### LIGO/Virgo GW170817 and GRB 170817A first evidence of Binary Neutron star Merging

or

Multifrequency search for prompt GRB emission

Abbott et al.

EALT ELO-NTT SOAR

EBO-VLT

2000

X-ray

Radio

16.4d

W

101

1

### 400 LIGO - Virgo Ferri/Q0 ¥ 300 §200 uenbeuj INTEGRAL/SPIACS BE 50 -12 -10 -8 400 600 1000 -6 -4 -2 0 1-6 (s) wavelength (nm) GWy-ray Total, MID I'M, Insign FIRMT, GWR, AGEE, DALET, HIT'S D., HANKS, Honza-HAnd X-ray UV aver, Har Optical Name Officer DUTAL NEM HORZ HDT 12AD USAD 117 Gentre-South DOTES-6, Judia, Delesson Net A Antonio, StayMagner, VISTA, MARTEN, Bagerlan, Sub-ND, BOAR, SIRC-VCL, RMTNer, ESC-VIST, VIRI, SALT Sky, ASTS-2, A7LAS, Deniet Tel, DIN, T985, CASA OPE, TOROS, IR HEM-ROLD, YE'R, Genie-Soult, INAGE Jalaw, NTT, SPOND, SOAR, NOT, 150-113-Karata Tempore, HET. ALL LUCIDUM COM Radio ATCA, V.A. ASKAP, V.BA. GMTT, WAR, LOWA, LINA, ACHA, OVIIO, EVN. #MERCH, Marchall, Pathin, THT, Ethilosop ..... 1.1.1.1.1.1.1 -100 -50 10.2 101 0 50 100 1-1; (S) t-t<sub>c</sub> (days) 1M2H Swope VISTA DLT40 Chandra 10.86h 11.08h h 11.24h YJK, 9d J VLA MASTER DECam Las Cumbres W 11.40h iz 11.57h

# GW170817 and GRB 170817A

11.31h

## Chronology

- Papers: about 50 published, submitted and in preparation
- Multi-messenger Observations Of A Binary Neutron Star Merger

LVC, Partner collaborations

(ApJL, http://iopscience.iop.org/issue/2041-8205/848/2)

 GRB170817a Associated With GW170817: Multifrequency Observations And Modeling Of Prompt Gamma-ray Emission

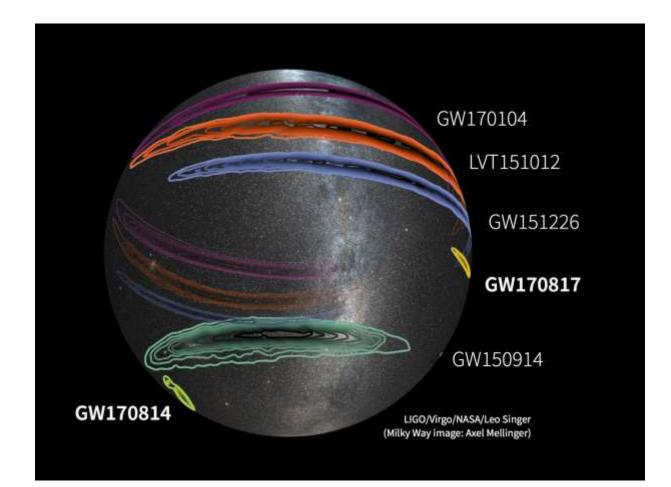
A.S. Pozanenko, M.V. Barkov, P.Yu. Minaev, A.A. Volnova, E.D. Mazaeva, A.S. Moskvitin, M.A. Krugov, V.A. Samodurov, V.M. Loznikov, and M.Lyutikov

(arXiv:1710.05448, ApJL submitted)

# Case study: GRB 170817A

- IKI GRB Follow up Network, aka IKI GRB FuN
- ISON network (more details in I. Molotov talk on Friday)
- Partner radio telescopes: RT-22, Big Scanning Antenna

