MINUTES OF THE OPEN MEETING HELD ON JUNE 8, 2011 AT THE UNIVERSITY OF PAVIA, ITALY, TO DETERMINE THE WINNER OF THE LEONDARDO DA VINCI COMPETITION BY SUBJECTING EACH ENTRY TO PUBLIC SCRUTINY.

On June 8, 2011, from 2:40 PM to 7:40 PM, in the meeting room at the Department of Physics of the University of Pavia, the final phase of the Leonardo da Vinci Competition (see http://www.insiemecontroilcancro.org/english.htm) took place which consisted of a public discussion about the projects submitted directly from the authors and those submitted by third parties in the presence of the Committee of guarantors Chaired by Dr. Vincenzo Vigna. The following members were present in the meeting room: Dr. Giulio Titta, Dr. Saverio Altieri, Dr. Danilo Verra, Dr. Elio Giroletti; members of the Panel connected via internet: Dr. Frank Guy, Dr. Don Swenson, Mr. Ruben Sonnino, Dr. Denise Simmons, and Dr. Franco Gaspari. Furthermore, any expert in the field could present their scientific arguments via internet (live interactively or via email). In fact, the event was broadcasted to the world via web TV on two channels: English and Italian and via EVO Caltec system which is widely used at research centers.

All material regarding the projects under examination was published on the website www.leonardodavinciprize.org (now available at www.leonardodavinciprize.info. See Note 1) before the event in order to enable anyone to follow different phases of the competition. The projects submitted by third parties also had their cover letters published which addressed their important questions to the experts in the field asking for example which approach should be pursued in order to obtain effective results in the reduction of cancer death and costs (for example by establishing if it should be improving spatial resolution or efficiency), changing the trend that for about half a century, in spite of large investments, continues to register meager results.

The Chairman, Dr. Vigna, after thanking all Institutions and philanthropists supporting this award, opened the session by presenting an overview on the dramatic data of cancer mortality together with the comforting data relative to the advantages of early diagnosis. He went on to underline that the goal for the day was that of identifying, in the area of the Particle Physics, the most efficient solution targeted to early cancer detection, while at the same time answering the questions of those who (by having the reduction of cancer death at heart) have contributed to the funding of the prize, and answering the questions of those who had nominated cancer projects. These questions needed to be answered by those who proposed cancer projects, by members of the committee, and by the experts connected via internet.

Dr. Vigna then went through the numerous steps of the scientific procedure that were followed during the preliminary phases of the competition. Starting from drafting the rules of the competition in an open and transparent manner involving the world's experts in the field (through press releases, email exchange, phone calls, etc. to solicit comments and discussion regarding the rules of the competition), including leaders from the top research centers in particle physics in order to satisfy the expectations of citizens and in particular of the cancer patients who are interested to uncover the best solution in the world through a rigorous scientific procedure. (See several press releases that were sent to over 6,000 newspapers, TV, Radio, online news, blogs and sent to tens of thousands of scientists as detailed at http://www.leonardodavinciprize.com/elenco_parziale_comunicati_inglese.htm).

Considering the projects that were submitted or nominated that complied with the rules of the competition finalized on April 22, 2011, after all suggestions were received and after thorough interaction and repeated solicitation to the authors of the projects nominated by third parties inviting them to submit additional documentation supporting the superiority of their project with respect to the others, Dr. Vigna listed the two projects submitted by the authors (GEIPE-RR project by Prof. Jay Kulsh and the 3D-CBS project by Dario Crosetto) and five projects nominated by third parties (FERMIlab TOF-PET project by Dr. Erik Ramberg, Axial-PET project by Dr. Christian Joram who received the first prize at the Workshop "Physics for Health" at CERN in February 2010, the BNL-PET project by Paul Vaska at Brookhaven National Laboratory –BNL-,

the "Magic Box" project by Prof. Umberto Veronesi and Prof. Massimo Bellomi and "Trimprob" project by Eng. Clarbruno Vedruccio).

Regarding the GEIPE-RR project, Dr. Vigna reported that Prof. Kulsh claimed a 15% reduction in cancer death, but admitted that because it is a cure and not early detection it does not comply with the requirements to receive the prize. He chose to submit his project anyway for the purpose of providing visibility, hoping to create enough interest to justify the creation of a specific competition in that area as specified in the rules of the Leonardo da Vinci Competition (see second paragraph of the rules: "…**if anyone knows of a solution in another field that he believes (and can support with scientific arguments) could have a higher impact on premature cancer death reduction, he is invited to submit his solution to this SCIENTIFIC PROCEDURE so that by being public, if such a project emerges, it will be given visibility during the analysis of the documents that were submitted to justify in such an event the creation of another competition targeted to compare projects with experts in the project's specific field"**)

The rules of the competition required that authors who claim superiority in efficiency and lower cost of his project compared to other projects submitted or nominated should demonstrate this superiority by writing up to five pages of comparison for each project he considered inferior.

