

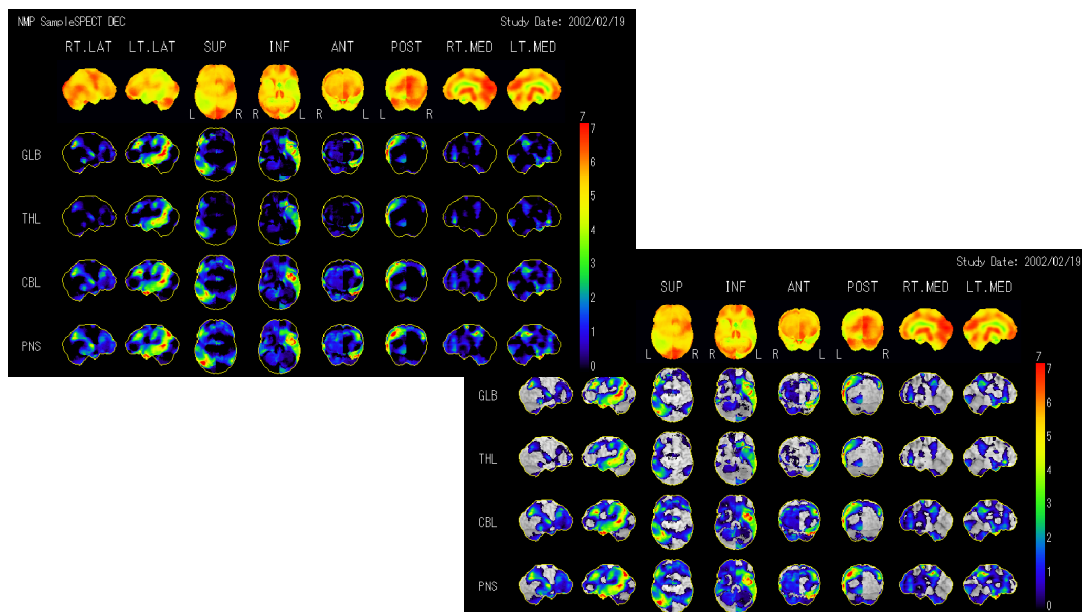
DRAFT

3D-SSP (3D-Stereotactic Surface Projections) Interface Software

"iSSP for CBF SPECT"

Version 3.5
Windows Version

Operation Manual



Nihon Medi-Physics Co., Ltd.

Usage Notes for iSSP Version 3.5

This program (called "Interface SSP," or simply "iSSP") is 3D-SSP interface software specifically for IMP or HMPAO-SPECT data and designed by Nihon Medi-Physics Co., Ltd. for research and experimentation. It is a program that provides support for even higher objectivity in analysis of brain function images.

Nihon Medi-Physics Co., Ltd., the University of Michigan and the University of Washington (providers of Neurostat), and normal database supplier facilities developed iSSP assuming that it would be used for research and experimentation purposes. The responsibility for any gains or losses realized through the usage of the programs contained on this CD-ROM rests solely with the user. Nihon Medi-Physics Co, Ltd, the University of Michigan, the University of Washington, normal database supplier facilities, and developers shall bear no responsibility for any losses incurred.

To optimize the anatomical standardization of SPECT images, iSSP uses setting values from stereotaxic anatomical standardized programs to set parameters suitable for SPECT image processing based on past data processing experience. Also, iSSP internal algorithms perform anatomical standardization using successive approximation. As a result, slight differences may occur in the final results due to disparities between different computers, operating systems, program versions, and preference file settings. Nonetheless, if analysis results of the same data in different environments yield significant disparities, this may be due to an error occurring in a portion of the analysis, the preference file settings not matching the properties of the computer or image, or some other cause.

When using this program, be sure that you have sufficient experience operating the program, and always check that the program is operating normally for every data sample.

This software is distributed solely for the purpose of individual, private playback. The unauthorized reproduction, copying, transfer, analysis (reverse compiling or reverse assembly), or modification (reverse engineering) without the express written permission of the copyright holder is strictly prohibited.

3D-SSP (iSSP) is intended for the analysis of "image data obtained from multi-sensor rotation type, ring type, or similar high-resolution SPECT devices." Please note that normal operation of the program has not been confirmed for data gathered from SPECT devices with limited resolutions.

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I. iSSP Version 3.5 Installation and Uninstallation

For information about iSSP Version 3.5 installation and uninstallation, refer to the Installation Manual.

II. iSSP Version 3.5 Overview

iSSP is 3D-SSP interface software operating in Windows 98, Me, NT, and 2000 and which is specifically for IMP or HMPAO-SPECT data. It was developed at the University of Michigan and the University of Washington by Dr. Minoshima and his colleagues, and it combines in a single package inside Neurostat, which is provided free of charge upon request, the programs required for execution of 3D-SSP together with IMP normal SPECT databases.

1. iSSP Version 3.5 Functions and Features

Functions

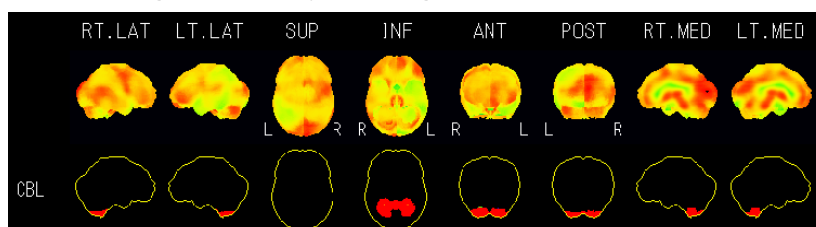
- Execution of 3D-SSP analysis
- Creation of 3D-SSP databases
- Execution of two-group comparisons (t test of two non-corresponding groups)
- **Database verification using Leave One Out**

Features

- **Includes updated anatomical standardization program**

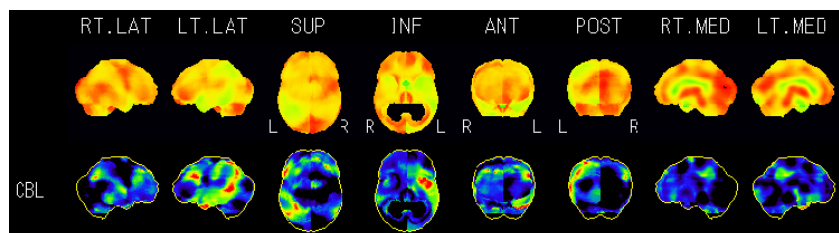
This enables correct analysis of data where the parietal region or cerebellum region is outside the visual range for improved anatomical standardization accuracy.

Version 6.6: Z-score image when analyzed using old version



When the cerebellum is outside the visual range, the area outside the visual range is judged to have decreased bloodflow in the analysis. Problems are particularly liable to occur in the reliability of data normalized by the cerebellum count.

Version 6.9: Z-score image when analyzed using new version



When the **cerebellum** is outside the visual range, the area is not judged to have decreased bloodflow, and it is not included in the analysis.

- **Comparison to multiple databases in a single operation, and execution of 3D-SSP analysis**
- **Incorporation of normal databases from three facilities**

Chiba University Medical School Hospital **4 age classes**

Toho University Medical School Omori Hospital **4 age classes**

National Center of Neurology and Psychiatry Musashi Hospital **2 age classes**

- Patient SPECT data image information (pixel size, matrix side, age, etc.) is automatically recognized and converted to a data format analyzable by 3D-SSP. (Some models and data cannot be automatically recognized due to the SPECT data format.)

- **Addition of Z-score image display format options**

Coregistration on the MR Image (M)

This displays the Z-score image over the MR image.

Ink Saving Mode (S)

The black color in the background is reduced when printing for saving ink when printing the Z-score tiff image.

INC/DEC View (Two Tail View) (T)

The Z-score of the region with decreased bloodflow and the Z-score of the region with increased bloodflow are displayed together on the same image.

Proposed by Dr. Takashi Nakajima, Dept. of Neurology, National Sanatorium Saigata Hospital

2. Operating Environment

The program contained in this CD-ROM is guaranteed to operate normally only under the following operating systems.

- Windows 98/Me/NT
- Windows 2000

To perform at a practical processing speed, a Pentium III 500MHz or faster CPU and at least 128 MB of RAM is recommended. Note that normal operation of the program is not guaranteed for OS other than those above. For Windows NT or 2000, use this software with administrator rights after obtaining permission from the system administrator. Operation is not guaranteed under Windows XP.

3. Overview of CD-ROM Package

● iSSP NMP Version 3.5

- iSSP35.exe: Executable file for 3D-SSP program
- iSSP35_2tZ.exe: Executable file for program used in comparison of two groups (t test of two non-corresponding groups)
- iSSP35_DBuilder.exe: Executable file for database creation program
- iSSP35_LOO.exe: Executable file for database verification program
- iSSP35_Viewer.exe: Image viewing software (for text format images)
- DosExec

stereo / ssploc / sspsmpl / sspcomp / ssp2tz / sspdb (3D-SSP program contained in Neurostat)

Neurostat keyword: Valid until June 30, 2004

- IMP Normal database (divided by age classes)

Facility Name (Database Name)	Model	Nuclide	Cases	Age classes
Chiba University Medical School Hospital (ChibaDBSample)	Prism3000	IMP	38	4 classes 60-65, 66-70, 71-74, 75-80
National Center of Neurology and Psychiatry (NCNP) Musashi Hospital (NCNPM15) Cutoff frequency: 0.30cycles/cm* (NCNPM30) Cutoff frequency: 0.60cycles/cm*	MULTISPECT3	IMP	23	2 classes 60-70, 71-80
Toho University Medical School Omori Hospital (Toho-Omori)				
	Prism3000	IMP	37	4 classes 20-29, 30-39, 40-49, 50-59

*These frequencies are equivalent to 0.15 cycles/cm and 0.3 cycles/cm by other manufacturers.

- SampleSPECT

Sample data for checking operation: SampleSPECT.img and SampleSPECT.hdr

Image alignment: L-R is left hemisphere, A-P is frontal lobe, and S-I is parietal region

X Y Z mm/pixel: X (2.162957), Y (2.162957), Z (3.56)

● Binary Viewer 3.5

- Viewing software for binary image data (With ROI setting function and 3D-SSP header file creation function)

● iSSP Win Convert 1.5

- 3D-SSP data conversion software

● iSSP Version 3.5 Package Software Operation Manual

III. iSSP 3.5 Basic Operations

1. Operation Screens

In iSSP3.5, you can select the patient SPECT data, enter the image information, specify where analysis results are output, and select a database for comparison, all in a single screen.

After entering the necessary information, click the **Run** button to start analysis.

iSSP3.5 Operation Screen

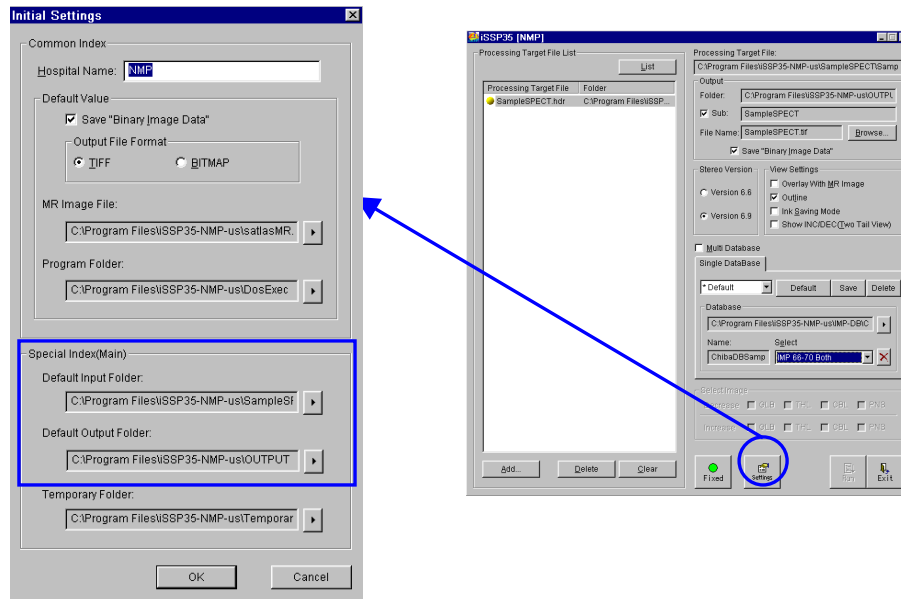
The screenshot shows the iSSP35 [NMP] window with the following components and callouts:

- Processing Target File List:** A table with columns 'Processing Target File' and 'Folder'. It contains one entry: 'SampleSPECT.hdr' in folder 'C:\Program Files\iSSP...'. A callout 'List the SPECT data properties' points to the 'List' button above the table.
- Processing Target File:** A section with fields for 'Folder' (C:\Program Files\iSSP35-NMP-us\SampleSPECT\Samp), 'Sub' (SampleSPECT), and 'File Name' (SampleSPECT.tif). A callout 'Select SPECT data See p.8' points to the 'List' button.
- Output:** A section with fields for 'Folder' (C:\Program Files\iSSP35-NMP-us\OUTPL), 'Sub' (SampleSPECT), and 'File Name' (SampleSPECT.tif). A callout 'Select/Change where data is output See p.14' points to the 'Folder' field.
- Stereo Version:** Radio buttons for 'Version 6.6' and 'Version 6.9'. A callout 'Select version of anatomical standardization program See p.3 and p.9' points to the 'Version 6.9' button.
- View Settings:** Checkboxes for 'Overlay With MR Image', 'Outline', 'Ink Sav', and 'Show I'. A callout 'Select output format See p.14' points to the 'Outline' checkbox.
- Multi Database:** A checkbox that is currently unchecked.
- Single DataBase:** A section with a dropdown menu showing '*Default', and buttons for 'Default', 'Save', and 'Delete'. A callout 'Select database (including multiple databases) See pp.11-13' points to the dropdown menu.
- Select Image:** A section with buttons for 'Decrease' and 'Increase', and checkboxes for 'GLB', 'THL', 'CBL', and 'PNB'. A callout 'Select normalization region when using multiple databases See p.12' points to the 'Decrease' button.
- Buttons:** At the bottom, there are buttons for 'Add...', 'Delete', 'Clear', 'Fixed', 'Settings', 'Run', and 'Exit'. Callouts point to these buttons: 'Confirm input See p.15' points to 'Fixed', 'Initial settings See p.7' points to 'Settings', and 'Run analysis See p.16' points to 'Run'.

