

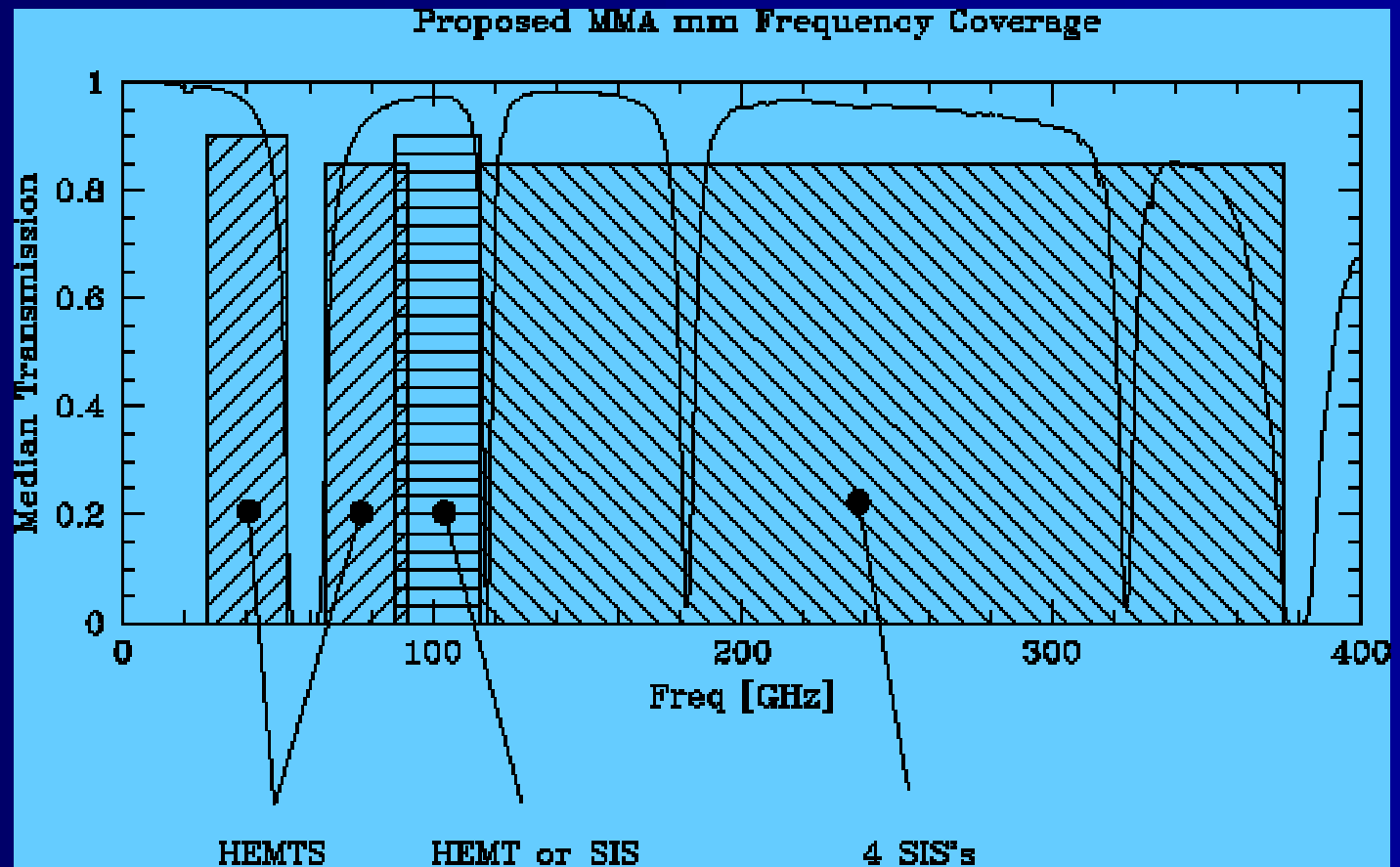
A Tour of the Radio Sky

J. J. Condon

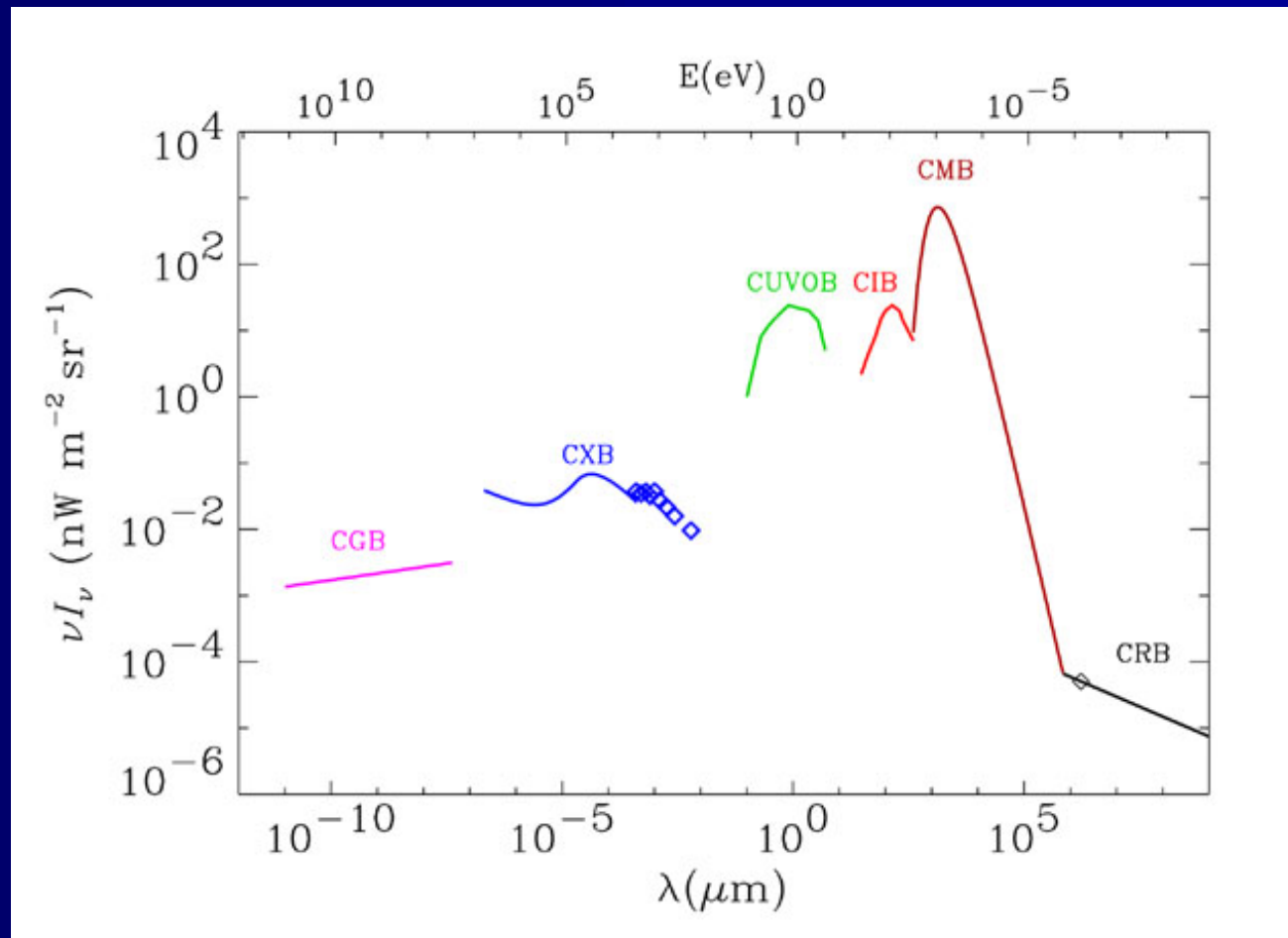


NAIC/NRAO School on Single-dish Radio Astronomy 2003

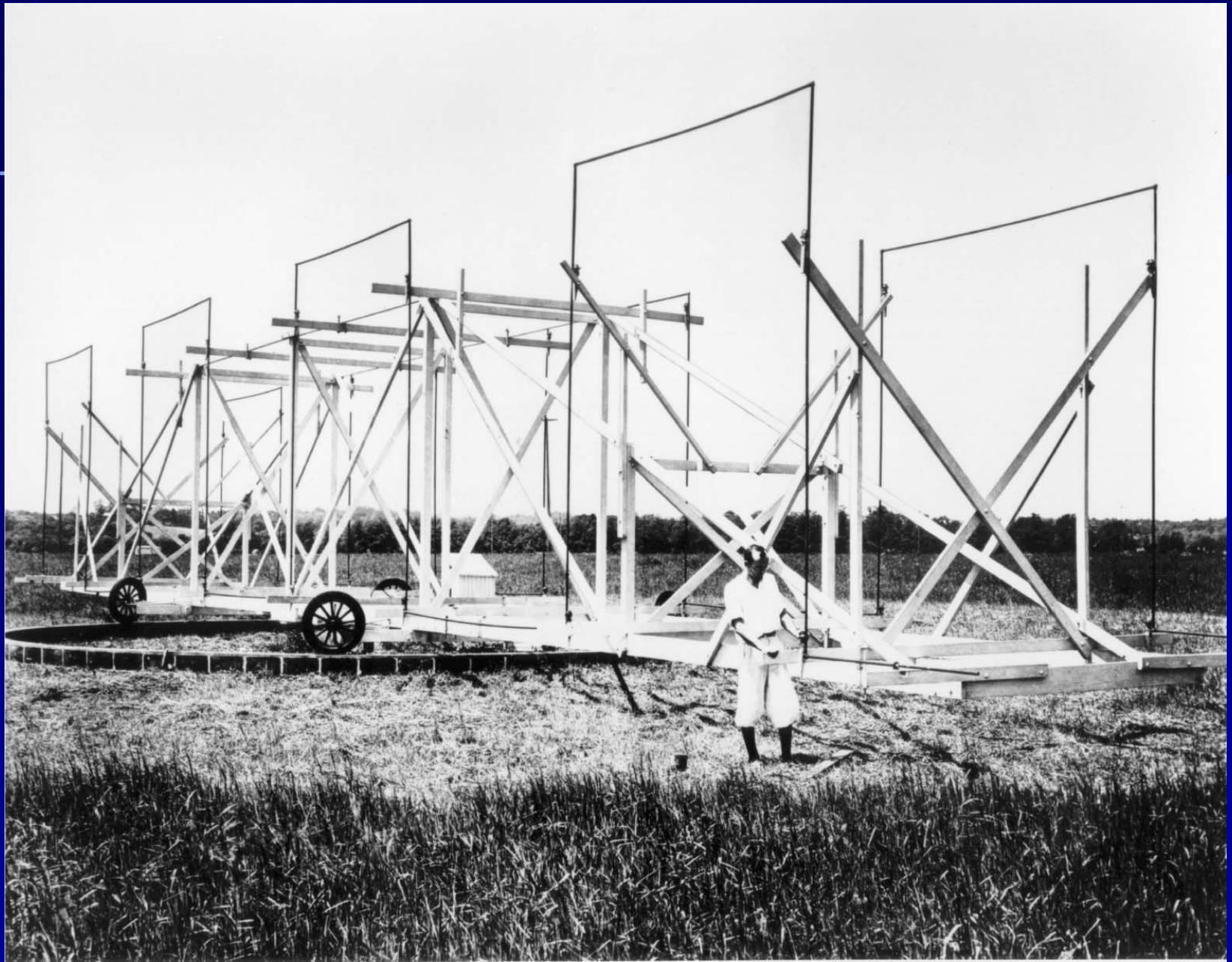
“Radio” frequency range defined by atmospheric transmission and receiver technology



