

# Asia-Pacific Workshop on Research in High Magnetic Fields

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## 1. Scope and format of the workshop

High Field Laboratory for Superconducting Materials in IMR is one of the three high field laboratories in the Japan High Magnetic Field Collaboratory, together with Megagauss Laboratory in ISSP, University of Tokyo and Advanced High Magnetic Field Laboratory in Osaka University. In Asia-pacific area, there are other world class laboratories in China in Wuhan and in Hefei. Activities of independent high field researches in other nations such as Korea. Recently, high magnetic research communities in Asia-pacific area join into the Asian high magnetic field forum for mutual exchange of researches and researchers. The forum was established in 2018 and there have been workshops in Tokyo and in Wuhan.

The symposium was planned to discuss the recent progresses in high magnetic field research and future directions as well as mutual collaboration among laboratories and groups in Asia-Pacific area. In the covid-19 pandemic, it was organized from December 1<sup>st</sup> to 3<sup>rd</sup>, 2020 as an online conference. The conference includes tutorial talks for students which is sponsored by KINKEN(IMR) Materials Science School 2020 for Young Scientists.

ARHMF2020 Outline of Time Table

	Dec. 1	Dec. 2	Dec. 3
AM	Opening Tutorial Talks	Scientific Sessions	24 Hours Session-America 24 Hours Session-Asia
Lunch	Break	Break	Closing
PM1	Tutorial Talks	24 Hours Sessions for Young Researchers 48 invited talks from around the world	PM1&PM2 User meetings or Scientific meeting in each Associations
PM2	Scientific Sessions	24 Hours Session-Asia	
Evening	Posters	24 Hours Session-Europe	
Night	Exchange Event	24 Hours Session-Europe	
Midnight		24 Hours Session-America	

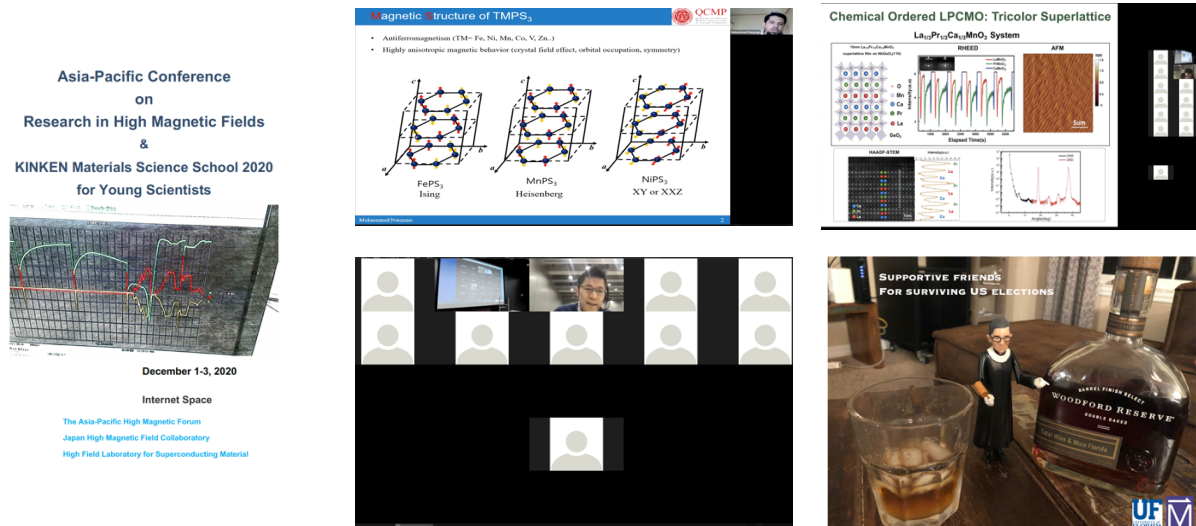
Time table of the ARHMF. There are tutorial lectures and a 24 hours non-stop session with 48 invited talks.

