



RESMA



ITALIAN AIR FORCE – METEOROLOGICAL SERVICE



W.M.O.

Field Rainfall Intensity Intercomparison



ET/IOC SIIB-3 MEETING

“Little Goodwill Men for great projects”

Vigna di Valle, 26.02 – 02.03.2007

Vuerich Emanuele

SUBJECTS

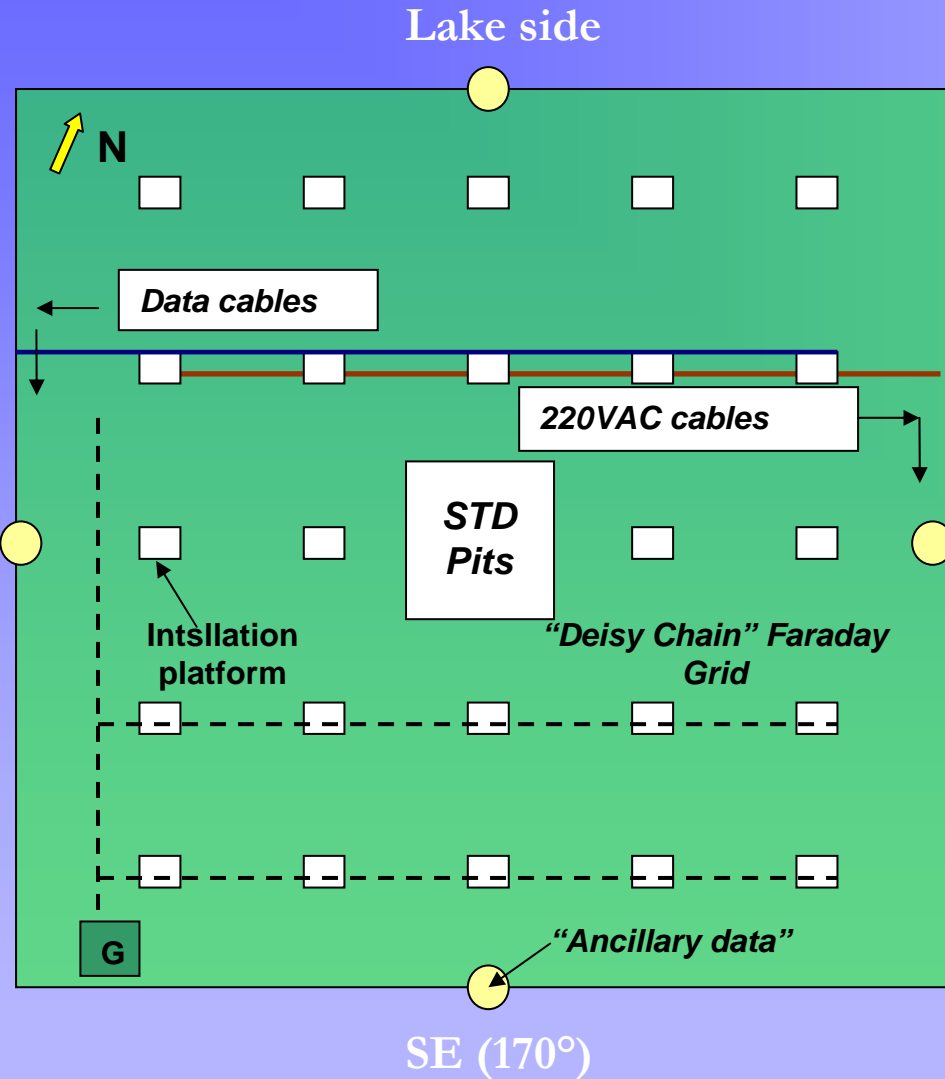
Status of site preparation and following tasks

- ✓ Structure and reference rain gauge pits
- ✓ Cabling and electrical protection
- ✓ Instruments installation aspects
- ✓ Additional sensors installation
- ✓ Supervision and maintenance

