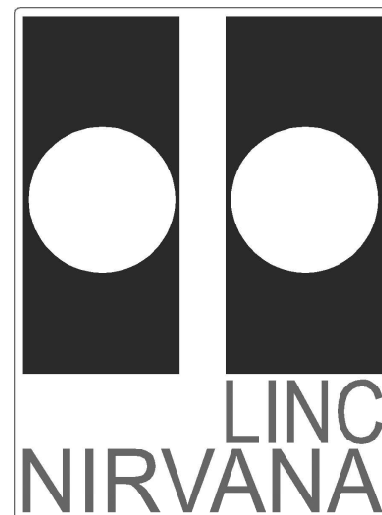


LINC-NIRVANA

The **L**BT **I**Nterferometric **C**amera and
Near-**I**nfra**R**ed / **V**isible **A**daptive
iNterferometer for **A**stronomy

A collaborative project of the MPIA Heidelberg, INAF-Arcetri,
Universität zu Köln, and MPIfR Bonn

<http://www.mpia.de/LINC>



LINC-NIRVANA

—

Project Management

Doc. No. LN-MPIA-FDR-PM-001
Short Title Project Management
Issue 1.0
Date 15 June 2005

Prepared M. Kürster 15 June 2005
Name Date Signature

Approved T. Herbst 15 June 2005
Name Date Signature

Released M. Kürster 15 June 2005
Name Date Signature

Document Change Record

Issue	Date	Section/Paragraph Affected	Reasons / Remarks
0.1	16 June 2004	all	new document
0.2	14 July 2004	all	added text
0.3	23 May 2005	all	major additions
0.4	31 May 2005	all	major additions
0.5	10 June 2005	all	major additions
1.0	15 June 2005	all	comments by T. Herbst implemented and sections 13 and 14 finalized

Contents

1	Scope	1
2	Applicable Documents	1
3	External Interfaces	1
4	Acronyms and Abbreviations	2
5	Introduction	3
6	Project Consortium and Investigators	4
6.1	Consortium	4
6.2	Investigators	4
6.3	Project Managers	5
6.4	Project Directory	5
7	Project Organisation	8
7.1	Memoranda of Understanding	8
7.2	Project Organigram	8
8	Project Responsibilities	10
8.1	Responsibilities of MPIA Heidelberg:	10
8.2	Responsibilities of INAF	10
8.3	Responsibilities of the University of Cologne:	11
8.4	Responsibilities of MPIfR Bonn	11
9	Division of Tasks	12
9.1	Tasks of MPIA:	12
9.2	Tasks of INAF:	13
9.3	Tasks of the University of Cologne:	13
9.4	Tasks of MPIfR:	14
10	Project Internal Communication and Meetings	15
10.1	Team meetings	15
10.2	Task Monitoring	15
10.3	Interface and Configuration Control	15
11	Project Milestones and Schedule	16
11.1	Baseline Instrument Configuration	16
11.2	Milestones for the Baseline Instrument	16
11.3	Milestones for the manufacture of major HW components:	17
11.4	Milestones for the completion of major SW products:	18
11.5	Project schedule	18
12	Deliverables	22
13	Hardware Funding	23
14	Manpower Estimates	24

15 Liaison with LBT

25

List of Figures

1	Project Organigram	9
2	LINC-NIRVANA project schedule part 1	19
3	LINC-NIRVANA project schedule part 2	20
4	LINC-NIRVANA project schedule part 3	21

List of Tables

1	LINC-NIRVANA Partner Institutes	6
2	LINC-NIRVANA Team Members	7
3	Milestones for major HW components	17
4	Milestones for the completion of major SW components	18
5	LN hardware funding status	23
6	LINC-NIRVANA manpower contributions	24

1 Scope

This document presents the project management plan for LINC-NIRVANA (LN).

2 Applicable Documents

No.	Title	Number and Issue
1	LINC-NIRVANA Preliminary Design Review MPIA Heidelberg, April 2003	PDR
2	Memorandum of Understanding for the Design, Construction and the Usage Rights of LINC-NIRVANA	MoU 1.2
3	LINC-NIRVANA, Implementation, Commissioning, and Acceptance Plans and Procedures	LN-MPIA-FDR-AIT-006 1.0

3 External Interfaces

Item	Short description
LINC-NIRVANA	All instrument components
Consortium partners	Infrastructure, dependancies, and policies of partner institutes
LBT	LBTO, LBTC, LBTB, policies and support
Funding institutions	DFG, FP6-JRA1 and JRA4, HBFG, INAF, MPG, Paul Award/ Alexander von Humboldt Foundation, Verbundforschung

4 Acronyms and Abbreviations

IPH	I. Physikalisches Institut of the University of Cologne
AIT	Assembly, Integration and Testing
AOS:	Adaptive Optics Software
BSCW	Basic Support for Cooperative Work (documentation archive)
CoI	Co-Investigator
COM	Common Software
CVS	Concurrent Versions System (software development archive)
DCS	Detector Control Software
DFG	Deutsche Forschungsgemeinschaft (German science funding agency)
DHS	Data Handling Software
DRS	Data Reduction Software
DM	Deformable mirror
FDR	Final Design Review
FFS	Fringe-Flexure-Tracker Software
FFT(S)	Fringe and Flexure Tracker (System)
FP6	Framework Programme 6 (of the European Commission)
FTE	Full time Equivalent
GWS	Ground-layer Wavefront Sensor
HBFG	Hochschulbauförderungsgesetz (University funding program of the German state Nordrhein-Westfalen)
HW	Hardware
ICS	Instrument Control Software
INAF	Istituto Nazionale di Astrofisica (Italian National Institute of Astrophysics)
IRC	Infrared Camera Software
JRA	Joint Research Activity (of the European Commission)
LBT	Large Binocular Telescope
LBTB	LBT Beteiligungsgesellschaft (German LBT participation group)
LBTC	LBT Consortium
LBTO	LBT Observatory
LM	Local Manager
LN	LINC-NIRVANA
MCAO	Multi-conjugate Adaptive Optics
MCS	Motor Control Software
MHWS	Mid-high-layer Wavefront Sensing System
MoU	Memorandum of Understanding
MPIA	Max-Planck-Institut für Astronomie (Heidelberg)
MPIfR	Max-Planck-Institut für Radioastronomie (Bonn)
MPG	Max-Planck-Gesellschaft (Max Planck Society)
OPS	Observation Preparation Software
OSS	Observation Support Software
PDR	Preliminary Design Review
PI	Principal Investigator
PM	Project Manager
SA1:	Science Application Software I
SA2:	Science Application Software II
SW	Software
UC	University of Cologne
VbF	Verbundforschung (German governmental funding program)
WFS	Wavefront Sensor

5 Introduction

To a large extent, the LINC-NIRVANA project management has been defined in the Preliminary Design Review (PDR) document, which serves as a reference source. However, some items have evolved:

- The definition of the tasks of the partners has seen a few adjustments and extensions. See sections 7, 8 and 9. The definition of tasks presented here follows the Memorandum of Understanding (MoU) of the LINC-NIRVANA consortium.
- Personnel changes have occurred, including a new project manager. See section 6.4 for an up-to-date project directory.
- Major design modifications (optical co-addition in the ground-layer wavefront sensors; two versus three layer AO correction) has led to substantial cost savings, but a number of previously unidentified hardware components have been added to the list as the detailed instrument design evolved.

