Aeronautics, Space, Security and Defence
Industries Association of Europe

Industry Perspectives on European Technology Dependency

Supply chain and enabling technologies

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Bernard Candaele – PoC Industry EDA Components Captech

Industry analysis on European Technology Dependency

Outline of the presentation

1. Innovation results from 2 complementary R&T models
2. Technology capability requires collaboration between system actors - users, industrial technology suppliers and research R&T labs
3. The recent threats for European supply chain with Globalization and economic crisis impact our supply chain
4. The established European cooperation
5. Pilot case of Cross-sectorial Si Electronic Component
6. Critical Technologies – Which enabling actions for the Future?

Developing innovative systems

Reactive and affordable innovation is the result of cross fertilisation between two complementary R&T models

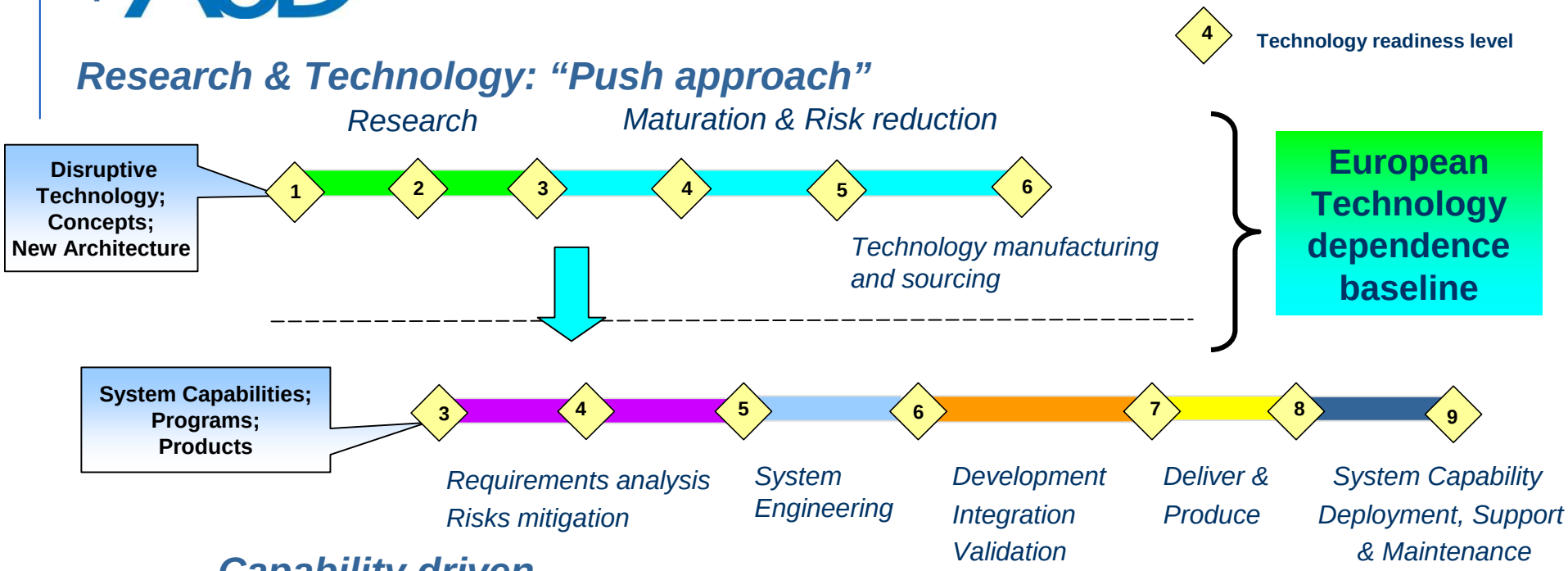
• ***A capability-driven R&T model*****,** with the objective to develop ***system capabilities***, focused on ***operational systems*** (such aeronautics, military, security and space) and demonstrators.

