

# The NERIS near-range atmospheric dispersion modelling experiment

**Johan Camps<sup>1</sup>, François Menneson<sup>2</sup>, Spyros Andronopoulos<sup>3</sup>, Gunther Bijloos<sup>1</sup>,  
Gerhard Heinrich<sup>4</sup>, Milagros Montero Prieto<sup>5</sup>, Geert Olyslaegers<sup>1</sup>, Margit  
Pattantyús- Ábrahám<sup>4</sup>, Tuomas Peltonen<sup>6</sup>, Wolfgang Raskob<sup>7</sup>, Cristina Trueba  
Alonso<sup>5</sup>, and Hartmut Walter<sup>4</sup>**

[johan.camps@sckcen.be](mailto:johan.camps@sckcen.be)

<sup>1</sup>Belgian Nuclear Research Centre (SCK•CEN), Belgium

<sup>2</sup>Federal Agency for Nuclear Control (FANC-AFCN), Belgium

<sup>3</sup>Institute for Nuclear and Radiological Sciences and Technology, Energy and Safety (NCSR Demokritos), Greece

<sup>4</sup>Federal Office for Radiation Protection (BfS), Germany

<sup>5</sup>Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT), Spain

<sup>6</sup>Radiation and Nuclear Safety Authority (STUK), Finland

<sup>7</sup>Karlsruhe Institute of Technology (KIT), Germany



# Goal and lay-out of experiment

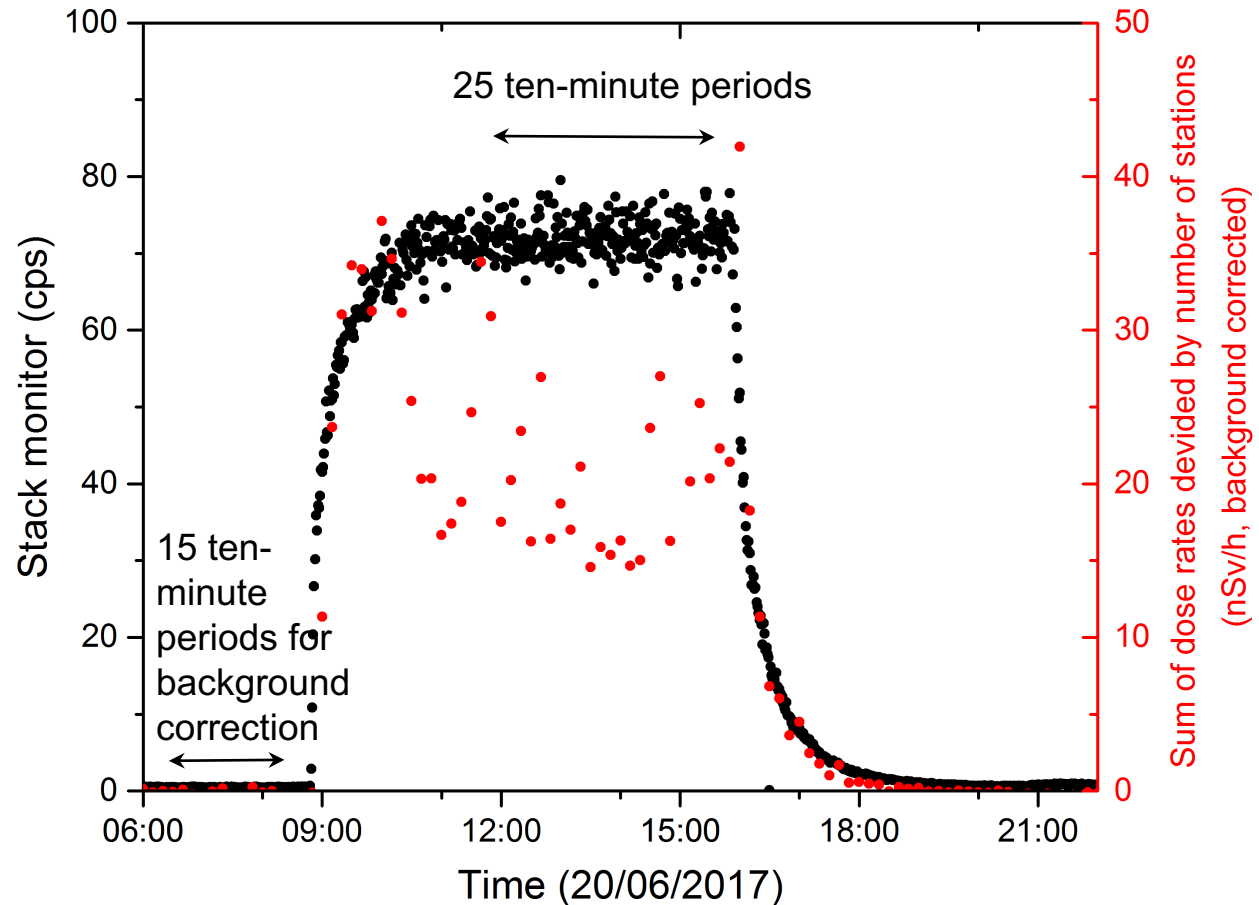
- ✓ Comparison of atmospheric dispersion models for near-range in a very well-defined release scenario (routine Ar-41 stack releases of BR1 at SCK•CEN)
  - ✓ Comparison of results with real gamma dose rate data obtained by 7 ring stations of TELERAD early warning network (operated by FANC-AFCN)
  - ✓ Participation of both model developers as well as operational users of ADM within NERIS community (6 institutes, 8 participants, 12 different model runs)
  - ✓ Statistical relevant sample size (not just case study), with on-site met-data
- Get insight in overall performance at near-range (@ around 200 m)



