STATUS OF THE C-BAND RF SYSTEM FOR THE SPARC-LAB HIGH BRIGHTNESS PHOTOINJECTOR

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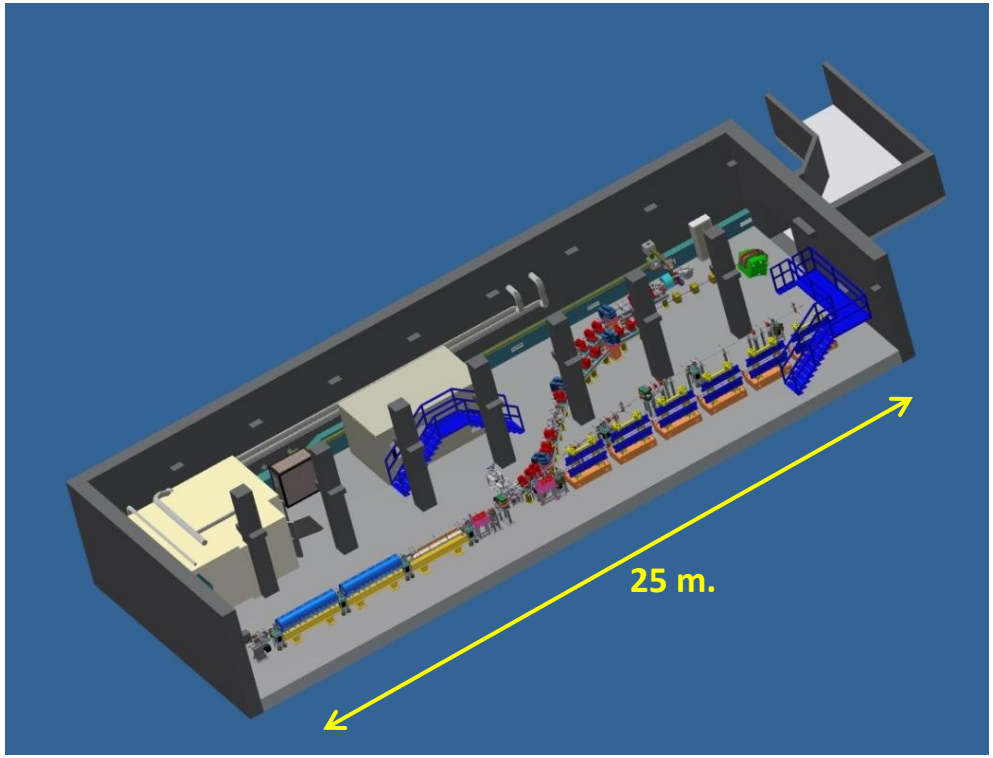

SPARC-LAB is a facility aiming to explore the physics of high brightness, low emittance, high peak current e- beams.
SPARC-LAB integrates a 150 MeV S-band injector with a line of pm undulators f or SASE/FEL experiments and a high power laser system (FLAME) for plasma acceleration research

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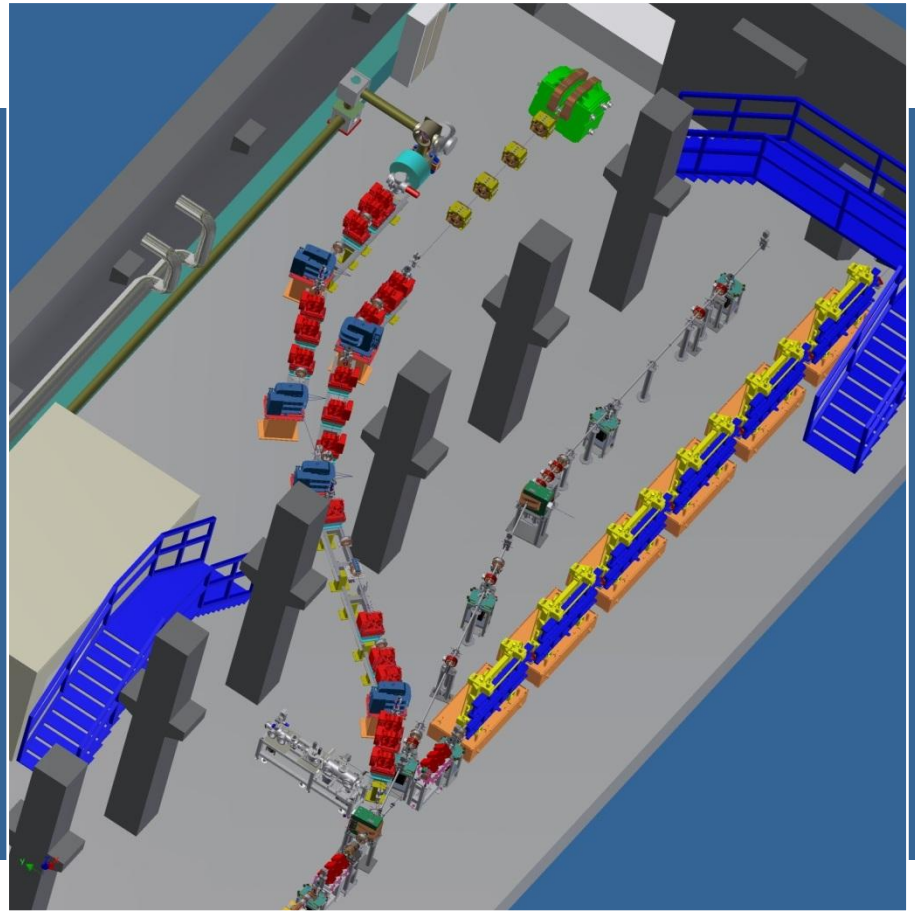

