

LOFAR Science Capabilities and Planning

*First Science with LOFAR Workshop
September 14, 2011*

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LOFAR Science Capabilities and Planning

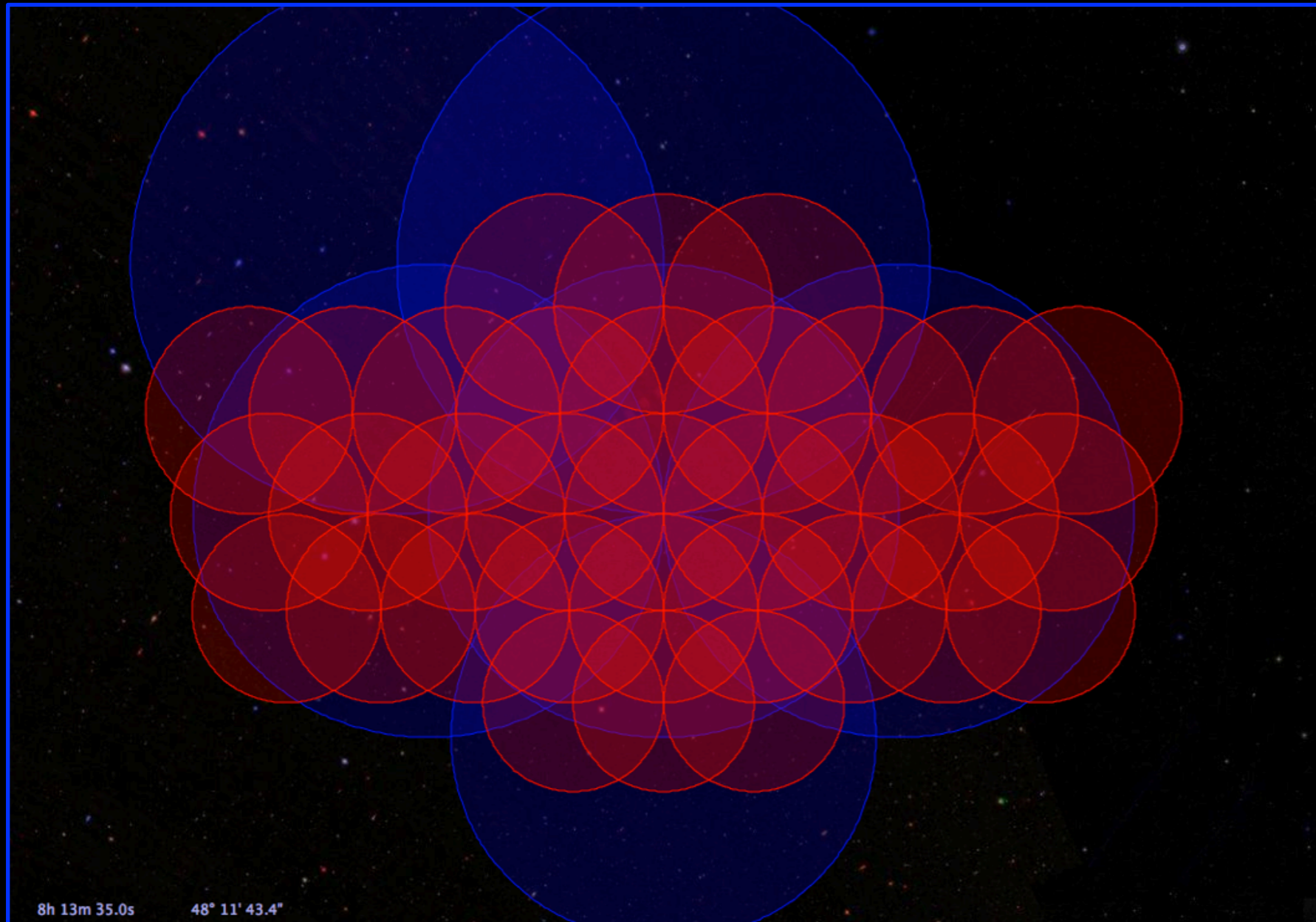
Major Upcoming Activities
Commissioning Observations and MSSS
Development and System Capabilities
Preparations for Proposal Call

