

NANTEN2

FUTURE PLANS

A new submillimeter survey
AND
Contribution to the community

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(Nagoya Univ.)

+ NANTEN Group

Question

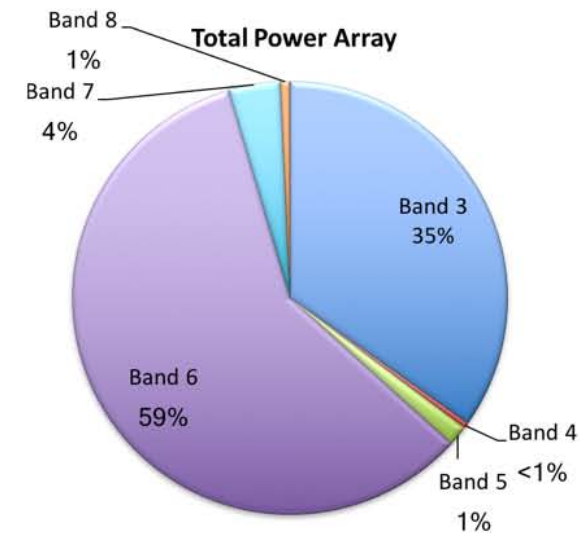
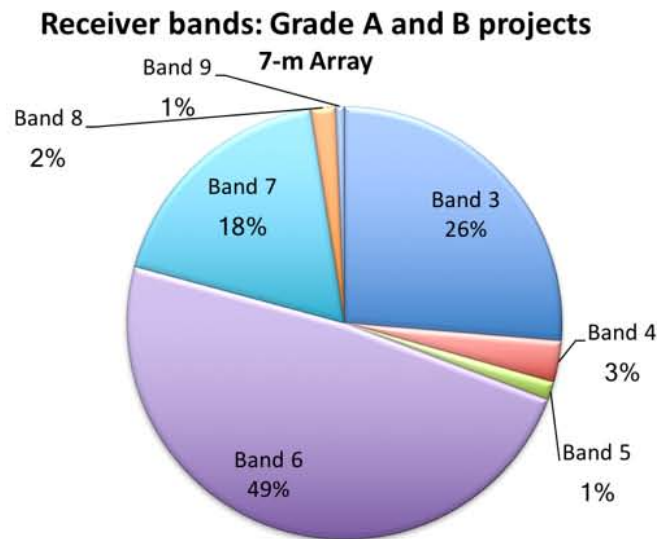
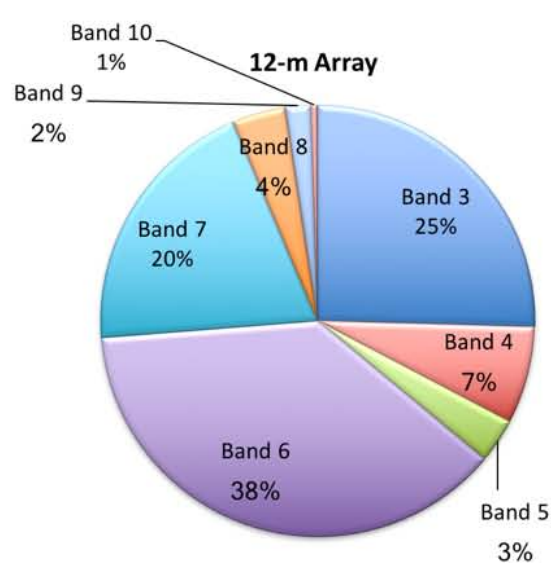
Do you want to use “NANTEN2” ?
(particularly in submm)

Option 1

Science
Pilot survey for ALMA

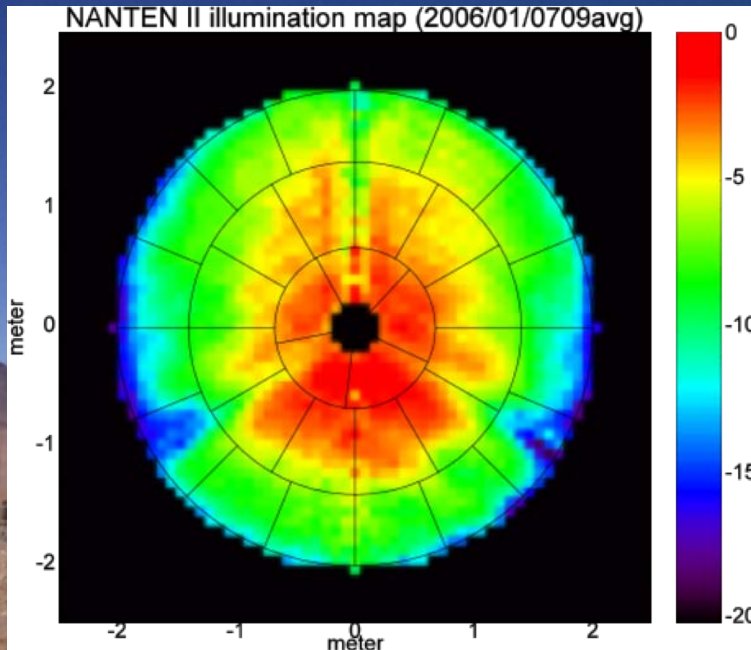
Option 2

Development
Test bench for New Receiver



NANTEN2

Surface accuracy



☆ SITE : Chile Atacama (4850 m)

