MedAustron Accelerator Control System

Design, Installation and Commissioning

Johannes Gutleber

MedAustron Project

- Ion therapy center in Austria
- Designed and developed under guidance of CERN
- Project handed over to Austrian company in 2013

- Wiener Neustadt
- 50 km south of Vienna
- 1’000 km East of CERN

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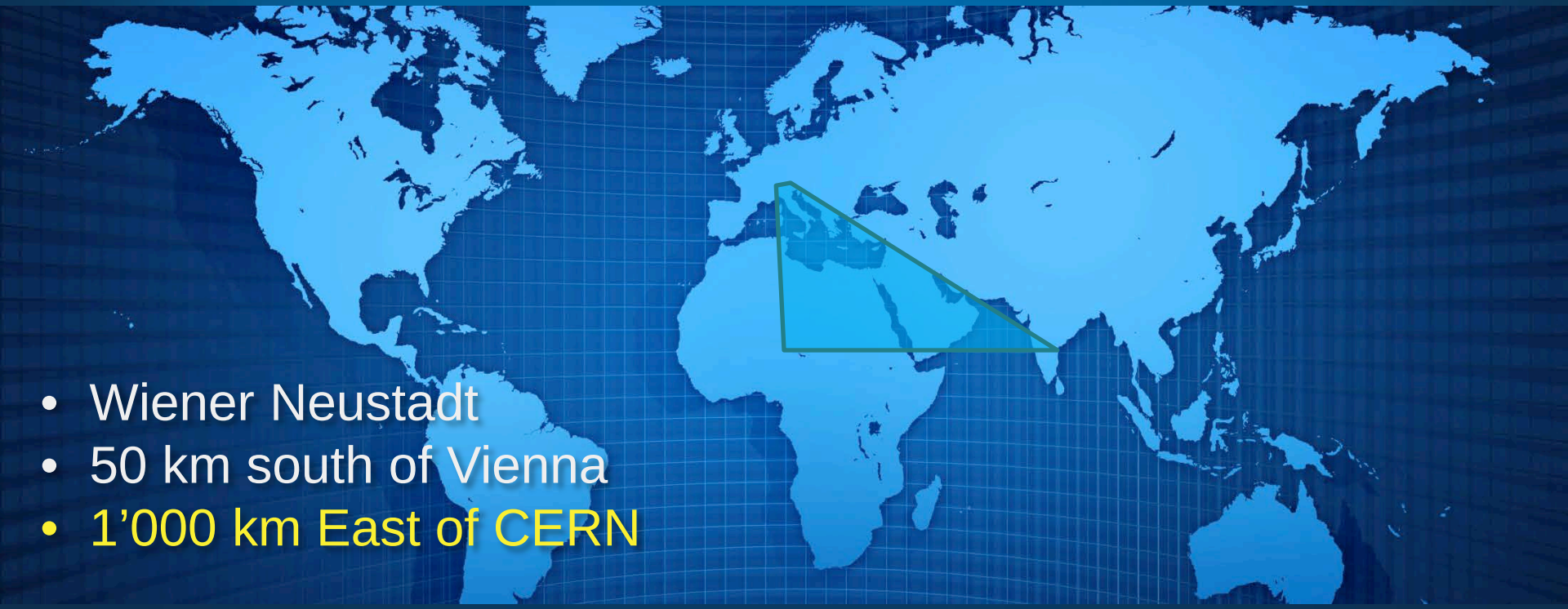

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Evolution of Radiotherapy

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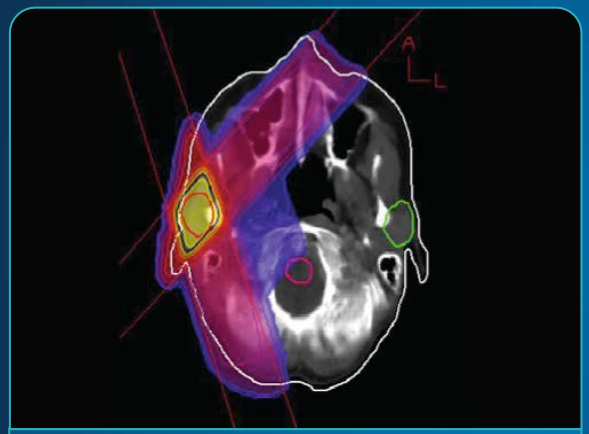
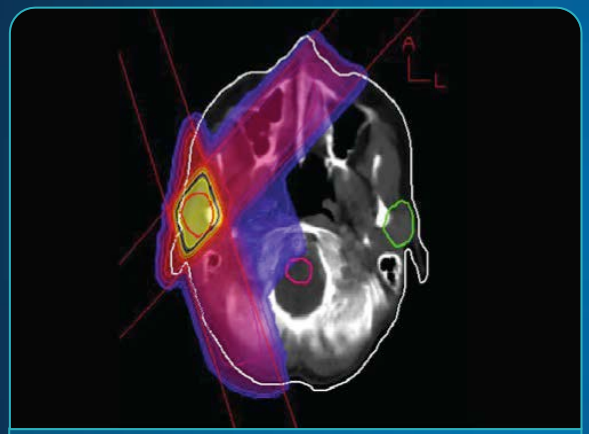


Photon 2 Fields

Evolution of Radiotherapy



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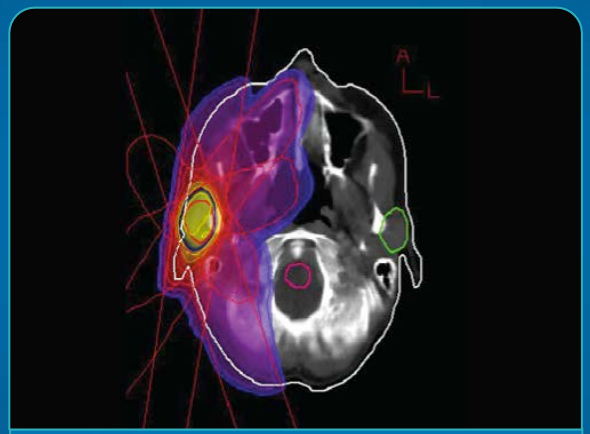
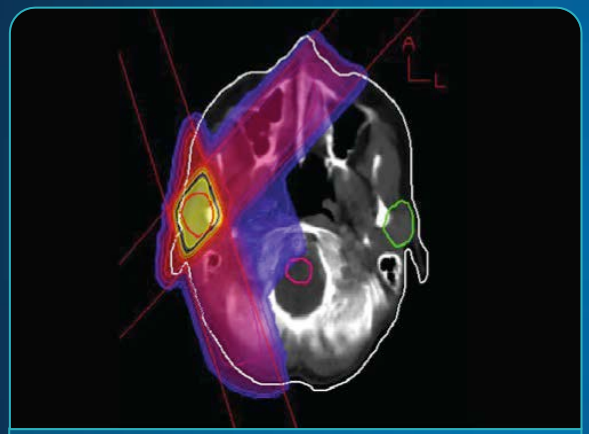
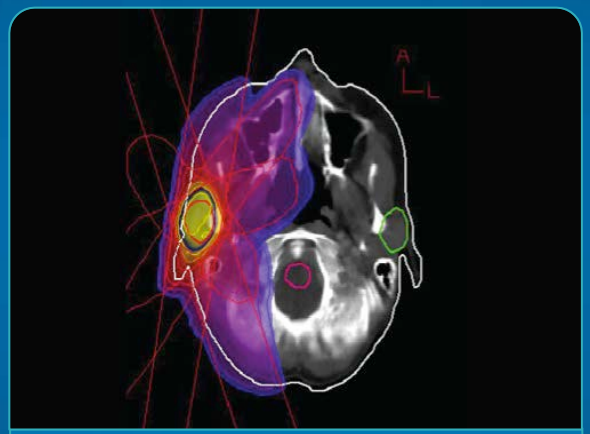


Photon 5 Fields

Evolution of Radiotherapy



Photon 2 Fields



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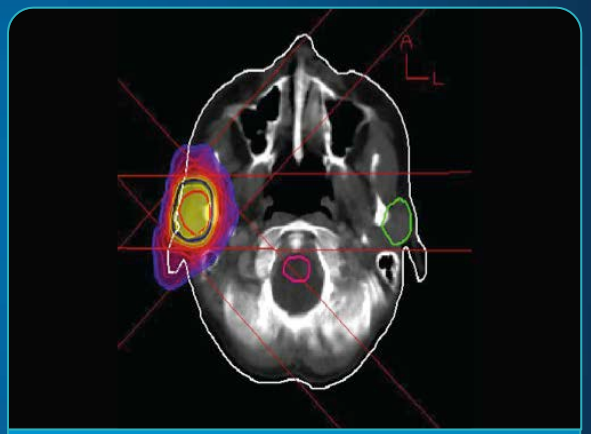
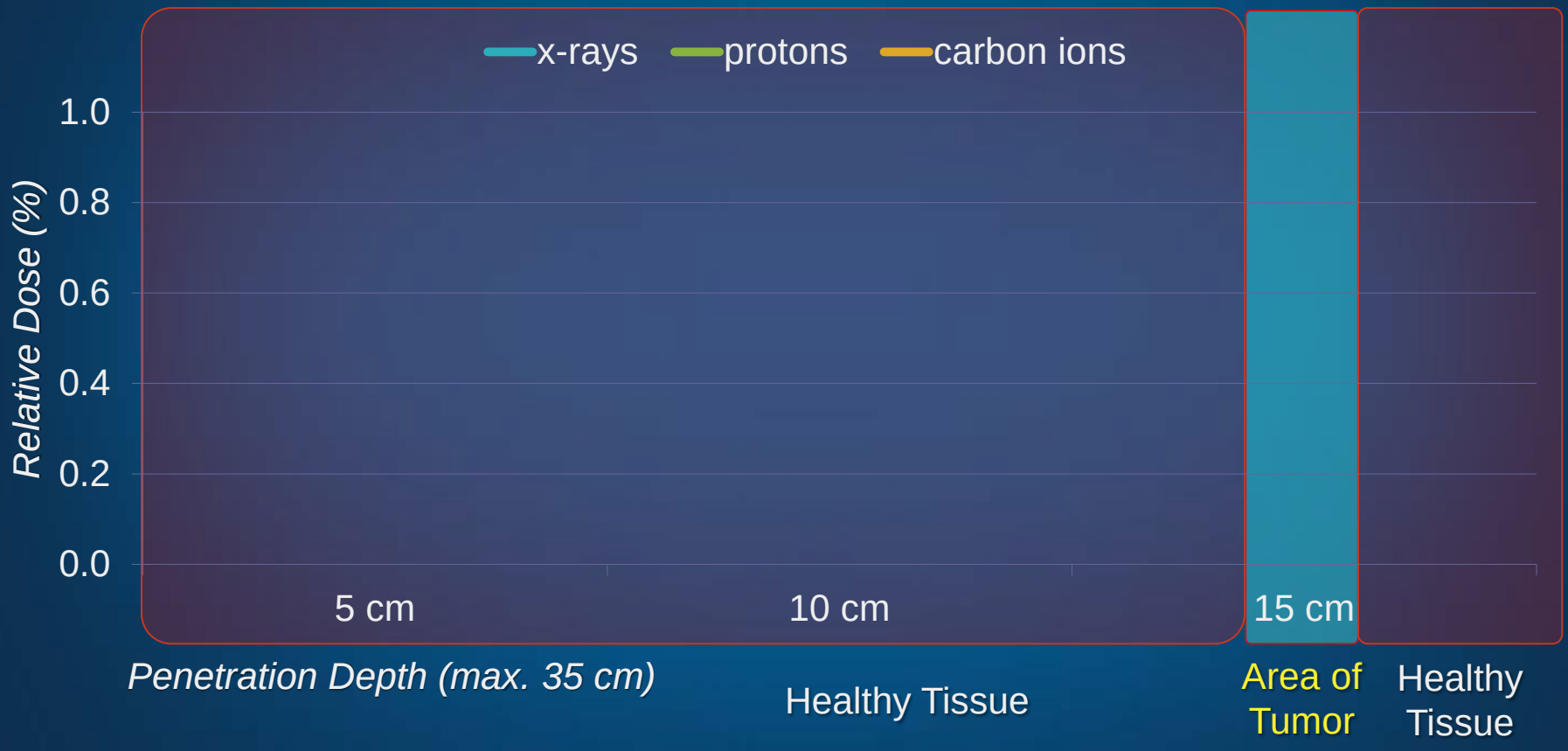
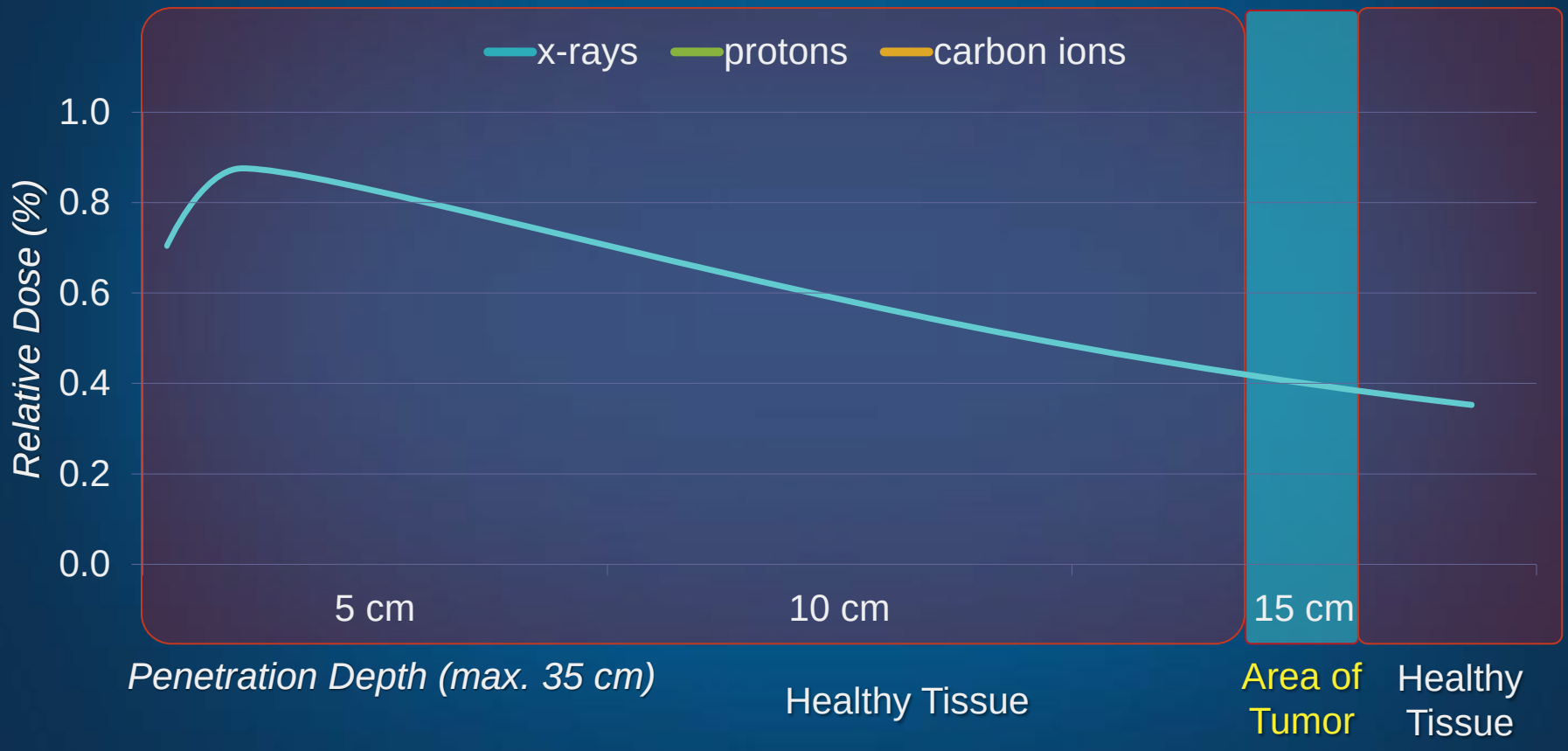


