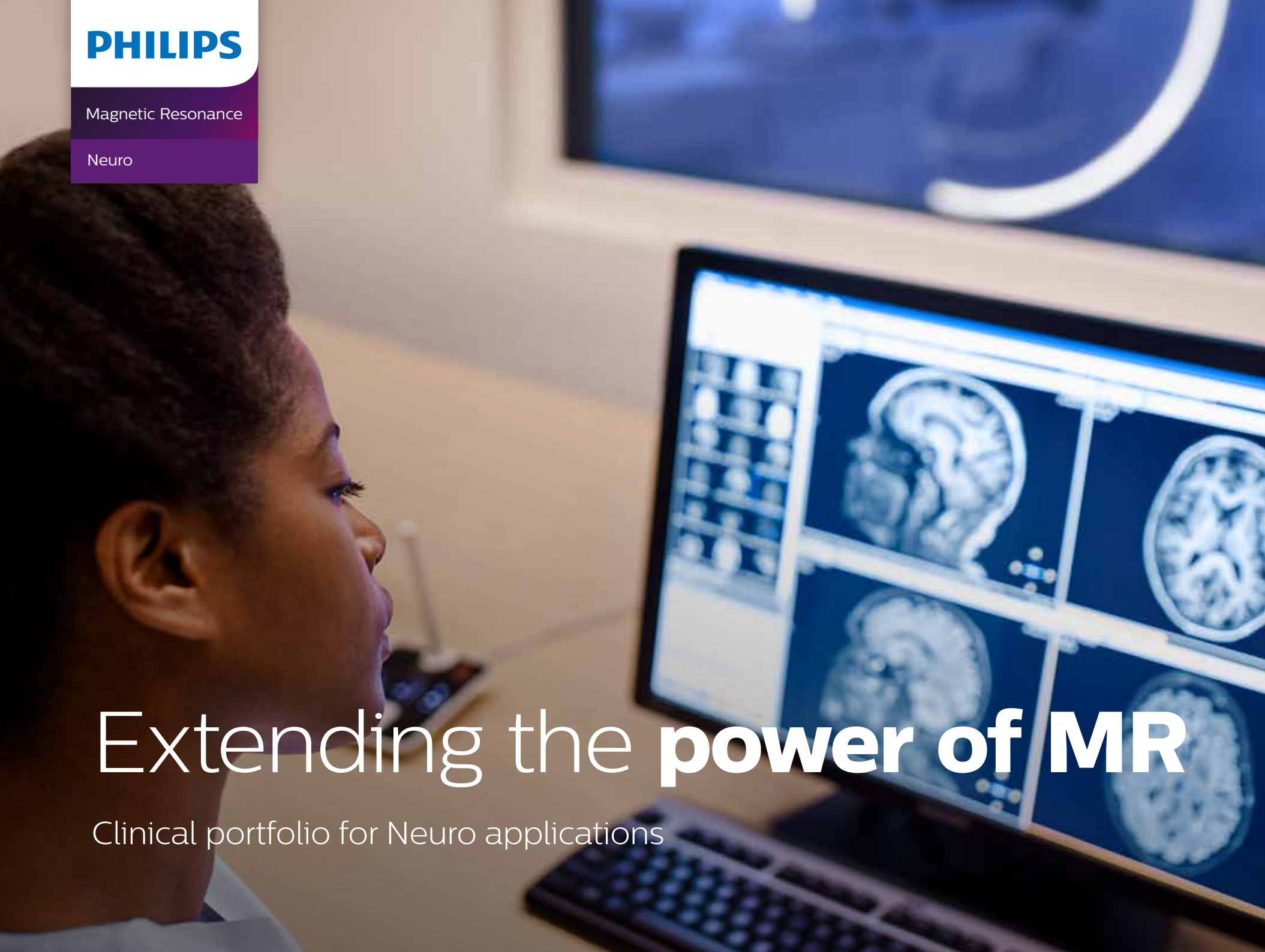
PHILIPS

Magnetic Resonance

Neuro

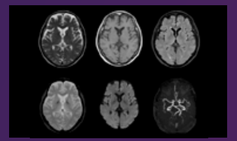


Extending the **power of MR**

Clinical portfolio for Neuro applications

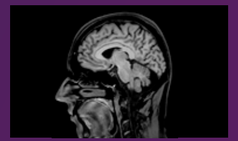
Our **Neuro** applications

Neurological disorders represent a heavy burden in today's society. Leveraging our dStream digital platform, Philips imaging and visualization strategies for neurology may empower you to resolve complex issues with more confidence. These clinical tools can help you unlock new territories in advanced neurofunctional applications, and perform standardized, contrast-free exams for consistent results. Designed to deliver clarity and treatment guidance, the rich portfolio helps you address growing demands in neuro imaging.

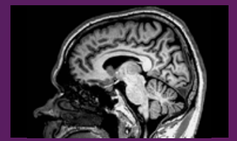


Compressed SENSE Neuro **Page 6**
Speed done right,
every time

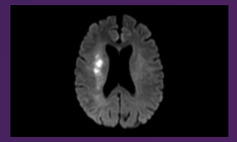
SmartExam Brain **Page 7**
Standardized exams for
consistent MRI results



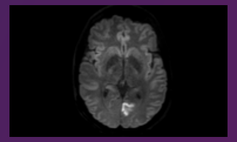
3D BrainVIEW **Page 8**
View your 3D TSE
imaging data in any plane



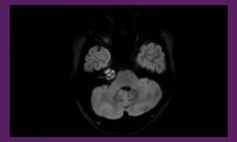
3D Non-selective Page 9
Fast and robust large volume 3D
FFE imaging



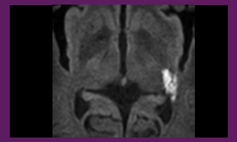
Diffusion Page 14
Non-invasive assessment
of tissue structure



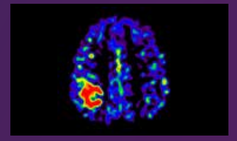
DWI TSE Page 15
Diffusion imaging
with reduced distortion



DWI XD TSE Page 16
Speed up and improve the
quality of your diffusion TSE



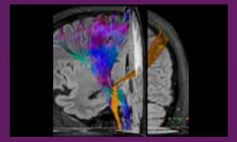
Zoom Diffusion **Page 17**
Small FOV diffusion imaging
for improved image quality



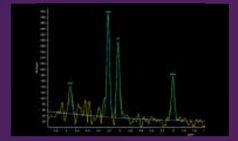
3D ASL **Page 22**
Reproducible contrast-free
brain perfusion

