

International Meteor Conference

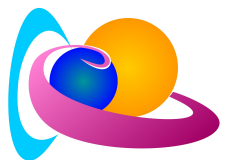
Aug 30 – Sep 2, 2018
Pezinok – Modra, Slovakia



Using SPADE for radio meteor observations

A. Martínez Picar and C. Marqué

*Additional help from ROB colleagues:
A. Ergen, M. De Knijf, V. Honet, P. Motte*



Solar-Terrestrial
Centre of Excellence



Solar Influences
Data analysis Center



Royal Observatory
of Belgium

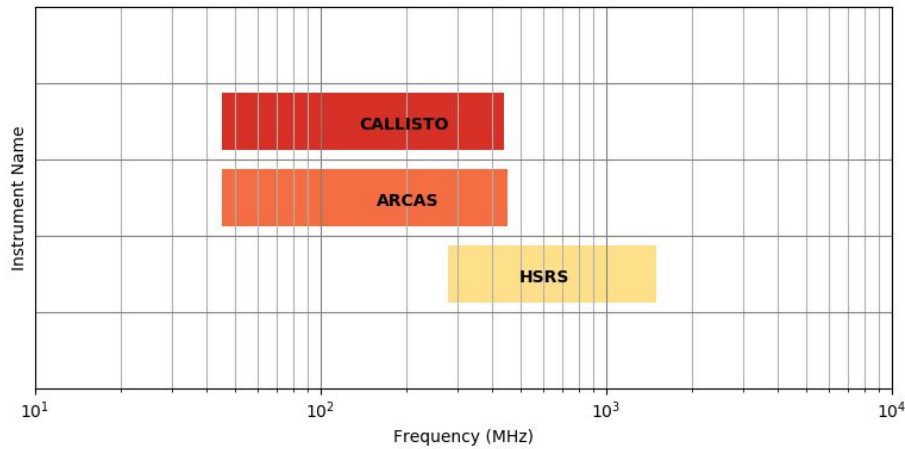
Belgian Science Policy Office



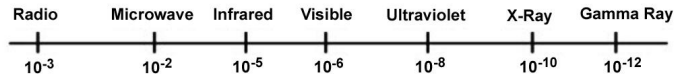
belspo

SPADE – The Project

A new radio-telescope for low-frequencies



Wavelength (meters)



Frequency (Hz)

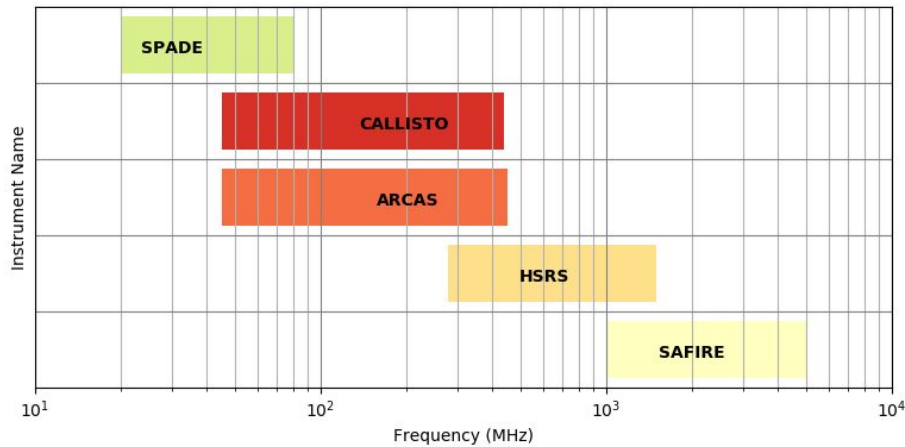


V I S I B L E L I G H T

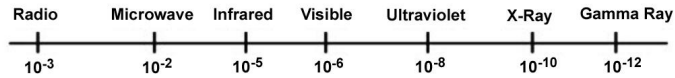


SPADE – The Project

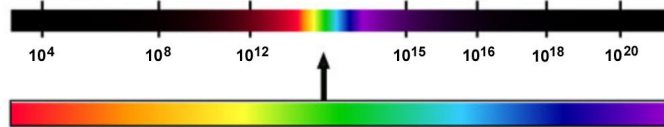
A new radio-telescope for low-frequencies



Wavelength (meters)



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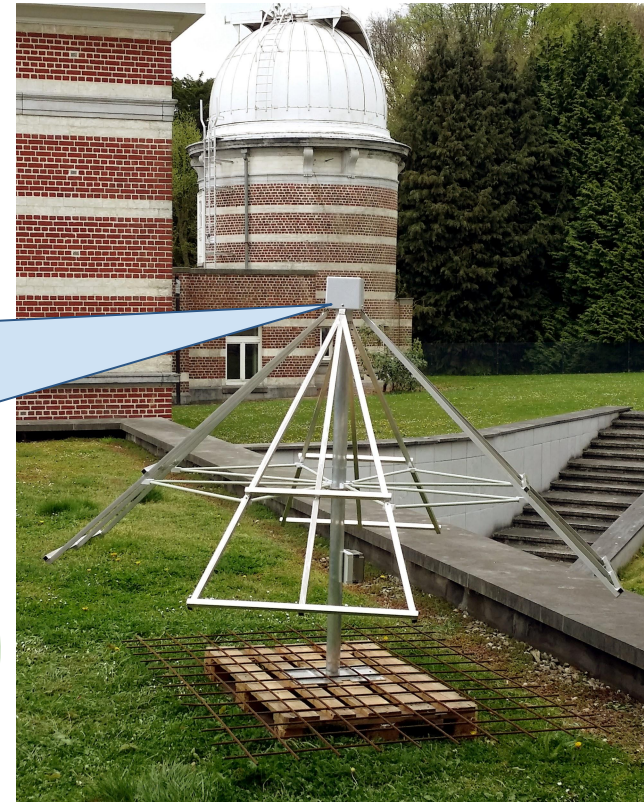


V I S I B L E L I G H T

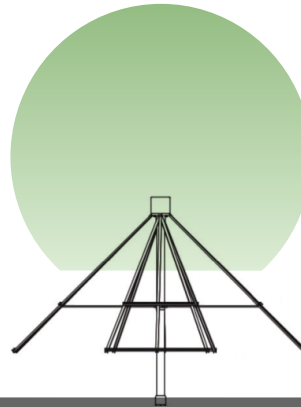


Beamforming technique

Principle



Antenna
Pattern
 $G_{max} = 0.8 \text{ dBi}$

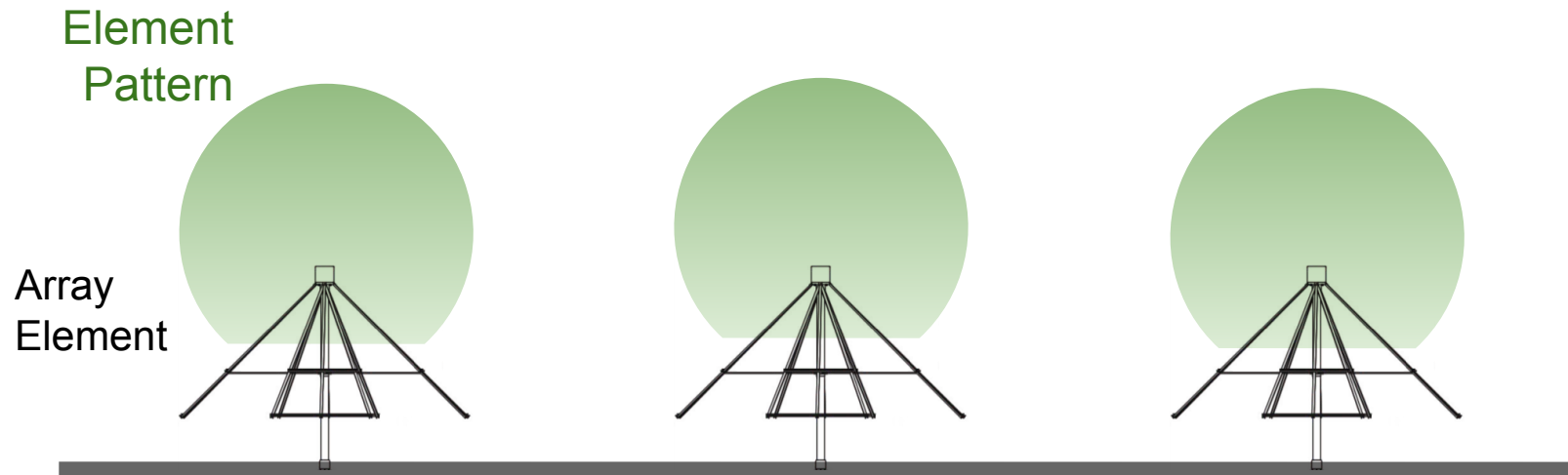


NENUFAR
Project
Antenna

- Cross *thick inverse vee*
- Additional conductive grid underneath
- Dual polarisation available

