ApRES Training Course

Assembling skeleton slot antennas

What's in the box?

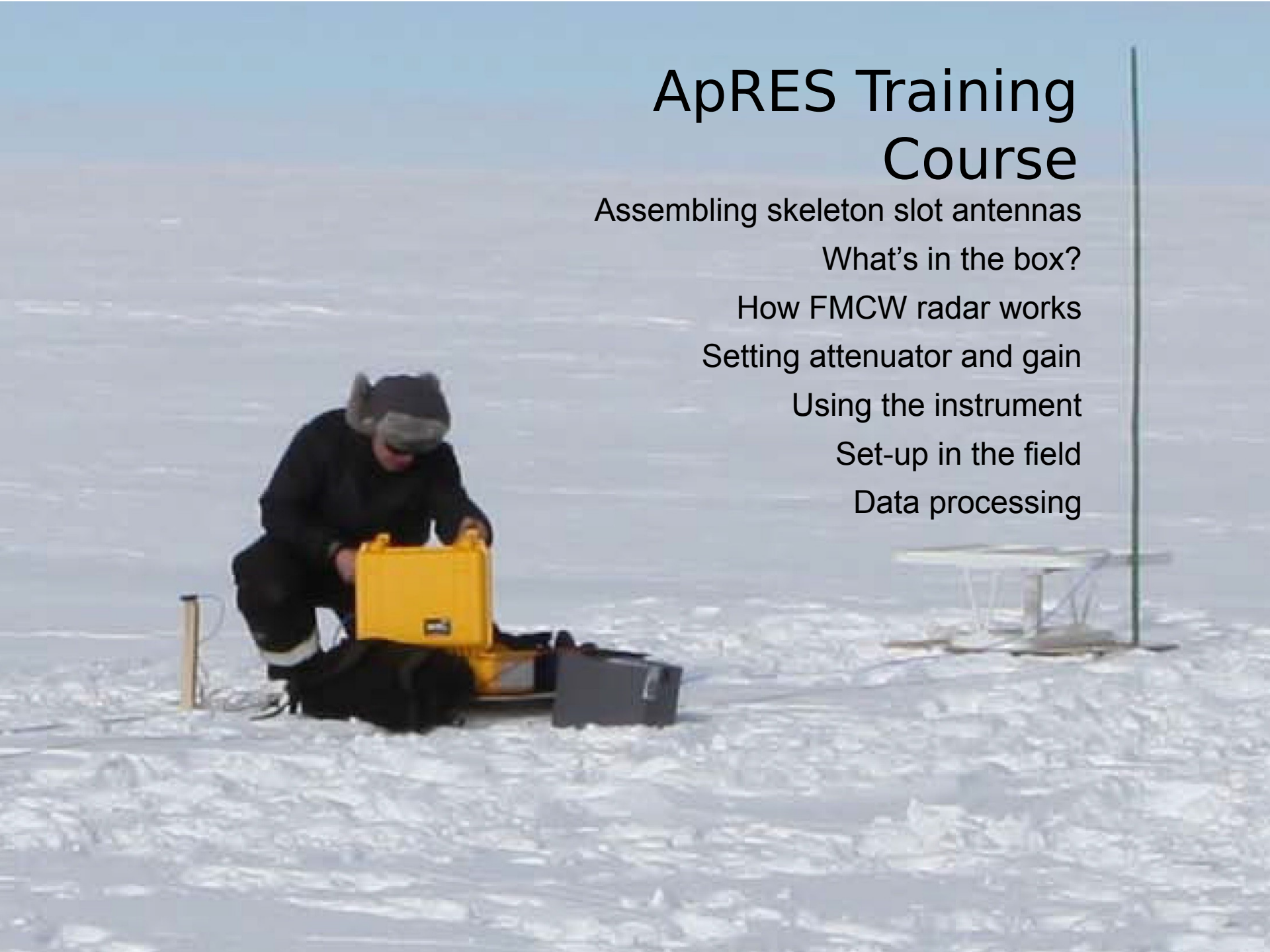
How FMCW radar works

Setting attenuator and gain

Using the instrument

