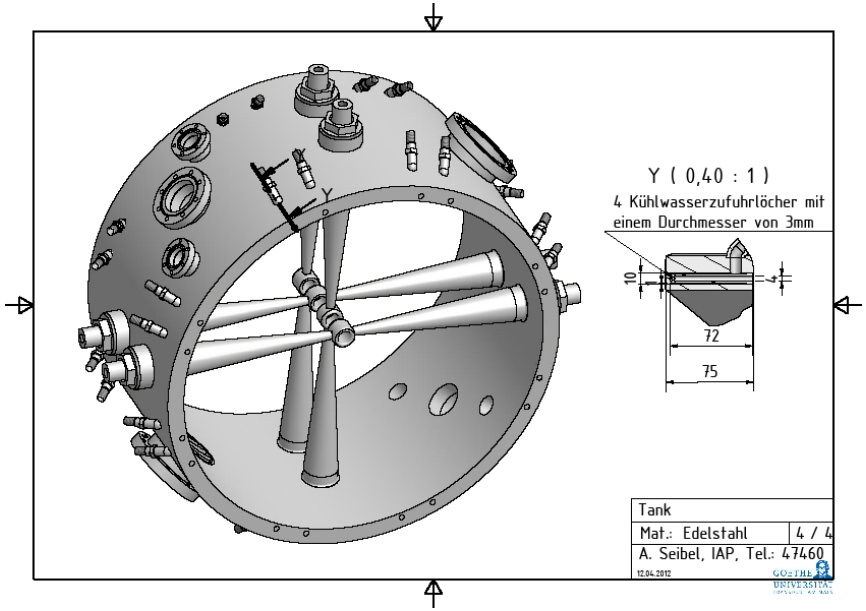


Parameter	CH-1	CH-2	Unit
Frequency	176	176	MHz
Duty factor	100	100	%
Z_{eff}	113	100	MΩ/m
U_{eff}	1.03	1.14	MV
P_c	16.5	18.5	kW

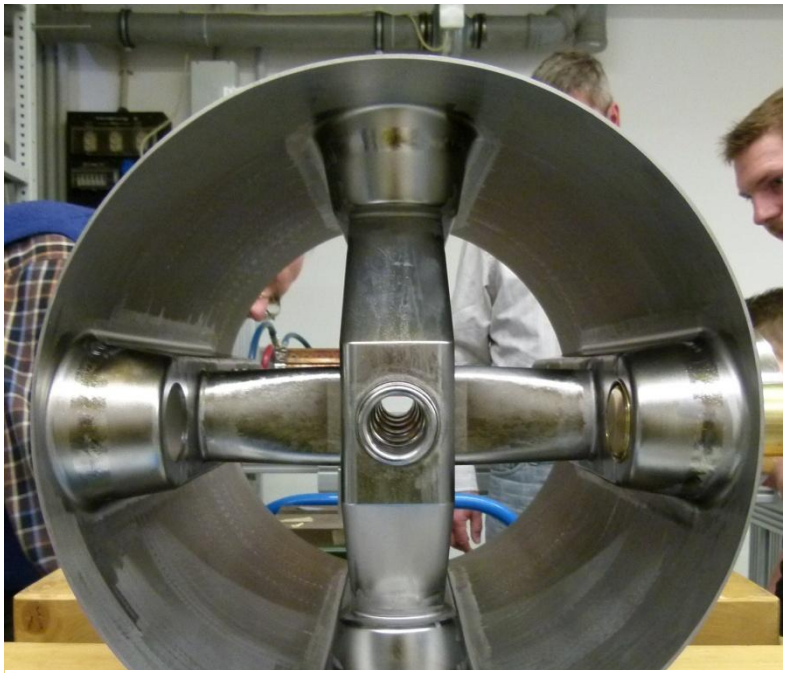
Mäder et al: THPB009

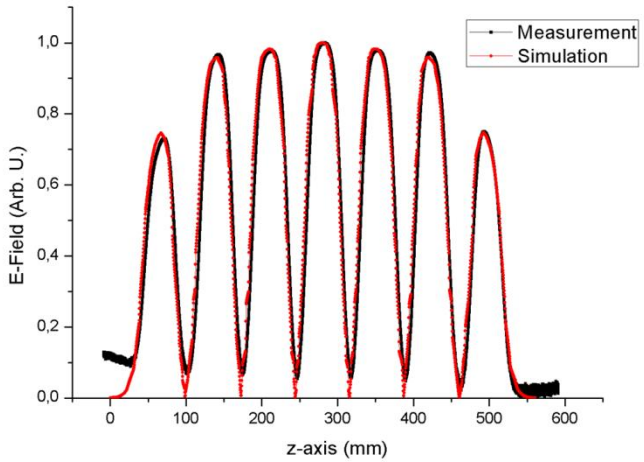
Prototype cavity presently under construction

RF test up to 40 kW/m



Superconducting CH-Prototype





Busch et al: TUPB071

First cryogenic test in October

Thank you