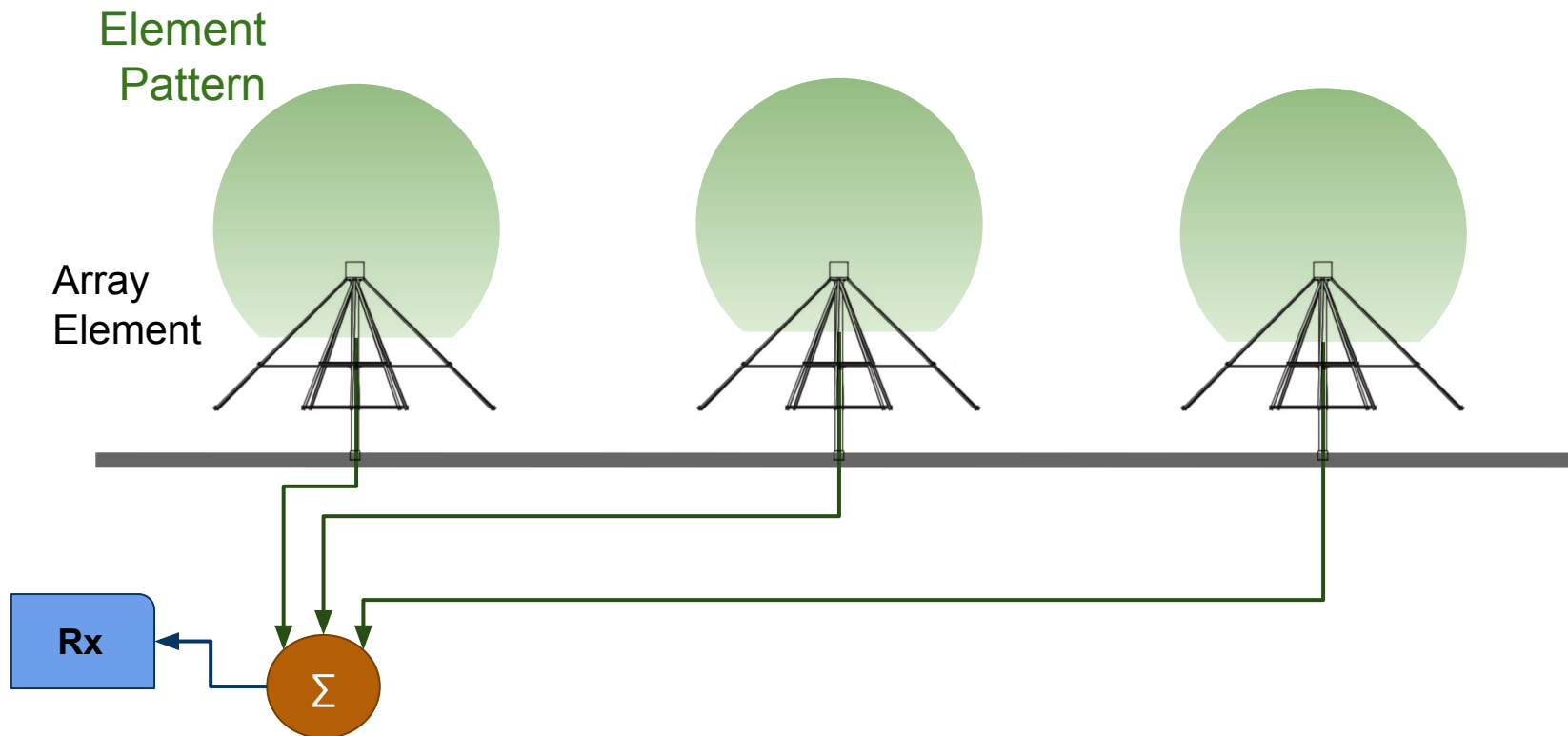
Beamforming technique

Principle



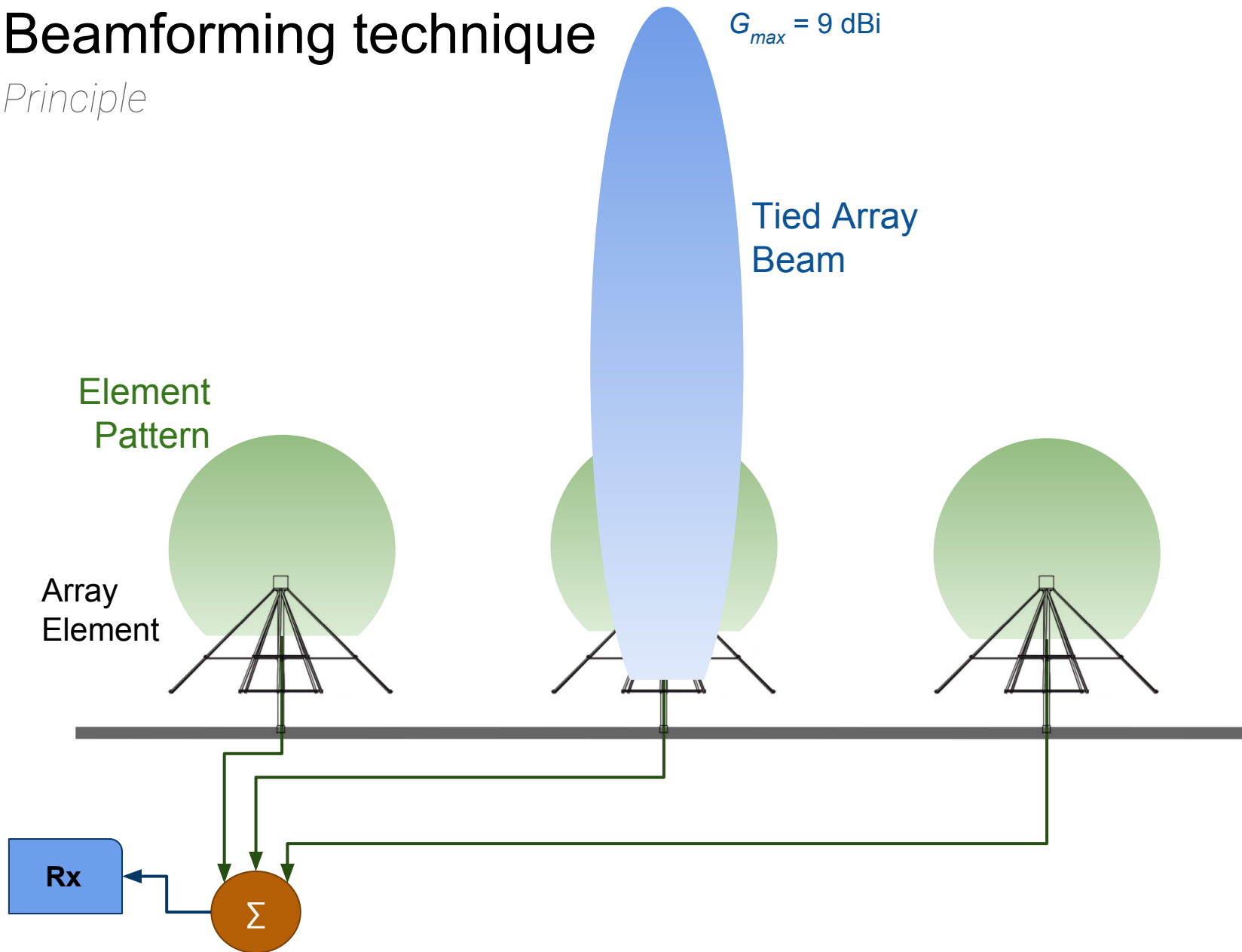
Beamforming technique

Principle



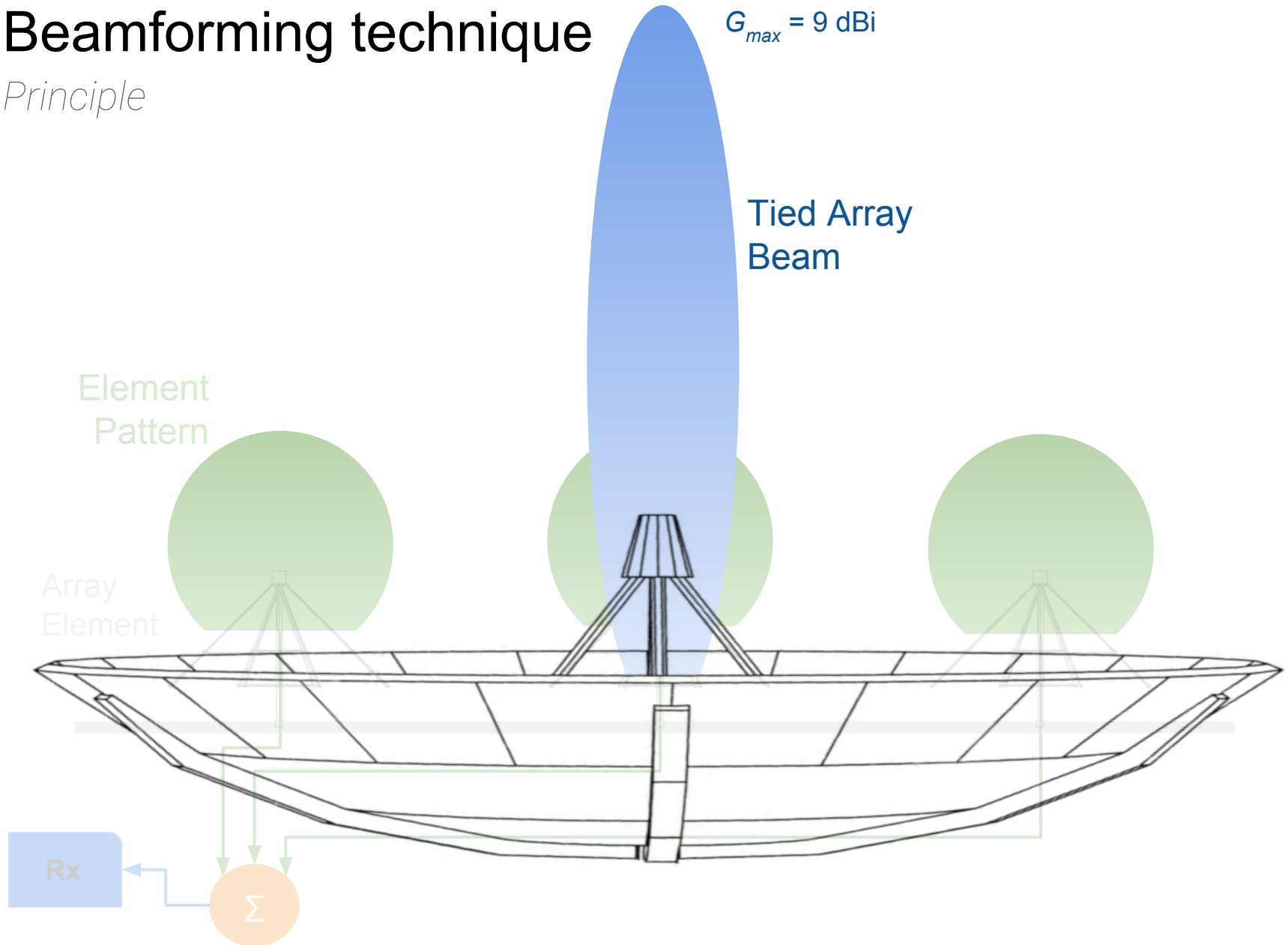
Beamforming technique

Principle



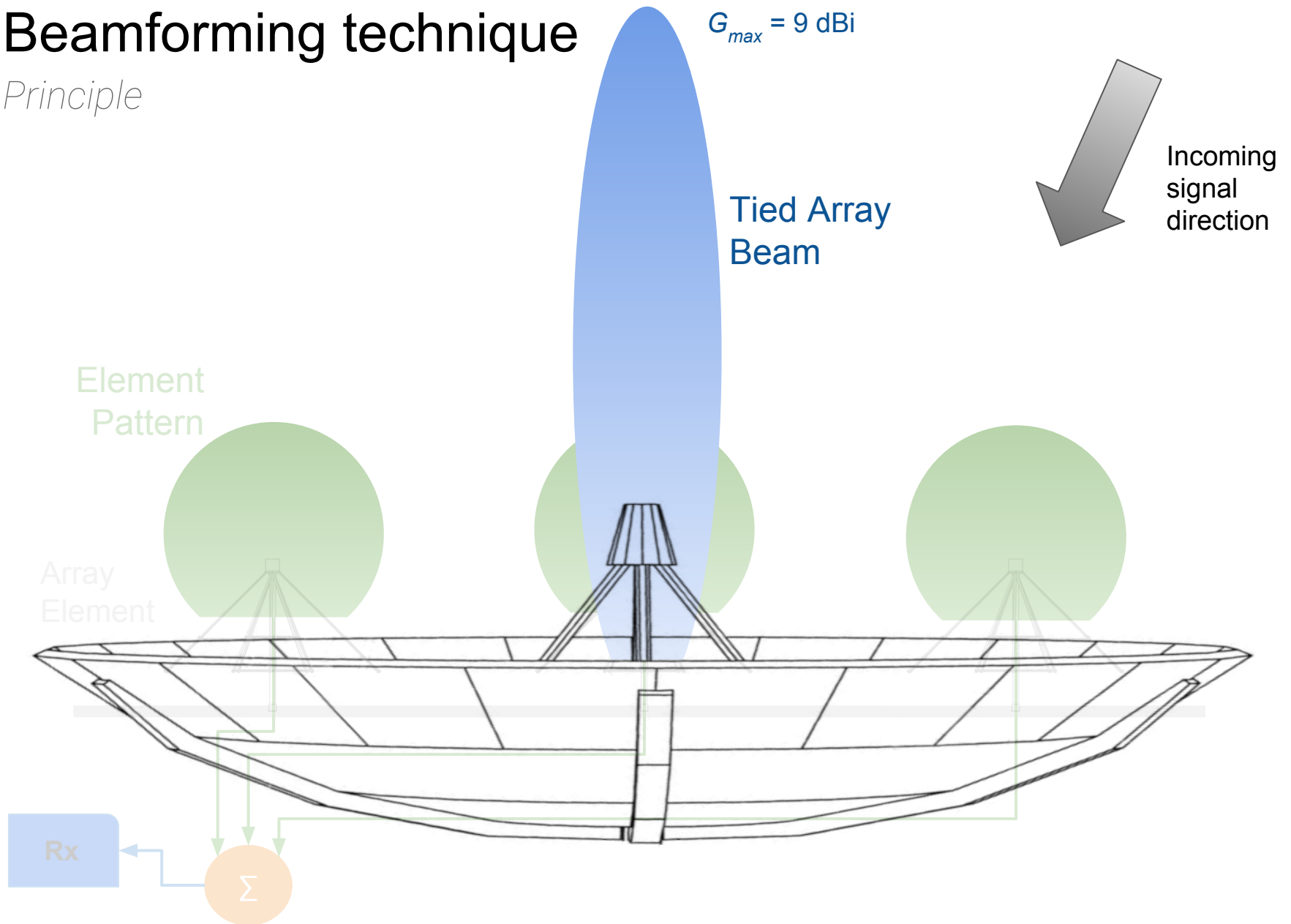
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Principle



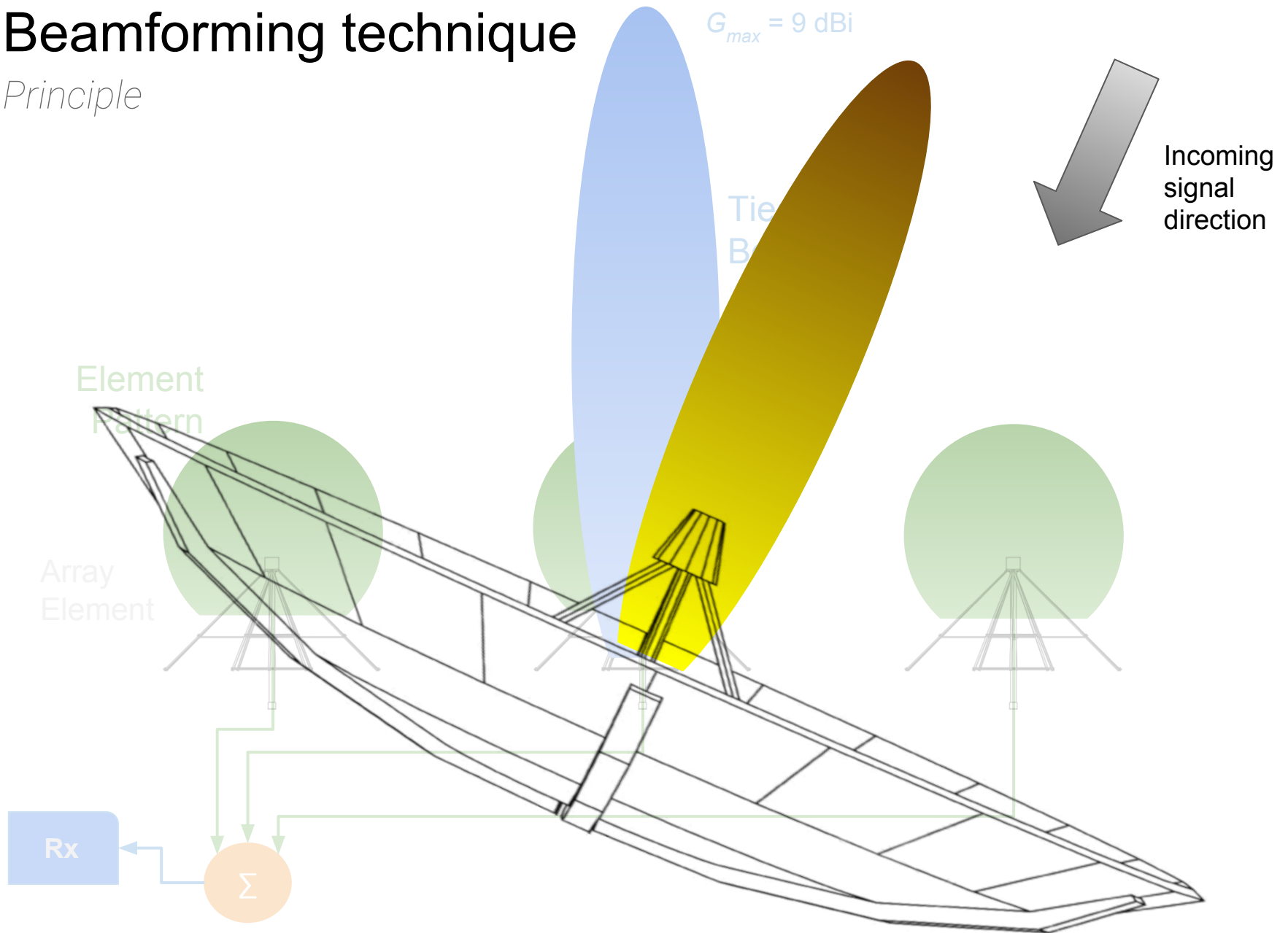
Beamforming technique

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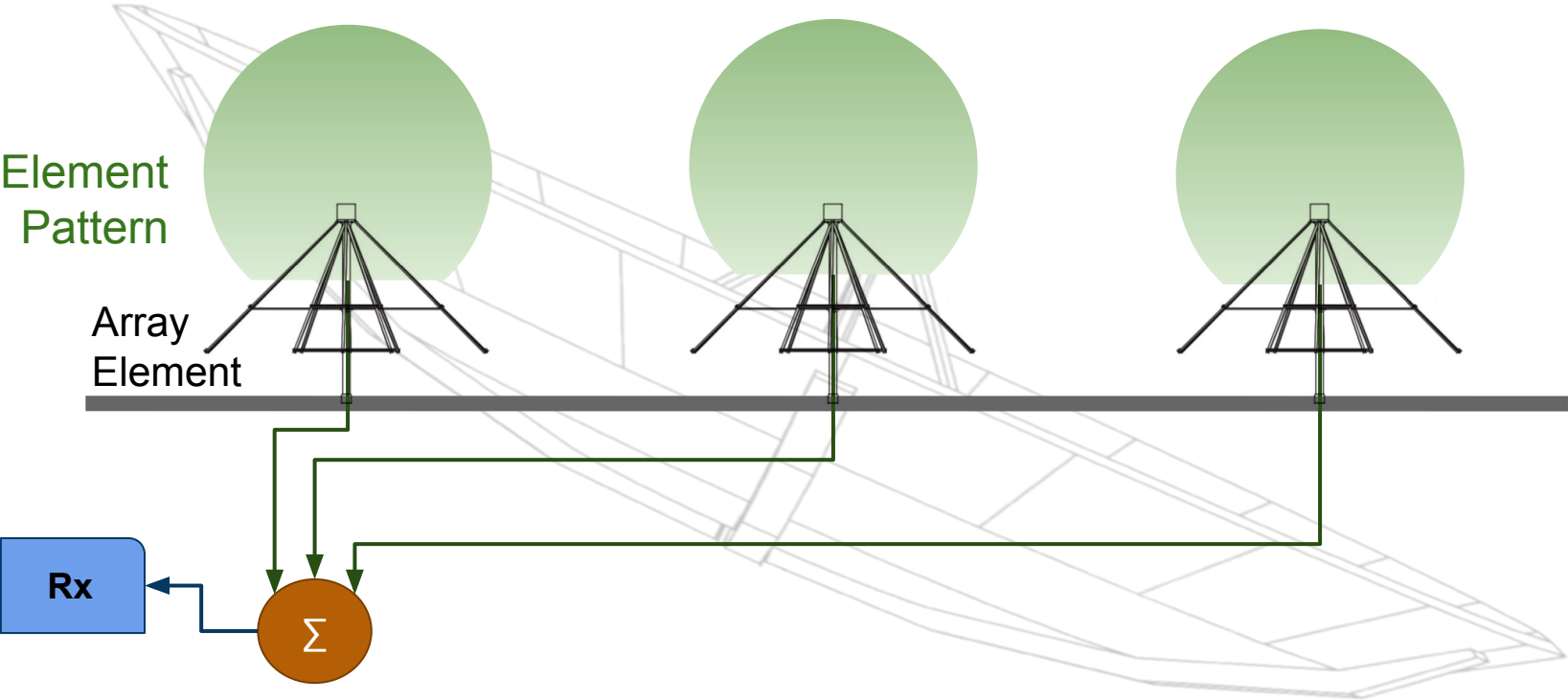
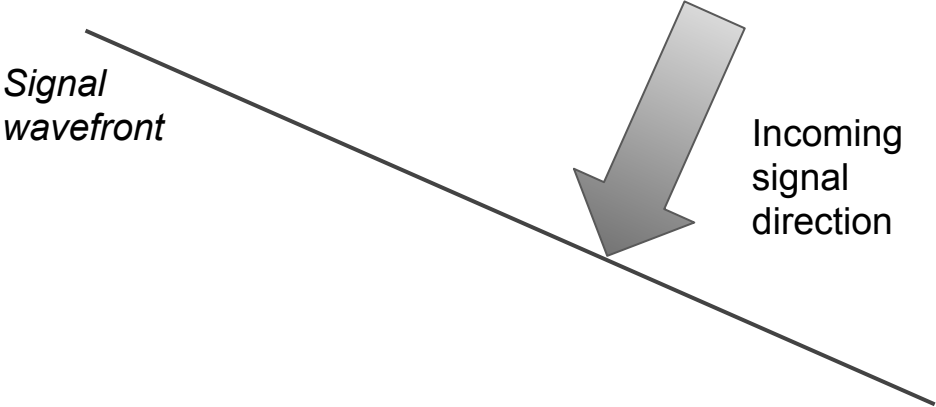
Beamforming technique

