



**Human Cardiovascular  
Disease Magnetic Bead  
Panel 5**

**96-Well Plate Assay**

**Cat. # HCVD5MAG-67K**

# **MILLIPLEX® MAP**

## **Human Cardiovascular Disease Magnetic Bead Panel 5 96-Well Plate Assay**

### **HCVD5MAG-67K**

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By purchasing this product, which contains fluorescently labeled microsphere beads authorized by Luminex® Corporation (“Luminex®”), you, the customer, acquire the right under Luminex®’s patent rights, if any, to use this product or any portion of this product, including without limitation the microsphere beads contained herein, only with Luminex®’s laser based fluorescent analytical test instrumentation marketed under the name of Luminex® 100™ IS, 200™, HTS, FLEXMAP 3D®, MAGPIX®.

## **MILLIPLEX® MAP Human Cardiovascular Disease Magnetic Bead Panel 5**

### **INTRODUCTION**

Cardiovascular disease is one of the major causes of death worldwide. Assessing the risk for cardiovascular disease is an important aspect in clinical decision making and setting a therapeutic strategy. The use of serological biomarkers may significantly facilitate risk factor identification. By exploring new applications of established biomarkers and new approaches to identify novel biomarkers, researchers continue to refine the mechanistic understanding of the biology of CVD diseases.

MILLIPLEX® MAP offers the broadest selection of analytes across a wide range of disease states and species. Once the analytes of interest have been identified, you can rely on the quality that we build into each kit to produce results you can trust. In addition to the assay characteristics listed in the protocol, other performance criteria evaluated during the validation process include: cross-reactivity, dilution linearity, kit stability, and sample behavior (e.g. detectability and stability).

Each MILLIPLEX® MAP panel and kit includes:

- Quality controls (QCs) provided to qualify assay performance
- Comparison of standard (calibrator) and QC lots to a reference lot to ensure lot-to-lot consistency
- Optimized serum matrix to mimic native analyte environment
- Detection antibody cocktails designed to yield consistent analyte profiles within panel

In addition each panel and kit meets stringent manufacturing criteria to ensure batch-to-batch reproducibility. The MILLIPLEX® MAP Human Cardiovascular Disease Magnetic Bead Panel 5 thus enables you to focus on the therapeutic potential of CVD. Coupled with the Luminex® xMAP® platform in a magnetic bead format, you receive the advantage of ideal speed and sensitivity, allowing quantitative multiplex detection of dozens of analytes simultaneously, which can dramatically improve productivity.

EMD Millipore's MILLIPLEX® MAP Human Cardiovascular Disease Magnetic Bead Panel 5 is part of the most versatile system available for CVD research. From our single to multiplex biomarker solutions, we partner with you to design, develop, analytically validate and build the most comprehensive library available for protein detection and quantitation.

- MILLIPLEX® MAP offers you:
  - The ability to choose any combination of analytes from our panel of 14 analytes to design a custom kit that better meets your needs.
  - A convenient "all-in-one" box format that gives you the assurance that you will have all the necessary reagents you need to run your assay.

EMD Millipore's MILLIPLEX® MAP Human Cardiovascular Disease Magnetic Bead Panel 5 is a 14-plex kit to be used for the simultaneous quantification of any or all of the following analytes in both *in vivo* and *in vitro* samples: Disintegrin and metalloproteinase domain-containing protein 15 (ADAM15), Mid region of proADM protein (MR-ProADM), Soluble scavenger receptor cysteine-rich type 1 protein M130 (sCD163), Cadherin-13 (CDH13), Chromogranin-A (CHGA), Heat shock protein 60 (HSP60), Insulin-like growth factor 1 receptor (IGF1R), Low-density lipoprotein receptor (LDLR), Leptin receptor (LEPR), Neurogenic locus notch homolog protein 1 (Notch1), Platelet-activating factor acetylhydrolase (PLA2G7), Prostaglandin-H2 D-isomerase (PTGDS), Soluble interleukin-1 receptor-like 1 (sST2), Syndecan 4 (SYND4).

***For Research Use Only. Not for Use in Diagnostic Procedures.***

***Please read entire protocol before use.***

***It is important to use same assay incubation conditions throughout your study.***

## PRINCIPLE

MILLIPLEX® MAP is based on the Luminex® xMAP® technology — one of the fastest growing and most respected multiplex technologies offering applications throughout the life-sciences and capable of performing a variety of bioassays including immunoassays on the surface of fluorescent-coded magnetic beads known as MagPlex®-C microspheres.

- Luminex® uses proprietary techniques to internally color-code microspheres with two fluorescent dyes. Through precise concentrations of these dyes, distinctly colored bead sets of 500 5.6 µm polystyrene microspheres or 80 6.45 µm magnetic microspheres can be created, each of which is coated with a specific capture antibody.
- After an analyte from a test sample is captured by the bead, a biotinylated detection antibody is introduced.
- The reaction mixture is then incubated with Streptavidin-PE conjugate, the reporter molecule, to complete the reaction on the surface of each microsphere.
- EMD Millipore provides three Luminex® instruments to acquire and analyze data using two detection methods:
  - The Luminex® analyzers Luminex® 200™ and FLEXMAP 3D®, flow cytometry-based instruments that integrate key xMAP® detection components, such as lasers, optics, advanced fluidics and high-speed digital signal processors.
  - The Luminex® analyzer (MAGPIX®), a CCD-based instrument that integrates key xMAP® capture and detection components with the speed and efficiency of magnetic beads.
- Each individual microsphere is identified and the result of its bioassay is quantified based on fluorescent reporter signals. EMD Millipore combines the streamlined data acquisition power of Luminex® xPONENT® acquisition software with sophisticated analysis capabilities of the new MILLIPLEX® Analyst 5.1, integrating data acquisition and analysis seamlessly with all Luminex® instruments.

