Storage Phosphor Screen BAS-IP

IMAGING ACCESSORIES

Storage Phosphor Screen BAS-IP is a film-like radiation image sensor designed to trap and store radiation energy in a stable state. When scanned with a laser, the energy is released as luminescence that can be quantified using storage phosphor imaging systems. The screen can be reused by exposing it to the extra-bright light of an Amersham™ Eraser light box.

- Up to one-tenth the exposure time is required compared with traditional autoradiography film
- Up to 100 times more sensitive than film, depending on isotope and sample type
- A linear dynamic range over five orders of magnitude enables quantitation and visualization of both weak and strong signals in a single exposure
- Results are digitized and quantitated using a storage phosphor imaging system
- Reusable screens do not require chemicals, a darkroom, or other special treatment for use
- Each step can be performed at the lab bench under normal lighting conditions and at room temperature

Composition

Storage Phosphor Screen BAS-IP comprises a three-layer phosphorimaging plate. The photo-stimulatable phosphor layer contains 5 µm phosphor particles formulated as BaFBr, and is sandwiched between a protective layer and a support film uniformly coated with trace amounts of bivalent europium (Eu^{2+}) as a luminescence center (Fig 1).

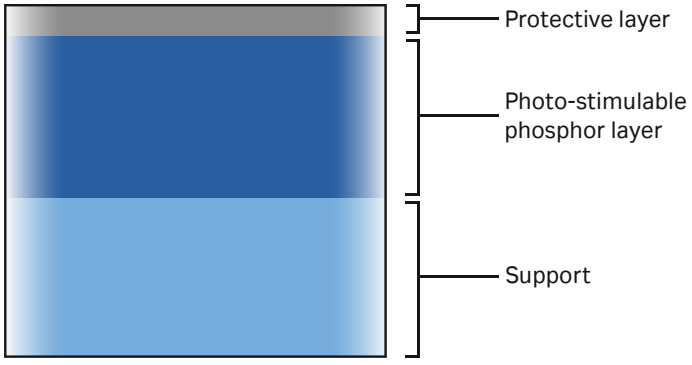


Fig 1. Composite structure of Storage Phosphor Screen BAS-IP.

Application

Storage Phosphor Screen BAS-IP retains energy produced by ionizing radiation from isotopes such as ^{14}C, ^{3}H, ^{125}I, ^{131}I, ^{32}P, ^{33}P, ^{35}S, and ^{99m}TC. Upon laser-induced stimulation, light is emitted from the phosphor layer in proportion to the amount of radioactivity in the sample. The resulting digital image allows for quantitation of subtle signal intensity differences over a wide dynamic range of up to five orders of magnitude using storage phosphor imaging systems such as Amersham™ Typhoon™ laser-scanner series (IP, RGB and 5) and FLA 7000/9000. Typically, use of Storage Phosphor Screen BAS-IP requires 50% to 90% less exposure time compared with an equivalent exposure to autoradiographic film.

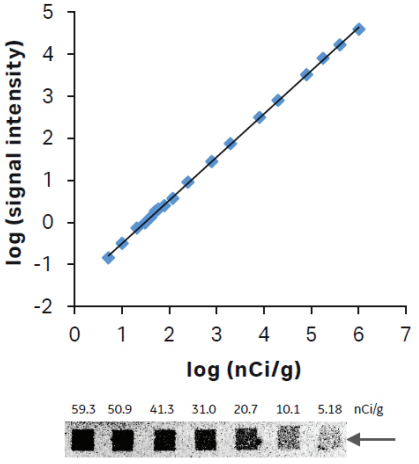
Storage phosphor screens are reusable and are not degraded by repeated exposure to laboratory levels of radioactivity. To reuse, simply expose the screen on an Amersham™ Eraser light box.

Table 1. Types of Storage Phosphor Screen BAS-IP

Type	Product name	Size (cm)
BAS-IP MS (Multipurpose Standard) High sensitivity, water resistance	BAS-IP MS 2025 E	20 × 25
	BAS-IP MS 2040 E	20 × 40
	BAS-IP MS 3543 E	35 × 43
BAS-IP SR (Super Resolution) High resolution, water resistance	BAS-IP SR 2025 E	20 × 25
	BAS-IP SR 2040 E	20 × 40
BAS-IP TR (Tritium) Optimized for 3H detection	BAS-IP TR 2025 E	20 × 25
	BAS-IP TR 2040 E	20 × 40
BAS-IP ND (Neutron Detection) Optimized neutron detection	BAS-IP ND 2025 E	20 × 25
	BAS-IP ND 2040 E	20 × 40

Multipurpose Standard (MS) screens

BAS-IP MS screens are suitable for a wide variety of applications and can be used with ionizing radiation from isotopes such as ^{14}C, ^{125}I, ^{131}I, ^{32}P, ^{33}P, ^{35}S, and ^{99m}TC. The durable protective coating and the phosphor layer formulation make the MS screens well-suited for ^{32}P blots, ^{125}I detection and quantitation. This is the screen of choice for ^{32}P Northern and Southern blots, and ^{125}I Western blots and gels.



