Atomically Precise Molecules (APM): DARPA-PS-26-141

Question and Answer Document

Version 2

Updated as of October 20, 2026

1. **Question**: If we are an individual researcher capable of addressing perhaps one of the pillars, but don't have a complete team (e.g., sustainability / manufacturing) will there be mechanisms for finding teams?

Answer: DARPA actively encourages cross-disciplinary teaming, but does not mandate or directly match partners. All teaming arrangements remain the sole responsibility of the proposers. To assist interested performers in connecting, DARPA facilitates networking via the APM Proposers Day and makes available attendee contact registries, lightning talks, and poster session materials so prospective performers can independently identify and build full proposal teams.

2. **Question**: One goal of the project is to achieve >1THz modulation. I am not quite sure if THz signal generator is available or not, are we expecting to demonstrate the THz modulator all optically? Could you use a pump-probe experiment?

Answer: We recognize that electrical THz modulation measurement is a challenge. We don't know yet what IV&V characterization methods will be available at the time of characterization. Once the project begins, All APM performers will collaborate the IV&V team for viable testing methodology based on their approach. A potential approach could be pump and probe approach as long as there is an established quantitative correlation of the test results with the required THz response.

3. **Question**: What is the relevant wavelength range for the optical metrics, for example r_33 * n^3 ? Is it near IR wavelengths (900-1500 nm) for the relevant optical applications? Is there a specific single wavelength at which the stated benchmarks are to be achieved? Or something else?

Answer: Metrics are defined without wavelength requirements. Performers are asked to propose an operating wavelength of their choice, accompanied by a sound technical justification demonstrating commercial and DoW relevance.

4. **Question**: What if during the course of the program all of the optical metrics are met expect for one? I believe the optical loss metric is fundamentally incompatible with the other optical metrics; if all of the other metrics are met expect for that one would the program be considered successful?

Answer: The optical loss metric is for passive materials for demonstrations 2 and 3. The optical loss for demonstration 4 is for the integrated device.

5. **Question**: Cost realism is one of the proposal evaluation metrics. Can you comment on the total program budget and number of anticipated awards?

Answer: DARPA anticipates multiple awards. The proposed program budget should be commensurate to the unique technical approach. Please review the Budget and Price evaluation criteria in Section II of the solicitation.

6. **Question**: Can non-US entities participate as a subcontractor under this solicitation?

Answer: Foreign entities may not perform research and development (R&D) tasks as primes, subcontractors, or team members. However, foreign commercial vendors are permitted if they are strictly providing standard commercial products or services.

7. **Question**: Is the APM program open to approaches that include biological/biochemical processes, as long as program goals and metrics are met?

Answer: DARPA is agnostic to approaches as long as the program goals and metrics are met.

8. **Question**: Can we hire non-us personnel like students and postdocs to work on this program

Answer: Foreign national students and postdoctoral researchers affiliated with an eligible U.S. performing institution may participate provided that all program security requirements and foreign national access controls - as specified in the solicitation and the program's Controlled Unclassified Information (CUI) Guide - are strictly satisfied

9. **Question**: I understand that final device fabrication and design will be done through the IV&V team. However, there may be some interim device fabrication that needs to be done for measuring material properties and examining integration techniques. Are costs for device fabrication and development allowable for these materials testing steps?

Answer: The IV&V team will be responsible for all device fabrication needs in Phase 2 including interim device fabrications prior to demonstration 4. However, any test bed or device proxy the performers require can be included in the cost volume.

10. **Question**: Are multi-institutional teams required, strongly encouraged, or optional? What is the limit on the number of PIs in the team? Would the organization determine which proposer can submit the abstract as only 1 lead proposal is allowed per organization?

Answer: 1. Multi-disciplinary teams, diverse in technical expertise are encouraged to meet the goals of APM, but there is no requirement on multi-institutional teams. There is no limit on the number of PIs, however, as with any personnel proposed, there should be a clear description of the team organization, key personnel, clear level of effort mapped to the technical tasks; Yes. The proposer team should have the Prime organization submit the abstract. The APM solicitation states that FFRDC, UARC and government entities can't be prime contractors. Non US organizations can't participate in this solicitation.