The capability of adding multiple conjugated beads to each sample results in the ability to obtain multiple results from each sample. Open-architecture xMAP® technology enables multiplexing of many types of bioassays reducing time, labor and costs over traditional methods.

## STORAGE CONDITIONS UPON RECEIPT

- Recommended storage for kit components is 2 - 8°C.
- For long-term storage, freeze reconstituted standards and controls at  $\leq$  -20°C. Avoid multiple (>2) freeze/thaw cycles.
- **DO NOT FREEZE Antibody-Immobilized Beads, Detection Antibody, and Streptavidin-Phycoerythrin.**

## REAGENTS SUPPLIED

**Note: Store all reagents at 2 – 8°C**

Reagents Supplied	Catalog Number	Volume	Quantity
Human CVD Panel 5 Standard	HCVMG5-8067-5	Lyophilized	1 vial
Human CVD Panel 5 Quality Controls 1 and 2	HCVMG5-6067-5	Lyophilized	1 vial each
Serum Matrix Note: Contains 0.08% Sodium Azide	MXHSM-14	Lyophilized	1 vial
Set of one 96-Well Plate with 2 sealers	-----	-----	1 plate 2 sealers
Assay Buffer	L-AB	30 mL	1 bottle
Bead Diluent	LBD-4	3.5 mL	1 bottle
10X Wash Buffer Note: Contains 0.05% Proclin	L-WB	60 mL	1 bottle
Human CVD Panel 5 Detection Antibodies	HCVMG5-1067-5	3.2 mL	1 bottle
Streptavidin-Phycoerythrin	L-SAPE4	3.2 mL	1 bottle
Mixing Bottle	-----	-----	1 bottle

**Included Human Cardiovascular Disease Panel 5 Antibody-Immobilized Beads are dependent on customizable selection of analytes within the panel (see next page).**

## REAGENTS SUPPLIED (continued)

### Human Cardiovascular Disease Panel 5 Antibody-Immobilized Magnetic Beads:

Bead/Analyte Name	Luminex ® Magnetic Bead Region	Customizable 14 Analytes (20 X concentration, 200 µL)	
		Available	Cat. #
Anti-ADAM15 Beads	13	✓	HADAM15-MAG
Anti-MR-proADM Beads	15	✓	HADM-MAG
Anti-sCD163 Beads	25	✓	HS_CD163-MAG
Anti-CDH13 Beads	27	✓	HCDH13-MAG
Anti-CHGA Beads	29	✓	HCHGA-MAG
Anti-HSP60 Beads	39	✓	HHSP60-MAG
Anti-IGF1R Beads	43	✓	HIGF1R-MAG
Anti-LDLR Beads	45	✓	HLDLR-MAG
Anti-LEPR Beads	47	✓	HLEPR-MAG
Anti-Notch1 Beads	61	✓	HNTCH1-MAG
Anti-PLA2G7 Beads	63	✓	HPLA2G7-MAG
Anti-PTGDS Beads	65	✓	HPTGDS-MAG
Anti-sST2 Beads	67	✓	HSST2-MAG
Anti-SYND4 Beads	77	✓	HSYND4-MAG

## MATERIALS REQUIRED BUT NOT PROVIDED

### Reagents

1. Luminex® Sheath Fluid (EMD Millipore Catalog # SHEATHFLUID) or Luminex® Drive Fluid (EMD Millipore Catalog # MPXDF-4PK)

### Instrumentation / Materials

1. Adjustable Pipettes with Tips capable of delivering 25  $\mu$ L to 1000  $\mu$ L
2. Multichannel Pipettes capable of delivering 5  $\mu$ L to 50  $\mu$ L or 25  $\mu$ L to 200  $\mu$ L
3. Reagent Reservoirs
4. Polypropylene Microfuge Tubes
5. Rubber Bands
6. Aluminum Foil
7. Absorbent Pads
8. Laboratory Vortex Mixer
9. Sonicator (Branson Ultrasonic Cleaner Model # B200 or equivalent)
10. Titer Plate Shaker (VWR® Microplate Shaker Cat # 12620-926 or equivalent)
11. Luminex® 200™, HTS, FLEXMAP 3D®, or MAGPIX® with xPONENT® software by Luminex® Corporation
12. Automatic Plate Washer for magnetic beads (BioTek® 405 LS and 405 TS, EMD Millipore Catalog # 40-094, # 40-095, # 40-096, # 40-097 or equivalent) or Handheld Magnetic Separation Block (EMD Millipore Catalog # 40-285 or equivalent).

Note: If a plate washer or handheld magnetic separation block for magnetic beads is not available, one can use a microtiter filter plate (EMD Millipore Catalog # MX-PLATE) to run the assay using a Vacuum Filtration Unit (EMD Millipore Vacuum Manifold Catalog # MSVMHTS00 or equivalent with EMD Millipore Vacuum Pump Catalog # WP6111560 or equivalent).

## SAFETY PRECAUTIONS

- All blood components and biological materials should be handled as potentially hazardous. Follow universal precautions as established by the Centers for Disease Control and Prevention and by the Occupational Safety and Health Administration when handling and disposing of infectious agents.
- Sodium Azide or Proclin has been added to some reagents as a preservative. Although the concentrations are low, Sodium Azide and Proclin may react with lead and copper plumbing to form highly explosive metal azides. Dispose of unused contents and waste in accordance with international, federal, state, and local regulations.

