Search for Magnetic Monopoles at RHIC and LHC

Praveen Chaudhari *, Peter Cameron, Vasily Dzhordzhadze, Nicholas D'Imperio, Veljko Radeka, Margareta Rehak, Pavel Rehak, Sergio Rescia, Yannis Semertzidis, John Sondericker, and Peter Thieberger

BNL
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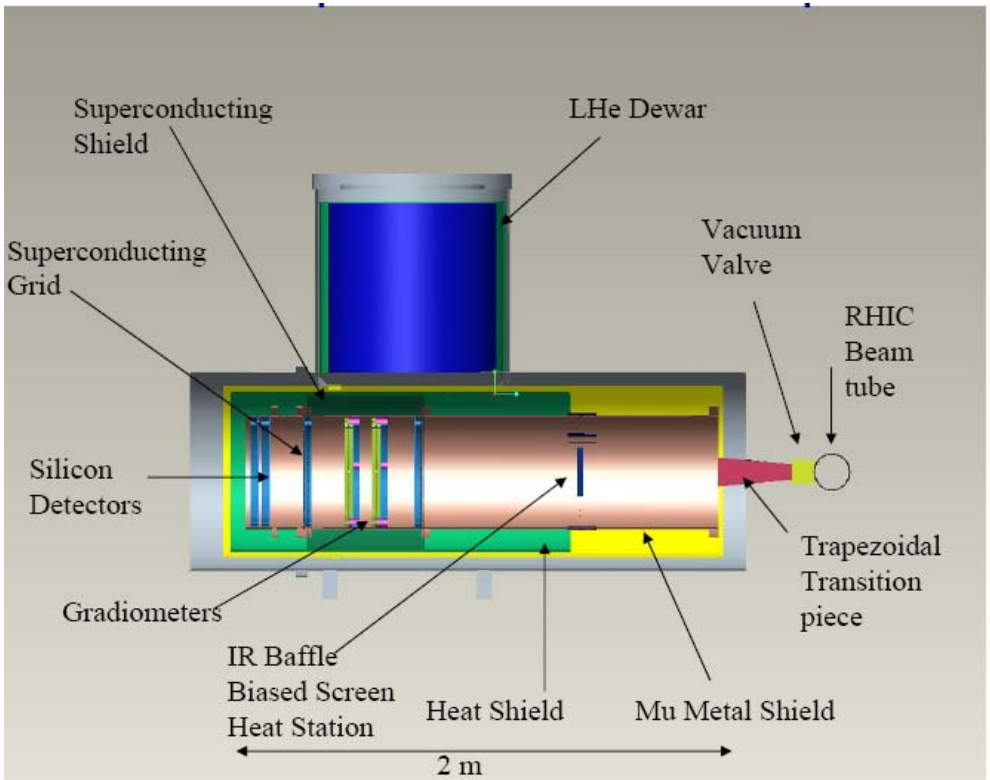
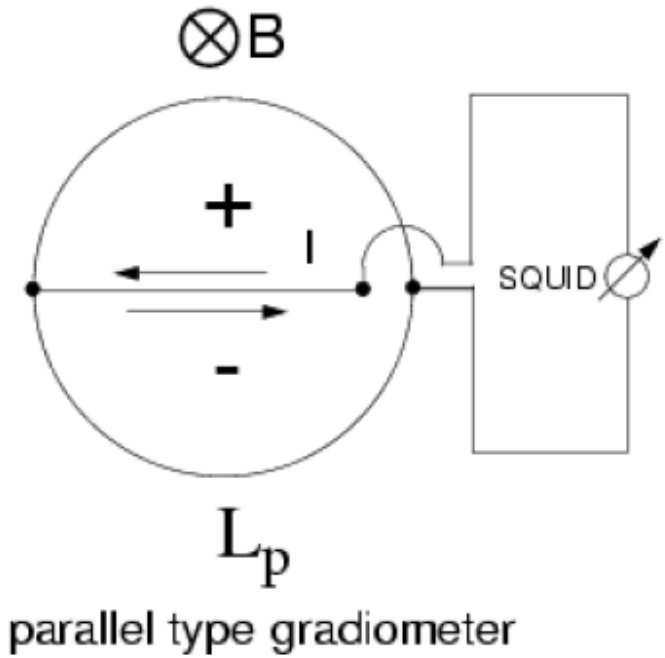
* Spokesperson