Upcoming Major Activities

Date	Activity
Sep 2011	Begin HBA modem repairs; Finish SIP integration work Finalize MSSS configuration; Complete MSSS test observations
Oct 2011	Begin LBA component of MSSS; Begin BF mode integration work
Nov 2011	Continue LBA component of MSSS; Begin execution of coordinated large commissioning projects
Dec 2011	Complete LBA component of MSSS; Begin HBA component of MSSS
Jan 2012	Finish BF mode integration work; Freeze version 1.0 of system software Continue execution of coordinated large commissioning projects
Feb 2012	Complete HBA component of MSSS; Continue execution of coordinated large commissioning projects; Begin VHECR integration work
Mar 2012	Announcement of Opportunity for Next Proposal Call

- Execute HBA tile repair program
- Start and complete MSSS (LBA component first, then HBA)
- Freeze first version of operation system by end of year (subset of full capabilities)
- Execute coordinated commissioning projects to characterize system
- Issue proposal call for open observing with LOFAR

Staged Execution of MSSS



(courtesy G. Heald)

Will dominate observing schedule ~6 months
Dedicated team of commissioners needed

Nominal start Oct 2011

*Start and complete
LBA component while
HBA tiles are repaired*

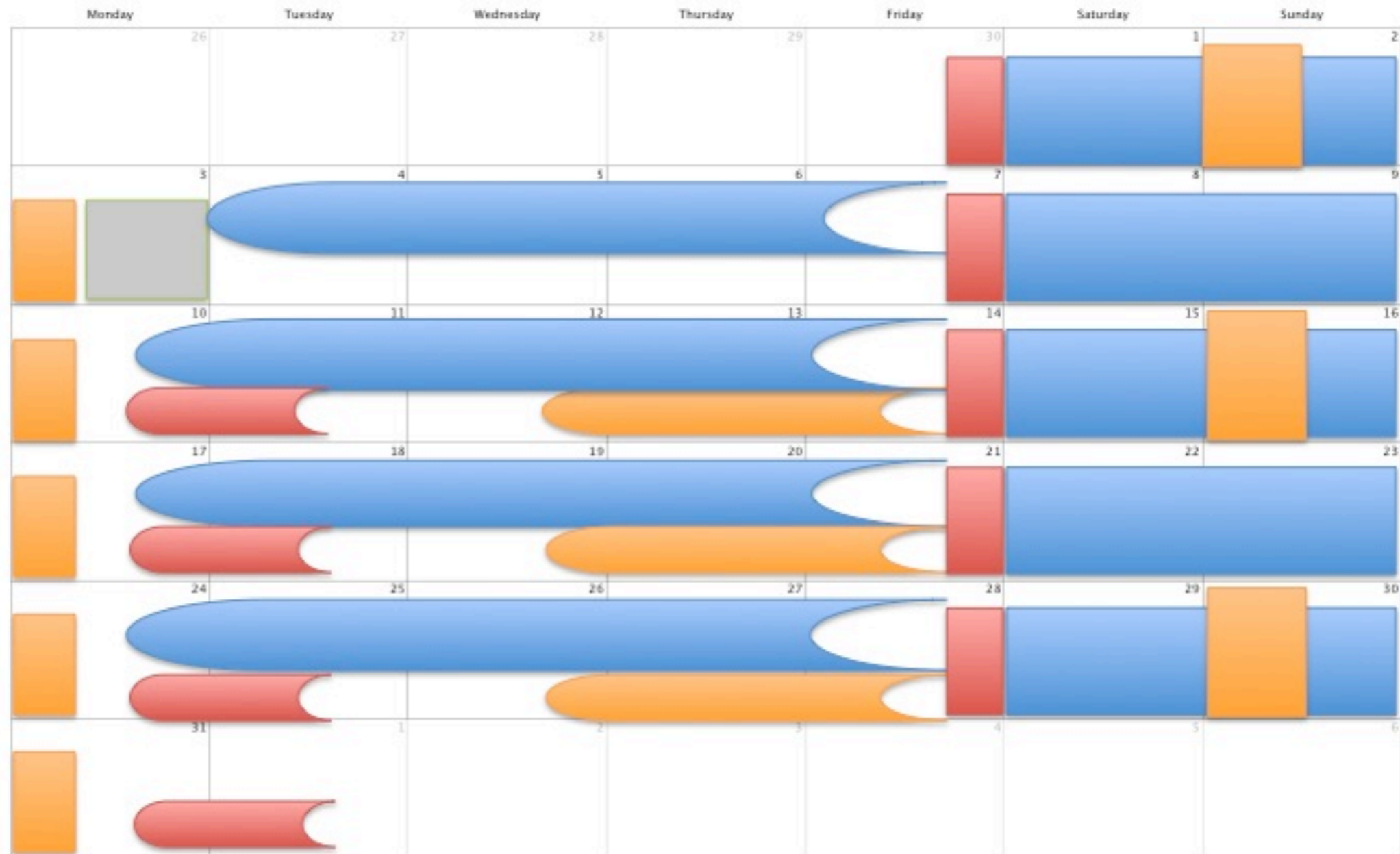
*Follow with HBA
component to complete
early in 2012*

