# METHOD OF MEASURING SPECIFIC ABSORPTANCE AT HUMAN HEAD

(Article 14.2 paragraph 2 of the Ordinance Regulating Radio Equipment)

October 10, 2001

Ministry of Public Management, Home Affairs, Posts and Telecommunications Announcement No. 628

The method of measuring the specific absorptance at the human head shall be stipulated pursuant to the provisions of Article 14.2 paragraph 2 of the Ordinance Regulating Radio Equipment (the Radio Regulatory Commission Regulations No. 18 of 1950), as follows, and shall come into force as of June 1, 2002.

1   The meaning of the terminology used in this Announcement shall be as follows.
  1)   "Phantom shell" stands for a shell like a container resembling the shape of a human body.
  2)   "RE" stands for the point corresponding to the position of the right ear on the surface of the phantom shell.
  3)   "LE" stands for the point corresponding to the position of the left ear on the surface of the phantom shell.
  4)   "M" stands for the point corresponding to the position of the mouth on the surface of the phantom shell.
  5)   "Reference plane of the phantom shell" stands for the plane that consists of RE, LE and M.
  6)   "Vertical central line of the radio equipment to be measured" stands for the straight line that combines the central point of the receiver of the radio equipment to be measured and the central point of the transmitter of the said radio equipment.
  7)   "Horizontal line of the radio equipment to be measured" stands for the tangent line at the central point of the receiver of the radio equipment to be measured which is orthogonal to the vertical central line of the radio equipment to be measured.
  8)   "Phantom liquid medicine" stands for a liquid medicine filled up in the phantom shell.
  9)   "Electric-field probe" stands for the equipment that measures the electric-field strength in the phantom liquid medicine with isotropy and high resolution.
  10)   "Probe scanning equipment" stands for the equipment that moves an electric-field probe three-dimensionally in the phantom shell.
  11)   "Retainer" stands for the jig for fixing the radio equipment to be measured.

2   The measurement of specific absorptance shall be conducted under the circumstances that comply with the following conditions.

    1)   The ambient temperature shall be within a range of 15　　to 30　　.

    2)   There shall be no influence from ambient electric-field sources.


3   The phantom shell, phantom liquid medicine, electric-field probe, probe scanning equipment, and retainer shall comply with the following conditions.

  1)   Phantom shell

    (1)   The shape and size of the phantom shell shall be those based on the data provided by the Minister of Public Management, Home Affairs, Posts and Telecommunications.

    (2)   A mark shall be indicated on the surface of the phantom shell so that reference points for positioning, RE, LE, and M can be clearly seen.

    (3)   The inductive tangent of the shell materials shall be 0.05 or less. The real part of the specific inductive capacity of the shell materials shall be 5 or less.

  2)   Phantom liquid medicine

    The electric characteristics of the phantom liquid medicine shall comply with those shown in the table below.

  3)   Electric-field probe

    (1)   The detection range shall be 0.02 W/kg or less in terms of the minimum detection value of the specific absorptance that is calculated from the measured value of the electric field using an amplifier and a computer, and shall be 100 W/kg or more (when a pulse signal is inputted) in terms of the maximum detection value.

    (2)   The linearity shall be within a range of ±0.5 dB against a detection range of 1.

    (3)   The isotropy shall be within a range of ±1 dB.

    (4)   The length of each small dipole element in the sensor shall be 5 mm or shorter.

    (5)   When specific absorptance is measured using a pulse signal wave, the measured value shall be reproduced with the accuracy within a range of ±5%.

  4)   Probe scanning equipment

    (1)   The accuracy of the positioning of the probe tip against the measurement range shall be within a range of ±0.2 mm for each scanning position.

    (2)   The resolution for positioning shall be 1 mm or less.

    (3)   It shall be possible to align the reference point of probe scanning equipment with the reference point in the phantom shell with the accuracy within a range of ±0.2 mm.

  5)   Retainer

    (1)   The accuracy of tilting angles shall be within a range of ±1 degree.

(2) The inductive tangent of the retainer materials shall be 0.05 or less. The real part of the specific inductive capacity of the retainer materials shall be 5 or less.