**Note: See Full Labels of Hazardous components on next page.**

**Full Labels of Hazardous components:**

Ingredient, Cat #	Full Label
Human CVD Panel 5 Quality Controls 1 & 2	 <p><b>Danger.</b> Harmful if swallowed. Causes serious eye damage. Harmful to aquatic life with long lasting effects. Avoid release to the environment. Wear eye protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/ attention.</p>
Human CVD Panel 5 Standard	 <p><b>Danger.</b> Harmful if swallowed. Causes serious eye damage. Harmful to aquatic life with long lasting effects. Avoid release to the environment. Wear eye protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/ attention.</p>
Human CVD Panel 5 Detection Antibodies	 <p><b>Warning.</b> Causes serious eye irritation. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p>
Streptavidin- Phycoerythrin	 <p><b>Warning.</b> Causes serious eye irritation. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p>
10X Wash Buffer	 <p><b>Warning.</b> May cause an allergic skin reaction. Wear protective gloves. IF ON SKIN: Wash with plenty of soap and water.</p>
Bead Diluent	 <p><b>Warning.</b> Causes serious eye irritation. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</p>

## Full Labels of Hazardous components (continued):

Ingredient, Cat #	Full Label
Serum Matrix	<p>MXHSM-14</p>  <p><b>Danger.</b> Harmful if swallowed. Causes serious eye damage. Harmful to aquatic life with long lasting effects. Avoid release to the environment. Wear eye protection. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/ attention.</p>

## TECHNICAL GUIDELINES

To obtain reliable and reproducible results, the operator should carefully read this entire manual and fully understand all aspects of each assay step before running the assay. The following notes should be reviewed and understood before the assay is set up.

- FOR RESEARCH USE ONLY. NOT FOR USE IN DIAGNOSTIC PROCEDURES.
- Do not use beyond the expiration date on the label.
- Do not mix or substitute reagents with those from other lots or sources.
- The Antibody-Immobilized Beads are light sensitive and must be protected from light at all times. Cover the assay plate containing beads with opaque plate lid or aluminum foil during all incubation steps.
- It is important to allow all reagents to warm to room temperature (20-25°C) before use in the assay.
- Incomplete washing can adversely affect the assay outcome. All washing must be performed with the Wash Buffer provided.
- The standards prepared by serial dilution must be used within 1 hour of preparation. Discard any unused standards except the standard stock which may be stored at  $\leq -20^{\circ}\text{C}$  for 1 month and at  $\leq -80^{\circ}\text{C}$  for greater than one month.
- If samples fall outside the dynamic range of the assay, further dilute the samples with the appropriate diluent and repeat the assay.
- Any unused mixed Antibody-Immobilized Beads may be stored in the Mixing Bottle at 2-8°C for up to one month.
- During the preparation of the standard curve, make certain to mix the higher concentration well before making the next dilution. Use a new tip with each dilution.
- The plate should be read immediately after the assay is finished. If, however, the plate cannot be read immediately, seal the plate, cover with aluminum foil or an opaque lid, and store the plate at 2-8°C for up to 24 hours. Prior to reading, agitate the plate on the plate shaker at room temperature for 10 minutes. Delay in reading a plate may result in decreased sensitivity for some analytes.
- The titer plate shaker should be set at a speed to provide maximum orbital mixing without splashing of liquid outside the wells. For the recommended plate shaker, this would be a setting of 5-7 which is approximately 500-800 rpm.

## TECHNICAL GUIDELINES (continued)

- Ensure that the needle probe is clean. This may be achieved by sonication and/or alcohol flushes.
- When reading the assay on Luminex® 200™, adjust probe height according to the protocols recommended by Luminex® to the kit solid plate or to the recommended EMD Millipore filter plates using 3 alignment discs. When reading the assay on MAGPIX®, adjust probe height according to the protocols recommended by Luminex® to the kit solid plate or to the recommended EMD Millipore filter plates using 2 alignment discs. When reading the assay on FLEXMAP 3D®, adjust probe height according to the protocols recommended by Luminex® to the kit solid plate using 1 alignment disc.

For FLEXMAP 3D® when using the solid plate in the kit, the final resuspension should be with 150 µL Sheath Fluid in each well and 75 µL should be aspirated.

- For cell culture supernatants or tissue extraction, use the culture or extraction medium as the matrix solution in background, standard curve and control wells. If samples are diluted in Assay Buffer, use the Assay Buffer as matrix.
- For serum/plasma samples that require further dilution beyond 1:5, use the matrix (MXHSM-14) provided in the kit.
- For cell/tissue homogenate, the final cell or tissue homogenate should be prepared in a buffer that has a neutral pH, contains minimal detergents or strong denaturing detergents, and has an ionic strength close to physiological concentration. Avoid debris, lipids, and cell/tissue aggregates. Centrifuge samples before use.
- Vortex all reagents well before adding to plate.

## SAMPLE COLLECTION AND STORAGE

### A. Preparation of Serum Samples:

- Allow the blood to clot for at least 30 minutes before centrifugation for 10 minutes at 1000xg. Remove serum and assay immediately or aliquot and store samples at  $\leq$  -20°C.
- Avoid multiple (>2) freeze/thaw cycles.
- When using frozen samples, it is recommended to thaw the samples completely, mix well by vortexing and centrifuge prior to use in the assay to remove particulates.
- Serum samples should be diluted 1:5 in the assay buffer provided in the kit. For example, in a tube, 15 µL of serum may be combined with 60 µL of assay buffer. When further dilution beyond 1:5 is required, use Serum Matrix as the diluent.

### B. Preparation of Plasma Samples:

- Plasma collection using EDTA as an anti-coagulant is recommended. Centrifuge for 10 minutes at 1000xg within 30 minutes of blood collection. Remove plasma and assay immediately or aliquot and store samples at  $\leq$  -20°C.
- Avoid multiple (> 2) freeze/thaw cycles.
- When using frozen samples, it is recommended to thaw the samples completely, mix well by vortexing and centrifuge prior to use in the assay to remove particulates.

