



Paper & Paperboard Testing Program

Summary Report #4252 - August 2023

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The CTS Paper & Paperboard Interlaboratory Program

In 1969, the National Bureau of Standards (now designated the National Institute for Standards and Technology) and the Technical Association of the Pulp and Paper Industry (TAPPI) developed an interlaboratory program for paper and paperboard testing. Since 1971, Collaborative Testing Services has operated the Collaborative Reference Program for Paper and Paperboard. With hundreds of organizations from around the world participating in these tests, this program has become one of the largest of its kind. The program allows laboratories to compare the performance of their testing with that of other participating laboratories, and provides a realistic picture of the state of paper testing.

About CTS

Founded in 1971, Collaborative Testing Services, Inc. (CTS) is a privately - owned company that specializes in interlaboratory tests for a variety of industries including color, rubber, plastics, fasteners and metals, containerboard, paper, agriculture, hemp, and wine, as well as proficiency tests for forensic laboratories. All of the tests are designed to assist organizations in achieving and maintaining quality assurance objectives. Labs from the U.S., as well as more than 100 countries, currently participate in the CTS programs.

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Key for Web Summary Reports (Page 1 of 2)

WebCode	Assigned laboratory identification number (temporary) used to ensure lab confidentiality while permitting a lab to locate its data in the Paper Report published on the CTS Website. The WebCode for each analysis can be found on the datasheets and in the Performance Analysis Report mailed to each participant.
Lab Mean	The average of the values obtained for each sample by the participant.
Grand Mean	The average of the LAB MEANS for all included participants. Laboratories flagged with an X or an M (see DATA FLAG column) are excluded from the GRAND MEAN.
Difference from Grand Mean	The difference of the LAB MEAN from the GRAND MEAN.
Between-Lab Standard Deviation	An indication of the precision of measurement between the laboratories. The greater the spread of the LAB MEANS about the GRAND MEAN, the larger the BETWEEN-LAB STANDARD DEVIATION (and vice versa).
Comparative Performance Value	An indication of how well a laboratory's results agree with the other participants. The CPV is a ratio indicating the number of standard deviations from the GRAND MEAN. The closer a laboratory's COMPARATIVE PERFORMANCE VALUE is to zero, the more consistent its results are with the other participants' data (and vice versa). The critical value for each CPV will vary depending on the number of labs participating in a test.
Inst Code	A code indicating the manufacturer of the instrument used to perform the test (see separate INSTRUMENT CODE LIST for each test section), if instruments are tracked.
Data Flag	DATA FLAGS are assigned based on the simultaneous analysis of both samples tested. Refer to the following chart for an explanation of each symbol:

<u>DATA FLAG</u>	<u>STATISTICALLY INCLUDED/EXCLUDED</u>	<u>ACTION REQUIRED</u>
*	INCLUDED	CAUTION - review testing procedure and monitor future results. Results fall outside 95% ellipse but within a 99% ellipse that is calculated but not drawn.
X	EXCLUDED	STOP - immediate review of data and/or testing procedure is required. Results fall outside the 99% ellipse. See specific notes following each table for more information on why the data is excluded.
M	EXCLUDED	PROCEED - lab was unable to report data for at least one sample.

Graph - For each laboratory, the LAB MEAN for the first sample (x-axis) is plotted against the LAB MEAN for the second sample (y-axis) with each point representing a laboratory. The horizontal and vertical cross-hairs are the GRAND MEANS for each sample. When 20 or more laboratories are in the statistics, an ellipse is also drawn so that 95% of the time a randomly selected laboratory will be included inside the ellipse. Plotted data flags are explained on the previous page.

Common Problems Highlighted in Footnotes

1. **Extreme data** - The laboratory's results for one or both samples are so inconsistent with those of the other participants that the lab mean(s) fall outside the plot. The participant is advised to immediately review his data and/or testing procedure.
2. **Systematic bias** - The laboratory's results are either consistently high or low for both samples when compared to the other participants (the plotted point falls near the top or bottom of the ellipse). This indicates that the participant is performing the test with a constant bias. Causes of systematic errors include improper calibration, the particular make/model of equipment or a modification to the testing procedure.
3. **Inconsistency in testing between samples/sample sets** - The laboratory's results indicate that there are differences in the way the two samples tested (the plotted point falls to the side of the ellipse). This type of error may be attributed to the analyst deviating from the procedure when testing one of the samples or a material interaction occurrence with the instrument or room conditions. The inconsistency is reflected in the CPVs for the two samples, such as a +1.5 CPV for sample A and a -2.2 CPV for sample B. CTS also will specify if the laboratory's data for one sample are high/low compared to the other participants. If this inconsistency is slight, the lab's plotted point will be an * that falls on the edge of the ellipse.
4. **Inconsistency in testing within a sample** - The laboratory's within-lab standard deviation for a specified sample is high when compared to the other participants, often causing the lab's plotted point to fall outside of the ellipse.

Labs flagged with an * are not typically included in the footnotes of a data table. These labs may locate their position in the control ellipse and use the definitions above to help identify the type of testing error. An * should serve as a caution flag, a "yellow light", to a lab. If this error is repeated in future rounds, a lab may need to stop and review its testing procedures. The initial data flag is not cause for alarm. Interlaboratory tests conducted at regular intervals permit a lab to recognize trends in testing.



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3501

Thickness (Caliper), Packaging papers

TAPPI Official Test Method T411

WebCode	Data Flag	Sample CK19			Sample CK20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
29C8RQ		13.91	0.00	0.03	13.98	0.07	0.45	XX
3GXUYX		13.95	0.05	0.31	13.84	-0.07	-0.45	LC
3JPQNR		13.79	-0.11	-0.77	13.83	-0.08	-0.52	OK
4P8JDW		13.74	-0.17	-1.14	13.68	-0.23	-1.54	EM
6CKTTK		13.84	-0.06	-0.43	13.80	-0.11	-0.74	XX
6PKU7L		13.99	0.08	0.56	13.96	0.05	0.35	XX
7UTBFA		13.69	-0.21	-1.43	13.83	-0.08	-0.52	EM
8TFZ33		13.93	0.03	0.18	13.88	-0.03	-0.21	LW
AEMKMT		14.00	0.10	0.67	14.01	0.10	0.67	LW
CVMAUA		13.68	-0.22	-1.53	13.75	-0.16	-1.09	XX
DHEQVE		13.58	-0.33	-2.22	13.57	-0.34	-2.34	XX
E68ZU8		14.04	0.14	0.93	14.07	0.16	1.11	TA
ED29EX		14.11	0.21	1.43	14.07	0.16	1.07	PP
G6X6ZB		13.85	-0.06	-0.38	13.73	-0.18	-1.25	TA
G84MY8		14.06	0.16	1.09	14.01	0.10	0.68	LA
HPNDX7		14.09	0.19	1.29	14.11	0.20	1.40	EM
JLJ672		13.84	-0.07	-0.45	13.78	-0.13	-0.87	EM
LU2MEQ		13.98	0.07	0.50	13.93	0.02	0.13	PP
M2FTP3		13.99	0.09	0.59	14.10	0.19	1.33	LC
MRQ6RE		13.72	-0.18	-1.22	13.70	-0.21	-1.43	LW
MWLYR2		14.00	0.10	0.67	14.05	0.14	0.98	EM
NCTDL4		13.81	-0.09	-0.60	13.85	-0.06	-0.40	TM
NGP4RF		13.89	-0.01	-0.10	13.97	0.06	0.44	XX
QCNUJ		13.80	-0.10	-0.68	13.80	-0.10	-0.72	LA
R89MQJ		13.71	-0.19	-1.32	13.70	-0.21	-1.43	LW
RJJWFU		14.23	0.32	2.20	14.15	0.24	1.67	LW
T42NRW		13.77	-0.13	-0.91	13.95	0.04	0.28	LW
V33ZPQ		14.00	0.09	0.63	14.02	0.11	0.78	LW
XAFVHQ		13.96	0.06	0.38	13.91	0.00	0.02	EM
XNZBLP		14.03	0.13	0.87	14.02	0.11	0.75	LW
ZHHRGD		14.00	0.10	0.69	13.99	0.08	0.57	LW
ZKQ8NJ		13.93	0.02	0.15	14.03	0.12	0.83	LB

Summary Statistics	Sample CK19	Sample CK20
Grand Means	13.90 mils	13.91 mils
Std Dev Btwn Labs	0.15 mils	0.15 mils
Statistics based on 32 of 32 reporting participants.		



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3501

Thickness (Caliper), Packaging papers

TAPPI Official Test Method T411

Analysis Notes:

NCTDL4 - Data appear to be reported as micrometers, not mils as indicated on data entry form. CTS will not correct the Units going forward.

Key to Instrument Codes Reported by Participants

EM	Emveco	LA	L & W Autoline
LB	L & W Autoline 600	LC	L & W Autoline 400
LW	L & W	OK	Oakland
PP	Technidyne Profile/Plus	TA	Thwing-Albert
TM	TMI	XX	Instrument make/model not specified by lab



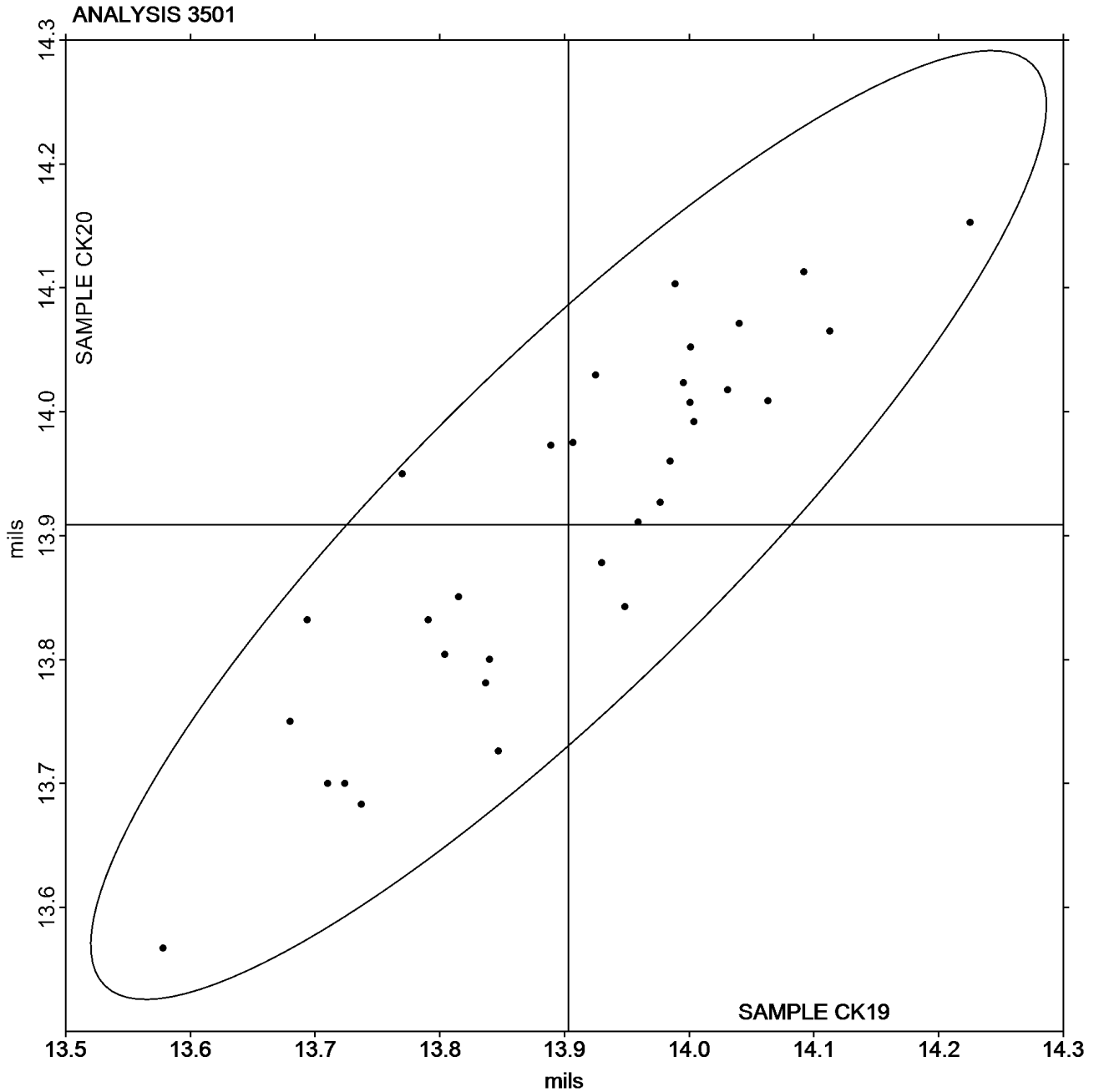
Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3501 Thickness (Caliper), Packaging papers TAPPI Official Test Method T411

Grand Mean Sample CK19 = 13.903
mils

Grand Mean Sample CK20 = 13.909
mils





Paper & Paperboard Interlaboratory Testing Program
Analysis 3511
Bursting Strength - Packaging Papers
TAPPI Official Test Method T403

Report #4252,
August 2023

WebCode	Data Flag	Sample BK19			Sample BK20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3JPQNR		47.50	-3.14	-0.57	62.50	-1.12	-0.22	ZZ
964ML4		47.83	-2.81	-0.51	58.52	-5.10	-1.00	ZZ
AEMKMT		45.97	-4.68	-0.85	58.18	-5.44	-1.07	ZZ
C76QMG		63.97	13.33	2.43	72.28	8.66	1.70	ZZ
E7FCB9		49.51	-1.13	-0.21	59.47	-4.16	-0.82	ZZ
G6X6ZB		44.20	-6.44	-1.17	60.85	-2.77	-0.55	ZZ
NCTDL4		53.46	2.82	0.51	70.47	6.85	1.35	ZZ
P9D6X4		46.67	-3.97	-0.72	60.83	-2.79	-0.55	ZZ
PNHWDE		47.20	-3.44	-0.63	62.40	-1.22	-0.24	ZZ
R89MQJ		48.70	-1.94	-0.35	62.20	-1.42	-0.28	ZZ
RJJWFU		47.59	-3.05	-0.56	59.69	-3.93	-0.77	ZZ
TFHB4H		50.20	-0.44	-0.08	62.50	-1.12	-0.22	ZZ
V33ZPQ		49.24	-1.40	-0.26	63.84	0.22	0.04	ZZ
VY6JCW		62.00	11.36	2.07	75.60	11.98	2.36	ZZ
XNZBLP		52.77	2.13	0.39	61.95	-1.67	-0.33	ZZ
ZHHRGD		53.45	2.81	0.51	66.66	3.04	0.60	ZZ

Summary Statistics	Sample BK19	Sample BK20
Grand Means	50.64 psi	63.62 psi
Stnd Dev Btwn Labs	5.49 psi	5.08 psi
Statistics based on 16 of 16 reporting participants.		

Analysis Notes:

E7FCB9 - Data appears to be transposed between samples. CTS will not correct going forward.

Key to Instrument Codes Reported by Participants

ZZ Instruments No Longer Tracked



Paper & Paperboard Interlaboratory Testing Program

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Analysis 3511

Bursting Strength - Packaging Papers

TAPPI Official Test Method T403

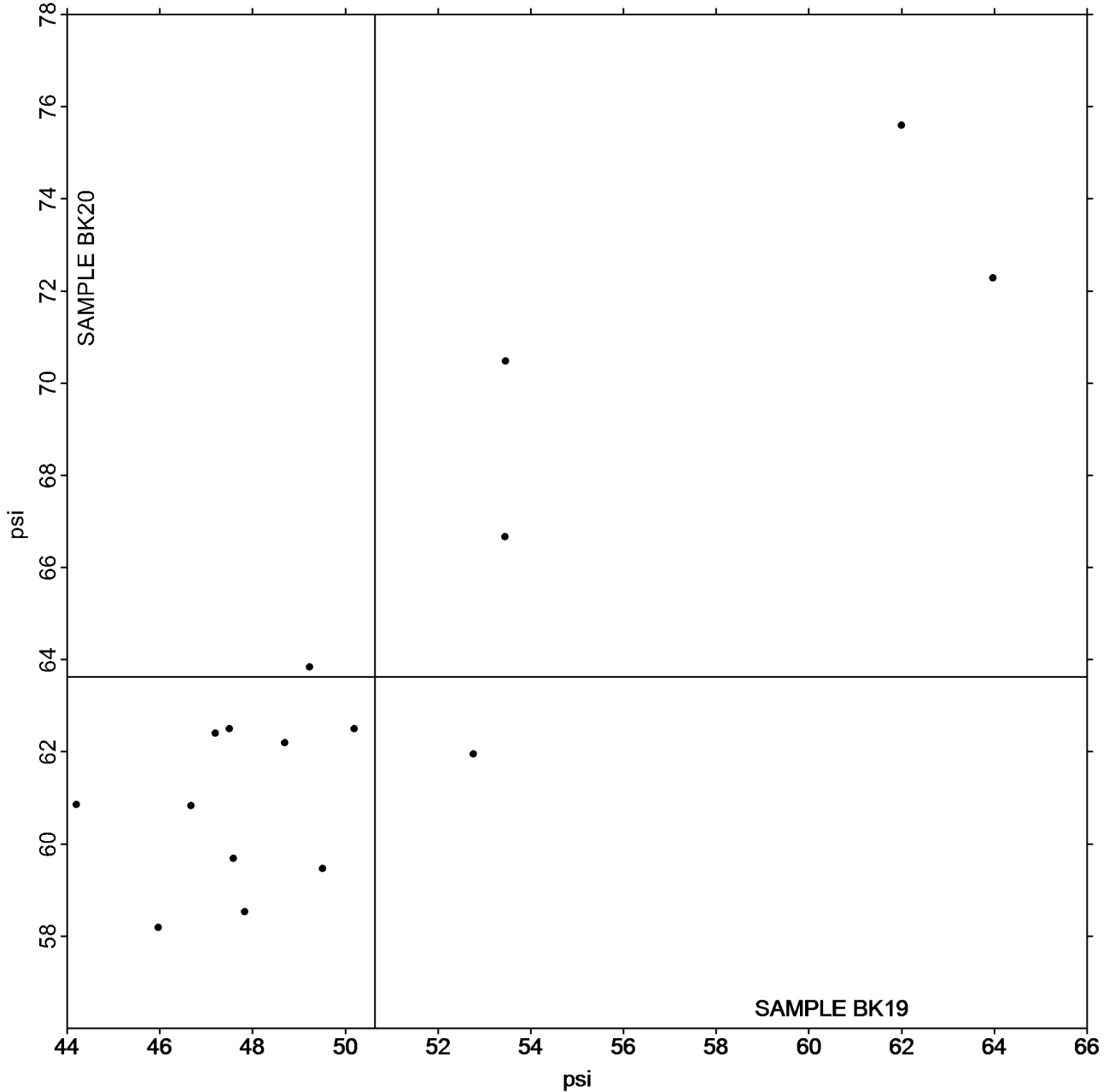
Grand Mean Sample BK19 = 50.640

psi

Grand Mean Sample BK20 = 63.622

psi

ANALYSIS 3511



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program

**Report #4252,
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Analysis 3513

Tearing Strength - Packaging Papers

TAPPI Official Test Method T414

WebCode	Data Flag	Sample RK19			Sample RK20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
2QBJ3C		129.9	-34.1	-1.84	129.4	-33.9	-1.81	ZZ
3GXUYX		157.9	-6.2	-0.33	158.0	-5.4	-0.29	ZZ
3JPQNR		168.8	4.8	0.26	168.8	5.4	0.29	ZZ
4P8JDW		150.2	-13.9	-0.75	153.9	-9.5	-0.50	ZZ
6PKU7L		188.5	24.5	1.32	187.7	24.4	1.30	ZZ
7BJFJW		171.4	7.3	0.39	168.3	5.0	0.26	ZZ
7TK3BW		163.8	-0.3	-0.02	159.2	-4.2	-0.22	ZZ
829DXW		156.9	-7.1	-0.38	159.1	-4.3	-0.23	ZZ
8TFZ33		160.0	-4.1	-0.22	156.3	-7.1	-0.38	ZZ
AEMKMT		167.6	3.6	0.19	163.4	0.0	0.00	ZZ
AT8ZQR		164.2	0.1	0.01	164.2	0.8	0.04	ZZ
CVMAUA		183.6	19.6	1.05	183.2	19.8	1.06	ZZ
E68ZU8		161.9	-2.1	-0.12	159.5	-3.9	-0.21	ZZ
E7FCB9		146.8	-17.2	-0.93	147.0	-16.4	-0.87	ZZ
FCZRE7		166.4	2.4	0.13	169.1	5.8	0.31	ZZ
GUEQYU		187.7	23.7	1.28	186.7	23.3	1.24	ZZ
HPNDX7	X	102.1	-61.9	-3.34	138.5	-24.9	-1.33	ZZ
JLJ672		191.9	27.9	1.50	188.6	25.3	1.35	ZZ
MRQ6RE		185.1	21.1	1.14	186.8	23.4	1.25	ZZ
NCTDL4		119.3	-44.7	-2.41	119.7	-43.7	-2.33	ZZ
P7L99B		196.3	32.3	1.74	200.1	36.7	1.96	ZZ
PNHWDE		154.6	-9.5	-0.51	155.0	-8.4	-0.45	ZZ
QCNUJ		149.8	-14.2	-0.77	148.6	-14.8	-0.79	ZZ
R89MQJ		147.2	-16.8	-0.91	142.0	-21.4	-1.14	ZZ
RJJWFU	X	235.0	70.9	3.82	217.8	54.5	2.90	ZZ
V33ZPQ		164.1	0.0	0.00	162.4	-0.9	-0.05	ZZ
XAFVHQ	X	162.6	-1.4	-0.08	181.2	17.8	0.95	ZZ
XNZBLP		167.3	3.3	0.18	167.1	3.7	0.20	ZZ

Summary Statistics	Sample RK19	Sample RK20
Grand Means	164.05 Grams	163.37 Grams
Std Dev Btwn Labs	18.54 Grams	18.78 Grams

Statistics based on 25 of 28 reporting participants.

