SMART ePANTS
(Smart electrically Powered And Networked Textile Systems)
Proposers' Day

Dawson Cagle | Program Manager | 11 May 2022

Intelligence Advanced Research Projects Activity

IARPA

Creating Advantage through Research and Technology

SMART ePANTS

WEAVING ELECTRONICS INTO TEXTILES

Welcome to the SMART ePANTS Proposers' Day!

- Thank you for your interest in this program and participating in this event
- To assure a clear broadcast stream, audio and video are disabled for meeting participants
- Comments and questions can be submitted to the IARPA team via the WebEx chat tool submission or via index cards for in-person attendees
  - **Please direct questions to "All Panelists" in the chat if you are virtual**
- Questions submitted to the alias (dni-iarpa-SMARTePANTS-proposersday@iarpa.gov) prior to this meeting and during this presentation, and corresponding answers, may be posted in writing online

Disclaimers

- This presentation is provided solely for information and planning purposes
- The Proposers' Day does not constitute a formal solicitation for proposals or proposal abstracts
- Nothing said at Proposers' Day changes the requirements set forth in a BAA
- **The BAA language supersedes anything presented or said by IARPA at the Proposers' Day**
- This meeting is being recorded and will be posted for public viewing
- For those viewing the recording, email aliases and POCs may be dated, please refer to IARPA.gov for updated information.

Proposers' Day Goals

1. Familiarize participants with IARPA's interest in the SMART ePANTS program and solicit questions and feedback
2. Foster discussion of complementary capabilities among potential program participants, i.e., TEAMING
   - Teaming information can be found at the following address: **https://www.iarpa.gov/index.php/research-programs/smartepants**
   - An attendance list, with contact information of participants who approved of sharing will be distributed soon
   - The chat feature is enabled for participants to plan future discussions associated with teaming
   - Teaming interests, capability summaries, and lightning talk slides will be posted publicly on the SMARTePANTS IARPA webpage until the BAA submission period closes

Please ask questions and provide feedback, this is your chance to alter the course of events.
Please talk with others, find great team members.

Feedback and Questions

- Questions can be submitted **until 12:00pm ET**.
- There will be a break after the contracting presentation at 12:00pm ET.
- Responses to selected questions will be broadcast at 2:00pm ET, so please don't log out or close your WebEx connection.
  - All programmatic and contractual questions will be captured but will not be answered in this session
- Feedback (but not questions) about the draft technical section may be submitted to the IARPA team email at dni-iarpa-SMARTePANTS-proposersday@iarpa.gov.
  - A new alias will be established when the full BAA is released
- After this Proposers' Day, IARPA will review all the feedback received for a final BAA to be posted on SAM.gov.

Teaming

- Participants are encouraged to find partners and collaborators . . . someone might have a missing piece of your puzzle.
- SMART ePANTS Test and Evaluation Partner: MIT – Lincoln Laboratory will present on their participation in the program (Technology baselining, Testing Procedures, and Government Furnished Capabilities)
- Lightning talks will take place following the Program presentations.
- Collaborating and capability summaries will be accepted, with minimal review for appropriateness, and made available to the public.
  - Teaming documents and summaries can be submitted until the BAA closes, submit to dni-iarpa-SMARTePANTS-proposersday@iarpa.gov.
  - If you would prefer your information not be shared (any recorded videos cannot be modified or removed) email dni-iarpa-SMARTePANTS-proposersday@iarpa.gov.

Agenda

Time	Topic	Speaker
9:30am-10:30am	(Attendees can log in early)	
10:30am-10:40am	Welcome, Logistics, Proposers' Day Goals	Dawson Cagle, Program Manager
10:40am-10:50am	IARPA Overview	Pedro Espina, Office Director, Collections Research, IARPA
10:50am-11:40am	SMART ePANTS Program Overview	Dawson Cagle
11:40am-12:00pm	Contracting Overview	NIWC
12:00pm-1:00pm	Break (Submit questions in chat before 12:00pm)	
1:00pm-2:00pm	Test and Evaluation Partner Team: Testing Strategy, Baselining and Government Furnished Capability to Participants	Livia Racz, MIT Lincoln Laboratory
2:00pm-2:30pm	Answers to Selected Technical Questions	Dawson Cagle
2:30pm-2:35pm	Introductions to Lightning Talks	Dawson Cagle
2:35pm-3:30pm (et.)	Lightning Talks (5 Minutes Each)*	Selected Presenters
3:30pm-5:00pm	Teaming Discussions*	In-Person Participants

