

ISART 2010 Survey of opinions related to spectrum sharing

Total number of registered ISART participants: 220
Started Survey: 84 Completed: 71

Demographics

1 Are you ...

Industry	32.1%	27
Government	31.0%	26
Academia	25.0%	21
Other	11.9%	10
Legal		
Pseudo Government		
QA Best Practices Consultant		
Consultant		
Association		
Consultant for govt, academia and industry		
Entrepreneur		
Contractor support to government		
Consultant		
Consultant (retired)		

2 Do you primarily work in ...

Engineering	66.7%	56
Policy	20.2%	17
Business	6.0%	5
Other	7.1%	6
CTO engineering and business development		
Highly mixed role - Engineering, Policy and Business		
All of the above (2)		
Management		
R&D		

3 Does your employer have spectrum licenses or assignments?

No	63.1%	53
Yes	36.9%	31

4 Where are you based?

US	89.3%	75
Europe	7.1%	6
Asia/Pacific	1.2%	1
Other	2.4%	2
Canada		
Mexico		

5 What is the highest level of education you have achieved?

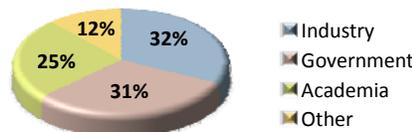
Master's	42.9%	36
Doctor of Philosophy	29.8%	25
Bachelor's	25.0%	21
High School	2.4%	2

6 Are you an ISART 2010 attendee?

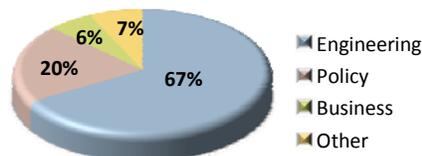
Yes	95.2%	80
No	4.8%	4

Survey demographics at a glance ...

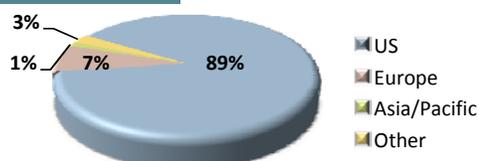
Industry Sector



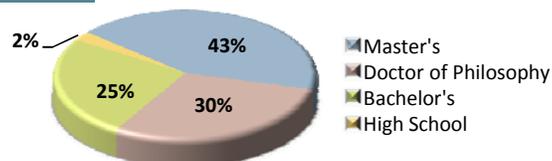
Area of Primary Responsibility



Geographic Base

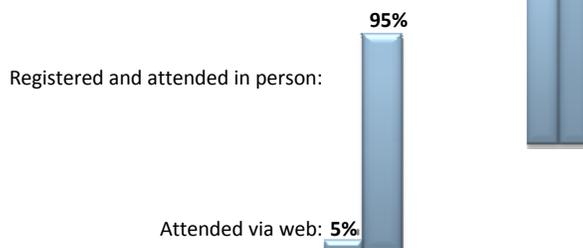


Education



Employer does not have licenses/assignments: **63%**

Employer has licenses/assignments: **37%**



Measuring Spectrum Occupancy

7 The role of spectrum occupancy measurements in policy-making will be ...

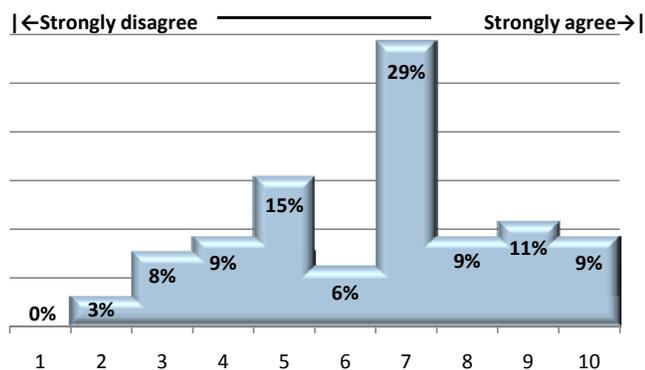
Decisive	16.0%	13
Significant	71.6%	58
Marginal	11.1%	9
Negligible	0.0%	0
Cannot answer question as framed	1.2%	1
Total answers:		81

8 Who should perform the spectrum occupancy measurements?

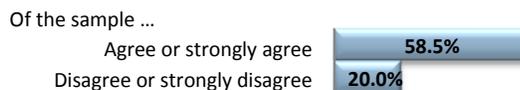
Government	39.5%	32
Industry	8.6%	7
3rd party	25.9%	21
Cannot answer question as framed	25.9%	21
Total answers:		81

Interference Protection Criteria

9 On a scale of 1 to 10, where 1 is "Strongly disagree" and 10 is "Strongly agree," tell us whether you feel that ...
interference is predictable.