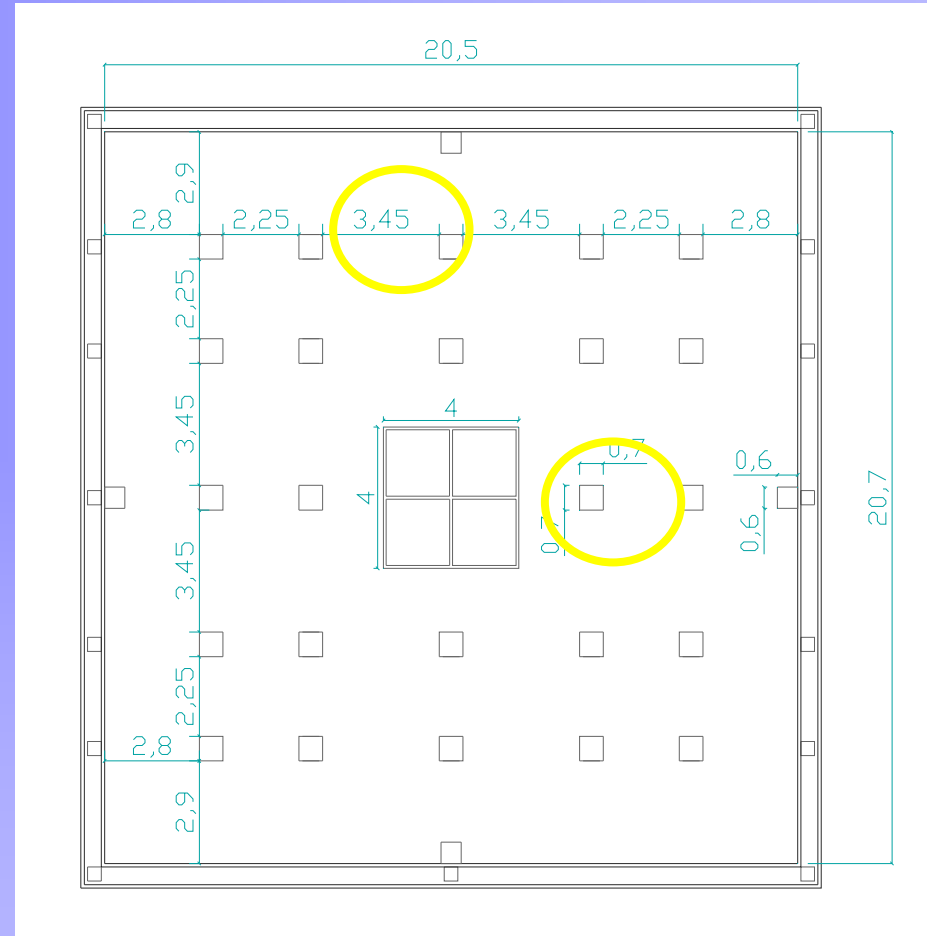


Sunset on
Bracciano and its lake
seen from Met Station

ReSMA SITE STRUCTURE



SE (170°)
SITE MAP



A) ENGINEERING DRAW
[Units=Meters]

ReSMA SITE STRUCTURE

- ✓ It consists in a 440m² symmetric array of 28 concrete cement platforms (70cm x 70 cm) regularly distributed
- ✓ It was perfectly levelled and oriented towards more frequent precipitation origin (Rome side, lake side, warm fronts SE-SW).
- ✓ Volcanic sands were put in the main basement where platforms are built to prevent platforms “sloping” and instrument levelling losing and to prevent flooding in case of heavy rain.
- ✓ It is covered with a green grass surface (426 m²), taken under control by an irrigation system properly designed for hot/dry seasonal periods (no disturbances for gauges)
- ✓ In the centre of the area a big pit was built, divided in 4 parts (4 pits) for hosting the working reference.
- ✓ Each concrete platform is connected to the others with a “deisy chain” of high quality big copper cable (like a big Faraday Grid) to have the same low Earth electric potential everywhere



