



ET_ITALIA



SEVENTH FRAMEWORK PROGRAMME

CdS – preventivi 2021

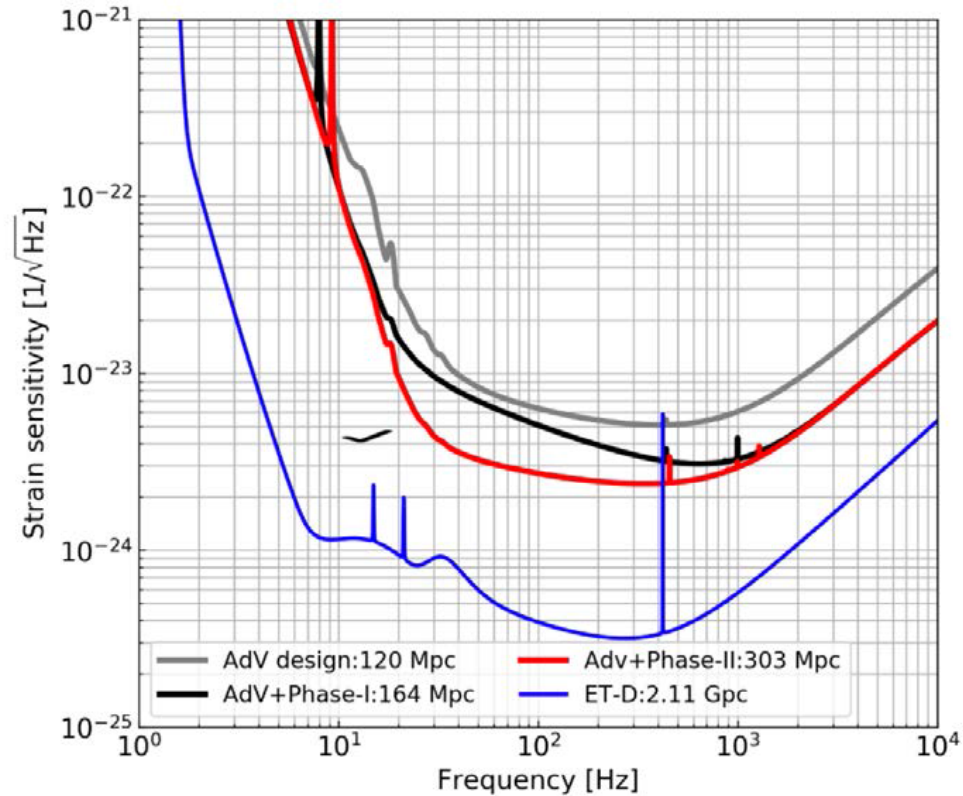
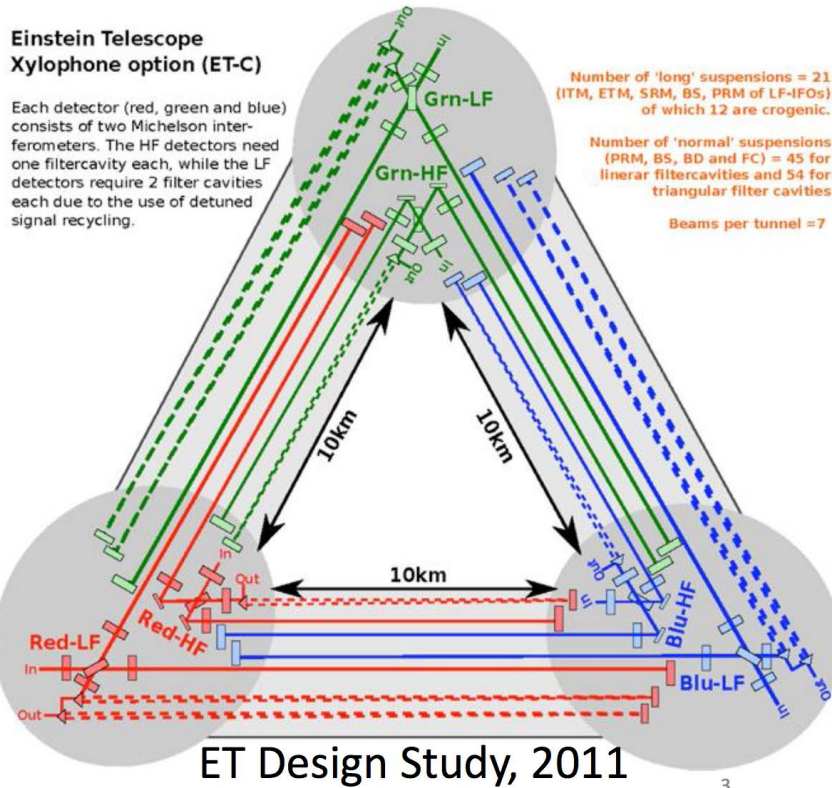
F. Sorrentino