Proton 3 Fields

Bragg Peak Effect



Bragg Peak Effect



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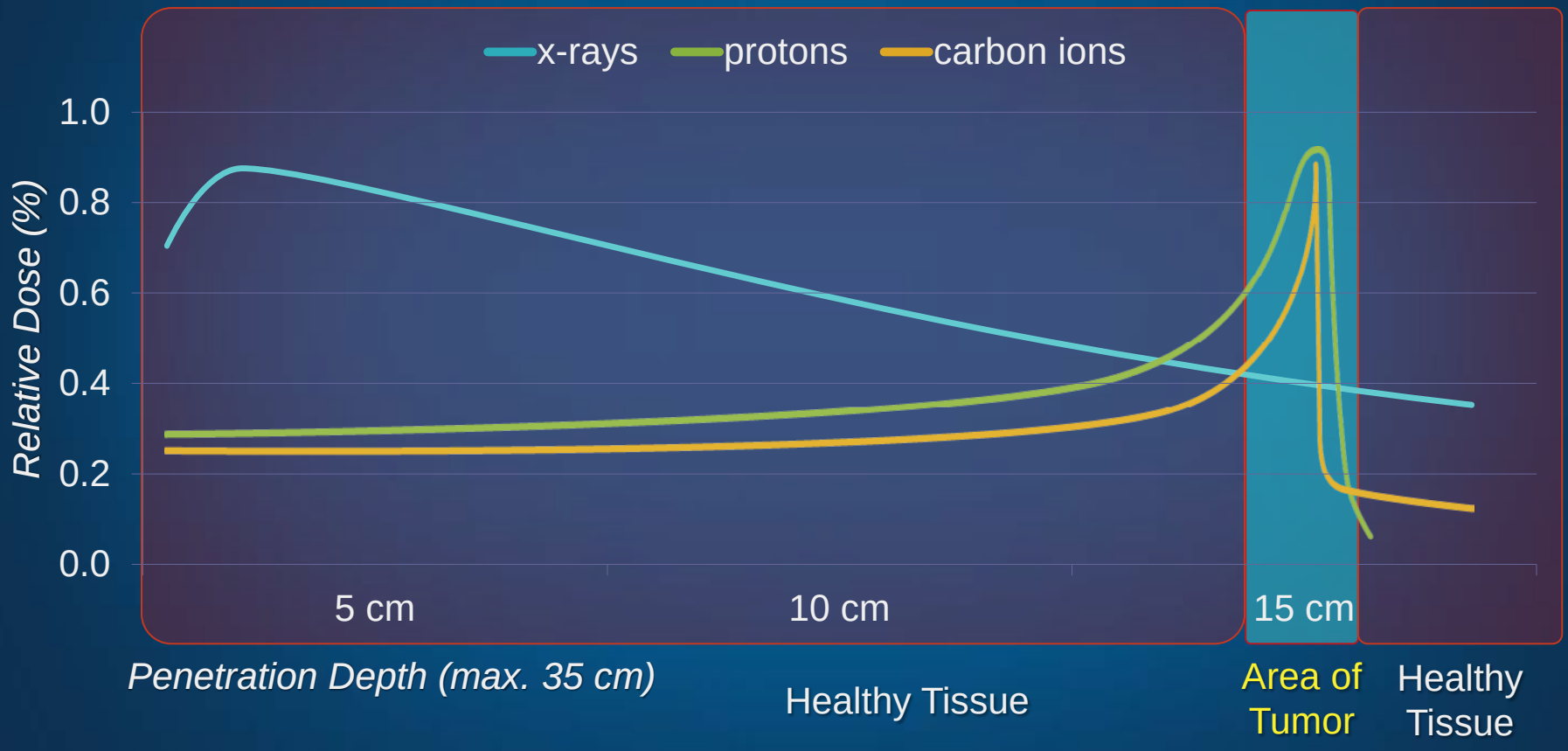
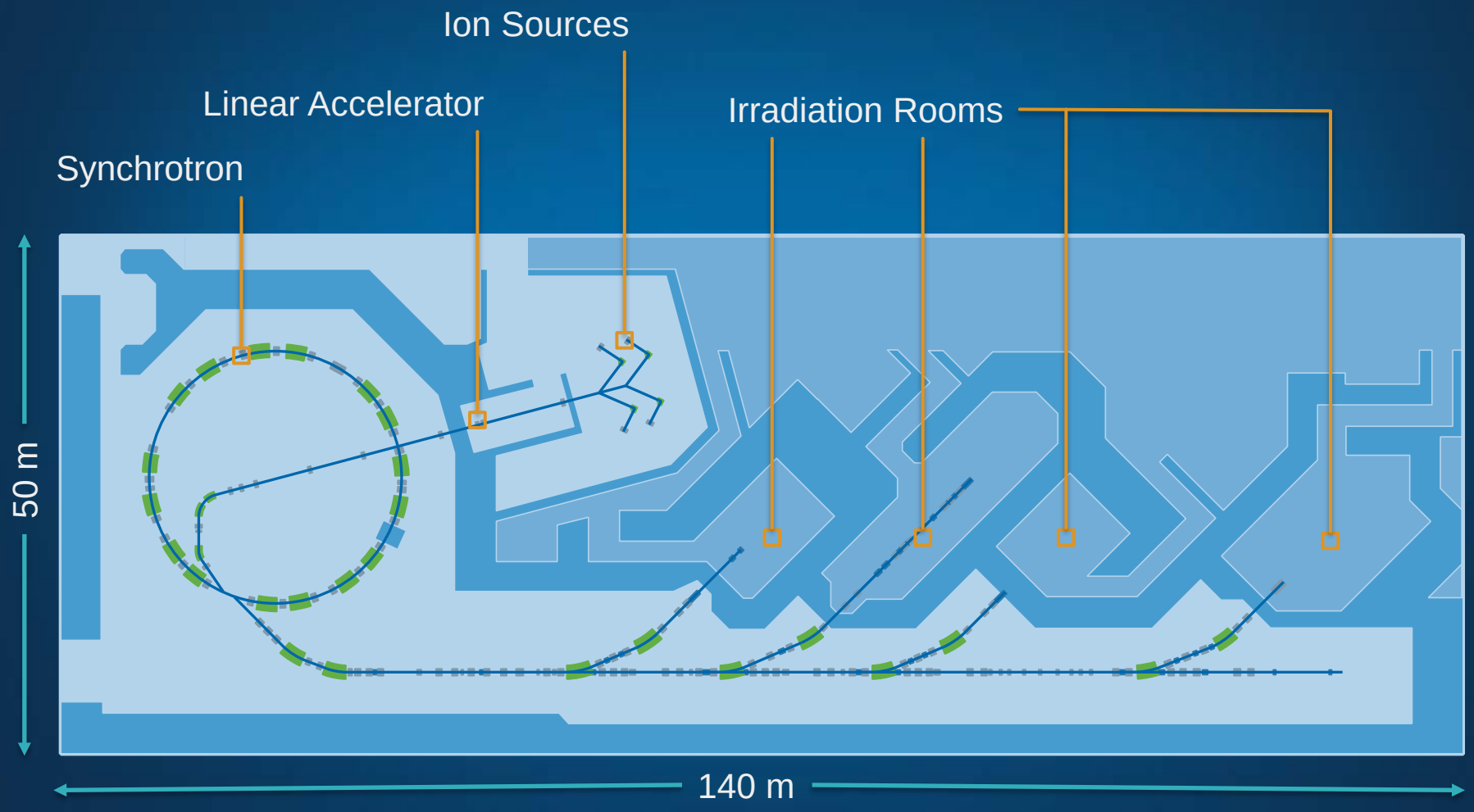


Ion Therapy Accelerator



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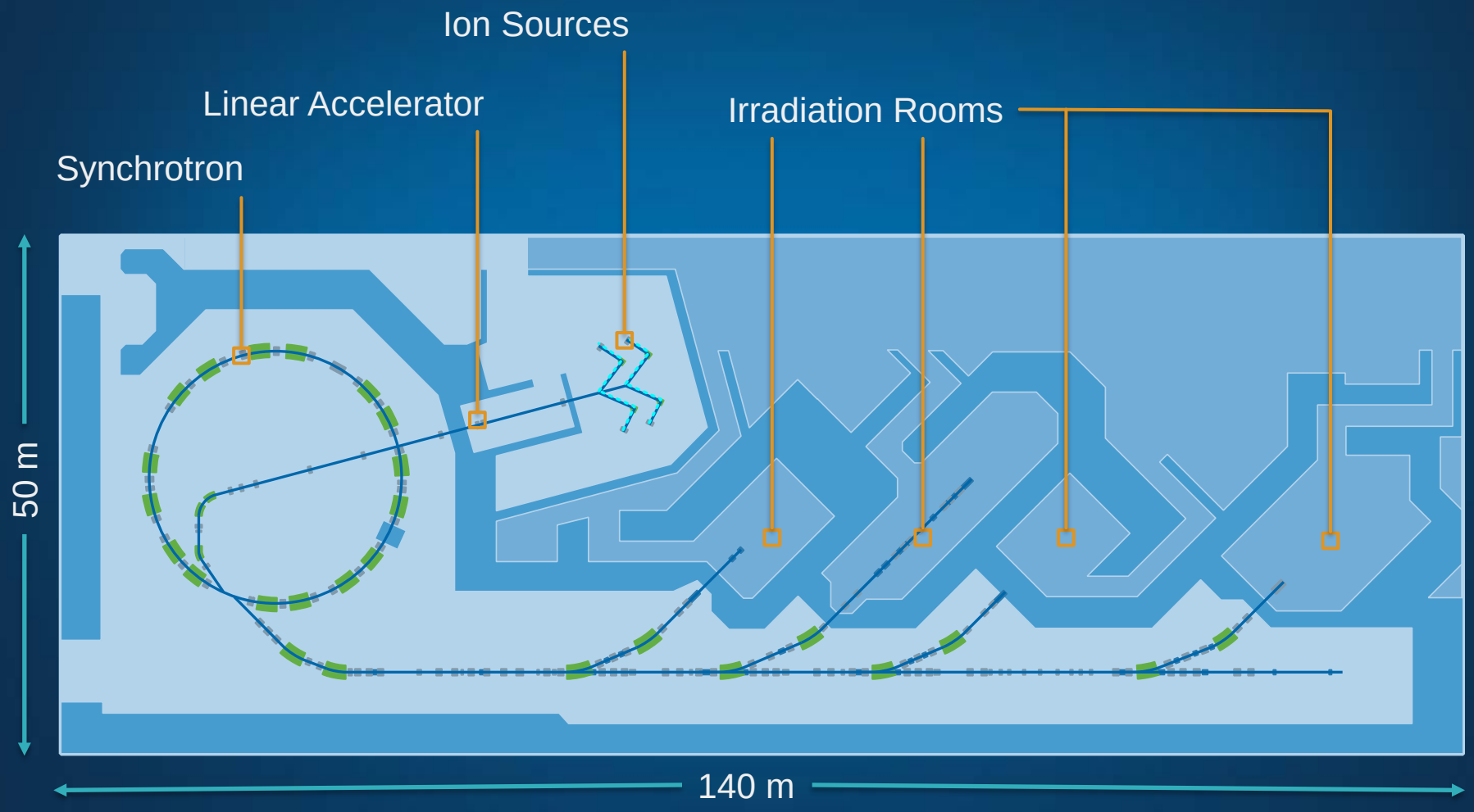

