



1791 Tullie Circle, N.E./Atlanta, GA 30329  
404-636-8400

**DRAFT**

**TC/TG/MTG/TRG MINUTES COVER SHEET**

(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/MTG/TRG No. 5.1 DATE 7/01/2019

TC/TG/MTG/TRG TITLE Fans

DATE OF MEETING 6/24/2019 LOCATION Kansas City, MO

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Armin Hauer	2018	Walter Mecozzi	2016	John Bade
Zhiping Wang	2018	Michael Feuser	2016	Paul Bauch
Joseph Brooks	2016			Akshay Bhargava
Brian Reynolds	2016			Mike Brychta
Z. Patrick Chinoda	2018			Lee Buddrus
Jay Eldridge	2016			David Carroll
Jay Fizer	2016			Thomas Cowen
Brent Fullerton	2018			Nathan Fetting
Tim Mathson	2018			Mark Fly
Adam Sterne	2018			Kevin Gildea
				Additional Attendance (next page)

**DISTRIBUTION: All Members of TC/TG/MTG/TRG plus the following:**

TAC Section Head:	SH5@ashrae.net
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	See ASHRAE email alias list for needed addresses.
Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.

Additional Attendance (continued):

Stephen Idem  
Sanaee Iyama  
Kenneth Kuntz  
Paul Lin  
Dennis Loveday  
Luke Fresconi  
Tim Mathson  
Jim Meats  
Greg Meeuwsen  
Jane Miller  
Kim Osborn  
Aresh Raychaudhuri  
Brian Reynolds  
Doug Ross  
Kezhen Shen  
Larry Smith  
James Sweeney  
Robert Taylor  
Greg Wagner  
Jamie Yeh

**Minutes**  
**Kansas City Conference Center**  
**Room: 2215B**

**Monday, 06/24/2019**  
**4:15 CDT**

**1. Call to Order**

The meeting was called to order by the chair at 4:40 pm

**2. Roll Call**

The following voting members were present:

Armin Hauer –Chair  
Zhiping Wang – Vice Chair & Handbook S/C Chair  
Joseph Brooks - Secretary  
Brian Reynolds – Research S/C Chair  
Z. Patrick Chinoda  
Jay Eldridge  
Jay Fizer  
Brent Fullerton  
Tim Mathson  
Adam Stern

The following voting members were not present:

Michael Feuser  
Walter Mecozzi

A quorum was present. The following non-voting subcommittee chairs were present:

Akshay Bhargava – Standards S/C chair  
Jaime Yeh – Program S/C Chair

The TC 5.1 webmaster, Harold Dubensky, was not present. Other non-voting members and guests are listed in the cover letter.

It was noted that Walter Mecozzi's term as a voting member ends on June 30 and that Asesh Raychaudhurri, Jaime Yeh and Akshay Bhargava will become voting members on July 1.

**3. Adoption of Agenda**

The agenda was approved by consensus with the addition of a 'basecamp' demonstration as part of new business.

**4. Approval of the Minutes**

The last meeting of this committee was held on 14 January 2019 in Atlanta.

Motion ASHRAE TC 5.1 -06-2019

Moved by: Brent Fullerton  
Seconded: Patrick Chinoda

To approve the minutes of the previous meeting held on January 14, 2019.

Passed unanimously (9-0-0 CNV)

**5. Items of business**

### 5.1 ASHRAE Code of Ethics

Chair reminded the TC of the ASHRAE Code of Ethics that requires us to act with honesty, fairness, courtesy, competence, integrity and respect for others, and that we avoid all real or perceived conflicts of interests. (See full Code of Ethics: <https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics>.)

### 5.2 TC 5.0 Section Head/Liaison Reports

The chair reported that ASHRAE is holding off on re-organization. Larry Smith provided a report when he arrived. He discussed the 2020 program and that TAC wanted to reiterate that the Code of Ethics should be on the agenda, and reminded the attendees that appearance of unethical practices is just as bad as the unethical practice.

Dennis Loveday (TC 5.1 Research Liaison to RAC) introduced himself and offered to answer any questions.

