









BOAT LOUNGE





















































IL BARONE
E. VON DER HEYDT
DONATORE
DEL MONTE VERITA
1882-1964



SALONE BALINT

IN MEMORIA

MICHAEL BALINT

1896 - 1970













Puisse la Paix Régner dans le Monde
May Peace Prevail on Earth

Cha la pasch regna sün terra

































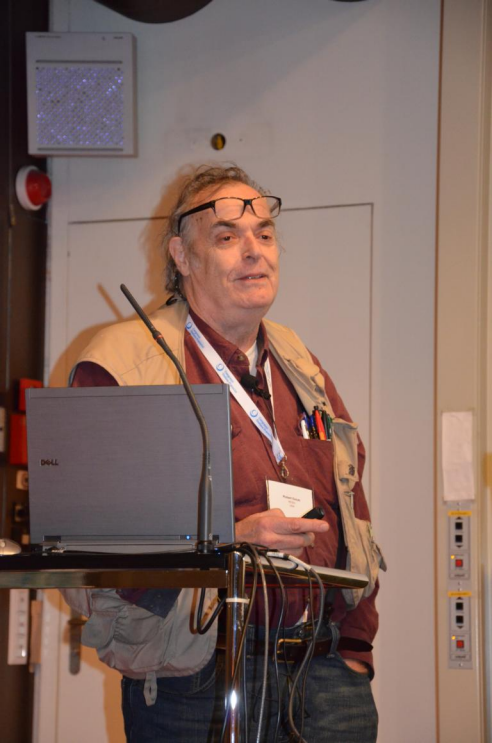


















Stephanie R. Cole
University of York, UK
London

warvision































MONTI VERITÀ



Hotel P. D.
Bar aperto
no al 4/12/20
el u. Bar
for his 9/12
restaurant
chiuso
geschlossener



B&B
aperti















Margherita Kozlovsk
University of Zurich
Switzerland





















Robynne Karamela
VP

wauvelon





















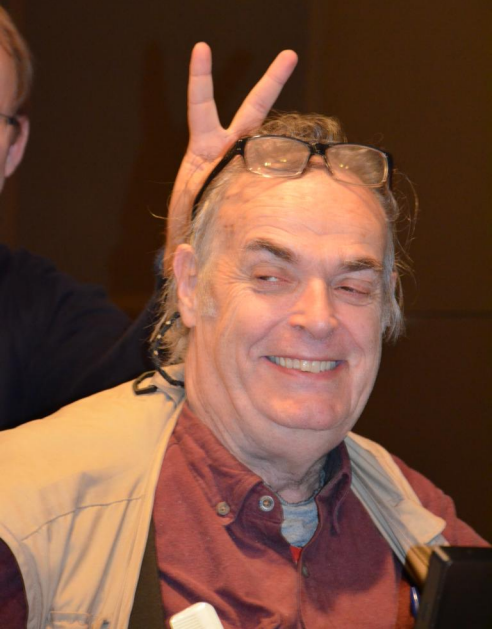












Chi è chi al Centro Stefano Franscini?

Stefano
Prof. Dr. Paolo Bassani

Stefano Bassani
Dr. Angelo Bassani - Capo

Stefano Bassani
Dr. M. Bassani, Claudio Bassani, L. Bassani

Stefano Bassani
Dr. Paolo Bassani

Stefano Bassani
Prof. Dr. Bassani

Stefano Bassani
Prof. Dr. Bassani

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Stefano Bassani
Prof. Dr. Bassani





KU LEUVEN

Transverse magnetic field measurement with scalar cesium magnetometers at the ...

E. Wurm

Institut voor Kern- en Stralingsfysica, KU Leuven, ...

1. Motivation & Goal

... homogeneous knowledge of the magnetic field ...

... we need a homogeneous field ...

... homogeneous field reduces neutron ...

... phase effect ...

... Neutrons probe a different part of the volume than ...

... field is inhomogeneous, the ...

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2. ...

... in the setup ...

... UCNs ...

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4. Method

... measure vector components?

