

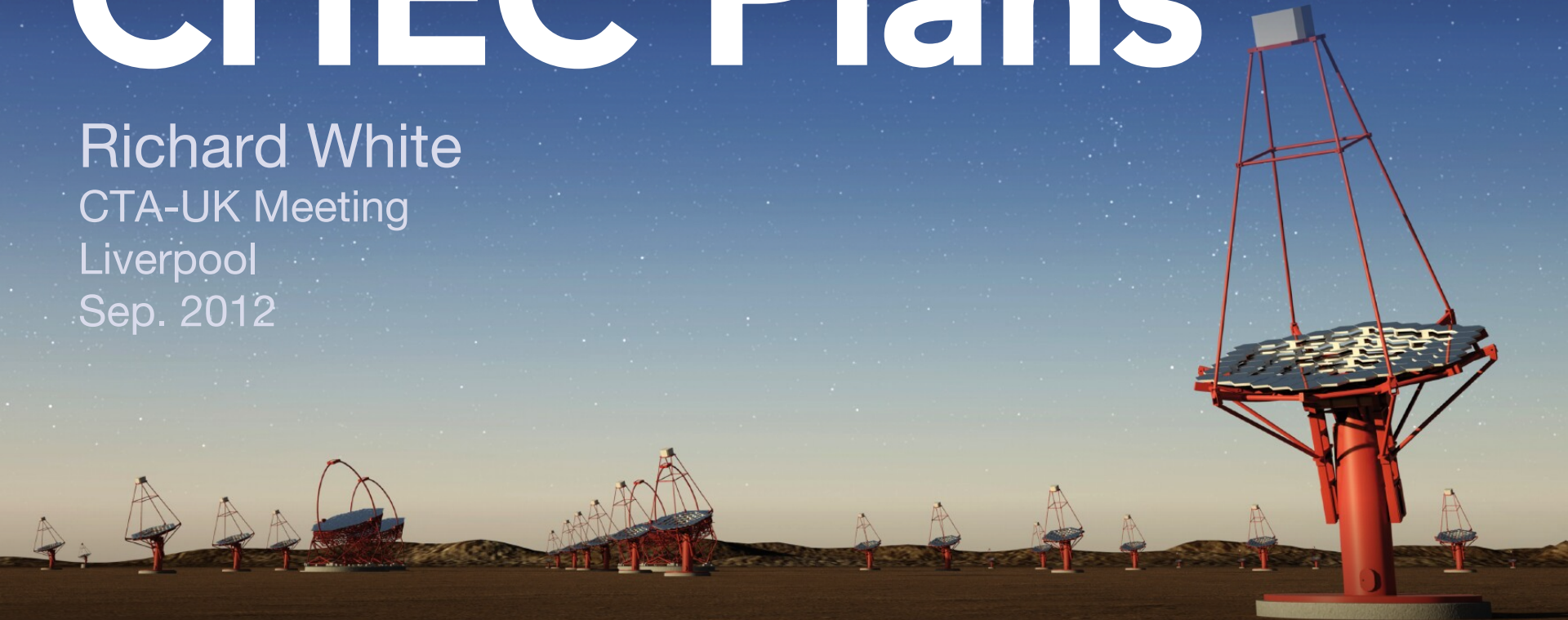
CHEC Plans

Richard White

CTA-UK Meeting

Liverpool

Sep. 2012



University of
Leicester

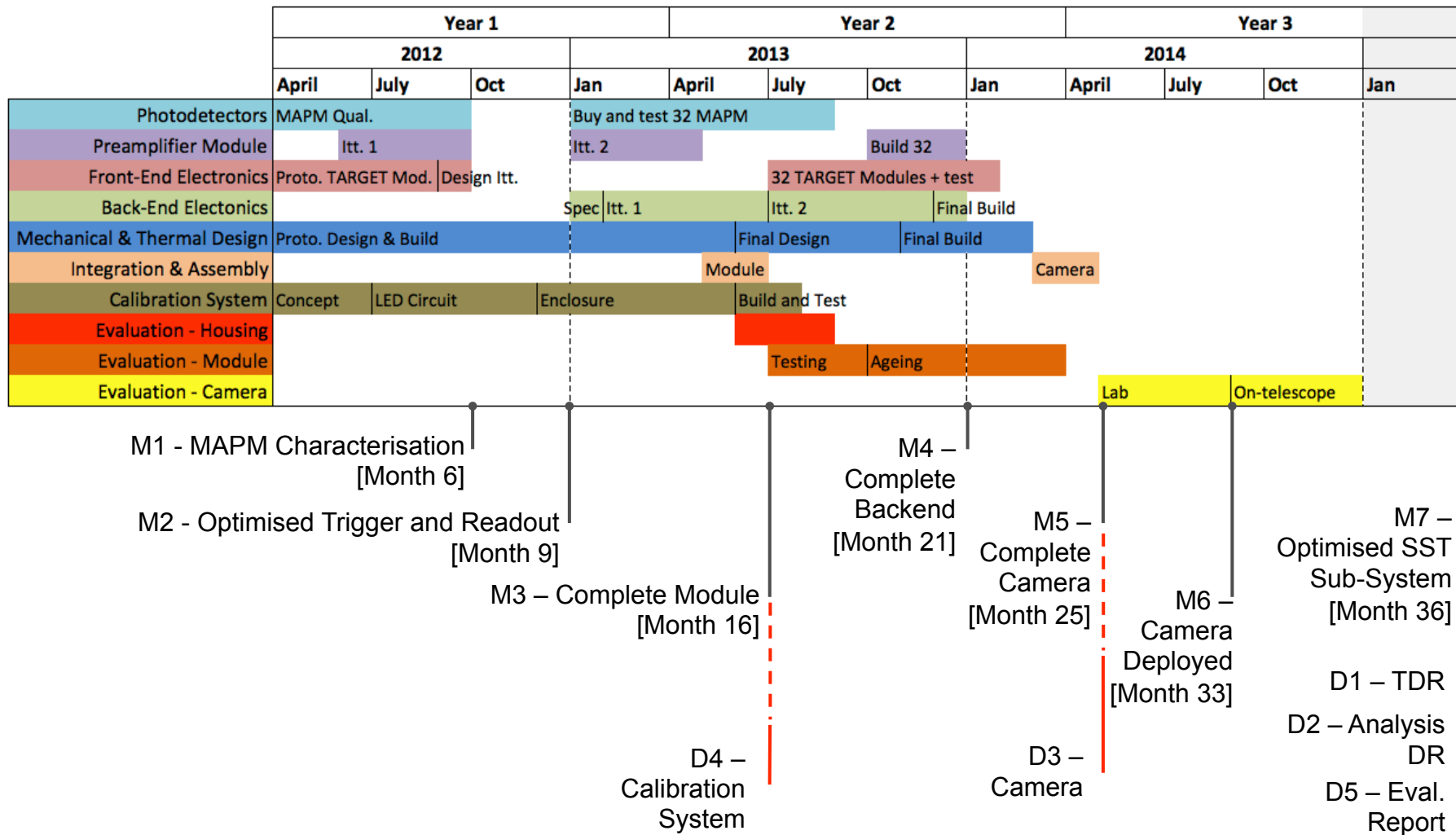
This talk



- Our original plan
- Things that will affect the plan:
 - Progress rate since the start of the grant
 - Resource changes since the start of the grant
 - Design choices
- The new plan

