PATENTS (INTELLECTUAL PROPERTY)

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Industry Day 2014

Presented by:
Charlene Haley, B.Sc., M.Sc., LL.B., J.D.
LEAD PATENT ATTORNEY

NAVAIR

2010 IEEE Spectrum Patent Power Scorecard

GOVERNMENT AGENCIES

RANK	COMPANY/ORGANIZATION, *COUNTRY* (PARENT ORGANIZATION)	2010 U.S. PATENTS	PIPELINE GROWTH INDEX	PIPELINE IMPACT	SELF-CITATIONS	ADJUSTED PIPELINE IMPACT	PIPELINE GENERALITY	PIPELINE ORIGINALITY	PIPELINE POWER	ADJUSTED PIPELINE POWER
1	U.S. Navy, *U.S.*	304	1.30	0.69	15%	0.69	0.88	0.99	238	238
2	U.S. Department of Health and Human Services, *U.S.*	151	1.25	0.49	15%	0.49	1.17	1.02	109	109
3	Commissariat à l'Énergie Atomique , *France*	224	1.52	0.43	17%	0.43	0.62	1.02	92	92
4	Japan Science and Technology Agency, *Japan*	172	1.61	0.36	13%	0.36	0.89	1.01	89	89
5	Centre National de la Recherche Scientifique, *France*	154	1.39	0.37	13%	0.37	1.08	1.03	87	87
6	Agency for Science, Technology and Research, *Singapore*	46	1.39	1.05	4%	1.05	1.20	1.01	82	82
7	National Aeronautics and Space Administration, *U.S.*	105	1.19	0.66	16%	0.66	0.97	0.99	80	80
8	U.S. Army, *U.S.*	151	1.24	0.46	12%	0.46	0.84	1.00	71	71
9	U.S. Postal Service, *U.S.*	40	3.00	0.79	60%	0.55	0.64	1.02	43	62
10	Ministry of Economy, Trade and Industry, *Japan*	105	1.31	0.44	15%	0.44	0.80	1.01	49	49
11	U.S. Department of Energy, *U.S.*	37	1.48	0.57	6%	0.57	1.00	1.02	32	32
12	National Research Council of Canada, *Canada*	40	2.11	0.41	5%	0.41	0.88	1.02	31	31
13	U.S. Department of Commerce, *U.S.*	9	2.25	0.75	0%	0.75	1.38	1.02	21	21
14	National Security Agency/Central Security Service, *U.S.*	24	1.85	0.67	19%	0.67	0.63	0.96	18	18
15	U.S. Department of Agriculture, *U.S.*	43	1.59	0.26	11%	0.26	0.81	1.04	15	15
16	U.S. Air Force, *U.S.*	45	0.94	0.52	8%	0.52	0.64	1.00	14	14
17	Council of Scientific and Industrial Research, *India*	73	1.38	0.25	26%	0.25	0.25	1.03	6	6
18	Israel Ministry of Defense, *Israel*	11	0.92	0.46	0%	0.46	0.97	1.10	5	5
19	U.S. Environmental Protection Agency, *U.S.*	11	1.10	0.49	18%	0.49	0.72	1.06	5	5

2010 IEEE Spectrum Patent Power Scorecard

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2011 IEEE Spectrum Patent Power Scorecard

GOVERNMENT AGENCIES

RANK	COMPANY/ORGANIZATION, *COUNTRY* (PARENT ORGANIZATION)	2011 U.S. PATENTS	PIPELINE GROWTH INDEX	PIPELINE IMPACT	SELF-CITATIONS	ADJUSTED PIPELINE IMPACT	PIPELINE GENERALITY	PIPELINE ORIGINALITY	PIPELINE POWER
1	U.S. Navy, *U.S.*	320	1.0	0.7	21%	0.7	0.9	1.1	228.3
2	U.S. Department of Health and Human Services, *U.S.*	161	1.1	0.8	28%	0.8	0.9	1.0	130.3
3	National Aeronautics and Space Administration, *U.S.*	110	1.0	0.8	9%	0.8	1.2	1.0	115.5
4	Commissariat à l'Énergie Atomique, *France*	247	1.1	0.7	18%	0.7	0.6	1.0	102.3
5	Agency for Science, Technology and Research, *Singapore*	59	1.3	1.0	1%	1.0	1.1	1.0	83.2
6	U.S. Army, *U.S.*	131	0.9	0.7	10%	0.7	0.9	1.0	76.1
7	U.S. Environmental Protection Agency, *U.S.*	17	1.5	1.1	12%	1.1	2.2	1.1	75.7
8	Ministry of Economy, Trade and Industry, *Japan*	116	1.1	0.7	18%	0.7	0.8	1.1	70.9
9	Centre National de la Recherche Scientifique, *France*	153	1.0	0.5	12%	0.5	0.6	1.1	55.6
10	Japan Science and Technology Agency, *Japan*	112	0.7	0.6	9%	0.6	0.5	1.1	23.2
11	U.S. Air Force, *U.S.*	45	1.0	0.6	6%	0.6	0.7	1.0	18.4
12	U.S. Department of Energy, *U.S.*	27	0.7	0.8	8%	0.8	1.1	1.1	17.9
13	U.S. Department of Agriculture, *U.S.*	61	1.4	0.5	10%	0.5	0.3	1.2	14.9
14	National Research Council of Canada, *Canada*	26	0.7	0.5	2%	0.5	1.0	1.0	8.6
15	Institute of Nuclear Energy Research (Taiwan), *Taiwan*	41	2.2	0.3	50%	0.3	0.3	1.0	5.8
16	State of Israel Ministry of Defense, *Israel*	11	0.9	0.6	10%	0.6	0.6	1.1	4.1
17	U.S. Postal Service, *U.S.*	26	0.6	0.4	9%	0.4	0.4	1.2	2.8
18	U.S. Department of Commerce, *U.S.*	16	1.5	0.3	33%	0.3	0.3	1.2	1.7
19	National Security Agency/Central Security Service, *U.S.*	10	0.4	0.7	2%	0.7	0.8	0.6	1.3
20	Council of Scientific and Industrial Research, *India*	36	0.5	0.3	14%	0.3	0.3	1.1	1.2

