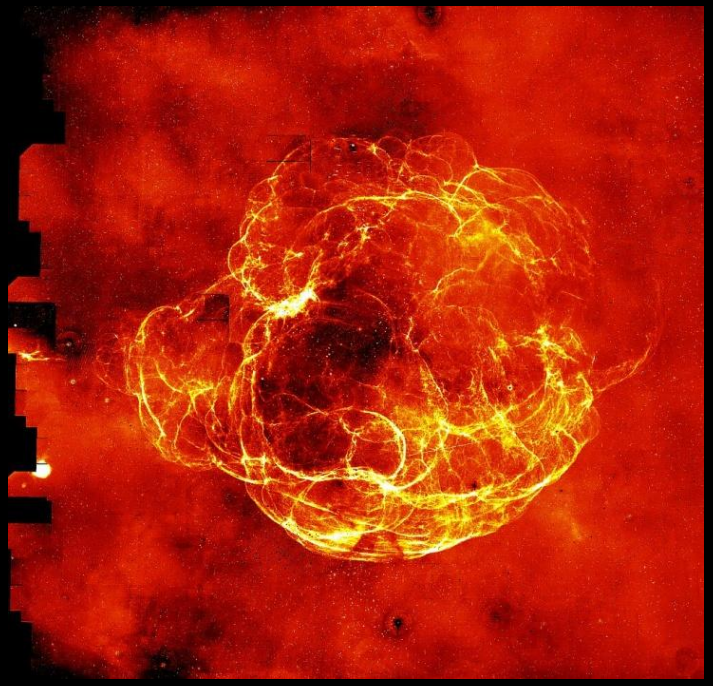


The VST Photometric Hα survey of the southern Galactic Plane:

VPHAS+ UPDATE

PI: Janet Drew *(University of Hertfordshire, UK)*

Steering group: Romano Corradi *(IAC, Spain),* Robert Greimel *(U of Graz, Austria),* Paul Groot *(U of Nijmegen, Netherlands)*, Boris Gaensicke *(U of Warwick, UK*), Nic Walton *(IoA Cambridge, UK)*

Our man at ESO: Jeremy Walsh
Optics advice: Bill Martin *(UH)*
CASU steering group participant: Eduardo Gonzalez-Solares

VPHAS+ website : http://www.vphasplus.org

VPHAS+ aims:

- The first digital/optical ~1 arcsec resolution survey of the southern Galactic Plane and Bulge.
  - Giving contemporaneous SEDs, enhanced by narrowband Hα, for all point sources to AB mag ~ 22.
  - → unprecedented accounting for the emission line objects – young and evolved – in the MW disk
  - → opportunities to map the disk: critical input to 3D extinction maps, calibrated stellar density mapping
  - → census of UV excess objects: massive stars, compact binaries, stellar remnants

