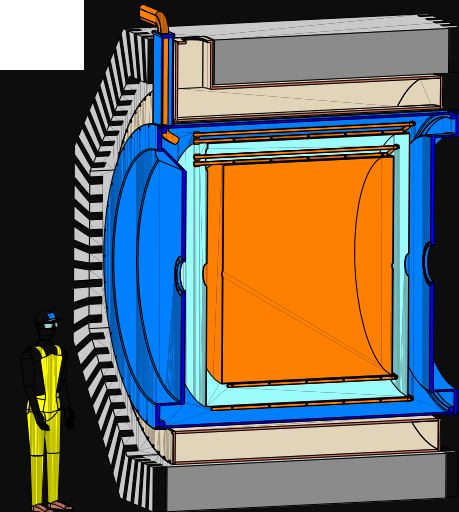


FLASH

Claudio Gatti LNF

March 2025



FLASH

Bylaws of the FLASH Collaboration

Preamble

1 Bylaws are the rules and regulations established by the FLASH Collaboration framework for its operation and management. All institutions formally and explicitly accept to abide by these rules. These bylaws are valid as long as the collaboration exists. The collaboration can end its existence by a decision of the Board with 2/3 majority of votes. The rules can be amended by the procedures contemplated in the same document.

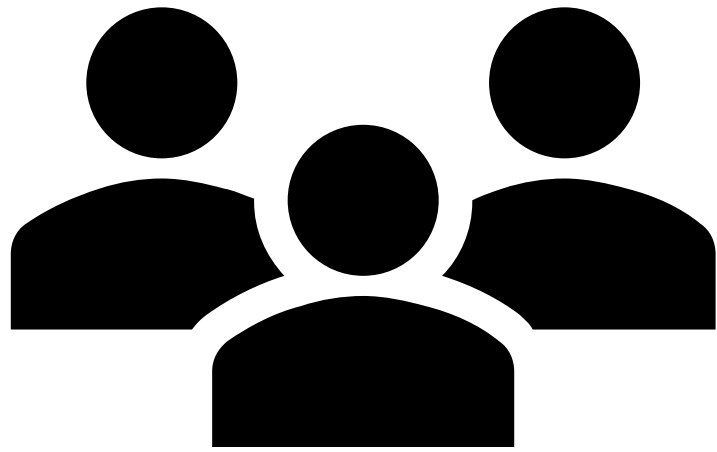
General considerations

FLASH Collaboration

1 Collaboration is an international scientific collaboration whose purpose is to build the FINUDA magnet for Light Axions Search Haloscope (FLASH) Haloscope that will probe the existence of QCD axions with mass about 100 meV and light scalar particles and will be part of the GravNet network for the detection of gravitational waves (HFGW).

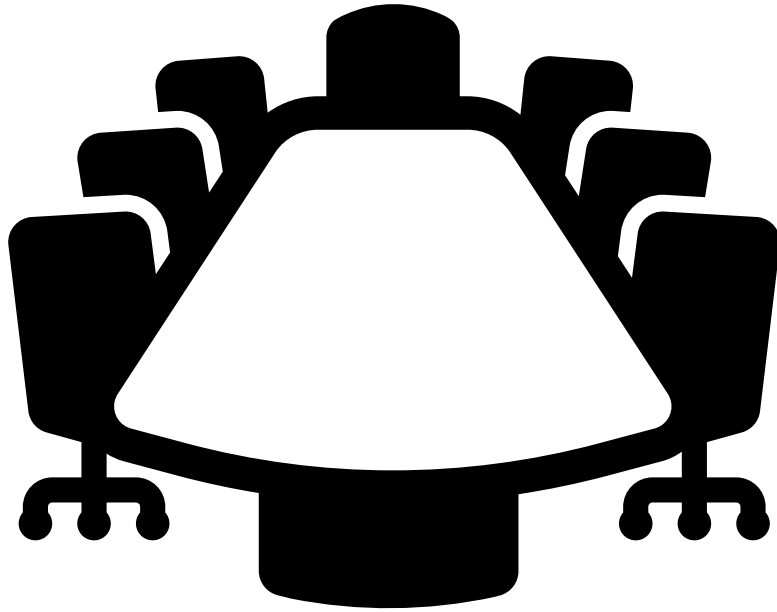
FLASH Collaboration

- Bylaws of the FLASH Collaboration
 - The FLASH Experiment
 - Participation to FLASH
 - Organization of the Collaboration
 - Publication policy
 - Other rules



