



# Einstein@Home 2012: Progress & Plans for the Future



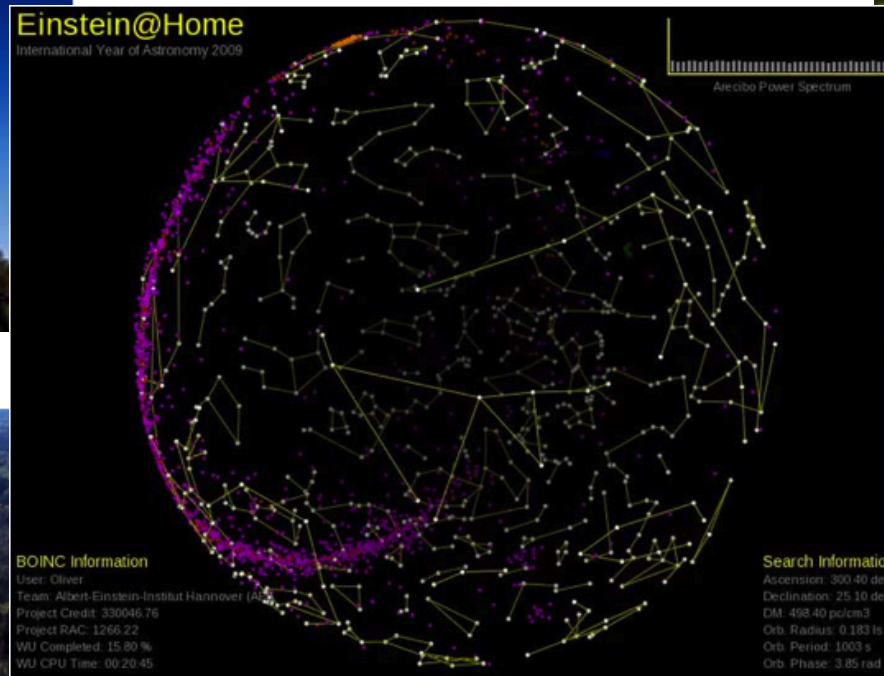
Copyright: CSIRO Australia



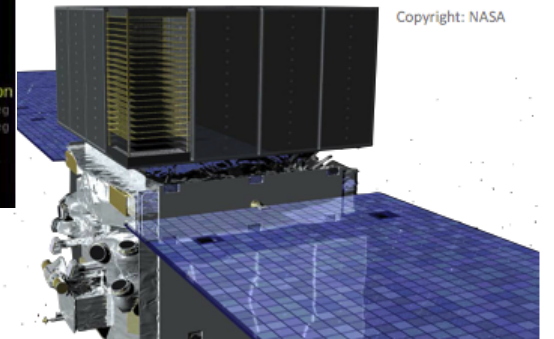
Copyright: Cornell University



Copyright: LIGO



Copyright: AEI



Copyright: NASA

Copyright: NASA

Heinz-Bernd Eggenstein,  
Albert-Einstein-Institute

8<sup>th</sup> BOINC Workshop  
Sept. 2012, London



# Introduction to Einstein@Home

What Einstein@Home is all about:

- Experimental Gravitational Physics, General Relativity
- Astronomy
- Special focus:
  - Gravitational Waves (GW): “Ripples in Space-Time”
  - Pulsars: GW & EM (Radio, Gamma)
- Join us at <http://einstein.phys.uwm.edu/>



# Introduction to Einstein@Home



- Sponsors & Stakeholders



- AEI



- LSC



MAX-PLANCK-GESELLSCHAFT

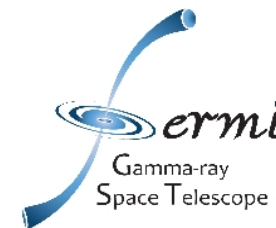


- Cooperation with

- PALFA

- Fermi/LAT

- Arecibo, Parkes, MPIfR,  
other Radio Observatories



Max-Planck-Institut  
für Radioastronomie





# Introduction to Einstein@Home



## Some statistics

- Started in 2005 (“World Year of Physics”)
- Active participants (got credit in last 2 weeks):  
ca 45,500
- All-time participants w/ credit:  
total 327,680
- Participants from all 192 United Nations countries
- Very roughly 650 TFLOPS