16 luglio 2020

Einstein Telescope design study (2011)

Einstein Telescope Xylophone option (ET-C)

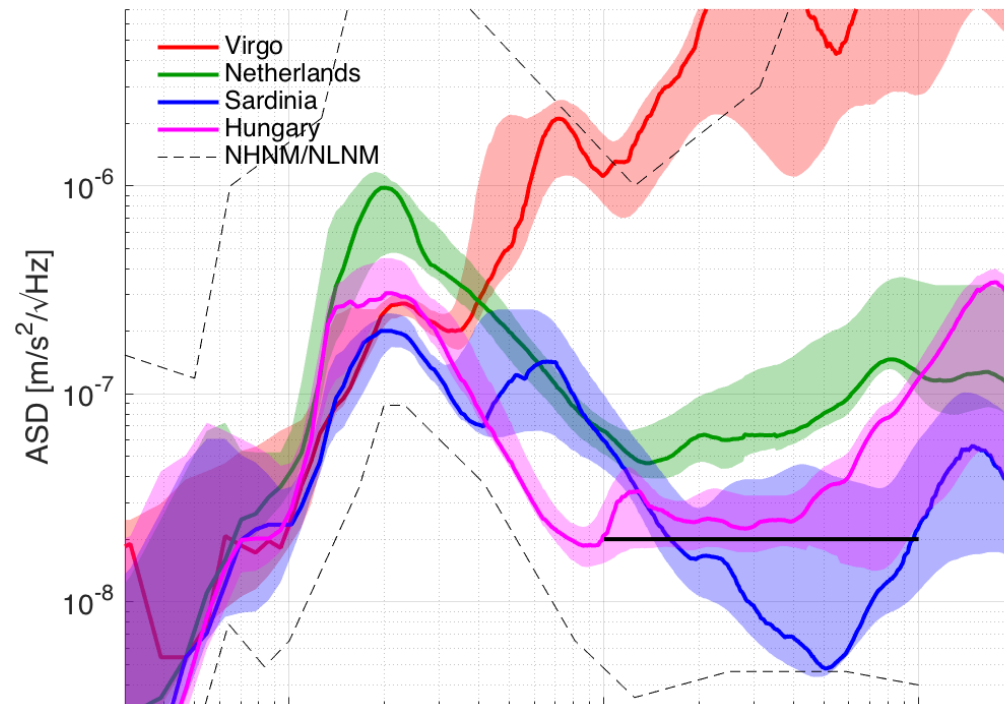
Each detector (red, green and blue) consists of two Michelson interferometers. The HF detectors need one filtercavity each, while the LF detectors require 2 filter cavities each due to the use of detuned signal recycling.