2012 IEEE Spectrum Patent Power Scorecard

Interactive: Patent Power 2013 - IEEE Spectrum

Rank ▼	Company / Organization	Country of Headquarters	2012 U.S. Patents	Pipeline Growth Index	Pipeline Impact	Self-Citations (%)	Adjusted Pipeline Impact	Pipeline Generality	Pipeline Originality
1	U.S. Navy	United States	358	1.12	0.68	0.22	0.68	0.84	1.09
2	Agency for Science, Technology and Research	Singapore	79	1.34	1.06	0.01	1.06	1.73	1.06
3	U.S. Army	United States	175	1.3	0.77	0.14	0.77	1.01	1.01
4	Commissariat à l'Énergie Atomique et aux Énergies Alternatives	France	292	1.16	0.62	0.23	0.62	0.66	1.04
5	Centre National de la Recherche Scientifique	France	197	1.23	0.62	0.16	0.62	0.74	1.1
6	U.S. Department of Health and Human Services	United States	144	0.82	1.29	0.29	1.29	0.78	0.99
7	National Aeronautics and Space Administration	United States	115	1.01	0.81	0.08	0.81	0.99	0.97
8	Israel Ministry of Defense	Israel	16	1.45	0.92	0.05	0.92	1.8	1.1
9	Rafael Advanced Defense Systems Ltd.	Israel	16	1.45	0.92	0.05	0 92	1.8	1.1
10	U.S. Department of Energy	United States	37	1.37	1.03	0.02	1.03	0.8	0.84

2012 IEEE Spectrum Patent Power Scorecard

The Patent Board Scorecard Ranks ETRI #1 in Initial Innovation Anchor Scorecard™

Top 10 Institutions in Innovation Anchor Scorecard™ | Annual snapshot

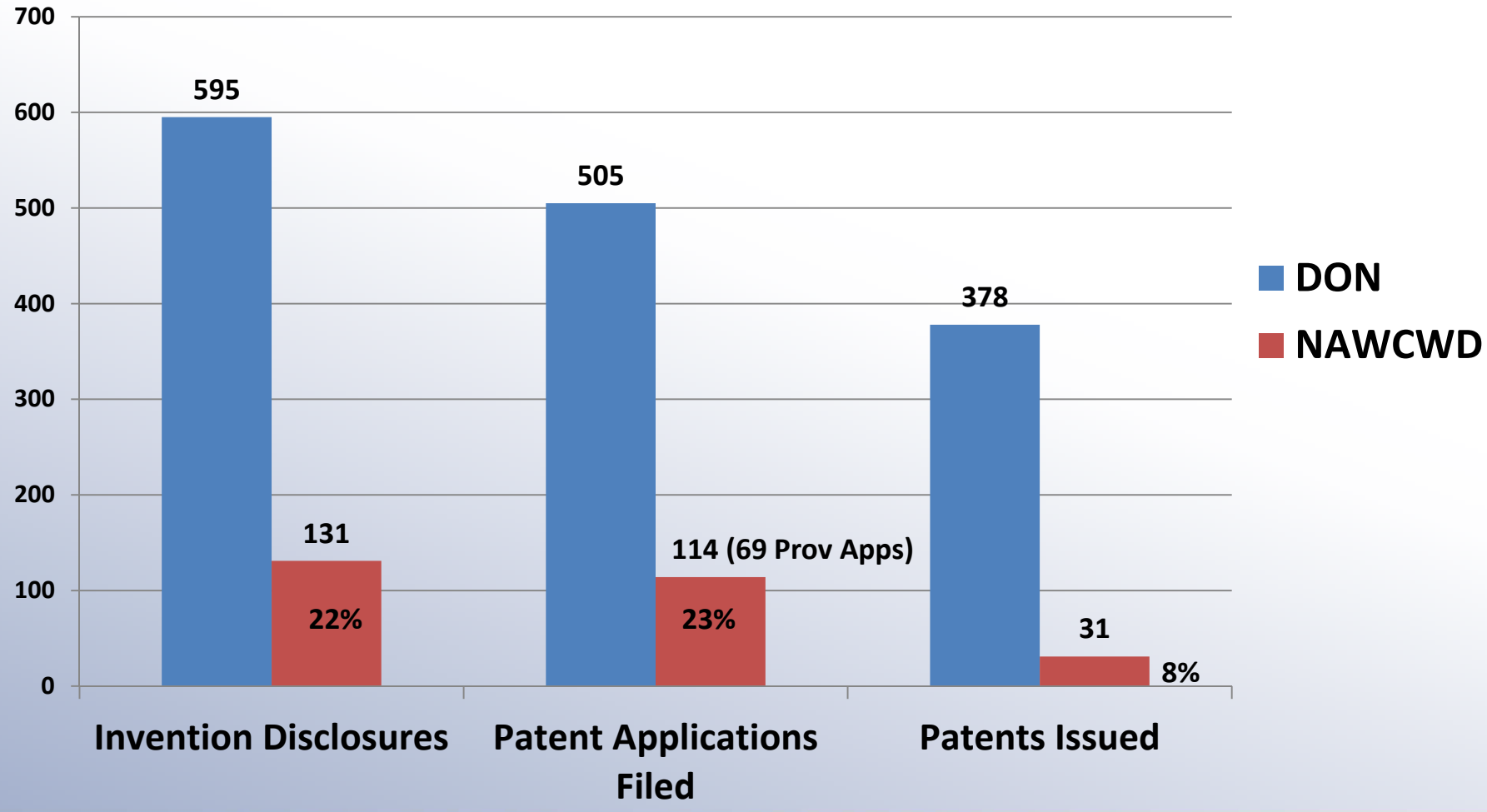
Previous Rank	Current Rank	Company	Patent Count*	Science Strength™	Innovation Cycle Time™	Industry Impact™	Technology Strength™	Research Intensity™
2	1	Electronics & Telecommunications Research Inst.	537	34	7.50	1.01	364.09	0.02
1	2	University of California	370	19277	11.10	1.37	341.88	1.41
3	3	Industrial Technology Research Institute	465	7	8.80	0.83	258.08	0.02
4	4	MIT/Mass Inst of Technology	173	5529	11.30	1.93	225.59	1.35
5	5	US Navy	321	316	12.60	0.91	194.21	0.28
7	6	Stanford University	176	2905	10.70	1.60	190.26	0.95
20	7	General Hospital Corp, The	90	31004	11.70	2.85	172.53	1.81
6	8	US DOE	266	1526	11.70	0.91	163.06	0.90
8	9	California Inst of Technology	116	4621	12.00	1.84	143.26	1.12
13	10	Fraunhofer Gesellschaft	147	71	11.90	1.35	133.18	0.05

