RECOMMENDATION ITU-R M.1084-1

IMPROVED EFFICIENCY IN THE USE OF THE BAND 156-174 MHz BY STATIONS IN THE MARITIME MOBILE SERVICE

(Question ITU-R 96/8)

(1994-1995)

Summary

This Recommendation provides for an interim measure to give immediate relief to administrations having urgent needs to resolve congestion. It cautions administrations to avoid distress and safety channels and other channels which may affect the safety of international shipping. The Recommendation also recognizes the need to continue studies leading toward a permanent solution to improving the efficiency using the band 156-174 MHz.

Annex 1 illustrates how administrations could migrate, in the future, from existing 25 kHz spaced channels to 5 or 6.25 kHz spaced channels in the maritime-mobile service band 156-174 MHz.

It also considers migration from 12.5 kHz spaced channels to cater for those administrations who may have introduced that channel spacing as an interim measure.

The ITU Radiocommunication Assembly,

considering

a) that Recommendation No. 318 of the World Administrative Radio Conference (Geneva, 1987) (WARC-87) seeks the most appropriate means to improve efficiency in the use of the Radio Regulations (RR) Appendix S18 [Appendix 18] VHF frequency spectrum for maritime mobile communications;

b) that any new equipments need to be compatible or able to coexist with existing equipments conforming to Recommendation ITU-R M.489 already in widespread use;

c) that the greatest long-term benefits in spectrum efficiency will be gained by using the latest narrow-band transmission techniques;

d) that the introduction of new technology should not interrupt the continuous availability of RR Appendix S18 [Appendix 18] maritime mobile distress and safety communications in the VHF bands for all users;

e) that congestion in the VHF maritime mobile band has become a serious problem in some parts of the world and is continuing to grow;

f) that because of this need administrations may decide to take extreme means to solve their congestion problem;

g) that because of the extensive studies and deliberations involved, it is not expected that the Radiocommunication Sector can respond conclusively to Recommendation No. 318 before 1995,

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Note by the Secretariat: The references made to the Radio Regulations (RR) in this Recommendation refer to the RR as revised by the World Radiocommunication Conference 1995. These elements of the RR will come into force on 1 June 1998. Where applicable, the equivalent references in the current RR are also provided in square brackets.

recommends

1 that, for administrations having an urgent need to resolve congestion, changing to 12.5 kHz analogue FM as an interim expedient would be a simple approach to improving spectrum utilization but could have an impact on current operations, especially where it involved international shipping using 25 kHz channel spacing;

2 that administrations, when employing 12.5 kHz analogue FM channels as an interim measure, should avoid distress and safety channels and channels affecting the safety of international shipping;

3 that the interim arrangements referred to in *recommends* 1 should not prejudice the longer term solution resulting from the ongoing studies which may result in channelling of a narrower bandwidth than 12.5 kHz and the use of advanced technologies. Annex 1 illustrates how administrations may, after appropriate decisions by a competent WRC, migrate, if necessary, to the use of narrow-band channels.

ANNEX 1

Migration to narrow-band channels in the maritime mobile service

1 Introduction

This Annex considers how in future the maritime mobile service might migrate to narrow-band channels spaced at 5 kHz or 6.25 kHz apart, using linear or digital modulation. Consideration is given to migration from 25 kHz channel spacing as used at present, and from 12.5 kHz if the latter was to be implemented as an interim measure by some administrations.

2 Implications of migration to narrow-band channels

2.1 Migration

The most practicable and least disruptive method of migrating from 25 kHz or 12.5 kHz to 5 kHz or 6.25 kHz would be by interleaving the narrow-band channels with the wider ones and a similar technique can be used in all cases. However because the linear and digital modulation techniques using 5 kHz and/or 6.25 kHz are incompatible with current FM equipment, dual mode or additional equipment would be required during the change-over period.