*The Government will not attend these events

Lightning Talks Agenda

No Q&A during the session. Participants should contact presenters directly, later

Time	Speaker	Institution	In person
14:30-14:35	*Lightning Talk Intro*	IARPA	Yes
14:36-14:41	Jeremiah Slade	DCS Corp.	Yes
14:42-14:47	Veena Misra	ASSIST Center, NC State	Yes
14:48-14:53	Ben Calhoun	University of Virginia	Yes
14:54-14:59	Gabriel Loke	International Fabric Machines	Yes
15:00-15:05	David Mackanic	Anthro Energy	No
15:06-15:11	Ramakrishnan Rajagopalan	Penn State	No
15:12-15:17	Qian Ye	Palo Alto Research Company	No
15:18-15:23	Tim Gipson	Mide	No
15:24-15:29	Amul Tevar	Flex Energy	No

IARPA Overview

Pedro Espina | Director, IARPA Office of Collections | SMARTePANTS Proposers' Day, 11 May 2022

Intelligence Advanced Research Projects Activity

IARPA

Creating Advantage through Research and Technology

Office of the Director of National Intelligence

IARPA Mission

IARPA envisions and leads *high-risk, high-payoff research* that delivers innovative technology *for future overwhelming intelligence advantage*

- Our problems are complex and multidisciplinary
- We emphasize technical excellence & technical truth

IARPA Method

- Bring the best minds to bear on our problems
  - Full and open competition to the greatest possible extent
  - World-class, term-limited Program Managers
- Define and execute research programs that:
  - Have goals that are clear, ambitious, credible and measurable
  - Run from three to five years
  - Publish peer-reviewed results and data, to the greatest possible extent
  - Employ independent and rigorous Test & Evaluation
  - Involve IC partners from start to finish
  - Transition new capabilities to intelligence community partners

IARPA R&D

- Technical and programmatic excellence are required
- Each program has a clearly defined and measurable end-goal
  - Intermediate milestones to measure progress are also required
  - Every program has a beginning and an end
- This approach, coupled with term-limited PM positions, ensures
  - IARPA does not “institutionalize“ programs
  - Fresh ideas and perspectives are always coming in
  - Status quo is always questioned
  - Only the best ideas are pursued, and only the best performers are funded

IARPA Snapshot

IARPA's research portfolio is diverse, including math, physics, chemistry, biology, microelectronics, neuroscience, linguistics, political science, cognitive psychology, and more.

- 70% of completed research transitions to U.S. Government partners
- 3,000+ journal articles published
- IARPA funded researchers have been awarded the Nobel Prize in Physics for quantum computing research, a MacArthur Fellowship, and a Bell prize
- IARPA serves on National Science and Technology Council (NSTC) committees and actively engages with the White House BRAIN Initiative, National Strategic Computing Initiative, and the NSTC Select Committee on Artificial Intelligence, the NSTC Subcommittee on Quantum Information Science (SCQIS), and NSTC Subcommittee on Economic and Security Implications of Quantum Science (ESIX)

How to Engage with IARPA

ENGAGE WITH US

Throughout our website you can learn more about engaging with us on our highly innovative work that is having a positive impact in the Intelligence Community and society in general. Click on any of the below links to learn more.

iarpa.gov | 301-243-1995

dni-iarpa-info@iarpa.gov

- Reach out to our Program Managers.
- Schedule a visit if you are in the DC area or invite us to visit you

Open BAAs

Broad Agency Announcements (BAAs) solicit research proposals for specific programs. Learn more about current BAA opportunities and ways to get involved...

Requests For Information

Requests for Information (RFIs) are designed to gather more information on an idea in an area in which our program managers are not fully informed...

Seedlings

Seedlings are typically 9 – 12 month research efforts that are less than $1M in cost. They are intended to address highly innovative ideas and concepts within...