STATUS OF PATENT PROGRAM FY2012

- **Increase in submission of Invention Disclosures**
  - **up 211%**

- **Increase in patent application filing**
  - **up 253%**

FY2012 PATENT STATS NAWCWD OGC COMPARED TO DON



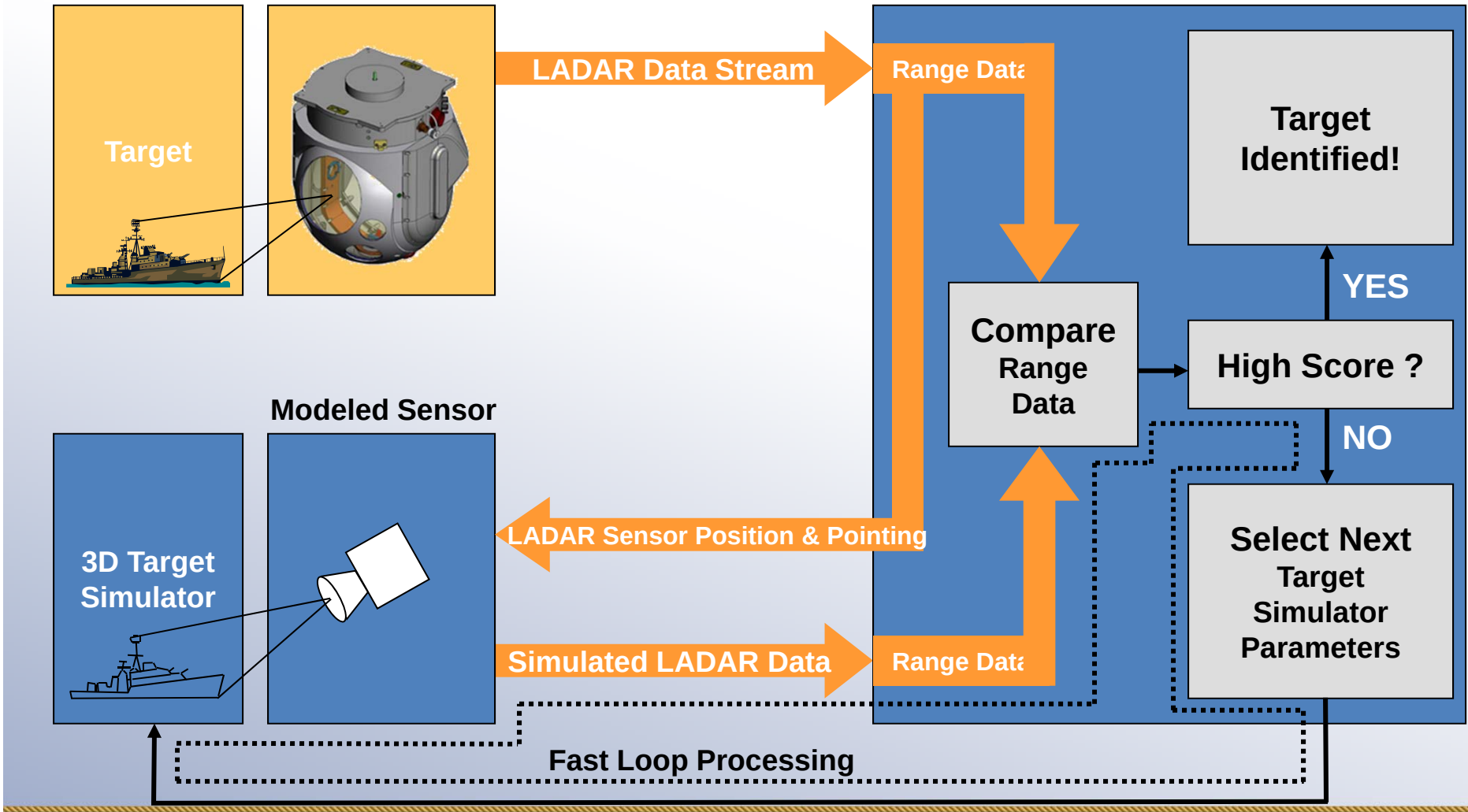
PATENTED TECHNOLOGIES

Top 10 Patents with Commercial Potential!

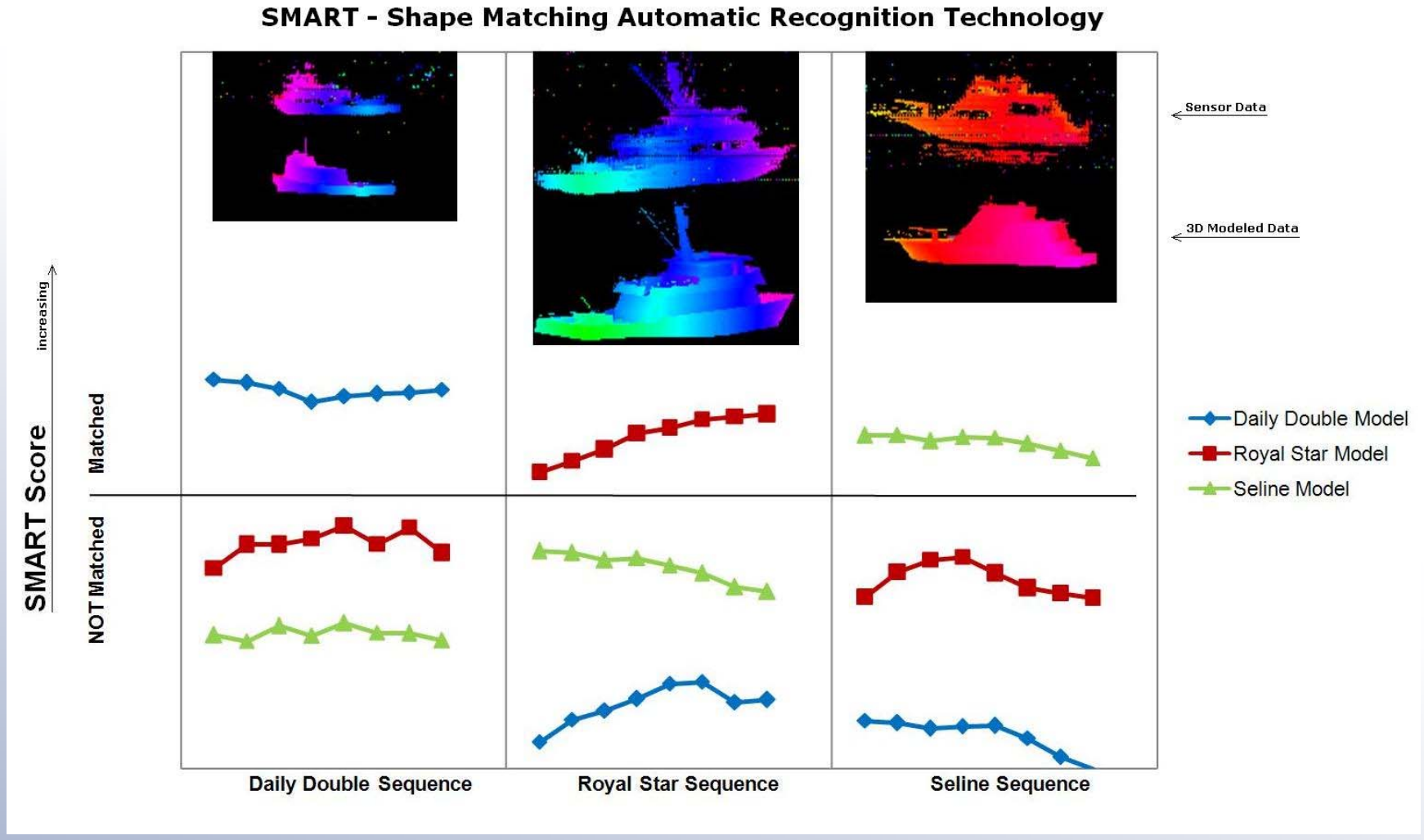
1. LADAR Stream Formatting and Processing Method
2. Three Dimensional Shape Correlator
3. Alcohol to Jet Fuels/Renewable High-Density Tactical Fuels
4. Poly(3,4-alkylene dioxythiophene)-Based Capacitors Using Ionic Liquids as Supporting Electrolytes
5. POSS Polymer
6. Face Recognition Process
7. Fumeless Latent Fingerprint Detection
8. Nanoplasmonic Cavities for Photovoltaic Applications
9. Field Colorimetric Test Device
10. Electro-Optic Signal Modulators

