

Interferometer observations of solar type III bursts by the radio telescope UTR-2

**Melnik V. (1), Shepelev V.(1), Brazhenko A.(2), Dorovskyy V.(1),
Rucker H. (3), Poedts S.(4)**

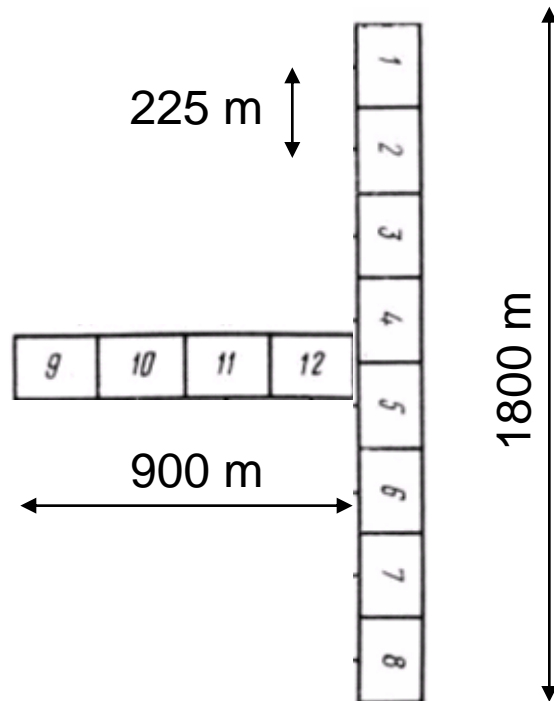
(1) Institute of Radio Astronomy, Kharkov, Ukraine

(2) Institute of Geophysics, Gravimetrical Observatory, Poltava, Ukraine

(3) Commission for Astronomy, Graz, Austria

(4) Catholic University of Leuven, Leuven, Belgium

Radio telescope UTR-2



frequency range – 8 -32 MHz
frequency resolution – 12 kHz
time resolution – 0.1ms
square – 150,000 sq.m
beam – 25`x25`

