TECHNICAL DATA SHEET

AlphaLISA® Research Reagents

# AlphaLISA Cry1F Assay Kit

Product number: AL402 HV/C/F

Caution: For Laboratory Use. A research product for research purposes only.

## Contents

## Product Information

**Application:** This kit is designed for the quantitative determination of Cry1F in plant seed and leaf using a homogeneous AlphaLISA assay (no wash steps). The assay shows negligible cross-reactivity with other Cry proteins.

**Sensitivity:** Lower Detection Limit (LDL): 111 pg/mL

Lower Limit of Quantification (LLOQ): 353 pg/mL

$EC_{50}$: 357 ng/mL

**Dynamic range:** 26– 300 000 pg/mL (Figure 1).

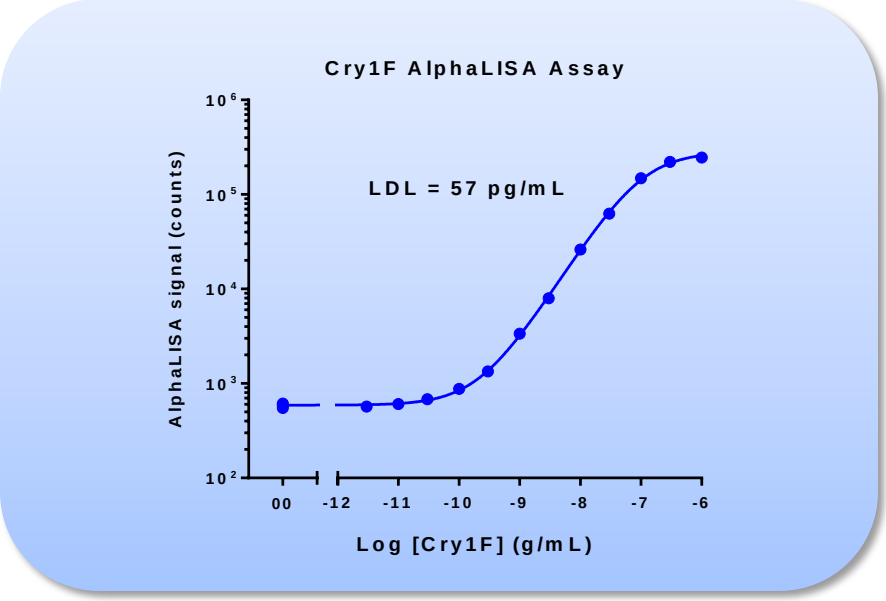



Figure 1. Typical sensitivity curve in AlphaLISA Immunoassay Buffer. The data was generated using a white Optiplate™-384 microplate and the EnVision® Multilabel Plate Reader 2103 with Alpha option.

**Storage:** Store kit in the dark at +4˚C.

**Stability:** This kit is stable for at least 6 months from the manufacturing date when stored in its original packaging and the recommended storage conditions.

## Quality Control

Lot to lot consistency is confirmed in an AlphaLISA assay. Maximum and minimum signals, $EC_{50}$ and LDL were measured on the EnVision Multilabel Plate Reader with Alpha option using the protocol described in this technical data sheet. We certify that these results meet our quality release criteria. Maximum counts may vary between bead lots and the instrument used, with no impact on LDL measurement.

## Analyte of Interest

Cry1F is an insecticidal produced by the naturally occurring soil bacterium *Bacillus thuringiensis subsp. kurstaki* (Btk). The protein is used extensively in agricultural farming as a direct application pesticide. The gene encoding Cry1F has been widely introduced to genomes of many crops (e.g. corn, cotton, and soybean) to create genetically modified organisms (GMO). During growth, genetically modified crops produce the Cry1F protein that confers protection against certain insect pests. The present kit permits the detection of Cry1F (i.e. analyte) in GMO seeds, leaf, and plant extracts.

## Description of the AlphaLISA Assay

AlphaLISA technology allows the detection of molecules of interest in buffer, cell culture media, serum and plasma in a highly sensitive, quantitative, reproducible and user-friendly mode. In an AlphaLISA assay, a Biotinylated Anti-Analyte Antibody binds to the Streptavidin-coated Alpha Donor beads, while another Anti-Analyte Antibody is conjugated to AlphaLISA Acceptor beads. In the presence of the analyte, the beads come into close proximity. The excitation of the Donor beads provokes the release of singlet oxygen molecules that triggers a cascade of energy transfer in the Acceptor beads, resulting in a sharp peak of light emission at 615 nm (Figure 2).