*ReSMA
Intercomparison site*

ReSMA SITE STRUCTURE

10 January 2007

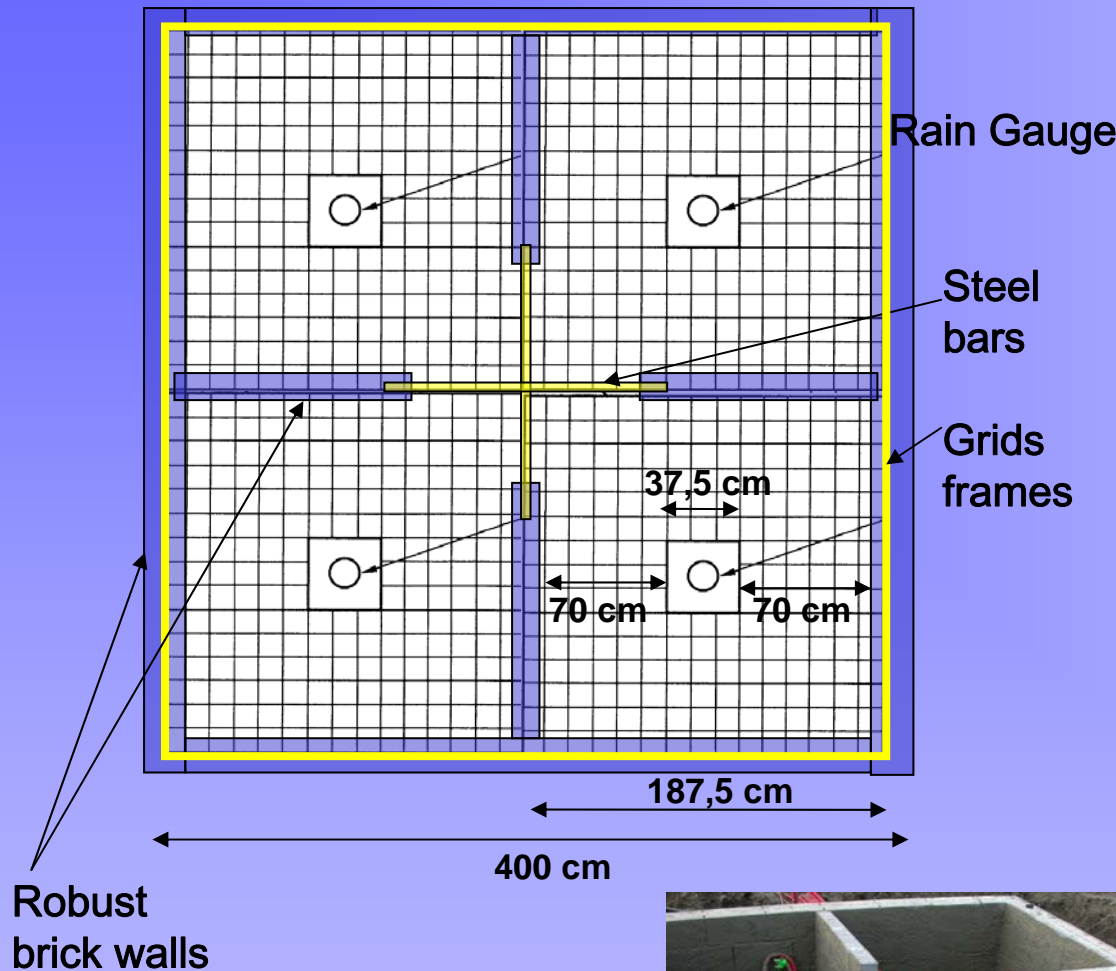
*Field building
phases*

23 February 2007

- ✓ 95% done
- ✓ To be completely finished during Meeting week!

Faraday copper Earth ground grid installation

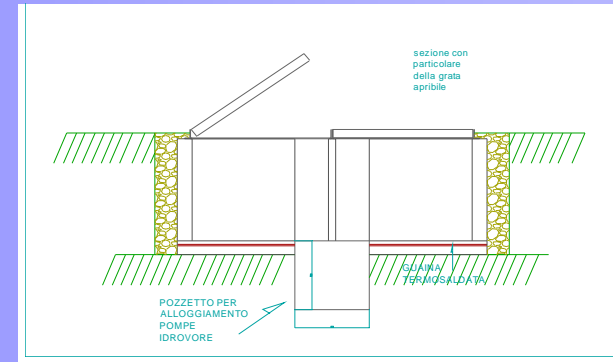
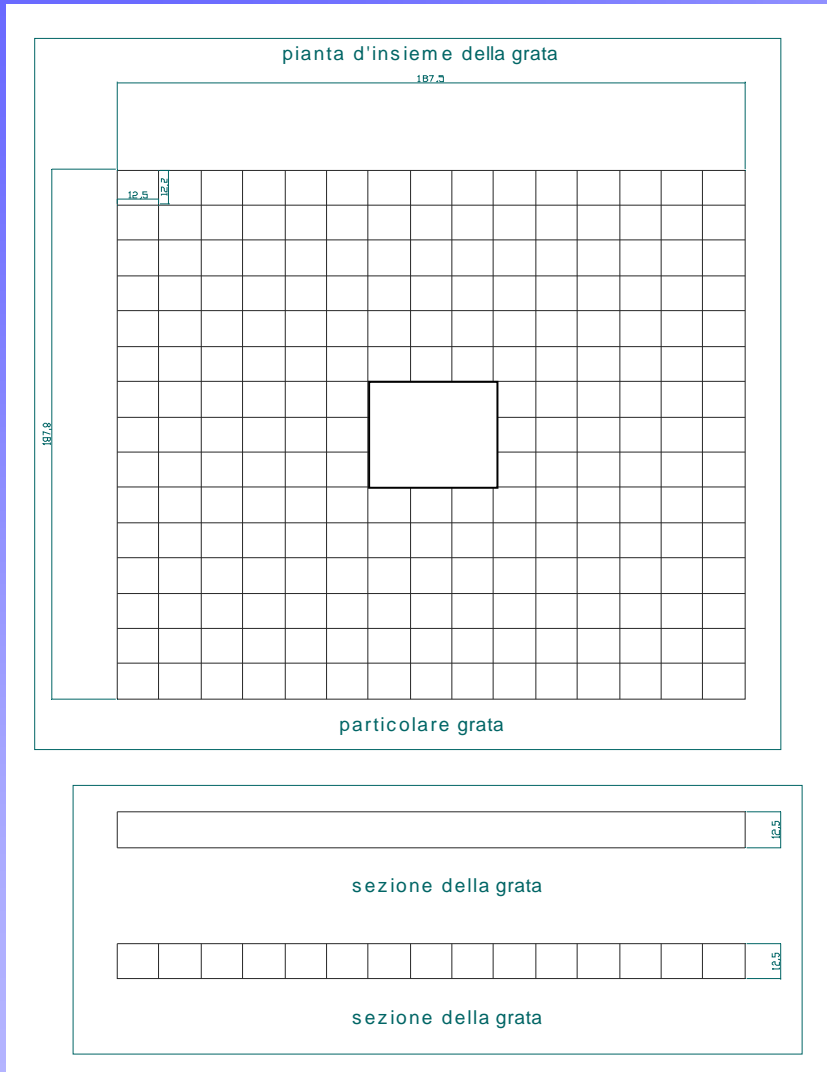
ReSMA REFERENCE RAIN GAUGE PITS EN13798:2002