Comments on Assigned Data Flags for Test #3513

- RJJWFU (X) - Data for both samples are high. Possible Systematic Error. Inconsistent within the determinations of both samples.
- XAFVHQ (X) - Inconsistent in testing between samples. Inconsistent within the determinations of both samples.
- HPNDX7 (X) - Data for sample RK19 are low.



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3513

Tearing Strength - Packaging Papers

TAPPI Official Test Method T414

Analysis Notes:

JLJ672 - Data appear to be reported as mN, not gf as indicated on data entry form. CTS will not correct the Units going forward.

Key to Instrument Codes Reported by Participants

ZZ Instruments No Longer Tracked



Paper & Paperboard Interlaboratory Testing Program

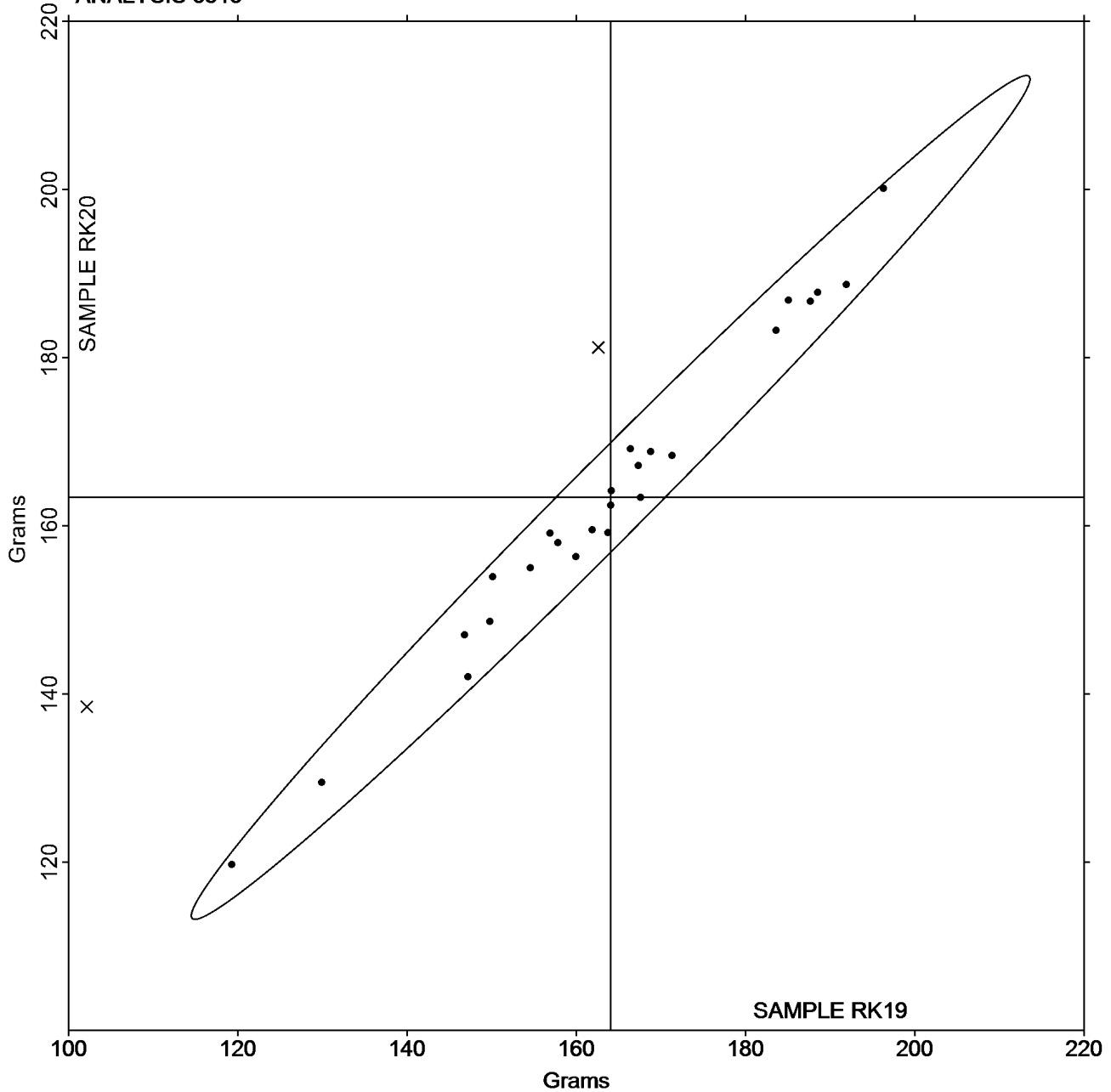
Report #4252,
August 2023

Analysis 3513 Tearing Strength - Packaging Papers TAPPI Official Test Method T414

Grand Mean Sample RK19 = 164.05
Grams

Grand Mean Sample RK20 = 163.37
Grams

ANALYSIS 3513





Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3515

Tensile Breaking Strength - Packaging Papers

TAPPI Official Test Method T494

WebCode	Data Flag	Sample NK19			Sample NK20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3GXUYX		8.785	-0.629	-1.09	10.52	-0.74	-1.19	IF
4P8JDW		9.947	0.533	0.92	11.89	0.63	1.00	TO
6CKTTK	X	7.233	-2.182	-3.78	10.42	-0.84	-1.35	XX
6PKU7L		9.153	-0.262	-0.45	10.76	-0.50	-0.80	ID
6Q2RYL		10.570	1.156	2.00	12.53	1.27	2.03	LA
7BJFJW		8.686	-0.728	-1.26	10.43	-0.84	-1.34	LE
829DXW		9.462	0.048	0.08	11.28	0.02	0.04	LE
8TFZ33		9.411	-0.003	-0.01	11.07	-0.19	-0.30	LE
964ML4		9.717	0.302	0.52	11.83	0.57	0.92	LW
9V4W3G		10.503	1.089	1.89	12.30	1.04	1.66	LI
AEMKMT		9.285	-0.129	-0.22	11.24	-0.02	-0.04	IM
AT8ZQR		9.168	-0.247	-0.43	11.01	-0.25	-0.40	LW
C76QMG		9.731	0.317	0.55	11.33	0.07	0.12	PT
CVMAUA		9.602	0.187	0.32	11.76	0.50	0.80	XX
DHEQVE		9.674	0.260	0.45	11.59	0.33	0.53	TB
E68ZU8		8.876	-0.538	-0.93	10.61	-0.65	-1.05	TB
E7FCB9		9.172	-0.243	-0.42	10.82	-0.45	-0.71	TX
FCZRE7		8.415	-1.000	-1.73	10.46	-0.80	-1.28	LH
FX6DEC		8.634	-0.781	-1.35	10.65	-0.61	-0.98	TT
G6X6ZB		9.575	0.160	0.28	11.36	0.10	0.16	TV
GUEQYU		10.119	0.704	1.22	11.76	0.50	0.80	LA
JLJ672		8.969	-0.445	-0.77	11.28	0.02	0.03	LW
LW8DFE		8.557	-0.857	-1.49	10.46	-0.80	-1.28	XX
M2FTP3		9.235	-0.179	-0.31	11.49	0.23	0.37	LB
MEQ4ED	X	5.124	-4.290	-7.44	5.90	-5.36	-8.59	TS
MRQ6RE		10.472	1.057	1.83	12.51	1.25	2.00	LW
MWLYR2	X	13.550	4.135	7.17	13.60	2.34	3.75	LE
NWZL23		9.284	-0.131	-0.23	11.21	-0.05	-0.09	DM
P7L99B		8.887	-0.528	-0.91	10.92	-0.34	-0.55	TR
PNHWDE		9.233	-0.182	-0.32	10.69	-0.57	-0.91	LE
QCNUJ		9.495	0.081	0.14	11.17	-0.09	-0.14	LA
R64Y99		8.708	-0.707	-1.22	10.20	-1.06	-1.70	IR
R89MQJ		10.385	0.971	1.68	11.83	0.57	0.92	LX
RJJWFU		9.529	0.114	0.20	11.41	0.15	0.24	TX
T42NRW		9.823	0.408	0.71	11.37	0.11	0.18	TH
V33ZPQ		9.318	-0.097	-0.17	11.31	0.05	0.08	LE
VRMDD6		8.847	-0.567	-0.98	10.39	-0.88	-1.40	IM
VUPBNX		9.198	-0.217	-0.38	11.29	0.03	0.04	TH
XNZBLP		9.550	0.135	0.23	11.31	0.05	0.08	LH
ZKQ8NJ		10.360	0.945	1.64	12.61	1.35	2.16	LC



Paper & Paperboard Interlaboratory Testing Program

**Report #4252,
August 2023**

Analysis 3515

Tensile Breaking Strength - Packaging Papers

TAPPI Official Test Method T494

Summary Statistics	Sample NK19	Sample NK20
Grand Means	9.41 kN/m	11.26 kN/m
Std Dev Btwn Labs	0.58 kN/m	0.62 kN/m
Statistics based on 37 of 40 reporting participants.		

Comments on Assigned Data Flags for Test #3515

MEQ4ED (X) - Extreme Data.

MWLYR2 (X) - Extreme Data.

6CKTTK (X) - Data for sample NK19 are low. Inconsistent within the determinations of both samples.

Analysis Notes:

4P8JDW - One determination removed from the Lab Mean of Sample NK19 per Grubb's Test at 1% risk (TAPPI 1205).

Key to Instrument Codes Reported by Participants

DM	IDM MTC-100 Tensile Tester	ID	Instron 4200 Series
IF	Instron 3340 Series	IM	Instron 5500 Series
IR	Instron 5900 Series	LA	L & W Autoline
LB	L & W Tensile - Autoline 400	LC	L & W Tensile - Autoline 600
LE	L & W Tensile Tester 066	LH	L & W Alwetron TH1 (Horizontal) SE 060
LI	Lloyds Instruments	LW	L & W Tensile Tester SE062
LX	L & W (model not specified)	PT	PTA Horizontal Tensile Tester
TB	Thwing-Albert EJA/1000	TH	Thwing-Albert QC-3A
TO	Thwing-Albert QC-1000	TR	TMI Horizontal Tensile Tester
TS	TMI Horizontal Tensile Tester 84-58	TT	Tinius Olsen Model MHT
TV	Thwing-Albert Vantage NX	TX	Thwing-Albert (model not specified)
XX	Instrument make/model not specified by lab		



Paper & Paperboard Interlaboratory Testing Program

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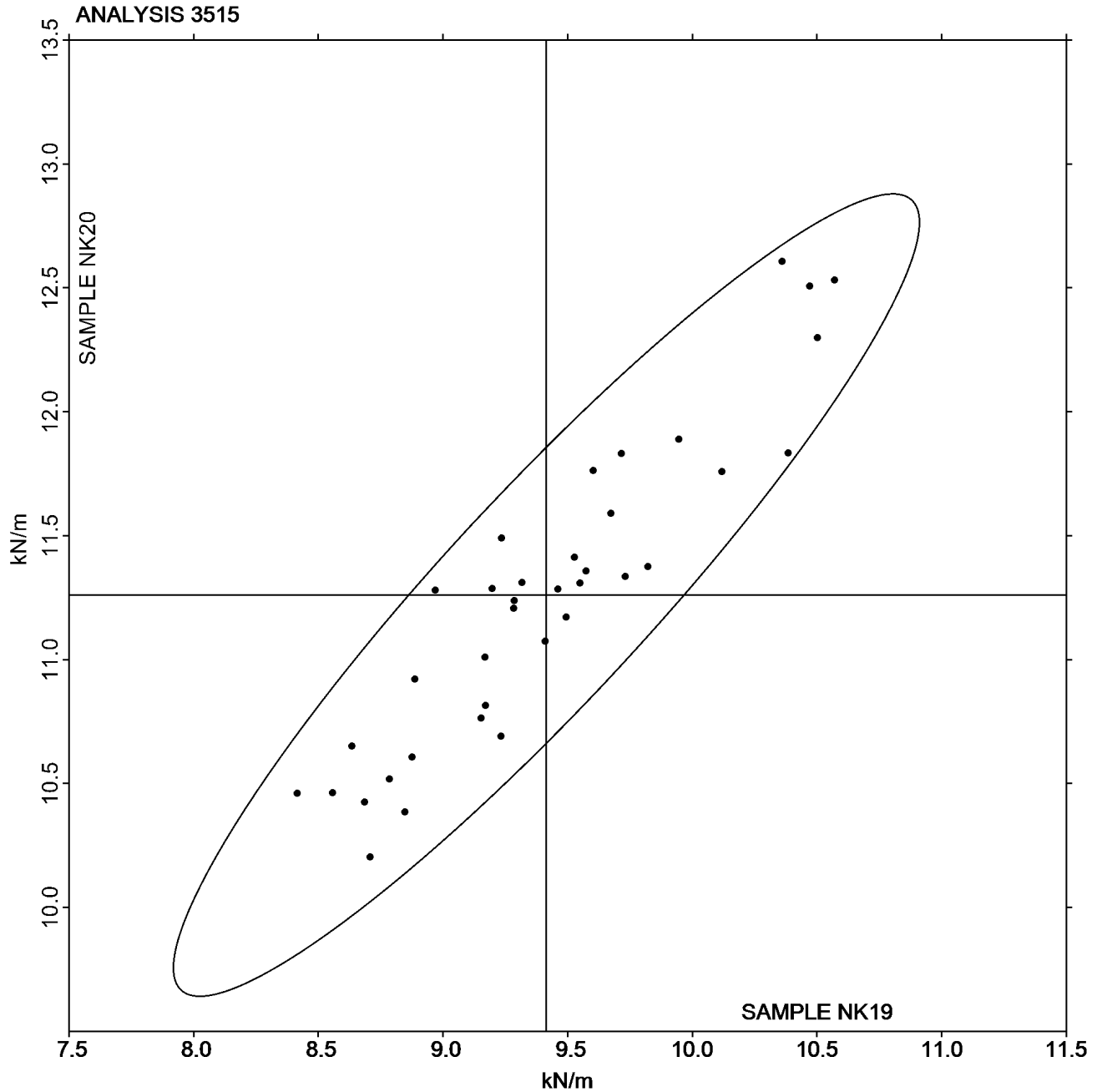
Analysis 3515

Tensile Breaking Strength - Packaging Papers

TAPPI Official Test Method T494

Grand Mean Sample NK19 = 9.4145
kN/m

Grand Mean Sample NK20 = 11.261
kN/m





Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3516

Tensile Energy Absorption - Packaging Papers

TAPPI Official Test Method T494

WebCode	Data Flag	Sample NK19			Sample NK20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3GXUYX		133.4	-6.8	-0.44	206.4	20.0	1.18	IF
4P8JDW		153.4	13.2	0.85	201.9	15.5	0.91	TO
6CKTTK	X	73.8	-66.3	-4.27	169.0	-17.4	-1.03	TH
6Q2RYL		144.6	4.4	0.28	183.6	-2.9	-0.17	LA
7BJFJW		126.6	-13.6	-0.88	167.0	-19.4	-1.15	LE
829DXW		133.8	-6.4	-0.41	180.4	-6.0	-0.36	LE
8TFZ33		130.7	-9.4	-0.61	163.2	-23.3	-1.37	LE
964ML4		135.5	-4.7	-0.30	175.6	-10.8	-0.64	LW
AEMKMT		155.4	15.2	0.98	214.6	28.2	1.66	IM
AT8ZQR		129.1	-11.1	-0.71	177.6	-8.8	-0.52	LE
C76QMG		122.7	-17.5	-1.13	163.0	-23.4	-1.38	PT
CVMAUA		132.4	-7.8	-0.50	191.2	4.8	0.28	XX
DHEQVE	X	806.2	666.0	42.91	965.9	779.5	45.96	TB
E7FCB9		156.4	16.2	1.04	199.4	12.9	0.76	TX
FCZRE7		119.4	-20.8	-1.34	174.5	-11.9	-0.70	LH
FX6DEC		124.2	-16.0	-1.03	174.4	-12.0	-0.71	TT
G6X6ZB		156.5	16.3	1.05	200.1	13.7	0.81	TV
GUEQYU		145.2	5.0	0.32	182.2	-4.2	-0.25	LC
JLJ672		115.7	-24.5	-1.58	169.6	-16.8	-0.99	LW
LW8DFE		135.7	-4.5	-0.29	192.9	6.5	0.38	XX
M2FTP3		124.5	-15.7	-1.01	175.1	-11.4	-0.67	LB
MEQ4ED	X	80.7	-59.5	-3.83	98.6	-87.9	-5.18	TS
MRQ6RE		147.1	6.9	0.45	196.3	9.9	0.59	LW
MWLYR2	X	275.4	135.2	8.71	276.7	90.3	5.32	LE
NWZL23	*	177.3	37.1	2.39	236.2	49.8	2.93	DM
P7L99B		123.8	-16.4	-1.06	175.2	-11.2	-0.66	TR
QCNUJ		164.6	24.4	1.57	208.5	22.1	1.30	LA
R64Y99		152.3	12.1	0.78	183.1	-3.4	-0.20	IR
R89MQJ		163.5	23.3	1.50	191.3	4.9	0.29	TH
RJJWFU		153.3	13.1	0.85	195.1	8.7	0.51	LE
T42NRW		156.3	16.1	1.04	188.1	1.7	0.10	TH
V33ZPQ		139.3	-0.9	-0.06	190.2	3.8	0.22	LE
VRMDD6		126.4	-13.8	-0.89	155.1	-31.3	-1.85	IM
XNZBLP		141.3	1.1	0.07	188.0	1.6	0.09	LH
ZKQ8NJ		125.6	-14.6	-0.94	179.2	-7.3	-0.43	LC



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3516

Tensile Energy Absorption - Packaging Papers

TAPPI Official Test Method T494

Summary Statistics	Sample NK19	Sample NK20
Grand Means	140.19 Joules/sq m	186.42 Joules/sq m
Stnd Dev Btwn Labs	15.52 Joules/sq m	16.96 Joules/sq m

Statistics based on 31 of 35 reporting participants.