71 respondents
6 could not answer the question as framed
65 sample size



Average rank: 6.48

10 Of the choices below, which is the better regulatory approach for controlling the interference?

To place direct restrictions on transmitters	21.8%	17
To place direct restrictions on the levels of interference experienced by	23.7%	33
Cannot answer question as framed	26.4%	28
Total answers:		78

11 Regulatory constraints should be based on ...

Science	46.2%	36
Economics	11.5%	9
Politics	0.0%	0
Other (please specify)	42.3%	33
Total answers:		78

- ____ All of the above (7)
- ____ All of the above plus other factors
- ____ All of the above, plus military and public safety considerations
- ____ Science and economics (8)
- ____ The best and highest value to citizens that regulation creates
- ____ Overall social welfare
- ____ Combination of science, economics, and politics (2)
- ____ Types of services and service levels
- ____ Optimization of science/economics/public interest
- ____ Diversity - maximum variants
- ____ National priorities, which includes economic prosperity
- ____ Combinations of all
- ____ Can't answer as framed - does this refer to regulatory process, or the resulting rules? Short answer: all of the above
- ____ Both Science and Politics
- ____ Science, policy, and economics
- ____ It needs to be based on a number of elements including science and economics. There will always need to be trade-offs
- ____ Quality assurance practices with Science and Economics

Federal Government Spectrum

12 To accomplish their missions, the amount of spectrum assigned to Federal agencies is ...

Too large	26.0%	19
Appropriate	37.0%	27
Too little	11.0%	8
Cannot answer question as framed	26.0%	19
		73

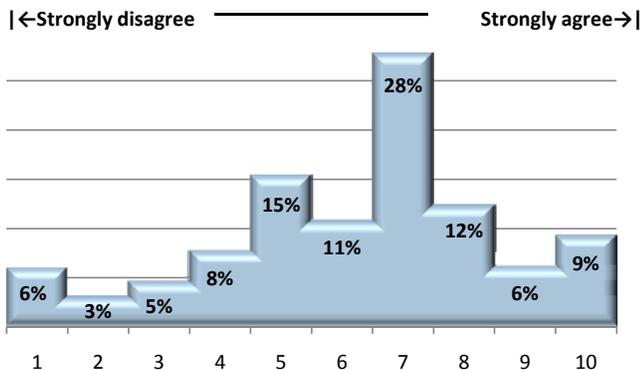
13 Rank in order of importance: incentives to encourage spectrum sharing by Federal users.

	Most important	2	3	Least Important	Average Rank	Number of Responses
Spectrum fees	9.2%	18.5%	41.5%	30.8%	2.06	65
Secondary market revenue	13.1%	34.4%	34.4%	18.0%	2.43	61
Funding for research and system upgrades	62.0%	26.8%	8.5%	2.8%	3.48	71
Other (please specify below)	40.9%	22.7%	9.1%	27.3%	2.77	22

- Legislative requirements
- Economic well being of US Telecom and Society
- cannot perform system upgrades on space systems
- Visible transparent operations on a QA designed system
- reallocation funds
- Understand how to motivate change and innovation inside a Government buracary
- requirement must be in 47 CFR
- appropriate sharing frameworks (with preemption) and enforcement
- Assurance of interference free operations for Fed operators.
- Ability to save resources while improving mission capability
- Funding for spectrum stewardship
- None
- Executive Branch mandate
- Improved acquisition/funding process
- Radio environment
- Clear entitlements and credible forum for conflict resolution
- Inherent Flexibility
- Different funding structure for government R&D
- Public interest considerations

Sharing LMR Bands:

14 On a scale of 1 to 10, where 1 is "Strongly disagree" and 10 is "Strongly agree," tell us whether you feel that ...
we should expect more Federal bands to be opened to unlicensed access

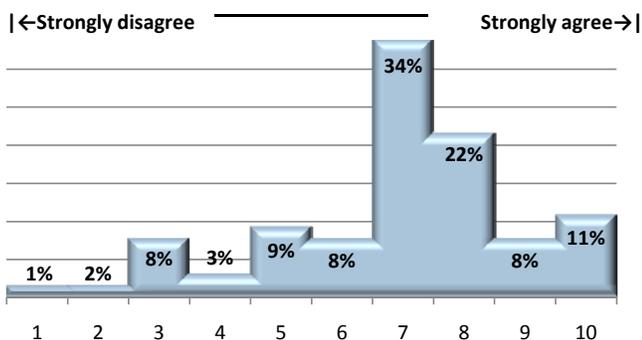


73 respondents
 6 could not answer the question as framed
 67 sample size

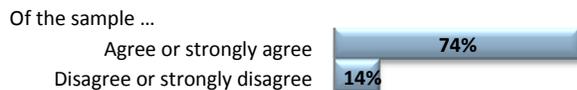


Average rank: 6.19

15 The US government already shares with unlicensed access at 900 MHz and 5.6 GHz, but does so passively. On a scale of 1 to 10, where 1 is "Strongly disagree" and 10 is "Strongly agree," tell us whether you feel that **we should expect a more active approach**