• ***A technology-driven R&T model*****,** with the objective to build-up ***in advance to programmes*** the ***technology basis*** from which programmes will draw off-the-shelf solutions**.**

It is improper to make a distinction only in terms of TRL, the difference is also in the level of integration

- *Technology shall reach maturity (high TRLs) before insertion in a program (electronic components, detectors, …) and be manufactured*
- *On an integration scale (system, equipment, component,…), technology base is rather in the lower part, when capability-driven projects are rather in the upper part.*

Research & Technology vs Engineering



R&T to be preserved (KET*)

While maturing European silicon technologies (TRL5)

towards Security of Supply chain

Eco system and related European component Suppliers to be maintained in Europe

Most of our component suppliers get hurt by the impact of globalization (consumer electronics has left Europe)

* : Considered KET by EU task force are Advanced materials, Microelectronics, Nanotechnologies, Photonics, Biotechnologies

Tackling European dependencies

- Addressing dependencies both in terms of :
  - Security of supply,
  - Access to emerging technology
- Multiple SoS current & strategic risks:
  - Crisis – Collapse of Suppliers
  - Fragility of suppliers because of a narrow aeronautics, defence, security and space market (specificities, long cycles,…),
  - Globalisation, shift of production (and now of R&T) to Asia and US
  - Strategic control of the supply chain by shareholders motivated only by economical considerations, not in a position to integrate sovereignty considerations.
- R&T funding for the technology base up to technology maturing is needed:
  - General situation of industrial policy budgets,
  - Prominence of capability-driven R&T.
- Technology Base is cross-sectorial by nature, and is a factor of innovation;
  - Coordination EC-ESA-EDA, Member States and Agencies, ASD and technology suppliers

European technological dependencies

4 – A case study of established European cooperation: MMICs

MMICs : An example

- Tripartite AMSAR (UK-FR-GE) active array antenna radar demonstrator : the capability-driven dimension

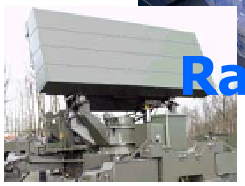
- UMS joint-venture : the technological dimension (AsGa)
  - But some other choose different route (ex :Filtronics, …)
- Development and consolidation of UMS as an industrial operator

- Coping with a technological breakthrough (GaN) : KORRIGAN
- Consolidating the supply chain with GaN material : MANGA
- MAGNUS programme expected to start in 2012 : dedicated to the development of new generation of MMICs and modules based on a stable and industrial GaN technology available at UMS (GH25 process)

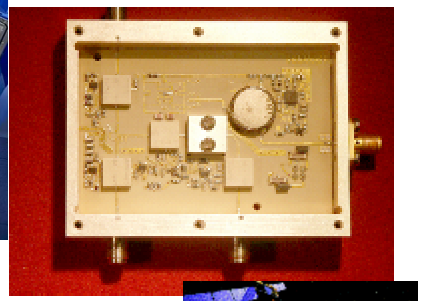
- Towards an extension of the « UMS Club » ?

UMS Business Model

- United Monolithic Semiconductors has been created in 1996, joint venture Thales and EADS, to provide a European source of III-V technologies and products.
- Activities: design, foundry, assembly (but no epitaxial material)
- Industrial facilities in Ulm, Germany and Orsay, France, and sales offices in USA and China.
  - 250 people, annual sales 51.2M€
  - **Four markets are:**
    - Telecommunication infrastructure,
    - Automotive and ISM,
    - Space,
    - Security and Defence.



Radars



Satcom
VSAT

Several models exist to manufacture European technology

UMS is one successful model serving Aerospace, Space, Security and Defence as well as European industrial markets

European technological dependencies

5 – Pilot case : silicon electronic components supply chain

First Actions from the Space Sector

ESA activities and priorities on components

- **ITAR regulation issues.**
- **Increase European non-dependence for space components and maintain the viability of European actors**
- **Current priorities : GaN, Rad Hard Power Mosfets, ASIC and DSM (Deep Submicron), non ITAR FPGA, …**
- **European Component Initiative (ECI), dedicated to components**

In Q1 2010, initial discussions to leverage component supply chain for future European System actors

- **Involved suppliers : ATMEL (ASIC with ST and FPGA provider), STM (DSM CMOS 65nm, SiC, new technology Ft>500Ghz, …), e2v (ADC 12bits/2Gsps, Imaging technologies), FPGA in 28nm**
- **Space System industries Thales Alenia Space and Astrium**
- **Question to Defense Industries : extend the solutions to Military needs**