The Original Plan

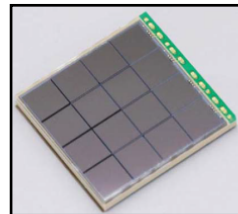
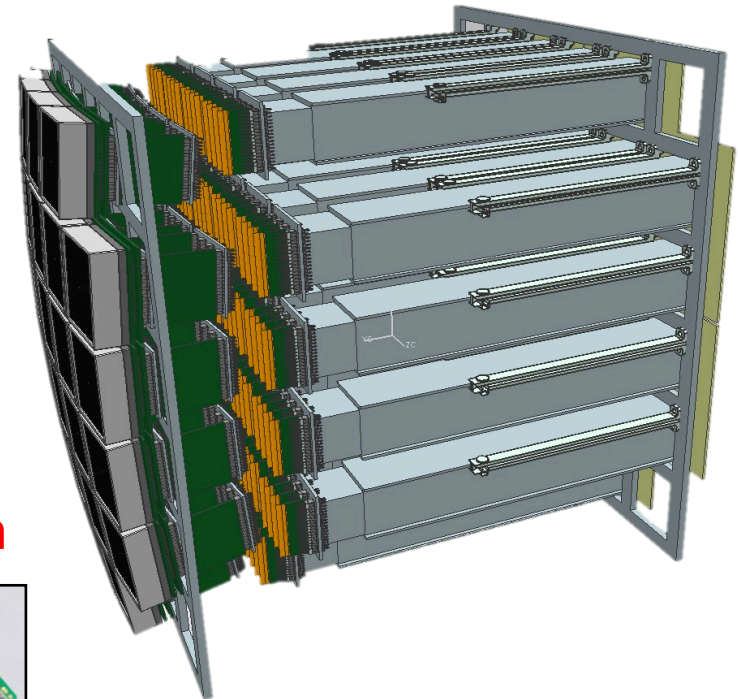
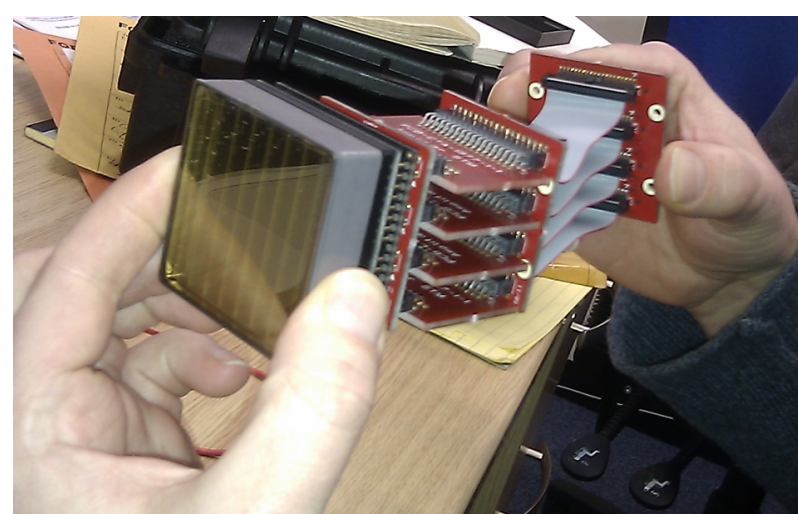
October 2011



A Good Start

Oxford March 2012

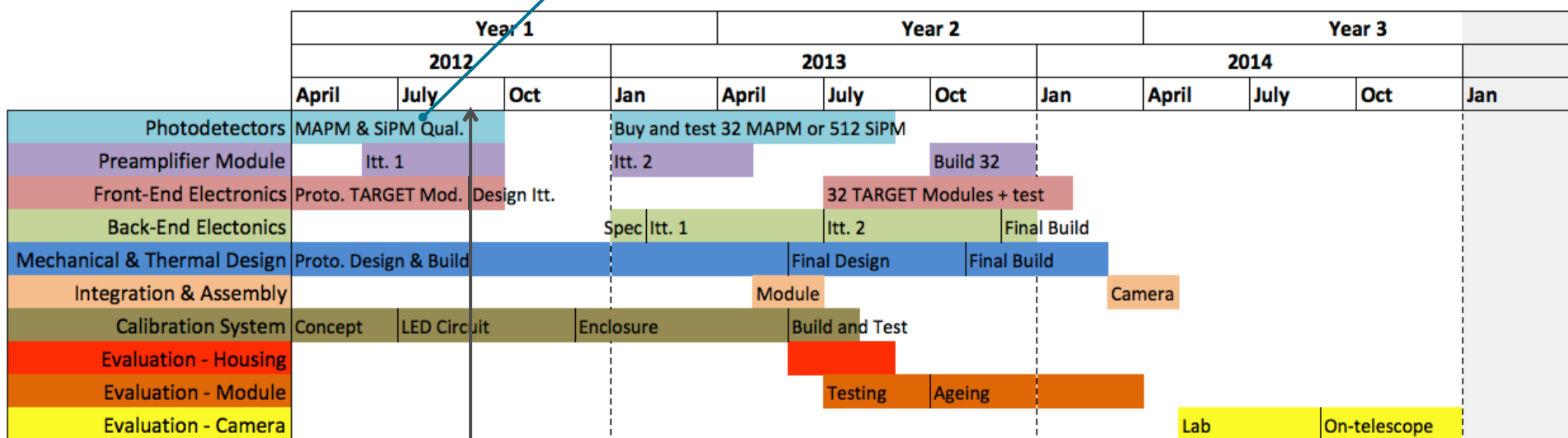
- Preamp Module
- TARGET Module
- Mechanical Concept
- Priorities:
 - Preamp requirements
 - Interface to telescope (camera weight and power)
 - TARGET requirements
 - Photosensors: should we stick with MAPMs or go for SiPMs?



