

Approved
Minutes

ASC OP1 ASC OP/SC 1, BSR/OEOSC-OP1.002, Optics and Electro-Optical Instruments – Optical Elements and Assemblies — Appearance Imperfections Task Force Draft Standard Review
Sunday, May 1, 2005, 9:00 a.m. — 3:00 p.m.
Rochester Riverside Convention Center, Aqueduct B Room
123 East Main Street, Rochester, NY 14604

Attending

<input checked="" type="checkbox"/>	Committee Members (7/12)	Representing
<input checked="" type="checkbox"/>	David Aikens (by phone)	Zygo Corporation
<input type="checkbox"/>	Sam Bailey	Davidson Optronics, Inc.
<input checked="" type="checkbox"/>	Gordon Boulton	JDS Uniphase Corporation
<input checked="" type="checkbox"/>	Walter Czajkowski	Edmund Industrial Optics
<input checked="" type="checkbox"/>	Frank Dombrowski	Gage-Line Technologies
<input type="checkbox"/>	Lincoln Endelman	SPIE (Endelman Enterprises)
<input type="checkbox"/>	Charles Gaugh	Davidson Optronics, Inc.
<input checked="" type="checkbox"/>	John Hamilton (by phone)	Northrop Grumman
<input type="checkbox"/>	Rudolf Hartmann	Retired
<input checked="" type="checkbox"/>	Hal Johnson	Harold Johnson Optical Lab
<input type="checkbox"/>	Kathleen Richardson	School of Materials
<input checked="" type="checkbox"/>	William Royall	Eastman Kodak Company
	Observers (2)	
<input checked="" type="checkbox"/>	Daniel Bronstrop	Brysen Optical Corporation
<input checked="" type="checkbox"/>	Gene Kohlenberg	OEOSC

Auditor's Summary of Meeting

Two clauses of the draft standard were reviewed to determine if they could be made clearer: Clause 3.5.1 Number of Maximum Size digs, and Clause 3.2.1.2 Did Designation. After considerable discussion minor word-smithing was agreed upon. A new clause 3.5.2 was added to quantify the allowable total number of digs on an optical surface. The draft will be balloted one last time to confirm that everyone is satisfied with the wording.

Welcome and Introductions

G. Kohlenberg opened the meeting at 9:17a.m. D. Aikens and H. Johnson participated in the meeting by phone. Since both gentlemen were on the phone, J. Hamilton asked G. Kohlenberg to lead the meeting.

Adoption of Agenda

G. Boulton moved that the draft agenda be adopted. H. Johnson seconded the motion. The motion carried unanimously.

Approval of the Sunday, January 23, 2005 ASC OP/SC 1, BSR/OEOSC-OP1.002, Optics and Electro-Optical Instruments – Optical Elements and Assemblies — Appearance Imperfections Draft Review Minutes

The minutes had been distributed by e-mail. There was an incomplete sentence in the minutes. The secretary stated that he apparently had been interrupted when typing the sentence, and then never went back to complete it. He could not remember what had been said. G. Boulton thought that he had replied to L. Endelman that OP1.002 is in conflict with an existing ISO standard, so the ANSI/OEOSC TAG would not be submitting this standard as a draft for a new ISO standard. The secretary stated that he would look up the ISO scratch and dig standard and add its number to the draft minutes. G. Boulton moved that the committee defer acceptance of the January 23, 2005 meeting until next scheduled OP 1 meeting. W. Royall seconded the motion which carried unanimously.

Status of BSR/OEOSC-OP1.002

The discussion started with a review of the G. Boulton's and J. Hamilton's interpretations of the dig specification. J. Hamilton said that while one of his engineers was developing Northrop Grumman's inspection calculator, he was confused by the interpretation clause 3.5.1. J. Hamilton contacted D. Aikens and W. Royall and proposed a rewording of the clause so that it now would say, "**Number of Maximum Sized Digs**. The number of maximum sized digs allowed shall be equal

to the element diameter divided by 20 mm, rounding up to the next whole number.” He then added a new clause that he numbered 3.5.1.1, which stated, “**Allowable Dig Total.** The sum of all the dig diameters on a single surface shall not exceed twice the product of the maximum size dig and the number of maximum size digs allowed per paragraph 3.5.1. Digs with diameters less than 2.5 microns shall be ignored.”

