

Draft Minutes  
 ASC OP1 Optics and Electro-Optical Instruments – Optical Elements and Assemblies – Wavefront Standard  
 Sunday, October 8, 2006, 1:30 p.m. – 6:00 p.m.  
 Hyatt Regency Rochester, 125 East Main Street, Rochester, New York, USA 14604  
 Loftus C. Carlson Room, Section B

<b>Attending</b>	<b>Committee Members (12 of 17)</b>	<b>Representing</b>
<input checked="" type="checkbox"/>	David Aikens	Zygo Corporation.
<input checked="" type="checkbox"/>	Gordon Boulton	JDSU
<input checked="" type="checkbox"/>	Andre Brunfeld	Xyratex
<input checked="" type="checkbox"/>	Benjamin Catching (Alternate) (by phone)	JDSU
<input checked="" type="checkbox"/>	Walter Czajkowski	APOMA (Edmund Optics)
<input checked="" type="checkbox"/>	Marla Dowell	IEEE/LEOS (NIST)
<input checked="" type="checkbox"/>	Andrei Brunfeld	Xyratex
<input checked="" type="checkbox"/>	Lincoln Endelman	SPIE
<input type="checkbox"/>	John M. Hamilton	Northrop Grumman Corporation
<input checked="" type="checkbox"/>	James E. Harvey	CREOL
<input type="checkbox"/>	Hal Johnson	Harold Johnson Optical Lab
<input type="checkbox"/>	Michael Morrill	Lockheed Martin Space Systems Co.
<input type="checkbox"/>	William Royall	Eastman Kodak Company (Retired)
<input checked="" type="checkbox"/>	Peter Z. Takacs	Brookhaven National Lab
<input type="checkbox"/>	Trey Turner	Research Electro-Optics, Inc.
<input checked="" type="checkbox"/>	Steven VanKerkhove	Corning Tropol
<input checked="" type="checkbox"/>	Ray Williamson	Ray Williamson Consulting
<b>Observers (5)</b>		
<input checked="" type="checkbox"/>	Lahsen Assoufid	Argonne National Laboratory
<input checked="" type="checkbox"/>	Charles Campbell	Self Employed
<input checked="" type="checkbox"/>	Gene Kohlenberg	OEOSC
<input checked="" type="checkbox"/>	Allen Krisiloff	Triptar Lens Co., Inc.
<input checked="" type="checkbox"/>	Stephen Martinek	4D Technology

**Auditor's Summary of Meeting**

The task force reviewed the purpose of the proposed wavefront measurement standard document. They also discussed how other standards groups define Zernike polynomials. They reviewed ISO 10110 parts 5, 8 and 14, and discussed how they could be modified to better support the US optics industry. The task force is planning to develop two wavefront standards OP1.004 and OP1.005 using existing standards material where practical.

The purpose statements of the future OP1.004 and OP1.005 were reviewed and accepted. Drafts of the scope statements for the two proposed standards will be prepared for review at the next meeting.

**1. Welcome and Introductions**

S. VanKerkhove opened the meeting at 1:38 p.m. with a round of introductions.

**2. Adoption of Agenda**

D. Aikens moved that the draft agenda as modified at this meeting be adopted. M. Dowell seconded the motion. The motion carried unanimously.

### 3. Approval of draft minutes of Sunday, October 8, 2006 meeting

D. Aikens moved that the minutes of the previous meeting be approved as presented on the OEOSC web site. L. Endelman seconded the motion. The motion carried unanimously.

### 4. Review of how other groups measure wavefronts

C. Campbell ANSI Z80-28, ISO 24157. This standard was primarily written so that those in the eye care industry would report in a standardized fashion. It tells how to convert from someone else's coordinate system to the standard coordinate system. It contains nomenclature to describe what each term means along with the equations. D. Aikens suggested that the copy of the standard that C. Campbell brought with him be circulated around the table. ISO/TC 172/SC 7/WG 6. This uses a slightly different notation than Born and Wolf and also Zernike. They use  $0^\circ$  to the right with a counter clockwise rotation to  $90^\circ$ , while astronomers use a map convention where  $0^\circ$  point to north with a clock wise rotation to  $90^\circ$ . D. Aikens could think of four different ways to write the Zernike polynomials in the optical instruments venue. Ophthalmics use gradient fields as a communication tool rather than wavefronts. C. Campbell said that there is a way to present the information as a magnitude and angle of orientation that is similar to how opticians report astigmatism, etc. S. VanKerkhove said that vector pairs would be a good way of describing astigmatism, etc. P. Takacs said that the intended audience would determine how best to specify the aberration. D. Aikens said that users want one way of specifying parts so that there is no confusion.