Set-up in the field

Data processing

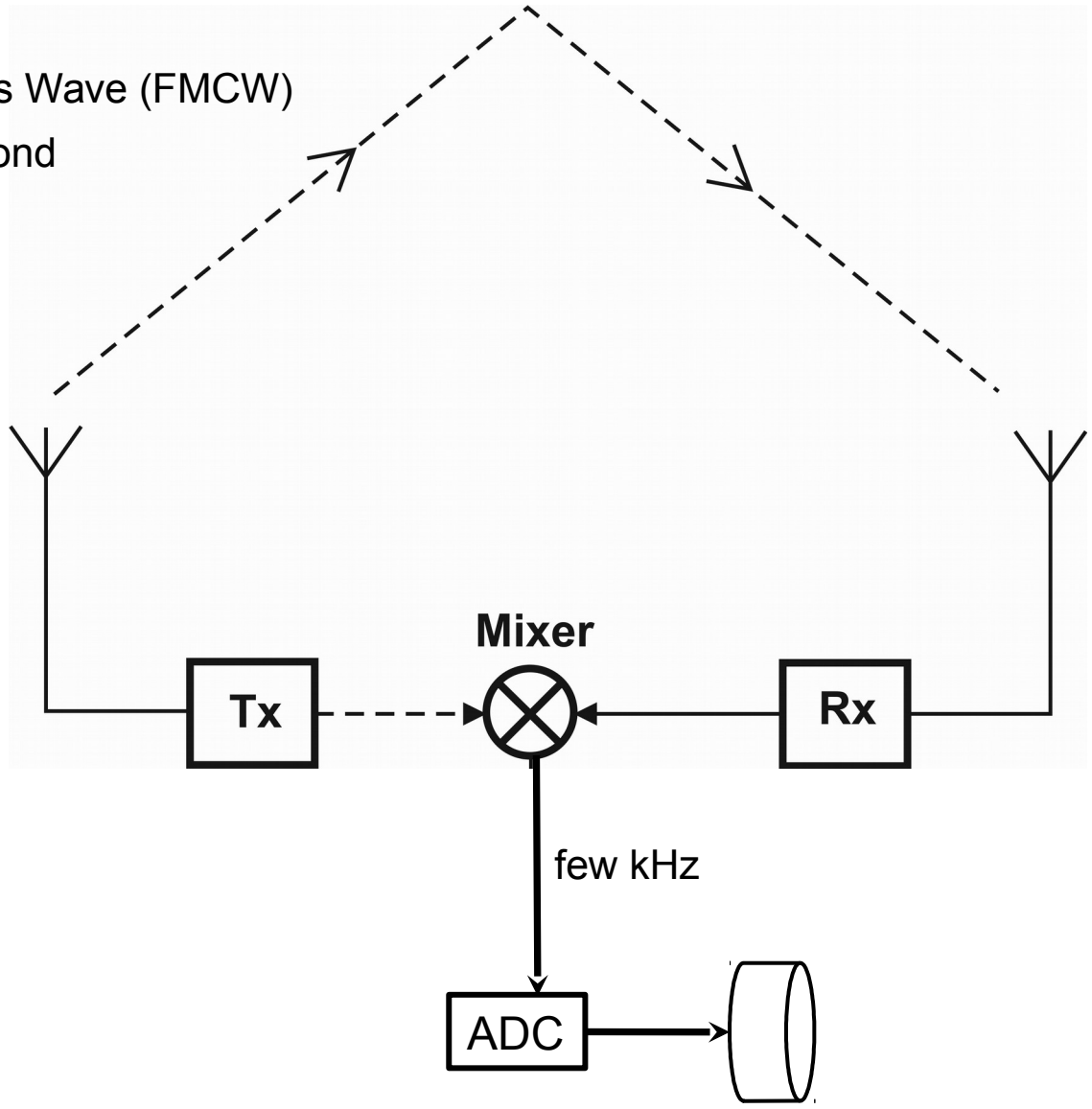


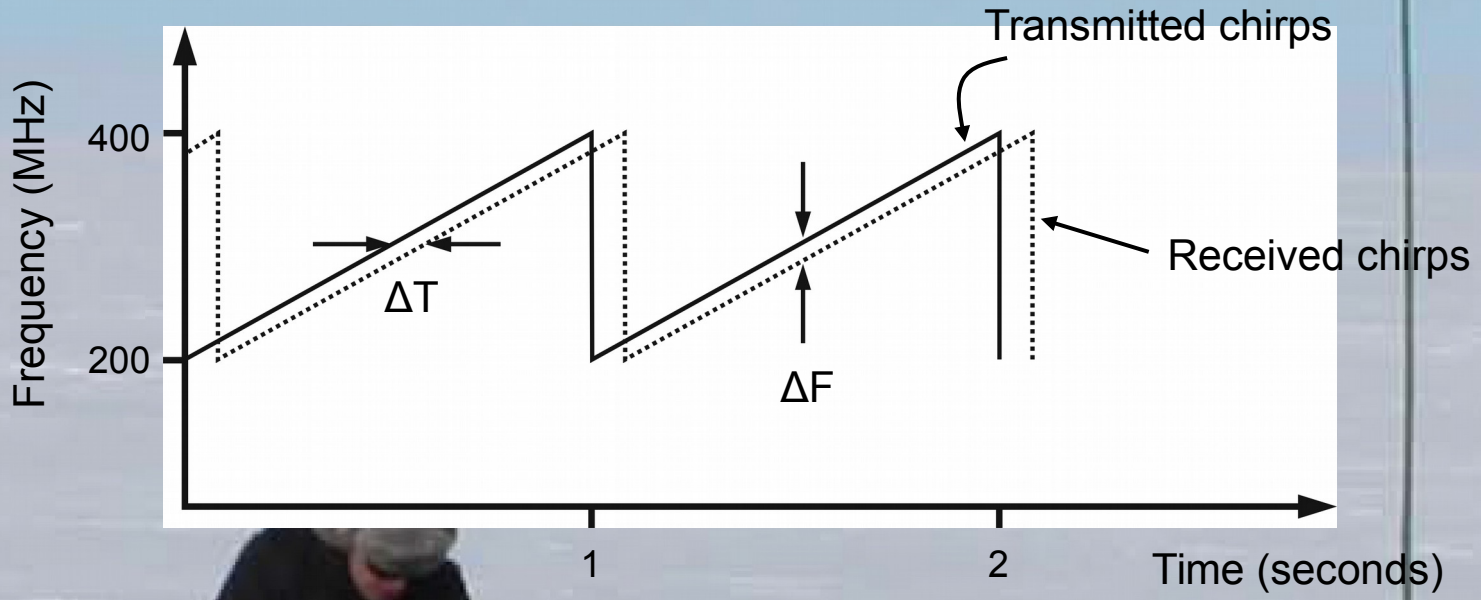
How FMCW radar works:

Frequency Modulated Continuous Wave (FMCW)

