UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

SCHEDULE 14A
Proxy Statement Pursuant to Section 14(a) of the Securities Exchange Act of 1934

Filed by the Registrant ☒

Filed by a party other than the Registrant ☐

Check the appropriate box:

☐ Preliminary Proxy Statement

☐ **Confidential, for Use of the Commission Only (as permitted by Rule 14a-6(e)(2))**

☐ Definitive Proxy Statement

☒ Definitive Additional Materials

☐ Soliciting Material Pursuant to §240.14a-12

LANTHEUS HOLDINGS, INC.
(Name of Registrant as Specified in its Charter)

(Name of Person(s) Filing Proxy Statement, if other than the Registrant)

Payment of Filing Fee (Check the appropriate box):

☒ No fee required.

☐ Fee paid previously with preliminary materials.

☐ Fee computed on table in exhibit required by Item 25(b) per Exchange Act Rules 14a6(i)(1) and 0-11.

A form of letter to the stockholders of Lantheus Holdings, Inc. (the "Company") regarding the special meeting of the Company's stockholders is provided below.

LANTHEUS

[ ], 2026

Dear Fellow Stockholder:

We previously sent you proxy materials for the important special meeting of stockholders of Lantheus Holdings, Inc. (the "Company") to be held on October 14, 2026, in connection with the transactions contemplated by the Agreement and Plan of Merger, dated as of August 3, 2026, by and among the Company, Curium US Holdings LLC and Coco Merger Sub Inc. (as it may be amended or supplemented from time to time, the "Merger Agreement").

Your Board of Directors unanimously recommends that you vote FOR the approval of the Merger Agreement proposal and related proposals.

Your vote is very important. Please note that failing to vote will have the same effect as a vote ***against*** the Merger Agreement proposal. **If you have not already done so, please vote TODAY *via* the Internet, by telephone, or by signing, dating, and returning the enclosed proxy card or voting instruction form in the envelope provided. (If you have received this letter by email, you may also vote by simply clicking on the "VOTE NOW" button in the accompanying email.)**

Thank you for your support.

Sincerely,

Mary Anne Heino,
Executive Chairperson and Interim Chief Executive Officer

YOUR VOTE IS IMPORTANT—PLEASE VOTE TODAY!

If you have any questions, or need assistance in voting
your shares, please call our proxy solicitor:

INNISFREE M&A INCORPORATED
1 (877) 750-5838 (toll-free from the U.S. and Canada) or
+1 (412) 232-3651 (from other countries)

Additional Information and Where to Find It

In connection with the proposed acquisition of the Company by Curium US Holdings LLC ("Parent"), the Company filed a definitive proxy statement with the Securities and Exchange Commission (the "SEC") on September 8, 2026. This document is not a substitute for the definitive proxy statement or any other document that may be filed by the Company with the SEC. THE COMPANY'S STOCKHOLDERS AND INVESTORS ARE URGED TO READ THE DEFINITIVE PROXY STATEMENT IN ITS ENTIRETY AND ANY OTHER DOCUMENTS FILED BY EACH OF PARENT AND THE COMPANY WITH THE SEC IN CONNECTION WITH THE PROPOSED ACQUISITION OR INCORPORATED BY REFERENCE THEREIN BECAUSE THEY CONTAIN IMPORTANT INFORMATION ABOUT THE PROPOSED ACQUISITION AND THE PARTIES TO THE PROPOSED ACQUISITION. Investors and security holders are able to obtain a free copy of the proxy statement and such other documents containing important information about the Company and Parent through the website maintained by the SEC at www.sec.gov. The Company makes available free of charge at its website at https://investor.lantheus.com/ copies of materials it files with, or furnishes to, the SEC.

Participants in the Solicitation

The Company, Parent and certain of their respective directors, executive officers and employees may be deemed to be participants in the solicitation of proxies from the stockholders of the Company in connection with the proposed acquisition. Information regarding the Company's directors and executive officers is contained in the definitive proxy statement. To the extent holdings of the Company's securities by its directors or executive officers have changed since the amounts set forth in the definitive proxy statement, such changes have been or will be reflected on Initial Statements of Beneficial Ownership of Securities on Form 3 or Statements of Changes in Beneficial Ownership of Securities on Form 4 filed with the SEC. These documents may be obtained free of charge from the SEC's website at www.sec.gov and the Company's website at https://investor.lantheus.com/. The contents of the websites referenced herein are not deemed to be incorporated by reference into the proxy statement.

No Offer or Solicitation

This communication is for informational purposes only and is not intended to and does not constitute, or form part of, an offer, invitation or the solicitation of an offer or invitation to purchase, otherwise acquire, subscribe for, sell or otherwise dispose of any securities, or the solicitation of any vote or approval in any jurisdiction, pursuant to the transaction or otherwise, nor shall there be any sale, issuance or transfer of securities in any jurisdiction in contravention of applicable law.