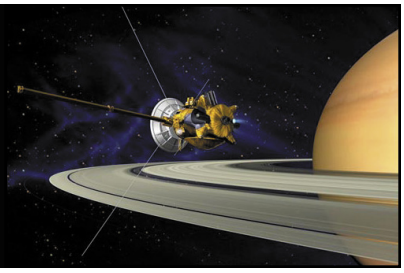
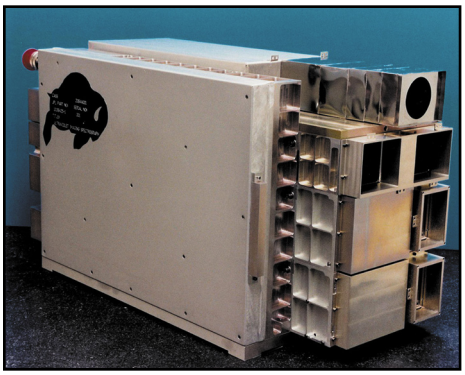
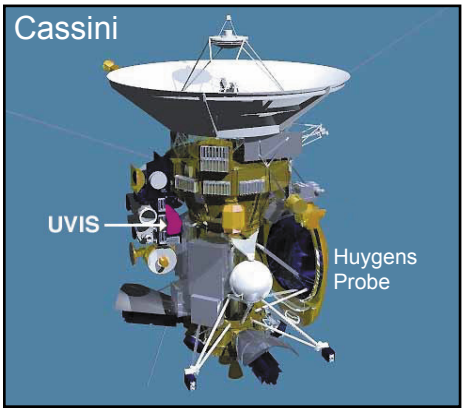
Cassini Mission's UVIS Instrument





The Cassini-Huygens mission includes the Cassini orbiter, which orbits Saturn and its moons for four years, and the Huygens probe, which was released from the Cassini orbiter and landed on the moon Titan to explore its surface and surroundings. The scientific instruments provide new and exciting data to help understand the mysterious Saturnian system. **The Ultraviolet Imaging Spectrograph (UVIS),** is one of the 12 instruments on board Cassini. Its four telescopes measure ultraviolet light from sunlight, hydrogen, and deuterium to provide information on the atmospheric composition and photochemistry of Saturn, Titan and other moons, and the nature and history of Saturn's rings. UVIS was built at the University of Colorado's Laboratory for Atmospheric and Space Physics in Boulder, Colorado.



Mission Details

Instruments on board Cassini	12, including UVIS
Instruments on board Huygens	6
Cost	$3.3 billion
Managed by	NASA's Jet Propulsion Laboratory (JPL)
Launched	October 15, 1997 by a Titan IV/B Centaur rocket
Launched from	Kennedy Space Center in Florida
Cruise to Saturn	7 years and 3.5 billion kilometers (2.175 billion miles)
Entered Saturn orbit	June 30, 2004
Orbital life	4 years (plus possible 2-6-year extension)
Huygens probe landed on Titan	January 14, 2005

UVIS Details

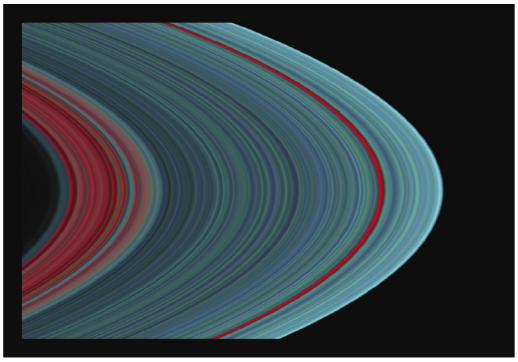
Dimensions	18.5" long x 9.2" wide x 11.8" tall and weighs 15.43 kg
Cost	$12.5 million to build, funded by NASA
UVIS's four Telescopes (Channels)—	*see letters by UVIS photo in uppler left corner:*
A: Extreme UV channel (EUV)	measures between 55.8-118 nm wavelengths of UV
B: Far UV channel (FUV)	measures between 110-190 nm wavelengths of UV
C: High Speed Photometer (HSP)	measures starlight and sunlight during an occultation
D: Hydrogen-Dueterium Absorption Cell (HDAC)	measure hydrogen and deuterium to learn about the origin and history of Titan's atmosphere

The UVIS instrument has been built by and is supported by more than 60 scientists, engineers, and other team members from the United States, Germany and France. The Cassini-Huygens mission a cooperation between 19 nations.