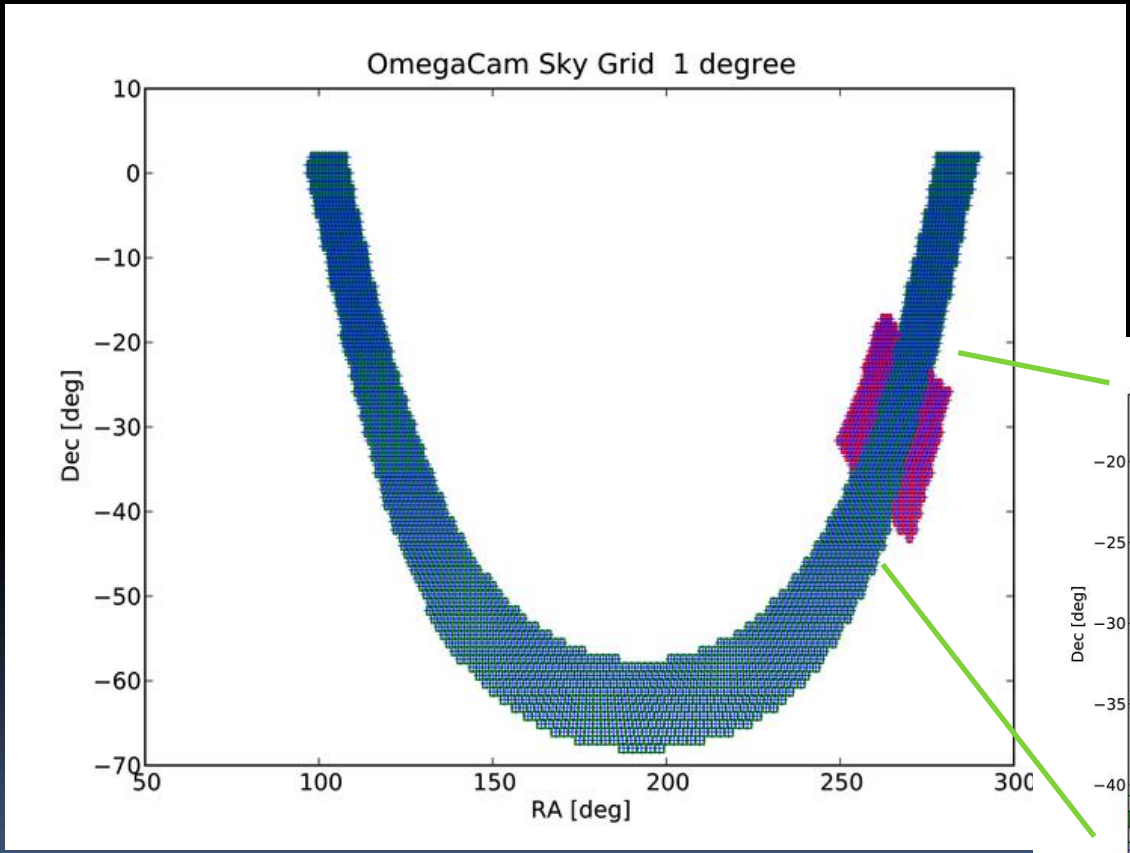
VPHAS+ specification:

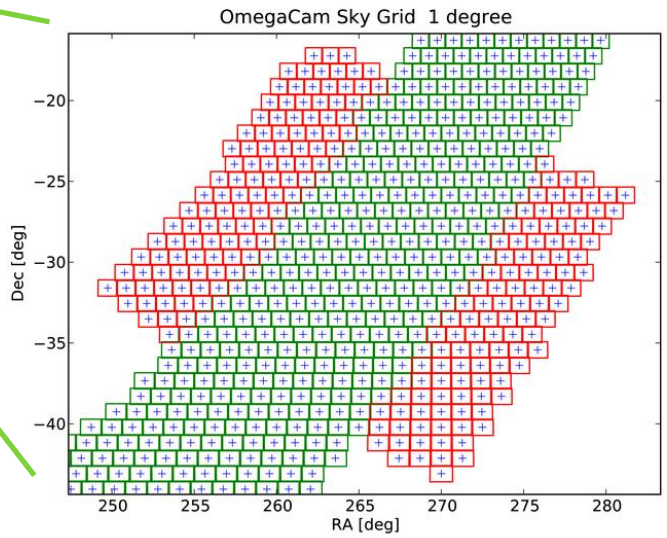
Filter	Exposure (secs)	Limiting AB mag
u	150	21.8
g	30	22.5
r	30	22.5
Ha	120	21.6
i	30	21.8

- Survey footprint: 1800 sq degs, $|b| < 5^{o}$, plus small overlap across celestial equator, plus Galactic bulge to $|b| < 10^{o}$.
- Every field centre observed once in each filter
  …plus another set of exposures in each filter, at an offset position (to achieve double pass)
- Contemporaneous data-taking required to avoid problems with variability
- < 1.2 arcsec seeing generally accepted, or < 0.8 arcsec in the most dense star fields;
- 'clear' conditions accepted

Tiling the plane

To assure |b| < 5 coverage – ~2100 field centres
Adding the Bulge, as shown, adds a further ~200 centres