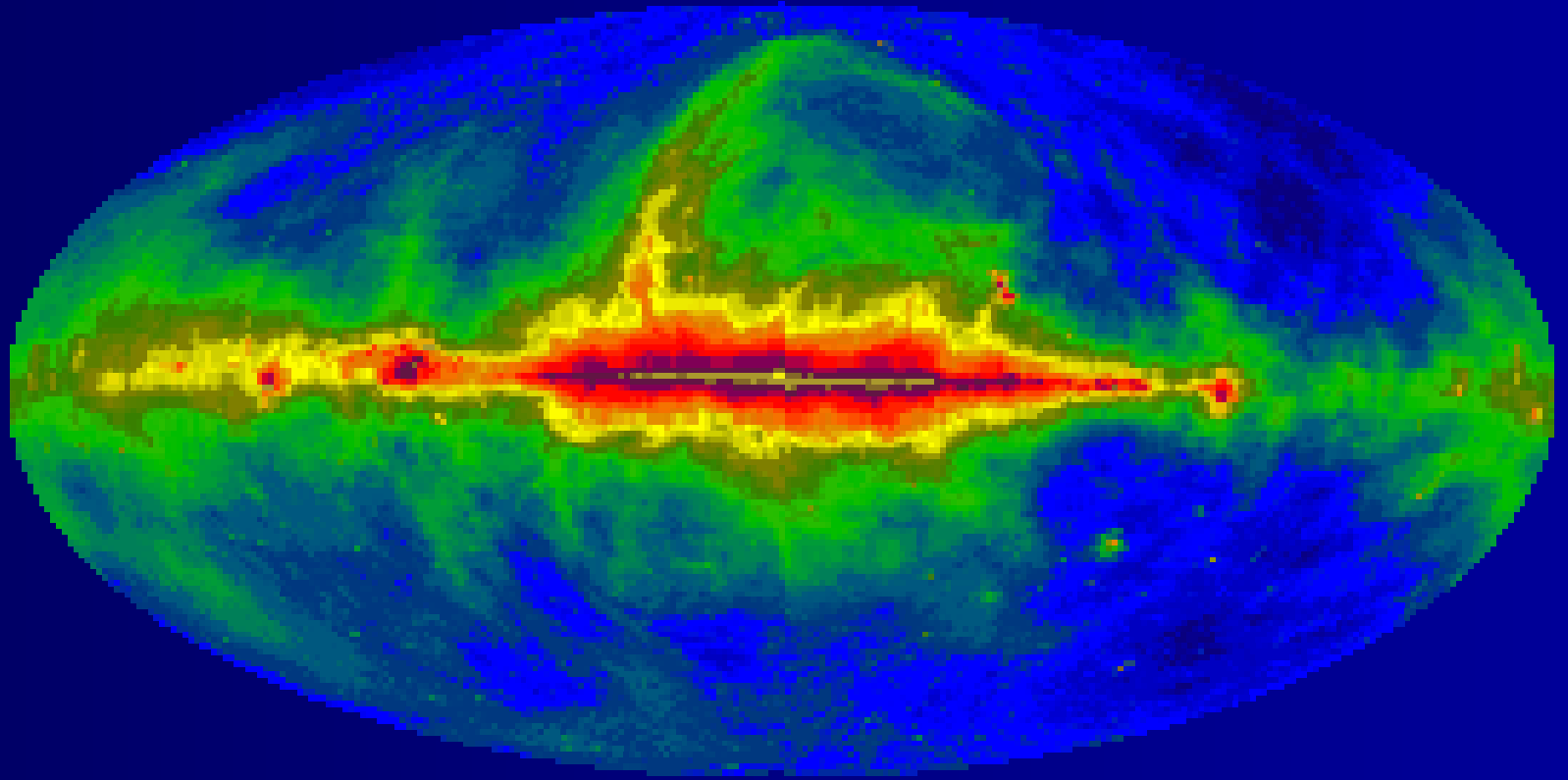
Electromagnetic energy spectrum of the universe



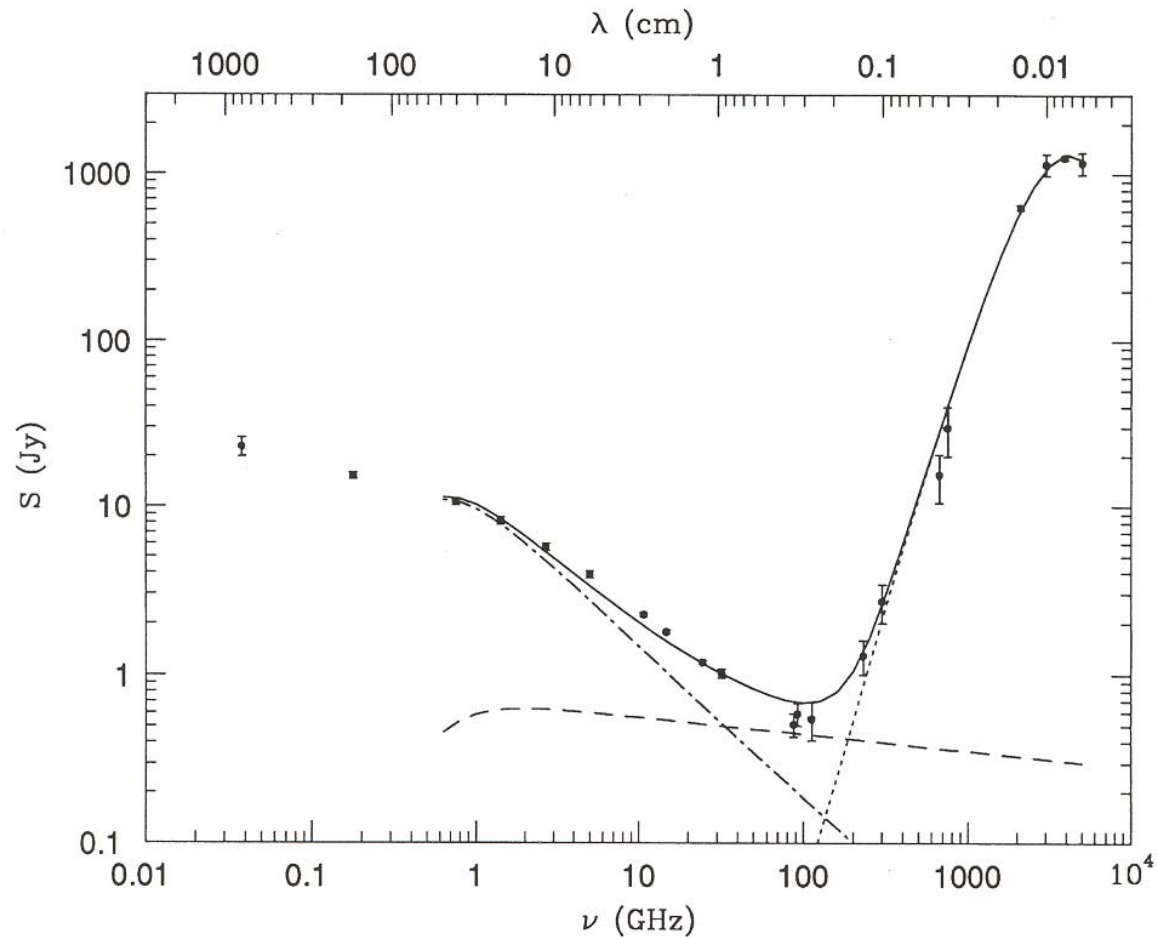
Karl Jansky and the first radio telescope



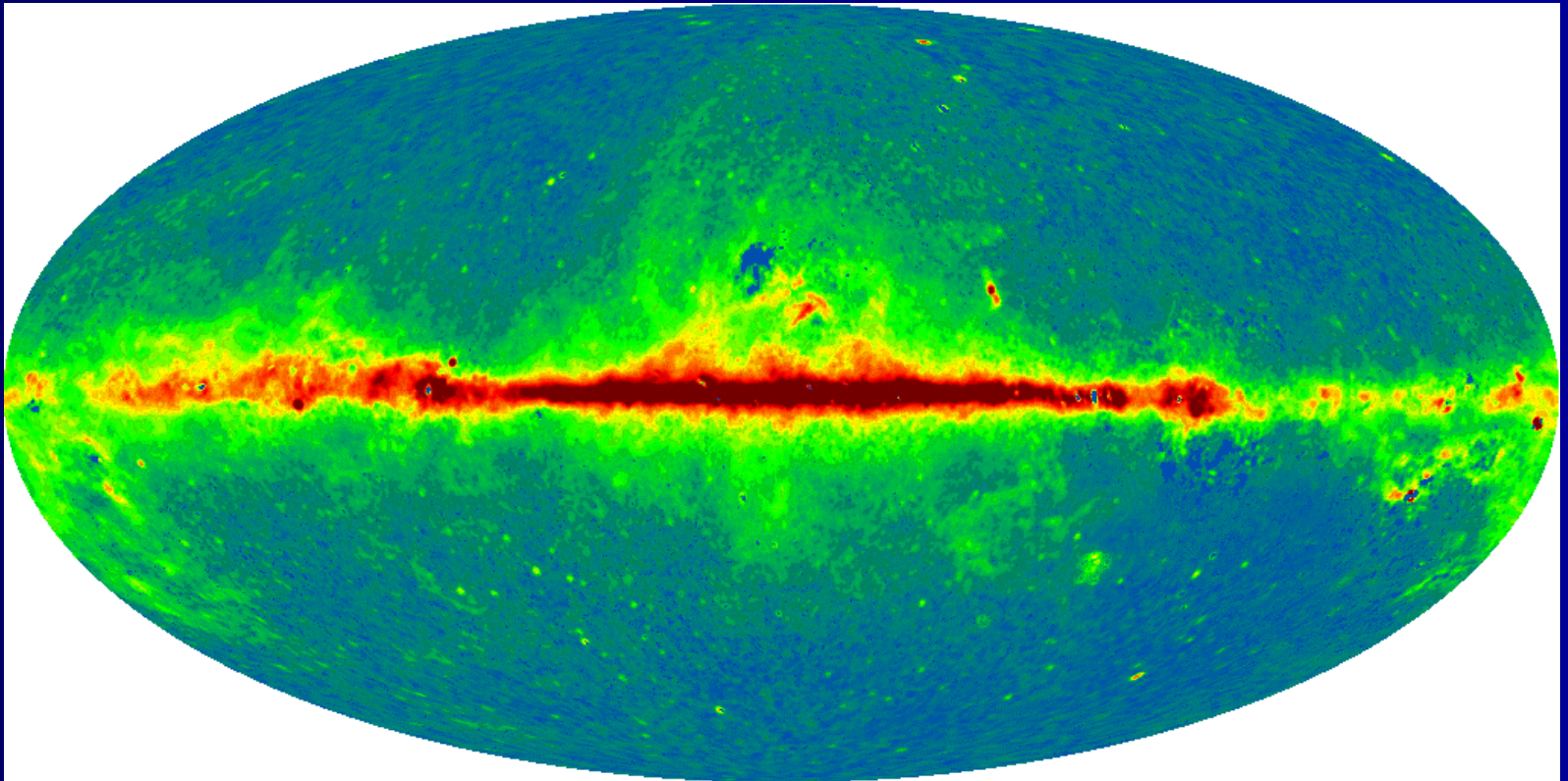
408 MHz continuum emission, galactic coordinates



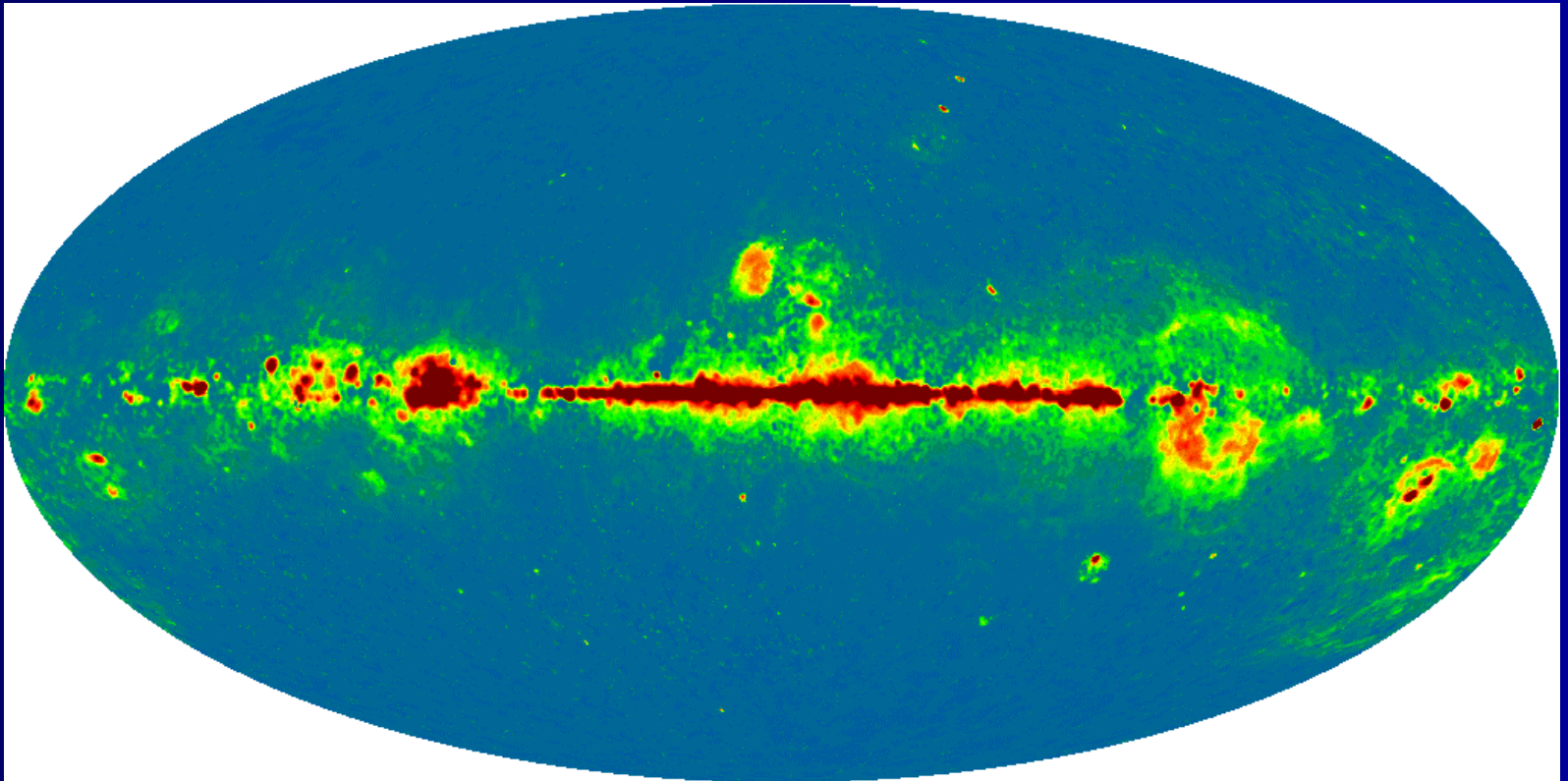
Synchrotron (dash-dot curve), free-free (dashes), and dust (dots) spectra typical of most spiral galaxies



