141. Production of Extra Short Electromagnetic Waves by Split-Anode Magnetron.

BY Kinjiro OKABE.

Tohoku Imperial University, Sendai.


In a previous communication (Proc. Imp. Acad. April, 1927) the author gave an account of a new method of producing undamped electromagnetic wave of a wave-length from twenty to thirty centimetres by means of a "magnetron." Stronger oscillations are now obtained in consequence of the following modifications.

The anode, which was originally a circular cylinder of sheet metal, is now split into two or more segments by narrow slits cut parallel to the axis of the cylinder. There are accordingly two or more anode leads, instead of one, all led out through the tube wall. These wires are brought together and made to approach the cathode lead at a certain point like B in the figure, and then connected together to the positive terminal of the high tension anode battery.

The separate anode lead and the anode segment seem to form a resonant antenna, the natural frequency of which can be altered by varying the length of the lead between the part B and the anode segment. When, at the point B, the distance between the anode leads
and the cathode lead is properly adjusted, a sort of tuning seems to occur, and the maximum oscillation thus obtained is generally several times stronger than ever. The change of the wave length due to the change of the anode voltage is inappreciably small.

In either case of the original incut-anode magnetron or the new sprit-anode magnetron, the essential factors for the production of the extra short waves are:

1. A high anode voltage,
2. a magnetic field stronger than the critical field of the magnetron, and
3. a high vacuum.

A fundamental oscillation of 12 cms. wave length could be obtained by the use of a small magnetron. A harmonic oscillation of 8 cms. was produced in one case with abnormally high magnetic field.

A typical case of a very intense oscillation at nearly 42 cms. is given below:

Dia. of anode = 1.4 cm.
Dia of cathode = 0.014 cm.
Length of anode = 2.6 cms.
Length of cathode = 3 cms.

<table>
<thead>
<tr>
<th>Anode Voltage</th>
<th>Wave length (cm.)</th>
<th>Intensity (arbitrary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>951</td>
<td>34.5</td>
<td>5.3</td>
</tr>
<tr>
<td>724</td>
<td>41.5</td>
<td>15.5</td>
</tr>
<tr>
<td>670</td>
<td>42</td>
<td>16</td>
</tr>
<tr>
<td>500</td>
<td>42.5</td>
<td>6.7</td>
</tr>
<tr>
<td>400</td>
<td>42.5</td>
<td>4</td>
</tr>
<tr>
<td>320</td>
<td>42.5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

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