International Centre for Radio Astronomy Research

OzSKA Conference Summary

10 April 2015

Professor Carole Jackson

ICRAR / Curtin University

Curtin University

The University of Western Australia

Thanks to organisers

Rachel

LOC

CAASTRO

www.ska.gov.au

OzSKA 2015

Excellent set of presentations & participation
> 80 attendees

Aus (& NZ) astro community
- **timely discussions for new science case**
- **review chapter contributions**
- **explore synergies**
- **draw on strengths within community (obs, theory, sims…)**

OzSKA 2015 is a "first" meeting
Improving Aus-NZ SKA communication (viz ASA discussion 2014)

OzSKA Themes

Aus/NZ strengths

Intermingling of simulator/obs/theory

Feedback from precursors – accelerating with ASKAP coming on line

Subtle effects; emerging from well-calibrated, high-quality data

Intermingling of science across SWGs

KSPs are not silos

Same or similar astronomical challenges

Design challenge – tailoring or not…

Intermingling of community

Strong cross-wavelength synergies; new decadal plan 2016-2025

Good exchange/overlap of people, skills etc.

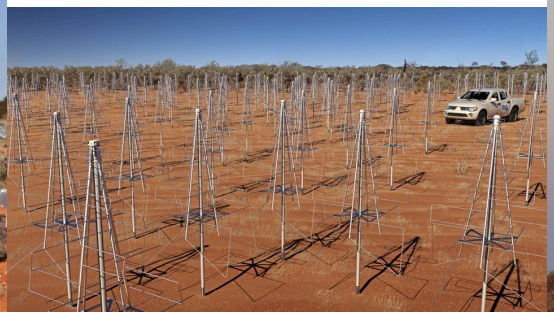
OzSKA 2015

MWA, ASKAP & more on the path to SKA

MWA Murchison Widefield Array (operating)
+ AAVS1 (LOW verification)

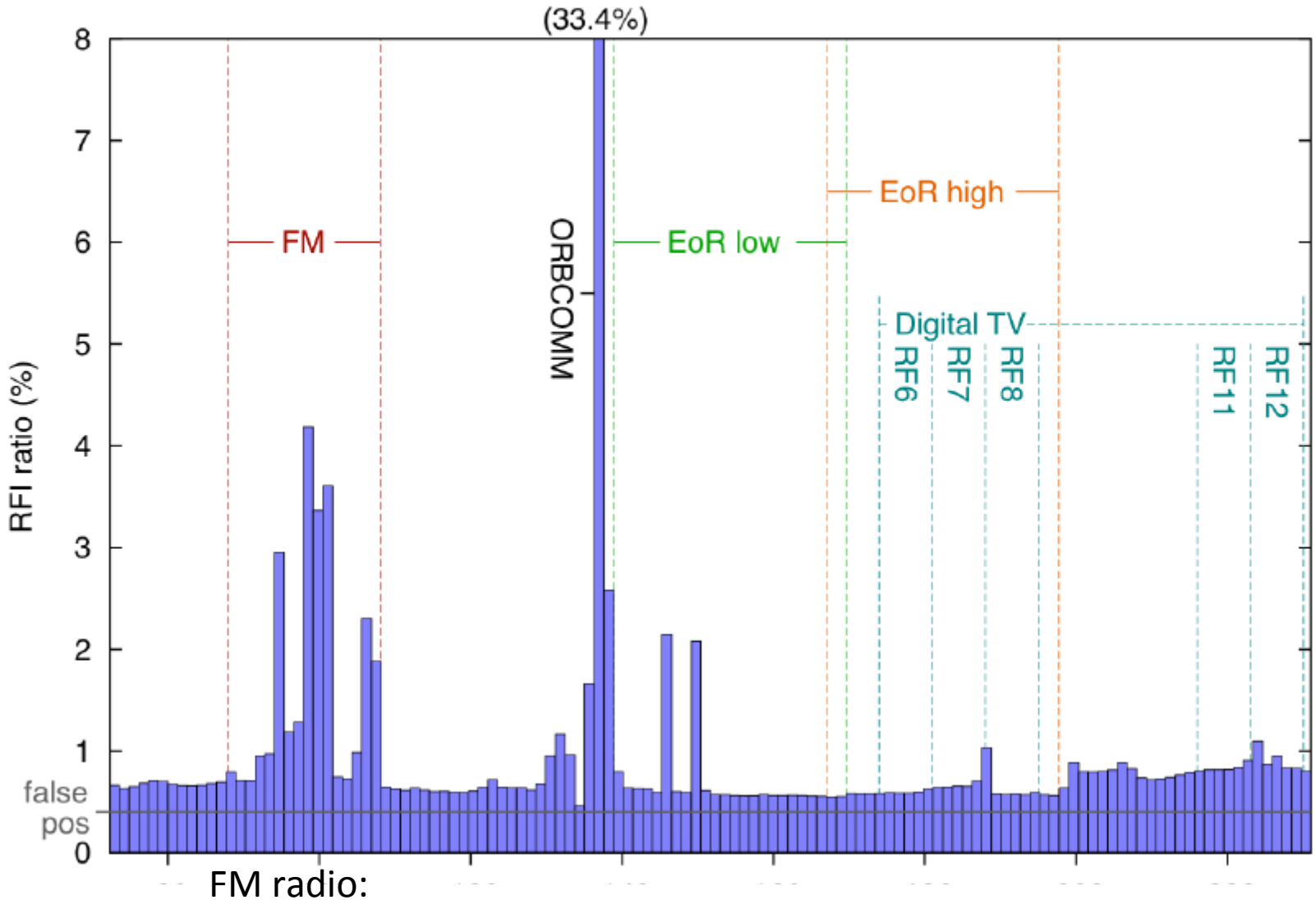
ASKAP BETA, -12, 30: full science operations
will be operational years ahead of SKA1_MID (& MeerKAT)

