Preview

For Volunteers

Balloon Fest is a Regional Interscholastic STEM Event

Teachers and teams of 3 to 6 students are invited to launch helium-filled, tethered balloons with student-designed instrumentation in order to measure different characteristics of our atmosphere, or to test alternative engineering designs.

After weeks of preparation, at an exciting all-day event, students will gather data, analyze it, and present their findings to peers, parents, and professionals.

Enthusiastic adult mentors, judges, and event volunteers provide encouragement and active support for these student teams.

Levels of Participation

Level 1

Introductory — Designed for first time experimenters, ES or MS.

Level 2

Intermediate — Designed for high school STEM students

Advanced — Only for experienced experimenters and special projects

When & Where

http://Regional.Endeavours.org

- Regional Balloon Fest:
  - Saturday, Dec 7, 2013
  - Allan Hancock College

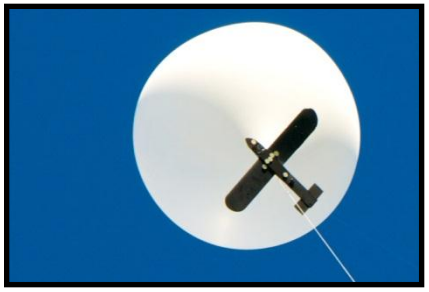
http://Championship.Endeavours.org

- Championship Balloon Fest:
  - Saturday, May 3, 2014
  - Tobin James Cellars
    Hwy 46 and Union road

Balloon Fest is Fun

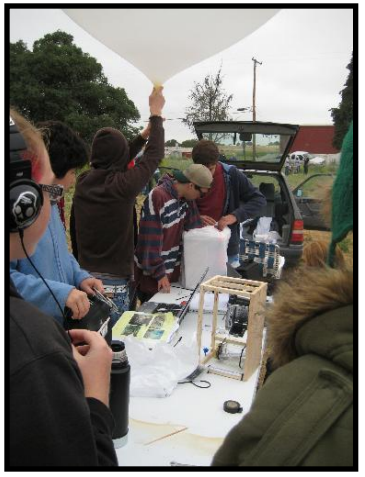
Exciting Investigations









Great Teamwork

Fine Analyses and Awards

Adult Participation

Mentor
Work with a team of great students by email and at the event. Lots of fun for you.

Team Support
Parents or friends of participating students help their team.

Judge
Evaluate readiness of team to compete, interview teams at the event, and award prizes

Event Volunteer
Help with refreshments, registration, filling balloons, parking, or directions.

If you are not yet ready to participate
Come watch! Bring your family. The best time is from 8 to 10am.

Balloon Fest - Endeavour Academy - Mozilla Firefox

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endeavours.org/events/BF2013Championship/index.htm

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Championship Balloon Fest STEM Event

Funding graciously provided courtesy of:

SCIPP, UCSC, Quarknet, and NASA grant NNX12AB97G

Small Satellites for Secondary Students

Check out video of untethered launch: Der Grosste Ballon

April 20, 2013

Tobin James Cellars Map

Paso Robles, CA

Description of Event

Timeline & Supplies

Event Schedule

Experiments

Awards

Images

Flyer for this event

Balloon Fest Preview ppt

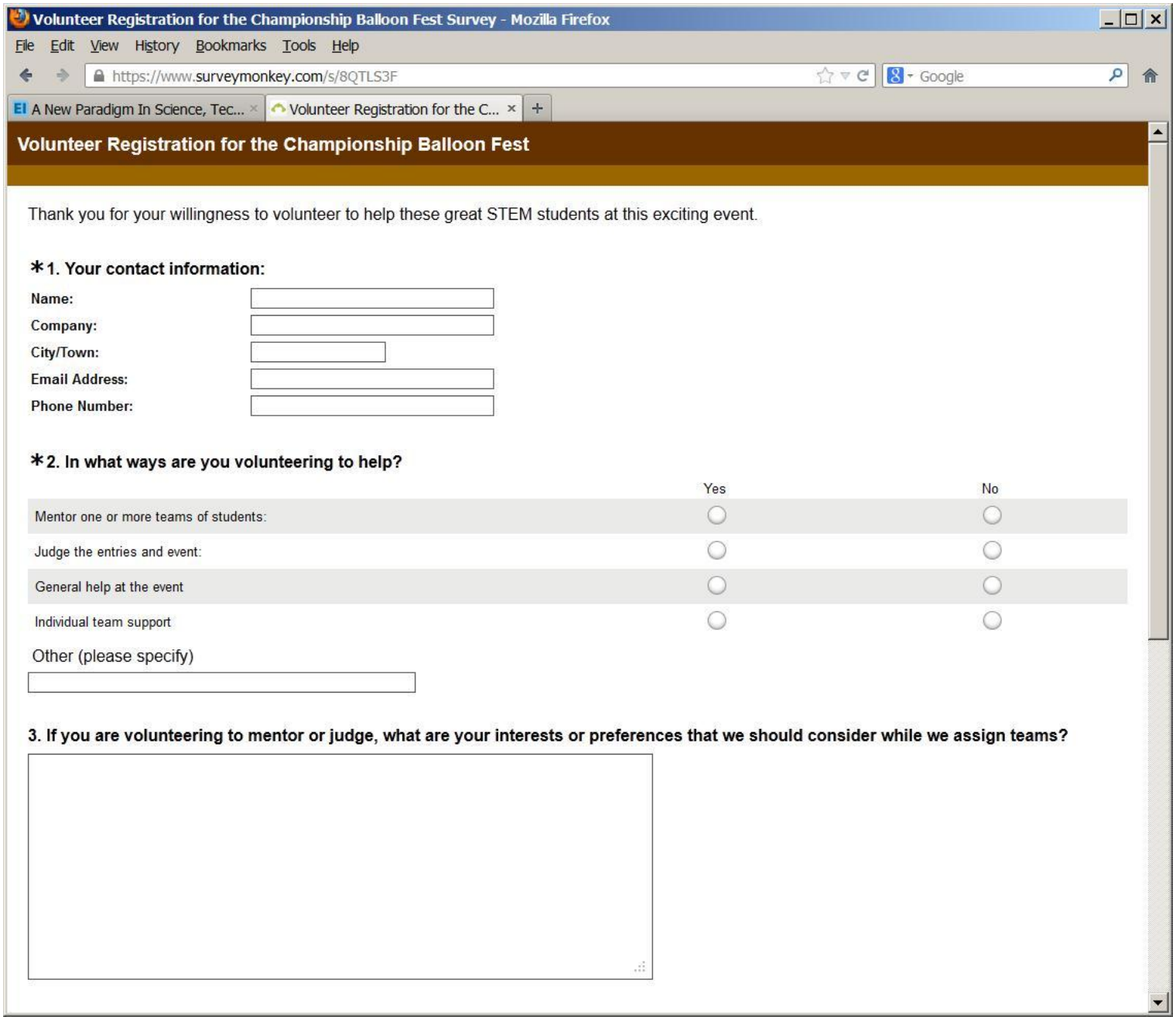
Student mentoring and support provided courtesy of various community members, universities, and other professional organizations.

How to Participate

Student Teams

Instructors

Mentors, Judges, and other Volunteers


Volunteer Registration for the Championship Balloon Fest Survey - Mozilla Firefox
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Google
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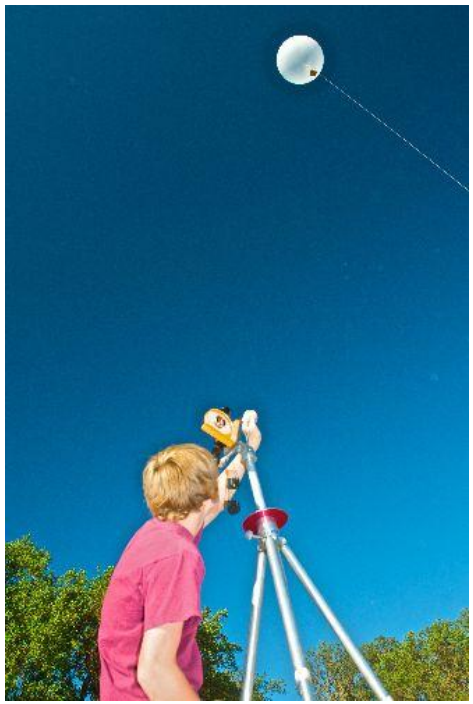
Volunteer Registration for the C...
Volunteer Registration for the Championship Balloon Fest
Thank you for your willingness to volunteer to help these great STEM students at this exciting event.
*1. Your contact information:
Name:
Company:
City/Town:
Email Address:
Phone Number:
*2. In what ways are you volunteering to help?
Yes
No
Mentor one or more teams of students:
Judge the entries and event:
General help at the event
Individual team support
Other (please specify)
3. If you are volunteering to mentor or judge, what are your interests or preferences that we should consider while we assign teams?