Comments on Assigned Data Flags for Test #3516

MEQ4ED (X) - Data for both samples are low. Possible Systematic Error.

MWLYR2 (X) - Extreme Data.

6CKTTK (X) - Data for sample NK19 are low. Inconsistent within the determinations of sample NK20.

DHEQVE (X) - Extreme Data.

Key to Instrument Codes Reported by Participants

DM	IDM MTC-100 Tensile Tester	IF	Instron 3340 Series
IM	Instron 5500 Series	IR	Instron 5900 Series
LA	L & W Autoline	LB	L & W Tensile - Autoline 400
LC	L & W Tensile - Autoline 600	LE	L & W Tensile Tester 066
LH	L & W Alwetron TH1 (Horizontal) SE 060	LW	L & W Tensile Tester SE062
PT	PTA Horizontal Tensile Tester	TB	Thwing-Albert EJA/1000
TH	Thwing-Albert QC-3A	TO	Thwing-Albert QC-1000
TR	TMI Horizontal Tensile Tester	TS	TMI Horizontal Tensile Tester 84-58
TT	Tinius Olsen Model MHT	TV	Thwing-Albert Vantage NX
TX	Thwing-Albert (model not specified)	XX	Instrument make/model not specified by lab



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

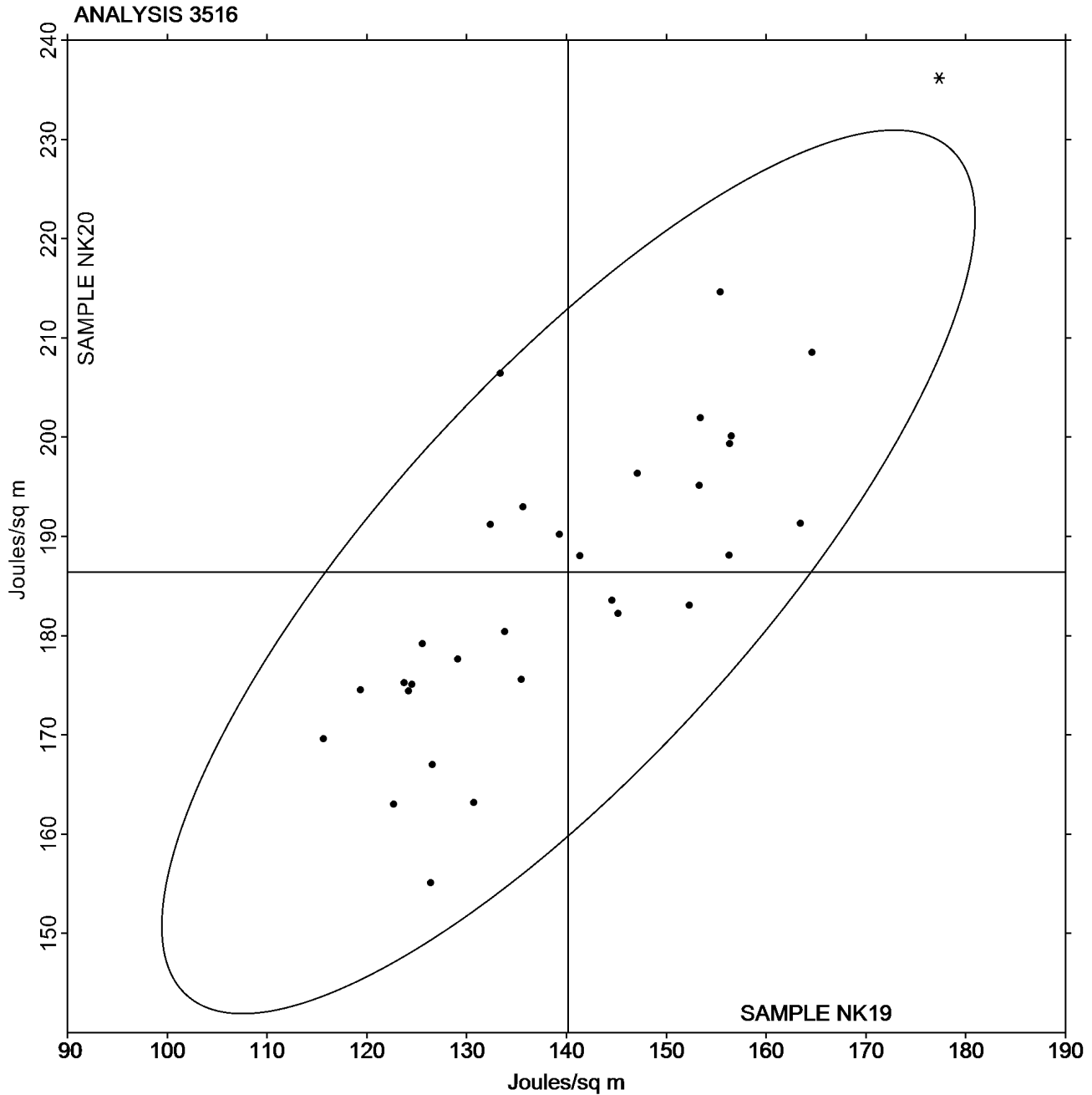
Analysis 3516

Tensile Energy Absorption - Packaging Papers

TAPPI Official Test Method T494

Grand Mean Sample NK19 = 140.19
Joules/sq m

Grand Mean Sample NK20 = 186.42
Joules/sq m





Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3517

Elongation to Break - Packaging Papers

TAPPI Official Test Method T494

WebCode	Data Flag	Sample NK19			Sample NK20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3GXUYX	X	2.260	-0.019	-0.07	2.915	0.434	1.79	XX
4P8JDW		2.270	-0.009	-0.04	2.497	0.016	0.07	TO
6CKTTK	X	1.600	-0.679	-2.57	2.390	-0.091	-0.37	XX
6PKU7L		2.349	0.070	0.26	2.453	-0.028	-0.11	XX
6Q2RYL		2.011	-0.268	-1.01	2.124	-0.357	-1.47	XX
7BJFJW		2.160	-0.119	-0.45	2.338	-0.143	-0.59	LE
829DXW		2.093	-0.186	-0.70	2.335	-0.146	-0.60	LE
8TFZ33		2.016	-0.263	-1.00	2.177	-0.304	-1.25	LE
964ML4		2.100	-0.179	-0.68	2.218	-0.263	-1.08	LW
AEMKMT		2.503	0.224	0.85	2.825	0.344	1.42	IM
AT8ZQR		2.088	-0.191	-0.72	2.360	-0.121	-0.50	LW
C76QMG		1.963	-0.316	-1.20	2.186	-0.295	-1.21	PT
CVMAUA		2.094	-0.185	-0.70	2.427	-0.053	-0.22	XX
DHEQVE		2.341	0.062	0.23	2.494	0.013	0.05	XX
E68ZU8		2.300	0.021	0.08	2.531	0.050	0.21	TB
E7FCB9		2.548	0.269	1.02	2.713	0.232	0.96	TX
FCZRE7		2.100	-0.179	-0.68	2.430	-0.051	-0.21	LH
FX6DEC		2.307	0.028	0.10	2.578	0.097	0.40	TT
G6X6ZB		2.503	0.224	0.85	2.677	0.196	0.81	TV
GUEQYU		2.084	-0.195	-0.74	2.229	-0.252	-1.04	LC
JLJ672		1.929	-0.350	-1.33	2.228	-0.253	-1.04	LW
LW8DFE		2.375	0.096	0.36	2.722	0.241	0.99	XX
M2FTP3		2.125	-0.154	-0.58	2.381	-0.100	-0.41	LB
MEQ4ED		2.373	0.094	0.35	2.493	0.012	0.05	TS
MRQ6RE		2.122	-0.157	-0.59	2.326	-0.155	-0.64	LW
MWLYR2	*	2.975	0.696	2.63	2.971	0.490	2.02	LE
NWZL23	*	2.866	0.587	2.22	3.140	0.659	2.71	DM
P7L99B		2.117	-0.162	-0.61	2.456	-0.025	-0.10	TR
QCNUJ		2.581	0.302	1.14	2.828	0.347	1.43	LX
R64Y99		2.610	0.331	1.25	2.663	0.182	0.75	XX
R89MQJ		2.570	0.291	1.10	2.620	0.139	0.57	LX
RJJWFU	X	0.092	-2.187	-8.27	0.098	-2.383	-9.80	LE
T42NRW		2.469	0.190	0.72	2.499	0.018	0.08	TH
V33ZPQ		2.178	-0.101	-0.38	2.435	-0.046	-0.19	LE
VRMDD6		2.363	0.084	0.32	2.474	-0.007	-0.03	IM
XNZBLP		2.261	-0.018	-0.07	2.502	0.021	0.09	LX
ZKQ8NJ		1.752	-0.527	-1.99	2.013	-0.468	-1.92	LC



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3517

Elongation to Break - Packaging Papers

TAPPI Official Test Method T494

Summary Statistics	Sample NK19	Sample NK20
Grand Means	2.28 Percent	2.48 Percent
Std Dev Btwn Labs	0.26 Percent	0.24 Percent

Statistics based on 34 of 37 reporting participants.

Comments on Assigned Data Flags for Test #3517

3GXUYX (X) - Inconsistent in testing between samples. Inconsistent within the determinations of both samples.

RJJWFU (X) - Extreme Data.

6CKTTK (X) - Inconsistent in testing between samples. Inconsistent within the determinations of sample NK20.

Key to Instrument Codes Reported by Participants

DM	IDM MTC-100 Tensile Tester	IM	Instron 5500 Series
LB	L & W Tensile - Autoline 400	LC	L & W Tensile - Autoline 600
LE	L & W Tensile Tester 066	LH	L & W Alwetron TH1 (Horizontal) SE 060
LW	L & W Tensile Tester SE062	LX	L & W (model not specified)
PT	PTA Horizontal Tensile Tester	TB	Thwing-Albert EJA/1000
TH	Thwing-Albert QC-3A	TO	Thwing-Albert QC-1000
TR	TMI Horizontal Tensile Tester	TS	TMI Horizontal Tensile Tester 84-58
TT	Tinius Olsen Model MHT	TV	Thwing-Albert Vantage NX
TX	Thwing-Albert (model not specified)	XX	Instrument make/model not specified by lab



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3517

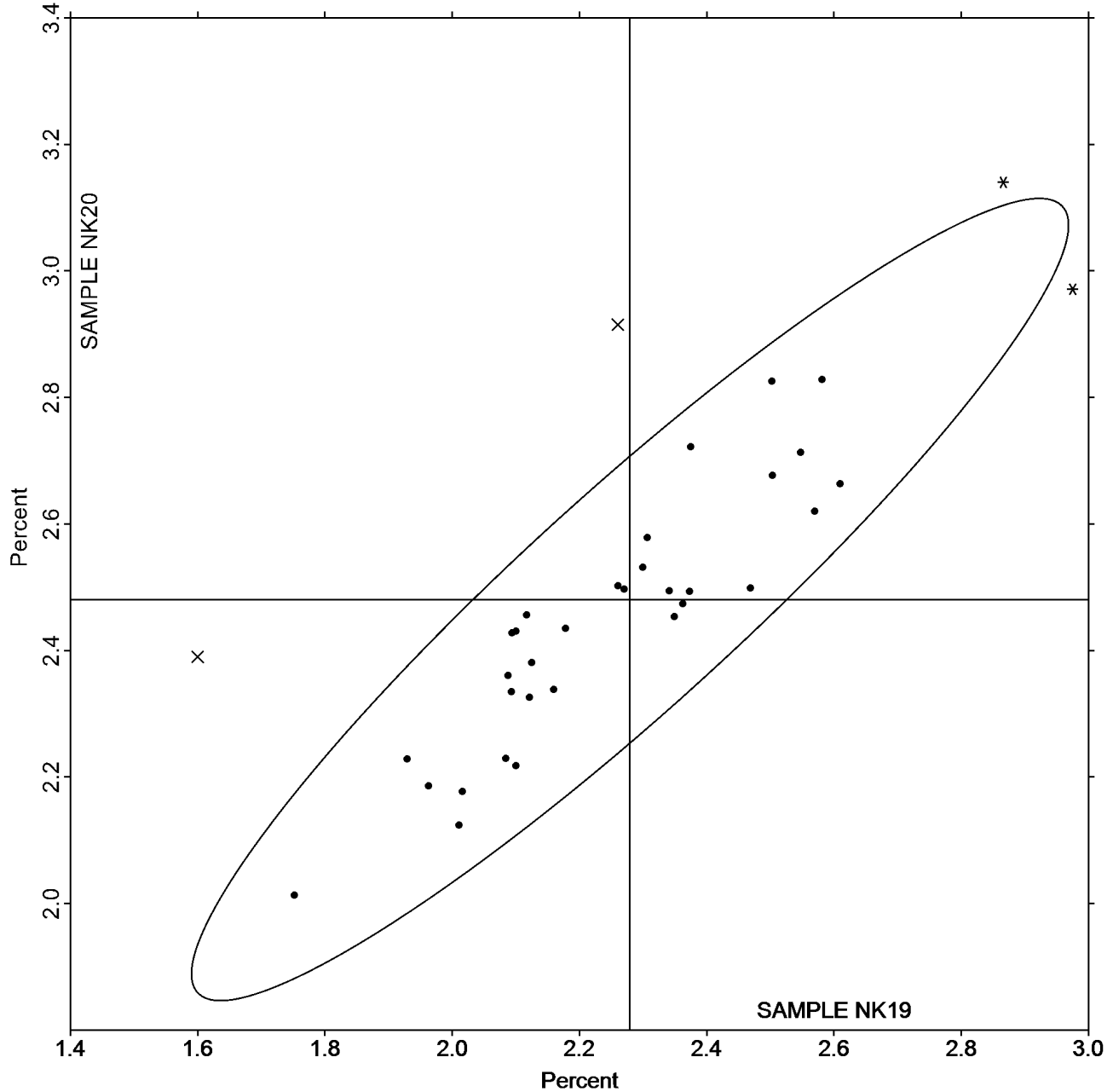
Elongation to Break - Packaging Papers

TAPPI Official Test Method T494

Grand Mean Sample NK19 = 2.2793
Percent

Grand Mean Sample NK20 = 2.4807
Percent

ANALYSIS 3517





Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3531

Roughness - Print Surf Method - 0.5 to 4.0 Microns

TAPPI Official Test Method T555

WebCode	Data Flag	Sample PS19			Sample PS20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3JPQNR		0.6010	-0.0516	-0.88	0.6030	-0.0463	-0.80	ZZ
6UZ3UL		0.6470	-0.0056	-0.10	0.6440	-0.0053	-0.09	ZZ
AP9PWD		0.7930	0.1404	2.39	0.7970	0.1477	2.56	ZZ
BKRG9D		0.5990	-0.0536	-0.91	0.5880	-0.0613	-1.06	ZZ
C6CXR		0.5720	-0.0806	-1.37	0.5770	-0.0723	-1.25	ZZ
DHEQVE		0.6400	-0.0126	-0.21	0.6400	-0.0093	-0.16	ZZ
HPNDX7		0.6370	-0.0156	-0.27	0.6380	-0.0113	-0.20	ZZ
JLJ672		0.5470	-0.1056	-1.79	0.5490	-0.1003	-1.74	ZZ
JLW2AK		0.6560	0.0034	0.06	0.6450	-0.0043	-0.07	ZZ
JQCAXK		0.6500	-0.0026	-0.04	0.6350	-0.0143	-0.25	ZZ
LYYA68		0.6270	-0.0256	-0.44	0.6200	-0.0293	-0.51	ZZ
M2FTP3	*	0.6790	0.0264	0.45	0.6290	-0.0203	-0.35	ZZ
MEQ4ED		0.6420	-0.0106	-0.18	0.6740	0.0247	0.43	ZZ
MWLYR2		0.6470	-0.0056	-0.10	0.6420	-0.0073	-0.13	ZZ
NCTDL4		0.7390	0.0864	1.47	0.7260	0.0767	1.33	ZZ
P4HBZ3		0.7260	0.0734	1.25	0.7140	0.0647	1.12	ZZ
T42NRW	X	1.0250	0.3724	6.33	0.6290	-0.0203	-0.35	ZZ
THL7MK	X	1.5430	0.8904	15.13	1.5000	0.8507	14.74	ZZ
V8GXWD		0.7490	0.0964	1.64	0.7420	0.0927	1.61	ZZ
VG6TT9		0.6520	-0.0006	-0.01	0.6650	0.0157	0.27	ZZ
VY6JCW		0.6530	0.0004	0.01	0.6500	0.0007	0.01	ZZ
XAFVHQ	X	4.1970	3.5444	60.23	4.7140	4.0647	70.45	ZZ
XF3HDV	X	0.9440	0.2914	4.95	0.8790	0.2297	3.98	ZZ
XNZBLP		0.6430	-0.0096	-0.16	0.6550	0.0057	0.10	ZZ
Z37FNK	X	1.0840	0.4314	7.33	1.0960	0.4467	7.74	ZZ
ZKQ8NJ		0.6060	-0.0466	-0.79	0.6020	-0.0473	-0.82	ZZ

Summary Statistics	Sample PS19	Sample PS20
Grand Means	0.65 Microns	0.65 Microns
Std Dev Btwn Labs	0.06 Microns	0.06 Microns
Statistics based on 21 of 26 reporting participants.		



Comments on Assigned Data Flags for Test #3531

Z37FNK (X) - Extreme Data.

XAFVHQ (X) - Extreme Data.

T42NRW (X) - Extreme Data for Sample PS19.

XF3HDV (X) - Data for both samples are high. Possible Systematic Error. Inconsistent within the determinations of both samples.

THL7MK (X) - Extreme Data.

