BEAM FORMING

ANTENNAS AND WAVE PROPOGATION ASSIGNMENT

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SLOT-:D2

BEAM FORMING

I.INTRODUCTION

Beamforming is a technique which focuses energy and thereby provides two positives: increasing signal energy to the intended user, and decreasing interference elsewhere. This technique can be used to increase the coverage of a particular data rate or the spectral efficiency of the system. The increased signal-to-noise ratio results in a larger gain in the direction of the user, and also provides better control of the distribution of spatial interference in the cell.
Beamforming can be applied to both, downlink and uplink.

II. BEAM FORMING CONCEPT

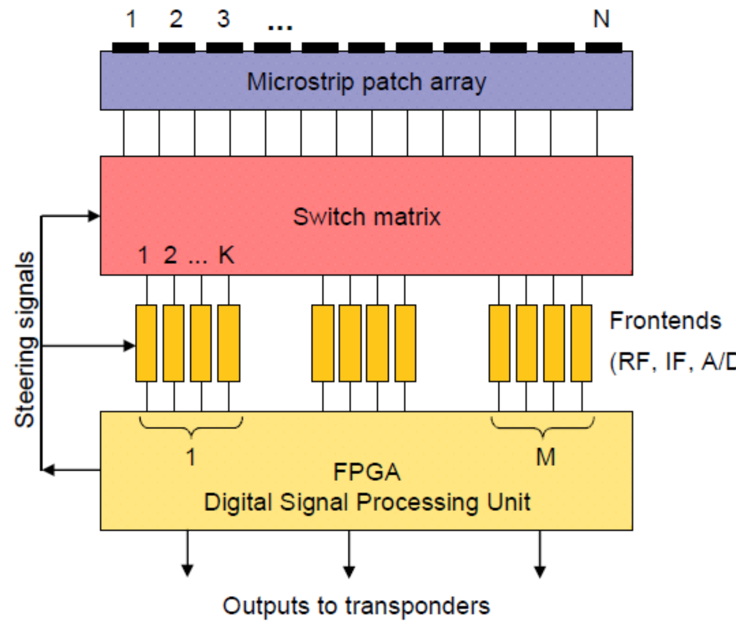
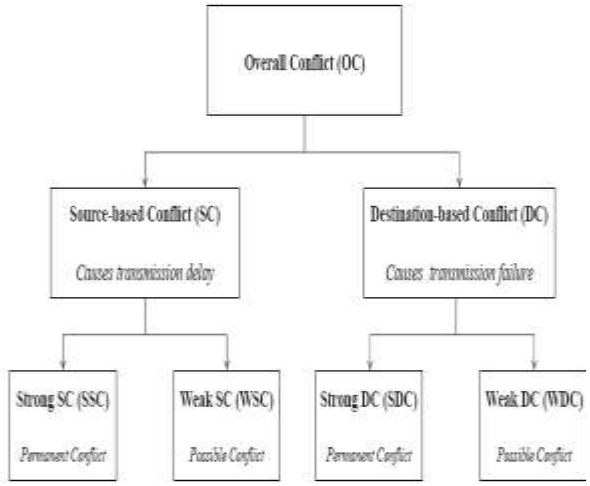


Fig. 2. Beamforming concept

The multifeed array has N elements from which the switch matrix simultaneously transmits signals of M beams, i.e. receives data from M LEO satellites in parallel. Each beam is generated by K array elements that are denoted in this paper as sub-arrays. Each array element can be a single patch or a small patch-array with its own fixed feed-network. For each beam, the beamforming coefficients are computed separately and applied in each case to K elements resulting in steering the beam to the desired direction or beam shaping to obtain the maximal possible directivity of the whole antenna.

III. CONFLICT ANALYSIS



:lassification of conflicts between the wireless links in contention-based multi-hop wireless networks with beamforming an

In a wireless network, the transmission on a wireless link causes interference on other links within a proximity defined by acceptable signal-to-interference ratio. For a successful transmission to occur on a certain link, interfering links should remain inactive during the transmission period. Hence, interference is a major factor in creating interdependency among wireless links and limiting the capacity of wireless networks.
In order to provide guaranteed bandwidth to network flows, interference dictates the constraints that decide which flows are admitted and how they are routed.