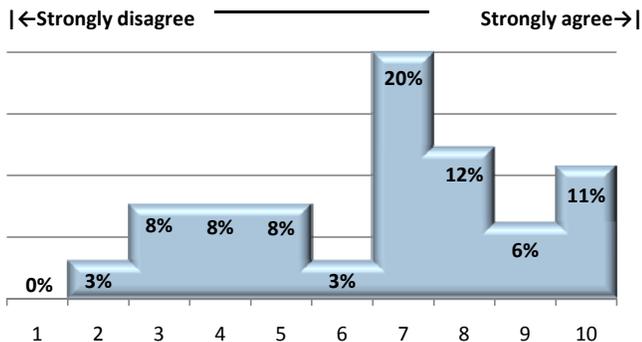


73 respondents
 5 could not answer the question as framed
 68 sample size

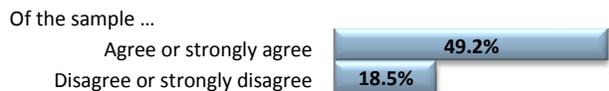


Average rank: 6.87

16 On a scale of 1 to 10, where 1 is "Strongly disagree" and 10 is "Strongly agree," tell us whether you feel that ...
in public safety, individual licenses should be replaced with pool eligibility and priority

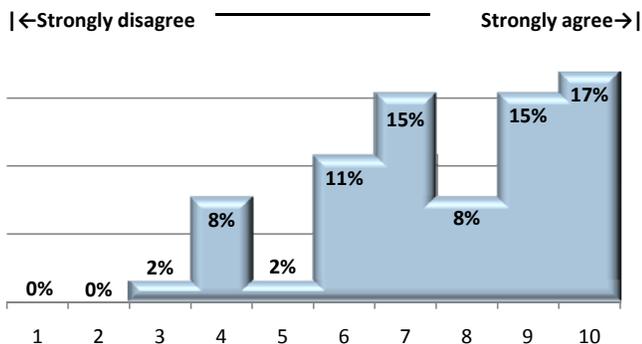


53 respondents
 2 could not answer the question as framed
 51 sample size

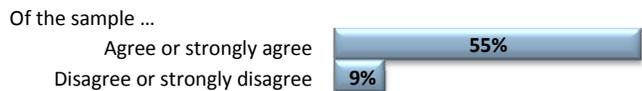


Average rank: 6.61

and, if so whether **prioritization should trump spectrum ownership.**



55 respondents
 5 could not answer the question as framed
 50 sample size



Average rank: 7.6

17 What are the reasons for your opinions? (34 responses)

I feel that municipality spectrum access could be better managed. From the example given in one of the panels, there should not be a large band given to Denver Water, Denver Fire, Denver Police, Denver Public Works, Denver Sheriff, etc.

The interoperability of public safety spectrum should follow greater coordination among public safety agencies at all levels; in such a world the nature of the issues facing public safety at any given time should regulate use of the spectrum; reallocation of uses must be done within reasonable time frames, of course.

PS is an intermittent and occasional user of spectrum. Large dedicated spectrum makes no sense. However, in a national emergency having a prior rights seems logical as long as the rules can be defined and the commercial users are apprised of the rules then a prioritization schema would work well.

Public safety services should have ABSOLUTE priority with regards to communications access. These forces protect and saves lives and property.

If in bands addressing public safety, priority of service should be the compelling factor to spectrum access.

Because otherwise, an agency can hoard spectrum.

Many have licenses and never use them

This would force individual P.S. agencies to seek spectrum efficiencies that are not presently in their best interest.

To establish trust as many panel members have suggested and get the various entities such as Gov - Industry working together we need to establish a set of Quality Assurance actions that are directed to " Best practices " and outcomes so that we are jointly working toward improved goals. Flexibility is a built in component that moves perception and technology changes.

Assuming prioritization is only in time of emergency, responders / govt should have first priority for any spectrum.

