field SENSE
Personal RF Monitor

AN INTRODUCTION TO RF SAFETY AROUND TRANSMITTING ANTENNAS

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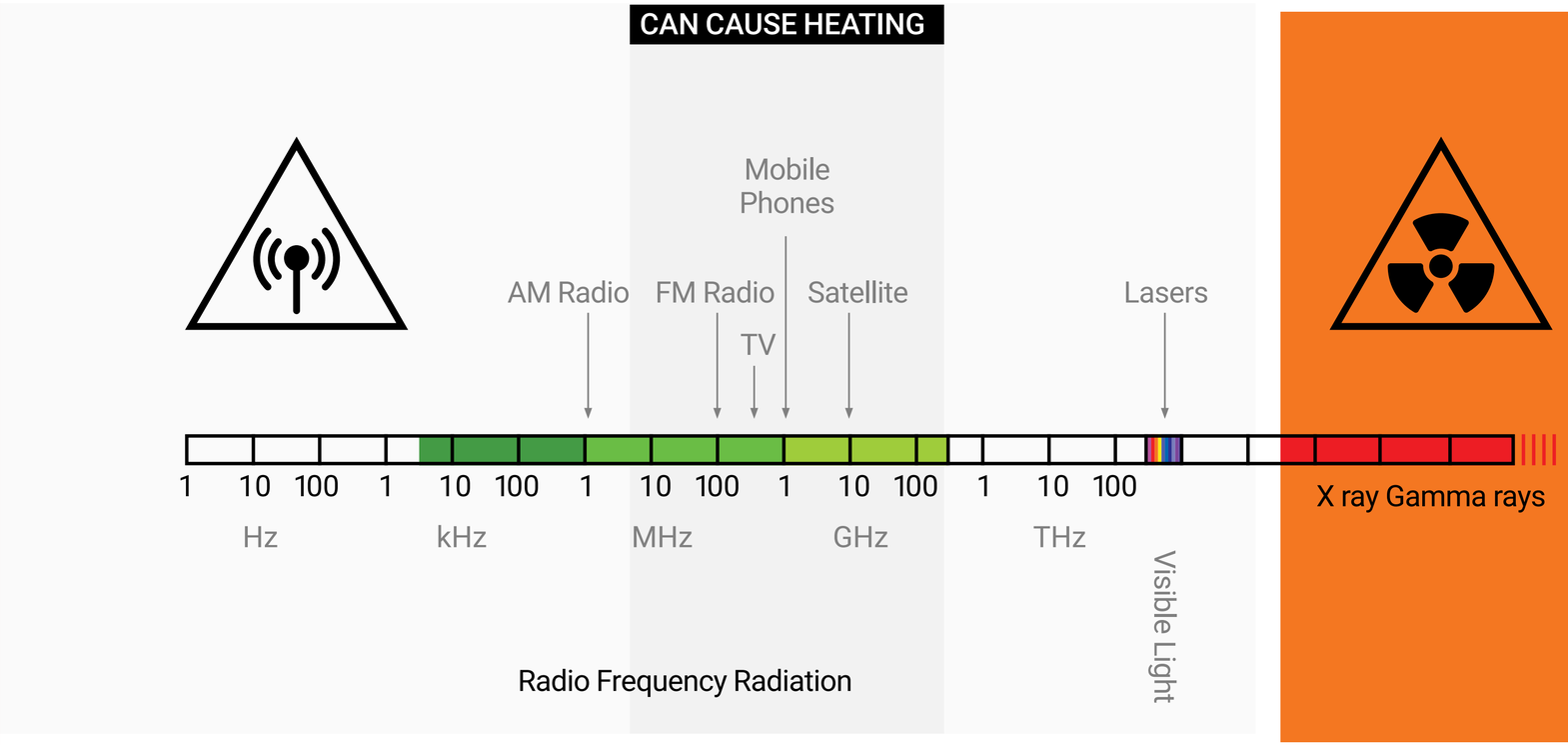
What is RF?

- Electromagnetic fields (EMF) are both naturally and man-made occurring forms of radiation (energy emissions), including visible light – the earth, sun and ionosphere are all natural sources of EMF.
- Radio frequency (RF) is the section of the electromagnetic (EM) spectrum used for telecommunications, such as TV, radio and cell phones.
- RF is non-ionising radiation – meaning it has insufficient energy to cause molecular damage.