# Release data and gamma dose rate data

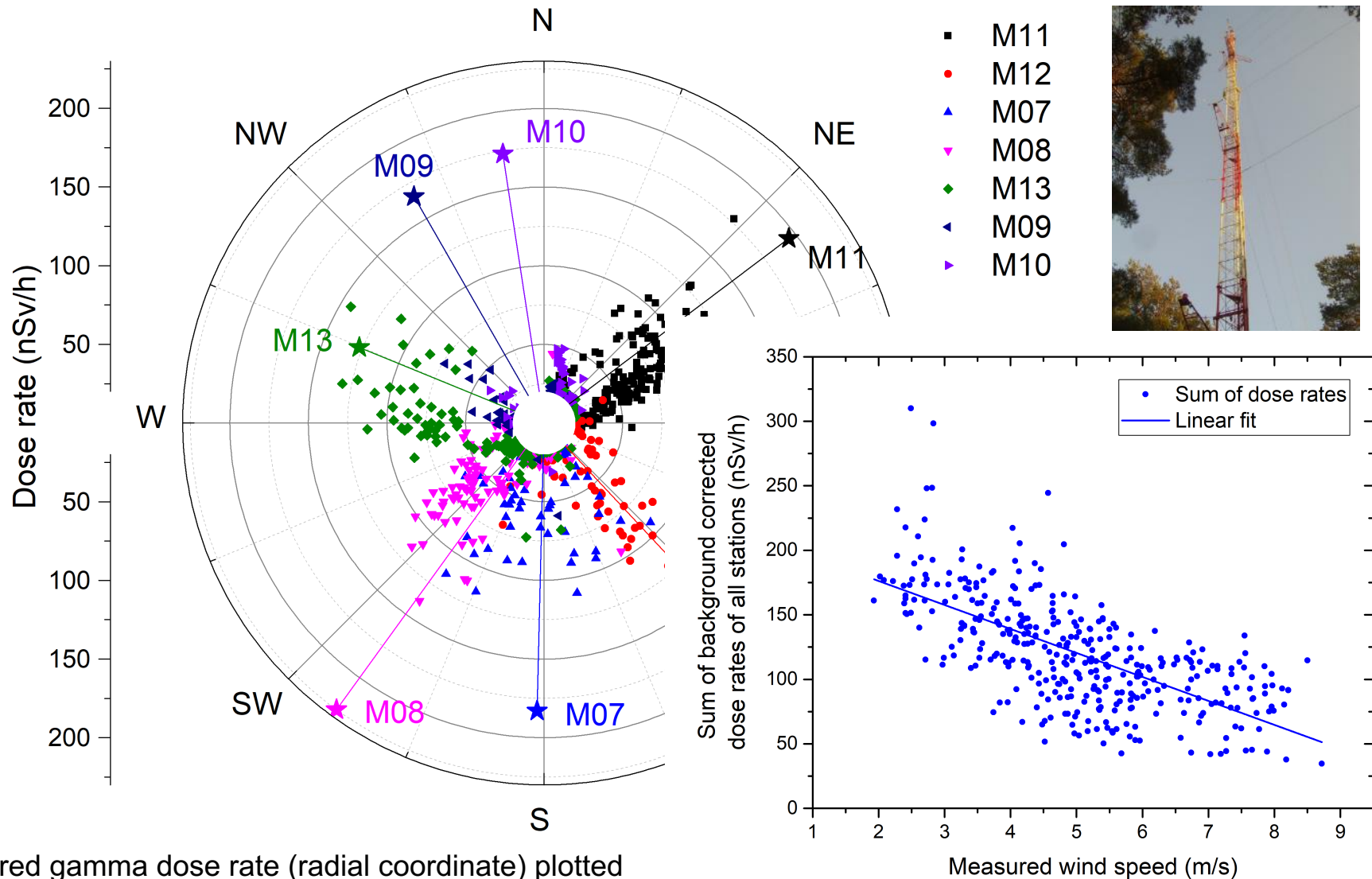
- ✓ Stack monitor only used to define periods of constant release
- ✓ Release rate determined based on reactor power
- ✓ Participants got hypothetical source term, results corrected in analyses
- ✓ Background corrected ambient gamma dose rate data (NaI detectors, spectroscopic information not used)

