

# BALLOONSAT I HARDWARE AND RESULTS

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For Additional Information  
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# Student Activities at UAH

Funding by the Alabama Space Grant Consortium

Students in EE 100 and EE 494 are designing,  
building and launching balloon payloads:

BalloonSat I launched last November:

Temperature Measurements

Pictures

Tracking

BalloonSat II planned for early April

Includes telemetry

BalloonSat III planned for late April

Space Week

## Student Activities at UAH

APRS Station operating in Engineering Building

Can follow balloon launches on the Internet:

<http://map.findu.com/KG4UWE-15>

# BALLOONSAT I

- Tiny Trak II  
Encoder  
Output by “audio” out and “push-to-talk” out connectors
- Transmitter  
Vertex-150  
Receives information from Tiny Trak II  
External Antenna



# BALLOONSAT I

- GPS UNIT

Motorola ONCORE

McKinney Technology interface board

GPS Antenna

Serial Port



# BALLOONSAT I

- Pictures

Canon Elph LT  
555 timer circuit

- Temperature

Hobo Data (not shown)  
Built in temperature sensor




- Ground Tracking
- APRS receiving station
- Layout of APRS station
  - GPS
  - Handheld Radio
  - TNC
  - Laptop
  - Antenna



# PREDICTED TRACK





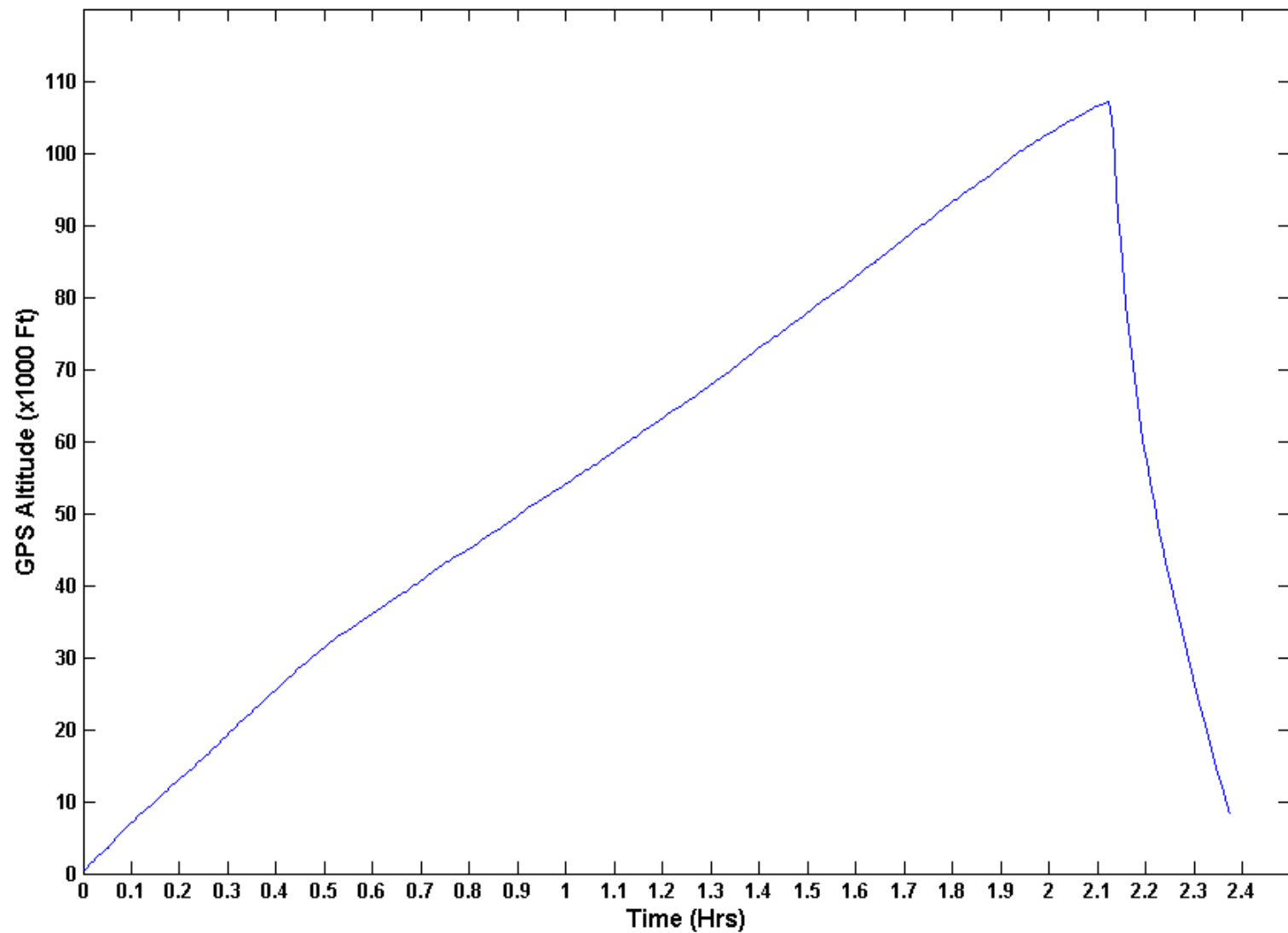
Launched at NSSTC/UAH  
November 20, 2002  
Max Altitude of 107,152 feet  
Recovered near Dayton, Tennessee  
December 4, 2002