- Motivation: “The observation of a monopole would be a profound discovery in physics” - PAC (BNL)
- Goal: Build an “assumption free” detector to operate at RHIC and LHC
- Proposal to PAC: Demonstrate feasibility of such a detector
- Challenge: Harsh accelerator environment

Monopole Detector



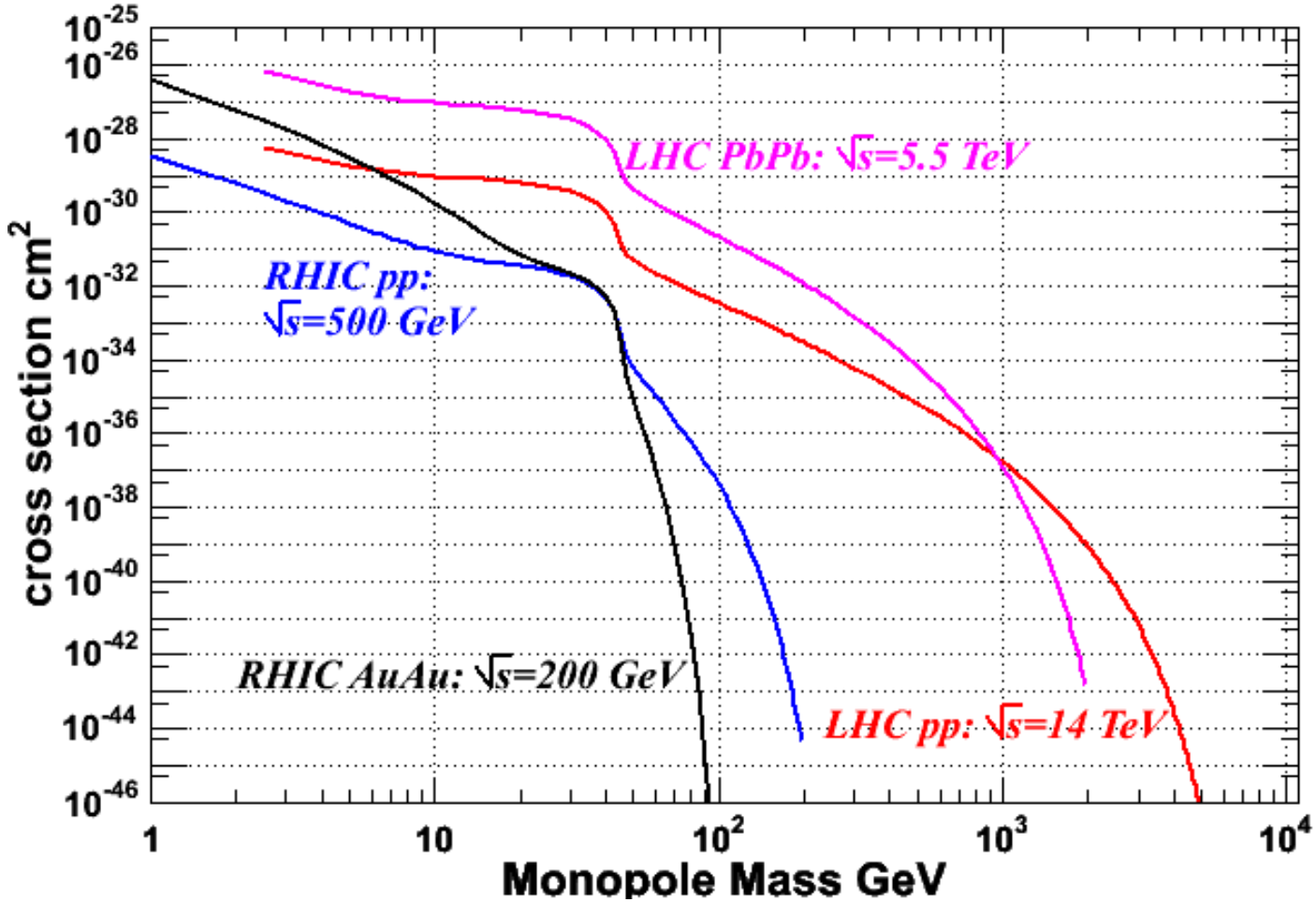


Motivation and Experimental Sensitivity

- Monopole production cross sections as a function of monopole mass by the Drell-Yan mechanism.
- Theoretical estimates of monopole masses.
- The cross section and mass limits achievable at RHIC and LHC.
- Comparison of these cross sections with existing experimental data.
- Discussions of three FNAL and one IHEP papers.