2. Initial Settings

- **Saving to default folder for analysis results output location and selecting patient SPECT data**

Making the settings below simplifies the process of selecting the data and specifying the output location. Double-click the iSSP35.exe shortcut icon on the desktop or in the iSSP-NMP folder. The window shown below is opened. Click the **Settings** button to display the **Initial Settings** screen.



- **Hospital Name**

The **Facility Name** that was registered during installation is displayed as the hospital name. This name can be changed on this screen.

- **Default Input Folder**

When the patient SPECT data is selected using the **Add (A)** button, the folder specified here is selected as the default folder. This can be changed on this screen. The folder data below is selected as the default setting at installation.

C:\Program Files\iSSP35-NMP\SampleSPECT

- **Default Output Folder**

The folder where the analysis results are output can be selected as the default folder. The analysis results are all saved to the folder below as the default setting at installation.

C:\Program Files\iSSP35-NMP\Output

- **Save Binary Image Data**

Insert a check mark here to save the analysis results in binary format.

- **Output File Format**

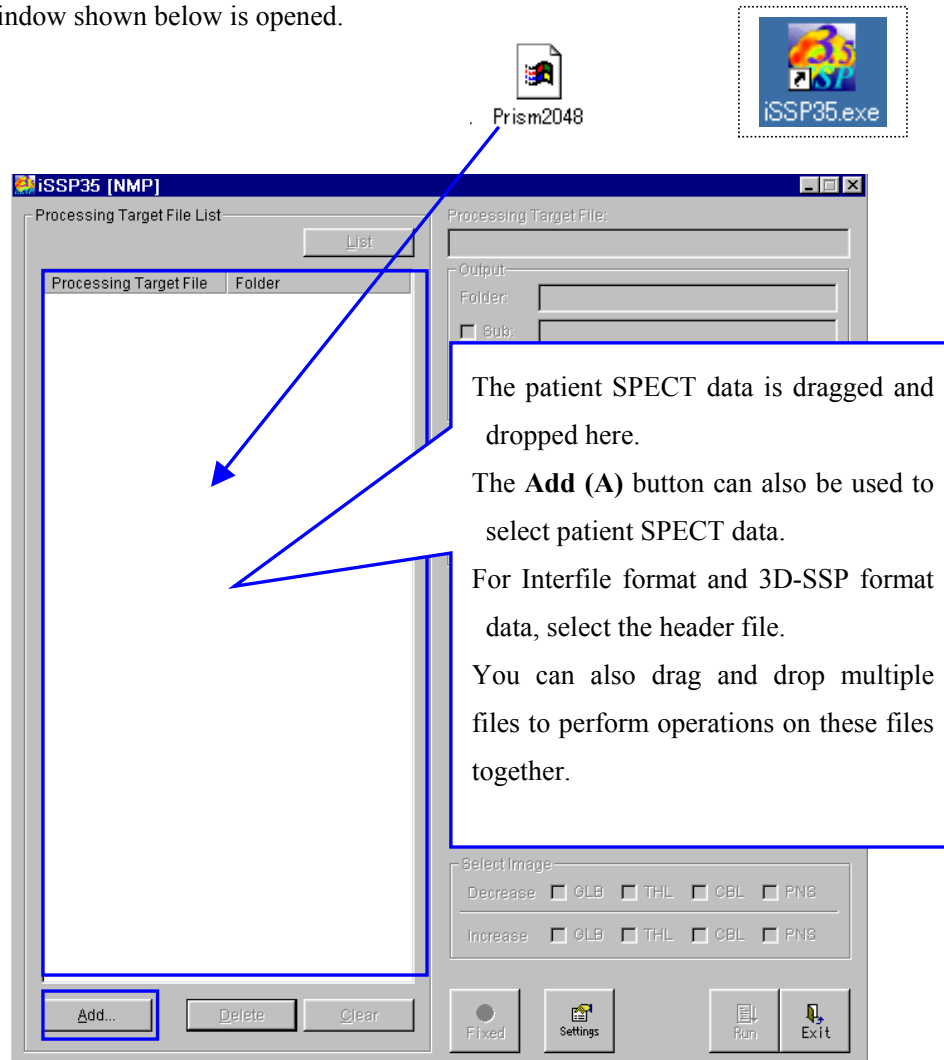
This selects the image format (TIFF or bitmap) of the analysis results.

3. Execution of 3D-SSP Analysis

1) Selecting patient SPECT data

Double-click the iSSP35.exe shortcut icon in the iSSP35-NMP folder or on the desktop.

The window shown below is opened.



*Patient SPECT data

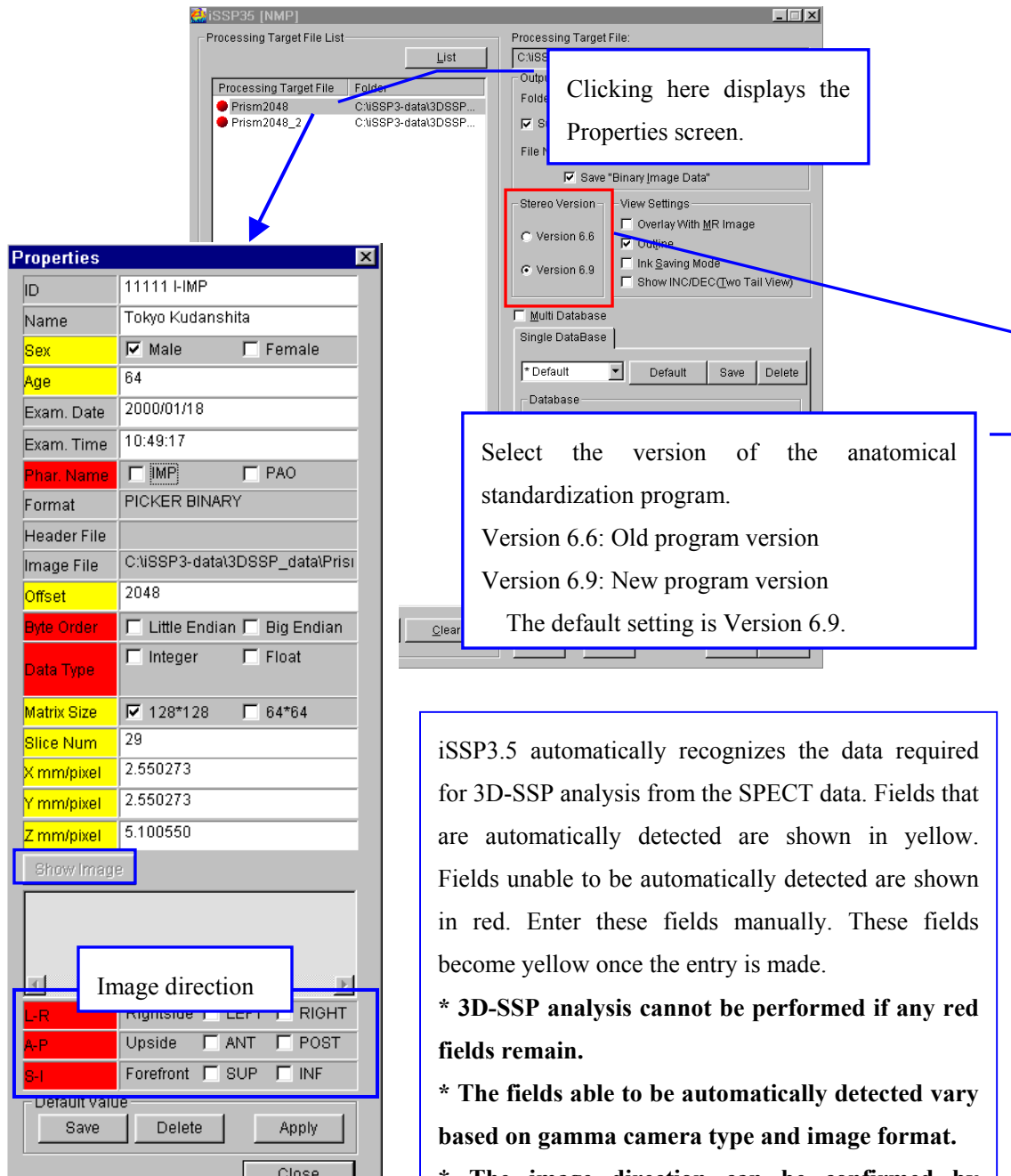
When zoom or slice additions are performed after reconfiguration of the image, the image information (header) for SPECT data may only include the information before the zoom or slice addition. In this case, the actual slice thickness and pixel size of the SPECT data will differ from the slice thickness and pixel size described in the image information (header).

If using iSSP to analyze data where zoom or slice addition has been performed after reconfiguration of the image, be sure to always check the actual slice thickness and pixel size. Also, to increase the accuracy of the analysis (anatomical standardization), use of the large-size data before slice addition is recommended for analysis.

2) Entering patient SPECT data image information

Clicking the patient SPECT data displayed in the window shows the Properties screen.

Enter the required information for 3D-SSP analysis of the patient SPECT data.



iSSP3.5 automatically recognizes the data required for 3D-SSP analysis from the SPECT data. Fields that are automatically detected are shown in yellow. Fields unable to be automatically detected are shown in red. Enter these fields manually. These fields become yellow once the entry is made.

*** 3D-SSP analysis cannot be performed if any red fields remain.**

*** The fields able to be automatically detected vary based on gamma camera type and image format.**

*** The image direction can be confirmed by displaying the image using Display Image.**

*** Be sure to always check that the pixel size that is automatically displayed is correct. For more information, see pages 24-28.**

Display Image button

Enter the data for the **Offset**, **Byte Order**, **Data Type**, **Matrix Size**, and **Slice Num** fields, click the **Display Image** button to display the image, and then check that there are no miscalculations in the input data from the displayed image, maximum count, minimum count, and number of slices.

Be sure to also make the entries for **L-R**, **A-P**, and **S-I** (image direction) after checking the displayed image. For more information, see pages 24-28.

ID	11111 I-IMP
Name	Tokyo Kudanshita
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	64
Exam. Date	2000/01/18
Exam. Time	10:49:17
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	PICKER BINARY
Header File	
Image File	C:\ISSP3-data\3DSSP_data\Pris...
Offset	2048
Byte Order	<input type="checkbox"/> Little Endian <input checked="" type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float <input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	29
X mm/pixel	2.550273
Y mm/pixel	2.550273
Z mm/pixel	5.100550
Show Image	731.000000 : 0.000000 : 29
L-R	Rightside <input checked="" type="checkbox"/> LEFT <input type="checkbox"/> RIGHT
A-P	Upside <input checked="" type="checkbox"/> ANT <input type="checkbox"/> POST
S-I	Forefront <input checked="" type="checkbox"/> SUP <input type="checkbox"/> INF
Default Value	
<input type="button" value="Save"/> <input type="button" value="Delete"/> <input type="button" value="Apply"/>	
<input type="button" value="Close"/>	

731.000000 : 0.000000 : 29

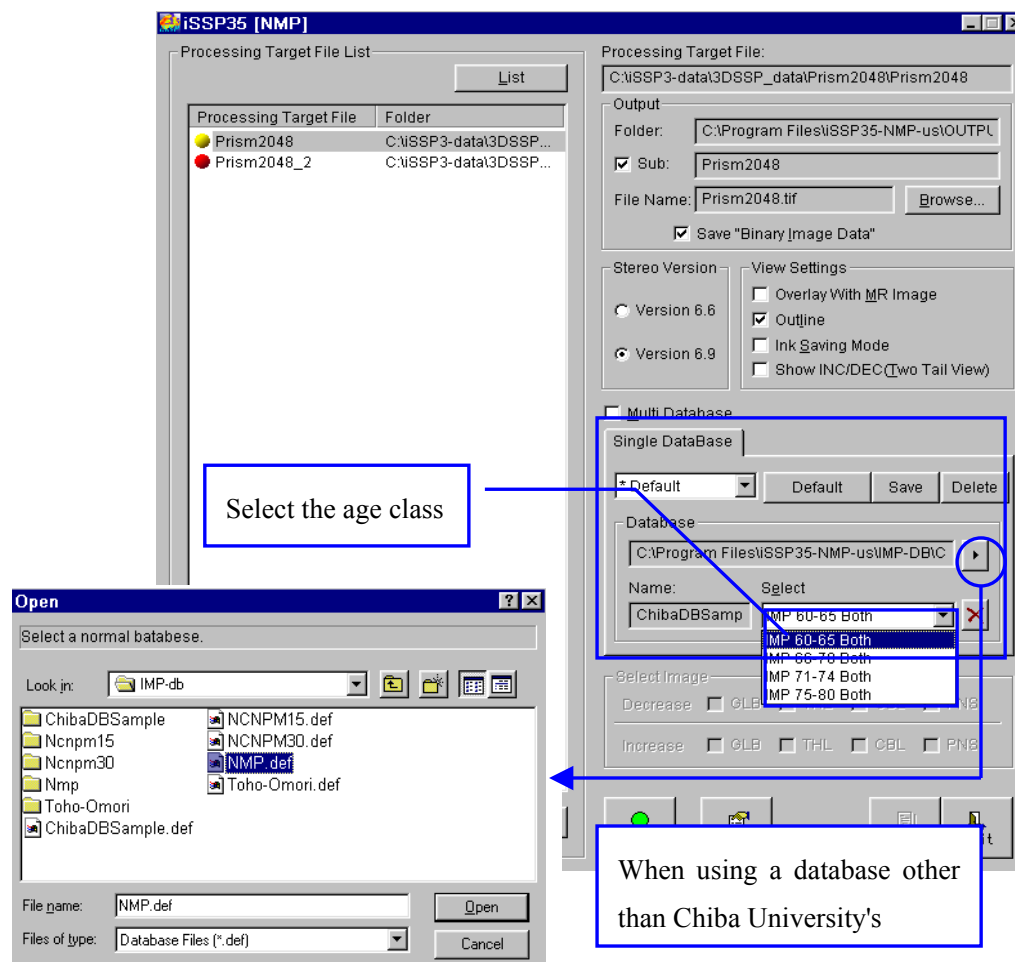
Max. count: Min. count: No. of slices

The patient image is displayed. Check, and then enter the image direction. You can scroll the displayed slices.