**ECE and NSSTC Launch BalloonSat I**

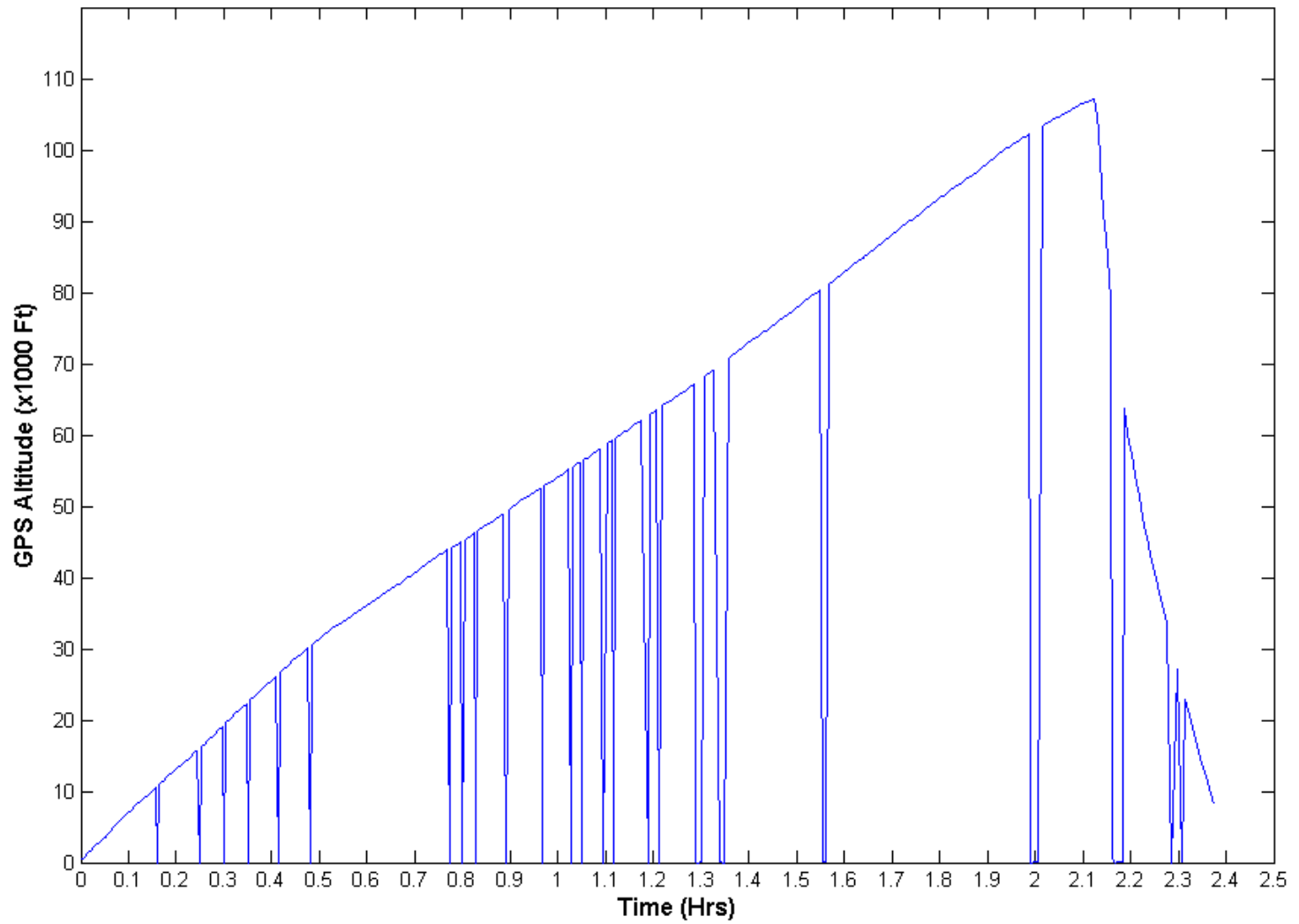


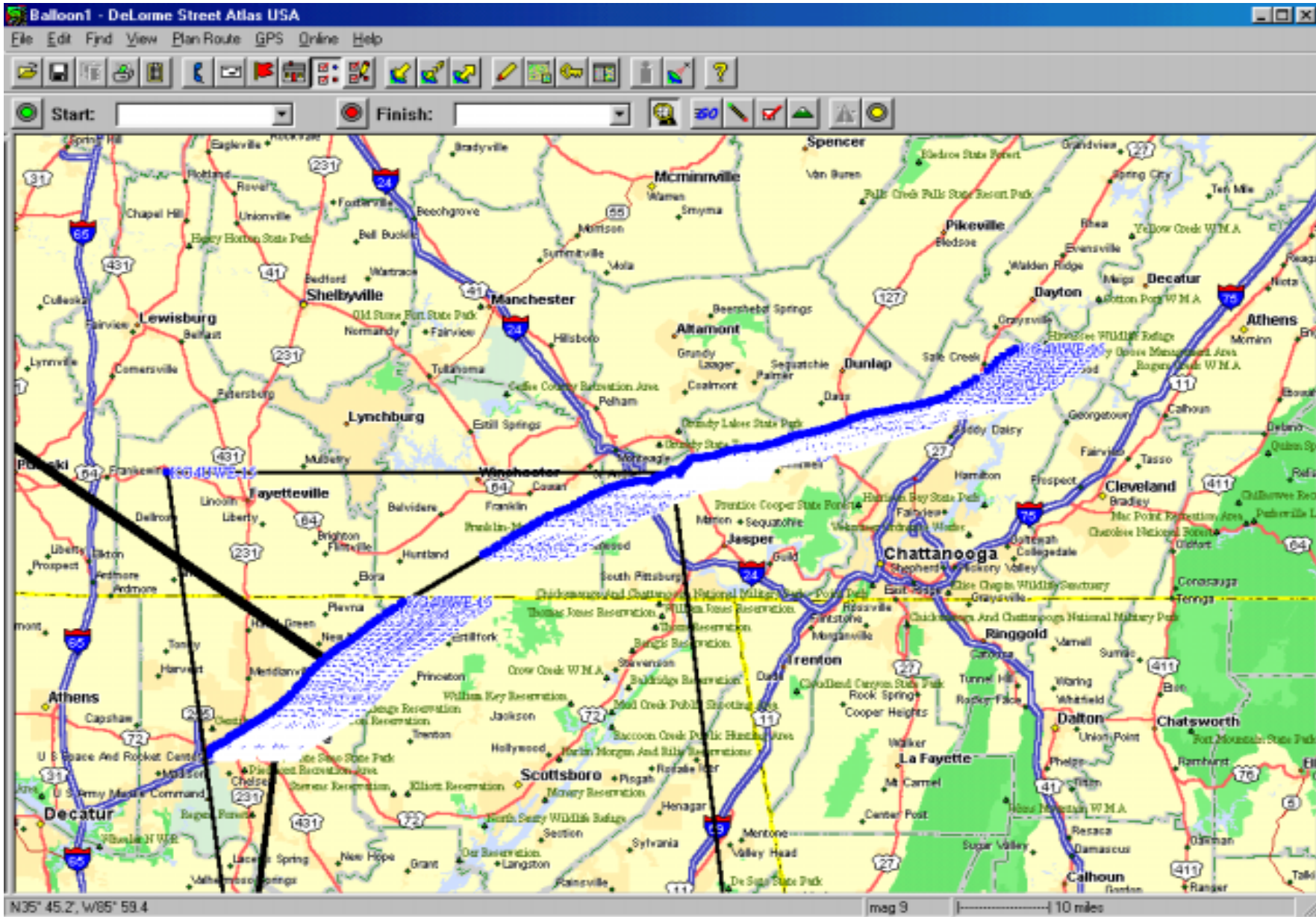
BALLOONSAT ON ITS WAY

**GPS Altitude Plot**



**GPS Altitude (with dropouts)**





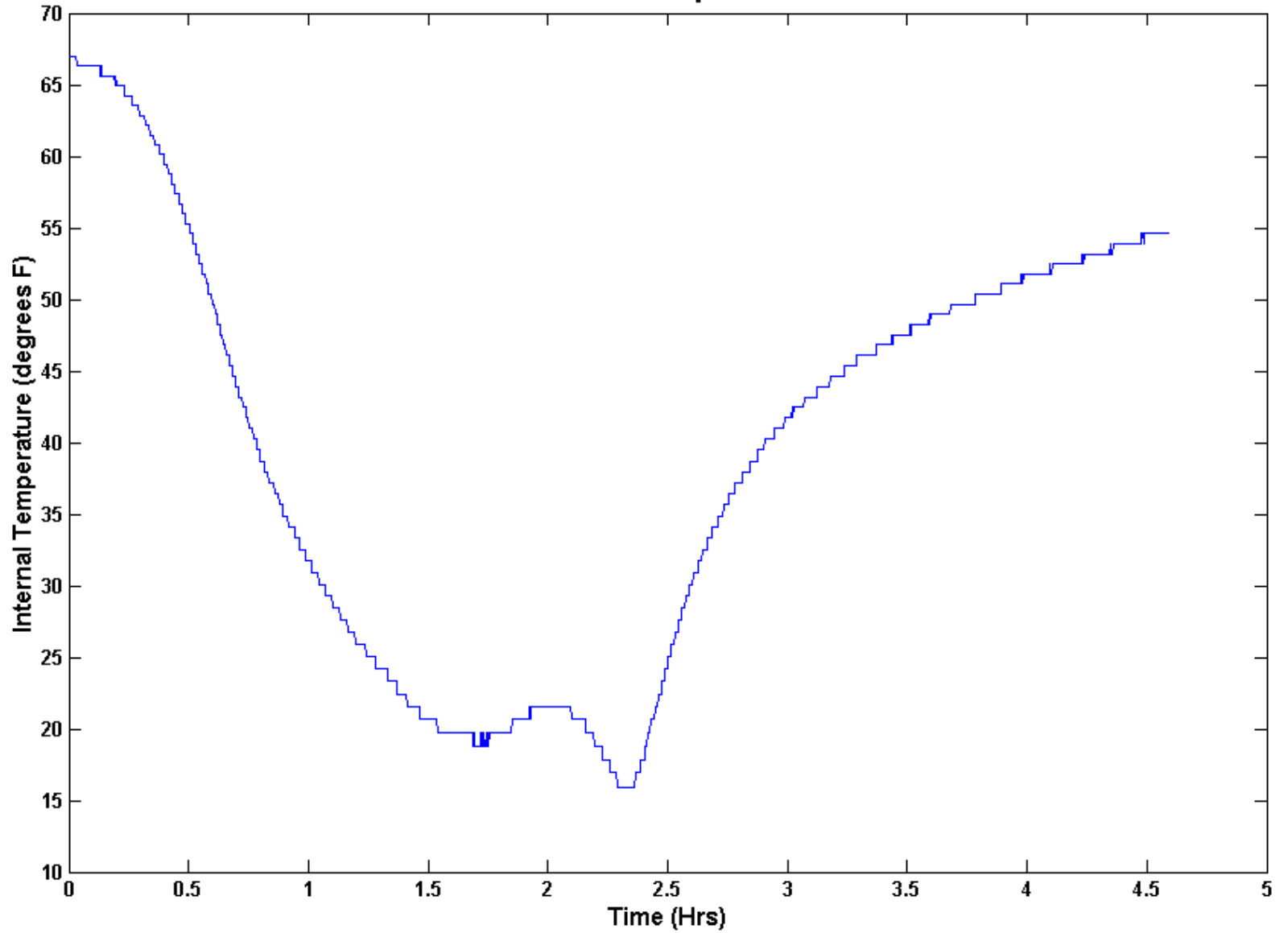
ACTUAL TRACK

KG4UWE	34.72283	-86.6413	./=APRS+SA, Huntsville, AL	22:55:09	V:APS214,RELAY,WIDE
KG4UWE-15	35.41117	-85.0487	-./=A=008250/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=8250	22:37:31	APT202,WIDE
KG4UWE-15	35.40683	-85.0563	-./=A=012069/UAH BALLOONSAT PROJECT SPD=36.8 TRK=64 ALT=12069	22:36:35	APT202,WIDE
KG4UWE-15	35.40467	-85.0613	-./=A=013955/UAH BALLOONSAT PROJECT SPD=49.5 TRK=62 ALT=13955	22:36:06	APT202,WIDE
KG4UWE-15	35.398	-85.0742	-./=A=017938/UAH BALLOONSAT PROJECT SPD=64.4 TRK=54 ALT=17938	22:35:10	APT202,WIDE
KG4UWE-15	35.39083	-85.0838	-./=A=020825/UAH BALLOONSAT PROJECT SPD=66.7 TRK=42 ALT=20825	22:34:28	APT202,WIDE
