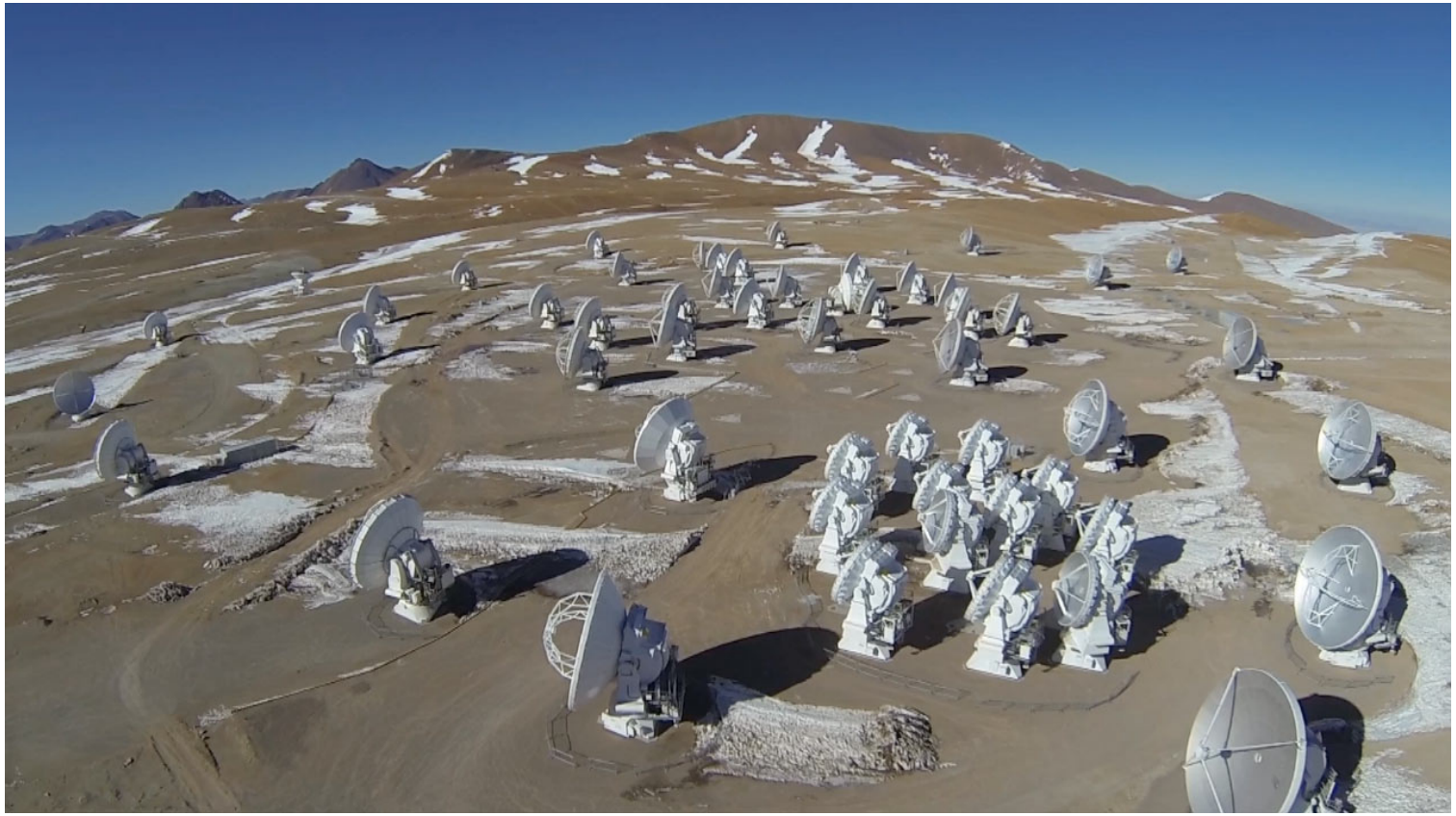
Korea ALMA Project

(http://alma.kasi.re.kr)

50 x 12m array
12 x 7m array
4 x 12m TP

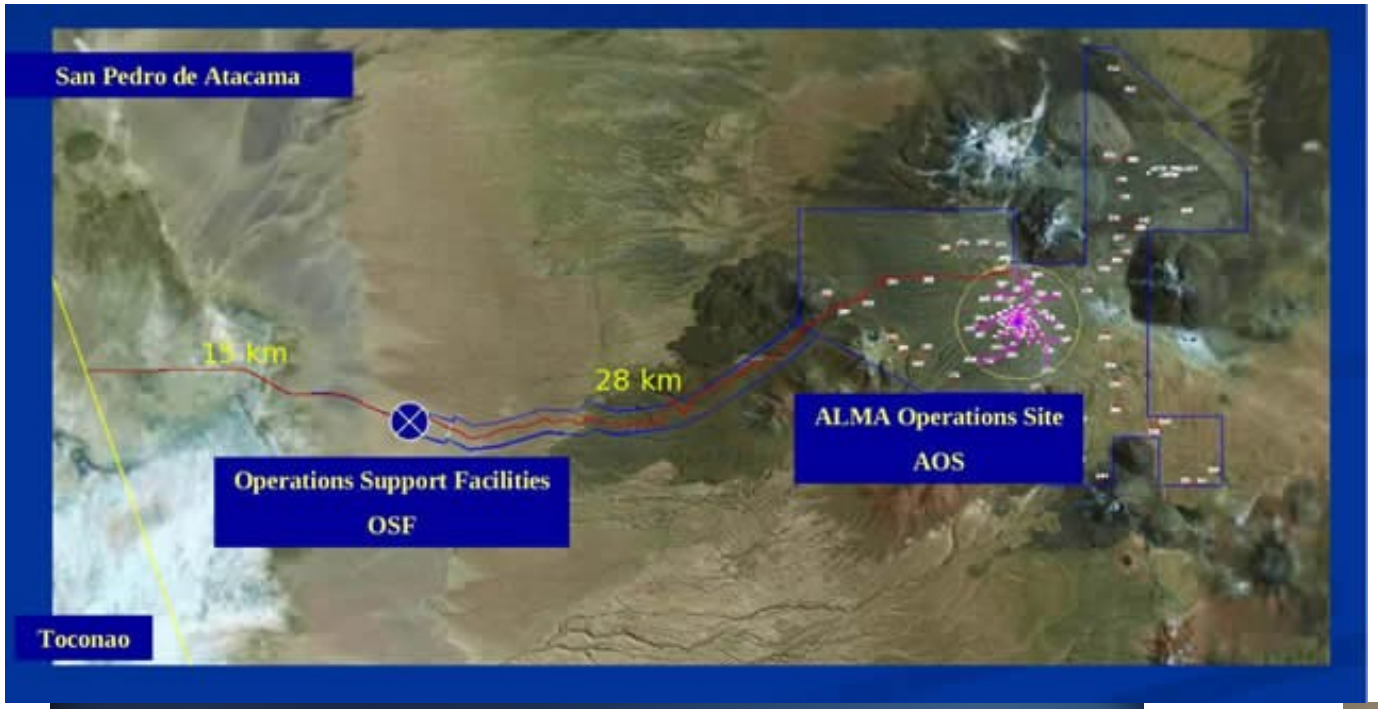
Longest baseline 16km
(about 0.02” at band-4, 6, 7, & 10)

