

New fashion for an old paradigm: efficient, no moving part, ingot-like WFSs for LGS



<i>Roberto Ragazzoni</i>	Elena Carolo
Elisa Portaluri	Simonetta Chinellato
Valentina Viotto	Davide Greggio
Marco Dima	Marco Guilleuszik
Maria Bergomi	Demetrio Magrin
Federico Biondi	Luca Marafatto
Jacopo Farinato	Daniele Vassallo



Astronomical
Observatory
of Padova
Adaptive Optics Group



LABORATORIO
NAZIONALE
ADONI
OTTICA
ADATTIVA

New fashion for an old paradigm: efficient, no moving part, ingot-like WFSs for LGS



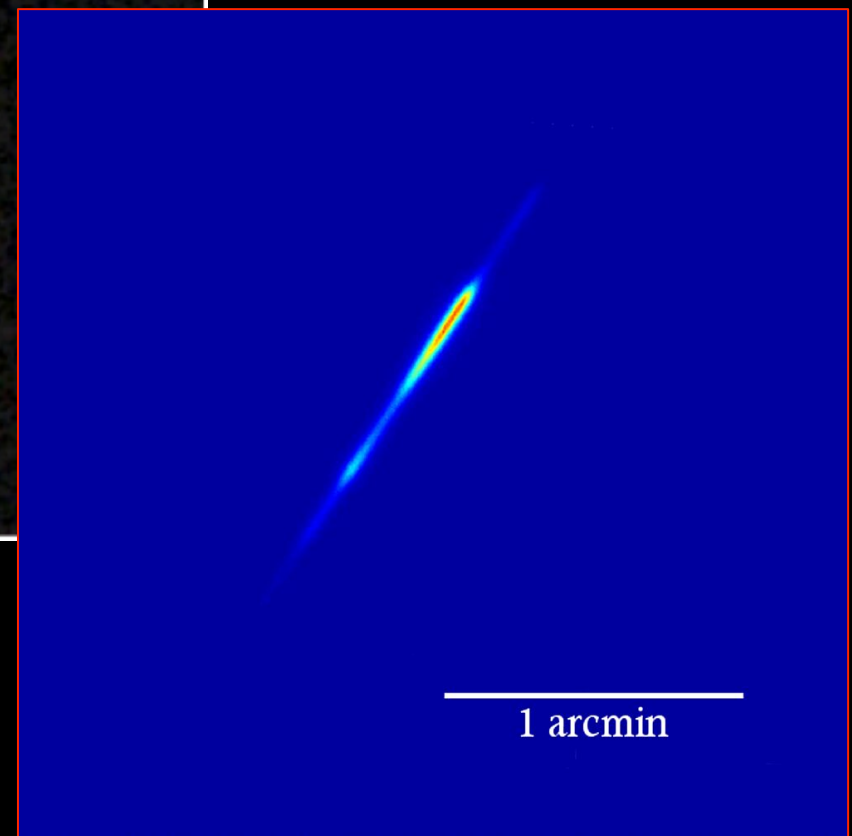
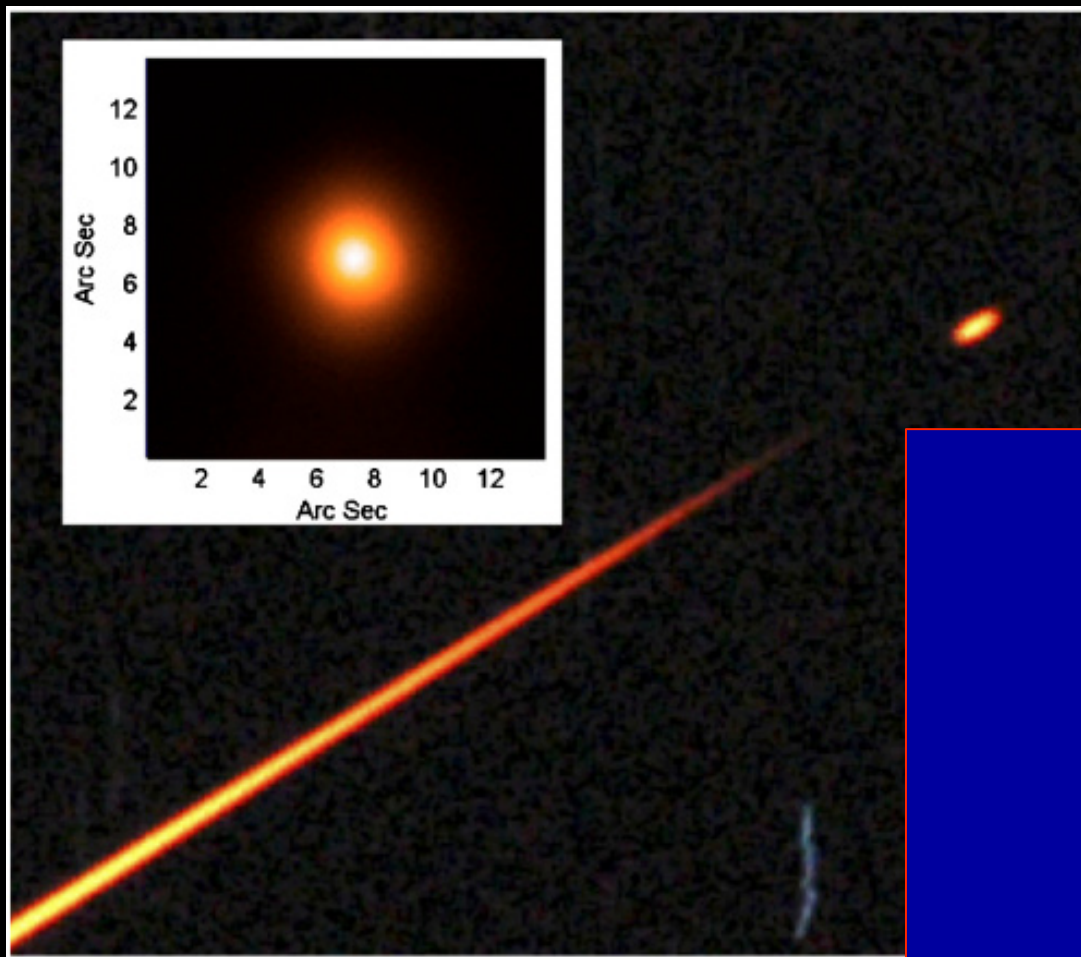
<i>Roberto Ragazzoni</i>	Elena Carolo
Elisa Portaluri	Simonetta Chinellato
Valentina Viotto	Davide Greggio
Marco Dima	Marco Guilleuszik
Maria Bergomi	Demetrio Magrin
Federico Biondi	Luca Marafatto
Jacopo Farinato	Daniele Vassallo



Astronomical
Observatory
of Padova
Adaptive Optics Group



LABORATORIO
NAZIONALE
ADONI
OTTICA
ADATTIVA



Laser Guide Stars
are not “stars”

Names *are* important...!!!



"WHO GAVE YOU THE RIGHT TO NEGOTIATE MY NAME?"

Do not be deceived by the terms 'international, bilateral, constitutional'

- Change it once, even bilaterally, and it will be changed **everywhere**
- Do you want to be called 'Northern Macedonian', 'Vardarian', 'Skopjan' or simply **Macedonian**?
- We applaud the Macedonian government for saying "We will not change our name", but by negotiating we are telling the world: "We will change our name"
- **No dual-name.** Greece is the only country that objects to our name. It is not our problem. No bilateral or international "solution" is needed
- Countries that have recognized Macedonia have said "If a bilateral solution is reached, we will abide by that decision and use the new name for Macedonia"
- Any change to our name is unacceptable, even 'qualifiers' like 'Democratic' or 'Northern' in front of 'Republic of Macedonia'. We would be known everywhere as 'Northern Macedonia' and 'Northern Macedonians', who speak 'Northern Macedonian'

WE ARE WINNING. 127 COUNTRIES HAVE RECOGNIZED MACEDONIA, INCLUDING 4/5 UNITED NATIONS SECURITY COUNCIL MEMBERS. WE HAVE THE POWER TO END THIS. STOP NEGOTIATING OUR OWN NAME.

Prior to 1988, Greece's policy was that Macedonia did not exist. Then it renamed 'Northern Greece' to 'Macedonia'. Now suddenly Macedonia is Greek?

As former Greek Prime Minister Constantine Mitsotakis admitted in 1995, the reason Greece objects to our name is to deny the existence and persecution of its large Macedonian minority

- Macedonians in the Balkans are fighting for their human rights as Macedonians, nothing else

REMEMBER: IT IS A LIE THAT A COMPROMISE WILL SOLVE OUR PROBLEMS WITH GREECE. IT WILL JUST STRENGTHEN GREECE'S POSITION TOWARDS ITS FINAL GOAL: TO ERASE MACEDONIANS FROM HISTORY, THE PRESENT AND FUTURE.

We are Macedonian! Do you want to go down in history as the people who changed our name and identity?

What gives the EU and NATO the right to ask you to sell out your identity?

- The EU and NATO are violating their own principles and laws by asking us to change our name
- Do not give in to scare tactics from Greece and media reports that Macedonia will "collapse" without EU & NATO membership
- Look at the current economic crisis in Greece
- **Scare-mongering is being used to get Macedonia to change its name**

Greece is holding the EU and NATO hostage

- Despite overwhelming support for Macedonia's NATO membership, Greece was permitted to use its veto power against Macedonia
- Greece lied about its economic situation, and now the rest of the EU is being forced to bail them out

The European Union cannot allow its member-states to be handcuffed by Greece's xenophobic policies. Recognize Macedonia.

- If the EU and NATO insist on a name change, what other concessions will they ask for?
- By continuing the negotiations, we are telling the world "we will change our name"
- **Stop negotiating our own name**

Common sense. Would any other country negotiate its own name?

- Should the US state of Georgia demand that the Republic of Georgia change its name?
- Should the Belgian province of Luxembourg demand that Luxembourg change its name?

THE MOST BASIC HUMAN RIGHT IS SELF-IDENTIFICATION.

THE MACEDONIAN PEOPLE MUST TELL THEIR GOVERNMENT TO STOP NEGOTIATING OUR NAME.

DEMAND AN END TO 'FYROM' REFERENCE.

DEMAND IMMEDIATE INTERNATIONAL RECOGNITION.

MHRMI
MACEDONIAN HUMAN RIGHTS MOVEMENT INTERNATIONAL
www.mhrmi.org

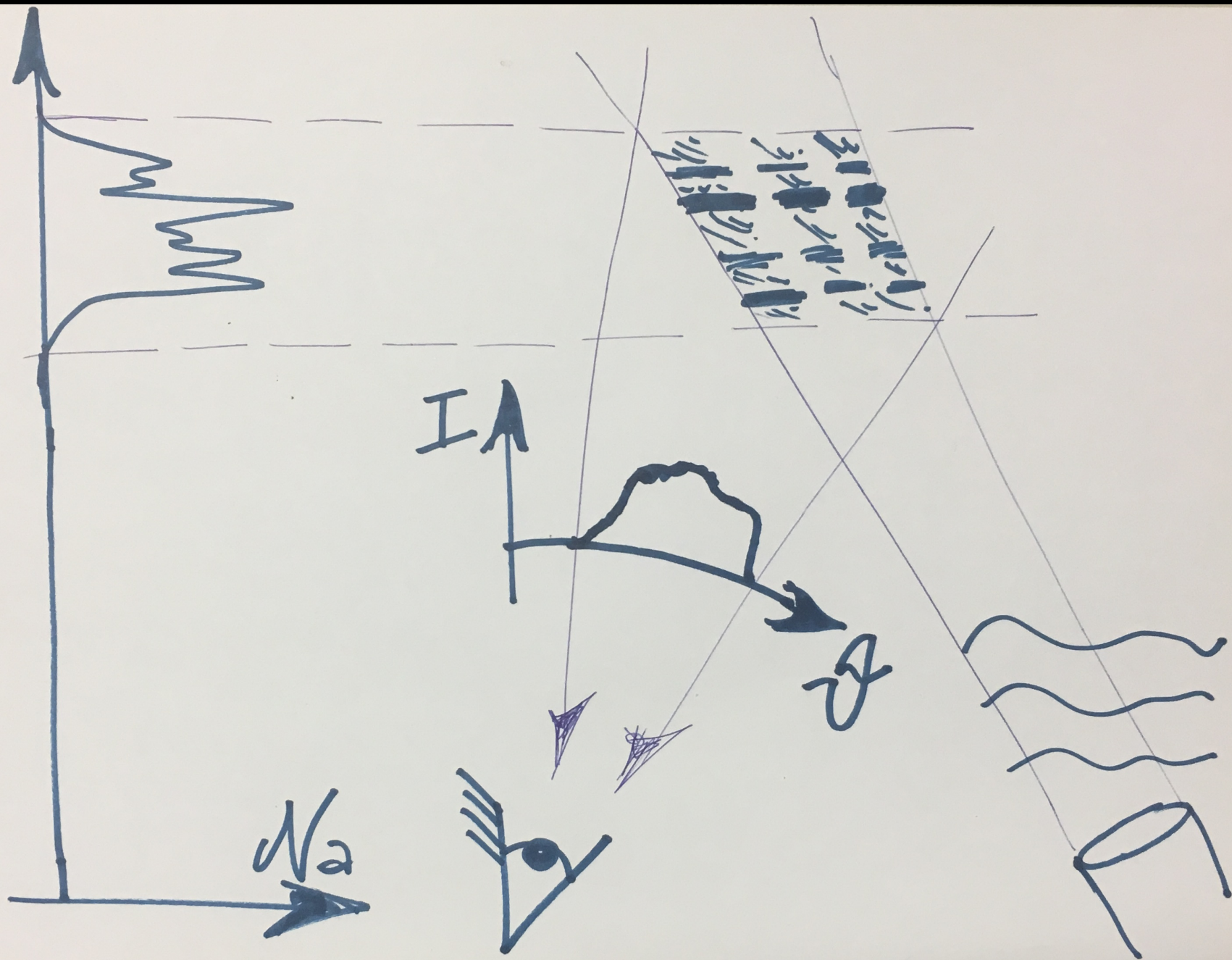
AMHRC
AUSTRALIAN MACEDONIAN HUMAN RIGHTS COMMITTEE INC.
www.macedonianhr.org.au

and other Macedonian organizations - www.mhrmi.org/nor_name_is_macedonia

OUR NAME IS MACEDONIA

LGSs...