KG4UWE-15	35.38517	-85.0898	-./=A=022790/UAH BALLOONSAT PROJECT SPD=66.7 TRK=43 ALT=22790	22:34:00	APT202,WIDE
KG4UWE-15	35.37883	-85.0965	-./=A=000026/UAH BALLOONSAT PROJECT SPD=76 TRK=43 ALT=26	22:33:32	APT202,WIDE
KG4UWE-15	35.37367	-85.1052	-./=A=027186/UAH BALLOONSAT PROJECT SPD=85.2 TRK=61 ALT=27186	22:33:03	APT202,WIDE
KG4UWE-15	35.36083	-85.128	-./=A=000000/UAH BALLOONSAT PROJECT SPD=105.9 TRK=54 ALT=0	22:32:08	APT202,WIDE
KG4UWE-15	35.35417	-85.1393	-./=A=033524/UAH BALLOONSAT PROJECT SPD=102.4 TRK=53 ALT=33524	22:31:40	APT202,WIDE
KG4UWE-15	35.35083	-85.1455	-./=A=034515/UAH BALLOONSAT PROJECT SPD=109.3 TRK=61 ALT=34515	22:31:25	APT202,WIDE
KG4UWE-15	35.34833	-85.1517	-./=A=035516/UAH BALLOONSAT PROJECT SPD=92.1 TRK=63 ALT=35516	22:31:12	APT202,WIDE
KG4UWE-15	35.34133	-85.1667	-./=A=038727/UAH BALLOONSAT PROJECT SPD=66.7 TRK=54 ALT=38727	22:30:29	APT202,WIDE
