

## APPLICATIONS

The SuperFASE package is an optional package for the Toshiba magnetic resonance imaging (MRI) system. This package provides new pulse sequences that are effective for vascular imaging etc. and new imaging functions in order to expand the range of clinical applications.

## DEFINITION OF TERMS

- ECG-Prep: Imaging technique that permits image acquisition for the same slice in different cardiac phases. Images are acquired sequentially at different delay times from the trigger in ECG gating or peripheral-pulse gating.
- FBI (Fresh Blood Imaging): A vascular imaging technique using ECG gating or peripheral-pulse gating. It permits visualization of the fresh blood ejected from the heart by setting the appropriate delay time relative to the R wave and performing gated scanning for each shot.
- SPEED (Swap Phase Encode Extended Data acquisition): Imaging technique for acquiring two images with the phase encode directions shifted by 90° for the same slice.
- Composite MIP: Image processing technique for superimposing two images acquired using the SPEED technique through MIP processing.
- FASE BB (Black Blood): Imaging technique for suppressing the signals from blood flowing into the slice plane by applying a Black Blood prepulse and for acquiring cardiac and thoracic images with reduced blood flow artifacts.
- T2 Plus technique: Imaging technique for enhancing T2 weighting by speeding up the recovery of residual transverse magnetization after data acquisition.
- TrueSSFP technique: Imaging technique for acquiring echoes from many coherent states by taking advantage of the steady-state free precession achieved by repeating excitation at specified intervals. This technique produces images with a high SNR.
- Flow-Spoiled FBI: Imaging technique for generating artery/vein separation images without the use of contrast medium by performing subtraction between cardiac-gated images acquired at end diastole and end systole.
- Flow-Adjusted FBI: Acquisition method with improved direction-dependency in vascular imaging due to a specially designed gradient magnetic field pulse control method, in addition to Flow-Spoiled FBI.
- Time-SLIP (Time-Spatial Labeling Inversion Pulse): Inversion pulse that can be applied at an arbitrary timing and arbitrary position independent of the imaging plane.
- BB (Black Blood) TI Prep: Prep function for determining BBTI in FASE. As a pre-test, images are obtained by varying the TI at regular intervals. In this way, the optimal TI is obtained in actual imaging.

# SuperFASE PACKAGE

## COMPOSITION

Software (License) ..... 1 set

This package does not include an operation manual. Refer to the operation manual supplied with the MRI system.

## APPLICABLE COMBINATIONS

This package is applicable to the following systems.

- Vantage Titan™ 3T

\* The optional interactive cardiac gating unit (model MKSU-ECG04/S1) must also be installed in the MRI system.

\* It is recommended that the optional respiratory gating kit (model MKSU-RSPK03/S1) be installed in the MRI system to ensure stable image quality during normal breathing.

## PERFORMANCE SPECIFICATIONS

### Features

This package provides the following features.

- ETS FASE

2D/3D-FASE pulse sequences with a short echo train spacing.

[Application]

Myocardial imaging, hepatic vessel imaging, Myelography, cholangiography, pancreatography, inner ear imaging, etc.

- Sequential FASE

This method is useful for the sequential acquisition of different slice images in the same cardiac phase.

[Application]

Multislice imaging of the heart and great vessels.

- SPEED (Swap Phase Encode Extended Data acquisition)

Using this technique, two images with the phase encode directions shifted by 90° can be acquired for the same slice in a single scan. From the two types of images acquired, a composite MIP image is obtained using post-processing software. The matrix and FOV in the scanning parameters are automatically set to square.

Respiratory gating can be used in combination with cardiac gating or peripheral-pulse gating.

[Application] Arteriovenous imaging

- ECG-Prep

By repeating acquisition with different preset delay times from the trigger in ECG-gated or peripheral-pulse-gated scanning and then generating images of the same slice in different cardiac phases, the optimal delay time for each scanning region or patient can be estimated.

The delay time from the R wave is displayed in ms together with the image as image-related information.

The gating trigger can be selected from among the following four types.

