

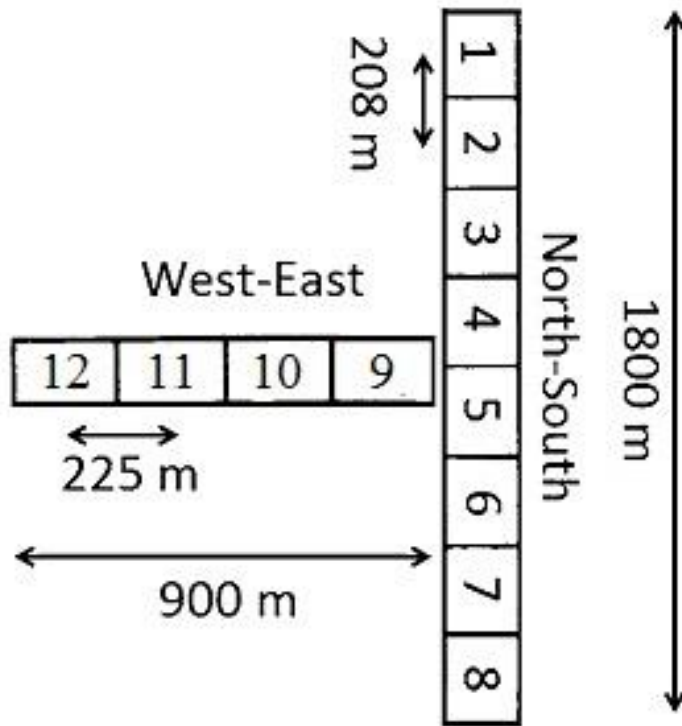
# **Interferometer observations of solar Type II and Type IV bursts by the radio telescope UTR-2 on 29 May 2014**

*Melnik V.(1), Shepelev V.(1), Dorovskyy V.(1), Brazhenko A.(2)*

1 Institute of Radio Astronomy, Kharkov, Ukraine

2 Institute of Geophysics, Gravimetrical Observatory,  
Poltava, Ukraine

# Radio telescope UTR-2



frequency range – 8 -33 MHz  
frequency resolution – 4 kHz  
time resolution – 0.1s  
square – 150,000 sq.m  
beam – 25`x25`





West-East arm



North-South arm

## Radio telescope URAN-2



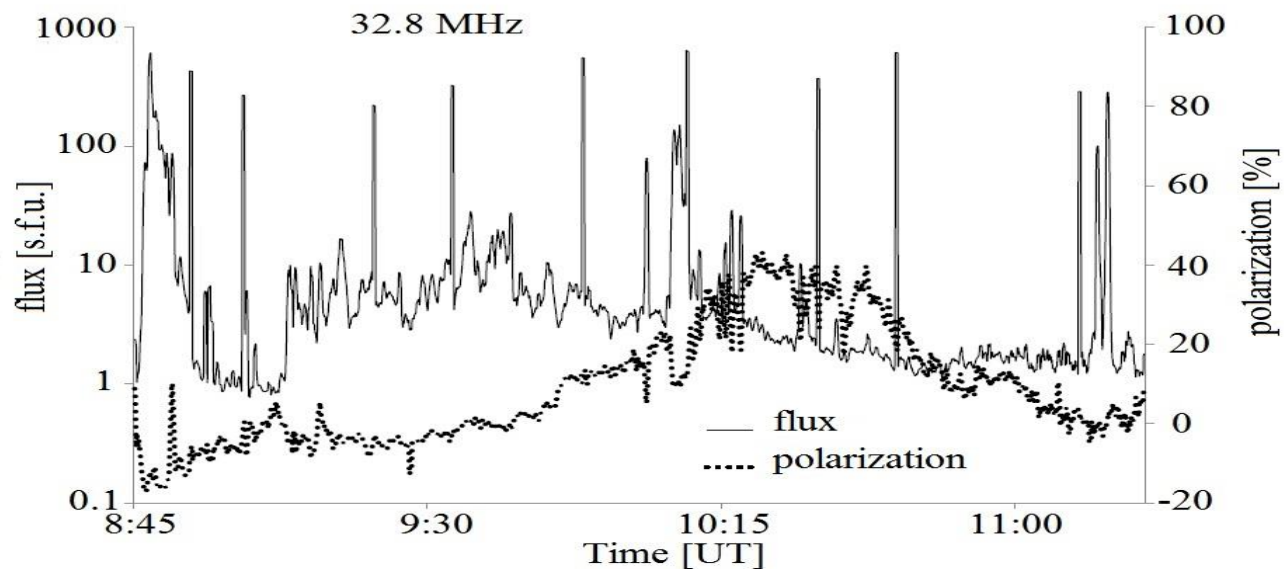
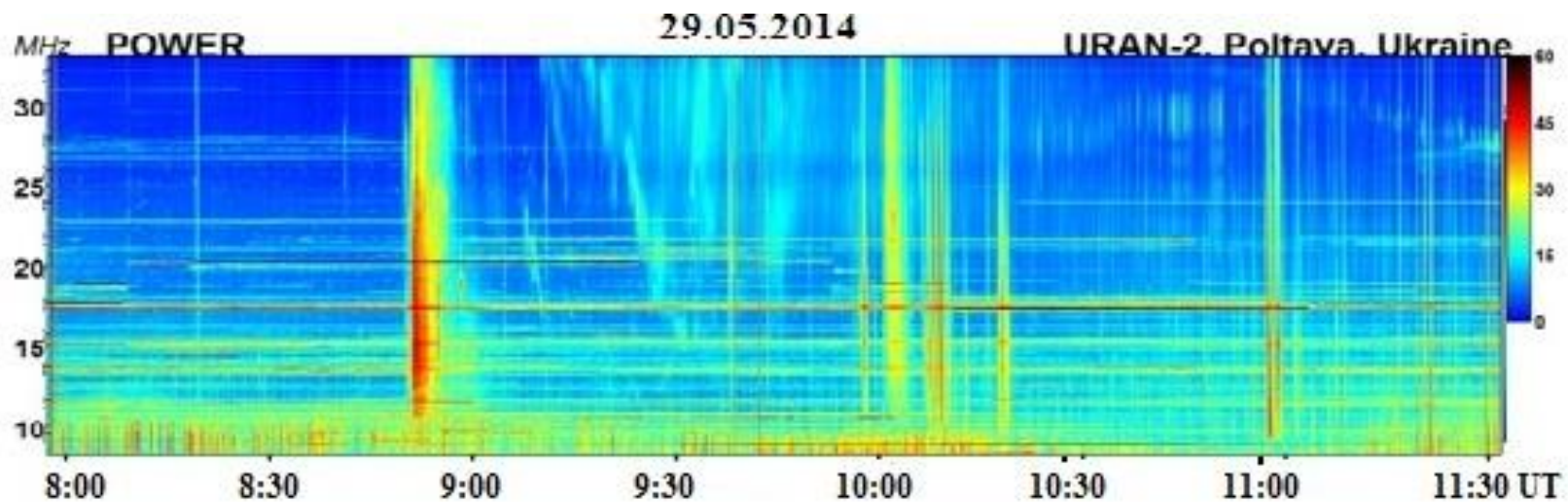
frequency range – 8 -33 MHz

