Session 23aE

Cryogen-Free Superconducting Magnets **23aE1**

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Various kinds of cryogen-free superconducting magnets such as a wide bore 8 T, a split pair 5 T, and a high magnetic field 15 T magnet have been constructed successfully at Tohoku University. A cryogen-free 23 T hybrid magnet composed of a cryo-cooled outer superconducting magnet and a water-cooled inner resistive magnet is now being constructed. Further, new projects of a cryogen-free 30 T hybrid magnet and a cryogen-free 20 T superconducting magnet have just started.

Heat Capacity Cell for Angular Measurements in High Magnetic Fields **23aE2**

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We present our design and initial results for miniature rotatable heat capacity cells (7.5 mm - 11 mm diameter) suitable for use in magnetic fields up to 45 tesla. Our most recent design for a top-loading dilution refrigerator allows full rotation of the cell at sample temperatures from below 50 to over 4000 mK. The magnetic field dependence of the thermometry has been characterized for fields up to 18 tesla (and is currently being extended to higher field), allowing programmatic temperature control of the cell over the full field and temperature range to better than 0.1%. This characterization over all fields and temperatures has been reduced to a minimum number of fitting constants.[1]

[1] Fortune, Gossett, Peabody, Lehe, Uji and Aoki; Rev. Sci. Inst., 71, 3825, 2000

23aE3 The Science Capability Of The Low Temperature Microgravity Physics Facility

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The Low Temperature Microgravity Physics Facility (LTMPF) is a multiple user and multiple-flight NASA facility that will provide a low temperature environment for about 4.5 months on board the International Space Station (ISS). The Jet Propulsion Laboratory is developing the Facility for its initial flight in late 2005. The LTMPF will be attached to the Japanese Experiment Module (KIBO) Exposed Facility of the ISS. The LTMPF will provide a reusable platform to enable state of the art experiments requiring both low temperatures and microgravity conditions. During each mission, two distinct primary experiments will be accommodated, as well as secondary experiments that can utilize the as built hardware. The scientific capabilities of the Facility will be presented, along with a description of the six science investigations selected to fly on the first two missions.

23aE4 Present status of the Cryogenic Dark Matter Search (CDMS II) Experiment

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The CDMS experiment utilizes Ge and Si detectors operating at 20 mK to search for the Dark Matter of the Universe hypothesized to exist in the form of WIMPs (Weakly Interacting Massive Particles). The discrimination ability of our detectors is based upon measuring the ratio of ionization to phonon energy generated. In early 2000 CDMS set the most competitive exclusion limit for scalar-interaction WIMPs and is presently embarking on a new search (CDMS II) with several improvements: a deep-site facility in the Soudan mine, Minnesota, is presently being commissioned; and the detector technology has been further improved to aid in the rejection of surface-electron (β) events. A new generation of detectors sensitive to the initial athermal phonon flux from a particle event have been in operation for the past year at Stanford's shallow site and are expected to set a new WIMP exclusion limit.

23aE5 EDELWEISS Dark Matter search using ionization-heat germanium bolometers at the Frejus Underground Laboratory

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Most of the recent observations lead to the conclusion that the density of the Universe is within 5 percent of the critical density. The matter content appears to represent mostly approximately one third of this critical density, and must be composed of non baryonic Dark Matter. The leading candidates are the supersymmetric Weakly Interacting Particles (WIMPs), and most notably, the neutralino, a stable supersymmetric particle created shorly after the Big Bang. Direct search of these relic particles with low temperature Germanium bolometers detecting both the heat and ionisation of the recoil event produced by theses particles is presented. The present results of the experiment will be presented, together with directions for future developments.