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<th><strong>Title</strong></th>
<th>A Low-Frequency Selective Amplifier</th>
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<tr>
<td><strong>Author(s)</strong></td>
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<tr>
<td><strong>Citation</strong></td>
<td>Bulletin of the Institute for Chemical Research, Kyoto University (1962), 40(3): 188-190</td>
</tr>
<tr>
<td><strong>Issue Date</strong></td>
<td>1962-07-20</td>
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<tr>
<td><strong>URL</strong></td>
<td><a href="http://hdl.handle.net/2433/75891">http://hdl.handle.net/2433/75891</a></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Departmental Bulletin Paper</td>
</tr>
<tr>
<td><strong>Textversion</strong></td>
<td>publisher</td>
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Kyoto University
A number of frequency-selective amplifiers at low frequencies have been
developed for various purposes1). In connection with dielectric measurements a
simple selective amplifier was built for null detection in bridge measurements
and for standing wave measurements at microwave frequencies. The amplifier
described here is featured with linear high amplification and high selectivity of
frequency. The circuit diagram of the amplifier including an indicator is shown
in Fig. 1. For obtaining a frequency-selective characteristic a twin T network
was used in the feedback loop of the amplifier stage of V-3, a 6AU6 tube, where
a cathode follower was employed to meet a no-load condition on the selective
network. The null frequency varied continuously form 30 cps to 3 kc with the
indicated values of components of the network in which non-linear variable resis-
tors such as antenns bias type were used for VR2 and VR3. Since the selectivity
of frequency is proportional to the amplification of V-3, the selectivity or the Q
value of circuit as well as the amplifier gain depends on the grid-bias potential of
V-3 that is fed from the 50 kilohm potentiometer VR1. A Q value of 30 or more
was obtained with a proper setting of VR1. A typical rejection curve is shown
in Fig. 2. The total gain of the amplifier was about 120 db at the maximum
gain setting and 20 microvolt input was sufficient to give full deflection on the
indicator. The hum or noise level was minimized by dc heating of V-1 to V-4,
being less than 0.2 microvolts at full gain in terms of the input level. The twin
T network encased in a shielding can was made a plug-in replacement type.
When it was replaced with a 500 kilohm grid-leak resistor (Fig. 1), the amplifier
showed a wide-band operation in a frequency range of 30 cps to 100 kc within
6 db of the amplitude characteristic.

The indicator circuit was straightforward which consisted of a rectifier V-6
and a tube voltmeter of the cathode follower type V-7. The indicator of a 0-1
ma meter showed rapid response with minimum overshoot. A voltage output of
about 25 volts on the stage of V-5 was enough to give full deflection of the
indicator. The voltmeter tube 12AU7 should be selected to obtain the minimum
zero drift of the indicator.

Revision for wider band operation is now in progress.

REFERENCE

(1) E.g. G. E. Valley, Jr. and H. Wallman, "Vacuum Tube Amplifier" (McGraw-Hill
Fig. 1. Circuit diagram of selective amplifier.
Fig. 2. Typical rejection curve at 1 kc.