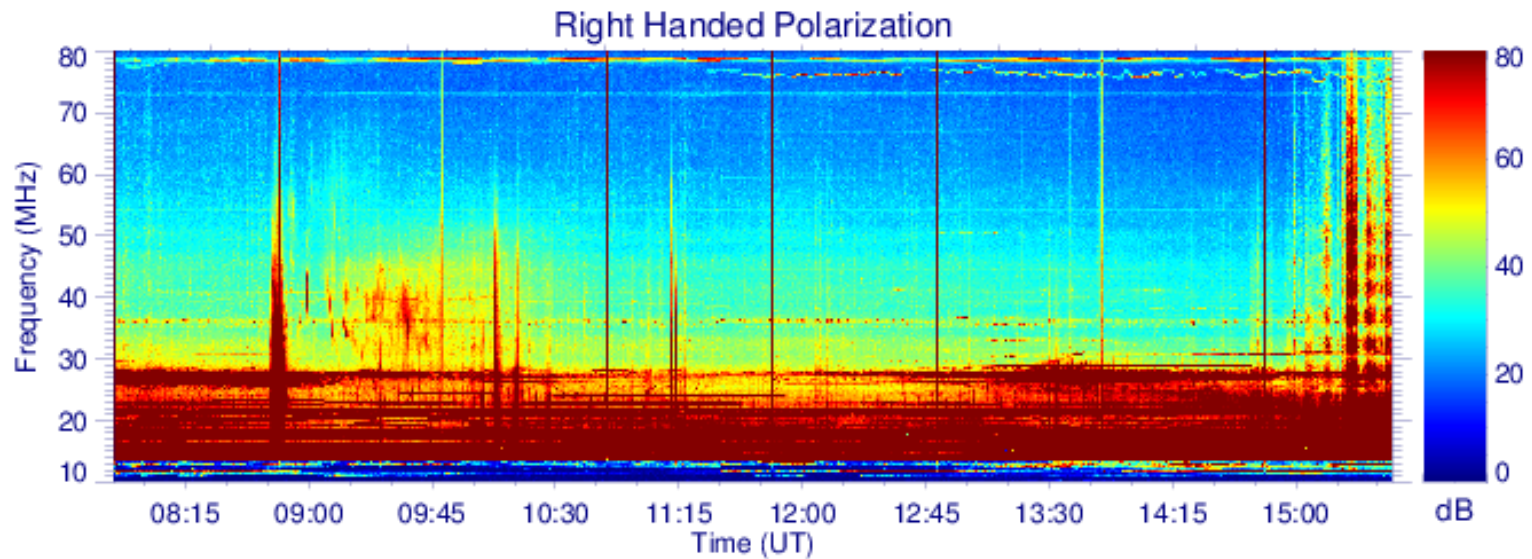
frequency resolution – 4 kHz

time resolution – 0.1s

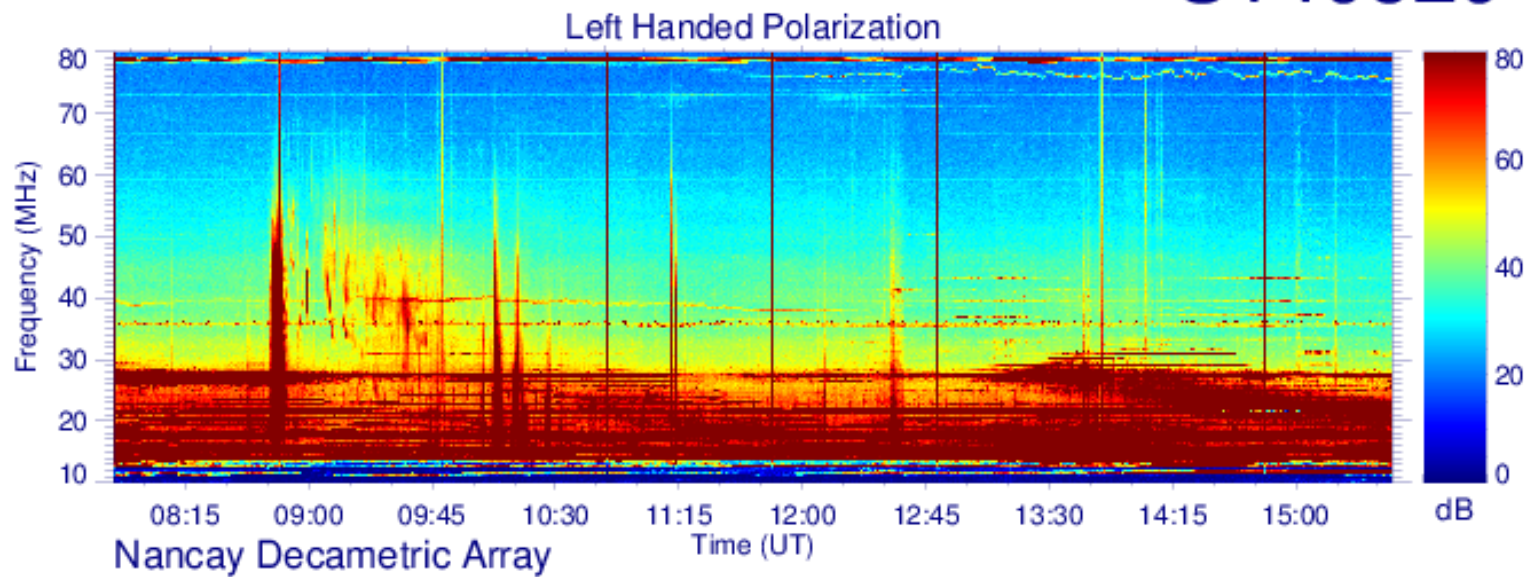
square –28,000 sq.m

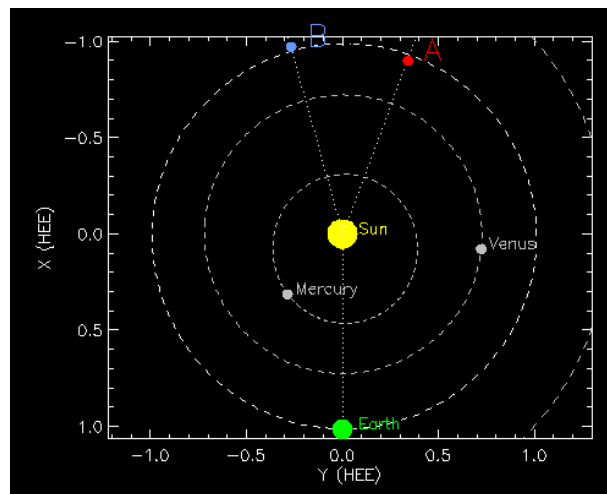
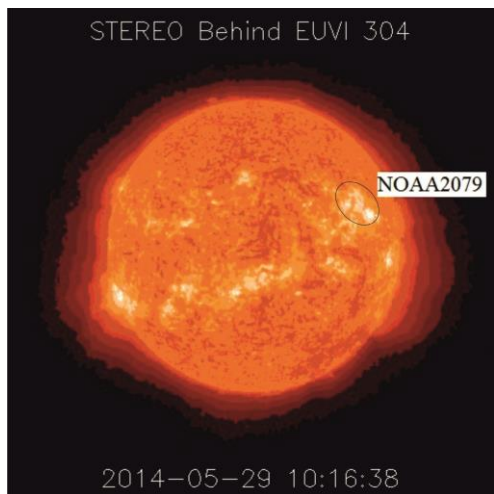
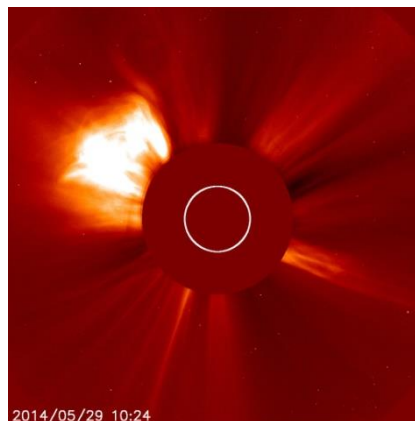
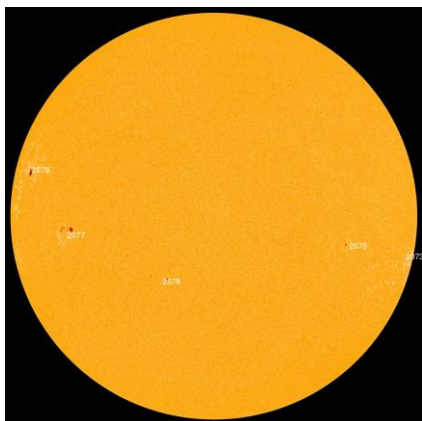
beam –  $3.7^{\circ} \times 7^{\circ}$





# S140529





# Definition of source position

$$\sin \Delta\theta = \frac{\Delta\varphi\lambda}{2\pi L}$$

$\Delta\theta$  - distance from the Sun,  $\Delta\varphi$  - phase difference  
 $\lambda$  - wavelength,  $L$  - baseline of interferometer