### 5.3 Chairman's report

Relevant announcements, reminders, and slides were posted on basecamp (by the chair) on the previous day. Highlights from his report were:

- It was reported that restructuring the TC system is on hold,
- Shared meetings of all program subcommittee chairs and all research subcommittee chairs across the section was thought to be a good experience,
- Prioritized program proposals for Orlando 2020 winter conference.
- Explained RPM (Remote Participation Meetings): RPMs maybe be conducted with personal hard- and software and it was not necessary to use ASHRAE's. It was also noted that ASHRAE supports RPM only for conference meetings that otherwise do not meet quorum.
- ASHRAE encourages meetings where everyone takes part through Internet before/after physical conferences.
- TAC supports installation of TC membership chair; with the idea to develop membership, liaison with YEA, welcome new members via email, greet at face-to-face meetings, and explain website and basecamp.

### 5.4 Old business

Scope: TC 5.1 is concerned with the selection, application and testing-for-rating of fans, including recommended installation practices and field test procedures.

TC scopes are always open for revision – Suggestions were solicited.

- It was suggested that maintenance, commissioning and recommissioning should be added to the scope.

Reviewed TC definition in [TC MOP dated February 2019](#):

“A TC is a standing committee with a defined scope of activity which is constituted to provide the Society with technical expertise on subjects within that scope of activity. TC functions may include:

- a) Handbook Content Development
- b) Program Development
- c) Development of Publications
- d) Research
- e) Standards Development”

Discussed the option to establish a Publication or Education subcommittee.

- Opportunities for web meetings
  - Handbook – had several
  - Research – had project-specific calls, but none for developing RTAR ideas).
  - Programs?
  - Standards?
  - Main TC?
- Basecamp - ASHRAE's preferred method of TC communication. Demonstration in 'new business.'

## 6. Subcommittee reports

### 6.1 Standards Development subcommittee – Akshay Bhargava

Only one standard, ASHRAE 51 is under the cognizant of this TC with nothing to report. He suggested that a list of any fan related standard could be maintained in basecamp and edited by any TC member. <https://public.3.basecamp.com/p/GPHYHb3hDY1kgp44QdVuD9if>

The idea was introduced regarding the appointment of a liaison to SPCs.

### 6.2 Handbook Content Development subcommittee – Zhiping Wang

TC 5.1 approved the fan section in the Handbook via a letter ballot with a vote of 8 yes, 0 no, 0 abstentions, and 4 not voting.

Patrick Chinoda will take over as the S/C chair at the start of the next cycle. Ideas for next cycle were solicited. It was thought that ASHRAE Terminology (Index / Definitions) needs to be compared with the handbook terminology and be updated if needed.

### 6.3 Research Subcommittee – Brian Reynolds

Brian Reynolds reported on the activities of RAC and the Research S/C. His report is attached.

After the winter 2019 meeting, a TC 5.1 letter ballot on the approval to co-sponsor RP 1835 passed with a vote of 8 - For, 2 - Against, 1 – Abstention, and 1 – not voting. Reason/comments from those two voting against are attached. RAC reviewed results of the letter ballot and Brad Cochran (the WS author) made changes that were satisfactory to those voting no. The Research S/C voted to recommend approval of the revised WS

Motion ASHRAE TC 5.1 -07- 2019

Recommended by Research Subcommittee  
Moved by: Brent Fullerton

To approve the work statement RP-1835 dated, June 13, 2019.

Passed with vote of 9-0-0  
Chair not voting

### 6.4. Program Development Subcommittee –Jaime Yeh

Jaime reported on the S/C meeting held yesterday. Her report is attached. In addition, it was reported that hot topics will become part of this S/C.

## 7. Website Report – Harold Dubensky

Harold could not attend but his website report is attached.

## 8. New Business

Akshay demonstrated the features and use of Basecamp.

## 9. Time and Place of Next Meeting

Interim TC or S/C meetings may be held via web / phone at the call of the chairs. The next full TC meeting is scheduled for the Winter meeting in Orlando, FL.

## 10. Adjournment

The meeting adjourned at 6:18 pm CDT.

