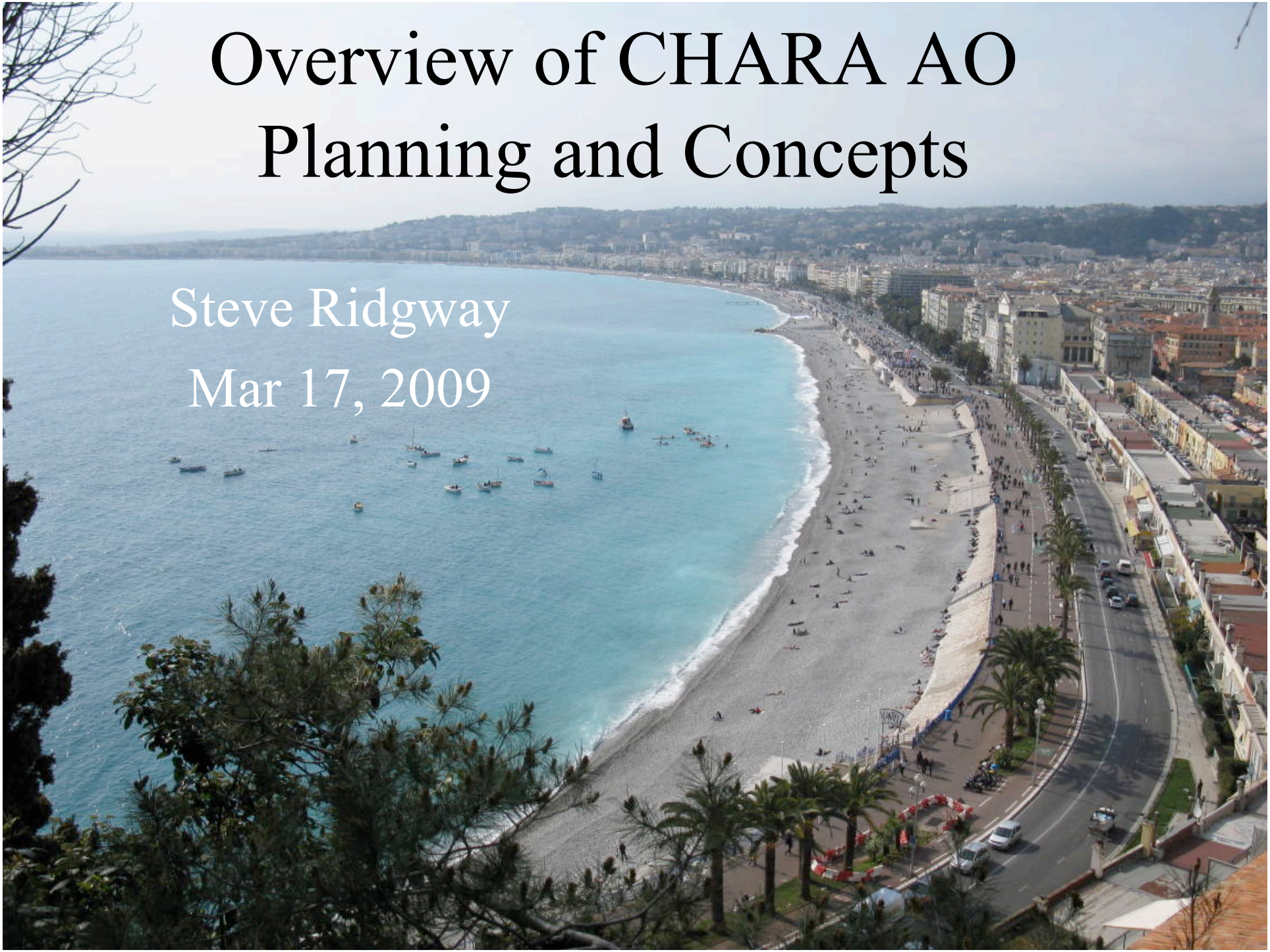
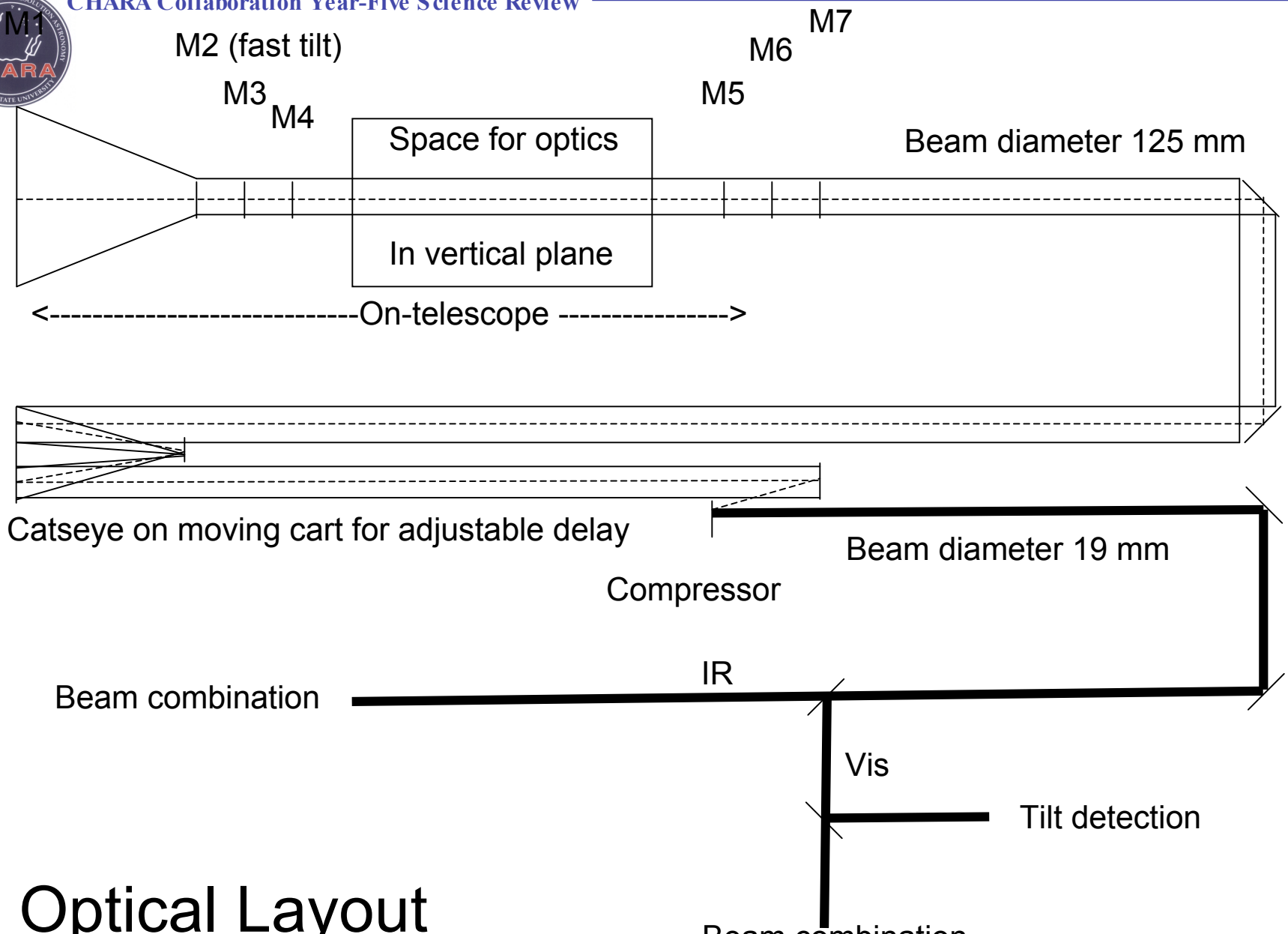
Overview of CHARA AO Planning and Concepts