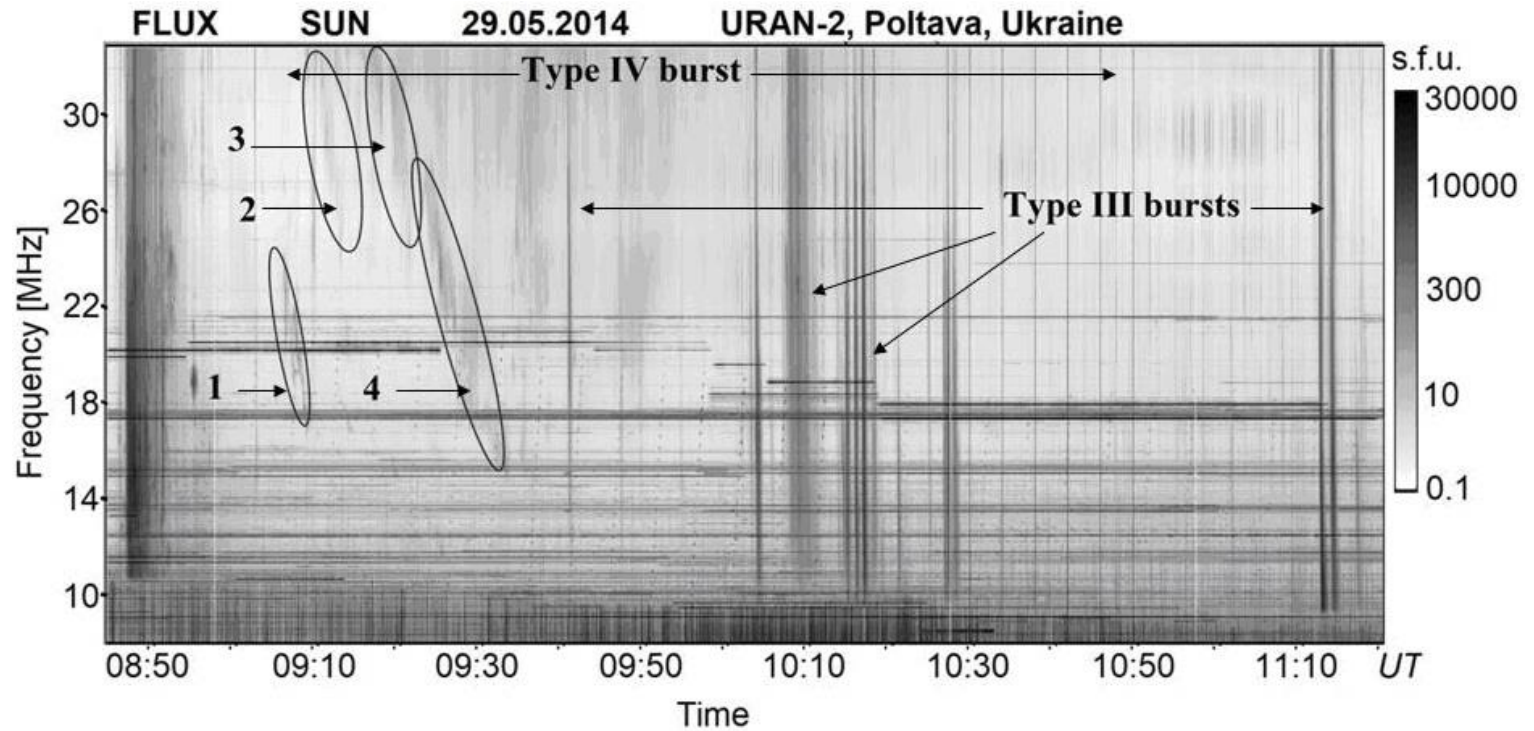
# Definition of source sizes on visibility function

$$\gamma = \exp\left[-\left(\frac{\pi\theta L}{2\lambda\sqrt{\ln 2}}\right)^2\right]$$