6 Project Consortium and Investigators

6.1 Consortium

The LINC-NIRVANA collaboration consists of four partners:

1. The Istituto Nazionale di Astrofisica (INAF). INAF is partner of the LBT Corporation. INAF Arcetri manages the interaction between the LINC-NIRVANA partnership and the Italian LBT community. The INAF observatories participating in the LINC-NIRVANA project are:

The Osservatorio Astrofisico di Arcetri, Firenze (INAF-Arcetri),
 The Osservatorio Astronomico di Bologna, Bologna (INAF-Bologna),
 The Osservatorio Astrofisico di Roma, Roma (INAF-Roma).

The Università degli Studi di Genova (University of Genoa) is also participating in the LINC-NIRVANA project under the co-ordination of INAF through INAF-Arcetri; it is not formally part of the LBT Corporation.

2. The 1. Physikalisches Institut (1PH) of the University of Cologne (UC).

The UC is not formally a member of the LBT Corporation. Its participation within the Large Binocular Telescope is managed through the Max-Planck-Institute for Astronomy (LBT Corporation partner).

3. The Max-Planck-Institut für Radio Astronomy (MPIfR) in Bonn. The MPIfR is a member of the LBTB (LBT-Beteiligungsgesellschaft), which is the German partner in the LBT Corporation.
4. The Max-Planck-Institute for Astronomy (MPIA) in Heidelberg. The MPIA is a member of the LBTB, the German partner in the LBT Corporation. The MPIA manages the interaction between the LINC-NIRVANA partnership and the German LBT community.

In addition to these partners, there has been an additional financial contribution from the Alexander von Humboldt foundation to the MPIA awarded through a Wolfgang Paul Prize to Roberto Ragazzoni. The funds of the Wolfgang Paul Prize were available throughout 2002-2004. Roberto Ragazzoni and his Paul Prize group were hosted by the MPIA during this period.

The MPIfR Bonn joined the consortium after the PDR. Participation from Italian institutes other than INAF-Arcetri (i.e. from INAF-Bologna, INAF-Roma, and the University of Genoa) also began after the PDR.

The institutes participating in the LINC-NIRVANA project are summarized in Table 1.

6.2 Investigators

The LINC-NIRVANA partnership recognizes the following responsible persons as investigators of the instrument project:

Tom Herbst (MPIA)	Principal Investigator (PI)
Roberto Ragazzoni* (INAF-Arcetri)	Co-Investigator (CoI)
Andreas Eckart (Cologne)	Co-Investigator (CoI)
Gerd Weigelt (MPIfR)	Co-Investigator (CoI)

* also affiliated with the MPIA for the period of Paul Prize award.

Tom Herbst is principal investigator (PI) of the consortium. The tasks of the PI comprise:

- Project leadership in close arrangement with the Co-Is
- Definition of overall project goals and implementation
- Supervision of the project execution done by the project manager and the project management team
- Organization of project funding together with the CoIs
- Implementation of the project science program
- Arrangement of the project collaboration environment through memoranda of understanding between the project partners
- Single responsible point of contact between the project and the LBT, and between the project and third parties interested to collaborate or benefit from the project work
- Consultation with the CoIs for discussion of all relevant decisions
- Final decision in case of controversial opinions

6.3 Project Managers

The overall instrument project is managed through a project manager at the MPIA Heidelberg, along with local managers at the four major project sites:

Martin Kürster (MPIA)	LINC-NIRVANA project manager and MPIA local manager
Jacopo Farinato (INAF-Arcetri)	INAF local manager
Christian Straubmeier (Cologne)	University of Cologne local manager
Udo Beckmann (MPIfR)	MPIfR Bonn local manager

The project manager establishes the management structure of the project and the personnel responsible for the various project tasks which make up the instrument development program. In this function, Martin Kürster replaced the former project manager, Herrmann Böhnhardt, as of 01 April 2004. Deputy project manager is Wolfgang Gässler (MPIA).

The project management team consisting of the PI, the Co-Is, the project manager and his deputy, the local managers, and the responsible personnel of major project tasks (see Section 8). The project management team is the forum for managing the project as a whole.

6.4 Project Directory

The institutes participating in the LINC-NIRVANA project are summarized in Table 1. The team members are listed in Table 2.

Table 1: LINC-NIRVANA Partner Institutes

Institute:	Max-Planck-Institut für Astronomie (MPIA) (Max Planck Institute for Astronomy)
Address:	Königstuhl 17, D-69117 Heidelberg, Germany
Telephone:	+49-6221-528-0
Telefax:	+49-6221-528-246
Web page:	http://www.mpia-hd.mpg.de
Institute:	INAF: Osservatorio Astrofisico di Arcetri (Astrophysical Observatory of Arcetri)
Address:	Largo E. Fermi, 5, I-50125 Firenze, Italy
Telephone:	+39 055 2752 1
Telefax:	+39 055 220039
Web page:	http://www.arcetri.astro.it
Institute:	1. Physikalisches Institut, Universität zu Köln (1 st Institute of Physics, University of Cologne)
Address:	Zùlpicher Str. 77, D-50937 Köln, Germany
Telephone:	+49-221-470-5737
Telefax:	+49-221-470-5162
Web page:	http://www.ph1.uni-koeln.de
Institute:	Max-Planck-Institut für Radioastronomie (MPIfR) (Max Planck Institute for Radioastronomy)
Address:	Auf dem Hügel 69, D-53121 Bonn, Germany
Telephone:	+49-228-525-0
Telefax:	+49-228-525-229
Web page:	http://www.mpifr-bonn.mpg.de
Institute:	INAF: Osservatorio Astronomico di Bologna (Astronomical Observatory of Bologna)
Address:	via Ranzani, 1, I-40127 Bologna, Italy
Telephone:	+39-051-2095701
Telefax:	+39-051-2095700
Web page:	http://www.bo.astro.it/
Institute:	INAF: Osservatorio Astronomico di Roma (Astronomical Observatory of Rome)
Address:	Via di Frascati, 33, I-00040 Monte Porzio Catone, Italy
Telephone:	+39 06 9428641
Telefax:	+39 06 9447243
Web page:	http://www.mporzio.astro.it/
Institute:	DISI, Università degli Studi di Genova (Univeristy of Genova)
Address:	via Dodecanesco, 35, I-16146 Genova, Italy
Telephone:	+39 010 353 6751
Telefax:	
Web page:	http://www.disi.unige.it