Example of one of the 16 selected days:



# Meteo-data

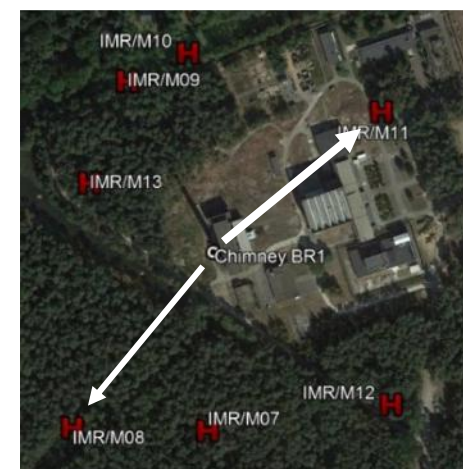
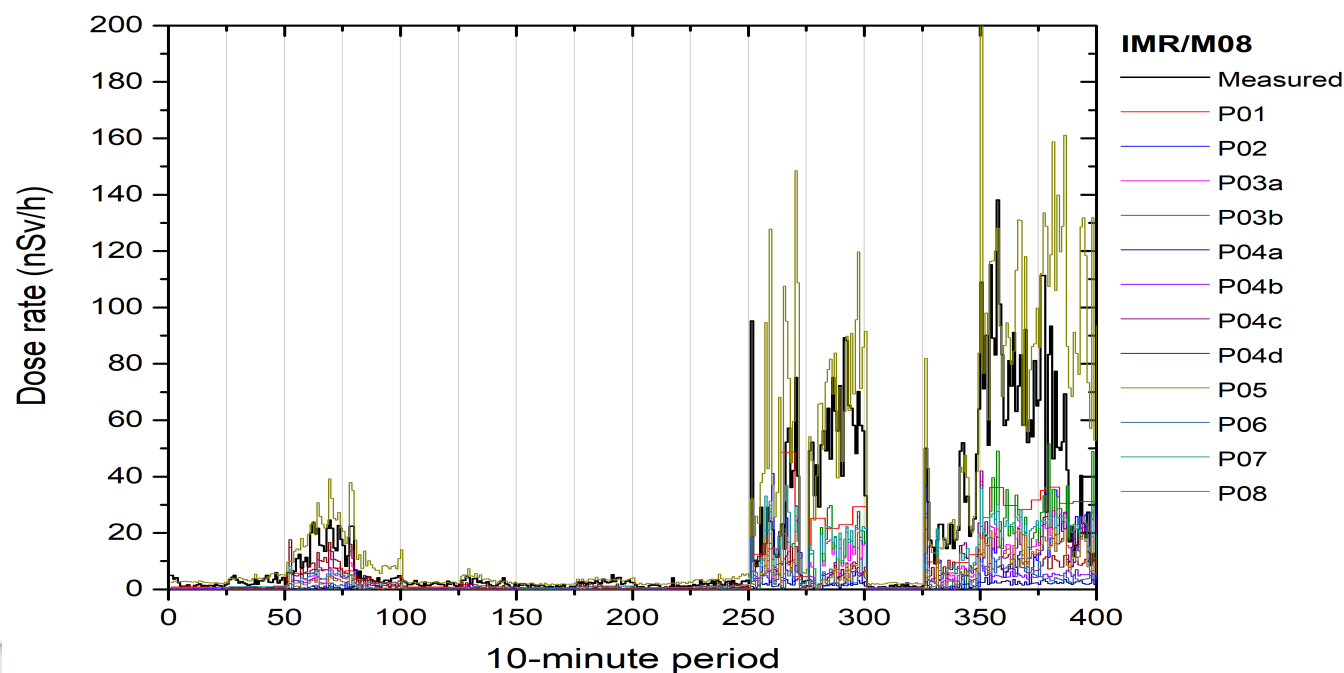
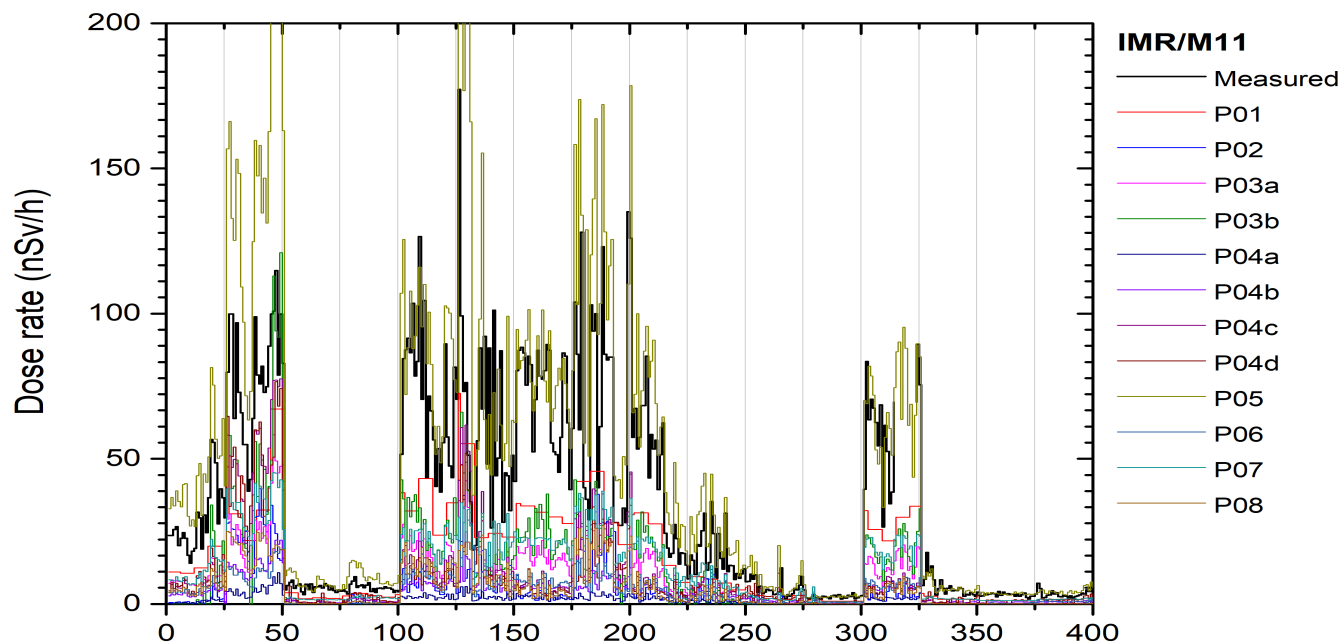
## Correlation wind direction (@69 m) – measurements



Measured gamma dose rate (radial coordinate) plotted against 180° reflected measured wind direction (angular coordinate)