Key to Instrument Codes Reported by Participants

ZZ Instruments No Longer Tracked



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

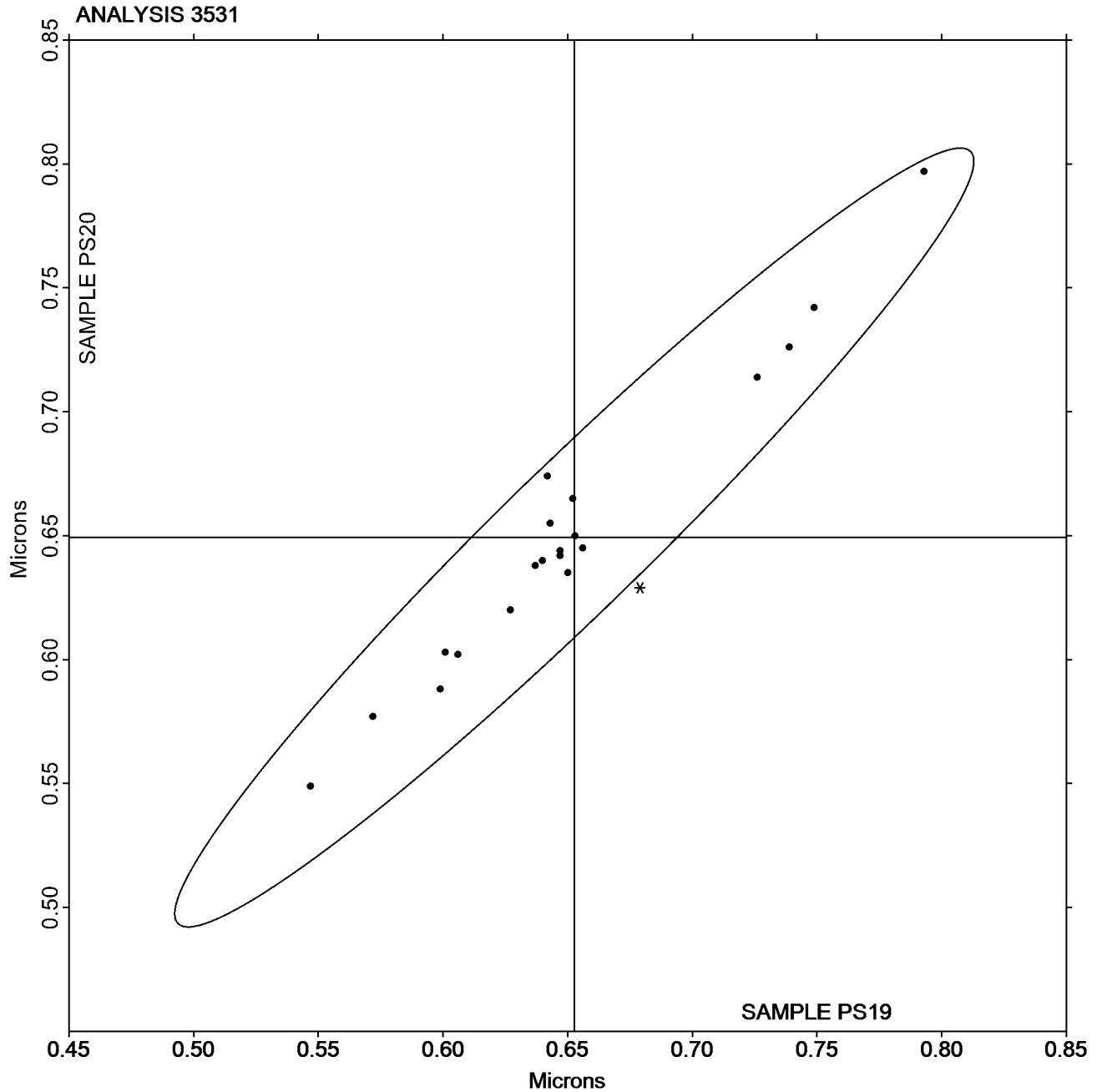
Analysis 3531

Roughness - Print Surf Method - 0.5 to 4.0 Microns

TAPPI Official Test Method T555

Grand Mean Sample PS19 = 0.65262
Microns

Grand Mean Sample PS20 =
0.64929 Microns





Paper & Paperboard Interlaboratory Testing Program
Analysis 3545
Directional Brightness
TAPPI Official Test Method T452

Report #4252,
August 2023

WebCode	Data Flag	Sample BR19			Sample BR20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3JPQNR		86.14	1.06	0.68	86.13	1.05	0.66	HG
B3CAWH	*	80.99	-4.09	-2.63	80.34	-4.73	-2.97	PE
C6CXR		86.94	1.86	1.19	86.91	1.84	1.15	TD
CVMAUA		85.90	0.82	0.52	85.59	0.52	0.33	XX
E68ZU8		85.15	0.07	0.05	85.49	0.41	0.26	XD
HEHVZ9		84.41	-0.67	-0.43	84.40	-0.67	-0.42	TS
HPNDX7		84.83	-0.25	-0.16	84.77	-0.30	-0.19	HG
JLJ672		87.74	2.66	1.71	87.23	2.15	1.35	TP
JLW2AK		84.42	-0.66	-0.43	84.53	-0.54	-0.34	PP
LYYA68		83.91	-1.17	-0.75	83.98	-1.09	-0.69	TP
MEQ4ED		84.77	-0.31	-0.20	84.91	-0.16	-0.10	TS
MRQ6RE		83.76	-1.32	-0.85	84.29	-0.78	-0.49	TS
MWLYR2		85.14	0.06	0.04	85.11	0.04	0.02	HG
T42NRW		86.96	1.88	1.21	87.06	1.99	1.25	TP
TDRAW9		84.65	-0.44	-0.28	84.49	-0.58	-0.36	XX
THL7MK		84.54	-0.54	-0.35	84.63	-0.44	-0.28	HZ
TYCBQ9		84.29	-0.79	-0.51	84.46	-0.61	-0.38	TT
XAFVHQ	X	86.88	1.79	1.15	84.81	-0.26	-0.16	TP
YADK2D		86.93	1.85	1.19	86.98	1.91	1.20	TP

Summary Statistics	Sample BR19	Sample BR20
Grand Means	85.08 Percent	85.07 Percent
Std Dev Btw Labs	1.56 Percent	1.59 Percent
Statistics based on 18 of 19 reporting participants.		

Comments on Assigned Data Flags for Test #3545

XAFVHQ (X) - Inconsistent in testing between samples.

Key to Instrument Codes Reported by Participants

HG	Hunter Labscan / XE	HZ	Hunter Lab ColorFlex EZ Series
PE	Photovolt 577	PP	Technidyne Profile/Plus
TD	Technidyne Color Touch 45X	TP	Technidyne Test/Plus
TS	Technidyne Brightimeter Micro S-5	TT	Technidyne Brightimeter Micro S4-M
XD	X-Rite Color Ci7600	XX	Instrument make/model not specified by lab



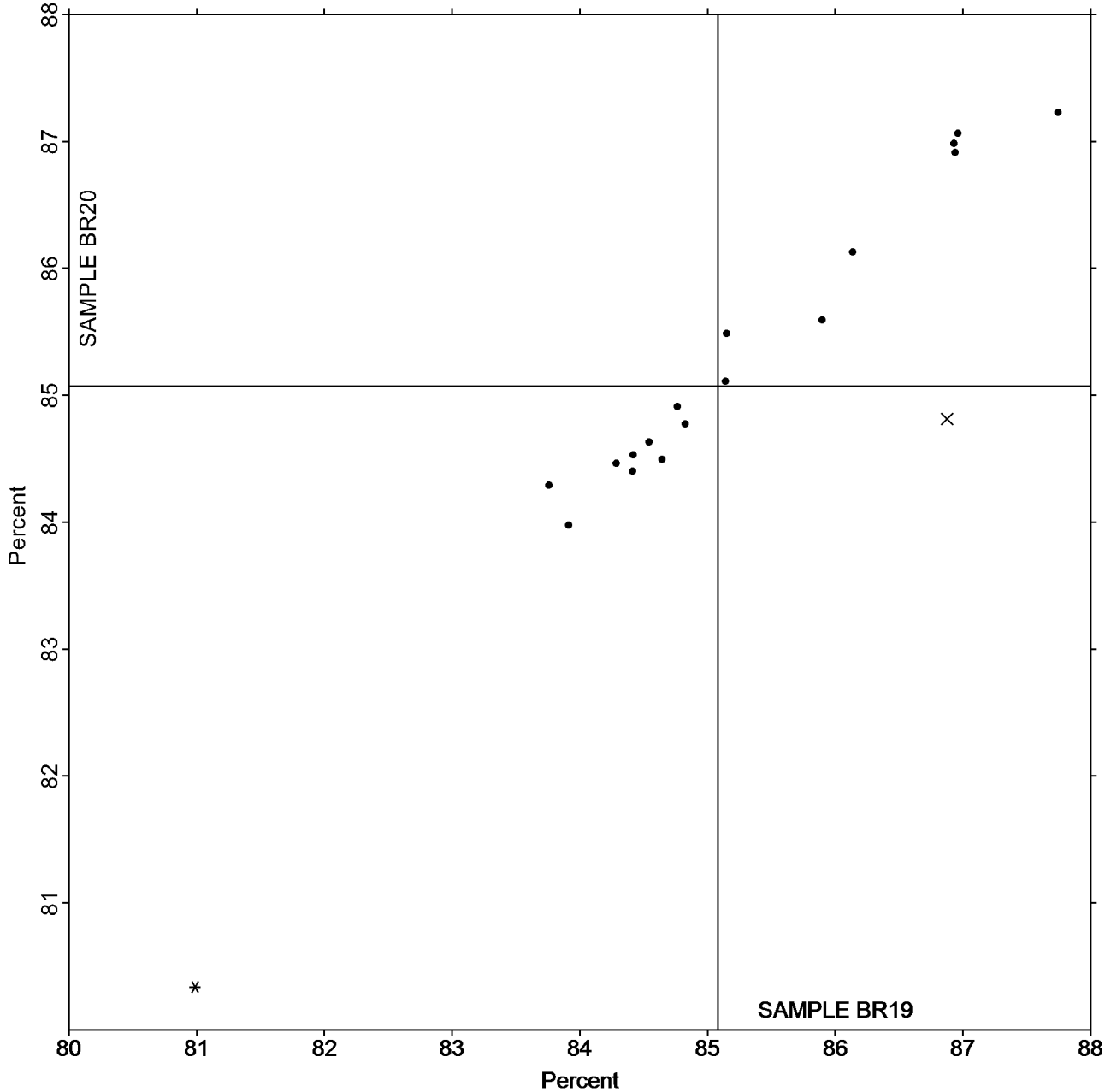
Paper & Paperboard Interlaboratory Testing Program
Analysis 3545
Directional Brightness
TAPPI Official Test Method T452

Report #4252,
August 2023

Grand Mean Sample BR19 = 85.081
Percent

Grand Mean Sample BR20 = 85.072
Percent

ANALYSIS 3545



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3547 Diffuse Brightness

TAPPI Official Test Method T525

WebCode	Data Flag	Sample BR19			Sample BR20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
2FAYZK		84.96	0.06	0.18	84.97	0.03	0.07	XX
2NJMDJ	X	68.32	-16.58	-48.58	68.53	-16.41	-42.76	TC
3JPQNR		84.70	-0.20	-0.57	84.68	-0.26	-0.67	TC
AT8ZQR		84.62	-0.27	-0.80	84.77	-0.17	-0.44	LT
G84MY8		84.99	0.09	0.26	84.97	0.03	0.08	LA
G8N4EA		84.58	-0.32	-0.92	84.61	-0.33	-0.86	LE
JLJ672		84.59	-0.31	-0.90	84.65	-0.29	-0.76	EA
MEQ4ED	*	85.90	1.00	2.94	86.12	1.18	3.07	LT
NCTDL4		85.00	0.10	0.31	85.09	0.16	0.41	LA
P7L99B		85.13	0.24	0.69	85.19	0.25	0.65	TC
T42NRW		84.92	0.03	0.08	84.90	-0.04	-0.11	LT
VG6TT9		84.85	-0.05	-0.15	84.83	-0.11	-0.28	TC
WAZCXT		84.98	0.08	0.24	85.00	0.06	0.16	LE
XAFVHQ		84.70	-0.20	-0.58	84.72	-0.22	-0.57	TC
XNZBLP		84.63	-0.26	-0.77	84.65	-0.29	-0.76	LT
Z37FNK	X	68.23	-16.67	-48.82	68.47	-16.47	-42.92	TC

Summary Statistics	Sample BR19	Sample BR20
Grand Means	84.90 Percent	84.94 Percent
Stnd Dev Btwn Labs	0.34 Percent	0.38 Percent

Statistics based on 14 of 16 reporting participants.

Comments on Assigned Data Flags for Test #3547

Z37FNK (X) - Extreme Data.

2NJMDJ (X) - Extreme Data.

Key to Instrument Codes Reported by Participants

EA	Datacolor Elrepho	LA	L & W Elrepho - Autoline
LE	L & W Elrepho	LT	L & W Elrepho SE 071
TC	Technidyne Color Touch Series	XX	Instrument make/model not specified by lab



Paper & Paperboard Interlaboratory Testing Program

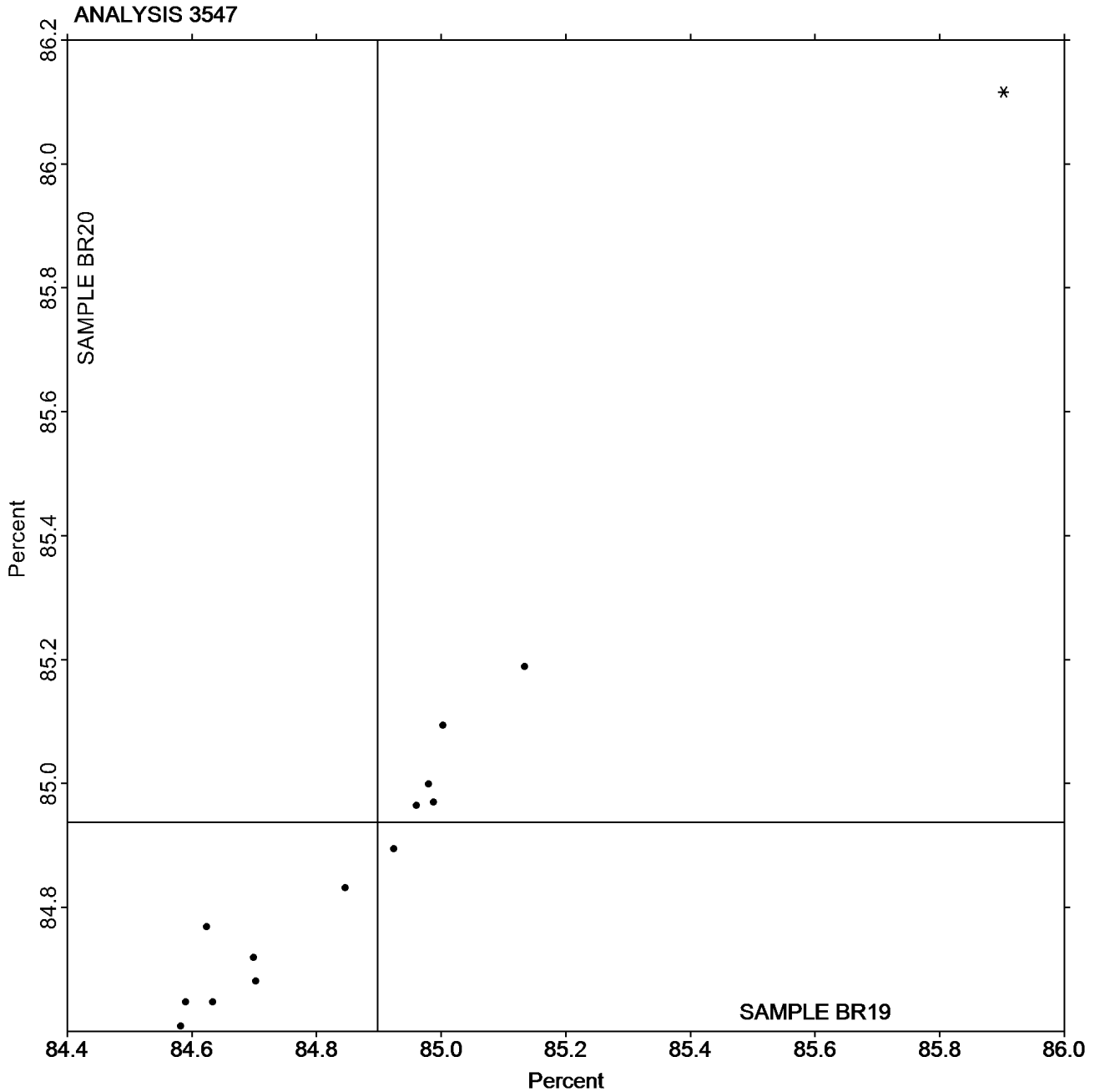
Report #4252,
August 2023

Analysis 3547
Diffuse Brightness

TAPPI Official Test Method T525

Grand Mean Sample BR19 = 84.898
Percent

Grand Mean Sample BR20 = 84.938
Percent



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



**Paper & Paperboard Interlaboratory Testing Program
Analysis 3549**

**Report #4252,
August 2023**

**Color & Color Difference - Near White Papers - C/2deg obs
Hunter L,a,b - Illuminant C - 2 Degree Observer**

Web Code	Data Flag	Samples	Hunter L, a, b Color Values			Color Difference Values				Instr Code
			L	a	b	ΔL	Δa	Δb	ΔE	
2FAYZK		CA19	94.86	-0.54	2.09	-0.01	0.01	0.00	0.02	TC
		CA20	94.85	-0.53	2.09					
3JPQNR		CA19	94.01	-0.41	1.89	0.00	0.00	0.00	0.00	HF
		CA20	94.01	-0.41	1.89					
7N8KTE		CA19	92.67	-0.68	1.74	0.04	-0.06	0.04	0.08	TS
		CA20	92.71	-0.74	1.78					
7UTBFA		CA19	94.74	-0.52	1.81	0.05	0.02	0.04	0.06	TC
		CA20	94.79	-0.50	1.84					
8ZFK3D		CA19	91.52	0.09	0.74	-0.01	0.06	-0.05	0.08	TS
		CA20	91.51	0.15	0.69					
B3CAWH	X	CA19	86.39	-0.46	0.63	0.01	0.03	0.00	0.03	XX
		CA20	86.40	-0.43	0.63					
C6CXRX		CA19	93.88	-0.21	1.42	-0.10	0.03	-0.02	0.11	TC
		CA20	93.78	-0.19	1.40					
CVMAUA		CA19	94.78	-0.59	1.54	0.42	-0.05	0.29	0.51	XX
		CA20	95.20	-0.64	1.83					
G84MY8		CA19	93.40	-0.29	1.70	0.02	0.01	-0.05	0.06	LA
		CA20	93.42	-0.29	1.65					
G8N4EA		CA19	94.65	-0.58	1.86	0.01	0.00	-0.01	0.01	LS
		CA20	94.66	-0.58	1.85					
HPNDX7		CA19	93.33	-0.60	1.68	0.03	0.00	0.00	0.03	HK
		CA20	93.36	-0.60	1.68					
JLW2AK		CA19	93.29	-0.59	1.91	0.00	0.02	-0.01	0.02	TC
		CA20	93.28	-0.56	1.90					
MEQ4ED		CA19	92.50	-0.11	1.27	-0.06	-0.01	0.05	0.08	TS
		CA20	92.44	-0.12	1.33					
MWLYR2		CA19	93.72	-0.60	1.65	0.02	0.01	0.02	0.03	HK
		CA20	93.74	-0.59	1.66					
NCTDL4		CA19	94.87	-0.59	1.87	0.02	0.00	0.02	0.02	XX
		CA20	94.89	-0.60	1.89					
XAFVHQ		CA19	93.29	-0.62	1.98	0.01	0.01	-0.05	0.05	TC
		CA20	93.30	-0.62	1.93					



Paper & Paperboard Interlaboratory Testing Program
Analysis 3549
Color & Color Difference - Near White Papers - C/2deg obs
Hunter L,a,b - Illuminant C - 2 Degree Observer

Report #4252,
August 2023

<u>Grand Means</u>			Summary Statistics				
CA19	93.701	-0.456	1.611				
CA20	93.730	-0.453	1.628	0.029	0.002	0.018	0.078
<u>Stnd Dev Btwn Labs</u>							
CA19	0.994	0.217	0.418				
CA20	1.037	0.234	0.424	0.115	0.029	0.082	0.124

Statistics based on 15 of 16 reporting participants

Comments on Assigned Data Flags for Test #3549

B3CAWH (X) - Extreme data for both "L" values.