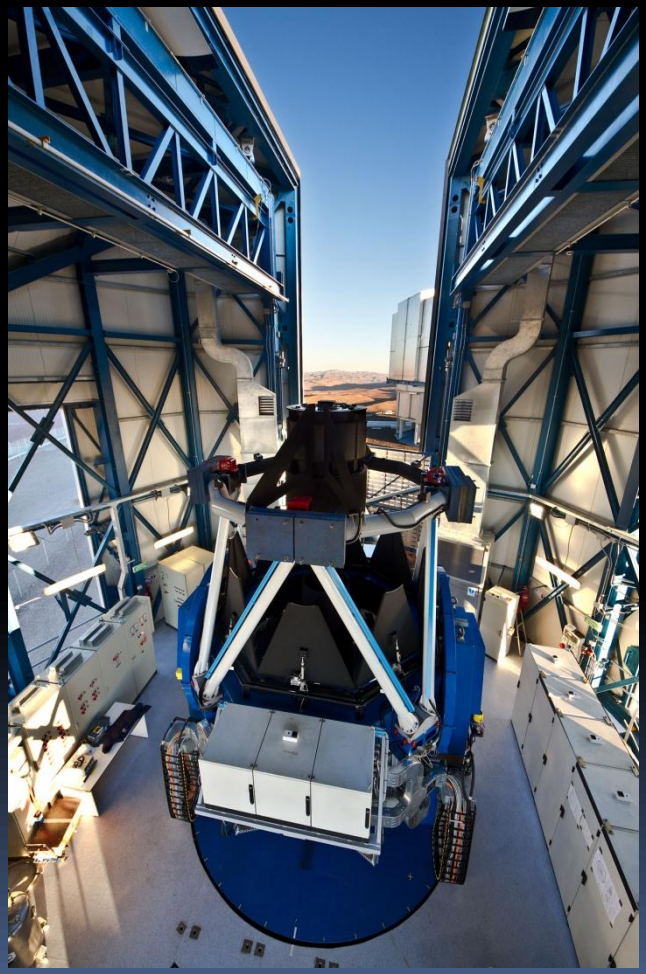
100 percent overhead + offset repeats
→105 nights for Plane
→+11 nights for Bulge

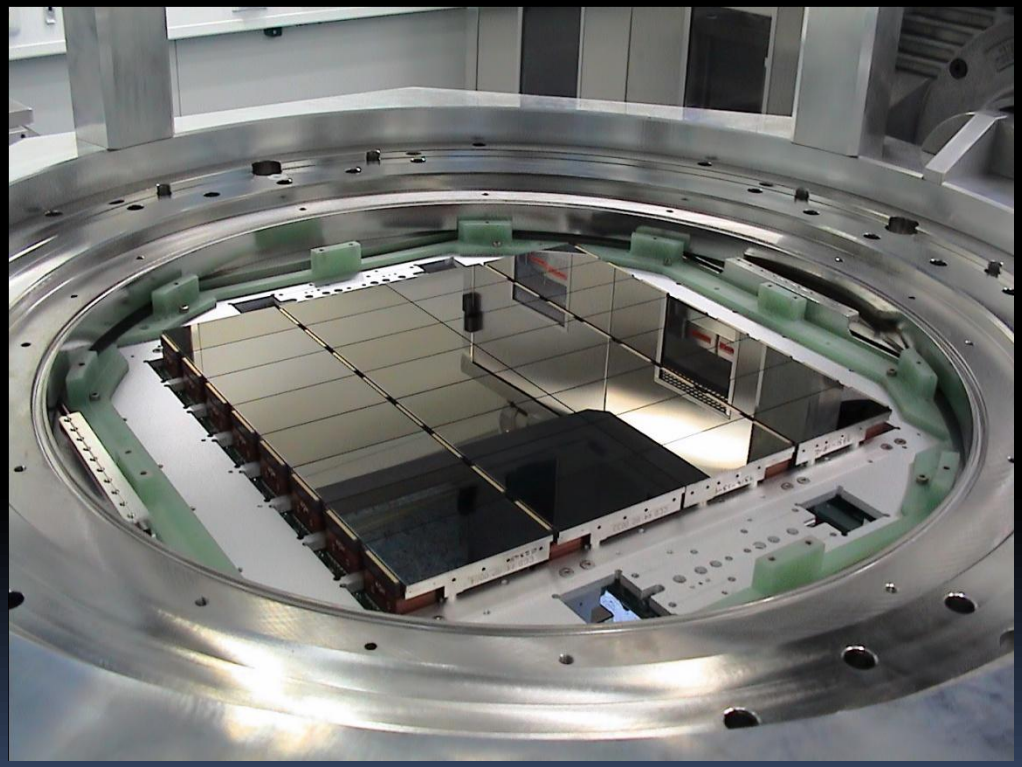
(Tiling by R Greimel, using OmegaCam software)