Dr. Vigna, after mentioning Prof. Kulsh's statement that he was not claiming his project to be superior in efficiency asked if there was anyone connected via internet or in the room who could claim superiority of his project compared to other projects.

Because Dario Crosetto was the only one who answered Dr. Vigna's appeal to claim superiority of his project, some members of the Panel of the Guarantors said and repeated several times the impression that there was only one project in the competition. It was also claimed that there was no interaction with authors of the projects that had been nominated. Crosetto disagreed stating there had been interaction between the author of the 3D-CBS project (Crosetto) and the authors of the other projects, as well as with the leaders of the research laboratories to whom they related (see www.unitedtoendcancer.org/doc/8.pdf), and that comparisons had been made.

During the open discussion and comparison of projects leading up to the actual competition (see link in previous paragraph), different view-points surfaced whose clarification is of extreme importance. Crosetto's approach is different from that of CERN, its Scientific Director, from FERMIlab and from that of Brookhaven National Laboratory. Crosetto stated that many people would like to know the different positions and what was said during the meeting with CERN Scientific Director Prof. Sergio Bertolucci, Dr. Vigna, and researcher Crosetto, and if Ramberg's approach favoring spatial resolution or Crosetto's approach favoring efficiency is the better choice.

After pointing this out, Crosetto diligently presented the comparison with the other six projects submitted and nominated (see details relative to this comparison at the web sites: www.unitedtoendcancer.org/doc/20.pdf; www.unitedtoendcancer.org/doc/21.pdf; www.unitedtoendcancer.org/doc/22.pdf; www.unitedtoendcancer.org/doc/23.pdf; www.unitedtoendcancer.org/doc/24.pdf; www.unitedtoendcancer.org/doc/25.pdf).

Among these projects, three relate specifically to the detection of particles arriving from tumor markers: Axial-PET by Christian Joram from CERN, TOF-PET project by Erik Ramberg from FERMIlab and the project RatCAP by Paul Vaska from BNL. For each of these projects Crosetto presented a synthesis of the comparison in tables showing clearly in figures the two fundamental requirements underlined at item 9 of page 5 of the rules of the competition (see http://www.leonardodavinciprize.org/concorso_premio_leonardo_da_vinci.htm, now available at http://www.leonardodavinciprize.com/leonardo_da_vinci_prize.htm. See Note 1)

- The **Efficiency** defined as ***THE RATIO, WITHIN THE UNIT OF TIME, BETWEEN THE TOTAL NUMBER OF PAIRS OF 511 KeV PHOTONS CAPTURED and accurately measured AND THE TOTAL NUMBER OF PAIRS OF 511 KeV PHOTONS EMITTED.***
- The **Cost for each photon captured** arriving from the tumor markers defined as ***THE RATIO BETWEEN THE COST OF THE DEVICE AND THE NUMBER OF PAIRS OF 511 KEV PHOTONS CAPTURED IN ONE SECOND.***

Following there is an excerpt extracted from the tables (whose references have been provided before) relative to the three documents presented by Crosetto.

FERMILab TOF-PET

a	Characteristics of a PET section 150 cm FOV (detector length)	3D-CBS[1]	FERMIlab TOF-PET[1]	Unit
b	**Efficiency** (number of 511 KeV pairs of photons captured divided by the number 511 KeV pairs of photons emitted in a 70 Kg patient)	**0.1**	**0.012**	
c	**Cost per photon captured** (divide cost of the device by the number of 511 KeV pairs photons/sec captured with 10 mCi radioisotope dose)	**0.1** (3.852/37)	**25.94** (115.2/4.44)	**USD**
d	Cost of the device[2] (d = o x 2) e (d = s x 2)	**3.852**	**115.2**	million USD
e	Radiation dose administered to the patient	0.33	4	mCi
f	Spatial resolution[3]	(from 1.4 to 13.8)+0.5+1	(from 1.4 to 13.8)+0.5+0.5	mm
g	Examination cost	400	6,000	USD
h	Early detection with screening	Yes	NO	
i	Cost of Crystal 64,000 cm^3 x \$15 = \$0.96 million	0.96		million USD
l	Cost of PMT or APD (back) 2,300 x \$200 = \$0.46 million	0.46		million USD
m	Cost of APD (front)2,300 x \$100 = \$0.23 million	0.23		million USD
n	Cost of electronic/channel 2,300 x \$120 = \$0.276 million	0.276		million USD
o	Total cost of the main materials (Crystals, sensors, electronics). (o = i + l + m + n)	1.926		million USD
p	Cost of Crystals 480,000 x \$14 (crystal + coating+gluing) = \$6.72 million		6.72	million USD
q	Cost of SiPMs 480,000 x \$60 = \$28.8 million		28.8	million USD
r	Cost of electronic/channel[4] 480,000 x \$46 = \$22.08 million		22.08	million USD
s	Total cost of the main materials (Crystals, sensors, electronics). (s = p + q + r)		57.6	million USD