KG4UWE-15	35.339	-85.1708	-./=A=039836/UAH BALLOONSAT PROJECT SPD=82.9 TRK=56 ALT=39836	22:30:15	APT202,WIDE
KG4UWE-15	35.33283	-85.1817	-./=A=043281/UAH BALLOONSAT PROJECT SPD=50.6 TRK=49 ALT=43281	22:29:32	APT202,WIDE
KG4UWE-15	35.331	-85.1845	-./=A=044528/UAH BALLOONSAT PROJECT SPD=49.5 TRK=48 ALT=44528	22:29:18	APT202,WIDE
KG4UWE-15	35.328	-85.1902	-./=A=047303/UAH BALLOONSAT PROJECT SPD=43.7 TRK=64 ALT=47303	22:28:51	APT202,WIDE
KG4UWE-15	35.32617	-85.1963	-./=A=049947/UAH BALLOONSAT PROJECT SPD=55.2 TRK=76 ALT=49947	22:28:22	APT202,WIDE
KG4UWE-15	35.3255	-85.1995	-./=A=051397/UAH BALLOONSAT PROJECT SPD=42.6 TRK=66 ALT=51397	22:28:08	APT202,WIDE
KG4UWE-15	35.32433	-85.2042	-./=A=054353/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=54353	22:27:41	APT202,WIDE