VPHAS+ and Skymapper

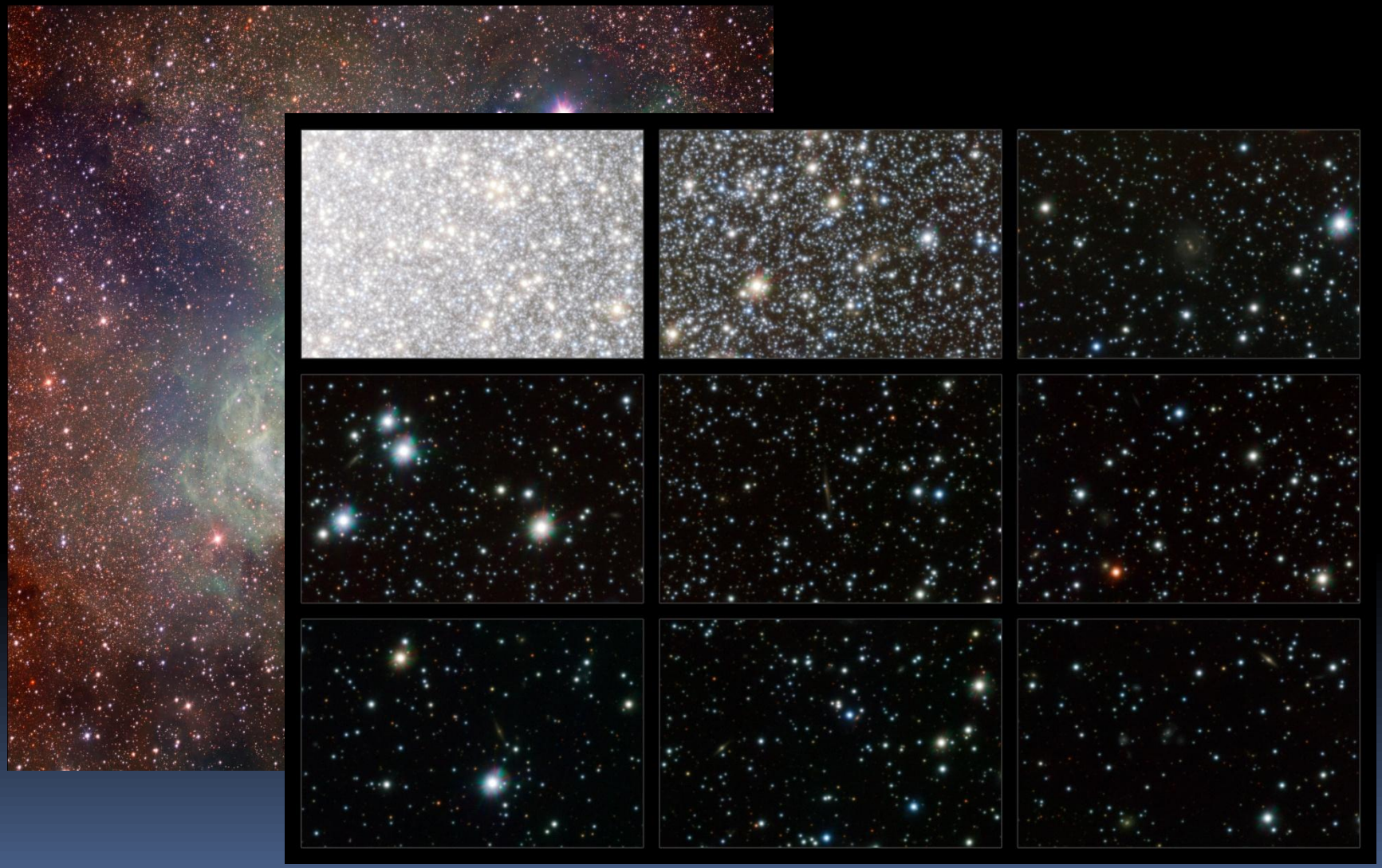
- Regular contact with Stefan Keller, Mike Bessell (and Brian Schmidt) in recent years
- Skymapper Hα filter in procurement – to be used for fast/shallow (< 18th mag) survey, complementary to VPHAS+
- …have been discussing possible follow-on procurement of single-piece filter for VST, to replace segmented filter in hand
- …interest in exploiting cross-calibration opportunities
- VST will outperform Skymapper in dense Galactic Plane fields.

