

# M2O Telecom Agenda, No. 13

## The main news items this month:

**1. Media:** We've been featured in Astronomy Now magazine ([link to online article](#)) which is now in stores this month. Contact ross.burns@nao.ac.jp if you would like a physical copy of the magazine (free).

**2. Proposals submitted:** This month was a busy time for VLBI proposal deadlines. In this month we have submitted triggerable ToO proposals to the EVN, KaVA and the LBA. All were updates of previously accepted proposals therefore we can reasonably expect they will be approved.

## 1 Activity since the previous Newsletter

- **SamePage:** +2 (Michal Durjasz, Elena Popova), total 64 members
- **Papers accepted:** +1; Total: 14
- **Papers under review:**  
Chen et al., Nature Astronomy, accepted, awaiting public announcement.
- **Updates on papers in prep:**
  - Bayandina et al., and Burns et al., see reports.
  - Orosz et al., 7.6 and 7.8 GHz methanol masers in G358, aiming for ApJL submission in August.
  - Hirota et al., ALMA follow-up observations of G24.33+0.14 in pre- and post- maser flare phases.
  - Olech et al., VLBI images of G24.33 during its maser flare.

- **M2O targets:**

Name	Maser [GHz]	Pre-burst Flux [Jy]	Max Flux [Jy]	Current Flux [Jy]	Reported by	Reobserved by	Status
Orion S6	6.7	3.1	7.5	4	Yonekura	Ib, Tr, Sz, Hh	active
G85.411+0.002	6.7	12	88	88	Yonekura	Ib, Ef, Sz, Tr, Hh, Ky, Vs	active
G33.641-0.228	6.7	-	236	236	Bringfried	Hh, Ib, Vs	active
IRAS 16293-2422	22	-	30k	24k	Sunada, Mc	Vr, Mc, Hh, Sz, Ib	active
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	40	Yonekura	Hh, Ib	post-burst
G24.33+0.14	6.7	-	800	8	Torun	Hh, Ib, Vs	post-burst
G25.65+1.05	22	-	60k	2150	-	Hh, Sz	post-burst

(Ib = Ibaraki) (Tr = Torun) (Sz = Simeiz) (Hh = HartRAO) (Ef = Effelsberg) (Ky = KVN Yonsei) (Vs = Ventspil) (Vr = VERA stations) (Mc = Medicina)

- **Follow-up observations conducted this month (see Record Keeping for details):**  
G85, VLBA, L/C/Ku/K, 22 Jun 2020
- **New observing proposals:**  
JWST triggerable ToO (A.C.o.G), in prep.
- **Active trigger proposals:**

Array	Code	Grade	Hours granted	Hours remaining	Active period	Resubmit deadline
EVN	RB007	1.3 / 5.0 (0 is best)	96	96	15/SEP/19 - 15/SEP/20	01/JUN/20
KaVA	EAVN20A-160	7.3 / 10.0 (10 is best)	48	24	01/FEB/20 - 01/JUL/20	15/JUN/20
LBA	V581	4.0 / 5.0 (5 is best)	96	88	01/OCT/19 - 01/OCT/20	16/JUN/20
VLBA	BB418	1.82 / 10.0 (0 is best)	48	48	01/AUG/20 - 01/AUG/21	01/FEB/21
Subaru	S20B0051N	accepted	0.5*2 or 1 night	0.5*2 or 1 night	01/AUG/20 - 01/JAN/21	-

New revised proposals were submitted to the EVN, KaVA and LBA this by the deadlines shown above (PI: Burns).

**Next Newsletter / Telecom: 31th July 2020, 18:00 JST**

## 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.

### Report on the VLA imaging results of G358: Olga Bayandina

JVLA observations at C,Ku,K bands reveal the continuum emission and distributions of many common and rare/new maser transitions.

### Publication plan for G358 VLBI data sets: Ross Burns

We now have completed all maser VLBI observations and most of the data reduction associated with the G358 maser flare. Regarding a publication plan, one natural way to piece together the full data set is by science topics:

- **VLBI 6.7 GHz movie:** tracing the expansion of the methanol maser emission in 7 epochs, covering a span of 9 months (progress report shown in a separate PDF).
- **VLBI maps of new/rare lines:** establishing the locations of excitement of rare masers, noting their uses as tracers for structures, and which transitions do/dont co-locate with eachother.
- **VLBI Multi-line maps:** for making tests of methanol maser models and/or superradiance.