Steve Ridgway

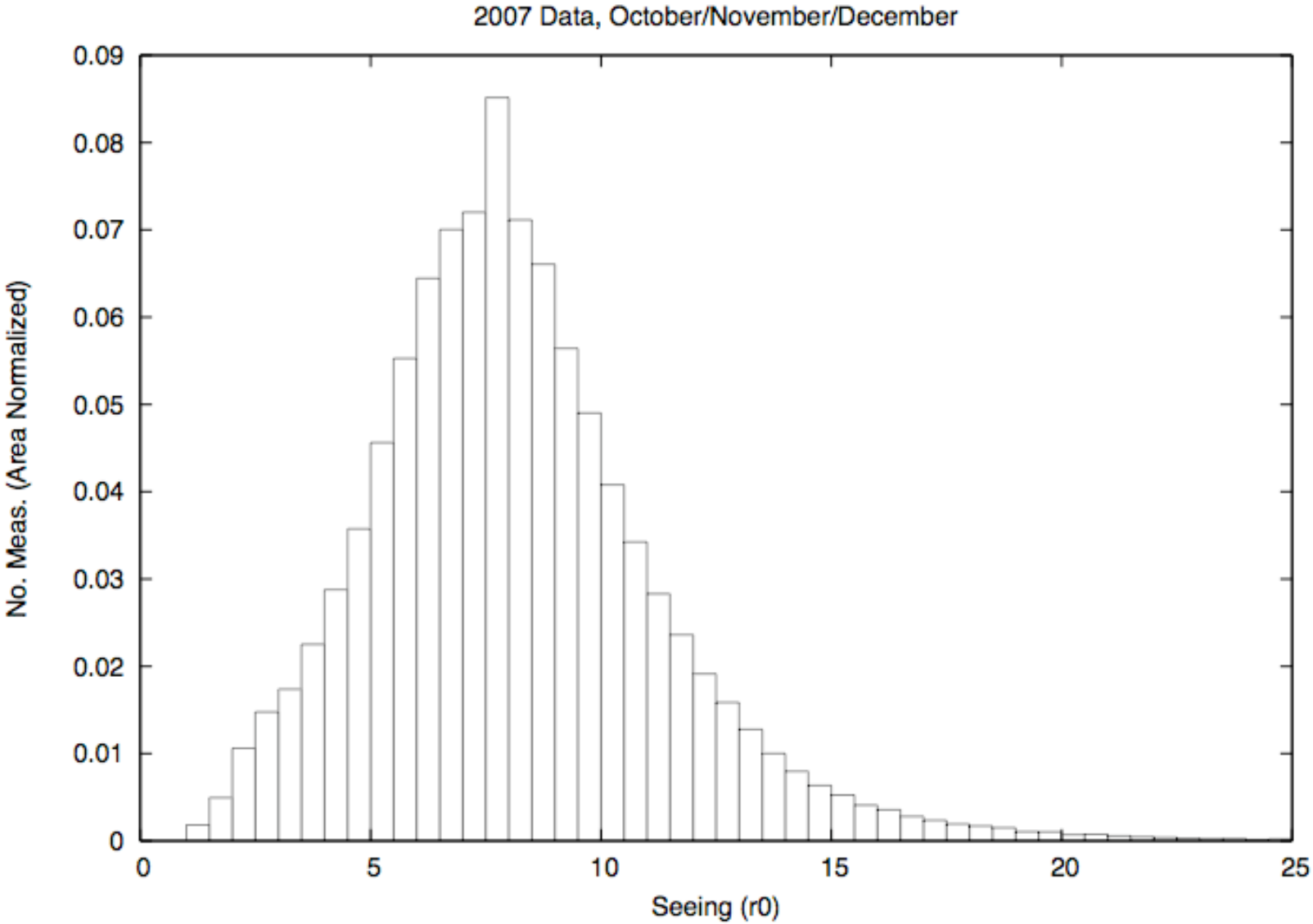
Mar 17, 2009

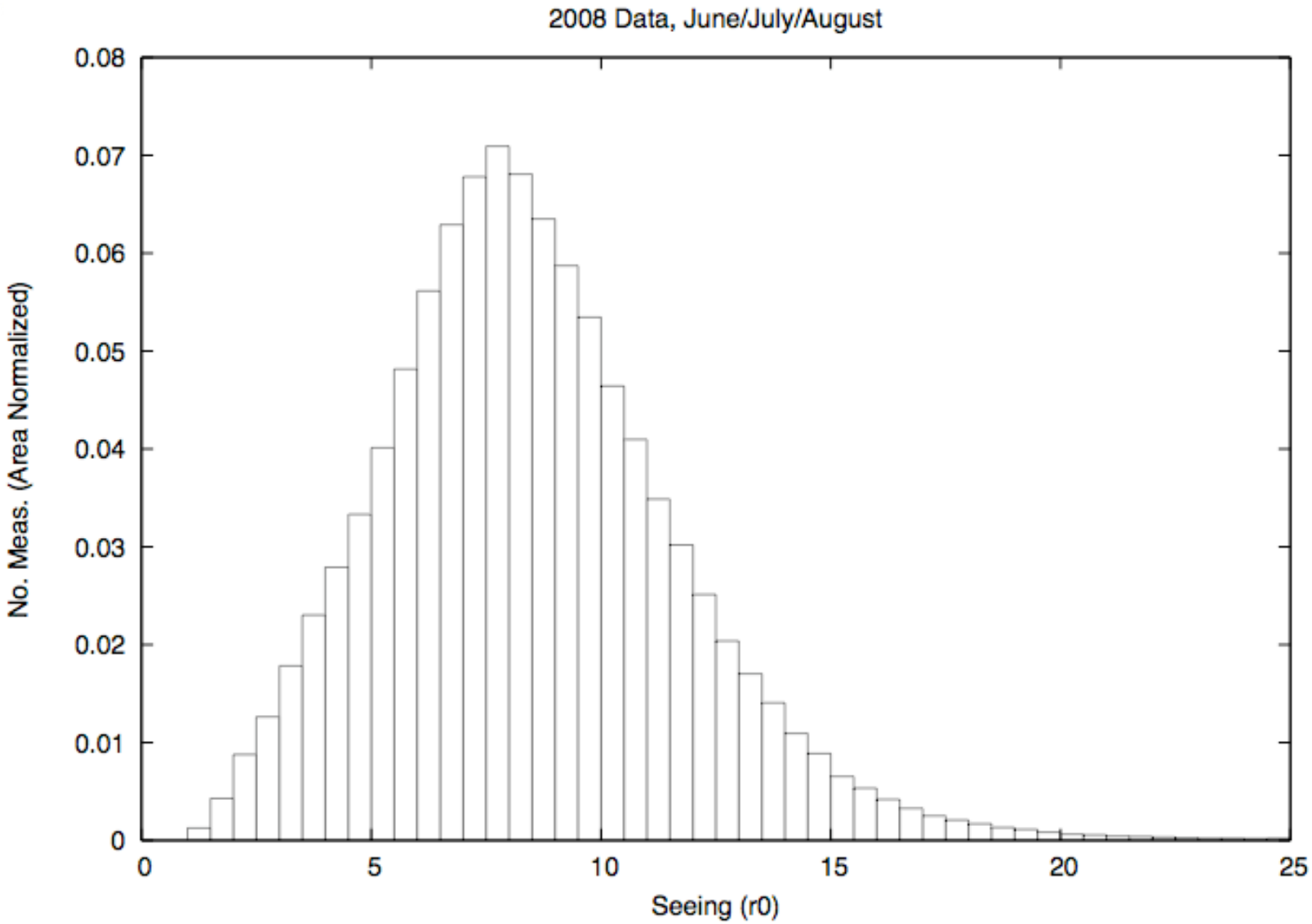


Optical Layout

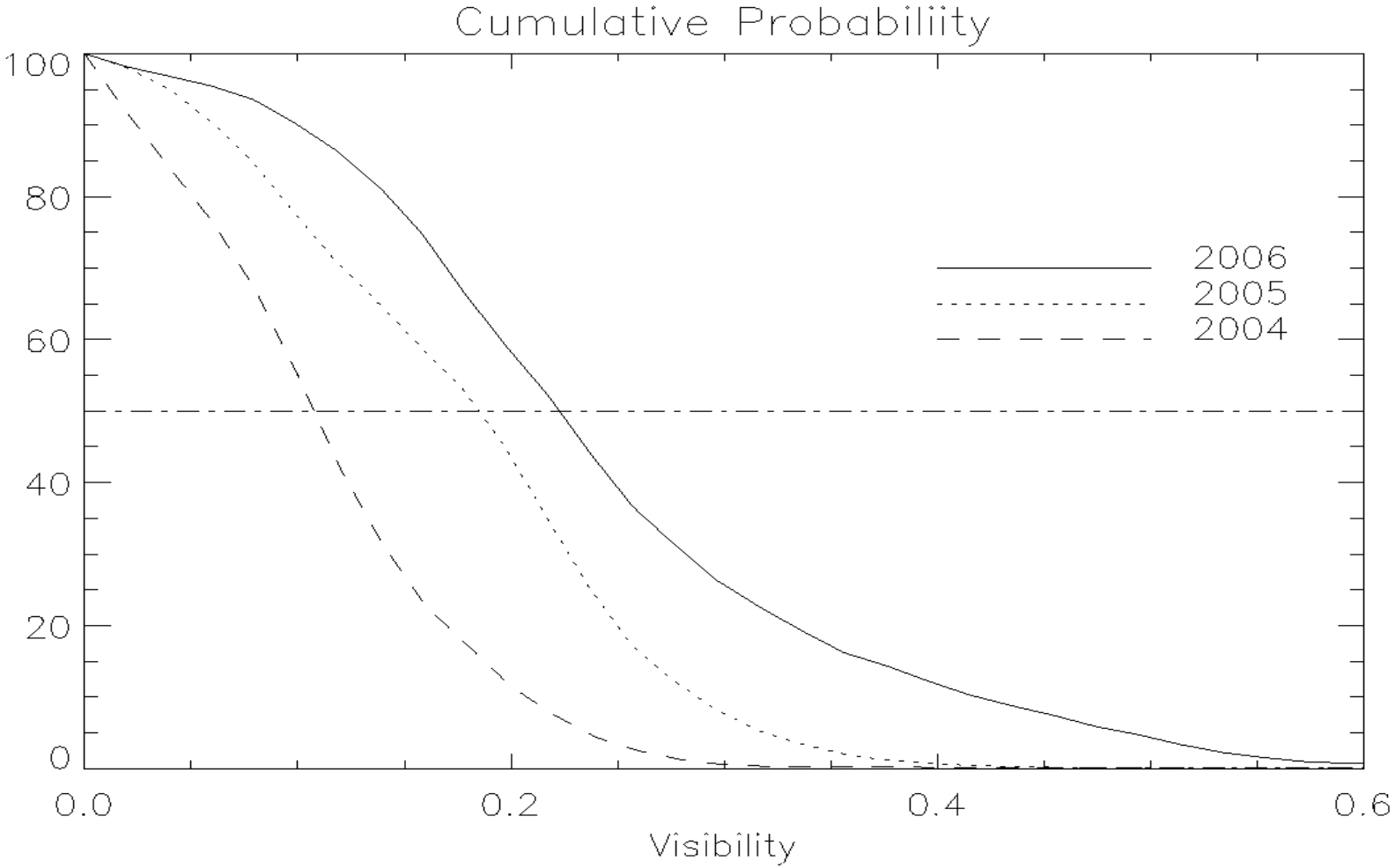
Current AO Expert Contacts

- University of Galway
