



EURISOL DS Project

TASK 7: Proton Accelerator design

Deliverable **D6 - High Energy Beam Transport**

Design report

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RADIOACTIVE ION BEAM FACILITY*

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Duration of the project: *54 months*

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Abstract

The present document describes the High Energy Beam Transport section (HEBT) of the EURISOL DS Driver Accelerator. The HEBT consists of three cw beam splitters and five beam transport lines. Its function is to transport with low losses the H^- , H^+ , D^+ and ${}^3\text{He}^{++}$ beams, accelerated by the driver linac, to the five RIB production targets of the EURISOL facility. Unique peculiarity of the EURISOL HEBT is its capability of feeding, in cw mode, two or more targets in parallel with high power proton beams.

A new, simple method for splitting a high power, continuous wave (cw) proton beam in two or more branches with low losses has been developed. The system can deliver up to 4 MW of H^- beam to the main radioactive ion beam production target, and up to 100 kW of proton beams to three more targets, simultaneously. A three-step method is used, which includes magnetic neutralization of a fraction of the main H^- beam, magnetic splitting of H^- and H^0 , and stripping of H^0 to H^+ . The method allows slow raising and individual fine adjustment of the beam intensity in each branch. The design and the performance of the beam splitter and the transport lines are presented.

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1. Introduction

One of the requirements of the European Isotope Separation On-Line Radioactive Ion Beam Facility (EURISOL) is the possibility of delivering, simultaneously, 1 GeV, continuous wave (cw) proton (or H⁺) beams to a neutron converter (up to 4 MW), and to one or more direct targets for radioactive ion beam (RIB) production (up to 100 kW each). Once the main beam is set up in the 4 MW target, the beam on each of the three direct targets must be raised slowly, to avoid dangerous thermal and mechanical stresses, and finely adjusted to the required value for optimum RIB production. This operation must be done without significantly perturbing the main 4 MW beam. The EURISOL driver is designed to accelerate to 1 GeV up to 5 mA of H⁺ beam (in addition to 100 μA of ³He⁺⁺ at 2 GeV and 5 mA of deuterons at 250 MeV). Another requirement is a very low rate of beam losses, below 1 W/m to allow hands-on maintenance [1] (see Deliverable D/-Beam Loss Calculations).

The High Energy Beam Transport section (HEBT) is the part of the EURISOL Driver (Figure 1.1) that allows to transport the H, D and ³He beams accelerated by the High-β linac (see Deliverable D4) to the RIB production target stations.

It includes the following main sub-sections:

1. Beam Splitter
2. 4 MW Beam Transport line
3. 100 kW Beam Transport lines
4. 1.2 MW Beam Transport lines

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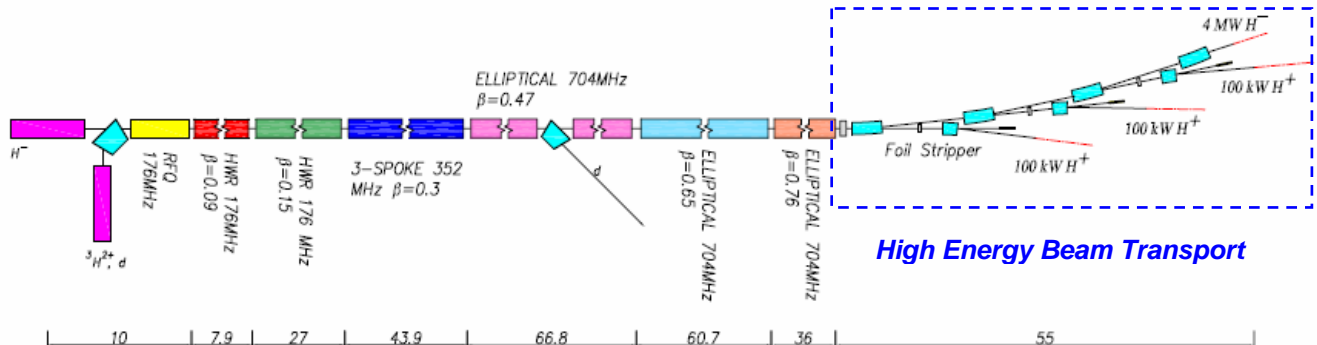


Figure 1. 1. Schematic layout of the EURISOL Driver accelerator (not to scale) with the HEBT section (highlighted in the blue square).

All the required characteristics could be reached with the development of a new beam splitting scheme based on magnetic neutralization of a H^- cw beam. This did not require risky technological breakthroughs, but simply state-of-the-art stripper foil technology and a new scheme of magnetic neutralization based on a short magnetic chicane [2].

The HEBT system allows transport of ${}^3\text{He}^{++}$ beam as well to any of the 100 kW stations, and of D^+ beam to a dedicated station.

One of the output beam specifications is the possibility of adjusting the gaussian beam radius at the target. A reference layout of the output lines, able to fulfill the specifications, was preliminarily studied in order to demonstrate its feasibility.

The need to transport charged beams with opposite signs requires the use of bipolar power supplies for all the magnetic elements of the HEBT.

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2. Output beam specifications

The main HEBT output beam specifications are listed in table 1. These values are dictated by the requirements of the RIB production target stations.

Table 1

Output beams	H ⁻	H ⁺	D ⁺	³ He ⁺⁺
current (emA)	4	0.1	4	0.1
A/q	1/1	1/1	2/1	3/2
Energy (GeV)	1	1	0.27	2
Output rms emittance (π mm mrad)				
ϵ_x	<0.4	<0.4	<0.4	<0.4
ϵ_y	<0.4	<1	<0.4	<0.4
ϵ_z	<0.4	<0.4	<0.4	<0.4
Beam power distribution	Gaussian	Gaussian	Gaussian	Gaussian
Shape on target	radial	radial	radial	radial
Rms size (mm)	$\sigma = 15$	$\sigma = 15$	$\sigma = 15$	$\sigma = 15$
Max radius (mm)	100	100	100	100
max beam losses (W/m)	1	1	1	1
max losses in beam dumps (W)	-	1000	-	-



3. The beam splitter

A natural way to split a H^- cw beam is to strip part of it, in order to change its A/q and separate it from the parent beam by means of a dipole magnet. Different techniques have been developed for this aim, mainly combining foil stripping, magnetic stripping and laser stripping [3-6]. The main problems encountered were beam losses, beam emittance growth, unacceptably short foil lifetime, or insufficient laser power. These problems are even more pronounced in the EURISOL case of high power, cw beam, with the requirement of low beam losses for hands-on maintenance. A simple foil stripper leads to three different beams (H^- , H^0 and H^+), and could not hold the 4 MW beam power. Laser stripping is a very successful and promising technique that, in our case, would require high power, cw lasers, not available at present. We propose a technique that fulfills all EURISOL requirements in a simple and cost effective way, first separating part of the beam by magnetic neutralization, and then transforming it in a proton beam by foil stripping. This method, which uses in a different way elements of the LAMPF PSR injection system [3], can lead to very low losses and long foil lifetime, and can be repeated along the main beam line.