A. Brunfeld said that there is no direct connection between Zernike polynomials and what the operator sees on a part. He measures ten or twenty flat surfaces per minute; he can't take time for polynomials. A. Krisiloff asked A. Brunfeld what he meant by wavefront aberrations. He said that what he needs to do is measure the wavefront in such a way that he can tolerance it. Testing must be done in an easy way so that the operator can understand how to do it.

J. Harvey mentioned the measurement of scattering from surface irregularities.

D. Aikens said that there are two communities: Zernike (deterministic) and power spectrum (is it good?). If this committee came up with a good formalism to describe surfaces with power spectrum over the next two years, that would be a good achievement.

### 5. Wavefront Standard

S. VanKerkhove suggested that the task force move on to the purpose of the wavefront measurement standard. He paraphrased the information. What is difference between OP1.004 and OP1.005? D. Aikens said that the task force decided to split ISO 10110-8, ISO 10110-5. and ISO 10110-14. OP1.004 covers ISO 10110-8 (surfaces) and OP1.005 is ISO 10110-14 (wavefront).

S. VanKerkhove read his purpose document. C. Campbell asked if the committee was going to limit itself to wavefronts? How will the task force bring surface into the standard. D. Aikens said that the task force is interested in the surface and how it affects a wavefront passing through it, not the general propagation of a wavefront.

A. Krisiloff still had a question about ranges.

ISO 10110-5 is for form, peak-valley, rms, Newton's rings.

ISO 10110-14 was written as an extension to ISO 10110-5 to cover long spatial frequency

B. Catching urged that even though the task force wants to chisel these in stone, let users pick the portions that they want to use.

P. Takacs suggested that the task force should think outside of box and write only one document to cover all of this.

D. Aikens said that ISO 10110-8 could be adapted for a US national standard. If the task force could get low and mid region standards done at the same time, then the US could have a unified document. S. VanKerkhove wants to use two documents to avoid the ball bouncing. Where is the gaping hole: the mid spacial-frequency domain – statistical vs. deterministic.

L. Endelman said that OP should forget ISO needs, and write a US standard; then revise it as an ISO document. D. Aikens said that he did not want to have to start with a blank page. He wants to use what has already been done that is useful for the optics community.

A. Krisiloff asked if OP is talking about surface problem vs. volume problems.

S. Martinek thought that measurement should be in an informative annex in order to keep the standards development problem manageable.

D. Aikens suggested that if 10110-8 be used as the basis so that this document would be backward compatible.

S. VanKerkhove reminded the group that the purpose statement is the why; the scope is the what.

M. Dowell moved to accepted the modified purpose statements, A. Brunfeld seconded the motion, which carried unanimously.

S. VanKerkhove volunteered to draft a scope statement for OP1.005. P. Takacs will do the same for OP1.004. The secretary will give each one a template for the individual drafts. A. Brunfeld suggested that the scope should be completed if possible by e-mail.

D. Aikens suggested a time frame to get a draft ready for the June ISO meeting. M. Dowell did not think that it is possible because the task force isn't meeting again until May. D. Aikens suggested that we would then have to write a position paper which would be due sixty days before the ISO meeting. The goal is to get the ISO standard back into draft status rather than being reaffirmed for five years.

**6. Time and Place for next OP1 Wavefront Meeting**

D. Aikens moved that the group meet next in Rochester, NY, during Optifab. L. Endelman seconded the motion. The task force could then meet in San Diego, CA, during SPIE's annual meeting the last of August.

**7. Adjournment**

D.Aikens moved that the meeting be adjourned. R. Williams seconded the motion. The meeting was adjourned at 4:46 p.m.