IV. SWITCHED BEAMFORMING ANTENNAS

First, we consider the Equal Power Split (EQP) model and obtain a low-complexity optimal algorithm based on dynamic programming.. Second, we consider the continuous rate function under ASP model, and develop a set of sufficient conditions under which the optimal solution has (i) 1 group, (ii) K group (where K is the number of beams), and (iii) arbitrary number of groups. In particular, we show that if the rate function is continuous, non-decreasing and concave, it is optimal to have only one group.

V. IMPROVING REFLECTOR ILLUMINATION

The directivity of the reflector antenna strongly depends on the illumination of the reflector. Feeder radiation patterns that are too narrow produce directivity loss due to insufficient illumination of the reflector fringe. Too broad radiation patterns cause efficiency loss due to spill-over effects. In the case of arrays used as feed elements, side lobes diminish the possible directivity. By utilizing beamforming it is possible to shape the radiation pattern of a feeder array to obtain optimal possible reflector illumination

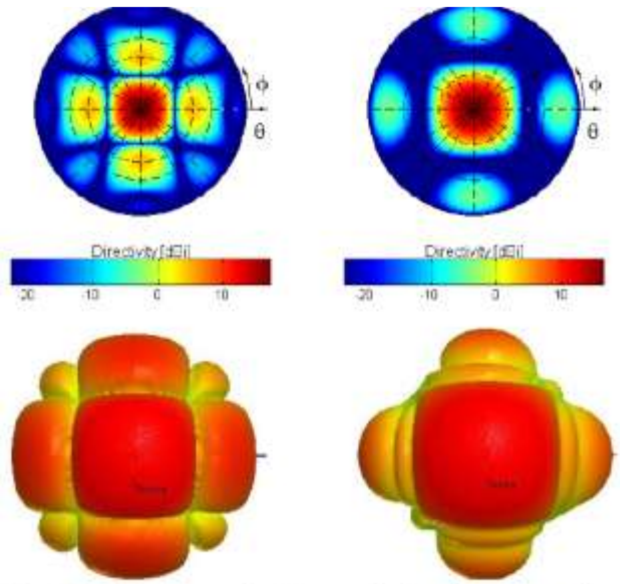


Fig. 3 Directivity patterns of a 3x3 array of patch radiators using uniform amplitude distribution (left) and Chebyshev tapering (right) with SLL = -25 dB. The upper results are obtained without mutual coupling using internal software SEQAR [9] and the lower results with mutual coupling using commercial software Ansoft Designer [10].

VI. ADAPTIVE BEAMFORMING ALGORITHM COMPARISONS

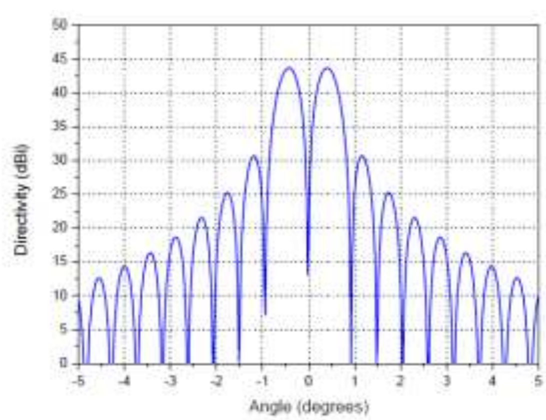
The LMS algorithm gives the best beamforming pattern. However, its convergence is slow and it depends mainly on the stepsize. The RLS algorithm shows high rate of convergence, but the sidelobes are not completely cancelled. The recursive equations used in the RLS algorithm allow faster update of array weights. The CGM algorithm calculates the array weights by orthogonal search at every iteration. It shows good beamforming pattern and a high convergence rate.