Click **Close** after completing the entries.

3) Specifying databases

You can specify which database the patient SPECT data will be compared to.



The Chiba University database is selected as standard. In this database, the ages are divided into four classes.

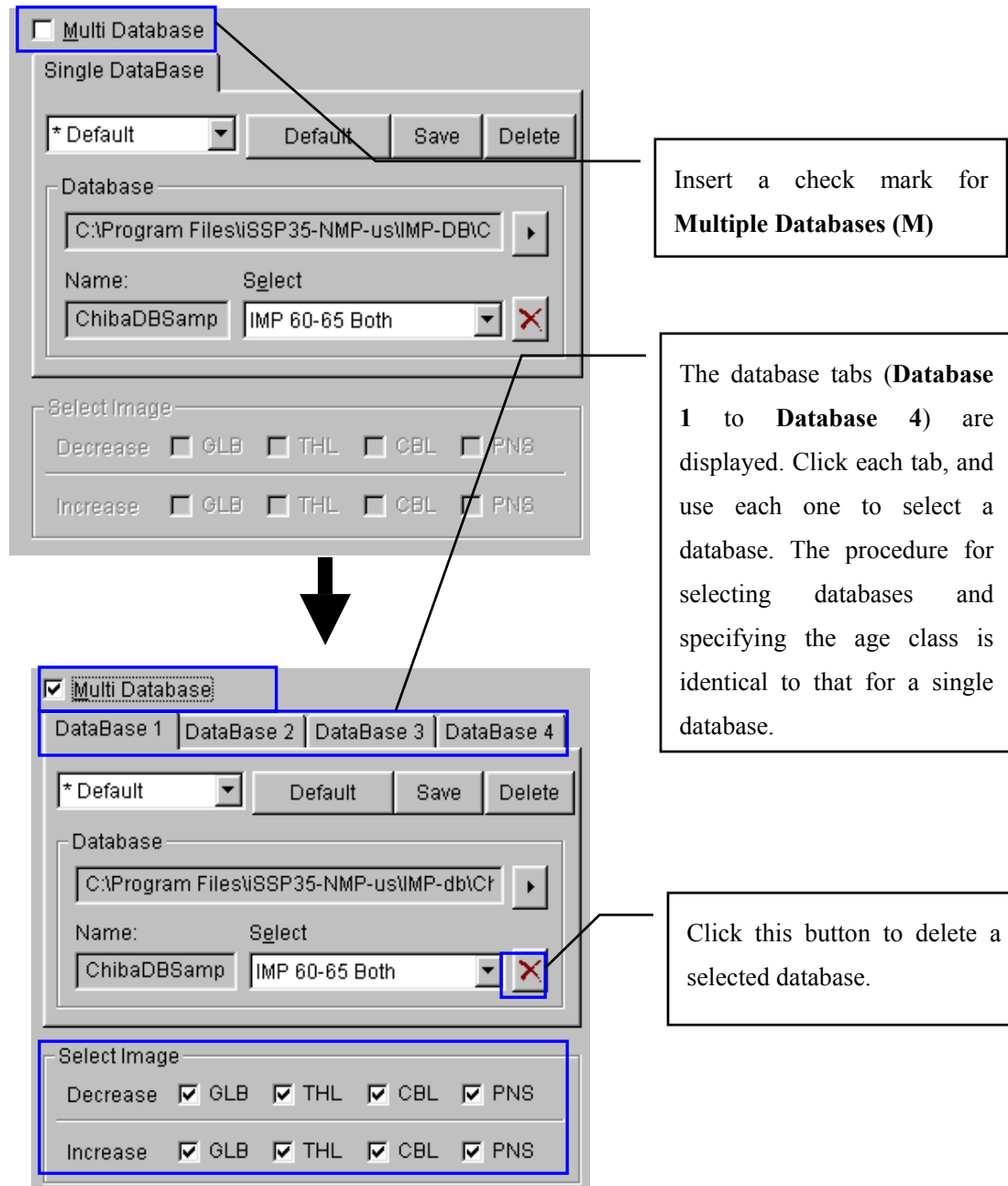
From the **Select (E)** pull-down menu, choose which age class database will be used for comparison. iSSP3.5 is also provided with databases from the Toho University Medical School Omori Hospital and National Center of Neurology and Psychiatry (NCNP) Musashi Hospital. To use these databases, select the "xxx.def" file stored in the **IMP-db** folder inside the **iSSP35-NMP** folder. The "xxx" section from the file name is displayed in the **Name** field.

Toho Univ. Medical School Omori Hospital	Toho-Omori.def
NCNP Musashi Hospital	NCNPM15.def (Cutoff frequency: 0.30 cycles/cm*)
	NCNPM30.def (Cutoff frequency: 0.60 cycles/cm*)

***These frequencies are equivalent to 0.15 cycles/cm and 0.3 cycles/cm by other manufacturers.**

4) Specifying multiple databases

If **Multiple Databases (M)** is selected, the patient SPECT data can be compared to up to four databases simultaneously.



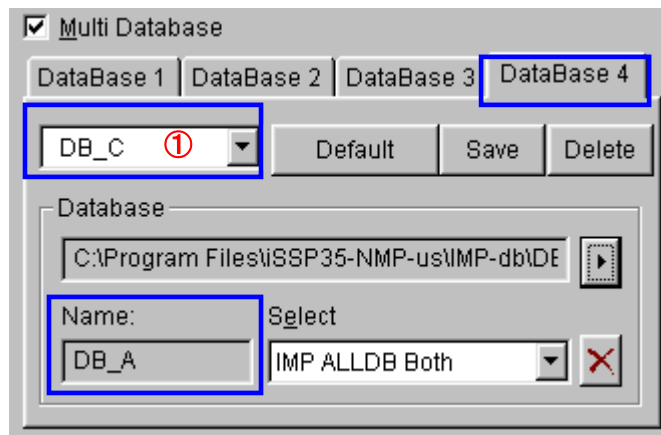
You can select which normalization Z-score image to create only when multiple databases have been selected. **TIFF format Z-score images are not output unless check marks are inserted in all check boxes.** In the settings shown above, The **Decrease** and **Increase** Z-score images are both created when normalization is performed based on **GLB**, **THL**, **CBL**, and **PNS**.

***Notes when Selecting Databases**

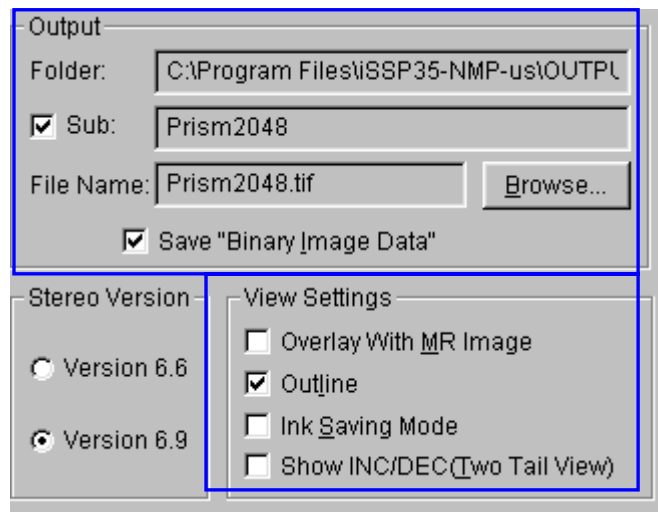
Relationship between registered name of database (see p.37) and selected database

The registered name of the database is shown in (1) in the figure below, but this does not always show the currently selected database. As shown in the figure, the registered name of the database is "**DB_C**", but in this case, the database actually selected by **Database4** is "**DB_A**".

The database displayed under **Name** is the currently selected database, and so be careful of this point when using the **Multiple Databases** function.



5) Setting output location of analysis results and display format of results



*Output location

Subfolder

A folder with the name of the file to be analyzed is created in the folder designated as the output location (**Output**), and the results are saved in this folder. Use the **Browse (B)** button to change the output location. You can also change the output file name from here.

Save Binary Image Data (I)

All data output by 3D-SSP analysis is saved here. Insert a check mark here when performing detailed analysis.

*Viewer Settings

Coregistration on the MR Image (M)

This displays the Z-score image over the MR image.

Display Outline (L)

This displays the outlines of the brain over the Z-score image. A check mark is automatically inserted here whenever the Properties screen of the file to be processed is displayed.

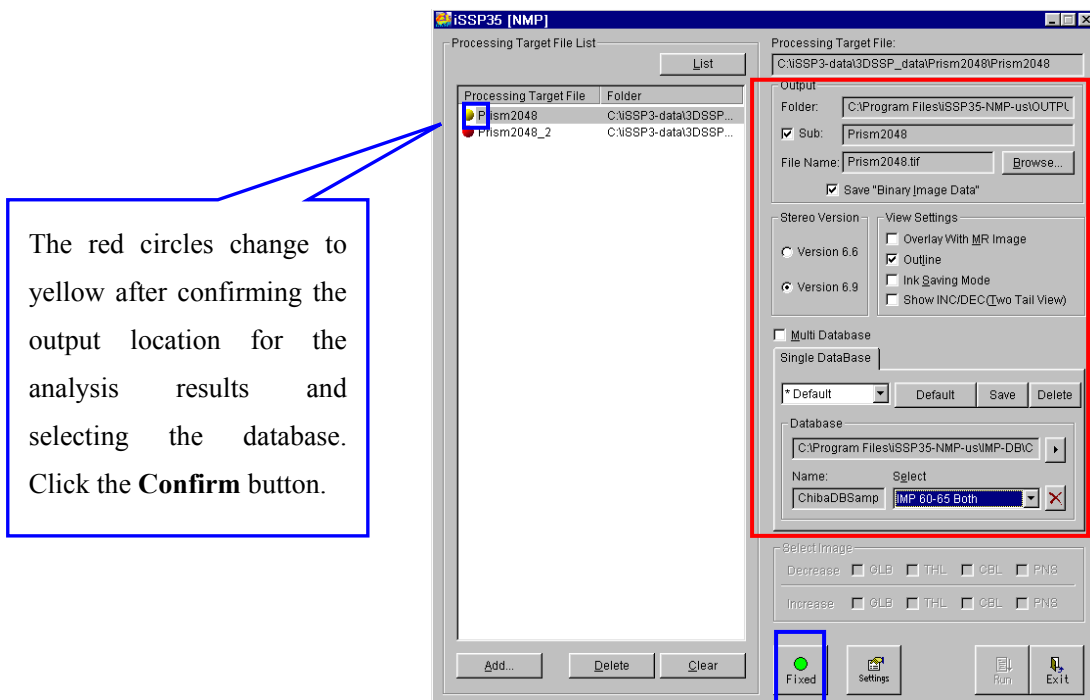
Ink Saving Mode (S)

The black color in the background is reduced when printing for saving ink when printing the Z-score tiff image.

