MAGNETOM Skyra

Operator Manual - TimTX TrueShape

syngo **MR D13**

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Manufacturer's notes:
This product bears a CE marking in accordance with the provisions of regulation 93/42/EEC of June 14, 1993 for medical products.
The CE marking applies only to medico-technical products/ medical products introduced in connection with the above-mentioned comprehensive EC regulation.

TimTX TrueShape A

A TimTX TrueShape

Introduction

This operator manual is an addendum to the MR system operator manual.

This manual may include descriptions covering standard as well as optional hardware and software. Contact your Siemens Sales Organization with respect to the hardware and software available for your system. The description of an option does not infer a legal requirement to provide it.

The graphics, figures, and medical images used in this operator manual are examples only. The actual display and design of these may be slightly different on your system.

Male and female patients are referred to as “the patient” for the sake of simplicity.

References to “Siemens Service” include service personnel authorized by Siemens.

Important icons

For readability, certain contents are highlighted. In the following sections, you will find the symbols and their contents used:

- ✓ Prerequisites for the operating steps to follow
- ◆ Request for action
- ■ Item in list

! Notes for optimal use of the system.

i Remarks that facilitate working with the system.

?! Problem

Description of possible sources of errors

- ◆ Requests for action to solve problems

Safety information

General

! All safety information of the valid operator manuals must be adhered to without fail. It is merely supplemented by the notes contained herein.

All personnel should be instructed in the proper connection, use and handling of the system.

! Always follow proper safety, operating and maintenance procedures to prevent exposure to electrical or mechanical hazards that may cause injury.

Patient padding

Dangerous current loops may be generated when parts of the patient's body touch. For information on how to position the patient appropriately, see (➡ Operator Manual MR system, chapter Safety)

! Furthermore, when using the TimTX TrueShape option, an adequate patient padding is necessary to keep a proper distance between the body parts (for example, legs and arms).

Overview

With *syngo* MR D13C, the TimTX TrueShape option is introduced for MAGNETOM Skyra, a new architecture for parallel transmit (pTx) technology. TimTX TrueShape provides multi-channel TX array imaging, resulting in higher image quality and shorter scan times.

The interaction of independent transmit channels in TimTX TrueShape enables the selective excitation of a specific body area. Besides a focused and more homogeneous *B1 Shimming*, TimTX TrueShape brings entirely new applications into the clinical world:

syngo ZOOMit allows *Zoomed Imaging* for highlighting regions and organs, with optimized protocols for neurology, oncology, and orthopedics applications.

B1 shimming

Mitigating B1 inhomogeneities

Depending on the patient, B1 inhomogeneities can present a problem for imaging in specific areas of the body, such as the liver, breast, the trunk (including hip and lumbar spine), and in the contrast-enhanced imaging of blood lumen, in particular in the pelvis. B1 field inhomogeneities are induced by the interaction of the patient with the RF energy introduced into a strong main magnetic field B0 ≥ 3 T. They may result in image artifacts such as shading and a general inhomogeneous impression in certain regions of the image.

Performing B1 shim

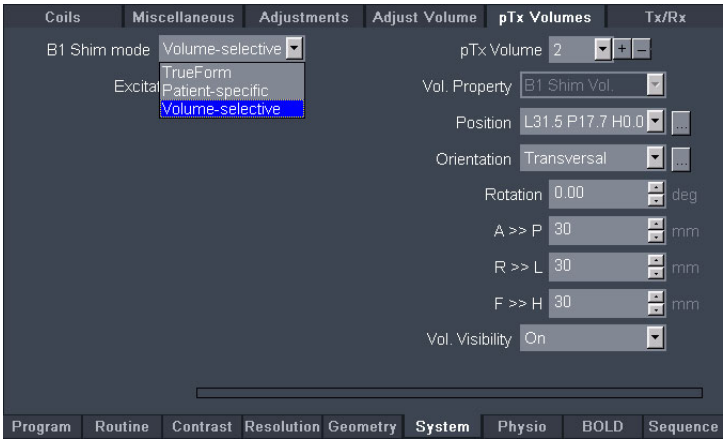
The B1 shim allows you to correct inhomogeneities of the RF excitation (B1 field). The adjustment is performed in two steps:

- Measurement of a 3-dimensional B1 map for each Tx channel
- Adaptations of RF pulses for each Tx channel

! High B1 field applied over a relatively long time heats the coil housing of the Spine 32. In order to avoid heating make sure that the coil cushion is mounted before performing B1 shim.

