Complexity

What is LINC-NIRVANA?

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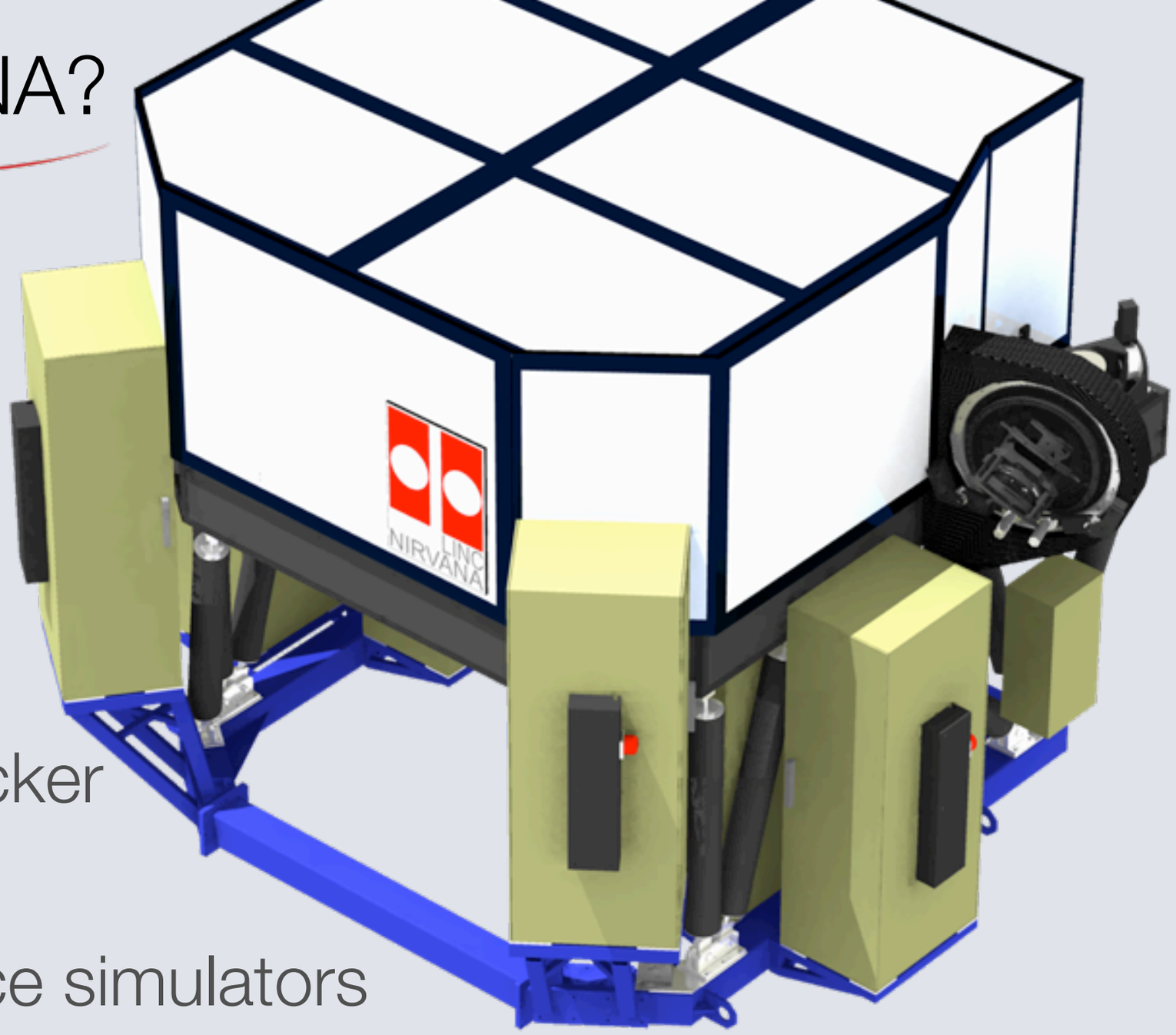
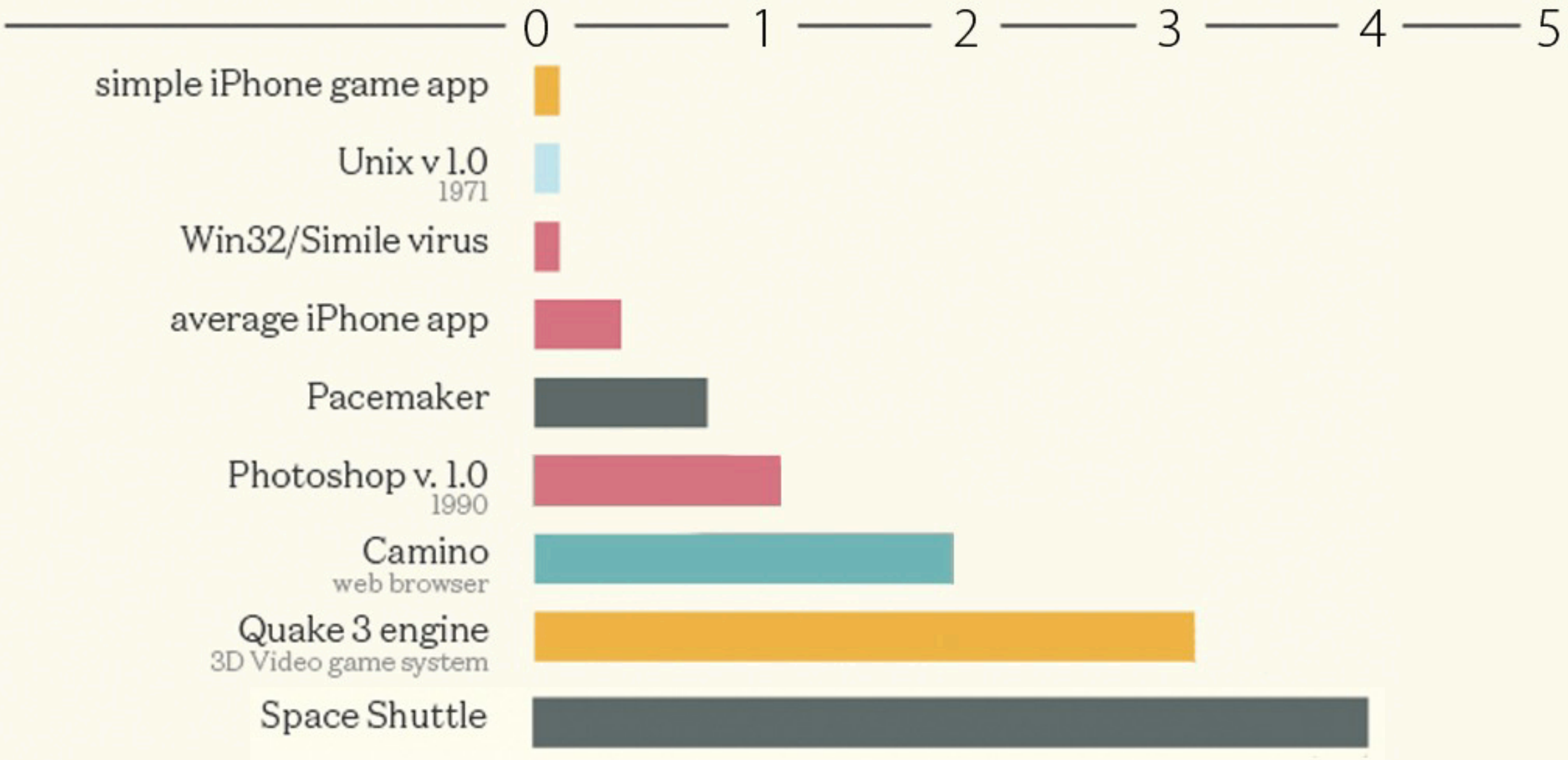


High Resolution
NIR Imager:
MCAO, Interferometry

- 1 large cryostat
- 4 wavefront sensors
- 1 cryogenic fringe tracker
- 2 calibration units
- 2 multi-layer turbulence simulators
- 1 piston (OPD) simulator
- 8 science-grade detector systems (2 IR, 6 visible)
- >250 lenses and mirrors
- 133 motors, 40 control systems, 966 cables

Codebases

Hundreds of thousands of lines of code



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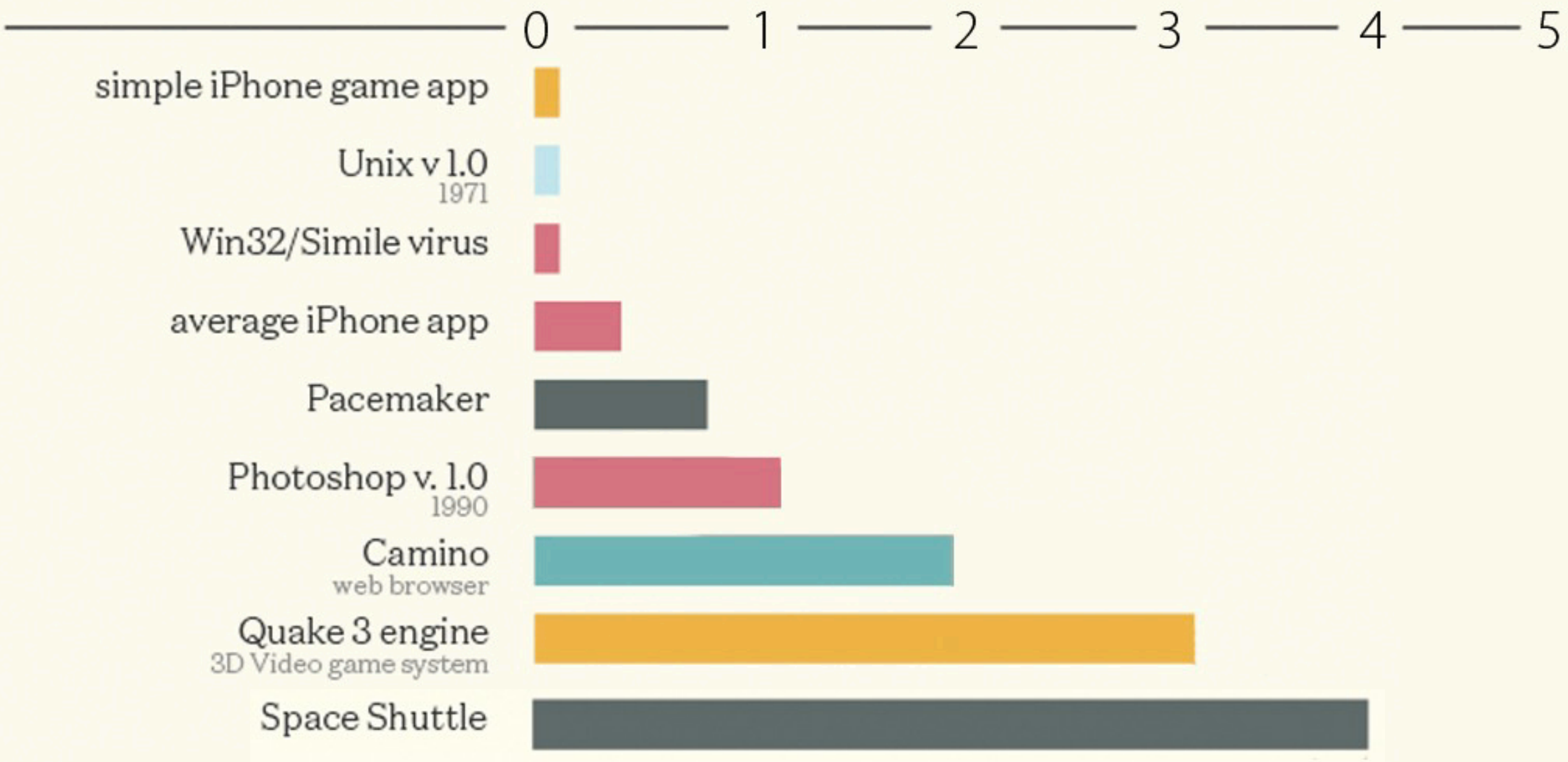