A Good Start

Oxford March 2012

MAPM & SiPM to be considered



Sep. 2012

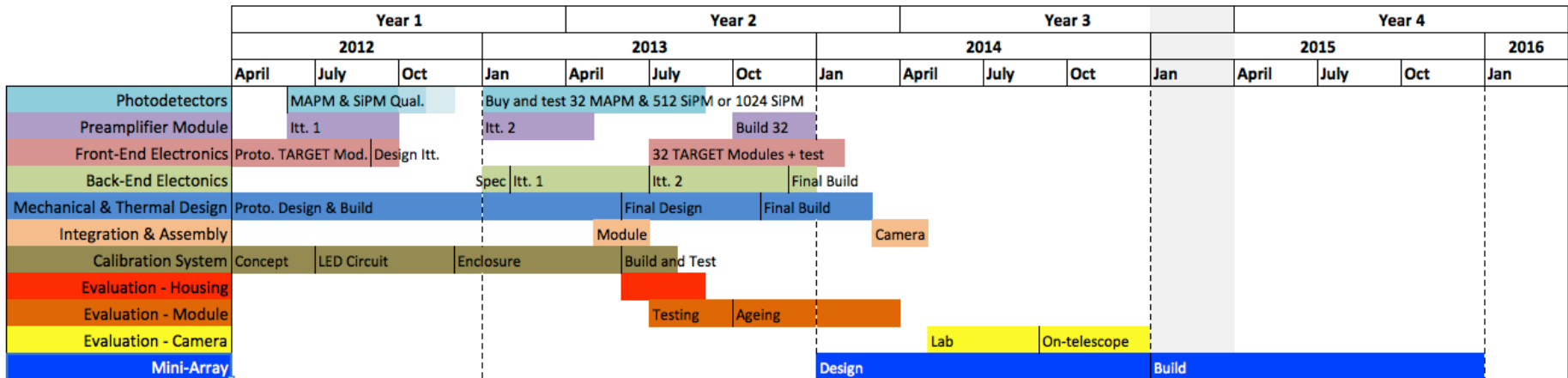
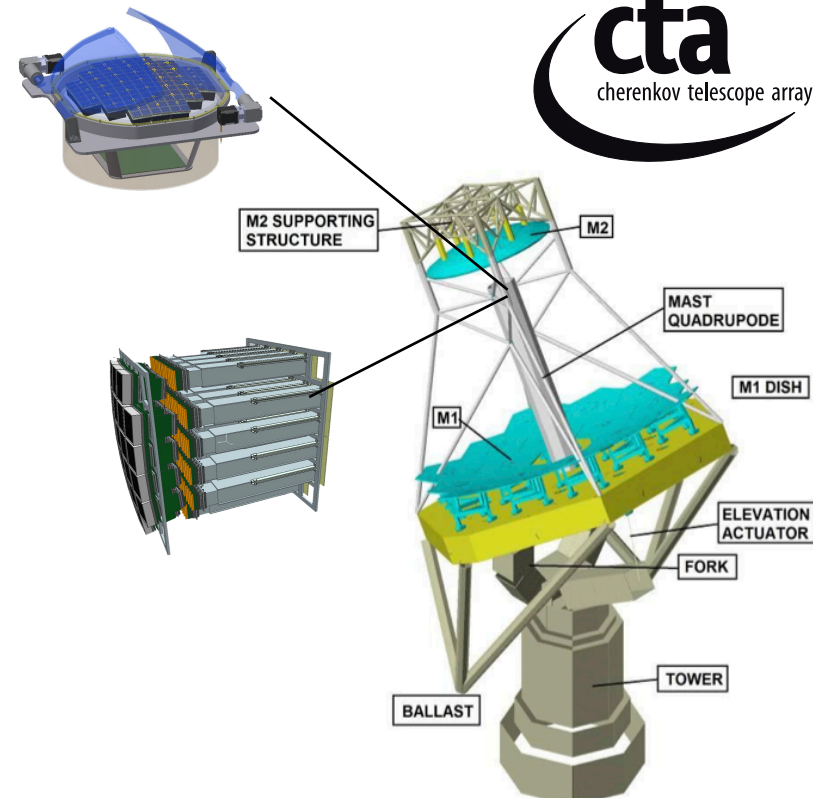
MAPM / SiPM Decision Point

The Mini Array

May 2012



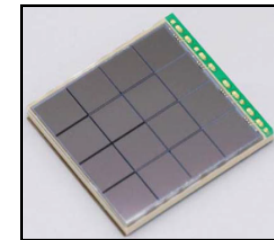
- Meeting in Paris about the “mini array” consisting of 4-8 SSTs.
- ASTRI very open to UK cameras



Leicester Infrastructure Bid

5 July 2012

- Successful application to University central fund for:
 - *New concept camera for the global CTA Observatory for high- energy frontier astrophysics, to be constructed in the University's Space Research Centre (SRC).*
- Timescale similar to the first camera.
- The money must be spent on a **SiPM** camera.
- What's included:
 - Camera hardware
 - Redevelopment of focal plane and preamps
 - Extensive re-development
 - Manpower
 - Lab Kit



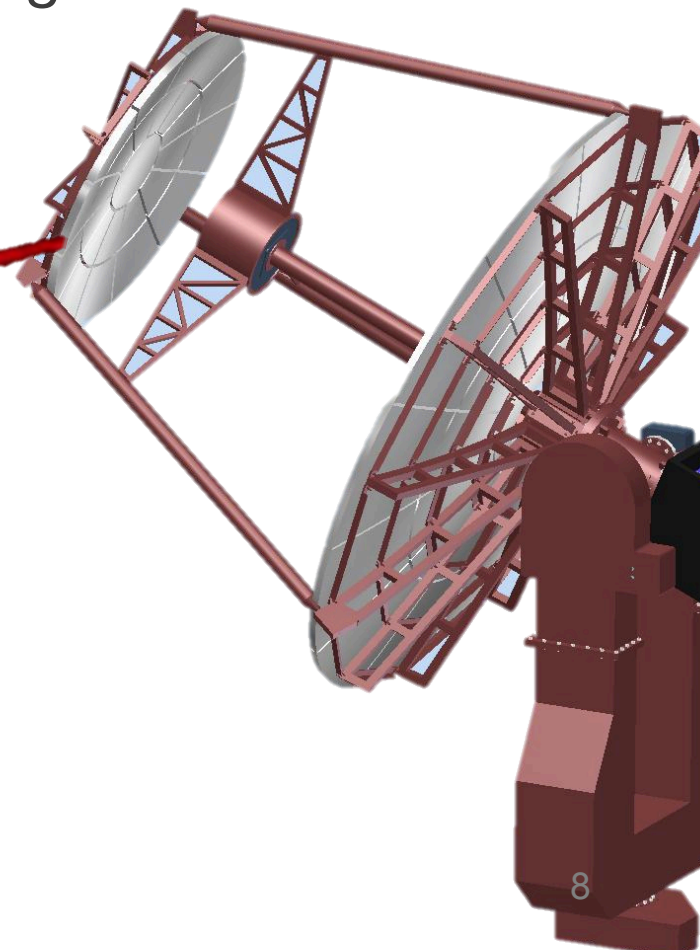
£165,000

Liverpool Laser Surveying Kit



31 July 2012

- Alignment of structures & mirrors
- A great contribution to SST prototyping.
- Could also be useful for CHEC?