3.1 Fractional neutralization of H^- beam by Lorentz stripping

When an H^- ion moves in a magnetic field B , it experiences a Lorentz force that bends its trajectory and also tends to strip its electrons. For a particle travelling at a speed β , a transverse magnetic field in the laboratory frame produces a transverse electric field in the rest frame of the particle. According to the Lorentz transformation of the fields,

$$|E_{\perp}| = \beta\gamma c |B_{\perp}|.$$

Where c is speed of light and γ the relativity parameter. This electric field can remove the extra

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electron of a H^- ion; the H^- lifetime, in its rest-frame, has been expressed by Scherk [7]:

$$\tau(z) = \left(\frac{A_1}{E_\perp} \right) \exp\left(\frac{A_2}{E_\perp} \right), \quad \text{with} \quad \begin{cases} A_1 = 2.47 \times 10^{-6} \text{ V} \cdot \text{s/m} \\ A_2 = 4.49 \times 10^9 \text{ V/m} \end{cases}.$$

Where E_\perp is given in V/m. The fraction f of the stripped ions per unit path length z can be expressed as [8]:

$$\frac{df}{dz} = -\frac{f}{(\beta\gamma c\tau)} = \left(\frac{f B}{A_1} \right) \exp\left(-\frac{A_2}{(\beta\gamma c B)} \right).$$

For 1 GeV H^- ions, a magnetic field of several kilo-gauss is sufficient to strip the first electron, due to its low binding energy (0.755 eV). Magnetic stripping is an ideal tool for neutralizing high energy H^- ions, since the H^0 production rate can be finely adjusted by varying B . Moreover, no H^+ is produced, due the large binding energy (13.6 eV) of the remaining electron in the H^0 ground state. To detach this electron, an extremely high magnetic field (around 40 T) would be required; for this reason, to produce H^+ , either H^0 can be excited to a level with low binding energy before passing it through a magnetic stripper [4], or other methods must be used (e.g. a carbon foil stripper).

An unwanted side effect of the magnetic neutralization is emittance growth. The H^- ions travel in a curved trajectory in the magnetic field; when they lose their extra electron, the so generated H^0 will approximately keep the instantaneous direction of the tangent of this curve. Particles neutralized at the very beginning will maintain the direction of the incoming H^- beam, while particles neutralized at the very end will have the same direction of the one coming out. Since stripping is a probabilistic process, the final H^0 atoms will be distributed between these two angles and the beam angular spread will be roughly increased by this amount [9]. Another source of emittance growth is the fact that, due to the curved trajectory in the magnet, the H^0 particles are created with transverse coordinates that depend on their position along the curve. The transverse size of the neutral beam is roughly increased by the sagitta of this curve. It is clear that the shorter is the magnet, the less



emittance growth will be produced by these two effects.

A method to reduce the emittance growth is using a magnetic wiggler. The bending curve is divided in shorter sections, and all angular spreads produced by the different sections are superimposed to each other [9]. Moreover, a wiggler can be designed in order to keep the output H^- beam on the same axis as the input one, no matter what the field strength is; this allows changing the H^0 fraction without perturbing main beam final trajectory.

3.2 The EURISOL beam splitting scheme

A three-step splitting scheme was developed, that combines a magnetic neutralizer to extract a 100 kW H^0 beam from the original ~ 4 MW H^- beam, a bending magnet to separate H^0 from H^- , and then a stripper foil on the H^0 line to strip the neutral beam into a proton beam that can be transported to the targets (see Figure 3.1). One more dipole separates the protons from the residual H^0 particles, that are collected by a beam dump. This scheme can be repeated several times to produce cw beams in parallel, provided that the main beam is not perturbed by the magnetic neutralizer.

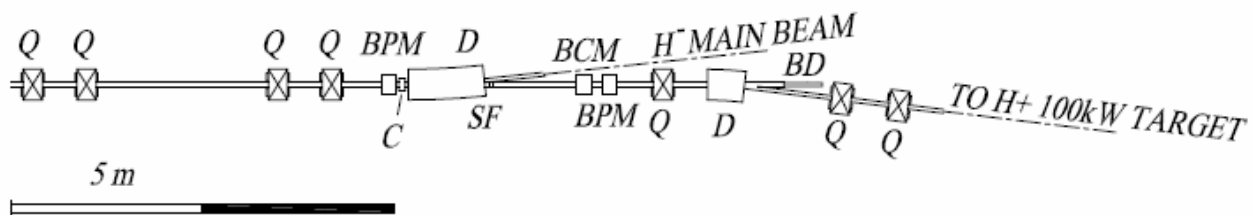


Figure 3.1. Splitter section based on a wiggler magnet (C). After the first bending magnet (D), H^- and H^0 beams are separated and sent, respectively, to the second splitter section and to the stripper foil (SF), to be stripped into H^+ . Q = quadrupole magnet; BD = beam dump; BCM = beam current monitor; BPM = beam profile monitor.

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The H^- and H^+ beam dynamics has been calculated with the Partran and TraceWin codes [10]. The H^- primary beam, with 176 MHz bunch frequency and 5 mA current, has been simulated using 100000 macro particles with 3×2D gaussian distribution, with normalized rms emittance $\epsilon_x = \epsilon_y = 0.3 \pi \cdot \text{mm} \cdot \text{mrad}$, $\epsilon_z = 0.4 \pi \cdot \text{mm} \cdot \text{mrad}$ and $\Delta E_{\text{rms}} = 450 \text{ keV}$. This is according with the output beam distribution obtained in the driver linac simulations (see deliverable D4- High β linac).

3.3 Beam line components

Matching sections

Four quadrupoles in front of each splitting section are needed to allow beam focusing, as well as one quadrupole before the second bending magnet in the proton section, and two quadrupoles after it. The quadrupoles total aperture is 10 cm.

Magnetic neutralizer

The H^- beam is neutralized inside an unconventional wiggler magnet (Figure 3.2), which is a chicane consisting of three dipole magnets separated by 40 mm (required to house the coils), with the same length of 30 mm but different magnetic field. The necessary gap height is estimated to be 30 mm. The neutralization is concentrated in the center magnet, set at the field strength required to neutralize 2% of the H^- beam (EURISOL requirement); this is about 0.64 T (see graph in Fig. 3.3), easily reachable with standard technologies. The 1st and 3rd magnets are set at one half of this value to have nearly no neutralization.

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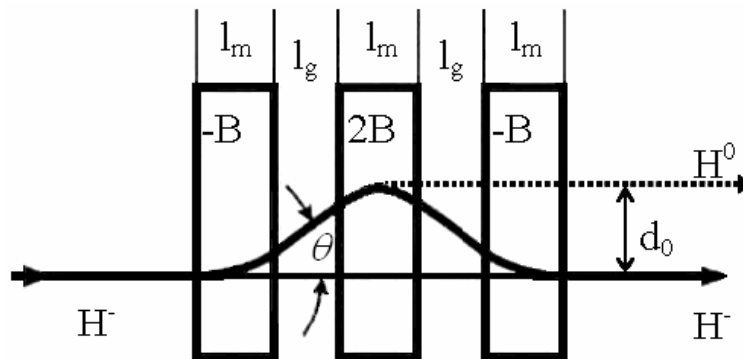


Figure. 3.2. Schematic representation of the wiggler magnet. l_m is the magnet length, l_g the gap between magnets, B is the magnetic field, θ is the deflection angle in the first and third magnets of the wiggler, and d_0 is the final displacement of the H^0 beam from the H one.

