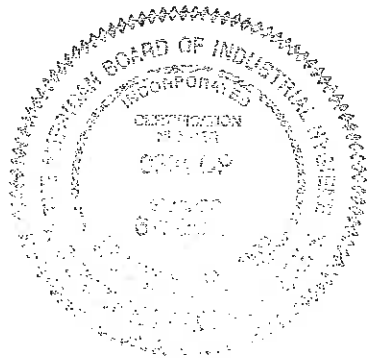
AIR MONITORING

DURING THE APPLICATION OF FIRST CONTACT

ON OPTICAL MIRRORS

AT THE LIGO LIVINGSTON OBSERVATORY

IN LIVINGSTON, LOUISIANA



June 2, 2010

TES Job#: SAF1019-10180

Chris T. Robertson
Certified Industrial Hygienist
Certification #: 9304 CP

BY:

TECHNICAL
ENVIRONMENTAL
SERVICES, INC.

PHONE: 504-348-3098 P.O. BOX 1601 MARRERO, LA 70073 FAX: 504-348-3043

AIR MONITORING
DURING THE APPLICATION OF FIRST CONTACT ON OPTICAL MIRRORS AT THE LIGO LIVINGSTON OBSERVATORY IN LIVINGSTON, LOUISIANA

PURPOSE AND SCOPE SURVEY:

Technical Environmental Services, Inc. (TES) was contracted by LIGO Livingston Observatory (LIGO) to evaluate airborne concentrations of various chemical constituents during the application of a chemical called First Contact. The purpose was to determine employee exposure so that future engineering controls, work practices and personal protection equipment could be administered to protect the employees. All sampling on June 2, 2010 and evaluation of the sample results were completed by Chris Robertson, CIH, CSP.

SITE BACKGROUND INFORMATION:

LIGO operates a research facility in Livingston, LA. The research calls for the use of 13 inch by 13 inch highly polished optical mirrors. To protect the mirrors, LIGO uses a chemical called First Contact - See the MSDS in **Attachment C**. First contact consists of six distinct hydrocarbons with various concentrations within the formula. The mirrors are housed in a clean room. First Contact is applied using a paint brush, and each application takes approximately four minutes with each coat taking twenty minutes to dry. See **Attachment B** for more information on the application procedure. One employee will be applying the First Contact, and other employees may be in the general area.
During this study the applicator wore a full face respirator with an organic vapor, acid gas, and particulate cartridge, viton gloves, lab coat, hair smock, and shoe covers. The application of the chemical was performed in a 16' x 16' x 16' curtained room. This study involved room sampling both under positive pressure, with 2.5 air changes per minute, and with the positive pressure system turned off. The applicator remained in the room while the chemical was drying.

SURVEY METHODOLOGY:

3M 3520 passive diffusion monitors were used to collect ethyl alcohol, acetone, and ethyl acetate vapors. Small charcoal tubes in line with SKC sampling pumps were use to collect formal glycol, bis(methoxy)methane, and ethyl lactate. The samples were analyzed at Galson Laboratory, an AIHA certified lab, using the following methods:

- *Modified OSHA 7 for formal glycol, bis(methoxy)methane, and ethyl lactate;*

- *NIOSH 1400 for ethyl alcohol;*
- *NIOSH 1300 for acetone; and,*
- *NIOSH 1457 for ethyl acetate.*

See **Attachment A** for laboratory results.

The breathing zone of the applicator was monitored with both the positive air flow on and the positive air flow off. An area sample was taken outside the containment approximately five feet from the containment, in the breathing zone area, while the positive pressure system was tuned on. The outside area sample was only taken during the worst case scenario, which was with the positive pressure system on. The temperature and humidity were constant at 68°F and 70%, respectively.

SURVEY RESULTS:

The results of the study revealed very low concentrations of the First Contact chemicals. No overexposures were identified. The results are summarized in **Table I.** The laboratory results can be found in **Attachment A.**

TABLE I:
Lab Result and Chemical Exposure Limits

Location/ Person	Agent	Lab Result (ppm)	8-hr ACGIH TLV (ppm)	8-hr OSHA PEL (ppm)	15-min OSHA STEL (ppm)	Target Organ
Applicator w/positive air flow	Formal Glycol	<0.13	20	NA	NA	Hematologic
	Bis(methoxy) methane	<0.24	1000	1000	NA	Eye irr, CNS
	Ethyl Alcohol	4.4	NA	1000	1000	URT irr
	Acetone	7.3	500	1000	750	URT & eye irr, CNS, hematologic
	Ethyl Lactate	<0.075	NA	NA	NA	NA
	Ethyl Acetate	<0.7	400	400	NA	URT & eye irr

TABLE I - CONT.:
Lab Result and Chemical Exposure Limits

Location/ Person	Agent	Lab Result (ppm)	8-hr ACGIH TLV (ppm)	8-hr OSHA PEL (ppm)	15-min OSHA STEL (ppm)	Target Organ
Area w/positive air flow	Formal Glycol	0.64	20	NA	NA	Hematologic
	Bis(methoxy) methane	<0.095	1000	1000	NA	Eye irr, CNS
	Ethyl Alcohol	<0.8	NA	1000	1000	URT irr
	Acetone	1.6	500	1000	750	URT & eye irr, CNS, hematologic
	Ethyl Lactate	<0.037	NA	NA	NA	NA
	Ethyl Acetate	<0.5	400	400	NA	URT & eye irr
Applicator w/o positive air flow	Formal Glycol	<0.16	20	NA	NA	Hematologic
	Bis(methoxy) methane	<0.23	1000	1000	NA	Eye irr, CNS
	Ethyl Alcohol	10	NA	1000	1000	URT irr
	Acetone	15	500	1000	750	URT & eye irr, CNS, hematologic
	Ethyl Lactate	<0.065	NA	NA	NA	NA
	Ethyl Acetate	<0.7	400	400	NA	URT & eye irr

ADDITIVE MIXTURE FORMULA:

The ACGIH suggests that when two or more hazardous substances have a similar toxicological effect on the same target organ, their combined effect, rather that of either individually, should be given primary consideration. This process is known as the Additive Mixture Formula. Based on the very low analytical results, as compared to the respective occupational exposure limits, the additive formula was not applied.

