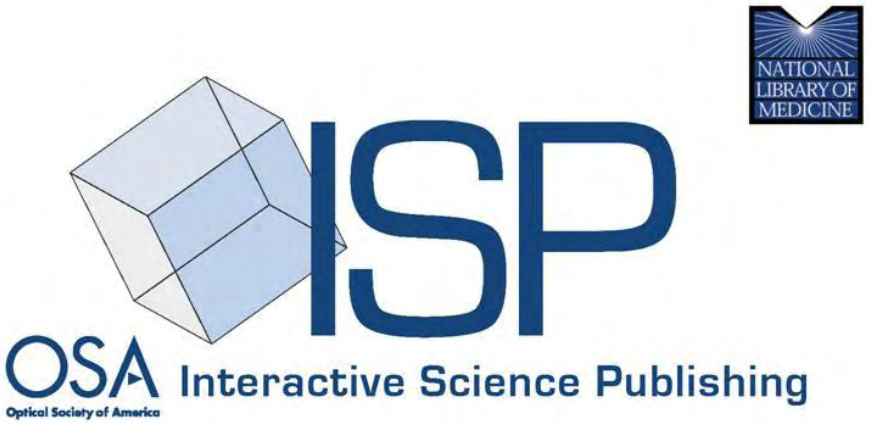
Interactive Science Publishing: A Joint OSA-NLM Project



Michael J. Ackerman
National Library of Medicine

John Childs
Optical Society of America

Goals

- To evaluate the educational value of ISP used within actual scholarly journal articles
- To explore the problems of archiving this medium
- To develop an interactive software and curated database infrastructure “Interactive Science Publishing”
- To give authors the ability to submit their own databases and ISP-enabled figures in actual peer-reviewed journal articles
- To give readers and editors the ability to view, analyze, and interact with source data published in conjunction with an article

Why OSA?

- NLM and OSA had the same vision of an interactive medium for scholarly publishing
  - OSA initial idea came from OSA member researchers working in “advanced imaging
- Four OSA journals already indexed in Medline
- OSA journals ranked by ISI at the top of their fields
- OSA’s solid scholarly reputation borne out by top rankings among optics journals and by more than 90 years of publishing experience

Project Description

- Publish special journal issues on biomedical research topics in OSA journals, most likely *Optics Express*

- Create on-line version in which incorporates printed article, source data, videos, and other media objects which can be:
  - Visualized using with PDF reader and ISP "PDF plug-in" reader software
  - Downloaded quickly and conveniently

- ISP Reader Software is free

Project Description

- Authors, reviewers and readers will be asked for feedback at every stage
- Project includes a formal usability analysis and a user evaluation survey
- Articles are indexed in Medline and are open access.
- Datasets are open access, fully citable and archived in OSA's "InfoBase" database
  - Datasets include source data and metadata
  - Datasets are searchable and accessible through a variety of available search engines
  - Datasets may be directly accessed through other publications

Progress

- Reader software version 2.2 deployed
- First issue, October 2008, 7 papers, 45 datasets, "*Interactive Science Publishing Introductory Issue*"
- Second issue, March 2009, 17 papers, 242 datasets, "*Optical Coherence Tomography in Ophthalmology*"
- Third issue, October 2009, 5 papers, 33 datasets, *"Digital Holography"*

Preliminary Assessment

- Feedback from authors, editors and usability experts is positive
- Reader feedback is positive for those that got past the initial learning curve
  - Installation problems
  - Navigation problems
  - Inadequate help facilities

Next Steps

- Reader software 3.0 with changes and additions based on preliminary user assessment, March 2010
- Issue 4 in process
  - "*Lung Cancer Imaging*", April 2010

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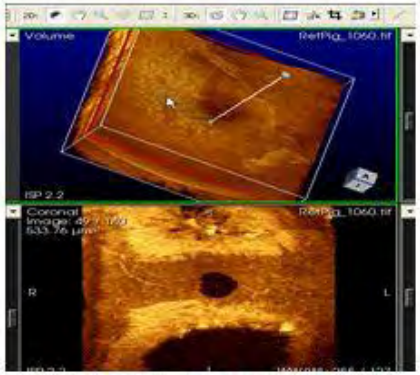


See Považay *et al.*, Opt. Express **17**, p. 4134 (2009).

