



STK

Serine Threonine Kinase Assay

Serine Threonine Kinase Assay on PamStation®12
Version 11.0

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Contents

1	Introduction	4
1.1	Intended use.....	4
1.2	Description of the assay.....	4
1.3	Quick guide	5
2	Kinase activity profiling protocol	6
2.1	Sample preparation	6
2.2	Materials.....	6
2.2.1	Preparation of experiment	7
2.2.2	Preparation of solutions.....	7
2.2.3	Assay Protocol.....	8
3	Tips and Tricks:	12
3.1	Assay	12
3.2	Lysates.....	12
3.3	Kinase Inhibitors	12
3.4	Recombinant kinases.....	13
4	Detailed information for running an experiment	14
5	Support	16
6	Rights and restrictions	17
6.1	Intellectual property rights	17
6.2	Trademarks	17
6.3	Disclaimer.....	17

1 INTRODUCTION

1.1 Intended use

The serine threonine kinase assay on PamChip® arrays on the PamStation®12 instrument is used to determine serine threonine kinase activity of recombinant kinases or kinases in lysates from tissues and cells and is intended for research purposes only.

1.2 Description of the assay

The serine threonine kinase assay performed on PamChip® arrays on the PamStation®12 is a flow-through microarray assay to determine the activity of serine threonine kinases. The phosphorylation activity is determined using peptides immobilized on the PamChip® arrays (Figure 1). The phosphorylation activity is detected with a fluorescently labelled antibody and recorded by a CCD-camera in the PamStation®12. The PamStation®12 is specifically intended for the processing of one to three PamChip®4 microarrays. Both the instrument and the PamChip® microarrays are products of PamGene International B.V. A schematic diagram of the assay is shown in Figure 1. During the assay, the assay mix is pumped up and down through the porous 3D arrays. The progress of the reaction in time is indicated in (pump) cycles. Figure 1 indicates the cycle numbers found for the images.