INAF: Istituto Nazionale di Astrofisica (National Institute of Astrophysics)

DISI: Dipartimento di Informatica e Scienze dell'Informazione

(Department of Computer and Information Science)

Table 2: LINC-NIRVANA Team Members

<u>MPIA Heidelberg</u>			
Harald Baumeister	Engineer	Werner Laun	Engineer
Armin Böhm	Engineer	Ulrich Mall	Engineer
Peter Bizenberger	Engineer	Lars Mohr	Engineer
Florian Briegel	Engineer	Vianak Naranjo	Engineer
Matthias Doersam	Engin./Dipl. Student	Aleksei Pavlov	Scientist/Engineer
Sebastian Egner	Scientist/PhD Student	Daniel Reymann	Engin./Dipl. Student
Rüdiger Friedlein	Engin./Dipl. Student	Hans-Walter Rix	Scientist
Wolfgang Gässler	Scientist, <i>Deputy PM</i>	Ralf-Rainer Rohloff	Engineer
Bernhard Grimm	Engineer	Johannes Schmidt	Student Assistant
Stefan Hanke	Scientist/PhD student	Roberto Soci	Engineer
Tom Herbst	Scientist, <i>PI</i>	Clemens Storz	Engineer
Martin Kürster	Scientist, <i>PM</i>	Valentin Volchkov	Student Assistant
<u>INAF Arcetri</u>			
Carmelo Arcidiacono	Scientist	Roberto Ragazzoni	Scientist, <i>Co-I</i>
Jacopo Farinato	Engineer, <i>LM</i>	Piero Salinari	Scientist
Matteo Lombini	Scientist	Laura Schreiber	Scientist/Dipl. Student
<u>University of Cologne (Köln)</u>			
Thomas Bertram	Scientist/PhD student	Steffen Rost	Scientist/PhD student
Andreas Eckart	Scientist, <i>Co-I</i>	Christian Straubmeier	Scientist, <i>LM</i>
Andreas Gatzke	Engineer	Yibing Wang	Engineer
Damian Moratschke	Engineer		
<u>MPIfR Bonn</u>			
Udo Beckmann	Scientist, <i>LM</i>	Matthias Heininger	Engineer
Jan Behrend	Engineer	Karl-Heinz Hofmann	Scientist
Claus Connot	Engineer	Eddy Nussbaum	Engineer
Thomas Driebe	Scientist	Dieter Schertl	Scientist
Manfred Heiden	Engineer	Gerd Weigelt	Scientist, <i>Co-I</i>
<u>INAF Bologna</u>			
Giovanni Bregoli	Engineer	Italo Foppiani	Engineer
Costantino Ciattaglia	Engineer	Carlotta Gruppioni	Scientist
Paolo Ciliegi	Scientist	Giancarlo Innocenti	Engineer
Giuseppe Cosentino	Engineer	Bruno Marano	Scientist
Emiliano Diolaiti	Scientist <i>HG</i>		
<u>INAF Rome (Roma)</u>			
Francesco D'Alessio	Scientist	Fernando Pedichini	Scientist
Gianluca Li Causi	Scientist/Engineer	Roberto Speziali	Scientist
Dario Lorenzetti	Scientist, <i>HG</i>	Fabrizio Vitali	Scientist
<u>University of Genova</u>			
Babara Anconelli	Scientist	Patrizia Boccacci	Scientist
Mario Bertero	Scientist, <i>HG</i>		

Co-I: Co-Investigator
HG: Head of Group

LM: Local Manager
PI: Principal Investigator

PM: Project Manager

7 Project Organisation

7.1 Memoranda of Understanding

The LINC-NIRVANA project is based on two Memoranda of Understanding (MoU). The first MoU, signed by all four project partners, lays out responsibilities, task definition, partner commitments to manpower and hardware costs, and provides suggestions for the distribution of benefits. Parts of the sections of the present document follow this MoU of the LINC-NIRVANA consortium (sections 6.1—6.3, 8, 9, 11.1—11.2). The second MoU regulates the particulars of accounting and distributing benefits between the MPIA and the University of Cologne and is signed by these two partners only.

7.2 Project Organigram

The organization of the LINC-NIRVANA project is illustrated by the organigram shown in Figure 1. The organigram highlights the responsibilities within the project based on a schematic division of tasks.