CONCLUSION:

This limited study revealed very low concentrations of the First Contact chemical agents identified on the MSDS. According to the laboratory results, the ambient concentration of the First Contact chemicals is less within the curtained room with the positive pressure system activated. The outside area concentration was also well below the respective occupational exposure limits. Therefore, respirator protection is not needed if the conditions during the study remain the same and the following recommendations are in place.

RECOMMEDATIONS:

1. According to the First Contact MSDS, there are two glove types recommended - Viton, and Butyl Rubber. One of these two gloves, should be used during activities that may result in dermal contact with the First Contact chemical. It is not recommended that the client use the Latex class 100 gloves unless permeation studies have be completed that show adequate breakthrough times.

2. All containers with liquid chemicals should be covered when not in use. This will help to reduce fugitive emissions from the liquids.

3. The applicator should apply the chemical, and then exit the curtain area while waiting the required twenty minutes for the chemical to dry between coats. This will help to reduce any exposure.

4. The First Contact chemical should be applied under a laboratory hood or within a positive pressure clean room with a minimum of 2.5 air changes per minute.

ATTACHMENTS:

A: LABORATORY ANALYSIS RESULTS
B: FIRST CONTACT APPLICATION PROCEDURE
C: FIRST CONTACT MSDS

ATTACHMENT A:

LABORATORY ANALYSIS RESULTS

GALSON
LABORATORIES

Mr. Chris Robertson
Technical Environmental Services, Inc.
5133 Taravella Road
Marrero, LA 70072

June 15, 2010

DOH ELAP# 11626 Account# 13258 Login# L215814

Dear Mr. Robertson:

Enclosed are the analytical results for the samples received by our laboratory on June 03, 2010. All test results meet the quality control requirements of AIHA and NELAC unless otherwise stated in this report. All samples on the chain of custody were received in good condition unless otherwise noted.

The samples submitted for 1,3-Dioxolane, Dimethoxymethane and Ethyl Lactate were subcontracted to Bureau Veritas/Clayton Group Services, Inc. Their report is enclosed in its entirety.

Results in this report are based on the sampling data provided by the client and refer only to the samples as they were received at the laboratory. Unless otherwise requested, all samples will be discarded 14 days from the date of this report.

Please contact John Bailey at (877) 482-5227, if you would like any additional information regarding this report.

Thank you for using Galson Laboratories.

Sincerely,

Galson Laboratories

Mary G. Unangst

Mary G. Unangst
Laboratory Director

Enclosure(s)

GALSON LABORATORIES

6601 Kirkville Road
East Syracuse, NY 13057
(315) 432-5227
FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Technical Environmental Services, Inc.
Site : LIGO
Project No. : SAF 1019-10180

Date Sampled : 02-JUN-10
Date Received : 03-JUN-10
Date Analyzed : 04-JUN-10 - 05-JUN-10
Report ID : 649856

Account No.: 13258
Login No. : L215814

Client ID : P01 **Lab ID : L215814-13** **Time : 60 Minutes**
Date Sampled : 06/02/10 **Date Analyzed : 06/04/10**

Parameter	LOQ ug	Front ug	Back ug	Total ug	Conc mg/m3	ppm
Acetone	10.	38	<10	42	17	7.3
Ethyl Acetate	5	<5	<5	<5	<3	<0.7
Ethyl Alcohol	5	18	<5	22	8.2	4.4

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media : M3M-3520

Submitted by: JWT
Approved by : KLD
Date : 09-JUN-10 NYS DOH # : 11626
QC by: Tom Burgess

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	ppm -Parts per Million	LOQ-Limit of Quantitation

Field sampling was not performed by Galson. Galson presents results based on sampling data provided by clients.

GALSON LABORATORIES

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FAX: (315) 437-0571
www.galsonlabs.com

LABORATORY ANALYSIS REPORT

Client : Technical Environmental Services, Inc.
Site : LIGO
Project No. : SAF 1019-10180

Date Sampled : 02-JUN-10
Date Received : 03-JUN-10
Date Analyzed : 04-JUN-10 - 05-JUN-10
Report ID : 649856

Account No.: 13258
Login No. : L215814

Client ID : A01 **Lab ID : L215814-14** **Time : 89 Minutes**
Date Sampled : 06/02/10 **Date Analyzed : 06/04/10**

Parameter	LOQ ug	Front ug	Back ug	Total ug	Conc mg/m3	ppm
Acetone	10.	12	<10	14	3.9	1.6
Ethyl Acetate	5	<5	<5	<5	<2	<0.5
Ethyl Alcohol	5	<5	<5	<6	<2	<0.8

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media : M3M-3520

Submitted by: JWT
Approved by : KLD
Date : 09-JUN-10 NYS DOH # : 11626
QC by: Tom Burgess

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	ppm -Parts per Million	LOQ-Limit of Quantitation

Field sampling was not performed by Galson. Galson presents results based on sampling data provided by clients.

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LABORATORY ANALYSIS REPORT

Client : Technical Environmental Services, Inc.
Site : LIGO
Project No. : SAF 1019-10180

Date Sampled : 02-JUN-10
Date Received : 03-JUN-10
Date Analyzed : 04-JUN-10 - 05-JUN-10
Report ID : 649856

Account No.: 13258
Login No. : L215814

Client ID : P02 **Lab ID : L215814-15** **Time : 60 Minutes**
Date Sampled : 06/02/10 **Date Analyzed : 06/05/10**

Parameter	LOQ ug	Front ug	Back ug	Total ug	Conc mg/m3	ppm
Acetone	10.	76	<10	85	35	15
Ethyl Acetate	5	<5	<5	<5	<3	<0.7
Ethyl Alcohol	5	42	<5	50	19	10

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media : M3M-3520

Submitted by: JWT
Approved by : KLD
Date : 09-JUN-10 NYS DOH # : 11626
QC by: Tom Burgess

< -Less Than mg -Milligrams m3 -Cubic Meters kg -Kilograms
> -Greater Than ug -Micrograms l -Liters NS -Not Specified
NA -Not Applicable ND -Not Detected ppm -Parts per Million LOQ-Limit of Quantitation

Field sampling was not performed by Galson. Galson presents results based on sampling data provided by clients.