## SAMPLE COLLECTION AND STORAGE (continued)

- Plasma samples should be diluted 1:5 in the assay buffer provided in the kit. For example, in a tube, 15 µL of serum may be combined with 60 µL of assay buffer. When further dilution beyond 1:5 is required, use Serum Matrix as the diluent.

### C. Preparation of Tissue Culture Supernatant:

- Centrifuge the sample to remove debris and assay immediately or aliquot and store samples at  $\leq -20^{\circ}\text{C}$ .
- Avoid multiple ( $>2$ ) freeze/thaw cycles.
- Tissue culture supernatant may require a dilution with an appropriate control medium prior to assay. Tissue/cell extracts should be done in neutral buffers containing reagents and conditions that do not interfere with assay performance. Excess concentrations of detergent, salt, denaturants, high or low pH, etc. will negatively affect the assay. Organic solvents should be avoided. The tissue/cell extract samples should be free of particles such as cells or tissue debris.

### SPECIAL NOTE:

- Freeze/thaw cycles have a significant impact on sample values of many analytes in the panel. To assure the sample reading consistency, please use special care when handling the samples.
- Many analytes are temperature sensitive in the panel. Please use fresh thawed samples and avoid leaving samples at room temperature. Leaving thawed samples in  $4^{\circ}\text{C}$  overnight can also have a significant impact on sample readings.
- A maximum of 25 µL per well of diluted serum or plasma can be used. Tissue culture or other media may also be used.
- All samples must be stored in polypropylene tubes. **DO NOT STORE SAMPLES IN GLASS.**
- Avoid debris, lipids and cells when using samples with gross hemolysis or lipemia.
- Care must be taken when using heparin as an anti-coagulant since an excess of heparin will provide falsely high values. Use no more than 10 IU heparin per mL of blood collected.

## PREPARATION OF REAGENTS FOR IMMUNOASSAY

### A. Preparation of Antibody-Immobilized Beads

For individual vials of beads, sonicate each antibody-bead vial for 30 seconds; vortex for 1 minute. Add 150 µL from each antibody-bead vial to the Mixing Bottle and bring final volume to 3.0 mL with bead diluent. Vortex the mixed beads well. Unused portion may be stored at 2-8°C for up to one month. (Note: Due to the composition of magnetic beads, you may notice a slight color in the bead solution. This does not affect the performance of the beads or the kit.)

Example 1: When using 6 antibody-immobilized beads, add 150 µL from each of the 6 bead vials to the Mixing Bottle. Then add 2.1 mL Bead Diluent.

Example 2: When using 13 antibody-immobilized beads, add 150 µL from each of the 13 bead vials to the Mixing Bottle. Then add 1.050 mL Bead Diluent.

### B. Preparation of Quality Controls

Before use, reconstitute Quality Control 1 and Quality Control 2 with 250 µL deionized water. Invert the vial several times to mix and vortex. Allow the vial to sit for 5-10 minutes. Unused portion may be stored at  $\leq$  -20°C for up to one month.

### C. Preparation of Wash Buffer

Bring the 10X Wash Buffer to room temperature and mix to bring all salts into solution. Dilute 60 mL of 10X Wash Buffer with 540 mL deionized water. Store the unused portion at 2-8°C for up to one month.

### D. Preparation of Serum Matrix

**This step is required for serum or plasma samples only.**

Add 2.0 mL deionized water to the bottle containing lyophilized Serum Matrix. Mix well. Allow at least 10 minutes for complete reconstitution. Leftover reconstituted Serum Matrix should be stored at  $\leq$  -20°C for up to one month.

## PREPARATION OF REAGENTS FOR IMMUNOASSAY (continued)

### E. Preparation of Human CVD Panel 5 Standard

- 1.) Prior to use, reconstitute the Human CVD Panel 5 Standard with 250  $\mu$ L deionized water. Refer to table below for analyte concentrations. Invert the vial several times to mix. Vortex the vial for 10 seconds. Allow the vial to sit for 5-10 minutes. This will be used as Standard 7; the unused portion may be stored at  $\leq -20^{\circ}\text{C}$  for up to one month.

#### 2). Preparation of Working Standards

Label 6 polypropylene microfuge tubes Standard 1 through Standard 6. Add 150  $\mu$ L of Assay Buffer to each of the 6 tubes. Prepare serial dilutions by adding 50  $\mu$ L of the reconstituted standard to the Standard 6 tube, mix well and transfer 50  $\mu$ L of Standard 6 to the Standard 5 tube, mix well and transfer 50  $\mu$ L of Standard 5 to the Standard 4 tube, mix well and transfer 50  $\mu$ L of Standard 4 to the Standard 3 tube, mix well and transfer 50  $\mu$ L of Standard 3 to the Standard 2 tube, mix well and transfer 50  $\mu$ L of Standard 2 to the Standard 1 tube and mix well. The 0 pg/mL standard (Background) will be Assay Buffer.