Selecting the B1 shim mode

- Open the **System pTx Volumes** parameter card.



- Set the **B1 Shim mode**.
  - **TrueForm:** The B1 field is optimized for body regions, so the optimization is anatomy-specific.
  - **Patient-specific**: The RF excitation is parameterized on basis of B1 maps of the subject. The optimization aims at the whole volume covered by the slice group.
  - **Volume-selective**: The B1 field is optimized in a specified volume according to the chosen pTx volumes.

Selecting second B1 shim volume

If anatomically necessary you can add a second B1 shim volume.

- Increase the **pTx Volume** parameter to **2**.

The B1 shim volumes are displayed in the GSP segments.

- Set the **Vol. Property** of the selected volume(s) to **B1 Shim Vol**.

Performing B1 shim manually

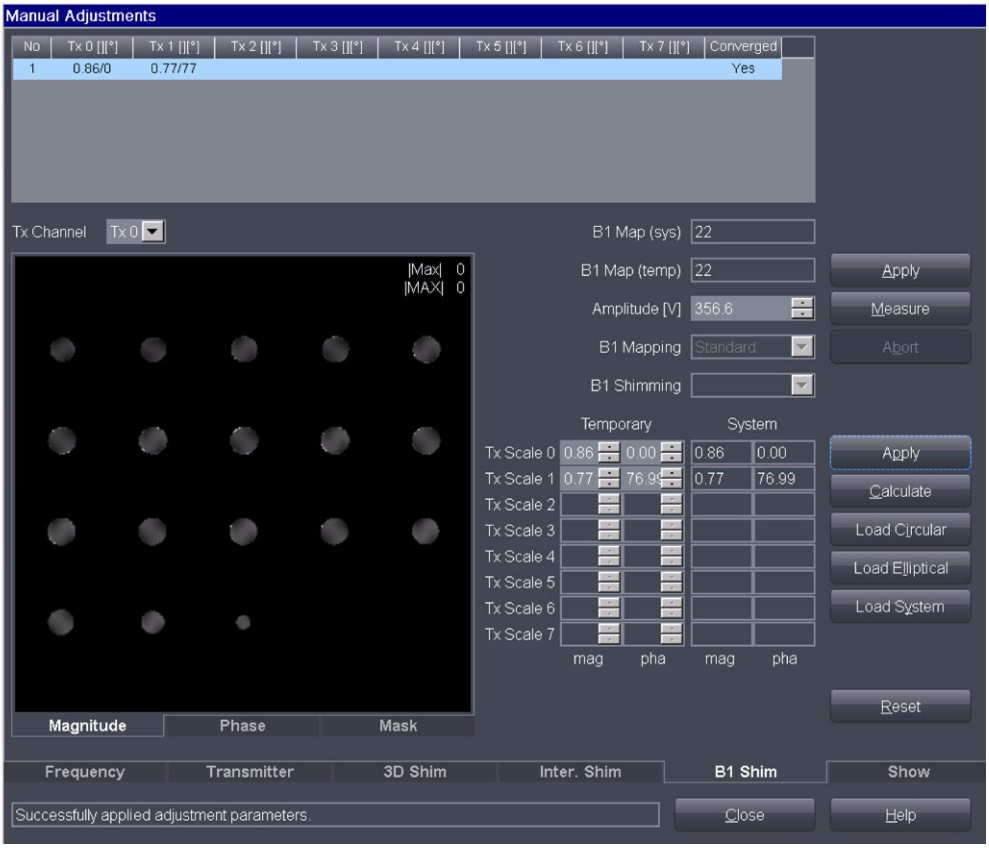
! The following description applies to *expert users* only.

With the B1 Shim you can correct inhomogeneities of the RF excitation (B1 field).

- Select **Options > Adjustments** from the main menu.