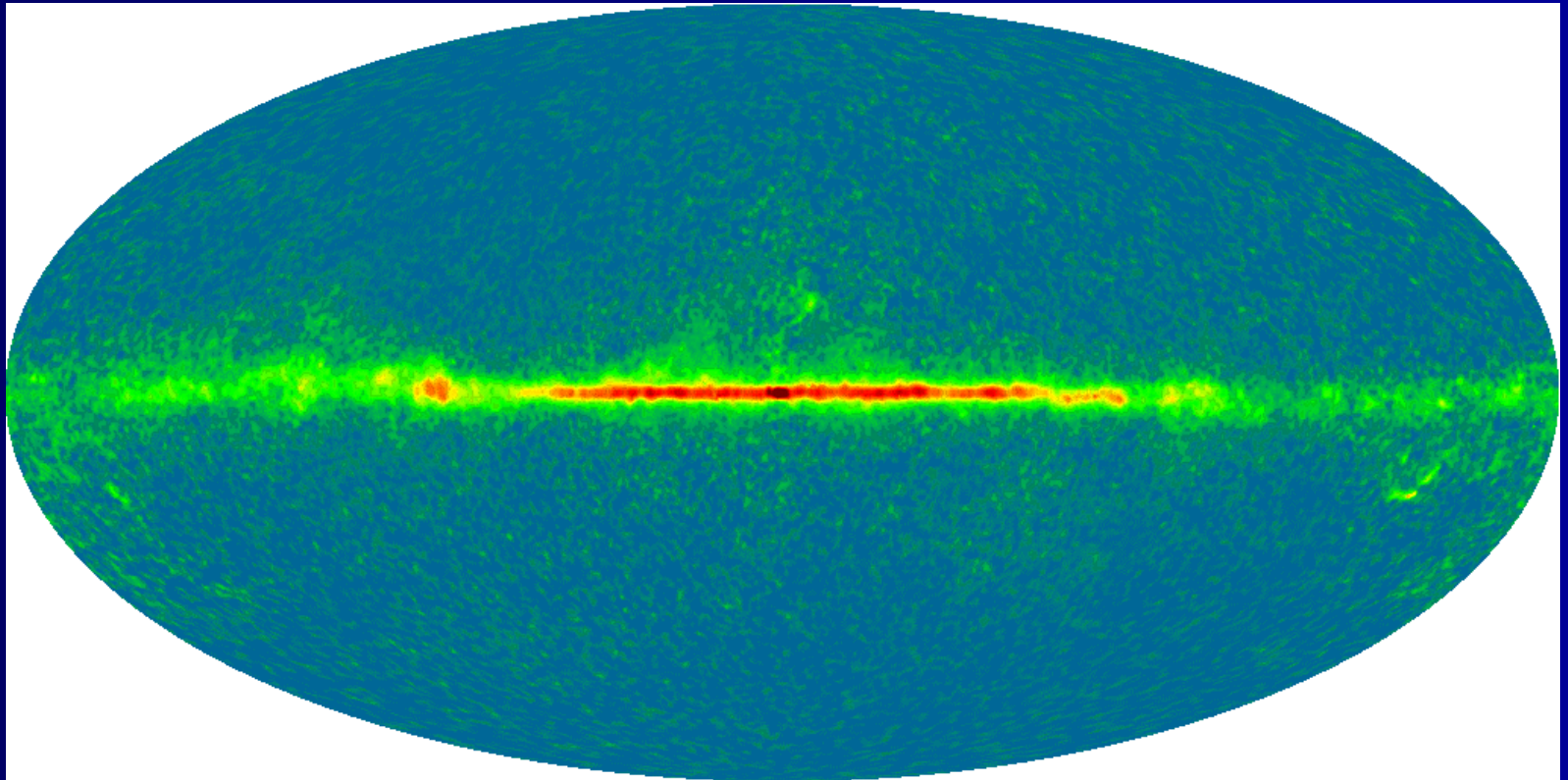
Galactic synchrotron emission (WMAP)



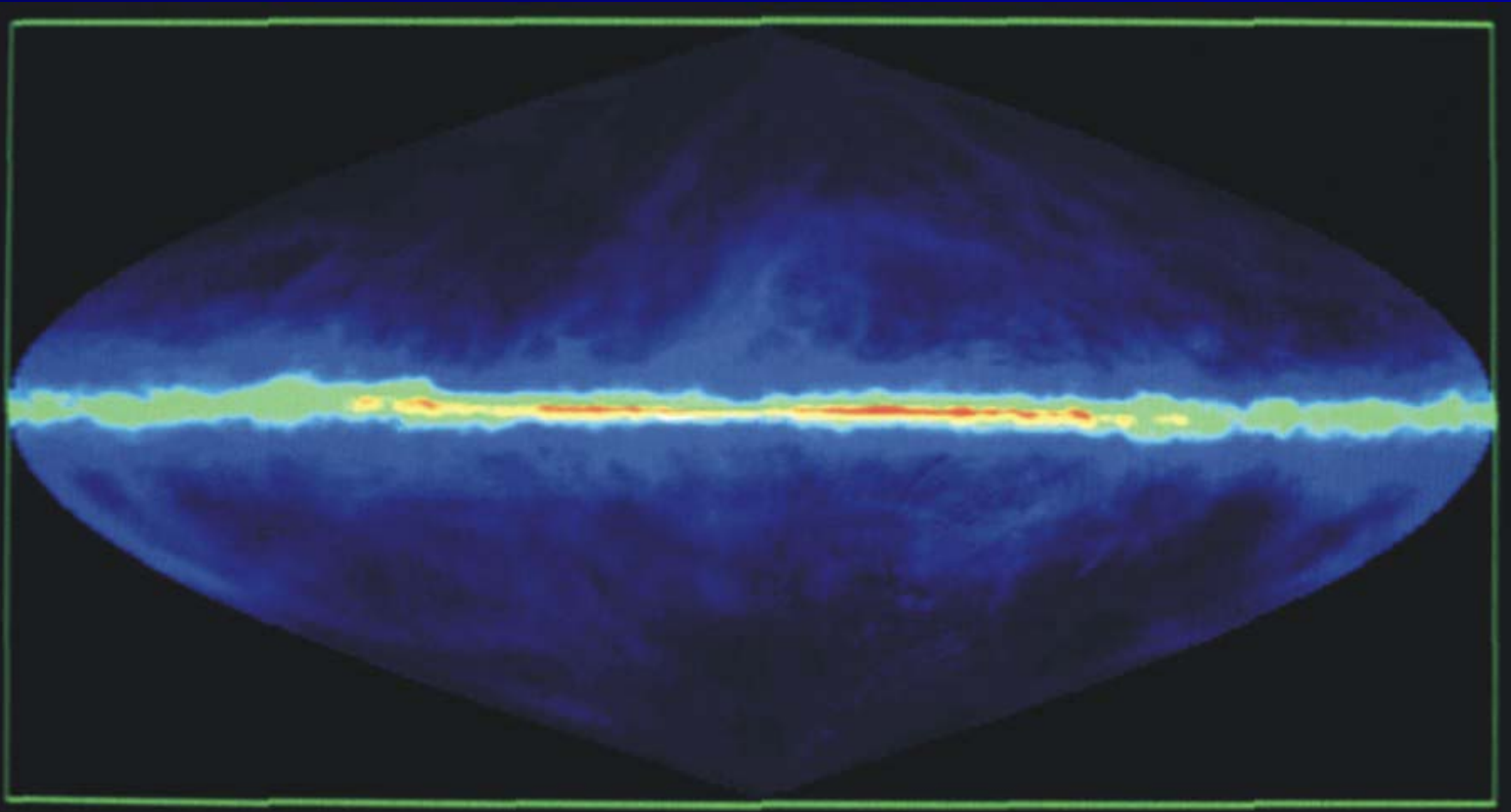
Galactic free-free emission (WMAP)



Galactic thermal dust emission (WMAP)



1420 MHz HI line emission, galactic coordinates



115 GHz CO emission and optical dust absorption,
first quadrant of the Galaxy





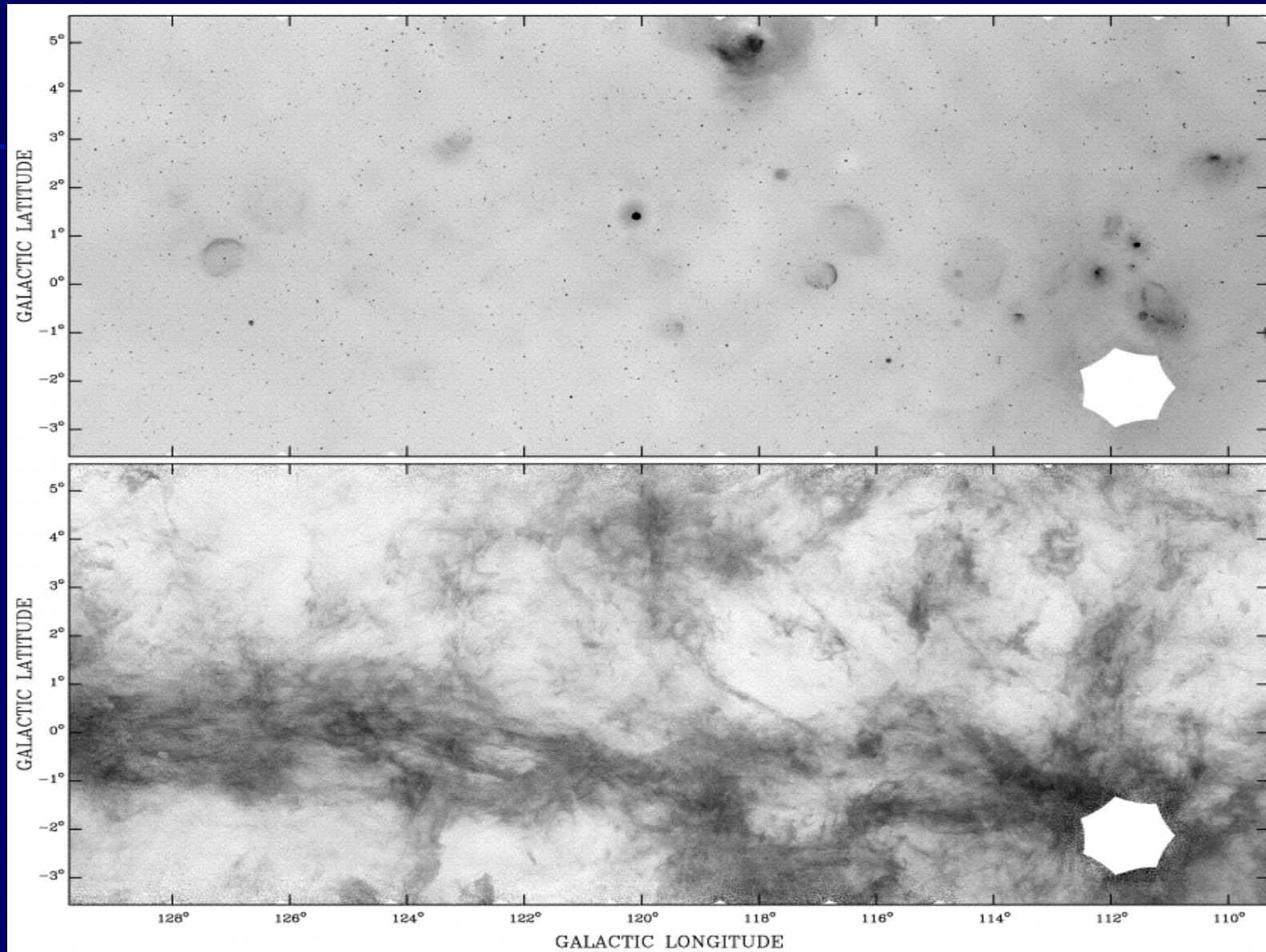
4.85 GHz
sky over
Green Bank



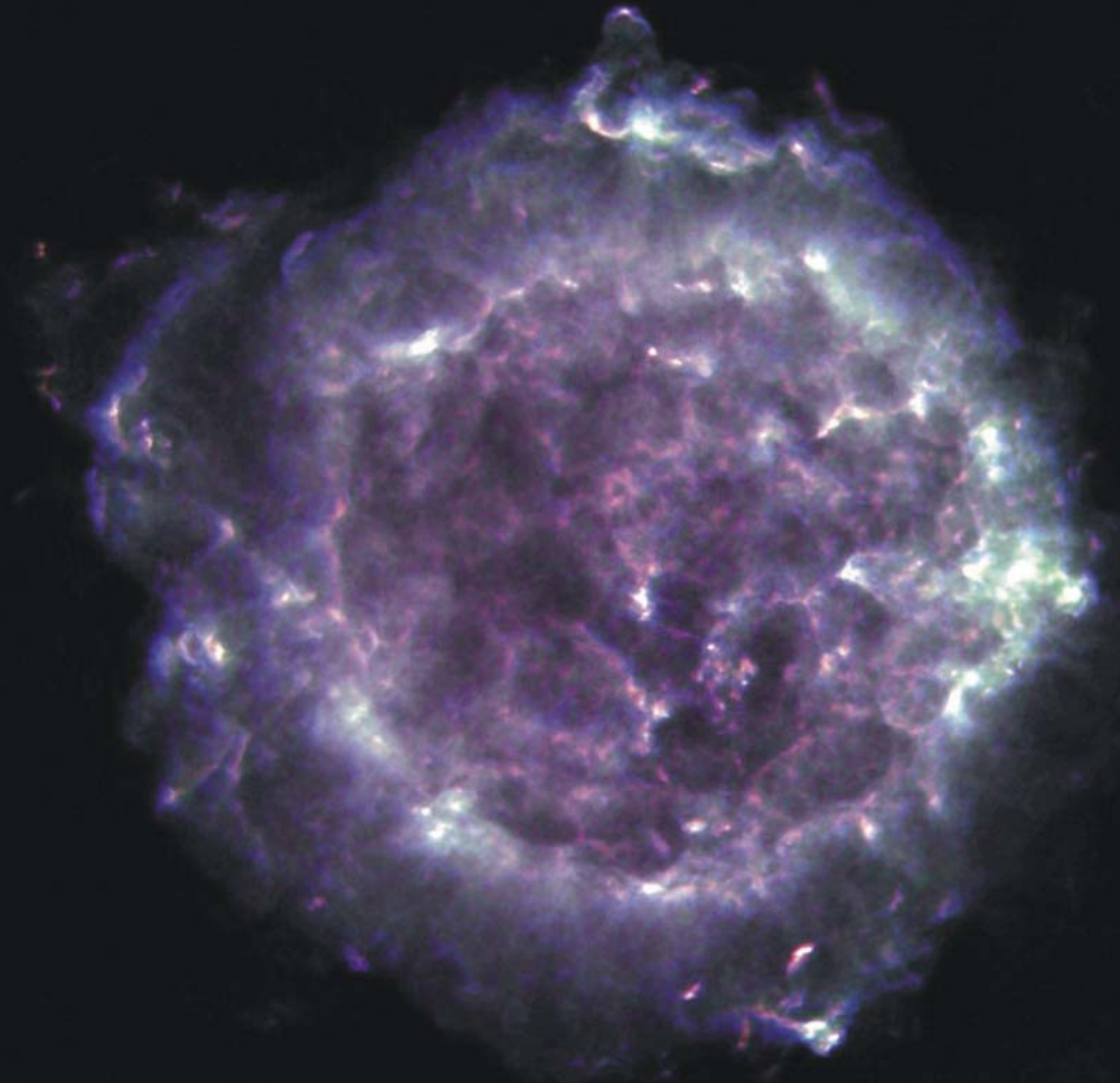
VLA (1 km D-configuration)