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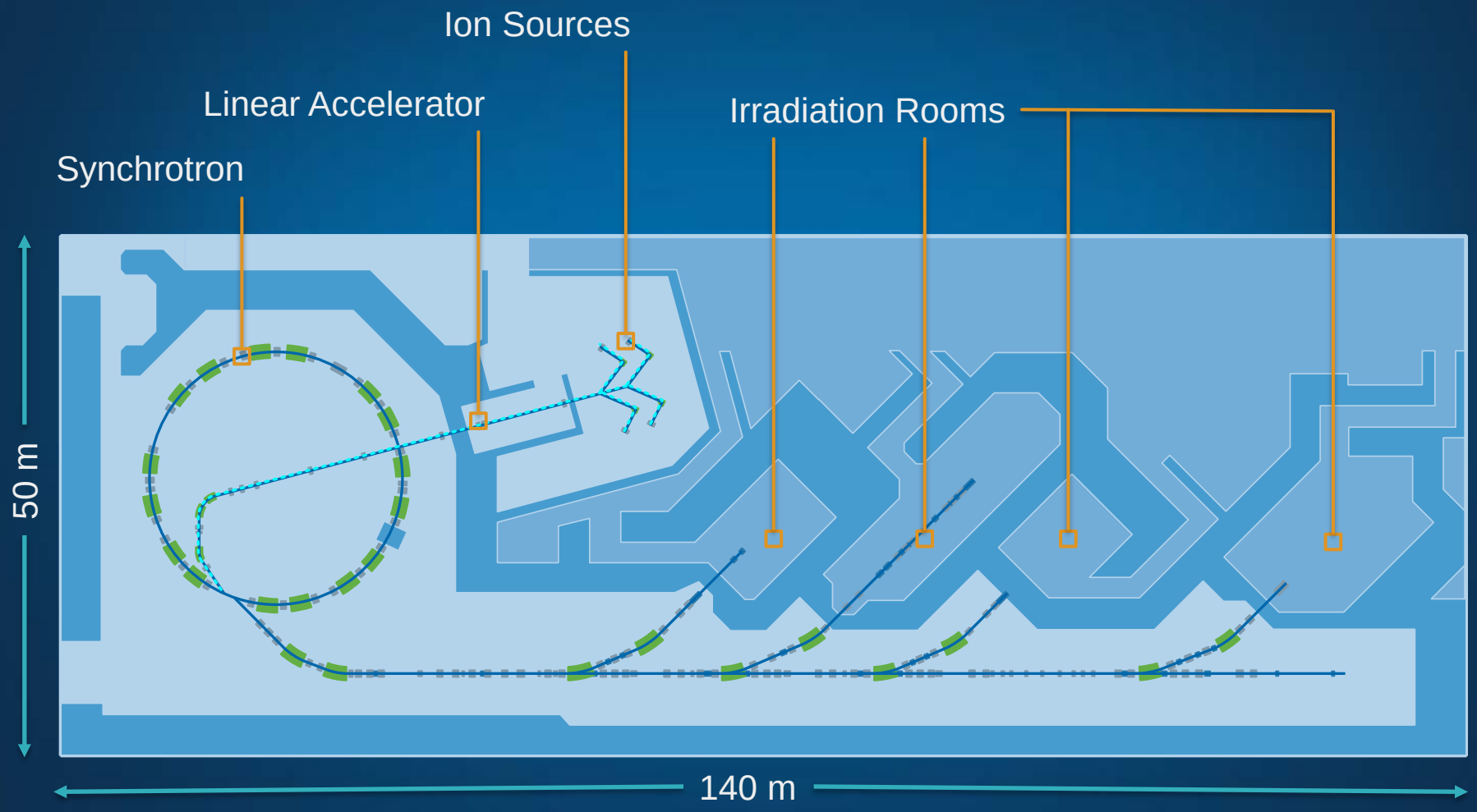

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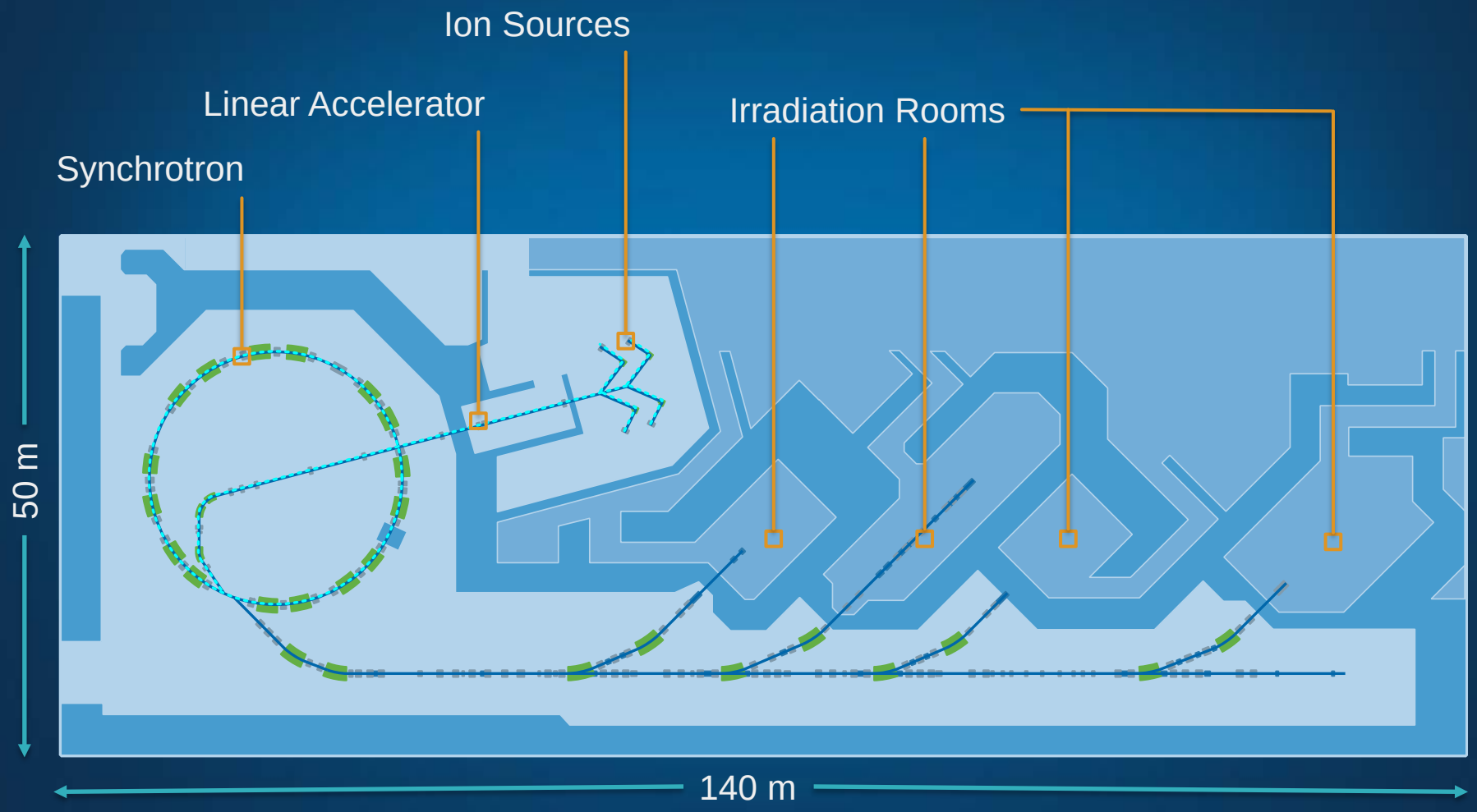

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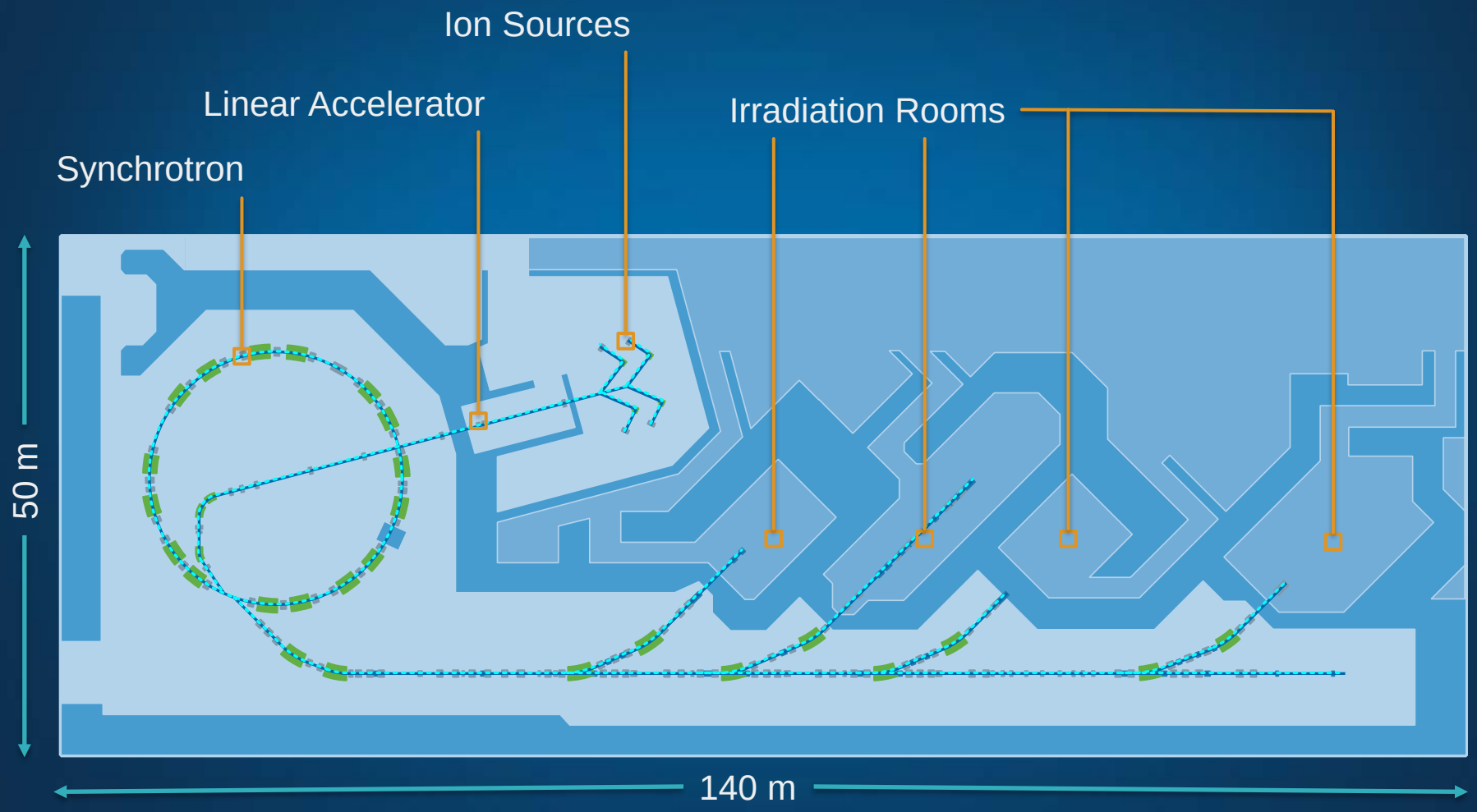
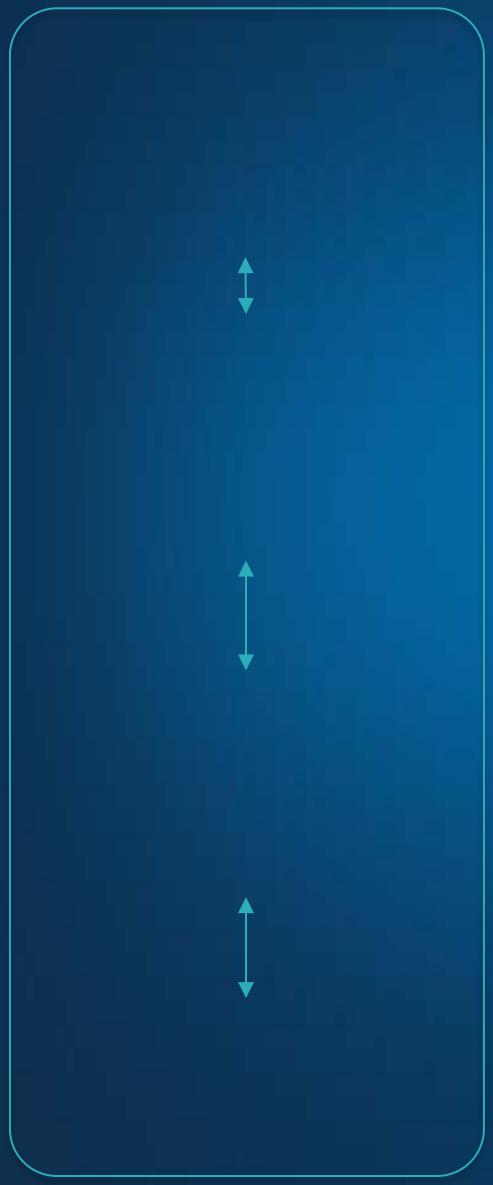


