Planck and CMB mapmaking

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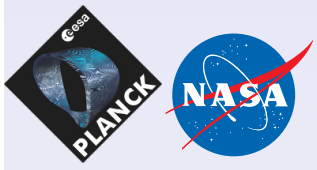
Planck current status

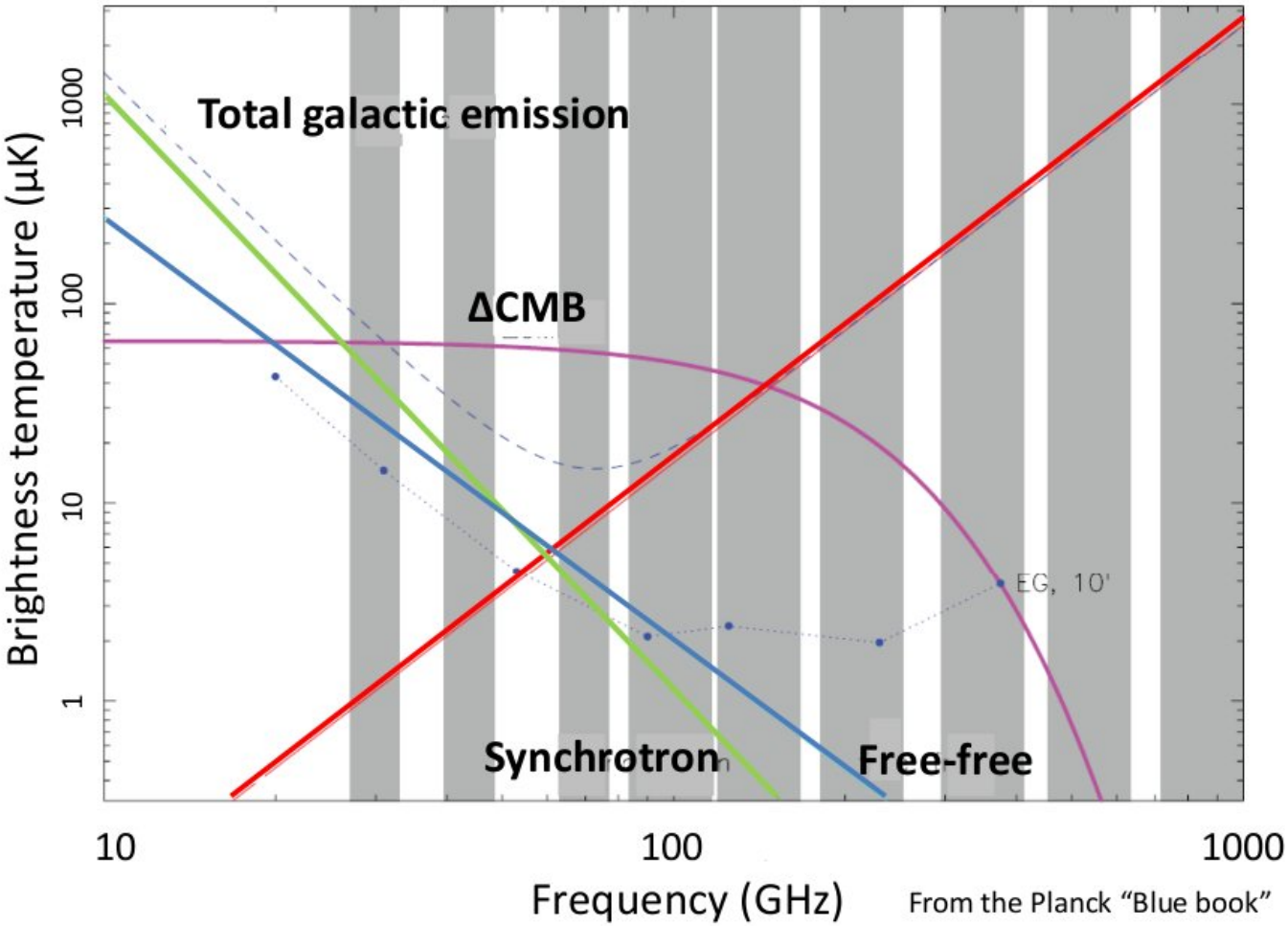
- Launch date: 14th May 2009
- Start of first survey: 13th August 2009 (301 days today)
- Start of second survey: 14th February 2009
- 100% sky coverage: 26th April 2010 (LFI) / 28 May 2010 (HFI)
- Mission extended to end of 2011 (30 months)



Data release

- Source catalog for followup (ERCSC): December 2010
- End of proprietary period: End of 2012
- First Data release:
  - Calibrated timelines
  - Frequency maps
  - Component maps
  - Source catalogs
  - Cosmological parameters likelihood function
  - Papers

Frequency coverage



From the Planck "Blue book"

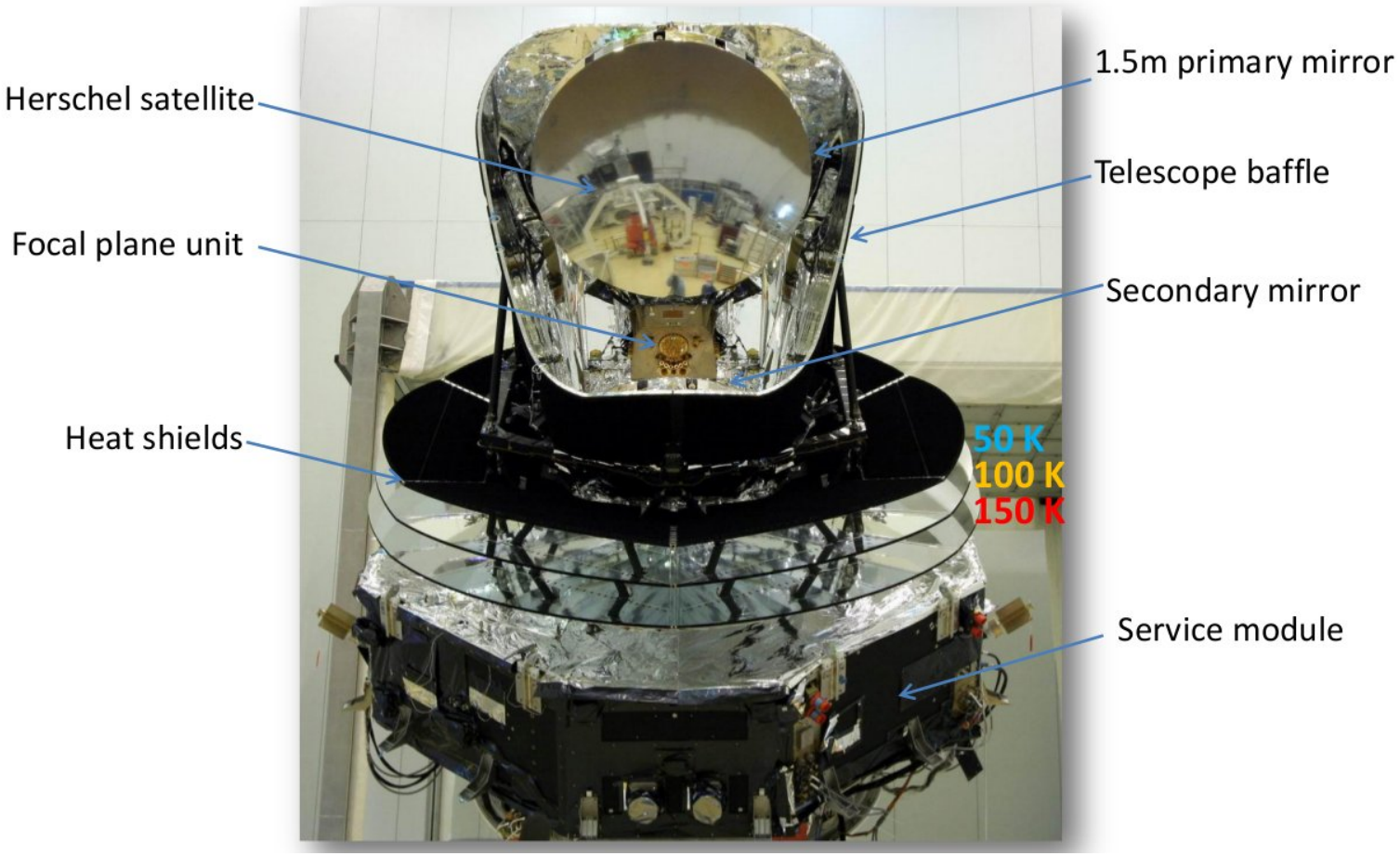
Sensitivity

PLANCK	LFI			HFI					
Center freq (GHz)	30	44	70	100	143	217	353	545	857
Angular resolution (FWHM arcmin)	33	24	14	10	7.1	5.0	5.0	5.0	5.0
Sensitivity in I [μK.deg] [$\sigma_{pix}\Omega_{pix}^{1/2}$]	2.7	2.6	2.6	1.0	0.6	1.0	2.9		
Sensitivity in Q or U [μK.deg] [$\sigma_{pix}\Omega_{pix}^{1/2}$]	4.5	4.6	4.6	1.8	1.4	2.4	7.3		