$\theta$  - size of source,  $\lambda$  - wavelength,

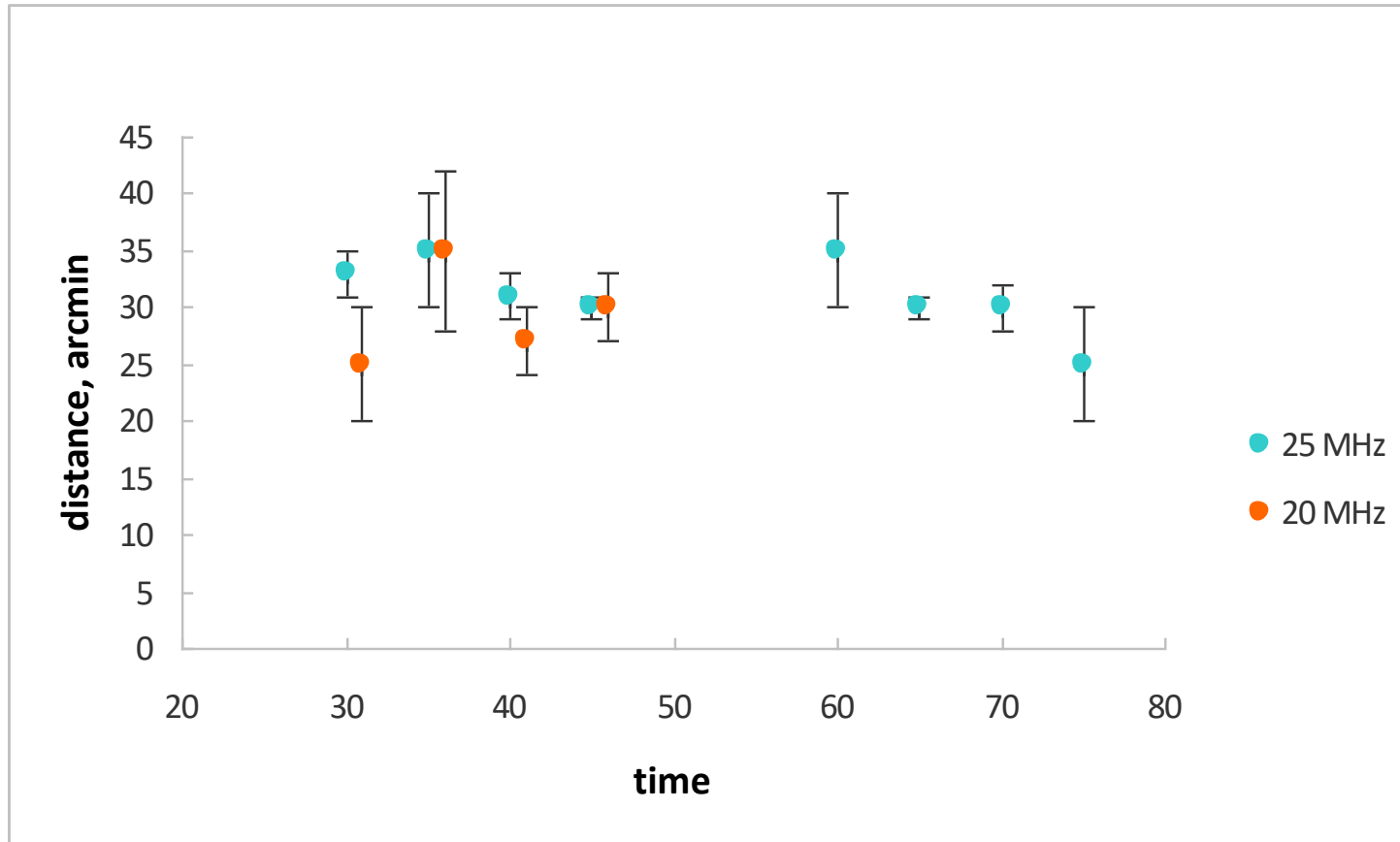
$L$ - baseline of interferometer

# Type IV

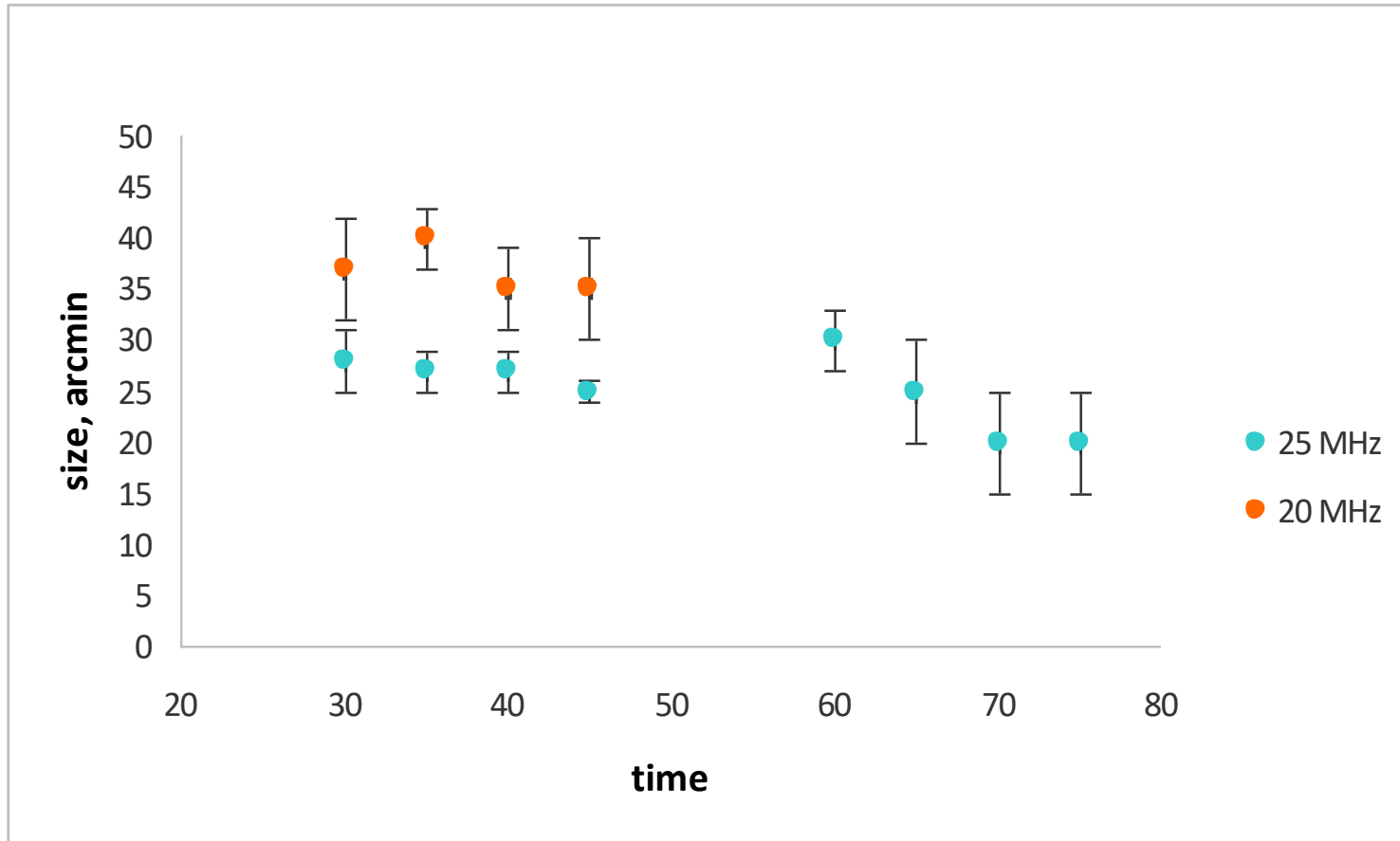


(Melnik et al., 2018, Melnik et al., 2020)