11. **Question**: The OT leaves the key data rights blank and states the Government rights to deliverables and generated data will be inserted at award. Can you provide a sense of what rights are anticipated for technical reports? Will APM-generated data receive Government Purpose Rights, Limited Rights, or something broader? Following delivery of milestone materials and technical reports, what is the anticipated process and timeline for IV&V review and Government Acceptance, and thus enabling milestone payments?

Answer: Please refer to the solicitation for information on the Government's Intellectual Property position for APM. Page 13 of the APM solicitation identifies a minimum of GPR for Foreground Data with an expectation of a license right to Background Data/IP solely for the purposes of performing IV&V, technical milestone verification, and performance metrics evaluation under the Agreement. Final IP and Data Rights terms will be negotiated into the model. Per DARPA's standard terms and conditions for Other Transactions, written notice

of acceptance or rejection with feedback regarding corrections is generally provided within 15-days of milestone delivery.

12. **Question**: Please provide more info on your interests for applications outside of NLO. For example, are applications at higher temperature environments of interest? If we are interested in bringing that type of non NLO application to the program, do we wait to join in phase 2. How do you see performers that just bring an application participating in phase 1?

Answer: APM is not seeking applications outside of NLO materials.

13. **Question**: 1. Early-Career Opportunities: Does the APM program consider proposals led by early-career faculty? Given the critical importance of program delivery, what seed funding pathways or mechanisms exist for early-career researchers to build a proven track record with DARPA? 2. YFA Alignment: Is there any anticipated alignment between upcoming DARPA Young Faculty Award (YFA) solicitations and the technical goals of the APM program?

Answer: 1. All responsible sources capable of satisfying the government's needs may submit a proposal that shall be considered by DARPA. 2. DARPA doesn't currently anticipate there will be alignment of upcoming YFA solicitation and APM program.

14. **Question**: Is it possible to get a bit more granular regarding what the DARPA team sees as being the outstanding challenges? Or put another way, what gaps does DARPA see in existing synthetic methods and strategies? Understanding where you view gaps will greatly help folks like me craft a proposal that addresses them.

Answer: APM is seeking approaches/technologies that enable the synthesis of currently inaccessible polymers, where the sequence, orientation, and composition of materials are programmable.

15. **Question**: What are the rules around the same institution participating in multiple proposals?

Answer: There is no restriction on the number of proposals an institution may submit or participate in, whether as a prime contractor, subcontractor, or team member. However,

DARPA seeks truly revolutionary, high-impact concepts rather than incremental variations or multiple speculative submissions. Proposers are strongly advised to concentrate their resources on developing their most compelling, transformative ideas. Please note that DARPA may decline or adjust funding across multiple awards if proposed technical scopes, tasks, or key personnel commitments are duplicative or substantially overlapping.

16. **Question**: Is the $25k for the optional Phase 1 CMMC Milestone for one organization or for the entire proposing team?

Answer: The Government will allocate per proposal a fixed amount of up to $25,000 for the successful execution and completion of the Optional Phase I CMMC Milestone per Agreement.

17. **Question**: Should all pillars have quantitative metrics in proposal?

Answer: Please refer to the Program Solicitation section B (Program Description) for instructions on how to address the four pillars in a proposal.

18. **Question:** Will the APM program consider AI-guided molecular design and simulation as a dedicated performer work package, or should modeling capabilities be embedded within synthesis/device teams?

Answer: Per section II of the solicitation (evaluation criteria), the proposal must detail the approach to team integration and how collaboration will be managed.

19. **Question:** What level of experimental validation is expected for computationally proposed programmable precision polymer candidates in Phase 1?

Answer: Proposals must include metrics for polymer synthesis that result in materials that meet optical performance metrics. Proposals must also describe analytical approaches to meeting those metrics. The IV&V team will work with performers to develop a test and evaluation plan to measure those metrics.

20. **Question:** Are structure-property prediction, uncertainty quantification, and active-learning loops considered responsive to the APM program goals?

