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Storm System

The standard in gel, blot, and
macroarray analysis



imagination at work



Three detection capabilities— united in one system

Storm™ Gel and Blot Imaging System unites superior storage phosphor autoradiography technology with two nonradioactive detection capabilities. Make the move to fluorescence gel and blot analysis methods without giving up popular radioisotope techniques. Storm system gives you proven PhosphorImager™ capability for autoradiography, direct fluorescence for nucleic acid and protein gel analysis, plus chemifluorescence for fast blot analysis—without exposures (Fig 1).

Based on proven performance

Storm system is known as the standard in gel, blot and macro-array analysis. Built on the technology of the first PhosphorImager system introduced by Molecular Dynamics in 1989, Storm system seamlessly merges world-class, filmless autoradiography with fluorescence technology. The wide, linear dynamic range of the PhosphorImager system yields useful data at every exposure intensity, enabling researchers to visualize and quantitate data from their gels and blots on the first try—even if there are both strong and weak bands on the same sample.

Storm imager maintains this level of data quality, and offers the same wide, linear dynamic range that PhosphorImager users have come to rely upon for their research. Now—along with high-resolution images, short scan times, large format capability, powerful software, and intuitive operation—Storm captures accurate data from radioisotopes, direct fluorescence, and chemifluorescence (Fig 2).

Intuitive operation

With Storm system, it doesn't matter whether you're using autoradiography, direct fluorescence, or chemifluorescence—you load and scan your sample the same way. Simply place your gel, blot, or storage phosphor screen on the glass platen; then point-and-click on the scan control window to start your scan. ImageQuant™ TL Image Analysis Software, included with Storm system, provides a consistent cross-platform user interface along with powerful data analysis and reporting capabilities.

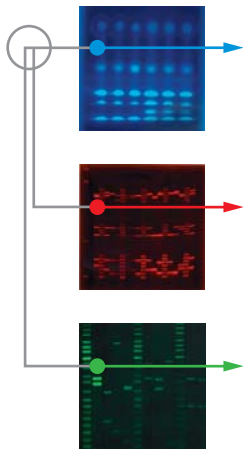


Fig 1. Storm system's unique VMI architecture enables the integration of multiple stimulation and detection wavelength capabilities in a single compact optical component.

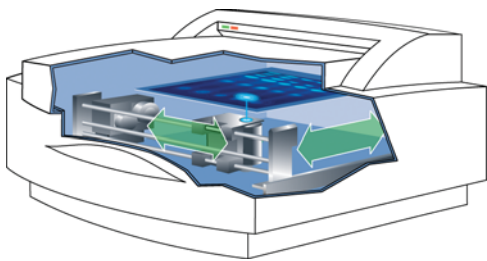


Fig 2. Storm system's mechanical and electro-optical design enable both high sensitivity and high resolution at fast scanning speeds.

Storm System selection guide

Storm System	Storage phosphor autoradiography	Direct red-excited fluorescence	Direct blue-excited fluorescence
820	●		
830	●	●	
840	●		●
860	●	●	●

Storm System applications

	Storage phosphor	Direct fluorescence	Chemifluorescence
1-D Protein gels	●	●	
2-D Protein gels	●	●	
AFLP	●	●	
Band shift assays	●	●	
Carbohydrate analysis	●	●	
CAT assays	●	●	
Colony hybridization	●		
DNA footprinting	●	●	
DNA quantitation	●	●	●
DNA sequencing	●	●	
DNA typing	●	●	●
Dot blots	●	●	●
Enzyme assays	●	●	●
In-vitro transcription	●	●	
Kinase assays	●	●	
Library screening	●		●
Macroarrays	●	●	
Microsatellite mapping	●	●	
Northern blotting	●		●
Plaque lifts	●		●
Primer extension	●	●	
Protein quantitation	●	●	
RAPD	●	●	
Reporter gene assays	●	●	
Restriction mapping	●	●	
RFLP	●		●
RNA quantitation	●	●	●
Rnase protection	●		
RT-PCR	●	●	
S1 Mapping	●		
Slot blots	●	●	●
Southern blotting	●		●
SSCP	●	●	
Short tandem repeat	●	●	
TLC	●	●	
Western blotting	●	●	●
Whole-body autoradiography	●		
VNTR	●	●	●