... measure the magnitude of the field

... generating current to a coil that produces a transverse field

... (B_{x0}, B_{y0}, B_{z0}) measured

... transverse time evolution of the field with the Cells

... $B_x(t) = B_{x0} \cos(\omega t)$

... $B_y(t) = B_{y0} \sin(\omega t)$

... $B_z(t) = B_{z0} \cos(\omega t)$

... $B_x(t) = B_{x0} \cos(\omega t)$

... $B_y(t) = B_{y0} \sin(\omega t)$

... $B_z(t) = B_{z0} \cos(\omega t)$

... $B_x(t) = B_{x0} \cos(\omega t)$

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... $B_x(t) = B_{x0} \cos(\omega t)$

7. Conclusion

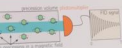
... transverse magnetic field

... are placed around the

... and is used to

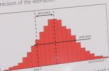


Jacek Zejma



defined as an **average shift** with respect to the real value.

spread of results Analysing a set of simulated FICs with σ (and thus known F) allows one to directly calculate both the **spread** of the estimation.

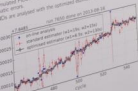


approach is external to the estimation method itself it also serves the precision estimator $s(f)$.

are analysed with initial sizes of the windows, e.g. $w_1 = 1$, $w_2 = 2$.
Results are used to assess the properties of the FDOs. signal-to-noise
window time. subsequent FDOs is used to assess drift
of a simulated

analysed with initial sizes of the droplets. The results are used to assess the properties of the FICs and relaxation time.

run TBM done on 2013-09-18



ing atomic-memory magnetometer. 2003
ent Science and Technology. 65(2):567, 1991.







Setup of the nEDM Experiment



Magnetometer sensitivity required

The accuracy in a change of the Larmor frequency of the neutron spin is a function of the magnetic field change, ΔB , and the frequency change, $\Delta \nu$.

$$\Delta B \Delta \nu = \frac{1}{2} \hbar \mu_N (B_0 - B_1)$$

For a magnetometer to be used to correct the LCN precession frequency, the accuracy in the magnetic field per measurement cycle is

$$\Delta B_{\text{min}} = \frac{2 \hbar \mu_N}{\Delta \nu} = 1.66 \text{ pT}$$

with lamp read-out

The signal-to-noise ratio (SNR) is shown. The sensitivity of the magnetometer is determined by the SNR. The SNR is a function of the magnetic field change, ΔB , and the frequency change, $\Delta \nu$.

$$\text{SNR} = \frac{\Delta \nu}{\Delta B} = \frac{1}{2} \hbar \mu_N (B_0 - B_1)$$

The SNR is a function of the magnetic field change, ΔB , and the frequency change, $\Delta \nu$.



JG|U

basics

He	Ce
(X)	✓
✓	X
X	✓



level. The component
radically increases

er











A laser based mercury magnetometer for the nEDM experiment at PSI

S. Komposch on behalf of the nEDM collaboration

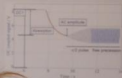


Setup of the nEDM Experiment at PSI



The Hg-Comagnetometer Setup

The Larmor precession of spin polarized ^{199}Hg atoms in the main magnetic field is induced by magnetic resonance and is optically probed (ODMR, optically detected magnetic resonance). The probe and pump beams are generated by ^{199}Hg discharge lamp which is then filtered with the ^{199}Hg F=1/2 line.



Magnetometer sensitivity

The uncertainty in a change of the Larmor frequency ω_L due to magnetic field changes, has to be smaller than the UCN precession frequency ω_p .

$$\Delta\omega_L \ll \omega_p$$

The Hg co-magnetometer is used to correct the UCN precession frequency drifts. To achieve the sensitivity goal of $\Delta\omega_L \ll 5 \times 10^{-11} \text{ rad/s}$ the uncertainty on the magnetic field per measurement cycle is

$$\sigma(B) \ll \frac{2E_g \sigma(d_{\text{Hg}})}{\hbar \gamma} = 160 \text{ fT}$$

Thus a co-magnetometer sensitivity of $\sigma(B) \sim 80 \text{ fT}$ has to be achieved for the nEDM measurement. For the ten times higher sensitivity the magnetometer has to reach below 8 fT.

