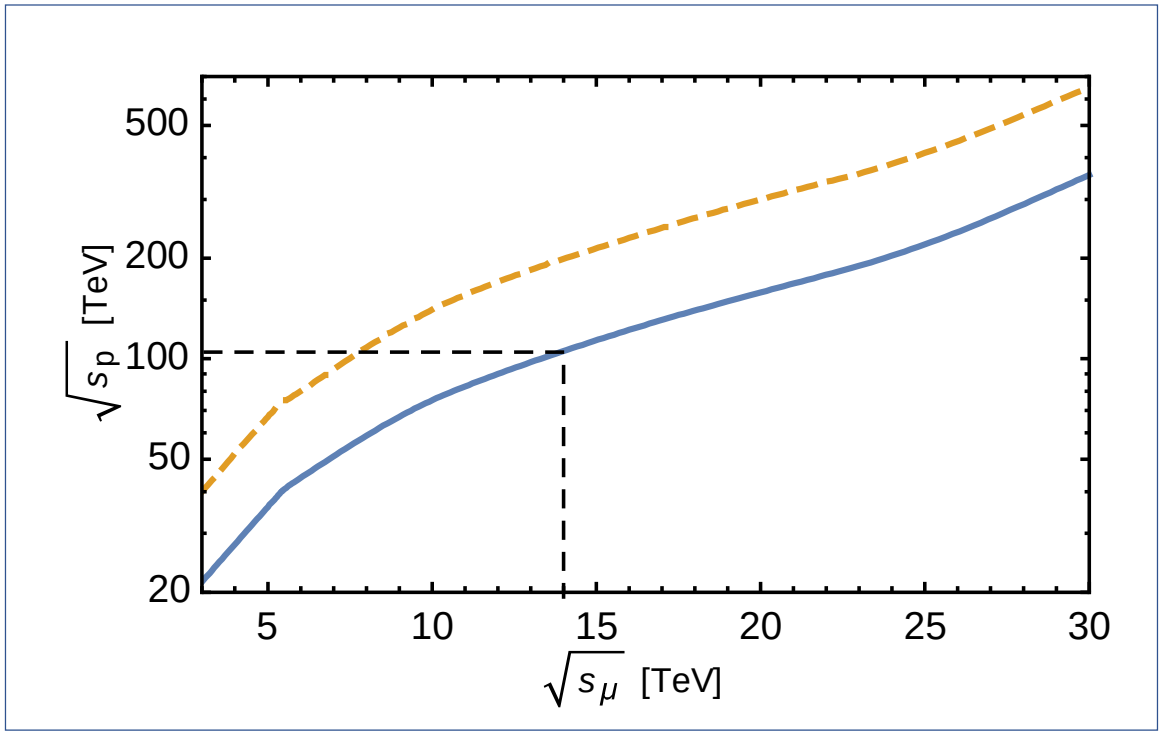


Figure 1

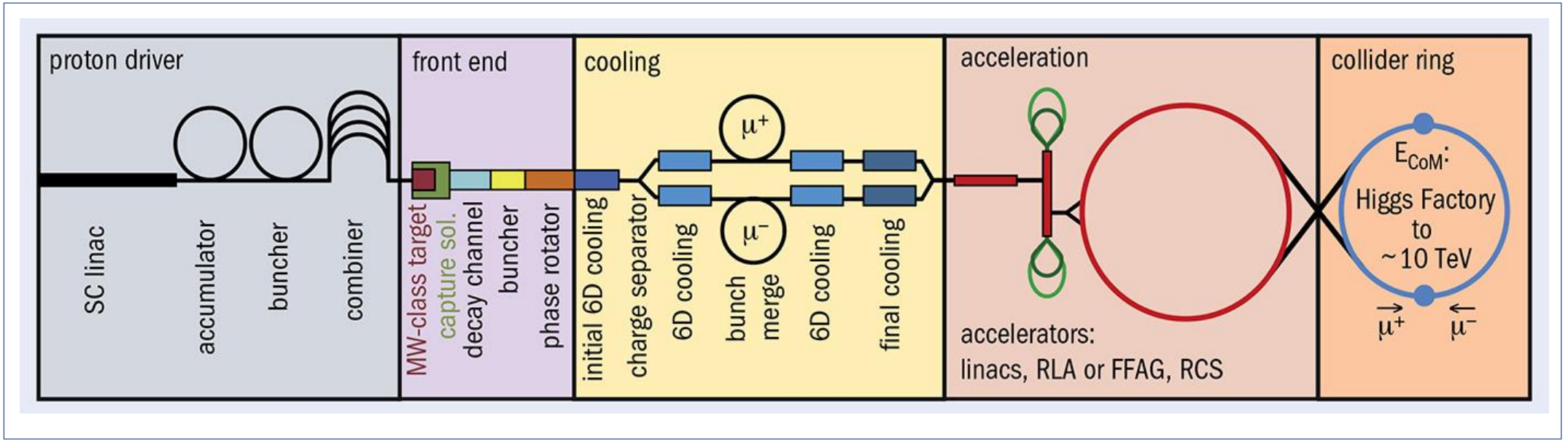

proton driver
front end
cooling
acceleration
collider ring
SC linac
accumulator
buncher
combiner
MW-class target
capture sol.
decay channel
buncher
phase rotator
initial 6D cooling
charge separator
6D cooling
bunch merge
6D cooling
final cooling
μ+
μ−
accelerators:
linacs, RLA or FFAG, RCS
E_CoM:
Higgs Factory
to
~10 TeV
μ+
μ−