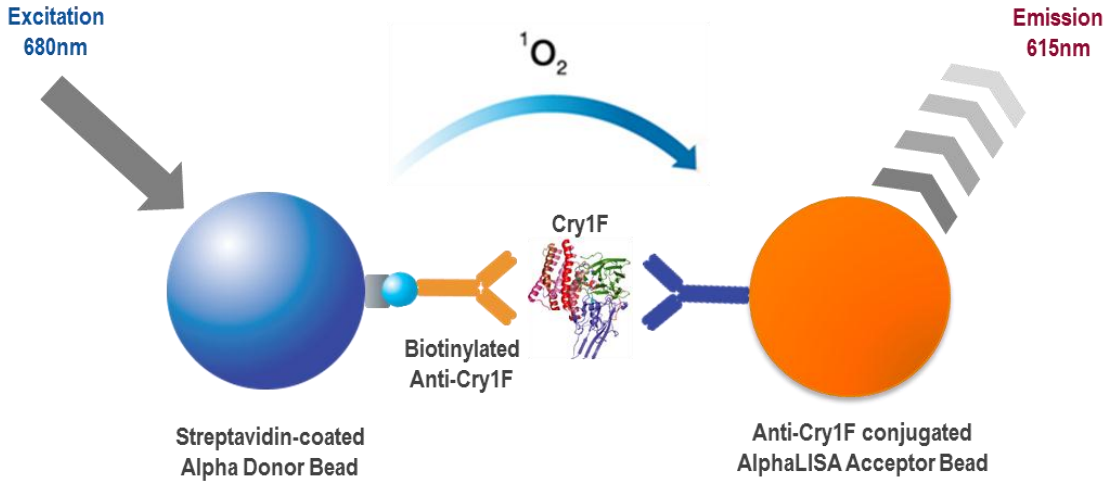



Figure 2. AlphaLISA Assay principle.

## Precautions

- The AlphaScreen® Donor beads are light-sensitive. All the other assay reagents can be used under normal light conditions. All Alpha assays using the Donor beads should be performed under subdued laboratory lighting (< 100 lux). Green filters (LEE 090 filters (preferred) or Roscolux filters #389 from Rosco) can be applied to light fixtures.
- All components and biological materials should be handled as potentially hazardous. The analyte included in this kit is from a human source.
- Take precautionary measures to avoid contamination of the reagent solutions.
- The Biotinylated Anti-Analyte Antibody contains sodium azide. Contact with skin or inhalation should be avoided.

## Kit Content: Reagents and Materials

| Kit components | AL402HV (100 assay points***) | AL402C (500 assay points***) | AL402F (5000 assay points***) |
|---|---|---|---|
| AlphaLISA Anti-Cry1F Acceptor beads stored in PBS, 0.05% Proclin-300, pH 7.2 | 50 µL @ 5 mg/mL (1 brown tube, white cap) | 100 µL @ 5 mg/mL (1 brown tube, white cap) | 1 mL @ 5 mg/mL (1 brown tube, white cap) |
| Streptavidin (SA)-coated Donor beads stored in 25 mM HEPES, 100 mM NaCl, 0.05% Proclin-300, pH 7.4 | 50 µL @ 5 mg/mL (1 brown tube, black cap) | 100 µL @ 5 mg/mL (1 brown tube, black cap) | 1 mL @ 5 mg/mL (1 brown tube, black caps) |
| Biotinylated Anti-Cry1F Antibody stored in PBS, 0.1% Tween-20, 0.05% $NaN_3$, pH 7.4 | 50 µL @ 500 nM (1 tube, black cap) | 100 µL @ 500 nM (1 tube, black cap) | 1 mL @ 500 nM (1 tube, black cap) |
| Cry1F Analyte* | 0.5 µg; lyophilized solid (1 tube, clear cap) | 0.5 µg; lyophilized solid (1 tube, clear cap) | 0.5 µg; lyophilized solid (1 tube, clear cap) |
| AlphaLISA Immunoassay Buffer** (10X) | 2 mL, 1 small bottle | 10 mL, 1 small bottle | 100 mL, 1 large bottle |

* The reconstituted analyte should be used within 60 minutes or aliquoted into screw-capped polypropylene vials and stored at -20°C for further experiments. Avoid multiple freeze-thaw cycles. One vial contains an amount of Cry1F sufficient for performing 5 standard curves. Additional vials can be ordered separately (cat # AL402S).