4D-TRANCE **Page 23**
Contrast-free imaging of
brain vascular anatomy

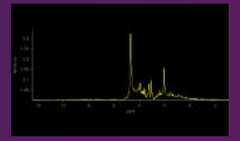
DTI FiberTrak **Page 24**
Fast and easy assessment
of fiber tracts in the brain



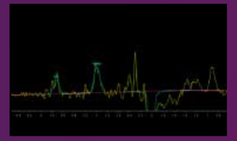
FiberTrak Extension Page 25
High definition fiber tracking
in the brain



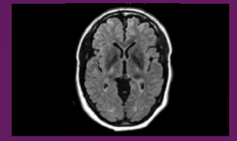
Spectroscopy **Page 30**
Comprehensive set of proton
spectroscopy acquisition methods



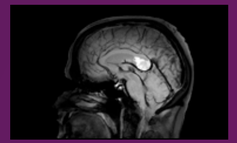
Spectroscopy XD **Page 31**
More precise and more
robust MR brain spectroscopy



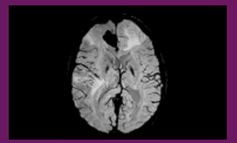
MEGA Page 32
Detection of additional
metabolites



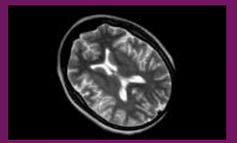
SyntAc Page 33
Exploring Neuro-radiology with
synthetic MR imaging



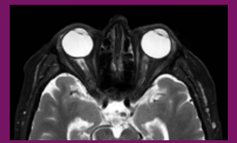
Black Blood imaging **Page 10**
Enhance your diagnostic
confidence for Brain imaging



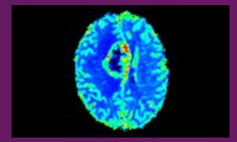
SWIp **Page 11**
Exquisite susceptibility contrast



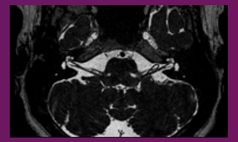
MultiVane XD **Page 12**
Motion-free imaging
in short scan time



mDIXON XD TSE **Page 13**
Replace all your FatSat by one
single fat-free imaging solution

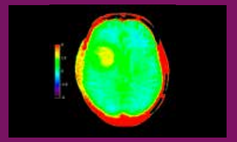


T2* Perfusion Page 18
Brain perfusion
with short scan time



3D DRIVE Page 19
Shorter scan time,
brighter fluid

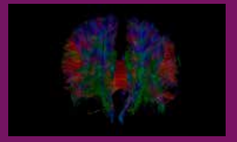
bFFE XD Page 20
Expanding clinical applications
of balanced FFE



3D APT **Page 21**
Enhanced diagnostic confidence in
Neuro oncology

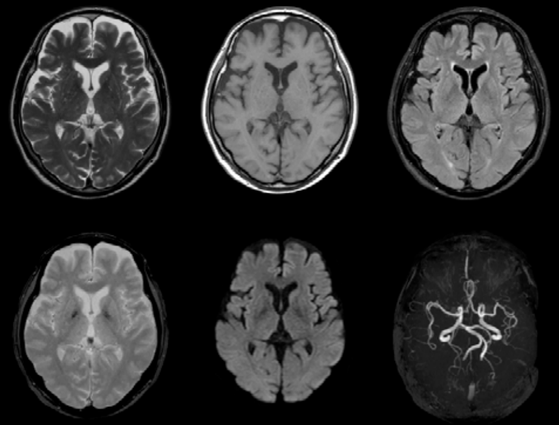
BOLD **Page 26**
Real-time processing of your
fMRI activation maps

MultiBand SENSE **Page 27**
High acceleration for your fMRI
and DTI sequences



NeuroScience **Page 28**
Explore brain connectivity

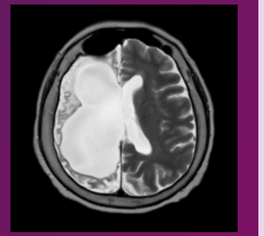
NeuroScience extension **Page 29**
Extend your diffusion
MRI studies



Compressed SENSE Neuro

Speed done right, every time

To meet the increased demand for productivity, a technology break-through in acceleration is required. Leveraging our long standing leadership position in speed (i.e. SENSE), Philips brings a breakthrough in productivity. Compressed SENSE is about accelerating full patient examinations to empower your staff to focus where it matters the most, enhanced patient care. This new paradigm in productivity is available for Neuro imaging, for all anatomical contrasts, and not only 3D scans but also 2D scans are (up to 50%) faster[1].



Fast 2D Brain imaging

Additional information:

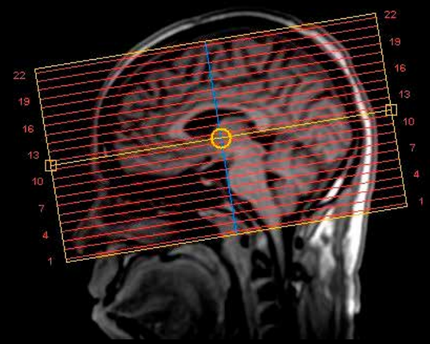
- Available for multiple cartesian scan techniques like FFE, SE, TFE and TSE.
- Available for all anatomical contrasts (e.g. T1, T2, PD, FLAIR, DIR, fat sat).
- A break-through acceleration technique speeding up not only sequences but your entire exam.
- Unique implementation enabling 2D and 3D scans to be up to 50% faster with virtually equivalent image quality[1].

1 Compared to scans without Philips Compressed SENSE.

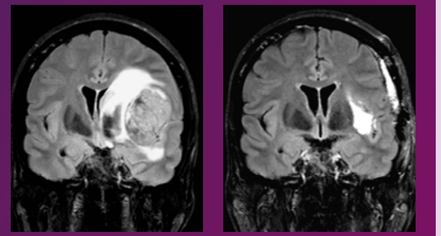
1 Compared to scans without Compressed SENSE.

SmartExam Brain

Standardized exams for consistent MRI results



SmartExam[1] Brain assists in delivering reproducible planning results by using intelligent software which automatically plans the scanning geometries, based on your validated scanning preferences. This enables you to standardize your MRI exam process helping you to enhance consistency in follow-up exams of the same patient and from patient to patient.



