# SPB/WP4: Updates

September 19th, 2022



# News and updates from sites

September 19th, 2022

Next Generation EU Investment focused on ET enabling technology and Sardinian site candidature support

Leaded by INFN Partners: 11 Universities, INAF and ASI (Italian Space Agency)

Budget 50M€ approved

### ETIC – Einstein Telescope Infrastructure Consortium



## **News from Sos Enattos Site**



➢ETIC (Einstein Telescope Infrastructure Consortium) project approved. Budget 50M€

□ Preliminary Design of ET infrastructure

□Network of Laboratories for R&D dedicated to ET





## ET-PP/INFRADEV Progress report SPB Euregio Meuse-Rhine Site

D4.1 – M10 Scan of legal affairs

Contract (~50 k€) awarded to Amberg & Tractebel-Engie to make inventory of legal/planological/environmental hurdles related to the realisation of ET in the EMR.

- Kick-off meeting 31-August-2022
- Report expected early 2023

### D4.2 – M15/INFN Socio-economic impact

(this is the main motivation of our governments to support ET, I fear)

4 studies performed of which 2 public (ESFRI annex)

Industrial collaboration

2,2 M€

+ 16 M€ Dutch NGF



3,6 M€

## Site preservation: Windturbines





Very popular, even more so with present electricity prices

Netherlands:- ban on new windturbines

 ban on other activities (like excavations) that risk to impact ET adversely

Belgium: - discussions ongoing with notably Engie (large windturbine supplier) regarding new initiatives.

Germany: -?

More measurement campaigns in preparation (with Engie)

### Main issue: Cost-effective location to build ET in EMR?





## Answer: requires lots of geology studies

Funding: • about 7,5 M€ E-TEST (Interreg-EMR, capital+personpower, 2020-2023) (boreholes, active seismic, •••)

- 18 M€ (Dutch NGF geology, mosty capital, 2022/2023-2025) (more boreholes, lots of active seismic, •••)
- ? M€ from a to be submitted Interreg-NWE application focused on sustainability (2023-2025)

### NGF: 2 full-day workshops, June 20 & September 1

<u>Participants</u>: TU/Delft, Liège university, RWTH-Aachen, KNMI, TNO, Antea, Implenia, Limburg province, geological survey Belgium, Royal Observatory Belgium, Nikhef, Bonn university, •••

#### **Objectives:**

- > Update on recent and upcoming activities
- Discussion on Urgent/Critical Activities
  - Construction of hydrogeological model (critical)
  - Establish baseline geological model (keep it up-to-date!), including universal data access – shared drive, etc.
  - Geophysical mapping of subsurface: seismic, EM, gravity, ••
  - Establish critical/minimum subsurface requirements/characteristics in view of excavations
- Activity planning & resourcing collaboration towards aligned goal(s)

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## **Geophysical measurements**



#### 2D & possibly 3D active seismic

### Electro-magnetic (resistivity)

#### Gravimetric







Small area: 2019 in Terziet Large area: Sep/2022 ~40 km (E-TEST project)

Anticipated: 2023 ~ 400 km (NGF project)

Discussed since 2021 with Emerald Geomodelling (Sardegna & EMR) Considered

*First tests Aug/2022* 

Large air-borne campaign in future?

## **Electro-magnetic test campaign** August 2022





Measurements at two locations each about few 100 × few 100 meters and at one smaller area location:

- Moving setup (EM pulses every few meter) as shown in photo
- Stationary setup with a very large (about 40×40 m<sup>2</sup>) source coil 'WalkTEM'
- Report (Emerald Geomodelling) expected by the end of September. Hope to reach few 100 m depth

## Active seismic campaign September 2022

3 lines, ~ 40 km total length Shots every 20 m (3 vibes) Receivers every 10 m





#### Extra tests:

- Study 3D potential: by adding 'cross' lines
- Best receiver separation:
   400 m line 1 m spacing

### Boreholes: 3 done, 1 planned (E=TEST)

3 lines, ~ 40 km total length Shots every 20 m (3 vibes) Receivers every 10 m



Extra tests:

Study 3D potential:

by adding 'cross' lines

Best receiver separation:

400 *m* line – 1 *m* spacing



## **Active seismic campaign – September 2022**





## Next SPB workshop: January 2023, Maastricht?





3 days with optional excursion to experience the Euregio Meuse-Rhine and to visit ETpathfinder

## **ET-PP WP4 Milestones**



### **Milestone name – Date (in months)/Lead Institution**

M4.1 – M3/UW : Document detailing the site-specific characteristics that impact ET sensitivity and its duty cycle => REPORT