LADAR Stream Formatting & Processing Method

SMART – Shape Matching Automatic Recognition Technology

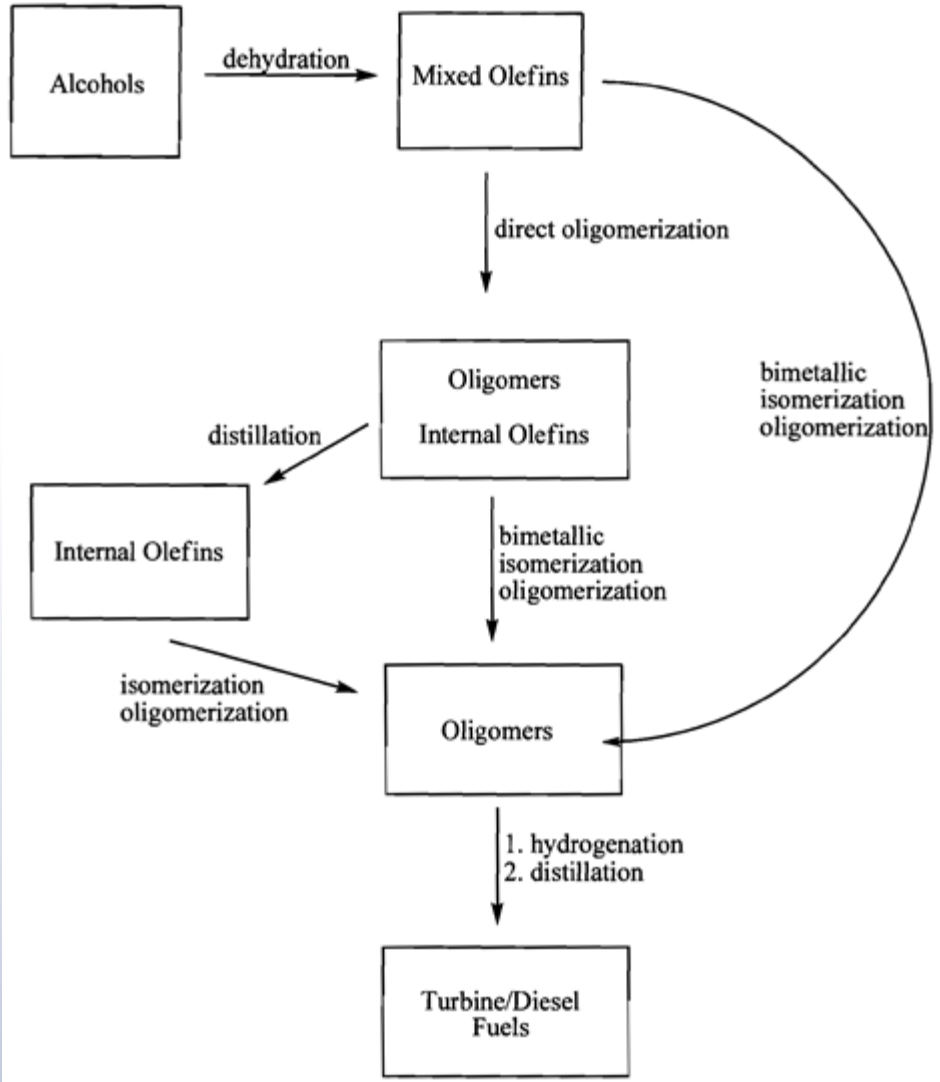


Three Dimensional Shape Correlator



Alcohol to Jet Fuels

- Biofuels patent portfolio consists of over 40 patent applications and continues to grow
- The first patent (U.S. Patent 8,227,651) was granted on July 24th, 2012 in NAWCWD's biofuels portfolio
- Patent Licensing Agreement with Cobalt Technologies, Inc. for 13 inventions
  - 4 patents have already issued
- Non-food biostock to fuels



Renewable High-Density Tactical Fuels

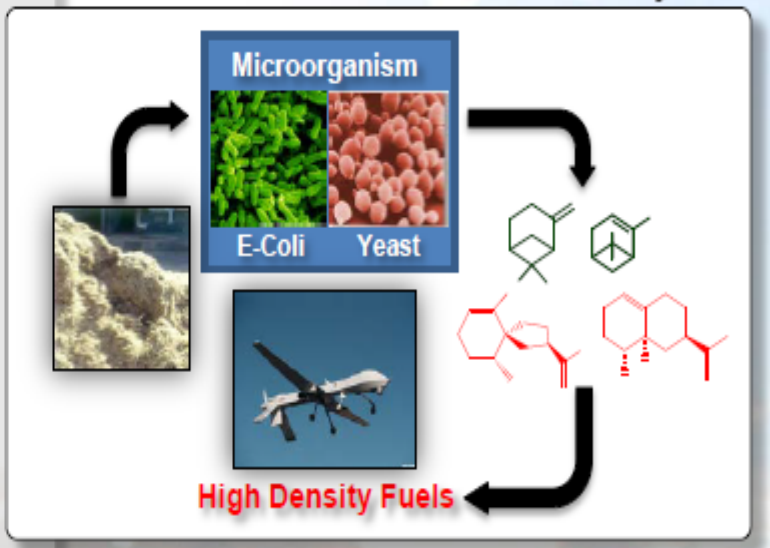
Inventor: Dr. Benjamin G. Harvey

(Michael E. Wright, Heather A. Meylemans, and Roxanne L. Quintana on several of the patents)

We have developed a variety of renewable high density fuels that have applications for jet, diesel, missile, and UAV propulsion. These fuels can be produced in a sustainable fashion from waste biomass and have been designed to outperform both conventional renewable fuels as well as petroleum derived fuels.