Principle



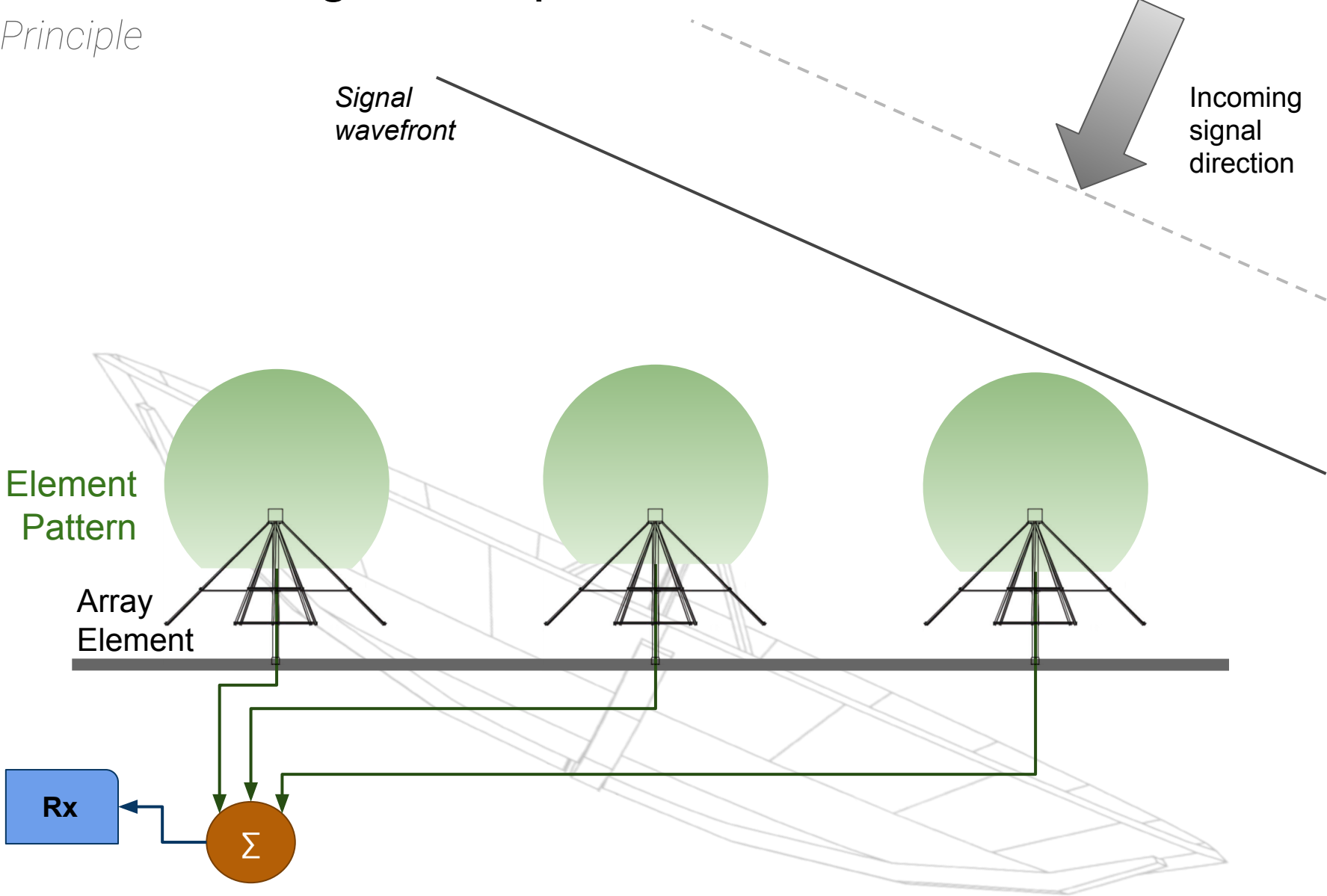
Beamforming technique

Principle



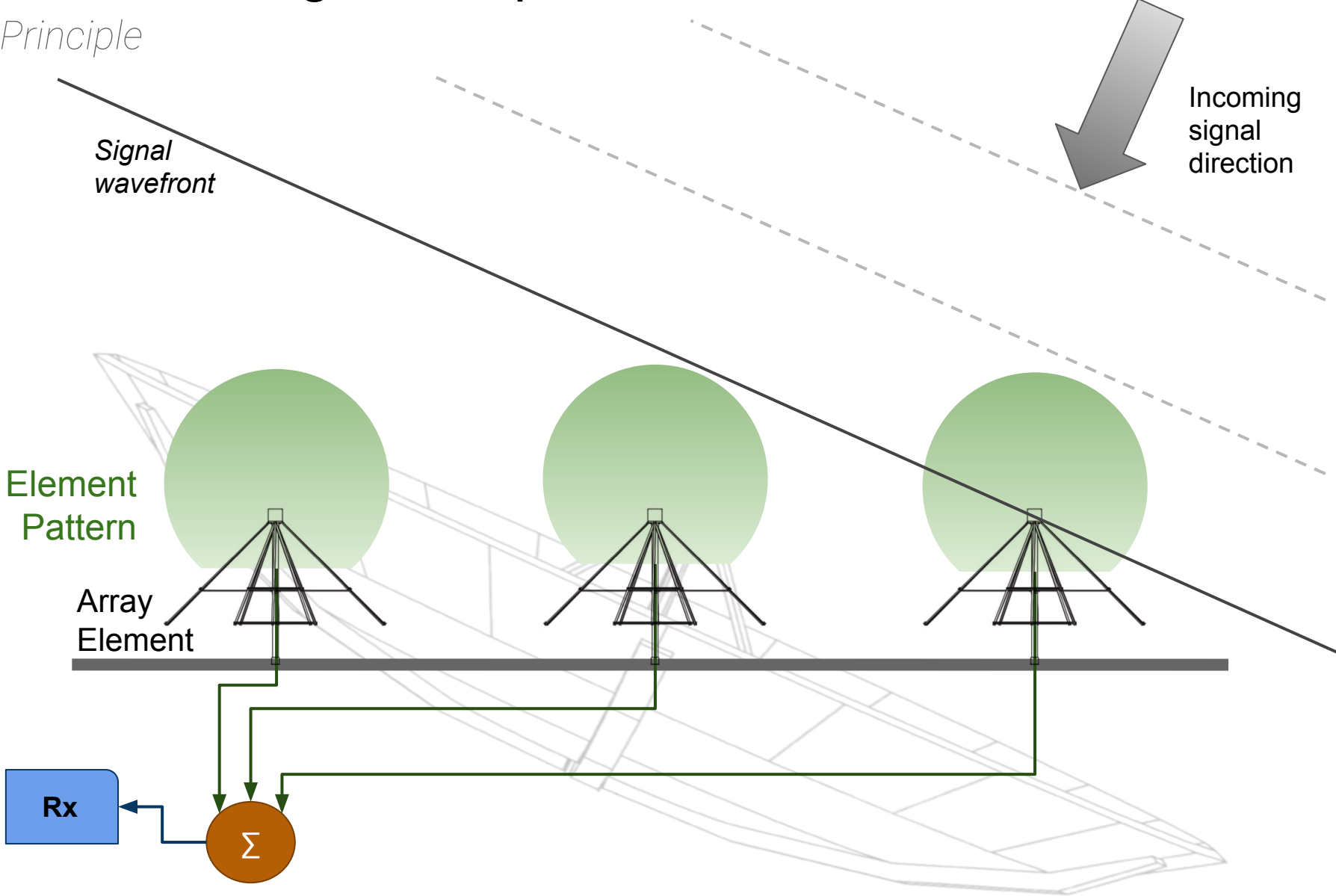
Beam-forming technique

Principle



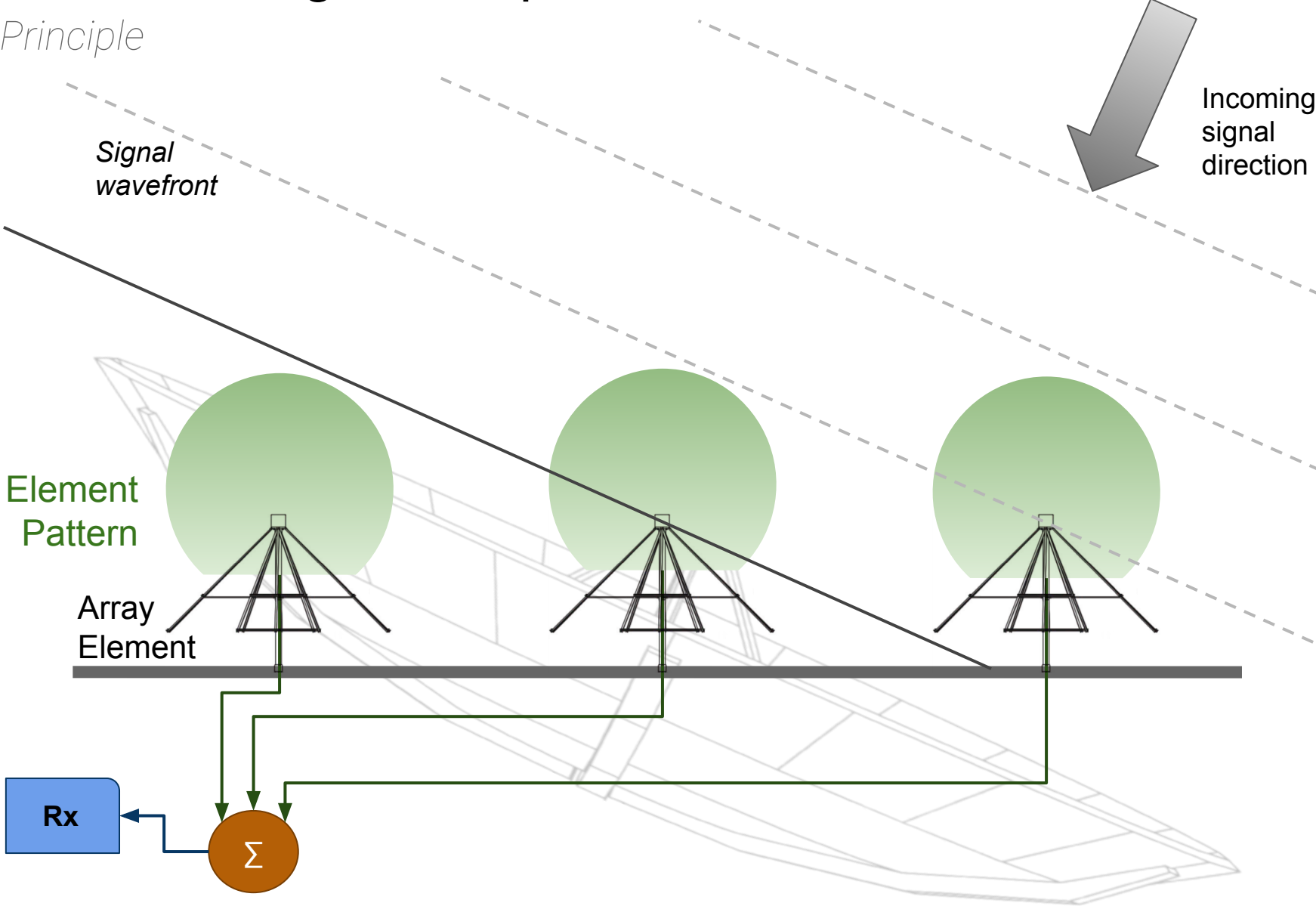
Beamforming technique

Principle



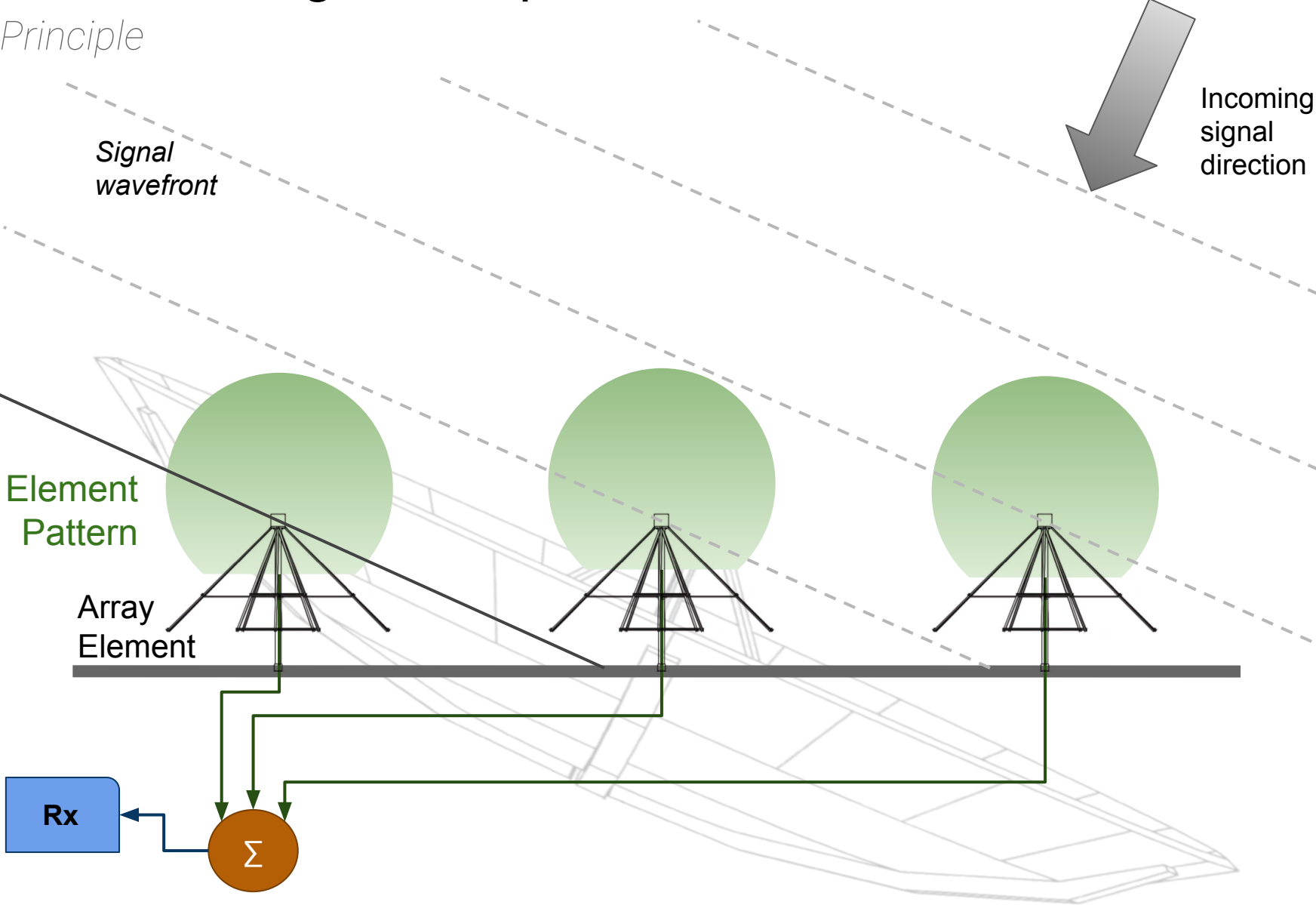
Beamforming technique

Principle



