

# ISTITUTO NAZIONALE DI FISICA NUCLEARE

## CONSIGLIO DIRETTIVO

### DELIBERAZIONE N. 12400

Il Consiglio Direttivo dell'Istituto Nazionale di Fisica Nucleare, riunito in Roma nei giorni 27 e 28 giugno 2012 alla presenza di n. 33 dei suoi componenti su un totale di n. 34;

- premesso che, in base all'art. 2 del proprio Statuto, l'Istituto Nazionale di Fisica Nucleare promuove, coordina ed effettua la ricerca scientifica nel campo della fisica nucleare, subnucleare, astroparticellare e delle interazioni fondamentali, nonché la ricerca e lo sviluppo tecnologico pertinenti all'attività in tali settori, prevedendo forme di sinergia con altri enti di ricerca e il mondo dell'impresa;
- premesso che, nel perseguimento della propria missione, l'Istituto Nazionale di Fisica Nucleare promuove e partecipa a collaborazioni, stipula convenzioni e contratti in materia di studio, ricerca e servizi con enti, società ed imprese pubbliche e private, nazionali, comunitari, stranieri e organizzazioni internazionali;
- premesso che la Best Theratronics, Inc. è un'azienda di ingegneria specializzata nella produzione e distribuzione di acceleratori di particelle che svolge attività di ricerca e sviluppo nel campo dei ciclotroni e, in particolare, è impegnata nella costruzione di un Test Stand che permetterà di esaminare la regione centrale di ogni ciclotrone ed eseguire dei test di accelerazione fino ad un massimo di energia di 1M;
- premesso che il Massachusetts Institute of Technology è un istituto di alta formazione nel campo della scienza e della tecnologia che, tramite il proprio Dipartimento di Fisica, è interessata a sviluppare un ciclotrone ad alta corrente da utilizzare per la produzione di radioisotopi;
- premesso che l'Istituto Nazionale di Fisica Nucleare promuove attività di ricerca e sviluppo nel campo degli acceleratori di particelle e, in particolare, presso Laboratori Nazionali del Sud dell'INFN è stata sviluppata una sorgente versatile di ioni ("VIS") in grado di fornire un fascio di protoni di corrente fino a 60 mA e un fascio molecolare di H<sub>2</sub><sup>+</sup>, con la corrente del fascio nel territorio di 20-30 mA.
- premesso che le Parti, nell'ambito delle rispettive competenze sopra descritte, sono interessate ad una collaborazione congiunta nel campo degli acceleratori di particelle e, in particolare, intendono collaborare ad attività di ricerca e sviluppo nel settore dei ciclotroni volta allo sviluppo di un acceleratore di particelle avente

l'obiettivo di offrire un fascio ad alta corrente di H2 +;

- esaminata la proposta di “No-Cost Collaboration Agreement” allegata alla presente deliberazione;
- vista la proposta formulata dal Direttore dei Laboratori Nazionali del Sud con comunicazione del 30 maggio 2012;
- premesso che l'onere finanziario derivante all'Istituto dallo schema di “No-Cost Collaboration Agreement” di cui alla presente deliberazione consiste nelle normali spese di funzionamento, che trovano copertura con le assegnazioni attribuite ai Laboratori Nazionali del Sud negli esercizi di competenza;
- su proposta della Giunta Esecutiva;
- in data 27 giugno 2012 con n. 33 voti favorevoli;

#### DELIBERA

Di approvare lo schema di “No-Cost Collaboration Agreement” tra l'Istituto Nazionale di Fisica Nucleare, la Best Theratronics, Inc e il Massachusetts Institute of Technology, allegato alla presente deliberazione di cui costituisce parte integrante e sostanziale. Il Presidente, o persona da lui delegata, è autorizzato a negoziarlo e sottoscriverlo.

## No –Cost Collaboration Agreement

This Collaboration Agreement (the “Agreement”) is made and entered into as of the day of signature (the “Effective Date”), by and among:

Instituto Nazionale di Fisica Nucleare having offices at 40 Enrico Fermi – 00044 Frascati (RM), Italy, (hereafter referred to as “INFN”), hereby represented by its President, Prof. F. Ferroni as authorized with resolution of INFN’s Board of Directors n. \_\_\_ of \_\_\_,

and

Best Theratronics Ltd. having offices at 413 March Road, Ottawa, Ontario K2K OE4 Canada and Best Cyclotron Systems, Inc. having offices at 7643 Fullerton Road, Springfield, VA, 22153 (hereafter collectively referred to as “BEST”),

and

**Massachusetts Institute of Technology**, a Massachusetts educational nonprofit corporation, (hereafter called “MIT”), having its place of administration at 77 Massachusetts Avenue, Cambridge, MA 02139, USA,

(hereinafter collectively referred to as “Parties” and individually as a “Party”) each setting forth an agreement to collaborate on the project described in Appendix A (the “Project”).