Experiment Update

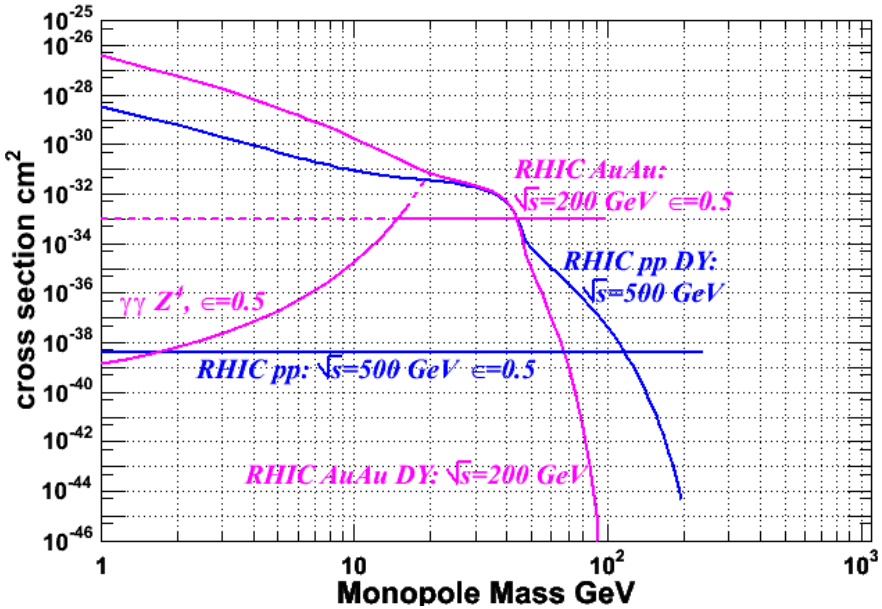
Drell-Yan Predictions at RHIC and LHC

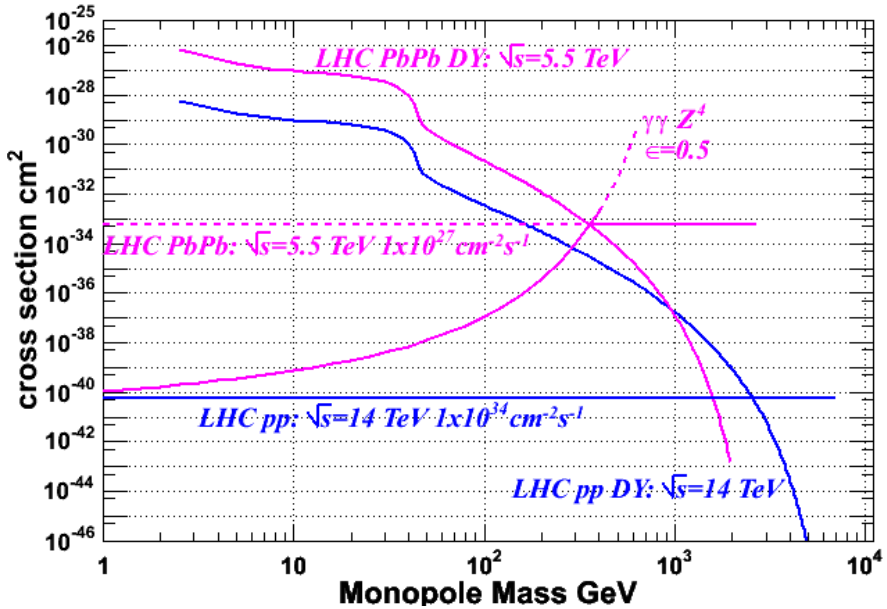


Proposed Mass or Mass Limits

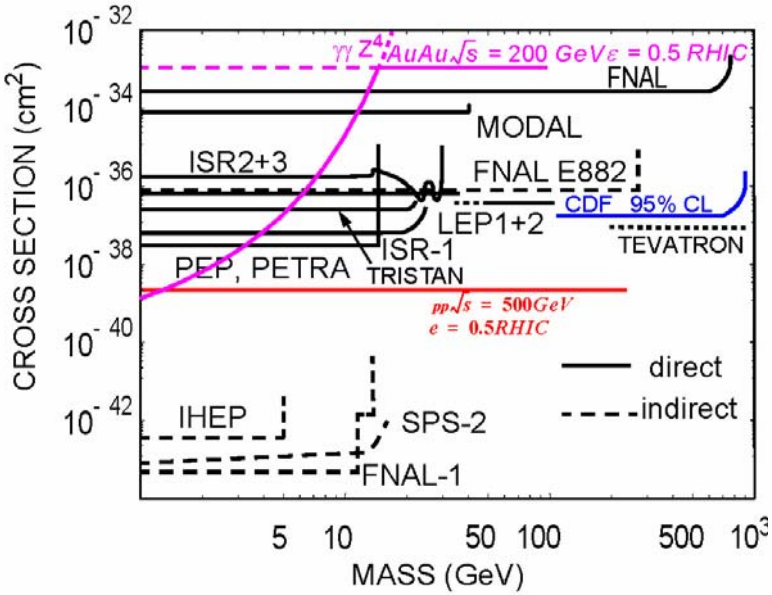
Electron radius	= 2.4 GeV
GUT	~ 10^{16} – 10^{17} GeV
Electroweak	~ 50 GeV – 10^{4} GeV
Super String	~ 10^{3} – 10^{5} GeV
g-2 of muons	> 240 GeV
Z->$\gamma\gamma\gamma$	> 400 GeV
High P_t γ's	> 610 GeV s=0
High P_t γ's	> 870 GeV s=1/2
High P_t γ's	> 1570 GeV s=1

