Compact Aperture Coupled Patch Antenna Design

T. Boman[1], A. Gustafsson[1], D. Axelsson[2] and G. Marafioti[3]

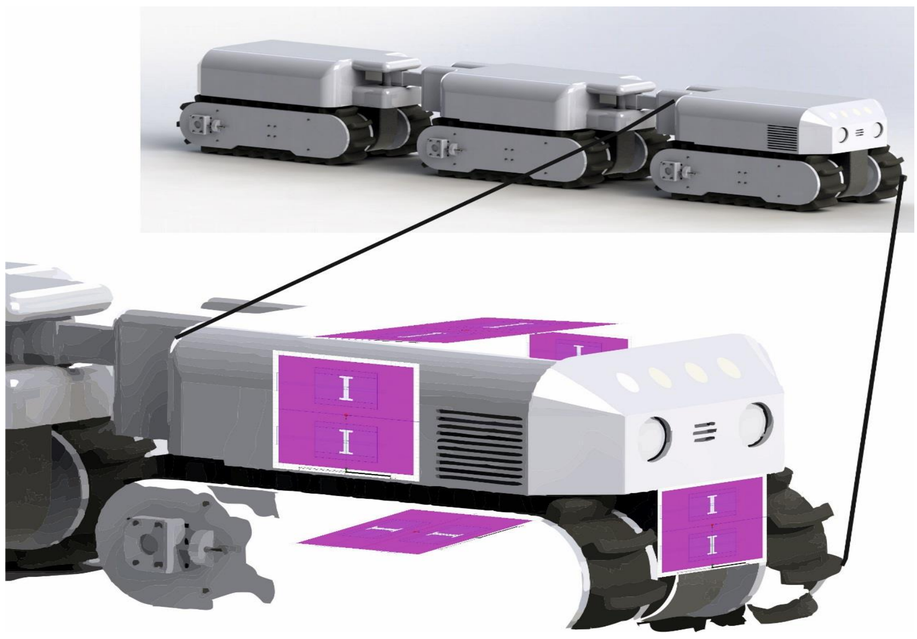
tomas.boman@foi.se, andreas.gustafsson@foi.se, danaxe@cinside.eu, giancarlo.marafioti@sintef.no

[1]FOI, Swedish Defence Research Agency, Linköping, Sweden

[2]Cinside, Linköping, Sweden

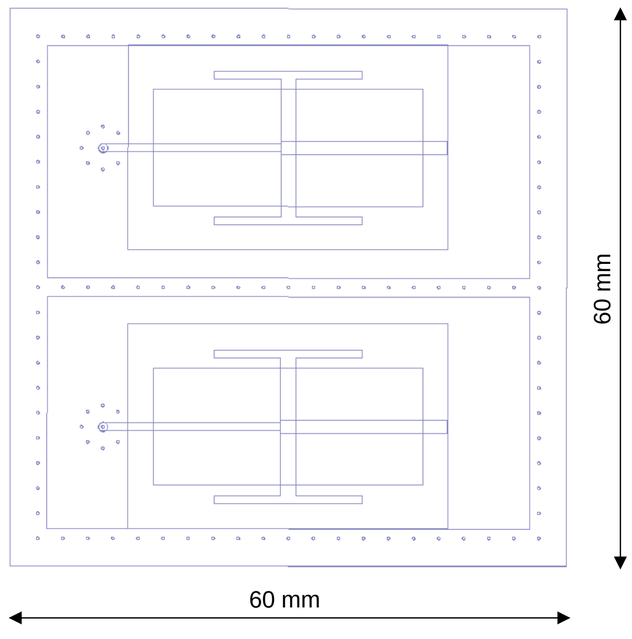
[3]SINTEF, Trondheim Norway

Urban Search and Rescue crews in disaster areas (e.g. earthquakes) must make decisions to detect, locate and rescue trapped victims under rubble as quickly and accurately as possible. The EU FP7 project INACHUS emphasizes the need for additional technological and methodological support expressed on all levels, from better sensors and more robust communication in the field to an improved operational picture at the command level. This poster focuses on the design of compact aperture coupled antenna elements for the radar to be used in a snake-like robot also developed within the project.