[1] 3D-CBS: www.unitedtoendcancer.org/doc/30.pdf FERMIlab TOF-PET: www.unitedtoendcancer.org/doc/33.pdf.

[2] The cost of the device is calculated by multiplying by 2 the cost of the main material (crystals, sensors and electronics). This multiplication factor is accounting for labor, mechanics, software, etc. and it could even be higher.

[3] Spatial resolution must take into account the errors introduced by the nuclear phenomenon that a) in average a positron travels a distance of 1.4 mm before encountering an electron for the FDG, 2.6 mm for ^{11}C, 3 mm for ^{13}N, 4.5 mm for ^{15}O, 13.8 mm for ^{82}R radioisotopes and b) it has a colinearity error of about 0.5 mm. To this errors one should add the accuracy of the measurements obtained by the system that for the 3D-CBS is estimated to be 1 mm, while for the BNL-PET it is estimated 1.5 mm because there is no accurate "x", "y" and "z" coordinate measurements.

[4] The cost of electronics per channel takes into account the cost of the chassis, power supplies, cables, etc. that when divided by the number of channels brings the cost per channel higher than the cost of the specific electronics on each channel.

Axial-PET CERN (Geneva, Switzerland)

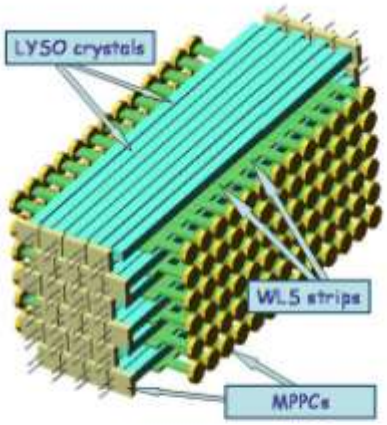


Fig.2. Drawing of one of the two modules of the AX-PET demonstrator. Six layers of eight crystals each are interleaved with six layers of WLS. The MPPCs are mounted alternately on one side or the other of the module in order to avoid dead areas. Each double layer composed by crystals and strips is optically isolated from the next one by a thin carbon fiber plate (not shown). The crystals in adjacent layers are staggered by half a pitch size.

Each module consist of 48 LYSO crystals 3x3x100 mm^3, each coupled to a MPPC 3x3 mm^2 and 156 WLS strips 3x0.9x40 mm^3, each coupled to a MPPC 3.22 x 1.19 mm^2.

a	Characteristics of a PET section 150 cm FOV (detector length)	3D-CBS[5]	Axial-PET[5]	Unit
b	**Efficiency** (number of 511 KeV pairs of photons captured divided by the number 511 KeV pairs of photons emitted in a 70 Kg patient)	**0.1**	**0.035**	
c	**Cost per photon captured** (divide cost of the device by the number of 511 KeV pairs photons/sec captured with 10 mCi radioisotope dose)	**0.1** (3.85/37)	**4.03** (52.29/12.95)	**USD**
d	Cost of the device[6] (d = o x 2) e (d = v x 2)	**3.852**	**52.29**	million USD
e	Radiation dose administered to the patient	0.33	3	mCi
f	Spatial resolution[7]	(from 1.4 to 13.8)+0.5+1	(from 1.4 to 13.8)+0.5+0.5	mm
g	Examination cost	400	4,000	USD
h	Early detection with screening	Yes	NO	
i	Cost of Crystal 64,000 cm^3 x $15 = $0.96 million	0.96		million USD
l	Cost of PMT or APD (back) 2,300 x $200 = $0.46 million	0.46		million USD
m	Cost of APD (front)2,300 x $100 = $0.23 million	0.23		million USD
n	Cost of electronic/channel 2,300 x $120 = $0.276 million	0.276		million USD
o	Total cost of the main material (crystals, sensors, electronics). (o = i + l + m + n)	1.926		million USD

[5] 3D-CBS: www.unitedtoendcancer.org/doc/30.pdf Axial-PET: www.unitedtoendcancer.org/doc/34.pdf.