The **Manual Adjustments** dialog window is opened.

- Select the **B1 Shim** subtask card.



Entering the amplitude

- Enter the transmit amplitude for the adjustment to be performed in the **Amplitude [V]** input field.

Starting the measurement

- Start the measurement with **Measure**.

After the measurement, the B1 field map is displayed in the image area of the **Manual Adjustments** dialog window.

Selecting the image type

- Display the magnitude images by selecting the **Magnitude** card.

– or –

- Display the phase images by selecting the **Phase** card.

– or –

- Display the mask images by selecting the **Mask** card.

Windowing images

You set the window values for the image, by dragging the mouse over the image with the center button pressed.

- Adjust the contrast by moving the mouse vertically.
- Adjust the width by moving the mouse horizontally.

Selecting the transmit channel

- Load the signals of specific transmit channels by selecting them from the **Tx Channel** list.

Applying the B1 map

- Transfer the current temporary B1 map to the MR system with **Apply** (to the right of the **B1 Map (temp)**).

Calculating the Tx scale factors

- Calculate the Tx scale factors from the current B1 map with **Calculate**.

The Tx scale factors are recalculated. They are displayed in the list of numeric results and used as the basis for the next B1 map measurement.

The numeric results are listed below the running number of the iteration. The following parameters are displayed.

Parameters	Comment
No.	Running number of the adjustment calculation
Tx0 ... Tx7	Tx scale factors in amplitude/phase display
Converged	Results of adjustment

Transferring the Tx scale factors

- Transfer the current temporary Tx scale factors to the MR system with **Apply** (to the right of **System**).

Loading the Tx scale factors

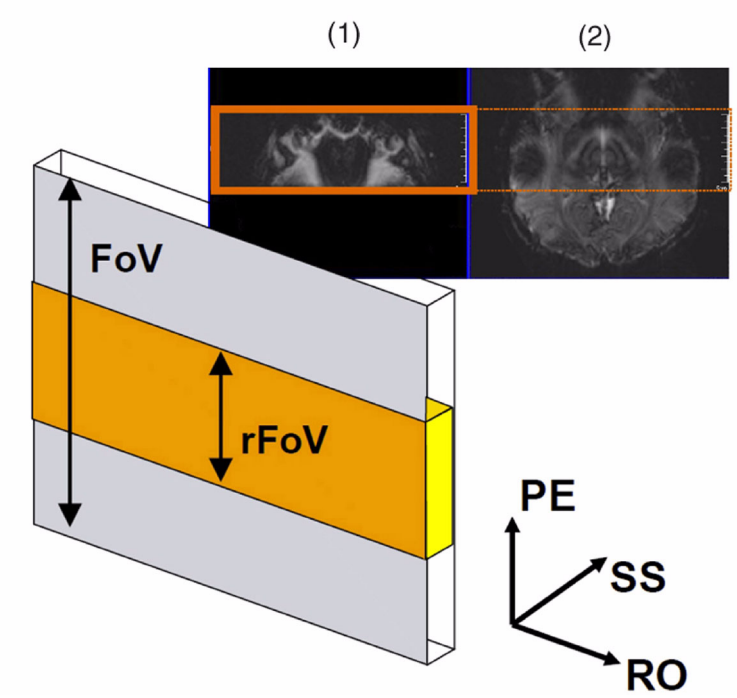
- Display the circular Tx scale factors as temporary parameters with **Load Circular**.
- Display the elliptical Tx scale factors as temporary parameters with **Load Elliptical**.
- Display the current Tx scale factors of the system with **Load System**.

Zoomed imaging

syngo ZOOMit applications

Zoomed MR imaging can be performed using *syngo* ZOOMit. Selecting a small stripe (reduced FoV) instead of a large excitation plane allows you to perform a targeted excitation by highlighting regions, organs, or even features of an organ. The reduced FoV can be imaged in a shorter scan time.

The excitation with ZOOMit is integrated in BOLD and diffusion EPI sequences (ep2_bold, ep2_diff) as well as SPACE. Using ZOOMit for EPI has the additional advantage that a shorter echo train for imaging is used which reduces distortions and in addition can shorten the echo time TE.