Key to Instrument Codes Reported by Participants

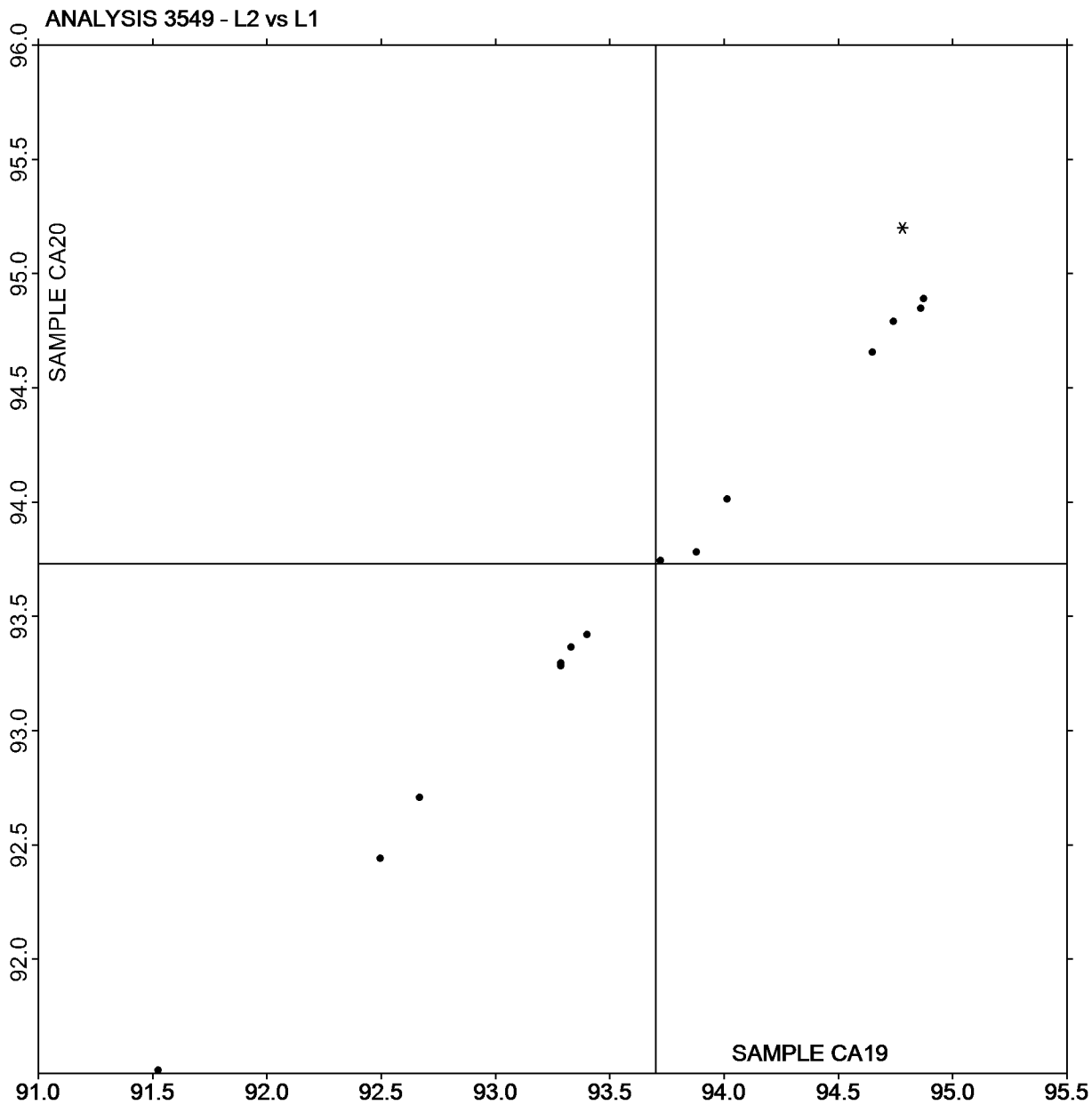
HF	Hunter LabScan II	HK	Hunter LabScan XE
LA	L & W Elrepho AL300	LS	L & W Elrepho SE 070
TC	Technidyne Color Touch Series	TS	Technidyne Brightimeter Micro S-5
XX	Instrument make/model not specified by lab		



Paper & Paperboard Interlaboratory Testing Program
Analysis 3549
Color & Color Difference - Near White Papers - C/2deg obs
Hunter L,a,b - Illuminant C - 2 Degree Observer

Report #4252,
August 2023

Plot of L values CA20 vs L values CA19



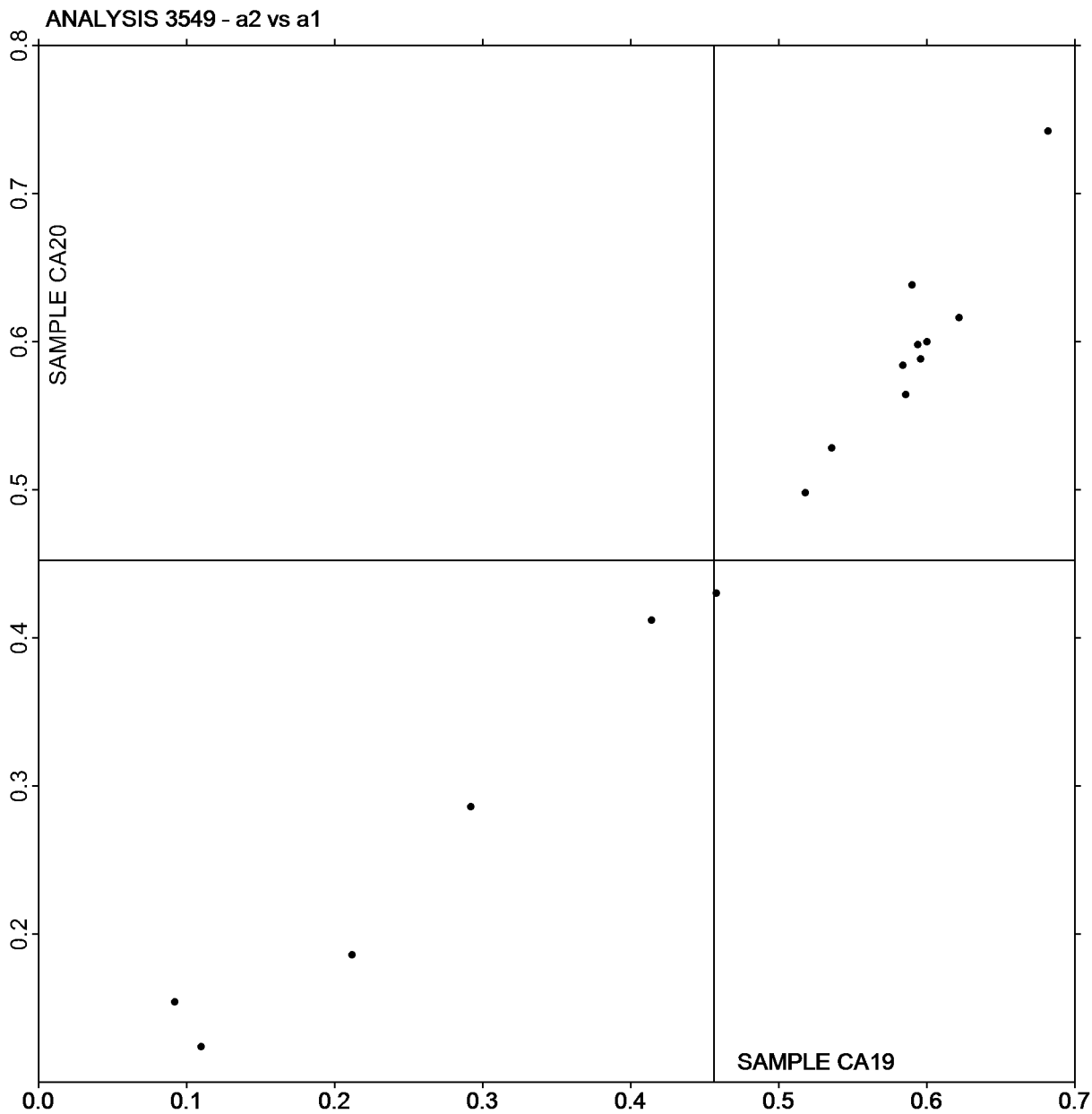
If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3549
Color & Color Difference - Near White Papers - C/2deg obs
Hunter L,a,b - Illuminant C - 2 Degree Observer

Report #4252,
August 2023

Plot of a values CA20 vs a values CA19



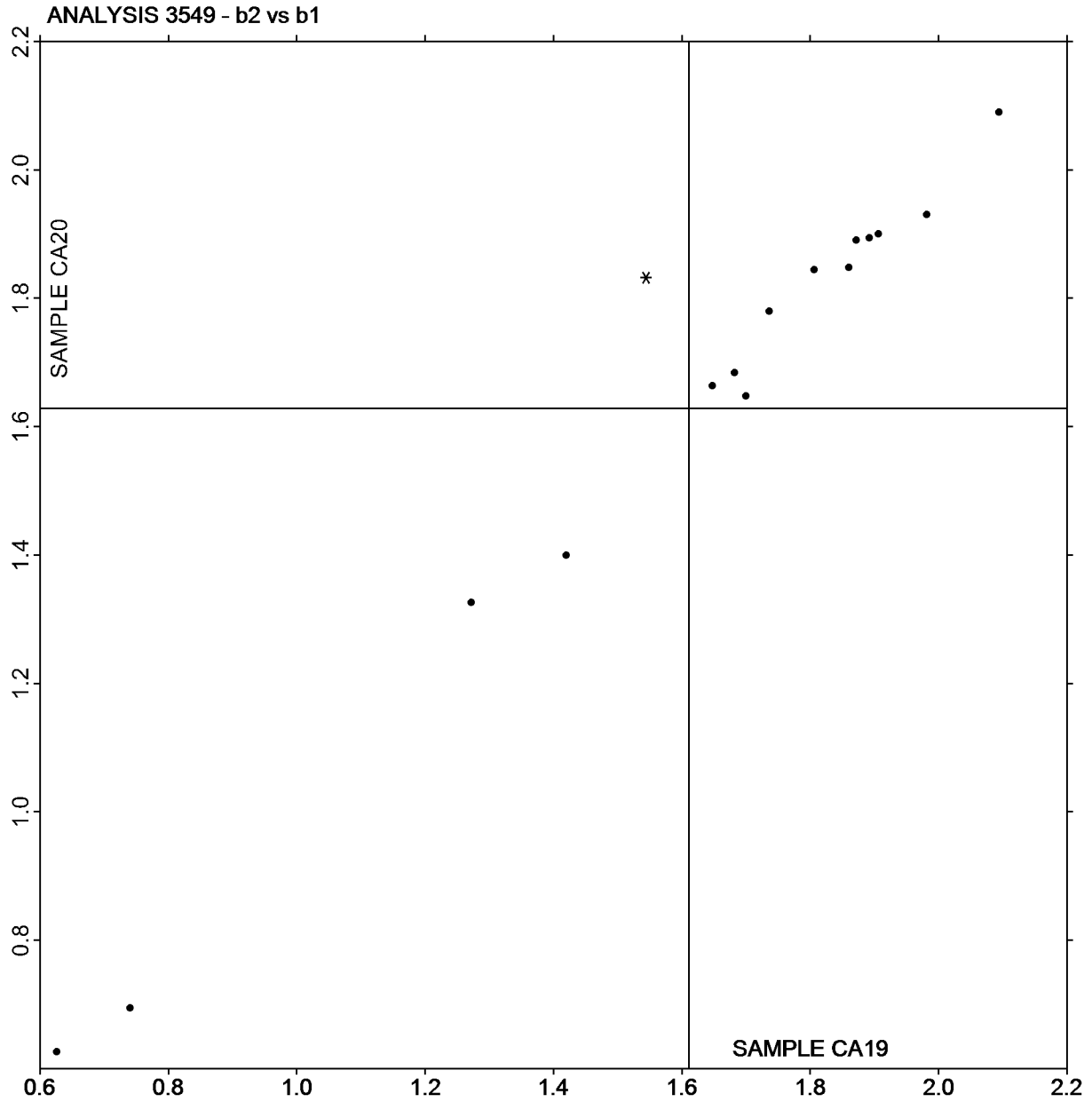
If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3549
Color & Color Difference - Near White Papers - C/2deg obs
Hunter L,a,b - Illuminant C - 2 Degree Observer

Report #4252,
August 2023

Plot of b values CA20 vs b values CA19



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



**Paper & Paperboard Interlaboratory Testing Program
Analysis 3551**

**Report #4252,
August 2023**

**Color & Color Difference - Near White Papers - D65/10deg obs
Hunter L,a,b - Illuminant D65 - 10 Degree Observer**

Web Code	Data Flag	Samples	Hunter L, a, b Color Values			Color Difference Values				Instr Code
			L	a	b	ΔL	Δa	Δb	ΔE	
3JPQNR		CA19	93.24	-0.66	1.83	0.00	-0.02	0.09	0.09	TC
		CA20	93.25	-0.68	1.92					
686L6K		CA19	95.19	-0.46	1.69	0.01	0.02	-0.05	0.06	NF
		CA20	95.20	-0.44	1.64					
6UZ3UL		CA19	94.77	-0.61	1.91	-0.02	-0.02	0.01	0.03	TC
		CA20	94.75	-0.63	1.92					
AT8ZQR		CA19	94.74	-0.54	2.01	-0.03	0.01	0.02	0.03	LS
		CA20	94.72	-0.53	2.03					
AVX2X2		CA19	95.28	-0.41 *	1.69	0.05	-0.05	-0.03	0.08	XX
		CA20	95.33	-0.46	1.66					
BCGEMD		CA19	94.94	-0.55	1.96	0.00	0.00	0.00	0.01	XX
		CA20	94.94	-0.55	1.96					
BW8BLR		CA19	94.46	-0.60	1.80	0.12	0.02	-0.06	0.14	XC
		CA20	94.59	-0.58	1.75					
HZY74R		CA19	94.16	-0.50	1.67	0.14	0.05	-0.03	0.15	XC
		CA20	94.30	-0.44	1.64					
JLJ672		CA19	94.67	-0.56	2.06	-0.01	0.00	0.00	0.01	EG
		CA20	94.66	-0.56	2.06					
LU2MEQ		CA19	94.81	-0.53	2.16	-0.06	0.00	-0.06	0.08	MN
		CA20	94.75	-0.53	2.10					
LYYA68		CA19	93.65	-0.43	1.77	0.01	0.01	0.00	0.02	HE
		CA20	93.67	-0.42	1.77					
NCTDL4		CA19	94.90	-0.60	1.87	0.00	0.01	0.00	0.01	LS
		CA20	94.90	-0.60	1.87					
R7VVX3		CA19	94.79	-0.52	2.10	0.01	0.00	-0.01	0.02	XX
		CA20	94.81	-0.52	2.09					
T42NRW		CA19	94.80	-0.54	2.00	-0.01	0.01	-0.03	0.04	LT
		CA20	94.79	-0.53	1.96					
TYCBQ9		CA19	93.78	-0.42	1.68	-0.01	0.02	-0.02	0.03	XB
		CA20	93.77	-0.40	1.66					
Z6XCDE		CA19	94.84	-0.57	1.89 *	-0.05	-0.01	-0.19 X	0.19	TC
		CA20	94.79	-0.58	1.70					



**Paper & Paperboard Interlaboratory Testing Program
Analysis 3551**

**Report #4252,
August 2023**

**Color & Color Difference - Near White Papers - D65/10deg obs
Hunter L,a,b - Illuminant D65 - 10 Degree Observer**

ZGQVRJ	CA19	95.08	-0.51	1.80	-0.01	0.00	0.04	0.04	NF
	CA20	95.07	-0.51	1.83					

<u>Grand Means</u>			Summary Statistics					
CA19	94.595	-0.530	1.876					
CA20	94.604	-0.528	1.857	0.009	0.003	-0.019	0.059	
<u>Std Dev Btwn Labs</u>								
CA19	0.564	0.071	0.154					
CA20	0.558	0.077	0.163	0.051	0.022	0.057	0.056	

Statistics based on 17 of 17 reporting participants

Key to Instrument Codes Reported by Participants

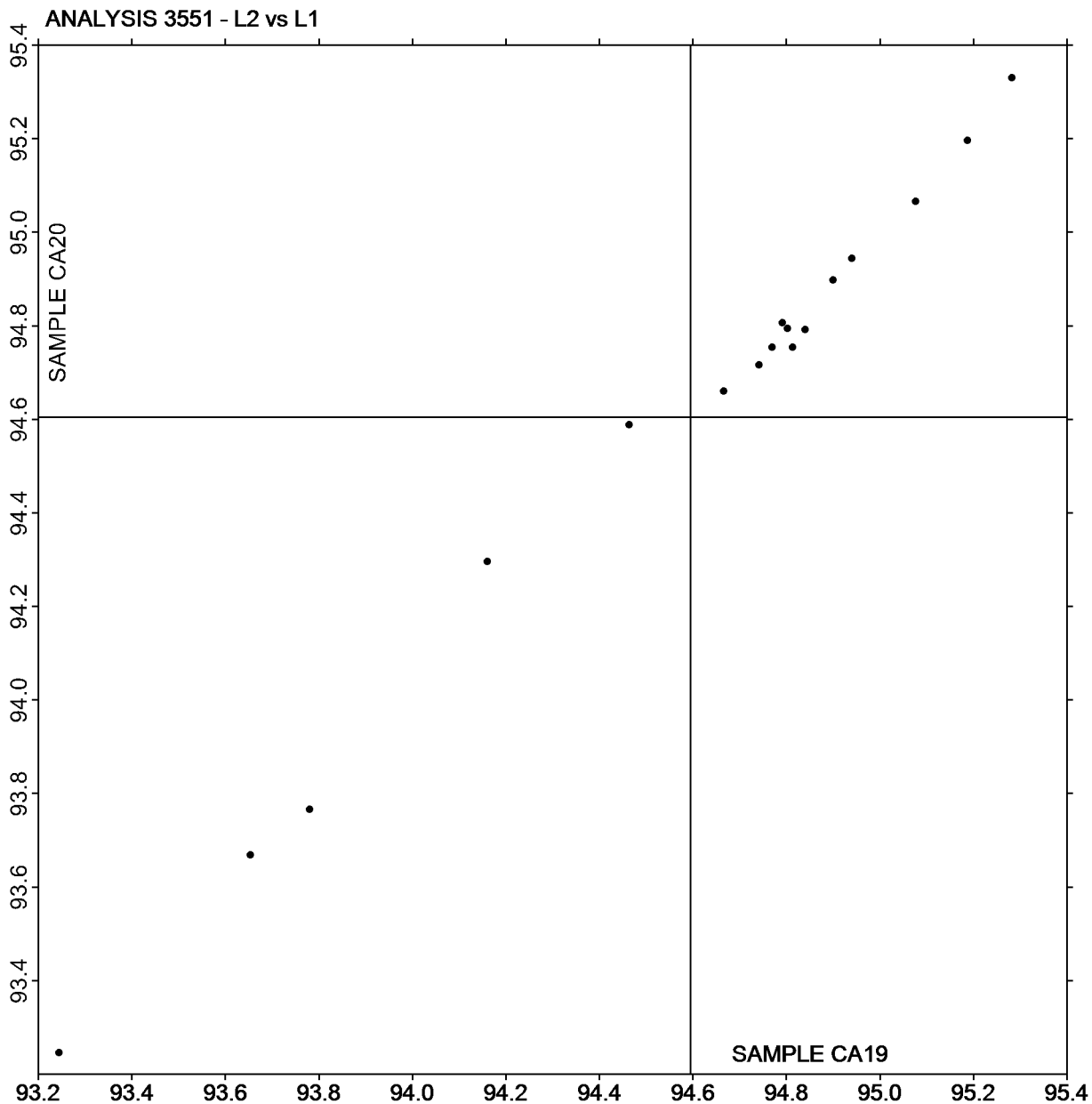
EG Datacolor Elrepho	HE Hunter LabScan
LS L & W Elrepho SE 070	LT L & W Elrepho SE 071
MN Minolta (model not specified)	NF Minolta CM-3600d Spectrophotometer
TC Technidyne Color Touch Series	XB X-Rite Ci7
XC X-Rite eXact Series	XX Instrument make/model not specified by lab



