## Area System: Acceleration MAP L2 Manager: J. Scott Berg[[1]](#footnote-1) Sub-System: Acceleration from 5 to 63 GeV Revision Date: February 28, 2014

## Introduction

This subsystem accelerates the muon beam for both a Higgs factory and a higher energy collider to 63 GeV. For a Higgs factory, the beam will start at 5 GeV. For a higher energy collider, that energy may be higher if necessary to allow the use of a common system for both beams.

## Design Requirements

We will use a recirculating linear accelerator with a dogbone geometry. The beam will be injected at one end of the linac and will be extracted from the opposite end, and will make a total of 9 passes through the linac. To minimize decays, arc magnets will have the highest fields that are compatible with NbTi technology and will meet physical constraints in the switchyard.

Table 1: Design requirements for acceleration from 5 to 63 GeV

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Units | Value | | |
|  |  | Higgs  Startup | Higgs  Production | High Energy  Collider |
| Input total energy | GeV | 5 | 5 | ≥5 |
| Output total energy | GeV | 63 | 63 | 63 |
| Normalized transverse emittance | µm | 400 | 200 | 25 |
| Normalized longitudinal emittance | mm | 1.0 | 1.5 | 70 |
| Muons per sign |  | 2 × 1012 | 4 × 1012 | 2 × 1012 |
| Repetition rate | Hz | 30 | 15 | 15 |
| Linac Passes |  | 9 | | |
| Minimum Amplitude Transmitted | σ | 4.5 | | |
| Maximum transverse emittance growth | % | 6 | | |
| Maximum longitudinal emittance growth | % | 6 | | |

## Sub-System Parameters

Table 2: RF parameters for acceleration from 5 to 63 GeV.

|  |  |  |
| --- | --- | --- |
| Parameter | Units | Value |
| Frequency | MHz | 325 |
| Gradient | MV/m | 20 |
| Maximum energy gain per cell | MeV | 9.22 |
| Maximum cells per cavity |  | 4 |
| Additional length at each end | cells | 1.5 |
| Maximum input power per cavity | MW | 1.2 |

## Technology Requirements

Table 3: List of required sub-system technologies and their Feasibility Ranking

|  |  |
| --- | --- |
| Technology | Feasibility Rank |
| Superconducting RF cavity systems | 1 |
| Detailed Description:  Pulsed superconducting RF cavities, their power supplies, and other associated systems. | |
| Superconducting magnets | 1 |
| Detailed Description:  NbTi technology. | |

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