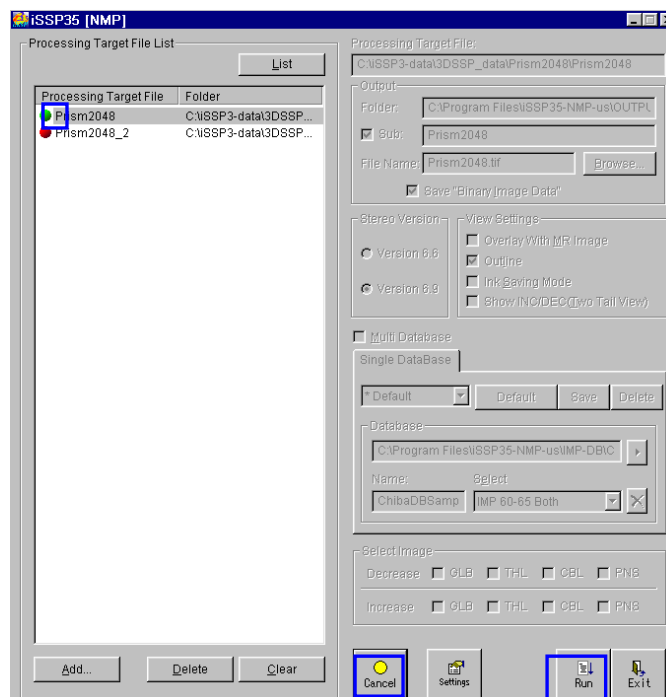
INC/DEC View (Two Tail View) (T)

The Z-score of the region with decreased bloodflow and the Z-score of the region with increased bloodflow are displayed together on the same image.

6) Confirming input



When the **Confirm** button is clicked, the yellow circles in front of the files change to green, and the **Run** button becomes available.

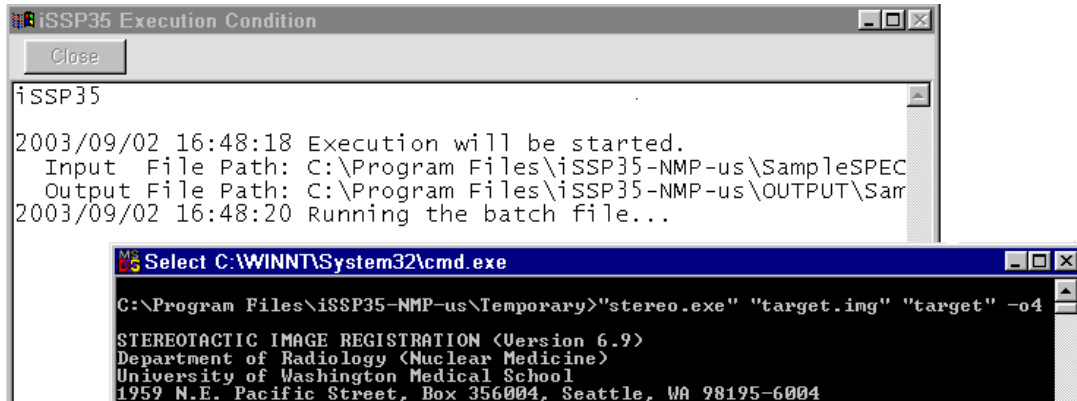


If more than one patient SPECT data is selected, make the above settings for each data file. To change the settings, click the **Cancel** button.

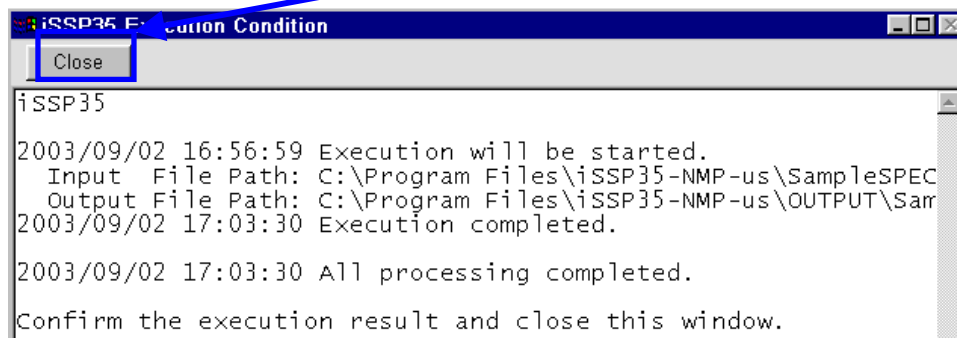
7) Execution

Click the **Run** button to start analysis.

Once analysis is started, the following two screens are shown to indicate the execution progress.



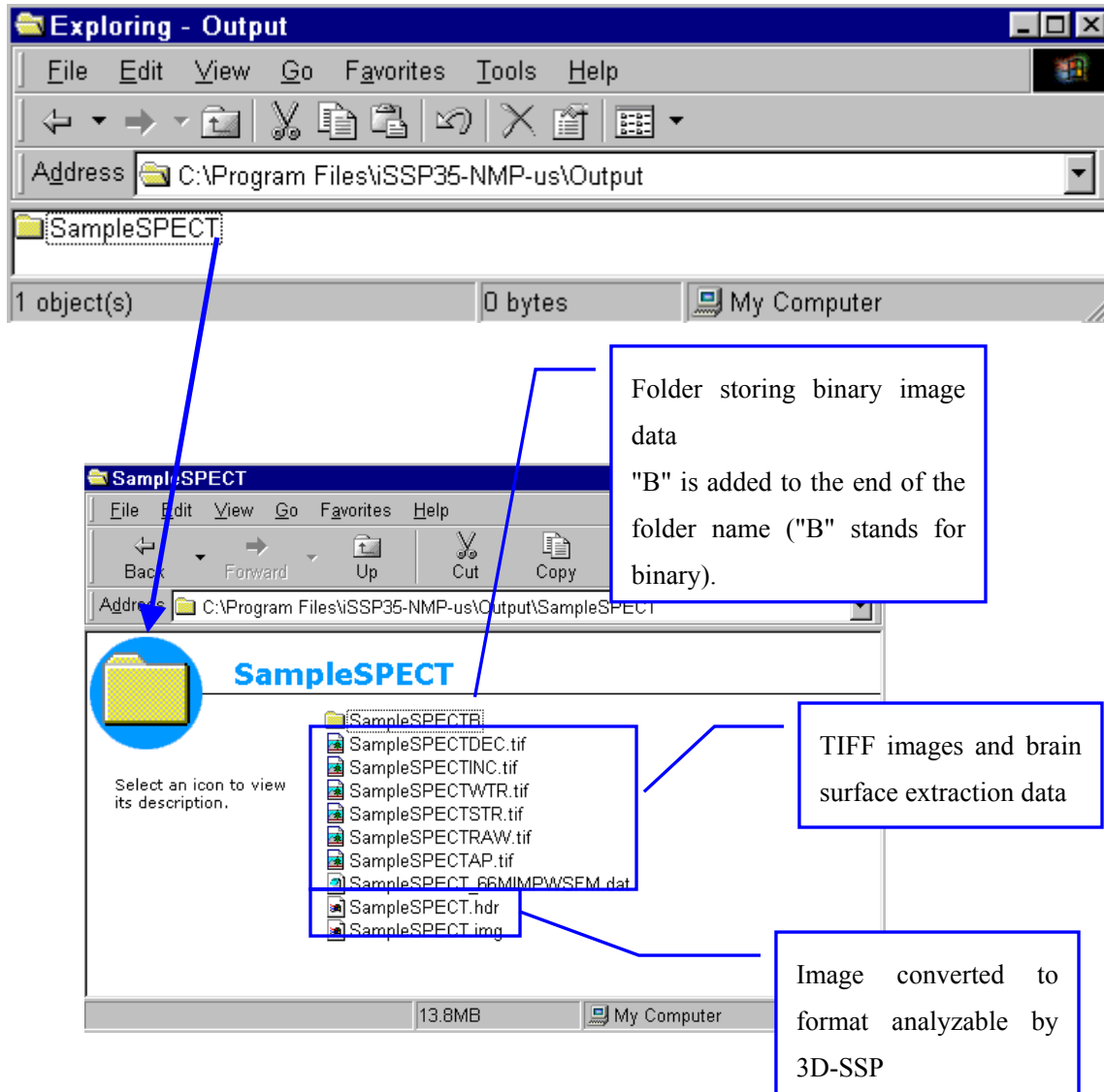
Once analysis is completed, the screen shown below is displayed. Click the **Close** button after checking the displayed information. The iSSP3.5 Input screen is displayed again.



Click **Exit** to exit iSSP3.5.

IV. Output of Data After Completion of Analysis

If analysis was performed with a check mark inserted at **Subfolder**, then when the analysis is completed, a folder is created with the name of the file that was analyzed, and the analysis results are saved inside that folder.



The following data is output.

- Image converted to format analyzable by 3D-SSP
- TIFF format images
- Brain surface extraction data (WSFM.dat)
- Binary image data

1. TIFF Format Images

TIFF format images

The following TIFF format images are created in the designated folder in the data output.

File name	Description
***DEC.tif	Image displaying the Z-score of the region with decreased bloodflow compared to the database
***INC.tif	Image displaying the Z-score of the region with increased bloodflow compared to the database
***RAW.tif	Original image which was analyzed
***AP.tif	Quality control image for confirming that detection of the AC-PC line was correct
***STR.tif	Cross-sectional image where only a recut was made parallel to the AC-PC line
***WTR.tif	Cross-sectional image for which anatomical standardization was performed.

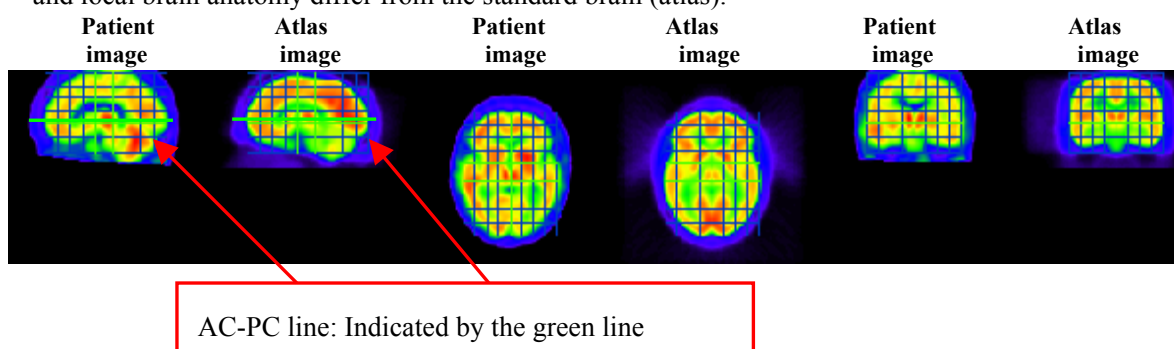
These six TIFF files can be displayed using the standard image viewing software in Windows.

Examples of images from ***AP.tif

Check that the brain alignment using **Image Conversion to AC-PC Coordinates** is correct.

If the AC-PC line of the patient SPECT data is not identified correctly, anatomical standardization cannot be performed properly. Recut the reconfiguration angle of the patient SPECT image at an angle that is nearly parallel to the AC-PC line, and then perform 3D-SSP analysis again.

This is an image before conversion to linear and non-linear images. There is no problem if the size and local brain anatomy differ from the standard brain (atlas).



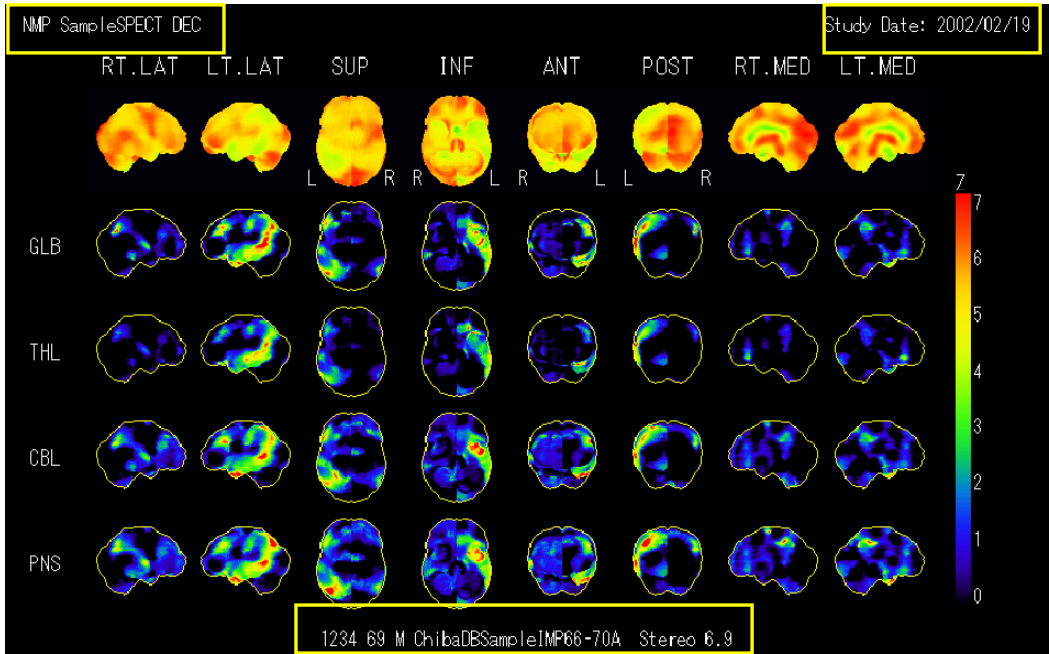
Z-score images (*.DEC.tif and ***.INC.tif)**

These images display regions which have decreased bloodflow (Decrease:DEC) or increased bloodflow (Increase:INC) compared to the database.

Examples of images from *.DEC.tif (with outlines shown)**

The **Facility Name**, **Output TIFF File Name**, and **Z-score Image Type (DEC or INC)** are displayed.