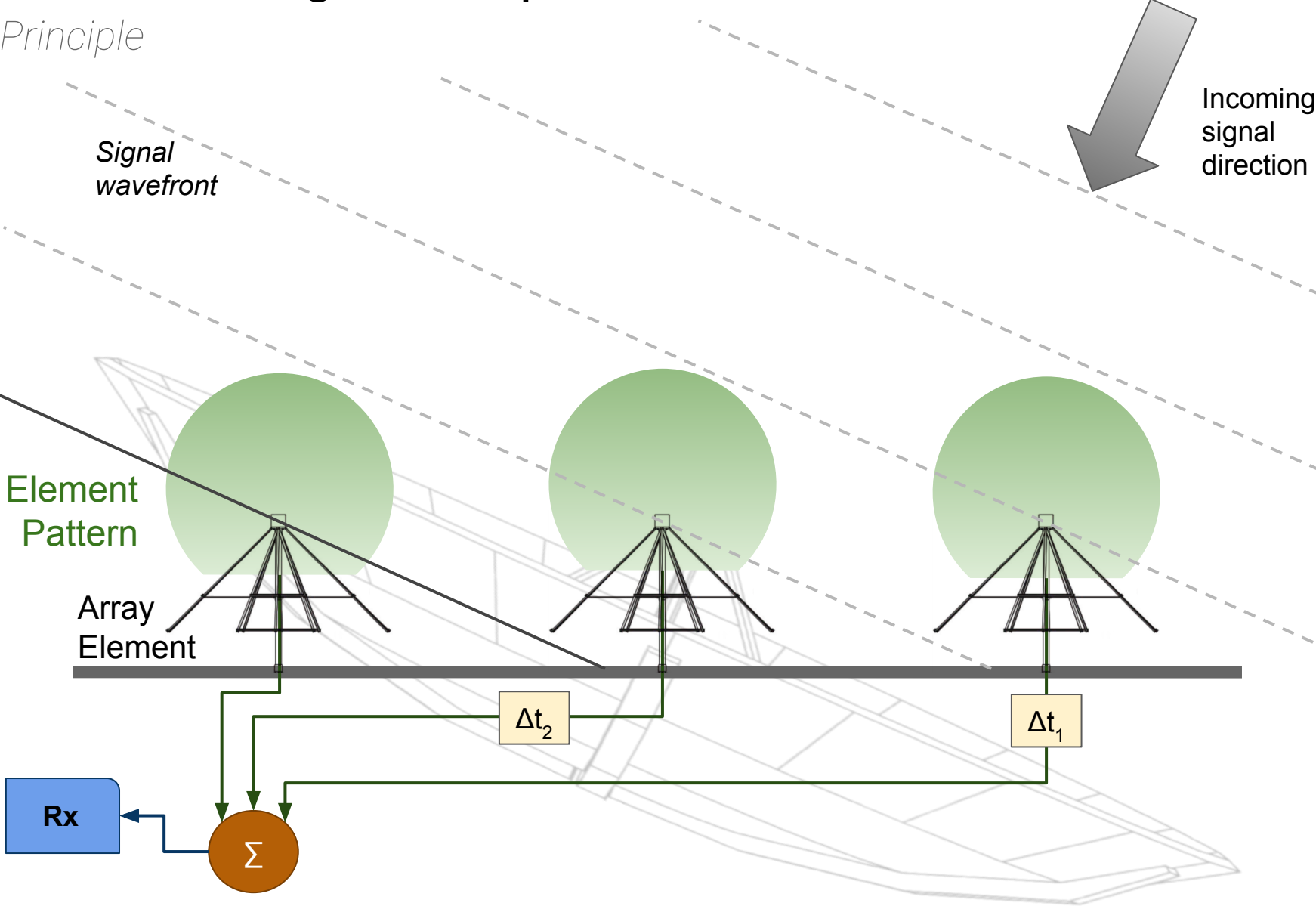
Beamforming technique

Principle



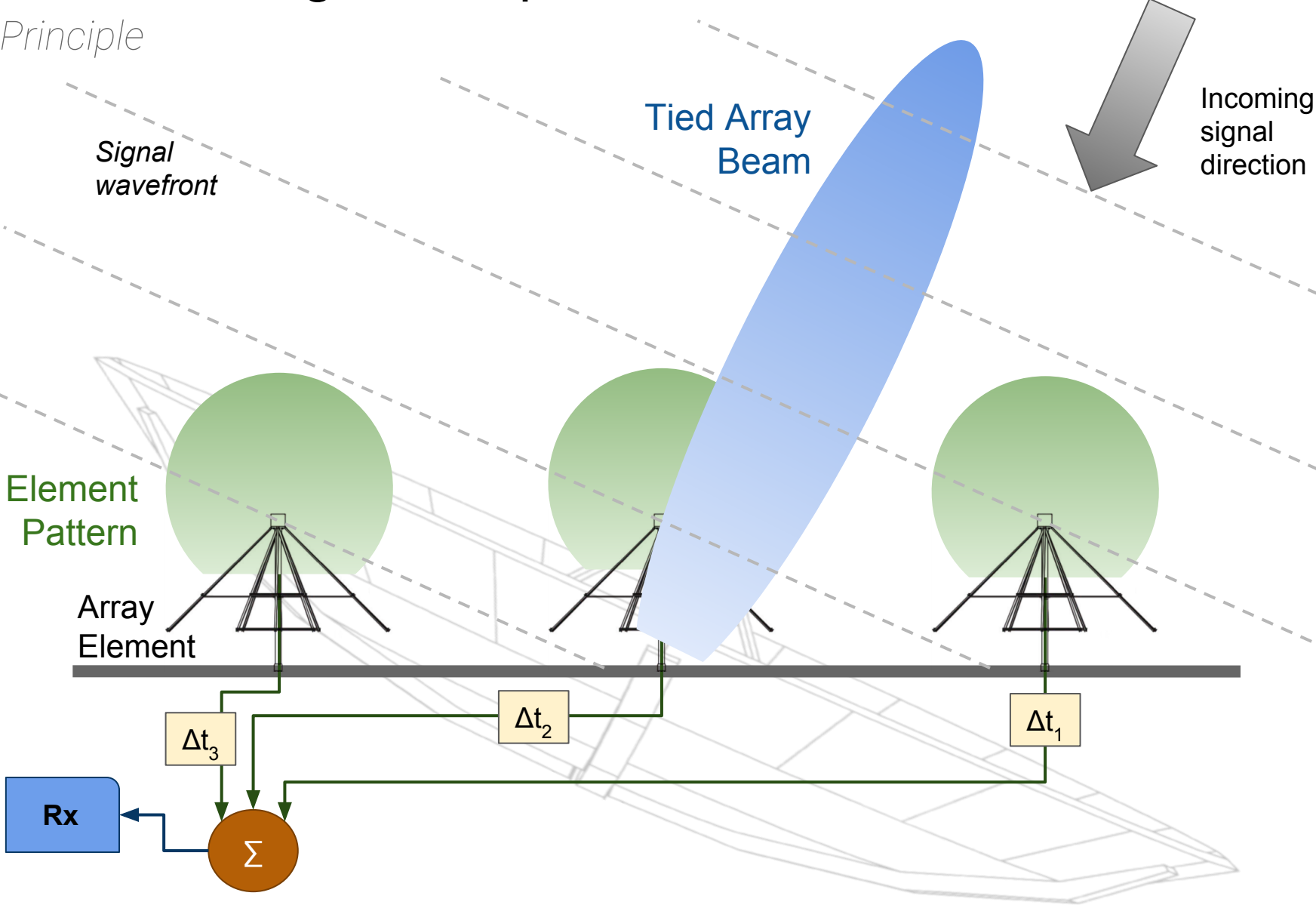
Beamforming technique

Principle



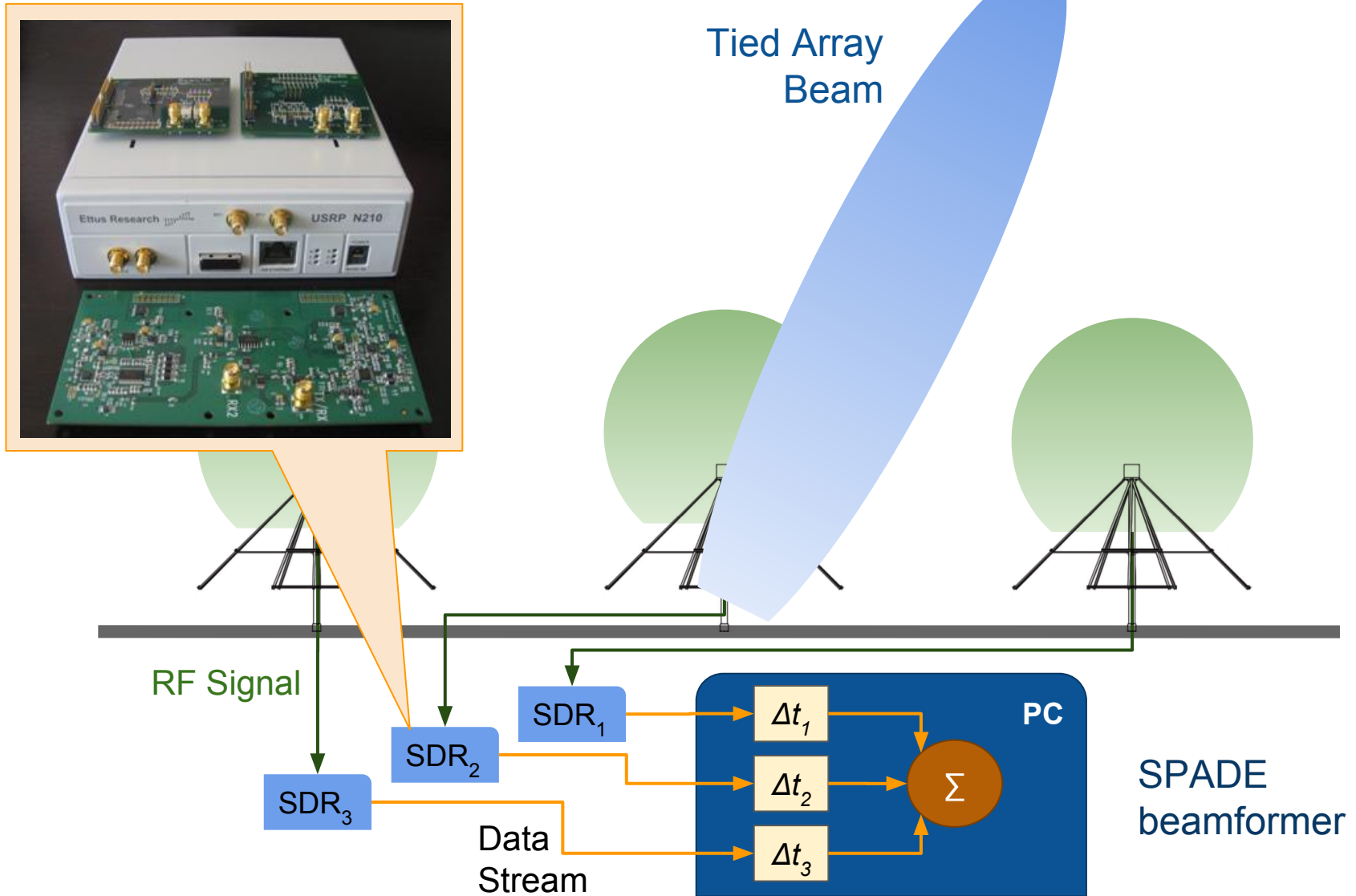
Beamforming technique

Principle



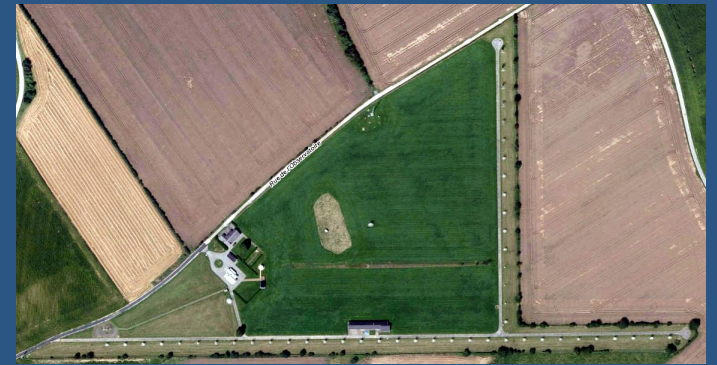
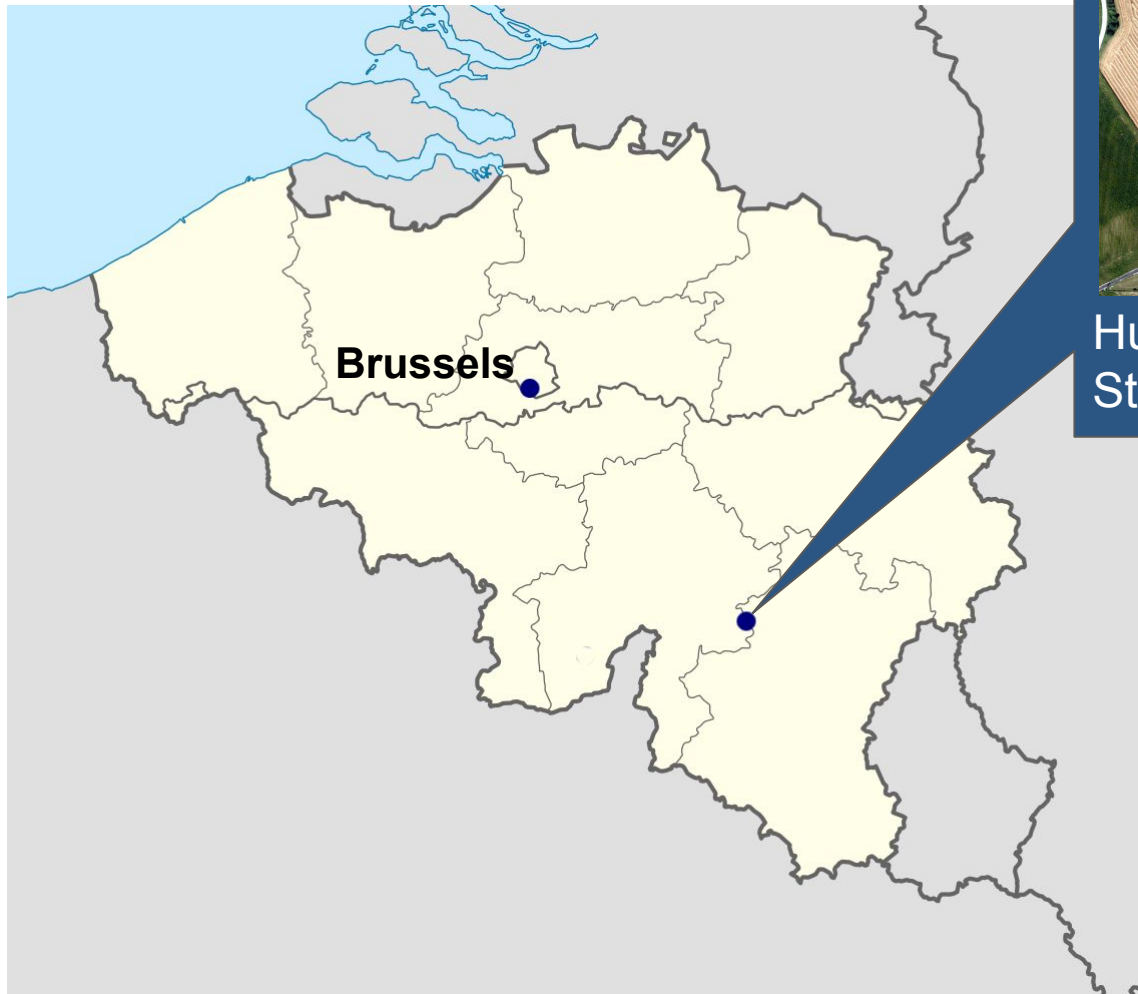
Beamforming technique