The aim of this system is to have a short stripping path, concentrated in the center magnet, to minimize emittance growth, and, at the same time, an optical system that keeps the output H beam unchanged when the magnetic field B is varied. The chicane beam optics is rather insensitive to the dipole fringe fields, since these short rectangular magnets with a small bending angle ($\theta \sim 0.1 \text{ deg}$ at the operation fields) produce a very weak focusing in both the horizontal and vertical planes [11]. The fringe fields have been calculated, for different pole shapes, with the standard 1st and 2nd order approximations [12] used in TRACEWIN and in many other codes. The H beam transport has been simulated with square-edged and Rogowski dipole geometries, as well as with linear fringe field and with no fringe field at all, obtaining always the same results, as expected. A complete field map simulation is anyhow planned as a future development.

Although the total power of the electrons created at the 2nd magnet, and strongly bent by the downstream magnetic fields, is only about 50 W, a cooled collector should be foreseen at the beam chamber walls.

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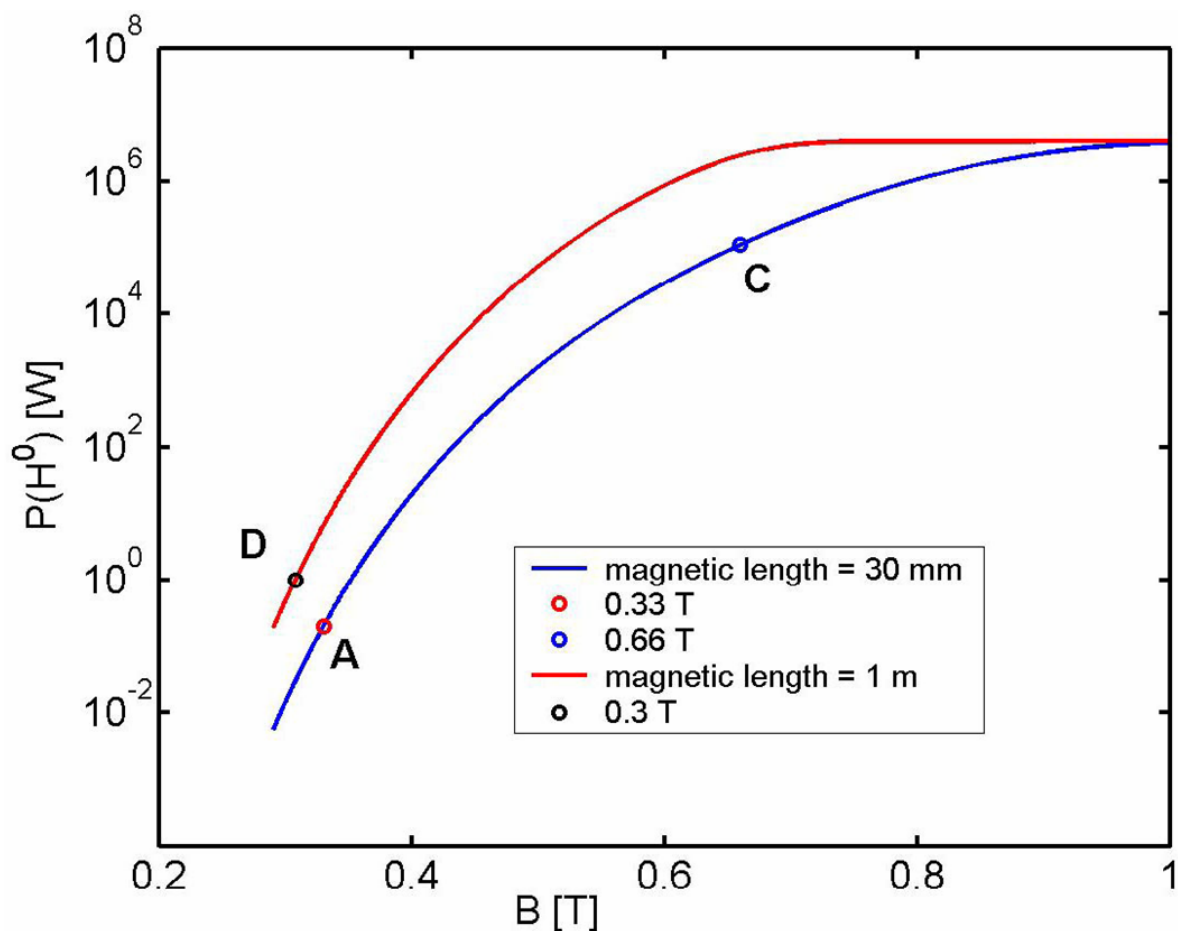


Figure 3.3. Neutralization rate vs B for 1 GeV, 4 MW H⁺ beam in a 30 mm (blue line) and in a 1 m (red line) dipole magnet. The circles represent the working points of: (A) 1st and 3rd chicane dipoles (0.33 T, H⁰ production <0.1 W); (C) center chicane dipole (0.66 T, H⁰ production 100 kW); (D) bending dipole (0.3 T, H⁰ production 1 W/m).



H⁰ beam emittance

The important parameter in the chicane design is the emittance of the generated H⁰ beam. The emittance growth of the parent H⁻ beam was found to be negligible. The H⁰ beam is produced with a 2θ angular spread ($\sin\theta = Bl_m/(B\rho)$) and with a transverse displacement of its axis of $d_0 \sim (l_g + l_m)\theta$. In Fig. 3.4 the transverse phase spaces of the H⁻ and H⁰ beams are shown. The generated H⁰ phase space distribution was calculated starting from the trajectories of the parent H⁻ particles, assumed with a gaussian distribution in the phase space. The total horizontal half angular spread of the H⁻ beam, at the chicane input, is about 1.6 mrad (Fig. 3.4, a). At the chicane output, the centroid of the generated H⁰ beam is displaced in x by 0.11 mm, and its horizontal half angular spread is about 3.3 mrad [Fig. 3.4(c)]. As a consequence, the H⁰ horizontal emittance is increased to $\epsilon_x = 0.78 \pi$ mm mrad, i.e., about 260% of the parent beam one; this is still an acceptable value for transporting the beam to the RIB targets without beam losses.

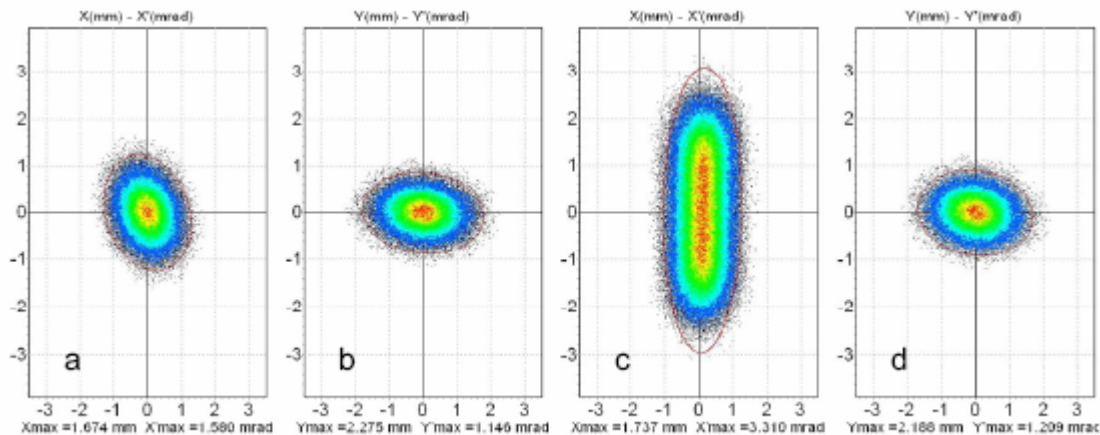


Figure 3.4. Horizontal and vertical phase spaces of the main H⁻ beam at the entrance (left), and of the H⁰ beam at the exit (right) of the second wiggler magnet.



