FOUR FREQUENCY AEM SYSTEM **EM-4H**

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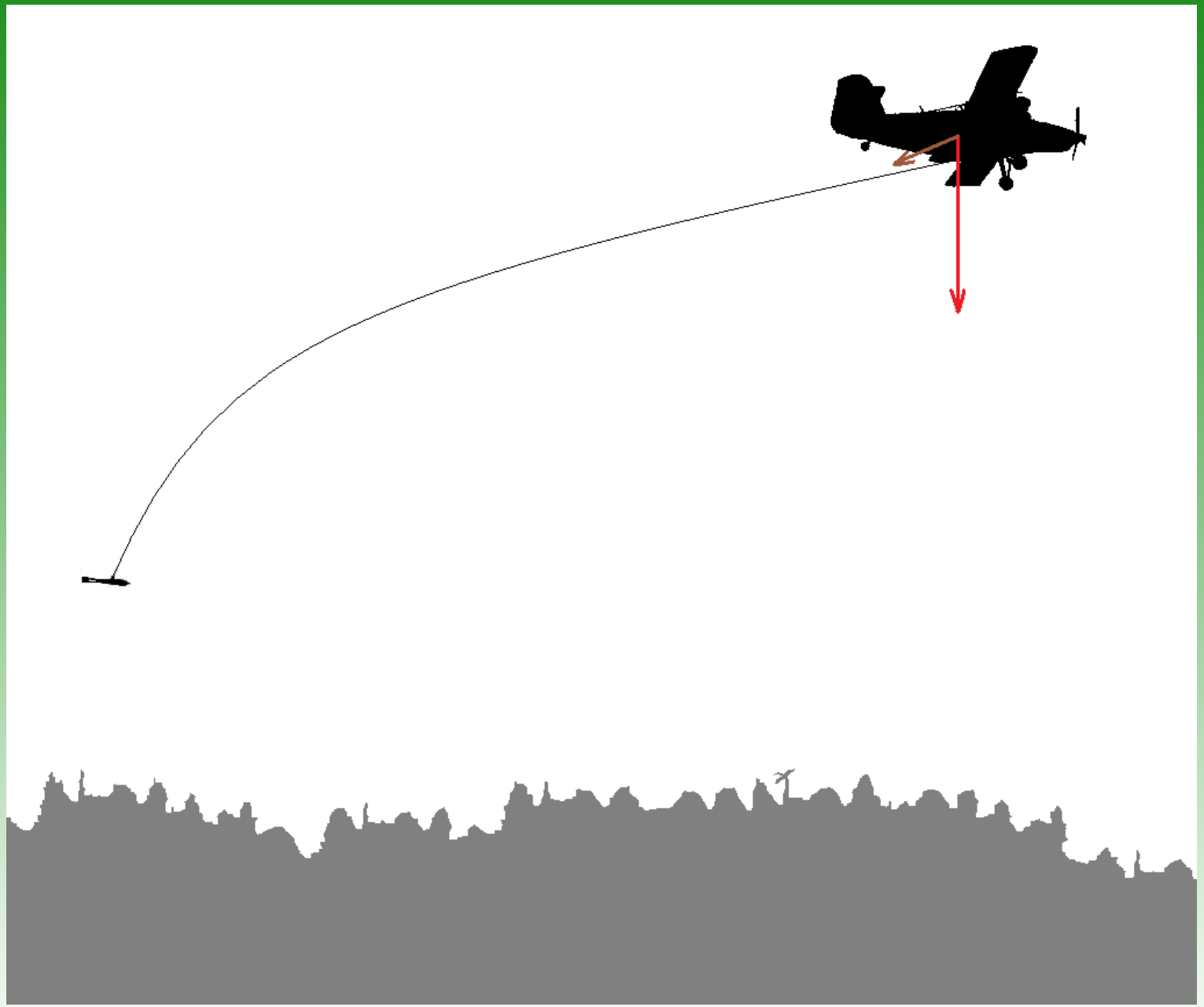
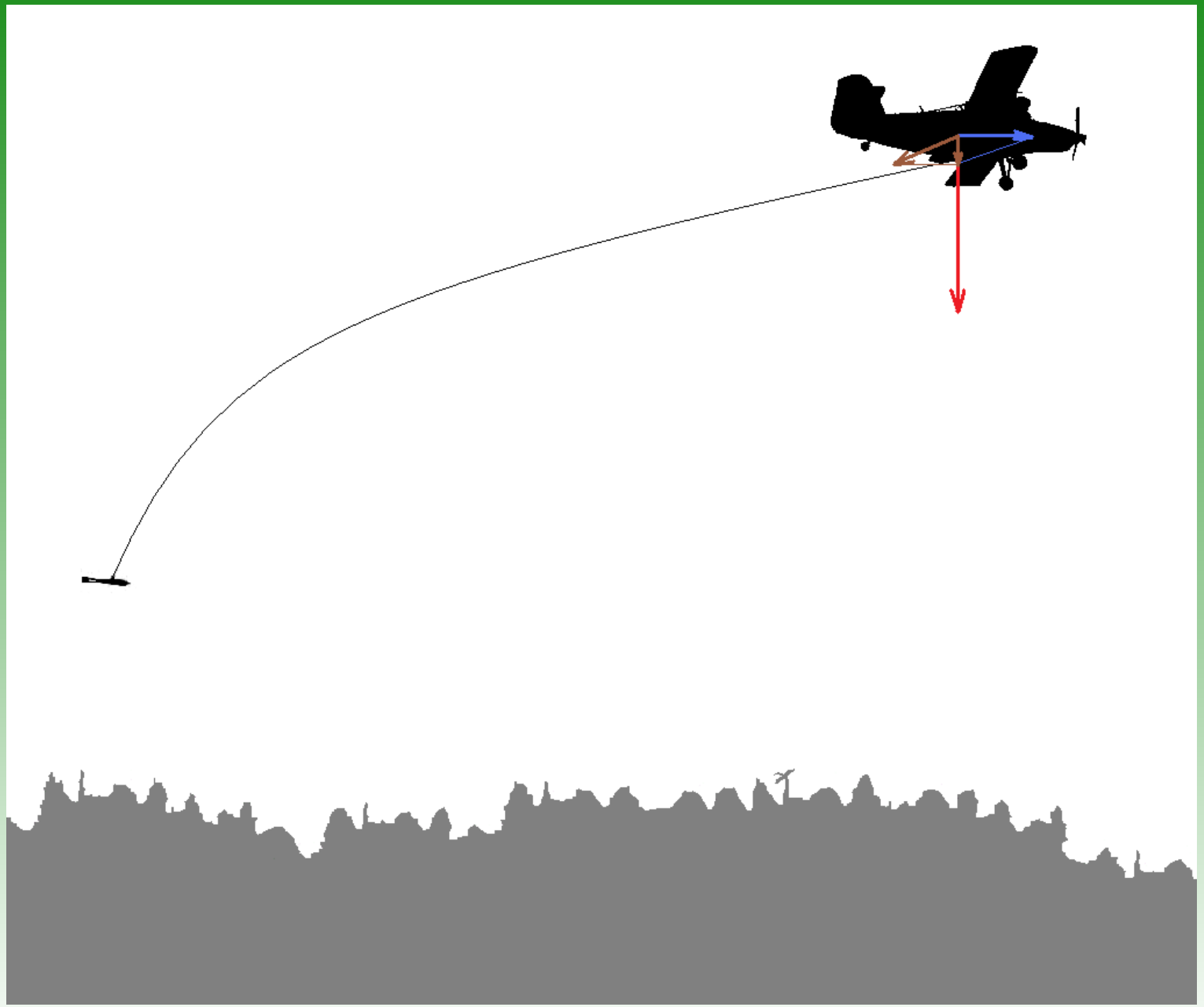
Installation Method

