Purpose: Parallel Imaging (PI) MRI protocols lead to image characteristics that differ from conventional MR images. An accurate and simple method for determining image intensity uniformity in PI is lacking. This study examines five methods of uniformity measurement with PI. Accurate uniformity metrics decrease with increasing R-value.

Methods: A phantom was used in a 12 channel head coil and 3T MRI with TR 1200ms, TE 76 ms, 5 slices, 5 mm thickness, 1 mm gap, FOV 220x220 mm, 256x256 matrix, ETL 16, BW 122 Hz/pixel, axially. Non-PI TSE sequence, PI method GRAPPA and PI method mSENSE with R: 2, 3 and 4 were inspected. Five uniformity measurement methods were investigated using equations involving: A) Minimum (Smin) and maximum signal pixels (Smax) calculated, PIUA B) Mean pixel value computed and each pixel grouped by: Group1=10% of mean, Group2=10%-20% of mean, Group3=more or less than 20% of mean. The number of pixels per group was used to compute: PIUB C) Same as A but Smax and Smin were 0.15% ROIs. D) This was the NAAD method E) The overall mean (S1) and the mean of 17, 7x7 square ROIs dispersed in the phantom were used. The average of each ROI was taken and PIUE was calculated. Two way ANOVA analysis evaluated reconstruction method and R-value.

Results: Methods D and E indicated increase in uniformity with R-value at R=3. Two-way ANOVA results indicated that uniformity measurements A-D were dependent on R-value. No uniformity method showed reconstruction method dependence.

Conclusions: Methods A and C are similar, A is more sensitive. Methods E and D are inaccurate. Method B gives accurate information but is not as sensitive as A. Method A should be used to obtain the most precise uniformity measurement with PI protocols.