[6] The cost of the device is calculated by multiplying by 2 the cost of the main materials (crystals, sensors and electronics). This multiplication factor is accounting for labor and mechanics; software could be higher.

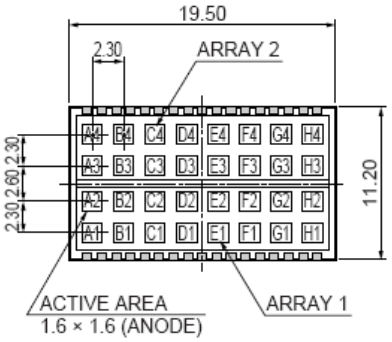
[7] Spatial resolution must take into account the errors introduced by the nuclear phenomenon that a) n average a positron travels a distance of 1.4 mm before encountering an electron for the FDG, 2.6 mm for ^{11}C, 3 mm for ^{13}N, 4.5 mm for ^{15}O, 13.8 mm for ^{82}R radioisotopes and b) it has a colinearity error of about 0.5 mm. To this error one should add the accuracy of the measurements obtained by the system that for the 3D-CBS is estimated to be 1 mm, while for the Axial Pet it is 0.5 mm. However, 0.5 mm added to an error of 5 mm given by the radioisotope ^{15}O used for brain studies does not support spending a lot of money to achieve that 0.5 mm. also because PET measures activity not dimensions.

p	Cost of Crystals 48 x 70 x 15 = 50,400 x $70 (crystal + coating + gluing) = $3.528 million		3.528	million USD
q	Cost of WLS 156 x 70 x 15 = 163,800 x $15 (WLS + coating + gluing) = $2.457 million		2.457	million USD
r	Cost of MPPC for Crystals 50,400 x $100 = $5.04 million		5.04	million USD
s	Cost of MPPC for WLS 163,800 x $50 = $8.190 million		8.19	million USD
t	Cost of electronic/channel[8] Crystal 50,400 x $40 = $2.016 million		2.016	million USD
u	Cost of electronic/channel WLS 163,800 x $30 = $4.914 million		4.914	million USD
v	Total cost of main material (crystals, sensors, electronics). (v = p + q + r + s + t + u)		26.145	million USD

BNL-PET (Brookhaven National laboratory)

Fig. 1. The RatCAP tomograph consisting of 12 LSO arrays with APDs and associated readout electronics.

■ Dimensional outline (unit: mm)



In order to equip a 2 cm FOV detector ring, 64 cm in diameter, 200 of the of these detector modules 2 x 1 cm are required. Each consist of 32 LSO crystals 2.3x2.3x5 mm^3, one sensor Hamamatsu S8550 and one custom made ASIC. To built a 150 cm FOV detector, 75 rings are required.

a	**Characteristics of a PET section 150 cm FOV (detector length)**	**3D-CBS[9]**	**BNL-PET[9]**	**Unit**
b	**Efficiency** (number of 511 KeV pairs of photons captured divided by the number 511 KeV pairs of photons emitted in a 70 Kg patient)	**0.1**	**0.01**	
c	**Cost per photon captured** (divide cost of the device by the number of 511 KeV pairs photons/sec captured with 10 mCi radioisotope dose)	**0.1** (3.852/37)	**12.25** (45.348/3.7)	**USD**
d	Cost of the device[10] (d = o x 2) e (d = s x 2)	**3.852**	**45.348**	million USD
e	Radiation dose administered to the patient	0.33	4	mCi
f	Spatial resolution[11]	(from 1.4 to 13.8)+0.5+1	(from 1.4 to 13.8)+0.5+1.5	mm
g	Examination cost	400	4,000	USD
h	Early detection with screening	Yes	NO	

[8] The cost of electronics per channel takes into account the cost of the chassis, power supplies, cables, etc. that when divided by the number of channels brings the cost per channel higher than the cost of the specific electronics on each channel.

[9] 3D-CBS: www.unitedtoendcancer.org/doc/30.pdf BNL-PET: www.unitedtoendcancer.org/doc/35.pdf.

[10] The cost of the device is calculated by multiplying by 2 the cost of the main material (crystals, sensors and electronics). This multiplication factor is accounting for labor, mechanics, software could be higher.

