**GAIA SECOND DATA RELEASE**

**A-ROLL**

Duration: 03:26

Interviews: Timo Prusti, Gaia Project Scientist, ESA

Languages: English (A and B-roll), Finnish (B-roll)

Suggested web copy:

The second data release of ESA’s Gaia mission has produced an extraordinary catalogue of over one and a half billion stars in our galaxy. Based on observations between July 2014 to May 2016, it includes the most accurate information yet on the positions, brightness, distance, motion, colour and temperature of stars in the Milky Way as well as information on asteroids and quasars.

TAPE: 00:00:00

VT STARTS: 00:00:10

[HUBBLE DEEP FIELD ANIMATION]

Galaxies come in all shapes and sizes. And while several hundred billion galaxies are estimated to be in our universe, only one of them is home to Earth.

10:00:22

[MILKY WAY ANIMATION]

Our planet and its Sun lies in one of the Milky Way’s spiral arms. But while special to us, our Sun is just one of around 100 billion other stars in the galaxy.

10:00:34

[GAIA SPACECRAFT ANIMATION, CREDIT: ESA]

So in order to better understand the Milky Way, its past and its future, the Gaia spacecraft has been surveying the skies since 2014. And it will make up to seventy observations on average for each star over the five year mission.

10:00:50

[GAIA FIRST DATA RELEASE STILL BLACK AND WHITE IMAGE, 2016]

The first data release in 2016 charted one billion stars, but only included the distance and motions for two million.

10:00:59

[GAIA SECOND DATA RELEASE STILL BLACK AND WHITE IMAGES, 2018]

The second has now updated this to an extraordinary 1.7 billion and with greater accuracy, including the distance and motions for nearly all the surveyed stars. This new image, showing the distribution of stars in the Milky Way, represents 22 months of observations. The dark areas are not empty. They contain interstellar gas and dust and are often regions where new stars are forming.

10:01:28

[GAIA SECOND DATA RELEASE COLOUR STILL IMAGE, 2018]

This stunning new image was produced by recording the colour from stars and combining it with their overall brightness.

10:01:35

[GRAPHIC]

We now know the position and brightness of 1.7 billion stars. Importantly, as well as the colour, we also know the distance and proper motion of 1.3 billion stars. Plus the surface temperature of 161 million, the radius and luminosity of 77 million, and the radial velocity of 7 million stars.

10:01:57

[INSET CLIP: Timo PRUSTI, Gaia Project Scientist, ESA]

*“The most eagerly awaited results from Gaia are so called parallaxes which is the measurement which gives a handle to the distance of the stars. And this is a very tough measurement to be done and we have known since Hipparcos, the previous ESA mission, distances to about 100,000 stars. And Gaia is going to increase that number to above one billion so that is a real revolution.”*

10:02:21

[PARALLAX ANIMATION]

Obtaining the parallax measurement involved determining the apparent motion of the star by using two different vantage points along the Earth’s orbit around the Sun, and separating it from the star’s true motion through the Galaxy.

10:02:35

[PARALLAX ANIMATION]

Closer to home, Gaia observed 14,000 known Solar system Objects too - mainly asteroids - and far away, it measured the positions of distant quasars to create a new cosmic reference system.

10:02:49

[STILLS GAIA SECOND DATA RELEASE]

The first data release already produced hundreds of scientific results.But for astronomers across the world the best is yet to come.

10:02:58

[INSET CLIP: TIMO PRUSTI, GAIA PROJECT SCIENTIST, ESA]

*“The essential thing of the Gaia mission is that the surprises will come later because we make the catalogue and it is the scientists in the community who are going utilise it and give the scientific surprises to us.”*

10:03:12

[GAIA SECOND DATA RELEASE COLOUR IMAGE AND EXOPLANET ANIMATION]

The Gaia mission is expected to be extended to 2020 which means not only cataloguing more stars but also examining possible exoplanets around them and even more surprises.

10:03:26

[END of a-roll]

**GAIA SECOND DATA RELEASE**

**B-ROLL**

10:03:26

**[TITLE] Timo Prusti**

**Gaia Project Scientist, ESA**

**[English]**

*“Gaia is measuring with three different instruments. It is doing astrometry, photometry and spectroscopy. Astrometry is measuring the positions which helps to get the distances and also the motion of the stars. Photometry is essentially getting the colour of the star and colour gives us the temperature of the star. With spectroscopy we are using one element which is based on the Doppler effect. We are looking how the lines on the spectra are moving and we get the speed of the star on the line of sight. But spectroscopy can be also used to analyse better the stars so it is really the combination of all these elements. We know where the stars are, how they are moving, what is their temperature and what are the properties of these stars.”*

*“So we have a multitude of targets. We have Solar System objects, asteroids, most of them are stars but we also see external galaxies and quasars and it is really a different kind of science what you can get out from this. From Solar System targets we can measure their positions extremely accurately. We will know much better than ever before the orbits of asteroids, for example. Stars we are using to understand our Milky Way better. From stars we get really the structure of our galaxy and the advantage of seeing some quasars is that the reference system of coordinates is based on quasars because they are far away so they don't move and we can observe them with radio and now finally with Gaia we can see the same objects in optical wavelengths so we can tie our radio reference system to optical one.”*

**10:05:18**

**[TITLE] Timo Prusti**

**Gaia Project Scientist, ESA**

**[Finnish]**

**To be translated**

1. Summary what the Gaia mission is doing

2. Benefits of the new catalogue and why it is unique

3. How astronomers will use this information

**10:07:06**

**[TITLE] Animation of Hubble Deep Field image**

**Credit: NASA, EAS and F. Summers [STScI]**

Animation from real Hubble Space Telescope images showing a multitude of galaxies.

**10:07:46**

**[TITLE] Milky Way animation**

Animation of our own galaxy, the Milky Way, from a side view showing the galactic plain to above, revealing its spiral shape. The location of the Earth’s Sun is shown on one of the spiral arms and compares the Hipparcus survey to the Gaia survey. Hipparcus was an earlier European Space Agency mission, November 1989 to March 1993, which pinpointed the positions of more than one hundred thousand stars to a high precision, and more than one million stars to a lesser precision.

**10:08:47**

**[TITLE] Gaia scanning the sky**

Animation of the Gaia spacecraft, showing it scanning the sky to produce an image of stars. The largest concentration of stars are in the brighter areas.

**10:10:18**

**[TITLE] Parallax and proper motion animation**

Animation showing how the stars appear to move depending on your point of view.

**10:10:52**

**[TITLE] Animation of Solar System asteroids**

Asteroids animation.

**10:11:53**

**[TITLE] Exoplanet animation**

Animation showing an exoplanet, a planet orbiting a star outside our Solar System.

10:12:45 end of b-roll