Principle



Building SPADE

Location



Humain Radio–Astronomy
Station

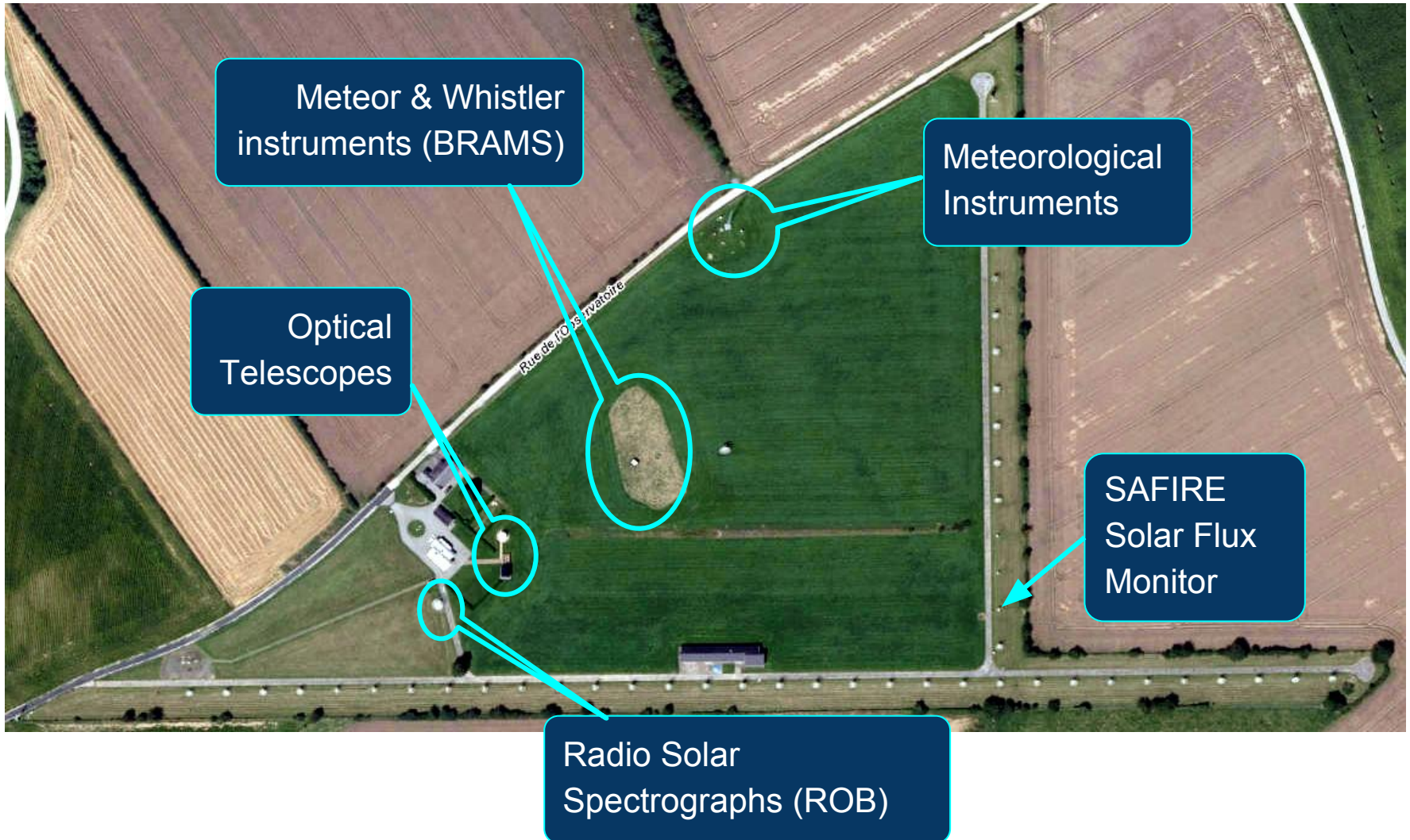
Building SPADE

Humain Radio–Astronomy Station



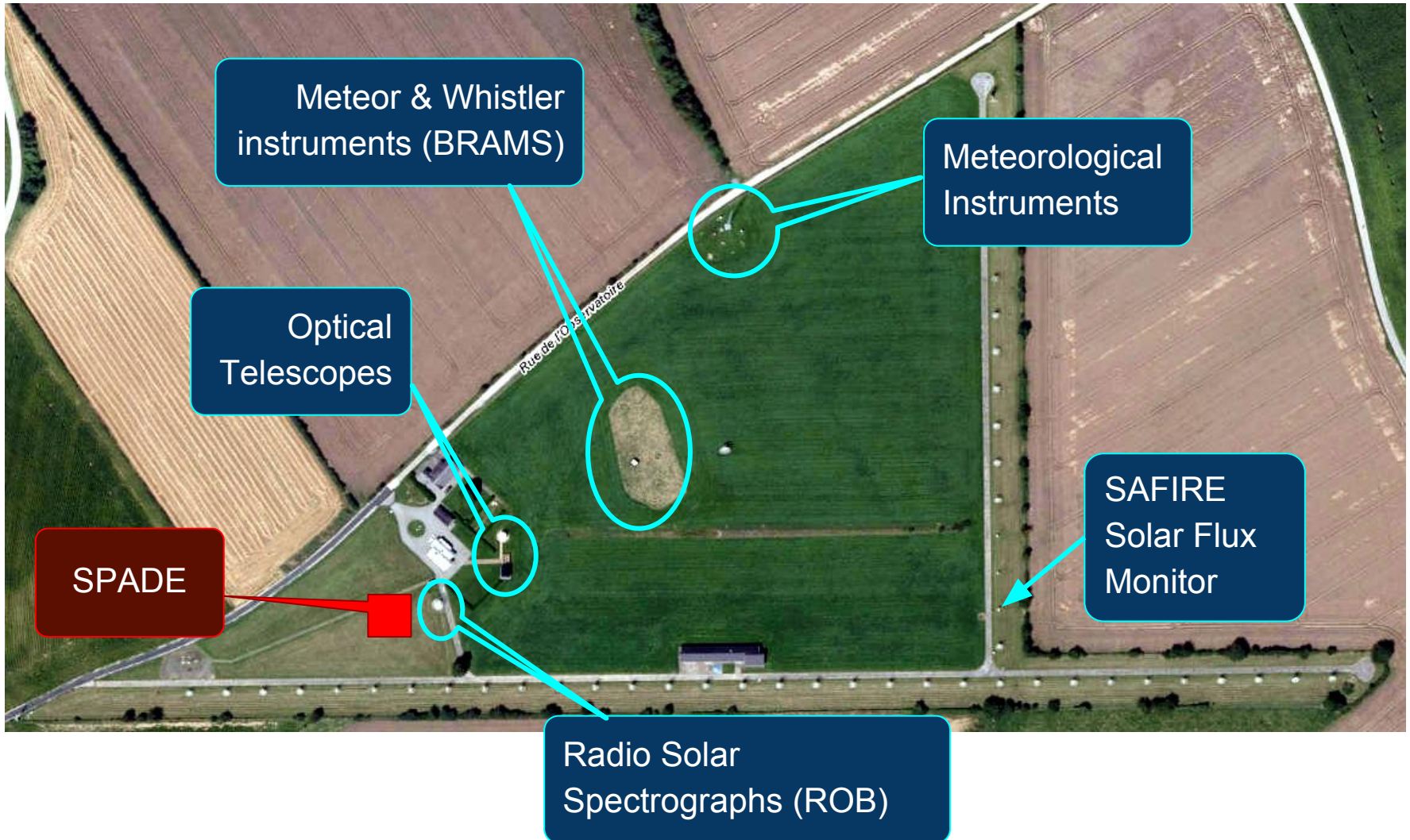
Building SPADE

Humain Radio–Astronomy Station



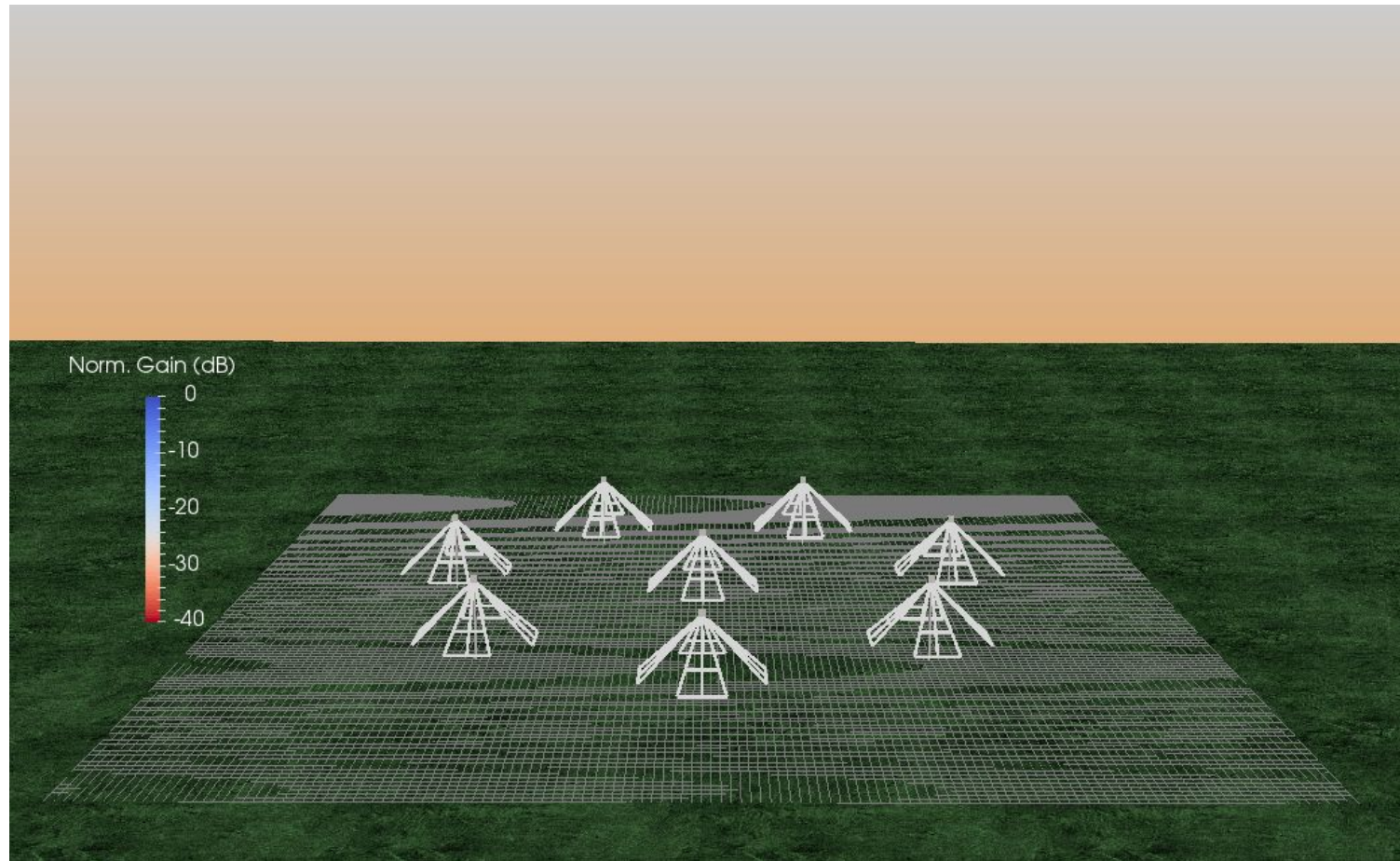
Building SPADE

Humain Radio–Astronomy Station



Building SPADE

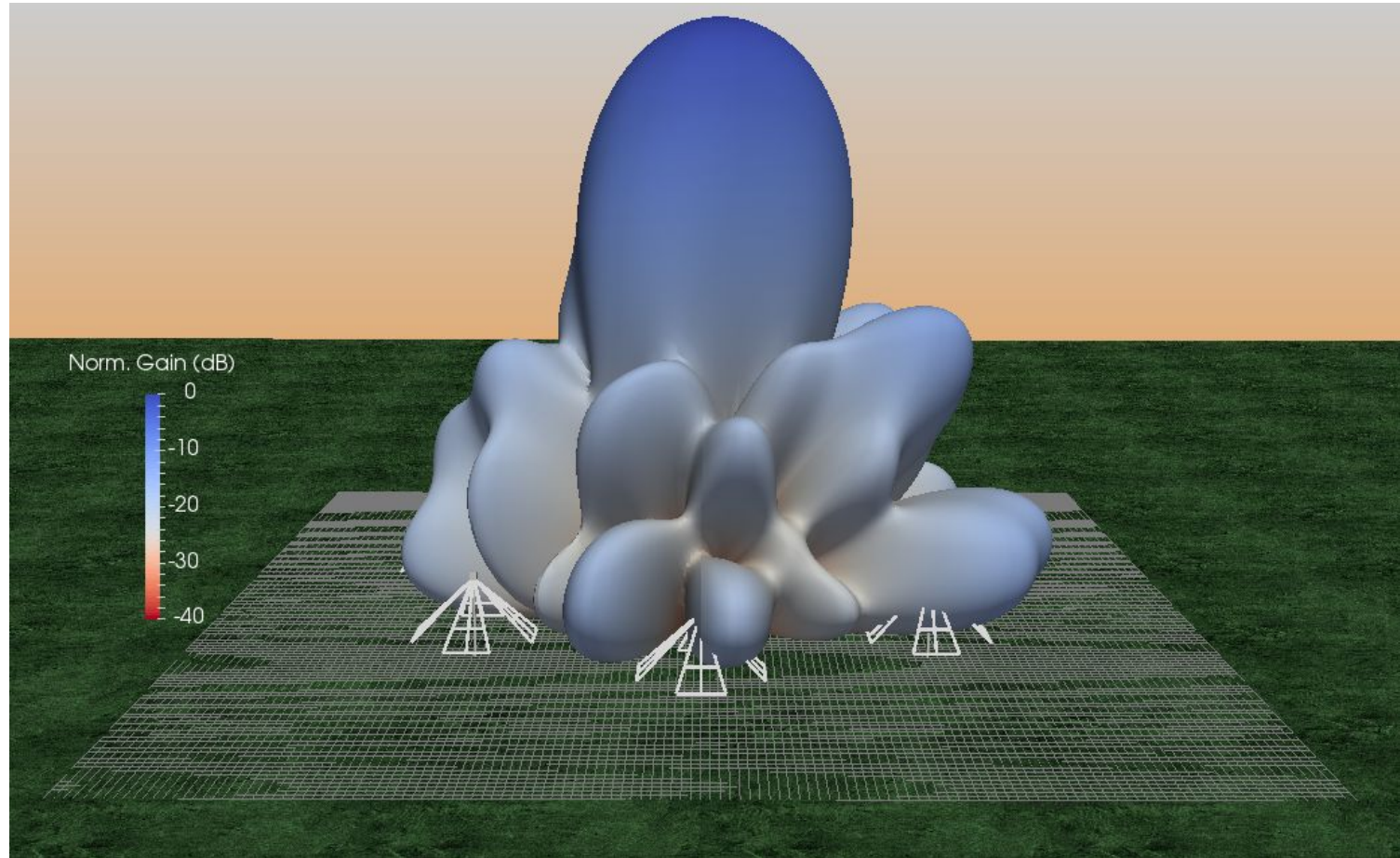
Array Configuration



The layout of the array must provide a symmetric beam with low sidelobe levels

Building SPADE

Array Configuration



The layout of the array must provide a symmetric beam with low sidelobe levels

Building SPADE

Terrain preparation



Building SPADE

Terrain preparation



Building SPADE

Terrain preparation



Building SPADE

Terrain preparation



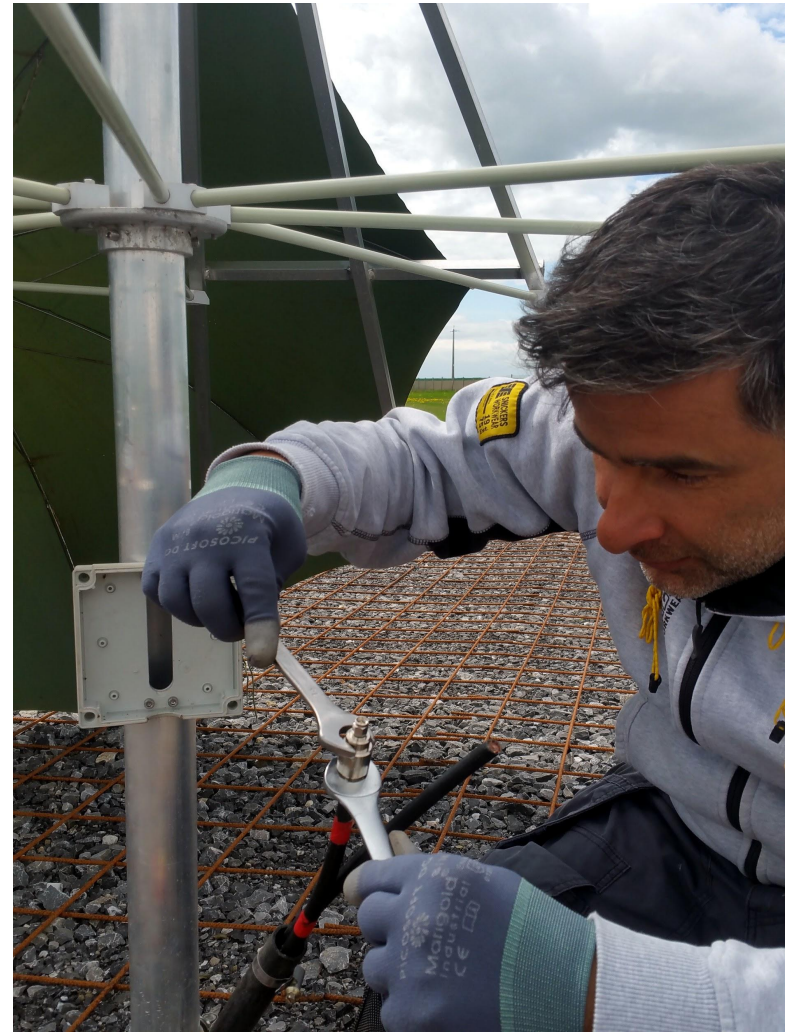
Building SPADE

Array Field



Building SPADE

Array Field



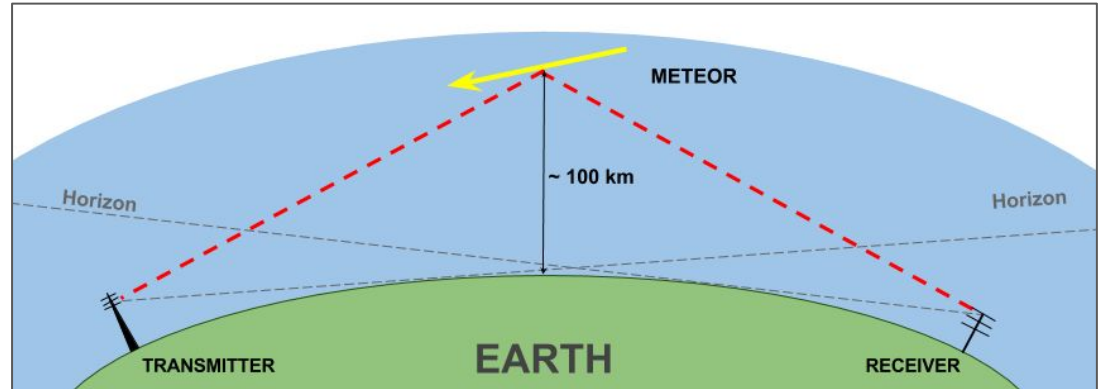
Building SPADE

Array Field



