This page describes the Channel Map and how to use it

But first, a note

Pico Ballooning is an amateur, non-commercial hobby.

There is no central authority for how people do it, the way they transmit, make trackers, or any other aspect of it.

That said, it's in everyone's benefit to work collaboratively because less chance of accidental interference.

This page represents a way of avoiding interference when flying pico balloons. There are others.

What channels are

Pico Balloon trackers use radio transmissions to announce their location so that you can track them.

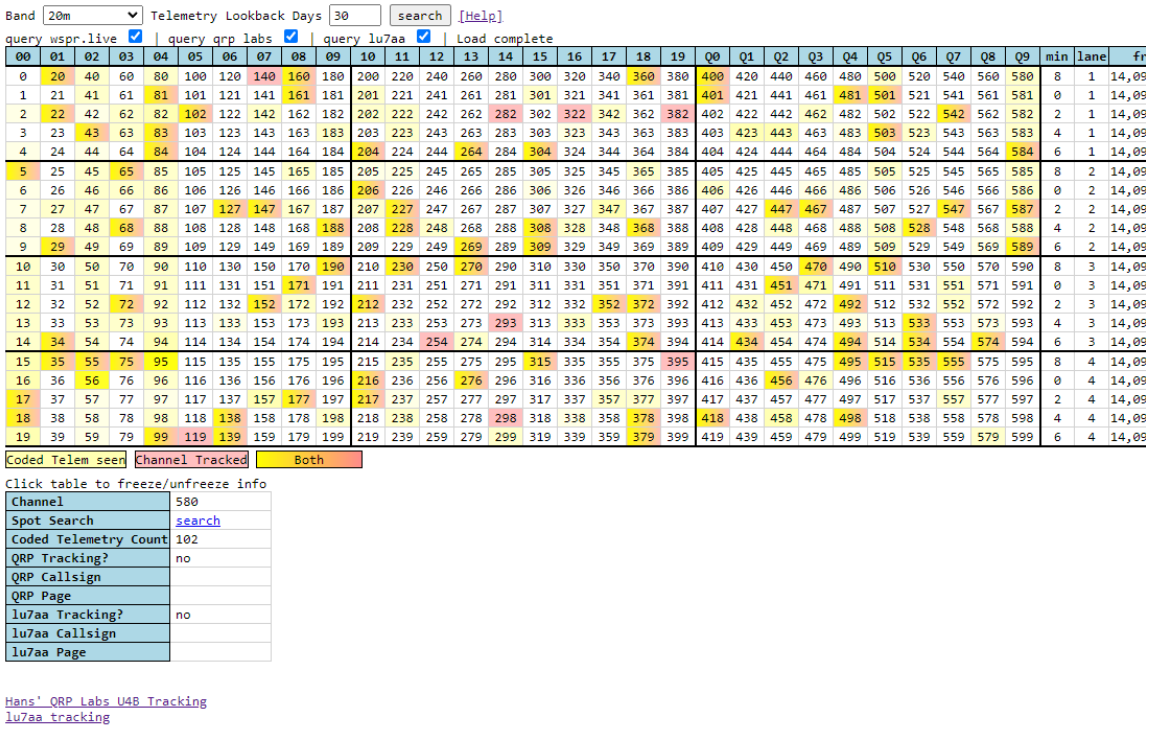
Without care, however, one tracker can conflict with another, messing up each other's data.

To avoid that conflict, a scheme was developed whereby each flying tracker could be assigned a number (a "channel"), which would differentiate it from another tracker.

This is visually indicated in the Channel Map page.

Each number in the table is a channel.

The color of each channel tells you something about whether the channel is being used or not.



