

The First Phase of the XMASS Experiment

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Dark Matter is one of the big mysteries of our universe. Tallying up gravitational forces we find that Dark Matter makes up roughly a quarter of *ALL* there is in the universe. Normal matter - like stars, galaxies, and us - only accounts for less than 1/20-th of all there is. So Dark Matter is a code word for a pretty big gap in our knowledge. And “Hey, it’s got to be WIMPS” is the cheerful answer to this challenge by some of our best theorists. But WIMPS are not the only “theoretically” motivated candidate for Dark Matter particles, and experiment will have to be the arbiter.

Underground here in Japan at Kamioka an exciting experiment is being commissioned for this purpose. In its current incarnation its name XMASS stands for “Xe detector for weakly interacting MASSive particles.” In modern physics jargon the latter abbreviates to “Xe detector for WIMPS.” 800kg of xenon are liquefied at -100°C and kept at its center. The innermost 100kg are used as a target for WIMPS to scatter on. Lowering background from radioactivity is paramount to its success and was the major concern during its construction. And the



The heart of the XMASS detector after its assembly in February of 2010.

beauty of its design is ready scalability.

If successful a new detector with 10 tons of liquid Xe in its target (24 tons total) may be built to open up new physics reaches. Then its name XMASS will take on new meanings: “Xe neutrino MASS detector” as it searches for neutrino-less double beta decay in ^{136}Xe , and “Xe MASSIVE neutrino detector” as it records low energy neutrinos from the sun. The key to these new experiments is the proof of its experimental concept in its current smaller incarnation as Dark Matter experiment.