Figure 2

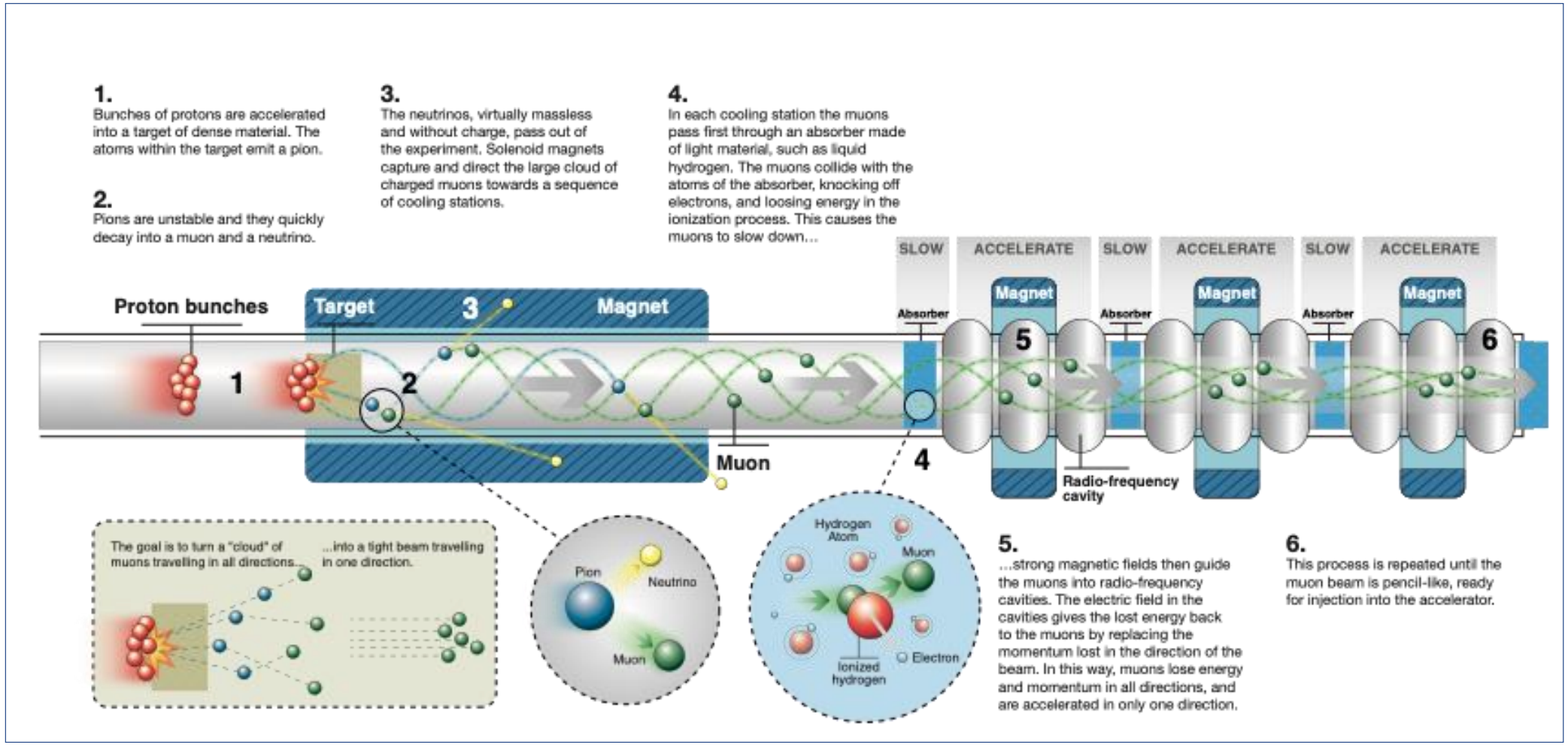

1.
Bunches of protons are accelerated into a target of dense material. The atoms within the target emit a pion.
2.
Pions are unstable and they quickly decay into a muon and a neutrino.
3.
The neutrinos, virtually massless and without charge, pass out of the experiment. Solenoid magnets capture and direct the large cloud of charged muons towards a sequence of cooling stations.
4.
In each cooling station the muons pass first through an absorber made of light material, such as liquid hydrogen. The muons collide with the atoms of the absorber, knocking off electrons, and loosing energy in the ionization process. This causes the muons to slow down...
SLOW
ACCELERATE
SLOW
ACCELERATE
SLOW
ACCELERATE
Proton bunches
Target
3
Magnet
Absorber
Magnet
Absorber
Magnet
Absorber
Magnet
1
2
5
6
4
Muon
Radio-frequency cavity
The goal is to turn a "cloud" of muons travelling in all directions...
...into a tight beam travelling in one direction.
Pion
Neutrino
Muon
Hydrogen Atom
Muon
Electron
Ionized hydrogen
5.
...strong magnetic fields then guide the muons into radio-frequency cavities. The electric field in the cavities gives the lost energy back to the muons by replacing the momentum lost in the direction of the beam. In this way, muons lose energy and momentum in all directions, and are accelerated in only one direction.
6.
This process is repeated until the muon beam is pencil-like, ready for injection into the accelerator.