Example: Zoomed EPI in the brain, using a reduced FoV in phase-encoding direction, compared to a standard full FoV acquisition.

(1) Reduced FoV using *syngo* ZOOMit
(2) Full FoV

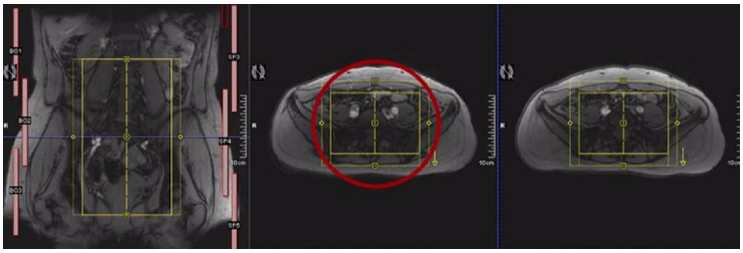
Explanation:

- PE: phase-encoding direction
- SS: slice-selection direction
- RO: readout direction

Zoomed SPACE

The SPACE sequence allows inner volume excitation. The resulting spin echo provides only signal from this inner volume.

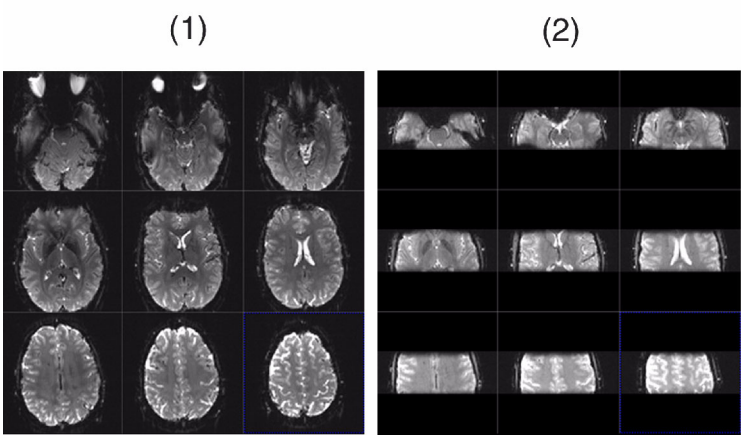
The patient's anatomy does not need to be fully covered in order to avoid aliasing artefacts. In practice, you can reduce the FoV in all directions to the volume of interest, as a result, a smaller cuboid volume is defined.



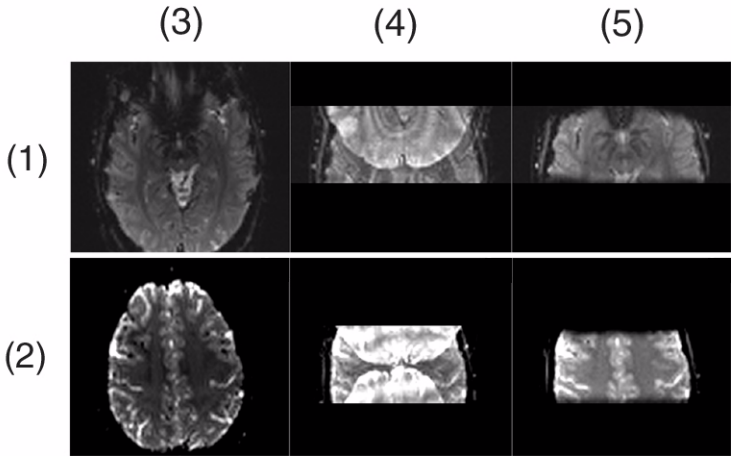
The zoomed SPACE sequence allows you to reduce the FoV in phase-encoding direction resulting in shorter scan time.

Zoomed BOLD imaging in the brain (Zoomed fMRI)

Zoomed imaging is especially useful for BOLD imaging in the brain. Compared to a full FoV excitation, zoomed images show visibly less distortions without aliasing artifacts.