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LABORATORY ANALYSIS REPORT

Client : Technical Environmental Services, Inc.
Site : LIGO
Project No. : SAF 1019-10180

Date Sampled : 02-JUN-10
Date Received : 03-JUN-10
Date Analyzed : 04-JUN-10 - 05-JUN-10
Report ID : 649856

Account No.: 13258
Login No. : L215814

Client ID : LAB BLANK **Lab ID : L215814-16** **Time : NA**
Date Sampled : **Date Analyzed : 06/05/10**

Parameter	LOQ ug	Front ug	Back ug	Total ug	Conc mg/m3	ppm
Acetone	10.	<10	<10	<11	NA	NA
Ethyl Acetate	5	<5	<5	<5	NA	NA
Ethyl Alcohol	5	<5	<5	<6	NA	NA

COMMENTS: Please see attached lab footnote report for any applicable footnotes.

Collection Media : M3M-3520

Submitted by: JWT
Approved by : KLD
Date : 09-JUN-10 NYS DOH # : 11626
QC by: Tom Burgess

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	ppm -Parts per Million	LOQ-Limit of Quantitation

Field sampling was not performed by Galson. Galson presents results based on sampling data provided by clients.

GALSON LABORATORIES

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FAX: (315) 437-0571
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LABORATORY FOOTNOTE REPORT

Client Name : Technical Environmental Services, Inc.
Site : LIGO
Project No. : SAF 1019-10180

Date Sampled : 02-JUN-10 Account No.: 13258
Date Received: 03-JUN-10 Login No. : L215814
Date Analyzed: 04-JUN-10 - 05-JUN-10

Unless otherwise noted below, all quality control results associated with the samples were within established control limits.

Unrounded results are carried through the calculations that yield the final result and the final result is rounded to the number of significant figures appropriate to the accuracy of the analytical method. Please note that results appearing in the columns preceeding the final result column may have been rounded in order to fit the report format and therefore, if carried through the calculations, may not yield an identical final result to the one reported.

The stated LOQs for each analyte represent the demonstrated LOQ concentrations prior to correction for desorption efficiency (if applicable).

L215814 (Report ID: 649856):
Acetone - Total ug corrected for a desorption efficiency of 90%.
Ethyl Acetate - Total ug corrected for a desorption efficiency of 95%.
Ethyl Alcohol - Total ug corrected for a desorption efficiency of 84%.
SOPs: GC-SOP-12(2), GC-SOP-16(4), GC-SOP-9(3)

Parameter	Method	PEL
Acetone	mod. NIOSH 1300; GC/FID BADGE	1000 ppm
Ethyl Acetate	mod. NIOSH 1457; GC/FID BADGE	400 ppm
Ethyl Alcohol	mod. NIOSH 1400; GC/FID BADGE	1000 ppm

< -Less Than	mg -Milligrams	m3 -Cubic Meters	kg -Kilograms
> -Greater Than	ug -Micrograms	l -Liters	NS -Not Specified
NA -Not Applicable	ND -Not Detected	ppm -Parts per Million	

June 14, 2010

Shelly Krause
GALSON LABORATORIES
6601 Kirkville Road
East Syracuse, NY 13057-

Bureau Veritas Work Order No. 10060296

Reference: L215814

Dear Shelly Krause:

Bureau Veritas North America, Inc. received 4 samples on 6/4/2010 for the analyses presented in the following report.

Enclosed is a copy of the Chain-of-Custody record, acknowledging receipt of these samples. Please note that any unused portion of the samples will be discarded 30 days after the date of this report, unless you have requested otherwise.

This material is confidential and is intended solely for the person to whom it is addressed. If this is received in error, please contact the number provided below.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact a Client Services Representative at (800) 806-5887.

Sincerely,

Wendy Lesniak
Client Services Representative

cc:

CASE NARRATIVE

Date: *14-Jun-10*

Client:	**GALSON LABORATORIES**
Project:	**L215814**
Work Order No	**10060296**

The results of this report relate only to the samples listed in the body of this report.

Unless otherwise noted below, the following statements apply: 1) all samples were received in acceptable condition, 2) all quality control results associated with this sample set were within acceptable limits and/or do not adversely affect the reported results, and 3) the industrial hygiene results have not been blank corrected.

Please note that there are not enough data points to provide statistical limits.

ANALYTICAL RESULTS

Date: *14-Jun-10*

Client: GALSON LABORATORIES

Project: L215814 **Work Order No:** 10060296

Sample Identification: P 62550

Lab Number: 001A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** 7.5

Analyte	Analytical Results (µg)	Analytical Results (mg/m^3)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
1,3-Dioxolane	<3	<0.40	<0.13	3	OSHA 7	06/06/2010

Sample Identification: A 62549

Lab Number: 002A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** 18

Analyte	Analytical Results (µg)	Analytical Results (mg/m^3)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
1,3-Dioxolane	35	1.9	0.64	3	OSHA 7	06/06/2010

Sample Identification: N 62555

Lab Number: 003A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** 6.2

Analyte	Analytical Results (µg)	Analytical Results (mg/m^3)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
1,3-Dioxolane	<3	<0.48	<0.16	3	OSHA 7	06/06/2010

ANALYTICAL RESULTS

Date: *14-Jun-10*

Client: GALSON LABORATORIES

Project: L215814 **Work Order No:** 10060296

Sample Identification: B 62556 BLANK

Lab Number: 004A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** NA

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
1,3-Dioxolane	<3	--	--	3	OSHA 7	06/06/2010

General Notes:
<: Less than the indicated reporting limit (RL).
--: Information not available or not applicable.
Back sections (if applicable) were checked and showed no significant breakthrough unless otherwise noted.

100602796

Clayton

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To : **Shelly Krause**
Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227

Invoice To : **Pamela Weaver**
Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227
Fax No. 315-437-0571

Site Name : **Project :** L215814 **Sampled By :** Client

Need Results By:	(surcharge)
☑ 10 Business Days	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same day	200%

Verbal Authorization :
Purchase Order No. : 13258
Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please
Email Results To : **skrause@galsonlabs.com**

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
✓ P 62550	6/2/2010	226-01	7.5	1,3-Dioxolane	OSHA 7	PPM
✓ A 62549	6/2/2010	226-01	18.0	1,3-Dioxolane	OSHA 7	PPM
✓ N 62555	6/2/2010	226-01	6.2	1,3-Dioxolane	OSHA 7	PPM
✓ B 62556	6/2/2010	226-01	BLANK	1,3-Dioxolane	OSHA 7	PPM

☑ **IF YOU DO NOT WANT A LABORATORY BLANK ADDED PLEASE CHECK BOX. If blanks are not submitted or box is not checked, our policy states that a laboratory blank will be added for each analyte and it will be charged at normal rate.**

Comments:
Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3. Need results by **06/18/10**. Rush charges are not authorized.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	A. Costello	A. Costello	06/03/10 1101
Received by LAB .			

