

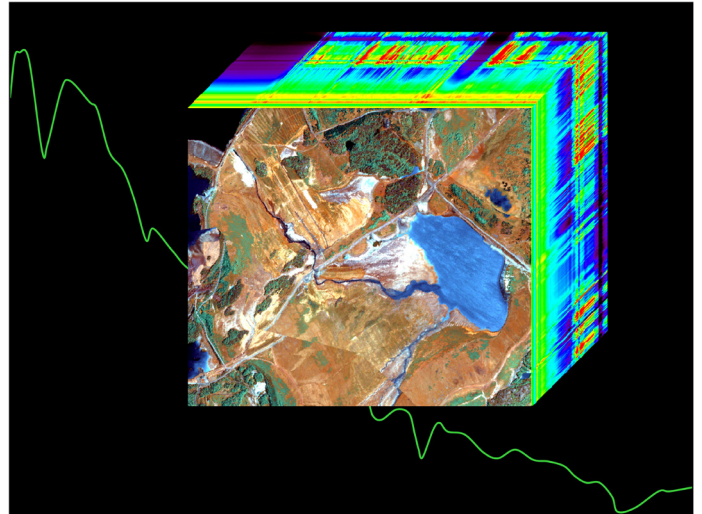
# HySIS Hyperspectral Instrument Simulator

HySIS is mainly designed to simulate airborne and spaceborne dispersive imaging pushbroom spectrometers but can be used for other types of spectral imagers.

HySIS (HyperSpectral Instrument Simulator) is a collection of software models that simulate the whole processing chain of a defined hyperspectral sensor, from acquisition of spectral radiance to end data products.

HySIS is constructed as a series of independent modules to prepare the data, simulate the instrument, simulate the calibration, simulate the atmospheric correction, compute the final product, and compare data products acquired under different conditions. The modules are set in a common structured frame.

HySIS adds instrumental effects (such as noise, spectral errors, calibration errors, etc.) to the data. The instrumental effects are determined from the Instrument simulator module. The Instrument simulator module can be used independently to define a hyperspectral instrument and estimate its spectro-radiometric performances. That module includes three sub-modules: The Optical design sub-module simulates the propagation of the photons from the entrance aperture to the detector array. The Sensitivity sub-module computes the total noise due to the incoming photons, the electronics, the dark current, the quantization, etc. The Radiometric accuracy sub-module assesses thermal drifts and other sources



of errors, and considers the accuracy of the calibration process to estimate the radiometric accuracy of the sensor. The Instrument simulator module can automatically loop on certain parameters to generate the necessary data for a specified trade-off analysis.

HySIS can use measured hyperspectral datacubes, synthetic datacubes or single spectra as input scene. The input parameters are entered with a graphical user interface and saved in plain ASCII files that can be edited.

**HySIS is a powerful tool that can serve several purposes during the definition phases of a hyperspectral system.**

**HySIS can be used to:**

- Estimate the performance of actual or hypothetical hyperspectral imagers.
- Construct error budgets.
- Perform system and instrument level trade-off analysis.
- Compare and review instrument designs.
- Study the effect of instrumental parameters (noise, resolution, accuracy, etc.) on acquired data and products.
- Study the effect of calibration errors on data and products.
- Study the effect of the atmospheric correction on data and products.

# Contact us

- Assess the capacity of a hypothetical or actual instrument to acquire useful data for a given application.
- Determine system requirements based on application requirements.
- Assess the accuracy of data products.
- Perform trade off and critical impact studies that involve the complete data chain.

This tool was developed by ABB under contract from the Canadian Space Agency.

For more information please contact:

**ABB Inc.**

**Analytical Measurements**

585 Charest Blvd East, suite 300

Quebec, (Quebec) G1K 9H4

Canada

Phone: +1 418-877-2944

Fax: +1 418-877-2834

E-Mail: [ftir@ca.abb.com](mailto:ftir@ca.abb.com)

[www.abb.com/analytical](http://www.abb.com/analytical)

Note

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document. We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents in whole or in parts – is forbidden without prior written consent of ABB.

Copyright© 2011 ABB

All rights reserved

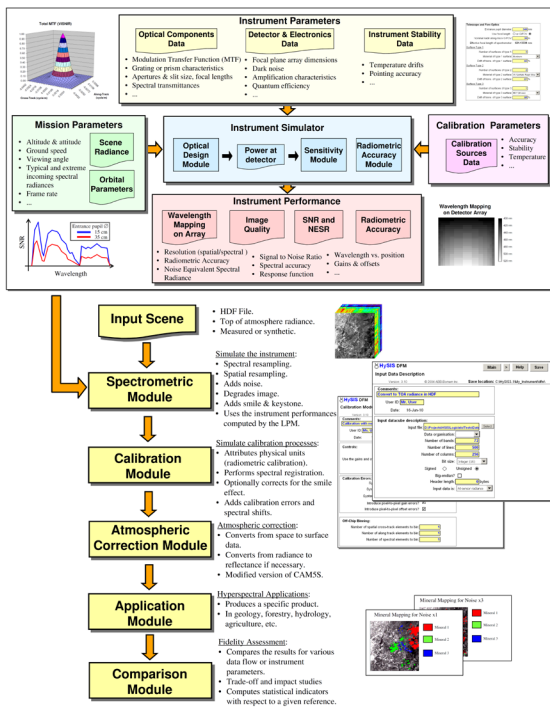


ABB Analytical Measurements designs, manufactures and markets optical instruments and analytical solutions for industrial and remote sensing applications. Building on more than 35 years of experience in Fourier spectrometers and optical instrumentation, ABB's engineering department has the expertise and capabilities to efficiently serve customers interested in remote sensing environmental, meteorological and defense applications. Its dedicated team of engineers offers the best solutions with reliable spaceborne and airborne instruments, infrared calibration systems, hyperspectral imagers, and software for ground segments and simulation.