☆ 4m - Main mirror

• Accuracy : $\sim 26 \mu\text{m}$

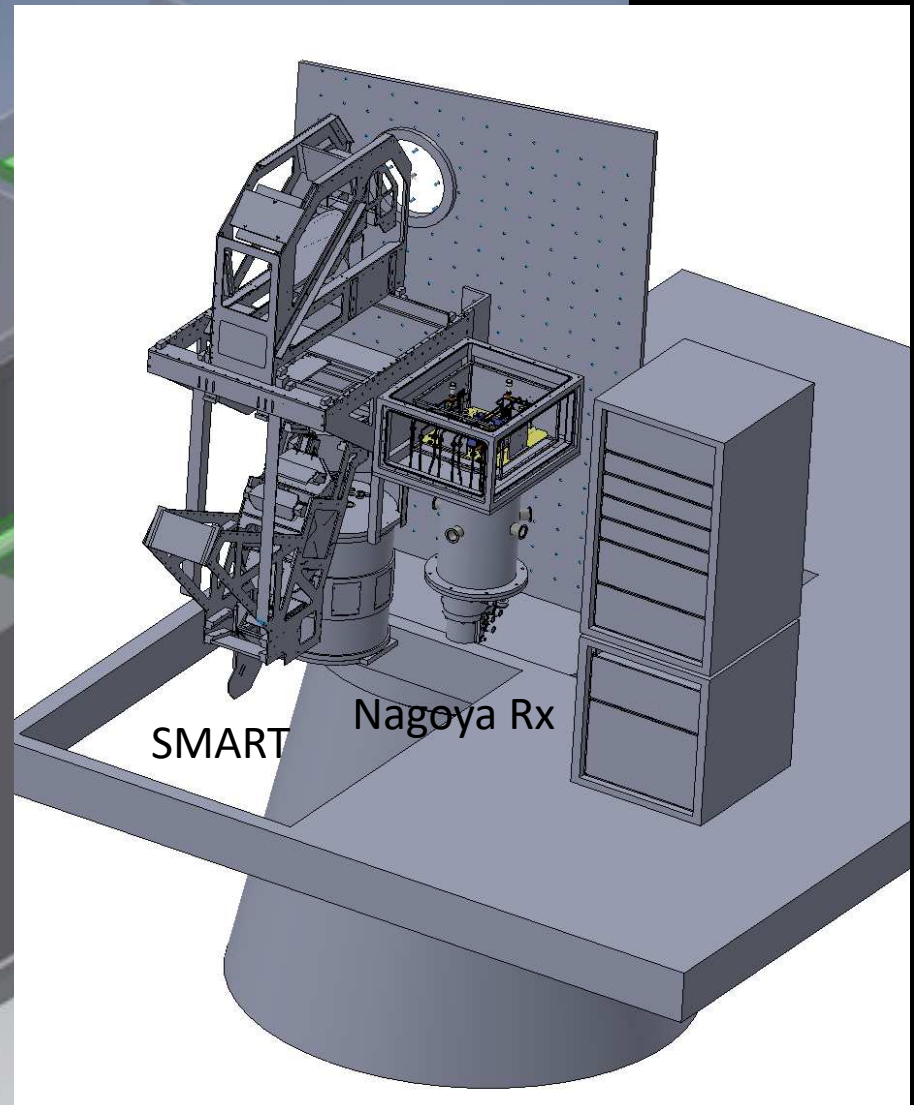
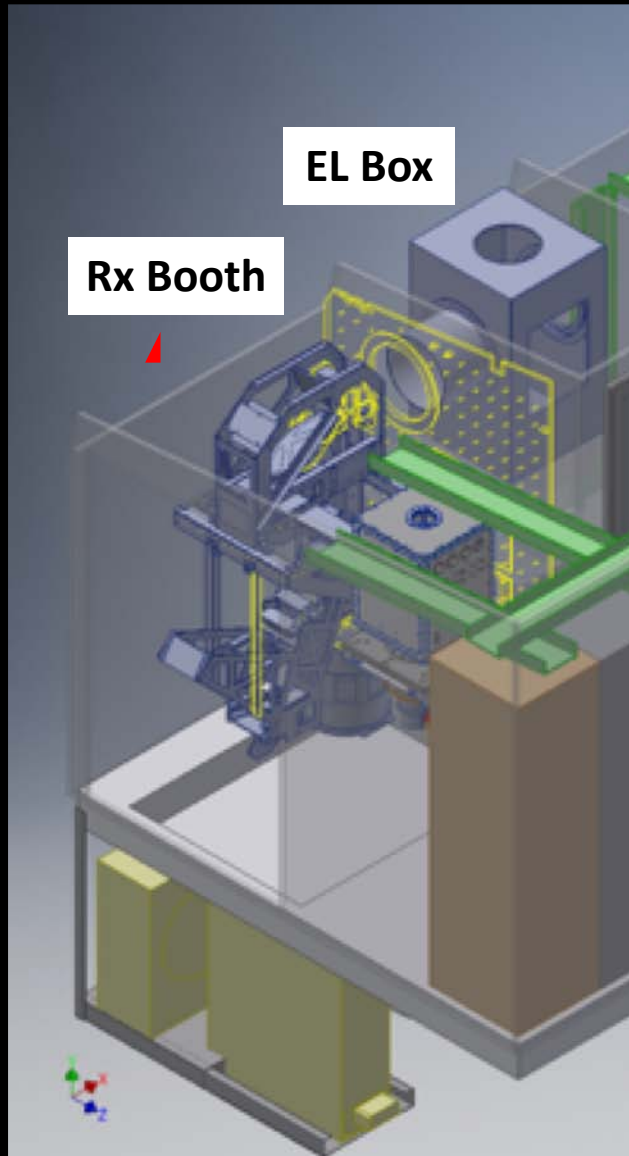
☆ Optics : Nasmyth