Enhanced consistency in follow-up exams

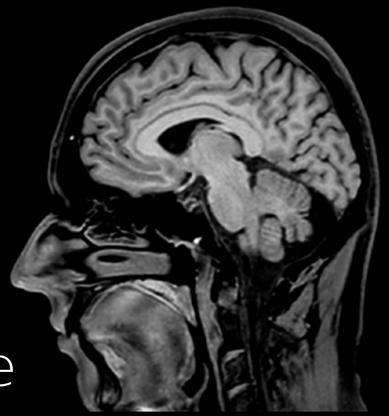
Additional information:

- Dedicated 3D survey scan is included to determine patient positioning.
- Automated planning of the imaging stack is based on anatomic landmarks relating those to a previously defined planning.
- SmartExam planning can be adapted and expanded to fit changing requirements.
- Automated geometry planning can be shared and applied across Philips MRI consoles.

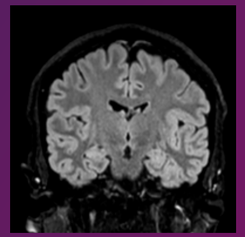
1 SmartExam is not available to patients with MR Conditional implants.

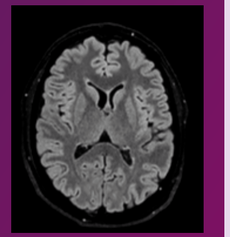
3D BrainVIEW

View your 3D TSE imaging data in any plane



3D BrainVIEW is an advanced 3D TSE technique that lets you acquire high resolution data in multiple directions, including oblique, in one scan helping you enhance your confidence when diagnosing lesions.





Data in multiple directions, in one scan

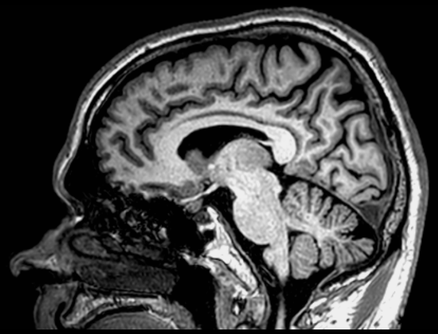
Additional information:

- Isotropic voxel size enabling reformats in any plane without loss of resolution.
- Allows for up to 20% shorter scan times[1].
- Available for a range of contrasts (T1w, T2w and PDw).

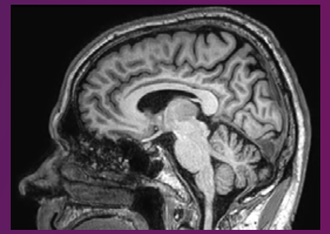
1 Due to time-efficient, low SAR flip angle sweep technology. Compared to standard 3D TSE.

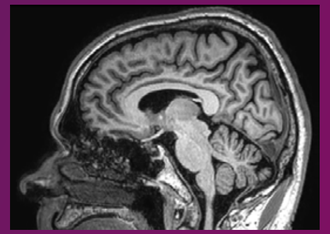
3D Non-selective

Fast and robust large volume 3D FFE imaging



3D Non-selective enables faster and more robust[1] large volume 3D FFE imaging in brain applications. Thanks to shorter TR and TE, 3D Non-selective delivers a 9% faster protocol and improved grey-white matter contrast in Brain 3D TFE[1].



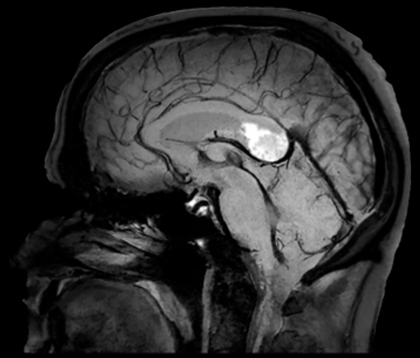


3D Selective imaging (left, 5:47 min) versus 3D Non-selective imaging (right, 5:02 min)

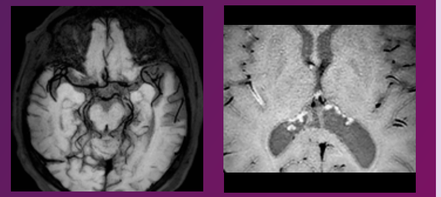
1 Compared to Philips 3D Selective 3D FFE imaging.

Black Blood imaging

Enhance your diagnostic confidence for Brain imaging



Black Blood imaging helps you better differentiate the vessel lumen from the intra lumen blood signal. This enhances your diagnostic confidence by performing your 3D brain imaging with higher and isotropic imaging resolution[1] with a reduction of the intra-lumen brain blood signal[2] over the complete imaging volume.



Reduction of the intra-lumen brain blood signal

Additional information:

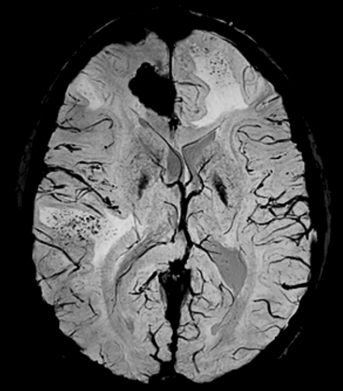
- Fast scan times[3] of five minutes.
- 3D isotropic acquisition enables reformats in any plane (including oblique) without loss of resolution.

1 Compared to our 2D double inversion methods with same brain coverage and scan time.
2 Compared to our 3D T1w scan without MSDE pre-pulse.

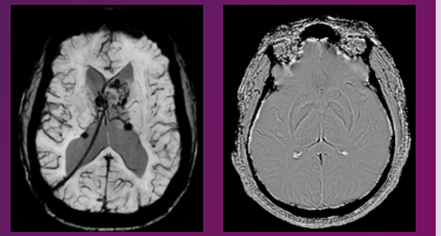
3 Compared to our 2D double inversion recovery methods with same full brain coverage.

SWIp

Exquisite susceptibility contrast



SWIp has a high sensitivity to enhance contrast for deoxygenated (venous) blood or calcium deposits and may help you, when used in combination with other clinical information, in the diagnosis of various neurological pathologies. SWIp offers high resolution 3D susceptibility weighted brain imaging allowing you to easily integrate it into your mainstream practice.



3D susceptibility weighted brain imaging, including phase maps

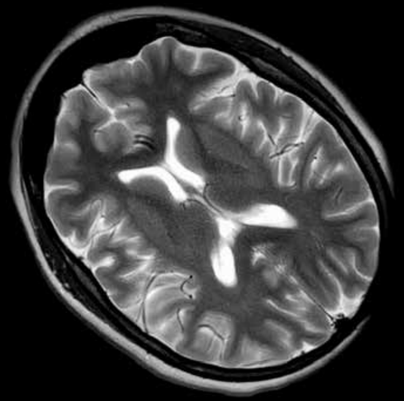
Additional information:

- High signal-to-noise ratio[1].
- Includes detailed phase maps to support advanced diagnosis.

