

UK Expression of Interest in ARC

- UK community meeting expressed strong support for establishment of ARC:
 - Essential for support of UK-based astronomers
 - A European ARC based around a major node would maximise scientific return for European astronomers
 - Willing to collaborate with other partners

- 3 key groups, already active in ALMA:
 - JBO @ Manchester
 - Cavendish @ Cambridge
 - ATC @ Edinburgh
 - Other groups working on technology

Instrument Complexity

Instrumental Complexity

Facility		Total
WSRT		21
GMRT		27
IRAM		29
VLBI		37
e-MERLIN		39
EVLA		40
LOFAR		40
ALMA		42
SKA		54

Support role crucial in early days of ALMA – all new users.

Commissioning timetable:

OSF tests Q4 2005

Single antenna Q4 2006

Single baseline Q3 2007

6-8 antennas & early science

Q1 2009

Full ops by 2012

Critical to have ARC before 2008 and running for 5-10 years.

ARC: Lessons learned from cm-wave interferometry

- Interferometry analysis is less straightforward than single aperture analysis.
- Astronomers need ‘support’ and advice. Need access to a skilled group of users/support scientists.
- Need skilled personnel to answer e-mail/phone questions in the same timezone.
- New users need physical access to a ‘centre’ – not a network (lessons from JIVE). Most important at start of life.
 - ‘All ALMA users will be new users.’
- Experienced users will use a centre at intervals to ‘top-up’ their knowledge, talk to instrument experts, learn about new software and new techniques.
- Users require easily accessible archive
- Useful to have software development remote from the telescope