June 11, 2010

Shelly Krause
GALSON LABORATORIES
6601 Kirkville Road
East Syracuse, NY 13057-

Bureau Veritas Work Order No. 10060294

Reference: L215814

Dear Shelly Krause:

Bureau Veritas North America, Inc. received 4 samples on 6/4/2010 for the analyses presented in the following report.

Enclosed is a copy of the Chain-of-Custody record, acknowledging receipt of these samples. Please note that any unused portion of the samples will be discarded 30 days after the date of this report, unless you have requested otherwise.

This material is confidential and is intended solely for the person to whom it is addressed. If this is received in error, please contact the number provided below.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact a Client Services Representative at (800) 806-5887.

Sincerely,

Wendy Lesniak
Client Services Representative

cc:

CASE NARRATIVE

Date: *11-Jun-10*

Client: GALSON LABORATORIES

Project: L215814

Work Order No 10060294

The results of this report relate only to the samples listed in the body of this report.

Unless otherwise noted below, the following statements apply: 1) all samples were received in acceptable condition, 2) all quality control results associated with this sample set were within acceptable limits and/or do not adversely affect the reported results, and 3) the industrial hygiene results have not been blank corrected.

We do not have enough QC data to provide details at this time.

ANALYTICAL RESULTS

Date: *11-Jun-10*

Client: GALSON LABORATORIES

Project: L215814 **Work Order No:** 10060294

Sample Identification: P 62553

Lab Number: 001A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** 6.8

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Dimethoxymethane	<5	<0.74	<0.24	5	OSHA 7	06/11/2010

Sample Identification: A 60366

Lab Number: 002A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** 16.9

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Dimethoxymethane	<5	<0.30	<0.095	5	OSHA 7	06/11/2010

Sample Identification: N 62552

Lab Number: 003A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** 6.9

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Dimethoxymethane	<5	<0.72	<0.23	5	OSHA 7	06/11/2010

ANALYTICAL RESULTS

Date: *11-Jun-10*

Client: GALSON LABORATORIES

Project: L215814 **Work Order No:** 10060294

Sample Identification: B 62551

Lab Number: 004A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst CCR **Air Volume (L):** NA

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Dimethoxymethane	<5	--	--	5	OSHA 7	06/11/2010

General Notes:
<: Less than the indicated reporting limit (RL).
--: Information not available or not applicable.
Back sections (if applicable) were checked and showed no significant breakthrough unless otherwise noted.

100600294

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Fax: 315-437-0571
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Clayton

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To : Shelly Krause
Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227

Invoice To : Pamela Weaver
Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227
Fax No. 315-437-0571

Site Name : Project : L215814 Sampled By : Client

Need Results By:	(surcharge)
☑ 5 Business Days	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same day	200%

Verbal Authorization :
Purchase Order No. : 13258
Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please
Email Results To : skrause@galsonlabs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
✓ P 62553	6/2/2010	226-01	6.8	Methylal	OSHA 07	PPM
✓ A 60366	6/2/2010	226-01	16.9	Methylal	OSHA 07	↓
✓ N 62552	6/2/2010	226-01	6.9	Methylal	OSHA 07	↓
✓ B 62551	6/2/2010	226-01	BLANK	Methylal	OSHA 07	↓ RC

☑ **IF YOU DO NOT WANT A LABORATORY BLANK ADDED PLEASE CHECK BOX. If blanks are not submitted or box is not checked, our policy states that a laboratory blank will be added for each analyte and it will be charged at normal rate.**

Comments:

Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3. Need results by **06/11/10**. Rush charges are not authorized.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	A. Costello	A. Costello	06/03/10 1646
Received by LAB :	E. Coffman	E. Coffman	6/4/10 10:40AM

June 10, 2010

Shelly Krause
GALSON LABORATORIES
6601 Kirkville Road
East Syracuse, NY 13057-

Bureau Veritas Work Order No. 10060298

Reference: L215814

Dear Shelly Krause:

Bureau Veritas North America, Inc. received 4 samples on 6/4/2010 for the analyses presented in the following report.

Enclosed is a copy of the Chain-of-Custody record, acknowledging receipt of these samples. Please note that any unused portion of the samples will be discarded 30 days after the date of this report, unless you have requested otherwise.

This material is confidential and is intended solely for the person to whom it is addressed. If this is received in error, please contact the number provided below.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact a Client Services Representative at (800) 806-5887.

Sincerely,

Wendy Lesniak
Client Services Representative

cc:

CASE NARRATIVE

Date: *10-Jun-10*

Client: GALSON LABORATORIES

Project: L215814

Work Order No 10060298

The results of this report relate only to the samples listed in the body of this report.

Unless otherwise noted below, the following statements apply: 1) all samples were received in acceptable condition, 2) all quality control results associated with this sample set were within acceptable limits and/or do not adversely affect the reported results, and 3) the industrial hygiene results have not been blank corrected.

Below is the statistical precision and accuracy information for ethyl lactate by OSHA 7:

Number of samples =34
Recovery % = 87.40
Relative Standard Deviation % =7.48

ANALYTICAL RESULTS

Date: *10-Jun-10*

Client: GALSON LABORATORIES

Project: L215814 **Work Order No:** 10060298

Sample Identification: P 62547

Lab Number: 001A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst SAS **Air Volume (L):** 8.25

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Ethyl Lactate	<3	<0.36	<0.075	3	OSHA 7	06/10/2010

Sample Identification: A 60357

Lab Number: 002A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst SAS **Air Volume (L):** 16.9

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Ethyl Lactate	<3	<0.18	<0.037	3	OSHA 7	06/10/2010

Sample Identification: N 62548

Lab Number: 003A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst SAS **Air Volume (L):** 9.6

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Ethyl Lactate	<3	<0.31	<0.065	3	OSHA 7	06/10/2010

ANALYTICAL RESULTS

Date: *10-Jun-10*

Client: GALSON LABORATORIES

Project: L215814 **Work Order No:** 10060298

Sample Identification: B 62554 BLANK

Lab Number: 004A **Date Sampled:** 6/2/2010

Sample Type Charcoal Tube **Date Received:** 6/4/2010

Analyst SAS **Air Volume (L):** NA

Analyte	Analytical Results (µg)	Analytical Results (mg/m³)	Analytical Results (ppm)	Reporting Limit (µg)	Test Method	Date Analyzed
Ethyl Lactate	<3	--	--	3	OSHA 7	06/10/2010

General Notes:
<: Less than the indicated reporting limit (RL).
--: Information not available or not applicable.
Back sections (if applicable) were checked and showed no significant breakthrough unless otherwise noted.