200 to 400 MHz chirp over 1 second

100 mW output power

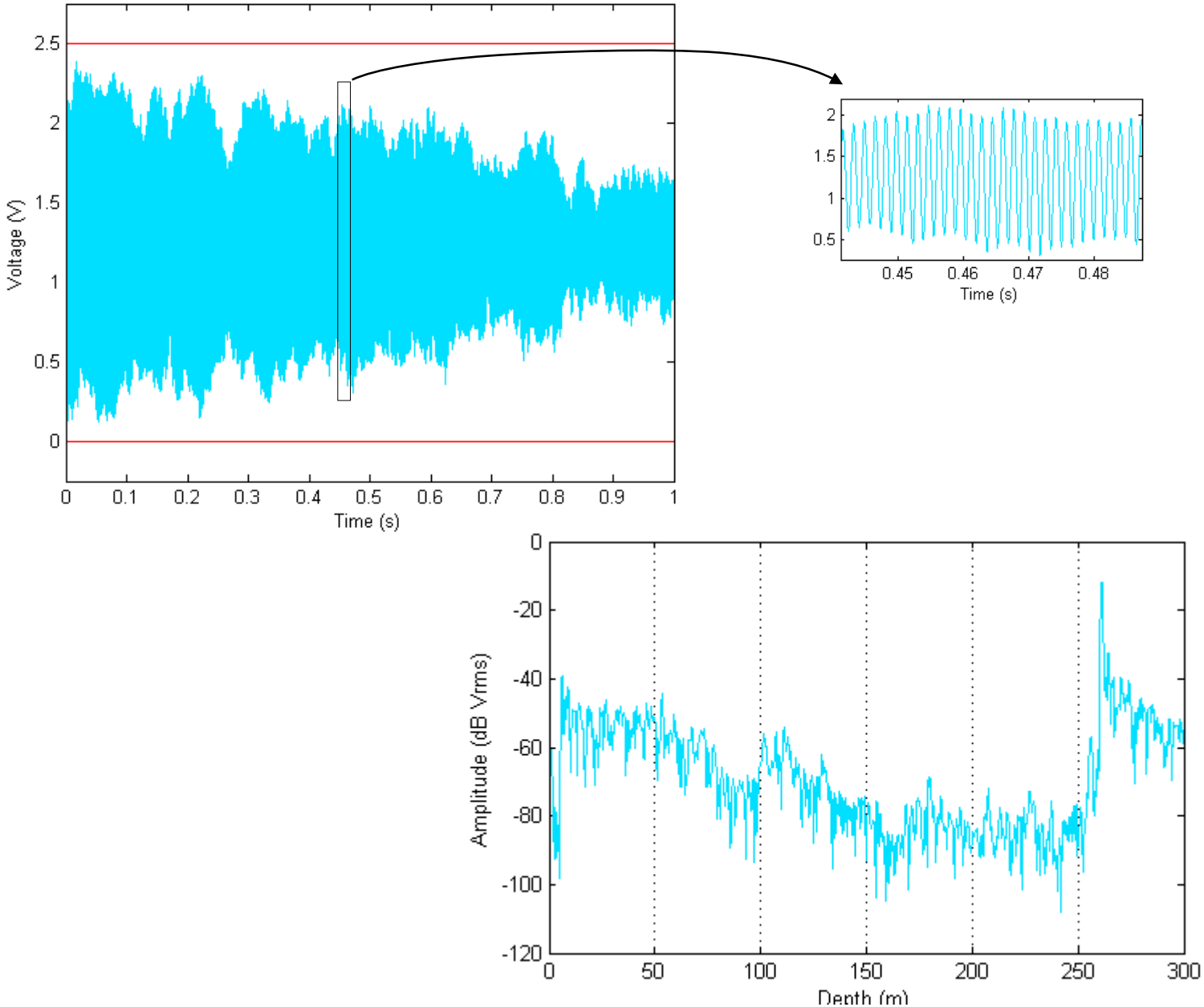




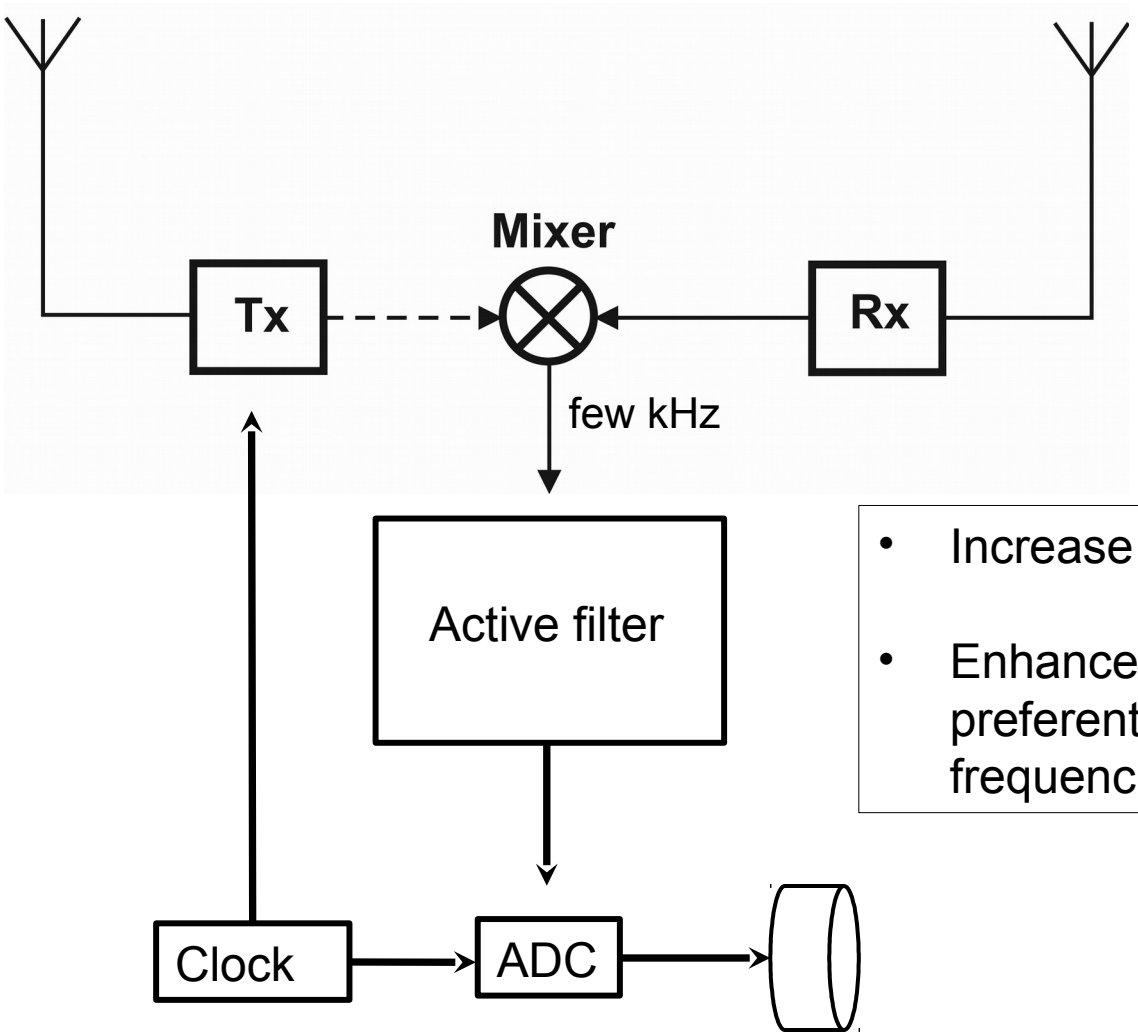
$$\Delta T = \frac{2 \times \text{Range}}{\text{Speed}}$$