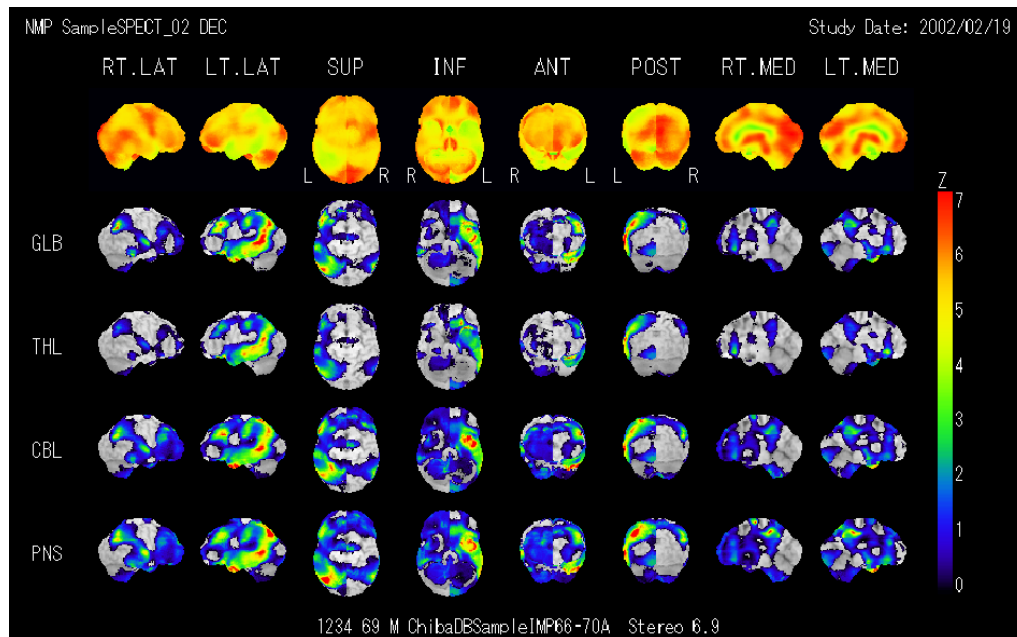
The **Study Date** displayed in the Properties is shown. If the study date and time in the Properties is blank, the iSSP processing date (**iSSP Date**) is displayed.



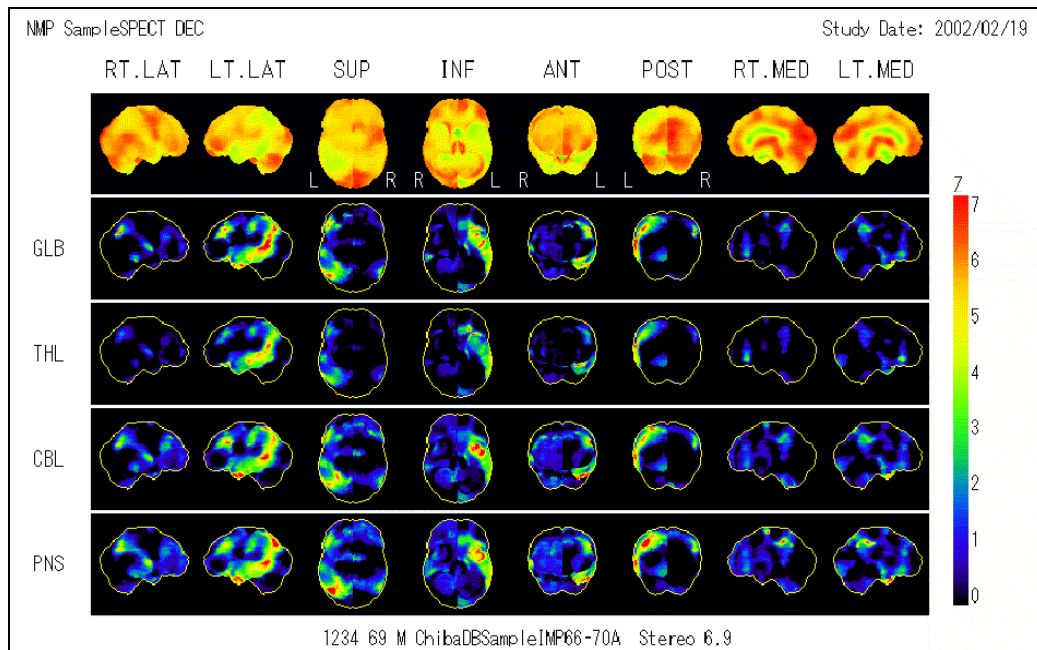
The **ID**, **Age**, **Sex**, **Database**, and **Version of Anatomical Standardization Program** are displayed.

- Top row: Patient's brain surface bloodflow images
- GLB: Z-score image when compared with database normalized by global count
- THL: Z-score image when compared with database normalized by thalamus count
- CBL: Z-score image when compared with database normalized by cerebellum count
- PNS: Z-score image when compared with database normalized by pons count

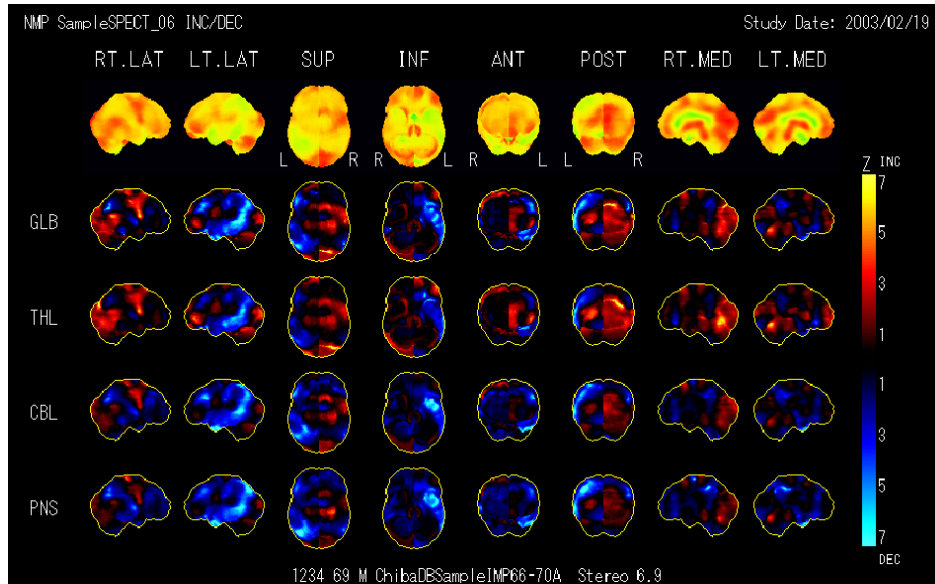
Examples of images from *DEC.tif (Coregistration on the MR image with no outlines)**



Examples of images from *DEC.tif (Ink saving mode)**

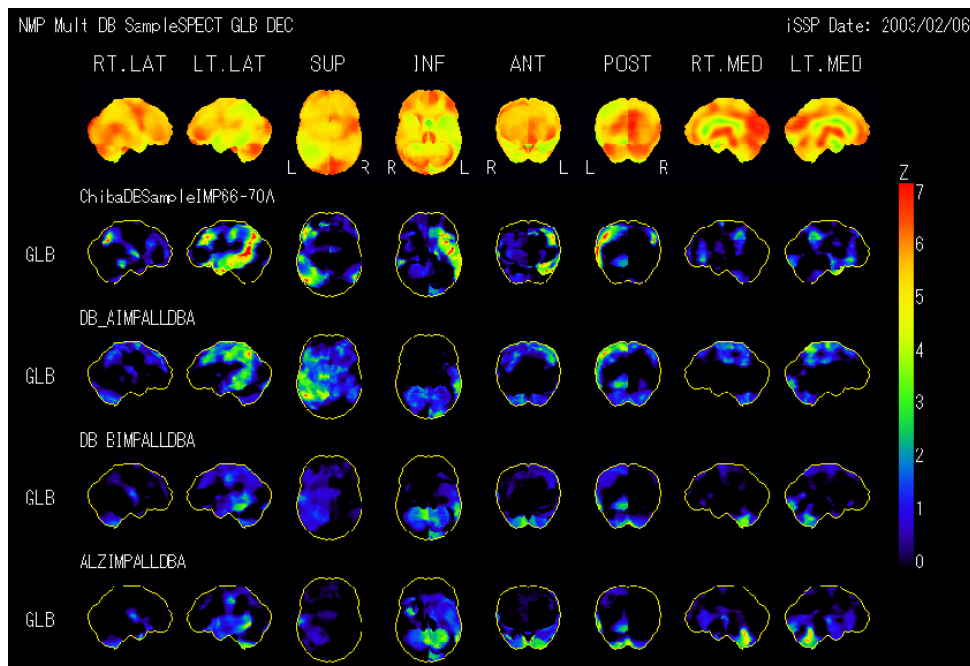


Examples of images from *INCDEC.tif (INC/DEC view: Two Tail View)**



The region with decreased bloodflow and the region with increased bloodflow are displayed on the same image.

Examples of images from *DEC.tif (Normalization by GLB with multiple databases)**

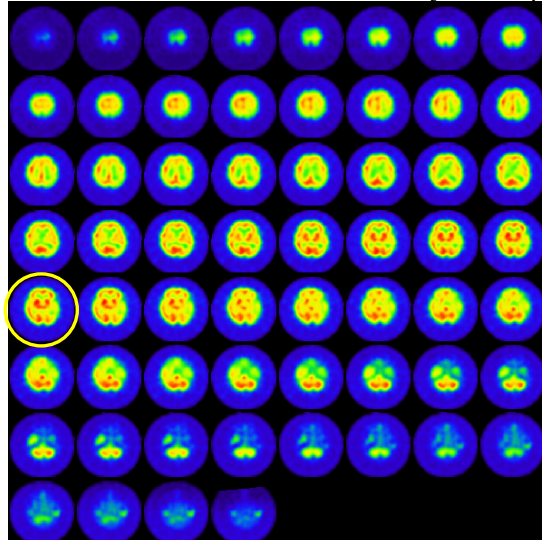


The comparison results for the four types of databases (in this example, ChibaDBSample / DB_A / DB_B / ALZ) are displayed on the same screen.

Examples of images from ***STR.tif

This is an image where a recut was made parallel to the AC-PC line on the original cross-sectional image which was analyzed (conversion to matrix: 128×128 , pixel size: 2.25 mm, slice thickness: 2.25 mm, and number of slices: 60), and no deformation of the brain size (conversion to standard brain) or other operations were performed.

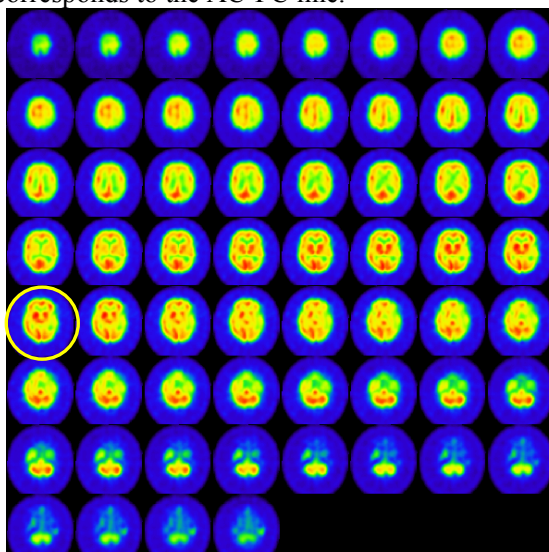
When comparing original cross-sectional images for different patients, this image can be used to always allow evaluation for a fixed slice. The 33rd slice always corresponds to the AC-PC line.



Examples of images from ***WTR.tif

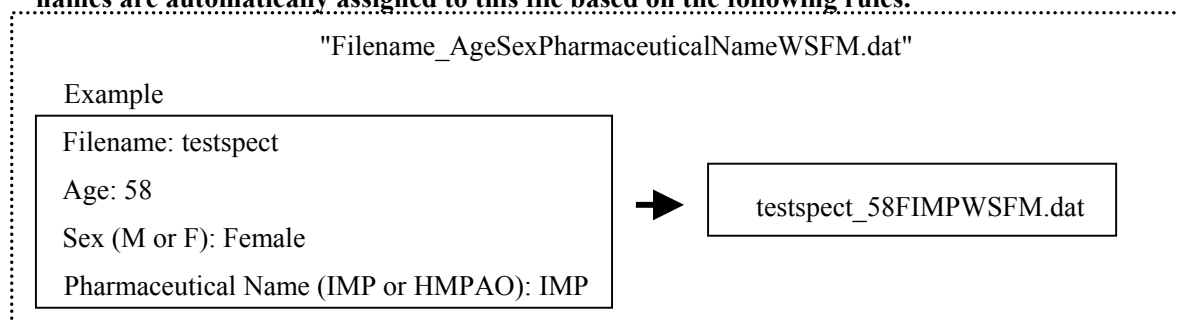
This is an image where anatomical standardization was performed on the original cross-sectional image which was analyzed. It has the same format as STR images (conversion to matrix: 128×128 , pixel size: 2.25 mm, slice thickness: 2.25 mm, and number of slices: 60).

The 33rd slice always corresponds to the AC-PC line.



2. Brain Surface Extraction Data Files (**WSFM.dat)

This data file is an extraction of the bloodflow information on the cerebral cortex to the brain surface. This file is used when performing **Create Database** or **Two-Group Comparison**. Also, **names are automatically assigned to this file based on the following rules.**



3. Binary Image Data

If saving of binary image data is selected, the following files are saved to the output folder.