GALSON LABORATORIES
6601 Kirkville Rd
East Syracuse, NY 13057-9672
Tel: 315-437-5227
888-432-LABS(5227)
Fax: 315-437-0571
www.galsonlabs.com

Clayton

Check if change of address ☐
New Client ? yes ☐ no ☐

Report To : Shelly Krause
Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227

Invoice To : Pamela Weaver
Galson Laboratory
6601 Kirkville Road
East Syracuse, NY 13057
Phone No. : 888-432-5227
Fax No. 315-437-0571

Site Name : Project : L215814 Sampled By : Client

Need Results By:	(surcharge)
☑ 5 Business Days	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same day	200%

Verbal Authorization :
Purchase Order No. : 13258
Credit Card No. : Card Holder Name : Exp. :

Fax Results To : Email Only Please Fax No. : Email Only Please
Email Results To : skrause@galsonlabs.com

Sample Identification	Date Sampled	Collection Medium	*Air Volume (liters)/ Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
✓ P 62547	6/2/2010	226-01	8.25	Ethyl Lactate	OSHA 7	PPM
✓ A 60357	6/2/2010	226-01	16.9	Ethyl Lactate	OSHA 7	PPM
✓ N 62548	6/2/2010	226-01	9.6	Ethyl Lactate	OSHA 7	PPM
✓ B 62554	6/2/2010	226-01	BLANK	Ethyl Lactate	OSHA 7	PPM

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Comments:

Please provide an uncertainty statement in accordance with AIHA LQAP policy document Section 2A.5.4.3. Need results by **06/11/10**. Rush charges are not authorized.

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	A. Costello	A. Costello	6/03/10 1101
Received by LAB :	E. Coffman	E. Coffman	6/4/10 10:44

GALSON LABORATORIES

6601 Kirkville Rd
East Syracuse, NY 13057
Tel: (315) 432-5227
888-432-LABS (5227)
Fax: (315) 437-0571
www.galsonlabs.com

☐ Check if change of address

New Client ? ☐ yes ☒ no

Report To : Chris Robertson
Technical Environmental Services
5133 Taravella Rd
Marrero, LA 70072
Phone No. : (504) 348-3098
Fax No. : (504) 348-3043

Invoice To : SAME

Phone No. :
Fax No. :

Site Name : LIGO

Project : SAF 1019-10180

Sampled By : C. Robertson

Need Results By:	(surcharge)
☐ 5 Business Days	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same day	200%

☒ Samples submitted using the FreePumpLoan™ Program.

☐ Samples submitted using the FreeSamplingBadges™ Program.

Client Account No. :

Purchase Order No. : SAF 1019-10180

Credit Card No. : Card Holder Name : Exp. :

Email / Fax Results To : croberts on @ tesconsult.com

Email Address : Fax No. :

Sample Identification	Date Sampled	Collection Medium	*Air Volume (Liters)	Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
1. P 62550	6/2/10	226-01 small charcoal	7.5		1,3 Dioxolane (646-06-0)	OSHA 7	ppm
2. P 62553		small charcoal	6.8		Methoxy Methane (109-87-5)		
3. P 62541		small charcoal	8.25		Ethyl Lactate (97-64-3)		
4. P 62549		small charcoal	18.0		1,3 Dioxolane		
5. P 60366		small charcoal	16.9		Methoxy Methane		
6. P 60357		small charcoal	16.9		Ethyl Lactate		
7. P01		3M 3520		60 min	Ethanol, Acetone, Ethyl Acetate	NIOSH 1400 (Ethanol)	
8. A01		3M 3520		89 min	Ethanol, Acetone, Ethyl Acetate	NIOSH 1300 (Acetone)	
9.						NIOSH 1457 (EA)	
10.							
11.							

Page 22 of 23

Report Reference: 1 Generated: 15-JUN-10 17:20

☐ Yes ☐ No We normally add a laboratory blank for each analyte. We will charge you for this at our normal rate. If you agree please check "Yes" otherwise check "No".

List description of industry or process / interference's present in sampling area:

Comments: I used the last 5 digits of the tube lot # for my sample ID - see tube

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	[illegible]	Chris Robertson	6/2/10 3:30 pm
Received by LAB :	[illegible]	[illegible]	6/3/10 1017

Samples received after 3pm will be considered as next day's business. * sample collection time X LPM = Air Vol.

LAB ORIGINAL

GALSON LABORATORIES

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East Syracuse, NY 13057
Tel: (315) 432-5227
888-432-LABS (5227)
Fax: (315) 437-0571
www.galsonlabs.com

☐ Check if change of address

New Client ? ☐ yes ☒ no

Report To : Chris Robertson
Technical Environmental Services
5133 Tarvella Rd
Marrero, LA 70072
Phone No. : (504) 348-3098
Fax No. : (504) 348-3043

Invoice To : SAME (57)
Phone No. :
Fax No. :

Site Name : LIGO Project : SAF 1019-10180 Sampled By : C. Robertson

Need Results By:	(surcharge)
☐ 5 Business Days	0%
☐ 4 Business Days	35%
☐ 3 Business Days	50%
☐ 2 Business Days	75%
☐ Next Day by 6pm	100%
☐ Next Day by Noon	150%
☐ Same day	200%

☒ Samples submitted using the FreePumpLoan™ Program. ☐ Samples submitted using the FreeSamplingBadges™ Program.