  - Chris Dainty, Derek Cobourn, Alexander Goncharov, Nicholas Devaney
- ALPAO
  - Frédéric Rooms

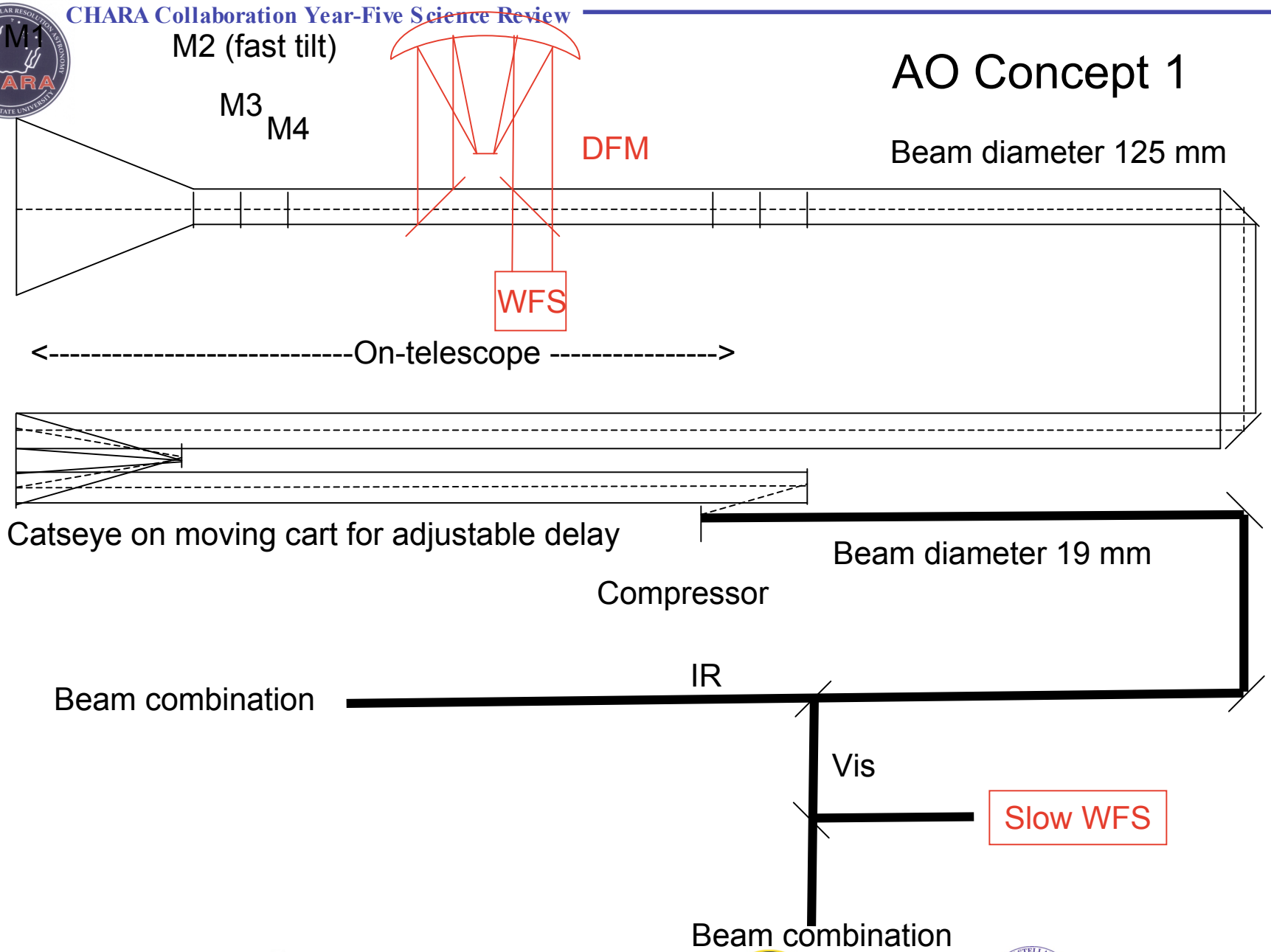

2007 Data, October/November/December
No. Meas. (Area Nomalized)
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
5
10
15
20
25
Seeing (r0)


2008 Data, June/July/August
No. Meas. (Area Normalized)
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
5
10
15
20
25
Seeing (r0)