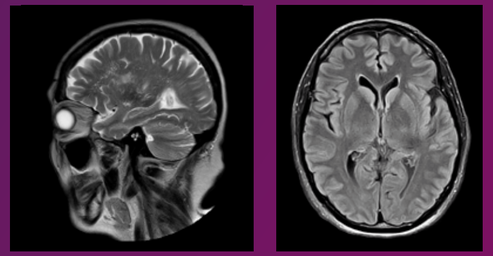
1 Due to multi-echo approach.

MultiVane XD

Motion-free imaging in short scan time



MultiVane XD delivers high resolution diagnostic images even in the case of severe patient motion by providing motion correction to a full range of anatomies, in short scan times[1]. MultiVane XD works in multiple orientations and for various contrasts (T1w, T2w, FLAIR) helping you to increase your diagnostic confidence.

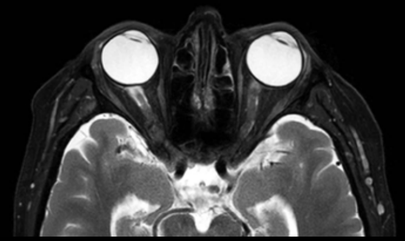


Diagnostic images, even in the case of severe patient motion

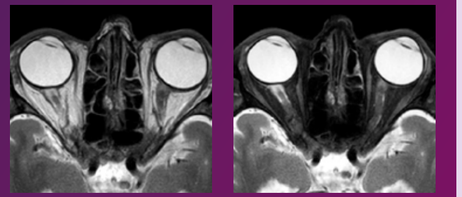
1 Compared to Multivane, thanks to compatibility with dS SENSE.

mDIXON XD TSE

Replace all your FatSat by one single fat-free imaging solution



mDIXON XD TSE brings a new dimension to fat suppression by providing uniform, complete and consistent fat-free imaging, even over large field-of-views and in challenging anatomies. Providing up to four image types in one single scan, including with/without fat suppression contrasts, in routine scan times and resolution simultaneously, you can easily replace your favorite routine TSE scans with it. mDIXON XD TSE will enable you to enhance your imaging strategies by simplifying your routine TSE procedures.



With/without fat suppression contrasts, simultaneously

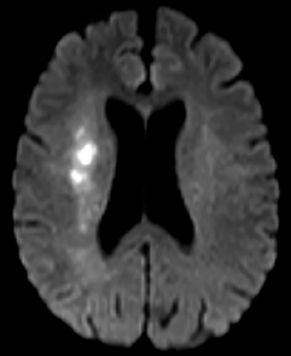
Additional information:

- 30% faster scanning and up to 30% reduced blurring[1].
- Increased signal-to-noise ratio[2].
- Acquire up to four image types in one single scan (water only, in phase, out phase, fat only).

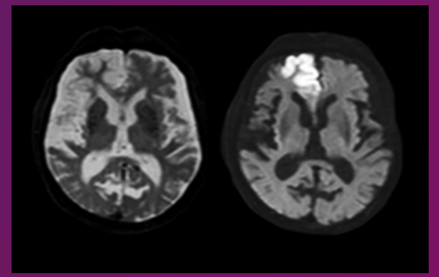
1 Due to its unique 2-echo technology, compared to the conventional 3-echo DIXON TSE techniques.
2 Compared to a standard non-fat-shift corrected fat-free TSE approach.

Diffusion

Non-invasive assessment of tissue structure



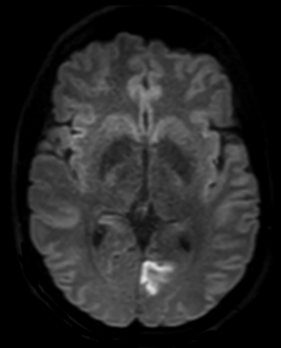
Diffusion is a single-shot EPI imaging method, robust against motion, providing DWI images in multiple b-values plus ADC /eADC maps. Additional diffusion gradient pre-pulses can be applied with three diffusion directions and up to 16 b-values. Diffusion imaging demonstrates pathology based on fluid motion states at the cellular level and can be used for non-invasive assessment of tissue structure.



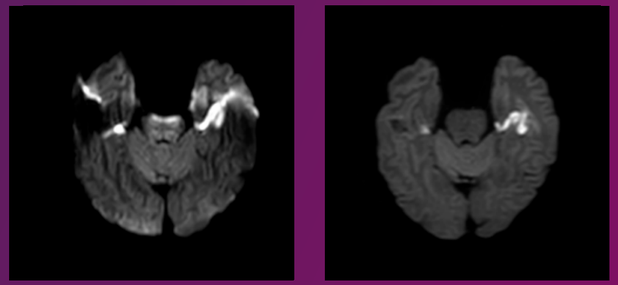
Diffusion b0 (left) and b1000 (right)

DWI TSE

Diffusion imaging with reduced distortion



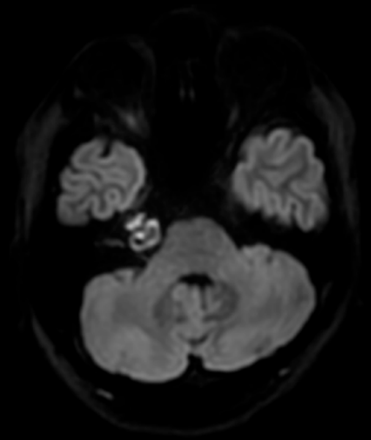
DWI TSE provides diffusion imaging with excellent signal-to-noise ratio and sharpness. DWI TSE is less sensitive to geometric distortion, compared to EPI based diffusion methods, which is especially beneficial in challenging anatomies such as inner ear.



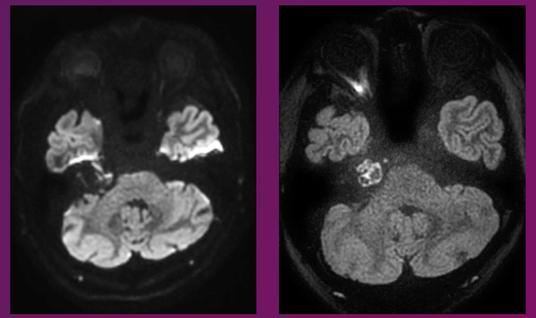
Inner ear DWI EPI (left) versus DWI TSE (right)

DWI XD TSE

Speed up and improve the quality of your diffusion TSE



DWI XD TSE delivers up to 25% faster diffusion TSE imaging with improved resolution due to its multi-shot approach[1]. DWI XD TSE is compatible with MultiVane, contributing to robust suppression of motion artifacts[2]. It also delivers images with less distortion because it is less sensitive to susceptibility differences compared to Philips conventional DWI EPI sequences.