Best of Breed Design



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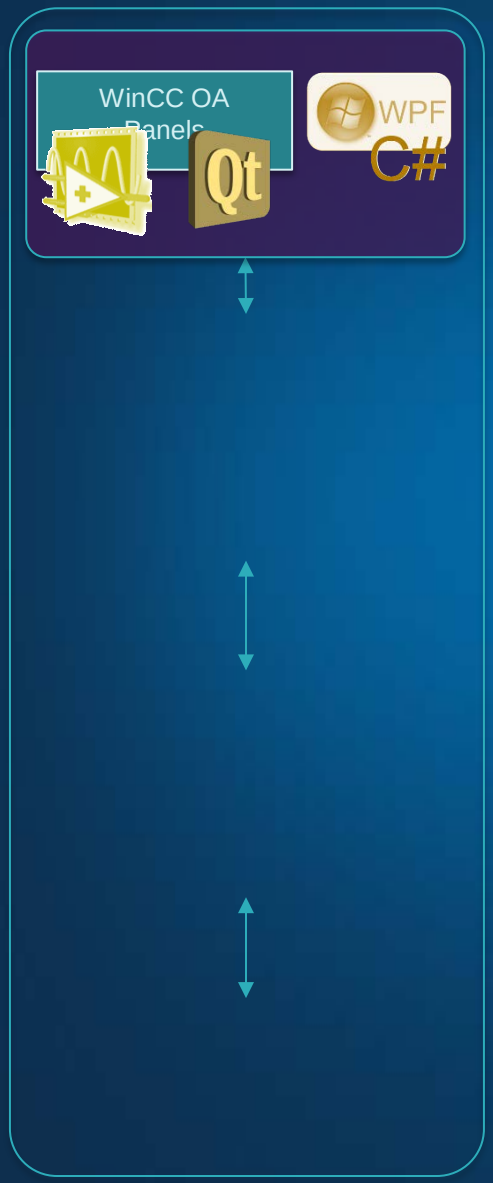

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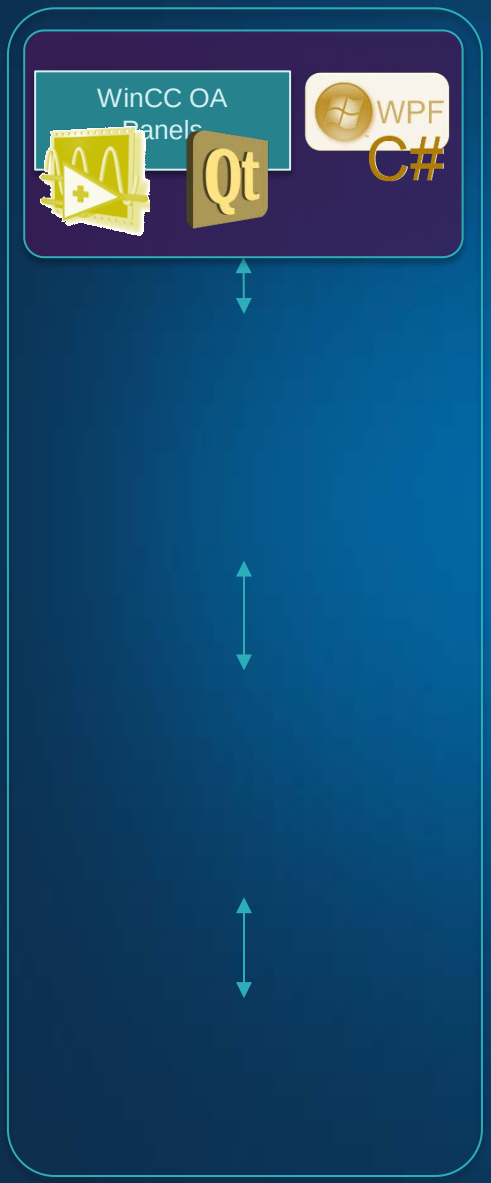

Presentation (Tier 1)

WinCC OA panels with **Qt extensions, Labview VIPs** integrated with WinCC OA, **ProShell** C# framework and procedures (**WPF**)

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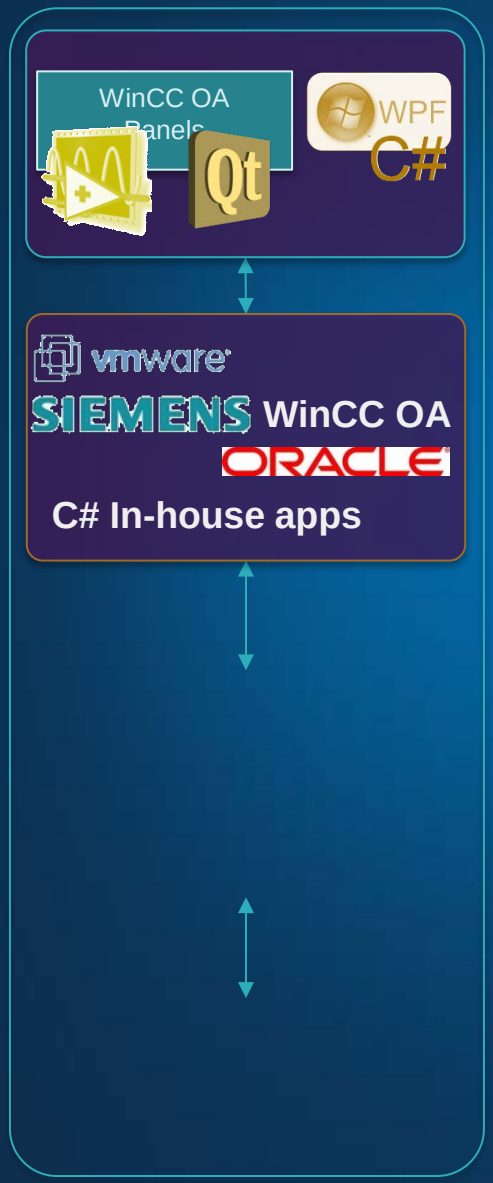

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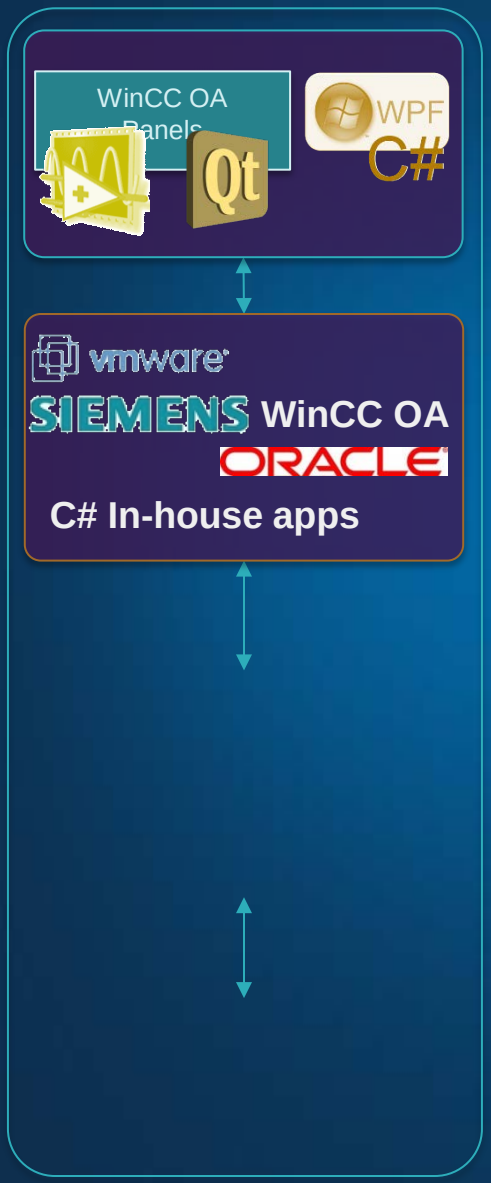

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Supervisory control via **SIEMENS/ETM WinCC OA** (Ctrl scripts)

SV/OPC for command & monitoring, **HTTP** for FEC configuration

Oracle for accelerator configuration (**R**epository **M**anagement **S**ystem), **Publisher/subscriber** (C#, C++, LV), **Virtual Accelerator Allocator**, **Logging service** from all systems via standard protocol

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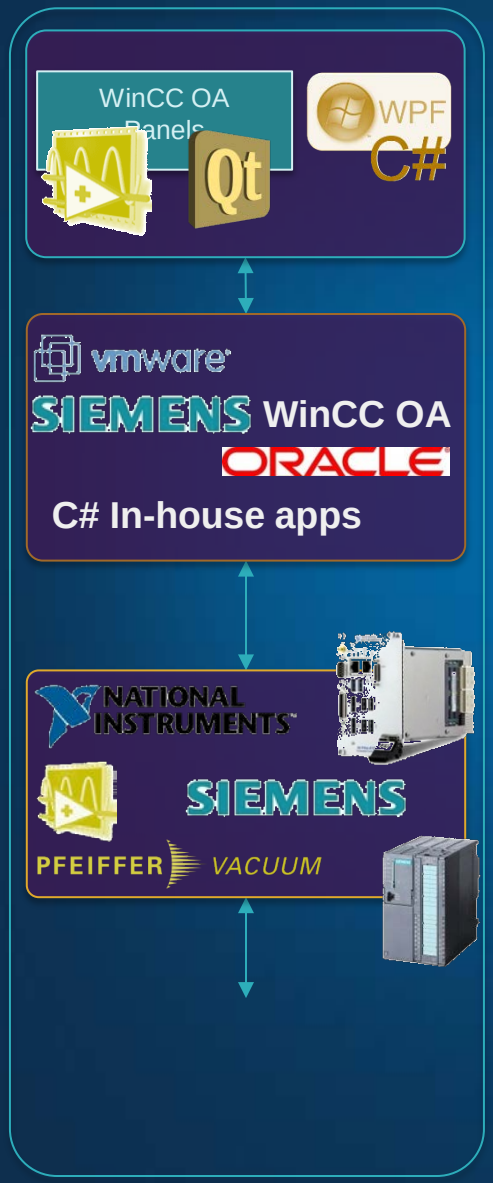

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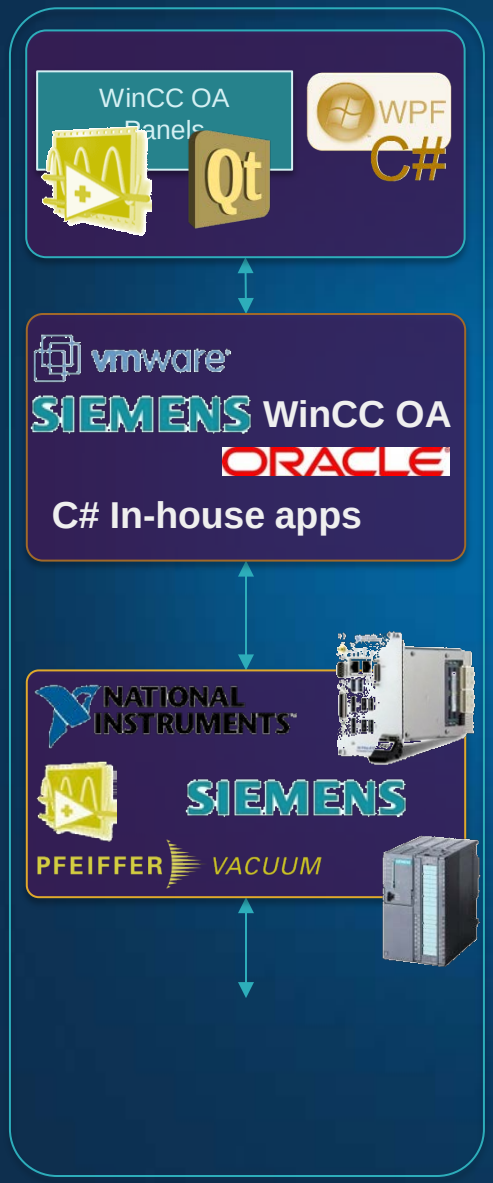

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Equipment (Tier 3)

PXIe (CPU 8135), Win 7, LV 2010, FECOS framework unifies configuration, commanding and monitoring (**Cosylab**), application components developed in **Labview,** 1 system VME/Linux/C++

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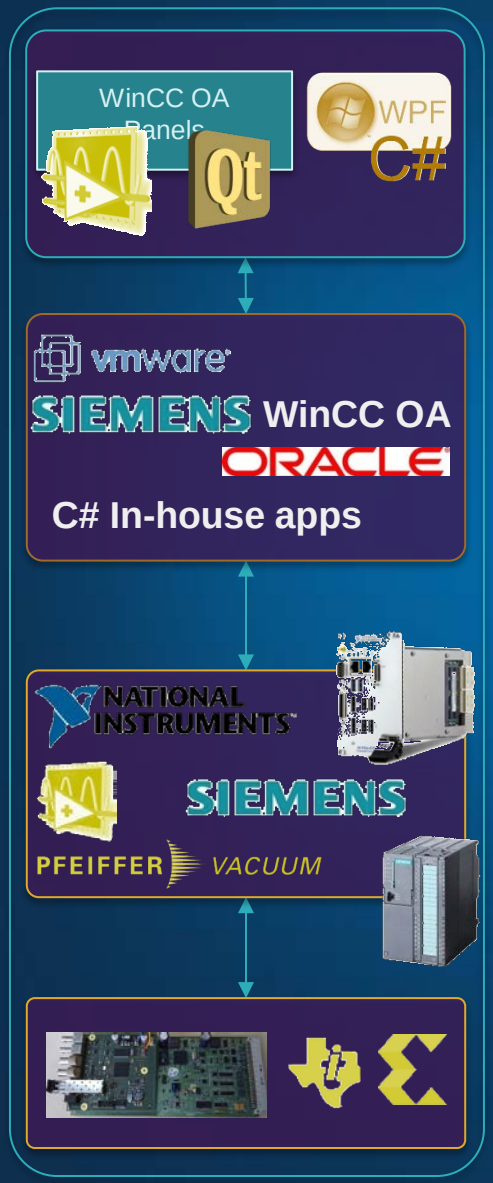