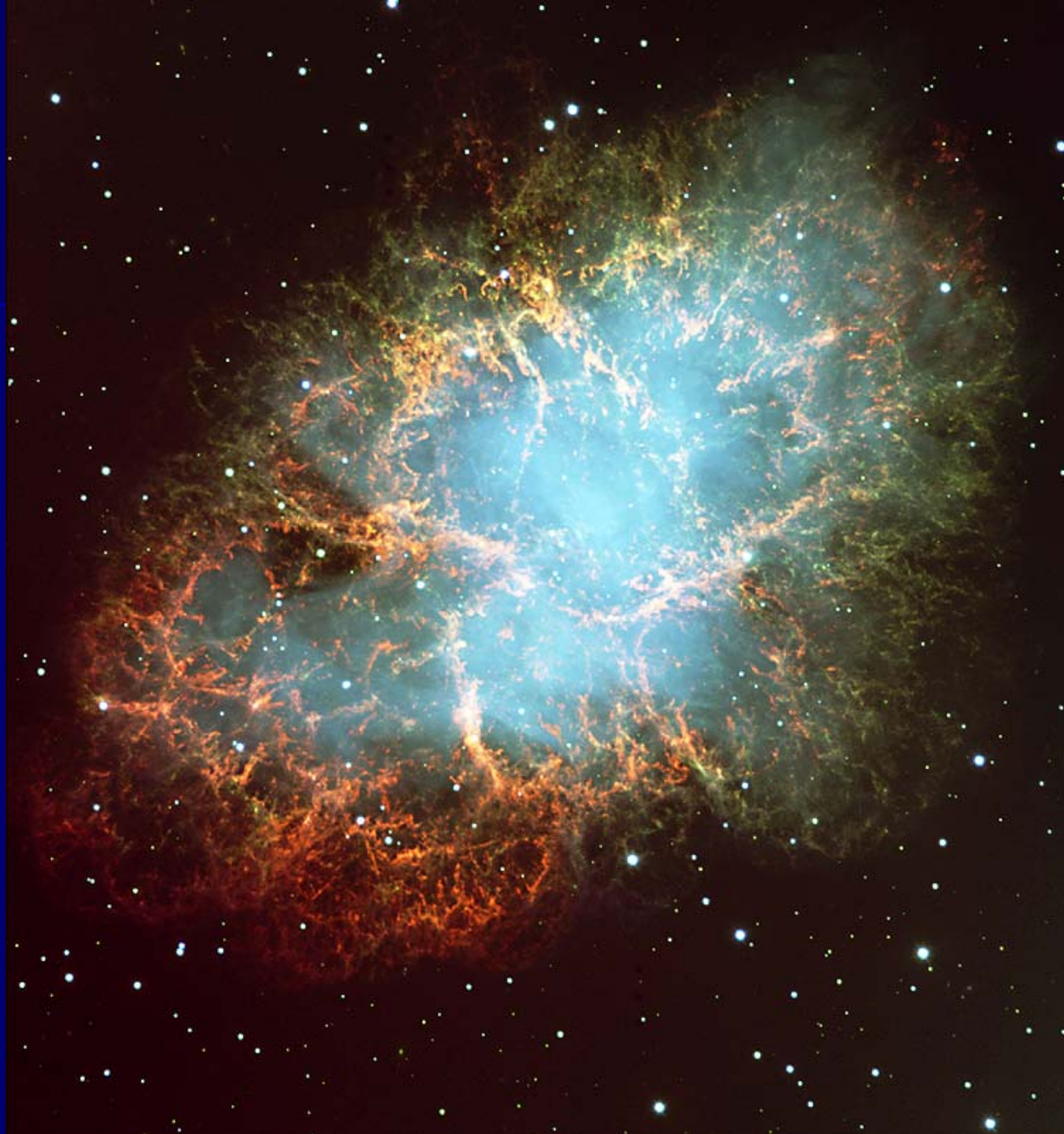
CGPS 21 cm continuum and HI



Cas A:
supernova
remnant
at 1.4, 5, and
8 GHz



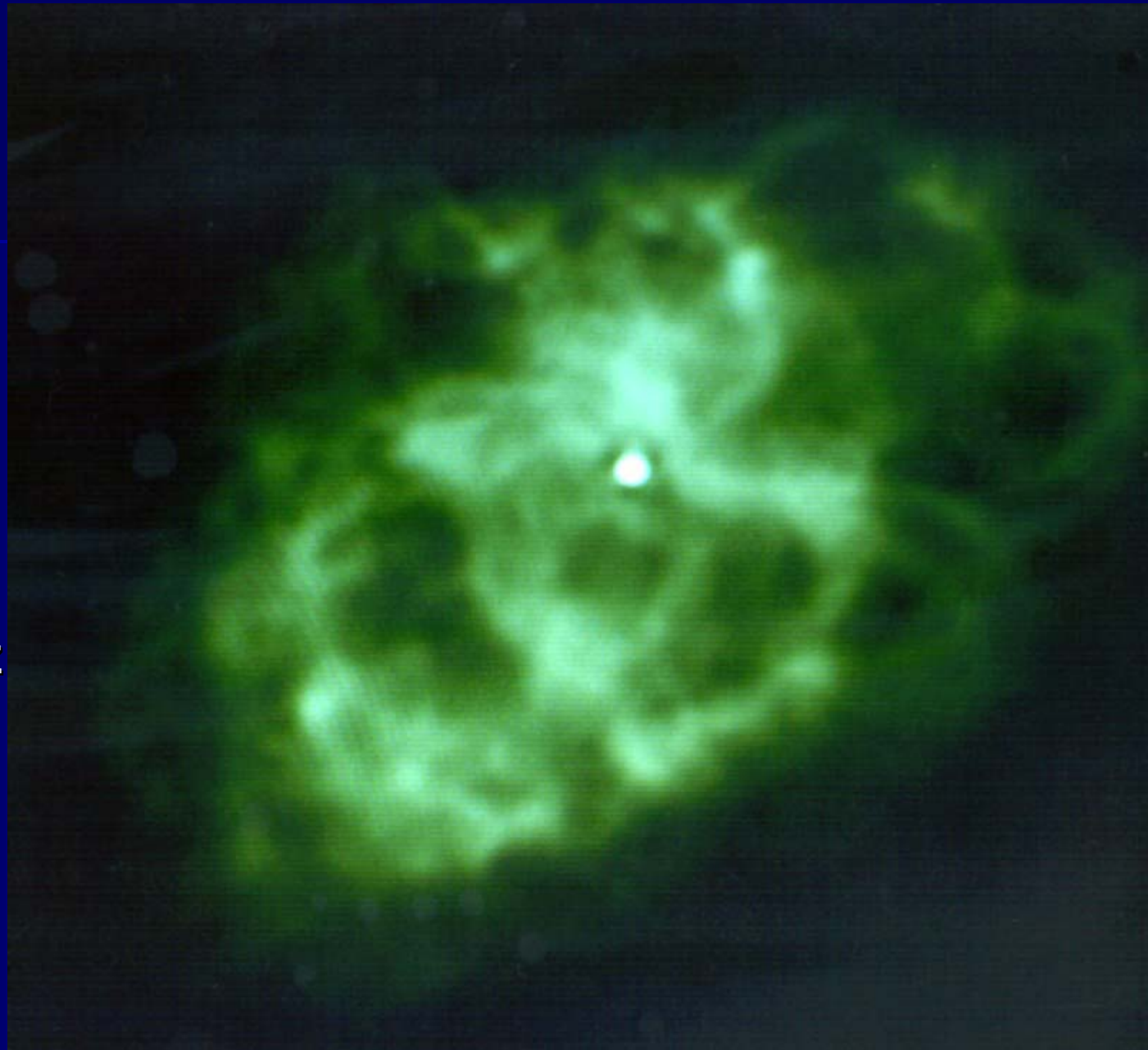
Crab Nebula
remnant of
1054 AD
supernova



