Calibration of Multi-Element Radio Heliograph (comment)

H. W. Urbarz

Calibration of multielement Radioheliographs

1.) an RT described by system parameters

2.) Context of 1.) with Objects (Sources, backgroun and with the output by the antenna equation

3.) Calibrat method taken from methods appl at single antenna RTs

a.) Man made source in front at far field distance

b.) cosmic sources near the sun resp. referen areas

c.) noise source feeds the radiometer input and calculate the T_A by means of 1.) and 2.)

procedure

a.) one fringe is on the sun to obtain a scan

b.) the fringes are off the sun.

c consider all the contributions, background aft the fringes, soil contrib by the 1/2 maximum lobes, loss contrib $T'_A = dT_A + (a-1)T_0$ a the waveguides, front end noise

e put up the antenna equation for the d. cases a.—b.)

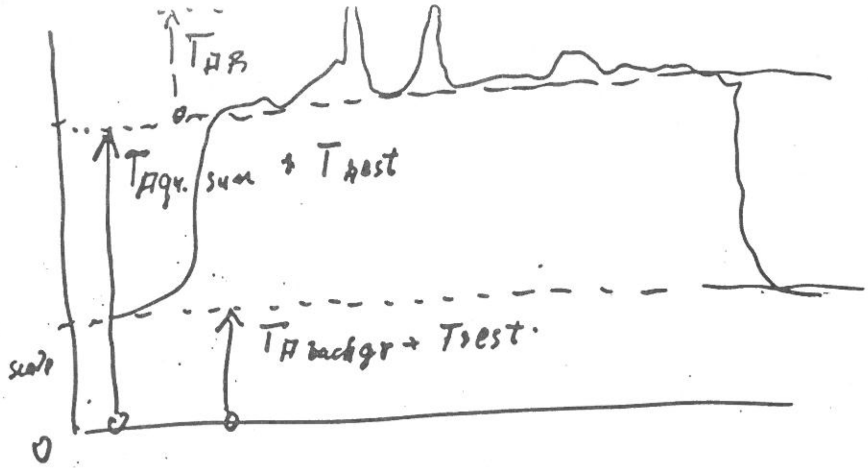
Minimum detectable flux of the system is dependent on the amps- & branching configuration, distinguish the correlated and uncorrelated noise. $\Delta S_{min} \to \Delta T_{s\,min} \neq \Delta T_{RADIOM.}$

one amp at the output of the branches is not realistic due to losses.
practical use is made of converters on each antenna or preamps after 4, 8 or more branches.

Where to feed in the noise source?

procedure of measurement the levels:
1 radiom off level 0
2 all radiometers on switched to the absorbers & noise measure the internal T_{in} → level 1 by noise source.
3 all radiom on the antennas, background only → level 3. measure the level by n source
4 same as 3 with the sun on our fringes. measure this level by n source
(substitution method, read the noise outputs.

Thus separation of contribution is possible



How to get Tqu sun for applic. of the convolution formula.

from a scatter diagram S_{sun} versus B_{spot}.

get the Tqu sun from the cylinder model with constant T = Tqu sun.

result one obtains the T K°- scale

$$T_A = \gamma \left\{ (1-\beta_s)\left[\frac{\lambda^2 S_Q}{2k\,\Omega_H} + T_u\right] + \frac{\beta_s}{2}(T_0 + T_u)\right\} + T_0(1-\gamma)$$

general Antenna equation with system parameters

no source in the lobe : $S_Q = 0$.

[ ] → convolution integral / formal