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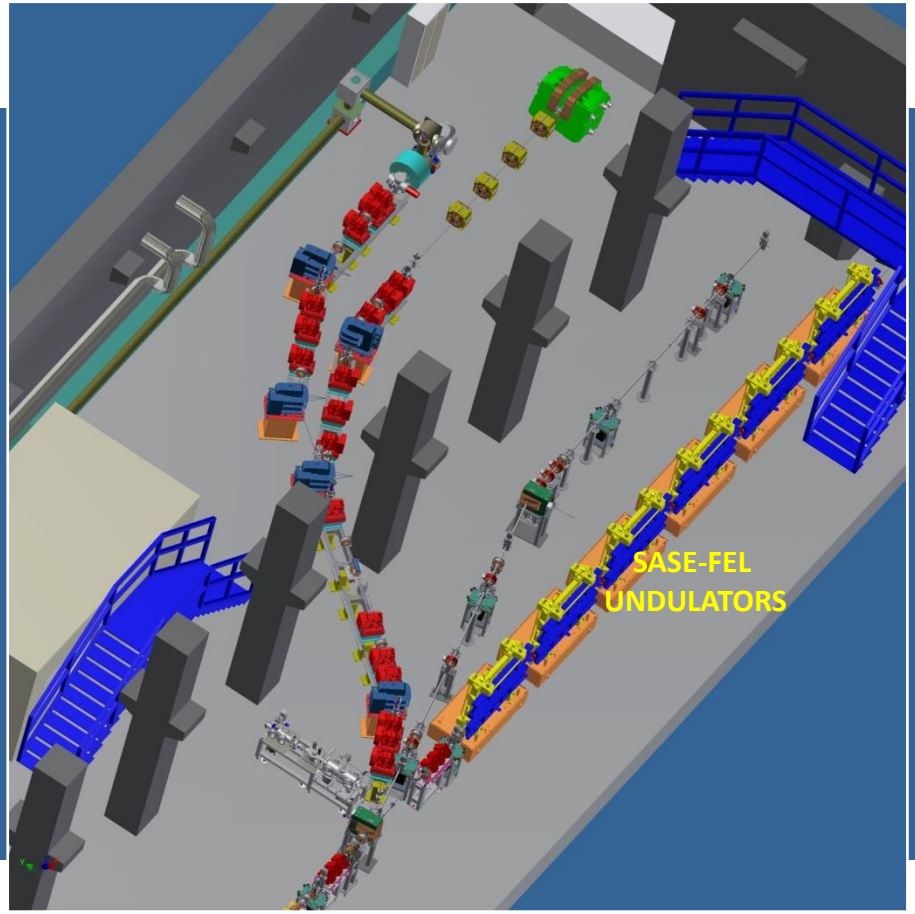

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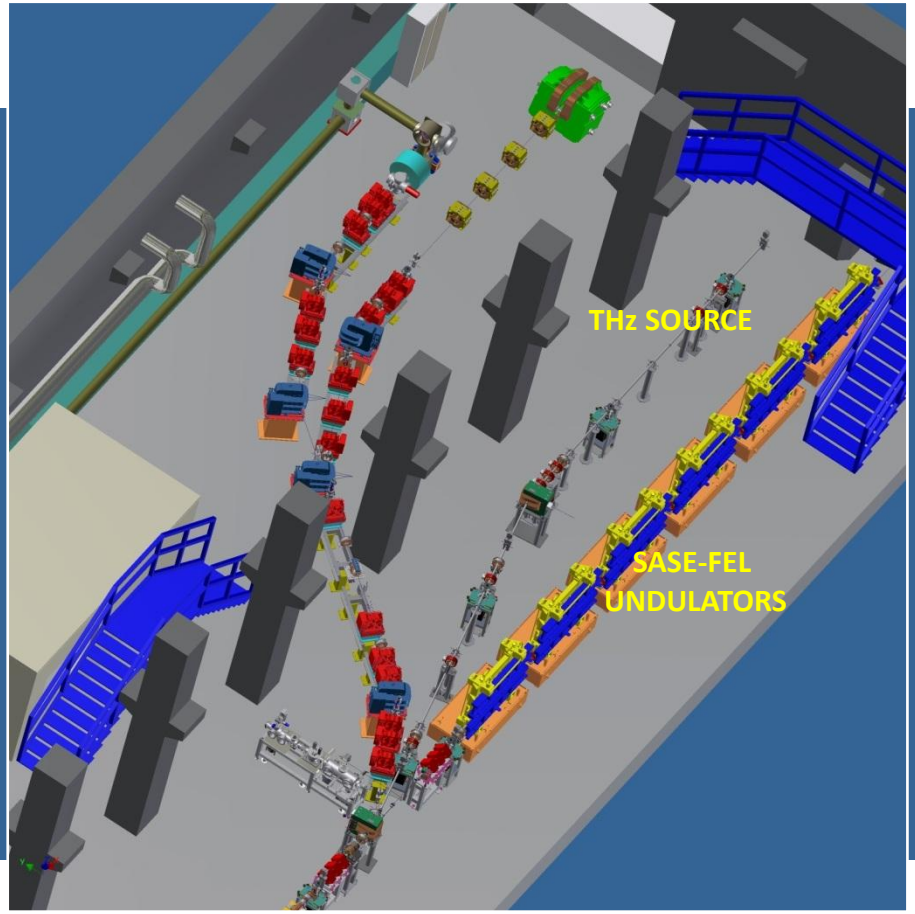