0.01km/s velocity resolution




ALMA
Santiago


ALMA
silica networks
Calama
1
ALMA
Calama
Telefónica
San Pedro de Atacama
ALMA
2
Calama
Antofagasta
Antofagasta
RedCLARA
Ciencia y Educación en Red
3
Antofagasta
Santiago
EVALSO
New Network
Existing Commercial Network
Existing Academic Network
to SANTIAGO

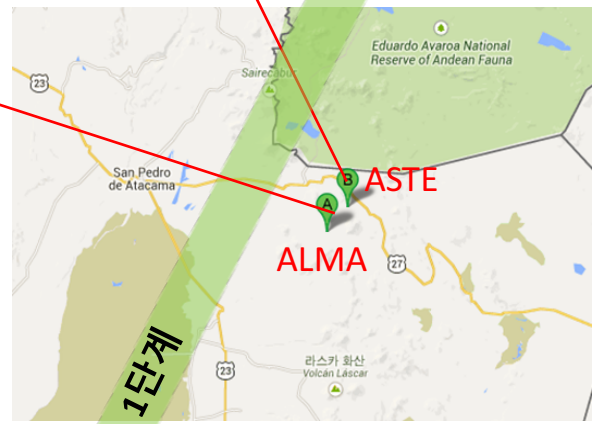

San Pedro de Atacama
15 km
28 km
ALMA Operations Site
AOS
Operations Support Facilities
OSF
Toconao

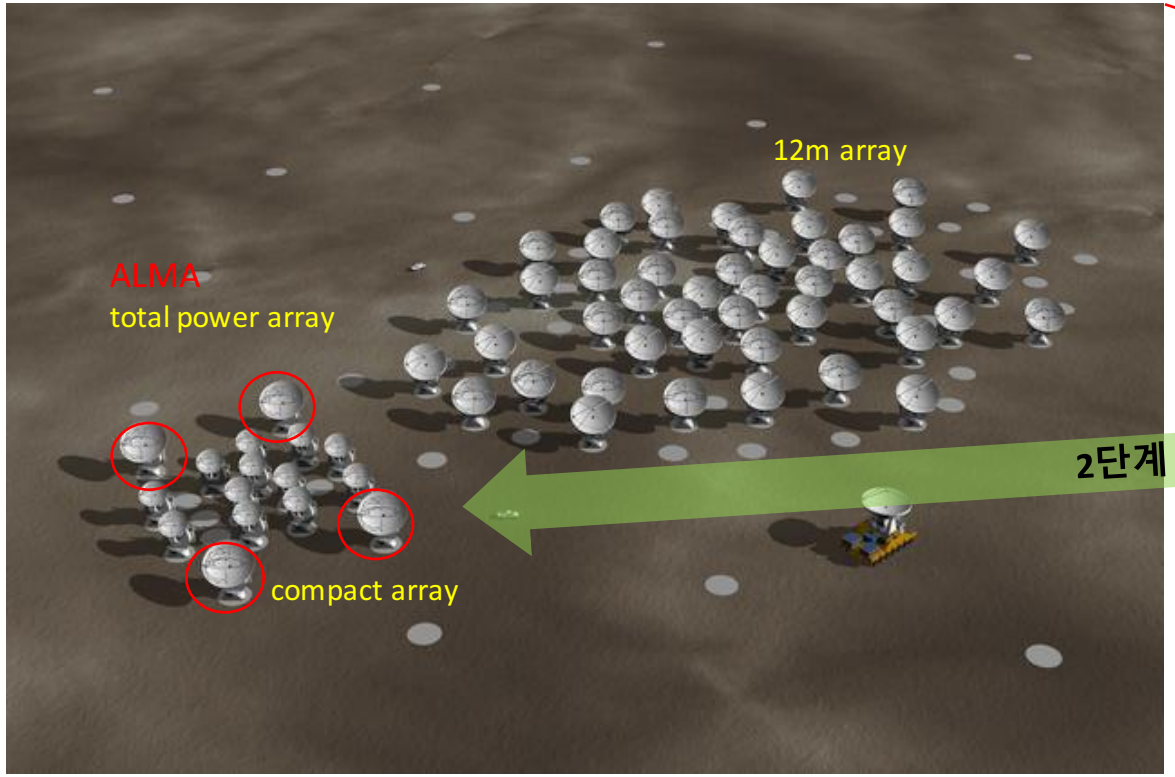
The Sun never sets on ALMA!

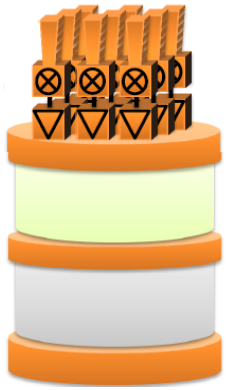
The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of the European Organisation for Astronomical Research in the Southern Hemisphere (ESO), the U.S. National Science Foundation (NSF) and the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Republic of Chile. ALMA is funded by ESO on behalf of its Member States, by NSF in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC) and by NINS in cooperation with the Academia Sinica (AS) in Taiwan and the Korea Astronomy and Space Science Institute (KASI).