Client Account No. :
Purchase Order No. : SAF 1019-10180
Credit Card No. : Card Holder Name : Exp. :

Email / Fax Results To : Crobertson@tesconsult.com
Email Address : Fax No. :

Sample Identification	Date Sampled	Collection Medium	*Air Volume (Liters)	Passive Monitors (Min)	Analysis Requested	Method Reference	Specific DL Needed
1. 62555	6/2/10	small charcoal 226-01	6.2		1,3 Dioxolane	OSHA 7	ppm
2. 62552		small charcoal	6.9		Methoxy Methane		
3. 62548		small charcoal	9.6		Ethyl Lactate		
4. P02		3M 3520		60 Min	Ethanol, Acetone, Ethyl Acetate	NIOSH 1400 (Ethanol)	
5. 62556		small charcoal	NA		1,3 Dioxolane OSHA 7	NIOSH 1300 (Acetone)	
6. 62551		small charcoal	NA		Methoxy Methane OSHA 7	NIOSH 1457 (EA)	
7. 62554		small charcoal	NA		Ethyl Lactate OSHA 7		
8.							
9.							
10.							
11.							

Report Reference: 1 General 553 JUN-10 17:20

Page 23 of 23

☐ Yes ☐ No **We normally add a laboratory blank for each analyte. We will charge you for this at our normal rate. If you agree please check "Yes" otherwise check "No".**

List description of industry or process / interference's present in sampling area:

Comments: I used the last 5 digits of the lot # for my sample ID - see tube

Chain of Custody	Print Name	Signature	Date/Time
Relinquished by :	Chris Robertson		6/2/10 @ 3:30
Received by LAB :	[illegible]		6/3/10 1017

Samples received after 3pm will be considered as next day's business. * sample collection time X LPM = Air Vol.

LAB ORIGINAL

ATTACHMENT B:

FIRST CONTACT APPLICATION PROCEDURE

First Contact Application and Removal Procedure

AUTHOR: Phelps, M.	DATE:04/04/10	Document Change Notice, Release or Approval
		see LIGO DCC record Status

1 Objective

This document explains the procedure that was developed for applying and removing First Contact(FC) to vertical Advanced LIGO optics in situ. This procedure works equally well for applying First Contact to horizontal optics.

2 Applicable Documents

T060161 Armandula, H. FTIR and scatter measurements indicate FC leaves no residue on clean optics.

T070280 Technical information from Photonic Cleaning Technologies.

T0900351 Dannenburg, R. FC Peeling and Charging Tests

T1000137 Phelps, M. Drag Wiping and First Contact

3 Materials

List of required materials, manufacturer and part number:
1. First Contact, Photonic Cleaning Technologies Part# FCL for 1 Liter
2. First Contact thinner, Photonic Cleaning Technologies Part#TFCL for 1 Liter
3. Clean room gloves, VWR Part #79999-xxx
4. Fine PEEK mesh, McMaster Carr Part# 9289T11
5. Nylon brushes, Purdy 100% Nylon Brushes from Home Depot
6. Flashlight, Stinger from Copquest Part#10-1552-000 OR barlight from Fiber Optic Systems, Part# FSI-060-250
7. Kapton tape, McMaster Carr part#7639A75
8. Ion gun, Terra Univeral Part#2005-55

4 Application

1. Put on gloves (LIGO approved kind for cleanroom use, see Materials item #3)
2. Pour some First Contact(Materials item #1) into a clean glass petri dish.(Fig.1)
3. Pour thinner (Materials item #2) or acetone into a small beaker.(Fig.1)

First Contact Application and Removal Procedure

Figure 1: To keep from having sticky petri dishes, wrap them in foil, pour in the FCand then discard the foil when finished.

4. Situate your flashlight (see Materials item #6 for the flashlight) so that you can see the FC you are applying. Resituate flashlight throughout procedure if you cannot see what you are doing. This is to avoid getting FC too close to the barrel of the optic, and to avoid drips. You can also use a fiberoptic barlight from FiberOptic Systems Inc. This light illuminates the surface much better but is quite large and unwieldy, it needs either an extra person to hold it or a Bunsen burner stand to keep it in place.

5. Immerse brush into First Contact. Wipe off excess against side of petri dish. J. Hamilton at Photonics Cleaning recommends Purdy 100% nylon brushes from Home Depot. Only nylon, PEEK or natural hair brushes can be used.

NOTE: If the optic is vertical it is important that the brush does not drip FC onto the barrel, or let it run down to the bottom edge. If there is not too much on the brush, this should not be a problem.

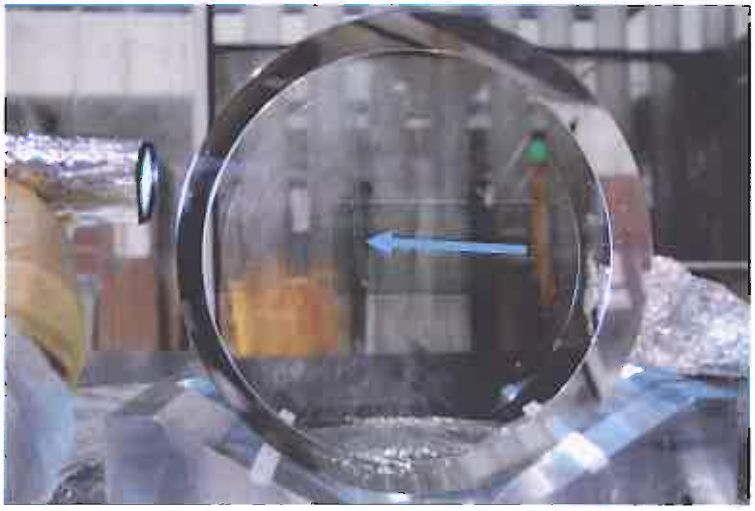

Figure 2: Avoid drips like this one. If it reaches the edge it will be hard to remove. Here the flashlight is used to illuminate but a barlight can be used as well.