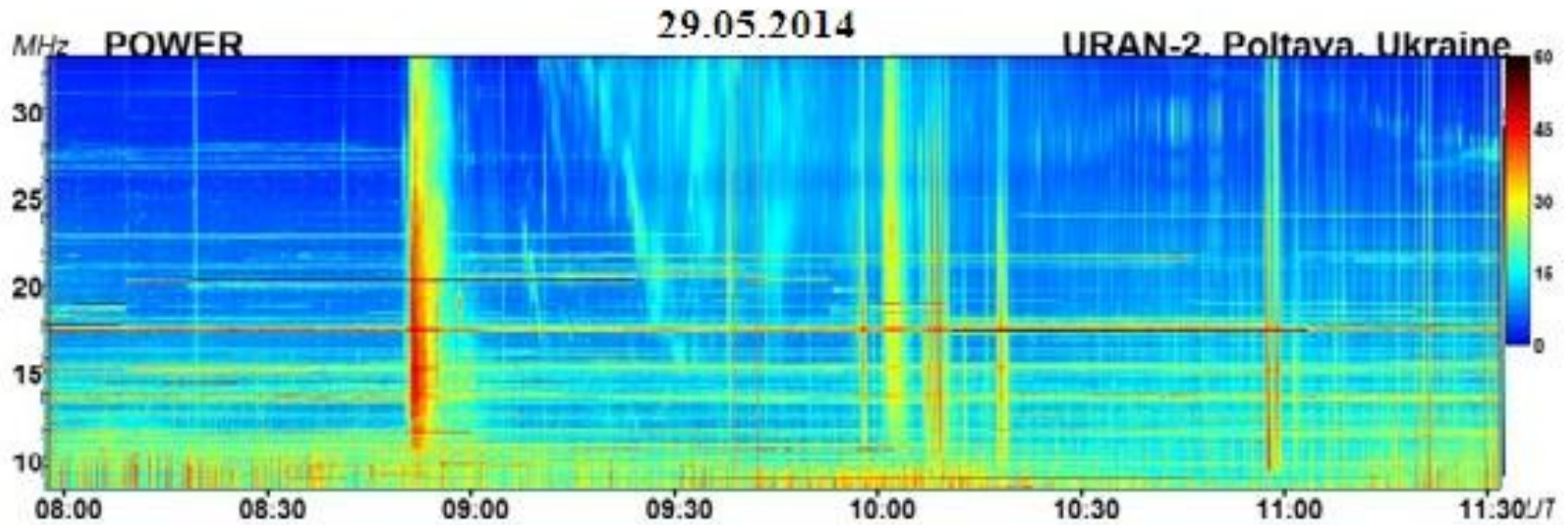




West-East arm



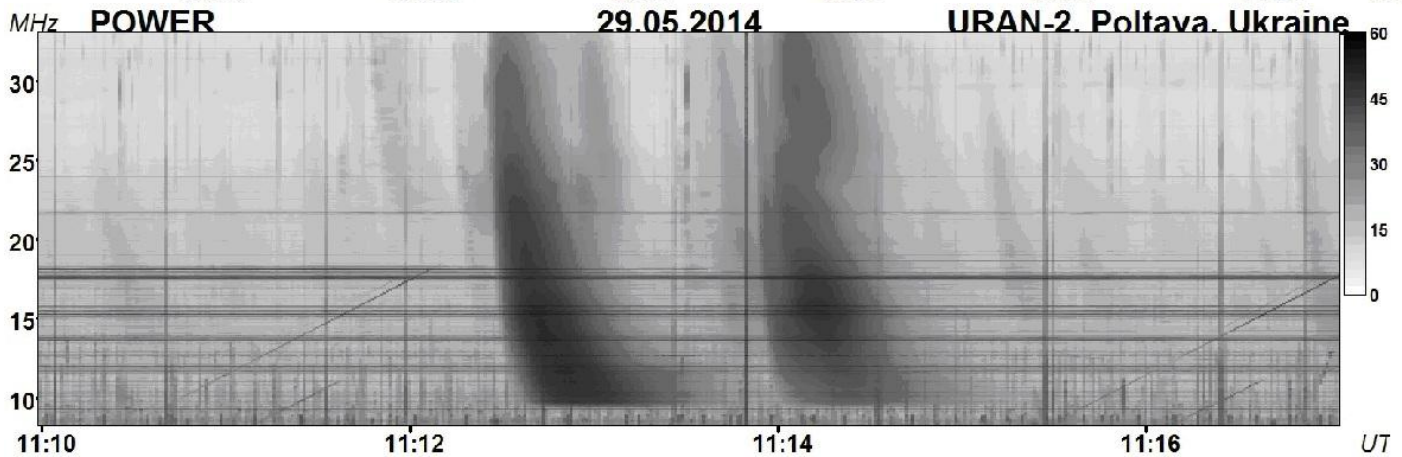
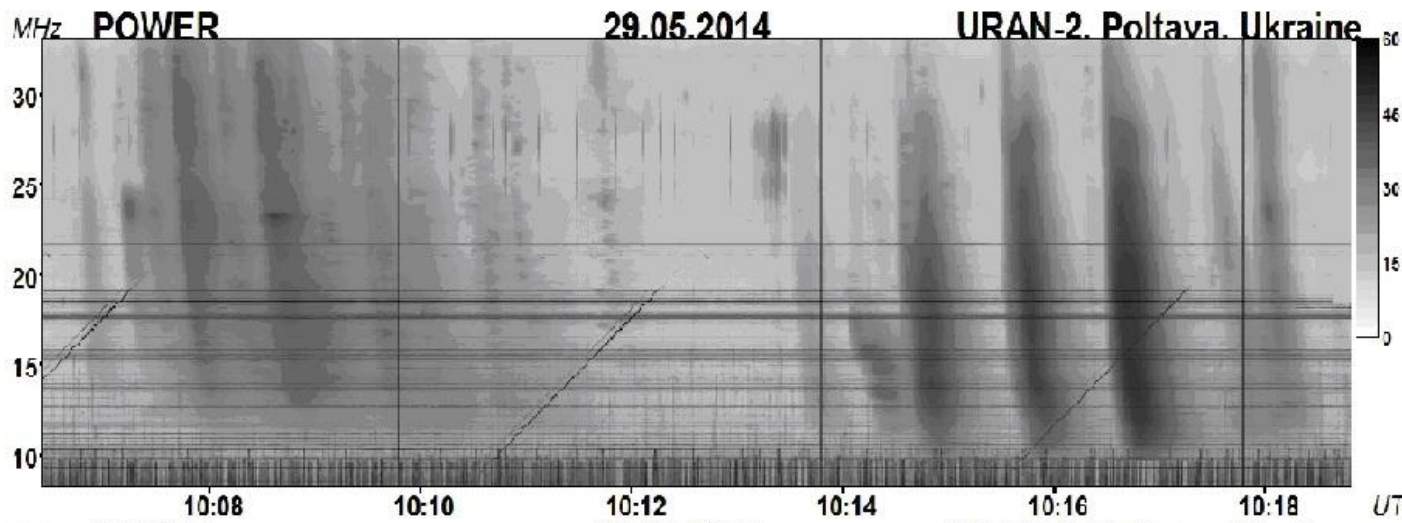
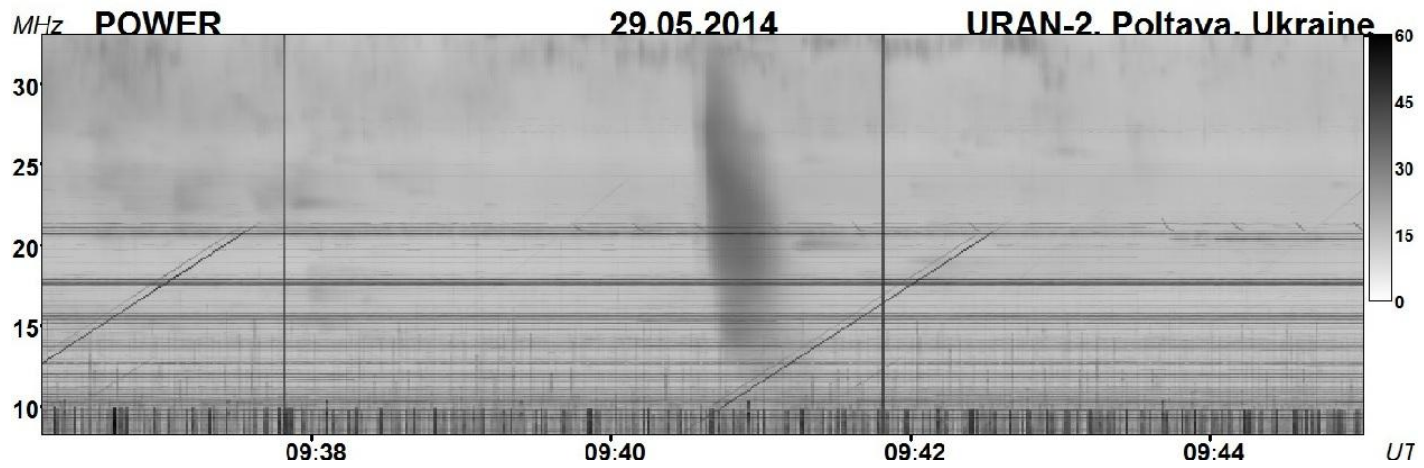
North-South arm