### Background Information

- A. **BEST** is a specialized engineering, manufacturer and distributor of particle accelerators as cyclotron and conducts research and development activities in this field. In particular Best is building a general “Test Stand” which will allow testing the central region of any cyclotron and performing acceleration tests up to a maximum energy of 1 MeV/n, to determine the best operating conditions and to maximize the injected and accelerated beam current.
- B. **INFN** is an Italian Governmental Agency responsible for the Italian research in the fields of sub-nuclear, nuclear, and astro-particles physics and, as part of its mission, promotes the research and development activities in such fields and in particle accelerators. Versatile Ion Source (“VIS”) has been developed at INFN to deliver proton beam current up to 60 mA and molecular beam of H<sub>2</sub><sup>+</sup>, with beam current in the territory of 20-30 mA.
- C. **MIT’s** Physics Department is interested in developing a high current cyclotron to be used for radioisotopes production (or an intense flux of neutrino).

NOW, THEREFORE, in consideration of the mutual covenants and agreements contained herein, the Parties hereby agree as follows:

**1. THE PROJECT** BEST, INFN and MIT are all interested in a joint collaboration to develop a cyclotron accelerator that will deliver a high current beam of H<sub>2</sub><sup>+</sup> in the range of 3-5 mA (the “Project”). Specifically, the Parties plan to conduct research and development in the cyclotron field to achieve this objective. This research will include the performance of an injection test experiment at BEST’s “Test Stand” site in Vancouver, Canada (the “Injection Test”). **Appendix A**, attached hereto, and incorporated herein, describes the scope of the work to be performed by the Parties, the allocation of responsibilities between the Parties, and a general timeframe for performance. Each of the Parties shall use reasonable efforts to perform the research and fulfill their respective duties, as set forth in **Appendix A**.

**2. PRINCIPAL INVESTIGATORS** The Project will be supervised by the following Principal Investigators: (i) Janet Conrad (email: [\\_conrad@mit.edu](mailto:_conrad@mit.edu)) for MIT; Luciano Calabretta (email: [calabretta@lns.infn.it](mailto:calabretta@lns.infn.it)) for INFN; and Bruce Milton (email: [Bruce.Milton@teambest.com](mailto:Bruce.Milton@teambest.com)) for BEST. The Principal Investigators shall keep each other informed regarding the Project on a regular basis and as set forth on Appendix A hereto. Each Party may change its Principal Investigator upon reasonable notice to the other Parties.

**3. TERM OF AGREEMENT** This Agreement will commence as of the Effective Date and, unless earlier terminated in accordance with the provisions of this Agreement, will terminate one (1) year(s) from the Effective Date (the “Term”). This Agreement may be extended by the mutual written agreement of the parties, under the terms and conditions contained herein, or as otherwise agreed in writing.

**4. TERMINATION** Any of the Parties may terminate this Agreement upon thirty (30) days written notice to the other Parties.

**5. PUBLICATION** BEST, INFN and MIT, will work jointly to create a written report documenting findings and conclusions based on the results of the Project. Authorship of publications or public disclosures of research results will reflect each Party’s contribution to such research results, in accordance with academic standards and customs. Joint publications shall include a joint copyright notice, for example, “Copyright © Massachusetts Institute of Technology, Best Theratronics, Ltd. and INFN 201X”. Notwithstanding the foregoing, each of the Parties will be free to separately publish the results of the Project after providing to the other Parties a sixty (60) day period in which to review each proposed publication to identify patentable subject matter and to identify any inadvertent disclosure of a Party’s confidential information. If necessary to permit the preparation and filing of U.S. patent applications, a Party’s Principal Investigator may agree to an additional review period, not to exceed thirty (30) days. Any further extension will require subsequent agreement among the Parties.

**6. COSTS** Except as otherwise agreed upon in a separate written document signed by the parties, each Party shall assume sole financial responsibility for any and all costs and expenses incurred by said Party during the performance of this Agreement.

