CLAIMS:

1. A sensor unit comprising at least one crystal structure comprising an ensemble of color centers, and a resonator arrangement for applying selected magnetic field on said ensemble of color centers; said resonator arrangement comprises a first split ring having a first diameter and a second split ring having a second diameter; wherein said first split ring and said second split ring are positioned within first and second parallel planes, and wherein said at least one crystal structure is located in an intermediate plane between said first and second parallel planes.

2. The sensor unit of claim 1, wherein said first and second split rings define a virtual cylindrical space between them and said at least one crystal structure is located within volume of said virtual cylindrical space.

3. The sensor unit of claim 1 or 2, wherein said at least one crystal is a diamond crystal, and said ensemble of color centers comprise a plurality of Nitrogen Vacancy centers within said diamond crystal.

4. The sensor unit of any one of claims 1 to 4, wherein a gap within said first split ring and a gap within said second split ring are placed at 180 degrees respective orientation.

5. The sensor unit of any one of claims 1 to 5, wherein a distance between said first and second parallel planes is in a range between 0.1mm and 20mm.

6. The sensor unit of any one of claims 1 to 7, wherein said first and second diameters of said first and second split rings are similar.

7. The sensor unit of any one of claims 1 to 8, wherein said first and second diameters of said first and second split rings are in a range between 0.5mm and 20mm.

8. The sensor unit of any one of claims 1 to 9, formed on a printed circuit board (PCB).

9. The sensor unit of any one of claims 1 to 10, wherein said first and second split rings form the resonator arrangement having resonance frequency within a range between 0.5GHz and 50GHz.

10. The sensor unit of any one of claims 1 to 11, further comprising a first lead associated with said first split ring and a second lead associated with said second split ring and at least one microwave signal generator connected using one or more switches to said first and second leads for driving said first and second split rings with one or more selected signals, said first and second leads provide excitation signal to respective one of said first and second split rings.

11. The sensor unit of any one of claims 1 to 13, further comprising at least one laser unit and optical arrangement adapted to provide selective optical excitation of said at least one crystal.

12. The sensor unit of any one of claims 1 to 14, further comprising a magnetic field generator adapted to provide static magnetic field onto said at least one crystal, said magnetic field generator is adapted to selectively vary magnitude of said static magnetic field.

13. The sensor unit of any one of claims 1 to 16, further comprising an optical collection arrangement and at least one detectors, said optical collection arrangement is positioned for collecting optical emission from said ensemble of color centers in said at least one crystal and direct said optical emission to be detected by said at least one detector.

14. The sensor unit of any one of claims 1 to 13, being a sensor unit within a sensor array system comprising an array of sensor units.

15. A method for use in operation of electromagnetic sensor comprising an ensemble of color centers, the method comprising:

a. providing a first split ring at a first plane at one side of said ensemble of color centers, where axial center of said first split ring aligns with center of said ensemble of color centers;

b. providing a second split ring at a second plane at an opposite side of said ensemble of color centers, where axial center of said second split ring aligns with center of said axial center of said first split ring;

c. providing selected excitation signal to said first and second split rings thereby applying corresponding selected magnetic field excitation to said ensemble of color centers, to thereby initiate said ensemble of color center at selected state for sensing electromagnetic signal impinging thereon.