

Unit 2: Smiley Basics

Teacher Packet

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KENAN FELLOWS PROJECT

2010

Unit 2: Smiley Basics

Author: Derek Dennis

Subject/Level: 9th grade Earth and Environment Science

Background: This is the second of three units that teach students how to utilize and conduct scientific investigations using PARI's Smiley Radio Telescope. While radio wavelengths take up the overwhelming majority of the electromagnetic spectrum, the study of radio astronomy is often unseen. Smiley is a world-class research class radio telescope, which opens student's eyes to the majority of the unseen universe. Students will learn how to use fairly complex equipment to conduct complex labs.

Summary of Activity: Students will learn specifics on how to use the Smiley Radio Telescope. Students will practice remote operation in preparation for upcoming labs in unit 3. Students will conduct hands-on investigations through the remote use of Smiley. The lesson is divided into eight PARIpod lessons:

- 1 Intro to Smiley (PARI Pod 2.1)
- 2 Gaining Access (PARI Pod 2.2)
- 3 Controlling Smiley (PARI Pod 2.3)
- 4 Scanning with Smiley (PARI Pod 2.4)
- 5 Spectrum Scan(PARI Pod 2.5)
- 6 Continuum Scan (PARI Pod 2.6)
- 7 Mapping Scan (PARI Pod 2.7)
- 8 Analyzing Smiley Data (PARI Pod 2.8)

Each of the segments will have a directing podcast in conjunction with their unit guide. Students will utilize the podcasts and guide while simultaneously interacting with Smiley online.

Prerequisite Skills:

Students should have reviewed Unit 1: Radio Astronomy Basics.

Students should have access to a podcast media player (iPod, computer, Etc.).

Fundamental Understanding:

Students will learn how a radio telescope functions. (PARI Pod 2.1)

Students will learn specifications of Smiley. (PARI Pod 2.1)

Students will practice accessing smiley on-line. (PARI Pod 2.2)

Students will acquire the skills needed to control Smiley. (PARI Pod 2.3)

Students will develop an understanding of the means of targeting smiley. (PARI Pod 2.3)

Students will practice controlling Smiley. (PARI Pod 2.3)

Students will learn how to conduct scans using Smiley. (PARI Pod 2.4)

Student will conduct spectrum, continuum, and mapping scans (2.5, 2.6, & 2.7)

Students will analyze data from scans. (PARI Pod 2.8)

Essential questions:

How does a radio telescope function? (PARI Pod 2.1)

What are a few advantages and disadvantages of a radio telescope? (PARI Pod 2.1)

Who is allowed to access Smiley? (PARI Pod 2.2)

What are the key parts to the Smiley interface? (PARI Pod 2.3)

What are the different ways to control Smiley's movements? (PARI Pod 2.3)

What is the Astronomical Coordinate System? (PARI Pod 2.3)

What is a Spectrum scan? (PARI Pod 2.5)

What is a Continuum scan? (PARI Pod 2.6)

What is a Mapping Scan? (PARI Pod 2.7)

How do you conduct data analysis? (PARI Pod 2.8)

State Standards: NCSCoS: High School Curriculum:

Earth and Environmental science

1.01 Identify questions and problems in the earth and environmental sciences that can be answered through scientific investigations.

1.02 Design and conduct scientific investigations to answer questions related to earth and environmental science.

6.04: Assess the spectra generated by stars and our sun as Indicators of motion and composition (the Doppler Effect)

6.05: Evaluate astronomers' use of various technologies to extend Their senses:

Optical telescopes

Cameras

Radio Telescopes

Spectroscope

Safety Precautions: (if any)

Proper internet usage protocols

Follow Smiley operational procedures

Materials/Equipment:

Podcast media player.

Computer with high speed internet connection.

Accompanying materials

Time Requirement:(estimated): Three 90 minute classes

The time required will shorten everyday as students become familiar with the procedures.

Estimated Average Time Per PARIPod:

- 5-10 minutes Engage
- 10-20 minutes Explore
- 10 minutes Explain and Elaborate
- 5-10 minutes Evaluate

- 30-40 minutes each PARIPod.
- If 3 PARIPods are completed each day.

IMPORTANT NOTICE: You must contact PARI before you can access and use Smiley.

You have to be assigned a username and password. Be sure to tell them you are using these materials. You will be expected to practice using Smiley before use in the classroom.

Contact either

Christi Whitworth cwhitworth@pari.edu

Dr. Mike Castelaz: mcastelaz@pari.edu

Assessment:

1. Students will complete their Student Guide during activities.
2. Students will complete activities associated with a PARI Pod/lesson.
3. Students will complete accompanying quizzes.

Teacher Pack Contents (Attached):

Lesson Plans: Down Below.

Student Guide

Teacher Manual

Activities

Quizzes

Copies of accompanying podcasts.

Lesson/Activities Overview: Specific details are in the specific lessons.

1. Preview the activity by reading segment in student guide.
2. Use PARIPods to complete lessons/segments in student guide (podcast can be paused, rewind, etc.). Take notes as needed
3. Complete accompanying quizzes.
4. Review answers to guide and quizzes.
5. Elaborate procedures.
6. Log-on Smiley website: <http://www.pari.edu/programs/teachers/smiley/>
7. Practice actual use of Smiley using student manual and podcasts in preparation for Unit 3 labs. .

Websites:



PARI www.pari.edu: Pisgah Astronomical Research Institute Website
<http://campus.pari.edu/radiosky/> Sensing the Radio Sky. Interactive website.



NRAO National Radio Astronomy Observatory:
<http://www.nrao.edu/> : National Radio Astronomy Observatories. Great national resources including:
<http://science.nrao.edu/> Great starting point for NRAO
<http://www.vla.nrao.edu/teachers/lessons/> Radio Astronomy Lesson Plans
<http://www.nrao.edu/whatisra/index.shtml> What is Radio astronomy? Great for research.
<https://safe.nrao.edu/wiki/bin/view/GB/Observing/NRAOStudentSupportProgram> student programs offered by NRAO.
<http://www.vla.nrao.edu/>: Very Large Array
<http://www.gb.nrao.edu/gbt/> : Greenbank WV Telescope
<http://www.almaobservatory.org/> :Atacama Large Millimeter Array (ALMA)
<http://www.vlba.nrao.edu/> :Very Long Baseline Array (VLBA)
<http://www.gb.nrao.edu/~rmaddale/Education/OrionTourCenter/glossary.html> Great resource. Offers online info with quizzes.
<http://www.nrao.edu/index.php/learn/googlesky>

<http://archive.cv.nrao.edu/skymark/> Use Google Earth for NRAO skymarks.
Google Earth is a free application



NASA related links:

<http://www.nasa.gov/audience/foreducators/index.html> Starting point for educators.

http://antwarp.gsfc.nasa.gov/htmltest/jbonnell/www/multiw_sky.html The multiwavelength sky. Good resources for the electromagnetic spectrum.

<http://imagine.gsfc.nasa.gov/docs/dictionary.html#R> : NASA Imagine the Universe! Dictionary

<https://astrophysics.gsfc.nasa.gov/imagineWiki/Resources> Great sources

<https://astrophysics.gsfc.nasa.gov/imagineWiki/ResourcesHr#Multi>

<http://www.radio-astronomy.org/>: The Society of Amateur Radio Astronomers (SARA) is an international society of dedicated enthusiasts who teach, learn, trade technical information, and do their own observations of the radio sky.

<http://www.astrocappella.com/> :Educational Astronomy Songs (including radio astronomy related: AstroCappella is a marriage of astronomy and music, developed by astronomers and educators and professionally recorded by the rocking *a cappella* group.

