

# The Dark Matter Radio

First Collaboration Meeting

Jan. 24, 2020

Kent Irwin

# DM Radio Experiment Family

## DM Radio-50L

- ~0.5 T, 50 L magnet
- Dilution refrigerator
- ALP science
- Platform for quantum sensor development and R&D

*Status: In construction and development*

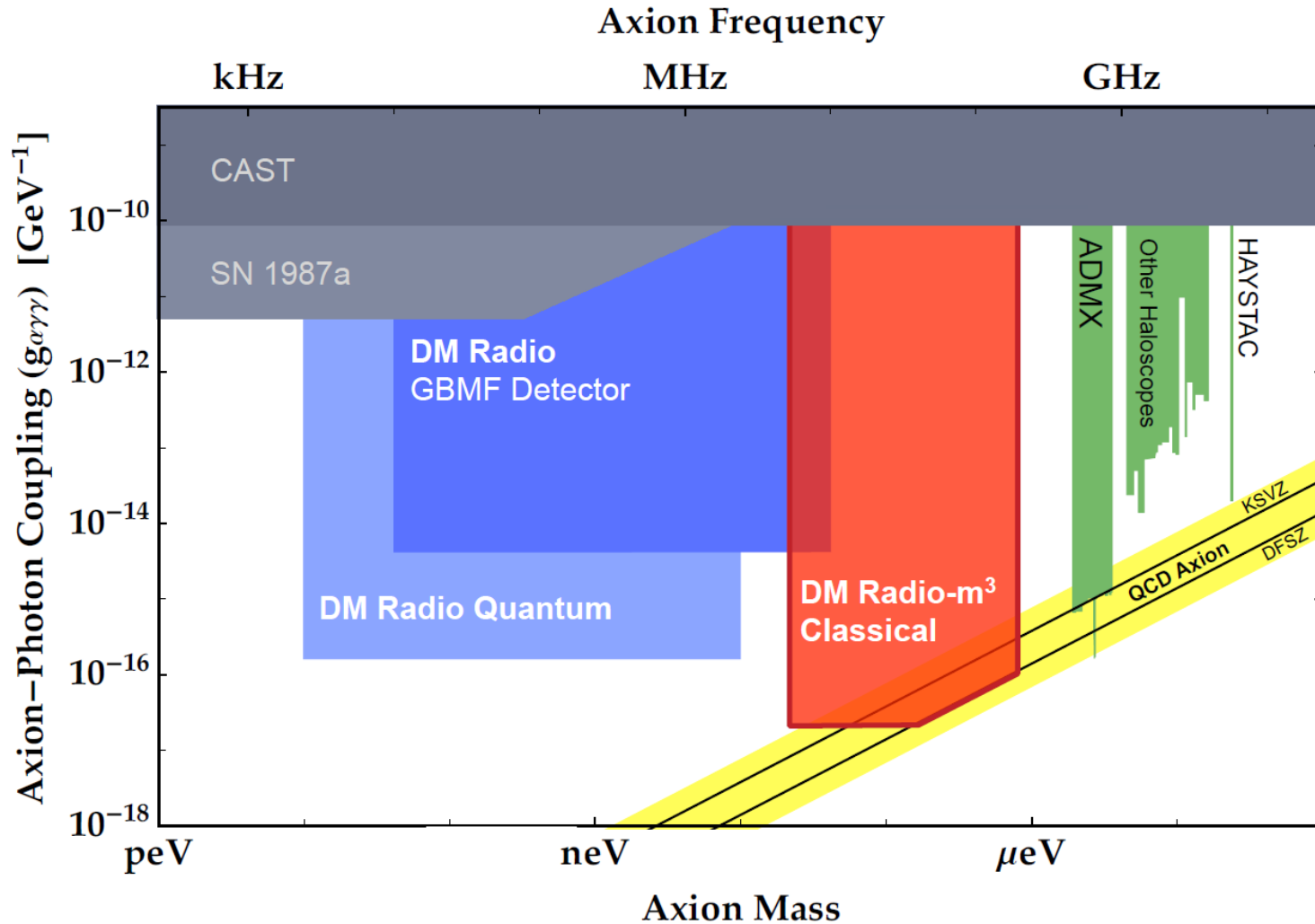
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## Dark Matter Radio Cubic Meter (DMRadio-m<sup>3</sup>)

