



International Society for μ SR Spectroscopy

Newsletter No. 4 - July 2005

Welcome from the President of ISMS, Robert Heffner

**It is a great pleasure to announce the winner of the 2005 ISMS
Toshimitsu Yamazaki Prize:
Prof. Yasutomo Uemura of Columbia University.**

Professor Uemura has distinguished himself with his pioneering μ SR experiments in various novel magnetic systems - in particular, his studies of spin glasses and the development of phenomenological models for the relaxation functions in these systems which are standards today - and in his more recent work systemizing μ SR penetration depth data in a wide range of superconductors. He has profoundly demonstrated the value of μ SR to the wider condensed matter physics communities. Congratulations, Tomo!

Following up on this, I would like to thank my colleagues on the **Yamazaki Prize committee** for their invaluable help: Prof. I. Affleck (U. of British Columbia), Prof. R. Cywinski (Leeds U.), Prof. E. Karlsson (Uppsala U., retired), Prof. M. Klein (U. Penn.), Prof. K. Nagamine (U. Tokyo, KEK, retired), Prof. J. E. Sonier (Simon Fraser U.) and Prof. H. Yasuoka (JAERI).

I hope that most of you will be attending our upcoming **μ SR05 conference** in Oxford, UK, this August. You can read more about it in this eNewsletter and on the web page <http://musr05.physics.ox.ac.uk/>.

This will be my last eNewsletter message to our μ SR community as inaugural President of the ISMS. It has been an honor to serve. During the last few years I believe we have created a firm foundation for the future of our Society. We have established the Yamazaki and Young Researcher prizes, set up a Facilities Subcommittee of the ISMS to enhance inter-facility communications and work on such things as data formats, established a Web site, held a workshop on advanced muon facilities (March, 2005, Japan)

and, of course, started this eNewsletter. In addition, we have resolved some administrative issues entailing changes to our Constitution, such as adding a President-Elect to the team of officers. Finally, as part of our outreach program, Prof. K. Nagamine and I also edited an issue of *Journal of Physics: Condensed Matter* dedicated to μ SR research in condensed matter physics. There is much more to be done, however. We need to increase our membership and our visibility in the wider condensed matter and chemistry communities, as well as continue to build improved μ SR facilities. Please vote your choices for our next slate of officers for the ISMS and give them your support. All voting will be done by email this time, so send your ballots back to our Secretary, Philip King by July 15.

In closing, I would like to warmly thank my colleagues on the ISMS Executive Committee for their excellent work and support; thank you Jess Brewer, Bob Cywinski, Philip King, Kanetada Nagamine, Jeff Sonier and Uli Zimmermann. Thanks also to Thomas Prokscha for chairing the Facilities Subcommittee, Roberto De Renzi for auditing our books, and Steve Blundell and Philip King for organizing our μ SR05 Conference.

See you all in Oxford!

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News from the regions . . .

. . . from the Vice President - N. and S. America

It has been a tumultuous year in Canadian politics to say the least. Late in the evening of June 23rd Canada's minority Liberal government forced a vote with several opposition politicians absent, and in doing so succeeded in having the federal budget approved. A defeat of the budget bill would have sent the country back to the polls just one year after the last federal election. It would have also suspended the cash flow to TRIUMF, effectively shutting down the facility. Fortunately, this did not happen. However, while the total funds awarded to TRIUMF in the new bill are not less than previous budgets, the new funding level is considerably less than what TRIUMF had requested, leading to significant cuts to the original 5-year plan. This includes the proposed upgrade to the M20B muon beam line that would have resulted in an additional low-background channel rivaling that of pulsed muon facilities. On the other hand, the Centre for Molecular & Materials Science (CMMS) at TRIUMF has been guaranteed funding over the next 5 years for the upgrade of the M9A surface muon channel into a dedicated high-luminosity μ SR beam line. The main objective of the M9A upgrade is to provide a muon beam line that is less intimidating to users that are new to μ SR. This will be achieved primarily by automation and the appointment of a dedicated instrument scientist. Funding for the latter, as well as the beam line spectrometer(s), must be sought elsewhere. Needless to say, a new state-of-the-art beam line will be a significant addition to the CMMS at TRIUMF. The work on M9A will formerly begin in 2006, and will be completed in 2010.