Collaboration Board

- Collaboration body that represents the institutions participating in FLASH.
- First Collaboration board meeting to be organized soon to start discussing Bylaws and MoU's.
- Bylaws must be compatible with GravNet project milestones and objectives.



FLASH Technical Board

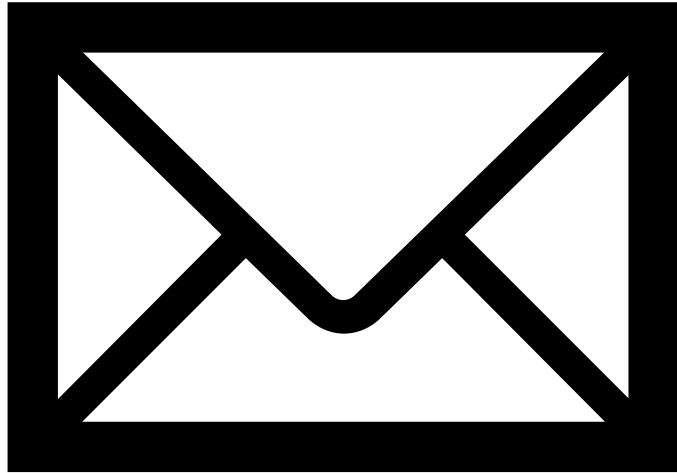
Provisional technical board nominated to start the activity of the decommissioning of the FINUDA detector

Fabio Bossi (chair)

Stefano Gazzana (Infrastructure)

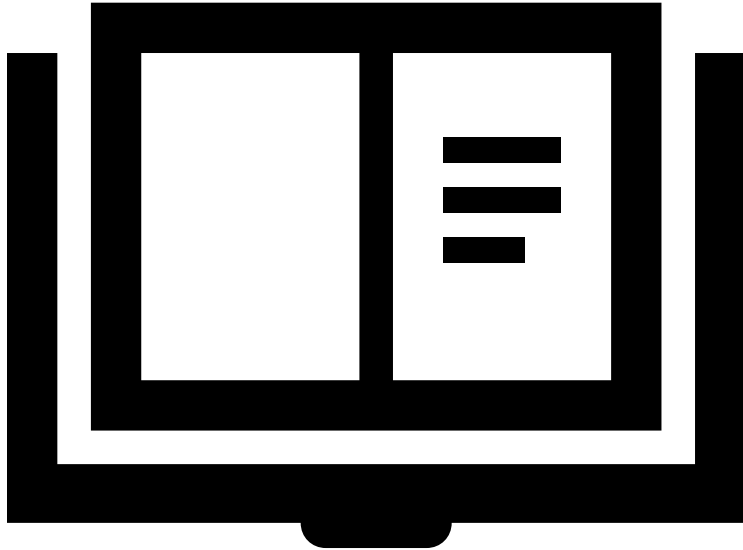
Giovanni Mazzitelli (DAQ-Computing)

Carlo Ligi (Detector).



