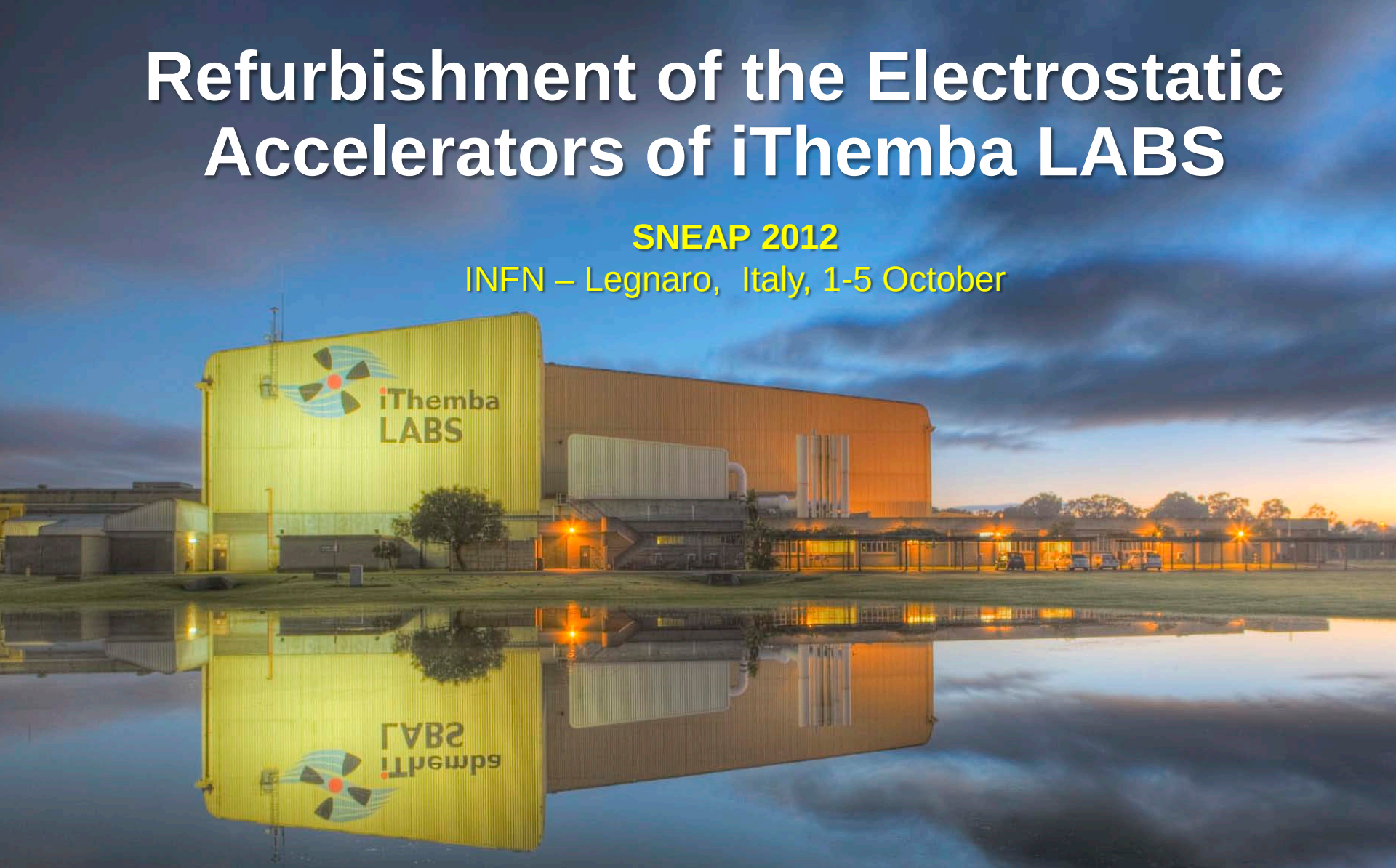
Refurbishment of the Electrostatic Accelerators of iThemba LABS

SNEAP 2012

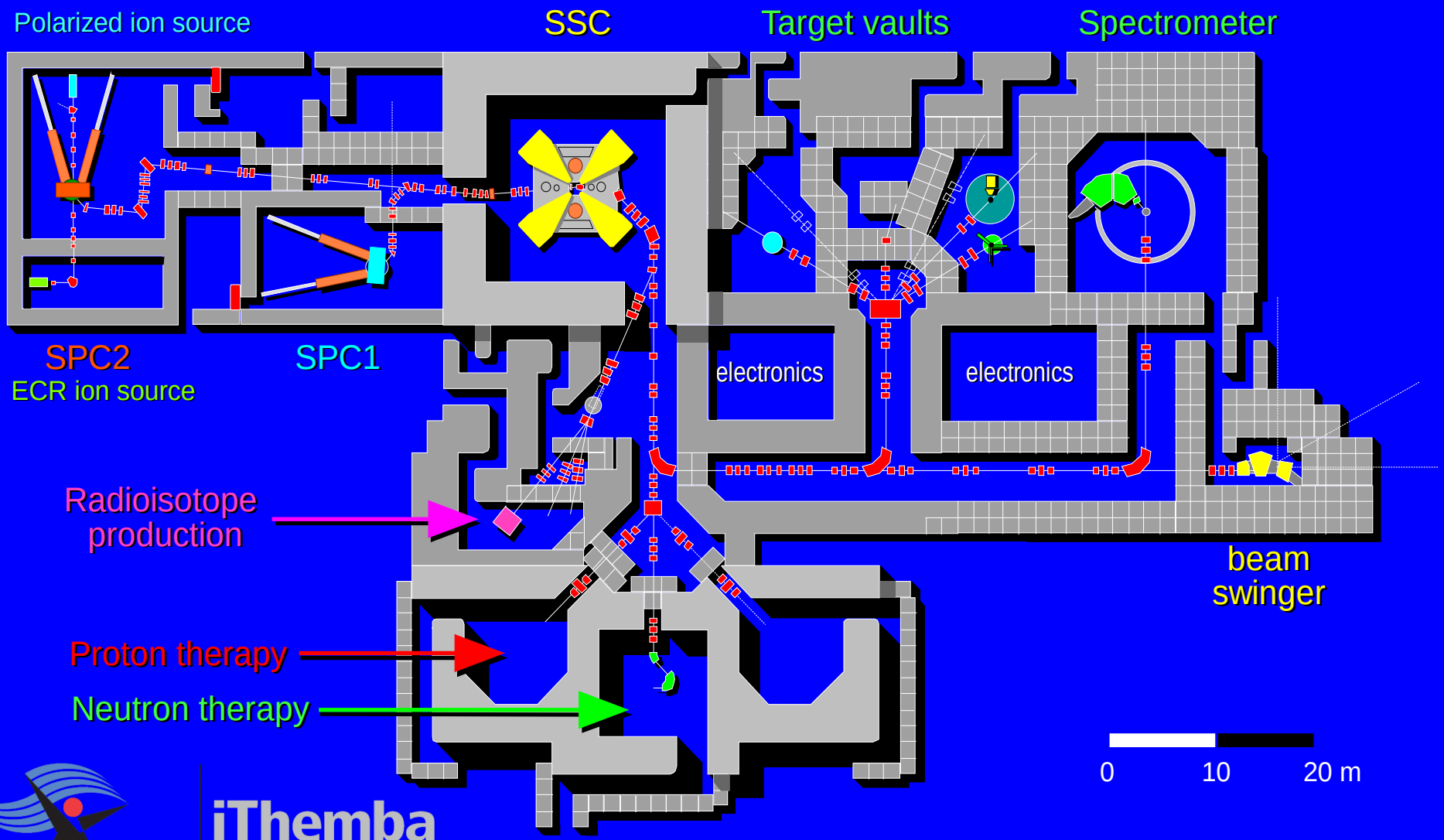
INFN – Legnaro, Italy, 1-5 October



J.L. Conradie, G. Badenhorst, F. Balzun, A. Crombie, G. De Villiers, H. Delsink, C. Doyle, C. Ellis, D. Fourie, M. Hogan, I. Kohler, S. Marsh, R. McAlister, H. Mostert, O. Pekar, J. Pilcher, S. Mullins, P. Van Schalkwyk, K. Springhorn, iThemba LABS, P.O. Box 722, Somerset West 7130, South Africa

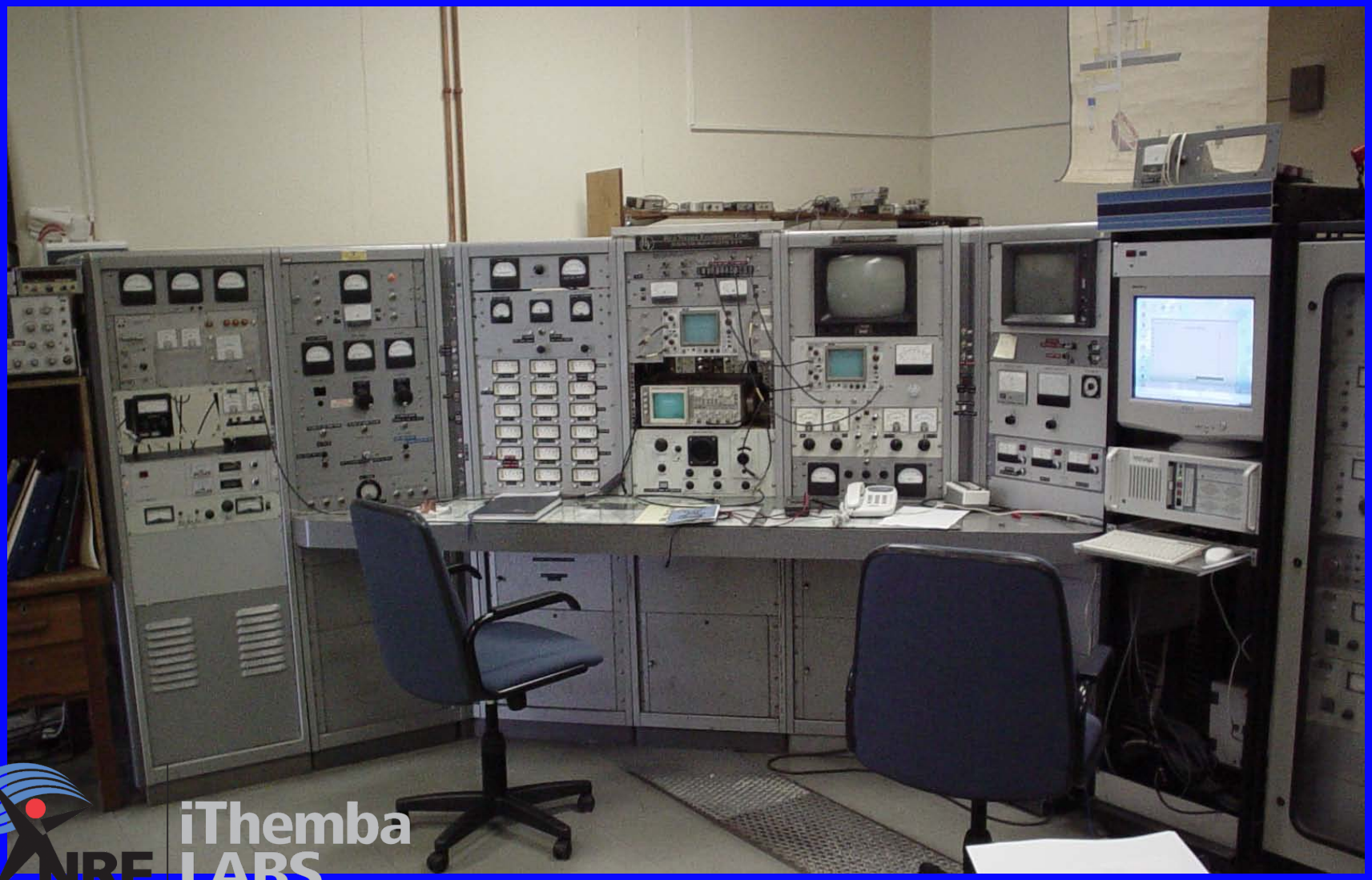

iThemba
LABS
National Research Foundation
Laboratory for Accelerator Based Sciences

Separated-Sector Cyclotron Facility

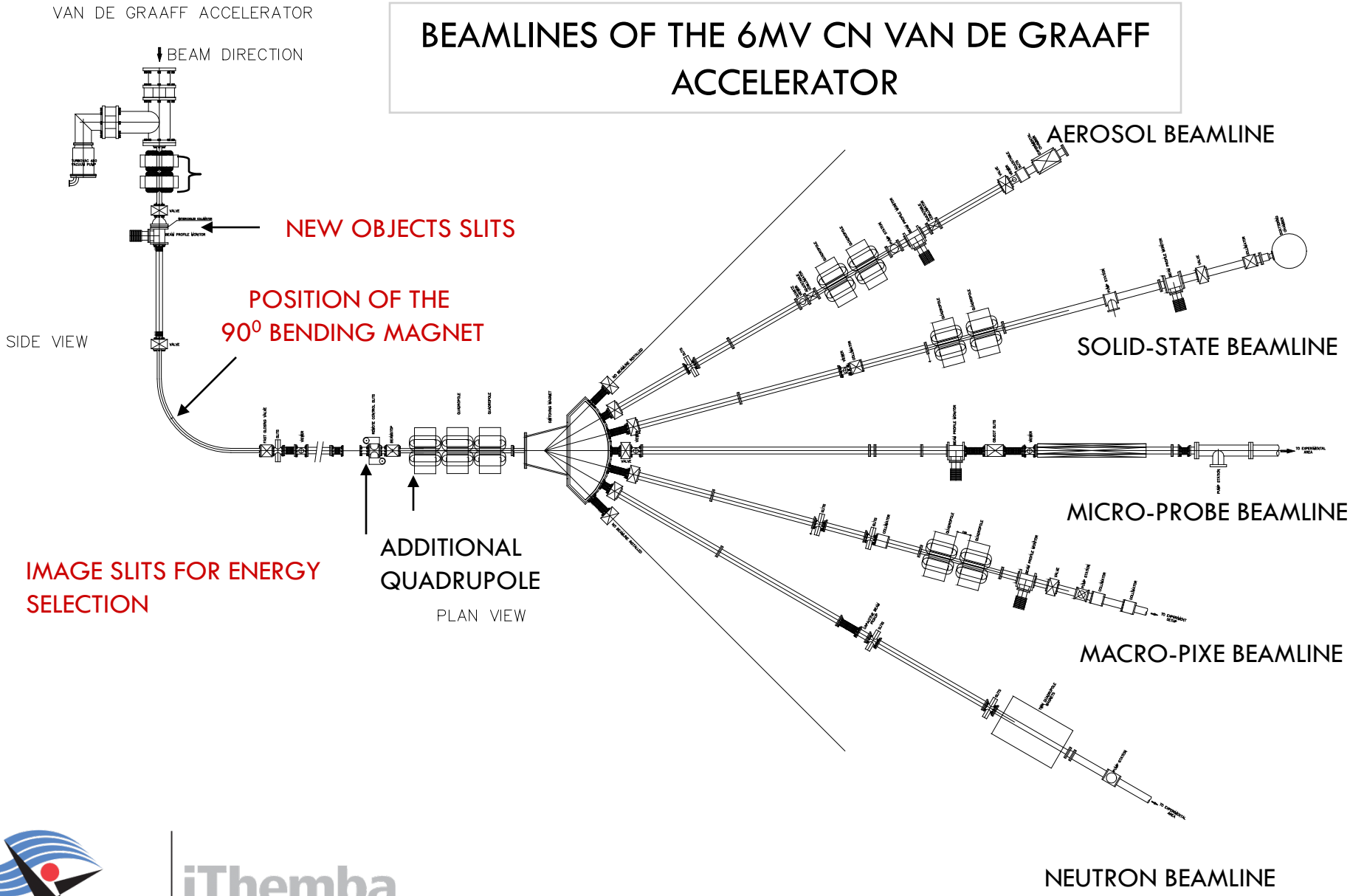


National Research Foundation | iThemba LABS Laboratory for Accelerator Based Sciences

