

Frequency-checking equipment in Amateur Station - P.O. requirements

The Post Office receives many enquiries seeking amplification of the clause in Amateur licences which requires a licensee to have in his station "Equipment for frequency measurement - - - capable of verifying that the sending apparatus comprised in the station is operating with omissions within the authorized bands." Although the Post Office must continue to assess the suitability of the frequency-measuring equipment offered by individuals in licence applications, the following notes may be helpful as a guide to P.O. requirements.

1. A licensee is required:-

- (a) to be able to verify that his transmissions are within the authorized frequency band, (i.e. that no appreciable energy is radiated outside the band.)
- (b) to use a satisfactory method of frequency control.
- (c) to ensure that his transmissions do not contain unwanted frequencies (i.e. harmonics and spurious frequencies.)

2. When his station is inspected by P.O. staff, the licensee will be expected to demonstrate that he can conform with the requirements (a) to (c) above.

3. The P.O. considers that, as a general rule, a station requires a crystal reference source to comply with 1 (a) and (b) above so that:-

- (a) with a crystal-controlled transmitter an absorption device of suitable frequency range and accuracy is necessary to check that the desired harmonic of the crystal frequency is selected.
- (b) with a transmitter that is not crystal-controlled a wavemeter based on a crystal oscillator is necessary.

Within these outline requirements the licensee is free to decide how he will meet the licence regulations. The Post Office cannot of course, endorse or recommend particular makes or types of equipment, and assesses the suitability of what the licensee proposes to use from the details he gives in his licence application.

4. The following comments may provide useful guidance:

- (a) Frequency measuring equipment should be of sufficient accuracy to verify that emissions are within the authorized frequency bands. For example, operation in the centre of the 21.0 - 21.45 Mc/s band would require frequency measurement to an accuracy of $\pm 1.0\%$ to ensure that emissions were within band, whereas operation within, say, 10 kc/s of band edge would require measurement to an accuracy of $\pm 0.05\%$. When determining the proximity of an emission to band-edge, the bandspread due to modulation, on the appropriate side of the carrier, needs to be added to the frequency tolerance of the carrier.
- (b) Heterodyne wavemeters and crystal calibrators. When used in conjunction with a general coverage receiver, a 100 kc/s crystal is usually adequate for checking frequencies up to 4 Mc/s. For higher frequencies the spacing between 100 kc/s marker points is too small for accuracy, and a crystal of 500 kc/s, or preferably 1 Mc/s, should be used in addition. If the receiver covers only the Amateur frequency bands the bandspread scale will usually allow a 100 kc/s crystal to be used with sufficient accuracy throughout the h.f. bands.
- (c) Absorption wavemeters and similar devices. The scale length and accuracy should be suitable for measurements of the required accuracy to be made, and the frequency coverage should extend up to the second,

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and preferably the third, harmonic of the radiated frequency so that the presence of unwanted frequencies may be detected. For v.h.f and u.h.f transmitters, probably the best technique is to measure the frequency of the fundamental oscillator as accurately as possible and to use an absorption device to confirm that the wanted harmonic has been selected. When a v.h.f or u.h.f converter is used in conjunction with an h.f receiver and the calibration of the main receiver can be checked with sufficient accuracy, this will provide a means of frequency measurement but it is also advisable to use an absorption wavemeter to check the measurement and to confirm that no unwanted radiations are present.