VST and OmegaCam: ...there and being commissioned





VST press release images: M17, Omega Cen



What has happened this year:

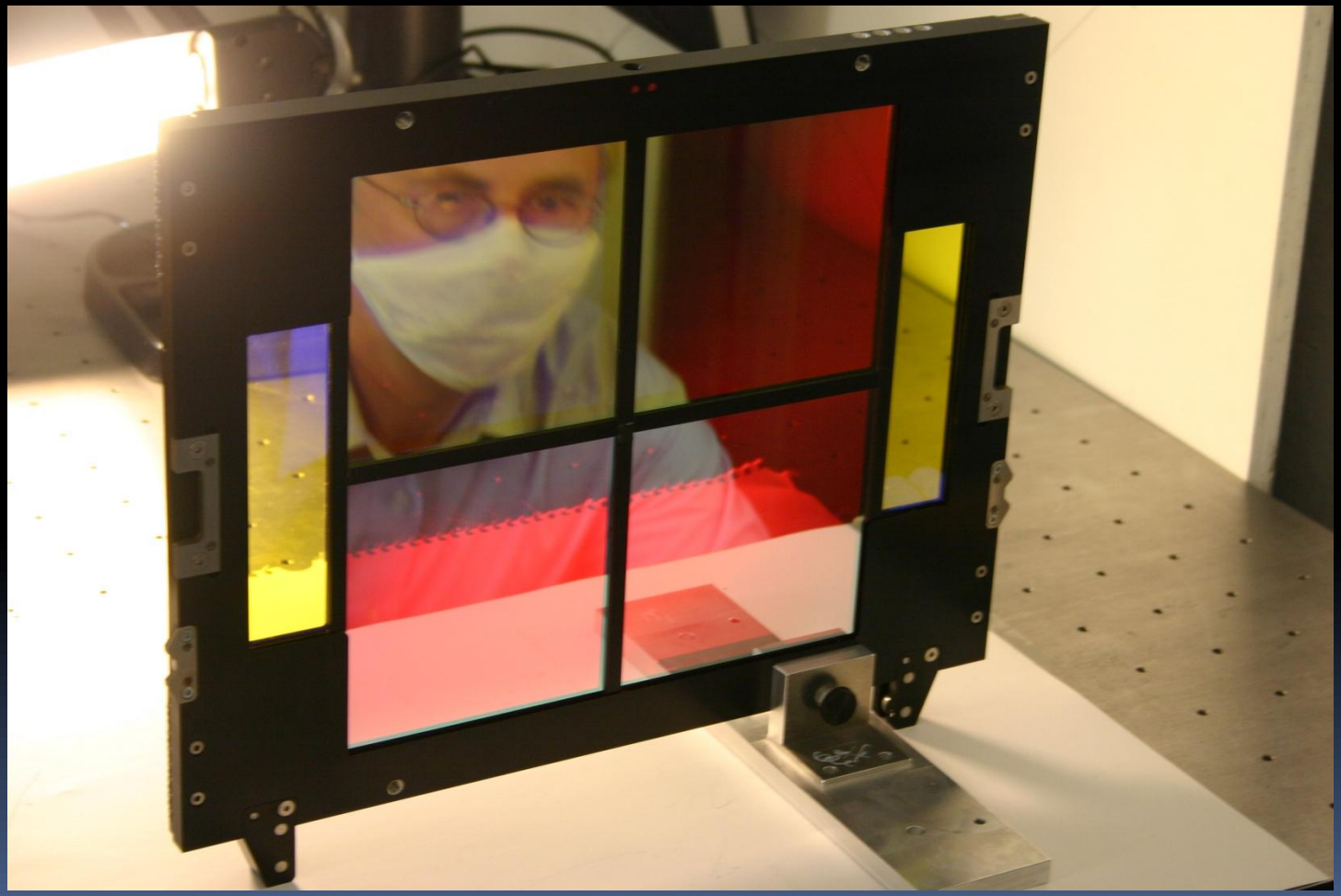
- Some remeasurement of filter late April in Munich → packed and sent to Chile