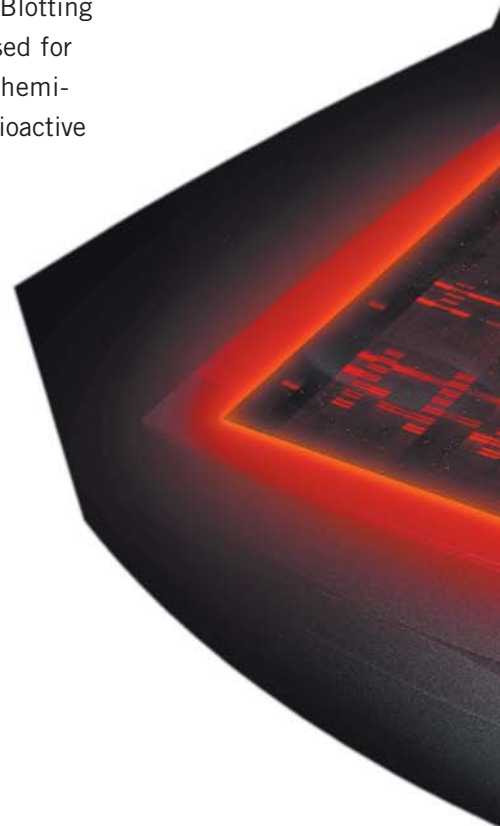
Direct access to all your data

The three-in-one functionality that Storm system provides also gives you the added convenience of having all your data and results saved in one place and in a common format. Simultaneously review and compare all the gels, blots, and autorads related to a single project, and print out your results for documentation or publication. You can also electronically archive your data and results, organized by project, for quick retrieval and review.

Better blot analysis with ECL Plus and chemifluorescence

ECL Plus™ Western blot imaging system yields high sensitivity images on Storm imager. Storm system delivers additional non-radioactive Southern, Northern, and Western blot imaging through the technology of chemifluorescence. With Storm imager, chemifluorescence is fast and sensitive. DNA and protein samples visualized by chemifluorescence are scanned directly in the Storm system without any exposures to film or storage phosphor screens. The fluorescent product of chemifluorescence is long-lived, so it won't die out before you get your data.

Chemifluorescence works with both nucleic acid and protein blots and is also compatible with strip and re-probe procedures. Blotting protocols for chemifluorescence are very similar to those used for chemiluminescence, but use a different final substrate. Chemifluorescence using ECF™ Western Blotting Kit makes nonradioactive blot analysis simple, direct, and convenient.





Storage phosphor autoradiography

Built-in PhosphorImager system functionality

With Storm system, even as you adopt nonradioactive alternatives, you can continue to use popular radioisotope labeling and detection methods.

Publication-ready data in one-tenth the time

Storm uses storage phosphor screens instead of film to capture quantitative data from radioactive gels and blots (Fig 3). A choice of screens to detect different isotopes is available (Fig 4). Screens are sensitive to any source of ionizing radiation, including commonly used isotopes such as ^{32}P , ^{33}P , ^{35}S , ^{14}C , ^3H and ^{125}I .

Storm system's wide exposure range and accurate signal quantitation give you publication-ready data on the first exposure, plus greatly simplified band intensity analysis—even if you have both strong and weak bands on the same exposure (Fig 5). Additionally, you can reduce your exposure times from days to hours, or from hours to minutes, as the system uses PhosphorImager technology which is many times more sensitive than film (Fig 6).

Large sample area for maximum applications versatility

Storm imager has a 35 x 43 cm (14 x 17 in) sample area that accepts large samples so you can scan sequencing-sized gels. Or, you can use the large sample area to expose many small gels and blots simultaneously for maximum throughput (Fig 7). Sample exposures take place in cassettes—not in the instrument—so Storm imager is always available for scanning. In addition, scanning can continue even while you're using the same computer to perform other functions.