MRO RFI quiet zone protection
(Kate Chow): best in world


MRO RFI (low)

Offringa 2015

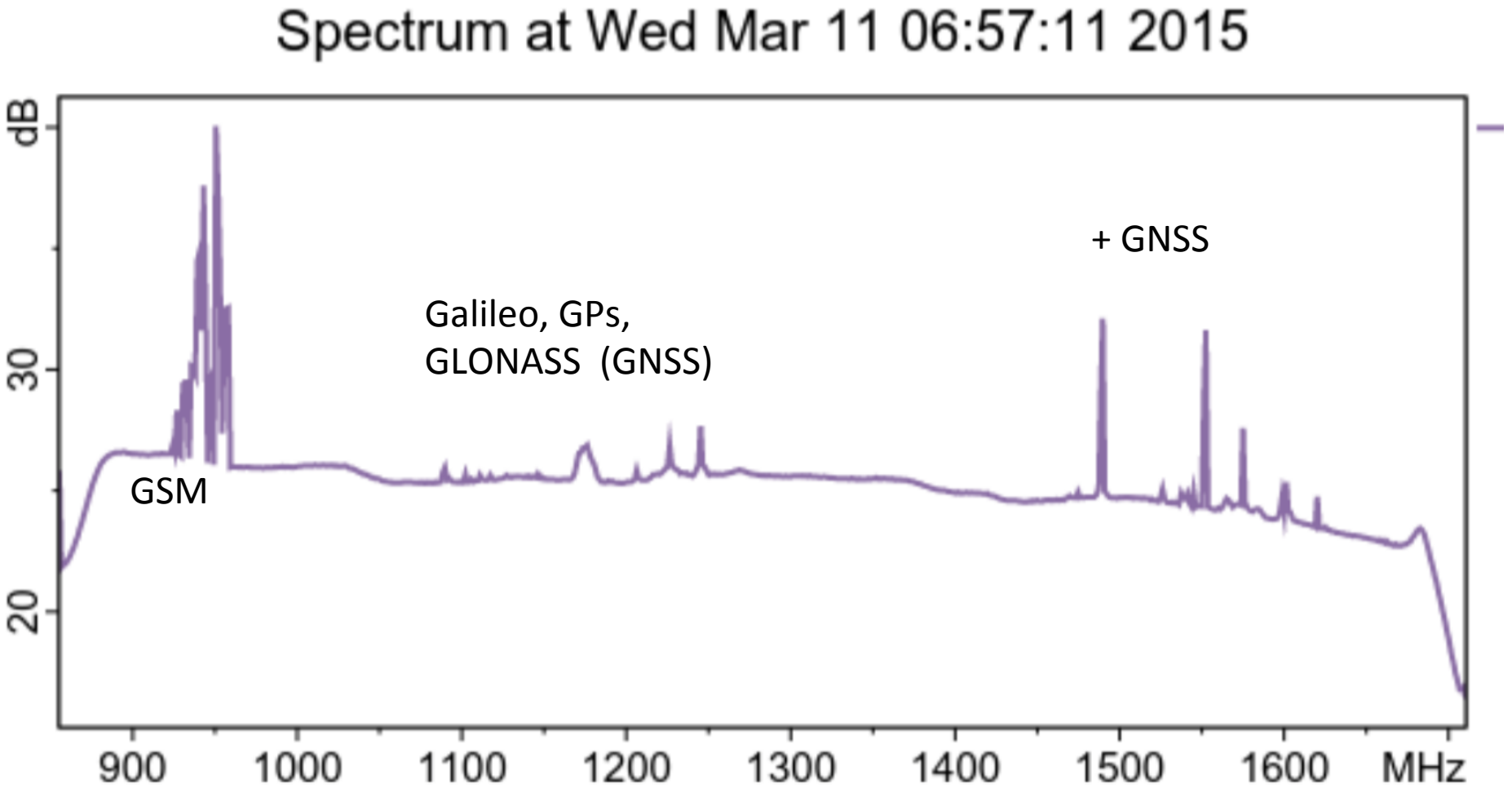


FM radio:
88-110 MHz

137 MHz

180 MHz ….. > 300 MHz

RFI at SKA-mid site



Schroeder (2015)

MWA/AAVS1 -> SKA_LOW

MWA – operational 2013

Huge range of new low frequency science
Including search for EOR signal
New tools & techniques
SKA_LOW validation (AAVS 0.5, 1.0)

SKA_LOW – operational 2020+

Key Science
Detect & map EOR
Pulsars & other transients
& much more

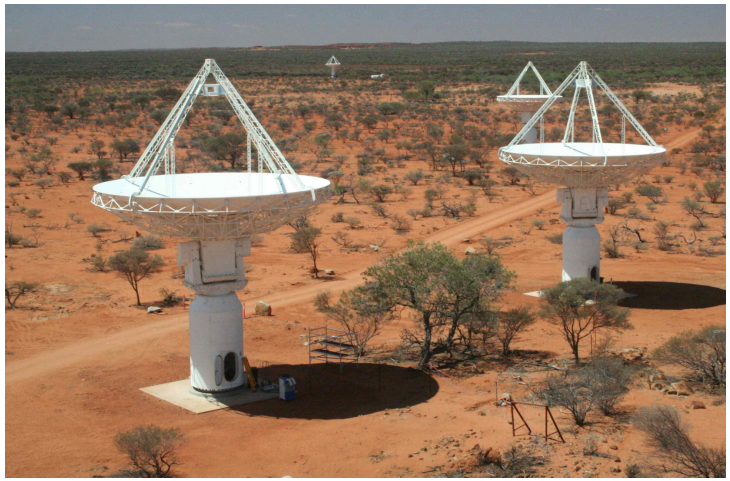
MWA sits squarely on the path to SKA_LOW
http://mwatelescope.org/science