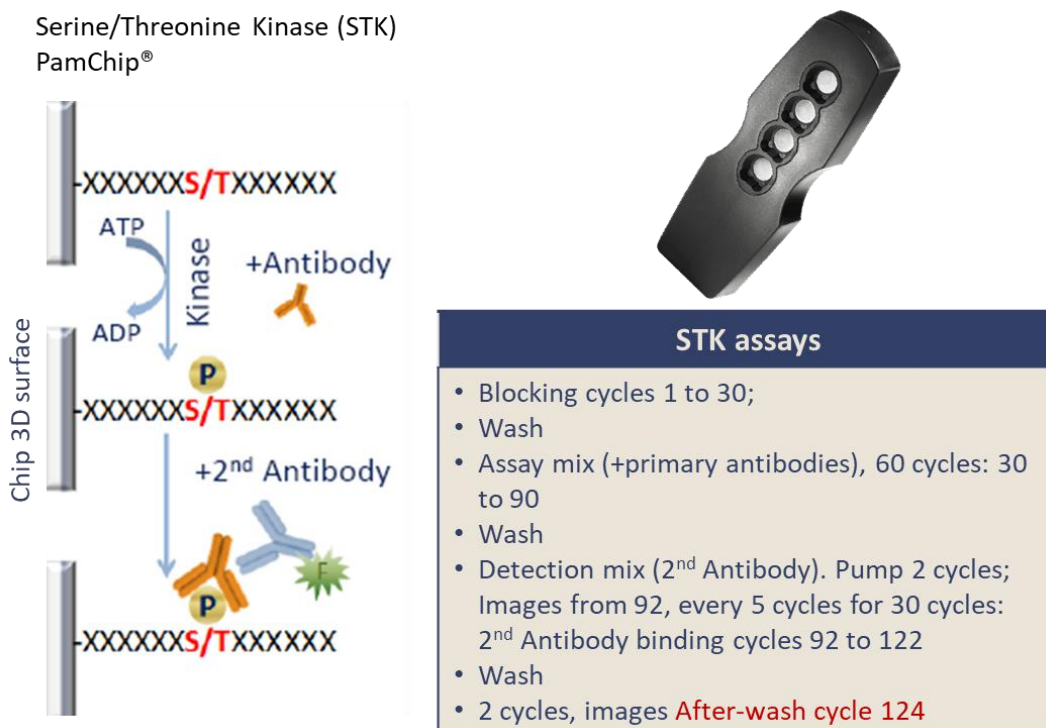


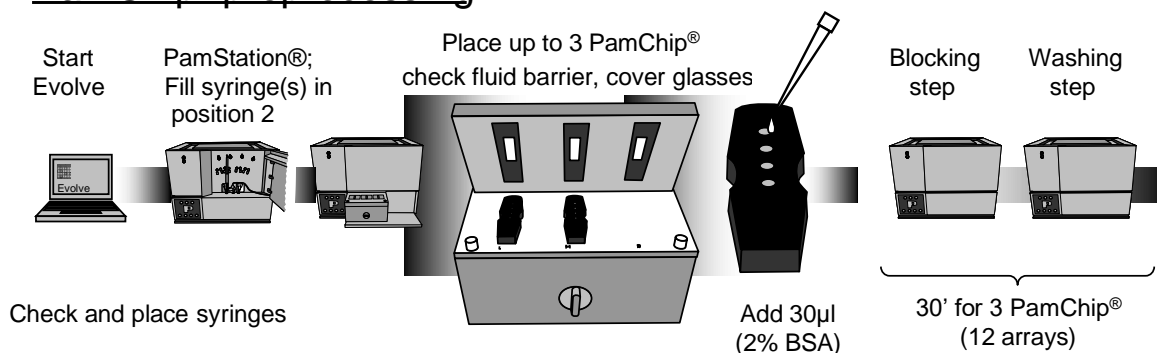
Figure 1 : The STK assay. Schematic diagram of the serine threonine kinase (STK) assay (left); PamChip®4 microarray (right, top); Cycle numbering using the standard EVOLVE STK assay protocols (right, bottom)

Notes:

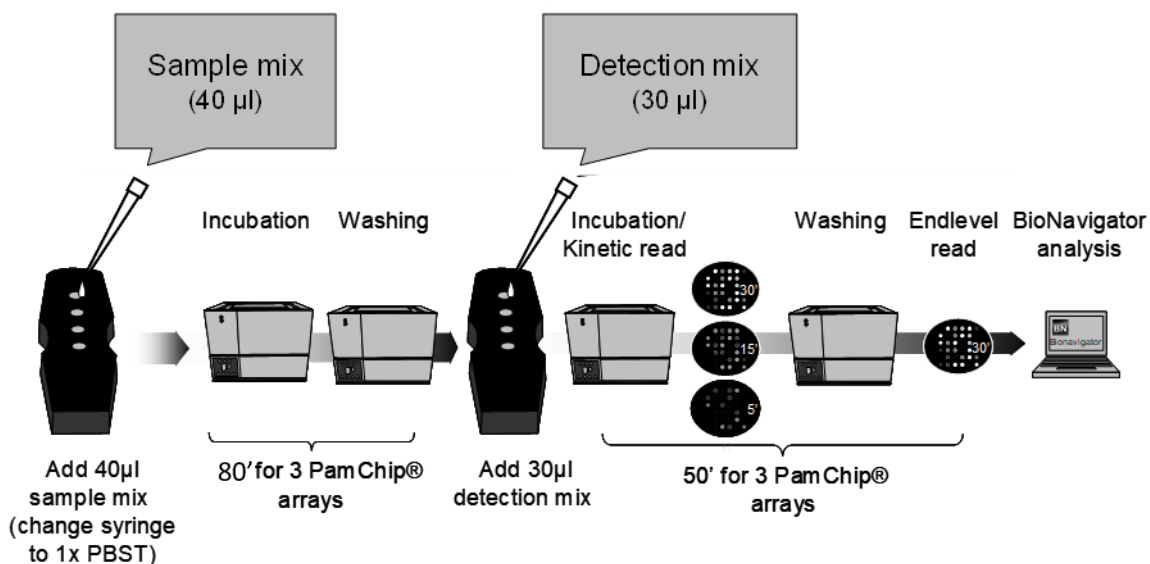
- Please refer to the PamStation®12 Operator Manual for details related to instrument procedures.
- Please refer to the BioNavigator Manual for details related to image quantification and data analysis.

