Infrared Wavefront Sensor (IR-WFS)

Yutaka Hayano

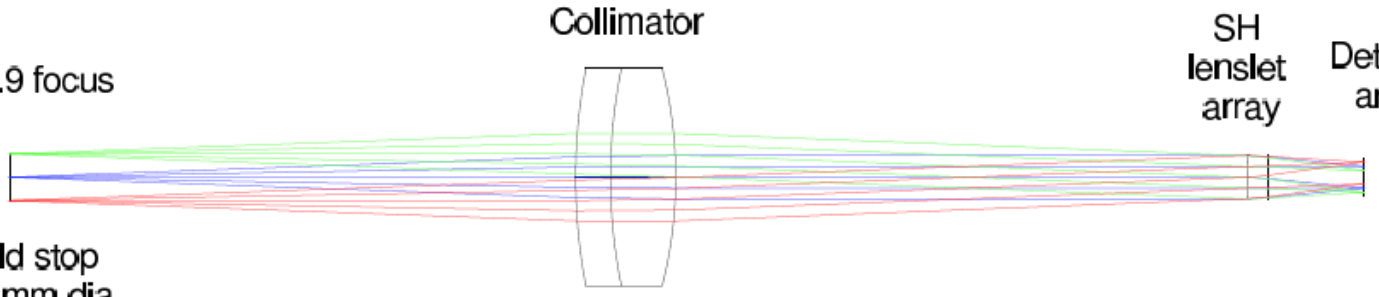
Internal Meeting on Future Instrument Projects at Subaru
April 26, 2010.

Why IR WFS

- Highly obscured region. (No visible guide star.)
  - Galactic center.
  - Star forming region.
    - Disks around massive YSOs
    - Molecular Gas disks in planet forming disks
    - Companion search for Class I stars (low mass YSOs)
    - Jet/Outflow (Class I includes HH objects)

- Red objects. (Bright source in IR no in visible.)
  - M dwarf stars in local group.
  - Brown dwarf.

IR Low-order WFS



Pupil diameter = 2 mm
Num. of sub-apertures = 2 x 2
Num. of detectors per sub-ap. = 10 x 10
Sub-aperture size = 1 x 1 mm
Focal length of lenslet = 5.24 mm
Pixel scale = 0.396 arcsec/pixel

