The Advanced Technology Microwave Sounder (ATMS): a New Operational Sensor Series

[#]Edward J. Kim [1], Joseph C-H. Lyu [1], William J. Blackwell [2], R. Vince Leslie [2],
Neal Baker [3], Lynn Chidester [4], Tsan Mo [5]
[1] NASA Goddard Space Flight Center
Greenbelt, MD 20771 USA, [#]ed.kim@nasa.gov
[2] Lincoln Laboratory, Massachusetts Institute of Technology
Lexington, MA 02420 USA
[3] Aerospace Corporation
El Segundo, CA 90245 USA
[4] Space Dynamics Laboratory, Utah State University
North Logan, UT 84341 USA
[5] NOAA Center for Satellite Applications and Research
Camp Springs, MD 20746 USA

Abstract

The Advanced Technology Microwave Sounder (ATMS) will provide atmospheric temperature and moisture profile observations for national weather agencies in the US, Europe, and possibly other countries. The first launch is scheduled for October, 2011 aboard the NPP satellite. A description of the sensor and post-launch activities will be presented.

Keywords: Remote Sensing, Microwave, Sounder, Atmosphere

1. Introduction

The Advanced Technology Microwave Sounder (ATMS) is a new satellite microwave sounding sensor designed to provide operational weather agencies with atmospheric temperature and moisture profile information for global weather forecasting and climate applications. ATMS will continue the microwave sounding capabilities first provided by its predecessors, the Microwave Sounding Unit (MSU) and Advanced Microwave Sounding Unit (AMSU). The first flight model is manifested on the NPOESS Preparatory Project (NPP) satellite. Microwave soundings by themselves are the highest-impact input data used by Numerical Weather Prediction models; and ATMS, when combined with the Cross-track Infrared Sounder (CrIS), forms the Cross-track Infrared and Microwave Sounding Suite (CrIMSS). The microwave soundings help meet sounding requirements under cloudy sky conditions and provide key profile information near the surface.

2. Basic Description

Designed & built by Aerojet Corporation in Azusa, California, (now Northrop Grumman Electronic Systems), ATMS has 22 channels spanning 23—183 GHz, closely following the channel set of the MSU, AMSU-A1/2, AMSU-B, Microwave Humidity Sounder (MHS), and Humidity Sounder for Brazil (HSB). It continues their cross-track scanning geometry, but for the first time, provides Nyquist sample spacing. All this is accomplished with approximately ¼ the volume, ½ the mass, and ½ the power of the three AMSUs. Table 1 lists the major characteristics of ATMS. A description of the ATMS design and expected performance will be presented.

Table 1: Key ATMS Characteristics

Parameter	FM1 value
Envelope dimensions	70x60x40 cm
Mass	75 kg
Operational peak power	200 W
Data rate	30 kbps
Absolute calibration accuracy	0.6 K
Pointing knowledge	0.03 degrees
NEDT	0.3/0.5/1.0/2.0 K
Orbit altitude	824 km (NPP)
Reliability	0.87

Figure 1 shows a photograph of the complete sensor, and Figure 2 provides a block diagram of the internal subsystems.

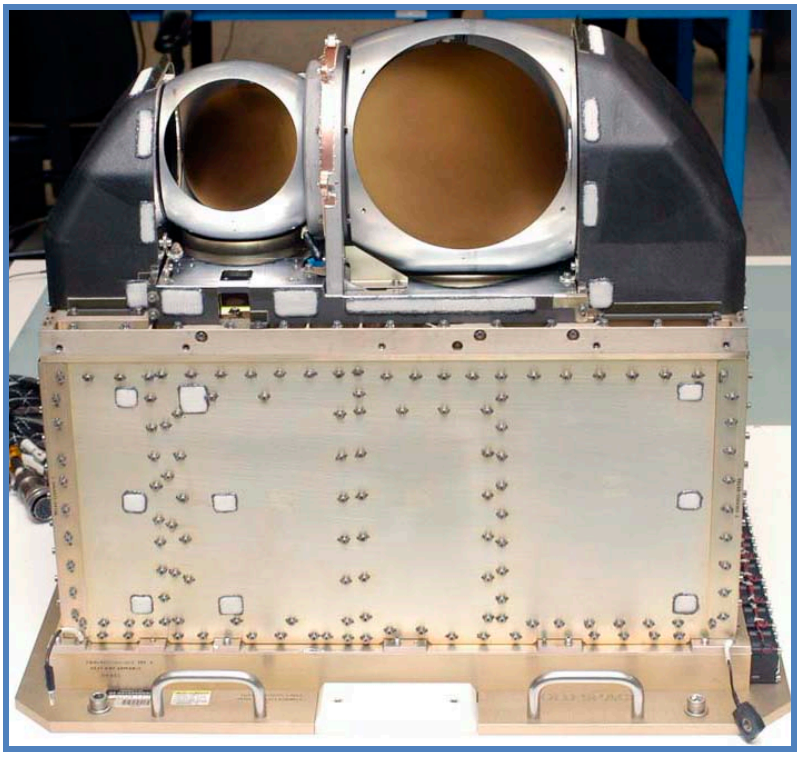

Figure 1: Photo of ATMS showing antenna apertures for channels 16—22 (left) and channels 1—15 (right). [photo courtesy of NGES]