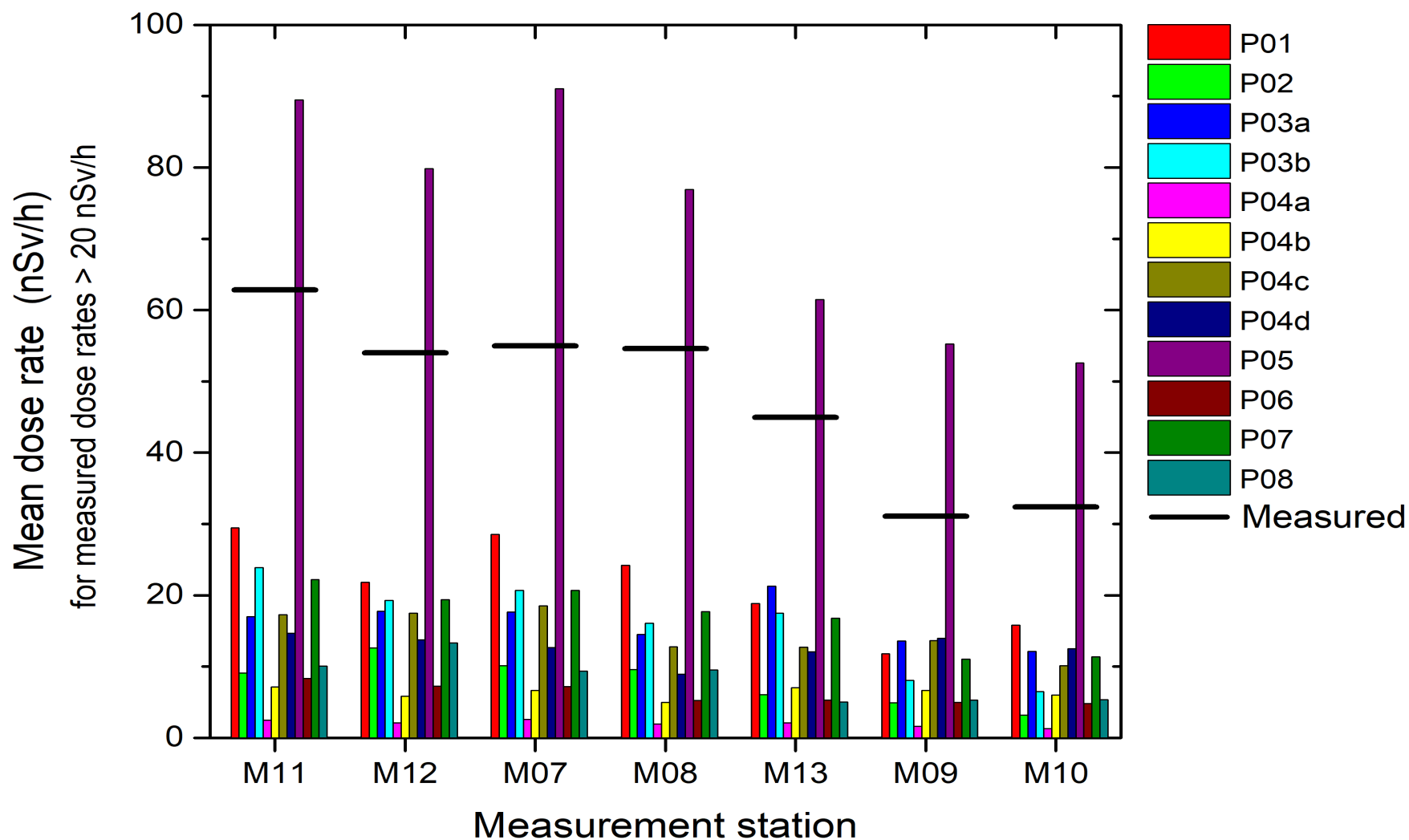
## Results

Example of 2 nearly opposite stations (measured and calculated by participants)