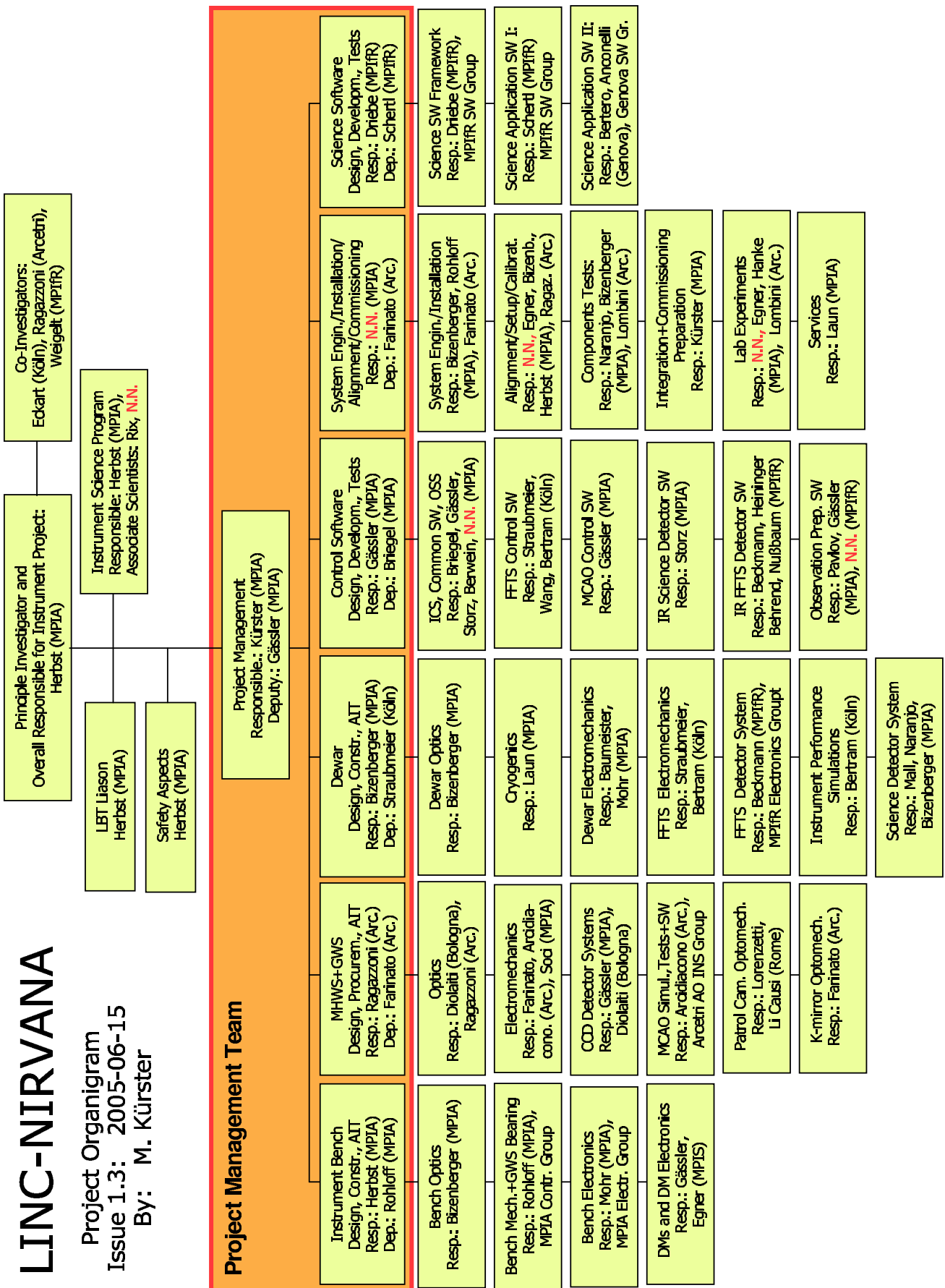


Figure 1: Project Organigram

8 Project Responsibilities

In the LINC-NIRVANA consortium MoU, the responsibilities for the technical realization and implementation of LINC-NIRVANA are distributed among the consortium partners as follows:

8.1 Responsibilities of MPIA Heidelberg:

- Instrument bench: Bench, warm optics including piston mirror, dichroics, and DMs, electromechanics, support structure, and general electronics, excluding GWS and MHWS systems.
- Dewar: Cryostat thermo-mechanical design, imaging optics, science detector equipment, electromechanics, and cryogenics, excluding the detector positioning and shielding units of the fringe and flexure tracker system.
- Wavefront sensing detectors for the GWS and MHWS units.
- Control software: Instrument control software, MCAO and GWS control software excluding the fringe- and flexure tracker, science detector control software.
- Ancillary software: Observation preparation software
- Test and commissioning software.
- Overall project management.
- Coordination of the AIT phase in Europe.
- Instrument commissioning at the LBT.
- Contributions to the test and commissioning software tools.

8.2 Responsibilities of INAF

- Ground layer wavefront sensor (GWS): Optics and electromechanics.
- Mid-high layer wavefront sensor (MHWS): Optics, electromechanics, and patrol cameras.
- Simulation software for single-arm adaptive optics system performance and model analysis of the MCAO performance.
- Support for assembly, integration and testing (AIT) of the instrument in Europe.
- Support for instrument commissioning at LBT.
- Contributions to the test and commissioning software tools.
- Contributions to the scientific data reduction software (DRS) through the co-operation with the University of Genoa.

8.3 Responsibilities of the University of Cologne:

- Science channel: filters, control software for the the fringe and flexure tracker system (FFTS), electromechanics of the detector positioning and shielding systems of the FFTS.
- Procurement of dewar vessel, temperature controllers, temperature monitors, vacuum pumps and mechanical coolers for the cryostat.
- Simulation software for the fringe tracking performance and end-to-end modelling of the interferometric performance of the instrument in different environmental conditions.
- Support for AIT of the instrument in Europe.
- Support for instrument commissioning at LBT.
- Contributions to the test and commissioning software tools.

8.4 Responsibilities of MPIfR Bonn

- Detector equipment, i.e. detector, readout electronics and detector control software for the fringe and flexure tracker system (FFTS).
- Scientific Data Reduction Software (DRS).
- Support for AIT of the instrument in Europe.
- Support for instrument commissioning at LBT.
- Contributions to the observation preparation software.
- Contributions to the test and commissioning software tools.

9 Division of Tasks

Since the PDR, the division of tasks has undergone a number of adjustments and is therefore presented here in detail. The following compilation follows the MoU of the LINC-NIRVANA consortium.

9.1 Tasks of MPIA:

1. project management and coordination of the partnership, including the overall budget, schedule, and progress control
2. coordination of the instrument project with the LBT Observatory
3. design, manufacture, procurement and implementation of the beam combining optics and optomechanics of the optical bench and of the cryo-optics of the dewar (excluding the optics for the adaptive optics systems - GWS and MHWS - of the instrument)
4. design, manufacture, procurement and implementation of the instrument mechanics and electromechanics, excluding the wavefront-sensors of the adaptive optics systems, i.e. in particular excluding the two GWS, the two MHWS; the patrol camera systems, and the K-mirror systems; the MPIA provides support for the design and manufacture of the optomechanical and electromechanical components of these subsystems (GWS, MHWS, patrol camera, and K-mirror); design of the cooling hardware and the head unit of the Fringe and Flexure Tracker system (FFTS — the head unit comprises the FFTS filter wheel, FFTS detector mount, fanout board, cabling, and thermal coupling); these components of the FFTS system may also be manufactured by MPIA subject to an evaluation of institute capacities
5. design, construction, procurement and implementation of the electronic and electric systems of the instrument
6. design, manufacture, procurement support, and implementation of the cryo-mechanics instrument concept, including cryostat and cooling system
7. design, manufacture, procurement and implementation of the detector system for the scientific exposures of LINC-NIRVANA
8. procurement and implementation of the wavefront sensing detectors for the GWS and MHWS units
9. design, coding, implementation and testing of the Instrument Control Software
10. design, coding, implementation and testing of the Observation Preparation Software
11. design, coding, implementation and testing of the control software for the science detector of the instrument
12. design, coding, implementation and testing of software tools for the lab experiments, and for the integration and commissioning phase of this instrumentation project
13. definition and implementation of the instrument alignment, set-up and calibration procedures and activities, including provision of the required hardware
14. management and execution of system engineering tasks