KG4UWE-15	35.32383	-85.2058	-./=A=055859/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=55859	22:27:26	APT202,WIDE
KG4UWE-15	35.3235	-85.2073	-./=A=057283/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=57283	22:27:13	APT202,WIDE
KG4UWE-15	35.32317	-85.2085	-./=A=058775/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=58775	22:26:58	APT202,WIDE
KG4UWE-15	35.323	-85.2097	-./=A=060363/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=60363	22:26:44	APT202,WIDE
KG4UWE-15	35.32267	-85.2107	-./=A=061984/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=61984	22:26:30	APT202,WIDE
KG4UWE-15	35.32233	-85.2118	-./=A=063801/UAH BALLOONSAT PROJECT SPD=21.9 TRK=0 ALT=63801	22:26:16	APT202,WIDE
KG4UWE-15	35.3225	-85.213	-./=A=000091/UAH BALLOONSAT PROJECT SPD=6.9 TRK=61 ALT=91	22:26:02	APT202,WIDE
KG4UWE-15	35.322	-85.2133	-./=A=000091/UAH BALLOONSAT PROJECT SPD=15 TRK=57 ALT=91	22:25:49	APT202,WIDE
KG4UWE-15	35.32217	-85.2145	-./=A=000091/UAH BALLOONSAT PROJECT SPD=5.8 TRK=332 ALT=91	22:25:20	APT202,WIDE
KG4UWE-15	35.3215	-85.2147	-./=A=000000/UAH BALLOONSAT PROJECT SPD=15 TRK=48 ALT=0	22:25:06	APT202,WIDE
KG4UWE-15	35.32083	-85.2157	-./=A=000757/UAH BALLOONSAT PROJECT SPD=21.9 TRK=69 ALT=757	22:24:52	APT202,WIDE
KG4UWE-15	35.3205	-85.2173	-./=A=079056/UAH BALLOONSAT PROJECT SPD=18.4 TRK=92 ALT=79056	22:24:38	APT202,WIDE
KG4UWE-15	35.31983	-85.2208	-./=A=084706/UAH BALLOONSAT PROJECT SPD=32.2 TRK=67 ALT=84706	22:24:10	APT202,WIDE
KG4UWE-15	35.31917	-85.2233	-./=A=087793/UAH BALLOONSAT PROJECT SPD=35.7 TRK=77 ALT=87793	22:23:56	APT202,WIDE
KG4UWE-15	35.319	-85.226	-./=A=091136/UAH BALLOONSAT PROJECT SPD=33.4 TRK=83 ALT=91136	22:23:42	APT202,WIDE
KG4UWE-15	35.318	-85.232	-./=A=098727/UAH BALLOONSAT PROJECT SPD=52.9 TRK=77 ALT=98727	22:23:13	APT202,WIDE