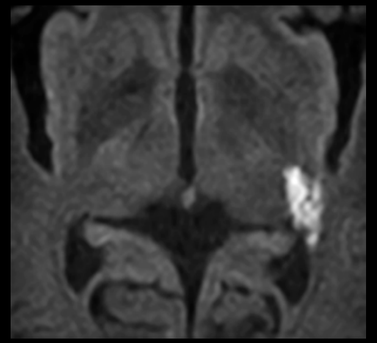


DWI EPI (left) versus robust inner ear DWI XD TSE (right)

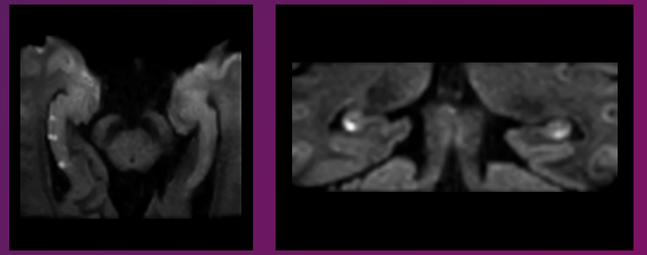
1 Compared to Philips DWI TSE (Single-shot).
2 Compared to Philips multi shot DWI TSE.

Zoom Diffusion

Small FOV diffusion imaging for improved image quality



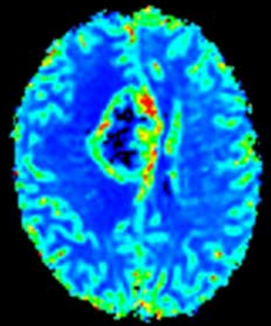
Zoom Diffusion allows you to acquire small FOV imaging, down to 200 x 50 mm, with reduced geometrical distortion, due to reduced EPI echo train length in DWI-EPI compared to conventional full FOV DWI-EPI, and higher spatial resolution, due to smaller acquisition voxel size compared to full FOV DWI-EPI, with same level of geometrical distortion.



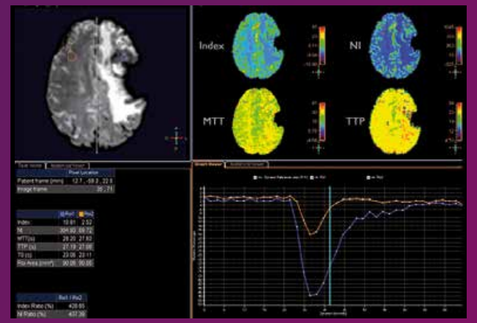
Small FOV diffusion imaging with high spatial resolution

T2* Perfusion

Brain perfusion with short scan time



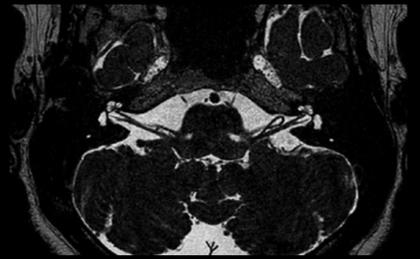
T2* perfusion provides physiologic maps of the microcirculation in the brain, including Mean Transit Time (MTT), Time To Peak (TTP), Time of Arrival (T0), Negative Integral (NI) and Index. T2* perfusion allows to perform MR brain perfusion imaging in a short dynamic scan time.



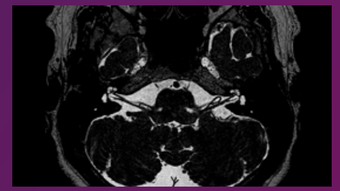
T2* Brain perfusion

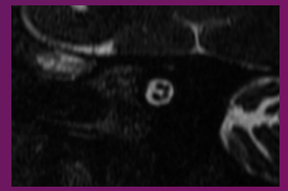
3D DRIVE

Shorter scan time, brighter fluid



3D DRIVE is a 3D TSE technique producing high-resolution T2-weighted images. Inclusion of the DRIVE pulse enables shorter TR's making the 3D DRIVE TSE method faster than conventional 3D TSE methods. Due to the intrinsic lower sensitivity for flow voids than multislice sequences, 3D DRIVE is especially useful to improve fluid visualization in IAC imaging.

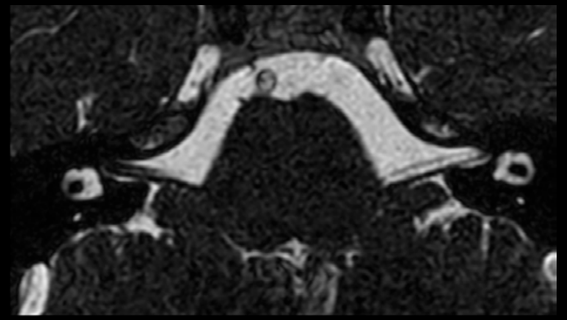




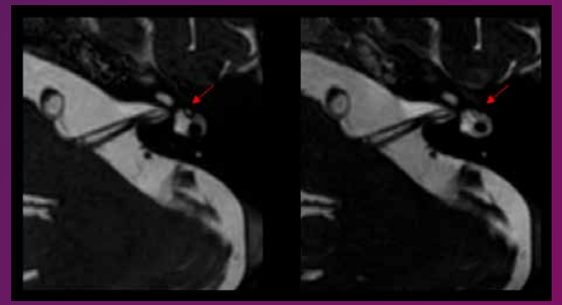
3D DRIVE inner ear imaging, including sagittal reformat

bFFE XD

Expanding clinical applications of balanced FFE



bFFE XD expands the clinical application of bFFE towards better visualization of fine structures. It delivers robust 3D, high resolution imaging with a spatial resolution up to 0.5 x 0.5 x 0.5 mm[1] in less than 6 minutes for inner ear applications, with reduced banding artifacts compared to conventional Philips balanced FFE.

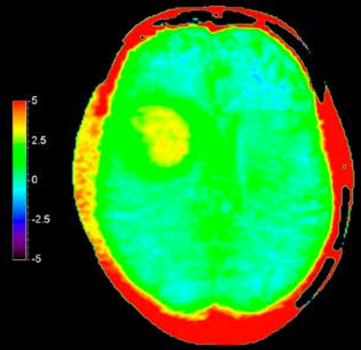


bFFE (left) versus bFFE XD (right)

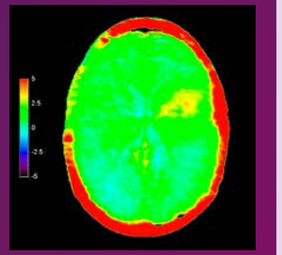
1 For 3.0T systems. For 1.5T systems: 0.6 x 0.6 x 0.6 mm .