2.2 Interleaving

2.2.1 Interleaving with 25 kHz channels

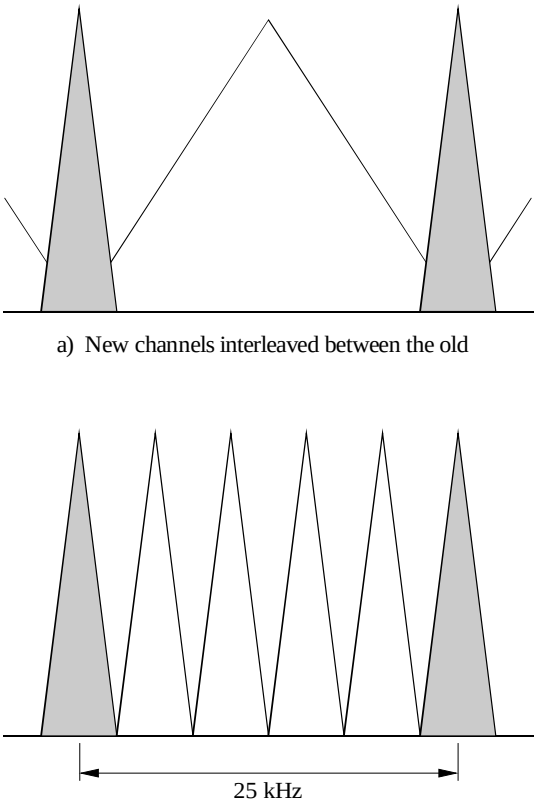
Figures 1 and 2 illustrate how 5 kHz and 6.25 kHz channels could be interleaved with the existing 25 kHz ones. During the change-over period, coast stations and ships would be required to equip with narrow-band equipment and move to the new narrow-band channels as they became available. The numbers of new narrow-band channels would be gradually increased during the transition period with the number of 25 kHz channels available correspondingly decreasing.

On a specified date all remaining 25 kHz channels would be withdrawn to be replaced by new ones.

The migration from 25 kHz channels is fairly straightforward but some realignment of channel or band edges is likely to be required.

FIGURE 1

Migration from 25 kHz to 5 kHz channelling

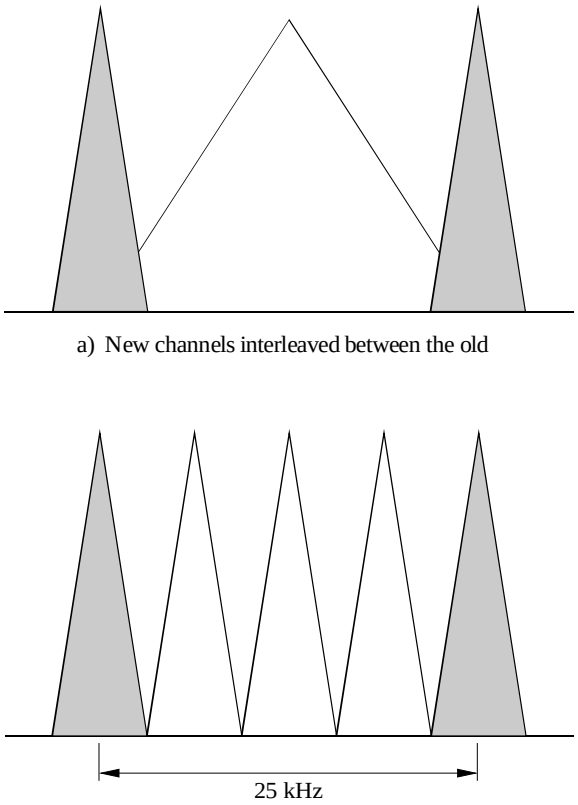


a) New channels interleaved between the old

b) All new channels after changeover

FIGURE 2

Migration from 25 kHz to 6.25 kHz channelling



a) New channels interleaved between the old

b) All new channels after changeover

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2.2.2 Interleaving with 12.5 kHz channels

Figures 3 and 4 show that the principle for interleaving 5 kHz or 6.25 kHz channels with any interim 12.5 kHz channels is exactly the same as for 25 kHz. However, the final transition is made more complicated in the case of 5 kHz as the channel initially interleaved on the centre of the 25 kHz band would have to be moved by 2.5 kHz.

2.2.3 Interleaving with 25 kHz and 12.5 kHz channels

If some administrations were to move to 12.5 kHz channel spacing as an interim measure, and if the 12.5 kHz channels were interleaved with the 25 kHz channels, future migration to 5 kHz or 6.25 kHz channels would be significantly more complicated. As shown in Fig. 5 the new 5 kHz or 6.25 kHz channel would overlap one or other of the wider bandwidth channels.

3 Interference

The interleaving process has to be done so as to minimize mutual interference. Some measurements of the interference and co-channel performance between interleaved linear modulation and 12.5 kHz FM have been made. No similar published information has been identified for narrow-band digital speech. It is however reasonable to assume that interleaving 5 kHz or 6.25 kHz channels between 25 kHz channels will lead to less interference and better co-channel performance than between 12.5 kHz channels.

