28 02 2025 _ Rat MRSI _ High Res And 3D_BA

SHAM - 793

date:		SCAN	GROUP	BDL

	study name	MAR - 003067	weight: 262,7 g

INSIDE THE MAGNET TAPE THE HOLDER AND PUT THE **BLUE LOCKER** UPP

study	**Application: MRSI_2_cryo/HEAD_PRONE**
	MRI_Default (cryo) / MRI_TxSuc (surface)
Time of start	09 : 18 AM

TAPPE ears and eyes + do not cover too much the rat and tall not on the heating pad + position well the cryocoil on the region you wish to see – for MRSI pay attention to STRIATUM

1 Localizer   **Adj:** wobble : Coil 1 VOLUME - setup (manual)-**do not do Apply**, Coil 2 CRYO: 5Mhz aiwth Start (automatic) – **DO PRINT SCREEN (both)**

E2 → Acquire localizer for position with **basic frequency/MR scan in the instruction cart**
fix the rat

power= 1,61 W

2 Localizer   **ref power is adjusted automatically**

E3 → Acquire with **automatic instructions**

Target power for MRSI: 1.6W

3 Loc MS **3_Localizer multislice_10_short** – for voxel and ellipsoid mapShim

E4 Seq: 1 avg, 10 slices, Image size: 256x256, FOV: 24x24 → **position the slices**
→ Acquire with **automatic instructions**

4 T2 turbo rare **4_T2 turbo rare for voxel position AXIAL (T2 turbo rare_8_52K_250924_Ax)/**(T2 turbo rare_6_54K_080822_Sag)
Seq: 2 avg, DS=4, Rare factor: 8, encoding start -1 (in resolution/encoding), 256x256, 28 slices,
0 gap, FOV=24x24
Position the slices, current shim   -follow rat temp for all RARE seq

No = E5 → Automatic acquistion

5 Coronal   **5_T2 turbo rare for voxel position CORONAL (T2 turbo rare_8_52K_Cor_mapshim_250924)**, 20 slices, TE=33ms, TR=2.5s
ACQ the B0 map before in the Adj platfrom (settings are already saved) -**CEREBELLUM SHOULD BE IN THE FOV**

E6 B0 map No E7   Can be increased or decreased basedon brain size
Mapshim – elliptical 13x9x19 Position the ellipsoid before starting the acquisition

5 Atlas   **5_T2 turbo rare_6_52K_Cor_250924_atlas_03_RC** – has 2 sat bands left-right -pe direction for aliasing)
Copy slice orientation from one coronal to the other (not the geometry) – **ATTENTION WHEN POSITIONING THE SAT BANDS**
Seq: 10 avg, DS=4, Rare factor: 6, encoding start -1 (in resolution/encoding), 128x128,40 slices, 0 gap
Position the slices +FOV =24x24 as MRSI

No = E8 → Automatic acquistion

Create a mapshim report **SD values:** 31 Hz

STEAM **QUALITY CHECH**
6_STEAM_water_MRSI_250924 (shim verification following ellipsoid shimming) – "_big" – bigger VOI (+cerebellum)
position voxel - 10 x 2 x 10 mm
Seq: 16 avg, 1 rep, offset 0, no WS, 2 DS, TE=3, TM=10, TR=4
OVS (15/12mm, gap=1mm), **spoilers 15-25-35%**, ref scan 16, **Seq spoilers : 30-36-25%**
Current shim

Vox size=10x2x10
position= 0,561 x 0,477
x 0,174 mm

No = E9 → Automatic acquistion   →topspin/tick in Reconstr. **lw =** 27,884 Hz
Save shim   (no matter the lw always save the first shim)
6_STEAM_water_MRSI_250924 _mapshim – for shimming - copy ONLY voxel geom from previous
If lw is very high (≥25-30Hz) then dulicate 1_Localizer and in Adj platform acquire B0map
B0 map No: E12
In STEAM in Setup card: Map shim on the voxel: cuboid, no margin, iterative corrections

No = E10 → Automatic acquisition (target 15-22 Hz)
Save shim

lw = 27,884 → 17,763 Hz

No =   →If necessary duplicate last STEAM acq (if lw is 17-25 Hz): copy seq, Setup/Current Shim, then **on Adj pltaform:**
loc.freq/loc.shim/loc.freq – 512 points
Save shim

Final lw = 17,763 Hz

Mandatory: **8_STEAM_met_MRSI_281024_300WS** - copy ONLY voxel geometry from
previous
1 repetition with 32 averages, ref scan 16, OVS on (Angles Geometry Display: 0/-180/-180)
WS ON : WS pulses 84/150   → If you change the WS note it here:
Last delay (no 7) in WS – 28ms – **test in Setup Mode – USUALLY IS 28ms, TEST IT BUT ACQ WITH
THE ONE FROM MRSI – 28.7 (BW=400 Hz) or 29.34 (BW=350Hz)**
TE= 3ms   TM=10 ms   TR= 4s