# LVC events maps

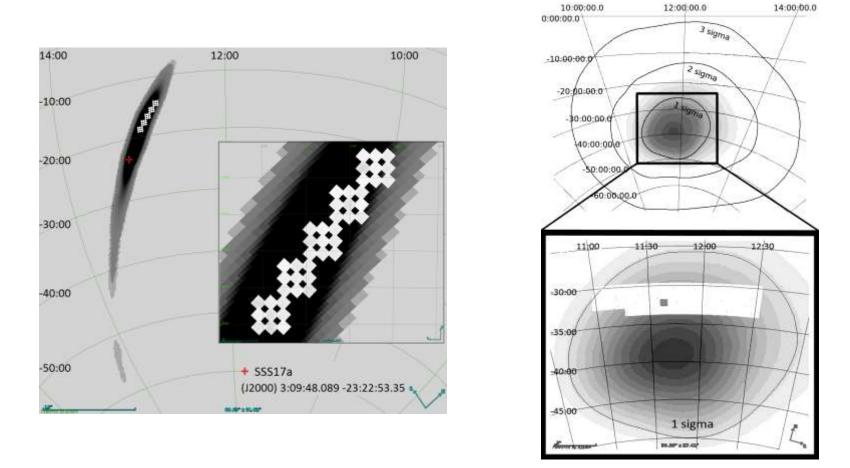


# Case study: GRB 170817A (optic)

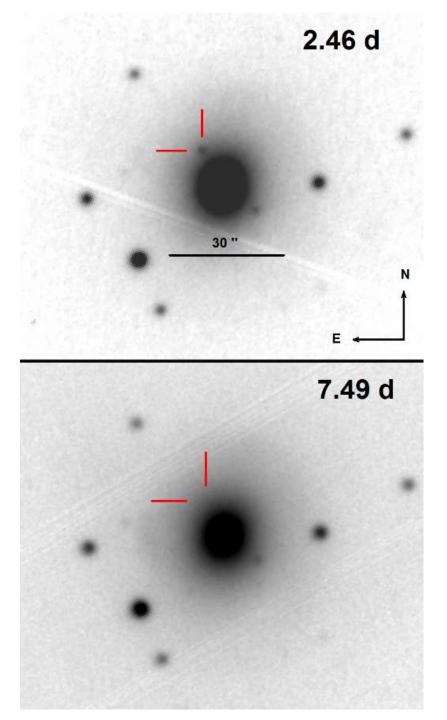
- Southern hemisphere
- Only partner Chilescope observatory was in operation
- Chilescope = <u>www.chilescope.com</u>
  - RC-1000, RC-500 x2 (ASA)
  - Fully autonomous (incl. power supply)
  - Remote control
  - Friendly user web interface
  - Dedicated time for GRB observations



### First day GRB170817A observations



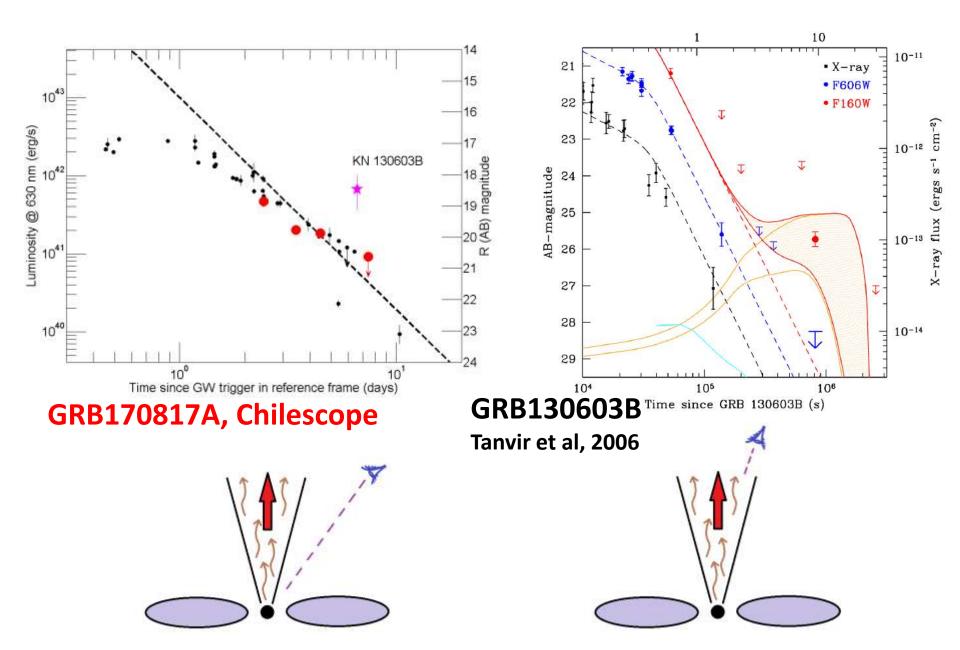
### CHILESCOPE, RC-1000 (left), RC-500 (right)