Sample	^{14}C autoradiographic standard (CFQ12000) 3 hour exposure to BAS-SR Imaging Plate	
Imaging	**Excitation** 635 nm	**Emission filter** IP BP390
LOD	0.00518 µCi/g	
DR	5.3 orders of magnitude	
Linearity	R^2=0.9998 and k=1.03 (trendline in log-log plot)	

Fig 2. Scanned image of a 14C autoradiographic standard using Amersham™ Typhoon™. A selection of the standard is shown in the image; the arrow indicates the limit of detection (LOD). The linear dynamic range (DR) was 5.3 orders of magnitude.

Super Resolution (SR) screens

SR screens are compatible with storage phosphor imaging systems such as Amersham™ Typhoon™ laser-scanner series (IP, RGB and 5) and FLA 7000/9000. The screens provide higher resolution where a pixel resolution of 50 µm is required. For resolution of 100 µm or lower, the MS screens provide sufficient resolution.

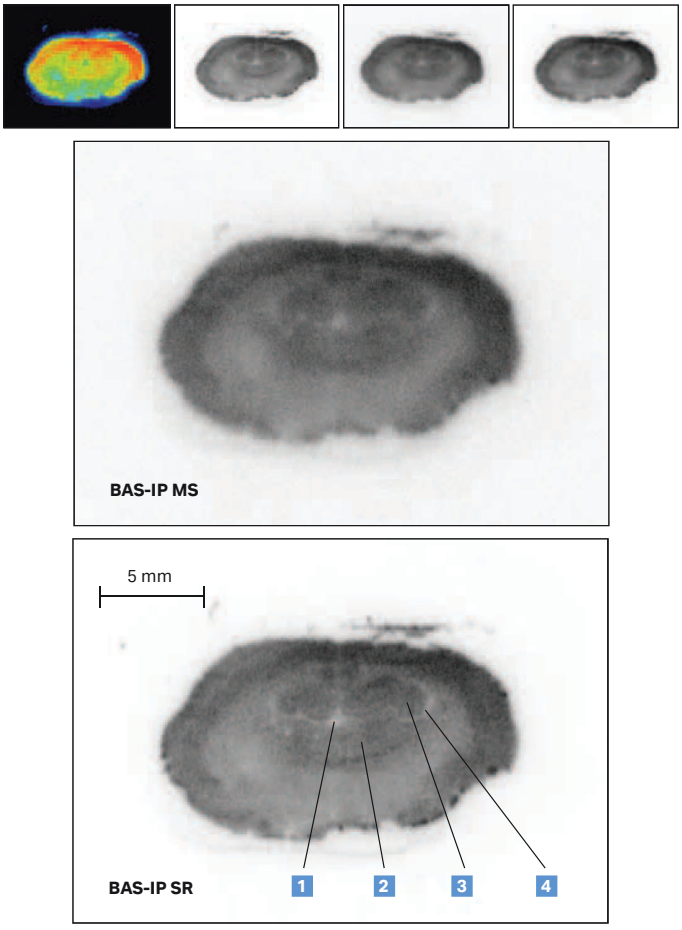


Fig 3. Autoradiography images of rat brain. [125I] Somatostatin (0.6 nM, 0.05 MBq/mL) on cryosections from brain exposed for 24 h to three different kinds of imaging plates. All plates were scanned in Typhoon™ FLA 7000. The upper left corner shows a color-coded autoradiogram of 125I. Small images in the gray scale in upper row show from left to right exposure to BAS-IP SR, BAS-IP MS, and mounted General Purpose (GP) screen. The lower images show the gain in resolution between BAS-IP MS and BAS-IP SR. The regions 1 to 4 can clearly be distinguished in the BAS-IP SR image.

1 Third ventricle 2 Thalamus 3 Hippocampus, and 4 Lateral ventricle.

Images courtesy of Håkan Hall, Preclinical PET Platform, Dept. of Medicinal Chemistry, Uppsala University and Kristina Magnusson, Department of Public Health and Caring Sciences, Uppsala University.

Tritium (TR) screens

To detect the weak energy of the tritium signal, Tritium screens are constructed without a protective layer. The highly sensitive screens eliminate the need for fluorographic reagents. Optimal results are obtained when the tritium signal is on the surface of the sample and available to penetrate the screen.

Neutron Detection (ND) screens

In order to detect and quantitate neutrons effectively, ND screens have the photo-stimulatable phosphor layer, a mixture of neutron converter and the photo-stimulated luminescence substance that is the major component of general IP. This screen adopts ^{203}Gd as the neutron converter. The ratio of neutron converter to photo-stimulatable phosphor is 1:1.