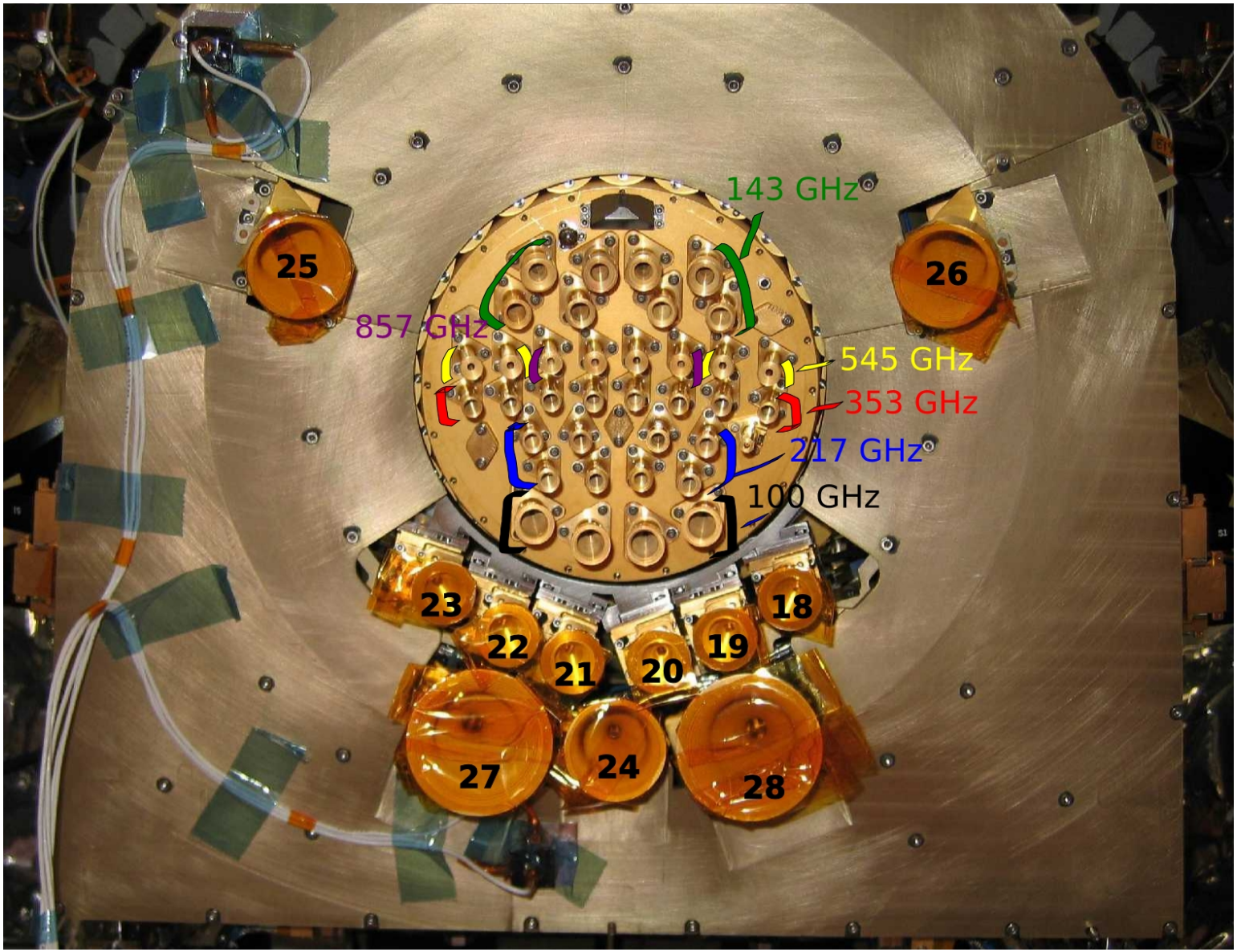
From the Planck "Blue book"

WMAP center freq.	23	33	41	61	94
Angular resolution (FWHM arcmin)	49	37	29	20	12.6
Sensitivity in I [μK.deg], 1 yr (8 yr)	12.6 (4.5)	12.9 (4.6)	13.3 (4.7)	15.6 (5.5)	15.0 (5.3)

