ALMA Development Studies Meeting

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Developing Future ALMA Proposal Submission Tools

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Science & Technology Facilities Council

UK Astronomy Technology Centre

Introduction to the ALMA-OT

1. Proposing to use ALMA is done using the *ALMA Observing Tool*
2. The same tool is later used to create detailed *Scheduling Blocks* (SBs) that will be executed to take data
3. The ALMA-OT provides a great deal more:
   - Automatic observing time feedback (incl. overheads)
   - Visualisation in both space and frequency (correlator)
   - Validation of proposals and SBs
   - Generation of summary sheets for both PIs and staff (reviewing)
   - Prompts for setups that require *Technical Justification*
   - Automatic generation of SBs for Approved proposals.
4. The OT is an *intelligent tool* - it encodes a model of the ALMA Observatory.
5. It is a Java desktop tool, with a server-side submission handler

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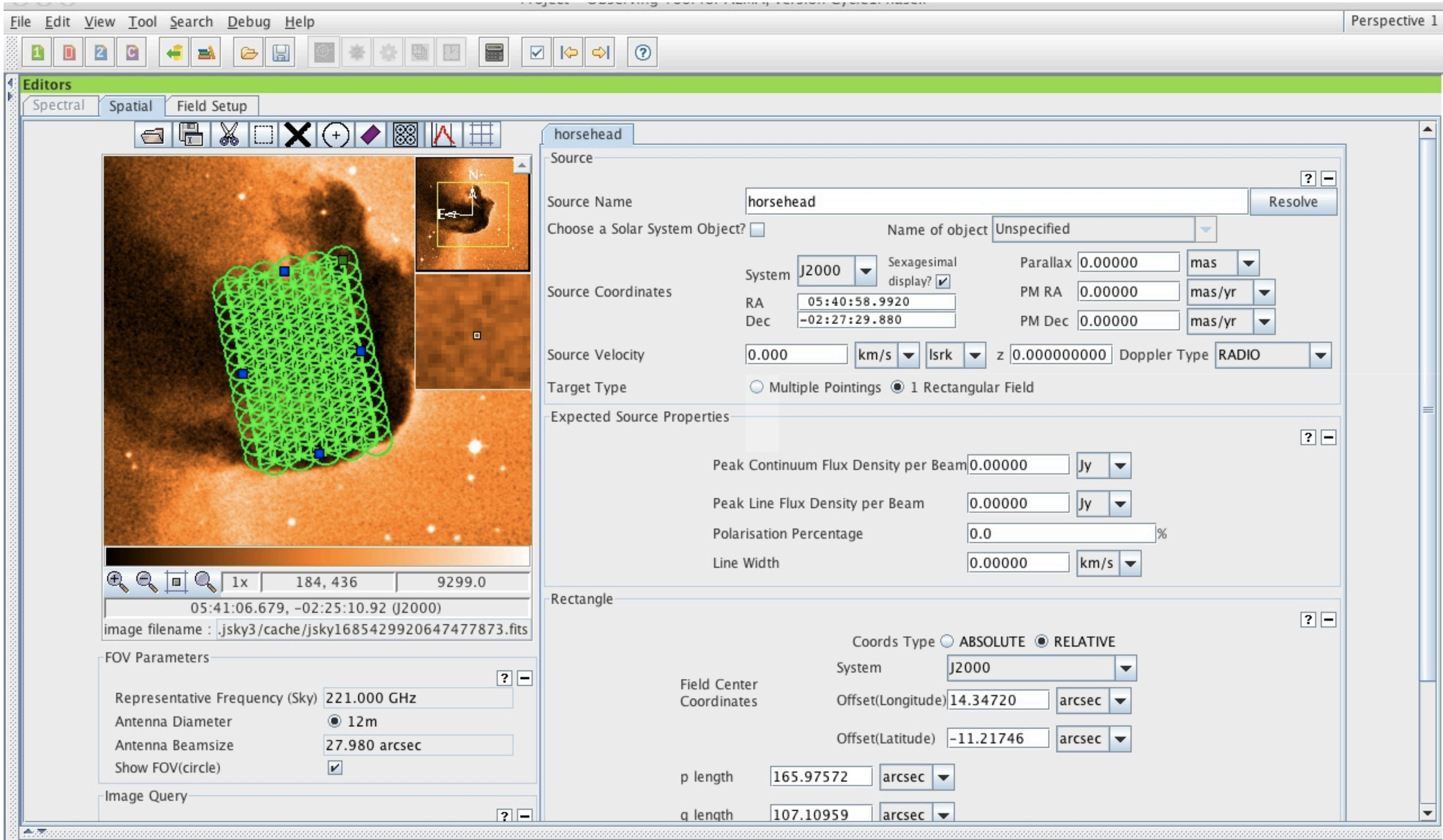
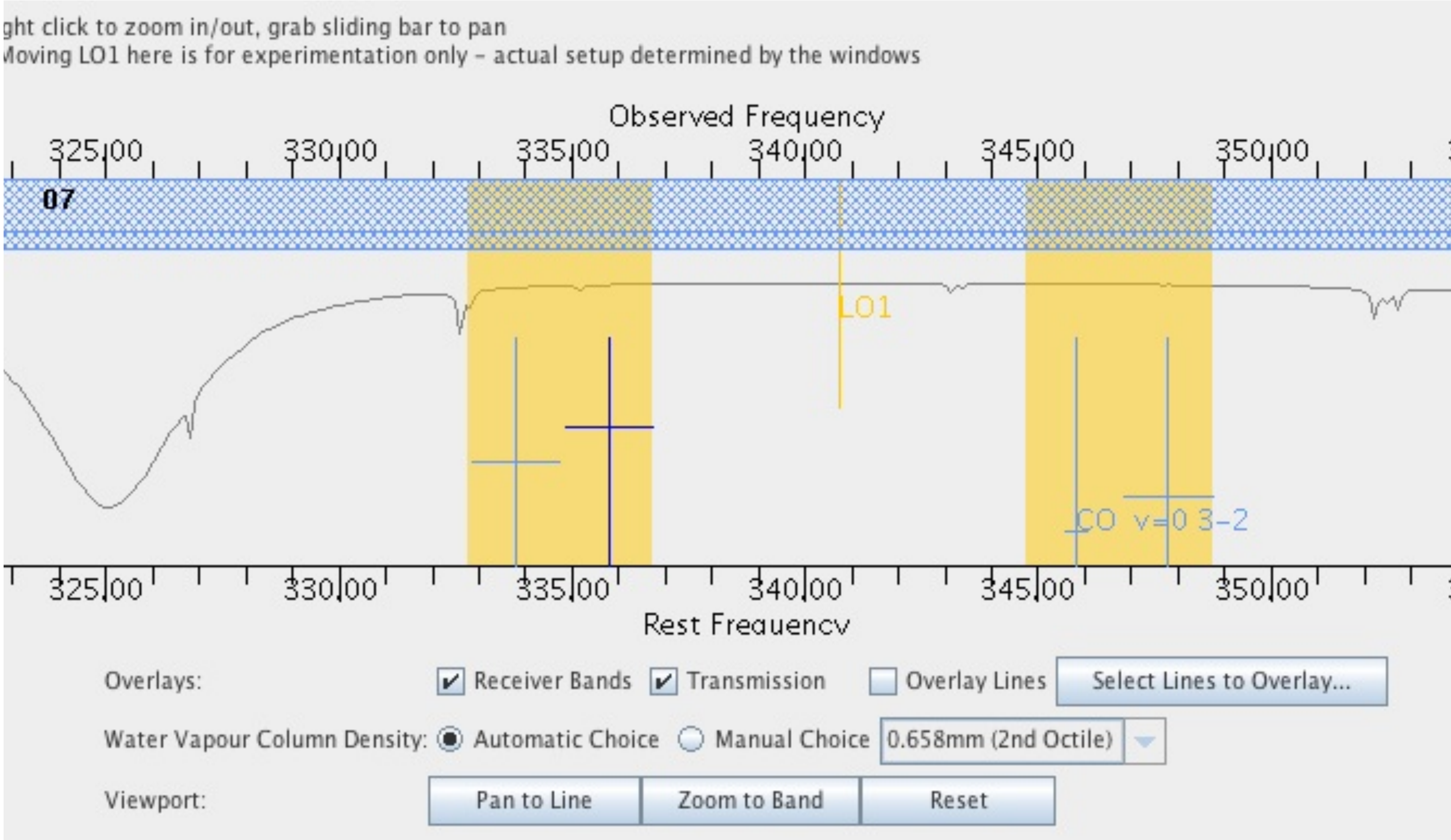
Spatial Visualation