- ✓ A big Pit 1,7 meters deep was built and divided in 4 parts (**4 pits**) for hosting the working reference (4 different instruments).
- ✓ 4 standard galvanized steel gratings **187,5 x 187,5 x 12,0 cm** (LxWxH) will be positioned on pit walls. Spaces: **12,5 x 12,5 cm**. Accuracy: $\pm 5\text{mm}$; Strips: **3mm**
- ✓ Square space in the middle of each grating = **37,5 x 37,5 cm**.



ReSMA REFERENCE RAIN GAUGE PITS EN13798:2002



EN13798 par. 4: *...in the case of large raingauges, the square space in the centre shall be approximately 250mm larger than the diameter of the gauge collector...to prevent in-splash from the grating.*

✓ **T-200B** Ø16cm:

$\Delta=21,5\text{cm}$ 37,5x37,5cm (EN)

✓ **MRW500** Ø25,2cm:

$\Delta=12,3\text{cm}$ 37,5x37,5cm ?

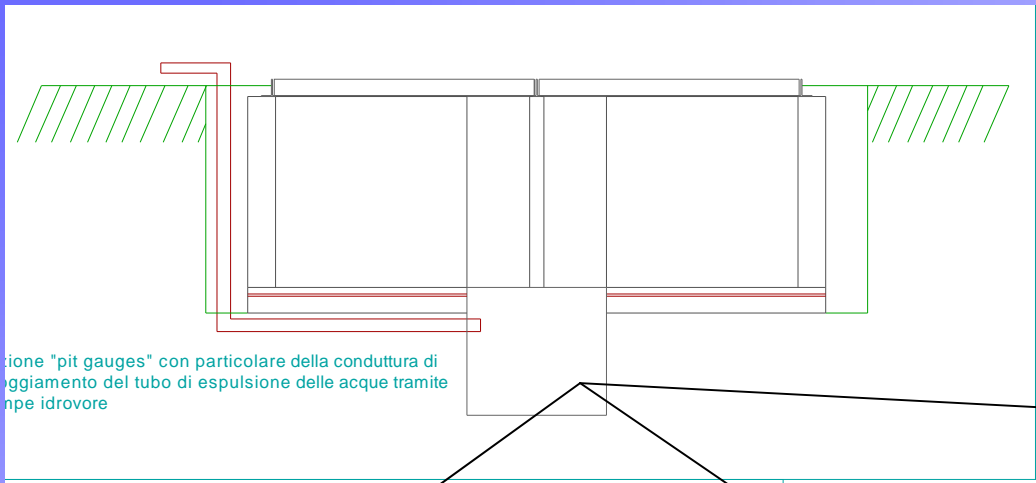
✓ **R102** and **PMB2** Ø35,7cm:

$\Delta=1,8\text{cm}$ 37,5x37,5cm ?

... to be decided, for gratings final design and positioning during the week after ET meeting

ENGINEERING DRAW
[Units = cm]

ReSMA REFERENCE RAIN GAUGE PITS EN13798:2002



✓ Additional hole in the pit for Drain **PUMPS** positioning (during **ET Meeting week**) to pits flooding prevention during heavy rains.

✓ Pits have an unique external access point: interrupted central walls permit operators to go everywhere in the pit