No = E13 → Automatic acquistion + Current shim + **copy sequence (WS off, 16 av) for H2O acq if absolute quantif is needed**

FID-MRSI   **9_CSI_fid_cor_metab_TE13_BL4_WScc_100225** - do the traditional ISMRM 2025 sat bands – do a print screen (see end this document) – OLD version: 9_CSI_fid_cor_metab_281024_TE13_BL4_WSOptimized

TR=822ms, novelty of the version WS last delay=28ms (the auto repetition spoiler was decreased to 1.2ms with 35%)

Copy ONLY Slice orientation from Coronal RARE ATALS (scan 5) - check that the values are ok (Geometry tab)

Adjust the slice ofsett - Middle coordinate of the VOI in STEAM

Adjust the position of saturation bands

Use both Axial and Coronal RARE acq as support

FOV = 24x24 , flip angle = 55, Dummy scans = 8Linear encoding, start at -1, -1

weighted acquisition / standard acquisition – Always standard with 1 avg.

Preparation/WS – VAPOR*

Launch in the **setup mode** to find optimal WS and BW of the pulses (test also with 8x8 matrix)

Matrix size= 31 x 31

Coronal Slice position (from Atlas): 10 — 16

WS flip angles =	84/150	BW =350-400

*For the flip angles 84/150 and **BW=400**,Hz last delay aprox **28ms** works best so start with those

BW=350 Hz can be used if shim is of good quality (17-20Hz for H2O), then last delay will slightly increase to **28.54 ms**

Number of averages:

Number of repetitions:

No= E14→ Automatic acquisition + current shim - **metabolites**

Duplicate sequence - preparation/WS -none

No= E15 → Automatic acquisition + current shim – **water**

(Angles Geometry Display: -90/0/-90)

FID-MRSI – 2nd DATA SET (if you do testing for the FOV sat)

!!!!! We can copy the previous acquired sequence and just move the sat bands ouside the brain (left and right on the coronal, upp on the coronal, and obliques one on the coronal

9_CSI_fid_cor_metab_100225_TE13_BL4_WScc_rooftop - done on 100225 – lipid suppression is better and we can keep the sat bands outside the brain

WS -last delay=29.4ms for 350HZ, WS -last delay=29.3ms for 400HZ

If you repeat with other parameters   *High Res*

1st repeat   **FID - MRSI** 47 x 47

weighted acquisition / standard acquistion - circle the one you select   *CS: AF=4 / Core = 20%*

Preparation/WS – VAPOR

Averages:	3	Repetitions: 1

No= E16 → Automatic acquistion + current shim – **metabolies**

No= E17 → Automatic acquistion + current shim – **water**

2nd repeat   **FID - MRSI** 63 x 63

weighted acquisition / standard acquistion - circle the one you select   *CS: AF=4 / Core = 20%*

Preparation/WS - VAPOR

Averages =	3	Repetitions= 1

No= E18 → Automatic acquistion + current shim - **metabolies**

No= E19 → Automatic acquistion + current shim - **water**

CENTER THE MRSI SLICE ON THE CORONAL IMAGE

(handwritten top) E 20 – STEAM for 3D Shim : lw = 24 Hz

(handwritten) 3D

3D MRSI -- checked on 04/02/2025 -OK
13_cristinaCSI_3D_100225_FOV_BL1_WScc - WS=400Hz, last delay 29.13

(handwritten right) Met = 21

SHIM THE 3D VOLUME first
Copy slice orientation from Atlas (not 2D MRSI), check inROutine that slice thk=1mm, slice offset – take the one from 2D+2mm to have the 3rd slice in the middle of the 2D slice

(handwritten right) Wot = 22

2D Multislice   *(handwritten)* Multislice
13_cristinaCSI_Multislice_100225_FOV_BL1_as3DWS
SHIM THE 3D VOLUME first

- Copy sat bands from 3D, Routine slice thk=1mm, copy slice orientation and geometry from 3D, again check thk slice in Routine, In geometry select 2D, In geometry put same slice offset as in 3D and keep 1 slice package but scroll to add 9 slices

(handwritten right) Met = 23

- 7398 ms=TR , 90RF, 8 DS ,WS=400Hz, last delay 29.5. ms, Pay attention to have the same WS param as in the previous 2D scans – same BW