G. Boulton had proposed revised wording by e-mail on 4/15/05: “**Number of Maximum Size Digs.** The number of maximum size digs allowed shall be equal to the element diameter in millimeters divided by 20 mm, rounding up.

$N = [\phi] / 20$, rounding up,
where N is the number of maximum size digs allowed,
[phi] is the element diameter in mm.”

D. Aikens observed that G. Boulton's proposal is a clarification of the original MIL-O-13830 wording, and J. Hamilton's is based upon a different interpretation of MIL-O-13830. The latter is easier to calculate. He suggested that it is up to the committee to decide whether to accept the accumulation of digs in a 20 mm diameter, or not. J. Hamilton thought that his proposal is closer to the original intent of MIL-O-13830, but that we are trying to determine the intent of those who wrote MIL-O-13830. They may not be around anymore. G. Boulton said that we could conjecture that those who wrote MIL-O-13830 also wrote MIL-C-48497A and MIL-F-48616. The wording in those documents is the same as in BSR/OEOSC OP1.002.

D. Aikens asked if John Salerno has been contacted concerning this draft. The secretary stated that a copy of the draft was sent to J. Salerno, who forwarded it to the Army's optical engineers for evaluation.

J. Hamilton said that MIL-C-48497A-1995 is consistent with his paragraphs. “The dig letter specifies the average diameter in accordance with the following table: ...The permissible number of maximum size digs shall not exceed one per 20 mm of diameter or a fraction thereof. (This is consistent with J. Hamilton's clause 3.5.1.) The sum of the diameters of all digs shall not exceed twice the diameter of the maximum size specified by the dig letter per 20 mm of diameter (The same thing is said in new clause 3.5.1.1.)

G. Boulton asked that the committee look at MIL-F-48616. “**Surface digs.** Coating and substrate shall not be in excess of the value specified on the component drawing or procurement document. Digs are permissible on a surface provided that the average diameter does not exceed that specified by the dig letter, and no more than one maximum-sized dig occurs in any 20 mm diameter circle on the substrate. The dig letter and corresponding average diameter are shown in table 2

“**Integrating Digs.** Where the digs, coating and substrate, do not exceed the requirements of the preceding paragraph, each surface shall be evaluated further by integrating digs. All digs with diameters less than or equal to the maximum allowable dig diameter and greater than or equal to the minimum dig diameter to be considered shall be included in the integration. All digs shall be accumulated such that the sum of the diameters does not exceed the twice the diameter of the maximum allowable dig for any 20 mm diameter circle on the surface. All digs of size B or smaller shall be separated by 1 mm minimum. The measurement of the distance between digs shall not be required for surfaces where dig larger than size B are allowed.”

D. Aikens said that we have clear examples of both interpretations. G. Boulton noted that he presented this information by e-mail to the entire committee in several e-mails dated 3/21/05 – 4/15/05. D. Aikens stated that G. Boulton is concerned with the 20 mm diameter to determine the $2\times$ criteria. D. Aikens said that the issue is for any 20 mm diameter on the surface, or is it the diameter of the part divided by 20 mm. MIL-O-13830 agrees for the accumulation step. G. Boulton said that JDSU is that accumulation applies to any 20 mm circle. D. Aikens said that Zygo interprets it as any 20 mm diameter. It is not consistent with Northrop Grumman and Kodak. H. Johnson said that his company agrees with JDSU. W. Czajkowski said that Edmund agrees with JDSU. D. Aikens says that the easier inspection method. D. Bronstrom noted that one never has an exact 50 size dig. It is a problem when looking at an infinite number of 20 mm circles; nothing says where they are located. G. Boulton said that it is simple because one looks at two digs to see if they are within 20 mm of each other. W. Royall said that Kodak takes a 20 mm aperture, locates it anywhere on the surface and then looks at the surface to see the number of digs. G. Boulton said that that means that Kodak is interpreting the standard the same as JDSU.

D. Aikens does not feel strongly one way or the other. He just wanted us to move forward today. D. Bronstrom noted that the case of many minor digs happens more frequently than the case of several large digs. It would be easier if the zones would be concentric with the center of the part. J. Hamilton and D. Aikens did not like the concentric ring approach. It doesn't seem to be consistent with the wording of the former specifications or the use of the part. D. Bronstrom said that the radius of each circle would be 10 mm larger than the previous.