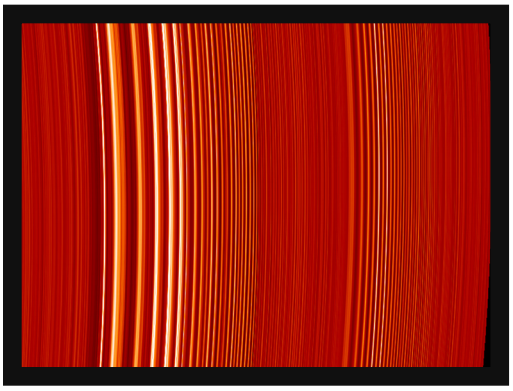
Saturn Details

Distance from Earth	1.279 billion km (795.15 million miles)
Average distance from Sun	1.4 billion km (887 million miles)
Average temparature	-139.15°C (-218.47°F)
Diameter	120,536 km (74.897 miles)
Mass	95.2 times Earth's mass
Length of a Saturn day	10.7 Earth hours
Length of a Saturn year	29.46 Earth years
Gravity	107% that of Earth's at the cloudtops
Moons	at least 34 and still discovering more
Composition	Saturn is 75% hydrogen and 25% helium with traces of water, methane, ammonia and other elements; Rings are water ice, with some rock—particle size ranges from a grain of sand to the size of a house.

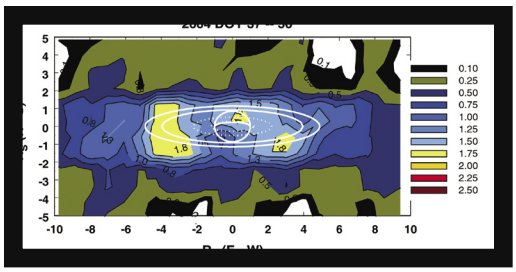
UVIS Scientific Observations—Measuring Ultraviolet Light in the Saturn System



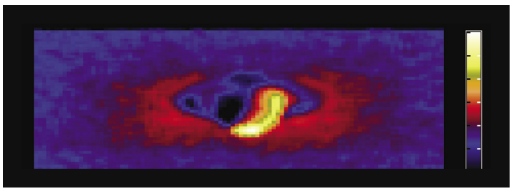
These are color-enhanced images of the rings from the UVIS observations during the Saturn orbit insertion event—when Cassini entered Saturn's orbit after a nearly seven year journey—on June 30th (MST). The turquoise represents more water ice in the rings. The red represents the most transparent (optically thinnest) area in the rings. From the inside out, the "Cassini division" in faint red at left is followed by the A ring in its entirety. The A ring begins with a "dirty" interior of red followed by a general pattern of more turquoise further away from the planet, which indicates material with more ice. The red band roughly three-fourths of the way outward in the A ring is the Encke gap.



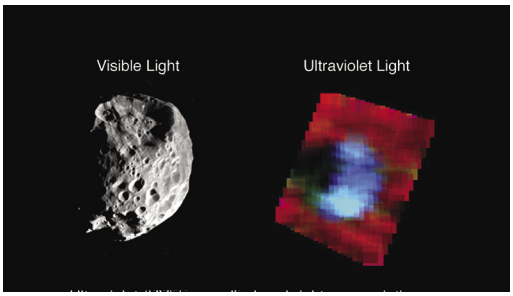
This color-enhanced image of two density waves in Saturn's A ring was made from the stellar occultation (a star shining through from behind) observed by UVIS when the spacecraft was 6.8 million kilometers (4.2 million miles) from Saturn. Bright areas indicate the denser regions of the rings. The bright bands on the left are the "peaks" of a density wave caused by gravitational stirring of the rings by Saturn's moon, Janus. A smaller density wave on the right is produced by the moon Pandora. UVIS observed the brightness of the star Xi Ceti as the rings passed in front of it, and the flickering of the starlight was converted into the ring density depicted by the image.



Oxygen surrounds Saturn in a large donut: fluctuations show active processes in Saturn's E ring. A movie showing a series of four similar images tracking the changes in the Saturn magneosphere's atomic oxygen emission during Saturn approach December 2003 - June 2004 can be found at http://lasp.colorado.edu/cassini on the What's New page.



Saturn and its rings block hydrogen Lyman-alpha emission. This image was taken on July 13, 2004, from a distance of 5 million km. You can see the southern auroral zone, the sunlit crescent Saturn, the dark nightside, the dim rings, Saturn's shadow on the rings, and Saturn's extensive atomic hydrogen corona.



Saturn's retrograde moon, Phoebe, in visible and ultraviolet (UV) light. On the right side, an ultraviolet image taken at a distance of 31,000 km, shows an irregular surface and bright crater region (white area). The ultraviolet spectra confirm water frost on Phoebe's surface. The image was taken by UVIS during the spacecraft's closest approach to Phoebe, on June 11, 2004. The large crater shows clearly in the image on the left.

Electromagnetic Spectrum

Extreme UV: 55.8-118 nm
Far UV: 110-190 nm

10^{-6} nm	Gamma-Rays
10^{-5} nm	
10^{-4} nm	
10^{-3} nm	
10^{-2} nm	
10^{-1} nm (1 Å)	X-Rays
1 nm	
10 nm	
10 nm	
100 nm	Ultraviolet
10^{3} nm (1 μm)	Visible Light
10 μm	Near Infrared
100 μm	Far Infrared
1000 μm (1 mm)	
10 mm (1 cm)	Microwave
10 cm	
100 cm (1 m)	
10 m	Radio
100 m	
1000 m (100 km)	
10 km	
100 km	
1 Mm	
10 Mm	
100 Mm	

To learn more, visit http://lasp.colorado.edu/cassini