- Attachments:**
- 1) TC 5.1 Research Subcommittee Report
  - 2) Previous letter ballot comments of WS 1835
  - 3) TC 5.1 Program Subcommittee Report
  - 3) Website analytics report

7 Research Topic Acceptance Requests (RTAR)

- 1 Accepted
- 2 Accepted with comments
- 3 Rejected

13 Work Statements

- 1 Accepted
- 5 Conditionally accepted
- 7 Returned

Wednesday - Contractor Selections for 6 Projects (27 bids)

**WORK STATEMENT#**

**Title:**

**Sponsoring TC/TG/MTG/SSPC:**

**Co-Sponsoring TC/TG/MTG/SSPCs (List only TC/TG/MTG/SSPCs that have voted formal support)**

**Plain English Abstract:**

As part of the information sharing activities for this project, RAC is interested in having a 100 word or less summary of the proposed research so that descriptions of ASHRAE research can be understood by a wider technical audience including trade magazines and on-line ASHRAE information sites. Please include your plain English Abstract in this section.

PMS meetings are open to membership

In-person meetings at summer and winter meetings

- schedule far enough in advance to include in program

Teleconference

- MORTS/Donna will set up doodle poll and GoTo Meeting

Make sure that ex-officio members are invited

- Liaison
- MORTS

Project Monitoring Subcommittee (PMS) Training for all new PMS members

- Spring webinar held on April 25
- Fall webinar being scheduled – stay tuned

RAC is developing a training webinar for Proposal Evaluation Subcommittee (PES) members

Similar to the RTAR for research projects, but addresses issues relevant to publication efforts

Key differences:

PTAR	RTAR
Publication Need	Research Need
Target Audience	Project Objectives
Why funded effort vs. volunteer	Approach
	Relevance and Benefit to ASHRAE

TC will fill out and submit PTAR form to MORTS



If Publications Committee approves and RAC concurs, the TC may prepare a Work Statement for Publications (WSP)

Key difference between WSP and WS

WSP	WS
Proposed Table of Contents	Scope/Technical Approach

RAC will ensure:

Publication project is biddable

Appropriate evaluation criteria to compare bids

Current status:

Pilot effort, if interested talk to liaison

If Publications Committee approves and RAC concurs, the TC may prepare a Work Statement for Publications (WSP)

Key difference between WSP and WS

WSP	WS
Proposed Table of Contents	Scope/Technical Approach

RAC will ensure:

Publication project is biddable

Appropriate evaluation criteria to compare bids

Current status:

Pilot effort, if interested talk to liaison

## TC 5.1 (Fans) Research Sub-Committee Report

June 23, 2019 (Kansa City)

Notes from the Research Chair Subcommittee Meeting

1. Research Liaison – Dennis Loveday
2. Selected ppt slides

### WS & RTAR's in progress

WS and RTAR updates will be distributed (or put in 'Base Camp') after Kansas City).

3. 1769-RP (Experimental Evaluation of the Efficiency of Belt Drives for Fans)
  - PMS members are Craig Wray, Tim Mathson (Chair), Eric Tinglof, and Brian Reynolds
  - First interim report has been approved. Includes literature review.
  - The Principal Investigator has left. The PMS met with the contractor, MORTS, and RL to come up with a plan for how to proceed. Contractor to present a proposal by the end of July. Project currently on hold. About 10% of the budget has been spent.
  - Request permission from Mike Vaughn to distribute the interim report (Basecamp).
4. WS-1829 (Parallel fans)
  - Authors – Kim Osborn , Patrick Chinoda
  - Several conference calls since Atlanta
  - Received RAC review comments just prior to Kansas City
  - Request from Aresh to include resulting array performance with one or two fans down.
5. New proposed RTAR (EC motor and fan)

Brian Reynolds

- Output will be a guideline for comparing EC fan & motor technology vs traditional centrifugal plenum fan with induction motor & controller.
  - Authors Tim Mathson and Rad Ganesh. Armin (representing TC 1.11) also contributing.
  - Several meetings since Atlanta including liaison review.
  - Subcommittee review in Kansas City. Need another liaison review before ready for a TC ballot.
  - May be more suitable for the new PTAR format (Publication Topic Acceptance Request)
  - Proceed with RTAR format for now and convert to PTAR if/when that becomes available.
6. WS 1835 (Brad Cochran) - Characterizing the Performance of Entrained Flow Stacks from TC 9.1, PES has volunteers from TC 5.1. Craig Wray will be on PMS.
- Motion to recommend to the main committee to approve the changes to the WS. Unanimous vote by the subcommittee (19)
7. Co-sponsoring of RTAR-1626 with TC2.4 (Particulate Air Contaminants and Particulate Contaminant Removal Equipment), Energy Implications of Air Filtration in Commercial Buildings –
- In Atlanta requested help to rework the RTAR
  - Co-sponsorship requires someone from TC 5.1 needs to be on the PMS.
  - Did not have time for discussion in Atlanta.
  - No recent contact, may withdraw support.
8. **Are there any ideas, suggestions for Fan Research topics?**
- A call for Fan Research suggestions **and RTAR authors** went out before Kansas City and also posted in Basecamp.
  - Can Basecamp be used for posting Fan Research suggestions?
  - VFD Efficiency (joint with TC 1.11) Armin, Dustin There are IEC standards.

