FNPB “Common Magnet” Design

Introduction

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10:30	0:20	Workshop Goals	Greene
10:50	1:00	Systematic and Statistical Uncertainties	Bowman
11:50	1:00	Lunch	
12:50	0:20	Requirements for Nab	Pocanic
13:10	0:20	Requirements for abBA	Wilburn
13:30	0:20	Requirements for Panda	TBD
13:50	0:45	Baseline design	Alarcon
14:35	0:25	Simulations and trajectory tracking	Frlez
15:00	0:20	Neutron Depolarization	
15:20		General Discussion	All

1st Round of FNPB Proposals Included Three Neutron Beta Correlation Experiments

1. Nab
   - Use unpolarized Neutrons
   - e-p coincidence
   - Detect electron total energy
   - Detect proton TOF

2. Panda
   - Use polarized Neutrons
   - Detect proton direction

3. abBA
   - Use polarized Neutrons
   - e-p coincidence
   - Detect electron total energy
   - Detect proton TOF
   - Detect electron & proton direction

Each of these experiments requires an expensive magnet.

PRAC Recommendation

Each of the three experiments has configured its own magnet to be put into the cold neutron beam line. While there are differences in the magnetic field profiles required for the three experiments, there is also much in common among them. The price of the three separate magnets certainly could add up to over $3 M and it would require three different setups in the beam line. This does not seem to be the best approach to the PRAC. **We strongly encourage the three efforts to investigate the option of a common magnet which could be tuned to provide the different field profiles needed for the three experiments**. This would certainly be a more complicated, and costly, magnet than any of the individual ones but it could be installed as a beta decay facility on the cold line which would be shared by several different efforts with different detector and polarizer/analyzer systems. **Such a coordinated strategy would make a series of neutron correlation coefficient measurements extremely compelling for the FNPB** and would allow for experiments to be mounted in a staged approach, perhaps starting with the measurements of ‘a’ and ‘b’ which do not require a polarized neutron beam.

Goals for this Workshop

Determine if a common magnet is feasible.

If answer is positive, organize ourselves to:

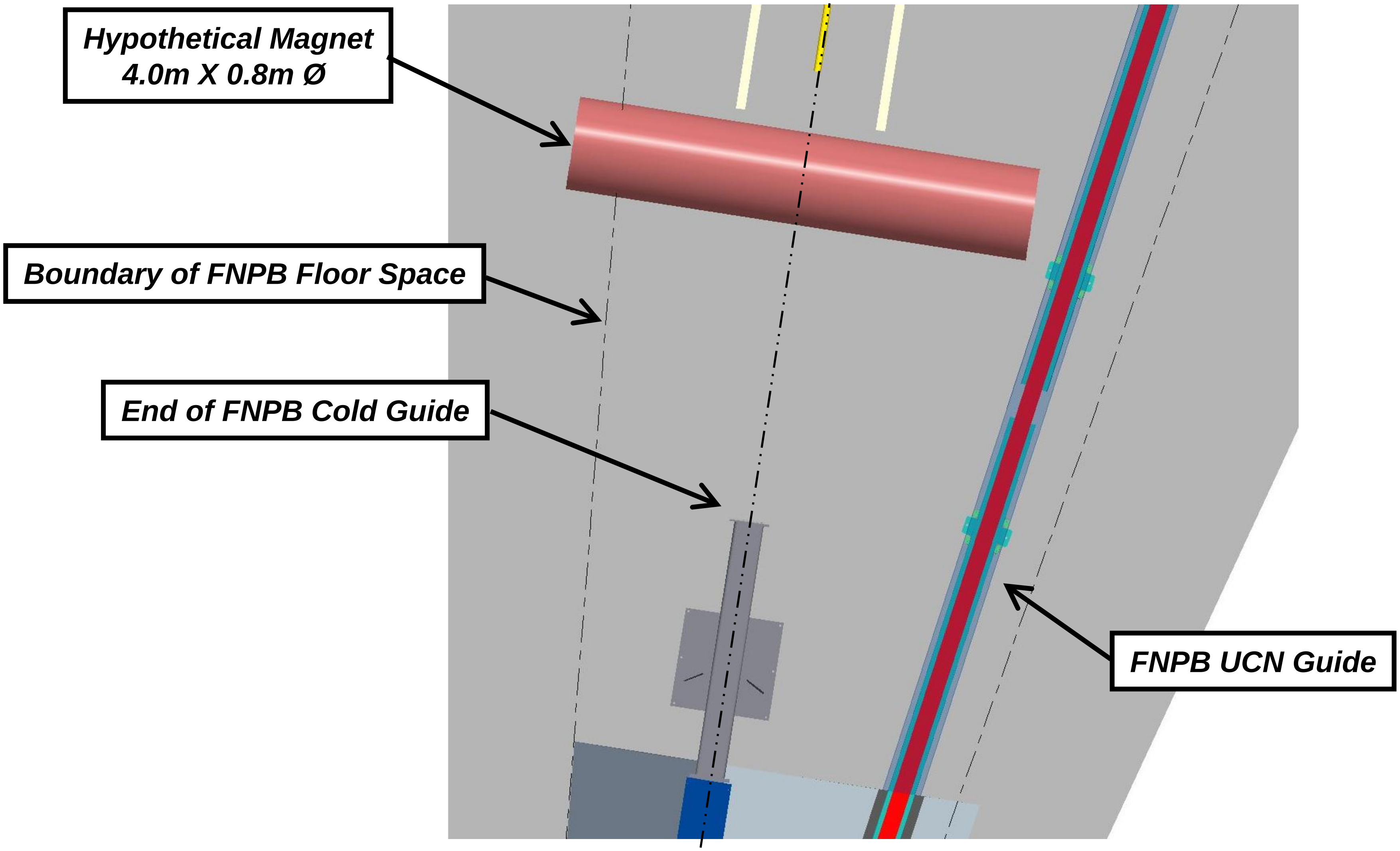
1. ***Develop a design criteria***
2. ***Produce an conceptual design (e.g. location of windings)***
3. ***Develop a plan for funding the magnet & lobby the agencies for support***

Some Specific Questions

1. How many different field configurations are needed?
2. Warm bore or cold bore?
3. How well does the field have to be mapped?
4. How do we map the field?
5. How do we stay within the SNS fringe field requirements?
6. How long does the magnet have to be?

Some Facility Constraints

Putting the Magnet on the SNS Floor – A Problem?



SNS Policy for Fringe Field Production

Generation of magnetic fields by an instrument or experiment can be assumed to be acceptable under normal conditions if either of the following conditions apply for both normal and abnormal (quenching or other failure) operating scenarios:

–The fringe fields produced do not exceed 50 milligauss at or beyond the boundaries of that instrument (defined by beamline bisectors or instrument physical boundaries).

–After careful review the fringe fields produced at any other instrument can be shown to be less than the acceptable threshold at that instrument (acceptable thresholds will depend on specific instruments and specific locations within those instruments, and are defined as field levels that result in a degradation of performance of that instrument).

Kent Crawford, Senior Group Leader, SNS Instrument Systems
Presentation to SNS Experimental Facilities Advisory Committee, 10/04

End of Presentation