A pool eligibility might establish more efficient use of the band since usage in these bands are so low. Prioritization should have precedence over ownership due to specific public safety needs during a certain time period.

Public Safety needs to modernize their systems using spectrum efficient approaches. They also need priority access in times of emergency.

Based on technical discussion/panel it would seem that the safety groups can work with spectrum sharing so we get more users in the same spectrum provided that the priority can be dynamically set and ensure access when needed by the public safety groups.

best guesses

Public safety reliability is paramount.

In the abstract, sharing is motherhood. The challenge will be in the details as to how sharing will occur including the frameworks, preemption rules, enforcement, funding, etc.

In order to achieve greater spectrum sharing, government components need to move away from a spectrum ownership mentality. Taking the spectrum out of the components hands would achieve this, but need guarantees that they will have access to spectrum (channels) in order to perform their missions pooling improves both efficient use of spectrum and facilitates interoperability and operational effectiveness

Very difficult to implement and control

Given the scarcity of spectrum its allocation should be reviewed periodically. New technologies need spectrum bands to evolve, while some legacy bands become obsolete or provide less utility over time.

Public safety is not my area of expertise, but public safety should have priority of other uses.

The sharing has to be enforced through legislation and appropriate statutory language by policy initiatives. Federal agencies need funds for any reallocation or repurposing efforts as well as for R&D.

Pools will most likely result in the largest user having significant occupancy, whether their operations have priority or not

Public safety must have a robust and assured communications systems upon which they can rely. Commercial services, even with strong SLAs will not meet this need. Public safety must have systems that work when infrastructure is demolished, e.g. the Greensburg, KS tornado. The idea that commercial systems, e.g. cellular, can implement prioritization is an extremely complex problem. How do you prioritize a situation in which public safety must respond to an incident on a college campus... and you still need to get alerts out to 25,000 students over multiple cellular systems. Public safety should pool narrow-band assignments into wideband systems for increased functionality. It is well known from queuing theory that a single large capacity channel provides better service than multiple narrow-band channels of the same total capacity. Public Safety should pool resources (i.e. individual LMR channels) into wideband channels to increase functionality, should make sure first responders use the same equipment and capabilities day in and day out, and have a robust and assured system that works when nothing else does.

As a general rule going forward, spectrum is a national resource whose utility must be optimized more actively than prior art (& history) as allowed for. As such, Federal users must strike a new balance surrounding spectrum use--as should the FCC side of the fence. Also.. IMO preemptive spectrum use should become more of a centerpiece in federal spectrum policy than it currently is. Mission flexibility and public utility must be put on the same level playing field.

I think that there is too much unassignable interference that raises the noise floor, and that more efficient spectral utilization can be obtained with new technology.

Importance of service is so great that pooling should only be considered when very comprehensive pilot programs have been used to iron out the bugs. For this last few questions what I expect (my answers) is not necessarily what I think is the right course. The momentum for action is so great that we will see non-optimal changes, that are based on few qualitative studies, a lot of emotion, and vested interests.

When there is a Black Swan event, we need deterministic systems. Failure of public safety systems will not be "OK" with the public after an event, regardless of what they say before an event.

Technology exists to more effectively share spectrum. Today it is up to 90% idle

Lots of licenses - not a lot of individual usage over a given period of time. Pooling would allow to better manage sharing.

In an emergency, it is more important for me to have the federal resources rather than whether I can send a video over my phone

In order to be able to provide communication services to situations in which it is most needed.

relatively long experience in spectrum management covering many bands and services, both in the US and internationally. Fairly well informed on US government and non-government spectrum use and the administrative, regulatory, and operational procedures and constraints that have controlled, and still control spectrum access and use.

efficiency of use

Sharing Radar Bands

18 In the hierarchical access model (with primary and secondary users), what are the appropriate mechanisms that will remedy harmful interference if it occurs?

(41 responses)

Cooperative radio via databases or signaling protocols would make the most sense. Cognitive radio doesn't help if the information is not coordinated amongst all other potential sources of interference.

There must be a process for primary users to alert regulators as to interference situations and procedures for quick mitigation.

Measurements to quantify the interference first, followed by experiments to simulate or replicate the interference in a controlled environment, and finally field measurements to verify that the solution works.

Rapid injunctions: turn off the devices that are causing interference.

Databases and sensing

Field enforcement, aggressive product surveillance, and good initial regulatory policy based on sound engineering rationale.

The solution is already built into current packet data information - the solution is to make the data intelligent which sadly is an oxymoron in dealing with politically oriented individuals

No comment - definition of harmful interference vague

Efficiently designed systems

Spectrum sensing - long and short term to avoid interference is very key. When it occurs, primary users need pre-emption capability.

