




1

The slide has a dark blue background with a light blue grid pattern. On the left side, there is a vertical column of colorful 3D isometric shapes in shades of pink, green, blue, and orange. The text is centered on the right side of the slide.

Welcome!

Create/Join a group of 4 and discuss this question:

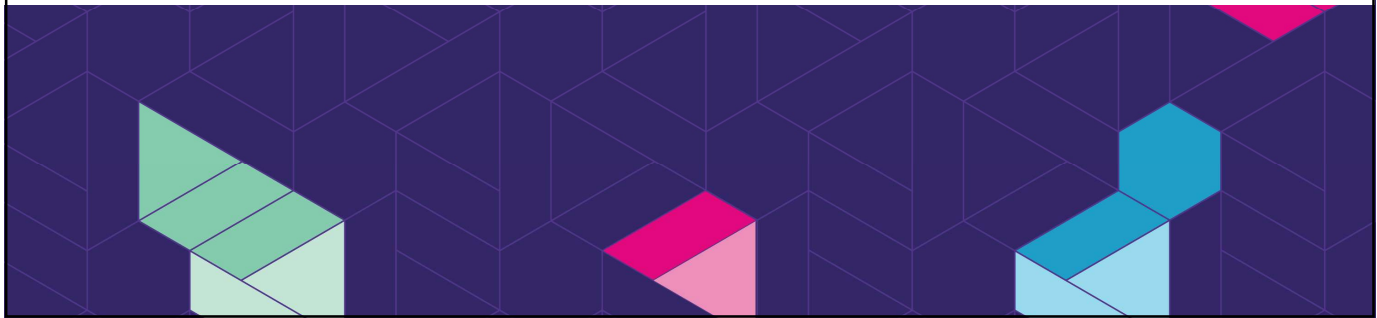
What challenges are you currently facing that you would like to help with today?



2



Measuring Intelligibility with STIPA



3



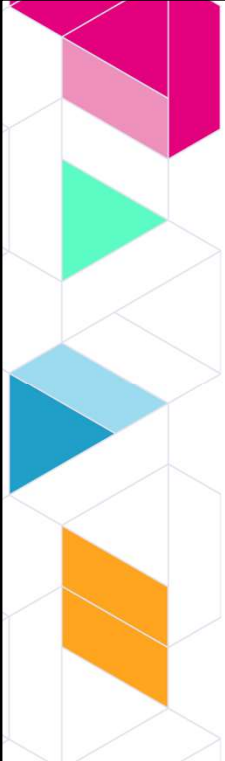
James Maltese
CTS-D, CTS-I, CQD, CQT
VP of Quality Standards
Level 3 Audiovisual



Jeremy Elsesser
CTS-D, CTS-I, CQD, CQT
President & CEO
Level 3 Audiovisual



infocomm

4

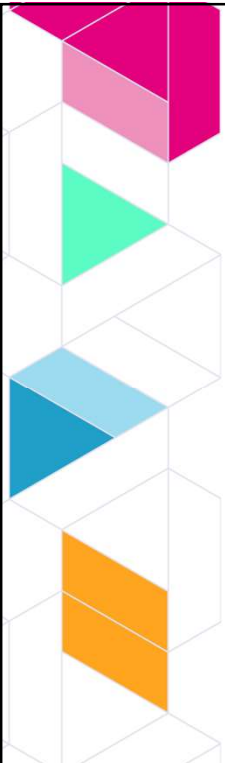


Speech is complex

- 100Hz – 10 kHz
- Modulates slowly between 0.63 – 12.5 Hz

5




A brief history of Intelligibility

- Harvard Sentences

**1965 Revised List of Phonetically Balanced Sentences
(Harvard Sentences)**

List 1

1. The birch canoe slid on the smooth planks.
2. Glue the sheet to the dark blue background.
3. It's easy to tell the depth of a well.
4. These days a chicken leg is a rare dish.
5. Rice is often served in round bowls.
6. The juice of lemons makes fine punch.
7. The box was thrown beside the parked truck.
8. The hogs were fed chopped corn and garbage.
9. Four hours of steady work faced us.
10. A large size in stockings is hard to sell.