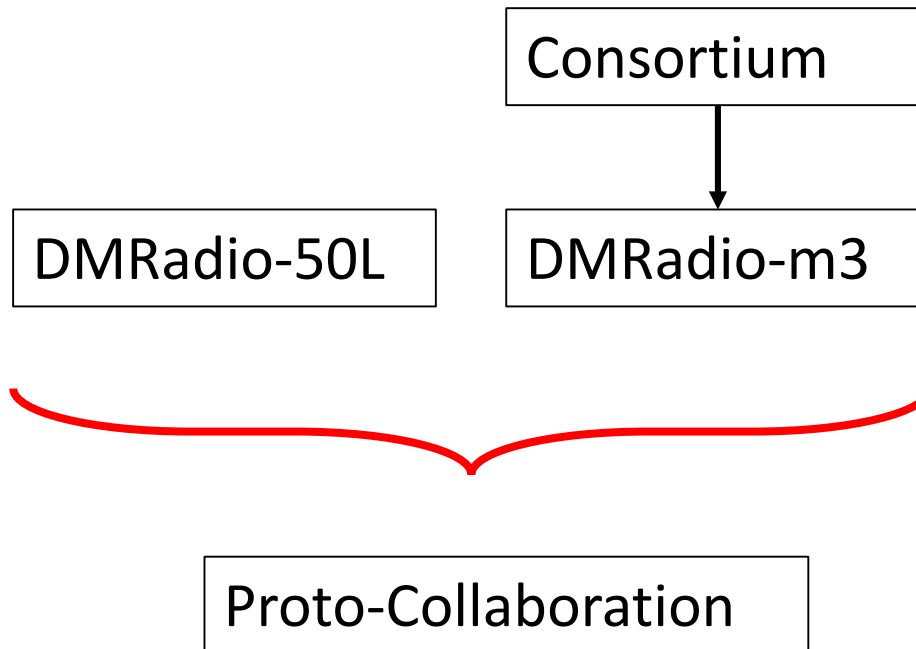
- Brings together both DM Radio and ABRACADABRA teams
- QCD axion over 5 MHz – 200 MHz (20neV-0.8  $\mu$ eV)
- ~4T, ~m<sup>3</sup> magnet
- Dilution refrigerator
- Optimal high-Q resonant experiment
- DC SQUID, 20x the quantum limit

*Status Engineering design under  
DOE Dark Matter New Initiatives  
call*

# DMRadio- $m^3$ Family Science Reach



- Still in progress!



- The Consortium leadership provides the executive committee for the Proto-Collaboration
- On the timescale of proposing the DMRadio-m3 Project, the Proto-Collaboration will evolve into the full DM Radio Collaboration, with elected officers, etc.

