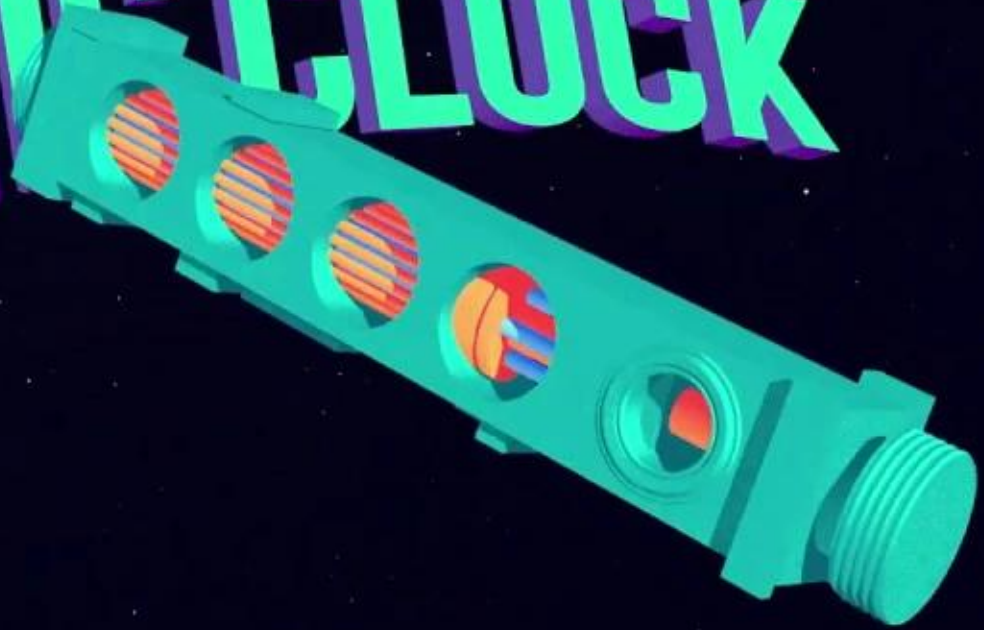


DEEP SPACE ATOMIC CLOCK



1
00:00:05,110 --> 00:00:02,710
how do we navigate through space

2
00:00:07,030 --> 00:00:05,120
currently spacecraft flying beyond earth

3
00:00:09,669 --> 00:00:07,040
don't have a gps to find their way

4
00:00:11,830 --> 00:00:09,679
through space navigators on earth send a

5
00:00:14,070 --> 00:00:11,840
signal to the spacecraft which receives

6
00:00:16,310 --> 00:00:14,080
it and sends it back

7
00:00:18,630 --> 00:00:16,320
extremely precise clocks on the ground

8
00:00:20,230 --> 00:00:18,640
called atomic clocks measure how long it

9
00:00:21,189 --> 00:00:20,240
takes the signal to make this two-way

10
00:00:23,429 --> 00:00:21,199
journey

11
00:00:25,670 --> 00:00:23,439
the amount of time tells them how far

12
00:00:26,710 --> 00:00:25,680
away the spacecraft is and how fast it's

13
00:00:28,630 --> 00:00:26,720

going

14

00:00:30,710 --> 00:00:28,640

the farther out in space the spacecraft

15

00:00:32,150 --> 00:00:30,720

is the longer it takes to receive and

16

00:00:34,150 --> 00:00:32,160

send a signal

17

00:00:35,830 --> 00:00:34,160

but what if humans are sent to another

18

00:00:37,910 --> 00:00:35,840

planet like mars

19

00:00:40,869 --> 00:00:37,920

a two-way system that sends a signal

20

00:00:42,869 --> 00:00:40,879

from earth to a spacecraft back to earth

21

00:00:45,029 --> 00:00:42,879

and then to the spacecraft again would

22

00:00:47,270 --> 00:00:45,039

take an average of 40 minutes

23

00:00:49,350 --> 00:00:47,280

imagine if the gps on your phone took 40

24

00:00:51,590 --> 00:00:49,360

minutes to calculate your position you

25

00:00:52,869 --> 00:00:51,600

might miss your turn or be several exits

26
00:00:53,830 --> 00:00:52,879
down the highway before it caught up

27
00:00:55,830 --> 00:00:53,840
with you

28
00:00:57,670 --> 00:00:55,840
if humans travel to the red planet it

29
00:00:59,590 --> 00:00:57,680
would be better if the system was one

30
00:01:01,189 --> 00:00:59,600
way allowing the explorers to

31
00:01:03,189 --> 00:01:01,199
immediately determine their current

32
00:01:05,429 --> 00:01:03,199
position rather than waiting for that

33
00:01:07,350 --> 00:01:05,439
information to come back from earth

34
00:01:09,510 --> 00:01:07,360
nasa is testing new technology that

35
00:01:12,710 --> 00:01:09,520
would allow future explorers to do just

36
00:01:14,710 --> 00:01:12,720
that the deep space atomic clock is the

37
00:01:16,710 --> 00:01:14,720
first demonstration of an atomic clock

38
00:01:17,749 --> 00:01:16,720

that can be used for navigation in deep

39

00:01:21,510 --> 00:01:17,759

space

40

00:01:23,429 --> 00:01:21,520

its own trajectory instead of depending

41

00:01:25,350 --> 00:01:23,439

on earth if a spacecraft had one of

42

00:01:27,190 --> 00:01:25,360

these clocks on board it could receive a

43

00:01:29,270 --> 00:01:27,200

signal from one of those big antennas on

44

00:01:31,590 --> 00:01:29,280

earth and quickly measure its speed and

45

00:01:33,749 --> 00:01:31,600

position the deep space atomic clock

46

00:01:37,190 --> 00:01:33,759

could one day let astronauts navigate

47

00:01:38,950 --> 00:01:37,200

safely and accurately to mars and beyond

48

00:01:41,109 --> 00:01:38,960

this technology demonstration is the