Figure 3

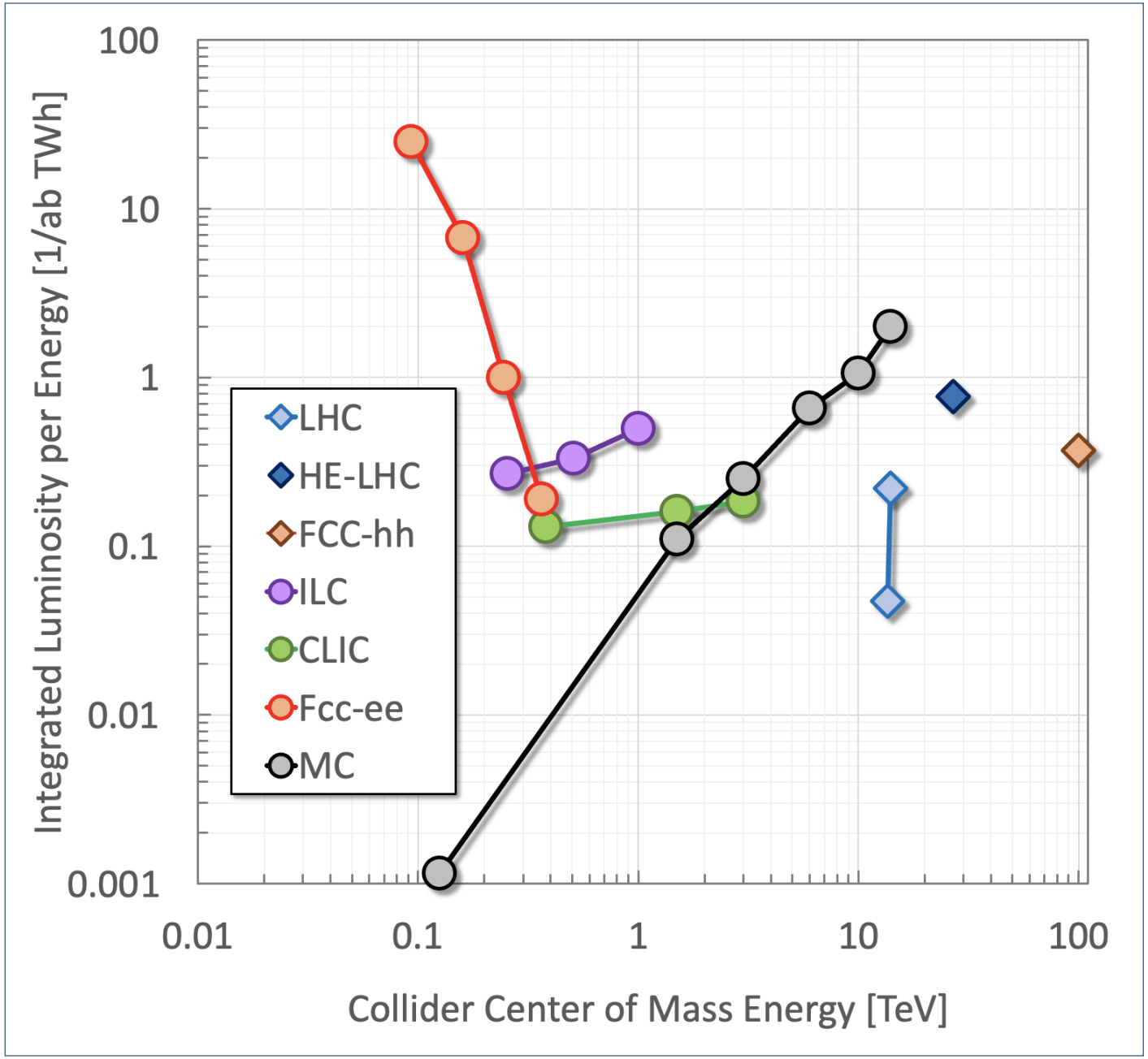

Integrated Luminosity per Energy [1/ab TWh]
100
10
1
0.1
0.01
0.001
0.01
0.1
1
10
100
Collider Center of Mass Energy [TeV]
LHC
HE-LHC
FCC-hh
ILC
CLIC
Fcc-ee
MC

