

Welcome

Afternoon sessions

- Yuri + Tennessee/US folk connecting
- Mike in grant review

13:00	1 - Welcome and plans <i>Tellus conference room, ship 7, floor 3, ESS</i>	David Milstead	
	9 - NNbar via sterile neutrons - a new type of search <i>Tellus conference room, ship 7, floor 3, ESS</i>	Yuri Kamyshkov et al.	13:15 - 13:45
14:00	23 - Neutron oscillations - overview <i>Tellus conference room, ship 7, floor 3, ESS</i>	Yuri Kamyshkov	13:45 - 14:15
	5 - Rare decays at HIBEAM <i>Tellus conference room, ship 7, floor 3, ESS</i>	David Milstead	14:15 - 14:45
15:00	2 - ESS - status and plans <i>Tellus conference room, ship 7, floor 3, ESS</i>	Valentina Santoro	15:20 - 15:50
16:00	3 - Lower moderator <i>Tellus conference room, ship 7, floor 3, ESS</i>	Luca Zanini	15:50 - 16:20
	12 - Engineering issues for NNBAR <i>Tellus conference room, ship 7, floor 3, ESS</i>	Luca Zanini	16:20 - 16:50
17:00	20 - Differential reflectors <i>Tellus conference room, ship 7, floor 3, ESS</i>	Matthew Frost	16:50 - 17:20

10:00	6 - Lucia procession/celebration		10:00 - 10:30
	7 - Tour of ESS		10:30 - 11:30
11:00			
13:00	16 - Using the annihilation generator	<i>Joshua Barrow</i>	13:00 - 13:30
	<i>Tellus conference room, ship 7, floor 3, ESS</i>		
	19 - Shielding for HIBEAM and NNBAR	<i>Valentina Santoro</i>	13:30 - 14:00
	<i>Tellus conference room, ship 7, floor 3, ESS</i>		
14:00	15 - Backgrounds and how the complete simulation/estimation chain	<i>Bernhard Meirose et al.</i>	14:00 - 14:30
	<i>Tellus conference room, ship 7, floor 3, ESS</i>		
	21 - Test bench in Stockholm	<i>Katherina Dunne</i>	14:30 - 15:00
	<i>Tellus conference room, ship 7, floor 3, ESS</i>		
15:00	17 - Neutron detectors	<i>Lisa Debeer-Schmitt et al.</i>	15:00 - 15:30
	<i>Tellus conference room, ship 7, floor 3, ESS</i>		
	Break		
	14 - Annihilation detector	<i>Anders Oskarsson</i>	15:45 - 16:15
16:00	<i>Tellus conference room, ship 7, floor 3, ESS</i>		
	10 - HIBEAM/NNBAR@ILL	<i>Albert Young</i>	16:15 - 16:45
	<i>Tellus conference room, ship 7, floor 3, ESS</i>		
	13 - HIBEAM funding/plans		16:45 - 17:15
17:00	<i>Tellus conference room, ship 7, floor 3, ESS</i>		

Where are we ?

- Paper – nearly “oven ready”
- Fair estimates of nn' and $nn\bar{n}$ sensitivity for HIBEAM and the challenges for the next steps
- Open questions of shielding, engineering and detector design.

New high-sensitivity searches for neutrons converting to antineutrons and/or sterile neutrons

HIBEAM/NNBAR collaboration: names

¹ Addresses of institutes

the date of receipt and acceptance should be inserted later

Abstract The HIBEAM/NNBAR experiment is a proposed two-stage experiment for the European Spallation Source (ESS) to search for baryon number violation. The experiment would make high-sensitivity searches for baryon number violating processes: $n \rightarrow \bar{n}$ (neutron-antineutron oscillation via mixing), $n \rightarrow [n', \bar{n}'] \rightarrow \bar{n}$ (neutron-antineutron oscillation via regeneration from a sterile neutron state) $n \rightarrow n'$ (neutron disappearance), $n \rightarrow [n', \bar{n}'] \rightarrow n$ (neutron regeneration), corresponding to baryon number violation of one or two units. The experiment addresses topical open questions such as baryogenesis and dark matter, and is sensitive to a scale of new physics substantially in excess of that available at colliders. This is a cross-disciplinary experiment with a clear particle physics goal. The diverse community encompasses physicists from large collider and low energy nuclear physics experiments, together with scientists specialising in neutronics and magnetics. European, US and Asian communities are represented. The experiment would increase the sensitivity to neutron conversion probabilities by three orders of magnitude compared with previous searches. The opportunity to make such a leap in sensitivity in tests of an unexplained yet apparent global symmetry is rare and should not be missed.

Money

- 2019
- Three applications in (KAW – build the detector, environment – design, prototype, project – design)
- Obtained 3MSEK (300000 Euro) project grant
- Depending on how internal money can be used combination of 1-2 PhD students, short term money for interested folk, test set-up.

Papers

- Capability quantified with Geant (priority with personpower) and full MC (downstream and upstream)
- HIBEAM is a kind environment.
- NNBAR may not be.

What can we do ?

- Test set-up at SU
 - Calo (low energy gammas + triggerless read-out, see Katie's talk)
- What type of bg measurements can be done in-situ at a commissioning ESS ?
- Mirror neutrons at Oak Ridge, ILL ?
- NNBAR@ILL (Albert) ?
- Plan for tests of non-bounce idea ?
- Do we have PhD students/postdocs ?
- Can we have a program with physics and R&D stretching over the next decade ?