SMART ePANTS Overview

Dawson Cagle| Program Manager | SMART ePANTS Proposers' Day, 11 May 2022

Intelligence Advanced Research Projects Activity

IARPA

Creating Advantage through Research and Technology

Introduction of the SMART ePANTS Team

- Dawson Cagle, IARPA Program Manager
- Jared Incorvati and Alex Reyes, Science and Engineering Support
- Robert Prokop, Programmatic Support
- Livia Racz and MITLL Team, Test and Evaluation Team
- Kari Moran and NIWC Technical Team
- Eric Pomroy (COTR) and Stephen Enokida (CO) NIWC Contracting Team

Disclaimer

- Some of the slides in this presentation will depict commercial products.
- These are intended to serve as illustrative examples.
- Inclusion of these images in this presentation is in no way to be construed as an endorsement for any of the products shown.

Wearable Technology Definitions

What we have

Wearable electronics: Electronic devices that can be worn as accessories, embedded in clothing, implanted in the user's body, or even tattooed on the skin. The devices are hands-free gadgets with practical uses, powered by microprocessors and enhanced with the ability to send and receive data via the Internet. At present, most wearable electronics are easily recognizable rigid structures.

FitBit
e-Watch

What we don't need

Passive Smart Textiles: Those that have functionality beyond that of a traditional textile, offering properties such as UV protection, anti-microbial, perspiration removal, or anti-static. The textile is not altered when environmental conditions change.

Gore-Tex Jacket

What we DO need

Active Smart Textiles (ASTs): Active smart textiles are those that adapt and change their functionality in response to changes in the external environment or in response to a user input. The textile generally utilizes electricity to support actuators and/or sensors to interact with their environment.

SMART ePANTS
WEAVING ELECTRONICS INTO TEXTILES

The Need

- IC and other US Government personnel need wearable electronics that include effective audio, visual, and/or location sensors.
  - Hands free operation and comfortable wear minimize errors and accidents
  - Applications in law enforcement and international weapons inspections

Four Electronic Components in today's wearable electronics

Sensors

Computation and Data Storage

Power Sources

Interconnects and Haptics

Today's Wearable Technology versus SMART ePANTS AST Goals

Requirement	Sensors: (GPS, cameras, microphones)	Power Sources	Computers And Storage	Wires and Connectors
Effective Data Gathering				
Clothing-Integrated Systems				
Comfortable/Hands Free Operation				
Flexible/Stretchable/Washable				

Technology fails to meet requirement

Technology does not meet requirement robustly

Technology meets the requirement

SMART ePANTS Program Goals

Integrate electronics into Active Smart Textiles (AST) that can perform tasks, but also meet the rigors of today's garments.

FLEXIBLE

STRETCHABLE

COMFORTABLE AND DURABLE

WASHABLE

SMART ePANTS Success Can Transform Commercial Markets

Flexible, washable ASTs may also improve public health and connectivity

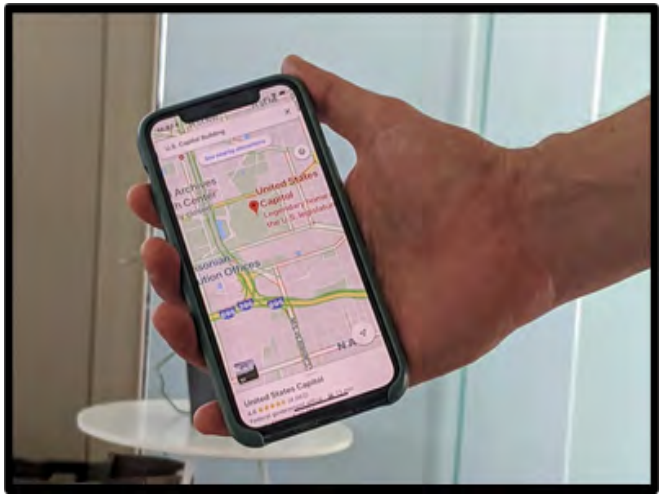
SPORTS PERFORMANCE

Image taken from https://www.liveathos.com/products/athos-mens-shirt

MEDICAL

Image taken from https://www.medicalnewstoday.com/articles/286101

COMMUNICATIONS



SMART ePANTS: Research Tracks

Program "Sensing Events"

Track 1: Listen

Track 1: Listen (Audio)

- 60 min. of verbal conversation at ≥ 60 dBA SBL, 2 meters from sensor, 400-3200 Hz freq. range
- Speech Transmission Index 0.6/1.0 or higher.

