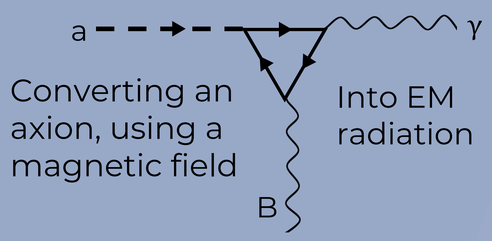
TOWARDS A CRYOGENIC CALIBRATION OF A DIELECTRIC HALOSCOPE

Motivation

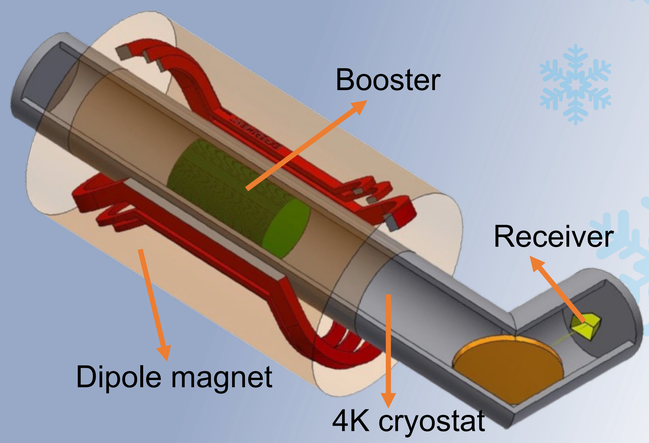
Detecting the **QCD axion** could **solve** both the **strong CP** and the **dark matter problem**.

Detection mechanism:



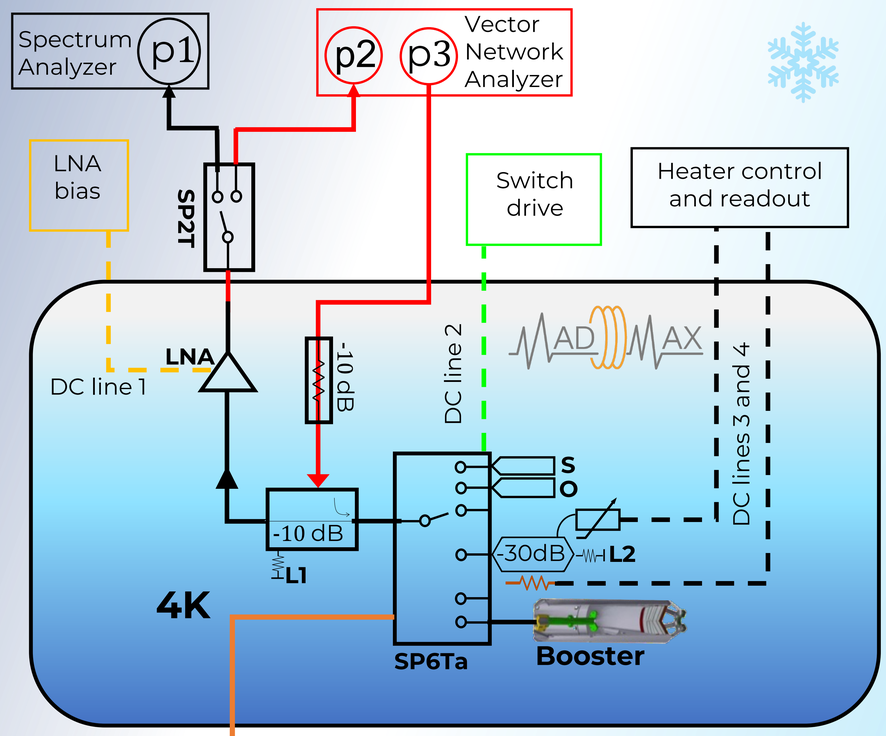
But! the **signal** would be extremely **weak.**

Possible **solution:** Constructive interference and resonant emission using a **dielectric haloscope in cryogenic temperatures**



