

# 15<sup>th</sup> QWG Workshop, September 2022

## Opening & welcome

**Frank Nerling**

HFHF, GU Frankfurt & GSI Darmstadt

A stylized logo for 'QWG 2022'. The 'Q' is green, the 'w' is red, the 'G' is blue, and the '2022' is a rainbow gradient. The letters are bold and have a slight shadow.



# QWG 2022 - The 15th International Workshop on Heavy Quarkonium

GSI Helmholtzzentrum Darmstadt, Germany, September 26-30, 2022

## QWG Conveners

Geoffrey Bodwin, ANL, USA  
Nora Brambilla, TU Munich, Germany  
Roberto Mussa, INFN Torino, Italy  
Vaia Papadimitriou, FNAL, USA  
Antonio Vairo, TU Munich, Germany

## Local Organisation Committee

Frank Nerling (Chair)  
Klaus Götzen  
Udo Kurilla  
Anja Meergans  
Daniel Mohler  
Marc Wagner

## Supported by:

Matthias Lutz  
Klaus Peters (GSI Contact)

## Topical Conveners: Theory/Experiment

### Spectroscopy

G. Bali, N. Brambilla, J. Soto /  
R. Mizuk, R. Mitchell, R. Mussa

### Decays

E. Eichten, A. Vairo /  
C. Patrignani, C.Z. Yuan, C.P. Shen

### Production

G. Bodwin, E. Braaten, J. Qiu /  
V. Kartvelishvili, V. Papadimitriou

### Standard Model Measurements

A. Kronfeld, A. Pineda /  
S. Eidelman (†), B. A. Shwartz

### Quarkonium in Media

P. Petreczky, R. Vogt /  
A.D. Frawley, E. Scomparin

### Beyond the Standard Model

A. Petrov, P. Ko / D. Wang

### Automated calculations and interface to Monte Carlo

P. Faccioli, H.-S. Shao  
and V. Shtabovenko

Photo: GSI Helmholtzzentrum für Schwerionenforschung GmbH, D. Fehreuz

Information and Registration: <https://indico.gsi.de/event/QWG2022>





## Simon Eidelmann 1948 – 2021

CERN Courier, November 2021:

“... , he was chosen to be the first author of the 2004 edition of the Review of Particle Physics. He was also a great source of inspiration for the Quarkonium Working Group (QWG). Attendees of the QWG workshops will remember his lucid presentations, his great enthusiasm for research and his keen scientific insights. Moreover, he was greatly appreciated for his wisdom and calm counsel during intense discussions.

[Image credit: Family archive]

QWG 2022 - The 15th International Workshop on Heavy Quarkonium

from Monday, September 26, 2022 (8:15 AM) to Friday, September 30, 2022 (6:30 PM)  
GSI Darmstadt (AUD)

