

**Towards
A
European Design Study
on
neutrino beams**

**V. Palladino
Apr 8, 2005 NNN05,
Aussois, France**

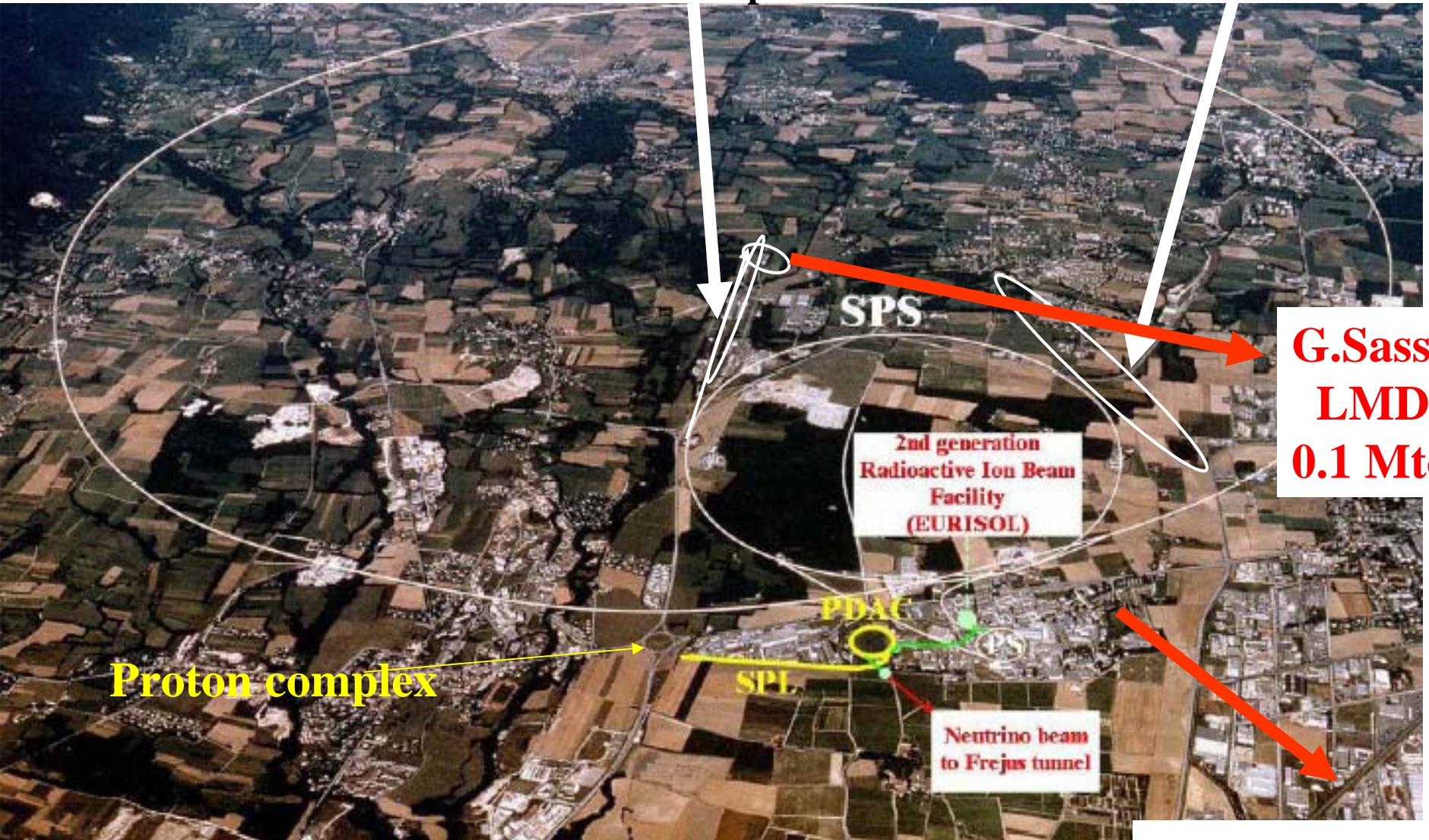
**on behalf of
the BENE FP6 Network
&
the ECFA Study Groups
since 1999**

Garoby
Haseroth
Lindroos

EU Neutrino Complex

Muon Complex

BetaRing



2 Main Physics options

NuFact

10 GeV & more

& Superbeam

high energy, high rate,

high density

large mass 50 Ktons

magnetic !!!!