** Extra buffer can be ordered separately (cat # AL000C: 10 mL, cat # AL000F: 100 mL).

*** The number of assay points is based on an assay volume of 100 µL in 96-well plates or 50 µL 384-well assay plates using the kit components at the recommended concentrations.

Sodium azide should **not** be added to the stock reagents. High concentrations of sodium azide (> 0.001 % final in the assay) might decrease the AlphaLISA signal. Note that sodium azide from the Biotinylated Antibody stock solution will not interfere with the AlphaLISA signal (0.0001% final in the assay).

**Specific additional required reagents and materials:**

The following materials are recommended:

| Item | Suggested source | Catalog # |
|---|---|---|
| TopSeal™-A Adhesive Sealing Film | PerkinElmer Inc. | 6050195 |
| EnVision®-Alpha Reader | PerkinElmer Inc. | - |

## Recommendations

- The volume indicated on each tube is guaranteed for single pipetting. Multiple pipetting of the reagents may reduce the theoretical amount left in the tube. To minimize loss when pipetting beads, it is preferable not to pre-wet the tip.
- Centrifuge all tubes (including lyophilized analyte) before use to improve recovery of content (2000g, 10-15 sec). Re-suspend all reagents by vortexing before use.
- Use Milli-Q® grade $H_2O$ (18 MΩ•cm) to dilute 10X AlphaLISA Immunoassay Buffer.
- When diluting the standard or samples, change tips between each standard or sample dilution. When loading reagents in the assay microplate, change tips between each standard or sample addition and after each set of reagents.
- When reagents are added to the microplate, make sure the liquids are at the bottom of the well.
- Small volumes may be prone to evaporation. It is recommended to cover microplates with TopSeal-A Adhesive Sealing Films to reduce evaporation during incubation. Microplates can be read with the TopSeal-A Film.
- The AlphaLISA signal is detected with an EnVision Multilabel Reader equipped with the Alpha option using the AlphaScreen standard settings (e.g. Total Measurement Time: 550 ms, Laser 680 nm Excitation Time: 180 ms, Mirror: D640as, Emission Filter: M570w, Center Wavelength 570 nm, Bandwidth 100 nm, Transmittance 75%).
- AlphaLISA signal will vary with temperature and incubation time. For consistent results, identical incubation times and temperature should be used for each plate.
- The standard curves shown in this technical data sheet are provided for information only. A standard curve must be generated for each experiment. The standard curve should be performed in the AlphaLISA Immunoassay Buffer for plant extracts.
- Chlorophyll interferes with the assay. It is recommended that Chlorophyll rich samples should be diluted at least 10 fold.

## Assay Procedure

IMPORTANT: PLEASE READ THE RECOMMENDATIONS BELOW BEFORE USE

- The protocol described below is an example for generating one standard curve in a 50 µL final assay volume (48 wells, triplicate determinations). The protocols also include testing samples in 452 wells. If a different amount of samples are tested, the volumes of all reagents have to be adjusted accordingly, as shown in the table below. These calculations do not include excess reagent to account for losses during transfer of solutions or dead volumes.
- The standard dilution protocol is provided for information only. As needed, the number of replicates or the range of concentrations covered can be modified.
- Use of four background points in triplicate (12 wells) is recommended when LDL/LLOQ is calculated. One background point in triplicate (3 wells) can be used when LDL/LLOQ is not calculated.