KG4UWE-15	35.3235	-85.2073	-=/A=057283/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=57283	22:27:13	APT202,WIDE
KG4UWE-15	35.32317	-85.2085	-=/A=058775/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=58775	22:26:58	APT202,WIDE
KG4UWE-15	35.323	-85.2097	-=/A=060363/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=60363	22:26:44	APT202,WIDE
KG4UWE-15	35.32267	-85.2107	-=/A=061984/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=61984	22:26:30	APT202,WIDE
KG4UWE-15	35.32233	-85.2118	-=/A=063801/UAH BALLOONSAT PROJECT SPD=21.9 TRK=0 ALT=63801	22:26:16	APT202,WIDE
KG4UWE-15	35.3225	-85.213	-=/A=000091/UAH BALLOONSAT PROJECT SPD=6.9 TRK=61 ALT=91	22:26:02	APT202,WIDE
KG4UWE-15	35.322	-85.2133	-=/A=000091/UAH BALLOONSAT PROJECT SPD=15 TRK=57 ALT=91	22:25:49	APT202,WIDE
KG4UWE-15	35.32217	-85.2145	-=/A=000091/UAH BALLOONSAT PROJECT SPD=5.8 TRK=332 ALT=91	22:25:20	APT202,WIDE
KG4UWE-15	35.3215	-85.2147	-=/A=000000/UAH BALLOONSAT PROJECT SPD=15 TRK=48 ALT=0	22:25:06	APT202,WIDE
KG4UWE-15	35.32083	-85.2157	-=/A=000757/UAH BALLOONSAT PROJECT SPD=21.9 TRK=69 ALT=757	22:24:52	APT202,WIDE
KG4UWE-15	35.3205	-85.2173	-=/A=079056/UAH BALLOONSAT PROJECT SPD=18.4 TRK=92 ALT=79056	22:24:38	APT202,WIDE
KG4UWE-15	35.31983	-85.2208	-=/A=084706/UAH BALLOONSAT PROJECT SPD=32.2 TRK=67 ALT=84706	22:24:10	APT202,WIDE
KG4UWE-15	35.31917	-85.2233	-=/A=087793/UAH BALLOONSAT PROJECT SPD=35.7 TRK=77 ALT=87793	22:23:56	APT202,WIDE
KG4UWE-15	35.319	-85.226	-=/A=091136/UAH BALLOONSAT PROJECT SPD=33.4 TRK=83 ALT=91136	22:23:42	APT202,WIDE
KG4UWE-15	35.318	-85.232	-=/A=098727/UAH BALLOONSAT PROJECT SPD=52.9 TRK=77 ALT=98727	22:23:13	APT202,WIDE
KG4UWE-15	35.317	-85.236	-=/A=102706/UAH BALLOONSAT PROJECT SPD=66.7 TRK=70 ALT=102706	22:23:00	APT202,WIDE
KG4UWE-15	35.31583	-85.241	-=/A=106341/UAH BALLOONSAT PROJECT SPD=84 TRK=78 ALT=106341	22:22:45	APT202,WIDE
KG4UWE-15	35.315	-85.2468	-=/A=107152/UAH BALLOONSAT PROJECT SPD=84 TRK=81 ALT=107152	22:22:31	APT202,WIDE
KG4UWE-15	35.31417	-85.2523	-=/A=107063/UAH BALLOONSAT PROJECT SPD=80.6 TRK=79 ALT=107063	22:22:17	APT202,WIDE