00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	min	lane	fr
0	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500	520	540	560	580	8	1	14,09
1	21	41	61	81	101	121	141	161	181	201	221	241	261	281	301	321	341	361	381	401	421	441	461	481	501	521	541	561	581	0	1	14,09
2	22	42	62	82	102	122	142	162	182	202	222	242	262	282	302	322	342	362	382	402	422	442	462	482	502	522	542	562	582	2	1	14,09
3	23	43	63	83	103	123	143	163	183	203	223	243	263	283	303	323	343	363	383	403	423	443	463	483	503	523	543	563	583	4	1	14,09
4	24	44	64	84	104	124	144	164	184	204	224	244	264	284	304	324	344	364	384	404	424	444	464	484	504	524	544	564	584	6	1	14,09
5	25	45	65	85	105	125	145	165	185	205	225	245	265	285	305	325	345	365	385	405	425	445	465	485	505	525	545	565	585	8	2	14,09
6	26	46	66	86	106	126	146	166	186	206	226	246	266	286	306	326	346	366	386	406	426	446	466	486	506	526	546	566	586	0	2	14,09
7	27	47	67	87	107	127	147	167	187	207	227	247	267	287	307	327	347	367	387	407	427	447	467	487	507	527	547	567	587	2	2	14,09
8	28	48	68	88	108	128	148	168	188	208	228	248	268	288	308	328	348	368	388	408	428	448	468	488	508	528	548	568	588	4	2	14,09
9	29	49	69	89	109	129	149	169	189	209	229	249	269	289	309	329	349	369	389	409	429	449	469	489	509	529	549	569	589	6	2	14,09
10	30	50	70	90	110	130	150	170	190	210	230	250	270	290	310	330	350	370	390	410	430	450	470	490	510	530	550	570	590	8	3	14,09
11	31	51	71	91	111	131	151	171	191	211	231	251	271	291	311	331	351	371	391	411	431	451	471	491	511	531	551	571	591	0	3	14,09
12	32	52	72	92	112	132	152	172	192	212	232	252	272	292	312	332	352	372	392	412	432	452	472	492	512	532	552	572	592	2	3	14,09
13	33	53	73	93	113	133	153	173	193	213	233	253	273	293	313	333	353	373	393	413	433	453	473	493	513	533	553	573	593	4	3	14,09
14	34	54	74	94	114	134	154	174	194	214	234	254	274	294	314	334	354	374	394	414	434	454	474	494	514	534	554	574	594	6	3	14,09
15	35	55	75	95	115	135	155	175	195	215	235	255	275	295	315	335	355	375	395	415	435	455	475	495	515	535	555	575	595	8	4	14,09
16	36	56	76	96	116	136	156	176	196	216	236	256	276	296	316	336	356	376	396	416	436	456	476	496	516	536	556	576	596	0	4	14,09
17	37	57	77	97	117	137	157	177	197	217	237	257	277	297	317	337	357	377	397	417	437	457	477	497	517	537	557	577	597	2	4	14,09
18	38	58	78	98	118	138	158	178	198	218	238	258	278	298	318	338	358	378	398	418	438	458	478	498	518	538	558	578	598	4	4	14,09
19	39	59	79	99	119	139	159	179	199	219	239	259	279	299	319	339	359	379	399	419	439	459	479	499	519	539	559	579	599	6	4	14,09

Selecting and using a channel

If you're going to fly, you need to use a channel which isn't in use already.

Any channel which is red is in use.
Any channel which is yellow is probably in use.
Pick one which is neither.

Hovering your mouse over each channel reveals details about that channel in the box below the map.

You can only use one channel at a time with the same minute (see the "min" value on the rightmost part of the Channel Map).

That means a maximum of 5 flights simultaneously, each with a different channel and different minute.

The day you are going to fly you will want to select a channel.

Once you have your channel in mind, you will want to register it on the LU7AA website.

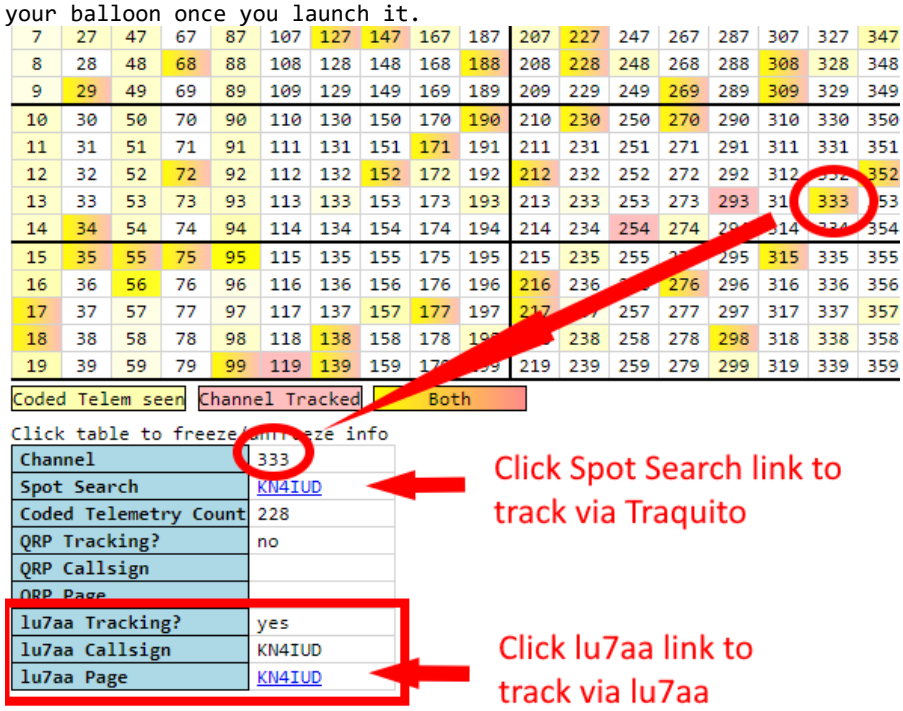
The fields are:

- Callsign - Your callsign
- Band - probably 20m, but make sure it's the same as what you chose on the Channel Map
- Balloon-ID - Ignore
- Time-Slot - Ignore
- Detail - Ignore
- Launch - The time of the launch, in UTC
- SSID - Ignore
- Tracker - The name of the tracker you are flying, eg traquito if using the Traquito Jetpack tracker
- QRP-ID - The channel number you have selected

Then click the blue button to submit.

Once you do that, the channel you selected on the Channel Map will be highlighted red.