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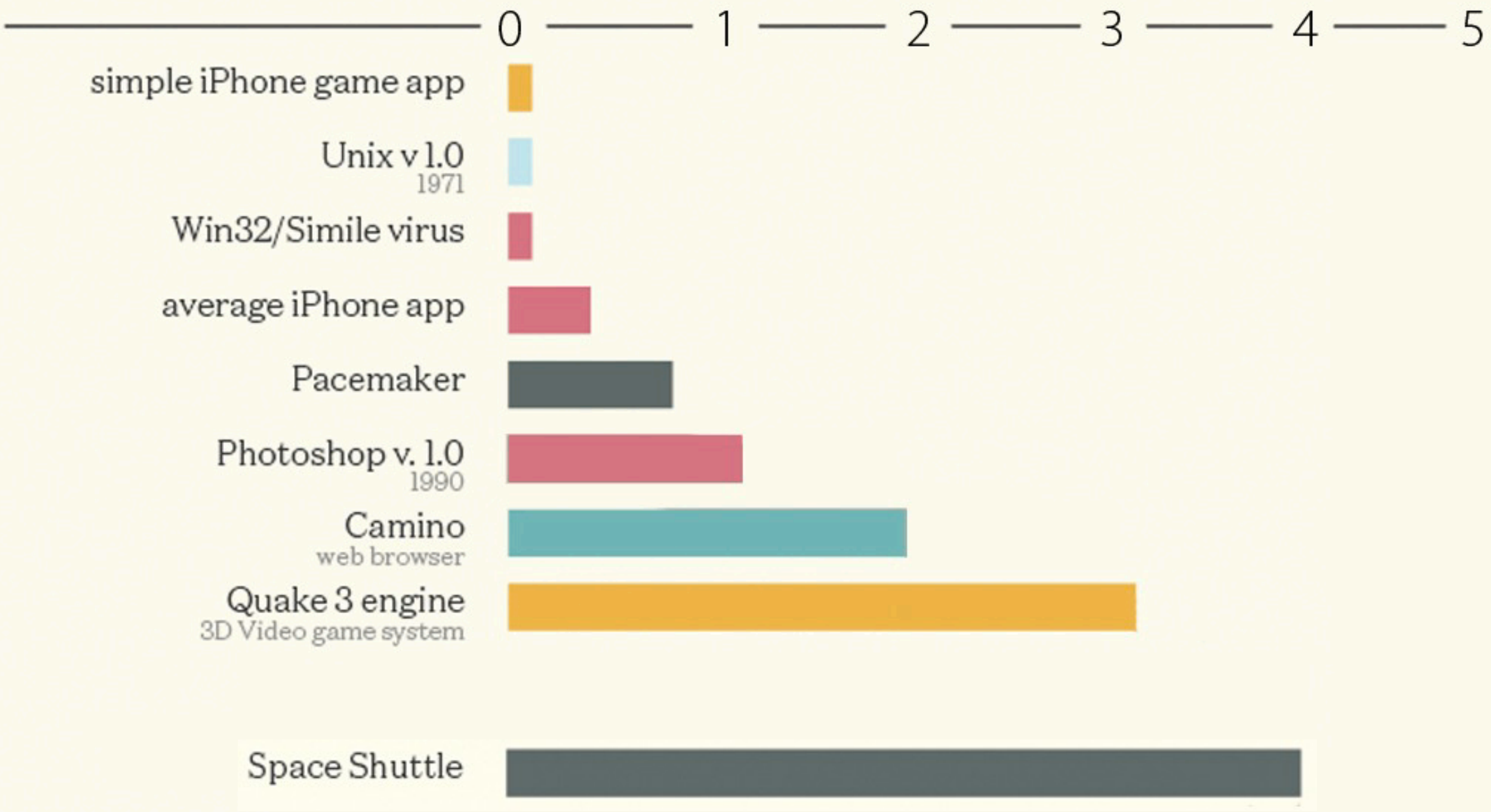

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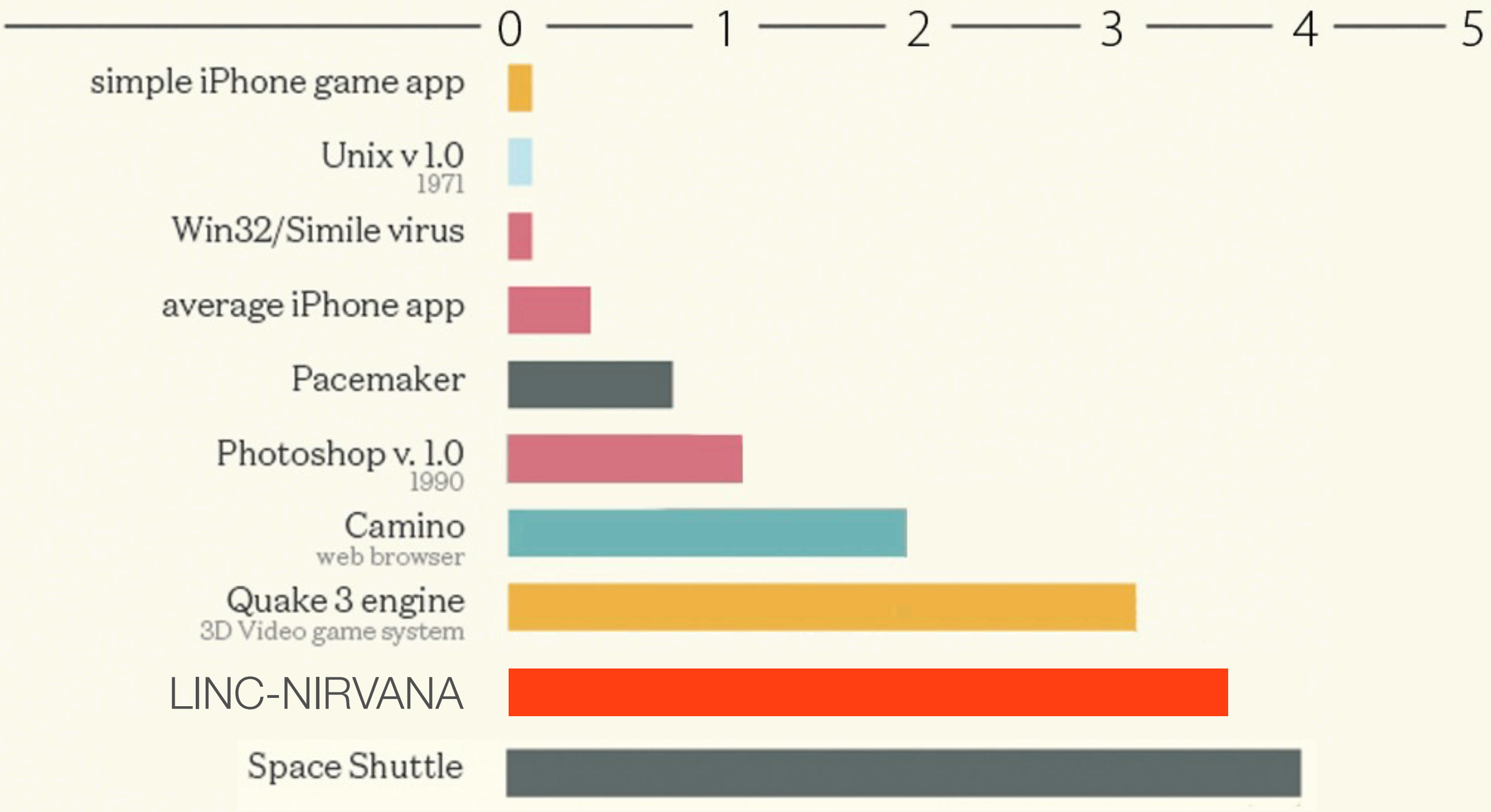
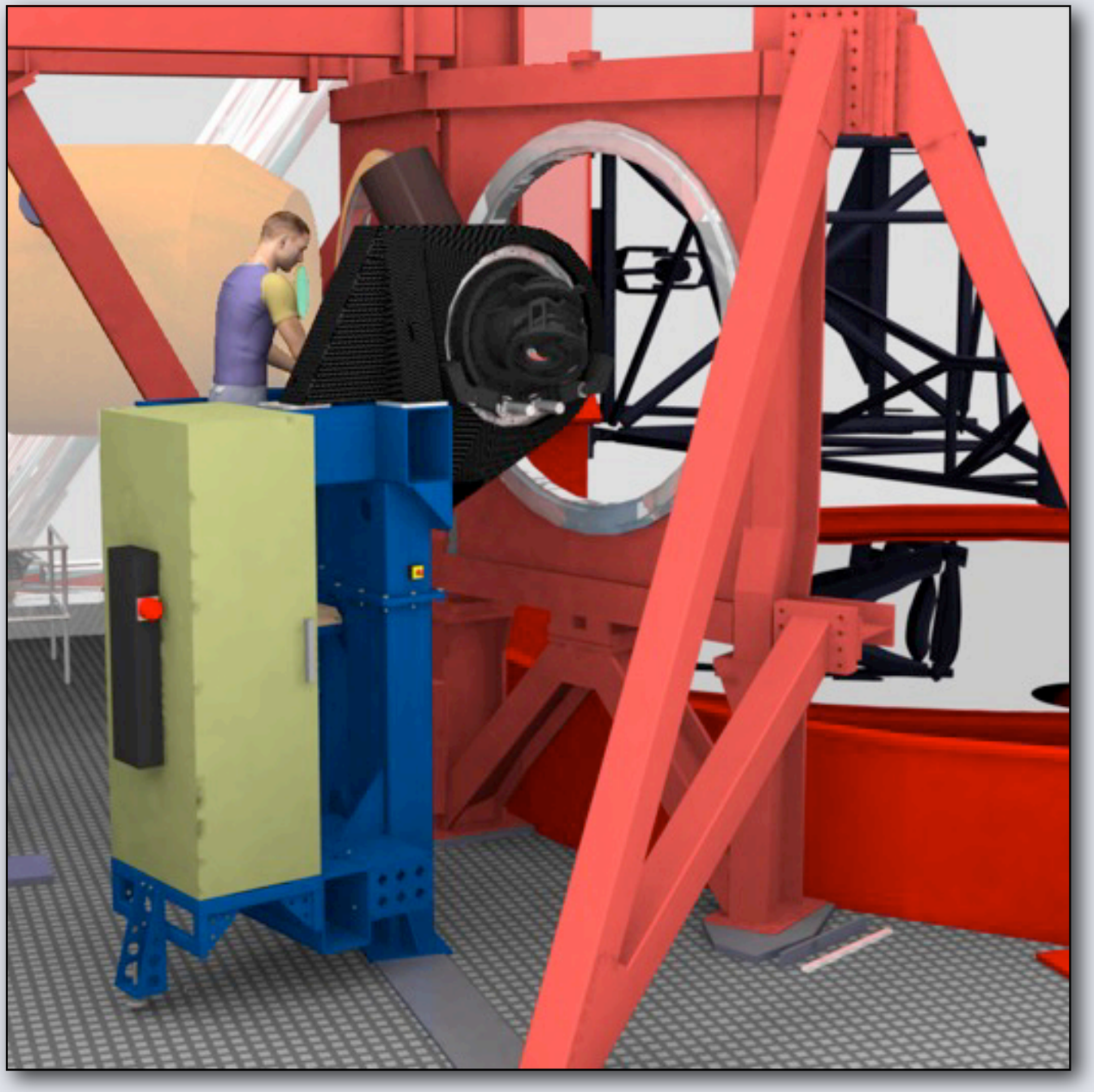