## 2. Day1, tutorial lecture, parallel sessions and poster presentation

The Day1 starts with three tutorial lectures, Practical High Temperature Super-conducting Wires for Magnets(Arnaud Badel, IMR, Tohoku Univ.), Invitation to 1000 T Science(Yasuhiro H. Matsuda, ISSP, Univ. of Tokyo) and Probing Quantum Transport in Atomically Thin Transition Metal Dichalcogenide Semiconductors (Ning Wang, HKUST). It is the joint session with KINKEN(IMR) Materials Science School 2020 organized by the school head(M. Kimata). More than 150 participants, mainly young students and researchers, have learned the most recent progresses and trends in the research area.

In the afternoon of the Day1, two parallel sessions have been organized with 18 talks from mainly by young researchers and students with some leading talks by senior experts. Topics are mixtures of transport, magnetism and inter-disciplinary science. Some of the titles are Giant anomalous Hall effect from spin-chirality scattering in a chiral magnet(N. Kanazawa), Possible liquid-liquid transition of oxygen(T. Nomura), Complex magnetic domain structures in oxides: physical origin and device application(J. Shen), Anomalous thermoelectric effects of ZrTe<sub>5</sub> in and beyond the quantum limit(J. Zhang), Magnetization

plateau of the breathing kagome-lattice antiferromagnet  $\text{Li}_2\text{Cr}_3\text{SbO}_8$  in ultra-high magnetic field (Y. Ishii). It was the good collection of the recent activities in high magnetic field researches. In the evening, we had 24 interactive poster presentations by using Zoom breakout function. The poster session is the one of the difficult functionality of the online conference. However, the smooth hopping among different posters is possible in the breakout room systems. There was also an online exchange event organized with REMO virtual conference room. The some of the screen shots of Zoom is combined in the figure shown below.



The screen of the talks, exchange program and the abstract book.

### 3. Day2, parallel session and 24 hours non-stop session

In the morning of the Day2, a single session about magnetic transport in high magnetic fields was organized. The talks included are Quantum oscillations and charge-neutral fermions in Kondo insulators (Y. Matsuda), Thermal expansion and resistivity measurements of heavy-fermion  $\text{CeAuSb}_2$  under pressure and magnetic field (S. Seo) and Enhancement of magnetoresistance anisotropy by hydrostatic pressure in a nodal line semimetal  $\text{ZrSiS}$  (D. Bhoi). The transport phenomena of Weyl-Dirac systems in high magnetic fields are one of the most active areas.

The main event of the workshop is the 24 hours non-stop session named as “Around the world”. It consists of 43 invited talks by talented young researchers and several senior lecturers. The format is chosen to enable the exchange among participants from different time zone. Another feature is that the longer talk time of 30 minutes for each lecture. The effectiveness of the session is the key to compromise the numbers of talks and the quality. The dedicated session for young researchers has played a very important role of supporting next generations of the communities

### 4. Day3, 24 hours non-stop session, closing and domestic meetings

In the morning of the Day3, the 24 hours session has been continued and then the closing session was hold. The alternation of presenters from three continents and the substantial overlaps among them shows the uniqueness of the session. It was really moving with the processing of the day.

In the closing, it was reported that there were 230 participants from more than 20 nations and that the even was successful to maintain the international exchange under the covid-19 pandemic. Acknowledge was expressed for the sponsors including The Global high magnetic field forum, the European High Magnetic Field Laboratory and for program committee, non-local organizing committee members from different areas and nations, chair persons contributed to the organization of the workshop. In the afternoon, the few nations hold a domestic meeting in the afternoon to discuss the issues of the national communities.

In summary, the workshop was very successful for the exchange among the international community at the point that the exchange had been suspended nearly 10 months. The participants realized the usefulness of the GIMRT program supporting such international event.

