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Source: **Motorola**
Title: **Example Simplified ARP Test Configuration**
Document for: **Discussion**

1. Introduction

In a companion document [2], a potential approach to simplifying ARP testing is offered which reduces the number of interfering signal sources while preserving at least some of the statistics of the composite interfering signal offered to the receiver under test. This document considers a potential test apparatus configuration resulting from such a simplified approach, based on an initial consideration of test complexity.[1]

2. Discussion

Figure 1 shows an example test apparatus consistent with [2] and similar to Figure 9-11 of the feasibility study technical report (TR)[1].[2]

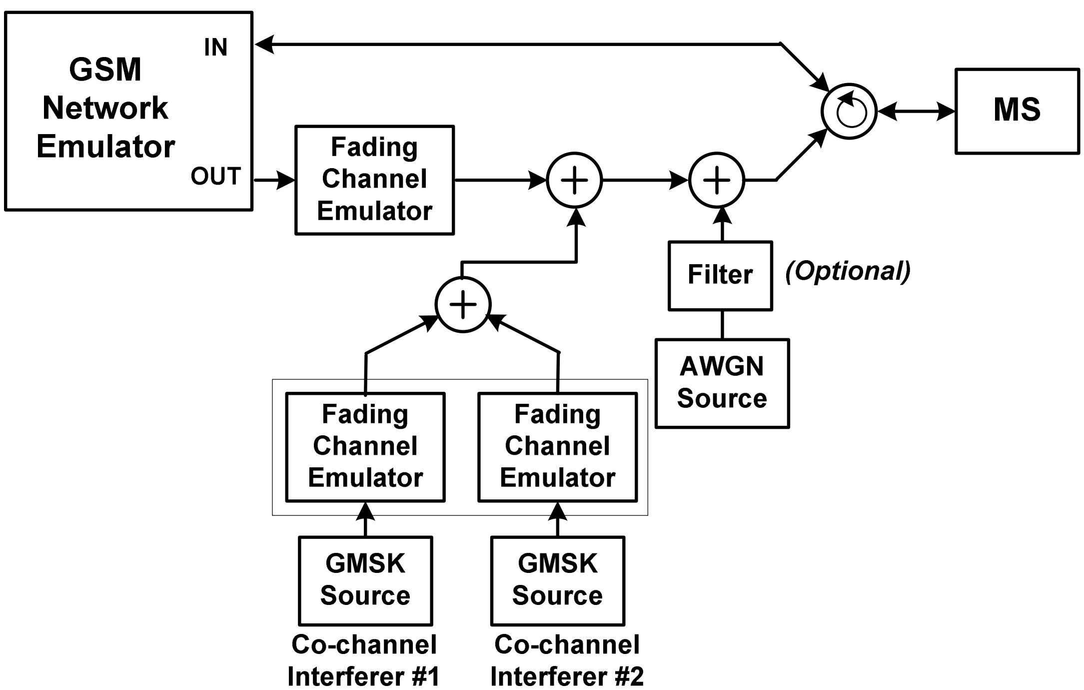

Figure 1 – Example simplified ARP test apparatus.

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[1] *The document is offered solely to continue the WG1 discussion of how the models of the feasibility study can be simplified. It is of course up to WG3 to determine how tests should be configured.*

[2] *The block diagram is not necessarily intended to suggest a physical implementation. For example, each block could be realized logically within a signal streaming approach.*

The following aspects of Figure 1 (or similar scheme) would, however, require further consideration.

Interfering Signal Synchronization – If it is determined that the pseudo-random variation of the time delay of each discrete interfering signal source is not readily realisable, another potential approach would be to specify a relative delay pair $\left[\delta_1, \delta_2\right]$ (with respect to the desired signal) for each discrete signal source over the duration of the test. $\left[\delta_1, \delta_2\right]$ could be specified to be consistent with synchronous network operation in a first test (or each of a sequence of sub-tests[3]), and in a second test with asynchronous network operation. The selection of $\left[\delta_1, \delta_2\right]$ would need to be done with care, however, to ensure that the resulting values $\left[\delta_1, \delta_2\right]$ were consistent with the performance observed under the original random delay distributions.

Interferer Training Sequences – Current-generation signal sources may be capable of pseudo-randomly selecting the interfering signal TSC. If so, it would be possible to keep this component of a simplified interferer model consistent with the model of the feasibility study.

Residual Signal Generation – In Figure 1 (and in [1]), the residual interference is shown as a single source, optionally filtered using the $c0$ pulse shaping filter. Of course, the feasibility study models require the residual interference to be constructed as the sum of a single co-channel residual interferer and two adjacent channel residual interferers. In practice, the simultaneous generation of three such sources may be problematic, especially in the case where frequency hopping is required. An obvious alternative is to specify the AWGN source to be a wideband source, with uniform spectral density (i.e. 'white') over the mobile allocation (MA) specified by the test, and this has the advantage of removing the frequency hopping requirement from the residual interference source. This requires, however, a significant deviation from the feasibility study models, and it may be desirable to investigate via simulation of advanced receiver performance the fidelity of this approach with the original models.

Frequency Offset – If generation of pseudo-random discrete interferer frequency offsets is found to be problematic, the specification of fixed interferer frequency offsets may be more feasible. In practice, this would depend, however, on the frequency offsets specified by WG1. The complete removal of frequency offsets is another option, however, and if the existence of typical interferer frequency offsets was shown via advanced receiver simulation to have only a limited effect on performance, they could be removed completely from the test configuration.

Power Control – Pseudo-random generation of different power levels in the timeslot-adjacent bursts comprising each discrete interferer under asynchronous test conditions may, again, prove problematic for contemporary test equipment with limited flexibility and dynamic range. This problem could potentially be solved, however, by fixing the power ratio between the adjacent and main bursts for the duration of the test (and potentially by using a different power ratio in each of a sequence of sub-tests). Again, the relative power Δ of the adjacent burst compared to the main burst would require further study via simulation.

3. Conclusions

A potential ARP test apparatus has been outlined. In order to establish, however, whether such an approach (or any other) is suitable for ARP testing it may be useful to investigate the effect of each potential simplification

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[3] *Averaging performance over more than one test configuration, each characterised by a different delay pair* $\left[\delta_1, \delta_2\right]$*, might provide a reasonably comprehensive way forward if the fully burst-wise pseudo-random delay variation model causes significant implementation difficulty.*

on simulated advanced receiver (AR) performance. This could be done in a progressive fashion, via the incorporation of each simplifying element into the foundation offered by Setups 2 and 3 of the current simulation alignment process.

4. References

[1] GP-032675, Rapporteur, “DRAFT Feasibility Study on Single Antenna Interference Cancellation (SAIC) for GSM Networks”

[2] GP-04xxxx, Motorola, “Observations on Interfering Signal Simplification for ARP Testing”, Cancun, Mexico, Apr. 19-23, 2004