Methods similar to DFS ...

don't know

The current method effectively addresses interference among authorized users.

finer

talk channels with radios that can establish priority users to have access to comms

I think there are opportunities for innovation, including markets, insurance, etc.

- technology such as spectrum monitoring to detect potentially harmful signals -contractual (legal) recourse to remedy interference damages

If transmitters could be traced, impose restrictions -up to forbid access, if they are not "playing with the rules of the game" (DB query, power tx,

Unable to comment due to not being versed in the hierarchical access model.

A signature (for lack of a better term) on the signal that identifies the offender.

Consider primary and secondary users as one system with agreed on interference they can live with.

In none critical systems a rule based approach could be applied.

Short reporting chain, quick responsiveness, fair, but firm, resolution

service rules

Showing harmful will be extremely difficult. The interference may be fleeting or due to an oddity in the atmosphere. Steady interference might be determined through measurements. But, arguing interference can be expensive as arguing points of law.

database and control channel metadata will ultimately create the most simple and cost effective approach. IMO tethering and controlling what depends on the particular bands and the facts of the specific case.

1. Negotiation 2. Arbitration

External sensing and acting on the transmitters that are interfering.

Packet retransmit.

Full understanding of the secondary systems and inhibition mechanisms to rapidly disable, or constrain the secondary operation.

self-detection and self-disconnect from the network

This is a legal question. It depends on the harm. Is the harm a plane crash or a few dropped seconds of an MTV video?

Well defined entitlements that make it clear who bears the burden for remedying failure of concurrent operation Predictable adjudication forum where parties can go when negotiation fails.

With a viable secondary market with business contracts in place most interference can be avoided and, in most cases, those business contracts will be a more effective vehicle to resolve interference issues than relying on government agencies.

Database registration with on/off switch, fast adjudication of disputes, and clearly defined operating rules.

Much tighter enforcement. People need to know what their rights are or aren't...

A priori frequency coordination (try to stop it before it starts). Measurements Sensing by secondary users?

I don't know enough about the technology and what could be harmed.

Access control by database.

deny access for time period proportional to harm

19 When secondary users are allowed permissive changes, what is the best way to monitor compliance?

Product surveillance	16.9%	12
Periodic compliance testing	38.0%	27
Cannot answer question as framed	22.5%	16
Other (please specify)	22.5%	16
		71

A combination of the choices listed above.

OSS measurements that are sent to an Electronic Surveillance Administration Center

Packet data intelligence (as proposed in IPVV6 - and onward

Compliance testing should be done after every "permissive change"

Giving manufacturer's tools to perform testing easily by them selves - this will allow them/encourage them to evaluate spectrum sharing techniques at regular intervals or whenever firmware changes are made.

Self-detection by primary users w. adjudication mechanism

RF monitoring and compliance testing

None... or both: PS useless if SDR firmware is modified; PCT imposes a lot of burden

Product surveillance and compliance testing is good, but limited. Spot checks of fielded operations might be worthwhile.

Establish certification boundary within which changes are not allowed

This is a complex issue w/many solutions..

Device logs, available to regulators, including a device 'observing' non-compliant activities from other devices.

a combination of compliance testing and surveillance

sensing by user device(s) already operating

use spectrum sharing databases

hybrid product surveill, field test, reporting (but economic, political, and operational constrains present a serious barrier.)

20 Rank in order of importance: impediments to the adoption of heterogeneous DSA networks today.

	Most important	2	3	4	Least Important	Average Rank	Number of Responses
Technology maturity	36.1%	27.9%	19.7%	14.8%	1.6%	3.82	61
Regulatory maturity	38.7%	32.3%	16.1%	11.3%	1.6%	3.95	62
Cost of implementation	11.5%	18.0%	41.0%	27.9%	1.6%	3.1	61
Business complexity	11.5%	19.7%	19.7%	41.0%	8.2%	2.85	61
Other (please specify below)	27.3%	0.0%	9.1%	18.2%	45.5%	2.45	11

Regulatory uncertainty

Failure to implement appropriate and visible Quality Assurance

Education

Undemonstrated capabilities and advantages

Well-defined rights and trusted enforcement/adjudication

21 When will heterogeneous DSA-based networks become common in commercial, or mixed commercial/government networks?

1 year	3.0%	2
3 years	6.1%	4
5 years	34.8%	23
10 years	45.5%	30
Never	4.5%	3
Cannot answer question as framed	6.1%	4

66

22 Who is (are) the primary drivers for the adoption of heterogeneous DSA networks?

DOD	11.9%	8
FCC	13.4%	9
Public Safety	3.0%	2
Commercial Service Providers	31.3%	21
Equipment Providers	7.5%	5
Academia	16.4%	11
Cannot answer	7.5%	5
Other (please specify)	9.0%	6

67

Broadband need

Drivers shifting from science (academia) to FCC and DoD, to equip providers and service providers.

combination of the above..