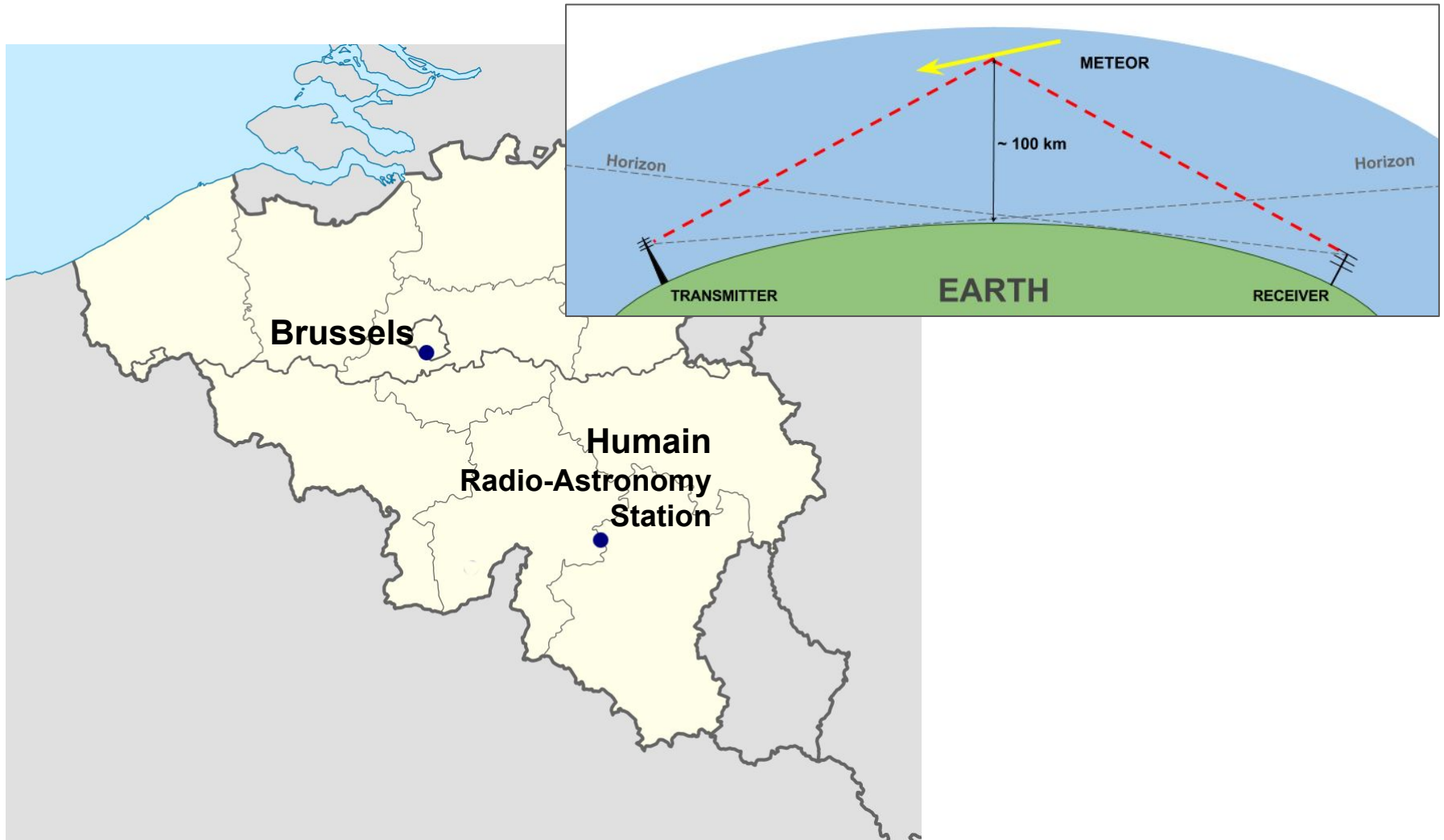
Building SPADE

Forward-scattering



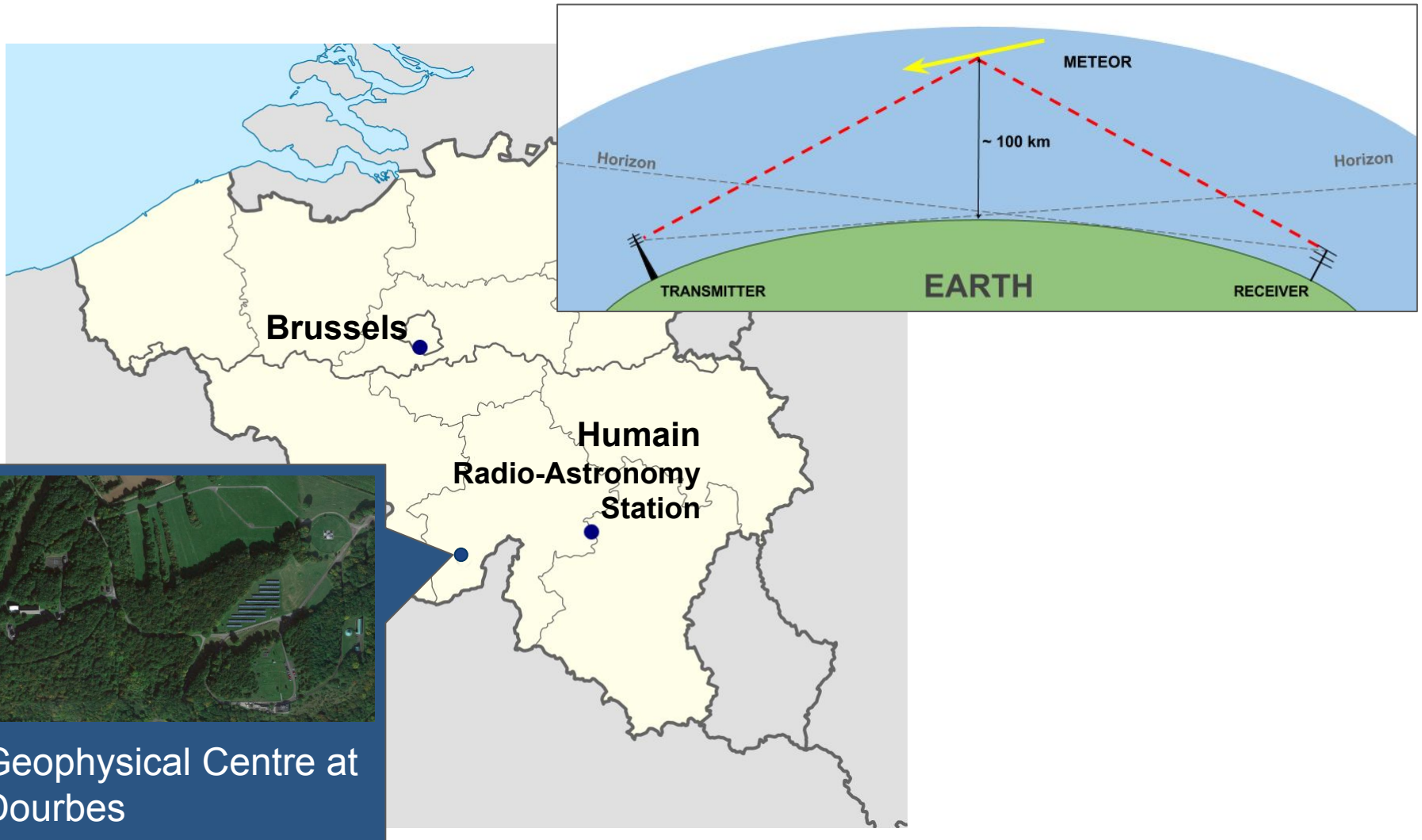
Building SPADE

Forward-scattering in Belgium



Building SPADE

Forward-scattering in Belgium



Geophysical Centre at Dourbes

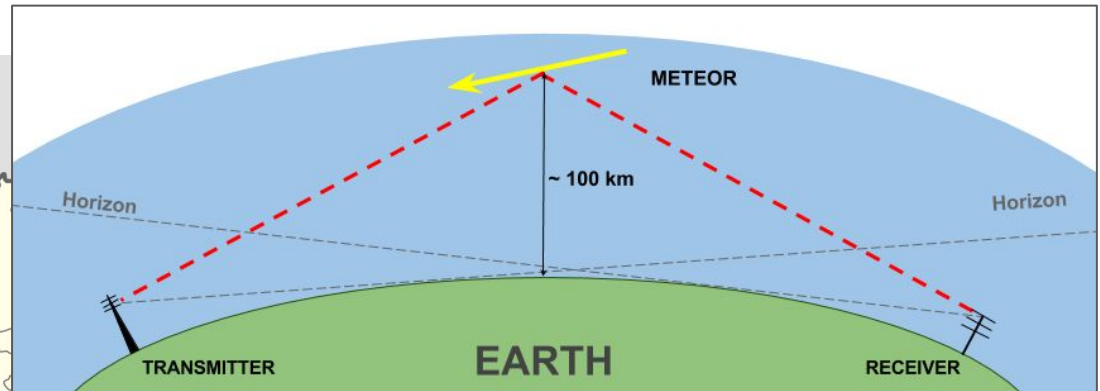
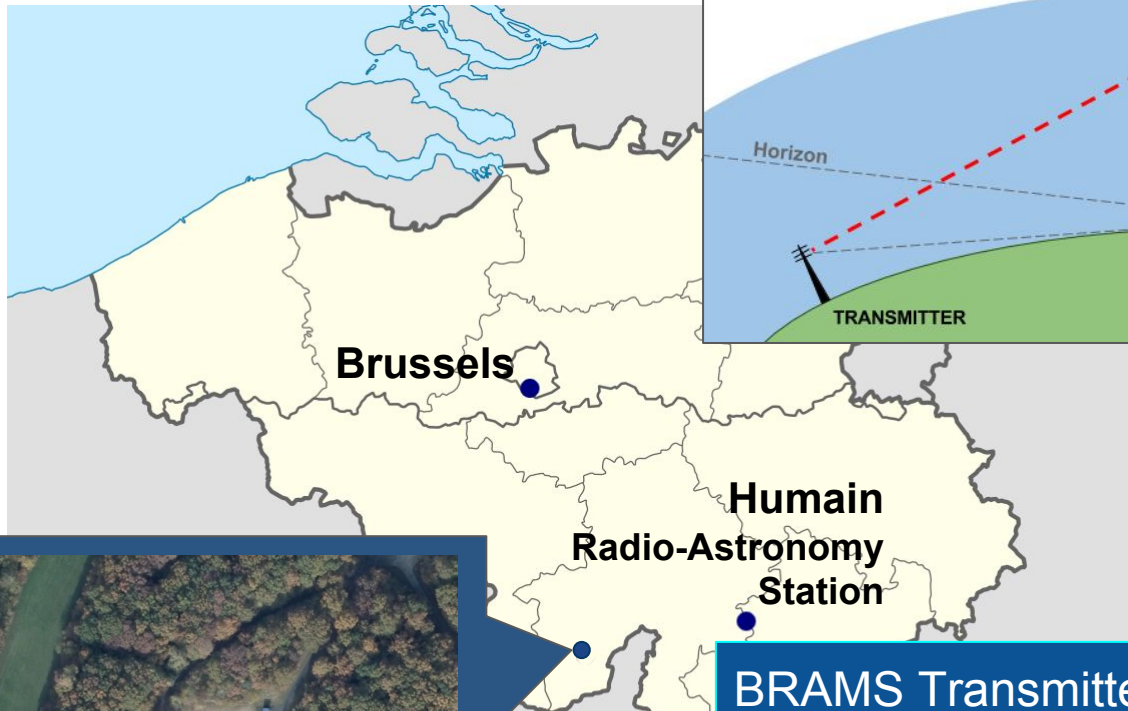
Building SPADE

Forward-scattering in Belgium



Building SPADE

Forward-scattering in Belgium



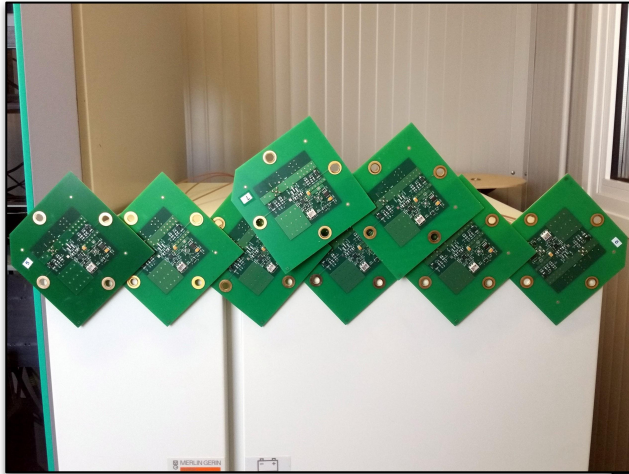
Geophysical Centre at Dourbes

BRAMS Transmitter – $f \sim 50$ MHz



Testing SPADE

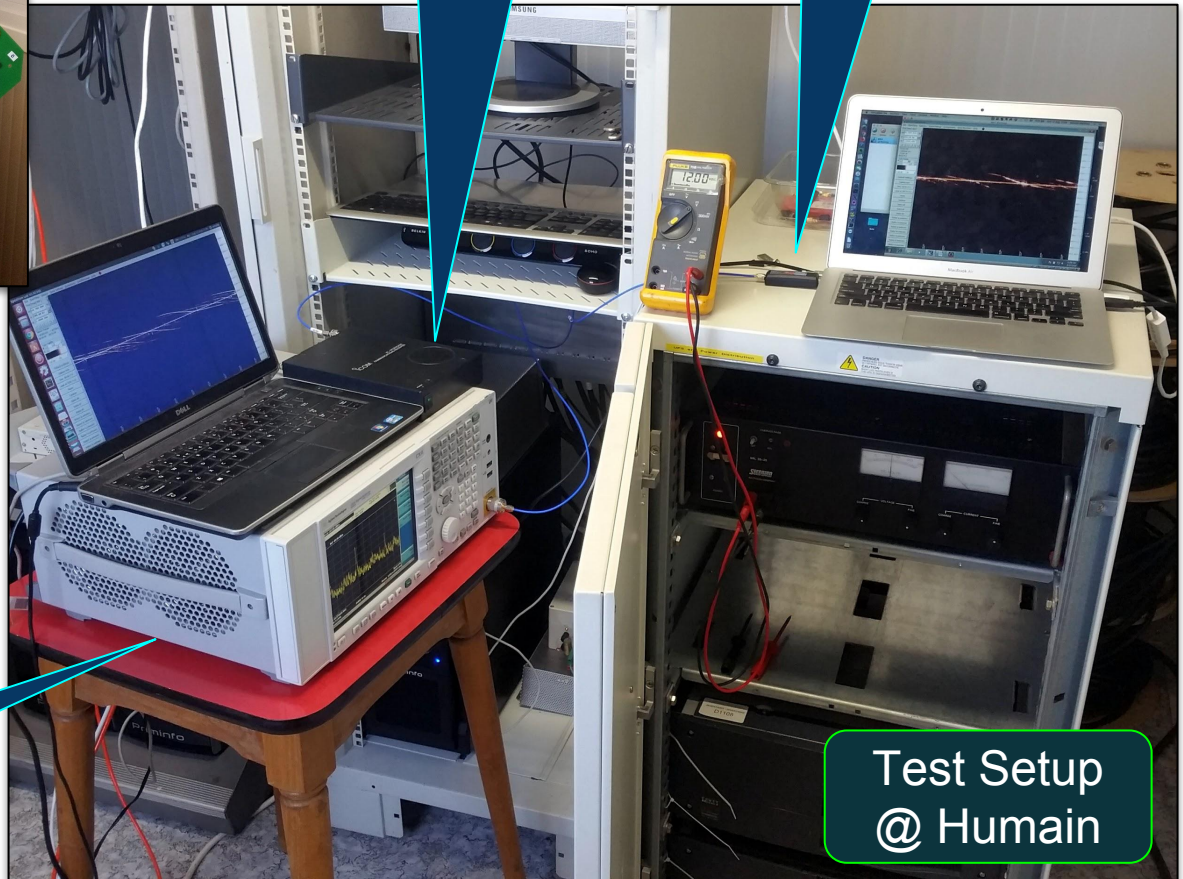
August 2018



Front End Electronics
(preamplifiers+baluns)
of SPADE antennas

Analog Receiver
Icom PCR1500

SDR Rx
Fun Cube Dongle

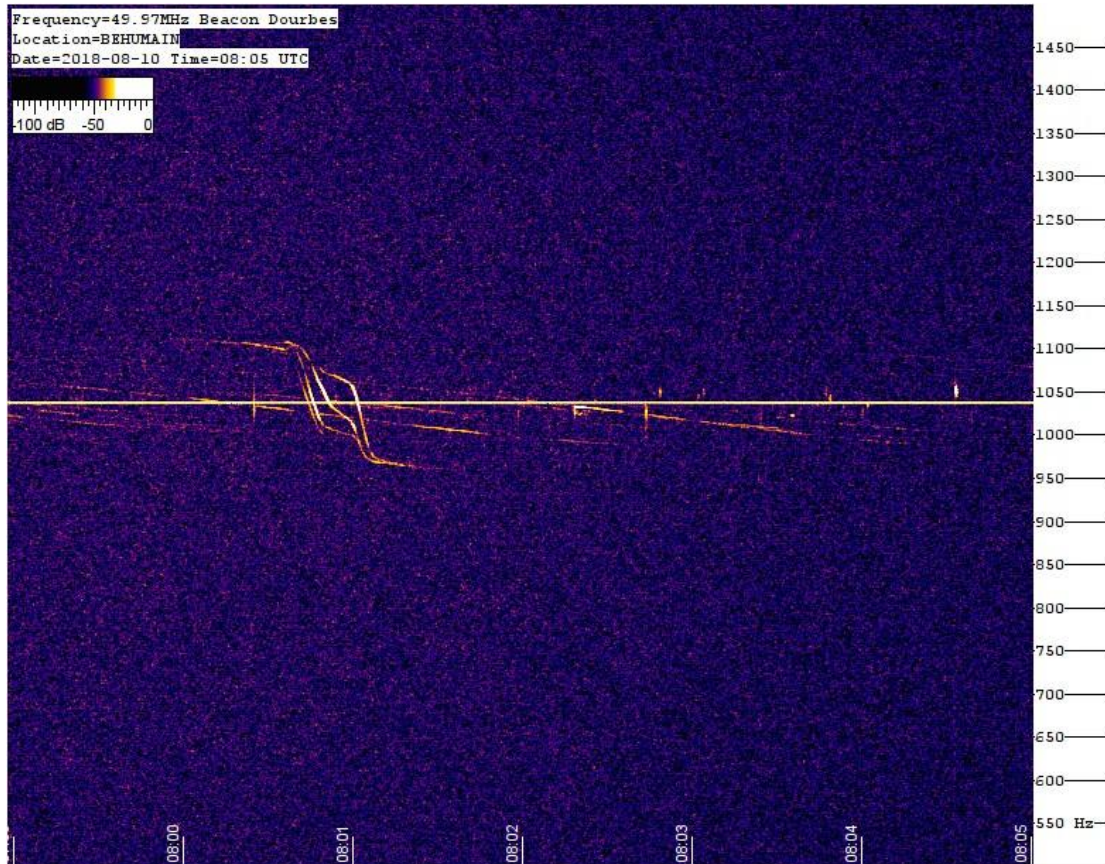


Spectrum
Analyzer

Test Setup
@ Humain

Testing SPADE

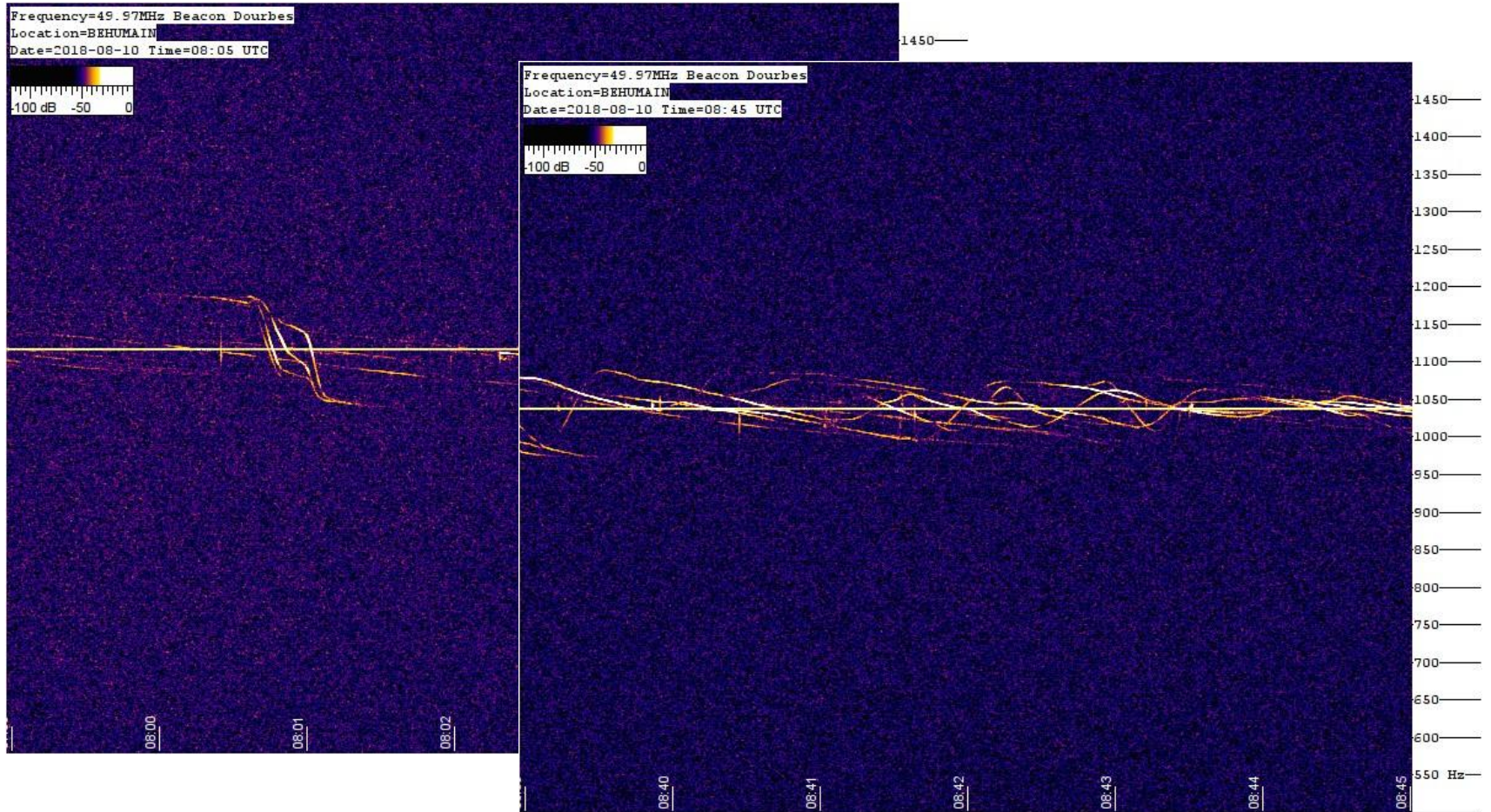
Some Results



We got planes!

Testing SPADE

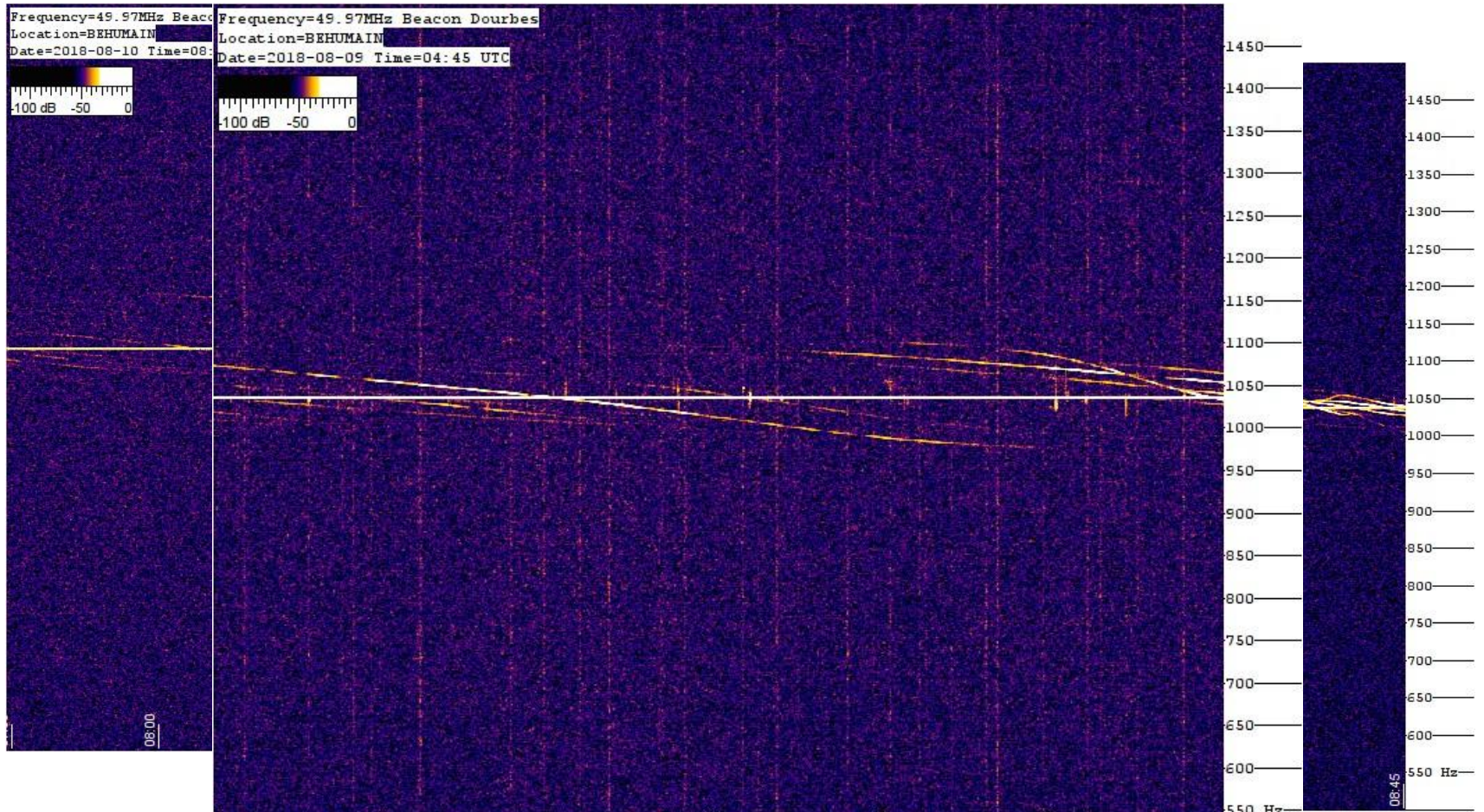
Some Results



A LOT of planes...