- Repeatability of instrumented inlet rings that are calibrated in an AHU (Armin) **Armin, Adam Adam Sterne (ACME), and Tim Mathson to draft an RTAR.** Suggestion to include TC 1.2, SPC 41.1. By Orlando.
- ~~Houston—Load profile (real world) information—John Bade, Gus (AHRI), Dustin, Craig. Design point vs. actual operating point.~~
- Any interest in being the next Research Chair? Succession & mentoring ideas.

## Work Statement 1835 – Letter ballot comments received in March 2019

Attachment 2 to TC 5.1 minutes of summer conference 2019

### Commenter #1, reason for no vote:

- I am very much in favor of this research project, but concerned about the work statement as written.
- The PMS proposed includes wind wake analysis companies who could benefit financially from a certain outcome of this research. I am not opposed to their presence, but there are no fan manufacturers or representatives of AMCA on the PMS. AMCA members have developed test standards for induced flow fans and they should be represented on the PMS.
- Fans used for this research should be tested per AMCA 210 and AMCA 260 in an accredited lab prior to field testing. The pitot traverse at the outlet of the fan will not provide an accurate measurement of airflow. This is important for the correlation to downstream plume rise and spread.
- Concentration measurements are used to determine plume rise and spread. The plumes should be characterized by concentration as well as plume rise and spread. This may be obvious but is not listed specifically.
- There is not much detail given on the conventional stack. Swirl from a conventional fan and stack would impact downstream measurements of plume rise and spread. This would be a fairly easy variable to add to the testing. Suggest simply testing a conventional stack with significant swirl and one with no swirl. But the WS does not give detail on this fan.
- Energy efficiency is riddled throughout the WS. Suggest eliminating the any measurement of power and therefor ignoring efficiency in the objectives of this WS. The power will be dependent on the individual fan design and duty point. These shouldn't be used to compare with other fans in the project. Stick with the correlation between downstream plume characteristics and fan outlet velocity characteristics.

### Commenter #2, reason for no vote:

I have discussed this with several manufacturers of induced flow fans and, although solidly in favor of the need and purpose of the research, it is felt that there were too many questions that need resolution in the Work Statement (dtd. 2-25-2019) to vote for the co-sponsorship at this time. A partial list of the issues within the current WS1835 wording:

1. Is one conventional fan (a non-induced type fan) with a round duct mounted on top of the fan sufficient to be a benchmark? Is the fan centrifugal, axial or mixed flow? And if one of those, will the test guarantee that the other fan types generate fully developed velocity profiles?

## Work Statement 1835 – Letter ballot comments received in March 2019

2. What is the stack geometry for the conventional fan?
3. Is a stack of five diameters mounted on top of the fan a benchmark that truly represents applications in the market? Or should some other fan/stack combination be used?
4. Conventional fan(s) should be AMCA Certified in accordance with AMCA Standard 210 and Publication 211.
5. Are five induced flow fans to be tested sufficient to provide an adequate sample from which to conclude that the results are generally attributable to all induced flow fans as a fan type?. If not, how should the test sample selection and quantity be modified to assure this?
6. Induced flow fans should be AMCA Certified in accordance with AMCA Standard 260 and Publication 211. This assures measurement and validation of the fan outlet airflow rate, outlet area, and nozzle velocity (inlet airflow rate divided by nozzle discharge area).
7. At 20,000 fan inlet CFM, what is the required fan inlet SP, and where and how will it be measured for all fans tested? Methodology needs to be clearly stated.
8. There are many references in the WS to energy. Fan power for all fans tested should be recorded. Methodology needs to be clearly stated.

It was also thought that there should be some representation of induced flow fan manufacturers on the PMS. I am willing to be an active member of the PMS that could represent fan manufacturers. I could also coordinate an effort from a small group of IFF manufacturers to recommend amendments to the WS fan selection and fan test set up which is more conducive to advancing the knowledge of air systems and send to Brad Cochran and TC 9.10.