Rebaselined SKA_MID

ASKAP -> SKA Survey == **ASKAP**

- **Wallaby: HI survey (500k galaxies to z=0.26)**
- **EMU: continuum survey (10 μJy/beam rms)**
- **GASKAP: Galactic & Magellanic HI & OH**
- **DINGO: evolution HI from z =0 – 0.5**
- **FLASH: HI absorption survey**
- **POSSM: polzn survey, RM synthesis**
- **VAST: variables and slow transients**
- **CRAFT: transients < 5s**

- **VLBI: capability**
- **COAST: pulsar capability**



http://www.atnf.csiro.au/projects/askap/science.html

OzSKA Themes

Lessons from MWA & ASKAP & more

New data insights

Challenges of new data, imaging and efficient software pipelines

(LOW) observing the entire sky beyond the FOV

Sources in far sidelobes

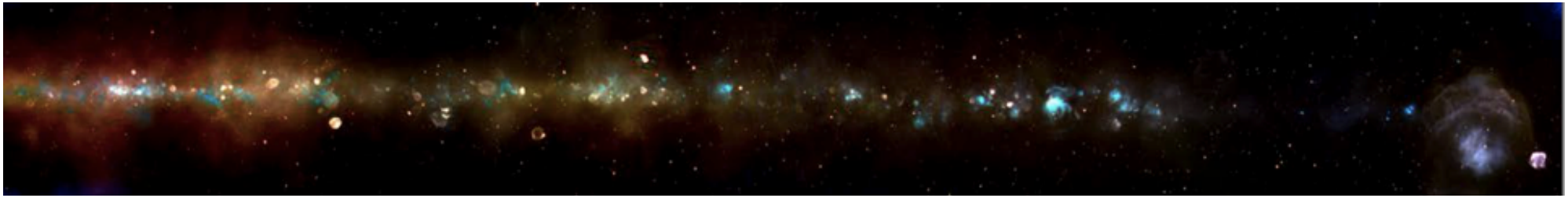
Linkages to SKA Design discussions <-> vital

Experience in managing

New surveys, big interdisciplinary teams: skills

70M sources (e.g. ASKAP EMU); complex large-N systems

Big data, storage, real-time processing & visualisation



OzSKA Themes

- Evolution since 2004 science case ✓ (Chris Blake)

- Science evolves faster than telescope design/realisation time
  Software does not
  Observing techniques evolve to extract max output from technology

- Science 'step': galactic, ISM, IGM, … near field science ++

Extragalactic: SKA radio obs sampling ALL galaxies; way beyond AGN dominated samples (RQQs, SFs, ...). Foreground complexities ⇧

Encourage thinking beyond replicating same project at other wavebands….

- Very large teams & resourcing

Specific expertise & assignment of credit (career path)

Healthy competition across same science teams

Stepping up to KSP leadership/involvement

Commensal surveys

The SKA Key Science Workshop

24-27 August 2015
Wenner-Gren Center
Europe/Stockholm timezone

One of the workshop aims:

- Maximizing commensality
  - It is likely that the same data stream will serve multiple KSP or PI-led groups, each with limited data rights to address specific scientific objectives.
    - This workshop aims to provide a forum for early discussion of support for such commensal programs, including the development of efficient survey strategies intending to maximise the scientific return of the KSP package.