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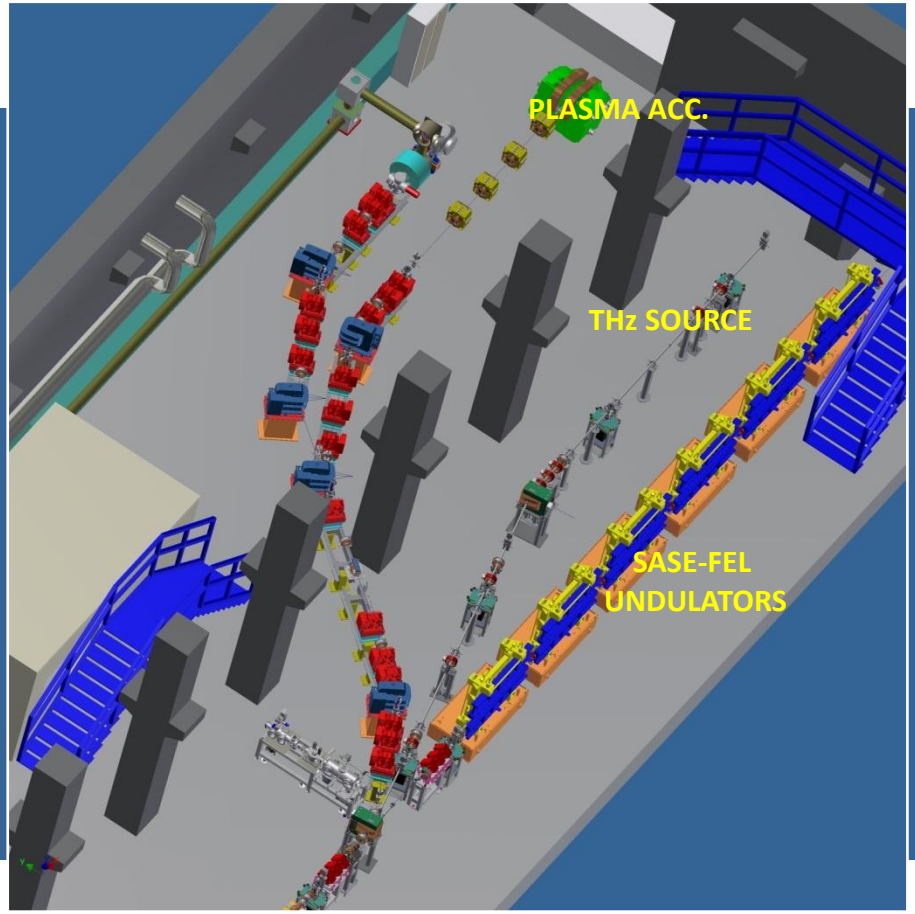

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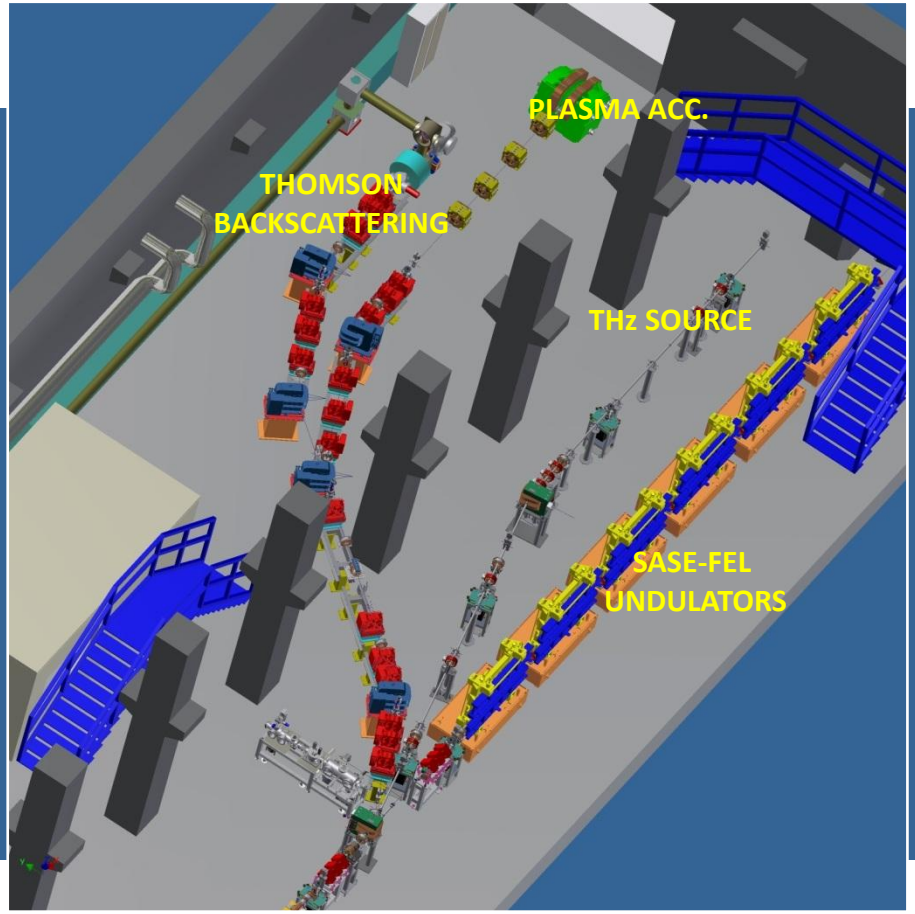

