



# *ISRMM Spectrum Monitoring*

*2<sup>nd</sup> September 2025:*

*EETT, Athens, Greece*

*The Spectrum We Take For Granted...*

*...is Spectrum Monitoring more S3A than RFI?*

**Notes:**

**S3A** = Space & Spectrum  
Situational Awareness

**RF** = Radio Frequency

**RFI** = RF Interference



Link to UN Web Page:  
<https://sdgs.un.org/goals>

# SPACE...

...is a big part of making these 17 UN Goals possible!

...we know more about Objects & Debris than **Spectrum Use!**

...and if we don't look after **Spectrum** with the **same priority** as Objects & Debris then all is lost!

The screenshot shows the United Nations Department of Economic and Social Affairs Sustainable Development website. At the top, it says 'Welcome to the United Nations' and lists languages: العربية, 中文, English, Français, Русский, Español. Below that is the United Nations logo and the text 'Department of Economic and Social Affairs Sustainable Development'. A search bar and user icon are also present. A navigation menu includes: Home, SDG Knowledge, Intergovernmental Processes, HLPF, SIDS, SDG Actions, Engage, News, About. Below the navigation, statistics are shown: 'THE 17 GOALS', 169 Targets, 4054 Events, 1363 Publications, and 8490 Actions. The main content is a grid of 17 goal icons, each with a number and title: 1 NO POVERTY, 2 ZERO HUNGER, 3 GOOD HEALTH AND WELL-BEING, 4 QUALITY EDUCATION, 5 GENDER EQUALITY, 6 CLEAN WATER AND SANITATION, 7 AFFORDABLE AND CLEAN ENERGY, 8 DECENT WORK AND ECONOMIC GROWTH, 9 INDUSTRY INNOVATION AND INFRASTRUCTURE, 10 REDUCED INEQUALITIES, 11 SUSTAINABLE CITIES AND COMMUNITIES, 12 RESPONSIBLE CONSUMPTION AND PRODUCTION, 13 CLIMATE ACTION, 14 LIFE BELOW WATER, 15 LIFE ON LAND, 16 PEACE, JUSTICE AND STRONG INSTITUTIONS, 17 PARTNERSHIPS FOR THE GOALS. A 'See all' link is at the bottom right of the grid.

...some useful links to help explain spectrum use, etc. to a wider audience.

# Spectrum... ...with

# ... & without



When Disaster Strikes



The Final Battle to End Polio



Satellite to the Rescue



Satellite Serves a Thirstier World



Cellular Ends at Forest Edge



Putting a CAP on Climate Change

Learn how nations in the EU are benefiting from the fusion of multi-orbit, public and private satellite data to meet ambitious climate goals for farmers.



Data from the Ends of the Earth

Scientists are in a race against time to understand and combat climate change, with satellite's help.



Schools Go Online in the Unconnected World



Smart Disaster Recovery



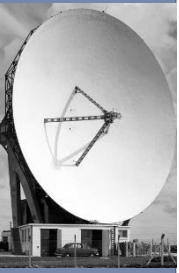
The Magic of Satellite



How Space Saves Lives




German Space Agency at DLR



# MANAGING SPECTRUM:

**Spectrum Management** has been talked about but, real action is needed and soon!

*So, where are we right now?*

- 1) *Satellite Operators need to enhance their **Spectrum Monitoring Capabilities** &...  
...move towards **ML/AI**.*
- 2) *Coordination & Regulation Challenges:*  
*Regulators do not have **Spectrum Data - Used & Not Used** or **Monitor Compliance**.*
- 3) *LEO operators do not **Share** operational **RF Data** & **Co-manage** their systems.*
- 4) *The **SES** /  **INTELSAT** Merger - will that help to manage **GEO/Spectrum/RFI**?*
- 5) *Adoption of **S3A** (**S**pace & **S**pectrum **S**ituational **A**wareness) - **ITU**...*
- 6) *New Tools are starting to emerge e.g., **THRIMOS**...*

**Space Sustainability Forum**  
International Conference Centre, Geneva  
7<sup>th</sup> to 8<sup>th</sup> October 2025

“to achieving effective **S3A** as a critical element for mission success, security & sustainability of space radiocommunications systems.”