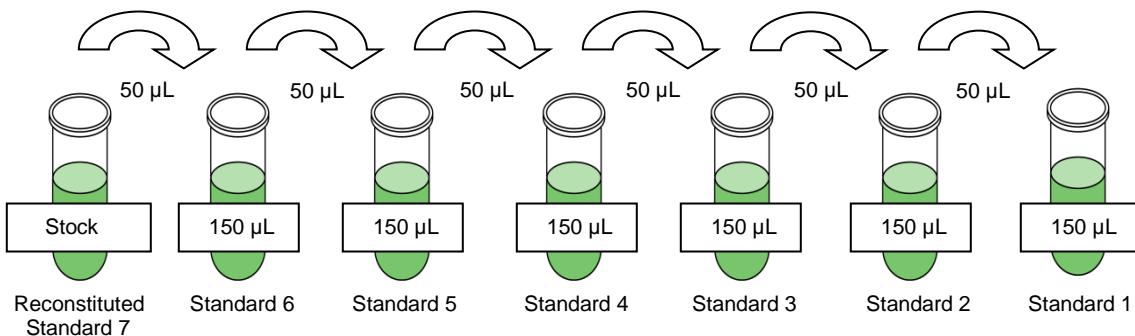
Standard #	Volume of Deionized Water to Add	Volume of Standard to Add
Standard 7	250 $\mu$ L	0

Standard #	Volume of Assay Buffer to Add	Volume of Standard to Add
Standard 6	150 $\mu$ L	50 $\mu$ L of Standard 7
Standard 5	150 $\mu$ L	50 $\mu$ L of Standard 6
Standard 4	150 $\mu$ L	50 $\mu$ L of Standard 5
Standard 3	150 $\mu$ L	50 $\mu$ L of Standard 4
Standard 2	150 $\mu$ L	50 $\mu$ L of Standard 3
Standard 1	150 $\mu$ L	50 $\mu$ L of Standard 2

## PREPARATION OF REAGENTS FOR IMMUNOASSAY (continued)

### Preparation of Standards Example 1 – 7 tubes



Standard	MR-ProADM, SYDN4 (pg/mL)	Notch1 (pg/mL)	PTGDS (pg/mL)	ADAM15, CDH13, CHGA (pg/mL)
Standard 1	4.88	9.77	24.4	48.8
Standard 2	19.5	39.1	97.7	195.3
Standard 3	78.1	156.3	390.6	781.3
Standard 4	312.5	625	1,563	3,125
Standard 5	1,250	2,500	6,250	12,500
Standard 6	5,000	10,000	25,000	50,000
Standard 7	20,000	40,000	100,000	200,000

Standard	sST2 (pg/mL)	LEPR, PLA2G7 (pg/mL)	CD163 (ng/mL)	HSP60, IGF1R (ng/mL)	LDLR (ng/mL)
Standard 1	97.7	195.3	0.24	0.49	1.95
Standard 2	390.6	781.3	0.98	1.95	7.81
Standard 3	1,563	3,125	3.91	7.81	31.3
Standard 4	6,250	12,500	15.6	31.3	125
Standard 5	25,000	50,000	62.5	125	500
Standard 6	100,000	200,000	250	500	2,000
Standard 7	400,000	800,000	1,000	2,000	8,000

## IMMUNOASSAY PROCEDURE

- Prior to beginning this assay, it is imperative to read this protocol completely and to thoroughly understand the Technical Guidelines.
- Allow all reagents to warm to room temperature (20-25°C) before use in the assay.
- Diagram the placement of Standards 0 (Background), Standard 1 through 7, Controls 1 and 2, and Samples on Well Map Worksheet in a vertical configuration. (Note: Most instruments will only read the 96-well plate vertically by default.) It is recommended to run the assay in duplicate.
- If using a filter plate, set the filter plate on a plate holder at all times during reagent dispensing and incubation steps so that the bottom of the plate does not touch any surface.

1. Add 200  $\mu$ L of Wash Buffer into each well of the plate. Seal and mix on a plate shaker for 10 minutes at room temperature (20-25°C).
2. Decant Wash Buffer and remove the residual amount from all wells by inverting the plate and tapping it smartly onto absorbent towels several times.
3. Add 25  $\mu$ L of each Standard or Control into the appropriate wells. Assay Buffer should be used for 0 pg/ml standard (Background).
4. Add 25  $\mu$ L of Assay Buffer to the sample wells.
5. Add 25  $\mu$ L of appropriate matrix solution to the background, standards, and control wells. When assaying serum or plasma, use the Serum Matrix. When assaying tissue culture or other supernatant, use proper control culture medium as the matrix solution.
6. Add 25  $\mu$ L of Sample (1:5 diluted plasma/serum or neat/diluted tissue or cell culture supernatant or lysate) into the appropriate wells.
7. Vortex Mixing Bottle and add 25  $\mu$ L of the Mixed Beads to each well. (Note: During addition of Beads, shake bead bottle intermittently to avoid settling.)
8. Seal the plate with a plate sealer. Wrap the plate with foil and incubate with agitation on a plate shaker overnight (16-18 hours) at 2-8°C.

