M2O Newsletter, No. 27

Maser activity reported: Discussion on the repeating and sometimes mini-flaring 6.7 GHz methanol maser in G33.641-0.228, no follow-up imaging requested. Significant 6.7 GHz flare in G024.541+0.312. Three epochs of VLBA observations at C/Ku/K with frequency switching have been prepared and accepted into the queue. They usually get us on sky in a week or so. Olga is considering VLA trigger obs too.

SamePage With the company buyover and upcoming exclusivity to US markets our M2O SamePage account was due to be closed in December. However, thanks to some negotiations with SamePage and help from Todd in NRAO we were able to get on SamePage's 'exception list' and will be able to continue using the platform passed the takover. No further action required and the subscription stays free of charge.

Nobeyama 45m radio telescope: Proposal to observe G358 was rejected.

Conferences: Proceedings reminder and early progress update on the next IAU Maser Symposium (see the Reports page)

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1 Activity since the previous Telecom

- **SamePage:** +1 (Lucero Uscanga): total 79 members.
- **Papers accepted:** +2; Total: 19

  A.E. Volvach, L.N. Volvach, M.G. Larionov, "Composite powerful short flare of water maser in young binary system IRAS 16293-2422"
  MacCarthy et al., ATCA observations of the G24 and G359 methanol maser flares
- **Papers in revision:**
  A.E. Volvach et al., "The powerful flare event of a water maser in the young protostellar system IRAS 16293-2422"
- **Updates on papers in prep:**
  - Bayandina et al., VLA masers in G358, first draft ready
  - Burns et al., 6.7 GHz VLBI movie in G358. Drafting and further analyses (see Telecom18 Report)
  - Burns et al., VLBI maps of rare maser lines in G358. (See Telecom13 Report)
  - Orosz et al., 7.6 and 7.8 GHz methanol masers in G358, aiming for ApJL
  - Hirota et al., G24.33+0.14 ALMA follow-up; pre- and post- flare phases. (see Telecom 20 Report)
  - Kobak et al., VLBI images and SD monitoring of G24.33 during the maser flare(s).
  - Gray et al., Two additions to the maser flare series: compression and skyplane overlap scenarios.
- **New observing proposals:**

- **Active trigger proposals:**

Array	Code	Grade	Hours granted target x epoch x hour	Hours remaining	Active period	Resubmit deadline
EVN	EB083	1.2 / 5.0 (0 is best)	(3x2x8)x2 bands = 96	96	15/SEP/20 - 15/SEP/21	1/JUN/22 *
KaVA	EAVN21A-213	7.6 / 10.0 (10 is best)	2 x 1 x 8 = 16	16	16/JAN/21 - 15/JAN/22	15/NOV/21 #
EAVN	EAVN21A-214	8.3 / 10.0 (10 is best)	1 x 2 x 8 = 16	16	16/JAN/21 - 15/JAN/22	15/NOV/21 #
LBA	V581	4.1 / 5.0 (5 is best)	96	88	01/OCT/20 - 01/OCT/21	16/JUN/22 *
VLBA	BB428	0.59 / 10.0 (0 is best)	48	48	01/AUG/21 - 01/AUG/22	01/FEB/22
VLA	VLA/21A-035	[score]	12	12	[dates]	-
SOFIA	90053	[score]	3.46	3.46	[dates]	-
ATCA	C3321	[score]	50	50	[dates]	-
Subaru	S20B0051N	[score]	0.5*2 or 1 night	0.5*2 or 1 night	01/AUG/20 - 01/JAN/21	-
JWST	01906	1st quintile	24.9	24.9	Cycle 1	-

(*/#) New proposals already (submitted/accepted) for the following observing semester

Blue coded proposals have public links (Ctr-F search the page for the code if it is not initially identifiable)