15. management and coordination of the handling, integration and internal (self-)alignment concept
16. establishment and coordination of the overall procurement plan of the project
17. manufacture and procurement of instrument parts, according to the procurement plan of the project
18. preparation and execution of lab experiments, including the single-arm experiment
19. coordination and support of the instrument integration in Germany
20. coordination and support of the implementation and commissioning of the instrument at the LBT

9.2 Tasks of INAF:

1. design, manufacture, procurement and implementation of the optomechanics of the GWS and MHWS, with support from MPIA for design and manufacturing
2. support of the design, manufacturing, procurement and implementation of the electronics and electrics of the GWS and MHWS
3. design, procurement and implementation of the camera optical systems of the GWS and MHWS, and integration of the wavefront sensor detectors
4. design, coding, implementation, and testing of application software modules for scientific data reduction within the overall framework defined for the DRS package (in coordination with MPIfR)
5. support for the preparation and execution of the single arm experiment
6. support of system engineering tasks
7. design, coding, implementation, and testing of software tools for lab experiments, integration, and commissioning of the sub-systems under the responsibility of INAF
8. manufacture and procurement of instrument parts according to the procurement plan of the project
9. support of the instrument integration in Germany
10. support of the implementation and commissioning of the instrument at the LBT
11. simulations for the characterization of MCAO performance

9.3 Tasks of the University of Cologne:

1. design, manufacture, procurement and implementation of the electromechanics of the Fringe and Flexure Tracker system (FFTS) except the design of the cooling concept and of the FFTS head unit (which are MPIA tasks)
2. provision of the filters for the scientific observations and for the FFTS

3. procurement and provision of the cryostat, including cooling system based upon the design proposal from MPIA
4. design, coding, implementation, and testing of the control software for the FFTS
5. design, coding, implementation, and testing of software tools for the lab experiments, integration and commissioning phases of the FFTS
6. manufacture and procurement of instrument parts according to the procurement plan of the project
7. support of system engineering tasks
8. support of instrument alignment, set-up and calibration tasks
9. support of the instrument integration in Germany
10. support of the implementation and commissioning of the instrument at the LBT

9.4 Tasks of MPIfR:

1. design, manufacture, procurement, and implementation of the detector system for the FFTS
2. design, coding, implementation, and testing of the control software for the FFTS detector system
3. design, coding, implementation and testing of the overall scientific data reduction software; provision of the general DRS framework for application software, including an interface to implement software modules provided by other users; provision of application software in coordination with INAF Arcetri as needed for typical observation programs with the instrument
4. contributions to the design, coding, implementation, and testing of the Observation Preparation Software for LINC-NIRVANA
5. manufacture and procurement of instrument parts according to the procurement plan of the project
6. support of system engineering tasks
7. support of alignment, set-up, and calibration tasks
8. support of the instrument integration in Germany
9. support of the implementation and commissioning of the instrument at the LBT

10 Project Internal Communication and Meetings

10.1 Team meetings

- Project team meetings:
These are status meetings of the consortium with representatives for the major tasks. They typically last one or two days and are convened four times per year, or more frequently, if needed; e.g. in the FDR preparation phase a series of monthly meetings took place.
- Topical meetings:
Discussion meetings of the responsible team members on selected subjects, convened as needed. They are in-person meetings, videocons, or telecons.
- Local weekly meetings:
Weekly meetings are held at the individual consortium institutes. All team members of an institute participate. Duration 1/2 – 1 hour.
- Board of Investigator (BoI) meetings:
The BoI consists of the PI and the CoIs. Meetings are convened and chaired by the project manager for the purpose of establishing project internal policies. They are convened as needed. So far, there has been one formal BoI meeting on 30 Nov 2004.

For all types of meetings, minutes are prepared and distributed to the LN team as a whole.

10.2 Task Monitoring

Task monitoring is covered by status reports given in the weekly meetings and in the project team meetings. Action item lists are used for issues that deserve special attention.

With the beginning of the AIT phase of the project, we plan to introduce a broader task monitoring scheme based on systematic follow-up of the defined tasks. This will consist of a task list containing:

- the task definition,
- the assignment of a responsible person,
- the due date,
- an regularly updated action log.

10.3 Interface and Configuration Control

At present LN interface and configuration control uses two major tools:

- A web-based BSCW (Basic Support for Cooperative Work) shared workspace server that is used by all consortium members as the central common documentation archive. It contains documents, meeting minutes, action item lists, publications, etc.
- LN software developers use the CVS (Concurrent Versions System) software for source file version control.

11 Project Milestones and Schedule

11.1 Baseline Instrument Configuration

LINC-NIRVANA will accept radiation from the two telescopes coming from a field of 6 arcminutes diameter. It will have a two-arm optical layout (except for the cryostat) to allow Fizeau-type imaging interferometry. The instrument must supply a number of sensors for both scientific and wavefront sensing measurements.

The main components of LINC-NIRVANA are:

1. The interferometer, consisting of two arms of beam combining and wavefront correcting optics on an ambient temperature bench and the cryostat with reimaging and wavelength separating optics, the scientific detector, and the fringe and flexure tracking system.
2. The multi-conjugate adaptive optics (MCAO) system, consisting of one Ground layer Wavefront Sensor (GWS), one Mid-High layer Wavefront Sensor (MHWS) and one Deformable Mirror (DM) per arm; in each arm the adaptive secondaries of the telescope serve as a second DM.
3. The control environment suitable to operate the instrument efficiently at the telescope.
4. The data reduction package tailored to extract the scientific results.

11.2 Milestones for the Baseline Instrument

The major milestones for implementation of the baseline instrument are:

- Concept documentation and review (performed in autumn 2001).
- Preliminary design documentation and review (performed April 2003).
- Final design documentation and review currently planned for July 2005.
- Completion of the single arm experiment of the MCAO system in the lab, currently planned for 2006.
- Readiness review of the instrument in Europe before installation at LBTO, currently planned for 2007. Procedural points to this item need to be discussed with the LBTO.
- Installation, stepwise implementation, commissioning and acceptance of the instrument at the LBT currently is planned to take place in 2007 and 2008.
- Delivery of the final documentation in 2008.

The recommendations of the FDR board will be considered by the instrument consortium for implementation. The LINC-NIRVANA project will follow the acceptance procedures for strategic instruments as defined by the LBTO.