☆ Frequency & Receiver

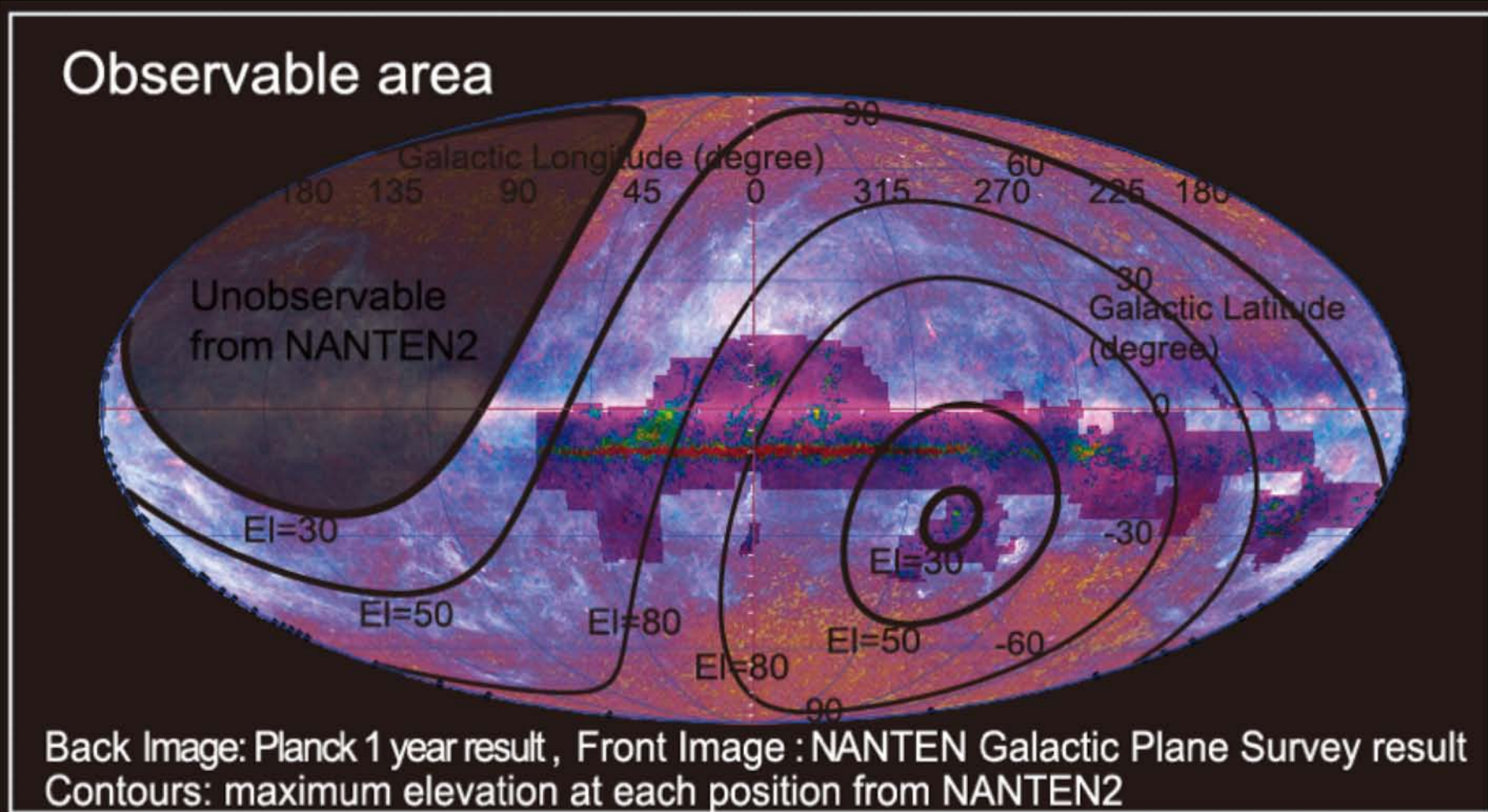
• Nagoya : 100, 200 GHz

• SMART : 460, 800 GHz

NANTEN2 Receiver Cabin



NANTEN2 SUPER CO SURVEY AS LEGACY



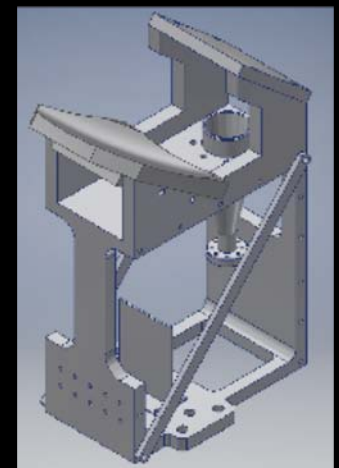
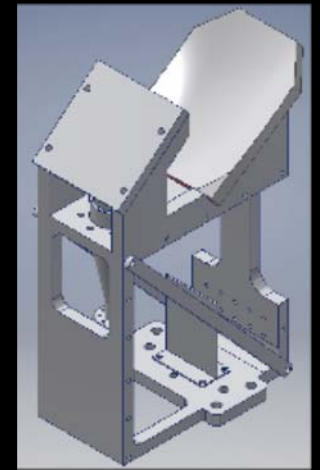
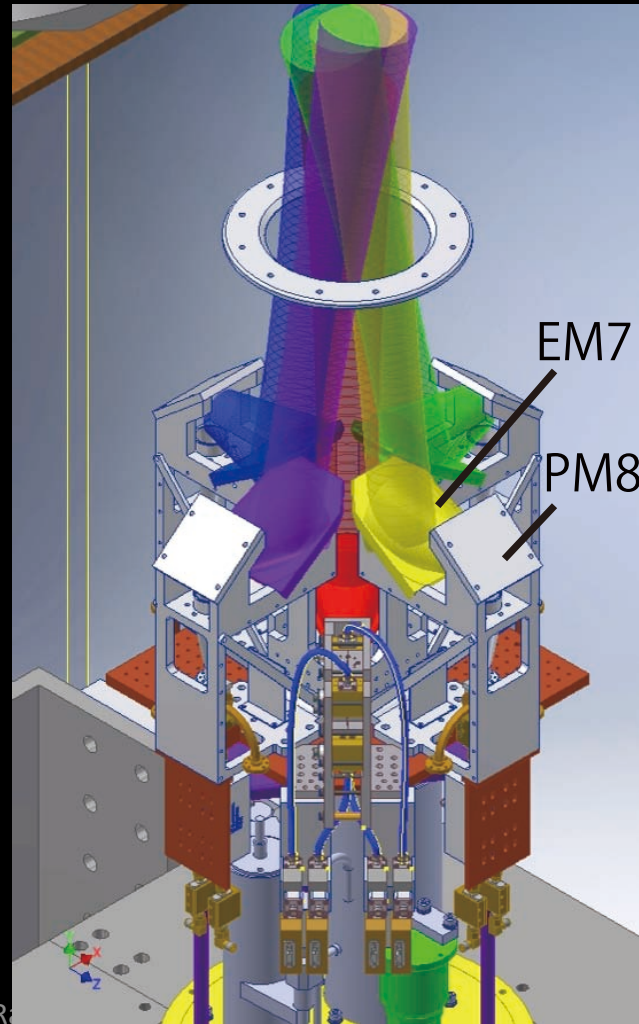
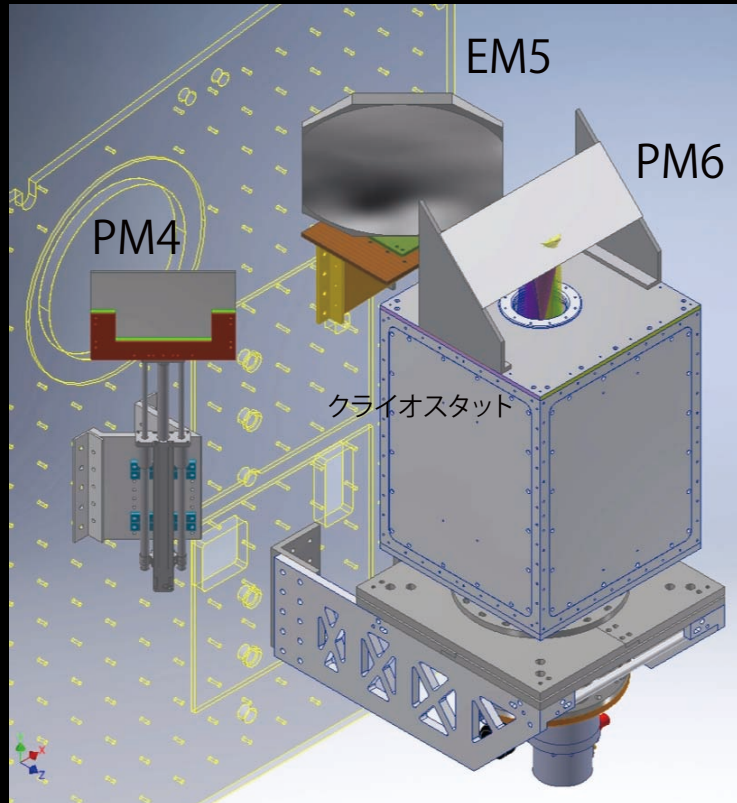
Fully sampled extremely-large scale ($\sim 0.7 \cdot 4\pi$ sr) CO survey