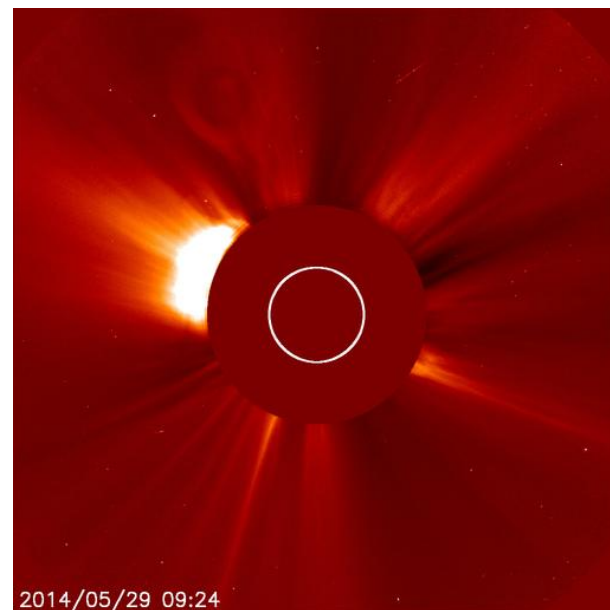
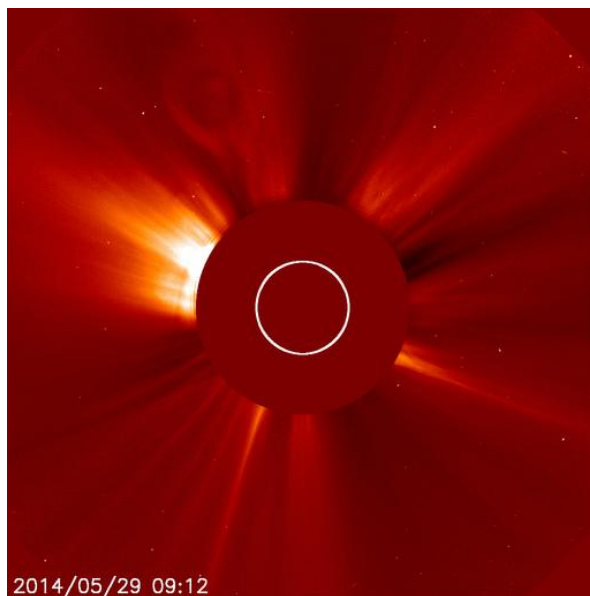
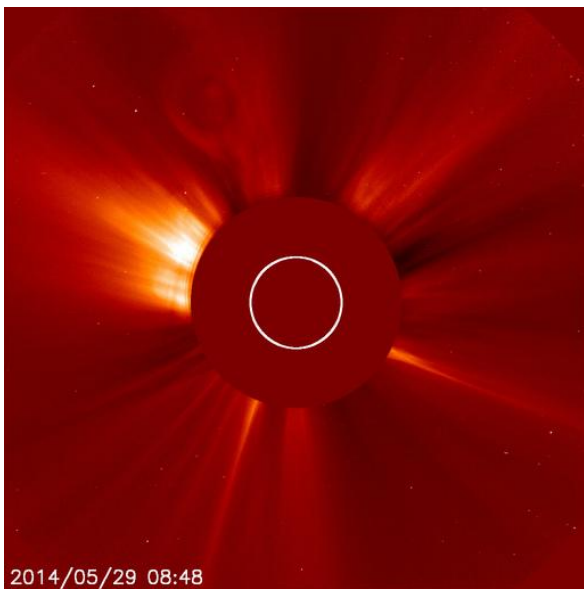
Classical consequence of bursts:

Group of type III bursts, type II bursts and type IV burst

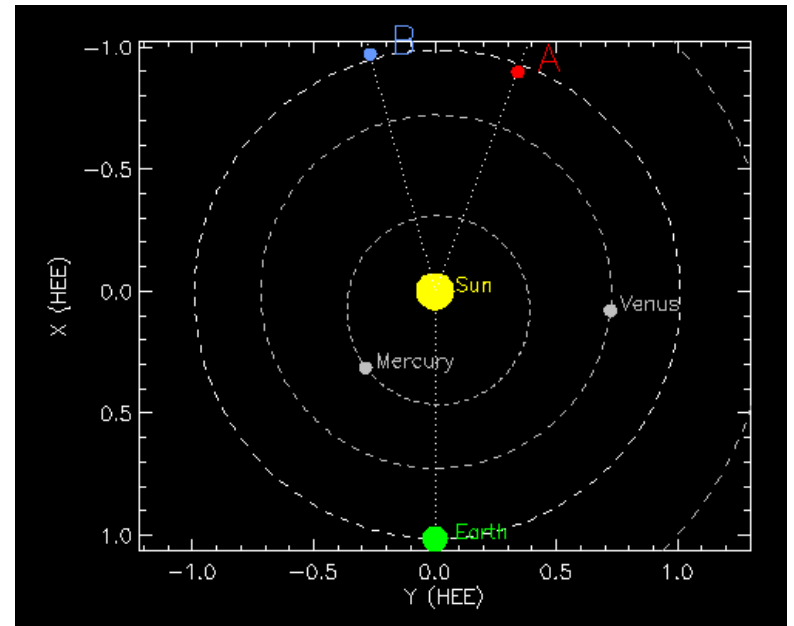
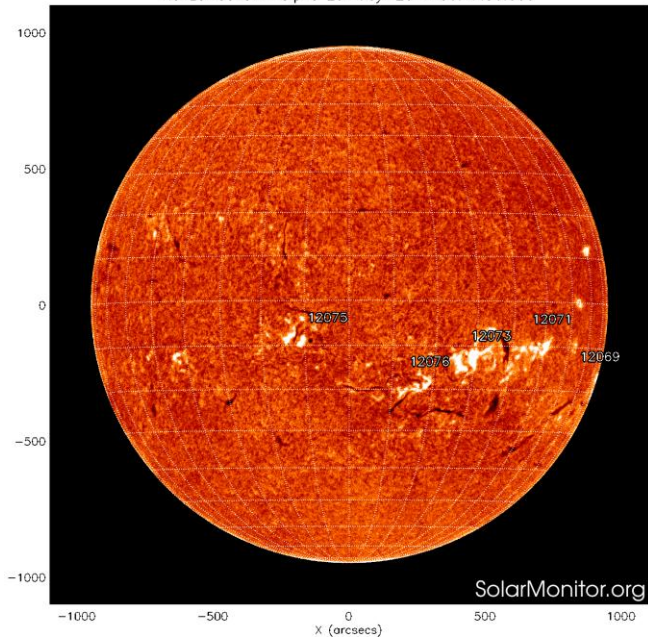
There are some type III bursts with radio fluxes above 100s.f.u.