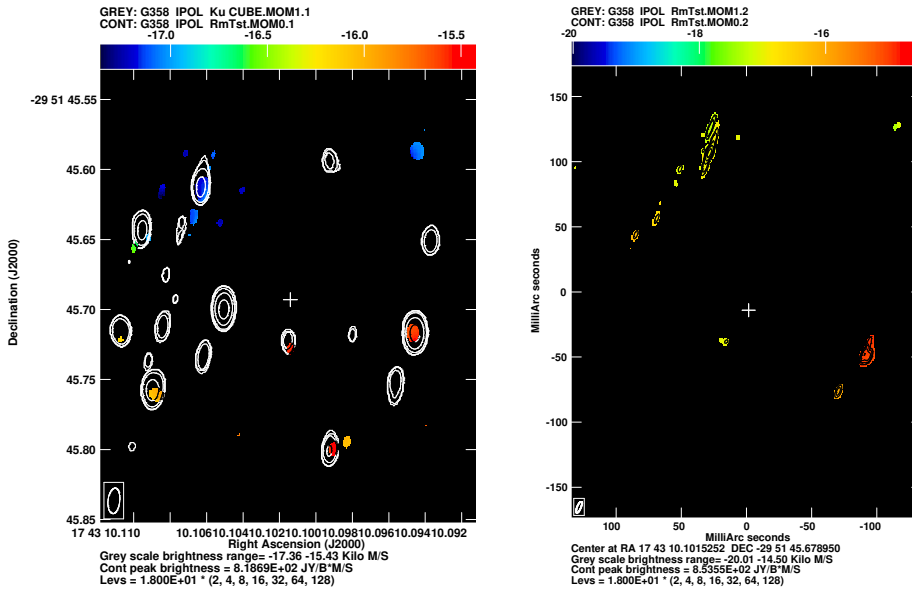


Figure 1: Left - Contours and colours are the 6.7 and 12.18 GHz methanol masers in G358, from a single epoch of VLBA data (BB412). Right - the 20.97 GHz methanol masers in G358 from the same observations (BB412). [Note: angular and velocity scales not perfectly matched in figures]

# 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+	Methanol	in review		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	in prep		A&A_L
26	G358	Sm and Hh	Volvach+	19.9, 20.9	Published	(14)	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

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- [2] Volvach, L. N. *et al.* Flaring water masers associated with W49N. *A&A* **628**, A89 (2019).
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- [4] Volvach, A. E., Volvach, L. N. & Larionov, M. G. Unusually powerful flare activity of the H<sub>2</sub>O maser feature near a velocity of -60 km s<sup>-1</sup> 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<sub>2</sub>O maser source G25.65+1.05. *arXiv e-prints* arXiv:1812.11353 (2018). [1812.11353](https://arxiv.org/abs/1812.11353).
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- [10] Brogan, C. L. *et al.* Sub-arcsecond (Sub)millimeter Imaging of the Massive Protocluster G358.93–0.03: Discovery of 14 New Methanol Maser Lines Associated with a Hot Core. *ApJL* **881**, L39 (2019). [1907.02470](https://arxiv.org/abs/1907.02470).
- [11] MacLeod, G. C. *et al.* Detection of new methanol maser transitions associated with G358.93-0.03. *MNRAS* **489**, 3981–3989 (2019). [1910.00685](https://arxiv.org/abs/1910.00685).
- [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).
- [13] Chen, X. *et al.* <sup>13</sup>CH<sub>3</sub>OH Masers Associated With a Transient Phenomenon in a High-mass Young Stellar Object. *ApJL* **890**, L22 (2020).
- [14] Volvach, A. E. *et al.* Monitoring a methanol maser flare associated with the massive star-forming region G358.93-0.03. *MNRAS* (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 / mostly Reduced
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 / Reduced
11	G358	LBA	3 Feb 2019	23.1	vc026b	GO / Abandoned
12	G358	LBA	28 Feb 2019	6.7	vc026c	RB / Reduced
13	G358	EVN	13 Mar 2019	6.7, <u>6.18</u>	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 / QuickLook
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 / QuickLook
18	G358	LBA	8 Sep 2019	6.7	vc026d	RB / Processing
19	G358	LBA+AusSCOPE	28 Sep 2019	6.7	v581a	RB / Processing
20	G358	SOFIA	30 April 2019	50...120 $\mu$ m		BS,JE
21	G358	GROND	8 Feb 2019	NIR		HL,BS,AC
22	G358	SMA	several 2019	mm		THunter,CB
23	G358	ALMA	several 2019	Bands 5,6,7		CB
24	G358	VLA	2019	GHz	-	OB
25	G358	VLA	2019	GHz	-	OB
26	G358	VLA	2019	HNCO	-	XC,AS
27	G24	LBA	8 Sep 2019	6.7	vx026d	RB,MO / not correlated
28	G24	LBA	13 Sep 2019	6.7	s002a	RB,MO / not correlated
29	G24	LBA	28 Sep 2019	6.7	v581a	RB,MO / not 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 1,0,1
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 / QuickLook
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	<a href="#">NGC2071, Ori-S6</a>	KaVA	13 Mar 2020	22/44/95/130	a20d3a	RB / QuickLook
41	<a href="#">NGC2071, Ori-S6</a>	KaVA	16 Apr 2020	22/44/95/130	a20d3b	RB / QuickLook
42	<a href="#">NGC2071, Ori-S6</a>	KaVA	11 May 2020	22/44/95/130	a20d3c	RB / not correlated
43	<a href="#">G85</a>	VLBA	24/Apr/2020	L/C/Ku/K	BB421B	RB / QuickLook
44	<a href="#">G85</a>	VLBA	22/May/2020	L/C/Ku/K	BB421A	RB / QuickLook
45	<a href="#">G85</a>	VLBA	22/June/2020	L/C/Ku/K	BB421C	RB / not correlated

**Reminder:**

**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 G85 papers** should include a member from the [Ibaraki](#) team in the author list and an acknowledgement of their funding.

**Data:**

If you are interested in any of the data listed above do not hesitate to contact the PI.