1.3 Quick guide

PamChip® preprocessing



Sample; kinase activity profiling



2 KINASE ACTIVITY PROFILING PROTOCOL

2.1 Sample preparation

Prepare lysates according to PamGene protocols for Sample Preparation available on our website: <https://pamgene.com/ps12/>. For additional protocols or questions, contact us at support@pamgene.com.

2.2 Materials

Material/Equipment	Supplier	Catalog No.	Storage
PamStation®12 System	PamGene	31500	N/A
Serine threonine Kinase PamChip®	PamGene	32501 or 32517	+4°C
STK reagent kit	PamGene	32201 or 32202	-20°C
M-PER™ Mammalian Extraction Buffer	Thermo Fischer Scientific	78503, 78501 or 78505	RT
Halt™ Phosphatase Inhibitor Cocktail (100x)	Thermo Fischer Scientific	78428	+4°C
Halt™ Protease Inhibitor Cocktail, EDTA free (100x)	Thermo Fischer Scientific	78437	+4°C
Water (ultrapure grade or equivalent)	Various suppliers		RT

STK detection antibody:

- Upon first use and recommended before each use: Spin the stock solution for 10 minutes at maximum speed (16.000 x g) in a pre-cooled centrifuge at +4°C to spin down fluorescent aggregates¹
- Carefully pipette from the supernatant layer
- Store at temperature listed on tube label protected from light

¹ Fluorescent aggregates may occur upon shipment or storage of the antibody solution.

2.2.1 Preparation of experiment

- For assays with **kinase inhibitors** and assays with **recombinant kinases**, See Section 3 Tips and Tricks
- Prepare the experimental setup, considering the desired analysis of data, following guidelines provided²
- Prepare a pipetting scheme for the preparation of the Assay “Basic mix” (e.g. mastermix). Use one of the pipetting schemes (assay calculation sheets) provided³
- For each new run, a fresh Assay “Total mix” (e.g. Assaymix) should be prepared, just prior to loading the samples onto the array. This step is to make sure that the Kinase and ATP are combined at the latest time prior to adding to arrays
- As shown in the excel sheet, multiply the volumes shown in the table with the number of arrays and add at least 10% (e.g. 4 arrays, multiply volumes with 4.4) to account for pipetting losses
- As shown in the Excel sheet, prepare a pipetting scheme for the dilutions of the lysate samples “Samplemix” with 10x Inhibitor in M-PER solution and M-PER
- Prepare the information needed for the annotation of the samples

2.2.2 Preparation of solutions

The following solutions must be prepared fresh and can be used for one day. Keep all solutions on ice.

- **1x PK wash buffer:**
 - Dilute 300 µl of 10x PK buffer with ultrapure water to a final volume of 3.0 ml
 - Use the remaining 100 µl 10x PK buffer for the preparation of the Assay “Basic mix”
- **ATP solution (4 mmol/l or 0.5 mmol/l)**
 - Dilute 4 µl ATP stock solution (100 mmol/l) with 96 µl ultrapure water to a final volume of 100 µl
 - or
 - Dilute 1 µl ATP stock solution (100 mmol/l) with 199 µl ultrapure water to a final volume of 200 µl (e.g. when using kinase inhibitors in the assay)
- **1x PBS/0.01% Tween:**
 - Dilute 300 µl of 10x PBST with water to a final volume of 3.0 ml

² <https://pamgene.com/ps12/> (Assay information - Experimental Design section)

- **M-PER with protease and phosphatase inhibitors**
 - 10x Inhibitors in M-PER solution: Add 2 µl Protease Inhibitor Cocktail (100x) and 2 µl Phosphatase Inhibitor Cocktail (100x) to 16 µl of M-PER

2.2.3 Assay Protocol

Pre-processing:

- Leave the closed pouch with PamChip® arrays 10 minutes at room temperature before opening
- Check the waste bottle and empty if needed
- Start PC and PamStation®12 system
- Start Evolve software
- Open the Evolve Runner application. Press “Initialize” button
- Open supplied Evolve protocol (e.g., 1300STKlysvXX.PS12Protocol)
- Fill a syringe with 1x PK wash buffer, check that the needle is not clogged, that it dispenses properly and does not leak. Place the syringe in position 2 (see Evolve protocol)
- Start protocol by pressing the “Run” button
- Select the one, two or three PamChip® arrays that will be tested. Use chips from the same production batch (e.g., 710227608). Check on the box that you have the correct type of PamChips (STK)
- Enter the barcode and select the appropriate article number (see PamChip® pouch)
- Open the PamChip Annotator and annotate your samples. This can also be done during or after the run
- Press “OK”
- Press the “Load” button and the incubator will appear
- Check fluid barriers and replace when a well has turned white
- Check the cover glasses and clean with a (moist) dust free cloth. Dry and replace in instrument with indication “TOP” on top

Blocking:

- Place 1-3 Serine threonine Kinase PamChip® arrays in the incubator on the place indicated by the barcodes
- Apply 30 µl of 2% BSA to the middle of each array by reverse pipetting. Do not touch the surface of the arrays with pipette tip!
- Press the “Load” button

Note: During blocking and washing procedure, Assay “Basic mix” and samples can be prepared

Prepare the “Lysate dilution mix”:

- After thawing on ice, the lysates must be centrifuged for 5 minutes at >10.000 x g at +4°C to remove precipitates.
- Calculate the sample volume required per array (based on desired total protein per array; usually 1 µg per array). Excel worksheets are provided to prepare the “Lysate/Sample dilution mix”⁴. First, pipet 1 µl of the 10x inhibitor in M-PER solution to this tube. Then, add M-PER (without inhibitor) to make a total volume of 9 µl.
- Store “Lysate dilution mix” on ice.
- To account for pipetting, extra volumes are factored in, as shown in Assay calculation sheets⁴.

Prepare the Assay “Basic mix”:

- Prepare the Assay “Basic mix” according to the Table, without the “Lysate dilution mix”. Excel worksheets are provided to prepare the Basic mix³ (with at least 10% extra to account for pipetting losses, See Section 2.2.1). Add components in the order indicated in the Table and keep on ice.

Mix gently, do not vortex

Solution	Volume (µl) for 1 array
Water	21 (Make to 30 µl)
10x PK buffer	4
100x BSA solution	0.4
STK Ab mix	0.46
4 mM ATP ⁴	4
Sample (“Lysate dilution mix”)	10
Total Volume	40

Prepare the Assay “Total mix”:

- To the “Lysate dilution mix”, in labelled tubes on ice, add the Assay “Basic mix”, according to the assay set up, as shown in the Excel assay calculation sheets⁴. Keep on ice.
- “Total mix” should be prepared, just prior to loading the samples onto the array.

³ <https://pamgene.com/ps12/> (Assay Information - STK section)

⁴ For assays with kinase Inhibitors and assays with recombinant kinases, See Section 3 Tips and Tricks

Continue the assay run after blocking Step

- Press the “Load” button to unload the incubator
- Apply 40 µl complete Assay “Total mix” per array
- Press the “Load” button and the assay run is started

Switch the syringe

- After the above step has started, fill a syringe with 1x PBS/0.01% Tween buffer, check that the needle is not clogged, that it dispenses properly and does not leak.
- Place the syringe in position 2 (see Evolve protocol)

Prepare Detection mix

- Prepare the Detection mix according to the instructions in the Table and keep on ice. Excel worksheets are provided to prepare the Detection mix⁵
- For each run, a fresh Detection mix should be prepared, just prior to loading the Detection mix onto the arrays
- Multiply the volumes in the table with the number of arrays and add 10 % (For 4 arrays, multiply volumes with 4.4) to account for pipetting losses

Check STK reagent kit catalog number before preparing Detection mix

	STK reagent kit Cat. # 32201	STK reagent kit Cat. # 32202
Solution	Volume (µl)	Volume (µl)
Water	26.6	25.1
10x Ab buffer	3	3
STK Ab FITC	0.4	1.9
Total Volume	30	30

Continue the assay run after incubation of the Assay “Total mix”

- After the incubation with Assay “Total mix” is done, press the “Load” button to unload the incubator
- Apply 30 µl of Detection mix per array
- Press the “Load” button and the run is continued
- After completion of the run, press the “Load” button and remove the PamChips.