Track 2: Look

Track 2: Look (Photo/Video)

- ≥ 55° field of view
- 360 monochromatic photographs, can OCR Read 12-point text at (200-500 lumens/m^2) at ≥ 50 cm
- Two-minute monochromatic video, resolution of Group 2, Line 2 USAF Test Chart (200-500 lumens/m^2), > 30 frames/sec at ≥ 50 cm

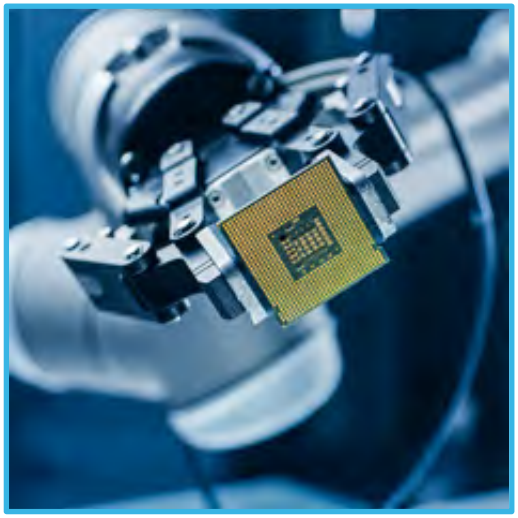
Track 3: Locate

Track 3: Locate

- Determine location 6x over the course of 1 hour, +/- 10 m indoors at 100 m distance from a point of reference
- No reliance on satellite navigation

SMART ePANTS' Three Phases

Phase 1: BUILD IT
18 Months



- Performer develops sensor(s) and reference textile
- System is integrated and tested outside textile
- Reference textile is tested to determine durability metrics

Phase 2: WEAR IT
12 Months

- Performer integrates system into garment using reference textile
- AST is tested for performance before/after durability measurements

Phase 3: WASH IT
12 Months

- AST is tested for all performance and durability factors, including washing

SMART ePANTS Representative Sensing Event Scenario

SMART ePANTS Components

- In order of *increasing importance*, proposals must describe the following components (requirements on the following slides)
  - Sensors
  - Computation and Data Storage
  - Power Source
  - Haptics
  - Interconnects
- Ideally, components, threads, and yarns exceeding 0.6 mm diameter shall be kept to a minimum

All components ***must*** be designed to function together!

Sensors

- Include cameras, microphones, and geolocation sensors
- Must be able to perform Sensing Events:
  - Audio: record 60 minutes of conversation
  - Video with a field of view at least 55 Degrees must do one or both of:
    - Record 360 monochromatic photographs
    - Record a 2-minute monochromatic video
  - Location: indoor geolocation system that can
    - Provide relative readings every 10 minutes for 1 hour
    - Uncertainty no more than 10 m at least 100 m away from a reference point of origin
    - Assume an environment without access to global navigation satellite systems, e,g. a building basement.

Computation, Data Storage and Offload

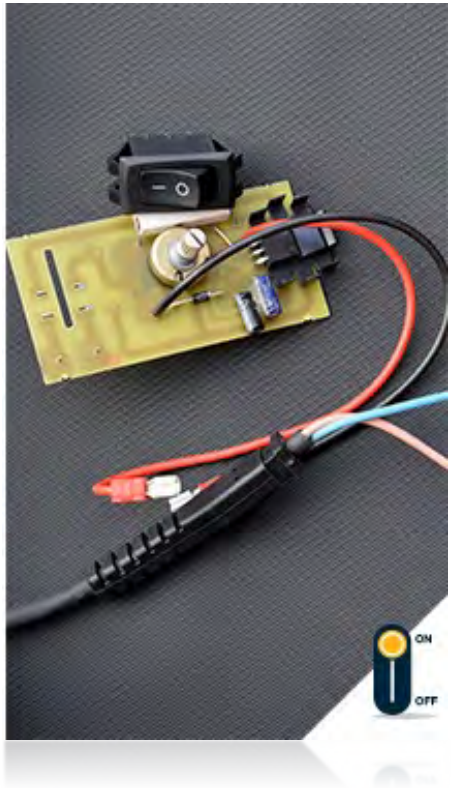
- Computers and data storage shall:
  - Function seamlessly (pun intended) with other system components
  - Record and store data from a single sensing event for later offloading to another device
- Data offloading must be performable by non-expert
  - Can be wired or wireless
  - Offerors must describe process and target device in proposals