In the H^0 distribution calculation, in order to keep the results independent from the particular choice of fringe field, the rather general approximation of constant magnetic field along the all center magnet was used. This is a conservative assumption; for any pole shape, in fact, the rather low aspect ratio (length/gap height) of the dipole gives a realistic magnetic field distribution which is peaked at its center, thus concentrating around this point the H^0 production and shortening the effective stripping path. For this reason, the H^0 horizontal emittance ϵ_x calculated with realistic fields is expected never to exceed the value calculated with constant field.

Bending magnet

After the magnetic neutralizer, a conventional bending dipole magnet is required to separate H^- from H^0 . To limit the Lorentz stripping of H^- below 1 W/m, the magnetic field is kept at 0.3 T. The dipole aperture is 100 mm and its radius is 18.86 m. Its length is 2 m, giving sufficient separation between the two beam lines (about 10.5 cm) to insert a stripping section at the dipole exit.

Stripper foil

A carbon foil stripper is placed across the H^0 path to turn the neutral beam into a proton beam. In our case, the stripper is inserted 10 cm after the bending magnet. A suitable space is required for the foil and for the horizontal foil changer. A cooled electron collector [13] is foreseen, to collect the electrons produced by the foil.

For 1 GeV, H^0 beam, the stripping efficiency (Fig. 3.5) can be calculated using the following cross sections [14]:

$$\sigma_{01} = 3.0 \times 10^{-19} \text{ cm}^2 / \text{atom}$$

At this energy, a carbon foil thickness of $500 \mu\text{g}/\text{cm}^2$ converts ~99.95 % of all the H^0 particles to



protons, resulting in only ~50 W of unconverted H^0 beam. A part of these H^0 atoms, however, leave the foil in an excited state with $n > 2$ and may be stripped in the subsequent magnets, creating a halo and possible beam losses [9] [15] [16]. The current of this part is roughly one order of magnitude lower than the total H^0 one. In our case, these losses are not expected to exceed a few watts. Moreover, since the cross section for electron pickup is very small for energies above 100 keV [17], the H^- fraction is negligible.

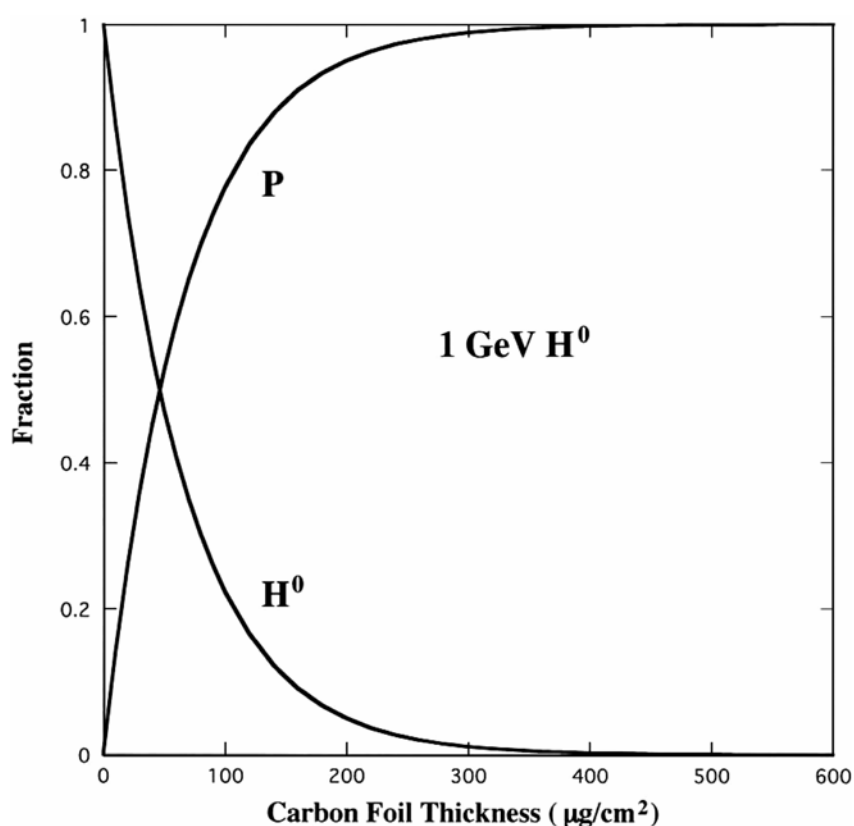


Figure 3.5. Proton and H^0 fraction versus carbon foil thickness, for a 1 GeV H^0 primary beam. The H^- fraction is negligible.



The lifetime of the stripping carbon foils primarily depends on three factors: beam current density, foil thickness, and foil preparation method. The estimated heat load in the foil is ~ 0.1 W; similar foils, in similar beam conditions, have shown lifetimes of several weeks [18]. In addition to foils such as the hybrid boron mixed carbon foil [19] and the diamond foil [18], the feasibility of the carbon nanotube foil [20] is also studied.

After stripping, the proton beam is further bent by a dipole magnet, similar to the previous one, and finally extracted. The weak current of the unbent neutral atoms is mainly collected by a beam dump (BD in Fig. 3.1), while the excited H^0 which are stripped in the dipole are lost in the vacuum chamber.

Negligible emittance growth induced by the foil is expected, thus a second foil can be placed along the line, a few centimeters apart. This significantly reduces the probability of transmitting the full 100 kW to the H^0 beam dump in case of rupture of one foil.

H beam transport

To spill three parallel high power proton beams from the main H^+ beam, three identical splitting sections are used in series (Fig. 3.6). At the wigglers, the beam aperture is necessarily narrow (30 mm), and a waist in both horizontal and vertical planes is required, at those locations, to prevent losses. The system is designed in order to reproduce the same beam transport in each splitting section (Fig. 3.7). No transverse emittance growth is observed, while the longitudinal emittance is increased by $\sim 3\%$ after each splitter. This has no serious consequences in this particular application; in case of a larger number of splitting stations, however, an achromatic design should be considered.

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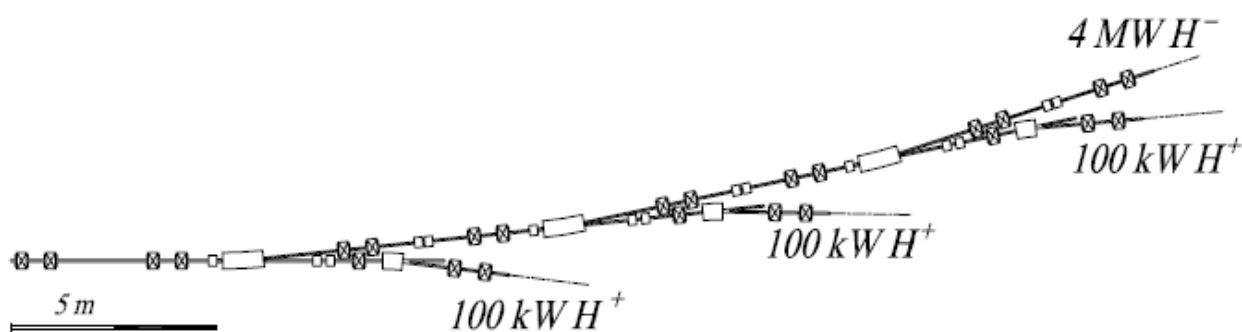


Figure 3.6. Schematic layout of a modular beam extraction area with three beam splitters and four output lines.