The NASCO multi-beam receiver

Warm optics

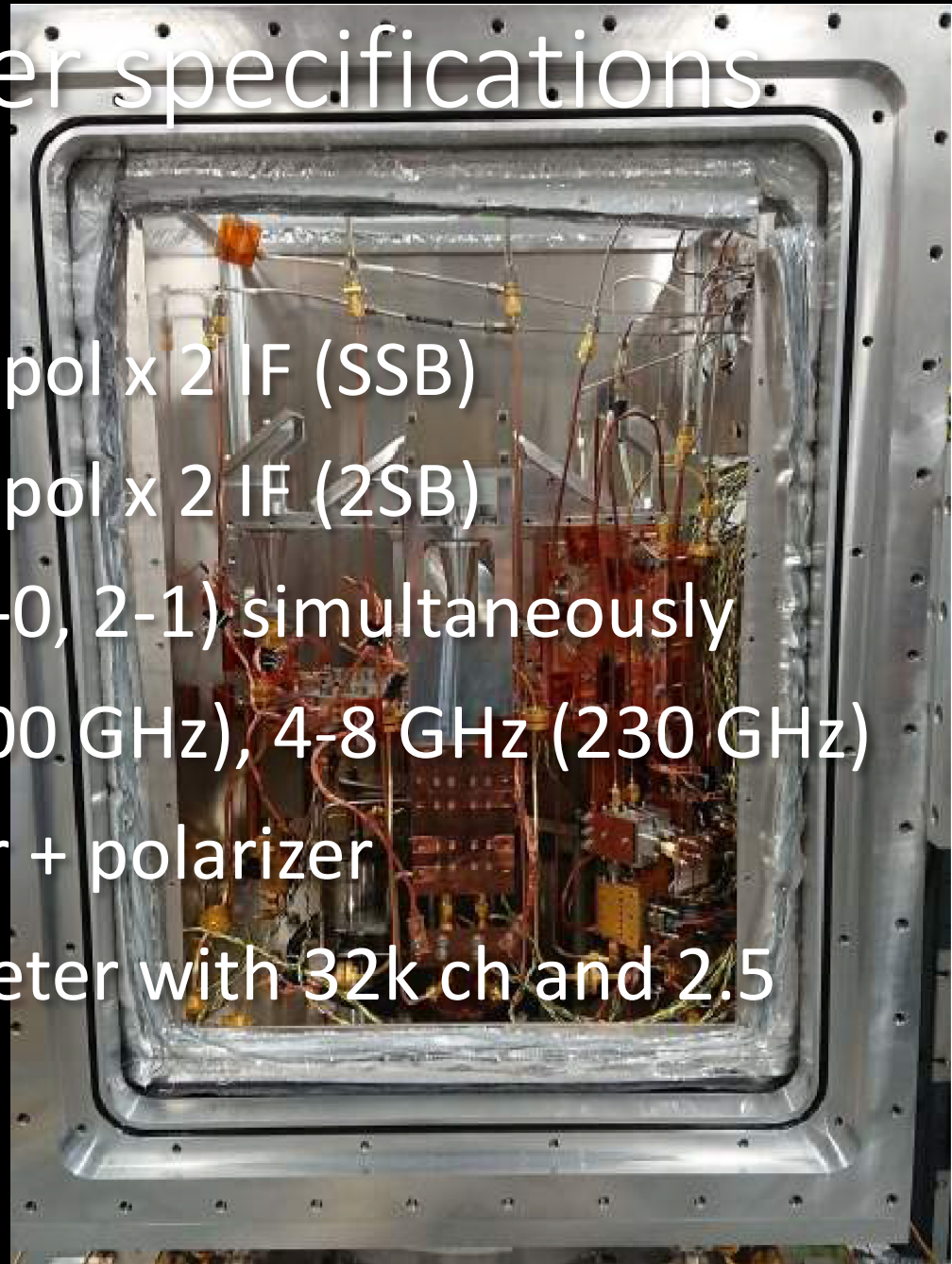
Cold optics

Gondola



NASCO receiver specifications

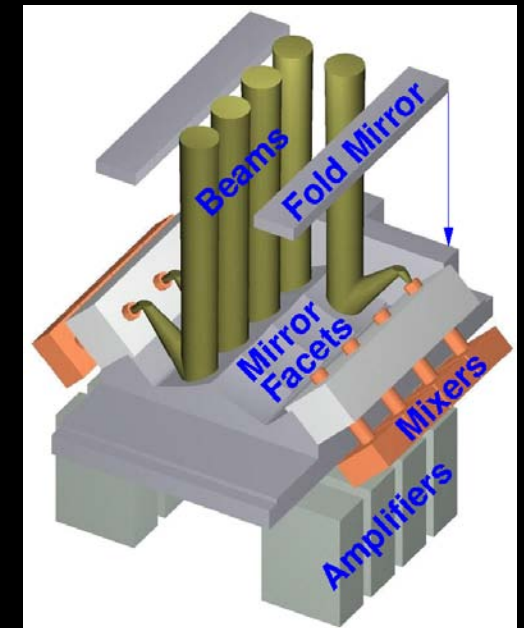
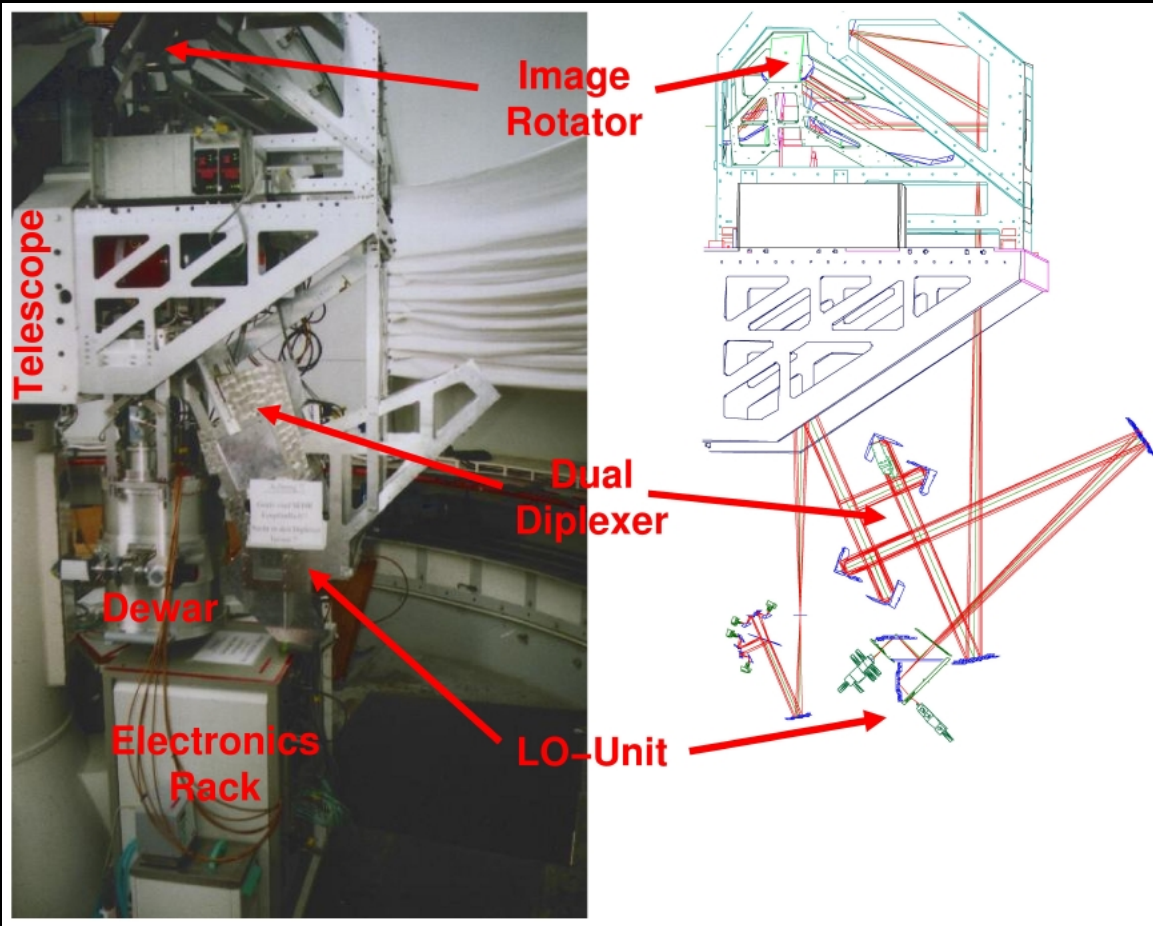
- 100 GHz: 4 beam x 2 pol x 2 IF (SSB)
- 230 GHz: 1 beam x 2 pol x 2 IF (2SB)
- ^{12}CO , ^{13}CO , C^{18}O (J=1-0, 2-1) simultaneously