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: Sessions : Talks : Breaks

	Sep 26, 2022	Sep 27, 2022	Sep 28, 2022	Sep 29, 2022	Sep 30, 2022
8:15 AM	Registration (until 9:30 AM) (AUD)	9:00 AM Session 2.1 - Vladyslav Shabavenko (KIT) (until 10:40 AM) (AUD)	9:00 AM Session 3.1 - Claudia Patrignani (Universita' di Bologna and INFN) (until 10:50 AM) (AUD)	9:00 AM Session 4.1 - Antonio Pineda (until 10:45 AM) (AUD)	9:00 AM Session 5.1 - Nora Brambilla (TUM) (until 10:40 AM) (AUD)
9:30 AM	Opening - Frank Nerling (GSI) (AUD)	9:00 AM Probing new physics via LFV quarkonium decays - Xabier Marcano (Universidad Autónoma de Madrid) (AUD)	9:00 AM Higgs boson decay to charmonia via c-quark fragmentation - Yang Ma (INFN Bologna) (AUD)	9:00 AM QCD static force in gradient flow - Xiangpeng Wang (TUM) (AUD)	9:00 AM Observation of the direct production of the $\chi_{c1}$ in $e^+e^-$ annihilation at BESIII - Riccardo Alberti (Mainz U.) (AUD)
9:35 AM	Welcome - Paolo Giubellini (SSI) (AUD)	9:20 AM Is $\chi_{c1}$ (3872) generated from string breaking? - Pedro González (Valencia U.) (AUD)	9:20 AM nNREFTs for self-interacting dark matter - Simone Blondini (Basel U.) (AUD)	9:20 AM The static force from the lattice - Julian Mayer-Stouckes (TUM) (AUD)	9:20 AM Properties of Charmonium Resonances at BESIII - Yufeng Guo (Fudan U.) (REMOTE)
9:45 AM	Session 1.1 - Vato Kartvelishvili (Lancaster U) (until 10:45 AM) (AUD)	9:40 AM Search for LFV in J/psi decays at BESIII - Jingshu Li (Sun Yat-Sen U.) (REMOTE)	9:40 AM Near Threshold Heavy Quarkonium Photoproduction at Large Momentum Transfer - Xuan Bo Tong (Hong Kong and Shenzhen U.) (REMOTE)	9:40 AM BES III measurements of the baryon electromagnetic form factors - Christoph Rosner (Mainz U.) (AUD)	9:40 AM Charm sea effects on charmonium physics - Francesco Knechtli (Wuppertal U.) (AUD)
9:45 AM	Multiplicity dependence of quarkonium production in pp collisions from ALICE - Anton Andronic (Münster U.) (AUD)	10:00 AM Triple J/psi meson production in pp at $\sqrt{s} = 13$ TeV - Stelanos Loantinis (Zurich U.) (AUD)	10:00 AM Search for LFV and a light Higgs boson in Y(nS) decays at Belle - Vishal Bhardwaj (IISER Mohali) (AUD)	10:05 AM Static Energy in (2+1+1)-Flavor Lattice QCD: Scale Setting and Charm Effects - Johannes Heinrich Weber (Technische Universität München) (AUD)	10:00 AM Observation of sizeable $\eta$ contribution to $\gamma^* \rightarrow \eta \rightarrow J/\psi$ decays at LHCb - Mikhail Mikhasenko (HESKPF) (AUD)
10:05 AM	Two-loop QCD corrections to exclusive J/psi $\chi_{c1}$ production at B factories - Jia-Yue Zhang (IHEP/UCAS Beijing) (REMOTE)	10:20 AM Recent ALICE results on single and double J/psi production and on collective effects in pp collisions - Sebastien Perrin (CEA Saclay France) (AUD)	10:25 AM Recent results of rare decay searches at BESIII - Guangyi Zhang (Henan Normal U.) (REMOTE)	10:25 AM Randomness and the static potential - Hiromasa Takaura (KEK) (AUD)	10:20 AM Updates on the X(3872) at BESIII - Chunhua Li (Liaoning Normal U.) (REMOTE)
10:25 AM	Observation of multiple near-threshold structures in J/psi/psi mass spectrum at CMS - Jingqiang Zhang (Beijing Tsinghua U.) (AUD)	10:40 AM --- Coffee break / Poster Session ---	10:50 AM --- Coffee break ---	10:45 AM --- Coffee break ---	10:40 AM --- Coffee break ---
10:45 AM	--- Coffee break ---	11:15 AM Session 2.2 - Vaia Papadimitrou (FNAL) (until 12:50 PM) (AUD)	11:20 AM Session 3.2 - Hua-Sheng Shao (LPTHE Paris) (until 12:45 PM) (AUD)	11:15 AM Session 4.2 - Ryan Mitchell (until 12:55 PM) (AUD)	11:10 AM Session 5.2 - Joan Soto (Barcelona U.) (until 1:00 PM) (AUD)
11:15 AM	Session 1.2 - Vato Kartvelishvili (Lancaster U) (until 1:00 PM) (AUD)	11:15 AM QCD factorization for hadronic quarkonium production at high $p_T$ - Jianwei Qiu (JLAB) (AUD)	11:20 AM ROUND TABLE: Status, challenges and prospects of SDCC calculations for quarkonium production - Pietro Facchioli Yan-Qing Ma Jian-Xiong Wang Hua-Sheng Shao Hee Sok Chung Valerio Bertone (AUD)	11:15 AM Three-loop QCD corrections to quarkonia electrostatic decay - Zhenan Mo (AUD)	11:10 AM Observation of a charmonium-like state in $D_s^+ D_s^-$ at LHCb - Chan Chen (Beijing Tsinghua U.) (AUD)
11:15 AM	Low-mass resonances in 4-muon channel at ATLAS - Hao Pang (Beijing Tsinghua U.) (REMOTE)	11:35 AM Exclusive J/psi photoproduction in Pb-Pb UPCs at the LHC in NLO QCD - Vadim Guzey (Jyväskylä U.) (AUD)	11:20 AM Quarkonium in Pythia: status and perspectives - Leif Lonnblad (Lund U.) (AUD)	11:35 AM $\eta_{c1}(2S)$ and $h_c$ decays at BESIII - Jialei Zhang (REMOTE)	11:35 AM Properties of the $\psi(3872)$ at BESIII - Zhiqing Liu (Shandong U.) (REMOTE)
11:35 AM	NLO results with operator mixing for fully heavy tetraquarks in QCD sum rules - Ren-Hua Wu (Peking U.) (REMOTE)	12:00 AM ROUND TABLE: Negative Cross Sections - Maxim Nefedov Hee Sok Chung Mathias Butenschön Jianwei Qiu (AUD)	12:20 AM Quarkonium in Pythia: status and perspectives - Leif Lonnblad (Lund U.) (AUD)	11:55 AM Study of $\chi_{c1}$ decays at BESIII - Zhiyong Wang (REMOTE)	11:55 AM Y decays to charmonium at BESIII - Lixin Wu (Peking U.) (AUD)
11:35 AM	Four-quark states with charm quarks in a two-body Bethe-Salpeter approach - Christian Fischer (Gießen U.) (AUD)	12:30 AM Quarkonium photoproduction in nuclear collisions at the LHC - Oluchan Liu (South China Normal U.) (AUD)	12:30 AM --- GROUP PHOTO --- (AUD)	12:15 AM J/psi radiative decay from lattice QCD - Xiangyu Jiang (AUD)	12:20 AM Energy scan results at Belle II - Bryan Fulson (PNNL) (AUD)
12:15 PM	Triangle Singularity in the Production of $T_{cc}^{++}$ and a Soft Pion - Kevin Ingles (Ohio State U.) (AUD)			12:35 AM Measurements of $\psi(3686)$ decays to baryon pairs at BESIII - Qingqing Ji (REMOTE)	12:40 AM Search for neutral Zcs state as BESIII - Ruijing Ma (UCAS) (REMOTE)