Commercial / Alternative applications

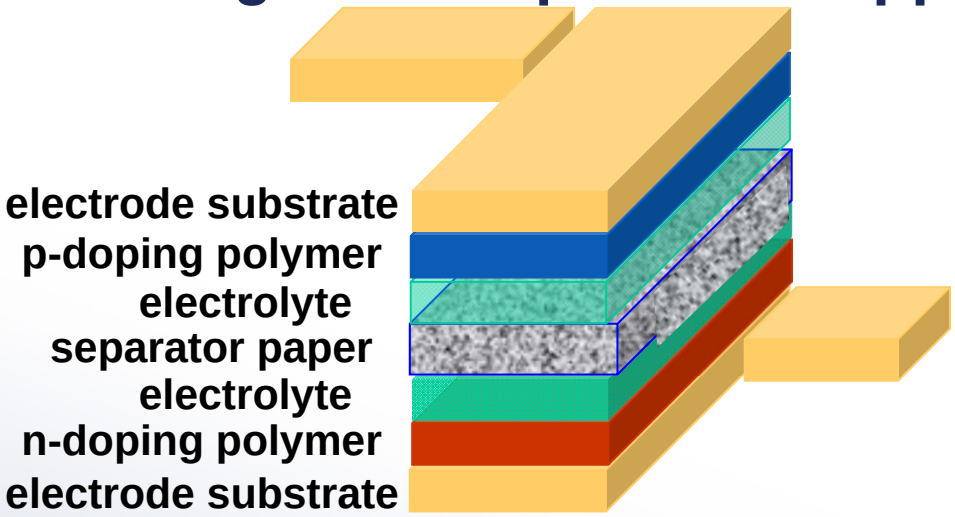
- ✓ Jet/Diesel Fuel
- ✓ We have a variant that can be used as high octane gasoline—automobiles, av gas, etc.
- ✓ Motor oil
- ✓ Lubricants
- ✓ Resins
- ✓ Paint
- ✓ Coatings/Finishes
- ✓ Scents/Flavorings
- ✓ Cosmetics



Poly(3,4-alkylene dioxythiophene)-Based Capacitors Using Ionic Liquids as Supporting Electrolytes

- **High power energy storage**
  - **Higher power density than batteries (kW/kg)**
  - **Lower operating voltage than batteries (1-3V)**
  - **Shorter operating times than batteries (sec-min)**
  - **Higher energy density than traditional capacitors (~3Wh/kg)**
- **Applications**
  - **Military (short intense bursts of power)**
  - **Computer backup (less power, longer time)**
  - **Electric vehicle burst power (intermediate power and length)**

Poly(3,4-alkylene dioxythiophene)-Based Capacitors Using Ionic Liquids as Supporting Electrolytes



These cells are smaller than a credit card

Power Density

- Currently 625 Watts/kg
- Cathode improvements could double this

Charge Time

- Under a minute; more studies needed.

Stability/Hold Life

- In inert atmosphere, devices are quite stable; good hermetically sealed packaging will be crucial.

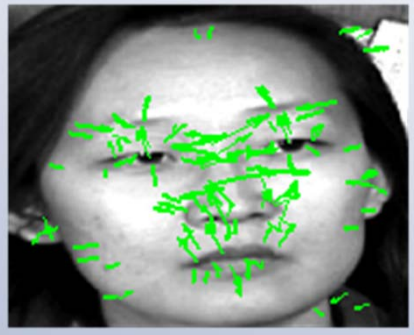
Face Recognition Process

Feature Descriptor (SIFT) detects and extracts local feature descriptors that are reasonable invariant to:

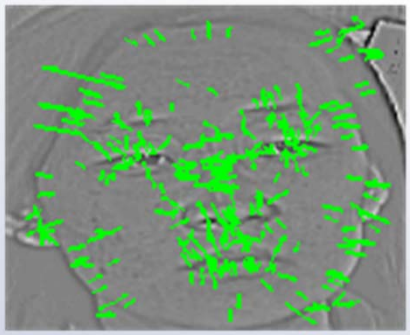
- Changes in scale, 2D translation and rotation illumination, image noise and viewpoint.

SIFT keypoint detector is not invariant to illumination changes.

Highpass filtering + adaptive thresholding ensures adequate number of descriptors per image.



