

# Status of SCEP experiment

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(SCEP Collaboration)

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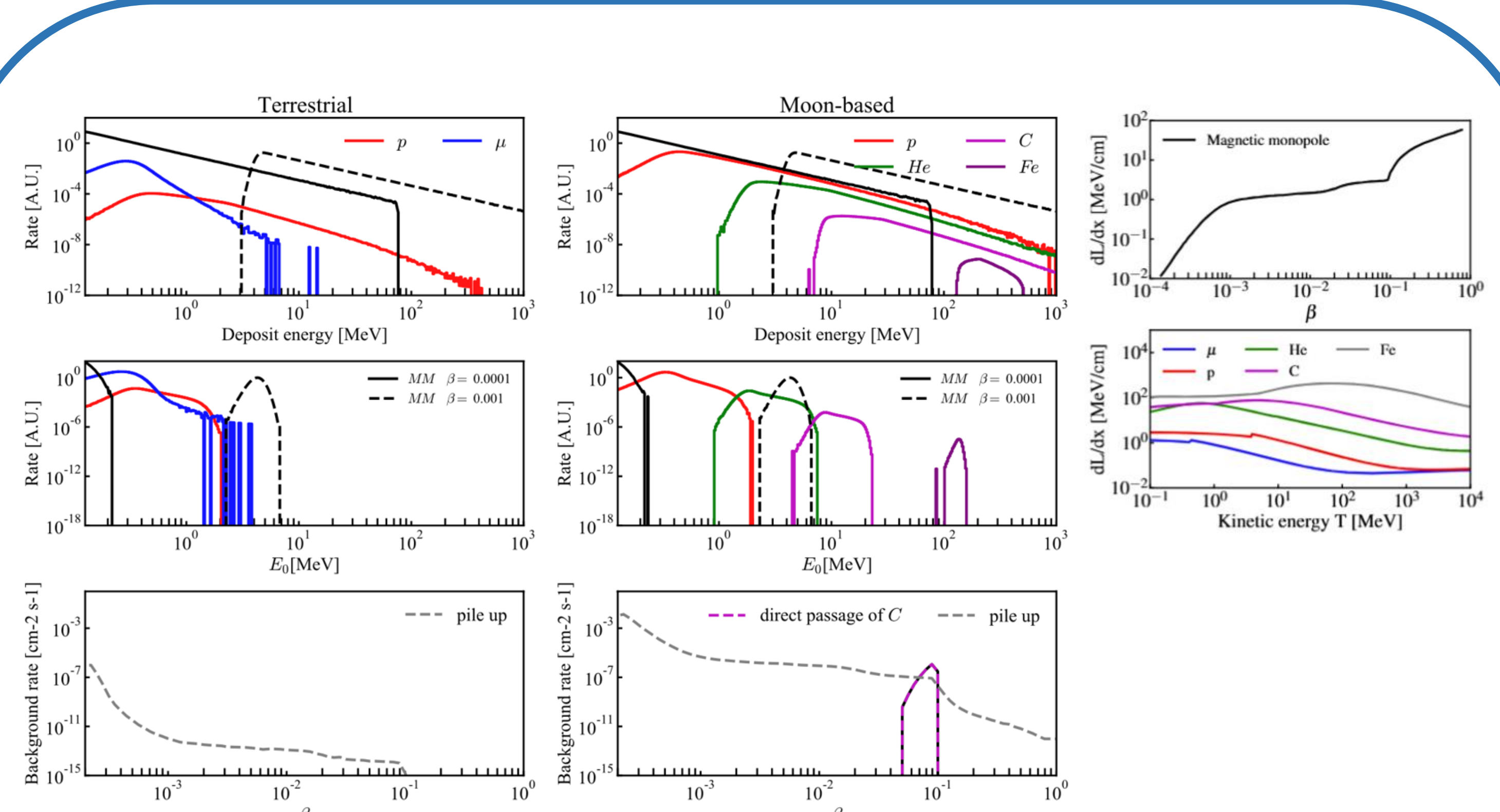
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## Theory of Magnetic Monopole

Dirac Quantization condition (1931), Yang, Chen Ning Wu-Yang monopole (1968), Schwinger Dinucleus (1969), 't Hooft GUT monopole (1974).

