PLANCK STATUS

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The Planck satellite has been operating with outstanding success since its launch on May 14^{th} 2009. This paper gives a brief description of the operations and an outline of the status of the spacecraft and its instruments. It recalls the pre-launch performance of the instruments and the main scientific objectives of the mission.

1 Planck goals

The Planck[a] satellite (Fig. 1) is the 3^{rd} generation space CMB experiment (Lamarre et al.[1]). It aims at a gain of a factor 2.5 in angular resolution and one order of magnitude in sensitivity with respect to WMAP. It is nearly photon noise limited in the CMB channels (100-217 GHz) and its temperature power spectrum sensitivity is limited by the ability to remove the foreground emissions. For this purpose it has a very broad frequency coverage from 30 GHz to 1 THz. The HFI (High Frequency Instrument) is based on direct detectors (bolometers) cooled to 100mK distributed in 6 bands from 100 to 857 GHz read in total power mode with a white noise from 10 mHz to 100Hz (no 1/f noise in the signal range). The LFI (Low Frequency instrument) uses coherent detection based on HEMT amplifiers distributed in 3 bands from 30 to 70 GHz, with photometric reference loads on the 4 K box of the HFI focal plane unit. The Planck *Blue Book* (http://www.rssd.esa.int/Planck) gives all detailed informations about the Planck mission and its goals.

[a]Planck (http://www.esa.int/Planck) is an ESA project with instruments provided by two scientific Consortia funded by ESA member states (in particular the lead countries: France and Italy) with contributions from NASA (USA), and telescope reflectors provided in collaboration between ESA and a scientific Consortium led and funded by Denmark.

Figure 1: The Planck satellite in the Centre Spatial Guyannais clean hall S1B in Kourou before its integration in the fairing of the Ariane 5 ECA launcher (credit ESA-CNES-Arianespace / Optique Video du CSG - L. Mira).

2 Planck operations

All informations and illustrations are taken from public information at the time of the conference. The injection of the spacecraft on the L2 orbit was performed on July 2nd 2009. At the same time the HFI detectors reached their operating temperature close to 100 mK (Fig. 2). The calibration and performance verification activities followed until August 13th 2009. The 4K cryocooler unexpectedly shut down on August 6th 2009: the HFI cryochain was lost but recovered to the same operating point in 6 days. This did not reoccur since. The spacecraft operation is very smooth, with only minor events on pointing and thermal control. The scanning strategy is fully implemented. The first light survey (August 13th-27th 2009) was followed by the first all-sky survey in continuity until February 13th 2010 The second all-sky survey is in progress.

2.1 Planck status

The 4 stages of the cooling chain are regulated at their nominal temperatures: the 18 K stage at 17.5 K, the 4 K stage at 4.72 K, the 1.6 K stage at 1.38 K. The dilution is regulated at 101 mK, operated with the lowest flow of isotopes providing a potential 30 months survey duration. The HFI detectors at their 103 mK operating temperature behave exactly as during ground tests. For more information on Planck, refer to the special issue of A&A on Planck pre-launch status papers (in press).

2.2 Planck data processing

The timelines consisting in circles (20 to 40 typ. per pointing) are processed into rings: the very stable pointing (5-10 arcsec) allows an efficient removal of glitches. The solar activity is at its minimum. This translate into a higher cosmic particules rate getting into the Solar system.

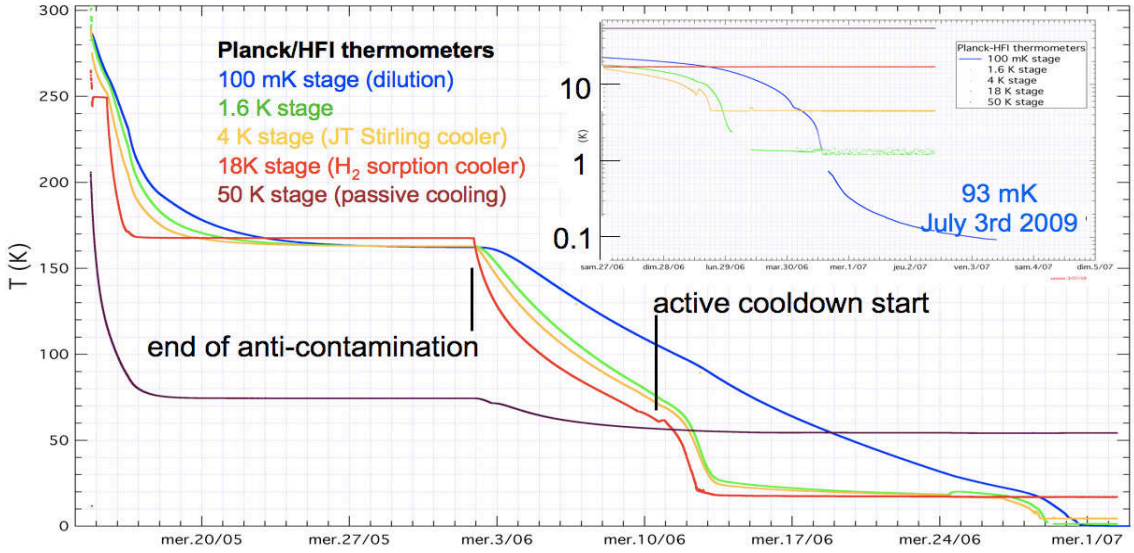

Figure 2: Cooldown profile of the Planck instruments cryochain.

The time transfert function is beeing carefully determined because it directly impacts the Cl spectrum. A first order calibration is derived from the CMB dipole or from the Galaxy in the day to day trend analysis. The mapmaking process already produced tantalizing pictures such as the one presented in the ESA/HFI/LFI press releases. All sky absolute calibration will be performed on the CMB orbital dipole or on the FIRAS data. Polarisation maps requires relative band to band fine calibration, as well as beams, side lobes and far side lobes determination. At all levels, a strict control of the systematics is needed to reach the most ambitious CMB science goals of Planck.

3 Conclusion

In August 2010 the DR2 "first all sky survey" internal data release will be released to the Planck scientists. These data are the basis for early papers on foregrounds which should be original, robust, and submitted by the end of 2010. They will be presented in January 2011 at a dedicated Planck conference in Paris on the missions performances, foreground emissions, and implications on the CMB science. At the same time the early release compact sources catalogue (ERCSC) public release will be done. The nominal mission (2 surveys) internal release is planned beginning of 2011, and its public release in mid-2012. The operations extention is approved by ESA until November 2011, for a 4 all sky surveys expected total duration of the mission. The potential impact of the extended mission on the CMB science is large. In particular an improved B-mode detection potential have been shown in Efstathiou and Gratton [2].

References

[1] Lamarre, J-M., Puget, J-L., Bouchet, F. et al., 2003, New Astronomy Review, 47, 1017.
[2] Efstathiou, G., and Gratton, S., 2009, JCAP, 6, 11.