**7. CONFIDENTIAL INFORMATION.** If, in the performance of the Project, the Principal Investigator of any Party and/or members of any of such Party's research team request and/or receive access to, and/or are provided with, any information which any of the Parties considers to be "Confidential Information" (as defined in **Appendix B**, attached hereto and incorporated herein), the rights and obligations of the Parties with respect to such information shall be governed by the terms and conditions set forth in **Appendix B** to this Agreement.

**8. INTELLECTUAL PROPERTY** BEST shall solely own all right, title, and interest in Intellectual property ("IP") conceived or first reduced to practice entirely by one or more employees of BEST or by those under a legal obligation to assign IP rights to BEST. INFN shall solely own all right, title, and interest in IP conceived or first reduced to practice entirely by one or more employees of INFN or by those under a legal obligation to assign IP rights to INFN. MIT shall solely own all right, title, and interest in IP conceived or first reduced to practice entirely by one or more employees of MIT or by those under a legal obligation to assign IP rights to MIT.

BEST, INFN and MIT shall jointly own all right, title, and interest in Intellectual Property conceived or first reduced to practice jointly by one or more employees of, or those under a legal obligation to assign IP rights to, BEST and one or more employees of, or those under a legal obligation to assign IP rights to, INFN and one or more employees or students of, or those under a legal obligation to assign IP rights to, MIT. Intellectual Property conceived or first reduced to practice by any two of the Parties or to those under a legal obligation to assign IP rights to those two Parties shall be owned jointly by the two inventive Parties. Prosecution of joint inventions shall be conducted according to terms to be decided by the Parties in a separate Agreement.

The Parties acknowledge that any IP (including copyrights and copyrightable materials) developed solely or jointly by MIT under this Agreement is subject to a nonexclusive royalty-free license to the U.S. Government.

With respect to copyrights or copyrightable material developed by any of the Parties in the performance of this Agreement, each of the Parties grants to each of the other Parties a nonexclusive, irrevocable, royalty-free, non-transferable right and license to use, reproduce, make derivative works, display, distribute and perform all such copyrightable materials for internal purposes related to the performance of the Project.

BEST, INFN and MIT agree to negotiate in good faith licensing issues related to any IP developed under this Agreement. The terms and conditions of any such licenses will be set forth in a separate agreement to be negotiated among the Parties.

**9. USE OF NAMES.** The Parties agree that they will not use the name, logo, insignia or trademarks of another Party hereto, or any variation, adaptation, or abbreviation thereof, or the

name of any such Party's trustees, officers, faculty members, students, employees, or agents, in any advertising or other form of publicity, fund-raising, promotional materials, websites or other public announcement or disclosure without the prior written consent of such Party. In the case of MIT, such permission must come from MIT's Technology Licensing Office, which consent MIT may withhold in its sole discretion. In the case of BEST, such permission must come from BEST's legal department, which consent BEST may withhold in its sole discretion.

**10. REPRESENTATIONS AND WARRANTIES** Each Party warrants to the others that it is duly authorized to enter into this Agreement EACH OF THE PARTIES MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND CONCERNING THE PROJECT OR ANY INTELLECTUAL PROPERTY RIGHTS AND HEREBY DISCLAIMS ALL REPRESENTATIONS AND WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NONINFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF MIT OR THIRD PARTIES, CREATION, VALIDITY, ENFORCEABILITY AND SCOPE OF ANY INTELLECTUAL PROPERTY RIGHTS OR CLAIMS, WHETHER ISSUED OR PENDING, AND THE ABSENCE OF LATENT OR OTHER DEFECTS, WHETHER OR NOT DISCOVERABLE.

IN NO EVENT SHALL ANY PARTY, ITS TRUSTEES, DIRECTORS, OFFICERS, EMPLOYEES, STUDENTS AND AFFILIATES, BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, INCLUDING ECONOMIC DAMAGES OR LOST PROFITS, REGARDLESS OF WHETHER THE PARTY WAS ADVISED, HAD OTHER REASON TO KNOW OR IN FACT KNEW OF THE POSSIBILITY OF THE FOREGOING. THIS SECTION SHALL SURVIVE THE EXPIRATION OR ANY EARLIER TERMINATION OF THIS AGREEMENT.