SUBJECTS

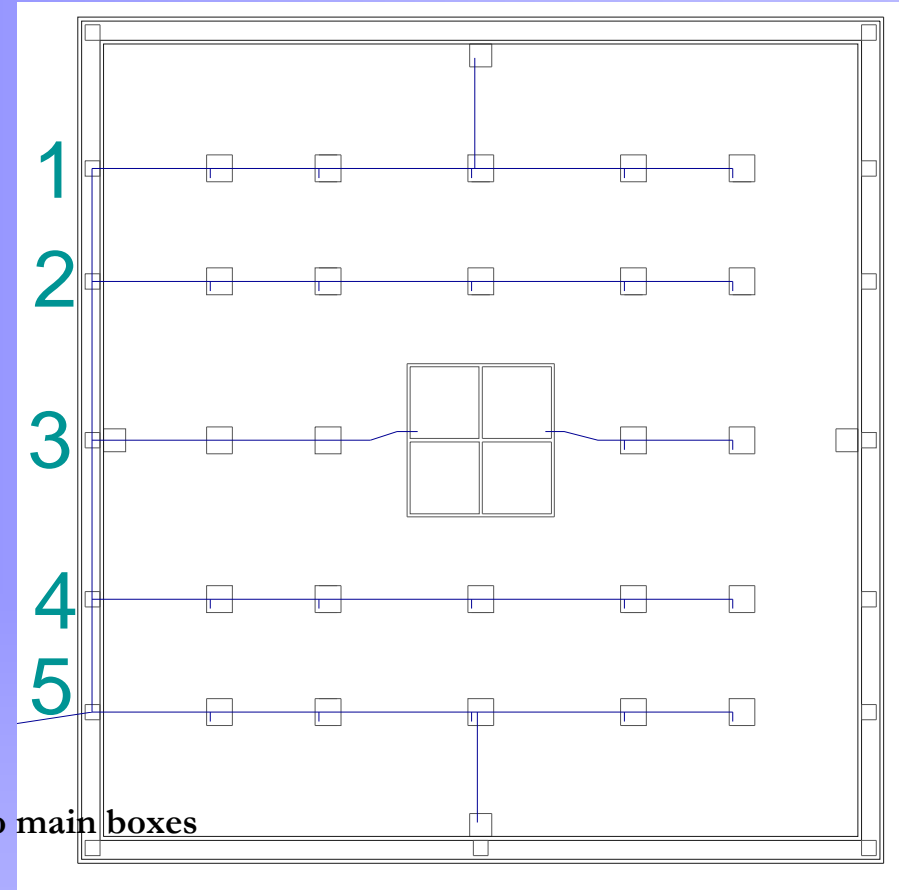
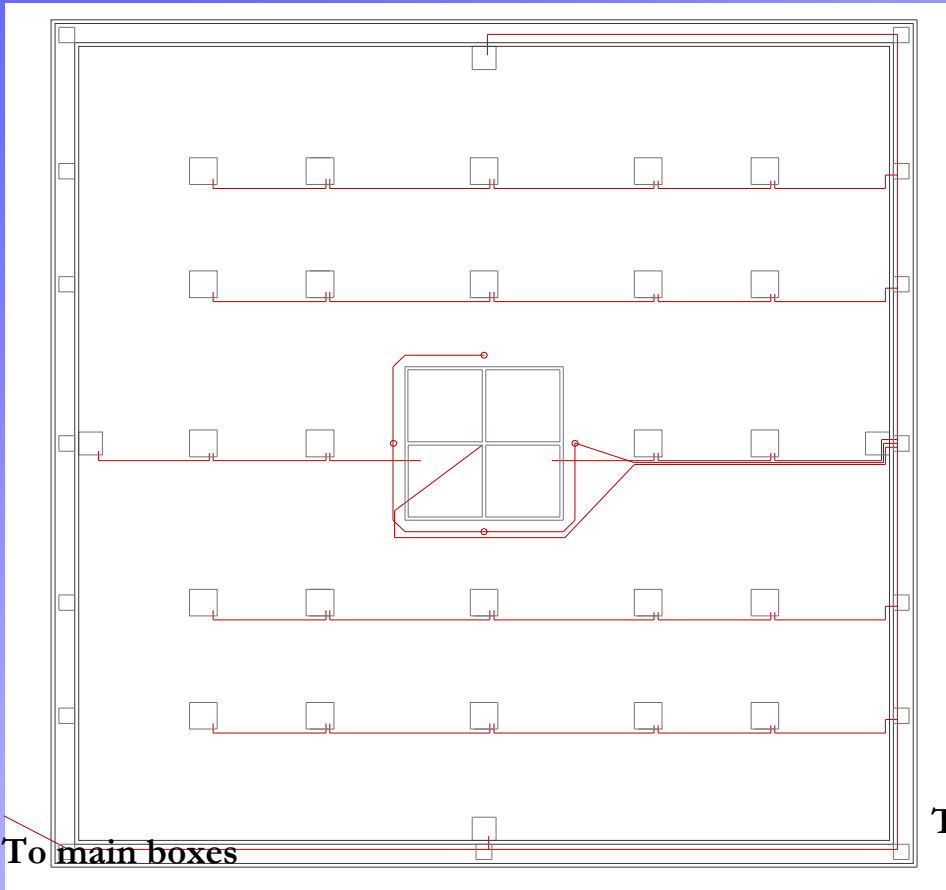
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SITE CABLING



B) ENGINEERING DRAW

Power underground tubes and cables
(each **red** line is a group of tubes)

Separated by data cables

C) ENGINEERING DRAW

Data underground tubes and cables
(each **blue** line is a group of tubes)

~1,5 km of cables

POWER CABLING

- ✓ 28 platforms and 4 pits have been divided in 5 groups. Each platform/pit is equipped with 220VAC “**differential**” switch (3 cables, one for a second earth ground connection to the same dispersion point of the Faraday Grid)
- ✓ Each group of platform is connected to the 220VAC main metallic box which is equipped with other 5 “**magnetic-thermal**” switches.
- ✓ The main box is connected to national network with “general” protection switch and **UPS** system.
- ✓ Total consumption: 1,5kW. A lot of power supply requirements of the selected instruments (Site manager evaluation, based on questionnaires and manuals available until now)
- ✓ In each platform, the **specific** instrument **DC** voltage/Watt **power supply** will be installed in a box (provided by ReSMA)