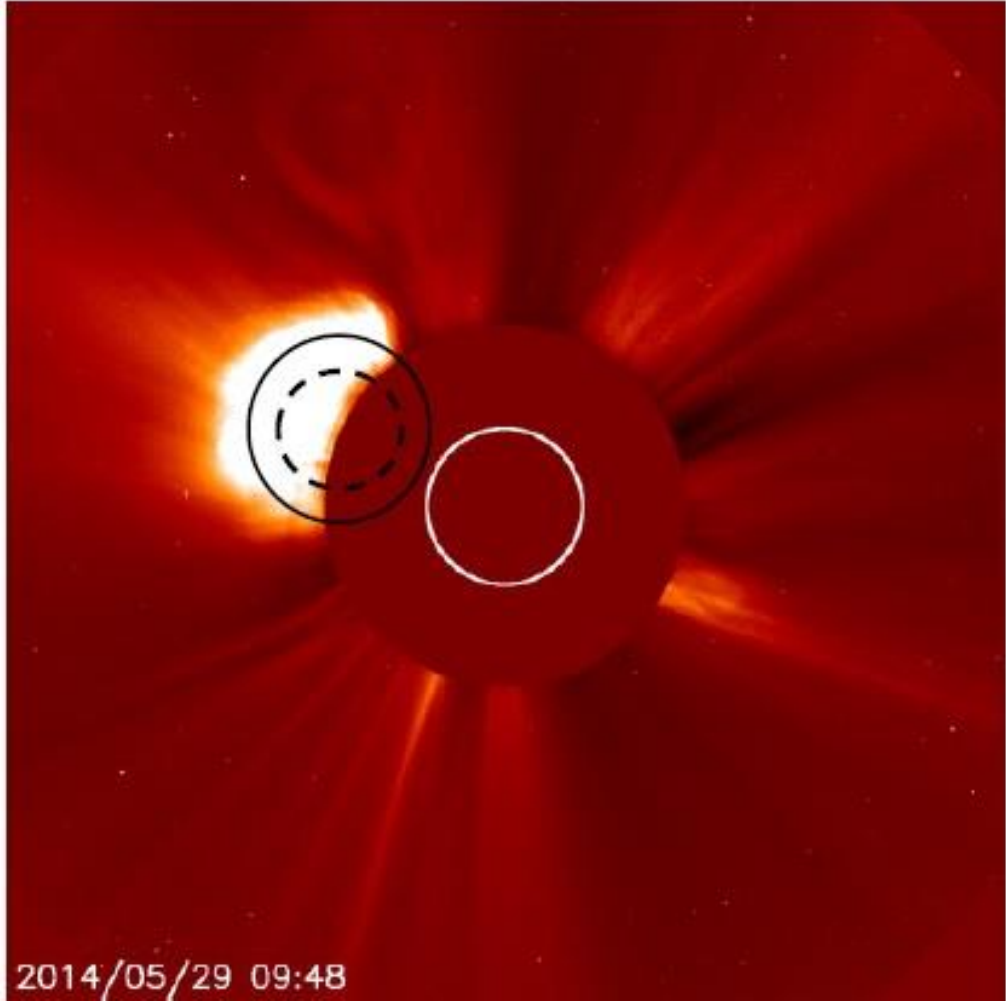
# Positions of Type IV sources at 20 and 25 MHz



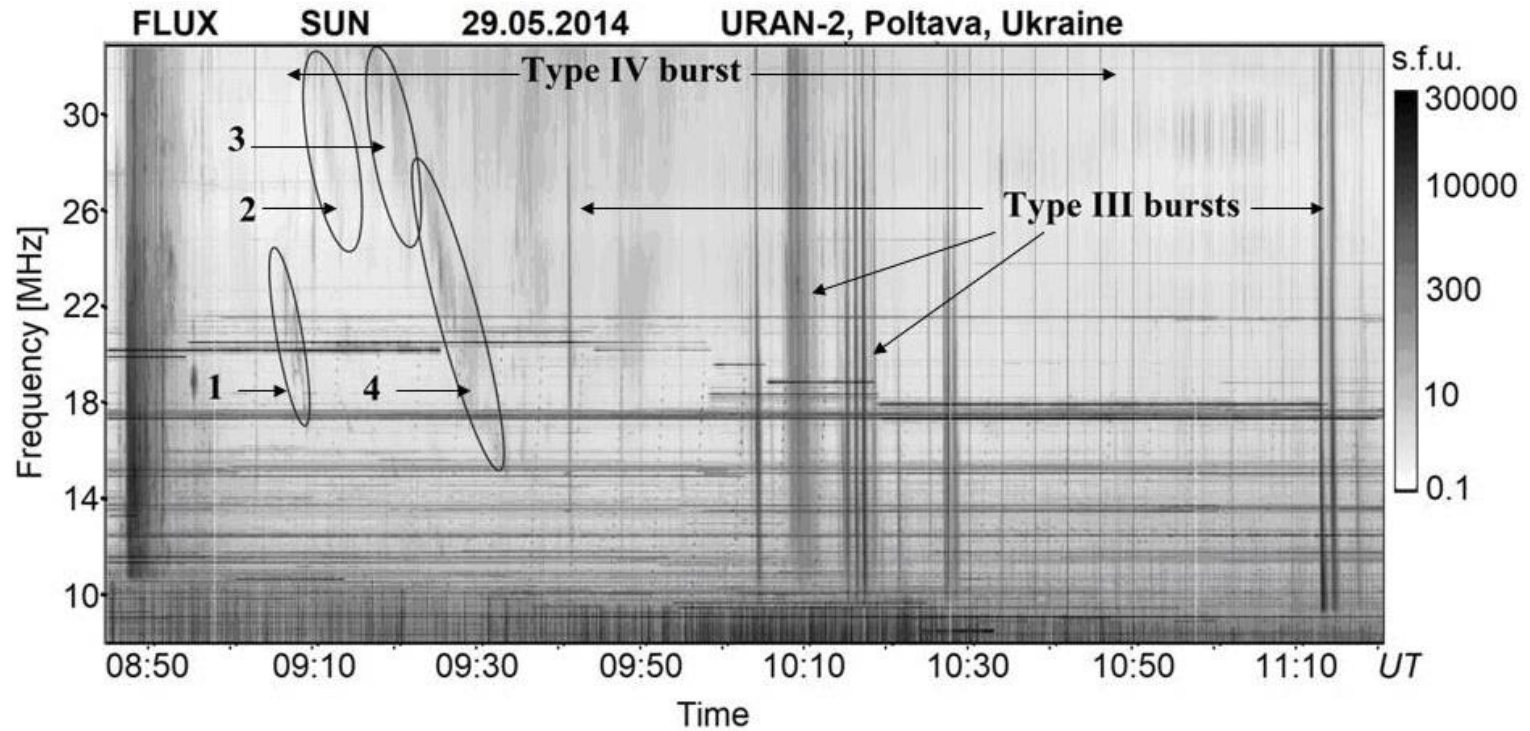
# Sizes of Type IV sources at 20 and 25 MHz



