**Motivation**

**Electron Electric Dipole Moment (eEDM)**
- Constrains physics beyond Standard Model
- Nonzero eEDM implies CP violation

**Energy Levels of HfF**
- The $^3\Delta_1$ is metastable science state
- Perform electron spin resonance on upper and lower $\Omega$ doublet levels
- The eEDM is the difference in resonance frequency of upper and lower states

**Spectroscopy of HfF**
- 2D frequency dispersed lock in detection
- 1300 parallel channels
- Sensitive to ions, no neutral background
- Tested with $\Lambda^3\Pi_u - X^2\Sigma_g (4,2)$ $N_2^+$ band

**Ion Creation and State Preparation**
- ~4000 ions created on resonance every shot
- Two color ionization uses intermediate state to be isotope selective

**State Detection of Decay Products using LIF**
- Ion autoionization spectra via different intermediate $J$ levels
- Observed parity propensity rule for autoionization

**Sensitivity Estimate**
- To reach current limit of $1.6 \times 10^{-27}$ e-cm$^2$/T

**Summary**
- Two color auto-ionization used to create ~3000 ions of $^{180}$HfF in a given rovibronic state, e.g., $^2\Sigma_g^+, J^\pi = 1, v=0$
- LIF used to probe decay products of auto-ionization
- Massively parallel survey spectroscopy

**References**

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