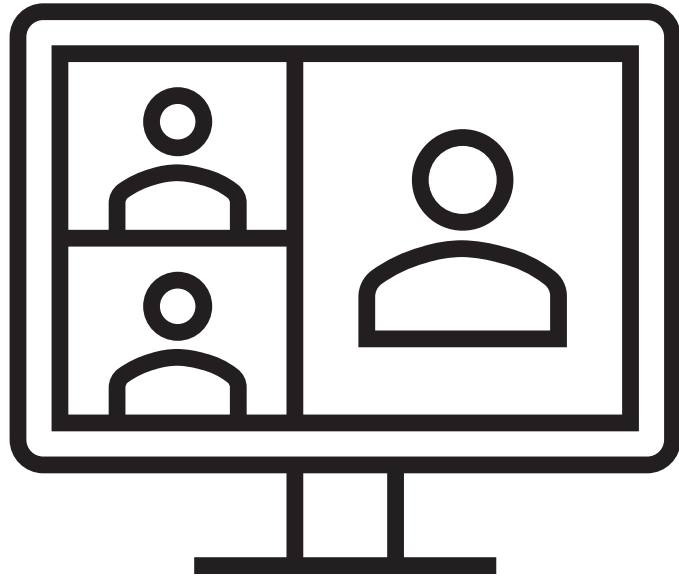
FLASH mailing List

- FLASH mailing list flashexperiment@lists.infn.it
- Send me the names of people not yet inserted in the list.



FLASH Technical Design Report

- Template TDR created in Overleaf (editors Alessio Rettaroli and Danilo Babusci):
 - Physics Case (WP1)
 - Technical Design
 - Mechanical Design and Cryogenics (WP2)
 - RF (WP3)
 - Signal amplification and Acquisition (WP4)
 - Analysis and Computing (WP5)
 - Commissioning (WP6)
- WP leaders are responsible for their section. Start filling sections titles asap.
- I will collect inputs and timeline to prepare a new more detailed GANTT chart. About 2 years for completing it.



FLASH meetings

Proposal for periodic meetings:

- General meetings: one meeting every two months
- WP meetings: one every month (at least?)
- Technical board: one every two weeks
- Collaboration Board: one every month (?)
- Editorial board meeting

INDICO page: <https://agenda.infn.it/category/1192/>

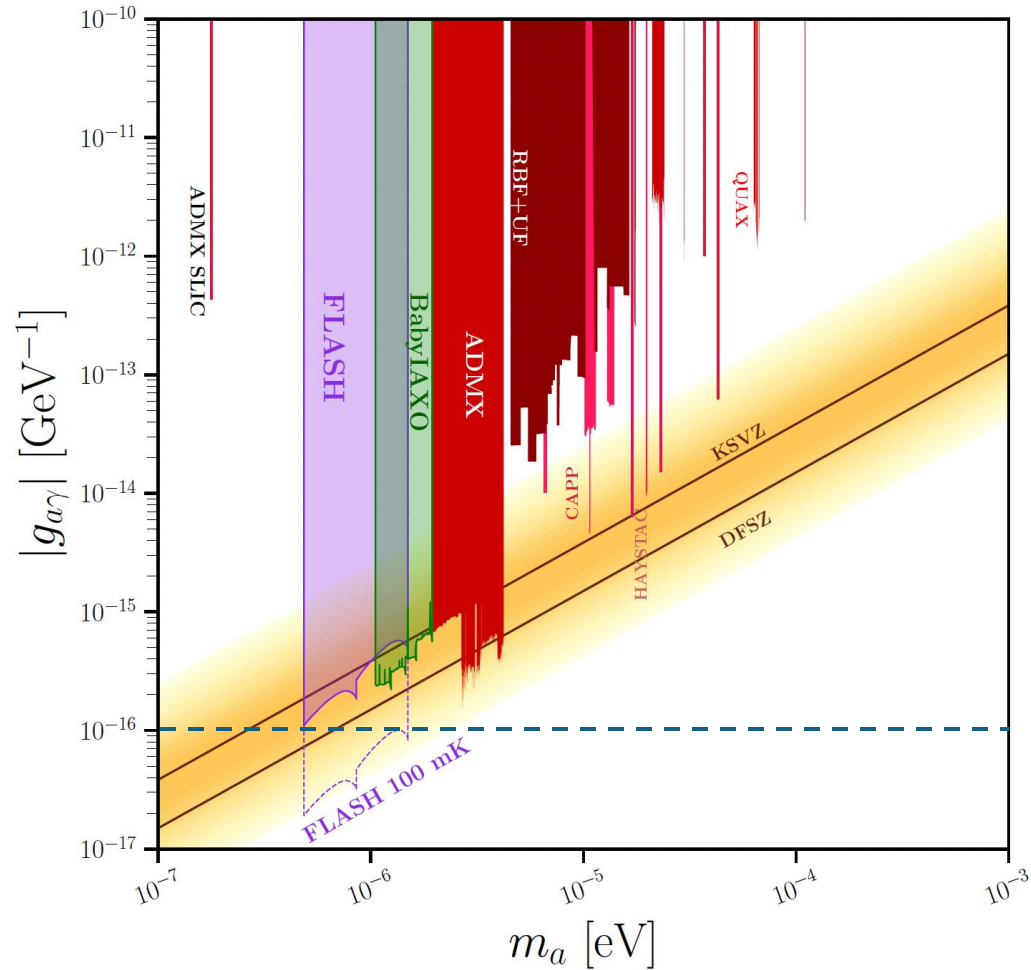
I can create WP subdirectories and grant management access to WP leaders.