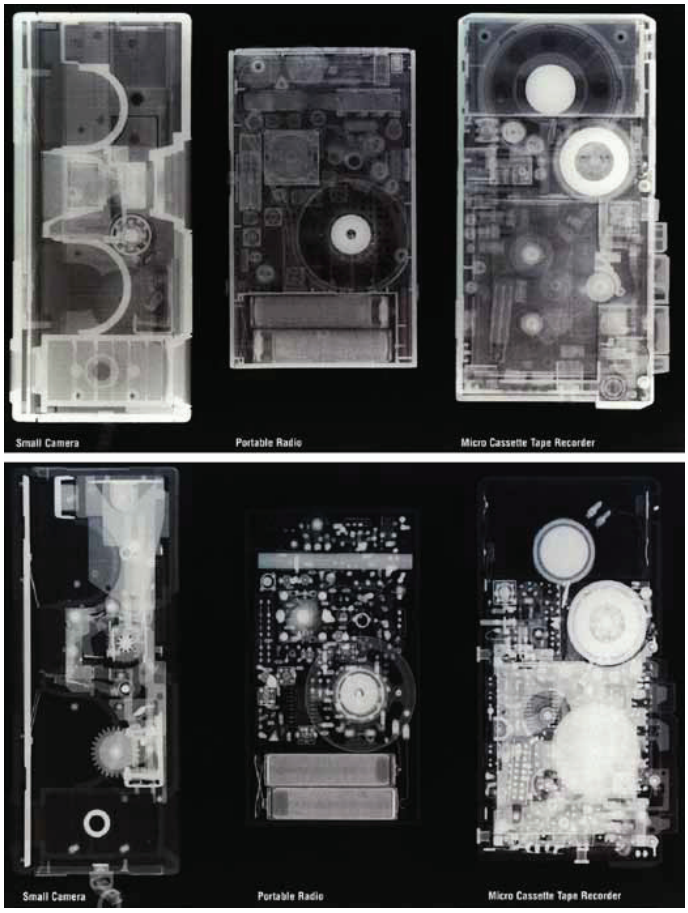


Fig 4. Neutron (upper) and X-ray (lower) radiographs. **Upper:** Neutron radiograph. Neutron generator: TRIGA-II 100 kW, Nuclear reactor Rikkyo University, Japan. Irradiation: Thermal neutron. Fluence: 1.4×10^8 neutron/cm^2. Time 90 s. Screen: BAS-IP ND. **Lower:** X-ray radiograph. X-ray generator: KX050G Inverter, Komazawa Junior College, Japan. Irradiation: X-rays. Accelerating voltage: 150 kV. Tube current: 260 mA. Time 71 s. Filter: 1.5 Al + 0.1 mm Cu. Screen: BAS-IP SR.

All data images courtesy of Professor Hisao Kobayashi, The Institute for Atomic Energy, Rikkyo University, Japan

Ordering information

Storage Phosphor Screen BAS-IP and Exposure Cassette

Products	Quantity	Product code
BAS-IP MS 2040 E Phosphorimaging plate, 20 × 40 cm, multipurpose	1	28-9564-74
BAS-IP MS 2025 E Phosphorimaging plate, 20 × 25 cm, multipurpose	1	28-9564-75
BAS-IP MS 3543 E Phosphorimaging plate, 35 × 43 cm, multipurpose	1	28-9564-76
BAS-IP SR 2040 E Phosphorimaging plate, 20 × 40 cm, high resolution	1	28-9564-77
BAS-IP SR 2025 E Phosphorimaging plate, 20 × 25 cm, high resolution	1	28-9564-78
BAS-IP TR 2040 E Phosphorimaging plate, 20 × 40 cm, for tritium detection	1	28-9564-81
BAS-IP TR 2025 E Phosphorimaging plate, 20 × 25 cm, for tritium detection	1	28-9564-82
BAS-IP ND 2040 E Phosphorimaging plate, 20 × 40 cm, for neutron detection	1	29-0171-33
BAS-IP ND 2025 E Phosphorimaging plate, 20 × 25 cm, for neutron detection	1	29-0171-39
Exposure Cassette, 20 × 25 cm	1	29-1755-23
Exposure Cassette, 35 × 43 cm	1	29-1755-24

Imaging systems

Products	Quantity	Product code
Amersham™ Typhoon™ 5	1	29-1871-91
Amersham™ Typhoon™ RGB	1	29-1871-93
Amersham™ Typhoon™ NIR Plus	1	29-2644-63
Amersham™ Typhoon™ NIR	1	29-2385-83
Amersham™ Typhoon™ IP	1	29-1871-94
Amersham™ Eraser	1	29-1871-90

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