[The Chromatics](#). Many of the songs, activities, and background science materials are freely available on this site.

<http://www.seti-inst.edu/>: The mission of the SETI Institute is to explore, understand and explain the origin, nature and prevalence of life in the universe.

<http://supernova7.apsc.csi.cuny.edu/weblinks.html>

<http://www.merlin.ac.uk//nam/dragons/index.html>

Acknowledgement: I want to recognize all the staff at PARI and especially my mentors Dr. Mike Castelaz and Christi Whitworth.

Attachments:

Teacher Lab Manual

Student Lab Manual

Podcast

Lesson Plans Start on next page.

Unit 2 Lesson 1:

PARIPod 2.1 Introduction to Smiley

PURPOSE: In this lesson: students will be introduced to Smiley and radio telescope basics.

ENGAGE:

Preparation before class arrives:

(Actual use of Smiley)

1. Watch the teacher introduction PARIPod.
2. Be sure have your Smiley username and password. (See teacher intro podcast)
3. Be sure your computers can access Smiley. Some schools block certain sites, so be sure to check with your technology person.
4. Computers need to have certain software installed:
 - Java
 - QuickTime player (free- mac or pc)
 - Adobe reader 9.0 (free)
5. You will need to make sure you have set up a reservation on Smiley for the class times.
6. Ensure your Internet connections are ready and working.
7. Practicing using Smiley.
- 8.

(General Preparation)

1. Download and review Teacher and Student guides. **NOTE: The teacher manual and student are identical except the student guide has many key instructions blanked out. The teacher is the answer key to the student guide.** Have copies ready.
2. Quizzes: Presently there are two formats, traditional print quiz and internet/web based quiz.
3. Have master pdf/presentation ready to be projected on screen.

When students enter classroom have one of the PARIPods playing on the screen. The video should evoke questioning which will lead to engagement. Ask students:

- Have you ever used a real radio telescope? Explain that they will be using one.
- Has anyone ever seen Smiley before? Tell them they'll be learning about it.
- Anyone know about PARI? The Pisgah Astronomical Research Institute? Tell them they'll be learning about it.
- How many would like to use podcasts and computers to access and use Smiley?

Explain to students that they will be the ones accessing and using Smiley and the podcasts will be their guide. The guide is basically going to be their instruction guide. Give out the student guides and have them look over it. Go through the guide with them explaining to them the following instructions: **(Remember: The teacher manual and student are identical except the student guide has many key instructions blanked out. The teacher is the answer key to the student guide.)**

1. Before starting a PARIPod Lesson preview the student guide.

2. They must be completed in order; there can be no skipping around.
3. There are a total of eight PARIPods in this Unit.
4. You must complete this unit before conducting labs.
5. Each PARIPod section is initially incomplete. The instructions are laid out step by step, but there are blanks where there is missing information.
6. The answers are in the PARIPod. The guide will not follow the PARIPod word for word, but they should be able to get the answers not just by listening, but also by understanding the procedures.
7. They can stop and rewind the PARIPods as needed.
8. There is a quiz after each PARIPod.
9. The class will go over the answers to the guide and quiz
10. They can correct their guides if needed.
11. Once the whole guide is completed and teacher approves student, student can actually practice using smiley in preparation for upcoming labs.

EXPLORE:

1. Give students a set time limit. Add around 4-5 minutes to the PARIPod length plus another 3-5 minutes for the quiz. For example, PARIPod 2.1 is 4:58 minutes; add 5 minutes to the PARIPod and another 5 for the quiz for a total time limit of 15mins. You can adjust this according to the level of the students.
2. Students begin, by completing their student guide utilizing the podcasts. They should be stopping and rewinding the PARIPod to listen and/or watch for the missing information in the guide.
3. After completing the PARIPod they will complete the corresponding quiz. It is up to the teacher how to deliver it. (hard copy, web, etc.)
4. Once they finish the PARIPod or the time limit is up have them stop and give them a minute or two to finish up the details.

EXPLAIN:

- Go over the student guide and quiz answers. The answers will explain themselves but students may need specific clarification. Refer to your teacher manual for assistance.
- Emphasize that:
 - Smiley is a real radio telescope that was once used by NASA and scientists.
 - Radio astronomy is very important to the study of the universe.
 - They will actually use Smiley to conduct scientific investigations.
 - Using quite expensive scientific equipment.

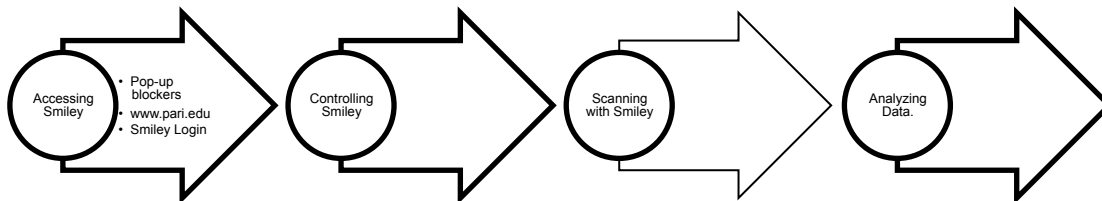
ELABORATE

After going over the answers to the guide and quizzes, should do necessary corrections to their guides, students should review back over their guide to understand what they missed and/or misunderstood. Then students can create a procedure graphic organizer as a quick guide in the future labs.

1. Students cannot have any assistance in creating the organizer (classmates and PARIPods included).
2. The organizer should show a detailed step-by-step procedure. Illustrations are esp. helpful, but not necessary. Students will often start off creating the wrong type of organizer or completely misunderstanding the instructions. There is an example below that might help.
3. Once finished with the organizer, have students pair up and swap organizers.
4. Using the other student's organizer, a student is to:
 - a. Read over it.

- b. Then listen to the PARIPod again comparing their organizer for accuracy.
- c. Make notes when appropriate.
- d. Discuss with one another about the other's organizer about needs improvement and/or correction.
- e. Student can then update their organizer.

Example layout of a procedure graphic organizer.



Evaluate:

5. The student guide. Assess for accuracy and if there are any additional notes.
6. Review students' quiz scores for the PARIPod quizzes.
7. Use the procedure graphic organizer.
8. Use a lab participation rubric according to your class rules, expectations, and procedures.
9. Students can create an individual lab report about the experience. Teacher can assess using his or her own rubric or grading system.

Unit 2 Lesson 2:

PARIPod 2.2 Introduction to Smiley

PURPOSE: In this lesson: students will learn how to access Smiley and practice access.

ENGAGE:

Preparation before class arrives:

(Actual use of Smiley)

1. Watch the teacher introduction PARIPod.
2. Be sure have your Smiley username and password. (See teacher intro podcast)
3. Be sure your computers can access Smiley. Some schools block certain sites, so be sure to check with your technology person.
4. Computers need to have certain software installed:
 - a. Java
 - b. QuickTime player (free- mac or pc)
 - c. Adobe reader 9.0 (free)
5. You will need to make sure you have set up a reservation on Smiley for the class times.
6. Ensure your Internet connections are ready and working.
7. Practicing using Smiley.
8. (General Preparation)
9. Download and review Teacher and Student guides. **NOTE: The teacher manual and student are identical except the student guide has many key instructions blanked out. The teacher is the answer key to the student guide.** Have copies ready.
10. Quizzes: Presently there a two formats, traditional print quiz and internet/web based quiz.
11. Have master pdf/presentation ready to be projected on screen.