Ongoing Collaborations

- CERN: ongoing discussion for a collaboration agreement for a consultancy/supervision on cryogenic design
- La Sapienza: candidate for Post Doc Position for cryogenic Design and PhD position for mechanical design

FLASH Physics Reach

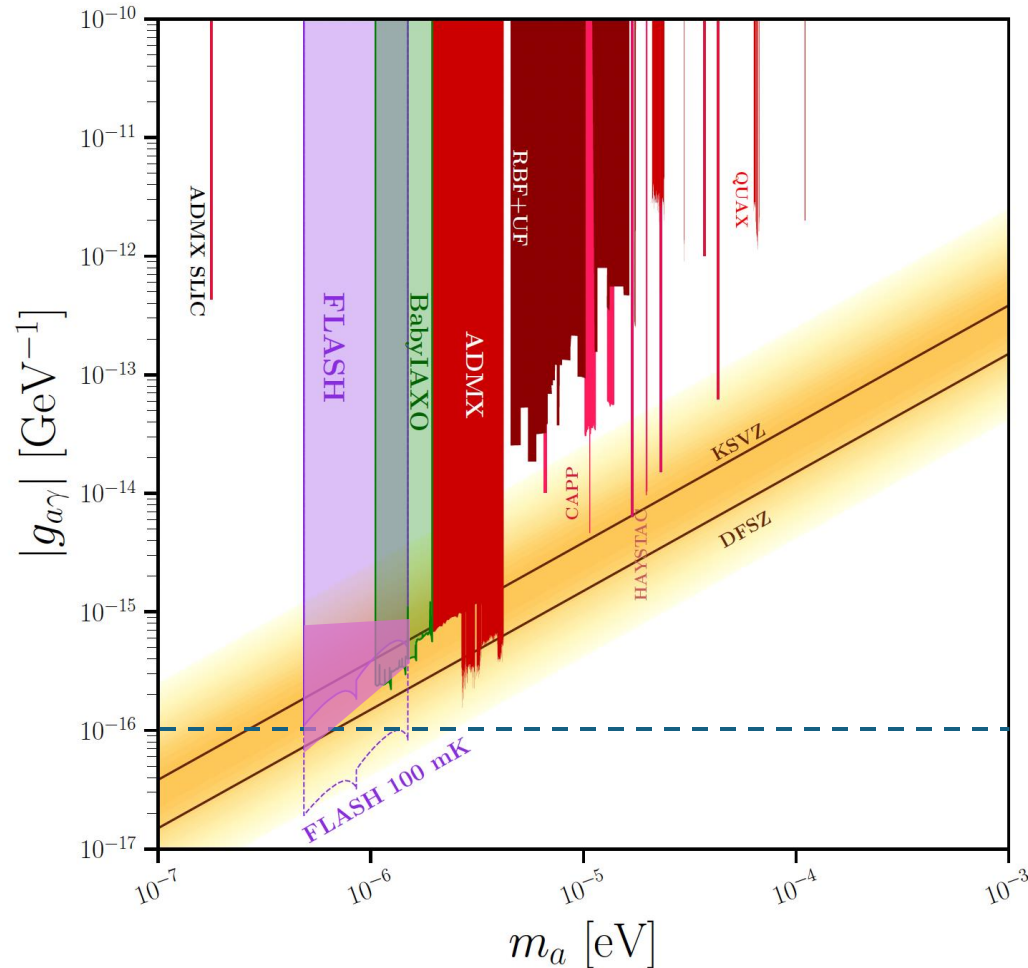
With Cu cavity at 4.5 K



Parameter	Value
ν_c [MHz]	150
m_a [μeV]	0.62
$g_{a\gamma\gamma}^{\text{KSVZ}}$ [GeV^{-1}]	2.45×10^{-16}
Q_L	1.4×10^5
C_{010}	0.53
B_{max} [T]	1.1
β	2
τ [min]	5
T_{sys} [K]	4.9
P_{sig} [W]	0.9×10^{-22}
Scan rate [Hz s^{-1}]	8
m_a [μeV]	0.49 - 1.49
$g_{a\gamma\gamma}$ 90% c.l. [GeV^{-1}]	$(1.25 - 6.06) \times 10^{-16}$

