

The background of the slide is a light beige, aged paper texture. On the left side, there are several black ink splatters of varying sizes, some appearing as solid circles and others as more diffuse, radiating shapes. The text is positioned on the right side of the page.

Writing the Design Study document:

Plan, scope and tasks

T. Dent (Cardiff)

ET WG4 meeting, Observatoire Côte d'Azur (Nice)

2nd September 2010



Warning

- This talk will not contain science!
- To get ET funded / built, need to coordinate and present scientific material together
- This is the aim of the Design Study

ET Design Study

- ET currently funded as a 3-year design study
- Started in May 2008
- End product of this phase: Design Study Document
 - Presented to EU to make preliminary case for building ET
 - Timescale 2015-plus for push towards funding decision
 - Coincidence with AdvLIGO, AdVirgo operation is not accidental!
- Document of ca. 400 pages
 - 100p per Working Group : WG 1-4

Elements of DS / funding case

- Technical studies (WG1,2,3)
 - How and where can ET be built?
 - How much is it likely to cost?
- Science case (WG4)
 - What can we study uniquely (better than any other method) with ET?
 - With several ET-class detectors in different sites?
- Characteristics of ET for ‘post-discovery’ GW science
 - Large SNR for many astrophysical systems \Rightarrow large amount of information about source
 - (Very) large number of sources over observing time \Rightarrow good statistics

WG1-2-3 overview

- WG1 – site choice and infrastructure
 - Realistically: **one ET site in Europe** (+ \times polarization)
 - Infrastructure of 30km long, 50m deep tunnels, access... makes strong demands on the site
- WG2 – suspension and cryogenics
 - Crucial to achieve good low- and mid-frequency sensitivity
- WG3 – optical topology
 - Realistic / possible optical design and noise curves
 - Interact strongly with WG1-2 to produce coherent overall design

ET Science Case (WG4)

- Identify science topics, observations for ET / 3G
 1. Strong-field tests of GR and fundamental physics
 2. Astrophysics
 3. Cosmology and cosmography
 4. Data analysis and computational challenges
- Studies of expected sensitivity (figure of merit) for each science observable
- ET Trade Studies : How do different choices of site or optical design affect science goals?
 - Interact with WG3 on optics \Rightarrow noise curve

Writing the Design Study Document

- Write *review* of science results relevant to ET design
- Results obtained by WG4 and ET Science Team, and other studies
- ‘Transverse writing team’ was (self-) selected from WG1-4, about 20 people
- For WG4:
 - Chris Van Den Broeck
 - Tania Regimbau
 - T.D.
 - Bangalore Sathyaprakash

DSD science case resources

- Special issue of CQG (2009) on ET science
- ET Vision Document (2009)
 - Initial estimates of ET science possibilities and goals
 - Many studies have significantly advanced since VisDoc
- A number of published or submitted scientific papers 2009 - 10 - ...
- Unpublished work (eg talks) by WG4, Science Team members and others

Tasks

- Science topics divided up between WG4 writing group
- Writers use existing resources to draft science case: total of ca. 100 pages
- Writers contact other researchers (e.g. YOU) to check / extend existing studies
 - Contributions welcomed on specific topics!
 - Author list of DSD drawn selectively from Science Team (i.e. YOU)
- First draft hoped for by November 2010 for EG General Meeting - ambitious timeline

Summary

- Lots of exciting science presented on several topics
 - Fundamental physics
 - Astrophysics
 - Cosmology
- ET DesignStudyDocument will summarize this to motivate building ET (and other 3G detectors)
- WG4 writing group will collect and present ET science studies
- Resulting Science case in DSD to be seen as *collaborative effort* of Science Team



An Accurate Map of EUROPE Laid down from the best Authorities

WESTERN OCEAN

SPAIN THE BARBARY P. OF AFRICA

HYPERBOREAN OCEAN

GERMAN OCEAN

MEDITERRANEAN SEA

ANATOLIA OF ASIA MINOR TURKEY IN ASIA

PART OF SIBERIA

TARTARY PART I

CASPIAN SEA

Degrees of West Longitude 30 20 10 0 10 20 30 40 50 60 East Longitude from London

I Hour 0 II Hours East from London III