When students enter classroom have one of the PARIPods playing on the screen. The video should evoke questioning which will lead to engagement. Ask students:

- How do you access Smiley?
- What specific information do you think you'll need?

Remind students that they will be the ones accessing and using Smiley. The podcasts will be their guide. Before starting a PARIPod Lesson preview the student guide. Here is the general procedure for the lesson.

1. Students should preview the correct section of their student guide.
2. Watch the PARIPod to complete the lesson/section in their student guides.
3. They can stop and rewind the PARIPods as needed.
4. There is a quiz after each PARIPod.
5. The class will go over the answers to the guide and quiz
6. They can correct their guides if needed.
7. Once the whole guide is completed and teacher approves student, student can actually practice using smiley in preparation for upcoming labs.

EXPLORE:

(Basically same as previous PARIPods)

1. Give students a set time limit. Add around 4-5 minutes to the PARIPod length plus another 3-5 minutes for the quiz. For example, PARIPod 2.1 is 4:58 minutes; add 5

- minutes to the PARIPod and another 5 for the quiz for a total time limit of 15mins. You can adjust this according to the level of the students.
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 4. Once they finish the PARIPod or the time limit is up have them stop and give them a minute or two to finish up the details.

EXPLAIN:

(Basically same as previous PARIPods

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- Go over the student guide and quiz answers. The answers will explain themselves but students may need specific clarification. Refer to your teacher manual for assistance.
- Emphasize that:
 - Smiley is a real radio telescope that was once used by NASA and scientists.
 - Radio astronomy is very important to the study of the universe.
 - They will actually use Smiley to conduct scientific investigations.
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ELABORATE

(Basically same as previous PARIPods)

After going over the answers to the guide and quizzes, should do necessary corrections to their guides, students should review back over their guide to understand what they missed and/or misunderstood. Then students can add to their procedure graphic organizer they created in 2.1.

- 1) Students cannot have any assistance in creating the organizer (classmates and PARIPods included).
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- 3) Use the procedure graphic organizer.
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- 5) Students can create an individual lab report about the experience. Teacher can assess using his or her own rubric or grading system.

Unit 2 Lessons 3-8:

Note: The procedures for remaining PARIPods are basically the same. Follow the same 5E procedures as 2.2.

PURPOSE: The name of each PARIPod explains its purpose..

ENGAGE:

Preparation before class arrives:

(Actual use of Smiley)

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- 3) Be sure your computers can access Smiley. Some schools block certain sites, so be sure to check with your technology person.
- 4) Computers need to have certain software installed:
 - a. Java
 - b. QuickTime player (free- mac or pc)
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- 5) You will need to make sure you have set up a reservation on Smiley for the class times.
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 - c. Make notes when appropriate.
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 - e. Student can then update their organizer.

Evaluate:

(Basically same as previous PARIPods)

- 1) The student guide. Assess for accuracy and if there are any additional notes.
- 2) Review students' quiz scores for the PARIPod quizzes.
- 3) Use the procedure graphic organizer.
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- 5) Students can create an individual lab report about the experience. Teacher can assess using his or her own rubric or grading system.

Unit 2: Smiley Basics

Student Guide: Teacher Version

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KENAN FELLOWS PROJECT

2010

Smiley Basics

Student Guide: Teacher Version

2010 Edition

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Smiley Basics

2.1 Introduction to Smiley



Podcast: 2.1 : Smiley Basics

The Podcast is **4:58** min in length.

P

Presentation Slide 2.1



Student Guide: P.2

Q

Quiz 2.1

SMILEY

1. "Smiley" is a **4.6m** radio telescope located at the **Pisgah Astronomical Research Institute**, or PARI.
2. Smiley is remotely accessed via the internet to be used by teachers and students to introduce them to **Radio** Astronomy.
3. Smiley is a real working radio telescope and not a simulation.
4. After training students will be able access and utilize a real working radio telescope to conduct real world scientific investigations.

RADIO TELESCOPE OPERATIONAL BASICS

5. A **telescope** is any device that makes an object look **bigger** than it is.
6. Most are familiar with **optical** telescopes, which view the **visible** spectrum.
7. Radio telescopes do the same as optical except they “look” at the radio spectrum.
8. Radio telescopes are **Astronomers** “ears to the sky”.
9. Smiley scoops up **radio** waves in a dish looking telescope.
10. Radio telescopes catch radio waves in a dish looking antenna called a **reflector**.
11. The reflector sends the signals up into the center of the dish called the **focal** point.
12. The feed is comprised of a horn.
13. The horn feeds the incoming signals to a sensitive radio **receiver** and amplifier.

14. Lastly, the signals are sent to a computer for conversion from analog to digital data.

RADIO TELESCOPE SPECS.

15. Hydrogen is the first element on the periodic table. It contains one positively charged proton and one negatively charged electron.

16. Normally the electron spins in the opposite direction in relation to the proton.

17. When a hydrogen atom is hit by another atom, or an electron, the hydrogen's electron is forced to flip into the same direction as the proton.

18. Since the proton is positively charged and the electron is negative, they repel each other causing the electron to flip back into spinning into the opposite direction.

19. When the electrons flip back energy is released in the form of a photon.

20. The photon has a wavelength of 21cm or a frequency of 1.42 GHz.

21. This Flip –Spin action identifies the presence of hydrogen.

22. Smiley collects the emissions from neutral hydrogen to locate and study hydrogen.

23. Since Hydrogen is the most abundant element, studying it gives us better insight into the Universe.

DATA ANALYSIS

24. Data from Smiley is processed by a computer to be analyzed by three types of scanning.

25. Spectrum Scanning measures the intensity of a radio emission's frequency.

26. Continuum Scanning measures the intensity of radio emissions over time.

27. Mapping Scanning Collects the intensity of an emission over an area to generate a Map image of the source

Proceed to 2.2

2.2 Accessing Smiley



Podcast: 2.2 Gaining Access

The Podcast is **5:37** min in length.

P

Presentation Slide 2.2



Student Guide: P.5

Q

Quiz 2.2

START POINT

1. **STEP #1:** Open web browser
2. **STEP 2:** Enable/allow Pop-ups (disable pop-up blockers) to the Smiley website.
 - a. Also, Make sure JAVA is enabled on your browser.
3. **STEP 3:** From your web browser, go to <http://www.pari.edu>.
4. **STEP 4:** Click on the Teachers and Students tab at the top.
5. **STEP 5:** Select Log in to Smiley link located mid page.
6. You are now in the **Smiley Control Room.**
7. If you are only observing a Smiley session, click the **Observe Current Session** tab. You do not have to login to Smiley to observe a control session.
8. If you are planning on controlling Smiley continue with the next procedure.

LOGIN PROCEDURE

9. After a minute in the Control Room a **Log-In** Box pops up.
10. **STEP 6:** Type in your username (case sensitive).
11. Type in your password (case sensitive).
12. Click on the Log in to Smiley link in the middle of the page.
13. The Smiley Control Room **Manager** pops up.

SCHEDULING A SESSION

14. New tabs now appear in blue.
15. **STEP 7:** Schedule your **control session** time by clicking on the schedule control sessions button.
16. **STEP 8:** Select the day you want to observe and select the Date on the calendar.
17. A new window will pop up asking for time of day. Enter the beginning and end times for when you want to observe. Use 24-hour time, or military time. Enter a short description of your session. Submit your request.
18. **STEP 9:** After receiving a successful reservation message and confirming it, Click on **Return** to Control Room
19. You can now **log off** and return later, or wait for your scheduled time to arrive.
20. **STEP 10:** Start session or return on the scheduled observing time.
21. Once logged in you now have control of Smiley.