- **Follow-up observations conducted (see Record Keeping):**
  VLBA: Approved 3-epoch imaging of the flare in G024.541+0.312 at C/Ku/K bands (PI: R Burns)
  EVN: Happy-Burstdays: revisiting VLBI imaging of S255 and G188 to see how they look after their flares subsided. EVN 6.7 GHz conducted Nov 3rd (PI: R Burns)

- **M2O targets:**

Name	Maser [GHz]	Pre-burst Flux [Jy]	Max Flux [Jy]	Current Flux [Jy]	Reported by	Reobserved by	Status
G359.617-0.251	6.7	120	200	90	Yonekura	Ib, Hh,	decreasing
Orion S6	6.7	3.1	9	2	Yonekura	Ib, Tr, Sz, Hh	variable
G85.411+0.002	6.7	12	95	80	Yonekura	Ib, Ef, Sz, Tr, Hh, Ky, Vs	decreasing
G33.641-0.228	6.7	-	236	60	Bringfried	Hh, Ib, Vs	eruptive
IRAS 16293-2422	22	-	30k	-	Sunada, Mc	Vr, Mc, Hh, Sz, Ib, Mc	-
NGC2071	22	1k	7k	920	Sunada, Hh	Vr, Hh, Sz, Ib	post-burst
G53.22-0.08	22	3	800	30	Sunada	Vr, Hh, Ib	post-burst
G358.93-0.03	6.7	5	1000	15	Yonekura	Hh, Ib	decreasing
G24.33+0.14	6.7	-	800	5	Torun	Hh, Ib, Vs, Mc	decreasing
G25.65+1.05	22	-	60k	2150	Volvach	Hh, Sz, Mc	post-burst
G034.196-0.592	22	-	120	120	Ladeyschikov	Sz, Oa, Hh, Mc	?
G35.200.74	22	600	4k	4k	Volvach	Sz, Hh, Ib	?
G024.541+0.312	6.7	∼5	60	60	Durjasz	Ib, Hh, Vr	Active

(Ib = Ibaraki) (Tr = Torun) (Sz = Simeiz) (Hh = HartRAO) (Ef = Effelsberg) (Ky = KVN Yonsei) (Vs = Ventspil) (Vr = VERA stations) (Mc = Medicina) (Ps = Puschino) (Oa = OAO-WFC)

2 Reports

Short reports on specific activities, please send me an email (ross.burns@nao.ac.jp) in advance if you have something to report in an upcoming telecom.

Upcoming conferences / registration dates?

IAU symposium on Astrophysical Masers: application in prep.
There has been agreement that the next IAU symposium on astrophysical masers will be proposed by a team lead by astronomers at Kagoshima University and the National Astronomical Observatory of Japan. In particular Hiroshi Imai is lead organiser. Myself and many other M2O members are LOC and/or SOC. It is notable to remember that the previous IAU maser symposium was what kickstarted the M2O and I hope many of us will be there to reconnect, reflect on what has transpired since the previous Symposium, and also share in the next big plans for the future.
The application submission will be later this November and if accepted the Symposium will be held in March 2023, hopefully with the option of in-person participation. That being the case I look forward to being able to be part of welcoming you to Kagoshima, which is the place where I got my PhD and is a city very dear to me.

Reminder of proceedings deadlines

European VLBI Network Mini-Symposium and Users' Meeting 2021
Proceedings submission deadline is 10th December 2021. Page limits are: Posters - 5 pages; Contributed talk - 10 pages; Invited seminar - 15 pages. These are some very generous page allowances and the M2O or M2O members featured often in many talks so I hope we will have some good representation in this set of proceedings. Details on how to submit contributions were circulated in email so if you've not got an instruction email yet do contact: pos-eo@pos.sissa.it