| | | | Volume | | | | |
|---|---|---|---|---|---|---|---|
| **Format** | **# of data points** | **Final** | **Sample** | **AlphaLISA beads** | **Biotin Antibody** | **SA-Donor beads** | **Plate recommendation** |
| **AL402HV** | 100 | 100 µL | 10 µL | 20 µL | 20 µL | 50 µL | White OptiPlate-96 (cat # 6005290)<br>White ½ AreaPlate-96 (cat # 6005560) |
| **AL402C** | 250 | 100 µL | 10 µL | 20 µL | 20 µL | 50 µL | White OptiPlate-96 (cat # 6005290)<br>White ½ AreaPlate-96 (cat # 6005560) |
| | 500 | 50 µL | 5 µL | 10 µL | 10 µL | 25 µL | White ½ AreaPlate-96 (cat # 6005560)<br>White OptiPlate-384 (cat # 6007290)<br>Light gray AlphaPlate™-384 (cat # 6005350) |
| | 1 250 | 20 µL | 2 µL | 4 µL | 4 µL | 10 µL | Light gray AlphaPlate-384 (cat # 6005350)<br>ProxiPlate™-384 Plus (cat # 6008280)<br>White OptiPlate-384 (cat # 6007290) |
| | 2 500 | 10 µL | 1 µL | 2 µL | 2 µL | 5 µL | Light gray AlphaPlate-1536 (cat # 6004350) |
| **AL402F** | 5 000 | 50 µL | 5 µL | 10 µL | 10 µL | 25 µL | White ½ AreaPlate-96 (cat # 6005560)<br>White OptiPlate-384 (cat # 6007290)<br>Light gray AlphaPlate-384 (cat # 6005350) |
| | 12 500 | 20 µL | 2 µL | 4 µL | 4 µL | 10 µL | Light gray AlphaPlate-384 (cat # 6005350)<br>ProxiPlate-384 Plus (cat # 6008280)<br>White OptiPlate-384 (cat # 6007290) |
| | 25 000 | 10 µL | 1 µL | 2 µL | 2 µL | 5 µL | Light gray AlphaPlate-1536 (cat # 6004350) |

**Protocol for Cry1F AlphaLISA Assay**

**3 Step High Sensitivity Protocol described below is for 500 assay points including one standard curve (48 wells) and samples (452 wells).** *If a different amount of samples are tested, the volumes of all reagents have to be adjusted accordingly.*

1) Preparation of 1X AlphaLISA Immunoassay Buffer:
   a. Add 5 mL of 10X AlphaLISA Immunoassay Buffer to 45 mL $H_2O$.

2) Preparation of Cry1F analyte standard dilutions:
   a. Reconstitute lyophilized Cry1F (0.5 µg) in 50 µL $H_2O$.
   b. Prepare standard dilutions as follows in 1X AlphaLISA Immunoassay Buffer (change tip between each standard dilution):

| Tube | Vol. of Cry1F (µL) | Vol. of diluent (µL) * | [Cry1F ] in standard curve | |
|---|---|---|---|---|
| | | | (g/mL in 5 µL) | (pg/mL in 5 µL) |
| A | 10 µL of provided Cry1F | 90 | 1.00E-06 | 1000000 |
| B | 60 µL of tube A | 140 | 3.00E-07 | 300000 |
| C | 60 µL of tube B | 120 | 1.00E-07 | 100000 |
| D | 60 µL of tube C | 140 | 3.00E-08 | 30000 |
| E | 60 µL of tube D | 120 | 1.00E-08 | 10000 |
| F | 60 µL of tube E | 140 | 3.00E-09 | 3000 |
| G | 60 µL of tube F | 120 | 1.00E-09 | 1000 |
| H | 60 µL of tube G | 140 | 3.00E-10 | 300 |
| I | 60 µL of tube H | 120 | 1.00E-10 | 100 |
| J | 60 µL of tube I | 140 | 3.00E-11 | 30 |
| K | 60 µL of tube J | 120 | 1.00E-11 | 10 |
| L | 60 µL of tube K | 140 | 3.00E-12 | 3 |
| M ** (background) | 0 | 100 | 0 | 0 |
| N ** (background) | 0 | 100 | 0 | 0 |
| O ** (background) | 0 | 100 | 0 | 0 |
| P ** (background) | 0 | 100 | 0 | 0 |

* Dilute standards in diluent (e.g. 1X AlphaLISA Immunoassay Buffer.
At low concentrations of analyte, a significant amount of analyte can bind to the vial. Therefore, load the analyte standard dilutions in the assay microplate within 60 minutes of preparation.

