Pacific Northwest
NATIONAL LABORATORY

Synthetic Axion Injections

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ADMX Collaboration Meeting

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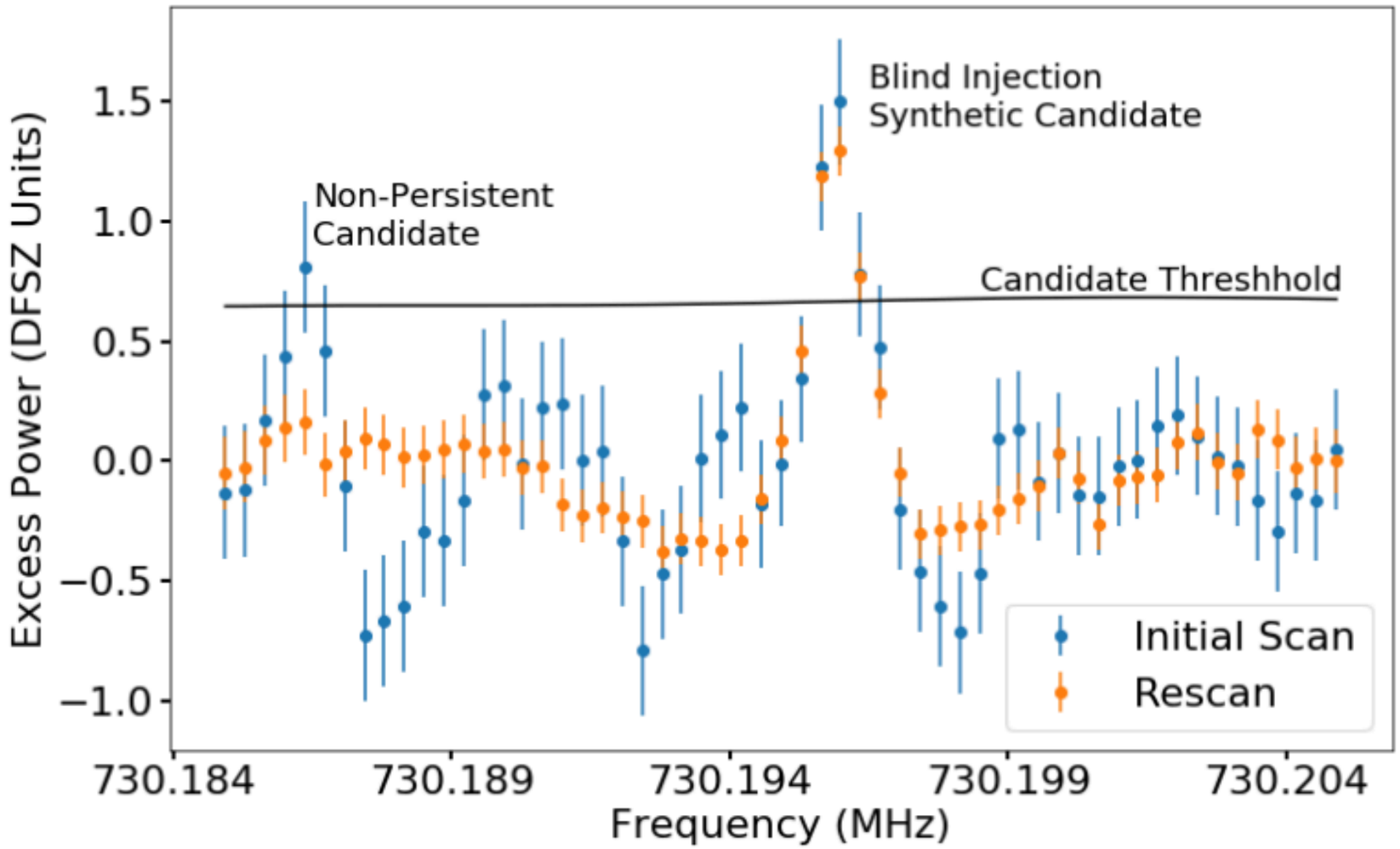
Synthetic Axions