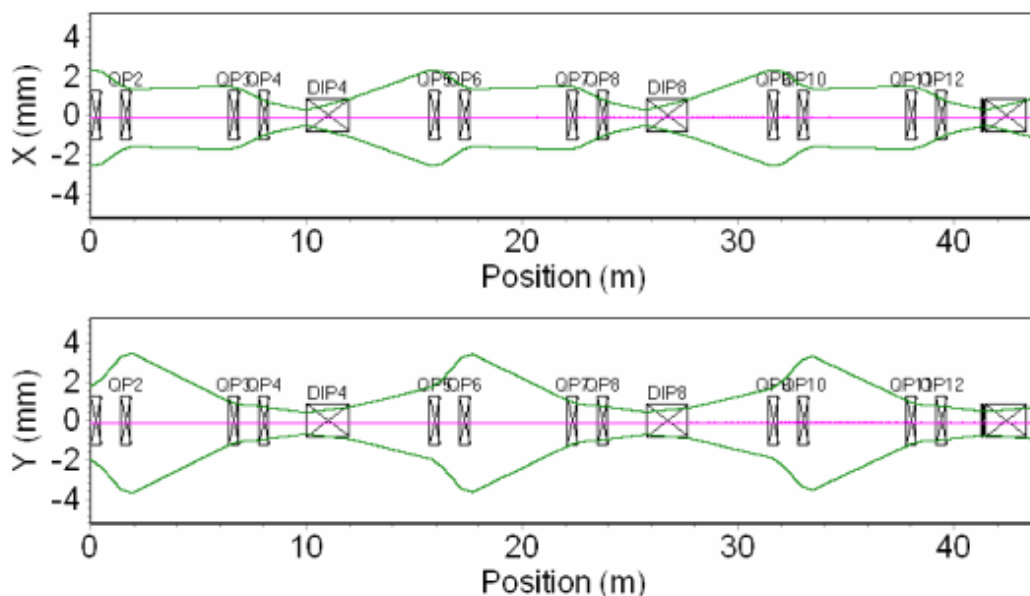


Figure. 3.7. H beam rms envelope along the three splitting sections.



H⁰ and H⁺ beam transport

By properly choosing the Twiss parameters at the wiggler, the neutral beam can be made to travel to the stripper with an acceptable increase in the transverse size. After the stripper, the so-generated protons are focused and separated from the weak residual neutral current by a second dipole magnet, and finally transported to the RIB source target. The proton beam emittance and size are always well suited for a low loss transport along standard, 100 mm diameter beam pipes.

3.4 Other applications

The high power, cw H/H⁺ beam splitter system described above, based on a magnetic neutralizer and a carbon foil stripper, is feasible with realistic parameters and the extracted beam current of the secondary lines is finely adjustable without perturbing the main H⁻ beam. The 500 μg/cm² carbon foil stripper is expected to receive a modest heat load, leading to foil lifetime of the order of several weeks. The emittance growth of the primary H⁻ beam through the splitter is negligible, and the splitting process can be repeated several times. The emittance of the secondary H⁰ beam after the magnetic neutralizer (less than a factor of 2 from the primary beam value) is fully acceptable for the EURISOL scope of bombarding a RIB source target.

These capabilities of the EURISOL scheme might be used for different applications, with different beam power values in the extraction lines, the limit being only the stripper foil lifetime. As an example, the beam might be completely neutralized and sent to the H⁺ lines without the necessity of transporting it to the H⁻ target (e.g. during maintenance time of the 4 MW target station).

Another application of this method might be in pulsed accelerators, where beam splitting is sometimes obtained by means of choppers, kickers and septum magnets. The EURISOL splitting method, eliminating high power rf devices, could significantly reduce both the installation and

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operation cost of the beam splitting stations, and nearly eliminate beam losses usually localized around septum magnets. In existing H⁻ linacs, moreover, beam splitting could be added with limited effort providing additional beam lines able to work in parallel.

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4. EURISOL Driver beam extraction lines

The beam extraction lines, connecting the beam splitter to the RIB stations, have been preliminary studied in order to verify their feasibility. The lines are assumed to be straight, except for the Deuteron extraction one (Figure 4.1); their length could be changed and beam bending could be added with standard beam transport techniques, if necessary. There are 3 different type of lines: 1) the 4 MW line, which transports the H^- beam to the high power RIB target through the three beam splitters; 2) the 3, 100 kW lines, each departing from one of the splitters, bringing H^+ and $^3He^{++}$ beams to the direct RIB targets; 3) the 1.2 MW line, originated from the 1st 100 kW one by means of an additional dipole magnet, that brings the 270 MeV, 4 mA deuteron beam to a special target station with neutron converter.

The final dipole magnets of the extraction lines have a bending angle of 20° and a curvature radius of 5 m; the length of the final beam tube to the target is always more than 15 m, keeping the distance between target stations above 10 m. This spacing is required to provide sufficient shielding of the accelerator vault from backstreaming radiation, and to prevent radiation between neighbouring target rooms.

Table 4.1. Beam specifications at the RIB production targets

	4 MW target	100 kW targets	1.2 MW target
Beam type	H^-	H^+ , $^3He^{++}$	D^+
Beam current (emA)	4	0.1	4
Beam energy (MeV/q)	~1000	~1000	~270
Beam distribution	~Gaussian		
Rms diameter σ (mm)	15 (adjustable)		