*Underground
cable tubes*



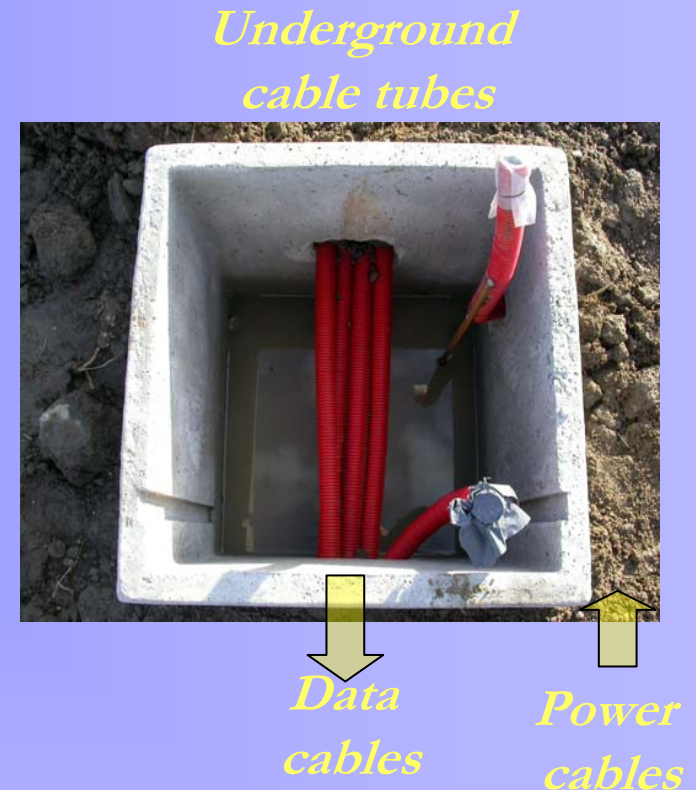
*Data
cables*



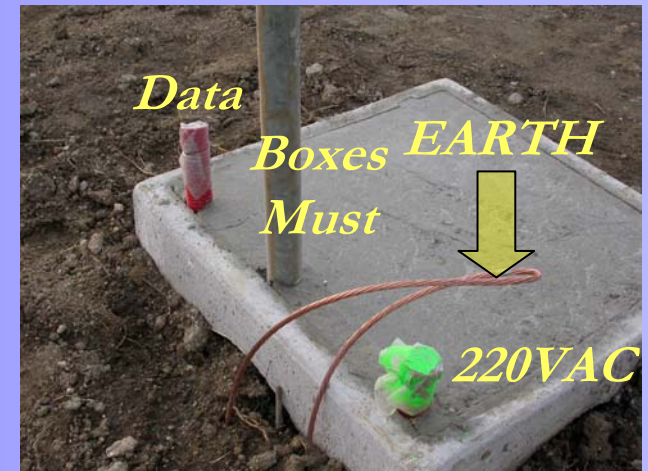
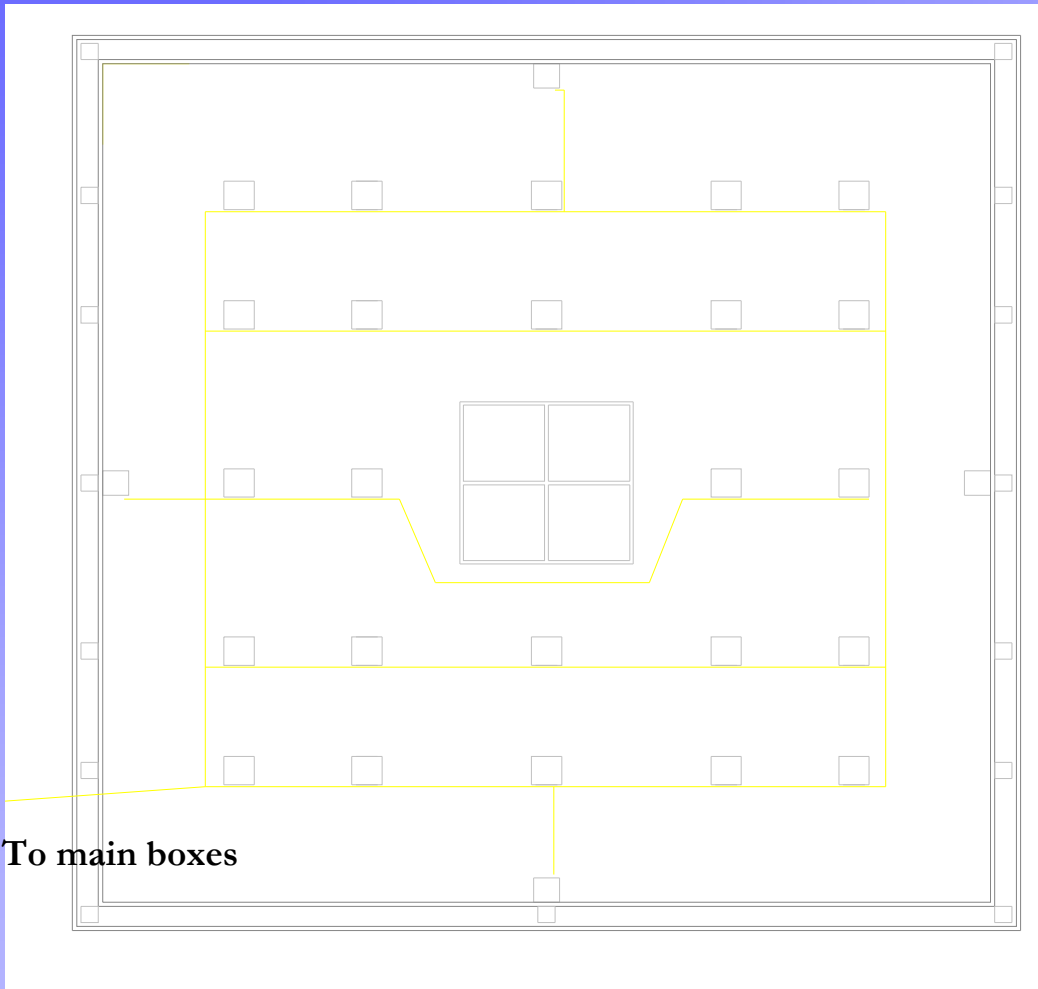
*Power
cables*

