The Exa Volt Antenna

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The Exa Volt Antenna is an ultra-high energy (UHE) particle observatory under development for NASA's suborbital super-pressure balloon program in Antarctica. Radio impulses are emitted via the Askaryan effect when UHE neutrinos interact in the ice, and from geomagnetic emission from UHE cosmic ray interactions in the atmosphere above Antarctica. The design utilized part of the balloons surfaces as a reflector which collimates the incoming radiation to a feed-array mounted on a surface inside the balloon. In this way, an ultra-large radio antenna system with a synoptic view on the Antarctic ice sheet below is created. The instantaneous aperture is estimated to be several hundred m^2 within the frequency rang between 150-600 MHz.

For standard models of cosmogenic UHE neutrino productions, EVA's sensitivity should result in the order of 30 events per flight. This is a 1-2 orders improvement over ANITA's integrated totals, which is the current state-of-the-art UHE particle observatory for cosmogenic neutrinos. The estimated total amount of UHE cosmic rays is in the order of 15,000, of which we expect several hundred above 10 EeV, and of order 60 above the GZK cutoff energy.

Using a the surface of a suborbital supper-pressure balloon as a toroidal reflector is a novel technique of which thorough validation with scale models and simulations is ongoing.

The focus of this talk will be the scientific motivation for the mission and recent results from ongoing design studies.