Figure 4a

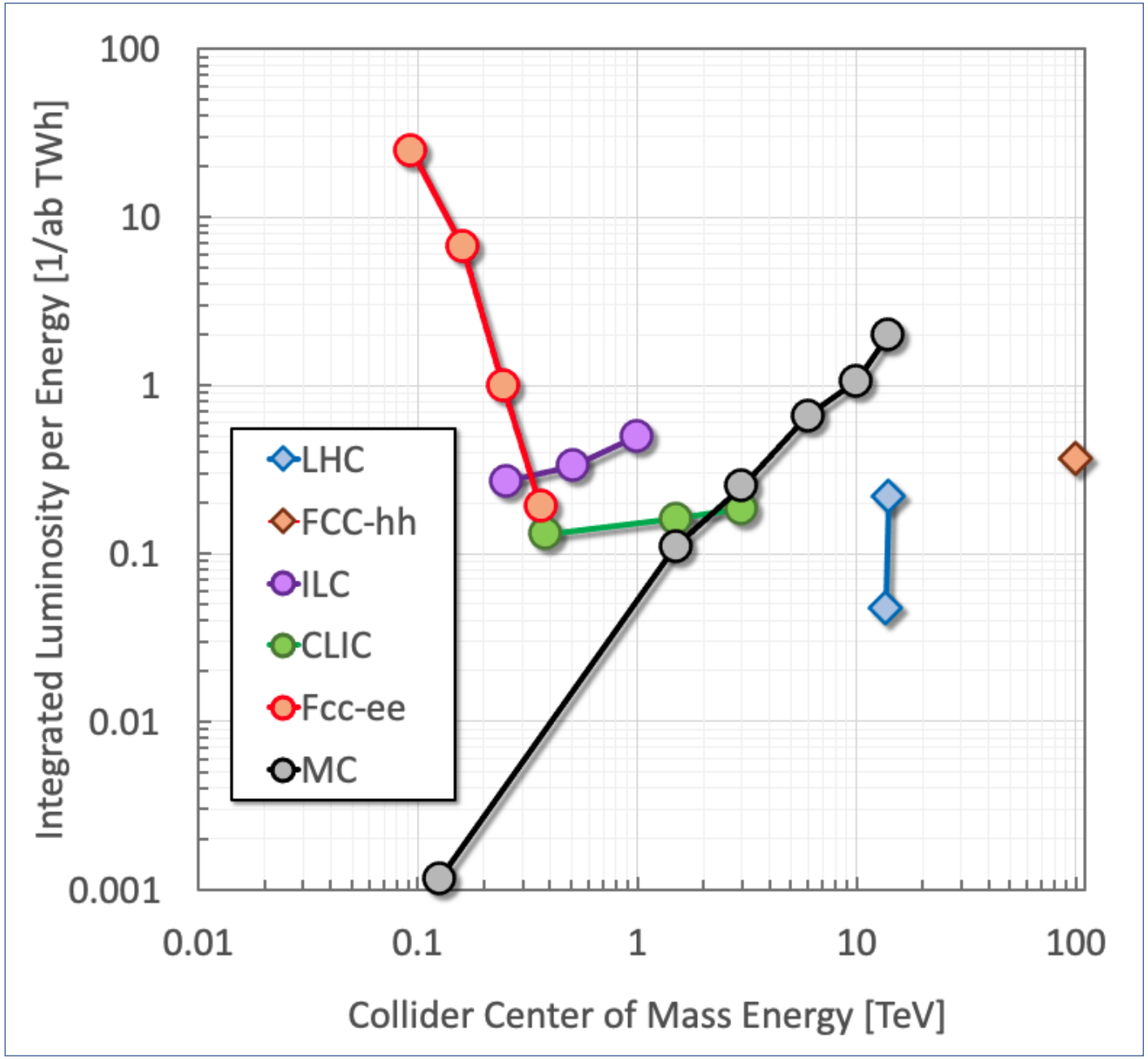


Figure 4a – no HE-LHC

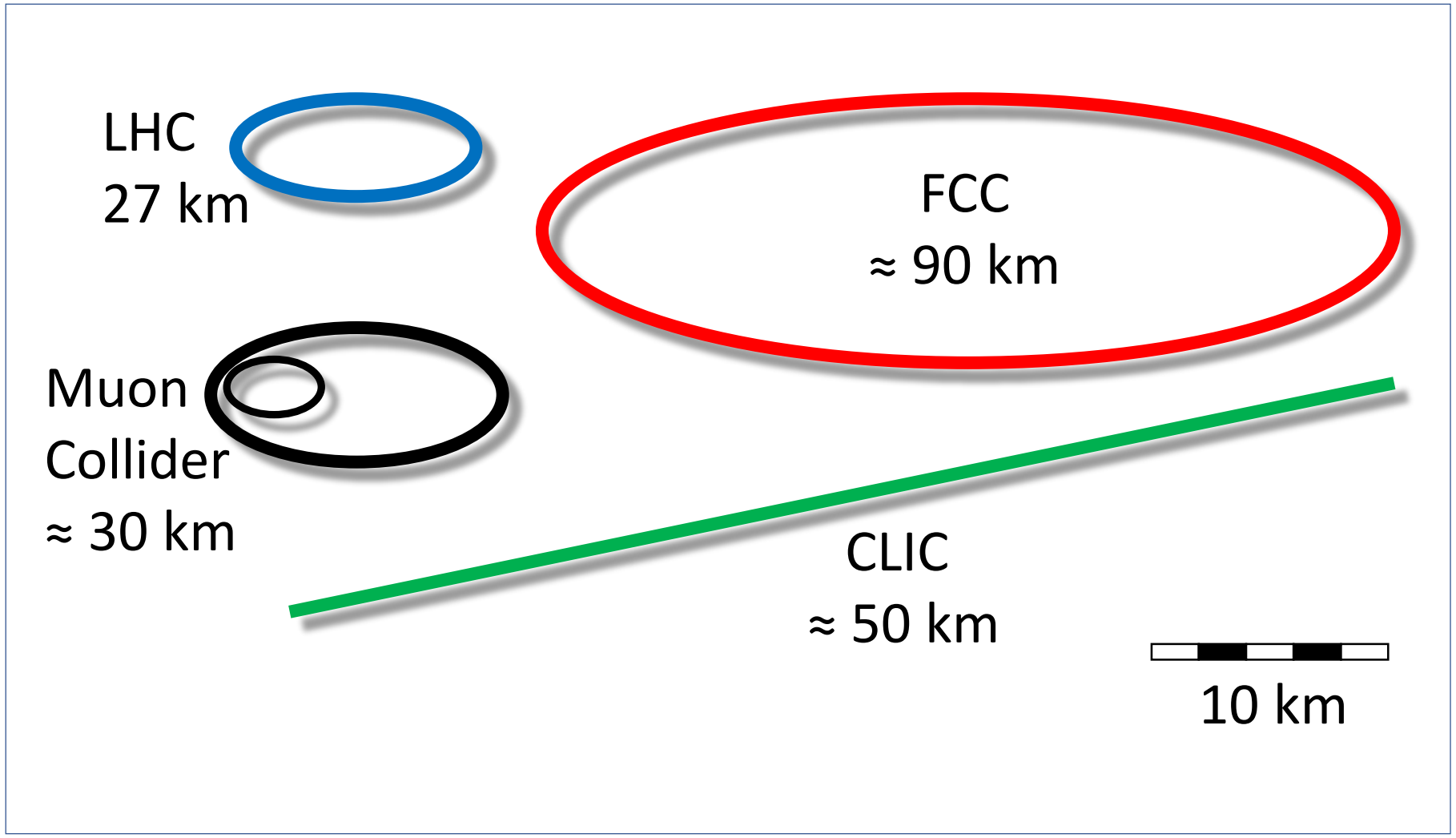


Figure 4b

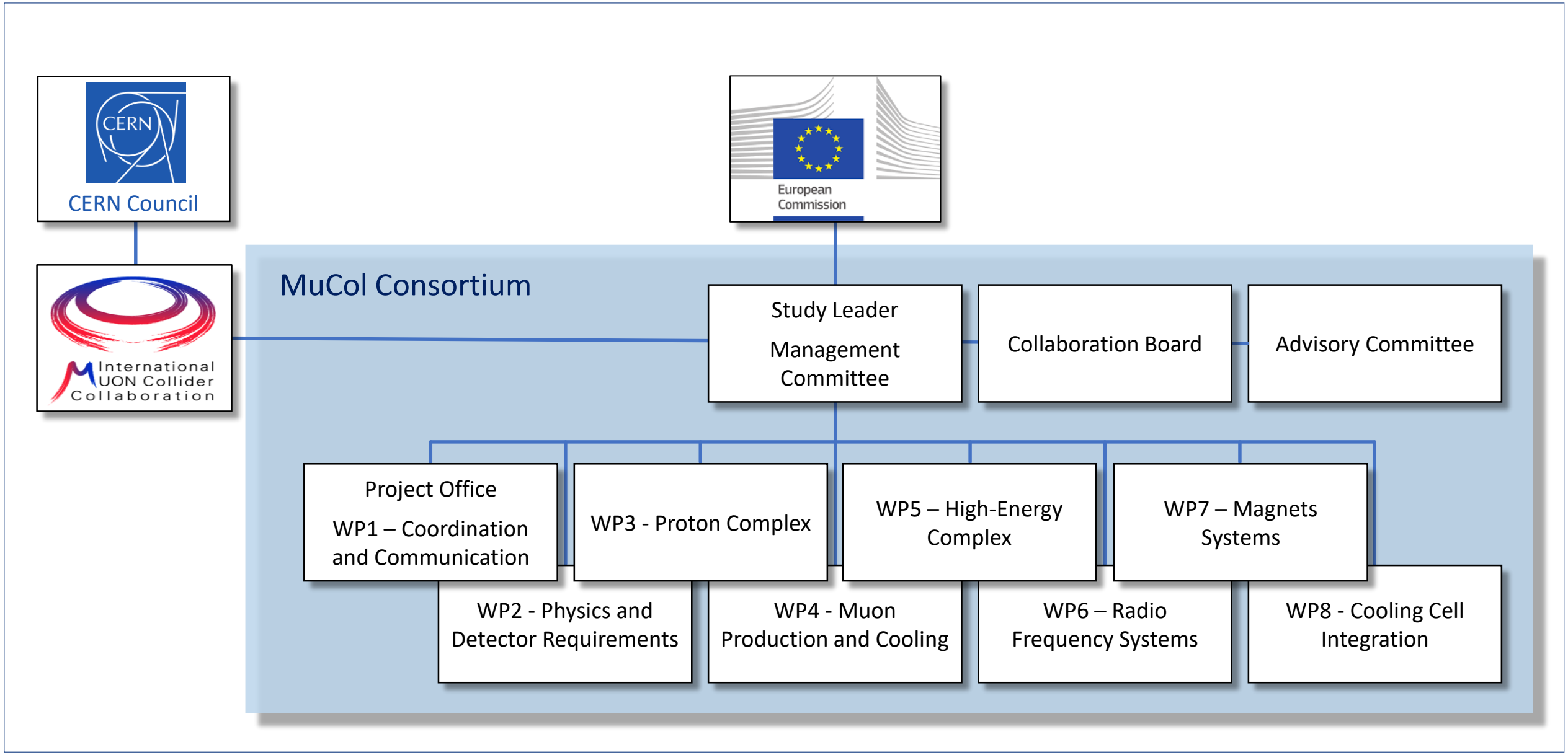

CERN
CERN Council
European Commission
International MUON Collider Collaboration
MuCol Consortium
Study Leader
Management Committee
Collaboration Board
Advisory Committee
Project Office
WP1 – Coordination and Communication
WP3 - Proton Complex
WP5 – High-Energy Complex
WP7 – Magnets Systems
WP2 - Physics and Detector Requirements
WP4 - Muon Production and Cooling
WP6 – Radio Frequency Systems
WP8 - Cooling Cell Integration

Figure 5

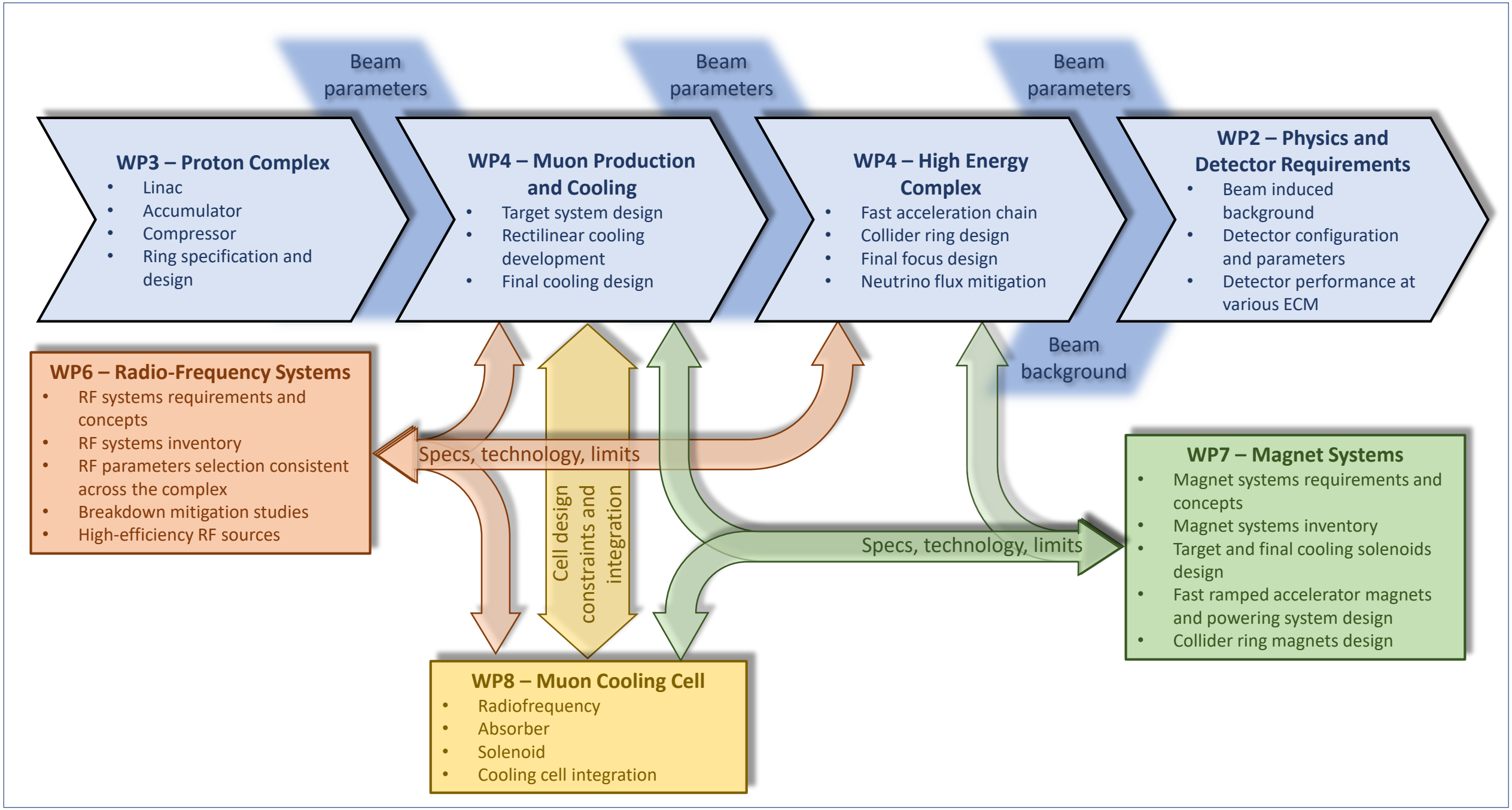

Beam parameters
Beam parameters
Beam parameters
WP3 – Proton Complex
Linac
Accumulator
Compressor
Ring specification and design
WP4 – Muon Production and Cooling
Target system design
Rectilinear cooling development
Final cooling design
WP4 – High Energy Complex
Fast acceleration chain
Collider ring design
Final focus design
Neutrino flux mitigation
WP2 – Physics and Detector Requirements
Beam induced background
Detector configuration and parameters
Detector performance at various ECM
Beam background
WP6 – Radio-Frequency Systems
RF systems requirements and concepts
RF systems inventory
RF parameters selection consistent across the complex
Breakdown mitigation studies
High-efficiency RF sources
Specs, technology, limits
Cell design constraints and integration
Specs, technology, limits
WP7 – Magnet Systems
Magnet systems requirements and concepts
Magnet systems inventory
Target and final cooling solenoids design
Fast ramped accelerator magnets and powering system design
Collider ring magnets design
WP8 – Muon Cooling Cell
Radiofrequency
Absorber
Solenoid
Cooling cell integration