Paper & Paperboard Interlaboratory Testing Program
Analysis 3551
Color & Color Difference - Near White Papers - D65/10deg obs
Hunter L,a,b - Illuminant D65 - 10 Degree Observer

Report #4252,
August 2023

Plot of L values CA20 vs L values CA19



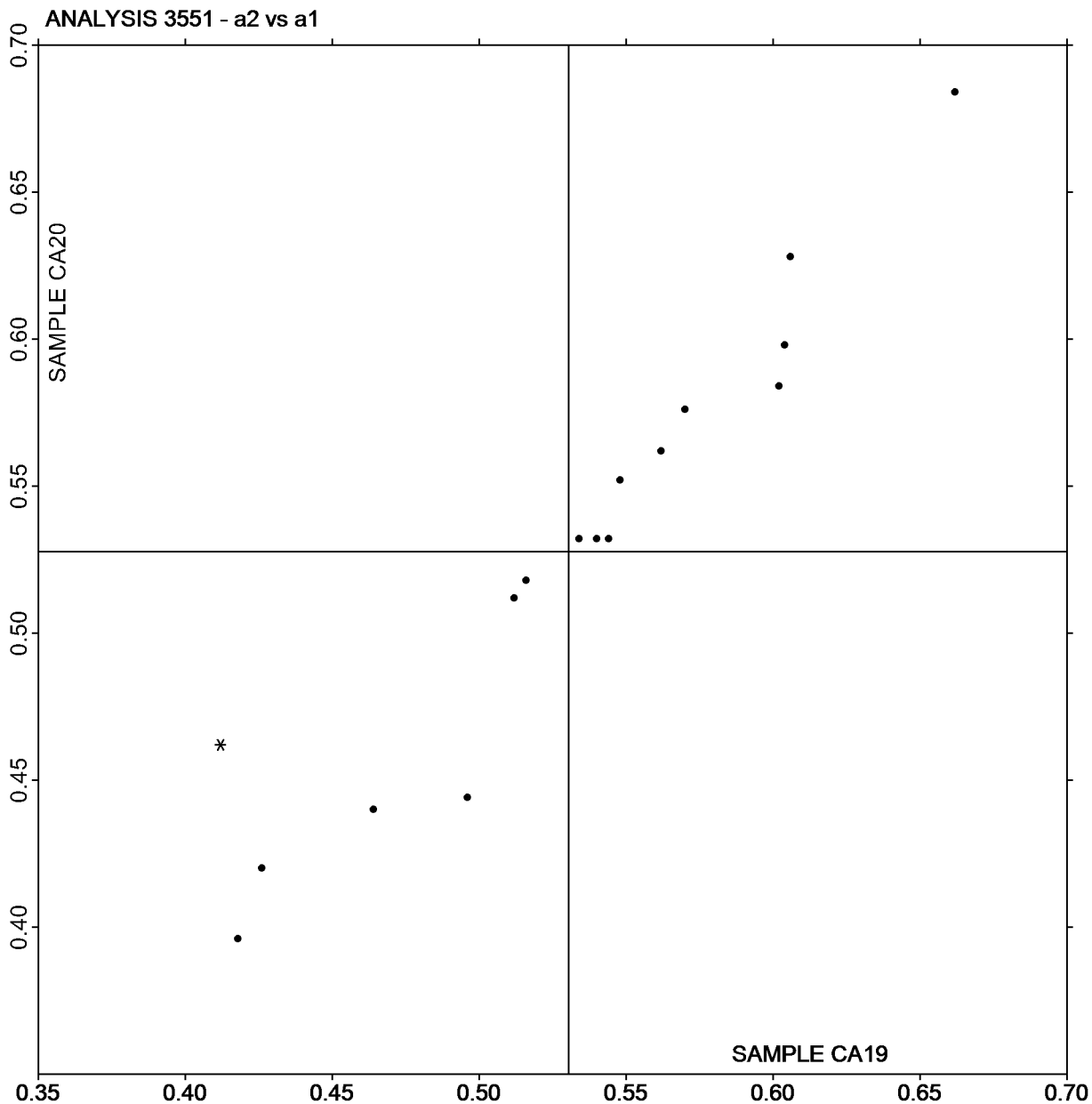
If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3551
Color & Color Difference - Near White Papers - D65/10deg obs
Hunter L,a,b - Illuminant D65 - 10 Degree Observer

Report #4252,
August 2023

Plot of a values CA20 vs a values CA19



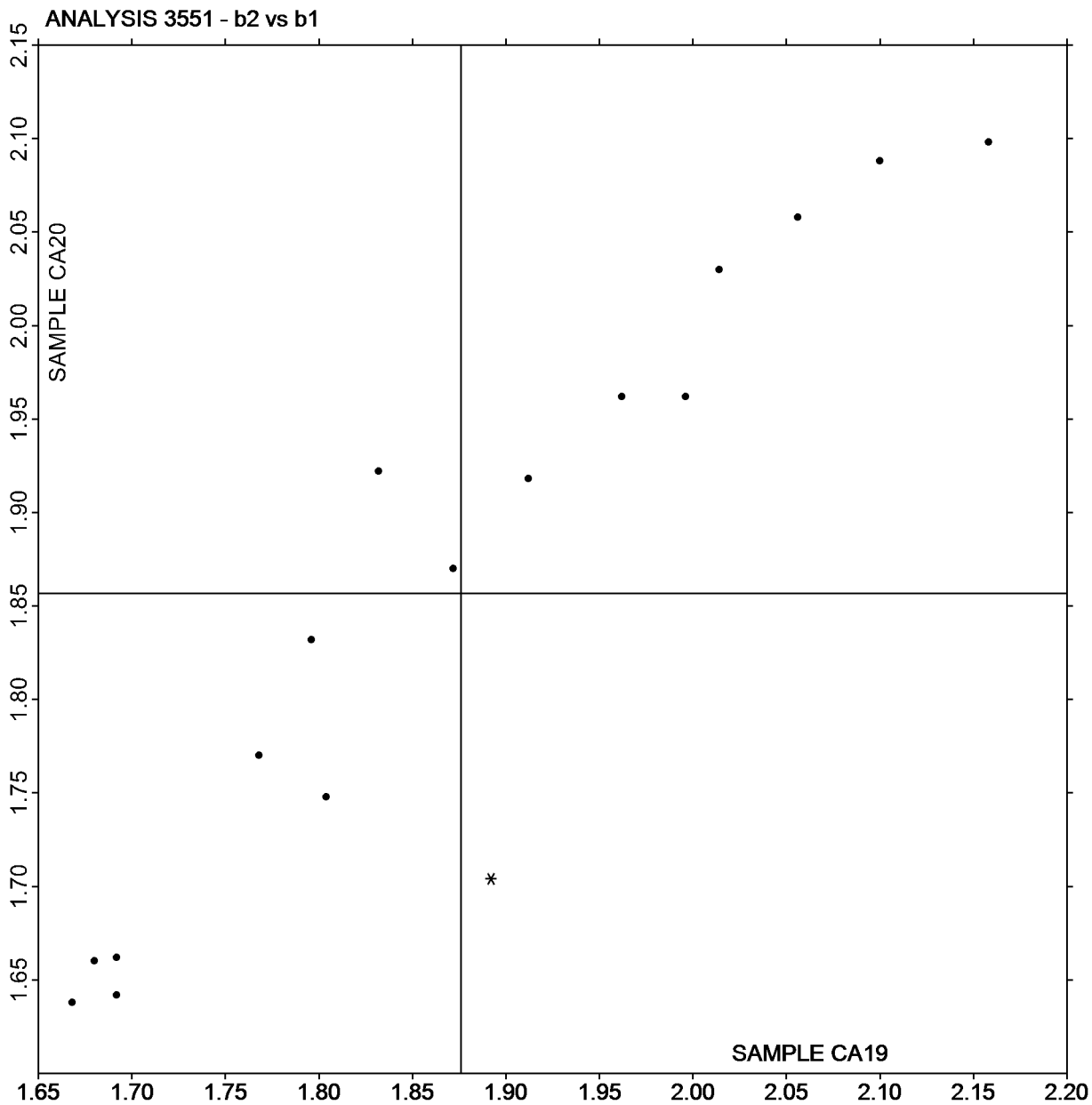
If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3551
Color & Color Difference - Near White Papers - D65/10deg obs
Hunter L,a,b - Illuminant D65 - 10 Degree Observer

Report #4252,
August 2023

Plot of b values CA20 vs b values CA19



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3553
Specular Gloss at 75 Degrees - High Range
TAPPI Official Test Method T480

Report #4252,
August 2023

WebCode	Data Flag	Sample GH19			Sample GH20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
6UZ3UL		73.26	0.19	0.12	70.13	-0.41	-0.23	LF
8ZFK3D		72.40	-0.67	-0.44	70.23	-0.31	-0.18	PT
C6CXR		72.28	-0.79	-0.51	70.48	-0.06	-0.03	LA
HPNDX7		71.94	-1.13	-0.73	69.66	-0.88	-0.50	TP
HZY74R		73.65	0.58	0.38	69.54	-1.00	-0.56	GM
JLJ672		72.69	-0.38	-0.25	68.92	-1.62	-0.91	TH
JLW2AK		73.30	0.23	0.15	72.49	1.94	1.10	PP
JQCAXK		73.54	0.47	0.30	71.67	1.13	0.64	VM
M2FTP3		75.95	2.88	1.87	72.67	2.13	1.20	LF
MWLYR2		73.68	0.61	0.39	70.73	0.19	0.11	PP
T42NRW		71.36	-1.71	-1.11	71.09	0.55	0.31	GA
XAFVHQ		72.17	-0.90	-0.58	70.29	-0.25	-0.14	GM
XNZBLP		76.14	3.07	1.99	73.39	2.85	1.61	LW
ZKQ8NJ		70.64	-2.43	-1.58	66.29	-4.25	-2.40	LG

Summary Statistics	Sample GH19	Sample GH20
Grand Means	73.07 Gloss Units	70.54 Gloss Units
Stnd Dev Btwn Labs	1.54 Gloss Units	1.77 Gloss Units
Statistics based on 14 of 14 reporting participants.		

Key to Instrument Codes Reported by Participants

GA BYK-Gardner (model not specified)	GM BYK-Gardner micro-gloss
LA L & W Gloss - Autoline 300	LF L & W Autoline 400
LG L & W Autoline 600	LW L & W Gloss Tester
PP Technidyne Profile/Plus	PT PTA Line Gloss Meter
TH Technidyne T480A	TP Technidyne Profile Plus
VM Valmet PaperLab (was Kajaani/Robotest)	



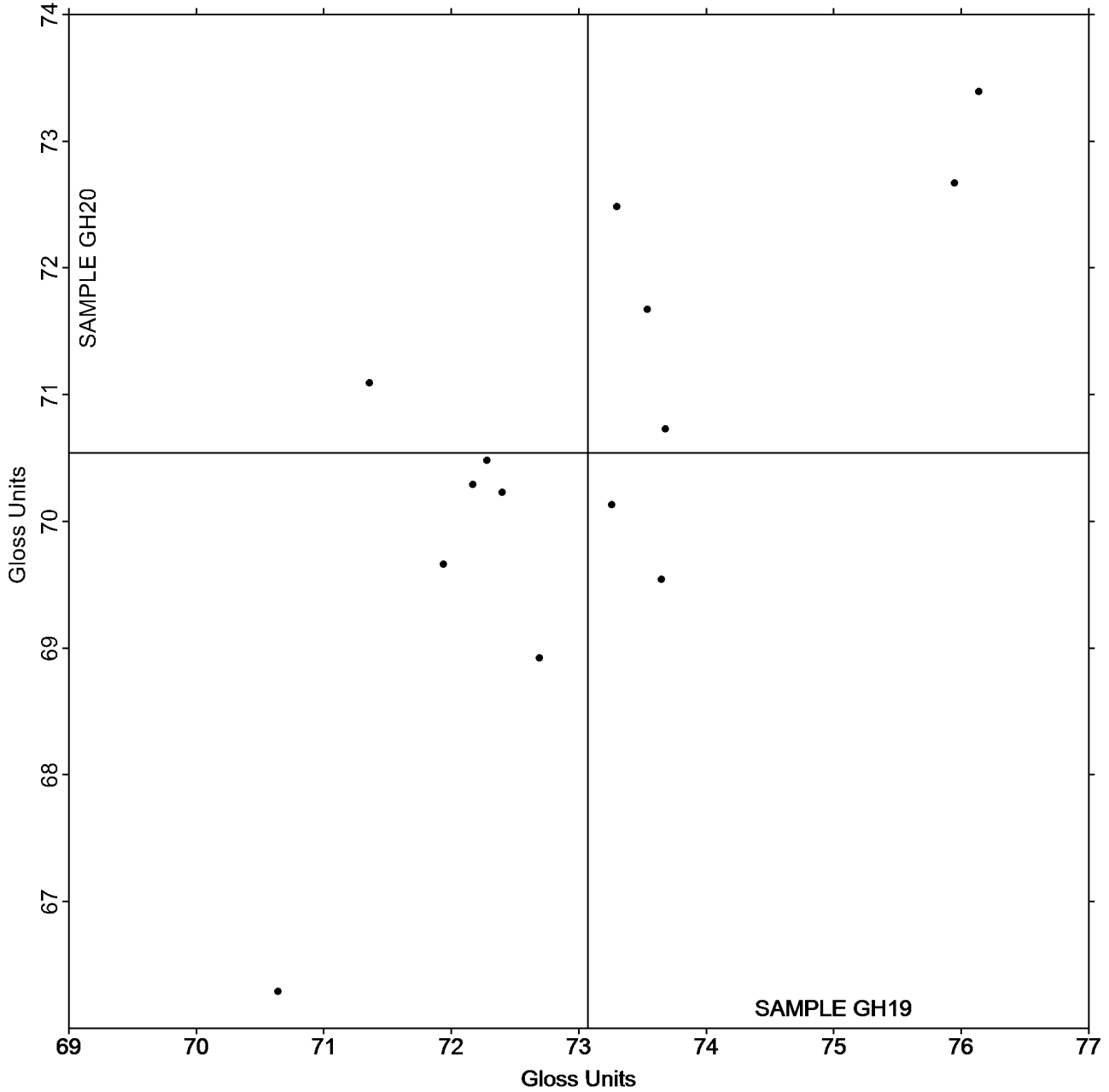
Paper & Paperboard Interlaboratory Testing Program
Analysis 3553
Specular Gloss at 75 Degrees - High Range
TAPPI Official Test Method T480

Report #4252,
August 2023

Grand Mean Sample GH19 = 73.071
Gloss Units

Grand Mean Sample GH20 = 70.541
Gloss Units

ANALYSIS 3553



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3555
Specular Gloss at 75 Degrees - Low Range
TAPPI Official Test Method T480

Report #4252,
August 2023

WebCode	Data Flag	Sample GL19			Sample GL20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3JPQNR		49.42	1.87	1.28	31.22	1.81	1.87	PP
7N8KTE		46.23	-1.32	-0.90	30.60	1.19	1.23	TP
8TFZ33		47.30	-0.25	-0.17	29.30	-0.11	-0.12	GM
AP9PWD		44.37	-3.18	-2.17	28.14	-1.27	-1.32	WJ
E68ZU8		48.35	0.80	0.55	29.54	0.13	0.13	TH
NCTDL4		48.00	0.45	0.31	28.79	-0.62	-0.64	TG
THL7MK		48.17	0.62	0.42	28.59	-0.82	-0.85	GS
TYCBQ9		48.23	0.68	0.46	29.14	-0.27	-0.28	TH
XNZBLP		47.87	0.32	0.22	29.39	-0.02	-0.02	LW

Summary Statistics	Sample GL19	Sample GL20
Grand Means	47.55 Gloss Units	29.41 Gloss Units
Std Dev Btwn Labs	1.47 Gloss Units	0.97 Gloss Units
Statistics based on 9 of 9 reporting participants.		