12:35 PM	Quarkonium Production at LHCb in pp collisions - Valeria Zhovkova (Orsay-ULCLAB) (REMOTE)				
1:00 PM	--- Lunch break ---	12:50 PM --- Lunch break ---	12:45 PM --- Lunch break ---	12:55 PM --- Lunch break ---	1:00 PM --- Lunch break ---
2:00 PM	Session 1.3 - Jianwei Qiu (JLAB) (until 4:00 PM) (AUD)	1:40 PM --- FAIR Construction Site Tour ---	2:00 PM Session 3.3 - Roberto Mussa (until 4:00 PM) (AUD)	1:55 PM Session 4.3 - Tim Gershon (until 3:55 PM) (AUD)	2:00 PM Session 5.3 - Roberto Mussa (until 3:50 PM) (AUD)
2:00 PM	Inclusive Production of Heavy Quarkonia in pNRQCD - Hee Sok Chung (TUM) (AUD)	2:20 PM Session 2.3 - Johannes Weber (TUM and Humboldt U.) (until 4:00 PM) (AUD)	2:00 PM Quarkonium Monte Carlo event generators at the LHC: status and issues - Carlos Lourenco (CERN) (AUD)	1:55 AM $\psi(3686)$ decays with a Ka final state at BESIII - Yitong Guo (REMOTE)	2:00 AM Doubly charmed tetraquarks at LHCb - Mikhail Mikhasenko (HESKPF) (AUD)
2:20 AM	Associated Production of J/psi plus W or Z bosons at NLO - Mathias Butenschön (Hamburg U.) (AUD)	2:20 AM Phenomenological study of quarkonium suppression and of the energy gap between singlets and octets - Miguel Escobedo (Instituto Gallego de Física de Altas Energías) (AUD)	2:20 AM NLO/Access: web event generators - Carlo Fiore (ULCLab Orsay) (AUD)	2:15 AM BES III results on the other hadronic cross section in $e^+e^-$ - Christoph Redmer (Mainz U.) (AUD)	2:30 AM $T_{cc}^{++}(3875)$ relevant $D^* D^*$ scattering from N <sub>3</sub> -J <sub>2</sub> lattice QCD - Chunyang Shi (IHEP Beijing) (REMOTE)
2:40 AM	J/psi relative yield vs relative multiplicity in pp collisions at PHENIX (REMOTE) - Ming Xiong Liu (LANL) (AUD)	2:40 AM Heavy quarkonium dynamics at next-to-leading order in the binding energy over temperature - Antonio Vairo (TUM) (AUD)	2:40 AM Interpretation of neutral charm mesons near threshold as unparticles - Hans-Werner Hammer (TU Darmstadt) (AUD)	2:40 AM ROUND TABLE: Naming scheme - Zhang Liming Ryan Mitchell U. Tamponi Gershon Tim Christoph Harhart (AUD)	2:50 AM Signature of a doubly charmed tetraquark pole in $DD^*$ scattering on the lattice - Sasa Prelovsek (Ljubljana U.) (AUD)
3:00 AM	Recent results on charmonium production at ATLAS (inclusive and/or associative) - Charles Burton (Texas U.) (AUD)	3:00 AM Recent results on Upsilon production in nuclear collisions from CMS - Jaebom Park (Korea U.) (AUD)	3:00 AM Is Zcs(3902) a molecular partner of Zc(3900) and Zc(4020) states? - Vadim Baru (Bochum U.) (AUD)	3:10 AM From the line shape of the X(3872) to its structure - Antonio Polosa (AUD)	3:10 AM Doubly charmed baryons at LHCb - Tim Gershon (Warwick U.) (AUD)
3:20 AM	Charmonia in modified NRQCD - K. Sidhar (Azim Premji U.) (REMOTE)	3:20 AM Recent ALICE results on $\psi(2S)$ production in Pb-Pb collisions - Enrico Scamporrin (INFN Torino) (AUD)	3:20 AM Coupled-channel approach to $T_{cc}^{++}$ including three-body effects - Christoph Harhart (FZ Jülich) (AUD)	3:30 AM Heavy Quarkonium Spectroscopy with PANDA - Johan Messchendorp (GSI) (AUD)	3:30 AM Perspectives at the EicC - Feng-Kun Guo (REMOTE)
3:40 AM	Measurement of the cross section ratio $\sigma(\psi(2S))/\sigma(\psi(1S))$ in exclusive photoproduction at HERA with the Zeus detector - Ada Solano (Turin U. and INFN Turin) (REMOTE)	4:00 PM --- Coffee break ---	3:40 AM Quarkonium hybrid decays - Abhishek Mohapatra (TUM) (AUD)	3:55 PM --- Coffee break / Poster Session ---	3:30 PM --- Coffee break ---
4:00 PM	--- Coffee break ---	4:30 PM Session 2.4 - Alexander Milov (Weizmann Inst.) (until 6:10 PM) (AUD)	4:30 PM --- Coffee break ---	7:00 PM Conveners and liaisons meeting (REMOTE) (until 8:00 PM) (Online)	4:20 PM Session 5.4 - Vaia Papadimitrou (until 4:45 PM) (AUD)
4:30 AM	Session 1.4 - Enrico Scamporrin (INFN Torino) (until 6:00 PM) (AUD)	4:30 AM The complex potential at T=0 from fine lattices - Rasmus Larsen (Stavanger U.) (AUD)	4:30 AM Session 3.4 - Antonio Vairo (TUM) (until 5:50 PM) (AUD)		4:20 AM Pentaquarks at LHCb - Ivan Polyakov (CERN) (AUD)
4:30 AM	Recent results on bottomonium production in Pb-Pb collisions at ATLAS - Alexander Milov (Weizmann Institute of Science) (AUD)	4:50 AM The heavy quark diffusion constant in quenched QCD from gradient flow - Vijarti Leino (Mainz U.) (AUD)	4:30 AM Upsilon decays at Belle - Umberto Tamponi (INFN and Torino U.) (AUD)		4:45 AM QWG 2022 Closeout (until 5:15 PM) (AUD)
4:45 AM	Upsilon - underlying event correlations in pp collisions from ATLAS - Alexander Milov (Weizmann Inst.) (AUD)	5:10 AM The chromo-electric and chromo-magnetic correlators at T=0 in 2+1 flavor QCD - Luis Alencar (Bielefeld U.) (AUD)	4:50 AM Colour-octet mechanism in quarkonium decays: a lesson from $\chi_{c1} \rightarrow K^* K^0$ decays - Nikolay Kivel (TUM) (AUD)		
5:00 AM	J/psi polarization in Pb+Pb collisions in the ICEM - Vincent Cheung (LLNL) (REMOTE)	5:30 AM X(3872) and B <sub>c</sub> production in Pb-Pb collisions - Florian Damas (LLR) (AUD)	5:10 AM A novel determination of the Bc lifetime - Jason Aebischer (Zurich U.) (AUD)		
5:20 AM	Collectivity of J/psi in Heavy-Ion Collisions - Ralf Rapp (Texas U.) (REMOTE)	5:50 AM Quarkonium polarization in pp and Pb-Pb collisions from ALICE - Luca Micheletti (CERN) (AUD)	5:30 AM Search for $\bar{b}(b) \bar{c}(c) \bar{s}(s)$ and $\bar{b}(b) \bar{c}(c) \bar{d}(d)$ tetraquark bound states using lattice QCD - Marek Wagner (Frankfurt U.) (AUD)		
5:40 AM	J/psi at high pT in AA collisions - Jiming Liao (Indiana U.) (REMOTE)		7:00 PM --- Conference Dinner (Walter Schwan, Anhalten) ---		
7:00 PM	--- Reception - Foyer ---				