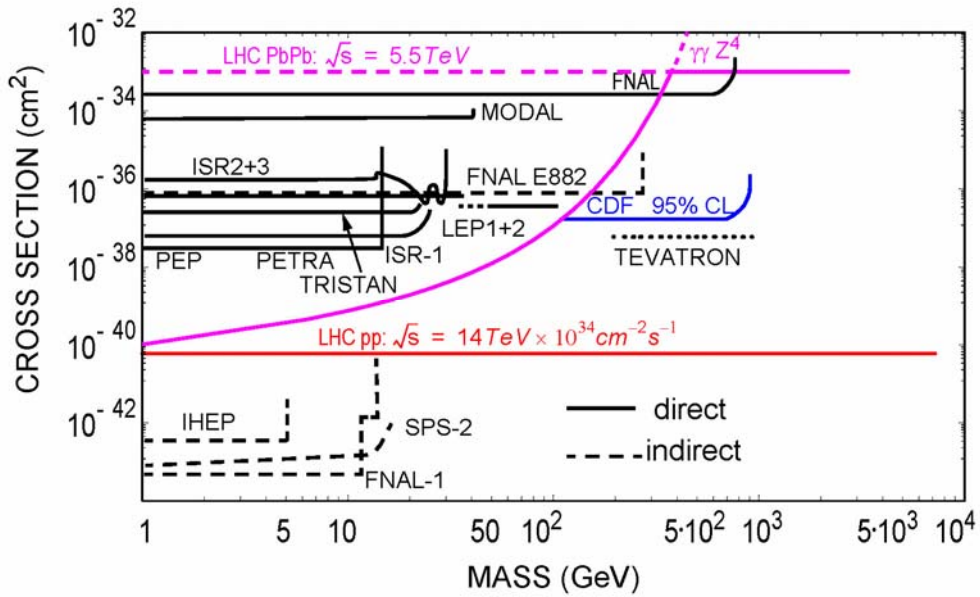
Expected Cross sections at RHIC and LHC





Published MM Experimental data



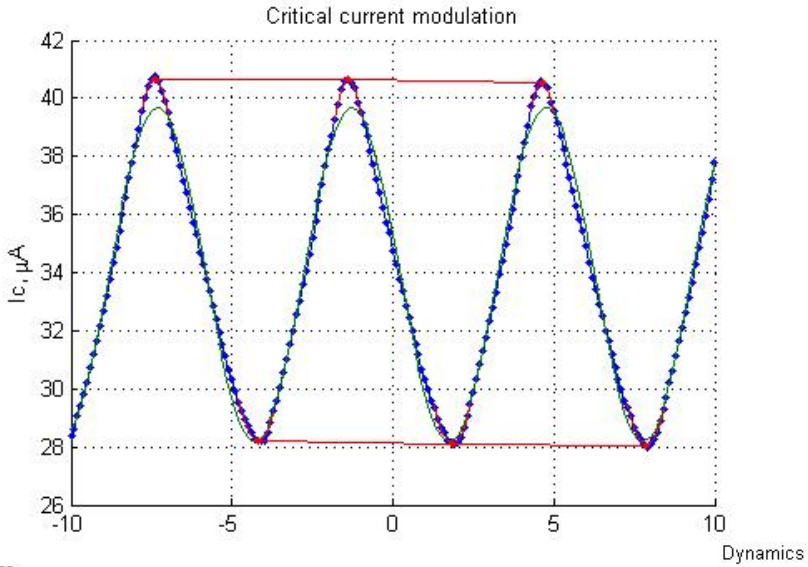


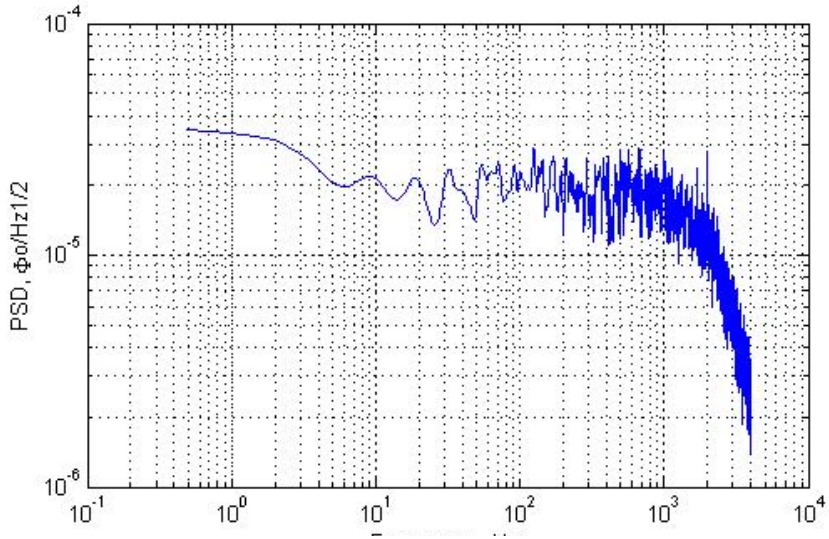
Experimental situation