- IF width 4-12 GHz (100 GHz), 4-8 GHz (230 GHz)
- Wave-guide SSB filter + polarizer
- RPG XFFTS spectrometer with 32k ch and 2.5 GHz BW



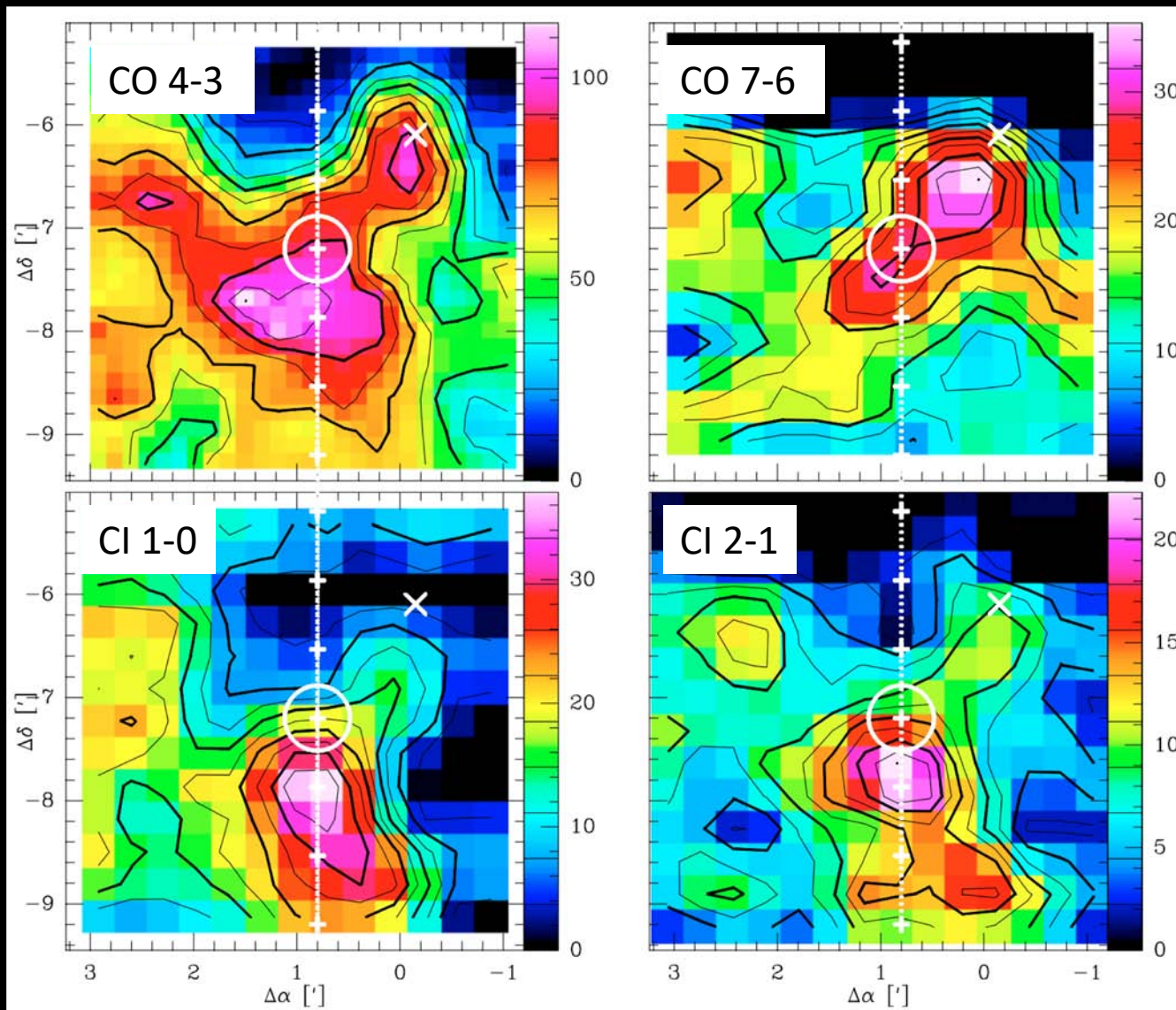
SMART submm Receiver

Developed by Universität zu Köln

4 x 2 pixel multi-beam
460 GHz, 800 GHz
CO (4-3, 7-6), CI (1-0, 2-1)
beam sizes (45", 25")
pixel distances (85")