[11] Spatial resolution must take into account the errors introduced by the nuclear phenomenon that a) on average a positron travels a distance of 1.4 mm before encountering an electron for the FDG, 2.6 mm for ^{11}C, 3 mm for ^{13}N, 4.5 mm for ^{15}O, 13.8 mm for ^{82}R radioisotopes and b) it has a colinearity error of about 0.5 mm. To this error one should add the accuracy of the measurements obtained by the system that for the 3D-CBS is estimated to be 1 mm, while for the BNL-PET it is estimated 1.5 mm because there is no accurate "x", "y" and "z" coordinate measurements.

i	Cost of Crystal 64,000 cm^3 x $15 = $0.96 million	0.96		million USD
l	Cost of PMT or APD (back) 2,300 x $200 = $0.46 million	0.46		million USD
m	Cost of APD (front)2,300 x $100 = $0.23 million	0.23		million USD
n	Cost of electronic/channel 2,300 x $120 = $0.276 million	0.276		million USD
o	Total cost of the main material (Crystals, sensors, electronics). (o = i + l + m + n)	1.926		million USD
p	Cost of Crystals 32 x 200 x 75 = 480,000 x $12 (crystal + coating + gluing) = $5.76 million		5.76	million USD
q	Cost of APDs 200 x 75 = 15,000 x $800 = $12 million		12	million USD
r	Cost of electronic[12]/ASIC 15,000 x$320 = $4.8 million		4.914	million USD
s	Total cost of the main material (Crystals, sensors, electronics). (s = p + q + r)		22.674	million USD

Regarding Vedruccio's project, Crosetto presented a document (www.unitedtoendcancer.org/doc/24.pdf) where it shows clearly that it is not a project related to particle detection.

In regard to the "Magic Box" of Veronesi-Bellomi, Crosetto pointed out that there were no references to scientific articles supporting the claims advertised in newspapers and magazines (for example the one signed by Maria Sorbi in the newspaper "*Il Giornale*" and another signed by Riccardo Lattanzi in "*WIRED*" magazine). On June 2010, after Italian newspapers published articles about the "Magic Box", Crosetto contacted Dr. Massimo Bellomi, who had indicated he was the head of the task force of this project to ask for bibliographical references to learn more of its benefits to patients. That phone conversation revealed that there was not even one publication in a scientific journal and that it was not a "box", nor a hardware component of any sort, but a very common commercial MRI device.

Later, after Lattanzi's article appeared in WIRED magazine on April 2011, Crosetto called Lattanzi asking for an explanation as to why he was assigning the invention of the Diffused Weighted Imaging (DWI) to Bellomi creating illusions about miraculous results that the DWI would provide when associated to the Magic Box. Lattanzi admitted that DWI was not invented by Bellomi and a "Magic Box" did not exist. Crosetto then asked Lattanzi to rectify the message he had broadcasted through his article as it was deceiving the public creating hopes for a non-existent discovery, as not even the authors, who were contacted in this regard (Bellomi), could estimate the benefits a patient would receive even if the results of their experiment would achieve 100% of their expectations that in any event they could not support with calculation.

Although Lattanzi agreed he would rectify this, it had still not been done, so at this point Crosetto expressed the intention to call Lattanzi on the phone to ask if he still planned to rectify his article in order to contribute to the identification and promotion of honest research and not deceive those who still believe that the Magic Box is cancer's solution and who would fund a project which has no theory supported by scientific arguments.

The result of the phone called was that Lattanzi agreed to answer to a synthesis prepared by Crosetto of the requests for clarification already anticipated over the phone in order to eliminate the illusions to the readers (and in particular to the cancer patient). Lattanzi promised that he would answer and agreed that his answer would be published.

Dr. Giroletti then intervened [This paragraph has been intentionally deleted at the request of Dr. Giroletti during the approval phase of these minutes on September 14, 2011, stating: "I have nothing to say about the entire video recorded statements" however, he asked Dr. Vigna: "Keep my voting statement and delete all my statements from the minutes and transcriptions" _____]; however the chairman, Dr. Vigna, cited the rules of the competition which states that every author who claims superiority for his project should demonstrate this superiority with calculus and scientific arguments.

[12] The cost of electronics per channel takes into account the cost of the chassis, power supplies, cables, etc. that when divided by the number of channels brings the cost per channel higher than the cost of the specific electronics on each channel.

Giroletti complained [This paragraph has been intentionally deleted at the request of Dr. Giroletti during the approval phase of these minutes on September 14, 2011, stating: "I have nothing to say about the entire video recorded statements" however, he asked Dr. Vigna: "Keep my voting statement and delete all my statements from the minutes and transcriptions" _____]; (See Note 2).