JSPS Fellowship

10 August 2012



- Akira Okumura secured a JSPS fellowship for a 2 year position in Leicester.
- Fortunately (for Akira at least) he was offered a permanent job in Nagoya.
- He will still come to Leicester for 6 months
- Start date: < Feb 28, 2013
- Help with TARGET and SiPMs

Dutch funding proposals

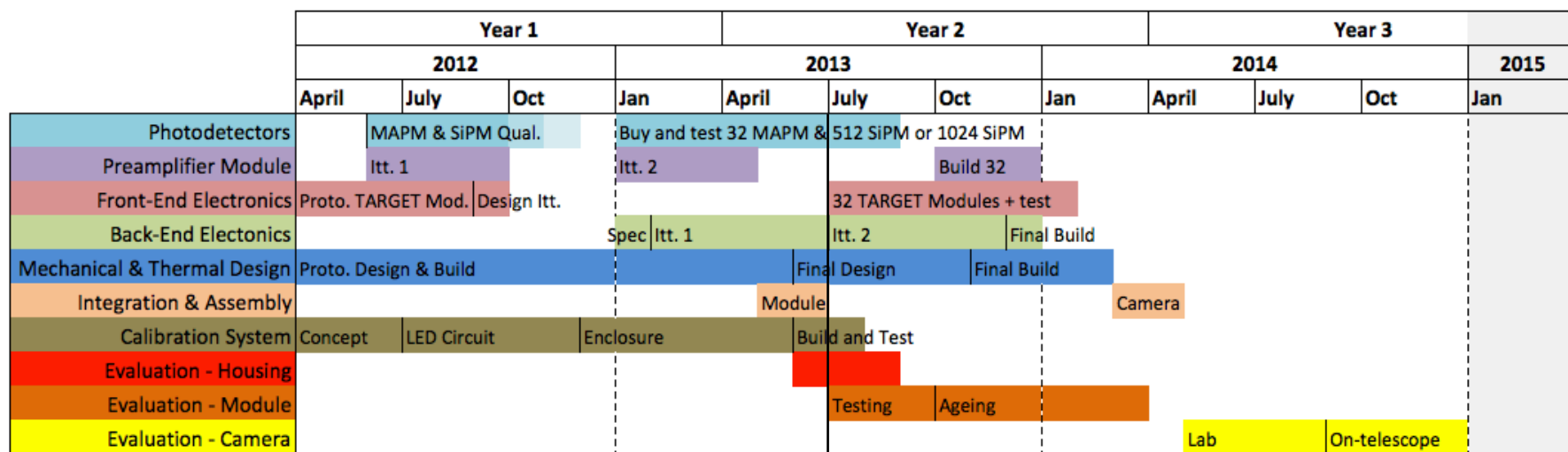


Aug-Sep 2012

- Two applications for funding to support CHEC at the University of Amsterdam.
- Pointing:
 - Use the in-situ detectors and analyse current from stars.
 - Funding includes money for a redesign of TARGET modules to include slow ADCs and test facility in the Netherlands.
- Camera Controller:
 - Proposal for 2 years of Post Doc and ~200k€ for hardware and engineering.
 - Funding for camera controller development (see back-end electronics talk).
 - Funding for Phillips SiPM development independent of CHEC, but will be incorporated if SiPM tests are successful.
 - Funding for incorporation of SiPMs into focal plane.

Dutch funding proposals

Aug-Sep 2012



Additional
Camera
Controller &
Pointing Funding



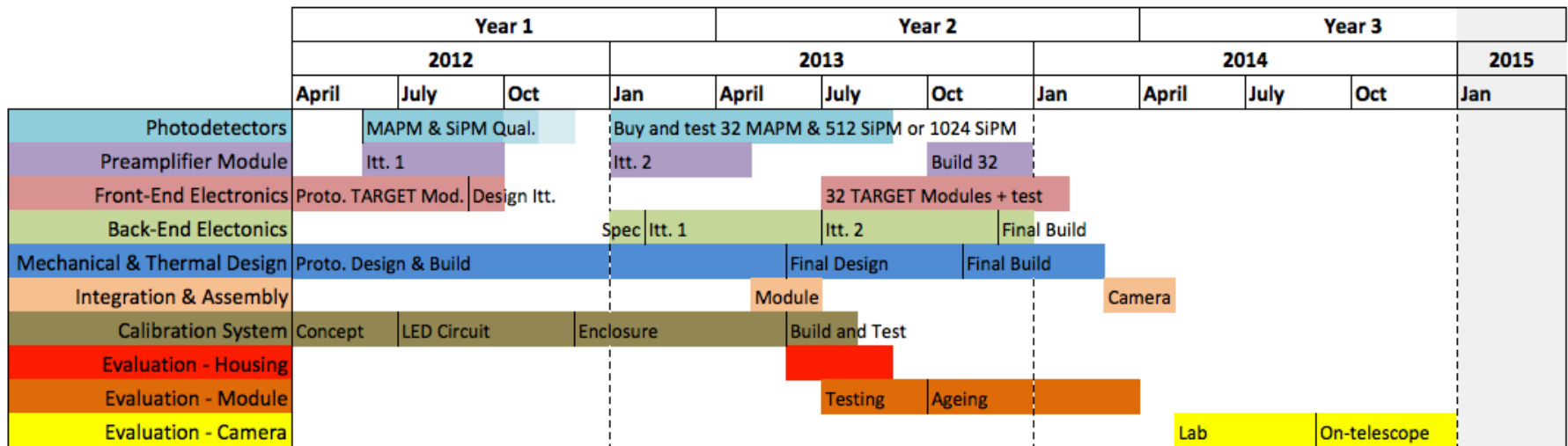
With all these resources we
can contribute 2 cameras to
the Mini Array

With all these resources we
can contribute 2 cameras to
the Mini Array

Smiley Face, LOL.