Keypoint selection with original SIFT method, 120 points



30˚ pose change

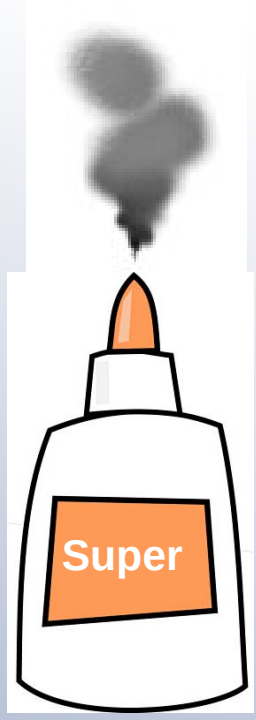
30˚ pose change

Face Recognition Process

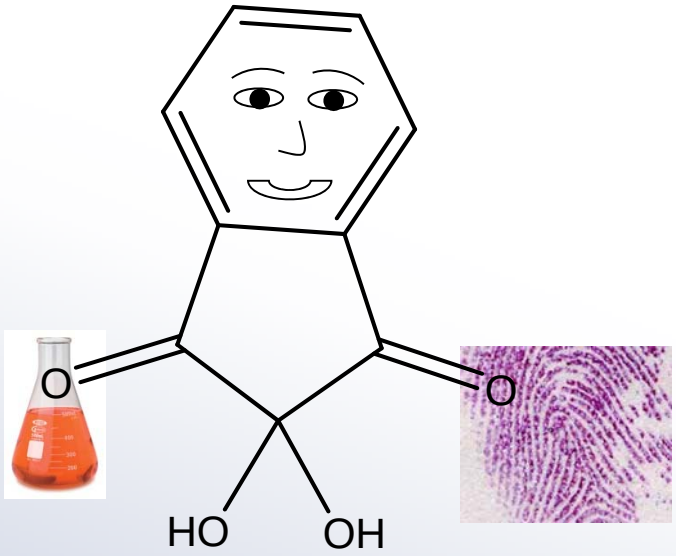
Fumeless Latent Fingerprint Detection

Current Methods of Latent Fingerprint Development

Fuming Super Glue



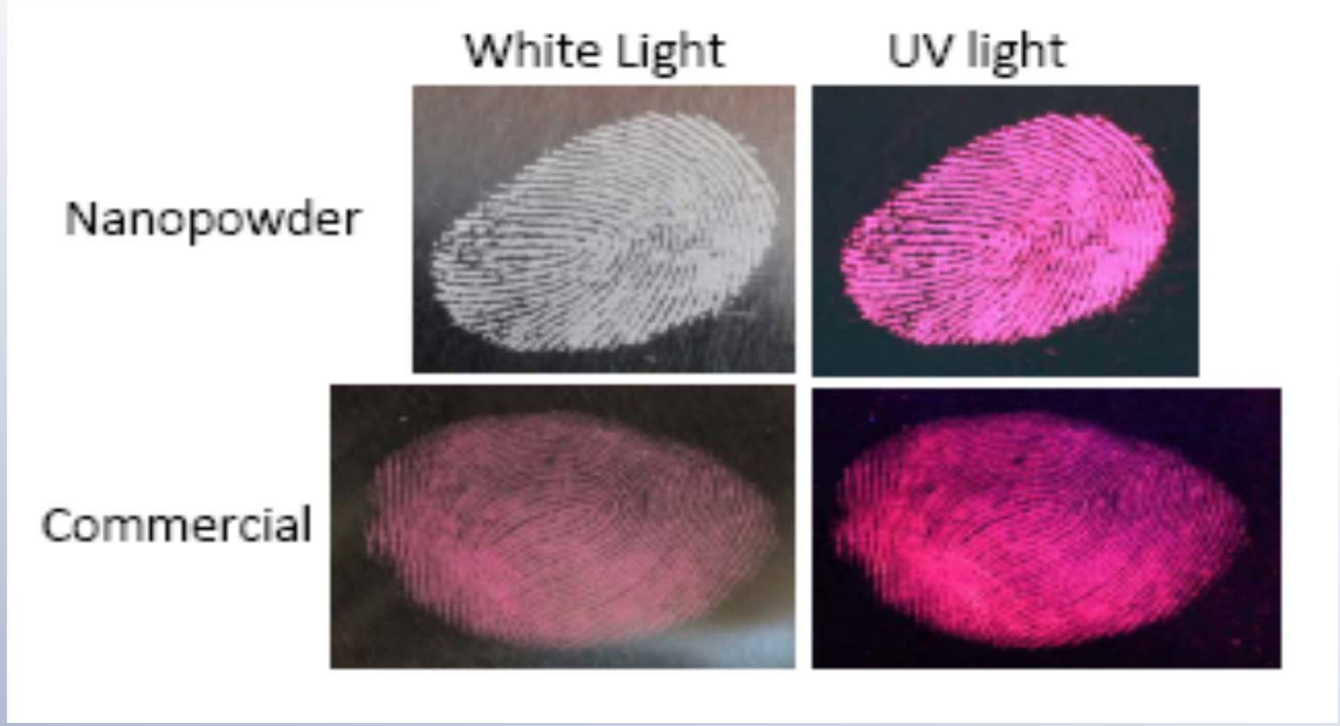
Ninhydrin



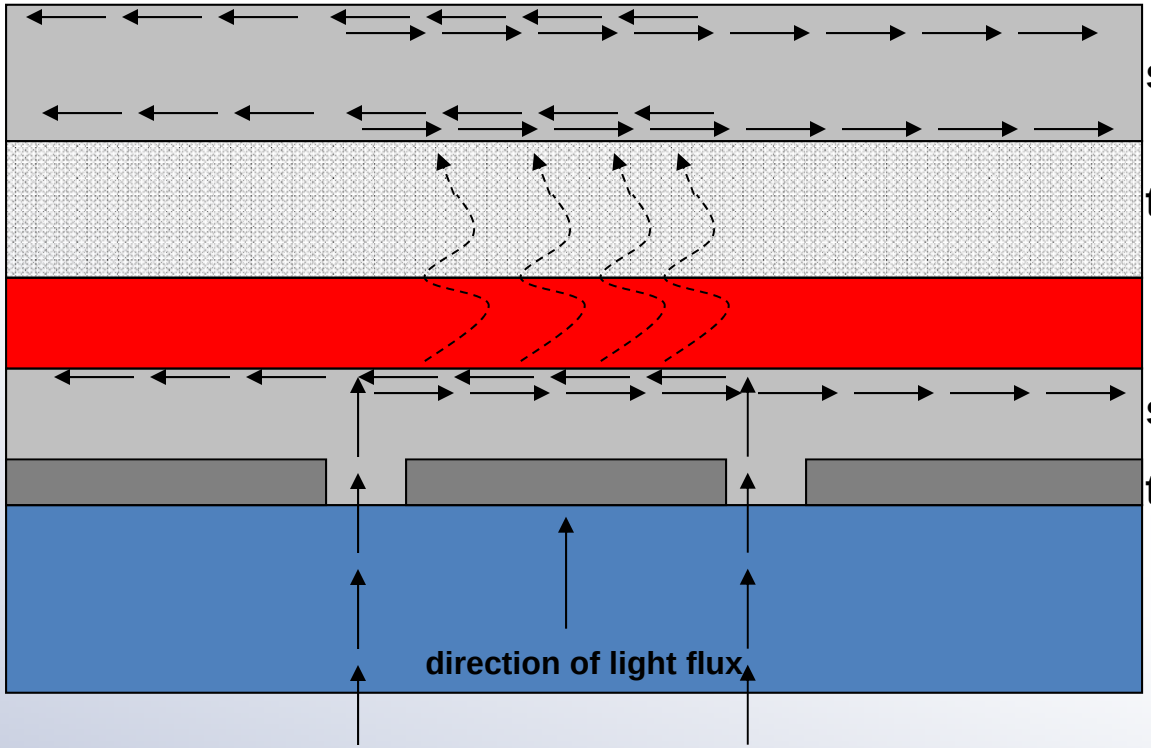
Fumeless Latent Fingerprint Detection

Commercial / Alternative applications

Detection of latent finger, nose, and paw prints for crime scene evidence collection and military applications.