Figure 6

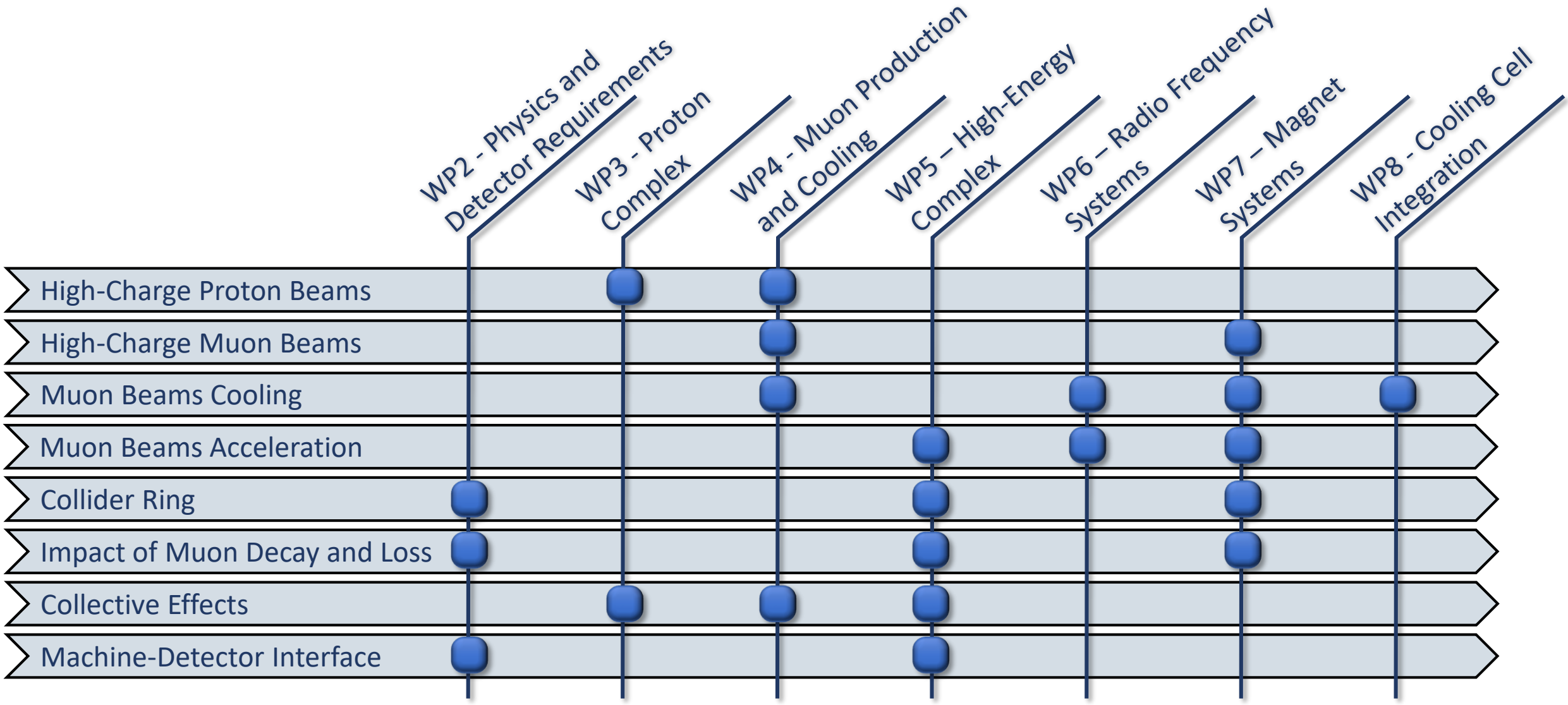

WP2 - Physics and Detector Requirements
WP3 - Proton Complex
WP4 - Muon Production and Cooling
WP5 – High-Energy Complex
WP6 – Radio Frequency Systems
WP7 – Magnet Systems
WP8 - Cooling Cell Integration
High-Charge Proton Beams
High-Charge Muon Beams
Muon Beams Cooling
Muon Beams Acceleration
Collider Ring
Impact of Muon Decay and Loss
Collective Effects
Machine-Detector Interface

