



# ***MICE: Controls & Monitoring***

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## Definitions:

- Controls and Monitoring (C&M) is the software (and hardware) used as the human interface to all experimental apparatus
- Designer overall responsible party
- Developer develops EPICS interface
  - ◆ DL or Hanlet
- Integrator integrates subsystem into MICE – Hanlet



## Definitions and Purpose:

- Controls refers to:

- user interface to equipment
- proper sequencing of equipment

- Monitoring serves to:

- protect equipment (early notification)
- protect data quality
- requisite for proper sequencing



# *Considerations*

**MICE is a precision experiment. We intend to measure a 10% cooling effect with 1% precision.**

**Therefore it is imperative that we tightly control any systematic effects which could affect the data quality.**



# Considerations

- **Each subsystem C&M must be designed by the expert(s)**
- **C&M is developed by EPICS expert**
- **Must integrate into MICE C&M**
- **Desire uniform interfaces**
- **Must consider system resources**
- **Similar components amongst different kits yields robustness**



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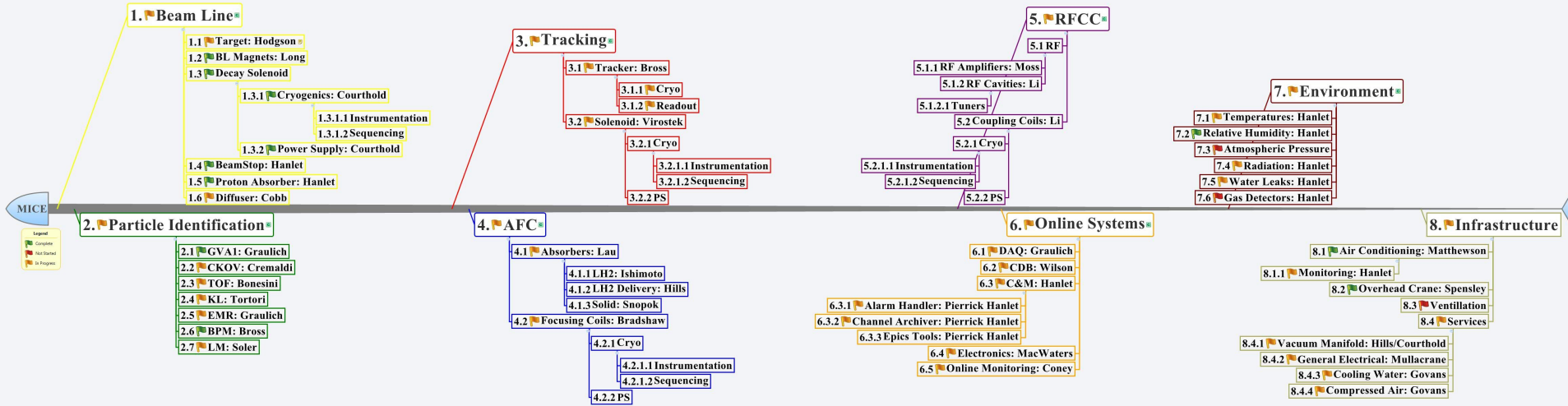
# Organization

## Beamline

## Tracking

## RF

## Environment



## PID

## Absorber

## Online

## Infrastructure





# Organization

**Task divided into multiple systems:**

- **Beamline:**
  - Target, magnets, PA, DS, BS, Diffuser
- **Particle ID**
  - LM, TOF, CKOV, BPM, KL, EMR
- **Environment monitoring**
  - T, Humidity, radiation, water, He, ...
- **Online systems**
  - DAQ—CDB—C&M interface, crates, network, ...