Proceed to 2.3

2.3 Controlling Smiley

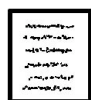


Podcast: 2.3 Controlling Smiley

The Podcast is **8:05** min in length.

P

Presentation Slide 2.3



Student Guide: P.6

Q

Quiz 2.3

USING SMILEY

1. Access Smiley by logging into the Smiley Control Room Manager.
2. From the Control Room Manager, select and click on Start Control Session and the Smiley Internet Telescope Control window pops up. You now are in control of Smiley. (Review 2.2)

SMILEY INTERFACE

3. It is important to understand Smiley's interface before use.
4. The interface is divided into several control panels.
5. In the upper right is Current Session Status, which gives information on the session.
6. In the middle is the live video feed of Smiley.
7. Upper right box is for administrators only to post important information.
8. The Coordinates Box: Refer to the blue box located in the center right of the page. Every object in the sky has a series of coordinates. The coordinate box is the true control panel center for Smiley.
9. To the right of the coordinates box is Local Sidereal Time. Astronomers use sidereal time as a way to keep track of the direction in which their telescopes need to be pointed to view any given star in the night sky.
10. Below is the Hand Paddle box which allows manual control of Smiley. It is only to be used under close teacher supervision.
11. You can move smiley UP, DOWN, CW (Clockwise), and CCW (Counterclockwise).
12. The status box to the left indicates Smiley's present Movements.
13. Since Smiley has certain Physical limitations, only use the hand paddle mode under teacher supervision.
14. You must Click and Hold the cursor down on the hand paddle buttons down to manually control Smiley.

15. The Coordinate box is divided into two headers, **Current** and **Target**.
16. On the right side is the Target, which uses two coordinate systems.
17. The two systems used are the **Azimuth** and **Altitude** Coordinate System and the Right **Ascension** and **Declination** System.
18. Both systems use the same units: **Degrees**, **Minutes**, and **Seconds**.
19. The left side of the coordinate box displays Smiley's current position in both formats.
20. Smiley's current coordinates will change as it moves toward the target until they match up.
21. In the bottom middle of the coordinate box is the **limit brakes**. It notifies you if Smiley is nearing its physical limits. If any of these boxes turn yellow or red, stop and notify your teacher immediately. (NOTE: Teacher, if this occurs- immediately move smiley to a safe position. Use the hand paddles if necessary. Smiley's parameters are between 350-10 AZ and 20-80 Alt.)
22. Below are the GO and STOP buttons. Go: starts Smiley's movements and Stop: Stops it's movement.
23. To the right you can choose track or drift. Track will continue to follow the target through the sky. Drift will allow the object to move away. End Session, ends the session and exits you out of the control room.
24. To the left is the **Source** Box. It is a drop down menu of several common and interesting radio emissions sources.
25. Below is the status box mentioned earlier.
26. The bottom half of the control Center is comprised of a large five-tab window.
27. The First tab is the **Sky Map** tab, which displays an overview of the sky. It lists many interesting target sources.
28. Smiley's **current position** is indicated on the map by a white crosshair or plus mark (+).
29. Many target sources are indicated on the map. A small yellow circle marks the Sun and the Moon is a small **white** circle.
30. Most target sources are distant sky objects.
31. Targets include the **Galactic** Poles.
32. There are three ways to select your target. First, all the objects indicated on the sky map are also available on the source drop down menu.
33. Secondly, clicking on a position/target on the Sky Map will automatically load its coordinates into Smiley's target coordinates.

34. Another way to choose the target is to manually enter its coordinates.
35. The next three tabs are the scanning methods you will learn about and use in PARI Pod 2.4.
36. These scans are *Spectrum*, *Continuum*, and *Mapping*
37. The last tab you see on the screen is weather, which gives the current weather conditions at *PARI*.
38. When done observing, click on End Session, then Exit Control Room

Proceed to 2.4

2.4 Scanning Basics



PARIPod: 2.4 Scanning Basics

The Podcast is **5:13** min in length.



Student Guide: P.8



Quiz 2.4

SCANNING BASICS:

1. There are three methods of collecting data from Smiley: Spectrum, Continuum, and Mapping. Each scan will have different individual parameters, but there are similar controls and features on all three.

THE CONTROLS

2. Controls are located to the left and are the same in all three scan interfaces.
3. Begin Scan. Once the scan starts the green button will change to a red stop scan.
4. Save Scan: allows you to save your current data.
5. Clear: clears the present data.
6. Open Data file: allows users to open previously saved data files to be re-analyzed. Files are saved to a location on the PARI server.
7. IF Gain, the IF stands for Intermediate Frequency which magnifies the amplitude of the incoming radio waves. It is the “volume” for radio scans.
8. Plot Rate: determines the rate at which Smiley collects data and is then plotted. It can be increased or decreased. Increasing the rate plots data more quickly but less data is collected.
9. Base Frequency: 1.42 GHz is the default base frequency because is the target frequency for neutral hydrogen. There are others frequencies.

THREE TYPES OF SCANS

10. Spectrum Scan graphs the intensity over frequency.
11. The intensity scales ranges from 0-10.
12. Continuum Scanning measures Intensity over time.
13. Mapping Scans take samples of several scans to form an overall map.

GRAPHING FEATURES

14. Graphs can be accessed and modified by right clicking, including:
Show unconnected points, Zoom in and Out, Translate: up, down, left, and right. Show Grid, and Data point color.

Proceed to 2.5

2.5 Spectrum Scan



PARIPod: 2.5 Spectrum Scan

The Podcast is **5:08** min in length.



Presentation Slide 2.5



Student Guide: P.9



Quiz 2.5

1. Spectrum scanning is a technique that collects radio emissions to analyze electromagnetic characteristics.
2. In spectrum mode Smiley separates the incoming radio waves into a spectrum (like a prism) and takes data on a single part of the spectrum. This is like finding a specific radio station on the stereo.
3. Signal intensity is based on 0-10 scale. 0 being the lowest intensity and 10 being the highest.
4. Steps for Scanning:
 - 1) Step One: Select a Target/Source by using one of the three methods learned in the previous PARIPod, manual, dropdown menu, or skymap.
 - 2) Step Two: Enter the spectrum control room by choosing the spectrum tab on the screen.
 - 3) Step Three: Select IF Gain.
 - 4) Step Four: Adjust Plot Rate if needed, Plot Rate determines the rate at which Smiley collects and is then collected.
 - 5) Step Five: Spectrum Parameters should be set to the base frequency of 1.42 for Neutral Hydrogen. Finally, Frequency range must be entered in KHz.
5. Frequency range determines the range for the scan.
6. Frequency offset and Intensity displays the current data during a scan. Nothing needs to be entered here.
7. Once you click Begin Scan, Smiley will begin taking data.
8. After a several seconds you should see data points being plotted on the graph.
9. Run the scan to the time required by the lab or by the teacher.
10. As you are observing, notice the changes in slopes, especially as the line approaches and passes the base frequency.
11. Hit Stop Scan to stop the data collection.
12. Useful Scan data file should be saved.
13. Once Scanned, refer to Analyzing Smiley Data (2.8)

Proceed to 2.6

2.6 Continuum Scan



PARIPod: 2.6 Continuum Scan

The PARIPod is 4:06 min in length.