*Interleave with some
commissioning projects*

*Limited piggybacking
capabilities supported*

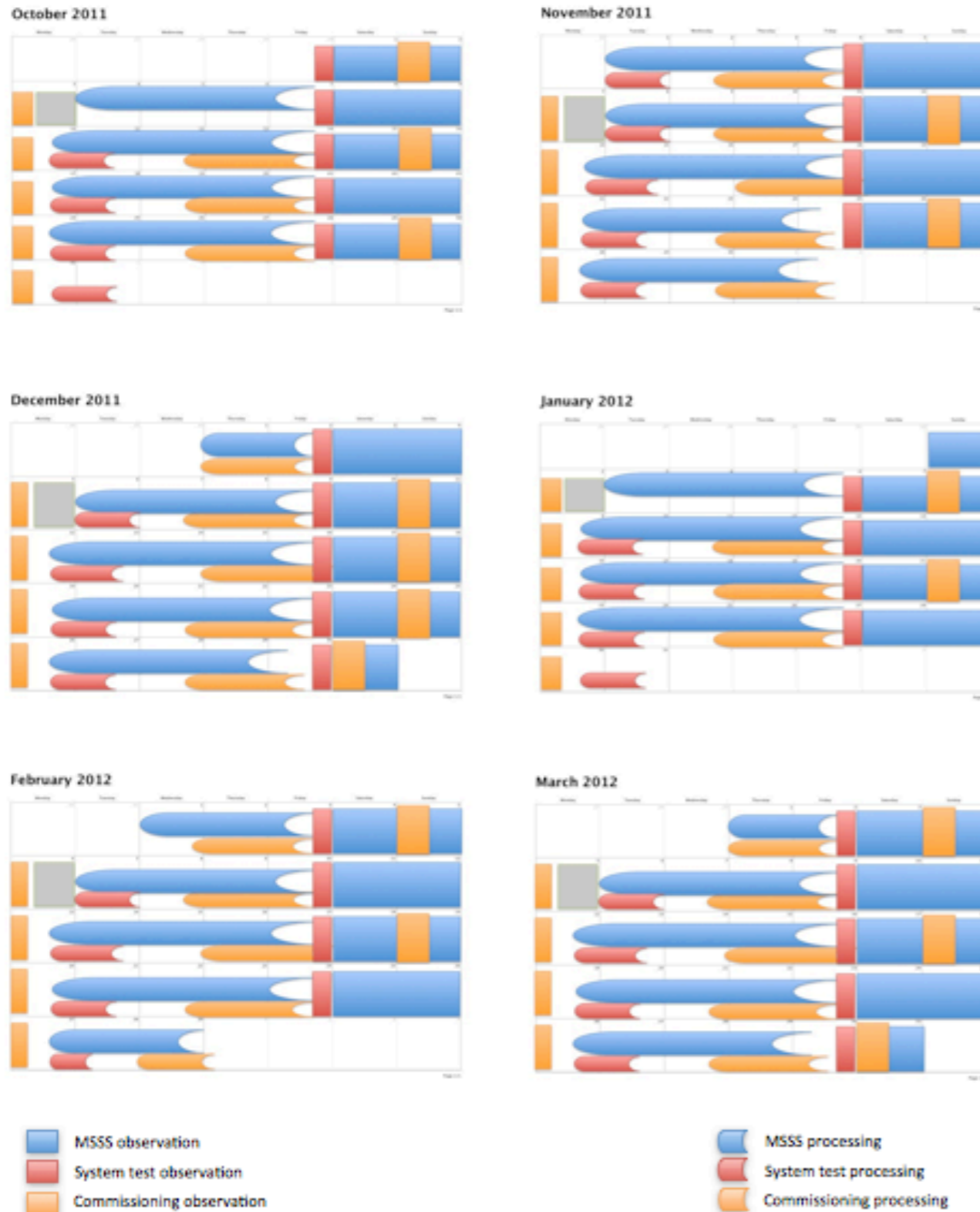
*Limited CEPII
resources available for
other commissioning*