- See the Latest ISP Articles
- How to Read an ISP Article
- What is ISP?
- View a Demo Video (Flash | QuickTime)
- Get the Software (Windows/Mac)
- Take the ISP Survey

www.osa.org - Optics InfoBase

Interactive Pubs (ISP)

www.opticsinfobase.org/isp.cfm

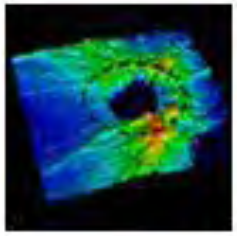
ISP SOFTWARE

OSA ISP Software and the ISP MIDAS Database were developed by OSA in cooperation with Kitware, Inc., and with support from the National Library of Medicine.

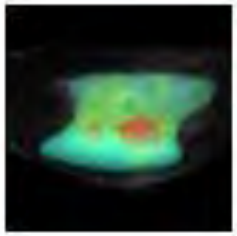
- Watch How to Read an OSA Article (Flash | QuickTime)
- Get the ISP Software
- Read ISP FAQs

ISP SPECIAL ISSUES

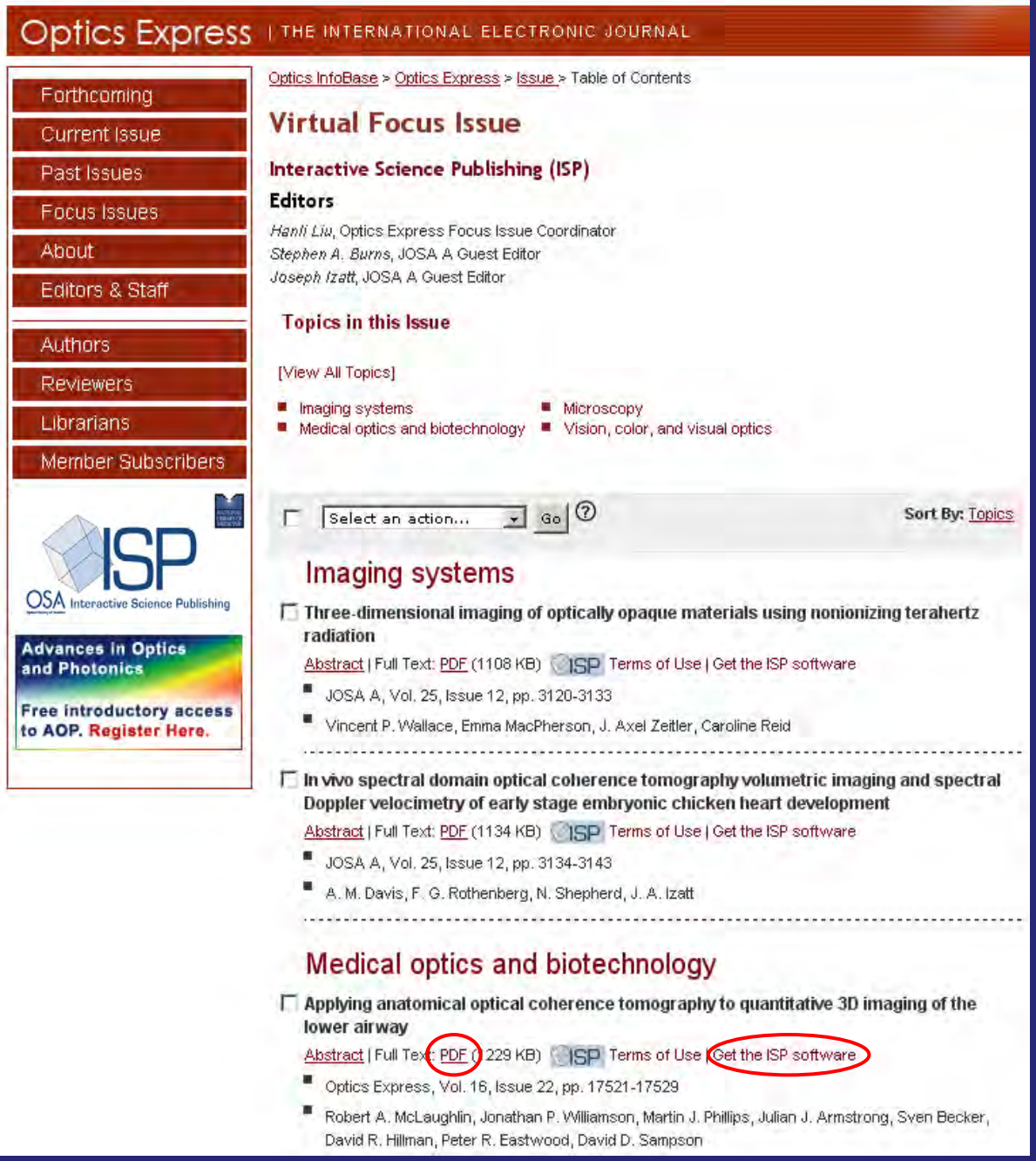
Issue 3. Digital Holography and 3-D Imaging
October 7, 2009: See the latest ISP articles — part of an *Applied Optics* ISP Feature on Digital Holography edited by Ting-Chung Poon (Virginia Tech), Byoungho Lee (Seoul National University), Hiroshi Yoshikawa (Nihon University), and Joseph Rosen (Ben Gurion University of the Negev).