Academia, equipment providers, and very limited element of DoD

TV White space will be the first legitimate DSA

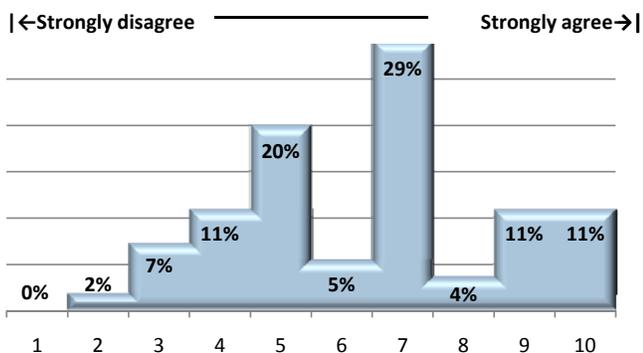
dod and fcc

23 Who should be the primary drivers for the adoption of heterogeneous DSA networks?

DOD	3.0%	2
FCC	30.3%	20
Public Safety	4.5%	3
Commercial Service Providers	28.8%	19
Equipment Providers	3.0%	2
Academia	1.5%	1
Cannot answer	18.2%	12
Other (please specify)	10.6%	7
		66

End users; however their is no "killer app" yet that will drive this business.
 a Mixture of the above with one checking the other dependent on usage needs
 NTIA working with FCC
 Drivers at this point in tech and regulator maturity should be FCC adn NTIA and innovative equipment providers.
 government
 Combination of the above..
 White House / NTIA

24 On a scale of 1 to 10, where 1 is "Strongly disagree" and 10 is "Strongly agree," tell us whether you feel that ...
the hierarchical access model is attractive for secondary users in a business sense.



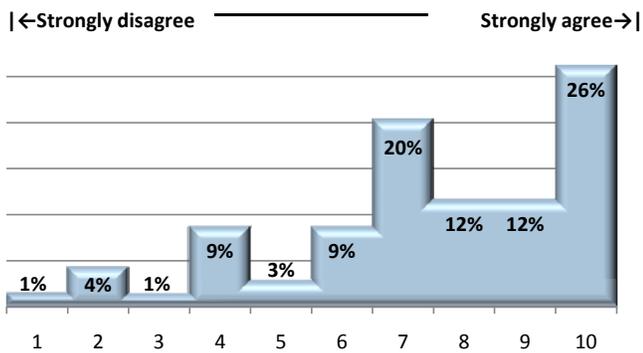
67 respondents
 12 could not answer the question as framed
 55 sample size

Of the sample ...

Agree or strongly agree	49.2%
Disagree or strongly disagree	18.5%

Average rank: 6.42

25 Mobile carrier business models are premised on exclusive control of spectrum. On a scale of 1 to 10, where 1 is "Strongly disagree" and 10 is "Strongly agree," tell us whether you feel that **carriers should be expected to adapt their business models to use shared spectrum.**



69 respondents
 2 could not answer the question as framed
 67 sample size

Of the sample ...

Agree or strongly agree	49.2%
Disagree or strongly disagree	18.5%

Average rank: 6.42

Context Awareness:

26 Rank in order of importance: contextual elements for sharing wireless systems.

	Most important	2	3	4	Least Important	Average Rank	Number of Responses
Local sensing	20.3%	23.7%	15.3%	32.2%	8.5%	3.15	5
Institutional context (e.g., license holders, industry structure)	13.8%	19.0%	32.8%	31.0%	3.4%	3.09	58
Standards that incumbents and partners follow	30.2%	28.6%	23.8%	9.5%	7.9%	3.63	63
Regulations (e.g., maximum transmit power)	26.2%	27.9%	24.6%	19.7%	1.6%	3.57	61
Other (please specify below)	54.5%	9.1%	9.1%	0.0%	27.3%	3.64	11
Intelligent Data							
Broad Area Sensing							
Preemption frameworks							
Database and radio environment map paired with local sensing							
the given case by case "ecosystem" in that band(s) involved							
The answer varies based on the specific band and users of the band, both current and prospective.							
Depends on context and the nature of the systems, whether legacy and non-modifiable, priority of mission. Regulations will be necessary in some for, sensing may have a role dependant on what they are sharing with - not suitable for all scenarios							
Spectrum sharing databases & secondary markets							
data bases							