Fig 3. How storage phosphor works. 1) Exposure of the storage phosphor screen to ionizing radiation induces latent image formation. 2) During laser scanning, the Europium complex crystals in the screen release energy as blue light, 3) and return to ground state. 4) Blue light is collected and measured to form a quantitative representation of the sample.

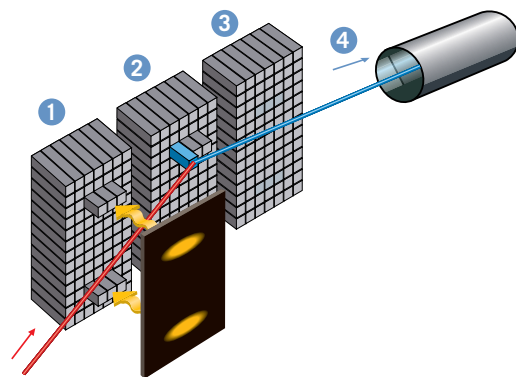




Fig 4. Storage phosphor screens are available in several different formats and sequencing gel sizes. With proper care, storage phosphor screens last indefinitely, regardless of how often they're used. A ten minute exposure to visible light prepares the screen for reuse.

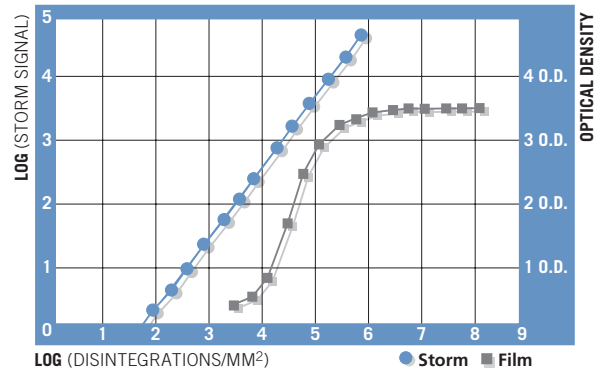


Fig 5. With five orders of linear dynamic range, Storm imager captures the image from both strong and weak signals in a single exposure. Storm system's linear dynamic range is 1000 times greater than film.

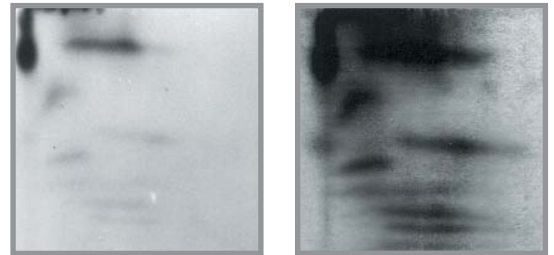


Fig 6. Storage phosphor vs. film. Exposures that would take a month with film can be completed in just 3 days with storage phosphor technology. Courtesy of Dr. Alan Schroit, Department of Cell Biology, M.D. Anderson Cancer Center, Houston, Texas, U.S.A.



Fig 7. A) Macroarray imaging of small or large format cDNA arrays is easily performed for gene expression profiling. B) Tritium-labeled samples can be imaged with tritium screens. Storm system's 50- μ m pixel resolution enables visualization of even the fine detail of tissue structure. C) Southern, Northern, Western, and other radiolabeled blotting assays produce images on storage phosphor screens 10–100 times faster than with film. And Storm imager lets you choose any radioisotope (or use nonradioactive chemifluorescence) for blotting applications. Courtesy of Christopher Hug, Dept. of Cell Biology, Washington University Medical School, St. Louis, Missouri, U.S.A.

Direct fluorescence

Fast and easy gel analysis

Storm imager lets you visualize your nucleic acid and protein gels just minutes after electrophoresis. To see and quantitate your DNA, RNA or protein samples, soak your gels in dye solution and rinse away the excess—just as you would for well-known ethidium bromide and Coomassie™ protocols.

