510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
DEVICE ONLY TEMPLATE

A. 510(k) Number:
K032575

B. Analyte:
Amphetamine, Methamphetamine, Opiates, Cocaine, Cannabinoids, Phencyclidine

C. Type of Test:
Qualitative immunoassay

D. Applicant:
W.H.P.M. Inc.

E. Proprietary and Established Names:
First Sigh Drug Screening Tests

F. Regulatory Information:

1. Regulation section:
   21 CFR§ 862.31000 Amphetamine Test System; 21 CFR § 862.3610 Methamphetamine Test System; 21 CFR § 862.3650 Opiate Test System; 21 CFR § 862.3250 Cocaine and Cocaine metabolite Test System; 21 CFR § 862.3870 Cannabinoid Test System; Phencyclidine Enzyme Immunoassay
2. Classification:
   Class II
3. Product Code:
   DKZ; DJC; DJG; DIO; DKE; LCM
4. Panel:
   Toxicology (91)

G. Intended Use:

1. Intended use(s):
   Refer to Indications for use.

2. Indication(s) for use:
   First Sign Drugs of Abuse Screening Tests are one-step lateral flow immunoassay intended for the detection of drug analytes in urine. First Sign Drugs of Abuse Screening Test are intended for use in the qualitative detection of drugs of abuse at the following Substance Abuse Mental Health Services Administration (SAMHSA) recommended levels:

Amphetamine	1000 ng/ml
Methamphetamine:	1000 ng/ml
Cocaine:	300 ng/ml
Cannabinoids:	50 ng/ml
Phencyclidine:	25 ng/ml
Opiates2000:	2000 ng/ml
Opiates300:	300 ng/ml

First Sign Drugs of Abuse Screening Tests provide only a preliminary qualitative test result. Use a more specific alternate quantitative analytical method to obtain a confirmed analytical result. Gas chromatography/mass spectrometry (GC/MS) is the preferred confirmatory method. Apply clinical and professional judgment to any drug of abuse test result, particularly when preliminary positive results are used.

For professional use only.

3. Special condition for use statement(s):

   These assays provide only the preliminary analytical test results. A more specific alternate chemical method must be used in order to obtain a confirmed analytical result. Gas chromatography/mass spectrometry (GC/MS) is the preferred confirmatory method. Clinical consideration and professional judgment should be applied to any drug of abuse test result, particularly when preliminary positive results are used.

4. Special instrument Requirements:
   Not applicable. The devices are visually read single-use devices.

H. Device Description:

The First Sign Drugs of Abuse Screening Tests are immunoassays based on the principle of competitive binding. Drugs which may be present in the urine specimen compete against the drug conjugate for binding sites on the antibody.

Labeled antibody-dye conjugate mixes sample specimen and binds to the free drug present forming an antibody-antigen complex. This complex competes with immobilized antigen conjugate in the test zone preventing the formation of pink-rose color band when drug concentration in the specimen is above the cut-off concentration. Unbound dye conjugates bind to the reagent in the negative control zone and produces a pink-rose color band, demonstrating that the reagents and device are functioning correctly.

A negative specimen produces two distinct color bands in both the test region and the control region. A positive specimen produces only one color band in the control region.

To serve as a procedural control, a colored line will always appear at the control line region, indicating that proper volume of specimen has been added and membrane wicking has occurred.

I. Substantial Equivalence Information:

1. Predicate device name(s):
   ACON AMP One Step Amphetamine Test Strip; ACON mAMP One Step Methamphetamine Test Strip; ACON COC One Step Cocaine Test Strip; ACON OPI One Step Opiate Test Strip; ACON THC One Step Marijuana Test Strip; ACON PCP One Step Phencyclidine Test Strip

2. Predicate K number(s):
   K011673; K011672; K010841; K013380; k003557; K011730
3. Comparison with predicate:

   The devices and their predicates are for the qualitative determination of the same analyte(s) in the same matrix, and utilize the same cutoff concentrations. All are visually-read single use devices.