- LGS is not a point source
- It is a “cigar in the sky” (LGC...???)
- Speckles pattern can develop if projector larger than Fried parameter
- Different point of the LGS focus at different planes
- Basically speckles pattern get smeared
- Structure in the LGS because of (unpredictable) density variations of the Sodium column is smeared out as well



Are we looking to the
future or to the past...???

NGS

NGS

THE FUTURE IS NOW

LGS

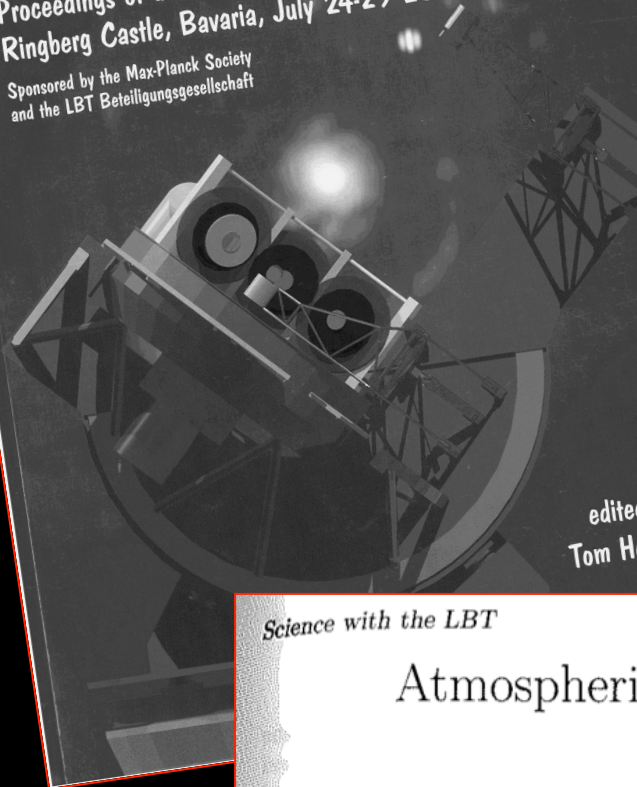


BLAST
FROM
THE PAST

Science with the Large Binocular Telescope

Proceedings of a Workshop held at Ringberg Castle, Bavaria, July 24-29 2000

Sponsored by the Max-Planck Society and the LBT Beteiligungsgesellschaft



edited by
Tom Herbst



Roger Angel, Roberto Ragazzoni, and Piero Salinari hatching new ideas on the sun deck

Science with the LBT

13

Atmospheric Tomography with Multiple Lasers

R. Ragazzoni^a

^aAstronomical Observatory of Padova, Italy

Further author information: (Send correspondence to R. Ragazzoni)

E-mail: ragazzoni@pd.astro.it

LGS WFSensing...

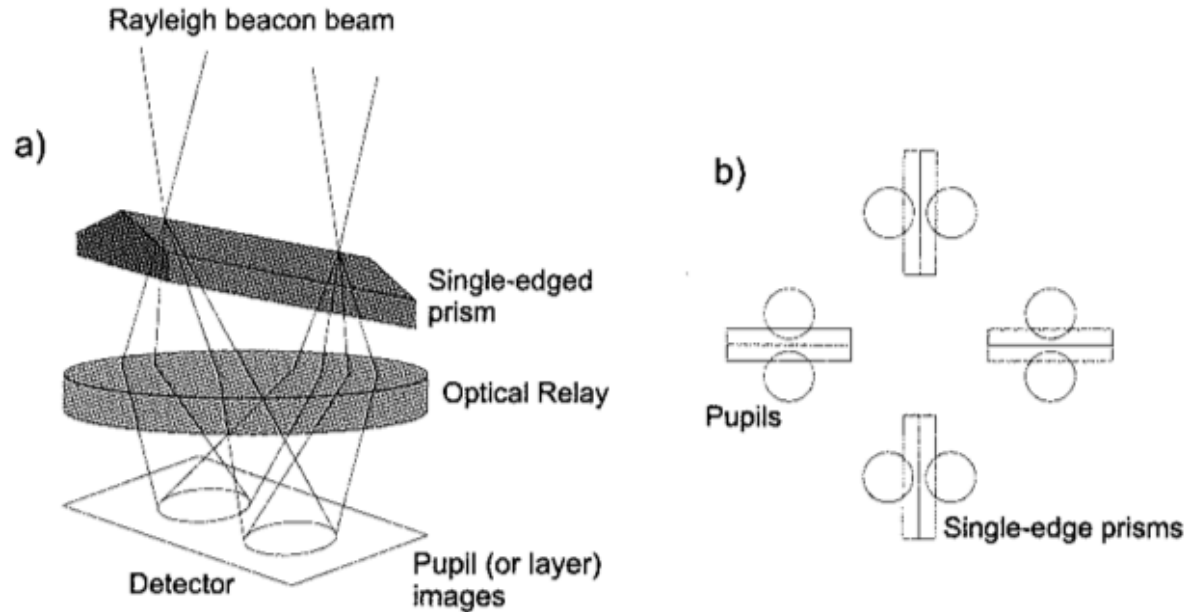


Figure 1. If a LGS is launched aside of the main mirror its apparent position on the focal plane will change and, simultaneously the minimum waist position will move. *a)*: One can place a roof-prism whose edge is aligned with such a continuous line. Provided the optical relay re-image the pupil of the telescope in this way one can, by the normalized difference of illumination on the two pupils images, retrieve the wavefront derivative along a given direction. *b)*: Using four LGSs fired by four equidistant positions around the main telescope and using the proper arrangement of such roof prism one can determine the derivative of the wavefront along two orthogonal direction.

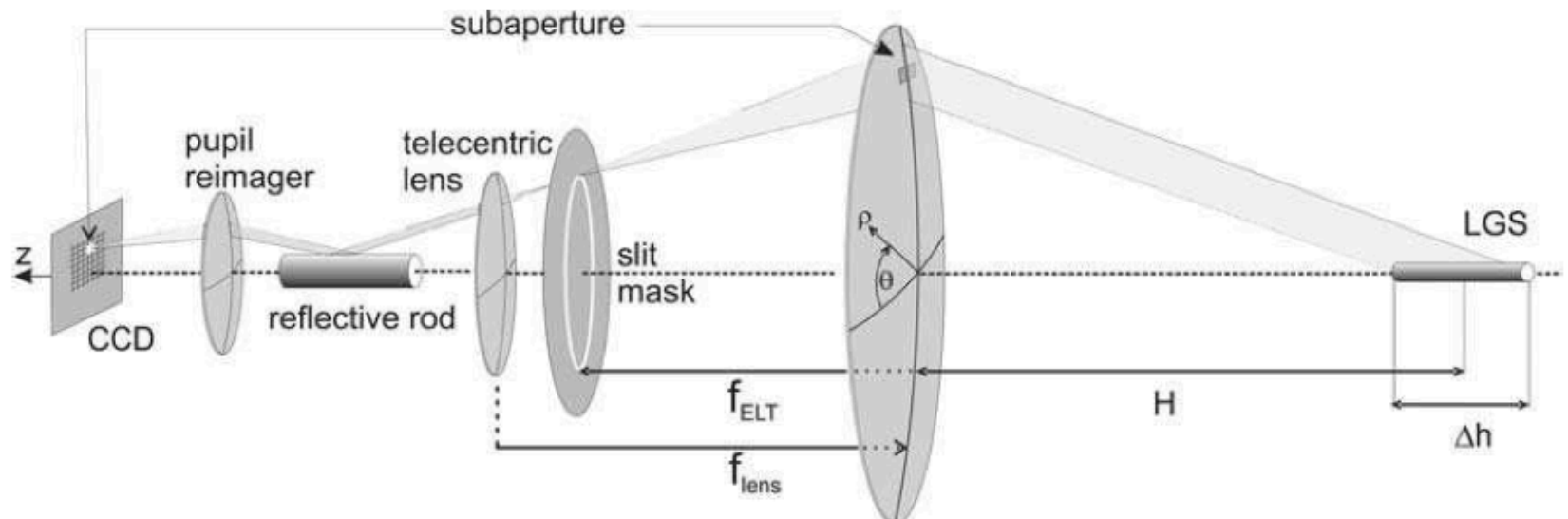
Pseudo-infinite guide stars for multi-conjugated adaptive optics on extremely large telescopes

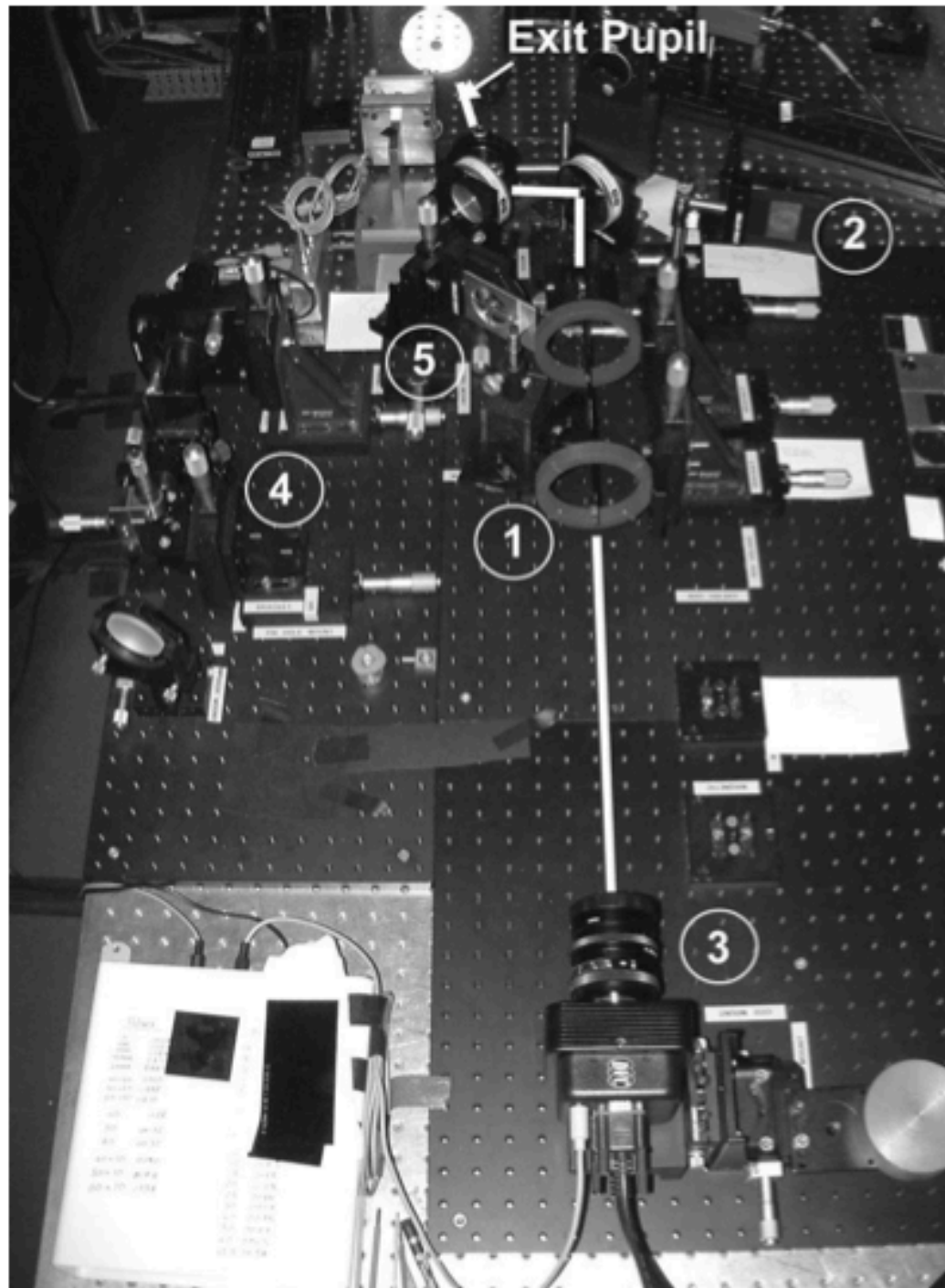
Roberto Ragazzoni,^{1★} Stephan Kellner,^{2★} Wolfgang Gaessler,² Emiliano Diolaiti³
and Jacopo Farinato¹