3D APT

Enhanced diagnostic confidence in Neuro oncology



3D APT (Amide Proton Transfer) is a new unique, contrast-free, brain MR imaging method addressing the need for more confident diagnosis in neuro oncology. 3D APT uses the presence of endogenous cellular proteins, to produce an MR signal that directly correlates with cell proliferation, a marker of tumoral activity. 3D APT can support trained medical professionals in differentiating low grade from high grade gliomas and, in differentiating tumor progression from treatment effect[1,2]



3D APT image

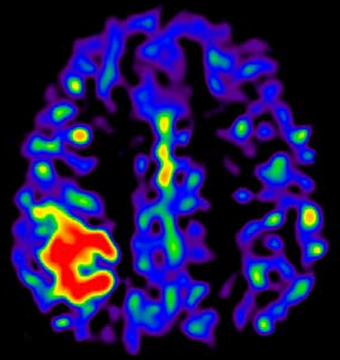
Additional information:

- 3D APTw images are calculated automatically and displayed as color maps
- Whole glioma coverage can be obtained with a resolution of 2.0 x 2.0 x 5.0 mm

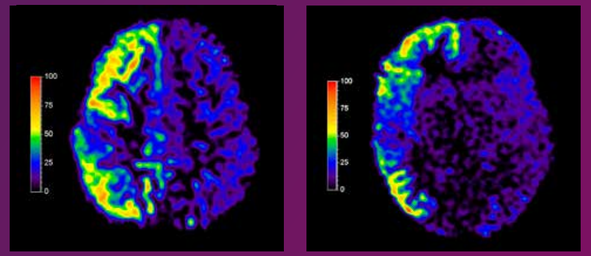
1 Togao et al. (2014) Neuro-Oncology.
2 Park KJ et al. (2016) Eur Radiol.

3D ASL

Reproducible contrast-free brain perfusion



3D ASL enables you to consistently quantify brain perfusion with an accuracy of 15%[1] in a non-contrast manner with full brain coverage, and better background suppression, compared to 2D pCASL method. 3D ASL includes fully automated calculation of color coded ASL maps.

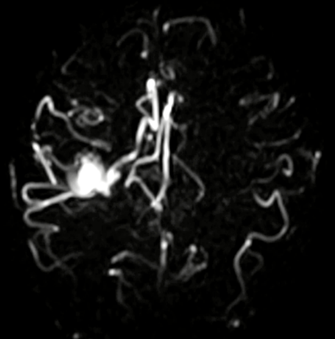


Quantification of brain perfusion in a non-contrast manner

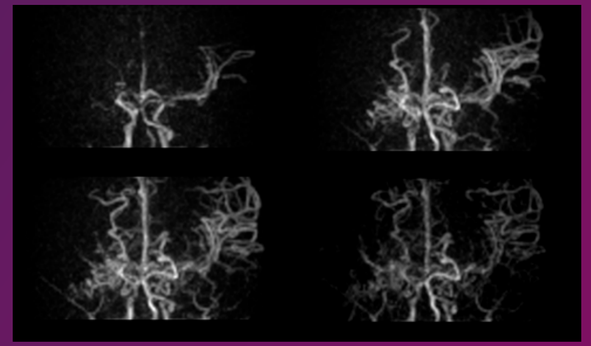
1 Measured on a single Philips 3.0T system for the same volunteer.

4D-TRANCE

Contrast-free imaging of brain vascular anatomy



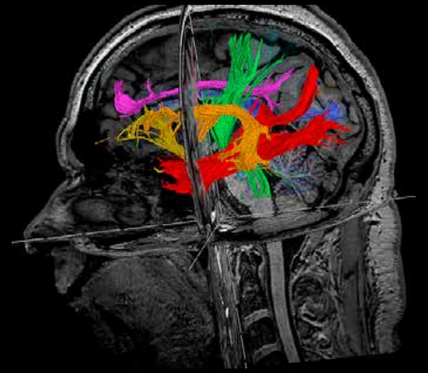
4D-TRANCE is a time-resolved technique for non-contrast angiography, promoting patient comfort and enabling you to evaluate the patency of the vascular anatomy in the brain using endogenous contrast with MIP visualization of multiple phases. 4D-TRANCE enables high temporal resolution down to 160 msec.



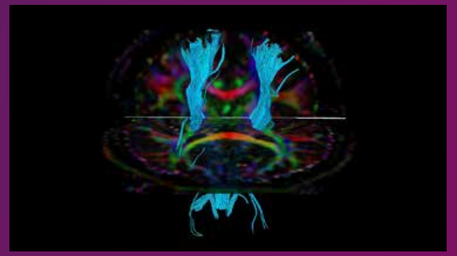
Non-contrast time-resolved angiography of the brain

DTI FiberTrak

Fast, easy clinical fiber tracking



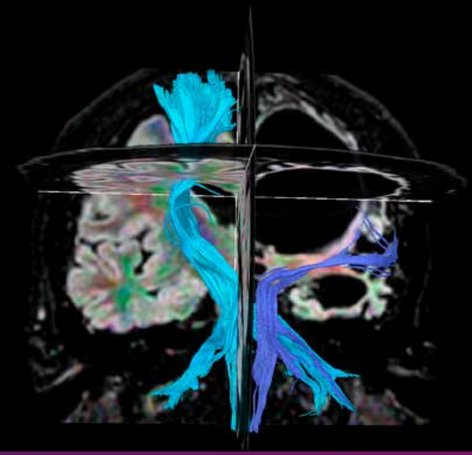
Visualize specific white matter fiber tracts in the brain with Diffusion Tensor Imaging (DTI) data and fiber tracking. This package allows you to trace, analyze and process fibers in real-time with minimal mouse clicks. It supports pre-operative surgical planning, post-surgery evaluation, and general evaluation of fiber tracts around tumors and lesions in connection with functional areas. DTI FiberTrak supports up to 32 directions and 16 b-values and includes automatic calculation of Fractional Anisotropy (FA) maps.