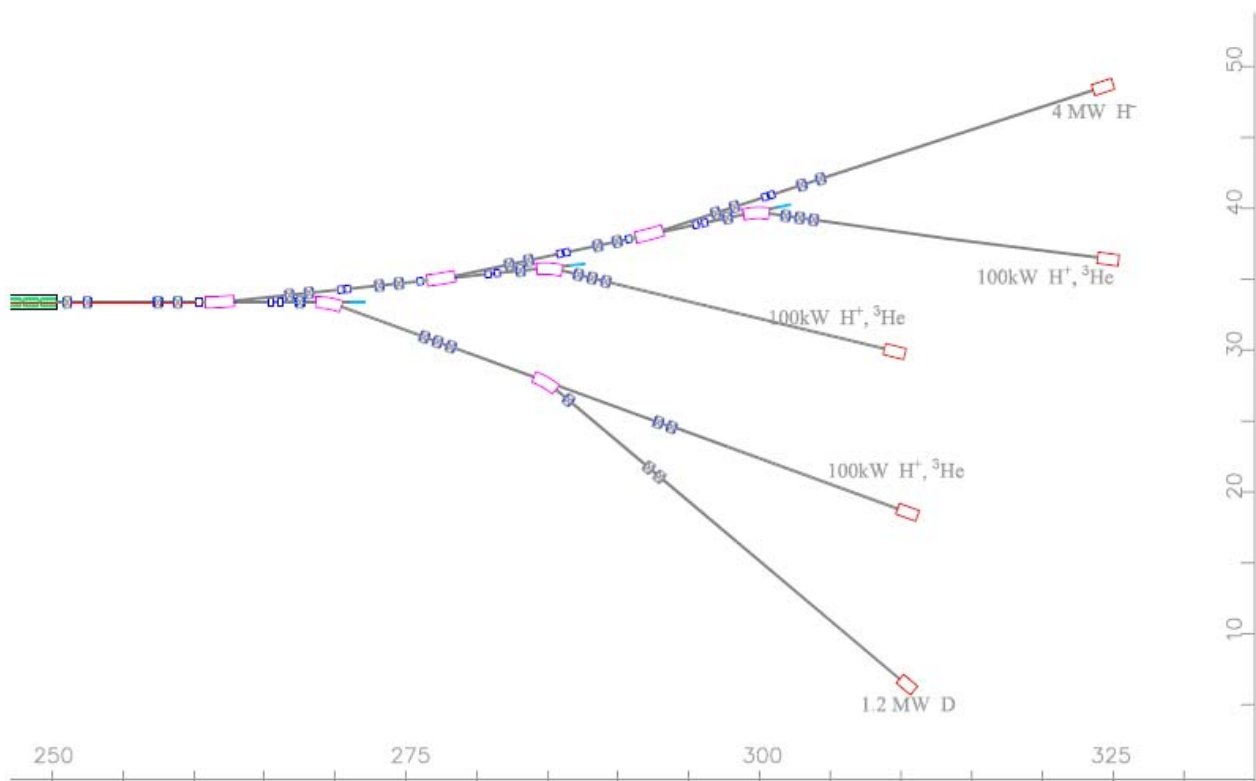


Figure 4.1. HEFT layout, with the upper “backbone” line and the 5 extraction lines.

4MW line

The 4 MW line starts from the end of the main beam line, after the 3rd (the last) splitter bending magnet. It is designed for transporting the 4 mA H⁺ beam to the multi-megawatt source (see fig. 4.1). It includes 4 Quadrupole magnets. The distance from the last quadrupole to the 4 MW target is 20 m, in order to allow for a concrete shielding of several meters thick required by the multi-megawatt source.

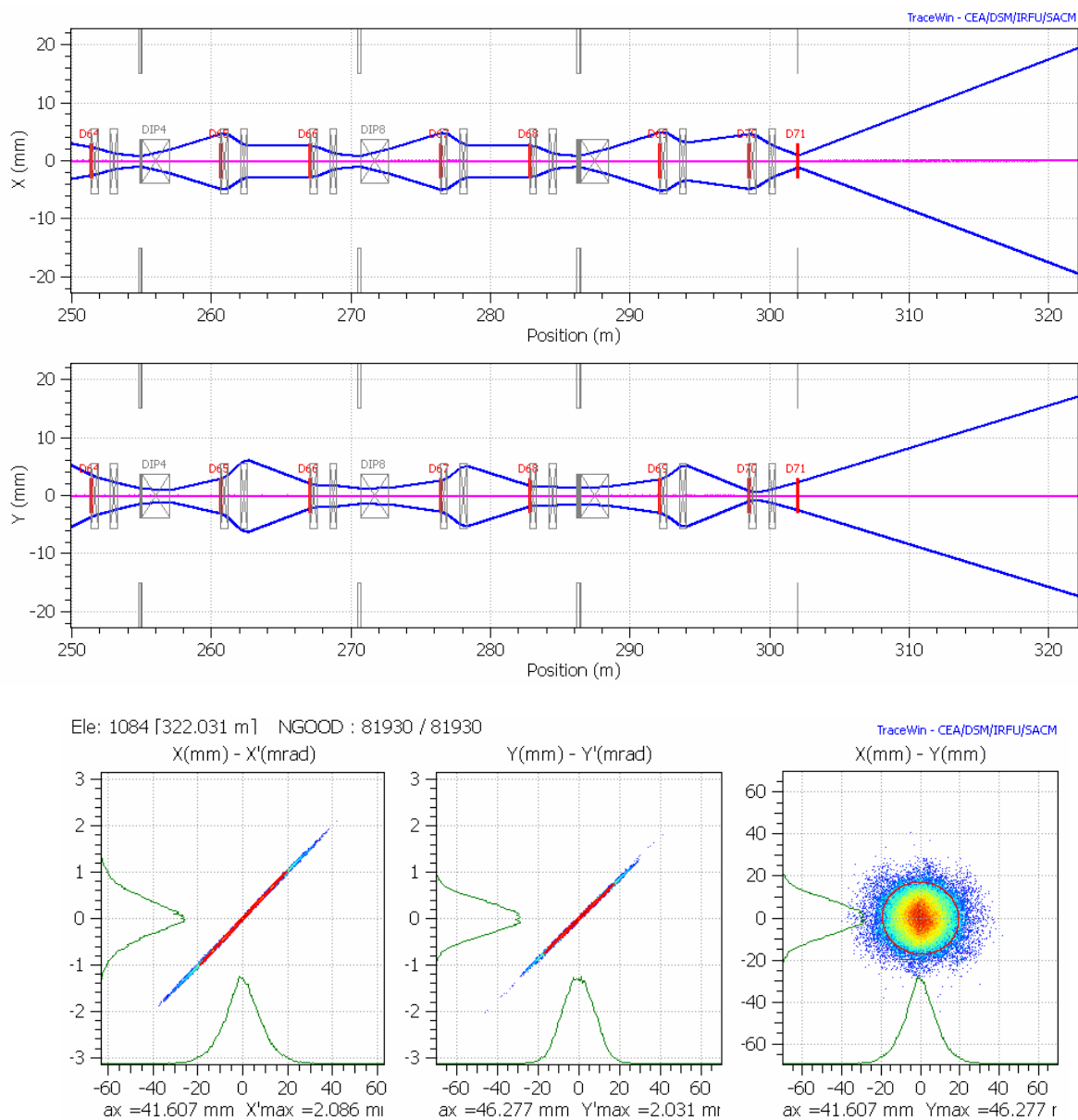


Figure 4.2. Top: H- multiparticle beam envelope along the 3 splitters (“backbone”) line and the 4 MW extraction line. Bottom: transverse phase spaces and beam cross section at the target. Particle distribution curves in green. Linac end-to-end simulation performed with ~82000 macroparticles.



The last bending magnet brakes the alignment of the final beam pipe opening in the shielding with the rest of the accelerator. The trajectory of the backscattered neutrons coming from the 4 MW source can be then directed to a shielding wall and the risk of activation of accelerator components that need hands on maintenance can be considerably reduced. The system allows to obtain a gaussian beam at the target with the required gaussian distribution σ .

100 kW lines

The 100 kW lines start from the 2nd and 3rd splitter sections. After the quadrupole and one $\theta=20^\circ$, $\rho=5$ m dipole, required for H^0 extraction, stripping and H^+ separation and transport (see par. 3) these lines include a quadrupole triplet and a ~ 20 m long line transport for final focusing into the 100 kW target. These lines can be used both for H^+ and ${}^3\text{He}^{++}$ beams.

