Amendment Number 0002

Broad Agency Announcement (BAA) 09-027

Affordable Modular Panoramic Photonics Mast

The purpose of this amendment is to answer questions received in response to the BAA. This amendment makes no changes to the time and date for which proposals are due.

Q1: The BAA describes Product 1 as a Modular Photonics Mast Housing. It describes the housing as consisting of the physical outer envelope, the optical bench (if required), opto-mechanical systems, mechanical subsystems, and electrical and optical interconnections between mast components. However, it is then stated: The system should exceed current Photonics Mast resolution and sensor performance specifications under defined operational conditions… The requirement is to meet the medium field of view resolution of the current Photonics Mast color camera and the wide field of view resolution of the current mid-wave infrared (MWIR) camera with non-rotating approaches. Additional 'pointable' high resolution sensors may be utilized to achieve full high resolution requirements. Based on this reference, should the deliverables for the Housing include the costing for those "sensors" to achieve the current Photonics performance?

A1: The cost for the housing should reflect the cost of the sensors required to meet the imaging performance stated in the BAA.

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Q2: The BAA describes the transmission path – A transmission path for signal and power between the mast and the hull penetrators must be designed as part of this effort. Is the design of a hull penetrator to be considered as well, along with cost for prototype delivery?

A2: The design and delivery of a hull penetrator is not part of this effort. Demonstration of the completed system would be done by the Navy using existing hull penetrator technology. The offeror is encouraged to provide suggested approaches for demonstration of the system within that constraint.

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Q3: The BAA discusses the Cost Proposal along with a sample template. What type of cost vehicle would the award be (Cost Plus Fixed Fee)?

A3: Awards will take the form of contracts only and there is neither a limitation nor instruction on contract type to be used. It is the offeror's responsibility to determine the type of cost type contract.

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Q4: Assuming that the SWIR spectrometer must interface with existing foreoptics, what are the optical speeds (F/no), the exit pupil location and size of the foreoptics? Is an Interface Document available?

A4: The F/no is nominally 6. Exit pupil location, size of the foreoptics, are not currently know. No Interface Document currently exists.

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Q5: Based on 512 (spectral) pixels over 700 nm spectral range, the spectral sampling is 1.34 nm/pixel. Is this the spectrometer design goal? Please clarify the 15 nm spectral resolution shown on page 6 of the BAA.

A5: The worst case spectral resolution required is 15 nm. There may be circumstances when better spectral resolution is desirable which drive the requirement for 512 spectral pixels. Pixel binning may be utilized to achieve a desired signal to noise ratio at the 15 nm resolution.

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Q6: Are there any size constraint for the processor for the SWIR hyperspectral sensor?

A6: There is no specific size constraint, but it should be consistent with rackmount computer installation on a submarine.

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Q7: Does the SWIR Hyperspectral Sensor follow the 3 phase development of the photonic mast? That is, a 6 months initial concept refinement, 12 months detail system design, and a 31/2 year fabrication and test?

A7: The SWIR Hyperspectral Sensor does not follow the 3 phase development of the photonic mast. That development plan applies only to the first product in the BAA.

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Q8: Product 2- Broad Spectral Band Window Technology - Please confirm that the 6" diameter dimension of the desired cylindrical window is the "inside" diameter of the cylinder.

A8: The 6" diameter dimension of the desired cylindrical window is the "inside" diameter of the cylinder..

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Q9: Product 2- Broad Spectral Band Window Technology - Please confirm that the 2" diameter dimension of the cylindrical test samples to be provided for UNDEX testing is the "inside" diameter of the cylinder.

A9: The 2" diameter dimension of the cylindrical test samples to be provided for UNDEX testing is the "inside" diameter of the cylinder..

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Q10: Product 2- Broad Spectral Band Window Technology - Please specify the desired "height" dimension of the qty 20- 2" diameter cylindrical test samples that are to be provided at the end of FY10. Please confirm that these samples are to be delivered at the end of the Initial Concept Refinement phase of the program.