FIGURE 3

Migration from 12.5 kHz to 5 kHz channelling

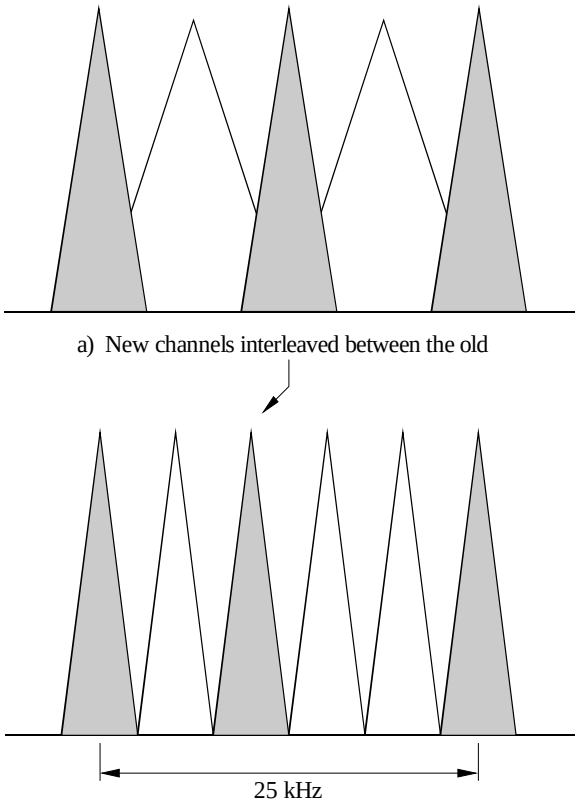


FIGURE 4

Migration from 12.5 kHz to 6.25 kHz channelling

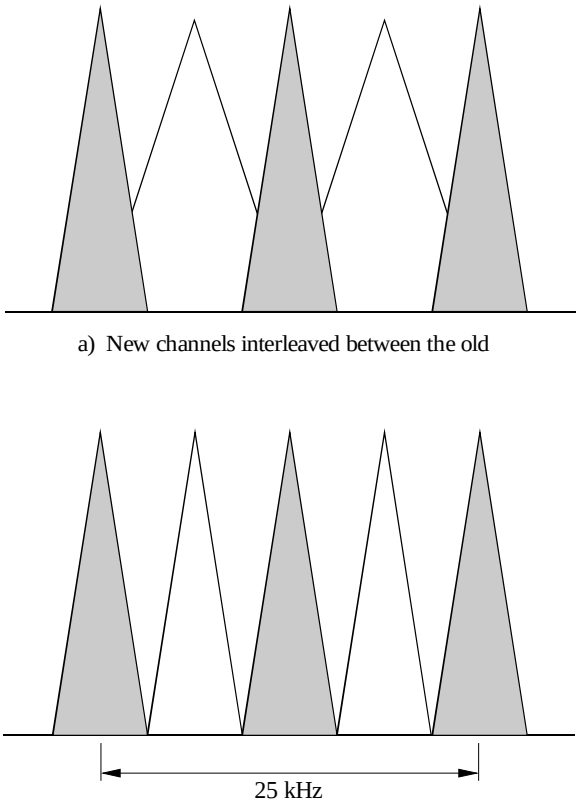
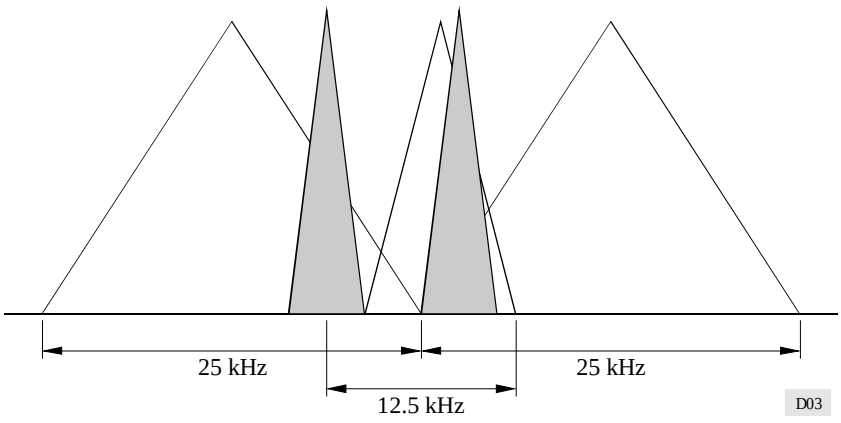


FIGURE 5

Inserting a new channel, 5 or 6.25 kHz, on top of 12.5 kHz channels already interleaved between 25 kHz channels, increases the overlap of transmissions Two alternatives cases are shown



4 Conclusions

The migration path to either 5 kHz or 6.25 kHz channels would be similar. However a direct transition from 25 kHz rather than via an interim step of 12.5 kHz would be simpler in that:

– it would require less channel planning and realignment of centre frequencies;

– it would avoid channel overlap if 12.5 kHz channels were interleaved, as an interim measure, with 25 kHz ones;

– the interference potential is likely to be less.

Clearly interleaving of channels will need to carefully planned and the use of frequency planning tools will be important. Further field measurements and studies will be needed to provide the necessary information.