https://tds.virgo-gw.eu/?call_file=ET-0106C-10.pdf

ET: from concept to realistic implementation

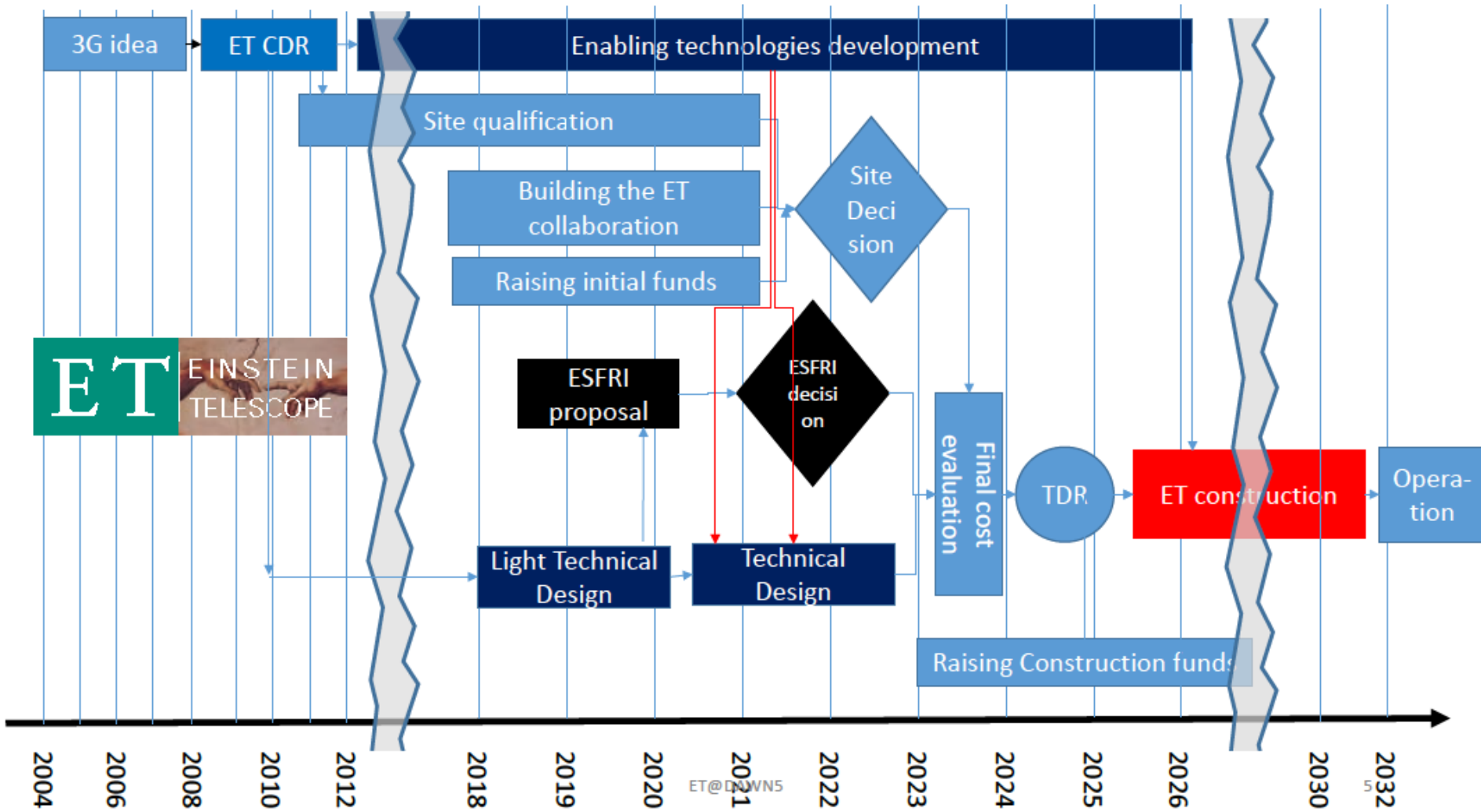
- Identify requirements for the infrastructure
- Put it in a realistic context (candidate sites)
- Do a preliminary feasibility study and costing
- Develop crucial technologies:
 - improvement of the VIRGO **seismic attenuation system**, to improve the low frequency sensitivity and to maintain the INFN historic leadership in this field
 - design, construction and test of a **cryogenic payload**
 - development of innovative **frequency dependent squeezing** techniques, to reduce quantum noise;
 - improvement of the (optical and mechanical) losses of the **mirrors' coatings**, to reduce thermal noise



ET: project roadmap

- ET has a clearly defined project roadmap:
 - 2018-2019 formation of the ET collaboration
 - **2019-2020 ESFRI roadmap**
 - Light TDR under finalization: refined CDR cost evaluation, selection of key options, ESFRI proposal
 - 2022 Site Selection
 - Technical/political activity
 - Requirements need to be compared with the site characteristics through an intense experimental activity in the next 3 years
 - 2023 Full Technical Design Report
 - Cost definition
 - 2025 Infrastructure realization start (excavation,)
 - 2030 -2031 end of infrastructure construction, beginning of installation
 - 2032+: installation / commissioning / operation

ET: project roadmap



National activities

- Currently only two sites are candidate to hosts the ET infrastructure
 - The three borders region (NL, BE, DE)
 - SosEnattos(Sardinia, Italy)