KG4UWE-15	35.31333	-85.2577	-=/A=106971/UAH BALLOONSAT PROJECT SPD=77.1 TRK=79 ALT=106971	22:22:04	APT202,WIDE
KG4UWE-15	35.31183	-85.2682	-=/A=106758/UAH BALLOONSAT PROJECT SPD=78.3 TRK=78 ALT=106758	22:21:34	APT202,WIDE
KG4UWE-15	35.31033	-85.2783	-=/A=106532/UAH BALLOONSAT PROJECT SPD=72.5 TRK=79 ALT=106532	22:21:06	APT202,WIDE
KG4UWE-15	35.3095	-85.2833	-=/A=106400/UAH BALLOONSAT PROJECT SPD=76 TRK=78 ALT=106400	22:20:53	APT202,WIDE
KG4UWE-15	35.3085	-85.2885	-=/A=106269/UAH BALLOONSAT PROJECT SPD=74.8 TRK=74 ALT=106269	22:20:38	APT202,WIDE
KG4UWE-15	35.3075	-85.2933	-=/A=106128/UAH BALLOONSAT PROJECT SPD=73.6 TRK=77 ALT=106128	22:20:24	APT202,WIDE
KG4UWE-15	35.30667	-85.2983	-=/A=105981/UAH BALLOONSAT PROJECT SPD=74.8 TRK=75 ALT=105981	22:20:12	APT202,WIDE
KG4UWE-15	35.306	-85.3033	-=/A=105826/UAH BALLOONSAT PROJECT SPD=73.6 TRK=80 ALT=105826	22:19:57	APT202,WIDE
KG4UWE-15	35.30517	-85.3085	-=/A=105669/UAH BALLOONSAT PROJECT SPD=74.8 TRK=83 ALT=105669	22:19:42	APT202,WIDE
KG4UWE-15	35.30467	-85.3137	-=/A=105515/UAH BALLOONSAT PROJECT SPD=78.3 TRK=82 ALT=105515	22:19:28	APT202,WIDE
KG4UWE-15	35.304	-85.319	-=/A=105364/UAH BALLOONSAT PROJECT SPD=77.1 TRK=85 ALT=105364	22:19:14	APT202,WIDE
KG4UWE-15	35.30333	-85.3243	-=/A=105213/UAH BALLOONSAT PROJECT SPD=74.8 TRK=79 ALT=105213	22:19:01	APT202,WIDE
KG4UWE-15	35.3025	-85.3293	-=/A=105065/UAH BALLOONSAT PROJECT SPD=72.5 TRK=76 ALT=105065	22:18:46	APT202,WIDE
KG4UWE-15	35.30167	-85.3342	-=/A=104924/UAH BALLOONSAT PROJECT SPD=71.3 TRK=77 ALT=104924	22:18:33	APT202,N4QE A-2*
KG4UWE-15	35.3	-85.3435	-=/A=104655/UAH BALLOONSAT PROJECT SPD=69 TRK=75 ALT=104655	22:18:04	APT202,WIDE
KG4UWE-15	35.299	-85.3482	-=/A=104508/UAH BALLOONSAT PROJECT SPD=66.7 TRK=76 ALT=104508	22:17:50	APT202,WIDE
KG4UWE-15	35.298	-85.3525	-=/A=104363/UAH BALLOONSAT PROJECT SPD=66.7 TRK=72 ALT=104363	22:17:36	APT202,WIDE
KG4UWE-15	35.29567	-85.3612	-=/A=104078/UAH BALLOONSAT PROJECT SPD=0 TRK=0 ALT=104078	22:17:07	APT202,WIDE



# Internal Temperature





### External Temperature