460 / 800 GHz Results with SMART



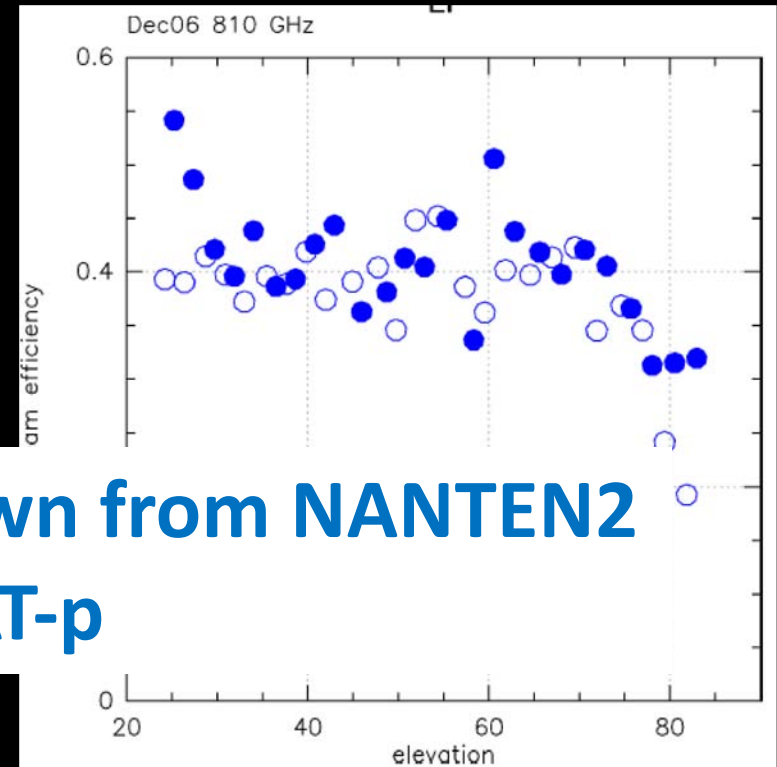
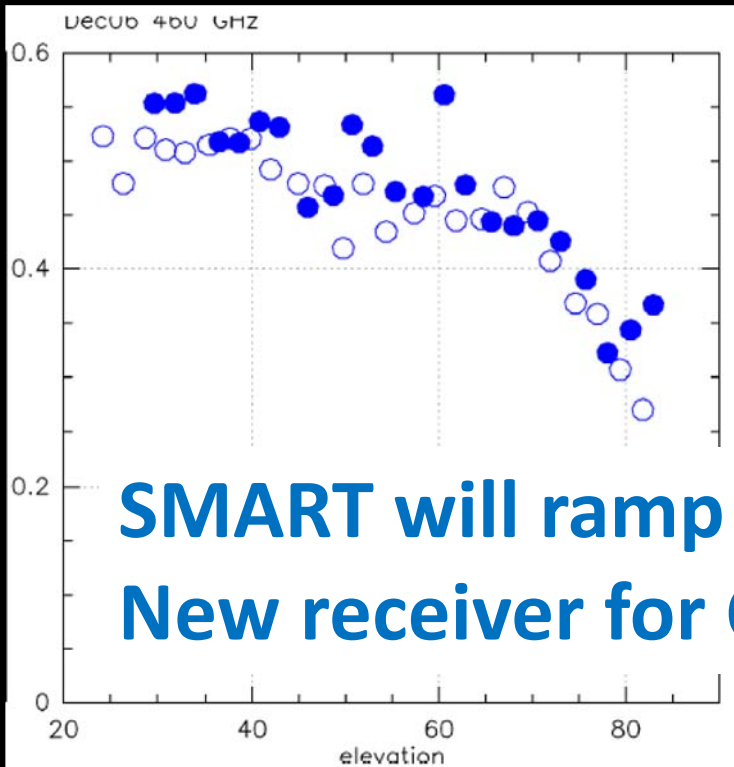
A part of
Carina GMC
4'x4' field

Clumpy PDR
(See also Mt.Fuji
telescope and
ASTE results)

Kramer+ 2008

Submm performance of NANTEN2 and SMART

| Freq. [GHz] | Main Beam | | Sensitivity | |
|-------------|--------------------|-------|------------------|--------------------------|
| | η_{MB} | HPBW | T_{rec} | T_{sys} (EI=80) |
| 490 | 0.50 | 38.0" | 250 K | 1710 K |
| 810 | 0.45 | 26.5" | 450 K | 4240 K |



SMART will ramp down from NANTEN2
New receiver for CCAT-p

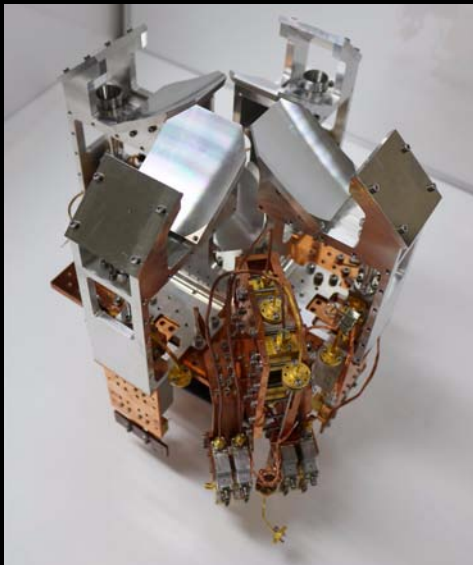
New submm capability of NANTEN2

- 新しいNANTEN2搭載サブミリ波受信機の検討
- ALMA Band 8, Band 10を買う？
 - ALMAのための技術開発の波及効果
 - コミュニティで共同利用？
- 2バンド同時観測はできないか？
 - サブミリ波周波数分離ミラーの開発？
- いっそALMAカートリッジデュワーを搭載？
 - 新しいアイデアの受信機開発のテストベンチとして利用？
 - 名古屋大学理学部装置開発室も利用可
- 高い教育的価値