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Legend: Sessions (blue), Talks (grey), Breaks (pink)

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1:00 PM	--- Lunch break ---	12:50 PM --- Lunch break ---	12:45 PM --- Lunch break ---	1:55 PM ps(3686) decays with a Ka final state at BESIII - <i>Yitong Guo</i> (REMOTE)	2:00 PM Doubly charmed tetraquark at LHCb - <i>Mikhail Mikheev (HESKF)</i> (AUD)
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2:40 PM	J/psi relative yield vs relative multiplicity in pp collisions at PHENIX (REMOTE) - <i>Ming Xiong Liu (LANL)</i> (AUD)	2:40 PM Heavy quarkonium dynamics at next-to-leading order in the binding energy over temperature - <i>Antonio Vairo (TUM)</i> (AUD)	2:40 PM Interpretation of neutral charm mesons near threshold as unparticles - <i>Hans-Werner Hammer (TU Darmstadt)</i> (AUD)	2:40 PM ROUND TABLE: Naming scheme - <i>Zhang Liming Ryan Mitchell U. Tamponi Gershon Tim Christoph Harhart</i> (AUD)	2:50 PM Signature of a doubly charmed tetraquark pole in DD' scattering on the lattice - <i>Sasa Prokavsek (Ljubljana U)</i> (AUD)
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4:00 PM	--- Coffee break ---	4:30 PM Session 2.4 - <i>Alexander Milov (Weizmann Inst.)</i> (until 6:10 PM) (AUD)	4:30 PM --- Coffee break ---	7:00 PM --- Conference Dinner (Waller Schwan, Arhagen) ---	4:30 PM Convenders and lisons meeting (REMOTE) (until 6:00 PM) (Online)
4:30 PM	Session 1.4 - <i>Enrico Scamporrin (INFN Torino)</i> (until 6:00 PM) (AUD)	4:30 PM The complex potential at T=0 from fine lattices - <i>Rasmus Larsen (Stavanger U)</i> (AUD)	4:30 PM Session 3.4 - <i>Antonio Vairo (TUM)</i> (until 5:50 PM) (AUD)		4:30 PM Session 5.4 - <i>Vaia Papadimitrou</i> (until 4:45 PM) (AUD)
4:30 PM	Recent results on bottomonium production in Pb-Pb collisions at ATLAS - <i>Alexander Milov (Weizmann Institute of Science)</i> (AUD)	4:50 PM The heavy quark diffusion constant in quenched QCD from gradient flow - <i>Vijani Leino (Mainz U)</i> (AUD)	4:30 PM Upsilon decays at Belle - <i>Umberto Tamponi (INFN and Torino U)</i> (AUD)		4:45 PM QWG 2022 Closeout (until 5:15 PM) (AUD)
4:45 PM	Upsilon- underlying event correlations in pp collisions from ATLAS - <i>Alexander Milov (Weizmann Inst.)</i> (AUD)	5:10 PM The chromo-electric and chromo-magnetic correlators at T=0 in 2+1 flavor QCD - <i>Luis Alencar (Bielefeld U)</i> (AUD)	4:50 PM Colour-octet mechanism in quarkonium decays: a lesson from chi_LcJ to K K' decays - <i>Nikolay Kivel (TUM)</i> (AUD)		
5:00 PM	J/psi polarization in Pb+Pb collisions in the ICEM - <i>Vincent Cheung (LLNL)</i> (REMOTE)	5:30 PM X(3872) and B_c production in Pb-Pb collisions - <i>Florian Damas (LLR)</i> (AUD)	5:10 PM A novel determination of the Bc lifetime - <i>Jason Aebischer (Zurich U)</i> (AUD)		
5:20 PM	Collectivity of J/psi in Heavy-Ion Collisions - <i>Ralf Rapp (Texas U)</i> (REMOTE)	5:50 PM Quarkonium polarization in pp and Pb-Pb collisions from ALICE - <i>Luca Micheletti (CERN)</i> (AUD)	5:30 PM Search for B(bar{b})B(b) and B(bar{b})B(b) tetraquark bound states using lattice QCD - <i>Mare Wagner (Frankfurt U)</i> (AUD)		
5:40 PM	J/psi at high pT in AA collisions - <i>Jinling Liao (Indiana U)</i> (REMOTE)		7:00 PM --- Conference Dinner (Waller Schwan, Arhagen) ---		
7:00 PM	--- Reception - Foyer ---				

## In Summary:

- 157 Participants
- 82 Talks
- 11 Posters
- 3 Round Table Discussions

QWG 2022 - The 15th International Workshop on Heavy Quarkonium

from Monday, September 26, 2022 (8:15 AM) to Friday, September 30, 2022 (6:30 PM)  
GSI Darmstadt (AUD)