11.3 Milestones for the manufacture of major HW components:

Out of the large number of LINC-NIRVANA hardware (HW) components the major ones were selected to represent milestones for the planning of the HW manufacture and delivery. These milestones are summarized in Table 3.

Table 3: Milestones for major HW components

Item	Delivery date	Status
Bench + Substructure	June/July 2005	due June/July 2005 at MPIA
Bench optics (warm)	End 2005	partially delivered
Cryostat optics (cold)	Goal: early 2006	
DM stages	late 2004	delivered, undergoing tests
DM1 (incl. control electronics)	late 2004 → late 2005	HW failure, replacement ordered
DM2 (incl. control electronics)	late 2004	undergoing tests
Piston Mirror Piezo stage	early 2004	delivered and tested
Piston Mirror vertical stage	June 2005	
Flexure test tilting mechanism (for MPIA integration facility)	Nov 2005	
GWS Unit 1 components	Goal: May 2006	
GWS Unit 2 components	Goal: May 2006	
GWS Bearings	Winter 2005	
MHWS Unit 1 components	Oct 2005	ordered
MHWS Unit 2 components	Goal: Feb 2006	
WFS CCDs (incl. control electronics)	End 2005	2 CCDs delivered, 2 ordered 3/4 electronics ordered, 2 delivered
Cryostat	Dec 2005	
Cryostat Handling Chart	Early 2006	
Electronics cabinets	Dec 2005	
Science detector	Fall 2004	delivered and tested
Science detector R/O electronics	ready	manufactured at MPIA
FFTS detector	2003	delivered
FFTS detector R/O electronics	Goal: spring 2006	
FFTS head unit	March 2006	

11.4 Milestones for the completion of major SW products:

Table 4: Milestones for the completion of major SW components

Item	Due Date	
	First release	Final release
OSS: Observation Support SW	Oct 2006	May 2008
ICS: Instrument Control SW	Oct 2006	May 2008
COM: Common SW	Oct 2006	May 2008
IRC: Infrared Camera SW	Dec 2005	May 2008
AOS: Adaptive Optics SW	Oct 2006	May 2008
FFS: Fringe-Flexure-Tracker SW	Oct 2006	May 2008
OPS: Observation Preparation SW	Oct 2006	May 2008
DRS: Data Reduction SW	Oct 2006	May 2008
SA1: Science Application SW I (Bonn)	Dec 2005 (not critical)	TBD
SA2: Science Application SW II (Genova)	Dec 2005 (not critical)	TBD

11.5 Project schedule

The schedule of the LINC-NIRVANA project is shown in Figures 2, 3, and 4. It is subject to a number of external and internal dependencies. Therefore, it represents project goals in several cases.

Briefly, the main dependencies are:

- LBT project schedule; the latest uncertainties have not been considered.
- The experimental nature of LINC-NIRVANA.

