



1  
00:00:00,050 --> 00:00:04,040  
[ music ]

2  
00:00:04,060 --> 00:00:08,050  
[ music, buzzing sound effects ]

3  
00:00:08,070 --> 00:00:12,070  
Once the ATLAS instrument transmits six laser beams to Earth,

4  
00:00:12,090 --> 00:00:16,090  
the telescope receives the photons that bounce back from Earth.

5  
00:00:16,110 --> 00:00:20,270  
Tyler: Hey there, I'm Tyler Evans, an optical

6  
00:00:20,290 --> 00:00:24,390  
mechanical engineer on the ICESat-2 mission, working on the ATLAS instrument.

7  
00:00:24,410 --> 00:00:28,410  
So for the receiver subsystem, the biggest component

8  
00:00:28,430 --> 00:00:32,430  
is the telescope, which is 0.8 meters in diameter, which is about

9  
00:00:32,450 --> 00:00:36,600  
31.5 inches in diameter for the primary dish. So the primary

10  
00:00:36,620 --> 00:00:40,620  
dish is the reflective surface that you see which has curvature to it, and

11  
00:00:40,640 --> 00:00:44,640  
the way that it works is light goes into the primary dish and is collected by this

12  
00:00:44,660 --> 00:00:48,650  
big dish and it gets focused up into the secondary mirror, which is at the end

13  
00:00:48,670 --> 00:00:52,820

of this tower. And this secondary mirror shines the light and focuses

14

00:00:52,840 --> 00:00:56,850

it down through that tube to the center, to the back

15

00:00:56,870 --> 00:01:01,030

of the telescope where the detectors are. And this telescope is made out of beryllium,

16

00:01:01,050 --> 00:01:05,050

which is kind of a unique material that has a strength-to-weight ratio,

17

00:01:05,070 --> 00:01:09,060

so this whole telescope only weighs 50 pounds.

18

00:01:09,080 --> 00:01:13,070

Now to know which way the telescope is pointing, there's four green laser that are coming

19

00:01:13,090 --> 00:01:17,070

out of the telescope. So if you look into the main dish you can see

20

00:01:17,090 --> 00:01:21,260

the four TAMS spots, the telescope alignment monitoring system,

21

00:01:21,280 --> 00:01:25,270

and those go out of the telescope and get picked off

22

00:01:25,290 --> 00:01:29,320

by this periscope. And the receiver periscope

23

00:01:29,340 --> 00:01:33,330

picks up the light from the telescope and bends back into the

24

00:01:33,350 --> 00:01:37,340

LRS. The LRS is the Laser Reference System camera. So that's really the brains

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00:01:37,360 --> 00:01:41,350

behind the closed-loop control system that looks at those four spots and knows

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00:01:41,370 --> 00:01:45,530

as it tracks those four spots how the telescope is pointing.

27

00:01:45,550 --> 00:01:49,680

So now that you've seen the front of the receiver subsystem where the light goes in,

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00:01:49,700 --> 00:01:53,690

I'll take you around back to be able to show you the fibers

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00:01:53,710 --> 00:01:57,710

on the other end where the light actually goes into the

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00:01:57,730 --> 00:02:01,730

detectors. You can see the six black fibers that are plugged into the back of the

31

00:02:01,750 --> 00:02:05,740

telescope. Those actually go out to the detector

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00:02:05,760 --> 00:02:09,740

where they're able to analyze those photons that came back from Earth and compare them to the

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00:02:09,760 --> 00:02:13,750

photons that were sent out to check the stopwatch and see

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00:02:13,770 --> 00:02:17,750

what the distance actually was of that ice that they just measured.

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00:02:17,770 --> 00:02:21,770

So this is the stellar side of that LRS camera and this

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00:02:21,790 --> 00:02:25,950

lens here looks out into space and it looks at the stars to see

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00:02:25,970 --> 00:02:29,960

how the satellite is pointed. So based on what constellations it's seeing and how

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00:02:29,980 --> 00:02:34,190

the stars' angles are coming into this lens, it knows how the spacecraft

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00:02:34,210 --> 00:02:38,340

is pointed relative to Earth. Once the photons are filtered

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00:02:38,360 --> 00:02:42,520

through the telescope and into the fibers, they go into the optical filter assembly

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00:02:42,540 --> 00:02:46,710

or the etalons. These filters have a really small bandwidth

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00:02:46,730 --> 00:02:50,840

around 532 nanometers. So that's really specific

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00:02:50,860 --> 00:02:54,890

to only have the photons that we sent out come back. This is really important because

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00:02:54,910 --> 00:02:58,970

otherwise the Sun would dominate the signal. So the photons now go to

45

00:02:58,990 --> 00:03:03,080

the PMT detectors, which are the photomultiplier tubes,

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00:03:03,100 --> 00:03:07,260

where the photons are converted to electricity and timed.