Testing SPADE

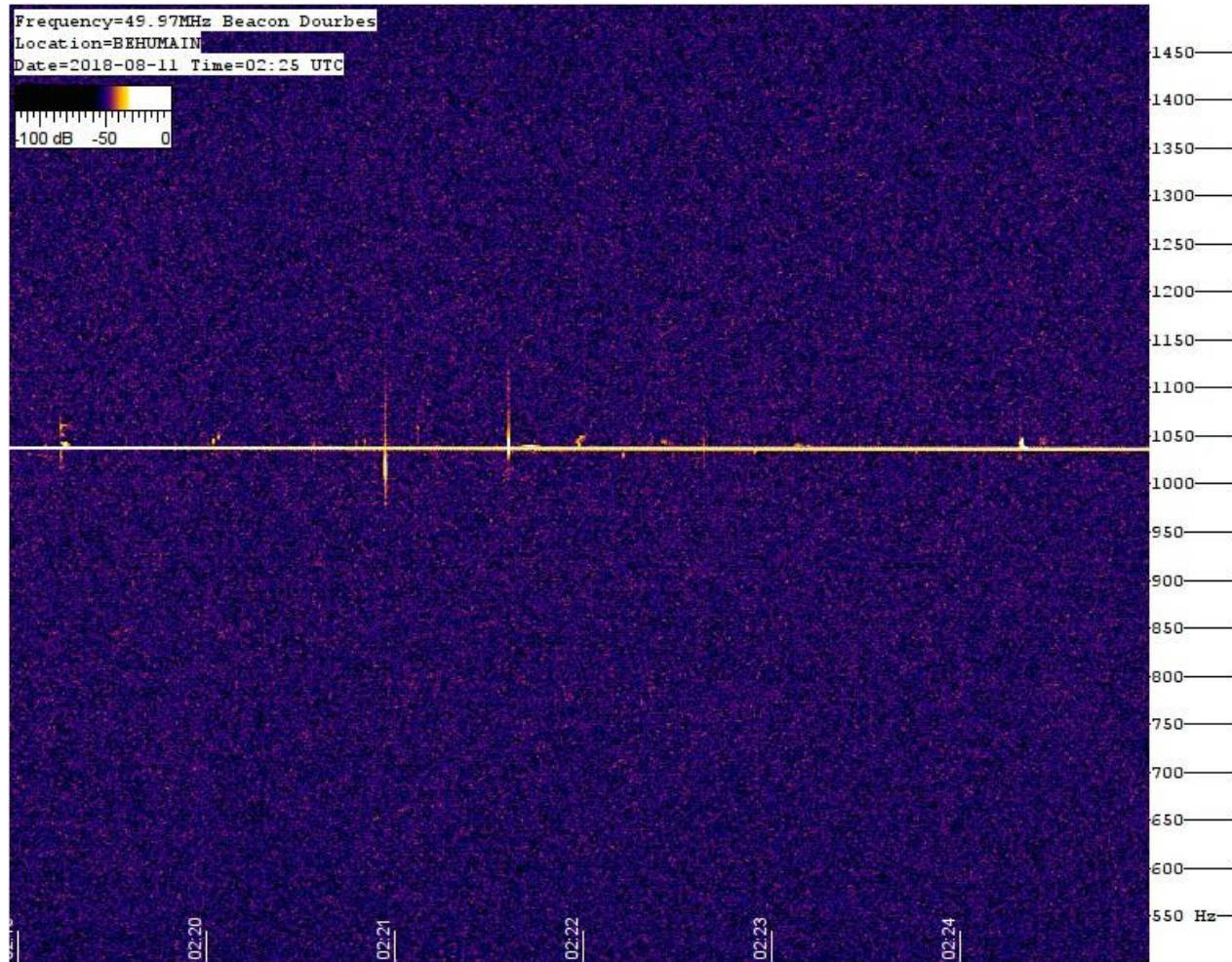
Some Results



... and even thunderstorms

Testing SPADE

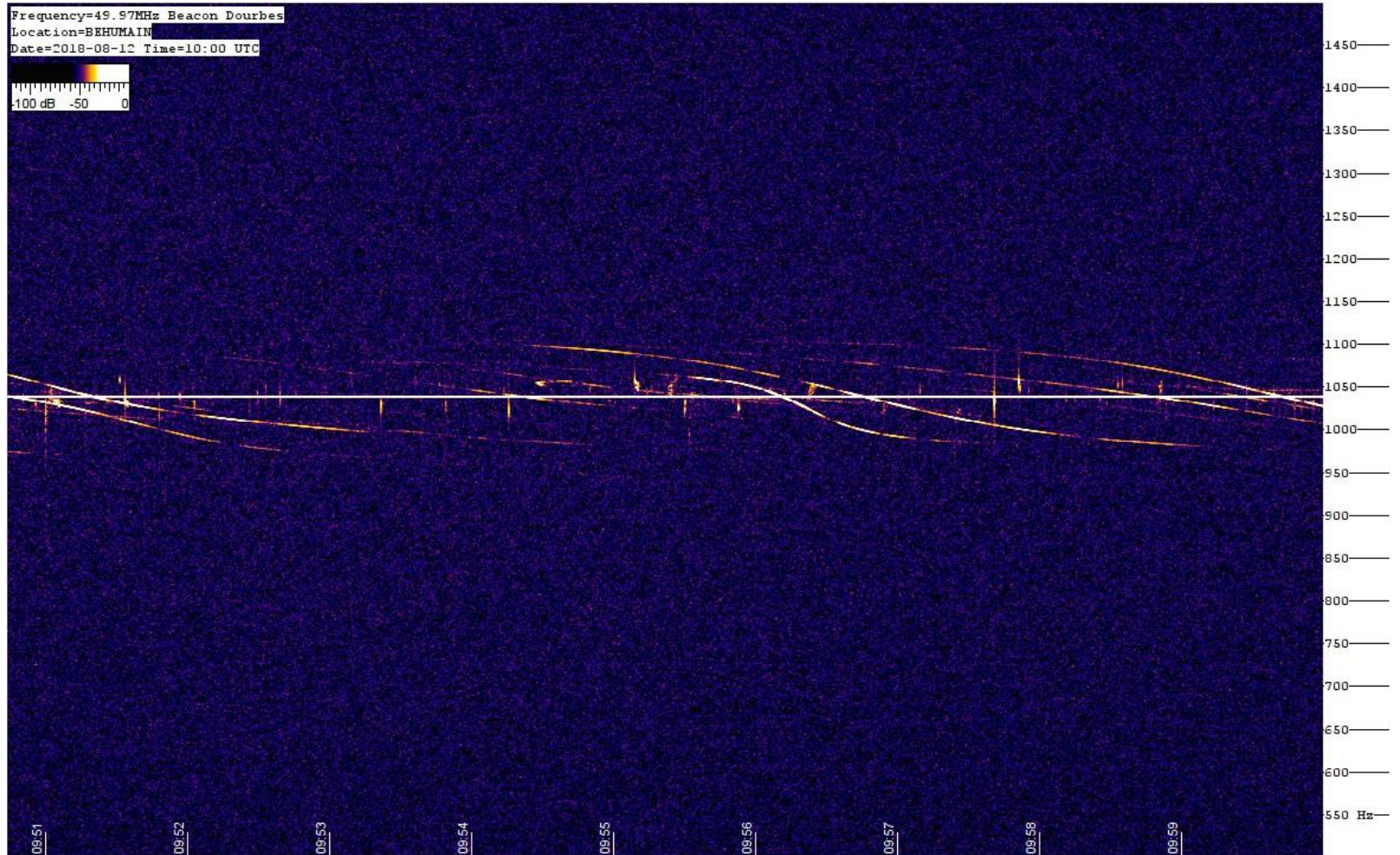
Some Results



Finally, some meteor echoes

Testing SPADE

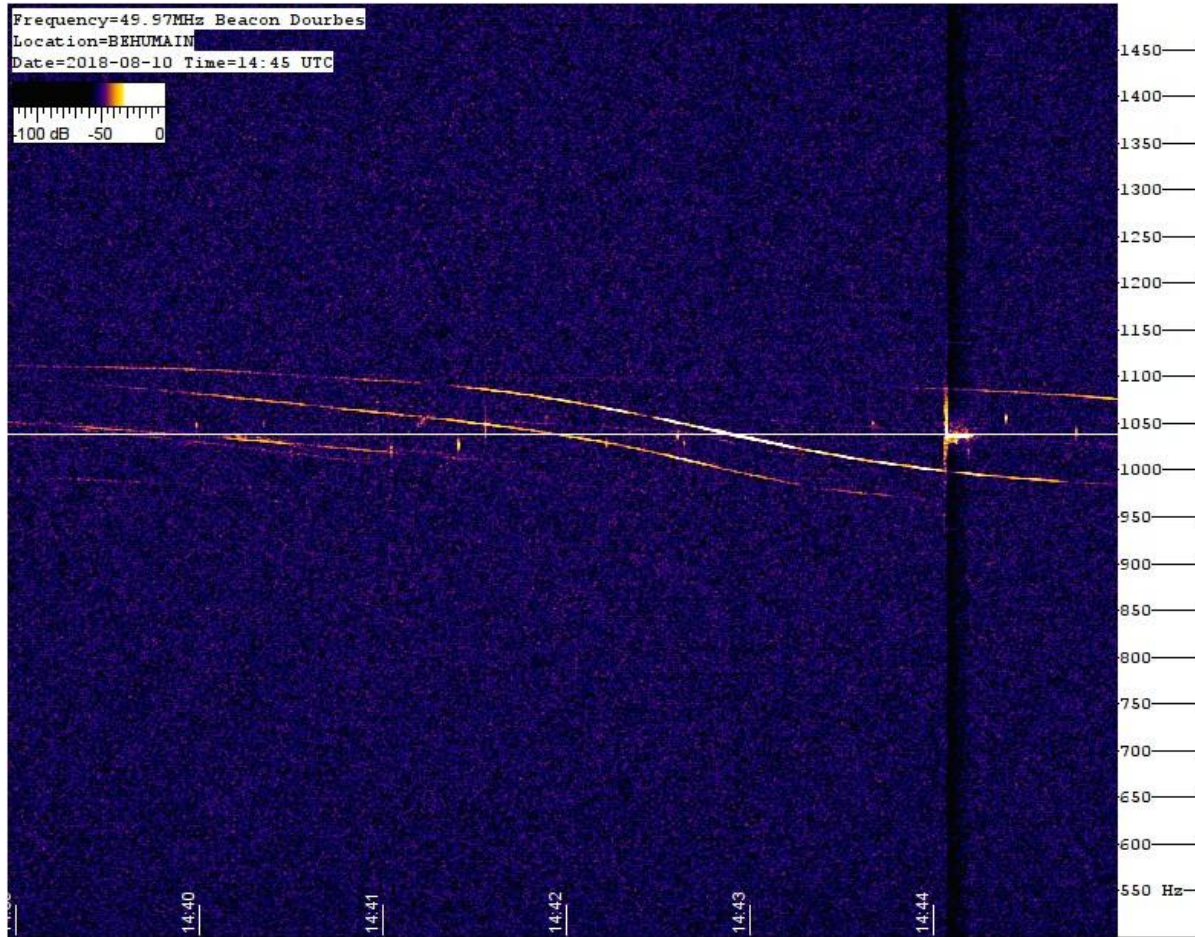
Some Results



Even underdense meteor echoes

Testing SPADE

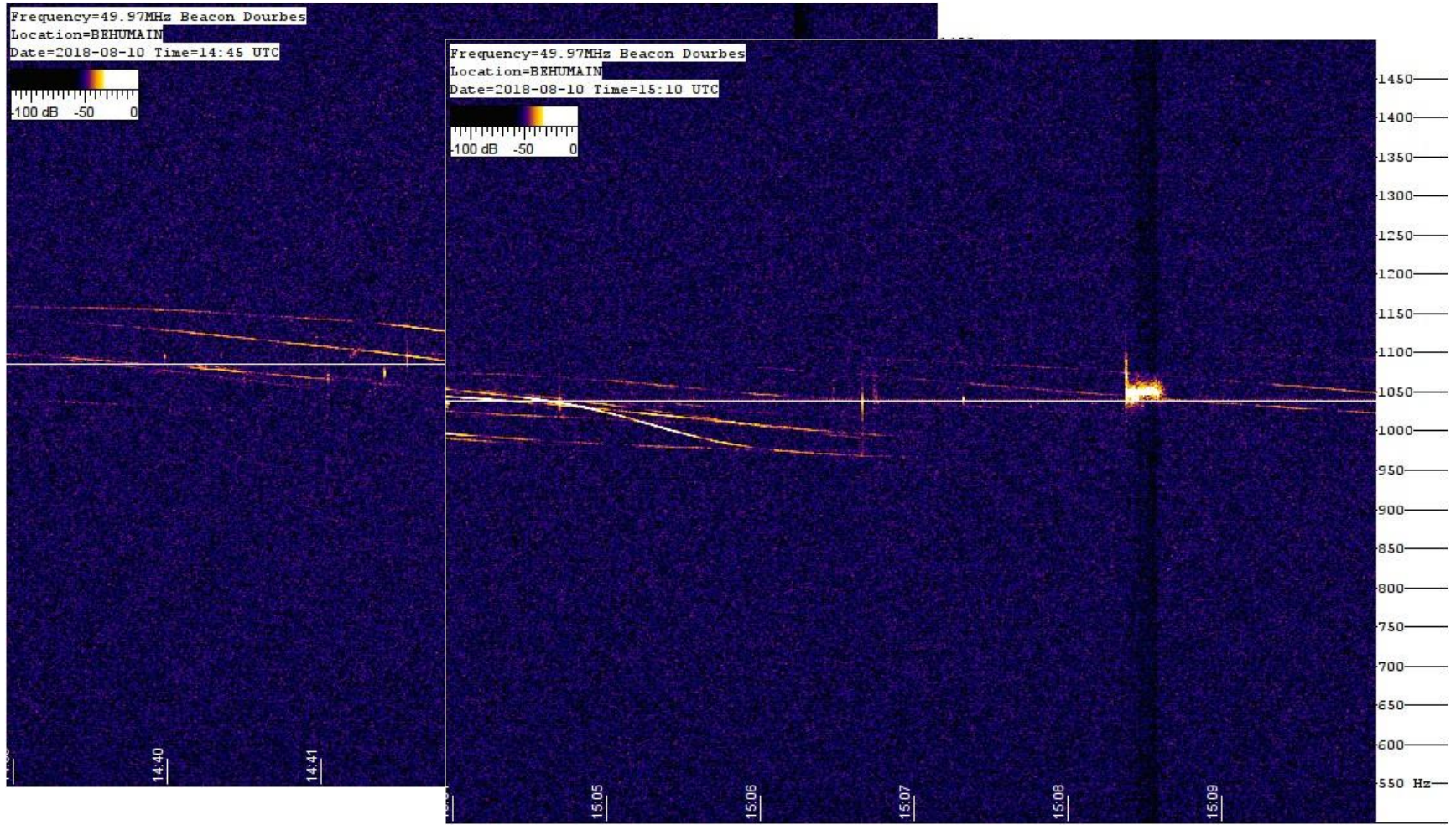
Some Results



Overdense meteor echoes as well

Testing SPADE

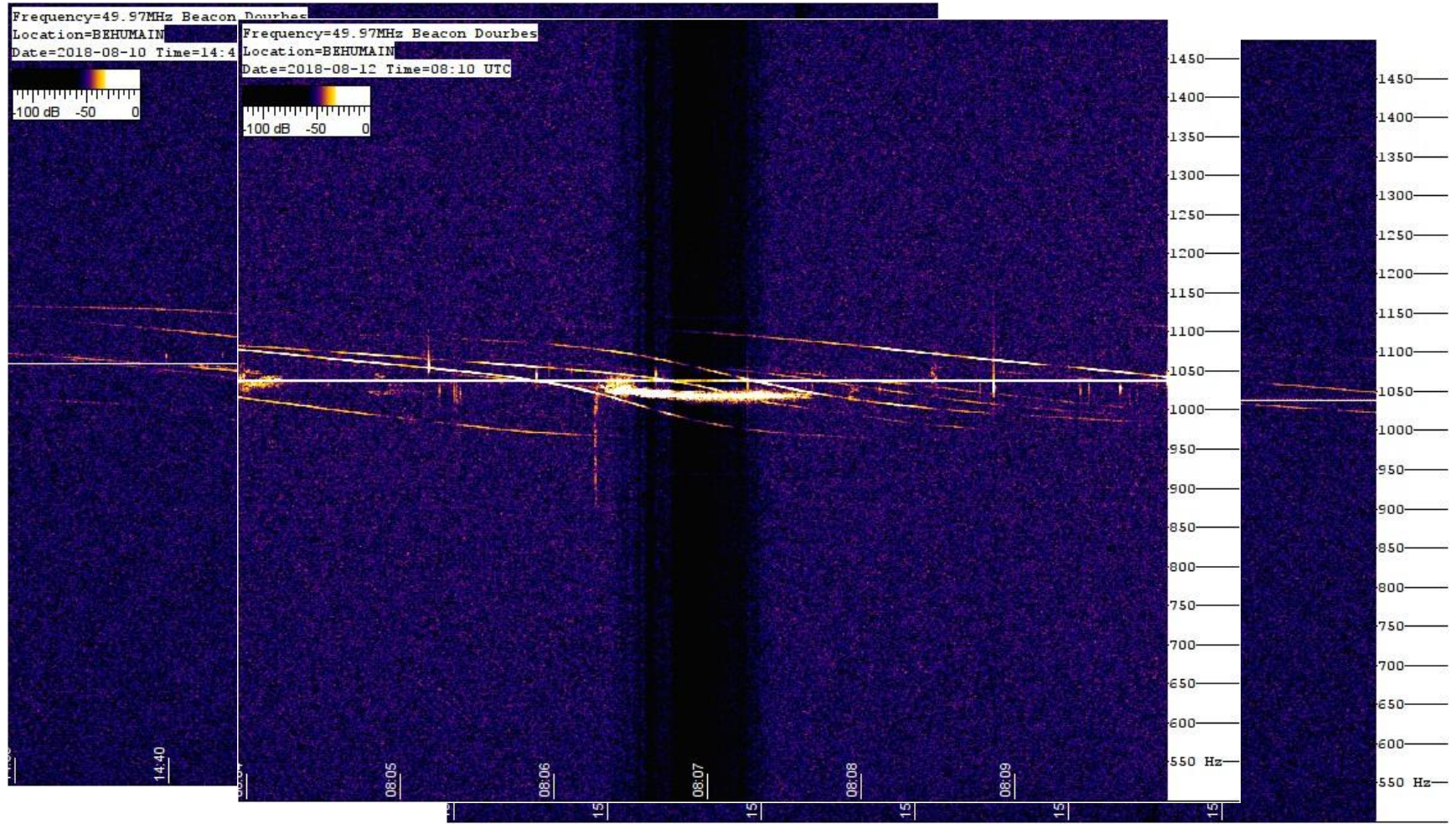
Some Results



Overdense meteor echoes as well

Testing SPADE