: Sessions | Talks | Breaks

AM	Sep 26, 2022	Sep 27, 2022	Sep 28, 2022	Sep 29, 2022	Sep 30, 2022
8:15 AM	Registration (until 9:30 AM) (AUD)	Session 2.1 - <a href="#">Vladyslav Shabovenko (KIT)</a> (until 10:40 AM) (AUD)	Session 3.1 - <a href="#">Claudia Patrignani (Universita' di Bologna and INFN)</a> (until 10:50 AM) (AUD)	Session 4.1 - <a href="#">Antonio Pineda</a> (until 10:45 AM) (AUD)	Session 5.1 - <a href="#">Nora Brambilla (TUM)</a> (until 10:40 AM) (AUD)
9:30 AM	Opening - <a href="#">Frank Nerling (GSI)</a> (AUD)	Probing new physics via LFV quarkonium decays - <a href="#">Xabier Marciano (Universidad Autónoma de Madrid)</a> (AUD)	Higgs boson decay to charmonia via c-quark fragmentation - <a href="#">Yang Ma (INFN Bologna)</a> (AUD)	QCD static force in gradient flow - <a href="#">Xiangpeng Wang (TUM)</a> (AUD)	Observation of the direct production of the $\chi_{c1}$ in $e^+e^-$ annihilation at BESIII - <a href="#">Riccardo Alberti (Mainz U.)</a> (AUD)
9:35 AM	Welcome - <a href="#">Paolo Giubellini (SSI)</a> (AUD)	Is $\chi_{c1}(3872)$ generated from string breaking? - <a href="#">Pedro González (Valencia U.)</a> (AUD)	nNREFTs for self-interacting dark matter - <a href="#">Simone Biondi (Basel U.)</a> (AUD)	The static force from the lattice - <a href="#">Julian Mayer-Stoucks (TUM)</a> (AUD)	Properties of Charmonium Resonances at BESIII - <a href="#">Yuping Guo (Fudan U.)</a> (REMOTE)
9:45 AM	Session 1.1 - <a href="#">Vato Kartvelishvili (Lancaster U.)</a> (until 10:45 AM) (AUD)	Search for LPV in J/psi decays at BESIII - <a href="#">Jingshu Li (Sun Yat-Sen U.)</a> (REMOTE)	Near Threshold Heavy Quarkonium Photoproduction at Large Momentum Transfer - <a href="#">Xuan-Bo Tong (Hong Kong and Shenzhen U.)</a> (REMOTE)	BES III measurements of the baryon electromagnetic form factors - <a href="#">Christoph Rosner (Mainz U.)</a> (AUD)	Charm sea effects on charmonium physics - <a href="#">Francesco Knechtli (Wuppertal U.)</a> (AUD)
9:45 AM	Multiplicity dependence of quarkonium production in pp collisions from ALICE - <a href="#">Anton Andronic (Münster U.)</a> (AUD)	Triple J/psi meson production in pp at $\sqrt{s} = 13$ TeV - <a href="#">Stefanos Laoutinas (Zurich U.)</a> (AUD)	Search for LPV and a light Higgs boson in Y(nS) decays at Belle - <a href="#">Vishal Bhardwaj (IISER Mohali)</a> (AUD)	Static Energy in (2+1+1)-Flavor Lattice QCD: Scale Setting and Charm Effects - <a href="#">Johannes Heinrich Weber (Technische Universität München)</a> (AUD)	Observation of sizeable $\chi$ contribution to $\chi_{c1}(3872) \rightarrow n\pi\pi$ J/psi decays at LHCb - <a href="#">Mikhail Mikhasenko (HESKP)</a> (AUD)
10:05 AM	Two-loop QCD corrections to exclusive J/psi+chi_cJ production at B factories - <a href="#">Jia-Yue Zhang (IHEP/JUCAST Beijing)</a> (REMOTE)	Recent ALICE results on single and double J/psi production and on collective effects in pp collisions - <a href="#">Sebastien Pagnat (CEA Saclay France)</a> (AUD)	Recent results of rare decays		
10:25 AM	Observation of multiple near-threshold structures in J/psi/psi mass spectrum at CMS - <a href="#">Jingqiang Zhang (Beijing Tsinghua U.)</a> (AUD)	--- Coffee break / Poster Session ---			
10:45 AM	--- Coffee break ---	Session 2.2 - <a href="#">Vaia Papadimitrou (FNAL)</a> (until 12:50 PM) (AUD)	Session 3.2 - <a href="#">Hua-Sheng Song</a>		
11:15 AM	Session 1.2 - <a href="#">Vato Kartvelishvili (Lancaster U.)</a> (until 1:00 PM) (AUD)	11:15 QCD factorization for hadronic quarkonium production at high $p_T$ - <a href="#">Jianwei Qiu (JLAB)</a> (AUD)	ROUND TABLE: Status, challenges and perspectives - <a href="#">Yan-Qing Ma, Jian-Xiong Wang</a>		
11:15 AM	Low-mass resonances in 4-muon channel at ATLAS - <a href="#">Hao Pang (Beijing Tsinghua U.)</a> (REMOTE)	11:35 Exclusive J/psi photoproduction in Pb-Pb UPCs at the LHC in NLO QCD - <a href="#">Vadim Guzry (Jyväskylä U.)</a> (AUD)	12:20 Quarkonium in Pythia: status and perspectives		
11:35 AM	NLO results with operator mixing for fully heavy tetraquarks in QCD sum rules - <a href="#">Ren-Hua Wu (Peking U.)</a> (REMOTE)	12:20 ROUND TABLE: Negative Cross Sections - <a href="#">Maxim Nefedov, Hee Suk Chung, Mathias Butenschön, Jianwei Qiu</a>	---- GROUP PHOTO ----		
11:55 AM	Four-quark states with charm quarks in a two-body Bethe-Salpeter approach - <a href="#">Christian Fischer (Gießen U.)</a> (AUD)	12:30 Quarkonium photoproduction in nuclear collisions at the LHC - <a href="#">Oluchan Liu (South China Normal U.)</a> (AUD)			
12:15 PM	Triangle Singularity in the Production of $T_{cc}^{++}$ and a Soft Pion - <a href="#">Kevin Ingles (Ohio State U.)</a> (AUD)				
12:35 PM	Quarkonium Production at LHCb in pp collisions				
1:00 PM	--- Lunch break ---				
2:00 PM	Session 1.3 - <a href="#">Jianwei Qiu (JLAB)</a> (until 4:00 PM) (AUD)				
2:00 PM	Inclusive Production of Heavy Quarkonia in pp collisions				
2:20 PM	Associated Production of J/psi plus W or Z bosons				
2:40 PM	J/psi relative yield vs relative multiplicity in pp collisions (AUD)				
3:00 PM	Recent results on charmonium production at Belle II (AUD)				
3:20 PM	Charmonia in modified NRQCD - <a href="#">K. Sridhar (IIT Bombay)</a>				
3:40 PM	Measurement of the cross section ratio sigma(J/psi)/sigma(e^+e^-) at HERA with the Zeus detector - <a href="#">Ada Solano (Iowa State U.)</a>				
4:00 PM	--- Coffee break ---				
4:30 PM	Session 1.4 - <a href="#">Enrico Scopcamini (INFN Torino)</a>				
4:30 PM	Recent results on bottomonium production in pp collisions - <a href="#">Institute of Science (IIS)</a> (AUD)				
4:45 PM	Upilon - underlying event correlations in pp collisions (AUD)				
5:00 PM	J/psi polarization in Pb+Pb collisions in the ICEM - <a href="#">Vincent Cheung (LLNL)</a> (REMOTE)	5:30 $\chi(3872)$ and B_c production in Pb-Pb collisions - <a href="#">Florian Damas (LLR)</a> (AUD)	5:30 A novel determination of the Bc lifetime - <a href="#">Jason Aebischer (Zurich U.)</a> (AUD)		
5:20 PM	Collectivity of J/psi in Heavy-Ion Collisions - <a href="#">Ralf Rapp (Texas U.)</a> (REMOTE)	5:50 Quarkonium polarization in pp and Pb-Pb collisions from ALICE - <a href="#">Luca Micheletti (CERN)</a> (AUD)	5:50 Search for $\bar{b}(\bar{b}')b(\bar{b})$ and $\bar{b}(\bar{b}')b(\bar{b}')$ tetraquark bound states using lattice QCD - <a href="#">Marek Wagner (Frankfurt U.)</a> (AUD)		
5:40 PM	J/psi at high pT in AA collisions - <a href="#">Jinling Liao (Indiana U.)</a> (REMOTE)				
7:00 PM	--- Reception - Foyer ---				

## In Summary:

- 157 Participants
- 82 Talks
- 11 Posters
- 3 Round Table Discussions

## Social Events:

- Reception (Mon, evening)
- Tour to FAIR construction site (Tue, lunch time)
- Conference Dinner (Wed, evening)

(all free of charge)