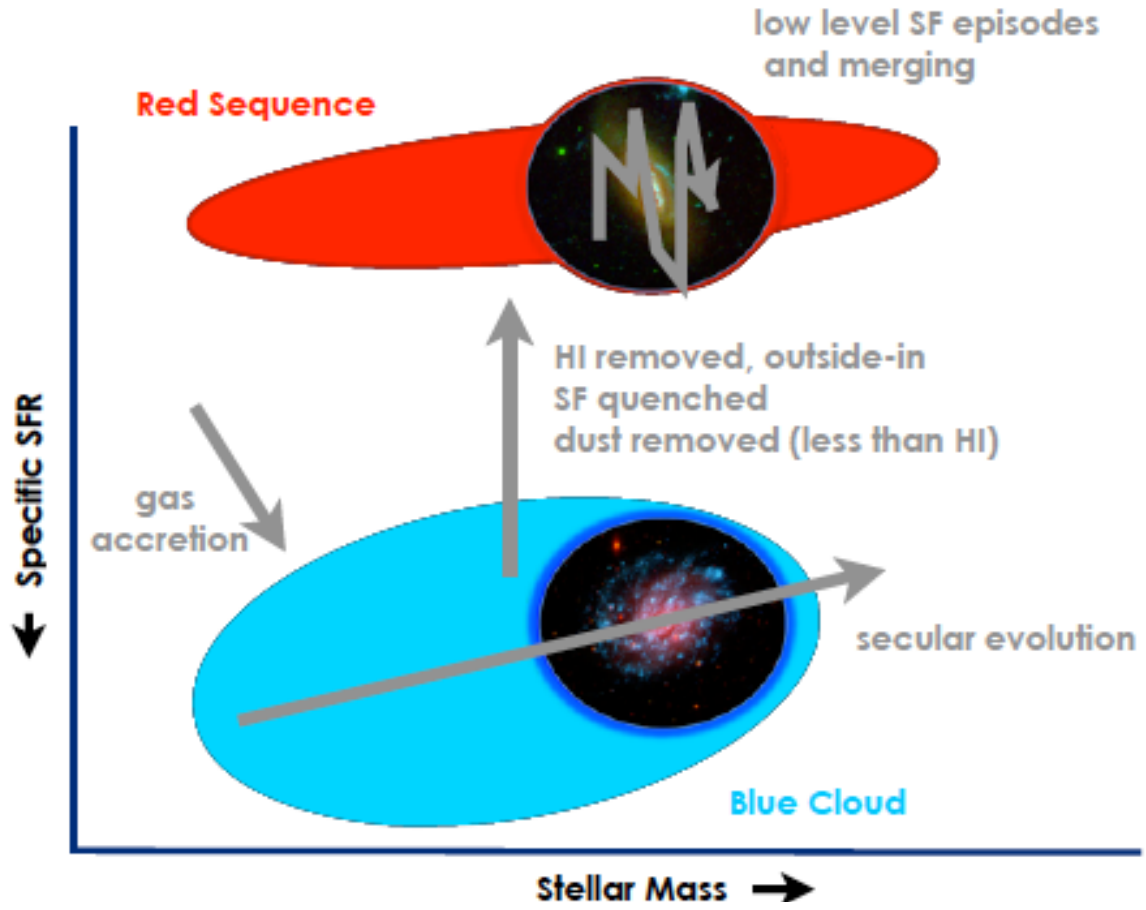
Lister Staveley-Smith

Multiwavelength multi-KSP SKA

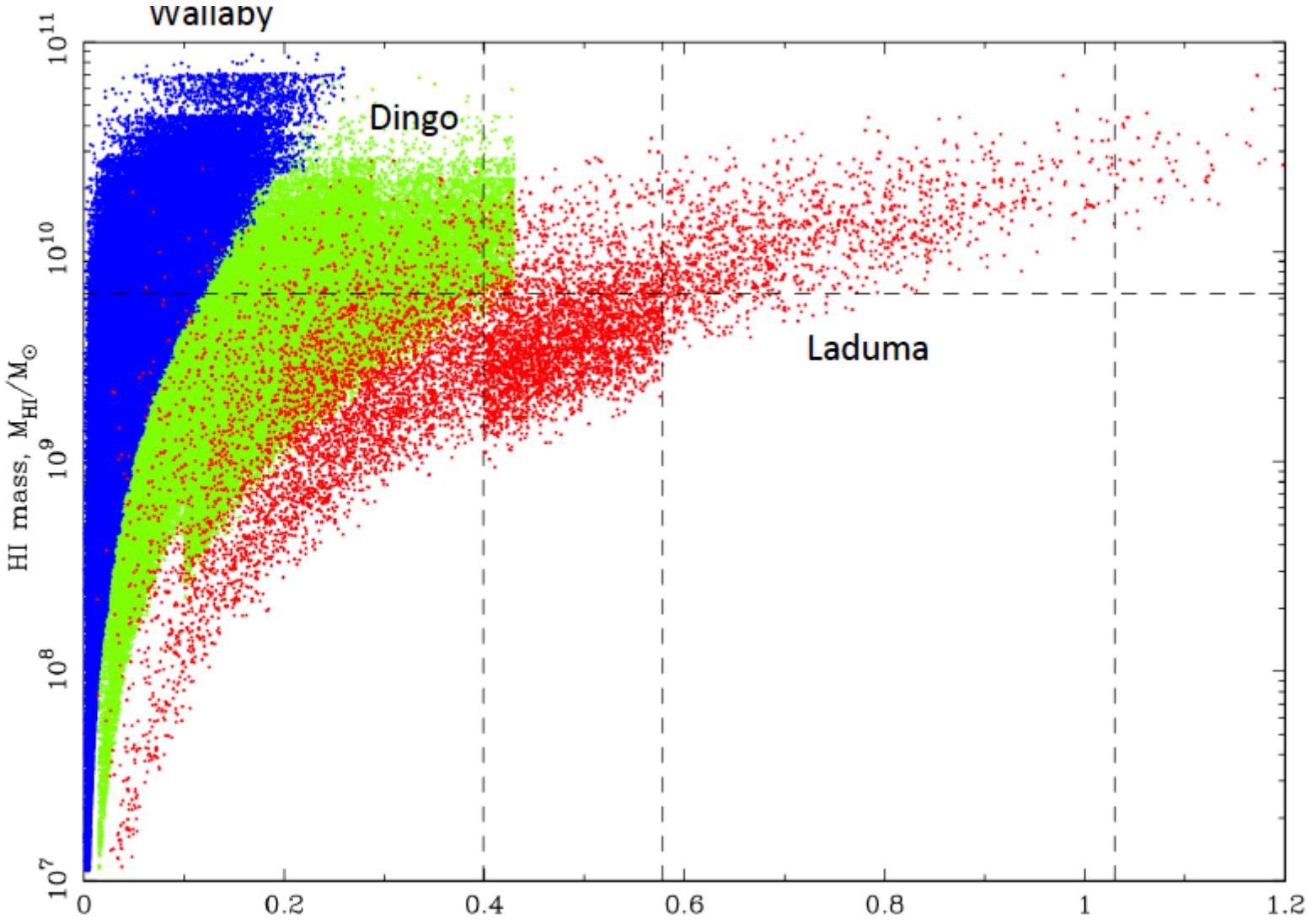
Martin Meyer

HI + multi-λ essential for understanding the evolution of galaxies

- **different baryonic states:** gas (atomic/molecular/ ionised), stars, dust
- **environment:** group properties (membership/ multiplicity/halo mass/ central-satellite), accretion, outflow
- **feedback:** AGN, stars
- **galaxy dynamics:** gas, stars, halo