The LINC-NIRVANA Pathfinder

AstroTechTalk
26 September 2014
MPIA Heidelberg

An Experiment to Reduce Risk and Accelerate Commissioning



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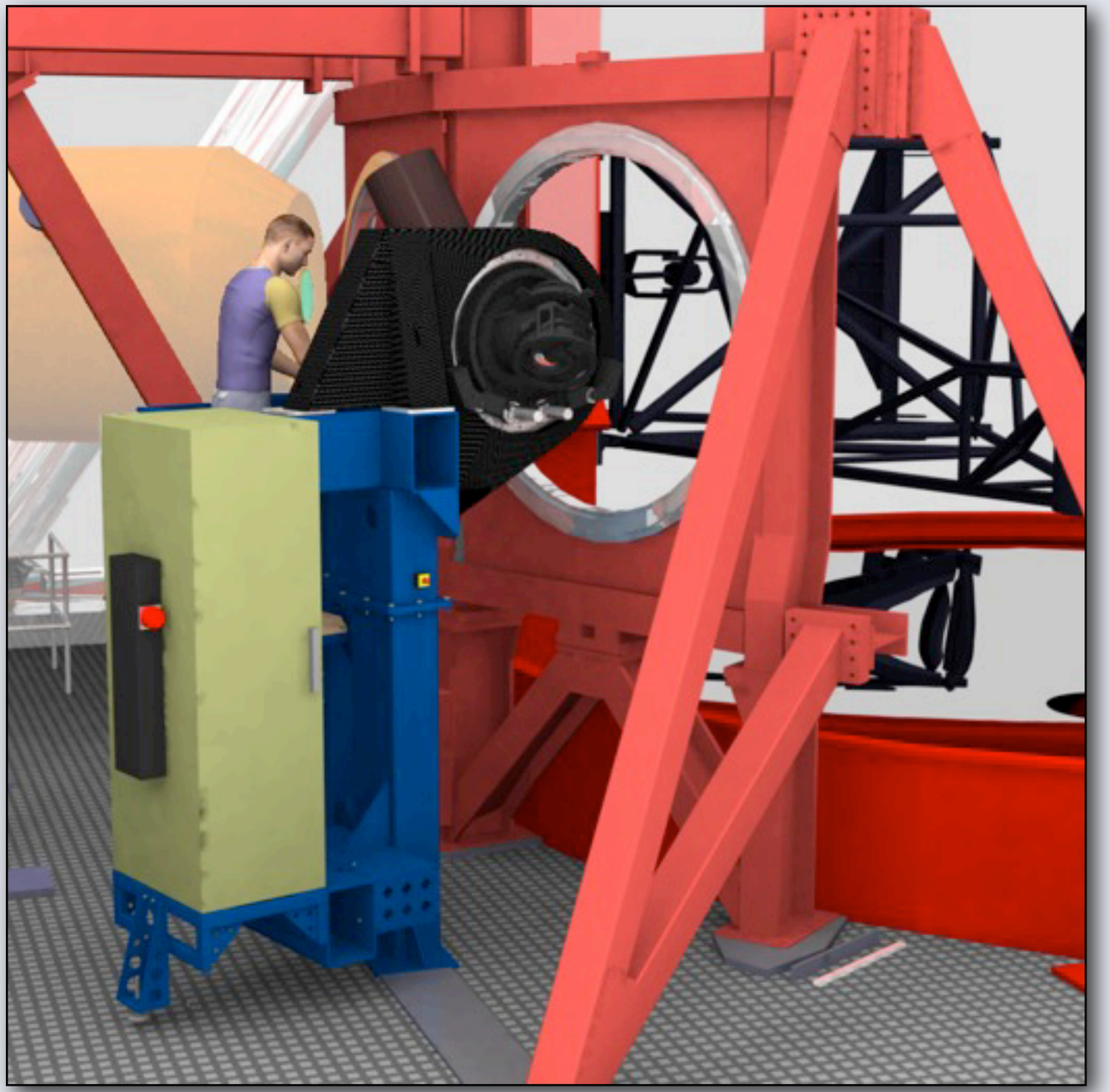

Will Verify:

- telescope communication
- AO secondary communication
- WFS calibration strategies
- field acquisition
- Rotating interaction matrix
- software compatibility

Additional:

- commission focal station
- integrate w/ TCS development
- on-sky experience
- plant flag, get on radar

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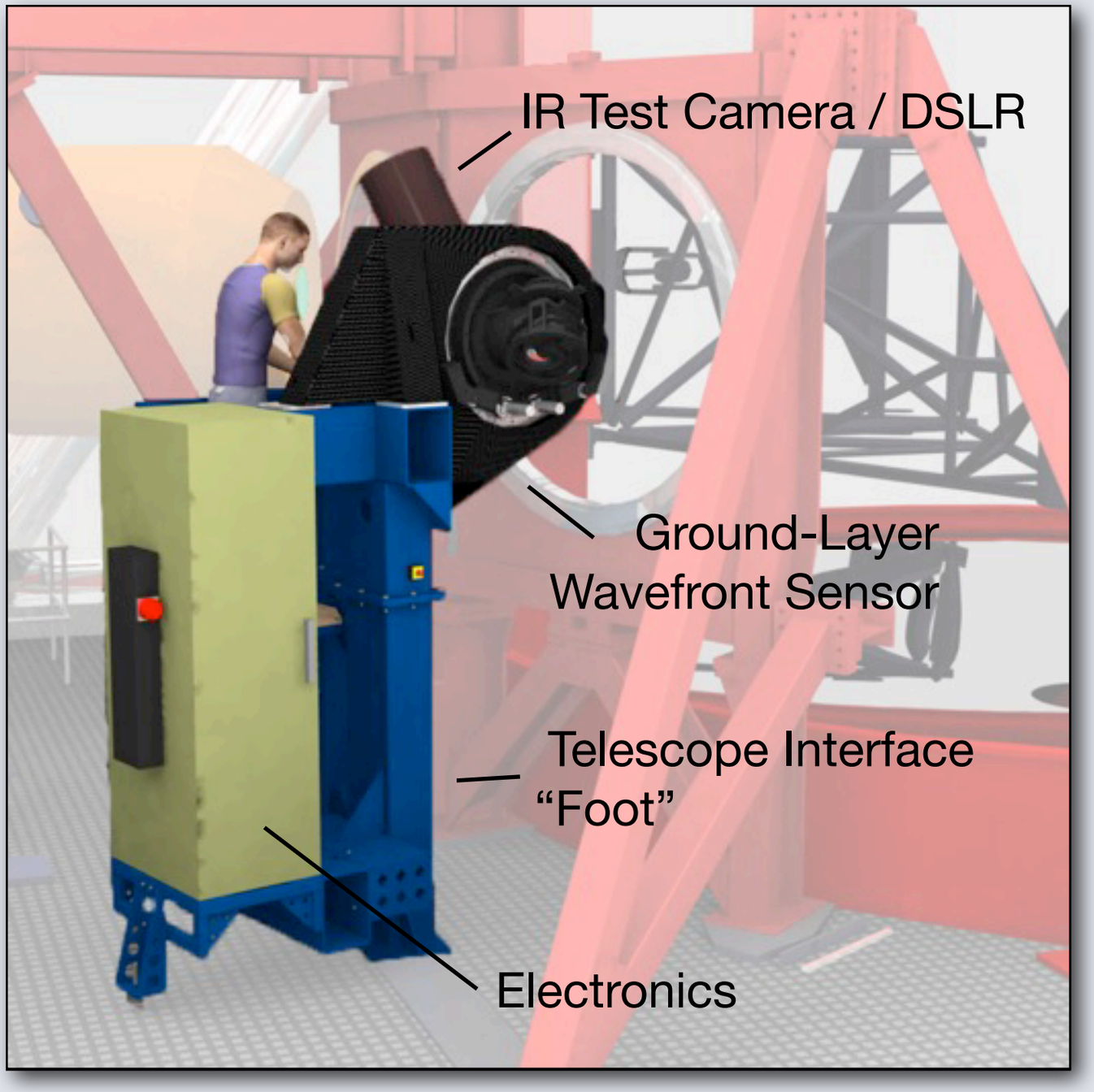

