The Geostationary Environment Monitoring Spectrometer (GEMS) is designed to provide measurements of air quality over South Korea and the greater Asia-Pacific region by measuring tropospheric pollution from space. The GEMS 10-year mission will investigate chemical concentrations critical to air quality and climate change, such as nitrogen dioxide, sulfur dioxide, formaldehyde, ozone, and other aerosols.
Overview
The GEMS mission will enable Korean scientists to assess and forecast air quality, monitor regional trans-boundary pollution and Asian dust, and understand the long-term effect of aerosols in climate change. This information will help reduce economic loss by improving climate change predictions. Early warning of natural disasters and pollution events will also help save lives.

Our Role
Ball Aerospace & Technologies Corp. is designing, building and testing GEMS in collaboration with the Korea Aerospace Research Institute (KARI) for the National Institute of Environmental Research in the Ministry of Environment of South Korea. GEMS will fly on KARI’s GEO-KOMPSAT-2B geostationary satellite and is scheduled for a 2018 launch.

Quick Facts
- GEMS will be the first air quality sensor in geostationary orbit
- GEMS is being developed jointly by a unified team comprised of KARI and Ball engineers
- Strong synergy with Ball-developed TEMPO instrument
- GEMS is a scanning ultraviolet/visible (UV/Vis) spectrometer
- GEMS will scan across a selectable 5000 km East/West swath in less than 30 minutes with high spatial and spectral resolution, and high signal-to-noise ratio across 300 to 500 nm
- GEMS will collect images of the required geographical locations at least 8 times per day
- Instrument delivery in early 2017
- Launch planned for mid-2018
- GEMS launches on the GEO-KOMPSAT-2B satellite along with the GOCI-2 ocean color sensor

In geostationary orbit at 35,786 km (22,236 miles) above the Earth, GEMS will collect images over an 8 to 12 hour period. GEMS will scan a 5000 km East/West area in less than 30 minutes with state-of-the art calibration and high spatial and spectral resolution. The instrument has a two-axis scan mirror and a 1k x 2k focal plane array using a Charge Coupled Device to image the ultraviolet/visible spectrum.

Ball is also building the Tropospheric Emissions: Monitoring of Pollution (TEMPO) instrument, NASA’s contribution to the worldwide air quality monitoring constellation. Building GEMS alongside TEMPO offers benefits through similar hardware development, common ground calibration and data processing, and interchangeable retrieval algorithms.

Ball Aerospace has a 30-year history as an established leader designing and building advanced spectrometers. Ball developed the Ozone Mapping and Profiler Suite Instrument now aboard the Suomi National Polar-orbiting Partnership satellite and is providing a newer model of the same instrument for the Joint Polar Satellite System. Ball was the primary developer of spectrometers for the Hubble Space Telescope, including the Goddard High Resolution Spectrograph, Space Telescope Imaging Spectrograph, and the Cosmic Origins Spectrograph.

Ball GEMS Program Manager Chris Randall interviewed by South Korea’s KBS-TV.