Power Source

- Sufficient power for AST operation over an entire sensing event.
- Must be sufficient for at least 8 hours between recharging/refueling
- Must support multiple uses via recharging or refueling
- Offerors must describe the power source specifications in terms of energy capacity, battery lifetime (if applicable), and methods for recharging or refueling
- May not rely on solar or kinetic energy for supplemental power during use

Haptics and Interconnects

- Haptics: User-evident activation for power on/power off and required operation (e.g. taking a photo or fixing location)
  - Easily performed when fully clothed in office factory setting using natural movements
  - Must not require disrobing
  - Must not require external objects (e.g. other electronic devices)
- Interconnects:
  - Allow for operation of the AST
  - Compatible with comfort and durability metrics



Rigid Items Permissible, but…

- Must be natural parts of the clothing
  - Grommets, zippers, buttons, collar stays, underwires
  - No removable components for washing
- Fewer is better
- Responses contained mainly within rigid parts is out of scope

AST Independent Test, Evaluation and Government Furnished Capability

Offerors will submit ASTs for independent test and evaluation during each Phase

- 5 Reference Articles
- 5 Test Articles and usage documentation
- Plans will be included to describe how final project metrics will be met
- No plans to test on humans

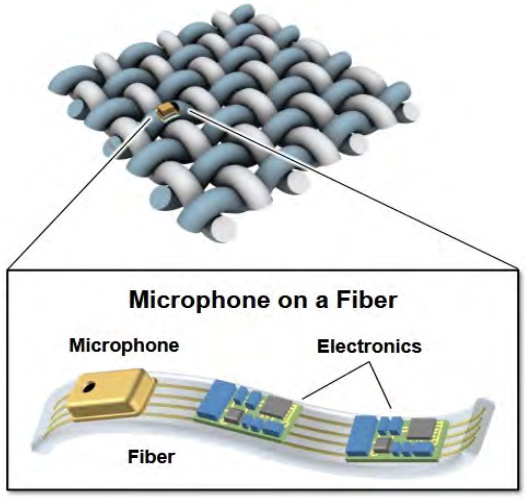
Offerors are invited to include MITLL-AFFOA provided Government Furnished Capability (GFE) in their proposals

- GFE costs should not be included in proposal
- Briefing on GFE capabilities will be provided during the Proposers' Day

SMART ePANTS Program has selected the MITLL-AFFOA Team as Test and Evaluation Partners

MIT LINCOLN LABORATORY affoa

Example of Audio AST Prepared by the T&E Team



Integrated System Durability and Comfort

- Textile Comfort Metrics:
  - Bend
  - Stretch
  - Compression
  - Surface Roughness
  - Breathability
  - Tests are relative to closely matching commercial reference garment
- Washability Metrics:
  - Based on ASTM 6330 or AATCC 61 test methods
  - Offerors should specify water or dry-cleaning solvent
- Breathability Metrics:
  - Based on ASTM Method D737

Reference: Apurba Das, R. Alagirusamy, "Chapter 4: Tactile aspects of clothing comfort, Section 4.3.2 Objective Assessment", Science in Clothing Comfort, 2010, Woodhead Publishing India PVT. LTD. pp. 54-78. https://doi.org/10.1533/9780857092830.54