# QwG 2022

## Monday, Sep. 26, 2022

26 Sep 2022		
08:15	Registration (until 09:30) (AUD)	🔗-
09:30	Opening - Frank Nerling (GSI) (AUD)	🔗-
09:35	Welcome - Paolo Giubellino (GSI) (AUD)	🔗-
09:45	Session 1.1 - Vato Kartvelishvili (Lancaster U) (until 10:45) (AUD)	🔗-
09:45	Multiplicity dependence of quarkonium production in pp collisions from ALICE - Anton Andronic (Münster U) (AUD)	🔗-
10:05	Two-loop QCD corrections to exclusive $J/\psi + \text{ch}_i\text{c}_j$ production at B factories - Jia-Yue Zhang (IHEP/UCAS Beijing) (REMOTE)	🔗-
10:25	Observation of multiple near-threshold structures in $J/\psi$ mass spectrum at CMS - Jingqing Zhang (Beijing Tsinghua U) (AUD)	🔗-
10:45	--- Coffee break ---	
11:15	Session 1.2 - Vato Kartvelishvili (Lancaster U) (until 13:00) (AUD)	🔗-
11:15	Low-mass resonances in 4-muon channel at ATLAS - Hao Pang (Beijing Tsinghua U) (REMOTE)	🔗-
11:35	NLO results with operator mixing for fully heavy tetraquarks in QCD sum rules - Ren-Hua Wu (Peking U) (REMOTE)	🔗-
11:55	Four-quark states with charm quarks in a two-body Bethe-Salpeter approach - Christian Fischer (Giessen U) (AUD)	🔗-
12:15	Triangle Singularity in the Production of $T_{cc}^+$ and a Soft Pion - Kevin Ingles (Ohio State U) (AUD)	🔗-
12:35	Quarkonium Production at LHCb in pp collisions - Valeriia Zhovkovska (Orsay-ILCLAB) (REMOTE)	🔗-
13:00	--- Lunch break ---	
14:00	Session 1.3 - Jianwei Qiu (JLAB) (until 16:00) (AUD)	🔗-
14:00	Inclusive Production of Heavy Quarkonia in pNRQCD - Hee Sok Chung (TUM) (AUD)	🔗-
14:20	Associated Production of $J/\psi$ plus W or Z bosons at NLO - Mathias Butenschoen (Hamburg U) (AUD)	🔗-
14:40	$J/\psi$ relative yield vs relative multiplicity in pp collisions at PHENIX (REMOTE) - Ming Xiong Liu (LANL) (AUD)	🔗-
15:00	Recent results on charmonium production at ATLAS (inclusive and/or associative) - Charles Burton (Texas U) (AUD)	🔗-
15:20	Charmonia in modified NRQCD - K. Sridhar (Azim Premji U) (REMOTE)	🔗-
15:40	Measurement of the cross section ratio $\sigma(\text{psi}2S)/\sigma(\text{psi}1S)$ in exclusive photoproduction at HERA with the Zeus detector - Ada Solano (Turin U. and INFN Turin) (REMOTE)	🔗-
16:00	--- Coffee break ---	
16:30	Session 1.4 - Enrico Scomparin (INFN Torino) (until 18:00) (AUD)	🔗-
16:30	$J/\psi$ at high pT in AA collisions - Jinfeng Liao (Indiana U) (REMOTE)	🔗-
16:50	Recent results on bottomonium production in Pb-Pb collisions at ATLAS - Alexander Milov (Weizmann Inst.) (AUD)	🔗-
17:05	Upsilon - underlying event correlations in pp collisions from ATLAS - Alexander Milov (Weizmann Inst.) (AUD)	🔗-
17:20	$J/\psi$ polarization in Pb+Pb collisions in the ICEM - Vincent Cheung (LLNL) (REMOTE)	🔗-
17:40	Collectivity of $J/\psi$ in Heavy-Ion Collisions - Ralf Rapp (TAMU) (REMOTE)	🔗-
19:00	--- Reception ---	

# QwG 2022

## Tuesday, Sep. 27, 2022

27 Sep 2022		
09:00	Session 2.1 - Vladyslav Shtabovenko (KIT) (until 10:40) (AUD)	🔗-
09:00	Probing new physics via LFV quarkonium decays - Xabier Marcano (Universidad Autónoma de Madrid) (AUD)	🔗-
09:20	Is $\chi_{c1}(3872)$ generated from string breaking? - Pedro González (Valencia U) (AUD)	🔗-
09:40	Search for LFV in $J/\psi$ decays at BESIII - Jingshu Li (Sun Yat-Sen U) (REMOTE)	🔗-
10:00	Triple $J/\psi$ meson production in pp at $\sqrt{s} = 13$ TeV - Stefanos Leontsinis (Zurich U) (AUD)	🔗-
10:20	Recent ALICE results on single and double $J/\psi$ production and on collective effects in pp collisions - Sebastien Perrin (CEA Saclay France) (AUD)	🔗-
10:40	--- Coffee break / Poster Session ---	
11:15	Session 2.2 - Vaia Papadimitriou (FNAL) (until 12:50) (AUD)	🔗-
11:15	QCD factorization for hadronic quarkonium production at high $p_T$ - Jianwei Qiu (JLAB) (AUD)	🔗-
11:35	Exclusive $J/\psi$ photoproduction in Pb-Pb UPCs at the LHC in NLO QCD - Vadim Guzey (Jyväskylä U) (AUD)	🔗-
12:00	ROUND TABLE: Negative Cross Sections - Maxim Nefedov Hee Sok Chung Mathias Butenschoen Jianwei Qiu (AUD)	🔗-
12:30	Quarkonium photoproduction in nuclear collisions at the LHC - Q. Liu (Guangzhou U) (AUD)	🔗-
12:50	--- Lunch break ---	
13:40	--- FAIR Construction Site Tour ---	
14:20	Session 2.3 - Johannes Weber (TUM and Humboldt U.) (until 16:00) (AUD)	🔗-
14:20	Phenomenological study of quarkonium suppression and of the energy gap between singlets and octets - Miguel Escobedo (San Sebastian U) (AUD)	🔗-
14:40	Heavy quarkonium dynamics at next-to-leading order in the binding energy over temperature - Antonio Vairo (TUM) (AUD)	🔗-
15:00	Recent results on Upsilon production in nuclear collisions from CMS - J. Park (Korea U) (AUD)	🔗-
15:20	Recent ALICE results on $\psi(2S)$ production in Pb-Pb collisions - E. Scomparin (INFN Torino) (AUD)	🔗-
16:00	--- Coffee break ---	
16:30	Session 2.4 - Alexander Milov (Weizmann Inst.) (until 18:10) (AUD)	🔗-
16:30	The complex potential at $T > 0$ from fine lattices - Rasmus Larsen (Stavanger U) (AUD)	🔗-
16:50	The heavy quark diffusion constant in quenched QCD from gradient flow - V. Leino (Mainz U) (AUD)	🔗-
17:10	The chromo-electric and chromo-magnetic correlators at $T > 0$ in 2+1 flavor QCD - L. Altenkort (Bielefeld U) (AUD)	🔗-
17:30	$\chi(3872)$ and $B_c$ production in Pb-Pb collisions - F. Damas (LLR) (AUD)	🔗-
17:50	Quarkonium polarization in pp and Pb-Pb collisions from ALICE - Luca Micheletti (CERN) (AUD)	🔗-