Present performance of

with lamp

Laser System



Topica TA

UV light

UV light

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UV light

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UV light

Cs magnetometer array in the nEDM experiment

M. Kaspzok for the nEDM collaboration

Department of Physics, University of Fribourg, Switzerland



Measurements of the EDM of the neutron

The experimental technique used to measure the EDM of the neutron (d_n) is based on the detection of hyperfine splitting, induced by a static electric field E (10 kV/cm) which is applied alternately parallel and anti-parallel with respect to a static magnetic field B (10 T). Any difference in the measured Larmor precession frequency between measurements with the electric field parallel and anti-parallel to the magnetic field indicates the presence of the EDM.

$$h\nu_L = 2\vec{\mu} \cdot \vec{B} + 2\vec{d} \cdot \vec{E} \quad \text{where}$$

$\vec{\mu} = \vec{\mu}_n$ is the magnetic dipole moment,

$$\vec{d} = \vec{d}_n$$

$\vec{B}$ and $\vec{E}$ the magnetic field in the parallel and anti-parallel configurations ($\vec{B}_\parallel = \vec{B}$, $\vec{B}_\perp = 0$ in the first case).

$$\frac{h}{4\pi} (\nu_\parallel - \nu_\perp) = d_n \frac{B_\parallel - B_\perp}{2\Omega} = d_n \pm 3 \cdot 10^{-27} \text{ e cm} \quad \frac{B_\parallel - B_\perp}{2\Omega} \text{ in } \mu\text{T s}$$

The two major experimental difficulties for (1) is the precise determination of the precession frequency and (2) is ensuring that for $n = 10^7$ the magnetic field in the μT and μs configurations do not differ by more than 100 nT in a single 100 s measurement for an anticipated sensitivity of an EDM of $1 \cdot 10^{-27}$ e cm.

Cs magnetometers are used for magnetic field control.

Operation of the magnetometer

(1) Cs beam 100

(2) Light modulation
AM - FID mode

(3) Power Fridge
 $4\text{ K} \pm 0.1$
FID mode

(4) Control of the FID mode
FID mode

(5) Control of the FID mode
FID mode

(6) Control of the FID mode
FID mode

(7) Control of the FID mode
FID mode

(8) Control of the FID mode
FID mode

(9) Control of the FID mode
FID mode

(10) Control of the FID mode
FID mode

(11) Control of the FID mode
FID mode

(12) Control of the FID mode
FID mode

Cs magnetometer assembly

Mounting of the magnetometer
for reducing the magnetic
field noise.

Shielding of the magnetometer
from external magnetic fields
using a mu-metal shield.

Shielding of the magnetometer
from external magnetic fields
using a mu-metal shield.

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Shielding of the magnetometer
from external magnetic fields
using a mu-metal shield.

Non-metallic Cryogenic Actuators and Sealing Devices for SNS-nEDM

Austin Reid, Karen Daniels, Paul Huffman, Ekaterina Korobkina,
Kent Leung, Mithi A. de los Reyes, Camen Roysse

North Carolina State University Triangle Universities Nuclear Laboratory



SNS-nEDM SYSTEMATICS



The full scale nEDM apparatus (left) will operate with 1200 L of LHe at 0.5 K, which will take weeks to cool and perform individual measurements. We are developing a small scale apparatus to explore key systematic effects that can be operated with a significantly shorter turn-around time.

DOUBLE VALVE HOUSING DESIGN



Figure 1: The test bed will accommodate one full sized measurement cell. Pneumatic line and VCR can be loaded through a side volume.

ENGINEERING CHALLENGES

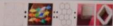
Operating at 0.5 K in a low magnetic field environment leads to serious engineering challenges:

1. Long T₁ and T₂ relaxation times
2. Plastic components
3. Superfluidity
4. Mechanical properties
5. Vertical flow

(2, 3, 4) require helium headspace

(2, 3, 5) prohibit use of standard test and seal

ORIGAMI KAPTON BELLOWS



DESIGN INSPIRATION

Attempts to stretch or curve Kapton result into a bellows folded. Paper and Kapton have similar mechanical properties, so I looked for folding patterns. Large format cameras use a springs biased side between the lens and film.



CRYOGENIC DURABILITY



ASSEMBLY



PEER REVIEW



Page 10

Although the assembly is not ideal, I believe the assembly is a good one and provides a good example of a good one.

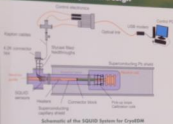


A SQUID Magnetometry System for a Cryogenic Neutron EDM Experiment

Amy Cottle, University of Oxford



Concept and Design



Precision magnetometry is essential to minimise the impact of magnetic field related systematic effects on a rEDM measurement. A description of a potential SQUID magnetometry system is given, as well as technical details behind magnetising its shielding equipment, and a method for determining the field within the neutron cells.