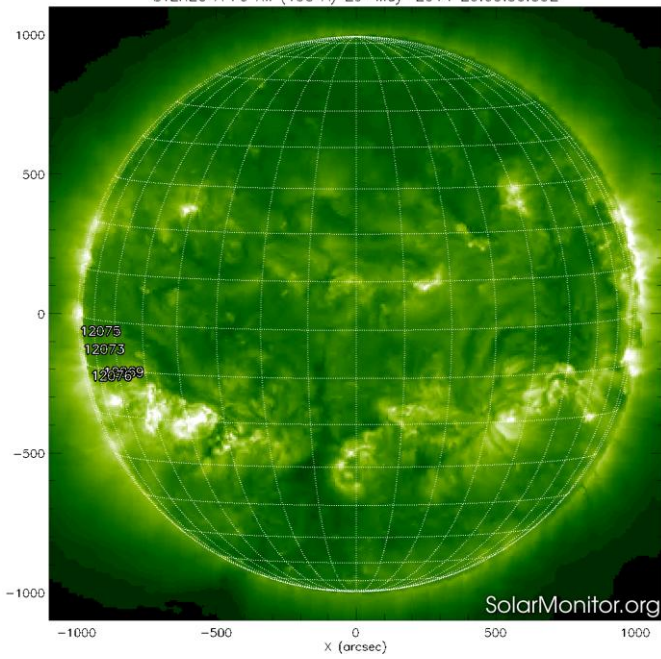
CME according to SOHO



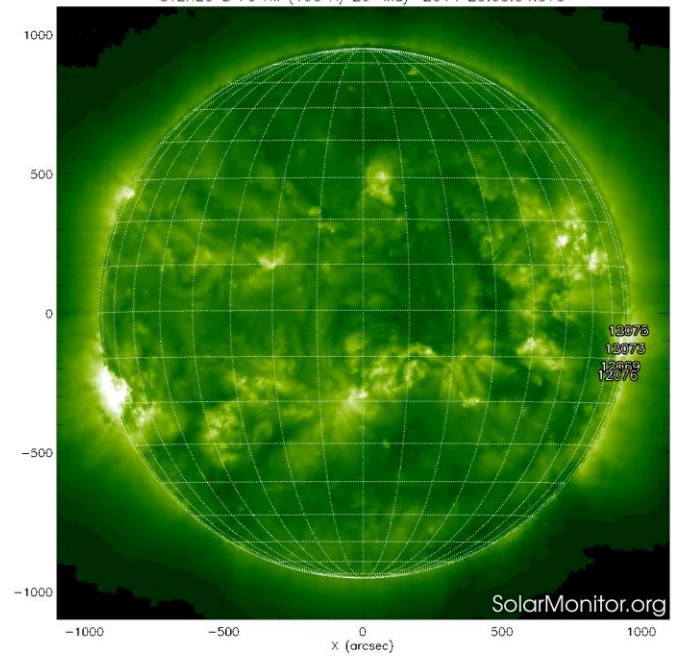
Kanzelhoehe H-alpha 29-May-2014 06:17:56.000