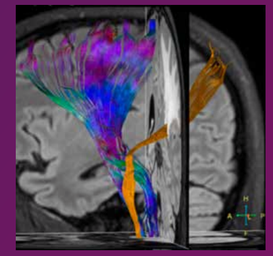
Visualization of white matter fiber tracts in the brain

FiberTrak Extension

High definition fibertracking



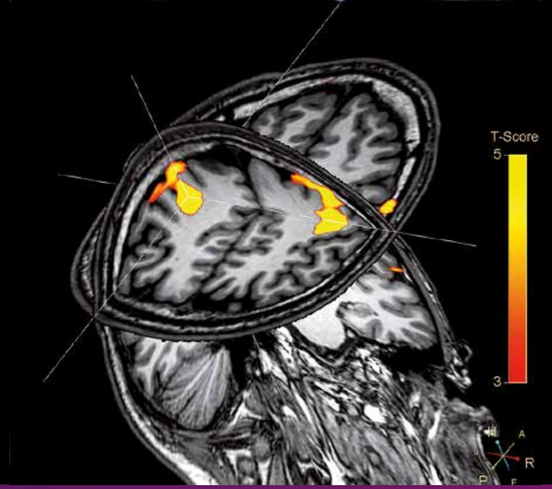
The FiberTrak Specialist Extension package Allows for diffusion imaging with up to 128 b-vectors and 16 b-values, delivering input for very high definition fiber tracking in the brain.



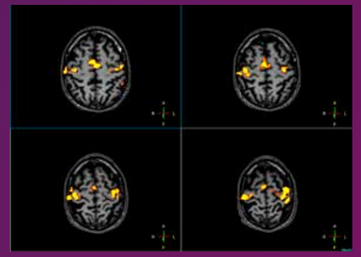
Visualization of white matter fiber tracts in the brain

BOLD

Fast, easy and reliable fMRI



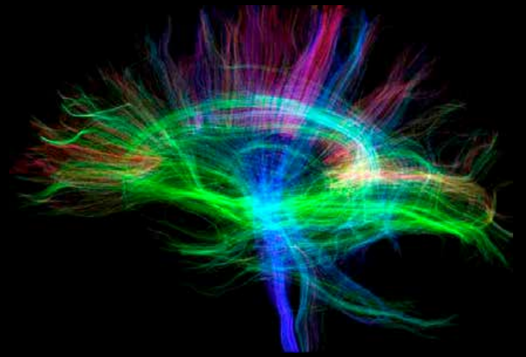
Accurately acquiring fMRI BOLD data during neuro imaging helps visualize task-related areas of activation in the brain. The fMRI paradigms that deliver and control stimuli are fully automated via dedicated ExamCards to make fMRI fast, easy, and reliable. The iView BOLD analysis package provides real-time processing of fMRI BOLD data into functional activation maps.



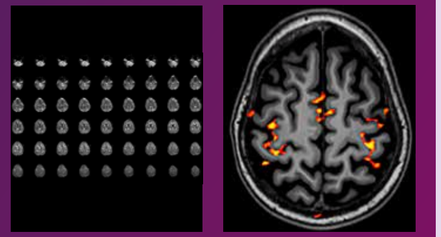
Visualize task-related areas of activation in the brain

MultiBand SENSE

High acceleration for your fMRI and DTI sequences



MultiBand SENSE allows you to use state-of-the-art acceleration factors in the brain by simultaneously exciting multiple slices. Due to a shorter minimum TR for fMRI, larger anatomical coverage or higher temporal resolution can be used. In your DWI/DTI sequences larger anatomical coverage or higher number of diffusion directions can be acquired[1]. With MultiBand SENSE you can perform fMRI and DTI exams with high speed and high resolution, simultaneously[2].



fMRI exams with large anatomical coverage

1 Due to a shorter minimum TR.
2 High speed due to using MultiBand SENSE and high resolution due to using in-plane dS SENSE.

Additional information:

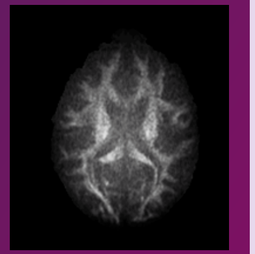
- Accelerate EPI scans in the brain with virtually no impact on SNR[3].
- Reduce scan time in your diffusion weighted protocols up to 73%[4].
- Acceleration factors of up to 8 for fMRI.
- Acceleration factors of up to 4 for diffusion MRI.

3 Up to an MB SENSE factor of 3.
4 Compared to normal Philips diffusion scanning.

NeuroScience

Explore brain connectivity

NeuroScience comprehensive package helps you to explore brain connectivity by supporting advanced acquisition schemes allowing for high-definition brain fiber tracking, including crossing fibers and advanced fMRI capabilities.



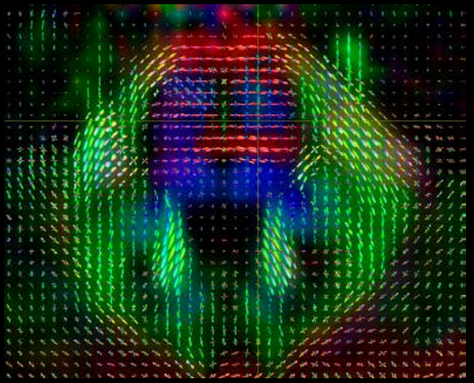
Diffusion acquisition with a b-value of 15.000

Additional information:

- Allows diffusion-weighted multi-shell acquisitions with up to 32 b-values and up to 128 unique diffusion directions
- Easy workflow for user defined gradient direction input
- Perform your fMRI studies with enhanced nyquist ghost stability and extended data storage (up to 64k images)
- Enables monitoring of consistency in longitudinal fMRI studies with a quality assurance tool, in line with fBRIN standards
- Includes B0 mapping for offline data correction and image processing
- Easy-to-use export tools in various formats, including NIfTI

NeuroScience extension

Extend your diffusion MRI studies



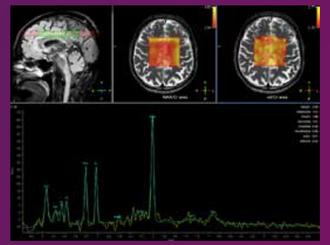
NeuroScience extension is an add-on to the comprehensive NeuroScience option. The extension brings your multi-shell DTI studies to a higher level. Advanced diffusion gradient control gives the scientific user control of the diffusion encoding gradient duration through selection of multiple diffusion encoding gradient waveforms. Furthermore, 2k DTI provides advanced control over diffusion gradients with up to 2048 independent diffusion encodings (vectors), each with up to 1024 different weightings and 1024 different directions.