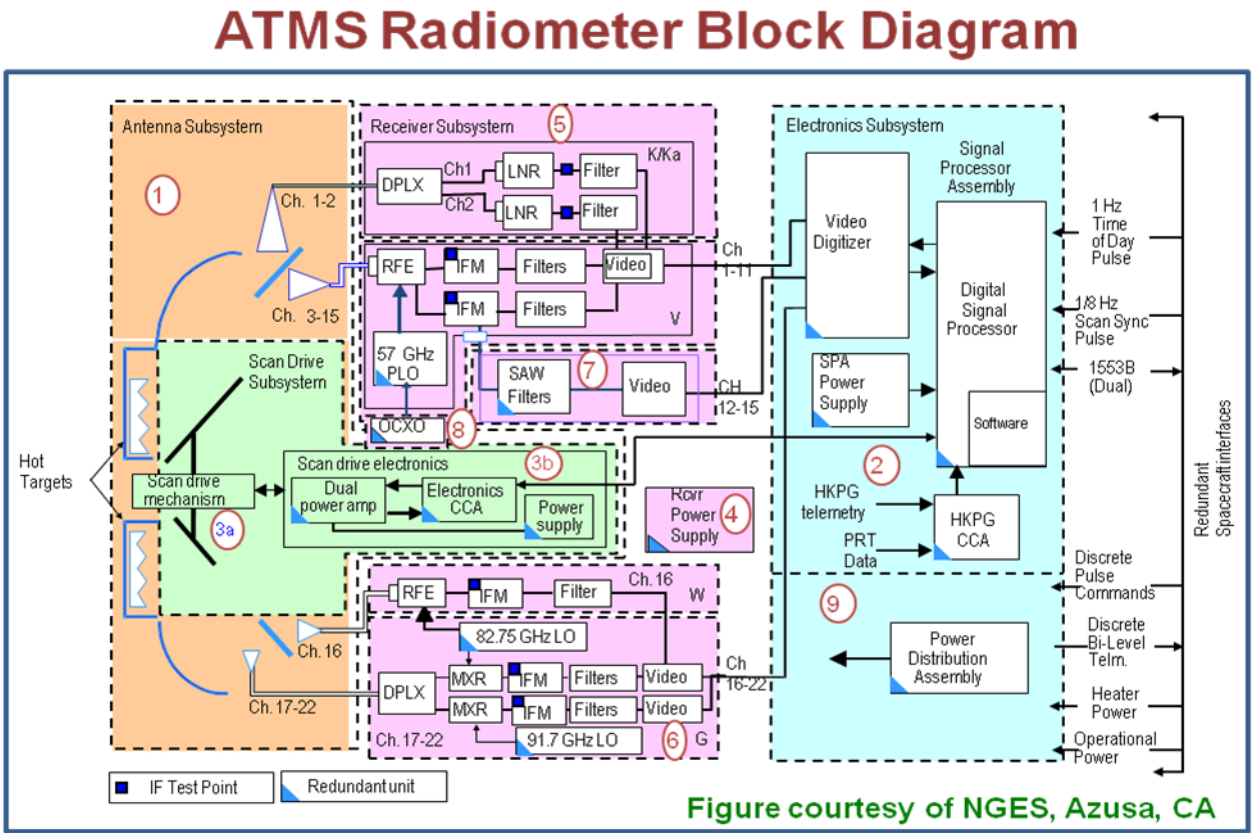

Figure 2: ATMS block diagram.

3. Post-Launch Activities

Post-launch calibration/validation activities include geolocation determination, radiometric calibration using the on-board warm targets and cold space views, simultaneous observations by microwave sounders on other satellites, comparison vs. pre-launch thermovacuum test performance; observations vs. atmospheric model predicted radiances, and comparisons of soundings vs. radiosondes. Brief descriptions of these activities will be presented.

The second ATMS flight model is planned for launch on the first satellite ("J1") of the Joint Polar Satellite System (JPSS) program in approximately 2016. Additional units are expected on the J2 and J3 satellites, as well as future European METOP satellites.

Acknowledgments

The authors wish to acknowledge the contributions of the many individuals and organizations that have brought ATMS to the state of launch readiness.