**All this is part of Step I**



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# *Future Organization*

- **Tracking**
  - **tracker and spectrometer solenoids**
- **AFC**
  - **absorber and focusing coils**
- **RFCC**
  - **RF cavities and coupling coils**
- **Infrastructure**
  - **Vacuum, power, compressed air, chilled water,...**



# Future Organization

**Task divided into multiple systems:**

- **Tracking** **Steps II & III**
  - **tracker and spectrometer solenoids**
- **AFC** **Step IV**
  - **absorber and focusing coils**
- **RFCC** **Step V**
  - **RF cavities and coupling coils**



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# Goals

## **MICE goes global**

- to date, independent subsystems

## **The Configuration Database (CDB)**

- memory of MICE
- all experimental parameters stored and loaded from CDB

**All subsystems required to define states of operation**



# Goals

## Several Considerations:

1. Subsystem C&M designed by different collaborators, implemented by others
2. Must be integrated to ensure safe use of resources and operations
3. MICE operates in different states over differing time periods:
  1. Shutdown/Installation
  2. Sleep (occasionally over weekends)
  3. Testing
  4. Data taking



# Goals

**Different states requires different equipment (and data) monitoring requirements:**

- **ignore many systems during shutdown state**
- **fewer systems ignored during sleep state**
- **nothing(?) ignored during data taking**
- **different parameters during testing or data taking?**
- **different alarms and different alarm limits**
- **different parameters and/or frequency to archive**





# ***Example: H<sub>2</sub> Delivery***

- **Off**
- **On (with helium)**
- **Purge**
- **Helium Fill**
- **Helium Empty**
- **On (with H<sub>2</sub>)**
- **Hydride Bed Charge**
- **Purge**
- **H<sub>2</sub> Fill**
- **H<sub>2</sub> Empty**

***Thanks  
Matt !!!***



## Step IV Example (10,240) run:

### Start run will require:

- ◆ Set magnet currents
- ◆ Set DS currents
- ◆ Set PA
- ◆ Set diffuser
- ◆ Set cooling channel magnets
- ◆ Absorber settings(?)

**All  
from  
CDB**

- ◆ Verify tracker ready
- ◆ Verify BS, DAQ, network ready
- ◆ Check hall environment
- ◆ Start DATE



**This  
must  
be  
properly  
planned  
!!!**



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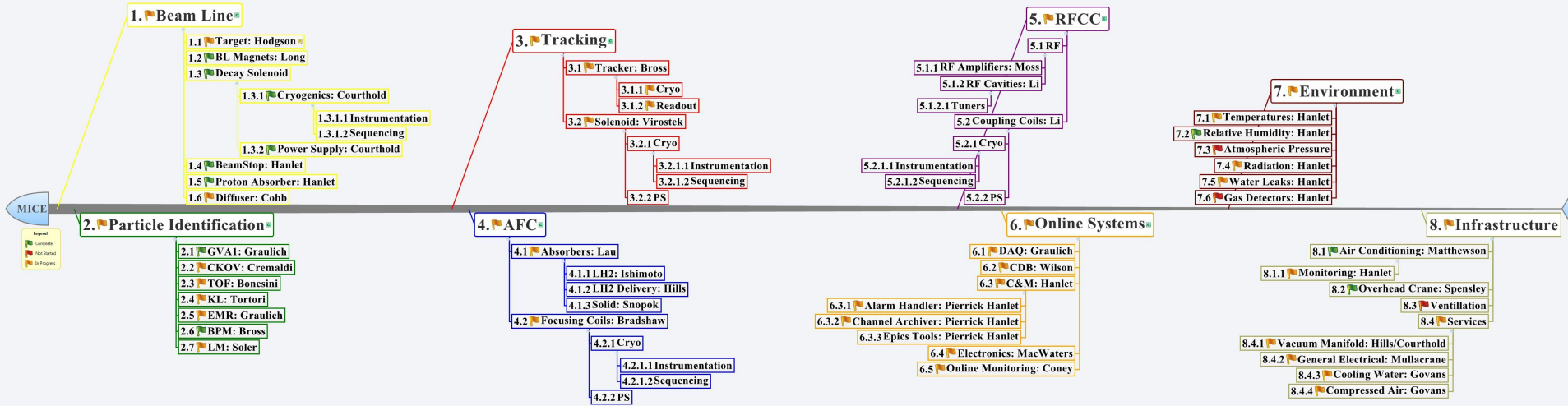
# Status and Schedule

## Beamline

## Tracking

## RF

## Environment



## PID

## Absorber

## Online

## Infrastructure



# Status

## • Beamline:

- Target, magnets, PA, DS, BS
- Diffuser

## • Particle ID

- CKOV, BPM, KL
- TOF, KL
- LM, EMR

## • Environment monitoring

- T, Humidity, radiation, water flow, water leaks



# Status

## • Online systems

- **DAQ—CDB—C&M:**  
**interface, crates, network, ...**

## • Tracking System

- **Tracker (only AFE finished)**
- **Spectrometer solenoids**

## • Absorber System (AFC)

- **Absorbers**
- **Focusing coils**



# Status

## •RF System (RFCC)

- Focusing coils
- RF

## •Infrastructure/services

- What do we want here?