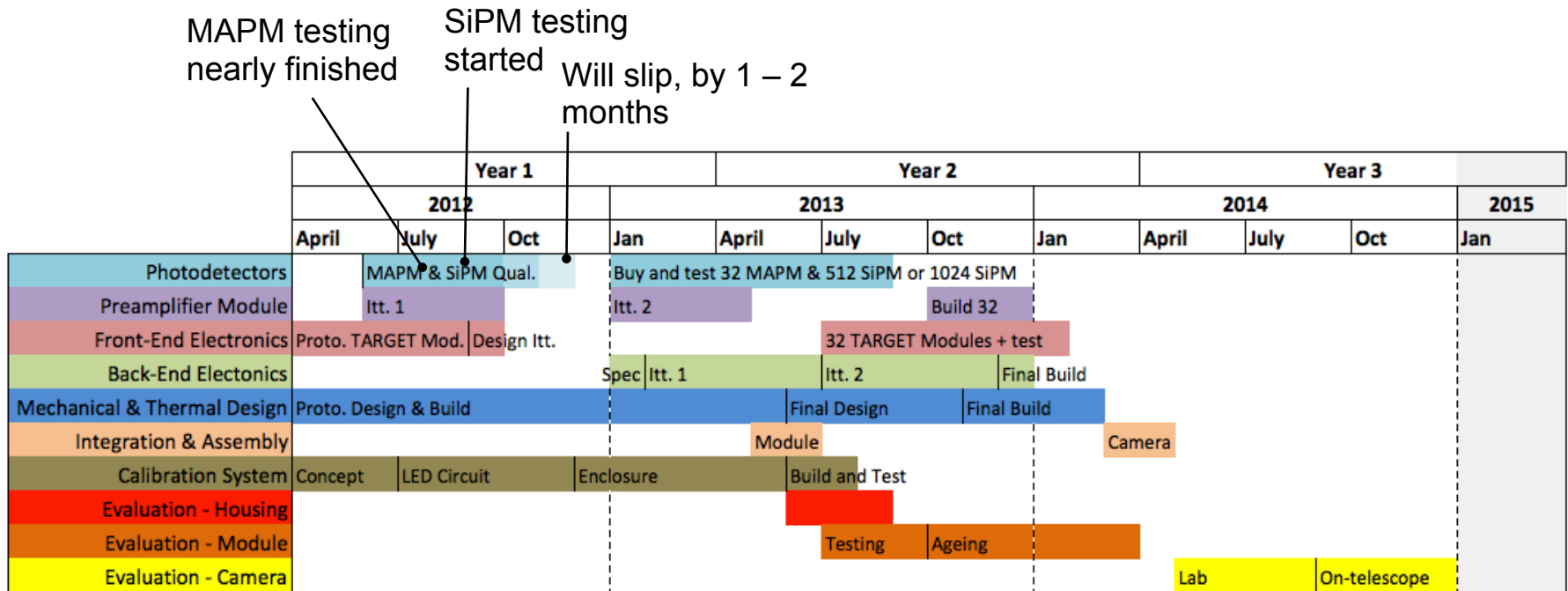
Progress

Work over summer 2012



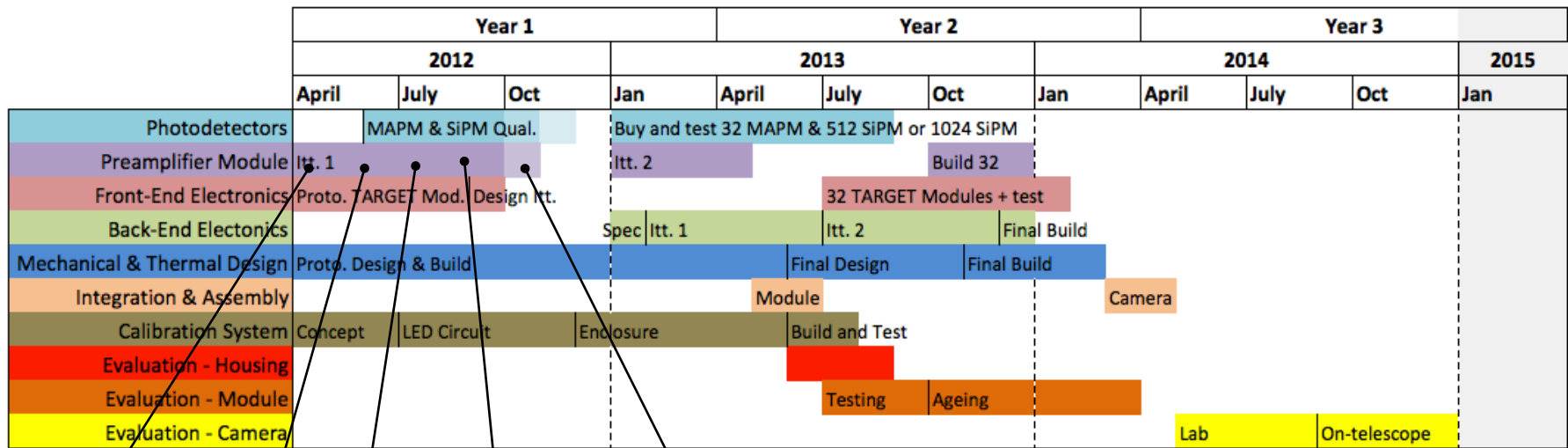
Progress

Work over summer 2012



Progress

Work over summer 2012



Preamp req. done

Initial circuit ideas complete (4-5 options)

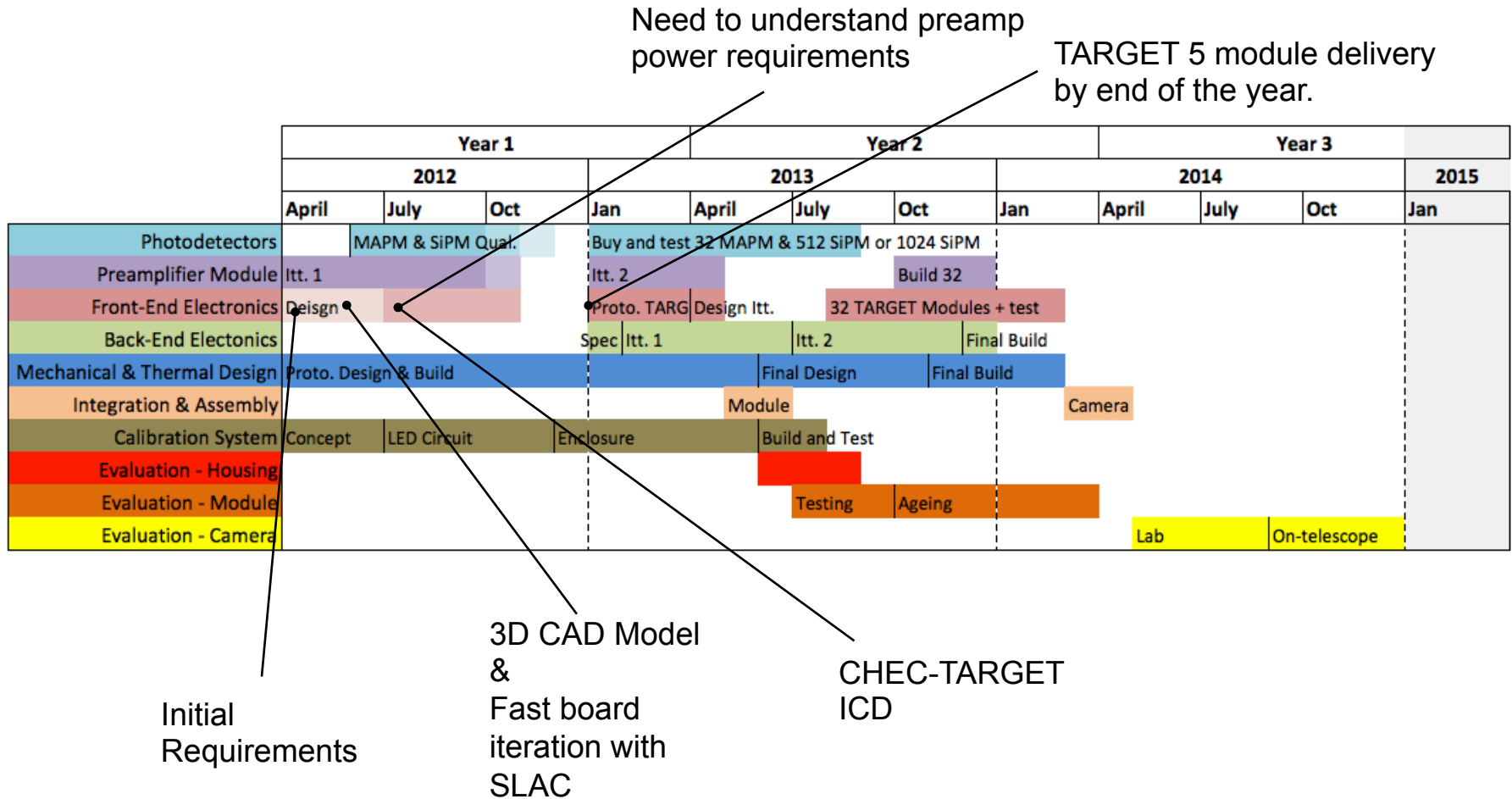
2nd version of module made

3 Preamp circuits built and tested

Could have all concepts tested by end of Oct.