**11. EXPORT CONTROLS; COMPLIANCE WITH LAWS** Each Party acknowledges that any information or materials provided by the other under this Agreement may be subject to U.S. export laws and regulations, including the International Traffic in Arms Regulations ([ITAR, 22 CFR Chapter 1, Subchapter M, Parts 120-130](#)), Export Administration Regulations ([EAR, 15 CFR Chapter VII, Subchapter C, Parts 730-774](#)), and Assistance to Foreign Atomic Energy Activities ([10 CFR Part 810](#)); each Party agrees to comply with all such laws, and all other applicable laws which may govern the equipment, materials, and services performed under this Agreement. For the avoidance of doubt regarding export regulations: a) INFN shall be responsible for compliance with Italy's export regulations applicable to any shipments made from INFN to BEST under this Agreement; and b) BEST shall be responsible for compliance with CANADA's export regulations applicable to any shipments made from BEST to INFN under this Agreement.

Because MIT is an institution of higher education and has many students, faculty, staff, and visitors who are foreign persons, MIT intends to conduct the research for the Project as fundamental research under the export regulations, such that the results generated by MIT qualify as "public domain" under [ITAR Parts 120.10\(a\)\(5\) and 120.11](#) or "publicly available under [EAR Parts 734.3\(b\)\(3\) and 734.8\(a, b\)](#).

The Parties will not knowingly disclose, and will use commercially reasonable efforts to prevent disclosure to MIT of any information subject to ITAR controls or in the Commerce Control List ([EAR Part 774 and Supplements](#)) or [10 CFR Part 810](#) Restricted Data or Sensitive Nuclear Technology. If for purposes of the Project, the Parties intend to disclose export-controlled information to MIT, the Parties agree that they will not disclose such information to MIT unless and until a plan for transfer, use, dissemination and control of the information has been approved by MIT's Export Control Officer. In the event that the Parties inadvertently (i) discloses export-controlled information or (ii) breach this Section, any deadlines contemplated by Appendix A will be adjusted based on the time it takes to address the disclosure.

## **12. TRANSPORT OF PROJECT COMPONENTS; PROPERTY OF PARTIES.**

12.1 A list of the components to be transported from INFN to BEST's facility in Vancouver, CANADA, is provided in **Appendix A**, attached hereto and incorporated herein (the "VIS Components"). INFN will be responsible for renting the container, properly packing the VIS Components, for both the initial trip to CANADA, and return trip to ITALY, and making all necessary arrangements for the temporary export of the VIS Components from Catania, ITALY to BEST's facility in Vancouver, CANADA, and back, upon the earlier of, the completion of the Project or termination of this Agreement, at MIT's sole cost, which cost, including transit insurance, shall not exceed \$15,000 (USD) roundtrip.

12.2 INFN acknowledges that neither BEST nor MIT shall have any liability to INFN for damage to, loss or the destruction of the VIS Components during the Term of this Agreement, unless such loss results solely from the willful misconduct of either or both of the other Parties to this Agreement. INFN waives its right of recovery and insurer's right of subrogation against BEST and MIT for any loss not caused by the willful misconduct of the other Parties.

12.3 BEST acknowledges that neither INFN nor MIT shall have any liability to BEST for damage to, loss or destruction of the Test Stand, including all related equipment and components to be provided by BEST during the Term of this Agreement, unless such loss results solely from the willful misconduct of either or both of the other parties to this Agreement. BEST waives its right of recovery and insurer's right of subrogation against INFN and MIT for any loss not caused by the willful misconduct of the other Parties.

12.4 In the event that any parts or materials required to be provided under this Agreement are damaged, destroyed, lost or stolen prior to the completion of the Project, the party responsible for providing such part shall promptly arrange for its replacement at its sole cost, unless such loss arises solely from the willful misconduct of another party or parties to this Agreement.

12.5 Upon the earlier of, the completion of the Project, or termination of this Agreement, the Parties shall disassemble the various components installed or attached to BEST's Test Stand, and such components shall be promptly removed from the Project site by and returned to the respective owners.

### 13. MISCELLANEOUS

13.1 Independent Parties. The execution and performance of this Agreement does not obligate the Parties to enter into any other agreement or to perform any obligations other than as specified herein. Nothing contained within this Agreement shall be deemed or construed to create an agency, partnership, joint venture, or exclusive relationship among or between any Parties to this Agreement.

13.2 Force Majeure. The Parties shall not be responsible to each other for failure to perform any of the obligations imposed by this Agreement, provided such failure is occasioned by causes beyond its reasonable control, including, without limitation, fire, explosion, flood, war, strike, earthquake, mudslide, hurricane, tornado, or governmental interference. The Party experiencing a delay or incident under this provision shall promptly notify the other Parties of the delay or incident and provide a reasonable estimate for the resumption of performance of obligations.