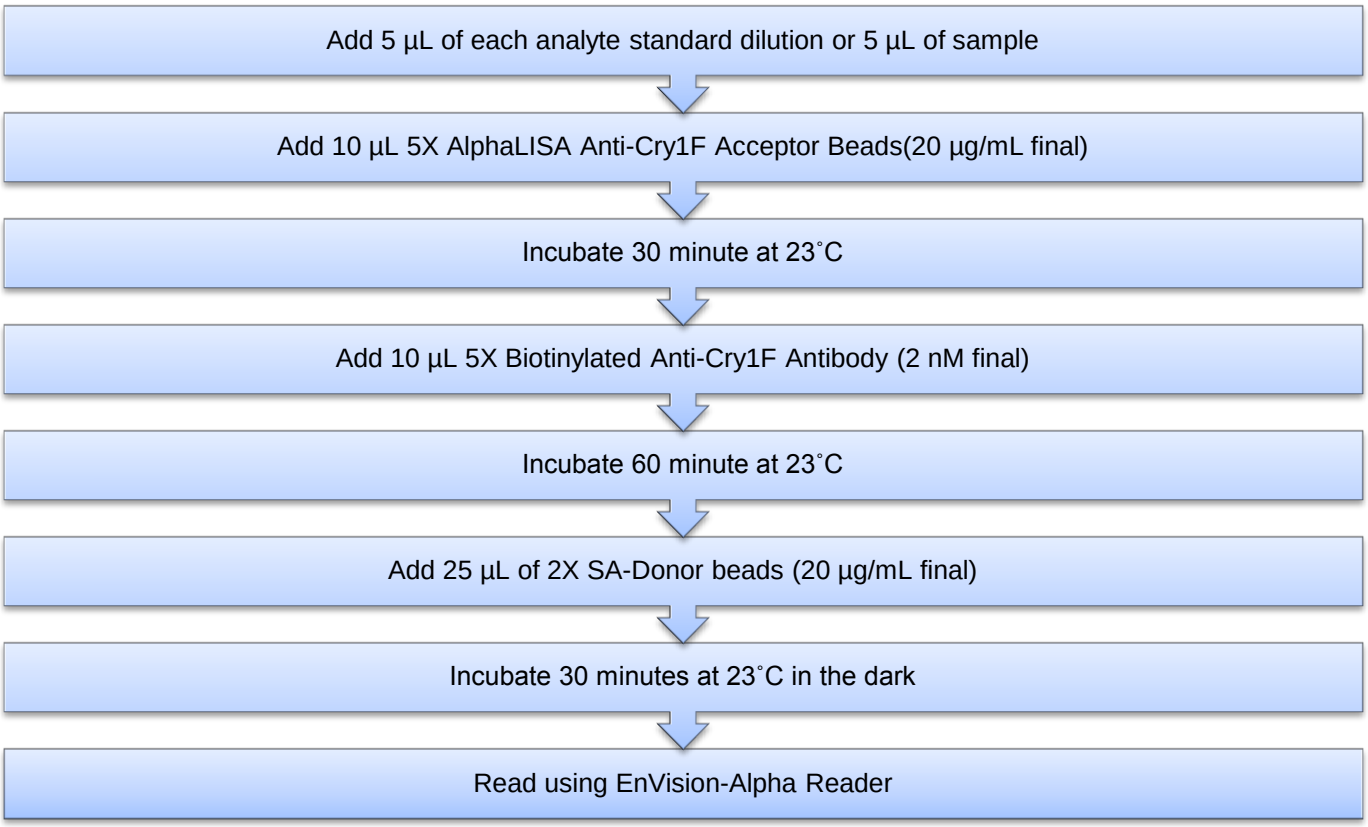
** Four background points in triplicate (12 wells) are used when LDL is calculated. If LDL does not need to be calculated, one background point in triplicate can be used (3 wells).

3) Preparation of 5X AlphaLISA anti-Cry1F Acceptor Beads (100 µg/mL): Add 100 µL of 5 mg/mL AlphaLISA anti-Cry1F Acceptor Beads to 4900 µL of 1X AlphaLISA Immunoassay Buffer. Prepare just before use.

4) Preparation of 5X Biotinylated Cry1F Antibody (10 nM): Add 100 µL of 500 nM Biotinylated anti-Cry1F Antibody to 4900 µL of 1X AlphaLISA Immunoassay Buffer. Prepare just before use.

5) Preparation of 2X Streptavidin (SA) Donor beads (40 µg/mL): Keep the beads under subdued laboratory lighting. Add 100 µL of 5 mg/mL SA-Donor beads to 12400 µL of 1X AlphaLISA Immunoassay Buffer. Prepare just before use.