¹INAF – Osservatorio Astrofisico di Arcetri, L.go E. Fermi 5, I-50125 Firenze, Italy

²Max-Planck-Institut für Astronomie, Königstuhl 17, D-69117 Heidelberg, Germany

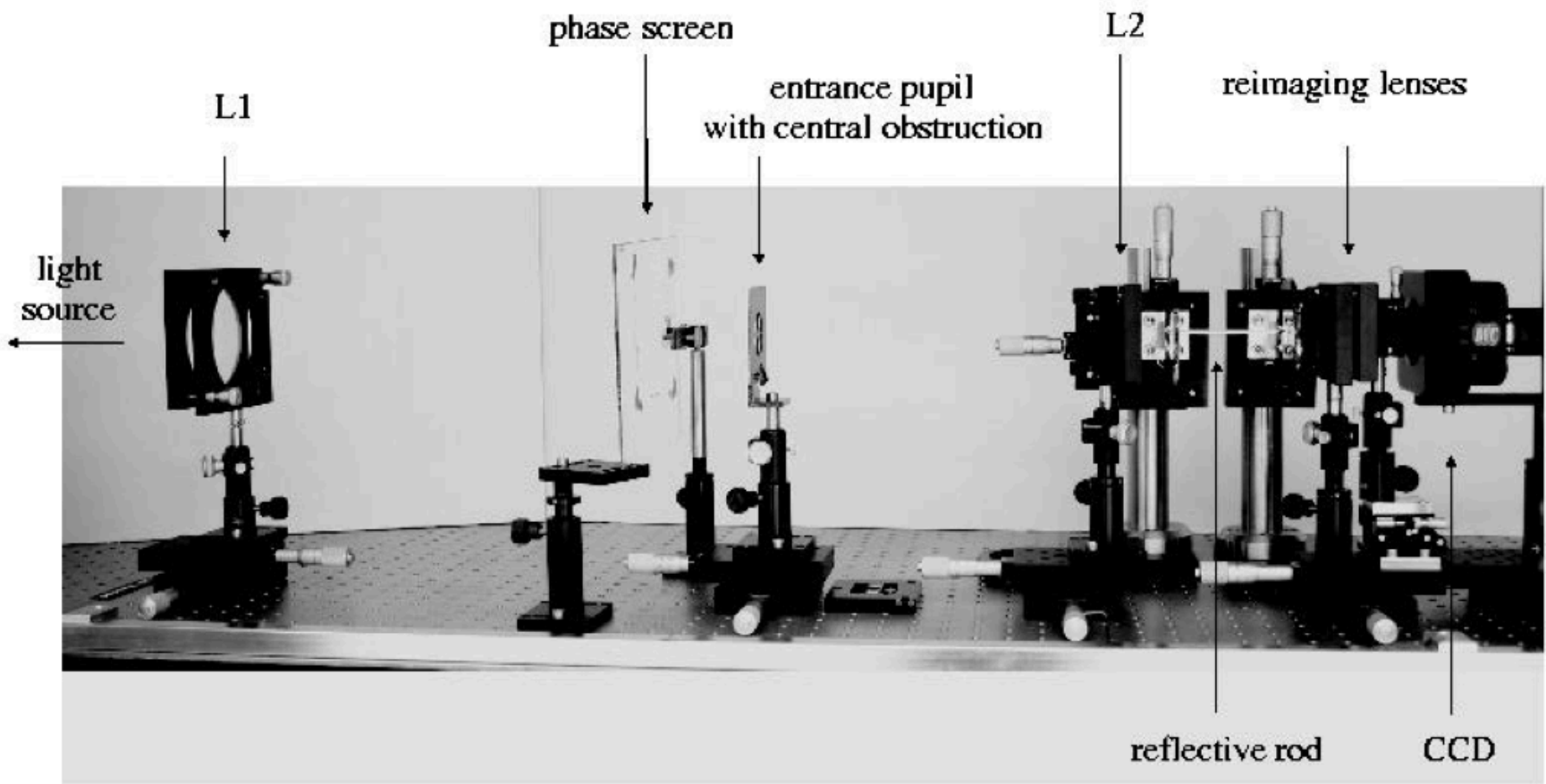
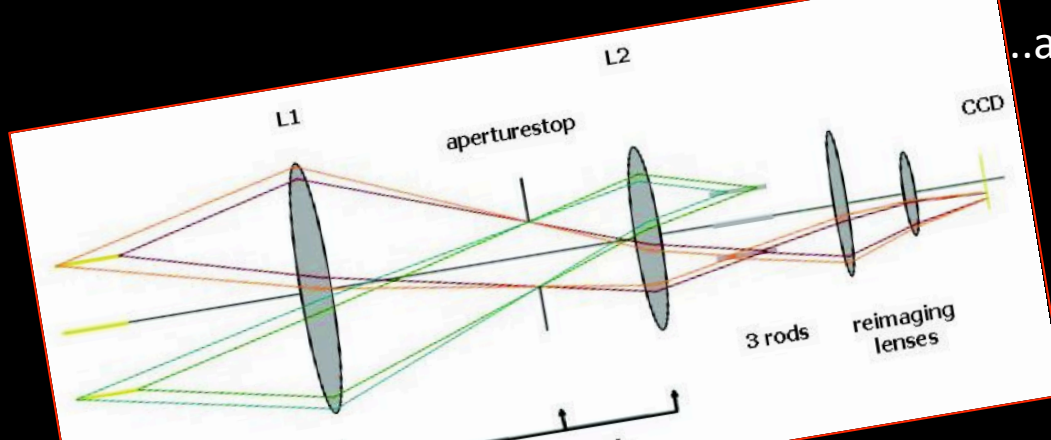
³INAF – Osservatorio Astronomico di Bologna, via Ranzani 1, I-40127 Bologna, Italy



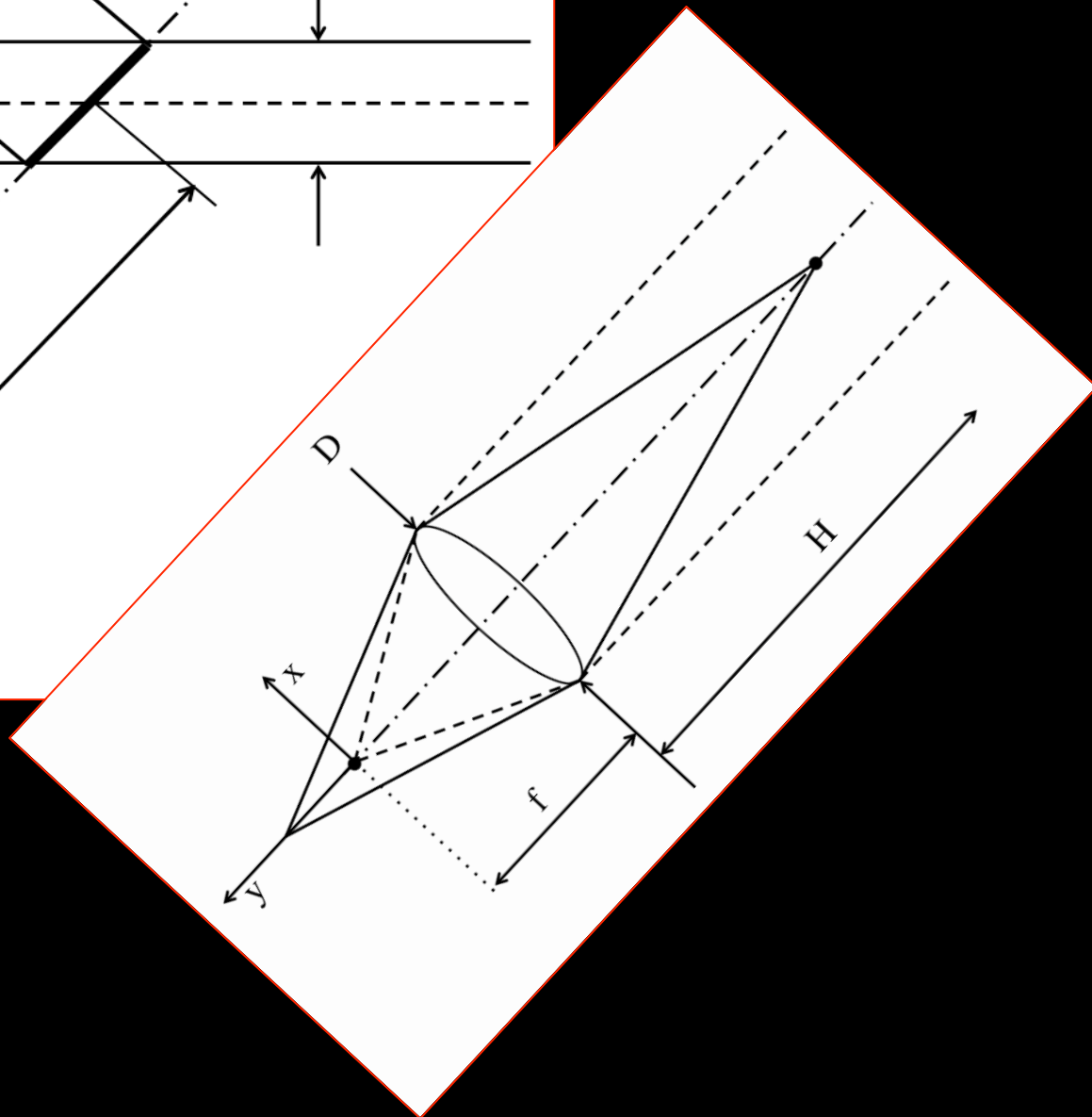
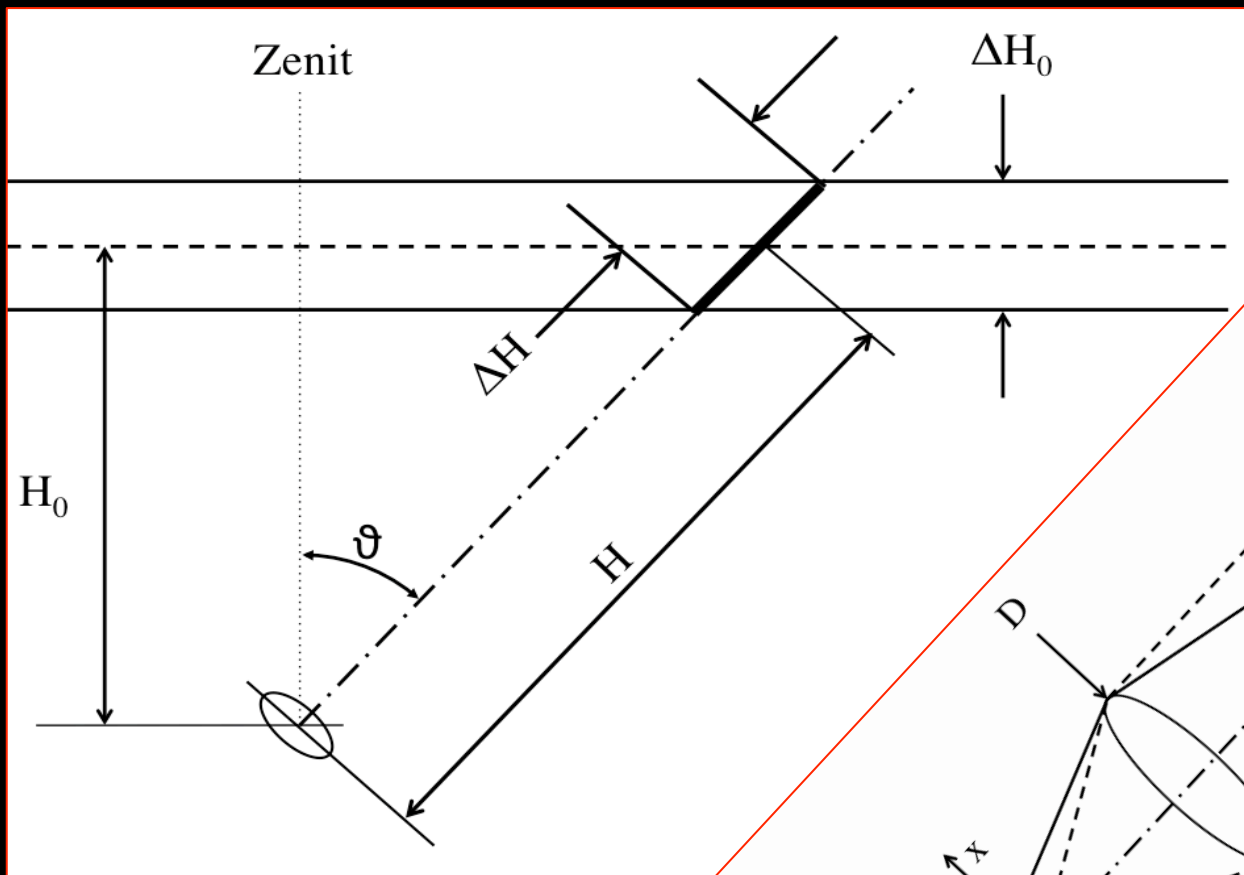


Even tested on the sky at WHT...