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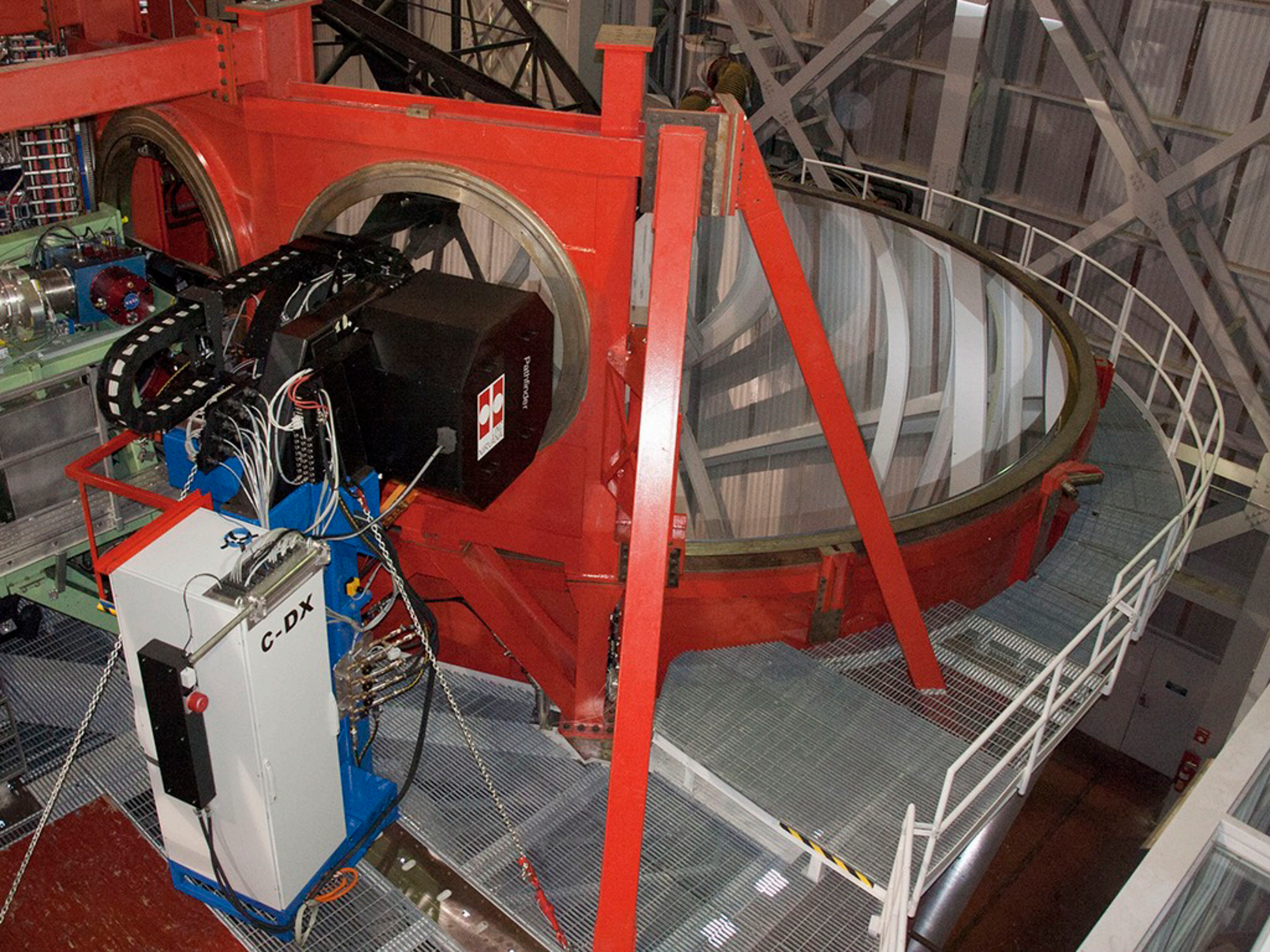
C-DX


Pathfinder
C-DX

LBT Pathfinder Test Plan

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26 September 2014
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LBT Pathfinder Test Plan

- Pathfinder Tests, Baseline
  - TCS Communication
  - First-Light AO System Communication
  - Align Pathfinder to Telescope
  - Calibrate Interaction Matrix
  - Close Loop - Single Reference Source

Day

  - Commission Focal Station
  - Close Loop - Single Star, non-rotating
  - Close Loop - Single Bright Star, rotating
  - Close Loop - Single Faint Star, rotating

- Extended Goals
  - Multiple Star Acquisition
  - Close Loop - Multiple Stars

Night

LBT Pathfinder Test Plan

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  - ✔ First-Light AO System Communication
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  - ✔ Close Loop - Single Reference Source
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  - (clouds) Close Loop - Single Faint Star, rotating
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  - (clouds) Close Loop - Multiple Stars

Mid-2013 (DX AO)

Day

Night

Dec-2013

Nov 2014

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Day

Night

Dec-2013

Nov 2014

LINC-NIRVANA Pathfinder First Light

9-17 November 2013

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LINC-NIRVANA Pathfinder First Light

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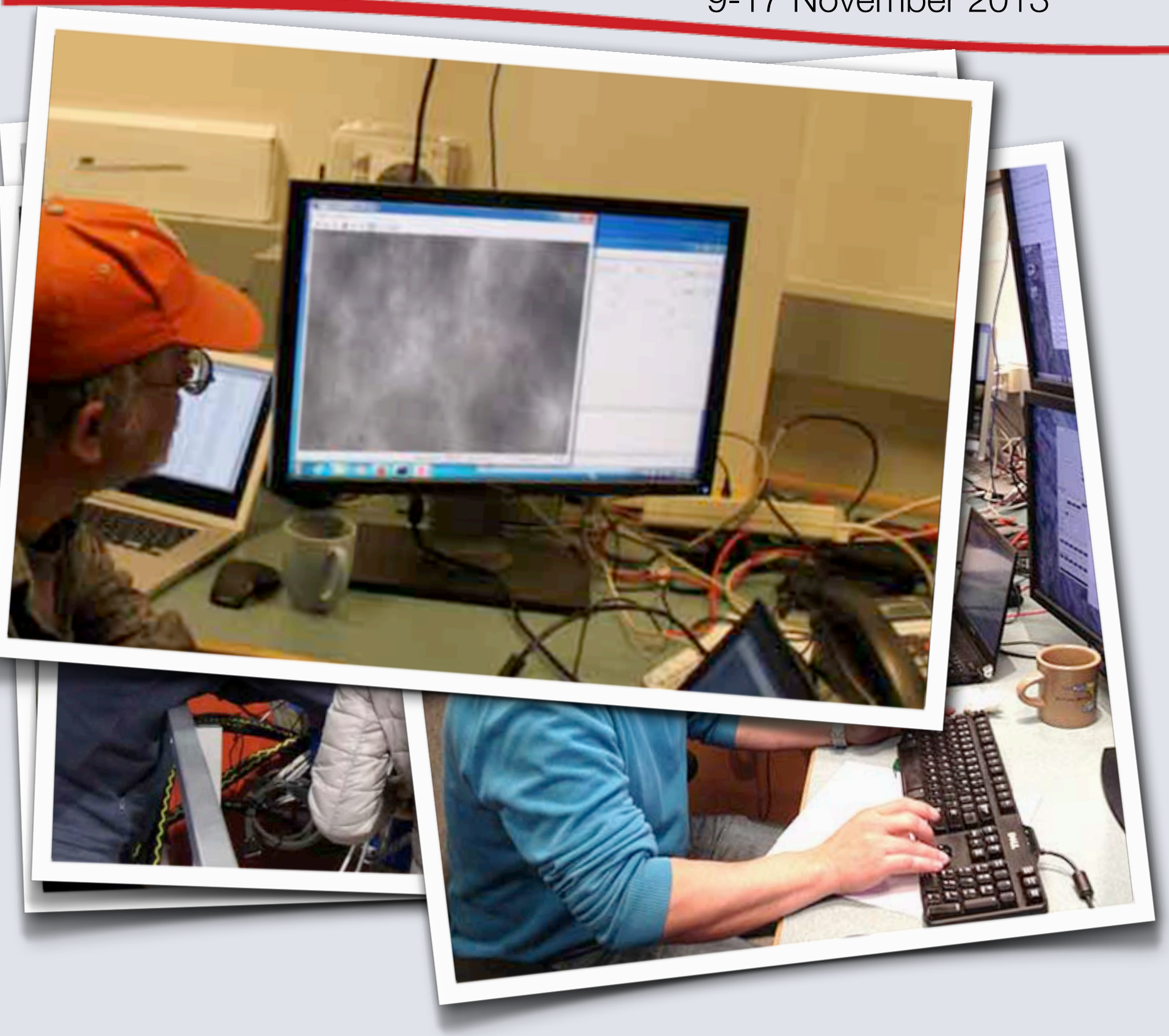

