



Inside Philips Fluoroscopy

DoseWise

Perfect image. Perfect sense.

PHILIPS



Crisp contours, bright contrast, and high resolution: these are the attributes that make perfect images. With DoseWise they're also made with less dose for staff and patients, and that makes perfect sense.

DoseWise A holistic approach with Eleva programming

DoseWise is a set of techniques, programs and practices that ensures optimal image quality, while protecting people in X-ray environments. It's a philosophy that drives Philips to develop innovative new strategies in dose management. Although image quality is strongly related to dose, it is not the only determining parameter. There are opportunities to optimize image quality throughout the entire digital imaging detection chain. Moreover, each of these elements interacts with the others. That's why Philips views each fluoroscopy system as a whole, and considers how each link affects the rest. To ensure optimal interaction, Philips has developed the unique Eleva programming: a continuous theme that runs throughout all the links, and the key to our 'holistic' view.

Eleva programming is an exam- and patient-related automatic parameter setting control. It includes exposure and fluoroscopy settings to regulate dose-levels, parameters for image pre- and post-processing, geometry settings, and beam limitation settings. With minimal user interaction, everything clicks into place – what's more, all the parameters for every type of examination, view and acquisition are optimized for virtually every type of patient, from newborn babies up to heavy adults.

In short, Eleva programming triggered via RIS coupling allows you to optimize the relation between the relevant image quality for the diagnostic information and the lowest achievable dose. The result? Perfect images, made with perfect sense.

“At all times you, the operator, remain in full control. You decide how to balance the integrated DoseWise concept, optimizing the dose - image quality equation.”



Universal X-ray systems must deal with a wide variety of examinations – each one requiring a different set of parameters for frame rate, filter strength, collimator shutter positions, and more. Now, thanks to Eleva, all of these parameters can be set and optimized automatically.

Three highly effective strategies

DoseWise is active throughout every level of your fluoroscopy system - from auto-parameter setting, In-Pulse control, pulsed fluoroscopy, beam filtration and more. It ensures we exploit every possible opportunity to reduce dose while allowing maximal diagnostic image quality. For fluoroscopy systems, DoseWise has produced three highly effective strategies for dose management:

1. Smart beam

Our DoseWise technologies modify the X-ray beam's energy spectrum, shape, and frequency (semi-) automatically. Giving the impression that the beam can 'think' for itself, adapting to each examination.

2. Less radiation-on time

In-Pulse control ensures that the beam always has the correct power to deliver optimal image quality for fluoroscopy and exposures. That means the exposure images are 'First Time Right' and virtually no retakes are necessary. During fluoroscopy, radiation-on time is minimized by pulsing the beam, and with a choice of very low pulse frequencies major dose savings are made while ensuring diagnostically relevant images.

3. More awareness

The DoseWise philosophy has driven the development of simple, easy to read displays and reporting – keeping you aware of dose levels, and fully in control.



How does DoseWise

By using In-Pulse control

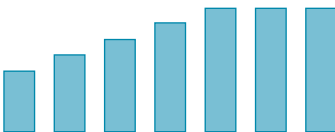
In conventional pulsed fluoroscopy, the beam's intensity and length is regulated after each pulse, with successive approximations leading to an optimum. But with Philips fluoroscopy systems, the pulse is completely optimized within every pulse, thanks to a highly advanced integrated parameter control circuit. We call this almost instantaneous optimization 'In-Pulse control'.

The Philips In-Pulse controlled fluoroscopy



Immediately, even within the first pulse, the beam power is optimized to provide the relevant diagnostic information.

Conventional after-pulse controlled fluoroscopy



Conventional regulation can take up to four or more pulses before the beam is optimized.

In-Pulse control is active for both fluoroscopy and exposures. For fluoroscopy it is used GCF (Grid

Controlled Fluoroscopy). For exposures it is used IQX (Intelligent Exposure).

In-Pulse control is especially useful in dynamic examinations. Here, the rapidly changing conditions (caused by panning and patient movement) are met with instantaneous beam adaptation.

In-Pulse control is unique to Philips and reduces dose:

during fluoroscopy by:

Eliminating over-exposure or under-exposure in every pulse

Providing immediate diagnostic information with the first pulse

Avoiding the so-called 'blooming' effect encountered during rapidly changing conditions

Giving you the choice to use very low fluoroscopy pulse frequencies (e.g. 1.5 fr/sec)

The possibility to change the used pulse frequencies continuously

when exposures are taken by:

Determining exposure settings without prior fluoroscopy

Optimizing exposure parameters in real time thus ensuring constant high image quality

Eliminating excessive exposure times which would cause motion blur

create a Smart Beam?