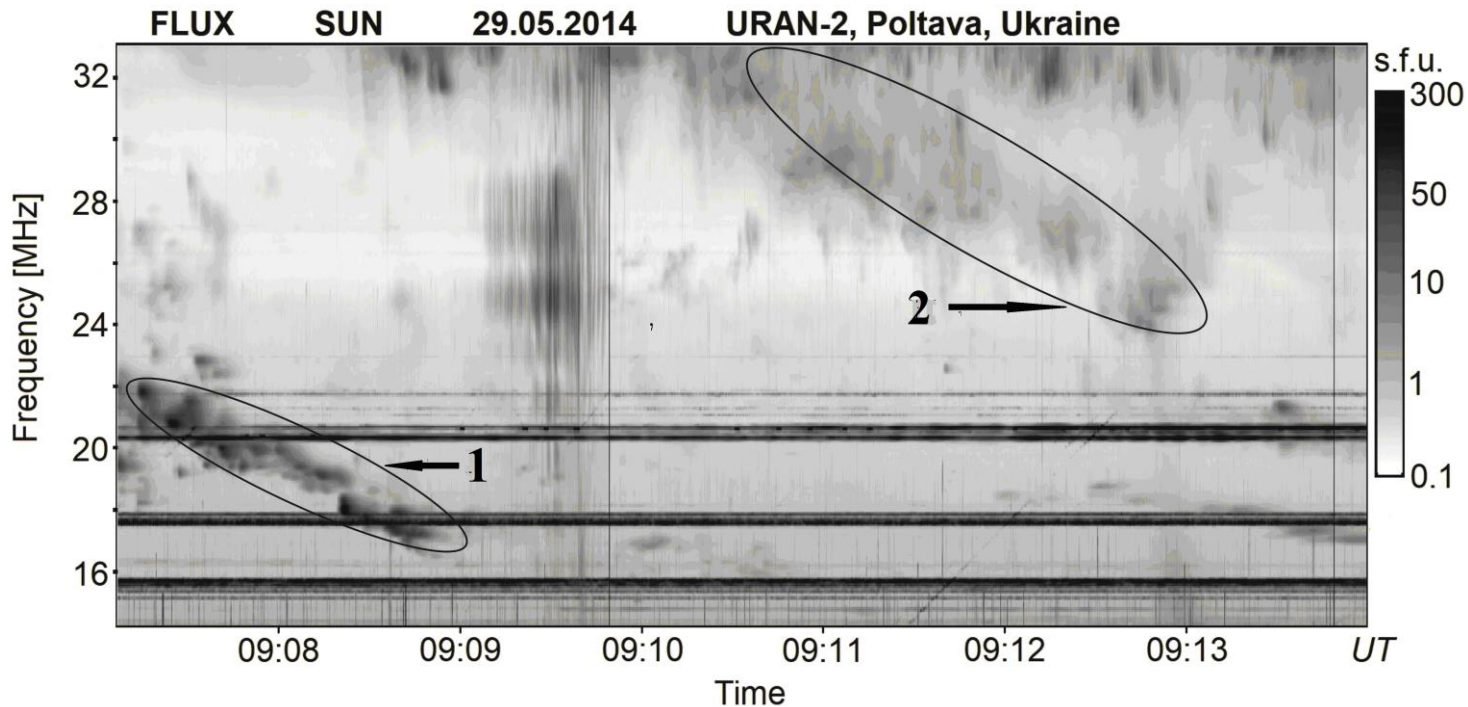
Brightness temperatures  $3.5 \cdot 10^7 K$  and  $1.8 \cdot 10^7 K$  at 25 and 20 MHz