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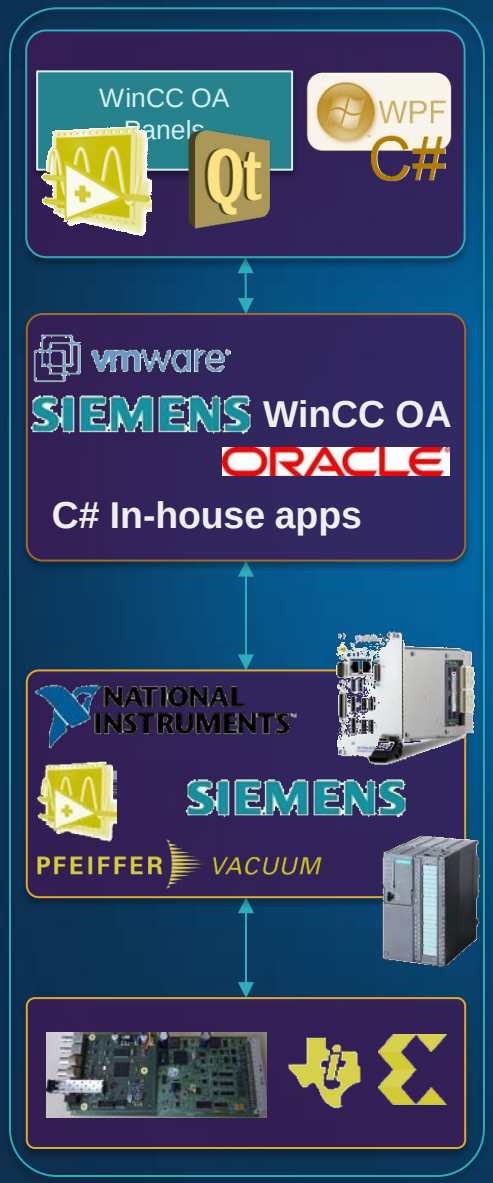

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Frontend (Tier 4)

Thomson LLRF, CERN LLRF, Pantechnik VIs, DSP code, PLCs, …

Installation Timeline 2012

Oct 1, 2012

Building and IT ready

- Development setup at CERN
- Remote deployment via Citrix VDI and RDP
- 1 person on-site permanently

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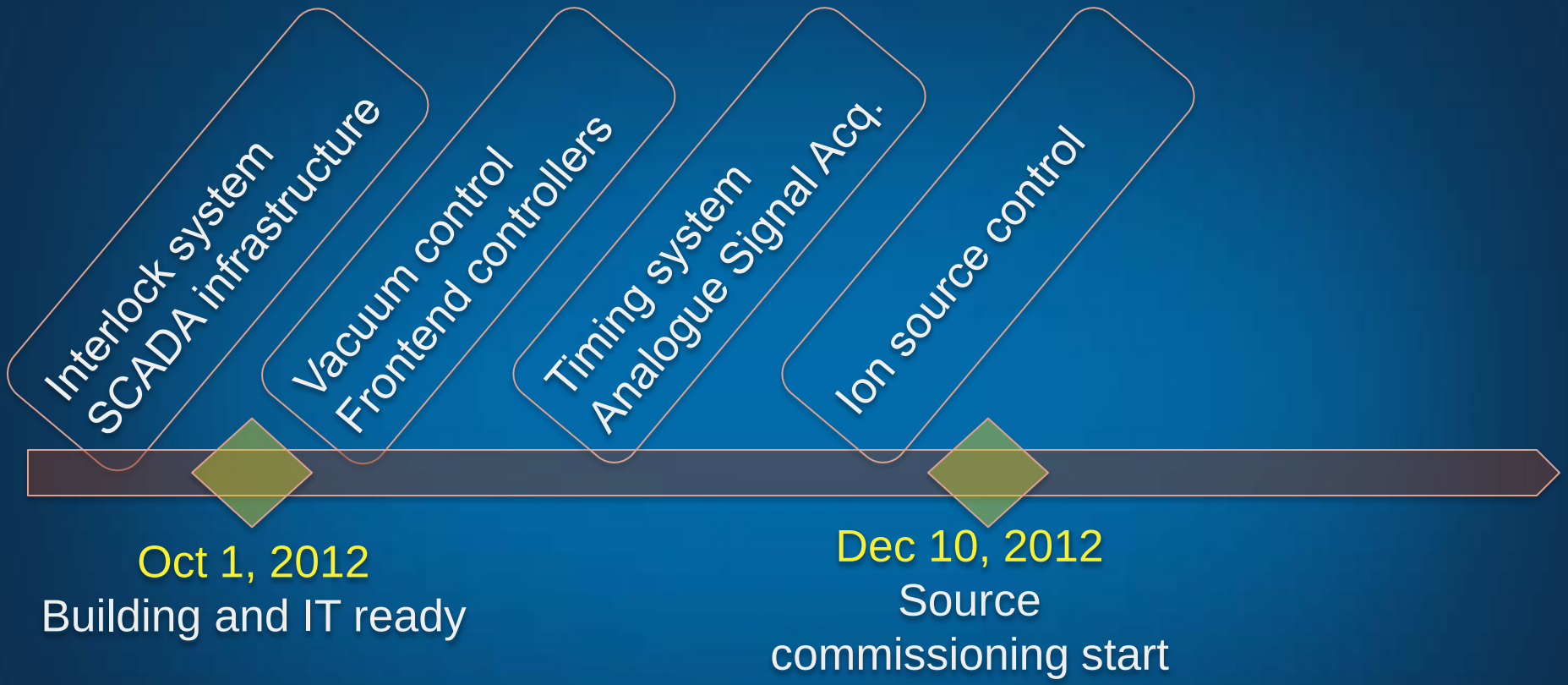

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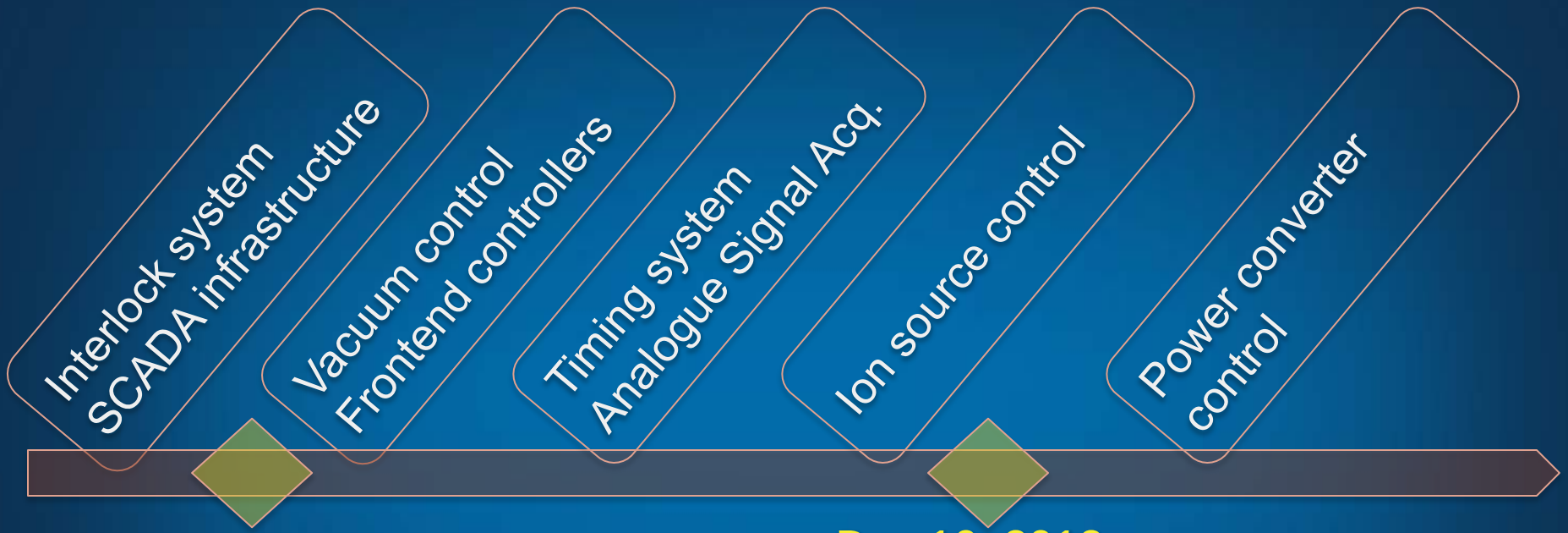

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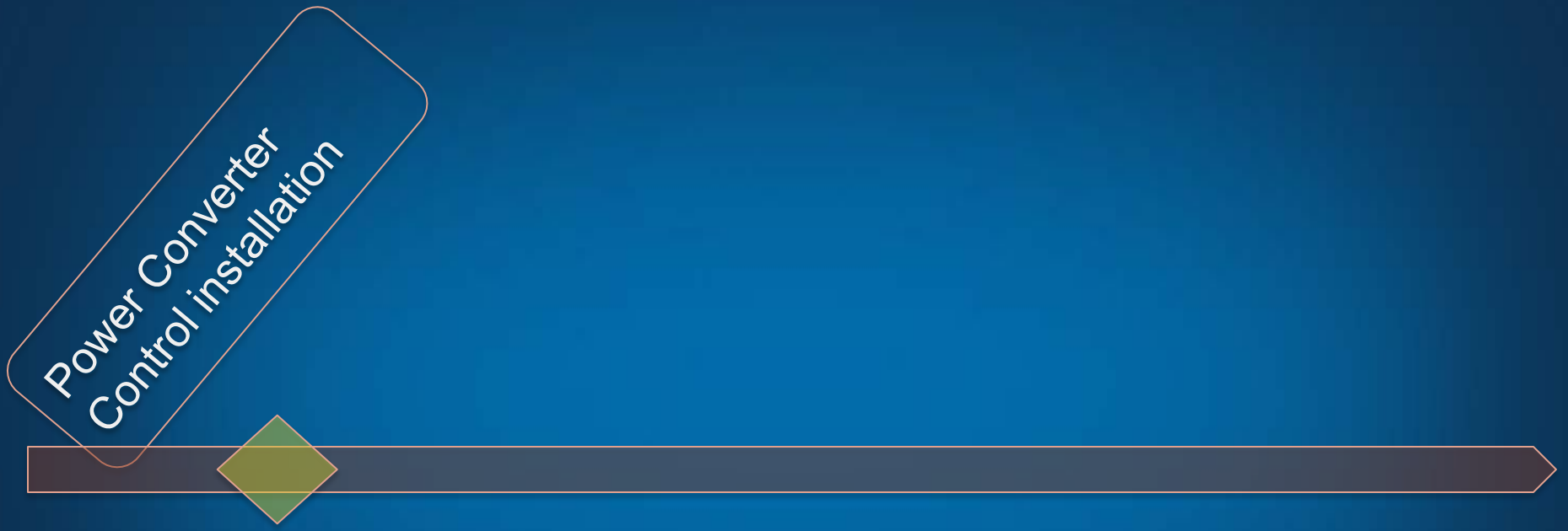
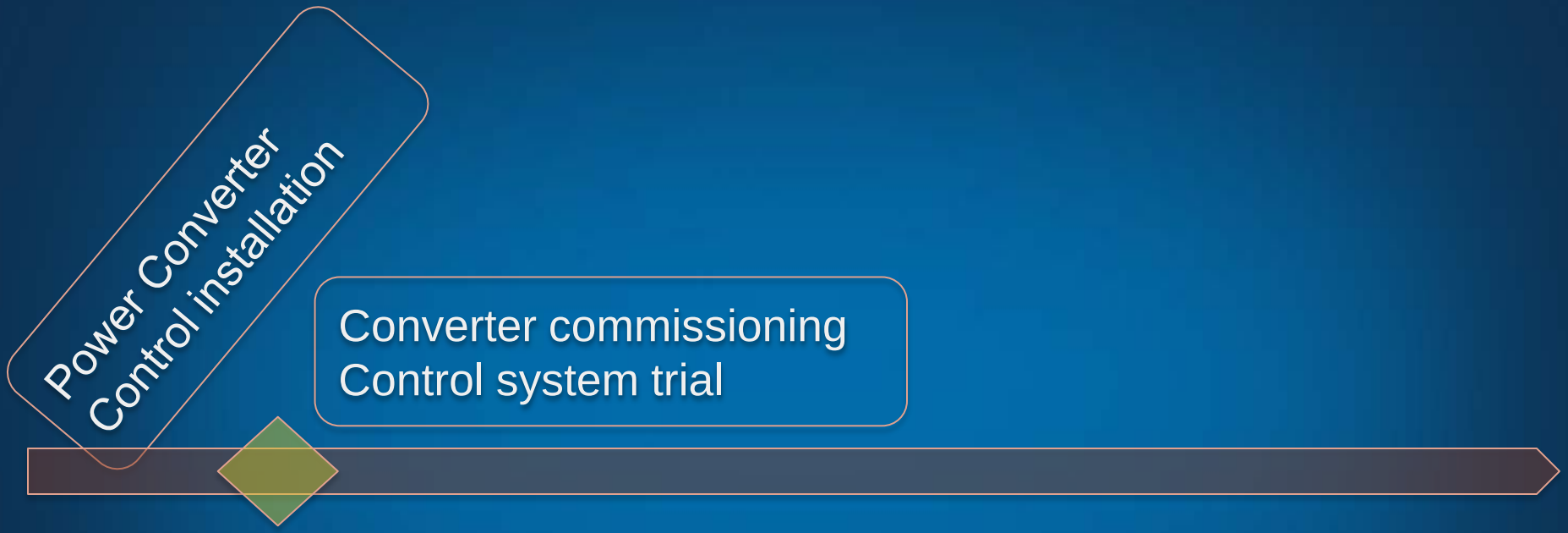
Installation Timeline 2013