13.3 Assignment. This Agreement shall not be assignable by any Party without the prior written consent of the other Parties hereto.

13.4 Choice of Law. This Agreement shall be construed under and governed by the laws of the State of New York, United States of America, without giving effect to the conflicts of laws provision thereof. In the event that any translation of this Agreement is executed by the Parties, the English language version shall be the official version and shall govern in the event of a conflict.

13.5 Notices. Any notice required or permitted to be given under this Agreement shall be given in writing and shall be effective from the date sent by registered or certified mail, by hand, facsimile or overnight courier to the addresses set forth below and to the attention of the following individuals for each party:

For BEST: Best Theratronics, Ltd.  
ATTN: Ruth Bergin, Senior Vice president and Counsel  
Address: 7643 Fullerton Road, Springfield VA  
Tel No. (703) 451-2378  
Fax No. (703) 451-8421

For INFN: Istituto Nazionale di Fisica Nucleare - LNS  
ATTN: Luciano Calabretta  
Address: 62, Via S. Sofia – 95123 Catania Italy  
Tel No. +39 095 542259  
Fax No. +39 095 7141815

For MIT: Massachusetts Institute of Technology  
ATTN: Michele Hudak  
Title: Grant and Contract Administrator



Building: E19-750  
77 Massachusetts Avenue  
Cambridge, MA 02139-4307  
Tel No. (617) 324-5382  
Fax No. (617) 253-4734  
Email: hudak@mit.edu

13.6 Entire Agreement. This Agreement, including Appendix A and Appendix B, constitutes the entire agreement with respect to the subject matter hereof between the Parties, and supersedes all prior agreements and understandings, written or oral, among the Parties with respect to the same. This Agreement may only be amended by an agreement in writing executed by authorized representatives of all of the Parties hereto. This Agreement shall inure to the benefit of and shall be binding upon the Parties hereto and their respective heirs, personal representatives, successors and assigns, subject, however, to the limitations contained herein.

(Signatures follow on separate page.)

**Istituto Nazionale di Fisica Nucleare**

**Best Theratronics, Ltd..**

By: \_\_\_\_\_

By: \_\_\_\_\_

Signature: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

**Massachusetts Institute of Technology**

By: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

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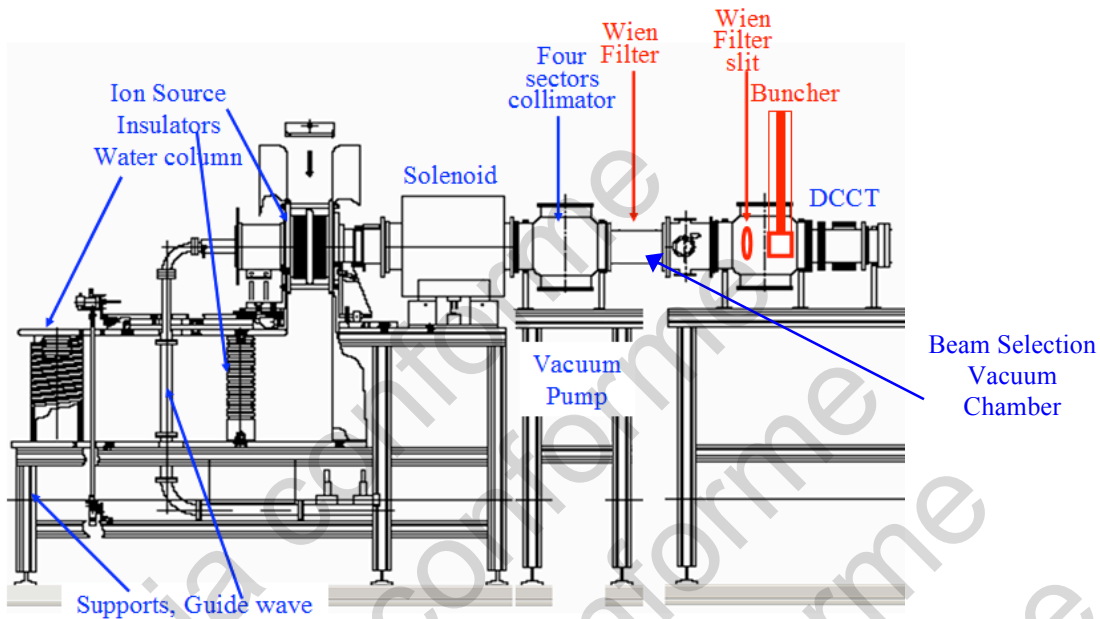
## Appendix A