Answer: Per section I.B (Program Description) of the solicitation, the proposal must present a strong technical plan addressing the 4 pillars of the APM program, including quantitative justification for the proposers choices to the approach.

21. **Question:** Will proposers be expected to demonstrate end-to-end synthesis-to-device integration, or can teams propose modular performers for design, synthesis, characterization, and device incorporation?

Answer: Per section II of the solicitation (evaluation criteria), the proposal must detail the approach to team integration and how collaboration will be managed.

22. **Question:** Does the CMMC level 2 status need to be acquired before Phase I activities begin, or before Phase II activities begin?

Answer: Please refer to the Program Solicitation section III (Submission Information). The CMMC Level 2 self-certification must completed and verified before a performer will be authorized to work beyond Milestone 2.

23. **Question:** Is poling in scope or are materials expected to be self-orienting within a given device?

Answer: See answer for Question 20.

24. **Question:** Do polymers need to contain covalent linkages between repeat units to be considered a responsive solution?

Answer: See the answer for Question 20.

25. **Question:** What is the expected level of scaling, to grams or kilograms?

Answer: Per section I.B (Program Description) of the solicitation, the proposal must describe the vision for scaling material production to relevant levels. Quantitative justification for metrics associated with relevant levels are the responsibility of the proposer.

26. Question: How many components constitute a material? Does the final delivered material need to be molecularly homogeneous, i.e. each molecule is structurally equivalent to the rest? Are multi-component materials in scope, i.e guest/host system where a polymer directs the orientation of guest chromophore.

Answer: See the answer for Question 20.

27. Question: Is any device fabrication prohibited from costing? Can proposers include costing for devices to test optical properties of newly developed materials, as well as to assess sufficient purity for device integration and provide the data for deliverable listed as suitability for device incorporation. "All data concerning incorporating polymers/materials into functional devices" pg.8

Answer: See the answer provided for Question 9.

28. Question: What is considered to be a polymer under APM? Are there requisite characteristics such as chain length, or monomer/polymer families (olefin, acrylates, peptides, etc.)?

Answer: APM is seeking approaches/technologies that enable the synthesis of currently inaccessible polymers, where the sequence, orientation, and composition of materials are programmable. It is the responsibility of the proposer to define and quantitatively justify metrics that can be used to characterize their approach.

29. Question: Are all teaming partners required to meet cybersecurity compliance (DoW Cybersecurity Maturity Mode Certification (CMMC) Level 2) requirements, including all sub-contractors even if the data they generate may not be CUI? For a subawardee that will process, store or transmit CUI but does not yet hold CMMC Level 2 (Self) at the time of proposal submission: is it acceptable for the prime to issue that subcontract later in the period of performance, once the subawardee's compliance has been verified in SPRS, provided the proposal describes the verification method and the expected timeline? In other words, must all CUI-handling subawardees be compliant at proposal submission or at award, or only prior to their own subcontract award?

Answer: Please see page 18 of the APM Solicitation, specifically the Subcontractor Flow-Down information, which lists minimum required CMMC levels for sub performers. If the subcontractor will only process, store, or transmit Federal Contract Information (FCI) only, then only CMMC Level 1 will be required. It is the Prime's responsibility to verify subcontractor compliance with CMMC Level 1 or 2 (Self-Assessment) and attest that all subcontractors who will handle FCI or CUI will

meet the applicable CMMC level required by APM. Primes should verify this status prior to subcontract award, regardless of when the subaward will be issued during performance.

30. Question: Should proposals include plans for fabricating an NLO device for preliminary testing in the lead up to IV&V PPP-device fabrication and evaluation?

Answer: See the answer provided for Question 9.

31. Question: if a proposed subawardee's CMMC compliance is in progress at proposal submission, what evidence would the Government consider sufficient for the prime's attestation — for example a documented remediation plan with a target date, or a signed statement from the subawardee's institutional official?

Answer: For **abstract submissions**, please see Attachment A for information on what should be included regarding CMMC status. For **full proposal submissions**, please see instructions contained in Attachment C.

32. Question: Does the Government have guidance for university subawardees specifically? Several research universities do not currently hold CMMC Level 1 or Level 2 and are working toward it on multi-month timelines, which affects their ability to participate as either prime or subawardee.