- Development setup at CERN and in Austria
- Remote development until July 2013
- On-site deployment and development 3 people

Installation Timeline 2013



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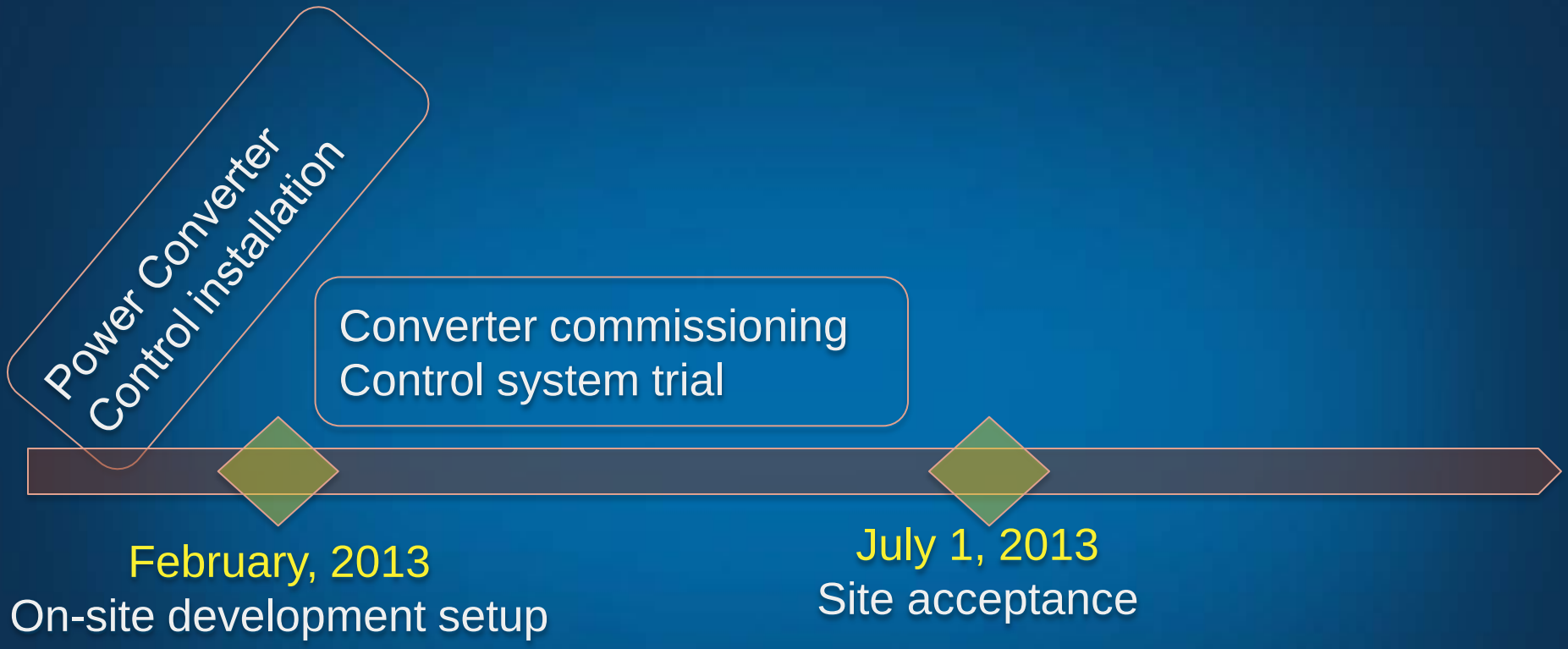

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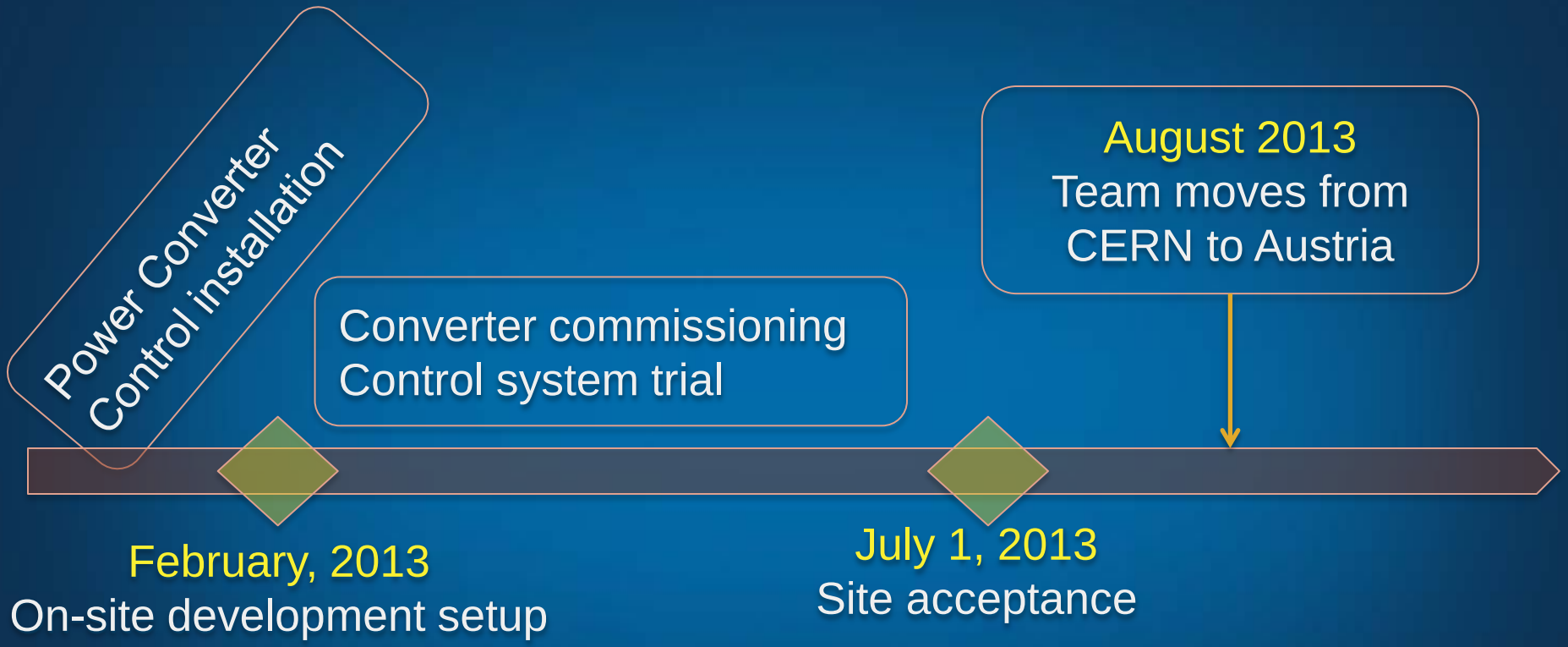

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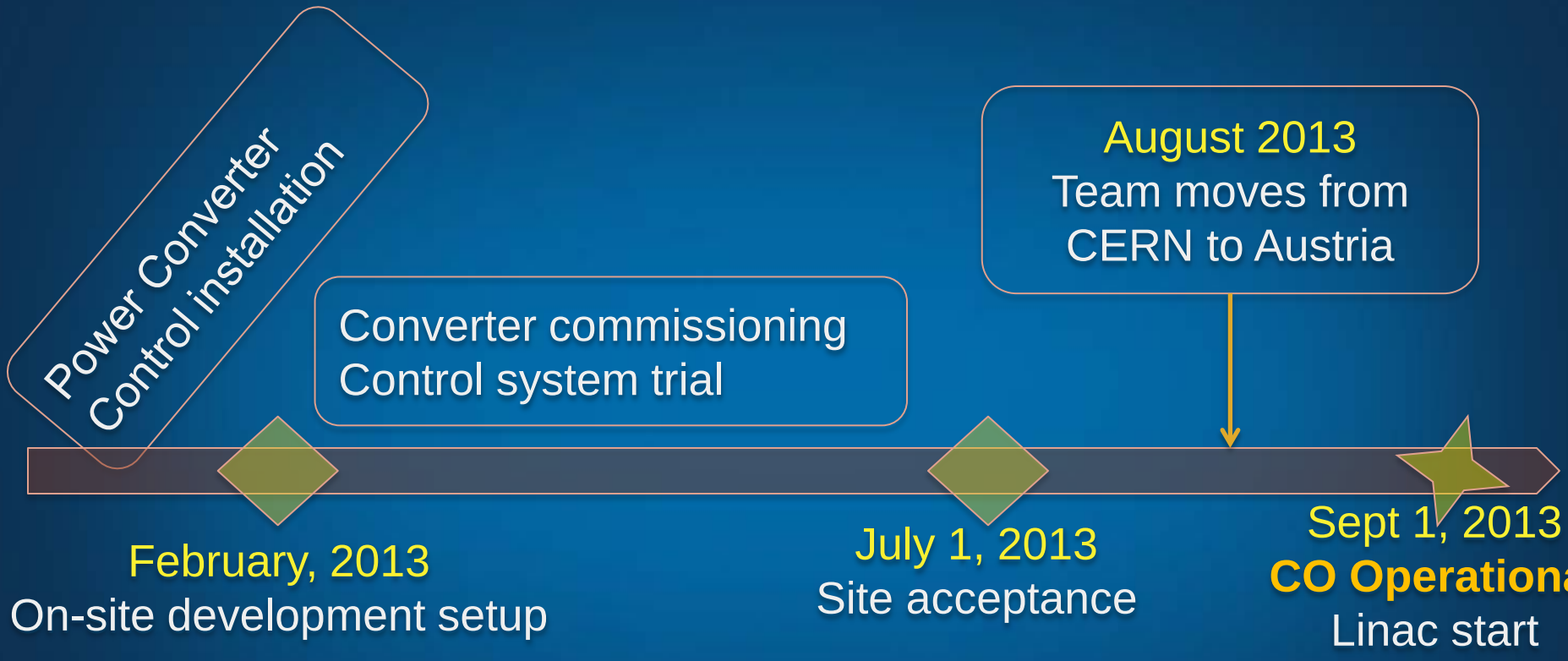

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- Remote development until July 2013
- On-site deployment and development 3 people

Commissioning Process

Commissioning Process

Identify and place equipment, put under asset control, connect and make operational.

Commissioning Process

Local Installation

Identify and place equipment, put under asset control, connect and make operational.

Local Commissioning

Test equipment and performances
Verify safety and interlock functions
Test controls communication + configuration

Remote Commissioning

Beam Commissioning

System Validation

Control System Involvement

Commissioning Process

Local Installation

Identify and place equipment, put under asset control, connect and make operational.

Local Commissioning

Test equipment and performances
Verify safety and interlock functions
Test controls communication + configuration

Remote Commissioning

Verify equipment functions, performances and safety functions **with control system**

Beam Commissioning

System Validation

Control System Involvement

Commissioning Process

Local Installation

Identify and place equipment, put under asset control, connect and make operational.

Local Commissioning

Test equipment and performances
Verify safety and interlock functions
Test controls communication + configuration

Remote Commissioning

Verify equipment functions, performances and safety functions **with control system**

Beam Commissioning

Generate beam using control system including equipment. Determine settings for baseline configuration and store in repository

System Validation

Control System Involvement

Commissioning Process

Local Installation

Identify and place equipment, put under asset control, connect and make operational.

Local Commissioning

Test equipment and performances
Verify safety and interlock functions
Test controls communication + configuration

Remote Commissioning

Verify equipment functions, performances and safety functions **with control system**

Beam Commissioning

Generate beam using control system including equipment. Determine settings for baseline configuration and store in repository

System Validation

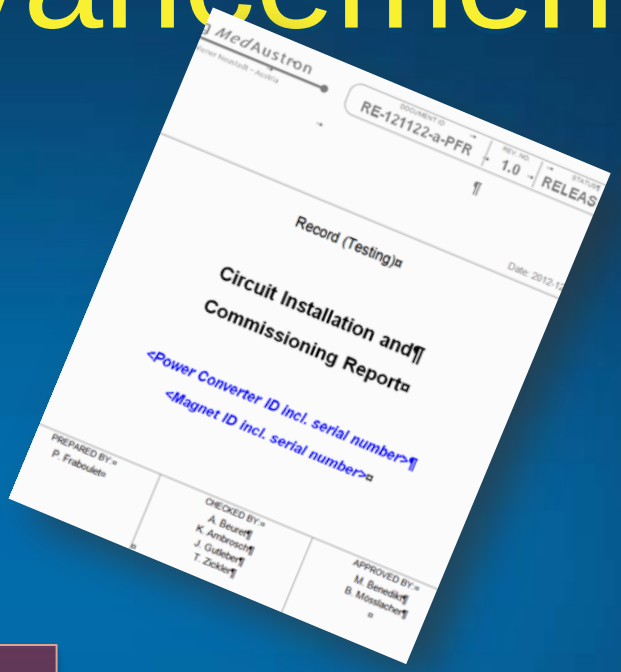
Perform beam operation with all integrated systems. **Measure performance and assess quality**.