A10: There is no height requirement for these samples currently defined. The samples are to be delivered at the end of the first phase of the program.

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Q11: Product 2- Broad Spectral Band Window Technology - Please confirm that the UNDEX and the hydrostatic pressure load environments to which these qty 20 window test samples are to be exposed are defined in the two specifications referenced above.

A11: Hydrostatic pressure load information is included in the reference documents. Specific UNDEX requirements have not been defined for this program.

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Q12: I do not see a lens called out in the ONR BAA 09-027 solicitation. Does ONR already have the lenses, will they be delivered under another program, or are they part of one of the four parts of this program? The sensor design goals for product # 3 and 4 do not have enough information to determine what is sort of optics are desired.

A12: Delivery of optics are not required as part of Product #3. They will be delivered as part of another effort. Imaging optics is required for Product #4. F# is the only optical parameter that has been specified for it. The bidder should base the rest of the optical system design on their understanding of the application.

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Q13: As part of the Modular Photonics Mast Housing Phase I and Phase II efforts, for bidders planning to offer proposals for only the Modular Photonics Mast Housing, will ONR facilitate collaborative design integration relationships with the successful Camera, Window, and IR Sensor bidders to enable the development of Interface Control Documents?

A13: ONR will facilitate collaborative design integration relationships with the successful Camera, Window, and IR Sensor bidders to enable the development of Interface Control Documents.

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Q14: The Phase I Modular Photonics Mast Housing Initial Concept Refinement effort is anticipated to be 6 months. The Phase I Broad Spectrum Band Window Initial Concept Refinement effort is stated to be 12 months. The Camera and Sensor development efforts have no defined concept refinement or detail design phases. Does ONR anticipate managing and/or integrating the development activities of the successful bidders offering Cameras, Windows, and IR Sensors to directly support the Modular Photonics Mast Housing Phase I concept refinement and Phase II detailed design efforts?

A14: ONR will coordinate and manage the respective efforts. It is expected that the housing supplier will provide camera and window technology beyond the new capabilities being developed in Products 2, 3, and 4 in order to meet the sensing capability described in the Product 1 section of the BAA.

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Q15: As part of the Modular Photonics Mast Housing Phase III effort, how many Mast Housing units does ONR require to be fabricated?

A15: One.

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Q16: As part of the Modular Photonics Mast Housing Phase III effort, will ONR require that a test article be fabricated and undergo full shipboard environmental qualification testing?

A16: The unit must be suitably environmentally qualified to undergo a temporary alteration installation for a shipboard demonstration.

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Q17: Phase III of the Modular Photonics Mast Housing effort calls for shipboard demonstrations to demonstrate "its full capability". In this context does 'its full capability" refer to the full capability of the Mast Housing populated with Cameras, Windows, and IR Sensors developed under this BAA?

A17: A housing populated with visible cameras, windows, and IR sensors is expected. Performance requirements for the cameras are described in the BAA.

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Q18: How many demonstrations does ONR anticipate? How many of those demonstrations are anticipated to be at-sea?

A18: Several laboratory and dockside demonstrations are anticipated. Laboratory demonstrations are within the scope of the requested proposal, dockside testing is not. One extended period at-sea demonstration will be performed. Execution of that testing is beyond the scope of the requested proposal.

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Q19: If ONR does not anticipate integrating the Cameras, Windows, and IR Sensors developed under this BAA into the Mast Housing for the shipboard demonstrations, does ONR anticipate the successful Modular Photonics Mast Housing bidder to populate the housing with simulators of those components to demonstrate the performance of the Mast Housing to its requirements and/or program goals?

A19: The "Housing" supplier is expected to deliver a mast with functioning visible and infrared sensors.

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Q20: Given that there may be uncertainty in the number of Modular Photonics Mast Housing units to be fabricated, the level of component qualification to be accomplished, and the number and complexity of shipboard demonstrations to be supported by the successful Modular Photonics Mast Housing bidder, will ONR accept ROM estimates for Phases II and III based on certain assumptions?

