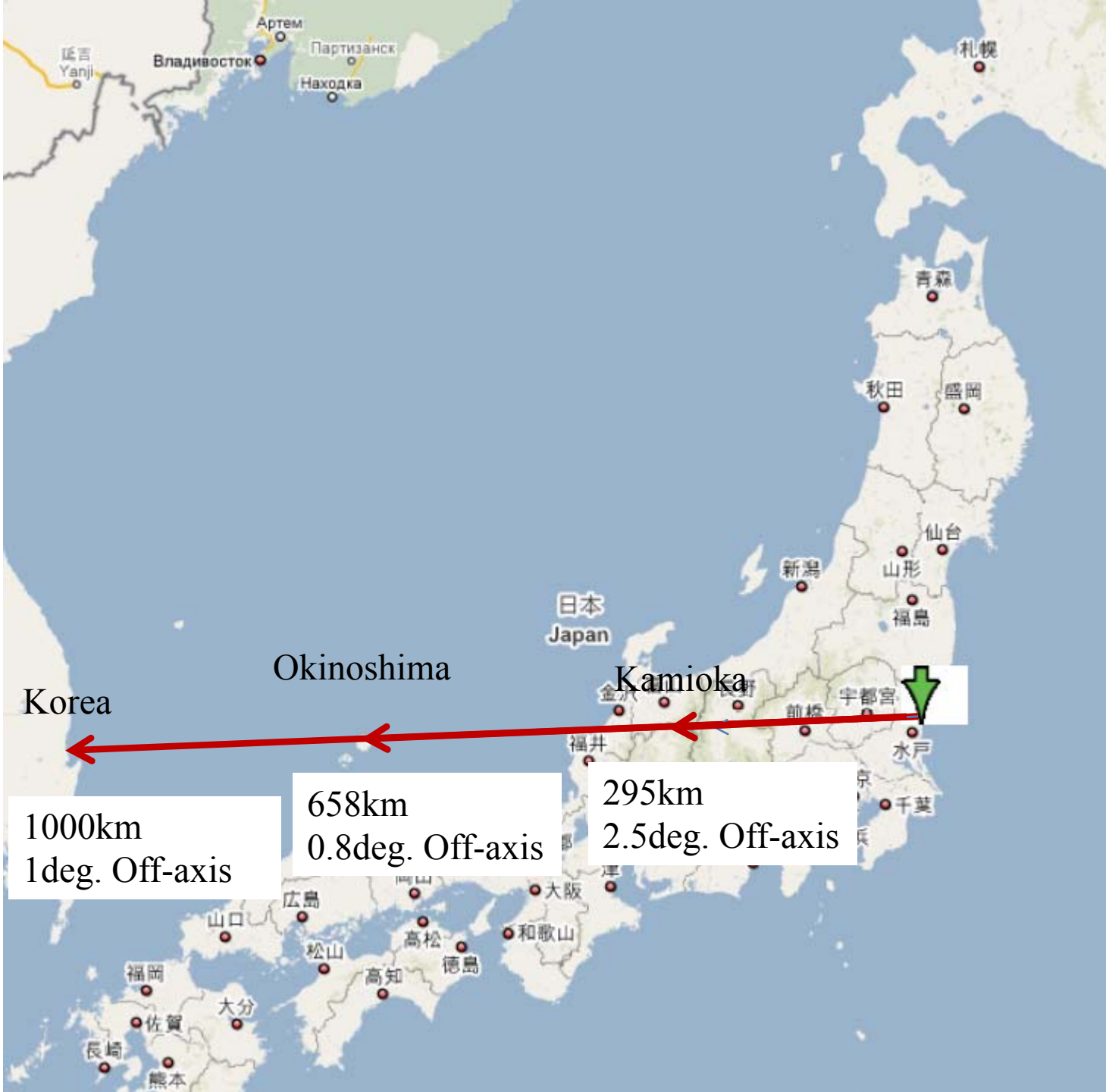
Brief Summary

J-Parc to Somewhere
Long Baseline Neutrino Experiment
and
Nucleon Decay Experiment
With
Huge Volume Detector


Артем
Партизанск
Владивосток
Находка
Yanji
札幌
青森
秋田
盛岡
仙台
新潟
山形
福島
日本
Japan
Okinoshima
Kamioka
Korea
宇都宮
前橋
水戸
福井
千葉
1000km
1deg. Off-axis
658km
0.8deg. Off-axis
295km
2.5deg. Off-axis
大阪
広島
山口
高松
和歌山
松山
徳島
高知
福岡
大分
佐賀
長崎
熊本

Quest for the Origin of Matter Dominated Universe

- Lepton Sector CP Violation
  - Search for CP violation in Neutrino Oscillation Process
    - Conclude Mass Hierarchy of Neutrinos
    - Examine Matter Effect in Neutrino Oscillation Process