- Induce new symmetry of Maxwell equation
- Explain the quantization of electron charge
- Predicted by GUT and string theory
- Evidence for inflation theory

## Plastic Scintillator Background Estimation



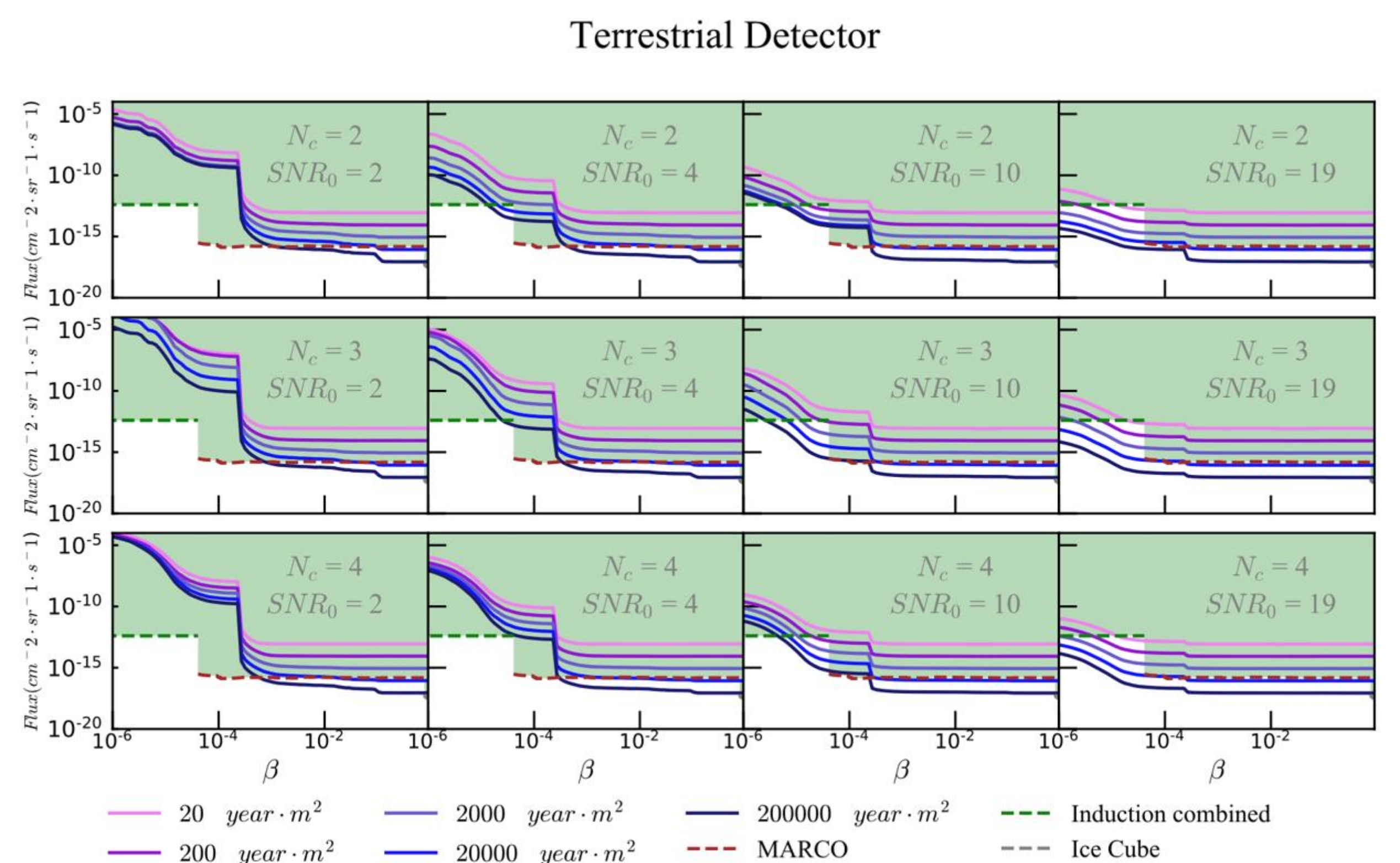
- The main background is the pile up of the top and bottom scintillation signal.
- Low speed MM deposit less energy in plastic scintillators which is similar to heavy ions causing high background rate in this speed region
- Angular correction is needed because of the long track of background particle in PS
- Moon-based detector suffers higher background rate than a terrestrial one in 3 order of magnitudes