$$\Delta F = \Delta T \text{ (secs)} \times 200 \text{ (MHz/sec)}$$

$$\text{Range} = \frac{\Delta F \times \text{Speed}}{2 \times 200}$$

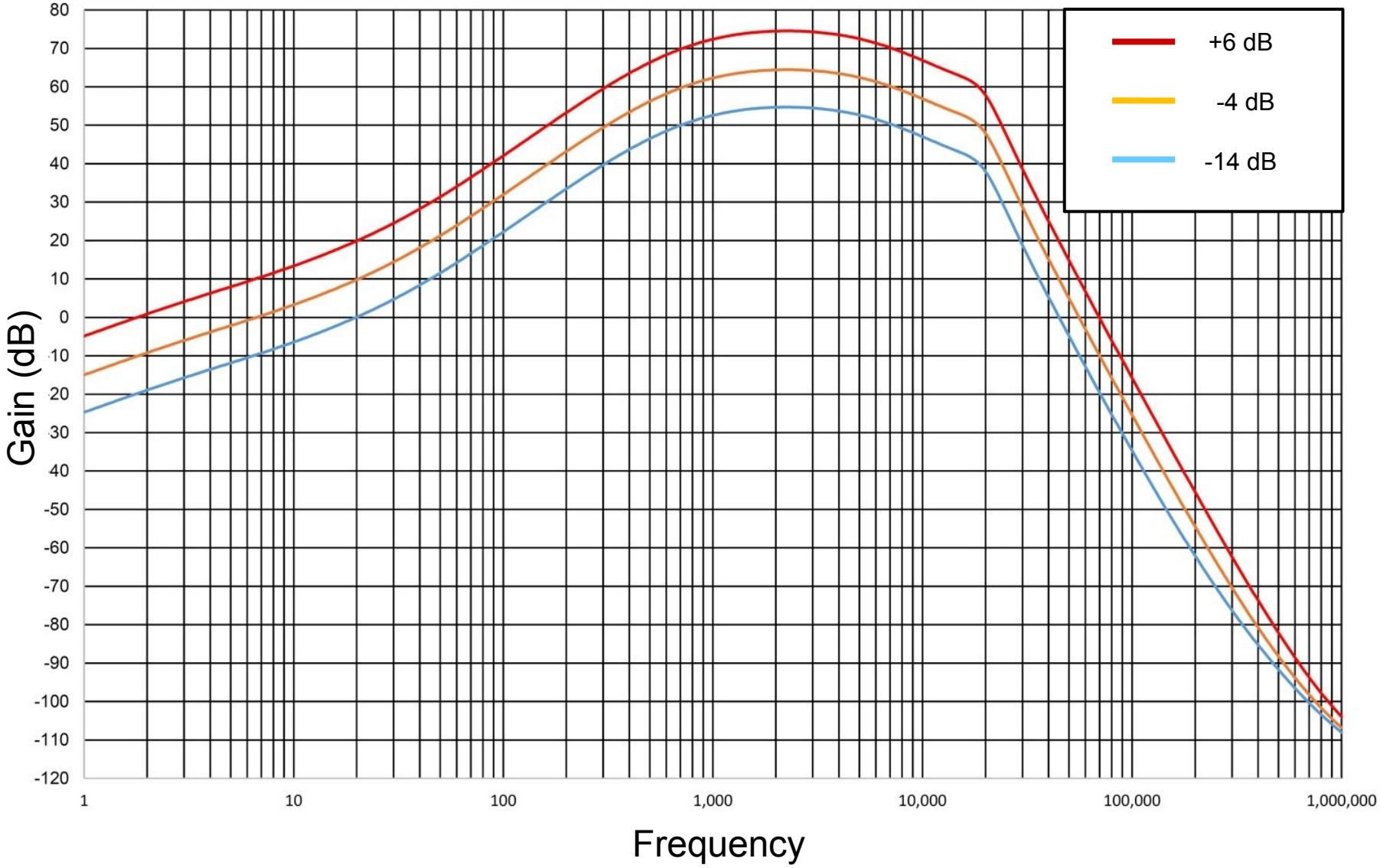

Voltage (V)
Time (s)
Time (s)
