EGU and IVS Training School on VLBI for Geodesy and Astrometry
March 2-5, 2013, Aalto University, Espoo, Finland

Exercise-1: Antenna / Feed / Receiver

1. For an antenna with diameter D = 26 m, Tcal = 4 K, and observing at f = 8.6 GHz, it was found that P(calon) was 0.5 dB above P(caloff) and that P(onsource)/P(offsource)=1.072 for a source with flux density 25 Jy.

What is the antenna efficiency and antenna gain?

2. For an antenna with diameter D = 12 m, efficiency = 50%, Tcal = 4 K, observing at f = 8.6 GHz, it was found the P(calon) was 0.4 dB above P(caloff).

What is the system equivalent flux density (SEFD) and half power beam width (HPBW)? [Hint: For HPBW use $HPBW = \frac{0.88\lambda}{\sqrt{A_e}}$]

3. Test SEFD from #2 above using an on/off source observation. For a source with flux density of 1000 Jy and half power disk diameter of 28 arc min, P(onsource)/P(offsource) = 1.122

4. Test SEFD from #2 above using an on/off source observation for another source. This source has brightness temp = 4100 K and is a disk of diameter 30 arc sec. P(onsource)/P(offsource)=1.096.

5. For the antennas from #1 and #2 observing a source with flux density 0.4 Jy using 1 GHz bandwidth at f = 8.6 GHz and integrating for 30 s, what is the fringe amplitude and SNR. Correlation efficiency is 0.7.

6. For a two amplifier cascade, the first amplifier has gain 35 dB and input noise 20 K and the second amplifier has gain 20 dB and input noise 1000 K. The antenna temperature entering the first amplifier is 1 K. What is the SNR after the first amplifier? What is the SNR after the second amplifier?

Please send your hopefully correct answers by April 1st to Bill Petrachenko. ☺