Agenda

https://indico.cern.ch/conferenceDisplay.py?confId=181008

I. Workpackage overview – R. Folch (25’ + 5’)
II. Functional requirements of the BIDs – R. Folch (5’ + 5’)
III. FLUKA simulations - A. Christov (15’ + 5’)
IV. Thermo-mechanical analysis – M. Delonca (25’ + 5’)
V. BREAK (15’)
V. Conceptual and detailed design – M. Fürtinger (25’ + 5’)
VI. Controls for movable BIDs – R. Folch (10’ + 5’)
VII. Manufacturing strategy – R. Folch (15’)
VIII. Discussion – All (15’)

End 12:00

II. Functional requirements

ebg MedAustron
2700 Wiener Neustadt – Austria

DOCUMENT ID	REV. NO.	STATUS
ES-100901-a-UDO	3.1	DRAFT

Date: 2010-09-01

Engineering specification

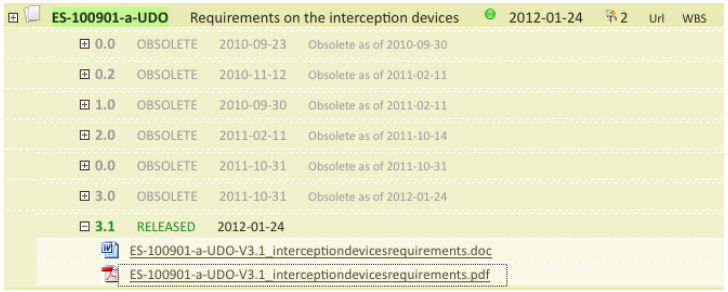
Requirement on the interception devices

Optics/ Operation view

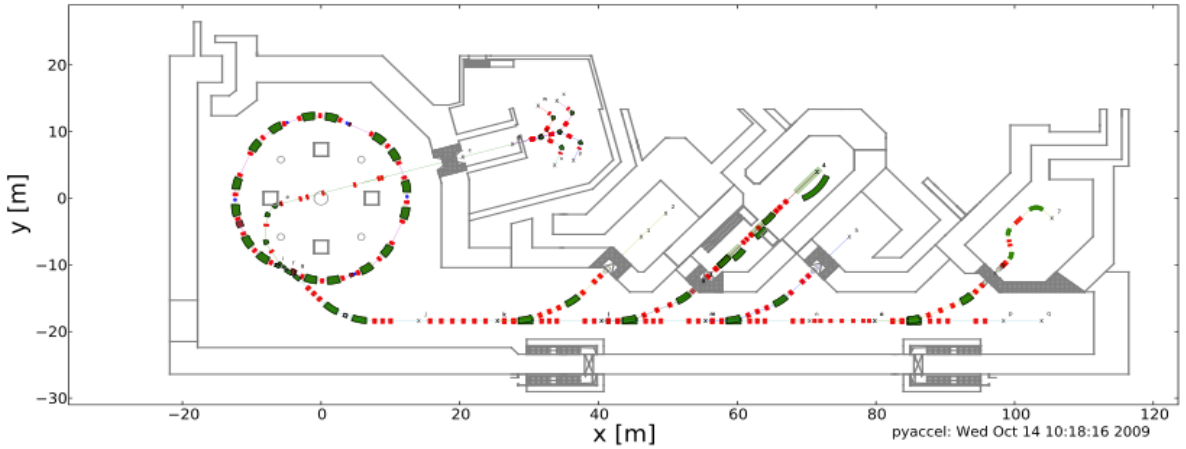
PREPARED BY:	CHECKED BY:	APPROVED BY:
U. Dorda	A. Fabich	[Approvers]

APPROVAL GROUP:

Reference document



General specification

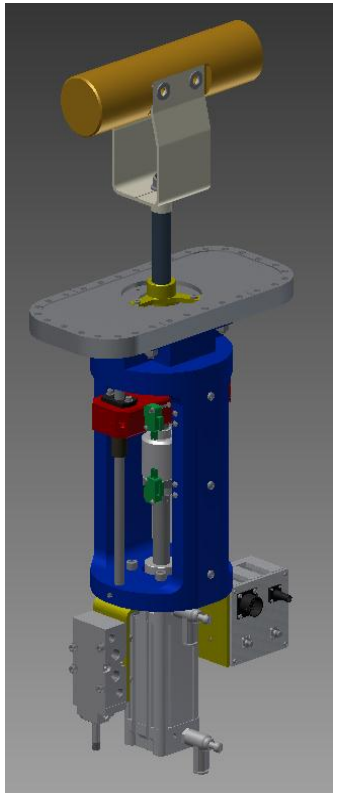


The following lists the most important background information about the MedAustron accelerator facility:

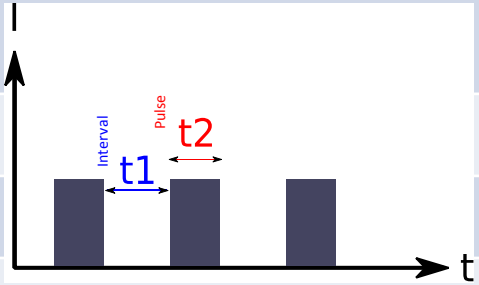
- The facility operates with Carbon and protons.
- The injection energy into the synchrotron is 7MeV/u for both particle species.
- The Synchrotron accelerates protons up to 800MeV and C^{6+} ions up to 400 MeV/u.
- The revolution period is in the order of 0.2 (extraction) and 2 μs (injection).
- The number of circulating ions in the synchrotron is up to: proton: 3E10, Carbon: 1.5E9
- The accelerator complex cycles with a repetition rate of maximum1Hz.
- The baseline spill durations (= beam in HEBT) is from 0.1 to 10s.
- The facility operates 24/7 and must be designed for minimal maintenance work and maximal uptime.
- The facility is designed to operate for ≈ 30 years.
- The beam sizes in the ring and HEBT depend on the extraction energy and the requested beam-size. The smallest possible values are listed.
- The horizontal beam shape in the HEBT is trapezoidal.

In order to a) shape the beam b) control the beam losses or c) to protect regions from unwanted beam exposure, interception devices are installed.

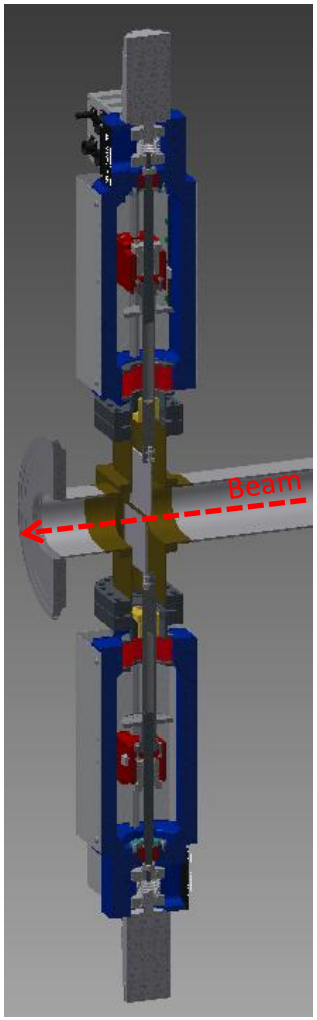
To allow the operation of the linac while the synchrotron is open for access



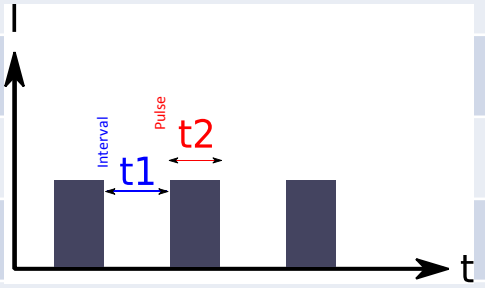
	MEBT Dump
Instance	ME-00-000-BDM-A
Beam Energy	7 MeV/u Particle flux: Protons 5e15/s, C-Ions 2e14/s
Beam Power	5W protons 2.5W C-ions
Beam Current	Full spill within 0.1s
Exposure time	t1 = 0.5s , t2 = 500µs
Yearly dose	P7: 2e16, C7: 1e15
Beam shape	Water-bag
Beam size	σ_y = 5.7mm, σ_y = 2.2mm
Beam pipe aperture	+ / - 32mm
Available space	300 mm
Movements	< 500 movements/year, few seconds



