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## Process for the Simultaneous Amplitude Allocation in Multi-Sender Multi-Receiver Groups for Digital Beamforming

### Field of Application

Digital Beamforming Systems simultaneously improve resolution and dynamic range. The dynamic range of a system suffers when there are only a limited number of senders and receivers. The present invention offers a process to increase the dynamic range of multi-sender multi-receiver systems which have only a small number of elements in the group.

### Current Status of Technology

In a multi-sender multi-receiver system, the resolution and dynamic range can be optimised by increasing the number of sender and receiver antennas and a separate amplitude allocation at the sender and at the receiver. A reduction in the number of antennas, on the other hand, reduces the dynamic range. The amplitude allocation in multi-sender multi-receiver systems is done separately, which in the case of only a few antennas does not improve appreciably the dynamic range of the system. Furthermore, the number of degrees of freedom for the allocation of amplitudes for a system with  $N$  senders and  $M$  receivers is only  $N + M$ . Each separate allocation is generally described by an allocation vector.

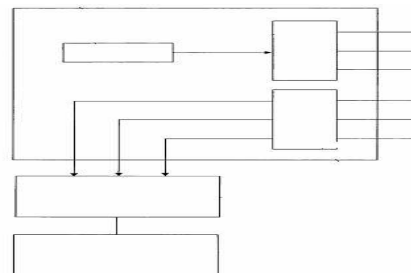
### Innovation

The invention delivers a means by which the amplitude allocation for sender and receiver in a multi-sender multi-receiver system can be represented simultaneously. This is achieved by describing the allocation by a matrix. The matrix is computed by projecting the multi-sender multi-receiver system on a virtual one-sender multi-receiver system. The known allocation vectors can be applied to this virtual system. By reverse projection of this system on a multi-sender multi-receiver system, the allocation matrix is calculated from the allocation vector. This increases the degrees of freedom to  $N \cdot M$  and therefore allows the dynamic range of the angle calculation to be increased without increasing the number of antennas in the group.

### Your Advantages at a Glance:

- High flexibility in the determination of the occupation function
- Increased dynamic response even with a small number of antennae
- Reduction of the number of elements in a group of senders and receivers
- Increased degrees of freedom allowing for a higher dynamic response of the system
- Savings in hardware costs

Fig. 1: Schematic Representation of the Matrix Formation



### Technology Transfer

The Technologie-Lizenz-Büro GmbH has been charged with the commercialization and now offers companies the opportunity to obtain a license to exploit this new technology.

### Patent Portfolio

A German patent (10 2007 039 897 B3) has been granted. EU (EP 2 028 508) and USA (US 2009/0051593A1) patent applications are still pending.

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