6) In a white Optiplate (384 wells):




## Data Analysis

- Calculate the average count value for the background wells.
- Generate a standard curve by plotting the AlphaLISA counts versus the concentration of analyte. A log scale can be used for either or both axes. No additional data transformation is required.
- Analyze data according to a nonlinear regression using the 4-parameter logistic equation (sigmoidal dose-response curve with variable slope) and a $1/Y^2$ data weighting (the values at maximal concentrations of analyte after the hook point should be removed for correct analysis).
- The LDL is calculated by interpolating the average background counts (12 wells without analyte) + 3 x standard deviation value (average background counts + (3xSD)) on the standard curve.
- The LLOQ as measured here is calculated by interpolating the average background counts (12 wells without analyte) + 10 x standard deviation value (average background counts + (10xSD)) on the standard curve. Alternatively, the true LLOQ can be determined by spiking known concentrations of analyte in the matrix and measuring the percent recovery, and then determining the minimal amount of spiked analyte that can be quantified within a given limit (usually +/- 20% or 30% of the real concentration).
- Read from the standard curve the concentration of analyte contained in the samples.
- If samples have been diluted, the concentration read from the standard curve must be multiplied by the dilution factor.

## Assay Performance Characteristics

*AlphaLISA assay performance described below was determined using the 3 step protocol.*

- Assay Sensitivity:

The LDL and LLOQ were calculated as described above. The values correspond to the lowest concentration of analyte that can be detected in a 5 µL sample volume using the recommended assay conditions. Average of 14 independent experiments is shown in the table.

| LDL (pg/mL) | LLOQ (pg/mL) |
|---|---|
| 111 | 353 |

* The standard was prepared in AlphaLISA Immunoassay Buffer

Note that LDL/ LLOQ can be decreased (i.e. sensitivity increased) by increasing the volume of analyte in the assay (e.g. use 10 µL of analyte in a final assay volume of 50 µL).

- Assay Precision:

The following assay precision data were calculated from the three independent assays using two different kit lots. In each lot, the analytes were prepared in AlphaLISA Immunoassay Buffer Each assay consisted of one standard curve comprising 12 data points (each in triplicate) and 12 background wells (no analytes). The assays were performed in 384-well format using AlphaLISA Immunoassay Buffer.

- Intra-assay precision:

The intra-assay precision was determined using a total of 16 independent determinations in triplicate. Shown as CV%.

| Cry1F | Immunoassay Buffer |
|---|---|
| **CV(% )** | 5.2 |

- Inter-assay precision:

The inter-assay precision was determined using a total of 3 independent determinations with 9 measurements for 10 ng/mL sample. Shown as CV%.

| Cry1F (10 ng/ml) | Immunoassay Buffer |
|---|---|
| **CV (%)** | 11.7 |

- Spike Recovery:

Three known concentrations of Cry1F analyte were spiked in AlphaLISA Immunoassay Buffer and the assays were performed along a standard curve. The average recovery from three independent measurements is reported.

| Spiked Cry1F (ng/mL) | % Recovery |
|---|---|
| 100 | 101 |
| 10 | 98 |
| 1 | 107 |

- Specificity:

Cross-reactivity of the AlphaLISA Cry1F Immunoassay Kit was tested using the following proteins at 100 ng/mL.

| Cry Proteins | % Cross-reactivity |
|---|---|
| Cry1Ab | 0 |
| Cry1Ac | 0 |
| Cry2A | 0.5 |
| Cry1F | 100 |
| Cry3B | 0 |
| Cry9C | 0 |

## Test of Cry Positive and Negative samples

Lyophilized Cry protein positive and negative controls with unknown concentrations of Cry proteins were purchased from Agdia Inc. and 8 control samples (5 uL each) were tested along with Cry1F standard. Positive/Negative Controls contain corn seed extract expressing/ or not expressing Cry proteins. Cry1F test samples should be diluted 8 to 40 folds. Note that a large amount of Cry1F is detected in the Cry1F positive sample.

| Control Sample | Detected (ng/mL) |
|---|---|
| Cry1Ab/Ac Positive Control | 0.5 |
| Cry1Ab/Ac Negative control | 0 |
| Cry2A Positive Control | 0 |
| Cry2A Negative control | 0 |
| Cry1F Positive Control | 2532 |
| Cry1F-Negative control | 0 |
| Cry3B+ Positive Control | 0 |
| Cry3B-Negative control | 0 |
| Immunoassay Buffer only | 0 |
| Immunoassay Buffer only | 0 |

## Troubleshooting Guide

You will find detailed recommendations for common situations you might encounter with your AlphaLISA Assay kit at:

http://www.perkinelmer.com/in/resources/technicalresources/applicationsupportknowledgebase/alphalisa-alphascreen-no-washassays/alpha_troubleshoot.xhtml

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