A20: As stated in the BAA, full proposal packages (technical and cost) are due by the closing date and time.

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Q21: Regarding the SWIR camera, is the specified temperature describing the ambient or is that the required image sensor temperature?

A21: It is the image sensor temperature.

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Q22: Regarding the SWIR camera, if all specifications can be met at a lower image sensor temperature using a thermal electric cooler (within the 20 W power budget), is that adequate?

A22: Yes, that is adequate.

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Q23: Regarding the SWIR camera, is there a required ambient temperature range that the camera needs to operate?

A23: The ambient temperature range is -30 to +40C.

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Q24: Regarding the SWIR camera, what functions are comprised within the power budget for the camera? Is the power consumption specification for the imager sensor and associated electronics to deliver video data via a camera link output? Are there any other system considerations with regard to the housing?

A24: The power specification is for what is required to deliver video data via the camera link output including all cooling and video data processing.

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Q25: Regarding the SWIR camera, is the FPA noise equivalent irradiance specified at the scene or at the FPA? If at the FPA, what is the significance of the F#?

A25: The noise equivalent irradiance is specified at the FPA. The F# is provided to help the bidder to better understand the application and to help assess any image quality and resolution issues associated with the requested pixel size.

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Q26: Regarding the SWIR camera, rolling shutter or global shutter integration mode: is the choice at the camera designer's option or the user's option (i.e. does the image sensor need to be capable of both modes)?

A26: This is the camera designer's choice. Only one mode is required.

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Q27: Regarding the SWIR Hyperspectral Sensor Operating temperature, if all specifications can be met at a lower image sensor temperature using a thermal electric cooler (within the 20 W power budget), is that adequate?

A27: Yes, this is adequate.

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Q28: Regarding the SWIR Hyperspectral Sensor, is snapshot mode required for this camera?

A28: Snapshot is not required per the BAA. The supplier should use their best technical judgment given the nature of the application in choosing the integration mode.

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Q29: Regarding the SWIR Hyperspectral Sensor, if the spectral resolution is 15 nm, and the spectral window is 700 nm, why are 512 spectral pixels needed?

A29: The worst case spectral resolution required is 15 nm. There may be circumstances when better spectral resolution is desirable which drive the requirement for 512 spectral pixels. Pixel binning may be utilized to achieve a desired signal to noise ratio at the 15 nm resolution.

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Q30: Regarding the SWIR Hyperspectral Sensor, the sensor excluding optics is to fit within 2.5x2.5x5. Does excluding optics mean excluding the dispersive element? Does the project comprise an optical system, or only an FPA?

A30: The volume includes the dispersing optics, but not the imaging fore-optics. The project encompasses a complete hyperspectral sensor not just an FPA.

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Q31: Is the camera (Product 3) or sensor (Product 4) expected to implement any specific image processing functions?

A31: The camera (Product 3) or sensor (Product 4) is expected to implement any specific image processing functions.

- Bad pixel, gain correction
  Answer: Yes.

- Motion compensation
  Answer: No.

- 360 degree image rendering
  Answer: No.

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Q32: If the award date is early in Sep 09, how will the $200K and $1000K spending occur before the end of FY09?

A32: Spending will not occur before the end of FY09.

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Q33: For "product 3" a performance goal of Operating Temperature >273 degrees K is specified. Is this the Focal Plane operating temperature and if so is a lower focal plane operating temperature acceptable if all other performance goals (e.g. camera electronics dimension and power consumption) can be met?

A33: A lower focal plane operating temperature is acceptable if all other performance goals (e.g. camera electronics dimension and power consumption) are met.

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Q34: For "product 4" a performance goal of Operating Temperature >240 degrees K is specified. Is this the Focal Plane operating temperature and if so is a lower focal plane operating temperature acceptable if all other performance goals (e.g. hyperspectral sensor dimension and power consumption) can be met?

A34: A lower focal plane operating temperature is acceptable if all other performance goals (e.g. hyperspectral sensor dimension and power consumption) are met.

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Q35: What is the ambient temperature requirement in which the system will operate?

