KOREAN VLBI NETWORK OBSERVING APPLICATION

VLBI

TERM: 2018A

Proposal ID: KaVA18A-00
Received Date: 2018/00/00

1.Title of proposal:

Detection of the background position noise due to non-stationary of Galactic gravitational field. Pilot project.

2.Authors: (PI on the 1st line)

Name	E-mail	Institution/Country	Student
Leonid Petrov	Leonid.Petrov@lpetrov.net	Astrogeo Center, USA	No
Tatiana Larchenkova	ltanya@asc.rssi.ru	Space Research Institute, Russia	No
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Mareki Honma	mareki.honma@nao.ac.jp	National Astronomical Observatory of Japan	No

*__If any student is involved, please give the following information.__
☐ M.S. ☐ Ph.D For thesis? ☐ Yes ☐ No

3.Contact author:
Name: Leonid Petrov E-mail: Leonid.Petov@lpetrov.net Phone: +1-703-556-8757 FAX: n/a

4.Staff support:
– Observing setup: ☐ None ☒ Consultation ☐ Extensive help
– Post processing: ☒ None ☐ Consultation ☐ Extensive help

5.Proposal type:
☐ Large project(≥100hrs) ☒ Normal proposal(<100hrs)
☐ Joint proposal ☐ If joint, network name:
☐ Resubmission Related previous/current proposal ID:

6.Scientific categories:
☒ Galactic ☒ Extragalactic ☒ Astrometry ☐ Geodesy ☐ Radio transient and pulsars
☒ AGN ☐ Maser ☐ Galactic center ☐ Star Formation ☐ Fundamental Physics

7.Observing type:
☒ Continuum ☐ Spectral line ☒ Phase referencing ☐ Polarimetry
☒ Survey ☒ Multi-frequency ☐ Target of opportunity

8.Observing frequency and polarization:
☒ 22GHz ☒ 43GHz ☒ 86GHz(risk shared) ☐ 129GHz(risk shared)
☒ Single polarization ☒ Dual polarization (at 86 GHz only)

9.Observing sessions: ☐ single epoch ☒ multiple epochs
– Total time requested: 64 hrs
– Number of sessions: 8 ; Number of hour each: 8 hrs; Separation: 5–50 days
– Min/Max LST (HH:MM:SS): 13:30:07 – 18:37:58
– Preferred range of dates or dates which are NOT acceptable:

10.Abstract (200 words max, 10 point)

Motion of stars in our Galaxy makes the gravitational field non-stationary. Radio waves propagating in the non-stationary gravitational field deflect and their deflection can be described as a stochastic process. Theoretical simulations based on the modern models of stellar mass function described in Larchenkova et al. 2017 predicts the rms of the arc lengths of a pair if AGNs exceeds 20 microseconds over 5 years if a pair is located within 1.5 degree of the galactic plane at distance closer 20 degrees of the Galactic center. Such a jitter sets a fundamental limit in astrometric accuracy. We propose a program to observe two groups of pairs of sources: one group within $l < 20$ deg and $|b| < 1.5$ deg and another group with $|b| > 30$ deg. The goal of the program is to detect systematic increase of rms in arc lengths in a group of sources within the Galactic plane with respect to the group of sources with high galactic latitude.

In order to evaluate the feasibility of detection excessive noise in arc lengths, we propose to observe in a group of 99 candidates sources with eight 8 hour sessions.

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11. Disk usage (recording time/total time): 0.8

12. Recording bandwidth: ☐ 16MHz ☐ 32MHz ☐ 64MHz ☐ 128MHz ☐ 256MHz
Recording rate: ☐ 512Mbps ☒ 1Gbps (VERA) ☒ 8Gbps (KVN)

13. Spectroscopy only (if you observe more than 4 lines, please attach the additional line information in a separate sheet.)

Items	Line 1	Line 2	Line 3	Line 4
transitions to be observed				
velocity range in LSR (km s^{-1})				
channel bandwidth (kHz)				
rest frequency (MHz)				

14. Number of sources: 99 [If more than 8 sources, please attach separate list.]

15. Name [order of priority]	**Coordinates (J2000)**		**Freq. (MHz)**	**Band width (MHz)**	**Flux density**		**Time requested (hr)**	**Cal? (Y/N)**
	RA (hh:mm:ss.ss)	**DEC** (±dd:mm:ss.ss)			**total** (Jy)	**peak** (mJy)		

16. Correlation setup:
- Correlator integration time: 1.0 (default 0.8096 sec)
- Spectral resolution: 0.5 MHz (default 128 channel for continuum, 512 for spectral line)

☐ Full stokes correlation ☐ Pulsar gating ☒ P-cal extraction ☐ Multiple phase center

If you need a special correlation setup, please briefly specify here.