Compensation

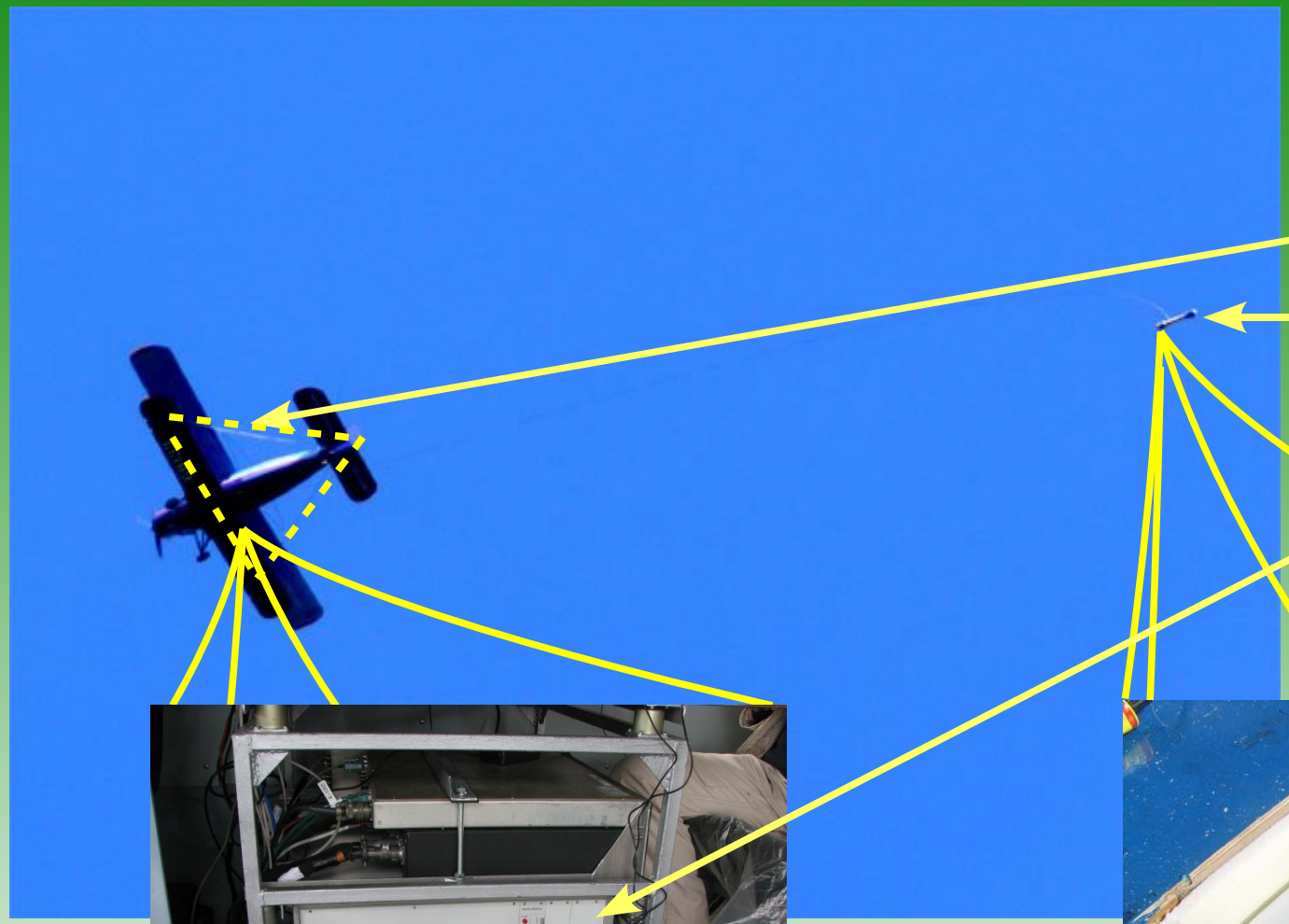


Compensation



ЕМ-4Н

Installation Method

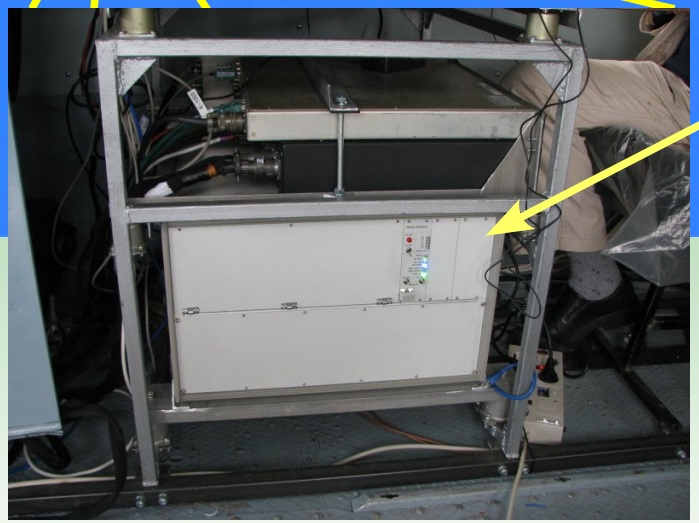


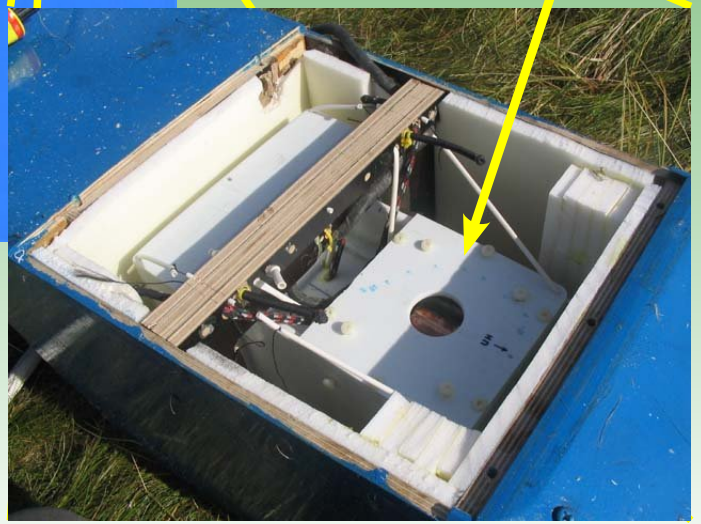
