Integral in Orbit*

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The Integral satellite was launched on 17 October 2002, at 4:41 Universal Time, from Baikonur aboard a Proton rocket. The flawless launch marked the culmination of more than a decade of work for the scientists and engineers dedicated to making this mission the most sensitive gamma-ray observatory in orbit.

Launch activities started in earnest at the end of August, when the satellite was shipped to Baikonur, in Kazakhstan. Following a short launch campaign, the highlights of which are featured in the accompanying panels, the Russian state commission gave the final go-ahead on the day of the launch. The countdown proceeded according to plan, with the following key events taking place exactly on time (all in Universal Time):

01:27 Completion of Proton propellant loading
01:49 Integral satellite powered up
03:55 Service tower rolled back
04:22 Integral satellite in launch configuration
04:30 Integral ground segment confirmed as ready for launch
04:36 Proton ignition key activated
04:41 Launch.

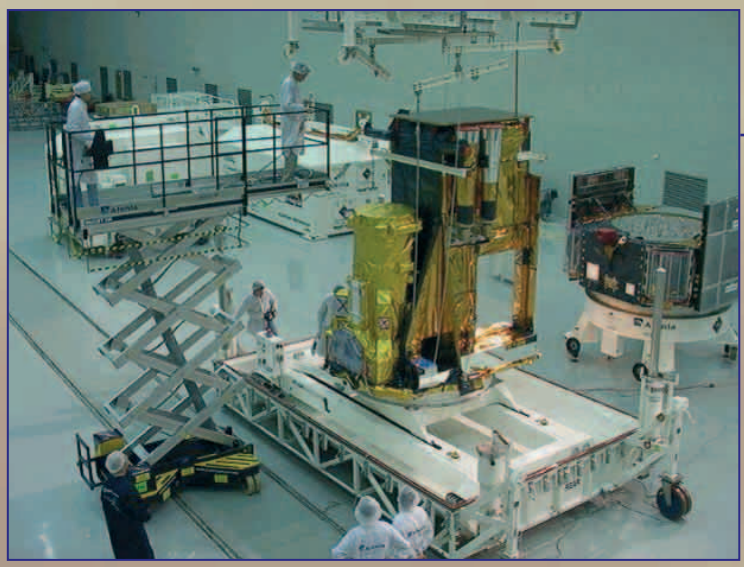
The flight sequence also proceeded precisely as planned. The upper stage separated 10 minutes after launch. It then coasted for 50 minutes until the upper stage engine fired for a 10 minute burn. An hour and a half after launch, the Integral satellite separated from the upper stage and its automatic activation procedure started, with the deployment of the solar arrays. Under the watchful eye of ESA's European Space Operations Centre (ESOC) in Darmstadt, Germany, the first few hours of the orbit were carefully monitored and controlled in order to start the commissioning of the spacecraft. By 1 November, the four perigee-raising manoeuvres had been executed, putting Integral safely into its operational orbit.

In parallel, instrument activation had already started, with the full participation of the teams from the Principal Investigator institutes, from Alenia and from ESA's Integral Project. On 21 October, the Optical Monitoring Camera (OMC) saw its first light (see panel). The Spectrometer (SPI) cool-down was achieved by turning on the onboard cryocoolers and by early November all of Integral's instruments were working well, in full scientific mode. They will now be carefully monitored until the formal completion of the Commissioning Phase, planned for mid-December 2002. At the same time, their fine tuning will continue, both at ESOC and at the Integral Science Data Center (ISDC) in Geneva.

* The Integral spacecraft and its sophisticated payload of scientific instruments were described in detail in the August 2002 issue of the ESA Bulletin (No. 111).

