Proposal Review Process
In response to the Call for Proposals for Cycle 4, ALMA received 1571 proposals by the 21 April 2016 submission deadline. The proposals were reviewed during a meeting in Vienna (Austria) on June 19–24. The review committee consisted of 18 ALMA Review Panels (ARPs), each comprising eight Science Assessors. The panels were distributed across five scientific categories:

1. Cosmology and the high redshift universe (4 panels)
2. Galaxies and galactic nuclei (4 panels)
3. ISM, star formation and astrochemistry (4 panels)
4. Circumstellar disks, exoplanets and the solar system (4 panels)
5. Stellar evolution and the Sun (2 panels).

Science Assessors were selected on the basis of scientific specialization while having the regional affiliation of the ARP members closely match the nominal ALMA regional shares of observing time. The 18 ARP Chairs served on the ALMA Proposal Review Committee (APRC), together with the APRC Chair, Anneila Sargent. The full list of Cycle 4 Science Assessors is given in the Appendix.

The proposal review process was carried out as described in the ALMA Cycle 4 Proposer’s Guide. The Joint ALMA Observatory (JAO) created an observing queue and assigned a priority grade to each proposal after considering the scientific rank from the APRC, the share of observing time for each region, and scheduling feasibility to avoid oversubscribing configurations and LST ranges.

Proposal statistics
Of the 1571 proposals submitted, 135 received the highest priority of Grade A, 340 received Grade B, and 232 received Grade C. Grades A and B were assigned such that the observing time on the 12m Array for each region corresponds to the regional share based on the 3000 h offered in Cycle 4. The titles, investigators, and abstracts of the Grade A and B projects are available from the ALMA Science Portal. Tables 1 and 2 list the number and requested time for all proposals grouped by region and science category, respectively. Various metrics of the proposal data are presented in the figures.

In Cycle 4, Large Proposals and VLBI proposals were accepted for the first time. Six proposals for 1mm VLBI and three for 3mm VLBI were accepted by both ALMA and the respective VLBI network. Two Large Proposals were accepted: ASPECS: The ALMA Spectral Line Survey in the UDF (P.I.: Fabian Walter) and Small-scale Substructures in Protoplanetary Disks (P.I.: Sean Andrews). Table 3 lists the number of Grade A and B projects for different proposal types.
### Table 1. Distribution of Cycle 4 proposals by region

<table>
<thead>
<tr>
<th>Region</th>
<th>Chile (CL)</th>
<th>East Asia (EA)</th>
<th>Europe (EU)</th>
<th>North America (NA)</th>
<th>Open Skies</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Submitted Proposals</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Number of Proposals</td>
<td>100</td>
<td>341</td>
<td>657</td>
<td>428</td>
<td>45</td>
<td>1571</td>
</tr>
<tr>
<td>12m Array time (hours)</td>
<td>919</td>
<td>2573</td>
<td>4919</td>
<td>3594</td>
<td>282</td>
<td>12286</td>
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<tr>
<td>7m Array time (hours)</td>
<td>397</td>
<td>1201</td>
<td>1539</td>
<td>1534</td>
<td>59</td>
<td>4730</td>
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<tr>
<td>Total Power Array time (hours)</td>
<td>337</td>
<td>1385</td>
<td>1214</td>
<td>1249</td>
<td>62</td>
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<td>Subscription rate</td>
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<tr>
<td>12m Array (1800 h offered)</td>
<td>3.1</td>
<td>3.8</td>
<td>4.9</td>
<td>3.5</td>
<td>-</td>
<td>4.1</td>
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<tr>
<td>7m Array (1800 h offered)</td>
<td>2.2</td>
<td>3.0</td>
<td>2.5</td>
<td>2.5</td>
<td>-</td>
<td>2.6</td>
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<tr>
<td>Total Power Array (1800 h offered)</td>
<td>1.9</td>
<td>3.4</td>
<td>2.0</td>
<td>2.1</td>
<td>-</td>
<td>2.4</td>
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<tr>
<td>Grade A and B Projects</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of projects</td>
<td>38</td>
<td>109</td>
<td>161</td>
<td>153</td>
<td>14</td>
<td>475</td>
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<tr>
<td>12m Array time (hours)</td>
<td>294</td>
<td>696</td>
<td>1000</td>
<td>1011</td>
<td>79</td>
<td>3080</td>
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<tr>
<td>7m Array time (hours)</td>
<td>70</td>
<td>259</td>
<td>171</td>
<td>304</td>
<td>6</td>
<td>811</td>
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<tr>
<td>Total Power Array time (hours)</td>
<td>67</td>
<td>190</td>
<td>76</td>
<td>111</td>
<td>6</td>
<td>450</td>
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<td>Grade C Projects</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Number of projects</td>
<td>17</td>
<td>40</td>
<td>123</td>
<td>47</td>
<td>5</td>
<td>232</td>
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<tr>
<td>12m Array time (hours)</td>
<td>101</td>
<td>267</td>
<td>681</td>
<td>290</td>
<td>31</td>
<td>1369</td>
</tr>
<tr>
<td>7m Array time (hours)</td>
<td>69</td>
<td>114</td>
<td>342</td>
<td>62</td>
<td>16</td>
<td>604</td>
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<tr>
<td>Total Power Array time (hours)</td>
<td>8</td>
<td>146</td>
<td>212</td>
<td>28</td>
<td>28</td>
<td>395</td>
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</table>