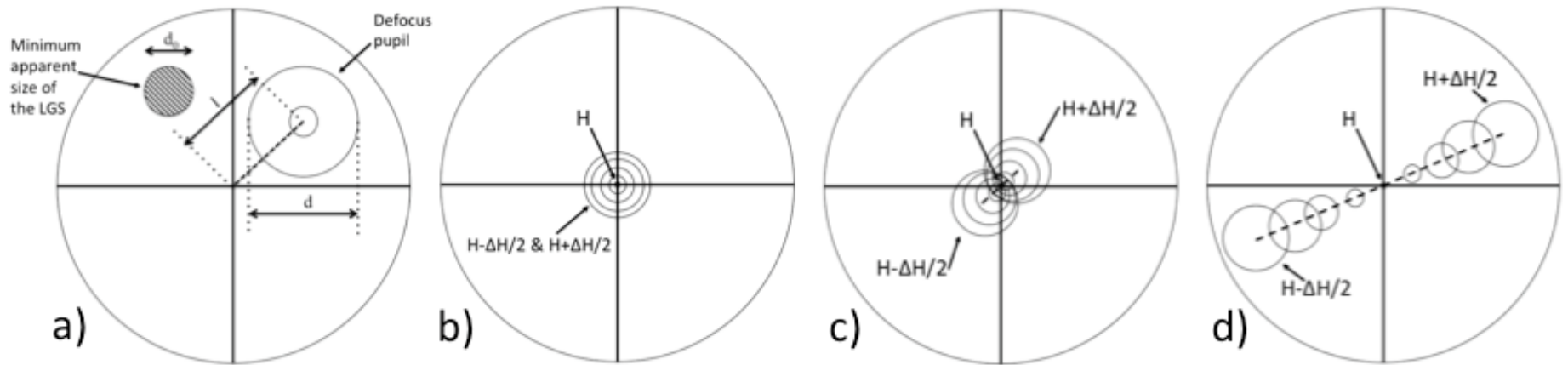
..and in the lab in their MCAO versions



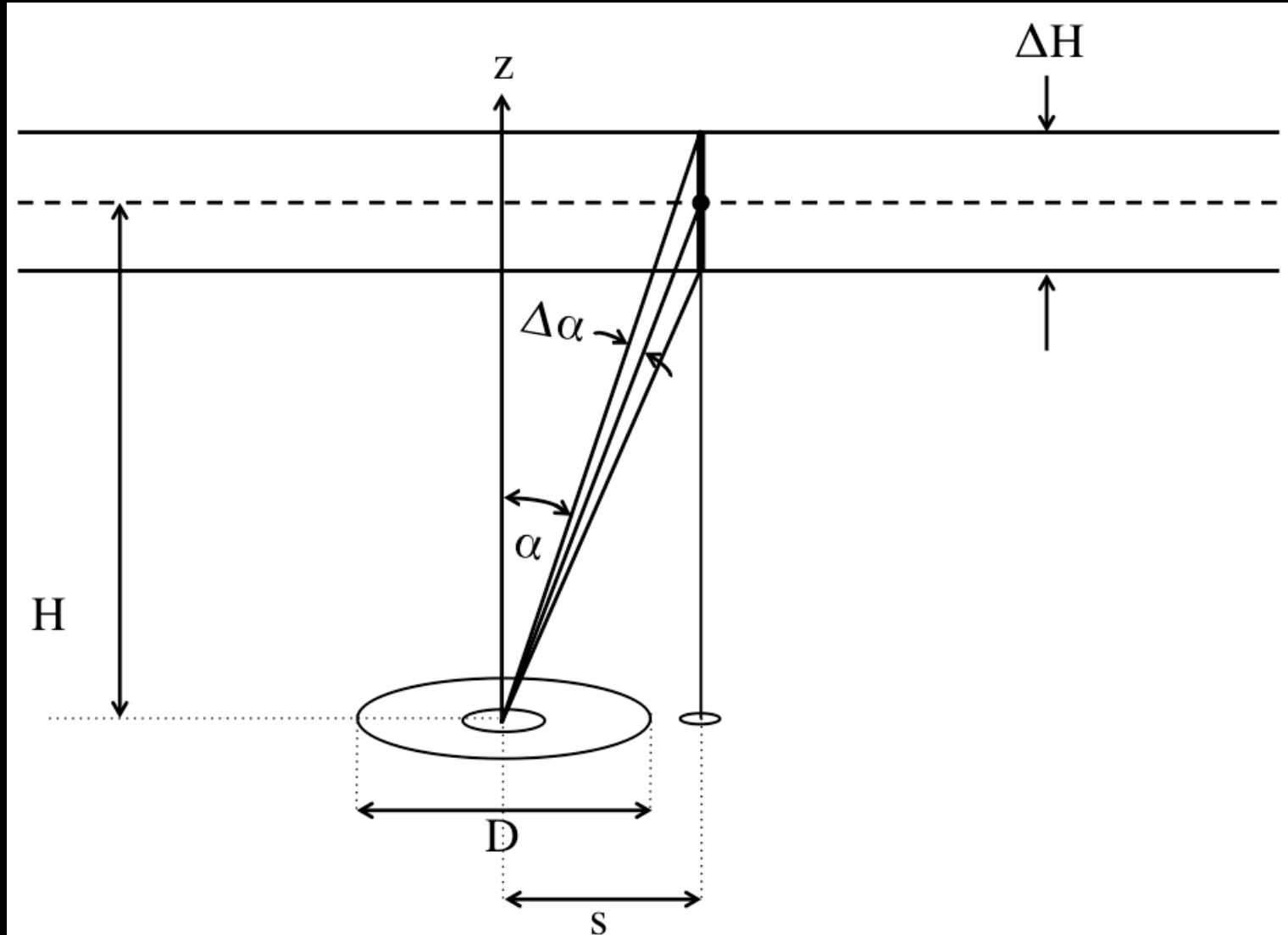
L1 + L2: telecentric lenses



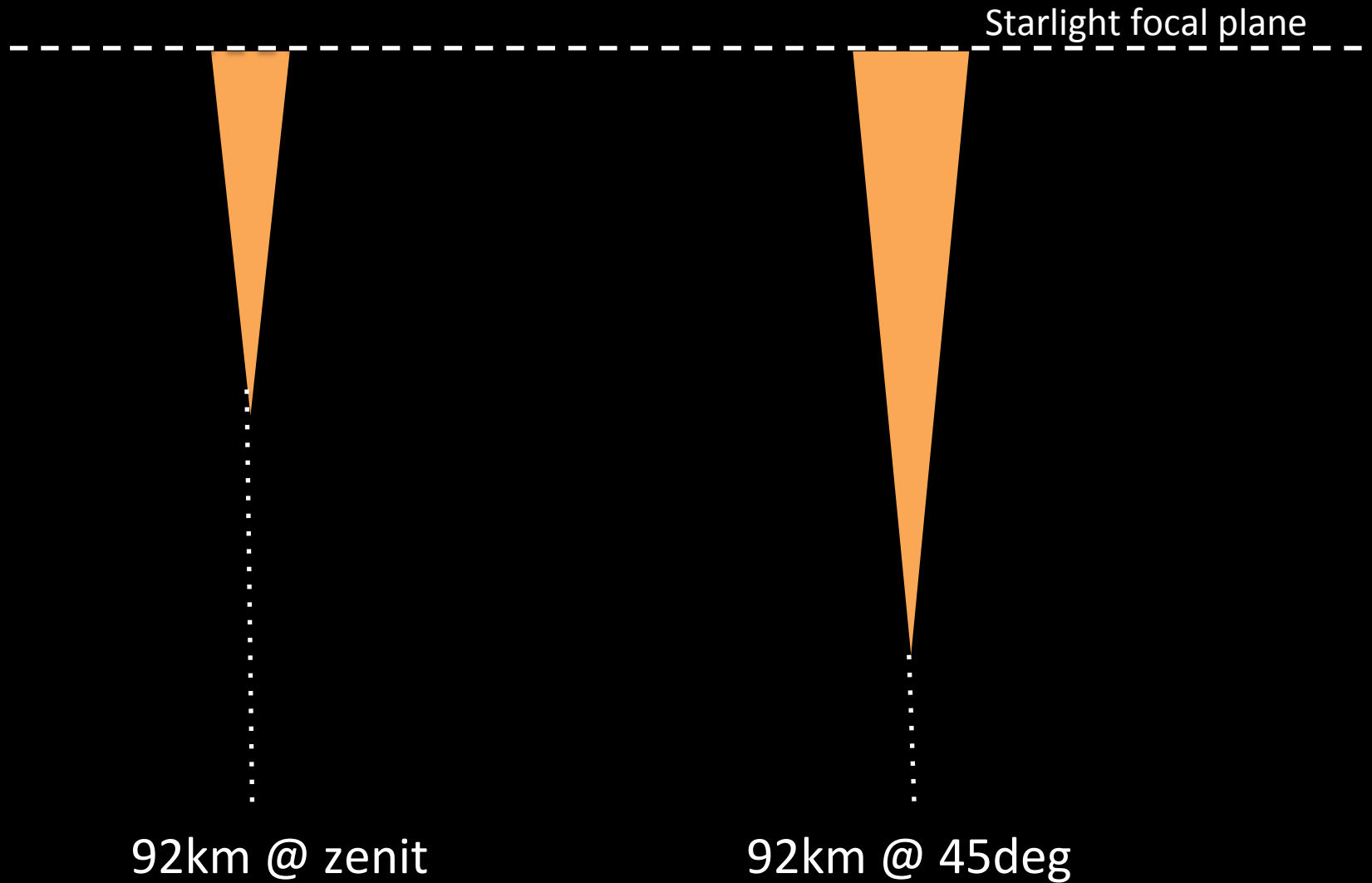
Elongation is not the whole story...



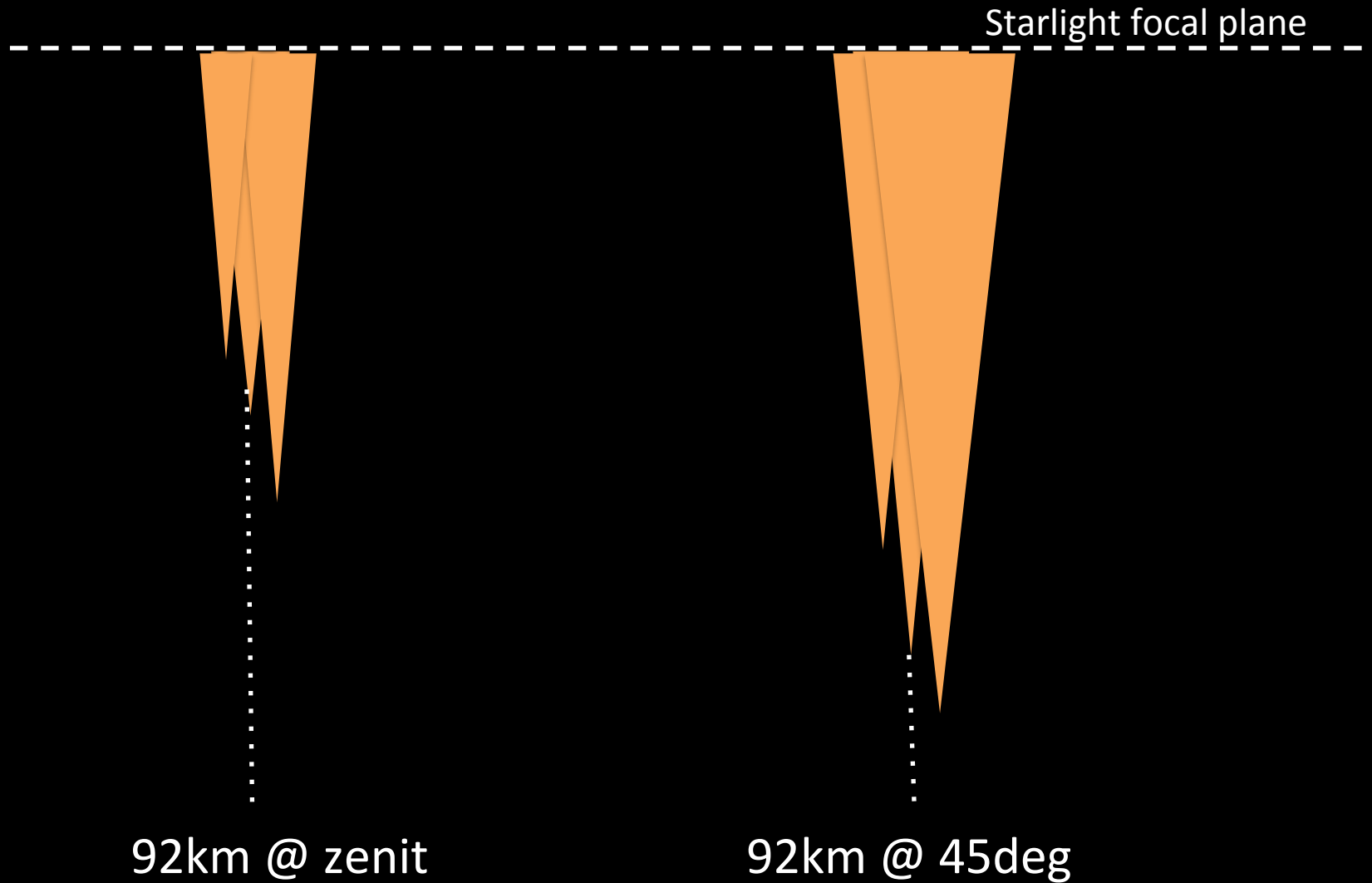
And, as soon as the LGS is fired from outside the pupil...