First Contact Application and Removal Procedure

6. Begin brushing the FC onto the top of the optic. Brush slowly and lightly, avoiding as much bristle to optic contact as possible. Brush FC on in a circle that starts at least 5mm from the optic's edge, taking special care that the FC does not drip or run off the optic face near the bottom. A circle helps keep dripping to a minimum.
7. After you complete the initial circle of FC, go back in and fill in the rest using slow, uniform sweeps across the face, as if you were drag wiping.
8. Now that one layer is done set your brush in acetone/thinner and wait 20 minutes. First Contact includes acetone, so it is ok to use acetone as a thinner to keep your brush from stiffening. However the thinner sold by Photonic Cleaning works better. Do NOT use methanol as thinner.
9. Repeat twice for a total of 3 layers.
10. Leave to dry for as long as possible before removing, at least 12 hours.

5 Removal

1. Cut a strip of PEEK mesh about 1''x 5''. The PEEK mesh is shown here:

Figure 3: Roll of PEEK mesh on aluminum foil

2. Hold mesh against the top of the optic. Leave about half the strip sticking up off the top of the optic (Fig.4).
3. With one hand hold the PEEK mesh strip, and with your other hand dip your brush into FC and spread a thin layer over the part of the mesh that is on the optic. Be careful to only brush FC onto the layer that is already there. Try not to spread FC all the way to the barrel! It may form a very thin layer, which will be hard to get off. Small strips that get left on near the edge by accident can be wiped off with acetone. Do not use methanol.

First Contact Application and Removal Procedure

Figure 4: Leave mesh sticking up enough to grab it for removal. Note: The mesh in this picture is nylon mesh, not PEEK.

4. Let the mesh dry for at least an hour. If the FC film is really stretchy and breaks when you try to remove it, wait longer until it does not stretch when pulled.
5. Holding the ion gun in position, begin to peel the PEEK mesh off from the surface. If the dried FC does not come off in one piece STOP, reapply a thicker layer if it has broken apart. As soon as the dry FC film starts coming off, start blowing nitrogen from the ion gun (Materials item #8) onto the optic. Hold the gun parallel to the optic face, focusing most on the area where the film is detaching itself from the optic. Use the flashlight and pay close attention to the edges when peeling it off to make sure nothing is left behind on the optic.

Figure 5: Keep a steady stream of nitrogen while peeling.

6. Once the film is off completely continue blowing off the optic for about 30 seconds to ensure the surface charge is zero. Try to keep the gun at the same angle and avoid waving your arm around,

as you want to avoid disturbing the surrounding particles in the air. You can also point the ion gun towards your gloves before removal, they are plastic and tend to charge up very quickly.

7. Shine the flashlight around the outer surface of the optic face to check for any stray dried First Contact. Remove any last bits by wiping a clean lens wipe around the edge in a circular fashion. The middle of the optic will be the cleanest part so wiping from edge to middle to edge will probably drag any contaminants you have into the center.
8. Done!

6 Alternative Removal(not allowed in vacuum chamber)

1. Stick a piece of kapton tape (Materials item #7) against the dried first contact.
2. Wait a few seconds, and then pull sharply towards you, the film should come with the tape.
3. Do not use this to remove FC in a vacuum chamber where tape is not allowed.

7 Additional Information

DO NOT use methanol to drag wipe an optic that has been cleaned with first contact. See First Contact wiki or LIGO #T1000137 for reasons why.
Each layer of FC will take about 20 minutes to "set", ie to be dry enough to allow for the next layer to be applied. For three layers it is good to leave them overnight to ensure it is completely dry.
Dry time is longer at cooler temperatures.
If the layer sticks or stretches enough to break while removing it is not dry.
The dried film must leave the optic in one single INTACT piece.
If the dried film is too thin it will break while peeling. If this happens, stop peeling and brush another layer over the dry layer to make a thicker coating and allow re-drying before peeling off again.
When brushing on polymer with a brush do not allow bristles to scour the optic surface.

ATTACHMENT C:

FIRST CONTACT MSDS

Safety Data Sheet

According to EC Directive 1907/2006/EC

Photonic
Cleaning Technologies

Date of issue: 19.2.2008
Supersedes edition of: 13.6.2007

1. Identification of the substance/preparation and of the company/undertaking

Identification of the product
Product name: First Contact Polymer Solutions
Product numbers: All First Contact Polymer Solution Sizes

Use of the substance/preparation

Chemical for cleaning, protecting, masking and shipping precision surfaces.

Company/undertaking identification

Company:
Photonic Cleaning Technologies, LLC 53818, PO Box 435, Platteville, Wisconsin, USA
Tel: +1 608-467-5396, email: safety@photoniccleaning.com

Emergency Telephone No.: Please contact the regional representation in your country (see website).

2. Composition/information on ingredients *Synonyms: Mix of solvents with inert polymer blend.*

CHEMICAL NAMES	*CAS NUMBER*	*MASS CONTENT*	*EXPOSURE LIMITS IN AIR (UNITS)*	
			ACGIH TLV	*OSHA PEL*
FORMAL GLYCOL	[646-06-0]	10-40%	none est.	none est.
BIS(METHOXY)METHANE	[109-87-5]	10-30%	1000 PPM	1000 PPM
ETHYL ALCOHOL	[64-17-5]	30-50%	400 PPM	400 PPM
ACETONE	[67-64-1]	10-30%	750 PPM	750 PPM
ETHYL LACTATE	[97-64-3]	<10%	none est.	none est.
ETHYL ACETATE	[141-78-6]	<10%	250 PPM	310 PPM

3. Hazards Identification

F, Xi - Highly Flammable, Irritating

4. First aid measures

After inhalation: fresh air.
After skin contact: wash off with plenty of water. Remove contaminated clothing.
After eye contact: rinse out with plenty of water with the eyelid held wide open. Call in ophtalmologist.
After swallowing: make victim drink plenty of water, avoid vomiting (risk of aspiration!). No milk.
No digestible oils. Laxative: Sodium sulfate (1 tablespoon/1/4 litre water). Immediately call in physician.

5. Fire-fighting measures

Suitable extinguishing media: Water, CO_2, foam, powder.

Special risks:
Combustible. Development of hazardous combustion gases or vapours possible in the event of fire. Vapours heavier than air. Could form explosive mixtures with air at ambient temperatures. Beware of backfiring.

Special protective equipment for fire fighting:
Do not stay in dangerous zone without self-contained breathing apparatus.

Other information:
Cool container with spray water from a save distance. Prevent fire-fighting water from entering surface water or groundwater.

6. Accidental release measures

Person-related precautionary measures:
Do not inhale vapours/aerosols. Ensure supply of fresh air in enclosed rooms.