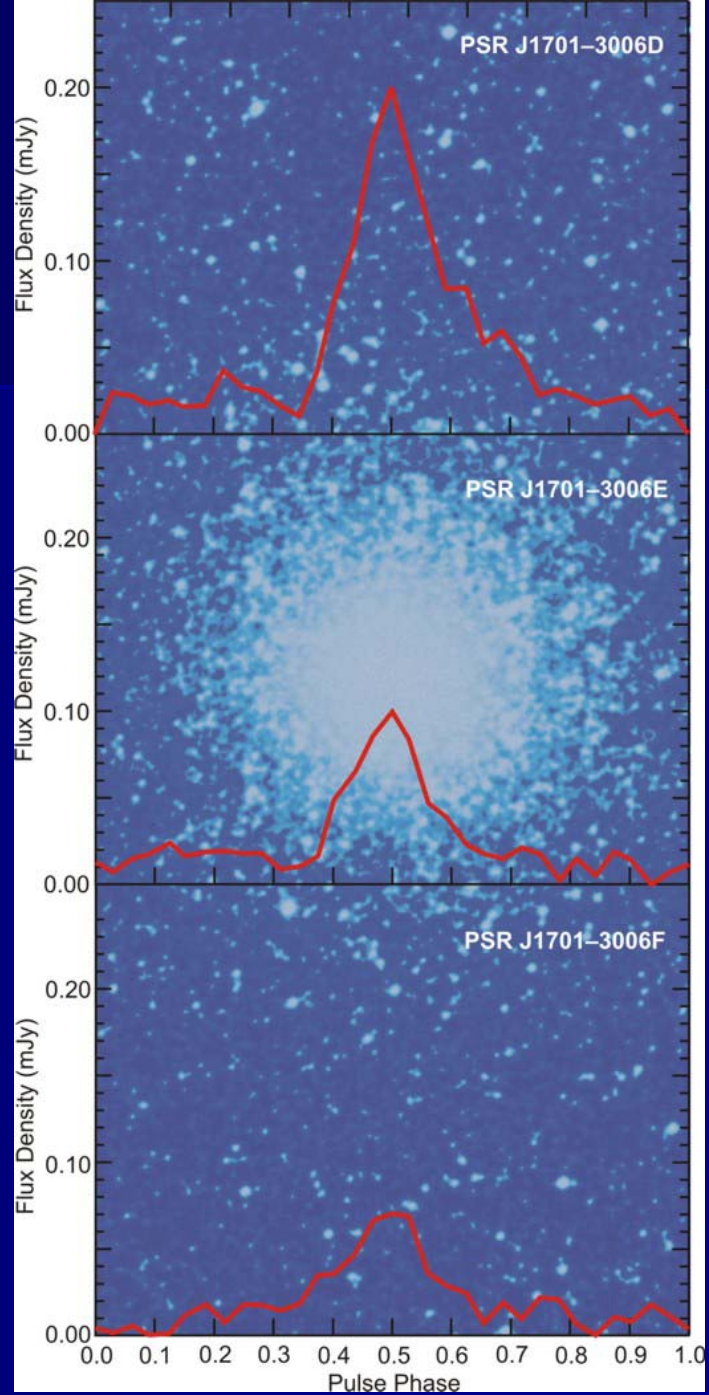
Crab
nebula
5 GHz
image



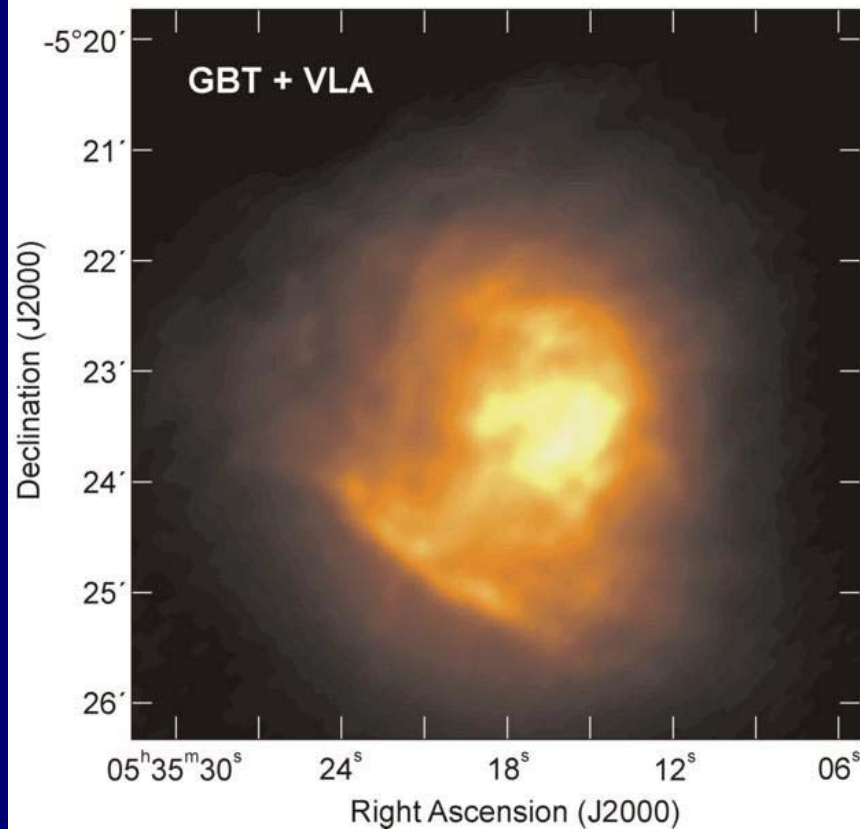
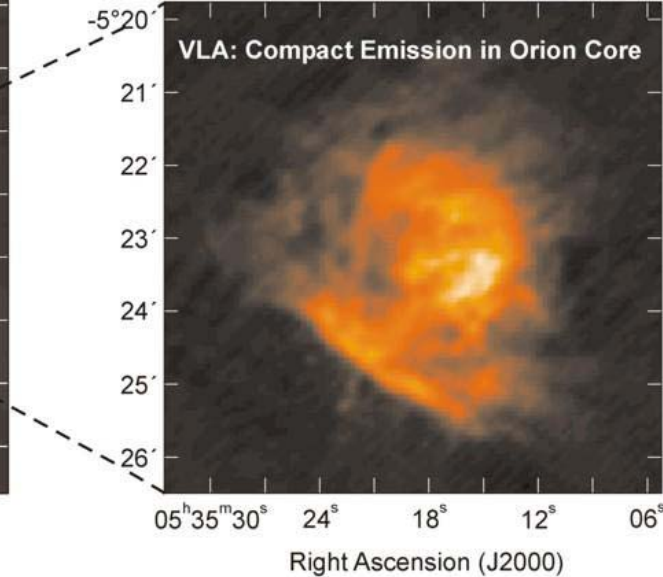
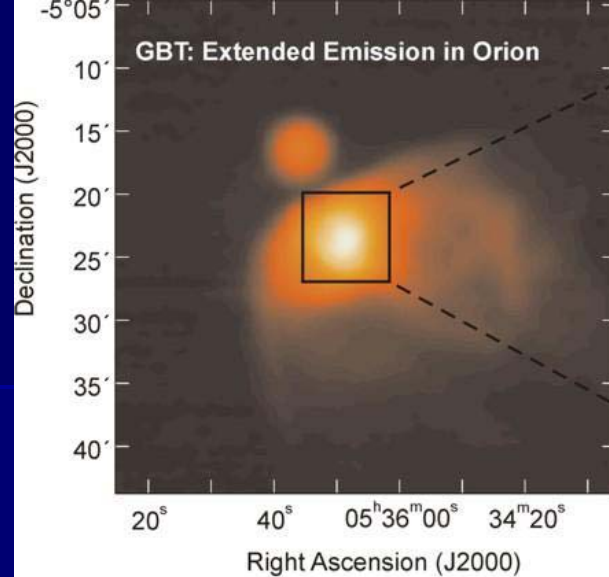
Crab
nebula
and pulsar
at 327 MHz



M62 pulsars



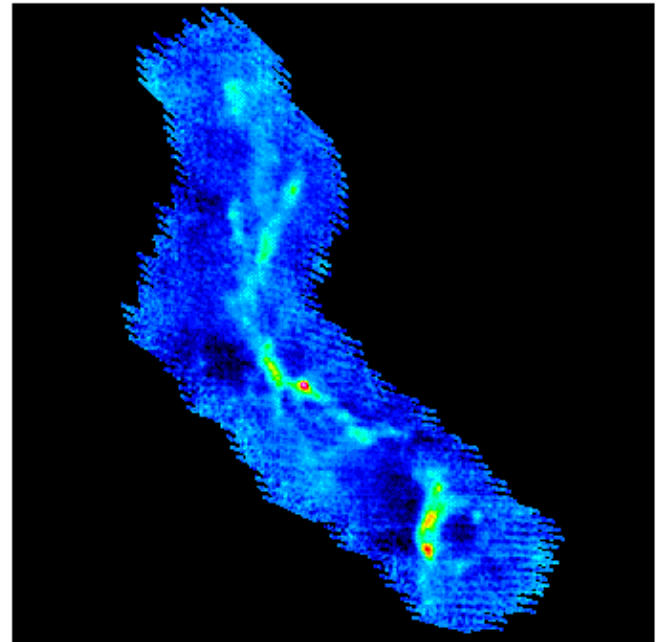
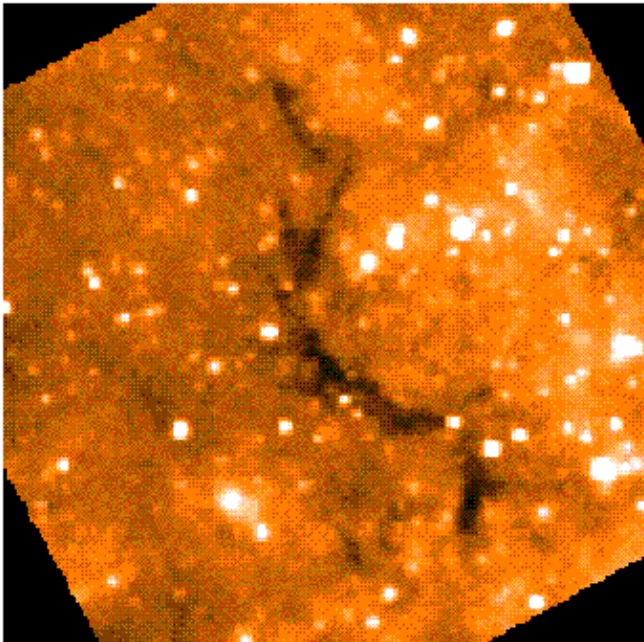
Orion
Nebula
HII region
8.4 GHz



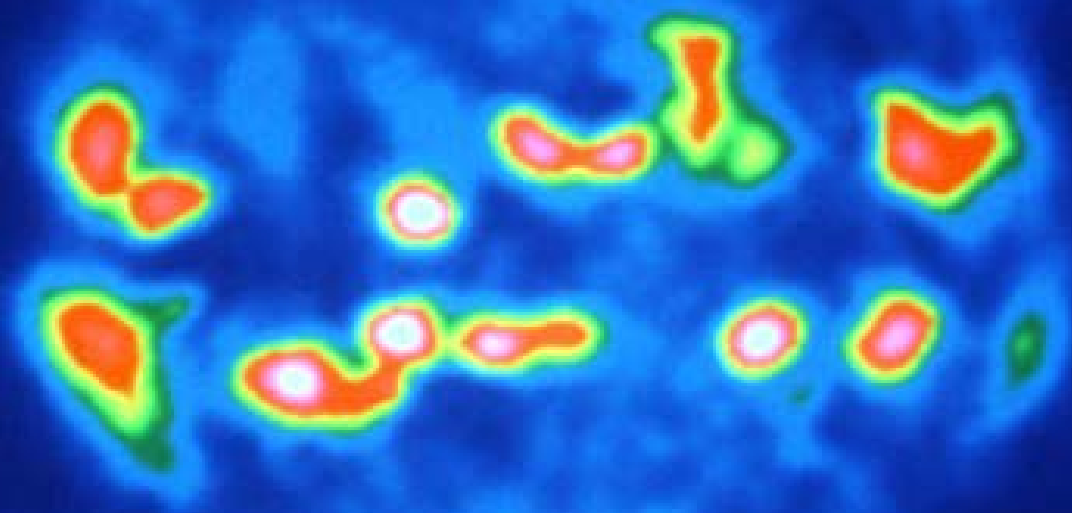
Orion Nebula
CO emission



The Galactic dark cloud G11.11-0.12 in absorption at 8 microns (left) and emission at 850 microns (right)