DATA CABLING

- ✓ Each platform is also equipped with high quality data cables, **2/platform**. One cable for **digital signals**: 8 couples of crossed wires separately isolated; one cable for **analogue signal**: 8 couples of wire separately isolated (also good for direct current power supply)
- ✓ Platform data cables are connected to a switching board positioned in a little signal box on the platform.
- ✓ Important: each data cable (analogue and digital) is directly connected to the data cables main metallic box, without intermediate connections. This characteristics allows to have only one switching board and to reduce the “shunt” resistance due to connections (High fidelity signals).
- ✓ Important: data cables are completely separated by 220VAC cables



EARTH GROUND CABLING



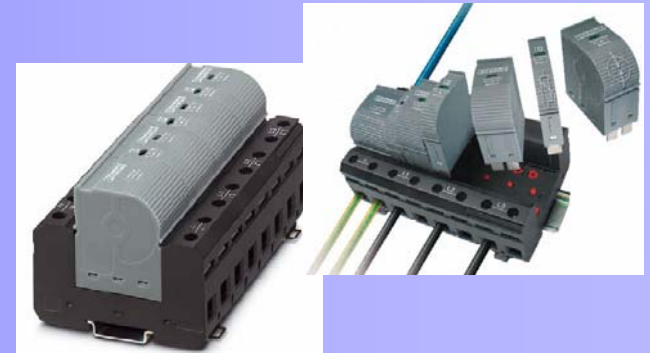
- ✓ Each concrete platform is connected to the others with a “**deisy chain**” of high quality big copper cable (like a big Faraday Grid) to a **unique earth ground dispersion**, in order to obtain a site uniform potential and to prevent “ground signals” to come out.

D) ENGINEERING DRAW

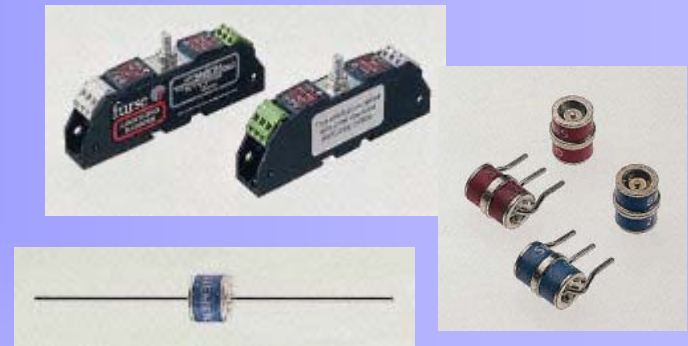
Faraday GRID-Ground Earth connection

ELECTRICAL PROTECTION

- ✓ Intercomparison site will be equipped with a system of electronic components to protect instruments from discharges/fast high voltages picks (in pictures)
- ✓ Having buried cables into the soil will limit the possibility of discharges into the system and
- ✓ Having chosen an “unique dispersion earth ground point” will prevent “ground signals” to come out
- ✓ To sum up, 3 electric protection stages: a) concrete platform Faraday Grid; b) Gas surge/high voltage dischargers and 3-phase surge arrester; c) Protection offered by the data acquisition central unit (*next discussion*)



3-PHASE lightning surge arrester



Data cables protection,
gas dischargers

“GREEN GRASS”

- ✓ The intercomparison site will be also covered by green grass, 426m² surface, taken under control by an irrigation fountains system properly designed for hot/dry seasonal periods (no rain events) and to not influence at all the gauges orifice.
- ✓ It is an underground net of black pipes buried before grass sowing



Irrigation net system
(black tubes)

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The Site Manager at work!

