



Medtronic

Standard Letter
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RADIO FREQUENCY TRANSMISSION Rev A. Page 1 of 2

PACEMAKER (IPG – IMPLANTABLE PULSE GENERATOR)

DEFIBRILLATOR (ICD – IMPLANTABLE CARDIOVERTER DEFIBRILLATOR)

This document addresses radios that transmit only or radios that transmit and receive (e.g. Ham Radio, Citizens Band, or Cellular Phone). Radios that receive only are not of concern.

Medtronic implanted devices have a highly selective filter designed to avoid sensing of EMF (electromagnetic fields). Some types of EMF can exceed the capability of this filter to reject it. This may cause a pacemaker to erroneously detect the EMF and either continuously pace or inhibit pacing. It may cause an ICD to erroneously detect the EMF as a rapid heart rate and deliver a therapy.

Guidelines for safe operation of radio equipment encompass such factors as transmission frequency, type of modulation, and the power being emitted from the antenna. These factors require the ICD/pacemaker wearer to maintain a certain distance from the antenna to avoid having a voltage induced on the leads. A high frequency, high power, continuous wave will not cause the ICD or pacemaker to falsely sense, but an amplitude or pulse modulated signal could cause inappropriate sensing at moderate output power. EMF from radio waves will not alter the ICD's or pacemaker's programmed parameters in any way.

Any time a cellular phone is on (i.e., listen or standby mode), it **MAY TRANSMIT WITHOUT USER INITIATED ACTION** because of system-initiated instructions. Talk into the hand-held phone with the phone against the ear opposite the side of an upper thorax implant. Do not carry the cellular phone in pockets or on a belt adjacent to or over the implant site. It is especially important that a phone with power turned **ON** (listen mode), not be carried in locations close to the implant site. A carrying location at the side of the body opposite an abdominal implant is recommended.

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The following guidelines are suggestions for safe use of radio equipment:

Power in Watts	Minimum Distance of device from Antenna	Example(s)
3 watts or less	6 inches (15 cm)	Cellular Telephone, Cordless Telephone, Cordless Microphone, home wireless electronics
>3 – 15	12 inches (30 cm)	Citizens Band, Long Range Cordless Telephone, Invisible Fences, Walkie-Talkies
>15 – 30	24 inches (60 cm)	Marine band radios, GPS survey equipment, some jobsite radios
>30 – 50	3 feet (1 meter)	Commercial and government dispatch, e.g. taxis, emergency vehicles
>50 – 125	6 feet (2 meters)	
>125 – 250	9 feet (3 meters)	Commercial broadcasting towers, Ham Radio
>250 – 500	12 feet (4 meters)	
>500 – 1000	20 feet (6 meters)	
>1000 – 2000	30 feet (9 meters)	
>2000	No exposures >100V/meter	High power broadcast towers

If the antenna transmits in a very directional pattern, it may be necessary for the patient to be further away from the antenna at the strongest part of the pattern. There is no concern when operating the transmitter/receiver when the cabinet shielding and coaxial cables are properly connected.

Radio frequency wireless communication technology such as Bluetooth for TV's, radios, computers, and other electronic devices should use the recommendations above. Radio frequency waves are used to communicate with or control remote electronic devices. Maintain a minimum 6 inch (15cm) distance between the transmitter/receiver and the implanted device. If the transmitter/receiver is closer than 6 inches (15 cm), there is a potential for inappropriate pacing, inhibition, triggering, reversion or ICD shock.