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NSS grounding strategy
- implementation status -

IKON 13

Lund, 26th September 2017

Thomas Gahl

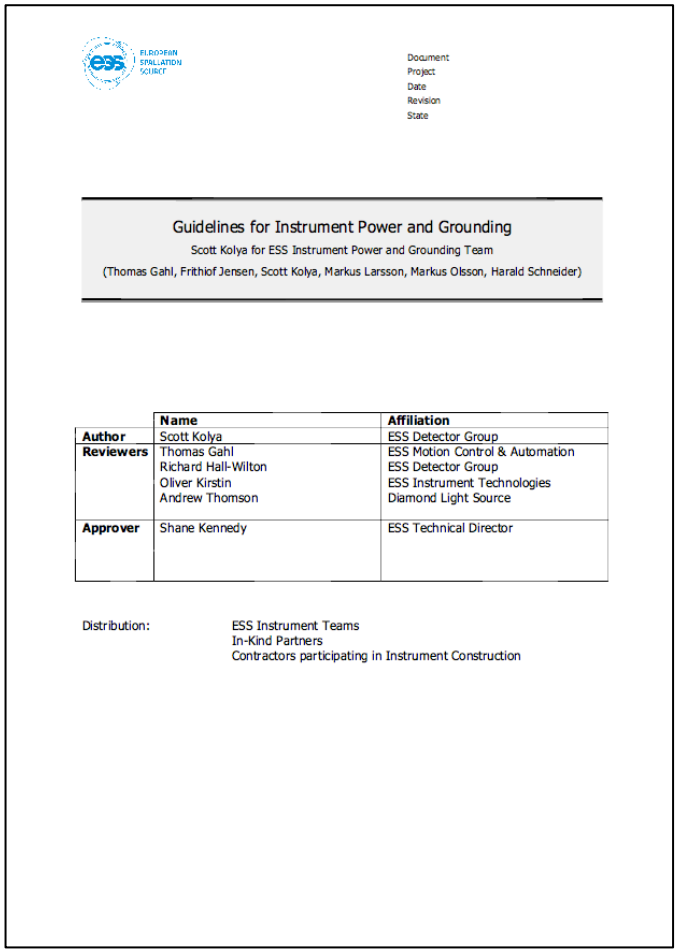
- Group Leader Motion Control & Automation -

Basis

"Guidelines for Instrument Power and Grounding"

On confluence pages as draft v0.2

Currently as ESS-0147271 under review



Document
Project
Date
Revision
State

Guidelines for Instrument Power and Grounding

Scott Kolya for ESS Instrument Power and Grounding Team

(Thomas Gahl, Frithiof Jensen, Scott Kolya, Markus Larsson, Markus Olsson, Harald Schneider)

