



GEO-COSMOS

TSU-NA-GA-RI

Feel the Earth — Geo-Cosmos

Geo-Cosmos, a more than 10-million pixel, ultra high-resolution, realistic spherical display of a brilliantly shining Earth floating in space, is the symbol of Miraikan, the National Museum of Emerging Science and Innovation. It is the world's first globe made of organic electroluminescent panels. Its creation reflects the first Chief Executive Director of Miraikan Mamoru Mohri's desire to share with everyone the experience of seeing the shining Earth from space. The clouds that flow over the displays are updated daily to reflect the latest imagery from weather satellites. Visitors can, thus, see the Earth as it actually appears from space. Thanks to data collected from satellites, a wide variety of simulations can be displayed on the Geo-Cosmos, such as ocean temperature and acidification simulations.

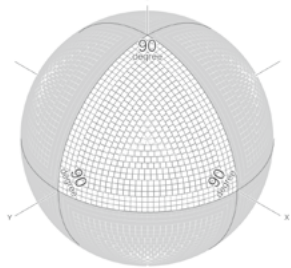


The World's First Large-Scale Organic Electroluminescent Display

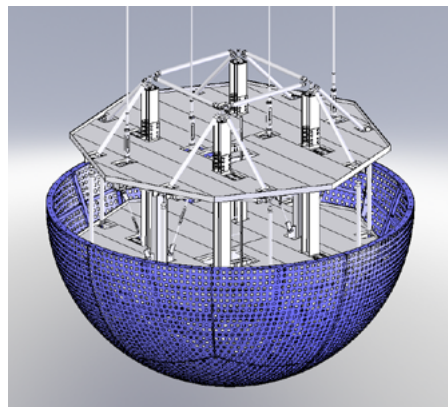
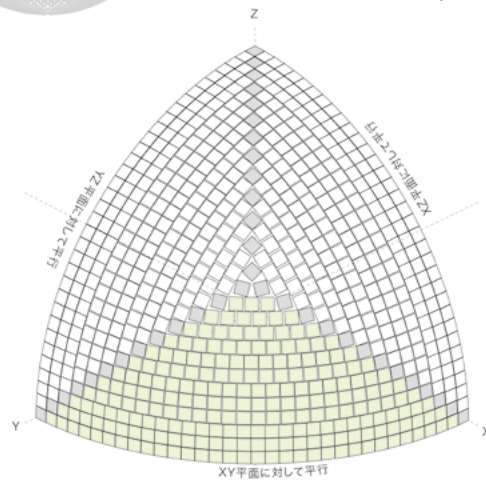
Using the world's first large-scale organic electroluminescent panels, then still under development, we designed the smooth panel layout based on a geodesic octahedron model. The new Geo-Cosmos is a sphere 6m in diameter, made up of 3mm dot pitch, ultra high-definition organic electroluminescent panels, which deliver a resolution of greater than 10 million pixels, more than ten times sharper than its 950,000 pixel predecessor. Energy-saving design has reduced per pixel energy consumption, resulting in only one-seventh the energy consumption, only 892kWh per day. Weight, too, has been reduced by streamlining systems and the use of aluminum. At about 13 tons, the new Geo-Cosmos comfortably clears the 20 ton or less design criterion.

Geo-Cosmos II Specifications	
Display system	Large-scale organic electroluminescent display
Diameter	6.0 meters
Spherical surface	113m ²
	*In the case of a perfect sphere (without taking into consideration the fan aperture)
Dot pitch [pixel size]	3mm
Panel dimensions	96mm x 96mm
Pixel count [resolution]	10,000,000-plus
	*More than 10 times sharper resolution than Geo-Cosmos I
Light-emitting surface	Approx. 46%
	*Seven times Geo-Cosmos I
Luminance	1200cd/m ²
Frame rate	480Hz *Compared to 60Hz or 120Hz for conventional LCD televisions
Color coding	14 bit
Contrast	1500:1
Viewing angle	More than 160° [up/down/left/right]
Display element life	30,000 hours
	*For 8 hours/day, 320 days/year, luminance 500cd/m ²
Optimal viewing distance	1000 times dot pitch is standard
	*Less than 1/3 the viewing distance for Geo-Cosmos I
Power consumption	892kWh/day
Weight	13t

Basic plan for display:
Panel distribution method
Octahedron



Panel layout: Diameter based on
geodesic octahedron model
The surface of the 6m sphere is
divided into eight blocks. The
panel layout was designed using
an algorithm that allocates square
panels whose side is 96mm to
each triangular block. The result is
a spherical display that displays a
decentered image of the world with
more than 10 million pixel resolution.



Internal structure

Geo-Cosmos Features

■ Output system

Dual output system

- HDDR (Hard Disk Drive Recorder)

- Storage for ultra high-resolution content

- RTWS (Real Time Work Station)

- Real-time data processing and image output

- Captures 4K video input from an external source, computes data in real-time, and delivers output of the converted contents

■ Content data format

- Image resolution = 6k × 3k (6204 × 3102)

- (Can also display lower resolution images.)

- Aspect ratio = 2:1

- HDDR frame rate = 59.94 fps

- RTWS frame rate = 30 fps

- Data structure = layered (5 layers: Base, L1, L2, L3, Text)

- Map format: equidistant cylindrical projection

■ Production/Recording environment for the data contents

- RTWS content creation environment

Programming languages: GCPL, XML

GCPL: Python-based API customized for use with Geo-Cosmos

XML: controls rotation, speed, and other aspects of image display

- Environment for the automatic recording of data contents for HDDR

- Designate a still image file with a serial number online, and record automatically

- Environment that supports data content production (Geo-Simulator)

- Browser-based simulator environment that recreates movement and appearance of contents on Geo-Cosmos

■ Operating interface

- Ball controller

- Controls 3D image rotation (RTWS only)

- Tablet controller (wireless terminal)

- Controls 3D image rotation and rotation speed (RTWS only)

- Selects and calls contents (RTWS, HDDR)

- Content feed function

- Operation console (installed in control room)

- Controls 3D image rotation and rotation speed (RTWS only)

- Selects and calls contents (RTWS, HDDR)

- Switches between auto and manual mode

■ Automatic operations

Automatic update function for data contents

= Numerical and image data is received periodically, and image data for use with the contents is generated automatically.

Automatic program control (Automatic screening function)

= Links up with the operational schedule for automatic execution of the demonstration program (simultaneous control of images and sound)

■ Audio environment

- Input = CD, audio recorder, automated audio recorder, or microphone,

External input

- Output = Oval Bridge speaker system (L, R) × 16

- 5th floor speakers (L, R) × 1

- 3rd floor speakers (L, R) × 1

- Symbols zone (first floor) speakers (L, R) × 2

■ Monitoring and system administration

[Monitoring]

- Remote monitoring = 24-hour remote monitoring via dedicated circuit

- Camera monitoring = Image monitoring of spherical surface and internal parts through status monitoring camera

[Management of operational program]

- Power activation for Geo-Cosmos, management of termination schedule

- Control/editing of operational schedule

- Contents program, data registration, editing

- Switching of viewing position

- Data synchronization management

[Equipment management]

- System control mechanism through alert interlocking

- Output system equipment, control equipment, network redundancy configuration

- System back-up function

- Temperature control

- Organic EL panel luminance control

■ Internal structure

The Geo-Cosmos until 2011 had been made up of several hundred parts made from iron. However, the current Geo-Cosmos has evolved into a simple structure that uses a geodesic structure even for the internal structure. Furthermore, the use of aluminum has created a lightweight system with improved precision and efficiency.