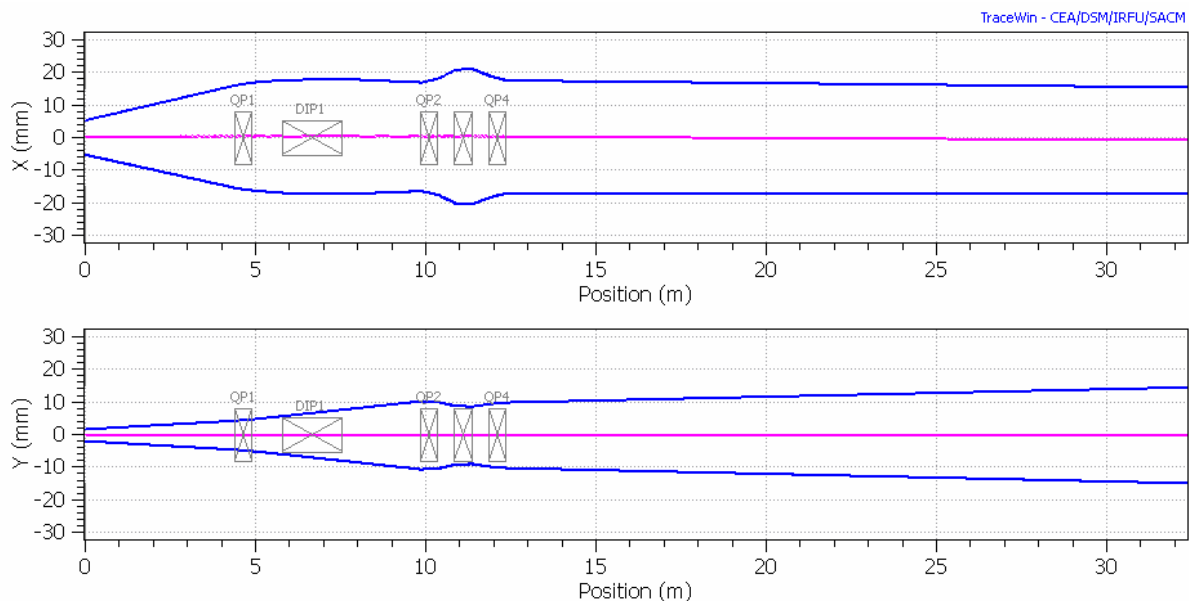
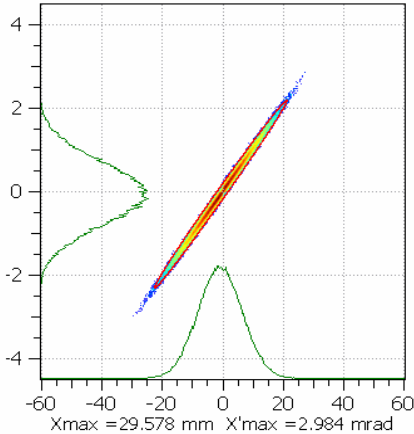


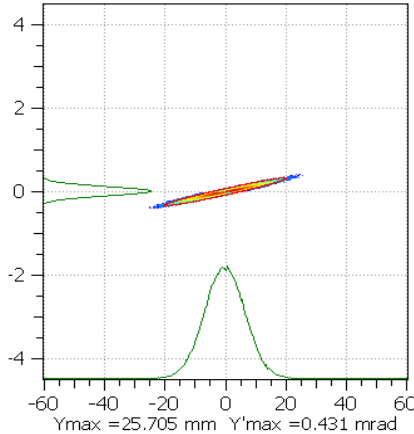
Figure 4.3. H^+ beam multiparticle envelope in the 2nd and 3rd extraction lines, from the stripper foil to the target. Simulation performed with ~ 100000 macroparticles.



Ele: 15 [32.3456 m] NGOOD : 100000 / 100000
X(mm) - X'(mrad)



Y(mm) - Y'(mrad)



TraceWin - CEA/DSM/IRFU/SACM

X(mm) - Y(mm)

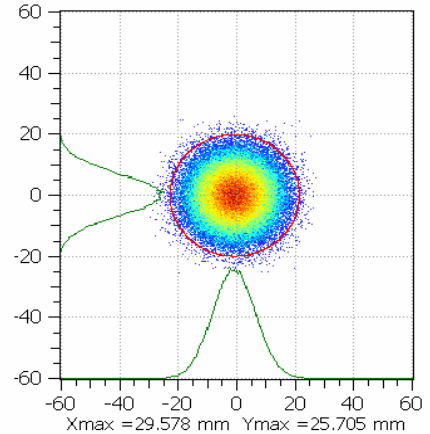


Figure 4.4. H^+ transverse phase spaces and beam cross section at the target in the 2nd and 3rd extraction lines. Particle distribution curves in green.

100 kW and 1.2 MW line

The 100 kW and 1.2 MW combined line starts from the 1st splitter, in a similar way as the 100 kW ones just described. After the 3rd quadrupole, however, an additional line is generated by means of a second dipole magnet which is used for extraction of the 4 mA, 270 MeV deuteron beam and its transport to a dedicated target. This additional line has an achromatic design and includes 3 quadrupoles and a 22.3 m drift. The last dipole allows also to direct the backscattered neutrons from the neutron converter to a heavily shielded area, preventing activation of accelerator components as in the 4 MW line.

In case of H^+ and $3He^{++}$ extraction, the second dipole of this line is switched off and the beam is transported to the 100 kW target by means of a straight transport line with a quadrupole doublet.

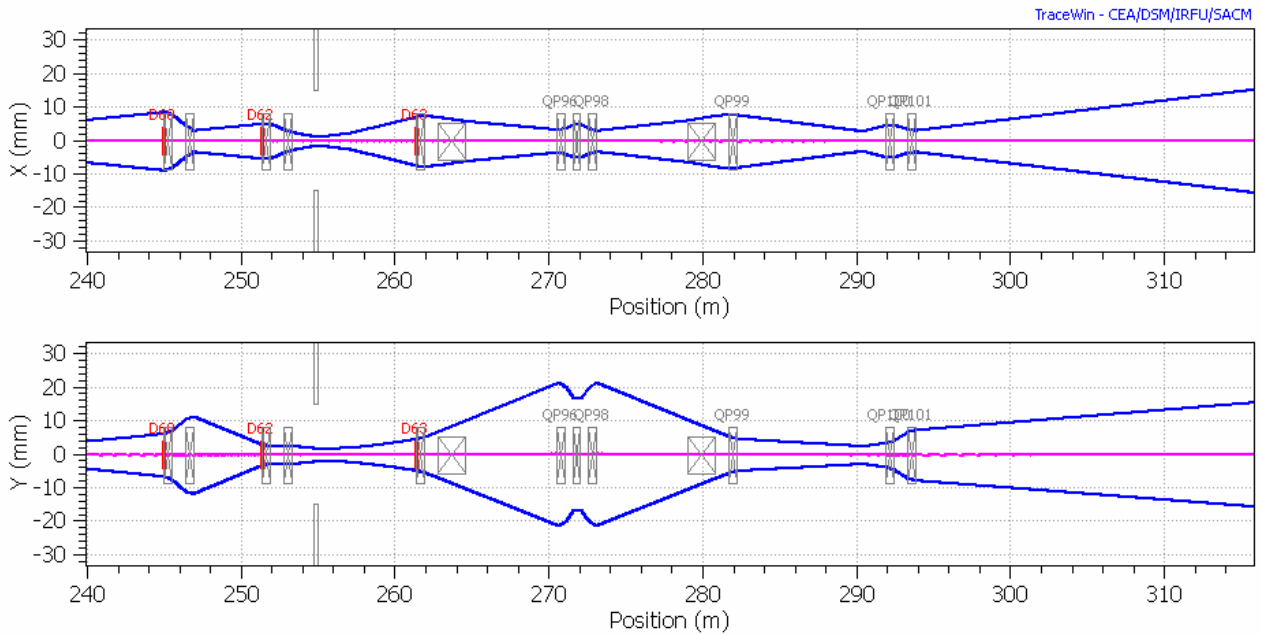


Figure 4.5. 1st extraction line: D⁺ beam envelope in the achromatic beam transport to the 1.2 MW target. Linac end-to-end simulation performed with ~93000 macroparticles.

