Purpose:
To study the feasibility of Singular Value Decomposition (SVD) method to quantify the MRSI data, and the effect of signal to noise ratio on SVD method was studied.

Methods:
In-house SVD program was developed with Matlab version 7.6 (Mathworks.com), in frequency domain water signal peak around 4.7ppm is used for referencing shifting. Hankel SVD method is used to compute the signal poles and from them the signal frequencies and damping factors. Known spectrum without noise was analyzed. Then introduce random noise, Gaussian filter of various frequency was used to reduce noise effect, wavelet threshold de-noise method was also tested with various hard and soft threshold selection methods.
Human breast MRSI data were analyzed with optimized parameters.

Results:
SVD can easily detect the small signal in low noise GSH data at 2.54ppm, GSH signal ratio to NAA is only 0.5%.
However SVD can not detect the signal after added random noise of SNR 15. By add Gaussian filter of 2.5Hz, peak could be detected by suppress noise, however if noise level is larger than the signal, fake peak could be resulted. For wavelet threshold method, hard threshold with wavelet principle of Stein's Unbiased Risk Estimate (SURE) can generate best results, random noise of SNR 7 can be reliably detected.
Typical patient data from breast tumor data was analyzed, even the detected cho peak is only 0.5% of water peak, it can be detected reliably, and the max residue error is 0.2% of water peak.

Conclusions:
SVD method can be used for human breast MRSI. the SVD method is sensitive to detect the signals as low as 0.5%. However it is suspected to noise, since it has no prior knowledge to reduce noise; improved SVD method with wavelet threshold de-noise can exploited in MRSI with SNR of 7.