### Table 2. Distribution of Cycle 4 proposals by scientific category

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Proposals</th>
<th>Category Time (hours)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>355</td>
<td>351</td>
<td>317</td>
</tr>
<tr>
<td>Category 2</td>
<td>380</td>
<td>317</td>
<td>2011</td>
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<tr>
<td>Category 3</td>
<td>351</td>
<td>2175</td>
<td>233</td>
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<tr>
<td>Category 4</td>
<td>317</td>
<td>2175</td>
<td>233</td>
</tr>
<tr>
<td>Category 5</td>
<td>168</td>
<td>1007</td>
<td>233</td>
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</tbody>
</table>

### Table 3. Number of proposals and Grade A & B projects by proposal type

<table>
<thead>
<tr>
<th>Proposal Type</th>
<th>Number Submitted</th>
<th>Number Grade A &amp; B</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>1571</td>
<td>475 (30%)</td>
</tr>
<tr>
<td>ACA</td>
<td>315</td>
<td>79 (25%)</td>
</tr>
<tr>
<td>ACA Standalone</td>
<td>30</td>
<td>5 (17%)</td>
</tr>
<tr>
<td>Large Programs</td>
<td>27</td>
<td>2 (7%)</td>
</tr>
<tr>
<td>Polarization</td>
<td>90</td>
<td>45 (50%)</td>
</tr>
<tr>
<td>Solar</td>
<td>53</td>
<td>15 (28%)</td>
</tr>
<tr>
<td>Target of Opportunity</td>
<td>21</td>
<td>13 (62%)</td>
</tr>
<tr>
<td>VLBI</td>
<td>22</td>
<td>9 (41%)</td>
</tr>
</tbody>
</table>
Figure 1. Distribution of execution time for Grade A and B projects by region for the 12-m (left), the 7-m (center), and the Total Power (right) arrays.

Figure 2. Distribution of execution time for Grade A and B projects by science category for the 12-m (left), the 7-m (center), and the Total Power (right) arrays. The definitions of the categories are provided in the text.

Figure 3. Distribution of execution time for Grade A and B projects by receiver band for the 12-m (left), 7-m Array (center), and Total Power (right) arrays.
Figure 4. Number of proposals submitted as a function of the 12-m Array execution time, excluding Large Proposals. The median requested 12m time per proposal is 5.5 h, which is a 17% increase over Cycle 3.

