



ESTEC Final Presentation Day, March 29, 2011

RADEF status report

**ESA/ESTEC Contract No. 18197/04/NL/CP:
“High Energy Heavy Ion Test Facility for
Component Radiation Studies”**

Ari Virtanen, JYFL

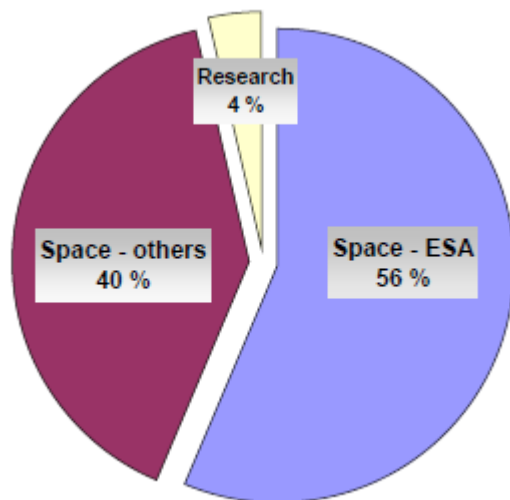




Usage of beam time

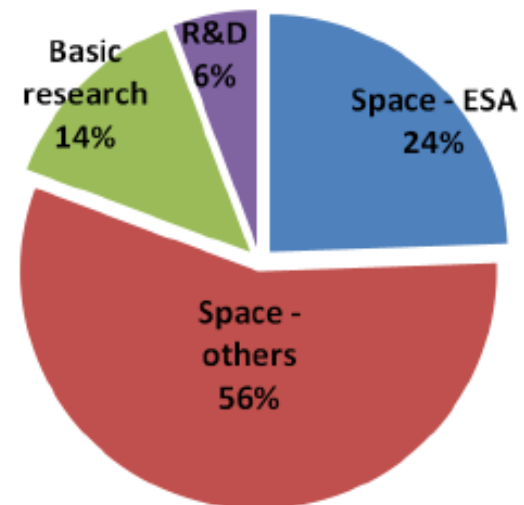
2009

Total space-beam hours 898



2010

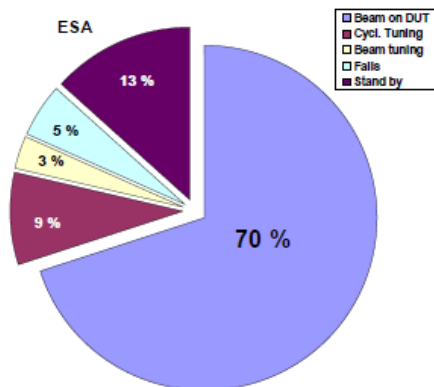