Transmitter Loop

Magnetometer

Generator

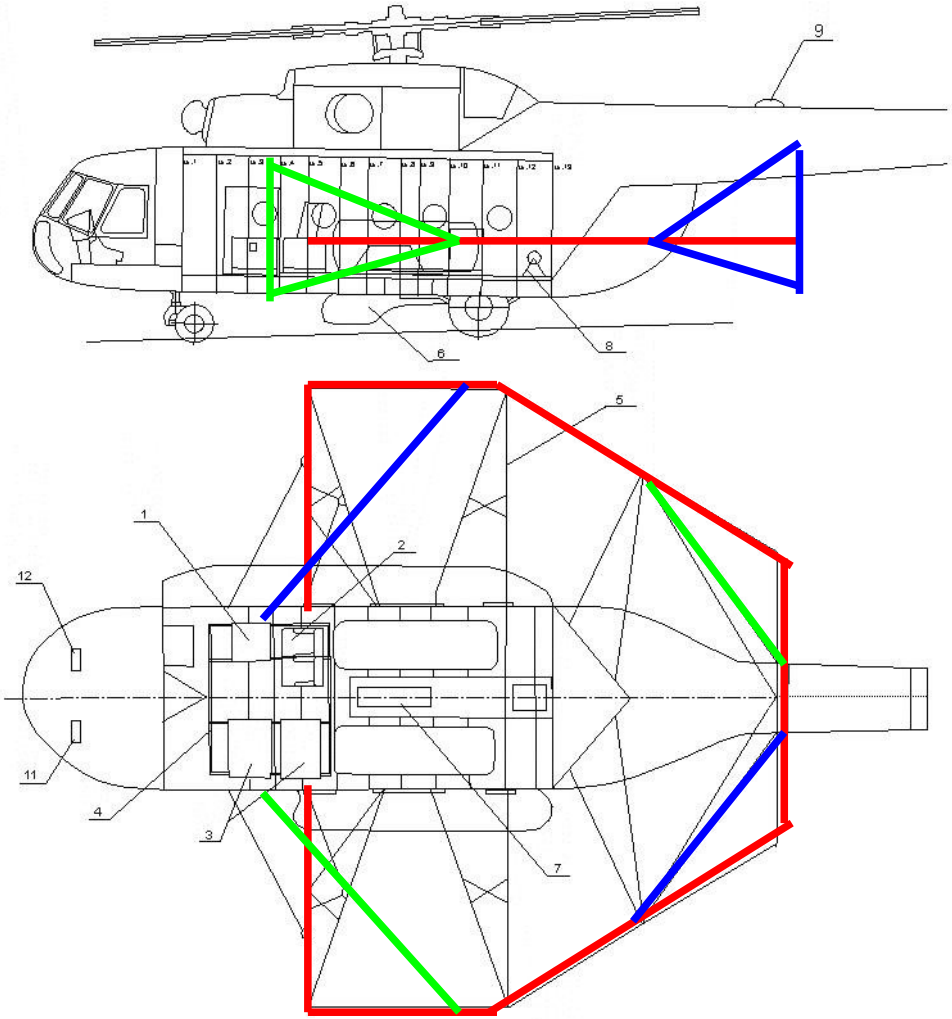
Receiver

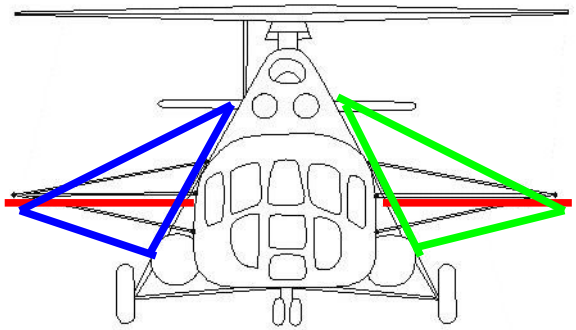




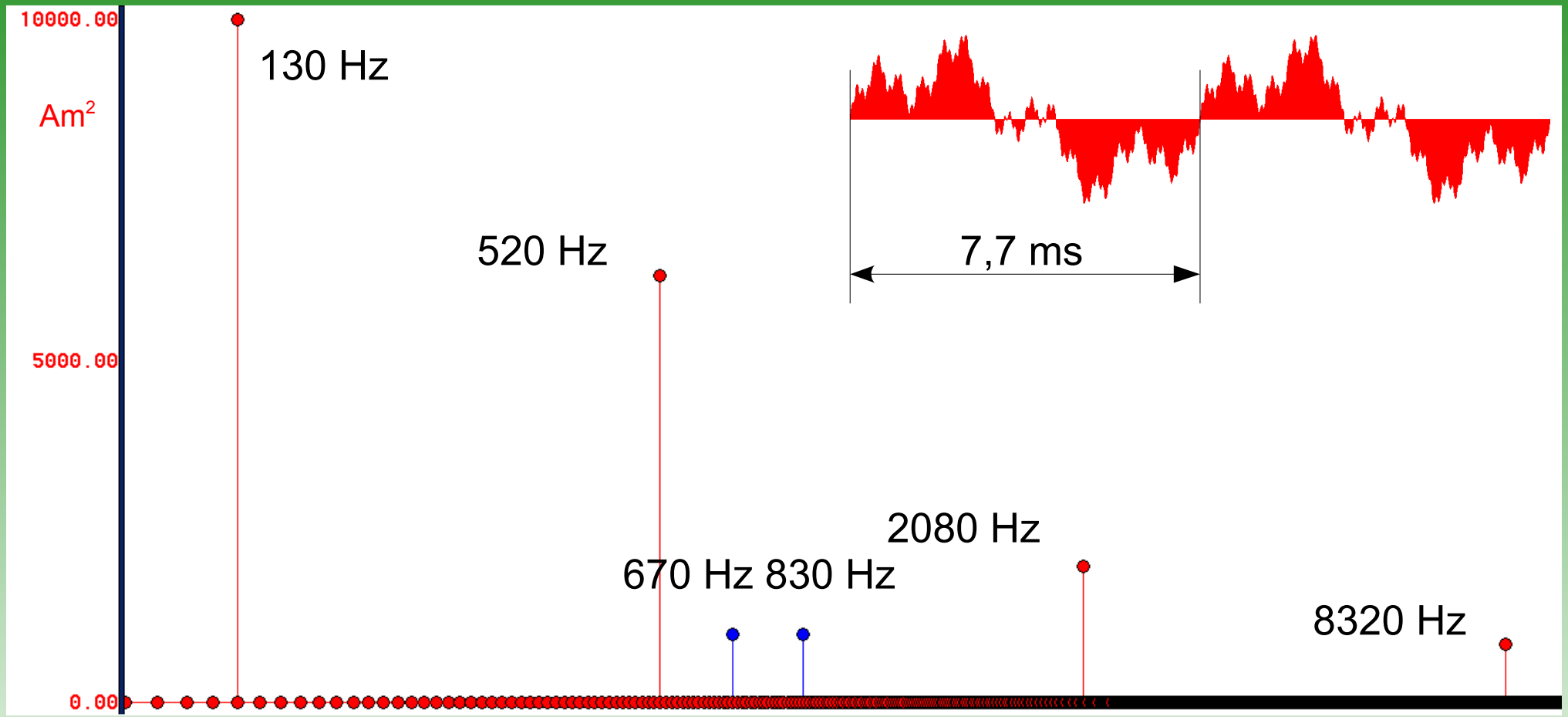