6

A brief history of Intelligibility

- Harvard Sentences
- STI

| Octave Bands | Modulation Frequencies | | | | | | | | | | | | | |
|--------------|------------------------|--------|------|---------|--------|------|--------|---------|------|------|--------|------|-------|---------|
| | 0.63 Hz | 0.8 Hz | 1 Hz | 1.25 Hz | 1.6 Hz | 2 Hz | 2.5 Hz | 3.15 Hz | 4 Hz | 5 Hz | 6.3 Hz | 8 Hz | 10 Hz | 12.5 Hz |
| 125 Hz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 250 Hz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 500 Hz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 1 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 8 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |



7

A brief history of Intelligibility

- Harvard Sentences
- STI
- RASTI

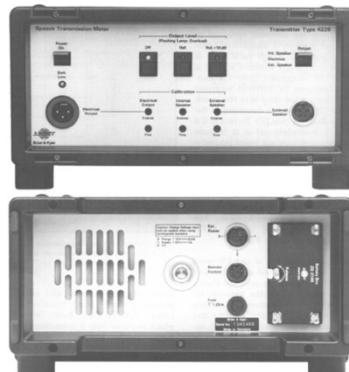


Fig. 1. Front and rear panels of the Speech Transmission Meter, Transmitter 4215. Note the loudspeaker on the left of the rear panel

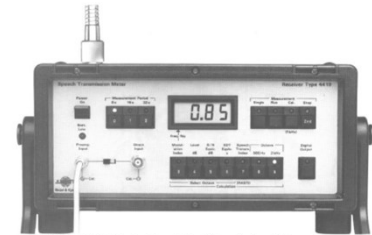
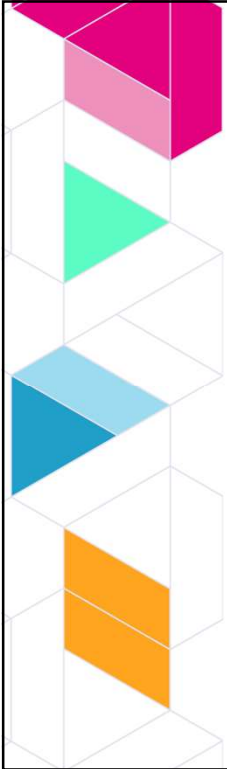


Fig. 4. Rear panel of the Speech Transmission Meter, Receiver 4419



8



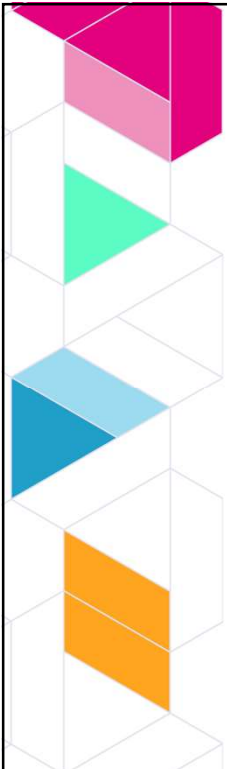
A brief history of Intelligibility

- Harvard Sentences
- STI
- RASTI
- STI-PA

| | | Modulation Frequencies | | | | | | | | | | | | | |
|--------------|--------|------------------------|--------|------|---------|--------|------|--------|---------|------|------|--------|------|-------|---------|
| | | 0.63 Hz | 0.8 Hz | 1 Hz | 1.25 Hz | 1.6 Hz | 2 Hz | 2.5 Hz | 3.15 Hz | 4 Hz | 5 Hz | 6.3 Hz | 8 Hz | 10 Hz | 12.5 Hz |
| Octave Bands | 125 Hz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 250 Hz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 500 Hz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 1 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 2 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 4 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 8 kHz | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 125 Hz | | | | | | | | | | | | | | |
| 250 Hz | | | ✓ | | | | | | | | ✓ | | | | |
| 500 Hz | ✓ | | | | | | | | ✓ | | | | | | |
| 1 kHz | | | | ✓ | | | | | | | ✓ | | | ✓ | |
| 2 kHz | | | | | ✓ | | | | | | | ✓ | | | |
| 4 kHz | | ✓ | | | | | | | ✓ | | | | | | |
| 8 kHz | | | | | | | | | | ✓ | | | | ✓ | |



