

critical components has been demonstrated its high performance through the stringent functional tests. Designing the challenging neutron source, various new concepts have been introduced and developed to maximize performances in terms of neutron pulse peak intensity, time integrated intensity and time resolution of pulse peak. For example, adopts of para-state hydrogen moderator, a high cut-off energy de-coupler, etc., would realized the high performance. Along with the neutron source, neutron instrument construction has significantly accelerated. Presently, fabrication and installation of 8 instruments e.g., the super high resolution power diffractometer, the most advanced engineering materials diffractometer, a high intensity chopper spectrometer, are to be available for users by the time of Day-one. This part highlights what J-PARC provides to users with emphasis on innovation in design and engineering of the MW pulse neutron source. Along with, novel design concepts applied in so called the next generation instruments are to be discussed in light of fulfilling the key research areas based on current scientific direction and prospect with neutron.

Keywords: pulse neutron source, J-PARC, novel concept instrument

### MS.81.5

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#### Progress for the european spallation source

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The proposal for the European Spallation Source (ESS) is still awaiting a decision to start construction. Nevertheless, there appears to be renewed interest and consensus in Europe to build a next-generation neutron source. The current understanding is that the ESS project will be based on a 5 MW linear proton beam accelerator and a long-pulse target station, feeding 22 neutron instruments. Several sites in Europe have submitted expressions of interest to host the ESS and are preparing their final bids. Furthermore, the site selection process and discussions on potential partnerships within Europe have started. Key factors for site selection include the potential for scientific environment and proximity to other European large-scale research facilities. We will present the Swedish proposal to construct ESS in Lund in more details.

Keywords: neutron sources, neutron instrumentation, neutron and X-ray scattering

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#### Momentum density of uncompensated electron spins measured by magnetic Compton scattering

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According to quantum mechanics, the momentum density (MD) of electrons can be described by momentum-space wavefunctions which are related to real-space ones through Fourier transformation. Therefore MD directly reflects electron states in matter as well as charge density. For studies of magnetic materials, information on spin states of electrons is important. During the years since 1976 [1], it has been found that magnetic Compton scattering of circularly polarized

X-rays is effective for measuring MD distribution of electron spins in ferro/ferri-magnetic materials, such as metals, alloys and compounds, all of which are composed of 3d-transition and/or 4f-rare-earth elements [2]. Following an introduction to characteristic features of magnetic Compton scattering, recent progress will be briefly reviewed by referring to notable reports. The review will include reconstructed three-dimensional MD distribution of spins from Compton profiles, that is, from twice integrated MD distributions of spins.

[1] N. Sakai and K. Ono, *Phys. Rev. Letters*, 37 (1976) 351.

[2] N. Sakai, Chap. 10, *X-ray Compton scattering*, ed. M. Cooper, P. Mijnarends, N. Shiotani, N. Sakai and A. Bansil, Oxford Science Publications, (2004) 289.

Keywords: Compton scattering, electron spin, magnetic material

### MS.82.2

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#### Inelastic X-ray scattering as a powerful probe of correlation effects in materials

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Electron correlation effects are becoming an increasing focus of attention in understanding the behavior of wide classes of novel materials. This talk discusses some of our recent work related to resonant inelastic x-ray scattering (RIXS) as well as magnetic and non-magnetic Compton scattering studies.[1-7] Specific topics include: (i) Modeling and analysis of RIXS data from electron doped cuprate Nd-Ce-Cu-O, which gives insight into the doping dependence of the Mott gap and its possible collapse with doping. (ii) Magnetic Compton scattering spectra in the double layer manganite La-Sr-Mn-O, which are shown to contain a distinct signature of the d-electrons of  $x^2-y^2$  symmetry, allowing us to adduce significant changes in the occupancy of these orbitals as a function of temperature in the manganite. (iii) Analysis of high resolution Compton scattering spectra from La-Sr-Cu-O to delineate evolution of Fermiology and correlation effects as the system goes from the insulating to the metallic state with doping. Work supported in part by the U. S. Department of Energy.

[1] R. S. Markiewicz and A. Bansil, *Phys. Rev. Letters* 96, 107005 (2006).

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Keywords: magnetic X-ray scattering, inelastic X-ray scattering, *ab-initio* calculations