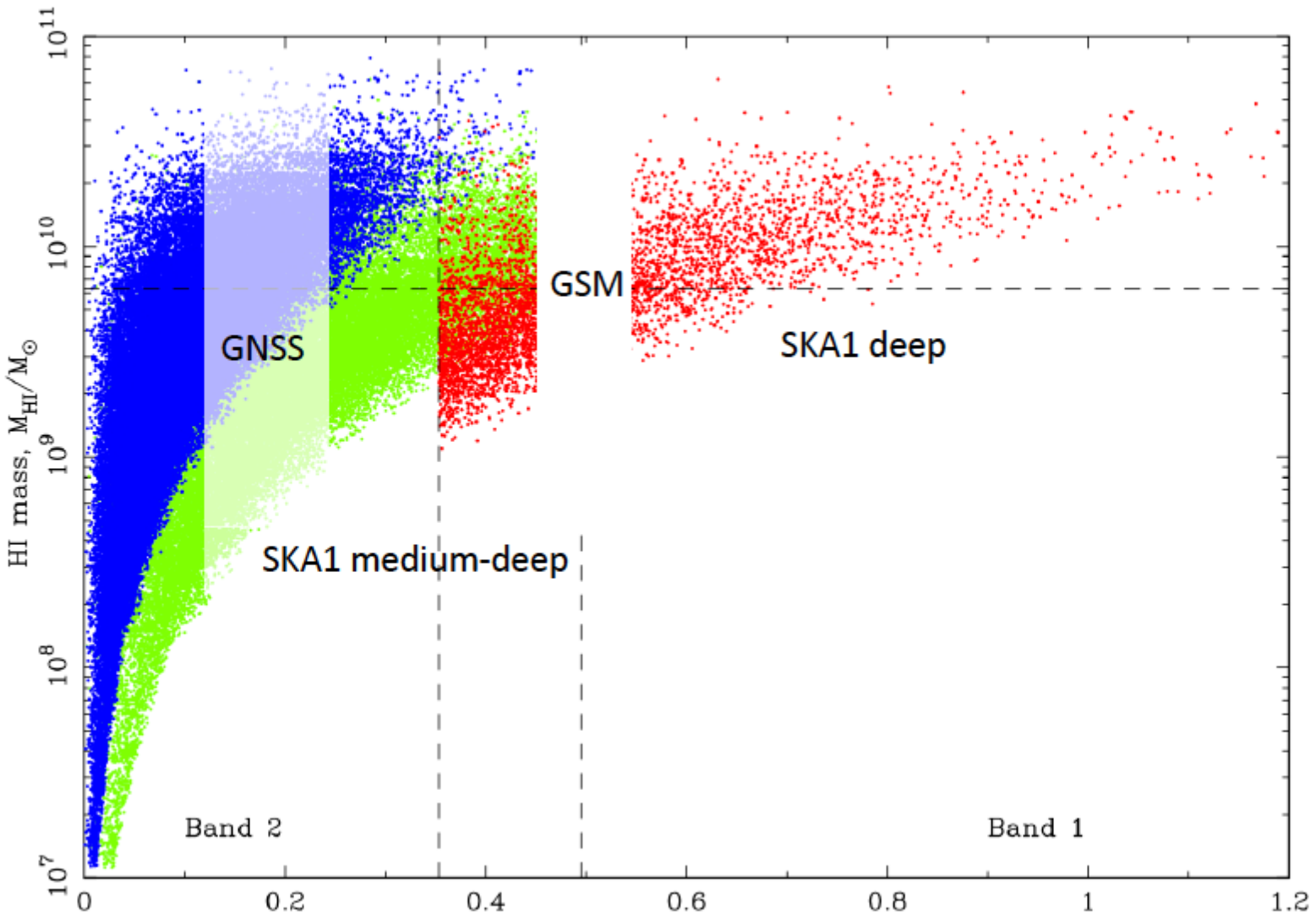


SKA precursor surveys



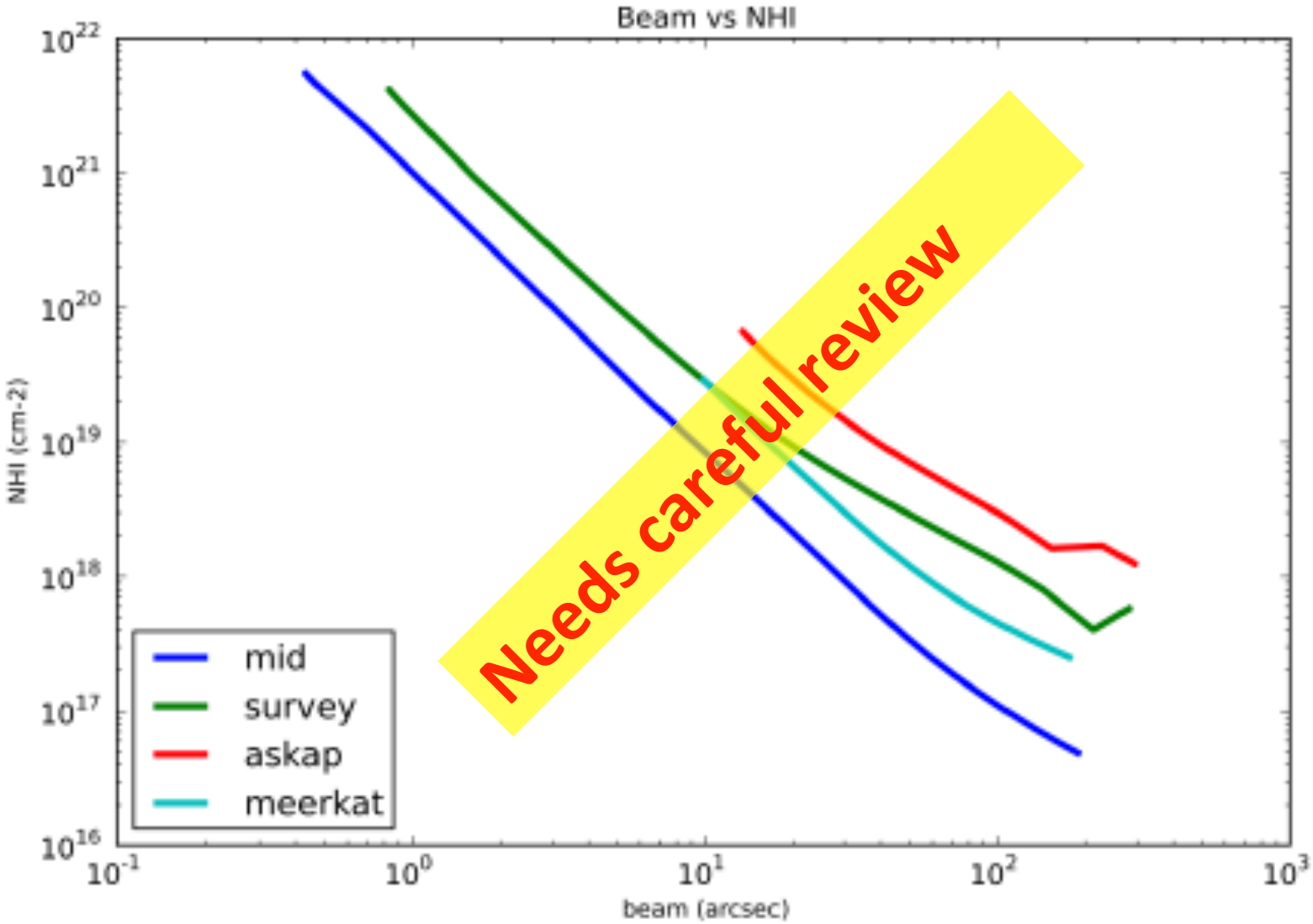
Lister Staveley-Smith

