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(Étudiant(e) du 1er cycle)

Type: **Poster Competition (Undergraduate Student) / Compétition affiches**

(U*) (POS-16) Constructing Rat-Head-Sized RF Coils for the Simultaneous ^{129}Xe MRI and ^{15}O PET Measurement

Tuesday 20 June 2023 17:30 (2 minutes)

Introduction

The use of laser-polarized Xenon-129 exponential (^{129}Xe) as a novel contrast agent for MRI has been shown to be effective for functional (1,2) and structural imaging the brain (3) and other organs(4). It was approved by the FDA in December 2022. ^{129}Xe -based imaging could transform our methods of mapping grey and white matter,(5) perfusion,(3) by improving sensitivity over other MRI methods and reaching beyond the resolution limitations of PET.

Methods

To develop this program, two birdcage radiofrequency (RF) coils for the use of simultaneous hyperpolarized ^{129}Xe MRI and ^{15}O PET imaging for brain perfusion measurements were developed. Birdcage RF coils have been widely used in MRI as their RF homogeneity and SNR exceed that of common linear RF coils.

Two coils were designed for optimal use with a Siemens 3T PET/MRI scanner, one using a low-pass-filter-design, and the other a high-pass-filter-design.

Both high-pass and low-pass coils were tuned to 34.05MHz (inside the PET-insert), with 8 rungs on each coil. The equivalent rung capacitance was calculated using Birdcage Builder software (Penn State, USA), with 242pF rung capacitance for the low-pass-coil and 1275pF rung capacitance for the high-pass-coil. The coil was built to 75mm in length, with a diameter of 45mm.

Results

The low-pass-circuit had a sensitivity of -19.8dB/-27.6dB. The high-pass-circuit had a sensitivity of -22.7dB/29.3dB. Initial phantom scans indicated that both coils have demonstrated good sensitivity, and therefore they can be used in the simultaneous in-vivo [^{15}O] PET and hyperpolarized ^{129}Xe MRI brain perfusion imaging measurement. To further optimize the sensitivity of both coils, in-vivo PET/MRI measurements will be used.

Discussion

We were able to build two rat-head-sized ^{129}Xe RF coils fitting into the animal-sized PET-insert resonating at the ^{129}Xe resonance frequency at the 3T MRI system. Initial phantom scans indicated that both coils have demonstrated good sensitivity, and therefore they can be used in the simultaneous in-vivo [^{15}O] PET and hyperpolarized ^{129}Xe MRI brain perfusion imaging measurement.

References

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Keyword-1

MRI

Keyword-2

Radiofrequency Coil

Keyword-3

PET

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