**All subsystem owners have been contacted to initiate implementation of global plan**





# *Plan - Summer 2011*

## **Goal is to have all existing subsystems finalized:**

- **Operational states defined**
- **Alarm limits set accordingly**
- **Alarm limits for different states set and tagged in CDB**
- **Alarm limits read from CDB**
- **Archived data finalized**



# Schedule

In the schedule that follows, the date considered is that of the first planned test of a subsystem.

The global magnet system C&M must be ready for the first operation of two magnets at RAL.

The codes used are:

PROGRESS	
0	not started
1	started
2	in progress
3	complete

PRIORITY	
0	none
1	highest
2	medium
3	lowest



# Schedule

PROGRESS	
0	not started
1	started
2	in progress
3	complete

PRIORITY	
0	none
1	highest
2	medium
3	lowest

SYSTEM	SUBSYSTEM	SUBSUBSYSTEM	OWNER	PROGRESS	PRIORITY	DATE
Beamline	Target		Hodgson	3	0	-
	New Target DAQ		Hodgson	2	3	01-06-2012
	BL Magnets		Long	3	0	-
	Decay Solenoid		Courthold	3	0	-
	Beamstop		Hanlet	3	0	-
	Proton Absorber		Hanlet	3	0	-
	Diffuser		Cobb	0	1	01-08-2011
PID	LM		Soler	0	2	?
	BPM		Bross	3	0	-
	GVA1		Graulich	3	0	-
	CKOV		Cremaldi	3	0	-
	TOF		Bonesini	2	1	15-06-2011
	KL		Torori	2	1	15-06-2011
	EMR		Graulich	2	1	15-06-2011
Online	DAQ		Graulich	2	1	15-09-2011
	DCB		Wilson	2	1	15-09-2011
	Online Monitoring		Coney	2	1	15-09-2011
	Electronics		MacWaters	2	1	15-09-2011
	C&M		Hanlet	2	1	15-09-2011
Environment			Hanlet	2	2	15-09-2011



# Schedule

PROGRESS	
0	not started
1	started
2	in progress
3	complete

PRIORITY	
0	none
1	highest
2	medium
3	lowest

SYSTEM	SUBSYSTEM	SUBSUBSYSTEM	OWNER	PROGRESS	PRIORITY	DATE
Tracking	Trackers		Bross	2	1	03-01-2012
	Spectrometer Solenoids		Virostek	2	1	27-10-2011
AFC	Absorbers					
		Solid	Snopok	?	?	?
		LH2	Ishimoto	2	1	01-07-2011
		LH2 delivery	Hills	2	2	01-09-2011
	Focusing Coils		Bradshaw	2	1	01-07-2011
RFCC	RF Amplifiers		Moss	2	2	01-09-2011
	RF Cavities		Li	?	3	?
	Coupling Coils		Li	?	3	?
Global Magnets	First SS & AFC		Preece/Courthold	1	3	06-01-2012
Infrastructure	Air Conditioning		Matthewson/Hanlet	3	0	-
	Overhead Crane		Spenseley	?	?	01-09-2011
	Ventillation		???	?	?	01-09-2011
	Services	Vacuum	Hills/Courthold	2	2	01-09-2011
		Electrical	Mullacrane	?	?	01-09-2011
		Cooling Water	Govans	?	2	01-09-2011
		Compressed Air	Govans	?	2	01-09-2011



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# Potential Problems

- **C&M should be considered as an integral part of system development, not as an afterthought**
- **Designer is not developer**
- **Integrator is (usually) neither designer or developer**
- **Schedule dominated by subsystems**



# Summary

- New systems come online and are (mostly) accounted for
- Integration with CDB underway
- Still need input from subsystem owners



- *Integration for new systems requires proper planning*
- *Designer/Developer/Integrator not usually same person*