기기 개발 계획

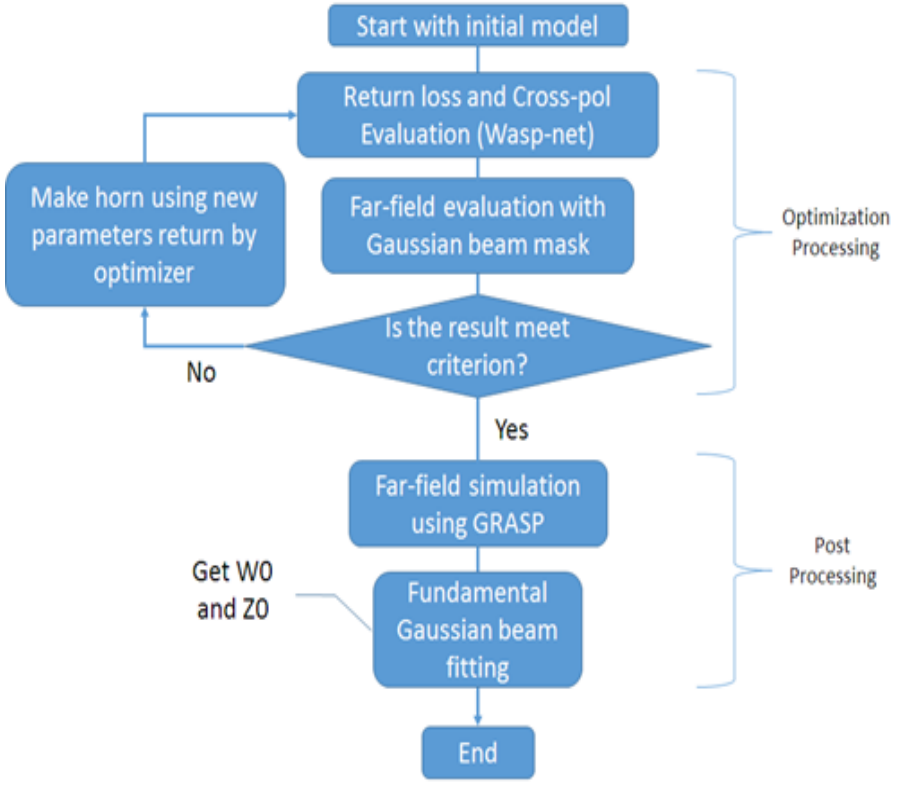
- 2015-2019 ASTE 다중빔 수신기 제작
  (2017 : ASTE 단일빔 수신기 시작품 제작)
- 2019-2020 ALMA 다중빔 수신기 시작품 제작
- 2021-2024 ALMA 다중빔 수신기 제작
- 2015-2018 ASTE, ALMA GPU 분광기 제작