Innovation and Research:

27 What are the major use cases we should expect for spectrum sharing?

(30 responses)

Among commercial mobile competitors
opportunistic non-life line data services and applications using secondary, temporal, spectrum access
land mobile and fixed services
1. New applications: robots, infrastructure, sensing, etc... 2. Mobile broadband data 3. Remote sensing
Hidden nodes. (Not mentioned during the sessions I attended.)
Spectrum sharing as opposed to non is a prudent objective
between partnered commercial operators in specific geographies
Incident response. Govt test and training sites.
?
Deploy broadband access in remote areas (802.22) More bandwidth = more services in urban areas
Not versed enough to comment.
Low power devices in TV white space
Flexible Internet access Public safety Operational deployment of tactical networks
I believe like services between fed and non-fed will be first. Later, non-critical services of different services.
Feds and non-feds in disaster situation.
Logical grouping of users (e.g., DHS, DOJ, DOI, etc.) Logical grouping of users (e.g., fire, police, medical response, etc.)
PLMR federal and non-federal government
secondary spectrum market
boxes, music systems, video archives and presentations, our cars, and our electrical devices. (2) De-fragmentation of the allocation chart. Stop giving case..
Virtually all wireless applications
Short range data transmission
User co-operation, like in DoD
consumer-grade devices/applications operanting in un-licensed bands
Within user communities, not between them = military = public safety
forward" or lower priority spectrum sharing schemes
DoD to show they can share internally. Non-federal entities between themselves.
Fixed point-to-point LMR
Broadband networks; wireless backhaul
LTE and beyond where large blocks of spectrum is needed

28 What technology or mechanism has the greatest promise for governing secondary access to Federal or commercially-licensed bands?

(30 responses)

Database; site-specific coordination

Cooperative radio through the use of signaling and/or databases

sensing with DSA and databased systems

Databases with real-time updates

Non definable and probably not know yet but it will come from INTELLIGENT data in the packets or something similar

Pre-emption coupled with economic incentive

dsa

Policy-based DSA in accordance with IEEE 1900.5.

establishing channels and user priority in times of national incidents

Start with white spaces (TV, radar) well defined in specific data bases for specific regions. White spaces to be used as unlicensed

Not versed enough to comment.

Geo-location for devices operating in TV White Space. Sensing for the presence of a TV signal is unreliable and should not be

REMs with interference models

DSA has a lot of potential, but there are challenges to its acceptance.

Cognitive Radio

Characterization of the behavior of the Primary User (PU)

look before transmit

A key technology is the capability to assure the radio (SDR) is operating in the manner it was designed and certified. That is, how

For TV band apps.. IMO "tethering" on the consumer devices side and using the right combo of databases and DPS (dynamic power

Varies based on the band being considered.

External sensing for monitoring the used spectrum

FCC/NTIA rulemaking process

Geo-location

Sharing on a non-interference basis, a number of options are possible, DSA will be most attractive in some scenarios, but the

software-defined radios + sensing

The secondary market already exists in the commercial markets (FCC ULS spectrum) TV White Space will introduce spectrum sharing

Geographic sharing is the easiest. DSA needs to be shown to be viable.

Databases

Database control

sense plus database

29 What research or demonstration projects do policy makers need to move forward more effectively to facilitate spectrum sharing?

(30 responses)

spectrum sharing methods must be developed on a specific-band specific basis taking into account specific uses and users; there is no

Whitespaces for type 1 and type 2. The rules for type 2 need to be further relaxed.

More funding for test bed, and any other spectrum sharing mechanisms.

INDEPENDENCE for pre defined goals and a true scientific investigation of what is and what works and does not

Pushing forward on TV Whitespace and D Block auction to get real experiments underway.

Show how preemption and in-system policy based controls can enable sharing with appropriate level of confidence.

cognitive radio demos, hybrid networks

- agreement on policies for the relative priority of spectrum uses as a function of who, what, where, when, and what is the situational

DSA

Reliability of geo-location-based equipment so they do not violate location/frequency restrictions

Prototyping, realistic modelling

Demos need to be repeatable and show success. Also, failure modes and security need to be addressed.

Test-beds

Extensive operational testing

PLMR federal and non-federal partnerships

secondary spectrum usage monitoring

(1) The systems work. (2) The systems scale. (3) The economic/business model is viable. (4) The systems make sense, perhaps a

How to design radar systems so they can share spectrum without interference

IMO creating the means to assess harmful interference (HI) in a given band for in band and adj uses (assuming NTIA/ITU-R or FCC and

Test methods that can quality interference mitigation measures and combination measures in different bands.