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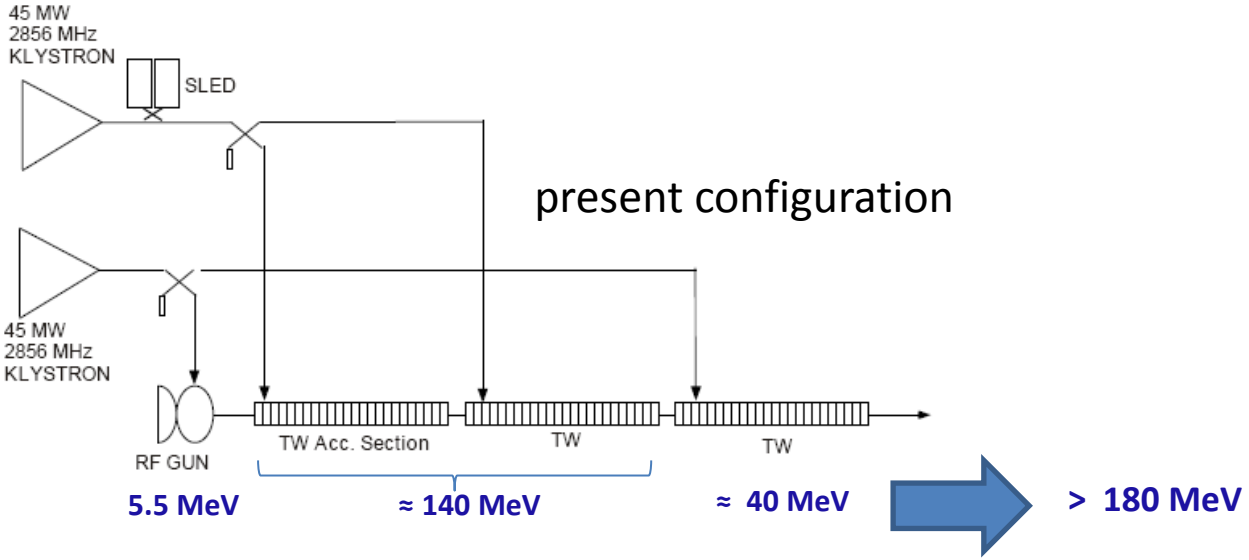
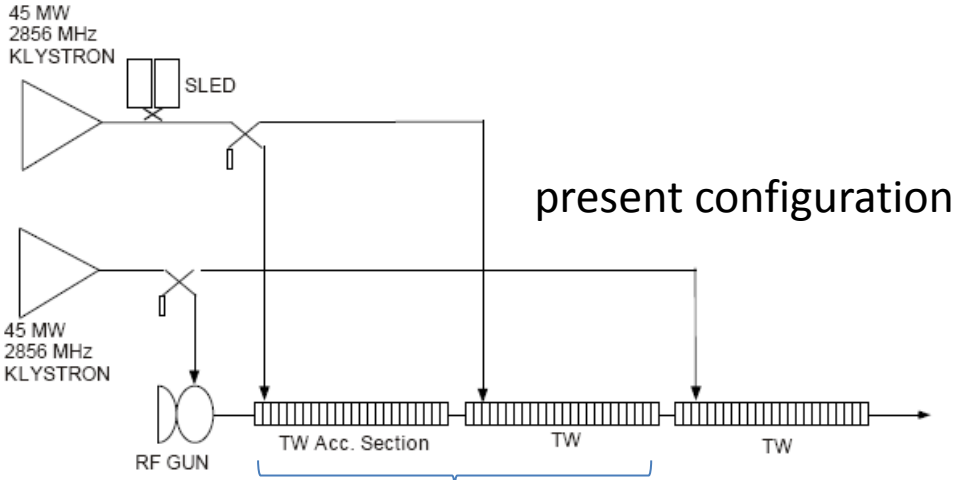
SPARC energy upgrade

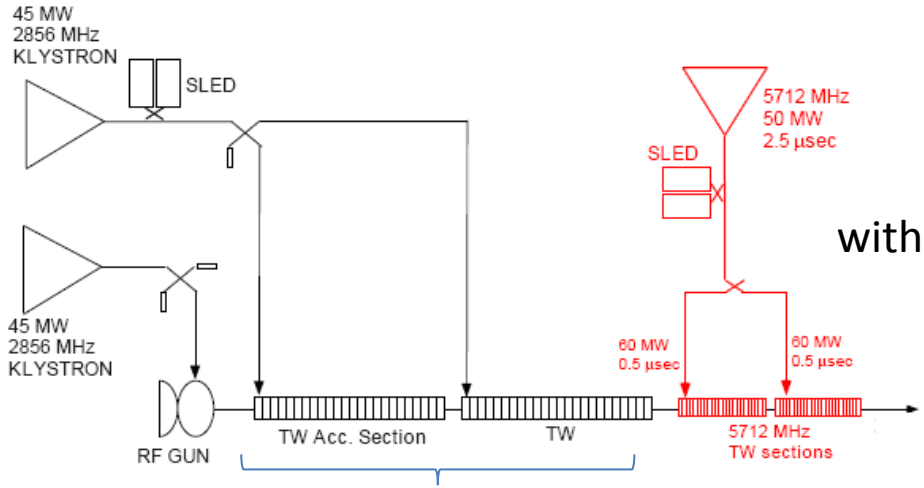


SPARC energy upgrade



present configuration

5.5 MeV **≈ 140 MeV** **≈ 40 MeV** **> 180 MeV**



with the C-band

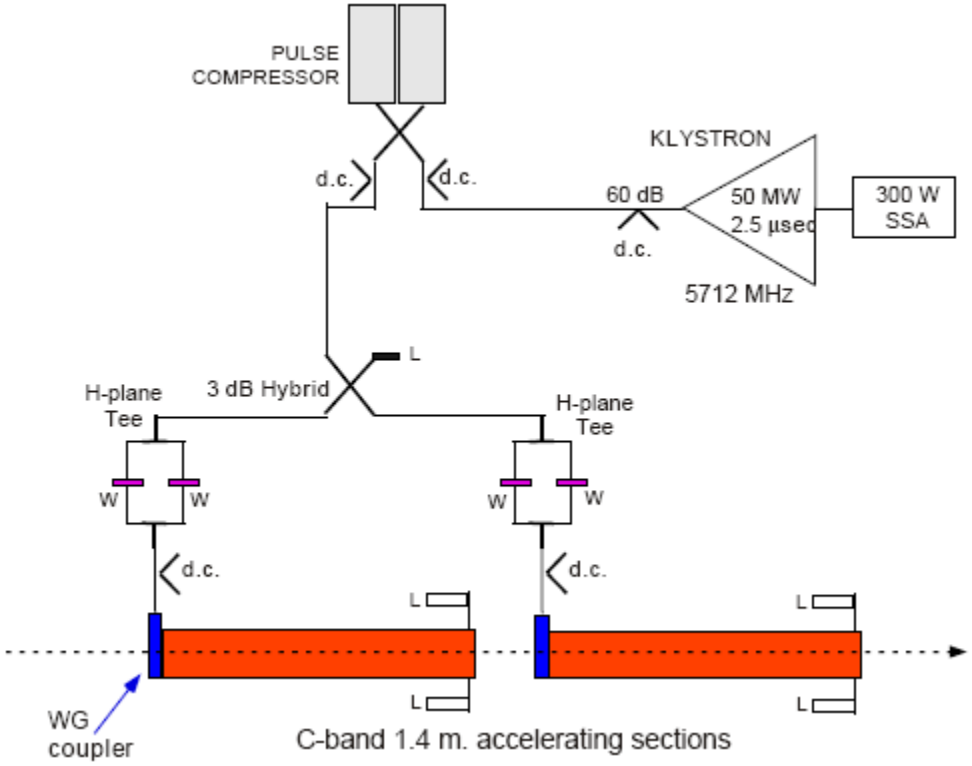
5.5 MeV **≈ 140 MeV** **≈ 100 ÷ 110 MeV** **≈ 240 ÷ 250 MeV**