Planck satellite

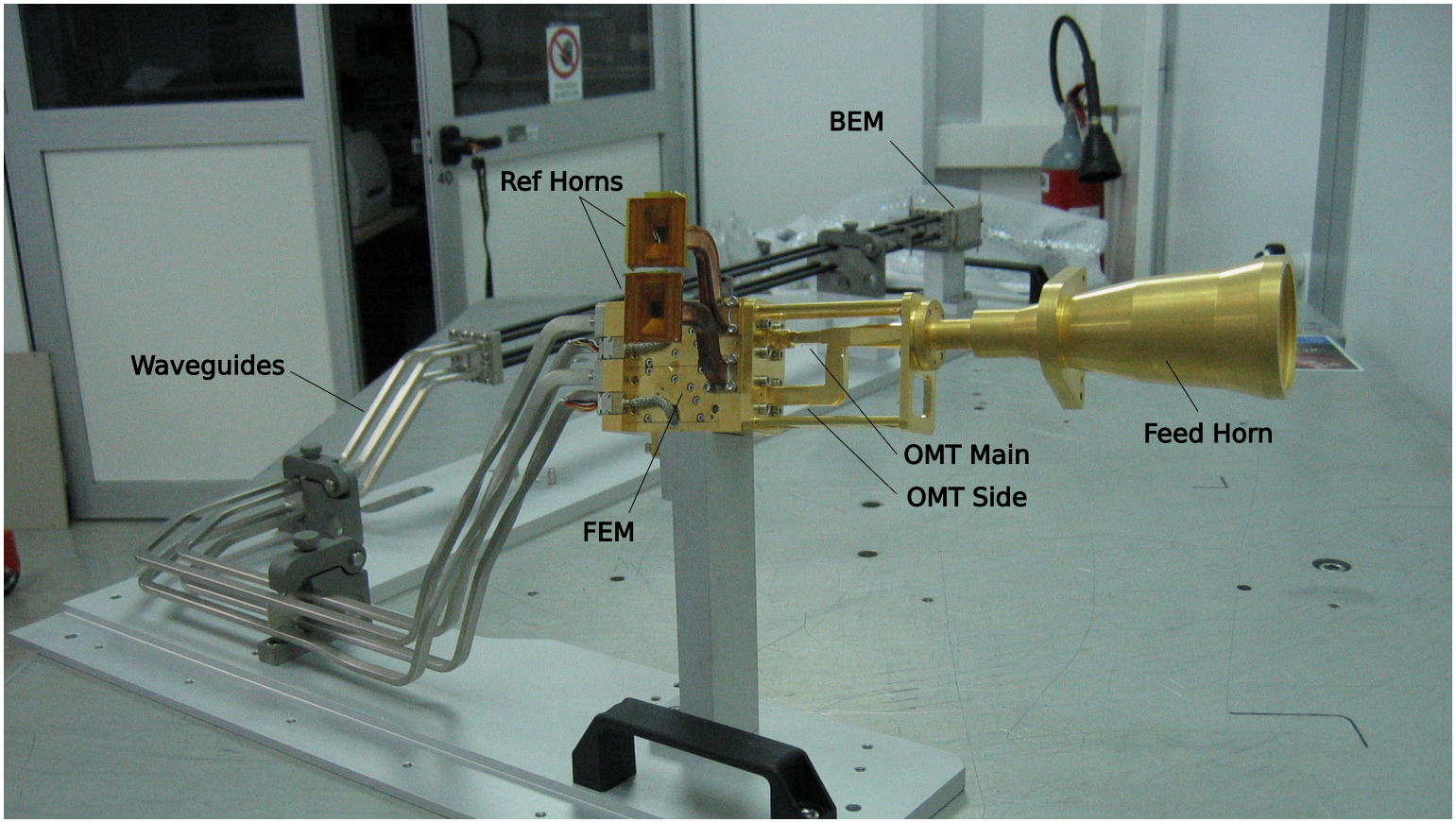


Planck focal plane

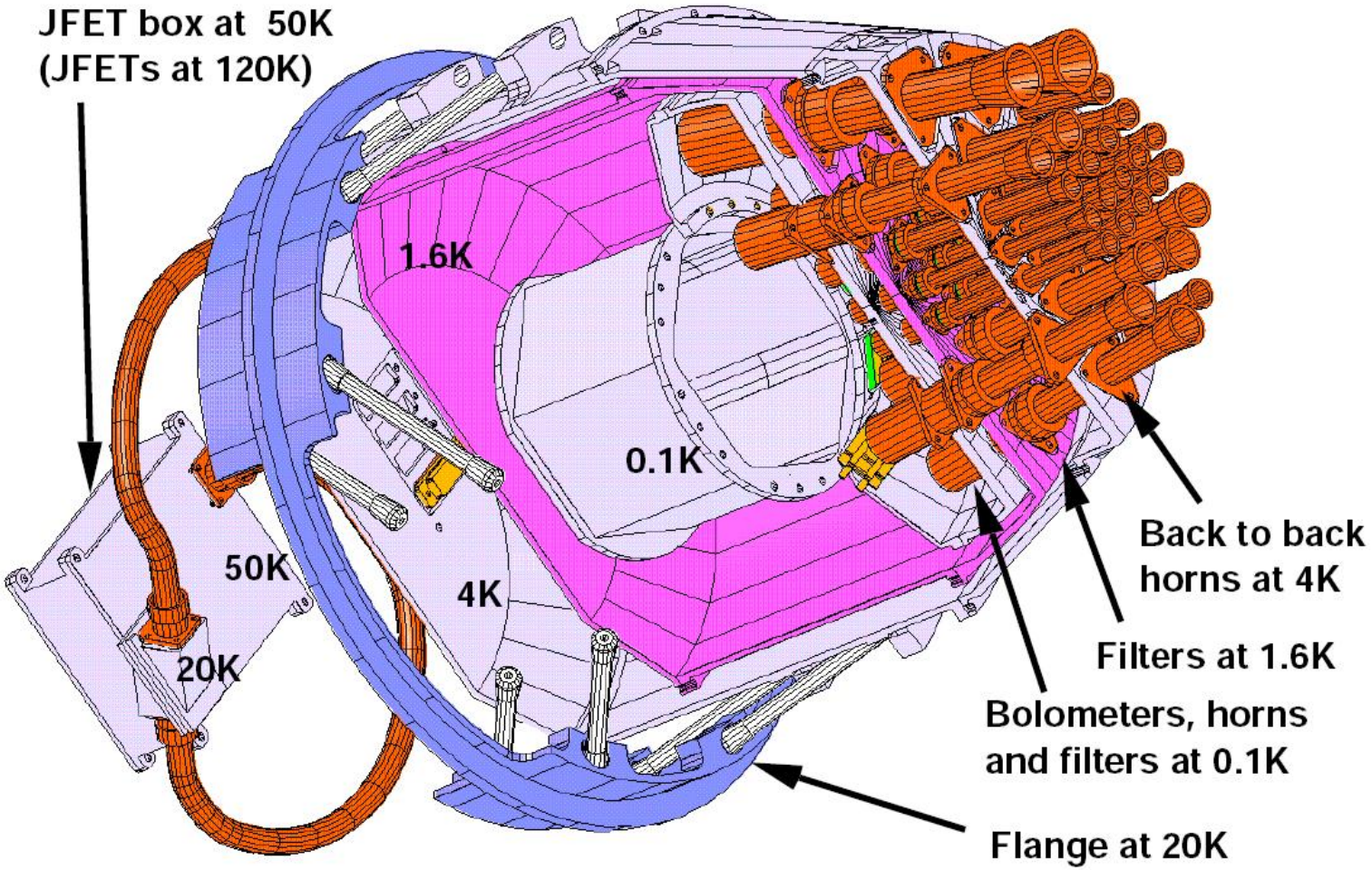


Planck focal plane

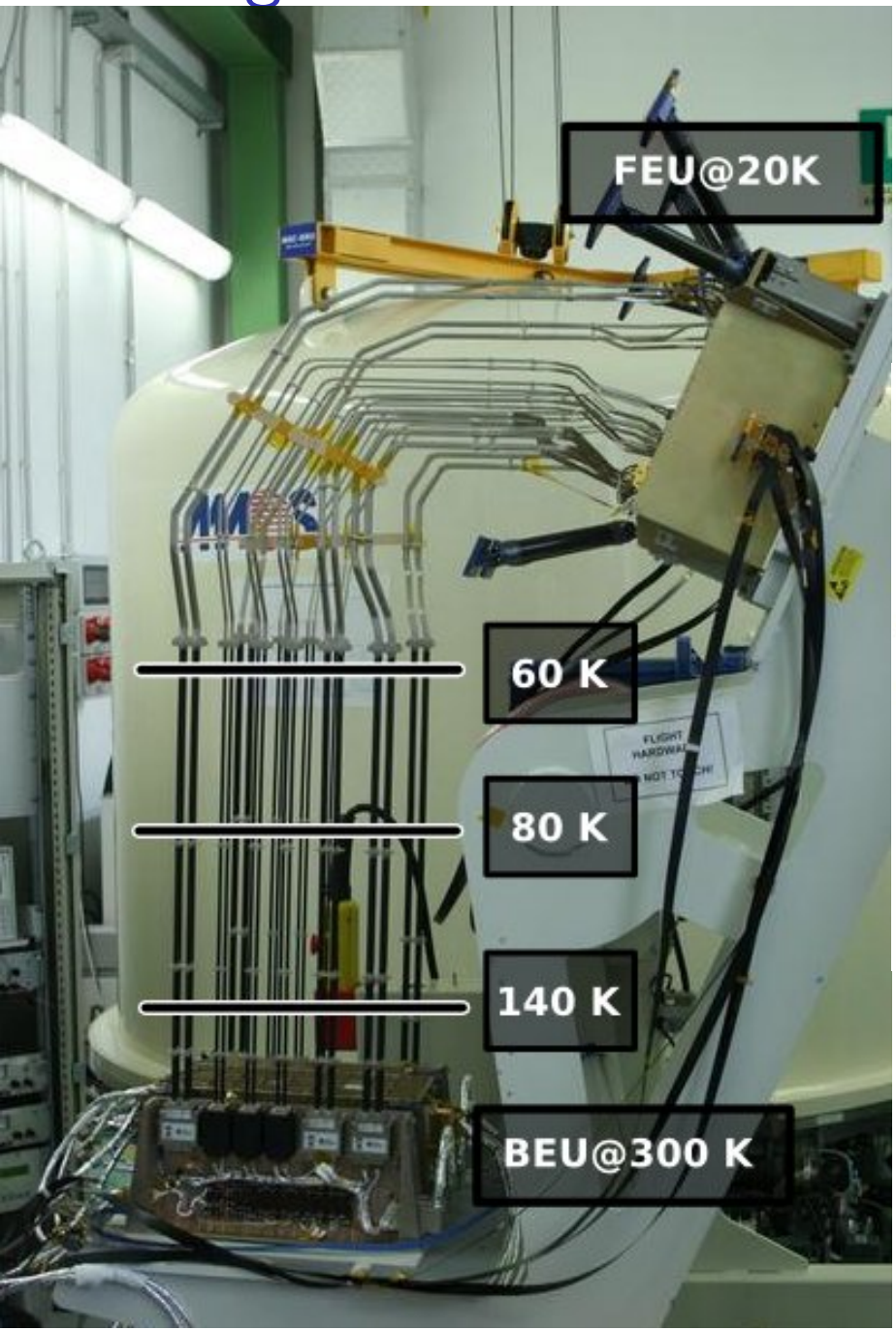
Low Frequency Instrument radiometer