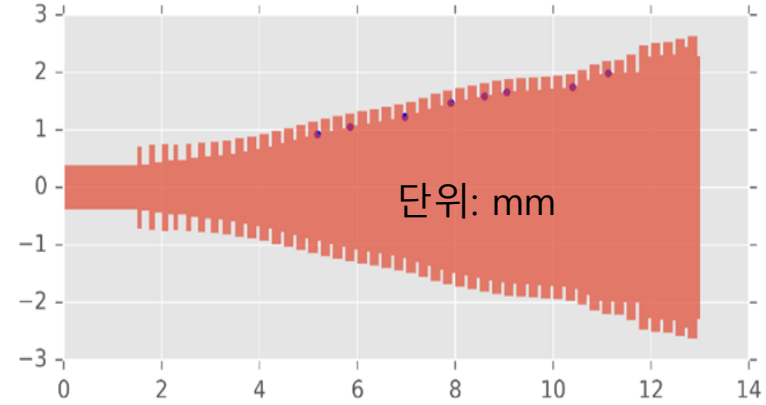


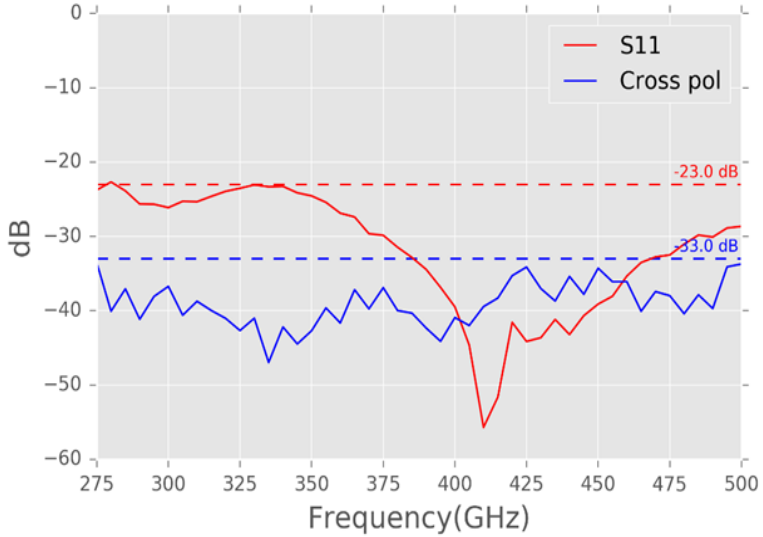




광대역 (270 – 500 GHz) 피드혼 설계 완료

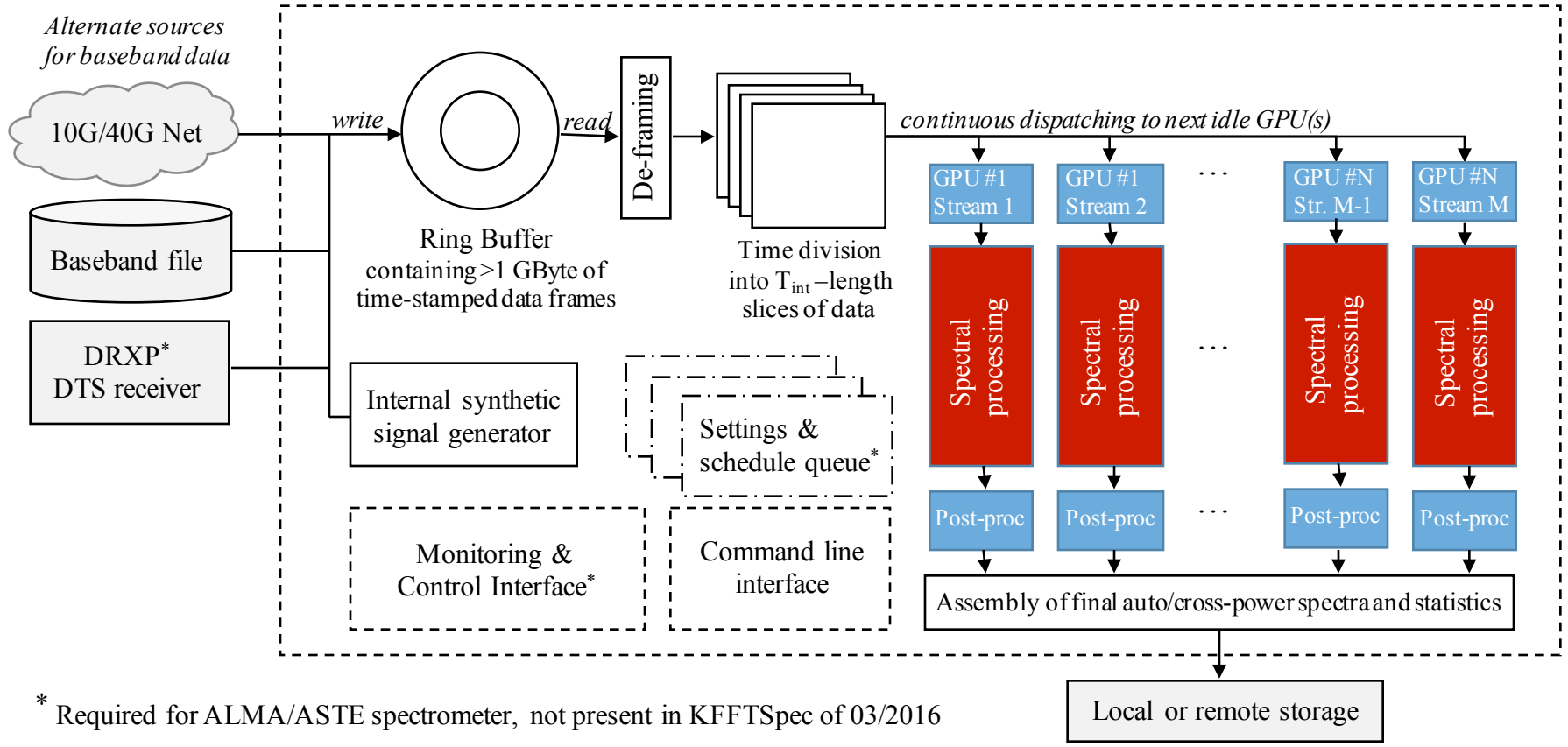






ASTE/ALMA TP (Total Power)용 GPU Spectrometer 제작 완료
(현재, 일본국립천문대에서 시험 중)

KFFTSpec: data flow and functions inside GPU server



* Required for ALMA/ASTE spectrometer, not present in KFFTSpec of 03/2016

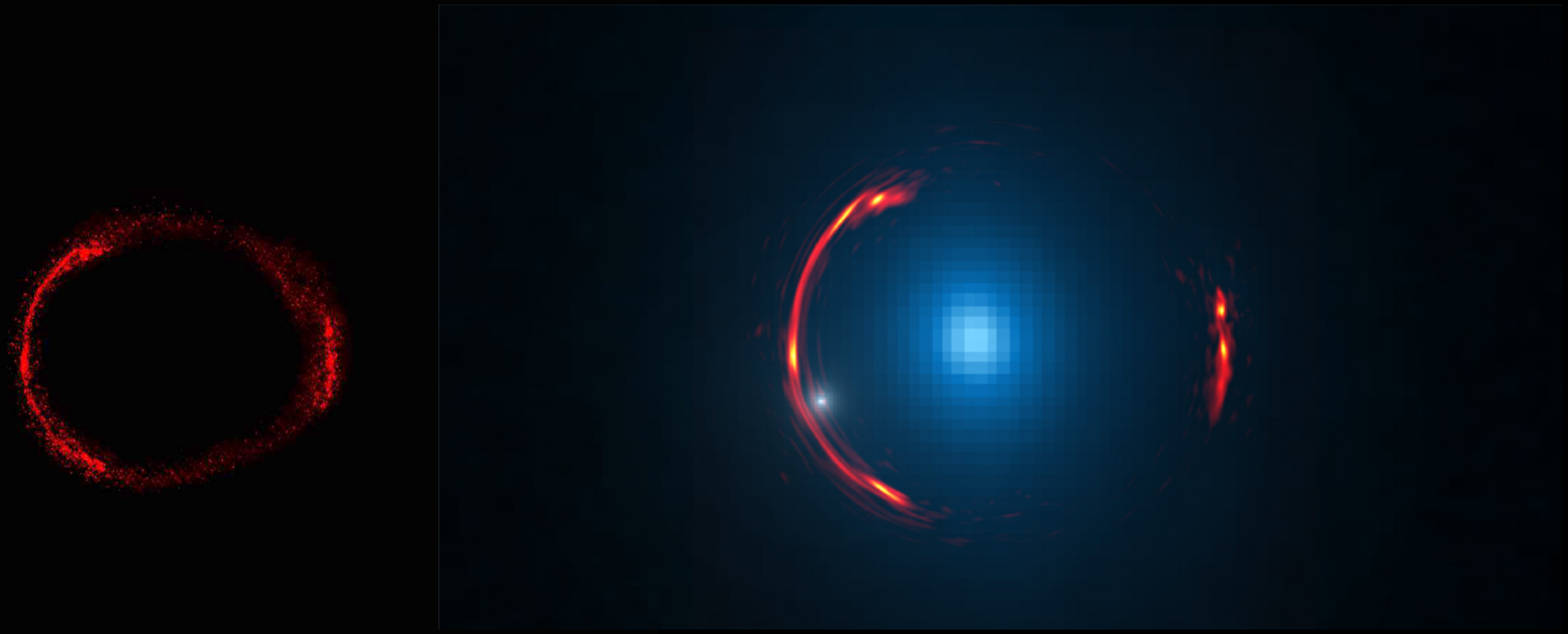
The design of ALMA is driven by three key science goals:

• The ability to detect spectral line emission from CO or [CII] in a normal galaxy like the Milky Way at a redshift of z=3, in less than 24 hours,

• The ability to image the gas kinematics in protostars and in protoplanetary disks around young Sun-like stars in the nearest molecular clouds (150 pc),

• The ability to provide precise high dynamic range images at an angular resolution of 0.1 arcsec.

