

2023-02-24 Spoofing Earth Observation Satellites through Radio
Overshadowing

- └ Countermeasures
- └ Countermeasures

Multi-receiver data comparison

- Certain systems already have multiple receiver stations
- Protects against decoder exploitation
- Doesn't require any hardware modifications to the receiver

Timing analysis

- Triangulating the source effective in other systems such as aircraft
- Calculated position can be compared against orbital parameters
- Requires accurate clock synchronisation and multiple receivers

Physical-layer fingerprinting

- Analyse properties of the legitimate/overshadowed signal
- Only effective on the downlink
- Traditional approaches like analysing signal-to-noise may prove effective

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Cryptography should be required in future satellites
But existing satellites can't be upgraded

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Backwards-compatible countermeasures:

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© International et al. (2017) "On-board Authentication Using GNSS Signatures in Satellite Networks"

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Backwards-compatible countermeasures:

- Multi-receiver data comparison
- Timing analysis²
- Physical-layer fingerprinting³

²Antonova et al. (2021) "Orbit-based authentication using GNSS signals in satellite networks"

³Ogier et al. (2022) "Physical layer authentication of satellite transmitters via Deep Learning"

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Comparative analysis presented in the paper

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