You will also be able to click the "Spot Search" link to track your balloon once you launch it.



Some specifics about tracker messages

To understand the details of the Channel Map you need to understand a few details about the messages that get sent by trackers.

Trackers typically use WSPR protocol for sending messages while flying.

WSPR protocol is a wireless radio protocol that has extremely long range (thousands of miles) but extremely small data payloads (only a handful of characters sent).

A WSPR message has the following fields

- Callsign
- Maidenhead Grid Locator 4-char (basically compressed GPS coordinates)
- Power Indicator

These messages can only be sent at the start of an even minute (eg 12:02, 12:04, 12:06, ...). Each message takes 1 minute 50 seconds to send.

This isn't very much data, and doesn't tell you interesting "telemetry" like altitude, speed, etc.

To overcome these limitations, the additional data is sent in a second specially-formatted (encoded) message. The U4B protocol was developed to encode this data.

U4B Protocol

U4B protocol basically answers the question of "how can I encode data in the callsign, grid, and power fields?"

EG, a real WSPR message might be: KD2KDD FN20 17 (real values)
An encoded WSPR message might be: 1V0CDC HN48 37 (encoded data that looks like real values)

Inside the encoded message is telemetry.

Here are the fields, and the range of supported values:

- Altitude = 0m/0ft to 21,340m/70,000ft
- Temperature = -50C/-58F to 39C/102F
- Voltage = 3.0v to 4.95v
- Speed = 0kph/0mph to 151kph/94mph

Jetpack "clamps" its reports to the ranges supported. Meaning, for example, if the real measured voltage is below 3.0v, 3.0v will be reported. Similarly, if the real measured voltage is above 4.95v, 4.95v will be reported. This approach is used for all fields.

Special decoding logic is used to extract the telemetry from the encoded form.

When doing "window testing" (letting your tracker run in Flight Mode) at home, you will see your tracker transmit both the Regular and Encoded messages.

Schedule

In U4B protocol, two messages are sent instead of one.

The first message, the Regular message, is sent once every 10 minutes, at the minute indicated by the channel.

The second message, the Encoded message, is sent in the 2 minute slot after the Regular message.

For example, take channel 589:

- Minute = 6, so the Regular message is sent at 12:06, 12:16, 12:26, ...
- Minute + 2 = 8, so the Encoded message is sent at 12:08, 12:18, 12:28, ...

Notice that there is a "lane" concept, corresponding to a specific frequency, which differentiates some channels from others, despite having the same minute ("min") value.

Q6	Q7	Q8	Q9	min	lane	freq
520	540	560	580	8	1	14,097,020
521	541	561	581	0	1	14,097,020
522	542	562	582	2	1	14,097,020
523	543	563	583	4	1	14,097,020
524	544	564	584	6	1	14,097,020
525	545	565	585	8	2	14,097,060
526	546	566	586	0	2	14,097,060
527	547	567	587	2	2	14,097,060
528	548	568	588	4	2	14,097,060
529	549	569	589	6	2	14,097,060
530	550	570	590	8	3	14,097,140

Tying together Regular and Encoded messages

When you track your flight, in addition to a map and graphs, you also get a table of data.

Traquito automatically finds and aligns the two messages, as well as decodes the messages, then maps/graphs them.

Regular Message | Encoded Message | Decoded Telemetry

DateTimeUtc	DateTimeLocal	RegCallsign	RegGrid	RegPower	EncCallsign	EncGrid	EncPower	Grid6	AltM	TempC	Voltage	SpeedKnots	GpsValid	AltMGraph	AltFt	SpeedKph	SpeedMph	TempF	Grid	DistK
2023-06-01 21:56:00	2023-06-01 17:56:00	KD2KDD	FN30	17	113ADY	HJ13	0	AQ	11,800	-12	4.4	20	1	11,800	38,714	37	23	10	FN30AQ	8
2023-06-01 21:46:00	2023-06-01 17:46:00	KD2KDD	FN20	17	1V3PVM	IB74	17	XR	11,800	-9	4.4	22	1	11,800	38,714	41	25	16	FN20XR	15
2023-06-01 21:26:00	2023-06-01 17:26:00	KD2KDD	FN20	17	1V3TOX	HQ20	50	VS	11,820	-10	4.4	24	1	11,820	38,780	44	28	14	FN20VS	7
2023-06-01 21:16:00	2023-06-01 17:16:00	KD2KDD	FN20	17	1U3HRC	IP89	0	US	11,840	-5	4.4	22	1	11,840	38,845	41	25	23	FN20US	7
2023-06-01 21:06:00	2023-06-01 17:06:00	KD2KDD	FN20	17	1S3VTF	IF27	60	TS	11,820	-8	4.4	22	1	11,820	38,780	41	25	18	FN20TS	8

Credit

Hans Summers designed the channel scheme as well as the U4B protocol. It was in use in his U4B tracker first, before Traquito existed.

Pedro Converso runs the LU7AA tracking and registration website.

To learn more about the relationship between different WSPR Pico Balloon sites, see the FAQ page on Site Relationships.