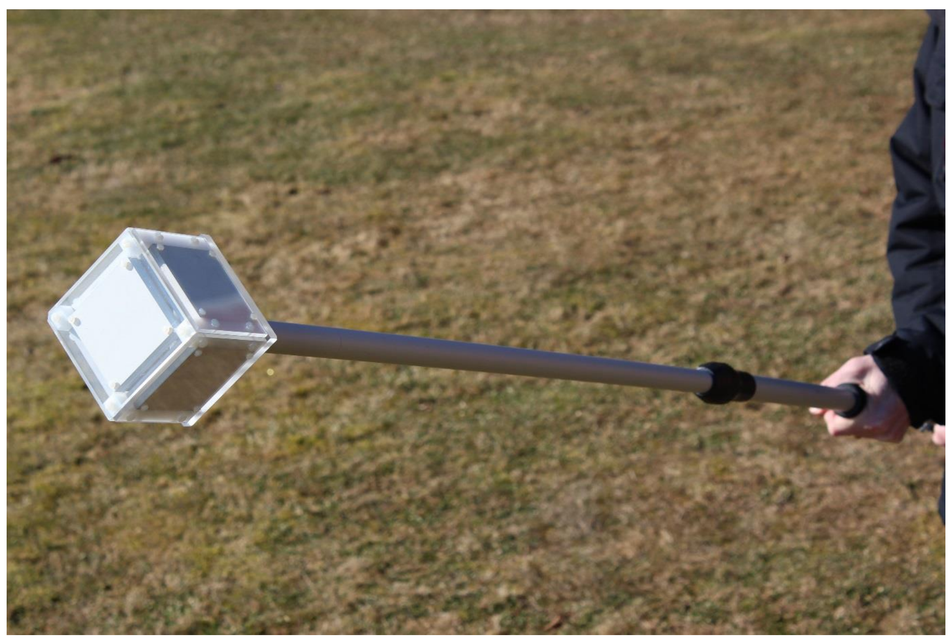
INACHUS robot implementation

The figure above shows a sketch of the INACHUS robot and the positioning of the radar antenna elements. It will consist of five antenna panels with transmitting and receiving antennas. In this way all around coverage will be achieved. This Doppler operating radar identifies trapped victims by detecting the chest movement due to breathing. The robot will also be equipped with video camera, IR-sensor, electronic nose sensor, microphone and speaker.



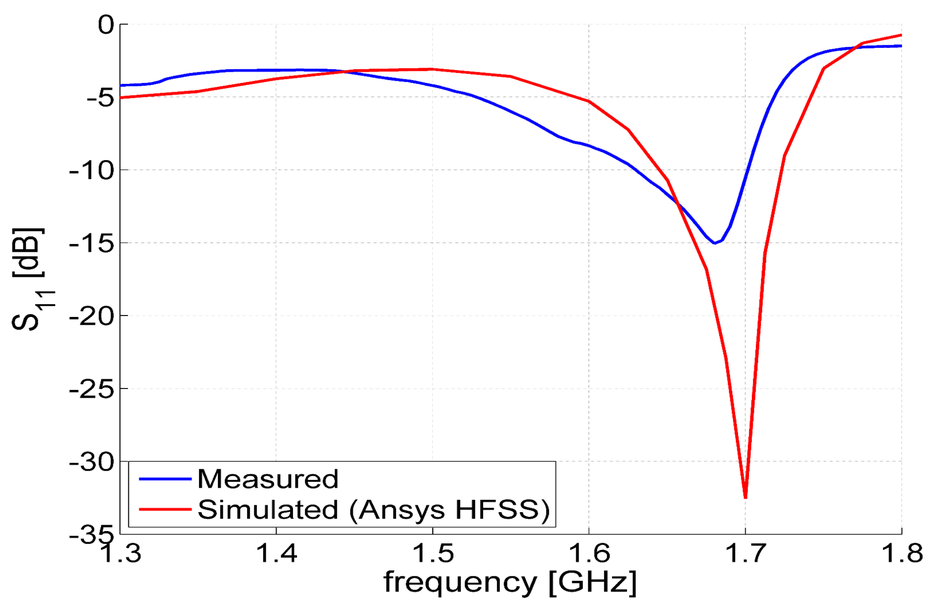
Antenna design

A working frequency below 2 GHz is considered advantageous for see-through radar capability, and the available space limits the size of the panels to 60 mm x 60 mm. Rogers TMM6 with relative permittivity ≈ 6 as dielectric layers was chosen to achieve a compact design. The antenna design consists of two aperture coupled stacked microstrip patches.



Stand-alone radar implementation

A photo of a cube consisting of five antenna panels on a stick. It will be used for development purposes and can also be used as a stand-alone product.



Results

The figure above presents simulated and measured impedance matching of the antenna design. The matching frequency is slightly lower in the measurements, and the measured impedance bandwidth (<-10 dB @ 1.63-1.7 GHz) is equally wide as the simulated bandwidth (1.65-1.72 GHz).

Conclusion

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

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