ARHMF2020 & KINKEN Materials Science School 2020 for Young Scientists Dec. 1-3, 2020

Date	S	Room	Time(JST)	Time: (CET)	Time: (CST)	Name	Affiliation	Title
		Main	21:10-21:30	13:10	6:10	Phase Recovery Time		
12/2	AW17	Main	21:30-22:00	13:30	6:30	Kimberly Modic	Inst. Sci. & Tech. Austria	Scale-invariant magnetic anisotropy in RuCl <sub>3</sub> : a signature of spin liquids?
12/2	AW18	Main	22:00-22:30	14:00	7:00	Sergei A. Zvyagin	HLD-HZDR	Pressure-tuned magnetic interactions in the triangular-lattice quantum antiferromagnet Cs <sub>2</sub> CuCl <sub>4</sub>
12/2	AW19	Main	22:30-23:00	14:30	7:30	Atsuhiko Miyata	HLD-HZDR	Magnetoelastic coupling in frustrated magnets: The cases of LiCuVO <sub>4</sub> and MnCr <sub>2</sub> S <sub>4</sub>
12/2	AW20	Main	23:00-23:30	15:00	8:00	Denis I. Gorbunov	HLD-HZDR	Elastic response to the first-order magnetization process of U <sub>3</sub> Cu <sub>4</sub> Ge <sub>4</sub>
12/2	AW21	Main	23:30-24:00	15:30	8:30	Shingo Yamamoto	HLD-HZDR	High-field soft x-ray dichroism of highly anisotropic ferrimagnets RFe <sub>5</sub> Al <sub>7</sub>
12/3	AW22	Main	24:00-0:30	16:00	9:00	Shivani Sharma	NHMFL	Magnetostriction in AlFe <sub>2</sub> B <sub>2</sub> investigated via In-field x-ray diffraction study under DC field of 25 Tesla
12/3		Main	0:30-0:50	16:30	9:30	Phase Recovery Time		
12/3	AW23	Main	0:50-1:20	16:50	9:50	Lucia Steinke	Phys., Univ. Florida & NHMFL	Towards a universal measurement platform for calorimetric and thermal transport measurements at the combined extremes of high magnetic fields and sub-millikelvin temperatures
12/3	AW24	Main	1:20-1:50	17:20	10:20	Mateusz Goryca	NHMFL	Revealing exciton masses and dielectric properties of monolayer semiconductors with high magnetic fields
12/3	AW25	Main	1:50-2:20	17:50	10:50	Marta De Luca	Univ. of Basel	Wurtzite III-V nanowires investigated by magneto-photoluminescence spectroscopy: effective masses and g-factors
12/3	AW26	Main	2:20-2:50	18:20	11:20	Jing Li	NHMFL, LANL	Spontaneous Valley Polarization of Interacting Carriers in a Monolayer Semiconductor revealed in 60 T pulsed field
12/3	AW27	Main	2:50-3:20	18:50	11:50	Rubi Km	HFML-EMFL & Radboud Univ.	High field magnetotransport in the quasi-two-dimensional electron gas at the aLaAlO <sub>3</sub> /KTaO <sub>3</sub> interface
12/3		Main	3:20-3:40	19:20	12:20	Phase Recovery Time		
12/3	AW28	Main	3:40-4:10	19:40	12:40	Johanna C. Palmstrom	NHMFL, LANL	Elastoresistivity of Fe-based Superconductors in High Magnetic Fields
12/3	AW29	Main	4:10-4:40	20:10	13:10	Matija Culo	HFML-EMFL & IMM, Radboud Univ.	Strange metal transport in FeSe <sub>1-x</sub> S <sub>x</sub>
12/3	AW30	Main	4:40-5:10	20:40	13:40	Aravind Devarakonda	Phys., MIT	Clean 2D superconductivity in a bulk van der Waals superlattice
12/3	AW31	Main	5:10-5:40	21:10	14:10	Audrey D. Grockowiak	NHMFL	Hot hydride superconductivity above 550 K

The part of the program of the 24 hours non-stop session-around the world. The time is indicated by Asia, Europe and American time zones.



The sponsors of the workshop.