

PBC REPORT

Executive Summary [assignments later]

Motivation and context: EDM searches as an investigation of CP-violation

Goal: Competitive storage ring search at CERN for the proton
summary of the yellow report

Roadmap to the goal: (features, what can be learned)

phase I: -- 30 MeV all electric ring

phase II: -- 45 MeV, $E \times B$, first frozen spin EDM search

Main Report [Editorial Committee: Hans Ströher, Mike Lamont, Yannis Semertzidis]

Introduction: [...] Essentially an abstract, capture present status and future goals...

Physics case: [Wirzba, Nikolaev] Need for new CP-violation, charged particle EDMs

Organization: [...] JEDI organizational history, personnel, experience, capabilities

Method: [Stephenson, Talman] Features, E and $E \times B$ options, major systematics
[same] EDM experimental requirements
[same] Reasons to begin with the proton, resulting features

Main ring: [Task Force*] Ring lattice description and parameter list (see appendix)

Components: [Stephenson, Gebel] Polarized source, injection, pre-cooling
[Stephenson, Keshelashvili] Polarimeter, target, DAQ
[Grigoryev] Electric field plates, quadrupoles, other optical elements
[Stassen] RF cavities, RF solenoid
[Kemerzhiev] Instrumentation, beam monitoring, SQUIDs, beam control
[...] Vacuum and cryogenics
[...] Magnetic shielding

Systematics: [Semertzidis, Carli] Discussions of effects and their mitigation

Operation: [Stephenson] Data taking cycle, polarimetry
[same] Data analysis strategies, calibrations, verification of results

Upgrades: [...] Convert to $E \times B$ ring, measure deuteron (new systematics, tensor polarization)

Roadmap: [Task Force] (I) Build 30-MeV all electric ring, conduct feasibility tests, establish operation

[same] (II) Convert to $E \times B$ ring, continue feasibility tests, do frozen spin search

New physics: [Wirzba, Stephenson, Park] Possible axion search, techniques and sensitivity

Management: [...] Siting at CERN, use of available equipment and infrastructure, personnel

Collaboration needs

Other institutional support

[Carli, Martin] Cost estimate

Appendices

1. Results and achievements, work in progress: [Pretz, Stephenson, etc.]

Storage ring polarimeter with systematic error recovery

Long horizontal polarization lifetime

High precision spin tune measurements

Invariant spin axis measurements

Feedback and control of polarization

Precursor experiment

Spin tracking calculations

Electric field testing

Orbit monitoring and control

...

2. Prototype rings: Phases I and II [Task Force] (There is additional material here.)

Design that captures features of main ring, lattice parameters

Experimental program

Upgrade with $E \times B$

First search with frozen spin conditions

Note: Items showing “[...]” are unassigned at this time.

* Task Force: Martin, Talman, Lehrach