Control Room 6MV CN Van de Graaff 2003 iThemba LABS



BEAMLINES OF THE 6MV CN VAN DE GRAAFF ACCELERATOR

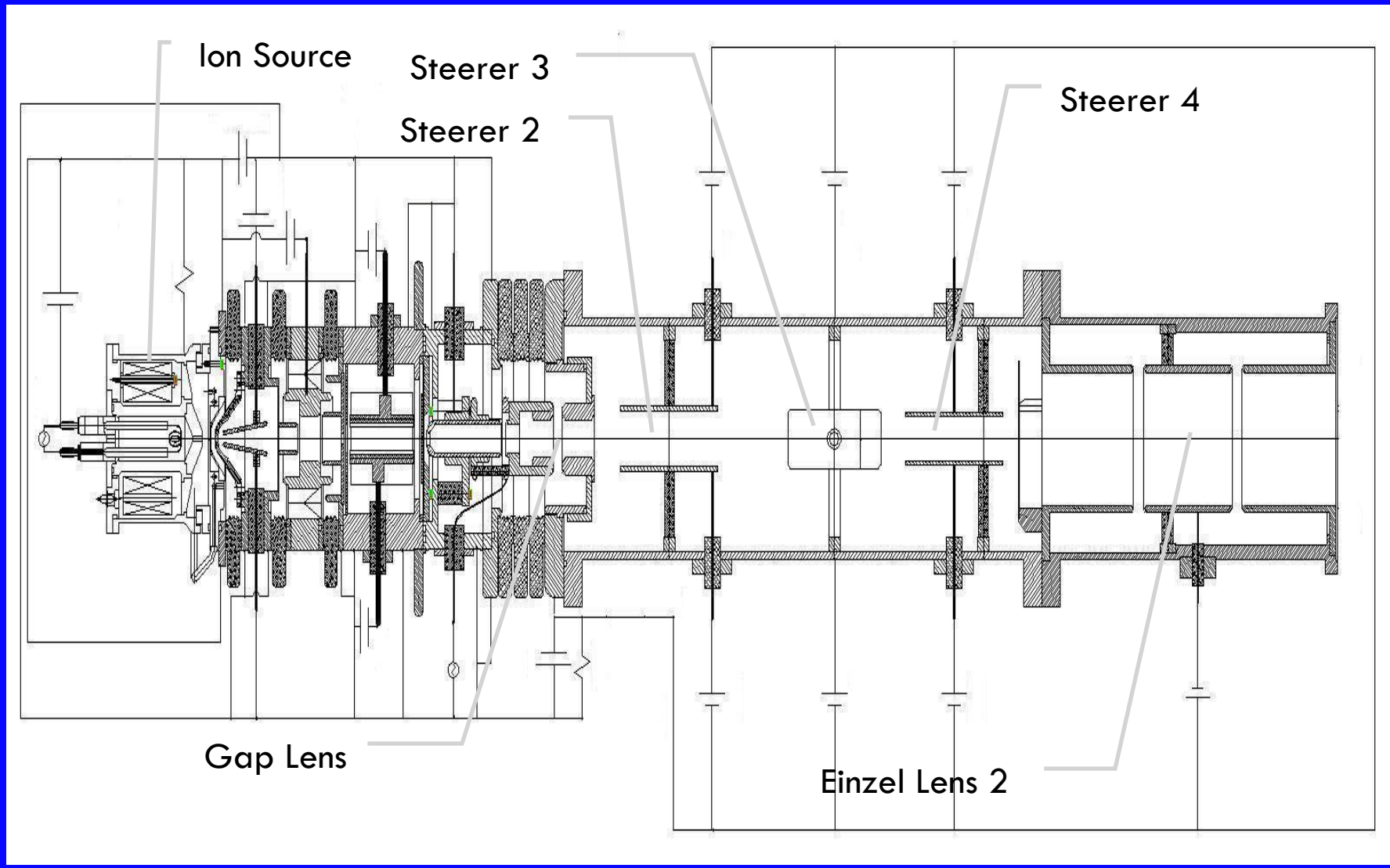


National Research Foundation

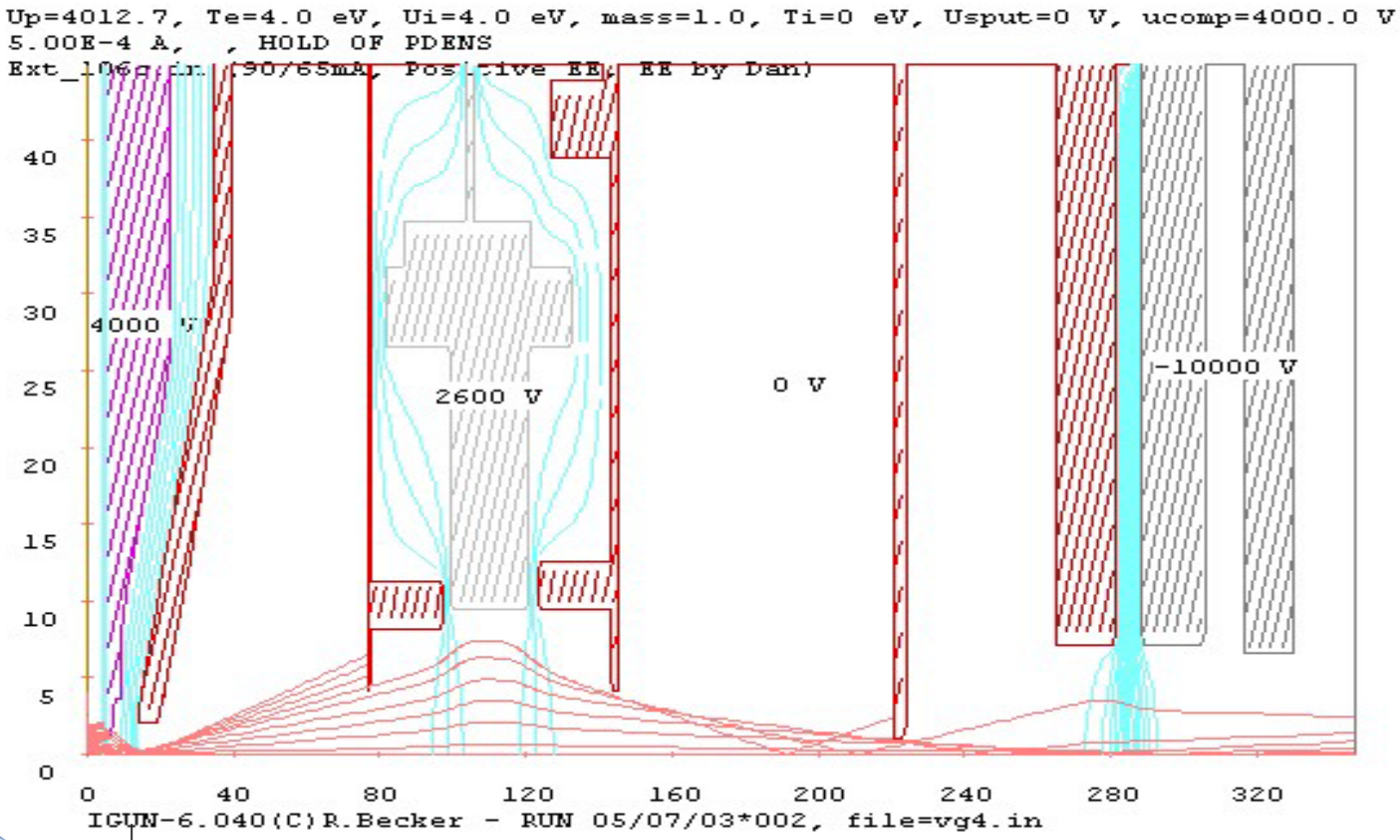
iThemba LABS

Laboratory for Accelerator Based Sciences

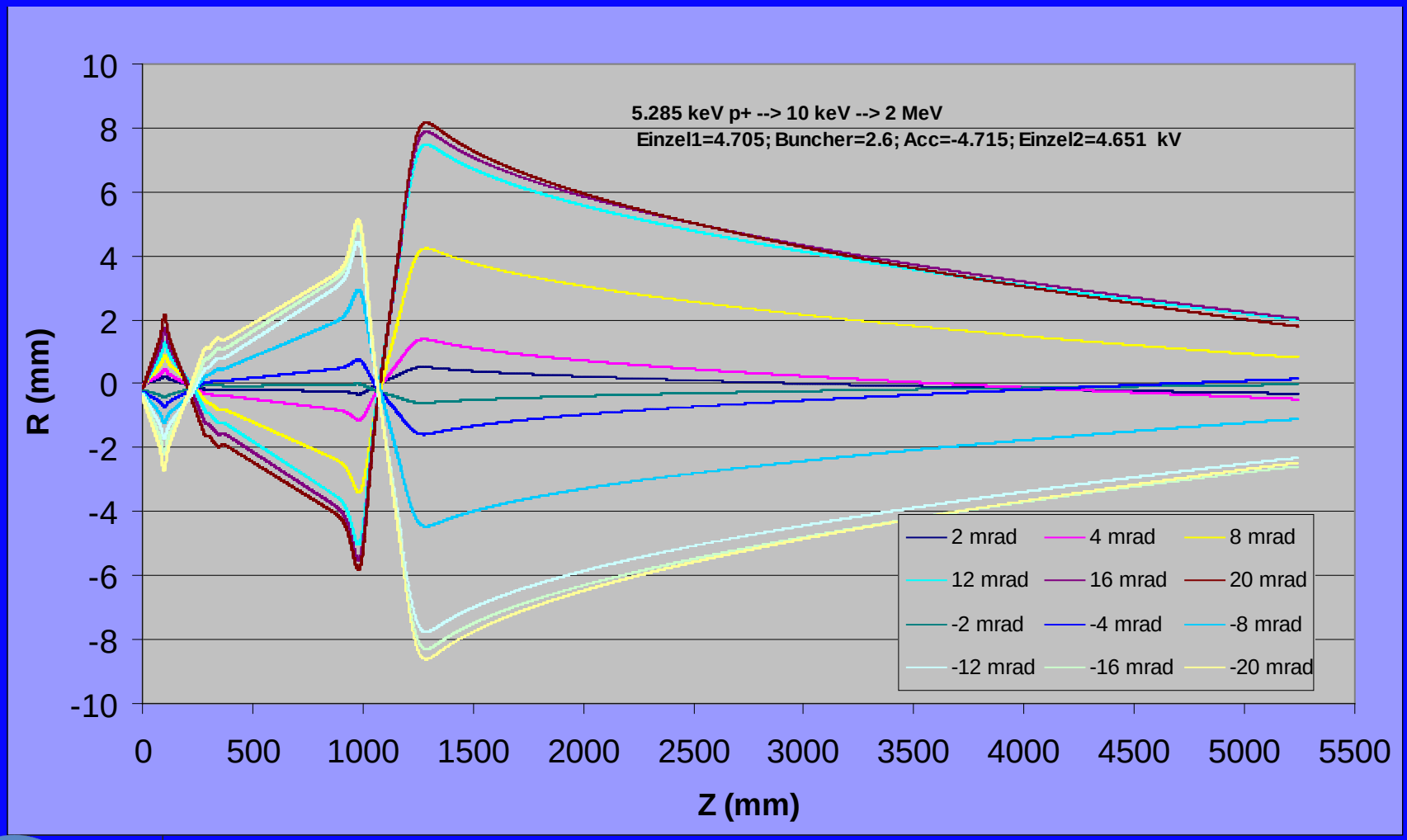
Layout – HV Terminal



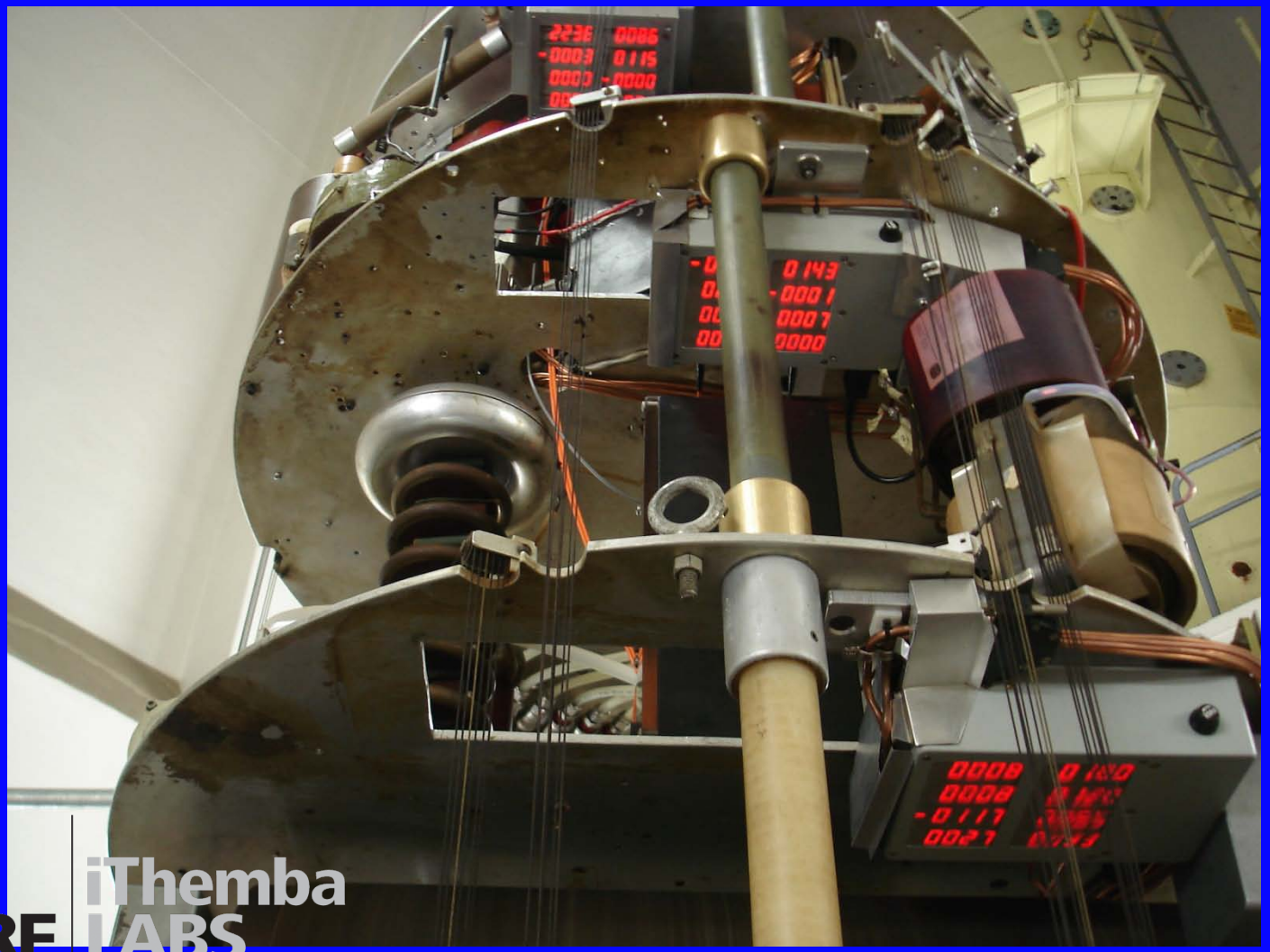
Beam Envelope Calculated with the Program IGUN