A number of neutron EDM experiments that are currently envisaged will operate in cryogenic conditions to exploit the greater UCN densities achievable. This presents a considerable challenge for the magnetometry, the 100mG magnetometer [1], developed for the UCN holding experiment, cannot be used at these temperatures, even though a comparable resolution on the order of $0.1 \mu\text{T}$ is desired. The system being investigated includes other species for cryomagnetonometry (e.g. He) by the SQUID experiment [2] and SQUID magnetometry. The 12 SQUID system utilised here was developed for the CryoEDM project at NS [3]. The main components are:

Pickup loops and input connections
140 pickup loops are wound on G10 ferrite cores, which are mounted on the configuration system. The configuration system has been designed to be placed around the neutron guide. The loop dimensions are determined by the signal-to-noise ratio with the electromagnetic interference.

Shielding Electronics
The shielding electronics are commercial FET electronics that the calibration and the shielding equipment are attached to the neutron, which is the main part of the system.

SQUID Input Shielding



The shielding shield is a superconducting shield that is used to shield the SQUID sensor from external magnetic fields. The neutron guide is a superconducting shield that is used to guide the neutrons into the SQUID sensor. The SQUID sensor is a superconducting loop that is used to measure the magnetic field. The pickup loop is a superconducting loop that is used to pick up the signal from the SQUID sensor.

The shielding shield is a superconducting shield that is used to shield the SQUID sensor from external magnetic fields. The neutron guide is a superconducting shield that is used to guide the neutrons into the SQUID sensor. The SQUID sensor is a superconducting loop that is used to measure the magnetic field. The pickup loop is a superconducting loop that is used to pick up the signal from the SQUID sensor.

Cryoperm Shields

Cryoperm shields are used to reduce the cooling load on the SQUID by preventing flux trapping in the shield, and to minimise the flux changes seen by the SQUID when superconducting. The high permeability material acts as an effective shield, but at the cost of affecting the surrounding field pattern. The SQUID is mounted using the neutron guide, such that the proximity of the cryoperm shield would cause distortion of the magnetic field in the neutron transport volume and flux depolarisation of the neutrons.



Simulations suggest that this is significant. A flux element model of the Cryoperm and nearby holding field coils was used to generate a field map of the off-axis guide volume. This was used in a Monte Carlo simulation to test the neutron spins in the volume. The observed or expected neutron spin flip rate was calculated. There are three solutions to this problem. To move the SQUID away from the neutron guide, to compensate the field distortion caused by the Cryoperm, or to use the SQUID without Cryoperm.



Running the SQUID without Cryoperm would lead to greater T1 noise in the form of measurement of trapped flux in the SQUID circuitry [4]. For the average field against flux, the integrated noise voltage for a SQUID shielded without Cryoperm is 1.44, and is 1.730 the measurement required to 10% larger noise flux than larger than that with Cryoperm. The increased voltages of the input and the lower operating temperature will cause a CryoEDM SQUID system will be between the not used flux coils, but the noise voltage may be reduced by the flux coil T1 noise required.

Field Extrapolation

The drawback of using SQUIDs as opposed to a permeameter is that they do not sense the magnetic field in the same volume as the neutrons. This must instead be inferred from the SQUID measurements. One extrapolation scheme being considered is a field square fit:

$$B = B_0 + B_1 x + B_2 x^2 + B_3 x^3 + B_4 x^4 + B_5 x^5 + B_6 x^6 + B_7 x^7 + B_8 x^8 + B_9 x^9 + B_{10} x^{10}$$



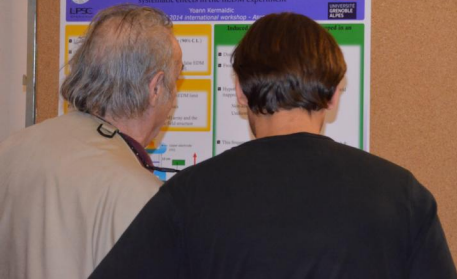
The field square fit is a method for extrapolating the magnetic field from the SQUID measurements to the neutron volume. It involves fitting the SQUID data to a polynomial function of the position, and then using the polynomial to estimate the field at the neutron volume.



Measurement of ^{199}Hg co-magnetometer related systematic effects in the nEDM experiment

Yann Kermadec

2014 international workshop - ALPS





Swiss National Science Foundation

Cs magnetometer array in the nEDM experiment

M. Kasprowik for the nEDM collaboration

Department of Physics, University of Fribourg, Switzerland



Measurements of the EDM of the neutron

The experimental technique used to measure the EDM of the neutron (n) is based on the detection of a beam of n atoms passing through a radio-frequency Paul trap (RFPT) which is loaded with a magnetic field and a laser beam. The n atoms are trapped in a radio-frequency Paul trap (RFPT) and their trajectory is monitored by a laser beam. The n atoms are trapped in a radio-frequency Paul trap (RFPT) and their trajectory is monitored by a laser beam.

$$m_n = 1.674927 \times 10^{-27} \text{ kg}$$
$$q_n = 0$$

$$\frac{q}{m} = 0$$

Cs magnetometer assembly

Measuring system that traps the n atoms. The frequency Paul trap (RFPT) is used to trap the n atoms.