J. Standard/Guidance Document Referenced (if applicable):

The sponsor did not reference any standards in this submission.

K. Test Principle:

The tests employ lateral flow immunochromatographic technology.

Drug in the sample and drug-labeled conjugate (containing a chromagen) compete for antibody binding sites in the test area of the test strip. Binding of drug in the sample causes the absence of a line at the test area, i.e., a positive result. When drug is not present in the sample, the drug-labeled conjugate binds at the test line, resulting in formation of a line, i.e., a negative result. The absence or presence of the line is determined visually by the operator.

The devices also have an internal process controls which indicate that adequate volume of sample has been added and that the immunochromatographic strip is intact.

The test line contains a membrane striped and coated with drug-protein conjugates on the test strip. A goat polyclonal antibody against gold-protein conjugate at the control line, and a dye pad which contains colloidal gold particles coated with a mouse monoclonal antibody specific to the test drug.

L. Performance Characteristics (if/when applicable):

1. Analytical performance:
   a. Precision/Reproducibility:

   Reproducibility studies were carried out using commercially available standards. Each standard was diluted in normal, drug-free urine to give the appropriate concentration. Each specimen, at each concentration of analyte, was tested four times daily, in duplicate, for five consecutive days. A total of 40 determinations were made at each concentration. The data are summarized below:

Amphetamine

Concentration (ng/ml)	Total number of Determinations	Result	Precision
0	40	40 negative	>99%
500	40	40 negative	>99%
750	40	40 negative	>99%
1000	40	40 positive	>99%
1500	40	40 positive	>99%

Cocaine

Concentration (ng/ml)	Total number of Determinations	Result	Precision
0	40	40 negative	>99%
150	40	40 negative	>99%
225	40	40 negative	>99%
300	40	40 positive	>99%
375	40	40 positive	>99%
450	40	40 positive	>99%

Methamphetamine

Concentration (ng/ml)	Total number of Determinations	Result	Precision
0	40	40 negative	>99%
500	40	40 negative	>99%
750	40	40 negative	>99%
1000	40	40 positive	>99%
1500	40	40 positive	>99%

Opiate 300

Concentration (ng/ml)	Total number of Determinations	Result	Precision
0	40	40 negative	>99%
150	40	40 negative	>99%
225	40	40 negative	>99%
300	40	40 positive	>99%
375	40	40 positive	>99%

Opiate 2000

Concentration (ng/ml)	Total number of Determinations	Result	Precision
0	40	40 negative	>99%
1000	40	40 negative	>99%
1500	40	40 negative	>99%
2000	40	40 positive	>99%
3000	40	40 positive	>99%

Phencyclidine

Concentration (ng/ml)	Total number of Determinations	Result	Precision
0	40	40 negative	>99%
12.5	40	40 negative	>99%
19	40	40 negative	>99%
25	40	40 positive	>99%
37.5	40	40 positive	>99%

Marijuana

Concentration (ng/ml)	Total number of Determinations	Result	Precision
0	40	40 negative	>99%
25	40	40 negative	>99%
37.5	40	40 negative	>99%
50	40	40 positive	>99%
75	40	40 positive	>99%

b. Linearity/assay reportable range:
Not applicable. The assay is intended for qualitative use.

c. Traceability (controls, calibrators, or method):
Procedural controls are included in the test strip and device. A color line appearing in the control region is considered as an internal procedural control. It confirms sufficient specimen volume, adequate membrane wicking and correct procedural technique.
Control standards are not supplied with these kits; however, it is recommended that positive and negative controls be tested as a good laboratory practice to confirm the test procedure and to verify proper

test performance. Users should follow local, state, and federal guidelines for testing QC materials.

d. Cutoff Studies:

Know concentrations of drug were added to normal, drug free urine. Ten (10) determinations were made at each serial dilution of the single analyte. Cut-off is defined as that concentration which produced positive responses in all replicates. The data are summarized below:

Amphetamine

Samples	1	2	3	4	5	6	7	8	9	10
Concentration (ng/ml)										
0	-	-	-	-	-	-	-	-	-	-
500	-	-	-	-	-	-	-	-	-	-
750	-	-	-	-	-	-	-	-	-	-
1000	+	+	+	+	+	+	+	+	+	+
1500	+	+	+	+	+	+	+	+	+	+

Cocaine

Samples	1	2	3	4	5	6	7	8	9	10
Concentration (ng/ml)										
0	-	-	-	-	-	-	-	-	-	-
150	-	-	-	-	-	-	-	-	-	-
225	-	-	-	-	-	-	-	-	-	-
300	+	+	+	+	+	+	+	+	+	+
375	+	+	+	+	+	+	+	+	+	+
450	+	+	+	+	+	+	+	+	+	+

Methamphetamine

Samples	1	2	3	4	5	6	7	8	9	10
Concentration (ng/ml)										
0	-	-	-	-	-	-	-	-	-	-
500	-	-	-	-	-	-	-	-	-	-
750	-	-	-	-	-	-	-	-	-	-
1000	+	+	+	+	+	+	+	+	+	+
1500	+	+	+	+	+	+	+	+	+	+

Opiate 2000

Samples	1	2	3	4	5	6	7	8	9	10
Concentration (ng/ml)										
0	-	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-	-
1500	-	-	-	-	-	-	-	-	-	-
2000	+	+	+	+	+	+	+	+	+	+
3000	+	+	+	+	+	+	+	+	+	+

Phencyclidine

Samples	1	2	3	4	5	6	7	8	9	10
Concentration (ng/ml)										
0	-	-	-	-	-	-	-	-	-	-
12.5	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	-	-	-	-
25	+	+	+	+	+	+	+	+	+	+
37.5	+	+	+	+	+	+	+	+	+	+

Marijuana

Samples	1	2	3	4	5	6	7	8	9	10
Concentration (ng/ml)										
0	-	-	-	-	-	-	-	-	-	-
25	-	-	-	-	-	-	-	-	-	-
37.5	-	-	-	-	-	-	-	-	-	-
50	+	+	+	+	+	+	+	+	+	+
75	+	+	+	+	+	+	+	+	+	+

e. Analytical specificity:

Interference and cross reactivity studies were performed by testing the drug analytes in the First Sign Drugs Screening Tests with various other drugs. Below is a list of drugs that will give a positive result at or above the concentration stated. All the following drugs were added to normal, drug free urine.

Amphetamine

Drug Compound	Response equivalent to cutoff in ng/ml
d-amphetamine	1,000
D,l-amphetamine	1,000
1-amphetamine	20,000
Phentermine	1,250
(+/-)Methylenedioxyamphetamine (MDA)	1,500

Methamphetamine

Drug Compound	Response equivalent to cutoff in ng/ml
Procaine (Novocaine)	60,000
Trimethobenzamine	20,000
+/-methamphetamine	1,000
+methamphetamine	500
3,4-Methylenedioxyethylamphetamine(MDEA)	20,000
(+/-)3,4-Methylenedioxymethamphetamine (MDMA)	2,500
Ranitidine (Zantac)	50,000

Opiates 300

Drug compound	Response equivalent to cutoff in ng/mL
6-acetylmorphine	500
Codeine	100
Heroin	500
Hydrocodone	1,250
Hydromorphone	2,000
Oxycodone	75,000
Morphine	300
Morphine-3-β-glucuronide	75
Ethylmorphine	100
Thebaine	13,000
Eserine (Physosotigmine)	15,000

Opiates 2000

Drug compound	Response equivalent to cutoff in ng/mL
6-acetylmorphine	1,000
Codeine	800
Heroin	400
Hydrocodone	10,000
Hydromorphone	2,000
Oxycodone	5,000
Morphine	1,600
Morphine-3-β-glucuronide	1,000
Ethylmorphine	50,000
Thebaine	26,000