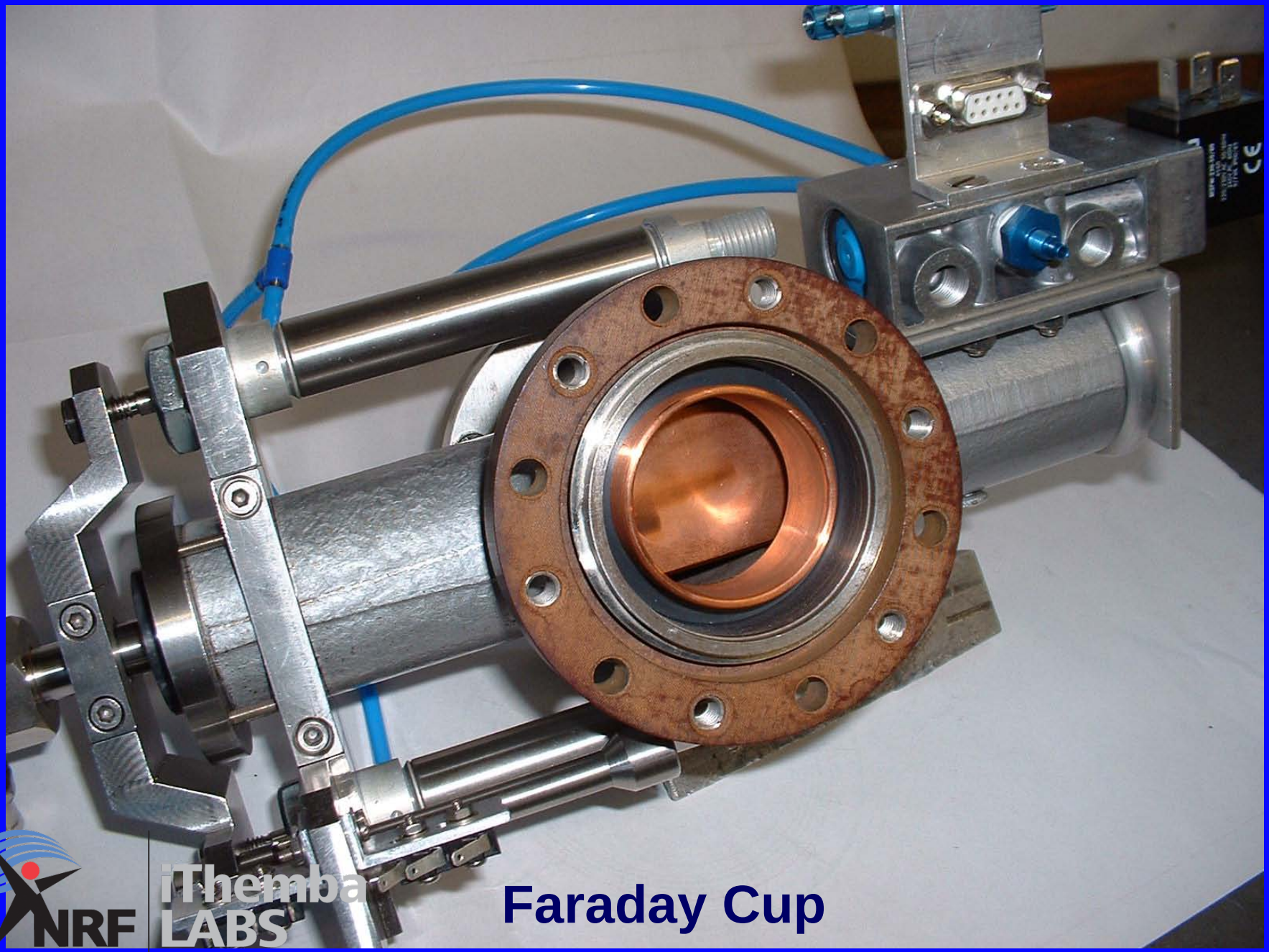


Beam Profile in the Van De Graaff - 2 MeV Protons



24 Digital Meters Installed in the Terminal of the 6 MV CN Van De Graaff

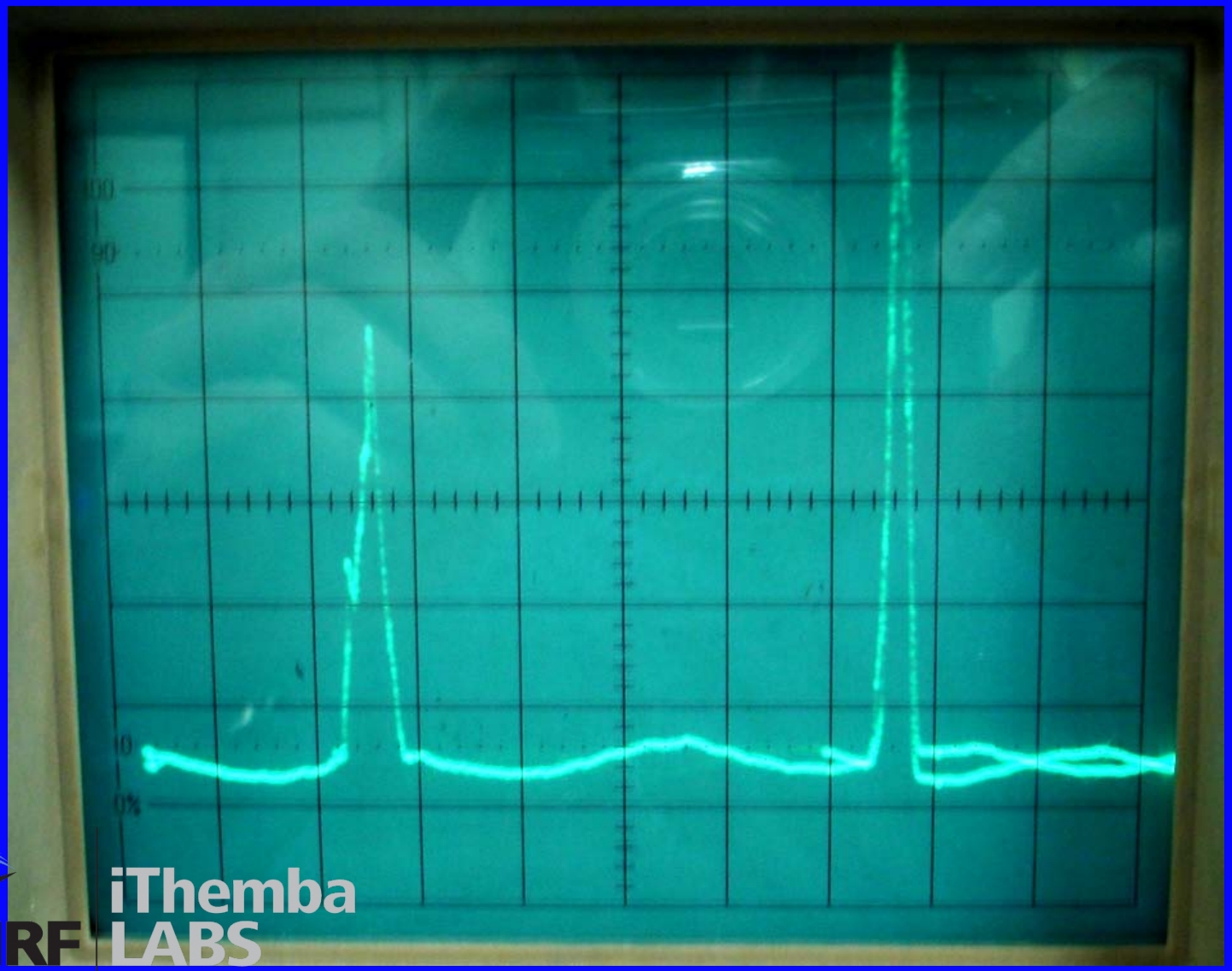




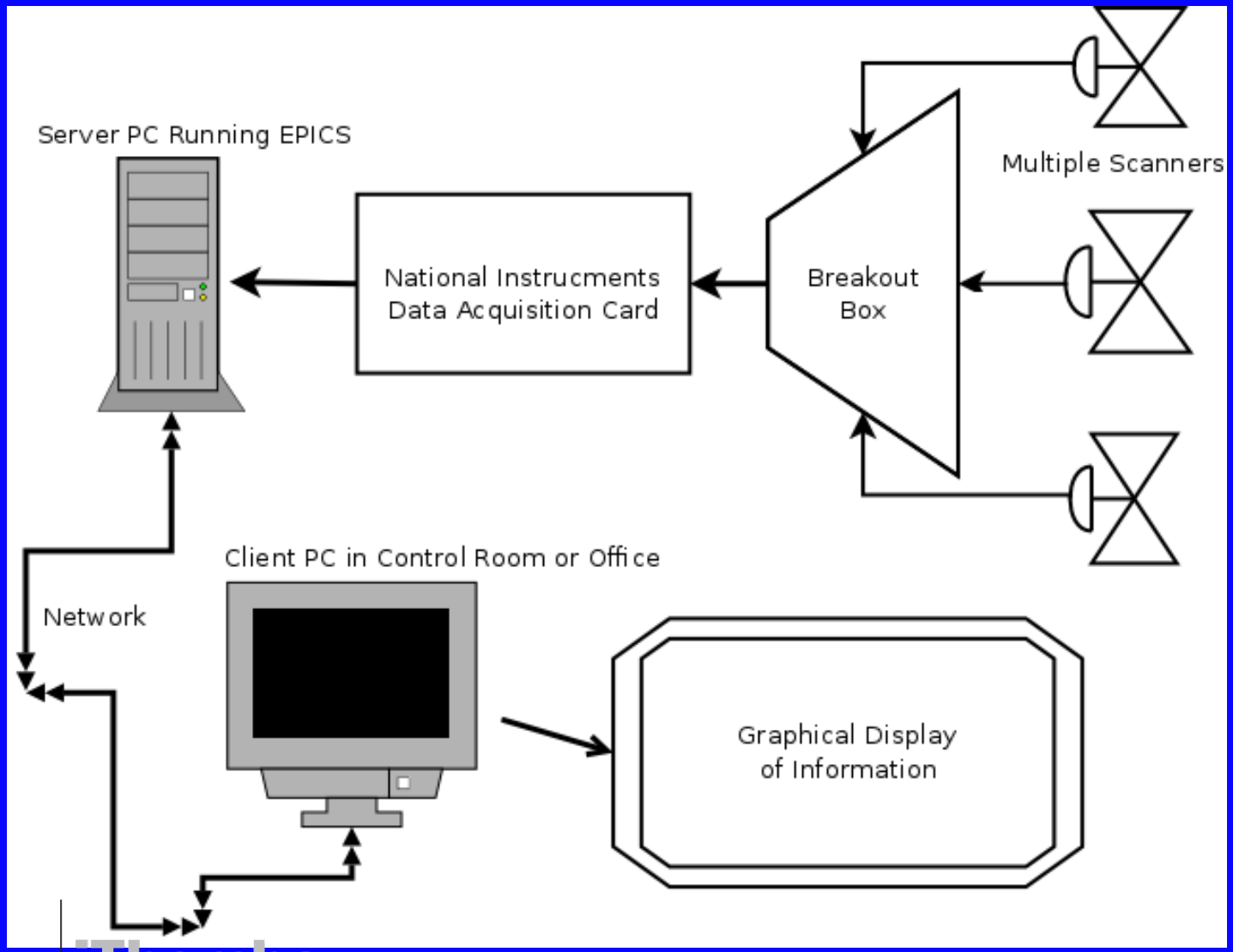
Faraday Cup

Scanner