Crosetto first of all replied that measurements do exist. Their values (relative to crystals, efficiency and geometry of the detector, etc.) were described in his project's description, in the comparison with the other six projects, and in their references.

However, he also underlined that the rules of the competition do not ask for measurements but rather calculation and logical reasoning on which the members of the Panel should base their evaluation in identifying among the projects submitted or nominated the one they consider to be more advantageous to the patient to justify funding the device in order to make the MEASUREMENTS.

Crosetto recognized (as did Altieri) that it would be almost impossible for all members of the Panel to verify all calculations as each one has his own area of expertise; however, everyone should be able to provide scientific arguments supporting the direction they judge to be better when comparing one project to another. Crosetto repeated several times to Giroletti that he was presenting calculations based on measurements performed on single components, based on the geometry of the detector, etc. eventually inviting him to refute the values Crosetto was reporting in regard to his project and the other projects under evaluation and declare Crosetto's project to be the one inferior in efficiency.

In fact, each member of the Panel should either verify the calculations, refute any of them with scientific arguments, or declare himself not expert in the field, but in no way should he stop the progress by requesting measurements, rather than verify the calculations as this would put the author in the impossible situation of producing measurements without a device on which measures could be performed.

In order to make his point clearer, Crosetto gave the example of CERN's request for eight billion Euros to build the particle accelerator LHC in order to find the Higgs boson. The money was provided to CERN based on calculations without having the politicians of different States asking for measurements in order to fund a project targeted to perform those measurements. It would have been absurd to ask for these measurements because, if the complete device already existed, the request for funding the experiment would not be justified.

Furthermore, Crosetto pointed out that none of the projects evaluated by the members of the panel had been built. All were awaiting funds to build a complete unit in order to perform measurements. However, based on articles and schematics written by the authors of all projects, it is possible to calculate the efficiency, the cost per each valid photon captured, and the cost of each device. The task of the members of the Panel is that of supporting with scientific arguments the superiority in efficiency and lower cost of one project with respect to the others.

Crosetto explained, therefore, the difference between his approach and the approach of Ramberg from FERMIlab, the Axial-PET form CERN, and the BNL-PET. He provided data on efficiency of all of them and asked Giroletti again if he could refute any of the values. He then reminded the members of the Panel that their task was to verify the data, and to conclude if it would be more advantageous to go in the direction of the spatial resolution claimed by Ramberg and the others or efficiency claimed by Crosetto in order to save time and money. The Chairman, Dr. Vigna, stated that it would be unthinkable to expect anyone to invest conspicuous resources to perform the experimental measurements requested by Giroletti. If it would be a matter of a few hundred Euros this could be done, but because it would require instead huge investments, members of the Panel should comply with the rules of the competition and make their judgment based on calculation and logical reasoning.
In conclusion, based on calculations, scientific arguments and references to articles of the other authors that Crosetto presented to support the values in his tables, Crosetto's 3D-CBs project, with respect to the other projects, was shown to be superior in efficiency and had a lower cost for each valid signal captured. In particular the 3D-CBS was shown to have an efficiency of 0.1 in capturing valid photons at a cost of $0.10 for each valid photon captured, while FERMIlab's efficiency was shown to be 0.012 at a cost per photon captured of $25.94.

The efficiency of the Axial-PET project was shown to be 0.035 at a cost per photon captured of $4.03, and finally the BNL-PET's efficiency was shown to be 0.01 at a cost per photon captured of $12.25.

Before such evidence and in the absence of refutation supported by scientific arguments, the Chairman, Dr. Vigna, invited the members of the Panel to provide their statements in regard to the assignment of the Leonardo da Vinci Prize.

Based on what was seen and discussed in the room and in particular based on the precise scientific arguments given by Crosetto supporting the values in his tables, the overwhelming majority of the Members of the Panel recognized the superiority of the 3D-CBS project and concurred with assigning the Leonardo da Vinci Prize to Dario Crosetto.

Only one member of the Panel, Elio Giroletti, was against this resolution; however, he was unable to revert the situation as he was not able to refute with scientific arguments (a requirement of the rules of the competition), the superiority in efficiency and cost reduction of Crosetto's 3D-CBS project with respect to the other projects

The following are some of the statements made by members of the panel:

Saverio Altieri:
I do not doubt the calculations and the arguments presented by Crosetto. I wish that this calculation would be confirmed by experimental data. I invite the Chairman to conclude the working session and go to the voting declaration. At this point I am in favor of awarding this project.

Frank Guy:
Crosetto has demonstrated that his project is superior to the other projects.