Example ASD

Cross-sectorial Si Electronic Component supply chain

Activities and effort in M€ (*)	Specific Part for Space	Specific Part for Defense	Specific Part for Home land Sec	Common Core investment	Total
A: 65 nm CMOS	15		8	22	45
B: assembling	10	7		17	34
C: FPGA	11	8	4	44	67
D: DSP/µP	15	10	8	70	103
E: µC 20 MIPS	8			4	12
F: CAN/CNA	10	6		4	20
G: Analog Asic	8	11	1	20	40
H: Imaging	24		13	30	67
I: Power devices	3,5	12	5	20	40,5
TOTAL	104,5	54	39	231	428,5

Several technologies to be addressed by the same supply chain eco-system for the benefit of several sectors such Defense EDTIB, Homeland security & Space

Effort about 110M€/year

* : first effort estimates

Propose a coordinated action for Micro/nano Electronic Components ?

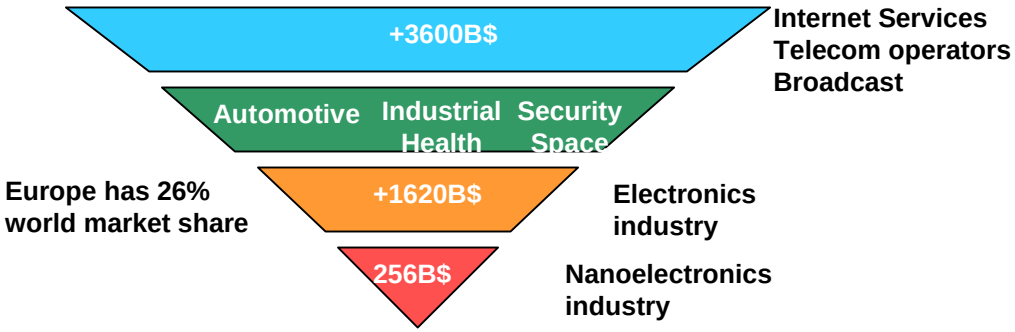
- **Si Electronic Components is a real issue for aeronautics, defence, security and space (plus other sectors)**
- **Adressing this requires an investment in the range of €100-120M/year (all relevant sectors)**
- **Corresponding business is estimated at €1-2B/year**
- **Such business is of no interest to current semi-conductor industry which is focused on the consumer sector**

Which enabling actions for the Future?

Several have now said :

FABLESS = JOBLESS

KETs* are a key enabler for added-value : microelectronics



R&T is not enough to deliver capabilities : Aeronautics, Defense, Security and Space require design solutions and manufacturing

Aeronautics, Defence, Security and Space cannot pay the alone for these factory and full component solution

The KET initiative appears to be a relevant answer to the challenge

The industry is not seeking budget for itself, it is seeking support for its supply chain

Relevant actors shall become associated to the governance at EU level for KET

* : KET : Key Enabling Technologies, Europe preparing 2020

Some back-up slides

Questions ?

What are the Keys for sustainable operations

Trends in electronic activity in Europe

Case of the Impact of globalisation on silicon electronic components

U.S.A. National Nanotechnology Initiative

US DoD Components related budget

Keys for sustainable operations

- **Address the entire supply chain, from material production to final assembly, through design and foundry:**
  - **Technology shall be ready for industrial applications (reproducibility, reliability,…);**
  - **Effort not limited to R&T (low TRL 2 ~4), development shall result in mature technology (TRL ~6).**

- **Competitiveness (both technical and economical)**
  - **A sustainable source is a source at market price, at market performance, with profitable operations (ref to some existing models).**
  - **Requires the right technical solutions**
  - **Requires usually access to a market larger than just space, or defence, or security (vertical model not a suitable one) (all grouped may not be enough) and export.**

