Planck and CMB mapmaking

Andrea Zonca

Planck

Current status
Instruments and
cooling
Published results

Scanning
Destriping

Planck and CMB mapmaking

Andrea Zonca

University of California, Santa Barbara

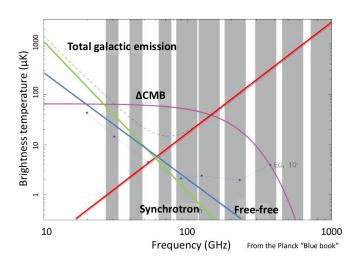
June 10, 2010

- 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



Planck and CMB mapmaking

Andrea Zonca







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 $[\mu K.deg] [\sigma_{pix}\Omega_{pix}^{1/2}]$	2.7	2.6	2.6	1.0	0.6	1.0	2.9			
Sensitivity in Q or U [μK.deg] [σ _{niv} Ω _{niv} ^{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 and CMB mapmaking

Andrea Zonca

Planck

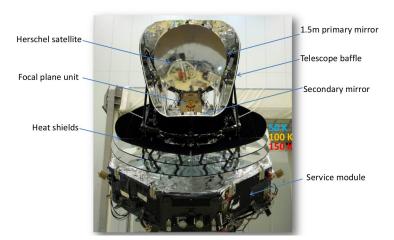
Current status Instruments and cooling Published results