## Combination of Induction & Scintillation Signal for MM Search

磁单极子穿过线圈产生感应电流，通过亥姆霍兹线圈转化为微磁场被磁力计探测；

- Combination of the plastic scintillator and specialized induction coils coupling to high sensitive atomic magnetometer or amplifiers.
- 1. Cost-effectiveness
- 2. Scalability under moderate conditions
- 3. Low background rate

## Projected Sensitivity



- It is estimated that such detector can reach current flux limit set by previous induction (particle) detection with a signal-to-noise ratio of the induction signal larger than 4.2 and coil layer larger than 3, assuming an effective exposure being 20000 year·m<sup>2</sup>

## Detector Simulation and Validation

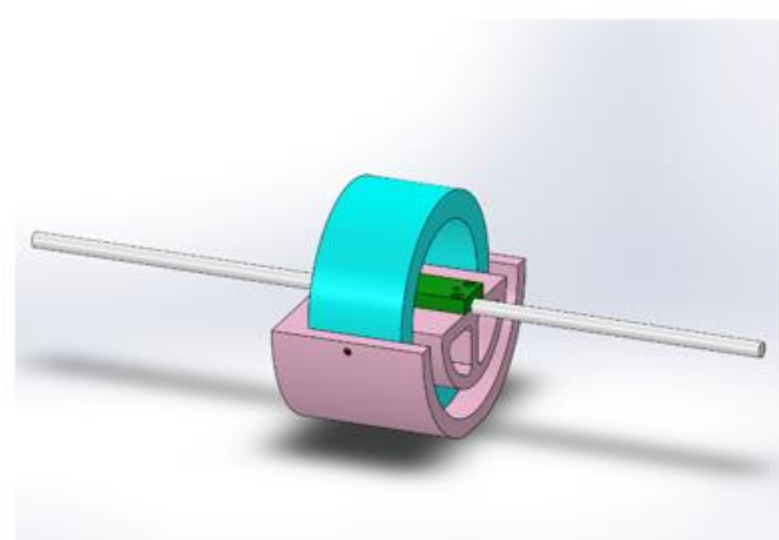
ADC readout mode and Magnetometer readout mode plots showing readout [V] vs time [ms].