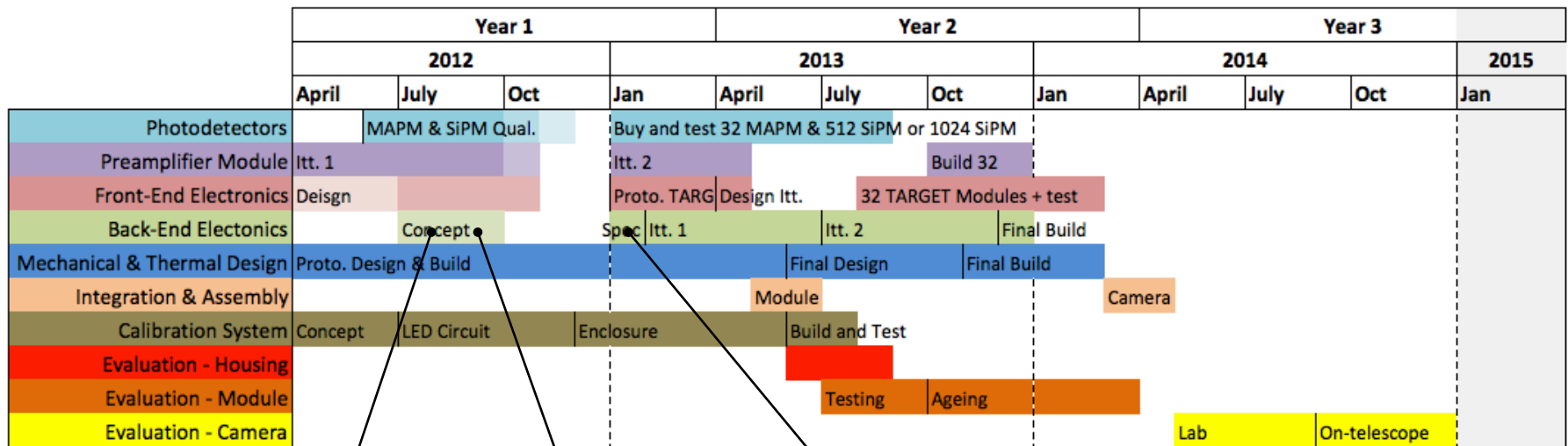
Progress

Work over summer 2012



Progress

Work over summer 2012



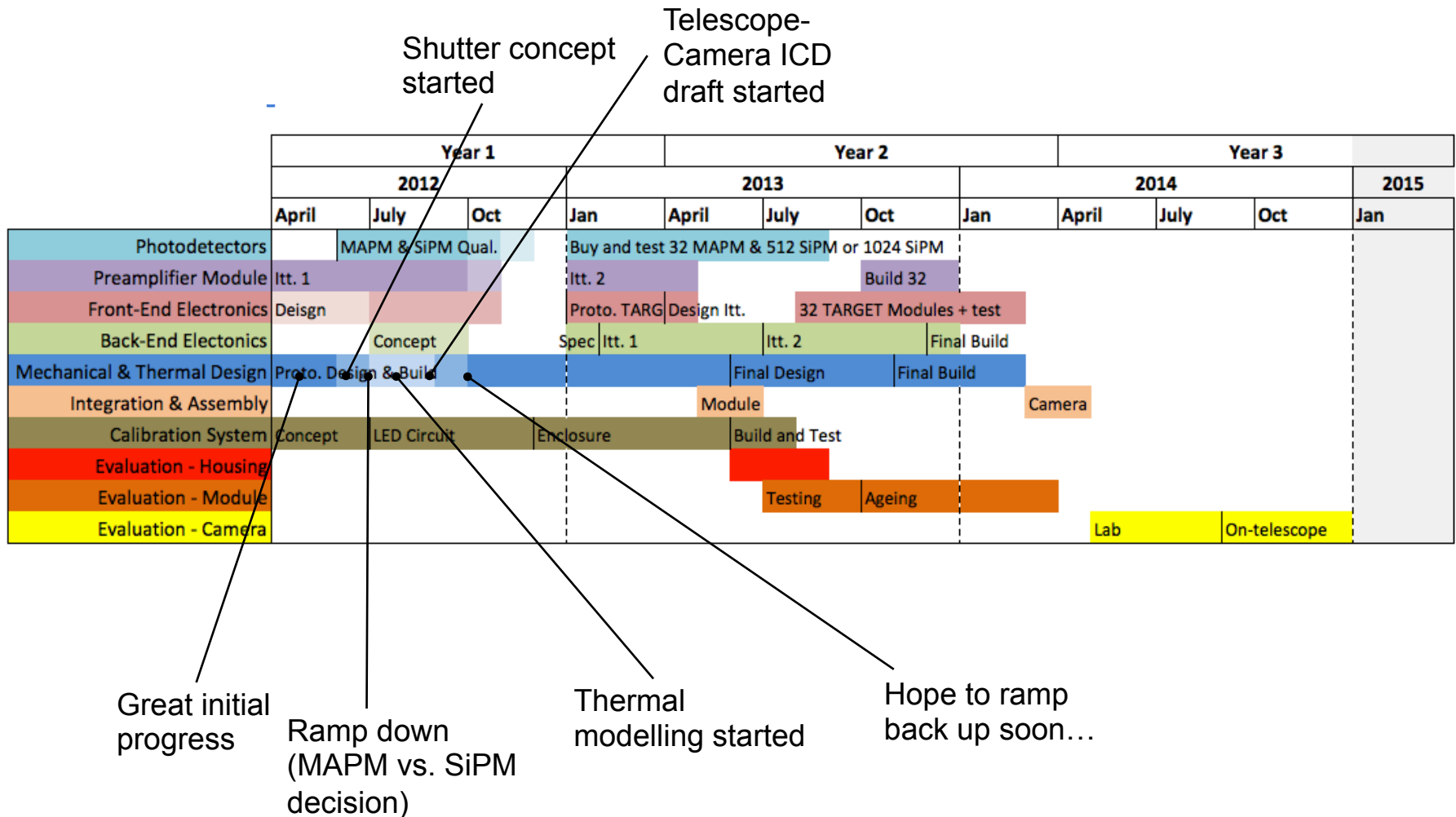
Started early

Agreed that Wash. U. will design and manufacture this.