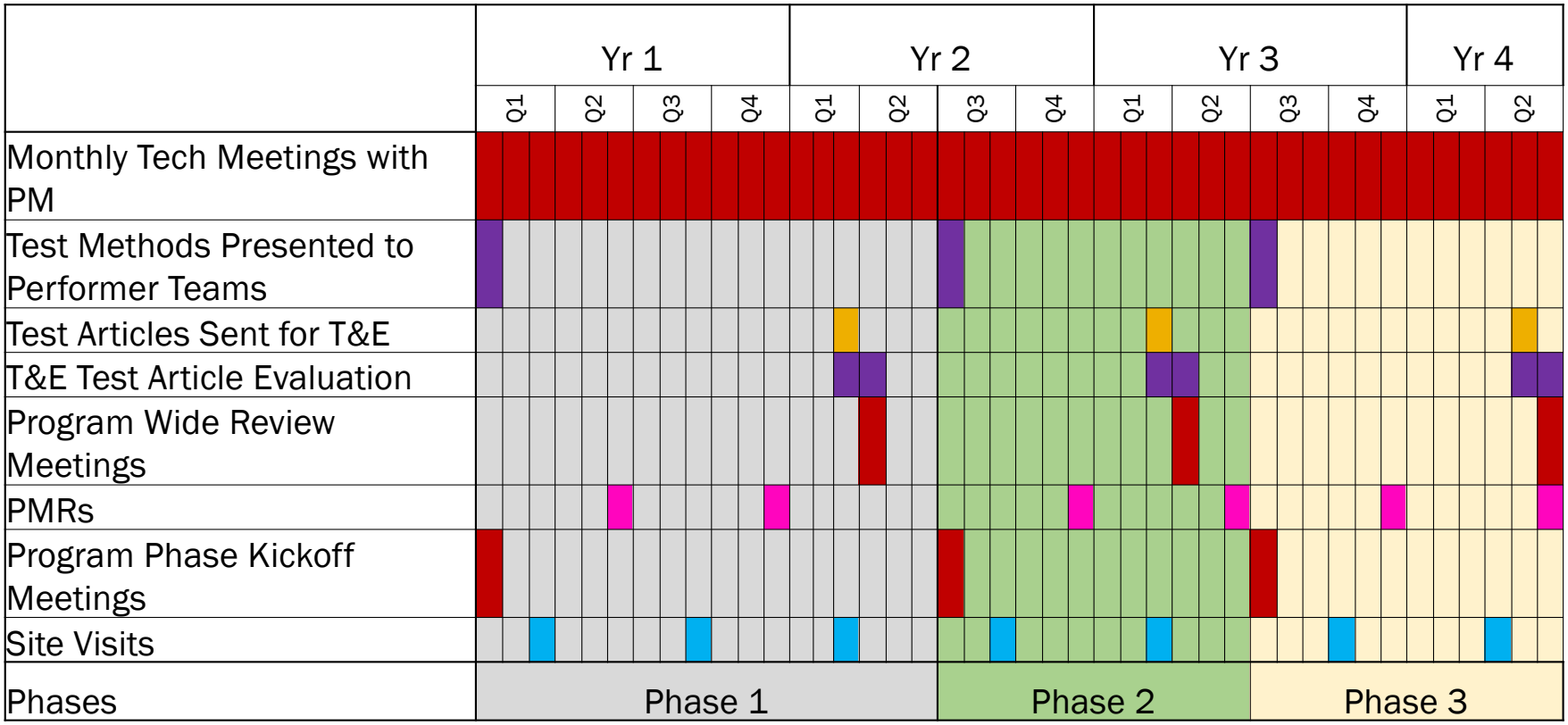
Calendar Life

- The duration between preparation of the system for a sensing event and the beginning of a successful sensing event test.
- For example, garment fully charged and stored for a week in a closet before being removed for immediate testing would have a one-week calendar life.

Metrics are based on Performance and Comfort/Durability

	Performance factor	Phase I: BUILD IT	Phase 2: WEAR IT	Phase 3: WASH IT
Performance	**Integration**	All components function separately and integrated	Systems integrated into a **primary garment**	Integrated garment meets program metrics
Performance	**Sensing Events**	7 Sensing Events (3 before, 2 during, 2 after durability testing)		
Comfort/Durability	**Stretch** Example: 3.5%	< 30% below reference (2.45 %) X 5 Reps	< 20% below reference (2.8 %) X 10 Reps	< 10% below reference (3.15 %) X 50 Reps
Comfort/Durability	**Bend** Example: 0.065×10^{-4} Nm/m	< 30% above reference (0.0845×10^{-4} Nm/m) X 5	< 20% above reference (0.078×10^{-4} Nm/m) X 10	< 10% above reference (0.0715×10^{-4} Nm/m) X 50
Comfort/Durability	**Compression** Example: 0.21 Nm/m^2		< 20% above reference (0.252 Nm/m^2) X 10	< 10% above reference (0.231 Nm/m^2) X 50
Comfort/Durability	**Surface Friction and Roughness**		< 20% above reference Friction Coeff. 0.21 ± 0.042 Rough. Geom. 12.2 ± 2.44	< 10% above reference Friction Coeff. 0.21 ± 0.021 Rough. Geom. 12.2 ± 1.22
Comfort/Durability	**Wash**	2 min. soak in solvent at 20 °C, hang dry 24 hrs.	30 min. wash in solvent at 20 °C, 2 min. rinse, hang dry 24 hrs.	30 min. wash in solvent, 2 min. rinse @ 20°C, 2 min. rinse, hang dry 24 hrs.
Comfort/Durability	**Breathability**		<20% reduction in air permeation vs reference	< 10% reduction vs reference
Comfort/Durability	**Calendar life**	Can perform sensing event after 1 day of storage	Can perform sensing event after 1 week of storage	Can perform sensing event after 3 months of storage