P

Presentation Slide 2.6



Student Guide: P.10

Q

Quiz 2.6

Starting point

1. A continuum scan is an extension/continuum of a spectrum scan.
2. Note that on the graph the y-axis is Intensity, which was the same in the spectrum scan, but the x-axis is now Time.
3. Continuum scanning plots the Intensity of a frequency over time.
4. The only controls that can be modified in this scan are the base frequency and IF gain.
5. The time is recorded/plotted in seconds based on UT Universal Time (UT)
6. Both current UT time and intensity are displayed in the two lower boxes.
7. To begin the scan, go to the Continuum tab at the bottom.
8. Use default parameters unless the lab or your teacher tells you otherwise.
9. Once controls and parameters are set, click Begin Scan, Smiley will begin taking data.
10. After a several seconds you should see data points being plotted on the graph, note how time and intensity changes over your graph. If you do not see major changes in your scan. You may want to run another frequency with a higher IF gain.
11. Run the scan to the time required by the lab or by the instructor.
12. Hit Stop Scan to stop the data collection. If you do not stop the scan it will continue to re-graph the scan starting over from the beginning.
13. Useful Scan data should be saved.
14. Once scanned, refer to Analyzing Smiley Data (segment 2.8)

Proceed to 2.7

2.7 Mapping Scan



PARIPod: 2.7 Mapping Scan

The PARIPod is 4:44 min in length.

P

Presentation Slide 2.7



Student Guide: P.11

Q

Quiz 2.7

Starting Point

1. A mapping scan is basically several spectrum snapshots put together over a source to form a larger map. This is like taking many small photos of an object put together to make a larger one.
2. Set Smiley to target an object.
3. Go to the Mapping Scan tab at the bottom.
4. Use default parameters unless the lab or your instructor tells you otherwise.
5. The scan controls and parameters of a mapping scan are the same as the other scans except there are now two new controls, AZ (Azimuth) and Altitude (ALT). These two controls help guide the speed thus the sampling rate while Smiley zigzags around its target area.
6. A lower rate increases the accuracy of the scan and a higher rate decreases.
7. The scanning range controls the size of the target range. The larger the range, the larger the grid, or map. The X-axis is the Azimuth while the Y axis is the Altitude.
8. Delta shows the current scan positioning.
9. To start your mapping scan, click Begin Scan, Smiley will begin taking data. There will be a 20 second delay before data begins being plotted on the graph, which allows smiley to position itself towards the target. Plots on your graph appear as square grayscale patches. This creates a mosaic map, which is a composite image of the target. Analyze or rescan data according to variations in your map. Depending on the variation in your graph, you may want to rescan with a higher IF gain.
10. The Scan will automatically stop once it has scanned the set map area or you can hit Stop Scan to stop the data collection.
11. Useful Scan data file should be saved.
12. Once scanned, refer to Analyzing Smiley Data (PARIPod 2.8)

Proceed to 2.8

2.8 Analyzing Smiley Data



PARIPod: 2.8

The PARIPod is 6:04 min in length.

P

Presentation Slide 2.8



Student Guide: 12 *Quiz 2.8*

Q

PREPARATION

1. There are two ways to access your data for analysis.
2. After scans save files before conducting analysis.
3. Name files in an organized format to make it easier to identify and locate for future use. 082909scansun is an example.
4. 08 stands for August, 29 stands for the day, and 09 for the year. Scansun identifies the source. The naming system needs to be consistent.
5. All files are saved to the PARI main server and stored under username and type of file.
6. Data analysis can be during a control session or outside of a session

ANALYSIS DURING A CONTROL SESSION:

7. Open saved data all your saved data files for the particular scan will be displayed. By using either plot or list.
8. Plot replots the graph using the data while list displays the data in raw number format. This data can be copied and pasted into a document or other applications such as Excel.

ANALYSIS OUTSIDE OF A SESSION:

9. Login to the Smiley Control Room Manager and locate the Inspect/Analyze Data button and click.
10. The Smiley Data Analysis Center will open.
11. The user selection drop down menu allows you to select the USER (The user is based on your Smiley username). All smiley users will be displayed. Your file(s) are not only accessible by you, but also by all other Smiley users. You can access others files as well.

12. Use file type to select the scan you wish to use and then use file selection to chose the desire file(s)
13. Select desired file(s) and move it to the right column using the arrows and then hit display data. Click on the new window to move it to the front.
14. Data from Spectrum and Continuum scans be displayed in three ways: **plot, table, and text.**
15. Plot format displays the graph with **data points.**
16. Table format presents data in raw numbers format .
17. Text displays data in **raw data format** which can be copied and pasted into another applications such as **Excel** to create graphs.
18. The **graph** features can be accessed through right clicking .
19. Mapping scan data can be viewed as a map or **text**. The map displays the original data map, while text provides the raw data.
20. Below the map view is specific information about the scan. Use the options below to zoom in & out, up or down, and change between greyscale and **colorscale.**

Unit 2 Completed:

Start Unit 3 Labs

Unit 2: Smiley Basics

Student Guide

Derek Dennis

KENAN FELLOWS PROJECT

2010

Smiley Basics

Student Guide

2010 Edition

Student: _____

Teacher: _____

Class Period: _____

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2.1 Intro to Smiley

SMILEY

1. "Smiley" is a 4.6m radio telescope located at the _____, or PARI.
2. Smiley is remotely accessed via the Internet to be used by teachers and students to introduce them to _____ Astronomy.
3. Smiley is a real working radio telescope and not a simulation.
4. After training students will be able access and utilize a real working radio telescope to conduct real world scientific investigations.

RADIO TELESCOPE OPERATIONAL BASICS

5. A _____ is any device that makes an object look _____ than it is.
6. Most are familiar with _____ telescopes, which view the _____ spectrum.
7. Radio telescopes do the same as optical except they “look” at the radio spectrum.
8. Radio telescopes are _____ “ears to the sky”.
9. Smiley scoops up _____ waves in a dish looking telescope.
10. Radio telescopes catch radio waves in a dish looking antenna called a _____.
11. The reflector sends the signals up into the center of the dish called the _____ point.
12. The feed is comprised of a horn.
13. The horn feeds the incoming signals to a sensitive radio _____ and amplifier.
14. Lastly, the signals are sent to a computer for conversion from _____ to digital data.

RADIO TELESCOPE SPECS

15. Hydrogen is the _____ element on the periodic table. It contains _____ positively charged proton and one negatively charged _____.
16. Normally the electron spins in the _____ direction in relation to the proton.
17. When a hydrogen atom is hit by another atom or an electron, the hydrogen’s electron is forced to _____ into the same direction as the proton.
18. Since the proton is _____ charged and the electron is negative, they repel each other causing the electron to _____ back into spinning into the opposite direction.
19. When the electrons flip back energy is released in the form of a photon.
20. The photon has a wavelength of _____ cm or a frequency of _____ GHz.
21. This Flip –Spin action identifies the presence of _____.
22. Smiley collects the emissions from _____ hydrogen to locate and study hydrogen.
23. Since Hydrogen is the most _____ element, studying it gives us better insight into the _____.

DATA ANALYSIS

24. Data from Smiley is processed by a computer and analyzed with three types of scanning.
25. _____ measures the intensity of a radio emission's _____.
26. _____ measures the intensity of radio emissions _____.
27. _____ Collects the intensity of an emission over an area to generate a _____ image of the source

2.2 Accessing Smiley

START POINT

1. **STEP 1:** Open ____ browser
2. **STEP 2:** Enable/allow Pop-ups (disable ____ - ____) to the Smiley website. Also, Make sure ____ is enabled on your browser.
3. **STEP 3:** From your web browser, go to <http://www.pari.edu>
4. **STEP 4:** Click on the Teachers and Students tab at the top.
5. **STEP 5:** Select Log in to Smiley link located mid page.
6. You are now in the ____.
7. If you are only observing a Smiley session, click the ____ tab. You do not have to login to Smiley to observe a control session.
8. If you are planning on controlling Smiley continue with the next procedure.