File Name	Description
**RAW.img / .hdr	Original cross-sectional image which was analyzed and its header file
**STR.img / .hdr	Cross-sectional image where a recut was made parallel to AC-PC line and its header file
**WTR.img / .hdr	Cross-sectional image where anatomical standardization was performed and its header file
**AP.img / .hdr	Quality control image for checking that AC-PC line was detected correctly and its header file
** WSFM.img / .hdr	Brain surface bloodflow image and its header file
**GLBZSFM. img/.hdr/.dat	Z-score image data showing the region with decreased bloodflow when compared to database normalized by global count (dat file also includes information about region with increased bloodflow)
**GLBZSFN.img / .hdr	Z-score image data showing the region with increased bloodflow when compared to database normalized by global count
**THLZSFM.img / .hdr/.dat	Z-score image data showing the region with decreased bloodflow when compared to database normalized by thalamus count (dat file also includes information about region with increased bloodflow)
**THLZSFN.img / .hdr	Z-score image data showing the region with increased bloodflow when compared to database normalized by thalamus count
**CBLZSFM.img / .hdr/.dat	Z-score image data showing the region with decreased bloodflow when compared to database normalized by cerebellum count (dat file also includes information about region with increased bloodflow)
**CBLZSFN.img / .hdr	Z-score image data showing the region with increased bloodflow when compared to database normalized by cerebellum count
**PNSZSFM.img / .hdr/.dat	Z-score image data showing the region with decreased bloodflow when compared to database normalized by pons count (dat file also includes information about region with increased bloodflow)
**PNSZSFN.img / .hdr	Z-score image data showing the region with increased bloodflow when compared to database normalized by pons count
**L.lib	Parameter information file during non-linear conversion
**STR.lib	Parameter information file during stereotaxic realignment
**WPX.lib	Parameter information file during data extraction

V. Usage Notes

1. Notes on Image Data Input at Properties Screen

1) ID, Name, Exam Date, and Exam Time

These fields are for checking that the selected data is the SPECT data for analysis.

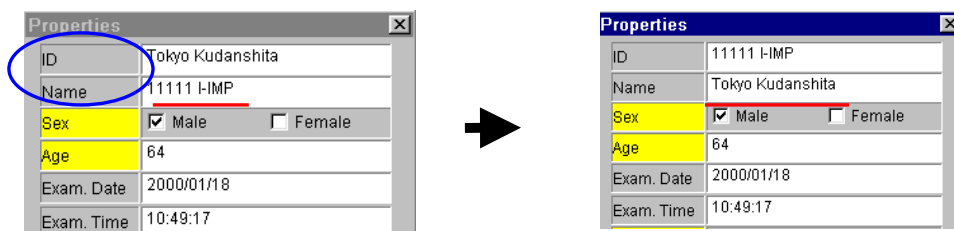
Analysis can still be executed if these fields are not filled in.

Study Date: When this field is entered, it appears as "Study Date" on the TIFF format Z-score image which is output.

When it is not entered, the date that this analysis is performed appears as "iSSP Date".

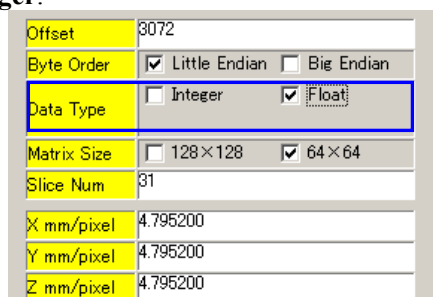
ID: This appears on the TIFF format Z-score image which is output.

To display the patient name on the TIFF format Z-score image, **double-click ID**. The patient name appears in the ID field.



2) Data Type

The **Float** option is only available for Toshiba SPECT data that is 4 byte type. All other data is **Integer**.



3) XYZmm/pixel (pixel size) information

There are various locations and methods of registering information about the pixel size (zoom and slice addition) in the SPECT data. **Therefore, be sure to always check that the displayed information is correct even when it is scanned automatically and the values are displayed.**

X mm/pixel	1.951605
Y mm/pixel	1.951605
Z mm/pixel	4.669260

The Siemens Multi SPECT data is particularly liable to be displayed incorrectly when using a fan beam collimator or zoom processing.

4) Display Image button

When displaying the image using **Display Image**, check that the input information is correct.

(1) Input of L-R, A-P, and S-I (image direction)

Click **Display Image**. The patient image is displayed.

ID	Tokyo Kudanshita
Name	11111 I-IMP
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	64
Exam. Date	2000/01/18
Exam. Time	10:49:17
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	PICKER BINARY
Header File	
Image File	C:\ISSP3-data\3DSSP_data\Pris
Offset	2048
Byte Order	<input type="checkbox"/> Little Endian <input checked="" type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float <input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	29
X mm/pixel	2.550273
Y mm/pixel	2.550273
Z mm/pixel	5.100550

Show Image 731.000 : 0.000 : 29

Max. count: Min. count: No. of slices

You can scroll the displayed slices.

L-R Rightside ☒ LEFT ☐ RIGHT
A-P Upside ☒ ANT ☐ POST
S-I Forefront ☒ SUP ☐ INF

Default Value
Save Delete Apply

The patient image is displayed. Check, and then enter the image direction.

731.000 : 0.000 : 29

Max. count: Min. count: No. of slices

You can scroll the displayed slices.

(2) Checking Byte Order

Click **Display Image**.

The patient image is displayed, and the **Max Count** and **Min Count** are also displayed.

If the **Byte Order** is entered incorrectly, the count will obtain abnormally high values in both the positive and negative directions. Also, the image may not be displayed properly.

Be sure to check the displayed count and the Byte Order setting from the image.

Correct Input of **Byte Order**

Incorrect Input of **Byte Order**

Properties

ID	98-12-15
Name	
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	35
Exam. Date	1998/12/15
Exam. Time	09:05:58
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	TOSHIBA_MEC
Header File	
Image File	C:\ISSP3-data\3DSSP_data\GME
Offset	3072
Byte Order	<input type="checkbox"/> Little Endian <input checked="" type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float <input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	36
X mm/pixel	3.440000
Y mm/pixel	3.440000
Z mm/pixel	3.440000
Max Count	436.000000
Min Count	0.000000
Show Image	436.000000 : 0.000000 : 36

☐ L-R Rightside ☒ LEFT ☐ RIGHT
☐ A-P Upside ☒ ANT ☐ POST
☐ S-I Forefront ☒ SUP ☐ INF

Default Value

Properties

ID	98-12-15
Name	
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	35
Exam. Date	1998/12/15
Exam. Time	09:05:58
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	TOSHIBA_MEC
Header File	
Image File	C:\ISSP3-data\3DSSP_data\GME
Offset	3072
Byte Order	<input checked="" type="checkbox"/> Little Endian <input type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float <input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	36
X mm/pixel	3.440000
Y mm/pixel	3.440000
Z mm/pixel	3.440000
Max Count	32513.000000
Min Count	-32768.000000
Show Image	32513.000000 : -32768.000000 : 36

☐ L-R Rightside ☒ LEFT ☐ RIGHT
☐ A-P Upside ☒ ANT ☐ POST
☐ S-I Forefront ☒ SUP ☐ INF

Default Value

(3) Toshiba SPECT data reference slices

The Toshiba SPECT data has an attached reference slice at the end. If the data is recognized as Toshiba SPECT data, ("TOSHIBA" is displayed in the **Format** field), the reference slice is automatically deleted. However, the reference slice is not deleted if the data is not recognized as Toshiba SPECT data ("TOSHIBA" is not displayed in the **Format** field). The reference slice may also remain in some rare cases when the data has footer information that is extremely large.

If processing Toshiba SPECT data, be sure to click the Display Image button, and check if there is a reference slice. To save the settings to the default setting, see page 35.

Properties

ID	98-12-15
Name	
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	35
Exam. Date	1998/12/15
Exam. Time	09:05:58
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	TOSHIBA_MEC
Header File	
Image File	C:\SSP3-data\3DSSP_data\GME
Offset	3072
Byte Order	<input type="checkbox"/> Little Endian <input checked="" type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float <input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	37
X mm/pixel	1.720000
Y mm/pixel	1.720000
Z mm/pixel	3.440000

Show Image 436.000000 : 0.000000 : 37

Reference slice

Save Delete Apply Close

When the reference slice is displayed, enter the number of slices displayed at the top right of the image minus the number of slices to be deleted into the **Slice Num** field.

In this example, "38" is entered at **Slice Num** for the number of slices after the reference slice is deleted.

After entering the number of slices, you can click the **Display Image** button to check that the reference slice was deleted.



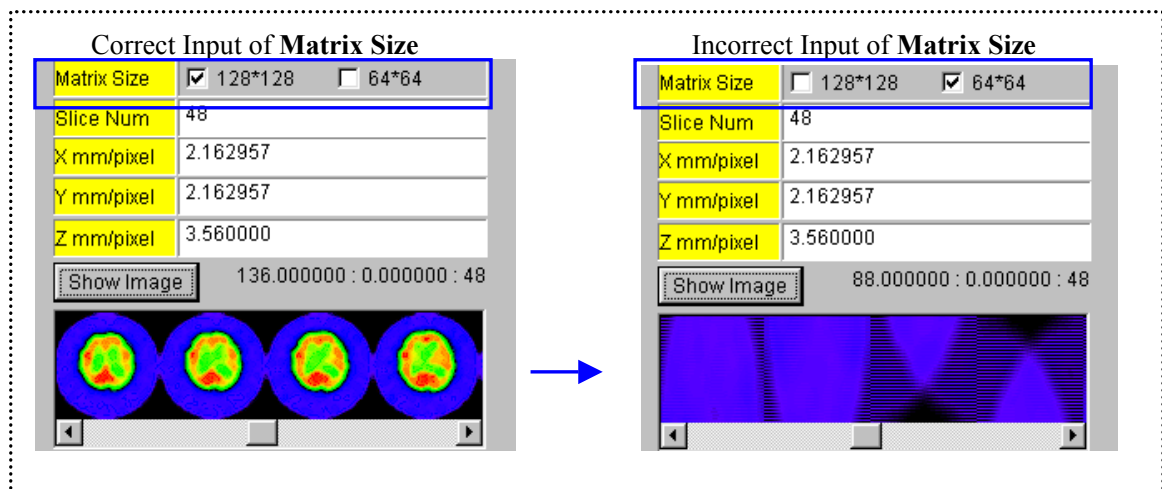
Properties

Slice Num	36
X mm/pixel	1.720000
Y mm/pixel	1.720000
Z mm/pixel	3.440000

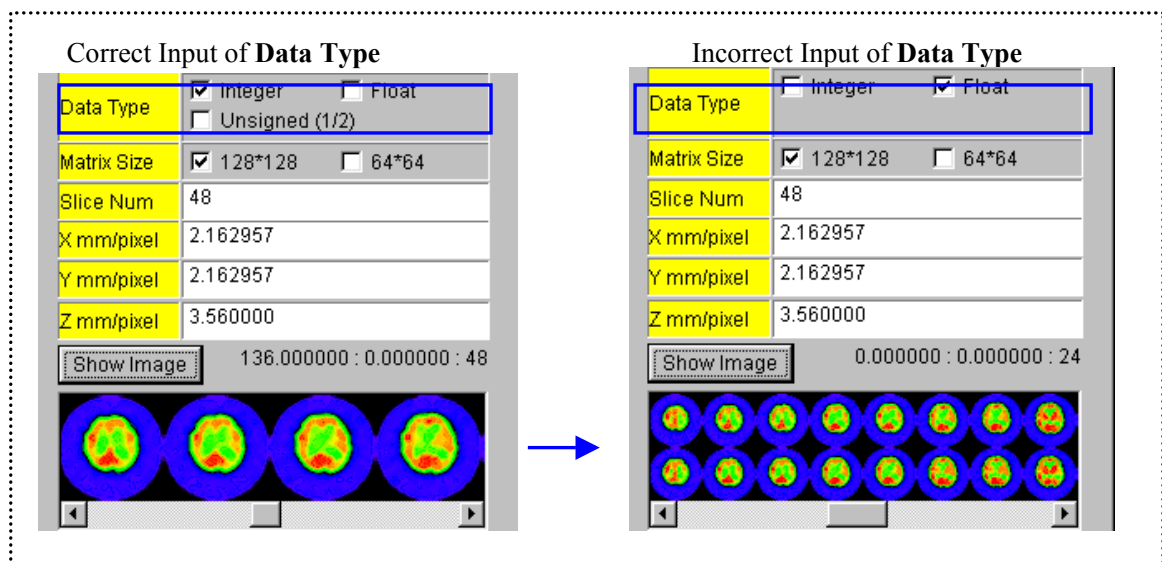
Show Image 436.000000 : 0.000000 : 36

Save Delete Apply Close

(4) Checking Matrix Size



(5) Checking Data Type



5) Switching the Properties screens

When multiple data is selected, clicking the next patient data switches the Properties screen to the next patient data. Enter the fields that are displayed in red.

3D-SSP analysis cannot be performed if any red fields remain. Click the Close button after the entries are completed.

2. Notes on Selecting Patient SPECT Data

1) Selecting SPECT data

Select **Header File** when using iSSP3.5 to process data having the following formats.