LGS WFSensing...



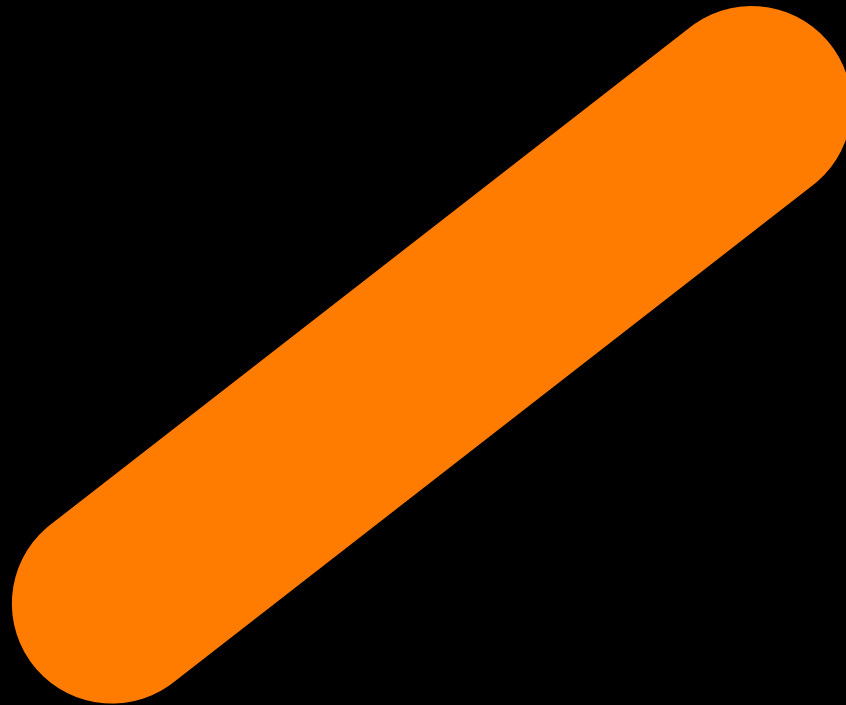
LGS WFSensing...



LGS WFSensing

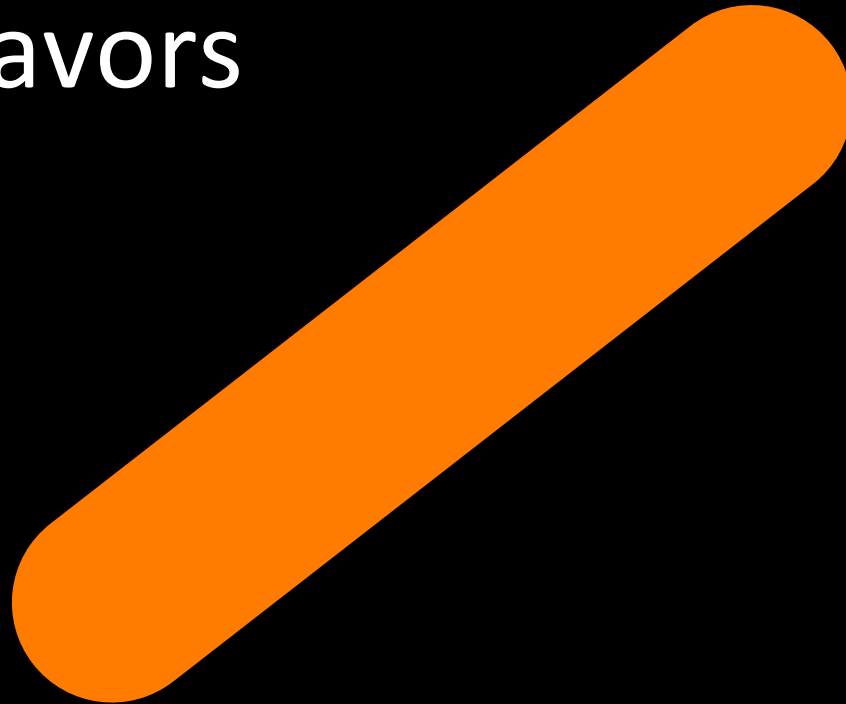
- Most (if not all) of proposed LGSs WFS are basically measuring local tilt into a subaperture
- If the LGS is an elongated stuff measurement along the elongation is inherently inefficient
- If the LGS has a structure one can use that but at the expense of a lot of pixels and with little gain
- The edges contribute to most of the signal
- If one edge is much sharper than the other that will contribute mostly

LGS WFSensing...



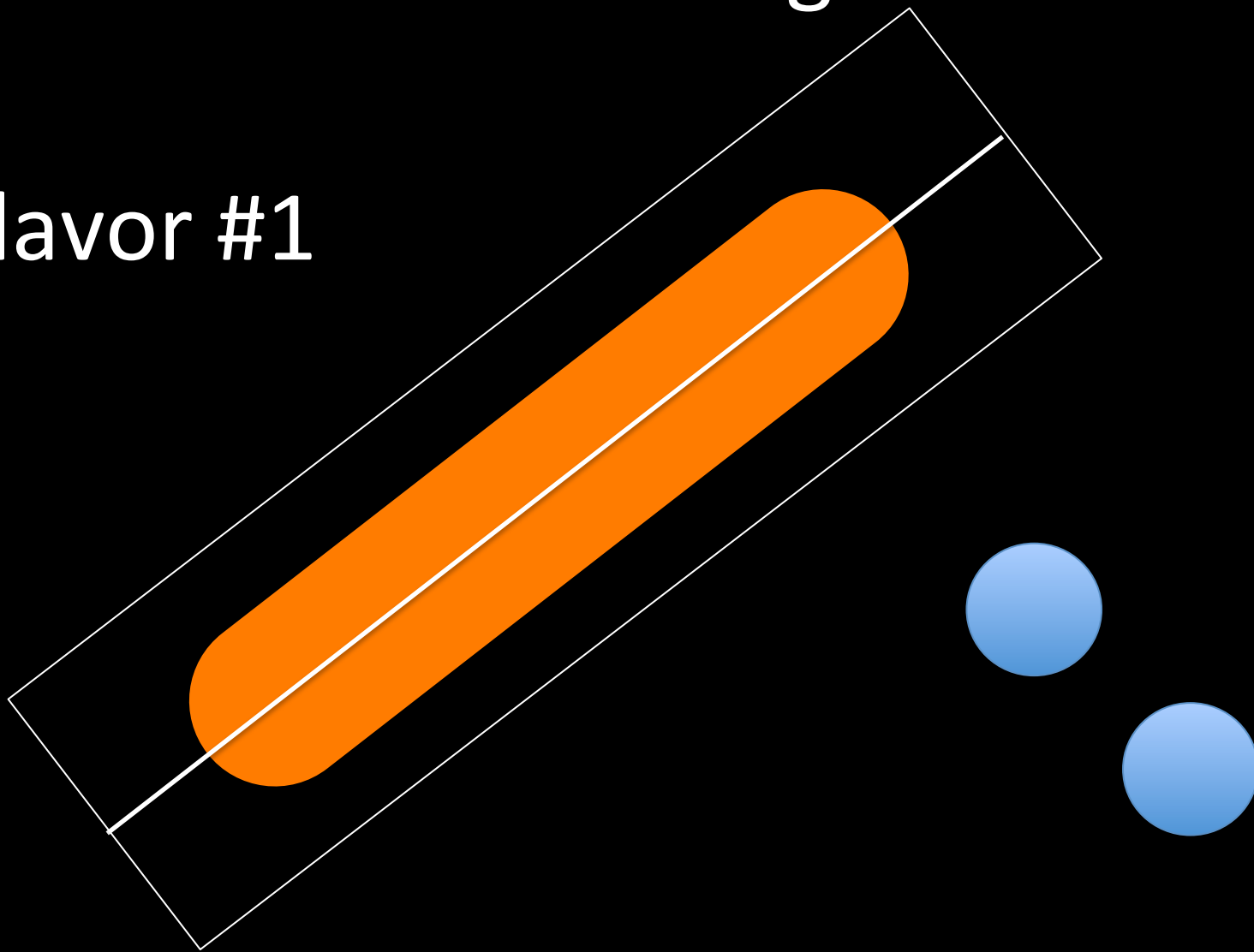
LGS WFSensing...

...in 5 flavors



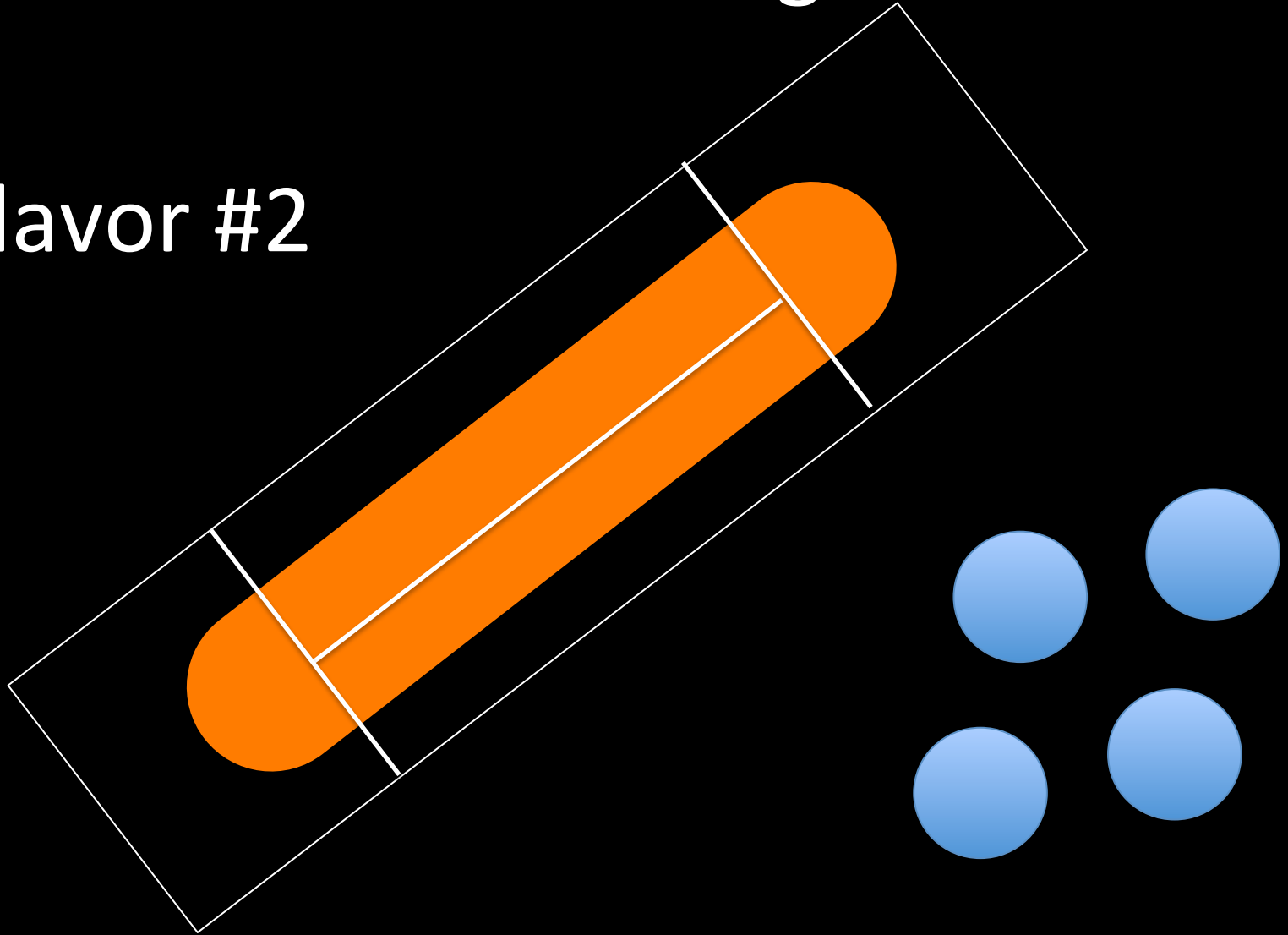
LGS WFSensing...