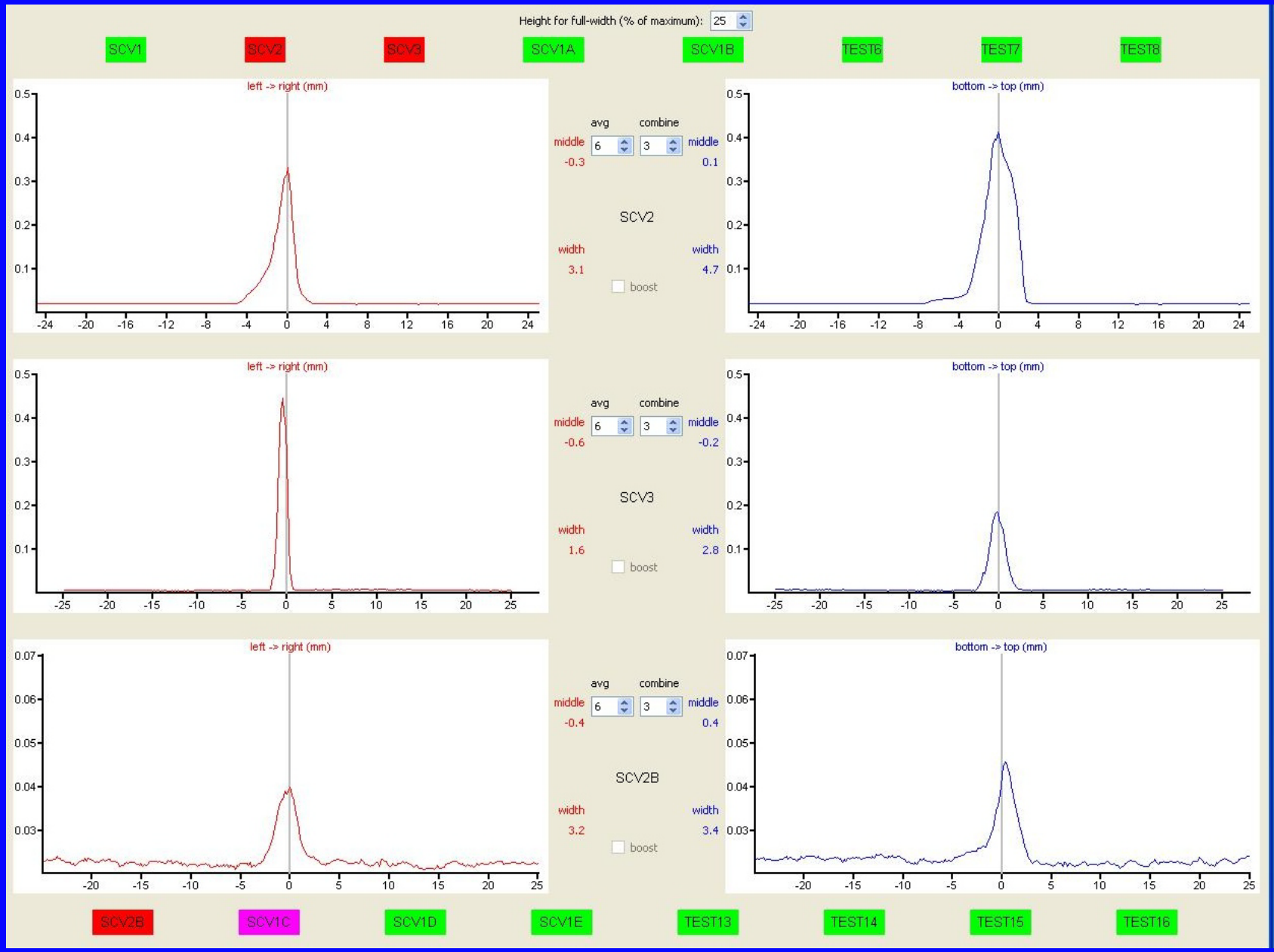
Oscilloscope Picture of the Beam Profile measured on a scanner



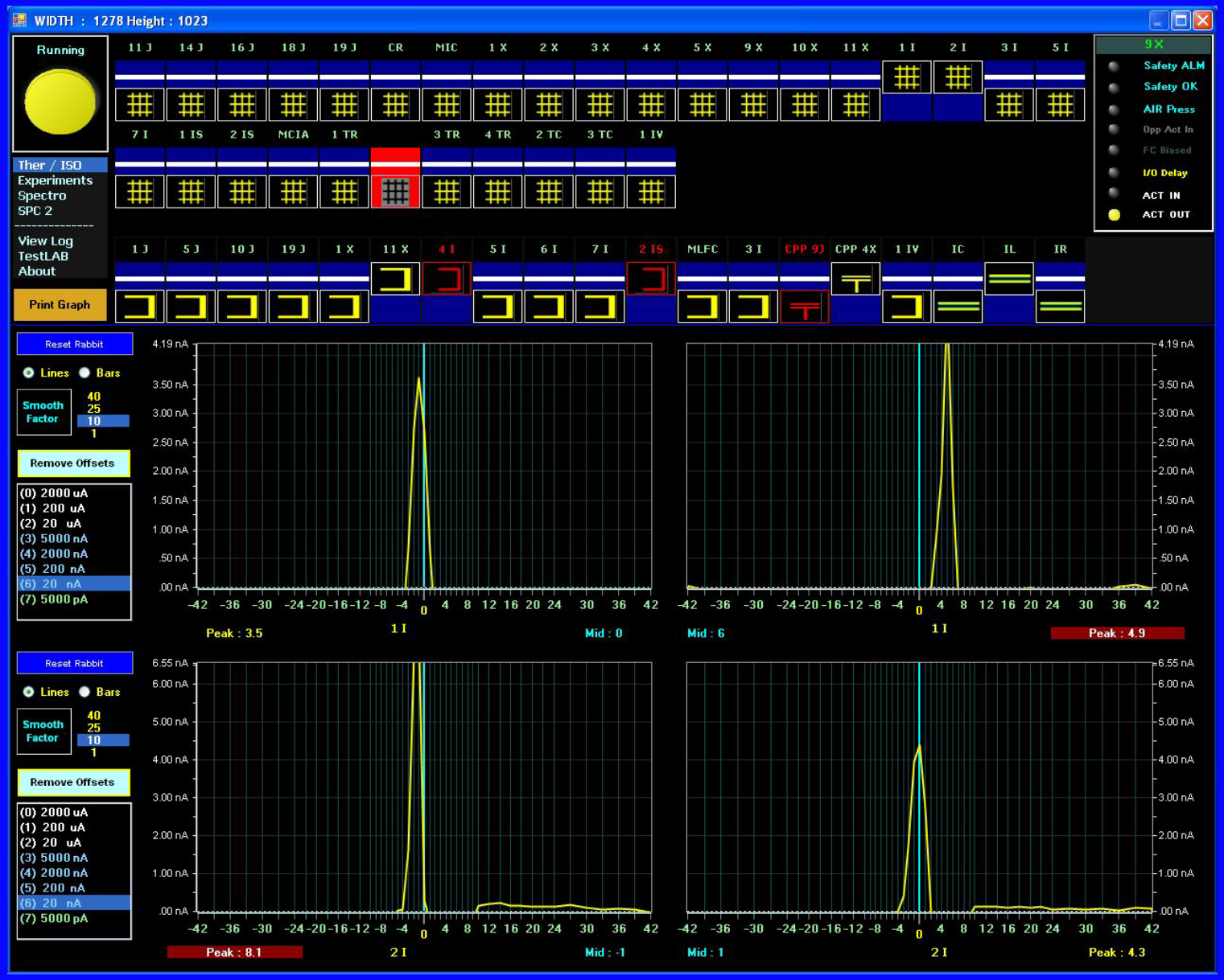
Scanner System for iThemba LABS



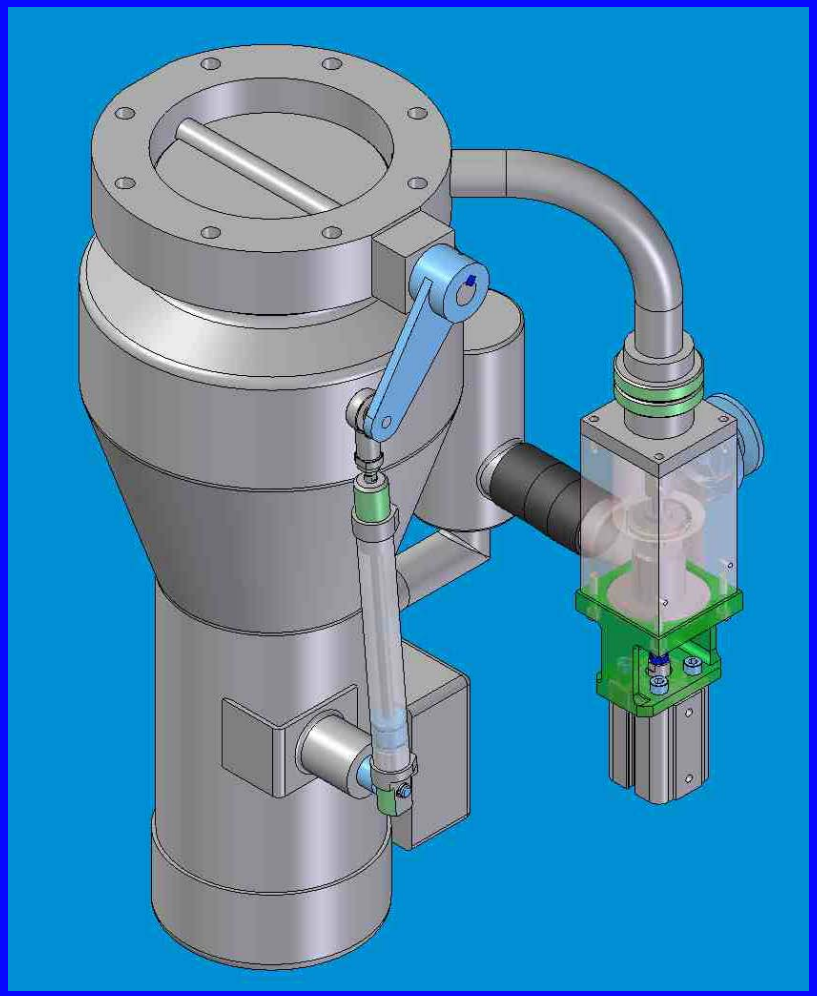
Measured Beam Profile on 3 Different Scanners