FLASH Physics Reach

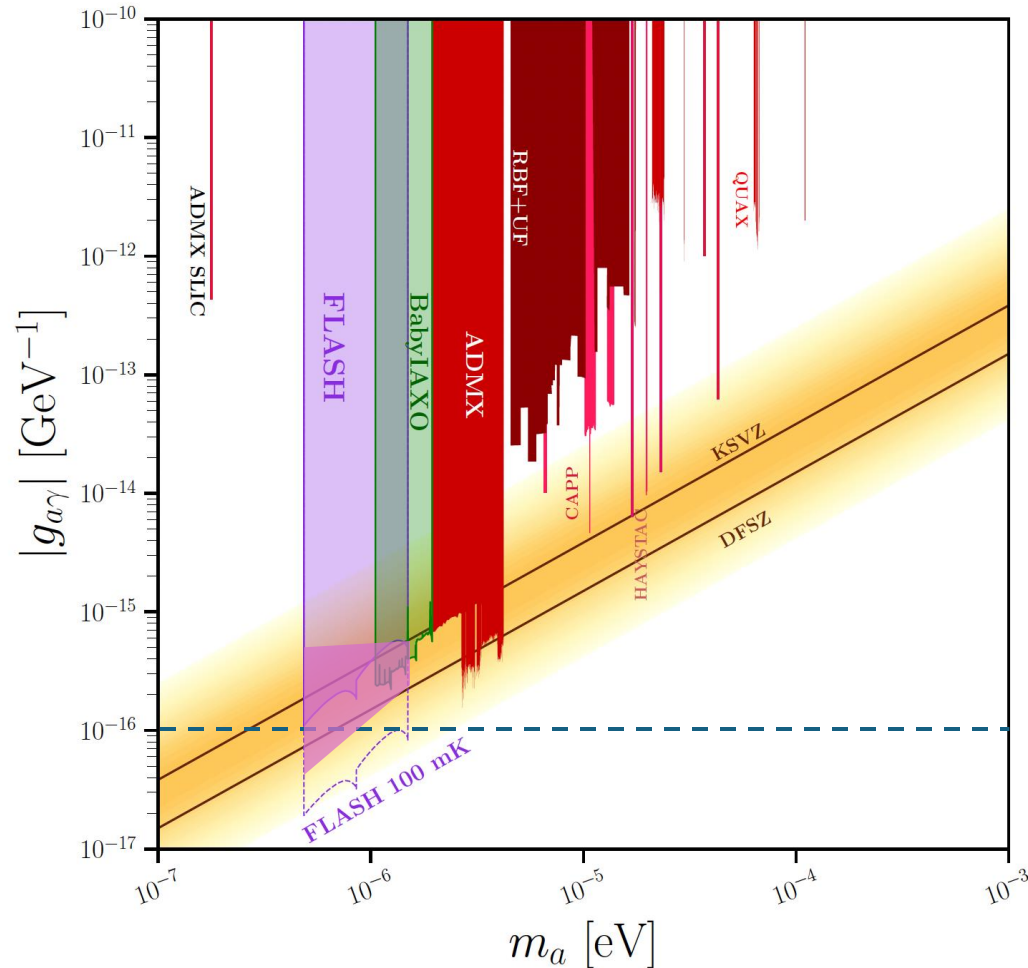
With Cu cavity at 1.9 K



Parameter	Value
ν_c [MHz]	150
m_a [μeV]	0.62
$g_{a\gamma\gamma}^{\text{KSVZ}}$ [GeV^{-1}]	2.45×10^{-16}
Q_L	1.4×10^5
C_{010}	0.53
B_{max} [T]	1.1
β	2
τ [min]	5
T_{sys} [K]	4.9
P_{sig} [W]	0.9×10^{-22}
Scan rate [Hz s^{-1}]	8
m_a [μeV]	0.49 - 1.49
$g_{a\gamma\gamma}$ 90% c.l. [GeV^{-1}]	$(0.8 - 3.96) \times 10^{-16}$

