

Stability analysis of FUNSTAR from Ospedale Bambin Gesù

Coil:
Element: HEA;HEP
Acquisition Date: 12/09/2020
Acquisition Time: 20:26:07
IRCCS: Ospedale Bambin Gesù
Manufacturer: SIEMENS
Repetition Time (msec): 2000.0
Echo Time (msec): 30
Number of Volumes: 21
Pixel Bandwidth (Hz/Px): 1595
Phantom center of mass: 32.0,32.0,15.755477426715407
Phantom type: FUNSTAR Phantom
Phantom mean radius: 85.92031078090616
Phantom shape factor: 0.9607843137254902
Imaging protocol: BIRN stability

Calculated images

Mean over time:

mean = 405.72, stddev = 178.81, max = 1176.05, min = 160.45

Standard deviation over time:

mean = 0.71, stddev = 0.24, max = 2.95, min = 0.22

Variance over time:

mean = 0.57, stddev = 0.52, max = 8.69, min = 0.05

SFNR:

mean = 583.08, stddev = 231.86, max = 2551.96, min = 65.78

Even-odd difference:

mean = 0.01, stddev = 3.26, max = 15.00, min = -19.00

Even-odd difference percent:

mean = 0.00, stddev = 1.01, max = 5.90, min = -5.90

Peak to peak:

mean = 2.52, stddev = 1.00, max = 12.00, min = 1.00

Normalized % stddev over time:

mean = 0.20, stddev = 0.09, max = 1.52, min = 0.04

ROI locations:

Object mask

Central ROI Analysis

Raw central ROI plot

mean=195.4160
stddev=0.0942 (0.0482%)
p-p=0.4300 (0.2200%)
drift=0.1371

Detrended central ROI plot

mean=195.5266
stddev=0.0582 (0.0298%)
p-p=0.1993 (0.1019%)

Central ROI over time

mean=385.8035
SNR=401.6027
PSC=3.9354%

Peripheral ROI Analysis

Raw peripheral ROI plot

mean=512.3384
stddev=0.3372 (0.0658%)
p-p=1.0799 (0.2108%)
drift=0.1863

Detrended peripheral ROI plot

mean=512.6723
stddev=0.0818 (0.0160%)
p-p=0.3098 (0.0604%)

Peripheral ROI intensity plot

mean=262.1783
p-p=204.6517 (78.0582%)

Peripheral ROI SFNR plot

mean=706.0631
p-p=464.8292 (65.8340%)

Peripheral ROI SNR plot

mean=1011.4938

SNR=205.6709

Peripheral ROIs Analysis at different Angles

Peripheral ROI plot at angle = 0

raw_mean=595.4722
raw_stddev=0.3564
raw_p-p=1.4444
raw_drift=0.1188

detrended_mean=595.8442
detrended_stddev=0.2762
detrended_p-p=1.2381

Peripheral ROI plot at angle = 45

raw_mean=419.3222
raw_stddev=0.4066
raw_p-p=1.5556
raw_drift=0.2358

detrended_mean=419.3282
detrended_stddev=0.2543
detrended_p-p=1.1386

Peripheral ROI plot at angle = 90

raw_mean=555.5444
raw_stddev=0.5419
raw_p-p=1.8889
raw_drift=0.2788

detrended_mean=555.9717
detrended_stddev=0.1805
detrended_p-p=0.6883

Peripheral ROI plot at angle = 135

raw_mean=392.4722
raw_stddev=0.3237
raw_p-p=1.3333
raw_drift=0.1559

detrended_mean=392.6837
detrended_stddev=0.2399
detrended_p-p=0.9773

Peripheral ROI plot at angle = 180

raw_mean=321.4500
raw_stddev=0.2471
raw_p-p=0.7778
raw_drift=0.1446

detrended_mean=321.3682
detrended_stddev=0.1840
detrended_p-p=0.6557

Peripheral ROI plot at angle = 225

raw_mean=438.9278
raw_stddev=0.3448
raw_p-p=1.2222
raw_drift=0.2315

detrended_mean=439.2148
detrended_stddev=0.1960
detrended_p-p=0.7700

Peripheral ROI plot at angle = 270

raw_mean=666.4278
raw_stddev=0.7960
raw_p-p=2.5556
raw_drift=0.3219

detrended_mean=667.5955
detrended_stddev=0.3314
detrended_p-p=1.0081

Peripheral ROI plot at angle = 315

raw_mean=654.1722
raw_stddev=0.5779
raw_p-p=1.8889
raw_drift=0.2206

detrended_mean=654.6568
detrended_stddev=0.3177
detrended_p-p=1.1943

Ghost ROI Analysis

Odd ghost ROI plot

mean=2.1813
stddev=0.0603
min=2.0457
max=2.2734
p-p=0.2277

Even ghost ROI plot

mean=2.5746
stddev=0.0750
min=2.3673
max=2.6545
p-p=0.2872

Spikes Detection

This is an analysis of spikes. Signal in a 5x5 corner ROI is evaluated within all the slices, for every repetition. The number of spikes detected for every repetition is then stored.