Motivations to upgrade the SPARC linac with a C-band system

a) increase of the beam energy to ≈ 250 MeV due to the higher electric field of the C-band sections

b) study and operate a double frequency linac

c) improve the performances of the SPARC-Lab experiments

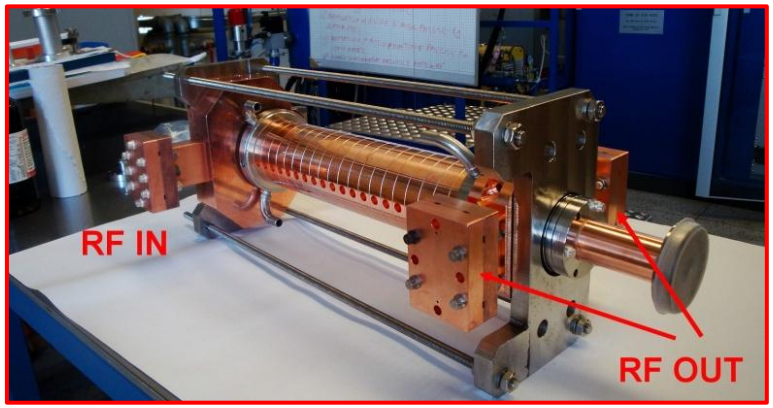


Development of a C-band accelerating structure

Most important specs.

- Traveling Wave, $2\pi/3$
- Constant Impedance (*easy fabrication, less expensive)*
- Large iris radius (*better pumping speed, higher v/c, lower* $E_{surface}$)
- Beam-pipe coupling (*no slots on end-cells*)

Cavity prototype



POWER TESTED at KEK

50 cm long including IN-OUT couplers
20 RF cells

Max Input power:	110 MW/ 300 ns / 50 pps
Gradient achieved:	55 MV/m
Breakdown rate :	3×10^{-4} bpp/m

Development of a C-band accelerating structure

Most importa

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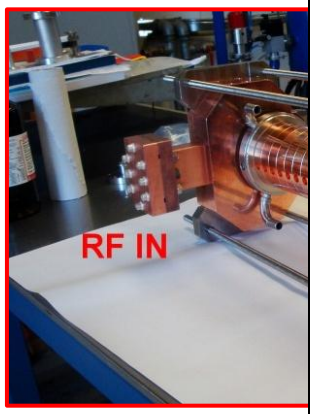
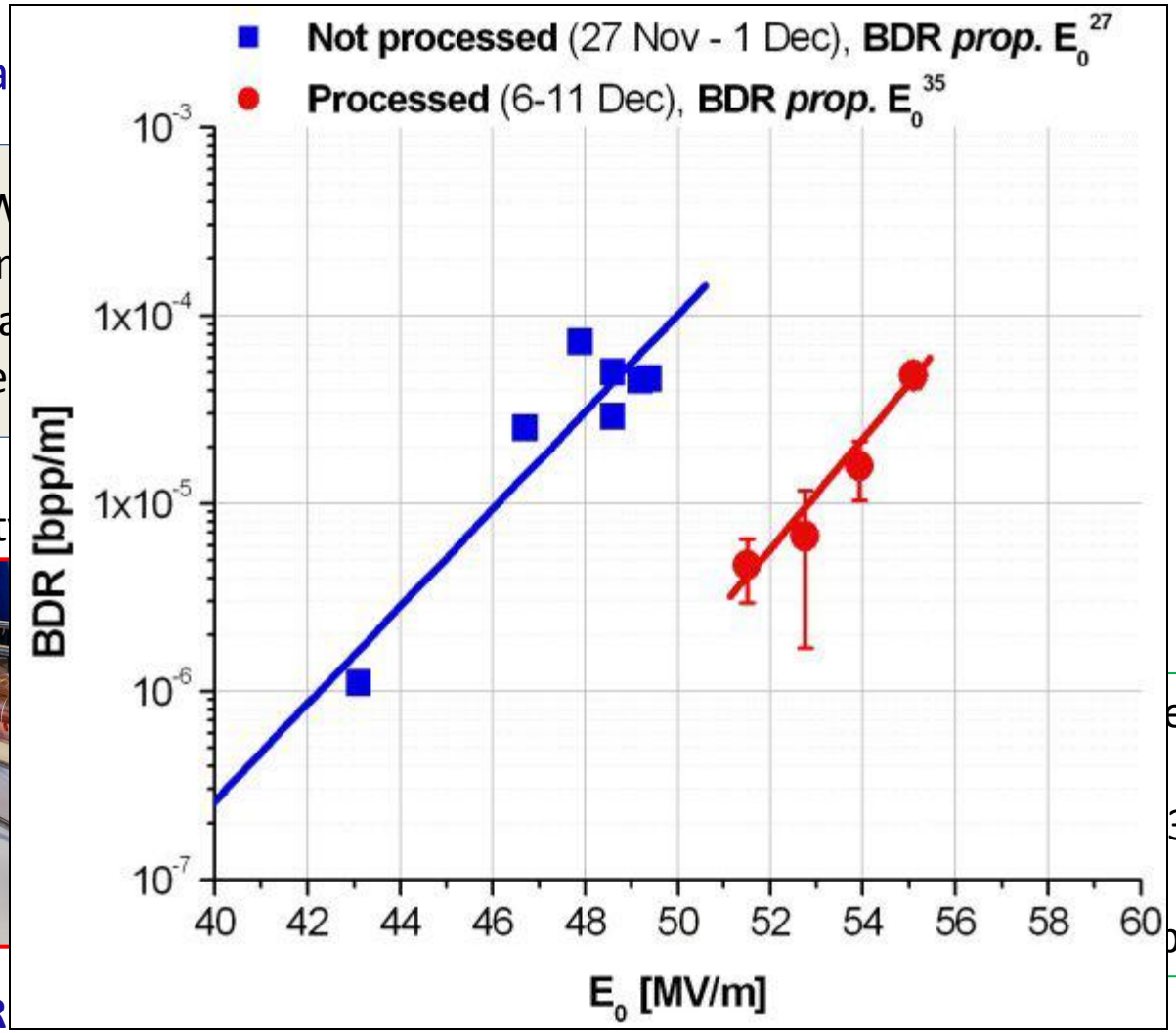
- Large iris ra
- Beam-pipe