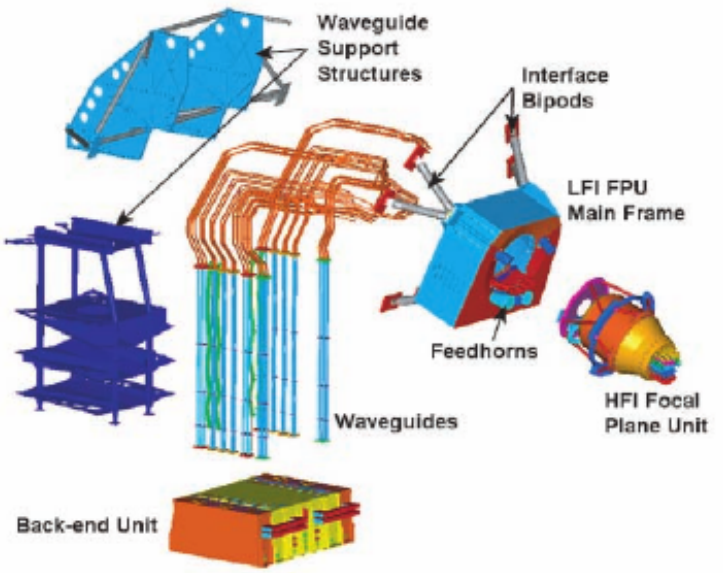


HFI Bolometers array

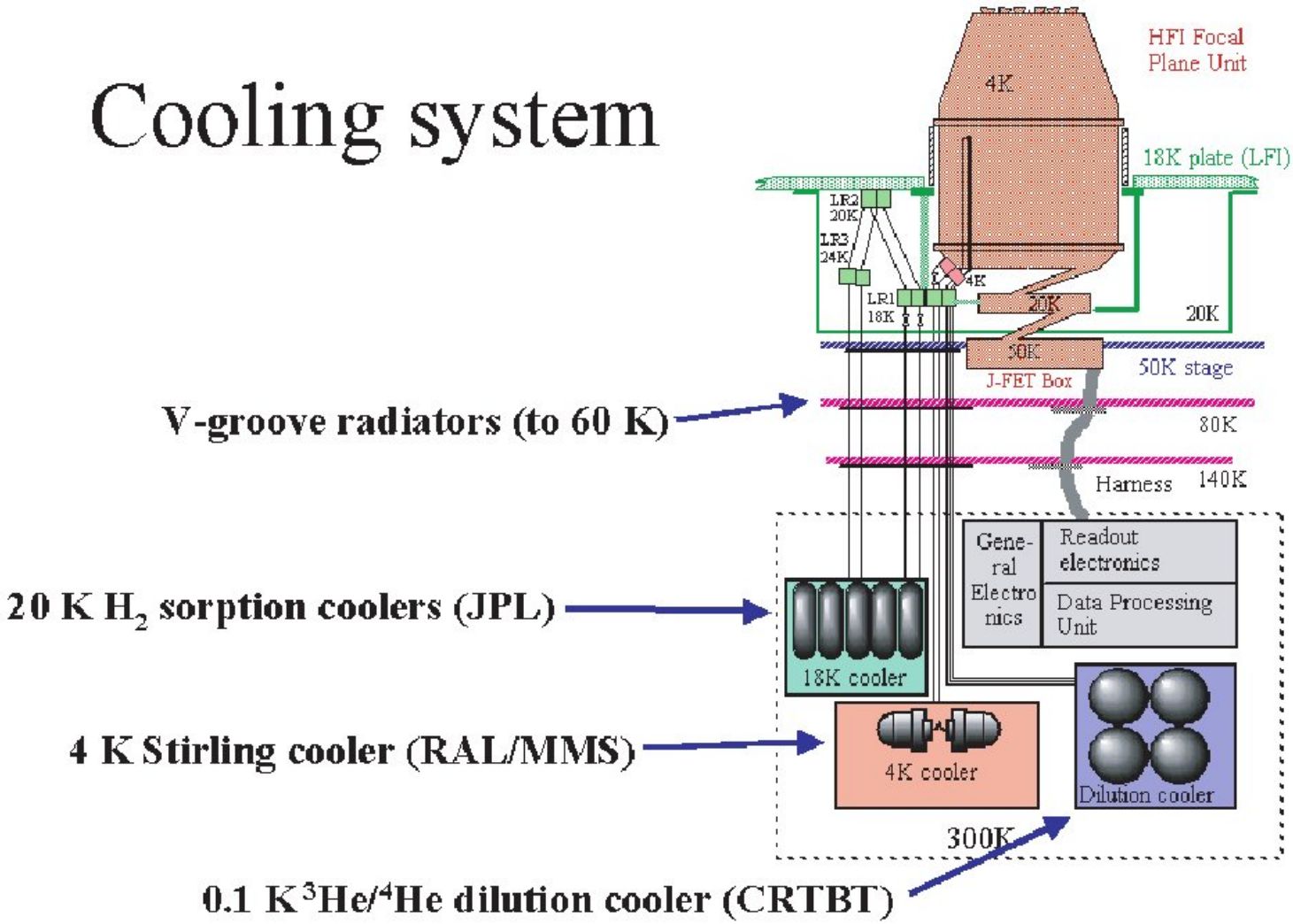


Cooling chain

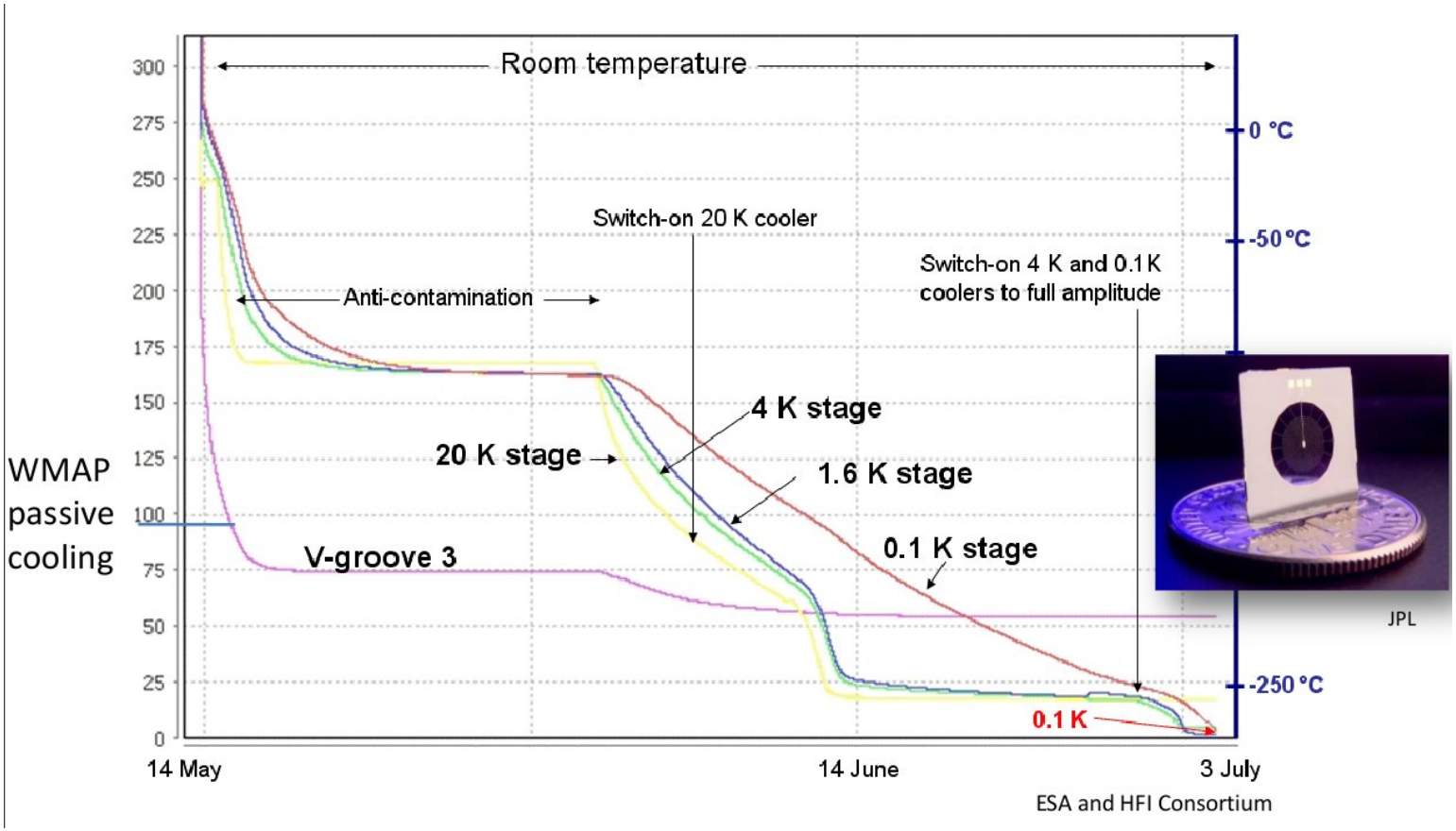




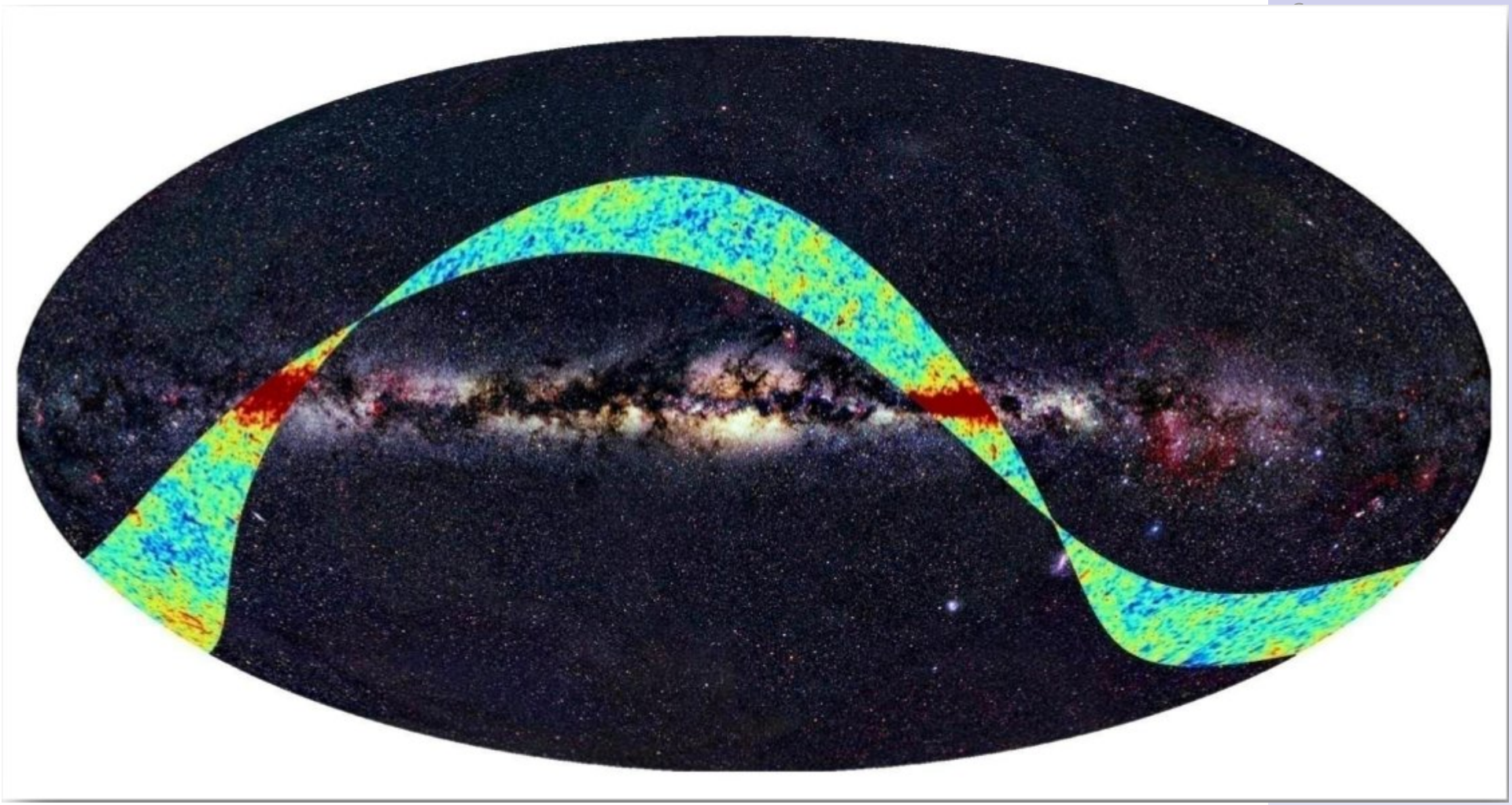