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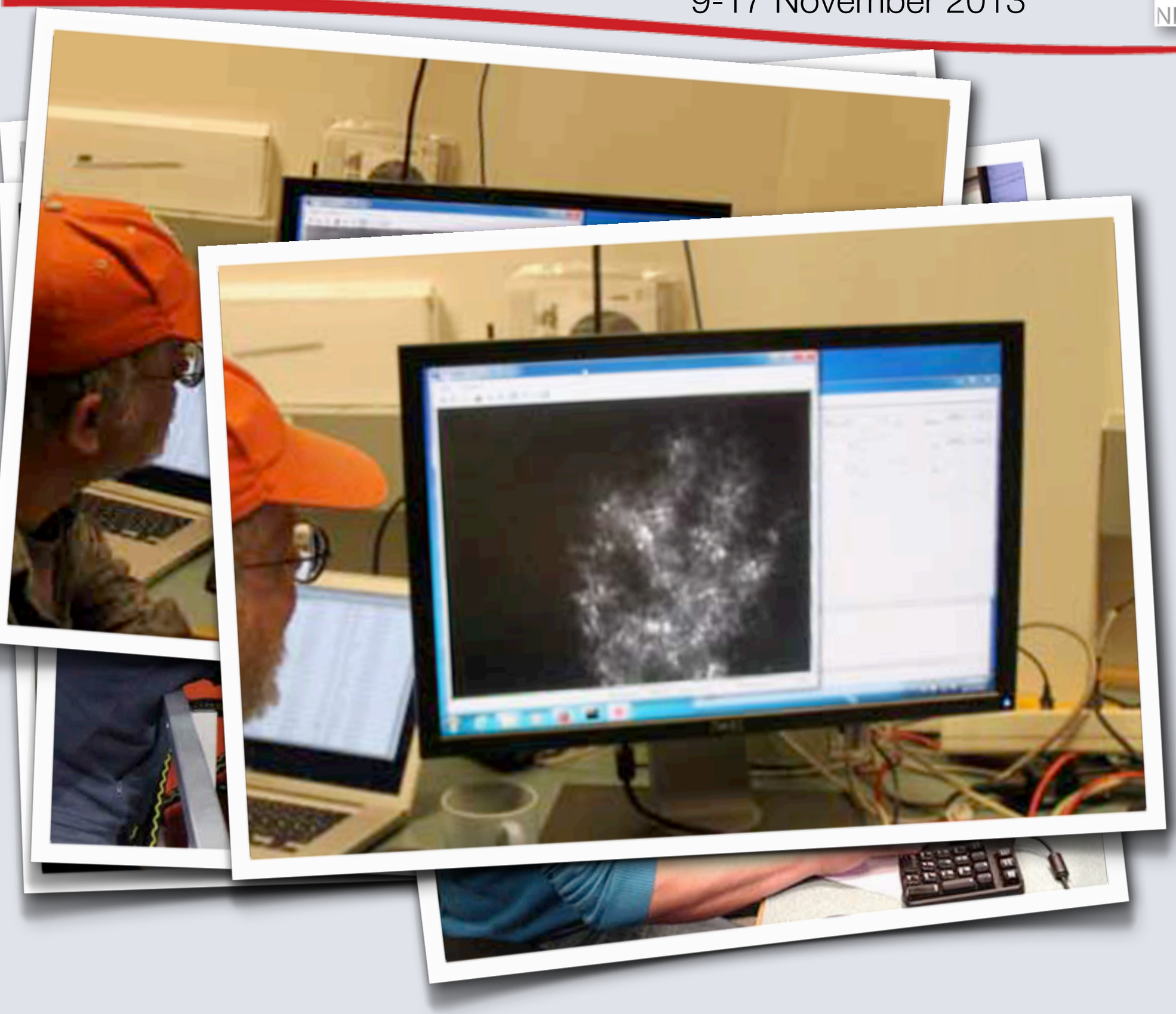

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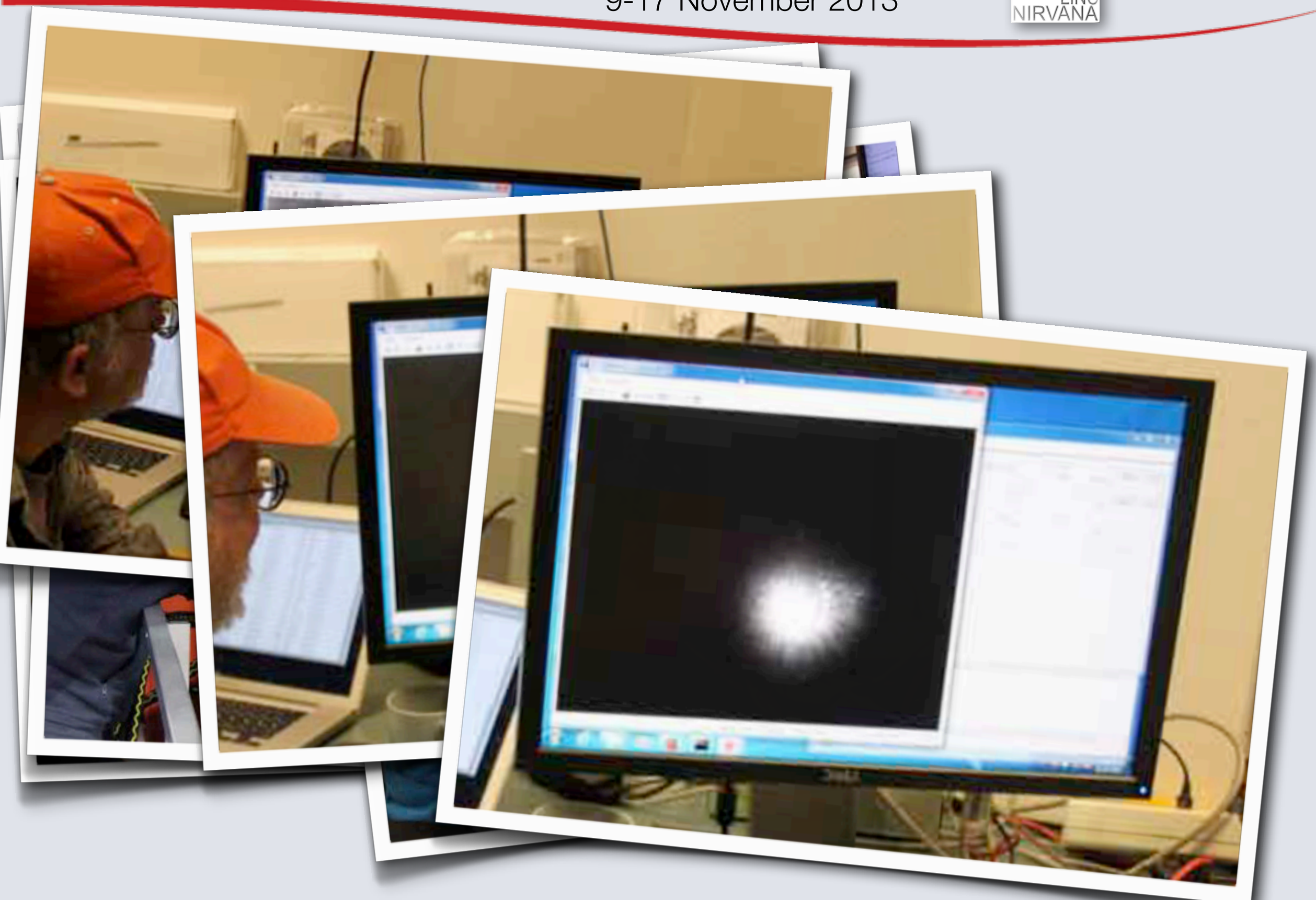

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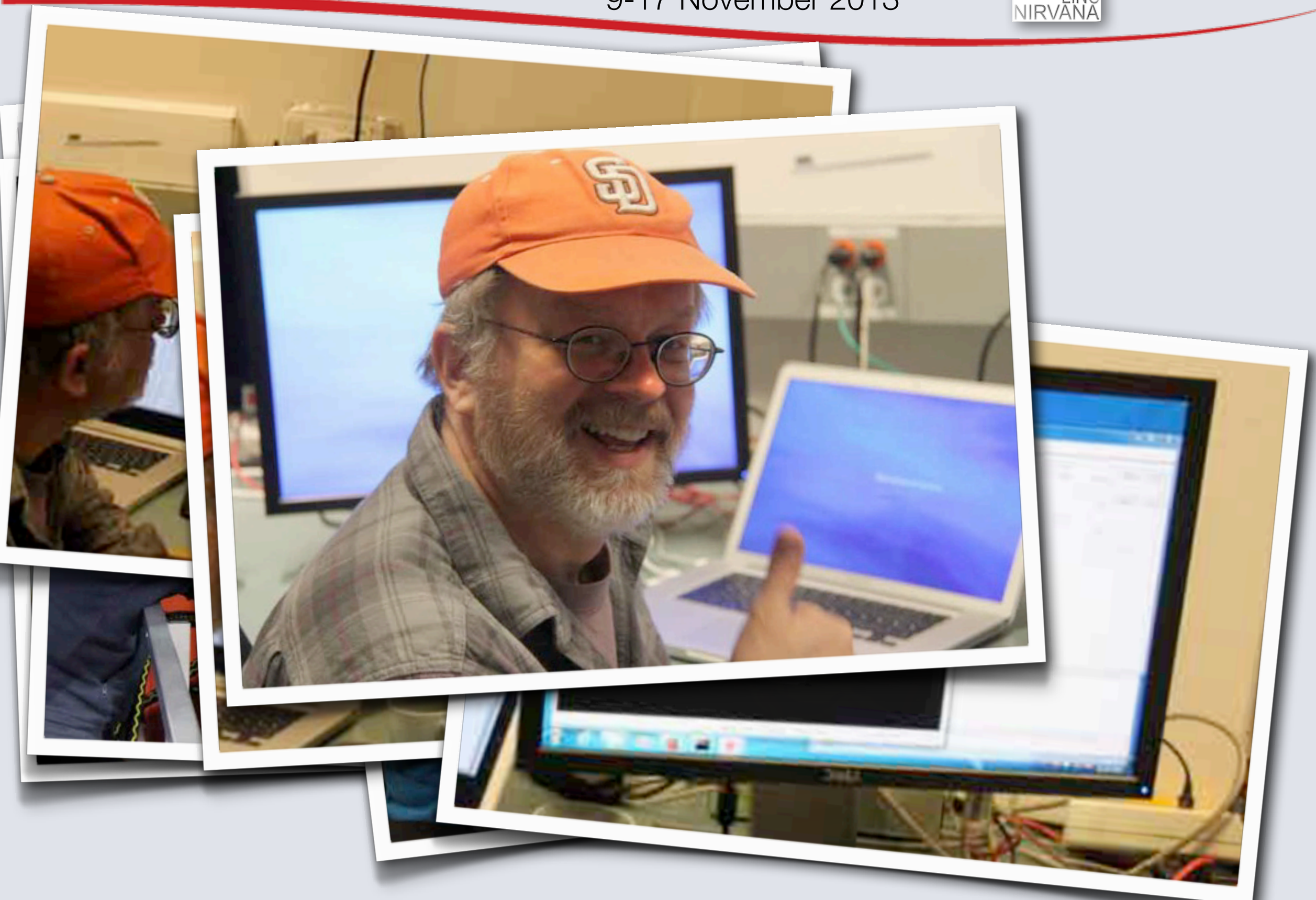