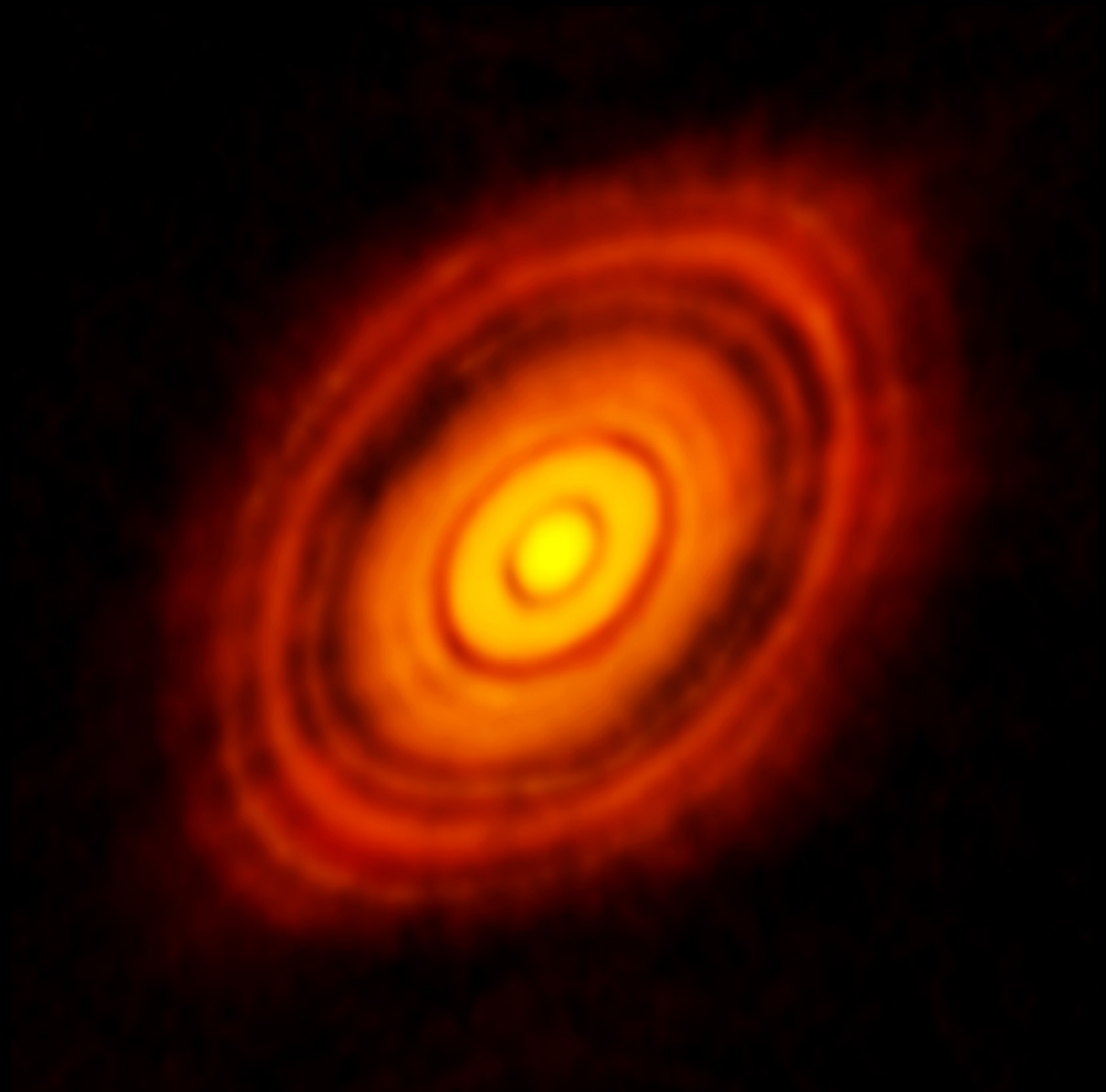
ALMA Image of the gravitationally lensed galaxy SDP.81



Detection of lensing substructure using ALMA observations of the dusty galaxy SDP.81

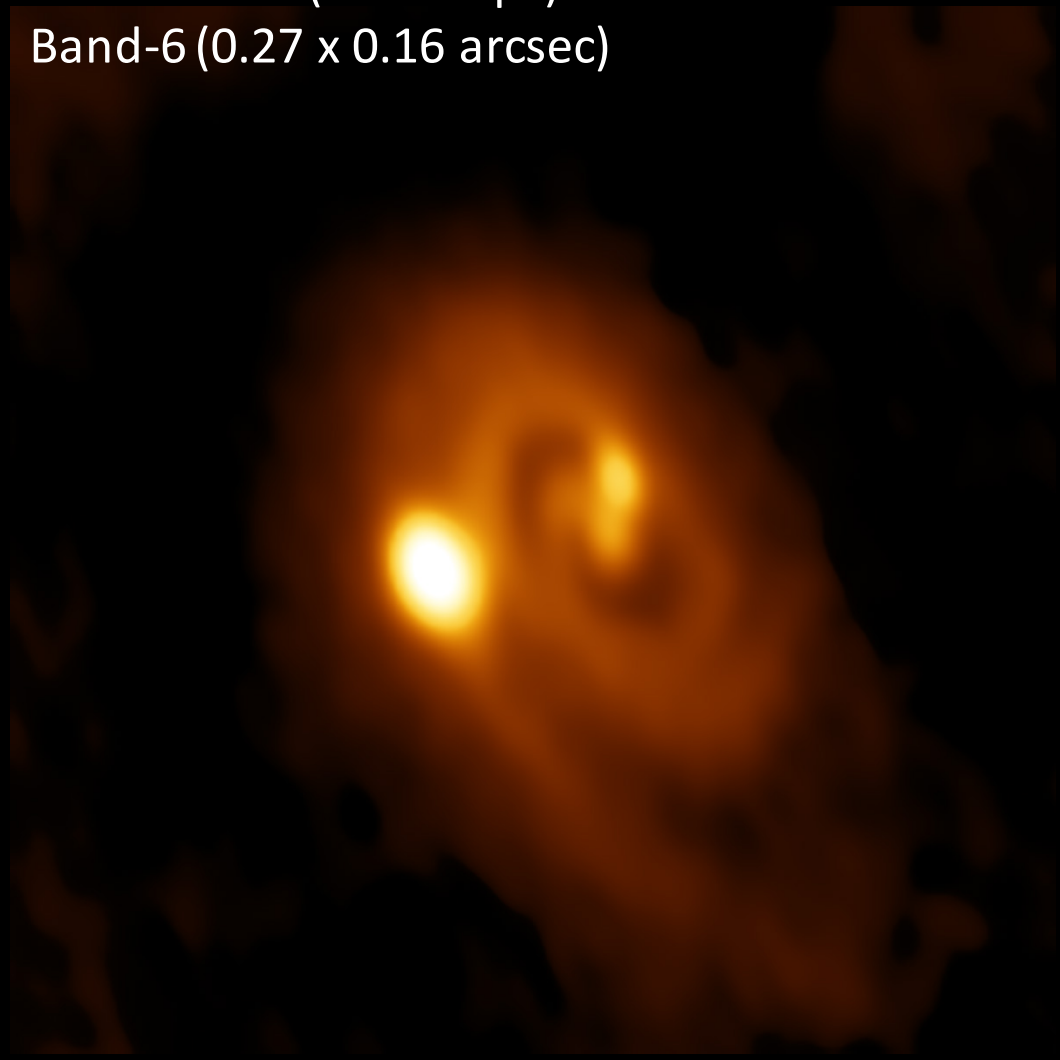
(Hezaveh, Y. D. et al. 2016, ApJ, 823, 37)

