



# STARFIRE Algorithm

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## Why in News?

Recently, Scientists at **Raman Research Institute (RRI)**, an autonomous institute of the **Department of Science and Technology** have developed an algorithm names **STARFIRE** to tackle unwanted **Radio Frequency Interference (RFI)** in space, enriching data obtained from space-based astronomy missions.

## What is STARFIRE?

### ▪ About:

- **Simulation of Terrestrial Radio Frequency Interference in orbits around Earth (STARFIRE)** is an advanced algorithm developed to **estimate and map unwanted RFI signals in space.**
  - The STARFIRE algorithm can estimate and identify the RFI emitted by various sources, **including FM radio stations, Wi-Fi networks, mobile towers, radar, satellites, and communication devices.**
- This innovative algorithm has the potential to revolutionize space-based Astronomy missions and enrich the data obtained from such missions in the future.
- To develop this algorithm, scientists utilized data on FM transmitter stations from six countries, including **Canada, the USA, Japan, Australia, Germany, and South Africa.**

### ▪ Applications:

- **Enhancing Radio Astronomy:**
  - STARFIRE helps astronomers study the early Universe by estimating and mapping unwanted RFI signals in space.
  - It enables the tuning of radio antennas within the **40 to 200 Mega Hertz (MHz) range to detect the 21-cm hydrogen line**, revealing secrets about the cosmos.
- **Optimal Instrument Design:**
  - The algorithm assists in **designing instruments for space-based Astronomy missions** that can operate optimally even in the presence of RFI.
  - This leads to improved data collection and analysis for future missions.
- **Supporting PRATUSH Mission:**
  - STARFIRE is utilized in missions like **Probing Reionization of the Universe using Signal from Hydrogen (PRATUSH)**, aimed at studying the **birth of stars and galaxies in the Universe** using the 21-cm hydrogen line from the far side of the moon.
  - The algorithm plays a key role in **fine-tuning antennas** and instrument components for successful data gathering.
- **Orbit Selection:**
  - The algorithm's capability extends to aiding **orbit selection for future space missions.**
  - It identifies **low RFI orbits, particularly in the ~100 MHz frequency range, making them suitable for various scientific experiments.**
- **Flexibility and Versatility:**
  - STARFIRE offers flexibility to **adjust the properties of transmitting and receiving antennas.**

- This enables including astrophysical radio signals from our own galaxy and the cosmos, leading to more meaningful experimental results.
- **Potential for Wide Range of Applications:**
  - The generic mathematical formulation of the STARFIRE code makes it adaptable for various applications, benefiting missions with low RFI orbits.

### **Radio Frequency Interference (RFI):**

- RFI is a type of **electromagnetic interference (EMI)** that affects **devices or circuits that operate with radio frequencies.**
- RFI in space can affect the **quality and reliability of satellite communications, navigation, and remote sensing systems.**
- RFI can also interfere with the scientific observations and measurements of space-based instruments, such as radio telescopes and radars.

PDF Reference URL: <https://www.drishtiias.com/printpdf/starfire-algorithm>