- Interfile format data

Image files (.img) and header files (.hdr)

***If the extension for the image files is .dat, be sure to change the extension to .img.**

- Data created for 3D-SSP analysis

Image file (.img) and 3D-SSP header file (.hdr)

Note that image files and header files must be saved as a set under the same file names and in the same folder.

VI. Default Setting

1. Default Setting for Image Information (Properties) of Patient SPECT Data

If the fields in the SPECT image data which remain the same for all patient SPECT data are entered and the fields which vary are left blank, this can be saved as the default setting to simplify the settings for image information when they are made later.

The fields enclosed in the blue frame can be saved in the default settings.

Properties	
ID	1294502
Name	abc
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	76
Exam. Date	2002/01/29
Exam. Time	09:05:45
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	SIEMENS NM
Header File	
Image File	C:\ISSP3-data\3DSSP_data\esol
Offset	274b
Byte Order	<input checked="" type="checkbox"/> Little Endian <input type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float <input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	39
X mm/pixel	3.895370
Y mm/pixel	3.895370
Z mm/pixel	3.895370
Show Image 158.000 : 0.000 : 39	
L-R	Rightside <input checked="" type="checkbox"/> LEFT <input type="checkbox"/> RIGHT
A-P	Upside <input checked="" type="checkbox"/> ANT <input type="checkbox"/> POST
S-I	Forefront <input checked="" type="checkbox"/> SUP <input type="checkbox"/> INF
Default Value	
<input type="button" value="Save"/> <input type="button" value="Delete"/> <input type="button" value="Apply"/>	
<input type="button" value="Close"/>	

Useful fields for default settings

(1) Fields which remain the same for all patients

(Enter and check that the information is correct, and then save.)

Examples: Pharmaceutical Name, Byte Order, Data Type, Matrix Size, Image Alignment (L-R, A-P, S-I), and fields where the information in the displayed field is different from the actual information

(2) Fields saved as blank in the default settings

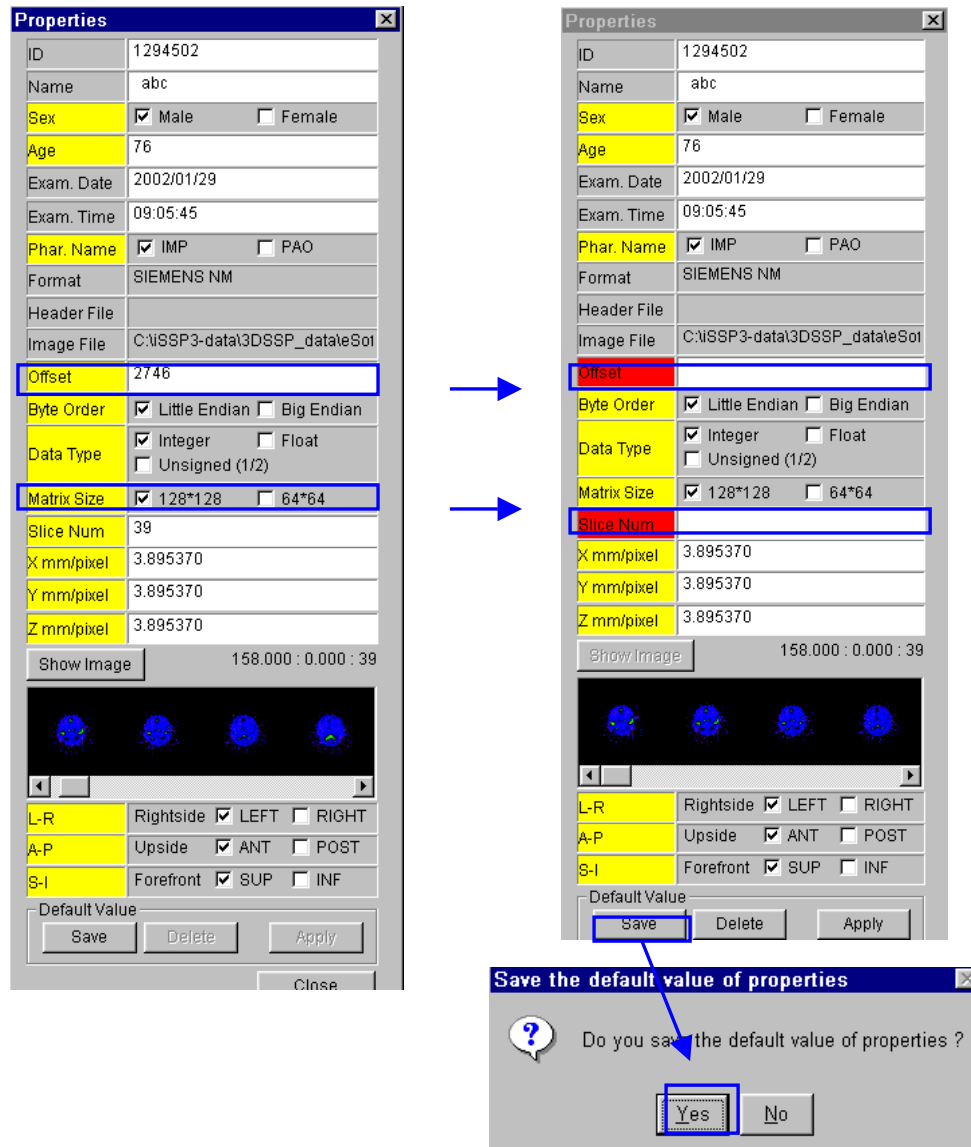
Fields which vary for each patient, but whose correct information can be recognized automatically

Examples: Slice Num (number of slices), Offset (header size), etc.

1) Default field settings (when Offset varies)

(1) Select the SPECT data serving as the basis for the default setting, enter the image information and leave the fields which vary for each patient blank, and then save as the default setting. In this example, **Offset** and **Slice Num** vary for each patient, and so they are set as blank in the default setting.

*Data where the Offset varies: DICOM format, Dr View format, Hitachi Medical Corp., etc.



After determining the default setting, click Save, and then select Yes (Y) to save the above settings as default values.

*Only one default setting can be saved.

(2) Reset the SPECT data serving as the basis for the default setting. **Offset** and **Slice Num** in the SPECT data serving as the basis for the default setting are left blank. 3D-SSP analysis cannot be performed without making the entries, and so enter the information for the blank fields.

The Properties dialog box shows the following fields and values:

ID	1294502
Name	abc
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	76
Exam. Date	2002/01/29
Exam. Time	09:05:45
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	SIEMENS NM
Header File	
Image File	C:\ISSP3-data\3DSSP_data\aleSol
Offset	
Byte Order	<input checked="" type="checkbox"/> Little Endian <input type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float
	<input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	
X mm/pixel	3.895370
Y mm/pixel	3.895370
Z mm/pixel	3.895370
Show Image 158.000 : 0.000 : 39	
L-R Rightside <input checked="" type="checkbox"/> LEFT <input type="checkbox"/> RIGHT	
A-P Upside <input checked="" type="checkbox"/> ANT <input type="checkbox"/> POST	
S-I Forefront <input checked="" type="checkbox"/> SUP <input type="checkbox"/> INF	
Default Value	
Save Delete Apply	

Entering information to blank fields

Select the SPECT data serving as the basis for the default data, and **Delete (D)** the data. Then, select the data again, and click **Apply**. This will enter all the image information.

The Properties dialog box shows the following fields and values:

ID	1294502
Name	
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	76
Exam. Date	2002/01/29
Exam. Time	09:05:45
Phar. Name	<input checked="" type="checkbox"/> IMP
Format	SIEMENS N
Header File	
Image File	C:\ISSP3-data\3DSSP_data\aleSol
Offset	2746
Byte Order	<input checked="" type="checkbox"/> Little Endian <input type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float
	<input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	999
X mm/pixel	3.895370
Y mm/pixel	3.895370
Z mm/pixel	3.895370
Show Image 158.000000 : 0.000000 : 39	
L-R Rightside <input checked="" type="checkbox"/> LEFT <input type="checkbox"/> RIGHT	
A-P Upside <input checked="" type="checkbox"/> ANT <input type="checkbox"/> POST	
S-I Forefront <input checked="" type="checkbox"/> SUP <input type="checkbox"/> INF	
Default Value	
Save Delete Apply	

The header size is displayed in Offset.

"999" is displayed in Slice Num.

The buttons are: Add... Delete Clear

To delete the selected SPECT data, click **Delete (D)**.

(3) Select the SPECT data for applying the default setting, and then click **Apply**.

Select the SPECT data for applying the default setting.

Click **Apply**.

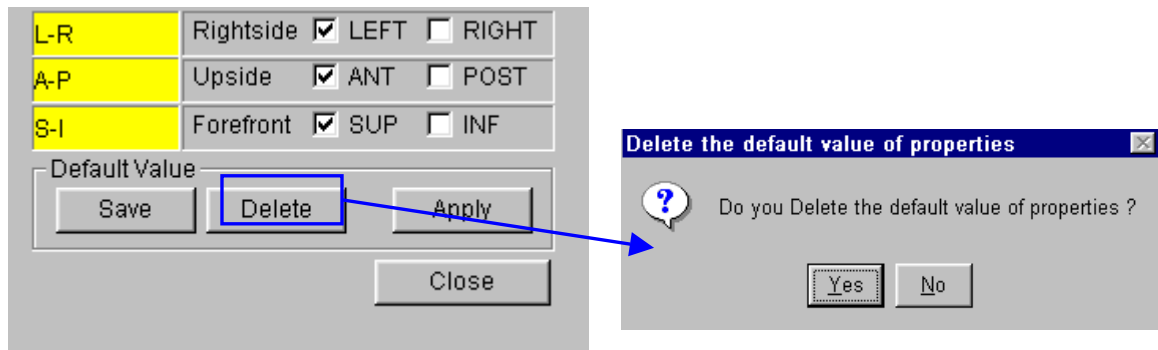
Image information for the default setting is applied to the selected SPECT data.

The **Offset** is automatically calculated and displayed.

Slice Num indicator "999" is displayed. This does not need to be corrected even if "999" is displayed since processing in 3D-SSP analysis is based on the actual number of slices (39 in this example) calculated from the file size.
*Except for Toshiba data

Select the next SPECT data, and then perform the same operation (click **Apply**).

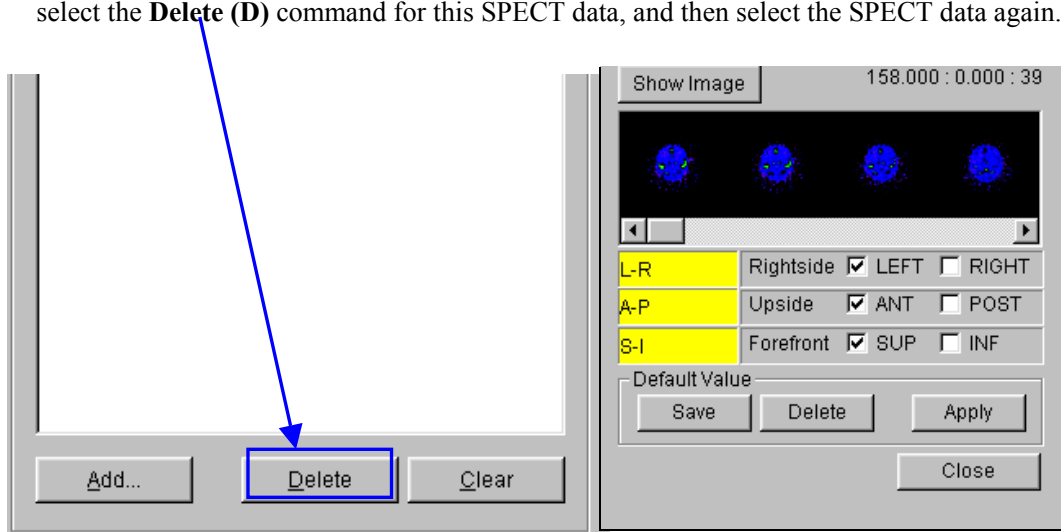
(4) Deleting the default setting



Click **Delete**. Select **Yes (Y)** to delete the default setting.