Betabeam

Few 100 MeV

& Superbeam

low energy, low rate

Low density

huge mass, 500-1000 Ktons

non magnetic

sinergy with p decay

NNN

Both should be pursued, for quite a while



CERN-SPSC-2004-024
SPSC-M-722
INFN-XXX
BENE- 2004-1

Final revised version
8 September 2004

**Workshop on
PHYSICS WITH A
MULTI-MW PROTON SOURCE
CERN, Geneva, May 25-27, 2004**



Editors: A. Blondel, Y. Blumenfeld, P. Butler, R. Garoby, M. Lindroos, V. Palladino, A. Rubbia
From oral and written contributions by: R. Aymar, J. Ellis, S. Nagamiya, S. Holmes, C. Prior,
W.Scandale, H. Haseroth, M. Apollonio, A. C. Mueller, P. Hernandez, L. Mosca, C.K. Jung,
K.Nakamura, A. Ereditato, S. Geer, P.Miglozzi, A.Baldini, A. Van der Schaaf, A. Cecucci,
W.Gelleley, F. Galminelli, K.-L. Kratz, K. Jungmann, J. Aystö, T. Nielsson, H.-J. Kluge, B. Weng,
M.Spiro, M. Harakeh, J. Engelen.

**A 140 pages Summary Report
of the MMW Workshop and 9 talks
were delivered by BENE in Villars**

The key event was the
“Physics with a multi
MegaWatt proton source”
Workshop at CERN, May 24-26

The Workshop was organized
in view of the the special
“strategic” Cogne IX session
of the CERN SPSC
(Super Proton Synchrotron Committee)
that was held in Villars, CH, Sep 22-28

John Dainton
Villars 2004
October 7th 2004
CERN seminar

Villars 2004



In Villars, the SPSC

recognized the strategic interest of accelerator v physics

SPSC-M-730

1 identified the possibility of **a construction window**,

roughly in the decade 2010-20, after LHC and before CLIC,

for a new European accelerator v complex at the frontier of the field

2 endorsed **the strategic importance of a MMW p driver**

for v physics and for other aspects of fixed target particle physics

3 recommended that, in the immediate future, CERN and European agencies

reinforce and support the R&D necessary

In December, the Chair of the SPSC presented its recommendations to the SPC (Scientific Policy Committee) and the Chair of the SPC presented similar recommendations to the CERN Council.

More discussion is planned at the SPC in June 2005

CERN-SPSC-2004-020
02/20/2004
February 25th 2005

CERN-SPS and PS Committee
Fixed-Target Physics at CERN beyond 2005
Summary and Conclusions of an Evaluation by the SPSC
(Villars meeting 22-28 September 2004)
February 2005

1. Introduction and Methodology

In 2004, the SPSC carried out an evaluation of fixed target (FT) physics at CERN. The scope of it was to reassess present activities, to identify opportunities, and to investigate possibilities and options beyond 2005. It included the parts of the FT programme which are already approved or which are recommended to the Research Board for approval. This report is a result of that evaluation and thereby it presents the views of the SPSC at the end of 2004 concerning the future for FT physics at CERN.

The evaluation procedure commenced in Spring 2004 with a call for short papers summarising current and potential FT physics at CERN. From 2004, 50 short papers were submitted and approved beyond 2005. It included the parts of the FT programme which are already approved or which are recommended to the Research Board for approval. This report is a result of that evaluation and thereby it presents the views of the SPSC at the end of 2004 concerning the future for FT physics at CERN.

The evaluation procedure commenced in Spring 2004 with a call for short papers summarising current and potential FT physics at CERN. From 2004, 50 short papers were submitted and approved beyond 2005. It included the parts of the FT programme which are already approved or which are recommended to the Research Board for approval. This report is a result of that evaluation and thereby it presents the views of the SPSC at the end of 2004 concerning the future for FT physics at CERN.