Cavit



POWER

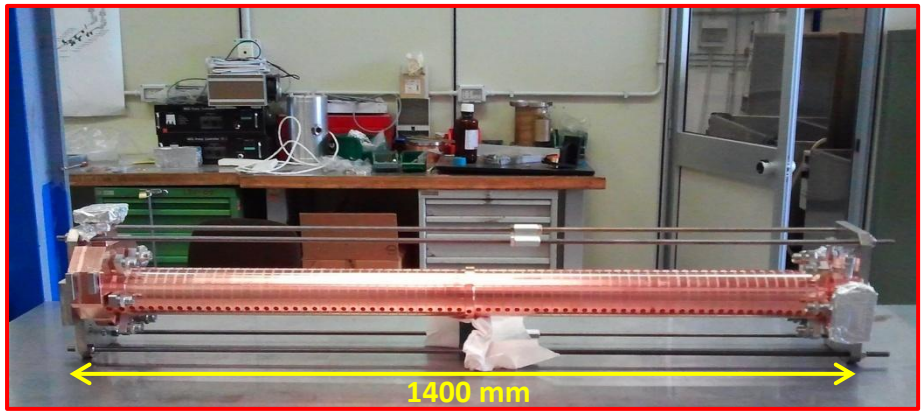


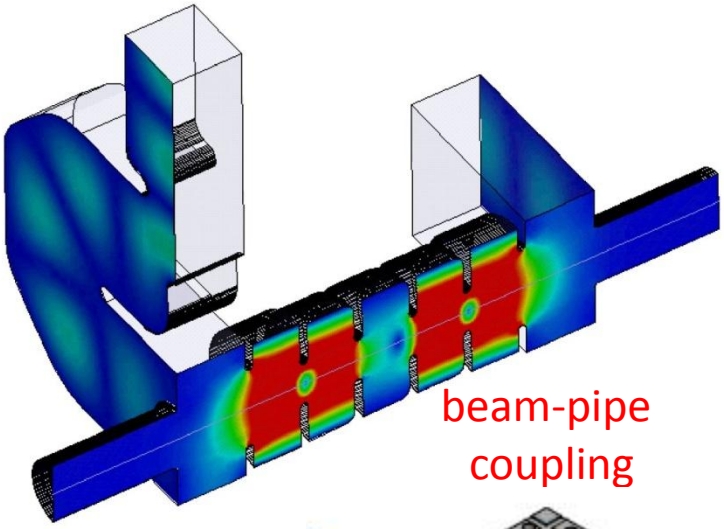
ers

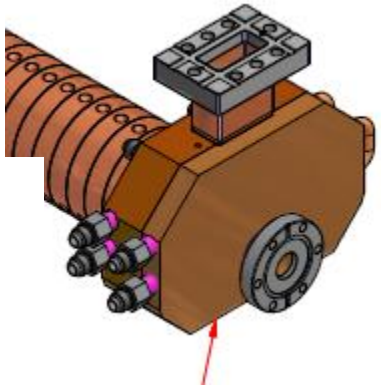
300 ns / 50 pps

p/m

The actual accelerating sections are in fabrication.
The first one is completed and ready for power testing

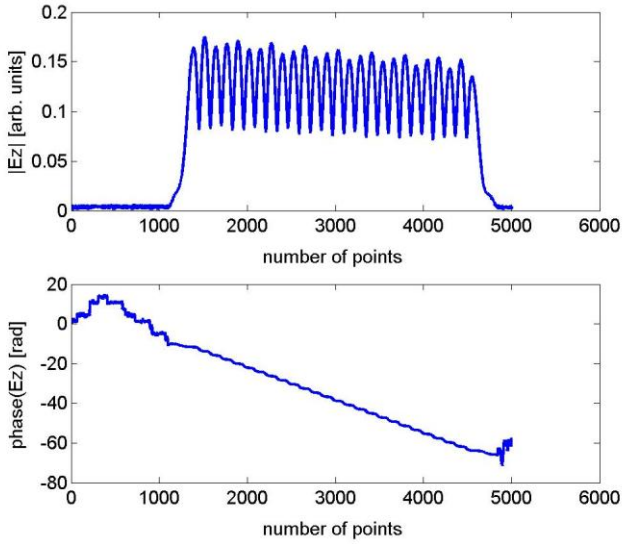






Main specs of the actual sections

type	TW, CI, 2p/3, disk loaded
coupling	beam-pipe
n. of cells	71
Iris radius	7 cm
v/c	0.028
Shunt-impedance	83 MΩ/m
Filling time	150 nsec
E_{surf}/E_{acc}	2.17
Total length with cpl's	1400 mm