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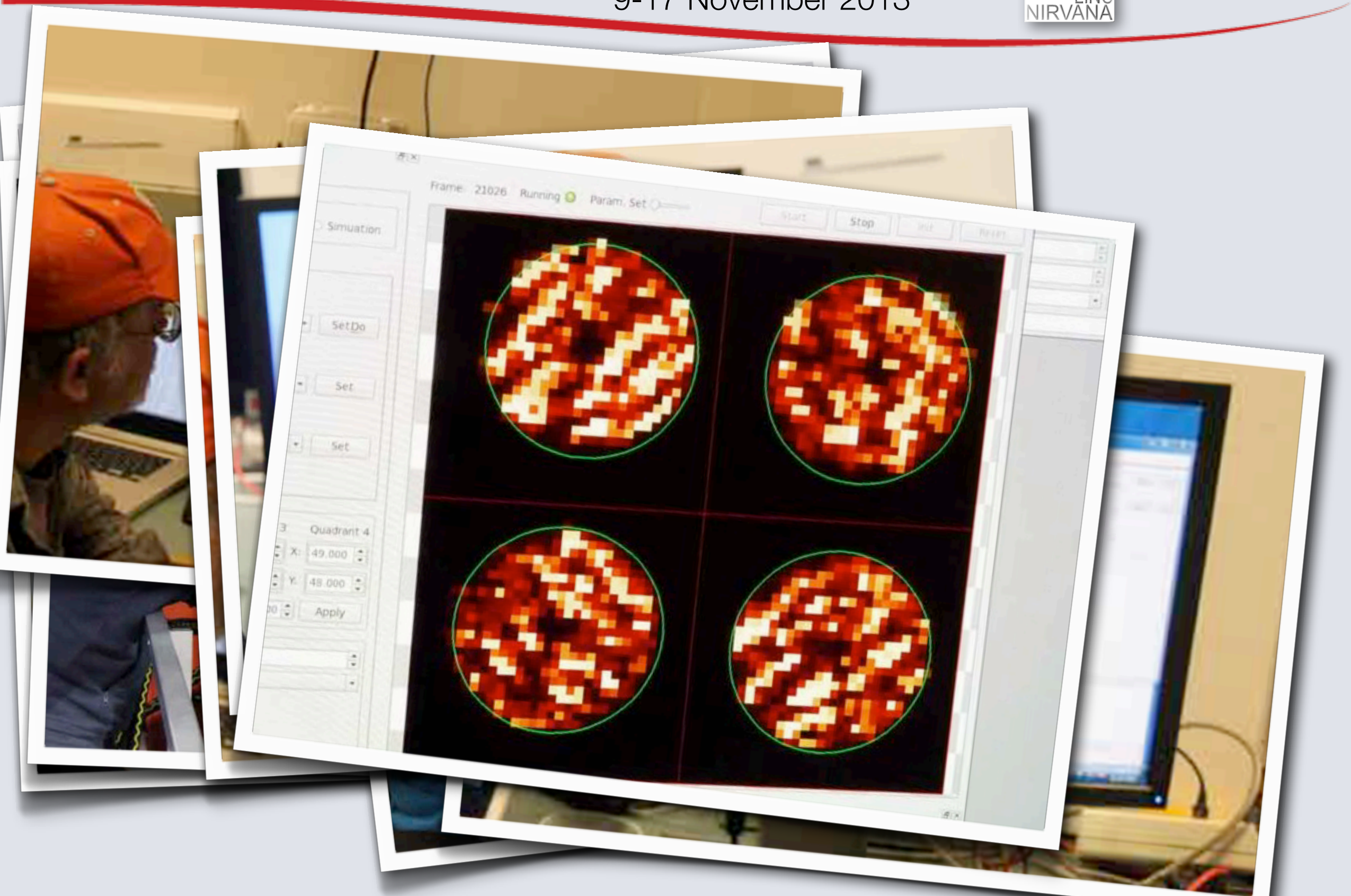

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26 September 2014
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t_{open} + 35

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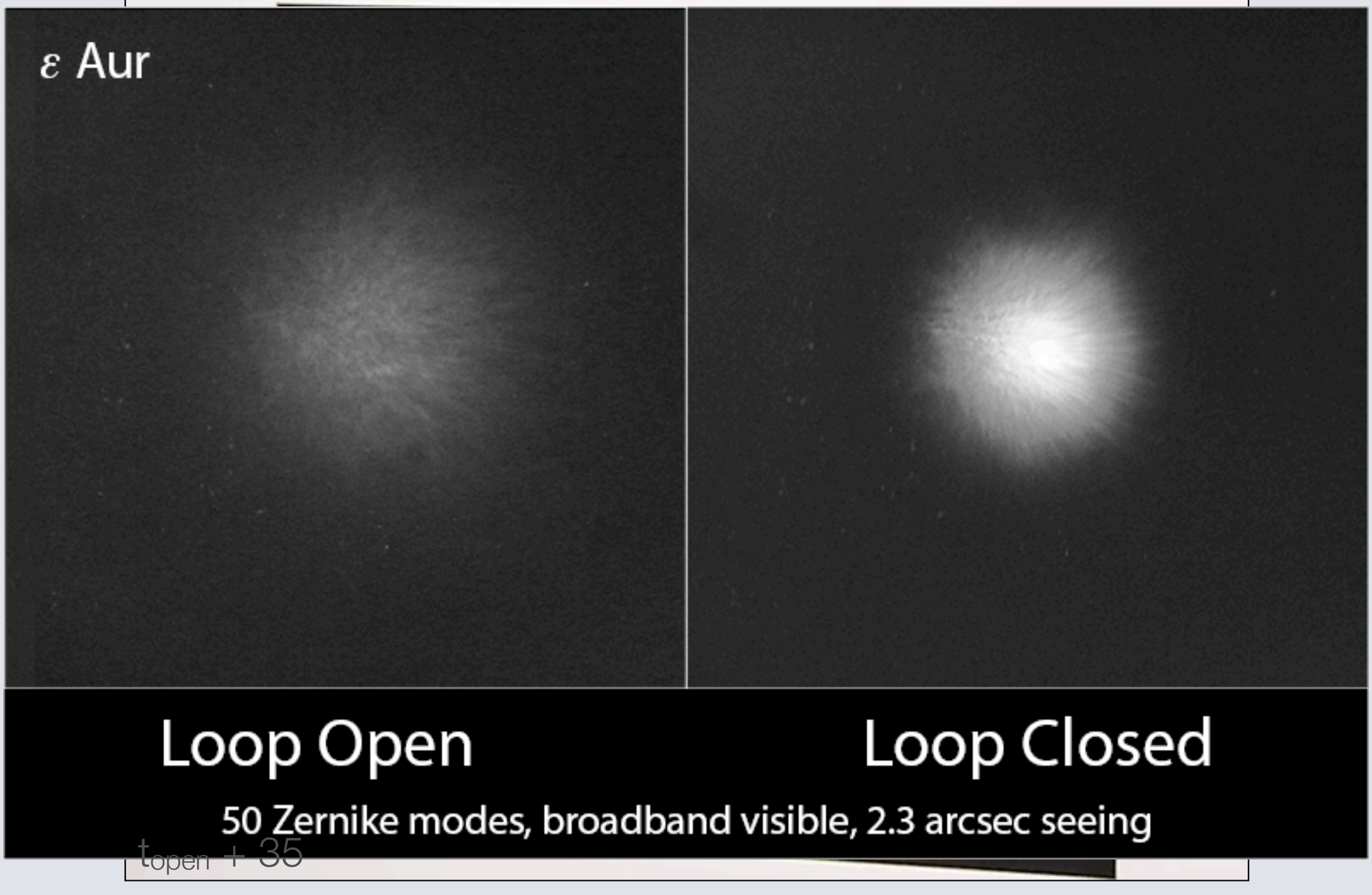

Outline

- About LINC-NIRVANA…
  - What it is
  - How it works
- Project Status…
  - LINC-NIRVANA AIV (HD)
  - First Light with Pathfinder (LBT)
- Implementation Plan…
  - MCAO & Interferometry
  - What's next…

Resource Situation

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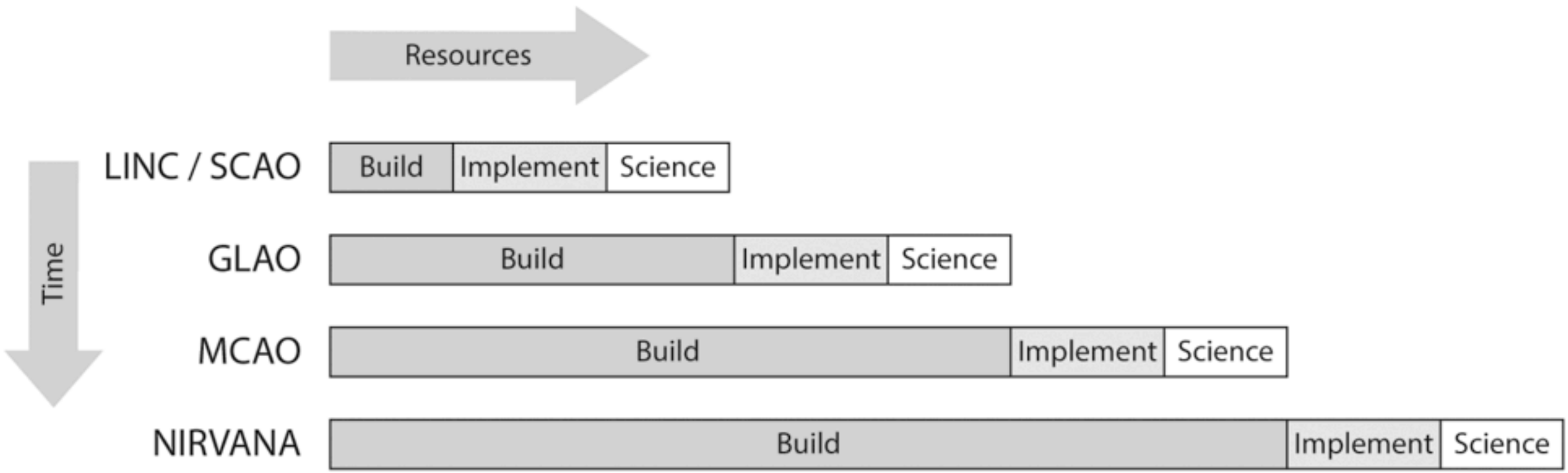
Original Plan