Taking account of the submitted papers¹, the SPSC assembled a programme for a special meeting on Villars on 6-8th June. Invited speakers from September 22nd to 28th 2004. Representatives of those who had submitted papers were invited to make presentations. The SPSC also sought contributions from others where further expert advice was appropriate. In addition, experts in all topics addressed were invited to present overviews of the status and likely future developments from a global perspective, thereby including work now and over the future at CERN and elsewhere. Valuable input was also available from the "High Intensity Proton Working Group" at CERN, and from two workshops which took place in 2004: "Physics with a Multi-MW Proton source" and "High Intensity Frontier Workshop".

The organisation of the Villars meeting, and the resulting programme, is to be found in Appendix 1, where it can be seen how the SPSC decided to divide its deliberations under different topics. The written submissions and the contributed presentations are listed also in Appendix 1.

¹ <http://cds.cern.ch/record/535676/files/SPSC-2004-020.pdf>
² <http://cds.cern.ch/record/535676/files/SPSC-2004-020.pdf>
³ <http://cds.cern.ch/record/535676/files/SPSC-2004-020.pdf>

2005 Must now to provide ECFA/BENE Week 16-18 March
clear indications to the management of CERN & EU funding agencies.

R&D activities that deserve priority must be clearly presented, approved and launched. In view of a first round of proposals for new modest investments in research infrastructures that the CERN management may present to the **CERN Council in 2006** (Linac 4 & hopefully more)

The key event that BENE will organize in 2005 will be the **NuFact05 Workshop**, i.e. *the 7th International Workshop on Neutrino Factories and Superbeams,*

Aim at launching there
a preliminary Scoping Study

7th International Workshop on Neutrino Factories and Superbeams
NuFact 05
 June 21-26, 2005
 Laboratori Nazionali INFN
 Frascati (Rome), Italy

Scientific program Committees

A. Blondel (Geneva U.)	M. Lindroos (CERN)
J. Bouchez (Saclay)	K. Long (Imperial College)
D. Casper (Irvine)	Y. Kuno (Osaka)
A. de Rujula (CERN)	F. Meot (Saclay)
Y. Declais (Lyon U.)	M. Mezzetto (Padova)
R. Edgecock (RAL)	Y. Mori (KEK)
E. Fernandez (IFAE Barcelona)	V. Palladino (INFN)
G. Fogli (Bari)	F. Ronga (INFN)
S. Geer (Fermilab)	A. Rubbia (ETH Zurich)
D. Harris (Fermilab)	T. Shibatani (Tokyo Tech)
D. Harrell (Cornell U.)	P. Strolin (Napoli)
H. Haseroth (CERN)	G. Tzanakos (Athens)
P. Hernandez (Valencia)	O. Yasuda (Tokyo Met U.)
M. Lindner (TU Muenchen)	M. Zisman (LBNL)

Chair Person
 V. Palladino (Napoli)

International Advisory Committee

M. Calvetti (INFN)	W. Namkung (Pohang U.)	S. Buontempo (Napoli)	P. Migliozzi (Napoli)
S. Chattopadhyay (Jlab)	M. Napolitano (INFN)	D. Campana (Napoli)	V. Palladino (Napoli)
P. Dornan (Imperial College)	K. Peach (RAL)	M.G. Catanesi (Bari)	A. Paoloni (LNF)
U. Dosselli (INFN)	A. Sessler (LBNL)	A. Cocco (Napoli)	L. Sabatini (LNF)
K. Eichler (PSI)	M. Shaevitz (Columbia U.)	M. C. D'Amato (LNF)	P. Strolin (Napoli)
B. Foster (Oxford U.)	A. Skirinsky (JINR)	G. Dell'Abate (Napoli)	F. Terranova (LNF)
Y. Kuno (Osaka)	H. Sugawara (Hawaii)	G. Greca (Napoli)	C. Vaccarezza (LNF)
S. Myers (CERN)	Y. Totsuka (KEK)	G. Giacomini (Padova)	L. Votano (LNF)
S. Nagamiya (KEK)	S. Wajid (Staherz U.)	M. Mezzetto (Padova)	

Local Organizing Committee

For Further Information
Please Contact:
 nufact05@...?
 http://www...?