Flavor #1



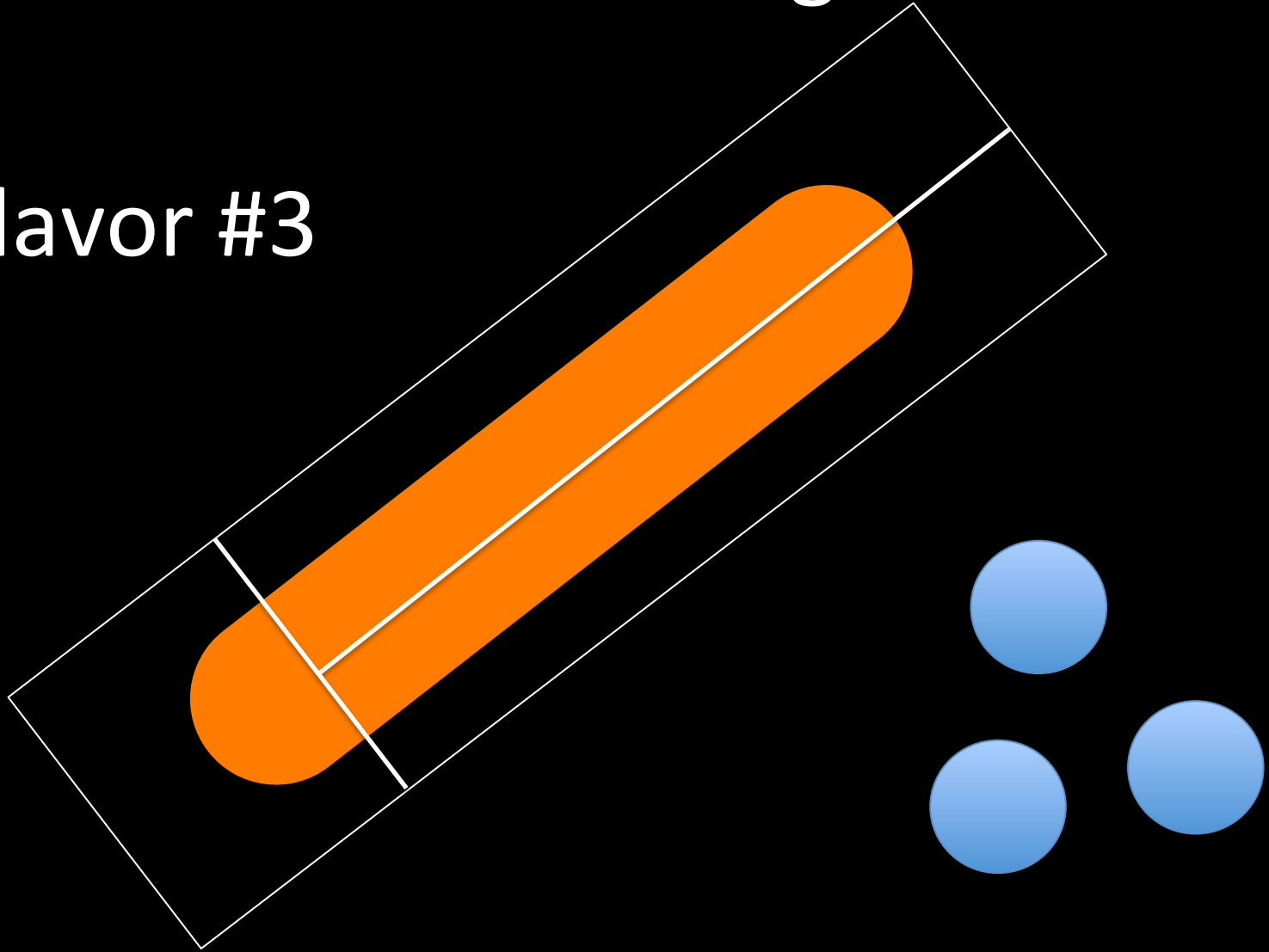
LGS WFSensing...

Flavor #2



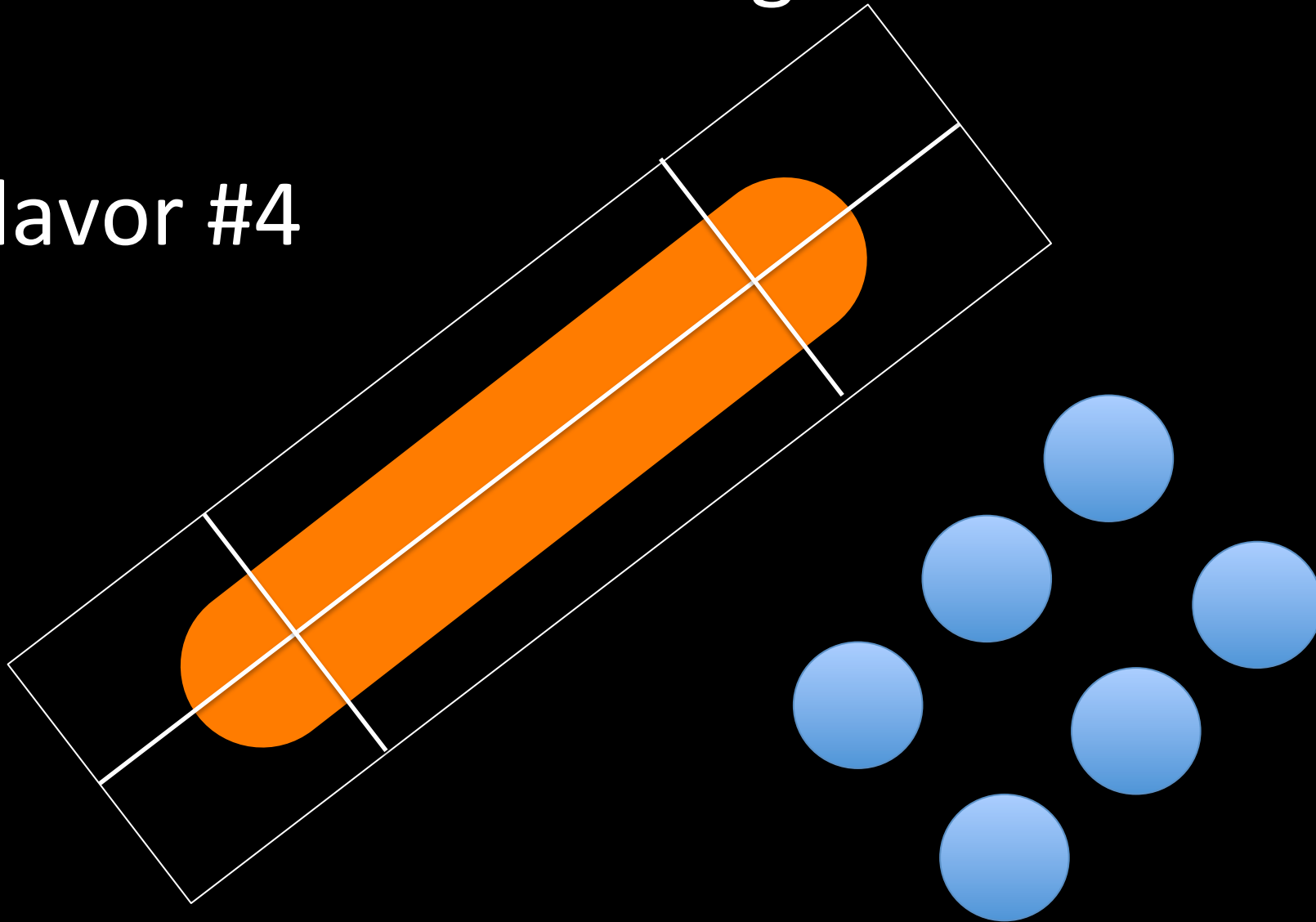
LGS WFSensing...

Flavor #3



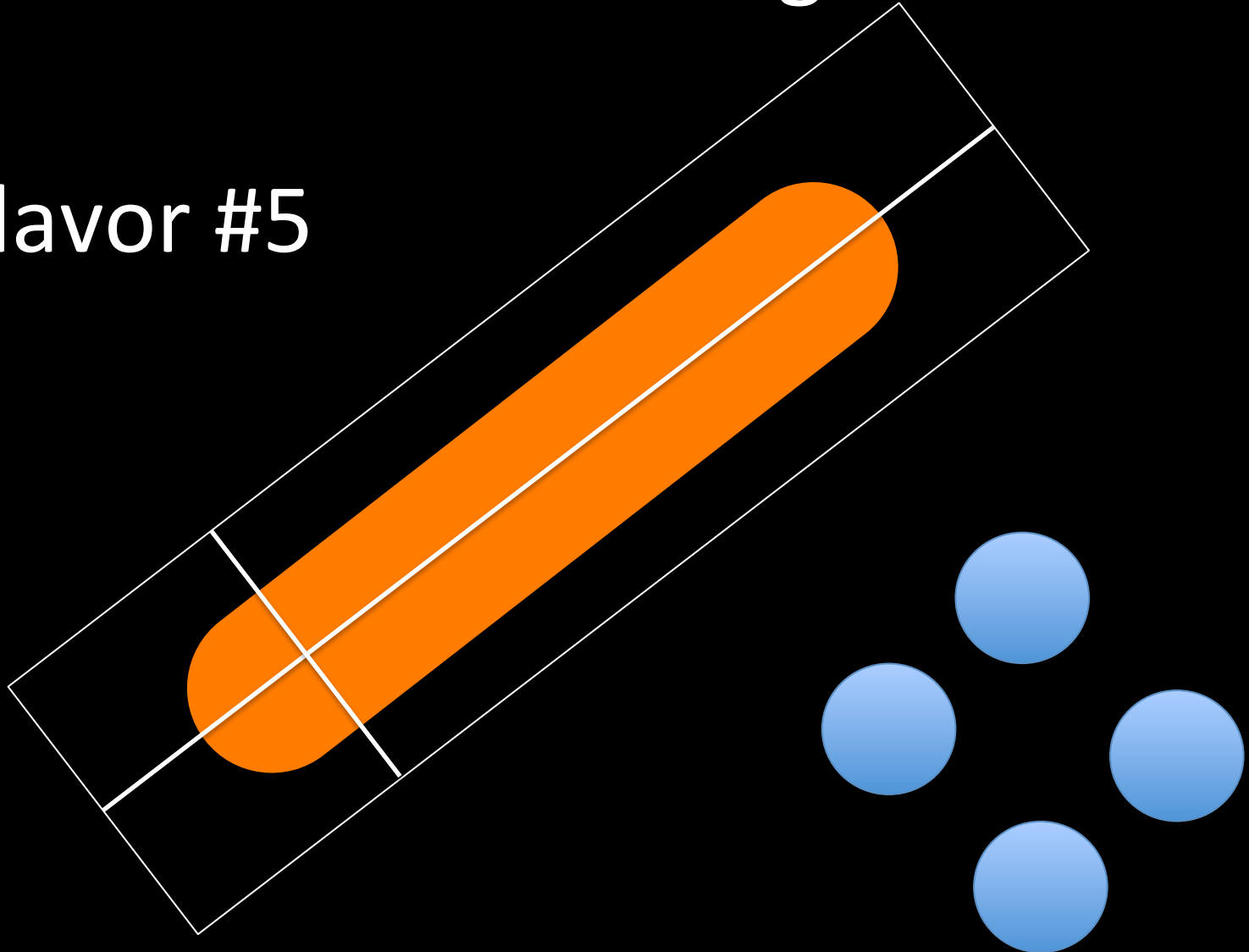
LGS WFSensing...

Flavor #4



LGS WFSensing...

Flavor #5



Ehi, remember,
names are
important..!!

"WHO GAVE YOU THE RIGHT TO NEGOTIATE MY NAME?"

Do not be deceived by the terms 'international, bilateral, constitutional'

- Change it once, even bilaterally, and it will be changed **everywhere**
- Do you want to be called 'Northern Macedonian', 'Vardarian', 'Skopjan'?

Reply: Macedonian!

We are the Macedonian government for saying "We will not change our name", but by negotiating with the world: "We will change our name."

No dual-name. Greece is the only country that objects to our name. It is not our problem. No bilateral or international "solution" exists.

Countries that have recognized Macedonia have **no problem**. **International solution is reached, we will abide by that decision and use the new name.**

Change to our name is unacceptable, even 'qualifiers' like 'Democratic', 'Southern', 'All Macedonians', 'Former Yugoslav Republic of' should be known everywhere as 'Northern' and 'Northern Macedonians', 'Macedonian', 'Macedonia'.

WE ARE WINNING. 127 COUNTRIES HAVE RECOGNIZED MACEDONIA, INCLUDING 4/5 UNITED NATIONS SECURITY COUNCIL MEMBERS. WE HAVE THE POWER TO END THIS. STOP NEGOTIATING OUR OWN NAME.

Prior to 1988, Greece's policy was that Macedonia did not exist. Then it renamed 'Northern Greece' to 'Macedonia'. Now suddenly Macedonia is Greek?

As former Greek Prime Minister Constantine Mitsotakis admitted in 1995, the reason Greece objects to our name is to deny the existence and persecution of its large Macedonian minority

- Macedonians in the Balkans are fighting for their human rights as Macedonians, nothing else

REMEMBER: IT IS A LIE THAT A COMPROMISE WILL SOLVE OUR PROBLEMS WITH GREECE. IT WILL JUST STRENGTHEN GREECE'S POSITION TOWARDS ITS FINAL GOAL: TO ERASE MACEDONIANS FROM HISTORY, THE PRESENT AND FUTURE.

WE ARE MACEDONIANS! Do you want to go down in history as the people who changed our name and identity?

What gives the EU and NATO the right to ask you to sell out your identity?

- The EU and NATO are violating their own principles and laws by asking us to change our name
- Do not give in to scare tactics from Greece and media reports that Macedonia will 'collapse' without EU & NATO membership
- Look at the current economic crisis in Greece
- **Scare-mongering is being used to get Macedonia to change its name**

Greece is holding the EU and NATO hostage

- Despite overwhelming support for Macedonia's NATO membership, Greece was permitted to use its veto power against Macedonia
- Greece lied about its economic situation, and now the rest of the EU is being forced to bail them out

The European Union cannot allow its member-states to be handcuffed by Greece's xenophobic policies. Recognize Macedonia.