4  Setting of measuring equipment, etc.
  1) Phantom shell and phantom liquid medicine
    (1) The phantom shell shall be divided into two pieces symmetrically, and they shall be set so that RE or LE may be the bottom. The phantom liquid medicine shall be filled in the phantom shell up to the depth of 15 cm or more around RE and LE. At that time, caution shall be taken so that no bubbles are produced.
    (2) The electric characteristics of the phantom liquid medicine shall be measured before specific absorptance is measured, and it shall be confirmed that its value is within a range of ±5% of the value prescribed in the Table below.
  2) Radio equipment to be measured
    (1) An internal transmitter shall be used as transmitting equipment.
    (2) The antenna, battery, and ancillaries that are designated by the manufacturer of the radio equipment to be measured shall be used.
    (3) The battery shall be completely charged before specific absorptance is measured, and it shall not be connected with any external power source.
    (4) The frequency and antenna power shall be controlled using an internal test program or an appropriate testing instrument.
    (5) The antenna power shall be set to the maximum output when it is used near the human head. A dummy base band signal shall be used as a transmitting signal, and the transmitting signal shall be continuously transmitted in accordance with the signal form of the communication method used for the radio equipment to be measured.
    (6) When a base station simulator is used, the antenna of the base station simulator shall be placed 50 cm or further away from the radio equipment to be measured. The input power at the feeding point of the antenna of the base station simulator shall be –30 dB or less as compared with the antenna power of the radio equipment to be measured.

5  Measurement of specific absorptance
  1) Measuring position
    The radio equipment to be measured shall be measured for both right and left sides of the phantom shell at the positions prescribed in (1) and (2) below.
    (1) Position that touches the cheek
      The position that keeps a vertical central line of the radio equipment to be measured in the reference plane of the phantom shell, that makes the plane including the vertical central line

and horizontal line of the radio equipment to be measured orthogonal to the reference plane of the phantom shell, and at which the central point of the receiver of the radio equipment to be measured touches the ear of the phantom shell and any point of the front side of the radio equipment to be measured touches the cheek of the phantom shell in the state where the central point of the receiver crosses the straight line that connects RE with LE. However, the central point of the receiver shall be positioned as close to the ear of the phantom shell as possible.

When the radio equipment to be measured does not touch the ear or cheek of the phantom shell, any point of the front side of the radio equipment to be measured shall be positioned closest to the cheek of the phantom shell in the state where the central point of the receiver of the radio equipment to be measured is in contact with the ear of the phantom shell.

(2) Tilted position

The position that keeps a vertical central line of the radio equipment to be measured in the reference plane of the phantom shell, and that turns the radio equipment to be measured 15 degrees in the direction in which the central point of the transmitter goes away from the cheek of the phantom shell on the basis of the central point of the receiver of the radio equipment to be measured from the position prescribed in (1) above in the state where the central point of the receiver crosses the straight line that connects RE with LE. However, the central point of the receiver shall be positioned as close to the ear of the phantom shell as possible.

When the radio equipment to be measured does not touch the ear of the phantom shell, the central point of the transmitter of the radio equipment to be measured shall be positioned furthest away from the cheek of the phantom shell before the radio equipment to be measured turns 15 degrees in the state where the central point of the receiver of the radio equipment to be measured    is in contact with the ear of the phantom shell.

2) The radio equipment to be measured shall be fixed at the positions prescribed in (1) and (2) of 1) above on both sides of the phantom shell, and specific absorptance shall be measured using the frequency around the center of each transmission band of the radio equipment to be measured.

3) Specific absorptance shall be measured for the position at which the maximum value out of the values obtained in 2) above has been obtained using the maximum and minimum frequencies in the transmission band of the radio equipment to be measured.

4) When the radio equipment to be measured has an antenna that can be housed therein, the measurement of 2) and 3) above shall be carried out in the state where the antenna is both extended and housed.

5) The maximum value out of the values obtained in 2) through 4) above shall be made the value of specific absorptance of the radio equipment to be measured.

Table    Electric characteristics of phantom liquid medicine

| Frequency (MHz) | Real part of specific inductive capacity | Conductivity (S/m) |
|---|---|---|
| 300 | 45.3 | 0.87 |
| 450 | 43.5 | 0.87 |
| 835 | 41.5 | 0.90 |
| 900 | 41.5 | 0.97 |
| 1,450 | 40.5 | 1.20 |
| 1,800 | 40.0 | 1.40 |
| 1,900 | 40.0 | 1.40 |
| 2,000 | 40.0 | 1.40 |

Note:    The values between the values listed above shall be obtained by linear interpolation.