BEST, INFN and MIT will conduct a test experiment (the “Injection Test”) to inject and accelerate an intense beam of  $H_2^+$  ions into the central region of a test cyclotron (the “cyclotron test stand”). The tests have relevance for the design work for a high-current  $H_2^+$  cyclotron being performed at INFN. The objective of the experiment is to demonstrate the feasibility of accelerating an  $H_2^+$  beam with an intensity in excess of 3 electrical milliamperes for at least three (3) turns inside the central region of the test cyclotron magnet. BEST, INFN and MIT will all participate in designing the experiment, acquiring the data and analyzing the results. BEST will oversee the operation of the test equipment.

INFN will supply the ion source, called VIS (Versatile Ion Source), and some components of the beam line. The beam particles will be accelerated to an energy not to exceed 60 keV. The beam current delivered by the ion source is expected to be in the range 25-40 electrical milliamperes for the  $H_2^+$  ion. To minimize the potential for thermal damage, the ion source will be pulsed, and thus will operate at a lower duty factor, not to exceed 10%. While peak beam power will be several kW, the average power will be kept below a few hundred watts, about half of which is expected to be lost at the first acceleration gap in the cyclotron.

The beam will be chopped by a fast modulation of the electric field applied on the electrodes of the Wien filter. When the electric field is off the magnetic field will deflect the ion beam into the wall of the beam line vacuum chamber, causing some outgassing and local heating. To lessen this problem the microwave generator that feeds the ion source will also be pulsed in synch with the Wien filter electrodes. The microwave generator needs to be turned on a few hundred microseconds prior to the Wien filter pulse to allow time for the ion source plasma and extracted beam to stabilize, but the heat load inside the Wien filter will be only a few watts.

The proposed layout of the first part of the beam line is shown in Fig. 1.



To perform the Injection Test:

INFN will supply:

- Ion source
- Insulators
- Water column
- Supports
- Solenoid
- Wave Guide
- Vacuum pump
- Four sectors collimator
- DC current transformers
- Wien Filter

BEST will supply laboratory space and the cyclotron test stand, including:

- Central region magnet, complete with vacuum system containing RF electrodes and agreed-upon diagnostic devices;
- Solenoid lens and two quadrupole magnets, to be installed near or inside the central region magnet (see Figure 3);
- RF Amplifier to drive the accelerating electrodes RF electrodes and buncher.
- HV insulator cage for the ion source;

- Buncher;
- Small components needed to complete the test stand, including cables, fasteners, small pumps;
- Test stand control electronics and safety systems;
- Utilities including power and water.

MIT will supply:

- Payment for the transport of the VIS source from Catania to Vancouver and back to Catania;
- Microwave generator for the ion source;
- Spiral inflector;
- Beam selection vacuum chamber.

### **The Beam Injection Line**

The function of the injection line is to transfer the beam delivered by the source to the center of the test cyclotron magnet, and to explore matching between the source emittance and the cyclotron acceptance. The first part of the beam transfer line is a copy of the existing beam line in operation at INFN to test the performance of the ion source, VIS, developed by Santo Gammino and his coworkers (see Fig.1). This beam line has been assessed as being able to satisfactorily match transport conditions for the BEST test stand in Vancouver. The beam line includes a large solenoid lens that will focus the beam at the selection slits following a Wien filter. These slits provide beam purification to separate  $H^+$  and  $H_3^+$  ions emerging from the ion source, possibly as much as 10-20% of the beam current, from the desired  $H_2^+$  ions. The Wien Filter consists of crossed electric and magnetic fields and is tuned to transmit undeflected the ions emerging with a charge-to-mass ratio of 0.5, corresponding to the velocity of the  $H_2^+$  ions. A simulation has shown that a 15 cm long Wien Filter with a magnetic field of 2.5 kGauss and electric field of about 850 V/cm is enough to separate the  $H_2^+$  from the proton and  $H_3^+$  beams. The separation between the peaks is approximately 6 cm at the slit location, about 40 cm after the Wien Filter, before the Buncher (see Fig. 2).