M4.2 – M10/UW : Common methodology to estimate impact of site characteristics on ET sensitivity and operation and, if required, a scheme to compensate it => REPORT

## **ET-PP WP4 Deliverables**



#### **Deliverable name – Date (in months)/Lead Institution**

- D4.1- M10/Nikhef: Scan of legal procedures, permitting and land acquisitions, i.e. the steps to be taken prior to starting excavations
- D4.2 M15/INFN: Updated socio-economic impact studies. Scan of accessibility, quality of life etc.
- D4.3 M28/UW: Complete quantification of all the aspects impacting the ET performance for each site
- D4.4 M30/INFN: Report on 3D geology, hydrology, etc. model with localisation of the ET infrastructure
- D4.5 M42/Nikhef: Updated cost and schedule estimates of the excavations, including, if necessary: instrumentation for Newtonian Noise cancellation; costs of debris removal; costs of land acquisition, permitting, etc.

(months from ET-PP start date, Sept. 1st)

## **SPB/SCB WBS**



Division structure within the SPB WBS:



## Issues to be addressed soon



- Timeline review (on going)
- Discussions with ISB/OSB on relevant parameters/requirements (Jan Harms workshop July 11<sup>th</sup> a very good start)
- $\succ$  ET basic geometry definition i.e.  $\Delta$  versus  $\perp$  (urgent, next ET) ET-PP INFRADEV kick-off Meeting – Barcelona 19-20 July 2022 Symposium will be devoted to that)
- Approach to update notably civil engineering with or without the involvement of
- Bidbook approach

## **SPB-ISB Interactions**



Sept. 19<sup>th</sup> : preliminary call SPB-ISB (organized by L. Naticchioni)
WD1 Div. Chairs, ISB Div. Chairs (Active Noise Mit., Interferometer, Suspensions)

Update of physical variables to be measured

Common methodology to estimate impact of site characteristics on ET sensitivity

➤Talk and meeting on Site characterization @ ISB workshop 17-21 Oct. GSSI L'Aquila <u>https://indico.ego-gw.it/event/465/</u>

### SPB-WD1: Physical Variables and Characterization



- What we are measuring (or we plan to measure) for site characterization:
- Seismic background: broadband seismometers (10mHz-10Hz), geophones, gravimeters (<1Hz);</li>
- Magnetic noise (MFS-06 type magnetometers, 0.1mHz-10kHz);
- Acoustic noise (B&K-GRAS type microphones, 0.1Hz-20kHz);
- Barometric fluctuations (Seismowave MB3a infrasound sensors type, 10mHz-28Hz);
- Radon outgassing (possible only in the Sos Enattos mine, Sardinia site) and natural radioactivity
  - Weather station (Davis Vantage Pro2): wind, temperature, pressure, rain... SPB (WD1) – ISB call 9-2022 Credits to L. Naticchioni

### **SPB-WD1: Physical Variables and Characterization**



# Do we miss something important that could affect the detector performances (sensitivity, locking, duty cycle...)?

### e.g.:

...

Seismic measurements  $\rightarrow$  ISB-SUSP

Seismic measurements  $\rightarrow$  NN modelling  $\rightarrow$  ISB-ANM-NN

Seismic measurements  $\rightarrow$  glitchness  $\rightarrow$  ISB-ITF

Magnetic noise measurements  $\rightarrow$  ISB-ANM-MN Environmental measurements  $\rightarrow$  ISB-ANM-ES



ISB-ITF: sensitivity, duty cycle...

## **SPB Re-Organization and Timeline review**



➤Today SPB meeting (Sept 21<sup>st</sup>) devoted to discuss plan and future activities of WD1 (Physical variables and characterization) and WD2 (Geology)

## **ET Annual and monthly Meeting**



ET monthly meeting: first Tuesday of each month, 2 hours, from 4pm to 6pm

Start	end	duration	Board	Subject	Speaker
16:00	16:10	0:10	EB	Status of ET Experiment	M.Punturo
16:10	16:20	0:10	CB	CB board activities and election of the future CB chair	H.Lueck
16:20	16:35	0:15	ISB	ISB general talk	ISB chair
16:35	16:50	0:15	ISB	ISB specific Talk	
16:50	17:05	0:15	OSB	OSB General talk	OSB chair
17:05	17:20	0:15	OSB	OSB specific talk	
17:20	17:35	0:15	SPB	SPB general talk	SPB chair
17:35	17:50	0:15	SPB	SPB specific talk	
17:50	18:05	0:15	EIB	EIB general talk	EIB chair
18:05	18:20	0:15	EIB	EIB specific talk	

ET Annual Meeting from 15-17 Nov., followed by the ET-PP Sustainability Workshop - EGO