Cocaine

Compound	Response equivalent to cutoff in ng/ml
Benzoylecogonine	300
Cocaethylene	300
Cocaine	300
Metoclopromide	80,000
procaine	75,000

Cannabinoids (THC)

Compound	Response equivalent to cutoff in ng/mL
11-Hydroxy-Δ^9-Tetrahydrocannabinol	5,000
11-Nor-Δ^8-Tetrahydrocannabinol	50
11-Nor-Δ^9-Tetrahydrocannabinol Glucuronide	2,5000
Δ^8-Tetrahydrocannabinol	20,000
Δ^9 –Tetrahydrocannabinol	20,000

Phencyclidine

Compound	Response equivalent to cutoff in ng/ml
Phencyclidine	25
4-hydroxyphencyclidine	90
Phencyclidine Morpholine	625

Cross-Reactivity
Studies were conducted to determine the cross-reactivity of the test with compounds in either drug-free urine or dugs positive urine. The list of substances show no cross-reactivity when tested with the First Sign Drugs of Abuse Screening Test at a concentration of 100,000 ng/ml are listed in the package insert.

f. Assay cut-off:
The First Sign Drugs Screening Test yield a positive result when the drug in urine exceed the specified drug concentrations. The recommended screening cutoff for listed drug positive specimens are the same as those set by the Substance Abuse and Mental Health Services Administration (SAMHSA). Characterization of how the device performs analytically around the claimed cutoff concentration appears in the Cutoff Studies Section, above.

2. Comparison studies:

a. Method comparison with predicate device:
Amphetamine:

The First Sign Amphetamine Urine Screening Test was compared to GC/MS at the claimed cut-off levels. Additionally, the performance of the first Sign was compared to marketed device, Acon AMP Rapid Test and reference method (GC/MS). A combination of clinical and spiked samples were tested. The following Tables provide a summary of test results.

All samples tested (clinical and spiked)

	First Sign	Predicate Device	Between – 50% and cutoff	Between cutoff and + 50%	GC/MS Positive (> +50%)	% agreement with GC/MS
Positive	79	79	0	38	43	100%
Negative	80	80	67	2	0	97%

First Sign AMP comparison with ACON AMP Rapid Test-Spike Samples

Method		**ACON AMP Rapid Test**		**Total Results**
	Results	Positive	Negative	
First Sign AMP	Positive	59	0	59
	Negative	0	61	61
Total Results		59	61	120
% Agreement		100%	100%	100%

First Sign AMP comparison with GC/MS at cutoff 1000 ng/ml – Spiked Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign AMP	Positive	59	0	59
	Negative	1	60	61
Total Results		60	60	120
% Agreement		98%	100%	99%

First Sign AMP comparison with GC/MS – Clinical Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign AMP	Positive	20	0	20
	Negative	1	19	20
Total Results		21	19	40
% Agreement		95.2%	>99%	97.5%

Cocaine:

The First Sign Cocaine Urine Screening Test was compared to GC/MS at the claimed cut-off levels. Additionally, the performance of the first Sign was compared to marketed device, Acon COC Rapid Test and reference method (GC/MS). A combination of clinical and spiked samples were tested. The following Tables provide a summary of test results.

All samples tested (clinical and spiked)

	First Sign	Predicate Device	Between – 50% and cutoff	Between cutoff and + 50%	GC/MS Positive (> +50%)	% agreement with GC/MS
Positive	88	86	2	56	30	98%
Negative	72	74	58	1	1	97%

First Sign comparison with ACON COC Rapid Test-Spike Samples

Method		ACON COC Rapid Test		Total Results
	Results	Positive	Negative	
First Sign	Positive	59	2	61
	Negative	0	59	59
Total Results		59	61	120
% Agreement		100%	97%	98%

First Sign comparison with GC/MS at cutoff 300 ng/ml – Spiked Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign	Positive	59	2	61
	Negative	1	58	59
Total Results		60	60	120
% Agreement		98%	97%	97%