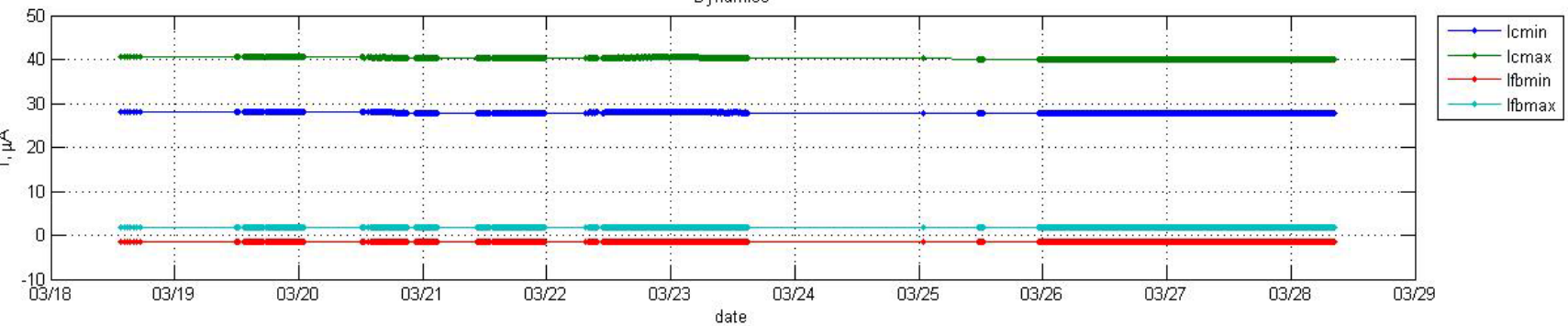
- Two Dewars: SBU and BNL
- SBU: Storage Dewar with superconducting magnetometer and SQUID
- BNL: Dewar with two 3rd order gradiometers, two magnetometers and 4 SQUIDs