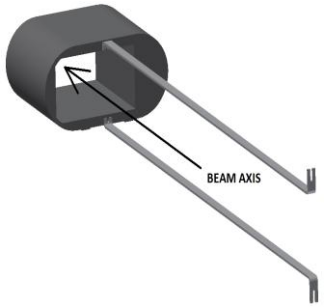
To suppress the beam halo, to reduce the beam size and to measure the beam



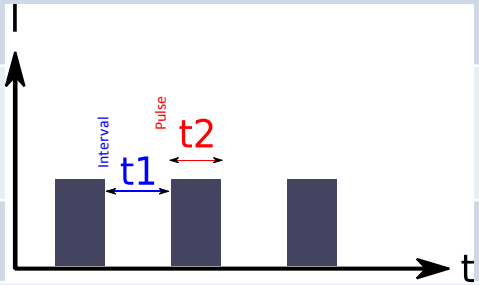
	Scrapers
Instances	MR-08-000-SCH, MR-11-000-SCV
Beam Energy	By default: 7MeV Occasionally: extraction energy
Beam Power	< 3 W
Beam Current	5% of full beam
Exposure time	t1 > 1s, t2 = few turns
Yearly dose	P: 9e15, C: 3.9e15
Beam shape	Gaussian
Beam size	SCH: σ_x > 5mm, σ_y > 3mm SCV: σ_x > 5mm, σ_y > 10mm
Beam pipe aperture	145mm x 74mm
Available space	500 mm
Movements	<500 movements/year, speed 72.1mm in 1 s



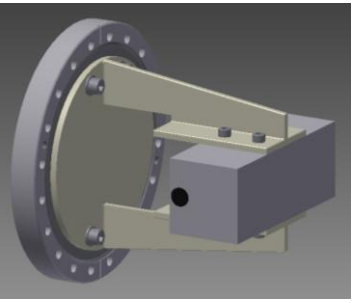
Horizontal: to intercept particles from scrapers.
Vertical: to dump on request



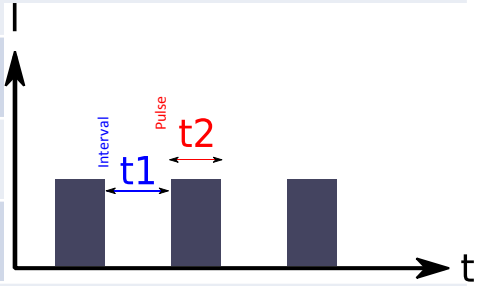
	Beam Dumps
Instance	MR-12-000-BDH, MR-05-000-BDV
Beam Energy	Protons 250 MeV and 800 Mev Ions C^{+6}: 400 MeV
Beam Power	< 3 W
Beam Current	BDV: full beam BDH: 5% of full beam
Exposure time	t1 > 1s , 1µs < t2 < 10µs
Yearly dose	BDV: p250 1.5e15, p800 2.4e14, C400 1.8e14 BDH: p250 3.8e14, p800 6e13, C400 4.5e13
Beam shape	Slice of Gaussian
Beam size	BDH: σ_x > 0.3mm, σ_y > 0.3mm BDV: σ_x > 0.3mm, σ_y > 0.7mm
Beam pipe aperture	145mm x 74mm
Available space	100 mm
Movements	No movements



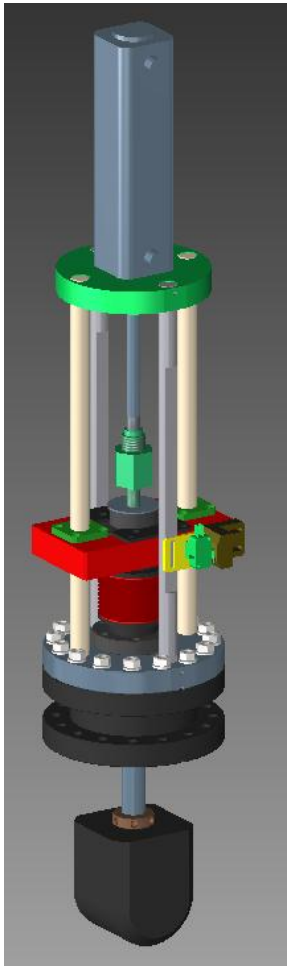
To stabilize and diagnose beam spills for clinical purpose