Even though the proposed upgrade to the M20B beam line will not occur in the next 5 years, major repairs to the front-end of M20B are scheduled for early in 2006. These are necessary for the continued operation of this beam line, which is the second most requested μ SR channel at TRIUMF. Work also continues on upgrading the CMMS dilution refrigerator (DR) to provide high-field capabilities at millikelvin temperatures, as well as the development of a high-pressure μ SR apparatus. When complete the DR will be operational at 5 Tesla.

On June 23-24, the TRIUMF Molecular & Materials Science Experimental Evaluation Committee meeting was held. Seventeen new proposals for μ SR beam time were presented. Of these, there were 5 Superconductivity, 3 Semiconductor, 1 Chemistry and 8 Magnetism proposals. The next meeting of the experimental evaluation committee will take place in December 2005.

Recently, **Kashayar Ghandi** was hired as an Assistant Professor in the Department of Chemistry at Mount Allison University in New Brunswick, Canada (approximately 4200 km from TRIUMF). Kashayar did his Ph.D. on muonium chemistry in sub- and supercritical water under Paul Percival at Simon Fraser University. He later worked as a Postdoctoral Fellow at TRIUMF and the Department of Chemistry at the University of British Columbia under Don Fleming, studying muonium formation as a probe of radiation chemistry in sub- and supercritical carbon dioxide. Kashayar is the seventh μ SR-based faculty appointment in Canada over the past 5 years. His employment is extremely important for maintaining the health of the CMMS, which is primarily funded as a national user facility. Given the recent retirement of Don Fleming at the University of British Columbia, Kashayar's new position also helps to maintain a significant presence in muon chemistry in Canada.



In August of this year, **Chris Wiebe** will leave his current position as an Assistant Professor at Brock University in Ontario, and assume a tenure-track position at the Assistant Professor level in the Department of Physics at Florida State University (FSU). He will also have an affiliation with the National High Magnetic Field Lab at FSU. Chris did his Ph.D. thesis under John Greedan in the Department of Chemistry at McMaster University, Ontario. Later he did postdoctoral work with Tomo Uemura at Columbia University and Graeme Luke at McMaster. In recent years, Chris has been studying exotic magnetism and superconductivity with both neutron scattering and μ SR. While his departure is a loss for Canada, it is a major gain for the North American μ SR community as a whole. Chris is the first μ SR researcher awarded a faculty position in the United States in a very long time. Perhaps the best way to build up the μ SR community in the United States is through the hiring of people like Chris who use μ SR as a complementary technique. We can only hope that Chris' appointment starts a trend.



Jeff Sonier

. . . from the Vice President - Asia

KEK-MSL Facility Status and Operation

The Meson Science Laboratory is the original facility using a pulsed (50 ns pulse width, 20 Hz repetition) muon beam produced by a rapid-cycling 500 MeV proton synchrotron for basic and applied research. At present, there are three channels producing muons for the Inter-University Experimental Program (IUEP), including the Large Solid-Angle and Axial-Focusing Superconducting beam channel (Dai-Omega channel) which is now providing the world's strongest pulsed 4 MeV μ^+ beam. Because of the planned movement of all the scientific activities and associated instrumentation to the J-PARC.MSL which will have first beam in 2007, the official IUEP beam-time will be ending in March 2006. Recent highlights of the IUEP programme have included muonium reaction studies (Shinohara, Osaka), magnetism in human blood (Nagamine, KEK), proton conductor investigations (Sugiyama, Toyota) and shallow muonium state studies in SrTiO_3 (Shimomura, KEK).

