



Variability of accessories used in magnetic resonance imaging medical diagnostics and static magnetic field exposure of personnel near scanners

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Extended Abstract

The static magnetic field (SMF) emitted in order to get the magnetic resonance imaging (MRI) of the morphology of a patient's body has also an influence on everyone present in proximity to the medical diagnostic scanners because MRI superconducting magnets are active permanently (24 hours per day). Because workers (usually radiographers, nurses, technicians, radiologists, anesthetists, cleaners) entering the MRI diagnostic chamber are affected by the strong SMF, their exposure is the subject of evaluation with respect to various adverse safety and health outcomes (studied of SMF exposure for example in the context of vertigo or a loss of balance experienced by humans entering the tube of MRI magnet, sometimes strong enough to significantly disturb their work ability of the tasks or to cause fall down accidents, or in the context of health outcome from the chronic occupational exposure, for example functioning of cardiovascular system of exposed population) – motivated for example by the provisions of labour law transposing the European Directive 2013/35/EU which require protection of workers against adverse short term (immediate) effects of electromagnetic field exposure or testing various hypothesis formulated for the epidemiological studies on the long term health outcome of such exposure [WHO, 2006; SCENIHR 2015].

Previous studies showed significant variability in variety of parameters characterizing the static and dynamic influence of SMF on MRI personnel, analyzed in the context of the MRI scanner main field and workers body parameters.

This study is aiming at the systematic analysis of the parameters of MRI personnel exposure to SMF with respect to the variability of MRI accessories (such as replaceable or fixed diagnostic coils; ear protection/head phones; hear, neck or limbs stabilizers; respiratory monitors), used in order to make relevant diagnostic or to improve a comfort of patient, and varied between scanners of different design and the health status of patients. The study was based on the exposimetric measurements during regular work activities, regarding the SMF affecting personnel equipped with the pocket-size data logger with SMF-sensitive Hall probe (THM-1176 data logger, Metrolab Technology SA, Geneva, Switzerland; measurement range of 0.1mT-20T; 6-25 Hz sampling rate). This study has been worked out within obligatory control of electromagnetic field exposure in the work environment required by labour law). The results of measurements were characterized by the statistical parameters of recorded sets of SMF samples over the time of work near MRI scanner and duration of that exposure, and analyzed by the statistical tests to found significantly different exposure cases.

It was found that the use of various sets of MRI accessories (for examinations of particular health problems of patients), which may be the result of organization of work in the MRI diagnostic center or the technical parameters of the scanner, has the most significant influence on the duration of SMF exposure of personnel. Strong SMF exposure of MRI personnel is allowed only temporarily over the shift (based on the provisions of Directive 2013/35/EU). Taking also into account that longer SMF exposure of MRI personnel may be correlated with the vertigo hazards experienced by them, as well as with their health hazards from the long term SMF exposure, as well as it may reduce daily time of the scanner availability for performing the patients diagnostics – the practical outcome of presented studies is important for better understanding how to organize optimal daily work of MRI diagnostic centers to reduce health and safety impact from SMF emitted by scanners and may also improve categorization of SMF exposure levels of MRI personnel participating in epidemiological studies.

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