Experiment Design Process

- Two Options
  - Science
  - Engineering



Examples: Science

- • Altitude Profiles:
  - a. **Barometric Pressure**
  - b. **Air Temperature**
    (Temp. Inversions)
  - c. **Humidity**
  - d. **Ultraviolet exposure**
  - e. **Cricket activity levels**
  - f. **CO_2 or O_2 %**
  - g. **Magnetic Intensity**
  - h. **Electric Field strength**
  - i. **Cosmic Ray Flux**
  - j. **Sound frequency attenuation** vs altitude

    Constant sound generator, microphone, oscilloscope with fourier analysis, printer and computer

Examples: Engineering

- • Find the **point directly below** the balloon
- • **Parachutes, Egg drop, Glider design**
- • Minimum **Aneroid Barometer device** to determine maximum altitude
  One-way valve to allow air out will sample lowest pressure if T is const.

- • **Trigonometric Altitude** measurement
  Two or three base stations, solid geometry, simultaneous measurements
- • **Aerial Pictures or wireless Video** for altitude measurement
  Interesting perspective but also ability to measure altitude by apparent size of image
- • **Remote Sensing**
  AIRSS: Crop Vigor
- • **Comparison of altitude measurements** by barometric pressure, line length & angle, Laser rangefinder, GPS, Trig, and plate scale. Precision & accuracy.
- • **Release and track a balloon** to measure air movement vs altitude.


Robin James Cellars

Why are we doing this?

Inspire - Engage - Educate - Employ

NGSS

Three essential Dimensions:

- Practices
- Crosscutting Concepts
- Disciplinary Core Ideas

BOX 3-1

PRACTICES FOR K-12 SCIENCE CLASSROOMS

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Balloons vs Rockets

1000 ft long elevation = 125,000 ft = 24 miles 6 hours flight 30 million cu. Ft.
5000 kg payload

≤ 2.2 kg payload

≤ 1000 ft AGL

Size and duration unlimited

~$80 per balloon with multiple launches

Payload mass and size limited

Higher altitudes Short duration

Expensive launches

Federal Regulations

http://www.ecfr.gov

Electronic Code of Federal Regulations

Title 14: Aeronautics and Space

PART 101—MOORED BALLOONS, KITES, AMATEUR ROCKETS AND UNMANNED FREE BALLOONS

§ 101.1 Applicability.
(1) Except as provided for in § 101.7, any balloon that is moored to the surface of the earth or an object thereon and that has a diameter of more than 6 feet or a gas capacity of more than 115 cubic feet.

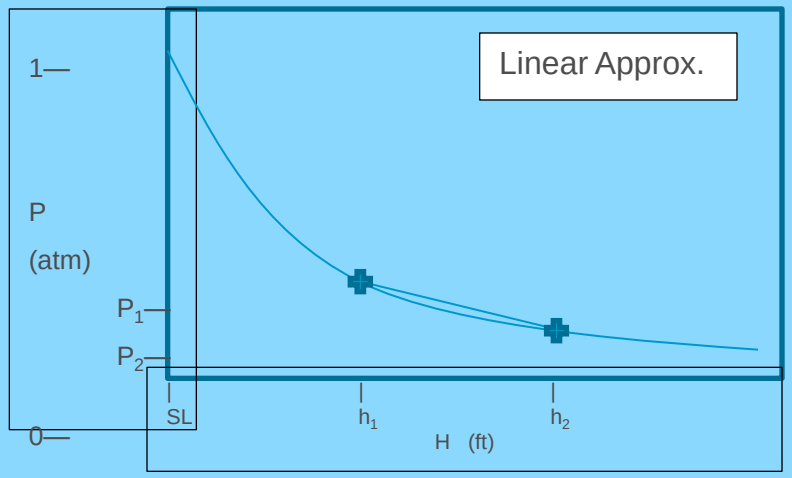
§ 101.7 Hazardous operations.
(a) No person may operate any moored balloon, kite, amateur rocket, or unmanned free balloon in a manner that creates a hazard to other persons, or their property.
(b) No person operating any moored balloon, kite, amateur rocket, or unmanned free balloon may allow an object to be dropped therefrom, if such action creates a hazard to other persons or their property.