SKA1_MID medium-wide



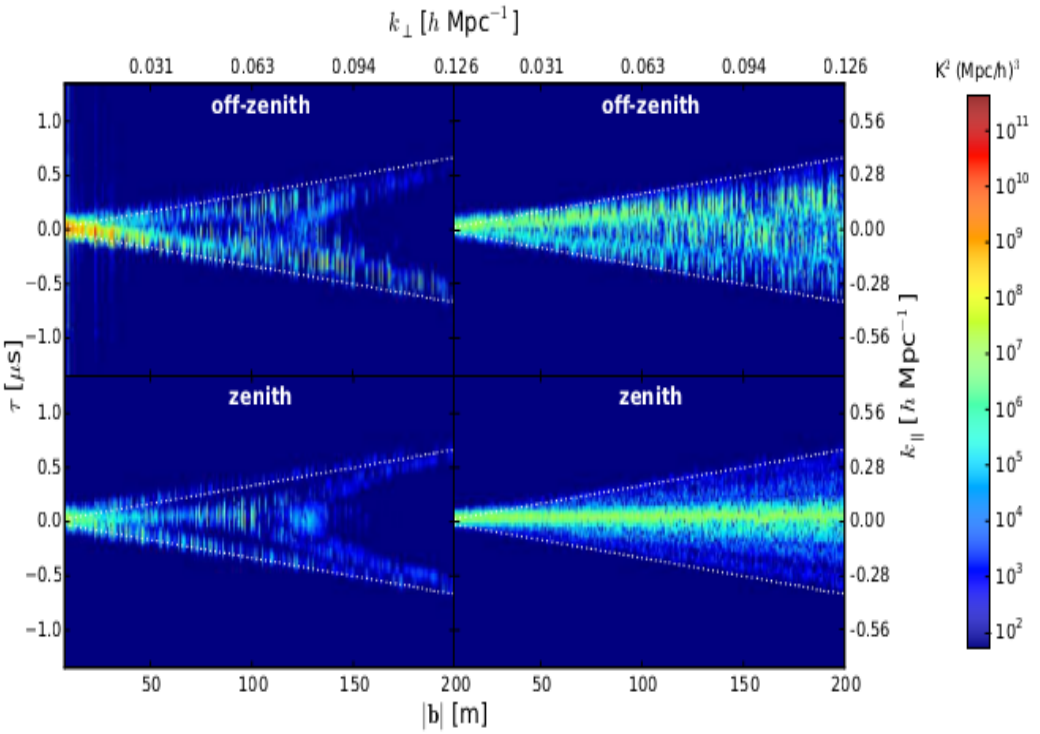
Lister Staveley-Smith

SKA1 sensitivity (8 hrs)



Popping et al. (2015)