Total space-beam hours 1190



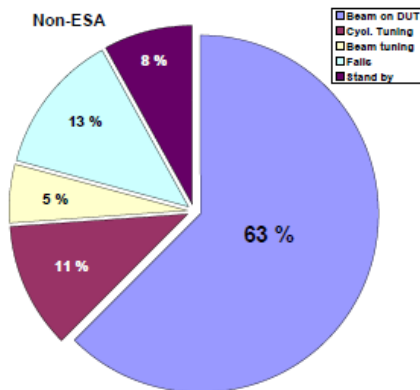


Beam distribution

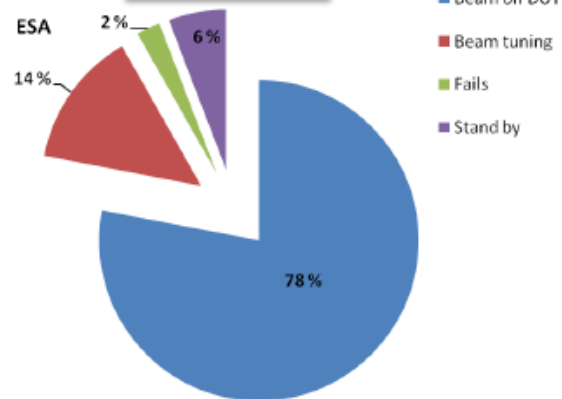
2009



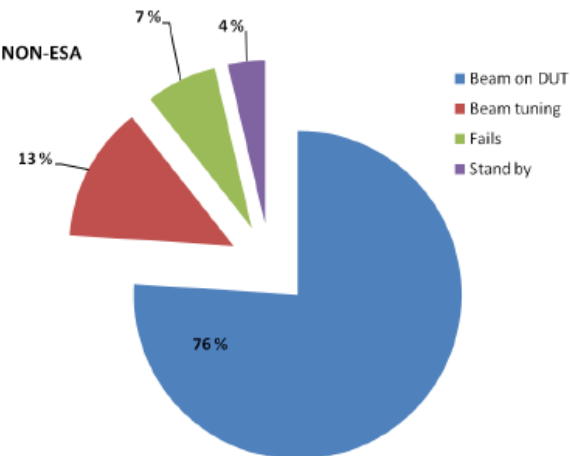
Non-ESA



2010



Non-ESA

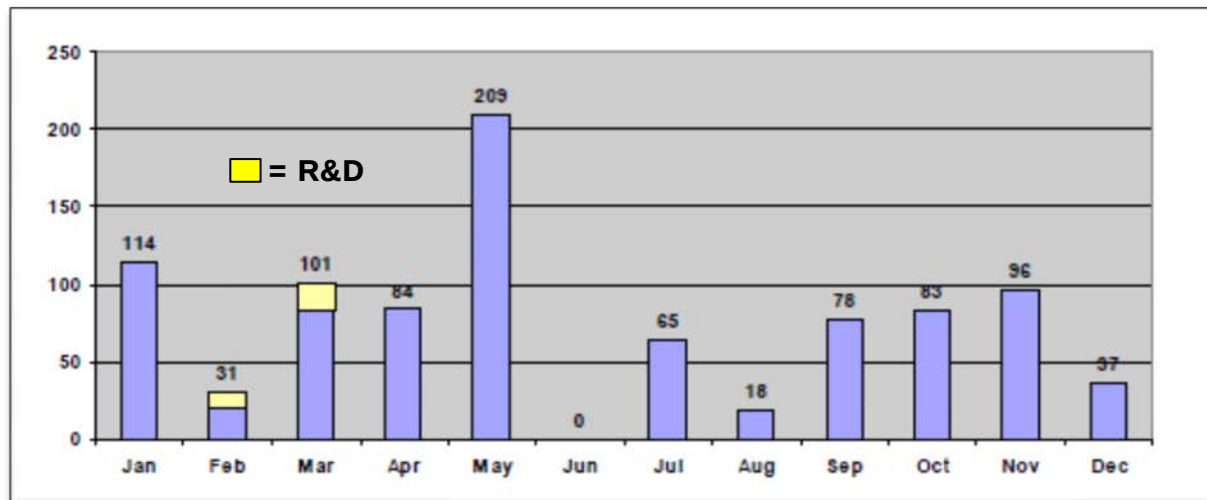




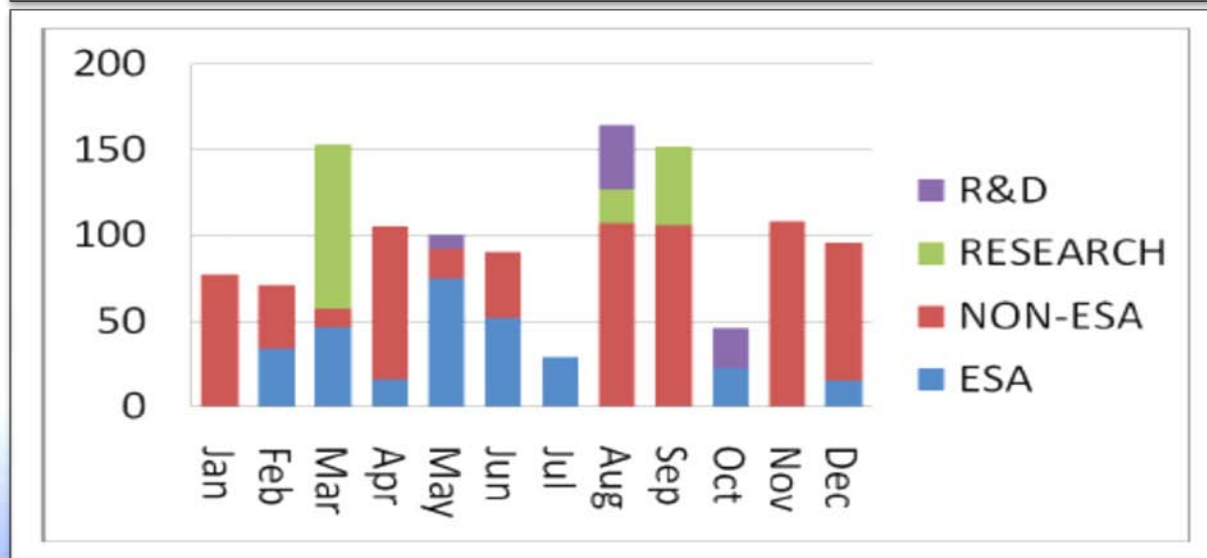
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Monthly distribution of beam hours