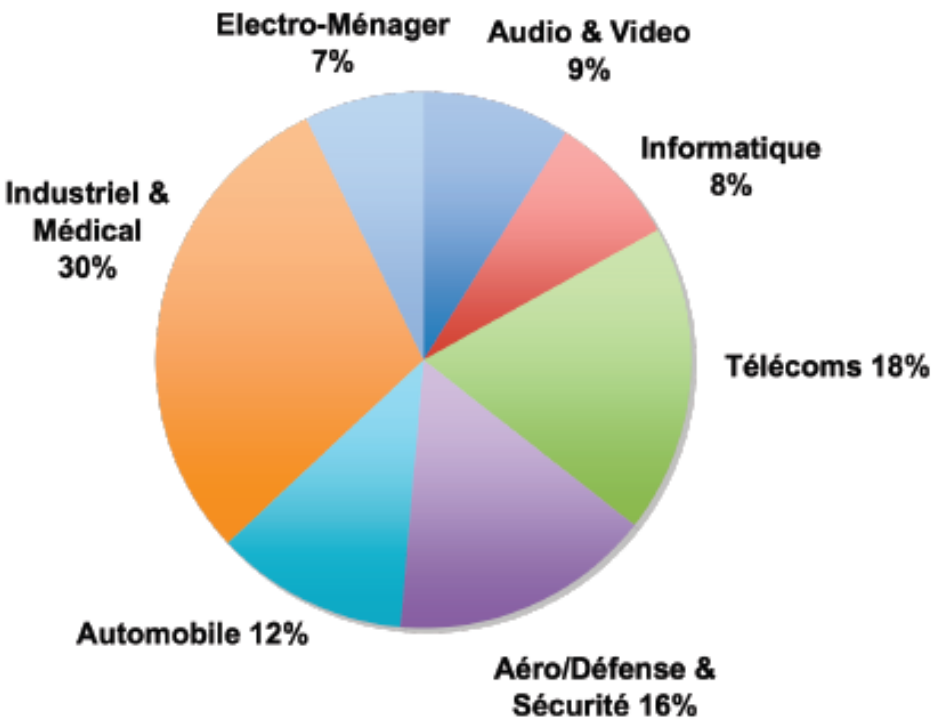
- **Strategic control of the supply chain**
  - **A tool for maintaining business focus on strategic applications**
  - **Keeping for Europe the benefit of European investment**

Size of the electronic activity

Worldwide 2009 production = 1 100 B€

European 2009 production = 220 B€

Production d'équipements électroniques en Europe en valeur, 2009



Source DECISION, Mai 2010

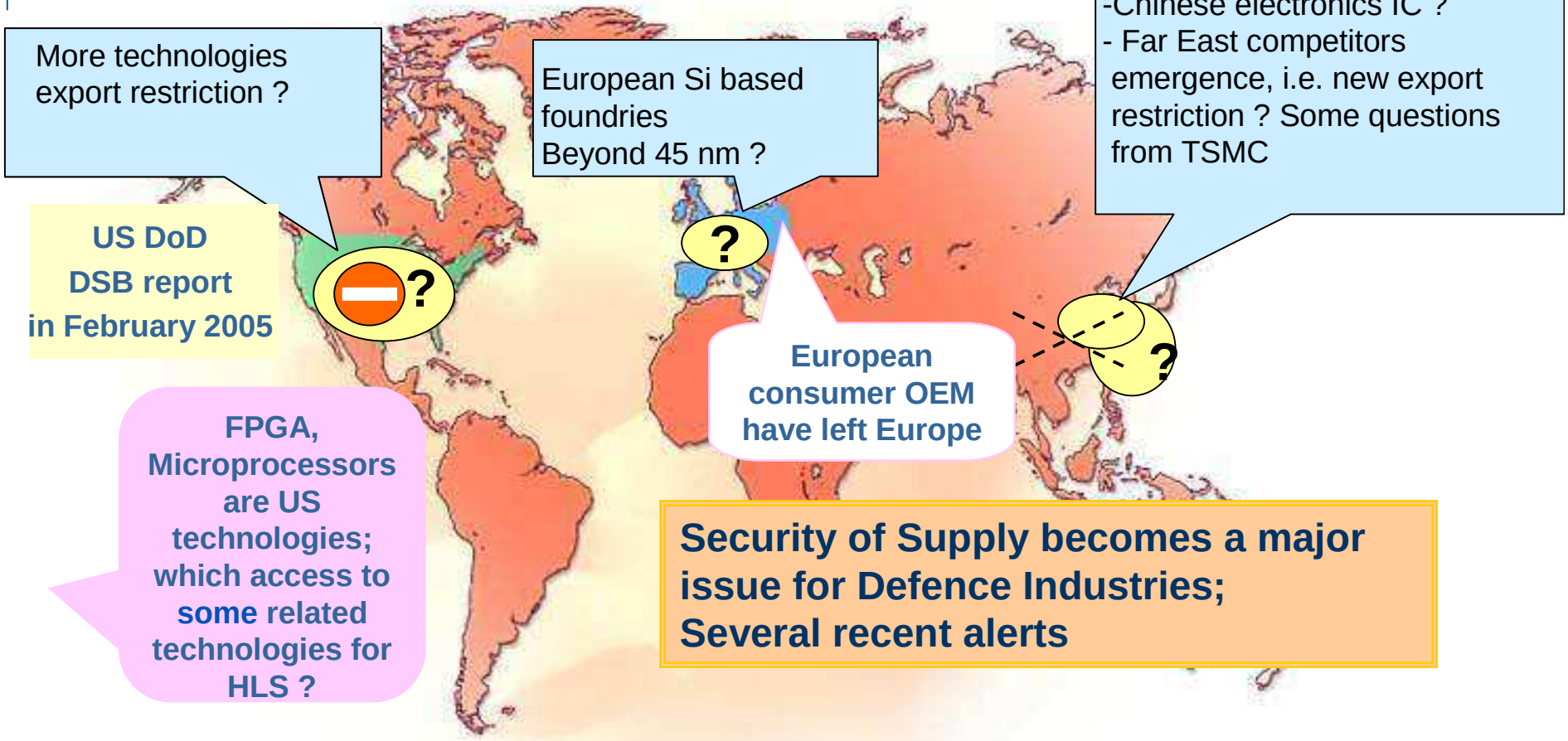
Part de l'Europe dans la production mondiale d'équipements électroniques en 2009