(handwritten right) Wot = 24

- You need to import sat bands from 3D
- Auto rep spoiler 1ms, 50%

ATTETTION – DURATION OF AUTO REPETITION SPOLER (SEQUENCE TAB) INCREASES THE LAST DELAY IN WS

MM acquisition protocol -- checked on 04/02/2025 -OK

13_cristinaCSI_DIR_MM_100225_RFandWScc_BA_BL_cc -done in 100225 to keep the smalles last delay in WS (28ms for 400Hz BW)
BA_djCSI_excpul_DIR_MM_100225_90RF_TE06_BL4_WScc --- AD=0.6ms, TR3600ms, 6av-standard, 2048p, 5000BW, WS=400Hz – 28ms, P10- 0.6ms for 90RF,

ATTENTION !!!
- **WS bandwidth will range between 350 – 440 Hz depending on the quality of the shimming**
- **Duration of the TI for the DIR modules is TI1=2200 ms and TI2= 850 or 750 ms**

Short AD protocol --- chcked on 04/02/2025 -OK

10_djCSI_excpul_100225_06_BL4_WScc -P10 (0.4ms due to power req), pe=0.2
10_CSIfid_cor_metab_100225_TE065_BL4_WScc – RF=0.3ms, pe=0.2ms

PRESS MRSI – chcked on 04/02/2025 -OK

9_CSI_PRESS_cor_metab_100225
TE=10.2ms as 14T, TR=2sec ;32 min
Same Spectroscopy tab as FID MRSI (768p, 5000HZ BW)
10x10x2 –(-90, 0, -90) - for FID-MRSI (-90,0-90)
WS as FID-MRSI just that last delay is 28ms for 350Hz – should we use the same as for FID-MRSI?? (if yes then we loose the only advantage of this seq)
OVS as for STEAM, 1mm gap, 10mm slab, 3ms spoilers (15-25-35%), RF 1ms sech
Seq tab: 90 RF – 0.5ms (8400Hz) but 180 RF -0.6ms due to power demands (4250Hz)
-2ppm as FID-MRSI; auto Rep Spolers (2ms, 25%), Auto Echo SPolire (1.5ms, 25%) – with this min TE=9.8ms – is this spoiler is decreased then TE is also decreased ☺

(handwritten bottom left) For 3D & Multislice :

(handwritten bottom)
Slice 1 = 6
Slice 2 = 10
Slice 3 = 13
Slice 4 = 16
Slice 5 = 20

Slice 6 = 23
Slice 7 = 26
Slice 8 = 30
Slice 9 = 33

STEAM   **QUALITY CHECH and SHIM**

1. **8_2_STEAM_water_hippo_281024_OVS** - position the voxel in the hippo and check the water linewidth after the shims done before **(usually we get between 14-18Hz)**
   2.8x2x2.8 - position=
   H2O – lw =
   WHEN SCANNING SICK ANIMALS THIS SCAN IS NOT NEEDED

2. **8_2_STEAM_water_hippo_281024_OVS_mapshim** –copy ONLY Voxel geometry - shim the voxel to improuve **(target values: 9-12 Hz)**
   H2O lw =
   Save shim

3. **Duplicate the previous sequence if lw is ≥11 Hz** – in the Setup Card select Current shim – in the adj platform do 1)Local freq; 2) local Shim; 3)Local freq by selecting in the Spectroscopy card only 512 points in the FID
   Acq the signal
   H2O lw =
   Save shim

   WS CALIBRATION

4. **9_STEAM_met_hippo_281024_OVS_32av** - test WS **(BW=270 Hz and last delay=28ms)** - copy ONLY voxel geometry from previous scan
   In Setup Mode you can test the WS
   WHEN SCANNING SICK ANIMALS – JUST USE SETUP MODE TO TEST THE WS YOU DO NOT NEED TO ACQ THE DATA , however you need to copy the voxel and WS param if changed in the next scan

   ACQ OF METABOLITE AND 2XWATER SIGNAL

5. **9_STEAM_met_hippo_281024_OVS_16x16** – acq metabolite signal - copy ONLY voxel geometry from previous scan
   Check that the voxel position is the good one

6. **9_STEAM_met_water_hippo_281024_OVS_absQ** – acq water signal for absolute quantif with OVS
   Copy ONLY voxel geometry from previous scan
   Check that the voxel position is the good one

7. **Duplicate -- 9_STEAM_met_water_hippo_281024_OVS_absQ** – take out OVS and acq water signal for absolute quantif without OVS

sSPECIAL
Specialjm_adiabIR_hippo_metf_281024
Specialjm_adiabIR_hippo_water_absQ_281024

Sat Bands – the strict version - \\cibmaitsrv1.epfl.ch\scannerdata\Toi\20250113