Program Schedule



Program Deliverables

- AST Test Articles
- AST Development Plan
- Technical Reporting
  - Monthly technical status reports
- Meetings
  - Monthly Technical Review (can be virtual)
  - Site Visits (at Performer facility, approximately semi-annually)
  - Kickoff and Principal Investigator Meetings (Usually Washington DC Metro, approximately annually)

Program Metrics versus Waypoints

- Metrics are ***defined by IARPA***
  - Quantitative measurement of system quality in achieving program goals and objectives
    - Measured during independent T&E
  - Strong factor in IARPA's determination to exercise options for continuing performance
  - Program Milestones set time-based targets for metrics.
- Waypoints are ***proposed by Offerors***
  - Interim performance measurements by Performers
    - E.g, if a metric is to be collected at month 12 then the offeror may wish to define waypoints for months 6 and 9
  - Determine progress towards achieving program metrics
  - Normally every 3-6 months but can be more frequent as needed

Out of Scope

- Approaches requiring an external device such as a smart phone, tablet, or smart watch for operation
  - Even if external item appears to be clothing but is not integrated, e.g, a belt.
- Solutions with rigid components exceeding 5 mm in height or width or 3 mm in depth
- Solutions only contained in rigid parts of a garment
- Approaches that do not produce an entire integrated system
- Solutions that employ radioactive or toxic materials
- Solutions that are visually or aurally obvious
- Solutions that cannot be reused
- Solutions focused on Artificial Intelligence/Machine Learning data processing

Proposal Evaluation Factors

- Positive Factors:
  - ASTs with more than one type of sensor
  - ASTs with a lower fraction of rigid components
  - Greater durability or comfort
    - Greater stretch, bend, washability, breathability
- Relative Importance:
  - Interconnects > Haptics > Power Source > Computation/Storage > Sensors

Q&A 1

- Q: Are other challenges such as fire-resistant performance, safety, or cyber-security properties of the garment expected to be needed?
  - A: Fire resistance will not be an evaluation metric. Per the BAA, solutions that cannot be packaged for safety are out of scope. Cybersecurity requirements are out of scope.
- Q: Given some of the use cases, did you consider inclusion of chemical sensing? and if so, why was it excluded?
  - A: Chemical sensing is out of scope for the SMART ePANTS program.
- Q: Are the 5 reference articles submitted are identiifed within the proposal?
  - A: The BAA specifies the time frames for delivering the reference articles. The proposer will need to identify the type of garment being produced. There will be no requirement to submit multiple types of garments at different points in the program.

Q&A 2

- Q: If AFFOA is a contractor/proposal evaluator are they not excluded from being part of a proposal team?
  - A: AFFOA is part of the Government T&E team and may not propose. Other private entities may propose subject to organizational conflict of interest restrictions.
- Q: 5 x 3 is VERY small. There are only a couple of thinned solutions available anywhere for the processor. Does this limit us to 2 year old microntrollers?
  - A: The Government will not comment on your proposed approach at this time but we note that the BAA requirements are very challenging. We expect that all components of the AST will require significant R&D. Proposers should refer to the BAA for all requirements.
- Q: Where does the image/audio/location data need to be when it's tested against the requirements, i.e. STI, OCR-ability, resolution test? Can we capture an intermediate representation on the garment, and have audio or image reconstruction performed off-garment?
  - A: Data extracted from the AST must meet BAA metrics without reconstruction or modification. Offerors will need to specify the process for offloading sensor data from the smart garment. What will be tested will be the final image/audio recording/location as processed on the offload device. Check the BAA for final details.