- ESO requested refreshed SMP, end May …revised SMP submitted July 1

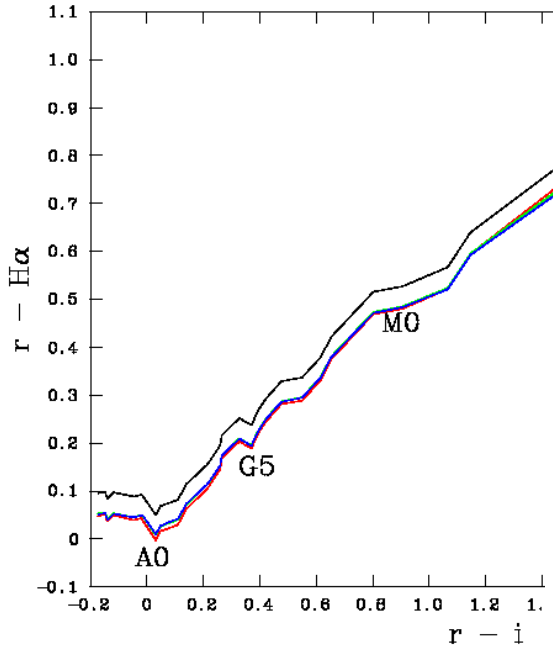
- Much email traffic about the segmented Hα filter and a revisit of the simulations of the lab measurements

- Some VST/OmegaCam frames supplied by ESO → CASU for appraisal (Mike's talk).

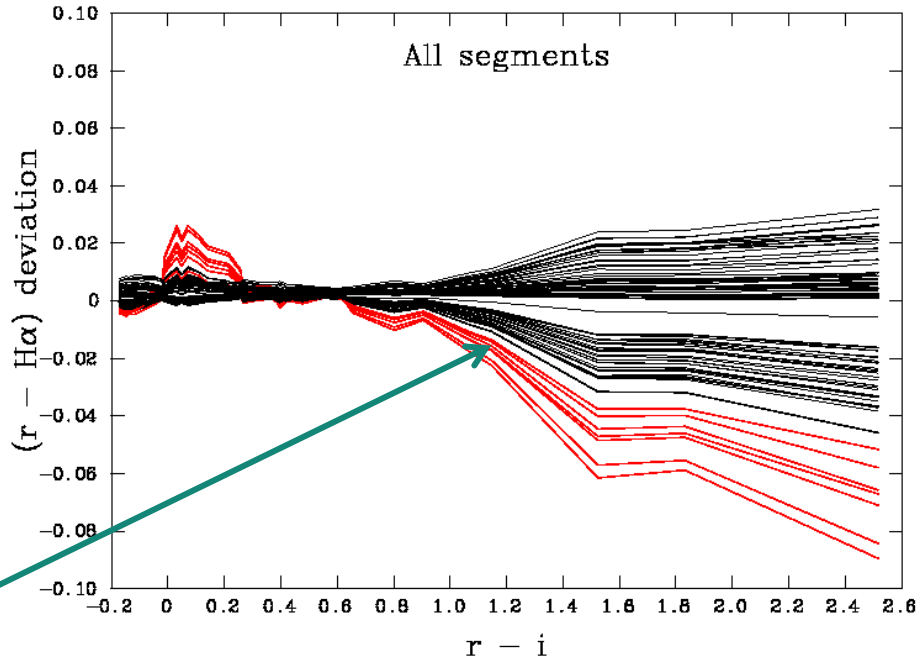
The defining VPHAS+ filter: Hα – segmented for ease of manufacture/cost