HL Tau

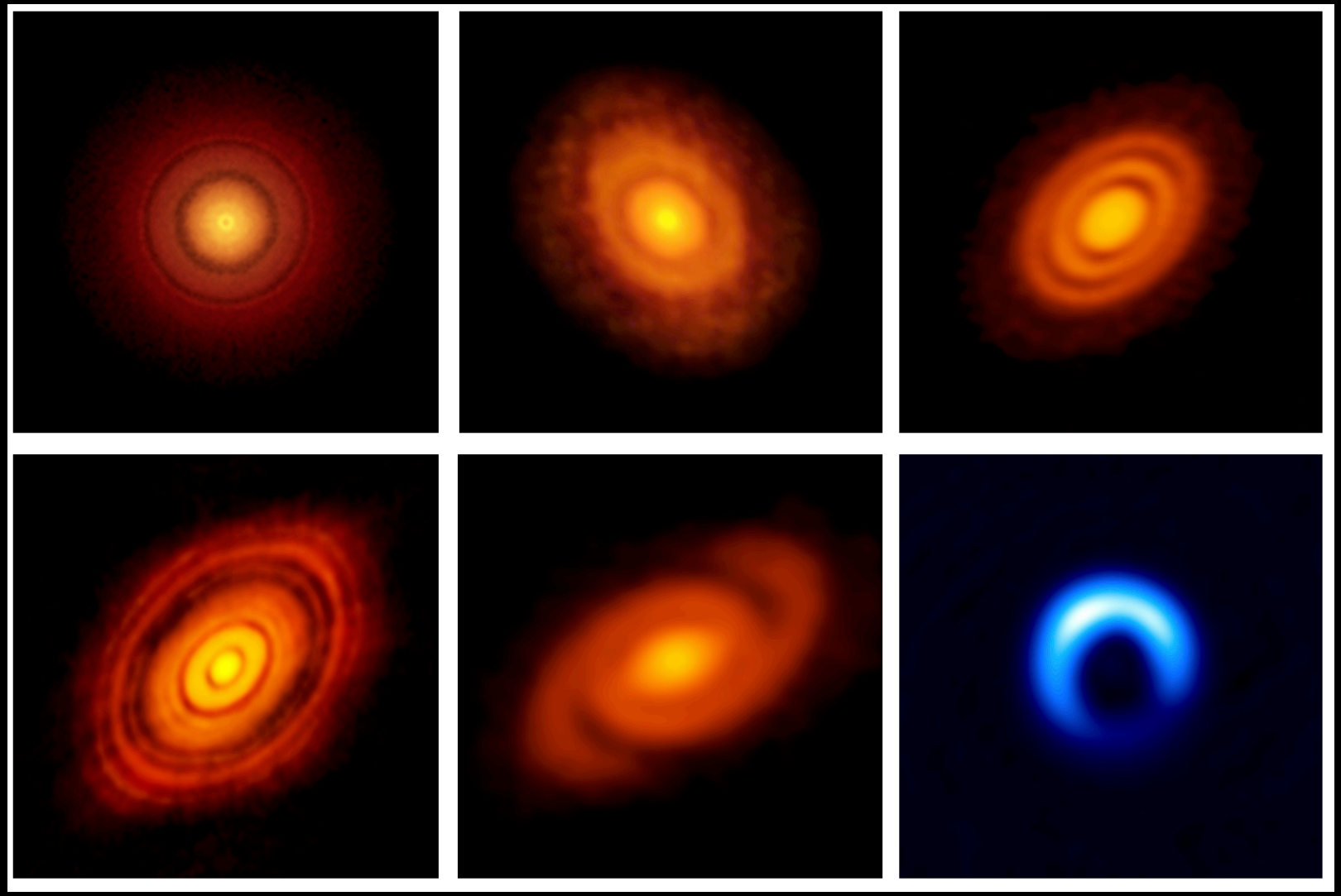


A triple protostar system formed via fragmentation of a gravitationally unstable disk
(Tobin, J. et al. 2016, Nature, 538, 483)

L1448 IRS3B (d ~ 230 pc)
Band-6 (0.27 x 0.16 arcsec)