J-PARC.MSL Related Activities

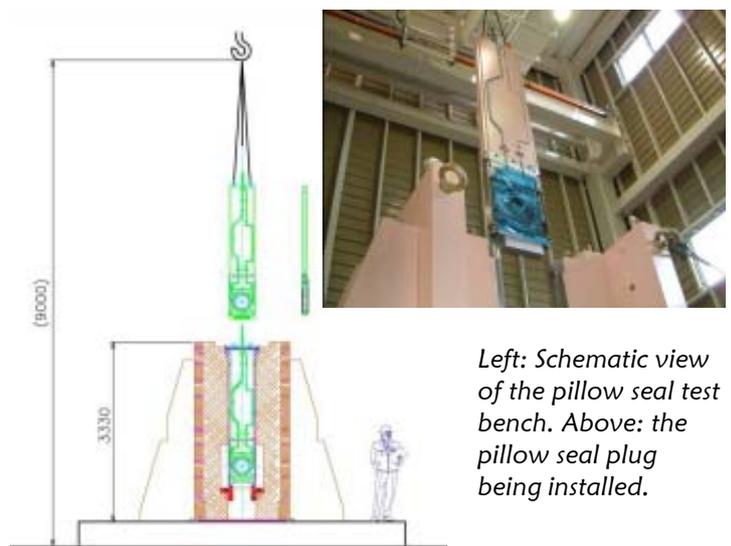
Construction of J-PARC.MSL

Because of the required changes in the design of the Material and Life Science Facility (MLF) building, the construction schedule has been delayed by at least eight months. Building construction started at the beginning of the 2004 fiscal year, aiming at first beam in November 2007. Recent construction and R&D work has included:

Embedding 1000 tons of iron shield. The shield structure and the quantity of iron were optimized in order to keep the cost of the shield as low as possible. Detailed calculation of the radiation and duct-streaming in the vicinity of the muon target was performed using the computer code MCNPX.

Installation and embedding of the muon base plates. Taking into account the alignment of the tall, heavy magnets and the target chamber by remote handling, it was decided to install 70 mm thick iron base plates with a level precision of 0.5 mm. By January 2005 about 85 % of the plate installation was complete with a precision of $XY \pm 2$ mm and level ± 0.2 mm.

Development of Pillow Seal and Monitor Chamber. In the M2 primary proton beam line, where the production target is located, the radiation level is expected to reach up to 100 MGy/y. Therefore, we have adopted pillow seal vacuum connections between the flanges of the beamline components that can be operated by remote handling, based on a PSI design. For the related R&D work, we have built a test bench (see Figures) to simulate the remote insertion of a pillow seal between two quadrupole magnets on the primary proton line.



Left: Schematic view of the pillow seal test bench. Above: the pillow seal plug being installed.

M-TAC and MuSAC Committee Meetings

The first J-PARC Muon Source Technical Advisory Committee (M-TAC) was held at KEK on Dec. 13-15, 2004, reporting to the J-PARC Muon Science Experimental Facility Advisory Committee (MuSAC) during the construction period. A variety of topics concerning the muon target design, the target chamber, interlocks and remote handling were discussed. The 3rd J-PARC Muon Science Experimental Facility Advisory Committee (MuSAC), was held at KEK on Feb. 25-26, 2005, reporting to the J-PARC Project Director. Project progress was reviewed, and the 'Core Users' initiative discussed, including its implementation and the concept of a call for letters of intent (LOI). Brief comments were then presented at the J-PARC International Advisory Committee meeting by Dr. J. M. Poutissou, MuSAC Chair, and the final committee report was submitted to the J-PARC Project Director.

International Workshop on Muon Science Instrumentation (MSI-O5)

-Advanced Beam and New Accelerator-

The MSI-O5 meeting was held at KEK from March 2 to March 4, 2005. It was hosted by the JSPS Core-to-Core Program on Development of Advanced Muon and Positron Beam. The organizing committee was K. Nagamine (KEK/UCR, Chairman), A.P. Mills, Jr. (UCR), J.-M. Poutissou (TRIUMF) and R.H. Heffner (LANL). The topics of MSI-O5 were Muons at High Intensity Hadron Accelerators, Advanced Muon Beam Generation, Topics on Other Particle Beams, positron, p-bar, etc., and Use of Advanced Muon Beams. The goal was bridge-making between low-energy muon science and high-energy muon particle physics and other particle beam communities. 17 foreign researchers and 40 Japanese scientists attended. The meeting programme together with abstracts of the talks are still available on the home-page (<http://msl.kek.jp/MSI-O5/program.html>).

Ken Nagamine

. . . from the Vice President - Europe

News from ISIS

ISIS has recently been seeking funds to provide a new high-field μ SR spectrometer. Such an instrument, capable of delivering longitudinal fields of several Tesla, would bring many benefits to a pulsed facility and would extend measurement possibilities for the muon technique in a wide range of science areas. A proposal was submitted at the end of last year to the CCLRC Facility Development Board, supported by letters from 40 researchers in the muon community, and we heard in the spring that this has been successful - an award of £2.1M over three years to build a new instrument for high-field studies. This is exciting news, and an encouragement to the muon community in general - it is the largest investment in ISIS muons for over 10 years. Much work is needed over the coming year to specify the magnet requirements and design an appropriate detector array, before component ordering can begin next year.