> MB Mapmakir icanning Destriping





Planck satellite



Planck and CMB mapmaking

Andrea Zonca

Planck

Current status Instruments and cooling

Published results

Scanning





Planck focal plane



Planck and CMB mapmaking

Andrea Zonca

Plane

Current status Instruments and cooling

Published results

Scanning Destriping



Andrea Zonca

Planel

Current status Instruments and cooling

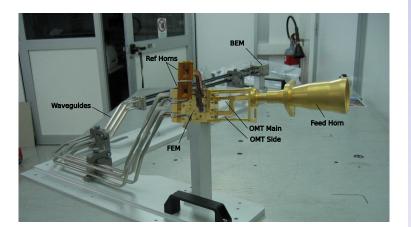
Published results

Scanning Destripin





Low Frequency Instrument radiometer



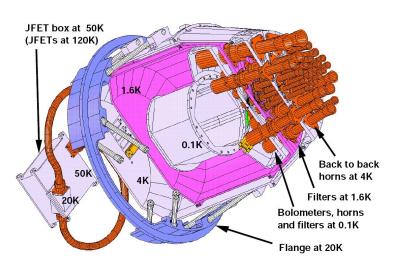
Planck and CMB mapmaking

Andrea Zonca





HFI Bolometers array



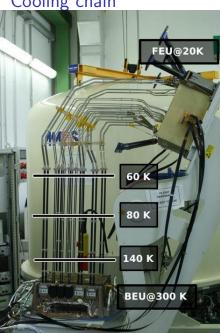
Planck and CMB mapmaking

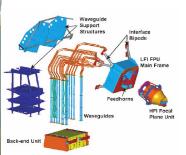
Andrea Zonca





Cooling chain





Planck and CMB mapmaking

Andrea Zonca





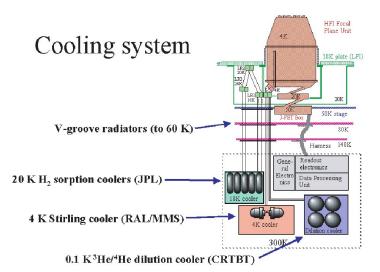
Andrea Zonca

Planck

Current status Instruments and cooling

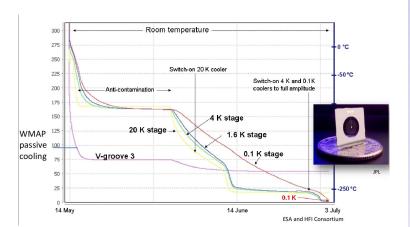
Published result

Scanning Destriping





Inflight cooling profile



Planck and CMB mapmaking

Andrea Zonca

Planck

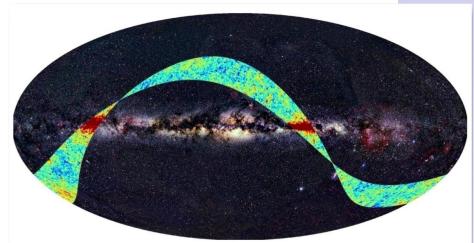
Current status Instruments and cooling

Published results

Scanning

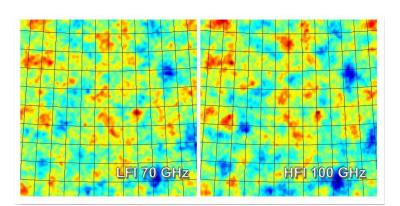








LFI 70 GHz and HFI 100 GHz patch



Planck and CMB mapmaking

Andrea Zonca

Planck

Current status Instruments and

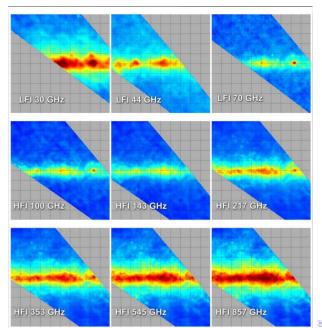
Published results

MB Mapmaking canning





20°x20° patches around the galaxy



Planck and CMB mapmaking

Andrea Zonca

Planck

Current status Instruments and

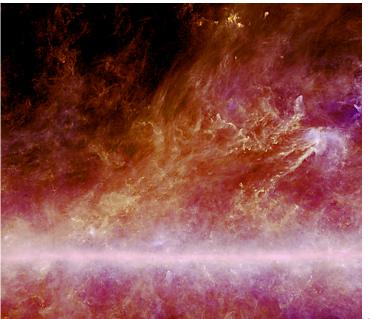
Published results

MB Mapmaking canning Destriping





Cold dust 12-70K 545/857 GHz



Planck and CMB mapmaking

Andrea Zonca

Published results





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

Planck and CMB mapmaking

Andrea Zonca

Planck

Current status Instruments and





Orbit and scanning

Planck and CMB mapmaking

Andrea Zonca

Planck

Current status
Instruments and
cooling
Published results

MR Manmakin

Scanning

Videos:

PLANCK_LAGRANGE_PC_03.wmv moll_G_ring.mov



Planck

Current status Instruments and cooling Published results

MB Manmakin

Scanning Destriping

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

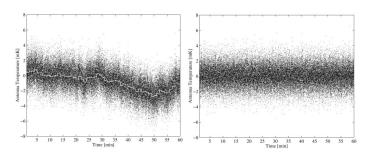


Figure by T. Poutanen

Planck and CMB mapmaking

Andrea Zonca

Planck

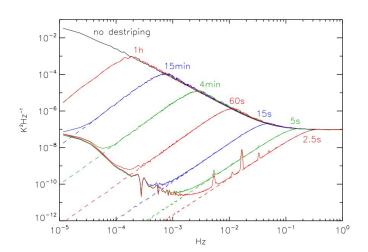
current status estruments and cooling

IR Manmakine





Destriping in frequency domain



Planck and CMB mapmaking

Andrea Zonca

Planck

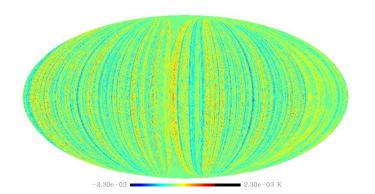
current status
enstruments and
cooling

CMB Mapmal Scanning Destriping





Simulated coadded map



Planck and CMB mapmaking

Andrea Zonca

Planck

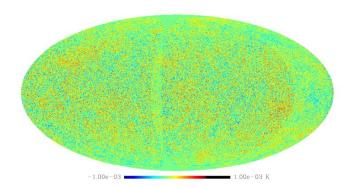
Current status
Instruments and
cooling
Published results

MB Mapmakin





Simulated destriped map 7 degrees



Planck and CMB mapmaking

Andrea Zonca

Planck

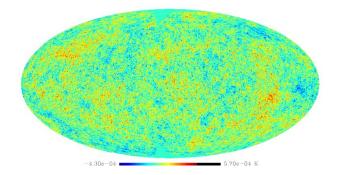
Current status Instruments and cooling

MB Mapmakin





Simulated destriped map 28 degrees



Planck and CMB mapmaking

Andrea Zonca

Planck

Instruments and cooling
Published results

MB Mapmakin