A35: The ambient temperature requirement in which the system will operate is -30 to 40 C.

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Q36: Is there any requirement to provide optics with product 3?

A36: There is no requirement to provide optics with product 3.

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Q37: Assuming that the SWIR spectrometer must interface with existing foreoptics, what is the optical speed (F/no), the exit pupil location and size of the foreoptics? Is an Interface Document available?

A37: The F/no is nominally 6. Exit pupil location, size of the foreoptics, are not currently know. No Interface Document currently exists.

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Q38: Based on 512 (spectral) pixels over 700 nm spectral range, the spectral sampling is 1.34 nm/pixel. Is this the spectrometer design goal? Please clarify the 15 nm spectral resolution shown on page 6 of the BAA.

A38: The worst case spectral resolution required is 15 nm. There may be circumstances when better spectral resolution is desirable which drive the requirement for 512 spectral pixels. Pixel binning may be utilized to achieve a desired signal to noise ratio at the 15 nm resolution.

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Q39: Are there any size constraint for the hyperspectral processor?

A39: There is no specific size constraint, but it should be consistent with rackmount computer installation on a submarine.

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Q40: Does the SWIR Hyperspectral Sensor follow the 3 phase development of the photonic mast? That is, a 6 months initial concept refinement, 12 months detail system design, and a 31/2 year fabrication and test?

A40: The SWIR Hyperspectral Sensor does not follow the 3 phase development of the photonic mast? That development plan applies only to the first product in the BAA.

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Q41: Section IV.1, Full Proposal Submission, page 10, states, “It is anticipated that final selections will be made within four (4) weeks after full proposal submission”. Four weeks after August 11, 2009 is September 8, 2009. Section IV.3, Significant Dates and Time, page 16, estimates contract awards to be on January 31, 2009. Please advise the anticipated start date for pricing purposes?

A41: The dates in the BAA are estimates. Awards are not anticipated until January 2010.

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Q42: Cost proposals for Phase II and Phase III activities are heavily dependent of the outcome of work performed in Phase I and Phase II respectively. For example, the cost of materials and fabrication in Phase III cannot be estimated with any degree of certainty without the resultant design products from earlier phases. Will ONR accept ROM estimates for Phases II and III?

A42: We will not accept ROM estimates. A formal cost proposal is required.

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Q43: Section 6.1, Background, page 2, defines the program goals to include the following:

- Reduce procurement cost
- Reduce time required for system assembly, integration, test and repair
- Reduce life cycle costs by 50% from current value
- Provide modular 'plug and play' capability for diverse imaging sensors
- Provide greater data transmission bandwidth capacity to meet current needs with room for future growth
- Meet or exceed the Photonics Mast resolution / performance specifications
- Achieve 5X factor improvement in 360 degree search time relative to current quick look requirements
- Develop new sensing technology for improved detection and tracking capability under degraded and restricted observing conditions.

To fully demonstrate that our proposal meets ONR's objectives it is required that ONR provide quantifiable metrics for each of the objectives. What are the current procurement costs for the Photonics Mast Housing, Widow, Camera, and IR Sensor? What are the times for system assembly, integration, test, and repair and what is the scope of each of these activities? What are the current Life Cycle costs for the Photonics Mast Housing, Widow, Camera, and IR Sensor? What is the current data transmission bandwidth capacity and what data transmission bandwidth capacity is required to meet current needs with room for future growth?

A43: Cost for the IR sensor is approximately $135,000. The entire mast cost is approximately $5M. Precise numbers for the other components are not available.

The data is not available on the metrics for system assembly, integration, test, and repair and the scope of each of these activities.

Repair costs are approximately $300K per unit per occurrence and are in large part driven by the requirement for all operations to be performed at DEPOT level. The ability to perform most repairs at I level is the goal for this program.

The goal is several hundred (e.g. 300) Gbits per second.for data transmission bandwidth capacity.