October 2011



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- MSSS observation
- System test observation
- Commissioning observation
- MSSS processing
- System test processing
- Commissioning processing



Observing Schedule

- Move away from ad hoc scheduling
- Schedule dominated by MSSS (~80%)
- Continue to observe on weekends
- Development, testing, and processing continues during week
- Processing benchmarks still needed
- Remaining CEPII resources available for commissioning and KSP projects
- Rotating pool of MSSS commissioners on duty every week for ~6 months
- Finalize MSSS specifications and observing schedule in next month

Targeted Commissioning

Proposal	Project	Target(s)	KSP	2010 Q3 & 4	2011 Q1 & 2	2011 Q3	Commissioners
LEA004	Trigger Events	LIGO events	T	16			Rol, Daw
LEA006	Solar Dynamic spectrum	Sun, IPS	SP	20	20	11	Fallows
LEA012	Solar Imaging	Sun	SP	95	30	30	Breitling, Vocks
LEA016, LEA018, LEA022	Pulsar modes	various	T	~400	~300	~150	Hessels, Coenen, Hassal, Kondratiev
LEA032	Transients	L0329+58, CygX3, CygX1, SS433, Crab	T	112	84	73	Bell, Broderik, Tudose, Swinbank
LEA046	3C sources	3C452, 3C445, 3C223, 3C390.3, 3C338, 3C465	S		60		Misrael, van Weeren, Orru, Williams, Natt, Mueller, van Bommel
LEA048	Saturn & Jupiter Spectra	Saturn	T	16	0	17	Griessmeier, Zarka,
LEA050	Imaging Planets	Jupiter	T			14	Wucknitz, Griessmeier
LEA052	Clusters	Abell 2256, Abell 2255, Coma, Hydra A	S	32	38	54	Van Weeren, Pizzo, Bonafarde, Rafferty, Maccario, Trasatti, Orru
LEA058	TBB modes		CR		8		ter Veen, Corstanje, McFadden, Frieswijk, Shulevski
LEA060	Extended radio sources	N6251	S		6		
LEA064	Virgo A	Virgo A	S		30	20	deGasperin, Orru
LEA066	Long Baselines	3C196, 3C147, Tau A, 3C48	S		130	33	Wucknitz, Andreson
LEA070	SETI		T	12	0		Penny
LEA072	Deep Fields	Lockman Hole	S	0	8		Guglielmino
LEA080	Magnetism	N4631	M		12		Drzazga, Jurusik Chyzny,
LEA082	Below 30MHz	3C196	S	12	16	7	
LEA092	EoR fields	7bm 3C196	E		12	6	Offringa, Lambropoulos
LEA102	Moon	Moon	E / CR		0		McFadden, Meevius, deBruyn
LEA114	FAN region	FAN	M	8	18	12	Havekorn
LEA122	Jupiter Polariz.	Jupiter	T		4		Scaife, Griessmeier
LEA128	Monitoring	3C196, NCP	E / Cal.	54	212	102	Lambropoulos, Brentjens, Yatawatta
LLT052	Nearby galaxies	M81/82	S		6		Batejat, Jurusik
MKSP	Magnetism KSP	various	M	24	22	10	
MSSS	Various tests			35	72	30	
Total Time				777	1080	661	

