



J064632+445116

J151002+570243

J163547+362930

J212912-153841

J135406-020603

1
00:00:00,020 --> 00:00:04,080

[Music]

2
00:00:04,100 --> 00:00:08,090

Thanks to emissions powered by monster black holes, galaxies called

3
00:00:08,110 --> 00:00:12,130

blazars rank among the most luminous objects in the universe.

4
00:00:12,150 --> 00:00:16,190

They're also the most common sources of high-energy light seen by NASA's

5
00:00:16,210 --> 00:00:20,230

Fermi Gamma-ray Space Telescope.

6
00:00:20,250 --> 00:00:24,300

Like all active galaxies, a blazar gets its energy from matter

7
00:00:24,320 --> 00:00:28,420

falling toward a central supermassive black hole.

8
00:00:28,440 --> 00:00:32,570

A small part of this material forms particle jets that travel outward in

9
00:00:32,590 --> 00:00:36,750

opposite directions at near the speed of light. What makes blazars so

10
00:00:36,770 --> 00:00:40,760

intense is that we happen to be looking almost directly down the jet.

11
00:00:40,780 --> 00:00:44,820

Now, Fermi team members have identified five

12
00:00:44,840 --> 00:00:48,880

of the most distant gamma-ray blazars known.

13
00:00:48,900 --> 00:00:52,940

The record holder emitted its light when the universe was just one-tenth its current age.

14

00:00:52,960 --> 00:00:57,040

That object hosts a black hole with a mass of about

15

00:00:57,060 --> 00:01:01,210

3 billion suns. That's 750 times bigger than

16

00:01:01,230 --> 00:01:05,390

the black hole at the heart of our own galaxy. Another of these distant

17

00:01:05,410 --> 00:01:09,440

blazars boasts a black hole more than twice this size.

18

00:01:09,460 --> 00:01:13,610

In fact, the observed properties of all five of these blazars

19

00:01:13,630 --> 00:01:17,790

show they're the most extreme known members of this extreme

20

00:01:17,810 --> 00:01:21,830

galaxy class. The discovery makes it clear that

21

00:01:21,850 --> 00:01:25,870

enormous black holes formed very early in cosmic history,

22

00:01:25,890 --> 00:01:29,930

but astronomers aren't sure how. In general it's thought that

23

00:01:29,950 --> 00:01:33,990

large galaxies--and their black holes--were built up over time through a

24

00:01:34,010 --> 00:01:38,070

series of mergers with other smaller galaxies.

25

00:01:38,090 --> 00:01:42,170

It is unknown exactly how mergers can build a

26

00:01:42,190 --> 00:01:46,280

billion-solar-mass black hole before the universe is much more than

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00:01:46,300 --> 00:01:50,420

one billion years old. But after netting five of these extreme blazars,

28

00:01:50,440 --> 00:01:54,440

researchers hope to find more of them in Fermi data.

29

00:01:54,460 --> 00:01:58,510

These objects allow scientists to map out how the most powerful jets in the universe

30

00:01:58,530 --> 00:02:02,690

evolved over cosmic time scales. And scientists hope

31

00:02:02,710 --> 00:02:06,750

that additional examples will help them better understand

32

00:02:06,770 --> 00:02:10,810

how supermassive black holes developed so rapidly in the early universe.

33

00:02:18,890 --> 00:02:14,860

[Music]