Sponsored by ...?

The highest priority task ahead appears already the one to design the optimal evolution of the CERN proton complex.

This will have to be capable to provide competitive performance for physics programs as different as the ones of the upgraded LHC, neutrino oscillations, other fixed target particle physics experiments, Eurisol and possibly more.

LONGER TERM PLANS OF ECFA/BENE

“be ready when the construction window may open”

Our target remains to **assemble**

all the necessary knowledge necessary in

a Conceptual Design Report

of a new Eu Neutrino Complex

grading and prioritizing the different options

(superbeams, betabeams, neutrino factories)

to support a second round of

more **ambitious** proposals for new **investments** that

the CERN management may present

to the CERN Council **in 2009**

NuFact will come back again to Europe in 2008

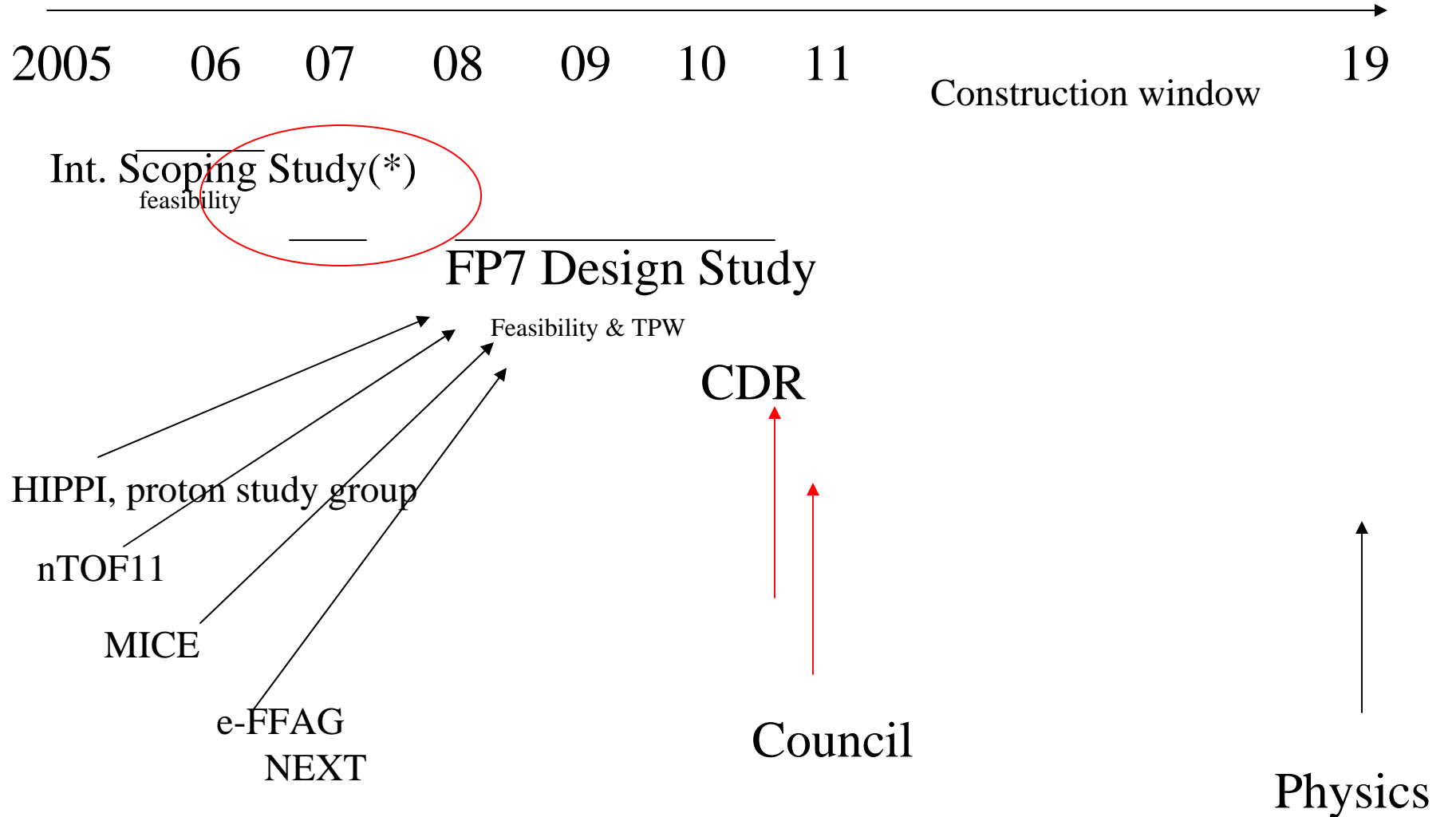
and will be again an important milestone in the process