## Summary and Prospects

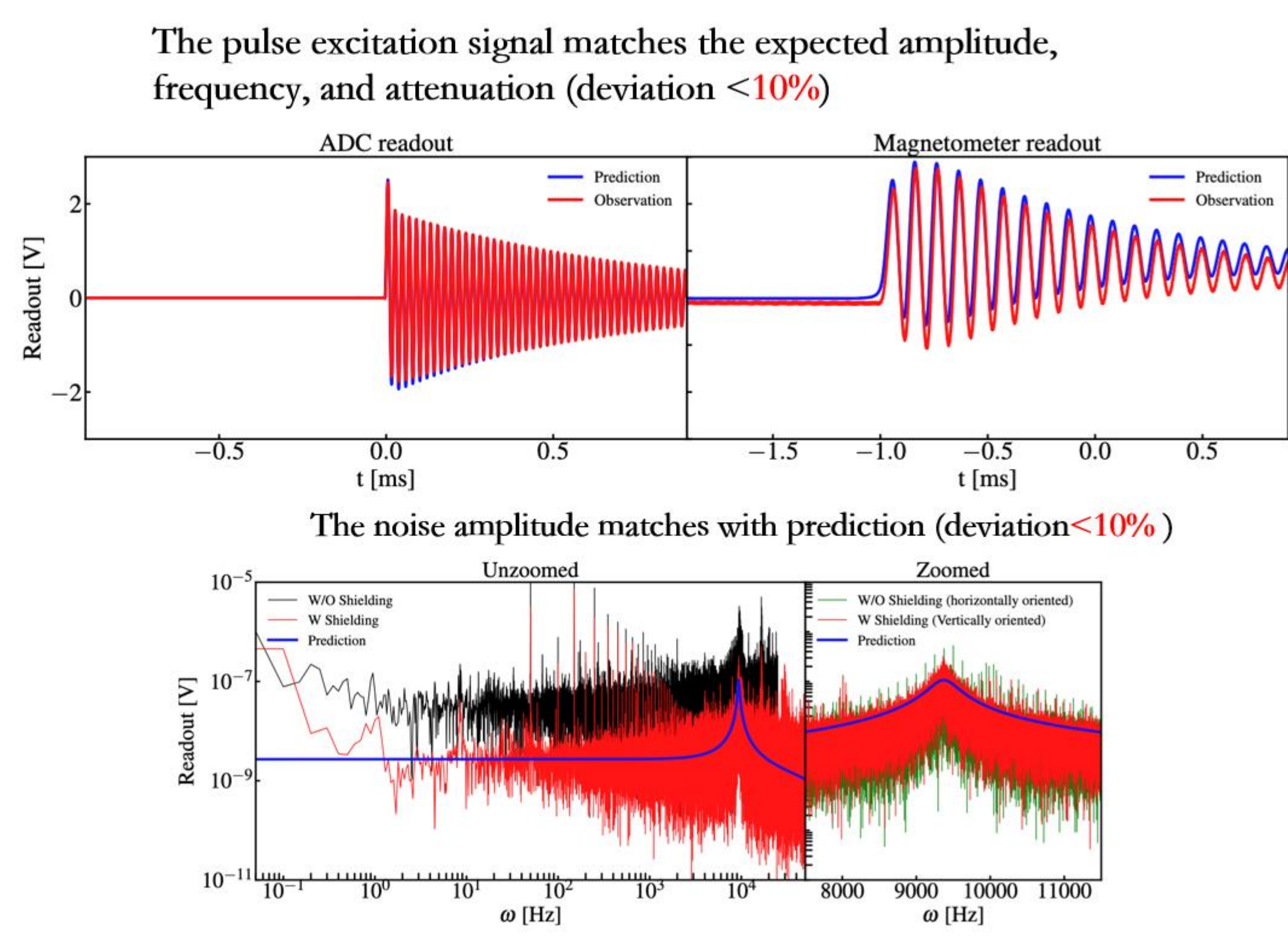
- The SCEP experiment aims to detect the induction signal and scintillation signal simultaneously when a MM passes through coils and deposits energy inside plastic scintillators.
- The simulation framework of such detector have been developed and validated.
- Such technique is potentially to reach the current flux limit for MM speed  $>10^{-6}c$  set by previous experiments.
- Further study will focus on the following aspects to increase the sensitivity.
- Induction coil optimization.
- Coil array arrangement design.
- Triggering algorithm development.

- Iron-core coils?
- Coil optimization, alternating current resistance modeling
- Amplifier circuit optimization
- Machine learning method for pattern discrimination

### Validation of signal



### Validation of noise



## CONTACTS

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