Low freq (MWA) widefield effects



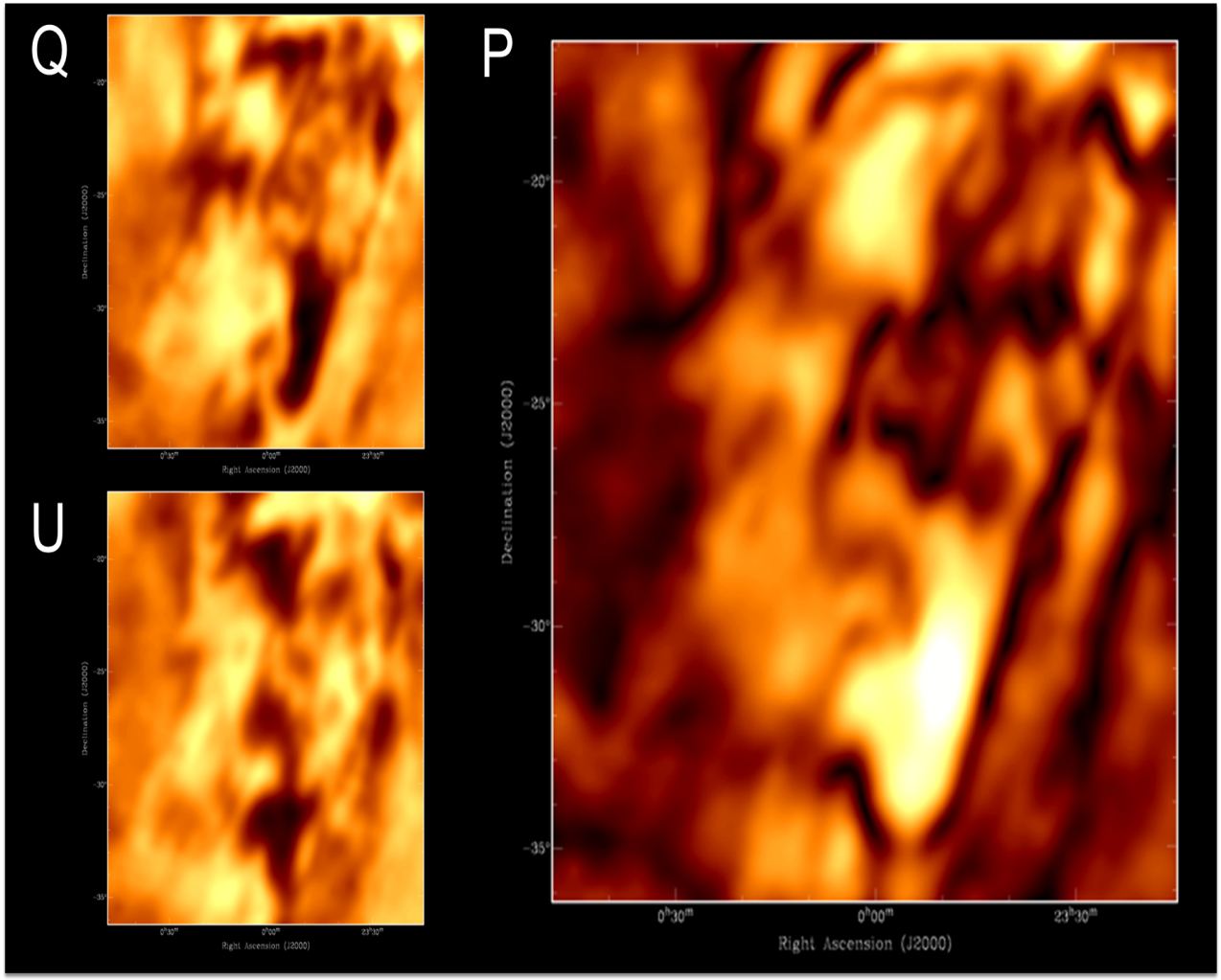
DIFFUSE COMPACT

- One of the important realizations coming out of the PAPER and the MWA is the need to consider FGs from the entire sky, not just FoV
- An interferometer sensitive to the entire sky sees power even from a uniform sky
- Realistic model which combines bright point sources and diffuse emission shows complex FG shapes in this space
- Primary FOV only one factor
- Long baselines are still effected by diffuse emission due to foreshortening ('Pitchfork')

Bart Pindor's presentation: (Thyagarajan 2015)