Amplitude (dB Vrms)
Depth (m)

How the radar works 2: Active filter

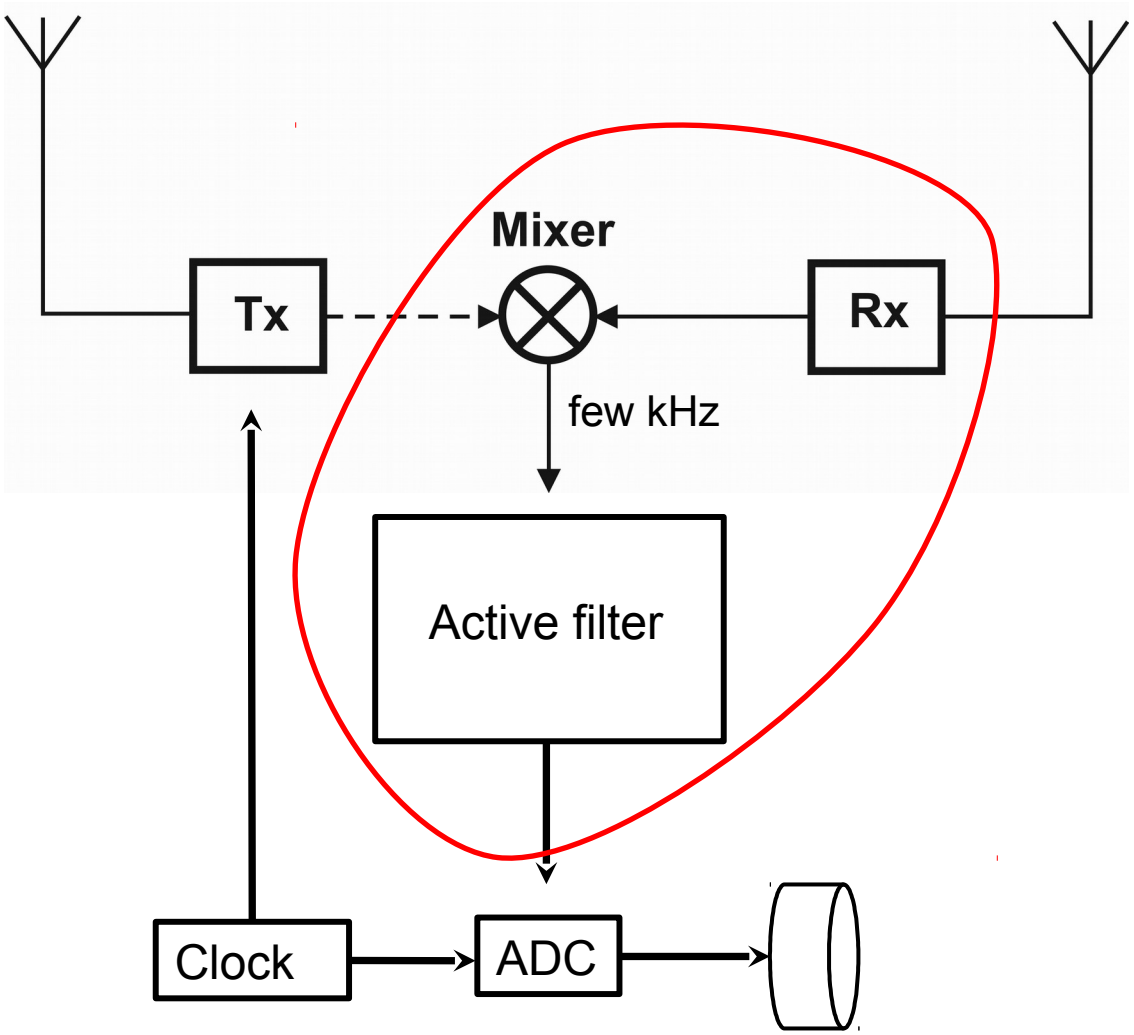


- Increase signal level (to fully use ADC)
- Enhance distant targets by preferentially amplifying higher frequencies