Secteur d'application	Part de la production mondiale
Industriel	**36%**
Aéro/Défense & Sécurité	**30%**
Automobile	**30%**
Médical	**24%**
Télécommunications	**18%**

Following the telecom crisis and the migration of its R&D and manufacturing in China, Europe specialises in electronics applications requiring safety, security and reliability compliant operation

Ex : Impact of globalisation on silicon electronic components

Today Silicon actors for Digital silicon



Tomorrow Silicon foundries accessible by ASD European Industries (pessimistic or realistic scenario ?)
Tomorrow European supply chain for industrial actors ?

U.S.A. National Nanotechnology Initiative
Actual 2009 Agency Investment per Program Component Area ($M)

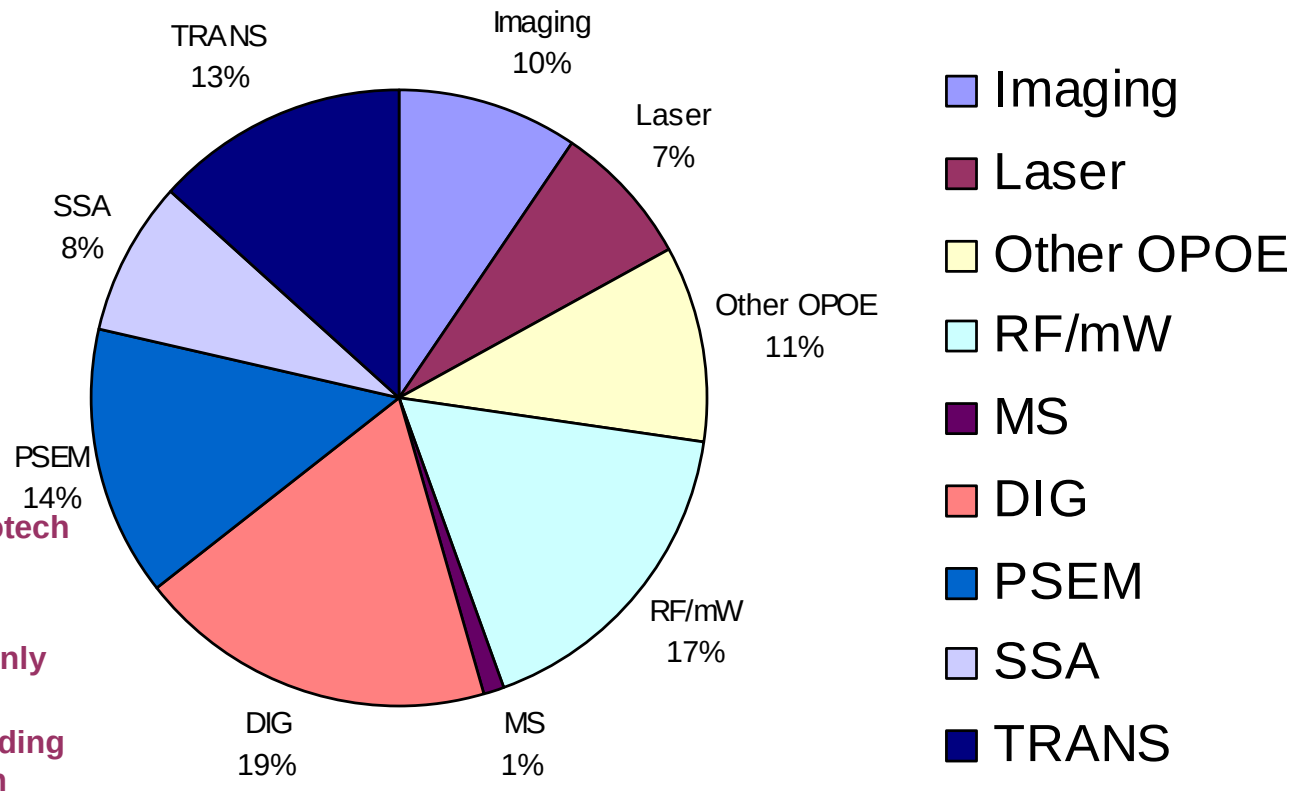
Who supports ?		1. Fundamental Phenomena & Processes	2. Nanomaterials	3. Nanoescale Devices & Systems	4. Instrument Research, Metrology & Standards	5. Nano-manufacturing	6. Major Research Facilities & Instr. Acquistion	7. Environmental, Health, and Safety	8. Education & Societal Dimensions	NNI Total
DOE	1	99.8	92.8	7.9	21.1	6.9	100.5	3.1	0.5	**332.6**
NSF	2	143.6	72.42	54	21.44	27.5	31.5	26.8	31.3	**408.56**
HHS/NIH	3	46.7	73.9	172.4	17.5	2.3	13.5	12.0	4.5	**342.8**
DOD	4	162.8	67.5	166.9	9	29	19.7	4.1	0	**459**