FLASH Physics Reach

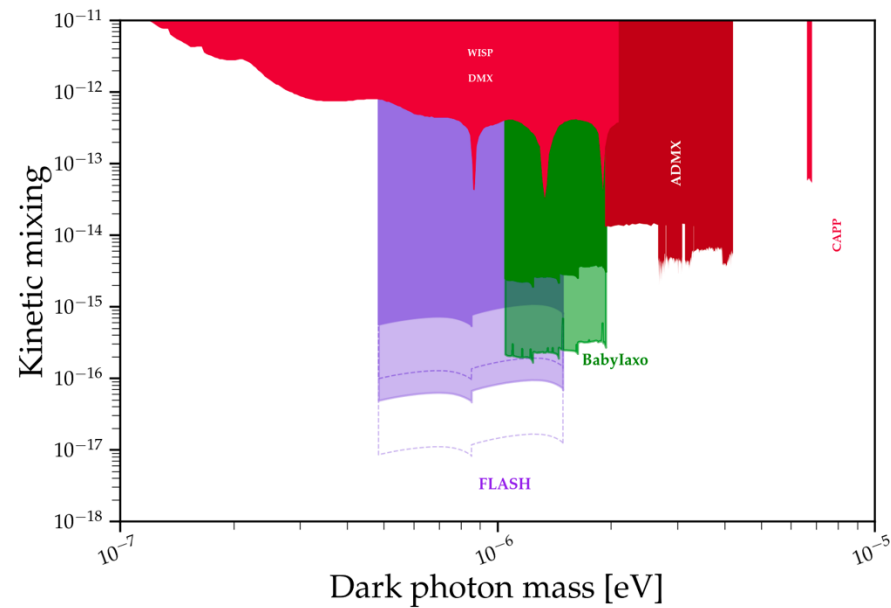
With NbTi cavity at 1.9 K



Parameter	Value
ν_c [MHz]	150
m_a [μ eV]	0.62
$g_{a\gamma\gamma}^{\text{KSVZ}}$ [GeV ⁻¹]	2.45×10^{-16}
Q_L	6.7×10^5
C_{010}	0.53
B_{max} [T]	1.1
β	2
τ [min]	5
T_{sys} [K]	4.9
P_{sig} [W]	0.9×10^{-22}
Scan rate [Hz s ⁻¹]	8
m_a [μ eV]	0.49 - 1.49
$g_{a\gamma\gamma}$ 90% c.l. [GeV ⁻¹]	$(0.37 - 1.8) \times 10^{-16}$