Next Newsletter / Telecom: 30th Nov 2021, 18:00 JST

Record keeping

3 M2O Publications

No.	Target	Facility	Author	Frequency (GHz)	Status	Ref	Journal
1	W49N	Sm, Tr	Volvach+	22.2	Published	(1)	MNRAS_L
2	W49N	Sm, Tr, Mc, Ef	Volvach+	22.2	Published	(2)	A&A
3	W49N	Sm, Tr, Mc, Ef, Kvazar	Volvach+	22.2	Published	(3)	Ast.Rep.
4	W49N	Sm	Volvach+	22.2	Published	(4)	MNRAS
5	G25	VLA	Bayandina+	6.7, 12.2, 22	Published	(5)	ApJ
6	G25	Sim/Hh/Tr	Volvach+	22	Published	(6)	MNRAS_L
7	G25	KVASAR	Volvach+	22	Published	(7)	Ast.Rep.
8	G25	EVN	Burns+	22	Published	(8)	MNRAS
9	G25		Aberfelds+	6.7	in prep		-
10	G25		Bayandina+	12.2, 23.1	in prep		-
11	G25		MacCleod+	6.7, 22	in prep		-
12	G358	ATCA	Breen+	mm	Published	(9)	ApJ
13	G358	ALMA-SMA	Brogan+	mm	Published	(10)	ApJL
14	G358	Hh	MacCleod+	New Methanol masers	Published	(11)	MNRAS
15	G358	LBA	Burns+	6.7	Published	(12)	Nat.Ast.
16	G358	Various VLBI	Burns+	6.7 movie	in prep		-
17	G358	Various VLBI	Burns+	Maps of rare masers	in prep		
18	G358	VLBA	Burns+	6.7 and 12.18	in prep		
19	G358	Asia-Pacific VLBI	Orosz+	7.6, 7.8	in prep.		ApJL
20	G358	VLA	Chen+	multiple lines methanol	Published	(13)	ApJL
21	G358	VLA	Chen+	New lines + Methanol	Published	(14)	Nat. Ast.
22	G358		MacCleod+	6.7 GHz monitoring	in prep		
23	G358		MacCleod+	6.2, 12.2, 20.3, 20.9	in prep		-
24	G358	VLA	Bayandina+	6.7, 12.2, 22.2	in prep		-
25	G358	SOFIA	Stecklum+	FIR	published	(15)	A&A
26	G358	Sm and Hh	Volvach+	19.9, 20.9	Published	(16)	MNRASL
27	G358	ATCA	Breen+	Rare transitions	in prep		-
28	G24.33	EVN, VLBA	Olech+	6.7, 12.2, 22.2	in prep		-
29	G24.33	Tr	Olech+	OH, Meth	in prep		-
30	G24.33	Hh	v. d. Heever+		in prep		-
31	G24.33	ALMA	Hirota+	Thermal and maser	in prep		-

References

[1] Volvach, L. N., Volvach, A. E., Larionov, M. G., MacLeod, G. C. & Wolak, P. Unusual flare activity in the extreme-velocity 81 kms1 water-maser feature in W49N. *Monthly Notices of the Royal Astronomical Society: Letters* **487**, L77–L80 (2019). URL https://doi.org/10.1093/mnrasl/slz088.

[2] Volvach, L. N. *et al.* Flaring water masers associated with W49N. A&A **628**, A89 (2019).

[3] Volvach, L. N. *et al.* An unusually powerful water-maser flare in the galactic source w49n. *Astronomy Reports* **63**, 652–665 (2019). URL https://doi.org/10.1134/S1063772919080067.

[4] Volvach, A. E., Volvach, L. N. & Larionov, M. G. Unusually powerful flare activity of the H_2O maser feature near a velocity of -60 km s^{-1} in W49N. MNRAS **496**, L147–L151 (2020).

[5] Bayandina, O. S., Burns, R. A., Kurtz, S. E., Shakhvorostova, N. N. & Val'tts, I. E. JVLA overview of the bursting H$_2$O maser source G25.65+1.05. *arXiv e-prints* arXiv:1812.11353 (2018).

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[9] Breen, S. L. *et al.* Discovery of Six New Class II Methanol Maser Transitions, Including the Unambiguous Detection of Three Torsionally Excited Lines toward G 358.9310.030. ApJ **876**, L25 (2019).