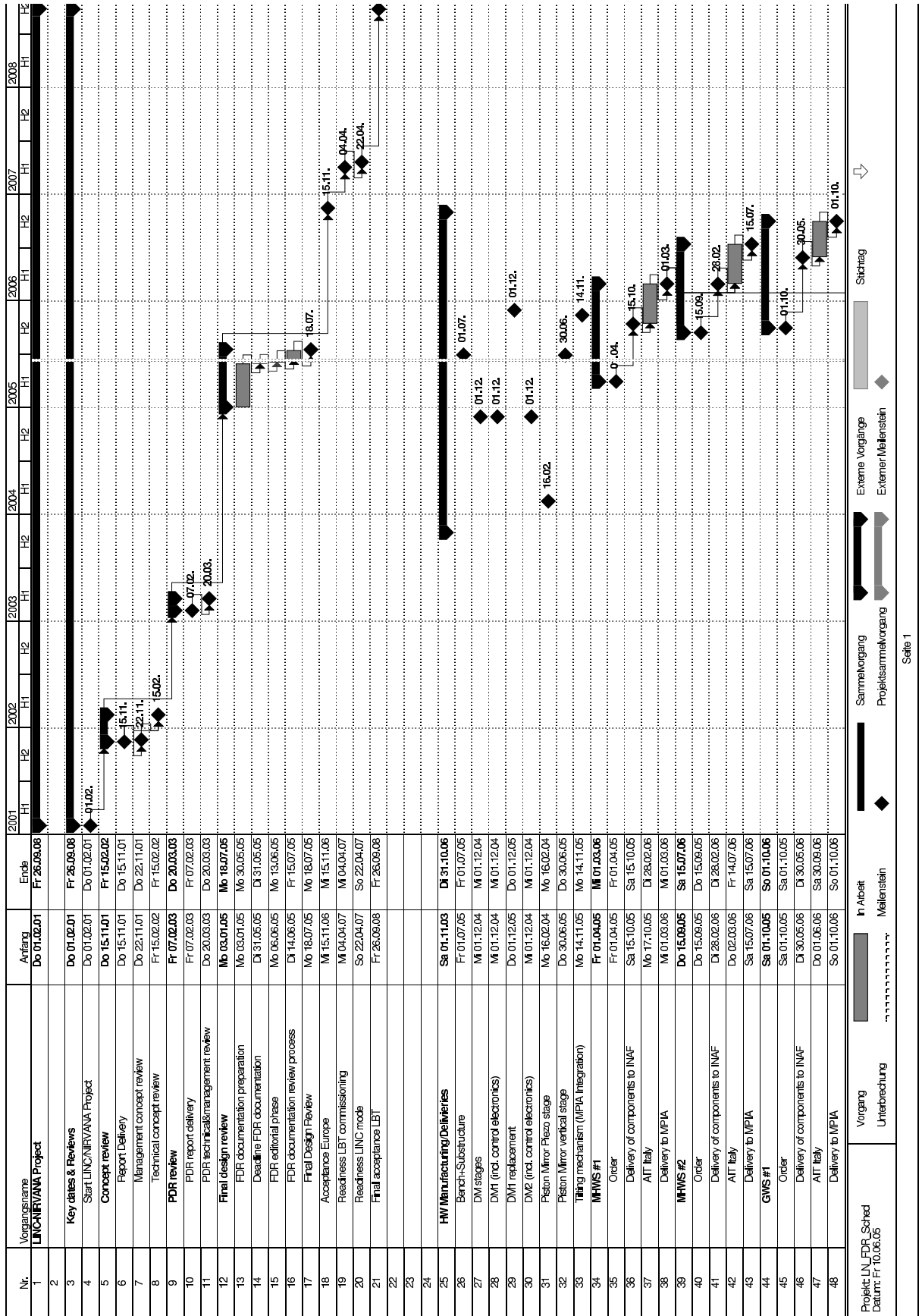


Figure 2: LINC-NIRVANA project schedule part 1

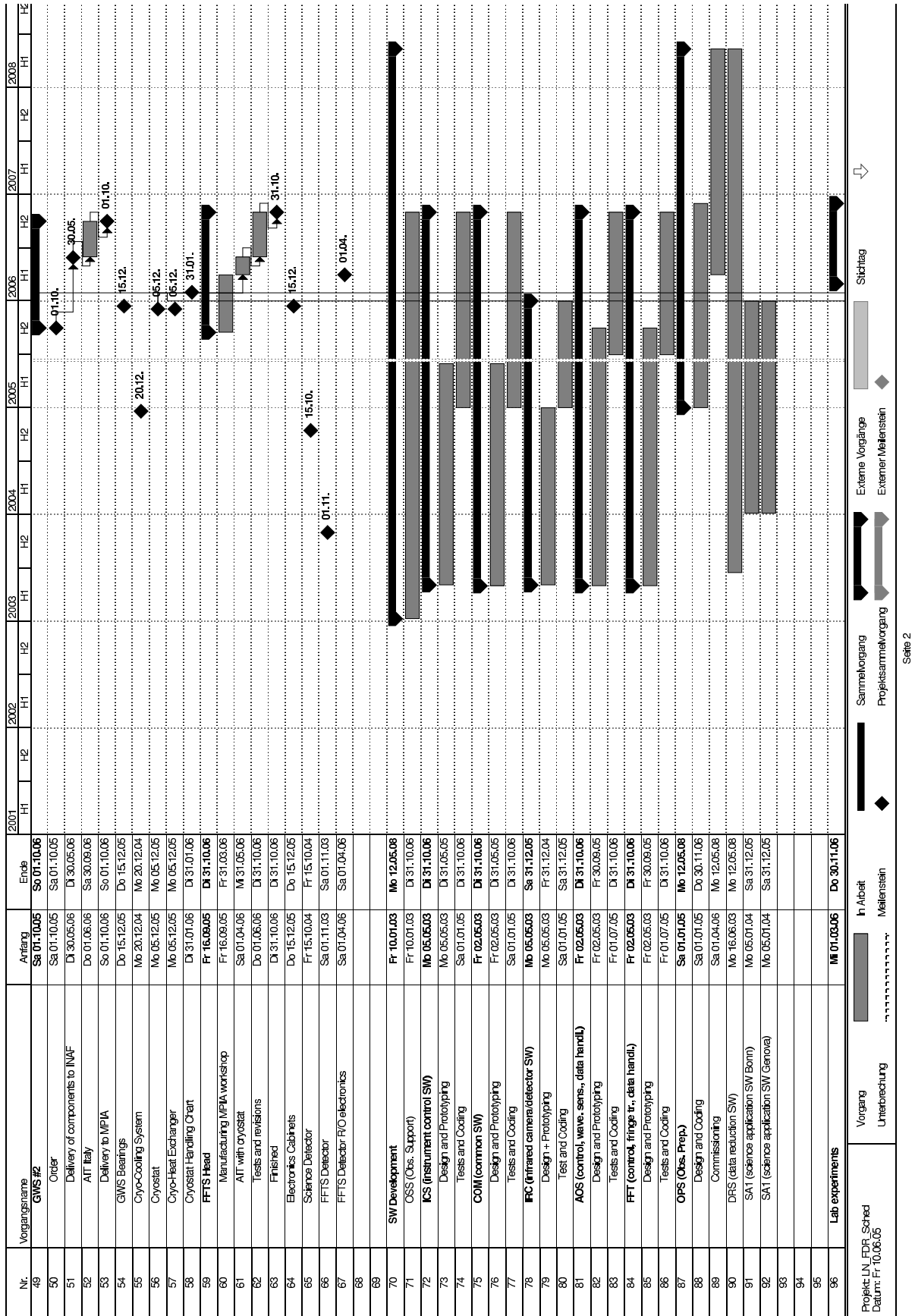


Figure 3: LINC-NIRVANA project schedule part 2

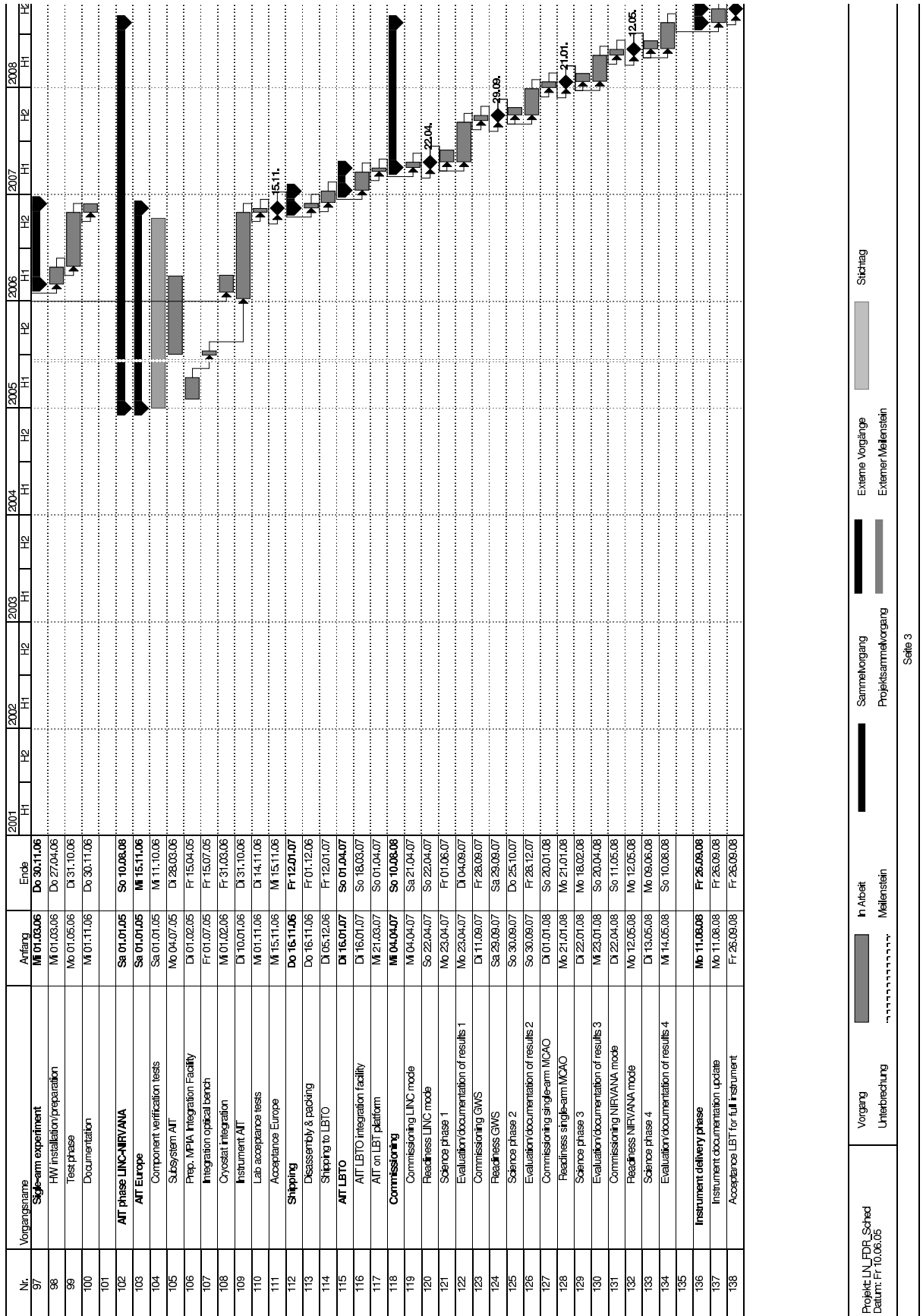


Figure 4: LINC-NIRVANA project schedule part 3

12 Deliverables

The main deliverables of the LINC-NIRVANA project are:

- The instrument hardware as defined for the baseline configuration of LINC-NIRVANA.
- Special handling and alignment devices for assembly, integration and tests (AIT) of the instrument.
- The control software needed for scientific operation of the instrument at the telescope. This includes the observation preparation software package.
- The software package for the reduction of scientific data taken with the instrument.
- The documentation for the instrument hardware and software, consisting of the instrument manual for users and engineering staff and relevant design documents, drawings, and reports produced internally during the course of the project.
- Any requirements appropriate to strategic instrument status.

Table 5: LN hardware funding status

Funding source		≤2002	2003	2004	2005	2006	Total
			spent		projected		proj.
MPIA	<i>Investments</i>	5,514	225,596	433,623	250,000	250,000	1,164,733
Heidelberg	<i>JRA1</i> ¹⁾	—	—	—	*165,000	*45,000	210,000
	<i>Paul</i>	50,059	620,255	45,367	*64,430	*73,200	853,311
	sub-totals:	55,573	845,851	478,990	479,430	368,200	2,228,044
INAF	<i>Arcetri</i>	—	96,094	—	*605,000	*555,000	1,256,094
	<i>JRA1</i> ¹⁾	—	—	—	—	140,000	140,000
	<i>Rome</i> ²⁾	—	—	—	90,000	—	90,000
	sub-totals:	—	96,094	—	695,000	695,000	1,486,094
MPIfR Bonn	<i>Investments</i>	—	184,991	159,054	145,608	160,347	650,000
U. Cologne	<i>Investments</i> ³⁾		2002-2004:	433,425	316,575	—	750,000
	totals:		by 2004:	2,253,978	1,641,613	1,377,453	5,273,044

* Amounts can be split up differently between 2005 and 2006.

- 1) For ground layer hardware and equipment only.
- 2) For patrol camera only.
- 3) For expenses related to the cryogenic assembly.

13 Hardware Funding

Table 5 provides an overview of the LINC-NIRVANA funding situation. The current projection of the funds available by the end of 2006 is EURO 5,273,044. The estimated HW cost for LINC-NIRVANA is EURO 5,500,000 and thus covered to 96% by the funds available until the end of 2006.