Active filter frequency response

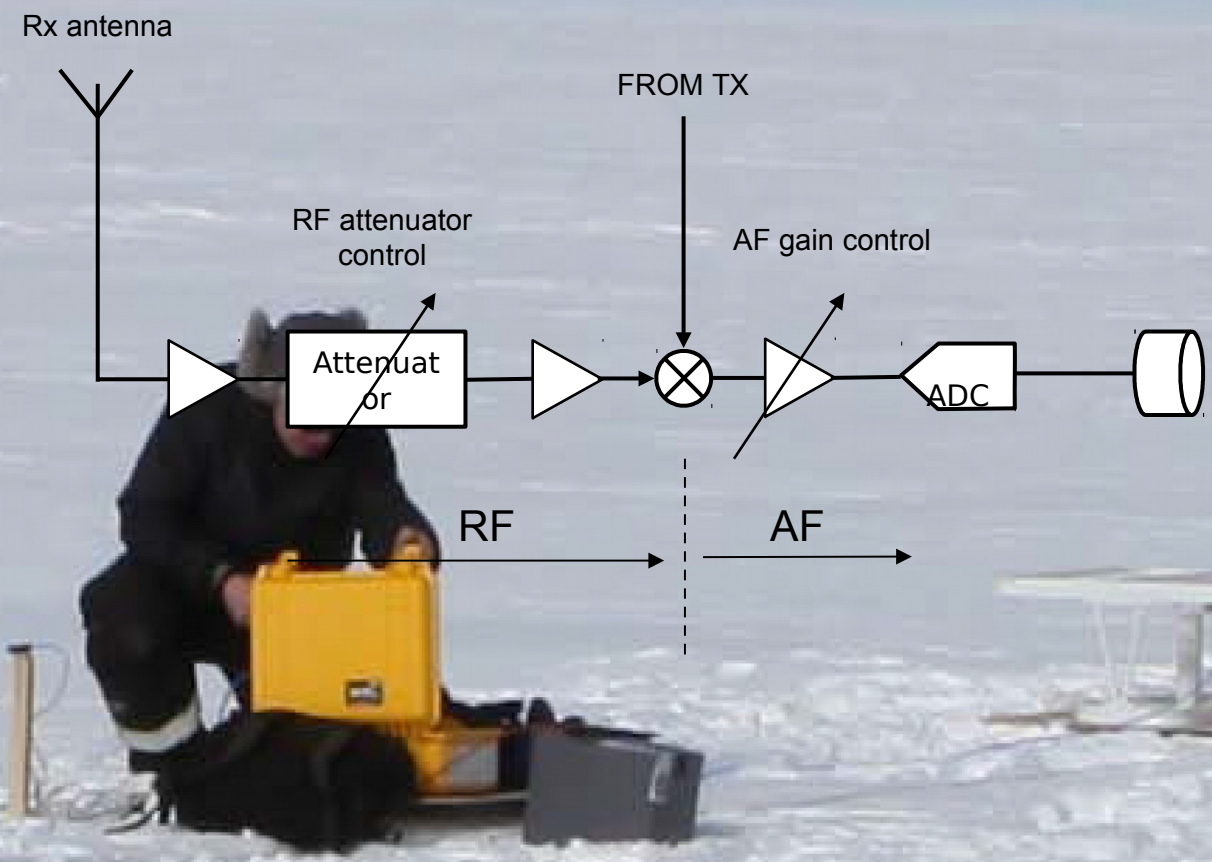


How the radar works 2: Active filter



RF Attenuation control to stop over-loading and saturation

AF Gain control to stop clipping of ADC



Selecting the optimum RF Attenuation and AF Gain settings

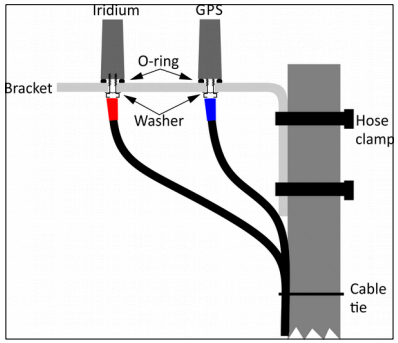
Get best results from higher RF attenuation

Down side is reduced signal/noise ratio

But can improve s/n by increasing the number of chirps ($10\log_{10}N$ dB)

The, down side is higher power consumption and memory requirements (unless averaging)

So, different optimal solution for Attended Mode (unlimited power and memory) and Unattended Mode.