VII. RF BEAMFORMING WITH CLOSELY SPACED ANTENNAS

The comparison has been done and demonstrated the performance improvement for using RF beamforming-based MIMO processing instead of antenna-based MIMO processing in closely spaced metamaterial antennas systems. The specific interest is in antenna arrays with a single RF chain. The result indicates that even without mutual coupling, antenna based MIMO processing is greatly impacted when moving from rich to correlated scattering environment. This suggests the robustness in beamform based MIMO processing and its potential to be utilized in small multi-antenna devices.

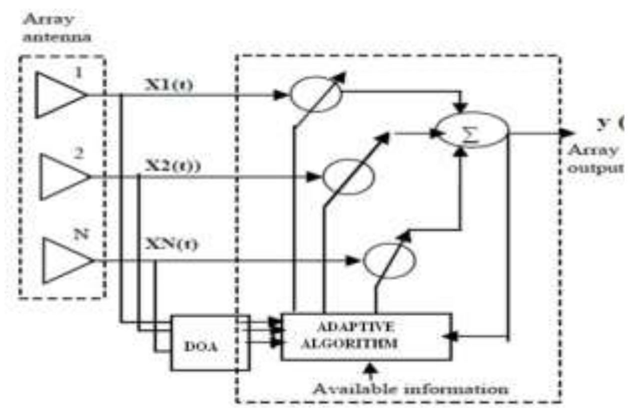
VIII. ARRAY FED REFLECTOR ANTENNAS

An important feature of array-fed reflector antennas is the possibility to null out the intended or unintended interferers. The figure shows the optimized directivity pattern of a reflector antenna in the case of an interferer at 0°.



IX. BEAMFORMING IN SMART ANTENNAS

Smart antenna generally refers to any antenna array, terminated in a sophisticated signal processor, which can adjust or adapt its own beam pattern in order to emphasize signals of interest and to minimize interfering signals. Smart antennas can provide higher system capacities, increase signal to noise ratio, reduce multipath and co-channel interference by steering the main beam towards the user and at the same time forming nulls in the directions of the interfering signal.



X. MULTI-USER DOW NLINK TRANSIT BEAMFORMING FOR BROADBAND SC-DAN

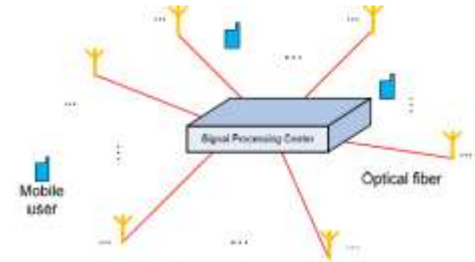


Figure 1 DAN structure.

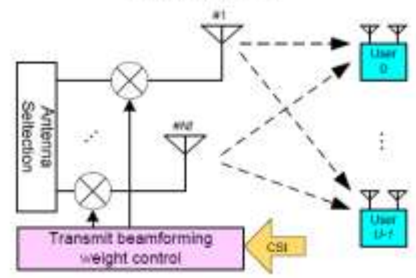


Figure 2 Downlink transmission using transmit beamforming.

The system model for downlink transmission using transmit beamforming is shown as in Figure. In the DAN, there exist a large number of transmit antennas and antenna selection is necessary before transmit beamforming is performed. After antenna selection, each transmit signal will be weighted by the transmit beamforming weight. Both antenna selection and beamforming weight control are carried out by the signal processing center (SPC).

XI. CONCLUSION

a) The concept and technique of beamforming is understood.
b)Various conflict issues arising in the process have been discussed.
c)Smart antennas to apply beam formation has been discussed along with smart sensor classification.
d)Concept of switched beamforming has been elaborated upon.
e)Adaptive beam formation algorithms, along with their advantages and disadvantages have been stated.
f)RF beamforming in closely spaced antennas has been explored.
g)Improving reflectivity of reflector type antennas while using them for beam forming -the process is didcussed.

h)The relation between angle and directivity of array based antennas for beam forming has been displayed.

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