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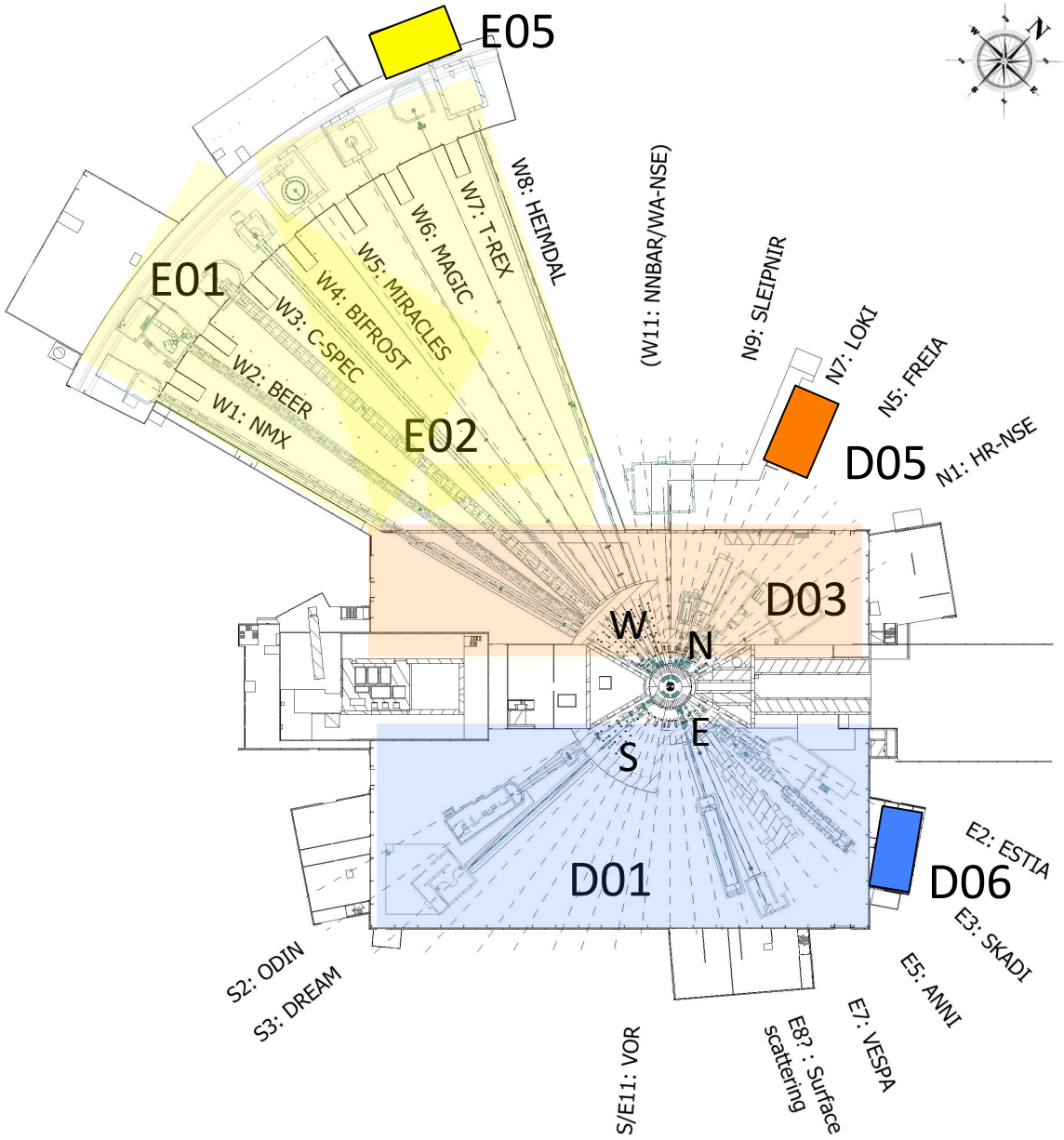
Approver	Shane Kennedy	ESS Technical Director

Distribution: ESS Instrument Teams
In-Kind Partners
Contractors participating in Instrument Construction