9



A brief history of Intelligibility

- Harvard Sentences
- STI
- RASTI
- STI-PA

| | | | | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | .38 | .42 | .46 | .50 | .54 | .58 | .62 | .66 | .70 | .74 | |
| U | J | I | H | G | F | E | D | C | B | A | A+ |
| | .36 | .40 | .44 | .48 | .52 | .56 | .60 | .64 | .68 | .72 | .76 |

| Category | Nominal STI value | Type of message information | Examples of typical uses (for natural or reproduced voice) | Comment |
|----------|-------------------|------------------------------------|--|--|
| A+ | >0.76 | | Recording studios | Excellent intelligibility but rarely achievable in most environments |
| A | 0.74 | Complex messages, unfamiliar words | Theatres, speech auditoria, parliaments, courts, Assistive Hearing Systems (AHS) | High speech intelligibility |
| B | 0.7 | Complex messages, unfamiliar words | Theatres, speech auditoria, teleconferencing, parliaments, courts | High speech intelligibility |
| C | 0.66 | Complex messages, unfamiliar words | Lecture theatres, classrooms, concert halls | Good speech intelligibility |
| D | 0.62 | Complex messages, familiar context | Concert halls, modern churches | High quality PA systems |
| E | 0.58 | Complex messages, familiar context | PA systems in shopping malls, public buildings offices, VA systems, cathedrals | Good quality PA systems |
| F | 0.54 | Complex messages, familiar words | Shopping malls, public buildings offices, VA systems | Target value for VA systems |
| G | 0.5 | Simple messages, familiar words | VA and PA systems in difficult acoustic environments | Normal lower limit for VA systems |
| H | 0.46 | Simple messages, familiar context | VA and PA systems in very difficult spaces | |
| I | 0.42 | | | |
| J | 0.38 | | Not suitable for PA systems | |
| U | <0.36 | | Not suitable for PA systems | |

NOTE 1 These values should be regarded as minimum target values.
 NOTE 2 Perceived intelligibility relating to each category will also depend on the frequency response at each listening position.
 NOTE 3 The STI values refer to measured values in sample listening positions or as required by specific application standards.



10

Overview of Measurement Tools

- Source with STIPA Signal
 - Generator (NTi MR-PRO)
 - Speaker (NTi TalkBox)
- Calibrated Sound Meter with measurement microphone and STIPA Option installed (NTi XL2)



11

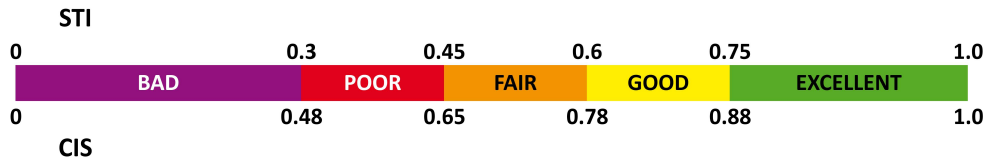
Overview of Measurement Process

1. Measure Background Noise (With Full Room)
 - Used for Ambient Noise Correction
2. Measure STI (with an empty Room – perhaps at night)
 - Using test plan for measurement positions
 - Minimum of 3 cycles per measurement position with deviation less than 0.03
3. Create STI Report



12

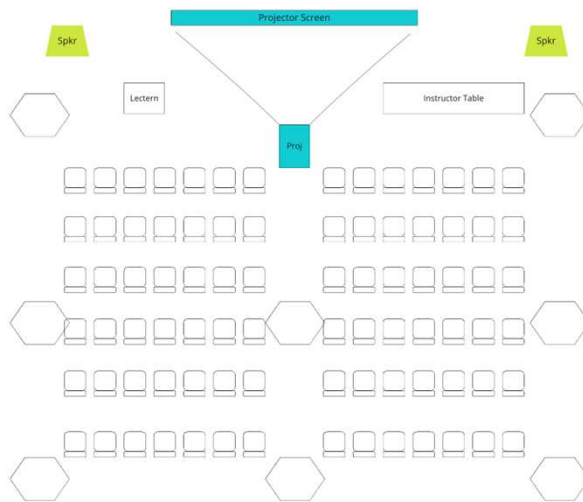
Overview of Measurement Process



13

On to the fun - Measuring the room!