The Electromagnetic (EM) Spectrum

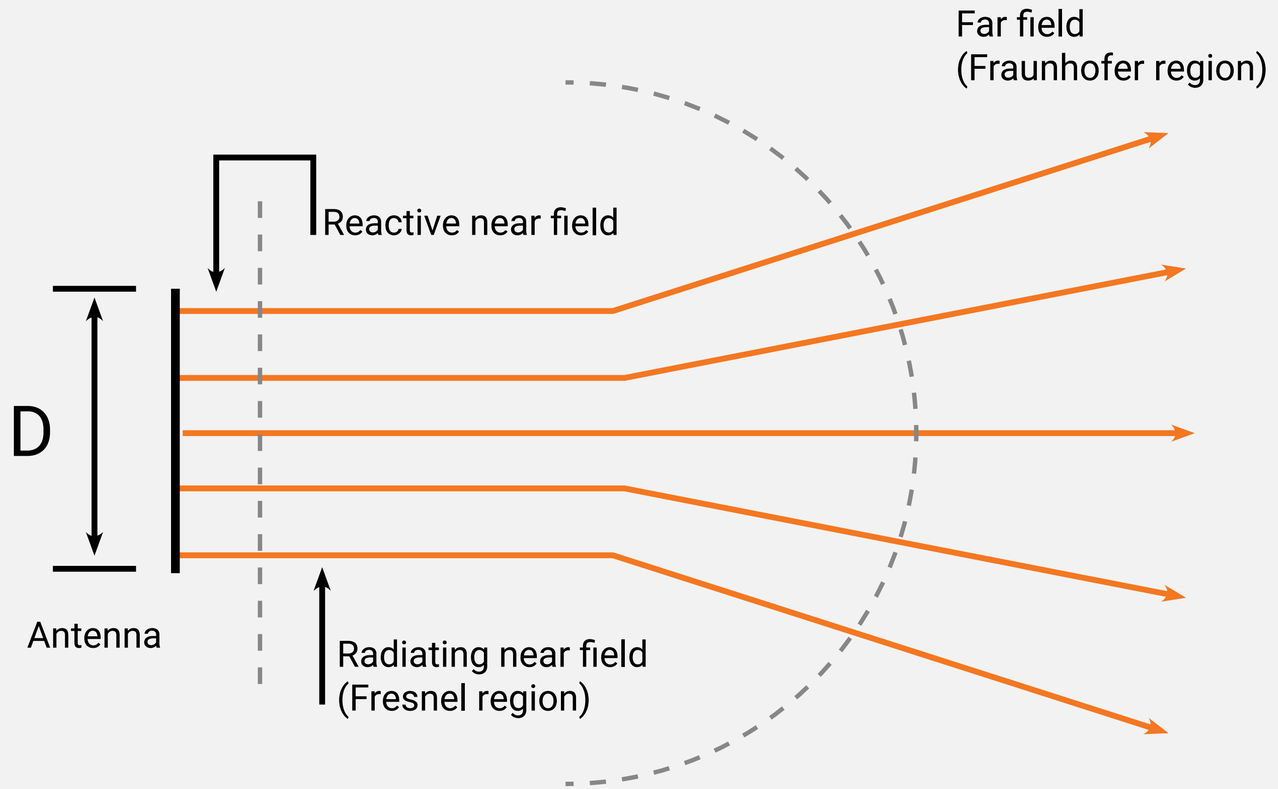


Why limit exposure?

- RF exposure at sufficiently high-power densities will cause heating of the human body.
- Excessive heating can overload the body's thermal regulating abilities, leading to overheating, dehydration and ultimately heatstroke, which is very dangerous to the worker.
- RF exposure is a recognised hazard and legislation requires limiting exposure to high levels thereof.
- Globally established exposure guidelines are defined by the likes of:
  - EU Directive 2013/35/EU – Europe
  - ICNIRP – Global
  - FCC – USA
  - Safety Code 6 – Canada
  - ARPANSA – Australia