Key to Instrument Codes Reported by Participants

GM BYK-Gardner micro-gloss	GS BYK-Gardner Glossgard II
LW L & W Gloss Tester	PP Technidyne Profile/Plus
TG Technidyne T480	TH Technidyne T480A
TP Technidyne Profile Plus	WJ Zehntner ZLR 1020



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

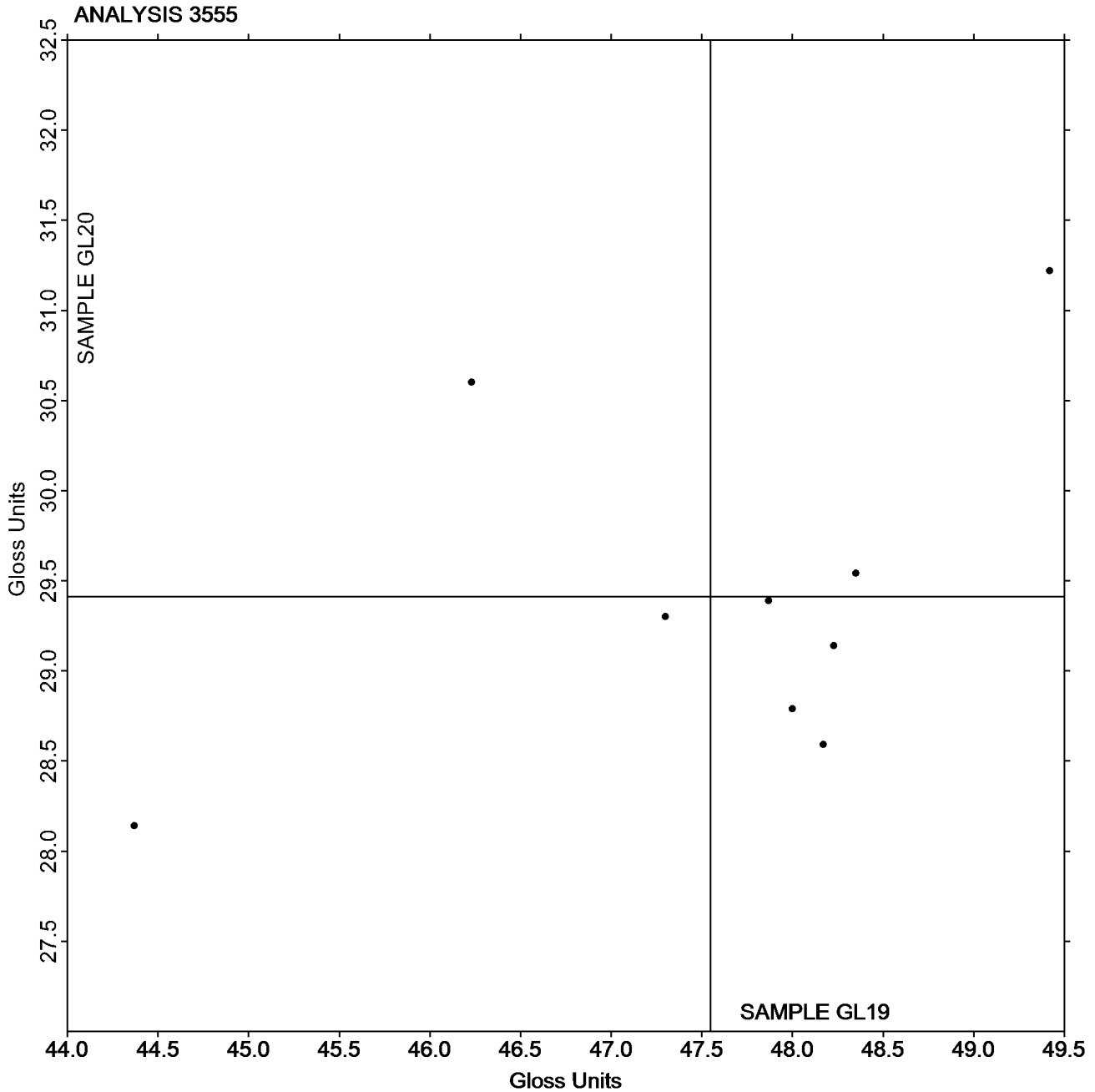
Analysis 3555

Specular Gloss at 75 Degrees - Low Range

TAPPI Official Test Method T480

Grand Mean Sample GL19 = 47.549
Gloss Units

Grand Mean Sample GL20 = 29.412
Gloss Units



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3601

Folding Endurance (MIT) - Double Folds

TAPPI Official Test Method T511

WebCode	Data Flag	Sample MT19			Sample MT20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
AEMKMT		43.00	-1.06	-0.09	50.90	4.04	0.47	MT
BCGEMD		41.20	-2.86	-0.23	49.70	2.84	0.33	XX
BKRG9D		49.30	5.24	0.42	43.60	-3.26	-0.38	MT
CZ2RCQ		58.50	14.44	1.17	58.60	11.74	1.36	XX
E68ZU8		33.70	-10.36	-0.84	39.70	-7.16	-0.83	MT
JQCAXK		27.80	-16.26	-1.31	30.90	-15.96	-1.85	MT
T42NRW		29.90	-14.16	-1.14	41.40	-5.46	-0.63	MT
TRX6GW		63.40	19.34	1.56	53.50	6.64	0.77	MT
TYCBQ9		49.70	5.64	0.46	53.40	6.54	0.76	MT

Summary Statistics

Sample MT19

Sample MT20

Grand Means

44.06 Double Folds

46.86 Double Folds

Stnd Dev Btwn Labs

12.37 Double Folds

8.63 Double Folds

Statistics based on 9 of 9 reporting participants.

Key to Instrument Codes Reported by Participants

MT MIT - Tinius Olsen

XX Instrument make/model not specified by lab



Paper & Paperboard Interlaboratory Testing Program

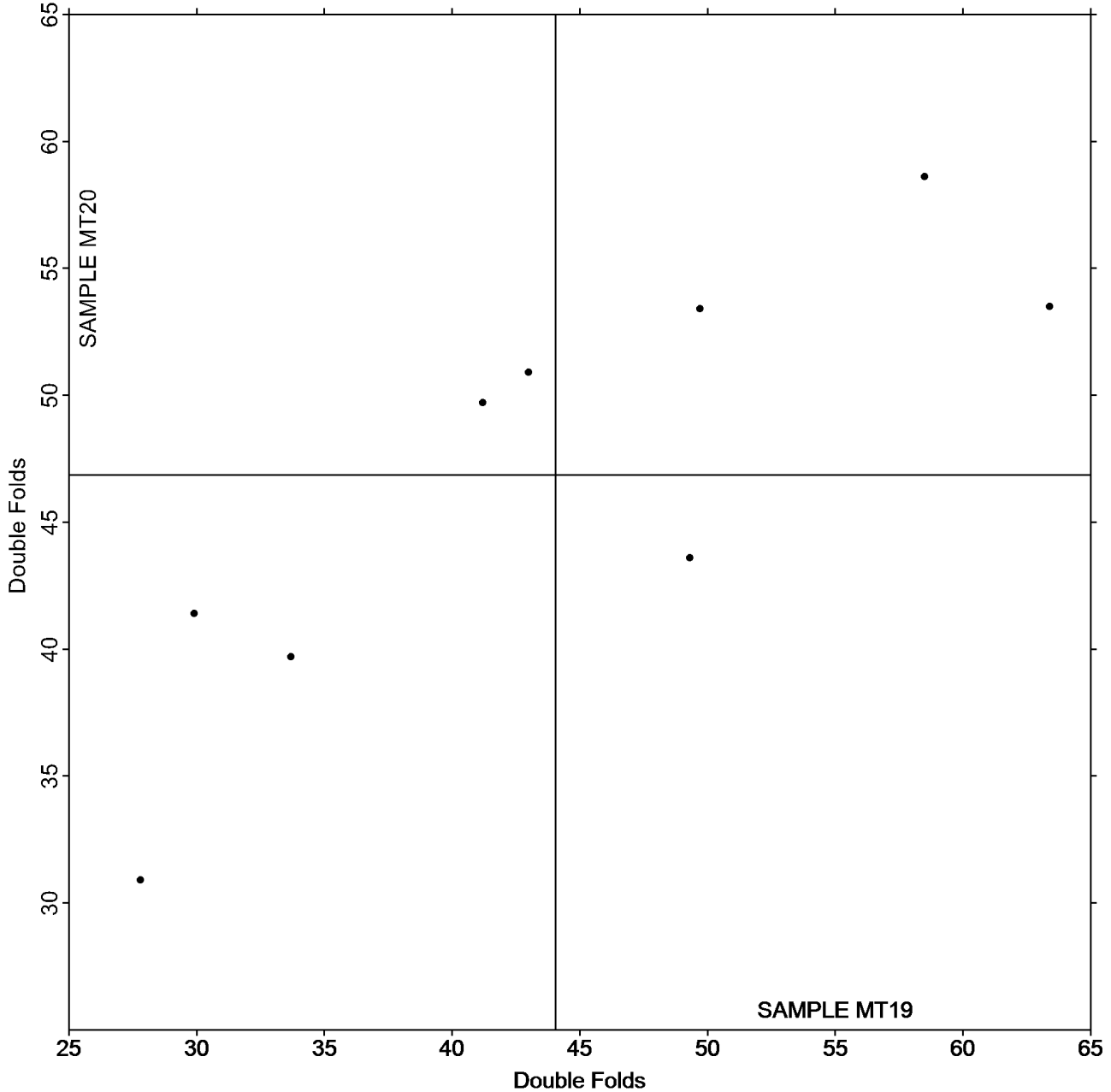
Report #4252,
August 2023

Analysis 3601 Folding Endurance (MIT) - Double Folds TAPPI Official Test Method T511

Grand Mean Sample MT19 = 44.056
Double Folds

Grand Mean Sample MT20 = 46.856
Double Folds

ANALYSIS 3601



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3603
Bending Resistance, Gurley Type
TAPPI Official Test Method T543

Report #4252,
August 2023

WebCode	Data Flag	<u>Sample BG19</u>			<u>Sample BG20</u>			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3TWNAA		139.9	-5.1	-0.44	142.1	-5.9	-0.52	ZZ
AEMKMT		139.1	-5.8	-0.50	157.4	9.4	0.83	ZZ
BKRG9D		133.2	-11.8	-1.02	144.1	-3.9	-0.34	ZZ
BW8BLR		147.0	2.0	0.18	148.6	0.7	0.06	ZZ
DALHBN		175.6	30.6	2.66	170.7	22.7	2.01	ZZ
E68ZU8		135.9	-9.1	-0.79	133.0	-14.9	-1.32	ZZ
F6GN84		155.0	10.0	0.87	154.7	6.8	0.60	ZZ
LYYA68		141.6	-3.3	-0.29	141.4	-6.5	-0.58	ZZ
TDRAW9		147.6	2.6	0.23	146.5	-1.5	-0.13	ZZ
TYCBQ9		146.5	1.6	0.14	160.8	12.9	1.14	ZZ
VG6TT9		143.9	-1.1	-0.10	144.3	-3.6	-0.32	ZZ
VGKTDX		134.2	-10.8	-0.93	131.8	-16.2	-1.43	ZZ

Summary Statistics	<u>Sample BG19</u>	<u>Sample BG20</u>
Grand Means	144.95 Gurley Units	147.94 Gurley Units
Std Dev Btwn Labs	11.52 Gurley Units	11.32 Gurley Units
Statistics based on 12 of 12 reporting participants.		

Analysis Notes:

TYCBQ9 - One determination removed from the Lab Mean of Sample BG20 per Grubb's Test at 1% risk (TAPPI 1205).

Key to Instrument Codes Reported by Participants

ZZ Instruments No Longer Tracked



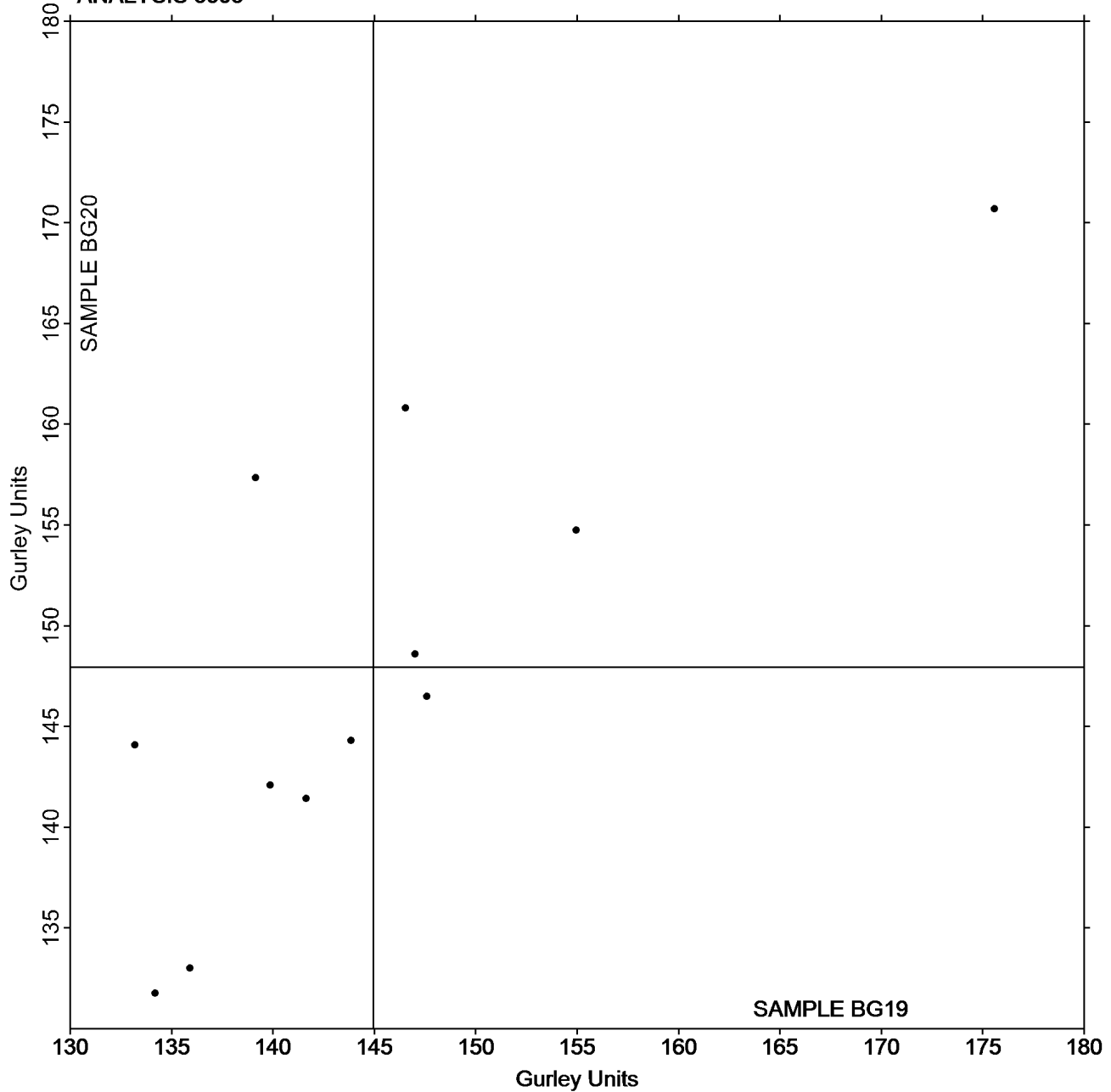
Paper & Paperboard Interlaboratory Testing Program
Analysis 3603
Bending Resistance, Gurley Type
TAPPI Official Test Method T543

Report #4252,
August 2023

Grand Mean Sample BG19 = 144.95
Gurley Units

Grand Mean Sample BG20 = 147.94
Gurley Units

ANALYSIS 3603



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3611
Coefficient of Static Friction - Horizontal Plane Method - Printing Papers
TAPPI Official Test Method T549

Report #4252,
August 2023

WebCode	Data Flag	Sample CF19			Sample CF20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
228PVB		0.5240	-0.0792	-1.00	0.5300	-0.0792	-1.08	XX
7N8KTE		0.7038	0.1006	1.27	0.6664	0.0572	0.78	TA
AEMKMT		0.5978	-0.0054	-0.07	0.6428	0.0336	0.46	TM
BKRG9D		0.6840	0.0808	1.02	0.7000	0.0908	1.24	XX
CVMAUA		0.5550	-0.0482	-0.61	0.5560	-0.0532	-0.73	XX
DALHBN		0.5720	-0.0312	-0.39	0.5800	-0.0292	-0.40	TA
LU2MEQ		0.5980	-0.0052	-0.07	0.5880	-0.0212	-0.29	TP
LYYA68		0.4636	-0.1396	-1.77	0.4896	-0.1196	-1.63	TA
MEQ4ED		0.6334	0.0302	0.38	0.6266	0.0174	0.24	TA
XF3HDV		0.7002	0.0970	1.23	0.7128	0.1036	1.41	TN

Summary Statistics	Sample CF19	Sample CF20
Grand Means	0.60 COF	0.61 COF
Std Dev Btwn Labs	0.08 COF	0.07 COF

Statistics based on 10 of 10 reporting participants.

Key to Instrument Codes Reported by Participants

TA	Thwing-Albert Friction Tester	TM	TMI 32-06 Monitor/Slip and Friction
TN	TMI 32-07 Monitor/Slip and Friction	TP	TMI 32-25 COF Tester (Inclined Plane)
XX	Instrument make/model not specified by lab		

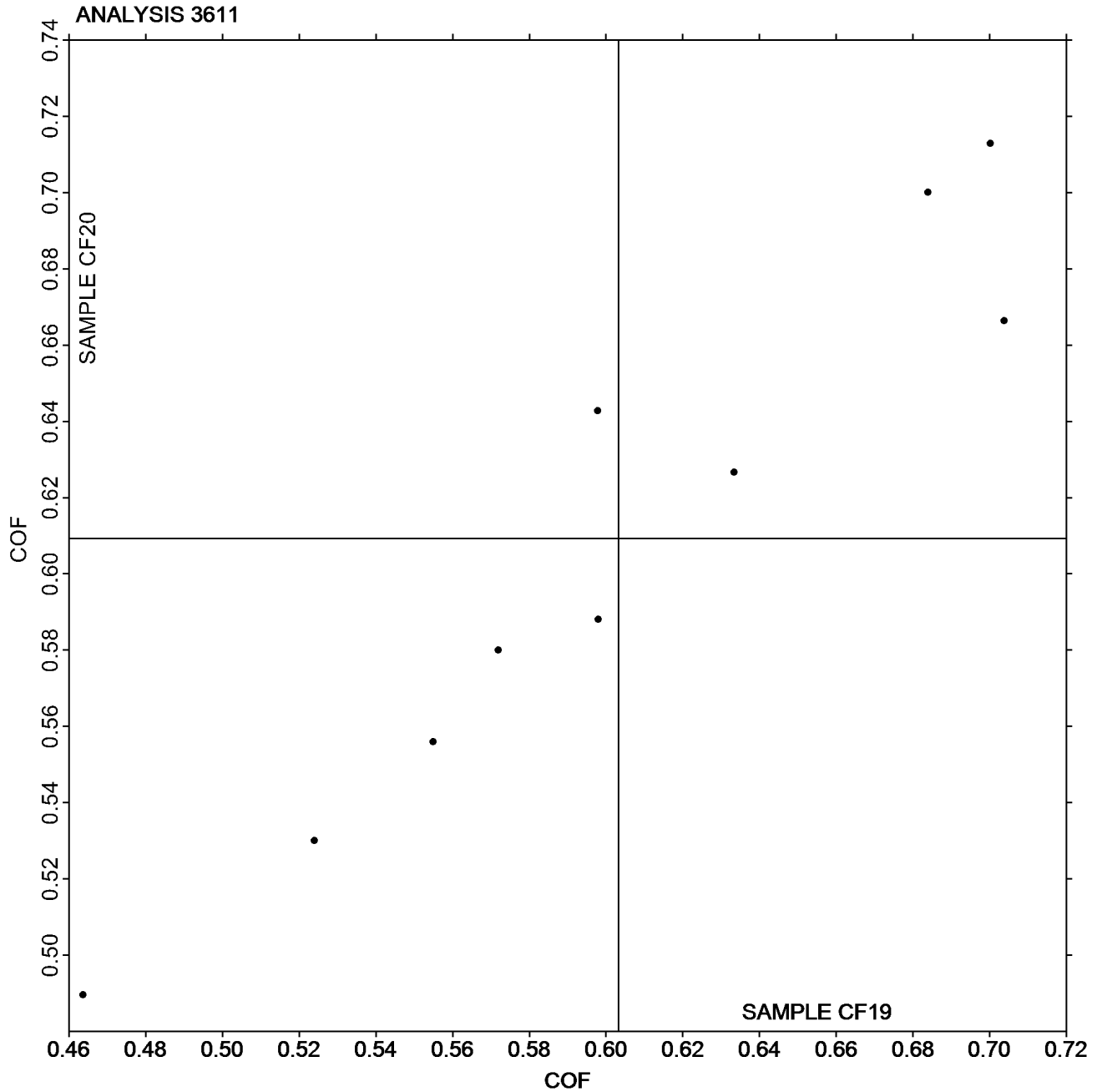


Paper & Paperboard Interlaboratory Testing Program
Analysis 3611
Coefficient of Static Friction - Horizontal Plane Method - Printing Papers
TAPPI Official Test Method T549

Report #4252,
August 2023

Grand Mean Sample CF19 = 0.60318
COF

Grand Mean Sample CF20 =
0.60922 COF



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3612
Coefficient of Kinetic Friction - Horizontal Plane Method - Printing Papers
TAPPI Official Test Method T549

Report #4252,
August 2023

WebCode	Data Flag	Sample CF19			Sample CF20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
228PVB		0.4840	-0.0502	-0.98	0.5180	-0.0257	-0.71	XX
7N8KTE		0.5516	0.0174	0.34	0.5252	-0.0185	-0.51	TA
AEMKMT		0.5786	0.0444	0.87	0.5962	0.0525	1.45	TM
BKRG9D		0.5628	0.0286	0.56	0.5726	0.0289	0.80	XX
CVMAUA		0.5772	0.0430	0.84	0.5596	0.0159	0.44	XX
DALHBN		0.5220	-0.0122	-0.24	0.5120	-0.0317	-0.88	TA
LYYA68		0.4250	-0.1092	-2.14	0.4824	-0.0613	-1.70	TA
MEQ4ED		0.5694	0.0352	0.69	0.5600	0.0163	0.45	TA
XF3HDV		0.5368	0.0027	0.05	0.5675	0.0238	0.66	TN

Summary Statistics	Sample CF19	Sample CF20
Grand Means	0.53 COF	0.54 COF
Stnd Dev Btwn Labs	0.05 COF	0.04 COF
Statistics based on 9 of 9 reporting participants.		