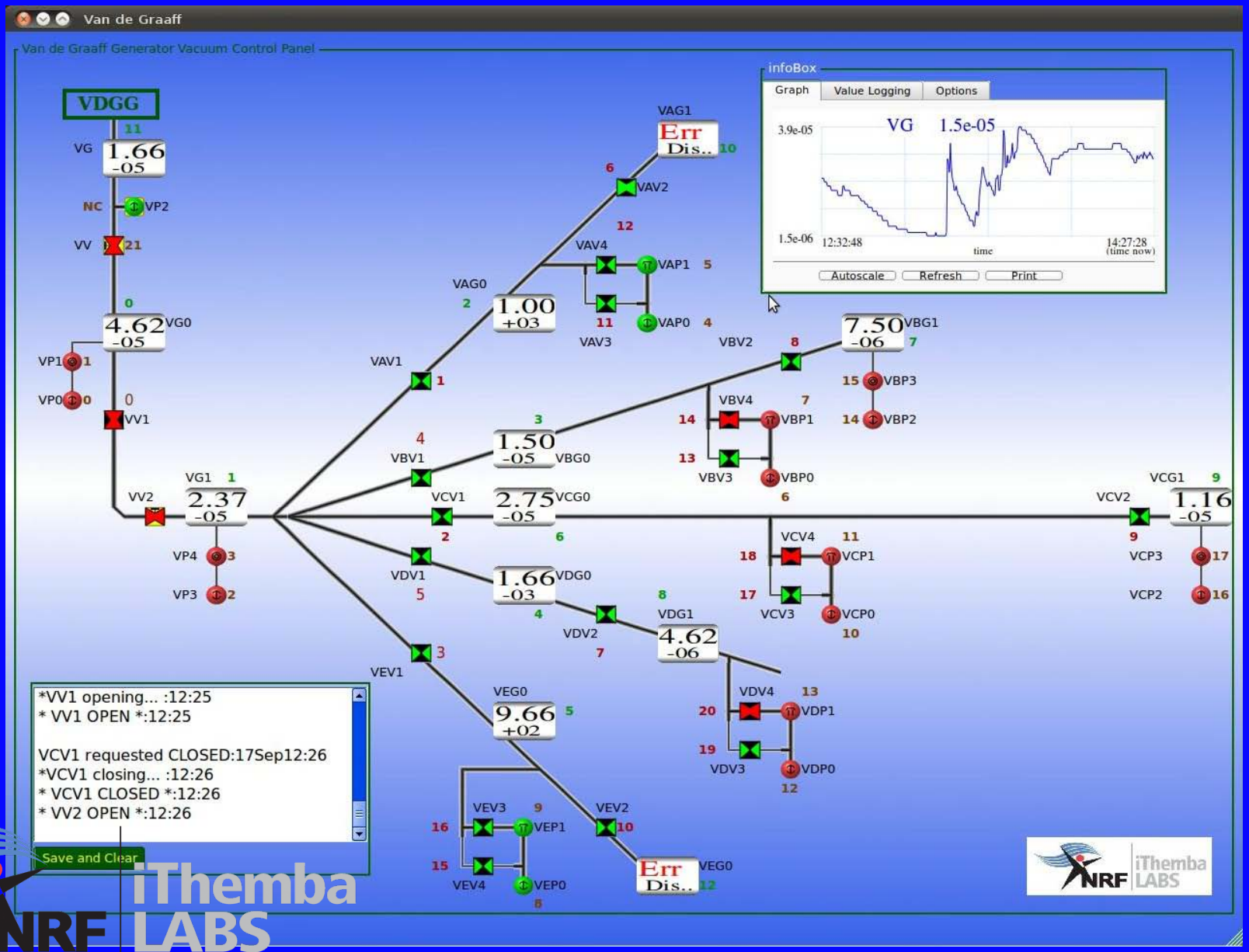
New Grid Electronics



1 of 7 Oil Diffusion Pumps that were Modified for Remote Control Operation

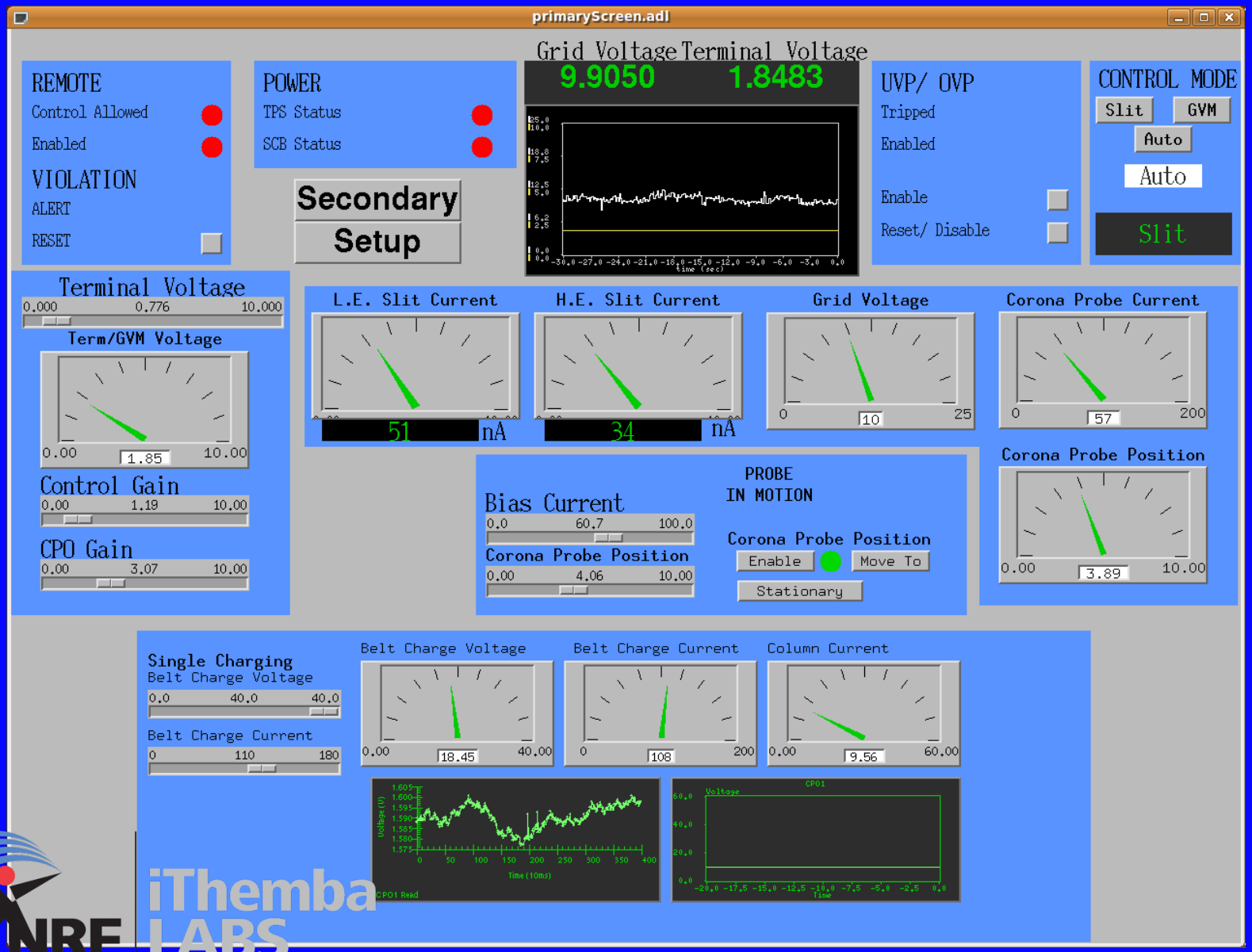


Display of the Vacuum System

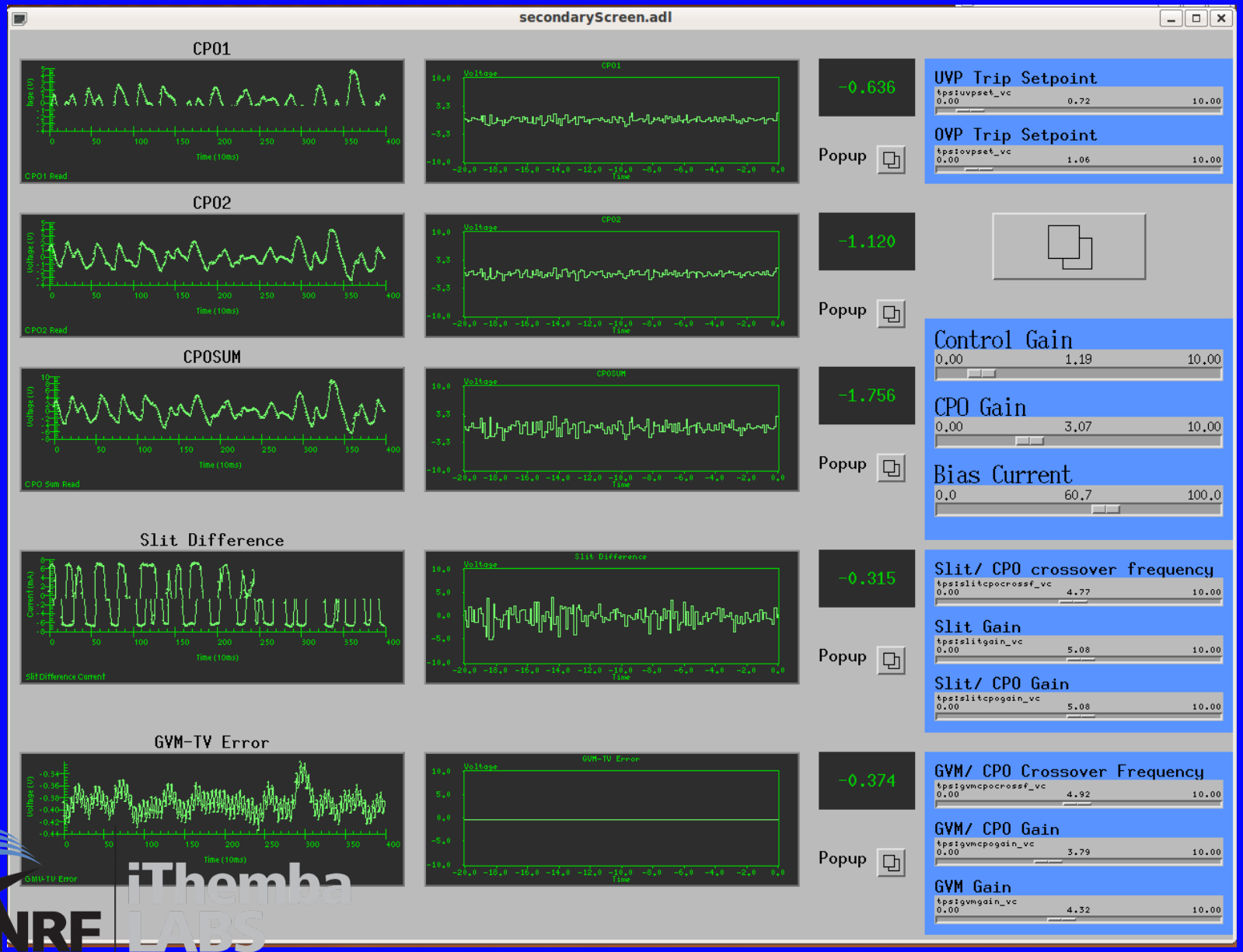


Terminal Potential Stabilizer

Terminal Potential Stabilizer Control Page



Display of Different Signals of the TPS



Energy Measurement at the Van de Graaff

HP34401A - VdG_Energy

File Calculate Help

Beam energy determination for the Van de Graaff accelerator

NMR frequency

15.998 MHz

Hall-probe signal

27.967 mV

Magnetic field

3.7574 kG

Magnetic field

3.7517 kG

Calculated beam energy

3.008 MeV

Beam type

H+