L1 - High level requirements

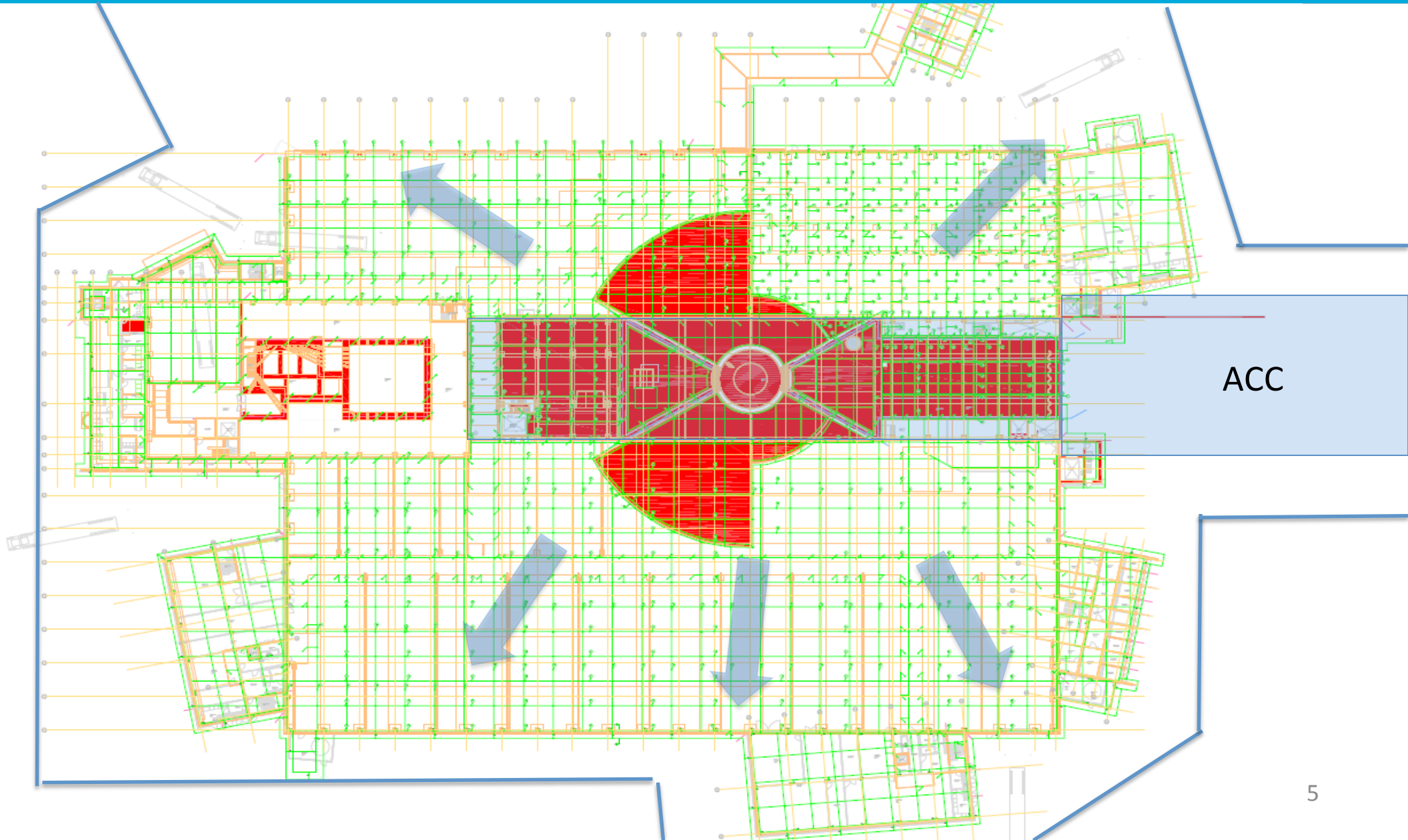
1. The grounding installations shall be divided into three greater grounding zones, following the different power supply zones in the D- and E-buildings.
2. The grounding of NSS instruments shall be implemented in a way that interferences from in- and outside the instrument through air, power cables or grounding bonds shall not compromise the availability, functionality and performance of the single instrument (e.g. by introducing isolated instruments grounding zones).
3. The number of grounding zones shall be minimized.
4. Lessons learned from other facilities shall be included in the design of the grounding installations.
5. Grounding shall fulfill functional, EMC and safety requirements to ESS and European standards.