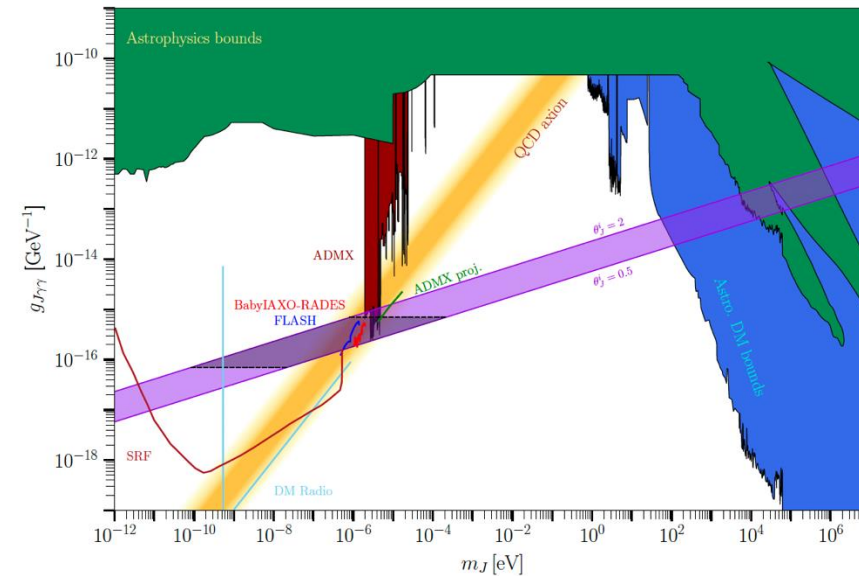
FLASH Physics Reach

Vector Dark Matter



Majoron

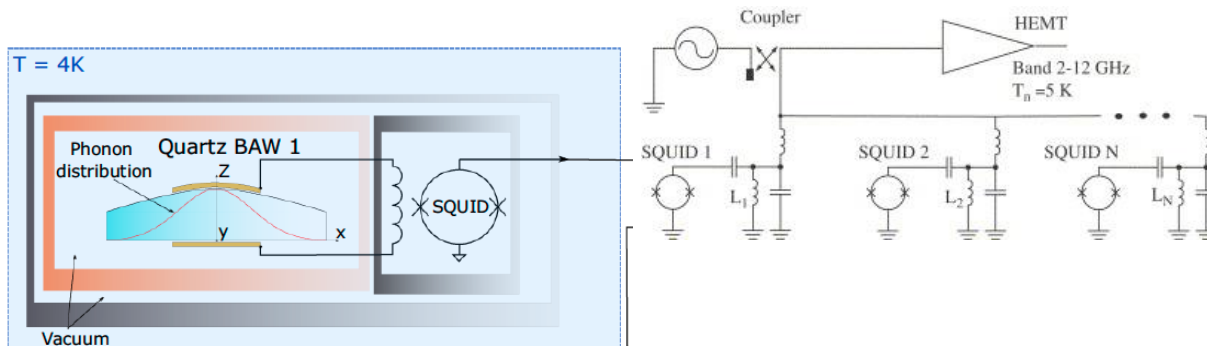
arXiv:2406.19083



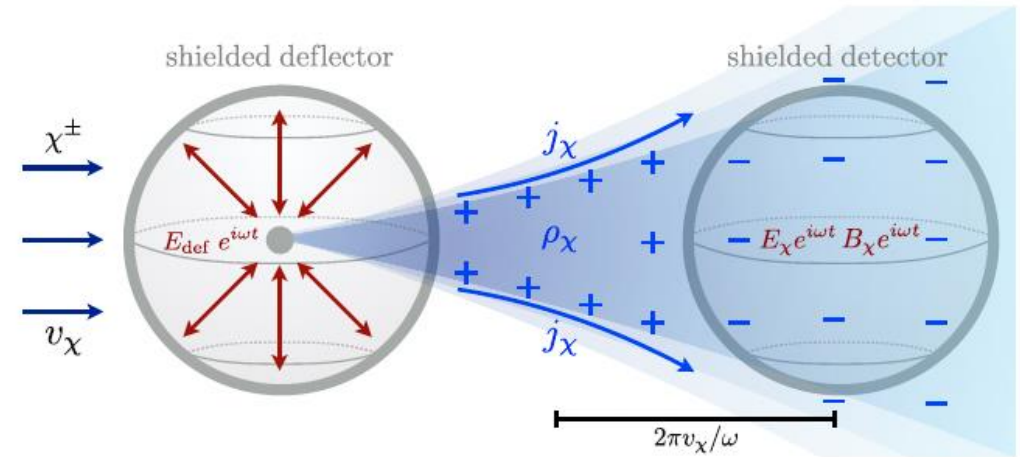
New ideas needed for scalars: Run with open endcaps for a non-uniform B field?