- Proton Decay
  - $p \rightarrow \nu K$
  - $p \rightarrow e \pi^0$

*Non-Equilibrium Environment in the Evolution of Universe is Assumed

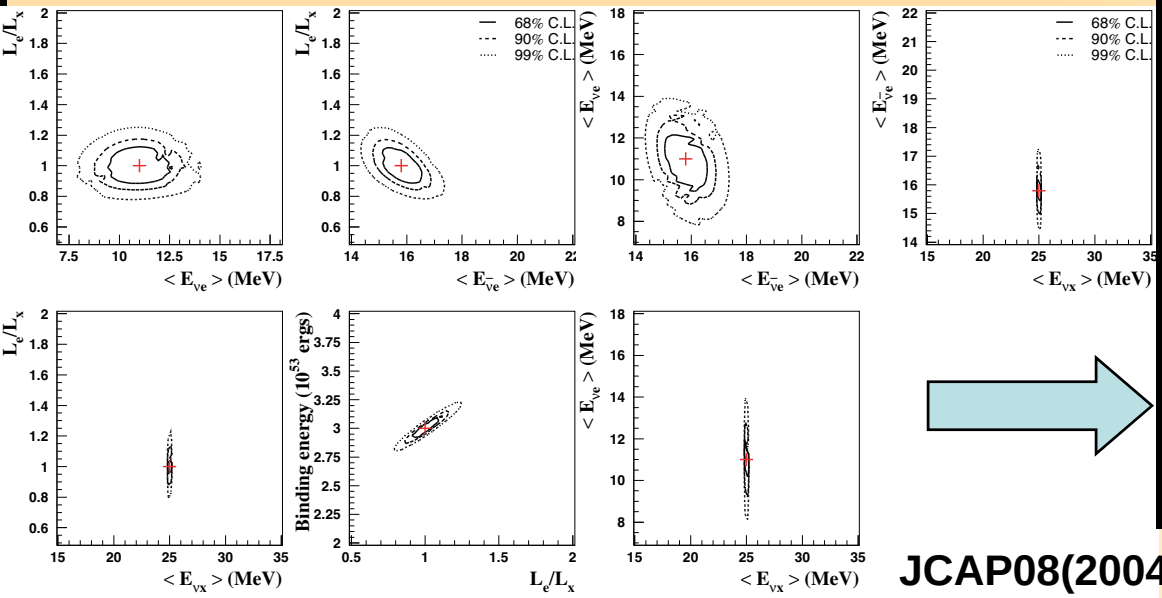
Supernova at 10 kpc

Interaction	Rates ($\times 10^4$)
ν_e CC (^{40}Ar, ^{40}K*)	2.5
ν_x NC (^{40}Ar*)	3.0
ν_x ES	0.1
anti–ν_e CC (^{40}Ar, ^{40}Cl*)	0.054

380 events from neutronization burst

Large statistics allow decoupled studies to:

- Probe explosion mechanism
- Measure intrinsic neutrino properties



Supernova property	Error (%)
Binding Energy	2-4
Average energy of electron neutrinos at the core	5-14
Average energy of electron anti-neutrinos at the core	3-9
Average energy of other (anti)neutrinos at the core	<1
Relative luminosity of electron to non-electron flavours	10-40

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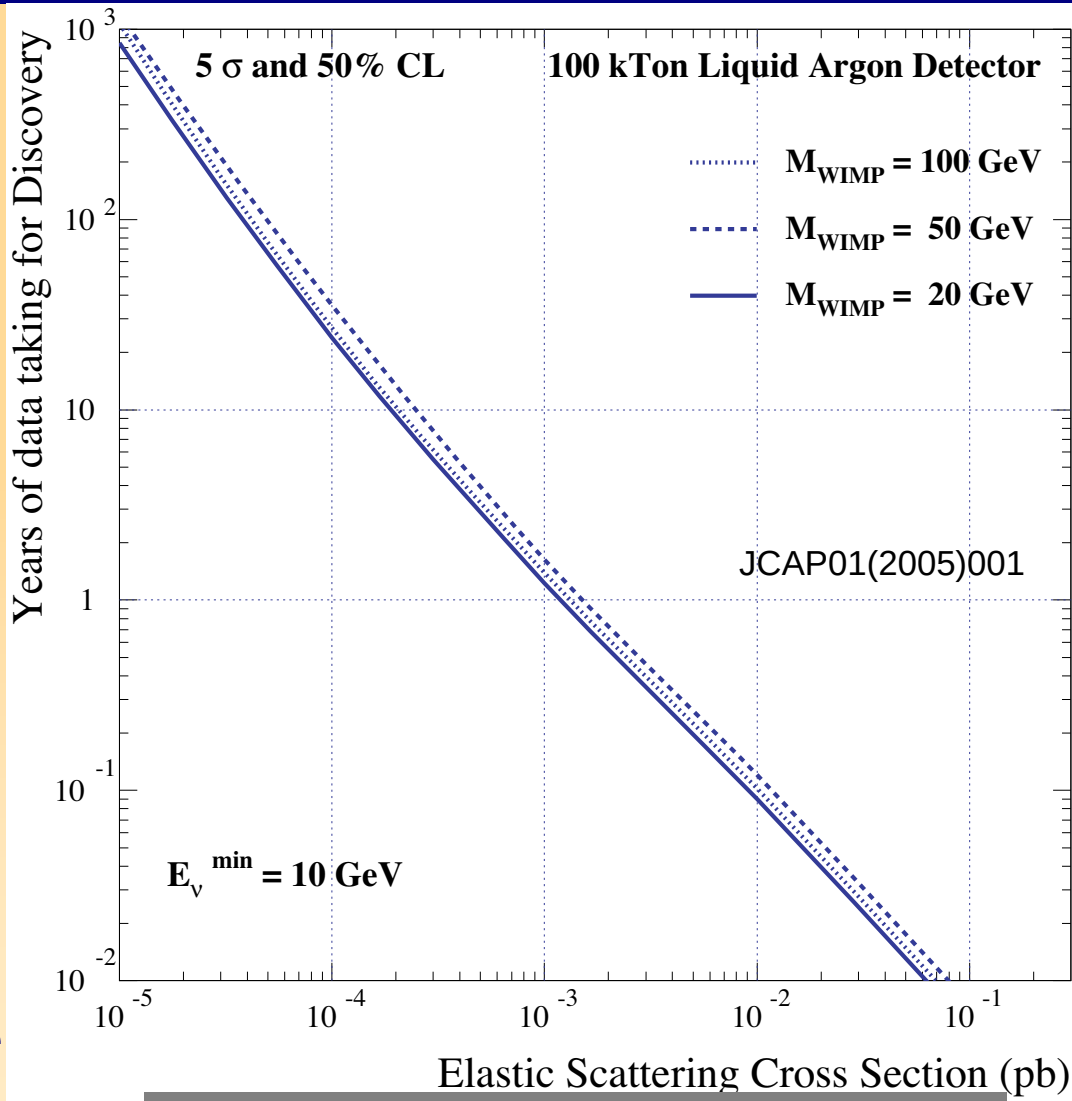
A. Bueno, U. Granada