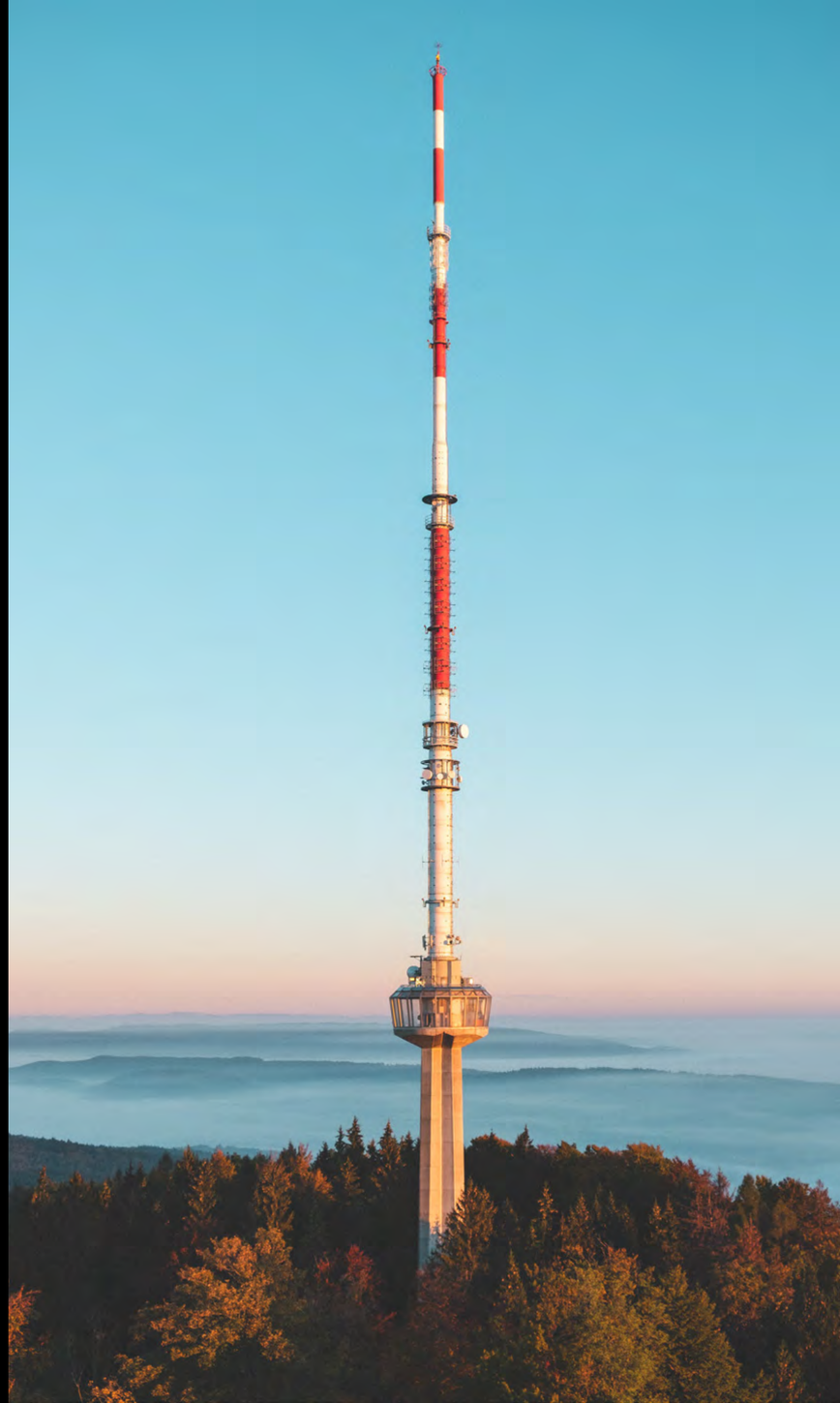
What are the limits?

- When the human body is exposed to RF fields, the absorption thereof is determined by the frequency of the RF.
- This is why exposure guidelines have a shaped response over frequency.
- RF radiation is comprised of Electric (E) and Magnetic (H) fields, which is why the exposure guidelines require compliance to both of these.
- This becomes more important when working in close proximity to transmitting antennas – known as the near-field.



