2020 McLean Imaging Center Fall Quarter Quality Assurance Report

McLean Hospital, Harvard Medical School, Boston, MA

MR System: Siemens Magnetom Trio (SL # 35070; SW VB15; Field Strength 3T)
Test Phantoms: ACR Large Phantom (J07785 & NiCl2 Large Cyl)
Test Protocols: ACR Routine & Site Sequences

Quarterly Report Date: **9/30/2020** **Test Date: 9/19/2020**
Prior Report : **7/30/2020** (Evaluations PASSED QA Guidelines)
Current Report : **9/30/2020**
(Evaluations PASSED QA Guidelines;
However, Image Uniformity for Site sequences were slightly suboptimal)
Follow-up recommended

Coils Tested: 12ch, 32ch Head Phased Array, BC and Tx/Rx CP Volume Coils were tested.
Magnet Homogeneity: Using FWHM on 70 mm sph estimated LW= 27 Hz …….. 0.25 ppm

Geometric Accuracy Measures:

Seq: Sag SE T1 (200/20/TA:51/130Hz/pix/20mm/250x250/256x256/Norm):
Measured Length: 147.0 mm ---------- PASS
Distortion (AP Lengths sup, Inf ends of phantom: 147.5, 148.0 mm (satisfactory)

Gradient Performance, Contrast and other Measures using sequences below

Seq : Ax SE T1 (500/20/2:08/**130Hz**/pix/250x250/256x256/Norm/90 flip):

Measured Diameters (AP = 189.5mm; RL = 189.5 mm)----------	PASS
Diag Length Measures 189.1; 189.2 mm ---------	PASS
High Contrast Resolution (0.9 mm UL 0.9 mm LR in SE T1)	PASS
High Contrast Resolution (0.9 mm UL 0.9 mm LR in SE T2)	PASS
Slice position accuracy : Image 1: 1.7 mm; Image 11: 1.8 mm -------	PASS
RAMP LENGTHS (slice thickness accuracy) 0.2*/[1/4.2 +1/4.8]=4.5 mm	PASS
# SPOKES (Low Contrast Detection : 10+10+10+10 = 40 identifiable)---	PASS
% Image Intensity Uniformity: 1-[2565-2045]/[2565+2045]=88.7% -----	PASS
Absolute % Ghosting = [(4.2+3.4)- (4.8+5.2)]/2x2385 = 5.0 E(-4) % -----	PASS

% Intensity Uniformity (**Site T1**): 1-[2875-2140]/[2875+2140]=**85.3%** -----
Less than optimal (perhaps due to RF Amplifier performance at 200Hz/pix BW)
Follow-up recommended

Optional Measures using sequences below

Site T1 (400/8.7/3:11/**200Hz**/pix/206x220/240x256/Norm,Disd/70flip):
Site T2 (4000/90/180Hz/pix/206x220/225x320/Norm/13ET/150flip):
ACR DE (2000/20,80/130Hz/pix/250sq/256sq/Norm/90_180 SE)

# SPOKES (Site T1 Low Contrast-**Optional** : 10+10+10+9 = 39)---	PASS
# SPOKES (ACR DE Low Contrast **Optional** : 10+10+10+10 = 40)---	PASS
RAMPS (slice thickness **Site T1**) 0.2*/[1/5.1 +1/5.3]=5.2 mm	PASS
T2 DE slice thickness (**optional**) 0.2*[1/3.8+1/4.6]=4.2 mm ------	Suboptimal

Technologist Weekly ACR QA: Weekly Logs are available and were periodically assessed, found satisfactory.

Additional coil testing for SNR Computations using Large Cyl NiCl2 vendor phantom)

Areas SNR evaluated: Superior, Isocenter, Inferior locations from large cylinder phantom images.
Sequence: Sag T1 from ACR without DISD, BW 130 Hz/pix

12CH HEA, HEP Ph Array (FWHM 30 Hz w 3D shim)

Superior Location:	S/N = 511 now; 657 in last quarter with identical shim.
Iso-center Location:	S/N = 481 now; 548 in last quarter with identical shim.
Inferior Location:	S/N =489 now; 448 in last quarter with identical shim

32CH HEA, HEP Ph Array (FWHM 35 Hz w 3D shim)

Superior Location:	S/N = 597 now; 732 in last quarter with identical shim.
Iso-center Location:	S/N = 573 now; 620 in last quarter with identical shim.
Inferior Location:	S/N =309 now; 379 in last quarter with identical shim

BC Phased Array Tx/Rx volume coil (FWHM 35 Hz w 3D shim)

Superior Location:	S/N = 103 now; 99 in last quarter with identical shim.
Iso-center Location:	S/N = 100 now; 102 in last quarter with identical shim.
Inferior Location:	S/N = 103 now 104 in last quarter with identical shim

Tx/Rx CP Head Single Ch (FWHM 25 Hz w 3D shim)

Superior Location:	S/N = 220
Iso-center Location:	S/N = 232
Inferior Location:	S/N = 238

Volume Coil QA Conclusion: 2020 Fall QA accuracy for TRIO system satisfies ACR guidelines, however there are two cases with suboptimal performance mainly due to RFPA. T/R coil SNR is approx. 2x BC while 12 and 32 ch are 2-2.5 times higher SNR than CP Head. Hence the system is functional and acceptable.

Comments on overall RF performance:

All the coils have suffered from some SNR loss, see above and there is some loss of image uniformity or slice thickness accuracy (noticed on Site T1 and DE SE T2). However, with one 3D shim cycling that are common in fMRI or MRS the system seems to come around these moderately well.

S.N. Sarkar 9/30/2020

_____ _____

Subhendra Sarkar, PhD, RT, CNMT, DABMP **Date**

_____ _____

Chun s. Zuo, PhD, DABMP **Date**

Appendix (Large Cylinder snr comparison: 4 volume coils) Date 9-19-2020 (3T Trio)
Summary SNR image data shown below.