Figure 5. The fraction of proposals assigned priority Grade A and B as a function of the estimated 12m Array time. Uncertainties represent 68% (1σ) confidence intervals for a binomial proportion.
Figure 6. Breakdown of the Grade A and B projects by scientific keyword, across all ALMA scientific categories. For each science keyword, the number of proposals in which it is selected is indicated.

Figure 7. Distribution of the amount of 12-m Array time per LST as a function of LST for the array configurations offered in Cycle 4. The red, orange, and blue histograms indicate Grade A, B, and C projects, respectively. The dotted line in each panel shows the expected amount of observing time available for the configuration.
Appendix: Cycle 4 APRC and ARP members

![Regional distribution of the Cycle 4 APRC and ARP members](image)

**APRC chair:**
Anneila Sargent  
California Institute of Technology (USA)

**APRC and ARP members:**
- Jose Afonso  
  Instituto de Astrofísica e Ciências do Espaço (Portugal)
- Manuel Aravena  
  Universidad Diego Portales (Chile)
- Roberto Assef  
  Universidad Diego Portales (Chile)
- Maarten Baes  
  Ghent University (Belgium)
- Franz Bauer  
  Catolica of Chile, Pontifica University (Chile)
- Amelia Bayo  
  Valparaiso, University of (Chile)
- Tracy Beck  
  Space Telescope Science Institute (USA)
- Rachel Bezanson  
  Arizona, University of (USA)
- Hans Boehringer  
  Max-Planck-Institute for Extraterrestrial Physics (Germany)
- Frederic Boone  
  Toulouse Observatory (France)
- Marusa Bradac  
  California, Davis, University of (USA)
- Elias Brinks  
  Hertfordshire, University of (United Kingdom)
- Marcella Brusa  
  Bologna, University of (Italy)
- Daniela Calzetti  
  Massachusettes at Amherst, University of (USA)
- Simon Casassus  
  Chile, University of (Chile)
- Caitlin Casey  
  University of Texas at Austin, Department of Astronomy (USA)
- Tzu-Ching Chang  
  Academia Sinica (Taiwan)
- Ranga Chary  
  California Institute of Technology (USA)
- Isabelle Cherchneff  
  Basel, University of (Switzerland)
- Aeree Chung  
  Yonsei University (South Korea)
- Lucas Cieza  
  Universidad Diego Portales (Chile)
- Cathie Clarke  
  Cambridge, University of (United Kingdom)
- Luis Colina  
  Centro de astrobiología (INTA-CSIC) (Spain)
- Martin Cordiner  
  National Aeronautics and Space Administration (USA)
- Diane Cormier  
  Heidelberg, University of (Germany)
Alessandra Corsi, Texas Tech University (USA)
Emanuele Daddi, CEA Saclay (France)
Imke de Pater, California, Berkeley, University of (USA)
Miroslava Dessauges-Zavadsky, Geneva, University of (Switzerland)
Mark Dickinson, National Optical Astronomy Observatory (USA)
Ana Duarte Cabral, Exeter, University of (United Kingdom)
Michael Dunham, Harvard-Smithsonian Center for Astrophysics (USA)
Ken Ebisawa, Japan Aerospace Exploration Agency (Japan)
Barbara Ercolano, Munich, University of (Germany)
Duncan Farrah, Virginia Polytechnic Institute & State University (USA)
Davide Fedele, INAF (Italy)
Yanga Fernandez, Central Florida, University of (USA)
Jacqueline Fischer, Naval Research Laboratory (USA)
Dale Gary, New Jersey Institute of Technology (USA)
Maryvonne Gerin, Paris Observatory (France)
Sarah Gibson, University Corporation for Atmospheric Research (USA)
Uma Gorti, National Aeronautics and Space Administration (USA)
Jane Greaves, Cardiff University (United Kingdom)
Pin-Gao Gu, Academia Sinica (Taiwan)
Antoine Gusdorf, ENS, Paris (France)
Graham Harper, Colorado at Boulder, Univ of (USA)
Jennifer Hatchell, Exeter, University of (United Kingdom)
Petr Heinzel, Astronomical Institute, Academy of Sciences of the Czech Republic (Czech Republic)
Tomoya Hirota, National Astronomical Observatory of Japan (Japan)
Martin Houde, Western Ontario, University of (Canada)
Annie Hughes, Institut de Recherche en Astrophysique et Planétologie (France)
Charles Hull, Harvard-Smithsonian Center for Astrophysics (USA)
Edo Ibar, Valparaiso, University of (Chile)
Akio Inoue, Osaka Sangyo University (Japan)
Andrea Isella, Rice University (USA)
Pascale Jablonka, Lausanne, Technical Federal School (EPFL) (Switzerland)
Knud Jahnke, Max-Planck-Institute for Astronomy (Germany)
Eric Jensen, Swarthmore College (USA)
Kelsey Johnson, Virginia, University of (USA)
Jes Jørgensen, Copenhagen, University of (Denmark)
Kay Justtanont, Chalmers University of Technology (Sweden)
Inga Kamp, University of Groningen (Netherlands)
Hyosun Kim, Academia Sinica (Taiwan)
Stefan Kimeswenger, Catolica of the North, University of (Chile)
Pamela Klaassen, UK ATC (United Kingdom)
Tadayuki Kodama, National Astronomical Observatory of Japan (Japan)
Shinya Komugi, Kogakuin University (Japan)
Agnes Kospal, Max-Planck-Institute for Astronomy (Germany)
Yi-Jehng Kuan, National Taiwan Normal University (Taiwan)
Guilaine Lagache, Paris-Sud University (France)
Claudia Lagos, International Centre for Radio Astronomy Research (Australia)
Shih-Ping Lai, National Tsing-Hua University (Taiwan)
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Chang Won Lee  
Korea Astronomy and Space Science Institute (South Korea)