High resolution and direct quantitation

In addition to fast detection and analysis, you also get great image resolution. Fast pixel-by-pixel fluorescent excitation eliminates fluorescent blooming caused by constant UV excitation in other traditional systems, so you get better resolution of closely spaced bands. Quantitation is simplified, because unlike instant film, Storm system offers a linear response to fluorescent signal intensities (Fig 8). Just scan your gel and determine band intensity ratios directly—there's no UV light box, camera system, or darkroom time required (Fig 9).



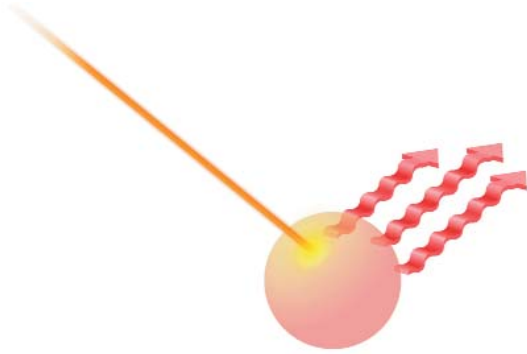
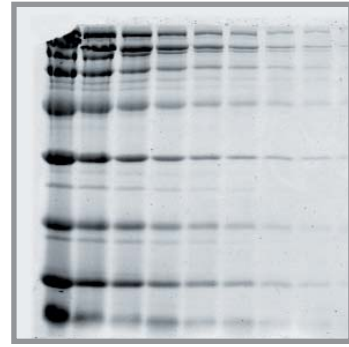
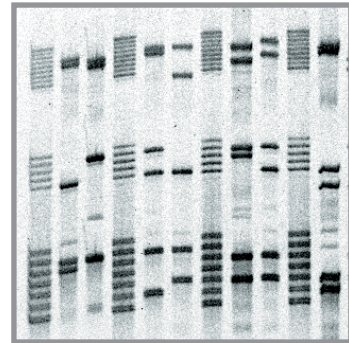


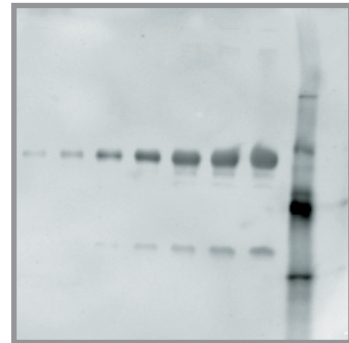
Fig 8. How fluorescence works. Fluorochromes are excited to higher energy states by the Storm system's light source. As they return to ground state, energy is emitted as light of a longer wavelength. The Storm system collects and quantitates the emitted fluorescent light.



A



B



C

Fig 9. A) Protein gel staining. Protein standards were separated on acrylamide and stained with SYPRO™ Orange. Courtesy of Dr. Vicki Singer, Molecular Probes, Eugene, Oregon, U.S.A B) DNA gel analysis. Short Tandem Repeat (STR) analysis of CSF1PO, TPOX, and TH01 loci. PCR products were separated on acrylamide and stained with SYBR™ Green I. C) Western blotting. Tubulin was detected on PVDF membrane using a Cy™5-labeled secondary antibody.



Chemifluorescence

Fast blot analysis with chemifluorescence

Chemifluorescence is an easy-to-use technique for nonradioactive DNA, RNA, and protein detection on blots (Fig 10). With chemifluorescence, there's no wait for exposure—Storm system reads your blots in minutes. Further, quantitative analysis is simplified because there's no film intermediate (Fig 11).

Easy, familiar protocols

Chemifluorescence sample preparation is very similar to chemiluminescence sample procedures, but chemifluorescence produces a stable, fluorescent reaction product—so you can scan your blot at your own convenience. Chemifluorescence works with strip and re-probe procedures and doesn't require you to change your hybridization conditions.