Receiver Spec

| | NASCO | | ALMA Band 8 | ALMA Band 10 |
|--------------------|-----------|-----------|-------------|--------------|
| # Beams | 4 | 1 | 1 | 1 |
| Freq. [GHz] | 109 - 116 | 218 - 232 | 385 - 500 | 787 - 950 |
| Polarization | 2 | 2 | 2 | 2 |
| Sidebands | SSB | 2SB | 2SB | DSB |
| IF Freq. [GHz] | 4 - 12 | 4 - 8 | 4 - 8 | 4 - 12 |
| T_{Rx} (SSB) [K] | 100 | 100 | 150 | 200 |

NASCO Rx



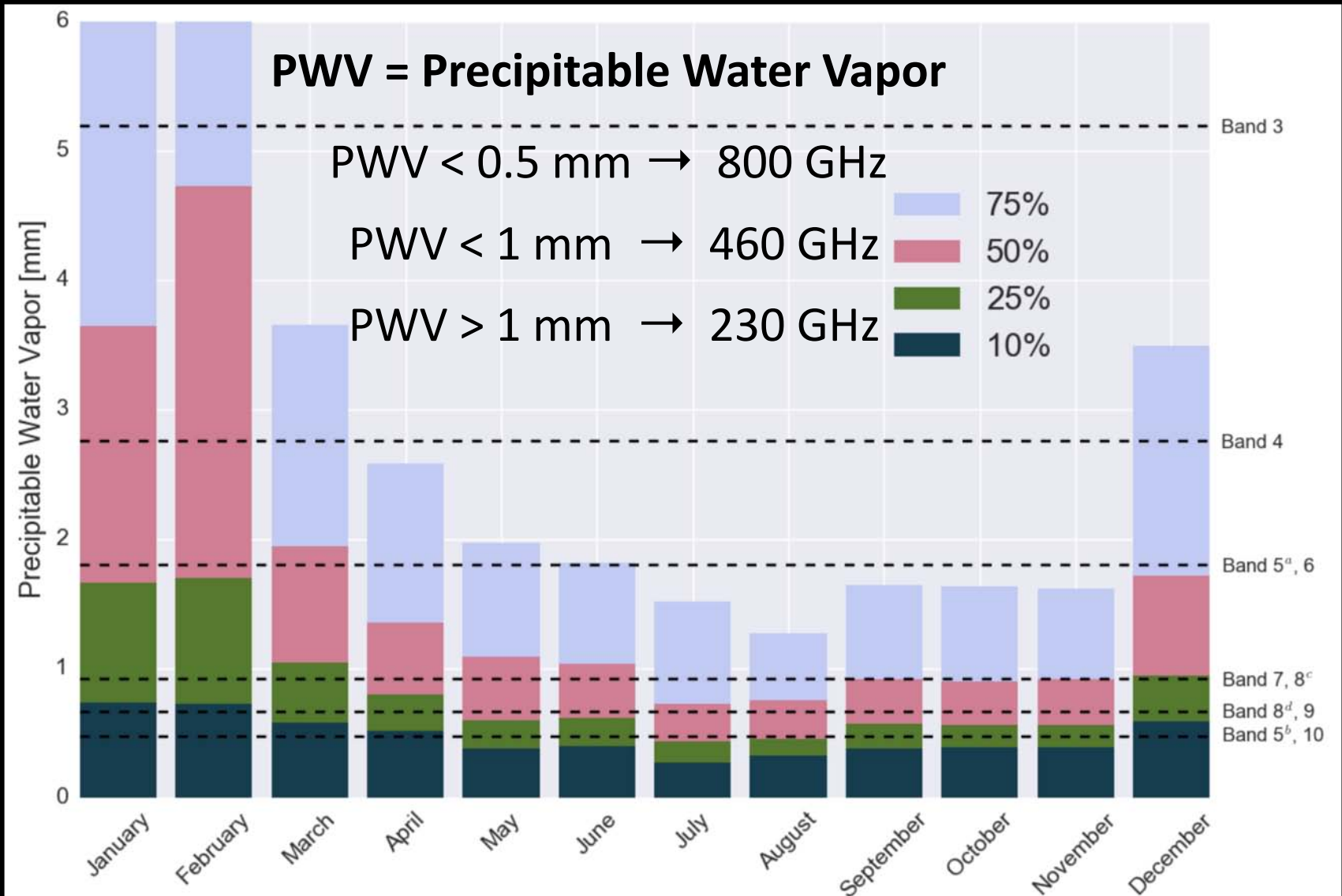
ALMA Band 8/10 Rx



XFFTS 16ch