Jeong-Eun Lee  
Kyung Hee University (South Korea)

Emmanuel Lellouch  
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Lihwai Lin  
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Lori Lubin  
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Sangeeta Malhotra  
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Claudia Maraston  
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Diego Mardones  
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Dan Marrone  
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Frederique Motte  
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Takayuki Muto  
Kogakuin University (Japan)

Tohru Nagao  
Ehime University (Japan)

Naomasa Nakai  
University of Tsukuba (Japan)

Hiroyuki Nakanishi  
Kagoshima University (Japan)

Jun-ichi Nakashima  
Ural Federal University (Russia)

Masatoshi Ohishi  
National Astronomical Observatory of Japan (Japan)

Monica Orienti  
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Deborah Padgett  
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Ilaria Pascucci  
Arizona, University of (USA)

Jenny Patience  
Arizona State University (USA)

Laura Perez  
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Ismael Perez-Fournon  
Astrophysical Institute of Canarias (Spain)

Ylva Pihlstrom  
New Mexico, University of (USA)

Jaime Pineda  
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Erik Rosolowsky  
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Hideo Sagawa  
Kyoto Sangyo University (Japan)

Raghvendra Sahai  
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Masao Saito  
National Astronomical Observatory of Japan (Japan)

Kazushi Sakamoto  
Academia Sinica (Taiwan)

Colette Salyk  
Vassar College (USA)

Claudia Scarlata  
Minnesota, University of (USA)

Peter Schilke  
Cologne, University of (Germany)

Marta Sewilo  
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Hiroshi Shibai  Osaka University (Japan)
Kazuhiro Shimasaku The University of Tokyo (Japan)
Snezana Stanimirovic Wisconsin at Madison, University of (USA)
Lisa Storrie-Lombardi California Institute of Technology (USA)
Eckhard Sturm Max-Planck-Institute for Extraterrestrial Physics (Germany)
Nial Tanvir Leicester, University of (United Kingdom)
Tomoka Tosaki Joetsu University of Education (Japan)
Ezequiel Treister Catolica of Chile, Pontifica University (Chile)
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Ann Wehrle Space Science Institute (USA)
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Satoshi Yamamoto The University of Tokyo (Japan)
Takaaki Yokoyama The University of Tokyo (Japan)
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