# Slice	# Spikes Detected
1	0.0000
2	0.0000
3	0.0000
4	0.0000
5	0.0000
6	0.0000
7	0.0000
8	0.0000
9	0.0000
10	0.0000
11	0.0000
12	0.0000
13	0.0000
14	0.0000
15	0.0000
16	0.0000
17	0.0000
18	0.0000
19	0.0000
20	0.0000
21	0.0000
22	0.0000
23	0.0000
24	0.0000
25	0.0000
26	0.0000
27	0.0000
28	0.0000
29	0.0000
30	0.0000
31	0.0000
32	0.0000

Shimming Analysis

This is an analysis of shimming. We evaluate pixel difference between phantom central slice and a circular mask, both for Standard Shimming and Advanced Shimming acquisitions. The ratio between Advanced Shimming and Standard Shimming pixel difference is reported as ShimmingRatio.

Advanced Shimming acquisition

Standard Shimming acquisition

ShimmingRatio=0.9937888198757764

Weisskoff analysis

Region Size	Predicted Std Dev	Actual Std Dev	Ratio
1	0.0031	0.0031	1.0000
4	0.0015	0.0012	0.7712
9	0.0010	0.0007	0.6490
16	0.0008	0.0007	0.9353
25	0.0006	0.0005	0.8921
36	0.0005	0.0005	1.0561
49	0.0004	0.0005	1.0375
64	0.0004	0.0005	1.1883
81	0.0003	0.0004	1.2347
100	0.0003	0.0004	1.4550
121	0.0003	0.0004	1.5520
144	0.0003	0.0004	1.4913
169	0.0002	0.0004	1.5987
196	0.0002	0.0004	1.9101
225	0.0002	0.0004	1.9709
256	0.0002	0.0004	2.2960
289	0.0002	0.0004	2.3626
324	0.0002	0.0004	2.6041
361	0.0002	0.0004	2.7171
400	0.0002	0.0004	2.8523
441	0.0001	0.0004	2.9353

Axial RDC=7.154201591882358

Region Size	Predicted Std Dev	Actual Std Dev	Ratio
1	0.0031	0.0031	1.0000
4	0.0015	0.0017	1.0921
9	0.0010	0.0010	0.9437
16	0.0008	0.0009	1.1663
25	0.0006	0.0007	1.1619
36	0.0005	0.0007	1.3017
49	0.0004	0.0006	1.2509
64	0.0004	0.0005	1.2087
81	0.0003	0.0004	1.2365
100	0.0003	0.0004	1.3428
121	0.0003	0.0004	1.3743
144	0.0003	0.0003	1.2389
169	0.0002	0.0003	1.1850
196	0.0002	0.0002	1.0941
225	0.0002	0.0002	1.1211
256	0.0002	0.0002	1.0583
289	0.0002	0.0002	1.0048
324	0.0002	0.0002	0.8859
361	0.0002	0.0001	0.8288
400	0.0002	0.0001	0.8906
441	0.0001	0.0001	0.7471

Sagittal RDC=28.107106069621516

Region Size	Predicted Std Dev	Actual Std Dev	Ratio
1	0.0031	0.0031	1.0000
4	0.0015	0.0017	1.1335
9	0.0010	0.0012	1.1387
16	0.0008	0.0009	1.1154
25	0.0006	0.0007	1.0708
36	0.0005	0.0005	0.9979
49	0.0004	0.0005	1.1776
64	0.0004	0.0004	1.1311
81	0.0003	0.0003	0.9690
100	0.0003	0.0002	0.8084
121	0.0003	0.0002	0.7723
144	0.0003	0.0002	0.8073
169	0.0002	0.0002	0.7812
196	0.0002	0.0002	0.8077
225	0.0002	0.0001	0.7012
256	0.0002	0.0001	0.7082
289	0.0002	0.0001	0.6474
324	0.0002	0.0001	0.7868
361	0.0002	0.0001	0.7490
400	0.0002	0.0001	0.6909
441	0.0001	0.0001	0.7602

Coronal RDC=27.62293213035868

Region Size	Predicted Std Dev	Actual Std Dev	Ratio
1	0.0031	0.0031	1.0000
64	0.0015	0.0011	0.7295
729	0.0010	0.0006	0.5670
4096	0.0008	0.0004	0.5694
15625	0.0006	0.0003	0.5622
46656	0.0005	0.0003	0.4918
117649	0.0004	0.0003	0.6079
262144	0.0004	0.0002	0.4272
531441	0.0003	0.0001	0.3828
1000000	0.0003	0.0001	0.3733
1771561	0.0003	0.0001	0.3335
2985984	0.0003	0.0001	0.3197
4826809	0.0002	0.0001	0.4059
7529536	0.0002	0.0001	0.4524
11390625	0.0002	0.0001	0.4009
16777216	0.0002	0.0001	0.4167
24137569	0.0002	0.0001	0.3481
34012224	0.0002	0.0001	0.3545
47045881	0.0002	0.0001	0.3317
64000000	0.0002	0.0001	0.3319
85766121	0.0001	0.0001	0.3793

Cube RDC=7.441019948267535