Barometric Altimetry

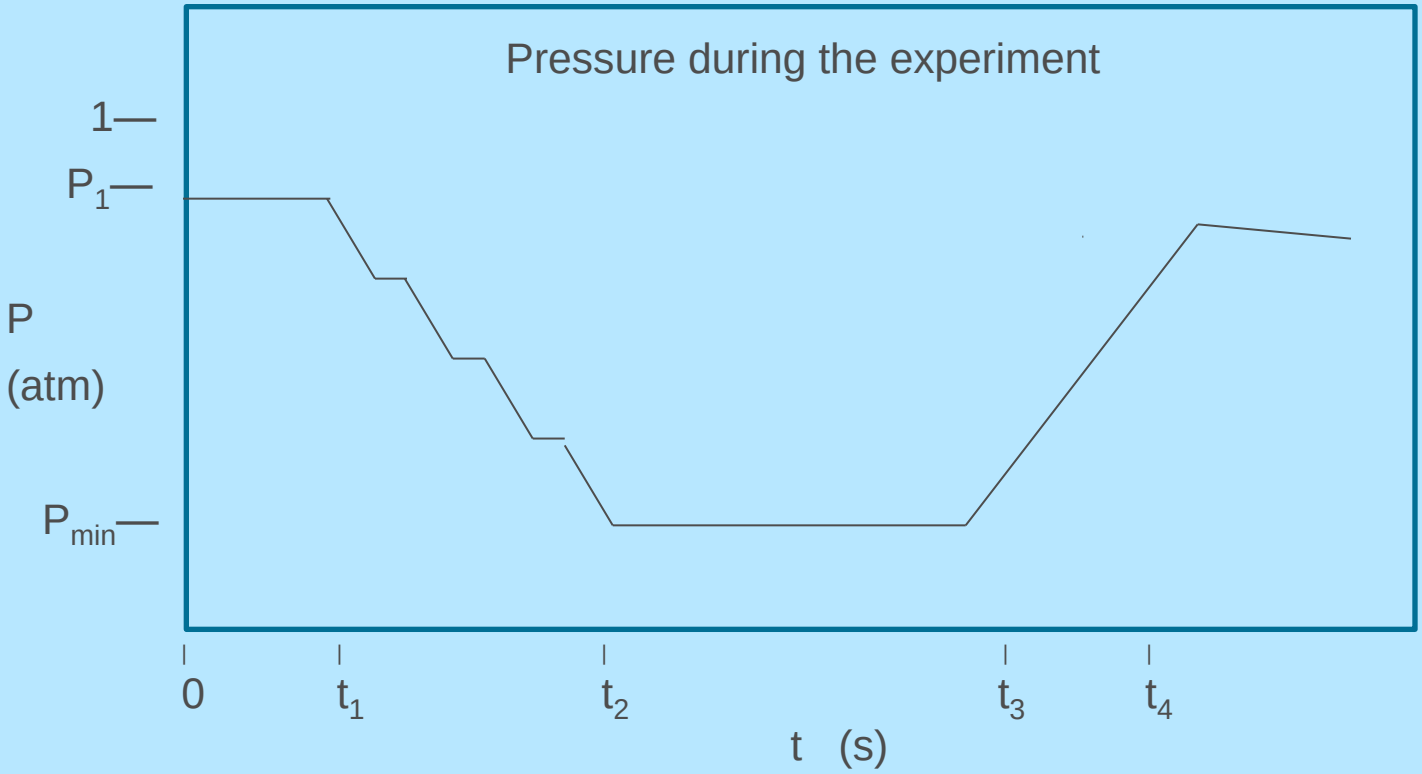
Hydrostatic pressure is the weight of the fluid above you.
14.7 lbs above every square inch (psi)
101,300 N above every square meter (Pa)

Four Atmospheric Models:
Isothermic $P = P_0 * \exp(-h/h_0)$ $P_0 = 101.3$ kPa $h_0 = 8435$ m
Adiabatic
Meteorological
US Standard Atmosphere of 1976

Linear Approximation:
$h = k_1 * P + k_0$
$k_1 = -307$ ft/kPa $= -93.4$ m/kPa
$k_0 = 30{,}900$ ft $= 9410$m
$h_1 = 2700$ ft
$h_2 = 3700$ ft
Error = 0.2% = 4 ft