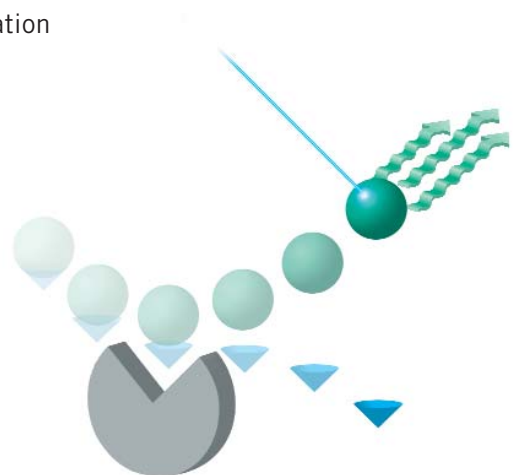
ECL Plus Western blots with no change in protocol

Although it is most commonly used in chemiluminescence procedures, Storm imager detects the fluorescent signal produced by ECL Plus substrate. ECL Plus Western blotting protocols are based on HRP-conjugated antibodies. This offers a useful complement to the AP-conjugates used in chemifluorescence.

Storm reads chemifluorescence right off the blot

- No guessing when to expose—chemifluorescence is stable for weeks
- No over- or under-exposures
- No film intermediate to complicate quantitation
- No darkroom processing

Fig 10. How chemifluorescence works. Alkaline phosphatase cleaves a phosphate group from the chemifluorescent substrate, releasing a highly fluorescent product. The product absorbs 450 nm light, and emits light at 540–560 nm.



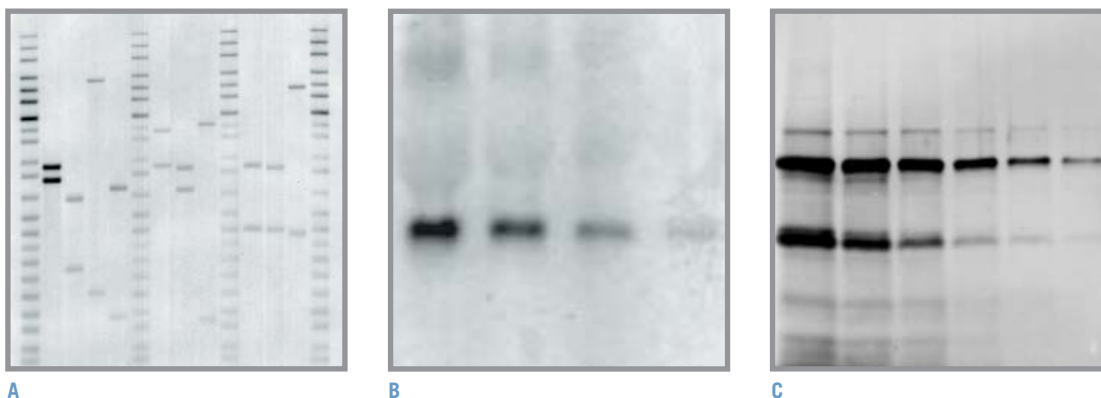


Fig 11. A) Southern blotting. Bands were visualized by chemifluorescence in this Southern blot of human genomic DNA. B) Northern blotting. A fluoresceinated cDNA probe was used to identify p53 mRNA in A172 glioblastoma cells. Bands were visualized by chemifluorescence. C) Western blotting. Total brain extract was probed for β -tubulin using HRP-conjugated antibody and ECL Plus substrate and visualized by chemifluorescence.

Service and support

GE Healthcare equipment and systems are supported in the laboratory by Labcrew™ service professionals. The Storm system's one-year service warranty entitles buyers to on-site services as needed and can be extended with additional support agreements on a year-to-year basis. GE Healthcare is dedicated to providing the service and support you need to get the most value from your investment.

Ordering information

Product	Code number
Storm 820 & ImageQuant TL Analysis Software	63-0035-52
Storm 820, ImageQuant TL Analysis Software, & Workstation	63-0035-54
Storm 830 & ImageQuant TL Analysis Software	63-0035-67
Storm 830, ImageQuant TL Analysis Software, & Workstation	63-0035-42
Storm 840 & ImageQuant TL Analysis Software	63-0035-57
Storm 840, ImageQuant TL Analysis Software, & Workstation	63-0035-59
Storm 860 & ImageQuant TL Analysis Software	63-0035-62
Storm 860, ImageQuant TL Analysis Software, & Workstation	63-0035-64
Additional configurations for European Community	Please inquire

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