Providers have been identified for all of the major hardware components. Cash flow is regularly monitored.

Table 6: LINC-NIRVANA manpower contributions

FTEs		≤2001	2002	2003	2004	2005 2006 projected		Total proj.
MPIA	Herbst group	<i>1.25</i>	<i>0.73</i>	0.73	<i>0.79</i>	<i>2.15</i>	<i>2.15</i>	7.80
Heidelberg	Technical Depts.	<i>0.36</i>	<i>2.97</i>	7.64	<i>8.22</i>	<i>10.58</i>	<i>12.72</i>	42.49
	General	<i>0.025</i>	<i>0.025</i>	0.025	<i>0.025</i>	<i>1.37</i>	<i>1.575</i>	3.045
	VbF	—	<i>0.23</i>	<i>0.70</i>	<i>0.64</i>	<i>1.315</i>	<i>2.00</i>	4.885
	JRA4	—	—	—	—	<i>0.50</i>	—	0.50
	Paul price	—	<i>2.44</i>	<i>4.07</i>	<i>1.01</i>	—	—	7.52
sub-totals:		1.635	6.395	13.165	10.685	15.915	18.445	66.24
INAF	Arcetri		2002-2003:	<i>1.73</i>	<i>1.60</i>	<i>1.80</i>	<i>2.30</i>	7.43
	Bologna	—	—	—	<i>0.40</i>	<i>1.85</i>	<i>2.15</i>	4.40
	Rome	—	—	—	<i>1.00</i>	<i>1.85</i>	<i>1.10</i>	3.95
	Univ. Genoa	—	—	—	<i>1.00</i>	<i>TBD</i>	<i>TBD</i>	<i>1.00</i>
sub-totals:			by 2003:	1.73	4.00	5.50	5.55	16.78
MPIfR Bonn		—	—	1.00	4.00	3.50	3.50	12.00
U. Cologne				2002-2004:	14.40	4.62	4.62	23.64
totals:				by-2004:	57.01	29.535	32.115	<u>118.66</u>

14 Manpower Estimates

Table 6 provides an overview of the manpower contributions of the LINC-NIRVANA partners up to 2004 as well as the estimated contributions for 2005 and 2006. These numbers do not include administrative work.

15 Liaison with LBT

We do not yet have a signed Memorandum of Understanding (MoU) between the LBTO and the LINC-NIRVANA consortium. A draft MoU is in preparation for discussion with LBTO.

The following are among the issues that may be dealt with in this MoU:

- Infrastructure and personnel support by LBTO for the installation of LINC-NIRVANA.
- Infrastructure and personnel support by LBTO for the operation of LINC-NIRVANA.
- Guidelines for the allocation of technical and science time.
- Requirements for acceptance and acceptance procedures.
- Access and data rights beyond the LN consortium.
- Roadmap for conversion to facility status.
- In-kind credit for LINC-NIRVANA.