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Towards reliable detection of Low Mass WIMPs ($M_{WIMP} < 10$ GeV/c^2).

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Weakly Interacting Massive Particles (WIMPs) may constitute most of the matter in the Universe. There are now intriguing results from DAMA/LIBRA, CoGent and CRESST-II, and recently CDMS-Si suggest that there is something at about 10 GeV/c^2 mass. The same data suggest that M_{WIMP}>5 Gev/c^2. CDMS-Ge and 1.Xenon detectors suggest that there is no DM candidates with M> 15 GeV/c^2.

The analysis of these events from cryogenic bolometers, suggests that they may be particles with relatively high velocity, say V = 400-500 km/sec, *i.e.* depends on particles with velocity close to or even beyond the "escape velocity". For these low mass particles, measured in high mass target nuclei detectors, the current method for background rejection becomes very difficult, some would say disputable. Furthermore, the ability to use detectors based on low A targets, will considerably facilitate detection of WIMPs by means of "annual modulation effect" (AME) and by means of "diurnal modulation effect" (DME). This Talk proposed a new classes of such direct WIMPs detection methods, with focus on low mass WIMPS. These new methods are enabled by use of nano-technology and molecular biology methods.

There are new hopes for detection of direction-specific annual modulation effect (DS-AME). Directional sensitivity requires either extremely large gas Time Projection Chamber (TPC) detectors or detectors with a few nanometer spatial resolution. We recently proposed a novel type of DS-AME compatible detectors made of DNA which provide nanometer resolution for tracking, energy threshold of 0.5 keV, and can operate at room temperature. Here the recoiling nuclei from WIMP scatter on Be foils traverse thousands of DNA strands (each with known base sequence) and break-those DNA strands they encounter. The cut-offDNAs are collected, amplified and sequenced using techniques well known to biologists. We comment on current status of this type of detectors.

Traditionally, the mass of WIMPs were assumed to be 30 GeV/c^2 < M_{WIMP}< 300 GeV/c^2. Combination of current experimental results and "aftershocks" of recent LHC results lead to increased interest in WIMPs with smaller mass 0.5 GeV/c^2 < M_{WIMP}< 10 GeV/c^2. These particles cannot be reliably detected with current generation of detectors. There are sever challenges concerning the expected count rate (detectors must be large) and especially, concerning the rejection of backgrounds. Detection of DS-AME is especially important in the case of low mass WIMPs.

However, the DNA-based detectors are only an example of a new generation of detectors in which the effects of recoiling nuclei are measured at nano-scale. Thus, we review all of the recently proposed DS-AME compatible detectors.