- If the EU and NATO insist on a name change, what other concessions will they ask for?
- By continuing the negotiations, we are telling the world "we will change our name"
- **Stop negotiating our own name**

Common sense. Would any other country negotiate its own name?

- Should the US state of Georgia demand that the Republic of Georgia change its name?
- Should the Belgian province of Luxembourg demand that Luxembourg change its name?

THE MOST BASIC HUMAN RIGHT IS SELF-IDENTIFICATION.

THE MACEDONIAN PEOPLE MUST TELL THEIR GOVERNMENT TO STOP NEGOTIATING OUR NAME.

DEMAND AN END TO 'FYROM' REFERENCE.

DEMAND IMMEDIATE INTERNATIONAL RECOGNITION.

MHRMI
MACEDONIAN HUMAN RIGHTS MOVEMENT INTERNATIONAL
www.mhrmi.org

AMHRC
AUSTRALIAN MACEDONIAN HUMAN RIGHTS COMMITTEE INC.
www.macedonian.org.au

and other Macedonian organizations - www.mhrmi.org/our_name_is_macedonia

OUR NAME IS MACEDONIA

LGS WFSensing...

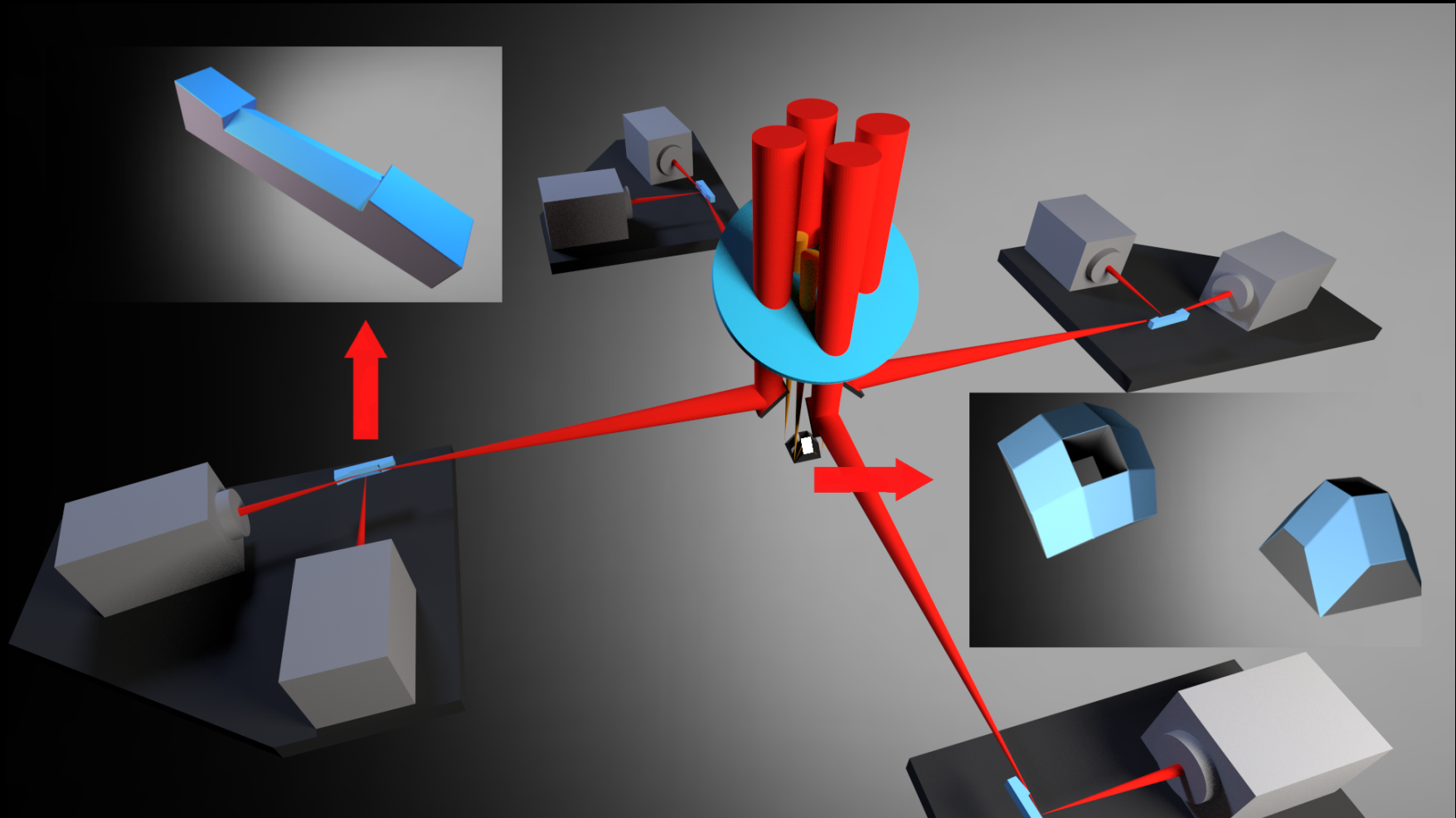


LGS WFSensing...

INGOT WFS...???



A bit more than conceptual...

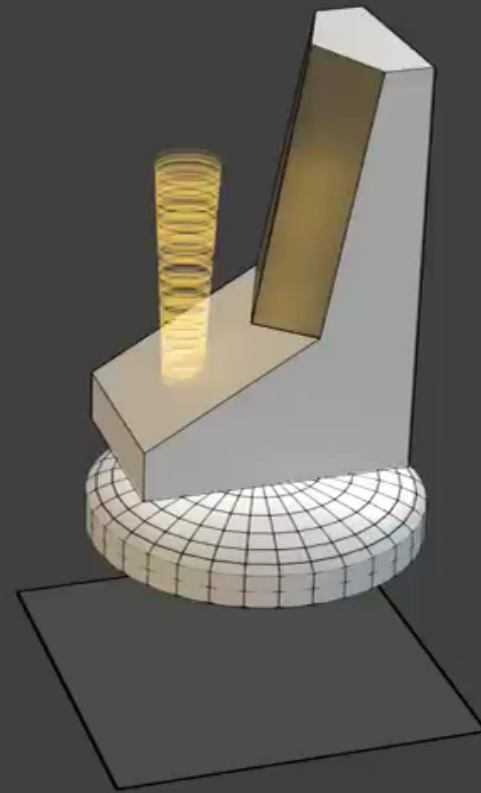




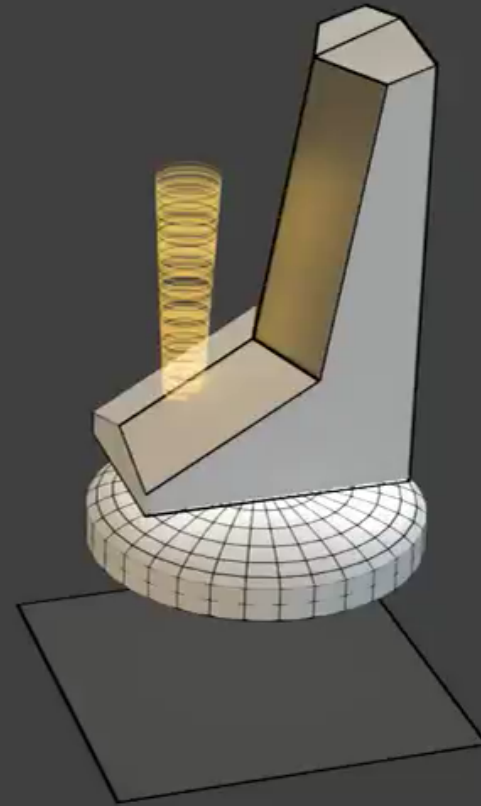


In the following LGS light
is propagated for display
purposes but a pulsed
laser is ***not*** required...!

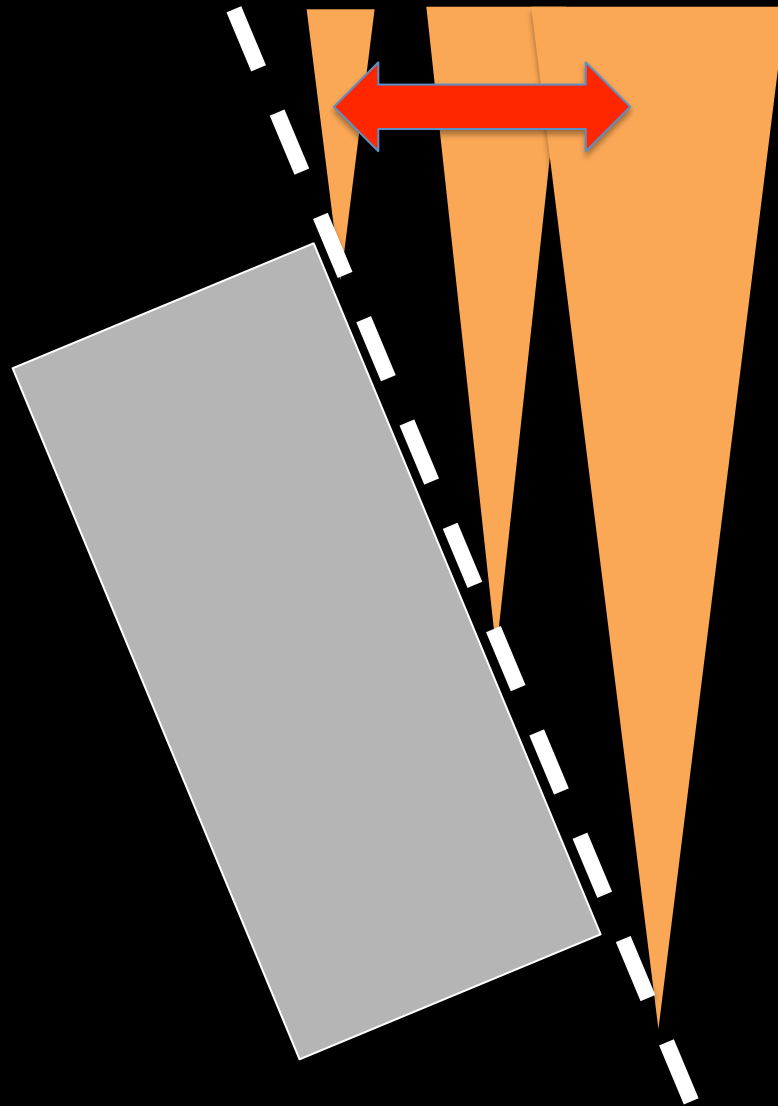
Na



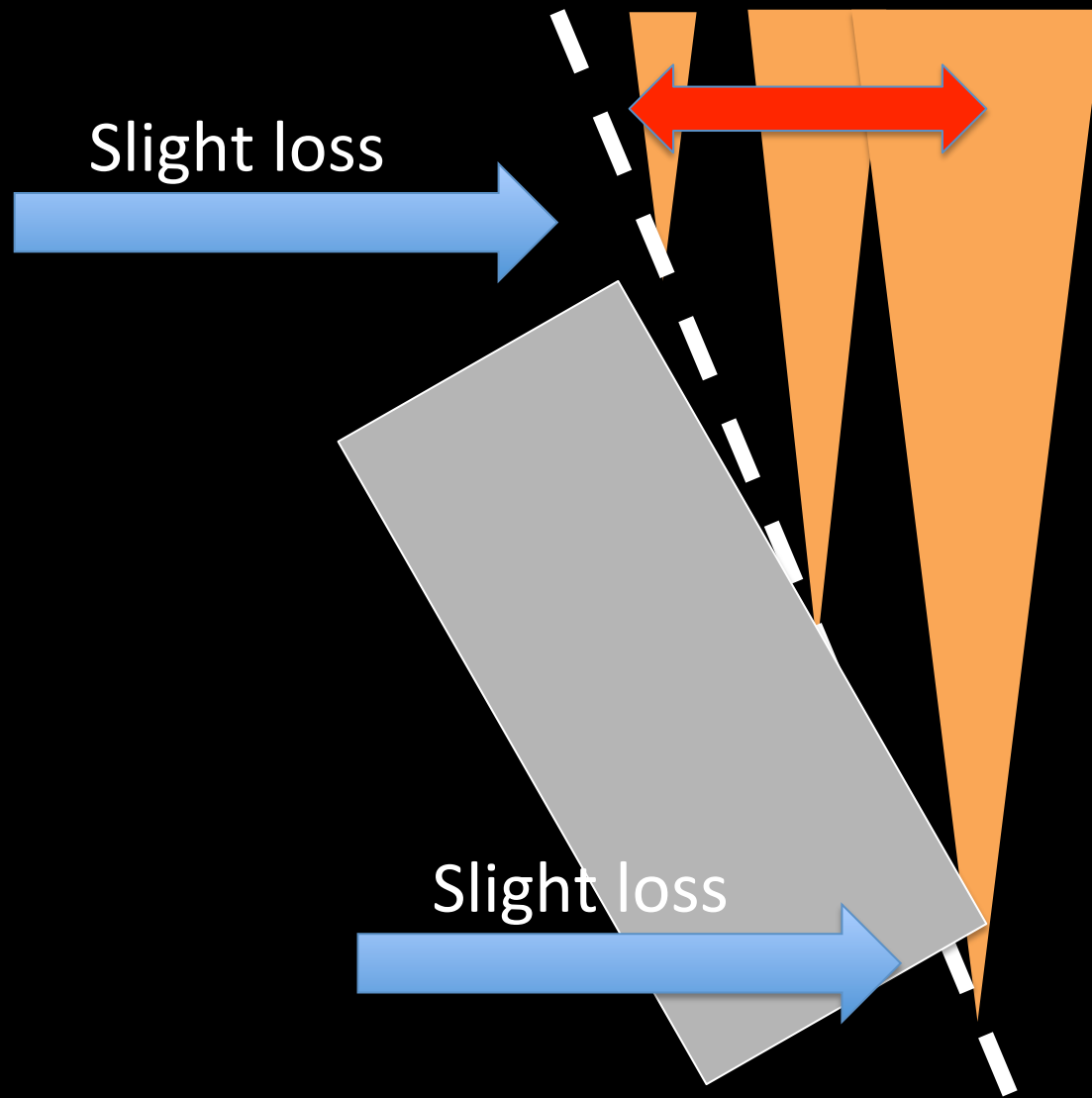
Na



How to adapt to different apparent
Sodium column lengths...??