Interference monitoring. Cellular management.

NTIA DSA Testbed

Low impact, like minor interference

Far more research on the potential impact of CR on legacy receive systems. When theoretical evaluation indicates that the

Test trial of advanced services (in DSA) with QoA guarantees done jointly with operators

Enhance TV white Space concepts to near real-time capability with push technology to "instantly" move secondary users off a channel

Need more work done in a systematic way to show something works.

Derivation of interference criteria

Propagation and spectrum usage; interference mitigation and control

show effective capacity increase and no harm to existing primary users

30 What do policy makers need that the research community is not addressing?

(31 responses)

the plain truth about the complexity and difficulties about measuring spectrum utilization; the methods by which capacity can be expanded within existing spectrum in an economical fashion

A cooperative/cognitive radio band to spur new investment and innovation.

Practical applications must be proven to work, and how does that affect what a consumer buys

Alternative enforcement and incentive models.

FACTUAL information such as "What is real Broadband = its speeds requirements and how will this affect our economic and scientific future "Why are we using different speed (Bit) measurements as opposed to BYTE measurements" Plain common sense unified understanding across entities again this could be done by good QA AND BEST PRACTICE TARGETS

Repeatable results

Reducing complexity and providing education on the "how to" approaches that make sense. Large scale experiments.

more data that directly addresses policy questions

Specific recommendations for regulatory text or modification.

Sharing frameworks

?

Better define use cases. Address security issues

Better input from the research community i.e. primary research projects.

It is up to policy makers to fund the research that they do need.

System models, deployment models, spectrum valuation

More dialog up front. Research done in isolation can be a good academic exercise, but might not be practical. Researchers need to address transition one technology to another.

Feasibility of single system approach

Risk mitigation

ROI and factual proof of resource and intrinsic savings and benefits

(1) Economic/Business model experimentation. We need to experiment with multiple economic/business models prior to making rules and regulations.

Incentives for gov't users to want to share spectrum

A realistic view of spectrum use--real-time thru to a statistical "over time" picture. A clear view of what makes a winning business models. (..yes policy folks need to admit that they are directly or indirectly in the business of picking winners) and how to see unintended consequences before they occur in a spectrum context. A deep understanding of why wireless spectrum is significantly different than wires are.

Test laboratory testing proficiency when evaluating DSA devices.

Better economic models

Simulations and measurements to validate the simulations.

Technology demonstrations for specific sharing of compatible users

Better understanding of the current limitations of CR and the threat to Fed receivers. They also need to understand the difficulties faced by Fed users in the funding and acquisition process, where some overhaul could help facilitate new technology development.

The business case. Bring-in operators/carriers to DSA - offer side-benefits to lure them in. Make policies pushing to cost-effective implementations

See above

Real world results that demonstrate in a scientifically objective manner that secondary use can coexist with primary users without causing interference. Much of the testing done to date has lacked scientific rigor and has been done largely as a PR exercise to advocate for unlicensed operation.

show no contamination of existing bands and promise of sharing is confirmed in real world environment

31 What have researchers achieved that policy makers have not properly internalized?

(22 responses)

that each context of potential spectrum sharing has unique details that require special study and coordination and that sharing cannot be forced by fiat

Full 3 layer DSA stacks that are truly transparent to the Internet Protocol and full IP radios

The timescale for development to a commercial product for type acceptance is much longer than most realize.

Just how diverse the potential PHY strategies are going forward.

The basic understanding of what the science is supposed to achieve without politically slanting its purpose and results

The facts

The level of understanding of the policy focused issues and the importance of on-going wide area spectrum monitoring.

DSA does not necessarily require sensing. In-system policy based controls are key.

policy people seem afraid of change and wish to hold onto their policy rules for managing spectrum. They should embrace cognitive

Better understanding of DSA and development of policies to advance its implementation.

I do not have an answer at this time.

A comprehensive understanding of all capabilities achieved so far.

The spirit for Innovation

Capabilities for spectrum cohabitation

I think the complexity of the problem, that spectrum management is an extremely complex problem that involves technology,

Improved spectrum efficiency. Why is LM narrowbanding so slow in implementation?

Cross layer protocol requirement to enable innovative spectrum use (even it industry drags its feet) The nature of the wireless medium itself will require this in the end.

Technology readiness of DSA for use, especially use of intentional, positive communication between different kinds of devices to coordinate use of spectrum.

Detect and avoid techniques

Limitations of monitoring.

Broad research on going.

not sure