2009



2010





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Users

2009

ASTRIUM SAS, France
ESA, The Netherland
NASA/JPL, CA, USA
IDA, Germany
TRAD, France
Thales Alenia Space, France
CEA, France
HIREX Engineering, France
RUAG Sweden, Sweden
EASII IC SAS, France
ST Microelectronics, France
Sandia National Laboratories, NM, USA
Democritus University of Thrace, Greece
Kayser Threde, Germany

2010

ASRO Oy, Finland
ATMEL, France
CEA, France
EASII IC SAS, France
ESA/ESTEC, The Netherland
HIREX Engineering, France
IDA, Germany
INTA, Spain
NASA/JPL, CA, USA
RUAG Sweden
Sandia National Laboratories, NM, USA
Swedish Space Corporation
STMicroelectronics, France
Thales Alenia Space, France
TRAD, France
Vanderbilt University, TN, USA





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Always everything does not work!

During the RUAG run, February 15th, 2010,
a "water beam" in RF-2 was noticed...



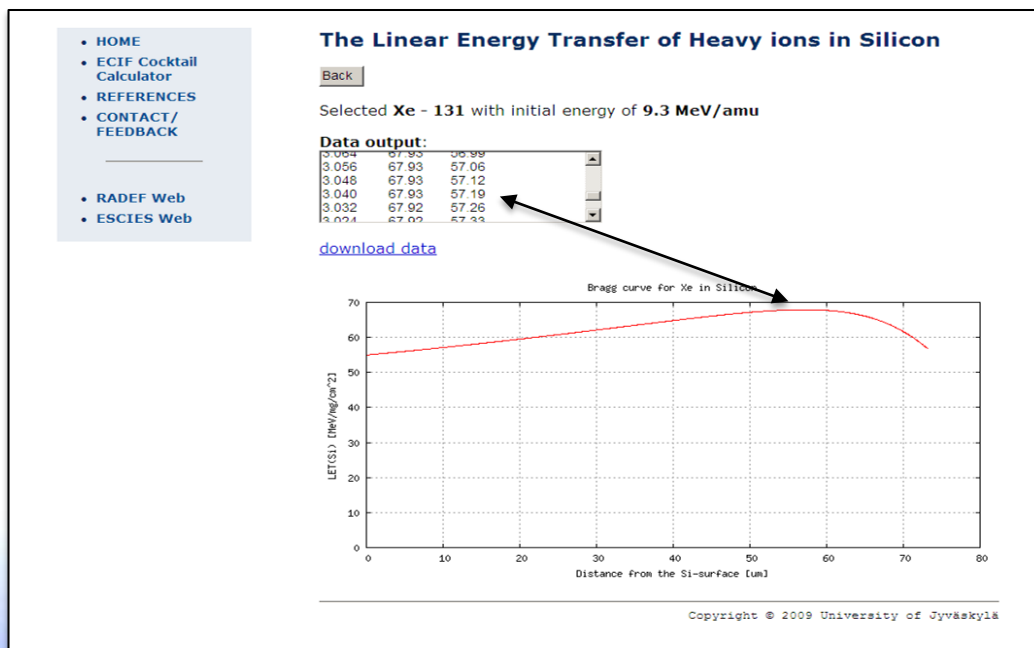


Upgrades and R&D

ECIF Cocktail calculator was installed:

A. Javanainen, W. H. Trzaska, R. Harboe-Sørensen, A. Virtanen, G. Berger and W. Hajdas, Semi-empirical LET Descriptions of Heavy Ions Used in the European Component Irradiation Facilities, IEEE Trans. Nucl. Sci., Vol. 57, No. 4(1) (2010) pp. 1946–1949

<http://users.jyu.fi/~arjavana/LET/>



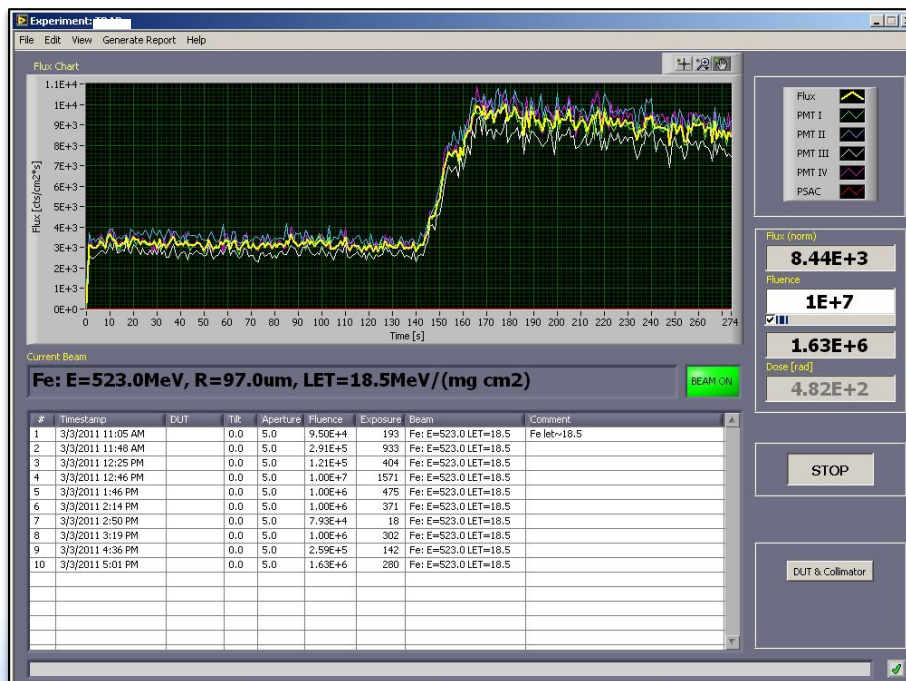


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Upgrades and R&D

New user interface was installed:

- Done simultaneously with the new LabVIEW 2010-version
- More flexible, customers can e.g. control the start /stop commands by using TTL-signal from their own computer