STIPA Test Plan



14



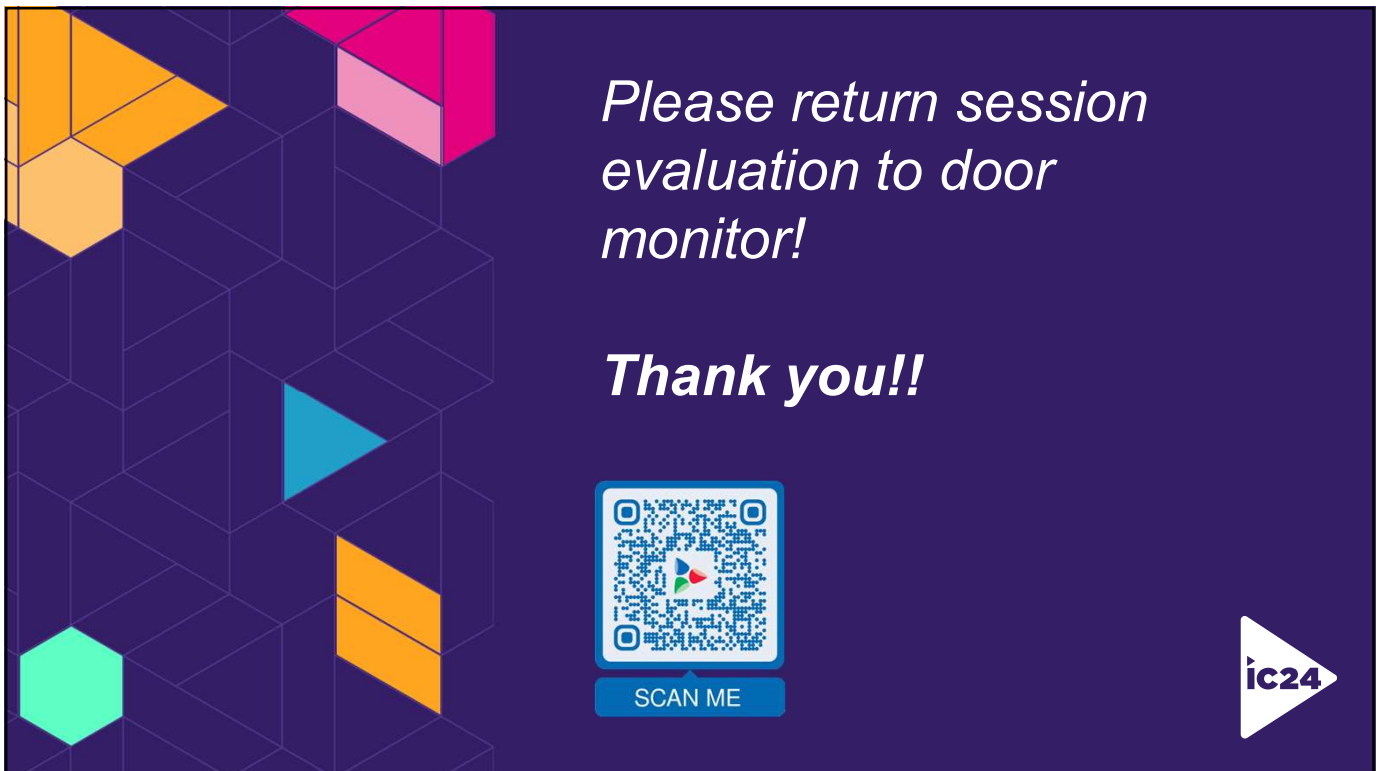
15



16



17



18