Q&A 3

- Q: To what extent is feasibility of transitioning from prototype garments to LRP and FRP important in the proposal?
  - A: (Assuming LRP is "limited rate production" and FRP is "full rate production"). IARPA's mission is in advancing the state of the art, not in operational procurement.
- Q: Is there a contrast requirement for the Group 2, Line 2 part of the USAF resolution chart? I'm not sure what "clearly reproduce" means.
  - A: The reference specification will identified exactly in the BAA.
- Q: Does the "smartness" have to be inside/on fibers? Or can we use printed flexible-smart components on woven or non-woven fabrics
  - A: Any AST components must meet the metrics for comfort and durability as mentioned in Table 1 of the BAA.

Q&A 4

- Q: Would temperature, humidity, and other environmental parameters be of interest?
  - A: Textile breathability is a metric which is related to temperature and humidity of the wearer. Temperature requirements are described in the BAA and are between 0 and 40 degrees Celsius. Temperature/humidity sensors are out of scope for the program
- Q: If a zipper is used as a sensor, it would exceed the 5mm length and/or 3mm depth requirement
  - A: A zipper is considered an expected component of the garment so it would be compliant.
- Q: Will the RF environment be described?
  - A: Please reference the final BAA

Q&A 5

- Q: Actuation: You say no stylus or mechanical object; can the hand be used to turn garment on/off?
  - A: Yes
- Q: Status: You do not specify whether the user needs to be able to ascertain status of garment. With a 60 minute audio requirement, user may wait to actuate and know when audio is connected/full
  - A: This detail is covered in the BAA in the description of haptics. Actuation must be evident to the user.
- Q: Does each sensing even track require a separate proposal?
  - A: No. Proposals should list all tracks being addressed.
- Q: Can we assume that government testing be available at any time throughout the program to form our program plan?
  - A: Performers should not assume that Government testing facilities will be available at times other than scheduled T&E events. Performers will need to decide what tests they will need to perform to meet their waypoints and Government milestones.

Q&A 6

- Q: When you said more than 1 type of sensor is positive. Is this more than 1 sensor of a given type (look/listen/locate) or a combo of these?
  - A: Combinations of different types of sensors are preferred.
- Q: Are sensors that have been developed and demostrated on other programs (DARPA, DOE, …) but not commercialized acceptable?
  - A: The government will consider existing sensors as long as they comply with published metrics but please be advised that an integrated AST must be provided as part of any final deliverable.
- Q: How will you select a proposal if your metrics are not fully defined. In other words, in the BAA we will not have a firm metric to write to.
  - A: Metrics will be defined in the BAA for sensing events, comfort, and durability. Metrics may be customized to meet the requirements of each individual application after selection.

Q&A 7

- Q: Do you have expectations on number of awards and dollar value?
  - A: IARPA does not disclose total program budget, but it is expected that there will be multiple awards based on the diversity of innovative approaches.
- Q: Washability? But description says solvent. Do you mean std washing machine. Dryer requried?
  - A: The solvent must be one of water or commercial dry cleaning solution. The washing metric is defined by international standards. Please see the final BAA for metrics concerning washing. Machine drying is not included as a metric.
- Q: Can you expand on role of active fibers? Role: a) carry electricity or optical signal; b) can the electrical signal be covered by portions of fabric?; c) sensing -> is expectation that fibers will sense?
  - A: Components should be contained within fibers to the maximum extent possible. Please see the BAA for more detail.

Q&A 8

- Q: Can very thin flexible boards be laminated to fabric?
  - A: Solutions must meet the requirements for comfort including stretch, bend, and breatheability (listed in Table 1 of the BAA).
- Q: Visually obvious: Can the AST be visually obvious? Could be important to have a metric here.
  - A: ASTs must meet comfort and durability metrics listed in the BAA. Deliverable items will not be measured for any other factors.
- Q: Can one sub be on multiple teams?
  - A: Yes, however no contractor can be paid for the same work twice.

Q&A 9

- Q: Will audio files (and/or video) files be allowed as part of submissions? Images and location are easy to render in a printable format, but audio is not. If wav files for instance won't be submittable how about YouTube or Dropbox links?
  - A: Proposal submission instructions are in the BAA.

Thanks For Your Interest!

SMART ePANTS

WEAVING ELECTRONICS INTO TEXTILES