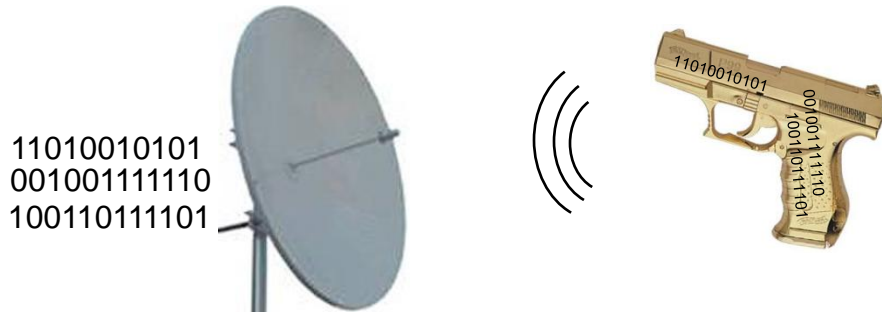


## Smart Material

- Data can be embedded in any metallic structure
- Displacement and deformation can be detected.
- All information can be read remotely



## Operational and Performance Capabilities - Summary

Any metallic structure can be used as an electromagnetic memory. Four dimensions of digital or analog data can be embedded in the structure. The shape, position, orientation, and deformations of the object are retrievable. In essence, the structure is now an electromagnetically smart material.

- A low power signal can be used as illuminator
- No semiconductor chips
- Can be applied to any metallic structure
- Data/Info is remotely retrievable

## Technical Approach:

- **Task 1:** Formulate the impulse response of a metallic structure using the singularity expansion method (SEM).
- **Task 2:** Use the scattered field to retrieve the original and embedded poles as stored data.
- **Task 3:** Use the magnitude and phase of the embedded poles to estimate the position, orientation and the deformation.
- **Task 4:** Design and test a chipless RFID as an embedded data structure.
- **Task 5:** Extend the technique for embedding data within the chipless RFID to an arbitrary structure.

## Present and past actions

- A 10-bit chipless RFID has been designed and tested successfully.

## ROM and Schedule:

- Task 1: ROM=\$75,000, POP=6 mos
  - Task 2: ROM=\$37,500, POP=3 mos
  - Task 3: ROM=\$75,000, POP=6 mos
  - Task 4: ROM=\$37,500, POP=3 mos
  - Task 5: ROM=\$75,000, POP=6 mos
- Total Cost: \$300,000

## Deliverables:

- Theoretical basis for data embedding technique
- Practical procedure to embed data into an arbitrary structure
- Prototyping and demonstration of sample designs

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