With Grid Controlled Fluoroscopy (GCF)

GCF extends the In-Pulse control concept with specially designed pediatric fluoroscopy curves and with even shorter pulse lengths (10 msec). Further, GCF utilizes a grid switched X-ray tube. Conventional 'on-off' switching has unavoidable ramp and trail edges. These produce soft radiation that adds to patient dose but does not contribute to image quality. However, the Philips electronically controlled, in-tube grid switching creates a virtually instant pulse rise, so that all the radiation is in the useful high-energy spectrum.



Conventional pulsed fluoroscopy

Shaded area represents unwanted low energy X-rays.

With GCF the grid switching is combined with In-Pulse control. So the tube voltage, tube current, and pulse length are optimized for each single pulse, and there is no over- or under-exposure. The instant response avoids the blooming effect and the sharply defined pulses help eliminate movement blur. What you get is a perfect image, with perfect sense.

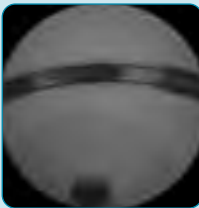
GCF contributes to dose reduction by:

- Eliminating ramps and trails
- Enabling immediate pulse optimization
- Utilizing especially designed fluoroscopy curves, e.g. for pediatrics.



DoseWise Grid switching

All X-rays in correct energy spectrum.



In continuous fluoroscopy, contrast and brightness are adequate, but the object is blurred.



With GCF, contrast and brightness are maintained, but the object is sharper and the dose is lower.

Clinical results indicate that GCF can reduce patient dose by up to 80%, and with specially developed pediatric kV/mA curves this saving can be boosted to almost 95% compared to conventional fluoroscopy.

How does DoseWise

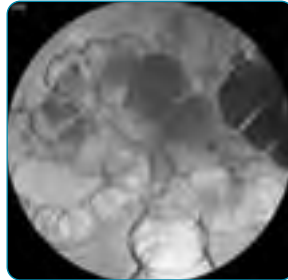
By filtering out 'soft' radiation

Special SpectraBeam RF filtration removes unwanted 'soft' radiation, i.e. those X-rays that hit the patient but do not have enough energy to reach the image intensifier.

Applying filters reduces patient dose significantly. With SpectraBeam RF filtration you have the choice to either maintain the dose at the same level as an unfiltered beam and create a much improved image quality, or you can 'trade off' some of this improved quality to reduce dose.

The type of filtration you use depends on the type of examination you are performing. During fluoroscopy, for example, a maximum filtration of 0.2mm Cu achieves diagnostic image quality. In pediatric radiology, 0.1mm Cu offers

the best relation between diagnostically relevant images and the lowest possible dose.