# Type II bursts

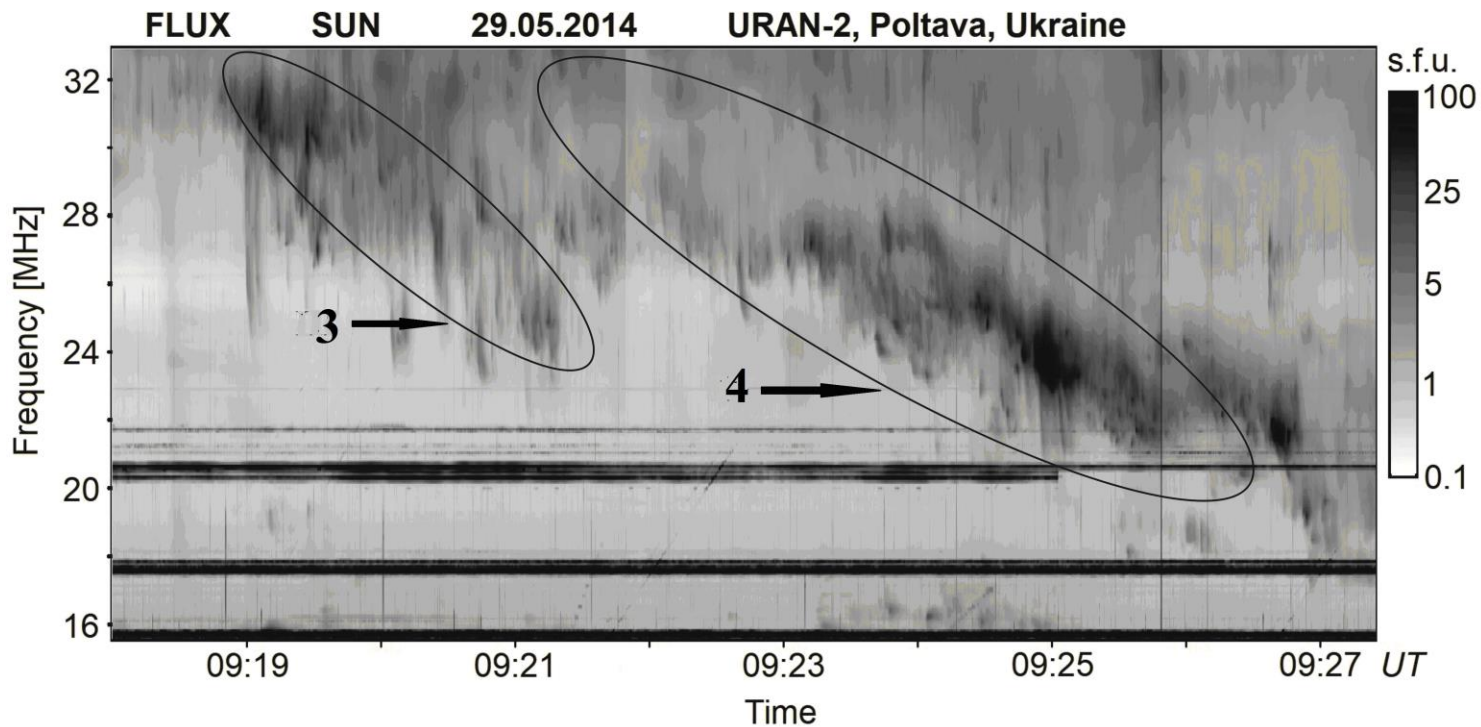


(Dorovsky et al., 2018)



Type II (1)  
 durations 3-6 s  
 fluxes 10-100 s.f.u.  
 polarization 1-3 %  
 drift rate 60 kHz/s  
 distance 25-30 arcmin  
 sizes 10-27 arcmin

Type II (2)  
 fluxes 1-4 s.f.u.  
 drift rate 60 kHz/s  
 polarization about 0%  
 sizes 13-15 arcmin  
 distance 35 arcmin

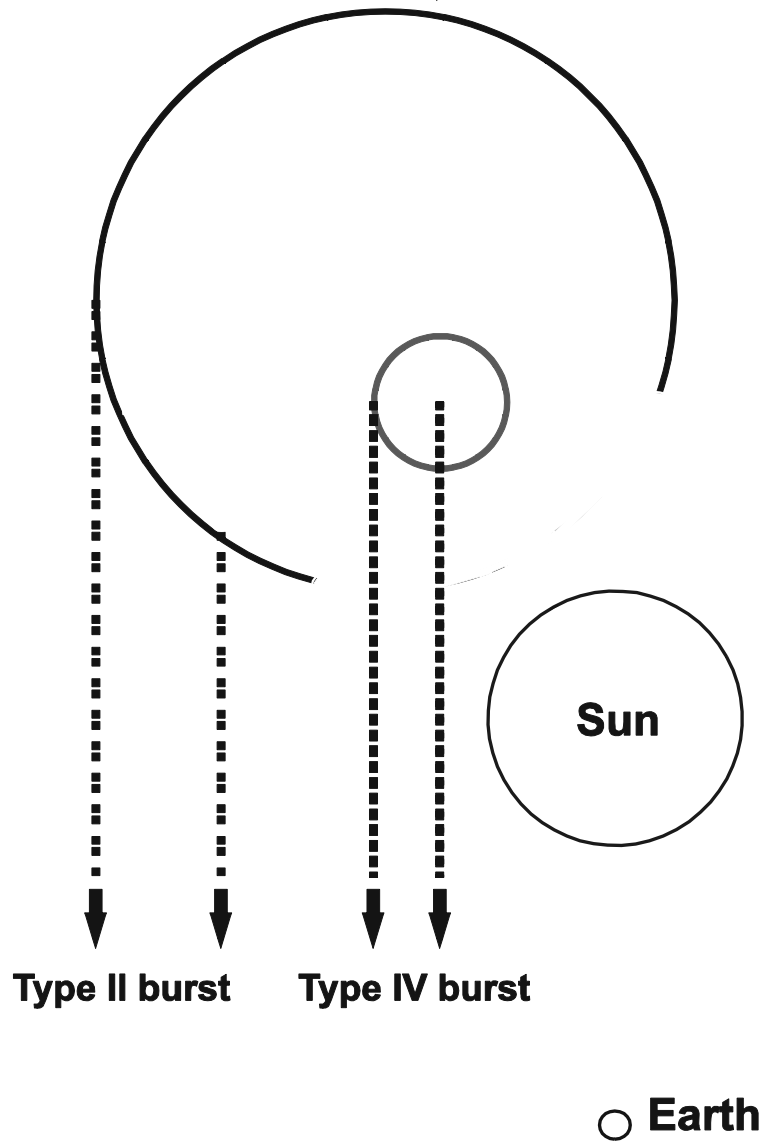


Type II burst (3)  
fluxes about 10s.f.u.  
sizes 13-18arcmin  
distance 30 arcmin

Type II burst (4)  
fluxes 10-30 s.f.u.  
sizes 20 arcmin  
distance 40-45 arcmin

Brightness temperatures  $5 \cdot 10^7 K$  -  $5 \cdot 10^8 K$





## Conclusions

1. Type IV burst on 29 May 2014 was stationary.
2. Type IV burst source was situated at the distance about 30'.
3. Its sizes were about 30 and 40' at 25 and 20 MHz correspondingly.
4. Type II bursts were generated by different parts of shock.
5. Sizes of sub-bursts of Type II bursts were from 10 to 27 '.

**Thank you for your attention!**