National activities - Maastricht

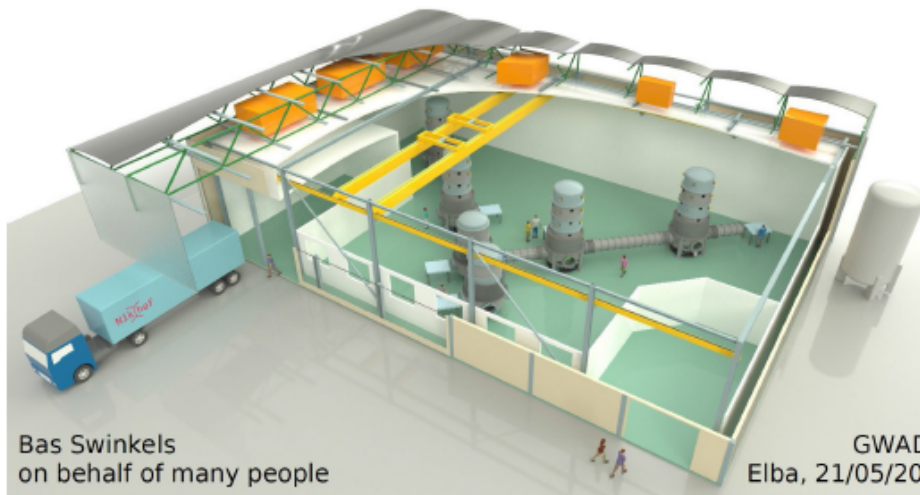
Why in Maastricht?



ET Pathfinder activities



ET Pathfinder in Maastricht



Bas Swinkels
on behalf of many people

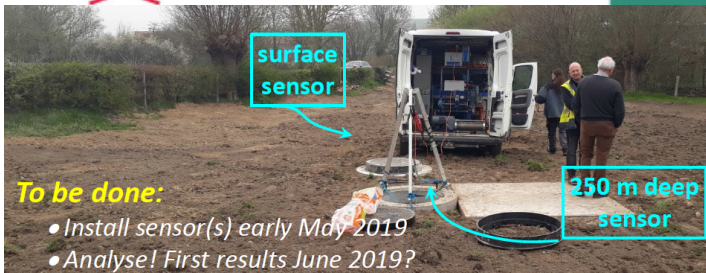
GWADW
Elba, 21/05/2019



Funding & partners



- Obtained ~14.5 MEuro funding from unconventional sources:
 - InterReg Flanders-South of NL (European fund for cross-border development)
 - Province of Limburg (NL), Dutch and Belgian national ministries
 - Matched contribution by partners
- Partners: Nikhef, universities of Antwerpen, Eindhoven, Ghent, Hasselt, Leuven, Maastricht
- Satellite partners: Aachen, Brussels, Fraunhofer, Liège, Louvain la Neuve, Twente, TNO
- Additional input from Glasgow, AEI, Perugia ...
- 100+ person-years (staff scientists and engineers) committed over the next 5 years
- New collaborators are welcome



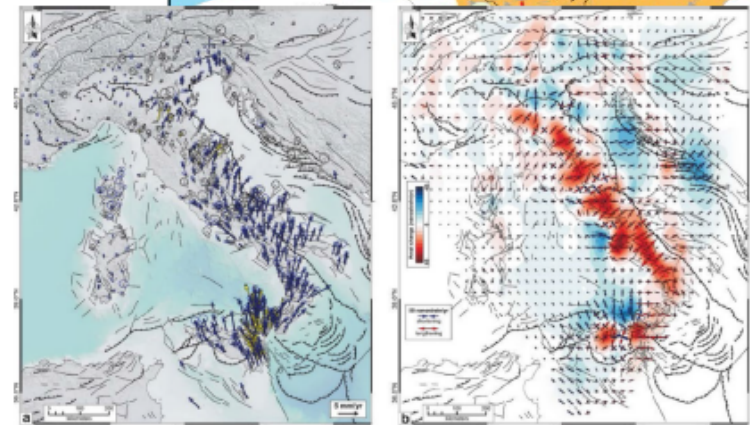
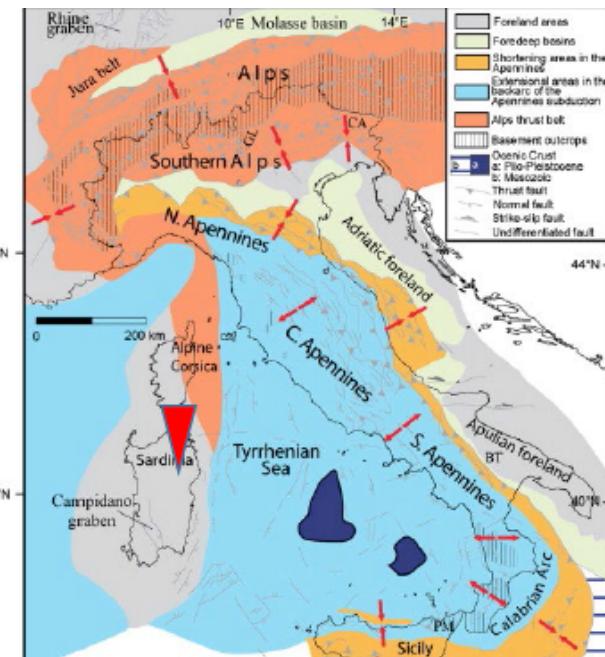
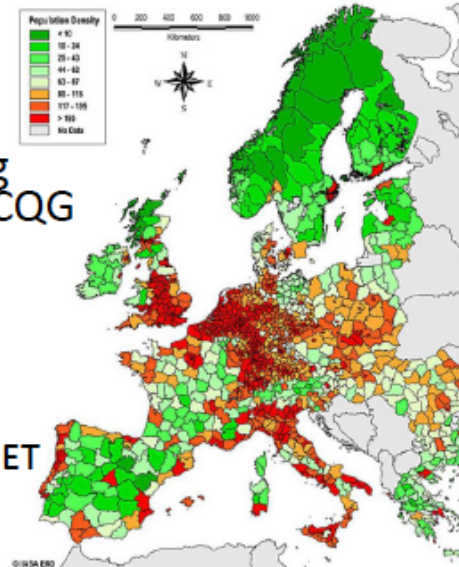
To be done:

- Install sensor(s) early May 2019
- Analyse! First results June 2019?

National activities – Sos Enattos



Sardinia - Italy



ET@DAWN5

- Site (preliminarily) qualified with a long measurement campaign, published in CQG
- Very high quality geological, seismic, constructive and environmental characteristics
- Support of the Italian Government
 - 17 M€ promised to support AdV+ and the ET site candidature
 - 5.5M€ delivered in 2018
 - 2.5M€ delivered by Sardinia region
 - 1M€ from Research Ministry (PRIN)
- Direct involvement of the largest academic institutions in Italy:
 - INFN, INAF, INGV
 - University La Sapienza Rome
- Direct involvement of the Sardinian Universities:
 - UniSS, UniCa

Attività svolte nel 2019÷2020

- Preparazione proposal EFSRI
 - Creazione di un TDR semplificato
 - Creazione della struttura di management della collaborazione
 - ET Lol firmata da circa 1000 scienziati
 - 10th ET symposium (Sos Enattos, 11÷12th of April 2019)
 - Presentazione ET management bodies e bozza di statuto ET
 - Presentazione attività ET Writing Team
 - Visita al sito sardo candidato alla installazione di ET
 - Discussione di geometria, costi, impegni nazionali
 - MOU tra INFN, Nikhef, CERN su ET
- Caratterizzazione del sito di Sos Enattos
 - Sensori sismici, magnetici, ed acustici installati in superficie e sotto terra
 - 1 paper in preparazione: Seismic noise at Sos Enattos, the Sardinia candidate site for the Einstein Telescope
 - Preparazione dello scavo di due pozzi per carotaggio ed alloggiamento di ulteriori sensori
 - Preparazione del laboratorio sotterraneo SarGrav

Impatto del COVID-19

- Impatto limitato sulla preparazione del proposal ESFRI
 - Cancellazione di workshops
 - Workshop on Vacuum and Cryogenics, 1-3 of April 2020, CERN
 - ET symposium, 30-31st of March, Annecy, Fr
 - Attività proseguita attraverso meetings online e scrittura del TDR
- Ritardi nelle attività di caratterizzazione del sito sardo
 - Tuttavia l'acquisizione da remoto e l'analisi di dati dalle stazioni di misura è proseguito

Contributo genovese

- Attività di coordinamento internazionale a nazionale (Gemme)
 - organizzazione e coordinamento per la preparazione del proposal ESFRI
 - Instrument Science Board
 - attività a supporto della candidatura del sito di Sos Enattos
- R&D per la terza generazione
 - sviluppo di modelli di propagazione del rumore sismico e newtoniano, basati su dati geo-morfologici del sito di Sos Enattos (Chincarini)
 - progettazione generale del layout ottico del detector, metodi di ottica quantistica (Sorrentino)
 - studio di metodi di caratterizzazione dei coatings delle masse di test a basse temperature per la riduzione del rumore termico (Canepa)
 - Contributo a sviluppo di tecniche avanzate per vuoto/criogenia

Anagrafica, servizi, richieste finanziarie

- Ricercatori:
 - M. Canepa (prof. ord.) 0.1
 - A. Chincarini (ric.) 0.2
 - G. Gemme (dir. dic.) 0.4
 - L. Rei (tecnol.) 0.1
 - F. Sorrentino (ric., coord. loc.) 0.2
- Servizi: n.a.
- Richieste finanziarie:
 - Missioni (soprattutto coordinamento) 12 k
 - Licenze SW 8 k
 - Consumo (lab coatings) 15 k TBC