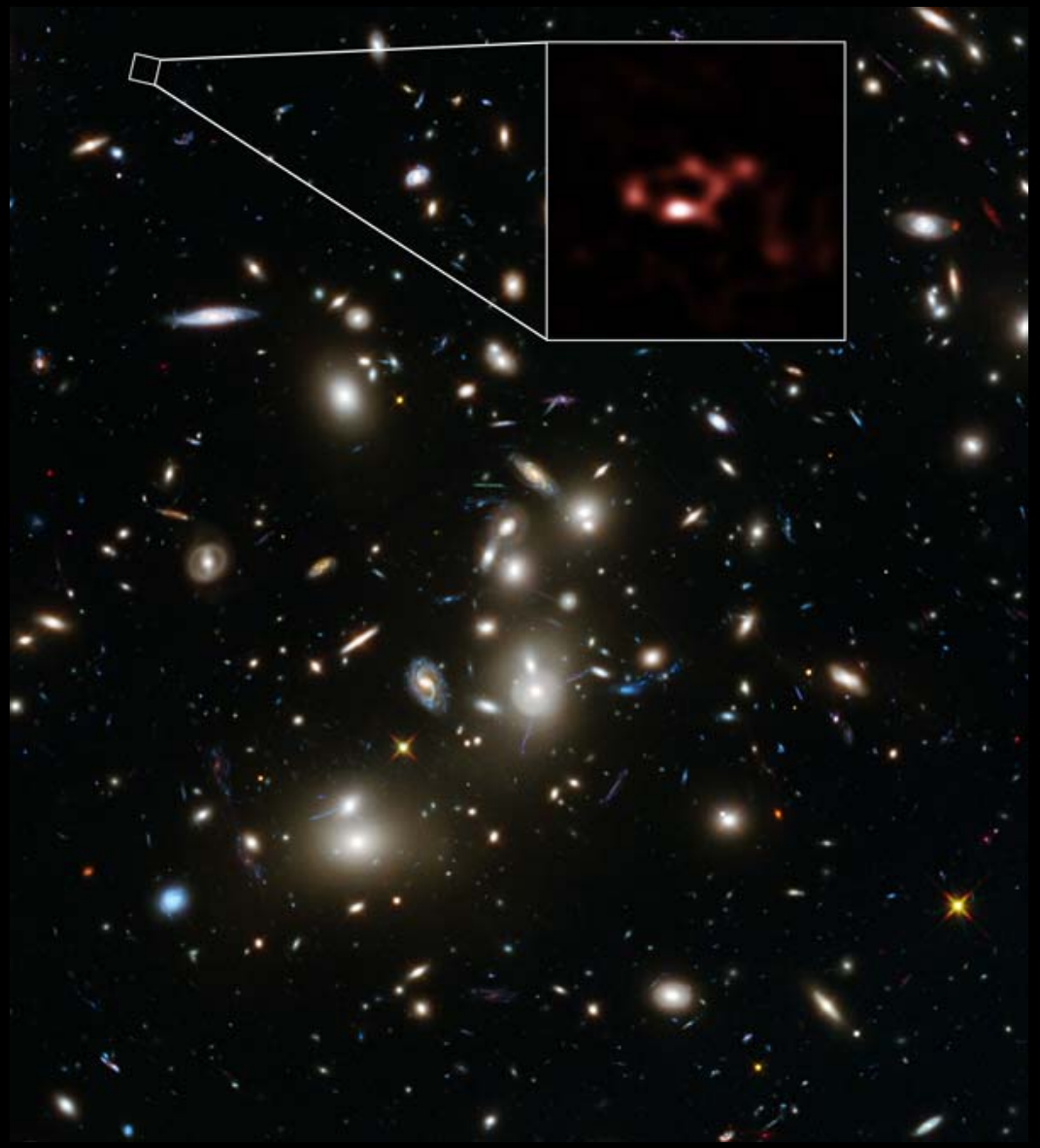
Structure of planet forming disks



Gallery of high angular resolution continuum observations of planet forming disks obtained with ALMA. From left to right and from top to bottom: TW Hya (Andrews et al. 2016), V883 Ori (Cieza et al. (2016), HD 163296 (Isella et al. 2016), HL Tau (ALMA Partnership et al. 2015), Elias 2-27 (Pérez et al. 2016), and HD 142527 (Kataoka et al. 2016). Credits: S. Andrews, L. Cieza, A. Isella, A. Kataoka, B. Saxton (NRAO/AUI/NSF), and ALMA (ESO/NAOJ/NRAO).

Dust in the Reionization Era: ALMA Observations of a Z=8.38 Gravitationally Lensed Galaxy

(Laporte, N. et al. 2017, ApJL, 837, L21)



A2744_YD4

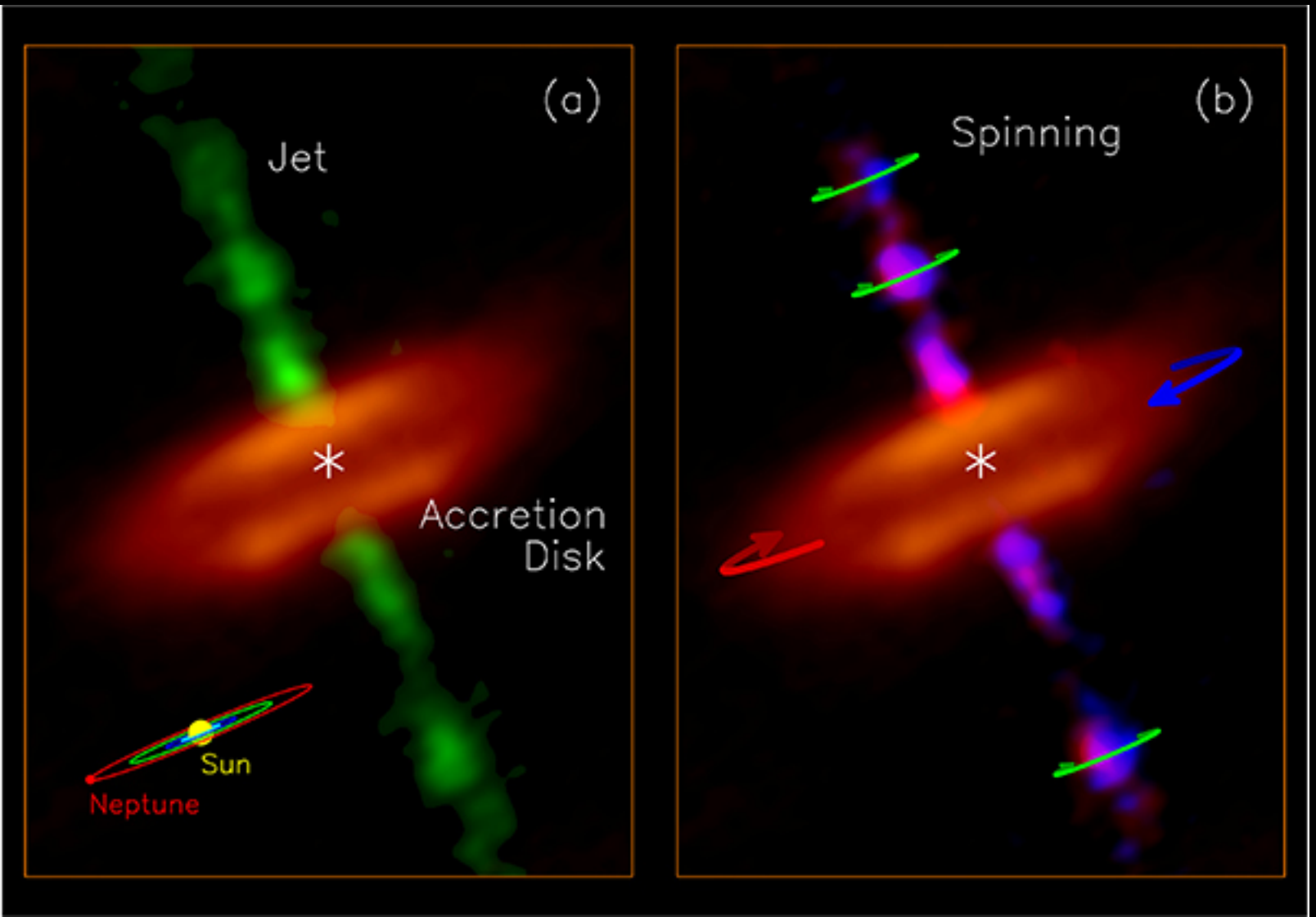
- z = 8.38 (X-Shooter/VLT)
- Band-7 continuum observation

