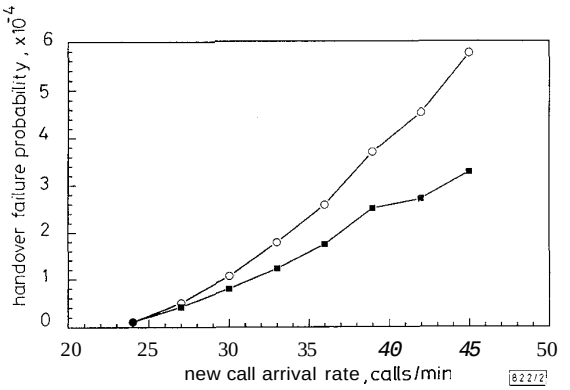

Fig. 2 *Handover failure probability against new call arrival rate*

○—○ without channel exchange
■—■ with channel exchange

a handover to the other cell is also asssumed to be exponentially distributed with a mean of $1/\sigma$ (= 60s). Thus, if $t_c \leq t_h$, the call is terminated within the current cell; otherwise, a handover request to the other cell is generated after holding the channel for a duration t_h in the current cell. With this model, a call may result in several handovers between the two cells before it is either naturally terminated or forced to terminate owing to handover failure. The mobiles are assumed to move with uniform speed within the handover area, and the handover area traversal time is assumed to be normally distributed with a mean of 10s and standard deviation of 2s. Thus, the radio power degradation within the handover area will be monotonic. The prioritisation of the handover requests is carried out as per the measurement based scheme [4].

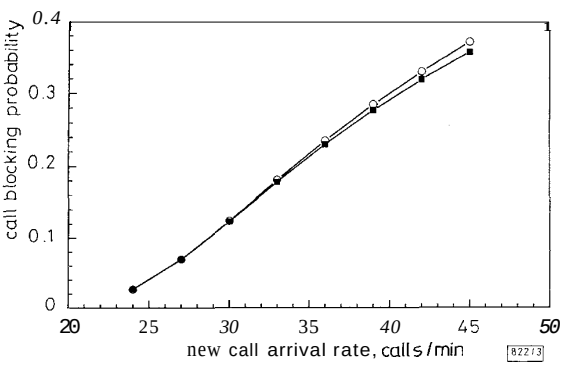

Fig. 3 *Call blocking probability against new call arrival rate*

○—○ without channel exchange
■—■ with channel exchange

Results and discussions: The above model was simulated using the Simscript II language. The number of new call requests simulated in each cell was one million. The simulation results calculated as averages for both the cells are shown in Figs. 2 – 4. The improvement in handover success rate caused by channel exchanges is clear from Fig. 2. As seen here, at a call traffic of 45 call/min, the new scheme reduces handover failure probability to almost 50% of that without channel exchanges.

As is clear from Fig. 3, the new scheme does not degrade the call blocking rate as compared to the scheme without channel exchanges. It is interesting to note that at higher call arrival rates there is some reduction in call blocking probability. These reductions in call blocking probability are possible because, in the new scheme, a part of the handover traffic is managed with channel exchanges and, as a consequence, the probability of assignment of released channels to new calls increases.

The role of handover channel exchanges in increasing the number of successful calls is clear from Fig. 4. Call dropping is defined here as the failure of a call in progress owing to handover failure.

The superiority of the handover channel exchange scheme is clearly evident from the simulation results discussed above.

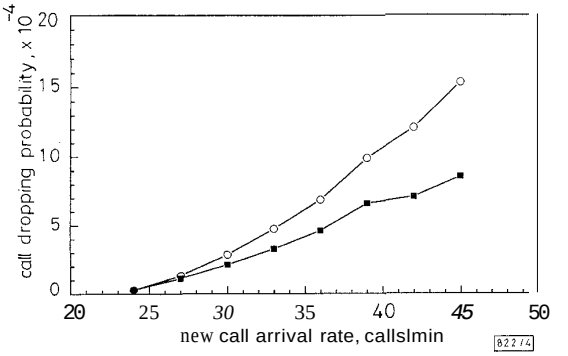

Fig. 4 *Call dropping probability against new call arrival rate*

○—○ without channel exchange
■—■ with channel exchange

Conclusion: The new handover scheme improves the handover success rate by exchanging channels between two mobiles moving in opposite directions across the handover area of adjacent cells. Performance evaluation using a two cell simulation model has shown that the new scheme not only minimises handover failure and call dropping probabilities but also reduces call blocking probability. These results clearly show the usefulness of the channel exchange scheme in modem mobile cellular communication systems.

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References

1 ANVEKAR, D.K., AGRAWAL, P., and NARENDRAN, B.: 'A traffic-driven channel reservation scheme for handovers in mobile cellular networks'. Proc. Sixth Int. Conf. Wireless Communications, Calgary, Alberta, Canada, July 1994,

2 ANVEKAR. D K., and AGRAWAL, P : 'A new criterion for processing handover requests in mobile cellular networks'. Proc IEEE Int. Conf. Personal Wireless Communications, India, August 1994

3 AGRAWAL. P , ANVEKAR. D.K., and NARENDRAN, B.: 'Minimizing cellular handover failures without channel utilization loss'. Proc. Globecom '94, San Fransisco, **USA,** 1994

4 TEKINAY. S , and JABBARI. B.: 'A measurement-based prioritization scheme for handovers in mobile cellular networks', *IEEE J. Sel. Areas Commun.,* 1992, **10,** (8), pp. 1343–1350

Hit probability between frequency hopping sequences generated by Reed-Solomon and Hermitian codes

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Indexing terms: Code division multiple access, Mobile radio systems

Frequency hopping systems produced by either Reed-Solomon (RS) or Hermitian codes (AG) are compared. The results show that AG codes perform better than RS codes if the ratio of the number of hits by length of sequences is considered.

Introduction: Time-frequency hopping modulation has a potential for application in those systems in which a large number of users, with widely variable distances or transmitted power, are to operate simutaneously in a single link. Such systems tend to use a simple code sequence, primarily as an addressing medium, rather than to spread the spectrum specifically. This type of modulation is suitable for mobile systems, in which random access and discrete addressing are the main concerns. The global system for mobile