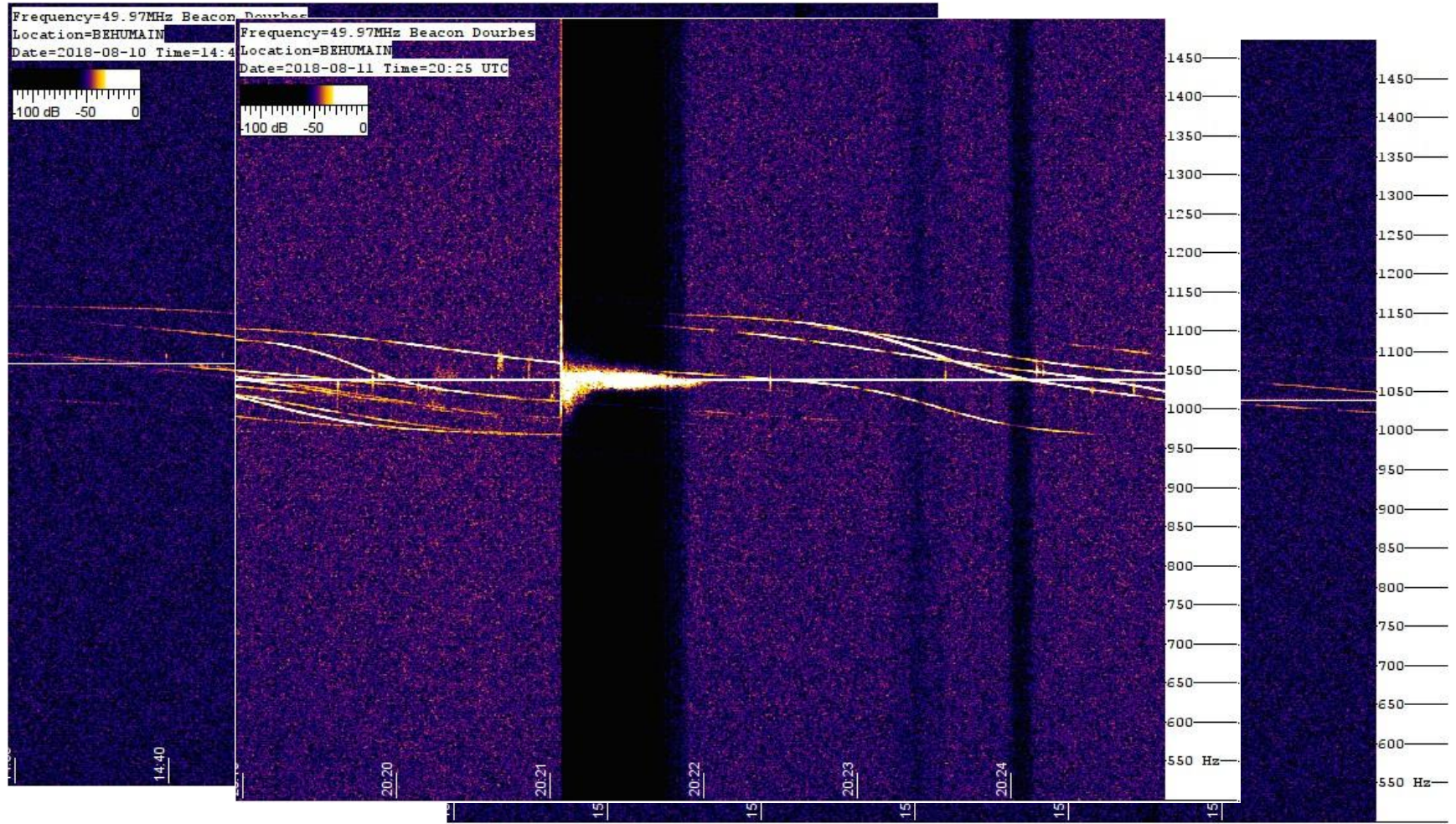
Some Results



Overdense meteor echoes as well

Testing SPADE

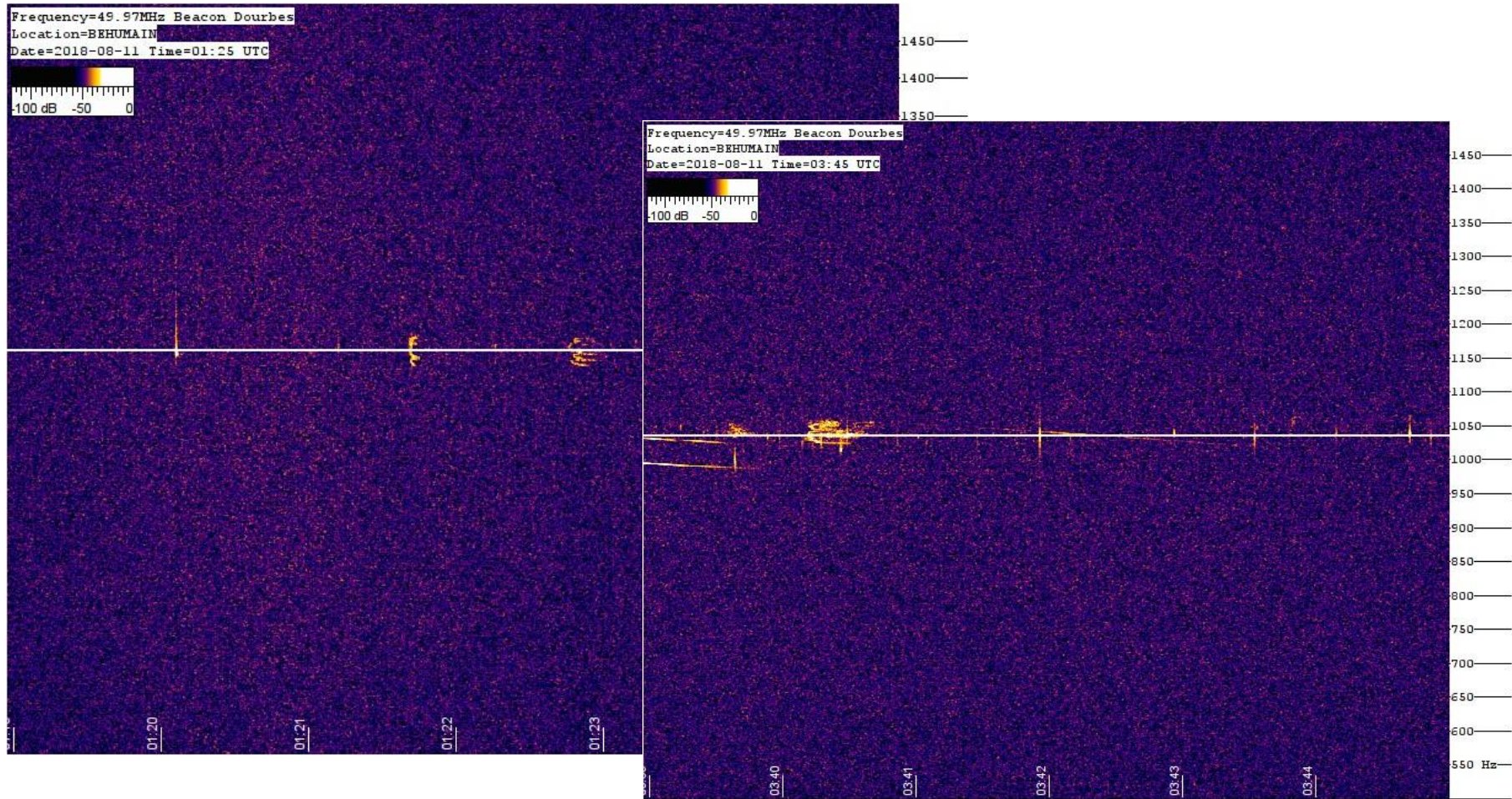
Some Results



Overdense meteor echoes as well

Testing SPADE

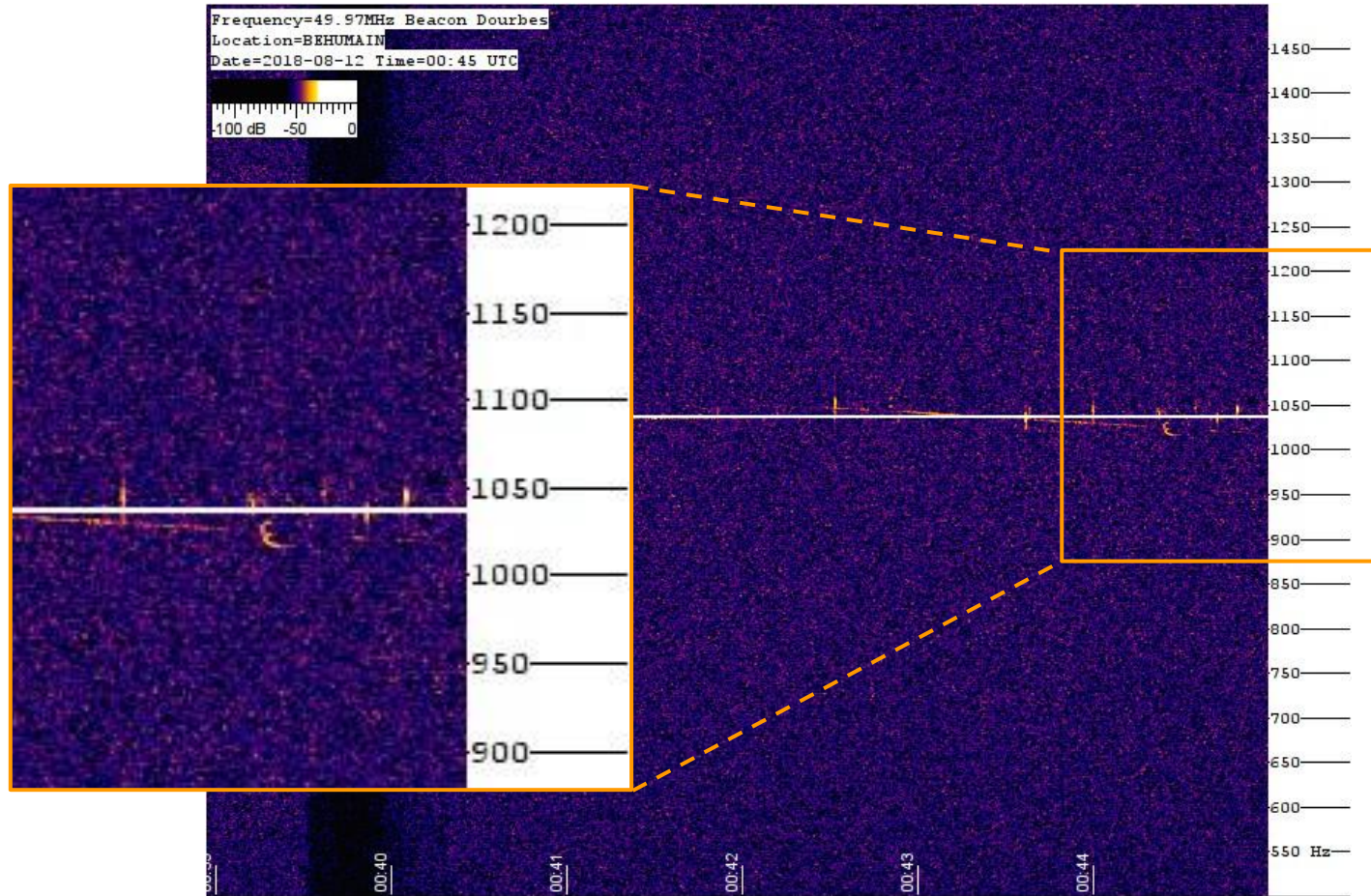
Some Results



Epsilons.... Present!

Testing SPADE

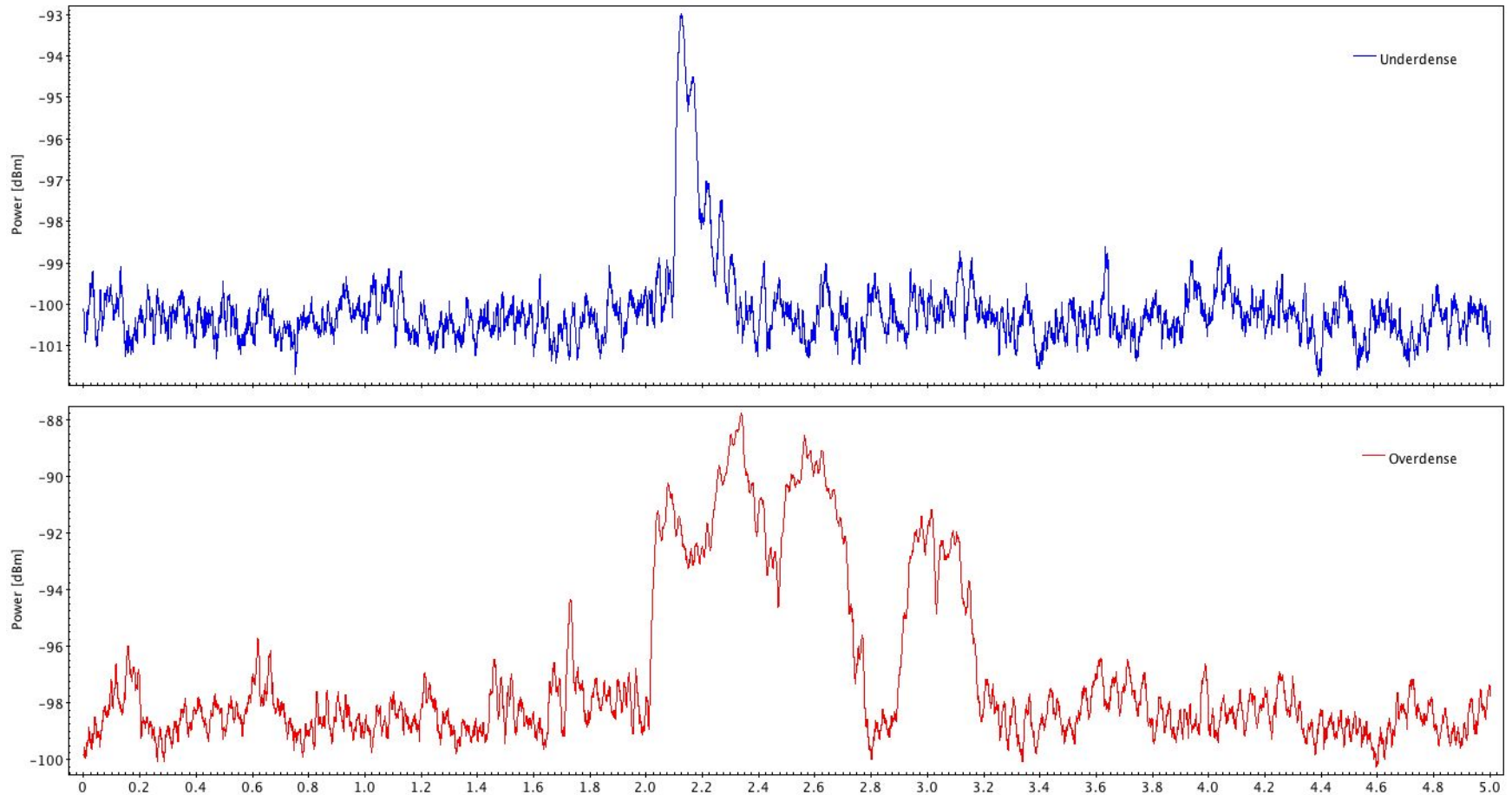
Some Results



Do not forget the baby-epsilon!

Testing SPADE

Some Results



Meteor echoes profiles

~~First Light~~ (not quite yet)

... but maybe it is the last appointment with the obstetrician!