Planck cooling chain



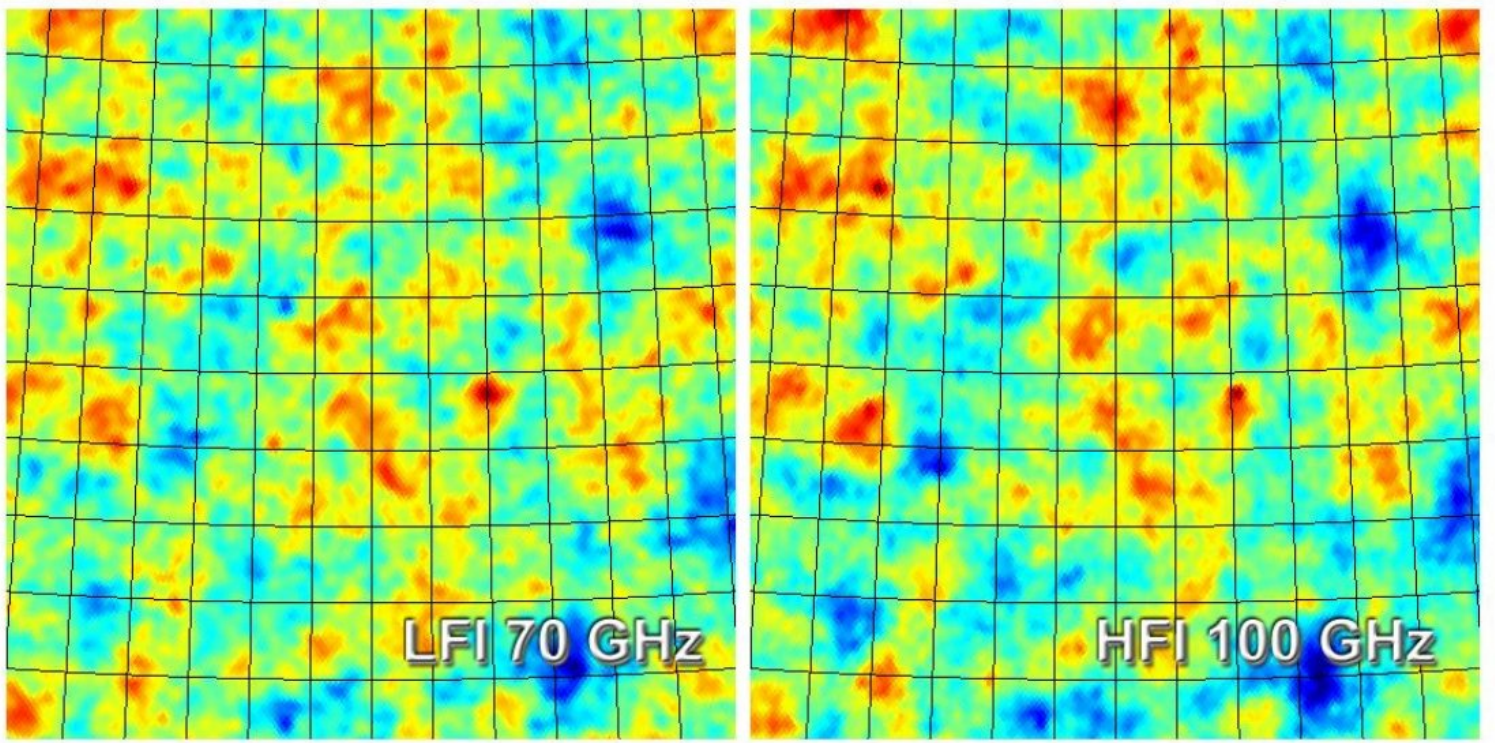
Inflight cooling profile



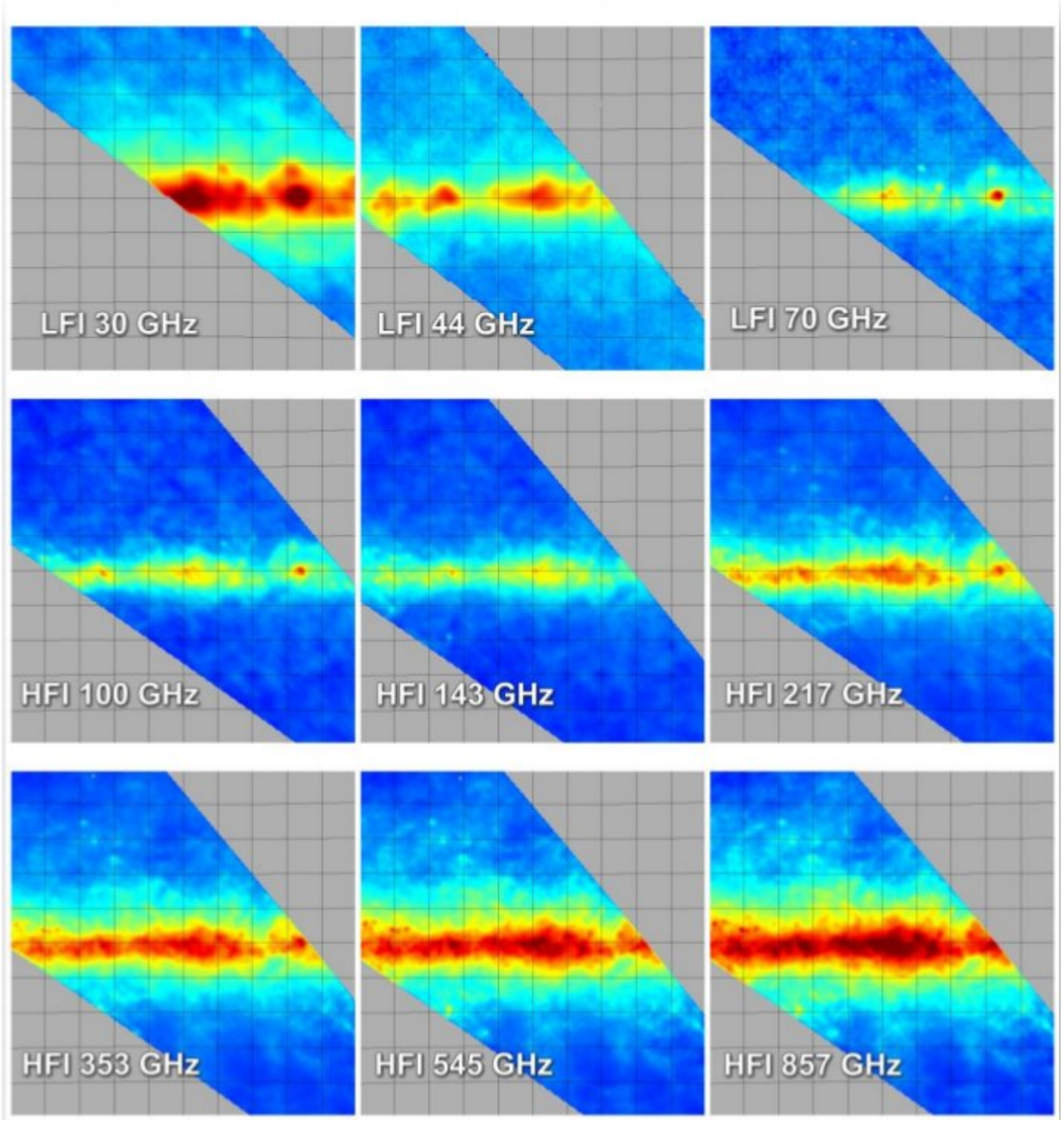
First light survey



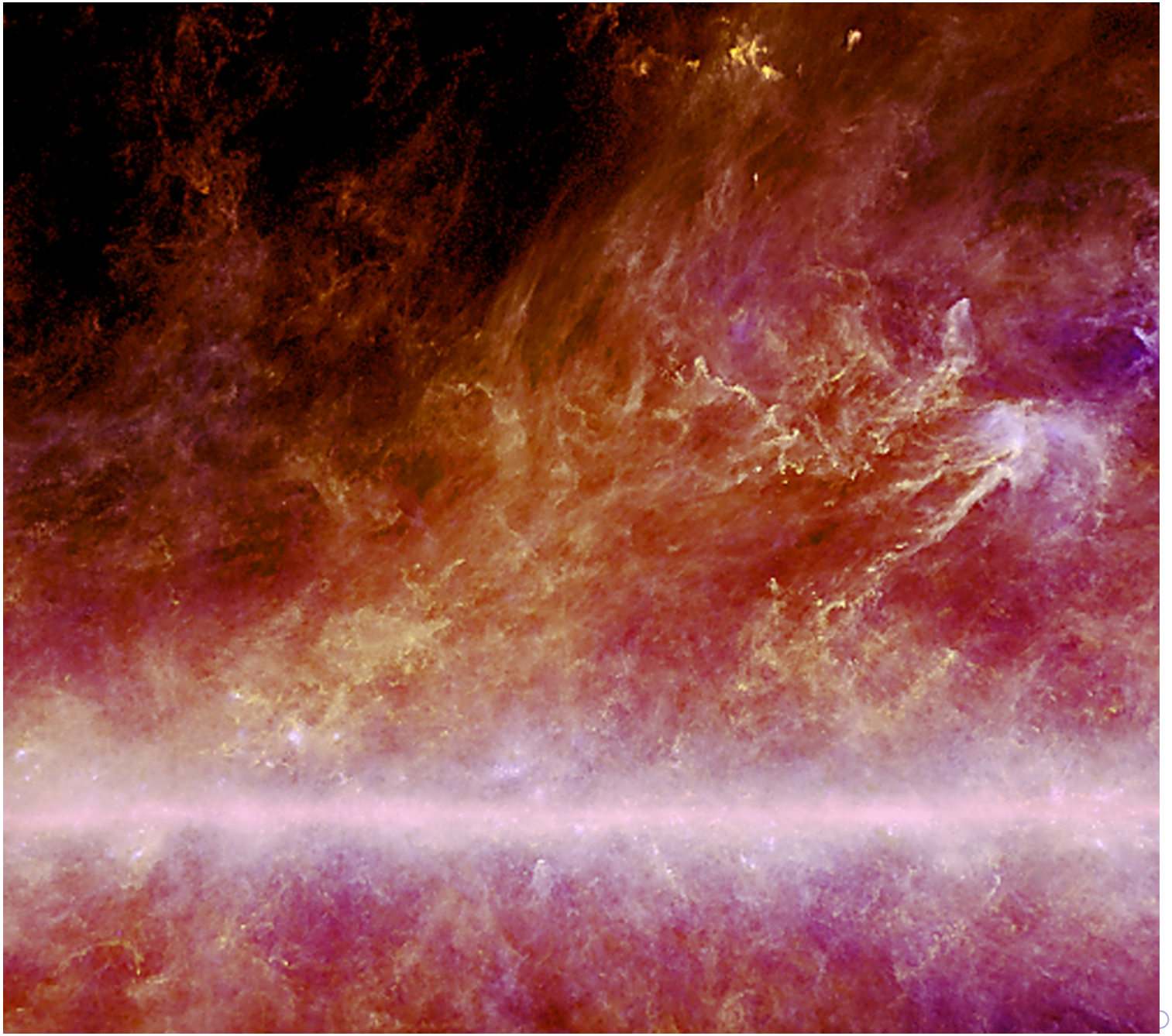
LFI 70 GHz and HFI 100 GHz patch