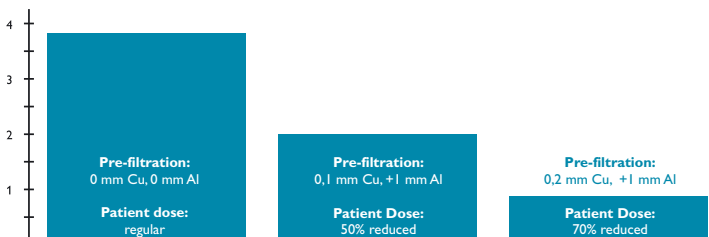


Pre-filtration: 0.1 Cu

By customizing the beam shape

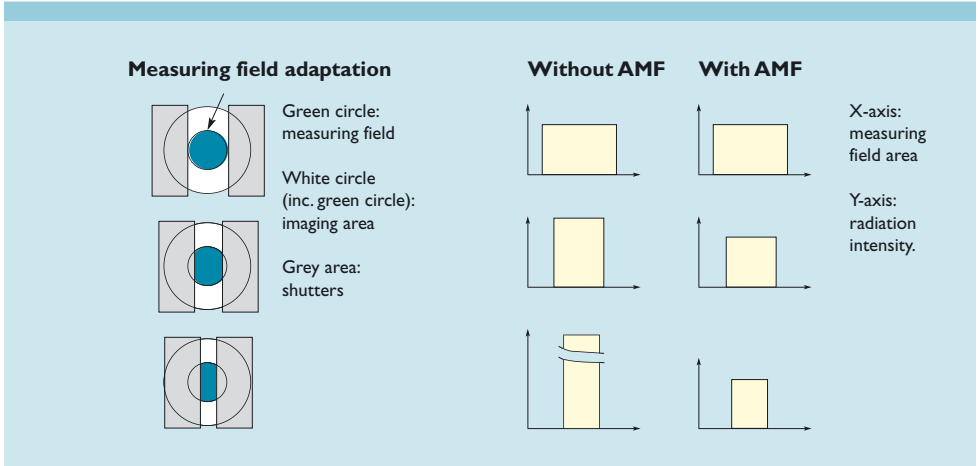
The Philips collimator comprises three successive steps to manipulate beam shape and thereby avoid radiating adjacent tissue. First the iris shutters clearly define the edges. Square shutters further adapt the beam shape. And finally, wedge filters can be used to complete the shaping process and create an exact tailor-made beam shape for the exam.

Dose Area Product: DAP [Gycm^2]



DAP measurements of fluoroscopy COLON examinations with adults

create a Smart Beam?



By using an Adaptive Measuring Field

Adaptive Measuring Field (AMF) technology ensures that there is never an over-exposed image, even when the shutters are almost closed.

When the measuring field is partly covered by the shutters, the radiation intensity in the remaining area must be increased in order to deliver the same integrated value (area of yellow). A higher radiation intensity can mean over-exposure. But with AMF the

measuring field area (X-axis) is reduced while the intensity (Y-axis) remains optimal.

With AMF the system recognizes the shutter position and takes the reduced area of the measuring field into account. This means that even with almost closed shutters the images will not be over-exposed.

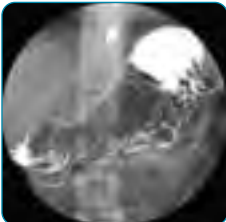
How does DoseWise create Less radiation-on time?

By getting it right first time

With a wide range of automatic parameter settings - covering the complete range from heavy adults to babies - our DoseWise technologies do everything possible to ensure that every exposure results in a diagnostically relevant image. This 'First Time Right' philosophy ensures that virtually no retakes are necessary. Furthermore, the wide dynamic range of the imaging chain and the digital image processing techniques enable you to get high quality diagnostic images every time.

By preventing incorrect exposures

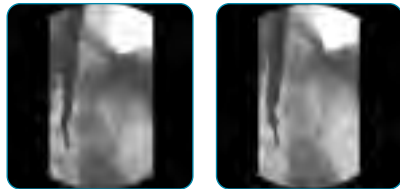
IQX, the unique In-Pulse control concept for exposures, monitors exposures in real-time and can adjust settings during the exposure. If initial settings cause the beam to be too weak or too strong, IQX adjusts the values within the first millisecond of the exposure.



Every exposure produces a crisp image at the touch of a button.

By grabbing fluoroscopy images

Of course you can use the 'Last Image Hold' feature to grab images, but grabbing fluoroscopy images can also be done 'on the fly' to reduce dose. In-Pulse controlled fluoroscopy makes this an even more valuable tool, giving you more opportunities to replace exposures. By replacing exposures with fluoroscopy grabbing, fluoroscopy and exposure frame rates can be adapted during the examination to accommodate changing circumstances.



By grabbing images dynamically 'on the fly' you can replace exposures with fluoroscopy images. Of course, the fluoroscopic image quality is different from the exposure, but it gives diagnostically relevant image information depending on your diagnostic requirements in the specific examination situation. The dose reduction is highly significant.

How does DoseWise create More awareness?

By showing information clearly

You as the user are constantly in control over your system. This makes you the most important factor in controlling the dose levels.

For this reason, our fluoroscopy control panels give you clear, real-time information, to help you decide on the optimal balance between diagnostic image quality and radiation exposure.

Dose levels and accumulated dose are continuously monitored and displayed in the unit Dose Area Product (DAP), which is independent of variables such as Source to Image Distance.

With easy-to-use protection

Your fluoroscopy system is available with a wide range of optional accessories, such as protective screens, drapes and aprons. But again, Philips goes further, by ensuring that all this protection can be mounted in a way that it does not hinder you or your staff, and everyone is able to use it optimally.

With advisory literature and training

Philips offers literature and comprehensive training material such as application videos to show how your staff can optimally use the system. In addition, our maintenance programs and remote service checks help ensure that your systems always run at peak performance.