Spectral Visualiser



Time Estimates

Project Summary

Total and Calibrati

Science Goal	12-m (1)		12-m (2)		12-m (1+2)		ACA 7-m	
	Tot.	Cal.	Tot.	Cal.	Tot.	Cal.	Tot.	Cal.
one	1.23 h	20.95 min	-	-	1.23 h	20.95 min	1.73 h	29.33 mi
two	1.23 h	20.95 min	-	-	1.23 h	20.95 min	1.73 h	29.33 mi
three	1.23 h	20.95 min	-	-	1.23 h	20.95 min	1.73 h	29.33 mi
four	1.23 h	20.95 min	-	-	1.23 h	20.95 min	1.73 h	29.33 mi
Overall	4.94 h	1.40 h	-	-	4.94 h	1.40 h	6.91 h	1.96 h

Data Volumes and D

Science Goal	Data Volume			
	12-m (1+2)	ACA 7-m	ACA TP	12-
one	82.34 GB	4.00 GB	17.26 GB	18.
two	82.34 GB	4.00 GB	17.26 GB	18.
three	82.34 GB	4.00 GB	17.26 GB	18.
four	82.34 GB	4.00 GB	17.26 GB	18.
Overall	329.37 GB	15.99 GB	69.06 GB	

Close

Time Estimate

Note: The time in brackets is that required to reach the sensitivity. Operational requirements often mean that the actual observed time is longer, especially for mosaics. Please see the User Manual for more details.

Input Parameters

Requested sensitivity	0.2499 mJy
Bandwidth used for sensitivity	1875.000 MHz
Representative frequency (sky, first source)	85.01 GHz
Estimated Total time for Science Goal	**4.17 h**

Cluster 1

Source Name	RA	Dec	Velocity
one	16:21:23.4806	-50:39:53.994	-50.000 km/s

Input Parameters

Precipitable water vapour (all sources)	5.186mm (7th Octile)

Time required for C40-3

Time on source per pointing (first source)	18.14 s [14.08 s]
Total number of pointings (all sources)	147
Number of tunings	1
Total time on source	44.45 min [34.50 min]
Total calibration time	20.95 min
Other overheads	8.68 min
Total time for 1 SB execution	1.23 h
Number of SB executions	1
Total time to complete SB	1.23 h

Calibration Breakdown per SB execution

3 x Pointing	36.00 s
1 x SidebandRatio	1.58 min
1 x Amplitude	2.50 min
1 x Bandpass	5.00 min
5 x Phase	2.50 min
7 x Atmospheric	4.67 min
Calibration overheads	4.10 min

Additional Arrays

Close

It works, so why change?

The ALMA-OT has been a very successful tool, supporting ~6700 proposals over the first five cycles, succeeding in reaching a wide community, and generally gets very positive comments.