**FP6 Design Study and I3 "failed"****SUPERBEAM and NEUTRINO FACTORY DS**

WP	Title	Responsible	Summary
1	Management	Edgecock	I3 attempt accreted new consensus notably CERN participation
	Proton Driver	Garoby	
2	Targetry	Bennett	
3	Collection	Campagne	
4	MICE	Blondel	
5	FFAGs	Meot	
6	Machine	Haseroth	
7	Physics and detectors	Mezzetto Strolin	

Leading House = RAL ; minor CERN involvement

NuFact & Superbeam DS : the new plan



NB Betabeam CDR End 2009 !

(*) CCLRC mandate
to UNKNF May 27

Hints of good hope from CERN

**CERN is clearly becoming aware of this
may well be willing to assume leadership/partnership**

Proton Acceleration Future

PAF study group "S. Myers", report mid 09

Physics study group (J. Ellis)
SPL Superbeam 3.5 GeV A.Cazes et al
Nufact 6-10 GeV S. Brooks et al

HIF05 Elba INFN & FNAL May 05

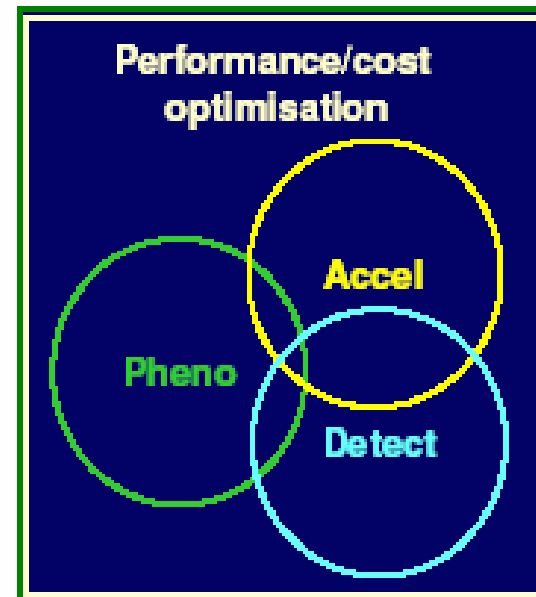
NuFact05 June 05

LHC injectors Workshop Sep 05

**More in general, a new Neutrino Complex
is gaining credit as a serious option for CERN future**

Scoping study:

- **Top-level divisions – to provoke discussion:**
 - **Phenomenology/theory:**
 - Precision/high-sensitivity oscillation measurements
 - Comparison of NF sensitivity with β -super-beam
 - **Accelerator-facility concept/R&D:**
 - Proton driver; front-end and acceleration
 - Target and collection
 - Muon front end
 - Rapid acceleration
 - Storage
 - **Neutrino detector:**
 - Iron calorimeter
 - LAr
 - H₂O Cherenkov
 - Other options ...



Proposed schedule

- Working backwards:
 - Hand in proposal 27May05
 - Full draft of proposal 13May05
 - Plenary meeting to discuss proposal 06/07May
- Preparing ‘key success criteria(!)’:
 - Example for physics part – draft only!

RAL?