First Sign comparison with GC/MS at cutoff 300 ng/ml – Clinical Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign	Positive	26	0	26
	Negative	1	13	14
Total Results		27	13	40
% Agreement		96.3%	>99%	97.5%

Methamphetamine:

The First Sign Methamphetamine Urine Screening Test was compared to GC/MS at the claimed cut-off levels. Additionally, the performance of the first Sign was compared to marketed device, Acon mAMP Rapid Test and reference method (GC/MS). A combination of clinical and spiked samples were tested. The following Tables provide a summary of test results.

All samples tested (clinical and spiked)

	First Sign	Predicate Device	Between – 50% and cutoff	Between cutoff and + 50%	GC/MS Positive (> +50%)	% agreement with GC/MS
Positive	82	83	0	30	52	100%
Negative	78	77	58	4	0	94%

First Sign comparison with ACON mAMP Rapid Test-Spike Samples

Method		ACON mAMP Rapid Test		Total Results
	Results	Positive	Negative	
First Sign	Positive	57	0	57
	Negative	1	62	63
Total Results		58	62	120
% Agreement		98%	100%	99%

First Sign comparison with GC/MS at cutoff 1000 ng/ml – Spiked Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign	Positive	57	0	57
	Negative	3	60	63
Total Results		60	60	120
% Agreement		95%	100%	97.5%

First Sign comparison with GC/MS – Clinical Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign	Positive	25	0	25
	Negative	1	14	15
Total Results		26	14	40
% Agreement		96.1%	>99%	97.5%

Opiate:

The First Sign Morphine 300 Urine Screening Test was compared to GC/MS at the claimed cut-off levels. Additionally, the performance of the first Sign was compared to marketed device, Acon MOR Rapid Test and reference method (GC/MS). A combination of clinical and spiked samples were tested. The following Tables provide a summary of test results.

All samples tested (clinical and spiked)

	First Sign	Predicate Device	Between – 50% and cutoff	Between cutoff and + 50%	GC/MS Positive (> +50%)	% agreement with GC/MS
Positive	85	85	0	48	37	100%
Negative	75	75	41	1	0	98%

First Sign AMP comparison with ACON MOR 300 Rapid Test-Spike Samples

Method		**ACON Rapid Test**		**Total Results**
First Sign	**Results**	Positive	Negative	
	Positive	60	0	60
	Negative	0	60	60
Total Results		60	60	120
% Agreement		100%	100%	100%

First Sign comparison with GC/MS at cutoff 300 ng/ml – Spiked Samples

Method		**GC/MS**		**Total Results**
First Sign	**Results**	Positive	Negative	
	Positive	60	0	60
	Negative	0	60	60
Total Results		60	60	120
% Agreement		100%	100%	100%

First Sign comparison with GC/MS – Clinical Samples

Method		**GC/MS**		**Total Results**
First Sign	**Results**	Positive	Negative	
	Positive	25	0	25
	Negative	1	14	15
Total Results		26	14	40
% Agreement		96.1%	>99%	97.5%

Morphine 2000

The First Sign Amphetamine Urine Screening Test was compared to GC/MS at the claimed cut-off levels. Additionally, the performance of the first Sign was compared to marketed device, Acon MOR Rapid Test and reference method (GC/MS). A combination of clinical and spiked samples were tested. The following Tables provide a summary of test results.