# QwG 2022

Wednesday, Sep. 28, 2022

28 Sep 2022	
09:00	<b>Session 3.1 - Claudia Patrignani (Universita' di Bologna and INFN) (until 10:50) (AUD)</b>
09:00	Higgs boson decay to charmonia via c-quark fragmentation - Yang Ma (INFN Bologna) (AUD)
09:20	pNREFTs for self-interacting dark matter - Simone Biondini (Basel U) (AUD)
09:40	Near Threshold Heavy Quarkonium Photoproduction at Large Momentum Transfer - Xuan-Bo Tong (Hong Kong and Shenzhen U) (REMOTE)
10:00	Search for LFV and a light Higgs boson in Y(nS) decays at Belle - Vishal Bhardwaj (IISER Mohali) (AUD)
10:25	Recent results of rare decay searches at BESIII - Guangyi Zhang (Henan Normal U) (REMOTE)
10:50	--- Coffee break ---
11:20	<b>Session 3.2 - Hua-Sheng Shao (LPTHE Paris) (until 12:45) (AUD)</b>
11:20	ROUND TABLE: Status, challenges and prospects of SDC calculations for quarkonium production - Pietro Faccioli Yan-Qing Ma Jian-Xiong Wang Hua-Sheng Shao Hee Sok Chung Valerio Bertone (AUD)
12:20	Quarkonium in Pythia : status and perspectives - Leif Lonnblad (Lund U) (AUD)
12:40	----- GROUP PHOTO ----- (AUD)
12:45	--- Lunch break ---
14:00	<b>Session 3.3 - Roberto Mussa (until 16:00) (AUD)</b>
14:00	Quarkonium Monte Carlo event generators at the LHC : status and issues - Carlos Lourenco (CERN) (AUD)
14:20	NLOAccess : web event generators - Carlo Fiore (IJCLab Orsay) (AUD)
14:40	Interpretation of neutral charm mesons near threshold as unparticles - Hans Hammer (Ohio State U) (AUD)
15:00	Is Zcs(3982) a molecular partner of Zc(4020) and Zc(4020) states? - Vadim Baru (Ruhr-Universität Bochum) (AUD)
15:20	Coupled-channel approach to T <sub>cc</sub> <sup>+</sup> including three-body effects - Christoph Hanhart (FZ Jülich) (AUD)
15:40	Quarkonium hybrid decays - Abhishek Mohapatra (AUD)
16:00	--- Coffee break ---
16:30	<b>Session 3.4 - Antonio Vairo (TUM) (until 18:10) (AUD)</b>
16:30	Upsilon decays at Belle - Umberto Tamponi (AUD)
16:50	Colour-octet mechanism in quarkonium decays: a lesson from chi <sub>cj</sub> -> K K* decays - Nikolai Kivel (AUD)
17:10	Bc decays at LHC experiment - TBD (AUD)
17:30	A novel determination of the Bc lifetime - Jason Aebischer (AUD)
17:50	Search for $\bar{b}b\bar{u}u$ and $\bar{b}b\bar{c}c$ tetraquark bound states using lattice QCD - Marc Wagner (Frankfurt U) (AUD)
19:00	--- Conference Dinner (Weißer Schwan, Arheilgen) ---

# QwG 2022

Thursday, Sep. 29, 2022

29 Sep 2022	
09:00	<b>Session 4.1 - Antonio Pineda (until 10:45) (AUD)</b>
09:00	QCD static force in gradient flow - Xiangpeng Wang (TUM) (AUD)
09:20	The static force from the lattice - Julian Mayer-Stuedte (TUM) (AUD)
09:40	BES III measurements of the baryon electromagnetic form factors - Christoph Rosner (Mainz U) (AUD)
10:05	Static Energy in (2+1+1)-Flavor Lattice QCD: Scale Setting and Charm Effects - Johannes Weber (TUM and Humboldt U.) (AUD)
10:25	Renormalons and the static potential - Hiromasa Takaura (KEK) (AUD)
10:45	--- Coffee break ---
11:15	<b>Session 4.2 - Ryan Mitchell (until 12:55) (AUD)</b>
11:15	Three-loop QCD corrections to quarkonia electroweak decay - Zhewen Mo (AUD)
11:35	eta <sub>c</sub> (2S) and h <sub>c</sub> decays at BESIII - Jielei Zhang (REMOTE)
11:55	Study of chi <sub>cj</sub> decays at BESIII - Zhiyong Wang (REMOTE)
12:15	J/psi radiative decay from lattice QCD - Xiangyu Jiang (AUD)
12:35	Measurements of psi(3686) decays to baryon pairs at BESIII - Qingping Ji (REMOTE)
12:55	--- Lunch break ---
13:55	<b>Session 4.3 - Tim Gershon (until 15:55) (AUD)</b>
13:55	psi(3686) decays with a Ks final state at BESIII - Yitong Guo (REMOTE)
14:15	BES III results on the other hadronic cross section in e+e- - Christoph Redmer (Mainz U) (AUD)
14:40	ROUND TABLE: Naming scheme - Zhang Liming Ryan Mitchell U. Tamponi Gershon Tim Christoph Hanhart (AUD)
15:10	From the line shape of the X(3872) to its structure - Antonio Polosa (AUD)
15:30	Heavy Quarkonium Spectroscopy with PANDA - Johan Messchendorp (GSI) (AUD)
15:55	--- Coffee break / Poster Session ---
19:00	<b>Conveners and Iasons meeting (REMOTE) (until 20:00) (Online)</b>