Indirect Dark Matter detection

- WIMPS can be gravitationally trapped in the centre of celestial massive bodies (e.g. the Sun)
- They can annihilate and produce standard particles (among others high energy neutrinos)
- Look for high energy (anti-) ν_e pointing to the Sun
  - Take advantage of superb angular resolution and electron ID capabilities of LAr TPCs
- Clear WIMP signal expected if elastic cross section above 10^{-4} pb



$$\sigma_{elastic} = \sigma_{H,SD} + \sigma_{H,SI} + \sigma_{He,SI}$$

Realization of the Huge Detector

- Test of the Key Components Underway
- Need to Understand
  the Detector as a Whole System
  - Physics Motivated Optimization is Important
  - Test with the Beam is Important
- Etc.
- Etc.
- Etc.(including costing)

Importance of Resolution (1)

- "Resolution" includes;
  - neutrino interaction
    - **Fermi motion**
    - **Nuclear interaction for final state particles.**
    - **Vertex nuclear activities (e.g. nuclear break up signal)**
    - **NC π^0 event shape including vertex activity**
  - detector medium
    - **Ionization**
    - **Scintillation**
    - **Charge/light correlation**
    - **Signal quenching (amount of ionization charge/scinti. light is non-linear to dE/dx. E.g.including recombination)**
    - **hadron transport**
    - **Signal diffusion and attenuation**
  - readout system including electronics
    - **Signal and Noise Ratio**
    - **Signal amplification**
    - **Signal shaping**
  - reconstruction
    - **Pattern recognition**
    - **π^0 event shape**
    - **Particle ID**

We assume these effects causes Gaussian resolution, then see the results

Neutrino Intensity Upgrade

Quest for the Origin of Matter Dominated Universe

T2K (2009~)

Discover ν_e app.

Neutrino Anti-Neutrino meas.

T2K upgrade

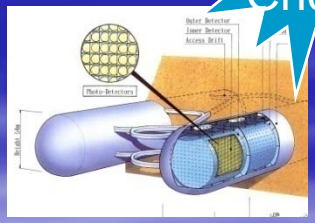
Intensity Upgrade

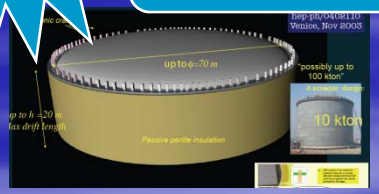
Detector R&D

Tech. Choice

Large det. Construction

CPV search
Proton decay





Possible Timeline

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	4	4	4	4	4	4	4	4	4	4
Linac(400MeV)		?			? →	400MeV				
T2K										
MR Intensity Upgrade					?		?	→ 1.66MW		
Detector R&D										
Construction						?				

Presented by KEK D.G. at P5 Panel at FNAL, 31-Jan-2008

We Should be Prepared

NOT MSSING

Rare Opportunity

(Probably Only Once at the $\nu_\mu \rightarrow \nu_e$ Discovery)

to Initiate the Discovery Experiment of

Lepton Sector CP Violation and Proton Decay

Let's Continue Discussion to Submit Proposal

(Target Year ～2012)