Spectral coverage = 0.9 - 2.5 micron

Detector = 128 x 128 HgCdTe array
Pixel size = 40 micron

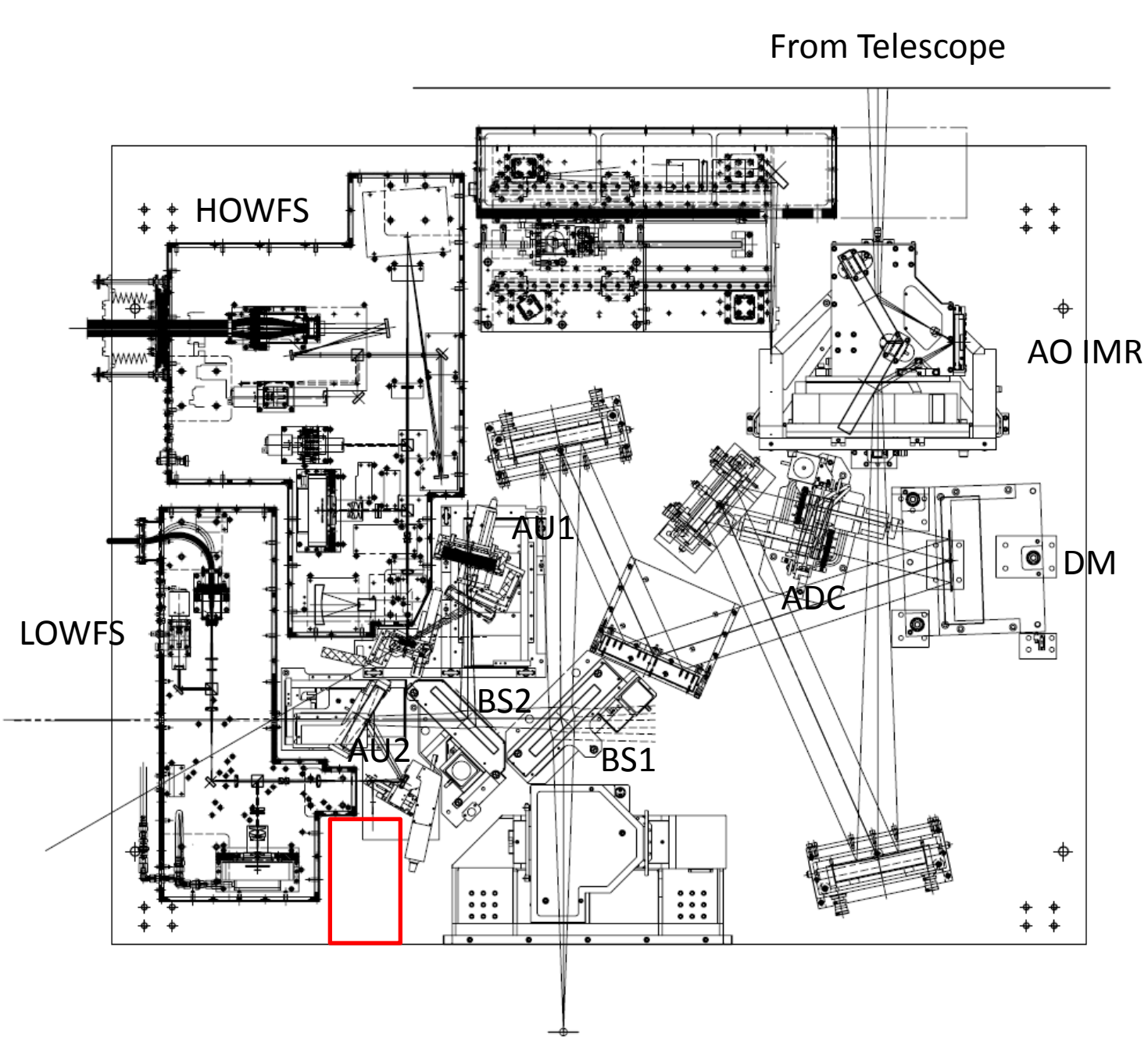
3D LAYOUT

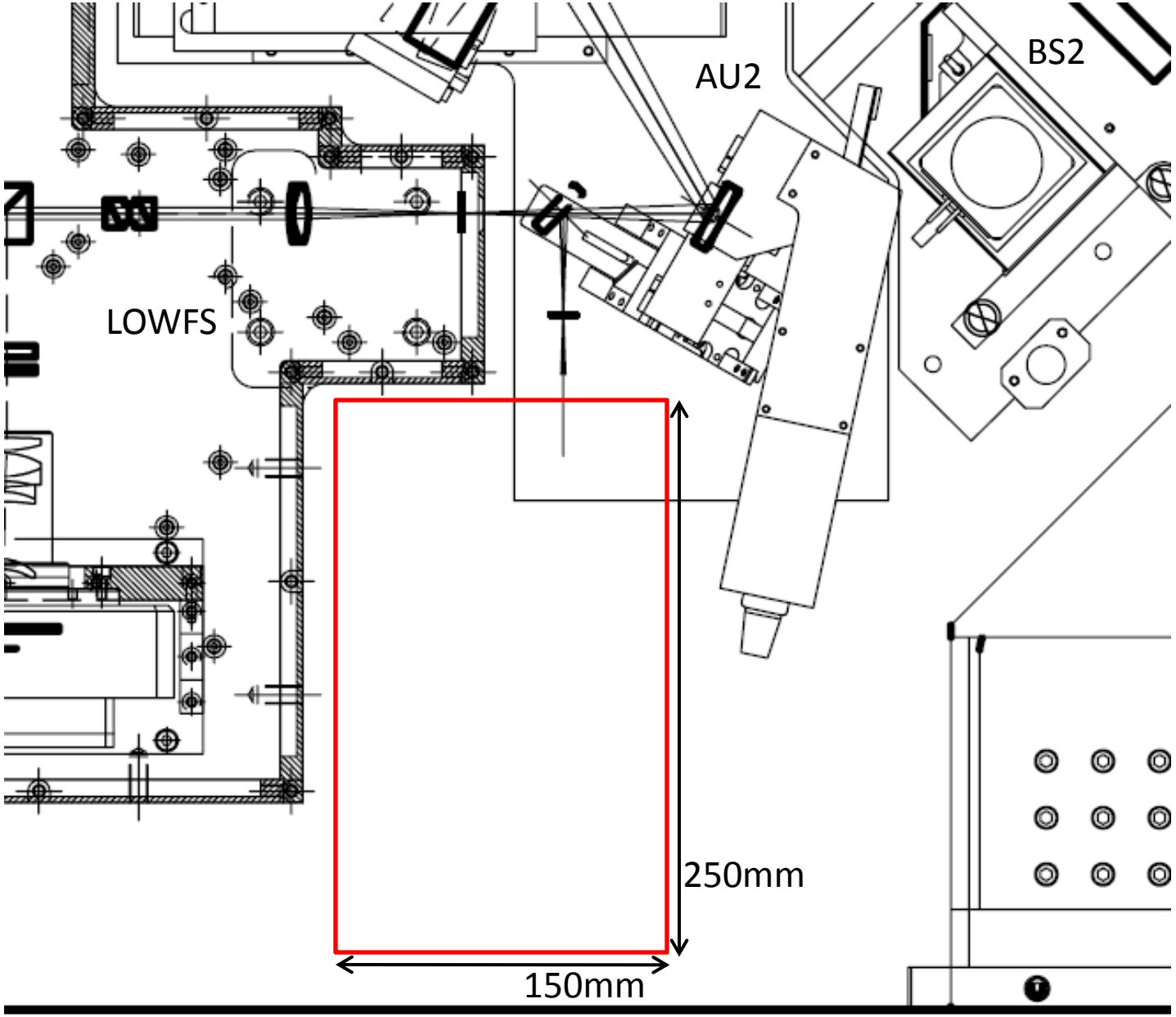
SUBARU IR NASMYTH + AO OAP RELAY + INFRARED LOW-ORDER WFS
THU APR 8 2004
SCALE: 3.3333