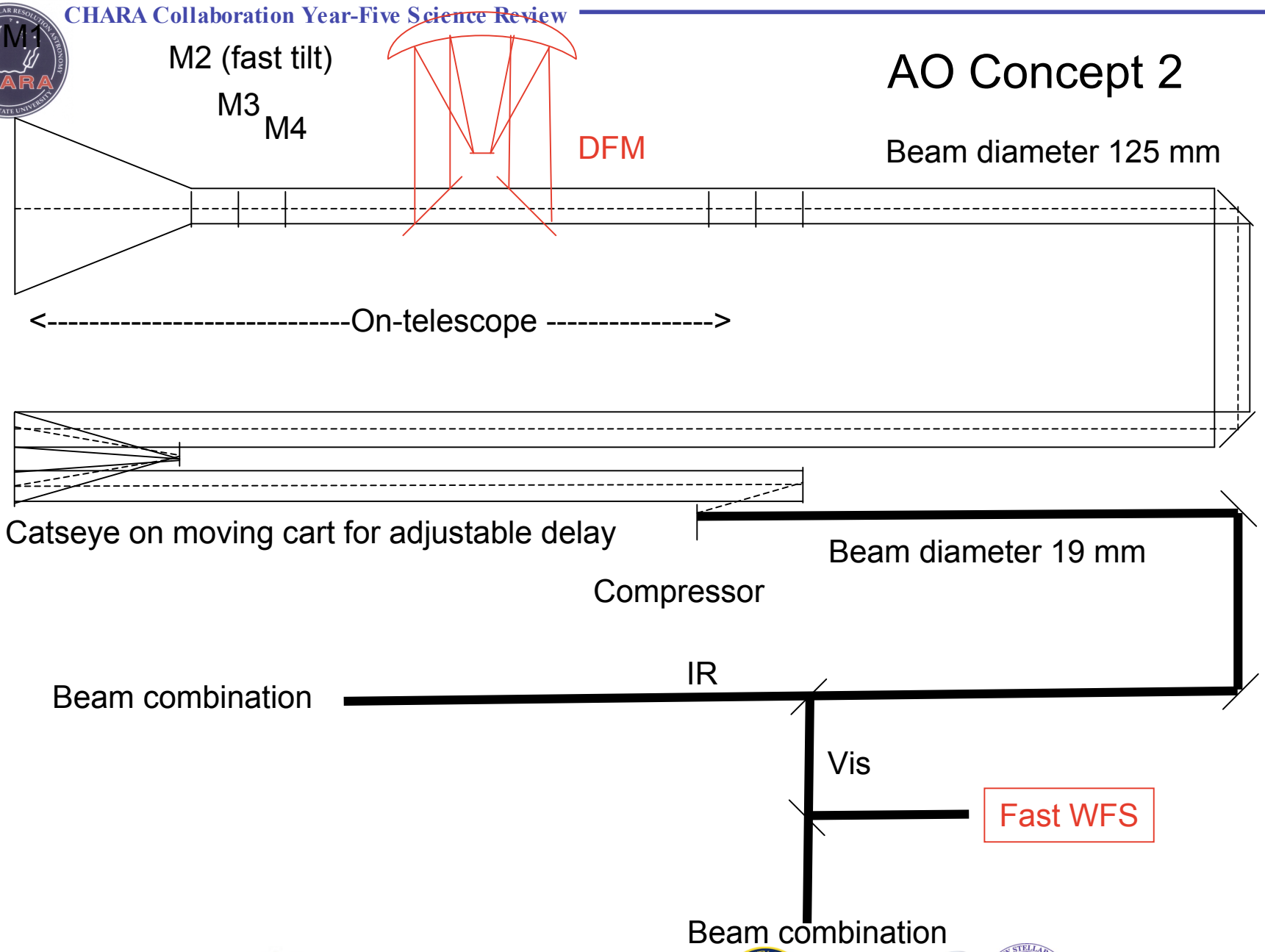
Raw Visibility



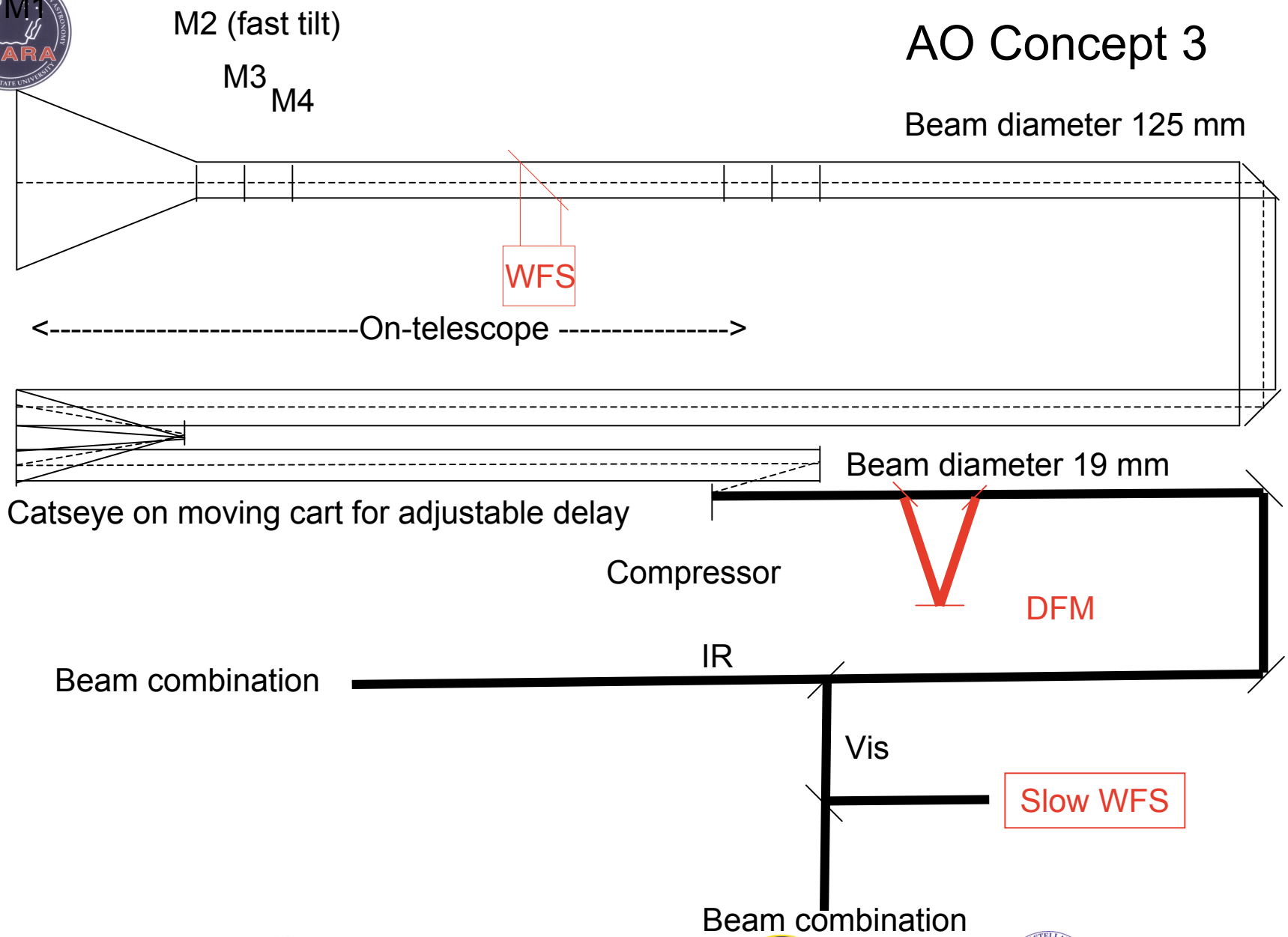
AO Concept 1


M1
M2 (fast tilt)
M3
M4
DFM
Beam diameter 125 mm
WFS
<----------On-telescope ---------->
Catseye on moving cart for adjustable delay
Beam diameter 19 mm
Compressor
IR
Beam combination