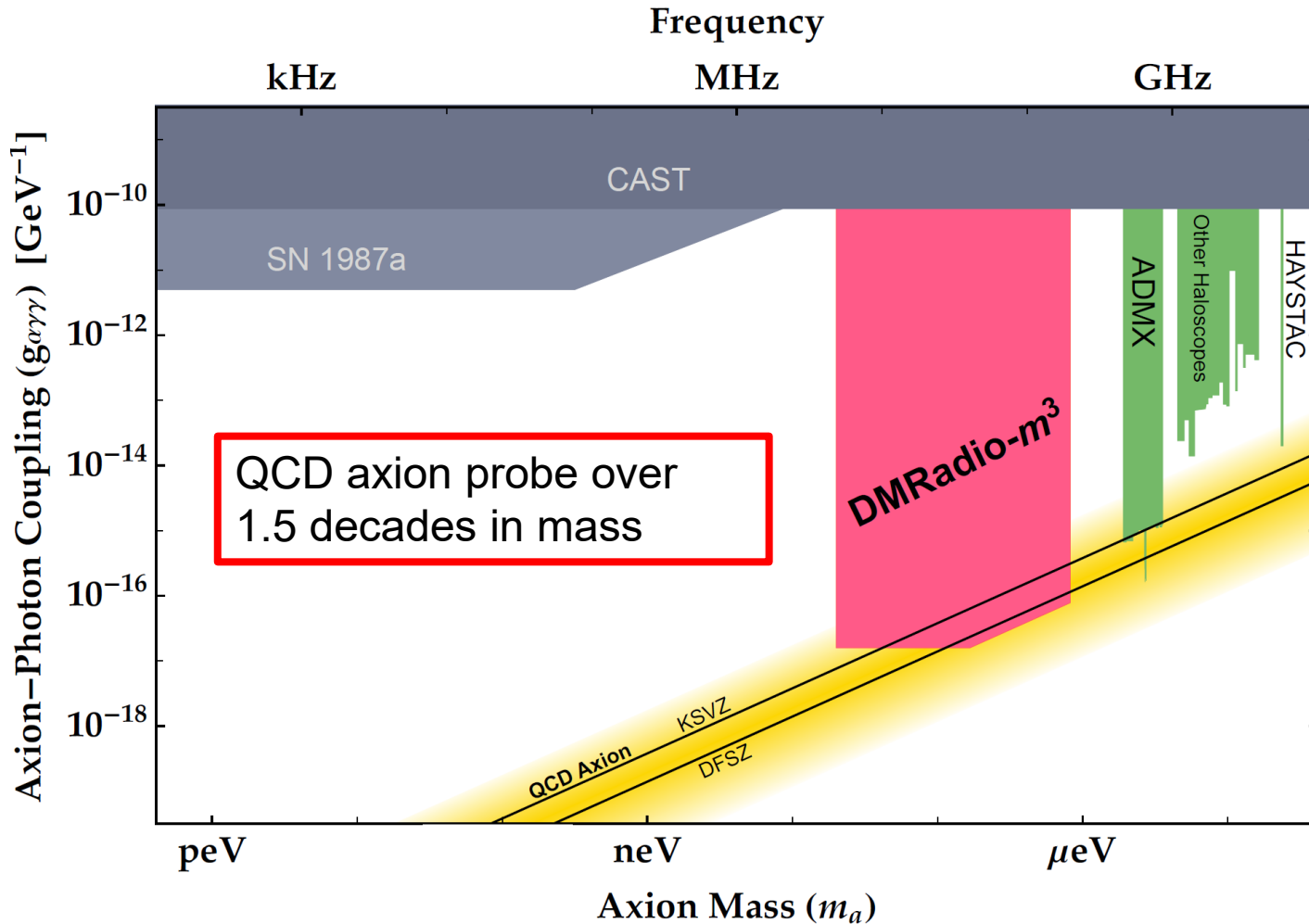
# DM Radio Cubic Meter Consortium

Engineering design funded under

DOE New Initiatives in Dark Matter program

<u>Name</u>	<u>Institution</u>	<u>Role / Team Lead</u>
Kent Irwin	SLAC and Stanford	Consortium PI
Karl van Bibber	UC Berkeley	Magnet
Lindley Winslow	MIT	Magnetic shielding, vibration
Saptarshi Chaudhuri	Princeton	Control system, scan
Peter Graham	Stanford	Theory
Reyco Henning	UNC Chapel Hill	Calibration and DAQ
Dale Li	SLAC	Cryomechanical
Hsiao-Mei Cho	SLAC	SQUID
Wes Craddock	SLAC	Engineering
Nadine Kurita	SLAC	Project Management

# DMRadio-m<sup>3</sup> Science Reach



- $\sim 4$ T,  $\sim \text{m}^3$  magnet
- Dilution refrigerator
- DC SQUID, 20x the quantum limit
- 5 MHz – 200 MHz
- (20 neV – 0.8  $\mu$ eV)
- 5 year scan (3 years live)

**08:30** → 09:00 **Welcome Overview and Collaboration Structure**

🕒 30m

**Speaker:** Prof. Kent Irwin (SLAC/Stanford)

**09:00** → 12:00 **Axion and Hidden Photon Science**

**Convener:** Peter Graham

**09:30** **General Introduction to Dark Matter, Axions, and Hidden Photons**

🕒 30m

**Speaker:** Prof. Yonatan Kahn

**10:00**

**Discussion/Break**

🕒 30m

**10:30**

**Axion and Hidden Photon Production Mechanisms**

🕒 30m

**Speaker:** Prof. Peter Graham

**11:00**

**Landscape of Existing Limits for Ultralight Dark Matter**

🕒 30m

**Speaker:** Prof. Surjeet Rajendran (UC Berkeley)

**11:30**

**Discussion/Break**

🕒 30m

**12:00** → 13:00

**Lunch**

🕒 1h

<b>13:00</b> → 15:00	<b>Experimental Precursors to DM Radio-M3</b> Convener: Dr Arran Phipps (Stanford)	
13:00	<b>Musings on Axion and Hidden Photon Detector Geometries</b> Speaker: Dr Saptarshi Chaudhuri (Princeton University)	🕒 20m
13:20	<b>ABRACADABRA 10 cm Experiment</b> Speaker: Dr Jon Oullet (MIT)	🕒 20m
13:40	<b>ABRA EM Simulations In Comsol</b> Speaker: Chiara Salemi (MIT)	🕒 20m
14:00	<b>DM Radio Pathfinder Experiment</b> Speaker: Stephen Keunstner (Stanford)	🕒 20m
14:20	<b>DM Radio Pathfinder Updates and Next Steps</b> Speaker: Dr Arran Phipps (Stanford)	🕒 20m
14:40	<b>Discussion/Break</b>	🕒 20m
<b>15:00</b> → 16:00	<b>DM Radio In Context</b> Convener: Prof. Lindley Winslow (MIT)	
15:00	<b>How to Optimize a Dark Matter Search</b> Speaker: Dr Saptarshi Chaudhuri (Princeton University)	🕒 20m
15:20	<b>DM Radio 50L</b> Speaker: Dale Li (SLAC)	🕒 20m
15:40	<b>DM Radio-M3</b> Speaker: Prof. Kent Irwin (SLAC/Stanford)	🕒 20m
<b>16:00</b> → 17:00	<b>Open Discussion</b> Convener: Prof. Karl Van Bibber (UC Berkeley)	