Environmental-protection measures: Do not allow to enter sewerage system; risk of explosion!

Procedures for cleaning / absorption:
Take up with liquid-absorbent material (e.g. Chemizorb®). Forward for disposal. Clean up affected area.

7. Handling and storage

Handling:

Notes for prevention of fire and explosion:
Keep away from sources of ignition. Take measures to prevent electrostatic charging.

Storage:

Tightly closed in a well-ventilated place, away from sources of ignition and heat. Cool (below +25°C).

8. Exposure controls/personal protection

Personal protective equipment:

Protective clothing should be selected specifically for the working place, depending on concentration and quantity of the hazardous substances handled. The resistance of the protective clothing to chemicals should be ascertained with the respective supplier.

Respiratory protection:	required when vapours/aerosols are generated. Filter A (acc. to DIN 3181) for vapours of organic compounds
Eye protection:	required

Hand protection:	In full contact:	
	Glove material:	viton
	Layer thickness:	0.70 mm
	Breakthrough time:	> 480 in.
	In splash contact:	
	Glove material:	butyl rubber
	Layer thickness:	0.7 mm
	Breakthrough time:	> 60 min.

The protective gloves to be used must comply with the specifications of EC directive 89/686/EEC and the resultant standard EN374, for example KCL 890 Vitoject® (full contact), 898 Butoject® (splash contact). The breakthrough times stated above were determined for Formyl Glycol (Merck) by KCL in laboratory tests for Merck acc. to EN374 with samples of the recommended glove types. This recommendation applies only to the product stated in the safety data sheet and supplied by us as well as to the purpose specified by us. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Industrial hygiene:
Immediately change contaminated clothing. Apply skin- protective barrier cream. Wash hands and face after working with substance.

---

9. Physical and chemical properties

Form:		slightly viscous liquid
Colour:		colourless
Odour:		ether-like
pH value		not available
Viscosity dynamic (25 °C)		circa 100 mPa*s
Melting Point		above -95 °C
Boiling point		(1013 hPa) below 74 °C
Ignition temperature		unknown °C
Flash point		below 2 °C
Explosion limits	lower	unknown Vol%
	upper	unknown Vol%
Vapour pressure (20 °C)		unknown hPa
Relative vapour density		circa 1.7
Density (20 °C)		circa 0.95 g/cm^3
Solubility in water (20 °C)		partially miscible in small quantities
log Pow:		circa -0.2 (extrapolation from solvents)

10. Stability and reactivity

Conditions to be avoided

Heating. Upon decomposition in closed containers and tubes risk of bursting due to buildup of overpressure.

Substances to be avoided

Risk of explosion with: perchlorates.

Risk of ignition or formation of inflammable gases or vapors with: fire-promoting substances, high-oxygen materials / oxidizing agent.
Exothermic reaction with: strong acids, strong bases.

Hazardous decomposition products: no information available
Trace Stabilizer in Formyl Glycol Additive: 2,6-di-t-butyl-4-methylphenol (BHT)

Further information

Explosible with air in a vaporous/gaseous state. light-sensitive, sensitive to air heat-sensitive. Protect from direct sunlight. tends to polymerize (Please observe stabilisation)

11. Toxicological information

Acute toxicity for components

LC_{50} (formyl glycol) (inhalation, rat): 87 mg/l /4 h.
LD_{50} (formyl glycol) (dermal, rabbit): 9040 mg/kg.
LD_{50} (formyl glycol) (oral, rat): 3000 mg/kg.

Specific symptoms in animal studies: Skin irritation test (rabbit): Slight irritations.

Subacute to chronic toxicity for components

Mutagenicity (mammal cell test): negative. Bacterial mutagenicity: Ames test: negative.

Further toxicological information

After inhalation: drowsiness, headache. After absorption of large quantities: narcosis.
After skin contact: Slight irritations. Degreasing effect on the skin, possibly followed by secondary inflammation.
After eye contact: Slight irritations. After swallowing: gastrointestinal complaints, Nausea, vomiting, diarrhoca.

Further data: The product should be handled with the care usual when dealing with chemicals.

12. Ecological information

Biological degradation:
Solvent Blend Miscible with water. Water-dissolved constituents biodegradable.
Polymer will precipitate when mixed with water.

Behavior in environmental compartments:
Distribution: log p(o/w): -0.37 (experimental for formyl glycol).
No bioaccumulation is to be expected (log P(o/w) <1).
Henry constant: 2.48 Pa*m^3/mol (formyl glycol). Distribution preferentially in air.

Ecotoxic effects: Biological effects:

Daphnia toxicity (formyl glycol): Daphnia EC_{50}: 6950 mg/l /48 h.
Algeal toxicity (formyl glycol): Selenastrum capricornutum IC_0: 1000 mg/l /14 d.

Further ecologic data:
No ecological problems are to be expected when the product is handled and used with due care and attention.

13. Disposal considerations

Product:

Chemicals must be disposed of in compliance with the respective national regulations. Under www.retrologistik.de you will find country-and substance-specific information as well as contact partners.

Packaging:

PCT product packaging must be disposed of in compliance with the country-specific regulations or must be passed to a packaging return system. Under www.retrologistik.de you will find special information on the respective national conditions as well as contact partners.

14. Transport information

Road & Rail ADR, RID
UN 1170 Ethanol Solution, 3, II

Inland waterway ADN, ADNR not tested

Sea IMDG-Code
UN 1170 Ethanol Solution, 3, II
Ems F-E S-D

Air CAO, PAX
Ethanol Solution, 3, UN 1170, II

The transport regulations are cited according to international regulations and in the form applicable in Germany . Possible national deviations in other countries are not considered.

15. Regulatory information

Labelling according to EC Directives
Symbol: F Highly flammable
R-phrases: 11-36-67 Highly flammable.
S-phrases: 9-16-23-33 Keep away from sources of ignition - No smoking.
EC-No.: 211-463-5 EC label

16. Other information

Reason for alteration

13.6.2007	Updated Version
19.2.2008	Updated Version to EC Directive 1907/2006/EC

Regional representation: see www.photoniccleaning.com

The information contained herein is based on the present state of our knowledge. It characterizes the product with regard to the appropriate safety precautions. It does not represent a guarantee of the properties of the product.