Iridium and GPS antennas

Hose clamps

Antenna bracket

Flagged bamboos

Antenna mast

Plywood sheet

Plywood sheets

1 m

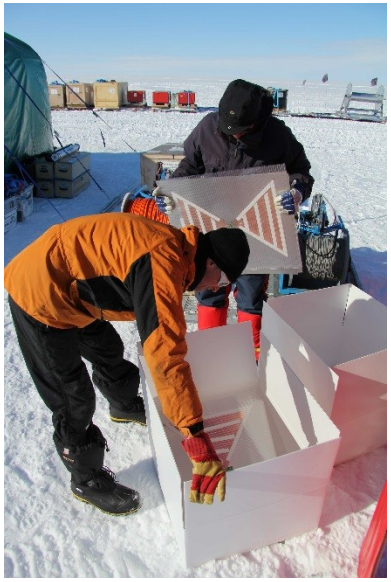
Skeleton Slot antennas

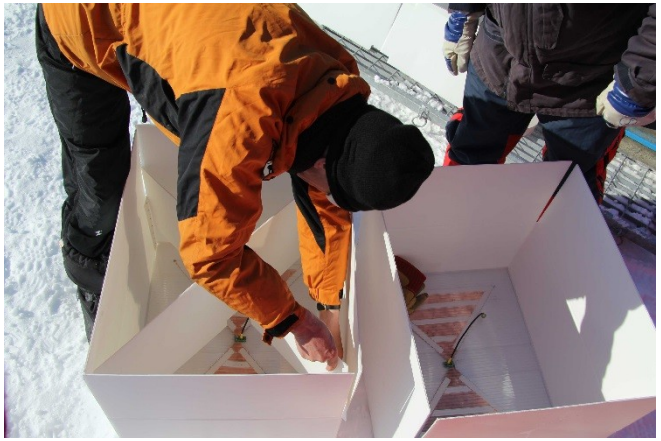
Battery

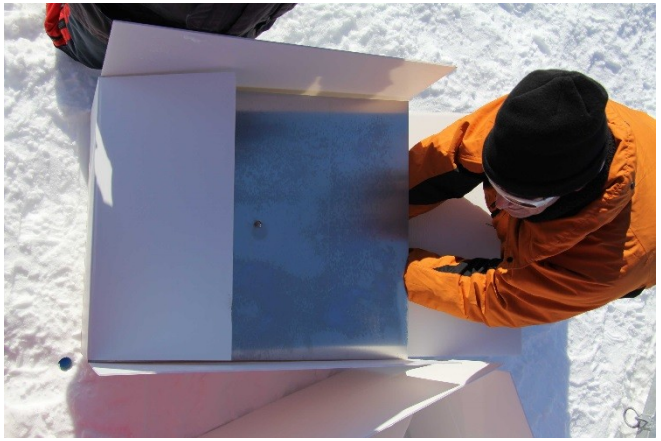
ApRES

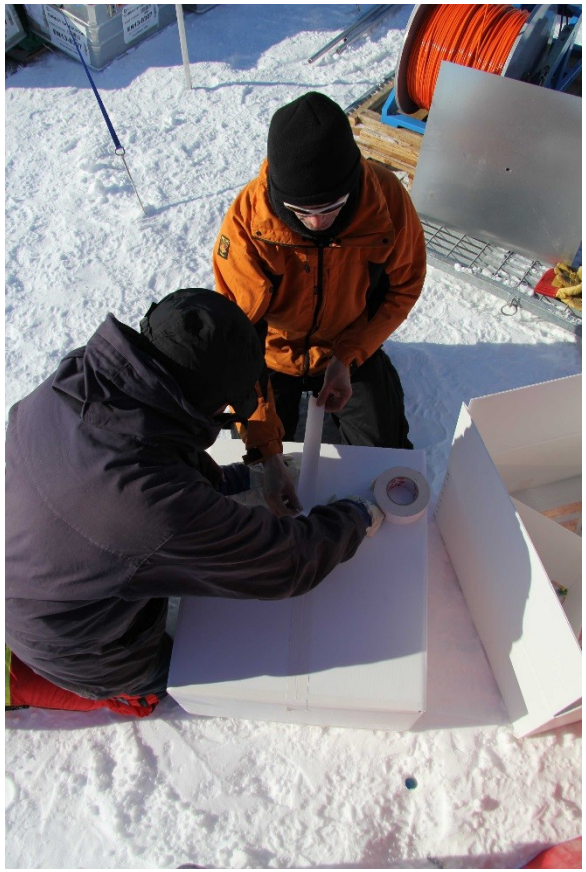
8-10 m

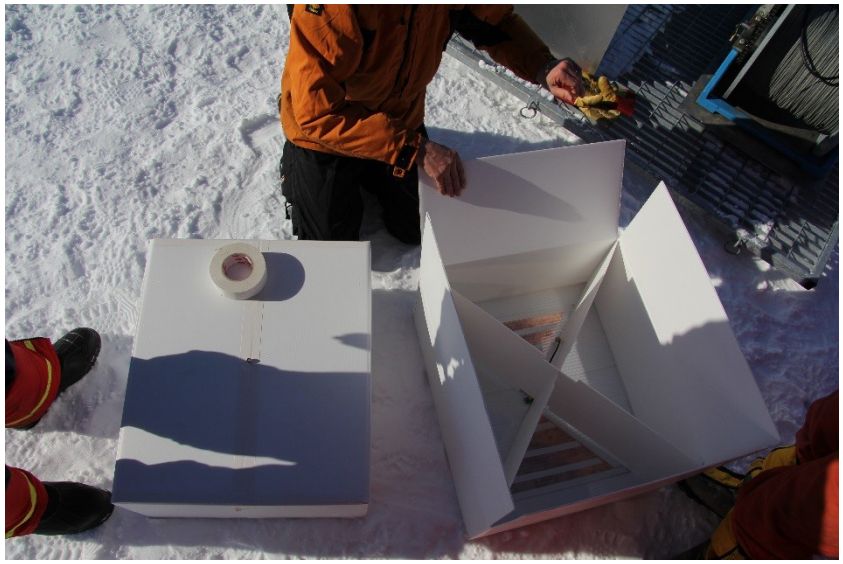
Bowtie antenna construction

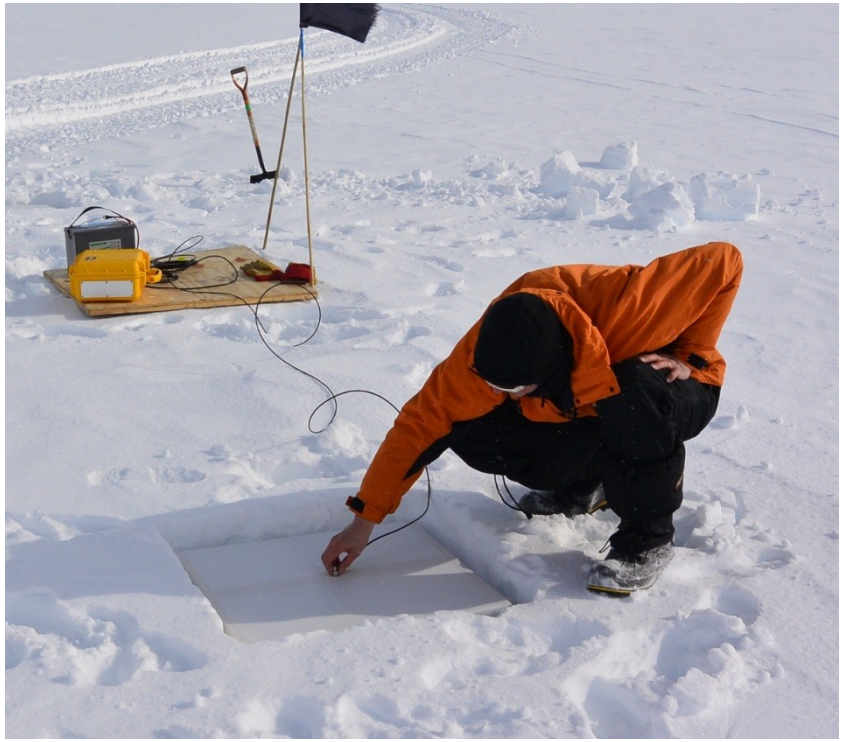




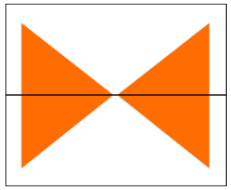


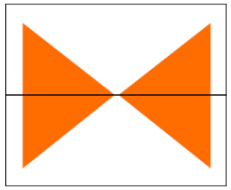