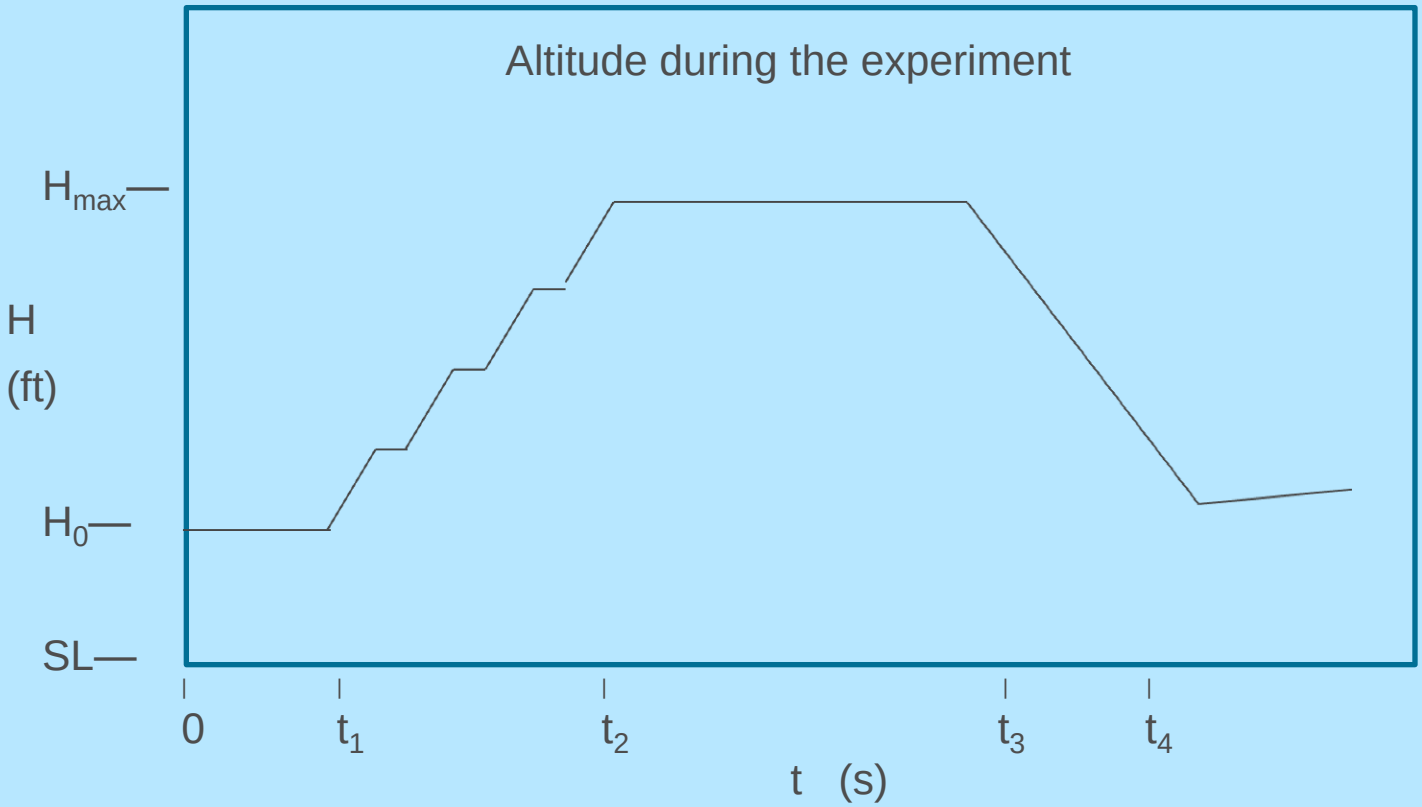
Pressure



P_0 = 101.3 kPa = 101300 Pa = 14.7 psi = 1013 mBar = 30 inHg = 760 mmHg = 32 ft of sea water =

During a normal weather day, the ambient pressure will often vary by about 0.1 to 0.2 kPa per hour. This translates to an ambient pressure-induced drift of about 8 to 16 m per hour.

Altitude



$P = P_0 * \exp(-h/h_0)$ $P_0 = 101.3$ kPa $h_0 = 8435$ m (Std Atm 1976)

$h = k_1 * P + k_0$ $k_1 = -307$ ft/kPa $= -93.4$ m/kPa $k_0 = 30{,}900$ ft $= 9410$m

Earth's Magnetic Field

Varies with time and location.
Higher intensity at greater latitudes
Solar storms cause rapid (minutes to hours) changes (K-index)
on the order of 10 mG
At our lat long: Intensity ~500 mG, Dip ~ 60 deg, Declination = 15 deg E

The included magnetometer measures 3 axes in milli Gauss with a resolution of 1 mG and a precision of .75 mG.

Avoid interference:
Common refrigerator magnets have intensities of ~ 100 G
Iron anywhere nearby will also disrupt readings

Additional Information

Steve Kliewer: Director@EndeavourInstitute.org

Endeavour Institute:
http://endeavourinstitute.org/

Balloon Fest:
http://championship.endeavours.org/
http://regional.endeavours.org/

Atmospheric Research in the High School:
http://scipp.ucsc.edu/outreach/balloon