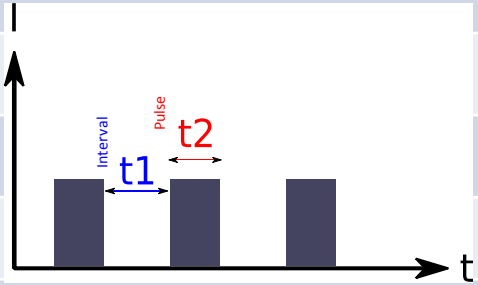
	Chopper Dump
Instance	EX-01-000-BDC
Beam Energy	Protons 250 MeV, failure case: 800 Mev Ions C^{+6}: 400 MeV
Beam Power	< 3 W
Beam Current	10% of the extracted beam
Exposure time	t1 > 1s , t2 = 0.1s
Yearly dose	P250 1.64e15, p800 none, C400 1.94e14 (distributed evenly 365/24/7)
Beam shape	H: trapezoidal / V: Gaussian
Beam size	Total in x = 7 mm, σ_y = 2 mm
Beam pipe aperture	According the BDT tank
Available space	300 mm
Movements	Adjustable



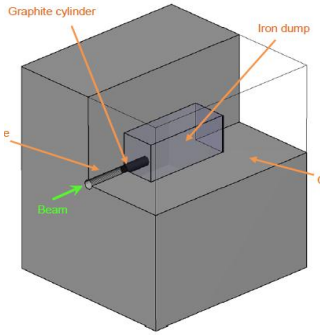
To stop the beams in the irradiation rooms, as a second protection measure



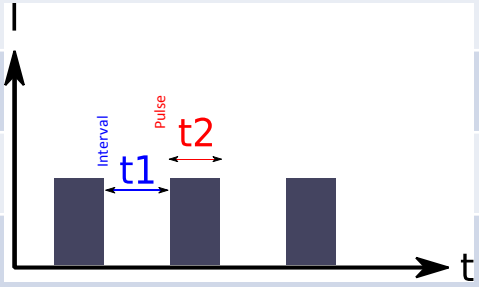
	Beam Stoppers
4 Instances	T1-00-000-BST, T2-00-000-BST, T3-00-000-BST, T4-00-000-BST
Beam Energy	Protons 250 MeV and 800 Mev Ions C^{+6}: 400 MeV
Beam Power	0 W
Beam Current	Full spill within 0.1 s
Exposure time	t1 ≈ ∞ , t2 = 0.1s
Yearly dose	0
Beam shape	H: trapezoidal / V: Gaussian
Beam size	Total in x = 4 mm, σ_y = 2 mm
Beam pipe aperture	+ / - 32mm
Available space	600 mm
Movements	10'000 movements/year in few seconds



For beam commissioning and accelerator performance check



	EX Beam Dump
Instance	EX-05-000-BDE
Beam Energy	Protons 250 MeV and 800 Mev Ions C^{+6}: 400 MeV
Beam Power	< 3 W
Beam Current	Full spill
Exposure time	t1 > 1s , t2 > 0.1s
Yearly dose	P250 2.1e14, p800 4.9e14, C400 2.1e13
Beam shape	H: trapezoidal / V: Gaussian
Beam size	Total in x = 3 mm, σ_y = 5 mm
Beam pipe aperture	Not applicable
Available space	Not specified
Movements	Fixed dump