before
tuning

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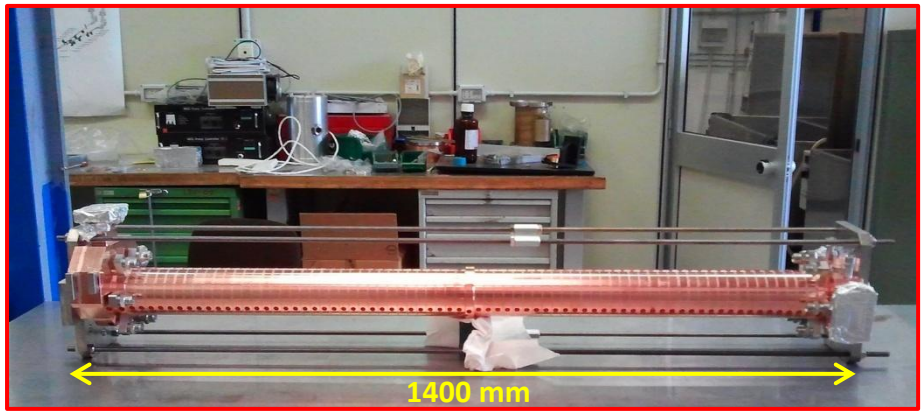
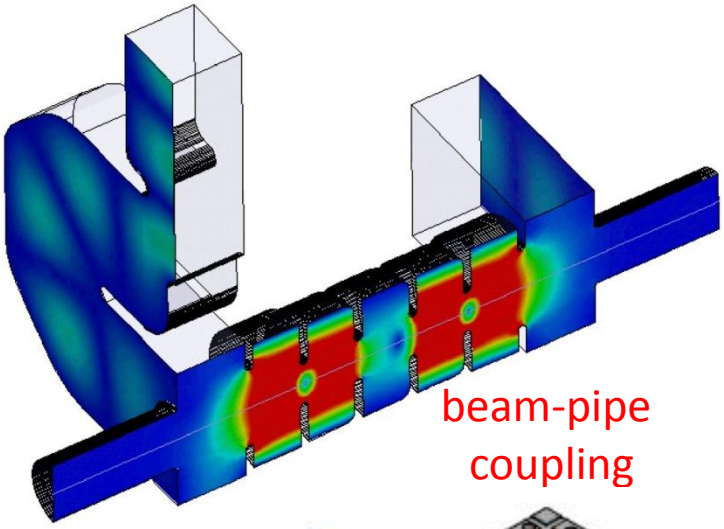
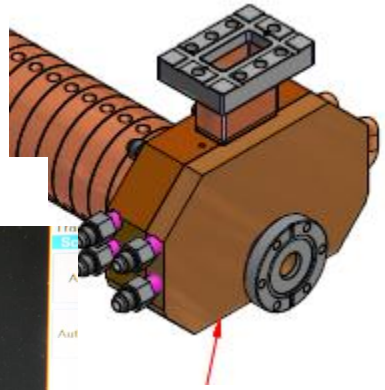
The first one is completed and ready for power testing







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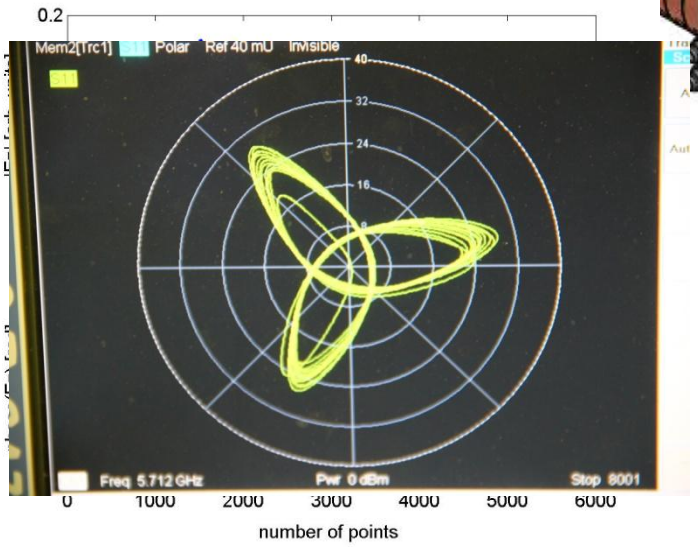
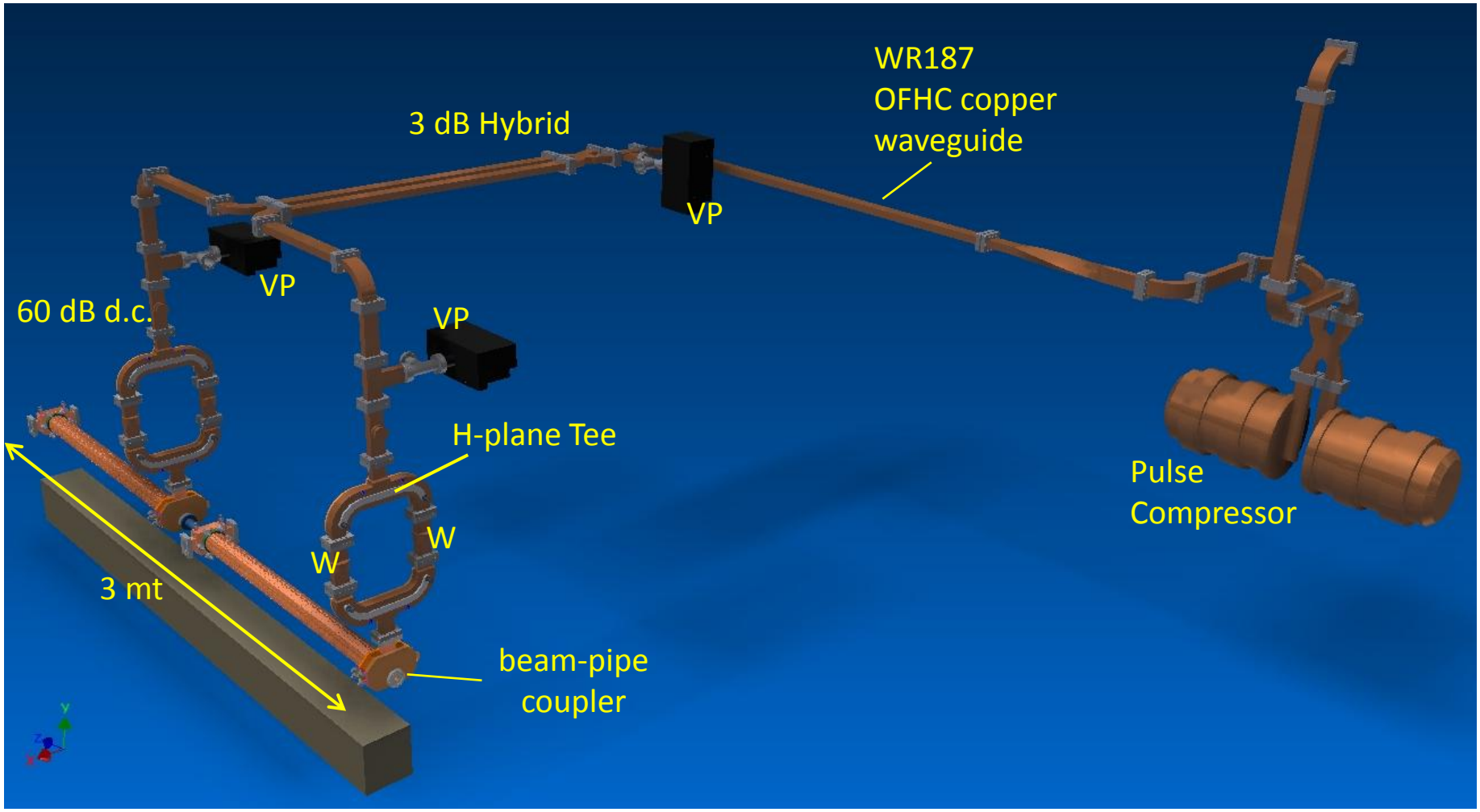