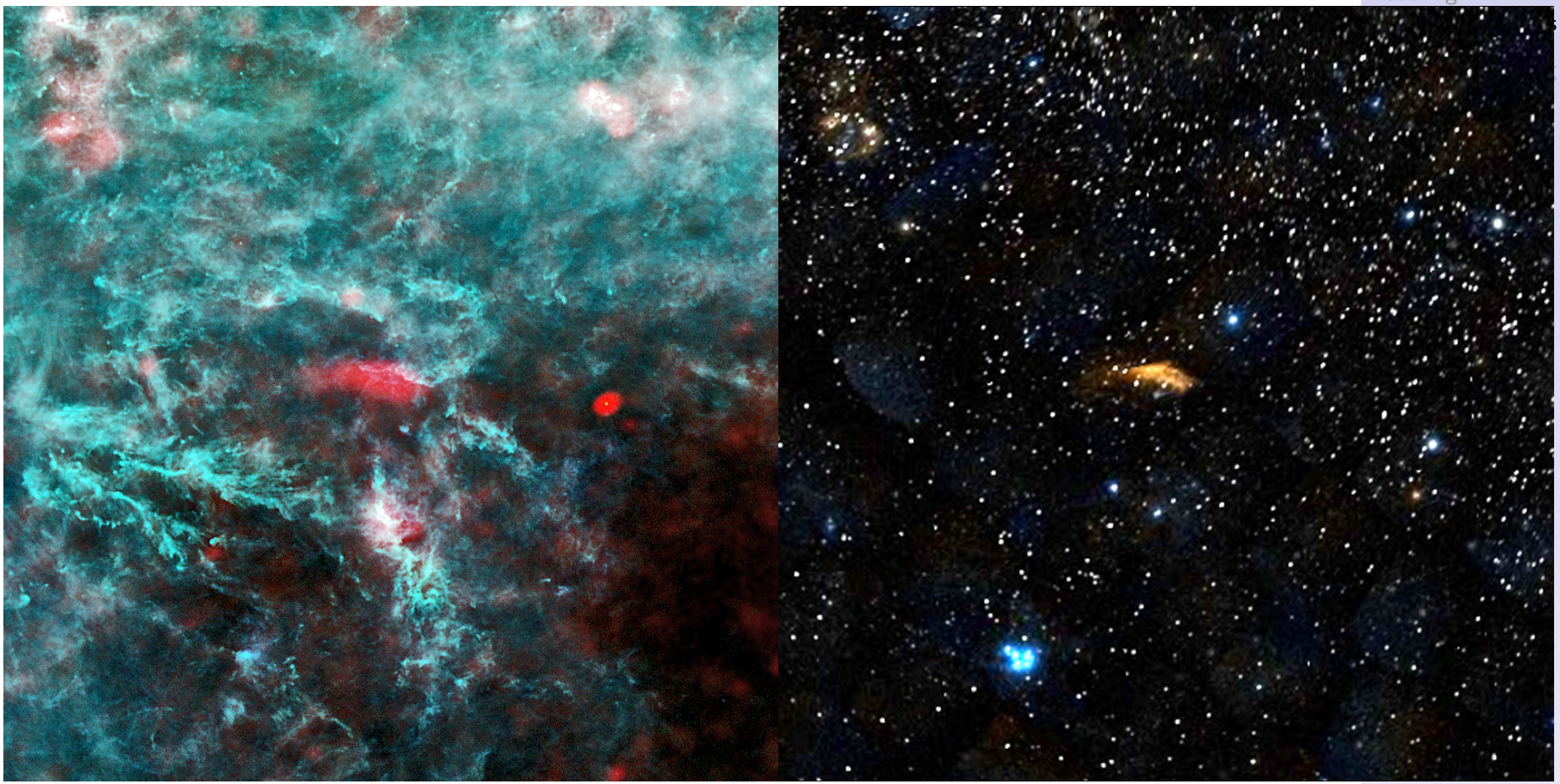
20°x20°patches around the galaxy



Cold dust 12-70K 545/857 GHz



Perseus, Planck (30/353/857) vs DSS



Orbit and scanning

Videos:

`PLANCK_LAGRANGE_PC_03.wmv`
`moll_G_ring.mov`

Mapmaking tecniques

- Optimal maximum likelihood mapmaker
- Destriper

$$y = Pm_{in} + Fa + w \tag{1}$$

y: radiometer output
P: pointing matrix
m_{in}: input map
a: baselines
F: baselines to TOD
w: white noise TOD