R1 - NSS Power supply zones

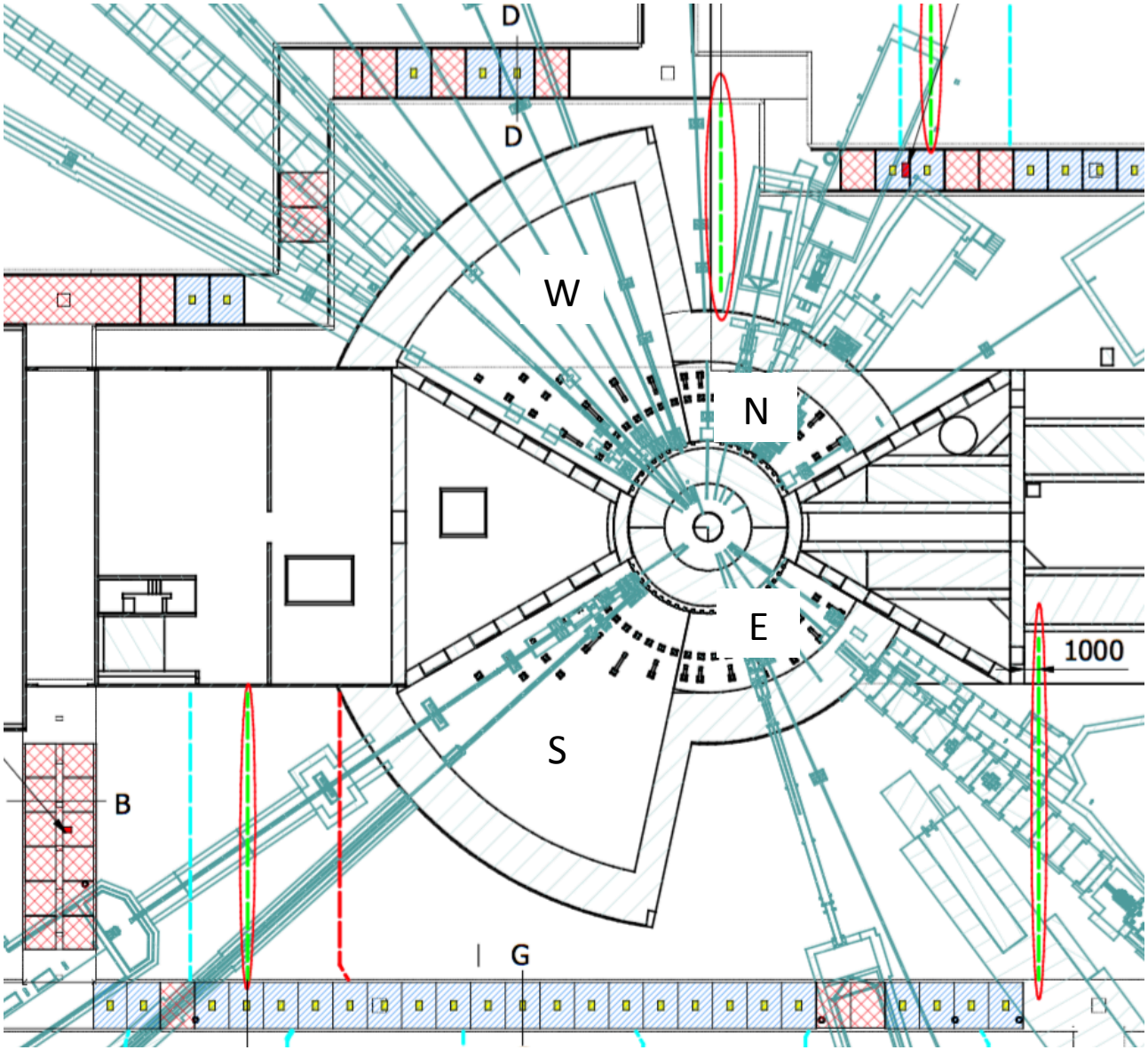


- E05:
  - Supply of the cave areas of instruments W1 to W8 in E01
  - Supply of instruments installations in the guide-hall E02
- D05
  - Supply of the Instruments N1 to N11 in D03
  - Supply of parts of the instruments W1 to W8 in D03
  - Supply of the bunker areas W and N
- D06
  - Supply of the instruments S1 to S20 and E1 to E11
  - Supply of the bunker areas S and E