A laser, optical and quadrupole beam loading system is used to trap the n atoms.



A specific control of the n atoms is required at each temperature and position in the Paul trap.

RFPT is used to trap the n atoms. The n atoms are trapped in a radio-frequency Paul trap (RFPT) and their trajectory is monitored by a laser beam.

Cs sensors

Currently there are 16 Cs sensors operating inside the Paul trap. The magnetometers are arranged in two rows. The sensors are arranged in two rows. The sensors are arranged in two rows.

Ground Cs sensors



The traps of the neutron chamber of the experiment are equipped with two magnetic traps. The ground Cs sensors are installed in the neutron chamber. The ground Cs sensors are installed in the neutron chamber.



Trap of the n atoms

The traps of the n atoms are arranged in two rows. The traps of the n atoms are arranged in two rows.

The traps of the n atoms are arranged in two rows. The traps of the n atoms are arranged in two rows.













Alard Schuster
PhD, MSc
Germany







Physikalisch-Technische Bundesanstalt



WE
FEE







Christopher Greenford
University of Kentucky
USA













WE KINDLY ASK YOU TO FILL OUT THE
FEEDBACK FORMS AND LEAVE THEM
IN THE PLASTIC BOX IN THE MAIN
CONFERENCE ROOM. THANK YOU!













Associazione Culturale
"Associazione Culturale"
Sala d'Arte





































Congressi
Stefano Franscini
Swiss Federal Institute
of Technology Zurich

Congressi Stefano Franscini
Monte Verità - Ascona, Switzerland
Conferences 2014

Challenges of the world-wide experimental search for the electric
dipole moment of the neutron
02.11. – 06.11.2014

Award for Best Contribution

to

Ms Elise Wursten
Katholieke Universiteit Leuven (Belgium)

for the presentation entitled

"Transverse magnetic field measurements with scalar cesium
magnetometers at the nEDM experiment"

For the Scientific Committee:

For the Congressi Stefano Franscini:

Ascona, November 6th 2014

















European Physical Society
Avenue 1055b - Rixens, Switzerland
CH-1015 St. Maurice

Challenges of the world-wide experimental search for the electric
dipole moment of the neutron
02.11 - 04.11.2014

Award for Best Contribution

to

Ms. Elke Wurtzen
Karlsruhe University of Applied Sciences
for the presentation entitled

"Coherent magnetic field measurements with scalar vacuum
fluctuations at the α -CDM experiment"

For the Scientific Committee:

Bonn, November 07, 2014

For the European Physical Society:





Negli anni 2004 - 2008 il
to un totale di 28.063 per
A questi vanno sommati
negli alberghi del lago
della capienza massima

In vent'anni, gli oltre 27
hanno effettuato all'incirca
ni della regione (Isola
Verzasca in testa alla clas
cale.

Il lago Lemano è un lago di origine glaciale, formato dall'accumulo di acqua in seguito alla ritirata delle ghiacciaie durante l'ultima era glaciale. La sua superficie è di circa 570 km² e la sua profondità massima è di 289 metri. Il lago è diviso in due parti principali: il lago Lemano superiore e il lago Lemano inferiore. Il lago Lemano superiore è la parte più profonda e più grande del lago, mentre il lago Lemano inferiore è la parte più superficiale e più piccola. Il lago Lemano è un importante sito per la pesca e il turismo. La sua acqua è molto pulita e trasparente, e il suo clima è molto mite. Il lago Lemano è anche un importante sito per la conservazione della natura. In molte zone del lago sono state create riserve naturali per proteggere la flora e la fauna. Il lago Lemano è un luogo molto bello e interessante da visitare. La sua acqua è molto pulita e trasparente, e il suo clima è molto mite. Il lago Lemano è anche un importante sito per la conservazione della natura. In molte zone del lago sono state create riserve naturali per proteggere la flora e la fauna. Il lago Lemano è un luogo molto bello e interessante da visitare.