All samples tested (clinical and spiked)

	First Sign	Predicate Device	Between – 50% and cutoff	Between cutoff and + 50%	GC/MS Positive (> +50%)	% agreement with GC/MS
Positive	70	70	1	33	36	99%
Negative	90	90	61	0	0	100%

First Sign comparison with ACON MOR 2000 Rapid Test-Spike Samples

Method		**ACON MOR 2000 Rapid Test**		**Total Results**
First Sign	**Results**	Positive	Negative	
	Positive	60	0	60
	Negative	0	60	60
Total Results		60	60	120
% Agreement		100%	100%	100%

First Sign comparison with GC/MS at cutoff 2000 ng/ml – Spiked Samples

Method		**GC/MS**		**Total Results**
First Sign	**Results**	Positive	Negative	
	Positive	60	0	60
	Negative	0	60	60
Total Results		60	60	120
% Agreement		100%	100%	100%

First Sign comparison with GC/MS at cutoff 2000 ng/ml– Clinical Samples

Method		**GC/MS**		**Total Results**
First Sign	**Results**	Positive	Negative	
	Positive	9	1	10
	Negative	0	30	30
Total Results		9	31	40
% Agreement		>99%	96.8%	97.5%

Phencyclidine:

The First Sign Phencyclidine Urine Screening Test was compared to GC/MS at the claimed cut-off levels. Additionally, the performance of the first Sign was compared to marketed device, Acon PCP Rapid Test and reference method (GC/MS). A combination of clinical and spiked samples were tested. The following Tables provide a summary of test results.

All samples tested (clinical and spiked)

	First Sign	Predicate Device	Between – 50% and cutoff	Between cutoff and + 50%	GC/MS Positive (> +50%)	% agreement with GC/MS
Positive	97	95	2	55	40	98%
Negative	61	63	46	2	0	96%

First Sign PCP comparison with ACON PCP Rapid Test-Spike Samples

Method		ACON PCP Rapid Test		Total Results
	Results	Positive	Negative	
First Sign	Positive	60	2	62
	Negative	0	58	58
Total Results		160	60	120
% Agreement		100%	97%	98%

First Sign PCP comparison with GC/MS at cutoff 25 ng/ml – Spiked Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign	Positive	60	2	62
	Negative	0	56	58
Total Results		60	60	120
% Agreement		100%	97.5%	98%

First Sign comparison with GC/MS at cutoff 25 ng/ml – Clinical Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign	Positive	35	0	35
	Negative	2	1	3
Total Results		37	1	38
% Agreement		94.6%	>99%	94.7%

Marijuana:

The First Sign Marijuana Urine Screening Test was compared to GC/MS at the claimed cut-off levels. Additionally, the performance of the first Sign was compared to marketed device, Acon THC Rapid Test and reference method (GC/MS). A combination of clinical and spiked samples were tested. The following Tables provide a summary of test results.

All samples tested (clinical and spiked)

	First Sign	Predicate Device	Between – 50% and cutoff	Between cutoff and + 50%	GC/MS Positive (> +50%)	% agreement with GC/MS
Positive	82	83	0	67	15	100%
Negative	78	77	45	3	0	94%

First Sign comparison with ACON THC Rapid Test-Spike Samples

Method		ACON THC Rapid Test		Total Results
	Results	Positive	Negative	
First Sign THC	Positive	58	0	58
	Negative	1	61	62
Total Results		59	61	120
% Agreement		98%	100%	99%

First Sign comparison with GC/MS at cutoff 50 ng/ml – Spiked Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign THC	Positive	58	0	57
	Negative	2	60	63
Total Results		60	60	120
% Agreement		98%	100%	98%

First Sign comparison with GC/MS at cutoff 50 ng/ml– Clinical Samples

Method		GC/MS		Total Results
	Results	Positive	Negative	
First Sign THC	Positive	24	0	24
	Negative	1	15	15
Total Results		25	15	40
% Agreement		96.0%	>99%	97.5%

b. Matrix comparison:
Not applicable. The assay is intended for only one sample matrix.

3. Clinical studies:
   a. Clinical sensitivity:
   Not applicable. Clinical studies are not typically submitted for this device type.
   b. Clinical specificity:
   Not applicable. Clinical studies are not typically submitted for this device type.
   c. Other clinical supportive data (when a and b are not applicable):
   Not applicable
4. Clinical cut-off:
   Not applicable.
5. Expected values/Reference range:
   Not applicable.

M. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalent decision.