Issue 2. Optical Coherence Tomography (OCT) in Ophthalmology
March 2, 2009: *Optics Express* ISP special issue on Optical Coherence Tomography (OCT) in Ophthalmology, with guest editors James G. Fujimoto (MIT), Wolfgang Drexler (Cardiff University), Joel S. Schuman (University of Pittsburgh), and Christoph K. Hitzenberger (Medical University of Vienna).



Issue 1. Interactive Science Publishing (ISP)
October 2008: Visit the inaugural Interactive Science Publishing (ISP) issue featuring Hanli Liu (Optics Express Associate Editor), Stephen A. Burns (JOSA A Guest Editor), Joseph Izatt (JOSA A Guest Editor).



www.opticsinfobase.org/oe/virtual_issue.cfm?vid=68

Applying anatomical optical coherence tomography to quantitative 3D imaging of the lower airway[◊]

Robert A. McLaughlin,[1,*] Jonathan P. Williamson,[2,3] Martin J. Phillips,[4] Julian J. Armstrong,[1] Sven Becker,[1] David R. Hillman,[2,5] Peter R. Eastwood,[2,3,5] and David D. Sampson[1]

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[2]*Department of Pulmonary Physiology, Sir Charles Gairdner Hospital, Nedlands WA 6009, Australia*
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Abstract: Endoscopic treatment of lower airway pathologies requires accurate quantification of airway dimensions. We demonstrate the application of a real-time endoscopic optical coherence tomography system that can image lower airway anatomy and quantify airway lumen dimensions intra-operatively. Results demonstrate the ability to acquire 3D scans of airway anatomy and include comparison against a pre-operative X-ray CT. The paper also illustrates the capability of the system to assess the real-time dynamic changes within the airway that occur during respiration.

OCIS codes: (170.4500) Optical coherence tomography; (170.2150) Endoscopic imaging; (170.3880) Medical and biological imaging.

[◊]**Datasets associated with this article are available at** http://hdl.handle.net/10376/1062.

Title: **Applying anatomical optical coherence tomography to quantitative 3D imaging of the lower airway**

Authors: Robert A. McLaughlin[1], Jonathan P. Williamson[2], Martin J. Phillips[3], Julian J. Armstrong[1], Sven Becker[1], David R. Hillman[2], Peter R. Eastwood[4], David D. Sampson[1]

Institutions: [1]Optical + Biomedical Engineering Laboratory, School of Electrical, Electronic & Computer Engineering, University of Western Australia, [2]Department of Pulmonary Physiology, Sir Charles Gairdner Hospital, [3]Department of Respiratory Medicine, Sir Charles Gairdner Hospital, [4]Department of Pulmonary Physiology, University of Western Australia

Publisher: Optical Society of America

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Journal: Optics Express, Vol. 16, Iss. 22, pp. 17521-17529

PDF Article: http://www.opticsinfobase.org/abstract.cfm?uri=oe-16-22-17521

Abstract: Endoscopic treatment of lower airway pathologies requires accurate quantification of airway dimensions. We demonstrate the application of a real-time endoscopic optical coherence tomography system that can image lower airway anatomy and quantify airway lumen dimensions intra-operatively. Results demonstrate the ability to acquire 3D scans of airway anatomy and include comparison against a pre-operative X-ray CT. The paper also illustrates the capability of the system to assess the real-time dynamic changes within the airway that occur during respiration.