Synergies and New Ideas

Synergies with BAW's (Scalars, HFGW)



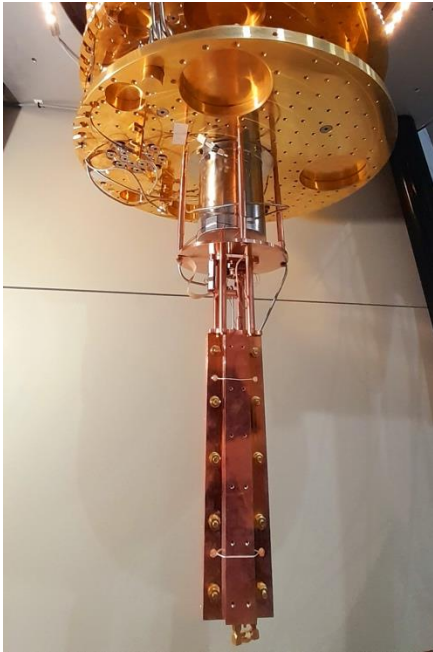
Start thinking to future use of FLASH cryostat!



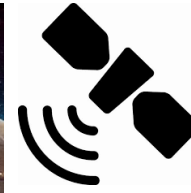
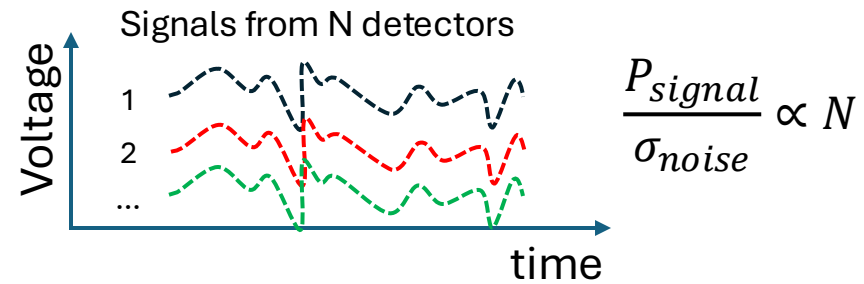
Also see:

1. Non virialized Axions (arXiv:2410.09203)
2. Axion miniclusters
3. Solar ALP halo
4. Axion Quark Nuggets
5. Daily modulations arXiv:2405.10972

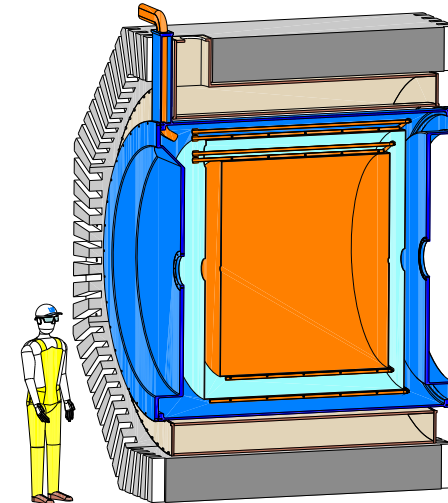
Network Operation



QUAX@LNF



SUPAX



FLASH

- 3 high frequency rf cavities per site
- One rf cavity at 100 MHz

GravNet initial sites: Mainz, Bonn, PSI, Frascati



In summary

- WP1: What about non-virtualized axions, miniclusters, modulations, AQN?
- WP2: Define envelope volume for cavity; Start prototype mechanical design.
- WP3: New cavity design; New tuning system;
- WP4: Purchase SQUIDs and start characterizations. Multimode acquisition and signal multiplexing. Shield design.
- WP5: Data analysis for non standard axions. HFGW time domain analysis. Test MIDAS DAQ and INFN Cloud with QUAX@LNF haloscope. Acquire GPS.
- WP6: Decommissioning FINUDA Started!