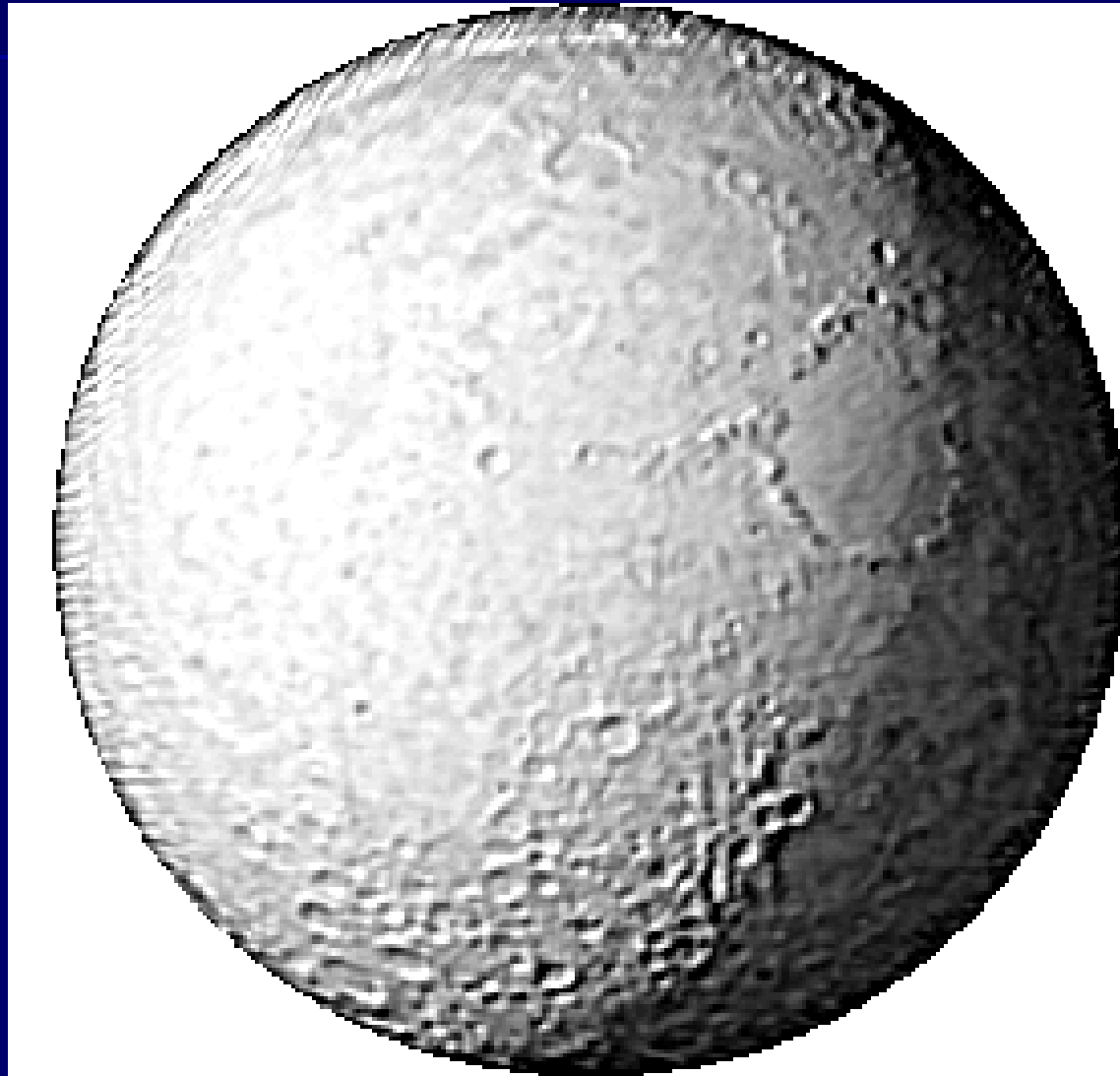
SUN

ULA

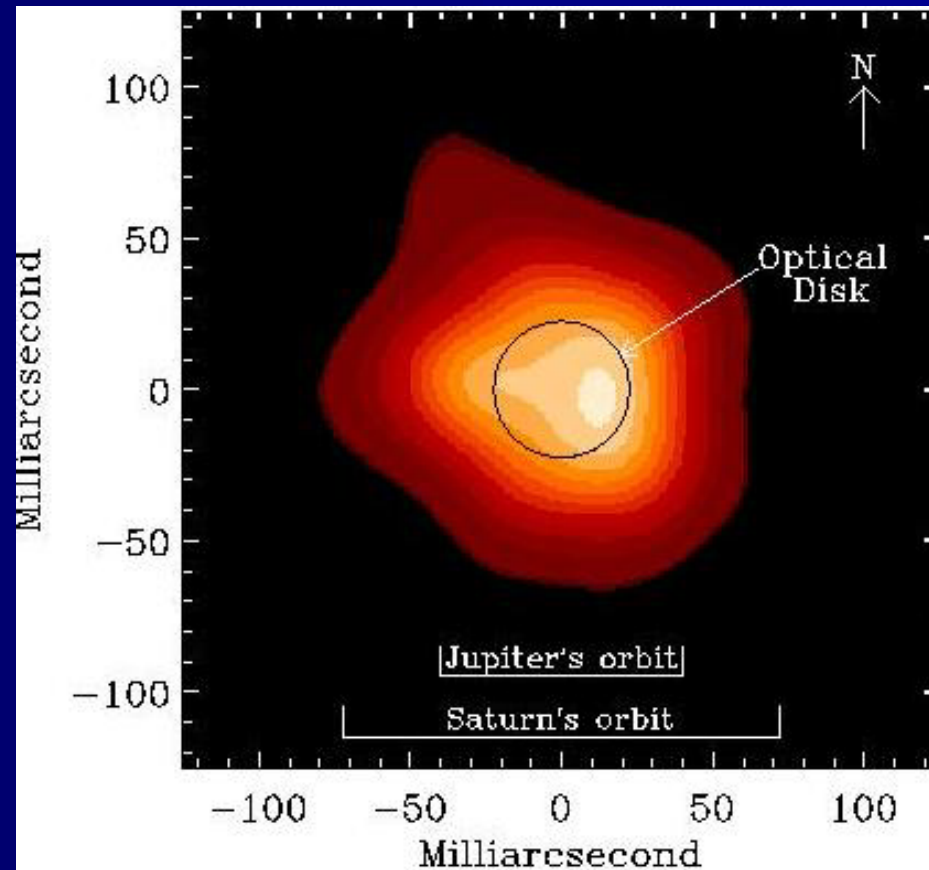
1981 Sep 26

1.4 GHz

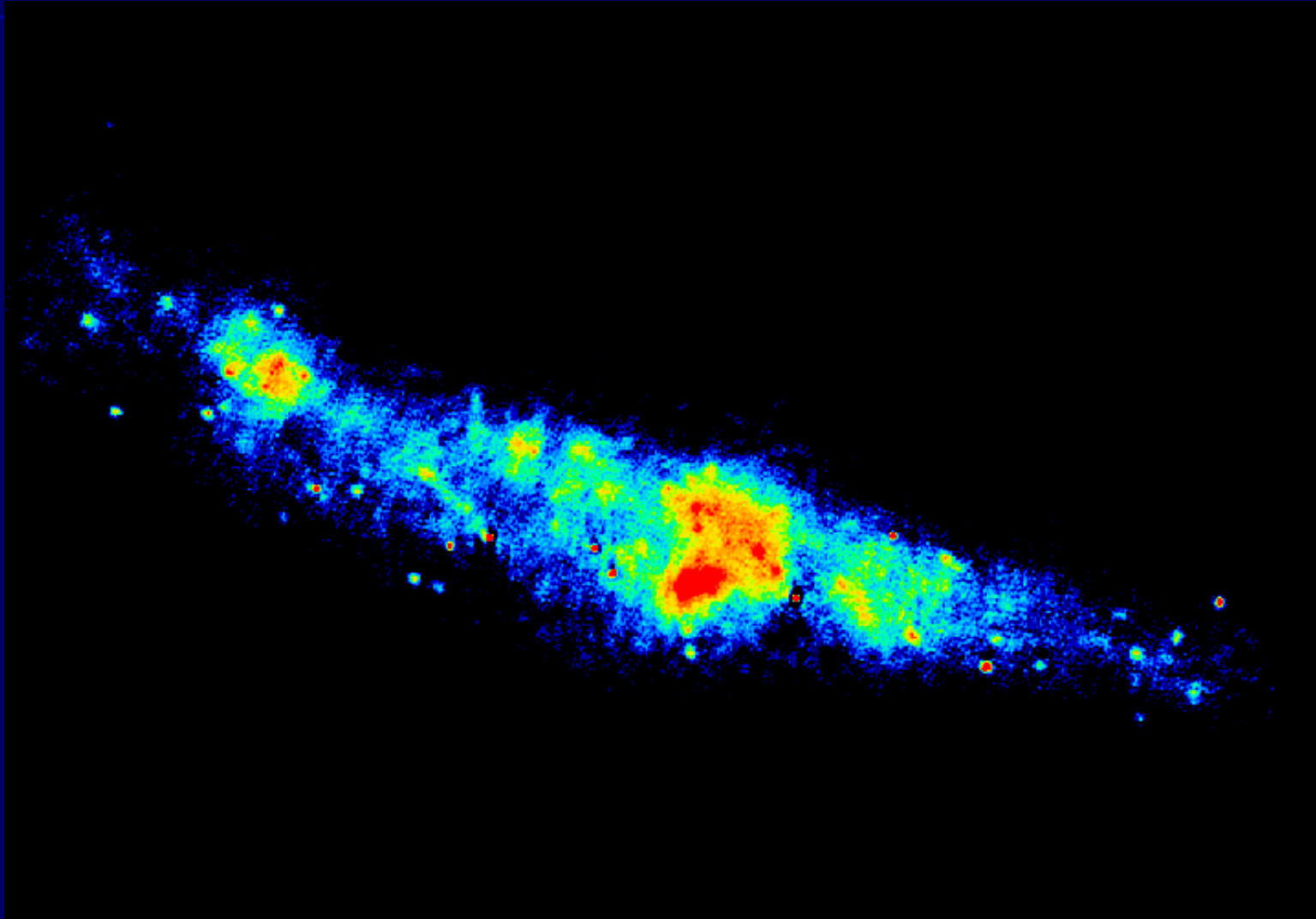
850 micron thermal emission from the Moon,
observed with SCUBA on the JCMT



Betelgeuse: 45 GHz thermal emission from the stellar wind of a red supergiant star