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Q44: Since this BAA is funded under 6.2 and 6.3 activities: Is the product (e.g., #4, SWIR Hyperspectral Sensor) expected to be demonstrated in an actual submarine mast? Or is a simple field demonstration (say on a tripod, in a relevant sea-like environment) adequate?

A44: The sensor must be compatible with demonstration in a periscope mast. The supplier is not responsible for integration of the sensor in the mast however.

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Q45: Why do you specify number of pixels and pixel sizes? Can you simply specify spectral and spatial resolutions?

A45: The goals for the size and number of pixels are consistent with the ultimate performance that is desired for the system. The stated goal for spectral resolution is the worst case required and may be achieved by pixel binning under low signal to noise conditions. Better spectral resolution is desirable and expected under higher signal to noise conditions.

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Q46: Product #2 - Broad Spectral Band Window Technology: do you envision that the flat or cylindrical (either monolithic or segments) windows would need to be polished to optical figure (to a specific transmitted wavefront error)? If so, is the specification for the level of optical figure available at this time?

A46: No specification is currently available. The windows will need to be polished to a surface figure consistent with conventional high resolution imaging in the visible, short wave infrared and midwave infrared spectral bands.

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Q47: The performance goals for products 3 and 4 say "Integration mode: Rolling or snapshot". Does this mean the camera needs to be able to handle both operating in rolling or snap shot mode at any given time or that it only needs to be capable of operating in one of those two modes?

A47: The camera may operate in either mode; there is no requirement to support both modes.

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Q48: Is the expected deliverable to be the camera including optics, the camera excluding optics or the FPA only?

A48: Deliverable is the camera with no optics.

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Q49: What are the specs for FPA operability and bad pixel clusters?

A49: There are no operability or bad pixel specs. The expectation is that the array will be capable of high quality imaging with no apparent cosmetic defects in a typical scene after bad pixel processing.

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Q50: What are the deliverables and milestones for each year's funding?

A50: There are no required deliverables by year or milestones. Proposed deliverables, submitted as part of the Full Proposal package, may be used to judge the offeror’s competitive position with respect to other offerors.

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Q51: If the listed performance goals for the camera are met, will this meet your expectations or are there other requirements not listed?

A51: If the listed performance goals for the camera are me this will meet the Government's expectations. There are no other additional requirements.

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Q52: A primary goal of the program is to achieve improved Reliability, Maintainability & Accountability (RM&A) measured against current performance. What is the current performance and what are the end objectives as it related to this SWIR camera?

A52: This is a new type of camera for a photonics mast so there is no current data available.

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Q53: Are there a number of cameras expected to be delivered by the end of the program and is there an expected need for an ongoing supply of additional cameras after the end of the program?

A53: Delivery of at least one camera is required. The delivery of a few additional units would be desirable. Delivery plans may be used to judge the competitiveness of the proposal. Delivery requirements beyond this program are currently not known.

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Q54: For Product 4) SWIR Hyperspectral Sensor: Is the expected deliverable to be the camera including optics, the camera excluding optics, the FPA with filtering capability or the FPA only?

A54: A complete sensor including optics is required.

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Q55: Which approach is preferred or required: on-chip or externally integrated filter?

A55: There is no preference. The system design approach is at the offeror's discretion.

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Q56: What are the specs for FPA operability and bad pixel clusters?

A56: There are no specs for theses parameters.

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Q58: If the listed performance goals for the camera are met, will this meet your expectations or are there other requirements not listed?

A58: There are no other additional requirements.

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Q59: A primary goal of the program is to achieve improved Reliability, Maintainability & Accountability (RM&A) measured against current performance. What is the current performance of the hyperspectral sensor and what are the end objectives as it related to this camera?

A59: This is a new type of camera for a photonics mast so there is no current data available.

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Q60: Are there a number of hyperspectral cameras expected to be delivered by the end of the program and is there an expected need for an ongoing supply of additional cameras after the end of the program?

A60: Delivery of at least one camera is required. The delivery of a few additional units would be desirable. Delivery plans may be used to judge the competitiveness of the proposal. Delivery requirements beyond this program are currently not known.

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