Destriping in time domain

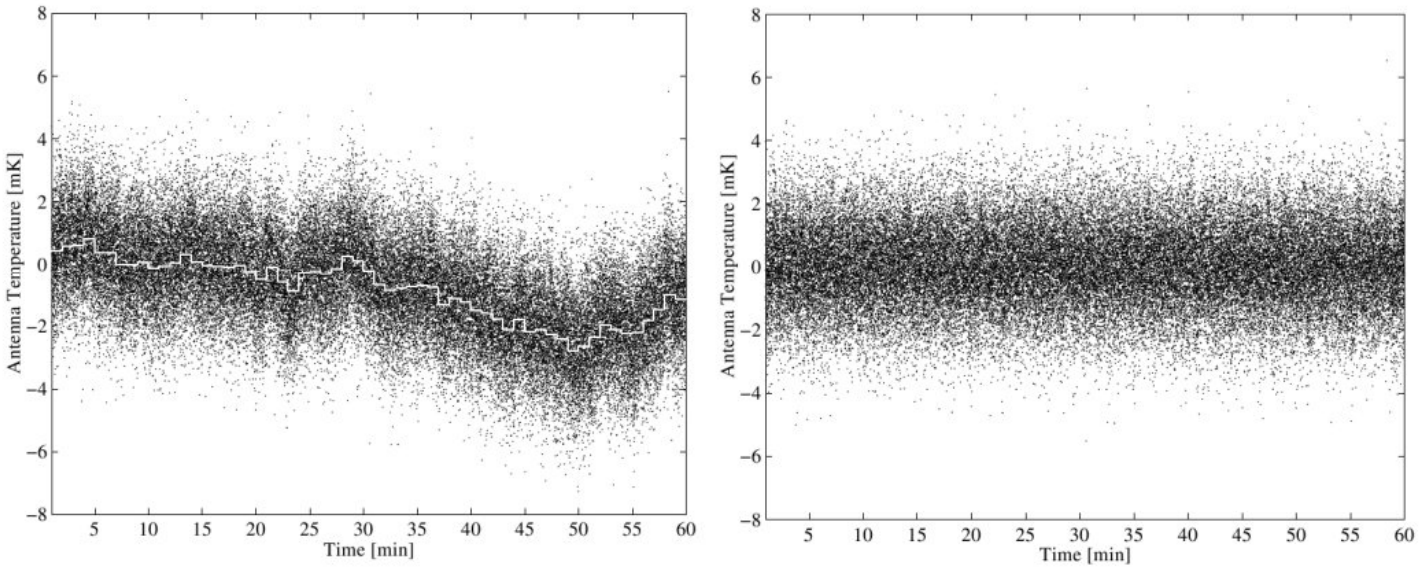
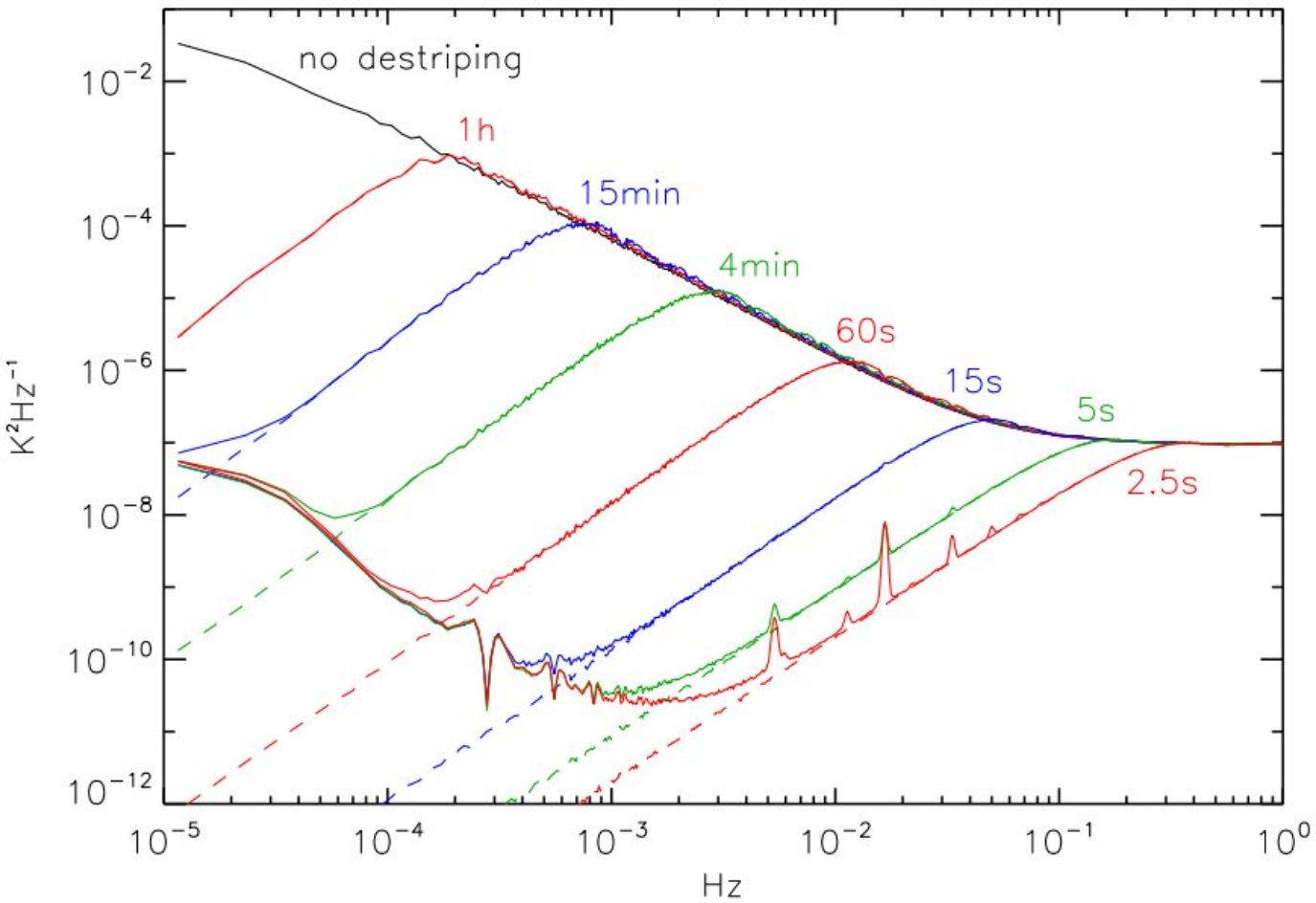
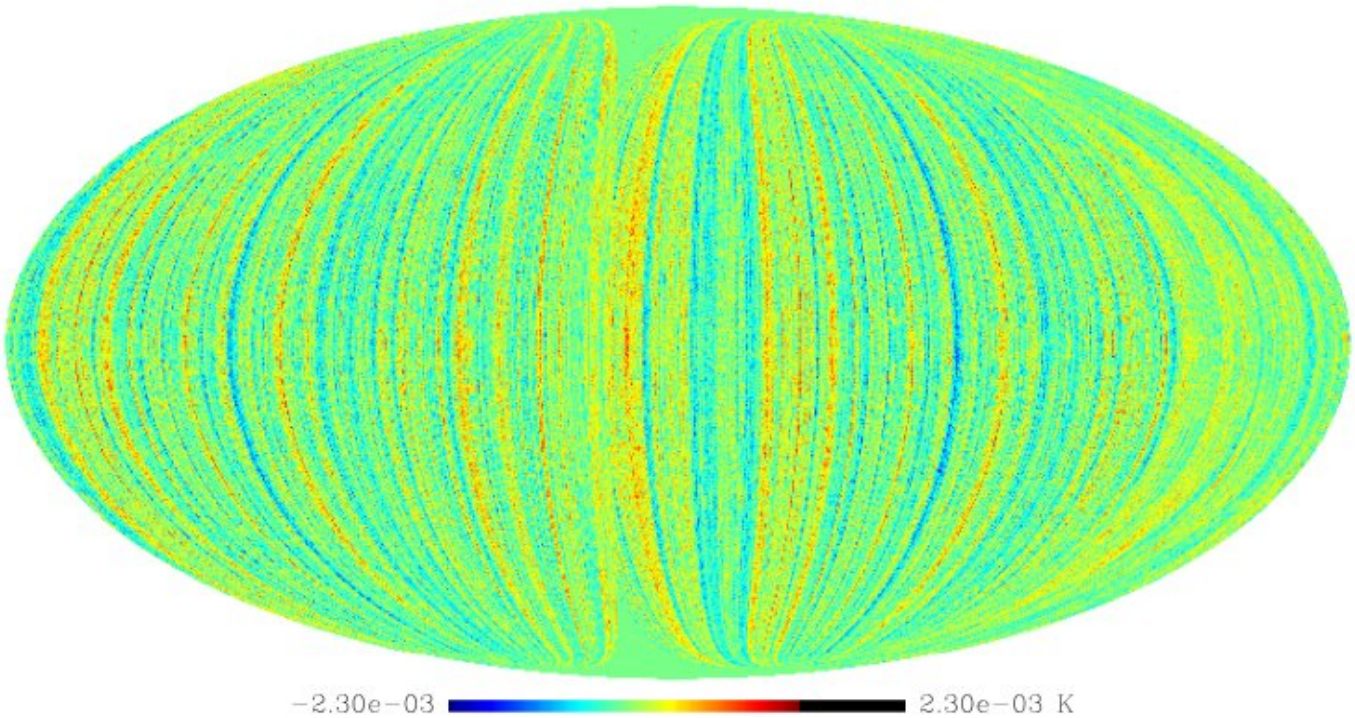


Figure by T. Poutanen

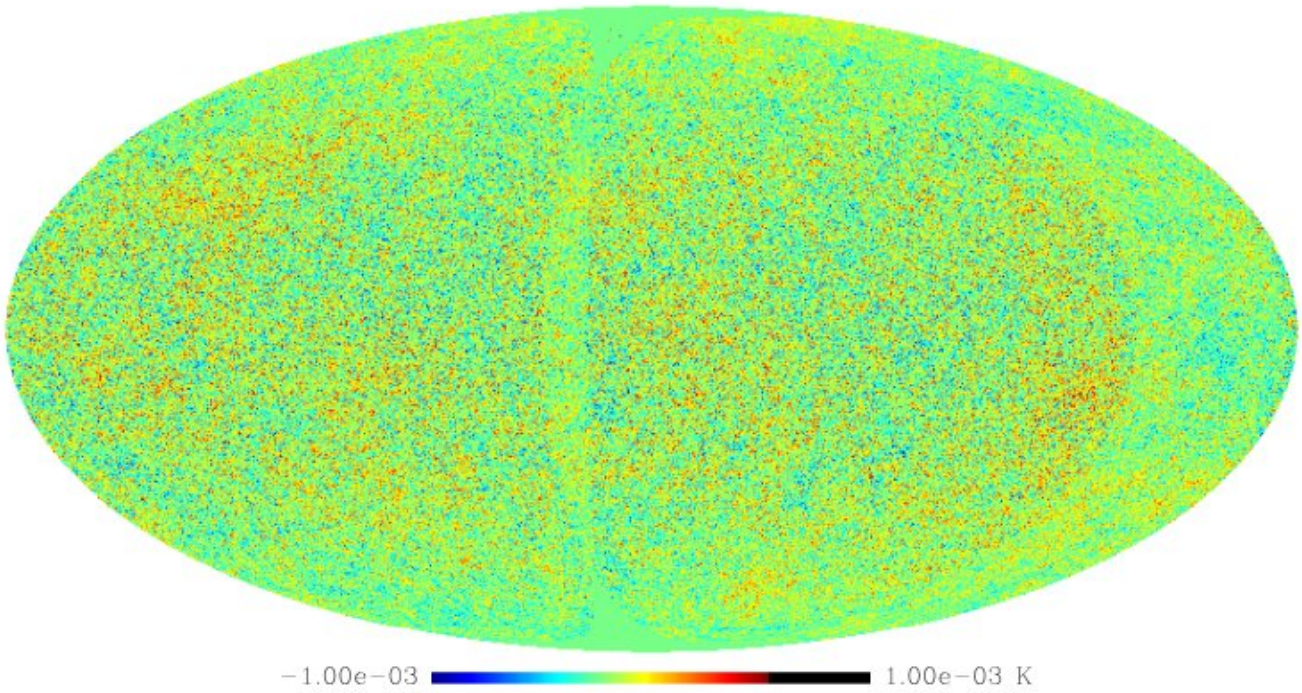
Destriping in frequency domain



Simulated coadded map



Simulated destriped map 7 degrees



Simulated destriped map 28 degrees