New Flux Limits in the Low Relativistic Regime for Magnetic Monopoles at IceCube

ABOUT

- Search for magnetic monopoles

- In low relativistic regime ($0.1\,c$ to $0.55\,c$)

- Only light production by luminescence

RELEVANCE

- Any search for magnetic monopoles

- Rest mass independent

- Assumes down going monopoles, consequently virtually no Earth shielding

- Simulation assumes Dirac charge but analysis designed to be light yield independent

WHAT WAS DONE

- Implement and validate luminescence in IceCube simulation framework

- Simulate magnetic Monopoles passing through IceCube

- Separate signal from background simulation (air showers and neutrinos)

- Straight cuts on different variables

- Background simulation statistically limited for last selection step

- Boostrap based machine learning approach for last selection step

- Apply analysis to about 7 years of IceCube data

RESULT

- Two candidate events remained, within background estimate

- Derived a flux limit for magnetic monopoles in the low relativistic regime

- Flux limit two orders of magnitude better than previous flux limits in the low relativistic regime