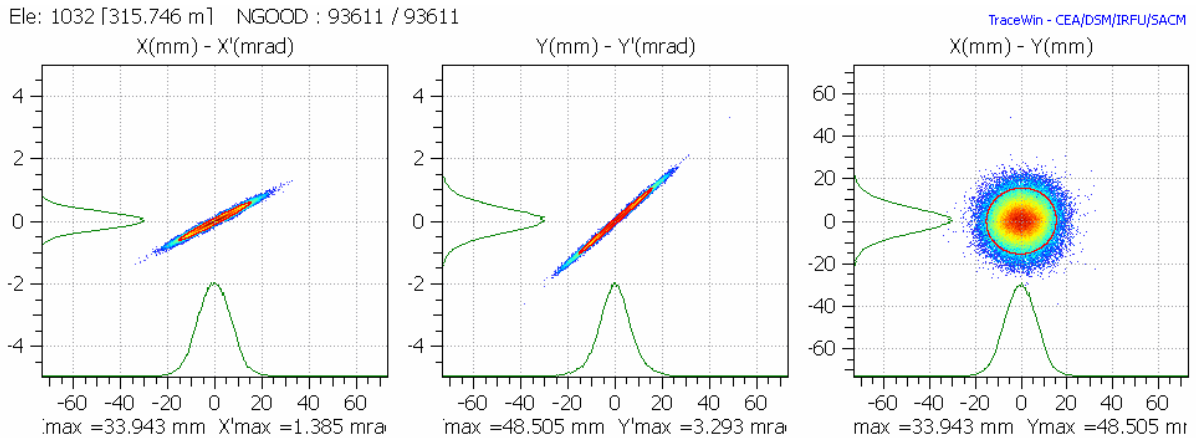


Figure 4.6. 1st extraction line: D⁺ transverse phase spaces and beam cross section at the target.
Particle distribution curves in green.

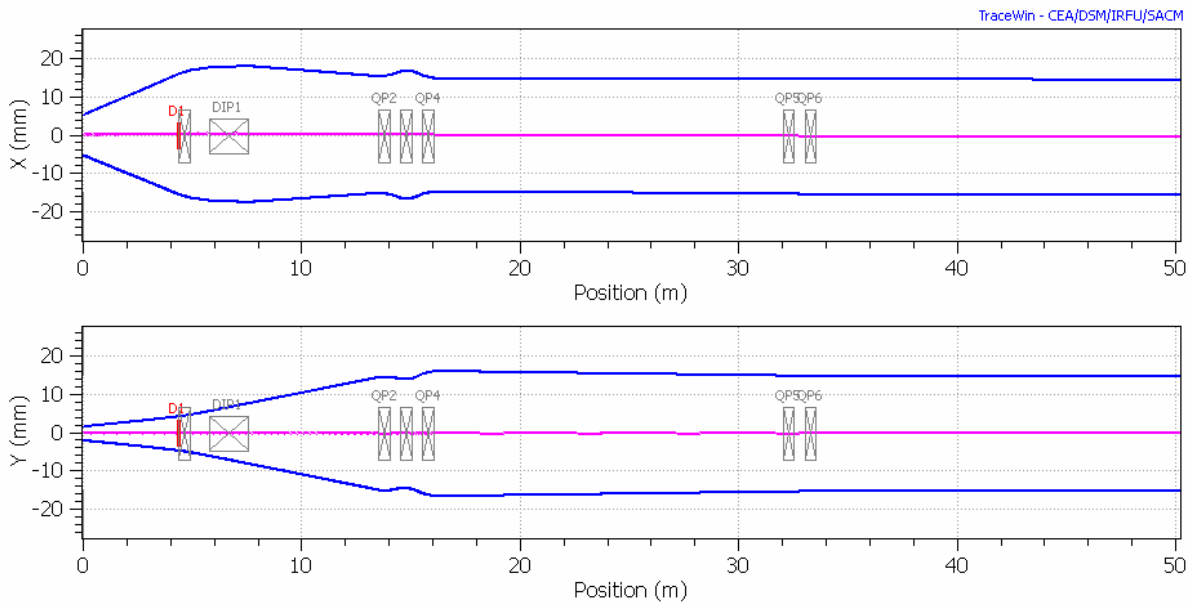


Figure 4.7. 1st extraction line: H⁺ multiparticle beam envelope in the to the 100 kW target. Simulation performed with ~100000 macroparticles.

Ele: 28 [50.1713 m] NGOOD : 100000 / 100000

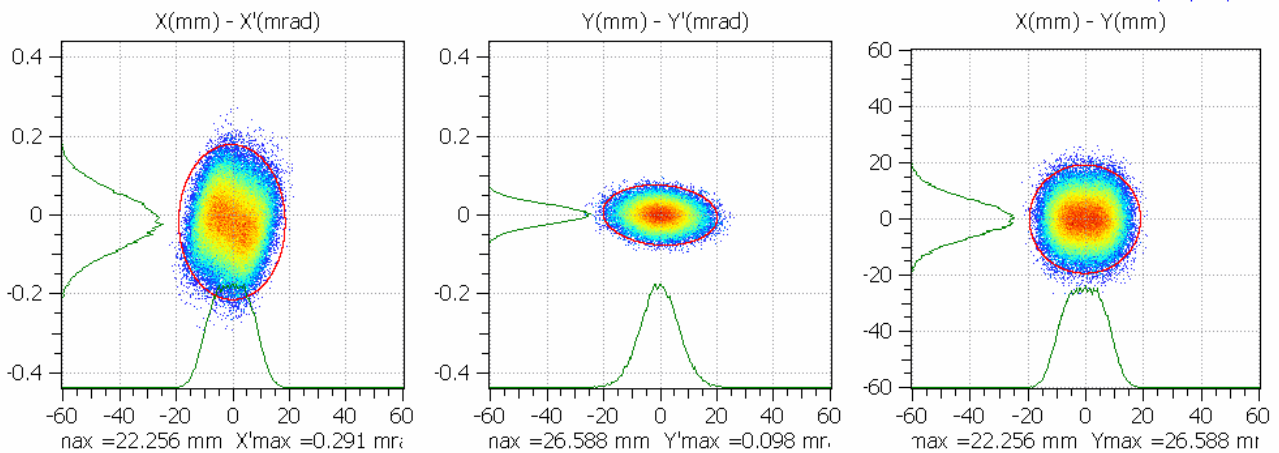


Figure 4.8. 1st extraction line: H⁺ transverse phase spaces and beam cross section at the target. Particle distribution curves in green.



5. Conclusions

The EURISOL HEBT design, based on a novel beam splitting scheme, reaches the goals of simultaneous extraction of up to 4 high power, cw proton beams. The system allows also extraction and transport to specialised targets of 100 kW ^3He and 1.2 MW D beams. The transport is performed with low losses and with the possibility of adjusting the output beam radius at the target. The possibility of feeding the primary beam to different targets at the same time can be used for delivery of exotic beam to experiments, RIB target development, beam preparation, allowing a flexible use of the EURISOL RIB production system. The presence of 5 different extraction lines gives the possibility of doing maintenance or replacement of some of the RIB targets while performing experiments in the remaining ones. The present HEBT layout could be adapted, without major difficulties, to different configurations of the EURISOL target area.

The so conceived EURISOL HEBT allows maximum efficiency in the use of the primary beam, with continuous RIB delivery to experiments during driver accelerator operation time.

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