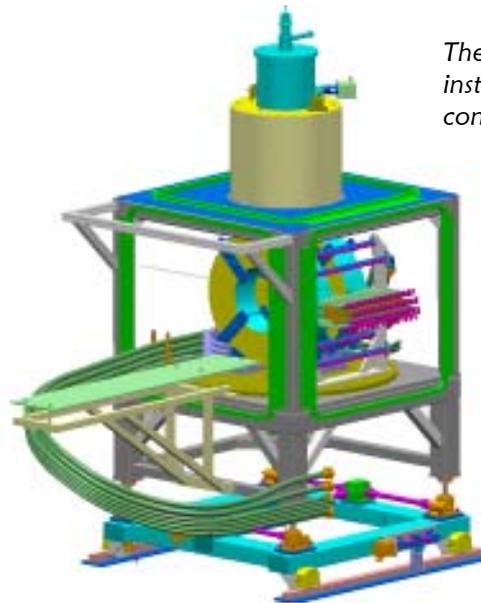
ISIS hosted a training course in muon techniques in February this year. 17 young researchers (pictured above, with members of the ISIS muon group) - post graduate or early post-doctorate - from the UK, Europe and Africa spent 5 days at the facility, learning about the basics of the technique from experts in the field, and running two experiments on the ISIS muon instruments to gain hands-on experience. Many have already come back to the facility to apply their new expertise to real experiments. The course was funded by ISIS and the EC through the ISIS muon access contract.

News from PSI

There has been substantial commitment to facility developments at PSI over the last few months. In particular a completely new high energy (decay channel) muon instrument, 'New GPD' for bulk MuSR studies is currently under construction. The instrument, shown in the figure, will be equipped with new detectors and new collimators, and provided with a sample environment that covers the temperature range from 0.3 K to 300 K (using an Oxford Instruments Variox cryostat with Heliox ^3He insert), and a magnetic field up to 0.65T provided by new air-core magnets.

On the theme of sample environment, new pressure cells, based on the novel alloy MP35N, have been developed by the TU Braunschweig group at the IPKM (Institut für Physik der Kondensierten Materie) and successfully tested at 2.9 GPa (29 kbar) at low temperatures. Also a separate, stand-alone cryostat and DAQ allowing one to determine the pressure inside a pressure cell by measuring the superconducting transition temperature of indium outside of the muon area is under construction and is expected to be operational around mid-August 2005.

Following the commissioning of the new μ E4 beam line (without separator), the Low Energy Muon (LEM) group measured a total rate of 700 million 4 MeV $\mu+$ per second for a proton current of 1.9 mA on a 4 cm carbon target. Under the same conditions, at the LEM moderator position they have obtained 240 million 4 MeV $\mu+$ per second on an area of 3x3 cm, which corresponds to the size of the LEM moderator. In addition, the new separator for the μ E4 area has successfully been conditioned up to +190 kV and is now being installed on the beam line.



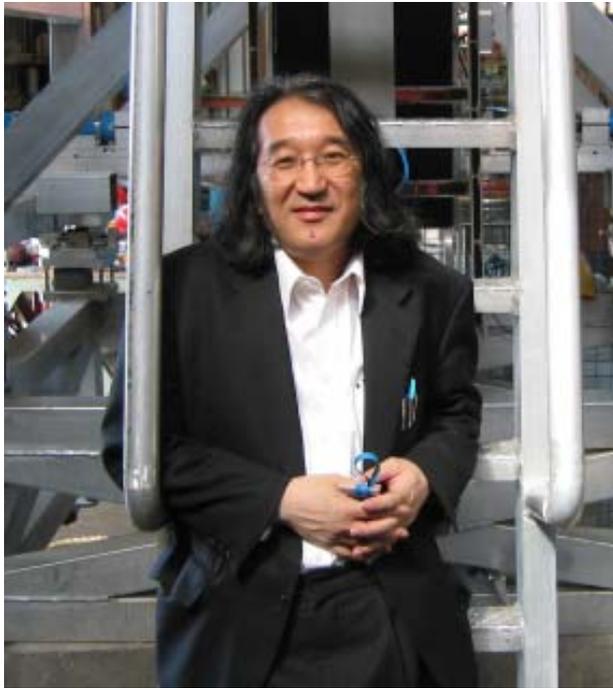
The 'New GPD' instrument currently under construction at PSI.