System Characterization

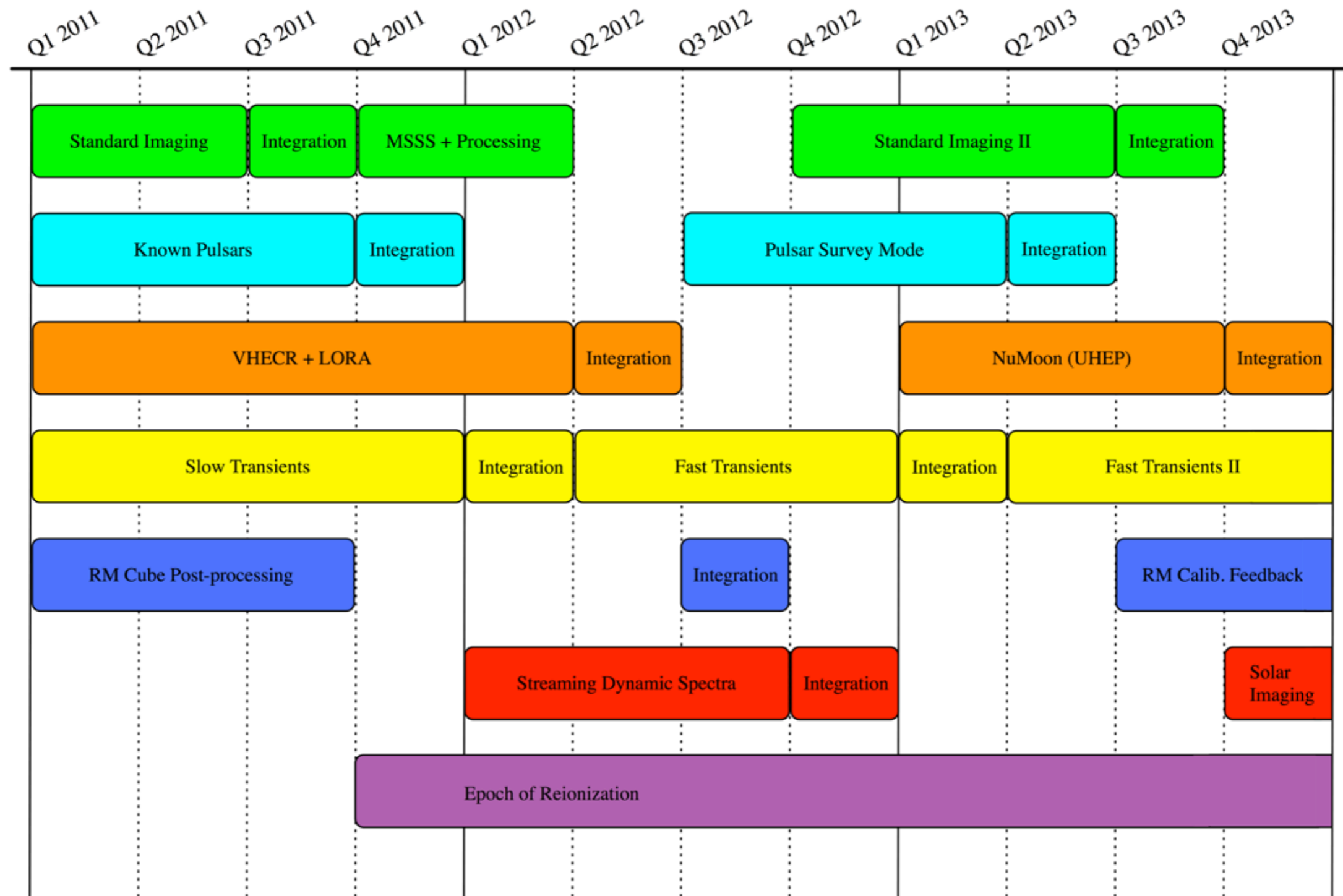
- Need to characterize system performance
- Focussed on functionality for proposal call
- Beta-testing of modes and pipelines
- Detailed inputs for proposal documentation