Complete Data Collection & Article: article_757_full.zip (151Mb)

Compressed Data Collection: article_757_preview.zip (1000Kb)

Data Collection: View1 Fig. 2 Case001 Chest CT showing the...

View2 Fig. 3 Case002 Anatomical optical...

View3 Fig. 4 Case003 Anatomical optical...

OCIS codes: 170.4500, 170.2150, 170.3880

through the left main bronchus and into the distal section of the trachea, acquiring a 3D scan of the airway lumen. As shown in the axial view of Fig. 3, the *a*OCT scan enabled quantification of the lumen diameters at the time of the bronchoscopy.

A strong correlation was observed between CT and *a*OCT estimates of airway lumen diameters. A representative site in the proximal left main bronchus was selected for the purposes of illustration, with the same anatomical site visually identified for comparison. Using CT, the airway diameter was estimated to be 17.8mm x 14.1mm (Fig. 2). In the *a*OCT scan, the diameter was measured as 17.3mm x 13.9mm. Note that with the CT scan, we have used the oblique (not axial) view, so as to orient the measurement perpendicular to the central axis of the airway.

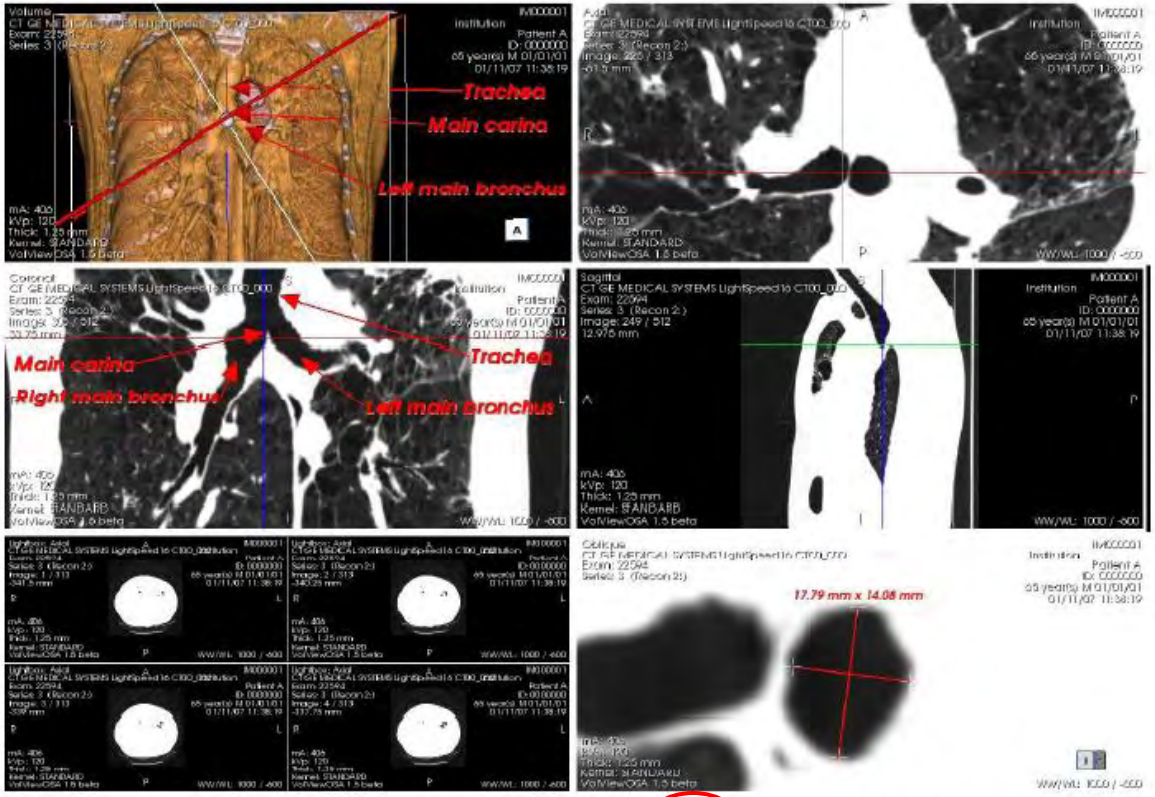
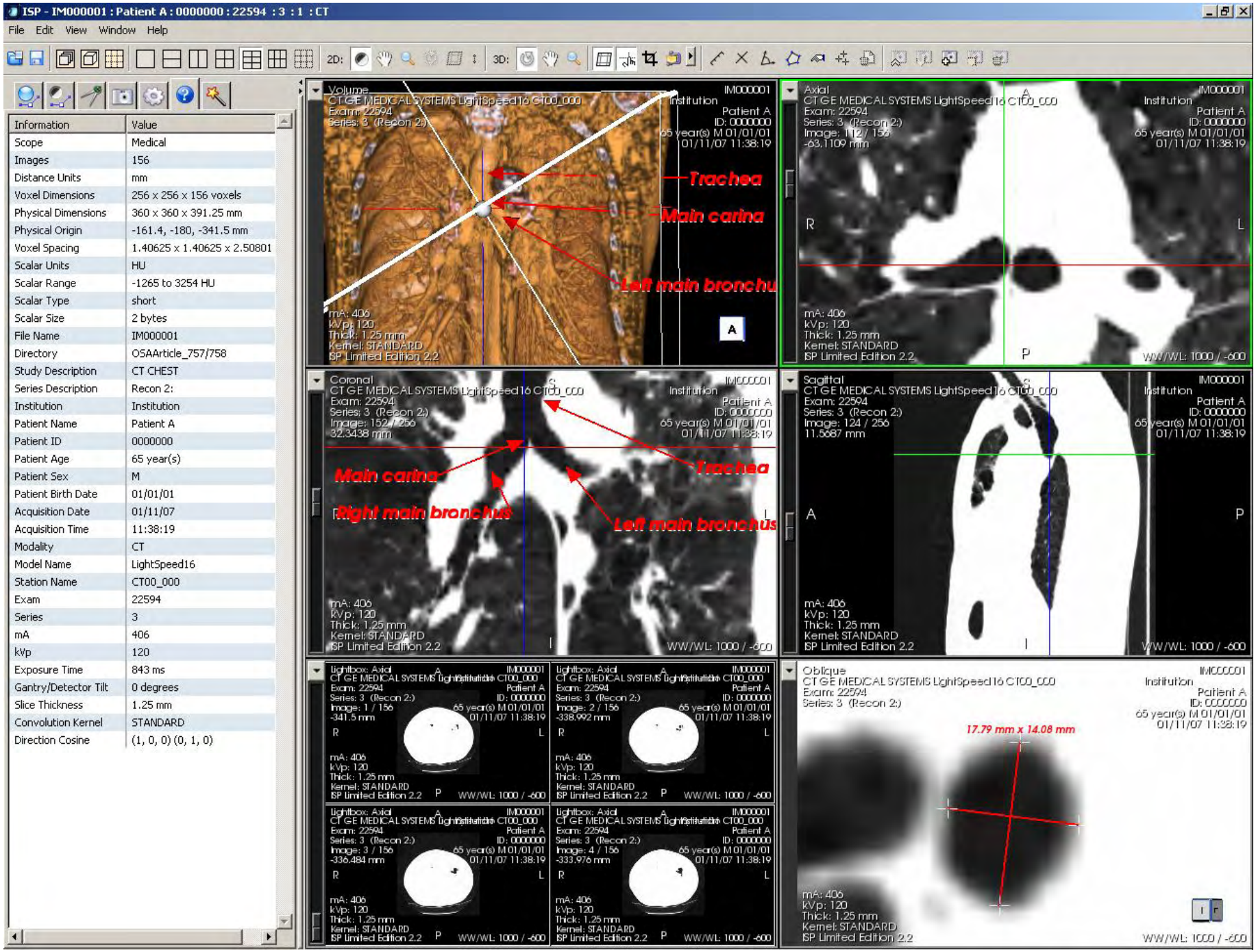


Fig. 2. Patient A. Chest CT depicting the lower airway (View 1). Top row (L-R): 3D view; Axial slice at the level of the main carina. Middle row (L-R): Coronal view; Sagittal view. Bottom row (L-R): Lightbox view; Oblique view measuring airway diameter.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