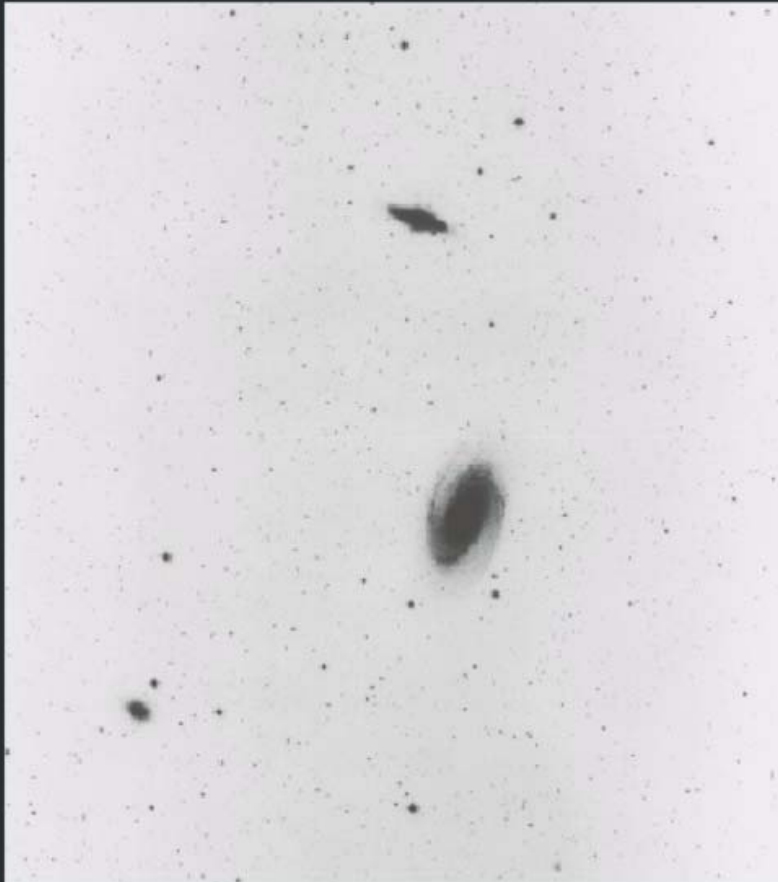


Starburst galaxy M82 continuum emission

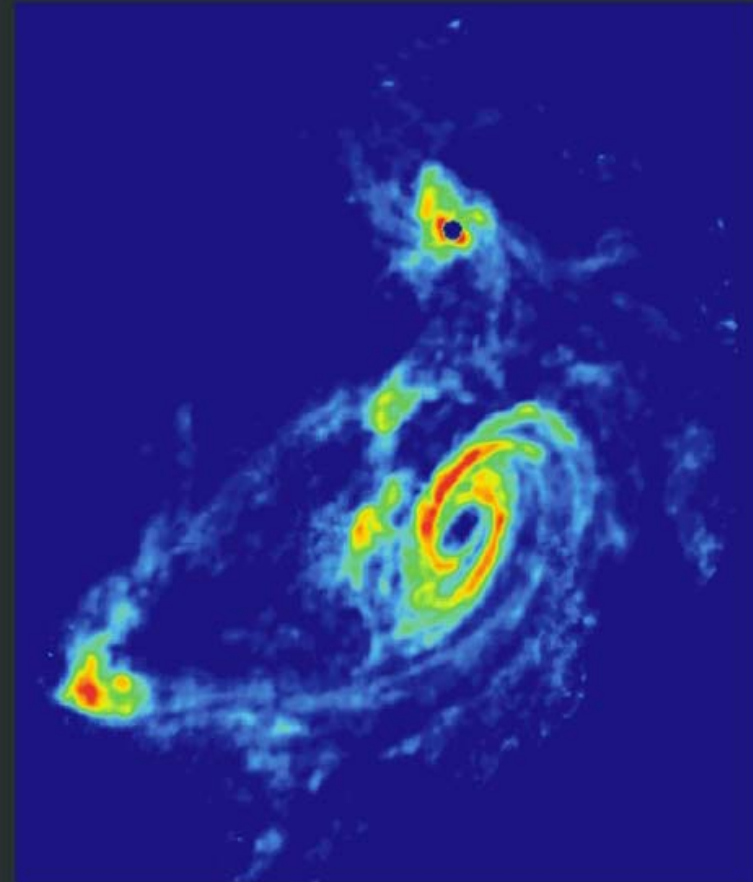


Extended HI emission tracing the interaction history of the M81 group

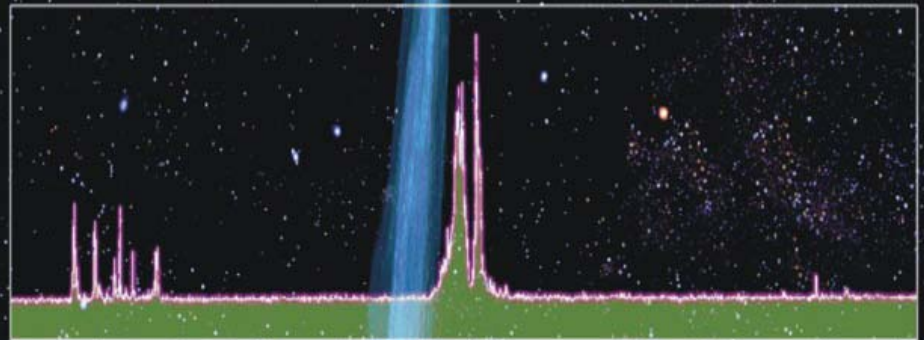
Stellar Light Distribution

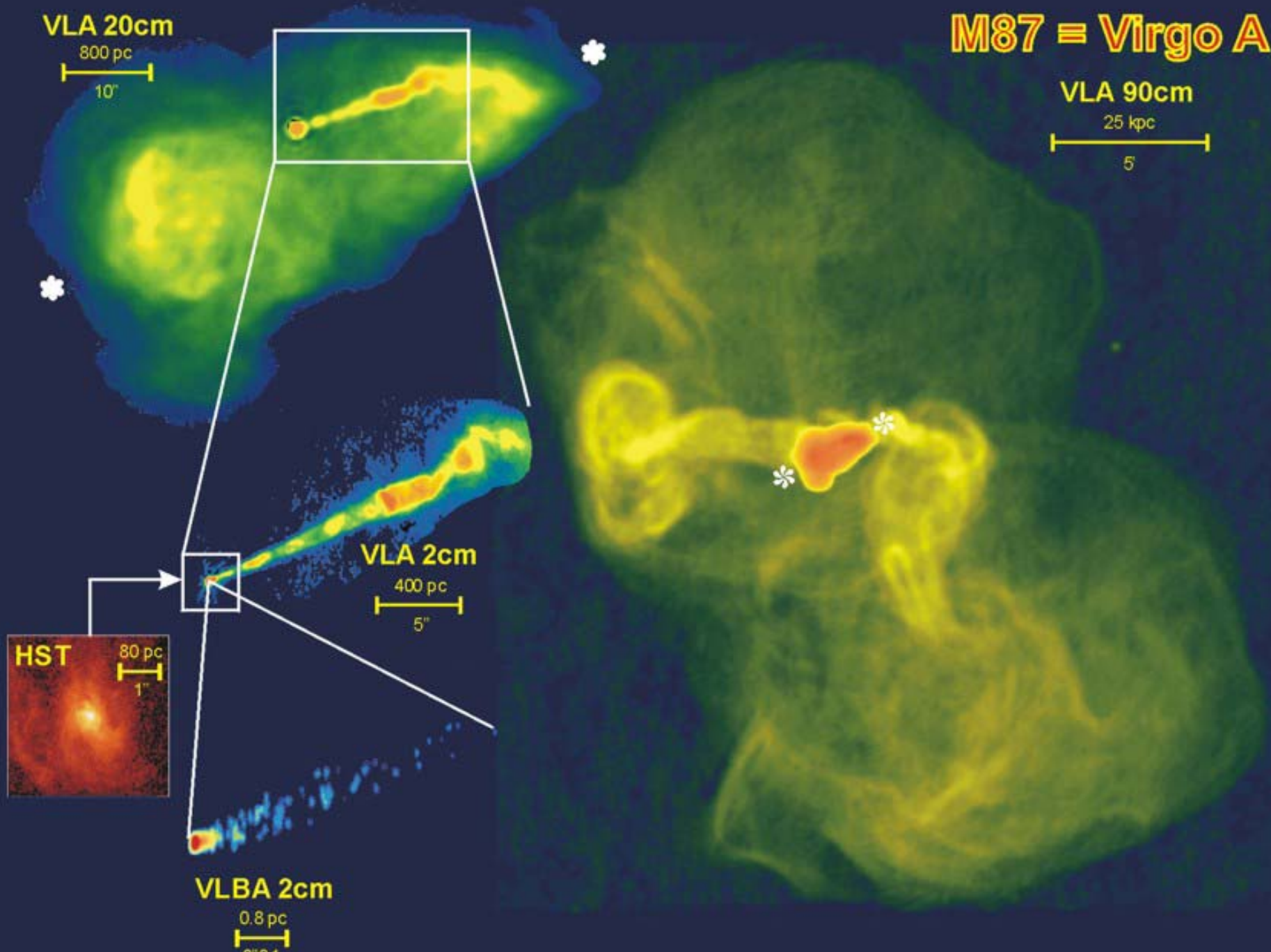


21 cm HI Distribution

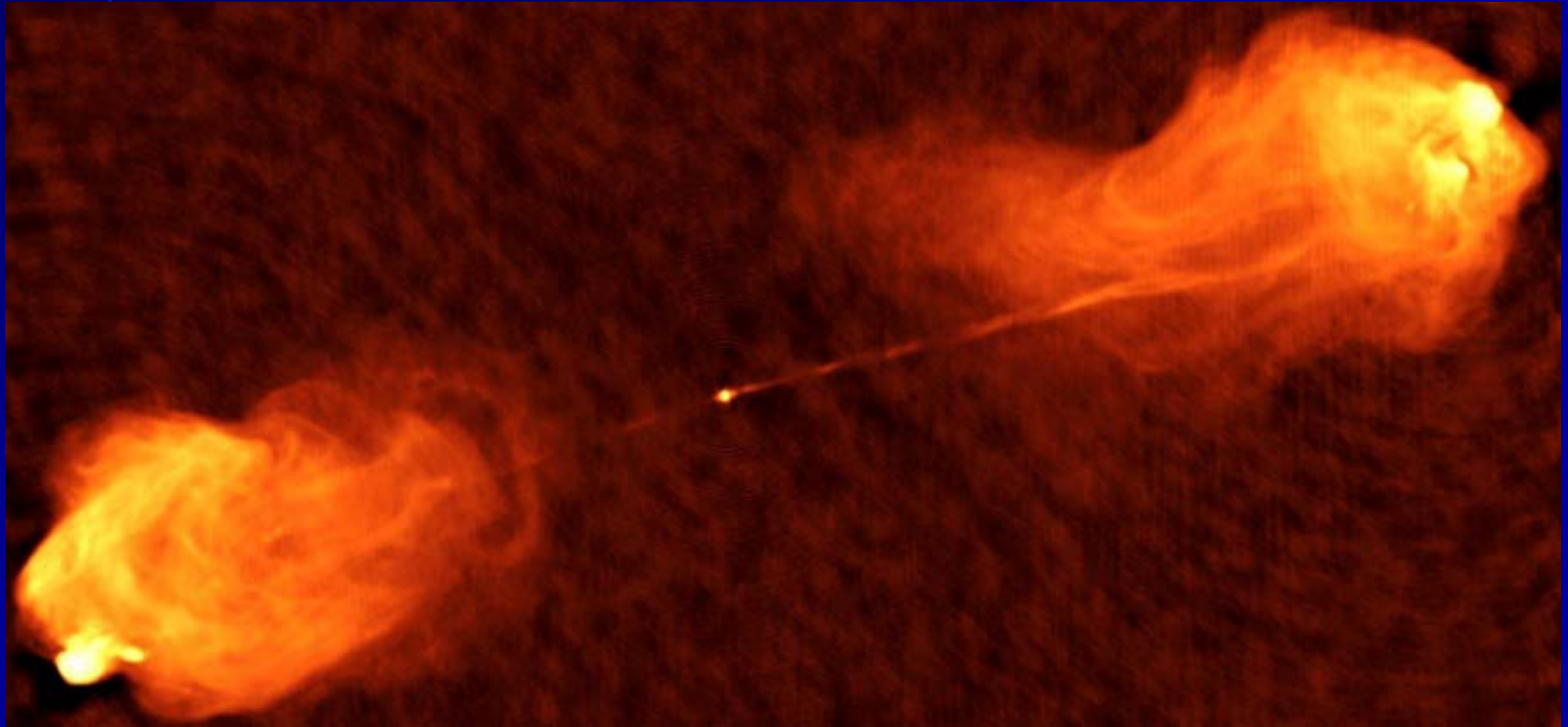


Spectrum of the
water maser
around the
massive black
hole in
NGC 4258

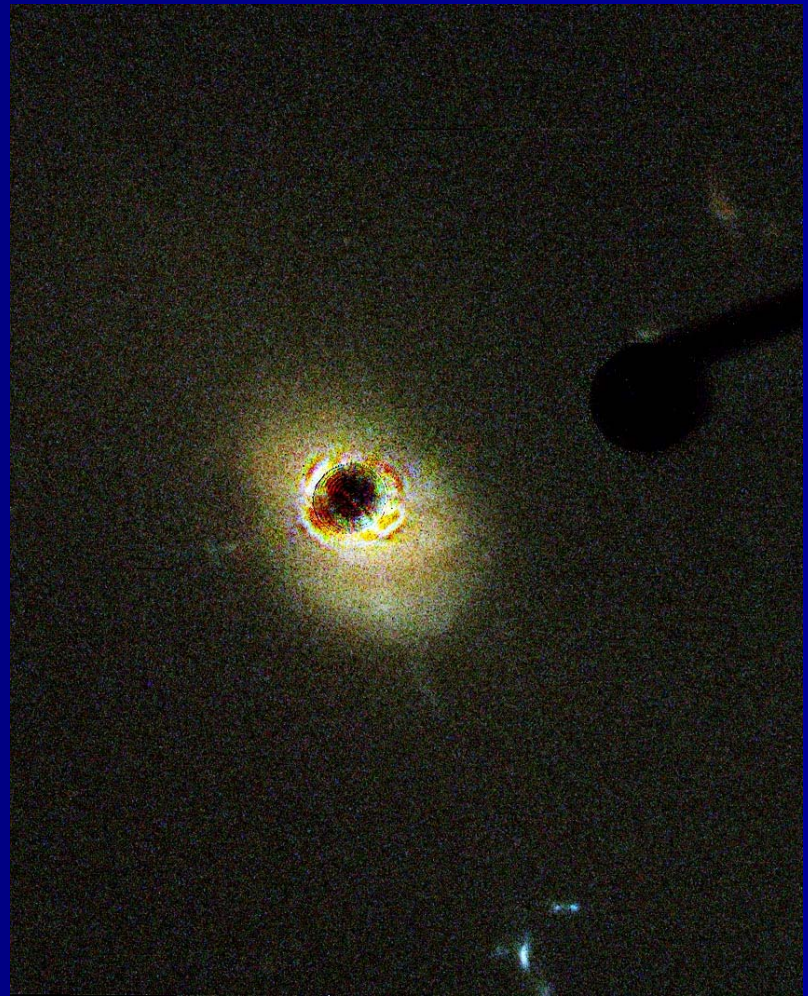
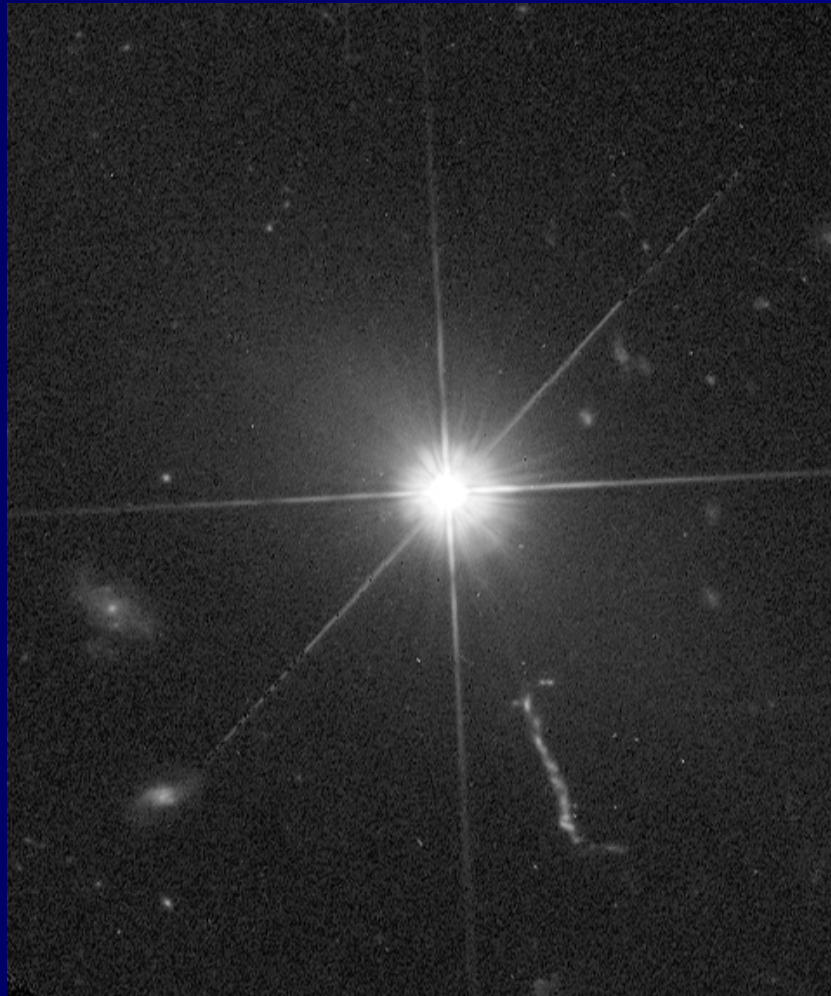




Cygnus A



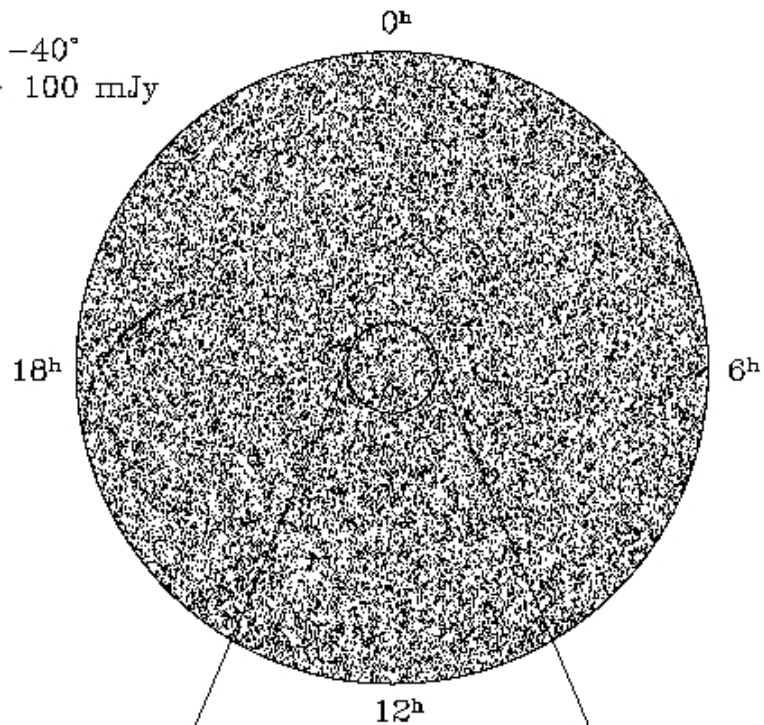
Quasar (3C 273) and host galaxy
with quasar subtracted



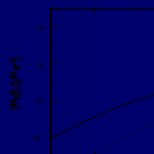
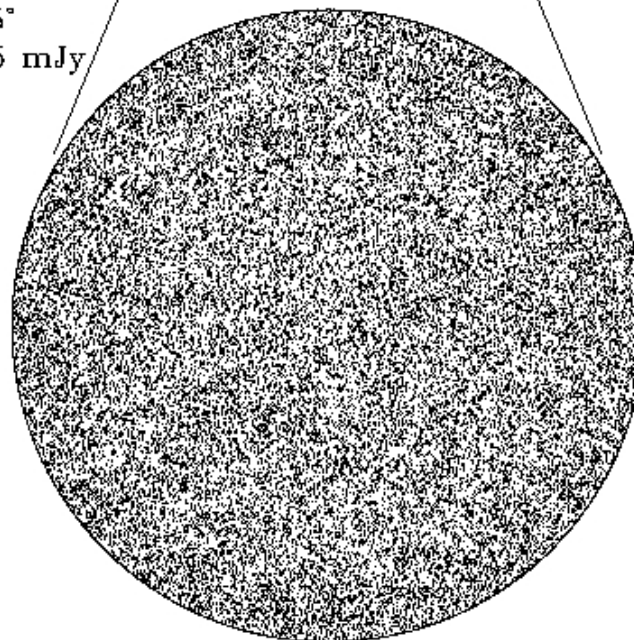