6.00 MILLIMETERS

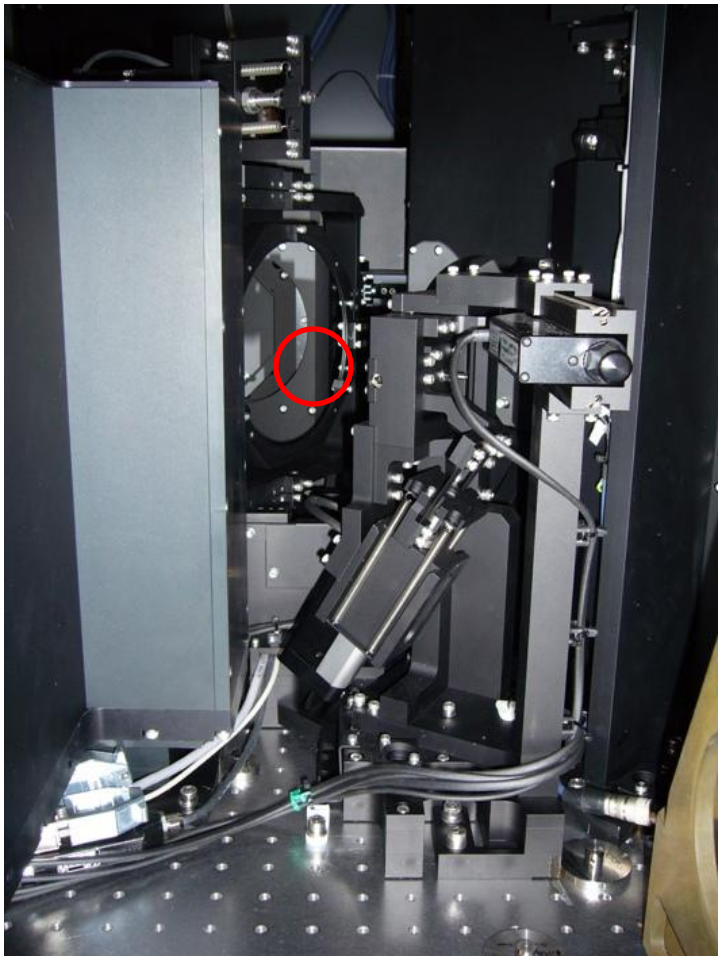
SUBARU TELESCOPE
NATIONAL ASTRONOMICAL OBSERVATORY OF JAPAN

