

In this project, we aim to design low cost, power efficient and a practically viable TWI radar system. To aid our design we first list the design considerations in this report that can be viewed as a foundation for our analysis and design.

Design considerations:

Material Properties of Wall and Frequency band:

In order to create an image of the interior of an object, the illuminating radiation must be able to pass through the object with little attenuation. For through the wall surveillance systems the material properties of the wall determine the degree to which the system will be successful. The major considerations are the absorption and refraction losses for the penetrating radiation. Most building materials are relatively transparent below 4 GHz. The following graph summarizes the one way attenuation loss through different types of materials.

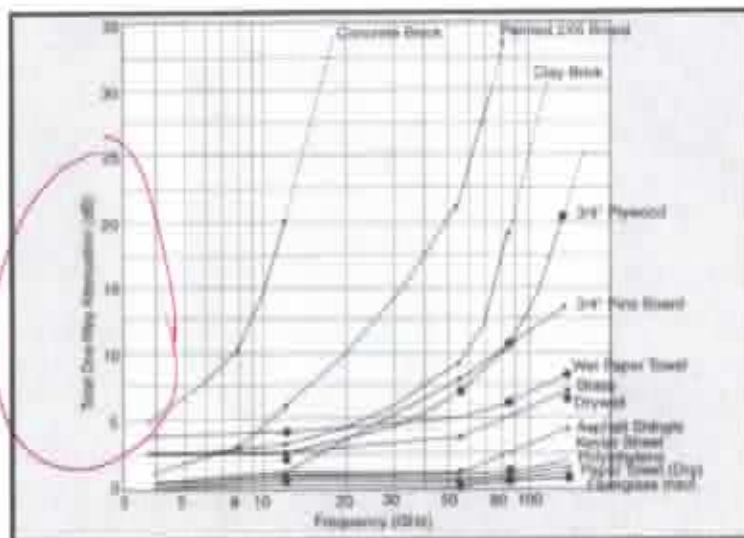


Figure 2: Attenuation of common building materials

Ultra wideband (UWB) radar poses as a good option to solve the TWI problem due to the fact that UWB systems compensates for the significant drop in center frequency by boosting the bandwidth which translates into fine range resolution. So bandwidth is chosen according to the wall penetration. In our problem we are assuming concrete wall, 3GHz is chosen as center frequency and Bandwidth is 0.8GHz which is more than 0.25 percent of center frequency for UWB system. One way attenuation at 3 GHz for concrete wall is less than 5 dB.

RCS and range resolution:

Must refer to some distance. What happens when you need to penetrate multiple walls? Need to analyse this aspect of the problem.

Motivate the Situation Analysis by describing a scenario, where the radar system responds to a call of a single terrorist rooming a building, say. What do you want the

radar to do for you? Be very specific. I imagine detection and tracking will be important. What Range, AR, AO, refresh rate, will be necessary?

These will be your performance specs, and in

the Design Analysis you will

try to build a radar that will meet these specs.