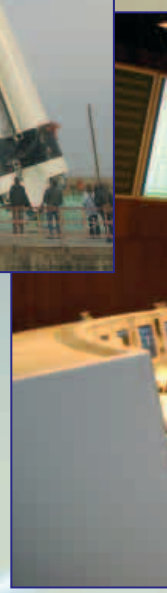
The Integral

L-54 days: Arrival of satellite modules



L-46 days: Mating of the 2 modules

L-39 days: Satellite preparation and functional tests



Launch Campaign

L-26 days: Propellant loaded

L-14 days: Tilting and encapsulation

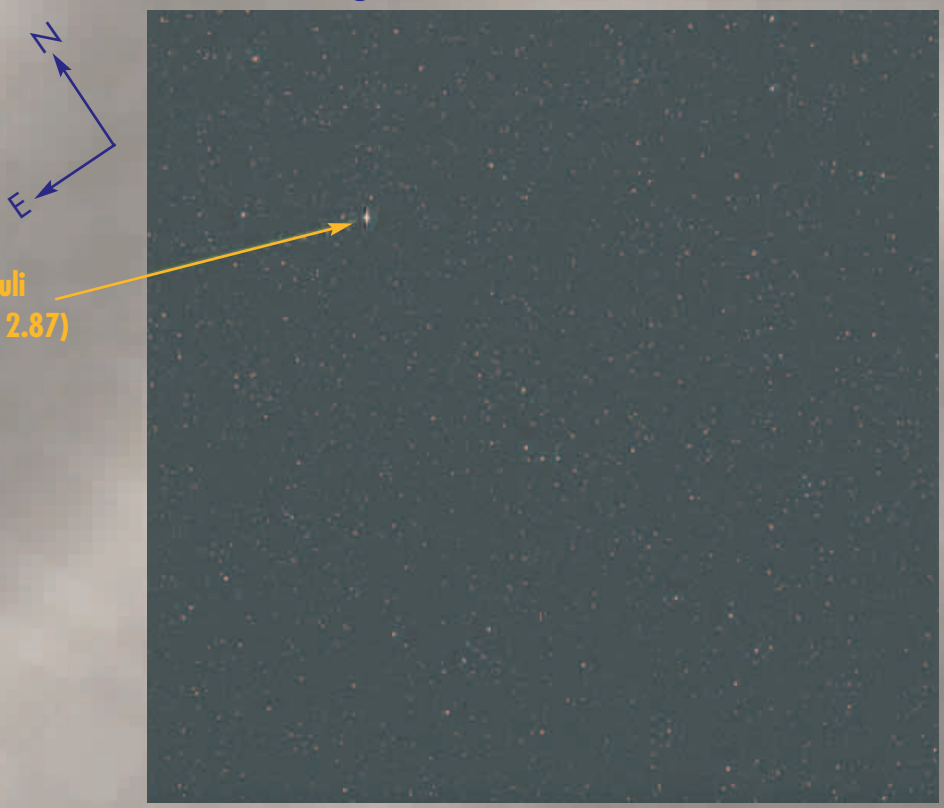
L-7 days: Mating of the upper-stage composite to Proton