Vis
Slow WFS
Beam combination

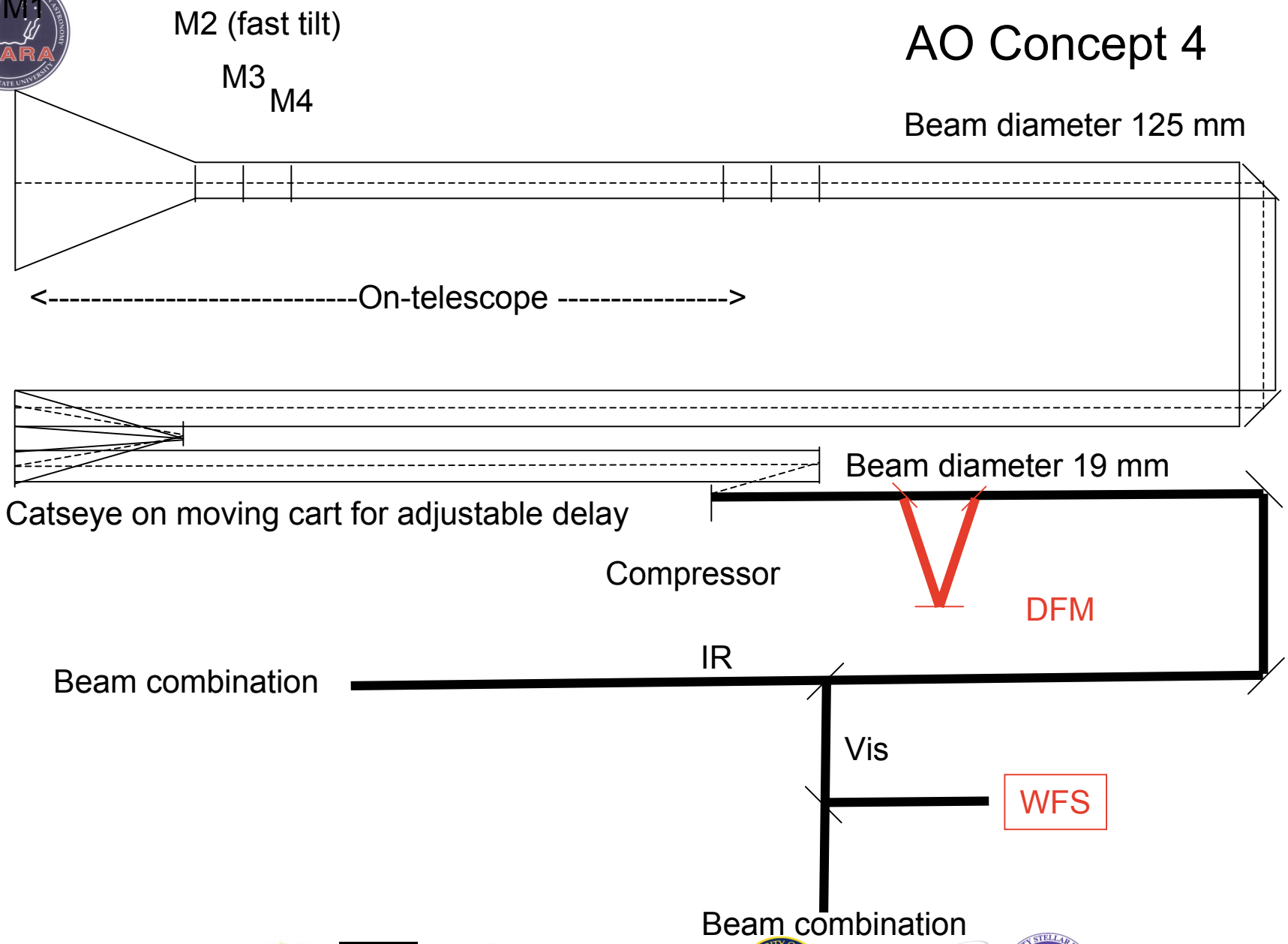
AO Concept 2


M1
M2 (fast tilt)
M3
M4
DFM
Beam diameter 125 mm
<----------On-telescope ---------->
Catseye on moving cart for adjustable delay
Beam diameter 19 mm
Compressor
IR
Beam combination
Vis
Fast WFS
Beam combination