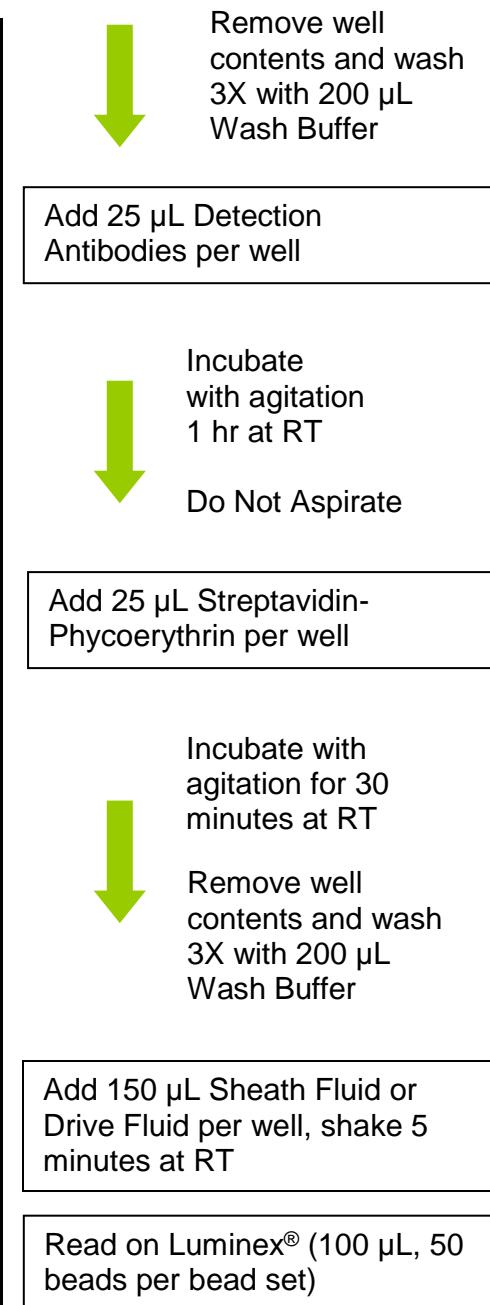
Add 200  $\mu$ L Wash Buffer per well

Shake 10 min, RT  
Decant

- Add 25  $\mu$ L Standard or Control to appropriate wells
- Add 25  $\mu$ L Assay Buffer to background and sample wells
- Add 25  $\mu$ L appropriate matrix solution to background, standards, and control wells
- Add 25  $\mu$ L appropriatelydiluted Samples to sample wells
- Add 25  $\mu$ L Beads to each well

Incubate with agitation overnight (16-18 hours) at 2-8°C

9. Gently remove well contents and wash plate 3 times following instructions listed in the **PLATE WASHING** section.
10. Add 25  $\mu$ L of Detection Antibodies into each well. (Note: Allow the Detection Antibodies to warm to room temperature prior to addition.)
11. Seal, cover with foil and incubate with agitation on a plate shaker for one hour at room temperature (20-25°C). **DO NOT ASPIRATE AFTER INCUBATION.**
12. Add 25  $\mu$ L Streptavidin-Phycoerythrin to each well containing the 25  $\mu$ L of Detection Antibodies.
13. Seal, cover with foil and incubate with agitation on a plate shaker for 30 minutes at room temperature (20-25°C).
14. Gently remove well contents and wash plate 3 times following instructions listed in the **PLATE WASHING** section.
15. Add 150  $\mu$ L of Sheath Fluid (or Drive Fluid if using MAGPIX®) to all wells. Resuspend the beads on a plate shaker for 5 minutes.
16. Run plate on Luminex® 200™, HTS, FLEXMAP 3D® or MAGPIX® with xPONENT® software.
17. Save and analyze the Median Fluorescent Intensity (MFI) data using a 5-parameter logistic or spline curve-fitting method for calculating analyte concentrations in samples. (Note: For diluted samples, final sample concentrations should be multiplied by the dilution factor. For samples diluted as per protocol instructions, multiply by 5. If using another dilution factor, multiply by the appropriate dilution factor.)



## PLATE WASHING

**If using a solid plate, use either a handheld magnet or magnetic plate washer.**

### 1.) Solid Plate

- A.) Handheld magnet (EMD Millipore Catalog # 40-285) - Rest plate on magnet for 60 seconds to allow complete settling of magnetic beads. Remove well contents by gently decanting the plate in an appropriate waste receptacle and gently tapping on absorbent pads to remove residual liquid. Wash plate with 200  $\mu$ L of Wash Buffer by removing plate from magnet, adding Wash Buffer, shaking for 30 seconds, reattaching to magnet, letting beads settle for 60 seconds and removing well contents as previously described after each wash. Repeat wash steps as recommended in Assay Procedure.
- B.) Magnetic plate washer (EMD Millipore Catalog # 40-094, # 40-095, # 40-096 and # 40-097) - Please refer to specific automatic plate washer manual for appropriate equipment settings. Please note that after the final aspiration, there will be approximately 25  $\mu$ L of residual wash buffer in each well. This is expected when using the BioTek plate washer and this volume does not need to be aspirated from the plate.

**If using an automatic plate washer other than BioTek® 405 LS or 405 TS, please refer to the manufacturer's recommendations for programming instructions.**

### 2.) Filter Plate (EMD Millipore Catalog # MX-PLATE)

If using a filter plate, use a vacuum filtration manifold to remove well contents. Wash plate with 200  $\mu$ L/well of Wash Buffer, removing Wash Buffer by vacuum filtration after each wash. Repeat wash steps as recommended in the Assay Procedure.

## EQUIPMENT SETTINGS

Luminex® 200™, HTS, FLEXMAP 3D®, and MAGPIX® with xPONENT® software:

These specifications are for the Luminex® 200™, Luminex® HTS, Luminex® FLEXMAP 3D®, and Luminex® MAGPIX® with xPONENT® software. Luminex® instruments with other software (e.g. MasterPlex®, StarStation, LiquiChip, Bio-Plex Manager™, LABScan™100) would need to follow instrument instructions for gate settings and additional specifications from the vendors for reading Luminex® magnetic beads.

For magnetic bead assays, the Luminex® 200™ and HTS instruments must be calibrated with the xPONENT® 3.1 compatible Calibration Kit (EMD Millipore Catalog # 40-275) and performance verified with the Performance Verification Kit (EMD Millipore Catalog # 40-276). The Luminex® FLEXMAP 3D® instrument must be calibrated with the FLEXMAP 3D® Calibrator Kit (EMD Millipore Catalog # 40-028) and performance verified with the FLEXMAP 3D® Performance Verification Kit (EMD Millipore Catalog # 40-029). The Luminex® MAGPIX® instrument must be calibrated with the MAGPIX® Calibration Kit (EMD Millipore Catalog # 40-049) and performance verified with the MAGPIX® Performance Verification Kit (EMD Millipore Catalog # 40-050).