STEREO A Fe XII (195 Å) 29-May-2014 20:05:30.832



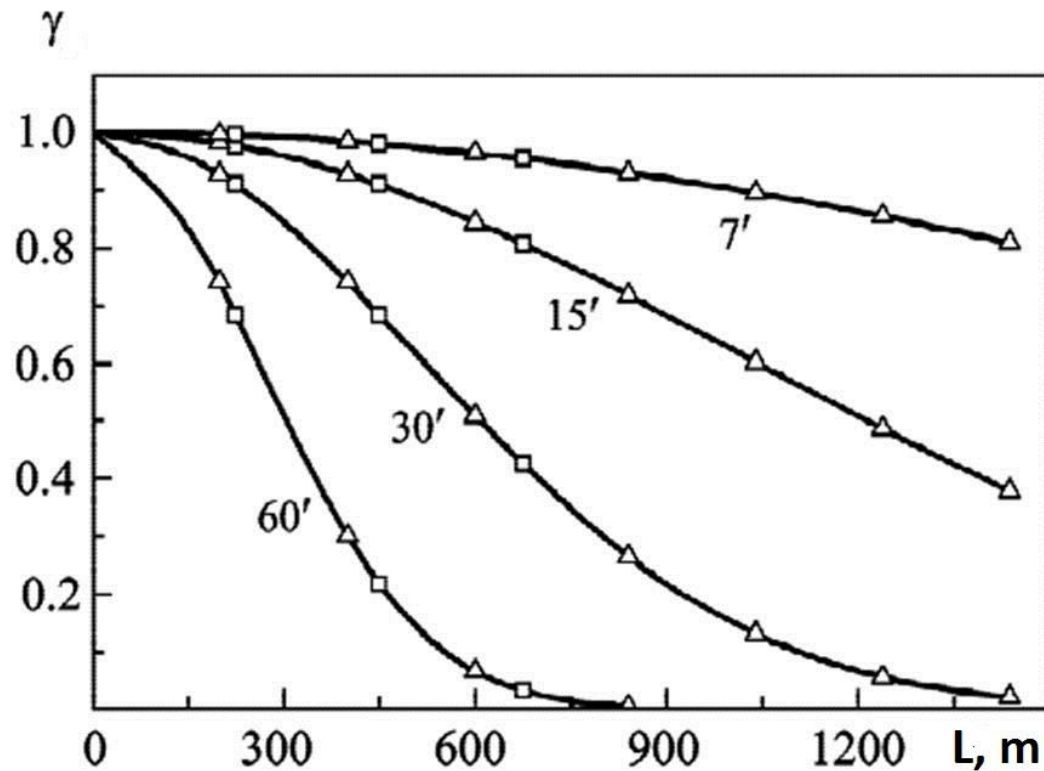
STEREO B Fe XII (195 Å) 29-May-2014 23:05:54.573



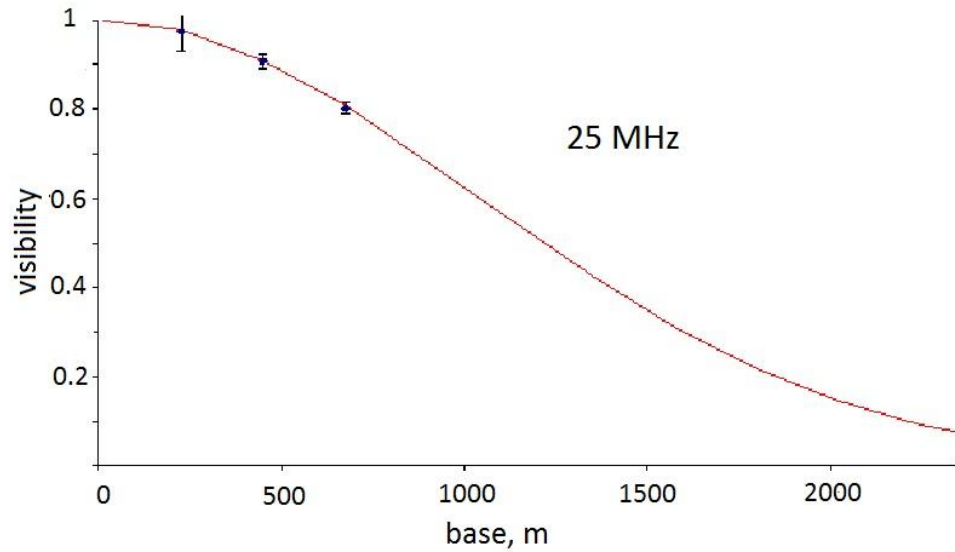
Definition of source sizes on visibility function