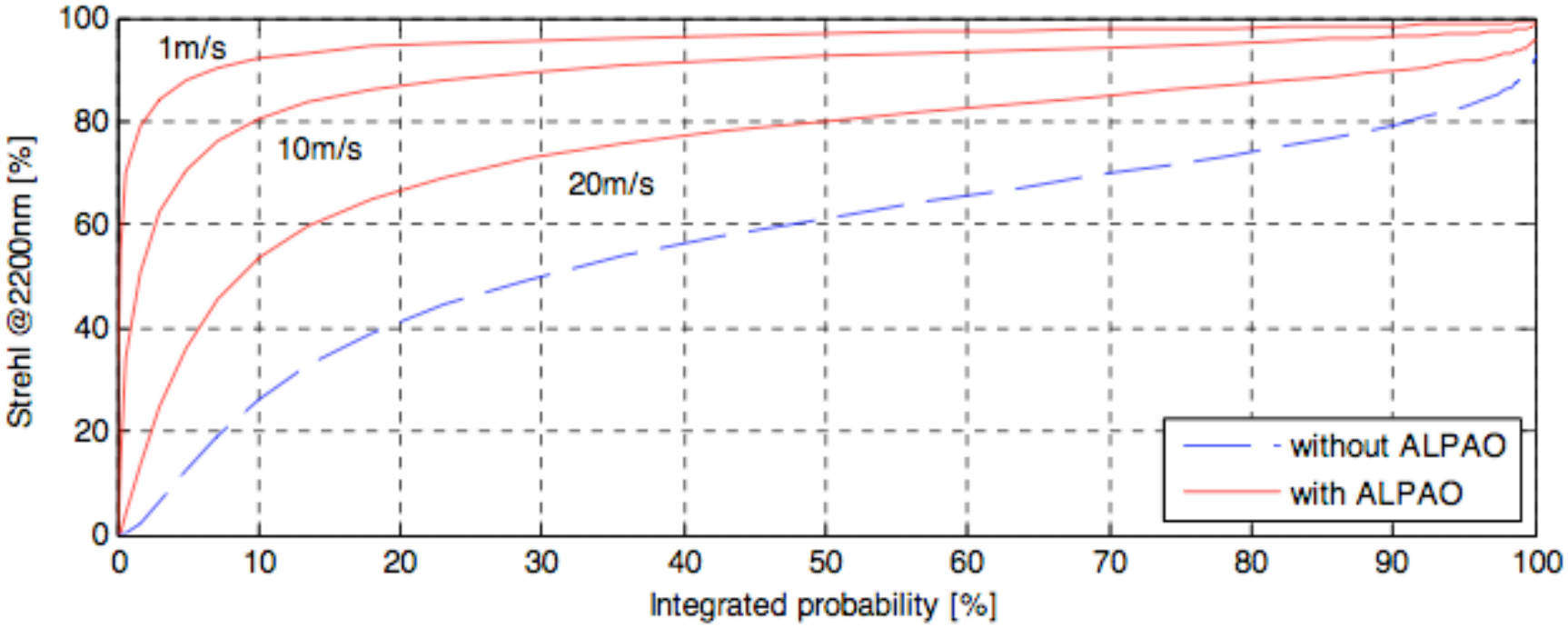
AO Concept 3


M1
M2 (fast tilt)
M3
M4
Beam diameter 125 mm
WFS
<----------On-telescope ---------->
Beam diameter 19 mm
Catseye on moving cart for adjustable delay
Compressor
DFM
IR
Beam combination
Vis
Slow WFS
Beam combination

AO Concept 4


M1
M2 (fast tilt)
M3
M4
Beam diameter 125 mm
<----------On-telescope ---------->
Beam diameter 19 mm
Catseye on moving cart for adjustable delay
Compressor
DFM
IR
Beam combination
Vis
WFS
Beam combination

ALPAO Performance - K band

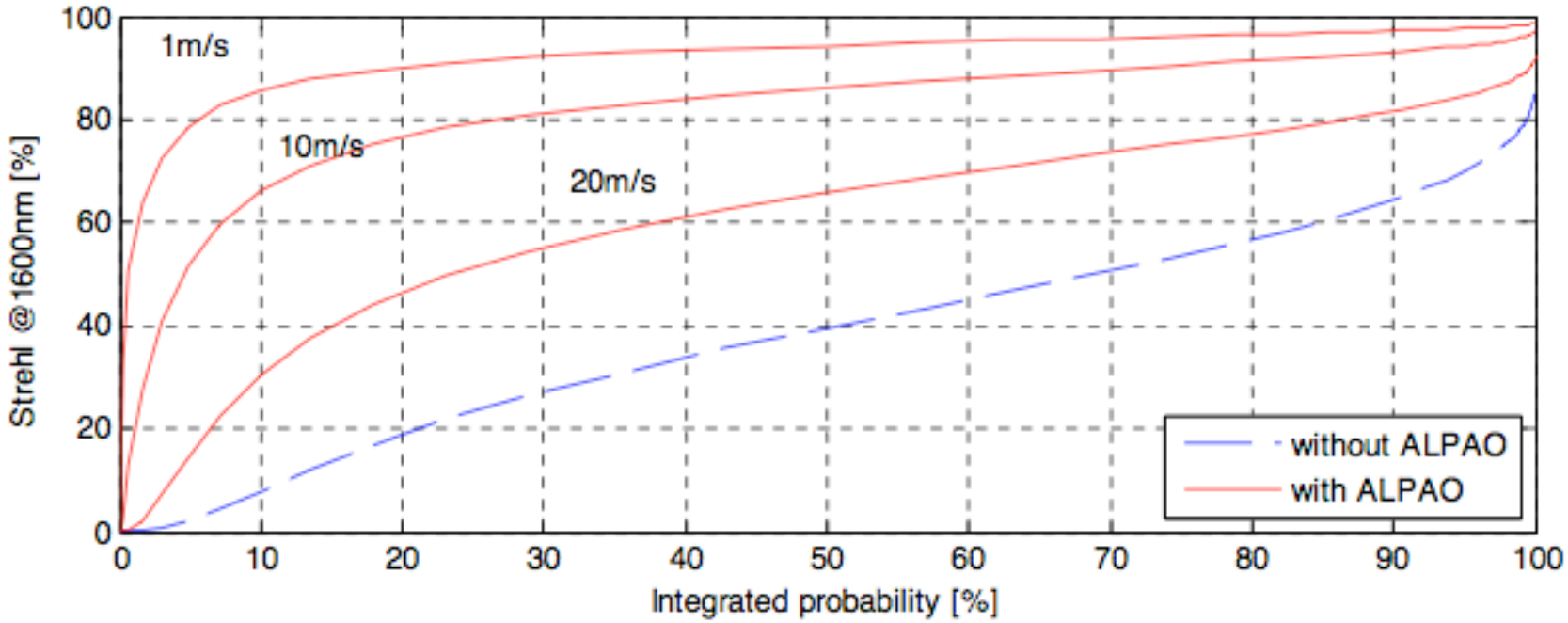


Star V=7.1

T_{wfs} = 0.8% (Expected >2.5%, or 80%)