Figure 7

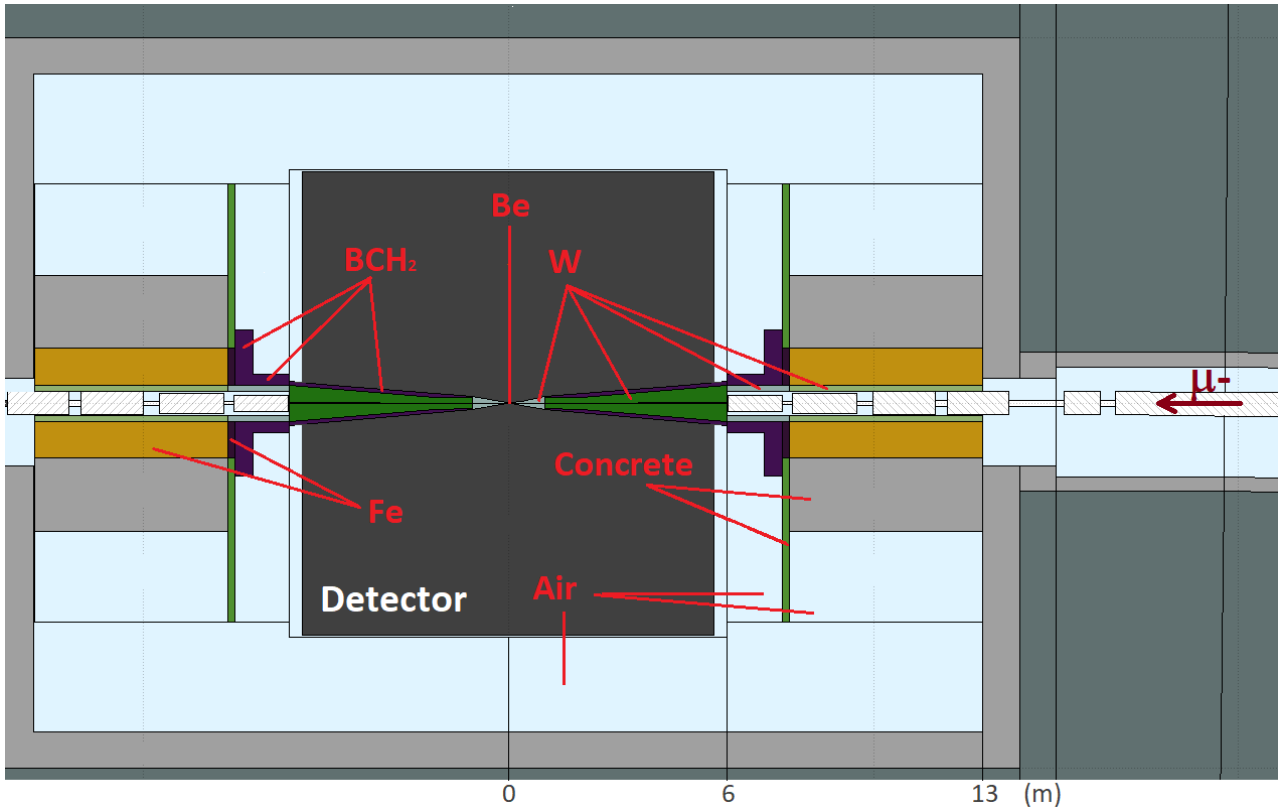


Figure 8

Figure 9

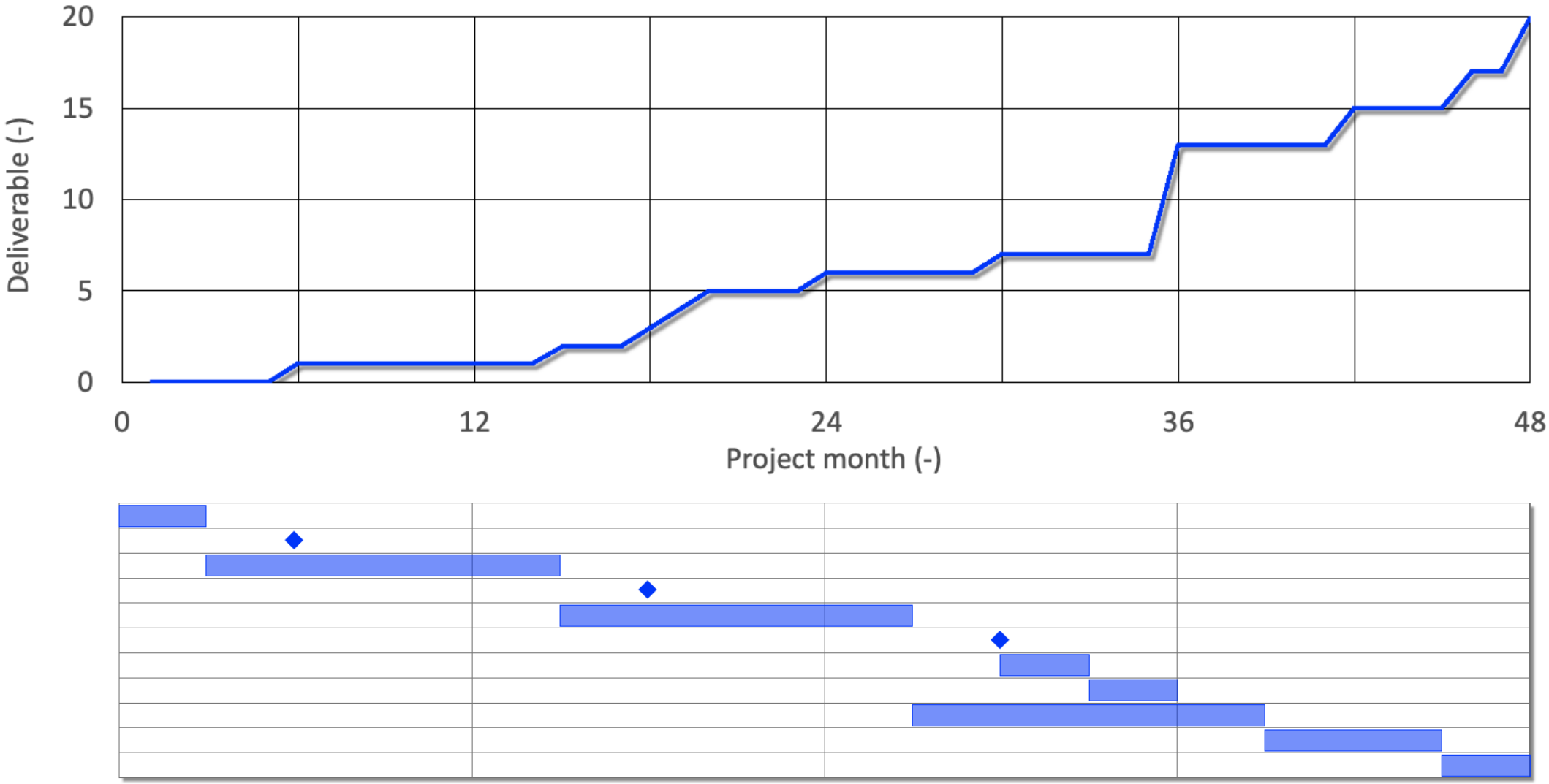


Figure 10

Work material

1. Bunches of protons are accelerated onto a target of dense material. The atoms within the target emit a pion.

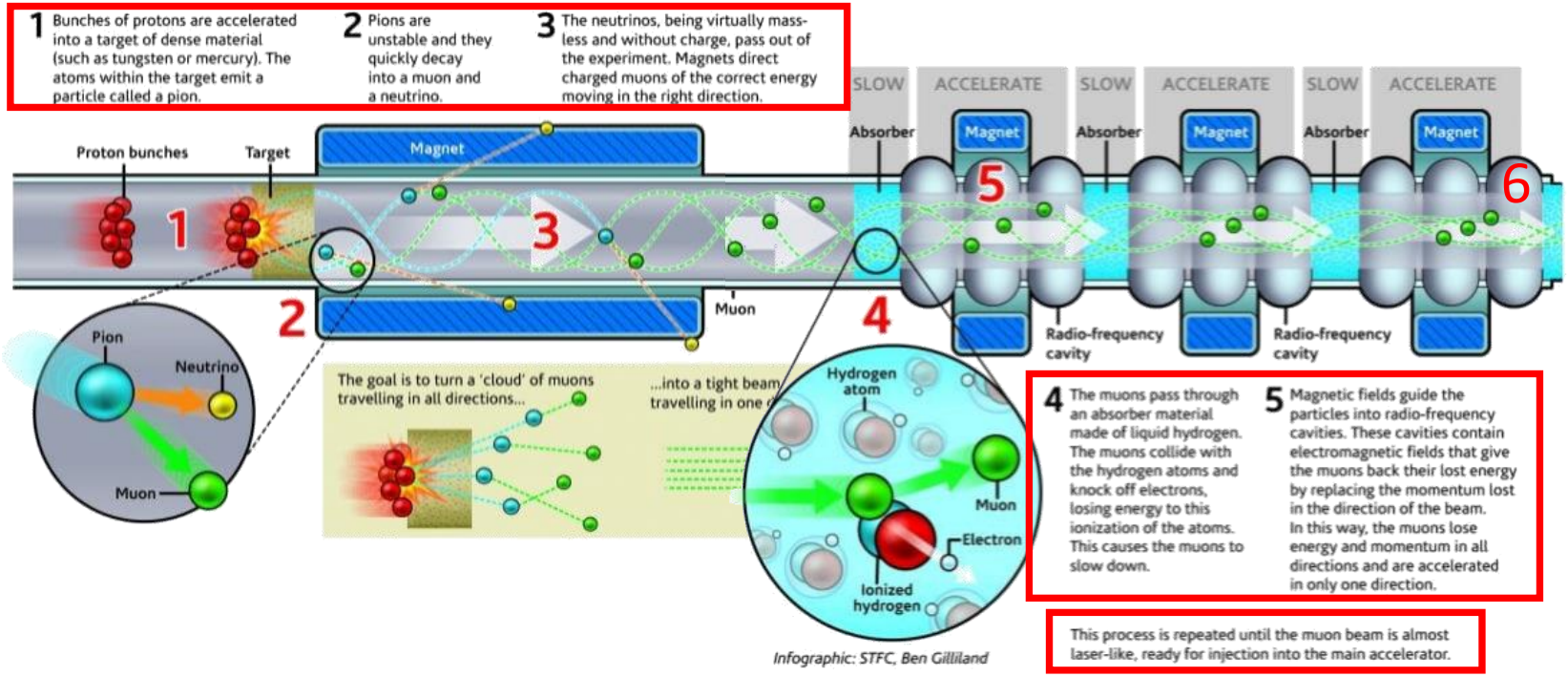
2. Pions are unstable and they quickly decay into a muon and a neutrino.

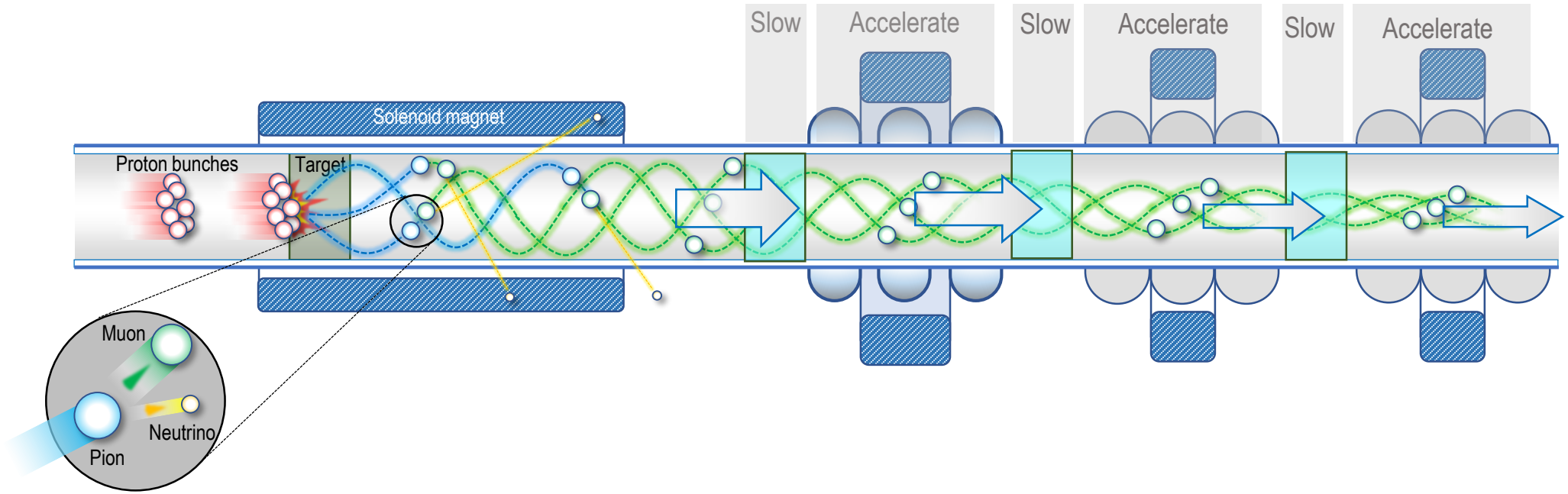
3. The neutrinos, virtually massless and without charge, pass out of the experiment. Solenoid magnets capture and direct the large cloud of charged muons towards a sequence of *cooling stations*.

4. In each cooling station the muons pass first through an absorber made of light material, such as liquid hydrogen. The muons collide with the atoms of the absorber, knocking off electrons, and loosing energy in the ionization process. This causes the muons to slow down…

5. …strong magnetic fields then guide the muons into radio-frequency cavities. The electric field in the cavities gives the lost energy back to the muons by replacing the momentum lost in the direction of the beam. In this way, muons lose energy and momentum in all directions, and are accelerated in only one direction.

6. This process is repeated until the muon beam is pencil-like, ready for injection into the accelerator.




Slow
Accelerate
Slow
Accelerate
Slow
Accelerate
Solenoid magnet
Proton bunches
Target
Muon
Neutrino
Pion