Key to Instrument Codes Reported by Participants

TA	Thwing-Albert Friction Tester	TM	TMI 32-06 Monitor/Slip and Friction
TN	TMI 32-07 Monitor/Slip and Friction	XX	Instrument make/model not specified by lab

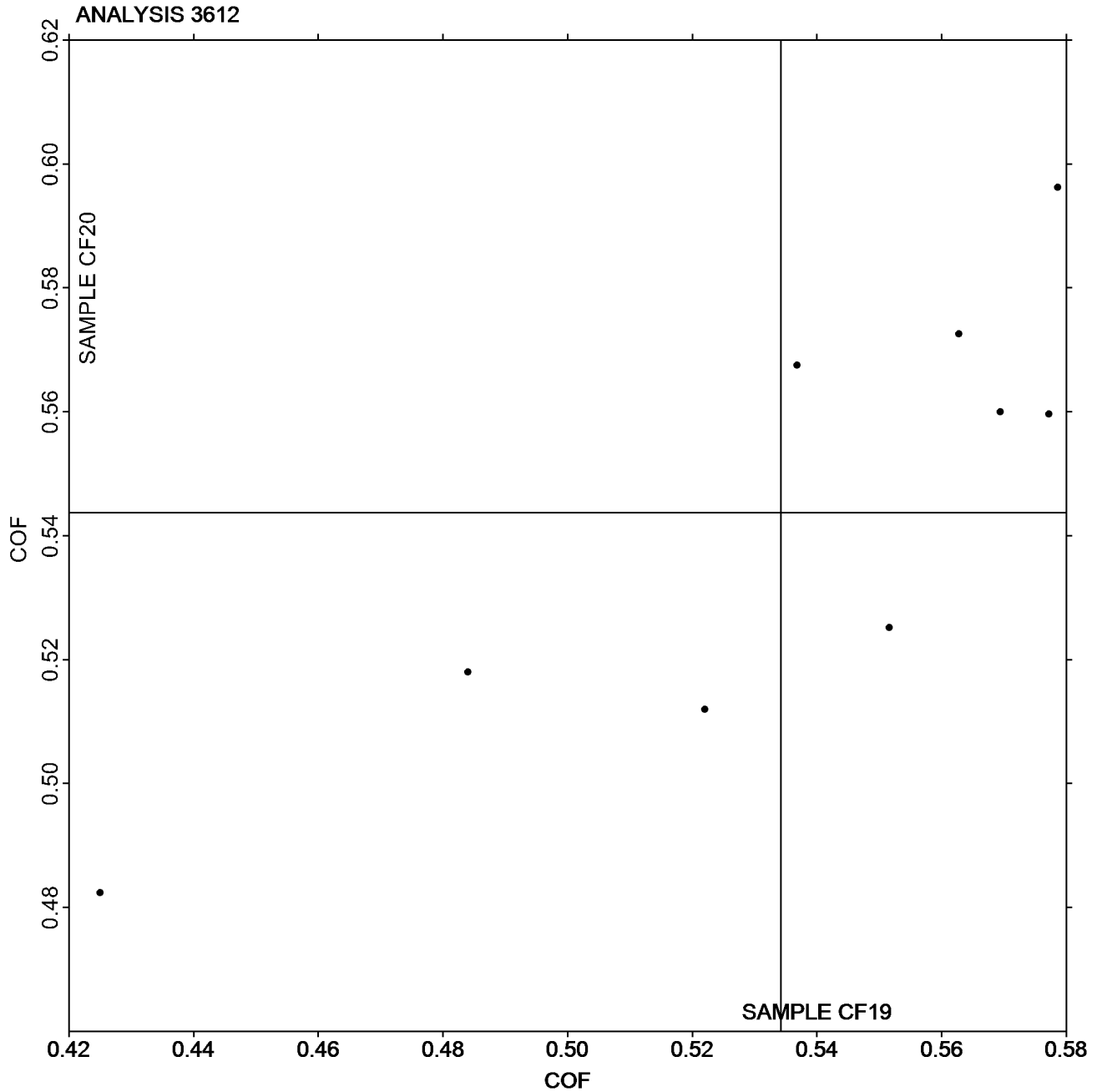


Paper & Paperboard Interlaboratory Testing Program
Analysis 3612
Coefficient of Kinetic Friction - Horizontal Plane Method - Printing Papers
TAPPI Official Test Method T549

Report #4252,
August 2023

Grand Mean Sample CF19 = 0.53416
COF

Grand Mean Sample CF20 =
0.54372 COF



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3613
Moisture in Paper
TAPPI Official Test Method T412

Report #4252,
August 2023

WebCode	Data Flag	Sample MC19			Sample MC20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
3TWNAA		4.084	-0.360	-0.44	4.159	-0.313	-0.36	ZZ
686L6K		4.190	-0.254	-0.31	3.930	-0.542	-0.63	ZZ
6PKU7L		4.431	-0.013	-0.02	4.504	0.032	0.04	ZZ
7EZN8W		4.209	-0.235	-0.29	4.094	-0.378	-0.44	ZZ
829DXW		3.960	-0.484	-0.60	4.900	0.428	0.49	ZZ
AP9PWD		4.223	-0.222	-0.27	4.000	-0.472	-0.55	ZZ
DALHBN		4.560	0.115	0.14	4.515	0.043	0.05	ZZ
EZC9NV	M	3.894	-0.550	-0.68	No data reported for this sample			ZZ
FX6DEC		4.658	0.214	0.26	4.510	0.038	0.04	ZZ
G8N4EA		3.398	-1.046	-1.29	3.598	-0.874	-1.01	ZZ
NCTDL4		6.774	2.330	2.87	6.999	2.527	2.92	ZZ
R2HCFL		4.700	0.256	0.31	4.380	-0.092	-0.11	ZZ
ZLH3CD		4.144	-0.300	-0.37	4.078	-0.394	-0.46	ZZ

Summary Statistics	Sample MC19	Sample MC20
Grand Means	4.44 Percent	4.47 Percent
Std Dev Btwn Labs	0.81 Percent	0.87 Percent
Statistics based on 12 of 13 reporting participants.		

Comments on Assigned Data Flags for Test #3613

EZC9NV (M) - Participant did not submit data for sample MC20.

Key to Instrument Codes Reported by Participants

ZZ Instruments No Longer Tracked



Paper & Paperboard Interlaboratory Testing Program

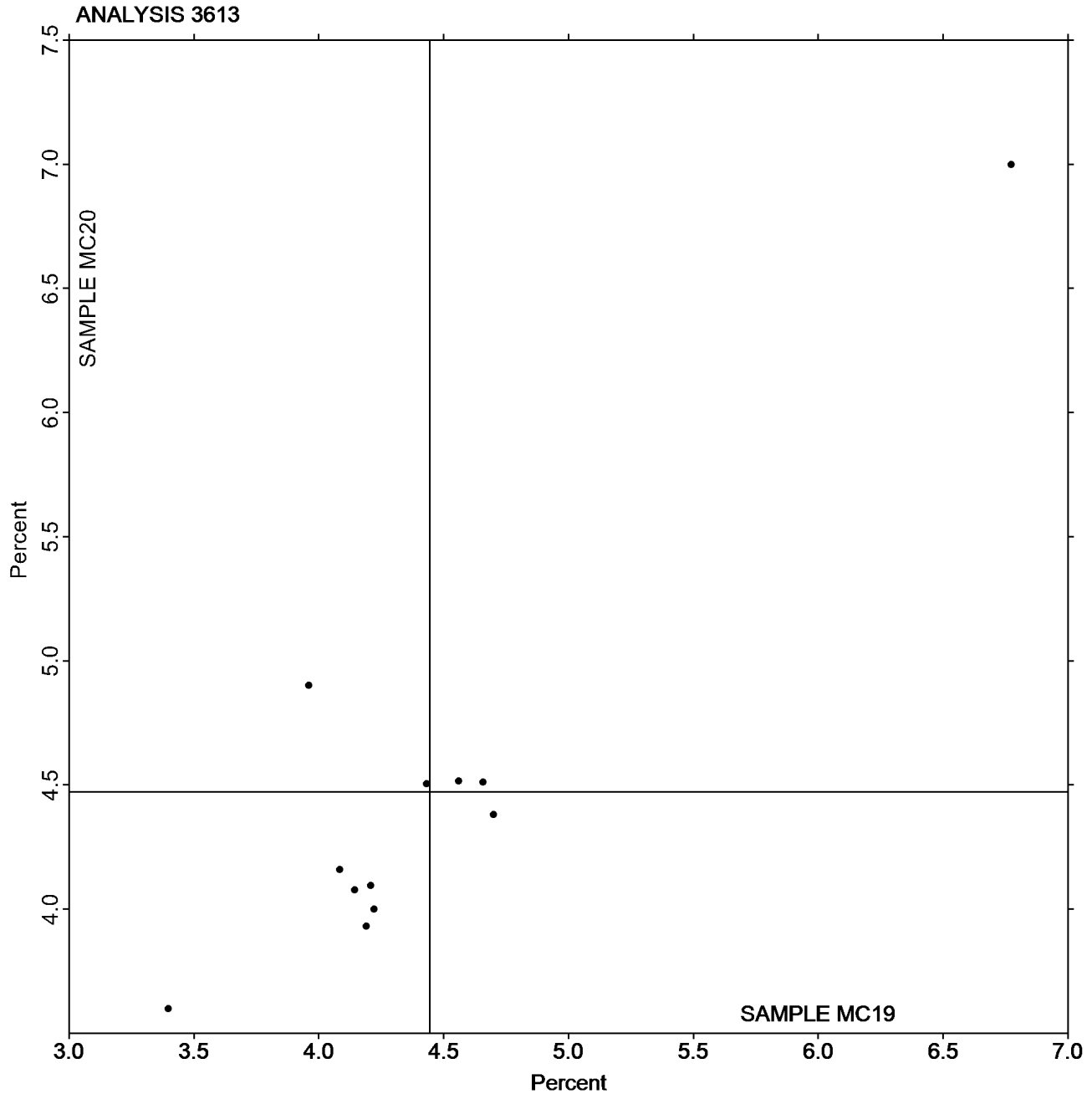
Report #4252,
August 2023

Analysis 3613 Moisture in Paper

TAPPI Official Test Method T412

Grand Mean Sample MC19 = 4.4442
Percent

Grand Mean Sample MC20 = 4.4723
Percent



If fewer than 20 laboratories are included in an analysis, a control ellipse will not be drawn on the two-sample plot.



Paper & Paperboard Interlaboratory Testing Program
Analysis 3615
Sizing Test (Hercules Type)
TAPPI Official Test Method T530

Report #4252,
August 2023

WebCode	Data Flag	Sample HS19			Sample HS20			Instr Code
		Lab Mean	Diff from Grand Mean	CPV	Lab Mean	Diff from Grand Mean	CPV	
228PVB		79.39	6.11	0.20	74.60	3.54	0.12	XX
3GXUYX		24.62	-48.66	-1.58	23.88	-47.18	-1.55	XX
4P8JDW		67.73	-5.55	-0.18	73.85	2.79	0.09	HE
6UZ3UL		97.41	24.13	0.79	98.37	27.31	0.90	HE
7N8KTE		92.12	18.84	0.61	92.31	21.25	0.70	HE
7UTBFA		65.01	-8.27	-0.27	48.83	-22.23	-0.73	HE
8TFZ33		112.70	39.42	1.28	113.20	42.14	1.39	HE
8ZFK3D	*	152.20	78.92	2.57	140.30	69.24	2.28	HE
AVX2X2		59.15	-14.13	-0.46	47.49	-23.57	-0.78	XX
B3CAWH		42.03	-31.25	-1.02	50.48	-20.58	-0.68	HE
BW8BLR		71.60	-1.68	-0.05	70.60	-0.46	-0.02	HE
CVMAUA		86.51	13.23	0.43	84.83	13.77	0.45	XX
DALHBN		85.47	12.19	0.40	77.81	6.75	0.22	HE
HEHVZ9		56.51	-16.77	-0.55	50.51	-20.55	-0.68	HE
JQCAXK		21.30	-51.98	-1.69	21.32	-49.74	-1.64	HE
LU2MEQ		67.40	-5.88	-0.19	78.10	7.04	0.23	HE
LYYA68		95.85	22.57	0.73	98.12	27.06	0.89	HE
MEQ4ED		16.00	-57.28	-1.86	15.17	-55.89	-1.84	HE
PNHWDE		54.03	-19.25	-0.63	52.77	-18.29	-0.60	HE
QCNUJ		89.90	16.62	0.54	97.30	26.24	0.86	HE
TDRAW9		107.19	33.91	1.10	94.24	23.18	0.76	XX
VG6TT9		91.89	18.61	0.61	89.96	18.90	0.62	HE
WY3BKP		63.60	-9.68	-0.32	66.40	-4.66	-0.15	HE
XF3HDV		86.20	12.92	0.42	84.30	13.24	0.44	HE
Z6XCDE		46.27	-27.01	-0.88	31.77	-39.29	-1.29	HE

Summary Statistics

Sample HS19

Sample HS20

Grand Means

73.28 Seconds

71.06 Seconds

Std Dev Btw Labs

30.73 Seconds

30.40 Seconds

Statistics based on 25 of 25 reporting participants.

Key to Instrument Codes Reported by Participants

HE Hercules Sizing Tester

XX Instrument make/model not specified by lab



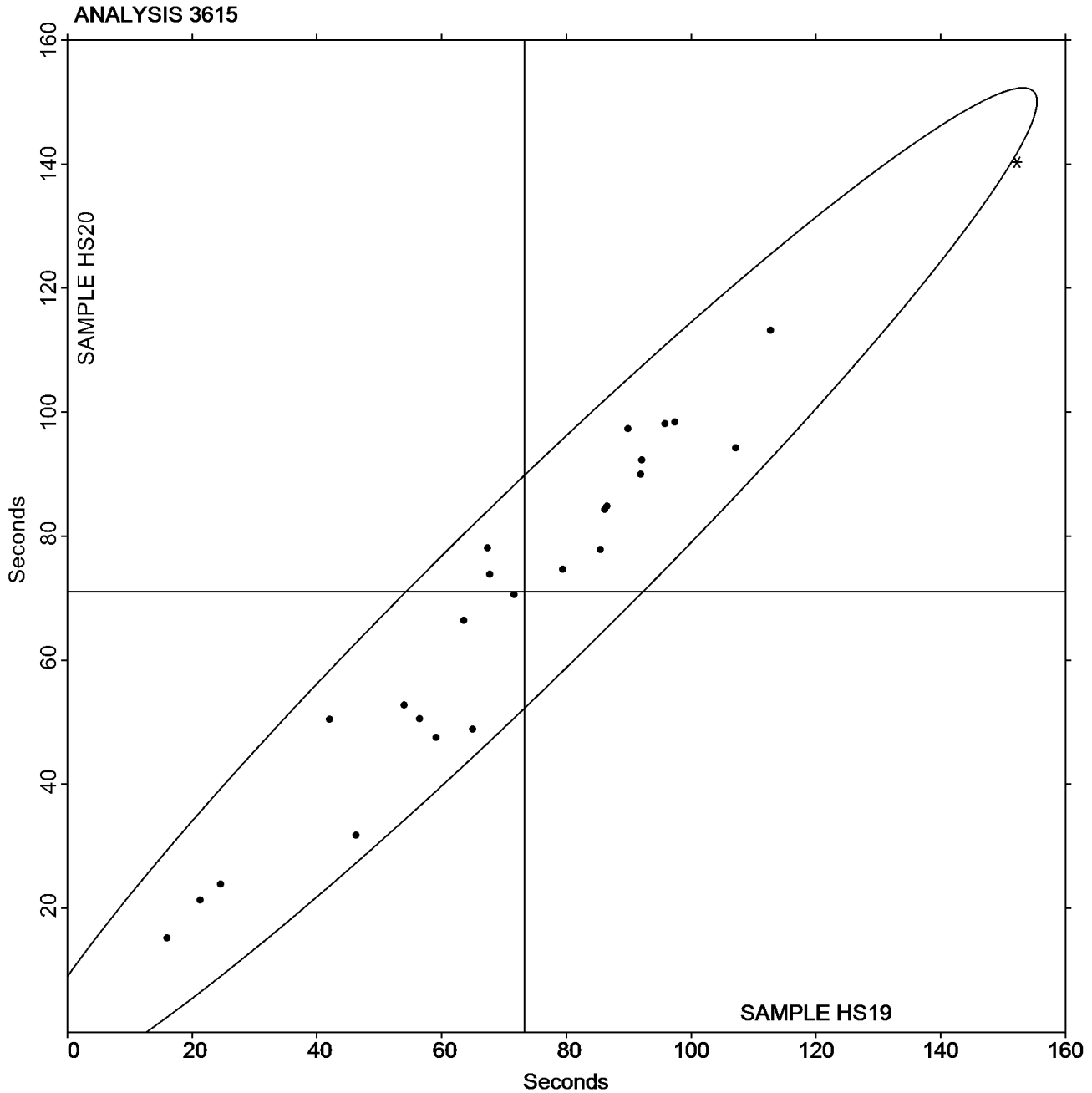
Paper & Paperboard Interlaboratory Testing Program

Report #4252,
August 2023

Analysis 3615 Sizing Test (Hercules Type) TAPPI Official Test Method T530

Grand Mean Sample HS19 = 73.283
Seconds

Grand Mean Sample HS20 = 71.060
Seconds



-End of Report-