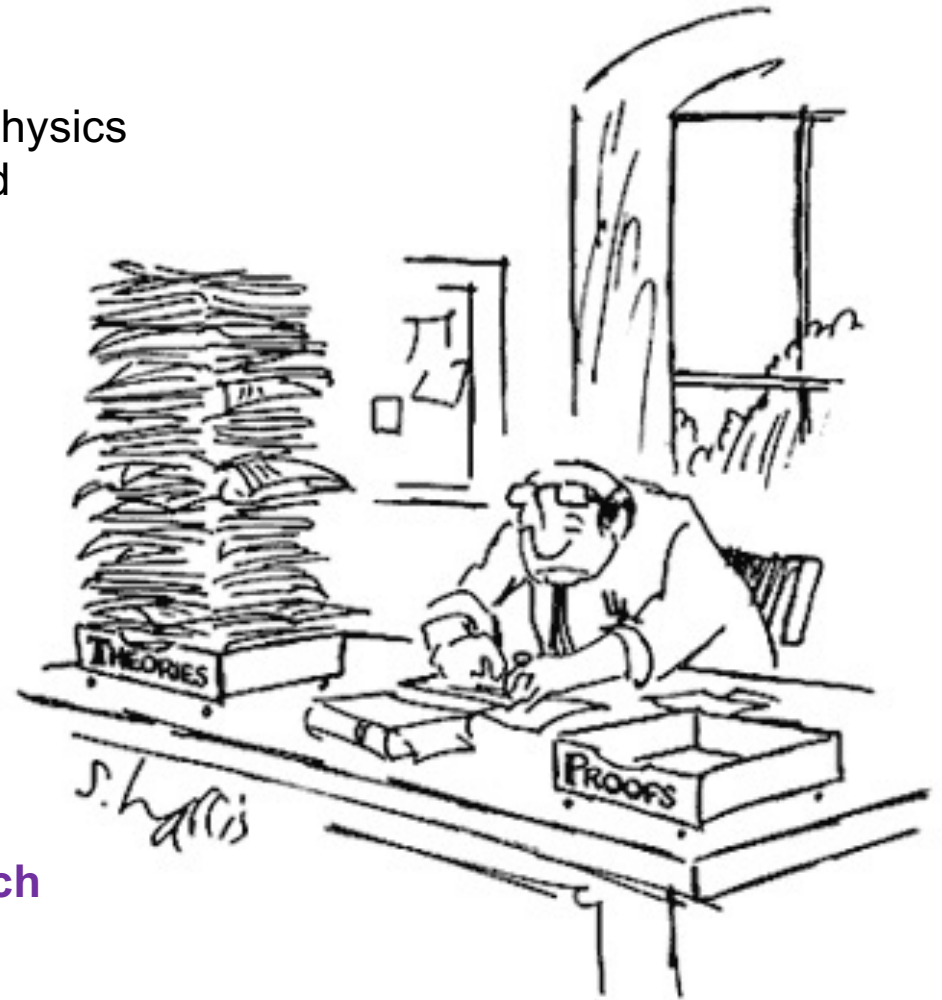
# QWG 2022

Friday, Sep. 30, 2022

30 Sep 2022		
09:00	<b>Session 5.1 - Nora Brambilla (TUM)</b> (until 10:40) (AUD)	
09:00	Observation of the direct production of the $\chi_{c1}$ in e+e- annihilation at BESIII - <b>Riccardo Aliberti (Mainz U)</b> (AUD)	
09:20	Properties of Charmonium Resonances at BESIII - <b>Yuping Guo (Fudan U)</b> (REMOTE)	
09:40	Charm sea effects on charmonium physics - <b>Francesco Knechtli (Wuppertal U)</b> (AUD)	
10:00	Observation of sizeable $\omega$ contribution to $\chi_{c1}(3872) \rightarrow \pi^+\pi^-\psi$ decays at LHCb - <b>Mikhail Mikhasenko (HISKP)</b> (AUD)	
10:20	Updates on the X(3872) at BESIII - <b>Chunhua Li (Liaoning Normal U)</b> (REMOTE)	
10:40	--- Coffee break ---	
11:10	<b>Session 5.2 - Joan Soto (Barcelona U)</b> (until 13:00) (AUD)	
11:10	Observation of a charmonium-like state in Ds+ Ds- at LHCb - <b>Chen Chen (Beijing Tsinghua U)</b> (AUD)	
11:35	Properties of the $\psi(3823)$ at BESIII - <b>Zhiqing Liu (Shandong U)</b> (REMOTE)	
11:55	Y decays to charmonium at BESIII - <b>Lianjin Wu (IHEP)</b> (AUD)	
12:20	Energy scan results at Belle II - <b>Bryan Fulsom (PNNL)</b> (AUD)	
12:40	Observation of a Neutral Zcs at BESIII - <b>Ruiting Ma (UCAS)</b> (REMOTE)	
13:00	--- Lunch break ---	
14:00	<b>Session 5.3 - Roberto Mussa</b> (until 15:50) (AUD)	
14:00	Doubly charmed tetraquark at LHCb - <b>Mikhail Mikhasenko (HISKP)</b> (AUD)	
14:30	T <sub>cc</sub> +(3875) relevant D*D* scattering from N <sub>f</sub> =2 lattice QCD - <b>Chunjiang Shi (IHEP Beijing)</b> (REMOTE)	
14:50	Signature of a doubly charm tetraquark pole in DD* scattering on the lattice - <b>Sasa Prelovsek (Ljubljana U)</b> (AUD)	
15:10	Doubly charmed baryons at LHCb - <b>Tim Gershon (Warwick U)</b> (AUD)	
15:30	Perspectives at the EicC - <b>Feng-Kun Guo</b> (REMOTE)	
15:50	--- Coffee break ---	
16:20	<b>Session 5.4 - Vaia Papadimitriou</b> (until 17:10) (AUD)	
16:20	Pentaquarks at LHCb - <b>Ivan Polyakov (CERN)</b> (AUD)	
16:45	<b>QWG 2022 Closeout</b> (until 17:15) (AUD)	

This series of QWG workshops is organised to

- Overview latest results in our exciting field of heavy quarkonia, experimentally and theoretically
- Define the substantial aspects of quarkonium physics to promote discussions among the experts, and thus, to support experimental measurements and theoretical progress
- Discuss the perspectives and opportunities in view of upcoming facilities and experiments



Let me wish us a very interesting workshop  
with lively discussions – **thank you very much**  
**for your participation!**