*The Questions...*

- a) *Can Satellite Operators **Share** their **RF Data**?*
- b) *How can Satellite Operators improve their use of internal **RF Datasets**?*
- c) *Do we know what **Spectrum** is **Used** and, more importantly, **Not Used**?*
- d) *How do we get to **Global Spectrum Management**?*



## THE MAJOR CHALLENGE TO ANY PROPOSAL TO MANAGE SPECTRUM?

- To manage, e.g. using ML/AI you **need DATA!** *...and plenty of it!*
- Satellite Operators can “train” ML/AI systems from **their RF Data...**  
...a good start but still a **limiting factor to using ML/AI!**
- ML/AI needs **more (random) Data** to improve the “learning” process.
- ...but there is a **Scarcity of Sharable, Independent RF Data!**

*Space related RF Data is limited and mostly Proprietary!*

**...THIS WILL BE HARD TO RESOLVE!**

**...OR WILL IT?**



# REVISED THINKING & NEW TOOLS REQUIRED:

...from “gut instinct” to **Evidence!**

- Possible LEO constellation interference incidents were discussed as early as 2017.
- No claims of interference, including GEO! Relying on Conjecture. And why? **No Evidence!** No Supporting Data! Talk & No Action, just Rumour!

...Just “gut-instinct” that new **RFI** problems were brewing!

- Early initiatives, started in 2020, actively looking at RF LEO operations, **recorded** the initial **Evidence** that LEO-to-LEO **RFI** existed!

...What is still missing? **A scarcity of Sharable RF Data!**

...What is needed? A systematic approach to collect **Spectrum RF Data**, received simultaneously from two or more Satellites within a receiving antenna’s beam.

- **THRIMOS** - Development started early 2024. Fully Operational since August 2024. Gathering **Spectrum RF Data** & **Real Evidence** of LEO-to-LEO **RFI!**
- A new era of collecting raw, meaningful & quality **Spectrum RF Data** now exists!

**In Conclusion:** **THRIMOS** Starts to solve the **scarcity of Sharable RF Data** to ensure **Spectrum Management** is doable.

**Moving Forward:**

<p><b>Satellite Operators:</b></p> <ul style="list-style-type: none"> <li>• Monitor their Spectrum &amp; its Use more intensively.</li> <li>• Constellation with Co-managed Service Planning to avoid RFI at <b>ALL</b> times!</li> <li>• Plan &amp; bring in New Tools to move towards ML/AI <b>Spectrum Management</b>.</li> </ul>	<p><b>Regulators / ITU...</b></p> <ul style="list-style-type: none"> <li>• A method to Verify / Falsify International Agreements?</li> <li>• Ensure Agreements made so Compliance can be Measured</li> <li>• Move Static Filing towards: <ul style="list-style-type: none"> <li>○ Dynamic, Performance-based Spectrum Rights</li> <li>○ Realtime Coordination Mechanisms</li> <li>○ Stronger Enforcement of “use-it-or-lose-it” Rules</li> <li>○ Better Inclusion of Emerging Actors.</li> </ul> </li> </ul>	<p><b>More Importantly...</b></p> <p><b>Create both National &amp; Global Repositories of <u>Sharable RF Data!</u></b></p>
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...from the Original Thinking behind S3A:

...a **Colem Experiment** started in 2020!

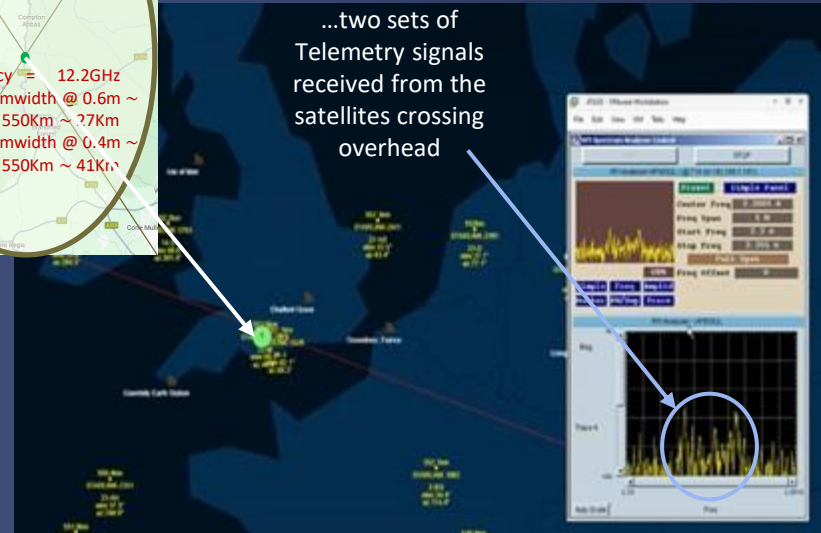
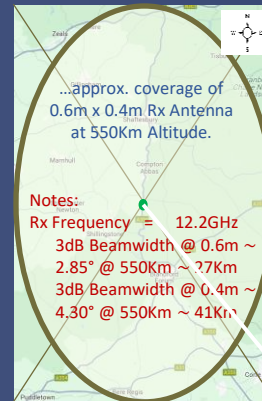
...an Educational/Science Project