Transmitter Loops, fixed wing

Transmitter Loops, helicopter





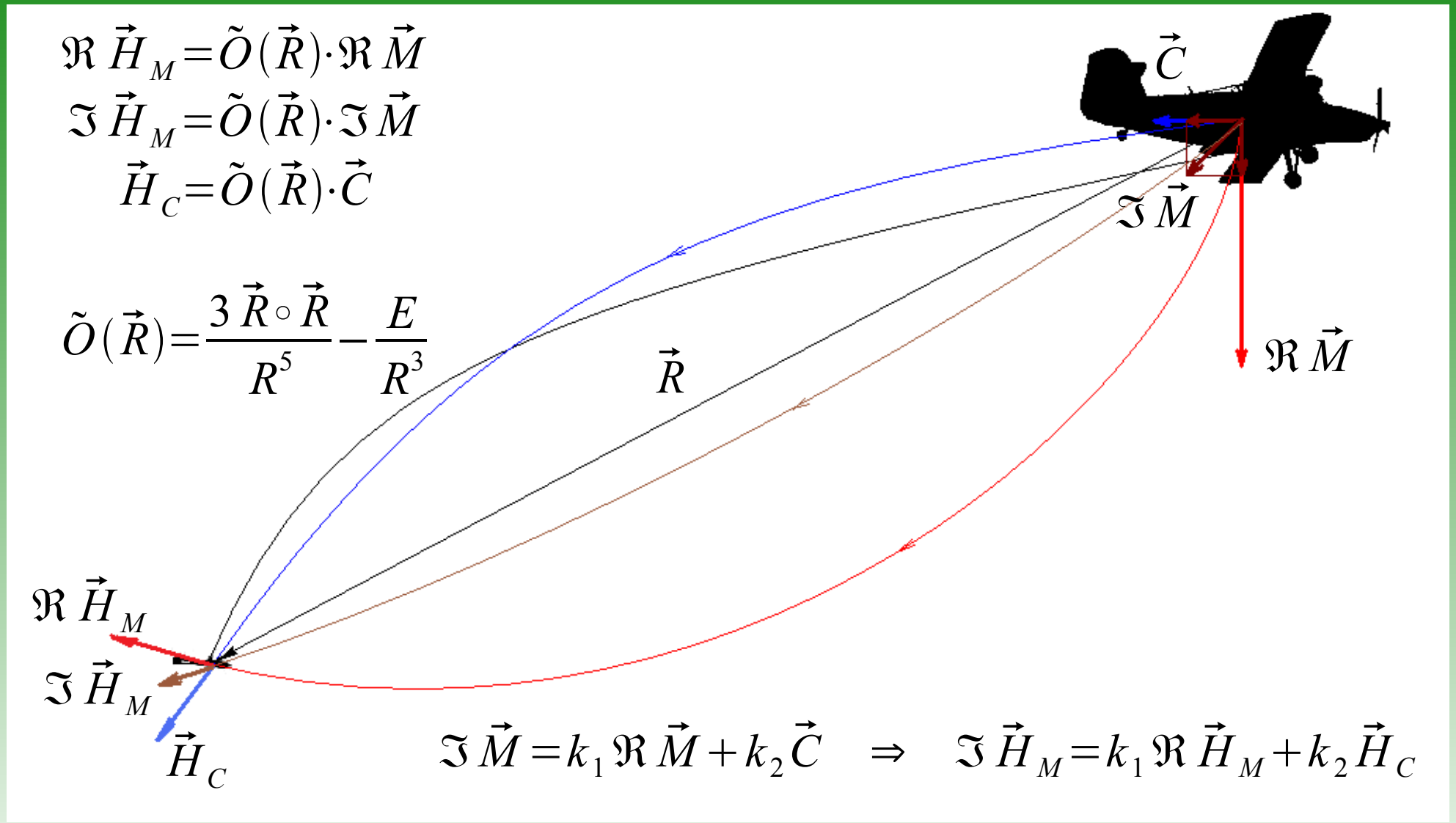
EM-4H Signals



Compensation Principle

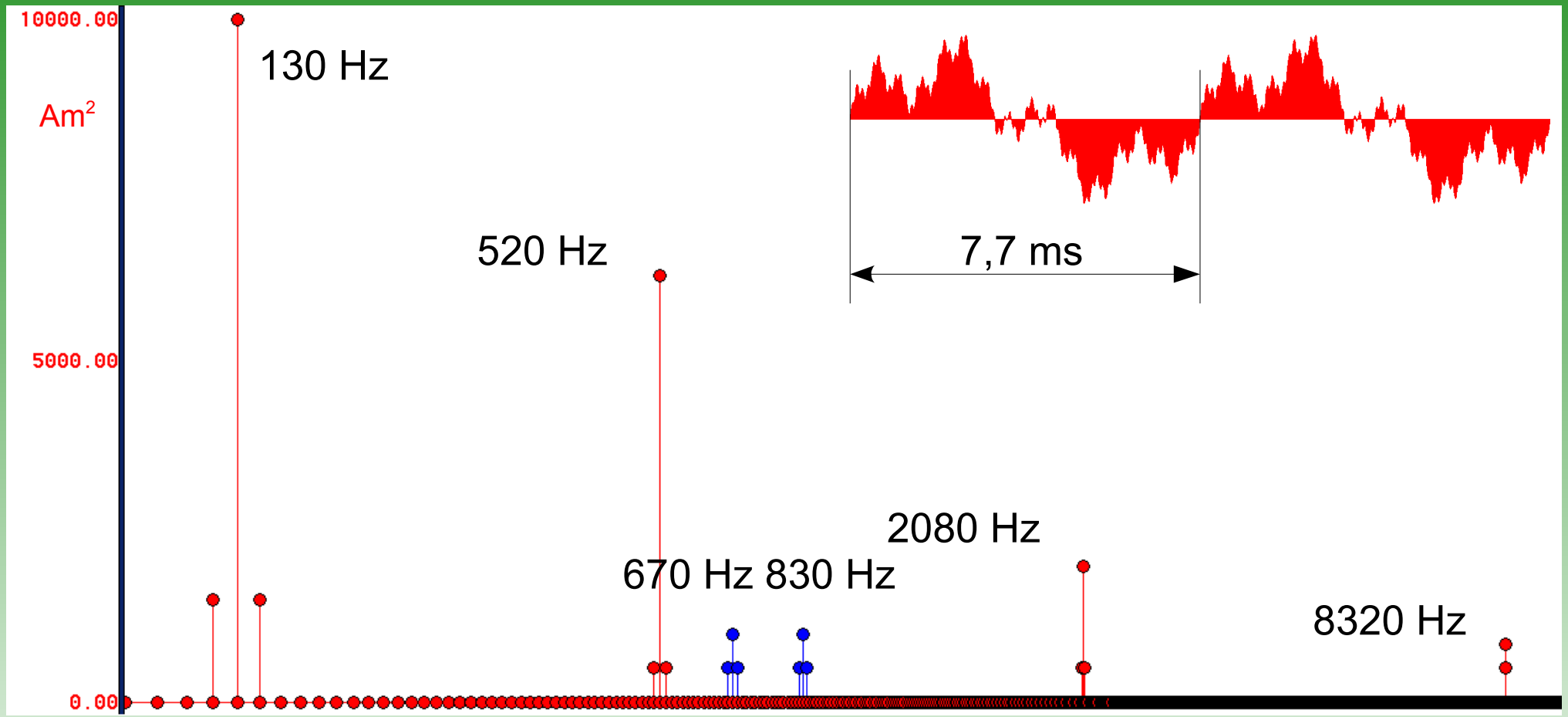
$$\Re \vec{H}_M = \tilde{O}(\vec{R}) \cdot \Re \vec{M}$$
$$\Im \vec{H}_M = \tilde{O}(\vec{R}) \cdot \Im \vec{M}$$
$$\vec{H}_C = \tilde{O}(\vec{R}) \cdot \vec{C}$$