The UK, or rather Oxford, is eagerly awaiting the influx of the international MuSR Spectroscopy community in just one month's time. I am sure that we all fully appreciate the hard work that the local organising team has put into ensuring that MuSR 2005 will be a scientifically outstanding, socially enjoyably and extremely memorable gathering. On behalf of the community I would like to thank the team, and Steve Blundell and Philip King in particular, for all their efforts. I look forward to meeting you all again soon under the dreaming spires of Oxford.

Bob Cywinski.

Yasutomo Uemura - Winner of the first ISMS Yamazaki Prize

Yasutomo J. Uemura, Professor of Physics at Columbia University in New York, is well known for his studies of superconductivity and magnetism in strongly correlated electron systems using the muon spin relaxation (μ SR) and neutron scattering techniques.



Born in Tokyo in 1953, Prof. Uemura obtained his D.Sc. in 1982 from Tokyo University under the supervision of Prof. Toshimitsu Yamazaki for μ SR studies of Cu(Mn) and Au(Fe) spin glasses performed at TRIUMF. During 1983-88, he worked at Brookhaven National Laboratory with the neutron scattering group lead by Dr. Gen Shirane, initially as a JSPS Special Overseas Fellow and later as Associate Physicist of BNL. His work included neutron scattering and μ SR studies of spin glasses, itinerant electron ferromagnets, heavy fermion systems, fractal spin systems and high-temperature superconductors (HTSC). He moved to Columbia University as an Associate Professor in 1988, and since then has been active in μ SR studies of HTSC and other exotic superconductors, and geometrically frustrated and/or low-dimensional spin systems, as well as in developing phenomenological pictures for explaining condensation and pairing mechanisms of HTSC cuprates. Prof. Uemura was awarded the Packard Fellowship in 1989 and a NEDO International Research Grant as a group leader in 1995, and was elected as a Fellow of American Physical Society in 1999.

Prof. Uemura and his co-workers discovered a strong correlation between T_c and the superfluid density of HTSC systems in 1988-89, which has been often referred to as 'Uemura plot' among HTSC researchers. Other μ SR accomplishments include development of Zero-Field μ SR and longitudinal spin

relaxation studies with the Yamazaki group in 1978; observation of dynamic spin fluctuations in various spin glass systems since 1980; the first observation of antiferromagnetic order in La_2CuO_4 , the parent compound of HTSC systems, in 1987; proposal of the 'swiss cheese model' for Zn-doped HTSC systems in 1994-5, which was later verified by scanning tunneling microscope (STM) measurements; discovery of time-reversal symmetry breaking in Sr_2RuO_4 superconductor in 1998; the first observation of coexistence of static magnetic order and superconductivity in CeCu_2Si_2 in 1988; establishment of spatial phase separation between volumes carrying superconductivity and static magnetism in HTSC systems; finding persistence of dynamic spin fluctuations at very low temperatures in Kagome lattice spin systems; and development of muon spin relaxation functions in spin glasses, spin density wave, and other spin systems.

In the period 1978-2005, Prof. Uemura has published 238 scientific papers, including 5 in Nature, 36 in Physical Review Letters, and 45 in Physical Review B, and has presented 64 invited talks at international conferences and workshops. The ISMS is proud to have Professor Uemura as the first winner of the Yamazaki Prize for his outstanding and sustained work in μ SR science.



Prof. Uemura at Brookhaven in 1988, around the time of proposal of the 'Uemura plot'.

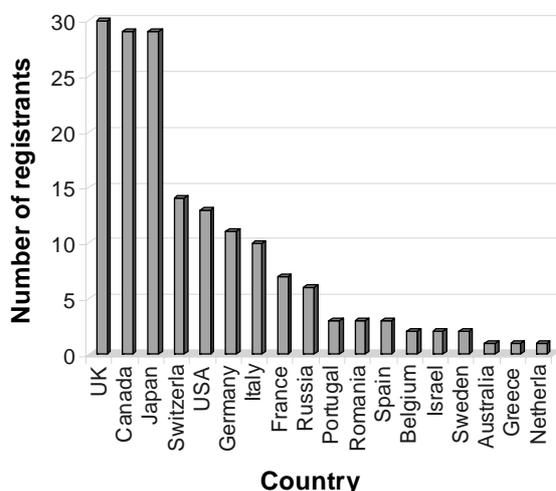


8th-12th August 2005

<http://musr05.physics.ox.ac.uk>

Conference facts and figures!