# TC 5.1 Fans Programs Report

ASHRAE 2019 Annual Conference – Kansas City  
June 23, 2019

---

## 1. Upcoming Conferences

2020 Winter Conference, Orlando, FL Feb 1-5, 2020

TRACKS:			
1	HVAC&R Fundamentals and Applications	5	High Efficiency Design and Operation
2	Systems & Equipment	6	Big Data and Smart Controls
3	Refrigeration and Refrigerants	7	Ventilation, IAQ, and Air Distribution Systems
4	Cutting Edge Approaches	8	Standards, Guidelines and Codes

CHALLENGE 2020 - Fill all of track 7 with programs from section 5

Basecamp: <https://3.basecamp.com/3106353/projects/10894950>

**Ventilation, IAQ and Air Distribution Systems:** This track solicits submissions pertaining to the design, operation and study of ventilation and air distribution systems in residential and commercial buildings. The intersection of these systems with respect to indoor air quality and health effects are also of significant interest for this track.

**Track Chair:** Robert Cox - [bob.cox@jacobs.com](mailto:bob.cox@jacobs.com)

DATES & DEADLINES:	
3/18/2019	Conference Paper Abstracts, Technical Papers, and Paper Session Requests Due
4/22/2019	Accept/Reject Notifications for Conference Paper Abstract
<b>6/7/2019</b>	<b>Website Opens for Seminar, Workshop, Forum, Debate, and Panel Proposals</b>
7/8/2019	Final Conference Papers Due / Request for Conference Paper Sessions Due
7/26/2019	Accept/Revise/Reject Notifications for Conference Papers
<b>8/2/2019</b>	<b>Seminar, Workshop, Forum, Debate, and Panel Proposals Due</b>
8/9/2019	Revised Conference Papers / Final Technical Papers Due
8/26/2019	Accept/Reject Notifications for Conference and Technical Papers
<b>10/4/2019</b>	<b>Accept/Reject Notifications for Seminar, Workshop, Forum, Debate, and Panel</b>

2020 Annual Conference, Austin, TX June 27-July 1, 2020

TRACKS:			
1	Fundamentals and Applications	6	Multifamily and Residential Buildings
2	HVAC&R Systems and Equipment	7	Resilient Buildings and Communities
3	Research Summit	8	Zero-Energy Buildings and Communities: Opportunities and Challenges
4	Professional Development		
5	Grid-Interactive Efficient Build Environment	9	(Mini Track) Building Myths

DATES & DEADLINES:	
8/12/2019	Conference Paper Abstracts, Technical Papers, and Paper Session Requests Due
8/30/2019	Accept/Reject Notifications for Conference Paper Abstracts
12/2/2019	Conference Papers Due
12/20/2019	Accept/Reject/Revise Notifications for Conference Papers
<b>1/8/2020</b>	<b>Website Opens for Seminar, Workshop, Forum, Debate, and Panel Proposals</b>
1/13/2020	Final Conference Papers Due / Request for Conference Paper Sessions Due
<b>2/10/2020</b>	<b>Seminar, Forum, Workshop, Debate, Panel, and Extended Abstract Papers Due</b>
2/18/2020	Accept/Reject Notifications for Conference and Technical Papers
3/2/2020	Accept/Reject Notifications for Extended Abstracts
<b>3/16/2020</b>	<b>Accept/Reject Notifications for Seminar, Workshop, Forum, Debate, and Panel</b>
5/1/2020	Upload of presentation open for review
6/1/2020	Presentation submissions due

## 2. Potential Programs List

1. Plastic Fans in Ducted Air Distribution Systems
  - A. Conference / Track: Orlando Track 7
  - B. Speakers:
    1. Brian Rodgers (UL)
    2. John Taecker (UL)
  
2. System Curves (Title to be finalized)
  - A. Conference / Track: Orlando Track 7 (?)
  - B. Speakers:
    1. Michael Feuser
    2. TBD – System Effects?



3. Computer Aided Engineering for the Design of Fans & Fan Systems
  - A. Conference / Track: Orlando Track 7 (?)
  - B. Speakers:
    1. Chait Johar – The Rise of CAE in Turbomachinery (Fans)
    2. TBD - Geoff Sheard?
    3. TBD - CFD for application, possibly car park / jet fan?
  
