Purpose:
To evaluate the difference in RF heating of deep brain stimulator (DBS) leads during MRI procedures using head-only transmitting coil versus whole-body transmitting coil.

Methods:
A DBS lead was inserted into the center of a 3-liter head phantom constructed and filled with gel prepared according the specifications in ATSM standard 2182. The portion of the lead outside of the head phantom was either coiled and fixed to phantom exterior (lead only), similar to that in DBS implanting surgery, or connected through an extension cable to an IPG, which is set to zero mA output and turned off (lead+Ext.+IPG).

Imaging was performed on a 1.5T MRI scanner using either a T/R head coil or the built-in T/R body coil. Two different scans: 3D MPRAGE (low SAR) and 3D TSE (high SAR) were performed. The temperature at the tip of the DBS lead was recorded every 10s using a fiber optical probe.

Results:
For lead only, the maximum temperature change (peak-to-peak) was less than 0.1 C with all scans or coils. For lead+Ext.+IPG, 0.4 C change was observed with T/R head coil and 0.95 C with T/R body coil for 3D MPRAGE (low SAR). However, 18.0 C and 35.3 C changes were observed, respectively, for 3D TSE (high SAR).

Conclusions:
If the DBS lead is NOT connected to the IPG, no substantial difference in RF heating between the use of a T/R head coil and body coil transmit was observed. The temperature changes were minimal even under high SAR. Such results suggests that DBS MRI may be performed safely with transmitting through body coil and receiving through phased array surface coils provided ONLY the lead is present which is often the case during intra-operative procedures. Since further study is needed, extreme caution is advised before extrapolating these results to patient exams.