CHEC-TARGET ICD

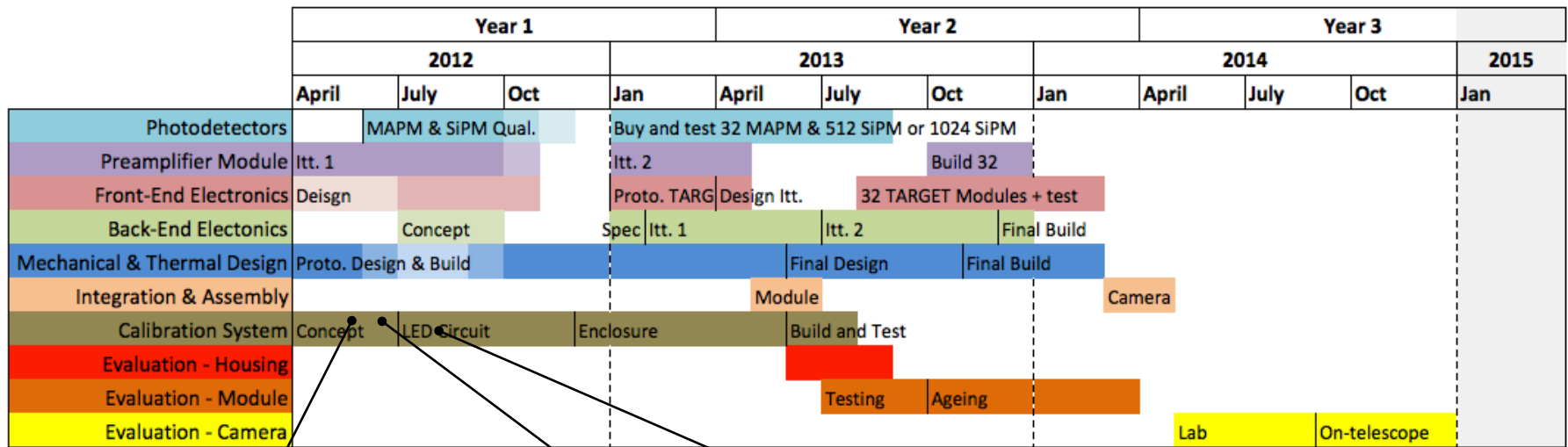
Progress

Work over summer 2012



Progress

Work over summer 2012



Calibration 'geometry' /
concept done.

Simulations underway

LED circuit on going

The New Plan



How to move forward

- One major decision:
 - 1 MAPM camera + 1 SiPM Camera
 - 2 SiPM Cameras.
- We could try to plan for both and set a decision point?

The New Plan



How to move forward

- One major decision:
 - 1 MAPM camera + 1 SiPM Camera
 - 2 SiPM Cameras.
- We could try to plan for both and set a decision point?
- I asked the internet what to do:
 - Q: “How do I add a decision point into MS Project and branch the Gantt chart based on that decision?”
 - A: “If you need to do that, then you don’t know what your project is. Decide on what you want to do first.”
- Detailed Gantt, Milestones and Deliverables can’t easily be completed beyond this decision point.

The New Plan

How to move forward

- One major decision:
 - 1 MAPM camera + 1 SiPM Camera
 - 2 SiPM Cameras.
- We could try to plan for both and set a decision point?
- I

We should just decide!

 - Q: “How do I add a decision point into my project and branch the Gantt chart based on that decision?”
 - A: “If you need to do that, then you don’t know what your project is. Decide on what you want to do first.”
- Detailed Gantt, Milestones and Deliverables can’t easily be completed beyond this decision point.

The New Plan

MAPM & SiPM Camera



- MAPM camera is a good service to CTA.
- How to do it?
 - Build the MAPM components then worry about SiPMs?
 - No slip in the camera 1 timeline
 - Could potentially use “better” SiPMs if we can wait
 - Could still be viable for both on Mini Array timescale
 - Build both in parallel?
 - I think we would have to do this due to the funding restrictions.
 - Potentially a large slip in the timescale...
- Resources will be very stretched for the SiPM camera (depending on Dutch proposal).
- Requires:
 - New focal plane
 - New cooling scheme
 - New preamp + module
 - New TARGET module (HV -> 70 V)
- SiPM camera may only be ½ as good as it could have been.

The New Plan

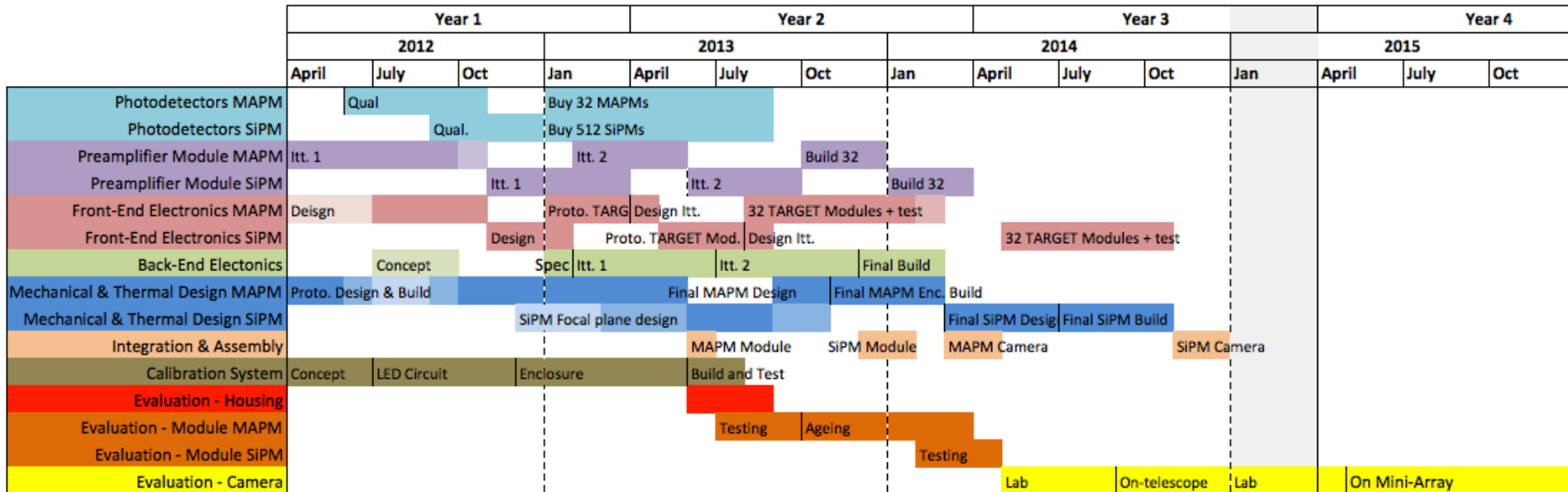


2 SiPM Cameras

- SiPMs are “the future”, can be used now and will only get better and cheaper.
- Danger of looking like we’re stealing the Italian’s idea?
- MAPM work would stop
 - Potentially wasted time on mechanics and preamp
- Potentially a 3-5 month slip in time line, but could catch up
- Resources not as stretched.
- Chance to focus on other areas of the camera to get them “production ready”.
- Would both cameras be the same? Or would they be iterations?