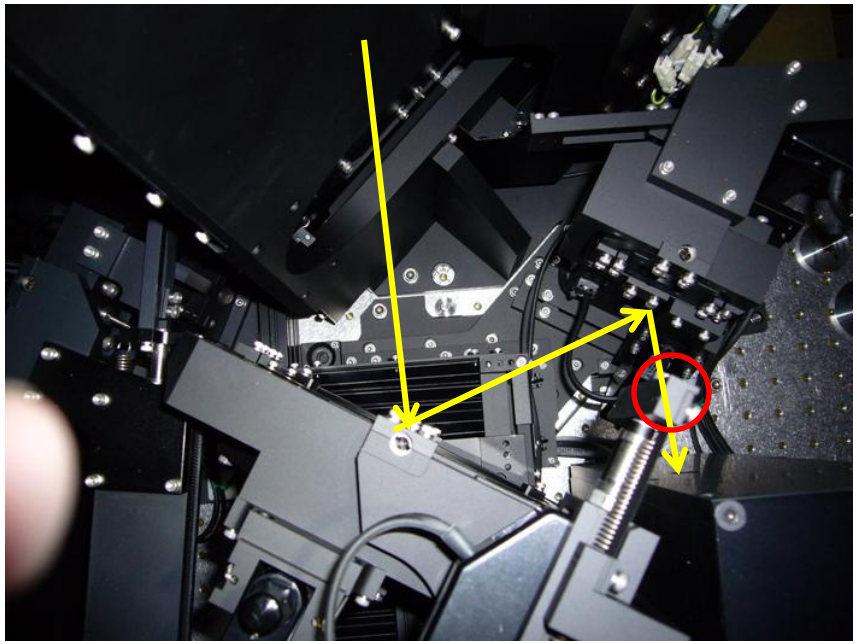
OAP24B90_L28_LA524.ZMX
CONFIGURATION 1 OF 1


