



SYNERGIES AT NEW FRONTIERS AT GAMMA-RAYS, NEUTRINOS AND GRAVITATIONAL WAVES

**Institute for Cosmic Ray Research (ICRR)
Tokyo, Japan**

24 -25 MARCH 2022

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Schedule

March 24

Experiments

Chair:
M. Teshima

High energy detection

Chair:
Hiroaki Menjo

09:00	Registration Alicia López-Oramas, Daniela Hadasch, Nataly Ospina The University of Tokyo, Kashiwa Campus	09:00 - 09:30
	Welcome and Introductory Talk Alicia López-Oramas et al.	09:30 - 09:50
10:00	Introduction to the experiments Super-K and Hyper-K The University of Tokyo, Kashiwa Campus	Kimhiro okumura 09:50 - 10:15
	Introduction to the KAGRA experiment The University of Tokyo, Kashiwa Campus	Junichi Yokoyama 10:15 - 10:40
	Coffee break The University of Tokyo, Kashiwa Campus	10:40 - 11:10
11:00	Introduction to Cherenkov experiments The University of Tokyo, Kashiwa Campus	Michiko Ohishi 11:10 - 11:35
	Introduction to the CALET experiment The University of Tokyo, Kashiwa Campus	Shoji Torii 11:35 - 12:00
12:00	Group photo The University of Tokyo, Kashiwa Campus	12:00 - 12:15
	Lunch Break	
13:00		
	Galactic transients at very high energies The University of Tokyo, Kashiwa Campus	Alicia Lopez-Oramas 12:15 - 13:30
	CALET Observation of Gamma Rays The University of Tokyo, Kashiwa Campus	Masaki Mori 13:30 - 14:00
	Supernovae detection with SuperKHyperK The University of Tokyo, Kashiwa Campus	Gillaume Pronost 14:00 - 14:30
15:00	KAGRA Perspectives The University of Tokyo, Kashiwa Campus	Takeshi uchiyama 14:30 - 15:00
	Galactic Supernova Detection with EGADSHHEIMDALL The University of Tokyo, Kashiwa Campus	Luis Martí-Magro 15:00 - 15:30
	Coffee Break The University of Tokyo, Kashiwa Campus	15:30 - 15:55
	Discussion The University of Tokyo, Kashiwa Campus	15:55 - 16:30
17:00		
		16:30 - 17:30

March 25

Gamma ray bursts
Chair:
Mitsunari Takahashi

Multimessenger
Chair:
Daniel Mazin

09:00	Theory GRB The University of Tokyo, Kashiwa Campus	Lin Haoxiang 09:00 - 09:30
	CALET GRBs The University of Tokyo, Kashiwa Campus	Yuta Kawakubo 09:30 - 10:00
10:00	GRBs at very high energies The University of Tokyo, Kashiwa Campus	Dmitry Khangulyan 10:00 - 10:30
	Coffee break The University of Tokyo, Kashiwa Campus	10:30 - 11:00
11:00	SuperKHyperK GRBs The University of Tokyo, Kashiwa Campus	Motoyasu Ikeda 11:00 - 11:30
	Discussion The University of Tokyo, Kashiwa Campus	11:30 - 12:00
12:00	Lunch break	
13:00		
	Gravitational waves (Theory) The University of Tokyo, Kashiwa Campus	Hideyuki Tagoshi 12:00 - 13:30
	Multi-messenger Super-Kamiokande The University of Tokyo, Kashiwa Campus	Hiroaki Menjo 13:30 - 14:00
14:00	Multi-messenger MAGIC-CTA The University of Tokyo, Kashiwa Campus	Koji Noda 14:00 - 14:30
	Multi-Messenger KAGRA The University of Tokyo, Kashiwa Campus	Kyochi Kawaguchi 14:30 - 15:00
	Coffee break The University of Tokyo, Kashiwa Campus	15:00 - 15:30
16:00	Discussion The University of Tokyo, Kashiwa Campus	15:30 - 16:00
	Summary The University of Tokyo, Kashiwa Campus	16:00 - 16:30
17:00		
		16:30 - 17:30

Experiments

Chair: Masahiro Teshima

- **Super-K/ Hyper-K**
 - Detection of neutrinos in the MeV to TeV domain, expecting the detection of neutrinos from astronomical sources (SN, GRB, AGN, GW...)
 - HyperK: plan to be operational from 2027
- **KAGRA**
 - Improving sensitivity for next observation runs O4 and O5
 - Best sensitivity up to 10Mpc. Design goal: 100Mpc.
- **Cherenkov Telescopes**
 - Better sensitivity compared to satellite experiment Fermi on short time scales
→ Good for transient detection
- **CALET experiment**
 - Dedicated Gamma-Ray Burst Monitor with energy range 7 keV-20 MeV
 - Follow-up of LIGO/Virgo GW observations

High energy detection

Chair: Hiroaki Menjo

- **Super-K/ Hyper-K**
 - MeV-GeV neutrinos can be expected from core collapsed SN (CCSN).
 - It is uncertain if Novae emit low energy neutrinos.
- **KAGRA**
 - Could detect GW from Galactic CCSN, although the waveform is unknown up to now.
 - Also Magnetars are possible sources of GWs.
- **Cherenkov Telescopes**
 - TeV emission from CCSN expected just after the explosion and after >10 days after. Immediate observation preferred to catch the onset of the flux, but it's not a question of seconds/ minutes.
- **CALET**
 - GRB alerts can be issued based on counts information. Event data are downloaded later.

Gamma ray bursts

Chair: Mitsunari Takahashi

- **GRB theory**
 - LIGO-CTA joint detection rate ~ 0.1 events/year for BNS
- **CALET**
 - 12% of GRB detections are sGRBs. No candidate of EM counterpart of GW events in CALET in O1-O3, more follow-ups during O4
 - For the moment, only GRB studies but plans to analyze other sources such as SGRs.
- **GRBs at VHE**
 - Hard to robustly measure the VHE GRBs spectra due to EBL attenuation
 - One-zone SSC models challenging to explain emission
- **SuperK/HyperK**
 - No GRB-neutrino association yet. Better expectations with HyperK

Multimessenger

Chair: Daniel Mazin

- **GW theory**
 - CCSN can be detected within $\sim 10\text{kpc}$, $\sim 100\text{kpc}$ for rapidly rotating progenitors
 - 3 or more detectors needed for accurate localization (KAGRA can contribute)
 - Pre-merger alert: improvement at lower frequencies needed.
- **Super-K**
 - SN: 100% efficiency for events in our galaxy
 - Searching for GW coincident events: No significant event was found.
- **MAGIC-CTA**
 - Automatic Alert systems implemented. 2019 first GRB detection at VHE.
 - Detection/ observation of prompt emission is next goal! Also UL are useful.
 - Blazar are interesting neutrinos sources, but might not explain all HE neutrinos.
 - GW follow up: BNS is hot topic for IACTs (hint found); MoU with LVK exists.
- **KAGRA**
 - Neutrino from BNS almost impossible... Maybe thermal neutrino can be detected?
 - Good expectations on GW+EM counterparts for O4 and O5
 - BNS remnants interesting to study, specially radio and X-ray

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THANK YOU!!!

- Midori Sugahara (ICRR, secretary)
- Masahiro Teshima (ICRR)
- Moritz Hütten (ICRR)
- Marcel Strzys (ICRR)
- Joshua Baxter (ICRR)
- Shotaro Abe (ICRR)
- Kazuaki Hashiyama (ICRR)
- Shunsuke Sakurai (ICRR)

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Thank you for your participation!