Giulio Titta:
In regard to the numbers I do not have a specific competence; therefore I cannot sustain a discussion in particle physics because it is not my field of expertise. My reasoning is that having followed the presentation of a series of numbers, these seem to me to be acceptable… with an acceptable criteria these numbers have been compared one against the other, and if I would have to judge on these numbers my judgment is positive.

Danilo Verra:
Also I agree to award the prize to Dario Crosetto. I wish that this prize would be useful to move on in the direction of the scientific research focusing on early detection to fight cancer. As a physician, the idea to target early detection is great and revolutionary. Although I am not a physicist, calculations presented by Crosetto are clear in demonstrating the superiority in efficiency and lower cost of the 3D-CBS with respect to other projects that no one could refute.

Don Swenson:
I read, with interest, the 6 documents of the comparison made by Crosetto between his 3D-CBS project and he other projects. I took this to be a fair comparison between Crosetto's scheme and the competition. Crosetto's scheme is, by far, the most efficient, and consequently the most appropriate for wide spread screening and early cancer detection.

Ruben Sonnino:
Following listening of the presentation made on June 8th, 2011 via webcast and reviewing the material of the 7 projects I received prior to the presentation and the summaries after the presentation; taking in account all the facts presented I conclude that the Crosetto 3D-CBS project is superior to the other projects presented at the "Leonardo da Vinci Prize" particularly when we look to the Efficiency of the equipment in capturing pairs of photons, costs per photon captured, Total cost of the equipment, Examination cost, and ability to perform early detection screening (lower radiation exposure for the patient under examination).

Elio Giroletti:
I shall make a premise: 1) I do not doubt the theoretical values of the total efficiency calculated by the last competitor, Crosetto in the competition, (I have some other doubts, but I doubts move on); 2) in the event the total efficiency of the device would be confirmed by experimental data published in accredited journals (not submitted to a committee), such a device would mark progress in the field; 3) because the task is to assign a prize and not to decide to fund research, I think that the prize should be awarded only when proven experimental data is published in international journals; because of the above reasons, my declaration of vote can only be negative and consequently against awarding the prize.

(On February 3, 2010, Axial-PET project was awarded the first prize at CERN workshop "Physics for Health". Axial-PET project not only had not been built (therefore did not have experimental data) but didn't even demonstrate with theoretical values in efficiency to be superior to other projects. Instead Giroletti has admitted to not having doubts about the theoretical values of the total efficiency calculated by Crosetto which is shown to be superior to the efficiency of the other projects. Furthermore, we refer the reader to the statement made by by Crosetto and Chairman Dr. Vigna that was reported on page 6-7 of this document regarding references to measurements that were indeed provided. Based on these references Giroletti had the task to calculate which project could provide results more advantageous to the patient. None of the projects analyzed by the Committee had been built in a full device. It would make no sense to request measurements to a researcher denying the recognition that would allow funding to perform such experimental measurements. In fact, the rules of the competition request calculations to be evaluated and then to compare them with the calculations of other projects in order to identify the most advantageous project for the cancer patient and then recommend it for funding in order not to waste time and money building a project for which it is known in advance to be inefficient).

Denise Simmons:
My concern was the limitation in the participant pool but given that the rules required selecting from among the participants; the result was clear. I do, however, discuss my reservations and my agreement on the notion of a funding mechanism that requires proof of efficiency.

Franco Gaspari:
Crosetto's 3D-CBS, PET is clearly superior in efficiency, cost and the estimation of its impact.

In this manner the objective of the Leonardo da Vinci competition was implemented, as the "JUDGE" was the result of the formula for efficiency that was applied objectively to all projects for the benefit of cancer patients, thus eliminating any possible favoritism from any member of the Panel. The 3D-CBS project passed the public comparison through a scientific, transparent procedure where no one could refute its superiority in efficiency and lower cost, and therefore Dr. Vigna proclaimed Dario Crosetto, its author, to be the winner of the Leonardo da Vinci Competition.

At 7:40 PM the Chairman, Dr. Vigna, closed the session giving the conclusive appointment of the Leonardo da Vinci Prize at noon on June 18, 2011 in the historical room Ugo Foscolo in Corso Strada Nuova 65, headquarter of the University of Paiva, Italy. During this event titled: "NEAOPLASMS AND DEGENERATIVE DISEASES" it will be awarded Crosetto's 3D-CBS project (See the program of the event at: http://www.unitedtoendcancer.org/doc/26.jpg).