before tuning

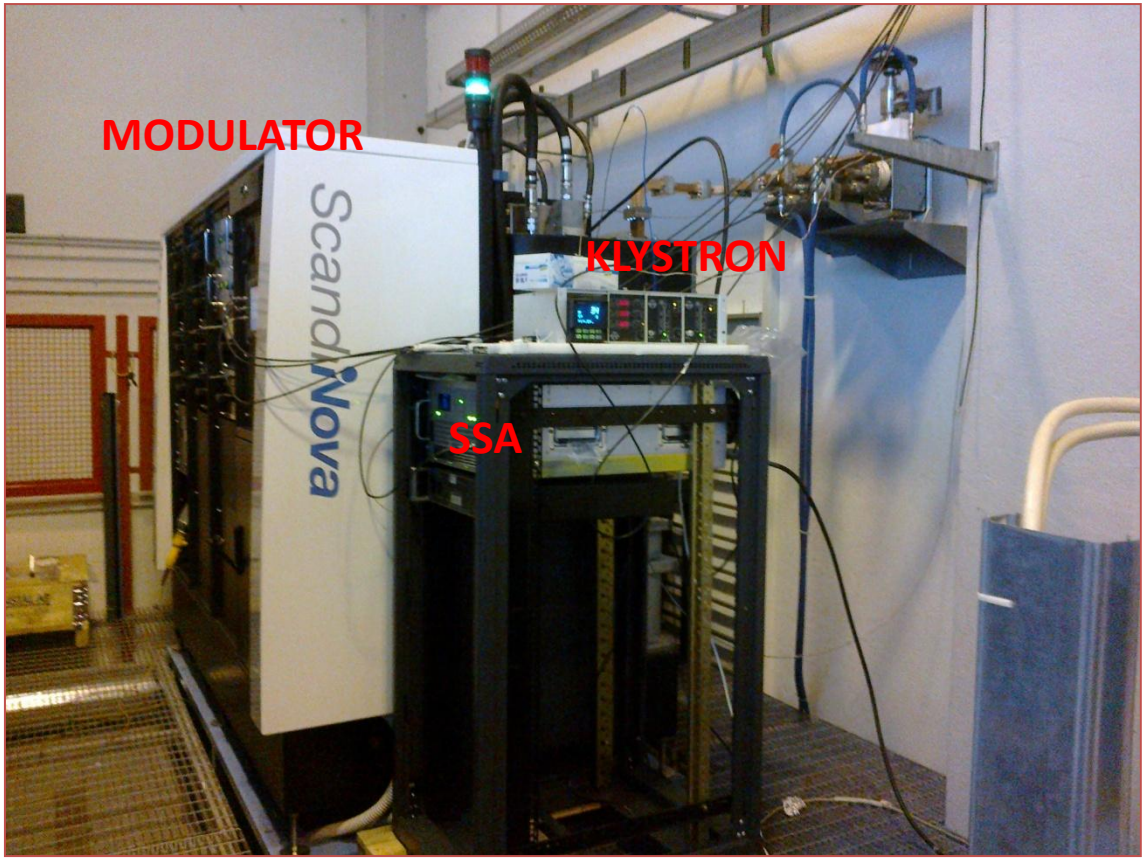
WAVEGUIDE NETWORK



Installation completion …… December 2012.

Commissioning …….. Jan – Febr. 2013

RF POWER STATION



Full Solid State Modulator
ScandiNova
350 kV – 320 A
3 µsec – 10 pps

Klystron
Toshiba E37202
5712 MHz
50 MW – 2.5 µsec – 10 pps

Solid State Amplifier
MITEC Telecom
C-band - 400 W – cw
Broadcasting product

Latest test results on dummy load

40 MW – 2 µsec – 10 pps