From Telescope
HOWFS
AO IMR
AU1
DM
ADC
LOWFS
BS2
AU2
BS1
To science instrument

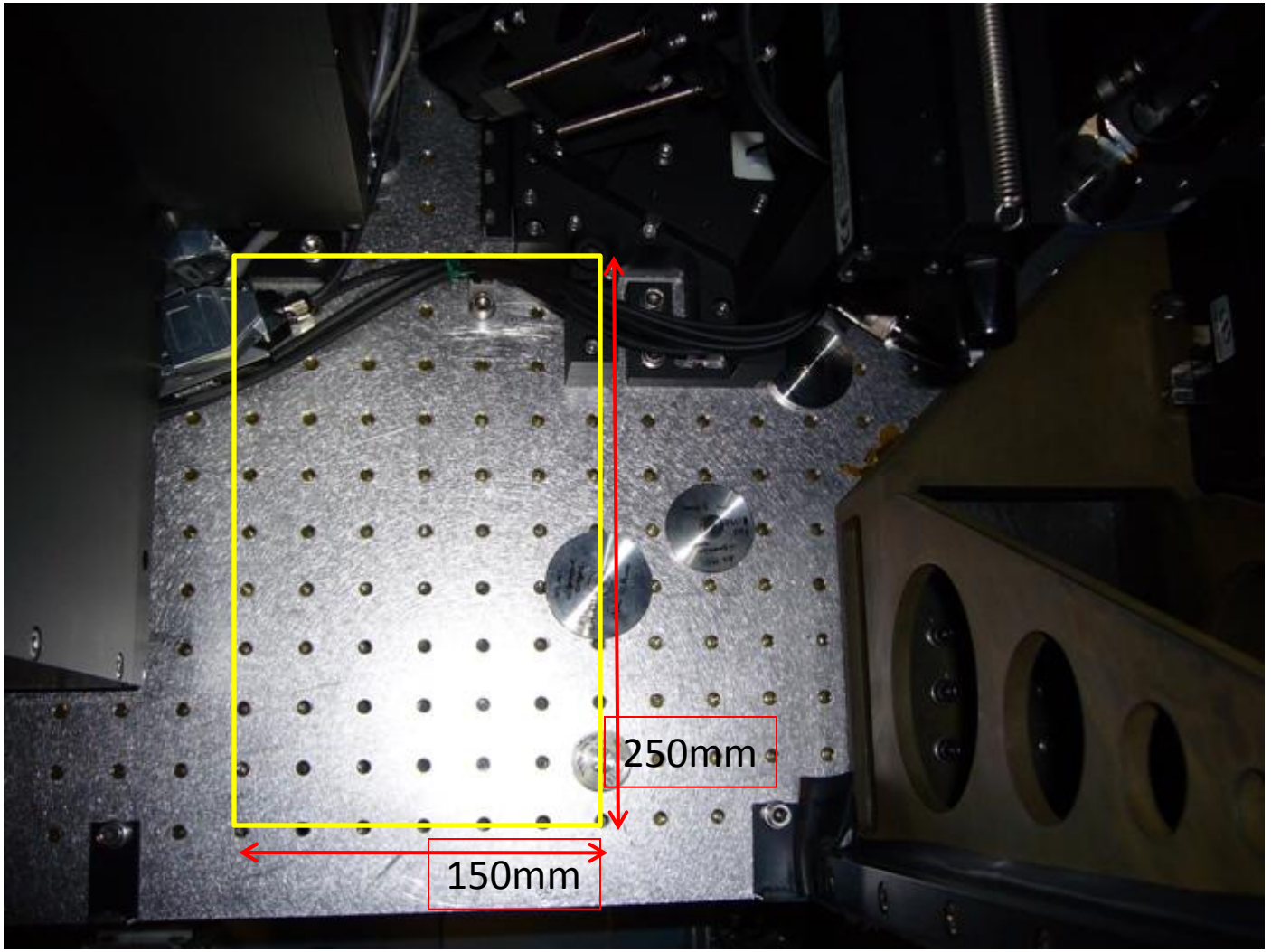

AU2
BS2
LOWFS
250mm
150mm

Reserved location for IR-WFS





Reserved location for IR-WFS



Letter of Understanding between Subaru and MPIA

Dr. Thomas Henning, Director
Max Planck Institute for Astronomy
Koenigstuhl 17
D-69117 Heidelberg
Germany

Dear Dr. Henning:
This letter is intended to set forth the understanding of the Subaru Telescope ("Subaru") and the Max Planck Institute for Astronomy ("MPIA") regarding the collaborative efforts of exploring the possibility of implementing an infrared wavefront sensor (IRWFS) developed by MPIA to the new laser guide star adaptive optics system with 188 elements (LGSAO188) of Subaru.

Accordingly, I expect that we agree to the terms and conditions set forth below.

1) The contact person of MPIA and Subaru will be Dr. Markus Feldt and Dr. Yutaka Hayano, respectively.
2) Subaru will start the feasibility study to incorporate IRWFS into LGSAO188.
3) Subaru will try to form the science team in charge of the engineering work development, as well as of the scientific exploitation of such an instrument. This team will also lead the search to identify necessary funding.
4) I understand that MPIA will carry out the feasibility study of IRWFS, including manufacturability of the IR detector suited to IRWFS
5) I understand also that MPIA will try to identify the necessary funding.

Now, therefore, in consideration of the mutual interests herein contained, I propose you to do mutually our best efforts to collaborate in these studies to explore the possibilities, with a perspective to pursue a dialogue and discussion about further collaborations to implement IRWFS to LGSAO188, to exploit them to observe the interesting astronomical objects in the highly extinct star forming region.

I propose also to jointly review the situation on July 2006 in order to keep up with the status of IRWFS plan.

Yours sincerely,

Hiroshi Karoji
Director
Subaru Telescope
National Astronomical Observatory of Japan

- AGREED AND ACCEPTED ON
- BEHALF OF THE MAX PLANCK INSTITUTE FOR ASTRONOMY:
- By: Date:
- Thomas Henning
- Its Director

- Contact person
  - Hayano (Subaru)
  - Markus Feldt (MPIA)
- Feasibility study.
  - S-H WFS.
  - IR Pyramid WFS.
- Science team.
- Funding efforts.
  - MPIA.
  - Wakate S. (Usuda)
  - Tokusui. (Tamura)

Conceptual optical design of IR pyramid WFS.