How to adapt to different apparent Sodium column lengths...??



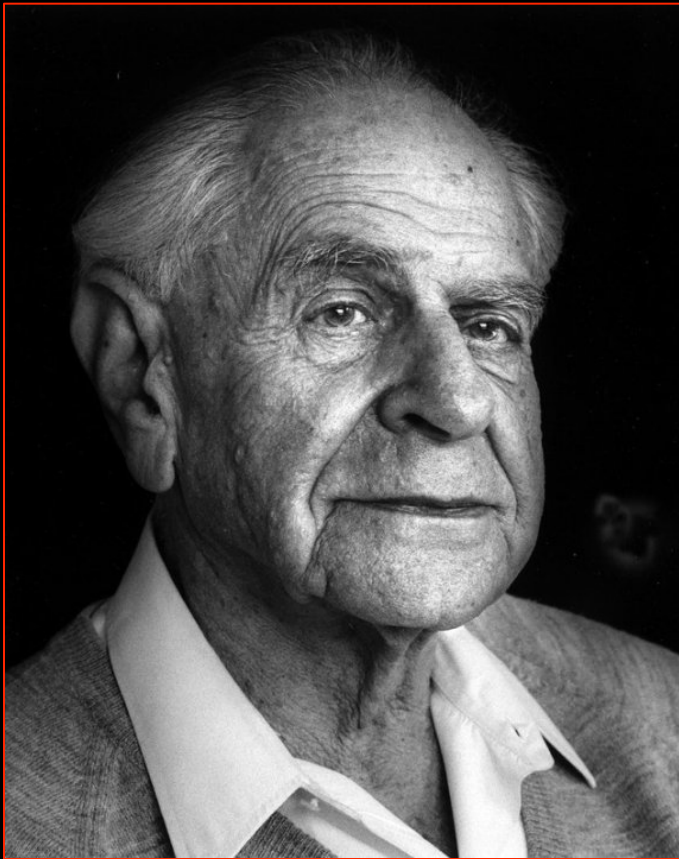
Summarizing... (1 of 2)

- Ingot-like WFS does not require pulsed LSG and do not require moving parts
- Are extremely efficient in terms of pixel occupations (pyramid-style)
- Sense LGSs with proper elongation and defocus effects taken inherently into account
- Using the profile structure of the LGS is given up
- The less complex flavors progressively give up part of the edges signal and one edge, eventually, presumably a small contribution to the overall signal.

Summarizing... (2 of 2)

- They are doable in a compact manner with a combination of refractive and reflective surfaces
- Chromatism in refraction is not an issue at all as monochromatic
- The one edge flavor can match any apparent column elongation with no loss
- The two edges flavor can match apparent column elongation with little loss by tilt of the device (or with no loss by changing the EFL, but it would become rather complex)

Epistemology of Adaptive Optics

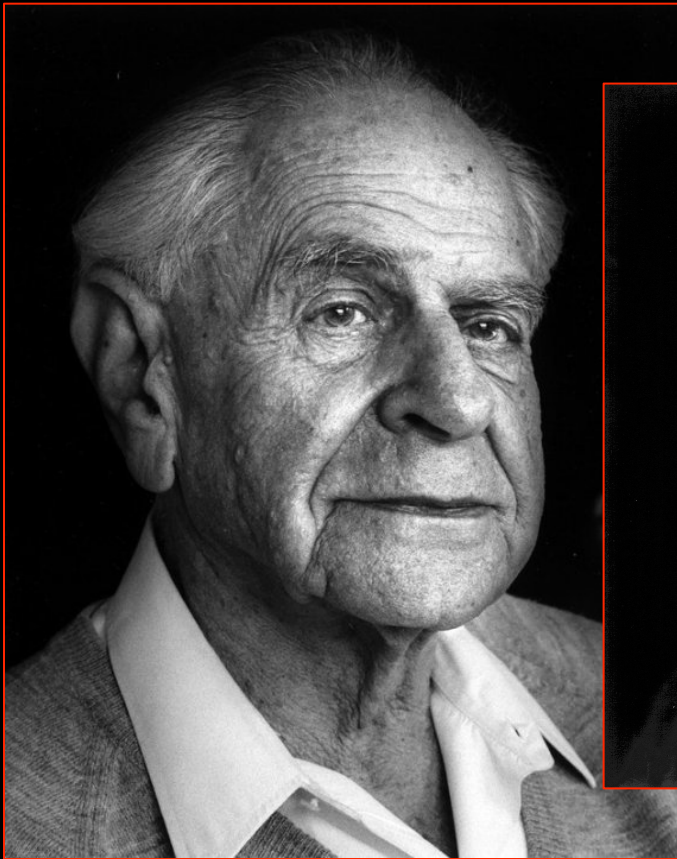


Karl Raimund Popper

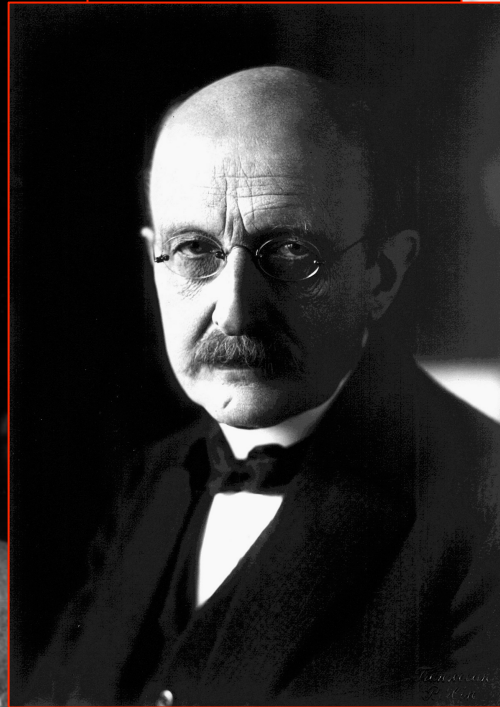


Thomas Samuel Kuhn

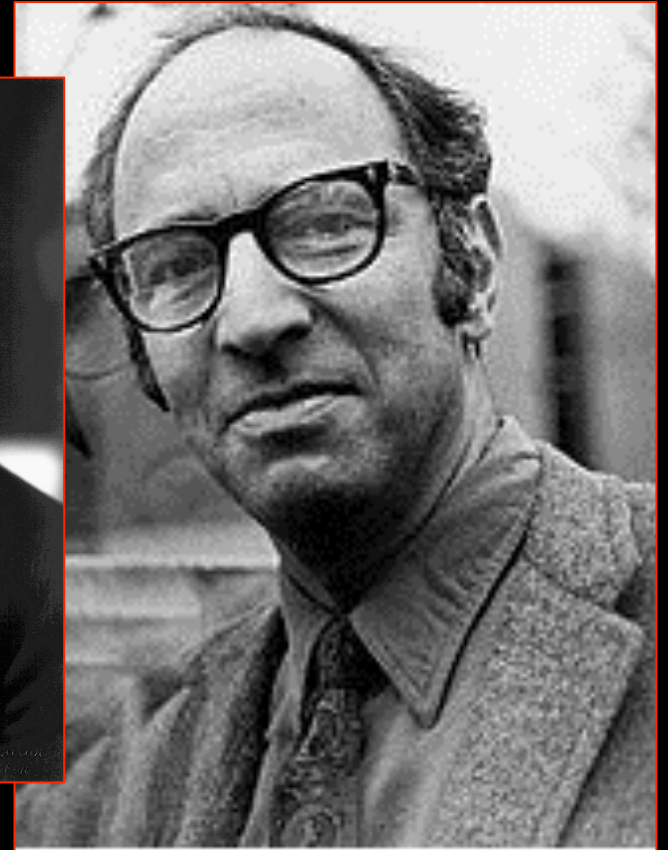
Epistemology of Adaptive Optics



Karl Raimund Popper



Max Planck



Thomas Samuel Kuhn

Epistemology of Adaptive Optics

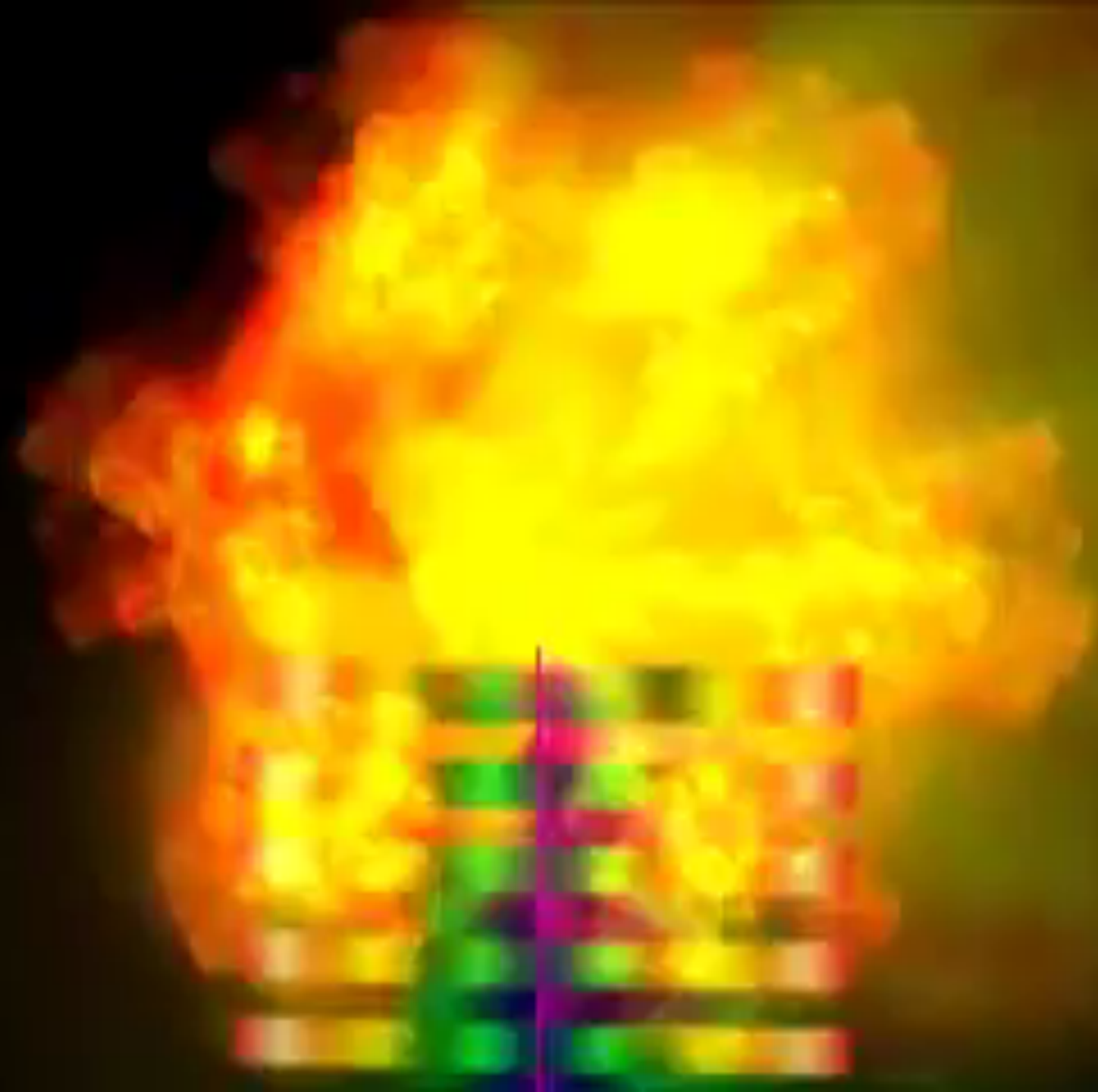
Science advances for new paradigms
but common people would call this

“fashion”



Thomas Samuel Kuhn

So, I Googled for fashion show...





The stylist



At the coffee break...

- Everyone can become a WFS-fashionist...
- *THANKS A LOT....!!!*