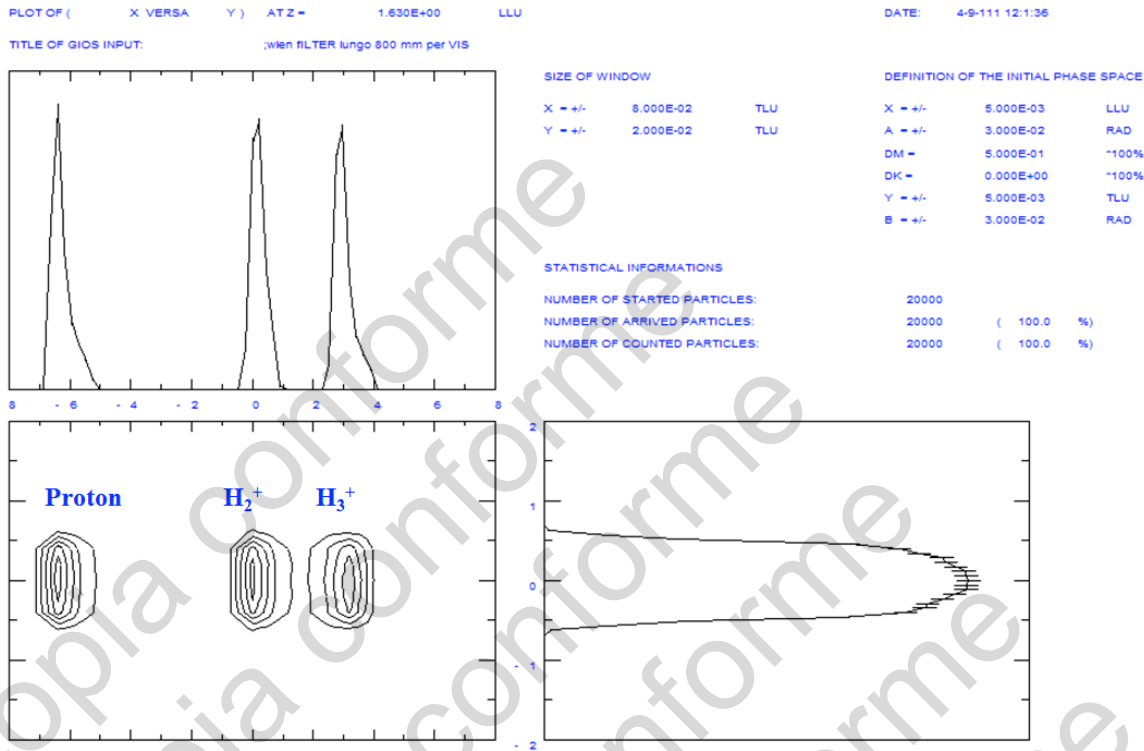


Figure 2: Beam spots of proton,  $H_2^+$  and  $H_3^+$  at the selection slits placed 40 cm after the Wien filter.

The proposed layout of the first part of the beam line is shown in Fig. 1, the first-order beam envelope is shown in Figure 3. Shown are the ion source coupled to a solenoid lens, which focuses the beam at the object point of the Wien filter analysis slits for charge state analysis and beam purification. After the analysis and purification, the beam is focused at the entrance of the cyclotron's inflector by two quadrupole magnets and by a second solenoid lens, matching the acceptance of the cyclotron central region. The quadrupoles and the second solenoid will be provided, and installed inside the axial hole of the test magnet by BEST personnel. The two magnetic quadrupoles are necessary to produce an asymmetric beam that compensates for the mixing produced by the spiral inflector to facilitate matching with the acceptance of the central region. The two quads should be rotatable about the beam axis to further tune for the mixing produced by the spiral inflector.

Accompanying the experimental tests will be measurements and simulations for taking into account the effects of space charge and stray fields. It is expected that all parties to this agreement will participate in these tests and simulation studies.

