Compact Aperture Coupled Patch Antenna Design

T. Boman[1], A. Gustafsson[1] and D. Axelsson[2]
[1]*FOI, Swedish Defence Research Agency, Linköping, Sweden*
[2]*Cinside, Linköping, Sweden*
tomas.boman@foi.se

I. INTRODUCTION

Natural or man-made disasters often result in chaotic, difficult and stressful working conditions for Urban Search and Rescue (USaR) crews. The crews must make quick decisions to detect, locate and rescue trapped victims under rubble as quickly and accurately as possible. Needs for additional technological and methodological support are expressed on all levels, from better sensors and more robust communication in the field to an improved operational picture at the command level, in order to reduce the response time and increase the efficiency and safety of USaR operations.

The EU FP7 project INACHUS emphasizes the need for technological development to be conducted in accordance with existing operational guidelines and methodology, in order to ensure acceptance among end-users.

To achieve this goal a snake-like robot will be developed in the project, equipped with different sensors, among these a see-thru radar sensor. This paper focuses on this sensor in the INACHUS project and presents the implementation of the radar and the current design of the compact aperture coupled antenna elements of the radar.

II. RADAR IMPLEMENTATION IN SNAKE ROBOT

Figure 1 shows a sketch of the snake robot and the radar implementation of the radar sensor. It is planned to consist of five antenna panels with two patch antenna elements on each panel (one for transmit and one for receive resp.). In this way all around coverage will be reached. One central radar transceiver will be used which will be switch among the antenna panels, one at a time.

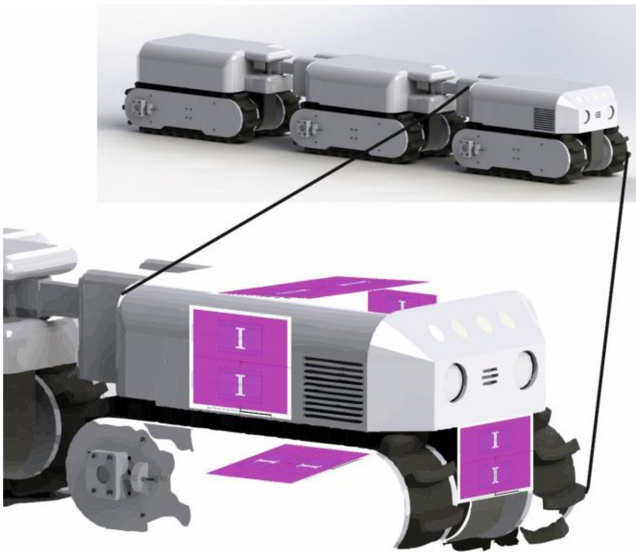

Figure 1: Sketch of the snake robot implementation for the antenna panels.

III. ANTENNA DESIGN

The antenna consists of aperture coupled microstrip patches, one for transmit and one for receive, placed on a panel with a size of 60 mm x 60 mm. The design impedance match frequency specification was below 2 GHz, thus a relatively high permittivity of the dielectric was needed in order to keep the antenna element size lower than 60 mm. TMM6 with epsilon ≈ 6 was chosen as dielectric for the antenna giving the design as presented in figure 2.

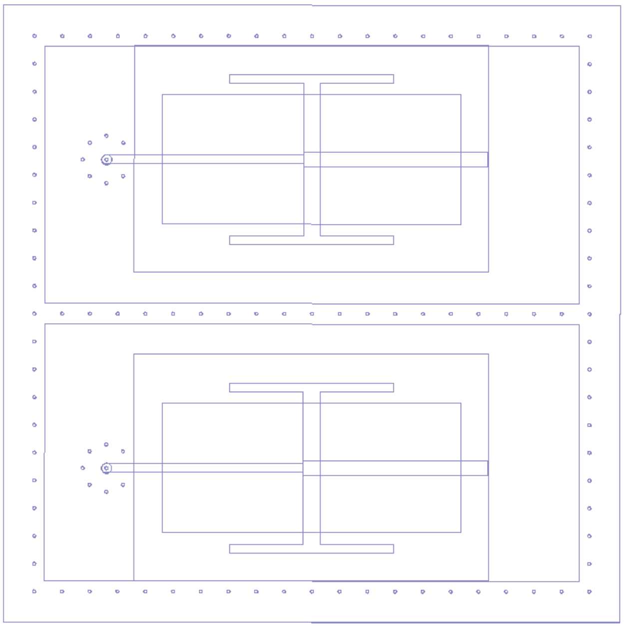

Figure 2: Antenna design on a panel with size 60 x 60 mm^2.

IV. SIMULATION RESULTS

Figure 3 presents simulated impedance matching of the antenna design where S11 is below -10 dB from 1.65-1.72 GHz with a centre frequency of around 1.69 GHz.

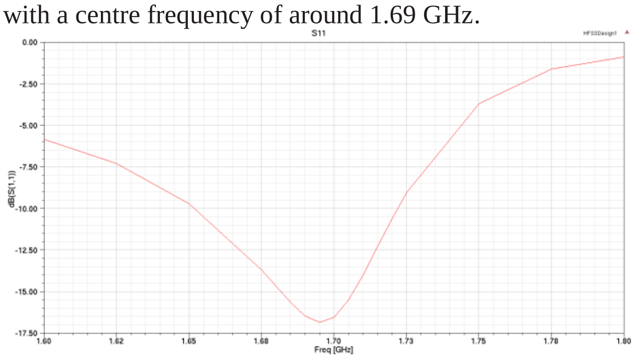

Figure 3: Simulation results.

V. CONCLUSIONS

A compact antenna design for a robot radar implementation is presented. The antenna is simulated to operate well impedance matched at 1.7 GHz.