Nanoplasmonic Cavities for Photovoltaic Applications

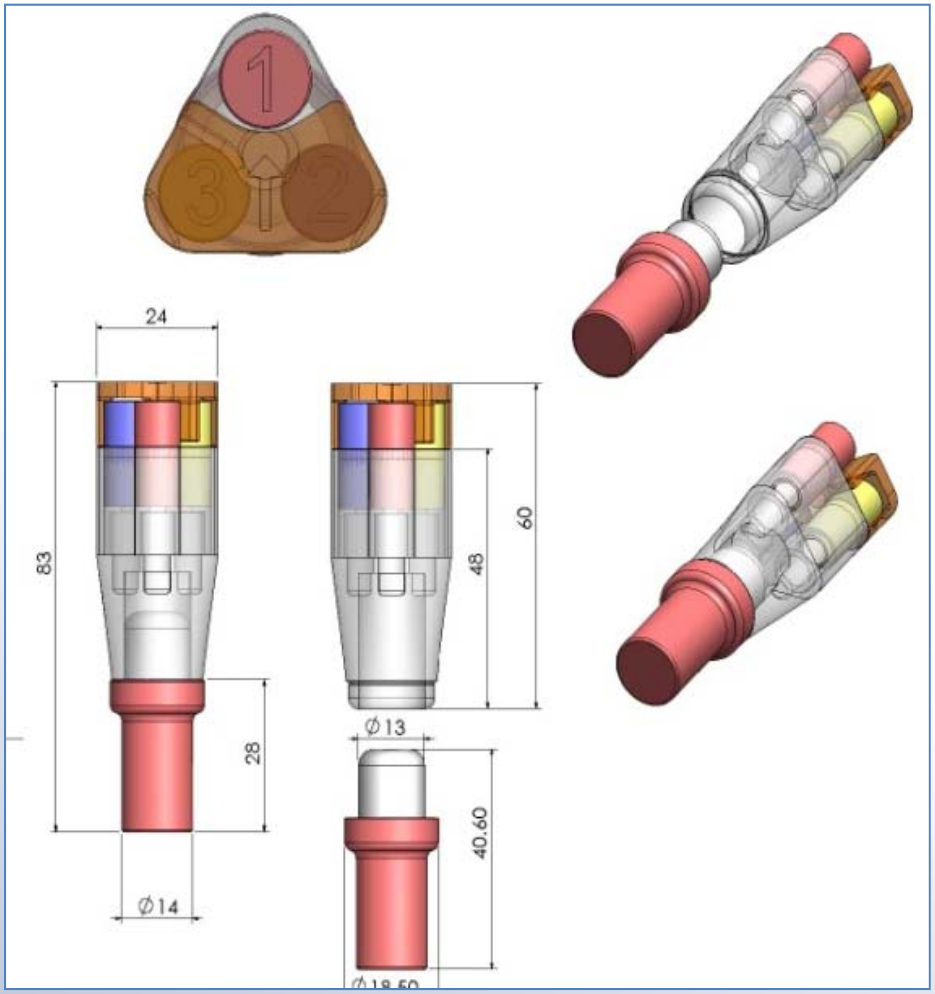


Advantages to this design

1) plasmonic enhancement of light absorbance
2) slits set up plasmonic interference pattern
3) polythiophene chains lie in plane and absorb light more efficiently travelling parallel, (McGehee, et al. Advanced Functional Materials, Volume 15, Issue 12 , Pages 1927 - 1932 : 31 Oct 2005). This design causes a fraction of the incident light to travel parallel to the chains.

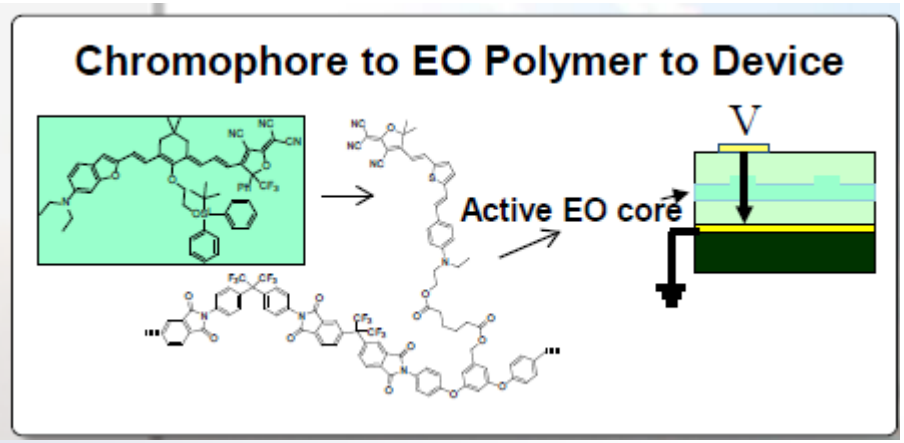
Field Colorimetric Test Device

Small, refillable, disposable, adaptable kit (like a first-aide kit) with tests that presumptively detect explosives and drugs

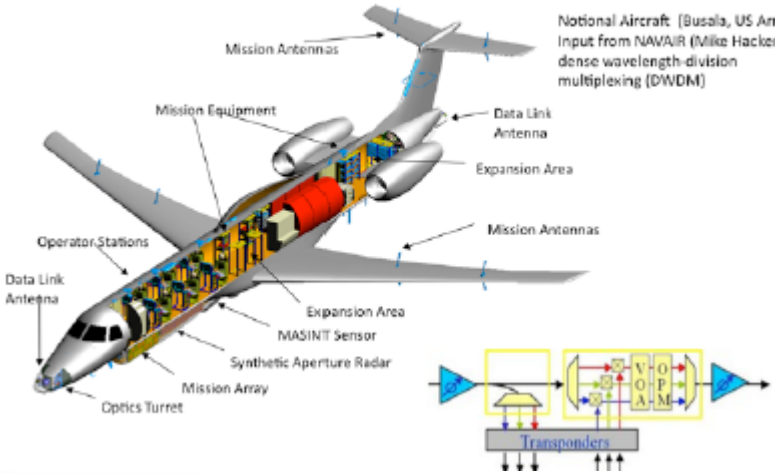


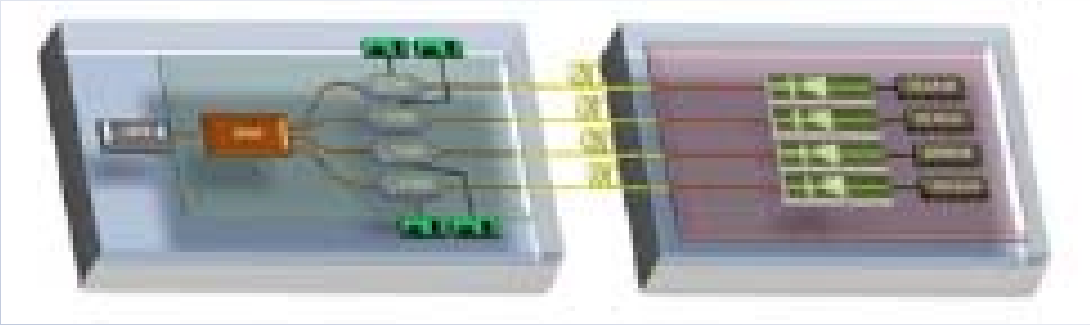
Conceptual Form:
Simple
Intuitive
Small
Obvious results
No sampling gloves
Contained reagents
Analyze now or later
Foolproof operation