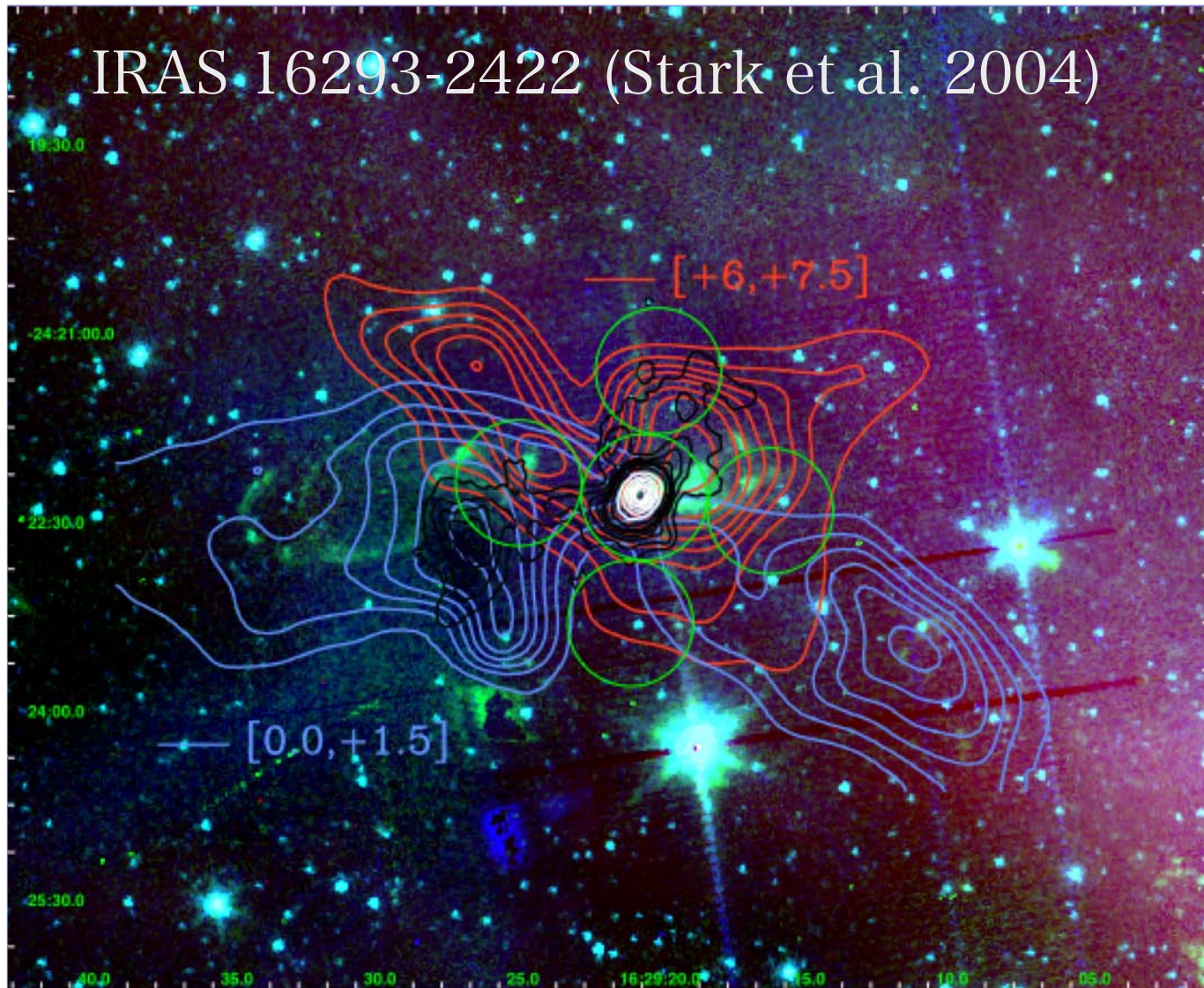
Choice : mm or submm



Science cases

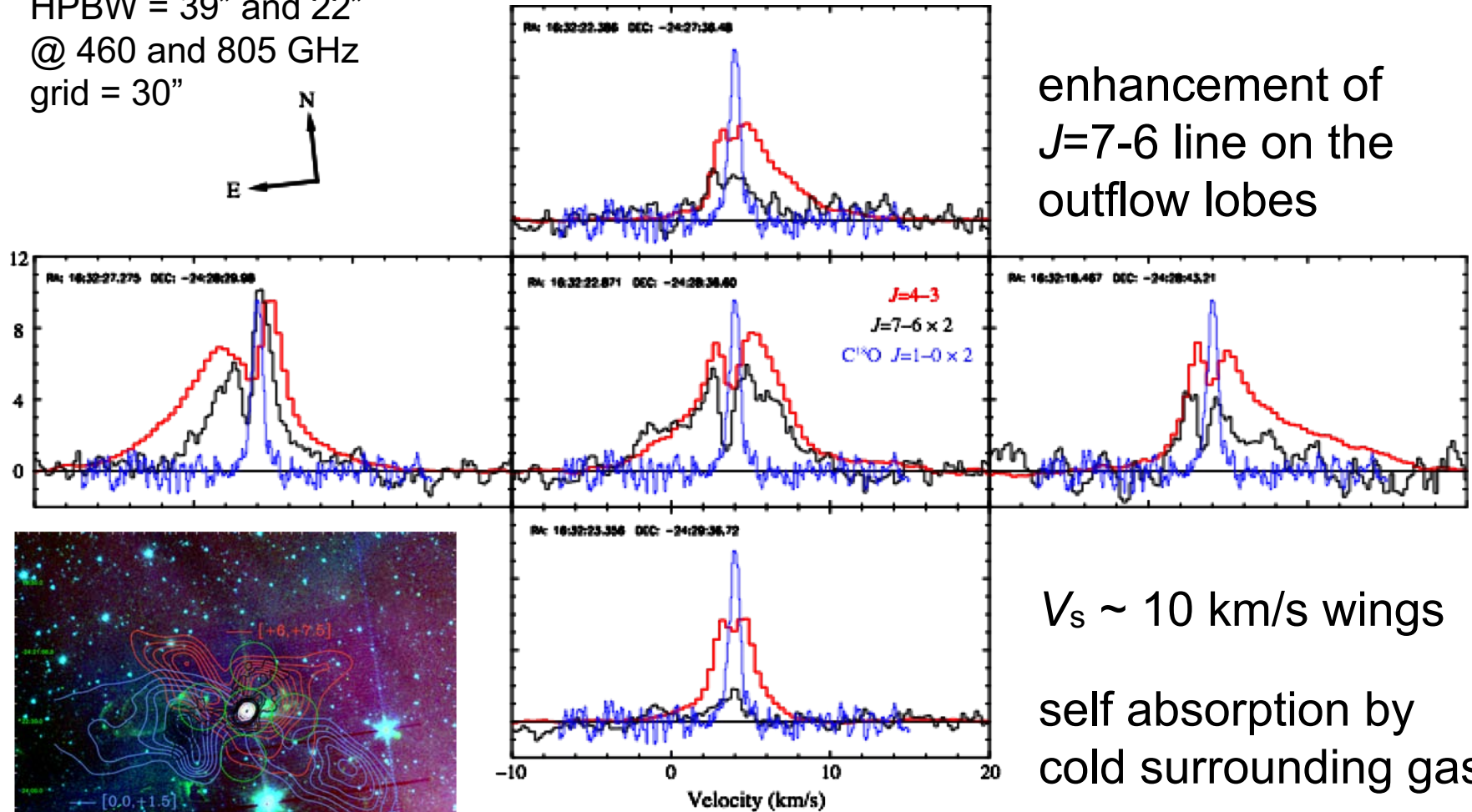
- CI/CO比で調べる f_{mol} の変化
 - 分子雲-PDRの形成進化, 低メタル環境, 銀河進化
- 系外銀河のCOガス探査
- 大質量星形成：warm gasでhot coreの探査
- ショック領域：SNR分子雲相互作用領域
- 小質量星形成：うもれた分子流天体

Case of Class 0 outflow



Case of Class 0 outflow

HPBW = 39" and 22"
 @ 460 and 805 GHz
 grid = 30"



enhancement of
 $J=7-6$ line on the
 outflow lobes

$V_s \sim 10$ km/s wings

self absorption by
 cold surrounding gas

皆さんのご意見をください

Fin.