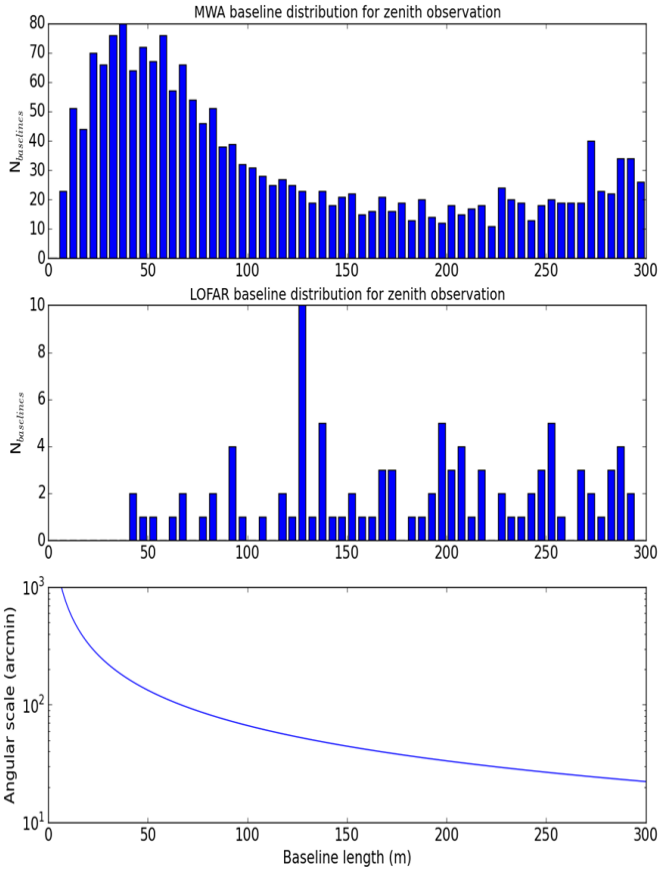
MWA detects Diffuse Polarization

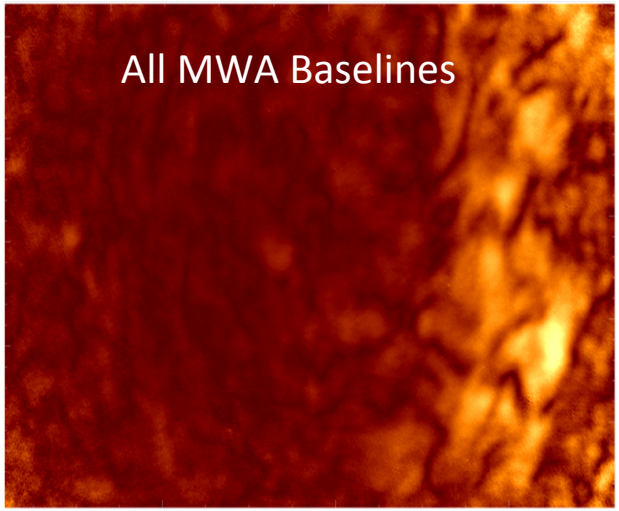
Bart Pindor's presentation: (Emil Lenc)

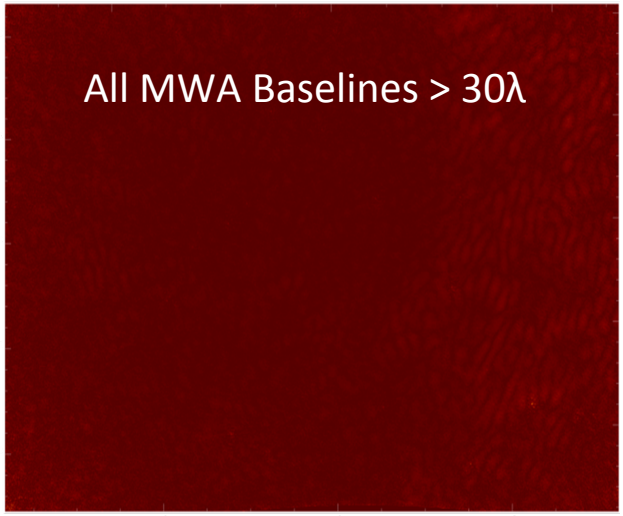


- **Diffuse Polarization in the SGP, as imaged by Emil Lenc**
- Not seen by LOFAR
- **Leakage will transfer power from polarized FG to Stokes I**
- **Some theoretical work (eg Geil 2011) for dealing with this but never tried in anger**
- Knowledge of polarized FG required

LOFAR vs MWA Polarization







Bart Pindor's presentation: Emil Lenc

OzSKA resources

SKA telescope
www.skatelescope.org
(Science link to SWGs, documents etc – top RH corner…)
SKA Science Working Groups
http://astronomers.skatelescope.org/science-working-groups/

Aus-NZ project webpage http://www.ska.gov.au/Pages/default.aspx

Aus-NZ SKA Coordination Committee (ANZSCC)
http://www.ska.gov.au/About/Pages/ANZSCC.aspx

ANZSCC's Science Advisory Committee
http://www.ska.gov.au/science/Pages/ANZSCC-Science-Advisory-Committee.aspx

SKA Science Working Groups I

Australian NZ members of the SWGs (CHAIRs are 2-year TERMS; membership is OPEN)
SWGs evolve as KSP discussion proceeds

Magnetism SWG
Melanie Johnston-Hollitt – co-chair, Magnetism
Core - Xiaohui Sun (U Syd) Associates: Jamie Farnes, Lisa Harvey-Smith, J-P Macquart,

EOR SWG
Members – Frank Briggs, Rachel Webster, Stuart Wyithe, Cath Trott

Continuum SWG
Nick Seymour – co-chair, Continuum
Associates: Andrew Hopkins, Minh Huynh, Ian Heywood, Natasha Hurley-Walker, Anna Kapinska, Carole Jackson

Cosmology SWG
Members – Chris Blake, Carole Jackson

Cradle of Life SWG
Members – Ian Morrison

HI Galaxy science SWG

SKA Science Working Groups II

HI Galaxy science SWG

Lister Staveley-Smith –co-chair

Members – John Dickey, Baerbel Koribalski, Naomi McClure-Griffiths, Martin Meyer, Attilia Popping, Elaine Sadler

Pulsars SWG

Tier 1 – George Hobbs, Tier 2 – Matthew Bailes, Simon Johnston, Dick Manchester, Willem van Straten

Transients SWG

J-P Macquart – co-chair

Core – Tara Murphy, Cath Trott Associate – Hayley Bignall

Focus group **Our Galaxy**

Naomi McClure-Griffiths, Jill Rathborne, Simon Ellingson, John Dickey

Focus group **(non-HI) spectral line**

No Aus-NZ members

Focus group **VLBI**

Hayley Bignall, Richard Dodson, Phil Edwards, Simon Ellingson, Ian Heywood, Cormac Reynolds, Chris Phillips, Steven Tingay, Tasso Tzioumis

OzSKA 2015

What's next

- Welcome feedback from this meeting
- SAC role & communications developing. Input welcome.
- ASA SKA/precursor science update special session – July 2015
- SKA + EMU + more at IAU 2015 – August 2015 (Aus/NZ 'presence')
- Establish SKA science focus groups (formal or informal)?
- Prepare for KSP proposals (Robert B ~2018 "letters of intent")