R2 – ESS grounding mesh design

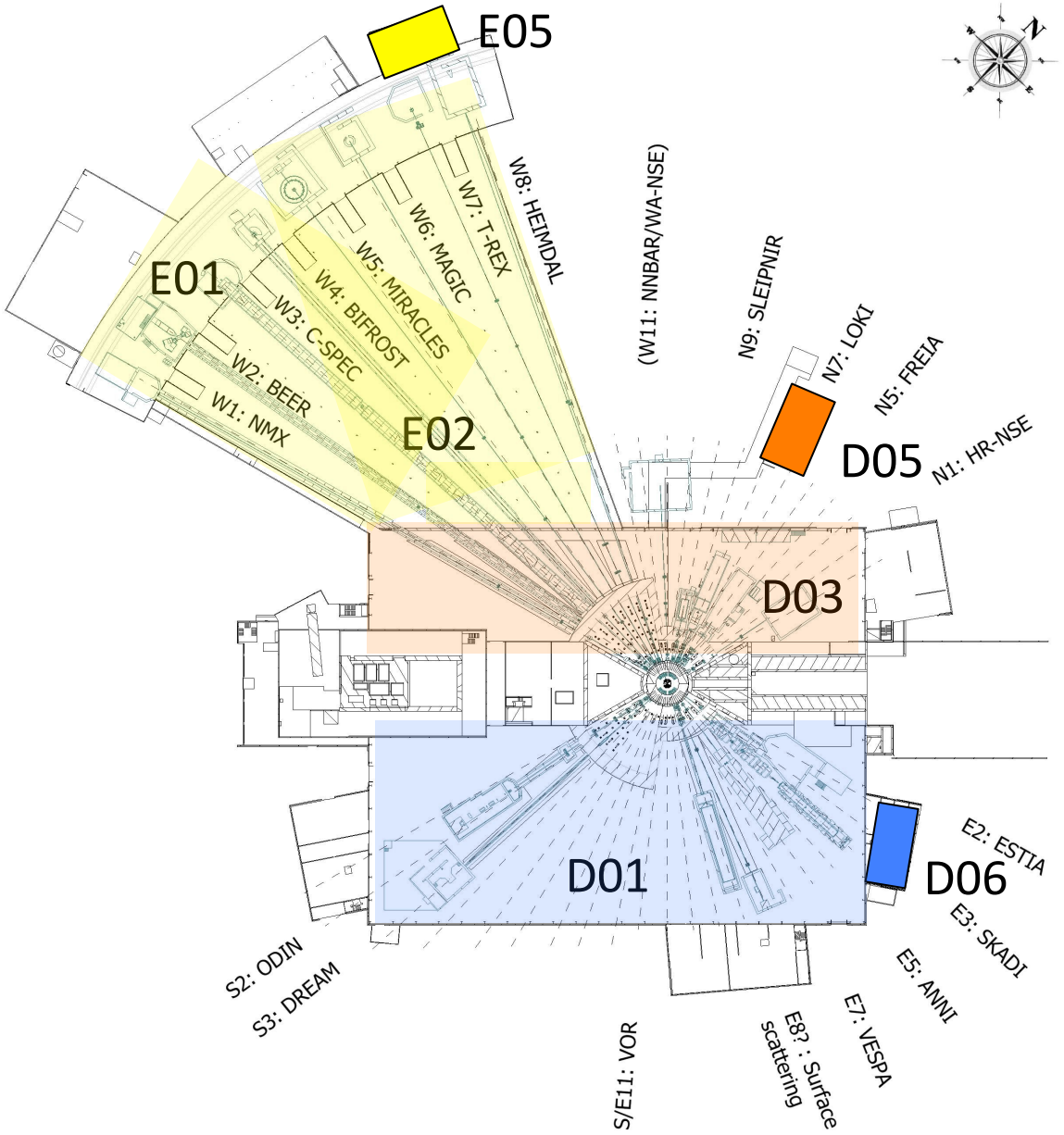


R3 – Minimising of instrument zones



- Bunker area
  - The separation of single instruments equipment in the Bunker zones is impractical
  - Proposal: Separation into four zones (W, N, E, S)

R3 - NSS Power supply zones



- Review isolation and zoning needs inside a (low populated) power distribution zone
  - Parts of W1 to W8 instruments in D03
  - Instruments installations in E02
  - Short instruments
- Follow “natural” zone borders
  - building wall between D03 and E02
  - bunker walls

R4 – Lessons learned at other facilities

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- Isolate Instruments from each other
  - Instruments with good ground connections are “punished” because all noise from other instruments finds it’s way through this instrument.
  - Faults on one instruments will compromise the availability, functionality and performance of the whole instruments suite.
  - Faults with distributed effects are much harder to find
- Shield instruments from HF noise emitted by the grounding mesh
  - ACC decided to implement an additional 2x2m mesh along the accelerator line
  - NSS evaluated the solution being to expensive for the large area of the instrument halls
- Inside a grounding zone sensitive equipment like detector electronics shall have its own “clean earth” return.

Project status

- Basis: Existing Guideline document ESS-0051373/0147271
- Goal: An agreed grounding strategy
  - Grounding Study
    - Do the main requirements and the rationales behind make sense ?
    - Ranking of the requirements
    - What can we do to minimize the costs ?
  - Agreement on project level NSS
- Issue an NSS Grounding Rules Document (“law”)
  - Basis:
    - Existing Guideline document
    - Grounding Study
- Issue NSS Grounding Design Document (“Implementation regulation”)
  - Basis:
    - Existing Guideline document
    - NSS Grounding Rules Document
    - Preliminary Instruments designs
    - Safety regulations
    - Operations plans
- Deadline: next IKON (February 2018)

Design Implementation Document

1. Define Design Implementation topics and put a price tag on it
    1. What is/definition of isolation?
    2. How to isolate water pipes?
    3. How to isolate concrete?
    4. How to isolate two instruments using the same cave wall?
    5. What about electrical safety?
    6. What about marking the zone boundaries?
    7. How to implement the grounding inside a zone?
    8. What should be connected to the hall grounding infrastructure?
    9. ….

    further suggestions and questions to Markus.Larsson@esss.se
2. Identify alternatives and balance them out
3. Issue the Design Implementation Document

Thanks!