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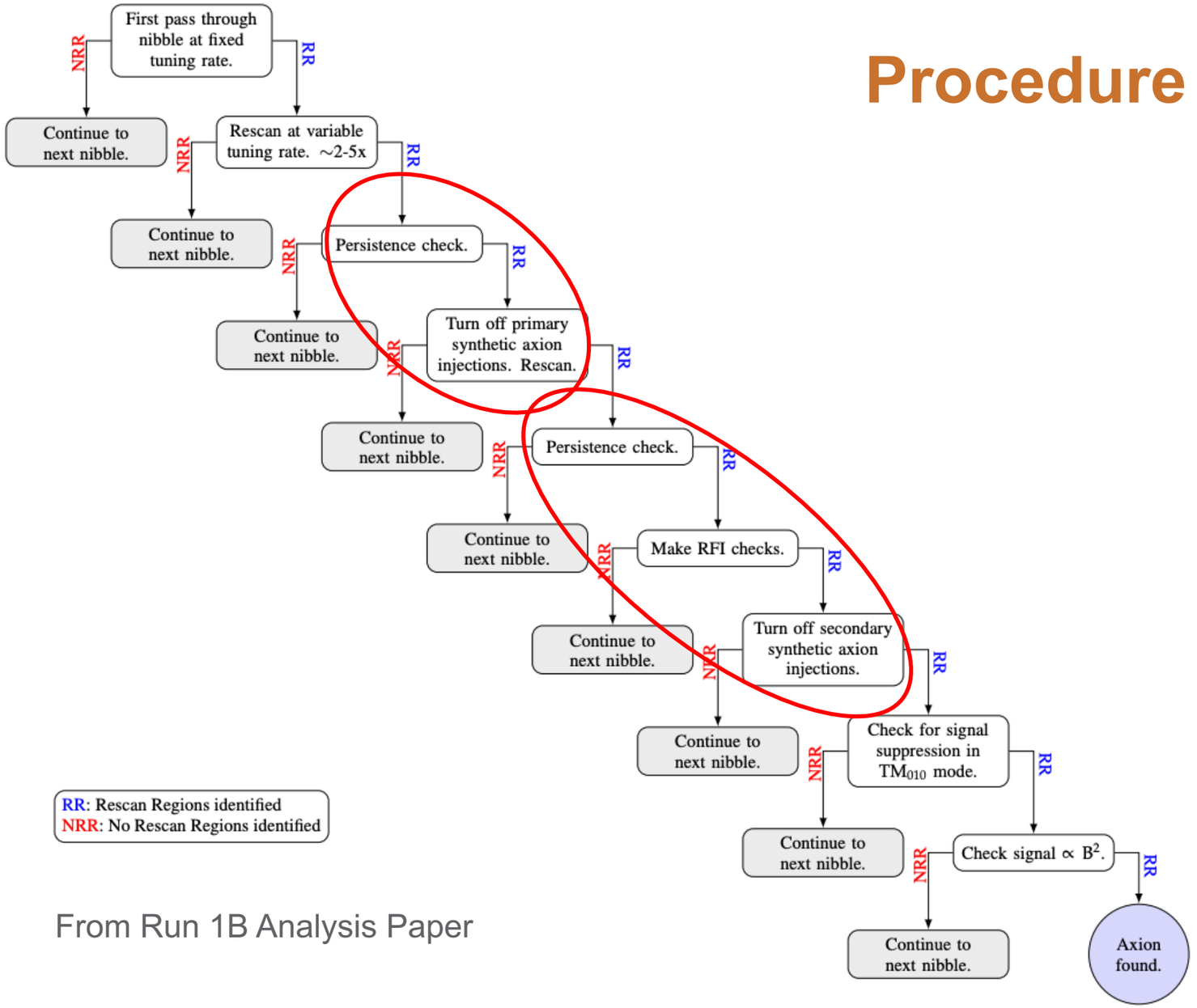
Blind Injections

- Purpose: blind operation of the experiment & validation of candidate-identification procedures
- Problem: we need to minimize the possibility of biases influencing our data-taking
  - This is particularly crucial when the data can be seen life and the data-taking procedure involves manual interactions
- Two injection categories
  - Primary blinding
    - ✓ Several (~4) per 10 MHz, on average
    - ✓ Unblinded after candidate search
  - Secondary blinding
    - ✓ Once per run, on average
    - ✓ Unblinded before magnet ramp procedure