Control System Involvement

Phase Advancement

SAFETY AND QUALITY GATE

Phase Advancement


MedAustron

RE-121122-a-PFR

1.0

RELEAS

Record (Testing)

Circuit Installation and Commissioning Report

<Power Converter ID incl. serial number>

<Magnet ID incl. serial number>

PREPARED BY:
P. Fraboulet

CHECKED BY:
A. Beuret
K. Ambrosch
J. Gutleber
T. Zickler

APPROVED BY:
M. Benedikt
B. Mosslacher

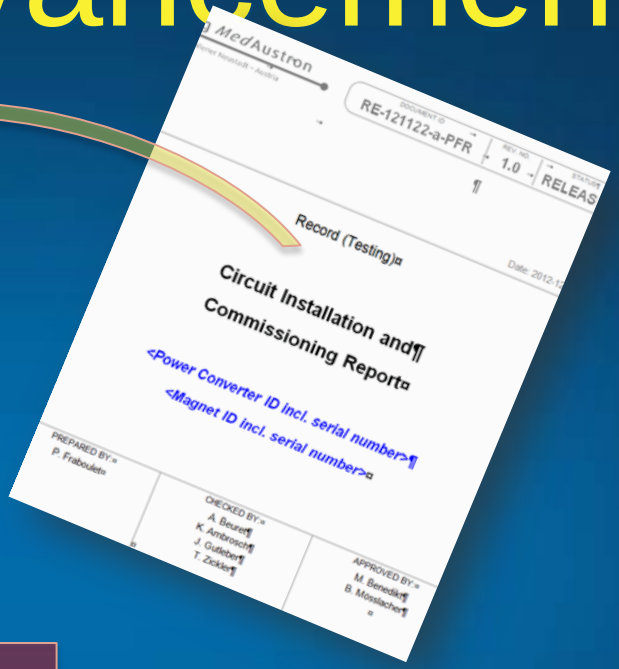
SAFETY AND QUALITY GATE

Phase Advancement

Preconditions

Phase C

Postconditions



SAFETY AND QUALITY GATE

Phase Advancement

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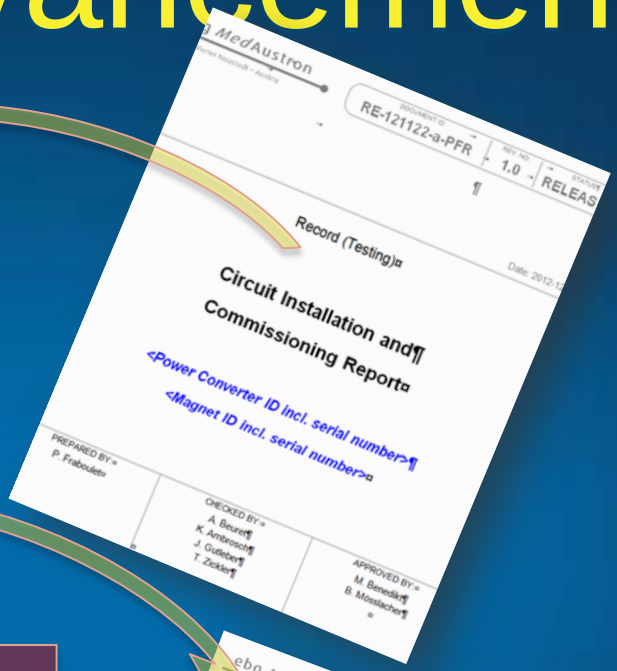
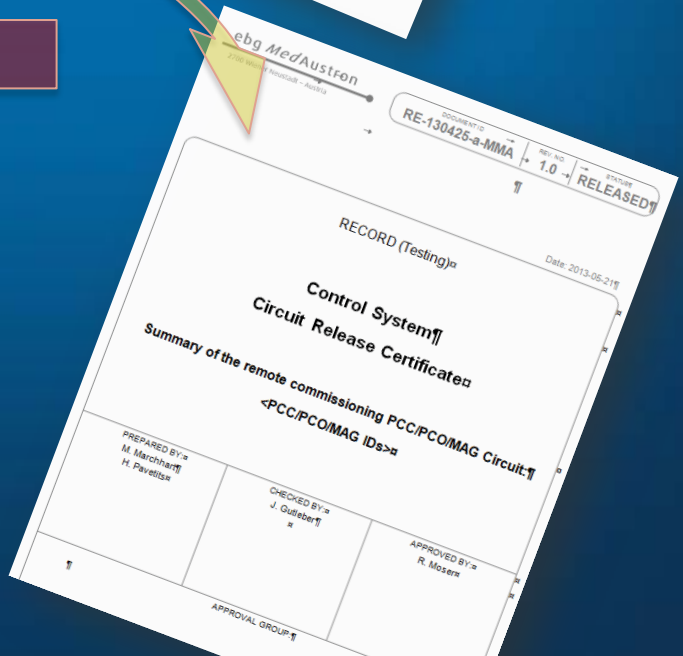
SAFETY AND QUALITY GATE





Phase Advancement

Preconditions

Phase C

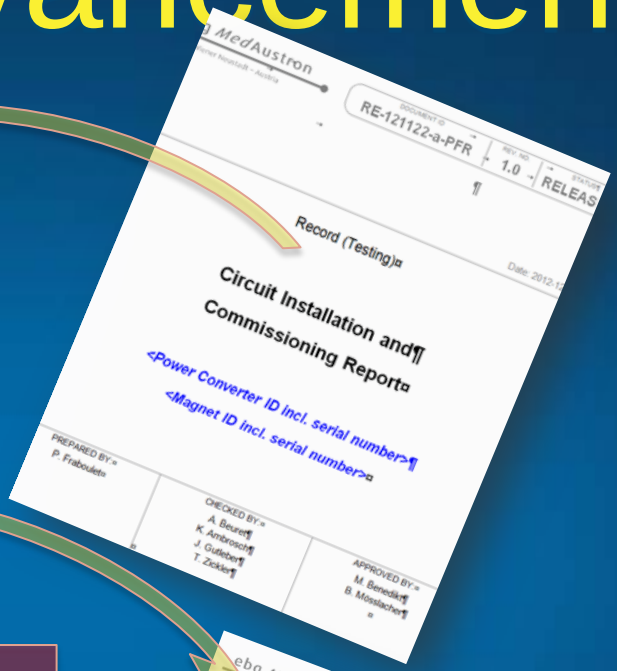
Postconditions

SAFETY AND QUALITY GATE

Preconditions

Phase D

Postconditions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RE-121122-a-PFR

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CHECKED BY:
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APPROVED BY:
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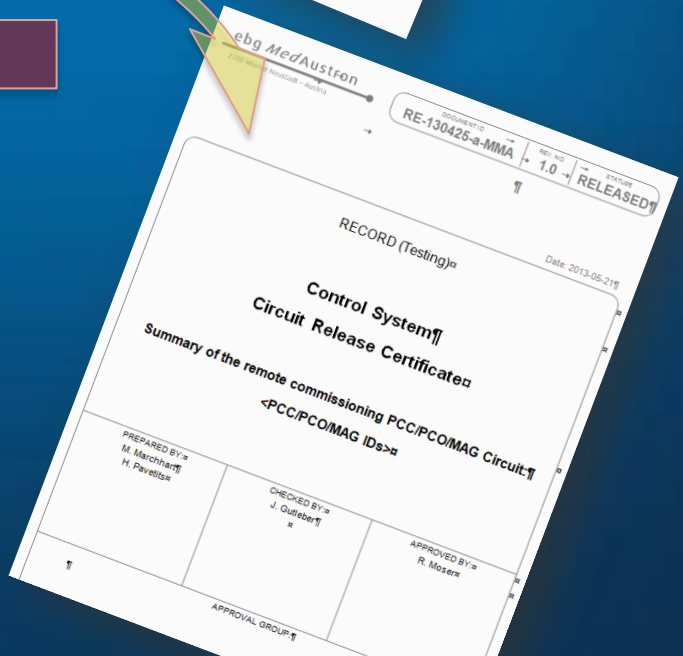
B. Mosslacher


ebg MedAustron

RE-130425-a-MMA

1.0

RELEASED

RECORD (Testing)

Date: 2013-05-21

Control System
Circuit Release Certificate

Summary of the remote commissioning PCC/PCO/MAG Circuit:

<PCC/PCO/MAG IDs>

PREPARED BY:
M. Marchhart
H. Pavettis

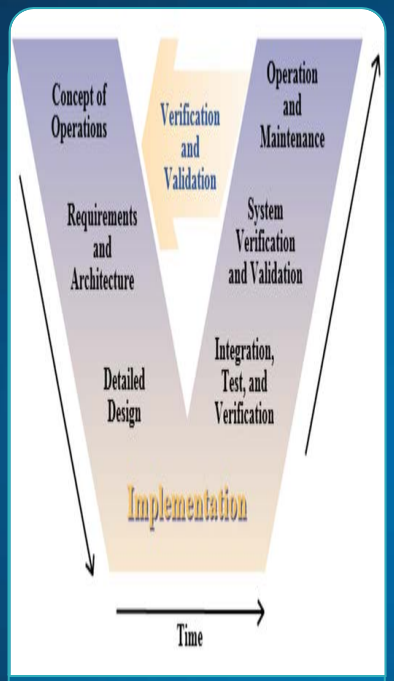
CHECKED BY:
J. Gutleber

APPROVED BY:
R. Mosers

APPROVAL GROUP:

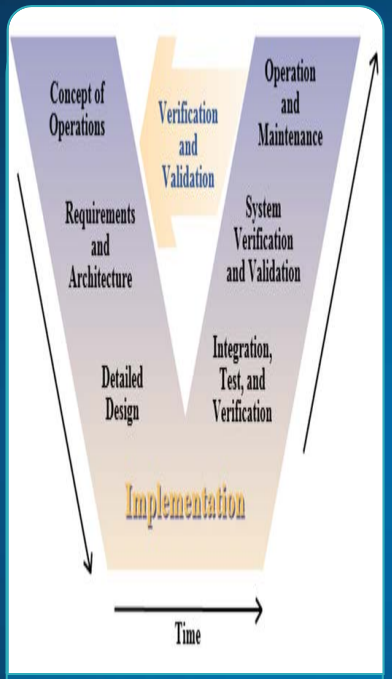
Lessons Learnt

Lessons Learnt



Systems Engineering

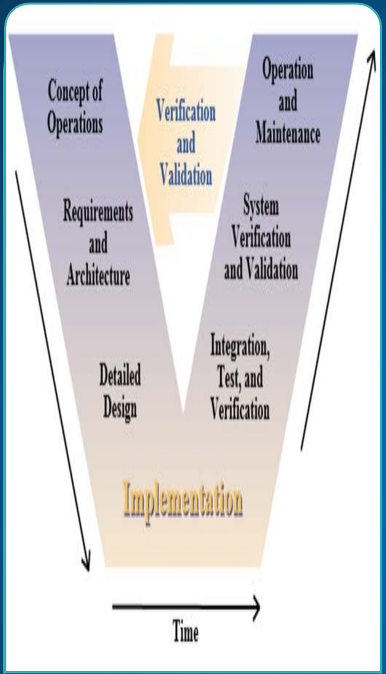
Lessons Learnt



Systems Engineering

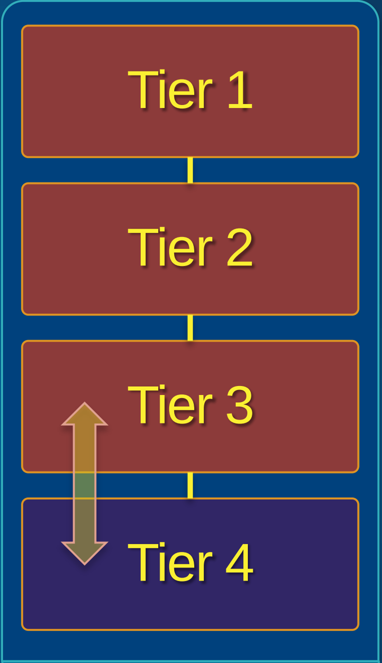
Work with Contractor

Lessons Learnt



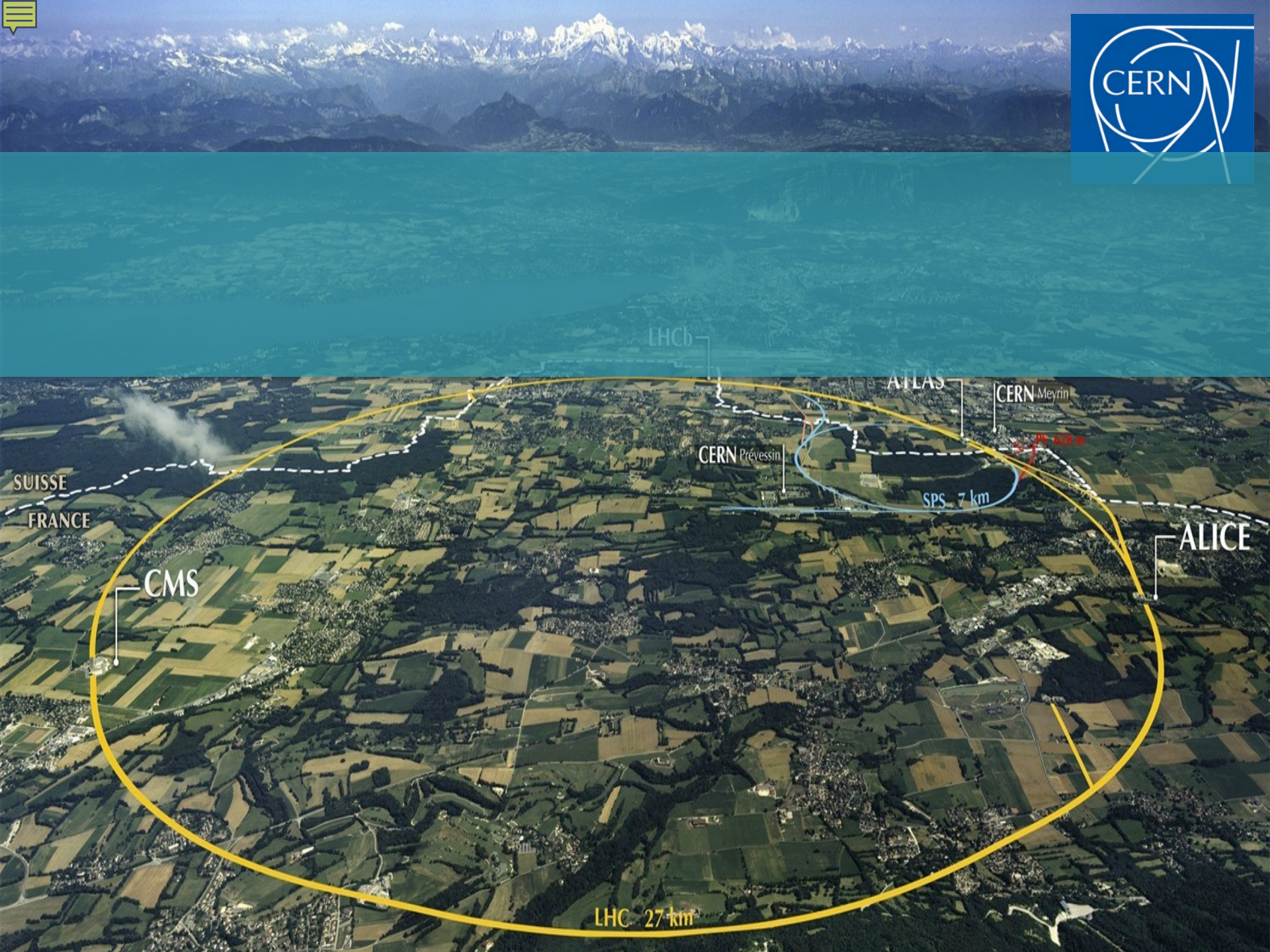
Systems Engineering

Work with Contractor

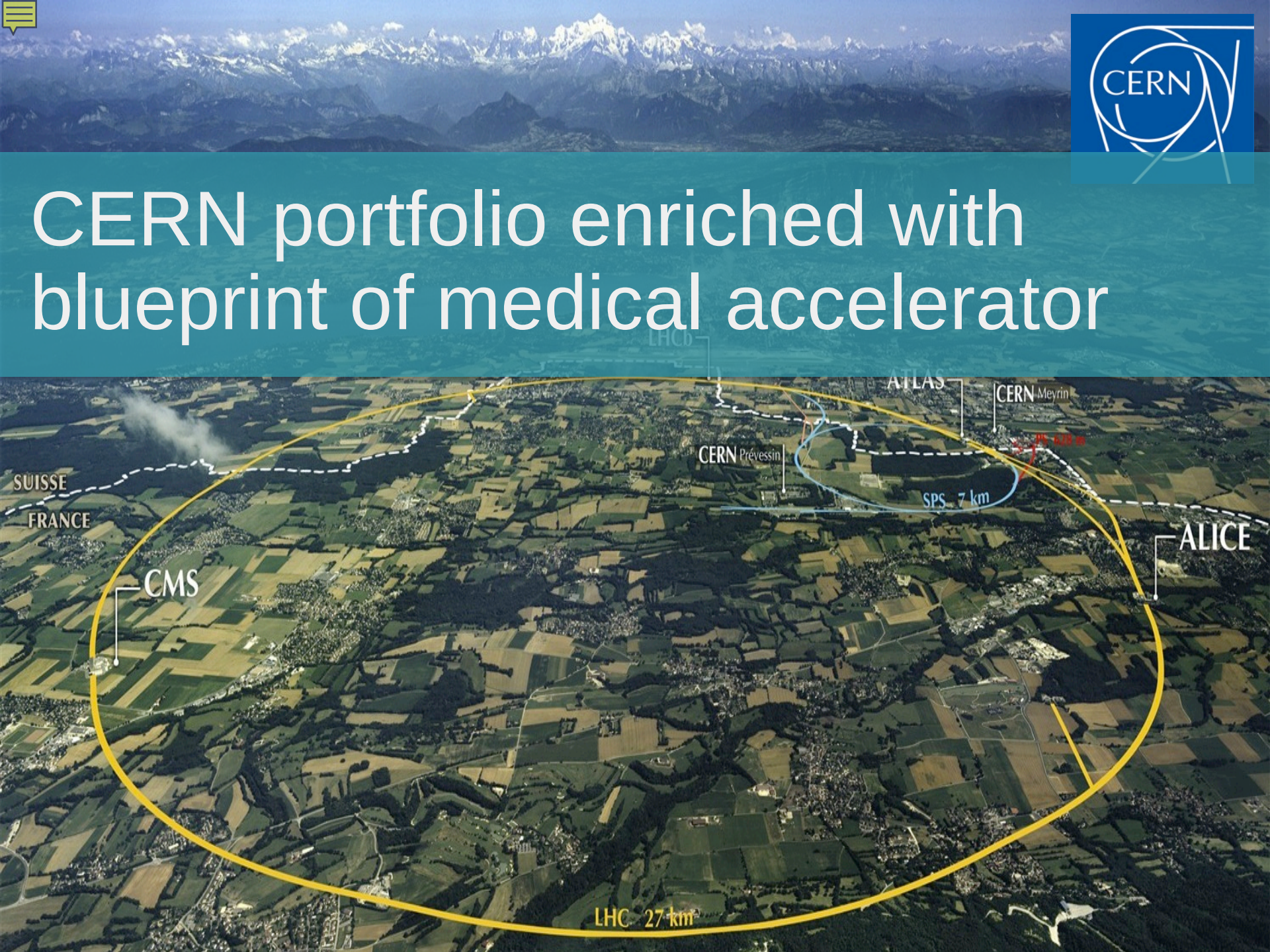


Varying Involvement

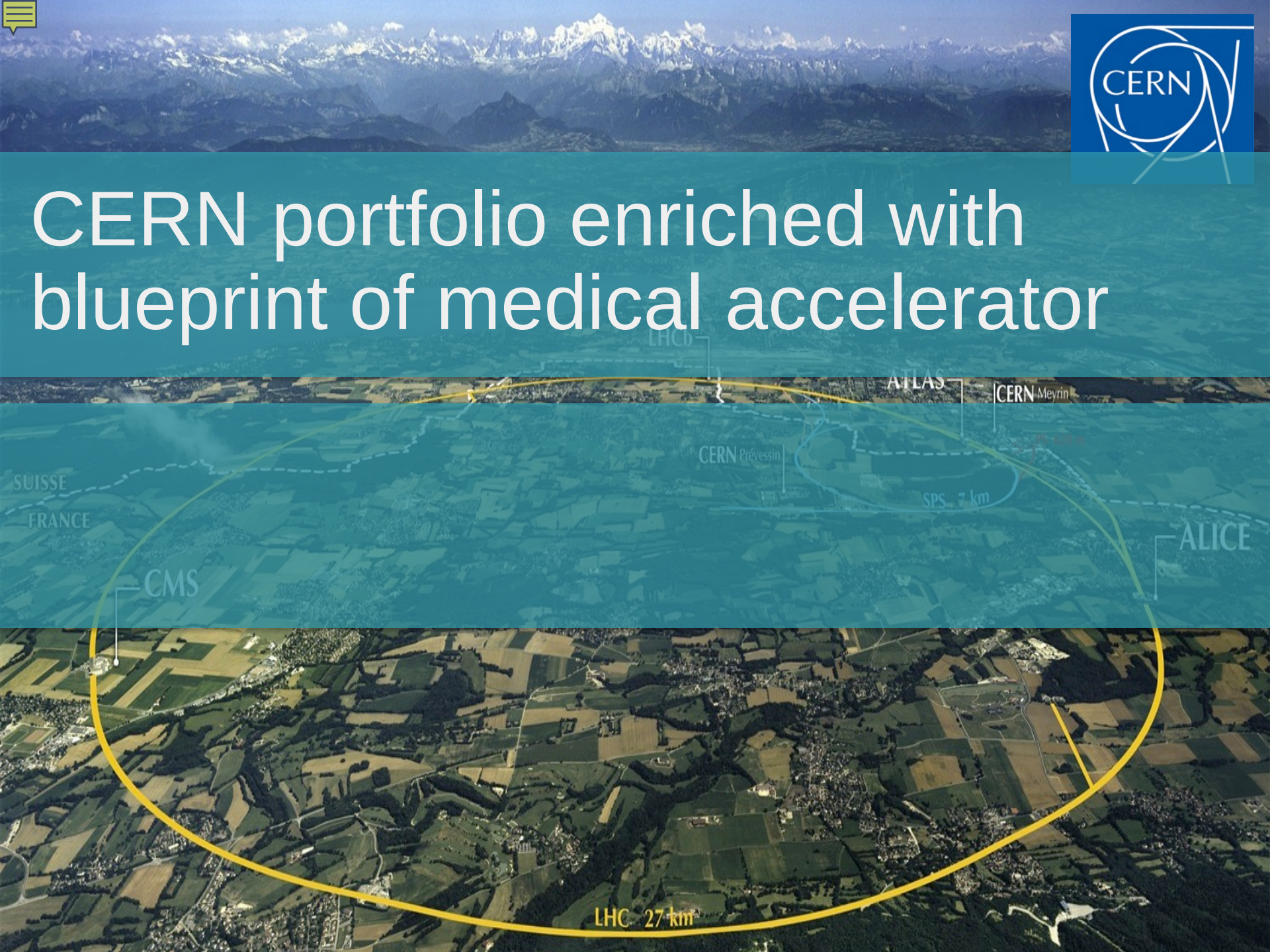

CERN
LHCb
ATLAS
CERN Meyrin
PS 628 m
CERN Prévessin
SPS 7 km
SUISSE
FRANCE
CMS
ALICE
LHC 27 km


LHCb
ATLAS
CERN Meyrin
CERN Prévessin
SUISSE
FRANCE
SPS 7 km
ALICE
CMS
LHC 27 km

CERN portfolio enriched with blueprint of medical accelerator



CERN portfolio enriched with blueprint of medical accelerator

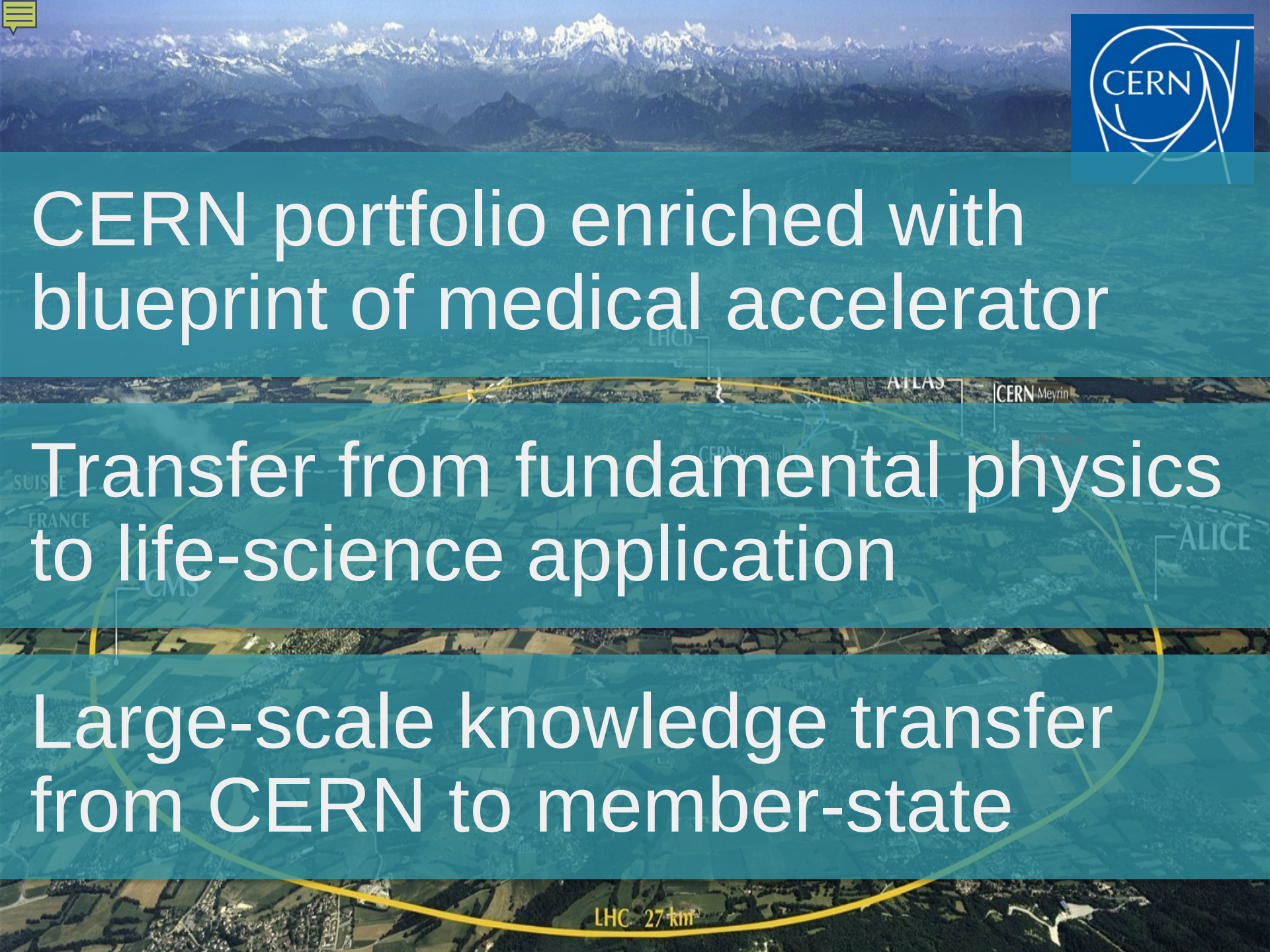


CERN portfolio enriched with blueprint of medical accelerator

Transfer from fundamental physics to life-science application

CERN portfolio enriched with blueprint of medical accelerator

Transfer from fundamental physics to life-science application



CERN portfolio enriched with blueprint of medical accelerator

Transfer from fundamental physics to life-science application

Large-scale knowledge transfer from CERN to member-state