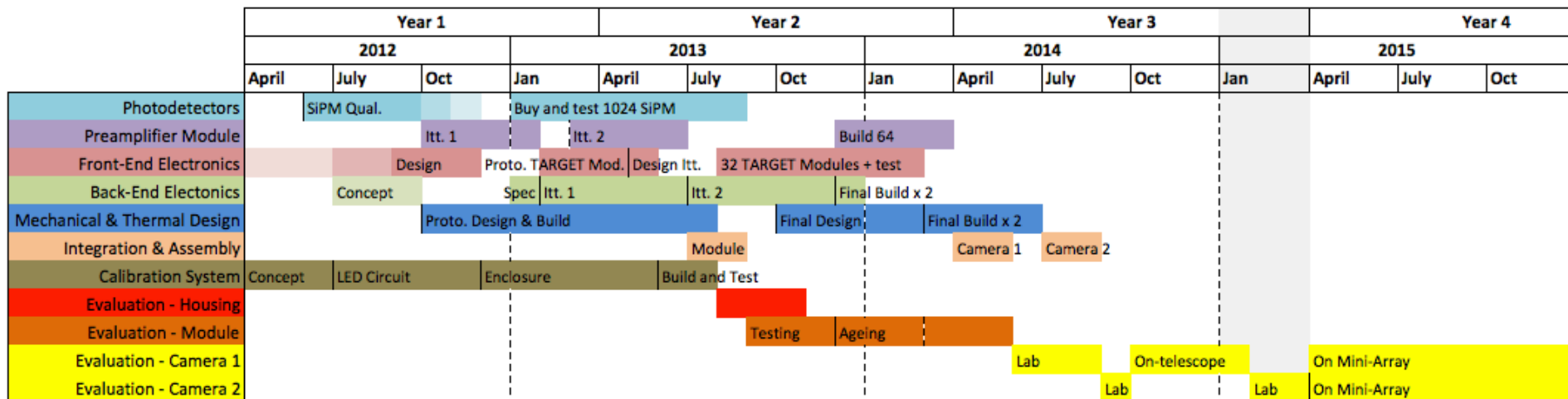
The New Plan

MAPM & SiPM Camera



The New Plan

2 SiPM Cameras



Conclusions

- Good progress so far!
- More resources than expected.
- Need to make a decision about what to build....

▪



Conclusions

- Good progress so far!
- More resources than expected.
- Need to make a decision about what to build....

NOW!



Conclusions

- Good progress so far!
- More resources than expected.
- Need to make a decision about what to build....

NOW!

In fact, I'm locking the door and you can't leave until we know what to do.



Additional Information

Durham (Total £9,590):

LEDs/laser diodes 1,000

PCB fabrication (3 runs) 1,050

LED drivers 1,070

Optical components 1,530

Monitoring/communication system 950

Power supplies 250

Enclosures 1,000

Connectors/cabling 500

Pump for salt fog chamber 440

Pipework, valves, etc. for salt fog chamber 1,800

Leicester (Total £83,160):

Prototype Back-end Electronics Components 13,840

Prototype Preamplifier Module Components 6,300

Prototype Readout Electronics Components 1,720

Prototype Power System Components 400

Prototype Cooling System Components 2,300

Prototype Internal Mechanical Components 9,500

Prototype External Mechanical Components 9,700

Assembly Rig Components 900

Preamplifier Module Components 9,960

Back-end Electronic Components 5,880

Readout Electronic Components 1,720

Power System Components 400

Cooling System Components 2,300

Internal Mechanical Components 7,600

External Mechanical Components 7,760

Custom Pulse Generator 800

Low Noise, High Precision Power supply 600

High Voltage Power Supply 1,480

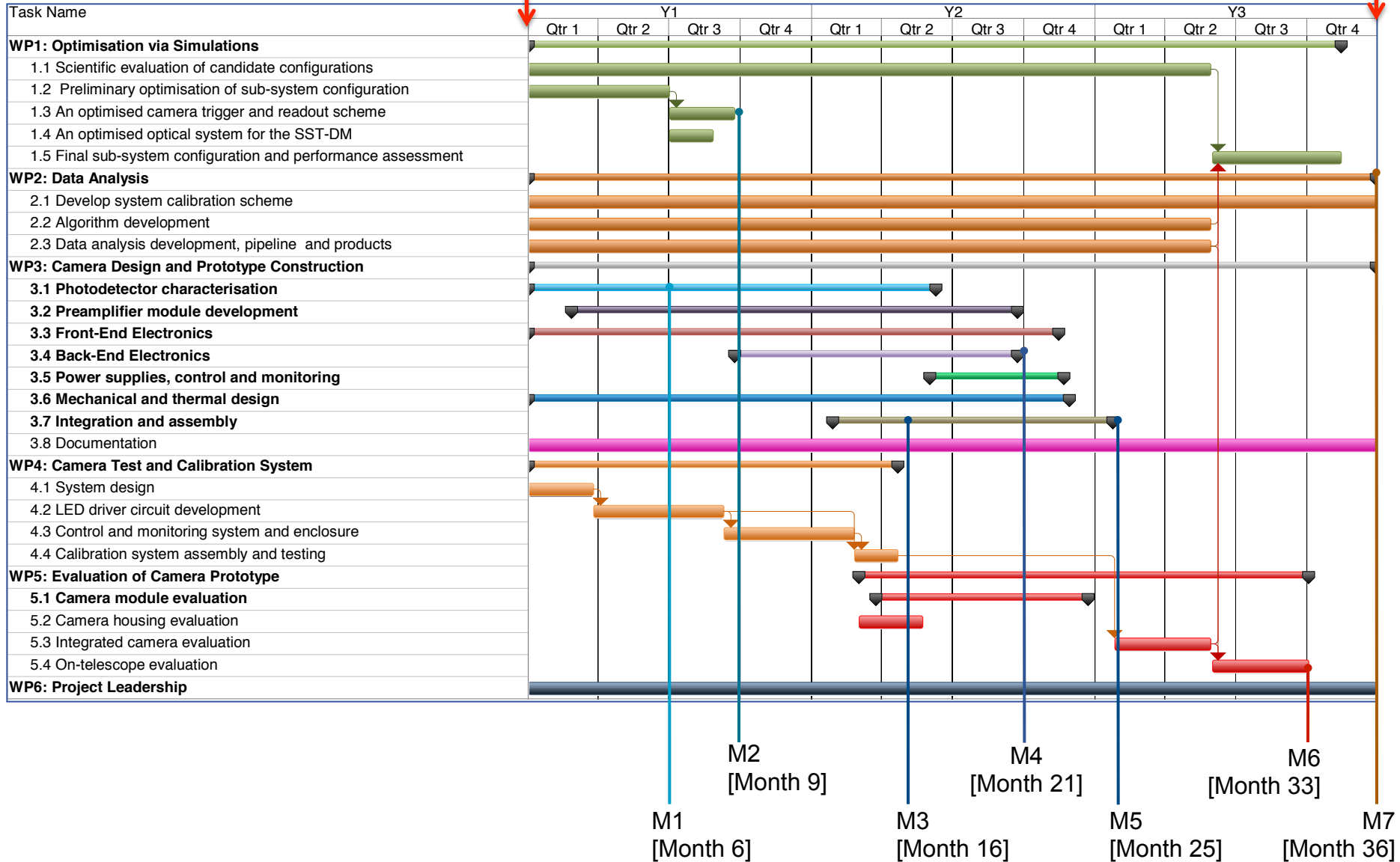
Liverpool (Total £9,960):

Materials for construction of camera shutter prototype and production version 9,960

Schedule

Spring-Summer 2012

Spring-Summer 2015



Key Technology

photosensors

- Dual Mirror candidates:
- MAPMT (H10966):
 - SBa photocathode
 - QE: 30% @ 350 nm, but low (0.7) CE
 - Gain variation x2 across 64 ch
- SiPM (S11828-3344M):
 - PDE: ~45% @ 350 nm,
 - Dark noise ~MHz (room temp.)
 - Gain depends on temperature
 - Gain depends on DC illumination (NSB)



4x4 pixels
pixel = 3x3 mm
3600 cells (50x50 μ)
Filling Factor = 70%