⁵ <https://pamgene.com/ps12/> (Assay information - STK section)

End of day procedure

- See Section 4 and the Operator Manual for details
- Discard the 1x PK wash buffer and PBST in the syringes
- Clean syringe according to protocol
- Rinse the barrel and plunger with ultrapure water. Repeat this process 3 times
- Dry needle, syringe and barrel thoroughly before storing, preferably by using compressed air
- Empty and rinse waste bottle
- Replace the fluid barrier if one of the wells has turned white
- Clean cover glasses if necessary

Safety & Precautions

- For equipment: see Operator Manual
- For materials: see supplier's information

Cleaning tools and equipment

- For equipment: see Operator Manual

3 TIPS AND TRICKS

3.1 Assay

- The arrays are made of very brittle material. Do not touch the arrays with the pipette tip to prevent breaking
- Samples (Assay “Total mix”) should be applied within 15 minutes after the blocking and wash steps
- Complete drying of arrays after blocking affects assay performance negatively. When a long time passes between washing and application of the Assay “Total mix”, the arrays may dry completely (white appearance). When it is expected that the time between the end of the washing step and application of Assay “Total mix” will be more than 15 minutes, the PamChip®4 disposable(s) may be removed from the instrument and stored in the original pouch to prevent further drying

3.2 Lysates

- Lysates can be very sensitive to freeze-thaw cycles. Preferably use a never thawed aliquot for every experiment
- Routinely 0.5-2 µg protein per array is used in STK assay
- When more than 2 µg protein per array is used, the signal intensity may not be linear with sample input
- As a control for occurrence of non-specific binding of the antibodies to peptides, an assay without ATP or the addition of a generic kinase inhibitor like staurosporin (10 µM final concentration) can be performed

3.3 Kinase Inhibitors

- The assay set up/calculation files can be found from the link provided in Section 2.2.1 or on request (Email: support@pamgene.com)
- When working with (ATP competitive) kinase inhibitors, the assay is performed with 50 µM ATP. ATP is not added to the Assay “Basic mix” but later to the “Total mix”
- Most kinase inhibitors are dissolved at a concentration of 10 mM in DMSO (recommended). Check for precipitates. These stock solutions can be stored according to the supplier’s instructions
- Shortly before the assay, dilute the kinase inhibitor in DMSO to yield a solution of 50x the final assay concentration. Prepare an Assay “Total mix” where 0.8 µl is reserved for DMSO or Inhibitor in DMSO. Add sample just before application onto the arrays

- The final DMSO concentration in the assay should not exceed 2%
- Some inhibitors bind slowly to the kinase. To assure proper binding, add the inhibitor before adding ATP

3.4 Recombinant kinases

- Recombinant kinases can be used in the assay. They can be diluted with 1x PK buffer. The M-PER can be replaced by ultrapure water
- For a recombinant kinase the optimal kinase input must be determined by testing a concentration series of the kinase. Since the sensitivity of the PamChip® assay is similar to a radioactive assay, the input suggested by the supplier is a good starting point. When such information is not available, 2, 20 and 200 ng per array can be tested to determine the optimal concentration. As control, an incubation without ATP must be performed to show ATP dependency of the reaction
- When preparing a concentration series of a kinase, one assay master mix containing the highest concentration kinase is made and one without kinase. The latter is used to dilute the kinase containing assay master mixture. This method avoids errors due to variation in pipetting small volumes
- Since recombinant kinases may be sensitive to freeze–thaw cycles, the recombinant kinases must be treated according to the instruction of the manufacturer. In many cases, aliquoting of the recombinant kinases is suggested to avoid freeze–thaw cycles
- Sample assay calculation sheets provided⁶ can be adapted to your assay set-up

⁶ <https://pamgene.com/ps12/> (Assay Information - STK section)

4 DETAILED INFORMATION FOR RUNNING AN EXPERIMENT

- Make sure the instrument and the PC are connected properly as described in the Operator Manual of the PamStation®12
- Periodically check the available free disk space on the computer (~400 Mb per run)