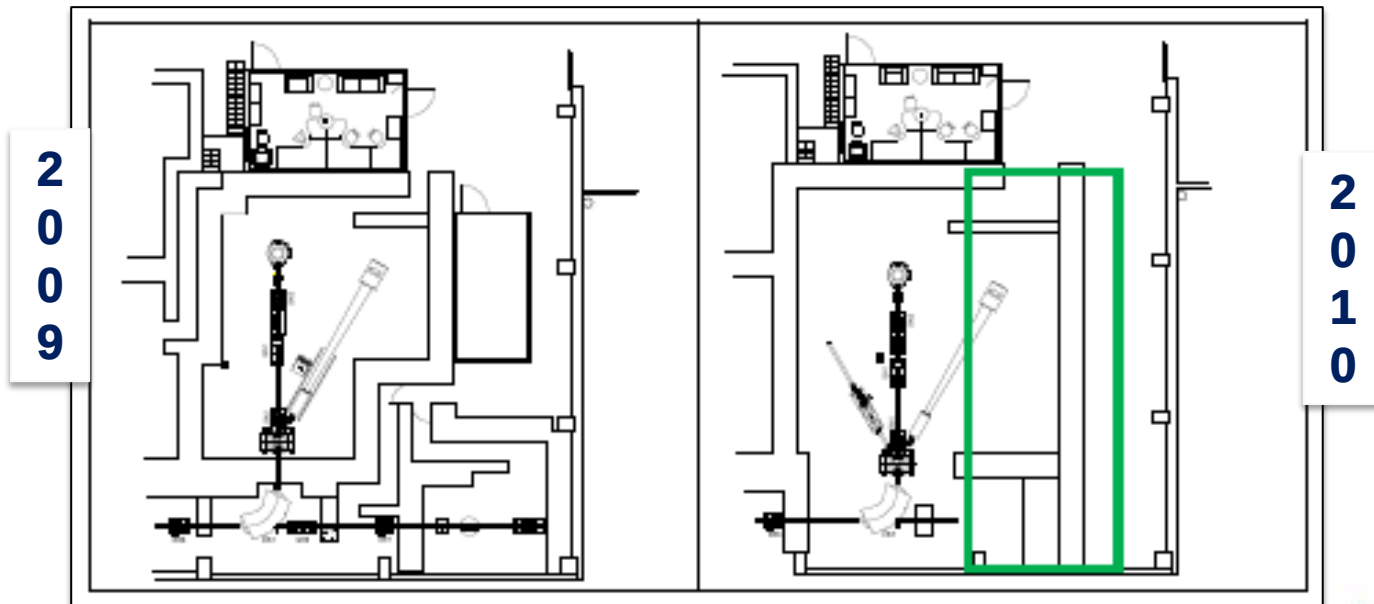




Upgrades and R&D

The re-construction of RADEF-cave was started:

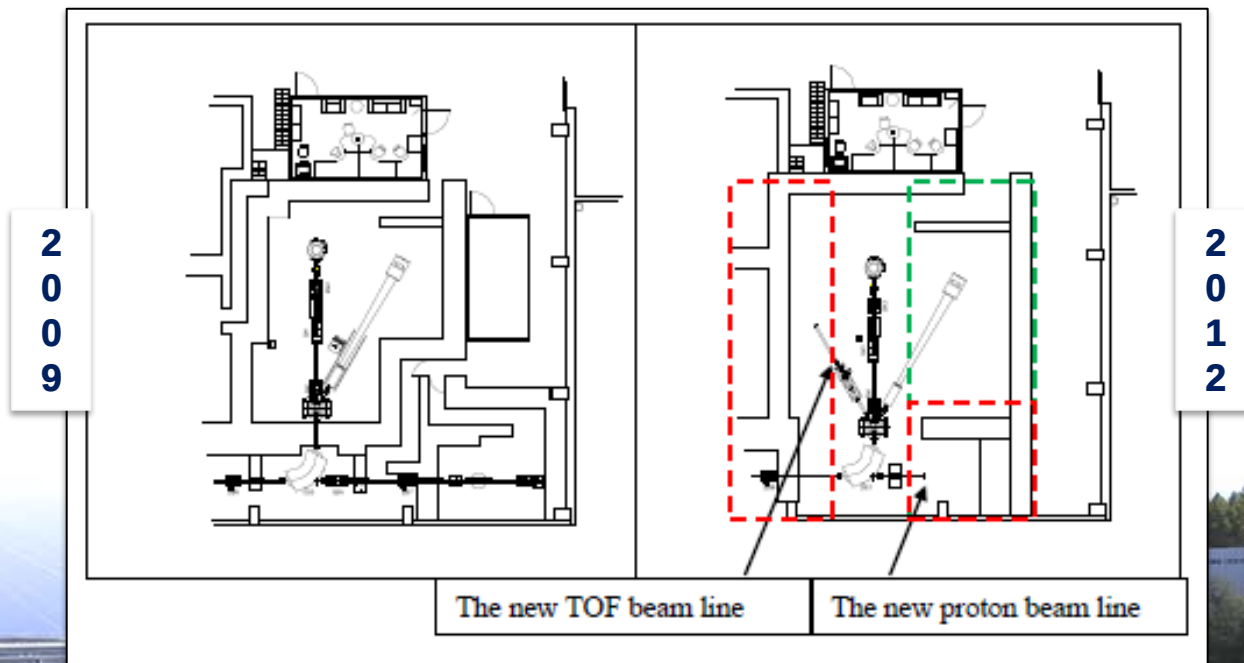
Green area represents the part of the cave where the work was started during the weeks 42-44 in 2010



Upgrades and R&D

The goal of the re-construction:

- The cave will be larger
- The proton beam line will be moved to the new position
- A new beam line will be built and furnished with a permanent time-of-flight (TOF) system
- Equipped with two MCP detectors with a pin-diode at the end. The construction allows a precise determination of ion mass and energy as well as the measurement of ion LET in a permanent set-up
- Will be very useful when developing new beams and ion cocktails
- Aim is to develop beams with higher energies to increase the ion range
- Easy to keep ECIF database up-to-date with the new TOF set-up.