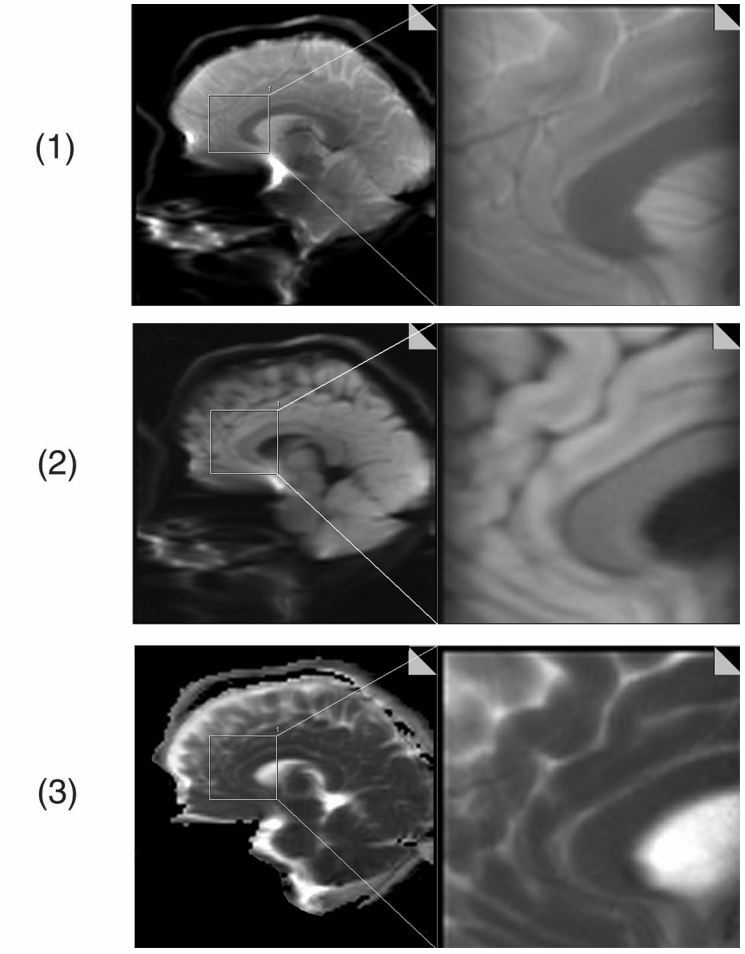
(1) Full FoV
(2) Reduced FoV using *syngo* ZOOMit



(1) Inferior slice
(2) Superior slice
(3) Full FoV
(4) Reduced FoV with aliasing artifacts using conventional techniques
(5) Reduced FoV without aliasing artifacts using *syngo* ZOOMit

Zoomed diffusion-weighted imaging

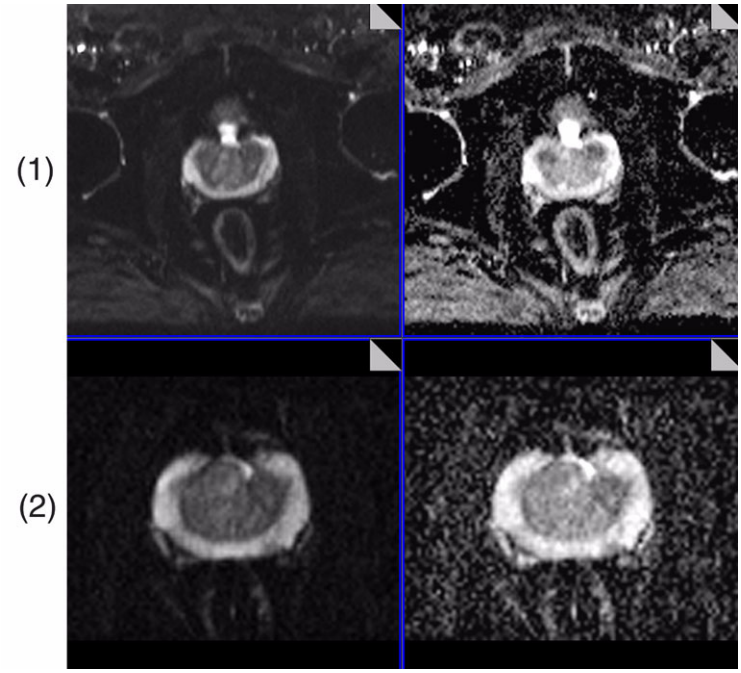
Zoomed diffusion allows imaging of smaller organs or smaller parts of an organ with a reduced FoV, eliminating aliasing artifacts. A selected organ can be imaged without signals from surrounding tissue (for example fat).