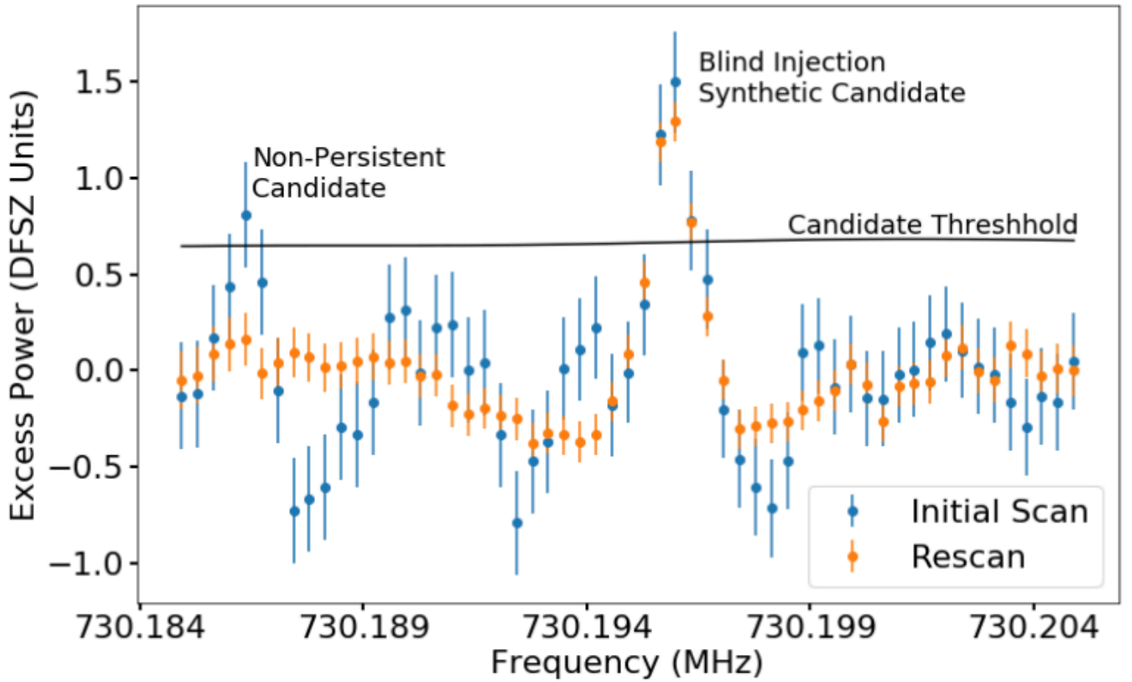
Procedure



From Run 1B Analysis Paper

When Have They Been Used

- ☒ Run 1A
  - SAG system not ready
- ☑ Run 1B
  - First iteration of system
  - Nibbles 5-10
- ☑ Run 1C
  - Improved hardware and software
  - Nibbles 4-7 (so far)



From Run 1B Analysis Paper

Run 1C Upgrade

- New electronics
- Physically isolated
- New database setup
- New controls setup

Existing SAG + second mixing stage

Blind Injections

Add an Injection

SAG ID is set automatically

SAG On ☐

Blind Injection ☑

Frequency (MHz)

Attenuation

Add

Toggle Injections

SAG IDs — Comma Separated List

SAG On ☐

On/Off

Blinded ☐

Blind/Unblind

Update an Injection

SAG ID

Parameter — Frequency (MHz)

Value

Update

Remove an Injection

SAG ID

Remove Injection

SAG Injections

ID	SAG On	Blind	Attenuation	Frequency (MHz)
30	1	1	[redacted]	[redacted]
29	1	1	[redacted]	[redacted]
28	1	1	[redacted]	[redacted]
27	0	0	58	971.1
26	0	0	59.9	970.7
25	0	0	56.3	698.3
24	0	0	56.3	968.3
23	0	0	59	968.1
22	0	0	59.5	965.5
21	0	0	59.9	982.9

Run 2A Plans

- Part of baseline plans
- Signal split to all four cavities
- Otherwise same as Run 1C/D