L-5 days: Erection and final preparation

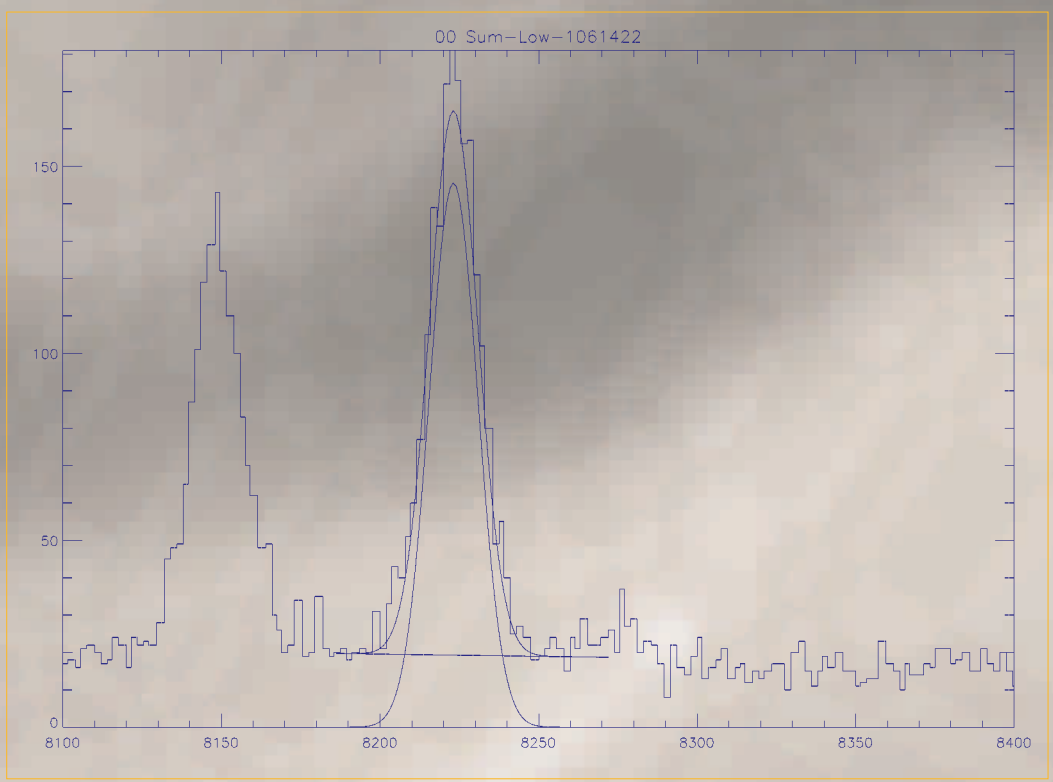
L-3 days: rehearsal with ESOC

First Images

OMC First Light *Oct. 21st, 2002*

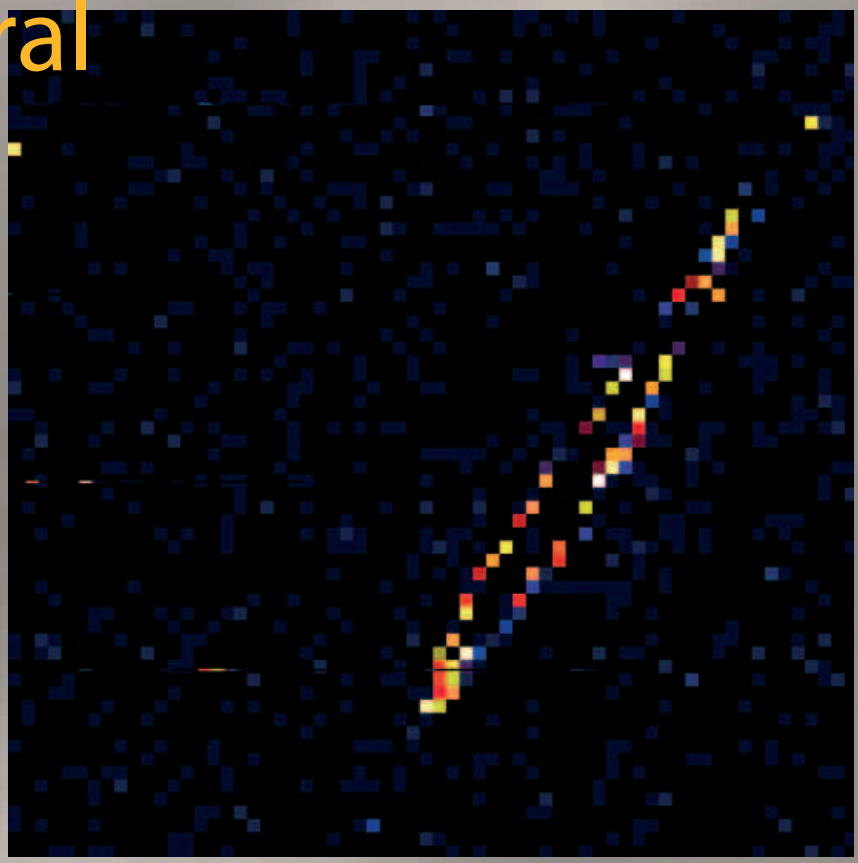


'First light' for Integral's Optical Monitoring Camera (OMC) just after the opening of its cover. The brightest star is Gamma Trianguli Australis. There is some saturation of the image pixels due to the combination of the brightness of the source and the relatively long integration time of ten seconds.
(Courtesy OMC Team)