Publications for 2009 - 2010

1. Can Atmospheric Neutrons Induce Soft Errors in NAND Floating Gate Memories?, G. Cellere, S. Gerardin, M. Bagatin, A. Paccagnella, A. Visconti, M. Bonanomi, S. Beltrami, R. Harboe-Sørensen, A. Virtanen, P. Roche, IEEE Electron Device Letters 30, no. 2 (2009) 178–180
2. The First Experimental Values for the Stopping Power of 89Y Ions in Carbon, Nickel and Gold, J. Perkowski, J. Andrzejewski, A. Javanainen, W.H. Trzaska, T. Malkiewicz, K. Sobczak, A. Virtanen, Vacuum 83 (2009) 73–76
3. RADECS 2008 Workshop Overview, Virtanen, R. Harboe-Sorensen, IEEE Trans. Nucl. Sci., Vol. 56, No. 4(2) (2009) pp.1889–1890
4. Experimental Linear Energy Transfer of Heavy Ions in Silicon for RADEF Cocktail Species, Javanainen, M. Sillanpää, W. H. Trzaska, A. Virtanen, G. Berger, W. Hajdas, R. Harboe-Sørensen, H. Kettunen, T. Malkiewicz, M. Mutterer, J. Perkowski, A. Pirojenko, I. Riihimäki, T. Sajavaara, G. Tyurin and H. J. Whitlow, IEEE Transactions on Nuclear Science, Vol. 56 No. 4 (2) (2009) pp. 2242–2246
5. Radiation Tolerance Tests of Small-Sized CsI(Tl) Scintillators Coupled to Photodiodes, E. Valtonen, J. Peltonen, O.V. Dudnik, A.M. Kudin, H. Andersson, Yu.A. Borodenko, T. Eronen, J. Huovelin, H. Kettunen, E.V. Kurbatov, J. Lehti, S. Nenonen, M. Rossi, R. Vainio, A. Virtanen, IEEE Transactions on Nuclear Science, Vol. 56 No. 4 (2) (2009) pp. 2149–2154
6. Radiation Hardness Studies of CdTe and HgI₂ for the SIXS Particle Detector On-board the BepiColombo Spacecraft, J. Ahoranta, M. Uunila, J. Huovelin, H. Andersson, R. Vainio, A. Virtanen and H. Kettunen, Nuclear Inst. and Methods in Physics Research, A 605 (2009), pp. 344–349
7. Heavy-Ion Induced Charge Yield in MOSFETs, A. Javanainen, J.R. Schwank, M.R. Shaneyfelt, R. Harboe-Sorensen, A. Virtanen, H. Kettunen, S.M. Dalton, P.E. Dodd, A.B. Jaksic, IEEE Trans. Nucl. Sci. Vol.56, No. 6 (1) (2009) pp. 3367 - 3371
8. Radiation Tolerance Tests of Small-Sized CsI(Tl) Scintillators Coupled to Photodiodes, E. Valtonen, J. Peltonen, O.V. Dudnik, A.M. Kudin, H. Andersson, Yu.A. Borodenko, T. Eronen, J. Huovelin, H. Kettunen, E.V. Kurbatov, J. Lehti, S. Nenonen, M. Rossi, R. Vainio, A. Virtanen, IEEE Trans. Nucl. Sci., Vol. 56, No. 4(2) (2009) pp. 2149–2154
9. CsI(Tl) + Photodiode Scintillation Assemblies for γ -Ray and Proton Detectors, A. M. Kudin, Yu. A. Borodenko, B. V. Grinyov, A. V. Didenko, A. V. Dudnik, B. G. Zaslavsky, E. Valtonen, T. Eronen, J. Peltonen, J. Lehti, H. Kettunen, A. Virtanen, and J. Huovelin, Instruments and Experimental Techniques Vol. 53, No. 1 (2010) 39–44
10. Semi-empirical LET Descriptions of Heavy Ions Used in the European Component Irradiation Facilities, A. Javanainen, W. H. Trzaska, R. Harboe-Sørensen, A. Virtanen, G. Berger and W. Hajdas, IEEE Trans. Nucl. Sci., Vol. 57, No. 4(1) (2010) pp. 1946–1949
11. Impact of Time and Space Evolution of Ion Tracks in Nonvolatile Memory Cells Approaching Nanoscale, G. Cellere, A. Paccagnella, M. Murat, J. Barak, A. Akkerman, R. Harboe-Sørensen, A. Virtanen, A. Visconti, M. Bonanomi Journal of Applied Physics Vol. 108(12) (2010) pp. 124907 – 124907-19
12. Effects of Scaling in SEE and TID Response of High Density NAND Flash Memories, F. Irom, D.N. Nguyen, M.L. Underwood, A. Virtanen, IEEE Trans. Nucl. Sci., Vol. 57, No. 6 (1) (2010) pp.3329 – 3335
13. IBSimu: A three-dimensional simulation software for charged particle optics, T. Kalvas, O. Tarvainen, T. Ropponen, O. Steczkiewicz, J. Ärje and H. Clark, Rev. Sci. Instrum. 81 02B703 (2010)
14. Electric solar wind sail: Toward test missions, P. Janhunen, P. K. Toivanen, J. Polkko, S. Merikallio, P. Salminen, E. Haeggström, H. Seppänen, R. Kurppa, J. Ukkonen, S. Kiprich, G. Thornell, H. Kratz, L. Richter, O. Krömer, R. Rosta, M. Noorma, J. Envall, S. Lätt, G. Mengali, A. A. Quarta, H. Koivisto, O. Tarvainen, T. Kalvas, J. Kauppinen, A. Nuottajärvi, and A. Obraztsov, Rev. Sci. Instrum. 81, 111301 (2010)
15. Ultra-high resolution mass separator-Application to detection of nuclear weapons tests, K. Peräjärvi, T. Eronen, V.-V. Elomaa, J. Hakala, A. Jokinen, H. Kettunen, V.S. Kolhinen, M. Laitinen, I.D. Moore, H. Penttilä, J. Rissanen, A. Saastamoinen, H. Toivonen, J. Turunen and J. Äystö, Applied Radiation and Isotopes 68 (2010) 450.



