Enhanced imaging with members of the new Artis **zee** family. Artis **zee** biplane system for interventional cardiology (left).
Artis **zeego** multi-axis system for cardiovascular interventions (right).

From 2D to 4D

Enhanced Imaging in Interventional Cardiology and Electrophysiology

The field of interventional imaging has never been more demanding. Especially in interventional cardiology and electrophysiology, it is vital to see catheters, guidewires and stents clearly without applying too high a dose to the patient. Here, excellent image quality is key. Imaging a moving structure such as the heart has always been a challenge.
The new Artis **zee** imaging system offers a wide range of imaging applications to provide outstanding image quality in 2D fluoroscopy to see obstructed vessels and fine stent meshes better. For a more spatial view of the heart, it also features 3D imaging for enhanced orientation and guidance during an intervention. There is even a 4D imaging application that takes the time phases of the heartbeat into account.

ECG-triggered Pulsed Fluoroscopy

Patient care and reducing X-ray dose to a minimum are always very important during interventions. This application virtually freezes the motion of the heart, because it uses the patient´s ECG to trigger the image acquisition at the same point in the heart cycle. By reducing the pulse rate down to one pulse per heart cycle, ECG-triggered fluoroscopy reduces the overall X-ray dose used in fluoroscopy by more than 90%. This is ideal for ablations and other lengthy fluoroscopy procedures and safeguards both the staff and the patient.

Temporal Filtration

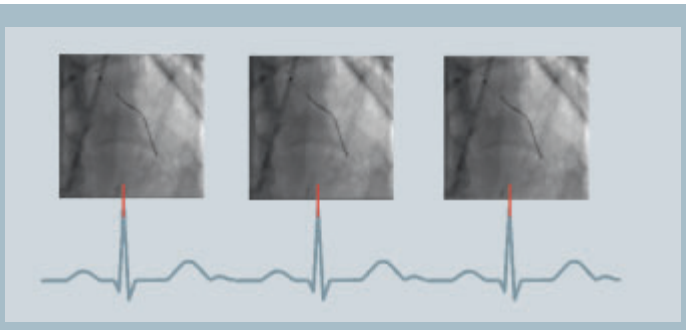
Another useful algorithm integrated into the Artis **zee** imaging system is temporal filtration. During fluoroscopy, this algorithm automatically detects motion in the images and reduces artefacts from movement by separating moving from non-moving structures in real time to improve the clarity of therapeutic instruments.
The non-moving objects can be integrated from image to image, thus reducing the noise level significantly. The result is a sharp image with a significantly reduced noise level and a step towards fast, efficient and confident diagnosis.

Automatic Noise Reduction

Intelligent noise reduction enables high image quality during live fluoroscopy and acquisition by significantly reducing quantum noise without an increase in dose. Automatic noise reduction is a new real-time processing algorithm that improves cardiac image quality significantly even under difficult circumstances such as steep angulations and/or with obese patients. It is based on a real-time image content analysis and application of automatically optimized filter parameters. The results are images with reduced noise, clearly defined vessel edges and better contrast.

IC Stent

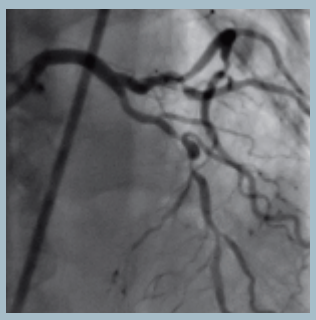
A deployed stent can be difficult to see and it is difficult for the physician to judge the proper outcome of the proce-



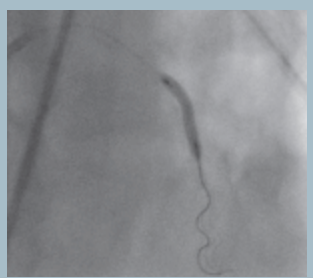
ECG triggered fluoroscopy sequence showing guidewire positioning.

2D Applications

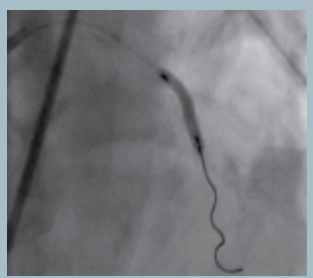
Left coronary artery
without image processing.



Fluoroscopy image
with advanced temporal filtration.

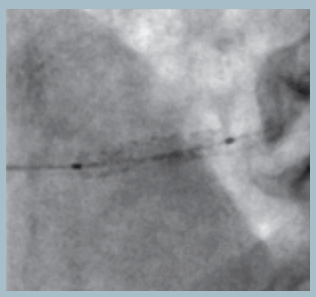


Fluoroscopy image
with conventional temporal filtration.



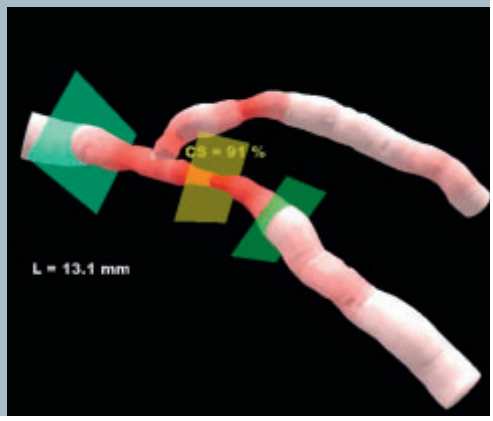
Fluoroscopy image
with advanced temporal filtration.

Control of device deployment
without IC Stent.