LOGIN PROCEDURE

9. After a minute in the Control Room a ____ - ____ Box pops up.
10. **STEP 6:** Type in your username (case sensitive)
11. Type in your password (case sensitive)
12. Click on the Log in to Smiley link in the middle of the page.
13. The Smiley Control Room ____ pops up.

SCHEDULING A SESSION

14. New tabs now appear in blue.
15. **STEP 7:** Schedule your ____ time by clicking on the schedule control sessions button.
16. **STEP 8:** Select the day you want to observe and select the Date on the calendar
17. A new window will pop up asking for time of day. End the beginning and end times for when you want to observe. Use 24-hour time, or military time. Enter a short description of your session. Submit your request.
18. **STEP 9:** After receiving a successful reservation message and confirming it, Click on ____ to Control Room
19. You can now ____ and return later, or wait for the scheduled time to arrive.
20. **STEP 10:** Start session or return on the scheduled observing time
21. Once logged in you now have control of Smiley.

Notes: _____

2.3 Controlling Smiley

USING SMILEY

1. Access Smiley by logging into the Smiley Control Room Manager.
2. From the Control Room Manager, select and click on Start Control Session and the Smiley Internet Telescope Control window pops up. You now are in control of Smiley. (Review 2.2)

SMILEY INTERFACE

3. It is important to _____ Smiley's interface before use.
4. The interface is divided into several _____ panels.
5. In the upper right is _____, which gives information on the session.
6. In the middle is the live video feed of Smiley.
7. Upper right box is for administrators only to post important information.
8. The _____ Box: Refer to the blue box located in the center right of the page. Every object in the sky has a series of coordinates. The coordinate box is the true control panel center for Smiley.
9. To the right of the coordinates box is _____ Time. Astronomers use sidereal time as a way to keep track of the direction in which their telescopes need to be pointed to view any given star in the night sky.
10. Below is the _____ box which allows manual control of Smiley. It is only to be used under close teacher supervision.
11. You can move smiley UP, DOWN, CW (_____), and CCW (_____).
12. The status box to the left indicates Smiley's present Movements.
13. Since Smiley has certain _____ limitations, only use the hand paddle mode under teacher supervision.
14. You must Click and _____ the cursor down on the hand paddle buttons down to manually control Smiley.
15. The Coordinate box is divided into two headers, _____ and _____.
16. On the right side is the Target, which uses two coordinate systems.
17. The two systems used are the _____ and _____ Coordinate System and the Right _____ and _____ System.
18. Both systems use the same units: _____, _____, and _____.
19. The left side of the coordinate box displays Smiley's current position in both formats.
20. Smiley's current coordinates will change as it moves toward the target until they match up.
21. In the bottom middle of the coordinate box is the _____. It notifies you if Smiley is nearing its physical limits. If any of these boxes turn yellow or red, stop and notify your teacher immediately. (NOTE: Teacher, if this occurs- immediately move smiley to a safe position. Use the hand paddles if necessary. Smiley's parameters are between 350-10 AZ and 20-80 Alt.)
22. Below are the GO and STOP buttons. Go: starts Smiley's movements and Stop: Stops it's movement.

23. To the right you can choose track or drift. Track will continue to follow the target through the sky. Drift will allow the object to move away. End Session, ends the session and exits you out of the control room.
24. To the left is the _____ Box. It is a drop down menu of several common and interesting radio emissions sources.
25. Below is the status box mentioned earlier.
26. The bottom half of the control Center is comprised of a large five-tab window.
27. The First tab is the _____ tab, which displays an overview of the sky. It lists many interesting target sources.
28. Smiley's _____ is indicated on the map by a white crosshair or plus mark (+).
29. Many target sources are indicated on the map. A small yellow circle marks the Sun and the Moon is a small _____ circle.
30. Most target sources are distant sky objects.
31. Targets include the _____ Poles.
32. There are three ways to select your target. First, all the objects indicated on the sky map are also available on the source drop down menu.
33. Secondly, clicking on a position/target on the Sky Map will automatically load its coordinates into Smiley's target coordinates.
34. Another way to choose the target is to manually enter its coordinates.
35. The next three tabs are the scanning methods you will learn about and use in PARI Pod 2.4.
36. These scans are _____, _____, and _____.
37. The last tab you see on the screen is weather, which gives the current weather conditions at _____.
38. When done observing, click on End Session, then Exit Control Room

Notes: _____

2.4 Scanning with Smiley

SCANNING BASICS:

1. There are three methods of collecting data from Smiley: _____, _____, and _____. Each scan will have different individual parameters, but there are similar controls and features on all three.

THE CONTROLS

2. Controls are located to the left and are the same in all three scan interfaces.
3. Begin Scan. Once the scan starts the green button will change to a red stop scan.
4. Save Scan: allows you to save your current data.
5. Clear: clears the present data.
6. Open Data file: allows users to open previously saved data files to be re-analyzed. Files are saved to a location on the PARI server.
7. IF Gain, the IF stands for _____ which magnifies the _____ of the incoming radio waves. It is the “volume” for radio scans.
8. _____: determines the rate at which Smiley collects data and is then plotted. It can be increased or decreased. Increasing the rate plots data more quickly but less data is collected.
9. _____: 1.42 GHz is the default base frequency because is the target frequency for neutral hydrogen. There are others frequencies.

THREE TYPES OF SCANS

10. Spectrum Scan graphs the _____.
11. The intensity scales ranges from 0-10.
12. Continuum Scanning measures Intensity _____.
13. Mapping Scans take samples of several scans to form an overall map.

GRAPHING FEATURES

14. Graphs can be accessed and modified by right clicking, including:
15. Show unconnected points, Zoom in and Out, Translate: up, _____, left, and _____, Show Grid, and Data point color.

Notes: _____

2.5 Spectrum Scan

1. Spectrum scanning is a technique that collects radio emissions to analyze _____ characteristics.
2. In spectrum mode Smiley separates the incoming radio waves into a _____
3. (like a prism) and takes data on a single part of the spectrum. This is like finding a specific radio station on the stereo.
4. Signal intensity is based on 0-10 scale. 0 being the _____ intensity and 10 being the highest.
5. Steps for Scanning:
 - 1) Step One: Select a Target/Source by using one of the three methods learned in the previous PARIPod, manual, dropdown menu, or _____.
 - 2) Step Two: Enter the spectrum control room by choosing the spectrum tab on the screen.
 - 3) Step Three: Select IF Gain.
 - 4) Step Four: Adjust Plot Rate if needed, Plot Rate determines the rate at which Smiley collects and is then collected.
 - 5) Step Five: Spectrum Parameters should be set to the base frequency of 1.42 for Neutral Hydrogen. Finally, Frequency range must be entered in KHz.
6. Frequency range determines the _____ for the scan.
7. Frequency offset and Intensity displays the current data during a scan. Nothing needs to be entered here.
8. Once you click Begin Scan, Smiley will begin taking data.
9. After a several seconds you should see _____ points being plotted on the graph.
10. Run the scan to the time required by the lab or by the teacher.
11. As you are observing, notice the changes in slopes, especially as the line approaches and passes the base frequency.
12. Hit Stop Scan to stop the data collection.
13. Useful Scan data file should be _____.
14. Once Scanned, refer to Analyzing Smiley Data (2.8).