Electro-Optic Signal Modulators



Replace heavy copper coax cable with Fiber Optic Links



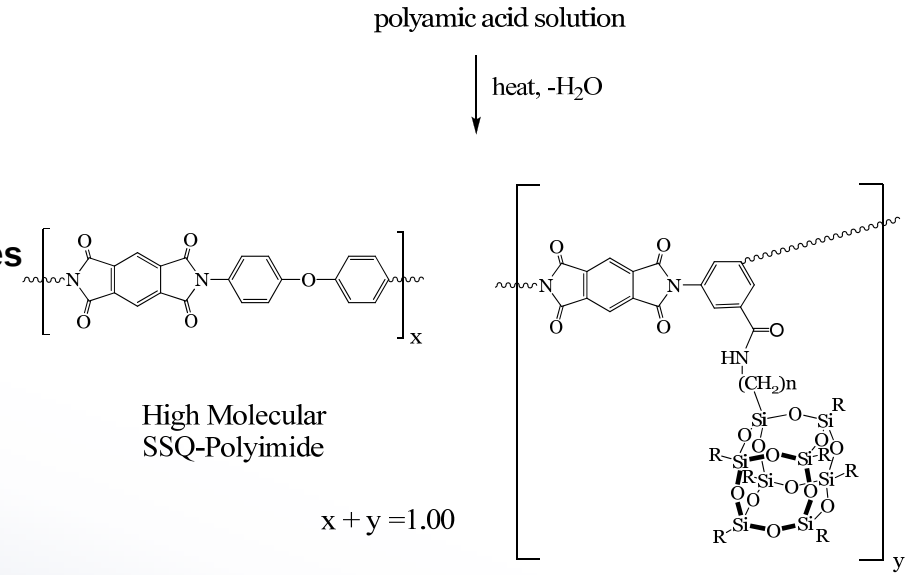


NEW MATERIALS FOR ELECTRO-OPTIC SIGNAL MODULATION
- Optical Switching at Sub-Nanosecond Speed
- Bandwidth Greater Than 100 GHz

Polyhedral Oligomeric SilSesquioxane (POSS) POLYMER

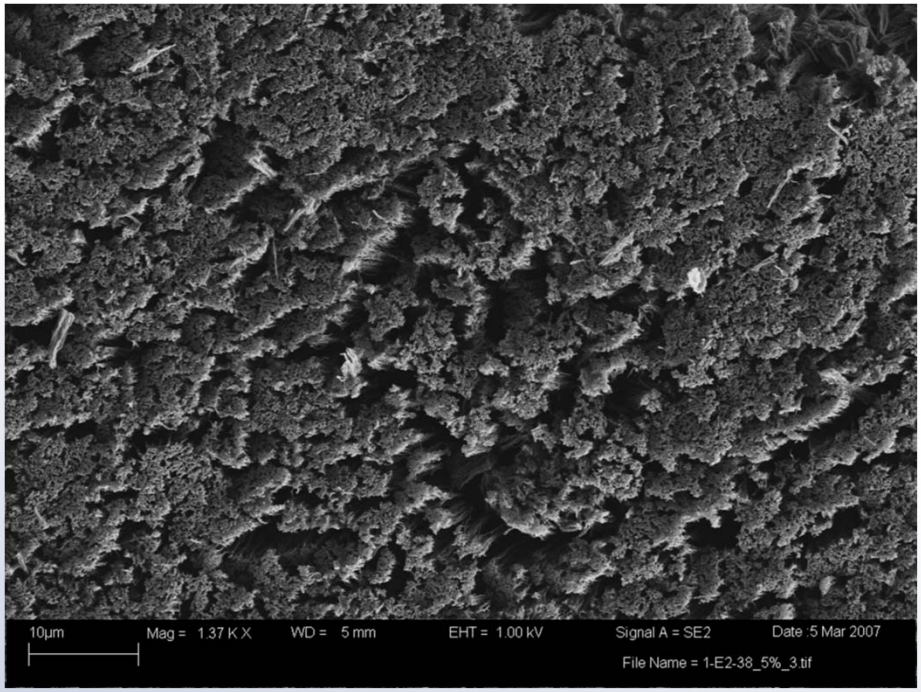
Commercial / Alternative applications

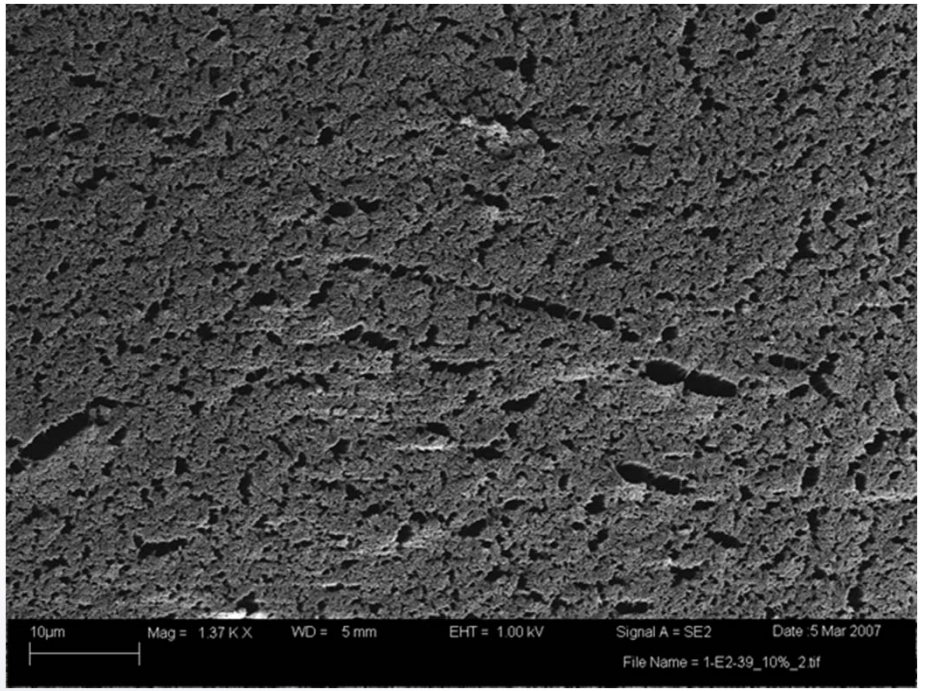
- ✓ Light weight composite structures for LEO
- ✓ Coatings to protect Photovoltaics/Electronics
- ✓ Flexible and Tough Kapton equivalent films
- ✓ Modifying/Decreasing flammability of polymers
- ✓ Adjusting hydrophobicity of the polymer surfaces
- ✓ Preparing Nano-structured polymer toughners
- ✓ Burn modifiers for Polymeric Materials
- ✓ Hybrid Polymeric Materials



Atomic Oxygen erodes away polymer in days without POSS protection

Polyhedral Oligomeric SilSesquioxane (POSS) POLYMER





Scanning electron microscope images of two MC POSS polyimides that were exposed to the LEO environment for 3.9 years on MISSE-1. The magnification in both images is 1,370.