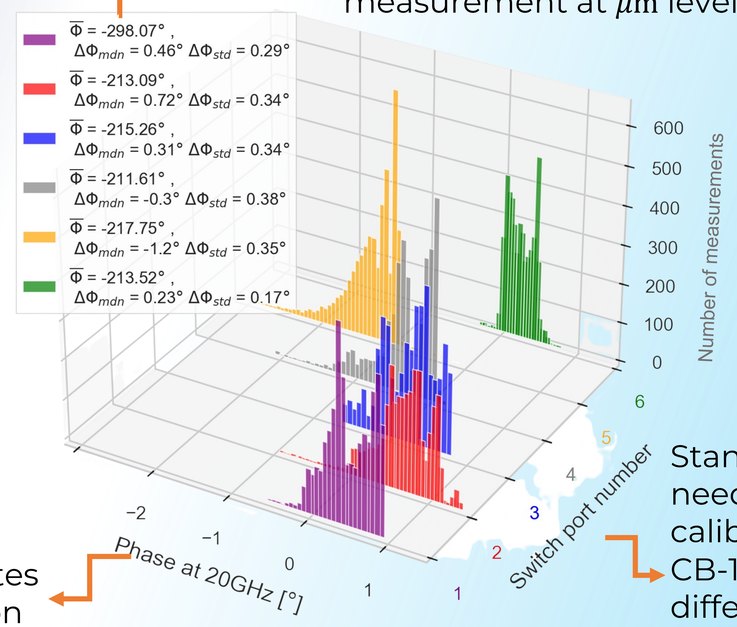
Single cycle calibration setup

Semi-automatic single-cycle in-situ calibration and operation setup maximizes stability and reproducibility



RF switch: A critical component

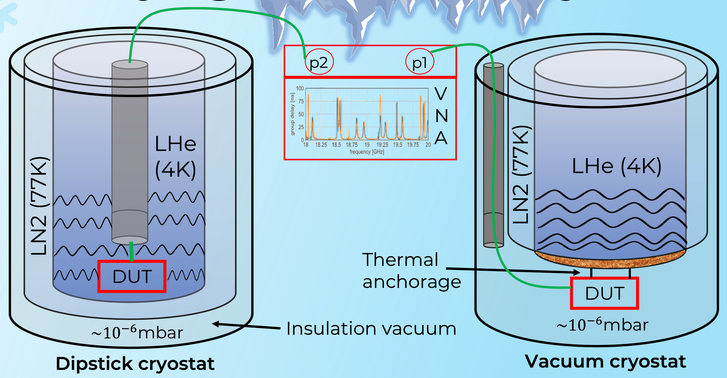
Internal length precision measurement at μm level

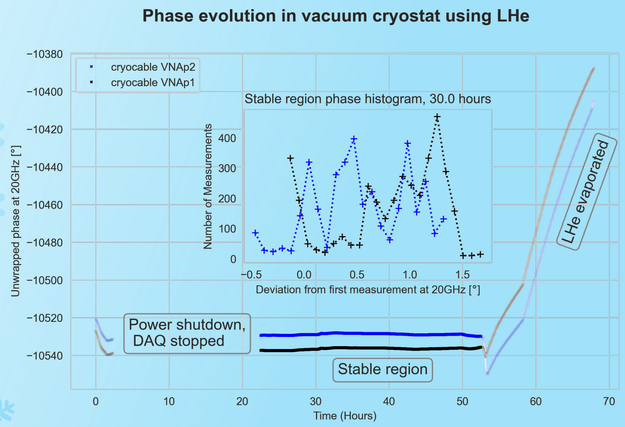


Higher frequency accumulates more phase → more precision

Standards needed for 1-port calibration and CB-100 on the different ports

Cryogenic stability





Vacuum cryostat provides the stability needed for MADMAX, Unlike the dipstick cryostat

Conclusions

Single cycle calibration and operation setup for the MADMAX prototype is in principle possible.

Investigations ongoing on stability of the setup and reproducibility of the measurements

Goal: 1 order of magnitude increase in sensitivity for axion search at CERN in 2024

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