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[12] Burns, R. A. *et al.* A heatwave of accretion energy traced by masers in the G358-MM1 high-mass protostar. *Nature Astronomy* 10 (2020). URL https://ui.adsabs.harvard.edu/abs/2020NatAs.tmp...10B.

[13] Chen, X. *et al.* $^{13}CH_3OH$ Masers Associated With a Transient Phenomenon in a High-mass Young Stellar Object. ApJL **890**, L22 (2020). URL https://ui.adsabs.harvard.edu/abs/2020ApJ...890L..22C.

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[15] Stecklum, B. *et al.* Infrared observations of the flaring maser source G358.93-0.03 – SOFIA confirms an accretion burst from a massive young stellar object. *arXiv e-prints* arXiv:2101.01812 (2021). URL https://ui.adsabs.harvard.edu/abs/2021arXiv210101812S.

[16] Volvach, A. E. *et al.* Monitoring a methanol maser flare associated with the massive star-forming region G358.93-0.03. MNRAS **494**, L59–L63 (2020).

M2O follow-up data

No.	Target	Facility	Date	Frequency (GHz)	Code	PI/comment
1	G25	VLA	Oct 2017	6.7, 12.2, 22	17B-408	OB / Reduced
2	G25+W49N	EVN	Oct 2017	22	RB004	RB / Reduced
3	G25+W49N	KaVA	Oct 2017	22	K17RB01A	RB / Reduced
4	G25+W49N	VLBA	Oct 2017	22	BO058	GO / Reduced
5	G25	VERA	2007-2013	22, 16 x epochs	[archival]	K. Motogi / On hold
6	G358	VERA	31 Jan 2019	6.7	-	SY / Reduced
7	G358	VERA	3 Mar 2019	6.7	-	SY / Reduced
8	G358	VERA	1 Apr 2019	6.7	-	SY / Reduced
9	G358	VERA	3 May 2019	6.7	-	SY / Reduced
10	G358	LBA	2 Feb 2019	6.7	vc026a	RB / Published
11	G358	LBA	3 Feb 2019	23.1	vc026b	GO / Abandoned
12	G358	LBA	28 Feb 2019	6.7	vc026c	RB / Published
13	G358	EVN	13 Mar 2019	6.7, 6.18	RB005	RB / Reduced
14	G358	KVN	25 Mar 2019	22, 44, 95, 120	n19rb01a	RB / Reduced
15	G358	VLBA	19 May 2019	6.7, 12.2, 23.1	BB414	RB / Reduced
16	G358	VLBA	7 Jun 2019	6.7, 12.2, 20.7	BB412	RB / Reduced
17	G358	LBA+E.Asia	17 May 2019	7.6, 7.8	vx028a	GO,SE / Reduced
18	G358	LBA+AusSCOPE	28 Sep 2019	6.7	v581a	RB / Reduced
19	G358	LBA+AusSCOPE	18 Aug 2020	6.7	v581b	RB / Reduced
20	G358	SOFIA	30 April 2019	50...120 μm		BS,JE / Published
21	G358	GROND	8 Feb 2019	NIR		HL,BS,AC / Published
22	G358	SMA	several 2019	mm		THunter,CB / Published
23	G358	ALMA	several 2019	Bands 5,6,7		CB / Published
24	G358	VLA	2019	C, Ku bands	-	OB
25	G358	VLA	2019	K band	-	OB
26	G358	VLA	2019	HNCO	-	XC,AS
27	G24	LBA	8 Sep 2019	6.7	vx026d	RB,MO / Correlated
28	G24	LBA	13 Sep 2019	6.7	s002a	RB,MO / Correlated
29	G24	LBA	28 Sep 2019	6.7	v581a	RB,MO / Correlated
30	G24	EVN	22 Sep 2019	22	RB006A	RB,MO / QuickLook
31	G24	EVN+Merlin	7 Oct 2019	6.7	RB006B	RB,MO / QuickLook
32	G24	EVN+Merlin	17 Nov 2019	1.667	RB007	RB,MO / correlated
33	G24	VLBA	27 Sep 2019	6.7, 12.2, 22	BB416A	RB,MO / QuickLook
34	G24	VLBA	27 Oct 2019	6.7, 12.2, 22	BB416B	RB,MO / correlated
35	G24	VLBA	02 Dec 2019	6.7, 12.2, 22	BB416C	RB,MO / correlated