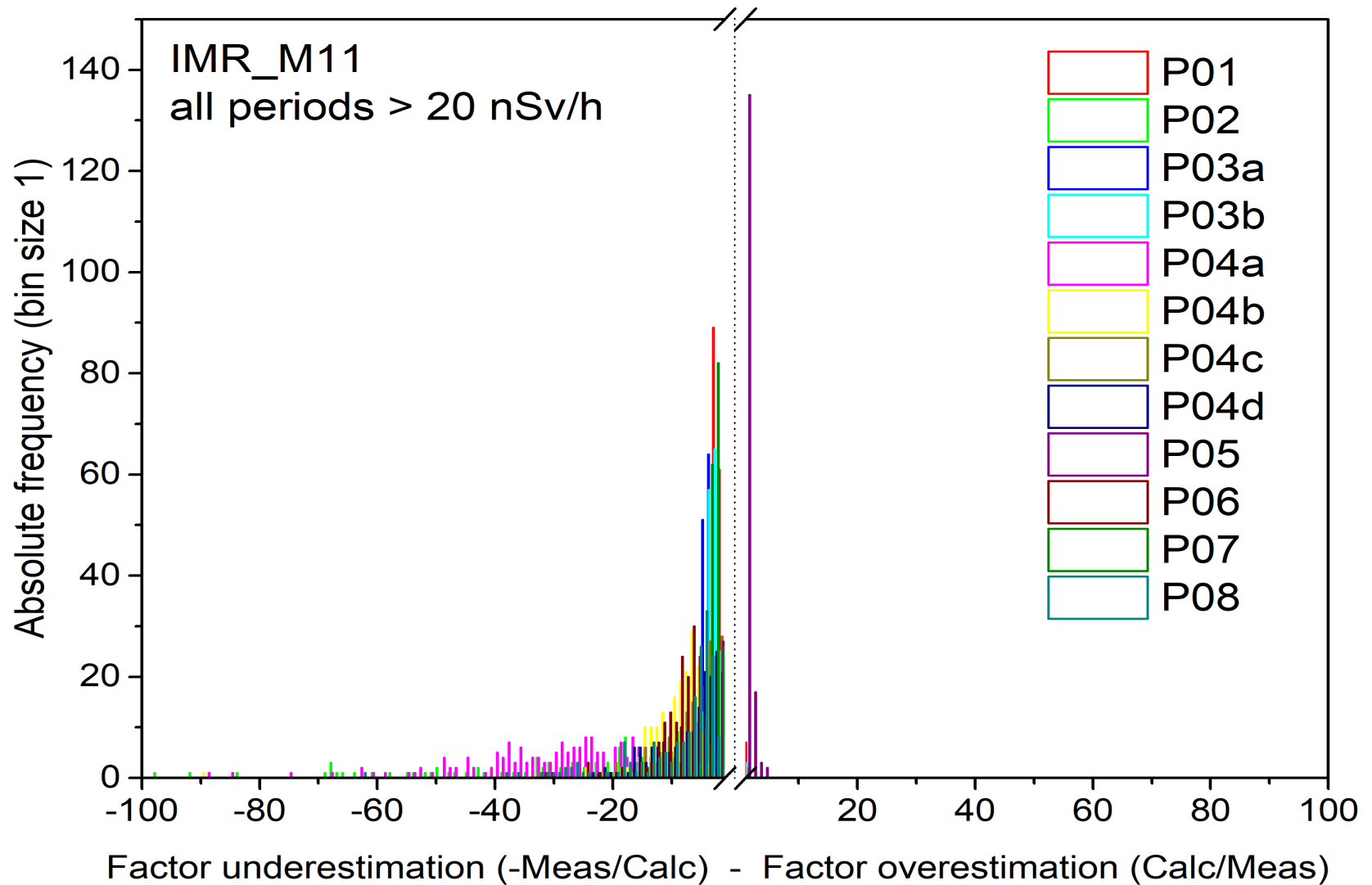


High correlation between measured and calculated results

## Comparison of mean results for every station



## Distribution of individual results of different participants (example of one station)





## Discussion of results – future plans

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- ✓ Atmos. Disp. Model types: simple Gaussian, puff, particle & CFD
- ✓ Gamma dose rate models range from semi-infinite plume approximations towards 3D finite plume models
- ✓ Differences between different models (measured >20 nSv/h)
  - ✓ Mean results: up to factor 30 (at least some models would not produce right order of magnitude)
  - ✓ Individual results: up to a factor > 100
  - ✓ Number of similar results: dose rate robust observable for source term estimation?
- ✓ Most models (except one) underestimate systematically the measured dose rates, “bias” by most models currently not understood:
  - ✓ Atmospheric dispersion modelling
  - ✓ Dose model
  - ✓ Source term
  - ✓ .... (combination of effects)
- ✓ Paper/report in preparation → data available for other interested modellers
- ✓ Interest in continuation:
  - ✓ Specific campaign around BR1 at larger distances (500 m)
  - ✓ Other sites with routine emissions