Long-term Proposal Revision

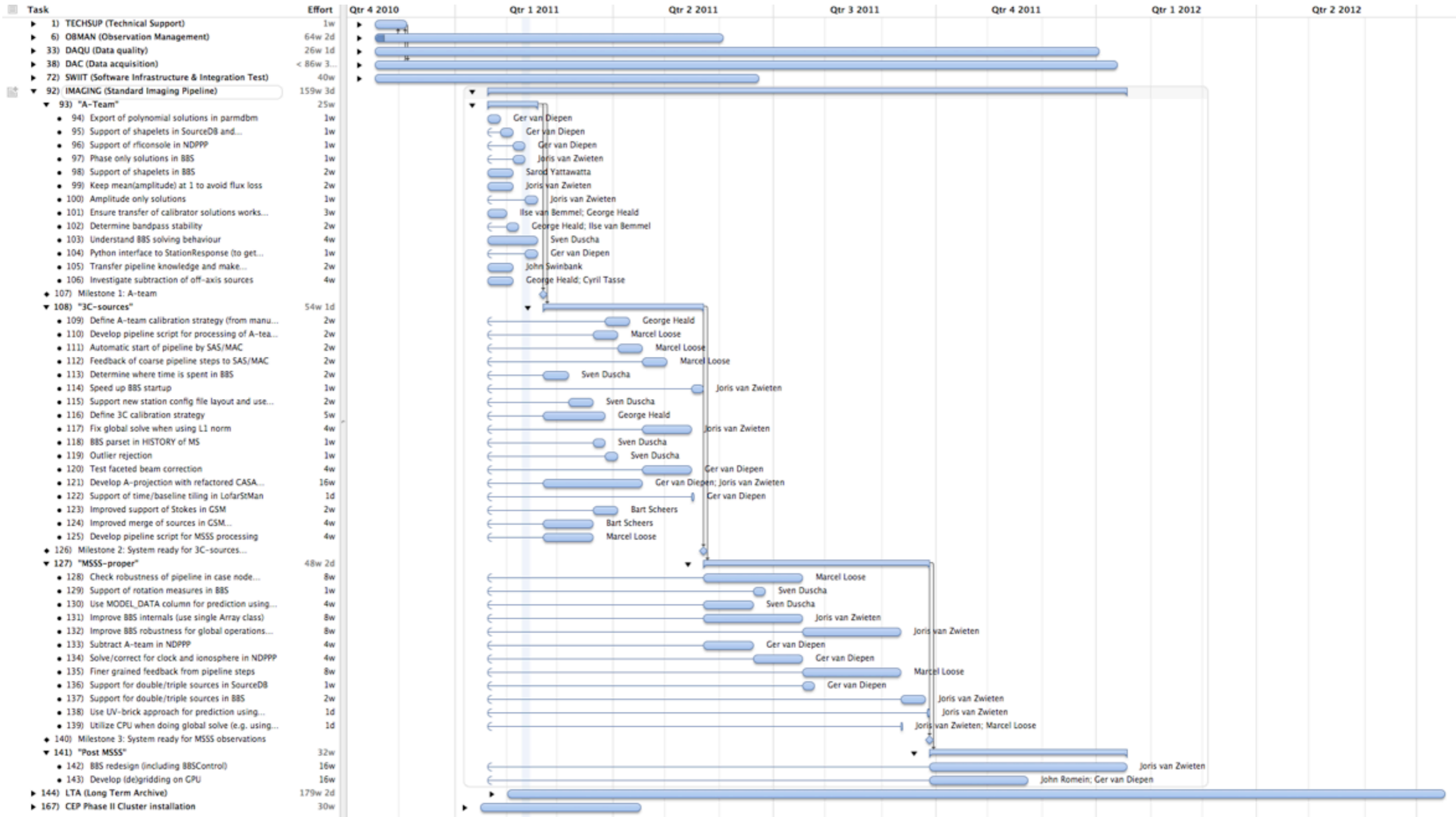
- Provide KSPs with required data
- Quantitatively refine LLT proposals
- Submitted as part of upcoming AO