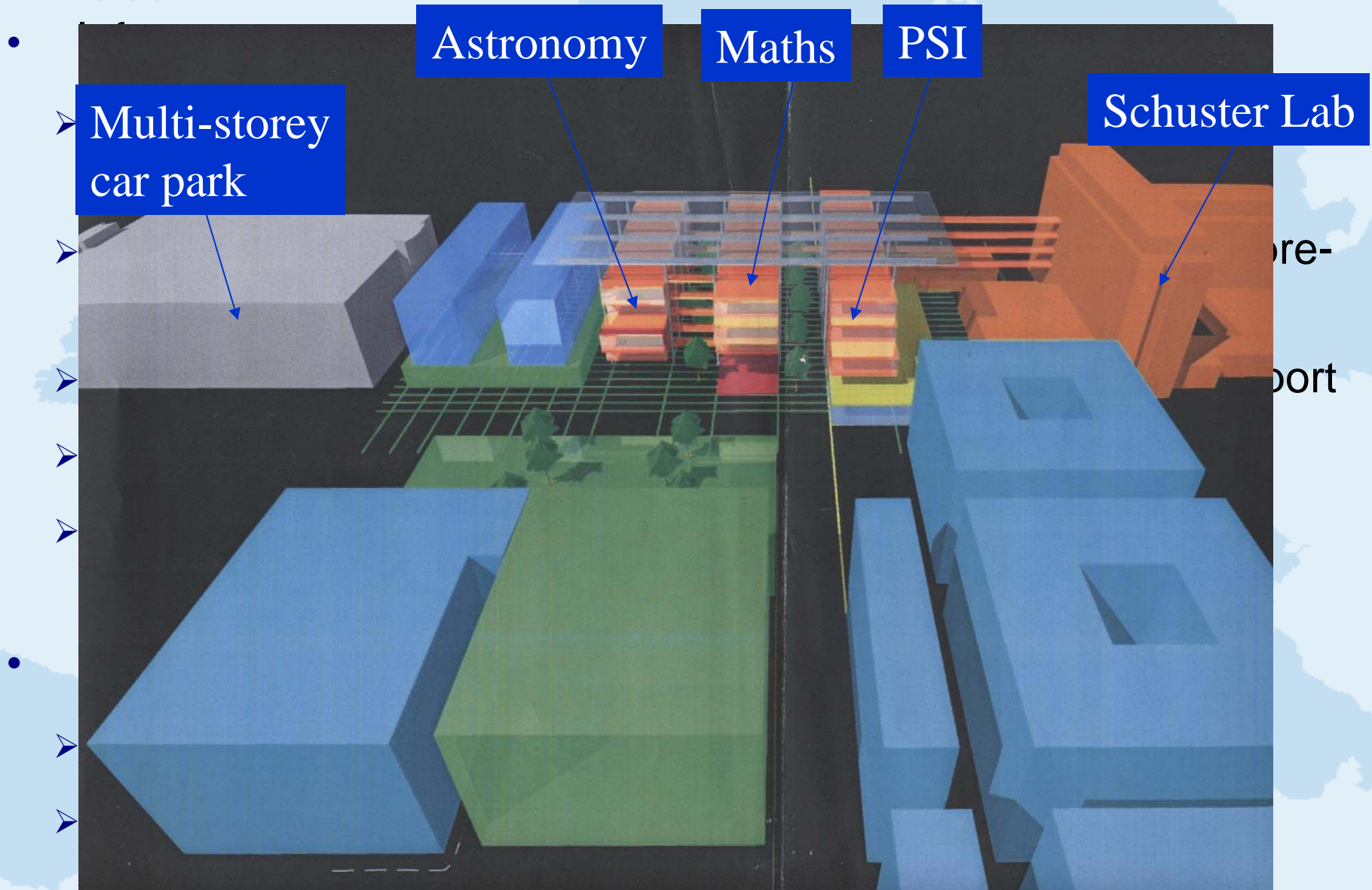
Role of an ALMA Regional Centre

- Core functions - Proposal assistance; archive maint; delivery of pipelined image ESO
- Possible roles foreseen in UK node:
 - Advice on proposal tool use and feedback
 - Calibration, imaging and analysis; extraction of science
 - Long-term quality control for ALMA
 - Assistance with large surveys
 - Coordinate and participate in software developments – archives, pipelines etc.
 - Coordinator for next generation hardware
 - Training – run schools, workshops, coordinate European post-docs etc
 - EPO

UK Expression of interest

- UK ALMA SAC suggested Manchester (JBO) as ARC location
- Experience:
 - ~25 years experience of interferometric user support
 - Enormous experience of interferometry software (closure phase, self-cal, difference mapping, AIPS calibration)
 - mm-wave experience, connection with U.Cam, ROE, ATC etc + European groups. HQ of RadioNet.
 - Developing generic radio archive (MERLIN, EVN, ALMA, AVO). Collaboration with NRAO. e-MERLIN will produce 0.5TB/day; parallel processing – same as ALMA.
 - Strong record of training astronomers thru interferometry schools etc. (next school in 2005)
 - Strong JBO-ALMA link : archive, fibre optics, data transmission

UK Expression of interest



Collaboration

- UK groups have strong history of collaboration and excellent links with all groups who have responded:
 - NL – JIVE, EVN, JCMT, ING, SKA
 - DE, IT, Nordic, IRAM – EVN, RadioNet, FARADAY, mm tech + other tech devs, training, SKA
- Seems sensible to link further development of ARC to RadioNet in FP7 – TNA programme for ALMA?



Estimated minimum resources required

Task name	Description	Tech/admin	Astron
Data analysis	Assistance during reduction & analysis		4.0
	Data archiving	1.5	
Software development	Evolution of existing software, scripts	0.5	2.0
Education	Organisation of specialized Schools; support PDRAs		1.0
Management		0.5	1.0
Total	FTE	2.0	8.0

But, astronomers will require ~ 1/3 time for science → 11 people.
Number based on estimated 500 proposals per year.

Summary

- ALMA will be most complex telescope ever built (only surpassed by SKA).
- Clear need for strong user support at stage of early science and beyond
- Centre works far better than network – concentrate, don't diffuse – viz NAASC.
 - Can visualize modest network but with strong centre.
- Manchester, building upon 25 years experience of interferometry user support, is logical place for European ARC.
 - Will enable UK astronomers to be best placed for ALMA exploitation.
- Where will resources come from?
 - PPARC? ESO? EC-FP7?

Instrument Complexity

Calibration Complexity

Facility	Phase-stable?	Ionos	Atmos	RFI	Polzn	Wideband	Total
WSRT	1	2	1	3	1	1	9
LOFAR	2	3	1	3	1	1	11
GMRT	1	2	1	3	2	1	10
EVLA	1	2	2	2	2	3	12
VLBI	3	3	3	2	2	1	14
e-MERLIN	2	1	2	2	1	3	11
IRAM	3	1	3	1	2	1	11
ALMA	4	1	4	1	2	2	14

1: good; 2: moderate; 3: difficult/in development; 4: extreme

Instrument Complexity

Ease of Use

Facility	User interface	Soft. stable	Data complex	Data volume	Useable pipeline		Total
WSRT	1	1	1	1	1		5
LOFAR	3	4	3	3	4		17
GMRT	2	2	1	2	3		10
EVLA	3	3	3	4	4		17
VLBI	2	1	2	3	3		11
e-MERLIN	3	3	3	4	4		17
IRAM	2	2	1	1	3		9
ALMA	3	3	4	4	4		18

1: good; 2: moderate; 3: difficult/in development; 4: extreme

Instrument Complexity

Imaging Complexity

Facility	uv-plane	weights	Sp.line	Widefield	Imag. Anal		Total
WSRT	1	1	2	1	2		7
LOFAR	2	2	2	3	3		12
GMRT	1	1	2	2	1		7
EVLA	1	1	3	4	2		11
VLBI	3	2	2	3	2		12
e-MERLIN	1	1	3	4	2		11
IRAM	2	1	3	1	2		9
ALMA	1	1	3	2	3		10

1: good; 2: moderate; 3: difficult/in development; 4: extreme

Instrument Complexity

Total Complexity

Facility		Total
WSRT		21
GMRT		27
IRAM		29
VLBI		37
e-MERLIN		39
EVLA		40
LOFAR		40
ALMA		42

1: good; 2: moderate; 3: difficult/in development; 4: extreme