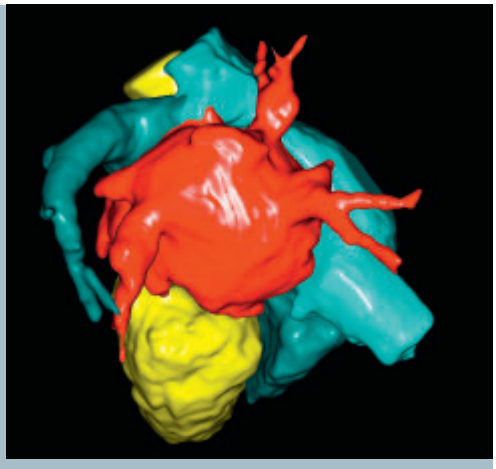


Clear device visualization with IC Stent.

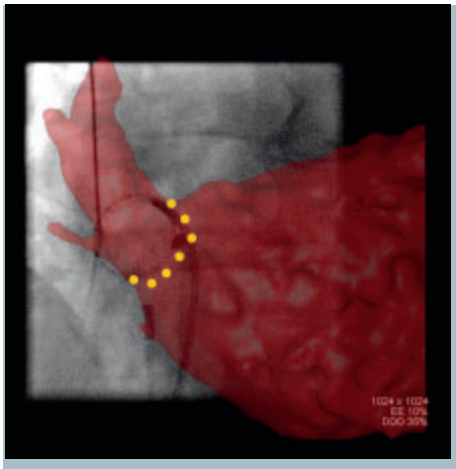
3D Applications



Confident quantification of lesion in 3D with *syngo* IC3D.



Quick and convenient segmentation of cardiac structures with *syngo* InSpace EP.



2D/3D overlay for improved orientation of devices with *syngo* iPilot.

dure especially in obese patients or when steep angulations are used.
IC Stent is a processing package that enhances the visibility of the deployed stent. It uses the balloon markers of the deployment balloon as reference points to shift and match images. Those images are then integrated to improve the signal-to-noise ratio to significantly enhance the visibility of stent meshes. All it requires is the simple push of a button at tableside and everything else is done automatically. Results are available in less than 30 seconds. IC Stent is simple and easy to use and helps to improve the long-term success of the interventional procedure.

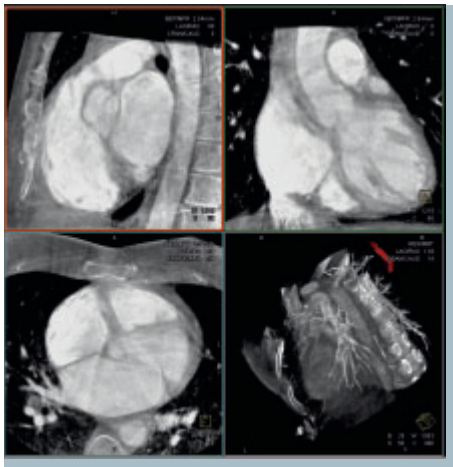
syngo IC3D

Selecting the accurate stent length and determining the degree of the stenosis can be quite difficult with 2D images only. The solution is *syngo* IC3D, an application that helps to accurately measure lesions in the coronary arteries by using two projections. From these projections, a 3D model is generated so that a vessel can be rotated freely in space to precisely assess a lesion's diameter profile and the degree of stenosis. It also enables accurate measurement of lesion length to simplify selecting a stent of the appropriate size and length. Even the measurement of bifurcations is possible.

syngo InSpaceEP

syngo InSpace EP optimizes EP workflow and supports the planning of ablation procedures by integrating preprocedural cardiac CT/MR images or intra-procedural *syngo* DynaCT Cardiac images. The result is a quick and convenient segmentation of cardiac chambers via mouse click. Also the esophagus can be displayed to reduce the risk of a fistula during AFib ablations in the left atrium. The 3D segmentation image is displayed in

4D Applications



Intra-procedural 3D visualizations with *syngo* DynaCT Cardiac.

"*syngo* DynaCT Cardiac is very exciting to me because I can get CT-like images in the EP lab. The fact that it's on the table at the time the ablation is done is the most exciting thing."

Prof. J. Marcus Wharton, MD,
Medical University of South Carolina, Charleston, USA

the examination room and can be rotated or explored via an endoscopic view.

syngo iPilot

For treating complex arrhythmias like atrial fibrillation the accurate guidance of the ablation catheter is crucial. But orientation in the patient's left atrium based on 2D fluoroscopy can be quite challenging. *syngo* iPilot enables the 2D/3D overlay of live fluoroscopy and a 3D volume. Visualizing the fused image in the examination room facilitates the accurate positioning of the ablation catheters and has the potential to speed up the procedure.

syngo DynaCT Cardiac

The latest cardiac application, *syngo* DynaCT Cardiac, widens the 2D/3D spectrum to 4D. By using rotational angiography and special reconstruction algorithms, *syngo* DynaCT Cardiac creates CT-like images of the beating heart right in the cath lab. Through rotational angiography, images are acquired with ECG-triggering and reconstructed with retrospective ECG gating. The reconstructed 3D or 4D volume is available for assessment within about two minutes afterwards and can be displayed in various modes. With this additional 3D information, catheter guidance and orientation improves greatly. This application is especially useful to plan complex ablation procedures. It visualizes the actual state of the heart's anatomy directly in the EP lab and has the potential to save time and costs if it is used instead of pre-procedural CT scans. The *syngo* DynaCT images can be used in the same way as CT images and transferred, e.g., to electroanatomical mapping systems, the NIOBE system for magnetic navigation or merged with live fluoroscopy.

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