“Shall not exceed” should be replaced by “is equal to” (Gordon's wording) to the next whole number makes the statement clearer.

D. Aikens urged the group to choose wording. W. Royall asked that we deal with J. Hamilton's wording.

J. Hamilton moved that the revised wording of clause 3.5.1, “The number of maximum size digs allowed shall be equal to the element diameter in millimeters divided by 20 mm, rounding up to the next whole number.” be adopted. G. Boulton seconded the motion. The motion carried unanimously.

J. Hamilton moved that his wording for 3.2.1.2 be adopted. W. Royall seconded the motion. G. Boulton asked why the last sentence needed to be added. J. Hamilton said that it has not been clear that the numbers can be added to get to the second number, and the last sentence explicitly says it. It supports the allowable dig total.

D. Bronstrop asked why the term “may be” was used. It sounds as if it were an option. He also asked for the meaning of maximum. Maximum length is the longest dimension and maximum width would be 90 degrees to that.

G. Boulton said that the length and width are summed; that sum is not an area. So using the word area makes 3.2.1.2 more confusing. He proposed that 3.2.1.2 remain unchanged. John withdrew his motion.

J. Hamilton moved that his 3.5.1.1 be approved with any paragraph numbering that is appropriate (3.5.2). H. Johnson seconded. The motion carried; G. Boulton abstained.

J. Hamilton moved that clause 3.5.2 be renumbered 3.5.3 and that the wording, as discussed, “Concentration of Digs. For any 20 mm diameter area anywhere in the clear aperture the sum of the diameters of all digs shall not exceed twice the diameter of the maximum dig specified.

$$\sum_i d_i \leq 2 \times D ,$$

where D is the dig diameter of the maximum dig specified,

d_i is the diameter of dig i .

“Digs less than 2.5 micrometers shall be ignored. On surfaces having dig specifications less than or equal to 10, the digs shall be separated, edge to edge by at least 1 mm.” G. Boulton seconded the motion. The motion carried unanimously.

Report of Gage Study

J. Hamilton stated that there was nothing further to report at this time.

Scope of Imperfection Performance Standard

D. Aikens stated that we need a white paper to indicate how the committee will move forward. J. Hamilton asked each committee member to prepare a white paper and submit it to secretary for distribution. D. Aikens asked the secretary to send out an e-mail asking for white papers covering a performance imperfection standard.

J. Hamilton suggested that D. Bronstrop’s concentric ring approach could be considered in the new standard.

Plan an Objective Scratch Measurement Method

D. Aikens noted that the British standard BS 4301 has not been used widely. The British Atomic Weapons Establishment stated to D. Aikens that they would probably go to the ISO standard before migrating to BS 4301. Currently, they are still using MIL-O-13830 because the ISO standard is not sufficiently adopted throughout the world.

D. Aikens took some samples and put them on a New View microscope. He was able to capture all of the surface defect information quickly. However, it’s like using a sledge hammer to drive a nail. He says that we need a way to do that with a lot less money.

F. Dombrowski: Meeting in Denver about Made to masters one like Kodak and one like European specs. Has samples with him. He brought a microscope.

J. Hamilton acquired a person from Zemax, and asked him to look at mono width scratches and variable depth scratches. The modeled system shows the same differentiation ambiguity as human observers. The depth component seems to be the problem.

Investigation of Other Technologies for Determining Equivalent Imperfections (e.g., Auto Industry), (ASME)

ASME standards: Dave Aikens found that auto industry is using more primitive techniques than the optics industry. They are just now approaching where optics industry has been for forty years. They have done a lot with surface roughness.

ASTM standards: W. Royall said that ASTM has old standards that are being maintained. They use the same method as the optics industry. The standards are F428, F528.

Time and Place of next OP 1 Meeting

D. Aikens said that he is scheduled to teach the scratch and dig course in San Diego during the SPIE Annual Meeting. D. Aikens asked that the meeting on Sunday, July 31st not start until 1:00 p.m.

G. Boulton noted a point of order for the next meeting. He moved that all material for the next meeting be available five days prior to the meeting. W Royall seconded the motion, which carried.

J. Hamilton moved that the meeting be adjourned G. Boulton seconded the motion. The committee voted to adjourn. The meeting closed at 11:50 a.m.