Optical Transient source SSS17a /AT2017gfo

- Host galaxy NGC 4993
- Distance 40 Mpc
- OT in outskirt of the galaxy

### Light curve



# Case study: GRB 170817A (radio) Big Scanning Antenna 110 MHz

24/7/365 survey in 98 beams at multi channels in 109-111 MHz with 12.5ms time resolution

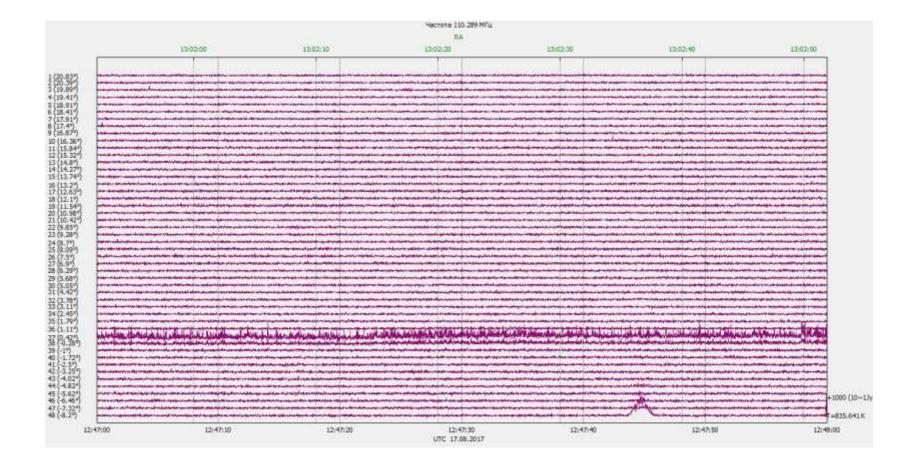
Meridian type telescope



# Case study: GRB 170817A at 110MHz

- At time of GW170817/GRB 170817A the position of optical transient was 11.5 degrees above horizon
- The source Optical Transient was out FOV of BSA, i.e. 18 degrees below and 13 minutes before
- A possible radio source can be detected by side lobes
- We found only one signal of about 100 Jy with duration of 1.5 sec at ~ 3 minutes after GW170817/GRB 170817A
- The signal is not astrophysical because of absence of specific dispersion pattern
- Uppr limit of posssiblke Radipotransirn is 15000 Jy at 110 MHz

# Case study: GRB 170817A BSA at 110MHz



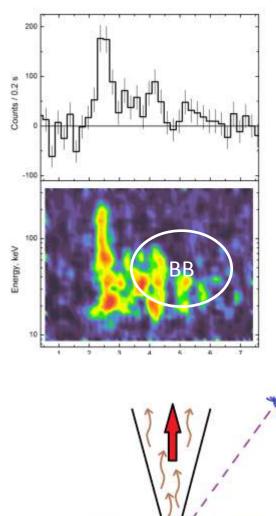
# Case study: GRB 170817A\ (gamma)

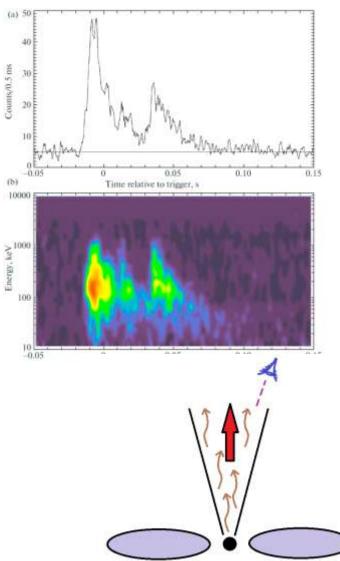
- GMB/Fermi
- SPI-ACS/INTEGRAL
  - Publically available data
  - Konus-Wind
  - Astrosat
  - AGILE
  - ...
- Proprietary data

Our model explains delay of prompt gamma against GW ring down and two different spectral episodes (arXiv:1710.05448) GBM/Fermi

GRB170817/GW170817

"Usual" short GRB





# The model of GRB170817A