**NOTE: When setting up a Protocol using the xPONENT® software, you must select MagPlex as the Bead Type in the Acquisition settings.**

**NOTE: These assays cannot be run on any instruments using Luminex® IS 2.3 or Luminex® 1.7 software.**

## EQUIPMENT SETTINGS (continued)

The Luminex® probe height must be adjusted to the plate provided in the kit. Please use Catalog # MAG-PLATE, if additional plates are required for this purpose.

Events:	50, per bead	
Sample Size:	100 $\mu$ L	
Gate Settings:	8,000 to 15,000	
Reporter Gain:	Default (low PMT)	
Time Out:	60 seconds	
Bead Set:	Customizable 14-plex Beads	
	ADAM15	13
	MR-ProADM	15
	sCD163	25
	CDH13	27
	CHGA	29
	HSP60	39
	IGF1R	43
	LDLR	45
	LEPR	47
	Notch1	61
	PLA2G7	63
	PTGDS	65
	sST2	67
	SYND4	77

## QUALITY CONTROLS

The ranges for each analyte in Quality Control 1 and 2 are provided on the card insert or can be located at the EMD Millipore website [emdmillipore.com](http://emdmillipore.com) using the catalog number as the keyword.

## ASSAY CHARACTERISTICS

### Cross-Reactivity

There was no or negligible cross-reactivity between the antibodies for an analyte and any of the other analytes in this panel.

### Assay Sensitivities (minimum detectable concentrations, ng/mL)

Minimum Detectable Concentration (MinDC) is calculated using MILLIPLEX® Analyst 5.1. It measures the true limits of detection for an assay by mathematically determining what the empirical MinDC would be if an infinite number of standard concentrations were run for the assay under the same conditions.

Analyte	Overnight Protocol (n = 14 Assays)	
	MinDC	MinDC+2SD
ADAM15 (pg/ml)	0.024	0.046
MR-ProADM (pg/ml)	0.017	0.021
sCD163 (ng/ml)	0.138	0.208
CDH13 (pg/ml)	0.015	0.027
CHGA (pg/ml)	0.023	0.039
HSP60 (ng/ml)	0.160	0.285
IGF1R (ng/ml)	0.133	0.211
LDLR (ng/ml)	1.498	1.984
LEPR (pg/ml)	0.049	0.068
Notch1 (pg/ml)	0.003	0.006
PLA2G7 (pg/ml)	0.070	0.133
PTGDS (pg/ml)	0.010	0.015
sST2 (pg/ml)	0.028	0.039
SYND4 (pg/ml)	0.012	0.015

## ASSAY CHARACTERISTICS (continued)

### Precision

Intra-assay precision is generated from the mean of the %CV's from 8 reportable results across two different concentrations of analytes in a single assay. Inter-assay precision is generated from the mean of the %CV's across two different concentrations of analytes across 14 different assays.

Analyte	Overnight Protocol	
	Intra-assay %CV	Inter-assay %CV
ADAM15	<10%	<15%
MR-ProADM	<10%	<15%
sCD163	<10%	<15%
CDH13	<10%	<15%
CHGA	<10%	<15%
HSP60	<10%	<15%
IGF1R	<10%	<15%
LDLR	<10%	<15%
LEPR	<10%	<15%
Notch1	<10%	<15%
PLA2G7	<10%	<15%
PTGDS	<10%	<15%
sST2	<10%	<15%
SYND4	<10%	<15%

### Accuracy

Spike Recovery: The data represent mean percent recovery of spiked standards ranging from low, medium, and high concentration in serum matrices (n=8).

Analyte	Overnight Protocol
	% Recovery in Serum Matrix
ADAM15	82%
MR-ProADM	97%
sCD163	88%
CDH13	82%
CHGA	86%
HSP60	71%
IGF1R	89%
LDLR	88%
LEPR	89%
Notch1	91%
PLA2G7	88%
PTGDS	87%
sST2	89%
SYND4	91%

## TROUBLESHOOTING GUIDE

Problem	Probable Cause	Solution
Insufficient bead count	Plate washer aspirate height set too low  Bead mix prepared inappropriately  Samples cause interference due to particulate matter or viscosity  Probe height not adjusted correctly	Adjust aspiration height according to manufacturers' instructions.  Sonicate bead vials and vortex just prior to adding to bead mix bottle according to protocol. Agitate bead mix intermittently in reservoir while pipetting this into the plate.  See above. Also sample probe may need to be cleaned with alcohol flushes, back flushes and washes; or, if needed, probe should be removed and sonicated.  When reading the assay on Luminex® 200™, adjust probe height to the kit solid plate or to the recommended EMD Millipore filter plates using 3 alignment discs. When reading the assay on MAGPIX®, adjust probe height to the kit solid plate or to the recommended EMD Millipore filter plates using 2 alignment discs. When reading the assay on FLEXMAP 3D®, adjust probe height to the kit solid plate using 1 alignment disc.  For FLEXMAP 3D® when using the solid plate in the kit, the final resuspension should be with 150 µL Sheath Fluid in each well and 75 µL should be aspirated.
Background is too high	Background wells were contaminated  Matrix used has endogenous analyte or interference  Insufficient washes	Avoid cross-well contamination by using sealer appropriately and pipetting with multichannel pipettes without touching reagent in plate.  Check matrix ingredients for cross-reacting components (e.g. interleukin modified tissue culture medium).  Increase number of washes.
Beads not in region or gate	Luminex® instrument not calibrated correctly or recently  Gate settings not adjusted correctly  Wrong bead regions in protocol template  Incorrect sample type used  Instrument not washed or primed  Beads were exposed to light	Calibrate Luminex® instrument based on manufacturer's instructions, at least once a week or if temperature has changed by >3°C.  Some Luminex® instruments (e.g. Bio-Plex®) require different gate settings than those described in the kit protocol. Use instrument default settings.  Check kit protocol for correct bead regions or analyte selection.  Samples containing organic solvents or if highly viscous should be diluted or dialyzed as required.  Prime the Luminex® instrument 4 times to rid it of air bubbles, wash 4 times with sheath fluid or water if there is any remnant alcohol or sanitizing liquid.  Keep plate and bead mix covered with dark lid or aluminum foil during all incubation steps.