INSTRUMENTS INSTALLATION

- ✓ The site manager will be in charge with the installation procedures according to instruments tech manuals to be provided
- ✓ S.M. will be assisted by a manufacturer technician when possible (as indicated on questionnaires).
- ✓ RESMA staff has the necessary expertise for mechanical installations and the common equipment is surely available
- ✓ **Installation kit (specific, ex. must)** should be possibly provided by each Participant
- ✓ **Installation “characteristics”** (according to questionnaires and tech docs available):
 - **Different installation heights (<1m and >1m)**
 - **Presence of heating systems (consumption)**
 - **Presence of Windshields, 5 of them (large dimensions)**
 - **Specific calibration/cleaning/inspection procedures to be done during campaign**



**Large rain gauge
and wind must
by sunset**

INSTRUMENTS POSITIONING

- ✓ No criteria has been established until now about instruments **positioning** on platforms array
- ✓ From a site managing point of view, **reasonable suggestions** could be:
 - Installing instruments with RS232 output (2 of them) and with analogue output (switch closure+frequency:7of them) on the platforms next to data cable main box (SW-SE side), in order to avoid signal degradation with distance as well as the installation of signal amplifiers
 - Instruments height could be simply like the manufacturer recommends (surely in agreement with WMO n°8)
 - Instruments grouping in the same range of height (similar effect on wind current)



**Rain gauge
and Bracciano
by sunset**

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The world seen by
Campbell Stokes sphere!

ADDITIONAL SENSORS

- ✓ The IMS will provide additional sensors for “ancillary” data to be included into intercomparison database for further evaluations and data analysis.
- ✓ Electronic sensors to be installed on the 4 free platforms:
 - Single **temperature** sensor (Pt100 transducer): **1,5-2m high**
 - Single **relative humidity** sensor (Humicap transducer): **1,5-2m high**
 - **Pressure** sensor (thin film capacitor): **1,5-2m high**
 - 2 HQ **ultrasonic wind** sensors (6 transducers each):
GaugeHmax ≤ Hwind ≤ GaugeHmin
 - **Pireheliometer** (global solar irradiance)



RESMA met sensors

ADDITIONAL SENSORS

- ✓ Additional sensors will be set to provide data on one-minute time resolution
- ✓ The sensors will be calibrated (ISO certified) at the beginning of the Intercomparison as stated by WMO recommendations and controlled during the campaign
- ✓ RESMA has spare sensors
- ✓ RESMA also has a Wetness sensor-rain event start/stop (planned to be provided)



RESMA
Chemistry Precipitation Lab



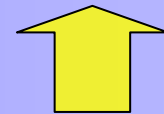
RESMA wetness sensor

ADDITIONAL OBS/MEASUREMENTS

- ✓ RESMA operates a H24 WMO-CGOS station: present weather, visibility and precipitation typology could be provided
- ✓ RESMA operates a H24 WMO-GAW station: ozone (total and profile), global irradiance and UV and chemic precipitation content could be provided
- ✓ On request, it is possible to receive radar maps and lightning detection maps



**RESMA = “OPEN SKY”
LABORATORY**



**A CIMO XIV concept:
“Data integration”**

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RESMA staff talking about

SUPERVISION - MAINTENANCE

- ✓ S.M. and selected RESMA staff will be in charge of performing maintenance actions according to manufactures advices:
 - Periodic inspections
 - Cleaning
 - Re-calibration (if necessary)
- ✓ Considering the **responsibility**, RESMA staff needs really detailed instructions on every instrument to avoid wrong procedures (**video images** could be another idea)
- ✓ A **periodic technical monitoring** will be planned by SM together with PL after the installation phase, in order to adopt appropriate actions in case of malfunctioning
- ✓ An **electronic log-book** will be filled and shared to record monitoring



**RESMA staff
never stops working!**

TO SUM UP – TASKLIST (1)

- ✓ Intercomparison site structure is ready
- ✓ RESMA is working on pit grids
realization: square holes dimensions to be decided for 3 reference gauges
- ✓ Electrical protection + power/data cables are coming soon (in time with the end of installation and with instruments communication first trials)
- ✓ Instruments positioning and installation height to be decided
- ✓ Additional sensors to be approved
(type, height, position)

TO SUM UP – TASKLIST (2)

- ✓ Metadata and other additional obs/measurements available (benefit for intercomparison)
- ✓ Installation assistance offered by manufactures technicians to be properly planned by PL and SM after ET meeting
- ✓ Periodic technical monitoring to be planned by SM and PL after installation (e-logbook)
- ✓ *All instruments detailed documents and technical manuals to be requested* as soon as possible to carry out previous tasks and for best data acquisition strategy

ET/IOC
DISCUSSION AND
EVALUATION
TIME



The original marble
“Jesus Cross
carrying” of
MICHELANGELO

*Bassano Romano
Monastery*