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

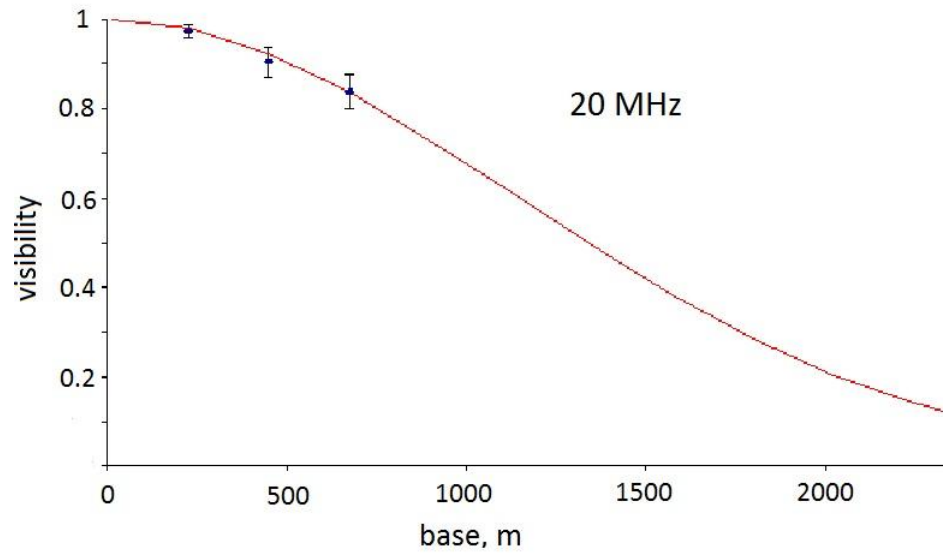
θ - size of source, λ - wavelength, L - baseline of interferometer