Answer: Per the solicitation, proposers should assume a start date of April 1, 2027 and CMMC Level 2 (Self-Certification) is not required until Milestone 2, which is estimated to be about a month into performance.

33. Question: For the Optional Phase I CMMC Milestone: is one month from award the expected duration, and does the $25,000 cap apply per performer organization or per team inclusive of subawardees who will process CUI?

Answer: If necessary, one $25,000 (NTE) milestone is available to be incorporated to the award. This is, inclusive of the Prime and any subawardees.

34. Question: Table 1 (p. 7) lists the performance metric as n^2r_{33} (pm/V), while the Phase I and Phase II milestone entries in Table 2 (pp. 11-13) state $n^3r_{33} \geq 3000$ pm/V and $n^3r_{33} \geq 8000$ pm/V.

Which figure of merit applies, and against which definition is the Current SoA value of ~4000 stated?

Answer: Based on a reading of current literature, DARPA estimates that the current state of the art for nonlinear materials n^2r_{33} (pm/V) is ~ 4000. Performers are expected to demonstrate 3000 pm/V by the end of Phase I. Performers are expected to target demonstrating 8000 pm/V by the end of Phase II.

35. Question: At what wavelength or wavelengths will the optical loss metric of 1 dB/cm be evaluated? Is this a material-level measurement on a thin film, or in-device propagation loss?

Answer: See answer for Question 3.

36. Question: Does the Government or the IV&V team have a preferred measurement method for the electro-optic figure of merit (for example Teng-Man, attenuated total reflection, or in-device extraction)? Since IV&V will corroborate performer-reported metrics, alignment on method would be useful early.

Answer: Proposers should indicate the approach they will take to evaluating these metrics independent of the IV&V team. The IV&V team will work with performer teams during the program to develop evaluation approaches relevant and applicable to the performer's approach.

37. Question: The Demo 4 bandwidth target of ≥ 10^{12} Hz is a device-level property, and the solicitation states that IV&V will design and fabricate the modulator. What material-level electrical properties should performers characterize and report to support this metric — for example permittivity and loss tangent in the GHz to THz range?

Answer: See answer for Question 2.

38. Question: The solicitation excludes "proposals aiming to modify/repurpose existing NLO materials resulting in incremental improvements to the state-of-the-art." If a proposed material incorporates a known chromophore class, but the performance gain derives from a novel synthesis capability and the resulting structural order rather than from new chromophore chemistry, would such an approach be considered within scope?

Answer: Per section II of the solicitation (program description), the proposer must provide quantitative justification for why the proposed approach is not an incremental improvement to state of the art.

39. Question: Regarding sequence and compositional control: does the program consider a polymer in which functional monomers are installed post-synthesis at sequence-defined positions to satisfy the sequence and composition control requirements, or is stepwise monomer-by-monomer addition during chain growth required?

Answer: See answer for Question 20.

40. Question: May a single organization participate in more than one proposal submitted under this solicitation — for example as prime on one and subawardee on another, or as subawardee on more than one?

Answer: See the answer provided for Question 15.

41. Question: Regarding the anticipated publication restrictions described in Section IV.A: can DARPA clarify the expected scope and process? Specifically, whether this is prepublication review or prepublication approval, the anticipated turnaround time, and whether individual team members whose scope constitutes fundamental research may be excluded from the restriction. This materially affects university participation.

Answer: Per the PS, the research under APM will be nonfundamental and pre-publication review will be in effect per the DARPA Public Release guidelines at https://www.darpa.mil/news/public-affairs/public-release.

42. Question: The program's performance metrics for VπL and bandwidth appear to require a modulator with deeply sub-wavelength features (e.g., < 100 nm). How is it physically possible to confine light at this scale and meet the program goals, given the diffraction limit?

