**Gaia, New Technology to see the Milky Way**

00:10 Our Galaxy, the Milky Way, is made up of around a hundred billion stars. To understand its evolution, we need to know exactly where we stand in this mass of constantly moving and changing celestial objects. To do this, we use Astrometry, the science of measuring the position, distance and movement of stars around us. And astrometry is just about to take a giant leap forward - with the launch of ESA’s new space telescope, Gaia. Gaia will make it possible to measure some billion stars of our Milky way, with roughly a milliard second level of accuracy, a precision never achievable before

*Images-Animation of zoom out of galaxy, Gaia mapping the universe June .2013, then scientist using Tycho catalogue, then animation of mapping stars, both from “Hipparcos –science update May 97” , Then images of Gaia intergration in Kourou Oct 2013, final close up shot Astrium Toulouse Feb 2013 (copywright Astrium)*

*00:48* **Giuseppe Sarri - Giuseppe Sarri, Gaia Project Manager- Kourou Oct 2013***, “***if you take a euro coin and you put on the moon, and you look from the earth the angular opening of this euro coin is exactly ten microseconds, this is the capability of Gaia which are beyond what you can believe**

01:04 The secret of achieving such precision is in the development of several ground-breaking new technologies specific to the Gaia mission. Because many of the stars being measured are extremely distant and very faint - 400 thousand times fainter than can be seen with the naked eye - Gaia houses an extremely sensitive camera - 100 times more powerful than a standard camera.

*Images- Images of Gaia integration pre-launch in Kourou, Oct 2013, then animations of Gaia scanning the sky from ESA/Astrium*

**01:26 Giuseppe Sarri - Giuseppe Sarri, Gaia Project Manager- Kourou Oct « We have a huge focal plane, a typical detector in our camera is 1 square centimetre maybe 3 square centimetre, here we are talking about almost half a square metre, a huge camera which is made by a mosaic of 106 CCD but each CCD is huge with respect to what we are used to.**

*Images – image covering integration of Gaia in Astrium Toulouse February 2013*

01:45 Another important factor in the accuracy of Gaia’s measurements is the creation of a stable environment. Gaia’s ten mirrors fold and focus the light beams coming from its two telescopes along a path until they finally hit the focal plane of CCD detectors . To remain stable these elements must remain stable so they are housed in a structure that won’t be affected by the often-turbulent conditions in space.

*Images- Animation animations of Gaia from ESA/Astrium, then animation of instrument bench, with mirrors and foval plane from* GmbH for ESA.

**02:08- Giuseppe Sarri, Gaia Project Manager- Astrium September 2013“that is done by using a very new innovative material /cut/which a combination of silicium and carbon, which is cooked at 3000 degrees and it become as stiff and hard as diamond, and with that one we can build an optical bench, we can build a telescope which is so stable, which is not moving at all in space even under the worst thermal environment.**

02:34 But stability is also about temperature. As well as choosing a thermally calm location known as Lagrange 2 for Gaia’s orbit, ESA has developed a deployable circular sun shield, a unique system for protecting the spacecraft . Over 10 metres in diameter; the sunshield will always face the sun and guarantee Gaia is in the shade and at a stable temperature. And finally, Gaia is equipped with a specially developed propulsion system.

*Image- animation of Lagrange 2, Astrium, animation of Sunshield opening Astrium Toulouse Feb 2013 (copywright Astrium) Time lapse sequence of sunshield deployment, Kourou OCT 2013, then Gaia in clean room Astrium 27/9/2013*

**03:01 Vincent Poinsignon, Gaia Project Manager,** *Astrium 27/9/2013* **"Encore afin d'atteindre une précision extrême, //Le satellite est en fait équipé de 8 micro tuyères dont le principe consiste à éjecter du gaz froid, avec une précision de l'ordre du micronewton. C'est en gros un million de fois plus faible que les propulseurs classiques."**

**"Then in order to have extreme precision the satellite is equipped with eight micro thrusters which eject cold gas with a pressure of around one micronewton. That's around a million times less powerful than a regular thruster**

A system designed to minimize disruption and maximize stability and precision of direction.

Thanks to all these developments; Gaia will have unprecedented precision to measure the stars in our galaxy, It will provide scientists from all fields of astrophysics with a new reference catalogue – and in particular – this will enable them to make a new 3D map of the Milky Way..

*Images – Animations of Gaia scanning the sky from ESA/Astrium*

*03:52 the end B-Roll*

*03:52 ITW:* **Giuseppe Sarri - Giuseppe Sarri, Gaia Project Manager- Kourou oct 2013 on The accuracy of Gaia’s measurements (English)**

*04:35 ITW:* **Giuseppe Sarri - Giuseppe Sarri, Gaia Project Manager- Kourou oct 2013 on The accuracy of Gaia’s measurements (Italian)**

**05:27 ITW: Giuseppe Sarri, Gaia Project Manager- Kourou oct 2013 scientific development since hipparcos, ccd focal plane. (English)**

**07:00 ITW: Giuseppe Sarri, Gaia Project Manager- Kourou oct 2013 on scientific development since hipparcos, ccd focal plane. (English) (Italian)**

**08:20 - ITW: Giuseppe Sarri, Gaia Project Manager- Astrium september 2013, Talking about Silicon Carbide Focal Bench (English).**

**09:38 - ITW: Vincent Poinsignon, Gaia Project Manager,** *Astrium 27/9/2013 talking about micro propulsion thrusters (English).*

**10:49 - Rushes Sunshield deployment tests ,Clean room X 17, Kourou October 2013**

**13:18 the end .**