

**The Fourth School in Spectrum Management
for Radio Astronomy**

**Joint ALMA Observatory Office, Santiago, Chile
7-13 April 2014**

Sponsored by NSF, IUCAF, ALMA, CORF, CRAF, RadioNet and RAFCAP

**Venue: Joint ALMA Observatory (JAO) Office,
Av. Alonso de Cordova 3107,
Vitacura Santiago, Chile**

Scientific Organizing Committee:

M. Ohishi (Japan) – **Chair**, A. Tzioumis (Australia), D. DeBoer (USA), H. van der Marel (The Netherlands), T. Gergely (USA), Y. Murata (Japan), W. Baan (China, The Netherlands), G. Langston (USA)

Local Organizing Committee:

T. Gergely (USA) – **Chair**, H.S. Liszt (USA), A. Tzioumis (Australia), R. Ogasawara (Chile)

Program

Monday, 7 April, 2014

08:30 – 09:00 Registration

09:00 Introduction

Tzioumis

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|---|------------------------------|
| Greetings..... | Pierre Cox (Director, JAO) 5 |
| Welcome: ALMA/ESO..... | F. Comeron (ESO) 10 |
| ALMA/NRAO | E. Hardy (NRAO) ...10 |
| ALMA (NAOJ) | T. Hasegawa (NAOJ) 10 |
| IUCAF | M. Ohishi (NAOJ) 10 |
| Spectrum Management:View from the Chilean Administration | M. Rodriguez(SUBTEL) 20 |
| Introduction of participants: Why am I here? What do I expect to get out of it? | (All) 30 |
| Administrative Details | 10 |
| (110 min) | |

10:45-11:00 Coffee Break

11:00 Radio Astronomy and the Spectrum School

Ohishi

ALMA: Description and details..... P. Cox (Director, JAO) 45
The Primary Purpose of the School T. Gergely (NSF) 15
Radio astronomy and radio telescopes A. Tzioumis (CSIRO) 30
(90 min)

12:30-14:00 Lunch

14:00 Radio Science & Technology— I

Van der Marel

Radio science and engineering basics.....A. Clegg (Google) 90
(90 min)

15:30- 15:45 Break

15:45 – 17:15 Radio Science & Technology— II

Van der Marel

Mm-wave Propagation: fundamentals and models..... H. Suzuki (CSIRO) 30
Mm-Wave Instrumentation..... D. Rabanus (ALMA) 60

Tuesday, 8 April 2014

9:00 Remote Sensing & Space RA Observations

Gergely

Earth Exploration Satellite Service: Frequency Allocation and Remote Sensing of our
Changing Earth from 1 GHz to 3 THz..... S. Reising (Colo State U)/T. Gaier (JPL) 40
EESS– passive and active. V.Meens (CNES) 25
Space RA observations, Far Side of the Moon, L2 pointG. Langston (NSF) 25
Active remote sensing from space: a constructive use
of the radio spectrum P. Siquieira (U Mass) 25
(105 min)

10:45-11:00 Coffee Break

11:00 Compatibility Studies

Gergely

Compatibility and aggregate interferenceH.van der Marel (Astron) (90)
(90 min)

12:30 -14:00 Lunch

14:00 Interference to Radio Astronomy I

..... Chung

The RAS protected bands and use by RAT. Tzioumis (CSIRO) 30
Interference to RA and RFI mitigation techniquesK. Warnick (BYU) 60
Destructive Interference in RAH. Liszt (NRAO) 30
(120 min)

16:00-16:15 Break

16:15 Interference to Radio Astronomy II Chung

Harmful (Detrimental) levels/Non-linearities..... D. DeBoer (U Berkeley) 45
Mm-wave Interference issuesH. Liszt (NRAO) 30
Low Frequencies: RFI's Playground..... D.DeBoer (U Berkeley) 45
(120 min)

Wednesday, 9 April 2014

09:00 The International Regulatory Structure Clegg

International spectrum management system..... V. Nozdrin (ITU) 30
The ITU-D and the SMTP Program..... (pres. By T. Gergely)(ITU-D) 15
WRC's and WRC preparationT. Gergely (NSF) 45
IUCAF's role.M. M. Ohishi (NAOJ) 15
(105 min)

10:45-11:00 Coffee Break

**11:00 National and Regional Regulatory Structures and how they feed into the
International structure Clegg**

USA, FCC, NTIA, CORFG.Langston (NSF) 15
Americas, CITEL T. Gergely (NSF) 10
CORF Initiatives. D. Lang (CORF) 15
Asia-Pacific Region, APT, RAFCAP K. Chung (KASI) 15
RAS Protection in China..... H. Zhang (Chinese Academy of Sciences) 20
Developments in the African Region..... Matlhane (SKA S. Africa) 15
Europe, CEPT, CRAF.....H. Van der Marel (ASTRON) 30

13:00-14:00 Lunch

Afternoon: Free

20:00-22:00 Spectrum School Dinner (Optional)

Thursday, 10 April 2014

9:00 The Regulatory Structure in Practice

DeBoer

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| ITU-R Recommendations, RA series | M. Ohishi (NAOJ) 60 |
| ITU-R Reports, RA series | M. Ohishi (NAOJ) 30 |
| The ITU-R Radio Astronomy Handbook (105 min) | A. Tzioumis (CSIRO) 15 |

10:45-11:00 Break

11:00 The Regulatory Structure in Practice II

DeBoer

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| ITU Registration | T. Gergely (NSF) 15 |
| Coordination with Satellites (CLOUDSAT, LEOs, etc)..... | H. Liszt (NRAO) 30 |
| Radio Quiet Zones and SKA..... | R. Millenaar (ASTRON) 30 |
| Dynamic scheduling and coordination agreements (95 min) | A. Clegg (Google) 20 |

12:35-14:00 Lunch

14:00 New Technologies and Unlicensed Devices Liszt

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| Software-defined & Cognitive Radio ... P.Thomasson/H. van der Marel (U Cambridge) 20 | |
| EMC..... | M. Ohishi (NAOJ) 20 |
| 608 MHz issues (TV Channel 37) | A. Clegg (Google) 20 |
| MSS – Iridium issues- Europe | H. van der Marel (ASTRON) 20 |
| MSS – Iridium issues- USA | A. Clegg (Google) 20 |
| Vehicular Radar | G. Langston (NSF) 20 |

16:00-16:15 Break

16:15 RFI Monitoring

Liszt

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| RFI monitoring: requirements, techniques, recent campaigns and results for the SKA..... | H. Millenaar (ASTRON) 45 |
| Radio Frequency Interference: Equipment and Measurements..... (65 minutes) | G. Gancio (IAR) 20 |

Friday, 11 April 2014

09:30 Conclusion

Gergely/Ohishi/Tzioumis

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| Spectrum management and radio astronomy: The future. A view from the other side | A. Clegg (Google) 30 |
| Open discussion: How to ensure the protection of the RA..... (90 min) | All 60 |

11:30 WORKSHOP ENDS

11:30 -12:30 LUNCH

13:00 DEPARTURE TO AIRPORT