Filter performance for normal stars: mean segment unreddened r-Hα,r-i main sequences (top left)



Variation across the 84 measured positions (below)



In red the 8 most deviant corners

Comments/questions re the filter

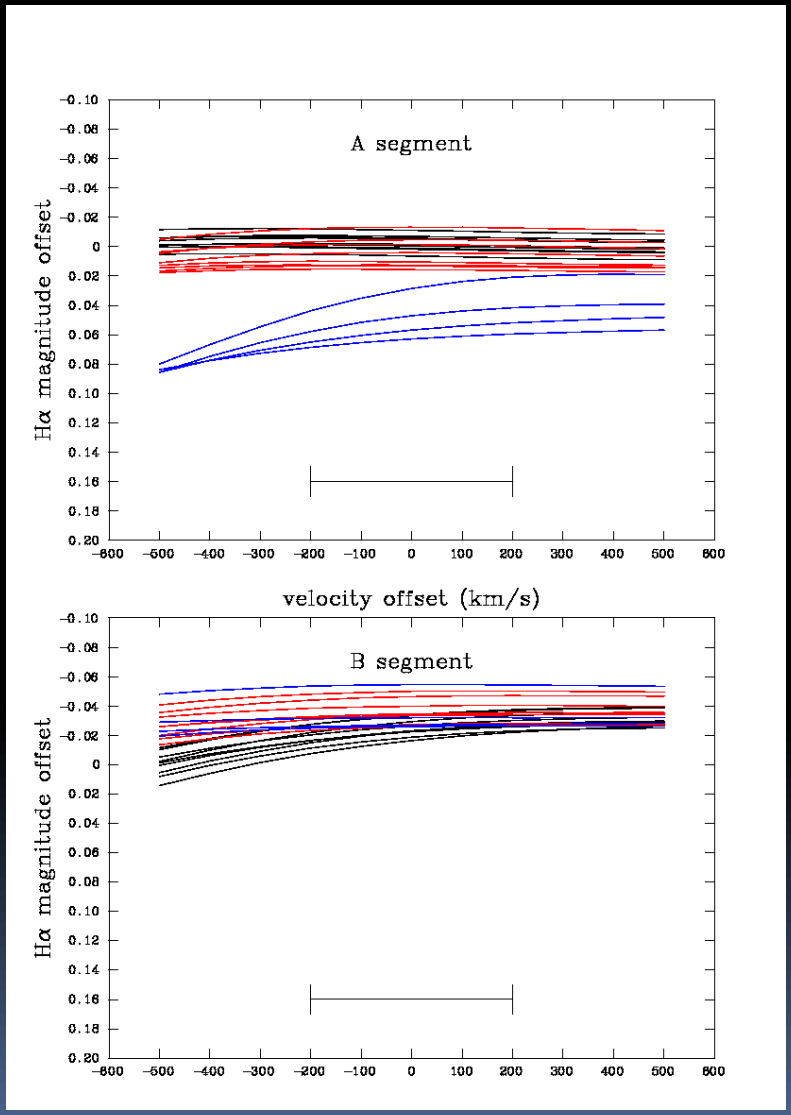
M-dwarf colour range: broad spread in response → a measure of CWL shift. (Evidence in INT Hα filter also!)

