M2O Newsletter, No. 28

Maser activity reported: 22 GHz moderate flare in G081.174-0.100.

Follow-ups Effelsberg, VLA and EAVN (See below and Record Keeping)

EVN mini sympoisum: Proceedings submitted describing the Irbene single-baseline interferometer, Lead Author: Janis Steinbergs

Talks: 50min presentation introducing the M2O to the Division of Science at NAOJ (National Astronomical Observatory of Japan) last week. There was quite some interest in our activities (R. Burns)
Nobeyama 45m telescope: will be transitioning to paid telescope time. This is unfortunate situation but rises some opportunities too. See more in Reports (R. Burns)

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1 Activity since the previous Telecom

- **SamePage:** +0: total 79 members.
- **Papers accepted:** +1; Total: 19

  O. Bayandina et al., Astronomical Journal, "A multi-transition methanol maser study of the accretion burst source G358.93-0.03-MM1"
- **Papers in revision:**
- **Papers in prep:**
  - Burns et al., 6.7 GHz VLBI movie in G358. Drafting and further analyses (see Telecom18 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:**
  ATCA Resubission of the trigger proposal (MacCarthy; submitted)
  LBA Resubission of the trigger proposal (Burns; submitted)
- **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	?
G35.20-0.74	22	600	4k	4k	Volvach	Sz, Hh, Ib	?
G024.541+0.312	6.7	∼5	60	60	Durjasz	Ib, Hh, Vr	Active
G081.174-0.100	22	10	45	45	Ladeyschikov	Ef	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)

- **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):**
  Effelsberg: Monitoring of 22 GHz water maser in G081 (PI: K Menten, Y. Gong, D. Ladeyschikov)
  VLA: Trigger approved for G081, obs pending, C/K bands (PI: O Bayandina et al.)
  EAVN: Trigger VLBI obs of G081 (epoch 1 of three), 22 GHz (PI: R Burns et al.)

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.

Nobeyama 45m Radio Telescope, changes to observing procedures: Ross Burns
As some of you may be aware the Nobeyama 45m Radio Telescope will be transitioning to a paid-time observing strategy from the next call for proposals. On the 14th of December there was an announcement by the NRO director Kenichi Tatematsu at the Users Meeting which detailed the current draft of these plans.

While the exact situation is not yet fully defined and publicly announced I was told it is OK to share basic information about what we can expect. Essentially the proposal system will be replaced by purchasing telescope time in which users are expected to handle observations themselves. This favors experineced users of the telescope, which itself is in good condition and continues to receive development work, such as the addition of an extended Q-band receiver which I am presently involved in the installation and commissioning. With a coverage of 30-50 GHz, and the 45m radius dish providing high sensitivity needing only a few minutes per target, this seems like an ideal instrument to survey for some of the newly discovered masers found during the G358 flare by our team.

You can probably see where I am going with this, but I suggest we consider raising funds to observe a survey of high-mass star forming regions for these masers. Since they are new and poorly understood we might find these masers in some unexpected places. I will handle fund raising by grant applications, research budget and any other means available depending on how much time we need and the total cost.

I plan to lead this campaign from the first opening of paid telescope time, the details of which will be announced when the particulars are all clarified and approved by NRO and NAOJ, sometime in 2022. If you're interested in this observing survey contact me by email or SamePage (I'll start a new page on SamePage soon for this). If you have any questions about this transition for the NRO45m in general please do ask me and if I cant answer with what I already know I can at least ask someone who does on your behalf. Hopefully we can support the observatory against closure.

Record keeping

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		MacLeod+	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	MacLeod+	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		MacLeod+	6.7 GHz monitoring	in prep		
23	G358		MacLeod+	6.2, 12.2, 20.3, 20.9	in prep		-
24	G358	VLA	Bayandina+	6.7, 12.2, 22.2	Accepted		AJ
25	G358	SOFIA	Stecklum+	FIR	Published	(15)	A&A
26	G358	Sm and Hh	Volvach+	19.9, 20.9	Published	(16)	MNRASL
27	G24.33	EVN, VLBA	Olech+	6.7, 12.2, 22.2	in prep		-
28	G24.33	Tr	Olech+	OH, Meth	in prep		-
29	G24.33	Hh	v. d. Heever+		in prep		-
30	G24.33	ALMA	Hirota+	Thermal and maser	in prep		-
31	G24.33 + G359	ATCA	MacCarthy+	6.7. 22. Rare transitions	Published	(17)	MNRAS
32	IRAS 16293-2422	Simeiz	Volvach+	Water maser flare	Published	(18)	MNRAS

References

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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.

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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. A&A **646**, A161 (2021).

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[17] McCarthy, T. P. *et al.* Molecular line search towards the flaring 6.7-GHz methanol masers of G 24.33+0.13 and G 359.62-0.24: rare maser transitions detected. MNRAS **509**, 1681–1689 (2022).

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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
56	S255 and G188	EVN	3/NOV/2021	C	EB087	RB / Correlating
57	G024.541+0.312	VLBA	16/NOV/2021	C/Ku/K	BB428A	RB / Correlating
58	G081.174-0.100	EAVN	9/DEC/2021	K(QWD)	a21d2a	RB / observing

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.
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