(=> >1 mag, or 5 mag)

ALPAO Performance - H band

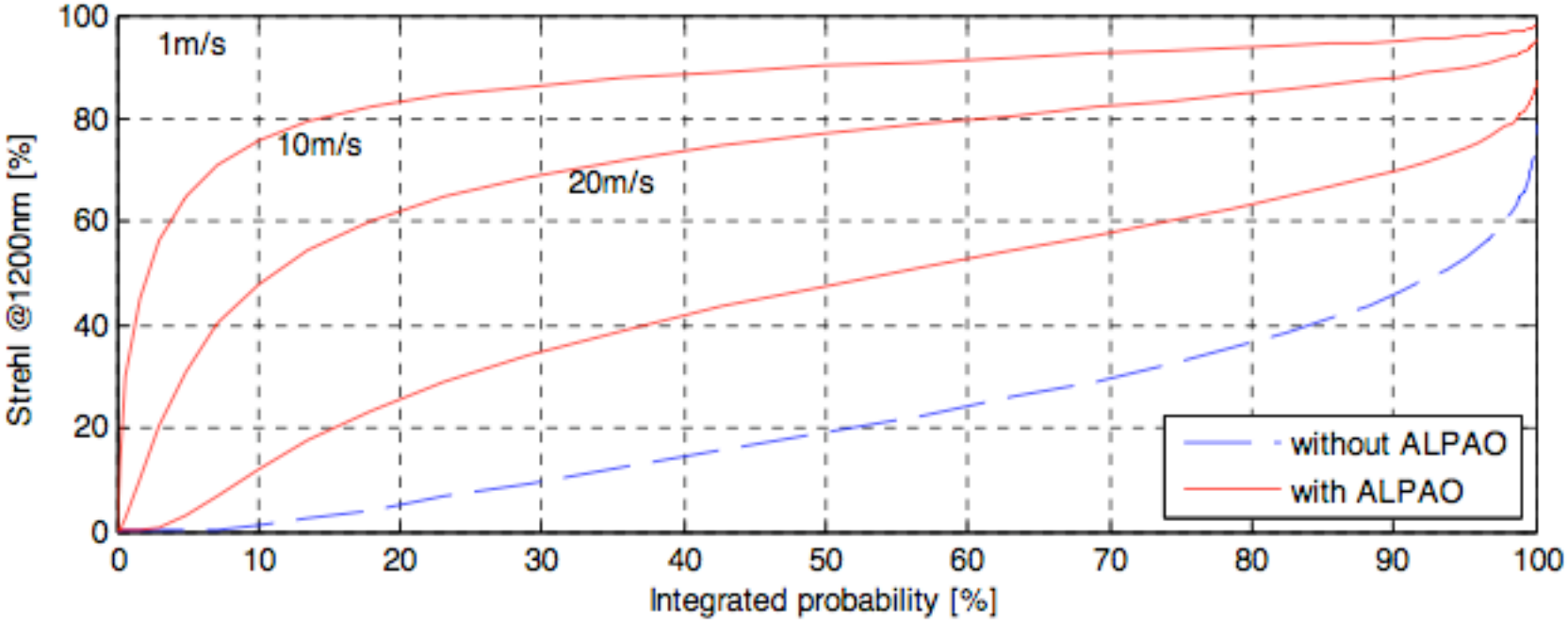


Star V=7.1

T_{wfs} = 0.8% (Expected >2.5%, or 80%)

(=> >1 mag, or 5 mag)

ALPAO Performance - J band



Star V=7.1

T_{wfs} = 0.8% (Expected >2.5%, or 80%)

(=> >1 mag, or 5 mag)

CHARA Performance Summary - no AO

Mode	Telescopes	Band	Typical limit Mag=	Best performance Mag=	At Spectral Resolution R=
Acquistion	2	V-R	10.0	12.0	Broad band
Tilt tracking	2	V-R	10.0	12.0	Broad band
FLUOR (standard)	2	K band	4.5	6.0	Broad band
FLUOR (grism)	2	K Band	??	??	100
CLASSIC	2	K band	7.0	8.5	Broad band
CLASSIC	2	H Band	7.0	8.5	Broad band
PAVO	3	R-I	6.5	8.2	50
VEGA	2	1 band, 150nm 480-820	6.5	7.2	1700
	2	2 bands, 30 & 45nm 480-820	5.5	5.8	5000
	2	2 bands, 5 & 8nm 480-820	3.5	4.2	30000
MIRC	4	J-H	4.0	4.5	40, 150, 400

CHARA Performance Summary - no AO

Mode	Telescopes	Band	Typical limit Mag=	Best performance Mag=	At Spectral Resolution R=
Acquistion	2	V-R	10.0	12.0	Broad band
Tilt tracking	2	V-R	10.0	12 -> (14.5)	Broad band
FLUOR (standard)	2	K band	4.5 -> 6	6 -> 7	Broad band
FLUOR (grism)	2	K Band	??	??	100
CLASSIC	2	K band	7.0 -> 8.5	8.5 -> 10.0	Broad band
CLASSIC	2	H Band	7.0 -> 8.5	8.5 -> 10.0	Broad band
PAVO	3	R-I	6.5 -> 8.3	8.2 -> 10.0	50
VEGA	2	1 band, 150nm 480-820	6.5 -> 11.5	7.2 -> 13.2	1700
	2	2 bands, 30 & 45nm 480-820	5.5 -> 9.5	5.8 -> 9,8	5000
	2	2 bands, 5 & 8nm 480-820	3.5 -> 7.5	4.2 -> 8.2	30000
MIRC	4	J-H	4.0 -> 6.5	4.5 -> 7.0	40, 150, 400

Funding Opportunities

- Keck Foundation
  - Any time
  - Any amount
- Air Force Support for University AO
  - August every year, up to $1M, average $235K.
  - For research equipment
- NSF ATI
  - November 1, 2009, up to $2M
  - In 1995-99, success rate 30%, avg award $331K
- NSF MRI
  - January 2010, NSF-wide, up to $2M ($4M)
  - Requires cost sharing (30%) !
  - In 2007, success rate 29%, avg award $402K