## TROUBLESHOOTING GUIDE (continued)

Problem	Probable Cause	Solution
Signal for whole plate is same as background	Incorrect or no Detection Antibody was added  Streptavidin-Phycoerythrin was not added	Add appropriate Detection Antibody and continue.  Add Streptavidin-Phycoerythrin according to protocol. If Detection Antibody has already been removed, sensitivity may be low.
Low signal for standard curve	Detection Antibody may have been removed prior to adding Streptavidin-Phycoerythrin  Incubations done at inappropriate temperatures, timings or agitation	May need to repeat assay if desired sensitivity not achieved.  Assay conditions need to be checked.
Signals too high, standard curves are saturated	Calibration target value set too high  Plate incubation was too long with standard curve and samples	With some Luminex® instruments (e.g. Bio-Plex®) default target setting for RP1 calibrator is set at high PMT. Use low target value for calibration and reanalyze plate.  Use shorter incubation time.
Sample readings are out of range	Samples contain no or below detectable levels of analyte  Samples contain analyte concentrations higher than highest standard point  Standard curve was saturated at higher end of curve	If below detectable levels, it may be possible to use higher sample volume. Check with technical support for appropriate protocol modifications.  Samples may require dilution and reanalysis for just that particular analyte.  See above.
High variation in samples and/or standards	Multichannel pipette may not be calibrated  Plate washing was not uniform  Samples may have high particulate matter or other interfering substances  Plate agitation was insufficient  Cross-well contamination	Calibrate pipettes.  Confirm all reagents are removed completely in all wash steps.  See above.  Plate should be agitated during all incubation steps using an orbital plate shaker at a speed where beads are in constant motion without causing splashing.  Check when reusing plate sealer that no reagent has touched sealer. Care should be taken when using same pipette tips that are used for reagent additions and that pipette tip does not touch reagent in plate.

FOR FILTER PLATES ONLY		
Problem	Probable Cause	Solution
Filter plate will not vacuum	Vacuum pressure is insufficient  Samples have insoluble particles  High lipid concentration	Increase vacuum pressure such that 0.2 mL buffer can be suctioned in 3-5 seconds.  Centrifuge samples just prior to assay set-up and use supernatant.  After centrifugation, remove lipid layer and use supernatant.
Plate leaked	Vacuum pressure too high  Plate set directly on table or absorbent towels during incubations or reagent additions  Insufficient blotting of filter plate bottom causing wicking  Pipette touching plate filter during additions  Probe height not adjusted correctly  Sample too viscous	Adjust vacuum pressure such that 0.2 mL buffer can be suctioned in 3-5 seconds. May need to transfer contents to a new (blocked) plate and continue.  Set plate on plate holder or raised edge so bottom of filter is not touching any surface.  Blot the bottom of the filter plate well with absorbent towels after each wash step.  Pipette onto the side of plate wells.  Adjust probe to 3 alignment discs in well H6.  May need to dilute sample.

**REPLACEMENT REAGENTS****Catalog #**

Human CVD Panel 5 Standard	HCMG5-8067-5
Human CVD Panel 5 Quality Control	HCMG5-6067-5
Serum Matrix	MXHSM-14
Human CVD Panel 5 Detection Antibodies	HCMG5-1067-5
Streptavidin-Phycoerythrin	L-SAPE4
Assay Buffer	L-AB
10X Wash Buffer	L-WB
Bead Diluent	LBD-4
Set of two 96-Well plates with sealers	MAG-PLATE

**Antibody-Immobilized Magnetic Beads**

<u>Analyte</u>	<u>Bead #</u>	<u>Cat. #</u>
ADAM15	13	HADAM15-MAG
MR-ProADM	15	HADM-MAG
sCD163	25	HSCD163-MAG
CDH13	27	HCDH13-MAG
CHGA	29	HCHGA-MAG
HSP60	39	HHSP60-MAG
IGF1R	43	HIGF1R-MAG
LDLR	45	HLDDL-MAG
LEPR	47	HLEPR-MAG
Notch1	61	HNTCH1-MAG
PLA2G7	63	HPLA2G7-MAG
PTGDS	65	HPTGDS-MAG
sST2	67	HSST2-MAG
SYND4	77	HSYND4-MAG

## **ORDERING INFORMATION**

To place an order or to obtain additional information about our immunoassay products, please contact your Customer Service or Technical Support Specialist.

Contact information for each region can be found on our website:

[emdmillipore.com/contact](http://emdmillipore.com/contact)

### **Conditions of Sale**

For Research Use Only. Not for Use in Diagnostic Procedures.

### **Safety Data Sheets (SDS)**

Safety Data Sheets for EMD Millipore products may be downloaded through our website at [emdmillipore.com/msds](http://emdmillipore.com/msds).

### WELL MAP

	1	2	3	4	5	6	7	8	9	10	11	12
A	0 Standard (Background)	Standard 4	QC-1 Control									
B	0 Standard (Background)	Standard 4	QC-1 Control									
C	Standard 1	Standard 5	QC-2 Control									
D	Standard 1	Standard 5	QC-2 Control									
E	Standard 2	Standard 6	Sample 1									
F	Standard 2	Standard 6	Sample 1									
G	Standard 3	Standard 7	Sample 2									
H	Standard 3	Standard 7	Sample 2									