Type III burst at 9:41 UT on May 29, 2014



W-E size 14 arcmin



W-E size 16 arcmin

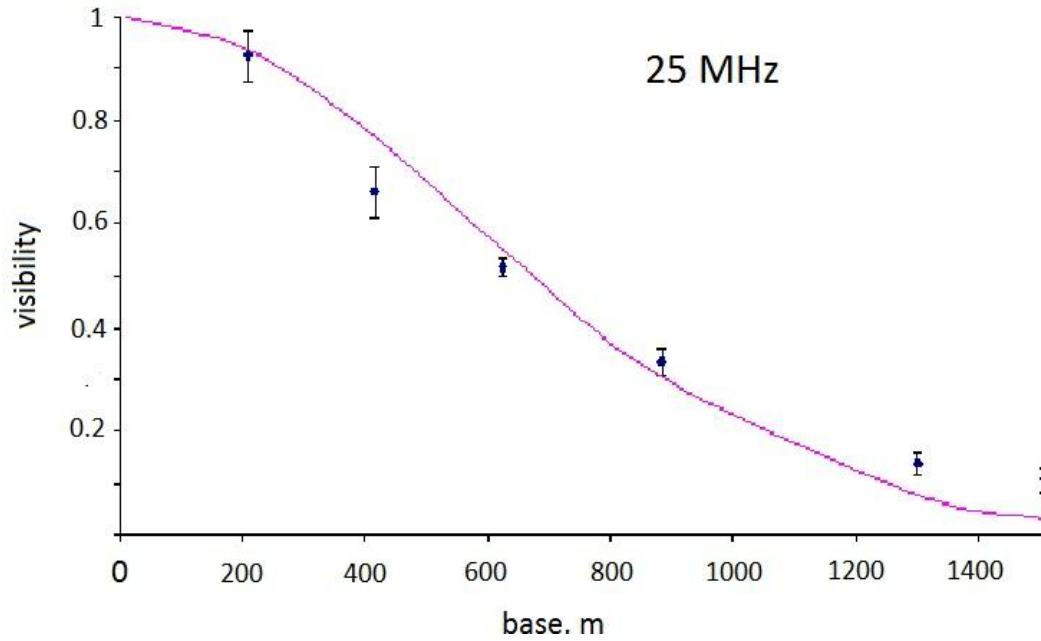
25 MHz

time, UT	size, arcmin	duration, s	velocity	Distance, arcmin
9: 40:43	14	10	0.2c	50
10:07:47	29	18.5	0.25c	39
10:08:36	28	19.6	0.21c	39
10:14:46	22	9.8	0.3c	41.5
10:15:42	22	11.9	0.26c	43
10:16:38	22	13	0.25c	41.5
11:12:33	20	11.3	0.27c	42.5
11:14:04	21	17.5	0.17c	41.5

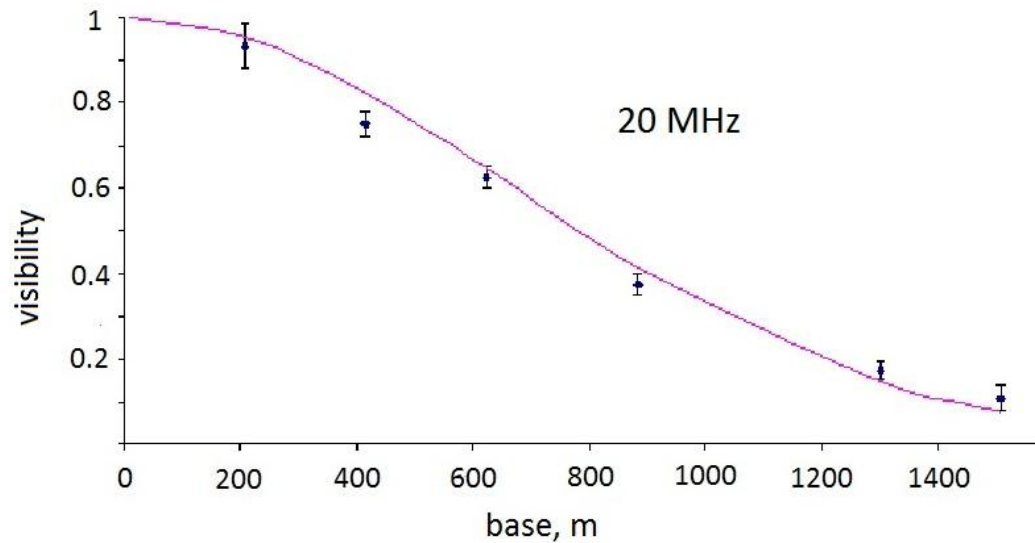
20 MHz

time, UT	size, arcmin	duration, s	velocity,c	Distance,arcmin
9: 40:43	16	16	0.15c	55
10:07:47	26	14.1	0.22c	49
10:08:36	27	20.7	0.2c	49
10:14:46	27	13.1	0.26c	47
10:15:42	25	11.9	0.23c	45.5
10:16:38	27	16	0.23c	44.5
11:12:33	24	12.4	0.29c	47
11:14:04	23	15.5	0.21c	46

Type III bursts on June 2, 2014



N-S size 27`



N-S size 29`

Definition of source position

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

$\Delta\theta$ - distance from the Sun, $\Delta\varphi$ - phase jump,

λ - wavelength, L - baseline of interferometer

Obtained heights corresponds to radio emission of type III bursts at the second harmonic in the Newkirk model of solar corona

Brightness temperature of type III bursts

$$T_b (^{\circ} K) = 5.5 \cdot 10^3 \frac{\lambda^2 S(Jy)}{\theta_W \theta_N}$$

Discussed type III bursts have brightness temperature

from $2 \cdot 10^9 K$ to $4 \cdot 10^{10} K$

Thank you for your attention !