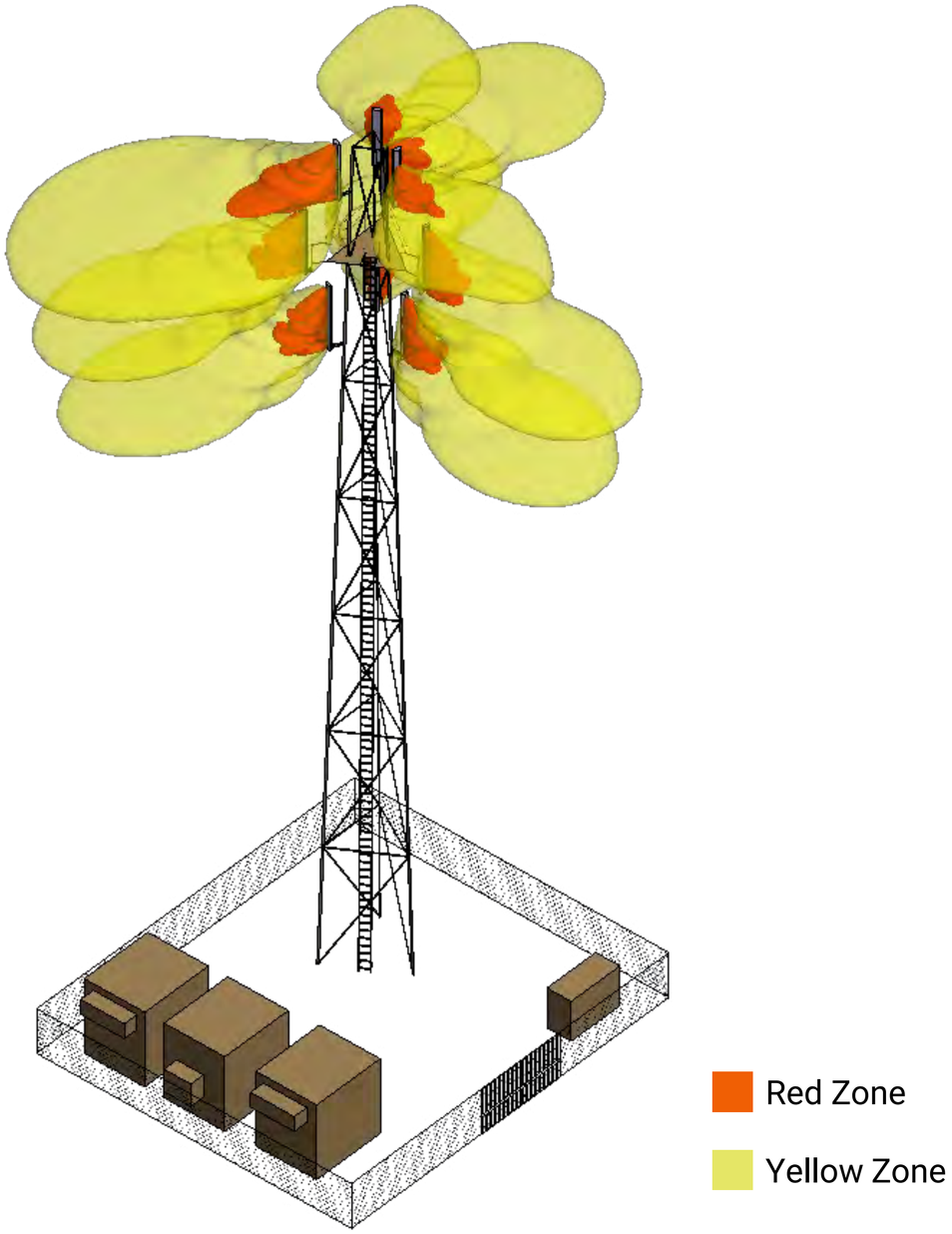
Where are limits likely to be exceeded?

- The intensity of RF is highest nearest to the source and drops off rapidly with distance.
- In telecommunications systems antennas are used to transmit and receive RF, with the highest intensity being closest to a transmitting antenna.
- This combined with the actual amount of power transmitted by the antenna will determine if there is an area about the transmitting antenna exceeding the safety limits.
- The area around an antenna exceeding the worker limits is referred to as the red zone.
- Public exposure limits are more conservative, the area around an antenna which exceeds these is larger than the red zone and is depicted as the yellow zone.