BNL and SBU Dewars at the BRAHMS Intersection Area

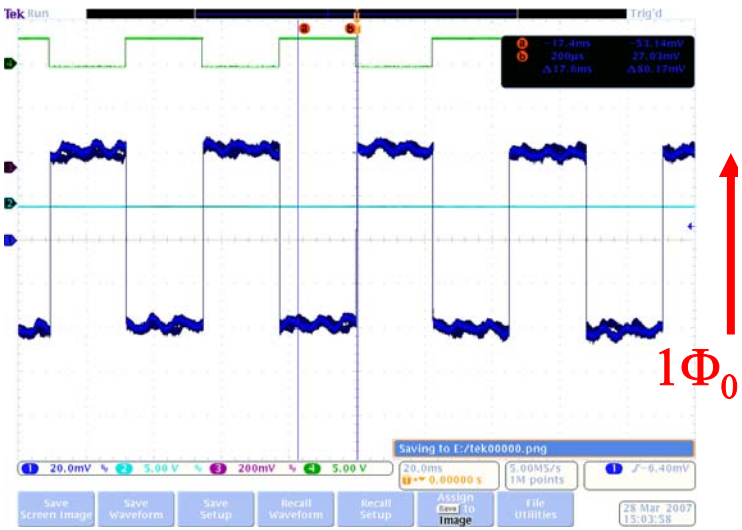
SBU SQUID Noise response



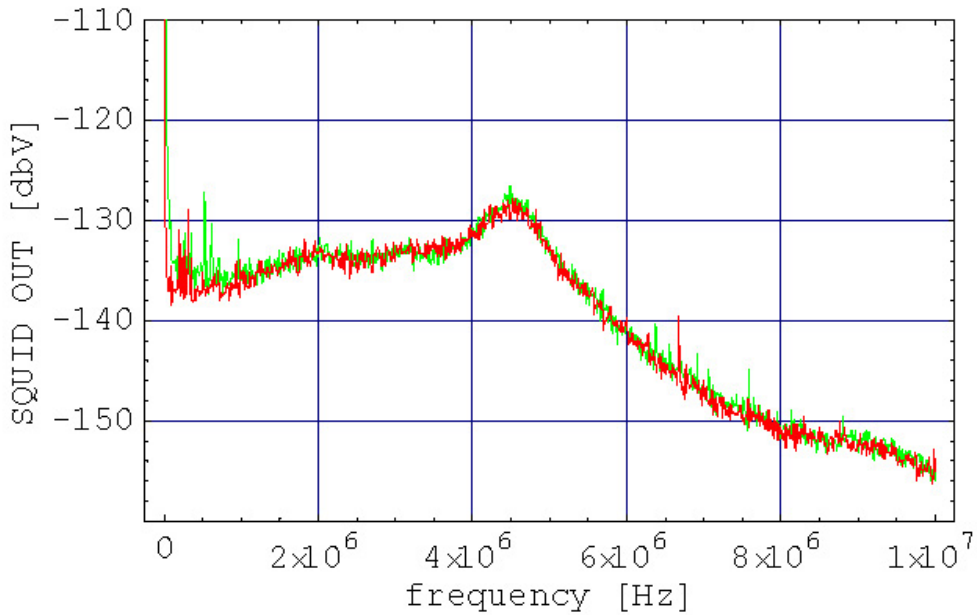




BNL Gradiometer-SQUID Response



Noise spectrum: beam on and off



Summary

- The counterpart to the quantized elementary charge is the magnetic monopole. No monopole has been detected so far
- We propose to demonstrate the feasibility of a superconducting inductive detector in an accelerator environment
- If successful, we propose to build a full scale detector to operate at RHIC and LHC