Answer: Confining a ~1.5 μm wavelength in a deeply sub-wavelength dielectric core is infeasible due to the diffraction limit. The APM program is architecture-agnostic, but proposers should consider materials and structure designs that can bypass this limit. As a point of reference, the Plasmonic-Organic Hybrid (POH) modulator is one such architecture. It uses Surface Plasmon Polaritons to confine light in a nanoscale metallic slot, circumventing the normal diffraction limit. The design and multi-stage coupling scheme for this type of device are detailed in:
• Koch, U., et al. (2017). Nature, Vol. 547.

Ultimately, the final test structure is not mandated. Per the solicitation, the selected performer teams will work with the DARPA IV&V team to design and fabricate an appropriate device that can fairly measure the performance of the developed nonlinear material against the program metrics.

43. Question: As a prospective performer with bio-based expertise, we find ourselves feeling under equipped to internally assess material performance characteristics outlined in the objectives of the solicitation. Thus, we've been focused on teaming with performers having more NLO expertise. Question: Would teams of biotechnology performers be allowed to rely exclusively on the IV&V team to validate PPP materials during Phase 1?

Answer: Per section 1.C of the solicitation, the IV&V team will provide evaluations of performer deliverables to the government team at scheduled demonstrations. Per section 1.B, A successful proposal will thoroughly discuss all details for meeting the metrics set forth for the program as well as the associated risks and risk-mitigation strategies to achieve those metrics and related milestones.

44. Question: Can the APM team provide more information about the devices into which we will need to incorporate our PPPs? What can you tell us about the expected channel geometries? What can you tell us about the expected surfaces? Is it a silicon surface? Can we assume that we can work with the IV&V partners to make modifications to the surface chemistry before add the electro-optical PPPs? Can we assume that the IV&V partners can provide us with base case devices at the start of phase 1 so that we can start addressing integration risks from the outset?

Answer: The Government does not prescribe specific device geometries, materials, or surface chemistries at this stage, as these will depend heavily on the unique technical approaches proposed by individual performers. Based on the current milestone schedule, there is no expectation to integrate electro-optical PPPs into physical devices during Phase 1. Consequently, offerors should not assume that the IV&V partners will provide physical base case devices at the start of Phase 1. IV&V's role will be to collaborate on design parameters, guide interface requirements, and plan the fabrication of testing devices that will best enable selected performers to meet performance metrics in the subsequent phase to enable performers to best meet the metrics.

45. Question: It is unclear that APM program goals align with my organization's long term commercialization plan. What options are available?

Answer: We encourage proposers to clearly articulate their commercialization vision in their proposal. If your long-term plan utilizes APM capability for a different commercial product line, you should describe that path in your submission. DARPA values proposals that demonstrate a robust,

self-sustaining commercial path for the underlying technology beyond the immediate government test-vehicle. Because this solicitation utilizes Other Transaction (OT) authority (10 U.S.C. § 4022), intellectual property (IP) and data rights are not rigid. Proposers have the opportunity to negotiate tailored IP arrangements during the award process to protect commercial proprietary methods and secure commercialization pathways. While not required for a complete submission, proposers are encouraged to provide redlines to the APM OT Terms and Conditions (Attachment I) to help communicate this position.

46. Question: For the synthesis of PPP, is it the synthetic recipe (knowledge that can be stored virtually) that falls under CUI? Or are the physically synthesized materials and location in which they are synthesized also considered CUI?

Answer: The synthetic recipes of PPPs and knowledge that can be stored virtually only becomes CUI when there is a direct association with their NLO properties. Storing materials and the locations of those materials would not fall under the CUI guidelines. Once those materials are associated in aggregation with their NLO properties, these recipes are CUI, as is all the labeled experimental data, presentations, memos, etc., concerning that recipe. All these need to be stored in systems compliant with CMMC Level 2 (Self-Certification). Please refer to Attachment J: APM Controlled Unclassified Information (CUI) Guide (signed as of September 25, 2026) for additional information.

47. Question: For the characterization of PPP, do the instruments used to characterize the PPP (e.g., those in a shared facility) all need to be CUI compliant, or is it just the data (e.g., showing NLO properties) that would need to be stored and handled in a CUI compliant way?

Answer: The instruments do not need to be CUI compliant, but the systems that store the labeled data, presentations, memos, etc., need to be CMMC level 2 compliant.