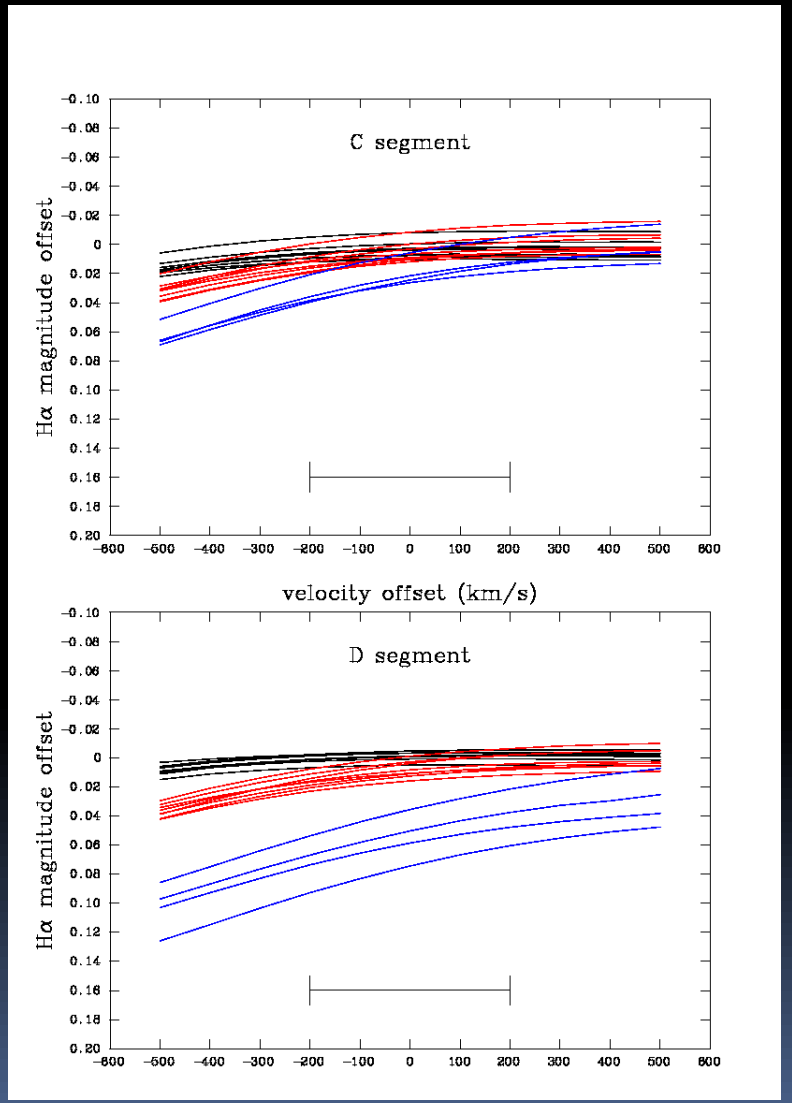
~Circular-symmetric variation of properties away from segment centres.
Corners of D segment show a marked 'out-of-spec' redshift of CWL → rest Hα no longer on transmission-curve plateau.

Plateau transmission very good. Over 2 years, no detectable time variation in throughput. Good off-band blocking.

Segmented → vignetting due to T bars.

Response of Hα filter to a modest emission line (EW 22 Ang.)





Coming:

• testing of the Hα filter on sky: check image quality; map integrated transmission; assess more subtle effects (4 tests – 4 hours approved for them)

• descent on final survey strategy when all necessary knowledge of performance, overheads etc is gathered in → critical consortium meeting before year end

•wait for the return of the Galactic Plane at the end of the calendar year …and START

What we think we know already...

- Read-out can be performed in parallel with slews and/or filter changes.
- Filter changes take 65 secs, if magazines are alternated …longer if not → need to minimise changes
- Read-out takes 40 secs, field acquistion ~120 secs
- Guide stars definitely not needed for exposures less than 60 secs …might not be needed for u, Hα either(?)
- Zeropoints (mostly) resemble INT zeropoints…
- Offset needs to take account of Hα filter non-uniformity → ~13 arcmin in each of RA and Dec. VST software already adjusted to allow this.

Present OB model

- Shorter cycle: field/offset (or offset/field) pair.
- Longer cycle: work through filter set, alternating magazines (for efficiency)
- →OB length of order 25 mins. …cf. 40 mins to achieve the same coverage with INT
- Exposure times:- u: 150 sec, g: 30 sec, r: 25 sec, i: 20 sec, Hα 150 sec (+15 sec wrt original application)
- → dark/grey time

To discuss:

OB structure (pattern, exposure times)?
…get a better unsegmented filter?
Data reduction options, e.g. use of nebuliser.

Consortium organisation