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Conference contributions

- Irradiation tests of optocouplers, J. Jaatinen, A. Javanainen, H. Kettunen, A. Virtanen, Proc. 43rd Annual Meeting of the Finnish Physical Society, March 12–14, 2009, Espoo, Finland, p. 274
- Heavy-ion induced charge yield and dosimetry issues in MOSFETs, A. Javanainen, J. R. Schwank, M. R. Shaneyfelt, R. Harboe-Sørensen, A. Virtanen, and S. M. Dalton, Proc. NSREC 2009 Conference, July 20–24, 2009, Quebec, Canada
- Ion beam cocktail development and ECR ion source plasma physics experiments at JYFL, O. Tarvainen, T. Kalvas, H. Koivisto, T. Ropponen, V. Toivanen, J.H. Vainionpää and A. Virtanen, Proc. 11th International Conference on Heavy Ion Accelerator Technology (HIAT09), June 7-12, 2009, Venice, Italy
- Effects of scaling in SEE and TID response of high density NAND flash memories, F. Irom, D.N. Nguyen, M.L. Underwood, A. Virtanen,, July 7, 2010, NSREC 2010, Denver, CO, USA

Other contributions

- A. Javanainen, A. Virtanen, H. Kettunen, RADEF facility, RADECS2010/Thematic Workshop, September 9, 2010, Längenfeld, Austria
- A. Virtanen, Radiation Effects Facility, RADEF, in Finland, NASA/JPL, California Institute of Technology, July 12, 2010, Pasadena, CA, USA





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But some things never change!

KOTIPIZZA MENU



KOTI
PIZZA
ABSOLUTELY.