36	G24	ALMA	26 Sep 2019	Band6	-	THirota / Reduced
37	G24	SOFIA	25 Oct 2019	FIR		BS,JE
38	G24	ATCA	26 Nov 2019	K-band	C3321	GO,SB
39	G24	ATCA	27 Nov 2019	C-band	C3321	GO,SB
40	NGC2071, Ori-S6	KaVA	13 Mar 2020	22/44/95/130	a20d3a	RB / QuickLook
41	NGC2071, Ori-S6	KaVA	16 Apr 2020	22/44/95/130	a20d3b	RB / QuickLook
42	NGC2071, Ori-S6	KaVA	11 May 2020	22/44/95/130	a20d3c	RB / Quick Look
43	G85.411+0.002	VLBA	24/Apr/2020	L/C/Ku/K	BB421B	RB / QuickLook
44	G85.411+0.002	VLBA	22/May/2020	L/C/Ku/K	BB421A	RB / QuickLook
45	G85.411+0.002	VLBA	22/June/2020	L/C/Ku/K	BB421C	RB / Quick Look
46	G359.617-0.251	LBA	18/Aug/2020	6.7	V581B	RB / Quick Look
47	G359.617-0.251	VLBA	21/Aug/2020	6.7 / 12.2 / 22	BB418A	RB / Quick Look
48	G359.617-0.251	ATCA	25-26/July/2020	6-10 GHz	C3321	GO / Submitted
49	G034.196-0.592	VLA	19/NOV/2020	C	VLA/20B-441	DL / Calibrated
50	G034.196-0.592	VLA	29/NOV/2020	K	VLA/20B-441	DL / Calibrated
51	G034.196-0.592	KaVA	12/DEC/2020	K(QWD)	a20d4a	RB / Quick Look
52	G034.196-0.592	KaVA	23/JAN/2021	K(QWD)	a21d1a	RB / Quick Look
53	G034.196-0.592	KaVA	18/FEB/2021	K(QWD)	a21d1b	RB / Quick Look
54	G35.200.74	KaVA	23/JAN/2021	K(QWD)	a21d1a	RB / Quick Look
55	G35.200.74	KaVA	18/FEB/2021	K(QWD)	a21d1b	RB / Quick Look

Reminders:
Please consult the original reporters of flare events on how they request their input to be acknowledged in follow-up proposals and publications.

All G25.65+0.15 papers should include a member from the Volvach et al. group in the author list and an acknowledgement of their funding.
All G358 papers should include a member from the Ibaraki team in the author list and an acknowledgement of their funding.
All G24.33 papers should include a member from the Torun team in the author list and an acknowledgement of their funding.
All Orion-S6 papers should include a member from the Ibaraki team in the author list and an acknowledgement of their funding.
All NGC2071 papers should include a member from the VERA / Sunada team in the author list and an acknowledgement of their funding.
All G53.22-0.08 papers should include a member from the VERA / Sunada team in the author list and an acknowledgement of their funding.
All G85 papers should include a member from the Ibaraki team in the author list and an acknowledgement of their funding.
All G359 papers should include a member from the Ibaraki team in the author list and an acknowledgement of their funding.
All G034.196-0.592 papers should include a member from the Ladeyschikov et al. group in the author list and an acknowledgement of their funding.
All G35.200.74 papers should include a member from the Volvach et al. group in the author list and an acknowledgement of their funding.
All 024.541+0.312 papers should include a member from the Torun team in the author list and an acknowledgement of their funding.