DoseWise Options and Features

DoseWise Smart Beam	
In-Pulse control	The unique Philips X-ray parameter control mechanism
Pulsed fluoroscopy	In-Pulse controlled fluoroscopy enables very low pulse frequencies and a typical pulse length of 20 msec
GCF	Grid Controlled Fluoroscopy is a powerful combination of In-Pulse control (allowing very low pulse frequencies and a choice of typical pulse lengths from 10 to 20 msec) and a grid switch tube to further eliminate radiation not contributing to the diagnosis
Pediatric fluoroscopy curves	Specially designed fluoroscopy curves for pediatric imaging: diagnostic Image Quality - Low Dose
SpectraBeam RF	For adjusting the energy spectrum of the beam
Collimator with wedges	For adjusting the beam to cope with high density differences in the image
Adaptive Measuring Field (AMF)	Automatically considers shutter positions to prevent over-exposure when using a very small field of view
Image Intensifier lift	Easy changing of the Image Intensifier position to enable both ideal working space and optimal imaging conditions
X-Ray beam Enhancer	For enlarging the focus object distance in nearby controlled systems
DoseWise Less radiation-on time	
IQX	Intelligent exposure parameter adjustment utilizing In-Pulse control
Adjustable frame speed	Within an exposure or fluoroscopy run it is possible to adjust the speed of acquisition
Tomo Density Control	Semi- automatic exposure control for tomography acquisition
(Dynamic) Fluorograb	Makes it possible to grab Last Image Hold or dynamic fluoroscopy images thus using these images for diagnosis and archiving. A powerful tool in combination with Pulsed fluoroscopy and even better with GCF

Pre-set collimation	Coupled to a procedure
(Electronic) Removable Grid	Removes the anti-scatter grid from the X-ray beam to achieve extra dose savings when imaging very small objects such as in pediatrics
Laser cross/Collimator light	For radiation-free positioning when you use your MultiDiagnost Eleva with the Image Intensifier in PA or lateral position
Digital noise reduction	Integration of fluoroscopy images, with motion detection
Store/recall positions	For radiation free positioning of your system
DoseWise More Awareness	
Dose calculation	Calculating the dose rate and accumulated dose during an examination based on X-ray parameter values and beam shape
Dose measurement	Measurement of dose rate and accumulated dose during an examination
Dose display	Real time information on dose rate and accumulated dose
Dose reporting	Reporting of calculated dose data via RIS coupling or via printed reports
X-Ray disable button	Switches off all X-ray exposure controls to avoid accidental switching on during room preparation
DoseWise accessories	Wide range of accessories to further reduce dose for staff and patients, such as shielding, protective screens, etc.
Application support	Philips specialists can train hospital staff in the optimal use of the systems, with explanation of all dose saving possibilities

Please note: some options and features are system specific.

Please refer to the system specific documentation for the available options & features per system.

Philips Medical Systems is part
of Royal Philips Electronics

Interested?

Would you like to know more about our
imaginative products? Please do not hesitate to
contact us. We would be glad to hear from you.

On the web

www.medical.philips.com

Via e-mail

medical@philips.com

By fax

+31 40 27 64 887

By postal service

Philips Medical Systems

Global Information Center

I.B.R.S./C.C.R.I. Numéro 11088

5600 VC Eindhoven

Pays-Bas /The Netherlands

Asia

Tel: +852 2821 5888

Europe

Tel: +31 40 27 63005

Latin America

Tel: +55 11 2125 0764

North America

Tel: +1 425 487 7000

© Koninklijke Philips Electronics N.V. 2004
All rights are reserved. Reproduction in
whole or in part is prohibited without the
prior written consent of the copyright
holder.

Philips Medical Systems Nederland B.V.
reserves the right to make changes in
specifications and/or to discontinue any
product at any time without notice or
obligation and will not be liable for any
consequences resulting from the use of
this publication.

Printed in The Netherlands
4522 981 94531/708 * SEP 2004

To order the folder containing the whole
DoseWise program: 4522 981 94591
To order the folder containing only the
general brochure: 4522 981 94581

All DoseWise modality brochures can be
ordered separately:

CardioVascular X-ray	4522 981 94541
Surgery (mobile C-arms)	4522 981 94561
Radiography	4522 981 94571
Computed Tomography	4522 981 94551