Multi-shell DTI b4000 (128 directions)

Spectroscopy

Fully integrated proton spectroscopy

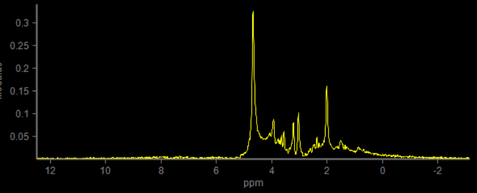
Spectroscopy Specialist provides extra information about the spatial distribution of metabolites in the brain. This package provides a set of single voxel, multi-voxel and multi-slice proton spectroscopy, fully integrated into the MRI console. To reduce scan time, a combination of Turbo Spectroscopic Imaging and dS SENSE can be used. Anisotropic matrix can be used to further reduce acquisition time. Includes SpectroView Analysis package for visualization and processing of all spectroscopic data.



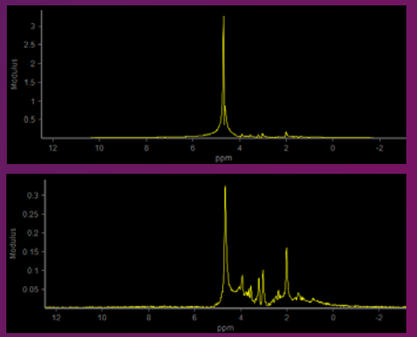
Spectroscopic imaging

Spectroscopy XD

More precise and more robust MR brain spectroscopy

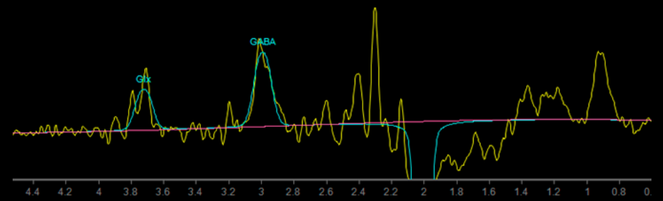


Spectroscopy XD is an add-on to our comprehensive Spectroscopy option. It includes VAPOR, which delivers faster MR spectroscopy examinations and more robust water suppression, up to a factor 4, than the conventional Philips water suppression technique (excitation) that uses time-consuming AWSO prescans. Furthermore, sLASER provides increased localization accuracy due to a reduction of the chemical shift displacement by a factor of 4 when compared to Philips PRESS.

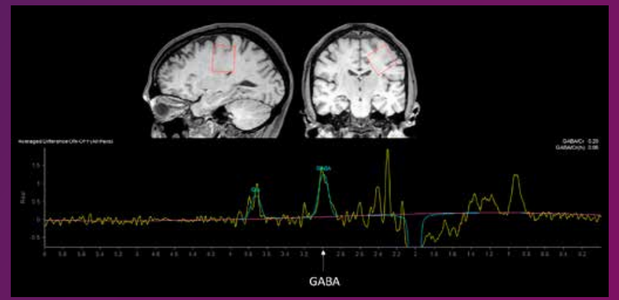


No VAPOR, amplitude ~3.5 (top) versus VAPOR, amplitude ~0.35 (bottom)

MEGA
Detection of additional metabolites

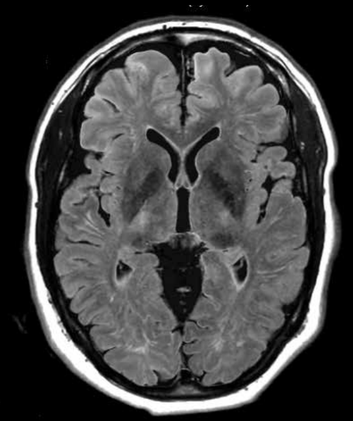


MEGA improves spectroscopy by revealing spectral peaks of interest which would otherwise remain hidden. It also allows detection and relative quantification of J-coupled metabolites such as gamma-aminobutyric acid (GABA) by automatically removing the spectral overlap from other metabolites. (In conventional spectroscopy, removing spectral overlap is only possible with spectral editing.) Frequency-selective RF pulses are included to manipulate the evolution of J-coupled MR signals. In addition, subtraction of on- and off-resonance spectra is used for relative quantification of J-coupled metabolites.

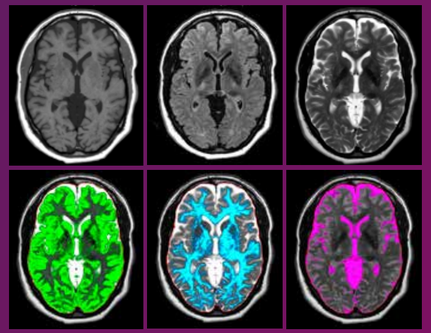


Detection of GABA with single voxel MEGA MR Spectroscopy

SyntAc
Exploring Neuro-radiology with synthetic MR imaging



SyntAc allows you to perform MR imaging with a single quantification scan of which the resulting data can be used as input for advanced 3rd party processing software (Synthetic MR, AB, Sweden) to synthesize MR images with different not only different contrasts, but also brain parenchyma fraction maps and/or brain segmentation maps.



Synthetic T1w, FLAIR, T2w and segmentation for grey matter, white matter and CSF

Clinical package **overview**

	ScanTools Pro	dS Performance Suite Plus	dS Performance Suite Pro	dS Performance Suite Premium
Compressed SENSE				●
SmartExam Brain		●		
3D BrainVIEW	●			
3D Non-Selective				
Black Blood imaging				
SWIp				
MulitVane XD			●	
mDIXON XD TSE			●	
Diffusion	●			
DWI TSE	●			
DWI XD TSE				
Zoom Diffusion				
T2* Perfusion	●			
3D DRIVE	●			
bFFE XD				
3D APT				
3D ASL				
4D-TRANCE				
DTI FiberTrak				
FiberTrak extension				
BOLD				
MultiBand SENSE				
Neurosciense				
NeuroScience extension				
Spectroscopy				
Spectroscopy XD				
MEGA				
Syntac				

Clinical package **overview**

	dS Neuro Suite Plus	dS Neuro Suite Pro	dS Neuro Suite Premium	dS Vascular Suite	A la carte
Compressed SENSE					
SmartExam Brain					
3D BrainVIEW					
3D Non-Selective					●
Black Blood imaging	●				
SWIp	●				
MulitVane XD					
mDIXON XD TSE					
Diffusion					
DWI TSE					
DWI XD TSE					●
Zoom Diffusion		●			
T2* Perfusion					
3D DRIVE					
bFFE XD					●
3D APT					●
3D ASL			●		
4D-TRANCE				●	
DTI FiberTrak		●			
FiberTrak extension					●
BOLD			●		
MultiBand SENSE					●
Neurosciense					●
NeuroScience extension					●
Spectroscopy	●				
Spectroscopy XD					●
MEGA					●
Syntac					●

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