4. Panel – Fan Efficiency metrics in codes and regulations around the world
  - A. Conference / Track: Orlando Track 7 (?)
  - B. Speakers:
    1. FEI - TBD
    2. FEG - Lee Buddrus?
    3. Chinese, European – Joe Brooks will see if he can find any speakers through AMCA Asia / AMCA Europe
    4. CFM/Watt (large diameter ceiling fans)
  
5. Possible co-sponsor with TC 5.10 - Exhaust Fans for Commercial Kitchens
  - A. Conference / Track: Orlando Track 7 (?)
  - B. Speakers:
    1. UL762 Fundamentals – Mark Skierkiwicz
    2. Upblast, Utility Set, Inline and High Velocity Discharge Pros/Cons – Terry McCabe
    3. Motor HP, Static Pressure Considerations – Brent Fullerton
  
6. Forum or Panel – Pros & Cons of component efficiency regulations
  
7. Forum – EC motors vs. induction motors

### 3. Other Notes

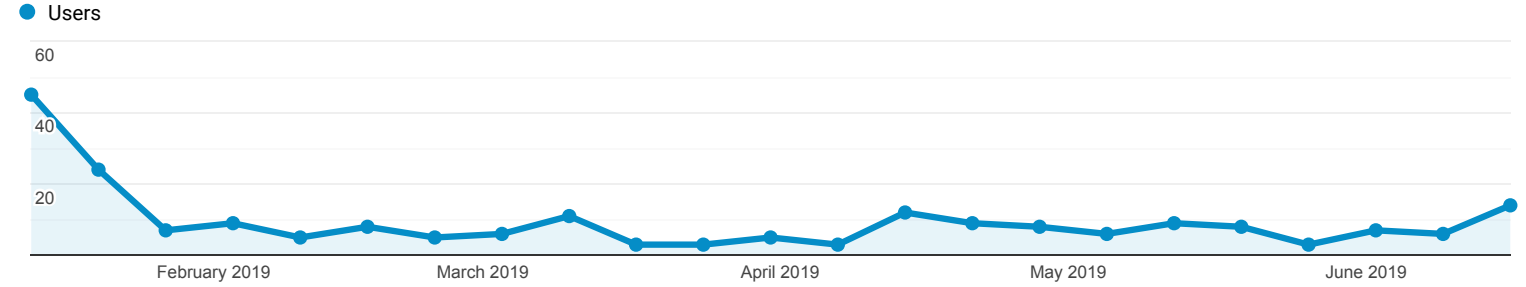
1. Please contact Jaime Yeh and Armin Hauer with any new program ideas or to volunteer as a speaker for any of the proposed programs.
2. If programs are rejected, will be considered for presenting during future TC 5.1 “Hot Topics” session.
3. May consider TC sponsored ALI course. Potential topics: FEI, System Effects.
  - a. Joe Brooks will look into possibility of using AMCA’s FEI course.

**Audience Overview**

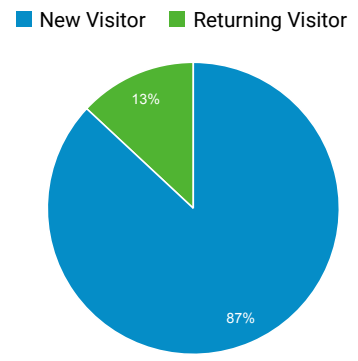
Jan 13, 2019 - Jun 21, 2019

All Users  
100.00% Users

**Overview**



<p>Users</p> <p><b>193</b></p>	<p>New Users</p> <p><b>180</b></p>	<p>Sessions</p> <p><b>236</b></p>
<p>Number of Sessions per User</p> <p><b>1.22</b></p>	<p>Pageviews</p> <p><b>412</b></p>	<p>Pages / Session</p> <p><b>1.75</b></p>
<p>Avg. Session Duration</p> <p><b>00:01:17</b></p>	<p>Bounce Rate</p> <p><b>67.37%</b></p>	



Country	Users	% Users
1. United States	137	70.98%
2. Canada	8	4.15%
3. China	6	3.11%
4. India	5	2.59%
5. United Arab Emirates	4	2.07%
6. Brazil	3	1.55%
7. Mexico	3	1.55%
8. Germany	2	1.04%
9. Egypt	2	1.04%
10. Finland	2	1.04%