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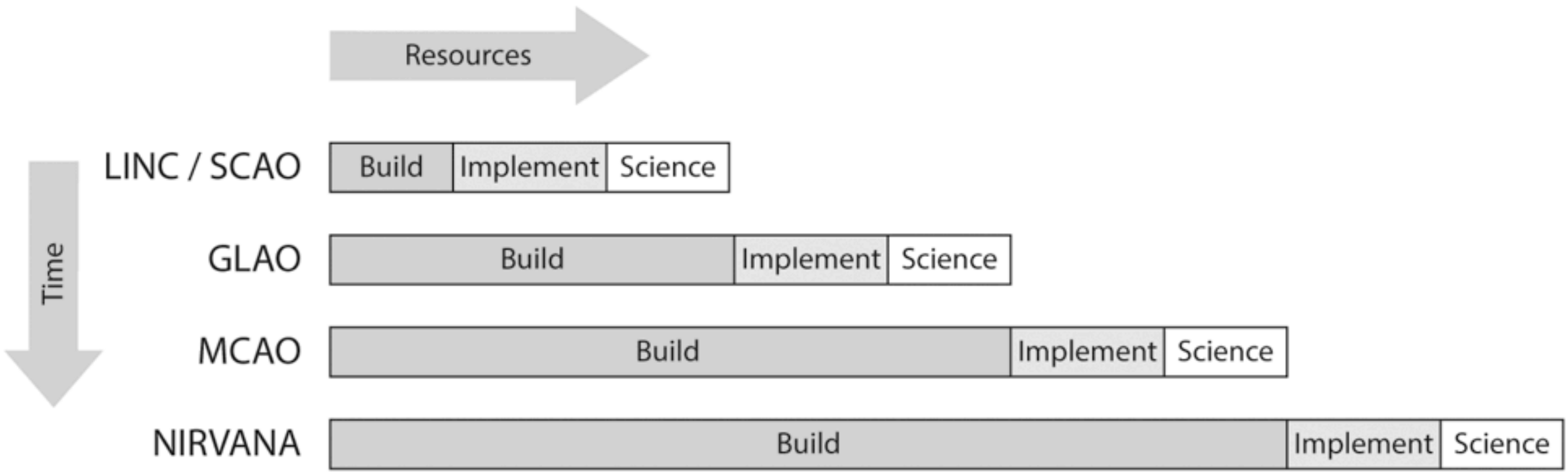
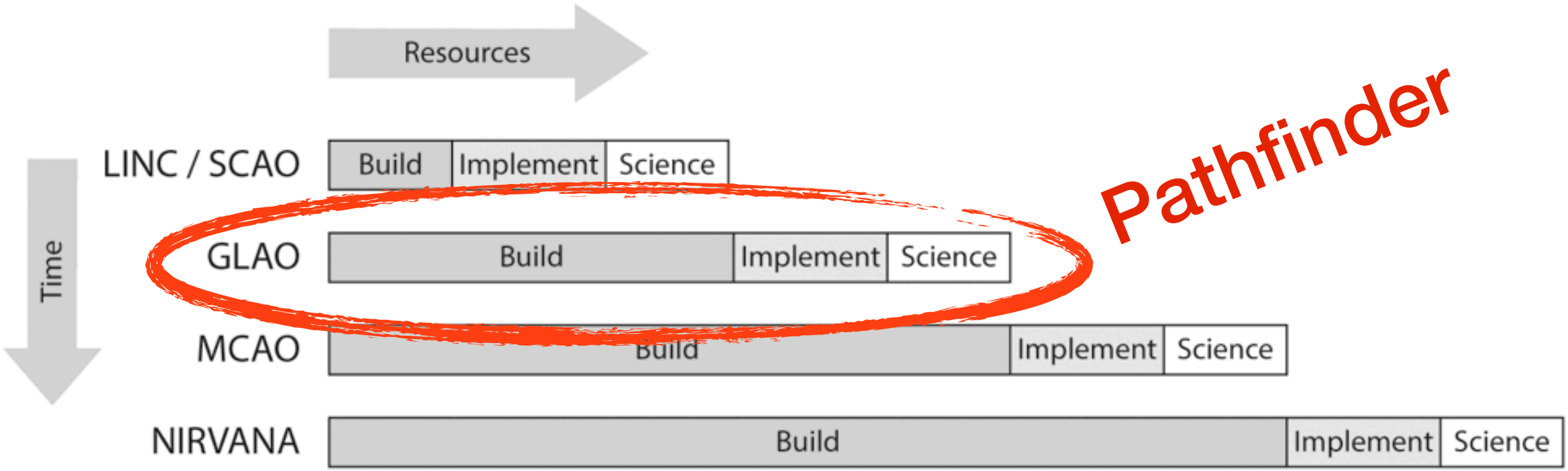


LINC: on-axis, self-referencing interferometry
GLAO: Ground-Layer Adaptive Optics
MCAO: Multi-Conjugate Adaptive Optics
NIRVANA: MCAO-fed off-axis interferometry

Original Plan



Two options:
- LINC as next step
- MCAO

evaluated in summer 2013

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Decision: focus on MCAO next…

MCAO at delivery

Item	Value / Comment
Mode	Multi-Conjugate Adaptive Optics Near-IR imaging
Wavelength	1.1 – 2.4 μm; broad and narrow band filters
Pixel Scale	5.11 mas per pixel (ideally, 20 mas/pixel)
Spatial Resolution	30 mas – J Band (FWHM of diffraction-limited peak) 41 mas – H Band 53 mas – K Band
Field of View	10.5” (110 square arcsec) Wide field optics give [41”square (1680 square arcsec) with a 2k detector] or [82”square (6720 square arcsec) with a 4k detector]
Detector Array	1 Hawaii-2 array [Upgradeable to 2 Hawaii-2 as well as 4k arrays]
Adaptive Optics	2-layer, multi-conjugate with 12 NGS for GLAO and 8 NGS for high-layer AO. The deformable mirrors have 672 (ground) and 349 (high) actuators
Strehl Ratio	J-band 20% (based on simulations and H-band 40% GeMS performance) K-band 60%
Sky coverage	Galactic plane 99% North Galactic Pole 48%
Point Source Sensitivity (Johnson)	J-band: 25.6, 5s 1 hour, assuming 20% Strehl Ratio H-band: 25.0, assuming 40% Strehl Ratio K-band: 24.7, assuming 60% Strehl Ratio, wintertime

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What Now?

What Now?

LINC-NIRVANA

The LBT INterferometric

Instrument Shipping –
Technical Specifications, Guidelines and Statement of Work

NIRVANA

LINC-NIRVANA

-

Instrument Shipping –
Technical Specifications, Guidelines and Statement of Work

Doc. No.	LN-MPIA-SPEC-AIT-001
Short Title	Shipping Spec
Issue	0.1
Date	07 May 2014

What Now?

5 Goods and boxing

This chapter addresses the package subdivision for LN. As for the transport itself, which is described in the next chapter, the protection of the very delicate goods by appropriate boxing is the most important demand in this mission.

The whole instrument will be disassembled into

- one oversize piece comprising the main mechanical structure (optical bench) and the electronics cabinets, and
- a set of about 70 individual units containing delicate opto-mechanical components, tool and auxiliary equipment of rather small and medium size.

Technical Specifications, Guidelines and Statement of Work

Doc. No.	LN-MPIA-SPEC-AIT-001
Short Title	Shipping Spec
Issue	0.1
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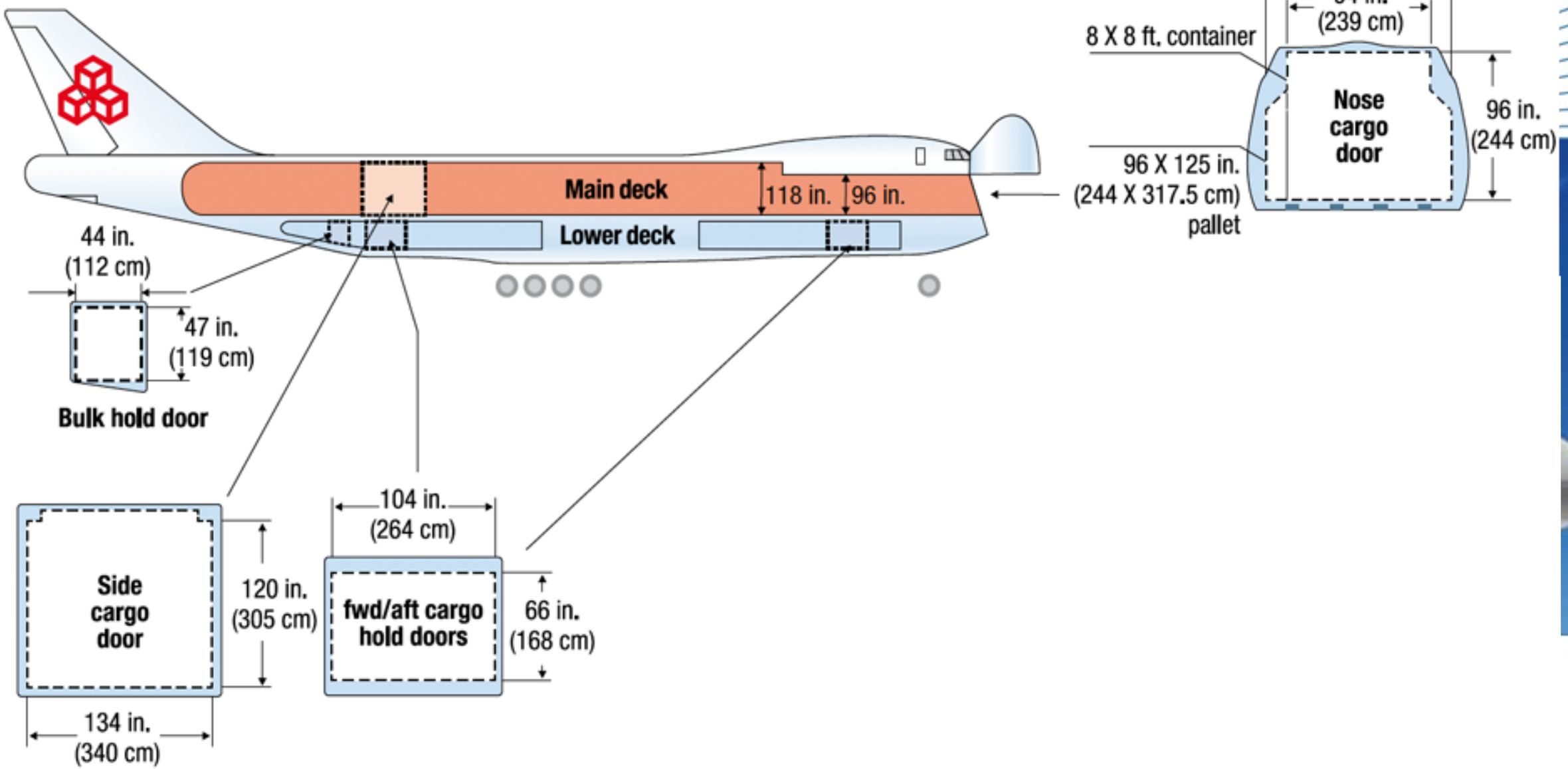
What Now?