# E@H Milestones in 2011/12



- Completed several “runs”: GW, Fermi/LAT
- Postprocessing & publications are pending
- 46 previously unknown radio pulsars discovered in BRP searches  
(more expected to be found)
- Added OpenCL GPU apps for AMD/ATI gfx cards



MAX-PLANCK-GESellschaft

# Now supporting AMD GPUs via OpenCL app



- Search for **Binary Radio Pulsars** uses apps for CPU, NVIDIA GPUs (CUDA) and now also AMD GPUs (OpenCL)
- Performance and stability of OpenCL app now on par with CUDA app.
- Watch out: GPU apps can definitely strain your project server infrastructure :-)
- Future: Next generation of Intel CPU integrated GPUs (Haswell) might be *very* interesting OpenCL devices!!



MAX-PLANCK-GESellschaft

# Now supporting AMD GPUs via OpenCL app



## Lessons learnt:

- :-( OpenCL support by some stakeholders is only lukewarm.
- :-( OpenCL spec. could be more concrete/restrictive in describing implementations of OpenCL
- :-) OpenCL does not require special compilation on app-build time. Code is compiled by runtime/driver at execution time.
- :-) Theoretically runs on NVIDIA/Intel/AMD GPUs (and also on CPUs)
- :-( In the real world it seems to be hard to get results to agree across different vendors.
- :-| Need to migrate to BOINC 7.x seems to limit OpenCL participation at E@H



# A Token of Gratitude & Appreciation: “Real” Discovery Certificates



- E@H can track back discoveries to individual volunteers
- Both “wingmen” who submitted a valid “discovery” result are treated equally.
- We send framed certificates to the discoverers, provided we can get their real addresses.
- Real frames, real signatures, in volunteer's native language and in English
- We got very positive feedback about the certificates
- No, you cannot give a name to “your” pulsar :-[



# A Token of Gratitude & Appreciation: “Real” Discovery Certificates





# A Token of Gratitude & Appreciation: “Real” Discovery Certificates



## Workflow:

- Identify Co-Discoverers
- Get their consent, real name and shipping address (convince them this is not spam/hoax :-)
- Translate certificate if necessary
- Have certificates signed (Bruce Allen & other Collaboration Lead)
- Frame, package and ship certificates
- Mention volunteers by name/nickname in scientific discovery article.



MAX-PLANCK-GESellschaft

# Outlook: Plans for the near Future



- Evaluate ways to implement other runs on GPUs as well (Fermi/LAT and GW searches)
- Start new GW run late 2012/early 2013
- Continue work on postprocessing finished runs
- Find more pulsars!
- Launch a Drupal version of the E@H Web Site (Homepage, Discussion Forum, additional content --> See Hackfest)



MAX-PLANCK-GESellschaft

# E@H Science & Infrastructure Contributors



Bruce **Allen**

David **Anderson**

Stuart **Anderson**

Carsten **Aulbert**

Oliver **Bock** 

Jim **Cordes**

Teviet **Creighton**

Julia **Deneva**

Heinz-Bernd **Eggenstein** 

Henning **Fehrmann**

Akos **Fekete**

Steffen **Grunewald**

Lucas **Guillemot**

David **Hammer**

Mike **Hewson**

Yousuke **Itoh**

David **Keitel**

Gaurav **Khanna**

Benjamin **Knispel**

Badri **Krishnan**

Paola **Leaci**

Bernd **Machenschalk** 

Kathryn **Marks**

Chris **Messenger**

Eric **Myers**

Maria Alessandra **Papa**

Holger **Pletsch**

Reinhard **Prix**

Gary **Roberts**

Miroslav **Shaltev**

Peter **Shawhan**

Xavier **Siemens**

Graham **Woan**



# What are Your Questions?





MAX-PLANCK-GESellschaft



**Thanks for your Time and Attention!**