$$\tilde{O}(\vec{R}) = \frac{3\,\vec{R} \circ \vec{R}}{R^5} - \frac{E}{R^3}$$



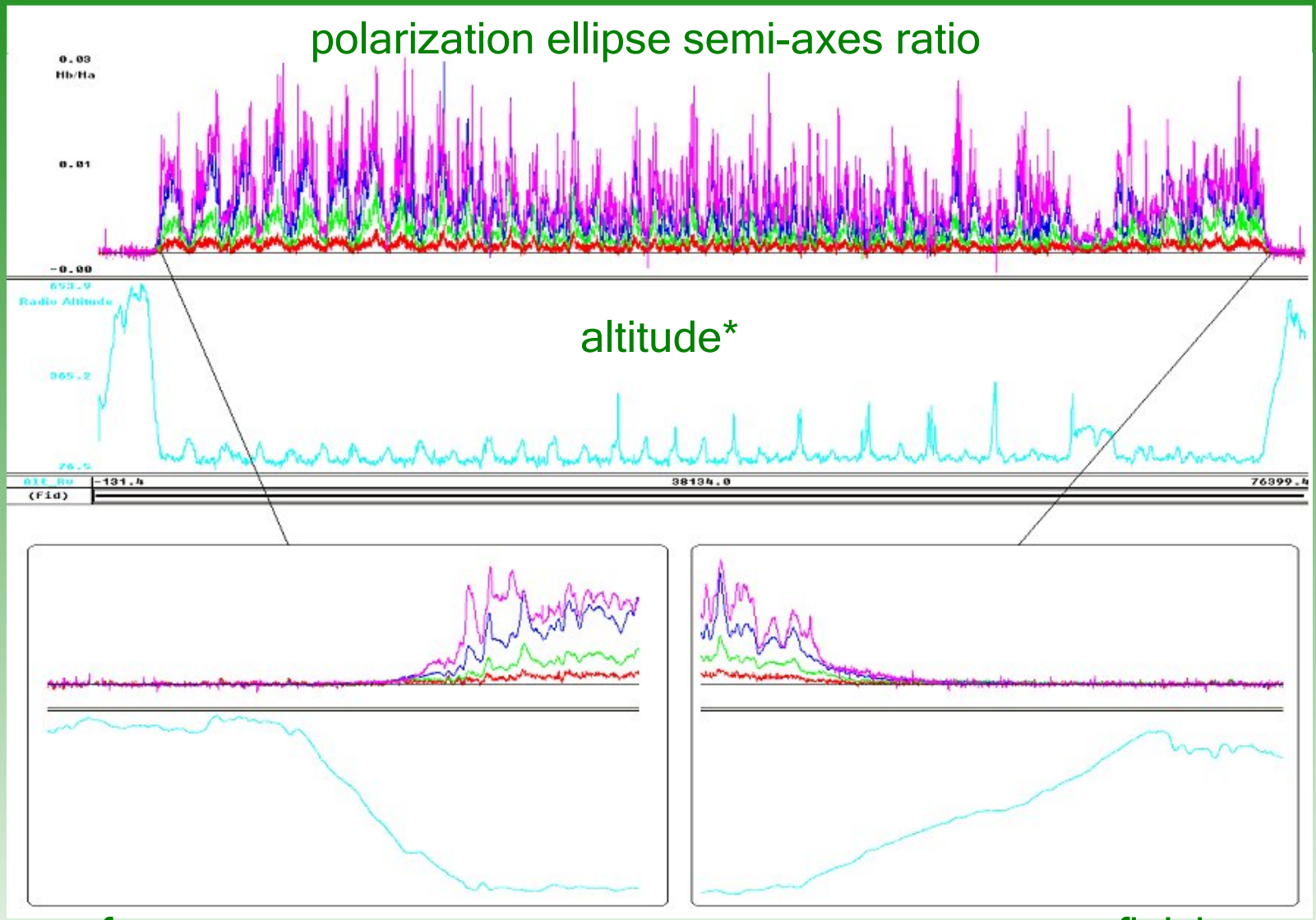
$$\Im \vec{M} = k_1 \Re \vec{M} + k_2 \vec{C} \quad \Rightarrow \quad \Im \vec{H}_M = k_1 \Re \vec{H}_M + k_2 \vec{H}_C$$

Pilot-signals



System Stability

Full Flight, more then 5 hours...



from start...

...to finish

*altitude changes from 650 meters in calibration zones (in the beginning and in the end) to 120 meters during survey

System Measurements

The EM-4H measures full vectors of active (imaginary) and reactive (real) components. In other words it measures full complex amplitude vector on four frequencies.

These measurements allow calculation of effective conductivity by inversing of the following equation:

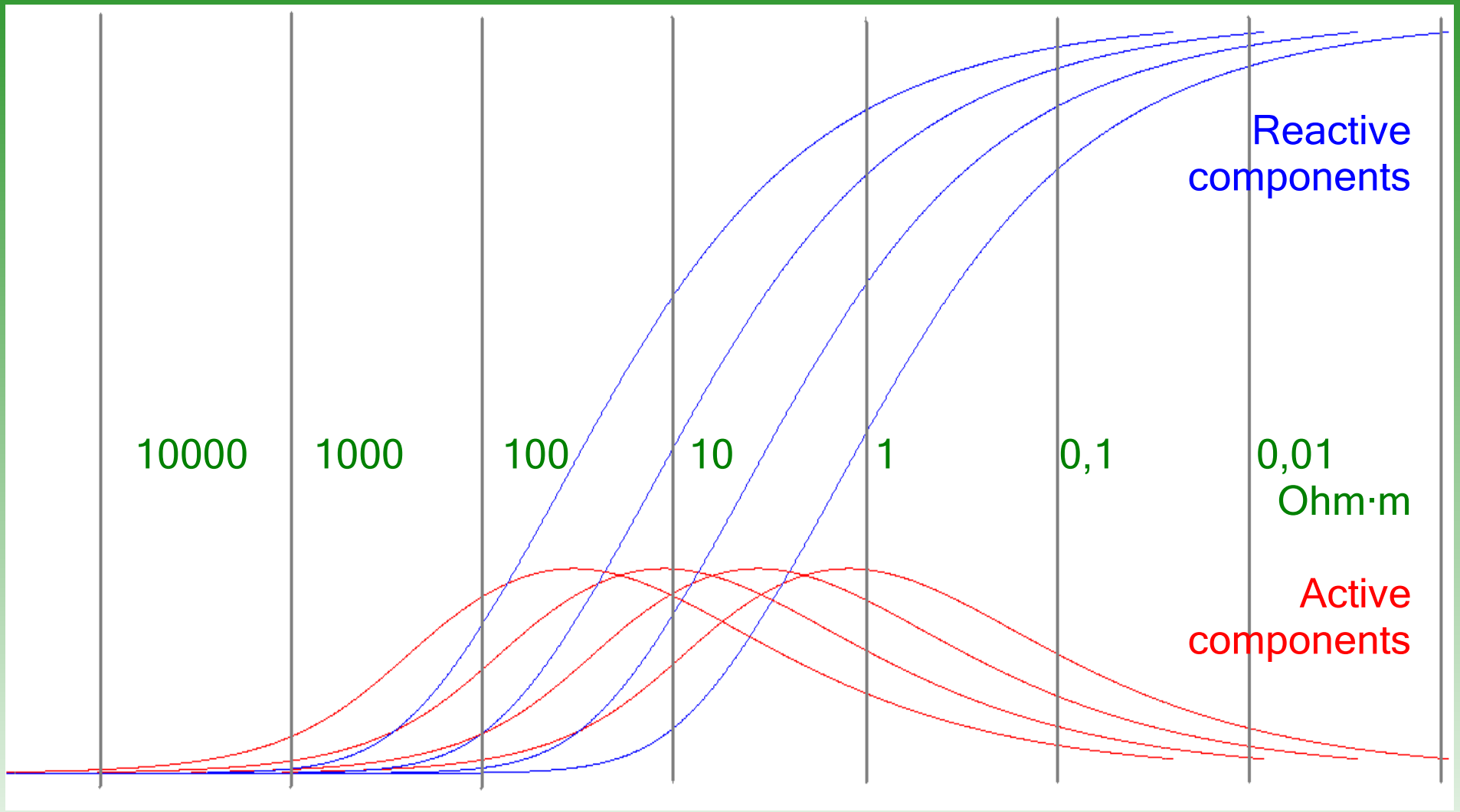
$$H_z^i(l, h_1+h_{2,}\sigma\omega) = -\frac{M}{4\pi}\int_0^\infty e^{-n_0(h_1+h_2)}\frac{n-n_0}{n+n_0}n_0^2 J_0(n_0 l)\,dn_0$$

$$n = \sqrt{n_0^2 - i\omega\mu_0\sigma}$$

where H_z^i – vertical component of internal field, l – horizontal distance between transmitter and receiver, h_1, h_2 – altitudes of transmitter and receiver, M – dipole moment on frequency ω, J_0 – zero order Bessel function of the first kind, σ – effective conductivity, μ_0 – magnetic permeability of free space.

All necessary values including receiver attitude with respect to transmitter are also measured by EM-4H during survey.

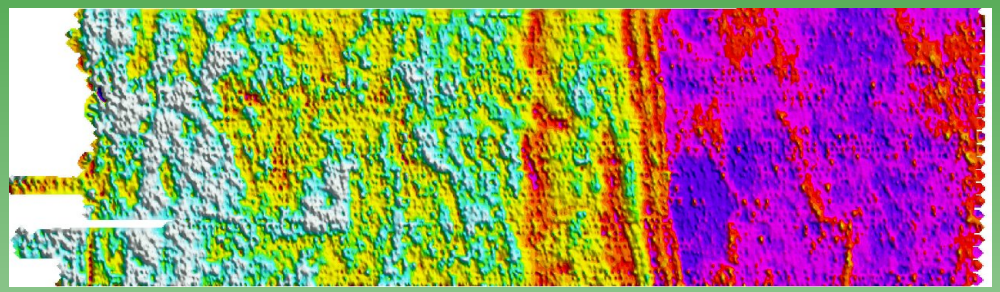
Applicability Range



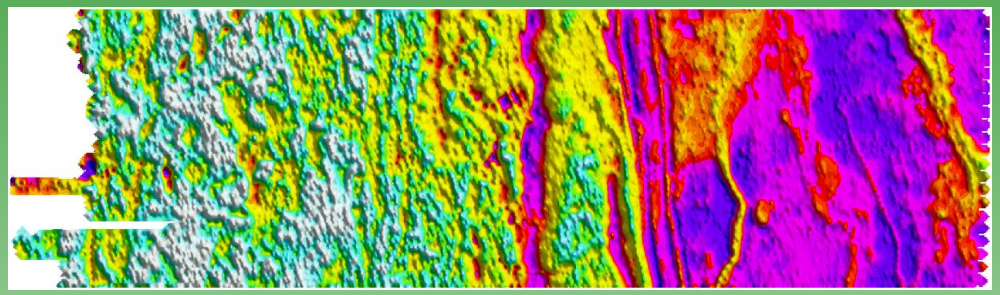
EM-4H Results

Initial processing results of **EM-4H** data are four maps of effective conductivity or resistance.