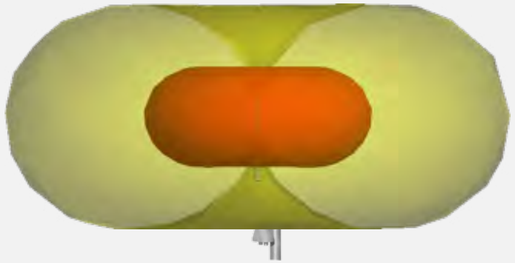


Understanding exclusion zones

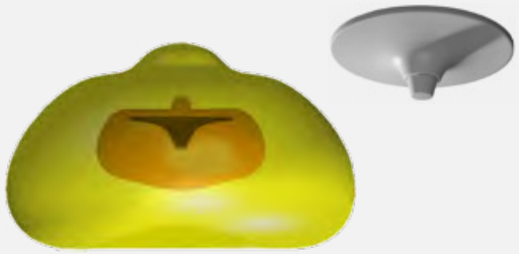
- A zone is a isosurface about an antenna with a specified power intensity.
- The red zone represents the RF worker exposure limits and the Yellow Zone represents the general public exposure limits.
- The type of antenna determines the zone shape (where the power is going).
- The power into the antenna determines the zone sizes.
- Multiple co-located antennas create “compound zones”.



Common antenna types and their zones

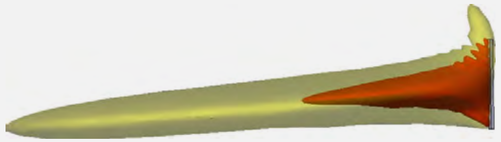


Typical multiband low gain omnidirectional antenna

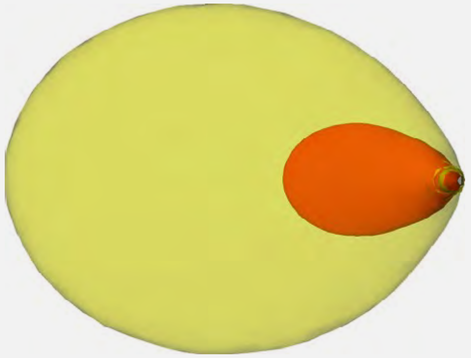


Typical ceiling-mounted indoor antenna

Typical macro cell sector antenna under full traffic



Side view



Top view

IXUS

* Exclusion zones created in Ixus EME Compliance Management Suite

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Safe working around transmitting antennas

- It is the employer’s responsibility to ensure that workers are not exposed to levels of RF exceeding the limits.
  - Occupational limits for RF trained workers (red zone)
  - Public limits for general workers and public (yellow zone)
- At sites with antennas there is no visible way of knowing what the power levels are so a Personal RF Monitor is required to know what the accumulated level of exposure is.
- The only reliable way to know the exposure conditions around transmitting antennas is to measure the levels referenced to the safety limits in percentage exposure using a Personal RF Monitor which measures both the E and the H field, having a shaped response.
- Measuring the exposure conditions allows any worker to quickly quantify and move away from the risk area to a safe area.

5 factors you need to consider when choosing a personal RF monitor

Personal RF safety monitors form part of the protective equipment worn on the body of the person working in areas exposed to radio spectrum radiation. The RF personal monitor is designed to warn of excessive RF exposure when working on, for example, industrial equipment, broadcasting towers, radar installations and other sources of electromagnetic radiation.

Here are some key factors you should keep in mind when choosing a personal RF monitor.

Measuring in accordance with international guidelines requires:

- Shaped response to account for the human body's susceptibility for RF absorption
- Both Electric (E) and Magnetic (H) field probes for accurate farfield and near field assessment
- Isotropic probe architecture for sources of radiation from multiple directions and polarizations
- On-body and handheld operation
- A broad-range exposure indicator in percentage of cumulative exposure

Additional requirements and benefits to look for:

- Ease of use.
- Clip on and off harness attachment with fall prevention coiled lanyard system
- Data logging and voice notes
- Rugged enclosure for all-weather working conditions
- Anti-drop tethering solutions with fall detection emergency alarm system
- 5-star reputation and global user-base
- Straight forward warranty and cost-effective refurbishment program

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