Waste bottle

- Before starting an assay, check that the waste bottle is empty and that it is attached in the proper way to the instrument (screwed to the red cap). The waste bottle must be positioned straight in the dedicated holder at the right-hand side of the instrument. Make sure that the tubes to the waste bottle are not blocked by the door
- At the end of the run(s) empty the waste bottle by unscrewing the glass part of the bottle. Dispose of the contents in the appropriate way. Check that the inlets in the lid of the bottle are clean
- There is no sensor to warn of a full waste bottle. If the bottle is full, aspiration errors might occur and the aspiration pump can be damaged

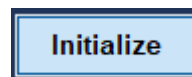
Syringes

- Preparation of the syringes: A syringe comprises of three parts; a needle, a glass barrel and a stainless-steel plunger. Assembly is done by attaching the needle with its Luer-Lock to the barrel.
Needles are included with any PamChip purchase, only use the dispense needle in combination with the PamChip box it was delivered with. Each needle should not be used more than 5 assays.
- When assembled as described above, fill the syringe with 3 ml 1x PK wash buffer. Place the plunger in the barrel. Remove any air bubbles in the syringe. Check that the needle of the syringe is not clogged and not leaking.
- If not ok, replace the needle, and test again as described above. If ok, place it inside the instrument in the 2nd position (according to the Evolve protocol)
Needles must be handled with care. It is very important to clean the needles as soon as possible after use to prevent clogging by crystallization of salts.
- For further preparation and cleaning of the syringe see Operator Manual

PamStation®12

The PamChip® assays come with standard protocol(s) for running PTK or STK kinase assays with cell lysates or recombinant kinases on PamStation®12. The PamStation®12 Operator Manual can be consulted for designing custom protocols. For running existing protocols, the Protocol Runner can be used. For creating or adapting existing protocols the Protocol Editor can be used (see Operator Manual).

- After opening the Evolve software and Evolve Runner application, the “Initialize” button appears. Press the “Initialize” button to connect the PC to the PamStation®12



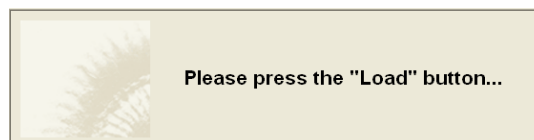
- Open the supplied Evolve protocol (e.g. 1300STKlysvXX.PS12Protocol)
- A large green “Run” button will pop-up. Click on the green “Run” button to start the protocol



- At the end of the protocol, this button will change into a red “Stop” button. While this red button can be used to stop a protocol at any time, it should only be used in case of emergency (see Operator Manual for further instructions)



- The protocol will always start with a “Load” step. During the “Load” step the instrument will ask the operator to press the “Load” button



- During the “Load” step in the Evolve protocol:
Check the fluid barriers
Clean the cover glasses

Fluid barriers

- Fluid barriers are filled with a liquid absorbing material to prevent liquid from entering the PamStation in case of a leaking or broken array. The material turns white when it becomes wet. Check that the fluid barriers are in place. A fluid barrier must be replaced when one of the wells has turned white. For more information see Operator Manual

Cover glasses

- Check before every experiment that the cover glasses are clean, by taking them out of the wagon and inspecting for irregularities
- When the wagon is in the unload position, pull the cover glass gently from the wagon
- Clean it with water and a piece of dust free optical quality cloth. Replace the cover glass with the TOP side up. This side contains the word "TOP"

5 SUPPORT

PamGene aims to provide total support to enable customers to fully realize the benefits of the PamGene technology and to maximize use of the PamStation®12 system.

The software components and data handling are essential interfaces to the system and are supported by a dedicated software support team through email, telephone and on-site visits, if required.

Please contact support on:

☎ +31 (0)73 615 89 00

✉ support@pamgene.com

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6 RIGHTS AND RESTRICTIONS

6.1 Intellectual property rights

The use of PamChip® microarrays is licensed, among others, under patent and patent applications issued to PamGene International B.V.

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6.2 Trademarks


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6.3 Disclaimer


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