Notes: _____

2.6 Continuum Scan

STARTING POINT

1. A continuum scan is an extension/continuum of a _____ scan.
2. Note that on the graph the y-axis is _____, which was the same in the spectrum scan, but the x-axis is now _____.
3. Continuum scanning plots the _____ of a frequency over time.
4. The only controls that can be modified in this scan are the base frequency and IF gain.
5. The time is recorded/plotted in seconds based on UT Universal Time (UT).
6. Both current UT time and intensity are displayed in the two lower boxes.
7. To begin the scan, go to the _____ tab at the bottom.
8. Use default parameters unless the lab or your teacher tells you otherwise.
9. Once controls and parameters are set, click Begin Scan, Smiley will begin taking data.
10. After a several seconds you should see data points being plotted on the graph, note how time and intensity changes over your graph. If you do not see major changes in your scan. You may want to run another frequency with a higher _____.
11. Run the scan to the time required by the lab or by the instructor.
12. Hit Stop Scan to stop the data collection. If you do not stop the scan it will continue to re-graph the scan starting over from the beginning.
13. Useful Scan data should be saved.
14. Once scanned, refer to Analyzing Smiley Data (segment 2.8)

Notes: _____

2.7 Mapping Scan:

1. A mapping scan is basically several _____ put together over a source to form a larger map. This is like taking many small photos of an object put together to make a larger one.
2. Set Smiley to target an object.
3. Go to the Mapping Scan tab at the bottom.
4. Use default parameters unless the lab or your instructor tells you otherwise.
5. The scan controls and parameters of a mapping scan are the same as the other scans except there are now two new controls, AZ (Azimuth) and Altitude (ALT). These two controls help guide the speed thus the _____ while Smiley zigzags around its target area.
6. A lower rate _____ the accuracy of the scan and a higher rate _____ it.
7. The scanning range controls the size of the target range. The larger the range, the larger the grid, or map. The X-axis is the Azimuth while the Y axis is the Altitude.
8. _____ shows the current scan positioning.
9. To start your mapping scan, click Begin Scan, Smiley will begin taking data. There will be a 20 second delay before data begins being plotted on the graph, which allows smiley to position itself towards the target. Plots on your graph appear as square grayscale patches. This creates a mosaic map, which is a composite image of the target. Analyze or rescan data according to variations in your map. Depending on the variation in your graph, you may want to rescan with a higher IF gain.
10. The Scan will _____ stop once it has scanned the set map area or you can hit Stop Scan to stop the data collection.
11. Useful Scan data file should be _____.
12. Once scanned, refer to Analyzing Smiley Data (PARIPod 2.8)

Notes: _____

2.8 Analyzing Smiley Data

PREPARATION

1. There are two ways to access your data for analysis.
2. After scans save files before conducting analysis.
3. Name files in an _____ format to make it easier to identify and locate for future use. 082909scansun is an example.
4. 08 stands for August, 29 stands for the day, and 09 for the year. Scansun identifies the source. The naming system needs to be _____
5. All files are saved to the PARI main server and stored under _____ and type of _____.
6. Data analysis can be during a control session or outside of a session

ANALYSIS DURING A CONTROL SESSION:

7. Open saved data all your saved data files for the particular scan will be displayed. By using either plot or list.
8. Plot _____ the graph using the data while _____ displays the data in raw number format. This data can be copied and pasted into a document or other applications such as Excel.

ANALYSIS OUTSIDE OF A SESSION:

9. Login to the Smiley Control Room Manager and locate the _____Data button and click.
10. The Smiley Data _____Center will open.
11. The _____drop down menu allows you to select the _____ (The user is based on your Smiley username). All smiley users will be displayed. Your file(s) are not only accessible by you, but also by all other Smiley users. You can access others files as well.
12. Use file type to select the scan you wish to use and then use file selection to chose the desire file(s)
13. Select desired file(s) and move it to the right column using the arrows and then hit display data. Click on the new window to move it to the front.
14. Data from Spectrum and Continuum scans be displayed in three ways: _____, _____, and _____.

15. Plot format displays the graph with _____.
16. Table format presents data in raw numbers format .
17. Text displays data in _____ which can be copied and pasted into another applications such as _____ to create graphs.
18. The _____ features can be accessed through right clicking .
19. Mapping scan data can be viewed as a map or _____. The map displays the original data map, while text provides the raw data.
20. Below the map view is specific information about the scan. Use the options below to zoom in & out, up or down, and change between greyscale and _____.

Notes: _____

Congratulations!

You have completed Smiley Basics.

You are now prepared for the labs.

Unit 2: Smiley Basics

Quizzes

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KENAN FELLOWS PROJECT

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PARIPod 2.1: Smiley Basics Quiz

True/False

Indicate whether the sentence or statement is true or false.

- _____ 1. The hand paddle is the best way to control smiley. It has unlimited parameters.
- _____ 2. On the Skymap the sun is marked by a large red circle.
- _____ 3. The true control panel for smiley is the skymap.

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 4. Local Sidereal Time is a way for Astronomers to keep track of the
 - a. direction of the milky way galaxy
 - b. location of the sun
 - c. time of day
 - d. direction the telescopes need to point
- _____ 5. The two coordinate systems that the target uses are
 - a. latitude/longitude, and Minutes/seconds
 - b. Altitude/Azimuth and Right Ascention/Declination
 - c. North/South and East/West
 - d. Azimuth/Lattitude and Left/Right

Short Answer

- 6. On the Sky Map, how is smiley's current position located?
- 7. What are the three ways you can load the coordinates for a location on the Skymap?

PARIPod 2.1: Smiley Basics Quiz

Answer Section

TRUE/FALSE

1. ANS: F
2. ANS: F
3. ANS: F

MULTIPLE CHOICE

4. ANS: D
5. ANS: B

SHORT ANSWER

6. ANS:
The white crosshair/plusmark
7. ANS:
Clicking on the target directly on the map, entering the coordinates manually, and selecting the target's name from the drop down menu.

PARIpods 2.2 & 2.3 Quiz**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. The browser settings must enable..
a. Java and pop-ups. c. pop-ups only.
b. Java only. d. neither.
- _____ 2. Which is the PARI website.
a. www.pari.com c. www.pari.edu
b. www.pari.gov d. www.pari.net
- _____ 3. Which link on PARI's website will take you directly to Smiley's control room log-in?
a. telescopes and instruments. c. programs and activities
b. teachers and students. d. for scientists.
- _____ 4. Where will you enter once you log-in to smiley ?
a. Smiley control room manager c. Smiley observation room
b. Smiley help center d. Smiley waiting room
- _____ 5. To only observe a Smiley session in progress, click.
a. start control session c. observe current session.
b. SGRA main page. d. schedule control session.
- _____ 6. Both the username and password are.
a. case sensitive. c. upper case only.
b. lower case only d. doesn't matter.
- _____ 7. Scheduling a control session uses which time format?
a. AM-PM time c. day light savings.
b. 24 hour time d. greenwich mean time.
- _____ 8. What window pops up once you start a control session?
a. Smiley internet telescope control c. telescope observation center
b. mission control d. Smiley control central
- _____ 9. There is a live feed of what in the top middle of the window?
a. the sky c. Smiley
b. actual control room at PARI d. SGRA control central
- _____ 10. The type of time Astronomers use to keep telescopes aligned.
a. local c. sidereal
b. 24 hr. d. coordinate
- _____ 11. The coordinate box displays the target and _____ coordinates?
a. current coordinate c. sidereal
b. sky d. spectrum
- _____ 12. What is used for manual control of Smiley?
a. coordinate box c. hand paddle
b. sky map d. keystrokes
- _____ 13. What is CCW?
a. clockwise c. coordinate clockwise
b. counter clockwise d. central clockwise.

