

ksepi RPM creation instructions

Ready-made RPMs for ksepi and reconstruction are available here:

http://bit.ly/ksepi_RPM

which allows ksepi and recon executable to be installed on the scanner.



If you are just going to *install* the RPMs available above (as opposed to *generate* your own RPMs), stop here and open the other document with installation instructions instead.

However, for those who wants to *modify* either ksepi.e or the corresponding Matlab recon (recon_epi.m) and then create an RPM file for installation on various MR systems, here is a quick overview of the key files in the Matlab tree ('matlab_epi') in the GitLab.com repository 'psd_ksfoundation'. To get access to the Git repo, please create an account on GitLab.com, and register [here](#). Note that you need to have an EPIC license agreement and a GE software sharing agreement as well (GE Healthcare requirements).

Note that the RPM recon only supports ScanArchives (not Pfiles), so the instructions below are only useful for DV26, PX26, MP26, RX27 systems or later.

1. Important files & directories

The GitLab repository 'psd_ksfoundation' is available here (see above):

https://gitlab.com/neuromr_karolinska/psd_ksfoundation

This repo contains both the KSFoundation library, pulse sequences and a matlab_epi folder. For this instruction, we care about the directories in bold:

Documentation/
KSFoundation/
ksepi/ksepi.e
ksfse/
ksgre/
ksgre_tutorial/
ksmodules/
matlab_epi/epi/recon_epi.m

For ksepi image reconstruction inside Matlab, the entire matlab_epi folder needs to be added to the matlab path, then call 'recon_epi.m' (matlab_epi/epi/recon_epi.m). This will in turn call recon_2depi.m for diffusion and recon3depi.m for 3D-EPI recon.

For the RPM build and helper scripts for the MR scanner, here is a list of important files:

- matlab_epi/deploy/ksepi/**compile_recon_epi.sh**
Script that calls 'mcc' to compile recon_epi.m and put the output binary in ksepi/recon/recon_epi
- matlab_epi/deploy/rpmbuild/**compile_psd.sh**
Script that compiles the ksepi psd in some specified directory
- matlab_epi/deploy/rpmbuild/**copy2rpm.sh**
Script that gathers psd and recon binaries + scripts and produces a temp tar file in SOURCES/
- matlab_epi/deploy/rpmbuild/SPECS/**ksepi.spec**
RPM config file. Recipe for creating the RPM file based on input tar file.
Note: If you need some other final name for the psd sequence on the MR scanner than 'ksepi-vre', you need to modify this file:
%define psd_install_name **ksepi-vre**

The same holds true if you want another recon number than 961 (rhrecon = 961 in ksepi.e):

```
In -s ${recon_folder}/recon_epi_live.sh ${buildroot}/usr/g/bin/recon961
```

- matlab_epi/deploy/rpmbuild/**build_RPM_ksepi.sh**
The **top-level script** that calls all other scripts for RPM generation
- matlab_epi/deploy/rpmbuild/RPMS/x86_64/
The output folder containing one RPM per ESE release.

2. Compiling psd & recon

To build an RPM for both the (modified) ksepi.e sequence and recon_epi.m recon, the build script (matlab_epi/deploy/rpmbuild/**build_RPM_ksepi.sh**) will (on a **linux** system with ESE environment installed only):

- a) Call 'mcc' to compile recon_epi.m to a standalone executable. Recommended is to use Matlab2018b (or 2017b, 2018a).
- b) Use its first (and only) input argument as path to the ksepi psd directory. This since, there may be different ksepi psd directories for various projects. With this path, the ksepi.e sequence will be compiled.
- c) Put the final output RPM file(s) in matlab_epi/deploy/rpmbuild/RPMS/x86_64/

3. Matlab runtime RPM

If you have compiled the Matlab recon with Matlab2017b or later, there are ready made RPMs that installs the Matlab runtime on the MR scanner in /export/home/sdc/MATLAB. This is where recon_epi looks for the Matlab runtime libraries. These RPMs needs to be installed once and are available here:

<https://drive.google.com/open?id=1Sc9xevu7kJKXuUseXyDNWTGcVV6VTnOg>

You can also build your own Matlab runtime RPM file using an MCR file from Mathworks (<https://mathworks.com/products/compiler/matlab-runtime.html>) and the matlab_epi/deploy/rpmbuild/**build_RPM_matlabruntime.sh**. But this is only necessary if you have another Matlab release than above. Note that recon_epi.m still needs Matlab2016b to work, so it is not worth creating a matlab runtime RPM for versions before that. build_RPM_matlabruntime.sh is slow, about 1 hour.

4. Copy the two RPM files to the MR scanner

In this example to: /usr/g/mrraw/

```
you@computer> scp mat*.rpm ksep*.rpm mrscanner:/usr/g/mrraw/
```

5. Install ksep psd and recon & Matlab runtime

```
{sdc@mrhost}[] cd /usr/g/mrraw
```

```
{sdc@mrhost}[] su  
password = operator
```

```
[sdc@mrhost mrraw]# rpm -i ksep*.rpm
```

This will install the following files in /export/home/sdc/ksep

- /export/home/sdc/ksep/data
- /export/home/sdc/ksep/psd/ksep
- /export/home/sdc/ksep/psd/ksep.psd.ice
- /export/home/sdc/ksep/recon/mkdir_vre_ksep
- /export/home/sdc/ksep/recon/recon_epi
- /export/home/sdc/ksep/recon/recon_epi.sh
- /export/home/sdc/ksep/recon/recon_epi_live.sh
- /export/home/sdc/ksep/recon/runtimeversion.txt
- /usr/g/bin/ksep-vre -> /export/home/sdc/ksep/psd/ksep
- /usr/g/bin/ksep-vre.psd.ice -> /export/home/sdc/ksep/psd/ksep.psd.ice
- /usr/g/bin/ksep-vre.psd.mgd -> /export/home/sdc/ksep/psd/ksep.psd.mgd
- /usr/g/bin/recon961 -> /export/home/sdc/ksep/recon/recon_epi_live.sh

```
[sdc@mrhost mrraw]# rpm -i mat*.rpm
```