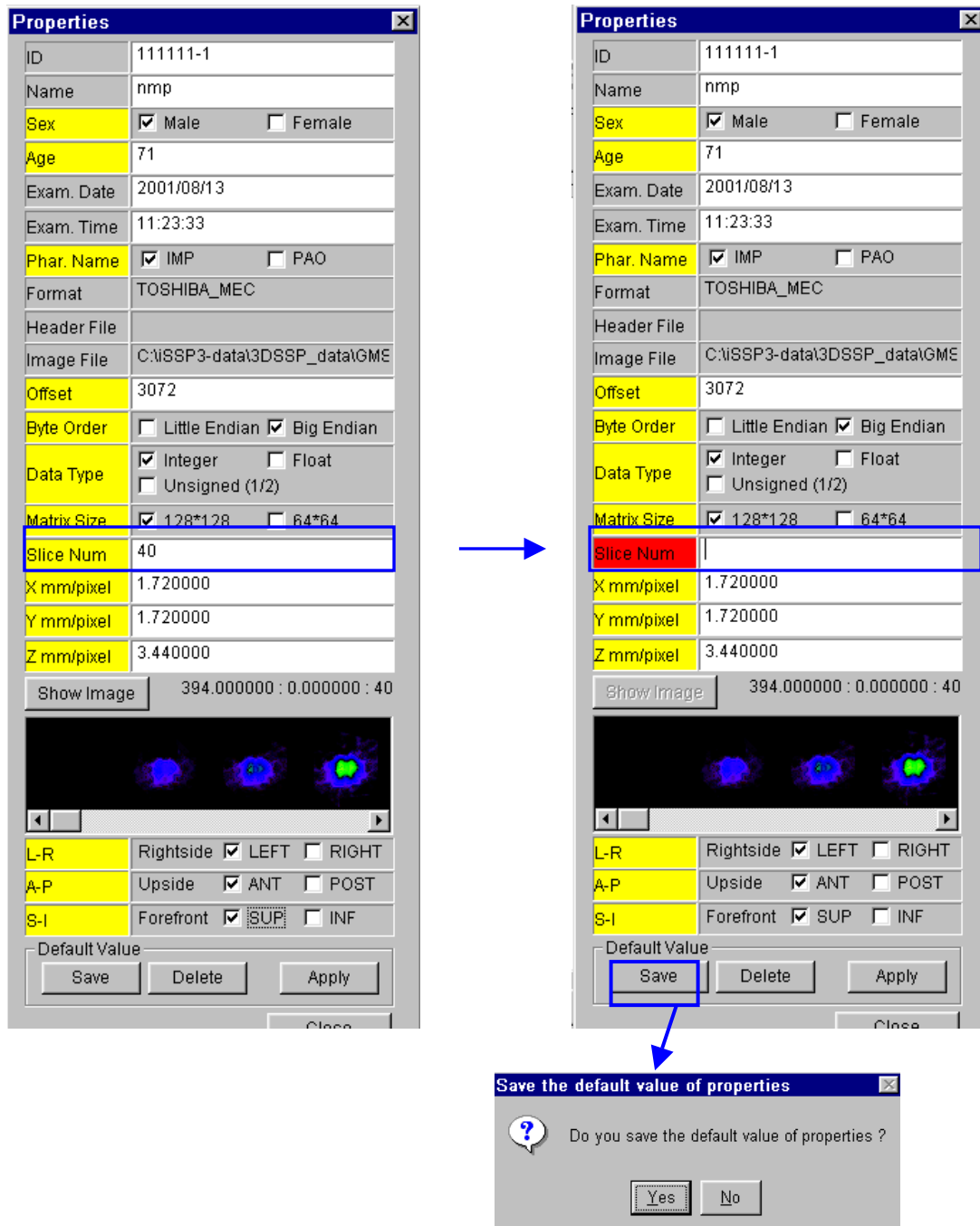
(5) Even if the default setting is deleted, the SPECT data image information where the default setting was applied does not revert to its original setting.

To restore SPECT data image information where the default setting was applied, select the **Delete (D)** command for this SPECT data, and then select the SPECT data again.



2) Notes when saving default settings for Toshiba SPECT data

(1) If saving the Toshiba SPECT data as the default setting, be sure to always use the settings below. Select the SPECT data serving as the basis for the default setting, enter the image information and leave the fields which vary for each patient blank, and then save as the default setting. In this example, **Slice Num** is set as blank in the default setting.



After determining the default setting, click Save, and then select Yes (Y) to save the above settings as default values.

(2) Select the SPECT data for applying the default setting (Fig. 1), and then click **Apply**. The default settings are applied, and the **Image Alignment (L-R, A-P, S-I)** and **Slice Num** are entered (Fig. 2). "999" is then displayed in the **Slice Num** field.

In this state, the 3D-SSP analysis will be performed on the number of slices (40 in this example) including the reference slice. Therefore, enter the number of slices after deleting the reference slice in the **Slice Num** field (39 in this example) (Fig. 3). Also, for the data serving as the basis for the default setting, apply the default setting to this data, and then delete the reference slice.

ID	111111-1
Name	NMP-NMP
Sex	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
Age	71
Exam. Date	2001/08/13
Exam. Time	11:23:33
Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	TOSHIBA_MEC
Header File	
Image File	C:\SSP3-data\3DSSP_data\GME
Offset	3072
Byte Order	<input type="checkbox"/> Little Endian <input checked="" type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float
	<input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	40
X mm/pixel	1.720000
Y mm/pixel	1.720000
Z mm/pixel	3.440000
Show Image	
L-R	Rightside <input type="checkbox"/> LEFT <input type="checkbox"/> RIGHT
A-P	Upside <input type="checkbox"/> ANT <input type="checkbox"/> POST
S-I	Forefront <input type="checkbox"/> SUP <input type="checkbox"/> INF
Default Value	
Save Delete Apply	
Close	

Fig. 1

Default setting is applied

Phar. Name	<input checked="" type="checkbox"/> IMP <input type="checkbox"/> PAO
Format	TOSHIBA_MEC
Header File	
Image File	C:\SSP3-data\3DSSP_data\GME
Offset	3072
Byte Order	<input type="checkbox"/> Little Endian <input checked="" type="checkbox"/> Big Endian
Data Type	<input checked="" type="checkbox"/> Integer <input type="checkbox"/> Float
	<input type="checkbox"/> Unsigned (1/2)
Matrix Size	<input checked="" type="checkbox"/> 128*128 <input type="checkbox"/> 64*64
Slice Num	999
X mm/pixel	1.720000
Y mm/pixel	1.720000
Z mm/pixel	3.440000
Show Image 394.000000 : 0.000000 41	
L-R	Rightside <input checked="" type="checkbox"/> LEFT <input type="checkbox"/> RIGHT
A-P	Upside <input checked="" type="checkbox"/> ANT <input type="checkbox"/> POST
S-I	Forefront <input checked="" type="checkbox"/> SUP <input type="checkbox"/> INF
Default Value	
Save Delete Apply	
Close	

Fig. 2

Slice Num	40
X mm/pixel	1.720000
Y mm/pixel	1.720000
Z mm/pixel	3.440000
Show Image 394.000000 : 0.000000 : 40	

Fig. 3

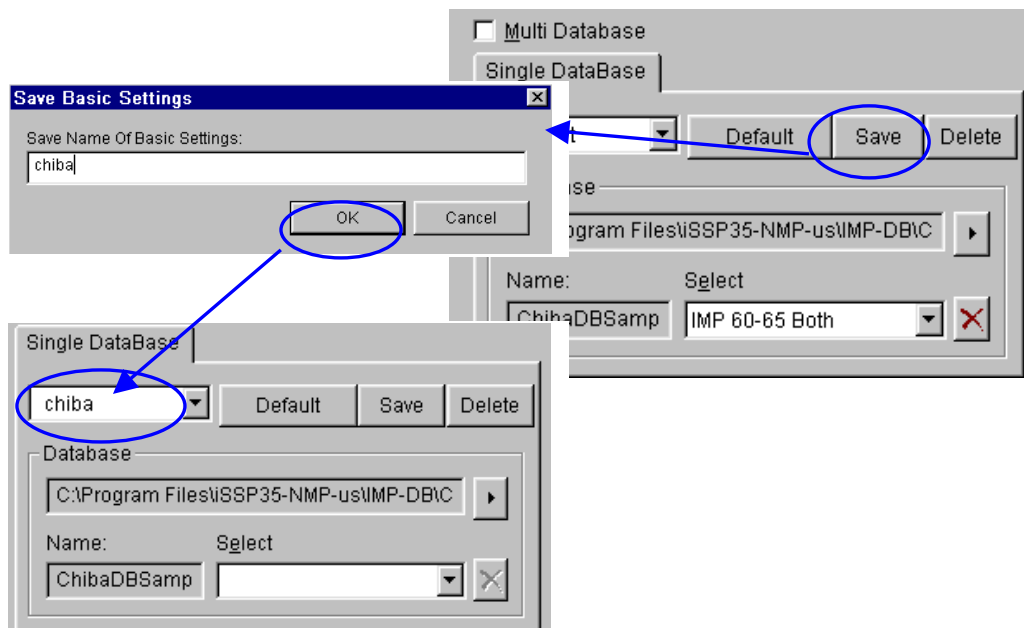
Enter the number of slices after deleting the reference slice.

2. Setting the Database as the Default

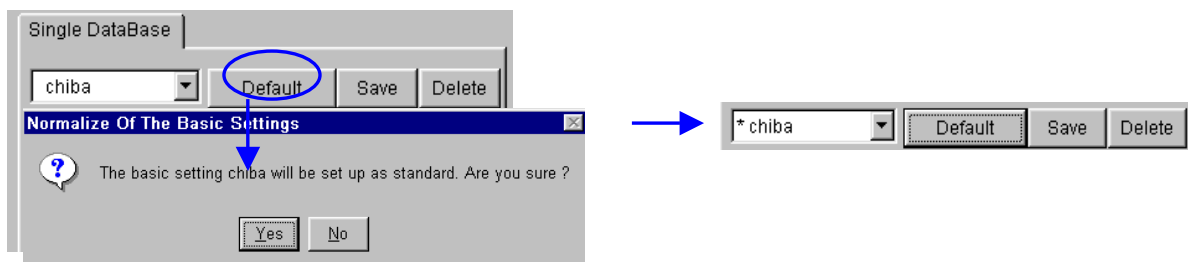
The **Save** button under **Basic Settings** can be used to set a database to be used as the default database.

- To set the Chiba University database as the default database

After selecting the Chiba University database, click the **Save** button. The **Save the Basic Setting** screen is displayed. Enter the name of the setting to be saved, such as "Chiba". Then, click **OK**, and "Chiba" is registered to the basic settings.



Once "Chiba" is displayed in the **Basic Settings** window, clicking the **Standardization** button displays the screen shown below.



When **Yes (Y)** is selected, "Chiba" is saved as the basic setting (an asterisk appears before Chiba), and in subsequent operations, comparison with the Chiba University database is the default setting.

VII. Interpretation of Image Analysis Results

Z-score images where the pixel values are normalized and calculated based on the global image, thalamus, cerebellum, and pons as a reference region. Also, images are displayed as viewed from eight directions with respect to the reference region. The Z-score is displayed as an absolute value. Analysis of SPECT images is conducted on non-quantitative images. As a result, once the images are normalized, they need to be compared to the corresponding database. However, in images obtained from actual cases, the reference region for normalization is not always normal, and a common problem is that in many cases this is not known before the image is analyzed.

iSSP automatically performs four different types of normalization and then displays the respective Z-score images so that if there is an abnormality in one of the reference regions, the abnormality of the reference region and other bloodflow abnormalities can be surmised from the Z-score images based on other reference regions. For example, in the case where the bloodflow of the pons and frontal lobe is extremely low compared to other regions, the Z-score image normalized based on the pons count will result in an undervaluation for the bloodflow reduction of the frontal lobe (abnormality is hardly detected by the Z-score image). In this case, all the Z-score images normalized by the other reference regions (global, thalamus, and cerebellum) will detect the decreased bloodflow of the frontal lobe, and so a comparison of these four different Z-score images enables improved detection accuracy of regions with abnormal bloodflow in non-quantitative images.

Note:

Do not only rely on the Z-score, but be sure to also always compare with the original cross-sectional image, and then finally, check your findings with the tomogram.

VIII. Normal Databases

Models, Collected Data, Age Classes, Nuclides, Collection and Reconfiguration Conditions

	Chiba University Medical School Hospital	National Center of Neurology and Psychiatry Musashi Hospital	Toho University Medical School Omori Hospital
Database name	ChibaDBSample	NCNPM15 0.30cycles/cm * NCNPM30 0.60cycles/cm *	Toho-Omori
Model name	Shimadzu PRISM3000XP	Seimens MULTISPECT3	Shimadzu PRISM3000
Data processing equipment	ODYSSEY-VP	ICON-P	ODYSSEY
Nuclides	Perfusamine	Perfusamine	Perfusamine
Dosage	111 MBq	111 MBq	222 MBq
Collected cases (total)	38	23	38
Age range	60-80	58-81	20-59
Age classes	4 classes: 60-65, 66-70, 71-74, 75-80	2 classes: 60-70, 71-80	4 classes: 20-29, 30-39, 40-49, 50-59
Imaging start time	30 minutes after dosage	20 minutes after dosage	22 minutes after dosage
Collimator	LEHR-FAN	LEHR	LEHR-FAN
Collection mode	Continuous rotation (6 times) (9° 40 views)	Step (5° 24views)×3	Step (5° 24views)×3
Collection time (minutes)	30 minutes (5 minutes/rotation)	24 minutes (60 s/step)	16 minutes (40s/step)
Matrix	128×128	128×128	64×64
Pixel size (mm)	2.16	2.46	3.45
Slice thickness (mm)	3.56	4.92	3.45
Preprocessing filter Order Cutoff frequency	-	Hanning 0.30cycles/cm * 0.60cycles/cm *	Low-pass (BWF) 8 0.25 cycles/pixel
Reconfiguration filter	Ramp	Shepp & Logan	Ramp
Postprocessing filter Order Cut off frequency	3Dpost(BWF) 4 0.17 cycles/pixel	—	—
Scattering correction (Correction method))	None	None	None
Absorption correction (μ value)	Chang (0.06)	Chang (0.07)	Chang (0.06)

*These frequencies are equivalent to 0.15 cycles/cm and 0.3 cycles/cm by other manufacturers.

IX. Contact Information

Please use the contact information below to send any inquiries, questions, or comments about this software.

This software requires registration since the validation period is set by the keycode. To use this software, please send your name, facility name, position, and e-mail address to the medical representatives (MR) at Nihon Medi-Physics. The software will then be sent to you.

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