

Evaluation of Quality Assurance Using Daily MR Quality Image – Can We Measure Planned Maintenance?

S. Haack¹

¹Department of Biomedical Engineering, Aarhus University Hospital, Aarhus N, Denmark

Purpose

For several years our technologists have begun the day by running a Daily Quality Image (DQI) protocol. We now wish retrospectively to evaluate our DQI procedure and its value. Furthermore we wish to compare the data retrieved from the DQI with the dates of planned maintenance performed by the manufacturer's service engineer.

Materials and Methods

DQI data from four 1.5 Tesla MR Scanners (1 Twinspeed, 2 Echospeed and 1 NV/i, GE Medical Systems, Milwaukee) were collected for one year. The four scanners are situated at three different hospitals. The DQI protocol was performed by placing a phantom in the headcoil and running a Spin-Echo sequence (TE = 10 ms, TR = 300 ms, NEX = 1, Matrix = 256 x 256 and FOV = 24 cm). The phantoms used were those delivered by the vendor. The scanner parameters (receiver and transmitter gain and resonance frequency) were outputs from an automatic prescan. The image parameters (mean intensity and standard deviation for signal and noise) were measured by placing a ROI in the center of the phantom and in the surrounding air.

Results

The data for SNR and frequency were divided into groups for each period between PM-service as shown in figure 1.

Pair wise ANOVA of the groups showed no significant difference in the means of the groups for either SNR or resonance frequency.

In table 2 the mean values for SNR and resonance frequency are shown. The maximum differences between the overall mean values and mean values for each period of time between PM services are calculated.

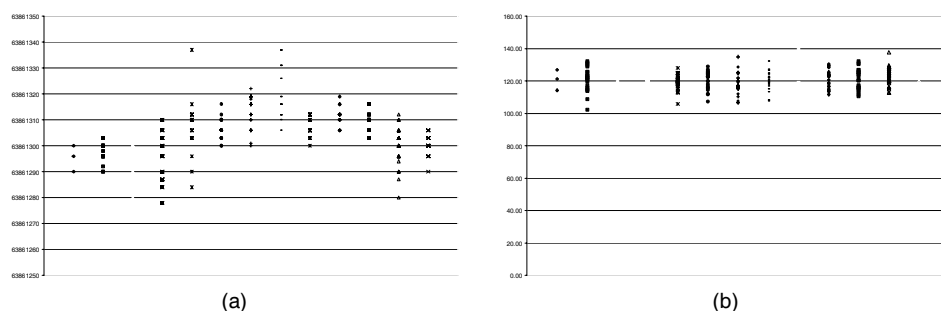


Figure 1: The resonance frequency (a) and the Signal-to-Noise (b) for one of the systems divided into groups between each PM Service.

	SNR Mean	Maximum SNR Mean Difference	Frequency Mean [Hz]	Maximum Frequency Mean Difference [Hz]
NV/I –GE Coil	216.61	2.00	63862627.79	6.44
NV/I - Medradcoil	305.35	42.79	63862416.37	47.63
Echospeed 1	171.32	6.27	63864171.04	18.62
Twinspeed	113.56	22.31	63855640.30	22.16
Echospeed 2	121.42	2.71	63861305.20	15.86

Table 1: Overall mean value for SNR and frequency for all systems. These are compared with the maximum differences between overall mean and the mean value for each period of time between PM services.

Conclusion

It is not possible to measure the result of Planned Maintenance using the data from this simple Daily Quality Image protocol. Even though variations in both SNR and frequency can be seen over time these are two small when comparing data from two groups close to each other. The protocol has its value in monitoring drift and deviations over time and it ensures the technologists that the system is up and running before the first examination of the day.