*This will install the Matlab2018b runtime environment in
/export/home/sdc/MATLAB/matlab2018b_runtime_linux*

In summary

/export/home/sdc/ksepi/ psd	The pulse sequence directory
/export/home/sdc/ksepi/ recon	The directory containing recon executables
/export/home/sdc/ksepi/ data	Empty directory storing the log files, temp files and DICOMs for the 5 last ksepi scans
/export/home/sdc/ MATLAB/	The Matlab runtime environment (needed byksepi/recon/recon_epi)

6. Sequence selections

Diffusion MRI

Plane: Oblique Mode: 2D

Family

- ☒ Echo Planar Imaging
- ☐ Fast Spin Echo
- ☐ Gradient Echo
- ☐ MNS
- ☐ Spin Echo
- ☐ Vascular

Pulse

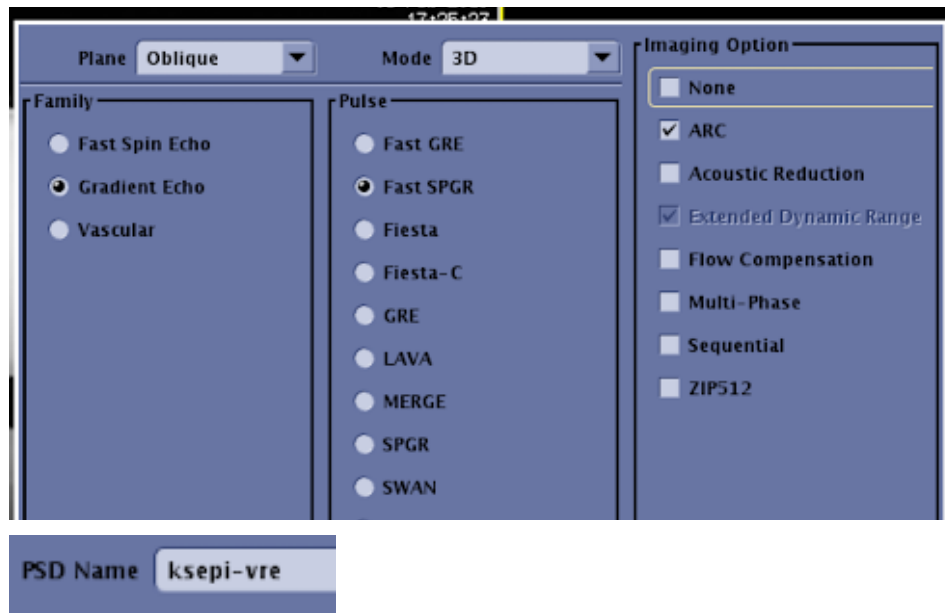
- ☒ DW EPI
- ☐ Flair EPI
- ☐ Gradient Echo EPI
- ☐ Spin Echo EPI

Imaging Option

- ☐ None
- ☐ Acoustic Reduction
- ☒ Extended Dynamic Range
- ☐ IR Prepared
- ☐ Sequential
- ☐ ZIP512

PSD Name: ksepi-vre

T1w 3D-EPI and SWI 3D-EPI



7. Recon options

```
{sdc@mrhost}[] gedit /export/home/sdc/recon/recon_epi_live.sh
```

At the top of this file:

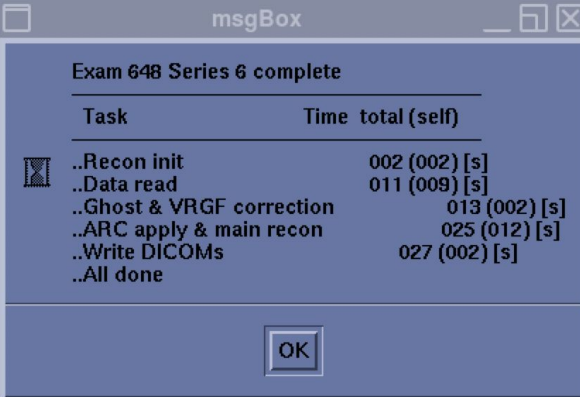
```
# Shorter VRE recon time for 2D diffusion (recon_epi.m->recon_2Depi.m)
recon_epi_options="tempdata disk parpool 4 moco 1"

# Remove '#' to reduce stress on the VRE (slower VRE recon for 2D diffusion)
# recon_epi_options="tempdata disk parpool 0 moco 1"

# Number of previous exams to keep in /export/home/sdc/ksepi/data on the MR
Host. ScanArchive, logs and DICOMs are stored here after recon
number_exams_to_keep=5

# show popup? Set to 0 to turn off
show_popup=1
```

By default, after every finished reconstruction a popup window is shown



A screenshot of a Windows-style message box titled 'msgBox'. The box has a blue background and a white border. At the top, it says 'Exam 648 Series 6 complete'. Below this is a table with two columns: 'Task' and 'Time total (self)'. The table lists several tasks with their corresponding times in seconds. An hourglass icon is next to the first task. At the bottom of the box is an 'OK' button.

Task	Time total (self)
..Recon init	002 (002) [s]
..Data read	011 (009) [s]
..Ghost & VRGF correction	013 (002) [s]
..ARC apply & main recon	025 (012) [s]
..Write DICOMs	027 (002) [s]
..All done	

Make sure there is no white space before or after the '=' signs. Otherwise, recon will not work.