Isotropy of radio sources

$\delta > -40^\circ$
 $S > 100 \text{ mJy}$



$\delta > +75^\circ$
 $S > 2.5 \text{ mJy}$



Counts of AGNs and star-forming galaxies

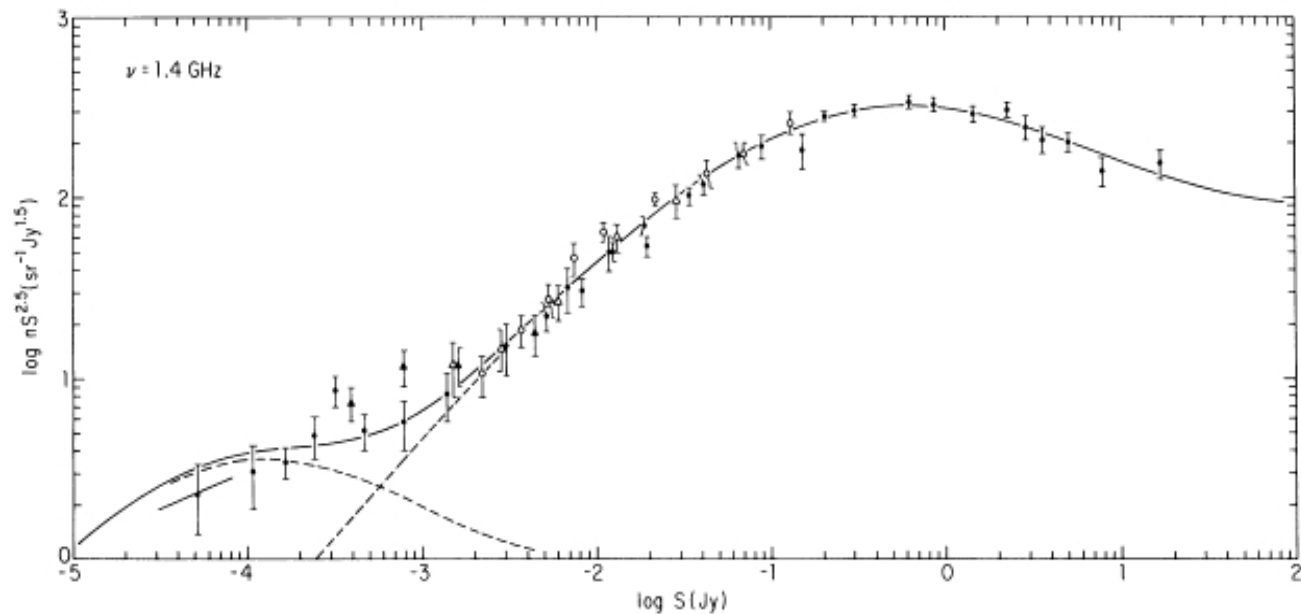
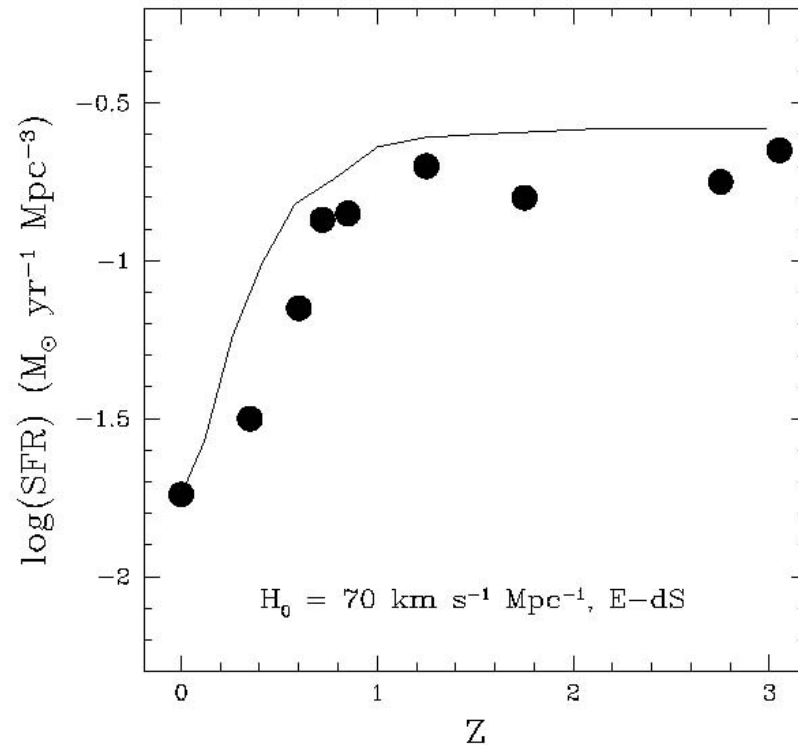
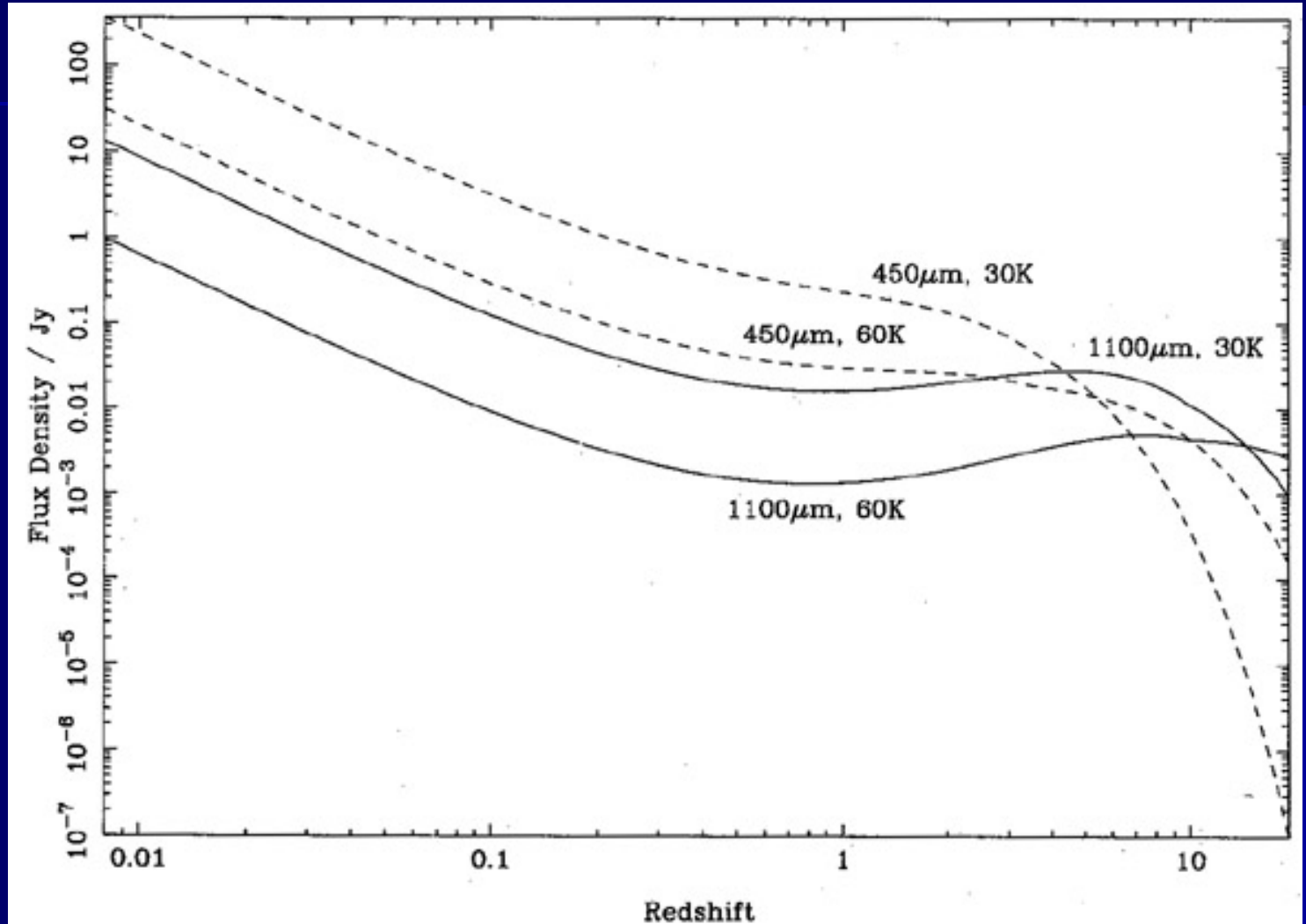


FIG. 3.—Normalized differential source counts at $\nu = 1.4 \text{ GHz}$. *Abscissa*, log flux density (Jy). *Ordinate*, log differential number of sources multiplied by $S^{2.5}$ ($\text{sr}^{-1} \text{Jy}^{1.5}$).

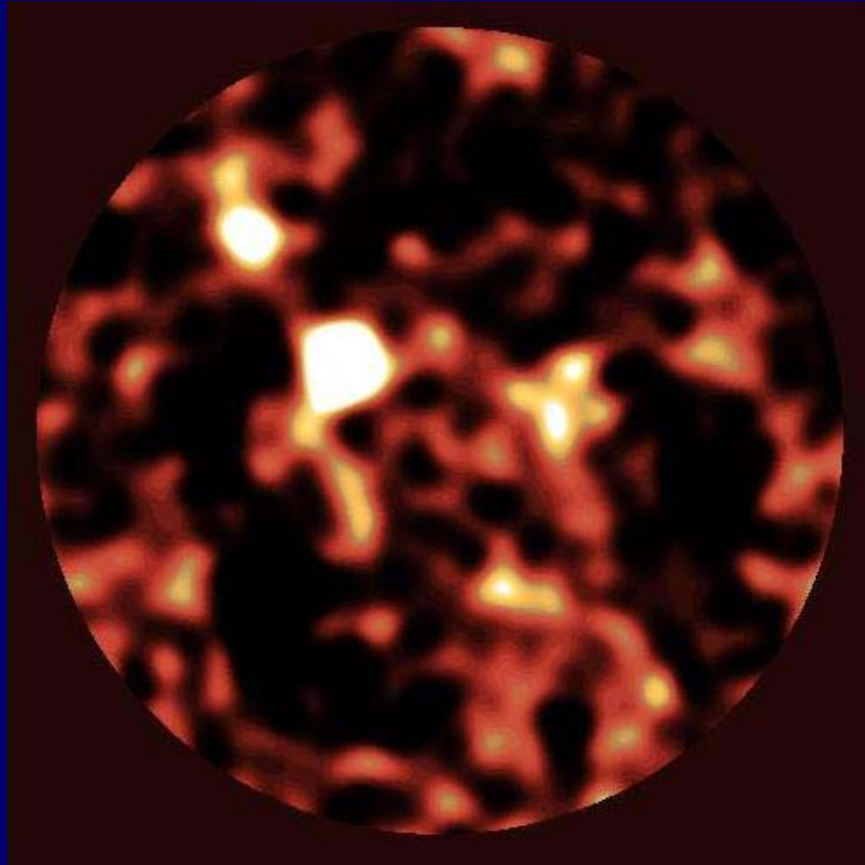
Star-formation history of the Universe: radio astronomer's view



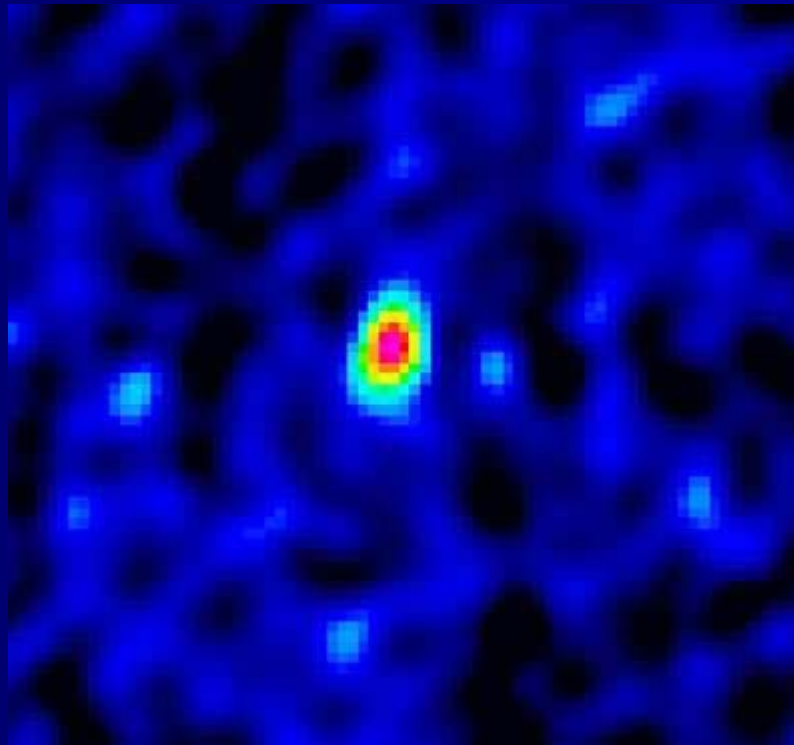
Dust emission at high redshifts



850 micron SCUBA/JCMT image of the HDFN



CO emission from a protogalaxy at $z = 6.42$



3K microwave background