- Cardiac gating
- Peripheral-pulse gating
- Combination of cardiac gating and respiratory gating
- Combination of peripheral-pulse gating and respiratory gating

[Application] Estimation of optimal delay time for FBI

- FBI (Fresh Blood Imaging)

This is an imaging technique for visualizing the fresh blood ejected from the heart by setting an appropriate delay time and performing gated data acquisition for each shot using cardiac gating or peripheral-pulse gating. Respiratory gating can also be used in combination.

[Application] Arteriovenous imaging

- FSE/FASE T2 Plus 3D

This technique accelerates the recovery of longitudinal magnetization in FSE 3D or FASE 3D imaging so as to reduce the imaging time and increase the resolution without a loss of T2 contrast or a fall in SNR.

[Application]

Myelography, cholangiography, pancreatography, inner ear imaging, etc.

- FSE/FASE T2 Plus 2D

This technique accelerates the recovery of longitudinal magnetization in FSE 2D or FASE 2D imaging so as to reduce the imaging time and increase resolution without a loss of T2 contrast or a fall in SNR.

[Application]

Imaging of the cervical spine, thoracic spine, lumbar spine, etc.

- FSE 3D ReallR

Heavily T1-weighted FSE 3D images can be obtained in a shorter time.

[Application] Head imaging

- FASE BB

Cardiac and thoracic images with reduced blood flow artifacts can be acquired.

[Application] Chest imaging

- Multishot FASE

When the number of shots is increased, the scanning time increases, but image blurring due to motion or T2 relaxation is reduced.

[Application] T2W imaging

- TrueSSFP

Images with T2/T1 contrast are acquired in a shorter time by taking advantage of steady-state free precession.

This technique is useful for visualizing tissues and blood vessels with relatively long T2 values during breath-holding. Fat saturation is possible by using the segmented scan technique in combination.

[Application] Imaging of hollow organs in the abdomen

- FE3D SSFP

Images with T2/T1 contrast are acquired in a shorter time by taking advantage of steady-state free precession.

This technique is useful for visualizing CSF and synovial fluid, which have relatively long T2 values. In addition, fat suppression combined with WET is possible. When the 3DFT technique is used in combination, thinner slices can be acquired.

[Application] Imaging of the head, joints, etc.

- TrueSSFP 3D

Images with T2/T1 contrast are acquired in a shorter time by taking advantage of steady-state free precession.

This technique is useful for visualizing tissues and blood vessels with relatively long T2 values during breath-holding. Fat saturation is possible by using the segmented scan technique in combination.

When the 3DFT technique is used in combination, thinner slices can be acquired.

[Application] Imaging of hollow organs in the abdomen

- Time-SLIP

When combined with FBI (FASE) or trueSSFP, this pre-pulse enables artery/vein separation and hemodynamic evaluation without the use of contrast medium. By acquiring data while turning ON/OFF the t-SLIP pulse, subtraction images with reduced misregistration can be obtained and the target blood vessels can be extracted more clearly.

[Application]

Non-contrast-enhanced vascular imaging in the abdomen and lung fields

- Time-SLIP BB (Black Blood) TI continuously variable (BBTI Prep)

As a pre-test for determining BBTI in FASE, images are obtained with the TI varied at regular intervals. In this way, the optimal TI is obtained in actual imaging. The settable parameters are the initial TI value (unit: 1 ms), interval (1 to 500 ms), and the number of repetitions (max 1,000).

[Application]

Optimization of vascular visualization in non-contrast angiographic imaging of the abdomen and lung fields with time slip

- Flow-Spoiled FBI

Arteries are visualized as low-signal areas in the systolic phase by applying a spoiler gradient pulse in FASE scanning. This permits artery/vein separation imaging without the use of contrast medium.

[Application] Vascular imaging of the lower limbs

- FASE3D MPV (Multi Planar Voxel)

MPV method can inhibit signal decay caused by T2 relaxation by optimizing flip angle of flop pulse per each echo. Therefore, this method decreases blur and increases the sharpness of an image because of the low shot number.

[Application] Head imaging

## POWER AND ENVIRONMENTAL REQUIREMENTS

The power and environmental conditions are the same as for the MRI system.

## COMPLIANCE WITH STANDARDS

This package complies with the same standards as the MRI system.

## MASS

Unit	Mass (kg)
SuperFASE package	Approx. 0.5

DRAFT



## TOSHIBA MEDICAL SYSTEMS CORPORATION

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