18. Please attach the following items written in English using TeX. The maximum number of pages is 2+1 if you requested less than 100 hours, otherwise it is 4+1. The minimum font size is 10.
- Scientific and technical justifications
- List of publications made by previous KVN observations
- If you requested ToO (Target of Opportunity) observation, please include well-defined trigger criteria.

Targets of the galactic plane source group:

1	J0709−1127	07:09:10.405189	−11:27:48.43044
1	J1734−2932	17:34:50.139342	−29:32:32.16073
2	J1740−2929	17:40:54.524962	−29:29:50.31132
3	J1745−2900	17:45:40.036065	−29:00:28.16819
4	J1745−2820	17:45:52.495420	−28:20:26.28694
5	J1748−2907	17:48:45.683730	−29:07:39.40314
6	J1751−2352	17:51:03.995263	−23:52:15.47809
7	J1751−2524	17:51:51.262596	−25:24:00.06273
8	J1752−2336	17:52:06.629310	−23:36:25.71991
9	J1754−2352	17:54:27.372407	−23:52:33.78133
10	J1754−2207	17:54:51.486035	−22:07:42.88668
11	J1755−2232	17:55:26.284539	−22:32:10.61556
12	J1757−2241	17:57:28.874629	−22:41:32.45275
13	J1758−2343	17:58:23.017663	−23:43:12.11570
14	J1800−2107	18:00:44.618720	−21:07:36.66020
15	J1801−2056	18:01:39.139562	−20:56:42.05314
16	J1801−2214	18:01:43.549960	−22:14:28.81513
17	J1803−2030	18:03:23.723151	−20:30:17.23049
18	J1805−1844	18:05:35.364551	−18:44:42.51669
19	J1808−2124	18:08:06.846773	−21:24:45.06177
20	J1808−1822	18:08:55.515437	−18:22:53.39586
21	J1809−1618	18:09:06.939864	−16:18:56.18503
22	J1809−1546	18:09:09.247482	−15:46:53.16651
23	J1810−1626	18:10:39.850651	−16:26:52.93509
24	J1815−1836	18:15:30.368313	−18:36:13.27294
25	J1818−1705	18:18:02.902750	−17:05:40.89620
26	J1819−1419	18:19:15.636755	−14:19:00.23018
27	J1820−1432	18:20:11.866033	−14:32:11.37892
28	J1820−1111	18:20:23.287525	−11:11:12.26448
29	J1821−1224	18:21:23.278253	−12:24:12.93360
30	J1822−0938	18:22:28.731993	−09:38:56.47925
31	J1823−1437	18:23:36.212554	−14:37:21.60931
32	J1824−1410	18:24:55.346531	−14:10:53.25301
33	J1826−1057	18:26:36.313390	−10:57:19.07547
34	J1827−0814	18:27:11.878558	−08:14:14.47401
35	J1828−0912	18:28:56.022085	−09:12:31.10831
36	J1829−0650	18:29:47.803712	−06:50:27.18520
37	J1831−0756	18:31:03.673694	−07:56:54.17198
38	J1831−1107	18:31:05.910035	−11:07:21.18109
39	J1832−1035	18:32:20.836439	−10:35:11.20137
40	J1832−0610	18:32:42.228047	−06:10:25.38055
41	J1833−0855	18:33:19.581134	−08:55:27.21013
42	J1833−0713	18:33:44.678720	−07:13:41.59772
43	J1833−0711	18:33:54.003559	−07:11:09.43489
44	J1837−0653	18:37:58.032875	−06:53:31.23925

Targets of the control source group:

1	J1205−2634	12:05:33.212308	−26:34:04.46432	0.414
1	J1330−2142	13:30:07.127636	−21:42:01.80437	0.190
2	J1330−2056	13:30:07.700430	−20:56:16.57699	0.150
3	J1331−2639	13:31:11.693016	−26:39:09.62009	0.190
4	J1332−0509	13:32:04.464672	−05:09:43.30586	0.840
5	J1332−1402	13:32:30.928224	−14:02:13.18640	0.150
6	J1332−1256	13:32:39.251400	−12:56:15.34350	0.191
7	J1333−2356	13:33:38.926018	−23:56:25.58106	0.198
8	J1333−1950	13:33:45.175646	−19:50:42.34290	0.259
9	J1333−1112	13:33:50.234189	−11:12:51.67351	0.133
10	J1334−1150	13:34:04.190743	−11:50:14.27168	0.272
11	J1335−0511	13:35:56.476739	−05:11:41.65959	0.228
12	J1336−1529	13:36:34.089148	−15:29:48.07079	0.109
13	J1336−1852	13:36:34.393306	−18:52:41.67339	0.328
14	J1336−1717	13:36:35.644571	−17:17:27.09663	0.109
15	J1337−1257	13:37:39.782778	−12:57:24.69339	4.726
16	J1339−2401	13:39:01.746378	−24:01:14.00628	0.451
17	J1339−0637	13:39:07.145581	−06:37:04.87851	0.110
18	J1339−2620	13:39:19.890769	−26:20:30.49573	0.728
19	J1343−1747	13:43:37.414206	−17:47:55.44602	0.417
20	J1344−1723	13:44:14.402439	−17:23:40.39544	0.389
21	J1349−1110	13:49:03.193042	−11:10:00.81930	0.165
22	J1349−1132	13:49:31.443240	−11:32:53.82926	0.347
23	J1350−1634	13:50:36.143948	−16:34:49.51466	0.199
24	J1351−2912	13:51:46.838795	−29:12:17.65073	0.229
25	J1351−1449	13:51:52.649603	−14:49:14.55692	0.615
26	J1352−2649	13:52:10.302265	−26:49:28.25631	0.174
27	J1352−2745	13:52:28.046108	−27:45:07.13256	0.191
28	J1354−1041	13:54:46.518685	−10:41:02.65625	0.688
29	J1356−1724	13:56:06.953017	−17:24:31.81742	0.132
30	J1356−1101	13:56:46.831832	−11:01:29.22739	0.112
31	J1357−1744	13:57:06.074199	−17:44:01.90494	0.816
32	J1357−1527	13:57:11.244977	−15:27:28.78691	0.702
33	J1400−1858	14:00:03.865993	−18:58:11.08606	0.407
34	J1401−0916	14:01:05.331817	−09:16:31.57122	0.230
35	J1402−2822	14:02:02.401665	−28:22:25.14455	0.245
36	J1402−1840	14:02:48.504532	−18:40:47.48955	0.214
37	J1406−0848	14:06:00.701856	−08:48:06.88056	0.497
38	J1406−0707	14:06:10.813715	−07:07:02.30969	0.376
39	J1407−2701	14:07:29.762283	−27:01:04.29276	0.219
40	J1408−2900	14:08:49.613726	−29:00:23.60839	0.325
41	J1408−0752	14:08:56.481203	−07:52:26.66655	0.935
42	J1409−2657	14:09:50.169787	−26:57:36.98045	0.702
43	J1413−2813	14:13:14.881720	−28:13:37.38808	0.119
44	J1415−2809	14:15:04.486198	−28:09:54.43144	0.107
45	J1415−0955	14:15:20.833948	−09:55:58.33093	0.107
46	J1416−1705	14:16:34.369717	−17:05:45.73277	0.189
47	J1416−2131	14:16:42.314596	−21:31:55.03298	0.141
48	J1418−1555	14:18:59.951364	−15:55:37.32364	0.153
49	J1419−0838	14:19:22.556083	−08:38:32.14083	0.230
50	J1420−0642	14:20:17.957556	−06:42:08.05120	0.216
51	J1421−1118	14:21:00.150736	−11:18:20.40300	0.105
52	J1421−0643	14:21:07.755621	−06:43:56.35616	0.185
53	J1422−2308	14:22:37.106321	−23:08:30.13626	0.253
54	J1422−2727	14:22:49.227148	−27:27:56.72406	0.183
55	J1423−2218	14:23:40.810204	−22:18:17.51612	0.209

The fifth columns shows the correlated flux density at 8 GHz in Jy.