Key success measures			
1	Review the physics case for the Neutrino Factory with a view to defining the baseline specification for the facility		
	Description	Success criteria	Date
1.1	Review previous analyses of physics reach of future facilities (muon-beam, beta-beam, Neutrino Factory) for precision neutrino oscillation studies to identify areas in which data used, assumptions made, or analysis performed needs to be extended.	Prioritized set of extensions to existing analyses; possibly including new data to be taken into account. Ge-analysis of impact of data sets likely to be available when facility is available, refinements to theoretical or phenomenological treatments.	Start + 3 months
1.2	Development of benchmarking codes (such as GLOBES) to be developed to allow performance comparison of future options to be made.	Review of available codes and analysis of developments required to allow physics reach of future facilities for precision neutrino measurements to be evaluated and compared. Extension of aged benchmarking codes to meet the highest priority extensions identified in the review of available codes.	Start + 3 months Start + 6 months
1.3	Re-evaluation of the physics case for the Neutrino Factory and a comparison of physics reach of future facilities for precision neutrino oscillation measurements.	Draft document summarizing both the physics reach of the Neutrino Factory and the comparison of the performance of the various options and the use of the various options to resolve degeneracies and parameter correlations.	Start + 12 months
2	Review the options for the accelerator complex with a view to defining a baseline, agreed among the various interested parties, that can form the basis of the full design study		

Contacts to date:

- **Japan: 28Mar05 – 01Apr05**
 - Supportive of initiative
 - Seek to contribute to:
 - Physics study
 - Rapid acceleration, especially development of FFAG option – scaling and non-scaling

- **US: phone/email only so far
dedicated discussion 15/16Apr**
 - Supportive of initiative
 - Seek to contribute to:
 - So far indication that US interested in making a broad contribution to physics, machine and detectors;
 - Need to discuss in person to make progress.

7th International Workshop on Neutrino Factories and Superbeams

NuFact 05

June 21-26, 2005

Laboratori Nazionali INFN
Frascati (Rome), Italy

Chair Person

V. Palladino (Napoli)

International Advisory Committee

M. Calvetti (INFN) W. Namkung (Pohang U.)
S. Chattopadhyay (Jlab) M. Napolitano (INFN)
P. Dornan (Imperial College) K. Peach (RAL)
U. Dosselli (INFN) A. Sessler (LBNL)
R. Eichler (PSI) M. Shaevitz (Columbia U.)
B. Foster (Oxford U.) A. Skrinsky (BINP)
Y. Kuno (Osaka) H. Sugawara (Hawaii)
S. Myers (CERN) Y. Totsuka (KEK)
S. Nagamiya (KEK) S. Wojcicki (Stanford U.)

Scientific program Committee

A. Blondel (Geneva U.) M. Lindroos (CERN)
J. Bouchez (Saclay) K. Long (Imperial College)
D. Casper (Irvine) Y. Kuno (Osaka)
A. de Rujula (CERN) F. Meot (Saclay)
Y. Deciais (Lyon U.) M. Mezzetto (Padova)
R. Edgecock (RAL) Y. Mori (KEK)
E. Fernandez (IFAE Barcelona) V. Palladino (INFN)
G. Fogli (Bari) F. Ronga (INFN)
S. Geer (Fermilab) A. Rubbia (ETH Zurich)
D. Harris (Fermilab) T. Shibata (Tokyo Tech)
D. Hartill (Cornell U.) P. Strolin (Naples)
H. Haseroth (CERN) G. Tzanakos (Athens)
P. Hernandez (Valencia) O. Yasuda (Tokyo Met U.)
M. Lindner (TU Muenchen) M. Zisman (LBNL)

Local Organizing Committee

S. Buontempo (Napoli) P. Migliozzi (Napoli)
D. Campana (Napoli) V. Palladino (Napoli)
M.G. Catanesi (Bari) A. Paoloni (LNF)
A. Cocco (Napoli) L. Sabatini (LNF)
M. C. D'Amato (LNF) P. Strolin (Napoli)
G. Delellis (Napoli) F. Terranova (LNF)
G. Greca (Napoli) C. Vaccarezza (LNF)
A. Guglielmi (Padova) L. Votano (LNF)
M. Mezzetto (Padova)

For Further Information

Please Contact:

nufact05@.....?
http://www. ?

Sponsored by ?



Sunday June 26

9:00-13:00

WW R&D Session

in the presence of
as many agencies
as possible

1) Physics Studies : Status & priorities

1) Accelerator R&D : Status & priorities

2) Neutrino Detectors: Status & priorities

PANEL & OPEN DISCUSSION

Launch International Scoping Study ... to report at NuFact06