Calculated beam energy

2.999 MeV

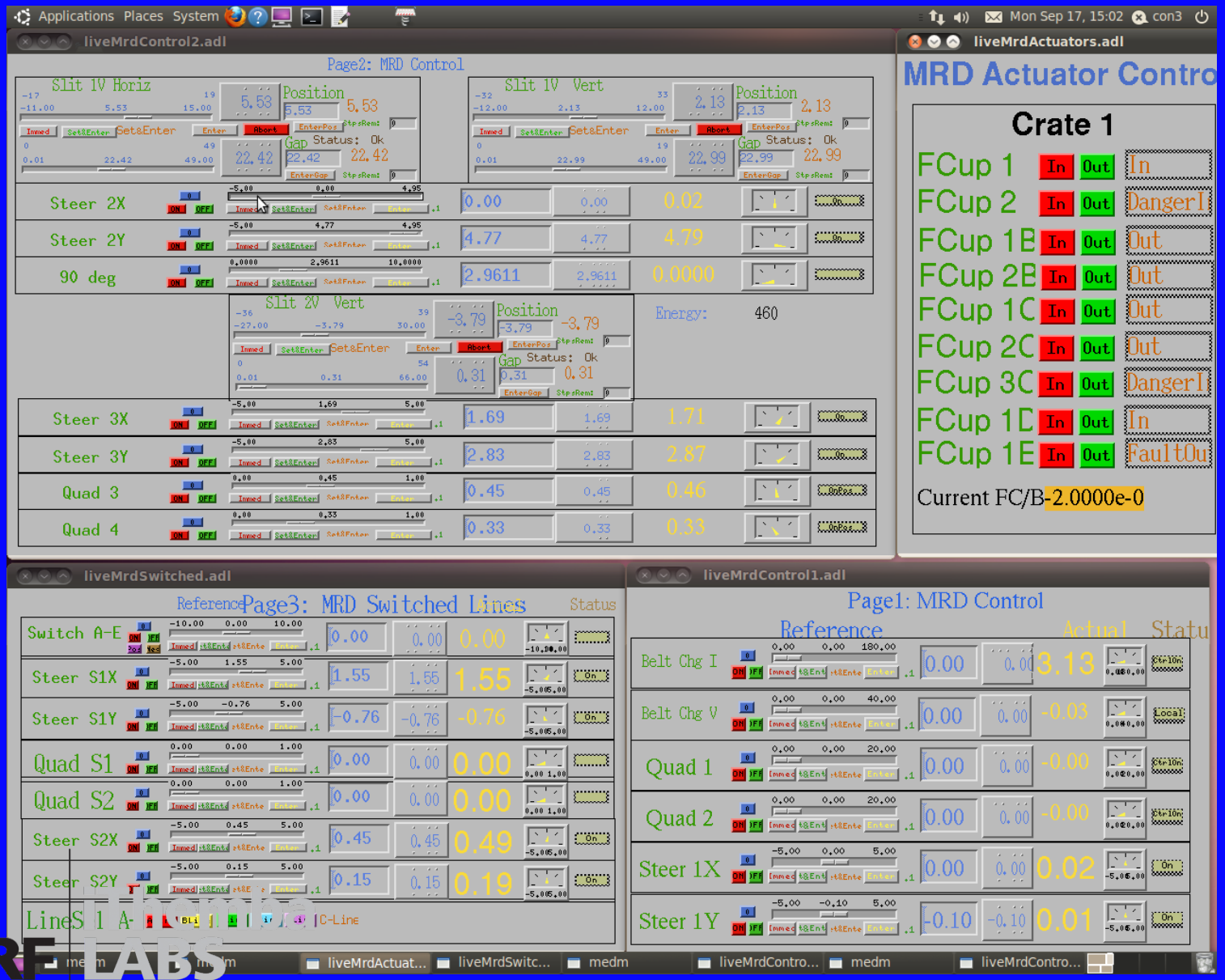
National Research Foundation

iThemba LABS

Laboratory for Accelerator Based Sciences

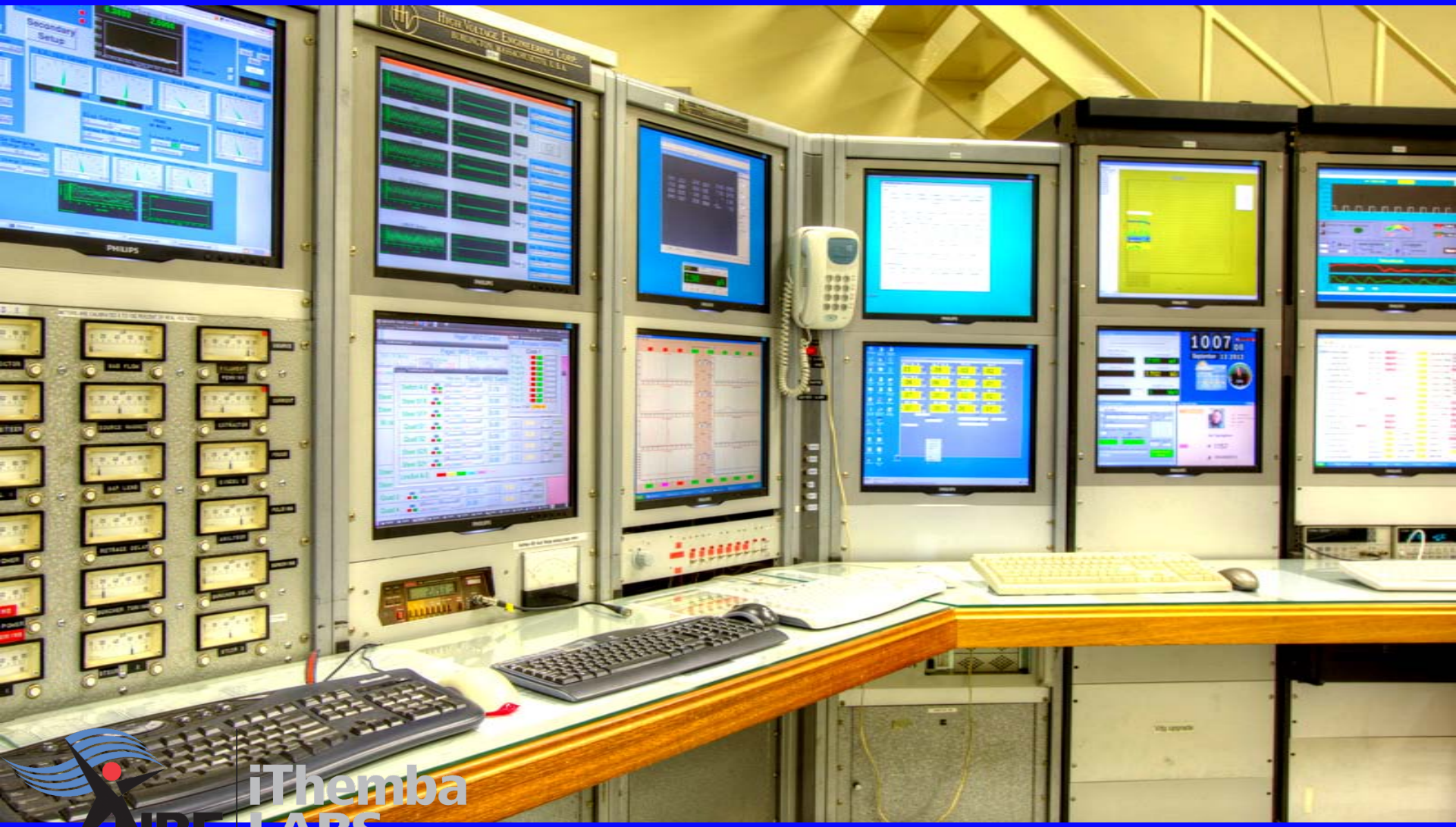
Safety Interlock System

EPICS Control Pages

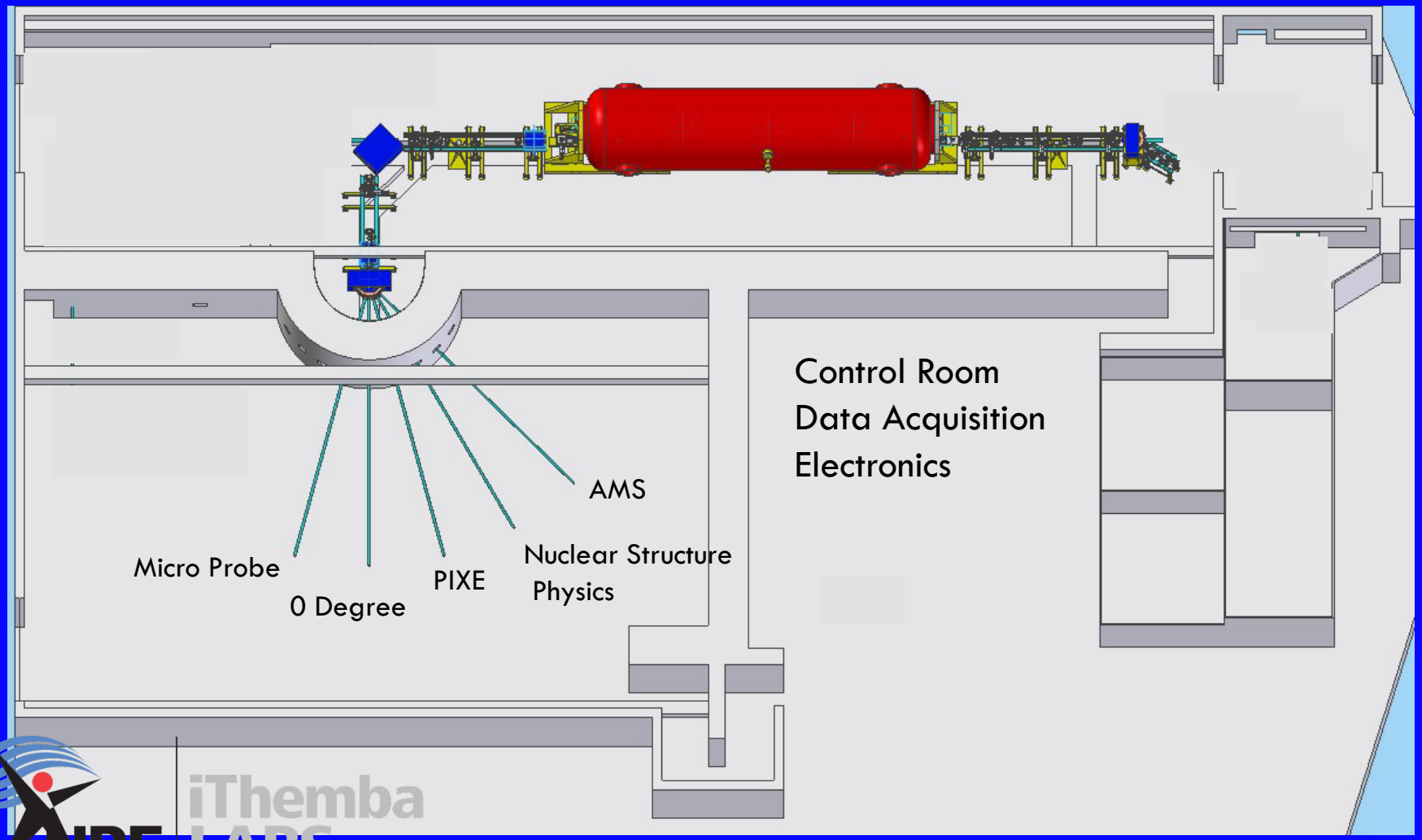


Power Supplies and Electronics

Control Room 6MV CN Van de Graaff 2012



iThemba LABS Gauteng 6MV Tandem Accelerator Facility Layout

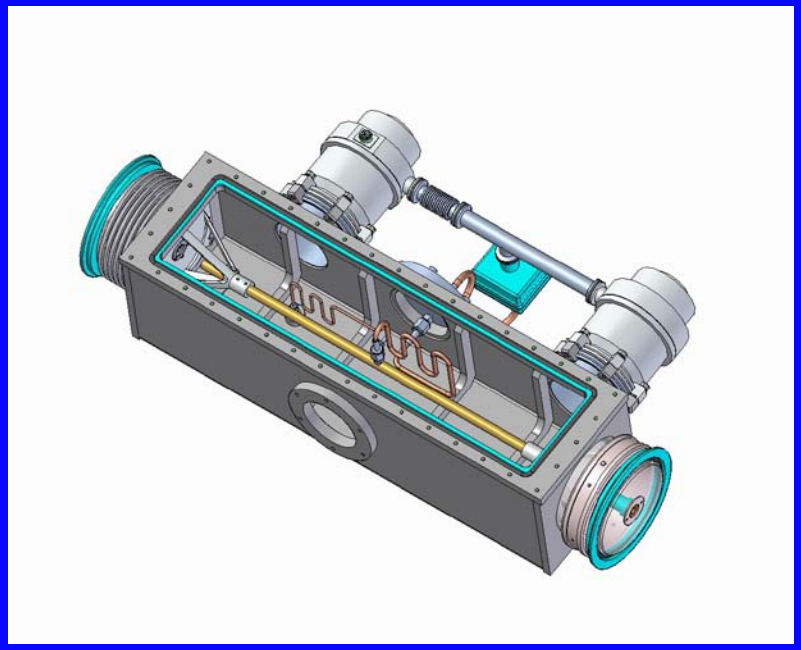


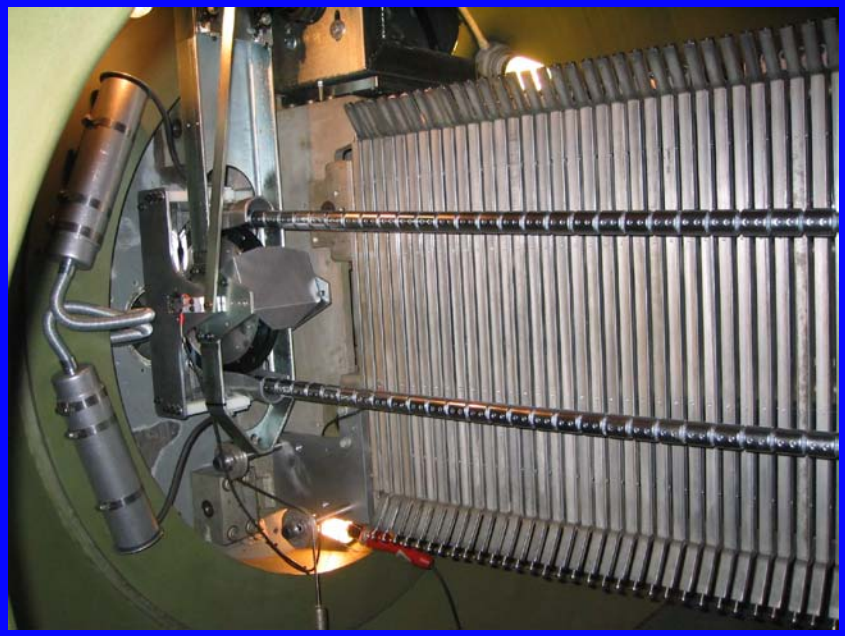
Injection Beam Line before the Refurbishment

Accelerator Injection

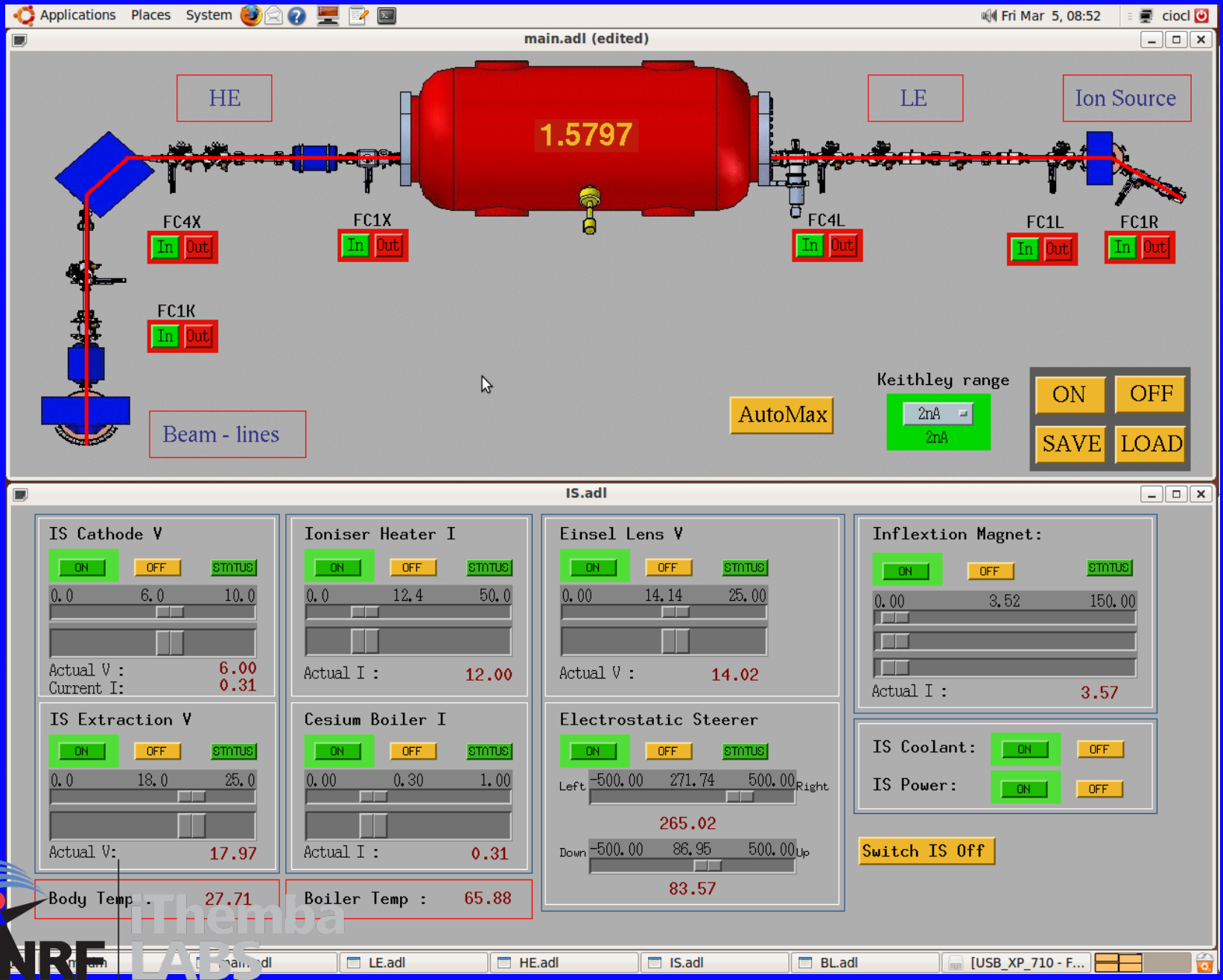
Injection Side of the Tandem Accelerator after Refurbishments