Name: _____

ID: A

- _____ 14. One of the two coordinate systems is
- a. azimuth and altitude
 - b. azimuth and ascension
 - c. altitude and declination
 - d. altitude and ascension
- _____ 15. Both coordinate systems use degrees, minutes, and _____ as units.
- a. hours
 - b. days
 - c. latitude
 - d. seconds
- _____ 16. What represents Smiley's current position on the sky map?
- a. white crosshair
 - b. white circle
 - c. yellow circle
 - d. blue circle
- _____ 17. What indicates that Smiley is nearing its physical limits?
- a. manual control takes control
 - b. brake limits
 - c. sky map starts blinking
 - d. Smiley live feed starts to blink
- _____ 18. What is the first tab on the large box at the bottom?
- a. weather
 - b. mapping
 - c. spectrum
 - d. sky

**PARIpods 2.2 & 2.3 Quiz
Answer Section**

MULTIPLE CHOICE

1. ANS: A
2. ANS: C
3. ANS: B
4. ANS: A
5. ANS: C
6. ANS: A
7. ANS: B
8. ANS: A
9. ANS: C
10. ANS: C
11. ANS: A
12. ANS: C
13. ANS: B
14. ANS: A
15. ANS: C
16. ANS: A
17. ANS: B
18. ANS: D

A 14.

 C 15.

 A 1.

 A 16.

 C 2.

 B 17.

 B 3.

 D 18.

 A 4.

 C 5.

 A 6.

 B 7.

 A 8.

 C 9.

 C 10.

 A 11.

 C 12.

 B 13.

PARIPod 2.4: Scanning Basics Quiz**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. Spectrum Scan measures
a. intensity over time c. frequency over time
b. intensity over frequency d. time over intensity
- _____ 2. How many types of scans can Smiley conduct?
a. 2 c. 4
b. 3 d. 5
- _____ 3. Determines the rate at which Smiley collects data.
a. IF Gain c. base frequency
b. plot rate d. spectrum scan
- _____ 4. How are graph features accessed?
a. drop down menu. c. right click on graph.
b. scan button. d. under file menu.
- _____ 5. IF stands for?
a. intermediate frequency c. instant frequency
b. inverse frequency d. immediate frequency

Short Answer

6. What are the types of scans available?
7. What does the IF gain measure?
8. What is the base frequency for Neutral Hydrogen?
9. What do each of the three types of scans measure?
10. How do you access and modify graphs?

PARIPod 2.4: Scanning Basics Quiz
Answer Section

MULTIPLE CHOICE

1. ANS: B
2. ANS: C
3. ANS: B
4. ANS: C
5. ANS: A

SHORT ANSWER

6. ANS:
Spectrum, Continuum, and Mapping
7. ANS:
Amplitude or “volume”
8. ANS:
1.42 GHz
9. ANS:
Spectrum measures intensity of a frequency in a certain location. Continuum measures Intensity over time. Mapping maps out the frequency intensities over a wider target range.
10. ANS:
by right clicking the mouse

PARIPod 2.6: Continuum Scan Quiz**Multiple Choice**

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 1. What does a continuum scan compare?
a. intensity over time. c. frequency over time.
b. intensity over frequency. d. frequency over wavelength
- _____ 2. What do the IF Gain do?
a. amplifies the signal. c. prevents IF loss.
b. reduces noise. d. reduces inference.
- _____ 3. What is IF Gain analogous to?
a. tuner. c. balance.
b. volume. d. bass and Treble
- _____ 4. Which is the standard base frequency?
a. 4.8GHz. c. 1.42GHz.
b. 6.7GHz. d. 8.4GHz.
- _____ 5. What is the length of time displayed on the x-axis for a continuum scan?
a. 60 seconds. c. 100 seconds.
b. 90 seconds. d. 30 seconds.
- _____ 6. Which of the following has the lowest intensity on a the continuum scale?
a. 10 c. -5
b. 5 d. 0
- _____ 7. What happens when the scan reaches the end of the x-axis?
a. automatically stops. c. continues scanning.
b. automatically starts a new scan. d. nothing.
- _____ 8. The UT time displays?
a. UT time during the scan. c. current local time.
b. current UT time. d. UT time after the scan.
- _____ 9. Which axis(axes) differs between a spectrum and continuum scan?
a. y-axis. c. y-axis and x-axis.
b. x-axis. d. neither.
- _____ 10. What should you do if there is little variance in your scan's intensity?
a. decrease the IF Gain. c. increase the IF Gain.
b. change the time. d. change the intensity scale.

**PARIPod 2.6: Continuum Scan Quiz
Answer Section**

MULTIPLE CHOICE

1. ANS: A
2. ANS: A
3. ANS: B
4. ANS: C
5. ANS: C
6. ANS: D
7. ANS: C
8. ANS: A
9. ANS: B
10. ANS: C

2.7 Mapping Scan Quiz

True/False

Indicate whether the sentence or statement is true or false.

- _____ 1. A mapping scan is similar to a spectrum scan?
- _____ 2. AZ stands to Azimuth.
- _____ 3. Lowering the sampling rate decreases accuracy during a scan.

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 4. What are the two new controls?
 - a. azimuth and altitude
 - b. azimuth and plot rate
 - c. altitude and plot rate
 - d. azimuth and IF gain
- _____ 5. During a mapping scan Smiley
 - a. drifts
 - b. tracks
 - c. zig-zags
 - d. stays in place
- _____ 6. What will the scan automatically do when it completes the scanned range?
 - a. continue
 - b. restart
 - c. stop
 - d. reset
- _____ 7. Once you begin your scan, how long do you have wait for data to appear?
 - a. 0 seconds
 - b. 20 seconds
 - c. 2 minutes
 - d. 5 minutes
- _____ 8. The data plots appears as _____ on the graph?
 - a. colored squares
 - b. grayscale squares
 - c. grayscale dots
 - d. colored dots

2.7 Mapping Scan Quiz Answer Section

TRUE/FALSE

1. ANS: T
2. ANS: T
3. ANS: F

MULTIPLE CHOICE

4. ANS: A
5. ANS: C
6. ANS: C
7. ANS: B
8. ANS: B

2.8 Analyzing Smiley Data Quiz

True/False

Indicate whether the sentence or statement is true or false.

- _____ 1. You must be in a control session to analyze your smiley data.
- _____ 2. Plot format shows data points.
- _____ 3. When you save your data as a spectrum scan, you can then go back and analyze the mapping scan.
- _____ 4. You cannot access graphing features unless you are logged into a current session.
- _____ 5. You can copy and paste data either from a current session or from outside a session.
- _____ 6. You can only access your data files for analysis.

Multiple Choice

Identify the letter of the choice that best completes the statement or answers the question.

- _____ 7. Saved data is stored and organized by.
 - a. password
 - b. username
 - c. student name
 - d. smiley
- _____ 8. Which scan can you change to either grayscale or colorscale?
 - a. Spectrum
 - b. Continuum
 - c. Mapping
 - d. Excel
- _____ 9. What can be accessed by right clicking in spectrum and continuum analysis?
 - a. file name
 - b. graph features
 - c. excel
 - d. username
- _____ 10. This drop down menu allows the selection of users.
 - a. file type
 - b. file selection
 - c. user selection
 - d. user type

2.8 Analyzing Smiley Data Quiz Answer Section

TRUE/FALSE

1. ANS: F
2. ANS: T
3. ANS: F
4. ANS: F
5. ANS: T
6. ANS: F

MULTIPLE CHOICE

7. ANS: B
8. ANS: D
9. ANS: B
10. ANS: C