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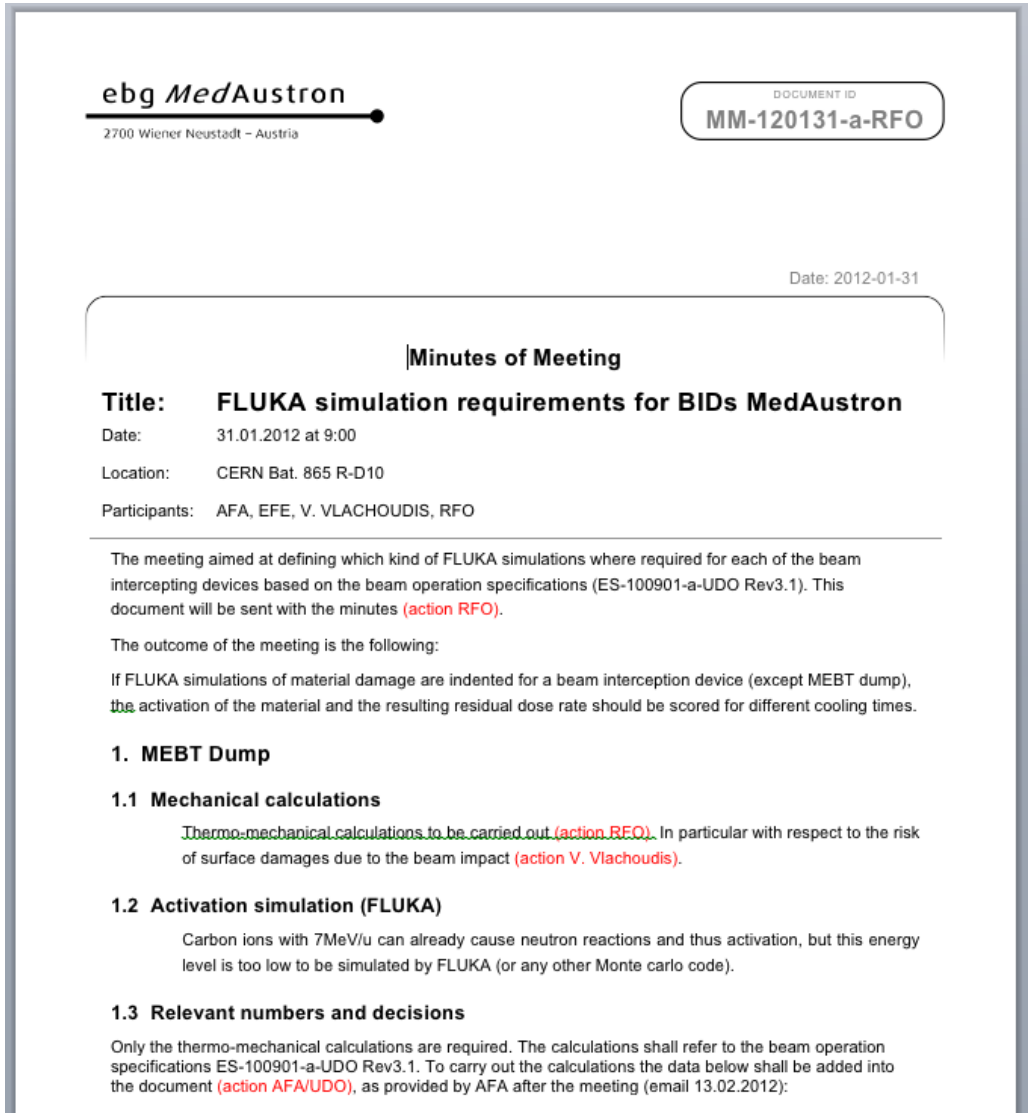

ebg MedAustron
2700 Wiener Neustadt – Austria

DOCUMENT ID
MM-120131-a-RFO

Date: 2012-01-31

Minutes of Meeting

Title: FLUKA simulation requirements for BIDs MedAustron

Date: 31.01.2012 at 9:00

Location: CERN Bat. 865 R-D10

Participants: AFA, EFE, V. VLACHOUDIS, RFO

The meeting aimed at defining which kind of FLUKA simulations where required for each of the beam intercepting devices based on the beam operation specifications (ES-100901-a-UDO Rev3.1). This document will be sent with the minutes (action RFO).

The outcome of the meeting is the following:

If FLUKA simulations of material damage are indented for a beam interception device (except MEBT dump), the activation of the material and the resulting residual dose rate should be scored for different cooling times.

1. MEBT Dump

1.1 Mechanical calculations

Thermo-mechanical calculations to be carried out (action RFO). In particular with respect to the risk of surface damages due to the beam impact (action V. Vlachoudis).

1.2 Activation simulation (FLUKA)

Carbon ions with 7MeV/u can already cause neutron reactions and thus activation, but this energy level is too low to be simulated by FLUKA (or any other Monte carlo code).

1.3 Relevant numbers and decisions

Only the thermo-mechanical calculations are required. The calculations shall refer to the beam operation specifications ES-100901-a-UDO Rev3.1. To carry out the calculations the data below shall be added into the document (action AFA/UDO), as provided by AFA after the meeting (email 13.02.2012):