Note 1:
Currently it is not possible to access the material related to the Leonardo da Vinci competition at the web site www.leonardodavinciprize.org because the site has been obscured by Boris Baldin at FERMIlab with the motivation that it was "marketing" (and such action was not corrected and/or supported by any argument after contacting FERMIlab leaders). However, because the site that was obscured has been republished at www.leonardodavinciprize.info in the identical form as it appeared when it was obscured, anyone can verify that it was not a site for "marketing" but rather it was an invitation to submit scientific arguments to identify the most efficient project in particle detection targeted to early cancer diagnosis. Rather than obscuring the web site, FERMIlab should have commented with scientific arguments the values reported in the table presented by Crosetto and reported before.
The web site that reports instead updated information (including these minutes of June 8, 2011 meeting) is available at www.leonardodavinciprize.com.

The outrageous and unacceptable reaction of FERMIlab shows clearly that there was indeed interaction.

Note 2:

The correct procedure for sending material relative to the competition was followed. On June 1, 2011, the Chairman sent all material relative to all entries of the competition to each member of the Panel and to all authors of the projects upon entry and made them public on the web, giving everyone an opportunity to both examine the entries and make any claim (supported by scientific arguments) regarding superiority in efficiency and lower cost of one project with respect to another. Specifically regarding Giroletti's complaint (reported on page 7) to have received documents only one day prior to the meeting, the documents he refers to were not part of the comparison among new entries, but simply a courteous communication from the Chairman to the members of the Panel as part of the "transparency" which has been the style of the competition, such as pointing out references (which are available on the web or in public libraries). In fact, two days before the competition the Chairman received a late communication from Kulsh, author of GEIPE-RR project, stating that he would like to withdraw his candidacy for the Prize of the LdV competition because: "T*he other 6 nominated/submitted projects aim to help in early cancer diagnosis, while my GEIPE-RR project is about … cancer therapy. … No comparisons can be made*". The Chairman decided that it was his duty to forward this correspondence to all members of the Panel in keeping with the goal of transparency of the competition. The other communications were sent as a courtesy to the members of the Panel in order to facilitate their task; for example, not receiving the translation from English of the "Magic Box" article by Veronesi-Bellomi published by WIRED Magazine on April 2011 until the day before, could not have been an impediment for Giroletti to express a scientific opinion because on June 1, 2011, he received (as did all members of the Panel) the article in its original version in Italian, his native language. As the translation was made online by Google, the other members of the Panel who do not speak Italian could have translated the Magic Box article on their own initiative using Google when it was first sent in Italian on June 1, 2011. Also sending references (all of which were publicly available on the web and in public libraries) was a courtesy from the Chairman to the members of the Panel to save their time in looking these up in the event they would find it necessary for determining the superiority of one project with respect to another. However, this was not necessary because none of the members of the Panel and no expert connected via internet refuted Crosetto's claims of superiority in efficiency and lower cost of his project. For example, if Giroletti, or any other expert connected via internet, would have demonstrated that 18 mm LYSO crystal thickness (3 x 6 mm as can be seen in Figure 2 at page 4 of this document), used by Axial-PET project would have a stopping power of 97% rather than about 65% (as reported by measurements performed by several research laboratories in the world), than there would have been some possibility for Giroletti and other experts to refute the claim that the 3D-CBS was superior in efficiency and lower cost compared to Axial-PET. Instead, because the Axial-PET geometry has sensors, connectors and cables on four sides (which are not crystal and therefore cannot capture photons), the efficiency would be further reduced in a way that could not be greater than the one of the 3D-CBS. The rules of the competition foresees the possibility to continue the discussion as needed during the following days until all refutations supported by scientific arguments were addressed and clarified, however, because no one refuted the values (in terms of superiority in efficiency and lower cost of the 3D-CBS compared to other projects) presented by Crosetto, it was not necessary to continue the discussion the following days and the Chairman concluded the working session on June 8, 2011.

The Leonardo da Vinci Organizing Committee would like to thank its Guarantors (members of the Panel, the University of Pavia, all sponsoring Institutions, all experts and others who participated via web or supported the competition) for helping make possible implementing this scientific procedure to identify the most efficient solution in particle detection for early cancer diagnosis based on objective judgment from the results of formulas eliminating any favoritisms, thus making prevail honest research to the benefit of the patient.

Dr. Vincenzo Vigna, President of the Leonardo da Vinci competition.

This document has been compiled by the Leonardo da Vinci Organizing Committee www.insiemecontroilcancro.org. The relation with the nine Committee guarantors for their approval was conducted by the Chairman of the Leonardo da Vinci competition, Dr. Vincenzo Vigna, Cardio- Surgeon at the Polyclinic San Matteo, Pavia, Italy

Pavia, September 15, 2011