" The detection of so much dust indicates early supernovae must have polluted this galaxy"

This image is dominated by a spectacular view of the rich galaxy cluster Abell 2744 (z=0.308) from the NASA/ESA Hubble Space Telescope. Credit: ALMA (ESO/NAOJ/NRAO), NASA, ESA, ESO and D. Coe (STScI)/J. Merten (Heidelberg/Bologna

A rotating protostellar jet launched from the innermost disk of HH 212

(Lee, Chin-Fei et al. 2017, Nature Astronomy, 1, 152)

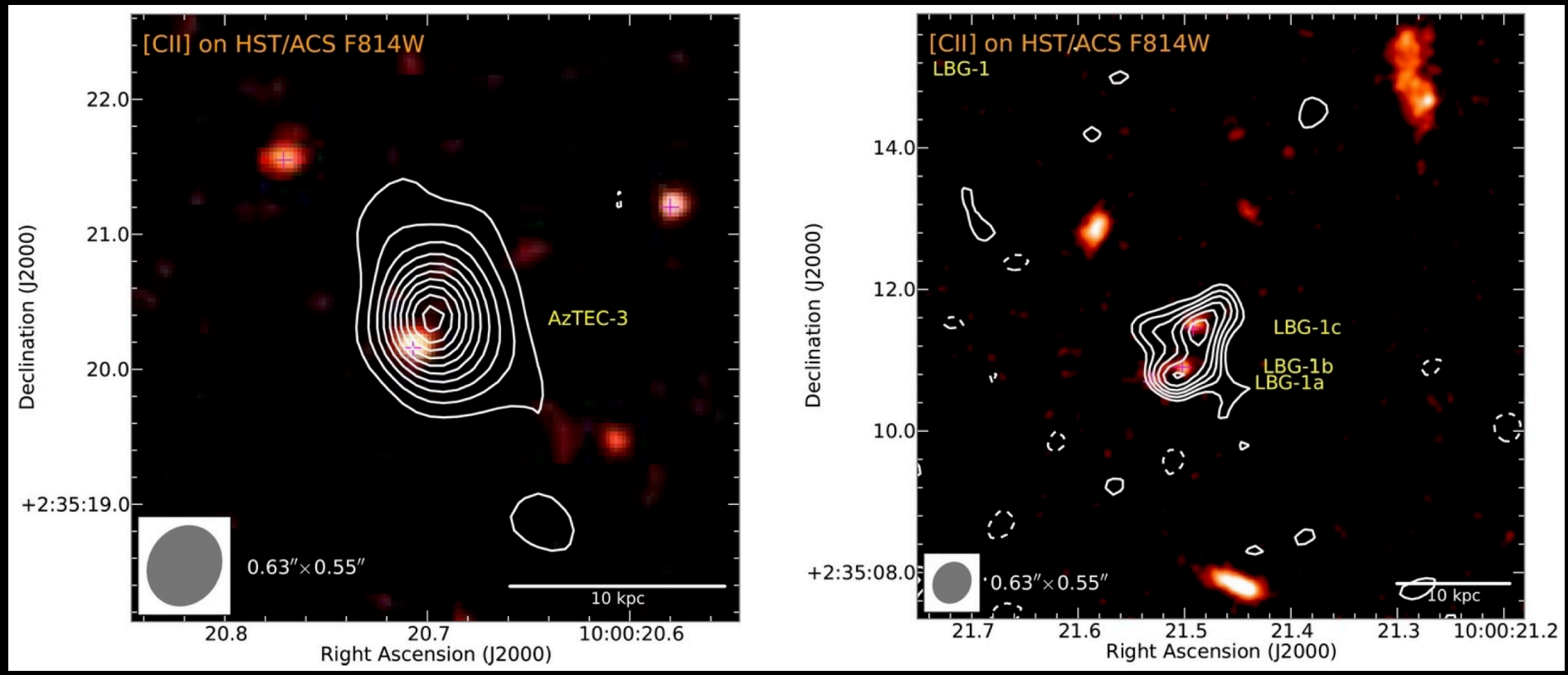


HH 212

- d ~ 400 pc in the L1630 of Orion
- 0.02 arcsec resolution (8 AU)
- SiO(J=8-7) & 352 GHz continuum

Highly collimated protostellar jets remove the residual angular momenta at the 0.05 AU scale, enabling the material in the innermost region of the disk to accrete towards the central protostar.

Rotation of the jet measured down to 10AU from the protostar in the HH 212 system. The measurement implies a jet launching radius of 0.05 AU on the disk, based on the magneto-centrifugal theory of jet production.



Left: ALMA [CII] image (contours) overlaid on HST optical image toward the z = 5.3 submillimeter galaxy AzTEC-3. Strong [CII] emission is detected toward AzTEC-3 distributed over a scale of 3.9 kpc. Right: ALMA [CII] image toward three Lyman Break Galaxies that are part of the galaxy protocluster associated with AzTEC-3. The [CII] emission is distributed over 7.5 kpc. Figure from Riechers et al. (2014).