PIZZA

	NORMAL	FAMILY	MEDIUM PAN
1 FILLING	6,90	14,40	8,30
MINCEPIZZA #3			
Pizza with mince sauce			
MARGHERITA #10			
Tomato sauce, extra cheese			
2 FILLINGS	7,40	15,80	8,80
OPERA #1			
Tuna, ham			
CAPRICCIOUSA #4			
Ham, mushrooms			
TROPICANA #5			
Ham, pineapple			
PEPPERONI #11			
Tuna, pepperoni sausage			
ALLA POLLO #14			
Grilled chicken, pineapple			
3 FILLINGS	8,30	17,20	9,50
FRUTTI DI MARE #5			
Tuna, prawns, mussels			
SPECIAL OPERA #6			
Tuna, ham, salami			
CACCIATORI #7			
Salami, pig-pepper, olives			
VEGETARIANA #9			
Mushrooms, peppers, olives			
AMERICANA #15			
Ham, pineapple, Aurablu cheese			
POLLO AMERICANA #17			
Grilled chicken, pineapple, Aurablu cheese			
BACON PIZZA #13			
Roast bacon, egg, red onion			
4 FILLINGS	8,80	18,60	10,20
QUINTA ESSENZA #12			
Pepperoni, sausage, mushrooms, olives, pineapple			
POLO #16			
Mushrooms, pepperoni, pineapple, olives			
MEAT #18			
Mushrooms, pepperoni, pineapple, olives			
MEAT #19			
Mushrooms, pepperoni, pineapple, olives			
MEAT #20			
Mushrooms, pepperoni, pineapple, olives			
ZORBAS #20			
Greek-style cheese, red onion, peppers, olives (low in lactose)			
BACON BBQ #22			
Barbecue sauce, bacon, red onion, pineapple			
MOZZARELLA PIZZA #23			
Mozzarella cheese, pineapple, sun-dried tomato, salami (low in lactose)			
5 FILLINGS	9,50	20,00	10,90
KEBAB #15			
Kebab meat, Greek pepperoni, red onion, peppers, sauce of your choice			
PANINATO #21			
Ruralia, Parma ham, cherry tomatoes, Parmesan cheese			
FILLINGS	0,70	1,40	
Pineapple • Aurablu cheese • Sun-dried tomato • Barbecue sauce • Chilli mayonnaise • Mushrooms • Olives • Mince sauce • Cheese • Egg • Ham • Red onion • Ham • Cherry tomato • Caviar • Pineapple • Greek-style cheese • Mexican sauce • Marinated cheese • Olives • Roast bacon • Pepperoni • Grilled chicken • Parmesan cheese • Pepperoni sausage • Red onion • Roast Salami • Mussels • Tuna • Garlic mayonnaise • Garlic • Parma ham			
• Parma ham	1,40	2,80	
• Sauce in mayonnaise in a dipping bowl	0,70	1,40	

COFFEES

ROBERT PAULIG COFFEE	1,35
ESPRESSO	1,80
DOUBLE ESPRESSO	2,40
CAPPUCINO	2,20
CAFE LATTE	2,40
TEA	1,10
HOT CHOCOLATE	1,60
FAZER CHOCOLATE OR RASPBERRY MUFFIN	2,00

DRINKS

DRINK AS MUCH AS YOU LIKE	2,30
Coca-Cola, Coca-Cola Light, Sprite-ZERO, Fanta, carbonated water	
0.5 L BOTTLE	2,30
Coca-Cola, Coca-Cola Light, Coca-Cola ZERO, Fanta, Fanta Light, Sprite-ZERO, BonAqua	
0.5 L BOTTLE, SPRING WATER	1,80
1.5 L BOTTLE	3,30
Coca-Cola, Coca-Cola Light, Coca-Cola ZERO, Fanta, Fanta Light, Sprite-ZERO, BonAqua	
0.33 L BATTERY	2,40

All pizzas include Koti pizza tomato sauce and Koti pizza cheese.
Zorbas and Mozzarella are low in lactose, all other pizzas are lactose-free.
Minimum delivery charge is €10 + delivery service charge €4.
We reserve the right to make changes.

SMALL PAN PIZZAS

1 FILLING	6,20
Pepperoni sausage	
6,90	
7,60	
8,30	
9,00	
9,70	
10,40	
11,10	
11,80	
12,50	
13,20	
13,90	
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