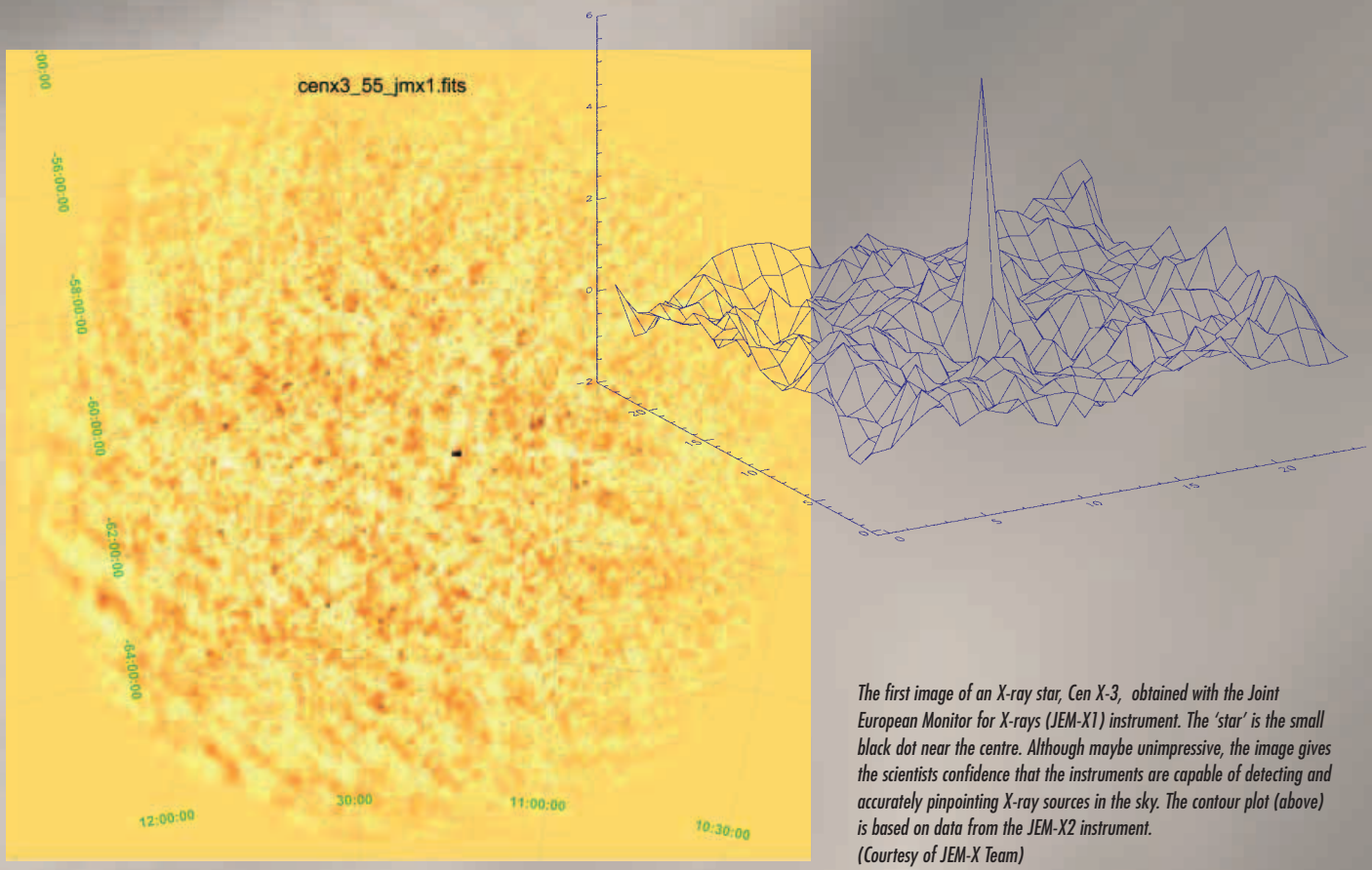


While looking to an empty space field, the Spectrometer sees spectral lines coming from its own germanium detectors (with the x-axis corresponding to the energy channels and the y-axis proportional to count rate). Here the two 69Ge lines at 1107 and 1117 keV can be clearly seen. The energy resolution around 2.5 keV indicates excellent instrument performance
(Courtesy of SPI Team)

from Integral



A high-energy particle track seen by the Imager on-Board the Integral Satellite (IBIS). The image (integrated on 100 msec) shows a well-defined particle passage in terms of time and energy profile that can be easily discriminated. (Courtesy of IBIS Team)



The first image of an X-ray star, Cen X-3, obtained with the Joint European Monitor for X-rays (JEM-X1) instrument. The 'star' is the small black dot near the centre. Although maybe unimpressive, the image gives the scientists confidence that the instruments are capable of detecting and accurately pinpointing X-ray sources in the sky. The contour plot (above) is based on data from the JEM-X2 instrument. (Courtesy of JEM-X Team)