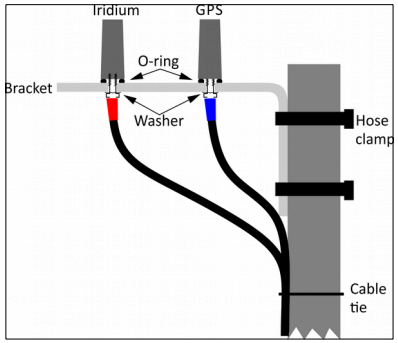




Preferred orientation:







Iridium and GPS antennas

Hose clamps

Antenna bracket

Flagged bamboos

Antenna mast

Plywood sheet

1 m

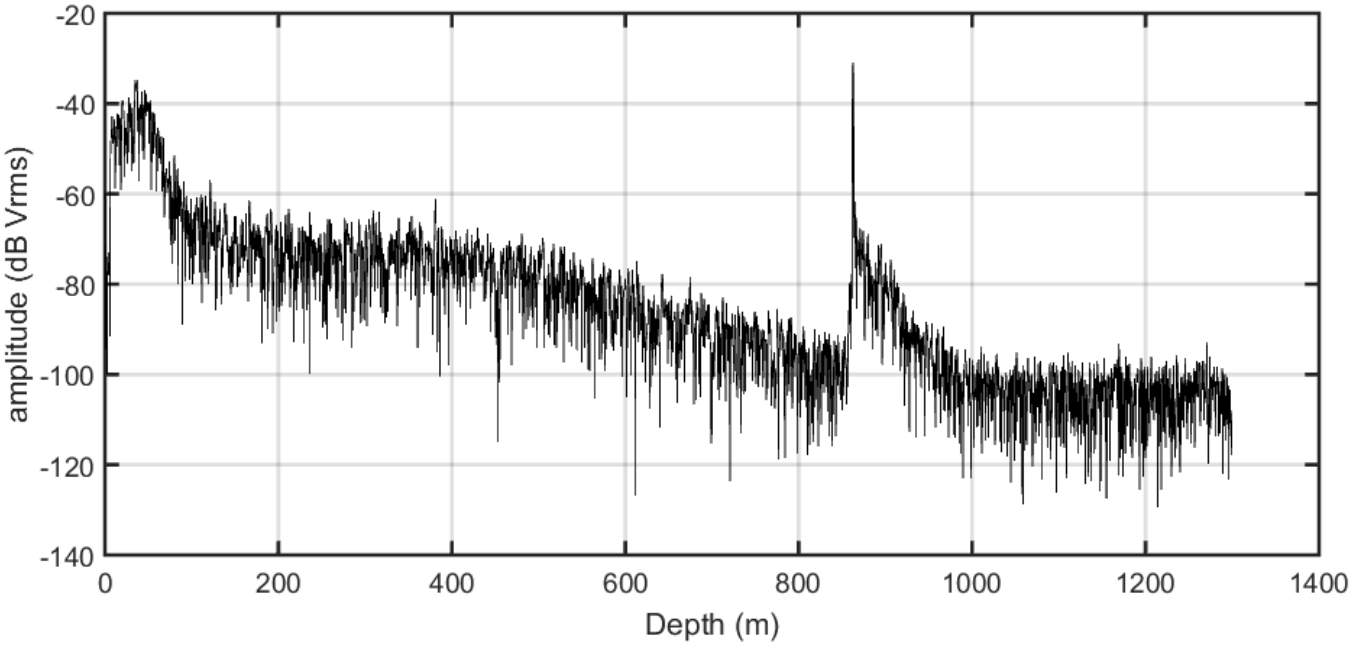
Bow tie antennas

Battery

ApRES

8-10 m

Setting up data uptell via Iridium



In config file:

Ndata=2
Triples=70,10,600,860,5,900

is interpreted as:

“Report data on highest amplitude in each 10-m interval between 70 and 600 m, and each 5-m interval between 860 and 900 m”