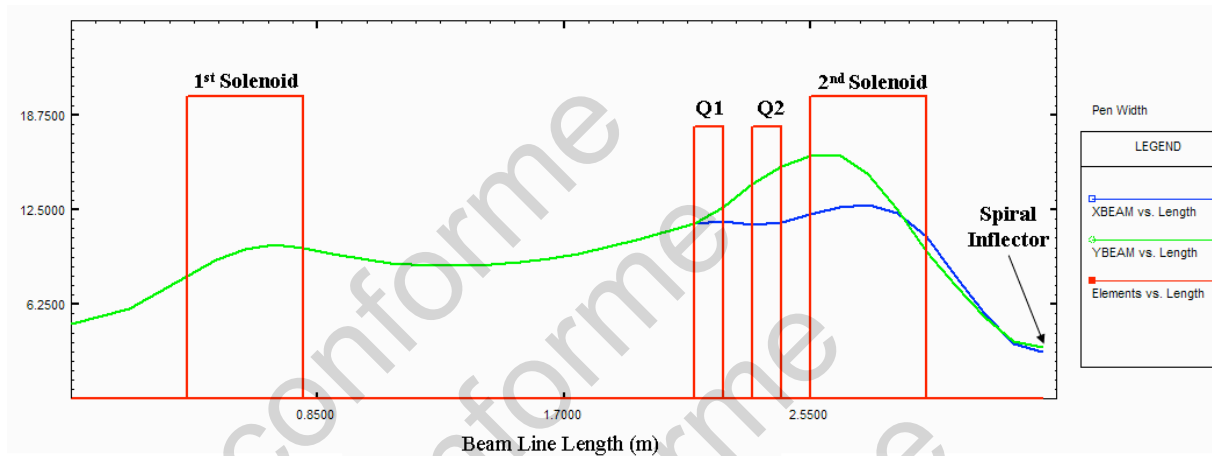


Figure 3: Beam envelope along the injection line.

## APPENDIX B

### CONFIDENTIAL INFORMATION

If, in the performance of the Project, the Principal Investigator of any party hereto and members of the research team designated by him/her (the "Receiving Party") require and accept access offered by another party hereto (the "Disclosing Party") to certain information that the Disclosing Party considers confidential, the rights and obligations of the Parties with respect to such information are as follows:

1. CONFIDENTIAL INFORMATION. When used in this Agreement, "Confidential Information" means confidential and proprietary information of any kind which is disclosed by the Disclosing Party to the Receiving Party that (i) prior to disclosure, is marked with a legend indicating its confidential status or (ii) is disclosed orally or visually, if the Disclosing Party identifies such information as confidential at the time of disclosure and, within 30 days of such disclosure, delivers to the Receiving Party's Principal Investigator a notice summarizing the confidential information disclosed. Notwithstanding the foregoing, in no event is information Confidential Information if it (a) was already in the Receiving Party's possession before receipt from the Disclosing Party; (b) is or becomes a matter of public knowledge through no fault of the Receiving Party; (c) is received by the receiving Party from a third party having an apparent bona fide right to disclose the information without a duty of confidentiality to the Disclosing Party; or (d) is independently developed by the Receiving Party without use of the Confidential Information.
2. LIMITATIONS ON USE. The receiving party shall use the Confidential Information solely for the purposes of the Project. Disclosure by the Disclosing Party of the Confidential Information does not constitute a grant to the Receiving Party of any right or license to the Confidential Information except as set forth herein or in a duly executed license agreement.
3. CARE OF CONFIDENTIAL INFORMATION. The Receiving Party shall exert reasonable efforts to maintain the Confidential Information in confidence, except that the Receiving Party may disclose or permit disclosure of any of the Confidential Information to its directors (in the case of MIT, to members of the MIT Corporation), officers, employees, consultants, advisors, students, subcontractors and agents, who need to know such Confidential Information in the performance of the Project and who have been advised of and have agreed to maintain the confidential nature of the Confidential Information.

The Receiving Party shall be deemed to have discharged its obligations hereunder provided it has exercised the foregoing degree of care and provided further that it shall immediately, upon discovery of any disclosure not authorized hereunder, notify the Disclosing Party and take reasonable steps to prevent any further unauthorized disclosure or unauthorized use.



The Receiving Party's obligations of confidentiality with respect to use and non-disclosure of Confidential Information provided under this Agreement shall survive for a period of three (3) years following receipt of the information.

4. REQUIRED DISCLOSURES. Nothing in this Agreement shall be construed to prevent the Receiving Party from disclosing Confidential Information as required by law or legal process, as long as the Receiving Party, if permitted by applicable law, promptly notifies the Disclosing Party of its obligation to disclose and provides reasonable cooperation to the Disclosing Party in any efforts to contest or limit the scope of the disclosure.
5. RETURN OR DESTRUCTION OF CONFIDENTIAL INFORMATION. When the Confidential Information is no longer required for the purposes of this Agreement, the Receiving Party shall, at the direction of the Disclosing Party, either destroy or return to the Disclosing Party all Confidential Information and shall destroy any electronic or digital manifestations of the Confidential Information, except that the Receiving Party may retain one copy of the Confidential Information solely for the purposes of monitoring its obligations under this Agreement.