Refurbishment of the 6 MV EN Tandem Accelerator

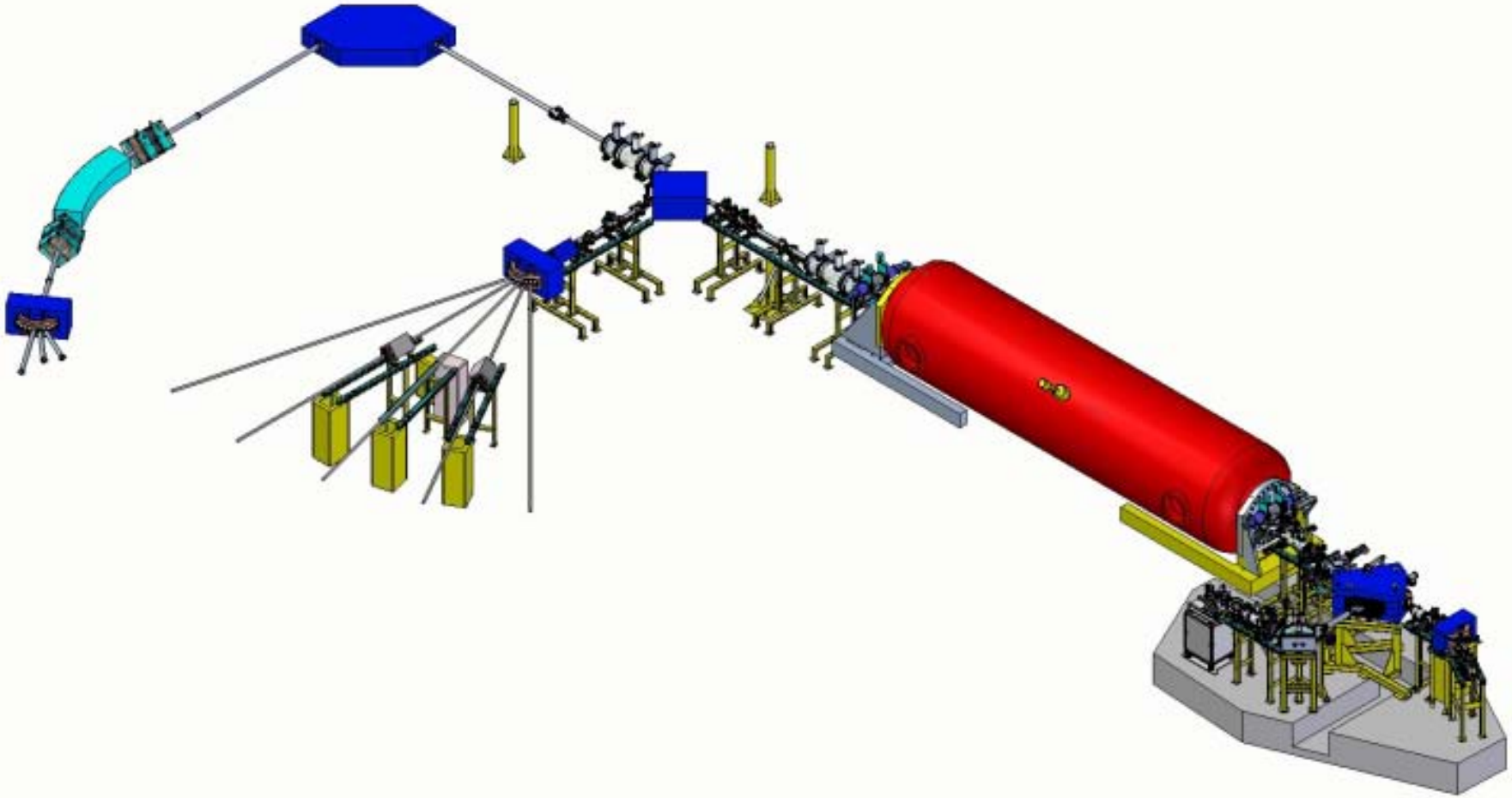




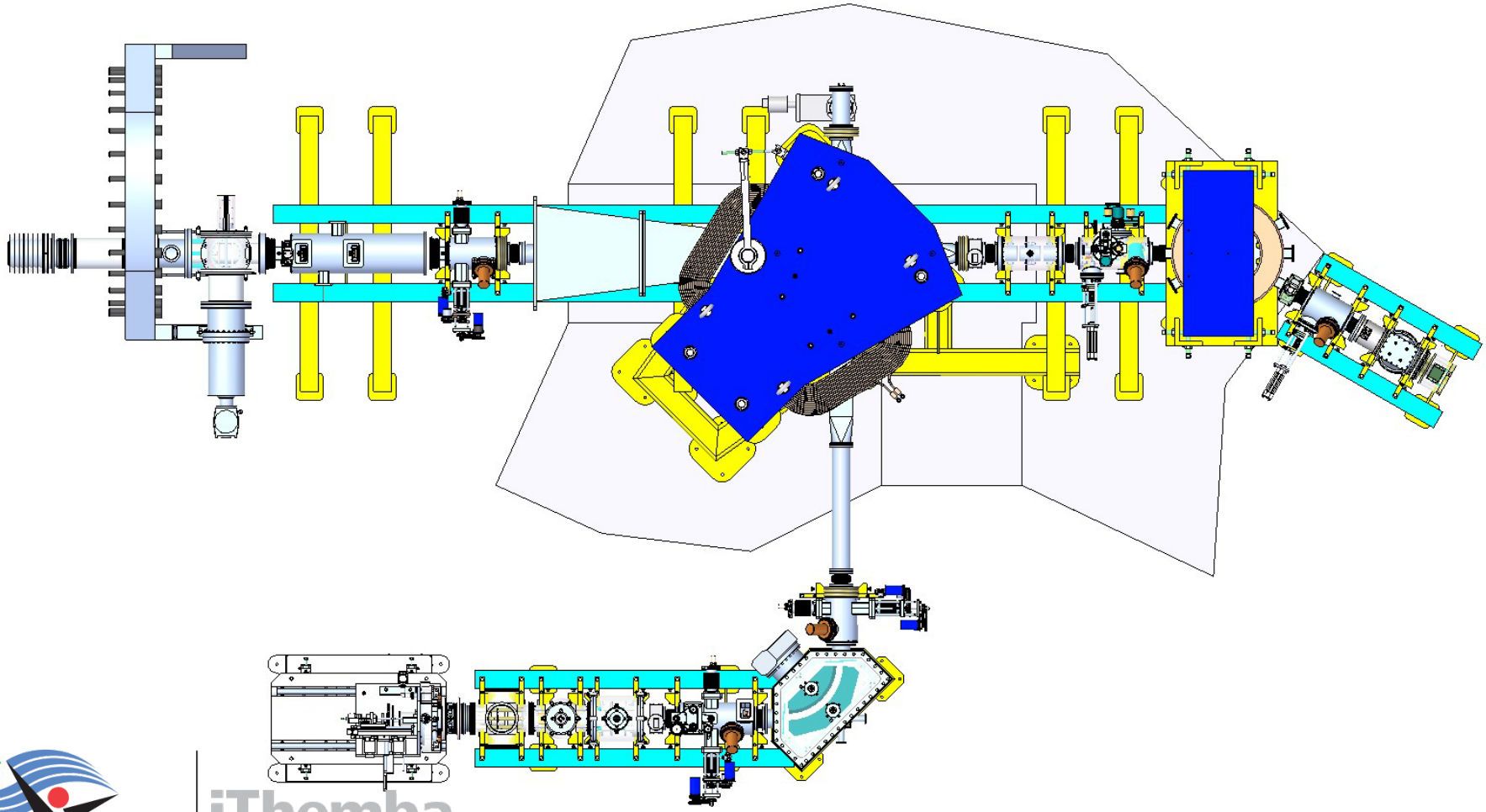
High Energy Beam Lines of Tandem


Applications Places System
Fri Mar 5, 08:52
ciocl
main.adl (edited)
HE
LE
Ion Source
1.5797
FC4X
In Out
FC1X
In Out
FC4L
In Out
FC1L
In Out
FC1R
In Out
FC1K
In Out
Beam - lines
AutoMax
Keithley range
2nA
2nA
ON
OFF
SAVE
LOAD
IS.adl
IS Cathode V
ON OFF STATUS
0.0 6.0 10.0
Actual V : 6.00
Current I: 0.31
Ioniser Heater I
ON OFF STATUS
0.0 12.4 50.0
Actual I : 12.00
Einsel Lens V
ON OFF STATUS
0.00 14.14 25.00
Actual V : 14.02
Inflextion Magnet:
ON OFF STATUS
0.00 3.52 150.00
Actual I : 3.57
IS Extraction V
ON OFF STATUS
0.0 18.0 25.0
Actual V: 17.97
Cesium Boiler I
ON OFF STATUS
0.00 0.30 1.00
Actual I : 0.31
Electrostatic Steerer
ON OFF STATUS
Left -500.00 271.74 500.00 Right
265.02
Down -500.00 86.95 500.00 Up
83.57
IS Coolant: ON OFF
IS Power: ON OFF
Switch IS Off
Body Temp : 27.71
Boiler Temp : 65.88
LE.adl
HE.adl
IS.adl
BL.adl
[USB_XP_710 - F...

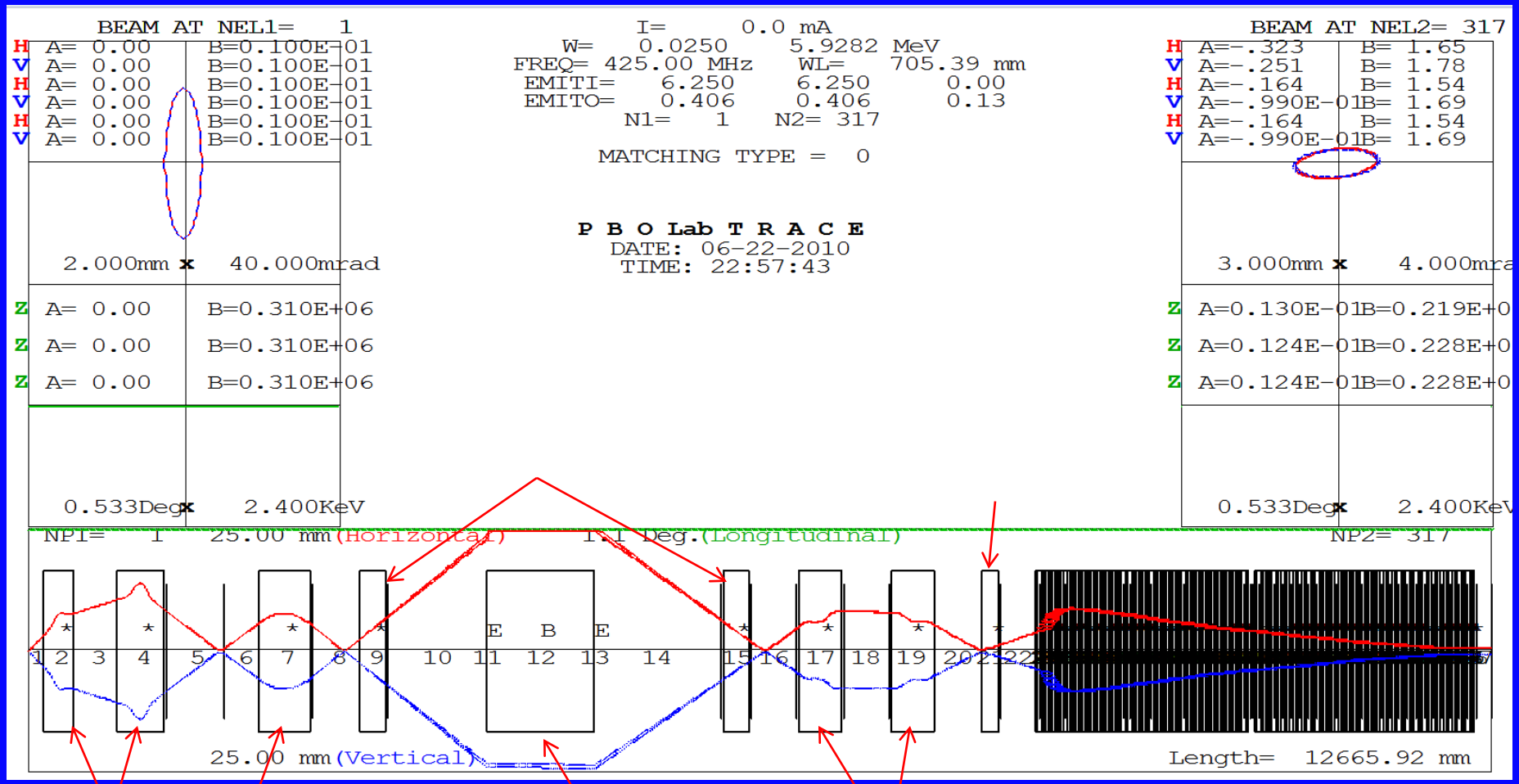
Layout of AMS system for iThemba LABS Gauteng



Injection System for 6 MV EN Tandem Accelerator of iThemba LABS



Injection Beam Optics from AMS Ion Source to middle of Tandem



einzel lenses

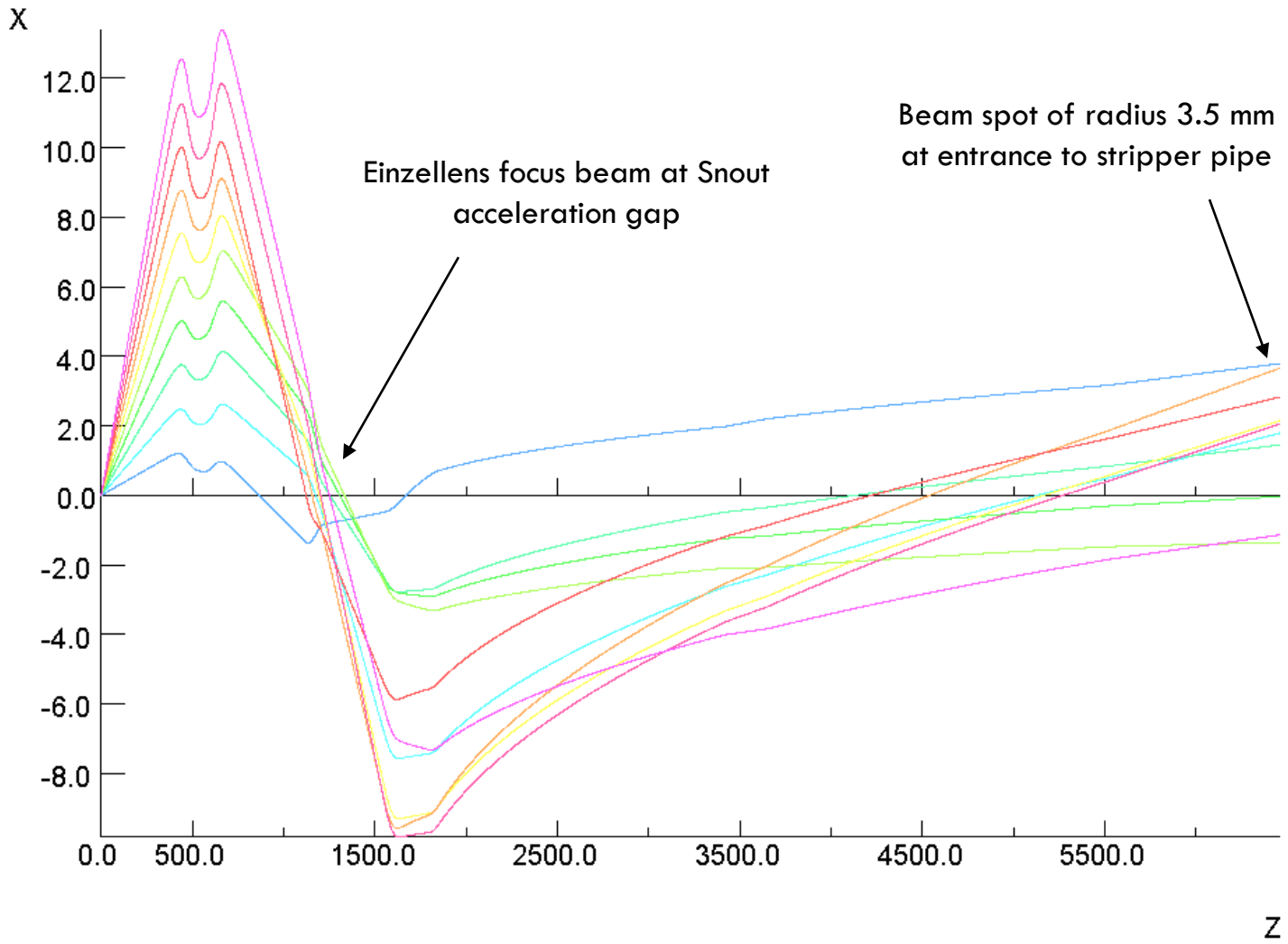
90 degree electrostatic analyser r =300 mm Energy/charge state ratio = 90 keV

90 degree bending magnet r = 600 mm Maximum mass energy product =15.6 MeV amu

einzel lenses

Acceleration tube

Tandem b02 Ve=45kV Vs=48kV Vt=6MV 25keV H- 3,6,...30mrad
1/Nov/2005 10:00:51



UNITS

Length	mm
Magn Flux Density	T
Magn Field	A m^{-1}
Magn Scalar Pot	A
Magn Vector Pot	Wb m^{-1}
Elec Flux Density	C m^{-2}
Elec Field	V m^{-1}
Conductivity	S mm^{-1}
Current Density	A mm^{-2}
Power	W
Force	N
Energy	J