**GEO Reference:**

FreeSat on ASTRA Fleet  
@ 28.2°E

**Zenith:**

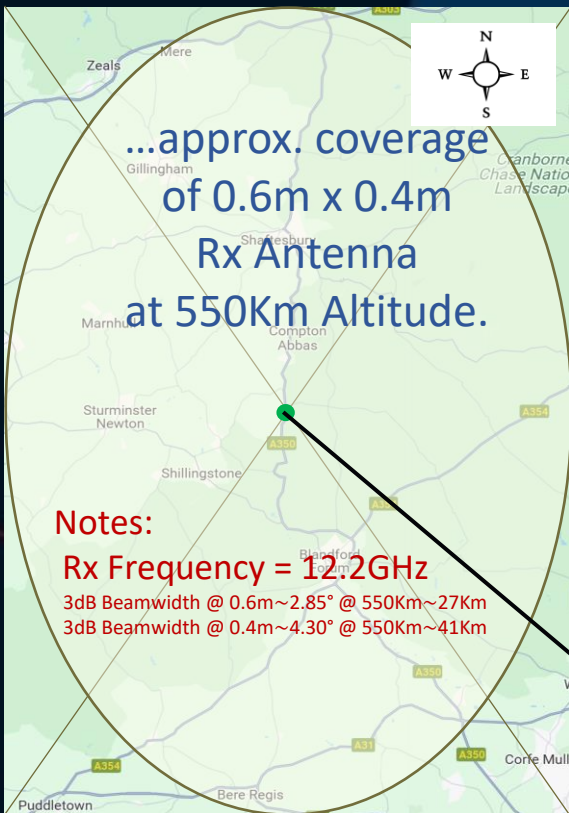
Starlink & OneWeb Tracking  
Reference Position



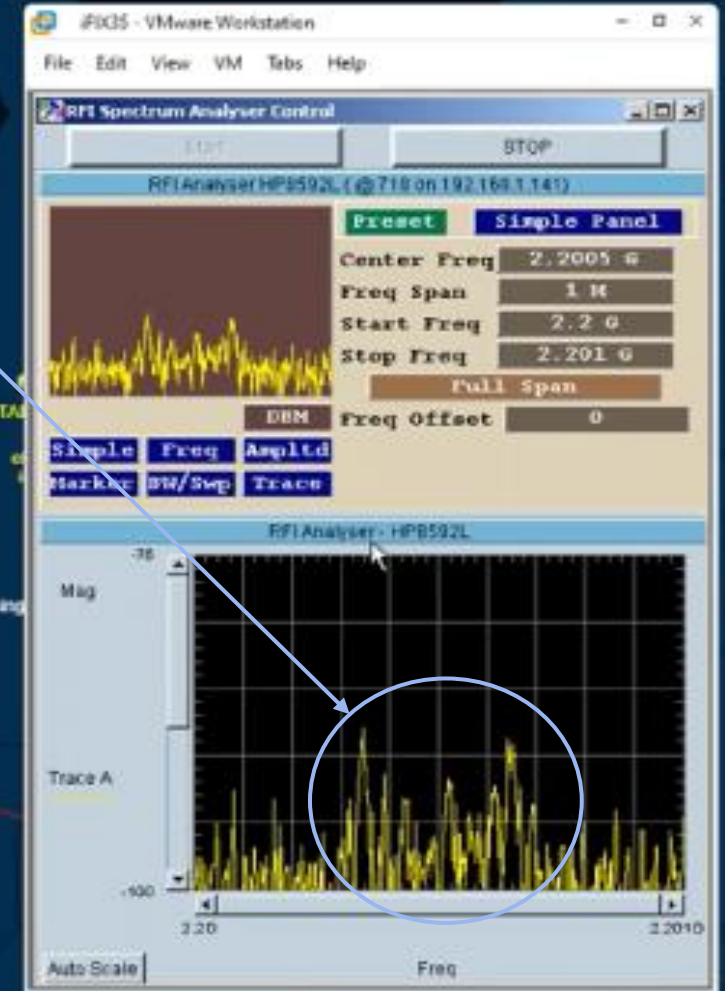


# ...those Initial (*albeit basic*) Results!

...an Educational/Science Project



...two sets of Telemetry signals received from the satellites crossing overhead





## **Contact...**

**Martin Coleman:**

COLEM: Partner  
Engineering

*...THANK YOU*

**Websites:**

**COLEM RESOURCE LIBRARY:**

<https://rfi.colem.co.uk/>