You may be interested to know that there are:
 169 registrants, with 24 accompanying persons
 37 students registered
 180 abstracts submitted
 59 talks to be given during the meeting
 46 registrants for the pulsed techniques meeting
 17 vegetarians amongst the registrants
 18 countries being represented - see graph below.



Invited Speakers

Speakers from outside the μ SR community have been invited to give overviews of their subject areas.

Speakers include:

- o Hideo Aoki (Tokyo, superconductivity in correlated systems),
- o Andrew Boothroyd (Oxford, cobaltates),
- o Ian Carmichael (Notre Dame, Indiana, hyperfine coupling theory)
- o John Chalker (Oxford, frustrated magnetism),
- o Peter Edwards (Oxford, chemistry, hydrides)
- o Stefan Estrieher (Texas Tech, semiconductors),
- o Bruce Gaulin (McMaster, neutron scattering and magnetism),
- o Nigel Hussey (Bristol, superconductivity),
- o Paolo Santini (Parma, molecular magnetism)

A full conference programme will be on the conference website shortly.

If you are coming to the conference . . .

. . . we will email you further travel instructions and information on registration nearer the conference time; these will also be available on the conference website.

Are you giving a talk at the conference?

All non-plenary talks have 20 minutes allocated to them, plus 5 minutes for questions. We prefer it if you bring your presentation (PowerPoint or PDF) on a CD or memory stick, to be preloaded on to one of our laptops and checked before your conference session. You may bring your own laptop, but your talk time will include your setup time.

Are you presenting a poster at the conference?

All poster boards support A0 (0.84 x 1.89 m) size posters in landscape orientation. We will provide velcro to stick your poster to the boards. There will be three poster sessions - we ask for posters to be put up during the day of the relevant session, and removed shortly after the session to allow boards to be used for the next session.

Are you preparing a manuscript for the proceedings?

Proceedings will be published in a special edition of Physica B in early 2006. All papers are limited to four journal pages. Papers for the proceedings must be handed into the conference desk (3 copies plus disk) by the end of Monday 8th August. Refereeing will take place during the conference and comments given to authors during the conference or very shortly afterwards. Further instructions on manuscript preparation can be found at <http://musr05.physics.ox.ac.uk/proceedings.html>

If you have signed up for the student afternoon

on Sunday 7th August: A bus will take you from St. Anne's College to the Rutherford Appleton Laboratory at 12-45. The programme can be found on the web at <http://musr05.physics.ox.ac.uk/studentafternoon.html>

Are you coming to the Pulsed Techniques Workshop?

This is being held after the main conference, starting on the Friday afternoon and continuing on until lunch on the Saturday, including dinner on the Friday evening. A full programme will be available on the conference website shortly.

We very much look forward to seeing you in Oxford in a few weeks time!

μ SR05 Local Organising Committee.

Other News and Information

ISMS Ballot

If you have not yet voted in the ballot for election of ISMS officers, you have until 15th July to do so. You should have received an email giving details of the elections and with a ballot paper attached - please contact the ISMS secretary (Philip King) at ISMS@rl.ac.uk if you have not received this.

Facility Proposal Deadlines and Contact Details

ISIS

Deadlines: 2 per year - 16th April and 16th October
Contact: Philip King (philip.king@rl.ac.uk)
<http://www.isis.rl.ac.uk/muons/>

PSI

Deadline: 1 per year - next one is November 2005
Contact: Dierk Herlach (dierk.herlach@psi.ch)
<http://lmu.web.psi.ch/>

KEK

Deadline: 2 per year; contact Kusuo Nishiyama
Contact: Kusuo Nishiyama (kusuo.nishiyama@kek.jp)
<http://msl-www.kek.jp>

TRIUMF

Deadline: please contact Syd Kreitzman
Contact: Syd Kreitzman (syd@triumf.ca)
<http://musr.triumf.ca/>

Comments on this newsletter?

The ISMS newsletter will be distributed twice per year, to inform the μ SR community of ISMS activities, and to provide other information and news of interest to community members. We would welcome comments and thoughts on the content and distribution method - please email the Secretary, Philip King, at isms@rl.ac.uk if you have suggestions.