DOC/NIST	5	23.1	8.5	17.0	19.4	9.4	12.4	3.5	0.0	**93.4**
EPA	6	0.2	0.2	0.1	0	0	0	11.1	0	**11.6**
HHS/NIOSH	7	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0	**6.7**
NASA	8	0	8.6	5.1	0	0	0	0	0	**13.7**
HHS/FDA	9	0.0	0.0	0.0	0.0	0.0	0.0	6.5	0.0	**6.5**
DHS	0	0	3.7	5.3	0	0.1	0	0	0	**9.1**
USDA/NIFA	11	1.0	2.0	5.7	0.0	0.2	0.0	0.5	0.5	**9.9**
USDA/FS	12	2	1.4	0.7	1.1	0.2	0	0	0	**5.4**
CPSC	13	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	**0.2**
DOT/FHVA	14	0	0.9	0	0	0	0	0	0	**0.9**
DOJ	15	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	**1.2**
TOTAL		**479.2**	**331.92**	**435.18**	**90.82**	**75.55**	**177.56**	**74.5**		**$1,701M**

Source: Executive Office of the President of the United States
Presentation A.Wild ENIAC JU – Nanoforum Madrid 11/2010

US DoD Components related budget

US DoD IAP1 related RDE&T - programs and budget in 2008

Total 1B$



As reported during EDA Discotech study and SRA

Refer to

- **Non confidential programs only (black programs not listed)**
- **Related R&D programs including integration and validation with higher TRL are part of system capability /platform /equipment procurement programs : they are not included in the 1B$ USD effort**

735 M$ DARPA related to Components

328 M$ RL Air Force, Army and Navy

Source: EDA Captech IAP1 program – Discotech SRA