1. However, we do get critical comments about the tool
   - Un-named user comment: “The OT is stale”
   - Of course it is difficult to satisfy everyone…(paraphrased comments)
     - We get “why can’t it be like the (HST) APT?”
     - They get “Why can’t the APT be more like the ALMA OT?”
2. More crucially: the OT was designed in 2002-05, technology of the time demanded a desktop application (google maps launched in 2005)
3. Starting now, default technology choice would be web
4. Java on the desktop is passé
   - (or is it: what about HST APT, Aladin??, …)

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Key Issues 1

Obsolescence: (cf - upgrading a receiver with better technology)

1. OT User interface based on "Swing" – 90s technology
   - Its looks "dated", it is no longer supported
   - More modern options are available
2. Spectral visualisation uses custom software, the spatial view a third party library no longer supported.
   - Both have significant limitations and drawbacks and are now hard to support (e.g. support for wide fields not good)
   - In both cases better options now exist

Key Issues 2

Environment:

1. Changing and evolving requirements have taken some areas beyond original design boundaries, causing “technical debt”
2. Future options will make this even more important…widefield, new receivers, bandwidth, correlator changes, etc.
   - Many of the things you’ve heard about in this workshop.

Expectations:

1. With rise of tablets, smartphones & many, many online websites users expect something different.
2. Performance has become an issue, particularly with Large programmes.

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Benefits

- Improved User experience
  - More effective/efficient proposal/project preparation
- Improved/more current/leaner code-base
  - Lower support costs
  - Ready for the 2020-2030 instrument improvements (better future-proofing)
- Improved deployment options
  - Smoother/cheaper for support staff, simpler/more transparent for users

Possible Options

1. Re-implement as a web-based application
   - Moving much intensive processing to web-services
   - Provides option of merging/interacting with the review manager (Ph1M) – a web-app.
   - Meets modern user expectations, more controllable deployments
2. Keep OT as desktop, but with significant technology/user interface overhaul.
   - User experience improvements,
   - Code-refactor to reduce future maintenance costs
3. Both options: consider separate tools for:
   - Spatial visualisation (interaction with existing ?)
   - Spectral/correlator setups
   - Sensitivity and observing time calculations

Considering a web-app

1. No need to worry about user's OS, just the user's browser
   - Though that can be concerning enough
2. Deployments more straightforward
   - full control over the software in use
3. Possible linking at least Phase I (proposals) with the Ph1M ->
   - Consistency of interface (for reviewers/assessors)
   - Sharing of code
   - "Natural" work-flow
   - This approach has been used elsewhere (Northstar, GMRT,...)

But, there are challenges...

Key Challenges for moving to the Web

The OT, even at Phase I, is not a simple proposal tool:

- In effect it encodes a "model" of the ALMA Observatory, calibration strategy, policies, constraints, etc.
- Time estimation includes SB generation (for realism), which can be cpu (and memory) intensive.
  - And time estimation is done frequently, everywhere – PDF generation, validation, technical evaluation (for justification requests)
- Visualisation tools – a significant challenge.

Designing and implementing this as a web application is a significant technology challenge.

Note in passing: Web & desktop apps are merging

Aims of possible study

Year 0.5: Usability study:

- Interviews with users, User observation.
- Analysis of projects *actually* created and submitted from last few cycles
- Measurements of performance bottlenecks

Year 1: Prototype risk areas of web-based option; down-select among options; design architecture

Year 2: Detailed design, begin implementation of evolutionary prototype

Year 3: Complete prototype, test

Opportunities

Work by other observatories:

- SKA, currently in design, likely to begin serious development late 2018. (Strong links – I am lead for design of related areas)
- ESO, work in progress to upgrade its systems for the E-ELT
- NRAO upgrades to PST etc. (for ngVLA)
  - Contacts with team strong.
- TMT, GMT, CTA??
- A common tool is very ambitious and *won't* be addressed, but common approaches may be hugely beneficial, and there is much potential for cross-project learning

Summary

- ALMA Proposal preparation is showing its age
  - Improvements are required
  - We need to reduce support costs
  - We need to enhance the user experience
- Change becomes vital when future ALMA enhancements are considered
- Moving to the web needs to be considered
  - But this needs some R&D time and prototyping
- We need to retain the good, and core parts of the code-base.
- Study will evaluate where we are, consider the best way forward and embark upon it.
- Many other projects are working in the same area currently: timing is good for synergy.

Thank You