Diffusion-weighted MRI: Full FoV (left side), reduced FoV using *syngo* ZOOMit (right side)

(1) DWI with b-value 0
(2) DWI with b-value 1000
(3) ADC map

Images of the prostate and the pancreas in particular will be improved. These organs cannot be imaged well with small FoVs using conventional means, because they are surrounded by tissue of several times their size.



Trace-weighted images of the prostate (left side), ADC maps (right side)

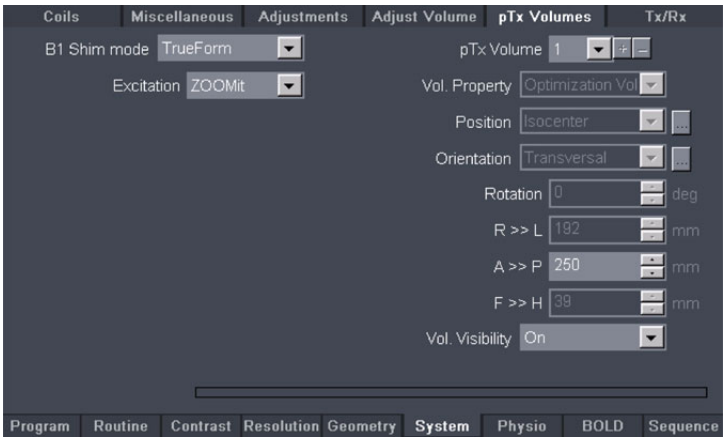
(1) DWI using conventional techniques

(2) DWI using *syngo* ZOOMit

Performing zoomed imaging

Preparing the zoom

- Open the **System pTx Volumes** parameter card.
- Switch **Excitation** to **ZOOMit**.



The pTx volume is shown in the graphical slice positioning (GSP) segments. The optimization pTx volume can be varied in the phase-encoding direction. The visibility can be switched on/off.

! When switching on the **Excitation** to **ZOOMit** in EPI or SPACE while reducing the FoV phase, it is recommended also to switch off the **PAT mode** to **None** (**Resolution iPAT** parameter card).

Zooming the FoV

The zoomed FoV (reduced FoV in the phase-encoding direction) determines the region of excitation.

The FoV is displayed active (yellow) in the image. An arrow indicates the phase-encoding direction.

- Position the zoomed FoV according to your desired volume of interest.

Adapting the suppression volume

For zoomed EPI, in addition to positioning the zoomed FoV, you define the Field of Excitation (FoE) outer border. The FoE is an optimization volume used for suppressing undesired signals from outside the FoV.

- Select the pTx volume with **Vol. Property Optimization**.

The FoE is displayed in the image.

- Adapt the FoE outer border in the phase-encoding direction so that the expected object size of the patient's anatomy is completely covered.

! The FoE outer border influences the total duration of the selective RF pulse and as a result the minimally achievable echo time TE. Therefore, it is recommended not to extend the FoE too far outside of the patient's anatomy.

pTx volume parameters	Comment
Position	Position of the selected pTx volume
Orientation	Orientation of the selected pTx volume
Rotation	In-plane rotation of the selected pTx volume
R >> L	Extension of the volume in the right-left direction
A >> P	Extension of the volume in the anterior-posterior direction
F >> H	Extension of the volume in the feet-head direction
Vol. Visibility	Specify if the selected volume shall be visible in the GSP segments or not

Coupling the adjustment volume to the pTx volume

The system's adjustment volume is normally calculated automatically, and coupled to the acquisition volume. Alternatively, a sequence, e.g. EPI in ZOOMit mode, may permit to couple the automatic calculation of the adjustment volume to the FoE/ pTx volume.

- Open the **Adjust Volume** parameter card.
- Set the **Couple to** parameter to **pTx Volume**.

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