Time is highly limited!
Must be coordinated across KSPs

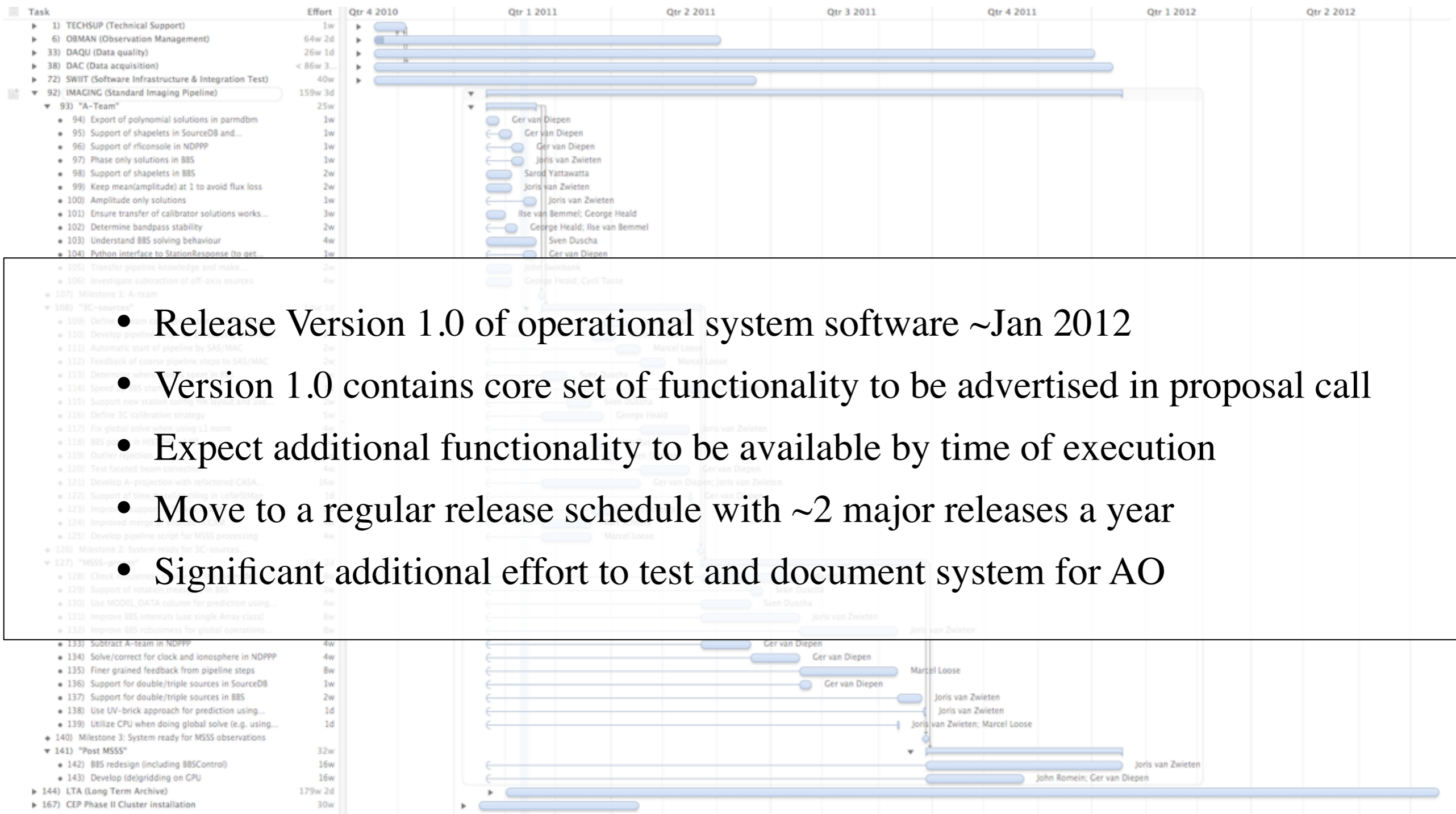
Development Priorities



Status of Planning



Status of Planning



Operational System Version 1.0

Observing Modes

Type	Mode	Description	Output
Interferometric	Correlated	Arbitrary number of stations, 8 beams per station, full Stokes	Visibilities
Tied-array	Incoherent addition	Arbitrary number of stations, 8 beams per station, Stokes I	BF data file
	Coherent addition	Coherent summation, superterp only, ~20 beams, Stokes I	BF data file
	Raw voltage	Coherent summation, superterp only, bypasses 2 nd PPF, raw voltage output	BF data file
Single Station	Station level beam-forming	Arbitrary stations, individual pointing and frequency settings per station, 8 beams per station, Stokes I	BF data file
Direct Storage	Raw voltage	Station level triggering of TBB dumps, direct storage to CEP II	TBB data file

Processing Pipelines

Pipeline	Mode	Description	Input	Output
Standard	Imaging	Limited spatial resolution, full field-of-view (alternatively highest spatial resolution but with limited field-of-view)	Visibilities	Image cubes Source lists Sky model Quality metrics
Known Pulsar	Beam-formed	Arbitrary number of stations, 8 beams per station, Stokes I	BF data file	Folded pulse profiles De-dispersed time series Quality metrics

Targets for Q4 2011- Q1 2012

- **Complete remaining hardware rollout (early 2012)**
- **Stabilize the operational system (hardware and software)**
- **Deploy the first three automated science pipelines**
- **Begin and complete the MSSS/GSM survey**
- **Open a first version of the LOFAR LTA**
- **Invest in design work for next set of science pipelines**
- **Initiate next phase of pipeline development**
- **First set of LOFAR science papers!**