Boeing 747-8F

Date 07 May 2014

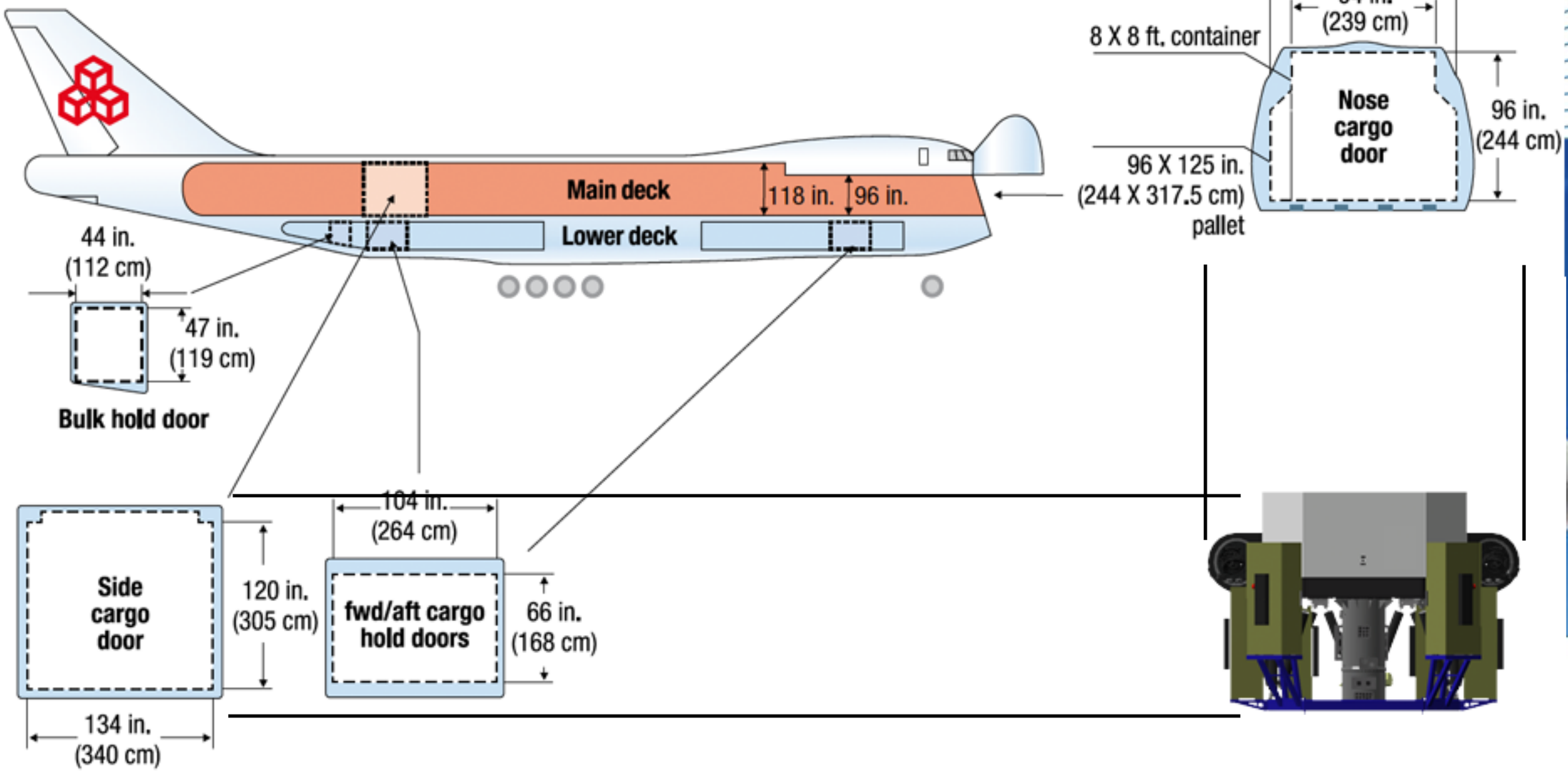
What Now?

747-8F Cargo door dimensions



What Now?

747-8F Cargo door dimensions



What Next ?

What Next ?

Rest of 2014

- Complete bench integration
- Optimize cryostat baffling
- Prepare for instrument level tests

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Early 2015

- Instrument level tests
- Dust cover integration
- Documentation

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Early 2015	Instrument level tests
	Dust cover integration
	Documentation
May 2015	Preliminary Acceptance Europe
Summer-	Shipment (end July)
Fall 2015	Begin re-integration in mountain lab
Spring 2016	Integration on telescope
	Start of the real work…

The Future…

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At delivery in 2015, LN will support:

- Natural guide star MCAO in a 10x10 arcsec field
- “campaign mode” JHK interferometry (on-axis ref)

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- Natural guide star MCAO in a 10x10 arcsec field
- “campaign mode” JHK interferometry (on-axis ref)

Possible next steps:

- “user mode” on-axis interferometry (full LINC)
- wider field MCAO
- off-axis MCAO interferometry (full NIRVANA)


SyncMaster P2370
2ms
50000:1
SAMSUNG

www.mpia.de/LINC

SyncMaster P2370

2ms 50000:1

LINC-NIRVANA

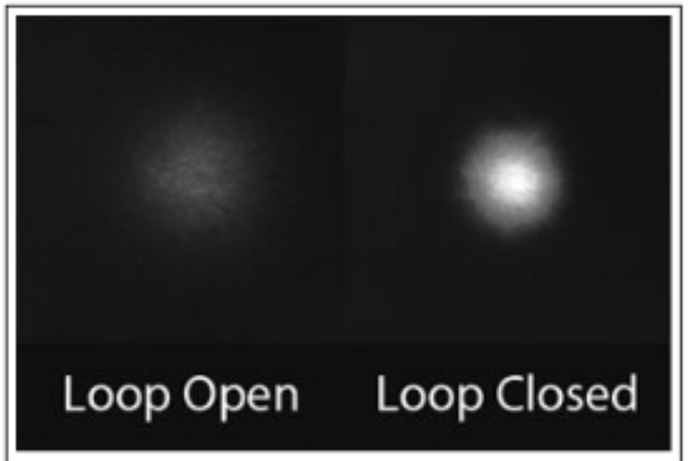
The German-Italian high-resolution imager

Home ▾ Science Instrument ▾ Documents ▾ Links Gallery Internal

Introduction

LINC-NIRVANA (LN) is a near infrared imaging instrument for the Large Binocular Telescope (LBT) offering both multi-conjugate adaptive optics (MCAO) and interferometric beam combination for ultra high spatial resolution. The combination of LN and LBT provides a unique platform for high angular resolution astronomy. On the one hand, the fully adaptive secondary mirrors of the telescope permit exquisite correction of ground layer atmospheric turbulence. When combined with higher layer correction within LN, the resulting MCAO system will deliver single-eye, diffraction limited imagery over a wide field of view. On the other hand, the two, co-mounted 8.4 meter primary mirrors of the LBT present an orientation-independent entrance pupil to the instrument. This allows LN to operate in so-called Fizeau-mode, delivering 23-meter spatial resolution and 12-meter effective collecting area for panoramic imagery.

This website explains the science and technology behind LINC-NIRVANA. It also provides links to a variety of resources to further your exploration. Enjoy!



LINC-NIRVANA Pathfinder First Light
The LINC-NIRVANA Pathfinder achieved first light on 17 November 2013. Click the image for more.

Latest from the Mountain…December 2013

click image for details

Latest from the Lab…

click image for details

SAMSUNG

www.mpia.de/LINC

SyncMaster P2370

2ms 50000:1

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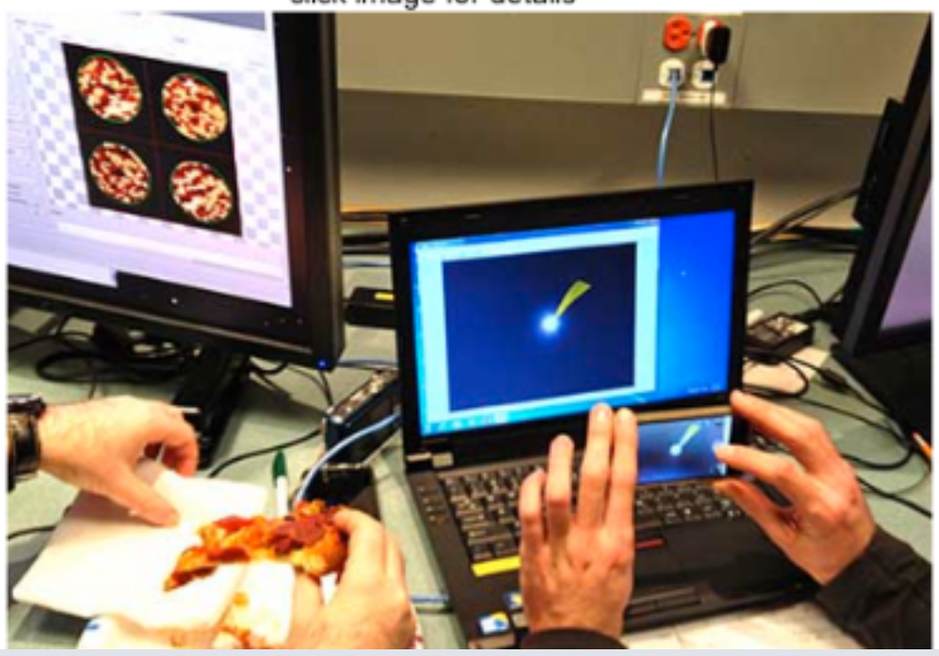

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click image for details

SAMSUNG


LINC
NIRVANA