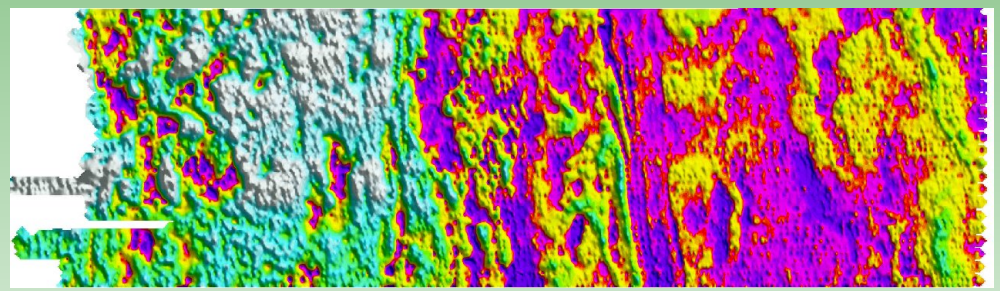
130 Hz



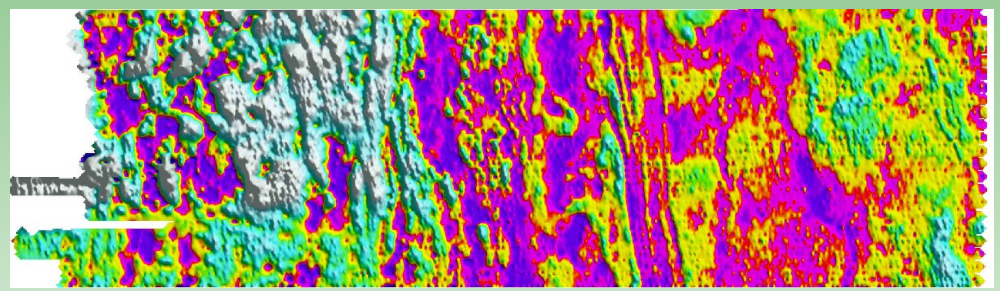
520 Hz



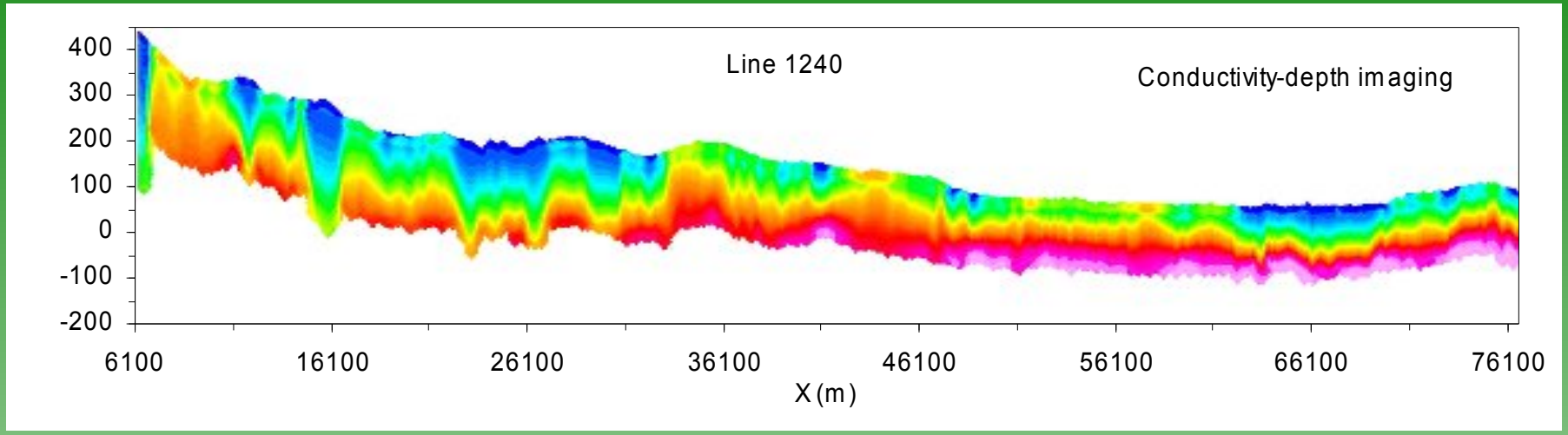
2080 Hz

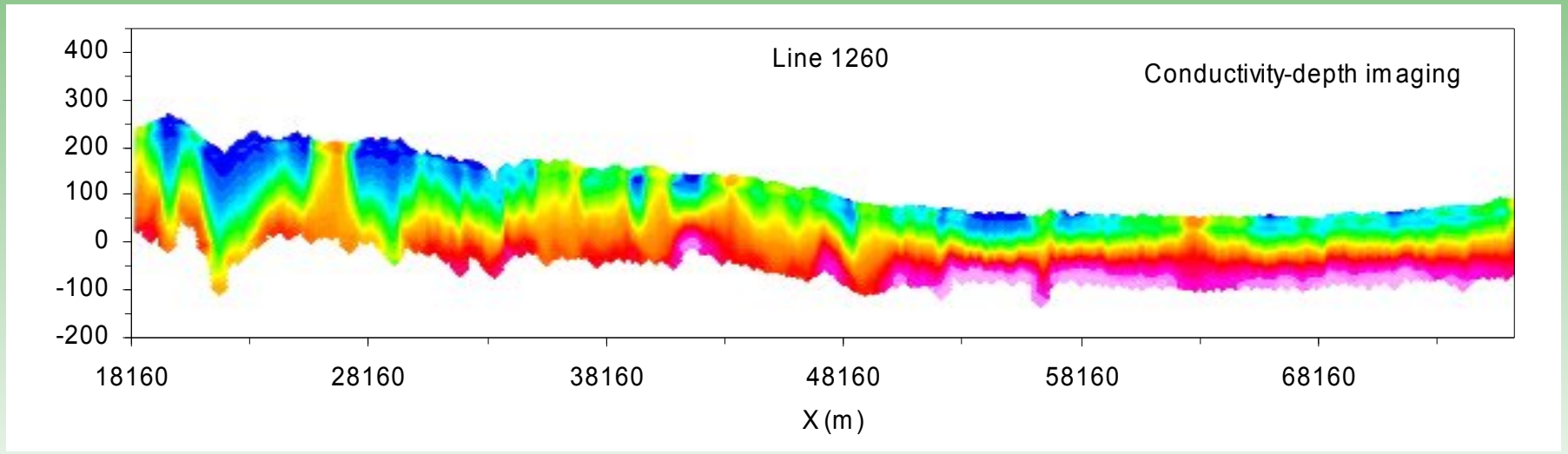


8320 Hz



Conductivity-depth analysis





EM-4H in work

AEROGEOPHYSICA (Mi-8, An-2)

ALROSA (An-2)

NF VSEGEI (An-2, An-3)

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