PROBLEM DATA

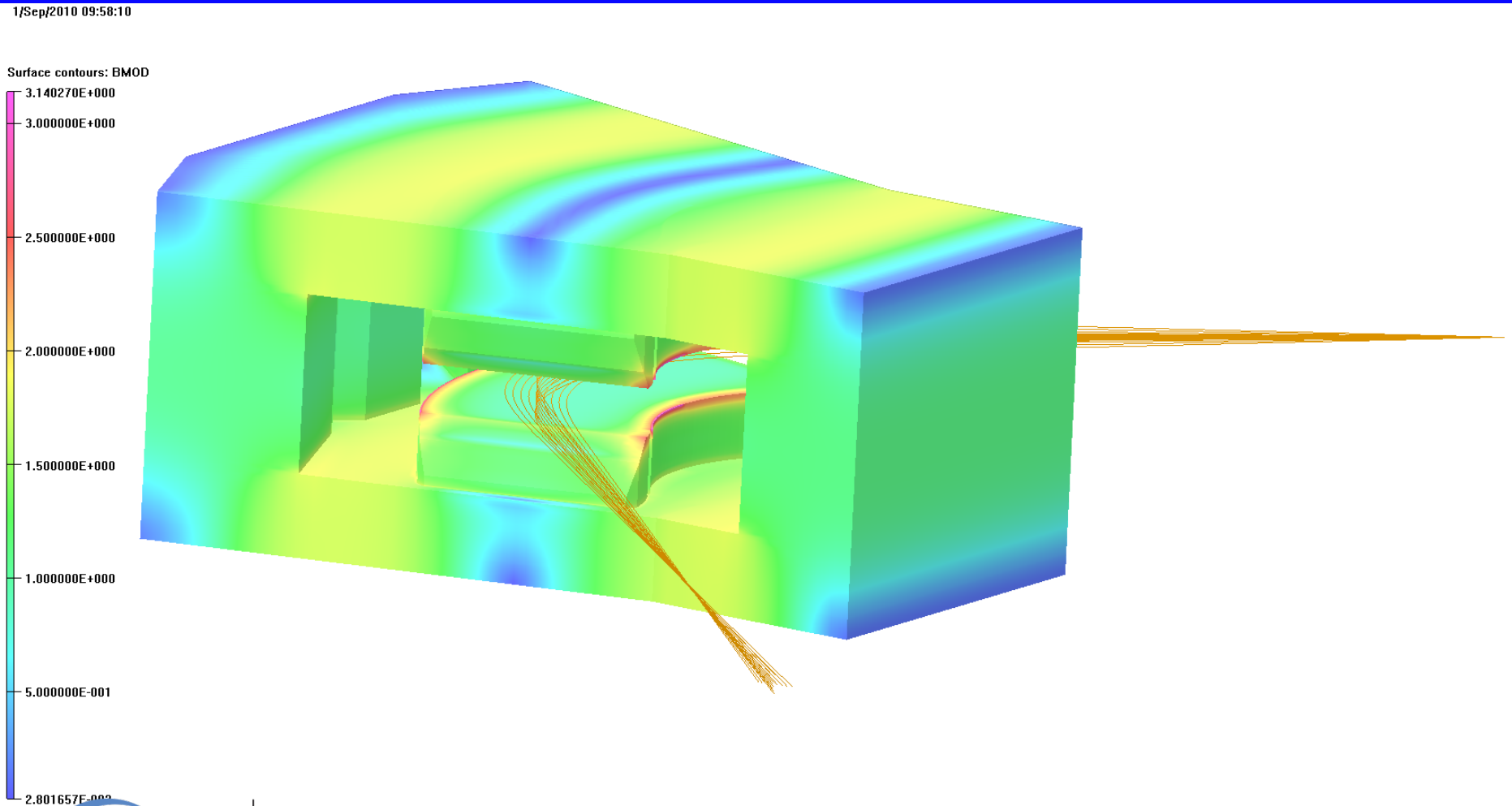
tand_b02.op3
TOSCA Electrostatic
Linear materials
Simulation No 1 of 1
204970 elements
247357 nodes
Nodally interpolated fields
12-fold rotational symmetry

Local Coordinates

Origin: 0.0, 0.0, 0.0
Local XYZ = Global XYZ

VECTOR FIELDS

90 Degree Bending Magnet

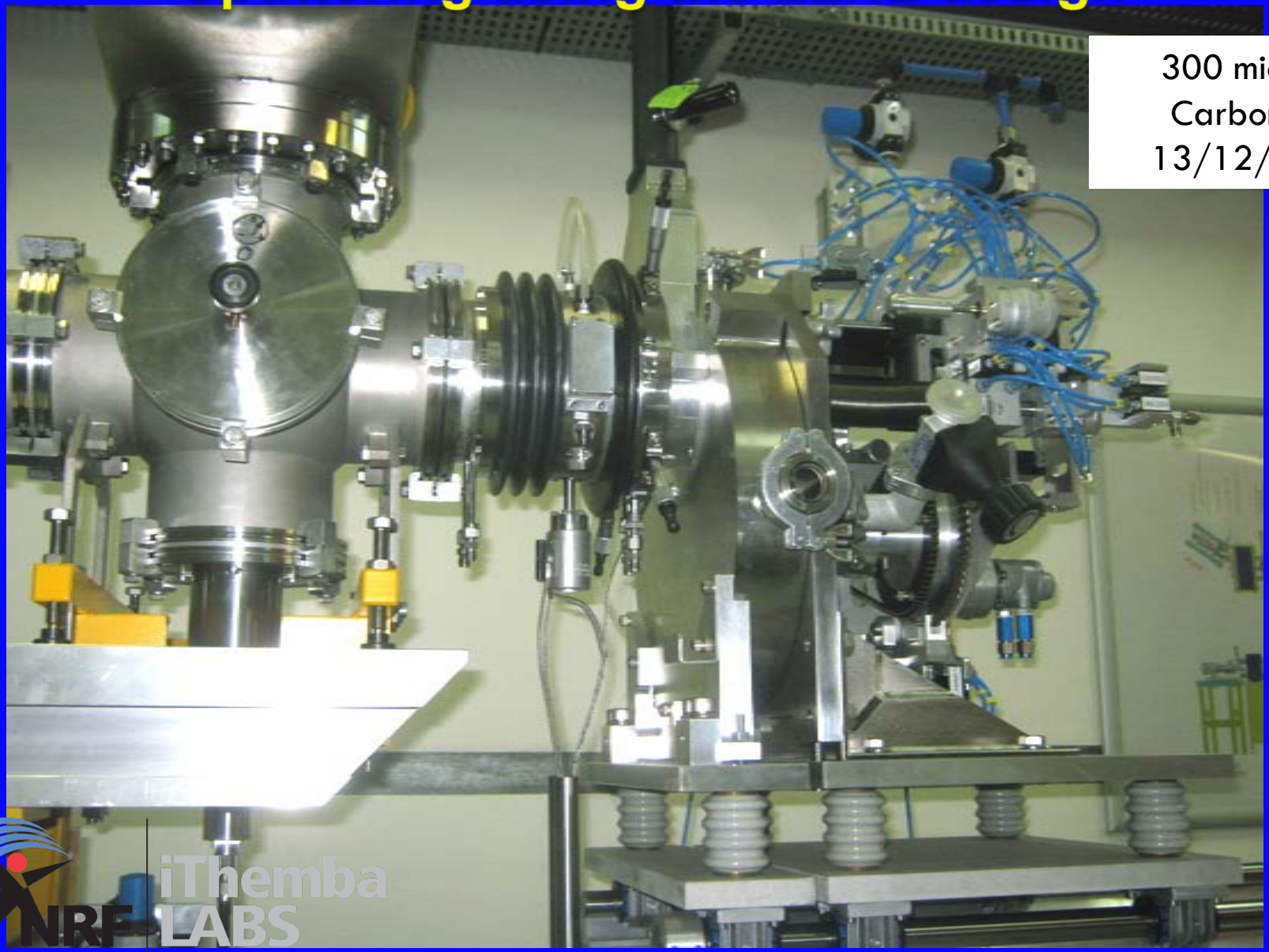


Opera

AMS Injection Beam Line

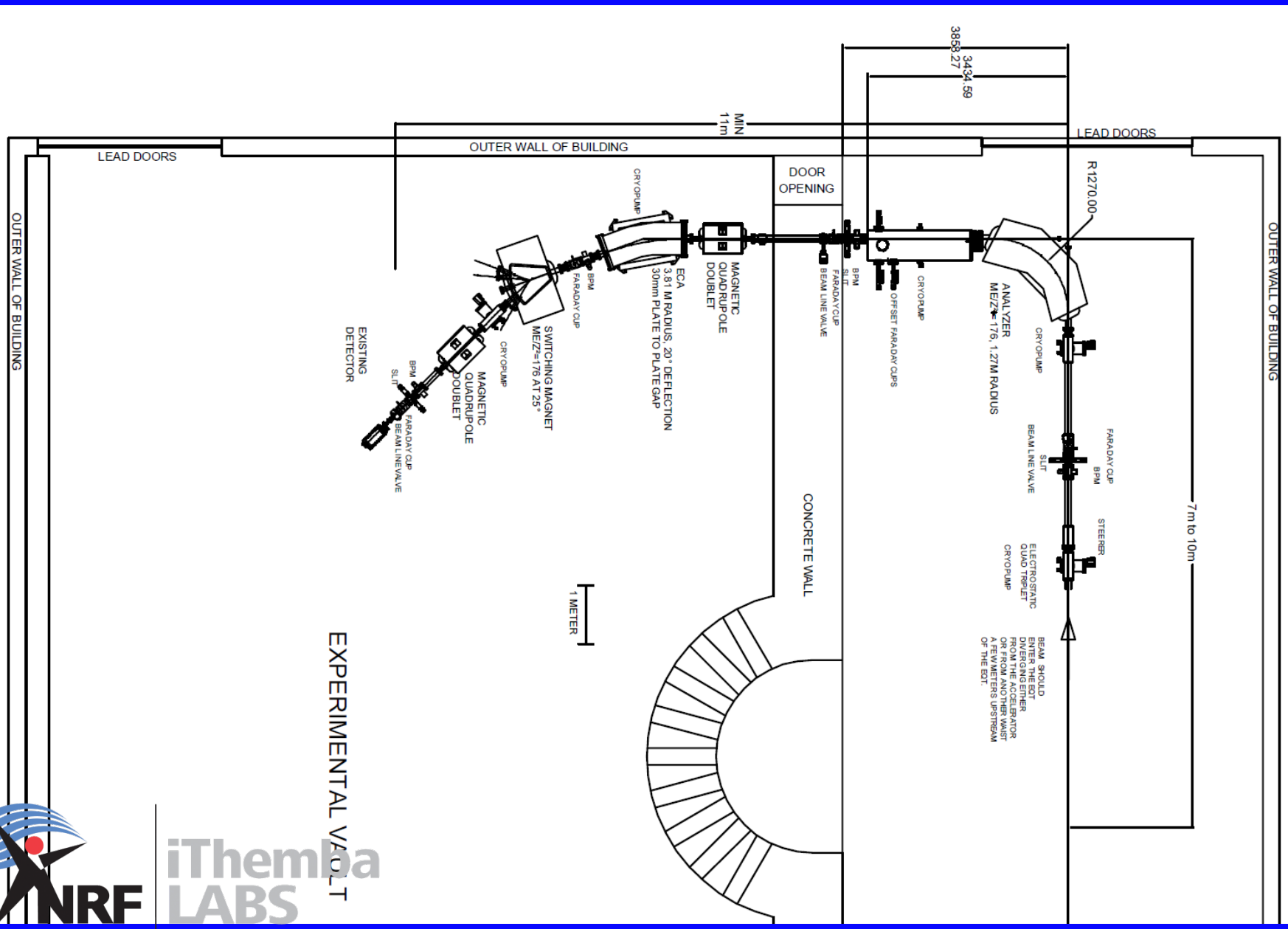
AMS Injection Beam Line

iThemba LABS Negative Ion Source by Cesium Sputtering using the LLNL design



300 micro A
Carbon 12
13/12/2009

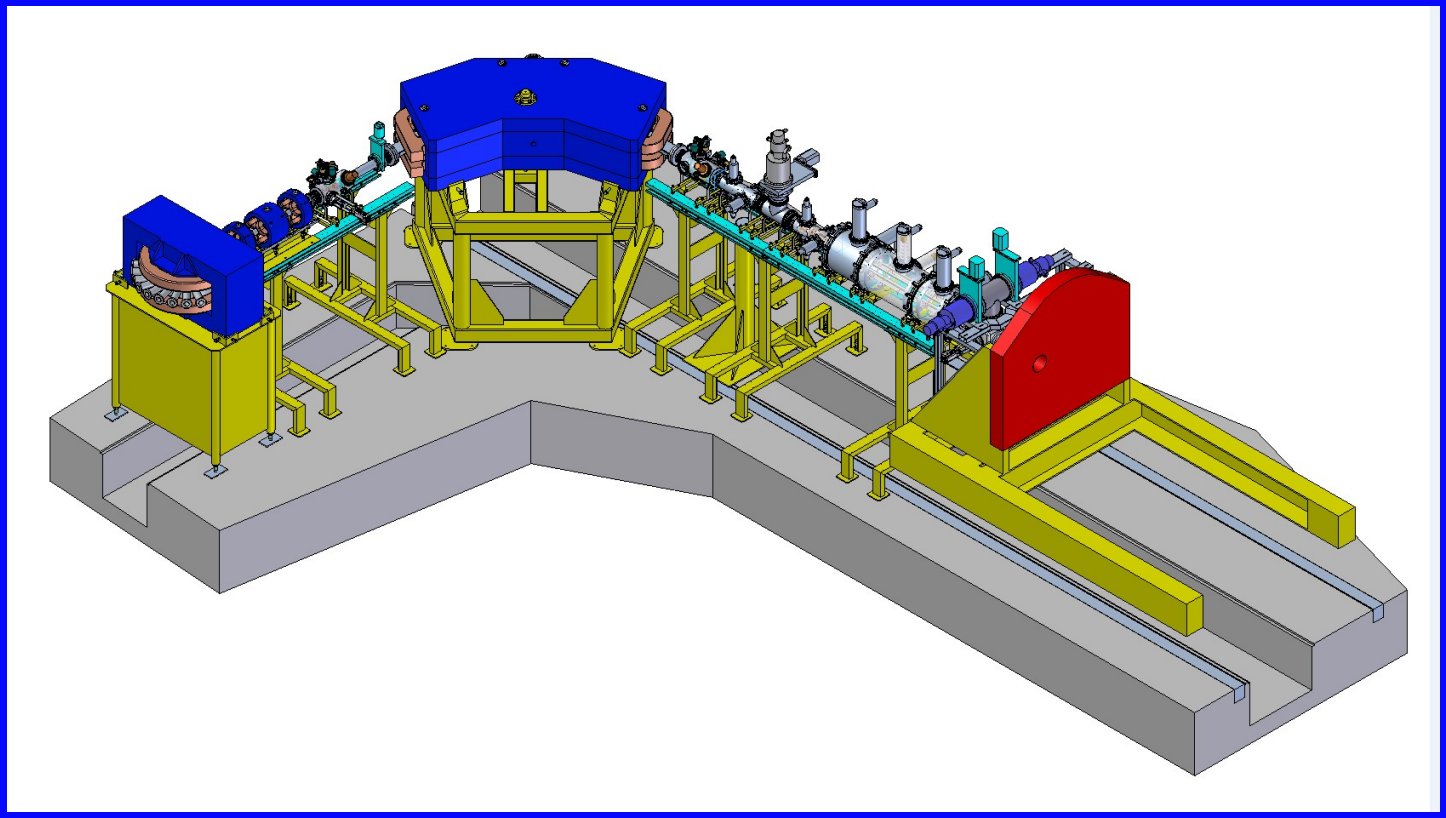
Layout of the High Energy AMS System



AMS ACTIVITIES ON THE HIGH ENERGY SIDE

Rebuild existing high energy beam lines:

- Replace analyzer magnet with larger magnet (better mass*energy product)
- Replace magnetic elements with electrostatic devices – AMS requirement
- Replace magnetic doublet after analyzer magnet with triplet arrangement
- Project to be completed by end of March 2013



Thank you